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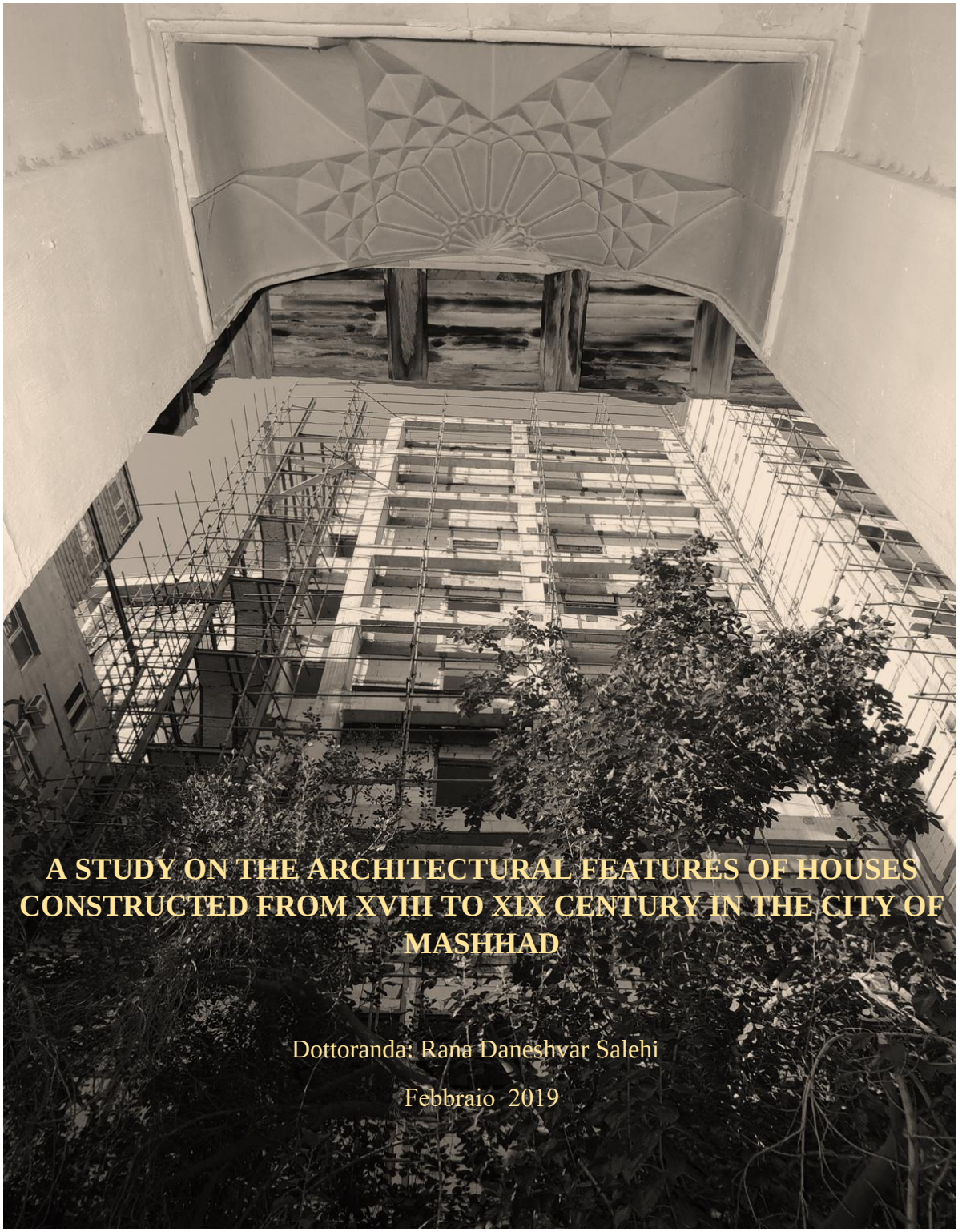

A STUDY ON THE ARCHITECTURAL FEATURES OF HOUSES CONSTRUCTED FROM XVIII TO XIX CENTURY IN THE CITY OF MASHHAD

Dottoranda: Rana Daneshvar Salehi

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I wish to remind everyone who assisted me in composing the dissertation with suggestions, criticisms, and observations. Nevertheless, I would like to point out that any inaccuracy is attributable to me only.

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Finally, I would like to thank the dearest persons to me: my friends, my fiancé, and my family, in particular, my father, to whom this dissertation is dedicated.

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Author's Note:

All drawings and photos, including maps, outlines, structural and decorative sketches, technical sheets, and specifically the image on the dissertation front cover, were prepared and designed by the author. Although the sources of visual documentation have been mentioned in footnotes in case achieved from written resources, archives or websites, it has also been applied to images. In Chapter 4, images concerning the restoration of Amiri House in traditional technique have been gained from the Cultural Heritage, Handcraft and Tourism Organization of Khorasan Archive. However, the images presented in the conservation sheets related to Amiri and Darugheh houses in the innovative method have been obtained from the archives of Bon Arch. Office and Arch. Govahi, except for the illustrations of sheet numbers 4.9, 4.13 and 4.14 that are captured by the author.

Abbreviations

GSI Geological Survey of Iran

GSINET Geological Survey of Iran North-East Territory

ICCROM International Centre for the Study of the Preservation and Restoration of Cultural Property

ICHO Iranian Cultural Heritage Organization

ICHHTO Iranian Cultural Heritage, Handcraft and Tourism Organization

ISESCO Islamic Educational, Scientific and Cultural Organization

KH-CHHTO The Cultural Heritage, Handcraft and Tourism Organization of Khorasan.

MET The Metropolitan Museum of Art

NECC North-Eastern Cartographic Center

UNESCO United Nations Educational, Scientific and Cultural Organization

Glossary

andaruni Family area
ark (arg) Persian, fortress
astaneh Threshold
badgir Wind catcher
biruni Guest zone
chaharbagh Four gardens
do-dari A room with two openings
eid Celebration
falake Square
gaz Traditional unit in Iranian Architecture made of 16 or 14 gerehs
gereh Node; traditional unit in Iranian Architecture is equal to 6.66 cm
girih strapwork
gol-e Sadbarg One-Hundred-Petalled-Rose
golmikh ornamental iron stud
gol-o-morgh A kind of pattern with flower and bird design
gonbad-e-kheshti Mud dome
hammam Bathhouse, communal bath
hashti Octagonal space (o entrance)
hasn Arabic, fort
hoz Ornamental pool
hoz-khaneh A room located on the ground floor with an ornamental pool at center
iwan Vast and semi-open area
iwancha Small iwan
kahghel Mixture of clay and straw
karawal-khana Guardhouse, garrison
karbandi A kind of arched covering pattern
katibeh Inscription
khan Ruler
khiaban Avenue
madrasa Islamic religious school
mahalla Neighborhood
mastaba Arabic, stone bench
matbakh Cooking room
orosi (ursi) Sash window
panj-dari A room with five openings
peimoon Module
qanat Persian aqueduct
qibla Direction of the Kaaba in Mecca
roun Persian house orientation
Sarab Headwater
sardabeh-khane A room on the basement with a domed roof
seh-dari A room with three openings
serai Small caravanserai
shah King
shahneshin Semi-closed space where the head of the family would rest or be seated
sharestan Urban road
taj Broken skyline element
talar Principal hall or room
tarma Balcony
waqf Religious endowments of a building or land for charitable purposes

INTRODUCTION

Mashhad is located in northeastern Iran and known as one of the most prominent religious cities in the Shia world. Religion, more than other factors such as geographical position and culture, has influenced the creation, expansion, and development of the city. The location of the burial place of Imam Alī al-Ridā, the 8th Imam of the Shi'ite, led the city to surpass its other nearby towns until it became one of the largest centers of Iran in the 16th century. With the official adoption of Shi'ism, Iranian kings have always shown a great deal of interest in the growth and development of Mashhad in order to reduce travels to Arabic religious centers and prevent the financial exploitation of these cities from pilgrimages. For this purpose, restoration and extension of the Holy Shrine have been undertaken as the primary innovative initiatives. Consequently, the first expansions of the city begin around the sanctuary within the ramparts with the formation of the neighborhoods that presented the typical form of an Islamic city comprising great public buildings, habitations, and alleys that would all lead to the sacred area. During the decades, the artistic taste of the governors brought various innovations to the town in terms of art, architecture and urban developments, to the extent that Mashhad became a city full of magnificent buildings like caravanserais, bazaars, mosques and grand mansions. In the 20th century, the city began extending out of the walls and turned into a modern city which gradually led to the loss of its historical identity and monuments. After the victory of the Islamic revolution in 1979, rulers have given more attention to this city. This attention towards Mashhad brought about the approval of Urban Master Plan in 1999 due to which historical residential quarters in Mashhad were destroyed and renovated to improve the context around the Holy Shrine Complex. During the last decades, countless traditional dwellings have been demolished by implementing renovation projects for historic centers. Almost all of the buildings in question presented great values that have never been recognized by society or the government.

The research that will be described in this thesis concerns a study on the architectural typology of three traditional ordinary dwellings in Mashhad. They are located in the most ancient districts of city which are the victims of modernity. According to the research conducted, the case studies are the most ancient type of houses in the town which show characteristics of habitations in the late 18th century. In comparison with the 19th century mansions, these kinds of houses are built on smaller proportions and are relatively more modest. Both types, glorious or ordinary, present the common principles and characteristics which would be observed in all Middle Eastern houses with a central courtyard. Nevertheless, the ordinary small houses are not considered as heritage regardless of their architectural and historical values. This neglect perhaps comes from the fact that houses belonging to the 18th century are not as large and decorated as mansions; however, great houses are the configuration of the minor houses in a developed form.

Up to now, the majority of researches or activities have been focused on the study of palaces or well-known houses located in cities like Isfahan and Yazd in most cases. Moreover, the studies conducted on traditional habitations of Mashhad included only the instances of the 19th century, all registered on National Heritage List. The lack of research on the ordinary traditional habitations have kept their values unknown to the community and state. As a result, due to not having been as heritage, they face serious challenges such as abandonment and destruction.

At the beginning of the research activity after identifying the case studies and observing their physical conditions, the aim was to document the characteristics of three houses; Nili, Tehrani and Bidari, which should be the most historical dwellings in Mashhad.

Through an in-depth research and focus on acquiring the required knowledge, their historical and architectural aspects will present a strong reason to register them as national heritage so they can be preserved. However, during the research, the first case of study, Nili House, was demolished by the owner in October 2018 and the third house, Bidari, was destructed by municipality in summer 2017 due to construction of a new urban avenue.

The current dissertation is an attempt to sensitize both general public and the state and encourage to participate in the protection of local patrimonies through presenting a description of how the traditional houses of Mashhad, that represent the historical and cultural identity of the city, disappear one after the other.

The research and activities carried out to achieve the objectives categorized in four separate chapters are as follows;

Chapter I concerns the city of Mashhad from the geo-historical point of view. Having described the origin of the city, the chapter presents its expansion under three different historical periods; Early Islamic Ages (1062-1381 AD), The Golden Era (1381-1925 AD), and the Eras of Modernization and Renovation (1925-present).

Chapter II initially intends to highlight the general characteristics of courtyard houses in Mashhad and to introduce the greatest examples of traditional habitations. The first section of this chapter concludes by presenting case studies and their physical features, proportions, geometry and changes, through various outlines, drawings and images. The end of the chapter deals with other traditional courtyard housing from Iran and Middle Eastern regions in order to provide a comparative study.

Chapter III discusses the stages of traditional construction methods that have been implemented with local materials. The second part touches on structural aspects of habitations with the goal of highlighting the materials characterization and understanding the damages they face by laboratory analysis. A group of remarkable ornamental elements will then be illustrated to prove that apart from the architectural importance these houses include decorative aspects that should be appreciated.

IV Chapter explores the constitution of Iranian laws, rules and legislation regarding the cultural heritage field before and after the Islamic Revolution (1907-present). This chapter defines the main reason for which the national patrimonies have been neglected and gradually disappeared. The second part of the chapter endeavors to present the relevant techniques which have already been undertaken to preserve two historical dwellings in Mashhad. The methods are divided in two sections; (i) *traditional*, in which the repair stages of a traditional habitation are presented, as in Amiri House; and (ii) *innovative*, where the recent conservation project of Amiri House and consolidation and restoration of Darugheh Mansion will be introduced. Each part will be concluded with advantages and disadvantages of undertaken measures on the architectural heritage.

In conclusion, the effective solutions have been proposed to prevent the destruction of houses and their revitalization. These proposals are not only applicable to protecting the only remaining house, Tehrani, but also to all heritage that are at risk of annihilation.

METHODOLOGY

The present research is the first in-depth study on the architectural and structural typology of small-scale houses built in Mashhad. The preliminary phase of the approach after having identified the case studies has been to access the archives of "The Cultural Heritage, Handcraft and Tourism Organization of Khorasan," (KH-CHHTO) to achieve outlines, images, papers and reports showing activities carried out on the same theme. However, there is not any kind of document that recognizes the case studies or this type of dwelling. Subsequently, the bibliographic research began from access to the national and local libraries such as "National Library of Iran," "Central Library of Astan Quds Razavi," "Golestan Palace Archive," "Roads and Urban Development Office of Khorasan Razavi," "The Cultural Heritage, Handcraft and Tourism Organization of Khorasan," and international libraries including "National Central Library of Rome" and "ICCROM Library." In addition, "Digital Nour Library," "Bibliothèque Nationale de France," "Met collection," and "JSTOR" are mainly used as online resources.

The recognition of the case studies was obtained from direct observation, inspection and interviews with owners and local people. The third phase is to accurately take into consideration the factors that define the architectural and structural typology of the houses, preparing the individual datasheets including maps, images, sketches drawn on sites, aerial photos and general descriptions on methods of construction, structure and materials. A measured survey has then been taken to provide outlines on physical condition of the houses and understanding what has been the original-earlier form of the them regardless of changes. In order to do that, walls and all structures are registered graphically

through plans, elevations and detailed drawings. The accuracy of the data is approximately 1 cm for plans and elevations and 5 mm for details. The measurements have first been obtained by a Total Station (Polar coordinate system); the second method has been the hand measurements taken with tape and hand-held laser meter that affords more accurate results.[1] Inspections also include the collection of eleven samples from the two abandoned houses to perform a laboratory analysis on the components of the materials. This stage consists of collecting the fallen fragments, together with surveying the structure and decorative elements through detailed illustrations and drawings. In order to reintroduce traditional methods of construction and geographic provenance of the construction materials, the author conducted interviews with experienced masons and specialist craftsmen who have been involved in restoration projects of public buildings or private houses in Mashhad.

Since all three houses exhibited various deteriorations associated with vulnerability of building, environmental impacts and human activities, the author collected a group of detailed documents concerning the methods of preservation. The implementation processes per measure regarding the traditional technique and modern method have been investigated step by step based on a direct observation. In some preservation cases, like dismantling and reassembling stages of architectural elements, the author was also directly involved.

[1] With regard to the Tehrani House, due to the existence of a high amount of stuff, it was difficult to find a suitable and sufficient space to install the photogrammetric means and acquire the required technical information. Moreover, as the owner was not fully willing and cooperative, a few parts of the building remained unmeasured.

CHAPTER 1

MASHHAD

1.1 Geographical and Topographical Position

Mashhad, as the capital of Razavi Khorasan province, is located in the northeast of Iran. The area of the city is about 270 km². It is 995 m (3,264 feet) above sea level in 59°35′ E. Longitude and 36°18′ N. Latitude with a population of 3,001,184 inhabitants (2016 census).

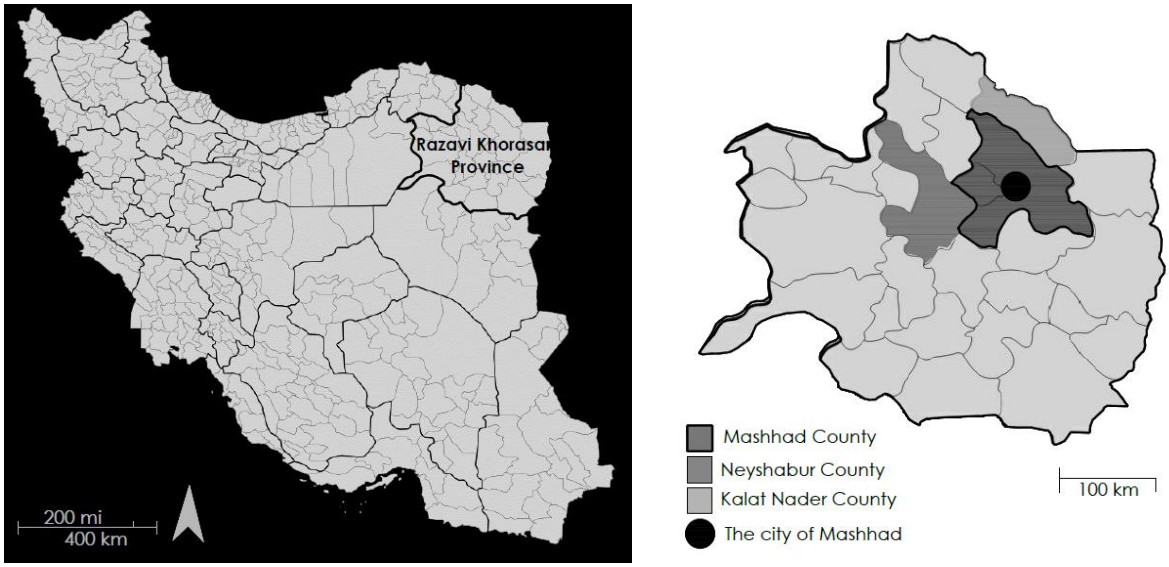


Figure 1.1 The location of Razavi Khorasan province in the northeast of Iran. (http://www.wikiwand.com/sh/Iranski_okruzi; accessed date: November 30, 2017), **Figure 1.2** The location of the city of Mashhad.

Table 1.1 The distance between Mashhad and other historical centers.

Historical center	Direction	Distances (km)
Neyshabur	West	127.4
Kalat Nader	East	158,7

Mashhad borders with Afghanistan and Turkmenistan which belonged to the Greater Khorasan before their separation from Persia (Iran) under the reign of Qajar.[2]

Mashhad plain, an area of 2,500 km² with a slop of 2% from west to southeast, lies about 6.44 km south of the bank of the Kashaf-Rud river. The river is located between the two mountain ranges of Binalud to the northwest of Mashhad running southeast, and Hezar Masjed to the north of Mashhad stretching in a northwest-southeast direction. The secondary branches of Kashaf-Rud led to creation

[2] Greater Khorasan was a historical region lying in the northeast of Persia, including part of Central Asia and Afghanistan, which loses Herat – part of current *Afghanistan* which was recognized as an independent country by Iran a few years later – to Great Britain in 1857 through the peace treaty. More, by the Akhal treaty, Turkmenistan officially separated from Persia in 1881, during the time of Nasir al-Din Shah Qajar, and became part of the Tsardom of Russia. (https://en.wikipedia.org/, Rezvani 2005, p.188)

of a green area around Mashhad, also those supplying waters required for irrigation of farmlands and the rural regions.[3]

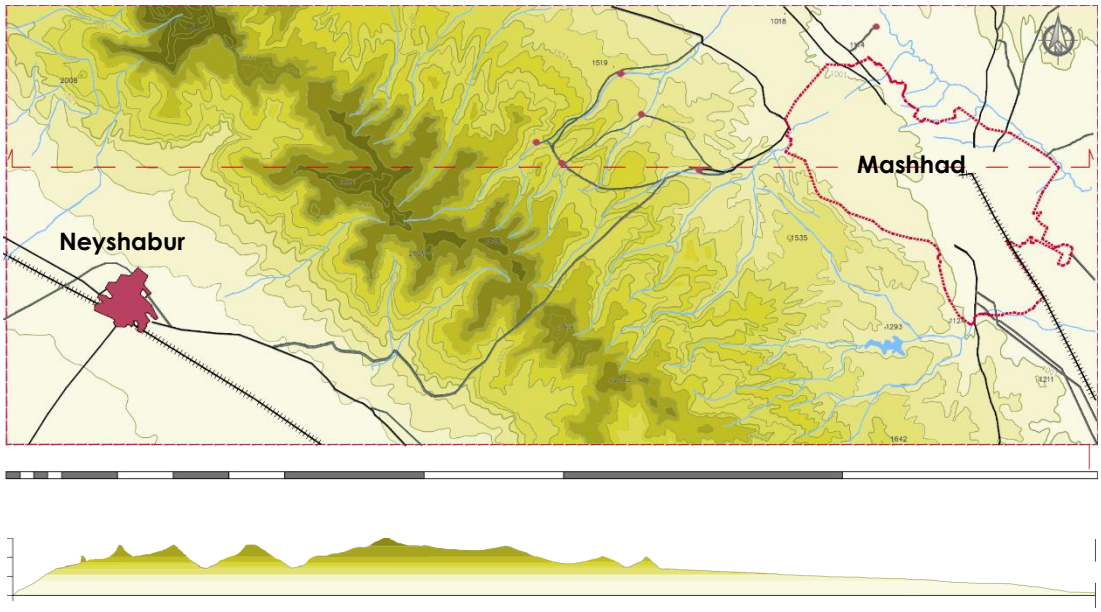


Figure 1.3 The topographic map of Mashhad and its position with respect to Binalud mountains and water sources like springs and rivers (1999). (Designed by the author according to the "Joint Operations Graphic")

In consequence, due to the proximity of the mountains, Mashhad has arid and semi-arid climate with cold winters and typically hot-dry summers. According to the statistics, winds often blow from the southeast to the northwest, but the direction of prevailing winds is south and southeast. The average of the wind speed is 1.5 m/s and they mainly blow during spring and summer seasons more than winter and autumn.[4]

The city has an annual precipitation of about 251.5 mm only. Mashhad has wetter months, from November to April and dry weather between June and September. The average annual temperature in Mashhad is about 21 °C and there is almost 14 °C difference between the average of highest temperature and the lowest one. The high temperature sometimes exceeds 43.8 °C while in winter it decreases to −28 °C. The average humidity of Mashhad is 54%, with its minimum and maximum being 37% in August and 75% in January, respectively. Lack of relative humidity in Mashhad has made warm summer weather more bearable, and the city has an average of two rainy months and the rest are semi-dry or dry annually. The annual medium amount of sunshine is 2,904 hours by the lowest amount in January and the highest in July.[5]

[3] Rezvani Alireza, *Mashhad, in Search of Identity*, Khorasan Razavi Housing and Urban Development Organization, 2005, p.30.
[4] Abedpour Mahdi. Khoshnevis, Hoda. Dehsorkh, Mahnaz, "Optimizing Energy Consumption by Considering the Climate and Orientation of the Building, Case Study; Mashhad," unpublished, (http://technical.mpo-skh.ir/images/amouzesh/BMS/Behinehsazi.pdf; accessed date: September 20, 2019).
[5] Rezvani 2005, p.32.

Despite the fact that Mashhad is located in the very fertile plain that includes water resources such as Kashaf-Rud river, the inhabitants have always had difficulty accessing this flow due to the reasonably long distance and an elevation difference. In addition, topographical conditions and the existence of southern mountains prevent water from being flown from Binalud valleys to Mashhad. From the beginning, all this led to the creation of an underground irrigation system called *qanat* (aqueduct), which originates from the west of the city and reaches the central plain inside.[6] Along with the urban development, several *qanats* were added to the earliest one, Sanabad, in order to supply the necessary water to each neighborhood. These old *qanats* are currently dried out and partially collapsed with their access wells having been filled by earth-fill soil. As a result, they have disappeared over the years.[7]

Figure 1.4 The presence of old *qanat* shafts outside northern Mashhad near the gateway and city's defensive wall, aerial photo (1956). (Archive of North-Eastern Cartographic Center)

[6] *Qanats* which are the traditional water piping systems invented by Iranians, consist of an underground tunnel connected to the surface by a series of shafts. Salehi, F., Ghafoori, M., Lashkaripour, Gh., Hafezi Moghadas N., "Evaluation of Qanat Collapse Hazard in Mashhad City," 1st International Applied Geological Congress, Department of Geology, Islamic Azad University - Mashad Branch, Iran, 26-28 April 2010, p.382. (http://conference.khuisf.ac.ir ; accessed date: 5 May, 2018)

[7] There are more than 100 *qanat* chains and 26,278 *qanat* shafts that were identified by using aerial photos. Most of their mother wells are located in the western and southwestern parts out of the city. However, due to the decline of groundwater level in Mashhad plain, many of these *qanats* are dry except Ghasem Abad *qanat* that recharges from mountains (Salehi, Ghafoori, Lashkaripour, Hafezi Moghadas, 2010, 382). In antiquity, the waters were brought from *qanats* to houses by asses and horses. There was also water-seller who carried waters with waterskins. When the city faced the loss of water because of increasing population in the 13th century, construction of a canal that carried water from the spring Cheshm-e-Gilas from 45 km to Mashhad provided the water required for *Ab-Anbars (water reservoirs)* for 400 years until the plumbing system came into existence (Rezvani 2005, p.36).

1.2 Geology and Seismicity

Mashhad city is laid on a Plain that comprises three distinct zones north which are: Kopeh Dagh basin on the north, the Suture Zone and the Binalud mountain range on the south.

In the geological period of the Paleozoic, north-eastern Iran was a part of the Paleotethys, and the Suture zone is the collision junction of the Iranian lithospheric plate in the south and the Turanian plate in the north that led to the closure of the Paleotethys.[8] Therefore, in some regions of the Mashhad, sediments like limestone, dolomite, schist, quartz and sandstone are found scatteredly which relate to the first geological period. However, the age of some of the rocks in Mashhad dates back to Cenozoic, the third geological era. Most of these rocks are volcanic and generally composed of drought sediments, most of which are sandstone and red conglomerate. However, no volcanic activity has been observed in Kopeh Dagh.[9]

The geological maps of Mashhad and Torqabeh-Shandiz countries present a variety of sediments can be identified in the geological information, including younger terraces and gravel fans (Qt2), conglomerate, reddish clay, sandstone, siltstone and gypsum (Qp1c) in the northern area of the city. Besides, the western and southwestern parts cover a vast expanse of Mashhad phyllite (FJm), turbidite, limestone (Pt) and intrusive rocks such as leucogranite (g2), porphyritic granite, and granodiorite (g1). On the opposite side, the eastern areas, in addition to the existence of clay, sandstone, and gypsum, we can recognize a considerable amount of limestone and light buff-gray dolomite (Jmz1) and also dark gray to green sandstone, shale, siltstone and cream limestone (Jk).[10]

Mashhad Plain was formed by tectonic movements of several parallel faults, which extend along the fields from the northwest to the southeast. The diversity and number of faults in Razavi Khorasan province are high. One of the most active faults in the area of Mashhad city is the Kashaf-Rud fault that has been active until the present time and caused many distractive earthquakes in this area.[11] According to the Seismic Hazard Map of Iran, one may suggest that Mashhad comes second in terms of cities being exposed to natural disasters.

[8] Didar Pezhvak, Emami, Mohammad. H., Emamian, Fatemeh, "Introduction to the geology and mineralogy of pegmatites located south of Mashhad; first report of Li-bearing pegmatites from Iran," *Journal of Tethys*, vol. 3, N. 2, (2015), pp. 123–136.

[9] The report of the geological map of Mashhad and Torqabeh-Shandiz countries, 2013.

[10] The geological map of Mashhad and Torqabeh-Shandiz countries prepared by GSI (Geological Survey of Iran) in 2013 by a scale of 1: 250,000 (GSINET archive).

[11] Hafezimoghadas Naser, *Seismic Microzonation of the Mashhad City*, Khorasan Razavi Housing and Urban Development Organization, Geological Survey of Iran North East Territory, 2008, p.32.

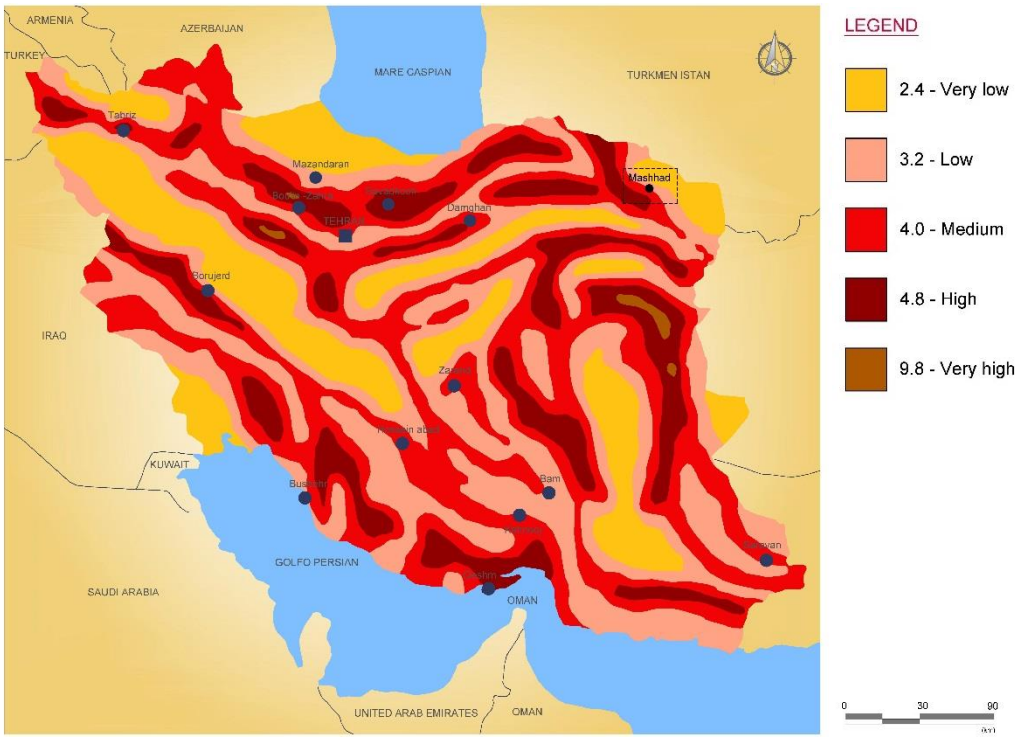


Figure 1.5 The seismic hazard map of Iran (1999). (Designed by the author according to the Seismic hazard map prepared by International Institute of Earthquake Engineering and Seismology)

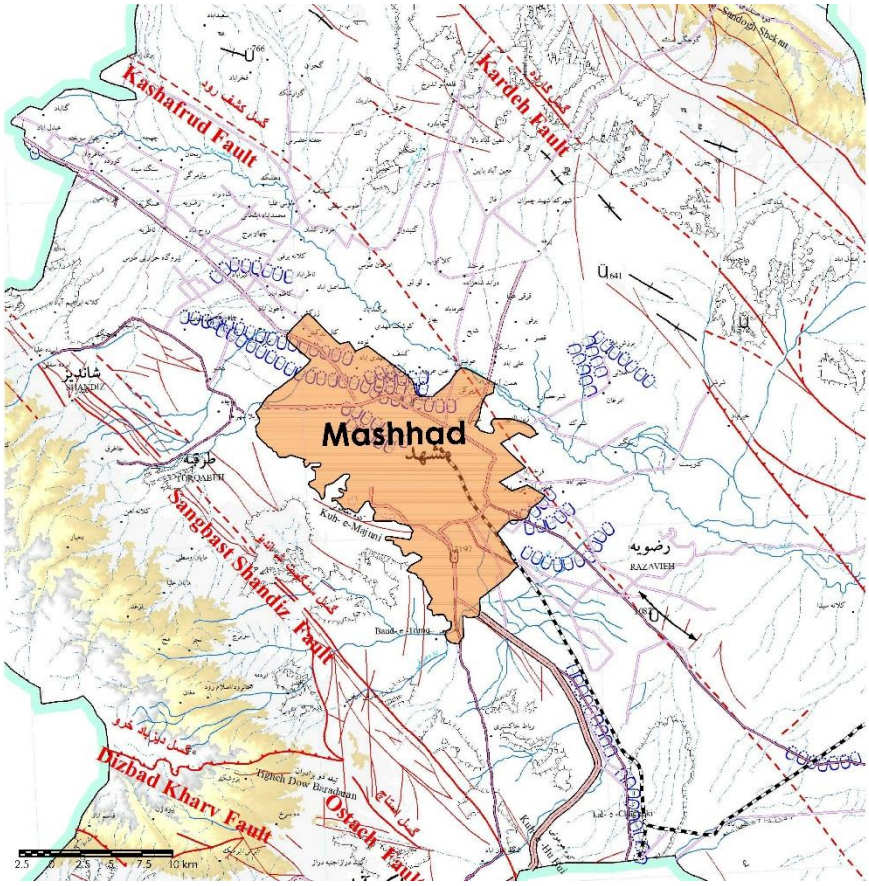


Figure 1.6 Mashhad active faults map and adjacent areas in scale of 1:250.000 (2013). (GSINET archive)

1.3 City origin and its historical geography

Talbi stated, "*In post-Kur'anic times, the term Mashhad comes from creating any sacred place, not necessarily with an associated construction. It could accurately signify a martyrium or be used for any building with religious aspects*."[12]

Before having been founded and raised in 1388-89 in the sense of a town, the city of Mashhad was a village named Sanabad in Tus district which was a burial place of the fifth Abbāsid Caliph, Harun al Rashid, (786-809 AD) and Shī'ite Imām, Alī al-Ridā (Reza).[13] Since the eleventh century, the history of Mashhad started first as a sacred place. It developed from a small village and turned into a religious city over time.[14]

The origin of Tus is undoubtedly prehistorical, and according to Professor Browne, *"*[..]*it is the Urva of the Vendidad, the eighth of the sixteen lands created by Ahura Mazda."* Tus is the very same Susia on the Silk Road that has been crossed by Alexander the Great in one of his journeys later on.[15]

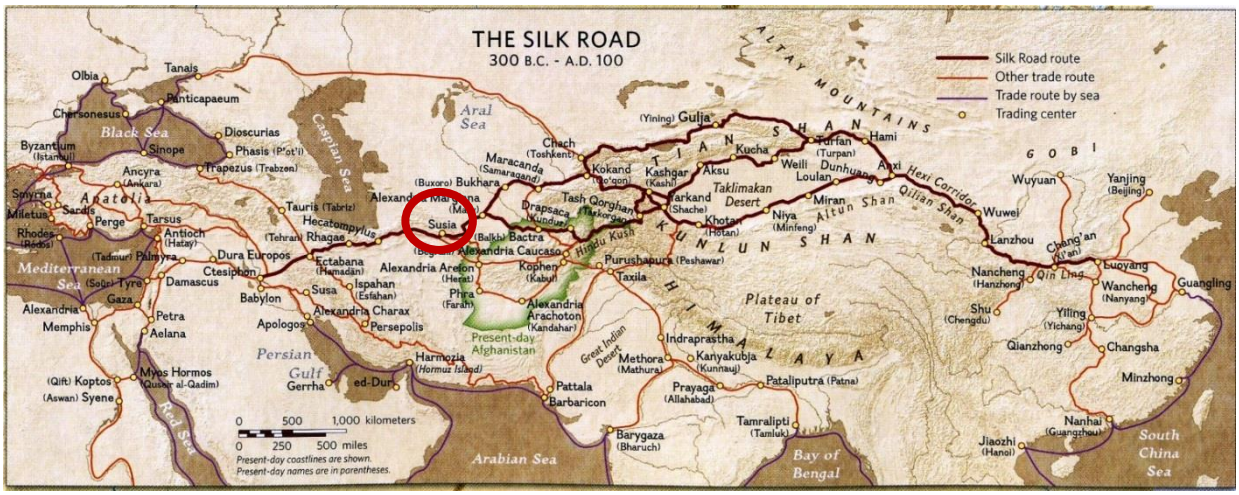


Figure 1.7 The location of Susia (Tus) on the ancient Silk Road (http://www.livius.org; accessed date: May 14, 2018)

[12] Talbi M., *The Encyclopaedia of Islam*, Leiden; E.J. Brill, VI, 1991, p.713.

[13] According to the Arab historians and geographers, Harun al Rashid had a journey to Khorasan for taking the land during the governing of Maamoon. Suddenly, he died of illness and was buried in Hamid ibn Qahtabe palace, the summer residence of Tus governors at Sanabad. About ten years later, Maamoon invited the eighth Shī'ite Imām, Alī al-Reza, to Khorasan in order to coronate the crown prince. Imam Reza was martyred (818 AD), and buried in the Mausoleum of caliph Harun al Rashid. However, this is only a common belief because Hamid ibn Qahtabe was passed ten years before Harun becoming Qaliph. Archaeological excavations around the shrine indicate that the burial place of Harun al Rashid and also Imam Reza is laid on a hill, which, perhaps, could be inside the Hamid ibn Qahtabe garden or adjacent to its palaces. Seyedi Mahdi, *History of Mashhad; From Beginning to Constitutional Revolution*, Tehran; Jami, 1994-1996, p.20.

[14] Mukaddasi, the Arab geographer, presented Mashhad as a place name in the last third of the 10th century. In his travel literature, Ibn Battuta has previously referred to Mashhad as Mashhad-i Tusi (Seyedi 1996, p.17).

[15] Sykes Percy. M., "Historical notes on Khurasan," *The Journal of the Royal Asiatic Society of Great Britain and Ireland*, (1910), p.1114 (JSTOR: https://www.jstor.org/stable/25189781; last accessed; December 22, 2015)

Tus was the political and royal capital of Khorasan in pre-Sāsānid times. Pourshariati informs us about the fact that "*Tausa has been the capital of Parthava under the Achamenid kings, Cyrus (559 BC-529 BC) and Cambyses (529 BC-522 BC). Also, Ferdowsi, the author of Shāh-Nāmeh or "Book of Kings," remarked Tus as the royal capital of Sāsānid in the east by describing Yazdgird's Letter to the Kanārang of Ṭūs. In spite of its apparent pre-Islamic importance, the city of Tus has lost its royal centrality during Sāsānids empire and onwards and, Neyshabur became the cultural and governmental center*."[16]

In the early Islamic centuries (1062-1381 AD), Tus would include Nukan and Tabaran as two separate capital towns where Nukan was the most central city. According to the testimony of the Arabic sources, Nukan was found only one Arabic mile (1.8-2 km) from the tomb of Imam Reza, and it must be the neighbor of the current Mashhad. It seems that Nukan might be the current Noghan – the ancient district of Mashhad that included a gate with the same name.[17]

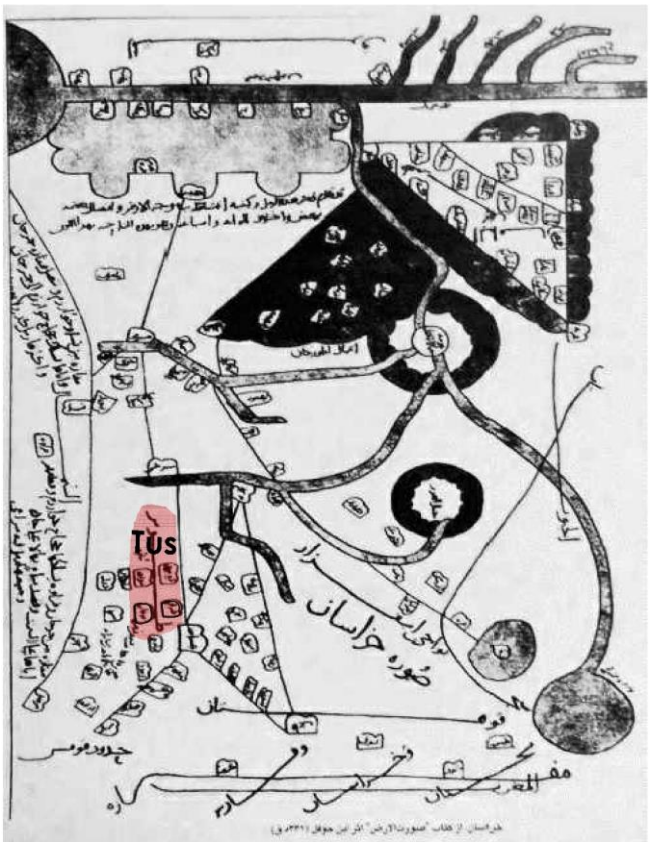


Figure 1.8 The map of Khorasan in "Ṣūrat al-'Arḍ," written by Ibn Hawqal. In this illustration, Tus district along with its towns has been marked with red, Nukan and Tabaran are located at the bottom if this area. (Morasa 2015)

[16] Pourshariati Parvaneh, "Iranian Tradition in Tus and the Arab Presence in Khurasan*," Ph.D. thesis*, Colombia University, 1996, pp.3-4

[17] Bosworth C.E., *The Encyclopaedia of Islam*, Leiden; E.J. Brill, VI, 1991, p.714. Ahmad al-Ya'qubi (died in 898 AD), a medieval historian, makes a mention of Nukan and refers to it as the great city of Tus in Kitab al-Buldan, Book of the Countries. "*A tribe from Arabs together with others inhabit in Tus; most of the inhabitants are Persians; the tomb of Rashid Amir al-Mu'minin is there and Reza Ali ibn Musa ibn Ja'far was martyred right there as well. The great city of Tus is called Nukan*." (Seyedi 1996, p.15)

Ibn Hawqal, the Arab writer and geographer, mentions in his famous work "Ṣūrat al-'Arḍ" (The Face of the Earth) (977 AD) that; "*The towns of Tus are Raikan, Tabaran, Nukan, and Toroghoz. The tomb of Ali al-Ridā, the son of Musa, is outside the city of Nukan adjacent to the grave of Rashid in a beautiful mausoleum in a village called Sanabad, which has a strong hasn, where pilgrims would pray*." *Hasn* in Arabic means fort, Seyedi, the historian, defines *hasn* as the first wall of Mashhad. Whereas taking the next sentence into consideration, we figure that *hasn* is defined as a wall that has surrounded the mausoleum and perhaps created a court. With burial of Imām Alī al-Reza at Sanabad, increased population of the Shiites and the lack of water, a large number of people moved to Tabaran and changed the centrality of Nukan.[18] At the end of the tenth century, Nukan and Sanabad continued to lose their previous importance because of a strong tendency of governors to Sunnis.[19] Although, only because of its position on the Silk Road, they could gradually surpass Tabaran, which was once a more crowded and populated city. Indeed, Mashhad has turned into a prominent pilgrimage and economic center since the 11th century, due to having been located on the Silk Routes.[20]

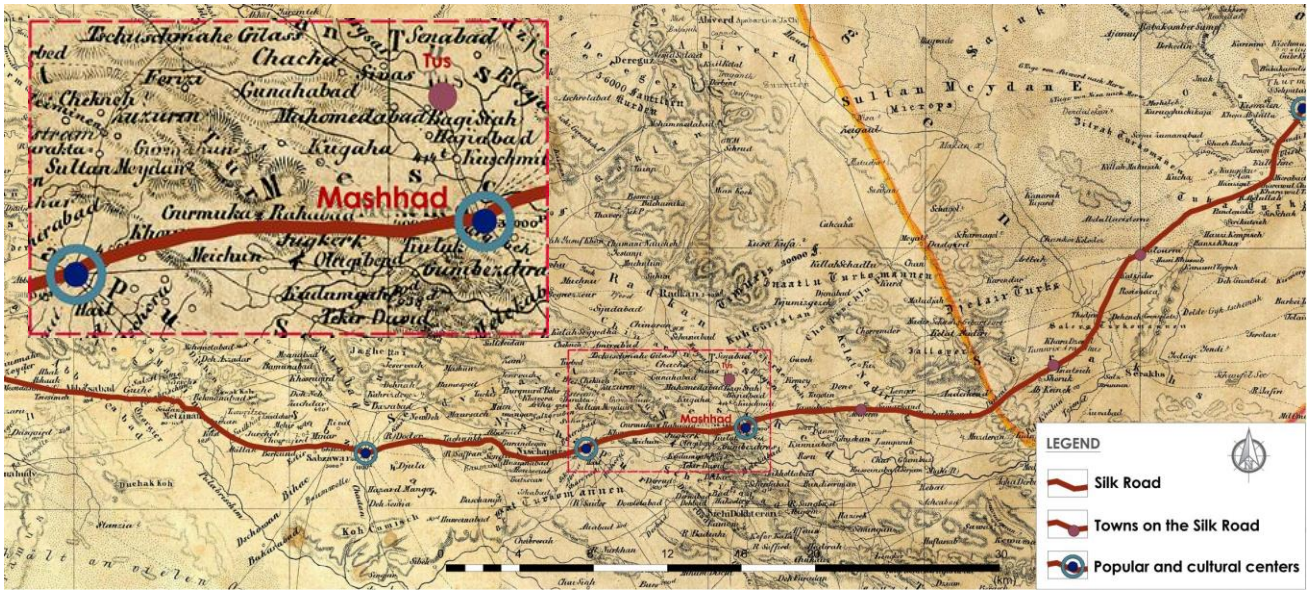


Figure 1.9 The position of Mashhad on Silk Route (1840). (Erdkunde, *Iranische welt*, Archive of Scientific Geography, Rome, p.147)

The first wall of Mashhad would have been constructed at the beginning of the 12th century because of a religious conflict. The religious differences between both towns, Nukan and Tabaran, caused a

[18] Al-Muqaddasi (945-991 AD) informs us about this immigration when he introduces Nukan "*as being smaller than Tabaran, with expanding and growing bazaars, where people are skilled in carving stone pots but who suffer from lack of water*." (Seyedi 1996, p.17)
[19] Seyedi 1996, p.21.
[20] Bakhtiari Mahmood, "The Ancient ways of Tus to Neyshabur and its Adjacent Monuments," *Athar Journal*, N.33-34, (2002), p.320.

fight which led to occupy Mashhad in 1116. After that, a defensive wall was built around the whole city between 1119 and 1124 which protected the mausoleum of Alī al-Reza from attacks.[21]

Although, Mashhad still would not be considered as a city, while even having a rampart and bazaar. In the first half of the XIV century, the name of Nukan still lies on the coins of the Ilkhans, but, in the later periods, Mashhad appears as a mint-town on the coinages.[22]

Some conditions were provided for further development of Mashhad when Mongols chose semi-ruined town of Tabaran as the center of the Khorasan government in 1239 and their rulers converted to Islam and Shia religion.[23]

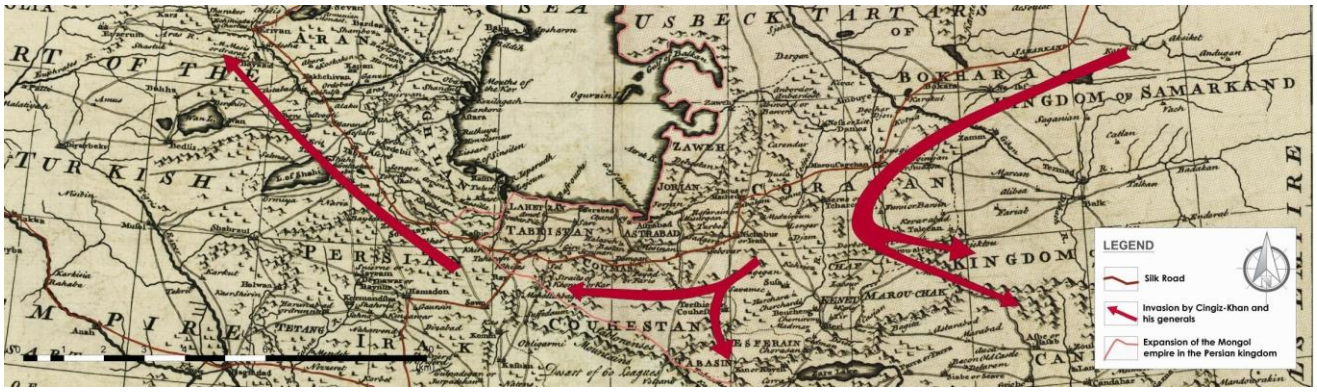


Figure 1.10 Cingiz Khan and his troops' invasion towards Khorasan and northern Persia (1747). (http://www.parstimes.com/geography/; accessed date: May 20, 2015)

1.3.1. The Golden Eras (1381-1925 AD)

After Khorasan was attacked by Timur in 1381, the inhabitants of Tabaran were killed and towers of their skulls were erected near the gate of the town. Whoever able to survive from these massacres emigrated to Mashhad – a new home to the people of Tus. After this invasion, Tabaran was never rebuilt and back to life; "[..] *no trace left of Tus*," however, Shahrukh, Timur's son, tried to reconstruct it after his accession to the throne of Khorasan.[24] Therefore, Mashhad gradually expanded through the development of the sanctuary together with the decline of Tus.

During the entire reign of Shahrukh (1404-1446 AD), much attention was paid to Mashhad and, after Herat, it was considered the second center of Timurid. The construction of religious buildings close to bazaar and the sanctuary under Shahrukh government was the first action taken to develop Mashhad.[25]

[21] Seyedi 1996, p.22.
[22] Ghasabian Mohammad. R., "Noghan's Story: Mashhad's Mother," *Khorasan Research*, N.1, (2000), p.47
[23] Rezvani 2005, p.151.
[24] Bosworth 1991, p.714.
[25] Farahbakhs Morteza, Hanachi Pirouz, Ghanaei Masomeh, "Typology of Historical Houses in the Old City Fabric of Mashhad, from the Early Qajar to the late Pahlavi I era," *Journal of Iranian Architecture Studies*, Vol.1, issue.12, (2018), p.100.

Shahrukh also ordered to create a garden and royal palace, called *Chaharbagh* where kings remained on their visits to the shrine.[26]

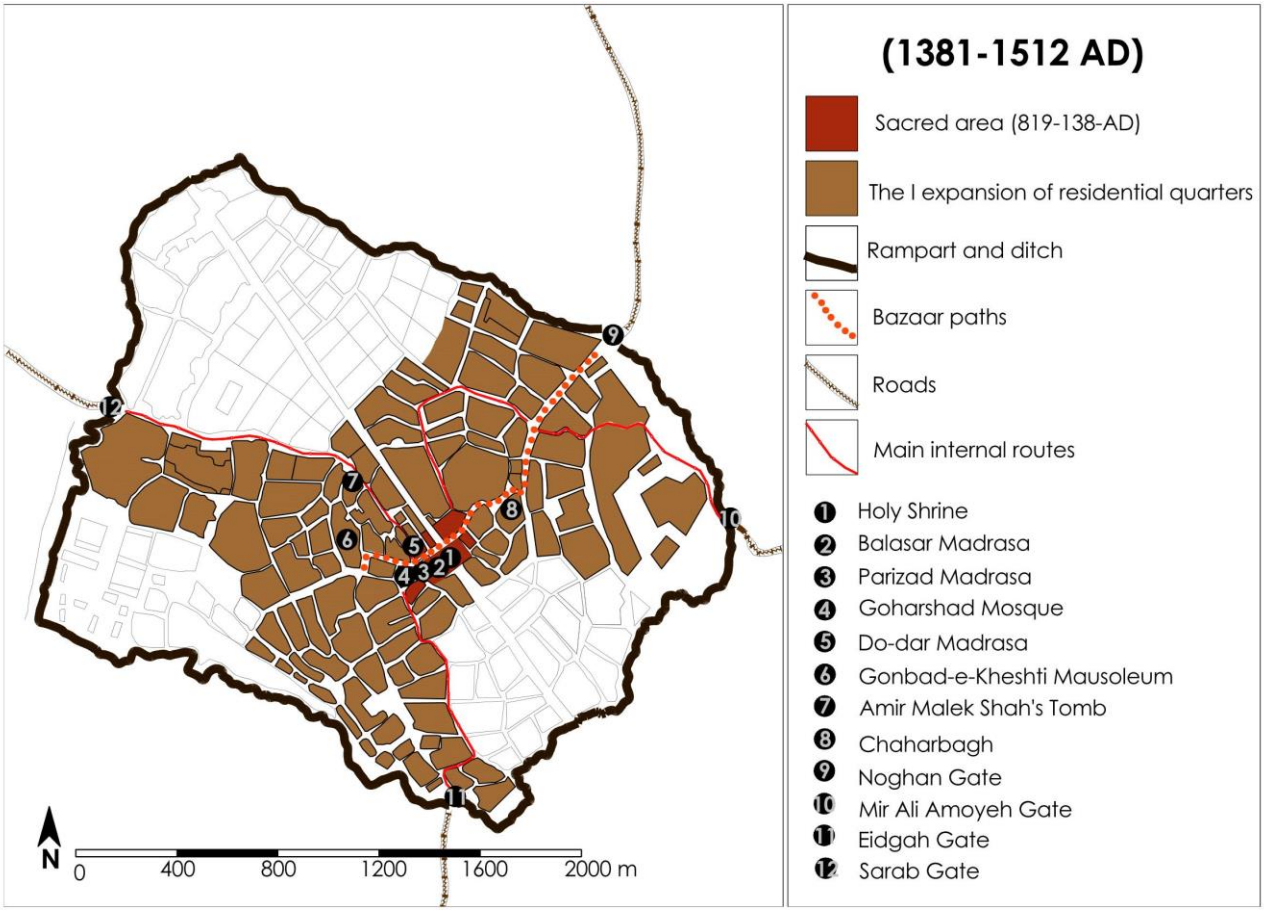


Figure 1.11 The expansion of residential quarters around the shrine and scared area along with monuments that constructed under Timurid empire. (Drawn by the author based on the first map of the city of 1858, Mehryar 2009, 143)

Table 1.2 The public monuments constructed under Timurid dynasty around the Holy Shrine and Bazaar.

Monument	District	Date of construction	Current state
Goharshad Mosque	Sacred area	1405–1418	Restored
Parizad Madrasa	Sacred area	1420	Restored
Dodar Madrasa	Sacred area	1440	Restored
Balasar Madrasa	Sacred area	-	Restored
Mud Dome	Noghan	1429	Restored & expanded
Amirshah Malek Tomb	Ancient bazaar	1451	Restored & expanded

[26] The word *Chaharbagh* is composed of *Chahar* and *Bagh* which mean "four gardens" altogether. Yusefi Golam. H., "Chaharbag-e Mashad," *Encyclopedia Iranica*, Vol.IV, fasc.6, p.626. (http://www.iranicaonline.org/articles/caharbag-e-mashad-term-applied-to-parks-or-gardens-and-garden-palaces; last accessed; December 01, 2016) .

Undoubtedly, the most valuable edifice of this age is Goharshad Mosque, built by the order of Goharshad Agha, Shahrukh's wife, which was connected to the shrine from one side and Bazaar from another. The portal of mosque presents the Samarkand style regarding depth and power.

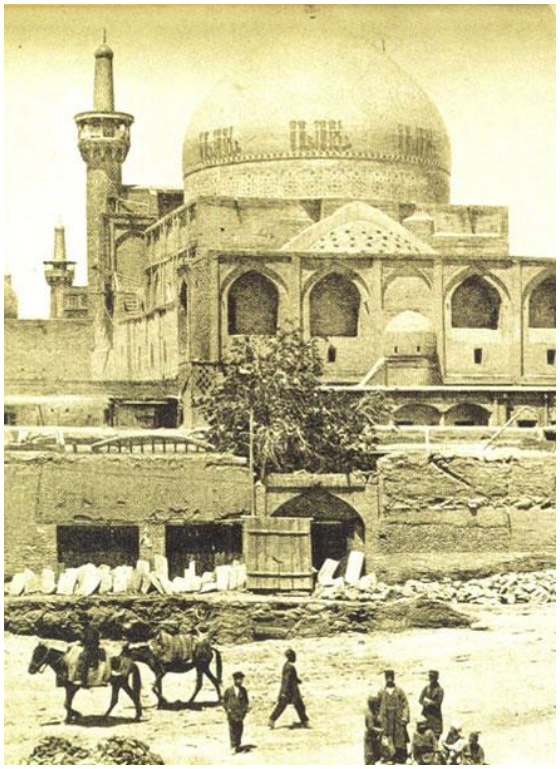


Figure 1.12 Goharshad Mosque, the photo above is probably taken in the time of Hazrat Square transformation in 1925. (https://photo.razavi.ir/Portal/Home/?Image; accessed date: May 19, 2018)

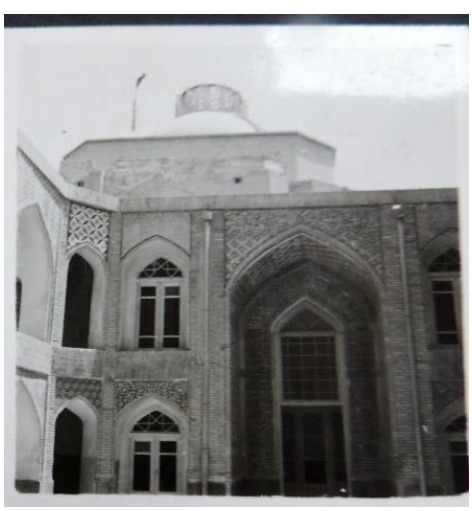
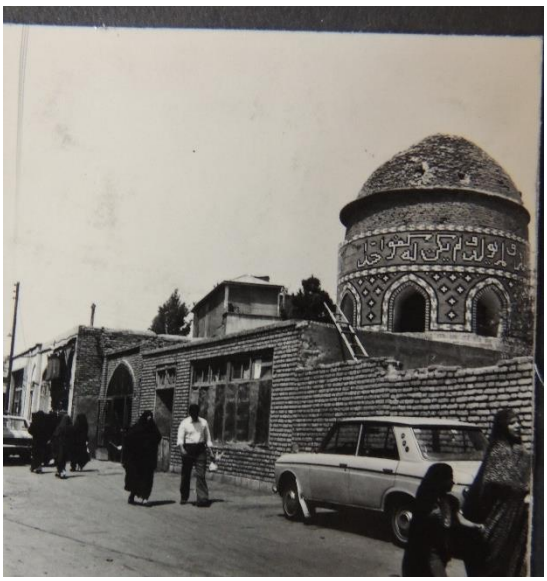


Figure 1.13 (1957) Parizad Madrasa erected in 1420 in connection to Goharshad Mosque with two stories and brick-tile ornaments. **Figure 1.14** (1970) Dodar Madrasas built in 1440 in front of Parizad Madrasa under Amir Seyed Khajeh's order. Today, both madrasas are a portion of the shrine complex. (KH-CHHTO archive)



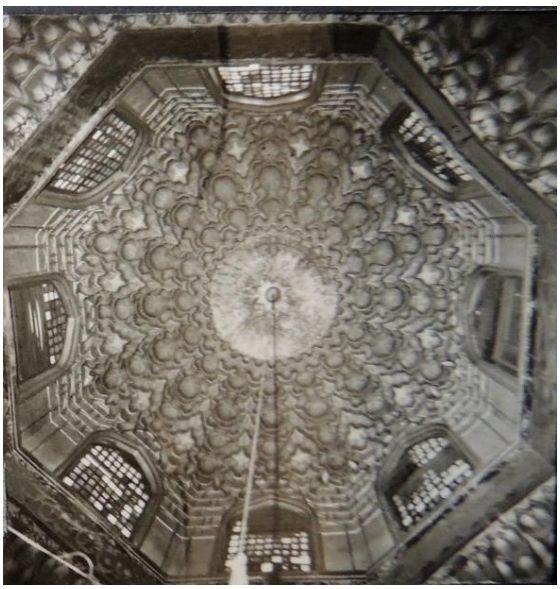


Figure 1.15 (1956) The mausoleum of Amir Soltan Ghias al-Din, also known as *gonbad-e-kheshti*, is situated in Noghan quarter. "gonbad-e-kheshti" means mud dome; the reason for this naming is its basic construction with mud brick and absence of any decorative elements like minaret. **Figure 1.16** (1956) The dome ceiling of building is decorated with stucco and arched covering patterns. (KH-CHHTO archive)

In that time, the old bazaar was situated between Noghan and Sarsogh quarters; moreover, Sarab and Eidgah were the other neighborhoods.[27]

Noghan Neighborhood at Mashhad is the remains of Nukan. Perhaps from the Mongol time onward when Mashhad has become more popular and well-known than Nukan, it has subsequently joined Mashhad. Noghan quarter has two gates; the first one with the same name in the north, and Mir Alimon or Mir Ali Amoyah gateway on the northeast. Sarab is the second earliest quarter of the city after Noghan that has been the location of traders' residence since the beginning owing to a higher altitude than other areas of the city. Its name means headwater in Persian (*sar:* head + *ab:* water) and it is derived from the Sanabad historical qanat. It was departed from this district leading to the shrine after having passed Charabagh quarter. In addition, there was a gate of the city's defensive wall with the same name near to qanat.[28] Eidgah neighborhood lies in the south of the city and it was extended along the city's defensive wall to the holy shrine.[29]

[27] Rezvani 2005, p.224,

[28] Mahvan Ahmad, *Mashhad Al-Reza History*, Mashhad; Mahvan, 2004, p.455.

[29]*Eid* is an Arabic word, and in the Dehkhoda Dictionary it is mentioned as a collection of habits, however, in the Moein Encyclopedic Dictionary, the meaning of *eid* is the celebration, the day of celebration and the day that is awesome and happy. The reason for naming this neighborhood as Eidgah is still unclear to this day. Nevertheless, some historical texts, including Muntakhab-ut-Tawarikh, believe that the inhabitants of this neighborhood after the survival of the massacre of Uzbegs, as a sign of Thanksgiving in 1598, have been held a celebration, since then the district has been called Eidgah (Rezvani 2005, p.108). Historians, Mahwan, and Seyyedi, associate the name to religious ceremonies such as *eid al-fitr* that have been held on the green and lush lands of the outskirts of the Eidgah Gate, which have joined the river and the historic village of Torogh (Mahvan 2004, p.457) (Seyedi 1996, p.318).

At the end of the Timurid period, because of increasing population of Mashhad, the city suffered from a shortage of water. To overcome this problem, in 1506, the water was brought from *cheshme-ye gilas* (*Gilas Fountain*), that was once used as a water source of Tus to Mashhad by a canal 45 miles long.[30] With establishing the Shiism in 1501 as the official religion of Persia, Mashhad became the capital of the province of Khorasan and started attracting the massive numbers of pilgrims. Shah Ismail I (1501-24 AD), considered himself as a descendent of Imam Reza, so he cared for the sacred cities within the Persian frontier, especially Mashhad, and it was since the time of this King when Mashhad has been enjoying the Shiites' benefits and attention.[31] In 1507, the town suffered considerably from the repeated raids of the Uzbegs. In order to protect Mashhad from invasion of Uzbegs, Shah Tahmasp I (1524-76 AD) ordered to erect stronger walls and bastions in order to build a safer and unattackable city.[32] The city rampart was made of clay and mud, about 9 kilometers long, and its height was between 6 and 7.5 meters. The number of towers has been estimated from 140 to 300, with four gates called Noghan, Sarab, Eidgah and Mir Ali Amoyeh.[33]

As Etemad al-Saltanah acknowledged, Shah Tahmaseb was a very radical Shiite. His frequent trips to Mashhad were meant to develop it, and after him, other Safavid Sultans had given the same attention to Mashhad.[34] Like Karbala and Najaf, Mashhad continually received more attention, and Shah Abbas I (1558-1629 AD) was among the people who have been working hard to build the religious monuments and their ornaments in this area.[35] To encourage the Shiites to pilgrim Imam Reza, he began to repair the shrine and turn Mashhad into a vast and magnificent city by creating the main avenue and public edifices. He made some improvements such as extending the courtyard of the shrine, putting up a pair of jeweled doors and the golden dome which was ornamented with a coating of gilded tiles under Shah Tahmasb period.[36] Another construction work from Shah Abbas I was the principal street termed *khiyaban* (Avenue*)*, which separated the whole town into two approximately equal halves. There were only two streets in Persia before, one in Herat and the other one in Qazvin. With the authority of the Safavid dynasty, the third Persian avenue was formed three

[30] Seyedi 1996, p.94.
[31] Etemad al-Saltanah Mohammad. H., *Matla al-shams*, Tehran: Pishgam, 1984, p.13.
[32]The first Safavid king, Shah Ismail (1501-24 AD), reached to Khorasan for suppressing Uzbegs in 1510, and succeeded in capturing Mashhad after killing Shibak Khan, the founder of the Uzbeg dynasty and ten thousand people from his armies. But, with the death of Shah Ismail and the succession of his eleven-year-old son, Tahmasb, the invasion of Uzbegs began and the town was occupied once again until 1528 when Shah Tahmasp I (1524-76 AD) succeeded in retaking it (Rezvani 2005, p.153).
[33] Rezvani 2005, p.227.
[34] Etemad al-Saltanah 1984, p.15.
[35] Due to the intense competition between the Safavid Shiite government and the Sunni Ottoman Empire, as well as the avoidance of financing the cities of Mecca and Medina, Shah Abbas I (1558-1629 AD) ordered that the ordinary people are not allowed to leave the country for pilgrimage unless they pay a huge payment to the king. For this reason, the great Shah Abbas walked the whole way on foot from Isfahan to Mashhad, which lasted twenty-eight days, and stayed in the city for three months (Rezvani 2005, p.154).
[36] Seyedi 1996, pp.166-167.

kilometers, from northwest to southeast of Mashhad, with about 3 km length. The upper half of the khiyaban is about 2 km long and is known as *bala khiyaban* (Upper Avenue), and the second half located in the southeastern section is called *paein khiyaban* (Lower Avenue).[37]

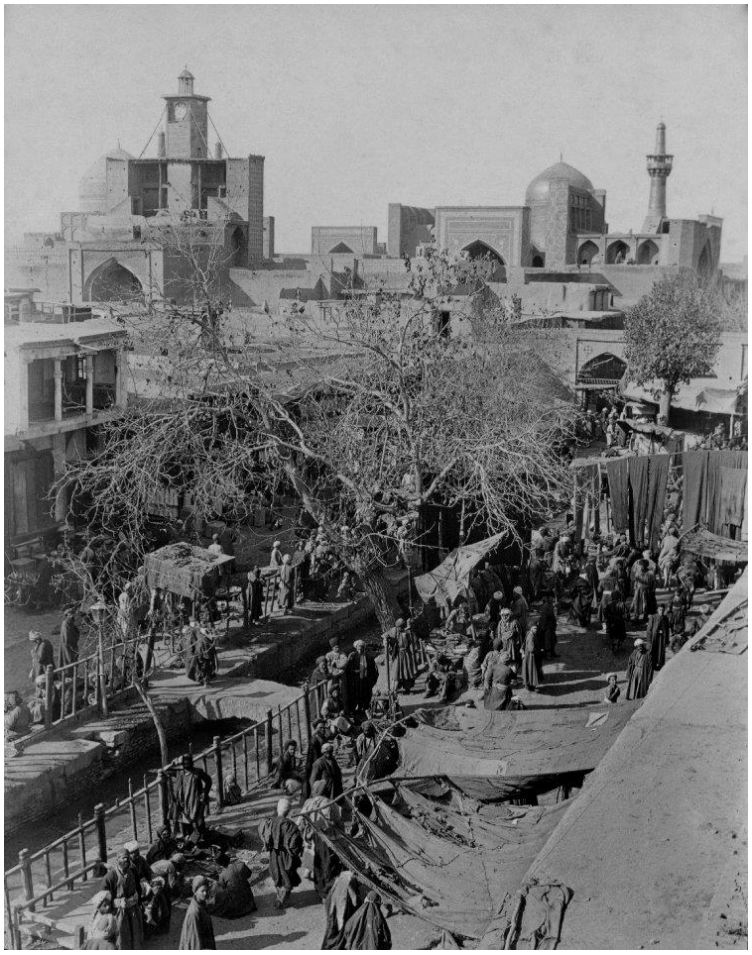


Figure 1.17 Paein khiyaban or Lower Avenue and its central canal, in the 19th century. (http://www.britishmuseum.org/research/collectiononline/collection_object_details; accessed date: November 3, 2016)

In the core of khiyaban, there was a stone canal, nine feet wide and 5 feet deep, in which the water was coming from the ceshme-ye gilas. The construction of this canal played a considerable role in the growth of the population of Mashhad, and inhabitants used it for drinking, washing and religious ablutions, although it would be dirty and marshy after entering the town.[38]

Shah Abbas raised two gates of the same name on the top and bottom of khiyaban. Since then, caravans and passengers arriving in Mashhad after leaving the caravanserai of Torogh and crossing a short distance of 9 km entered the city from one of the two gates, Paein khiyaban or Eidgah.[39]

[37] Rezvani 2005, p.227.
[38] Bosworth 1991, pp.715-716.
[39] Bakhtiari 2002, p.334.

By expanding the shrine complex and increasing the new constructions around it, especially in the lower half of the street.[40]

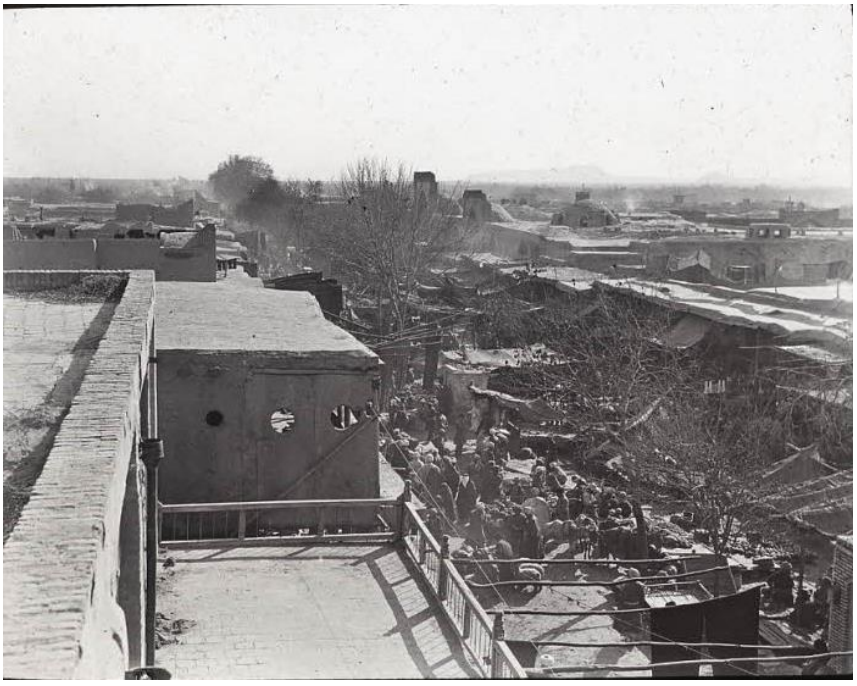


Figure 1.18 (1878) View of paein khiyaban and the public buildings on the left side of avenue. (http://www.britishmuseum.org/research/collectiononline/collection_object_details; accessed date: November 3, 2016)

The Ancient Bazaar was divided into two portions, flanking two sides of the sanctuary courtyard. During this era, Mashhad included every type of public buildings such as mosque, madrasa and *hammam*, which are the principal components of an Islamic city.[41]

Table 1.3 The well-known public masterpieces erected by the order of Shah Abbas I, who transformed the town to a remarkable pilgrimage city.

Building	District	Date of Construction	Current State
Shah Abbas moseque	Bala Khiyaban	1623	Demolished
Green dome tomb	ark (arg)	1627-46	Restored
Pir Palandouz mausoleum	Paein Khiyaban	1577	Restored & expanded
Shah Mosque-Hammam	Ancient bazaar	1618	Museum of Anthropology

[40] The paein khiyaban district was found between the Eidgah and Noghan regions. According to the popular belief, this district was formed before the upper half of the avenue (bala khiyaban). In fact, the natives raised their homes as they *paien pa* literally "below the feet" of Imam Reza to respect him. Etemad al-Saltanah introduced it as one of the largest district with a substantial portion of residential and historical-well-known public buildings as madrasa, hammams, caravanserais and a bast "the place of asylum" near to the shrine or sacred area and filled all day with the many pilgrims and caravans of camels and asses. He also stated that there were some narrow passages covered with wooden beams and straw matting and inhabitants of paein khiyaban made their houses top of that structure (Etemad al-Saltanah 1984, p. 43).
[41] Rezvani 2005, p.230.

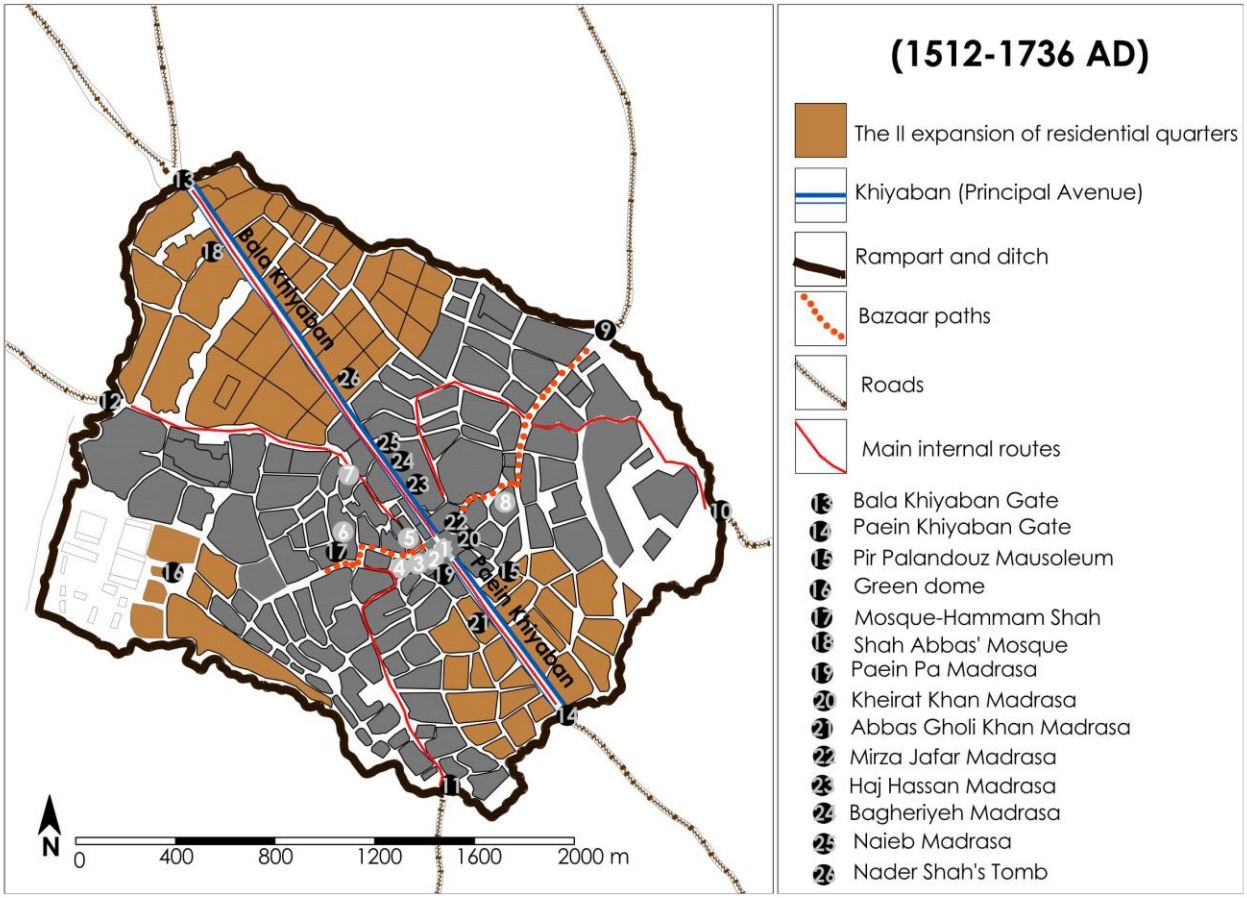


Figure 1.19 The second expansion of residential quarters and well-known monuments built in the Safavid era. (Drawn by the author based on the first map of the city of 1858, Mehryar 2009, 143)

Figure 1.20 (1858) The mosque and bathhouse are known as *Masjid-hammam Shah*. Before expansion and becoming a mosque, the complex belonged to the Amirshah Malek tomb, built in 1451. Shah Abbas I added elements and architectural components to the persisting mausoleum to create a worship place. However, hammam in Sarsogh neighborhood is one of the endowments to the Holy Shrine in Safavid period. (https://commons.wikimedia.org/wiki/Category:Historical_photographs_of_Iran_by_Luigi_Pesce; accessed date: November 18, 2016) **Figure 1.21** (2018) Currently bathhouse is converted to the Museum of Anthropology.


Figure 1.22 (1970) Abbas Gholi Khan's madrasa endowed to social-religious affairs with massive revenues in baths, shops, and lands in 1667. (KH-CHHTO archive)

Table 1.4 The madrasas or seminaries that belong to the Safavid empire.

Madrasa	District	Date of Construction	Current State
Kheirat Khan	Sacred area	1647	Demolished
Mirza Jafar	Sacred area	1649	Restored
Fazel Khan	Sacred area	1647	Demolished
Abbas Gholi Khan	Paein Khiyaban	1667	Restored
Bagheriyeh	Bala Khiyaban	1672	Demolished
Haj Hasan	Bala Khiyaban	1674	Demolished
Paien pa	Sacred area	1675	Demolished
Navab	Bala Khiyaban	1675	Demolished
Naieb	Bala Khiyaban	1675	Demolished

In 1673, during the reign of Shah Soleiman Safavid, a devastating earthquake caused severe damage to the city's buildings, including the shrine's Golden Dome, the Parizad Madrasa, and Torogh Mosalla.[42]

[42] In this regard, Chardin writes, "[..]*Two couriers, one after the other, arrived in the capital (Isfahan) with terrifying news. They both announced that two-thirds of Mashhad, the capital of Khorasan, half of the city of Neyshabur, and another town near the city were destroyed by the earthquake. What was most unfortunate to all Muslims was the damage to the shrine in Mashhad, where the tomb of Imam Reza is located* [..]. *The dome wholly collapsed by the earthquake, but according to what they say, the other parts of the building are left intact*." Chardin Jean, *Travels to Persia*, translate in Persian; Yaghmai E, Tehran; Tus, 1996. (http://ketabnak.com/book/; accessed date: May 05, 2017)

Figure 1.23 The illustration presents Torogh Mosalla after the earthquake of 1673, drawn by Mac Gregor. He described that as a ruined arch of considerable architectural beauty which seems to have been the entrance to a tomb or mosque. (MacGregor 1879, 277)

In the early of 18th century, Khorasan was captured by Afghans tribes and Safavid authorities in Mashhad were unable to control the situation when Nadir Afshar succeeded to reconquer Mashhad. Indeed, this occupation played an essential role in the formation of Nadir's early career who became a founder of Afsharid dynasty.[43]

Under Afsharid dynasty (1736-47 AD) Mashhad, the capital from about 1740 until 1796, was the most important trading center in eastern Iran, apart from Herat, which was later lost to the Afghans and the early Qajars made great efforts to retain the control over it. Through the reign of Nadir Shah, coins were stricken with his name by local mints, so as to increase the commercial boom.[44]

The trading boom of Mashhad and its importance under Afsharid is evident from a description of the city given in 1741 by an English merchant, George Thompson. He writes, "[..] *it is a place of great trade, caravans are employed daily from Bokhara, Balkh, Badakhshan, Kandahar, and India, as well as from all parts of the Persia. The bazaars and marketplaces are large and well built. They are filled with precious merchandise and frequented by significant numbers of people from different nations. There are computed about ninety caravanserais, all in good repair*." [45]

Unlike Safavid rulers, he ordered the freedom of religion and Sunni-Shiite alliance. For this reason and the political centrality of Mashhad, a lot of people immigrated to this city and resided in the whole

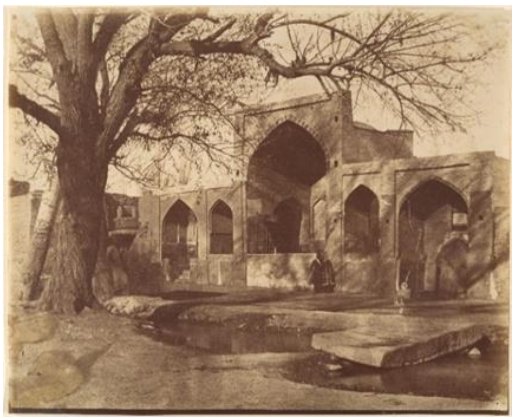
[43] It would not be so easy to approach Mashhad, but in the conquest process of the city, Malik Mahmud Afghan's Commander-in-Chief, arranged with Nadir to open a gate for the army's entrance. This gate is said to be Mir Ali Amoyeh gateway, which later had mostly been closed because Mashhad inhabitants believed that opening this gate at any time will lead to sedition in the city (Seyedi 1996, p.226). Since turned from military to the ruler, Nadir was a powerful and influential person in government. Following the conclusion of a treaty between Shah Tahmasp II and the Ottoman government in January 1732, the Georgian and Armenian regions, which had previously been returned to Iran by Nadir, were again assigned to the Turks. So, Nadir used this treaty as an excuse and deposed Shah, proposing that the Shah's infant son should be raised to the throne as Abbas III. Tahmasp was sent to Khorasan and Nadir suggested himself as the only man universally obeyed for governing the land (Avery Peter, "Nadir Shah and the Afsharid legacy," *Cambridge University Press*, 2008; vol. VII, 2008, p.30).

[44] Rezvani 2005, p.155.

[45] Gopal, Surendra, *Born to trade: Indian business communities in medieval and early modern Eurasia*, Abingdon: Routledge, 2016 (https://books.google.it/books; accessed date: May 19, 2018).

living quarters, the number of inhabited houses increased to 60,000, and the growing population caused the water shortage.[46]

Therefore, the first action made to settle this problem was changing the water source of Mashhad inhabitation from *Gilas Fountain* to the creek of Golestan village. Passing from Chaharbagh quarter where it was the accommodation of the governors and shrine court, the water would flow to the paein khiaban canal which used to be dry.[47] There was not a significant development of art and architecture due to Nadir's obsession with the conquest of new territories. Nevertheless, he restored Mashhad to a high degree of magnificence together with the reconstructions made in the shrine under his orders.[48] Moreover, he built two mausoleums for himself and his son in Chaharbagh, which began to collapse after his death. At the end of Qajar, a new construction has been erected on the preexisting structures, which again went into decay because of humidity and abandonment.[49]



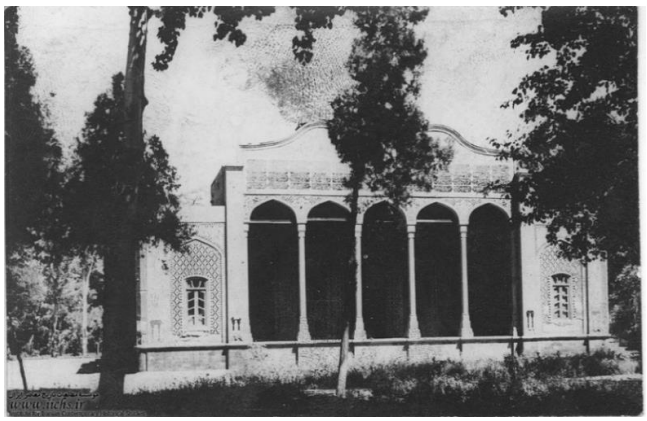


Figure 1.24 (1840-60s) Nadir Shah's first mausoleum in bala khiyaban known as the *Golden iwan* of Ali Shir Nawai. (https://www.metmuseum.org/art/collection; accessed date: May 19, 2018) **Figure 1.25** The Qajar construction erected on the ruined Nadir's mausoleum. (http://www.iichs.org; accessed date: May 19, 2018)

After the fall of Nadir Shah, Mashhad has not been a critical city and its population has stopped growing. In this era, the Persian empire lost its unity due to civil wars among the claims of the throne. During this period of independence, Mashhad was strongly influenced by the Afghans for almost half

[46] Etemad al-Saltanah 1984, p.38.
[47] Seyedi 1996, p.235.
[48] Nadir demanded to set the white slate which was shifted from Herat to Mashhad be placed on the *hoz* (pond) of the courtyard *sahne Atiq* already erected by Shah Abbas. Then, a *kushk* (pavilion) was raised on top of that with a gold ceiling. This structure is commonly known as a *saghakhaneh* created as a water source for the pilgrims. He also restored the Golden iwan and minarets of the sanctuary court (Seyedi 1996, p.234).
[49] Fraser and Burnes, English diplomats, commented on these constructions as "*Mushed contains the ruins of the tombs, Nadir Shah, and his son Reza Koolee Meerza: they are situated about halfway between the mausoleum of Imam Reza and the northwestern gate (bala khiyaban). They were chiefly built of fine brick and both are now heaps of rubbish*." (Fraser 1825, 462) "*Nadir Shah's grave, now dishonored and marked by the ruins of the edifice that once sheltered it from the elements, is one of the most interesting sights to a traveler... The fountains and flowers encircling it have disappeared."* Burnes Alexander, *Travels into Bokhara*, London: John Murry, Albemarle Street, 1834, p.205. (https://books.google.it/books/about/Travels_Into_Bokhara; accessed date: September 28, 2018)

a century, up to 1796, in which Agha Muhammad Khan Qajar marched on Mashhad and ended the separation of Khorasan from the rest of Persia.[50] During kingdom of Agha Muhammad Khan (1794-97 AD) nothing appears to have been done in this period to restore this sacred place to its former splendor. On the contrary, he rarely visited the city only to fight some rebellion to reunite Khorasan with the entire Persia and end its independence.

However, his successor Fath Ali Shah, ordered some repairs that were required and presented to the shrine with a door, plated with gold, and inlaid with jewels. During his reign (1797-1834 AD), Mashhad contained a population of 50,000 people and was one of the most prominent urban centers in Iran.[51] The nineteenth century coincided with the presence of politicians, soldiers, and travelers from foreign countries, who provide a detailed description of Mashhad and its places in their writings.

Table 1.5 The name of foreign or national travelers who travelled to Mashhad from the Afsharid dynasty to Qajar time

Travellers	Date of Journey
John Malcolm	1808
Mac Gregor	1875
Fraser	1821-22
Conolly	1830
Sir. Alexander Burnez	1832
Ferrier	1845
Khanikoff	1858
Eastwick	1862

James Fraser, who visited the holy city of Mashhad in 1821-22, describes Imam's shrine, *ark* (the citadel), residential and public buildings correctly. He noticed the particularity of the mausoleum of Imam Reza more than other mosques or religious buildings and referred to Goharshad Mosque as an eye-catching monument which was in large ruined.

Fraser writes, "*There are thirty-two mahallas or divisions in Mashhad, each of which governed by its kadhodah or magistrate. The majority of these various spaces are totally empty of either inhabitants or houses or occupied by gardens or orchards. The whole of the city appears from the first to have*

[50] Rezvani 2005, p.156.

[51] Following the treaties of Golestan and Turkmenchay, which concluded in 1813 and 1828, respectively, to the establishment of peace between Russia and Iran, some parts of northern Iran, including the Caucasus, Armenia and the eastern states of Georgia, were taken from the Iranian government and entrusted to Tsarist Russia. Thus, many of their inhabitants migrated to Mashhad. (Seyedi 1996, p.290) The most notable urban centers were those which enjoyed a continuous history going back to at least the beginning of the Islamic age; Isfahan (Iran's largest city in the early nineteenth century), Shiraz, Mashhad, Kashan, and Kermanshah were probably all of the similar sizes. Only Tehran, selected by Qajar's founder as his capital, was a relatively recent foundation where villages had laid. (Hambly. Gavin R.G., "The Traditional Iranian City in the Qajar Period," *Cambridge University Press*, 2008*;* vol. VII, 2008, p.543)

been built of sun-dried bricks or mud, and even the houses that entirely remain in a miserably poor condition." [52]

He also considered the existence of numerous small mosques in all quarters, sixteen madrasas and twenty-five caravanserais. This Englishman visited *ark*, the governor's seat, and remarked its location among masses of ruins in the highest point of the town, connected to the defensive wall with an entrance gate and a surrounding ditch.[53] The palace is characterized by its fortification shape composing of four great towers at each corner together with smaller bastions. In front of the ark, there was an open space named the *maydan-i toop* (cannon place) which was used for military parades only, and no other building would be allowed to be built there. Like most eastern fortifications, it was protected by various winding passages, so that the assailants are exposed to a destructive fire on their arrival through narrow defiles, from where they can not resist.[54]

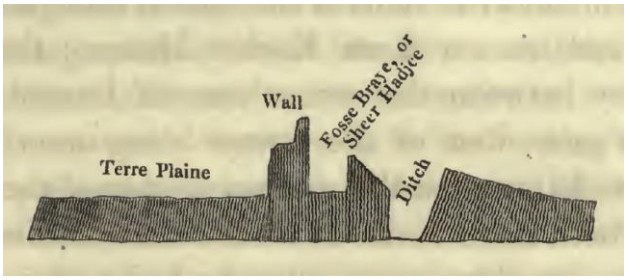


Figure 1.26 The style of ark fortification drawn by Fraser in 1821-22. (Fraser 1825, 461)

Figure 1.27 The governor's palace (ark) in the 19th century. (Gohavi's personal archive)

[52] Fraser James. B., *Narrative of a journey into Khorasan, in the years 1821 and 1822*, London; A. & R. Spottiswoode, 1825, p.443. (Retrieved from https://www.archive.org/details/narrativeofjourn00frasuoft, accessed date: November 16, 2016)

[53] There are different theories on the construction date of *ark*; some writings considered the erection of ark under Afghan leaders, while other sources indicated that citadel began to exist by Abbas Mirza in 1825 but completed in 1876 (Bosworth 1991, p.716). Whereas, Fraser should have been in Mashhad in 1821-22 AD when ark already existed; therefore, it can be considered that ark was formed during Afghans' occupation and repaired and developed in 1825.

[54] Fraser 1825, pp.460-463.

In addition, Fraser mentions that the unique bazaar should also be taken into consideration. It was extending from the southwest corner of Goharshad Mosque for five or six hundred yards (457 to 548 m) in one end, while in another it becomes a narrow lane leading to the palace (ark).

Another English diplomat who attended Mashhad in 1832 is Sir Alexander Burnes. He represents the city in this way, "*Mashhad has no buildings but the shrine. The pilgrim who visits this shrine must first walk through the bazaar and cross the chain. There are some colleges (madrasas) and a large and unfinished caravanserai, with twenty-one others in different parts of the city."*[55]

From 1813, local rulers and *khans* rebelled against the central government in Khorasan and also occupied Mashhad, and it was not until 1831-2 that the crown prince, Abbas Mirza, finally forced the obedience of all the most turbulent chiefs. More, in 1839, there occurred a revolt against the Jews living in Mashhad, which led to killing 200 of them and plundering of their homes.[56]

These revolutions led to the construction of thirty towers of *karawal khana* in all districts of the town.[57]

Figure 1.28 (1858-9) The view of the Holy Shrine, Goharshad Mosque and some of the habitations. Photo courtesy of Antonio-Giannuzzi from *paein khiyaban* to the East. (Torabi 2004)

[55] Burnes 1834, p.205

[56]Seyedi 1996, 318. The 600 survivors forcedly converted to Islam to preserve their lives and, apparently became Muslims and known as Jadid-al-Islam (new to Islam) and later *jadida* (the new ones). They are Jews who moved from Nakhchivan to Mashhad during the reign of Nader Shah (1848-1896 AD) and resided in the Jews lane, located in Eidgah, that was later renamed to Jadida lane. (Rezvani 2005, p.109)

[57] In Dehkhoda Dictionary, it has two meanings: a high place outside the city, where the soldiers guarded day and night, and when they saw the enemy's army from afar, they would inform the inhabitants by lighting a fire or making them aware by another means; and, a room where the captors of a military unit are based, the guardhouse. Each karawal khana in Mashhad had a small porch and a room behind it. Guns, usually loaded, are arranged in front of it, and when a European passenger crosses the entrance, a soldier takes one of the guns (Seyedi 1996, p.331)

The first map of the city was prepared by someone from the Russian staff under the leadership of Khanikoff accompanied by two topographers, Petrov and Djarinov, in 1858.[58] "*Mashhad expanded in the form of a rectangular and its big axis is oriented from west towards east. The sacred area was surrounded by a wall and contained a square space with the burial place of Imam Reza at the core. The richest bazaars, caravanserais, hammams and madrasas were placed in the sacred area. A quite wide canal runs in the middle of the principal venue. ark laid on the northwestern part with a large square in front which occupies an isolated position*."[59]

In 1875, MacGregor, the English Colonel, designed the second plan of the city and presented Mashhad and its monuments accurately through his writings and sketches. He reported the irregular outline plan of Mashhad with a mud rampart which was falling into disrepair. The perimeter of the town was 10,539 yards (11,525 km), and the most extended length along the khiyaban (the main avenue) was 2,780 yards (3 km), while the broadest breadth was about 2,000 yards (1,828 km).[60]

Since Tabaran was the most critical center of Tus district before Mashhad became a city, it seems that perhaps the town of Tabaran and its outline was a model for raising Mashhad and its expansion. By comparison of MacGregor's map with Sykes' sketch of Tabaran, it is interesting to note that both boundary walls were formed by an irregular circle and more or less the same location of gates. Furthermore, *ark-e-Tus*, the citadel, is situated on the northwest close to the wall as the governor palace position at Mashhad.

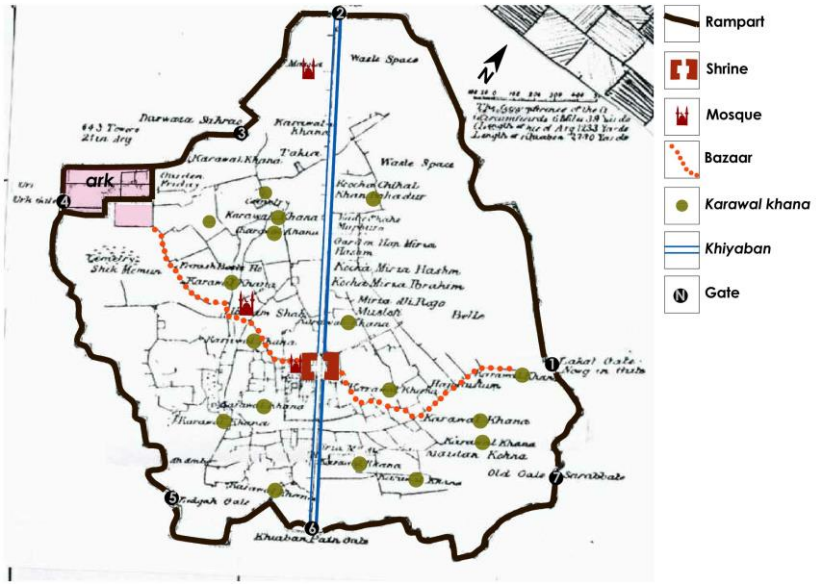


Figure 1.29 The identification of buildings, avenue, gateways and guardhouse on the 1875 city's plan. (MacGregor 1879, 277).

[58] Mehryar Mohammad, *Pictorial Documents of Iranian Cities in the Qajar Period*, Shahid Beheshti University, 2009, p. 46.
[59] Khanikoff Nicolas, *Khanikoff travelogue*, Mashhad; Asten-e- Ghods Razavi, 1997, pp.110-111.
[60] MacGregor C.M., *Narrative of a journey through the province of Khorassan in 1875*, London: W. H. Allen & Co, 1879, p. 284. (Retrieved from https://books.google.it/books, accessed date: November 28, 2016)

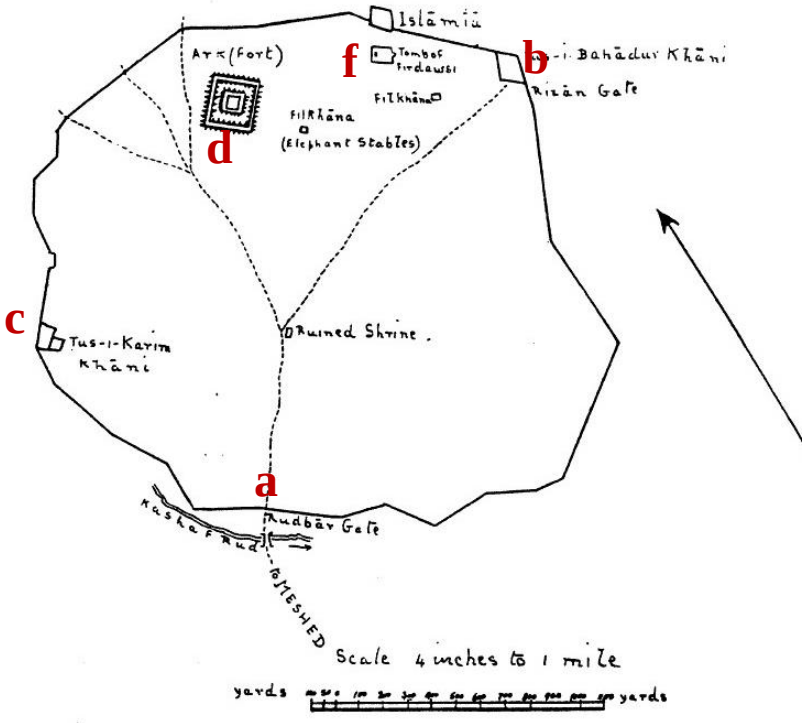


Figure 1.30 Sykes has represented *ark* and the ruins of Tabarn. a) Rudbar gate, b) Razan gate, c) Neyshabur (Radkan) gate, d) Ancient *ark*, and f) Ferdowsi's tomb. (Sykes 1910, 1119)

In his opinion, apart from the golden dome, minarets of the shrine and Goharshad Mosque, Mashhad had no other significant buildings, and the whole town presents a consistent level of mud house-tops with a few *badgirs* (windcatchers).[61]

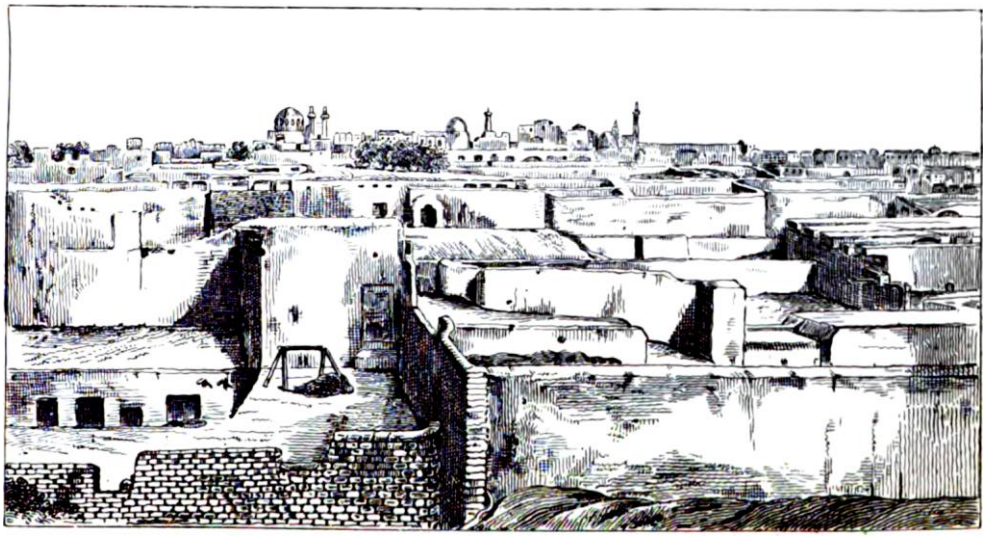


Figure 1.31 MacGregor's illustration representing a uniform level of mud house-tops and Imam Reza's shrine at the background. (MacGregor 1879, 283)

[61] MacGregor 1879, p.283.

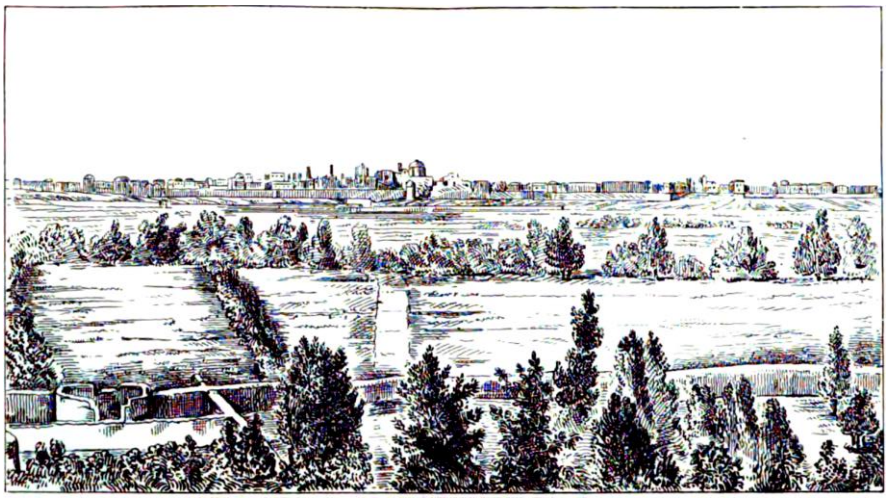


Figure 1.32 The view of Mashhad from the south, designed from the paein khiyaban gate, where MacGregor described as the best view that depicts the foreground of mud houses, shrine complex and dark green trees. (MacGregor, 1879, 286)

Like his grandfather, Naser al-Din Shah (1848-1896 AD) paid attention to the religious buildings, he traveled to Mashhad twice. On his journeys, he ordered to complete a new court at Imam Reza's shrine and replacement of the wooden roof of the grand bazaar with durable brick-arched ceiling and, as well as making a domed ceiling for roofing another bazaar, near the grand one. In fact, the alleys of different bazaars were lit and ventilated by large holes placed at intervals in the brickwork of the vaulting.[62]

Figure 1.33 The main Ancient Bazaar (Rezvani 2005, 246). **Figure 1.34** Vazir Nezam bazaar constructed in bala khiyaban, which was later destroyed by the start of the shrine development plan in 1975. (http://mashhadenc.ir/; accessed date: May 19, 2018)

Mashhad has the same expansion and state as it used to have at the beginning of Safavid. The rampart was already built and only the citadel and constructions around the shrine were new structures added to the ancient area.

[62] Sykes Ella. C., *Persia and its People*, New York: The MacMilian Company, 1910, p.99. (Retrieved from https://archive.org/details/persiaitspeople01syke/page/n10, accessed date: November 27, 2016)

The city's wall had 141 towers with a total of six open main gateways, which had the same name of the six significant neighborhoods that included ten small quarters in their hearts. The residential quarters were included; Bala Khiyaban, Paein Khiyaban, Eidgah, Noghan, Sarab and Arg o *ark* which this last one was a direct entrance to the citadel. With the rise of Tehran as the place of authority under the Qajar era, the royal garden and palace of Chaharbagh gradually turned into ruins. It started appearing as a district described as follows, "[..] *a street called Chaharbagh, which leads to the mansion, and it is a long way between the high walls that are close to destruction.*"[63]

Apart from the expansions of the city within the wall concerning urban development and architecture, there was a high construction of trading paths and caravanserais out of the wall. Before the golden eras, there was only one low-lying course that a part of the high Silk Road connected Neyshabur to Tus district from the first Islamic ages. However, another main path was constructed as the road from Mashhad to Neyshabur that was used from the Safavid period (XVI) to the late Qajar (XIX).

The earlier route provided a smooth and comfortable path for caravans from the ninth to the sixteenth century, including the centers Nishabur, Baghshan, Deh Sorkh, and Nukan, and reached Tus.[64]

On average, there was a caravanserai in well-maintained areas to rest, every 30 to 40 kilometers, which reflects the growth and prosperity of these routes.[65]

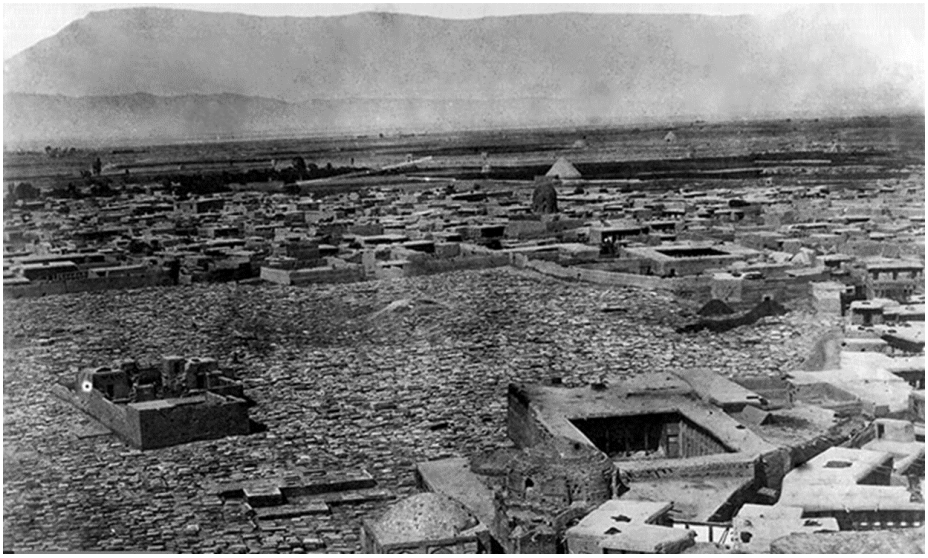


Figure 1.35 The defensive wall of Mashhad in Qajar period. The presented photo was taken by Abd-Allah Qajar, Naser al-Din Shah's photographer in 1893. (https://photo.razavi.ir/Portal/Home/?Image; accessed date: May 10, 2018)

[63] Etemad al-Saltanah 1984, p.17.

[64] Having considered travelers and Arab geographers' descriptions, this route can be introduced as the old winter road of Mashhad, which was about 16 *farsakh* (about 100 km), with a distance of 10 km from Nukan to Tabaran. It had two branches after the Baghshan, one that continued to Tus and Marv and the other to Herat. Imam Reza has crossed the same route to get to Marv and has had a short stay in Deh Sorkh. (Bakhtiari 2002, p.320)

[65] Bakhtiari 2002, p.321.

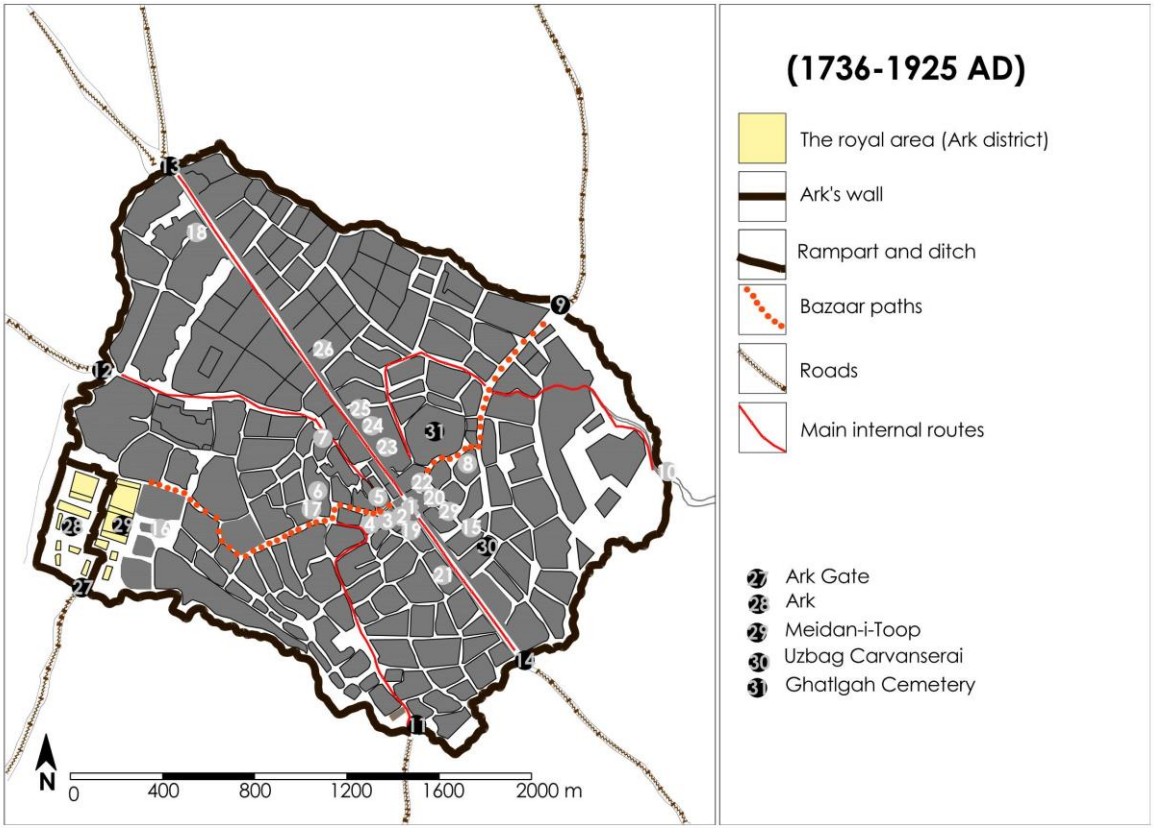


Figure 1.36 The construction of ark, royal quarter and Qajar buildings. (Drawn by the author based on the first map of the city of 1858, Mehryar 2009, 143)

The latest low-laying path was a harsh and stony way that was extended for four *farsakh*. Along the distance, one would cross through Fakhr Davoud, Sharif Abad and Torogh continued to Mashhad or vice versa. Most passengers in the Qajar period have brought the features of Sharif Abad Route in their writings as Afzal-al-Molk in 1902; *"*[..] *on the previous journey that I went through this path, I was suffering from ups and downs and its abysses, from Sharifabad to Torogh. And these four farsakh were such that one would have to cross the mountains and high hills by a narrow rocky way full of stones where the horse would fall down the valley if slipped [...] repeatedly the carriage broke down in this road."*[66]

Table 1.6 The introduction of historical routes which connected Tus district to Neyshbur and then Mashhad to Neyshabur and vice versa.

Historical Routes	Towns between Nishabur- Tus /Nishabur Mashhad	Date of Use
Low- Laying Paths	Nishabur- Baghshan- Deh Sorkh- Nukan- Tabaran	(IX- XVI)
	Mashhad- Torogh- Sharif Abad- Fakhr Davoud- Nishabur	(XVI- XIX)
Mountainous Roads	Nishabur- Kharv- Zoshk- Virani- Nukan	(IX-XXI)
	Nishabur- Daroud- Torqabeh- Nukan	(IX-XXI)

[66] Afzal-al-Molk Gholam. H., *Khorasan and Kerman travelogue*, Tehran: Tus, 1980, p.52

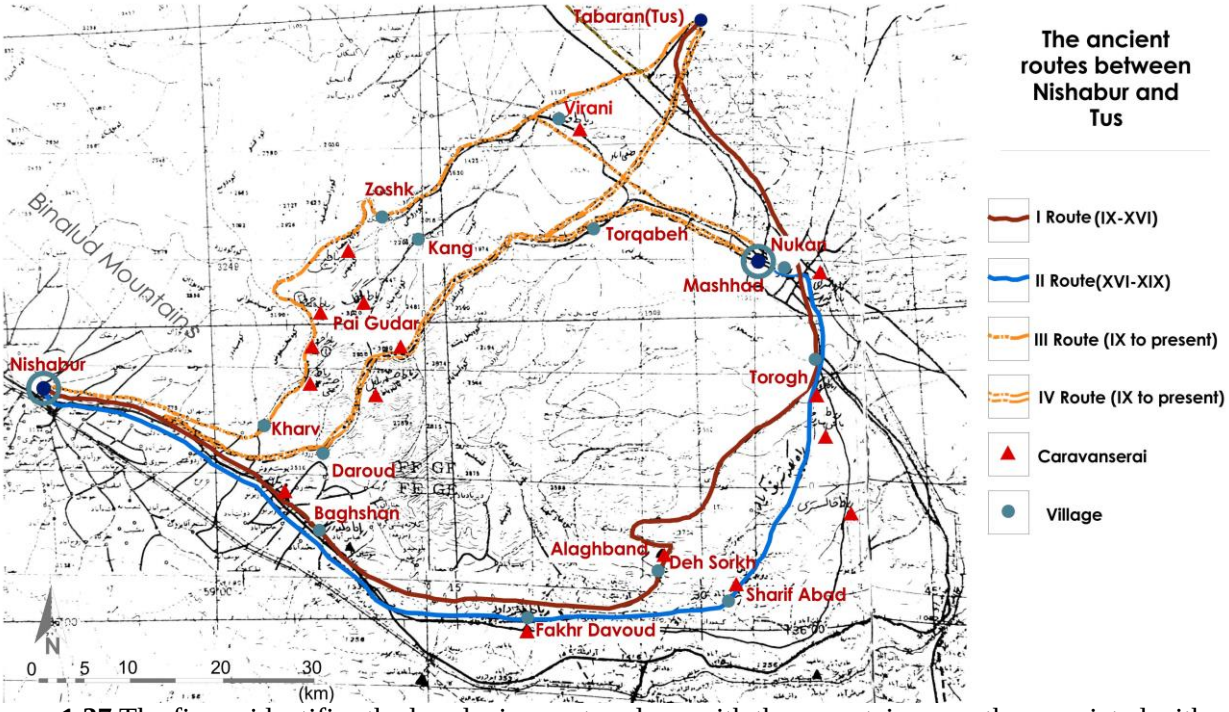


Figure 1.37 The figure identifies the low-laying routes along with the mountainous paths associated with caravanserais which housed many caravans from early Islamic ages to 20th century. (Bakhtiari 2002, p.323)

In addition to main routes, the other two narrow mountainous ways made in the Binalud mountain range, which connected Mashhad and Neyshabur as shortcuts. In fact, heavy snowfalls on the streams and valleys in winter made it almost impossible for passengers to traverse the passage because the roads would practically be blocked.[67] Therefore, these courses could be considered as the summer roads for Mashhad whose fertile valleys of Kharv and Daroud on the southern slopes and Zoshk and Jaghargh on the north side of Binalood would make the journey pleasant and frequent from past to present.[68]

Figure 1.38 The mountainous way between Mashhad and Neyshabur. (https://photo.razavi.ir/ accessed date: May 20, 2015)

[67] English Colonel Yate describes these routes in this way "*The road over this pass is the direct route between Nishapur and Mashhad which is frequently used by pilgrims and caravans in the summer. In the winter from November to March it is closed by snow*," Yate C. E *Khurasan and Sistan*, Edinburgh and London: William blackwood and sons, 1900, p.349. (https://books.google.it/books; accessed date: November 17, 2016)

[68] Bakhtiari 2002, p.335.

Mashhad becomes identified as a significant and populated center in the Qajar period. The results of the first official census of the six Mashhad regions in 1878 presents that Eidgah, as neighborhood with the high social class, and on the contrary, Paein khiyaban identified as the most impoverished and populated district.[69]

Table 1.7 The house-to-house statistics of the six Mashhad neighborhoods in 1878.

District	Sarab	Sarsang	Eidgah	Paien Khiyaban	Noghan	Bala Khiyaban	Overall
No. of households	1275	1119	1379	1585	1445	881	7666
Population	9848	8744	10275	10757	9996	5877	57287
Government employee	324	295	220	165	215	127	1346
Craftsman	1480	1486	1991	2549	2299	1284	11098
Wealthy	220	190	328	177	323	55	1193
Ordinary	870	801	906	1159	992	743	5471
Poor	167	128	145	249	230	83	1002

During Naser o-Din Shah's reign (1848-1896 AD), the first steps were taken towards modernization. He brought Iran occidental thoughts and modernity, through his trips to Europe which were financed with foreign loans. Thus, given the presence of two governments, Great Britain and Russia and their interference and territorial encroachment led to an impact on housing architecture and occupation of houses in royal Arg district by an English colony until the early 20th century.[70]

Figure 1.39 (1893) British hospital in Mashhad. Photo courtesy of Abd-Allah Qajar. (Torabi 2004)

[69] This registration began from the royal quarters, Sarab, next to it *ark (arg)*, and continued toward the south, east and north, arriving at other neighborhoods. Mirza'i Qajar introduces his work in this way, "*This volume includes the number of inhabitants of Mashhad Razavi, comprehensive and accurate on the male and female, small and big, old and young, blind and sighted, poor and wealthy, mystic and ordinary, anonymous and well-known, by recording all the professions, industries and the number of their homes and dwelling*." (Mirza'i Qajar Zain al-Abedin, *Peoples of the Aqdas Land or the old Mashhad people*, Mashhad: Mahban, 2003)

[70] Sykes 1910, p.91.

One of the most critical striking events after the Iranian Constitutional Revolution (1906-1911) was the Russian bombardment of the Imam Reza sanctuary in 1912 because Iranian anti-imperialists were seeking refuge there. This assault led to the death of 39 people and caused significant damages to the shrine complex.[71]

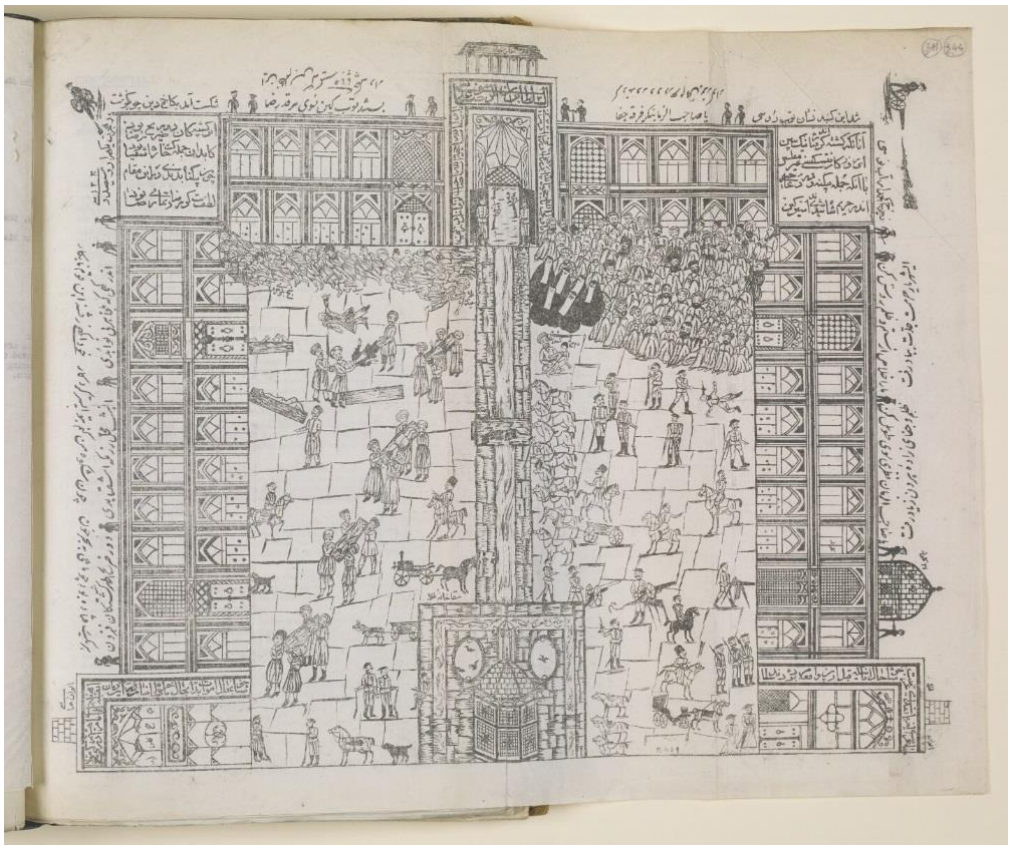


Figure 1.40 A print of an illustration that depicts the bombardment of the Imam Reza shrine in Mashhad by Russian artillery forces in April 1912. A poem in Farsi is displayed around the edge of the illustration. (https://www.qdl.qa/en/archive; accessed date: May 05, 2018)

The well-known Russo-British agreement of 1907, which divided Iran into two spheres of influence and various rebellions in different areas, caused the decline of the last Qajar era and foundation of Pahlavi dynasty in 1925.

[71] Rezvani 2005, p.243.

1.3.2. The Eras of Modernization and Renovation (1925-present)

Even though with the coming of Reza Khan Iran officially entered modernism, in the Naseri era (1848-1896 AD) modernity had gradually penetrated into the structure of the city and its monuments. However, Mashhad had not reached a high level of transformation until this era. Pahlavi's desire to renovate and modernize the city structure led to the development of the city within the wall and gradually out of it. The rampart lost its real use of protecting the city and fell into ruins, although in the first decade of the twentieth century some of its parts collapsed and were not repaired for several years, and the moat was filled with clay and mud.[72]

With a glance at Mashhad's aerial photo, we notice the expansion of the city on the west and southwest, outside the two gates of the citadel and the Eidgah. Development in this area was for the existence of infertile land in the west and fertile agricultural filed on the opposite side (east).[73]

The creation of new ways has damaged a vast residential area, then the enclosed space of the city has been developed out of the barrier, and gardens and fields outside the city have been transformed into residential zones.[74]

The most significant transformation for the city in I Pahlavi era (1925-1941) was the construction of a large circular road around the sacred area in 1929-30 called *falake hazrat* (*Hazrat Square).* This square constructed to facilitate the connections between the two halves of main avenue (khiyaban). Indeed, there was no path connection between the two sides, and it was no longer necessary to pass through the sanctuary to get to the other half of the khiyaban. Meanwhile, the trend towards modern architecture led to the construction of two-story buildings around the square, which gave it an extraordinary effect with ornamental elements, making it completely different from the previous architectural styles and structures. Reaching Imam Reza shrine through the alleys and lanes was tough because they were mainly narrow and overcrowded. Khiyaban was the only pathway that gave direct access to the sanctuary. Thus, with the construction of the Hazrat Square, two more avenues, called Tabarsi and Tehran, were created perpendicular to the main avenue in order to connect the sanctuary from four sides to the neighborhoods of Mashhad.[75]

[72] D'allemagne Henry. R., *From Khorassan to Bakhtiari country*, Tehran: Amirkabir, 1956.
[73] Morasa Hooman., Govahi Hedayat, "Study on Amiri Historical House," unpublished, 2015.
[74] Rezvani 2005, p.252.
[75] Mahvan 2004, p.416.

Figure 1.41 (1939) *Falake hazrat*. The image presents the replacement of introversion architecture by extraversion one and the transformation of dome-adobe ceiling into the pitch-roof. (http://meshad.mihanblog.com/; accessed date: May 10, 2018)

The invention of Tabarsi Ave. led to the disappearance of the semi-east section of the grand bazaar, and the Noghan district, which used to be the most crowded locality of Mashhad, was divided into two eastern and western sectors. Also, part of *ghatlgah*, the city's most historical cemetery, was also destroyed to build the path on the eastern side of the sanctuary.[76]

Figure 1.42 (1961) A view of the Holy Shrine and Goharshad Mosque dome and minaret from the northern side of the Hazrat Square, the beginning of Tabarsi Ave. (Morasa 2015)

[76] Mahvan 2004, p.445. Mahvan declares that this cemetery was a portion of Hamid ibn Qhahabe's garden, which was purchased by Imam Reza and transformed increasingly into the burial place of the dead.

Tehran avenue began on the southern side of Hazrat Square, after crossing the Eidgah cemetery, the city walls and ditch ending up on the outskirts of the city. The result of an impressive engineering technique employed to create the Teheran Ave. is that the road is located precisely along the golden dome and can be seen individually. Because of its geographical location and topography along the southern mountains, Tehran Ave. was more at risk of flooding than the rest of the other routes, so engineers had to prevent damage to the buildings of the sanctuary. Consequently, the level of the sanctuary's courtyard and the southern side of the Hazrat Square, which led to this path, rose about one meter and twenty centimeters and placed a slight slope from the sanctuary towards the first part of Tehran Ave.[77]

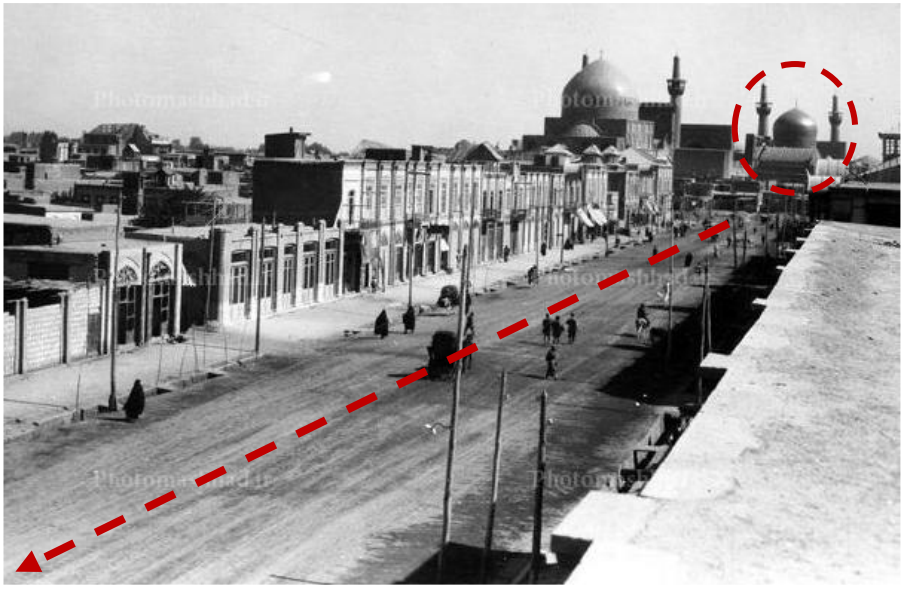


Figure 1.43 In this image the dome's viewing angle from Tehran Ave. and street slope can be identified. (Morasa 2015)

The neighborhood of Ark was formerly a state-owned district which also kept its original identity in Pahlavi with the construction of new administrative, national and governmental buildings such as the National Bank, Department of Finance and the Consulates, and became the most modern and wealthiest area in the city. For this importance, Pahlavi St, was established in this region, which started from the former site of the citadel and continued directly to the east in order to lead to Bala khiyaban (Upper avenue). This junction led to the construction of a symbolic square denominated Shah Square, which was the intersection of six routes.[78]

[77] Mahvan 2004, p.450.
[78] Rezvani 2005, p.254.

Figure 1.44 (1954) Pahlavi St. (Morasa 2015)

Two other streets, including Shah Reza (presently Azadi) and Khosravi St., were also constructed. Shah Reza divided the Chaharbagh quarter, into eastern and western divisions, and connected this neighborhood to the Bala khiyaban through a straight path. On the contrary, Khosravi St. was a shorter street that was created in 1309 to link the Pahlavi St to the Shah Reza St.

Figure 1.45 (1941) Intersection of the Pahlavi St and Khosravi St. (Morasa 2015)

The first aerial photograph taken from Mashhad in 1956 can show the city's substantial changes from 1925 to 1956.

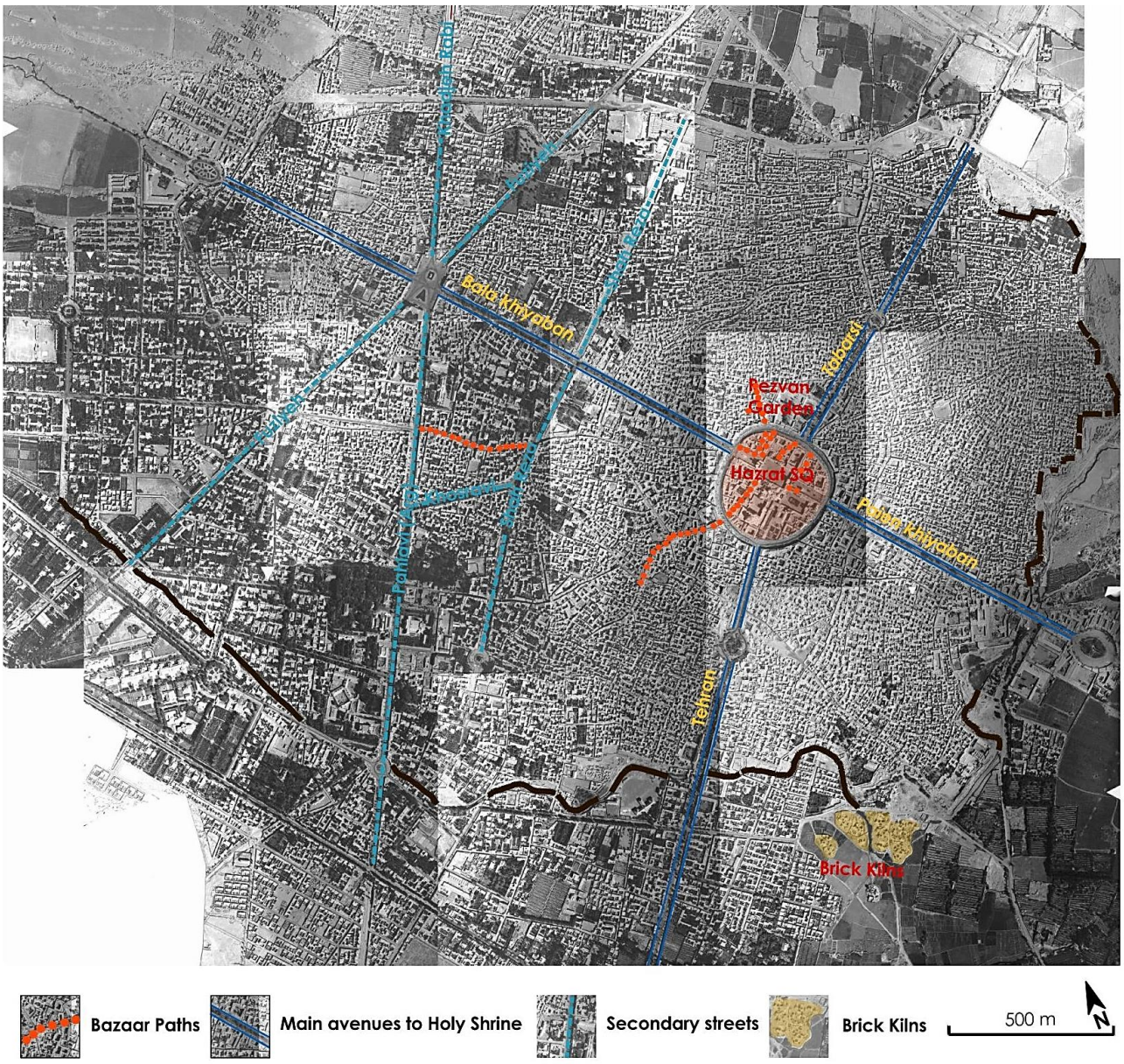


Figure 1.46 (1956) The expansion of Mashhad within the wall and out of it.

In the second period of the Pahlavi regime (1941- 1979) in addition to the development of the city in the southwest and western parts, an irregular expansion took place in the northern region near the gardens outside the city. Also, in 1950, a worse flood flowed in Mashhad which has led to the destruction of many houses, especially in the neighborhood of Eidgah.[79]

[79] Seyed Mohsen Sadr, known as Sadro al Ashraf, the governor of Khorasan in his memoirs, has described this flood; *"[..] the ruins of houses in the Eidgah district, where the houses are made of adobe bricks and mud and built inside the hole, are more than the rest of the city."* Sadr Mohsen, "The notes of Sadro al Ashraf; my entrance to holy city of Mashhad, flood and the ruin of houses," *Vahid Journal*, n.6, (1971), p.930.

Because of its commercial and religious growth, Mashhad turned to be an immigrant city to the point where the population of this city doubled in this period of history. According to the information obtained from the Statistics Organization of Iran, in the decade between 1956 and 1966, the population rose from 241,989 to 409,616 people and the city's extension doubled and led to the creation of many different neighborhoods.[80]

Another route, named Khosravi No, was created along Khosravi St. which was built under Reza Khan era. This newly constructed street led to the breakdown of the city's bazaar for the third time. The Ancient Bazaar has been before divided twice; under Safavid and Pahlavi I. A part of this bazaar was demolished again and placed on the two sides of the Khosravi No St. A large portion of the residential buildings was also destroyed, and even the lands of mansions were divided into two parts in such a way that their garden was placed on either side of the street. For this reason, in order to recompense for this destruction, small bazaars were made, including the Haj Aghajan bazaar in the vicinity of Rezvan Garden and the Sarab bazaar in Sarab district.[81]

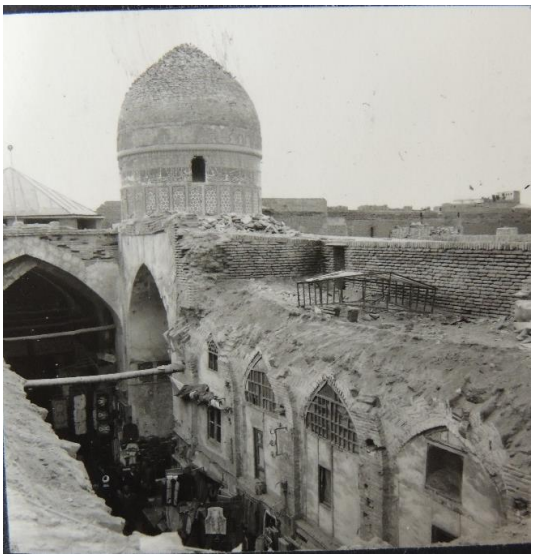


Figure 1.47 (1956) The semi-ruined ceiling of the Ancient Bazaar near Dodar Madrasa dome. **Figure 1.48** (1956) A piece of western halve of Grand Bazaar. (KH-CHHTO archive)

The first Master Plan of Mashhad was prepared in 1967 for urban development in Mashhad for a period of twenty-five years. Based on the findings of this project in 1991, Mashhad should contain a population of about 1.5 million people, which is about four times the population in 1967. The directions of the city expansion must be dependent on the Binalud and Hezar Masjed Mountains and

[80] According to Iran's official census in 1956, Mashhad was the fourth most populous city after Tehran, Tabriz, and Isfahan with 241,989 people. However, based on the latest report from Iran's Census (2016), it ranked the second among the cities of Iran with 3,372,660 people. The figure takes both urban area population and those residing in rural vicinities into consideration, which are 3,012,090 and 360,498 people, respectively.

[81] Mahvan 2004, p.417.

climatic conditions and, the use of land should be aimed at establishing an economic link between the city and the surrounding villages.[82]

The most serious environmental issue of the city until this time is the plan for the expansion of the Hazrat Square known as the Green Ring. Almost in 1974, Valiyan, Khorasan governor, ordered to demolish all dwellings and monuments with a radius of 320 meters from the Shrine complex. This type of intervention has brought demolition to a portion of the Grand Bazaar and a large number of mosques and madrasas.[83]

The buildings survived from this destruction were placed inside the shrine and a wide green ring encompassed the entire complex.

Figure 1.49 (1974) Destruction of a madrasa around the shrine because of construction of Green Ring. **Figure 1.50** (1974) Elimination of public buildings on the south western side of Holy Shrine**.** (KH-CHHTO archive)

Figure 1.51 (1974) Creation of the Green Ring in progress. (KH-CHHTO archive)

[82] Rezvani 2005, p.267.
[83] Mahvan 2004, p.418.

Figure 1.52 (1975) The aerial photo highlights green areas, Khosravi No St, the remnant portion of bazaar around the Shrine and Hazrati Bazaar on the left. (NCC archive).

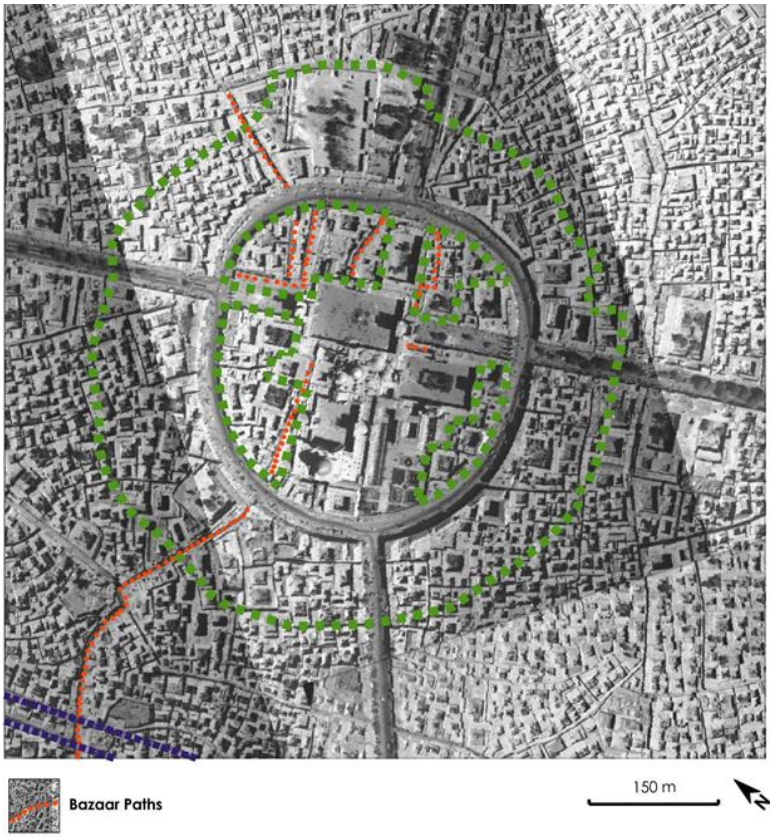


Figure 1.53 (1956) The present of Hazrat Square and bazaars before the intervention of 1975. (NCC archive).

Figure 1.54 (1977) The shrine and the Green Ring surrounding it. (KH-CHHTO archive)

Since the merchants lost their property in this plan, Valiyan built Reza bazaar adjacent to the passage of Eidgah, which is perpendicular to the Tehran Ave., in 1976.[84] Also, the Hazrati Bazaar, which is now in the vicinity of Abbas Quli Khan's Madrasa, moved from the Ancient Bazaar to the current place in 1976 due to its destruction in the development plan of the square.[85]

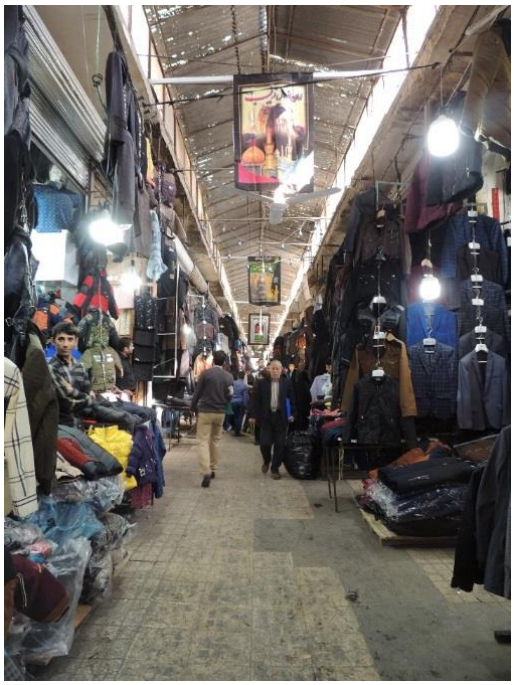


Figure 1.55 (1970s) The initial structure of Hazrati Bazaar. (Morasa 2015) **Figure 1.56** (2017) The current state of Hazrati Bazaar.

[84] Reza Bazaar has been built with traditional materials such as brick and its vaults are similar to the ceiling of traditional bazaars, although its path and structure do not follow common guidelines and the standard of a traditional bazaar. Indeed, apart from the entrance and the doorway, it does not lead to any other lane or path, as a traditional bazaar must be connected to narrow alleys, main squares and public buildings such as mosques and hammams. Therefore, naming this market as bazaar wouldn't sound right.

[85] Rezvani 2005, p.270.

The overthrow of the Pahlavi monarchy through 1979 Revolution, the establishment of the Islamic Republic of Iran and attention of the country's leaders to the Shi'a religion drew more attention to the shrine of Imam Reza and the surrounding tissue. This tendency to religion led to the first development of the shrine's complex in 1981 carried out by Astan Quds Razavi, which was implemented subsequently. This development plan aimed to expand the area of the shrine from 120,000 to 570,000 m². To that end, Astan Quds has begun to purchase lands, including a total of 2,500 commercial and residential properties, since 1985.[86] The project meant to build a round circular subterranean road to decrease the traffic, give easy access to the streets around the sanctuary and to create the underground parking reserved for pilgrims. The project concentrated only on the shrine complex and its outline, but it also destroyed the traditional madrasas and the bazaar surviving from the expansion projects carried out under Pahlavi era.

Figure 1.57 The illustration presents the development intervention of the shrine's complex and creation of the subterranean route in 1981 carried out by Astan Quds Razavi. (KH-CHHTO archive)

[86] Rahnam Mohammad. R., *Identification of the neighborhoods and public places of Mashhad*, Mashhad: Sokhan Gostar, 2011, p. 25.

The sharp growth of population during the first decade of the Islamic Republic led to creation of the city's new Urban Masterplan in 1992.[87] This second plan, which regards the renovation and reconstruction of the old town for a period of 25 years from 1992 to 2017, took place in two separate stages:

The first stage (1992-1999): The Minister of Housing and Urban Development sent a letter to the Iranian Leader asking for the founding of an individual company to renovate and rebuild the area surrounding the shrine, which received acceptance by the leader. Following this decision, in 1995, this project plan was approved based on the low number of main roads and avenues in the central city area, in addition to the increase in population density in the future and the resulting obstacles for the city's central district. However, for reasons such as the lack of clarity in project management and the status of citizen participation in the process of developing, its implementation process stopped in 1999, and proposed the necessity for revision.[88]

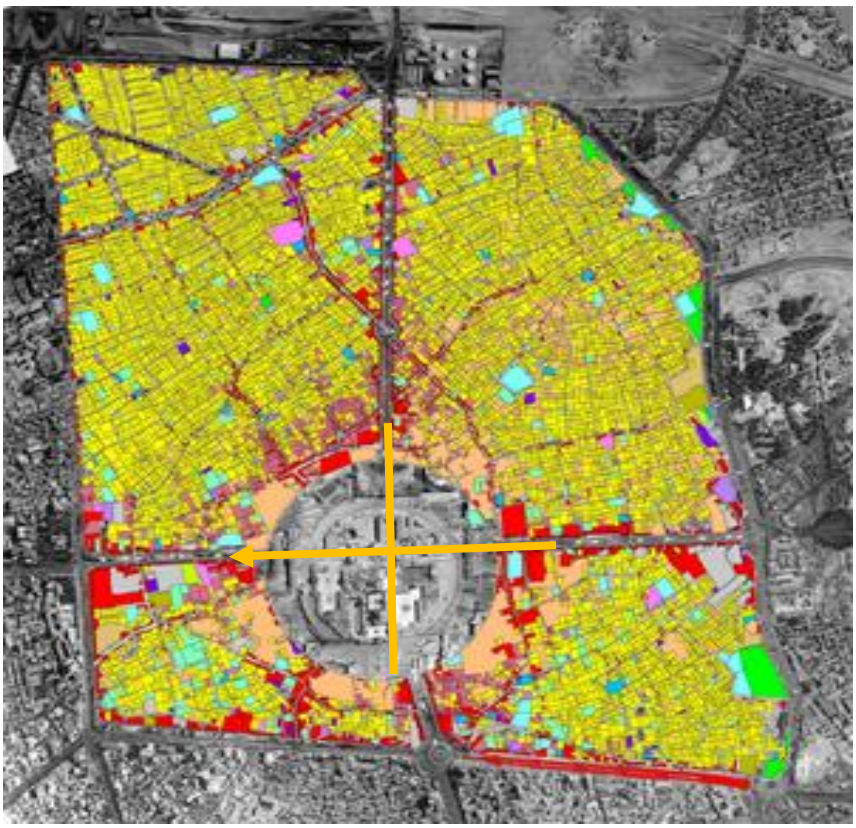


Figure 1.58 The first plan approved in 1995. By observing this image, at first glance we realize that the residential buildings (marked with yellow) are decidedly more than the commercial ones. (http://www.samen.mashhad.ir, accessed date: October 05, 2017)

[87] Rahnama 2011, p.26.

[88] The Commission approved the plan on 30/05/1995. The Supreme Council for Urban Planning and Architecture of Iran found it incompatible with the Master Plan approved on 04/02/1997. However, it was re-reviewed in 1998, and the Commission approved the layout plan under Article 5 on 20/04/1999, and its specific project was approved by the same Commission on 18/03/2000. (http://www.samen.mashhad.ir; accessed date: October 05, 2017)

Table 1.8 The table represents all areas involved in the innovation project and the number of inhabitants living in the mentioned space.

Object	Amount	Unit
Number of properties	13000	piece
Total area	366	Hectare
Shrine area	42	Hectare
Total area without taking into consideration holy shrine zone	324	Hectare
Razavi Sharestan (Razavi Road)	8	Hectare
Resident population in 2007	32330	Person
Resident population in 2011	21456	Person
Resident population in 2016	13861	Person

The final stage (1999- 2017): In 1999, Samen Construction and Housing Company, which was responsible for implementing this great project, merged with the municipality of the holy area and the new plan was implemented. The improvement and renovation project of the texture surrounding the Holy Shrine covers an area of approximately 366 hectares, which is divided into four significant sections as follow; (i) Chaharbagh (North-West), (ii) Noghan (North-East), (iii) Paein Khiyaban (South-East), and (iv) Eidgah (South-West).[89]

The Samen municipality defines replacement of the historic district with a recent and new one as the primary purpose of the project to provide an exceptional urban aspect to the city and consequently create a contemporary space for pilgrimage. For this end, the traditional narrow lanes that were all connected to the holy region were destroyed along with their historic houses and public monuments which acted as the primary and essential components in the concept of an Islamic city. Studying all four maps guides us to identify about the semi-circular highway; *Razavi Sharestan* as a connecting path between the four sections.

Figure 1.59 Razavi Sharestan, section (IV). (http://www.samen.mashhad.ir; accessed date: October 05, 2017)

[89] (http://www.samen.mashhad.ir; accessed date: October 05, 2017)

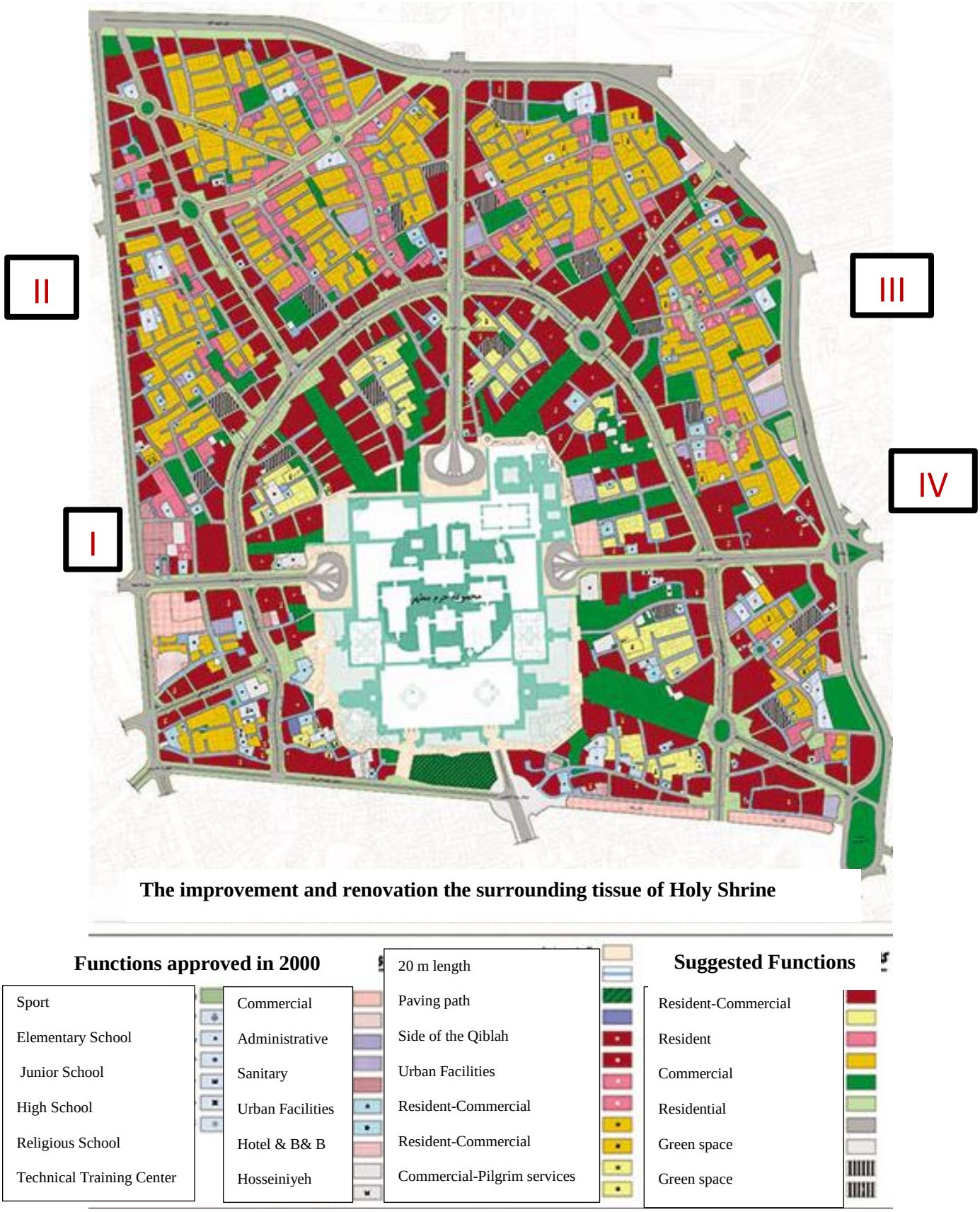


Figure 1.60 The identification of four sections based on districts division. As it can be seen, in the second map, the number of commercial-tourism edifices and avenues is higher than those of the dwellings. (http://www.samen.mashhad.ir; accessed date: October 05, 2017)

Through the making of this disadvantageous element, a significant portion of the residential neighborhoods, that also included caravanserais, bazaars, hammams, alleys and stores, became demolished, even those that had been registered as national cultural heritage.

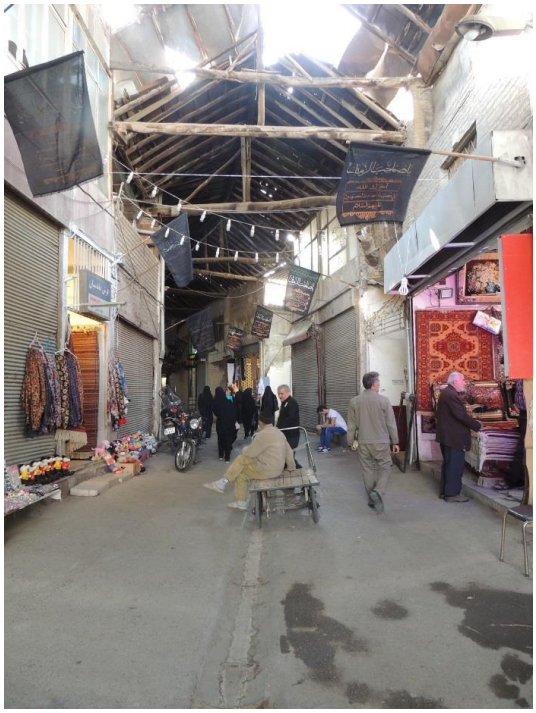


Figure 1.61 The only part left from the Ancient Bazaar, now known and called as the Carpet Bazaar, starting from Khosravi No St. and ending near the Shah Mosque-Hammam. **Figure 1.62** A traditional narrow alley survived from recent demolitions in Lower avenue (Paein khiyaban).

All destructions have led to the erection of modern malls, hotels, parking and apartments that give an unpleasant appearance to the historic center. For example, Fig.1.64 illustrates an apparent disharmony between recent constructions and historical ones. It clearly presents the expansion of the sidewalk and creation of heterogeneous buildings in the historic district that has now lost its identity due to the new master plan of Mashhad.

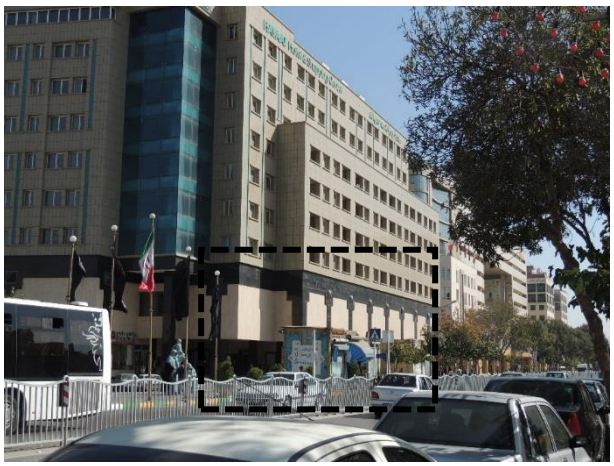


Figure 1.63 As seen on Paein khiyaban, shops with mostly traditional characters are located on the sidewalk in front of a giant shopping center.

Instead, on the opposite side, there is Haj Ahmadian Yazdi *Serai*, a kind of common market that contained various shops in the period not so far from our time. This complex has all the characteristics considered for recognition of a monument as heritage. However, its historical, social and architectural values have not been observed and, like many other buildings, it is in a state of abandonment, as well. This serai is currently a place of commerce for street vendors and is gradually turning into a ruin caused by human activities and building vulnerability.

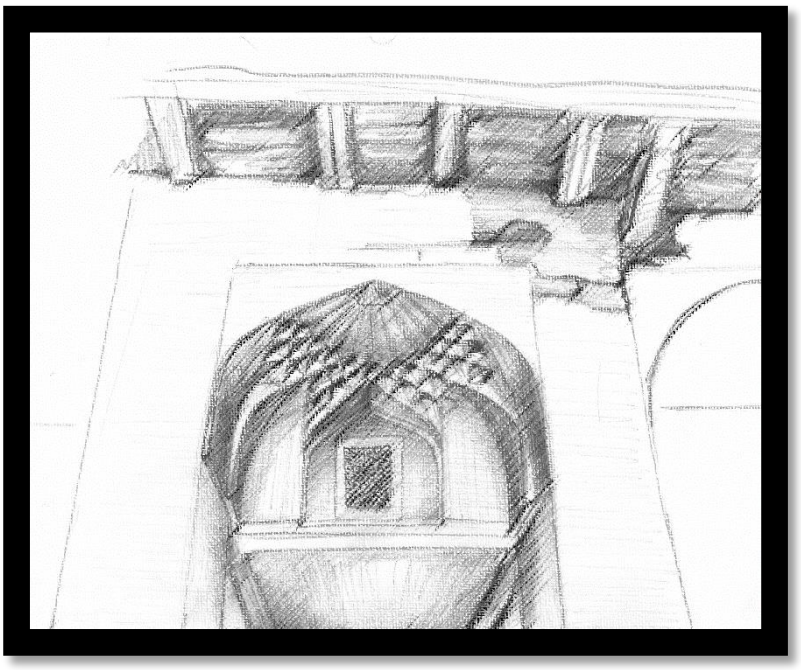
Figure 1.64 The location of Haj Ahmadian Yazdi Serai in *Paein Khiyaban (Lower Avenue)* close to Zamen commercial-residential complex.

Figure 1.65 View of Haj Ahmadian Yazdi Serai from the inside and the situation of the commercial center in the background.

To conclude this chapter, it is necessary to recognize that religion influences the history of Mashhad and its territory more than other factors such as social, cultural and even economic ones. Although the closeness to the trade routes as the Silk Road has adapted this city to become an essential center from the early Islamic centuries until our time. However, the presence of the resting place of Imam Reza has always brought an enormous development from an urban point of view. Indeed, the birth of Mashhad and expansion of its territory came from the decline of Tabaran city (presently called Tus) and growth of Sanabad, where the eighth Imam of the Shia is buried. Thus, according to the evidence, Mashhad was founded in the fourteenth century after Timurids sacked Tabaran and its surviving inhabitants have immigrated to Mashhad.[90] Hence, the expansion of Mashhad as a sizeable sacred city begins precisely from 1404 and continues under the kingdom of Safavids, (1512-1736 AD) due to their tendency towards Shia religion. Although the attacks of Uzbeg and Afghan tribes invaded there, it became the capital of Persia under Nadir Shah realm (1736-47 AD), and in consequence, it was restored and returned to its previous state. After Nadir's death, Mashhad remained isolated and independent from the rest of Persia for almost half a century until the nineteenth century when it was taken over by the Qajar dynasty. From that era, it continues to grow and expand until becoming the second largest and most populous city in Iran today. In fact, these expansions and developments are the fruit of massive destructive projects that have taken away history, architecture, culture and all features that present the identity of a place. Through the new city plan prepared during the last ten years, the few remaining sections from previous times have been neglected or destroyed. As a result, the narrative of Mashhad's history was fundamental and essential from birth to destruction.

[90] All foreign or national passengers who have visited Mashhad also described the ruins of Tabaran in which nothing is left except a small portion of ruined walls, three gates, and the degraded citadel.

CHAPTER 2



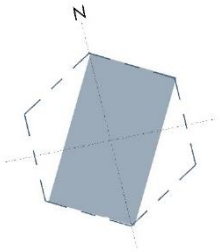
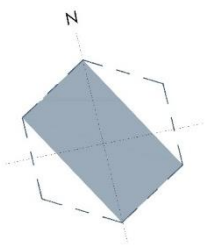
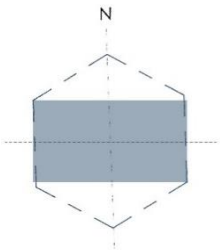
MASHHAD TRADITIONAL COURTYARD HOUSING: CASE STUDIES

2.1 General Characteristics of Traditional Houses in Mashhad

During the past decade, Mashhad has lost its identity, and has become a modern city. Identifying Mashhad as the capital of the Islamic Culture in 2017 by ISESCO and looking for new developments and transfiguration led to the demolition of a large number of habitations. Nonetheless, majority of the remnants escaped from the destruction are still abandoned or partially in ruin. According to various descriptions of travelers, a high number of traditional dwellings in Mashhad consisted of one central courtyard, and only a few of them presented two yards.[91] The central yard forms a regular geometry design. A square plan is surrounded by all of the constructive components, like high walls and in some cases arcades, which can reduce the floor warmth. This enclosed space acts as a function to modify hot climate, protect inhabitants from warm wind and sun and also provides a natural cooling system with the help of trees and water. The courtyard is never a completed structure; most of the time, it is easy to add some new constructions to original plans through using the empty ground of the yard which can be extended or reduced based on family size or needs. Just like each and every traditional Iranian house, almost all habitations of Mashhad follow Iranian-Islamic principles in designing and also seemed to be considerably below the level of the streets.

More, two fundamental parameters were considered by Iranian architects to build a house; orientation and access. The building structure is aligned to take the greatest advantage of direct sunlight. Pirnia used the term *roun* to refer to the house orientation toward the sun and wind. He has mentioned that there are three types of directions created by a rectangular to determine summer and winter living zones.[92]

Table 2.1 The building orientation considered in traditional Iranian habitations.

Types of building orientation		
Row orientation ***(roun-e-rasteh)*** North-East/South-West	**Isfahani orientation** ***(roun-e-Isfahani)*** North-West/South-East	**Kermani orientation** ***(roun-e-Kermani)*** West/East
		

[91] Khanikof 1997, p.116.
[92] Pirnia, Mohammad. K, *Introduction to Islamic Architecture of Iran*, Tehran: Soroush Danesh, 2005, p.155.

According to Mashhad's aerial photos, traditional houses are oriented in two directions: North-East/South-West (*roun-e-rasteh*) or North-West/South-East *(roun-e-Isfahani)*. Considered by local builders, these kinds of positioning were according to geographical and climatic features which provide a seasonal immigration of the inhabitants during the year. In summer or winter, indeed, the building masses would be inhabited based on their exposures to the direct sun and wind.[93]

Instead, the leading house entrance was usually a weak, dark and narrow corridor that opened with a slope to the yard. The house was basically separated into two or three parts; in remarkable houses, living zones were facing each other and service area would be located on one side between them. However, modest houses usually consisted of a courtyard and only two sections.

There were various rooms that could be identified by their functions or the number and type of openings.[94] They are *panj-dari,* a room with five openings, *seh-dari,* a room with three openings, *do-dari,* a room with two openings, *hoz-khaneh (pool room)* and *matbakh (cooking room).* In fact, all types of houses, wealthy and ordinary, present two or more than three types of the mentioned rooms. Nevertheless, economic condition together with land dimension always obliged inhabitants to use these elements more or less.

In a traditional house, the yard and chambers follow the proportion of Iranian Golden Rectangle which contains a rectangle drawn in a hexagon. The employment of this specific shape could constitute a harmonious geometry and a balanced ratio between the internal and external areas.[95]

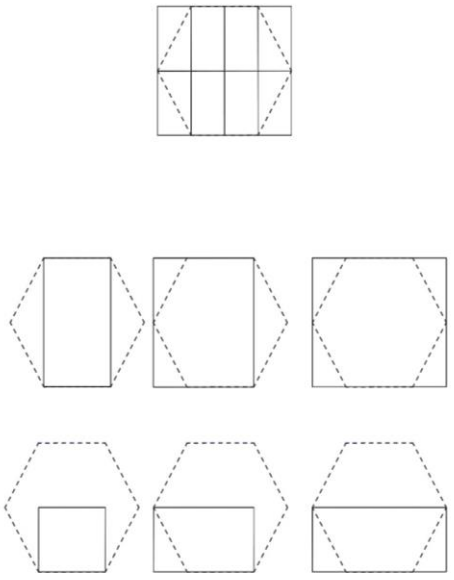


Figure 2.1 The proportion of Iranian Golden Rectangle.

[93] Pirnia 2005, p.155.
[94] Nabavi Faezeh., Ahmad Yahaya., Goh Al Tee., "Daylight and Opening in Traditional Houses in Yazd," in *Proc. 28th Int. Conf. Opportunities, Limits & Needs Towards an Environmentally Responsible Architecture*, Lima, 2012.
[95] Pirnia 2005, p.159.

In order to create appropriate spaces for householders, Iranians applied specific units of traditional measurement, derived from human scales.[96] Also, regulating and standardizing vast spaces, builders have probably followed these units to form the less detailed areas in order to respect the concept of avoiding belonging to Iranian culture.[97] Traditional architects utilized particular units obtained from the size and breadth of a medium man. These units create a system of modulation called *peimoon* (module), which can be divided into submodules; Minor and Large. In fact, *gereh* is defined as the basic unit meaning node and equals to 6.66 cm. Beside, *gaz*, made of 14 or 16 *gerehs*, has been considered as a specific unit to determine the proportion of outdoor areas, indoor areas, and facades. The studies carried out highlight that *gaz* was utilized as a unit to generate large-scale areas such as courtyards, chambers and iwans. *Gereh*, on the other hand, was applied to elements on a smaller scale such as pillars, openings, niches, and so on.[98]

Table 2.2 Traditional units and submodules.

Traditional units		
gereh		6.66 cm
Large *gaz*	16 *gerehs*	106.5 cm
Minor *gaz*	14 *gerehs*	93.25 cm

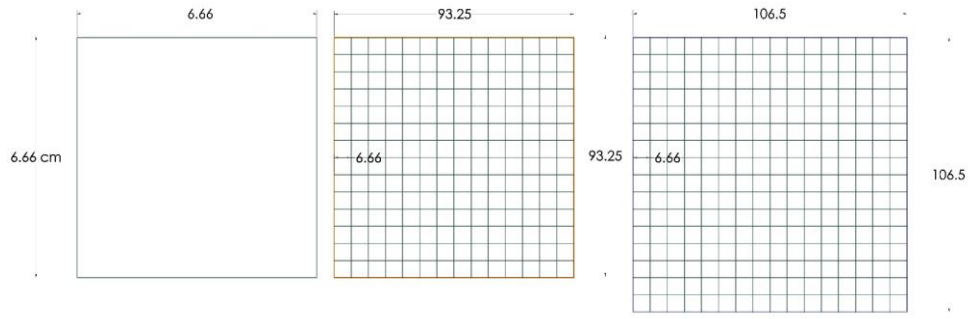


Figure 2.2 Traditional unit; *gereh* and modules; Minor and Large *gaz*

Examples selected in this section are categorized into distinct groups based on their architectural style and scale. The first group belongs to great houses listed among the National Heritage of Iran and presented the architectural style of late Qajar (1795-1925). The second category introduces the largest houses of a domestically wealthy architecture belonging to I Pahlavi (1925-1941) in which Kuzeh-

[96] Traditional architects utilized particular units obtained from the size and breadth of a medium man. Soflaei. F., Shokouhian, M., Mofidi Shemirani, S.M., "Traditional Iranian Courtyards as Microclimate Modifies by Considering Orientation, Dimension and Proportion," *Frontiers of Architectural Research*, 2016, p.231.
[97] Pirnia K. Memarian G. The Typolpgy of Iranian Architecture, Tehran; Soroush Danesh, 2008, p.6.
[98] Zakeri, M., Gharemani, A., Shahnazi, A., Hamzekhani, D.,"Module and Iranian Golden Rectangle Theory in Historical Houses of Qajar Era in Shiraz City," *Scientific Journal of Research in Islamic Architecture*, Vol.1, N.1, p.19.

Kan’ani House is inhabited today and Nasirzadeh House has destroyed. The third row refers to case studies which are the most ancient ordinary examples of traditional dwellings in Mashhad. Since they have been on various occasions, much retouched and altered, it is even hard to guess the date of their construction. However, according to typology, proportion and ornamental components, the case studies have followed the architectural style of Zand era (1751-1795) and early Qajar.

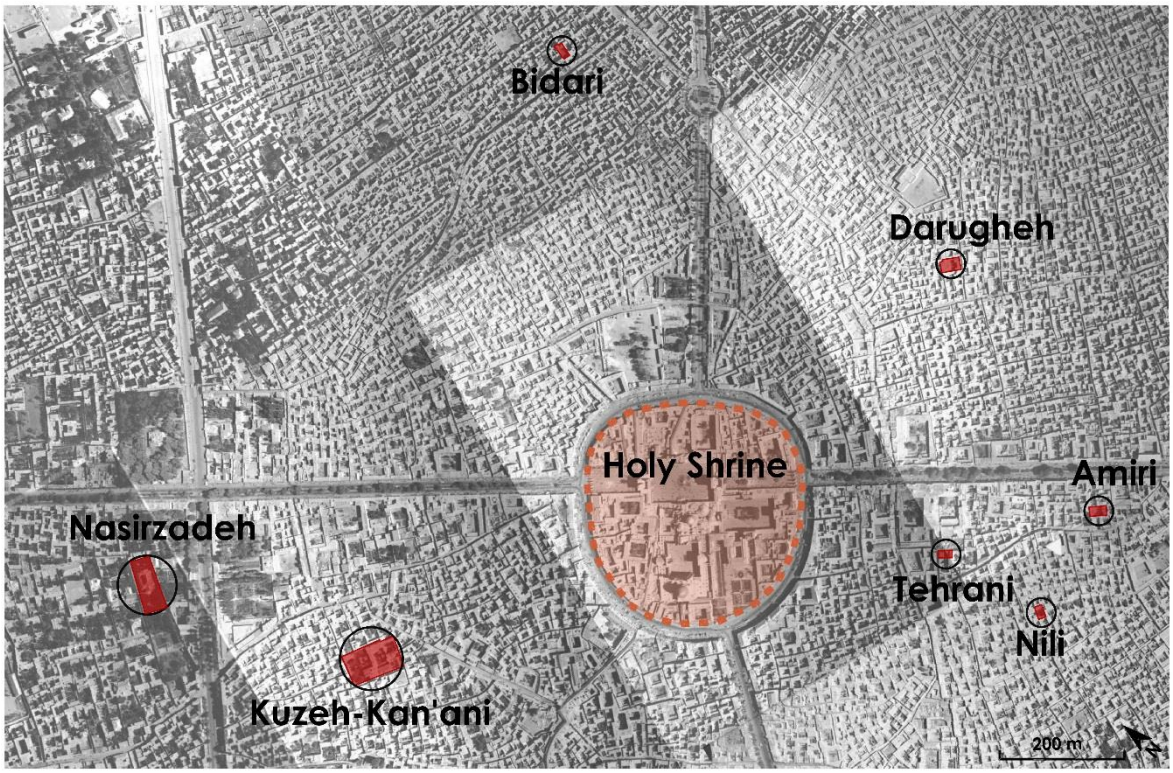


Figure 2.3 Location of traditional houses on 1956 aerial photo. (NCC archive)

Table 2.3 Division of selected houses into three groups based on their style and scale.

N	Traditional House	Architectural Style
1	Darugheh, Amiri	Late Qajar
2	Kuzeh-Kan’ani, Nasirzadeh	Pahlavi
3	Nili, Tehrani, Bidari	Zand-Early Qajar

2.1.1 Late Qajar Architectural Style

i. Darugheh House

Darugheh’s house is one of the most popular monuments of the city built on the orders of Muhammad Yosef Khan, the sheriff of the town at the end of the Qajar era (1795-1925 AD). It is located in the small neighborhood of Gheir Shomalha which was recognized to be the most impoverished area of

the town.[99] Close to the city's sheriff house, there was a *karawal-khana* to secure the bazaar, stores, and houses. This garrison has existed until the late Qajar and early Pahlavi times.[100]

The Darugheh house is inspired by Russian architecture and according to some historians it was erected by Russian builders. The monument was a private house, where also used as a reception place which follows Isfahani orientation North-West/South-East.

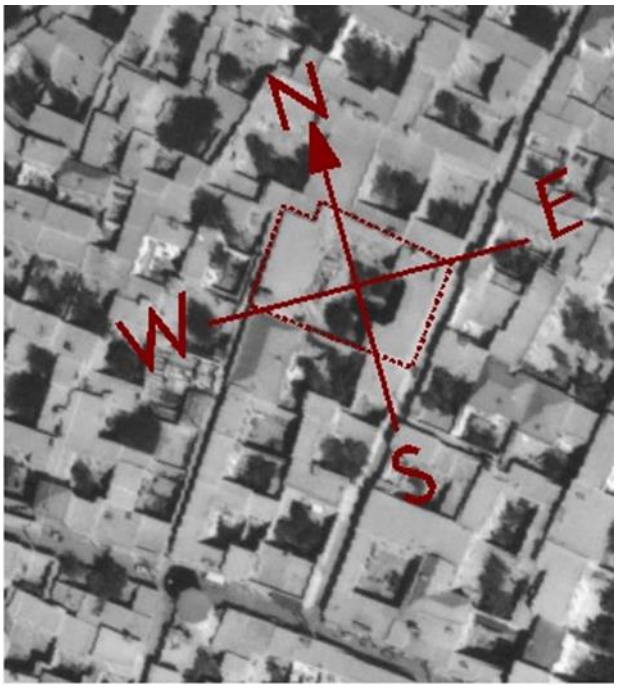


Figure 2.4 (1975) Darugheh's house orientation; *roun-e-Isfahani*, aerial photo.

The open yard is rectangular, with two principal sections facing each other. In this house, like other Qajarian houses from the 19th century, the seasonal immigration was not followed as the usual tradition. Indeed, the summer living or winter rooms were not allocated to a specific building mass. In fact, the ground floors in both building masses were reserved for summer days. That said, the first floors of northwestern and southeastern sections would be useable in cold months. The reasons for selecting this position were that the prevailing wind direction from the northwest in spring and summer is more than that in winter. Also, the south and southeastern sides of the yard are more exposed to solar radiation during the year than the rest of the fronts. The integration of nature and architecture can been seen in Darugheh's houses. On the ground level of the northwestern portion,

[99] This building is located in in the Ghabre Mir alley in the eastern part of the large Noghan district. *Ghabr* in Persian means tomb and *Mir* is probably coming from the name of Mir Mohammad Taghi Razavi who was buried at the end of this passage in 1737. Probably, in the 1950s, according to an order of the Minister of Culture, to convert cemeteries inside the city into the educational center, a school was built on the Mir's grave site. That said, in the last few decades, this place was used as a warehouse for the Education Organization of Mashhad, and nowadays there is nothing left of it except ruins. (Mahvan 2004, p.444, p.458)

[100] See chapter I, p.43.

there is a room with double openings named *hoz-khaneh* that is reserved as resting room. In this room, the combination of architectural components as *badgir* (wind catcher) and *hoz* (ornamental pool) and natural elements as wind and water created a natural ventilation system. To serve another example, *iwan*; a vast and semi-open area sited in the front of *panjdari* room not only aesthetically improved the architecture, but also prevented the direct entrance of sunlight into the living spaces and generated shade during summer days.

Figure 2.5 Distribution of living and service areas on Darugheh's house layouts. (The archive of Bon Architects Studio)

Figure 2.6 The façade of the north western living quarter.

Figure 2.7 The façade of the south eastern living quarter.

Panjdari, the central reception area with five openings on the first floor where the mural paintings attract everyone's attention were considered as the guest and also dining room. In the opposite facade, the ground level on the southeastern side consists of a vestibule entrance, cooking room and a *seh-dari* and its adjoining room. The existence of fireplaces and wall heater on the first story of this section confirms the identification of this floor as winter zone. Service area on the northeastern side of the courtyard encompassed storerooms, bath, and a passageway to the roof remained separated from householders comfort. Thus, there are architectural structures exposed to natural phenomena to harness energy and offer a decent home temperature without any cost to manage.[101]

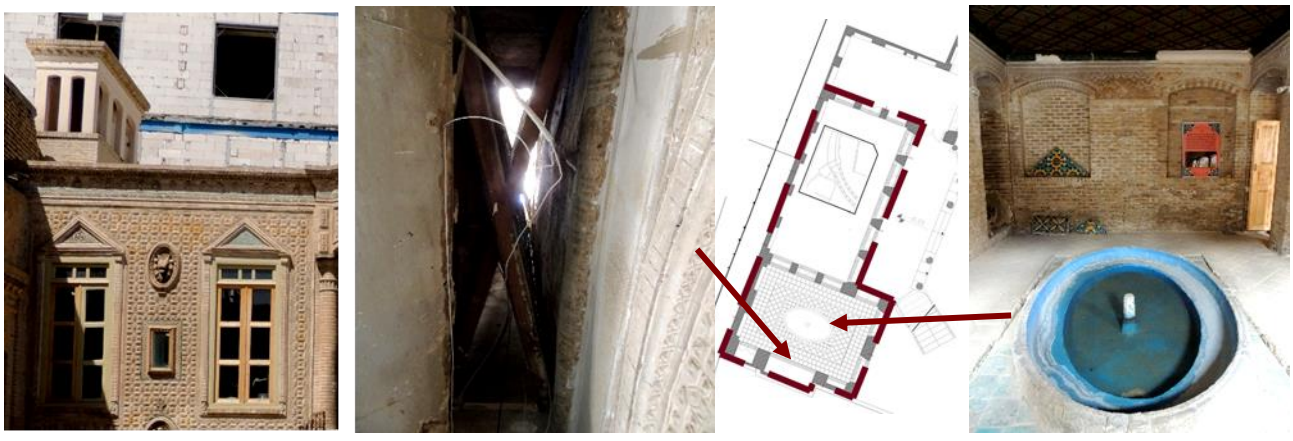


Figure 2.8 Application of traditional architecture structures as *badgir* and *hoz* in *hoz-khaneh*; summer living room, -1 floor.

[101] Afrasiabian, S. Mahdavinejad, M. Badri, N. "Nature as a source of sustainable design in architecture of oriental countries, case study: traditional architecture of Iran," *in Proc. 2nd Int. Conf. Archi-Cultural Translations through the Silk Road,* Nishinomiya, 2012. p. 261. (http://www.mukogawa-u.ac.jp/; accessed date: May 23, 2016)

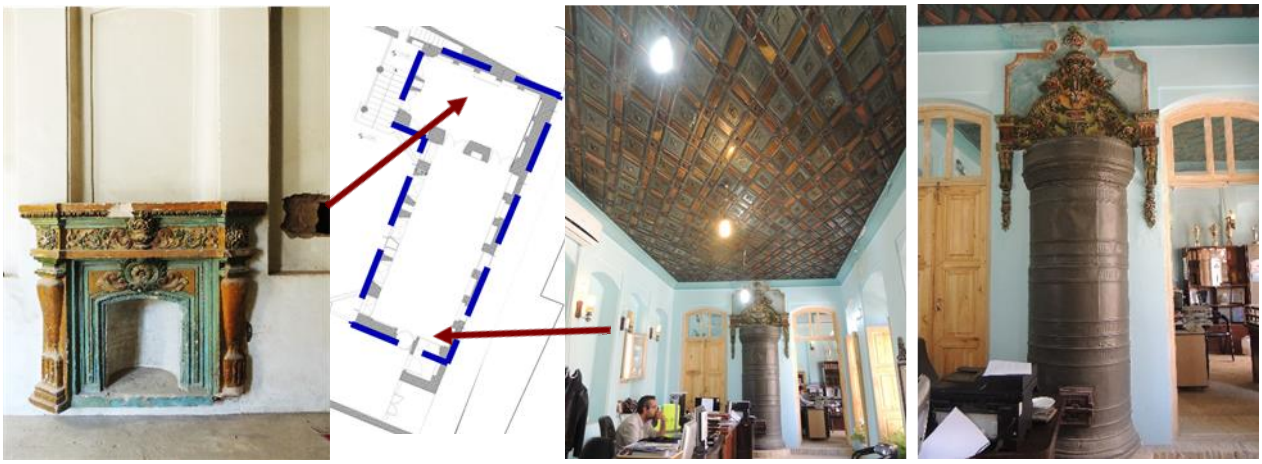


Figure 2.9 Utilization of decorative-functional elements as fireplace and heater in winter living rooms.

Until 1987, the building has been used as a residence. Later, one of the clerical staff of Meibod, a town of Yazd province has purchased it from the heirs. Since that time in 2012, it was utilized like an impermanent accommodation for Yazdian pilgrims.

In the same year, the house was owned by the local municipality and at the expense of this government organization and cooperation with the private sector, the restoration and conservation process was completed in spring of 2015. Nonetheless, it seems that this heritage is not safe from the modern heterogeneous constructions which have surrounded it. Today, Darugheh's house is being reused as an administrative office of local municipality.

Figure 2.10 Demolition of old residential buildings and construction of apartment-hotel high-rise structure near the Darugheh's house.

ii. Amiri House

Amiri's house is found in Paein khiyaban and has been becoming a residence for Amiri family from the early of the I Pahlavi period (1925-1941) until 1986. However, it has been later rented to pilgrims for eleven years and abandoned from 1997 to 2007 when the restoration project was going to be carried out under the supervision of Cultural Heritage Organization. This construction follows the Isfahani orientation (North-West/South-East) and represents the characteristic features of an ordinary traditional housing of later Qajar period and early Pahlavi.

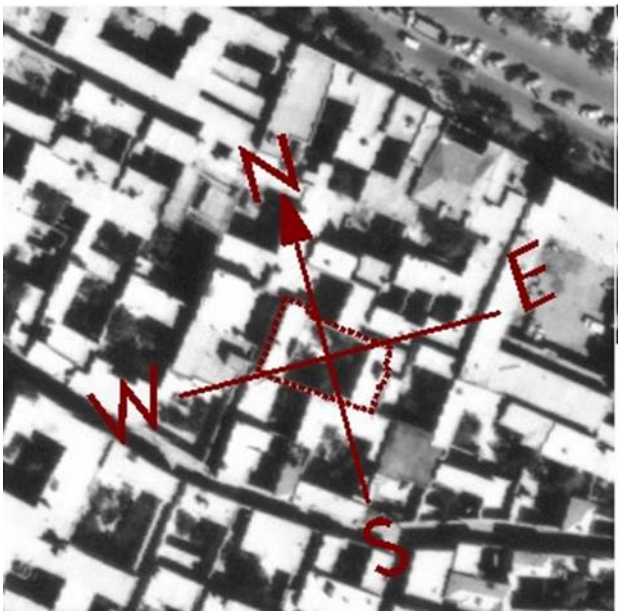


Figure 2.11 (1975) The Isfahani orientation (North-West/South-East) in Amiri House.

The entrance in Amiri's house is centered on the southeastern ground level and made of a *hashti,* an octagonal space. It is opened on the four axises and lined on both sides with flanking side chambers such as a service room and *hoz-khaneh. Hashti* can be considered as the versatile architectural unit which gives access to the courtyard, *hoz-khaneh* and also the guest zone.

First, the plan designing of the house is related to the inhabitants' needs and mainly consists of a series of living quarters namely *andaruni*; family area, *biruni;* guest zone and a rectangular courtyard. The entire *andaruni* on the northwest division presents a simple structure with two stories introduced by a rectangular living room either winter chamber and sleeping room on the first floor. The ground level presented a summer room and a cooking area. The floors are linked by connecting stairs on the corridor. Integrating architecture with nature is manifested on the ground level of this section through transmission of cooling air from *sardabeh-khane,* a basement with a domed roof built exactly under which.[102]

[102] To achieve the purpose, providing the better air transfer, the ground of this area is covered with small pieces of mirror mixing with bricks and soil. (Morasa, Govahi 2015)

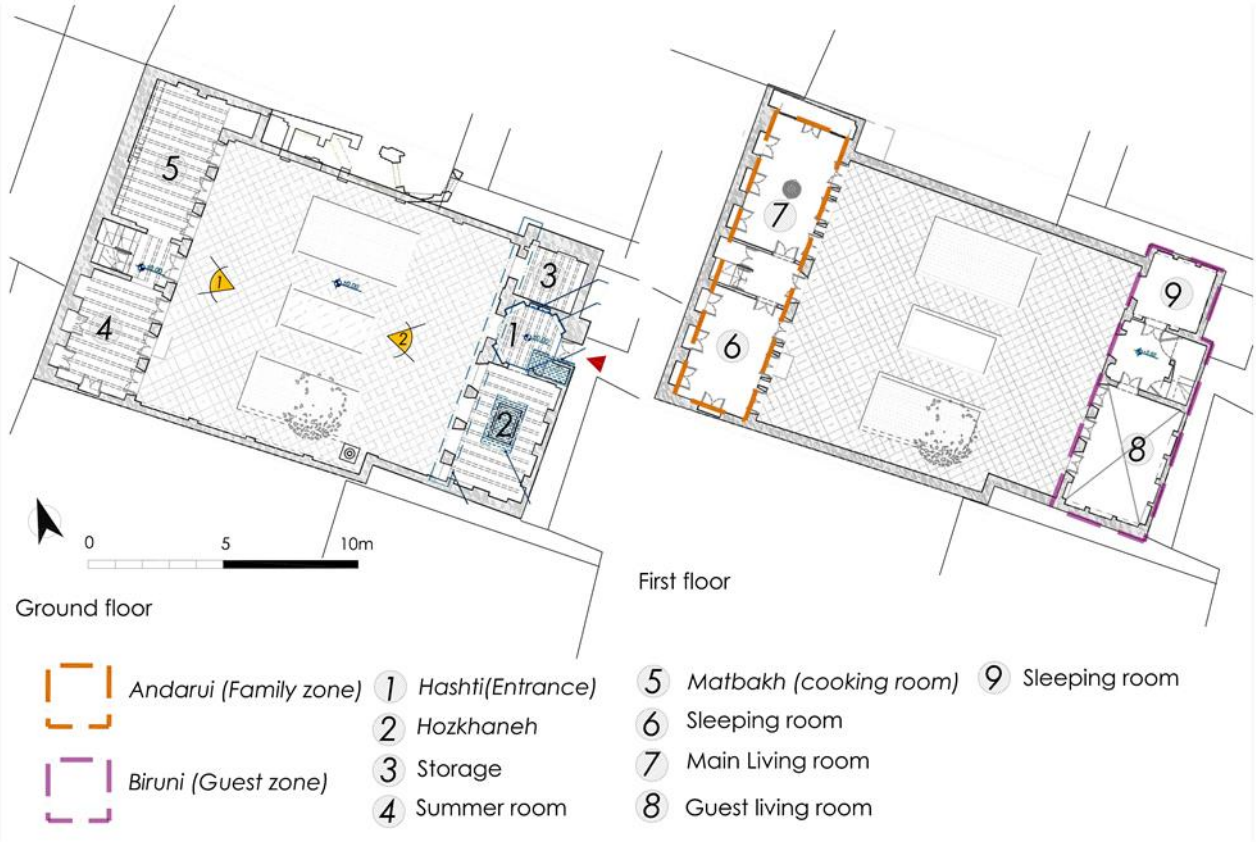


Figure 2.12 The identification of guest and family zones and distribution of living spaces in Amiri House.

The façade of the northwestern building mass presents a *taj*, a broken skyline element with a crown shape at center. In addition, to supply the ambient light in the dark of nights, there were some places considered for lanterns or lamps on the internal and exterior faces.

Figure 2.13 The latest building mass of house where was serving as the family zone. (Govahi, 2014)

biruni, unlike *andaruni*, does not present itself as an elegant structure. The guest zone is interrupted by a square guest bedroom and reception hall on the first floor. This structure perhaps was built before the northwestern quarter according to the renovation of the facade.[103] In addition, *biruni* is directed into the Holy Shrine. Based on a religious belief, the first structure of a building should be erected towards the shrine.[104]

Figure 2.14 The earliest building mass of house where was serving as the guest zone. (Govahi, 2014)

Regarding the Amiri's House architectural and functional features, we can realize that it did not follow the tradition of seasonal migration. As clearly seen, there was no apparent separation between winter and summer quarters. For example, *matbakh* or cooking room would be mostly constructed on the ground floor of the winter section to heat the upper rooms in cold months. However, at Amiri's House, summer and cooking room are both placed on the same level. Hence, two quarters were inhabited in all seasons and there was no immigration between them.

The restoration and conservation of the Amiri's House has begun since 2015 and is still ongoing. Also, it has been integrated with a modern residential-commercial building to protect this monument from any destruction related to the late project of renovation and improvement targeted at the texture surrounding the shrine.

[103]A comparison of its frontage with the section standing at northwestern side reveals the use of Qajarian ornamental elements on the initial layer of the facade on the southwest. Accordingly, it might be more ancient than another brick front which was hedged by usage of Pahlavi brick types. To harmonize with the façade of the family area, the surface of the guest zone is covered by the same method.

[104] Zomarsheidi, Hossein, *Implementation of Buildings with Traditional Materials*, Tehran: Zomorod, 2012, p.33.

2.1.2 Pahlavi Architectural Style

i. Kuzeh-Kan'ani House

Kuzeh-Kan'ani's house located in Chaharbagh neighborhood and construction of this building belongs to Pahlavi I era (1925-1941). Kuzeh-Kan'ani's house is aligned on the *qibla* (the direction of the Kaaba in Mecca) that is the *rasteh orientation* North-East/South-West with four yards.

Figure 2.15 (1975) Kuzeh-Kan'ani's house is followed the *rasteh orientation* North-East/South-West.

It was one of the few houses in Mashhad which had more than one courtyard. Each court is connected to the adjacent area, which is accessible through the openings on its walls. Access to the householder's area and garden would be gained through an indoor entrance of massive brick columns and semi-columns centered on the south external facade. The family living quarter is divided into two sections associated with a central yard; the southwestern building mass with an *iwan*, and a three-story building on the northeast. In spite of the many differences that can be seen in facades, both divisions on an immoderate frontage and a more moderate one perform a precise symmetry and harmony.

Figure 2.16 (1975) Distribution of courtyards on Kuzeh-Kan'ani House.

Figure 2.17 Family living quarter; the southwestern building mass with an *iwan.* (Source: https://memari98.com; accessed date: January 18, 2018)

Figure 2.18 Family living quarter; the three-story building mass.(Source: https://memari98.com; accessed date: January 18, 2018)

A coal heater sitting on the left in the living room of three openings was utilized to increase the room temperature in winter. In the underground of southwestern section, in addition to the openings, the small lattice rectangular windows are vertically inserted to enter the daylight.

The servant or rider's entry is the small hall on the southeast side that is linked to other next small-scale environments, third and fourth courts. The servant's quarter composed of an outdoor area and minor indoor rooms remained separated from the householder's comfort. The fourth yard was a place

to keep the horses in the past, and after the arrival of the automobile, this location has become a parking space.[105] Today, the servant's area and its adjoining yard is transformed into different ambiences with several additional structures

The edifice has been the resident of Kuzeh-Kan'ani family for years. Based on Mashhad's map in 1954, however, the central residence was probably rent to the American consulate. Over the next few years, the house faced new reuses, including the Khorasan Agricultural Office in 1971 and a student dormitory.[106] After the 1979 revolution, the ownership of the western part of the house land was assigned to build a massive modern building, where religious ceremonies are held by the Kuwaitis. Besides, the eastern side was purchased by Forushan village inhabitants from the Khomeini Shahr, Isfahan, who have been using it as an accommodation during their stay in Mashhad since 1990. Nowadays, the only preexisting structure remained from Kuzeh-Kan'ani's house is the middle part of the entire house land. On the other hand, the secondary courtyard constructed around a garden does not stand any longer today and is replaced by a high and modern building, the Husainiya Kuwaitia.[107]

ii. Nasirzadeh

Nasirzadeh Mansion is recognized to be the best example of the houses standing free on four sides, which are rarely found in Mashhad and even Iran. It was situated next to the midwest garden of the Shrine administration on Ghonsulgari lane placed in *rasteh-e-sarab*, a gravel road with a steep slope extending to the Shah Mosque.[108]

The importance of choosing it for being introduced in this section is that in Mashhad, houses of the wealthy in the same kind were built similar to the mansions in Isfahan. On the other hand, Nasirzadeh Mansion, unlike traditional dwellings, did not have a central courtyard and its building mass was positioned in the middle of the first half of a large garden. Based on the location of the living quarter and images of the house (only available documents), the house was constructed in the early 20th century by following the Qajar architectural style, as well.

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[105] The registration document of Kuzeh-Kan'ani House. (KH-CHHTO archive)

[106] Mahhvan 2004, p.441.

[107]Vafa Sabeti, the director of the Cultural Heritage Center of the historical context surrounding the shrine, announced that revitalization of the Kuzeh-Kan'ani's house is one of the projects approved by the Planning and Coordination Council of Mashhad 2017, which must be preserved and restored until the beginning of this international event. (Razavi Khorasan newpaper 2015, khorasanrazavi.khorasannews.com/Newspaper/PagePDF/807; accessed date: January 15, 2018)

[108] Some authoritative sources say that Nasirzadeh's habitation was leased to the consulate of the Russian government in the early twentieth century. The author sought the [in]correctness of this issue and found a brief description about this mansion in the travelogue of d'Allemagne. He describes that the Russian embassy's palace was in a vast garden with old trees and lower level than the street. (D'Allemagne, Henry, *From Khorassan to Bakhtiari country*, Tehran: Amirkabir, 1956, p.611) Since there are only two or three examples of such houses in Mashhad (the central building in a large garden), and the alley where Nasirzadeh's home is located in is called *Ghonsulgari*, meaning Consulate, the claim that this house was the Russian consulate is approved.

Figure 2.19 (1975) The aerial photo depicts the location of a building mass at the core of the first half of the garden. It also presents the destruction of the second part which has made to construct a madrasa.

Figure 2.20 (1973) Nasirzadeh Mansion, the southwestern facade; The principal internal entrance with an *iwan* and *taj* (broken skyline element). (KH-CHHTO archive) **Figure 2.21** A'lam's House (Isfahan), the northern building mass that composted of an *iwan* and ornamental *taj*. (Haji-Qassemi 1998, p. 65)

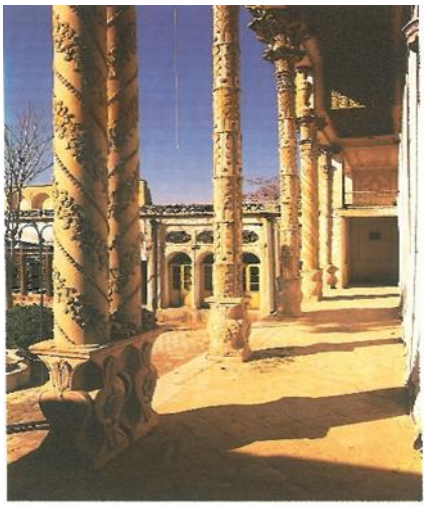

Figure 2.22 (1973) Nasirzadeh Mansion, the structure of *iwan* in the southwestern facade. (KH-CHHTO archive) **Figure 2.23** A'lam's House (Isfahan), the *iwan* from inside in northern building mass. (Haji-Qassemi 1998, p. 69)

In Nasirzadeh Mansion, *iwan* had six external piers to support the rectangular ceiling along with a broken skyline element shown in a crown shape, *taj*. Characteristics outlined above plus *iwan* direction to the Kaaba indicated its function as an entrance lobby for both householders and guests. Another important feature in Nasirzadeh's house is the secondary internal entrance derived from a simple *iwan*, laid out in the opposite of the main entry, which is probably made for servants to maintain complete privacy at home. All the faces were formed from high oblong openings framed by semicircular arches.

Figure 2.24 (1973) The secondary internal entrance that was reserved for servants. **Figure 2.25** (1973) The southeastern façade of Nasirzadeh House. (KH-CHHTO archive)

The garden of the house was considerably enormous before it was divided due to the construction of Shah Reza street in 1939.[109] It has further been distributed into two halves in the 70s in order to construct a madrasa in the bottom half. Afterwards, a mosque was built next to the madrasa that caused the total demolition of the house.

2.1.3 Zand and Early Qajar Style; Case Studies

According to the author's research, the majority of Iranian scholars' studies have been concentrating on only magnificent palaces or wealthy mansions on a grand scale, while the principals of house formation are respected in all traditional Iranian residential buildings; from moderate to great ones. It aims at introducing the three ordinary examples of a domestically architecture which are at greatest risk. They are facing serious challenges; abandonment, poor maintenance and non-standard additions, and the need for a safeguard through a deep survey and documentation. Among case studies, Nili and

[109] Mahvan 2004, p.441.

Bidari Houses faced the demolition in October 2018 and August 2017, caused by renovation and improvement projects of the texture surrounding the Holy Shrine.

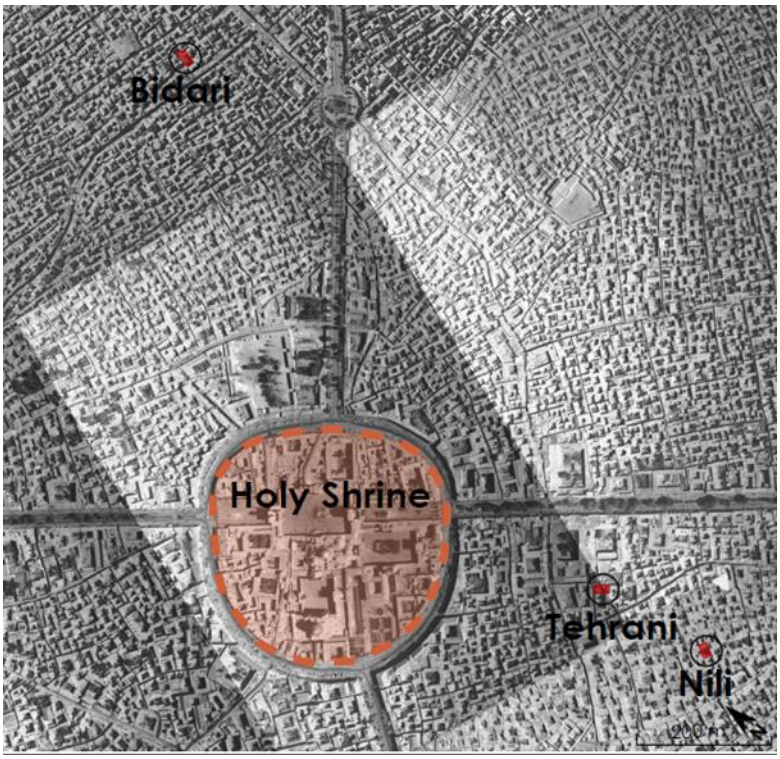

Figure 2.26 The location of three houses on 1956 areial photo. (NCC archive)

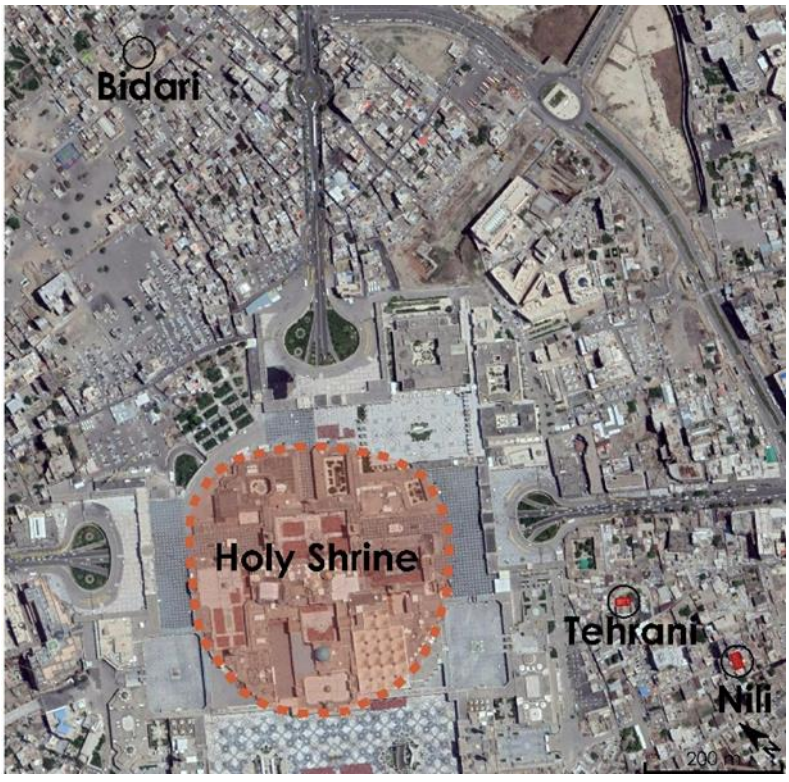

Figure 2.27 The position of two remaining buildings until Oct.2018. (https://www.google.com/earth/, accessed date; July 31, 2018)

i. Nili House

Among the case studies, Nili is perhaps the most ancient instance of a mini-scale house which is located in Eidgah district (9 Nawab Safavi, today). It has been occupied by pilgrims for many years and has totally been abandoned in the last decade. The house is placed at the end of a dead-end path and perpendicular to the main route. It is oriented towards Mecca (North-East/South-West) not only to capture the advantage of solar heat but also to align the structure with the neighborhood's roads and lanes.[110]

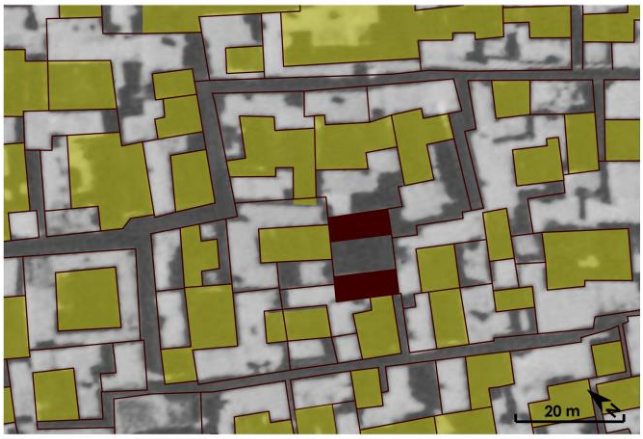

Figure 2.28 The location of Nili houses on 1956 areial photo. (NCC archive) **Figure 2.29** The figure presents the location of Nili House near to public monuments (highlighted with violet color) and the main routes. (https://www.google.com/earth/, accessed date; July 31, 2018)

One could reach the house through a narrow and roofed corridor on the ground floor. The undirected entrance can be explained by the concept of privacy recommended in Islamic belief in response to the separation between public and private boundaries. Nili has a standard design of Iranian traditional houses, two building masses disposed around a rectangular courtyard and no windows open to the outside. Mainly, the open court is the place for outdoor activities in particular for younger children and women who were not allowed to go outside the house.[111] So it provided an open-air setting for holding daily domestic activities and plays. The courtyard still reflects the concept of heaven with a *hoz*, an ornamental pool at the center and accompanying berry trees arranged symmetrically. This integration of nature and architecture affords a natural cooling system that reduces the harsh warmth of the sun and increases humidity during summer days.[112]

[110] Zomarsheidi 2012, p.33

[111] Regarding this absence of permission for females, there is a story told by Yate in 1897. He specified, on the thirteenth day after *Nowruz (Persian new year)*, while the body of Mashhad was outside the city women were excluded from this day's outing. In fact, he was going out for his ride from the Sarab gate, found the unusual guards posted there, and when he asked about their presence there, they answered him to prevent any women leaving the city. It is a fixed custom in Persia that everybody must leave their own house and go out on this day. (Yate 1900, p.307)

[112] Afrasiabian, Mahdavinejad, Badri, 2012, p.261

The two-story southwestern building mass of the house was the destination for seasonal immigration of the inhabitants during summer months where there was less exposure to the sun and hot desert winds blowing from the south. According to the architectural survey and study of proportion, the traditional scheme of the summer quarter has been made from the principal spaces associated with a secondary area. Indeed, each floor included an entrance and the living rooms which were in some way connected to a storage. In ornamental terms, the façade performs a regular rhythm and harmony by repeating the rectangular apertures on the first floor which are framed with a frontal arch in semi-circular, sharp or denticulate forms.

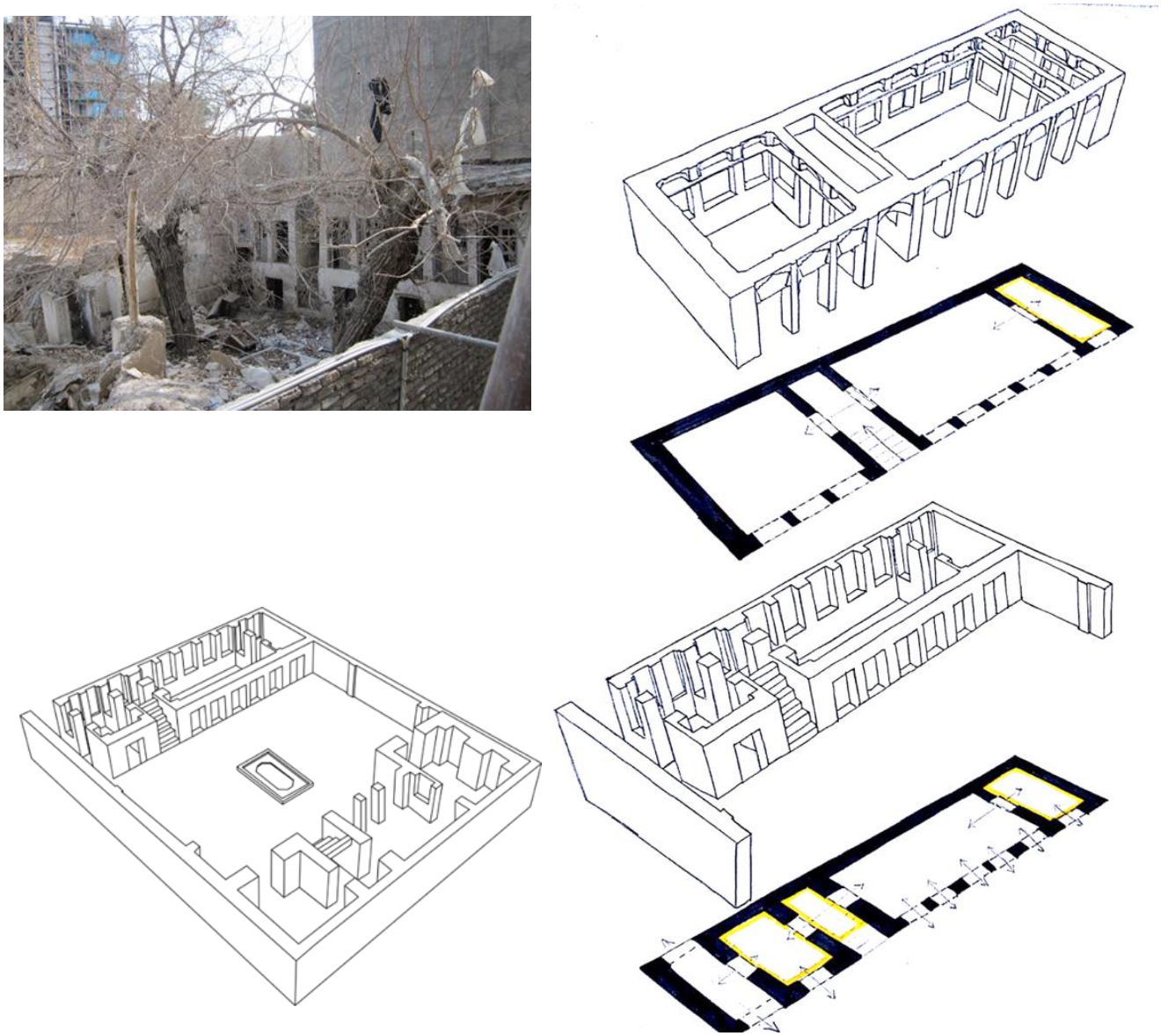

Figure 2.30 The presence of courtyard and southwestern building mass in Nili House, drawings highlight the first distribution of spaces; living and secondary zone in which storages are highlighted with yellow.

Normally, in a double-story house, the lower level is always comparatively cool and with opened windows and doors its temperature would rarely rise above 23 degree centigrade.

In Nili's house, the central chamber of the ground floor in summer quarter was serving as sleeping zone and the first and last rooms were the appropriate areas for food storages to keep them naturally fresh. In addition to conserving foods, in these zones barrels of water have been maintained as well. In the past, the passage from an enclosed zone to another one was continuously repeated without any interruption.

Figure 2.31 The two-story southwestern building mass, summer quarter façade.

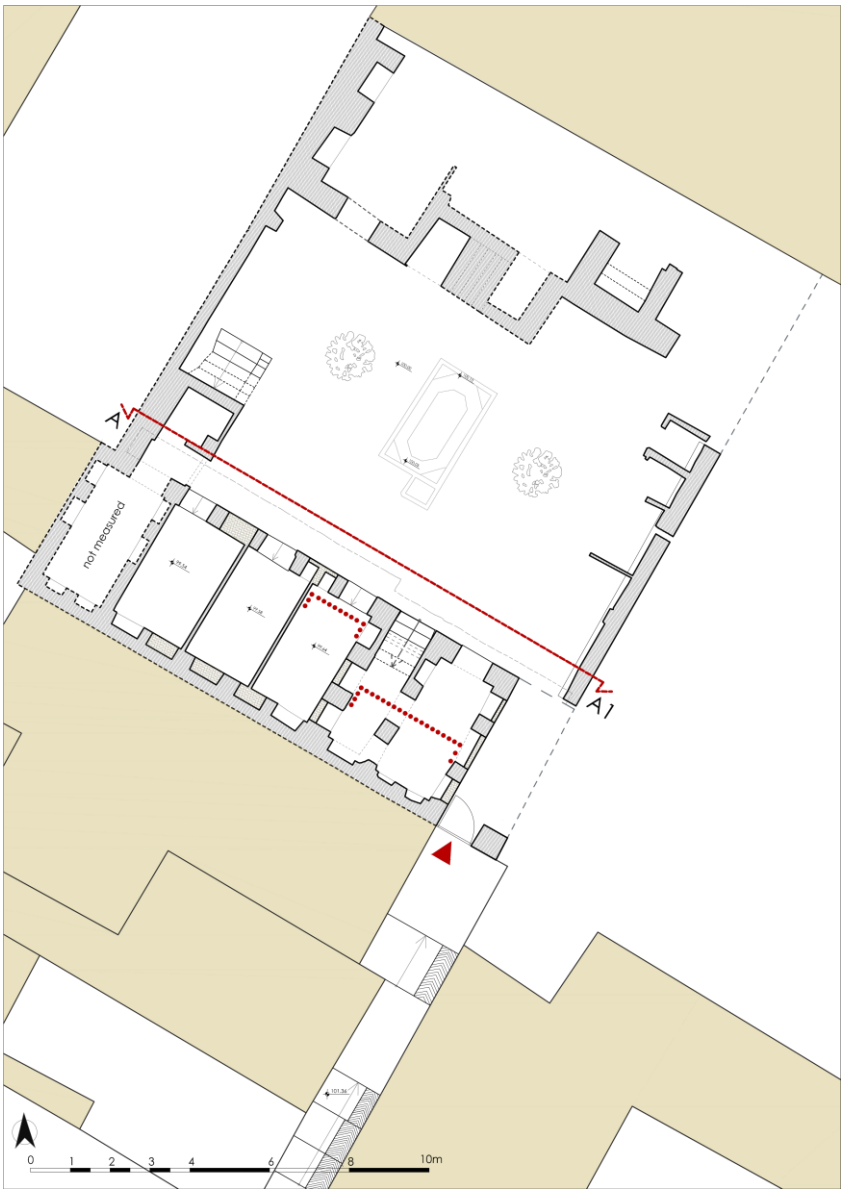

Figure 2.32 The presence of courtyard at the core of structure and ground floors of two building masses.

Figure 2.33 Summer quarter, the rooms on the ground floor.

The ruined building mass on the north-eastern side of the court is a relatively recent structure which was built during Pahlavi I era (1925-1979) on the foundation of a previous construction. This portion is identified as the winter quarter of the house because of its location contrary to the direction of cool winds coming from the north and northeast. Undoubtedly, its typology and structural area were not so far from those of summer quarters. It seems that in winter quarter, three spaces that are reserved for cooking, living and storages located and interconnected from inside.

Figure 2.34 The ruined building mass on the north-eastern side of the court (winter quarter).

Figure 2.35 The ruins of cooking room in northeastern mass.

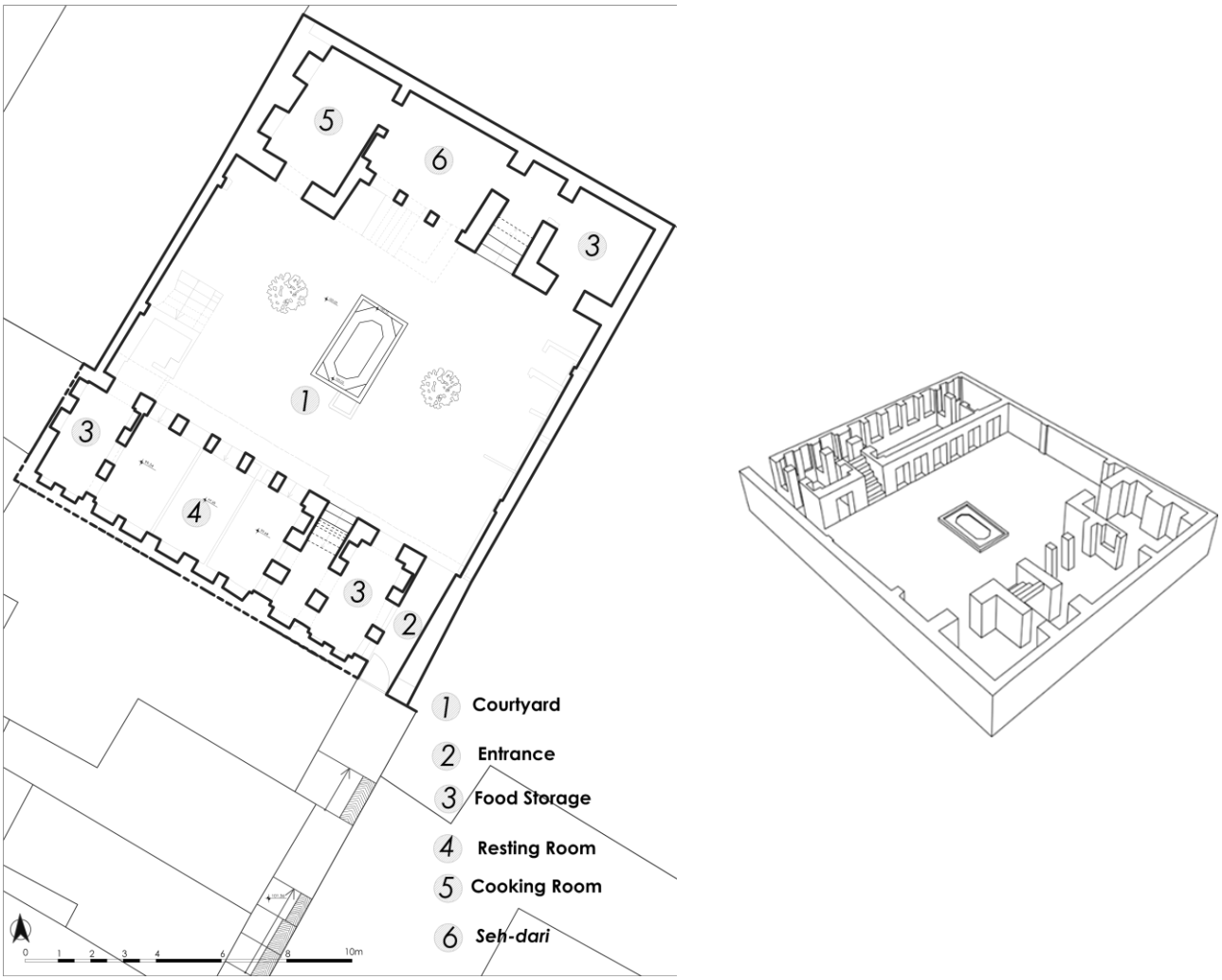

Figure 2.36 The original–earlier plan of the ground floors in two building masses and identification of thier spaces.

The top floor, elevated by a set of stairs from the courtyard, was allocated to the guestroom and living chamber, which are tied together by an *iwan.* The crawl space, on the roof of *iwan* and behind the arch with a meter high, is used as a storage to contain the family's valuable objects or even treasures. This area became ventilated through a carved gypsum plate located under the vault. Unlike the preceding examples, here, *iwan* is a narrow and deep corridor, three sides of which are closed by flanking rooms and boundary walls and one side is open to the courtyard.[113]

The principal room served as a multi-functional place where it would be used for family gathering and dining. It was characterized as *panj-dari,* which included a narrow enclosed storage at the end of its composition.There is a combination of openings at a variety of scales in an attempt to correspond their dimensions to space function .The application of openings positioned toward north-east and the

[113] A number of Iranian scholars have mentioned *iwan* as a large semi-open structure, with exterior columns in front of the rooms. However, in some Arabic and Islamic texts, *iwan* is commonly referred to as a narrow and semi-closed space, as in the case of Nili.

yard was to prevent the summer harsh sunlight and hot winds from coming inside. Except for the last aperture placed at the bottom of the room axis. The guestroom features as a *seh-dari*, a room with three apertures which represents a square form. There are niches in the walls of both rooms at different levels for keeping several objects, such as lamp, candlestick, Quran, mirror and foods. The arrangement of the interior niches in the design of each inner space represents a compatibility between the house form and the resident's needs.[114] The builder tended to make the optimal use of an architectural component like walls by digging some parts of it in order to make utilizable shelves, and also a lightweight structure. The upper level in the northeastern mass also included an *iwan*, living and sleeping rooms. However, it is impossible to realize the precise form and design of the winter quarter due to its disrepair and degraded aspect.

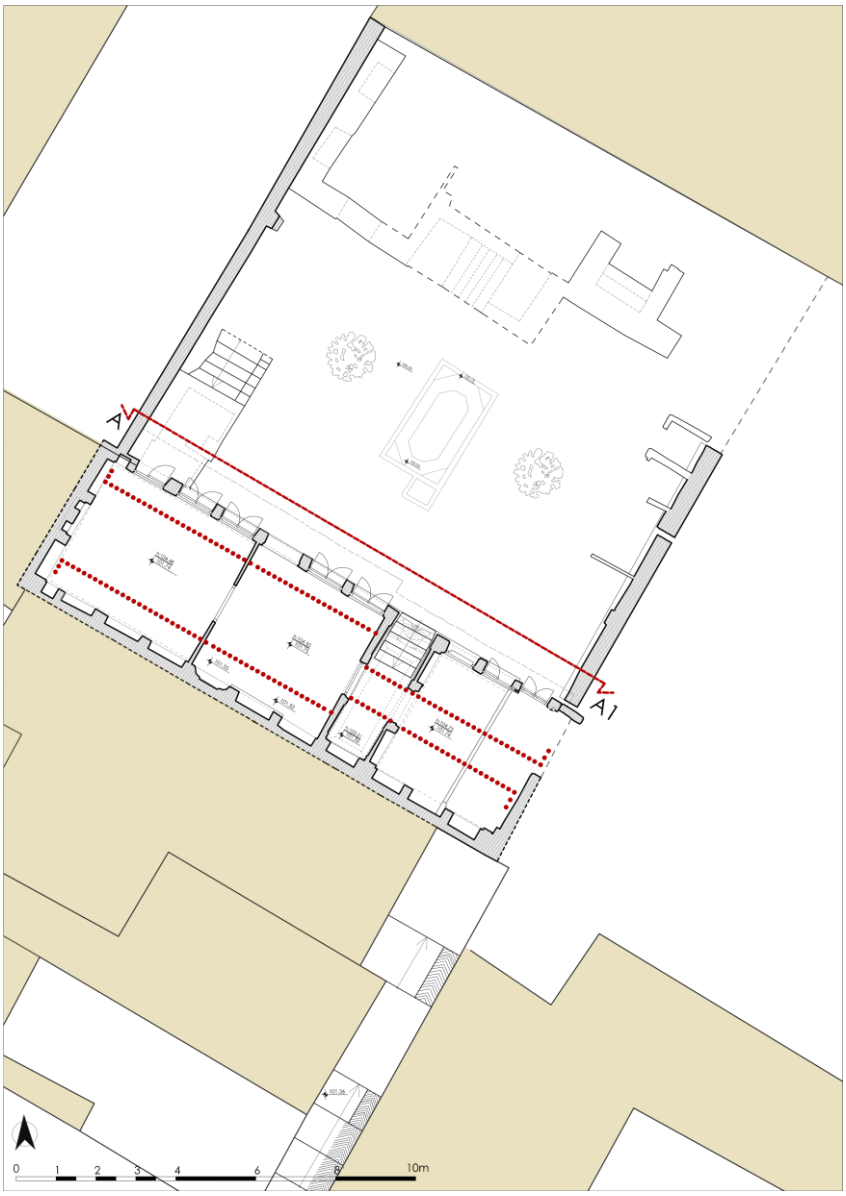

Figure 2.37 The first floor of southwestern quarter and distribution of spaces.

[114] Pirnia, Memarian 2008, p. 163.

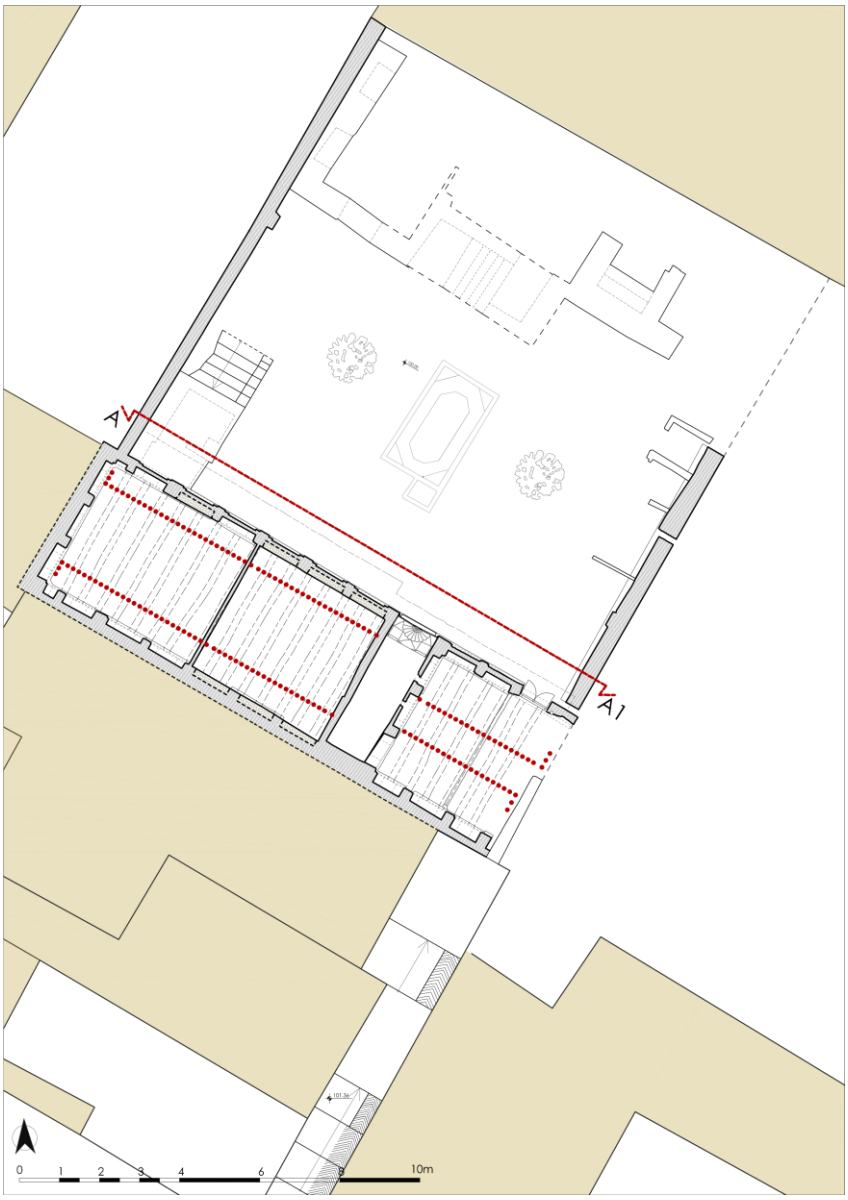

Figure 2.38 The plan of the first floor that has drawn according to the level of upper niches.

Figure 2.39 The internal façades of the summer quarter which performs a regular symmetry.

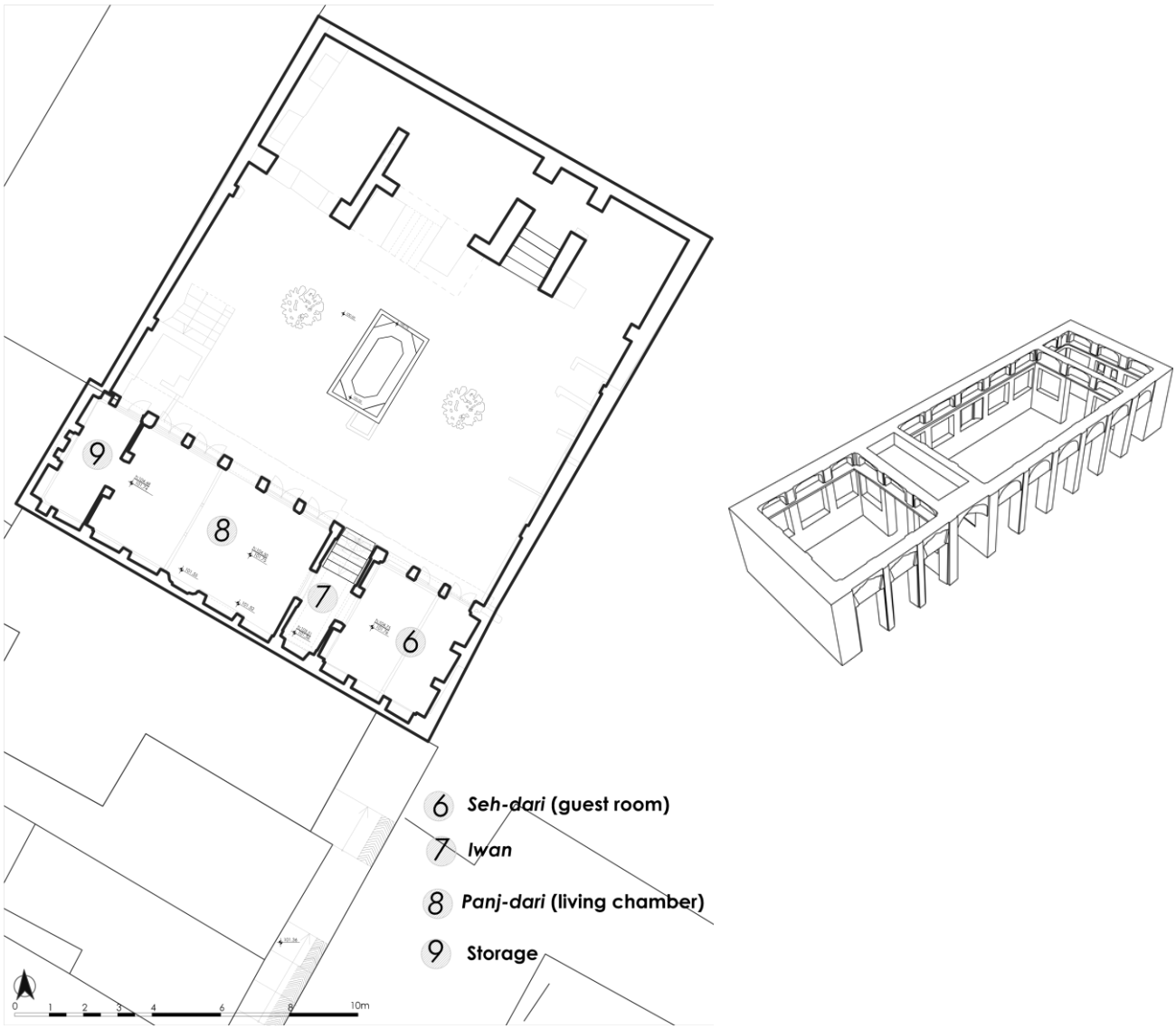

Figure 2.40 The image depicts the earliest plan of the first floor of south western building mass in which a main chamber, a guest room and an *iwan* are located.

Perhaps Nili is one the most proportional and geometrical house among the three samples because of proper distribution of spaces on its land. The ratio between length and width of the courtyard is 1.73, which has been defined as a standard proportion for the central yard.[115]

The guest room total area is approximately 17.15 m^2, half of the living chamber by considering the thickness of the walls. It is interesting to note that through Iranian Golden Rectangle, the architect has managed to divide the land in a balanced way and then distribute the spaces in a regular mode. Although, in internal zones, the proportion of Golden Rectangle does not conform to the plan, it is sufficiently close to it.

[115] Pirnia 2005, p.160.

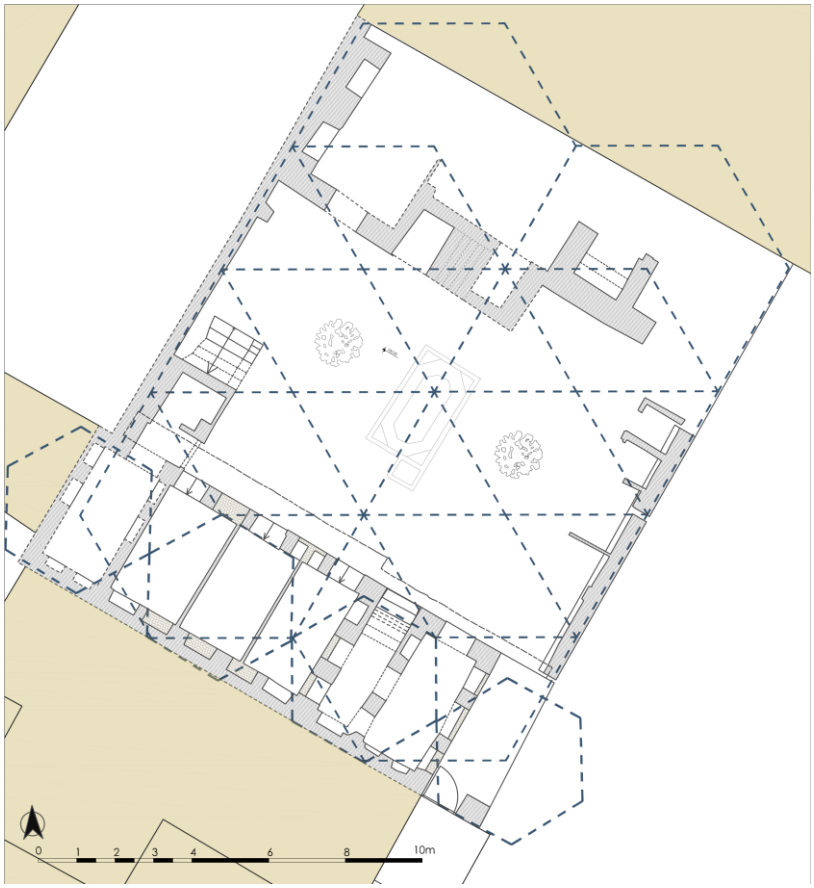

Figure 2.41 The analyzing the Nili House proportion through bringing the regular hexagon to the layouts of buildings, Iranian Golden Rectangle system.

The placement of traditional modules made of *gereh* (6.66 cm) on layouts of Nili House specifies that the builder considered *gereh* as the basis unit to divide the land in a balanced way and distribute the spaces in a proportionate system. Although, it seems that the proportion of rooms is closer to the minor module than the large one.

Gereh, also was used for elements on a smaller scale. For example, the apertures of rooms correspond to a measure about 12, 13 and 15 *gerehs* in width and, 177 cm (26 ½ *gerehs*) in height.

The multiples of *gereh* like ½, ¼ and ¾ have also been employed to make the architectural components like pillars and niches.

Table 2.4 The dimension of spaces in Nili House according to the traditional units.

Spaces	Width		Length	
	L. Gaz	***M. Gaz***	***L. Gaz***	***M. Gaz***
Courtyard	7	8	12¼	14
Summer Quarter	4	4 ½	13 ¼	15
Winter Quarter	4 ¾	5	13 ¼	14

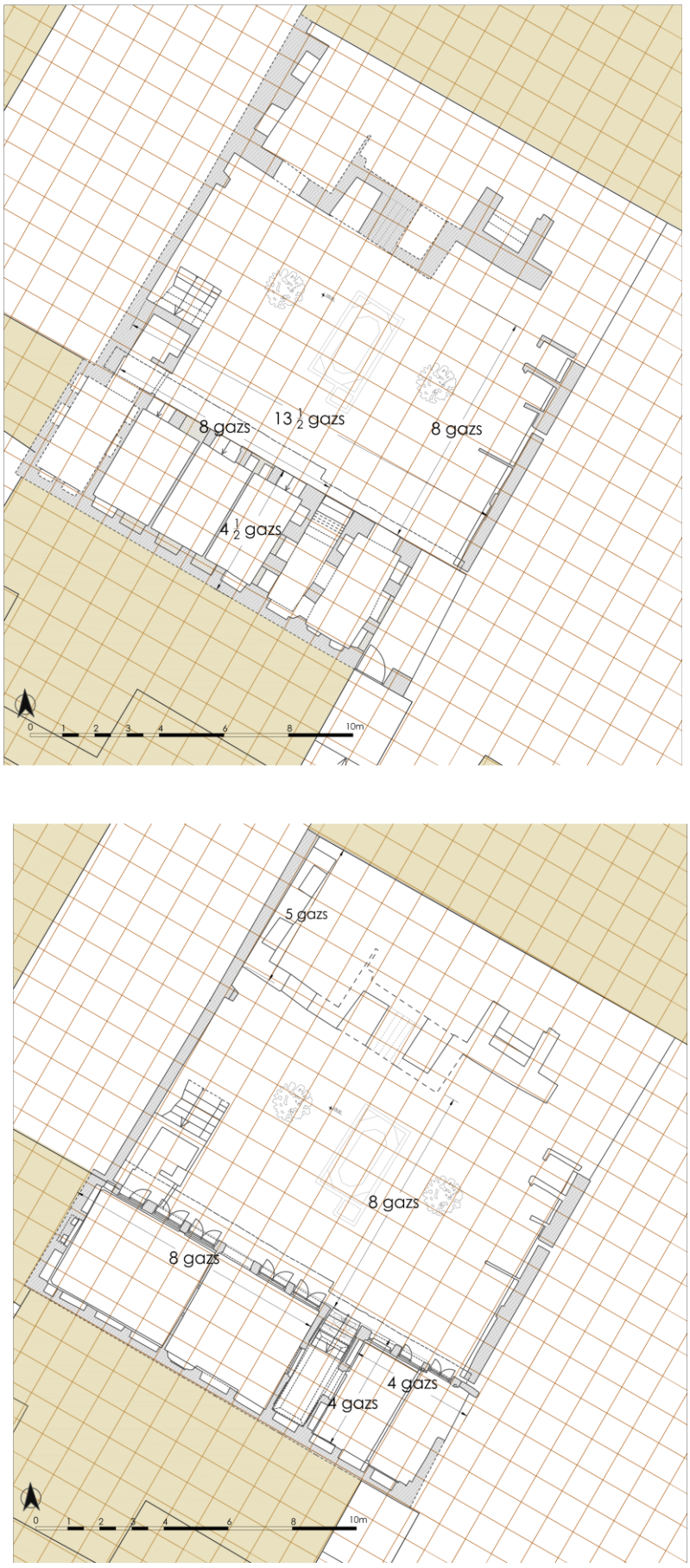

Figure 2.42 The placement of minor module *(minor gaz*) made of 14 *gerehs* on the ground and first floors.

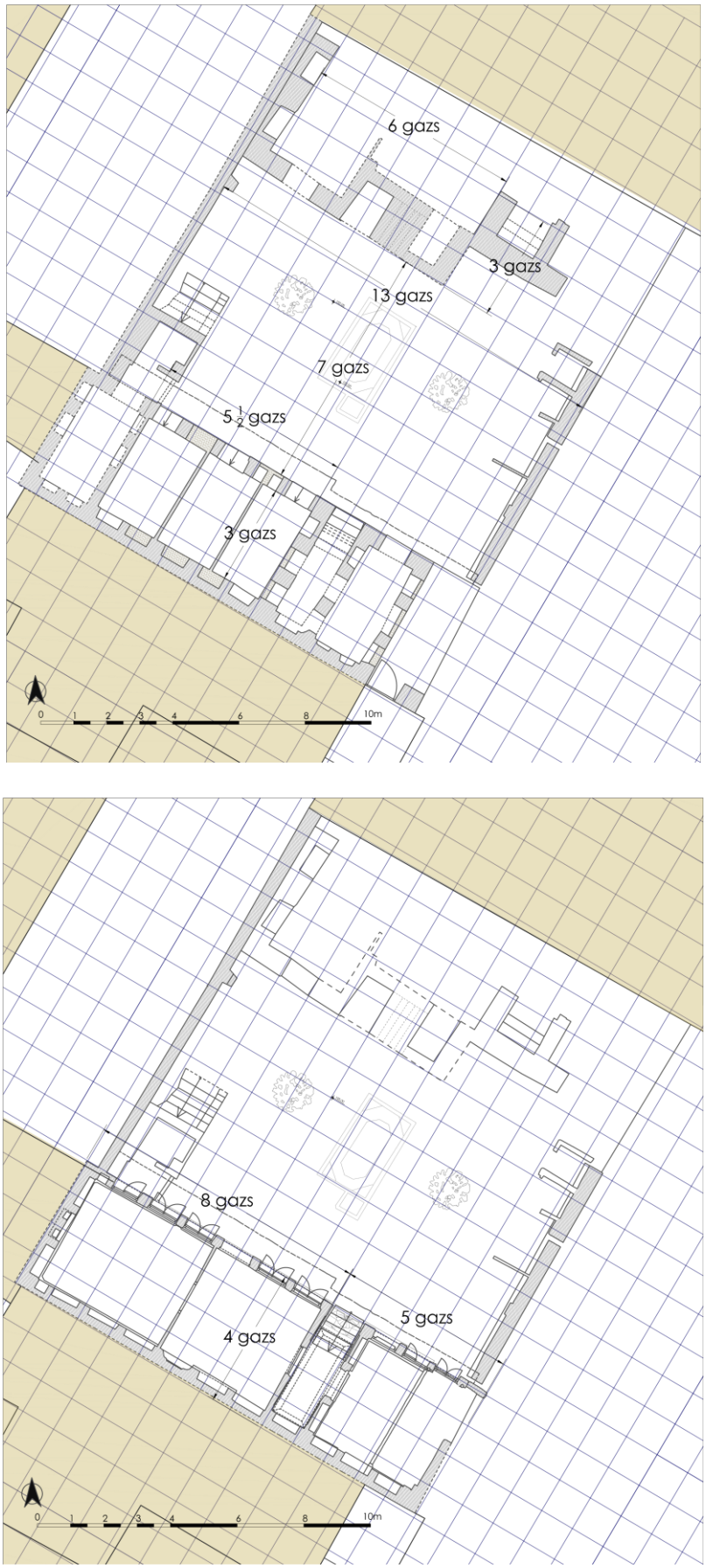

Figure 2.43 The placement of large module (*large gaz*) made of 16 *gerehs* on the ground and first floors.

At first glance, it appears that the house had almost lost its authentic identity completely. In fact, those changes and renovations performed by homeowners had caused damage to various parts of the building, particularly the northeast quarter, the eastern wall and the entrance passageway. The entrance corridor is currently filled and closed by the collapse of the eastern boundary wall through a gradual process of human activities and environmental impacts.

According to the evidence, the yard has gradually lost its architectural shape by the addition of new structures like a staircase on the western side and the low and thick walls on the eastern one. They were made to form independent entrance steps and toilet facilities which do not belong to the primary form of dwelling.

The owner subdivided his residential property into more individual spaces in order to rent them to pilgrims.[116] In fact, the main living chamber was divided into small rooms by a thin spilt wall to achieve the highest autonomy function.[117] Also, the adjunctive walls divided the central chamber into three smaller rooms. Position of the pillars and their thickness indicate the presence of a room with five openings in the core of the composition. On the other hand, the guest room has been much altered by making a specified area above the entrance passageway to keep mattresses. The fact is that to create this space, a wooden and adobe structure has been erected and the third aperture has been lifted up from its original position.

On the ground floor, the openings which provide an access to resting room from the storages are filled by the square bricks in sight and there is no direct connection among the rooms anymore. Also, we can see the existence of the niches with a typical distance on the length of the wall which are currently closed in addition to the two external openings.

Based on remnant elements in winter quarter, in addition to the main staircase at the entrace to the *iwan*, there is another staircase that connects the courtyard to the first floor. The stairs have now been hidden under the ruins, and only a part of them is visible. Due to providing direct access from the yard to the western room, which is an unusual connection in traditional houses, it has been added to the northeastern front in recent decades.

[116] It is a usual and commonplace of economic exploitation method used by poor families who live in the neighborhood surrounding the Holy Shrine.

[117] The position of the middle ornamental niche in the composition and the correspondence of the length size of the sixth pillar with the first one would still reinforce the theory of the division of the room and demolition of its storage.

Figure 2.44 The current plans show the transformation and changes made in courtyard and indoor spaces.

Figure 2.45 Construction of staircase in the courtyard in order to create separated entry into the western rooms on the first floor, southwestern mass. **Figure 2.46** The new walls built on the eastern side of courtyard to make new spaces like bathroom.

Due to the vulnerability of the building, Nili House has gradually turned into ruins and only *waqf* prevented the possible demolition by the municipality.[118] Although, the house has totally been demolished in October 2018 by the houseowner.

ii. Tehrani House

If the architectural and aesthetic characteristics of Tehrani's House cannot be regarded as a value too, its position in Paein Khiyaban district near the public monuments including Aziz al-ahof serai, Abbas Gholi Khan's madrasa and Hazrati bazaar can be a reason to consider this house as heritage.[119]

The building is oriented from northwest to southeast (Isfahani direction*)* and its main entrance has been placed 2 meters below the street level with a passageway which provided a direct access to the courtyard and ground floor of the summer quarter. With a wooden characteristic door and brickworks in jagged form, the entry still attracts attentions.

The basic structure of the dwelling is a combination of a yard at the core and two building masses on the yard's longitudinal axis. Similar to all Iranian traditional houses, Tehrani's composition represents a tradition of seasonal immigration and optimal use of indoor and outdoor spaces in summer and winter. In addition to the position of each building mass on the courtyard, the utilization of particular architectural bodies in their structure can identify the functionality of the living quarter.

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[118] Endowments created when the endower or founder of a *waqf* put his/her property into *waqf* to support specified individuals usually members of the founder's family for religious, social or charitable purposes. This type of foundation is referred to as *waqf-al-ul-aulad (family waqf).*
(http://cnqzu.com/library/To%20Organize/Books/Brill%20Ebooks/Brill._Handbook_of_Oriental_Studies/Brill.%20Handbook%20of%20Oriental%20Studies; accessed date: February 20, 2017)
In this case, Nili's owner left his house to the members of the family as the *waqf* beneficiaries with the propose of using there for *hussainia* mourning; the religious events have been held during Muharram month. Because of its dedication to the social-religious affairs, Oqaf (the governmental Department of Endowments and Charity of Khorasan Razavi Province) will manage this endowment house. According to the traditional waqf charter, this foundation was theoretically established "for eternity." But, in reality, there were changes on the waqf regulation proved by the related administration. In November 2016, the author had a personal interview with Hassan Nili, the family's son, who reported a summary of the first architectural features of the house before its transformation as follows:
In my view, estimating the age of the building is very complicated due to the absence of similar samples. Do you have any information about the date of construction? Not exactly. This edifice is the only heredity remained from my family, which was of great significance for my grandfather and then to my father. That is why my father dedicated it to the children because he wanted to preserve this house. Perhaps this great significance with my ancestors could be an indication of the age of this building. That is why my father put it into family *waqf (waqf-al-ul-aulad)* because he wanted to preserve this house. Perhaps the survival of Nili's home from the past to present day and its importance to my ancestors can be a justification for its historicity.
Due to the changes made in the initial form of the composition and the intense destruction of the northeastern mass, can you give us an explanation of the primary state of the dwelling? The currently destroyed portion was rebuilt by my father on the pre-existing ruined structure, and since my father was a carpenter, the doors and windows of this section are made by him as well. *Matbakh (cooking area)* was found on the ground floor of this quarter and there was a well in the courtyard.
During my observations, I noticed the repairs and a series of basic restorations. These actions were carried out by whom and for what reason? As I already mentioned, this place had a high value for my family, and for this purpose, some improvements and renovations have been carried out by them over the years.

[119] Not far past, Abbas Gholi Khan's hammam also laid on the east side of house, which was destroyed in the 70s.

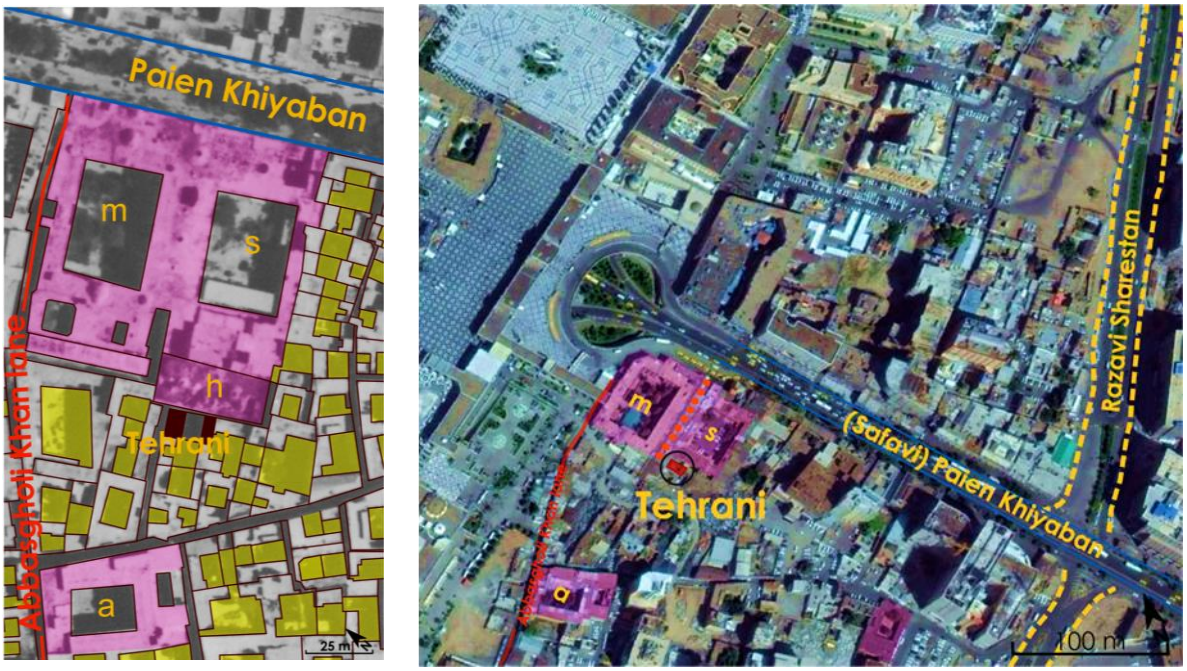

Figure 2.47 (1956) The figure presents the location of Tehrani House near to public monuments as Abbasgholi khan monuments; m) madrasa, s) serai, h) hammam and a) Aziz al-ahof Serai and highlights the courtyards of traditional houses. **Figure 2.48** (2018) The image depicts changing of historical context, construction of Hazrati Bazaar between serai and madrase and demolishing of hammam and dwellings. (https://www.google.com/earth/, accessed date; July 31, 2018)

On the ground story of the summer quarter, there is a cross-shaped area was allocated to *hoz-khaneh*, a pool room. According to the householder's statement, this room has been used as a place to take siestas during summer days. The pool had been employed as an architectural and aesthetical component in collaboration with natural elements namely water and wind to manage their energies and form a sustainable architecture. It generally provides a high amount of humidity and relaxed atmosphere and its water is also used for washing and ablution. The connection between *hoz-khaneh* and courtyard was possible through five openings placed on the southwestern wall. Moreover, this room is directly linked to the entrance corridor that ties inside with outside.

Figure 2.49 The current state of the summer quarter façade, northwestern mass. **Figure 2.50** The winter quarter façade, southeastern building mass.

The winter section is laid on the opposite side of the summer one, currently having a facade far from the usual harmony and symmetry. This building mass is much less extensive in comparison with the summer part and consists of two identical rooms on each floor plus a central staircase. This living quarter can be considered as a secondary area used only in the cold seasons based on its land percentage occupation and the simplicity of the rooms.

The ground floor rooms in the southeastern building mass may be recognized as cooking area and *seh-dari* room. As a rule of thumb in Iranian house designing, the room intended for cooking has been allocated in the winter section to heat the surrounding areas. According to the owner's declaration, *matbakh*, the cooking room composed of an oven on the western corner with a chimney and millstone. The inner opening in the center and the outside apertures would be providing a direct connection between this space and the yard and another room. The second rectangular room which typically corresponds to the cooking room defined as *seh-dari*. Like the cooking room, the *seh-dari* included three apertures placed with a regular distance from each other to make an access to the yard.

Figure 2.51 The architectural survey of northwestern mass, summer quarter façade. **Figure 2.52** The architectural survey of southeastern mass, winter quarter façade.

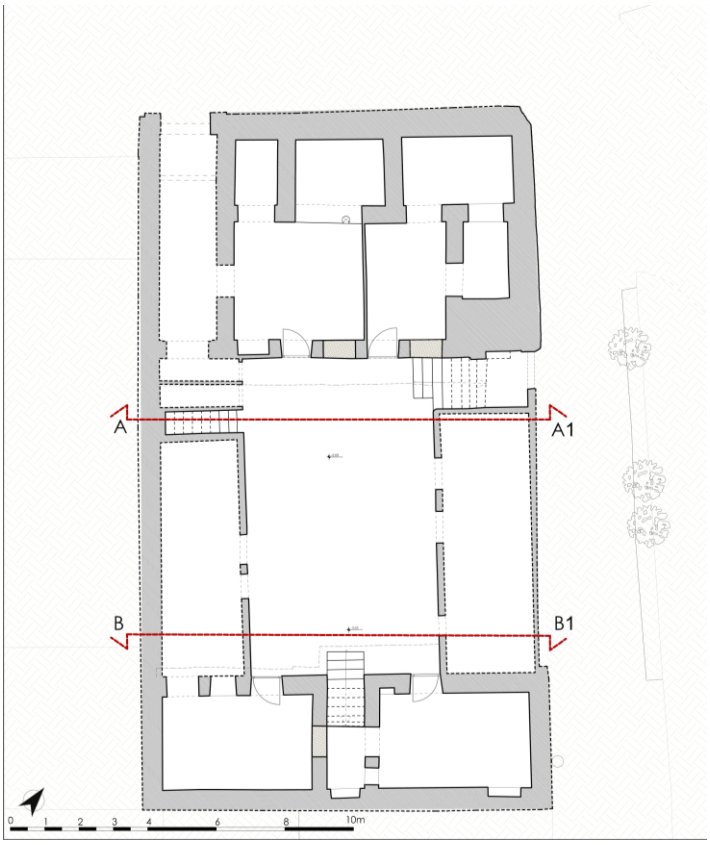

Figure 2.53 The presence of courtyard at the core of structure and ground floors of two building masses.

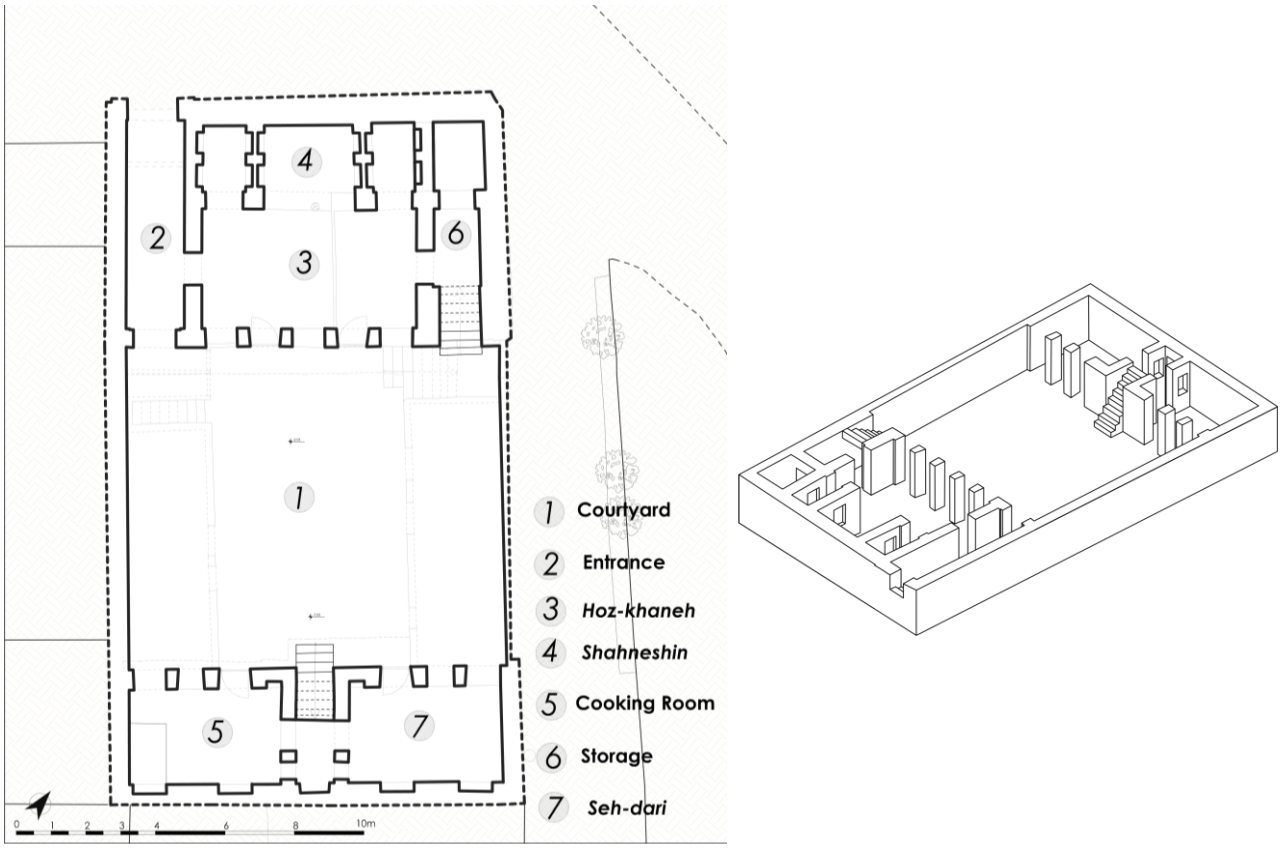

Figure 2.54 The original plan of the ground floors of two building masses and identification of earlier spaces.

At the core of the summer quarter, there is a *talar*, a principal hall on the first floor with a wooden sash window made of seven openings called *orosi*. This living hall previously had a cross form with a *shahneshin* space on the northern half part which was surrounded by two small storages on either side. *Shahneshin* was a semi-closed space where the head of the family would rest or be seated. It was also higher than the room level, about the dimension of a brick laid vertically.[120]

Two relatively narrow rooms flanking the living chamber were both connected through central apertures. Indeed, the internal spaces were arranged adjunct to each other in such a way to eliminate the necessity to enter the courtyard. The walls of the hall are decorated with niches in two levels. The upper one is a rectangular hole covered by a semicircular arch. The lower part contains two small semi-open shelves in its two upper corners held by the triangular angles. Only the higher portion of the niches closed by a semicircular arch can be observed and measured accurately. Similar to other case studies, allocating two-thirds of the height of each enclosing wall to the niches was an intelligent choice to perform a lightweight structure for the buildings. Furthermore, architects and builders know that a housing component, like a niche, can adorn the walls and at the same time is able to respond to the essential needs of the inhabitants. In this house, *iwan*, facing the yard from the first level of the winter quarter, connects the living room and sleeping room. Both rooms have the same semicircular niches and the central decorative fireplace where a hot coal brazier is placed to heat the room.[121]

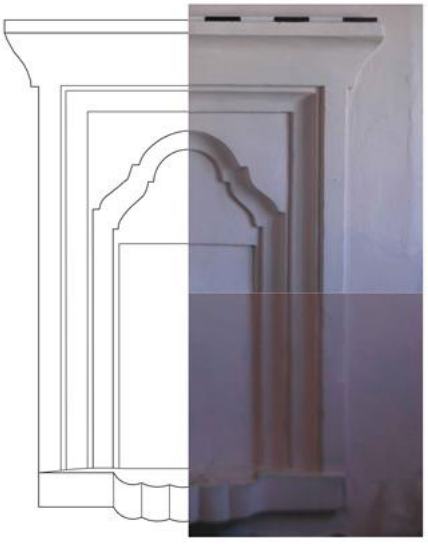

Figure 2.55 The living room in winter quarter currently used as warehouse. **Figure 2.56** The central decorative fireplace located in sleeping room, winter quarter.

[120] The word *shahneshin* is composed of *"shah"* meaning king and "*neshin*" meaning to sit.

[121] Apart from this container, average people generated warmth using a particular device known as *korsi* which means seat. During wintertime, they rested under a table setting on a small brazier of ashes covered with a massive cotton blanket. (Polak 1989, p.53) Instead, in the wealthy houses as in case of Darugheh, the ambiance would become warm by a wall heater.

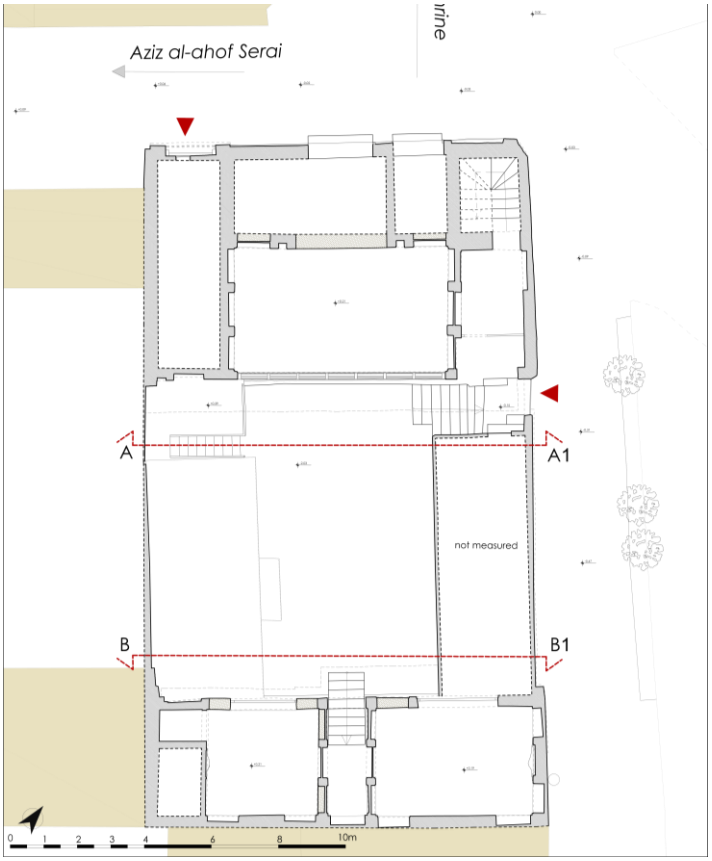

Figure 2.57 The plan of the first floors in Tehrani House.

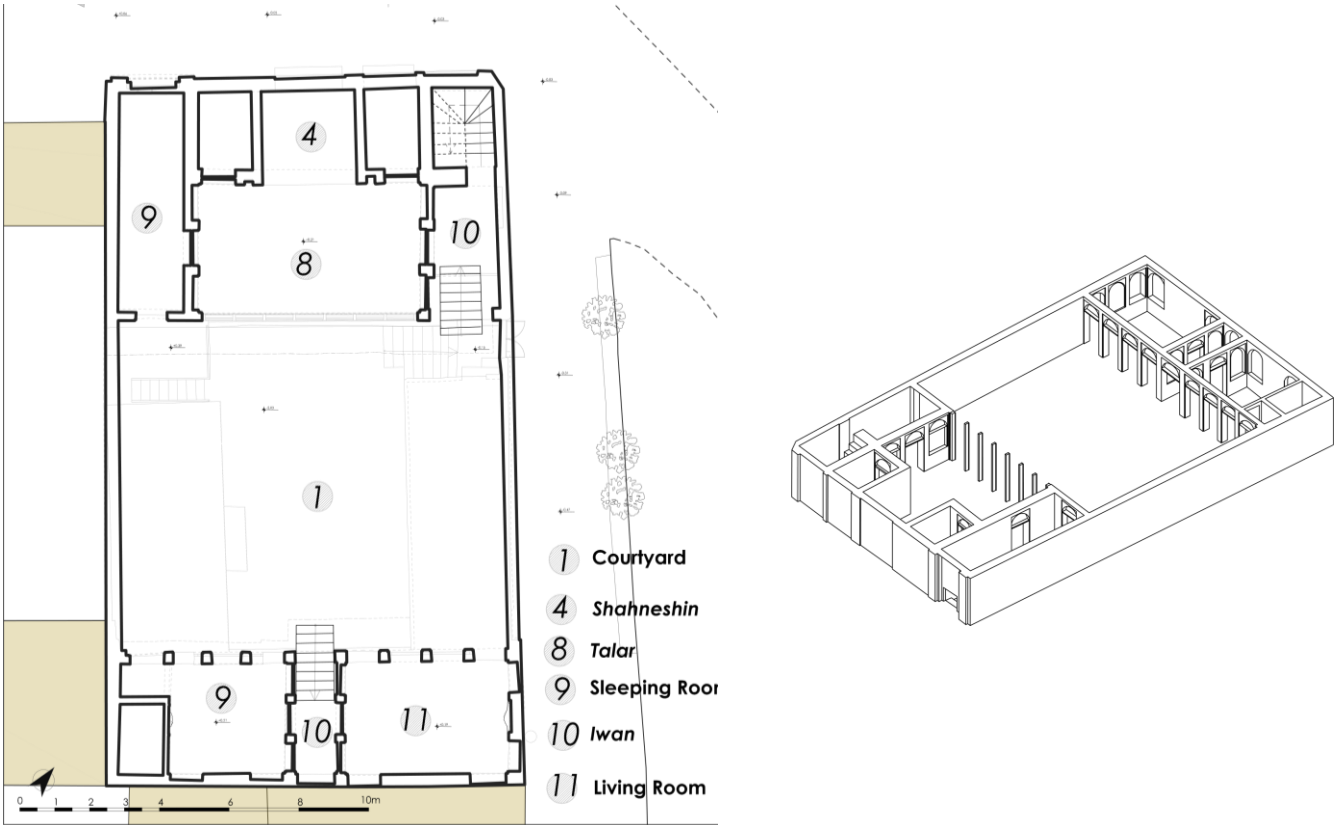

Figure 2.58 The image depicts the earlier plan of the first floors of both building masses in which spaces are identified.

As the previous sample, the maximum proportion of the courtyard to the total area at Tehrani's house is near 42%. The summer quarter on the northwest holds a space approximately 35% of the total area of the land, and the southeastern part occupies almost 23%. In this house, the proportions of Iranian Golden Rectangle are used in order to divide the land into proportionate living spaces like courtyard and main rooms.

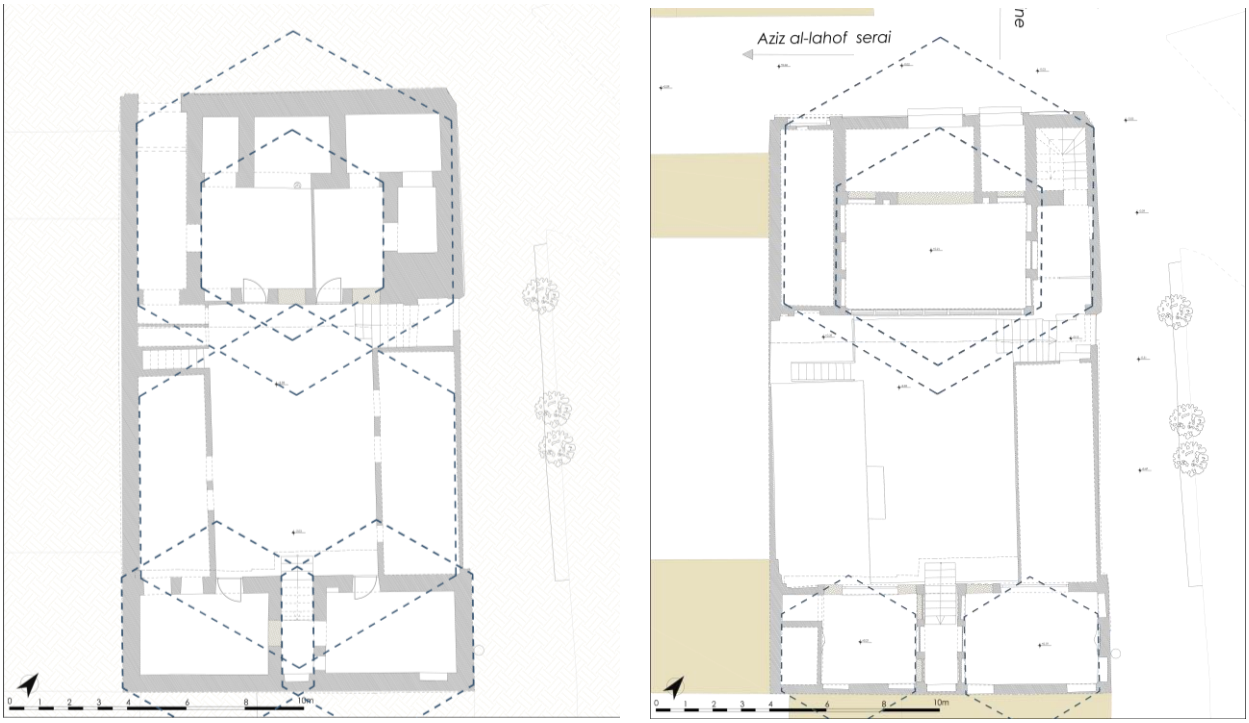

Figure 2.59 The analyzing the Tehrani House proportion through Iranian Golden Rectangle system.

In the summer quarter, the breadth of the lower rectangular is precisely equal to 4 minor *gaz* which is also present in the width of both chambers in the winter quarter. However, based on the largest module, the total area of the main hall has included a square with a side of 6 *large gaz.* On the opposite side, the ground rooms of the southeastern building present the same area by 4 L.G × 2 ½ L.G. Thus, having matched both modules on the layouts, it can be concluded that minor *gaz* has been the one applied as in the module to realize the spaces of the house. In addition, the width of niches and openings corresponds to 14 *gerehs* or one minor *gaz* which is defined in Iranian architecture as a standard unit for designing a small-scale house.[122]

The table below displays the correspondence of percentages to traditional units.

[122] According to the words of scholars, the common dimension of width for openings is between 12 and 16 *gerehs.* Also, 14 *gerehs* is a standard measurement for apertures of houses on small scale. (Pirnia 2005, p.167)

Table 2.5 The dimension of spaces in Tehrani House according to the traditional units.

Spaces	Width		Length	
	L. Gaz	***M. Gaz***	***L. Gaz***	***M. Gaz***
Courtyard	8 ½	10	11	12
Summer Quarter	7	7½	11	12
Winter Quarter	3 ½	4	11	12

Summer Quarter	Width		Length	
	L. Gaz	***M. Gaz***	***L. Gaz***	***M. Gaz***
Talar	7	7½	12¼	7½
Hoz-khaneh	4	4 ½	13 ¼	15

Winter Quarter	Width		Length	
	L. Gaz	***M. Gaz***	***L. Gaz***	***M. Gaz***
Cooking room	7	7½	12¼	7½
Bathroom	4	4 ½	13 ¼	15
Iwan	4	4 ½	13 ¼	15
Living room	4	4 ½	13 ¼	15
Sleeping room	4	4 ½	13 ¼	15

Figure 2.60 The placement of minor module (14 *gerehs*) on the ground and first floors.

Figure 2.61 The placement of large module (16 *gerehs*) on the ground and first floors.

Unlike the other two examples, Tehrani's house has not been abandoned, but, various occupations other than the housing function have brought many changes to the first composition. The rooms are being utilized as clothing warehouse for some of *Hazrati Bazaar*'s merchants. The current entrance is formed on the east side in a dead-end alley after closing the primary access due to having become a small storage. A staircase has been erected to make a direct connection between the secondary entry and the courtyard. Also, the owner added new disparate structures to the yard as warehouse and bathroom in order to create more spaces.

Tehrani yard, presently, does not demonstrate any architectural-functional components such as ornamental pool with accompanying flower beds. This representation does not mean that the courtyard did not have the same characteristics as the traditional courtyards. This means that human activities changed its features by implementing the current mosaic ground and filling of the pool and beds. In the northwestern building mass, the living hall is divided into two separate spaces, with the northern half containing two shops. *Hoz-khaneh* similarly has undergone many additions and transformations. A thin wall has divided it into two unequal parts, and its rectangular basin of water is filled up.

Apart from closure of some lateral niches, the winter quarter inside has not undergone other alternations; however, the ground floor rooms may be recognized as the most damaged part of the southeastern building mass due to being changed into warehouses. Except for the oven chimney on

the roof, no other trace presents earlier identity of the western room as the cooking area. The central openings within rooms and outer apertures are walled, and currently each room includes only one opening instead of three.

The winter façade presents an inadequate and inharmonic appearance. The combination of the remaining arches and rectangular windows on the façade is far from the usual harmony and symmetry considered in Islamic-Iranian architecture. Hence, the use of inappropriate long windows and implementation of the thickest bricks to fill the former apertures cannot correspond to the principles of a traditional uniform architecture.[123]

Figure 2.62 The location of stores at the upper part of hall where was *shahneshin* area. **Figure 2.63** The present illustration shows the boundary between the original-earlier appearance of winter façade and the new one.

[123] Since the reasons for which the innovational activities have been carried out are unrecognizable, the author has conducted an interview with Mr. Tehrani, the owner of the house, on March 30, 2017. The summary of the interview is as follows;

What has been the reason for these extensions and other activities that have changed the primary aspect of the house? They were all done by myself for economic exploitation. For example, at the inner end of the room with *orosi*, there was a *shahneshin* and two storages flanking it that has now become a shop. The entrance to the room was in the center of that; actually, I walled it and opened a new one next to it. I also made new constructions in the yard as to use in a warehouse capacity.

During the architectural survey and collecting the necessary materials, I found a stepping brick in the room of the ground floor, which shows a difference in the level that no longer exists. Can you explain it? The chamber of this floor was a *hoz-khaneh* with a rectangular pool in the middle, and the end-half of it was as high as a step above the level, where a bed was set and used as a place to take siestas. By filling the pool, the floor was also filled and reached the same level with the step.

Could you give us some more information about the primary form of the winter front? On the ground floor, there was a cooking room containing a relatively large millstone and a special oven with a still-existent chimney on the roof. There was a service area in another room, but without *hammam* or any shower. All interior and exterior walls of the ground floor in both quarters were covered with cement to prevent climbing of moisture and more building vulnerability.

Figure 2.64 The current plans show the transformation and changes made in courtyard and indoor spaces.

iii. Bidari House

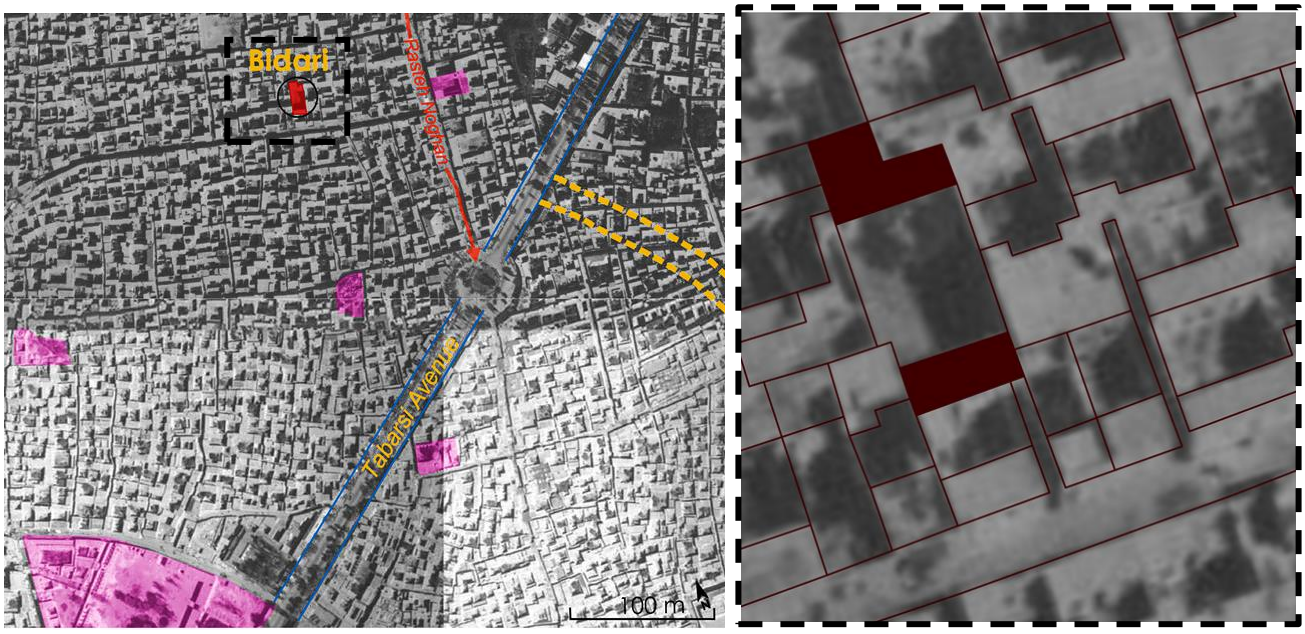

Figure 2.65 The images present the location of Bidari House near to public monuments (highlighted with violet color) and the main routes in 1956.

The third type of the house that belonged to this group is Bidari's House which was entirely abandoned in recent years, and wholly demolished in August of 2017. The habitation was located in *Tah-pol mahalla* the most popular alley of Noghan neighborhood, which is oriented towards Imam Reza shrine and Mecca (*roun-e-rasteh*). The entrance of the house was placed at the end of an inclined dead-end path that was a roofed corridor to provide indirect access to the courtyard.

Figure 2.66 Bidari house before (2016) and after destruction (2017)

The yard had a rectangular shape in which was located a central reflecting pool (*hoz*) and the accompanying trees. The two building masses were positioned on the transverse axis of the yard.
The lower floor functioned as the secondary zone and was allocated to cooking, resting, service area and food storages, each of which contained different spaces internally connected by apertures. The central room with an L shape configuration has been served as a resting room during the summer days. Unlike the other ground floor chambers, only a central opening provided the connection between the central room and courtyard. *Matbakh* or cooking area was located on the western sides of the ground floor which was directly connected from the north to a pantry and from the south to the yard by three apertures.[124] The space under the stairs together with the eastern room were perhaps

[124] The wall plaster and the ceiling beam of the western room had entirely been covered in ash color; this sign leads us to recognize that perhaps this enclosure has been dedicated to cooking. However, the absence of the chimney doubts positioning of the cooking room in this area as well.

dedicated to conserve food, water and other stuff. In all spaces except for the pantry, the niches were regularly arranged with a distance of a pillar in order to provide the householders with usable shelves.

Figure 2.67 The Cooking room and living rooms on the ground floor, northeastern building mass.

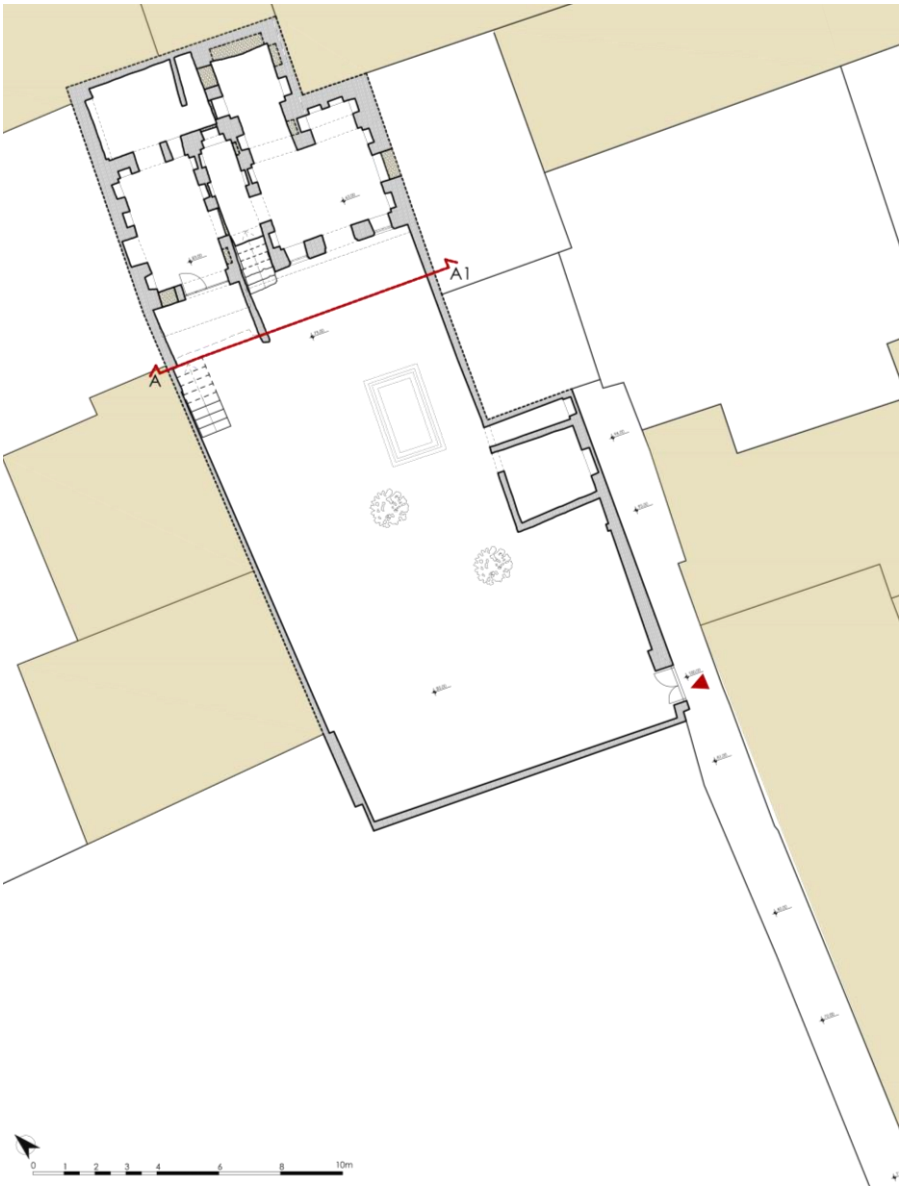

Figure 2.68 The design depict the latest outlines of courtyard and ground floor before demolishing.

Figure 2.69 The façade of northeastern building mass.

Figure 2.70 The plan presents the original design of the ground floor in the northeast quarter.

The spatial distribution of the northeastern living quarter on the first level had a rhythm consisting of *seh-dari* (three-opening room), *iwan*, central chamber, *iwan*, and another *seh-dari*. It was divided into householder and guest zones linked together by an *iwan*. The family zone included a main chamber with a cross shape, inside which there was a *shahneshin* circulated by two semi-closed storages and three openings to the yard. It also contained a secondary room for sleeping and a three-door room *(seh-dari)* on the eastern side. The main chamber served as the hall for family members' daily activities, contrary to *seh-dari* room which was used to work or rest. Another three-door room on the west was reserved for reception where guests could be lodged without entering the area reserved for householders. On the north, in the longitudinal direction of this room, there was a relatively small space that functioned as a sleeping-guest room. Here, *iwan*, as a major connector element, not only has internally connected guest and family areas, but it has also connected them through stairs to outside, the courtyard. It had the same characteristics of the Nili's *iwan* with an ornamental arch and an upper space for storing precious objects. The principal areas like guest and living rooms presented identical niches in two levels which were repeated in a regular way. Presenting a curved shape, the upper niches are more decorative than the lower ones with rectangular form. Since the sleeping rooms functioned as a subordinate zone, they contained just a few simple niches.

Within the niches in the northern wall of the main chamber, small holes have been made that allowed for ventilation of air inside the room. The holes permitted turning the hot air into a cold wind by semi-enclosed spaces placed at their back which were directed to the roof. It seems that type of channel acted as a *badgir* (windcatcher), but no signs of such structure were visible on the roof of the habitation.

Figure 2.71 The internal façades of living main chamber with the *shahneshin* are at center and the guest room.

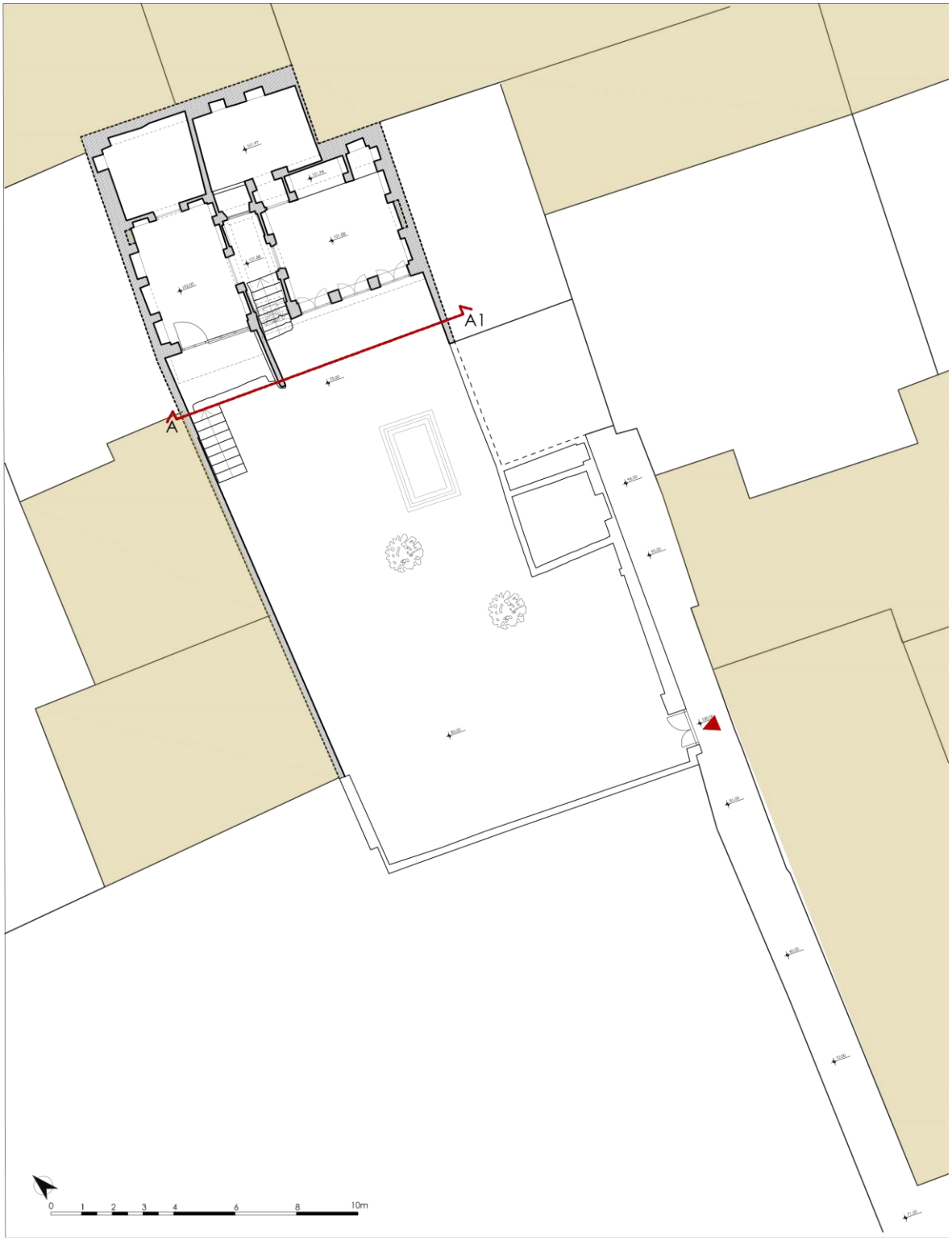

Figure 2.72 The first floor of north eastern building mass in which family and guest zone are located.

Figure 2.73 The earliest plan of the first floor, north eastern building mass, and division of areas.

Through nine openings on both stories and two *iwans*, the combination of architectural and ornamental components in the façade represented a harmony and symmetry of Iranian philosophy and architecture. Based on the north eastern quarter orientation towards sunlight, this portion was probably reserved for the cold months. However, the shape of the principal hall and its ventilated

elements in addition to the central room on the ground floor could be interpreting this section as the summer quarter as well. Thus, it seems that the tradition of seasonal immigration has not been followed in Bidari's House. On the opposite side, the southwestern building mass has contained the entrance passageway and the living spaces within. Since the northeast building mass has been the only remaining living quarter of the entire house until its demolition in 2017, it is impossible to realize the earlier state of this quarter.[125]

The land occupation ratio of the northeastern and southwestern building masses to the courtyard were respectively 25% and 15%. The ratio between length and width of the central yard was corresponded to the standard proportion of the Iranian Golden Rectangle by 1.5. Also, the interior spaces of Bidari's habitation are particularly loyal to the principles of Iranian architecture regarding proportion and size. The length of the sleeping room reserved for the guests corresponds correctly with that of the pantry on the lower floor. Since the living room is served as a social space with daily function, its width is more than its depth. While in space with sleep or work function, the rooms' width is less than their depth.

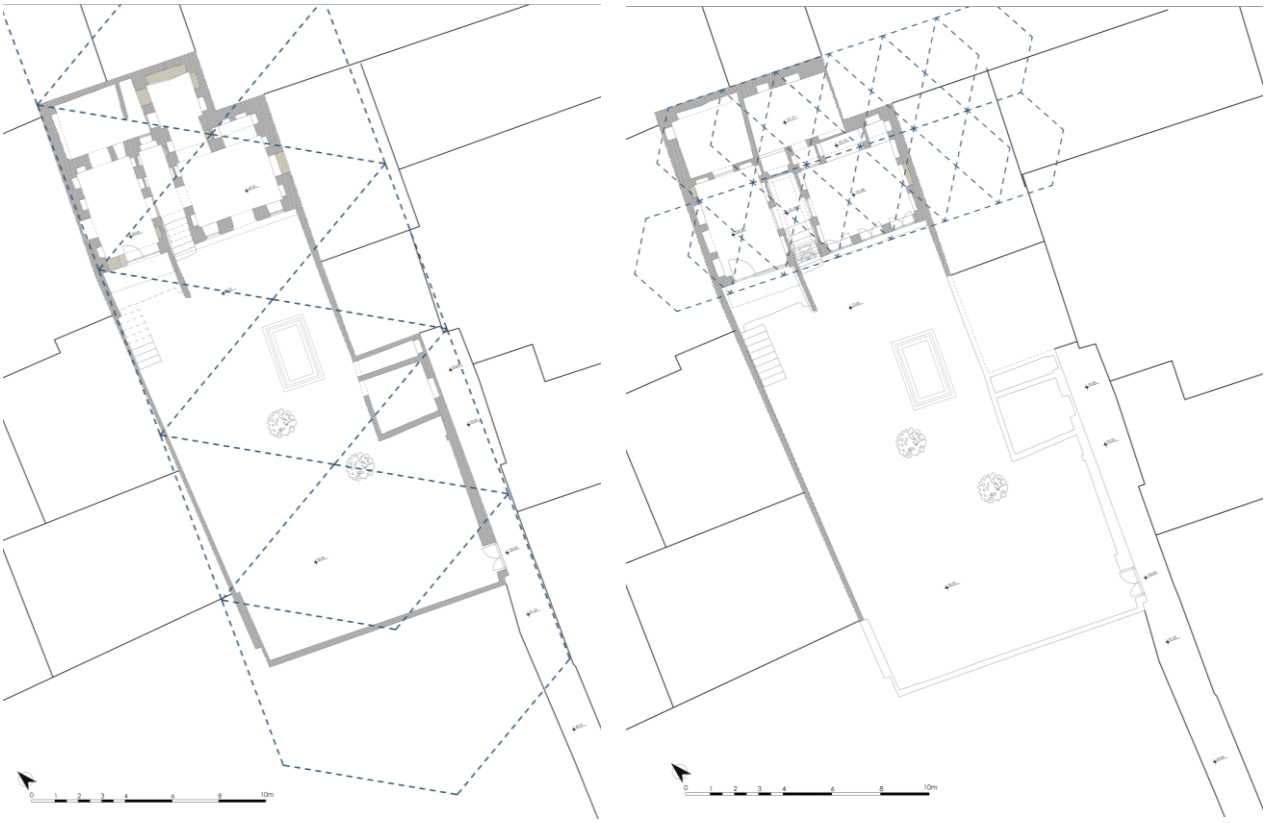

Figure 2.74 The analyzing the Bidari House proportion by placement of the Iranian Golden Rectangle.

[125] Only 1956 aerial photograph and the pre-existing elements such as pillars and the left roof affirm the existence of this southwestern mass.

The placement of both modules on the outlines of building highlighted that the house has followed the minor *gaz* as module to proportionate its spaces. For example, the dimension of the openings inside shows a standard amount of 14 *gerehs (*1 minor *gaz),* moreover, the niches were regularly arranged with a distance of a pillar in variety of sizes by 30, 40, 50 and 60 cm. These thicknesses are equal to 4 ½, 6, 7 ½, and 9 *gerehs*. Like other two studies case, the total height of facade corresponded to 6 minor gazes precisely. Therefore, these results can still confirm the reorganization of case studies as accurate traditional houses.

Table 2.6 The dimension of spaces in Bidrai House according to the traditional units.

Spaces	**Width**		**Length**	
	L. Gaz	***M. Gaz***	***L. Gaz***	***M. Gaz***
Courtyard	12	14	17	19
NE Quarter	7½	9	12	14
SW Quarter	4	5	12	14
Summer Quarter	**Width**		**Length**	
	L. Gaz	***M. Gaz***	***L. Gaz***	***M. Gaz***
Principal Hall	3 ½	4 1/8	4	4½
Three-opening room (seh-dari)	2½	2 ¾	3 ¾	4½
iwan	*Shahgaz*	1 ¼	2	2 ¼
Cooking area	2 ¼	2½	3 ½	4 1/8

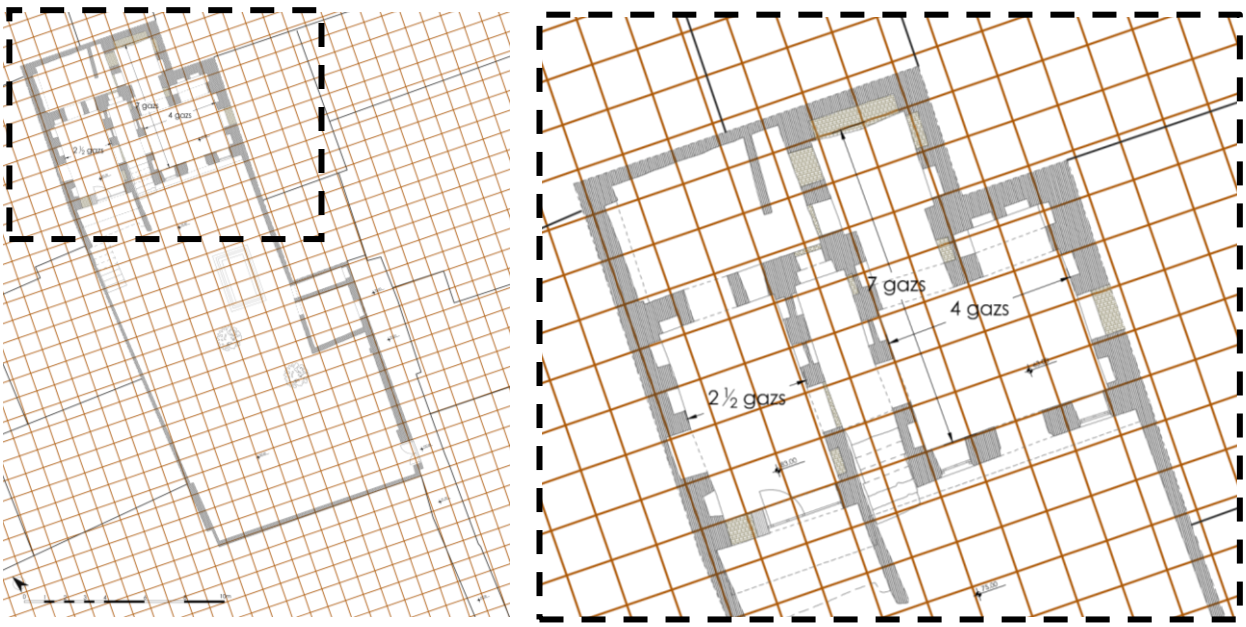

Figure 2.75 The placement of minor module (14 *gerehs*) on the ground floor.

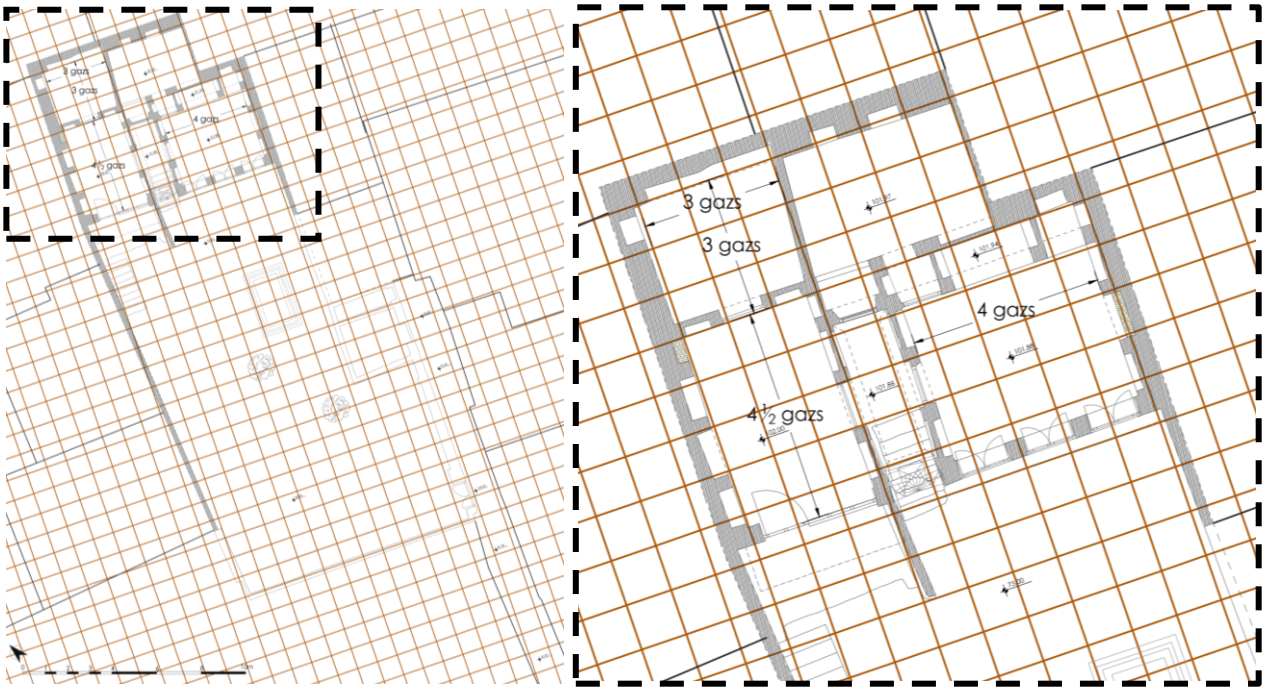

Figure 2.76 The placement of minor module (14 *gerehs*) on the first floor.

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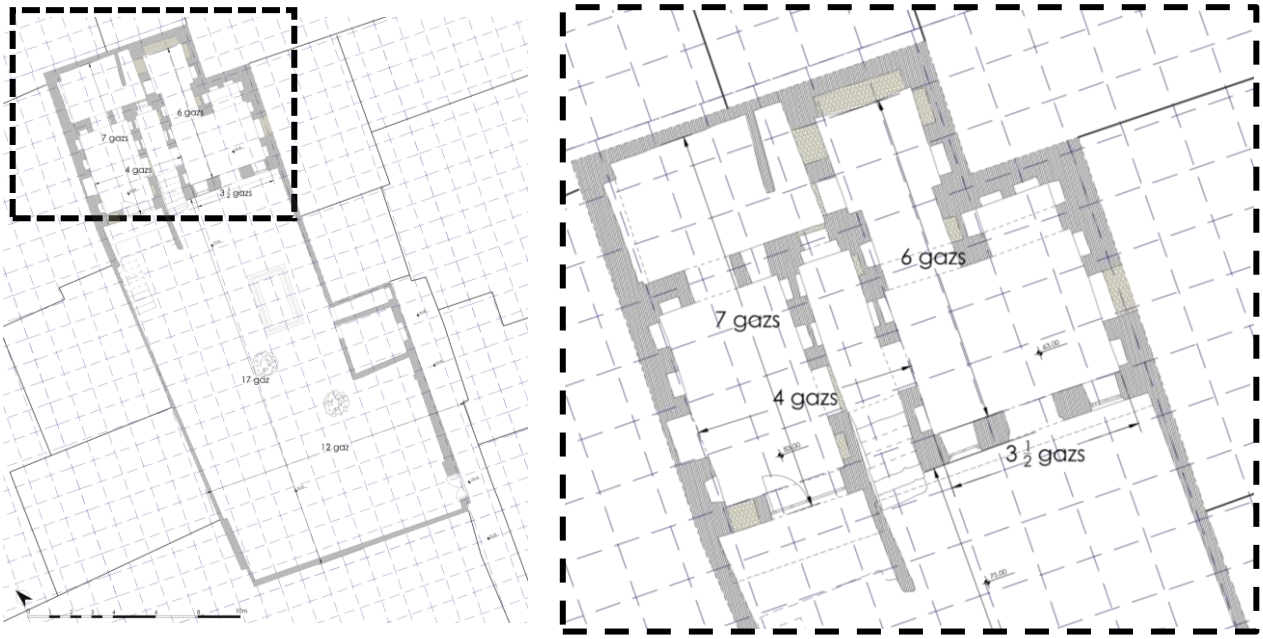


Figure 2.77 The placement of large module (16 *gerehs*) on the ground floor.

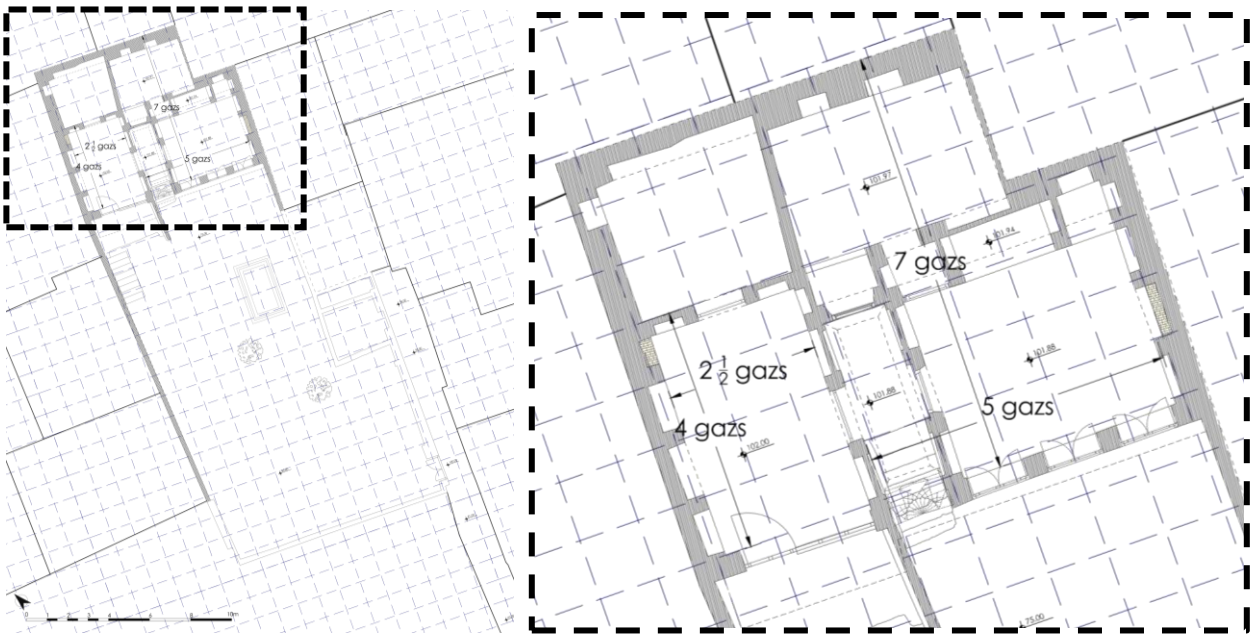


Figure 2.78 The placement of large module (16 *gerehs*) on the first floor.

In comparison to the other samples, this house has undergone various changes and more manipulations that have caused destruction and vulnerability of the building. The 1956 aerial photograph affirms that the house was much larger than the current site and that it has been divided into separate sections in order to create another residential building. In other words, the small proportional habitation found on the northeast was reserved as part of Bidari's house until a few decades ago. After dividing the building to form a passageway to the recent house, the earlier original entrance has been removed; this could mean that the upper piece of the today's narrow lane belonged to a portion of the house courtyard. The new entry faced the alley laterally and directly connected to the courtyard. Today an iron door is presented instead of the primary wooden one.[126]

The courtyard currently presents an L-shaped area with new constructions on its western side. This irregularity in the shape of the yard would still approve the separation of the upper part and existence of the southern living quarter. Moreover, the owner added some non-uniform components to the courtyard to create two completely separate living rooms.[127] In addition to the leading staircase, the secondary stairs on the northwestern side and balcony have been made to connect the courtyard directly to the western room (former guest room). It seems that internal spaces did not face so many modifications except filling of some niches and apertures on the eastern wall on both stories that acted

[126] During the survey, half of a wooden door was found that presented its traditional functional-decorative features such as door knockers dedicated to males and females and ornamental nails. Since the yard has become a rubbish place, we cannot be sure about the identification of the mentioned component as the original door in our case study, and its movement from another site to here must also be considered.

[127] These changes have been made for renting the property to pilgrims that has recently become a source of income for the inhabitants of downtown.

as openings for connecting the householder zone to the eastern *seh-dari* room before the division of the house. While the outer space, including the façade, has experienced several additions and reforms. The guest room has completely lost its original outward appearance. The openings and their pillars have given their place to iron doors and windows. In addition, the openings of the western room on the ground level—except for the last one which is walled with bricks as we see in the façade have been demolished as well and replaced by an iron door.

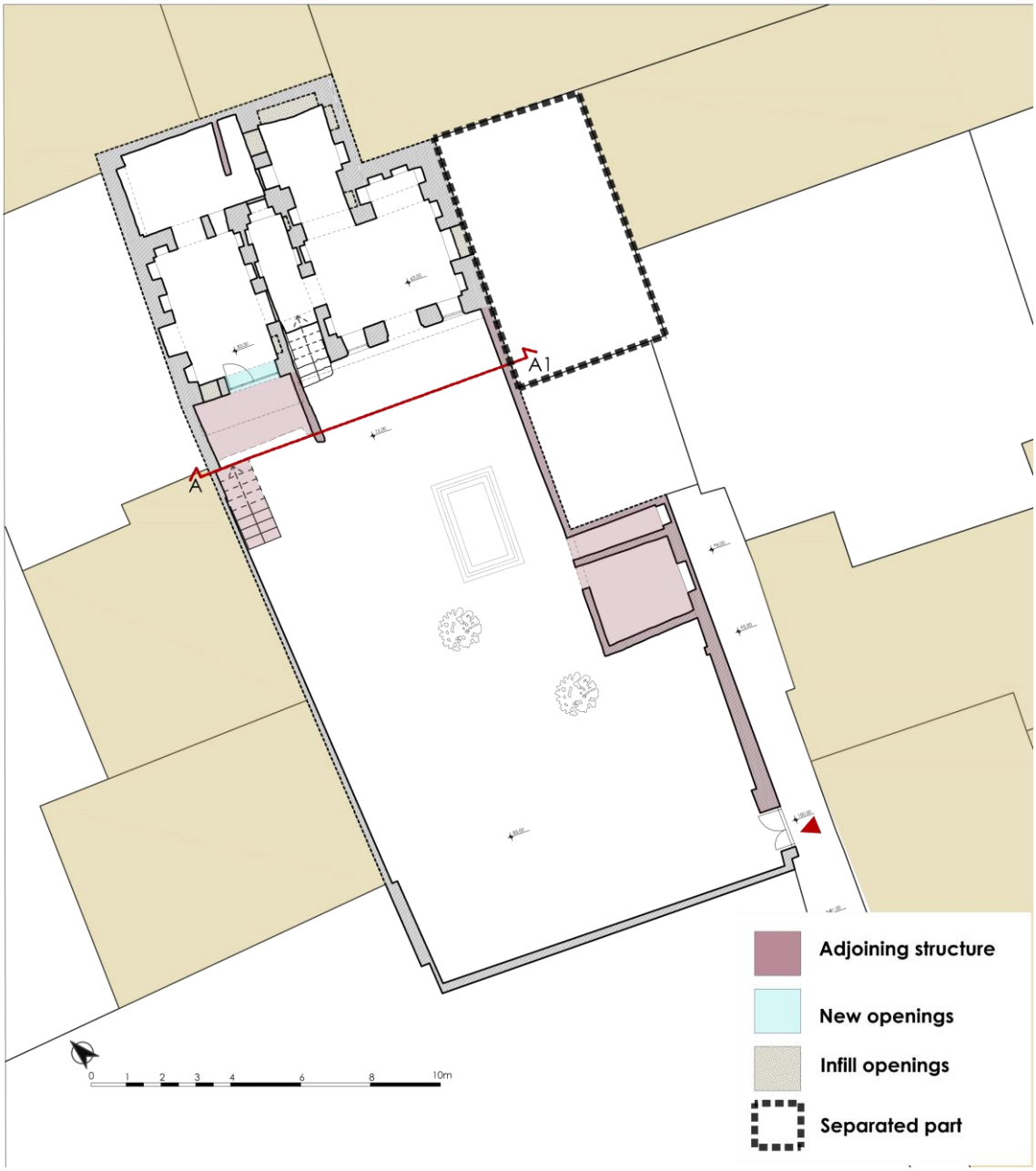


Figure 2.79 The plan shows the transformation and changes made in courtyard and indoor, also the part which was been a portion of Bidari House in the past.

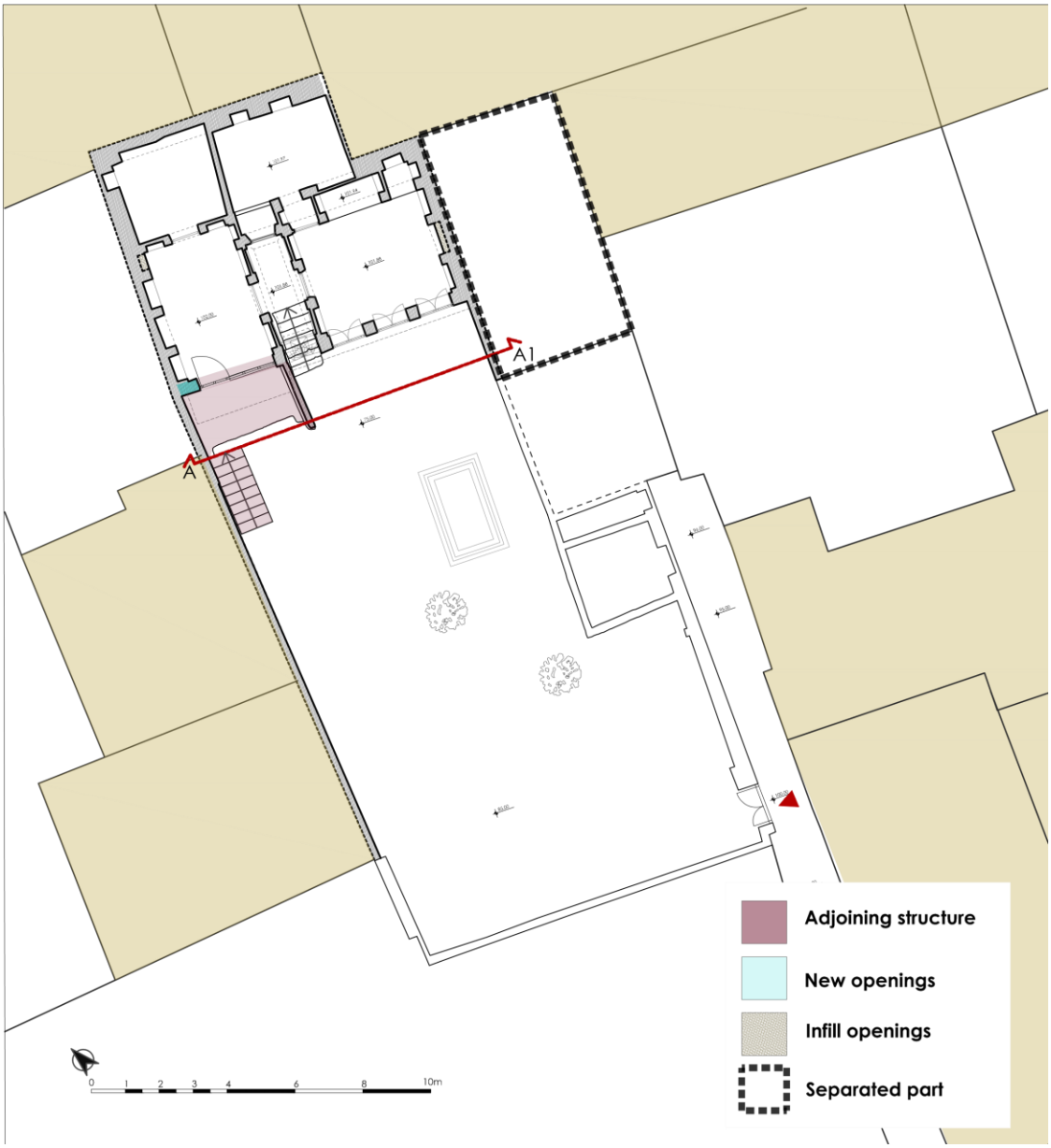


Figure 2.80 The drawings presents the adjoining structures added to the spaces on the first floor.

2.2 A comparative research between case studies and Middle Eastern examples

Iran is a vast land that includes large cities and villages, each of which having a various geographical position and climatic condition. These situations determine a specific style and appropriate guidelines for architecture in each area while the housing principles followed are almost the same in the urban and rural housing.

The examples that have been taken into consideration are selected based on accessible documents, current status and their similarity to the case studies. The following paragraphs are assigned to habitations of Iranian cities, in particular, Isfahan and Yazd.

Isfahan is the most magnificent city in terms of having ornately traditional mansions constructed on the large scale. This city was the capital of Iran during the reign of the Safavid for more than two centuries. From that era on, many magnificent houses are still alive, and since it is considered as a tourist center, what belongs to history is attempted to be preserved.

Most of the remaining houses from Safavid era are still available and they are oriented from northwest toward southeast (*Isfahani direction*) in which asymmetry is at work in both the plan and façade. In addition, the summer area positioned on the northwestern side of the land was more relevant than other parts of the building. They have a clear skyline, rectangular-shaped courtyard, and chambers made of modules with short and wide openings.[128]

Fig. 2.81 demonstrates the distribution of the building masses of houses as follows;

A: building standing free on four sides, **A1**: building as A, with the addition of winter rooms, **B:** building with lateral blind walls, and two separate unroofed areas, **B1**: building as B, with addition of winter rooms, **C**: building with inner garden and all the outside main walls blind, **C1**: three-side building with blind outside main walls and inner garden, **D**: two separate buildings, winter and summer rooms, at the opposite ends of the area, each one with three blind walls and opening only onto the garden in the middle, **D1**: building similar to type D, but lacking the summer rooms.[129]

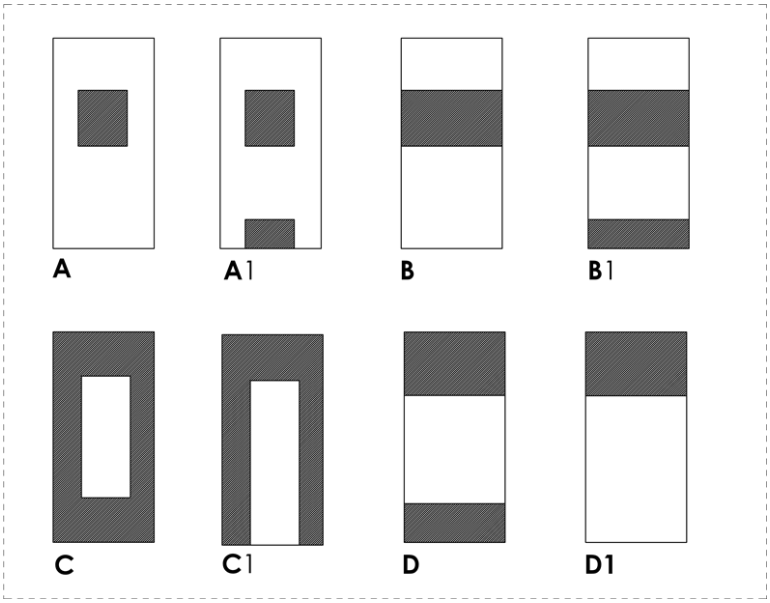


Figure 2.81 The position of building masses in traditional houses in Julfa district. (Karapetian 1974)

[128] Bahramzade, M. Heidari, S. "Investigating the Typology of Isfahan's Houses in Qajar Era from the Archaeological Perspective," *Journal of Basic and Applied Scientific Research*, n.3, 2013, p. 484.

[129] Karapetian, K. *Isfahan, New Julfa: le case degli Armeni*, Rome; Istituto italiano per il medio ed estremo oriente, 1974.

There are still some precious mansions related to Qajar time with introverted style (central courtyard) and which are generally positioned in the direction of Mecca (northern-east to southern-west). The size, typology, and quantity of the decoration is the significant difference between the houses made in Safavid and Qajar.[130] In the following paragraphs, only some of the houses in Isfahan will be introduced and their architectural characteristics described, which can be applied as a reference to understand the design of our selected cases.

The first example to consider is Harandi Mansion that consisted of a central yard and three building masses on the north, south and west sides. Based on the orientation and proportions of the rooms, it can be realized that the northern front had been used in the summer days and the southern side as the winter quarter. The summer living front is formed of a chamber at the core of the composition accompanied by two three-opening rooms (*seh-daris*) on its both sides linked to the courtyard by two small *iwans*.[131] This building mass also includes a *hoz-khaneh* (pool room) on the eastern corner that presents almost the common characteristics with the same area at Tehrani house regarding the shape and arrangement of niches, with several differences in proportion and decorative elements. On the other side, the middle hall and western rectangular room in the winter quarter are comparative with the *panj-dari* chamber (five-opening room) at Nili and its ending storage.

Figure 2.82 The mansions of Isfahan; A'lam and Harandi in which main spaces are identified as:1) courtyard, 2) entrance, 4) sleeping room, 5) main living room *(panj-dari*), 6) *seh-dari*, 7) iwan, 9) talar, 9a) *hoz-khaneh*. (Haji-Qassemi 1998, 115,73)

[130] Bahramzade, Heidari, 2013, p. 485.

[131] Haji-Qassemi, K. *Ganjnameh: Cyclopedia of Iranian Islamic Architecture; Mansions of Isfahan*, Tehran: Shahid Beheshti University, Cultural Heritage Organization, Vol. 4, 1998. p.79.

From the Qajar period, the aristocratic A'lam mansion is an excellent example in which one can observe all standard rooms of a traditional house. Living spaces occupy all sides of the courtyard and *talar* on the northern side is the most prominent among them. A long pool along with flower beds is laid on the main axis of the yard. The entrance located on the northeastern corner has an octagonal shape *(hashti)* connected to a long corridor to give access to the courtyard.[132] Like the main hall in Tehrani's house, this chamber is allocated to family gathering by its cross-like shape, including a reserved place for the head of the family and two storage areas on its upper part. A large sash window *(orosi)* provides a view into the *iwan* and courtyard from inside and two *badgirs* (windcatchers) flanking the *shahneshin* ventilate this hall. The eastern and western building masses follow the same rhythm of space distribution (*seh-dari*, *iwan*, central room, *iwan* and *seh-dari)* as observed in the northeastern quarter of Bidari House, as well. In addition, the northern building mass of Qodsiyeh Mansion consisted of a cross-shaped hall flanked by two *iwans* and *seh-daris* precisely correspond to the guest and householder zones in Bidari House.

Figure 2.83 The mansions of Isfahan; Qodsiyeh and Sartipi in which main spaces are identified as:1) courtyard, 2) entrance, 4) sleeping room, 5) main living room *(panj-dari*), 6) *seh-dari*, 7) *iwan*, 9) *talar*, 9a) *hoz-khaneh*. (Haji-Qassemi 1998 63,95)

[132] Haji-Qassemi 1998, p. 117.

Yazd is known as the capital of the desert and rich in traditional Iranian architecture. In the hot arid regions, a house with a courtyard can be utilized in all seasons, the northern part of the yard that receives more heat is used in winter and the rooms that are located in the southern side are used in summer.[133] Like Mashhad houses, they are oriented in both directions; northeast-southwest *(roun-e-rasteh)* and northwest-southeast *(roun-e-Isfahani)* due to the characteristics of Yazd, sun, and wind. They are also divided into various types regarding their number of yards and building masses.[134]
Through a brief comparison of Yazd's mansions with the case studies, we would realize that large houses even with two courtyards display similar general divisions despite numerous differences. The majority of these mansions have consisted of householder zone and servant area where each one has a separate entrance. The reception hall, *iwans*, and *seh-daris*, as the principal closed or semi-open spaces, are laid on around the central yard. Each main living quarter, northern and southern building masses, comprises a central cross-shaped chamber or *iwan* surrounded by two three-opening rooms or *seh-daris* living rooms at the core of the composition enclosed by two *iwans*. Both sides contain one or more than one sleeping rooms at the end of their arrangement directly linked to side spaces.[135]
In addition to selecting samples from the cities of Isfahan and Yazd (center), other similar examples have been chosen from different regions of Iran, such as Babol (North), Bafq (South) and Ardebil (West), which are presented in Fig.2.84.[136]

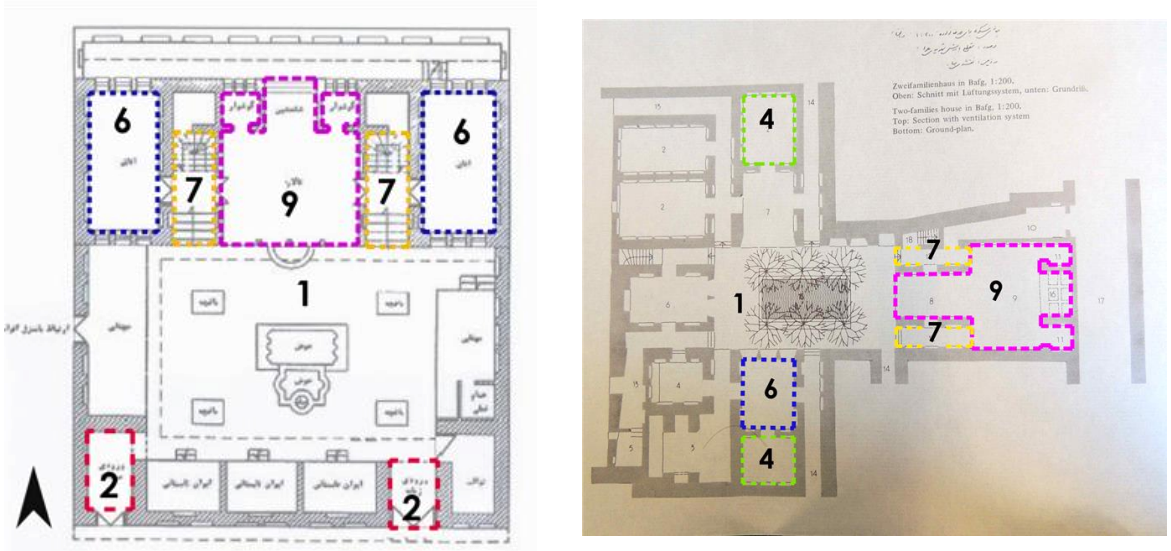


Figure 2.84 The houses of Babol and Bafq in which main spaces are identified as:1) courtyard, 2) entrance, 4) sleeping room, 6) *seh-dari*, 7) *iwan*, 9) *talar*. (http://www.zohreh-bozorgnia.com/fa/, last access: October 10, 2016) (Rainer 1977, p.156)

[133] Nabavi, Ahmad, Goh, 2012.
[134] Nabavi, Ahmad, Goh, 2012.
[135] Haji-Qassemi, K. *Ganjnameh: Cyclopedia of Iranian Islamic Architecture; Mansions of Yazd,* Tehran: Shahid Beheshti University, Cultural Heritage Organization, vol. 4, 2004.
[136] The author has tried to examine the outlines of the three selected houses with one or more comparable examples to confirm what was stated before and to address the concept of "how it was."

To assume the initial state of the demolished house of Bidari, two other traditional houses have also been identified to obtain an accurate comparative study. The first house located in Sarshoor quarter has currently lost the entire earlier appearance due to addition of new structures in the courtyard and facade. Apart from the wooden ceiling and brickwork of the entry, there is no component left from the primary aspect. However, some images and layouts are available in KH-CHHTO archive.[137] The rhythm of spatial distribution in this house could be the same as recognized in Bidari's house, including *seh-dari*, *iwan*, central hall, *iwan*, and *seh-dari* again.

Another habitation located in Eidgah neighborhood is the most similar case to Bidari House. It is still inhabited and in a pretty well physical condition. The house has two L-shaped living quarters. The western building mass is perpendicular to the northern facade and has covered a portion of it; therefore, it was integrated with the north facade in later periods. They perform two distinct styles of architecture and decoration, testifying to their being constructed in two different historical periods. In terms of proportions and distribution of spaces, however, the earlier mass entirely matches with the destroyed dwelling of Bidari. The building is composed of a hall in the center, surrounded by two *iwans*, and three-opening chambers at the corners. In this instance, the entrances of the *iwans* are not decorated with pointed vaults, but arches of crescent shape. On the ground floor, spaces are allocated to storages and *seh-dari* rooms on the first story served as rooms for sleeping or work. From the proportional point of view, the dimensions of the ground columns and openings are perfectly in line with these elements in Bidari House.

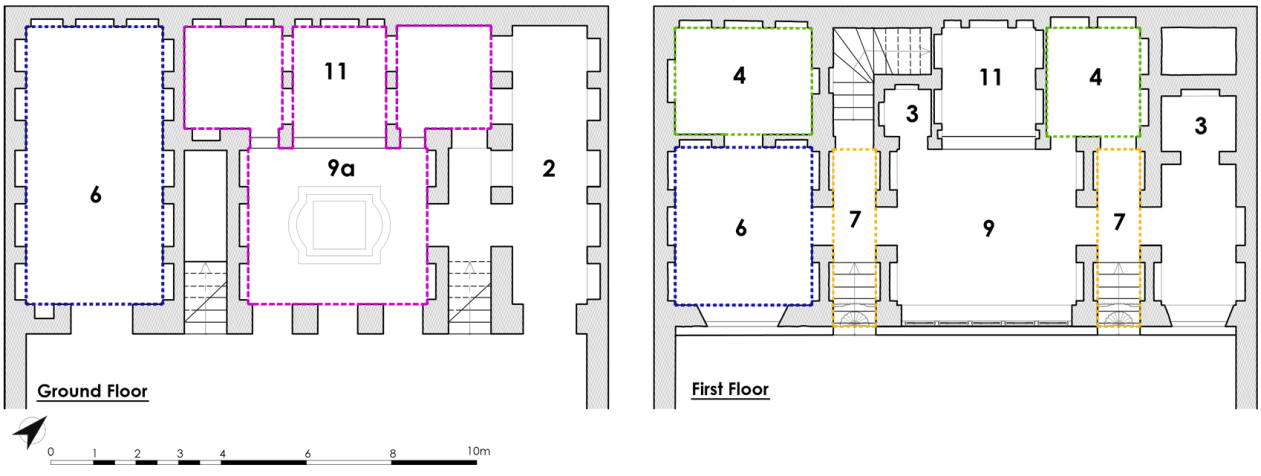


Figure 2.85 The traditional house located in Sarshoor quarter of Mashhad which can be compared with Bidari House by following the same rhythm in distribution of spaces. In present plans main spaces are identified as:1) courtyard, 2) entrance, 4) sleeping room, 6) *seh-dari*, 7) *iwan*, 9) *talar*.

[137] These documents are prepared before the house transformations; however, the layouts did not contain an excellent presentation graphically. Thus, the plans were modified and redesigned by the author.

Figure 2.86 The traditional house located in Eidgah quarter in which the northern façade presents the similar façade characteristics in Bidari House.

The selection of the two countries, Afghanistan and Iraq, as an example of a comparative study comes from the fact that Afghanistan was once a region of the Greater Khorasan and Afghans also dominated Mashhad in the 18th century for half a century. On the other hand, Iraq was studied as an Islamic country neighboring Iran, because the characteristics and rules of Iranian housing architecture inspire Islamic culture and beliefs.

In Afghanistan, based on the householders' needs, all traditional dwellings have an inner court surrounded by building masses which communicate internally. The basic structure of the houses reflects the tradition of migrating to the optimum internal location, in summer and winter, during day and night. The entire shape of the building masses derived form of a simple *iwan* as the semi-open architectural element.[138]

Like Iranian houses, Afghan domestic architecture is turned inward facing onto courtyards, and the exteriors present anonymous surfaces to visitors. The entrance lobby from the street consists of one portal which prevents any direct visual connection to the house through a passageway form. To maintain complete privacy, the male guest rooms are separated from women's living quarter. Like Isfahan mansions, the service area in Herat houses like cooking room and storages are found far from the main living rooms; nonetheless, in small-scale houses similar to the case studies, cooking or oven room would be served for cooking and keeping the house warm in cold winter days.[139]

[138] Kazimee, B.A., Mcquillan, K. "Living Traditions of the Afghan Courtyard and Aiwan," *TDSR*, Vol. EX III, N.11. 2002 .p.26 ,

[139] Kazimee 2002, p.28 .

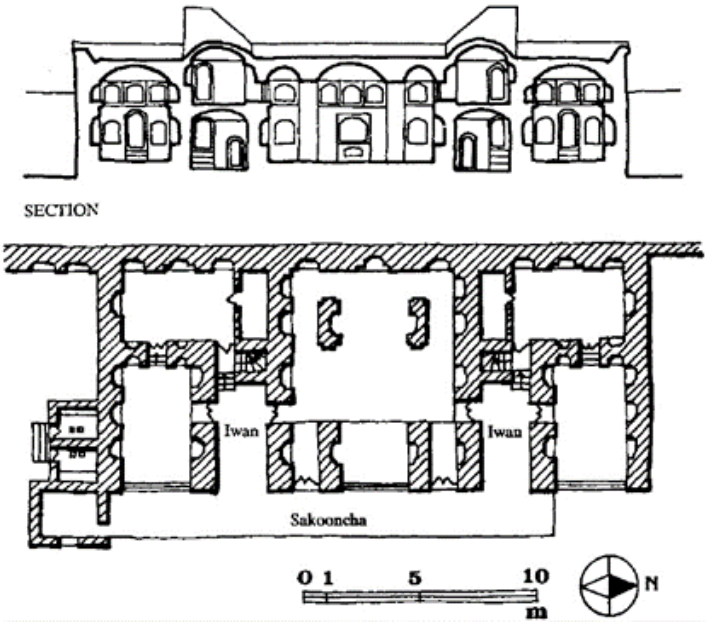


Figure 2.87 An example of traditional dwelling in Herat. (Kazimee 2002)

The descriptions of European travelers present the Baghdadi Houses as being colonnaded, lofty with few windows and modest from outside. From the inside, they contained a square yard surrounded by a group of rooms. The yard and underground chambers have been served as places to sleep during summer months. The ground floor is allocated to the cooking room and food storages. Also, the *talar* (reception hall), recognized as the principal place of the home laid on the second floor, has a *tarma* (balcony) continued around inside. Houses are generally distributed into the householder and guest, with each having a separate access.[140]

As in Iranian houses, symmetry and regularity are considered in the arrangement of the living rooms and basic design of the porch. Spaces on upper stories open to a *tarma* each, and those on the ground floor open to the yard. The areas have the same Iranian traditional terms—*iwan, talar, ursi (orosi), iwancha (small iwan)*—and functions. An *iwan* placed between the two main rooms acted as a connector space facing the central opening of each chamber laterally. *Talar* made of a rectangular frame and a pair of columns divided it from the balcony. On the other hand, the room with *ursi* or *orosi* contained tall sash windows opening towards the *tarma.*[141]

[140] Warren John, Fethi Ihsan, *Traditional houses in Baghdad*, Horsham: Coach Publishing House, 1982.
[141] Warren, Fethi, 1982.

It seems that Afghan and Iraqi houses follow the similar principles, proportions and basic spatial divisions that have been reflected in representation of the Iranian houses.

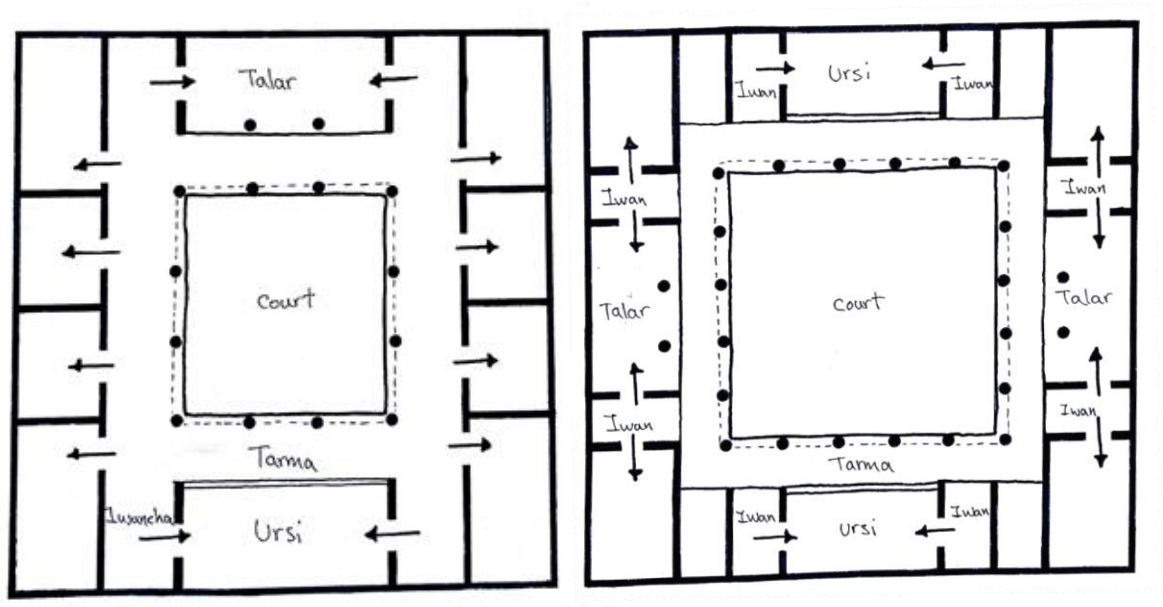
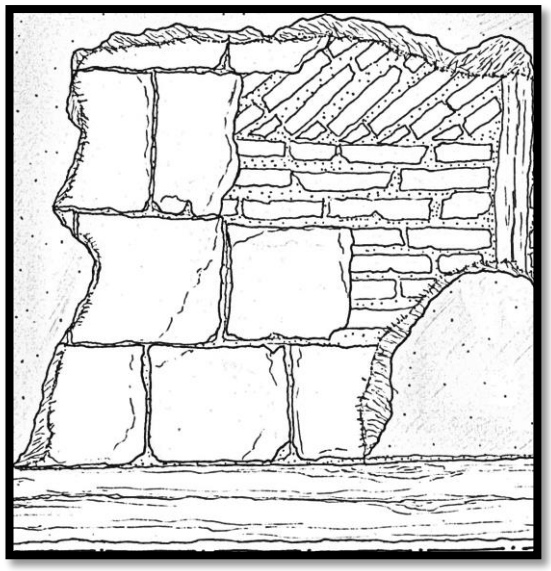


Figure 2.88 Distribuition of sapaces and living rooms in Baghdadi Houses. (Warren, Fethi 1982)

CHAPTER 3



CONSTRUCTION, IMPLEMENTING TECHNIQUES, MATERIALS AND DECORATIONS

3.1 A Study on Masonry Construction and Materials

The building process first requires the architect's design and the skills of variously specialized artisans who have specialized in brickwork, carpentry or carved decoration and stucco. They have generally learnt the practical knowledge and methods as apprentices through following the examples of master craftsman.[142] Most Iranian traditional houses of any scales present a similar construction technique that was easy to apply. The structure of a great mansion with the skeleton of a vernacular house carries many common features in terms of erection types and methods of implementation.

Mashhad buildings are no exception and are built based on the standard construction systems with local production which were regularly employed in dried or moderate regions.

The habitations basically are built in two stories. The ground floor formation is consisted of solid masonries and columns with high thickness which in rural habitations reaches one meter.

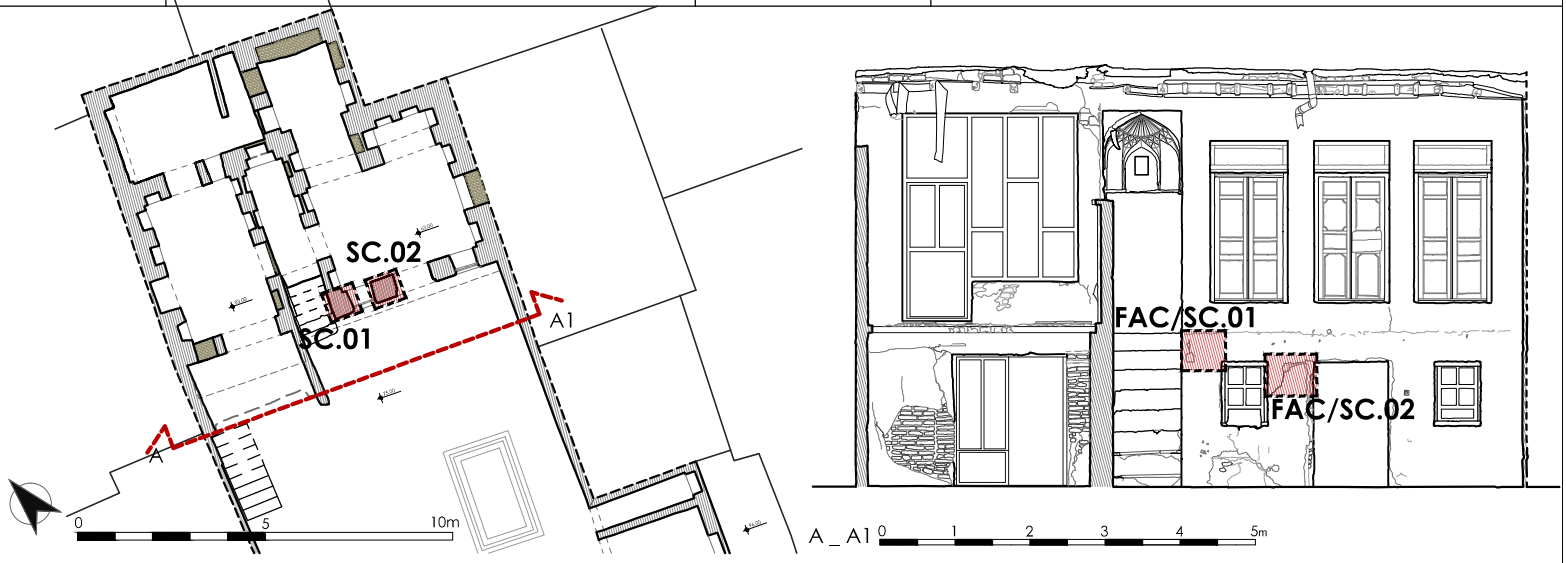
The presence of the wide walls was in order to bear the weight of the overlying parts. In addition to load bearing, the solid masonries were built to delay the transfer of heat from outside to inner spaces in the hot seasons. The size of the columns on the ground level is basically between 50 and 60 centimeters. In parts that carry more load, such as pillars of food storages, this amount reaches 76 centimeters.

The sophisticated characters of baked bricks, namely durability and resistance, have led them to serve for the construction of thick walls in the ground floor. These bricks have been applied in various size in square or half form. Also, they would be used in small pieces as rubble infill to fill the central part of the masonry with a weak mortar of mud-lime.

The placement of the bricks in the upper portion of the ground walls are different from that of the lower parts. The brickwork of this part is implemented in such a way that in the external angles, the square bricks are aligned horizontally with a slight distance. On the other hand, the spaces between the corners are lined up with a row of bricks arranged longitudinally on a row of horizontal bricks.[143] Moreover, the lower walls include the horizontal length of wood which arranged along the masonry by a distance of about 210 centimeters from the ground to increase the bearing walls' strength against earthquakes. However, because of the use of fired bricks in the walls, there is no joist running through the height of columns. In other words, as an extra support, the timber beams are laid on the top of the brick walls provide an anti-seismic protection system in a traditional manner. The timber beams are made of trunks in square shapes and are connected to each other by lap-joints.

[142] Scarce Jennifer, "The Arts of the Eighteen to Twentieth," *Cambridge histories Online*, Vol.7, (2008), pp.895-896.
[143] This type of brickwork keeps the ceiling beams in place and immovable. (Golabchi 2013, p.181)

Sheet 3.1	Structurale-architectural component	Historical House	Location
	Burnt-brick masonry	Bidari	NE facade, ground floor



1 FAC/SC.01detail, construction materials;

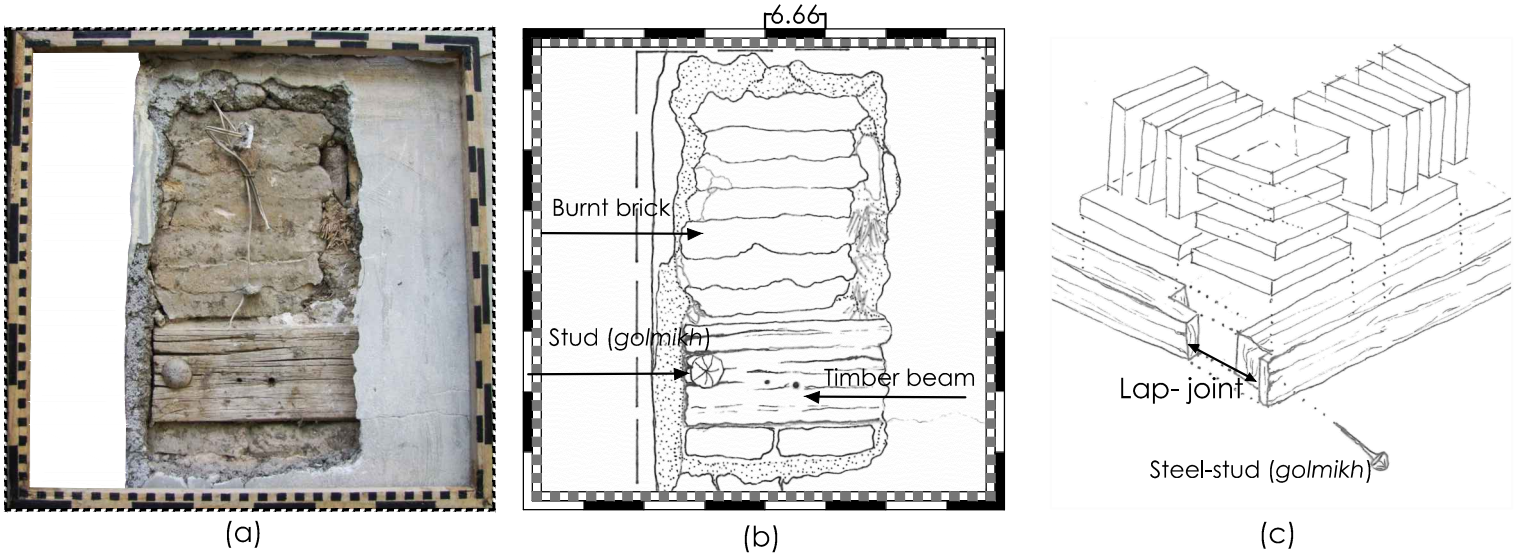


Fig. 3.2.1 Construction of fired-brick masonry; (a) as the demolition of Bidari House was expected, the author decided to remove a thick layer of white cement that had covered the façade to discover construction materials and methods, (b) use of local materials such as timber beam (10 cm), fired kiln bricks (19 × 19 × 4 cm) and mixture of wet mud and straw, (c) combination of lap joint and steel decorative stud *(golmikh)* to provide a stronger connection between the horizontal beams.

2 FAC/SC.02 detail, construction materials;

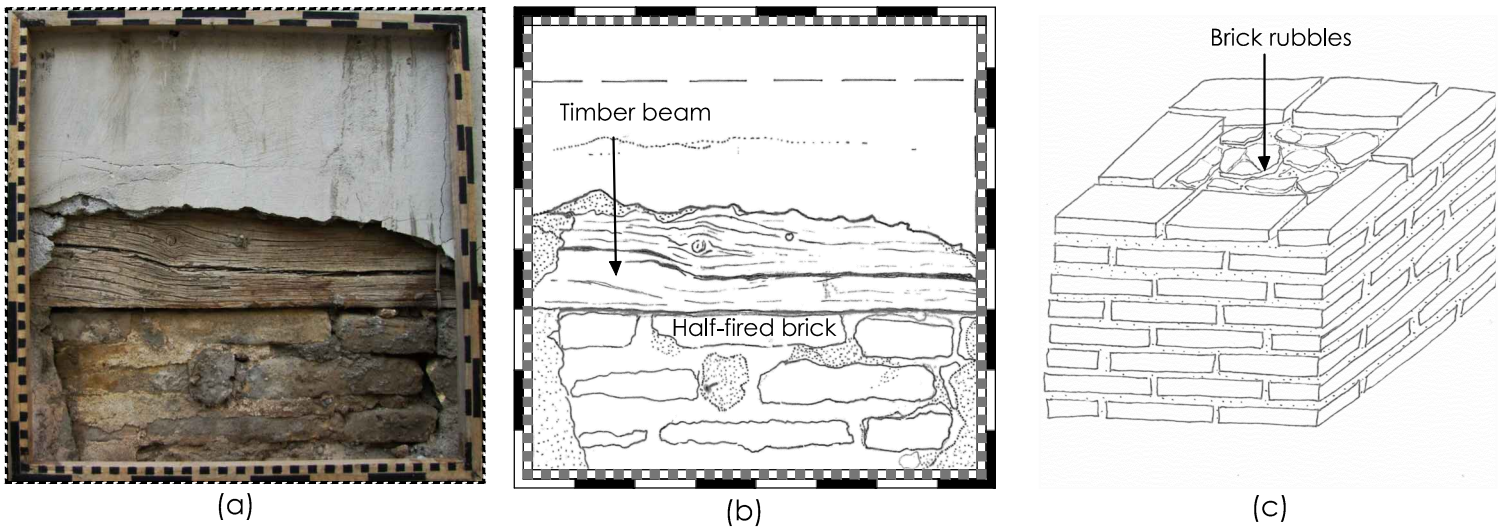


Fig. 3.2.2 The burnt-brick masonry details on the ground floor; (a) removal of the cement layer, (b) use of half-fired kiln bricks (23 × 11.5 × 4.5 cm) along with wooden beams in order to create a durable masonry and an anti-seismic protection system, (c) use of brick rubbles with lime-mud mortar at the central part of the thick column.

Figure 3.1 The placement of brick rows in the upper portion of the fired-bricks wall; Tehrani House, SE building mass, ground floor. **Figure 3.2** The construction of walls on the ground floor with burnt bricks and horizontal beams; Nili House, SW building mass.

Figure 3.3 Connection of horizontal beams by lap-joints in the ground floor of Bidari House. (After the building demolition, 2017)

On the other side, the thickness of walls and pillars in the upper level by 35 centimeters is much lesser than that of the lower ones to provide a lightweight construction. Builders would even tend to make a lighter structure by placement of openings and niches in a regular manner. In addition, it slightly decreases towards the upper niches through implementing the curved ceiling at the lower niches.

Masonries on the first floors are raised by sun-dried bricks that were employed on both summer and winter living quarters, because of their higher heat insulation that would need lower energy requirements. Since, mud-brick walls tended to crack by 45 degrees from one third of their height, builders would integrate joists into the masonries.[144] The joists are placed vertically at the center of upper columns and surrounded by row sun-dried bricks on both sides. In several piers, the small

[144] Golabchi 2013, p. 60.

pieces of mud brick like rubbles are laid on one side of the joist in place of their square. Connected to horizontal beams by Male and Female joints in adobe walls, the vertical joists were used to increase the wall's stability against tensile forces.[145]

They are glued to adobe bricks with mud-straw mortar that has a high adhesion and plasticity properties. Also, the combination of mud mortar and sun-dried brick delivers a compatible construction.

Figure 3.4 The curved ceiling of lower niches on the first floor. Location: Bidari House, NE building mass, first floor, principal chamber.

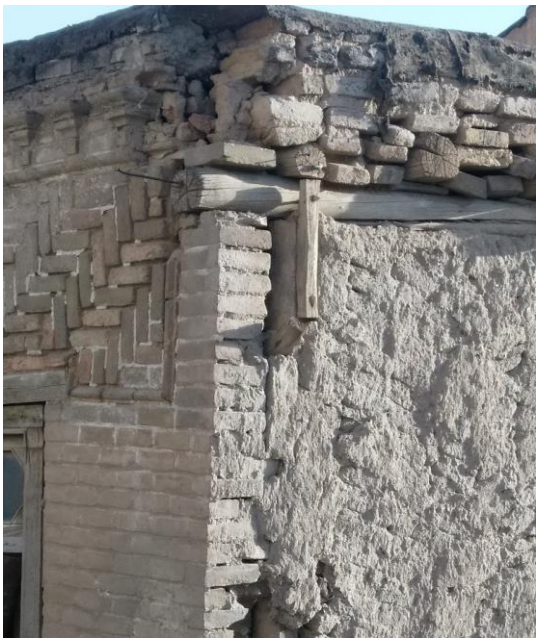
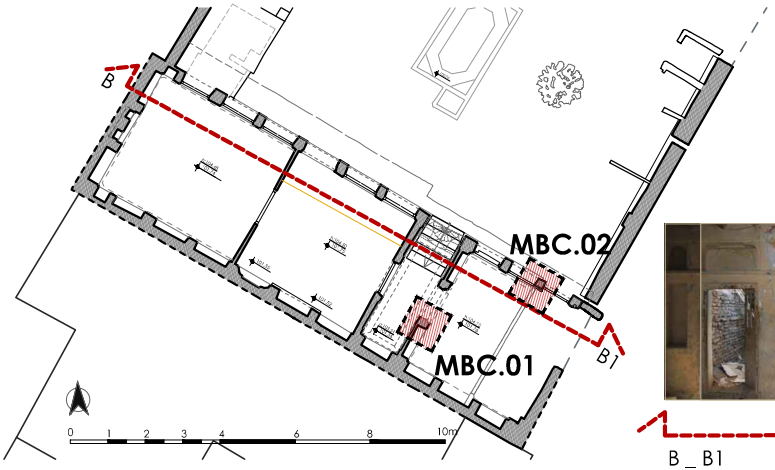


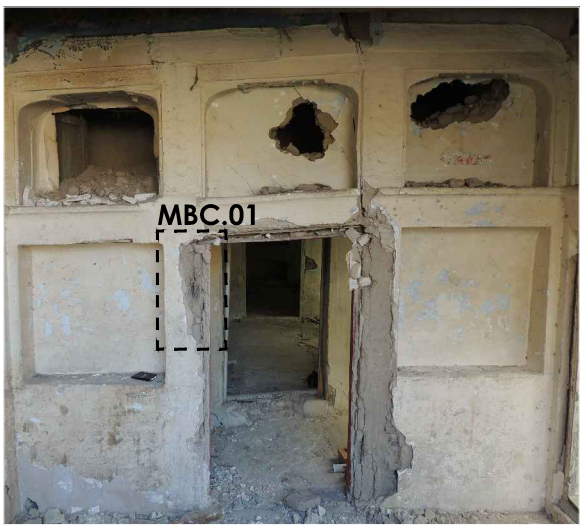
Figure 3.5 Connection of vertical joist and horizontal beam by Male and Female joint using wooden pins, Amiri House. **Figure 3.6** Integration of wooden joists and bricks and utilization of wooden pins to make a comprehensive joining between timber beams in a boundary wall in Ghomi House.

[145] The joining of timber beams would be completed through using wooden pins nailed to both elements.

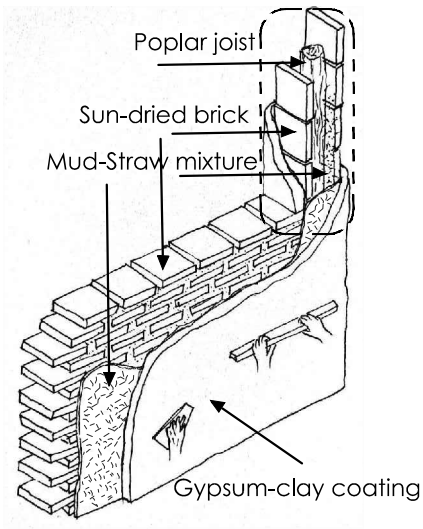
Sheet 3.2	Structurale-architectural component	Historical House	Location
	Mud-brick masonry	Nili	SW building mass, first floor, guest room



1 Mud-brick column (MBC.01), construction materials and techniques;



(a)



(b)

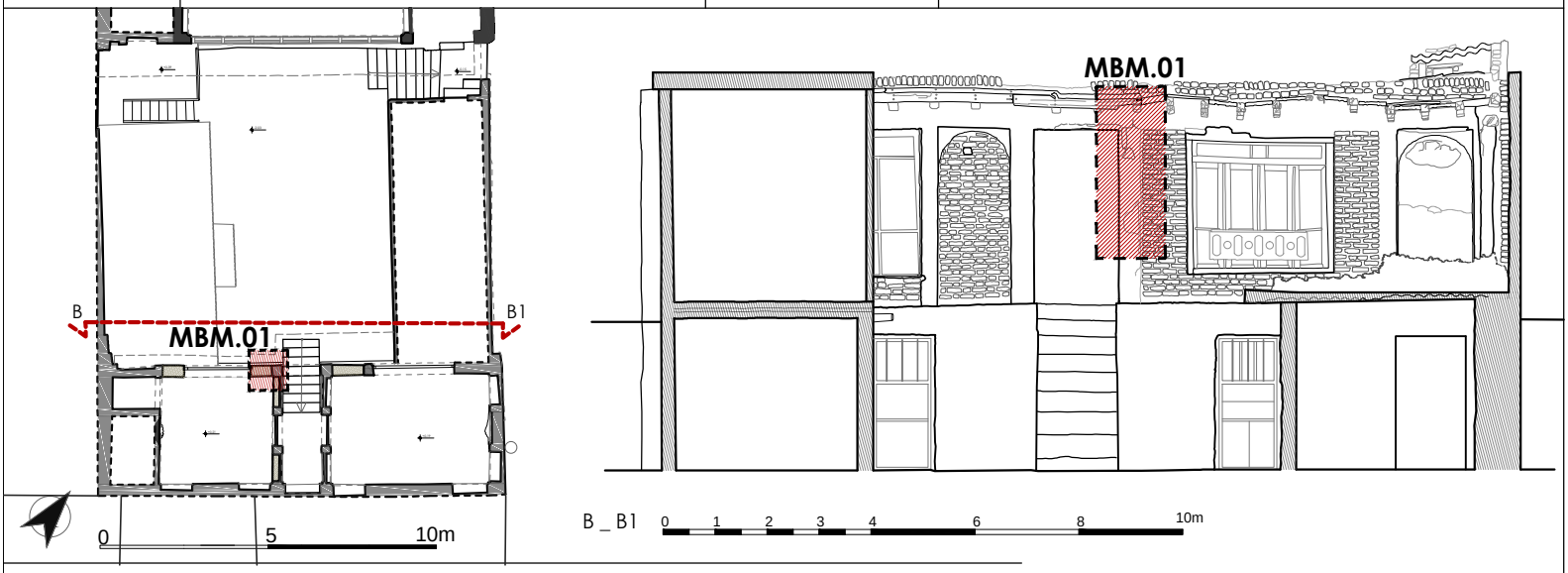
Fig. 3.1.1 Construction of northwestern columns in the guest room on the first floor; (a) in upper floors, to provide a lightweight structure, columns are built by square sun-dried bricks (17 × 17 × 4 cm) along with wooden poles, and the vertical joists are glued to adobe bricks with mud-straw mortar, (b) a schematic drawing of the construction method in the guest room implemented in all internal spaces on the first level.

2 Mud-brick column (MBC.02), construction materials;

(a)

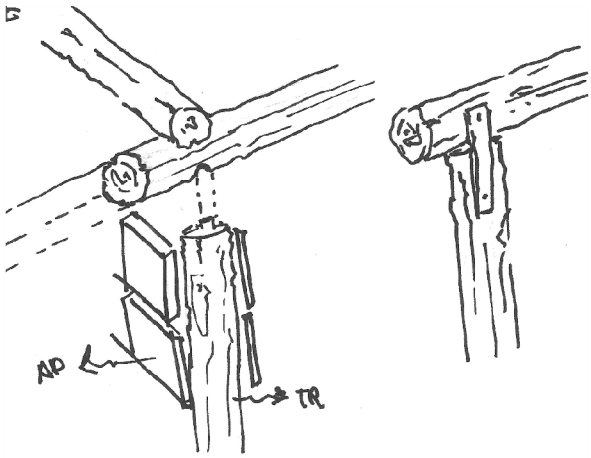
Fig. 3.1.2 Construction of northeastern columns in the guest room on the first floor; (a) in pillars with less thickness, mud-brick rubbles are employed along with mud-straw mortar in place of square mud-bricks.

Sheet 3.3	Structurale-architectural component	Historical House	Location
	Mud-brick masonry	Tehrani	SE building mass, first floor facade

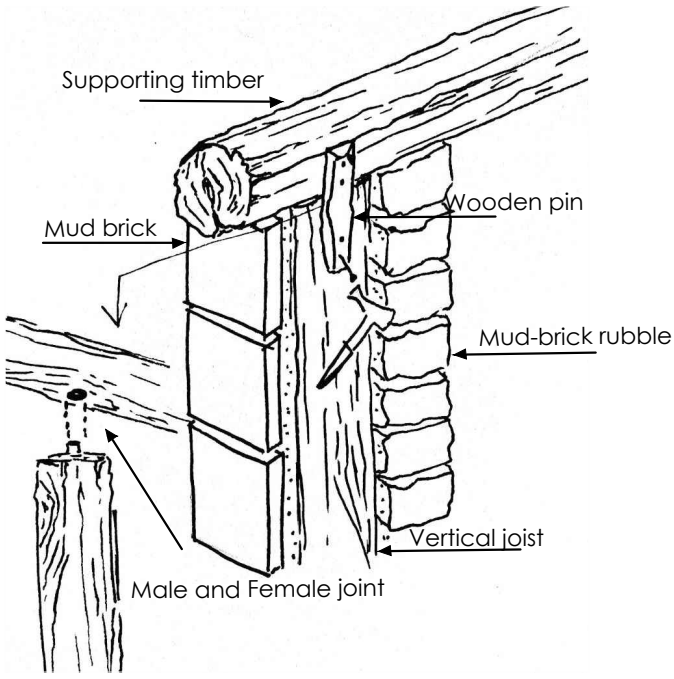


1 Mud-brick masonry (MBM.01) detail, construction materials and technique

(a)



(b)



(c)

Fig. 3.3.1 Construction of columns on the first floor; (a) column made of vernacular materials such as wood and sun-dried bricks originally coated by a layer of mud-straw mortar; use of cement layer does not belong to the earlier traditional technique, (b) implementation of Male and Female joint and wooden pin to connect the wooden components, vertical joist and supporting timber, (c) construction material details in the sun-dried column.

Note: Since measurement of materials has not been possible, the size of bricks and joists or beams not mentioned.

The mentioned construction would be recognized as the standard and common method associated with local materials in order to raise an earthen structure. This traditional technique was affordable by the local people due to abundance of materials and application stages which were simple and clear to follow, as well as being inexpensive.

3.1.1 Brickmaking and types of bricks

Full consideration of local climatic conditions with the detectability of clay presented the raw earth as the preferred construction material in most regions of Iran.[146] It is in form of sun-dried or baked bricks made from a mixture of clay, water, and sand which were dumped into a soak-pit and left for a night. Also, the pottery sherds, stone aggregates and organic materials would be added to the mixture to prevent the cracking during drying process and reinforce the low tensile strength of sun-dried bricks (*Tempering*).[147]

Brick molds come in different formats including single, double, more than double, with or without bottoms, wooden or iron-lined. The common brick mold employed in the process of brickmaking was the single-wooden type without bottoms. The brick maker inserted manually the blend into the wooden molds which were already covered with straws or ash to prevent the clay from adhering to their edges. After which, the surplus mud would be removed with a wooden scraper, the molds reversed on the ground and lifted immediately.[148] Since the clay containing a considerable amount of water would be exploded when heated, a kiln raw brick needs to be thoroughly dry before burning. Thus, adobe bricks were arranged towards sun in a chain form; on their edge with air spaces between them for one or two days.[149] After the drying process, the adobe bricks were loaded for burning in the kiln. The difference between sun dried-bricks and the baked bricks is that sun-dried bricks are directly exposed to the sun to dry, and the firing process in the furnace did not apply to them.

The brick kilns are commonly located near to clay pits at outskirts of town. There were two types of kilns used to fire the bricks; *Cylindrical* and *Hoffman* kilns. As an intermittent type, the traditional Cylindrical furnaces were operated manually and the bricks made this way would not generally be uniform regarding shape and color. At present, Cylindrical furnaces are rarely found throughout the country. In this kind of kiln, the fire is inserted into the holes of 5-6 m deep and 2-3 m long. The raw bricks would be arranged in a radial way to the top and the gaps between them filled by gypsum. In

[146] The most ancient utilization of mud bricks in Iran dates back to the early 8th millennium BC at Ganj Dareh on the west of the country. However, the brick fired in a kiln has been applied in Iranian buildings since 2nd millennium BC. Azarpay Guitty, "Brick", *Encyclopædia Iranica, V. IV, 1989. (*http://www.iranicaonline.org/articles/brick-blocks-of-tempered-mud; accessed date: April 24, 2018)

[147] Claasz Coockson Ben, *Living in Mud*, Istanbul; Ege Yayinlari, 2010, p.31.

[148] Wulff Hance. E., trans; Ebrahimzadehm S., *The Traditional Crafts of Persia*,Tehran; Enghelab Press, 1993, p.98.

[149] Maheronnaqsh Mahmud, *The Iranian Heritage of Brickwork*, Tehran: Soroush, 2002, p.27.

order to circulate the heat, the lower row is stacked with crawl spaces. The dome roof of the furnace would be blocked almost for three days to reserve the heat.[150] The utilization of Cylindrical traditional kilns continued almost to the early 20th century when the modern brick kilns called Hoffman were constructed in south Tehran.[151]

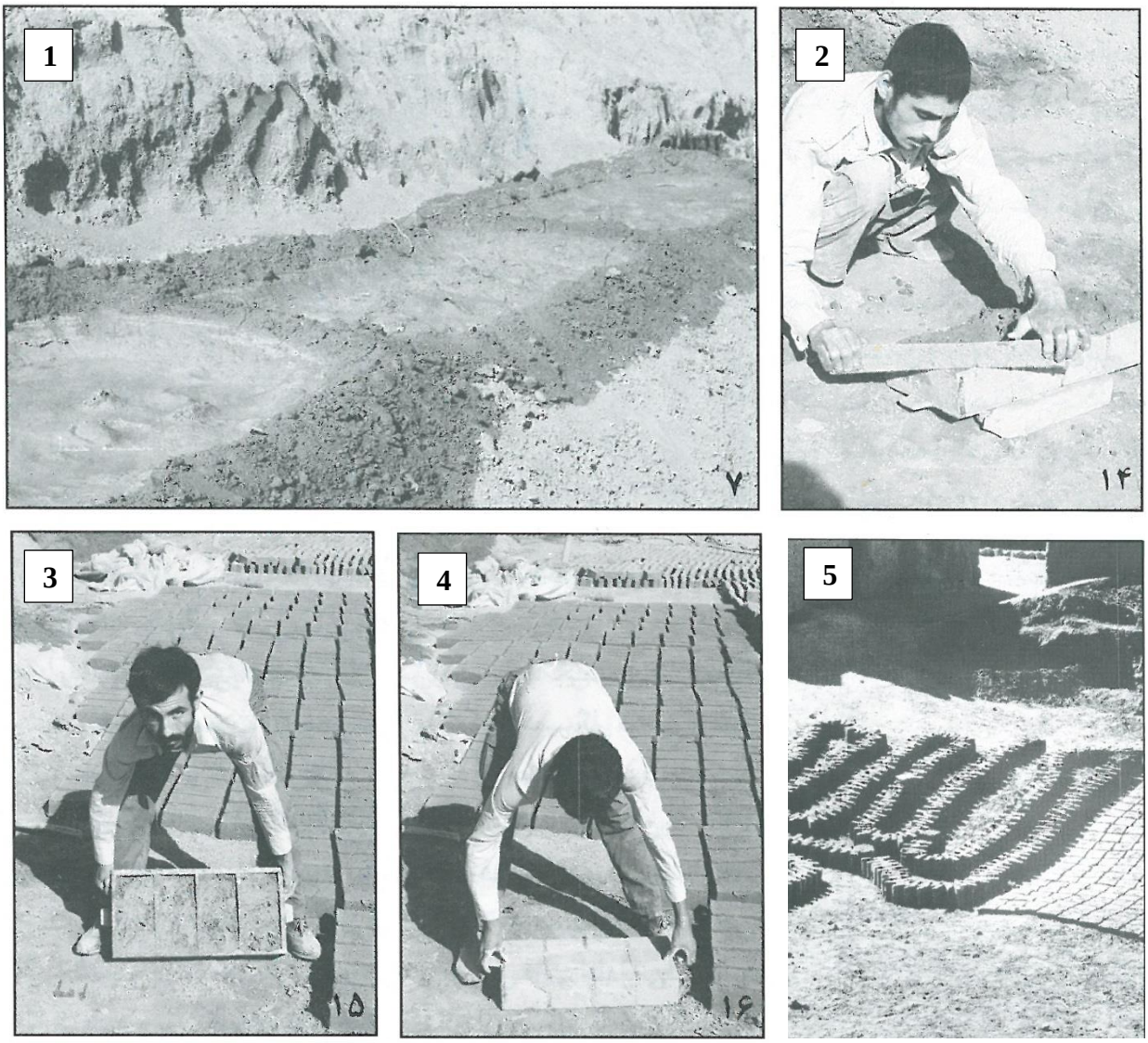


Figure 3.7 Preparation of sun-dried bricks; 1. Blending, 2-3. Molding, 4. Removal, 5. Drying. (Maheronnaqsh 2002, 7-31)

[150] Maheronnaqsh 2002, pp.23-24.

[151] The first modern brick-kiln known as Hoffman was constructed in 1935, south Tehran. Until 1948, about 35 Hoffman kilns have been constructed at Tehran's outskirts and during the 1950s-60s, this number increased because of construction boom. Usually, each Hoffman kiln could produce about 15,000 bricks per day. Floor, Willem, "Bricks and Ceramics Industry," *Encyclopaedia Iranica*, 2005. (http://www.iranicaonline.org/articles/bricks-and-ceramics-industry; accessed date: April 24, 2018)

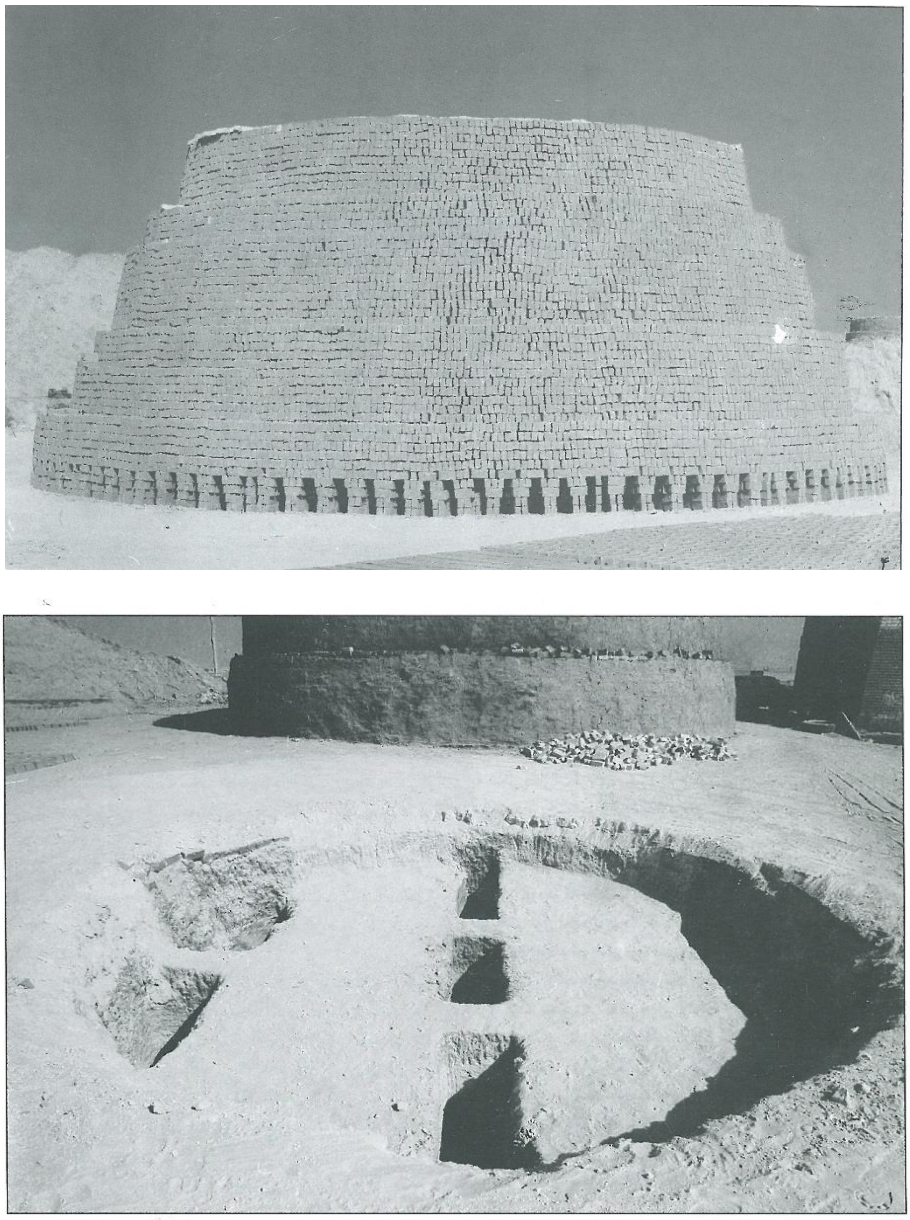


Figure 3.8 The Cylindrical kiln and the fire location. **Figure 3.9** The arrangement of mud bricks around the kiln from the lower row to the roof. (Maheronnaqsh 2002, 22-24)

Hoffman kilns produce high-quality bricks compared to earlier Cylindrical furnaces because of providing a uniform temperature. They are continuous in which sun-dried bricks are unloaded, pre-heated, fired and cooled. The oval-shaped plan has divided into rooms by using the blended walls. Each room has outer openings for mud bricks loading and draining in the kiln.

In this furnace, after being unloaded, sun-dried bricks get warmed by hot air before being directly burnt. The pre-heating is carried out by shifting the hot air along with gases from the back chamber to the adjacent rooms. The heat enters into other rooms through the holes embedded in the ceiling and below the walls of the kiln. The holes are connected to the central path associated with a high chimney that is constructed to direct the gas from fossil fuels to the outside. The bricks get burnt

through the hottest fire of gas flares accessed from the ceiling into the room. At the time of firing, in the farthest room, loading and unloading of bricks continue which brings fresh air into the kiln. Therefore, the airstream moves between the rooms where the burning operation has already taken place, and the cooling of the baked bricks proceeds.[152]

Figure 3.10 The Hoffman kiln near Gonabad (284 km to Mashhad) which serves as a traditional kiln to produce the bricks used for restoration of monuments

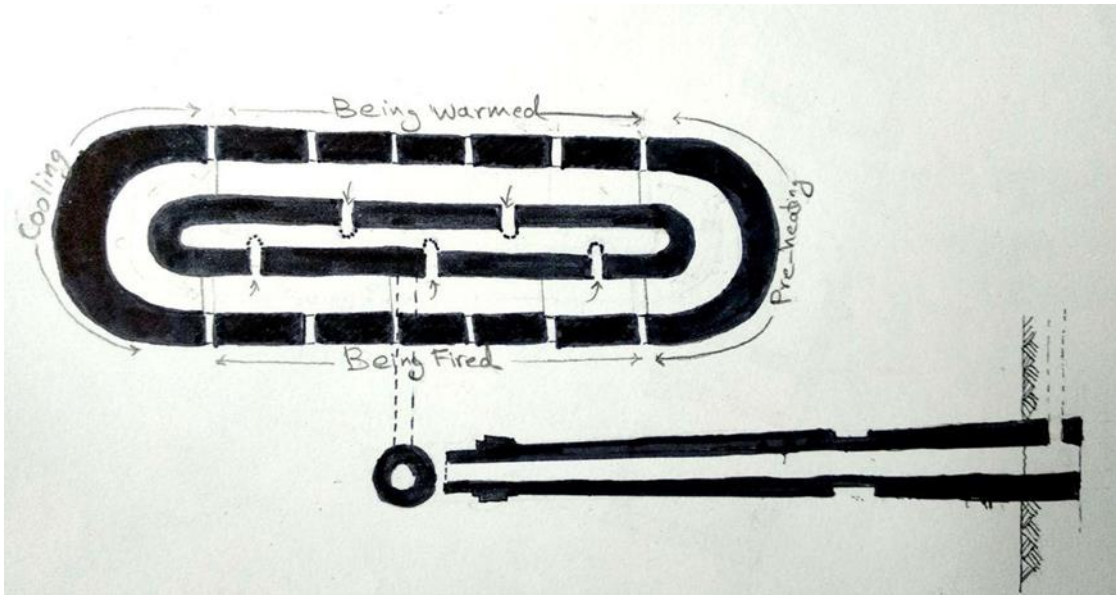


Figure 3.11 The presented drawing depicts the passage of airstream from the kiln to the chimney and stages of pre-heating, burning and cooling in a Hoffman kiln.

[152] Maheronnaqsh 2002, p.26.

Figure 3.12 Drying of sun-dried bricks before firing in the kiln. **Figure 3.13** Setting of raw bricks in a Hoffman kiln.

Figure 3.14 Burning the bricks by a gas flare. **Figure 3.15** Loading the burnt bricks.

Since cylindrical kilns could produce non-uniform bricks in color, shape and durability, the bricks burnt in them would either have a high quality or be considered improper. For instance, the bricks arranged far from the fire presented a softer texture than ideal. However, many bricks exposed to the high temperature (nearby fire) presented a red color and proved to be more durable. [153]

Besides, the bricks burnt in a Hoffman kiln are heavier and more compact than the ones baked in traditional furnaces. The 1968 aerial photo presents the locality of Hoffman kilns and the clay pits on the south of Mashhad. The clay used in the bricks came from the nearest pits by well wheels. Each

[153] Although, the one-fifth of clay used in brick mixed with gray sand in order to clean the mud mixture and make the color of fired bricks bright yellow. Otherwise, the color of the brick will be red after backing (Wulff 1993, p.103).

kiln had a chimney in the center or a short distance from its structure. These chimneys have a long and empty brick cylinder structure sloped upward to increase the stability coefficient of the stack.

Figure 3.16 The 1956 aerial photo and 1954 city map present the location of the earliest cylindrical furnaces on the southwestern of the city and their distance to the selected houses (case studies). (KH-CHHTO archive)

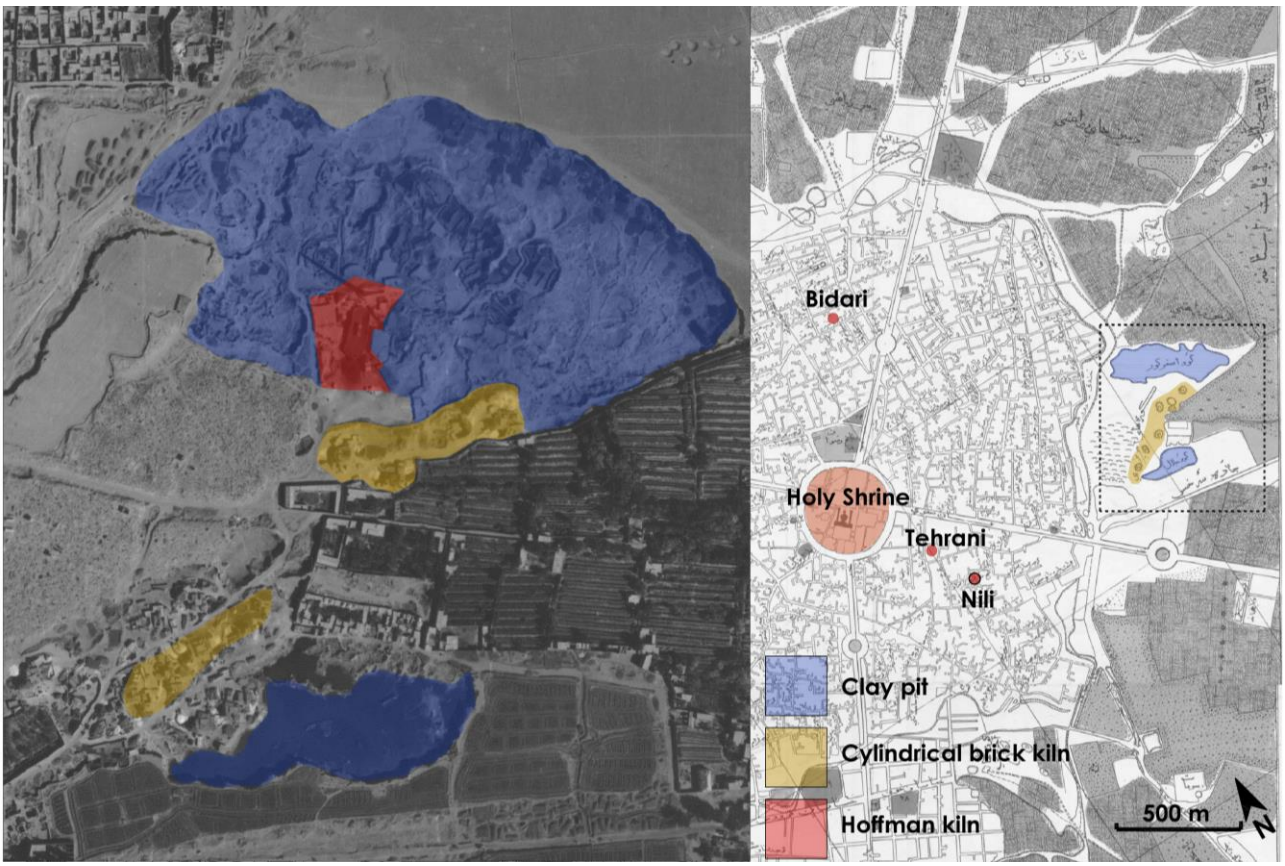


Figure 3.17 The 1968 aerial photo and 1954 city map present the location of cylindrical traditional furnaces, Hoffman kiln and clay pits near the kilns on the south. (KH-CHHTO archive)

Figure 3.18 The 1968 aerial photo presents the location of Hoffman kiln in outskirts of Mashhad. **Figure 3.19** A ruined structure of Hoffman kiln along with a high brick chimney which are entirely abandoned. (Charbagh Chanel)

The dimension of the bricks and their shape can to some extent indicate the historical periods when they have been used.[154] In the Mongol period (1265-1336 AD), the standard brick size was between 18-31 square cm and 4-7 cm; under Safavid, it was 26-27 × 26-27 × 5-5.5 cm. In later eras, such as Afsharid and Zand, the common type of brick was the large one with rectangular shape which has 23.5-24 centimeters in length. This amount decreased and reached the standardized size of about 19.5-20 × 19.5-20 × 4-4.5 cm in the 20th century.[155]

Table 3.1 In the case studies, backed bricks show at least five different dimensions which were the standard brick size in golden eras (1501-1925 AD) and I Pahlavi era (1925-1941).

Historical Period	Fired Bricks Size (cm)	House
Safavid *(1501-1736 AD*)	**27 × 27 × 5**	Nili, Bidari
Afsharid *(1736-47AD)*	**23× 23 × 4.5**	Nili, Bidari, Tehrani
	24 × 24 × 4.5	Bidari
Qajar *(1795-1925AD)*	**17 × 17 × 4.5**	Nili,
	19 × 19 × 4	Bidari
I Pahlavi *(1925-1941)*	**22 × 11 × 6**	Tehrani
	23.5 × 11.5 × 5.5	Nili

[154] There was a relationship between the architectural proportion of a building and the brick size. Since the pre-Islamic buildings were constructed in a large scale, the standard size of the brick was 30-40 × 30-40 × 10-13 cm (the Parthian period, 247 BC-224 AD) and 33-35 × 3-35 × 8-9 cm (Achaemenid Period, 559-330 BC). In the Islamic eras, these dimensions are gradually diminished. Azarpay, 1989).

[155] Golabchi Mahmood, Javani Dizaji, A., *Iranian Architecture Technology*, University of Tehran Press, 2013, p.17.

From numerous dimensions of the bricks brought in the table, it can be realized that houses have been altered differently in various historical periods, and some cases like winter quarters in Nili's house have also have also been reconstructed on the pre-existing structures. For instance, the bricks types implemented on the ground floors in study cases correspond mostly to the bricks sizes of the 18th century (23 × 23 × 4.5 cm) by being 23 cm long, 11.5 cm wide and 4.5 cm thick. However, in the northeastern building mass (winter quarter) of Nili house the size of the bricks is equal to typical I Pahlavi bricks by 23.5 × 11.5 × 5.5 cm. The dimensions of the bricks in the upper portions of the ground walls are much shorter by 19 × 19 × 4 cm, which was a common brick size under Qajar era (1795-1925 AD). Moreover, the sun-dried bricks in masonries on the first floors present 17 × 17 × 4.5 cm, which is the type widely used in Qajar houses.

Two samples of the earliest bricks have been collected from Nili and Bidari houses to explore their type and the kind of kiln in which they have been burnt. Thus, the components of both kinds of baked bricks have been identified under optical microscope observation in order to recognize the similarities and differences between them.

The first sample collected from Bidari house belongs to square bricks (24 × 24 × 4.5 cm**)**. The second sample was separated from backed bricks with a size of 23 × 11.5 × 4.5 cm in Nili House.

According to the optical microscope observation, the process of making these red durable bricks has been carried out at a fast pace. The mixture of these bricks highlights the use of other fragments of brick along with the screening clay and little sand. The use of sand with rounded grains was because of reducing the tendency of clay to cracks when baked.[156]

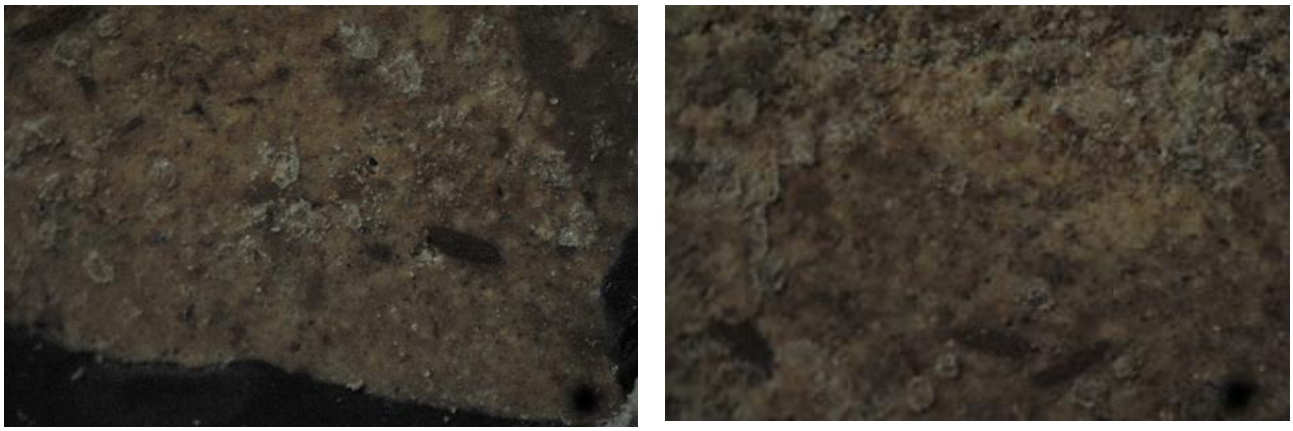


Figure 3.20 Burnt brick sample collected from Bidari House, NE building mass, ground floor, living room, western wall.[157]

On the other hand, the structure in the other brick type does not have an excellent quality and it is inhomogeneous. The sample mixture has an orangish yellow color in which the presence of some

[156] Golabchi 2013, p.14.

[157] See Appendix III.

fragments of bright red refers to the employment of reused bricks sherds in gridding mode. Probably, due to the existence of reclaimed materials, the micro ferrous laminations can be observed in the mixture.

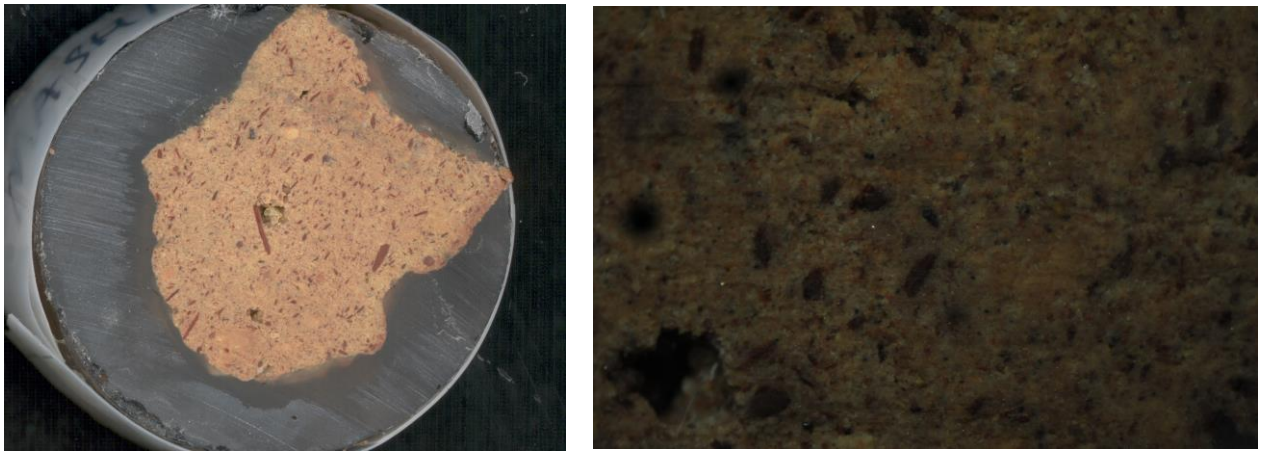


Figure 3.21 Fired brick sample collected from Nili House, SW building mass, first floor, SE boundary wall.[158]

According to color and texture of the samples it can be concluded that the both kinds of bricks probably have been fired in the cylindrical furnaces were located on the south-western outskirts of Mashhad. In addition, based on dimensions, both types of bricks were made in late eighteenth century when the Hoffman or Tunnel kilns did not exist in Iran.

As Mashhad is located in a moderate region where it has no possibility to face heavy rainfalls, the employment of mud bricks is widely common.[159] According to the statements of Mr. Javedani, the specialist craftsman, at the request of the householder, sun-dried bricks are made in the courtyard from a mixture of clay was carried from the nearest pit with black soil gained by digging the ground of the house. [160] British traveler, Yate also stated about this action, "[…] *almost all the houses in Mashhad seem to be considerably below the level of the streets, owing to the fact apparently that everything is built of mud, and the people, not having been able to dig up the streets to get earth for their houses, have gradually cut away the ground on either side of them to build their walls with.*"

In order to confirm or disprove this claim, a sample of sun-dried brick was collected for preparing the microscopic section. The results of microscopic observation are as follows.

[158] See Appendix III.

[159] Fraser's remarks (19th century) could confirm this application as, "[…] *in Mashhad houses built of sun-dried bricks or mud with a poor entrance that opened to the pure light of heaven* […]*."* (Fraser 1825, p. 444)

[160] Yate 1900, p.327

The mixture of mud brick proves to be inhomogeneous and strongly degraded. It constitutes a clay mixture that included black lamelliform ingredients, micro feldspathic components and other black volcanic aggregates.[161]

It cannot be excluded the use of reclaimed materials and sandy components. In addition, the round-shaped appearance of the curding would be belonging to the inclusion of the air bubbles inside the blend. The presence of these impurities claims the application of black soil in the mixture of the adobe mixed with the clay gotten from the pit.[162]

Figure 3.22 Mud brick sample collected from Nili House, SW building mass, guest room, NW wall.[163]

To sum up, accessibility of kilns in outskirts of Mashhad has brought usage of bricks in a wide and common way. Furthermore, the walls made this way would also be produced and repaired easily because of wide availability of clay and low-cost feature of bricks production.

Nevertheless, it is also necessary to consider the disadvantages of raw bricks. Sun-dried bricks not baked in the kiln can be quickly eroded by water and attacked by termites and lack of maintenance of mud-brick masonries will lead to damage to the structure. For instance, in summer quarter of Nili House where is less exposure to the sun, the presence of a high amount of humidity causes erosion

[161] At first glance, it seems that the presence of feldspar in the raw clay mixture cannot be the result of an intentional process. For this reason, the clay composition accompanied with various minerals, including quartz, kaolin, calcite, chlorite, and feldspar which come from destruction, erosion and chemical decomposition of silicate minerals. Nevertheless, we all know that feldspars are ingredients used in clay making and ceramic glazes due to their characteristics such as melting point, thermal expansion, transparent color, and hardness. Therefore, it could be added to the mixture of adobe as a component. According to the mine and mineral indices distribution map of Mashhad and Torqabeh-Shandiz counties in 2014, almost five feldspar mines are placed near Mashhad, among which there exists one abandoned mine. The feldspar mines in operation are located in the 20 km south and 25-28 km southeast of Mashhad.

[162] Since destroyed buildings would be a source to obtain high-quality rubble soils from, it is possible to make a resistant mud brick. Zomarsheidi Hossein, *Implementation of Buildings with Traditional Materials*, Tehran: Zomorod, 2012, p.72.

[163] See appendix III.

of bricks. Though, being built with burnt bricks, the masonry in the ground floor presents a durable structure despite the loss of mortar in most of the parts.[164]

Even so, fillings of brick rubbles and a weak mortar of mud-lime mixed with some black soil to make a reasonable execution brought more vulnerability to the structure. For this reason, the masonries have lost their solidarities under pressure leading to deformation or being divided into two halves (splitting).

Figure 3.23 Splitting of burnt-brick masonry in the north-earthen quarter of Nili House. **Figure 3.24** The sun-dried brick rubbles found from the central part of masonry in the western building mass of Darugheh House. (Govahi, 2012)

3.1.2 Complementary Materials

In addition to the brick, wood is another main material applied in all structural or architectural forms because of its abundance and availability. Indeed, wooden trunks integrate with row bricks in vertical and horizontal modes to reinforce the masonry and hold it immovable.

Identifying wood species used in the structure of historical buildings requires sampling of wooden beams and laboratory analyses. However, based on the resources available in this field, *Populus* is applied more than other species in the implementation of structural elements of buildings constructed between16th and 19th centuries.

[164] At the ground floors as well the principal causes of deterioration are linked to water directly or indirectly. There is a moisture absorption at the basement piers which led to decay of mortar in most of the parts. Also, a heavy layer of white cement on the façade has exacerbated this damage to the masonry which increases accumulation of water in the bricks and deposit of external materials. In Nili and Bidari houses, human activates have caused an accumulation of black soot and dust on the brick masonries, because of their state of abandonment and having been a place for homeless. Indeed, pollutant gases, in particular, sulfur dioxide, produce sulfuric acid in an environment containing particulates such as black soot, under the influence of moisture. The acid, reacting with bricks, darkens their surface and makes them erode. (Farokhyar 2007, p.116)

Based on the studies, it can be realized that either of the two species *Populus nigra* or *Populus* alba has been used as poles in the construction of columns or load-bearing walls. These species have a smooth, fine and uniform texture, and are considered among indigenous and fast-growing trees in Iran.[165] The *Populus nigra* or black poplar is a medium to tall tree reaching up to 30 meters. The bark is greenish-grey on the young tree trunks, and dark grey and thick on the old ones.[166]

Regarding the use of *Populus* woods in traditional Iranian houses, the Austrian physician, J. E. Polak, mentioned, "[…] *there is almost no timber in the high plains. So, the black poplar trees of eight to ten years old will be cut, peeled and used instead of the beams. But this feeble wood is not resistant enough, gets rotten quickly and often becomes a termite bait."* "[…] *only in large buildings are there a few beams of planes wood that are both inaccessible and expensive.*"[167]

Populus alba, commonly called *white poplar*, is a medium-to-high tree with a widespread crown; it can grow up to 24 meters in height.[168]

Through a study of report on the structural analysis of Darugheh House, we can claim that *Populus alba* trunks have commonly been used in the structure of houses. As white poplar trees are available in outskirts of Mashhad, they were mainly in use as the ordinary wood with a soft and flat surface. Physical and mechanical properties of poplar woods such as being lightweight, knot-free, and resistant to pressure loads and termite attacks encouraged builders to utilize them in vertical mode. In addition, poplar trees have the long lengths, thus, they could be employed in construction of large spaces.[169]

Figure 3.25 The present image shows the placement of poplar trunks as poles into brick columns, Ghomi House. (Date taken: 24 Nov 2017)

[165] Ahmadi Hossein, Pourtahmasi Kambiz, Mohammadi Achachluei Mohsen, "Wood Identification of Structural Elements of Seven Historical Buildings related to Safavid and Qajar Periods," *Maremat & Me'mari-e Iran*, Vol.8, N. 15, (2018), p.107. (http://mmi.aui.ac.ir/article-1-161-fa.html; accessed date: 10 January, 2019)
[166] Ahmadi, Pourtahmasi, Mohammadi Achachluei., 2018, p. 113.
[167] Polak, J.E. translate; Jahandari, *K. Das land und seine bewohner*, Tehran; Kharazmi, 1989.
[168] Ahmadi, Pourtahmasi, Mohammadi Achachluei., 2018, pp.112- 113
[169] Morasa 2005.

The poplar trunks are also used in the horizontal and vertical mode in the structure of traditional Afghan dwellings, to reinforce brick masonries.[170]

Among the neighboring countries of Iran, Afghan construction is probably the one that bears a lot of similarities with case studies, even in the selection of building materials.

Along with brick and wood, other complementary materials including gypsum and mud mortar would protect the building against moisture and cover its bricks or rubble façades, as well as provide a substrate for stuccoworks or mural paintings.

On the ground floor, the courses of baked bricks were not traditionally coated with any plaster; they were only bonded with sand or gypsum mortar left uncovered. This mortar found in Nili House consists of highly thin bindings and aggregates with possibly chalky components. There are visible cracks in them apparently due to water access to the mixture. In Bidari House, the brick mortar presents a great deal of sand and fragments of phyllosilicates and microfossils in its blend though.[171] The structure is very compact inside where quite thin or well-sifted sand and traces of brick sherds are also visible.[172]

Figure 3.26 Gypsum mortar collected from Nili House, SW building mass, ground floor, storage, NE wall.
Figure 3.27 Appearance of sand mortar fragments under microscope observation. The present sample was collected from the living room at the ground floor of Bidari House.

Unlike the ground floor, the masonries on the first floor are covered with a layer of mud-straw mix. Mud-straw is suitable for thermal insulation and moisture and generally used to support the adobe walls and provide adequate bedding for gypsum plaster.[173] However, because of moisture mud mortar started losing its adhesion despite the existence of a decent amount of straw. Having a wood-

[170] Bechhoefer, W. Fethi, E. *Serai Lahori. Traditional housing in the old city of Kabul*, University of Maryland School of Architecture, 1975.
[171] Based on the geological map of Mashhad and Torqabeh-Shandiz counties (2014), there are some fossil localities in the southwest near Sangbast Shandiz Fault.
[172] See Appendix III.
[173] Almost 40 to 45 kg straw, 1.08 m^3 of clay and 414 Lt of water would be required to prepare each m^3 of such coating. If the thickness of the mud-straw mix is between 20 to 30 centimeters, it is excellent moisture and heat insulation. (Golabchi 2013, p.38)

like composition, straw is at fire risk or decay due to a high long-term moisture content. Also, as a cellulosic material, straw is an excellent food for termites and in the event of any attack on the clay, it will disintegrate.[174] In Nili House, a thick layer of gypsum-clay mortar has coated the mud-straw covering to prepare an appropriate underlay for stuccowork.[175]

Figure 3.28 The blistering and delamination of mud-gypsum plaster layers caused by expansion of the humidity.

As the final stage, internal walls will be whitewashed with a thin layer of gypsum plaster. Besides, the finishing plaster of the facades was traditionally a mud-straw coating with a red ochre color that highlights the presence of clay in the gypsum mixture (original external plaster in Nili House). Microscopic observations indicate that compact with small dark granules inside, the inner finishing coat is protected probably by an organic glue type, possibly, Tragacanth.

Addition of Tragacanth to gypsum mixture effects the setting and increases its resistance to impact and abrasion. However, the finishing layer covering the external façades is composed of clay components with the most exceptional screening. It also highlights the presence of an organic protection layer which is seemingly different from the glue observed in the inner plaster.

[174] Rezazadeh Mojtaba, *Restoration of Architectural Heritage: Cognition Diagnosis Intervention Methods*, University of Tehran, 2011, p.119.

[175] The gypsum-clay plaster should be free from sands and impurities, and if the distribution of gypsum and clay is one to one, it will be resistant to the pressure. (Golabchi 2013, p.46)

Figure 3.29 Inner gypsum layer collected from Nili House, SW building mass, first floor, guest room, SW wall. **Figure 3.30** Traditional plaster sample coating the external surfaces on the first floor and basically presenting a red-ochre color, (Nili House, SW façade).[176]

3.2 Beamed ceiling

Upon the completion of the walls, wooden beams are placed on each side as supporting elements on which the round beams of ceiling are arranged. The basic structure of the roof and floor in traditional houses is composed of a combination of horizontal supporting joists and planks of wood. The round supporting joists are placed above the beams with a clear distance (about 30-40 centimeters) from each other to bear the weight of the roof or floor.These main beams are continued about 50 cm ahead of the roof line and they are connected to a kind of wooden-decorative element called *sorou* made of carved boards and brackets. [177]

The distances between round beams are infilled with carved wooden boards that are nailed on top of the round joists. Rectangular planks are overlaid with straw matting used to spread the weight of the roof-floor and help resist against moisture. The structure of the roof will be completed with three different layers. Each coating will be applied after the lower layer has dried. The first layer, a mixture of clay, sand and water, termed *ghoreghel*, is daubed for a thickness of 10 cm over the mat. As for the purpose of roof inclination, a coat of dirt is used as the second layer. These slopes are made toward downspouts to prevent rainwater absorption. The final coating is made from straw-mud mix by 5 cm thickness mixed with a layer of salt.[178] The use of salt in straw-mud mix allows for freezing-point depression in winter and despite the snow, freezing was not possible. It would prevent the growth of weeds in summer, as well.[179] It must be admitted that flooring operation includes the same stages and

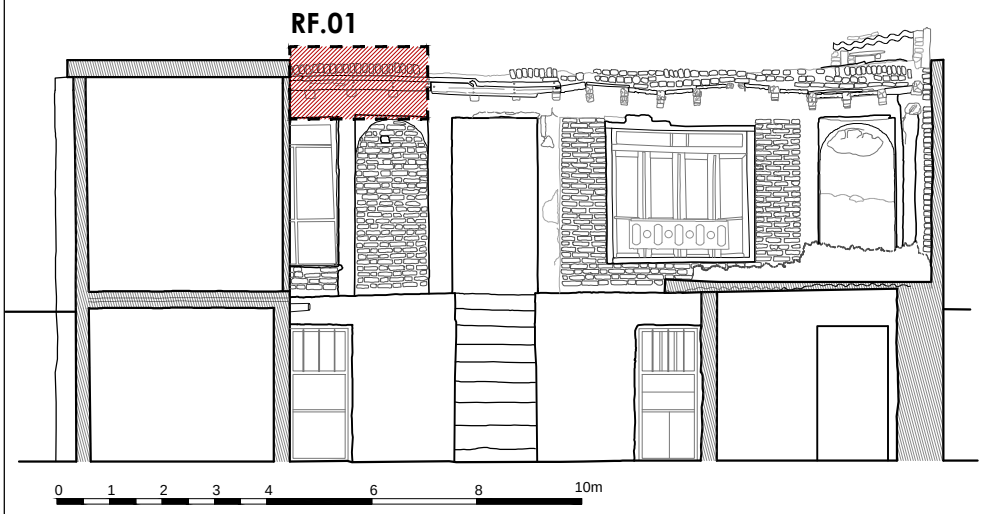
[176] See Appendix III.
[177] In addition to the ornamental aspect, these wooden elements are prevented the direct contact of rainwater with the facade.
[178] Zomarsheidi 2012, p.164.
[179] Rezazadeh 2011, p.156.

application methods of roof construction; however, it finishes with a course of square floor bricks just on the ground levels or basement. On the upper floors, instead of paving, the ground was covered with gypsum coating.

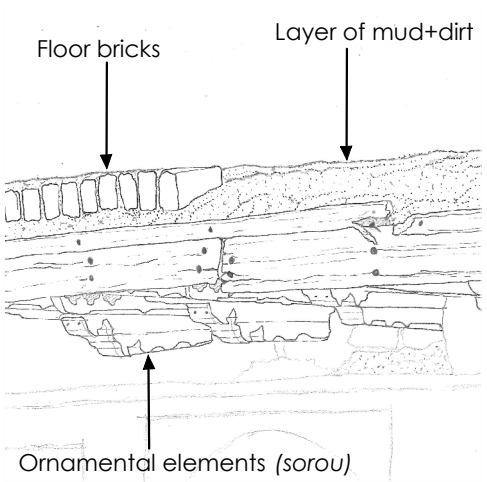
Figure 3.31 The combination of round beams and wooden planks in timber ceiling of living room in Nili House.

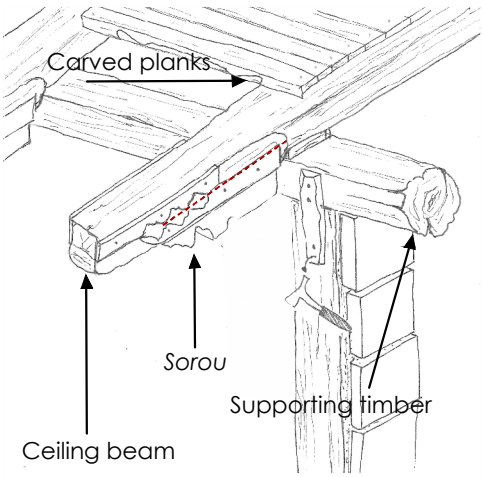
Figure 3.32 The connection of ceiling beams with the carved boards that are collected from a traditional house before its demolition**.**

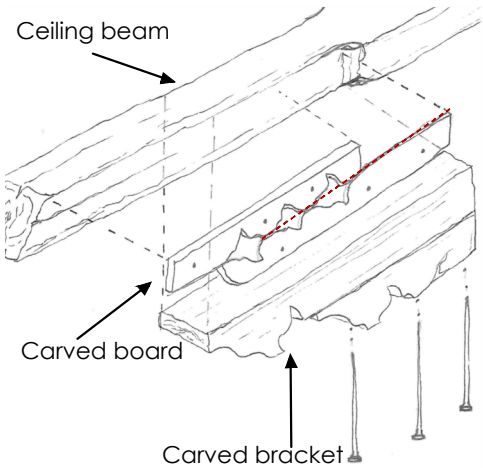
Sheet 3.4	Structurale-architectural component	Historical House	Location
	Roof and Ceiling	Tehrani	SE building mass



1 Roof details (RF.01), construction materials and technique;



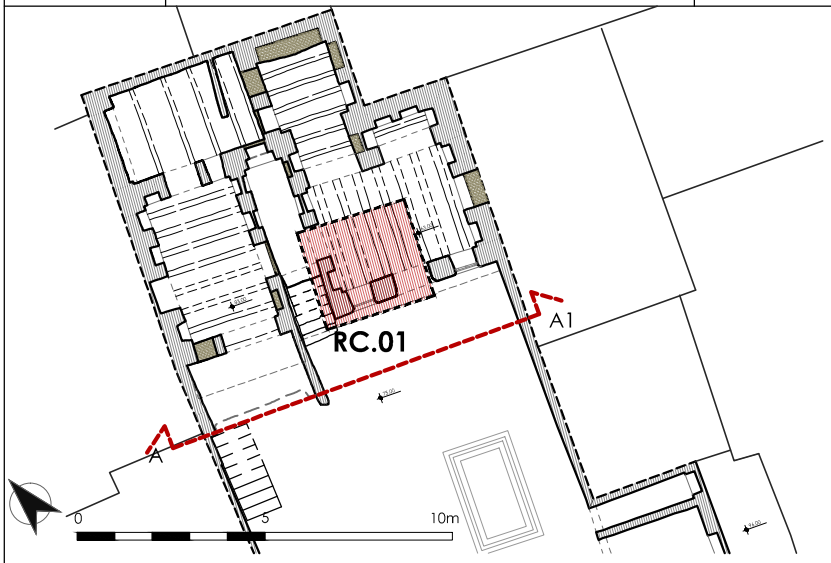




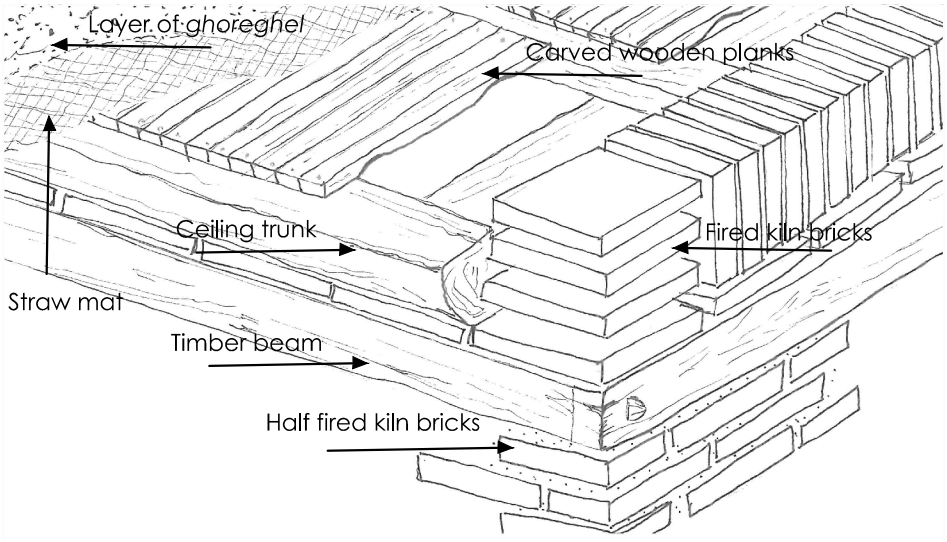
(a) (b) (c)

Fig. 3.4.1 Study on construction method of the carved ceiling; (a) a sketch of the roof line presents the wooden ornamental elements (*sorou*) made of carved boards and brackets, (b) integration of structural ceiling-components and mud-brick masonry; jointing *sorou* and ceiling beam.

Sheet 3.5	Structurale-architectural component	Historical House	Location
	Roof covering	Bidari	NE building mass, ground floor, living chamber



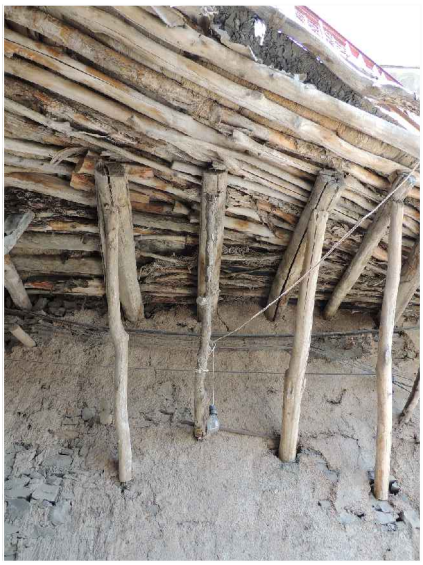
1 Roof covering details (RC.01), construction materials and technique;

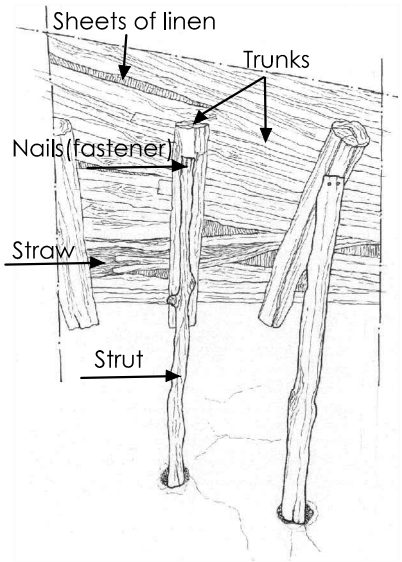


(a) (b)

Fig. 3.5.1 (a) basic structure of a traditional roof built up with round ceiling beams (20 cm), carved wooden planks (35 × 4 cm), wooden planks, straw matting and a layer of *ghoreghel (*mixture of clay, sand and water, (b) wooden ceiling details on the ground floor.

2 Similar examples; Kang, Iran and Tell Hammam at-Turkman, Syria;





(a) (b)

Fig. 3.5.2 (a) balcony of a vernacular house located in Kang Village (28 km from Mashhad) showing utilization of medium-sized trunks, wooden struts, straw and sheets of linen in its construction, (b) placing the reed over the beams in the roof construction, Tell Hammam at-Turkman, Syria. (Claasz Coockson 2009)

These well-insulated roofs would warm the room during the winter and keep it cool during the summer. However, the problem in this type of roof is that it can become too heavy and even absorb a high amount of moisture during wet days of the year. On the one hand, these high thickness of dirt mass exerted a lot of pressure on roofs which leads to bending of the ceiling.[180] On the other, the roof contains a high percentage of water which has infiltrated the lower components including wooden boards. Thus, wooden elements present white and brown rots formed by fungus attacks.

Figure 3.33 Deformation of the ceiling because of high pressure on the roof; Tehrani House, NW building mass. **Figure 3.34** Extreme inclination of the ground level due to flooring heaviness of the upper story, Nili House.

3.3 Ornamental Elements

The Iranian craftsmen knew how to transform an architectural component into a decorative element that, in addition to its functional aspect, it also is ornamented the building. This transformation was commonly possible through the use of geometric and vegetative motifs dating back to the pre-Islamic era. Every form of geometry and vegetal was a component of a general pattern, which by reproducing and placing together, created a complete performance that had a symbolic and mystical meaning.[181] These patterns were often applied to cover the rough surfaces made of brick walls, gypsum plaster, and wooden openings. For example, during the Safavid era (1501-1736 A.D.) the implementation of brick ornament on the exterior facades has been frequently employed. This technique applied in Naseri's buildings (1848-1896 AD) to avoid the uniformity of smooth brick walls at houses and

[180] For example, in Tehrani's house covering roof of both living quarters with mud plaster without removing the lower dirt layers caused a deformation in wooden ceilings. Since there is no any extra support joist in addition to round beams under the middle point of roof, it turned to be deformed at center. In Nili's house, an additional layer of cement to the previous mass caused the settlement of the floor by 20 cm in iwan and 10 cm in the guestroom. Thus, wooden supporting beams and timber joists begin to sag and the lower brick walls start to break and deform.

[181] Shamsizadeh Maleki Rohallah, Mansouri Amir, Shoshchian Moghaddam Asghar, "Study of Traditional Interior Decorations in terms of Wall Painting," *Fine Arts - Visual Arts Journal*, Vol. 18, (2013), p.59. (https://journals.ut.ac.ir/article_36411.html; accessed date: October 11, 2018)

palaces. Also, apart from Islamic patterns, western ornaments and figures have utilized as the ornament in stuccowork, ceiling and facades.[182]

All three case studies include the decorative elements such as arch, wooden openings and stucco that are not only provide the ornamental characteristics but also acted as functional-architectural part.

i. Vault and Arch

Since the chambers on the first story were allocated to living and reception, they are commonly more decorated than the secondary zones at the ground floors. The facades of the first level also perform as ornamental characteristics by arrangement of semi-circular arches and pointed vaults.

By repeating, the semi-circular arch served as an ornamental component in order to adorn the rectangular frame of openings and niches. This arc has a decorative and load-bearing function; however, its resistance is much less than a pointed vault. In fact, traditional architects consider semi-circular arches to be very unstable and do not employ it in making barrel vaults.[183]

Since the span of the semicircular arches at Nili's house is about 1 meter with low thickness, 3 centimeters, it seems that they are built manually as stucco without employment of any gypsum or wooden molds. Thus, semicircular arches in this case have ornamental characteristics only. Although, in the niches of Tehrani House, this arch acted as a load-bearing element as well implemented probably by using gypsum molds.[184] Besides, the highest niches in other two houses performance the ornamental arches; shouldered-flat and *kond-e-abro* curve. The first vault categorized as non-Iranian arc, and the second instance comes from the group of pointed arches (Fig. 3.44).

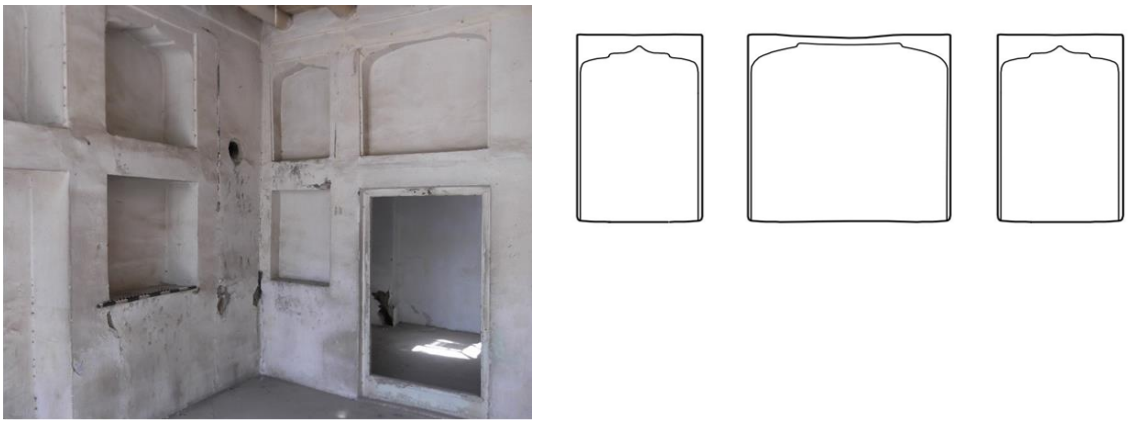


Figure 3.35 Utilization of ornamental arches; shouldered-flat and *kond-e-abro* curve in Bidari House, first floor, guest room.

[182] In Qajar times, especially during the reign of Nasir al-Din Shah (1848-1896 AD), with the entry of modernity to Iran due to his three visits to Europe, obviously, it has seen a highly elaborate means of decorating in the ceilings and walls of domestic architecture. (Scarce 2008, p.902)

[183] Zomarsheidi Hossein, *Vault and Arch in Iranian Architecture*, Urban Development and Revitalization Organization of Iran, 2009, p.137

[184] Based on the dimensions of the arch, its molds are prepared in two ways, either wooden or gypsum. Commonly, the gypsum molds are used for arches less than 120 cm in width, and for those with diameters of between 120 cm and 2 m, wooden frames are employed which can withstand the arc's weight. (Zomarsheidi 2009, p.139)

The entrance of *iwan* is adorned with a vaulted ceiling which identified as *panjohaft tond*, the most common arch in traditional architecture. It is considered as a load-bearing and decorative arch that has a high resistance and rarely breaks down due to the pressure of balanced loads. However, in case studies, *panjohaft tond* arch is not applied as a load-bearing vault but as decorative arc in which the pressure from the roof weight is onto the horizontal beam and, the arch does not bear any load.

panjohaft tond arches in Nili and Bidari Houses were adorned with *karbandi*, an arched covering pattern which is a suitable insulation for sound and movement. In Iranian architecture, there are different types of such decorative coverings. The type is specified based on dimensions of the surfaces on which *karbandi* is going to be implemented. In both houses, *karbandi* of *iwan* has a simple 12-sided type which includes an opening in its center. This aperture, carved with *girih* (strapwork), is called gypsum plate that allows for circulation of air in the storage by its surface.

Figure 3.36 *Iwan* entrance in the summer quarter of Nili House that includes *panjohaft tond* arch. **Figure 3.37** Utilization of supporting timbers above the pointed arch (*panjohaft tond*), proving the implementation of vault as an ornamental component not a load-bearing arch. It also represents the space behind the vault that was allocated to keep valuable objects.

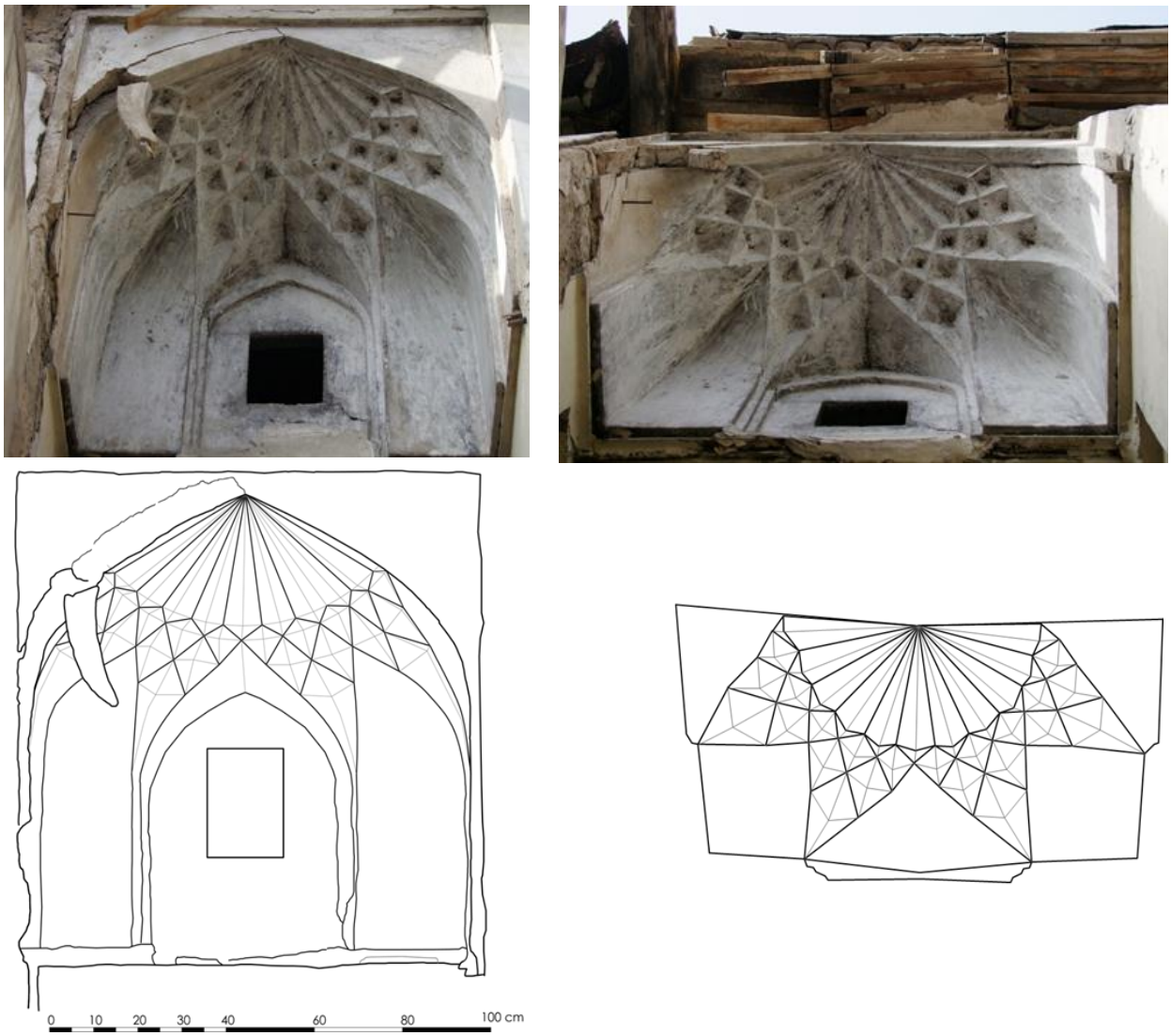


Figure 3.38 Performance of *panjohaft tond* arch covered with decorative patterns; *karbandi*. Location: Bidari House, *iwan* entrance.

ii. Wooden Openings

The structure of a traditional door is a combination of wooden panels with iron elements. The boards are placed in thresholds and lintels of the opening. Also, instead of hinges, the round pieces of wood are inserted to turn into the holes of the corners at the bottom and top of the doors.[185]

The iron-work includes a group of chains and padlocks outside and a staple and fastener inside the door. Apart from them, the ornamental pins (*golmikh)* and door knockers are made of iron. Circular and rectangular in shape, the door knockers sounded differently informing the residents about the gender of the person waiting behind the door.[186]

[185] This type of door and its open and closed manner is described in Charin's book "Travel in Persia- 1673-1677." (Chardin 1996)

[186] The circular one is allocated to women and the other one with a rectangular form is for men.

Figure 3.39 Wooden openings in the winter quarter (SE building mass) of Tehrani House with no hinges to turn.

Figure 3.40 Integration of wooden planks and iron-works such as studs, door knockers, chains and padlocks in the main door entrance at Tehrani House.

Figure 3.41 Structure of the openings in the living chamber at Nili House, including wooden doors with decorative studs (*golmikh*) and a staple and fastener at the center.

Orosi is a type of opening with a group of wood panels commonly placed in chambers where served as dining, gathering, and guest rooms. Like sash windows, this component is placed from the floor to the ceiling, opening and closing vertically. Also, it acts as a curtain wall to reduce the dead load on the basement parts. Consisting of tall doors embedding a thick waved glass each, this aperture has been mainly employed in the houses of the wealthy.

The *orosi* structure is generally made from several parts as follows:[187]

Vadar: The vertical beams that divided the window into equal parts as apertures in the longitudinal direction. *Rokoub*: The woods with low thickness, which are placed on both sides of *vadars* and which are attached to the decorative studs *(golmikh).* Together, they create holes on both sides in which the doors *(lats)* move and go up and down.

Astaneh (Threshold): The horizontal beam is positioned below the *orosi*, and its height is generally between 10 and 50 cm.

Katibeh (Inscription): It is the upper part of the window which is immovable and connected to the frame. It commonly presents a rectangular or curved shape determined based on the type of the roof and taste of the householder.

Kolah: The horizontal bar placed between the fixed (*katibeh*) and moving parts of the *orosi*.

Lat: The doors with long vertical glasses arranged in the lower portion of the *orosi*, sliding up and down in a vertical position. They usually follow odd numbers, like three, five, seven and nine.

In the construction of *orosi*, walnut wood was mainly applied which has smooth fibers and is resistant to fungi. Another wood that can be employed with a little texture is Platanus which has a moderate strength and dries up easily.[188]

The *orosi* in Tehrani House includes seven doors with a flat and rectangular inscription which is carved and filled by color glasses in yellow, green, red, blue and white. They are produced by adding minerals and metal oxides into the glass providing a complete view of the yard, while the inside is invisible from the outside. On the hot days of the year, the colored glasses prevent the entrance of insects into the living chamber, as well as, they direct the sunlight to the room lightly and colorfully.[189]

[187]Zarei Mohammad, "Sanandaj a City of Orosi: The Study of Formation and Development of orosi based on the existed Samples," *Journal of Iranian Architecture Studies*, N.4, (2013), pp.112-113. Memarian, G. Introduction to House Typology in Iran; Introverted Type. Tehran: University of Science and Technology, 1995, p. 175.

[188] *Vadars* (vertical beams) are generally made of Platanus wood, and the *rokoub* is built of walnut wood. For this reason, *vadars* are covered with walnut wood for technical and decorative purposes. (Zarei 2013, p.113)

[189] Zarei 2013, p.115.

Considering the *orosi* windows at Tabriz houses, the *orosi* in Tehrani's house belongs to the early 19th century due to the shape of its inscriptions, colored glasses and the number of doors.[190]

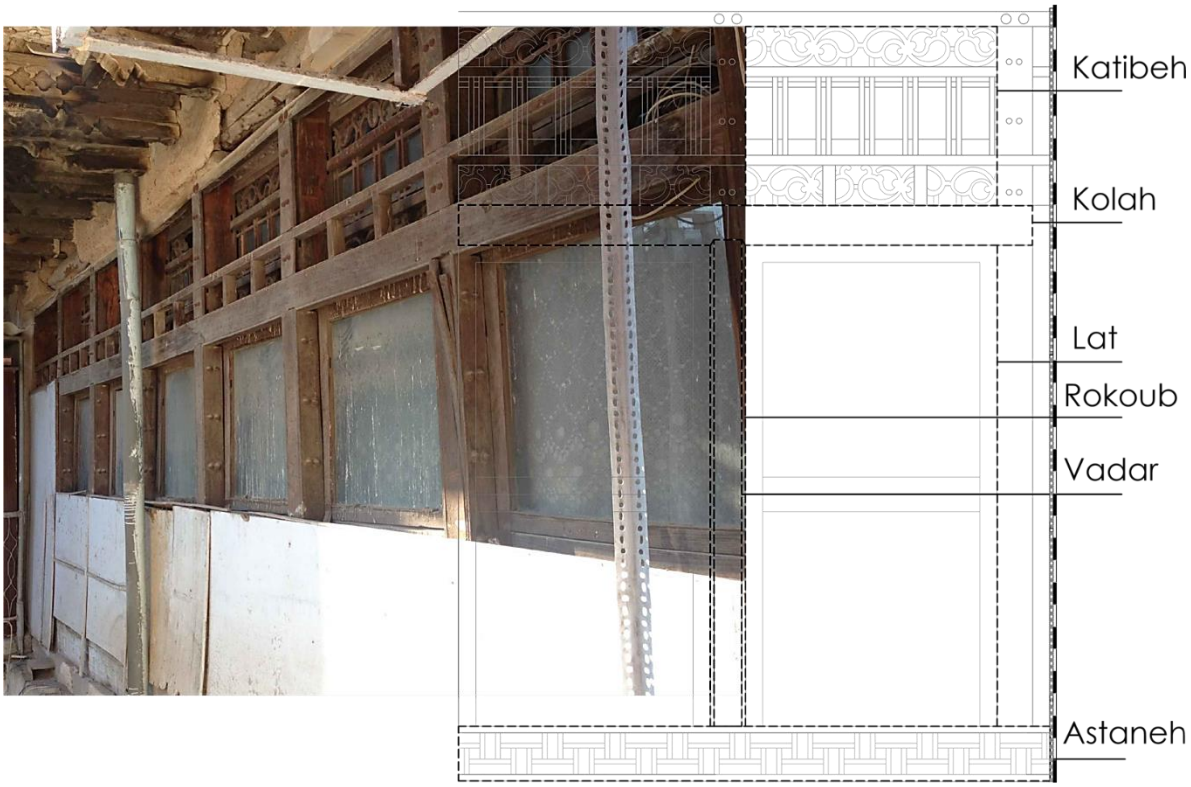


Figure 3.42 *Orosi* (sash window) components at Tehrani House, summer quarter (NW building mass), first floor.

Figure 3.43 Rectangular inscription of *orosi* with color glasses in yellow, green, red, blue and white. Location: Tehrani House, summer quarter (NW building mass), first floor, central hall

[190] The appearance of the flat inscriptions belongs to the first period of the Qajarian architecture, early nineteenth century. In the second and third period (mid and late nineteenth century), only curved inscriptions are used. Furthermore, during the first and second period, the use of *orosi* with seven or nine doors was widespread. However, in the third period, the largest *orosi* had three doors. The presence of yellow in colored glass is only visible in the first and second periods. The colored glasses employed in *orosi* in Tabriz were limited to red, blue, green, yellow, and colorless (white). The application of these colors, other than yellow, has been common in all three periods. In the third period, there is no performance of yellow. Askari AL-Muteti Hojatollah, Medauchi Mohammad, "Qualitative and Quantitative Differences in the evolution of Qajarian sash windows in Tabriz" *Fine Arts - Visual Arts Journal*, Vol. 21, (2014), pp.77-84. (https://journals.ut.ac.ir/article_59956.html; accessed date: February 22, 2017)

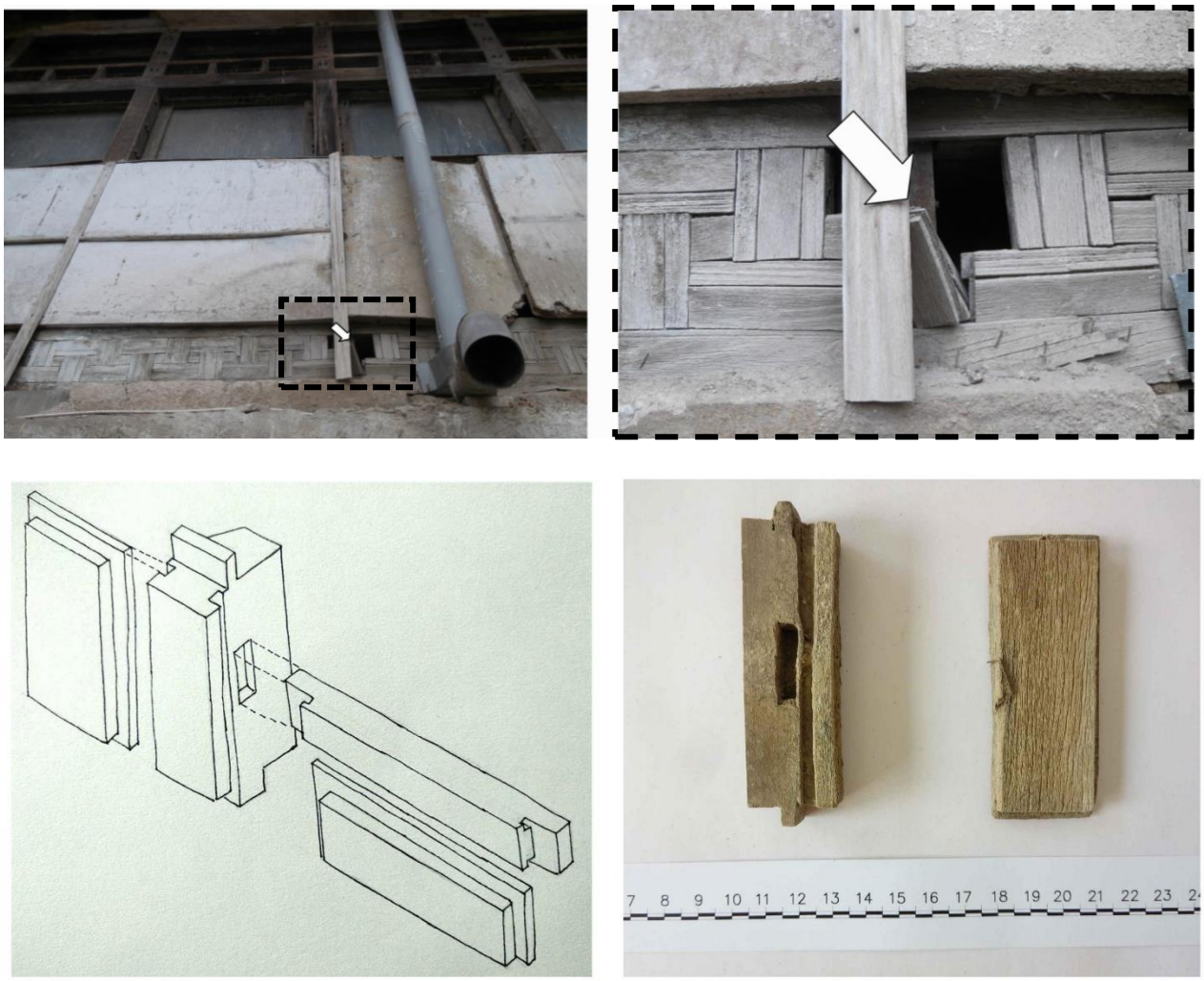


Figure 3.44 Connection between the lower wooden elements by Mortise and Tenon joint in *orosi* structure.

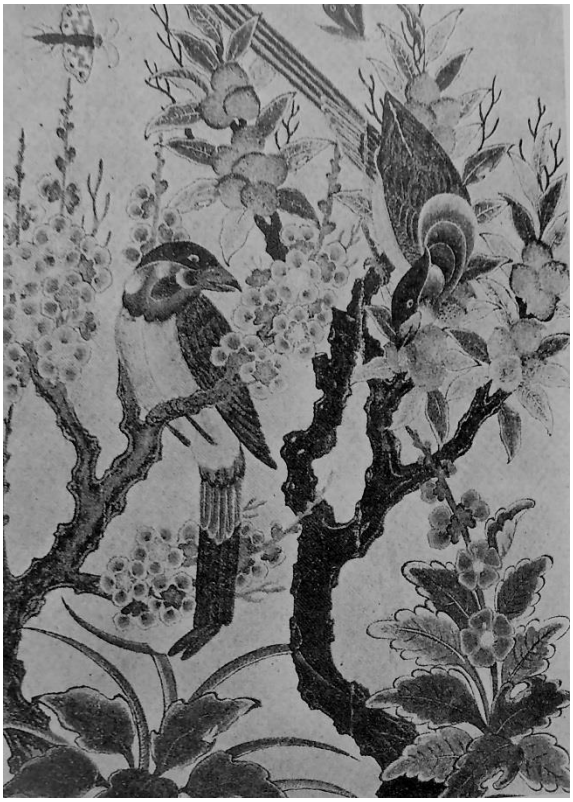
iii. Stuccowork

Since the masonries in traditional habitations are built with earthen materials, Iranian specialist craftsmen have covered the surface of the interior space with a layer of gypsum plaster. However, the walls and inner parts of the niches in the guest room and living hall are adorned with stucco. The implementation of decorative stucco reflects the Islamic beliefs about hospitality and honoring the guest, as well as representing the owner's living condition. It also shows that how a householder, even middle-class, would intend to form a magnificent location for guests and his desire to respect traditions and culture. In terms of pattern and implementation technique, stucco presented different types.

The first kind with a flower and bird pattern, called *gol-o-morgh*, was allocated to the walls and pillars of the guest room in Nili House. Each of the components, pillars, and walls exhibit a different *gol-o-morgh* pattern in terms of composition and scale. The pillars are ornamented with *gol-e Sadbarg* (One-Hundred-Petalled-Rose) which is located in the center of the axial symmetry in the molded

stucco and a bird. In Iranian literature and art this pattern shows the growth and life cycle in a flower bush. *gol-e Sadbarg* has been entered the Persian literature as the sign of spring and beauty and the bird is the symbol of the soul. The presence of the butterfly on the left side of the stucco highlights the life cycle and the purpose of employing a bird as a conceptual element was to ignore the tangible world.[191] Before the sixteenth century, the motif of the bird in the Iranian illustrated art was limited to swallows sat on the highest branch of a plane tree or top of the cedar. However, in Iran undoubtedly, the pattern of the bird which sits on the flower is sought to imitate the Chinese instances admired by Safavid kings. In the Chinese style, painters saw the birds in an objective view and tried to draw them more realistically. In Iranian form, although the birds would be designed carefully, the artist aimed to demonstrate poetic beauty. In other words, the mysterious nature of the bird has been the center of focus, not its original details. [192]

There were two approaches to the development of *gol-o-morgh* motif; Isfahan and Shiraz. In guest room of Nili House, the pattern followed the principles of the Shiraz, which belong to the late eighteenth and early nineteenth century. In Shiraz style, both the flower and bird plants have a full appearance, and in addition to One-Hundred-Petalled-Rose, the bird has been at the center of attention.



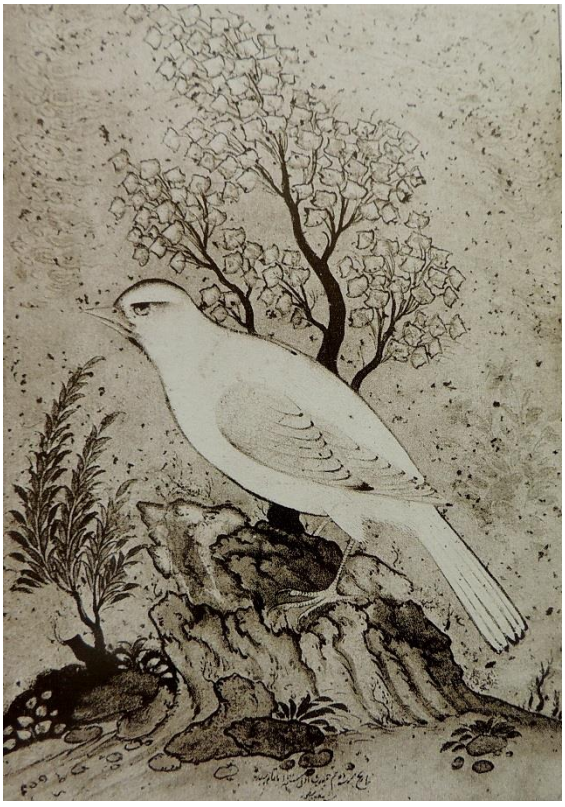


Figure 3.45 Tree and bird, Herat painting style, 15th century. (Shahdadi 2005, 66) **Figure 3.46** Bird and tree painted by Mo'en Mosavver, 17th century, Isfahan style. (Shahdadi 2005, 62)

[191] Shahdadi Jahangir, *Gol-o-Morgh*, Tehran: Khorshid, 2005, pp.65-87.
[192] Nafisi Noushin, "The Single Bird on the Flower," *Art and People Journal*, N.126, (1973), p.60.

On the other hand, in the *gol-o-morgh* motif of Isfahan style, trees or shrubs (bird location) are designed outside the axis of symmetry. The pattern has only one center of attention, and the bird is entirely natural and recognizable. The motif does not present the life cycle of the plant or flower, and the position of the bird is a hazel shrub, blossom or thick trees in most cases.[193]

Figure 3.47 Flower and bush, Mohammad Hadi II, 18th century, Shiraz style. (Shahdadi 2005, 69) **Figure 3.48** *Gol-o-morgh* (sleeping bird), Mohammad Zaman II, 18th century, Shiraz style. (Shahdadi 2005, 108)

In Nili House, the stuccoes with *gol-o-morgh* pattern were implemented by pressing molds (12 × 16 cm) onto wet plaster, called semi-dead gypsum mortar. [194]

In this stuccowork, the craftsman troweled a thin layer of semi-dead plaster on a gypsum-clay coating. After it became a little hard, he placed the wooden (or clay) mold on the plaster and removed it following applying a low pressure. With this method, the motifs appear in the negative or positive This kind of plasterwork allows for creation of decorative stuccoes with minimal (about 1 mm) thickness.[195]

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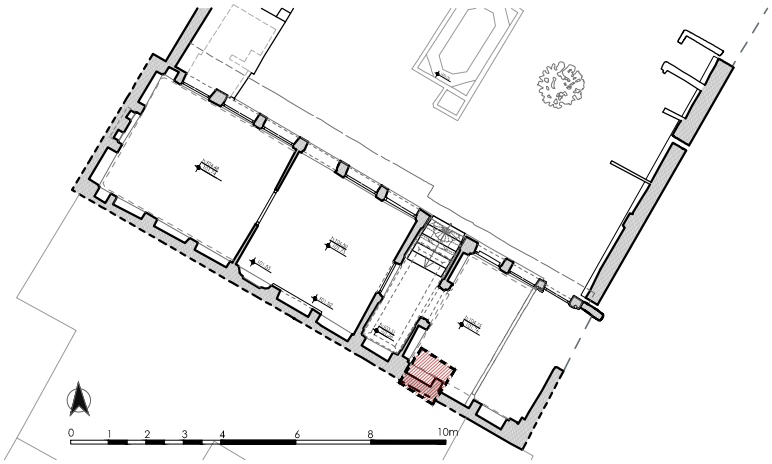
[193] Shahdadi 2005, pp.244-245.

[194] In the production of semi-dead plaster, the first step is mixing the screened gypsum with water, and then kneading the paste for ten to twelve minutes. Afterwards, some water and a third of the dough powder gypsum are added into the admixture and mixed.

[195] Aslani Hessam, Mirniam Asefeh, Olumi Majid, "A Study on the Different Types of Implementation of Molded Stuccowork in Historical Monuments of Qajar Period in Yazd, Based on the Case Study of Shahzad's Shrine's Altar, in the Great Mosque," *Restoration and Architecture of Iran*, Vol.3, N.5, 2013, p.6. (https://www.sid.ir/fa/journal/ViewPaper.aspx?id=206660; accessed date: April 22, 2017)

Sheet 3.6	Decorative Element	Historical House	Location
	Stuccoes with *gol-o-morgh* pattern	Nili	SW building mass, guest room, southwestern wall



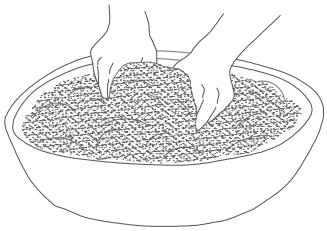
1 Cleaning process, ST.01, ST.02, *gol-o-morgh* pattern;

(a) (b) (c)

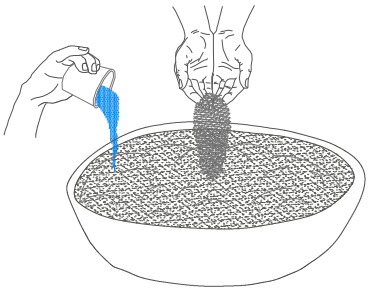
Fig. 3.7.1 Stuccoes with *gol-o-morgh* pattern after cleaning the layers of colors; (a) layers were removed using of a mixture of ammonia and acetone, scalpel and rubbing cotton swabs, (b) SW pier, ST.01 after cleaning in which the sign of using molds can be observed, c) SW wall, ST.02 after cleaning, the edges of the stuccoes may present a sign for the mold position caused by the involvement of the frame and the plaster when detached.

2 Implementing method: using wooden mold 12 x 16 cm with 1 mm thickness;

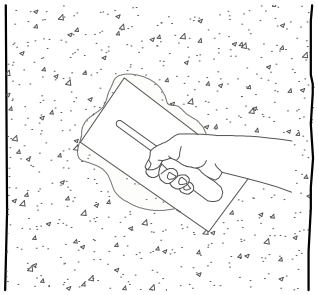
1. Carving in wooden molds



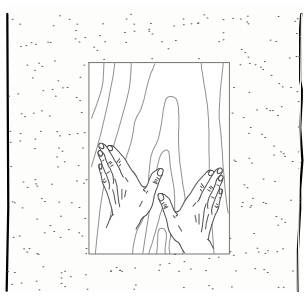
2. The creation of the stucco compound (a mixture of gypsum and water) for a time not less than 10-12 minutes



3. Addition of gypsum and water for the amount of one-third each with immediate processing



4. Execution of a layer of dough



5. Positioning the mold on fresh gypsum plaster and pressing it

6. Finishing the implementation of the stucco

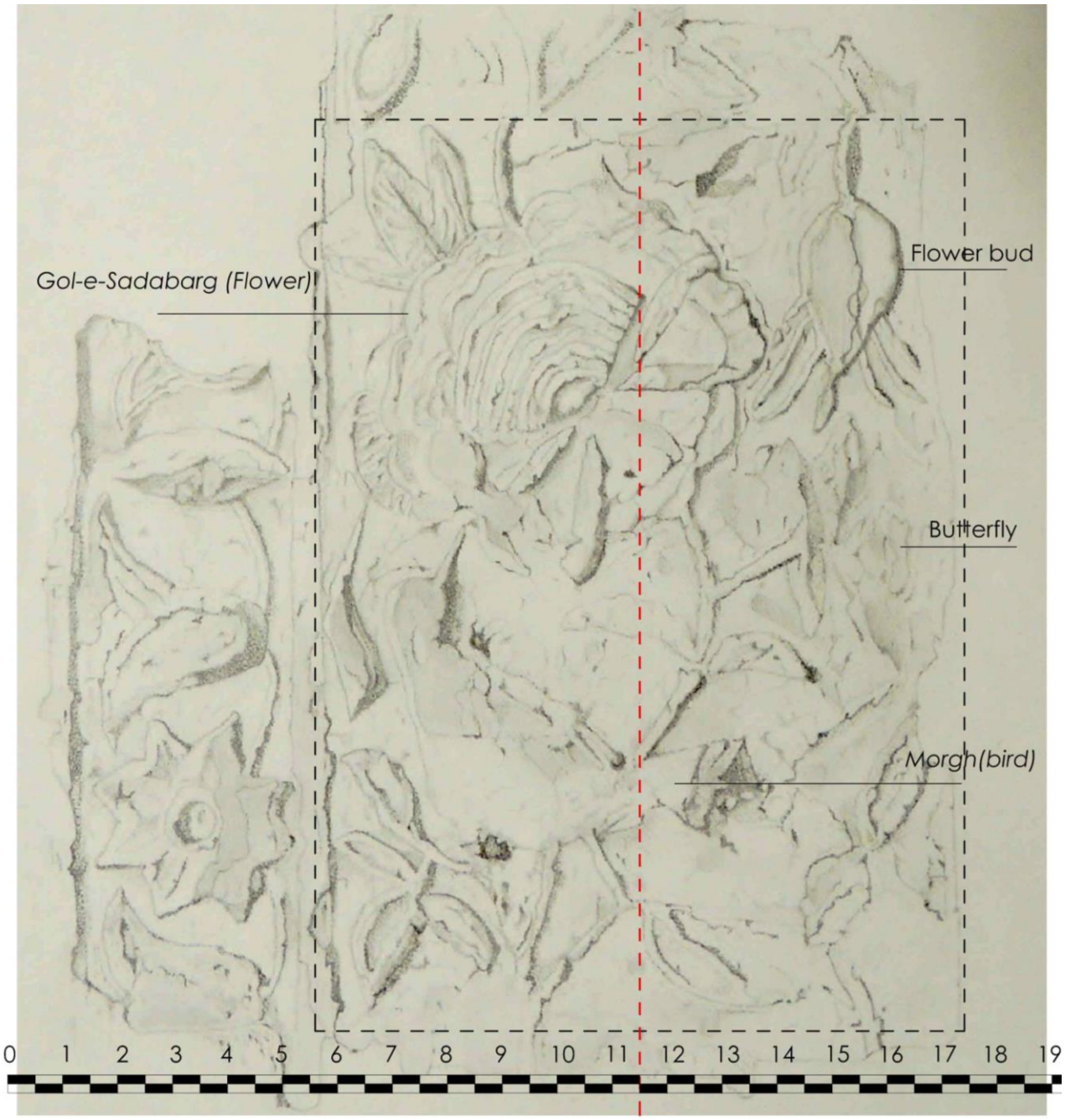


Figure 3.49 Flower and bird position in *gol-o-morgh* pattern that shows the pattern has followed Shiraz style in terms of location and element forms. Nili House, SW building mass, guest room, SW pier.

The second type of decorated stucco presents the floral motifs that are repeated as a band on the upper and central part of the guest room walls. Because of losing cohesive strength, a large portion of the decorative band were detached from its base and fallen on the floor in fragments. Since these patterns are repeated without the slightest difference and change, it is likely that these stuccoes have been implemented using pre-made molds. The fresh gypsum dough is poured into a wooden mold, which has previously been greased with oil lamp. Once the mortar is stretched and becomes a little hard, the

plaster is removed from the mold. At the end of the process, the pieces are glued to the desired location with a paste made of gypsum and organic glue (or Tragacanth or gum arabic).[196]

Figure 3.50 The fallen stuccos with floral motifs found in the guest room at Nili House that present only 1 mm thickness after the cleaning process.[197]

Observation of the presented fragment under microscope indicates that the sample is composed of four layers, the first and second of which consisting of a mortar with fragile clay components. The third layer which is higher concludes the white portion with a chalky element and a layer of protection glue. Through direct observation, we note the existence of iridescent laminates that determine the brilliance of the stucco possibly due to the presence of Tragacanth as glue or fragments of gypsum mineral.[198]

[196] Maki Nejad Mehdi, *Iranian Art History in the Islamic period; Architectural decoration*, Tehran; Samt, 2008, p.179.
[197] At first glance, the recognition of the stuccoworks was not easy because of their being entirely covered with at least three layers of colors. Therefore, to furnish visibility to the reliefs, the surface was first wetted with a mixture of ammonia and acetone. The removal of the layers was carried out employing a scalpel. The cleaning process was finished by rubbing cotton swabs on the surfaces.
[198] In his journey to Isfahan in the 17th century, Chardin describes the presence of this brilliant aspect on the stuccoes of Isfahan's houses in this way, "[..]*the shell of the house is first overcast with a mortar, called kahghel (clay +straw), then put on a layer of fine plaster, then they whiten it with beaten Talcum, which is a dust of the Stone Talcum, blended with lime, that gives a fine gloss to the walls, for you would think that those walls are silvered over. Therefore, Persians called it 'Zarvaragh,' meaning leaf silver*[...]," (Chardin 1996)

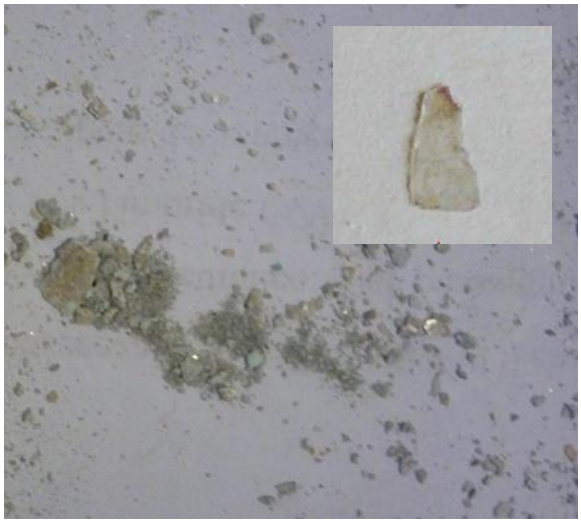


Figure 3.51 Stucco sample collected from Nili House, SW building mass, first floor, guest room. **Figure 3.52** Brilliant laminates detached from the surface of the stucco during the cleaning phase.

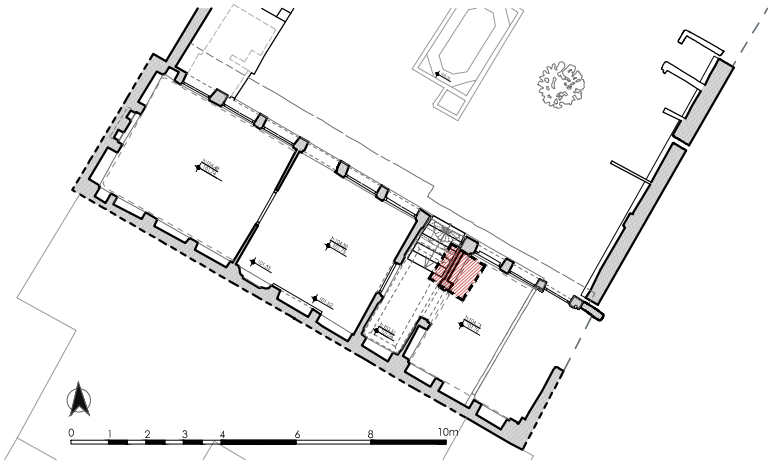
Unlike the previous ones, the stuccos within the niches, that exhibit naturalistic motifs with 1 mm thickness, have been made by pouncing technique. The stuccowork mainly presents paisley patterns which include a group of leaves, floras and birds inside. The stuccowork motif is completed by mirroring the paisley designs in the right and bottom and, an eight-point star at the center.

The vegetal motifs are inspired by the natural leaves and flowers and became popular in architectural ornaments under Safavid dynasty (1501-1736 AD). In addition, paisley ornament was one of the patterns utilized under Afsharid and Zand eras (1736-1796 AD), especially in rugs produced in Shiraz, Kerman, and Khorasan.[199] The star pattern is one of the most commonly used geometric designs in Islamic architecture that would usually include six, eight, or sixteen points, representing symmetry and harmony.

These stuccoes have been made by pouncing technique (freehand manner). In this method, after preparing a substrate surface that should not be polished but a bit rough, the plaster should be stretched to a thickness of one and a half centimeters on the desired surface and flattened with a trowel. A quarter of the original design is then drawn on the paper and its lines are drilled with a needle. The design is stuck on the spot and the edges of motifs will be transferred onto the surface through beating a canvas of soft ashes over the holes. After this stage, the design is begun to be cut with special tools. Firstly, the edges of the motif are scratched with a pointed tool to prevent it from being erased. Then, with a sharp pen, the patterns are cut off on the plaster layer, and the background coat sculpted.

[199] Diba Layla.S, "CARPETS x. Afsharid and Zand Periods," *Encyclopædia Iranica*, IV/8, pp.875-877. (http://www.iranicaonline.org/articles/carpets-x; accessed date: Fubabary 22, 2017)

Sheet 3.7	Decorative Element	Historical House	Location
	Stucco with paisley motifs	Nili	SW building mass, guest room, northwestern niche



1 Cleaning process, ST.03, paisley and naturalistic motifs;

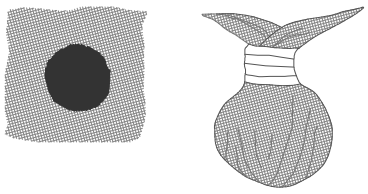
(a)

(b)

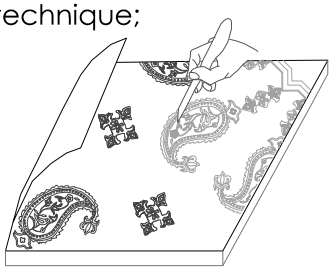
(c)

Fig. 3.8.1 One-fourth of the second type of the stuccowork ornamenting the interior of the niche by repeating paisley and floral patterns; (a) cleaning process, (b) NW niche, ST. 03 after cleaning; utilization of paisley as the base pattern to design the floral and vegetal motifs, (c) 8-point star pattern at the core of the stuccowork.

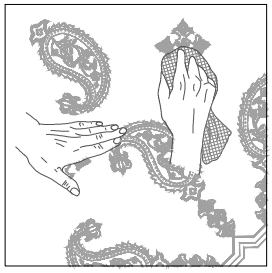
2 Implementing method: pouncing technique;



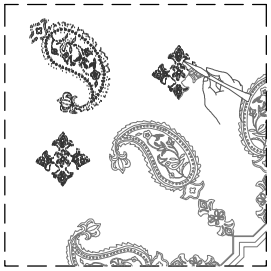
1. Enclosing soft ashes in a canvas



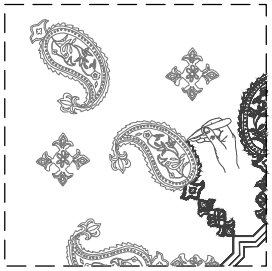
2. The patterns are drawn on a paper



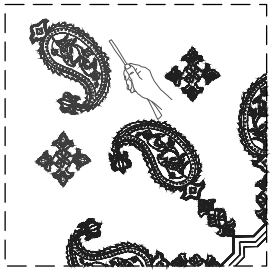
3. The drawing was conducted to the surface through pouncing technique



4. Stages from pouncing to engraving



5. Carving the borders of the motifs



6. Removal the gypsum plaster from the substrate

Figure 3.53 Vegetal and floral motifs in the main chamber at Bidari House; (h) Similarity of the central floral pattern to the carnation flower in Safavid motifs (1501-1736 AD); Bidari House, NE building mass, living chamber, NW wall.

The stuccoes of the central columns in the living chamber (family zone) at Bidari House have been implemented by both techniques, using molds and pouncing (freehand). They are present the vegetal and floral patterns that are similar to the naturalistic motifs designed on the Safavid porcelains in which the influence of Chinese art regarding motif and color is evident.[200]

The carved plaster aperture is another instance of stucco presentations, a model of which is located under *iwan* arch in Nili house. To create this gypsum plate, a mold made of wood has first been made and then placed on a flat, polished floor. Secondly, some plaster is inserted the frame, and when the gypsum is slightly dried, the pattern is transformed onto the surface. The negative space of the motif would then begin to be carved by iron sharp tools and what remained would be a gypsum plate with *girih* (strapwork). Girih presents the Islamic geometric patterns which are symbols of unity and plurality. The geometric compositions in *girih* are created by dividing the circle, symbol of unit, into

[200] Akbari Abbas, SadeghiTaheri Ali, "A Comparative Study of Safavid Pottery in Kerman and Mashhad and the Influence of Chinese art on them," *Journal of faculty of art Shahed university*, N.29, 2014, p.80.

regular polygons. In the Islamic era, this kind of decoration became prevalent because of Islam's prohibition in the use of the human face.

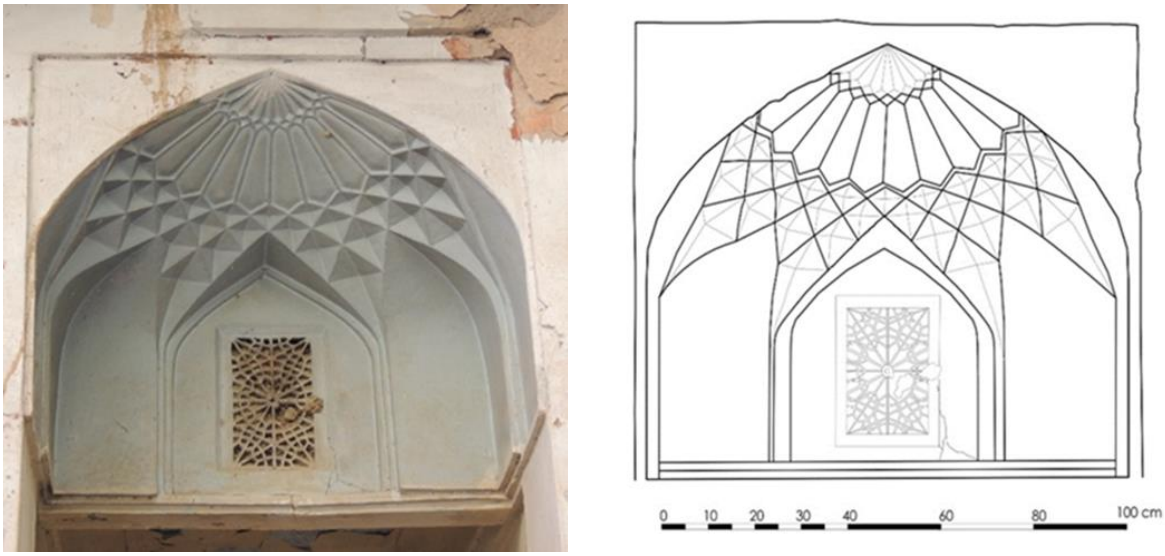


Figure 3.54 The entrance arch of iwan in Nili House and a gypsum plate at the center carved with *girih* (strapwork).

CHAPTER 4

PRESERVATION AND CONSERVATION METHOD(S)

4.1 An overview of the Iranian laws before and after the Islamic Revolution (1907-2018)

The first approach towards preservation of the cultural patrimonies dates back to 1907 when the "Central Office of the Antiquities" was established under the law of the state organization by the first "National Consultative Assembly." According to the *Baldieh's law (Municipal Law),* building museums, protection and restoration of mosques, madrasas, and ancient buildings were the duties of the department.[201] However, the greatest cultural measure was the law on the establishment of "Ministry of Science, Bequeaths and Public Utilities" ratified in 1910 by the second "National Consultative Assembly." The law determined the maintenance and preservation of antiquities and property of holy places as one of the Ministry obligations.[202] Perhaps this assignment derives from the fact that during the Qajar monarchy (1794-1925 AD), according to two contracts, various antiquities are transported by Frenchmen from Iran to the Louvre Museum.[203] For this reason, in 1924, the first law on the preservation of the antiquities, "Law of Antiquities," was signed in 4 chapters to prevent unauthorized excavation and movement of cultural and historical objects. Nevertheless, for growing antique trade and excavation, on November 3, 1930, the first comprehensive regulation, "National Heritage Protection Act," was approved that has obliged "Ministry of Science, Bequeaths and Public Utilities" to implement it. The law was based on European similar versions and defines the responsibility of the state against the protection of immovable and movable properties.[204] The "National Heritage Protection Act" includes 20 articles that are introduced briefly as follows:

Art.1- Government's responsibility to protect the remnants from the past until Zand Dynasty (1750-1794 AD);

Art.2- Preparation of National Heritage List;

Art.3- Registration of properties in the List of National Heritage;

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[201] The responsibilities of the "Central Department of the Antiquities" determined in *Baldieh's law* that was approved on June 2, 1907, to protect the interests of cities and their residents. (http://rc.majlis.ir/fa/law/show/90099; accessed date: September 14, 2018)

[202] Nikzad Zatoallh, Nazari Farhad, "Historic Monuments Sheltered by Law," *Athar Journal*, n.66, (2002), p.115.

[203] On May 12, 1895, under Naser al-Din Shah (1848-1896 AD), a contract was concluded between the French and Iranian governments by which the privilege of scientific excavation throughout Iran has been assigned to France for 15 years. Also, the ownership of all artifacts from the silver and gold belonged to the Iranian government. However, a new agreement was established on August 11, 1900, between Mozaffar al-Din Shah (1896-1907 AD) and the French government. According to the terms of the contract, the French had the right to excavate and discover historical sites and hills in Iran exclusively and permanently. By 1927, "National Consultative Assembly" canceled the agreement conditionally. Bagvand Fatemeh, "Report on the Activities of French Archaeological Missions in Iran (1883-1963)," *History of Foreign Relations Journal*, n32, (2007), pp.35-36. (http://m-hosseini.ir/ghajar/articles-14/1395.pdf; accessed date: October 16, 2018)

[204] (UNESCO Cultural Heritage Laws Database: http://www.unesco.org/culture/natlaws/index.php; accessed date: March 3, 2018)

Art.4- Informing the relevant department about the existence of properties with the ability to be known as heritage;

Art.5- Reserving the right of ownership for the owner of the registered properties;

Art.6- Punishing the destruction of or damages to the registered properties;

Art.7- Registration of movable properties under private ownership in a separate inventory;

Art.8- Preparation of two letters of identification and a description for each movable property registered in National Heritage List;

Art.9- Informing the pertinent governmental organization in writing before selling a registered movable property;

Art.10- Informing the Ministry of Education in case of finding a valuable movable property;

Art.11- The exclusive right of the state to dig and excavate the lands;

Art.12- Allowing for scientific excavation by scientific institutes;

Art.13- Excavation in private lands after obtaining the owner's contents and permission from the state;

Art.14- Government ownership of objects discovered from commercial and scientific excavations;

Art.15- What is the share of the state from the scientific excavation shall be kept in state collections and museums and selling them is not allowed;

Art.16- The fine for the excavations carried out without permission from the state;

Art.17- Dealing in antiquities is possible only with the permission from the state;

Art.18- The right of the government to refuse permitting the exportation of the objects considered as national heritage;

Art.19- Setting special rules to determine the terms of trading in antiquities;

Art.20- Excavation licenses issued so far are invalid if they do not comply with this law;

The "National Heritage Protection Act" law has obliged the Iranian government to identify historical properties and provide an inventory of relics prepared with the registration of 56 immovable properties on September 16, 1931. Although earlier German archaeologist Ernst Hertzfeld had given a list of Iranian monuments as per the request of "Society for the Conservation of National Monuments," it cannot be considered as an official list. The society for conservation, which was constituted in 1922 to encourage public interest in the ancient scientific, took steps to register and classify properties as national heritages and to help rebuild Iranian monuments in Isfahan, Shiraz and Khorasan.[206]

[206] "Society for the Conservation of National Monuments" was constituted for *"[…] encouraging public interest in the ancient scientific and industrial manufacturers of Iran and trying to preserve these industries and handicrafts and maintaining their traditional style*." (Nikzad 2014, p.115)

During the years 1930 and 1940, no changes were made in cultural affairs, except for the ratification of a bill by the parliament which considered the conservation and restoration of the historical monuments from Qajar period having public functions subject to the 1930 "National Heritage Protection Act."[207] In 1950, within the "Ministry of National Education" (1936) a special department called "Fine Arts" was established to develop archeological research, the establishment of libraries openings, museums, and art schools. Thus, the ministry was termed "Ministry of National Education and Fine Arts" which was subsequently divided into two ministries in 1964; "Ministry of Cultural and Arts" and "Ministry of Education." According to the law of formation of the "Ministry of Culture and Arts" (1964), "[...] *the duties of this ministry to national heritage were protecting and making known the cultural heritage and civilization of the country by safeguarding cultural work* […]."[208] The ministry set up an organization, "General Administration of Museum and Historic Monuments," that has established museums, collected and preserved ancient objects, and supervised the repair and conservation of the monuments.[209] Among these years, the first methods of technical conservation in Iran have been provided by "Society for the Conservation of National Monuments" in 1963. The orders recorded in Resolution No. 1 of the "Society for the Conservation of National Monuments" have been implemented in the preservation of Isfahan monuments.[210]

In the same year, the IV International Congress of Iranian Art and Architecture made recommendations that considered preservation of Iranian traditions and artistic taste in the construction of modern buildings and avoiding the imitation of Western architectural style. The presence of foreign interests in Iranian monuments, the queen's (Farah Diba) attention to cultural heritage and the definition of European restoration cards in the 60s led to establishment of the first "Organization for Conservation of Ancient Iranian Monuments" in 1965.[211] The regulations of the organization listed in 11 articles include similar subjects mentioned in the 1930 law.[212]

A portion of the funds required for restoration and conservation was obtainable from the proceeds of the sale per ton of cement that was approved on May 10, 1967, as a law in favor of the "Society for

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[207] Hodjat Mehdi, "Cultural Heritage in Iran: Policies for an Islamic Country," *Ph.D. Thesis*, (1995), p.188. (http://etheses.whiterose.ac.uk/2460/1/DX193597.pdf; accessed date: October 15, 2018)

[208] Djamchid Behnam, "Cultural Policy in Iran," *UNESCO Paris*, 1973, p.19. (http://unesdoc.unesco.org/images/0000/000027/002769eo.pdf; accessed date: October 16, 2018)

[209] Most of bridges, places and mausoleums have been registered and restored under the supervision of the "Ministry of Culture and Arts." In this period, the Iranian government had a collaboration with UNESCO in order to restore the major historical buildings. (Djmachid 1973, p.25)

[210] The proposed operations recommended included roof lightening, reinforcing the columns, designation of specific boundaries for each monument and using indirect lighting to laminate the historical buildings. (Hodjat 1995)

[211] Under Pahlavi era (1925-1979), Europeans carried out a lot of research on Iranian relics many of which were published. Also, foreign embassies were involved directly or indirectly in the ancient excavation sites. Thus, a relative organization was established to promote Iranians' interest in national relics and increase their presence in the cultural heritage field.

[212] Hodjat 1995, pp.197-198.

the Conservation of National Monuments."[213] The law is significant in the sense of creating a proportion between the growth of new buildings and the restoration of ancient monuments.[214]

A year later, the "Law on the Purchase of Land, Buildings, and Facilities for the Conservation of National Heritage" was adopted on December 1968. According to the law, if the "Ministry of Culture and Art" needed to purchase a property or installations belonging to private individuals or institutions with the aim of preserving historical and ancient works, as well as improving their views and carrying out excavation operations, compliance with the provisions of this law would be required to be met.[215]

In the same year, the enactment of Art.127 of the Universal Penal Code provided for the punishment of those who intended to violate national assets. According to this law, anyone would be sentenced to two or six months' imprisonment and fines for the restoration, alteration and repair of the building or the decorations of works registered on the National List.[216]

The cultural heritage legislation of the period before the Islamic Revolution concludes with a single article of the law of the "National Heritage Registration Act" signed on October 23, 1973. "*The Ministry of Culture and Art (today Iranian Cultural Heritage, Handicrafts and Tourism Organization) hereby authorized to register—in addition to the properties subject to National Heritage Protection Act dated Nov. 3, 1930—the immovable properties which are important from the view point of history or national dignity, regardless of age and origin, among the national properties included in the mentioned Act. These properties shall be registered following the approval of the Supreme Council of Culture and Art. The properties mentioned herein are subject to the rules and regulations concerned with national heritage.*"

The article was established in addition to the law of 1930 and permitted the "Ministry of Culture and the Arts" to register the immovable properties which present the historical value or national dignity as heritage regardless of their era and origin.[217]

After the victory of the Islamic Revolution, the approach to cultural heritage affairs has changed compared to the past, culture and history have been considered after religion, and many of the historical sites and monuments have been neglected.[218] For this purpose, in the first days of the Revolution, the "Ministry of Arts and Culture" was excluded and it was integrated with the "Ministry of Culture and Higher Education." Therefore, cultural heritage was transferred to a ministry whose

[213] Samadi Younes, *Set of rules and regulations of the Cultural Heritage Organization*, Tehran: Scientific and Cultural Press, 1992, p.191.
[214] Hodjat 1995, p.197.
[215] Samadi 1992, p.49.
[216] (http://rc.majlis.ir/fa/law/show/96224; accessed date: October 16, 2018)
[217] (UNESCO Cultural Heritage Laws Database: http://www.unesco.org/culture/natlaws/index.php; accessed date: March 3, 2018)
[218] In the early years of the revolution, the largest historical mosques of the towns were the place for Friday prayers such that temporary shades roof and public ablution facilities were constructed in a short time to protect the worshippers in winter and summer which gradually caused damages to historical buildings. (Hodjat 1995, p.219)

greatest tendency was towards university affairs. Also, only a few laws were approved upon the preservation of cultural properties within the first years of the Islamic Revolution.[219]

Exactly three months after the Revolution, on May 8, 1979, the first legislative law ratified on "prevention of unauthorized excavation and exploration from obtaining antique objects and historical monuments which must be built or created for a hundred years or more based on international standards."[220] In addition, in the same year, an approval on the importation and exportation of original antiquities and cultural and artistic works was sanctioned.

The sanction cancelled the existing law on exemption from customs duties for import and export of antique objects (1975). Also, exportation of ancient and artistic relics requires the issuance of a permission from "Ministry of Culture and Higher Education."

In the meantime, Art. 83 of the Constitution of the Islamic Republic of Iran (1979) also deals with the transfer of national buildings and properties; "*Governmental buildings and properties categorized as precious national items cannot be transferable except by the approval of the National Consultative Assembly if they are not unique national objects."* [221]

One year later, the "Bill concerning the palaces of Niavarn and Sa'd-abad (the formal habitation of the king and his family) and evaluation and maintenance of the properties therein" was approved on April 2, 1980. According the law, both palaces devoted to the "Ministry of Culture and Higher Education" and all their antiquities and carpets shall be transferred to this ministry in order to be kept in museums. The objects with high value must be shifted to the Treasury of Central Bank and items with cultural value preserved in Bank for the use which will be determined in the future.[222]

In the first three years after the revolution (1979-1981), historical monuments were kept in awful conditions. Since many historic sites were located in nearby cities or towns, many people had tended to build their dwellings upon these sites taking advantage of the opportunity provided by the Iranian Islamic Republic to build houses of theirs with no supervision. Moreover, the removal of the ministry, the abandonment of ancient sites in which foreigners excavate, the direct pressures of the war on the four provinces containing more essential parts of Iranian cultural heritage and the inconsistency of the instructions to be applied to the violators, and the conservation of cultural patrimonies had all turned into an almost unresolvable issue.[223]

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[219] Nevertheless, the first action carried out relative to heritage was the announcement of Taleciani's (a religious leader) which declared objects of the palaces belong to the nation and should not be destroyed. (Hodjat 1995, p.215)

[220](http://rc.majlis.ir/fa/law/show/98106; accessed date: October 16, 2018)

[221] Samadi 1992, p.26.

[222] (UNESCO Cultural Heritage Laws Database: http://www.unesco.org/culture/natlaws/index.php; accessed date: March 3, 2018)

[223] Hodjat 1995, p.219-220.

To deal with the mentioned obstacles, in 1981 the section of the "Ministry of Culture and Higher Education" that was involved in education became an independent ministry. Another part belonging to the earlier "Ministry of Culture and Art" integrated into the "Ministry of Islamic Guidance." However, the most significant action taken under the Islamic Republic period was the ratification of the "Law on establishing the Iranian Cultural Heritage Organization (ICHO)" on 30 January, 1986, mainly in order to survey, explore, register and conserve national heritage; both movable and immovable properties.

The charter preparation of the new law took two years (1988) because of defining new ideals in the cultural heritage field and job classifications and responsibilities. "The Statue of the Iranian Cultural Heritage Organization" includes 9 articles in which described is mostly the definition of cultural heritage, objective and the duties of the new organization. The charter is notable since for the first time the meaning of cultural heritage is defined in an Iranian law (Art. 1), as well as the preparation of archeological map of the country. The responsibilities of the Organization toward the cultural heritage are briefly described as follows:[224]

1. *Designing and performing research plans on the remnants of the past;*
2. *Surveying and identifying sites, hills, buildings and historical complexes and providing a comprehensive inventory and the archaeological map of the country;*
3. *Performing archaeological research and scientific excavation;*
4. *Undertaking anthropomorphic surveys, anthropological and bio-anthropological studies and gaining acquaintance with vernacular cultures in different regions of the country;*
5. *Researching on traditional arts and preparing the ground for preservation, revitalization, and growth of these arts;*
6. *Registration of movable and immovable properties of cultural-historical values in the List of National Cultural Heritage and related Lists;*
7. *Having exclusive standing to perform all legal affairs concerning cultural heritage and initiating penal actions against the violators of the regulations;*
8. *Taking necessary measures to identify and restitute Iran's cultural properties;*
9. *Identification of all properties considered as cultural heritage which are of outstanding cultural and historical value;*
10. *Designing and implementing plans to safeguard the works and buildings;*
11. *Giving opinions concerning all developments comprehensive and master plans for cultural and historical zones;*

[224] UNESCO Cultural Heritage Laws Database: http://www.unesco.org/culture/natlaws/index.php; accessed date: March 3, 2018)

12. *Delineating the protected areas for registered historical buildings and sites;*
13. *Presenting relics in museums and exhibitions;*
14. *Founding and developing the museums;*
15. *Instituting a documentation center for organization;*
16. *Publication of studies and researches on cultural heritage at national and international level;*
17. *Publishing the encyclopedia of Iranian historical works;*
18. *Developing research activities on various fields of cultural heritage;*
19. *Implementing educational programs and training courses in cultural heritage activities;*
20. *Encouraging the community to participate in exploration and conservation of cultural heritage;*
21. *Establishing association for cultural heritage throughout the country;*
22. *Establishing communications and scientific-cultural heritage exchanges with relevant organizations at national and international levels;*
23. *Co-operating with the "Ministry of Cultural and Islamic Guidance" on national and international tourism;*
24. *Providing consultative, investigative, technical and educational services;*

Another effective action in the cultural field was the creation of the councils for the conservation of cultural heritage in cities and towns. The committees were made up of trusting local people, elderly citizens, and school teachers, in large cities, having included culturally responsible authorities and educational managers who were led by regional governors. The duties of the Council concern observation of the historical heritage of their regions and propose solutions to combat illicit excavations and the destruction of relics, in addition to attracting the support of the local populations for involving in cultural heritage activities. Since, during the 1980s, many illicit excavations were carried out under the local government by ignoring the cultural heritage laws, the Minister of Interior requested all mayors to consider existing rules and conservation standards for urban development in their cities.[225] Moreover, to avoid further destructions and damages in the future, the parliament ratified a law which prescribed hefty penalties for theft, harm and demolishes of historical buildings and relics in 1991. In the same year, the rules were enacted to obtain 20 Rials from the cement sack in favor of the organization and exclude municipal taxes for all cultural-historic sites. The last considerable legislation, "The Law on the Establishment of the Cultural Heritage and Tourism Organization," was approved on February 3, 2004, to integrate the organization with Iranian Travel

[225] Hodjat 1995, p.249.

and Tourism Organization.[226] The head of it was appointed by the President and the duties of the organization are described briefly as follows;

1. *Focus on the introduction, research, conservation, and revival of the cultural, historical and natural heritage of the country;*
2. *Presenting the values of Iranian cultural heritage at the national and international levels;*
3. *Raising the level of public culture in the field of cultural heritage and tourism using the educational, cultural and media capacities of the country;*
4. *Sustainable tourism development concerning the cultural values of the community;*
5. *Increasing domestic tourism and achieving an appropriate share of the global tourism market by utilizing all the facilities with a priority to attract pilgrimage, cultural and natural tourists to increase GDP and development employment;*
6. *Development of tourism exchanges with Islamic countries;*
7. *Observance of the rights and security of tourists;*

The organization is subsequently integrated with "Iranian Handicraft Organization" in 2006 and newly named "Iranian Cultural Heritage, Handicrafts and Tourism Organization (ICHHTO)" for the purpose of growing and supporting the country's crafts, as well as creating harmony with Tourism Development Policy.

4.2 Applying the Rules in Mashhad

Mashhad, as one of the largest Shiite religious cities, has been receiving millions of pilgrims annually. Therefore, by arriving the Iranian Islamic Republic, Mashhad has become more extended and modernized. In today's modern city, local urban regulations ignore the national laws concerning cultural heritage protection and they increasingly cause the destruction of the city's historical identity. Hence, the rules are in contradiction with each other. In the meantime, the first law to be criticized on preservation of cultural heritage is the "National Heritage Protection Act," in 1930. According to Art. 1 of the law, buildings constructed under Qajar era (1794-1925 AD) and the following periods are not considered as monument and would not be registered on the national list. Furthermore, Art. 3 concerns the requirement of the owner's written permission to register a private property on the National Heritage List that has not been occurred in the majority of the cases because of Art. 5 and Art. 6 of the same law. The mentioned articles are present in the following paragraphs.

Article 1- *Observing Article 3 of this Law, all artifacts, building and places having been established before the Zand Dynasty era (before 1795) in Iran, either movable or immovable may be considered as national heritage of Iran and shall be protected under the state control*.

[226] (http://www.ichto.ir/Portals/0/part4.pdf; accessed date: October 17, 2018)

Article 3- *Registration of properties in the list for National Heritage shall require the recognition and written permission from the Ministry of Education. In case the property to be registered is owned privately, the owner must have already been notified, and the registration would not be final unless the owner has been notified and his/her objection has been settled. The owner shall undertake the duties concerning national heritage prescribed in this law only after finalization of the registration.*

Article 5- *Persons who own or possess a property registered in the List for National Heritage may retain their right of ownership or possession. However, they must not prevent the state from taking the measures it considers necessary to conserve the items of national heritage. In case the conservation operation involves expenses, the State shall not charge the owner in return. The aforementioned measures shall leave the ownership intact*.

Article 6- *The operations mentioned in detail below shall be prohibited, and according to the verdict passed by a court of justice, the violators shall be fined as much as 50 to 1000 Tomans, and also, they may be condemned to pay compensation equal to the impairment they have caused to these properties .A- Destructing or causing damage to national properties, covering them with plaster or paint, and engraving or drawing on them. B- Any operations near a national monument, which makes the foundation of the monument unstable or disfigures the monument. C- Taking possession or trading in the materials and objects belonging to the buildings included in the list for National Heritage without permission from the state.*

Since, based on these articles, renovations and changes in a registered private property was allowed only with permission from the state, the owners do not intend to list their properties. On the other hand, the Single Article of Law, "National Heritage Registration Act," signed in 1973 could modify Art. 1 of the 1930 law by authorizing registration of any historical-monumental properties without considering their age. However, the absence of surveying leads to not knowing the monumental values of a building that could be registered as a heritage. Whereas Art. 3 of the "Law on the statute of Iranian Cultural Organization," 1988, includes the duties of the organization regarding cultural heritage in which sub-paragraphs 2 and 6 are defined exploring the historic buildings and their registration and protecting them against destruction as the organization's responsibilities.[228]

Refer to sub-paragraphs 2 and 6 of Art.3, the duties of the Iranian Cultural Heritage, Handcrafts and Tourism Organization as follows;

Sub-paragraph 2; "*Surveying and exploring historical sites, hills, buildings and complexes and building up their comprehensive inventory and the archeological map of the country*."

[228] (UNESCO Cultural Heritage Laws Database: http://www.unesco.org/culture/natlaws/index.php; accessed date: March 3, 2018)

Sub-paragraph 6; "*Registering the country's movable and immovable properties of cultural-historical significant in the national list for cultural heritage and other relevant list.*"

The mentioned legislations are able to list the great and historical buildings as heritage; also, by referring to the existing rules, it is possible to remove the monuments from the Heritage List. Indeed, due to current and non-updated laws many registered buildings have been excluded from the List of National Heritage that included even seven traditional houses of Mashhad. To confirm this act, Jam-e-Jam newspaper reports, "[..] *until 2011, 2664 historic houses were entered on the national registration. On the other hand, since 2005, 50 monuments have been eliminated from the list following owner complaints to the Administrative Justice Court and the weak defense of the Cultural Heritage Organization."*[229]

The annulment of the ICHHTO decision to register private properties issued by the Iranian Administrative Justice Court were based on the following reasons;

1) Failure to provide adequate reasons following Art. 1 and Art. 3 of "the National Heritage Protection Act" 1930, concerning the construction date of the properties and notifying the owner before the registration of his/her properties.

2) Ineligibility from the historical point of view and national dignity, the terms of the Single Article of the "National Heritage Registration Act," 1973.

3) Unconstitutionality of the National Heritage Protection Act 1930, its subsequent amendments and additions relative to private properties according to the jurisprudence theory 6076 signed on 9 October, 1982, ruled by the Guardian Council .[230]

Thus, registration cannot guarantee the preservation of the heritage and rules do not claim that there is no risk of destruction to cultural patrimonies. Unlike the ICHHTO duties concerning the protection of heritage against any kind of destruction defined in Art. 3, sub-paragraph 11 of the "Law on the statute of Iranian Cultural Organization" (1988), the historical or even public houses were demolished after removal from the list. Sub-paragraph 11 describes the obligation of organization to protect

[229] The seven removed houses are listed by referring to their name, file number, and date:
1. Sheikhkhani House, 1126-02/08/2008
2. Rajab pour House, 237-02/05/2009
3. Tafti House, 710-13/07/2009
4. Khan Manesh House, 1090-12/09/2009
5. Amir Fakhrian House, 1687-17/11/2009
6. Sabzavariha House, 8909970900300641-29/11/2010
7. Tamadoni House, 9009970900101687-16/10/2011 (http://www.csr.ir/files/fa/news/1396/3/8/1242_549.pdf; accessed date: February 5, 2018).
(http://press.jamejamonline.ir/Newspreview/1262846757598686212; accessed date: February 10, 2018).

[230] Following the letter No. 5736, dated 09/10/1982, the National Heritage Preservation Law of 1930, and its subsequent amendments and additions in relation to private properties were recognized as the unconstitutional rule according to a greater share of the votes by jurists of the Guardian Council. (http://divan-edalat.ir/aho-print/8073; accessed date: February 5, 2018).

heritage in this way " *Give opinions concerning all development comprehensive and master plans for cultural and historical zones and make final decisions about valuable sites, fabrics and places in these zones, and protect them against any kind of destruction."*[232]

Figure 4.1 Darban Maghami House before and after the demolition in 2008 that occurred due to removal from the List of National Heritage. (Govahi 2013)

A lot of destructions might mainly be caused due to the renovation of the surrounding tissue of Holy Shrine that led to construction of various structures with modern appearances in the vicinity of monuments as well. This lack of attention to the boundaries of monuments originated from the fact that until 1999 there was no specific boundaries for the Shrine of Imam Reza and the nearby historical buildings. However, the date of determining the boundaries for the first time dated back to 1963 when Resolution No. 1 provided recommendations for the preservation of monuments in Isfahan by "Society for the Conservation of National Monuments." Within the document, sufficient free perimeters and spaces around historical monuments were defined in which construction of inharmonious new buildings in the vicinity of historical monuments had been avoided. In this way, construction of buildings more than 12-meter high within a distance of three kilometers from the Naqsh-e Jahan Square was not permitted in all of the city of Isfahan. This elevation near the monuments is not more than 8 meters, and the Archaeological Center should approve the design of facades in new constructions located at least 100 meters from the historic buildings.[233]

Furthermore, accordance with sub-paragraph 12 from Article 3 of the "Law on the statute of Iranian Cultural Organization" specifying the architectural design and standards within boundaries of a historical monument is among the duties of the Organization.[234] However, the organization

[232] (UNESCO Cultural Heritage Laws Database: http://www.unesco.org/culture/natlaws/index.php; accessed date: March 3, 2018)
[233] Hodjat 1995, p.199.
[234] Article 3- sub-paragraph 12 - *Delineating the protected areas for registered historical buildings, complexes, sites and hills, and formulating specific regulations for architecture and design inside the protected area.* (UNESCO Cultural Heritage Laws Database: http://www.unesco.org/culture/natlaws/index.php; accessed date: March 3, 2018)

determined the limits and conservation standards only for 141 registered historical buildings and sites, in which there are no monuments of Mashhad, not even the Shrine.[235]

At the beginning of implementing the renovation project (1999), KH-CHHTO notified the relative municipality (Samen Municipality) upon the boundaries specified for designated monuments. According to Clause 4-2-3-3 of the report, prepared by KH-CHHTO, the maximum permitted height in the first boundary is 10 meters, and in the secondary area, the maximum allowed height is 20 meters (Fig. 4.2).

Nevertheless, the regulations of the improvement and renovation project have established a permitted elevation between 23 and 43 meters. In addition, in 1999 only seven public monuments were introduced to Samen Municipality for preservation in the new urban project. However, in 2008, this number has risen to 42 registered buildings of which 14 buildings were demolished and other than seven great monuments, only 21 constructions could be maintained. Also, 158 buildings identified to be recognized as heritage are totally ignored.[239]

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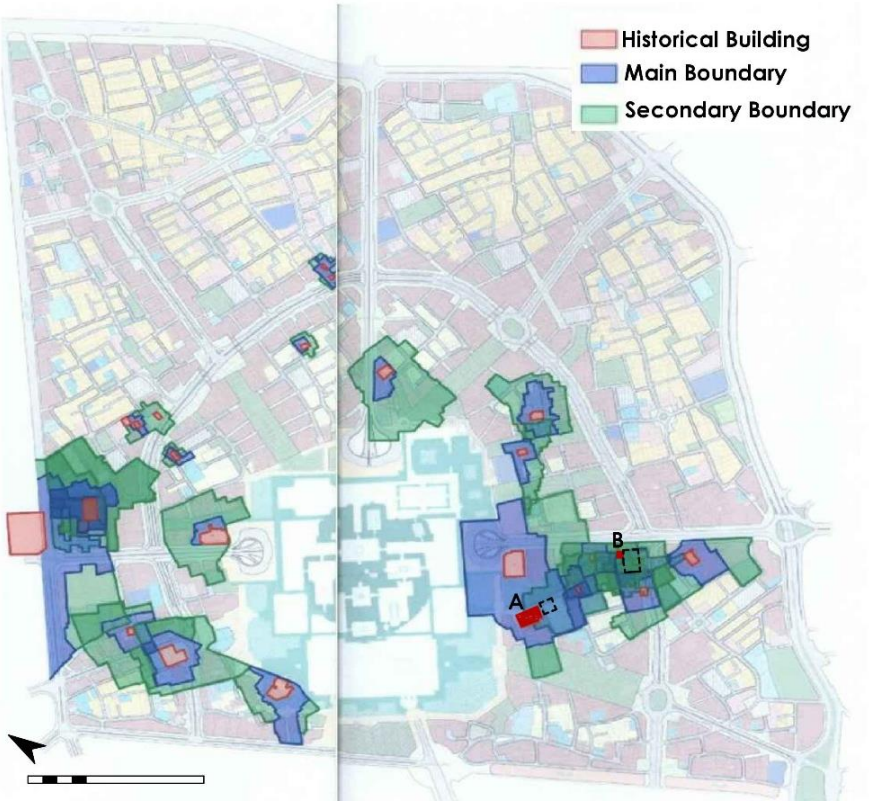


Figure 4.2 Determining the boundaries; in the area highlighted with blue, the maximum permitted height is 10 meters, and in the green zone, the maximum allowed height is 20 meters.

[235] "Determining the Boundaries and Protection Standards of Historical Monuments," *Athar Journal*, N. 36-37, (2002), pp. 323-328. (journal.richt.ir/athar/article-1-301-fa; accessed date: Jun 30, 2018).

[239] It is interesting to note that two case studies, Nili and Tehrani houses, were listed among the 158 identified buildings. (Tash, "The improvement and renovation of the surrounding tissue of Holy Shrine; A Comparative Study between the Renovation Plan and the Cultural Heritage Criteria," N. 2-105-19-158, 2008).

Figure 4.3 Vicinity of a tall building to Aziz al-ahof Serai.
Figure 4.4 Construction of residential-commercial building, Zamen close to Rahimian House.

Based on Art. 102 of the "Municipality Law," municipalities are required to observe ICHHTO plans and considerations regarding the conservation of ancient monuments, the extent of the protected areas, and the appearance of the building and neighboring squares. That said; "*In case historical monuments are discovered during the planning stage and implementation of the programs concerned with developing the streets and providing for other urban needs, mentioned in the Article 96 annexed herewith, the municipality is obliged to meet the approval of the Ministry of Culture and Art in advance. Note: The Ministry of Culture and Art is obliged to declare its decisive opinion to municipalities within three months after the date the Ministry of Interior has referred the case*." [241] Thus, it seems that what we observe in the historical context of Mashhad nowadays is entirely in conflict with the rules and regulations

4.3 The Analysis of Conservation and Restoration of Traditional Houses in Mashhad

The provincial legislations, nature and architectural-structural features of a heritage all determine the type of preservation methods and building standards. Indeed, a uniform protection intervention will not be applicable and universal to all cultural monuments and sites. The current national and international recommendations sound useful if considered generally regarding the principles and guidelines for safeguarding an architectural heritage. However, it is necessary to also take into account the circumstances of site and physical conditions of the heritage involved in conservation that limit the application of traditional or innovative methods of repair.

[241] (UNESCO Cultural Heritage Laws Database :http://www.unesco.org/culture/natlaws/index.php; accessed date: March 3, 2018)

The current conditions of the historical context in Mashhad plus the existing municipal laws bring us a number of challenges in detection of a proper method for restoration. In addition, the lack of state funds to pay the cost of preservation is another issue that shall be taken into consideration. Nonetheless, it seems clear that urgent action is required to be taken in order to safeguard the surviving buildings before being destroyed. For this reason, during the recent years, several interventions were made upon the heritage structures under the supervision of KH-CHHTO or collaboration of private sectors and governmental offices. In the majority of operations, the principles of European and international charters have been followed, in particular ICOMOS Charter, "Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage, 2003." In this charter two types of traditional and innovative intervention are mentioned, both of which were applied in projects of restoration and consolidation of traditional houses in Mashhad.

The first dwelling will be Amiri House that in 2007 was restored for the first time with the traditional method and eight years later in 2015 the consolidation started with innovative techniques.

The second example will be Darugheh House in which the restoration and conservation project started in 2012 and ended in 2014. In this case, the new measures applied more than traditional methods and where it was necessary, both technicians integrated. These protection measures will be described step by step through sheets in the next pages. In addition to applying frequent methodologies concerning restoration and revitalization of a historic home, there is another solution to safeguard what belong to history and architectural of a place that disappears in continuous. This method is the dismantling and dislocation of the architectural and structural components of buildings that are not considered as heritage and instead will be destroyed as two case studies; Nili and Bidari houses. Even if this method is in contradiction with the principles of safeguarding, but in some circumstances it will be the only way to preserve cultural heritage. The demolition of the buildings in the historic center of Mashhad has permitted to carry out the removal, relocation and reutilization of their components of which that were destined to destroy. In the recent years, materials and elements of several buildings have preserved by following this method that in some cases, author has gained a direct involvement and observation. Therefore, one part of chapter has been assigned to theme; dismantling and reassembling and, national and local examples existing in this field.

4.3.1 Amiri House, the traditional measures (September-December 2007)

Amiri House is one of the traditional houses restored after being abandoned for 11 years according to the safeguard plans designed by a professional commission of Cultural Heritage, Handicrafts and Tourism Organization of Khorasan. The assigned stages have been implemented from September 2007 for three mounts under the supervision of the KH-CHHTO. Since April 2007, the house has

been abandoned that has caused severe damages to the building. The system repair of structures and replacement of architectural components have been undertaken with employing the original-traditional techniques and respecting the earlier materials.

In the project, emptying the courtyard and interior rooms on the floors from waste and garbage has been taken as the first stage of the conservation process.

Following the clean-up, there comes the establishment of a provisional safeguard system and scaffolding. The third main stage concerned the roof lightening and repairing the wooden ceilings following the original technique and using traditional materials. In the meantime, elements like the broken skyline (*taj*), which is placed on the roof, are also reinforced.

Without any components having been consolidated, the final measures under the original earlier patterns and materials consisted of restoring the ruined parts of the masonries and recoating the outer façades. The sheets below depict the traditional measures employed in Amiri House from September to December 2007.

Figure 4.5 View of Amiri House before the onset of the innovative restoration project. (Govahi 2015).

Sheet 4.1	Historical House	Location	Methodology	Project Implementer	Date
	Amiri	Courtyard, Interior spaces	Traditional	KH-CHHTO	Sep-Dec 2007
Treatment	Site Cleaning				

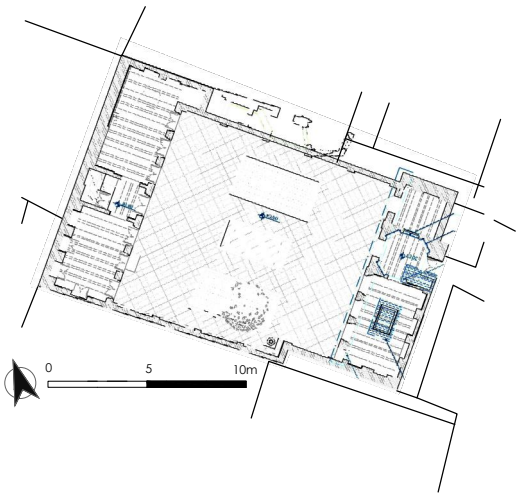


Fig. 4.1.1 Collecting branches of trees and cleaning the area to begin the restoration operation.

Fig. 4.1.2 Emptying the courtyard and rooms from garbage and waste.

Sheet 4.2	Historical House	Location	Methodology	Project Implementer	Date
	Amiri	Northeastern Boundary Wall	Traditional	KH-CHHTO	Sep-Dec 2007
Treatment	Implementation of Provisional Safeguard System				

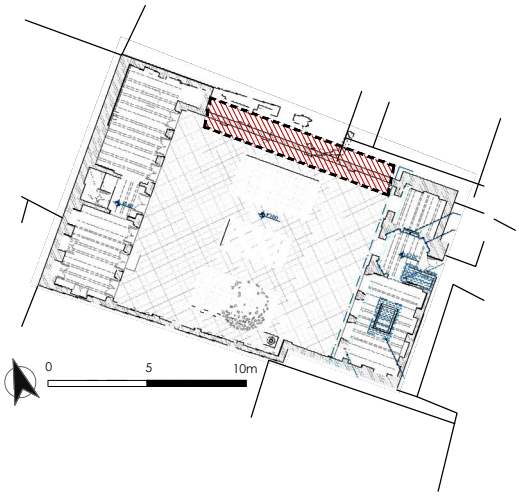
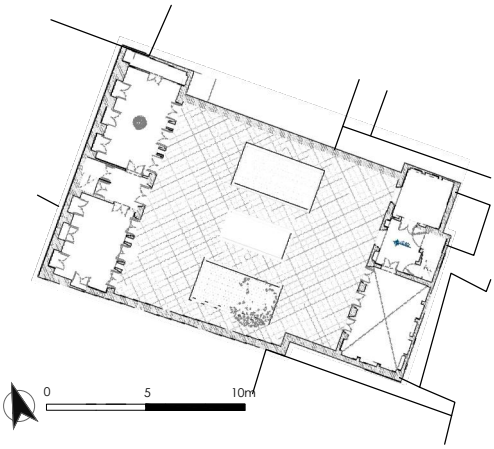


Fig. 4.2.1 Use of wooden props and beams to prevent the collapse of the northeastern boundary wall.

Fig. 4.2.2 Inappropriate connection between wooden props and the brick wall using gypsum mortar to paste.

Sheet 4.3	Historical House	Location	Methodology	Project Implementer	Date
	Amiri	Northwestern Building Mass	Traditional	KH-CHHTO	Sep-Dec 2007
Treatment	Restoration of Roof and Beamed Ceiling				



(a)

(b)

Fig. 4.3.1 Roof lightening; (a) removal of finishing layers like mud mortars, reeds or straw mats, (b) dismantling the elements that belong to the roofing structure, such as wooden planks, in order to reach the ceiling beams.

1 Repair of wooden ceiling elements, supporting beams and wooden boards;

(a)

(b)

(c)

Fig. 4.3.2 Removal of rotten ceiling beams and placement of intact poplar trunks (original material) in place of the removed timbers; (a) dismantling the deteriorated beams, (b) their replacement with undamaged lumber, (c) placing the new trunk where the damaged timber has been.

Fig. 4.3.3 Connection between the inserted beams and the roof parapet using a mixture of gypsum and water .

Fig. 4.3.4 Fixing the new long boards on the ceiling beams with iron studs.

2 Roof insulation, inclination and paving;

(a)

(b)

(c)

Fig. 4.3.5 Roof insulation; (a) covering the boards with straw mats, (b) smearing a 10-cm layer of *ghoregel* (mixture of clay, sand and water) over the mats, (c) covering *ghoregel* mortar with a coat of dirt.

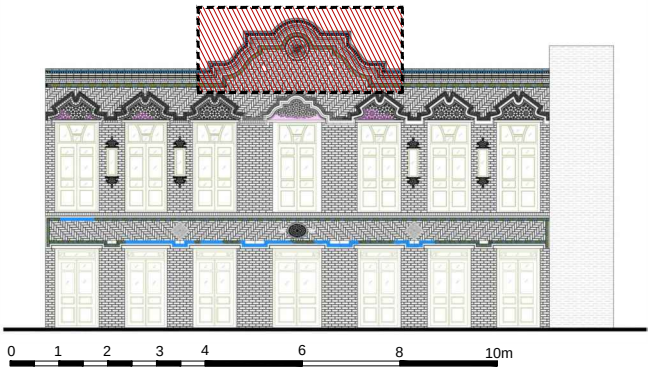
(a) (b) (c)

Fig. 4.3.6 Roof inclination; (a) creation of slopes by layers of dirt (b) implementation of square bricks and gypsum-sand mortar to make the perimeter of the first flooring, (c) utilization of brick rubbles to fill the empty spaces between the brick lines.

(a) (b)

Fig. 4.3.7 Paving the roof; (a) covering the surface of the roof with square bricks (20 X 20 X 5 cm), (b) pointing the sand-gypsum mortar between the brick courses.

3 Reinforcement of *taj* (broken skyline element);



(a) (b)

Fig. 4.3.8 Reinforcement of *taj* (broken skyline element); (a) consolidation of *taj* using wooden planks, glued with chalky mortar to a thick layer of gypsum-clay coat covering the brick structure, (b) construction of a 30-cm thick brick wall behind the element.

Sheet 4.4	Historical House	Location	Methodology	Project Implementer	Date
	Amiri	Southwestern Wall	Traditional	KH-CHHTO	Sep-Dec 2007
Treatment	Repair of Masonry				

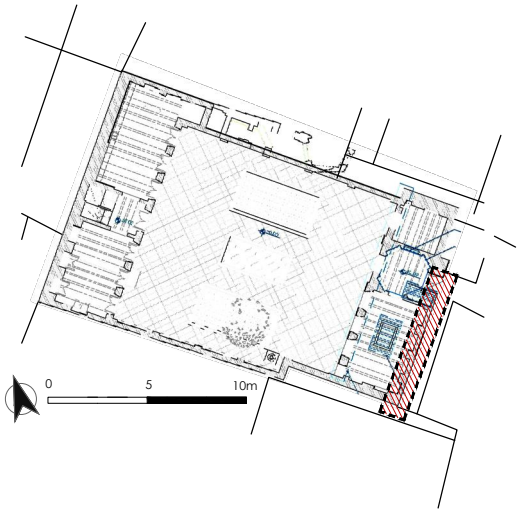


Fig. 4.4.1 Physical condition of southwestern wall before the onset of restoration operation

1 Restoring the ruined parts of the masonry;

(a) (b) (c)

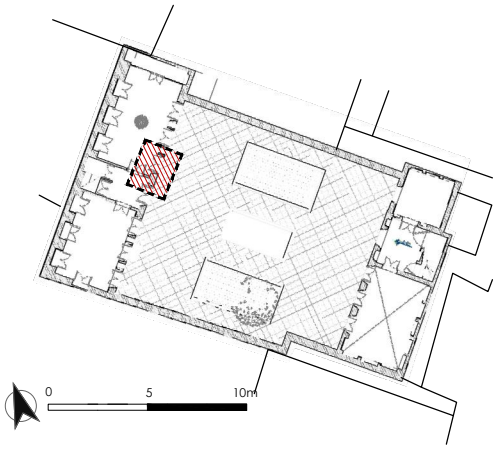
Fig. 4.4.2 (a) utilization of *ghoregel* mortar (mixture of clay, sand and water) to infill and cover the ruined parts of the outside façade, (b) removal of eroded bricks and their replacement with the new ones (20 X 20 X 5 cm), (c) completion of the wall reconstruction.

2 Recoating the outer façade;

(a) (b)

Fig. 4.4.3 (a) coating the wall by a finishing traditional layer of straw-mud mixture like the original method, (b) completion of plastering.

Sheet 4.5	Historical House	Location	Methodology	Project Implementer	Date
	Amiri	Northwestern Façade	Traditional	KH-CHHTO	Sep-Dec 2007
Treatment	Reconstruction of Masonry				



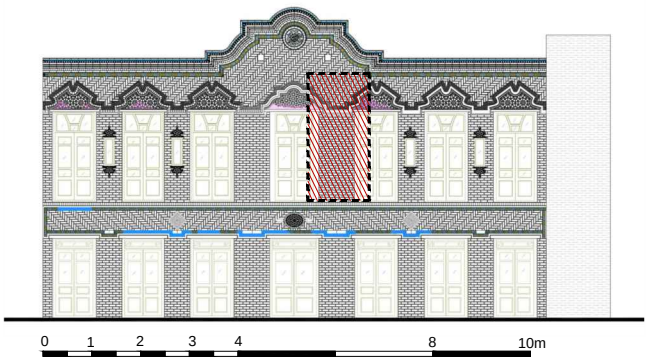


Fig. 4.5.1 Physical condition of northwestern façade before the onset of reconstruction and repair.

1 Rebuilding the missing and ruined portions of the burnt-brick masonry with compatible traditional materials and technique;

(a) (b) (c)

Fig. 4.5.2 (a) removal of original materials, such as raw bricks and mud mortar, which have lost their characteristics and durability, to reconstruct the masonry with fired bricks, (b) using the bricks in half form in the front row, brick rubbles in the back row and a mixture of gypsum-sand as mortar, (c) completion of the brick wall.

2 Brickworks and tileworks in accordance with the original pattern;

(a) (b) (c) (d)

Fig. 4.5.3 (a) implementation of bricks with curved edges in the first row, and compact and small bricks (5 X 5 cm) in the second course, (b) remaking the arch according to its earlier form with curved-edge bricks and mud-gypsum mortar, (c) laying the tiles (15 X 1.5 cm) around the frame of the window with respect to the traditional arrangement, (d) completion of reconstructing the damaged portion of the northwestern facade through pointing the mortar (sand-gypsum mix) between the brick courses.

According to the general criteria for conservation and restoration of architectural heritage, it is mandatory to know the kind of structure, material characteristics and the cause of damage and decay prior to any intervention. The outcomes of the system and materials describe that the primary principles defined for the preservation of a historical building have not been taken into account. The first incorrect action is the use of an inappropriate system of safeguard which has caused the collapse of the northeastern boundary wall. The protective mean is composed of only wooden beams arranged as props implemented without using any additional supporting elements and consideration of wall deflection. Neglecting the vulnerability of the building, lack of intervention to reinforce the masonry and mainly the weak function of the protection system against environmental factors and human activities, including the construction of a massive commercial center near the house, have led to complete destruction of the wall.

Figure 4.6 The implementation of weak safeguard system without considering the deformation of brick northeastern brick wall. **Figure 4.7** The collapse of the northeastern boundary wall in 2015. (Govahi 2015)

Another fact that created harm to the building was the use of a plastic layer on the roof of northwestern building mass to protect it from rain and snow moisture. However, the plastic cover itself causes humidity retention on the roof, which has generated a better condition for the growth of greens between brick rows. Nevertheless, the mud mortars used as an insulation commonly provide the accumulation of moisture. Therefore, in the traditional system of roof construction, the final coating was a layer of straw-mud mixed with salt for preventing the growth of weeds. As Sheet 4.3 presents, in repairing measure of the roof, the mixture of straw-mud and salt has not been applied, instead, dirt and *ghoreghel* mortar (a mixture of clay, sand, and water) served as the layers under the brick courses.

(a) (b) (c)

Figure 4.8 (a) moisture retention on the roof of the northwestern mass due to the use of plastic as a protective cover, (b) removal of plastic cover, (c) weeds growth between brick rows. (Govahi 2015)

The implementation of double row of bricks on the rooftop to cover and pave it further increases the weight of the roof. This type of intervention will not guarantee long-term safety and durability. In addition, building of a brick wall with a thickness of 20 centimeters behind the *taj* structure not only has not reinforced it, but also using heavy materials such as bricks transmits a compressive force to the broken skyline element and an excess load onto the roof.

Reconstruction of the ruined portion on northwestern façade was carried out without the reinforcement of the structure and highlighting the renewed parts from the original one. However, number 3.12 of ICOMOS Charter 2003 presented the principles for conservation and structural restoration as, "*Each intervention should, as far as possible, respect the concept, technique and historical value of the original or earlier states of the structure and leave evidence that can be recognized in the future*."[242]

It can be concluded that in the traditional method , using modern materials to increase the strengthen of columns and walls is not allowed. In other words, any reinforcement of masonries and foundation has been avoided and only repairs have been made. However, integration of new materials that are compatible with the existing ones can raise the stability of the structure against human and natural threats. Buildings restored with traditional method basically show a low resistance to earthquakes and environmental factors.

4.3.2 Amiri House, the Innovative measures (2015-present)

From 2007 until April 2015, once again Amiri House was abandoned when it was being conserved. The integration of the building as the restaurant of Zamen commercial mall led to protect this monument from final demolition relating to the late renovation plan of the texture surrounding the Holy Shrine. Through the cooperation between the private sectors, Bon Architectural Office and Zamen as a sponsor, the house was decided to be inserted into a contemporary complex to prevent

[242] ICOMOS CHARTER-Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage, 2003. (https://www.icomos.org/charters; accessed date: December 10, 2017)

the destruction of the southwestern quarter caused by construction of the Razavi Sharestan's sidewalk.

Figure 4.9 Location of Amiri House within the commercial- residential building, Zamen. (https://www.google.com/earth/, accessed date; January 31, 2018)

The proposed scheme was not approved by the Cultural Heritage, Handcrafts and Tourism Organization of Khorasan because the house was in the vicinity of a modern and enormous building. This disapproval led to the closure of the worksite for 25 months bringing a great deal of damage to the building as already mentioned. In September 2017, KH-CHHTO started implementing repair interventions, but after two months and because of a shortage in state funds, the project was suspended for the second time until the spring of 2018 when the organization decides to collaborate as a supervisor with both private offices, Bon and Zamen.

The restoration is still in progress and it mainly focuses on the reinforcement of structures with innovative methods and materials that are compatible with existing components.

After having emptied the courtyard from the waste and rubbles accumulated in these eight years of abandonment, the primary operation in the spring of 2015 was to collect the bricks and tiles fallen from destruction of the northwest boundary wall. These materials were individually separated based on their form and size and transferred to a warehouse for subsequent reassembling of the wall. In the next step, the plastic cover was collected from the roof before the ceiling was cleaned and lightened. The measures executed until today are as follows;

Sheet 4.6	Historical House	Location	Methodology	Project Implementer	Date
	Amiri	Southwestern Boundary Wall	Innovative	Bon Arch. Office	Apr-Sep 2015
Treatment	Implementation of Provisional Safeguard System				

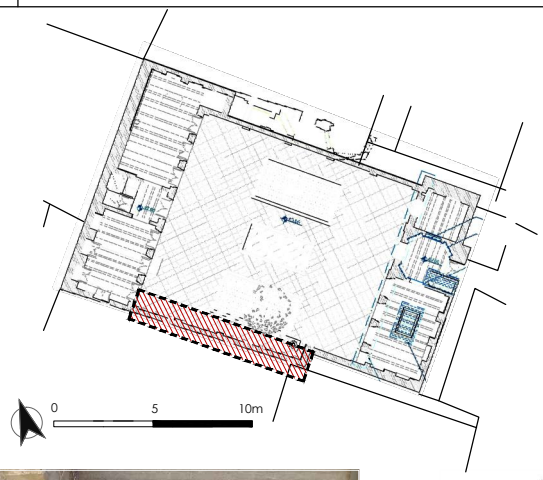
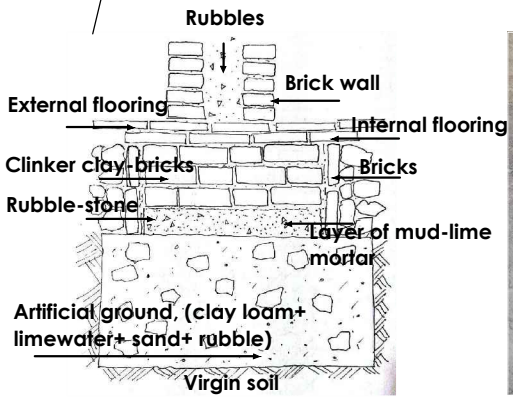


Fig. 4.6.1 Physical condition of southwestern boundary wall before the onset of restoration operation.



(a) (b) (c)

Fig. 4.6.2 Establishing the foundation for erection of safeguarding structure; (a) digging a pit in a width of 40 and the depth of 50 cm adjacent to each brick pillar until reaching the original foundation, placing a layer of nylon over the artificial ground before concreting (using a mixture of cement and coarse sand) in order to prevent the absorption of cement water from the ground and get the concrete to its ultimate resistance, (b) the scheme of the original traditional foundation in Amiri House, (c) the concrete foundation.

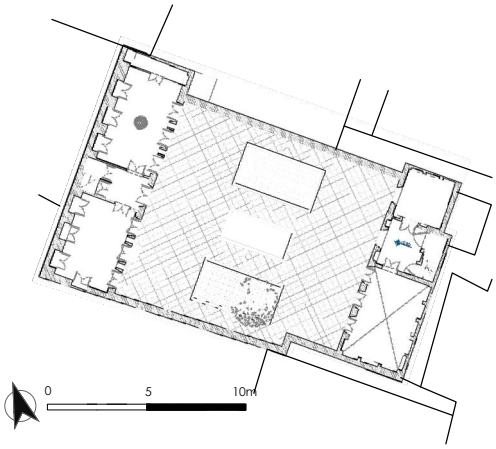
(a) (b) (c)

Fig. 4.6.3 Implementation of provisional protective system; (a) placing steel columns in line with the position of brick semi-columns, (b) connecting the pillar with the base plate using steel corners by welding, (c) jointing columns and horizontal beams through welding.

(a) (b) (c)

Fig. 4.6.4 Jointing brick walls and iron protective structure; (a) preparation of wooden elements to attach to horizontal iron beams to prevent the direct contact of the structure with the wall, (b) screwing the wooden boards to the horizontal iron beams, (c) utilizing the Styrofoam sheets and wooden sticks between the protective structure and brick walls.

Sheet 4.7	Historical House	Location	Methodology	Project Implementer	Date
	Amiri	Northwestern Building Mass	Innovative	Bon Arch. Office	Apr-Sep 2015
Treatment	Roof Lightening and Reinforcement of the Ceiling Beams Joints				



1 Roof cleaning and lightening;

(a)

(b)

(c)

Fig. 4.7.1 Roof cleaning and lightening; (a) removal of roof bricks , (b) cleaning the roof from layers of *ghoregel* (mud + sand) and dirt covering the panels, (c) removing the wooden boards to spot the decayed beams and replacing them with undamaged trunks.

2 Reinforcement of the ceiling beams joints;

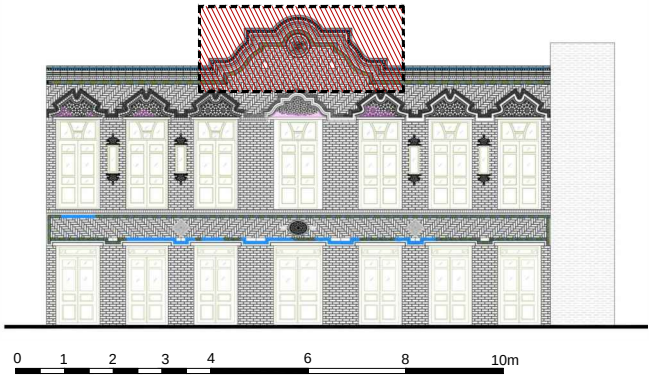
(a)

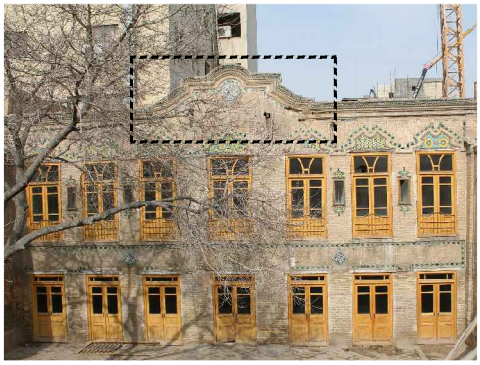
(b)

(c)

Fig. 4.7.2 Reinforcement of the ceiling timbers joints; (a) freeing the timber heads to create a hole for fastening the bolts, (b)-(c) bolted jointing the ceiling timbers with horizontal beams laid on the top of wall using small wooden planks and threaded bars.

3 Dismantling the construction materials and inscription of the broken skyline element (*taj*);





(a) (b) (c)

Fig. 4.7.3 Dismantling *taj* construction elements; (a) demolishing the brick wall built in the 2007 restoration project and dismantling the materials of the broken skyline element, (b) removing the inscription from the structure as a single piece and consolidating it using a Styrofoam frame with a bracket mounted on it, (c) collecting the disassembled components and conserving them in warehouse to reassemble *taj*.

(a) (b)

Fig. 4.7.4 Restoration of the inscription; (a) filling the missing parts with new tiles and gluing them to the base with a mixture of gypsum and organic glue, (b) finishing the restoration with repairing the parts that have almost been detached from the surface.

Sheet 4.8	Historical House	Location	Methodology	Project Implementer	Date
	Amiri	Southwestern Boundary Wall	Innovative	Bon Arch. Office	Apr-Sep 2015
Treatment	Consolidation of Masonry				

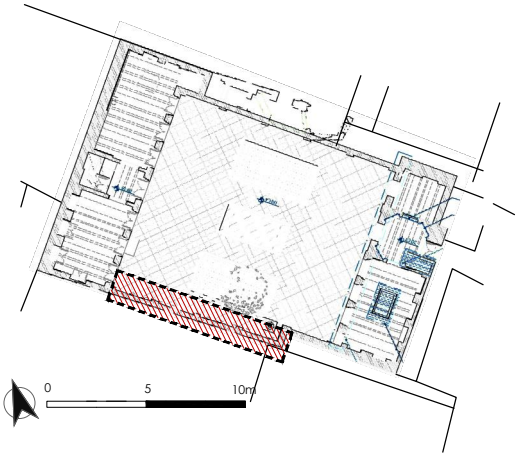


Fig. 4.8.1 Physical condition of southwestern boundary wall before the onset of restoration operation.

(a)

(b)

(c)

Fig. 4.8.2 Removal of bricks at risk and reinforcement of the southwestern-wall foundation; (a) dismantling the bricks from where the wooden beam is located and using the gypsum mortar to hold the upper portion and prevent the collapse, (b) excavating underneath the wall equal to its width and the depth of almost 50 cm, and placing a layer of plastic before concreting (using a mixture of cement and coarse sand), (c) making the internal flooring before reconstruction of southwestern wall.

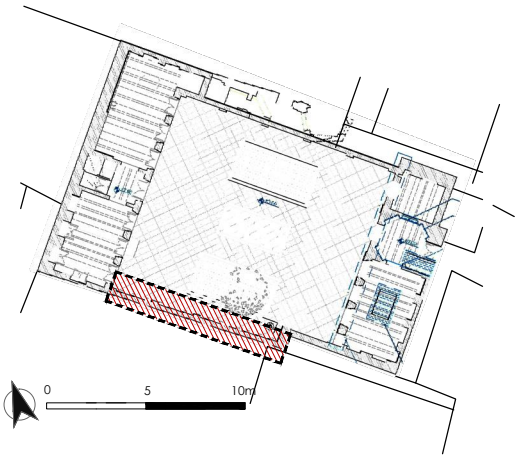
(a)

(b)

(c)

Fig. 4.8.3 Consolidating the structure and providing a safer connection to the new walling and the backing wall; (a) preparing the anti-corrosion steel rebar before insertion into some parts of the masonry, (b) using Geogrid for overlapping the space between the new wall and the backing one, (c) view of the lower part of the brick wall together with the upper portion unbuilt.

Sheet 4.9	Historical House	Location	Methodology	Project Implementer	Date
	Amiri	Southwestern Boundary Wall	Innovative	Bon Arch. Office	July-Nov 2017
Treatment	Reconstruction of Southwestern Wall				



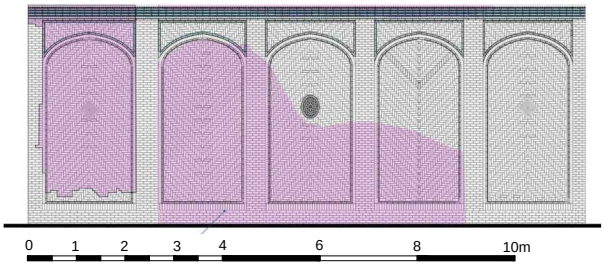


Fig. 4.9.1 Southwestern boundary wall facade in which the highlighted portions must be reconstructed following the original brickworks pattern as seen.

(a) (b) (c)

Fig. 4.9.2 Implementation of brickworks; (a) removing the bricks placed unto the walls contrary to the earlier pattern of brickworks and preparing the masonry for new walling by Geogrid sheet, (b) smoothing the edges of the bricks collected from adjacent historic houses and even cutting them into small pieces for reconstruction of the southwestern boundary wall as materials, (c) reconstructing the wall with reused bricks using cement-dune sand mortar by following the earlier original pattern

(a) (b) (c)

Fig. 4.9.3 Inscription preservation; (a) protecting the central geometrical inscription at its place for emptying the backing space, (b) utilizing a Styrofoam sheet, metal prop, and wooden pieces as bracket and steel bars, (c) view of the southwestern boundary wall after rebuilding the first and central niches.

In the innovative method, creation of a temporary protective system with steel columns and beams supported on concrete foundation brought a stability to the southwestern boundary wall. As a result, excavation of the adjacent land did not cause any damage to the wall. In fact, for the implementation of the protective structure, it was necessary to establish the concrete foundation only near the brick semi-pillar, which strengthen the existing foundation and provided the connection between the steel columns and horizontal elements of the temporary safeguarding structure. Therefore, the use of reinforced concrete in a continuous way was not necessary (Sheet. 4.8).

In the present method, roof became lighter in weight by removing of layers of brick and mud mortars that was executed in the previous restoration and exposed a lot of pressure to the ceiling. Also, the construction of a brick wall in the traditional method behind *taj* (broken skyline element) added more load into the roof. For this reason, the destruction of the wall could help to lighten roofing and to avoid cracking *taj*. Even if dismantling the *taj* structure and materials has not been much acceptable, in this case it was certainly the only possible means to conserve it.[243]

Since the restoration project would be stopped for a long time and the construction of the enormous Zamen shopping mall would be continued up to a few meters close to the roof of the northwestern mass, no choice would remain except for the removal of the broken skyline element. Moreover, in the second restoration, jointing between the ceiling beams and the main timber were fastened through stainless steel bars. However, there was no stable connection between the wooden elements of roof in the traditional system of restoration.

Figure 4.10 *Sottosquadro* method**;** leaving evidences between the restored and original portion of southwestern boundary wall, original (above) and restoration (blew).

In order to increase the resistance of the wall against flexural strength, the use of new materials such as rebar and Geogrid are proposed in combination with brick masonries. Also, brickworks of the wall should be implemented with historic-reused bricks in a cement-dune sand mortar in accordance with

[243] 3.17- Dismantling and reassembly should only be undertaken as an optional measure required by the very nature of the materials and structure when conservation by other means is impossible, or harmful. (ICOMOS CHARTER-Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage, 2003, https://www.icomos.org/charters; accessed date: November 5, 2017)

the original pattern. Unlike the traditional technique in which the repaired parts were not distinguished from the earlier ones, in innovative system, the reconstructed portions of the wall are distinguishable through *sottosquadro* method. In this way, the recycled bricks in restored parts are placed with a little distance prior to the alignment of the original brick rows. The reused materials have been gained from demolished historic houses corresponding to the building in terms of construction, architecture, structure and decorative elements. These houses would be studied and surveyed as far as possible before destruction, and their reusable materials were extracted during the demolition of the building.

Figure 4.11 Collecting the materials during the demolition of a traditional house in Mashhad. (Govahi 2013)

It can be determined that the innovative method, where the materials and techniques applied are different from the original ones, is more faithful to the principles of conservation. However, the choice between modern and traditional techniques depends on the type of materials and methods used in the construction of the building. In addition to considering the nature of the building where it is located, the local common methods must all be considered in selecting the restoration process.

4.3.3 Darugheh House, the innovative measures (2012-2014)

Darugheh Mansion is another building conserved and restored with collaboration between the private sector and "Samen Municipality" under the supervision of KH-CHHTO. The building was purchased by the municipality of Samen in 2012 and restored until the fall of 2014 by following safeguard measures prepared by Bon Architecture Office.

The major destruction of *Noghan* Neighborhood (the location of the house) led to the loss of neighboring constructions that supported the building's structure. In addition, due to the vibrations and build-ups of heavy machinery, Darugheh House has faced serious structural problems. The functional change from being a house to accommodating the pilgrims has also caused damages to the building. Non-standard additions, lack of accurate maintenance and moisture all contribute to the degradation of the structure. In the proposed restoration plan, consolidation of the building has firstly been considered against the environmental degradation factors, and for the new function the

revitalization of the building has then been taken into account. Removal of the added architectural elements was the first action taken after full understanding of the structure, material characteristic and cause of the damages. Indeed, the division walls separating each room into several sections and the attached staircase were demolished, openings and niches that were closed with bricks were also reopened. Following which, the layer of cement on the walls was removed which led to the creation of a channel for disposal of moisture in the floor.[244]

Figure 4.12 View of southeastern building mass in Darugheh House before starting the new restoration project. (Govahi, 2012)

In the safeguard project of Darugheh House, measures were applied by an integration of innovative and traditional methods. On one side, the foundation and masonries were consolidated through materials and techniques. On the other side, Anastylosis Restoration was followed as a system to reconstruct the brick façades. In the first technique, reinforced concrete was used for the parts whose foundation required to be strengthened. Instead, the masonries that were damaged due to the presence of moisture as the walls of cooking were consolidated by implementation of reinforcing steel which acts as the wooden original-vertical beams. In some masonry, the wooden poles have also been preserved and an armature of rebar has been inserted around them. The decorative molded bricks have been placed on the facades and together they form a unit pattern. Due to the presence of moisture and lack of mortar adhesion, they have tended to decay. For this reason, a large number of these bricks are dismantled and after being washed with water and a little salt essence they are reapplied to the façade with gypsum-limewater mortar which is resistant to moisture. In some areas, where the bricks are completely damaged, recycled bricks with the same shape were positioned in place of earlier materials. The following technical sheets depict the measures regarding the reinforcement of the foundation, consolidation of the masonry and reconstruction of facades in Darugheh House.

[244] "The plan for restoration and revitalization of the historic house of Darugheh," *Bon Arch. Office*, Chap. 4, (2012), pp. 387-392.

Sheet 4.10	Historical House	Location	Methodology	Project Implementer	Date
	Darugheh	NW Building Mass, G-Floor	Innovative	Bon Arch. Office	2012-2014
Treatment	Reinforcement of Foundation				

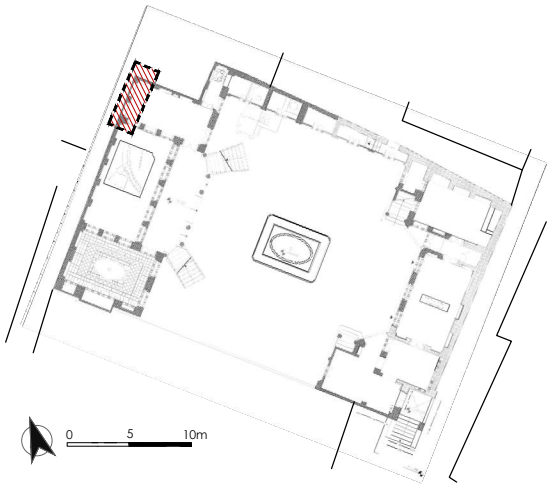
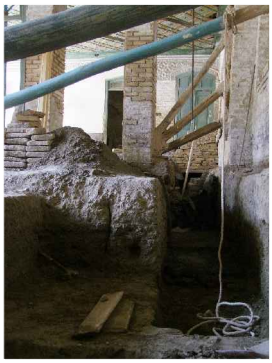


Fig. 4.10.1 The traditional foundation of Darugheh House, (location: *hoz-khaneh*, *pond room*); it is made of artificial ground on the virgin soil, construction of a layer of mud-lime mortar along with a wide brick wall at the lower part floor to diagonally transmit the force from the masonry to the foundation.



(a)

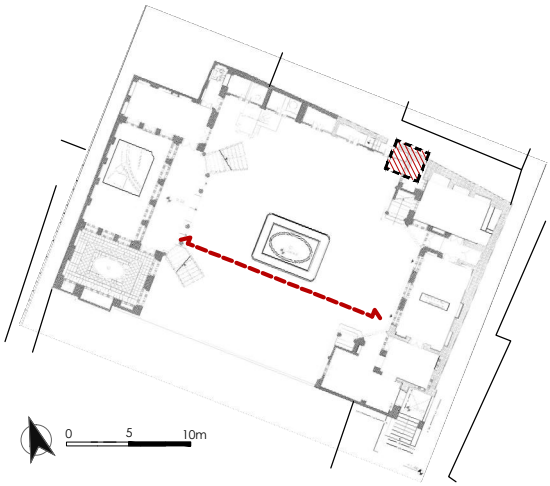
(b)

(c)

(d)

Fig. 4.10.2 Using the reinforced concrete for the parts whose foundation required to be strengthened; (a) a part of the floor, near the wall, is excavated for a width and depth of 50 cm, (b) workers tying steel reinforcing bars with wire to strengthen the foundation, (c) placing a layer of insulation nylon on the ground before the framework in order to prevent the clay from absorbing the cement water; concreting (using a mixture of cement and coarse sand), (d) final stage of making foundation; erection of brick rows on the concrete and inserting the moisture disposal pipes before flooring.

Sheet 4.11	Historical House	Location	Methodology	Project Implementer	Date
	Darugheh	SE Building Mass, G-Floor	Innovative	Bon Arch. Office	2012-2014
Treatment	Consolidation and Reconstruction of Masonry				



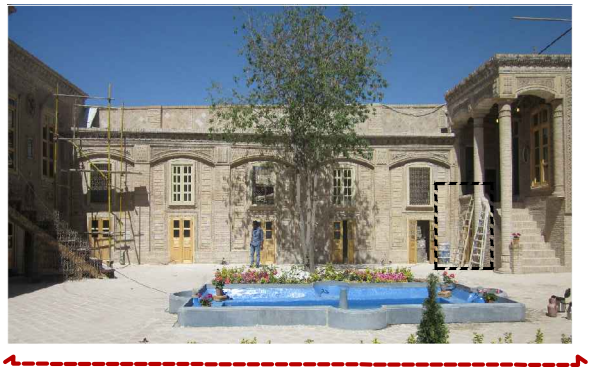


Fig. 4.11.1 The facade of northeastern building mass after the onset of the innovative restoration project.

(a) (b) (c) (d)

Fig. 4.11.2 Implementing the reinforcement steel in the masonry; (a) evacuating a portion of the masonry from one side to recreate it with a reinforced concrete core, (b) concreting (cement-coarse sand mixture), (c) using a tied rebar beam in the masonry before its rebuilding, (d) rebuilding the wall; making two flooring brick rows and implementing the next brick rows only at the edges; the empty central part of the masonry has been filled by a mortar of cement and coarse-grained sand.

Sheet 4.12	Historical House	Location	Methodology	Project Implementer	Date
	Darugheh	NW Building Mass, G-Floor	Innovative	Bon Arch. Office	2012-2014
Treatment	Consolidation of Balcony				

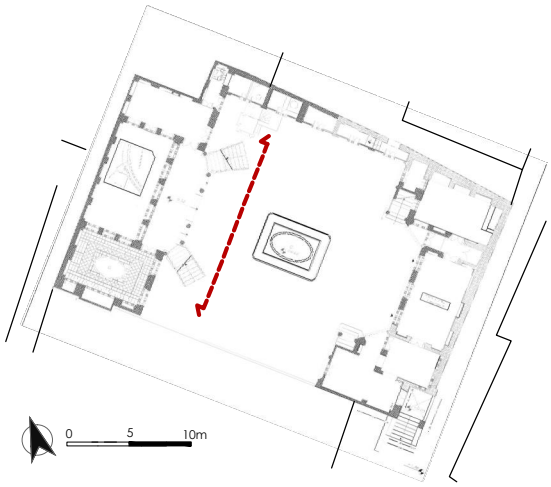


Fig. 4.12.1 Deformation of the balcony in the northwest building mass.

(a)

(b)

(c)

Fig. 4.12.2 Consolidation of the balcony; (a) a view of the balcony in the northwestern building mass after reinforcing, (b) utilization of steel girder under the balcony to reinforce the structure where deformed, (c) jointing the brick wall and steel girder by steel plates.

Sheet 4.13	Historical House	Location	Methodology	Project Implementer	Date
	Darugheh	Southeastern Building Mass	Innovative	Bon Arch. Office	2012-2014
Treatment	Reconstruction of brick facade				

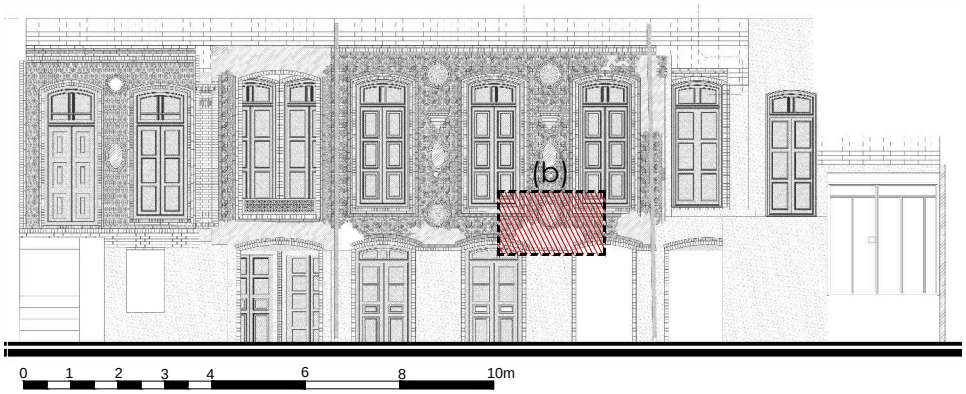


Fig. 4.13.1 The southeastern building mass in the last phase of the restoration.

1 The first method: *sottosquadro;*

(a)

(b)

(c)

Fig. 4.13.2 Restoration of lacuna; (a) the southeastern facade after removing the white cement layer from the lower part and before the onset of restoration, (b) *sottosquadro* method; separating the restored part and earlier materials by leaving a little distance prior to the alignment of the original brick rows, (c) the strong sign of *sottosquadro*; original bricks (above) and restoration (blew).

2 The second method: Use of the bricks of the same shape and smooth surfaces;

Fig. 4.13.3 Reconstructing the damaged part of the walls with recycled bricks that are the same in terms of shape and size, avoiding the use of bricks that have the geometric pattern to highlight the two types of material, reused and original.

As mentioned on the sheet. 4.10, in the original foundation, the clinker clay-bricks along with the mud-lime mortar used to create a moisture-resistant foundation. However, in some parts of the building where it was necessary to strengthen the foundation, these materials are replaced by reinforced concrete. Although these current material are not compatible with the traditional elements, but, concrete has high compressive strength and is an available and low-cost material. In order to prevent moisture retention in the concrete foundation, during the flooring the moisture disposal pipes have been inserted at 1-m intervals from each other. In addition, the utilization of reinforcement bars as a frame in masonries can be a proper method to replace the vertical wooden poles inserted in traditional methods. Also, to increase the strength of the structures against earthquakes, an armed construction integrated with cement-coarse sand mortar will not undergo erosion or decay of traditional materials owing to moisture and insect attacks. Arch. Govahi, the supervisor of the restoration project, states about the use of cement mortar that, "*Although cement is considered to be an inappropriate material for repairing traditional-historical buildings, buildings constructed or restored in Mashhad with this material during the first Pahlavi era (1925-1941) are still durable and resistant after about a century*. *Also, the reason for not using more suitable mortar like bâtard (lime + cement + dune sand) is because of its high cost in Iran*."

The innovative measures implemented in both components: foundation and masonry, are invisible due to use of brick rows (traditional material) that brings a homogeneous aspect to the building. Although, in some treatments such as balcony consolidation use of the steel elements in a visibly manner was intentional to highlight between the restored and the original parts. Moreover, the high strength of the steel girder against pressure force was the main reason for placing it under terrace instead of utilizing wooden beam. Implementation of steel pillars and frames have been widely common in consolidation of Mashhad historical buildings since 1970s, which has made them durable after more than forty years.

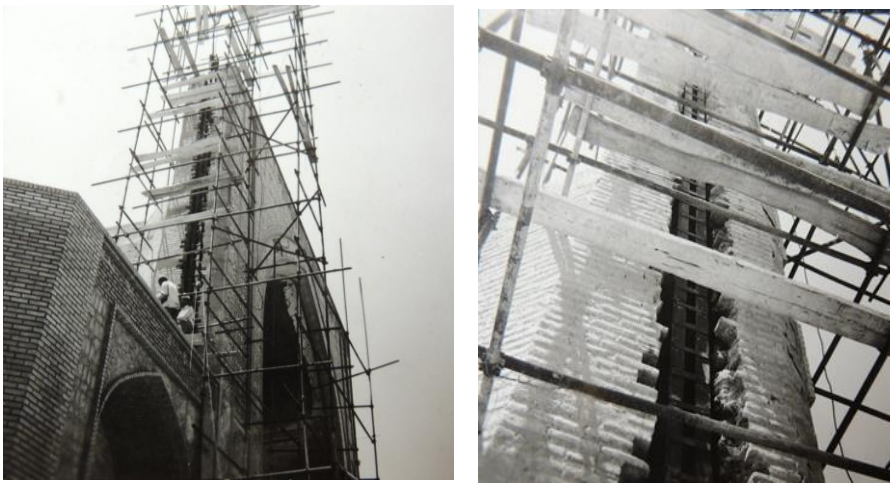
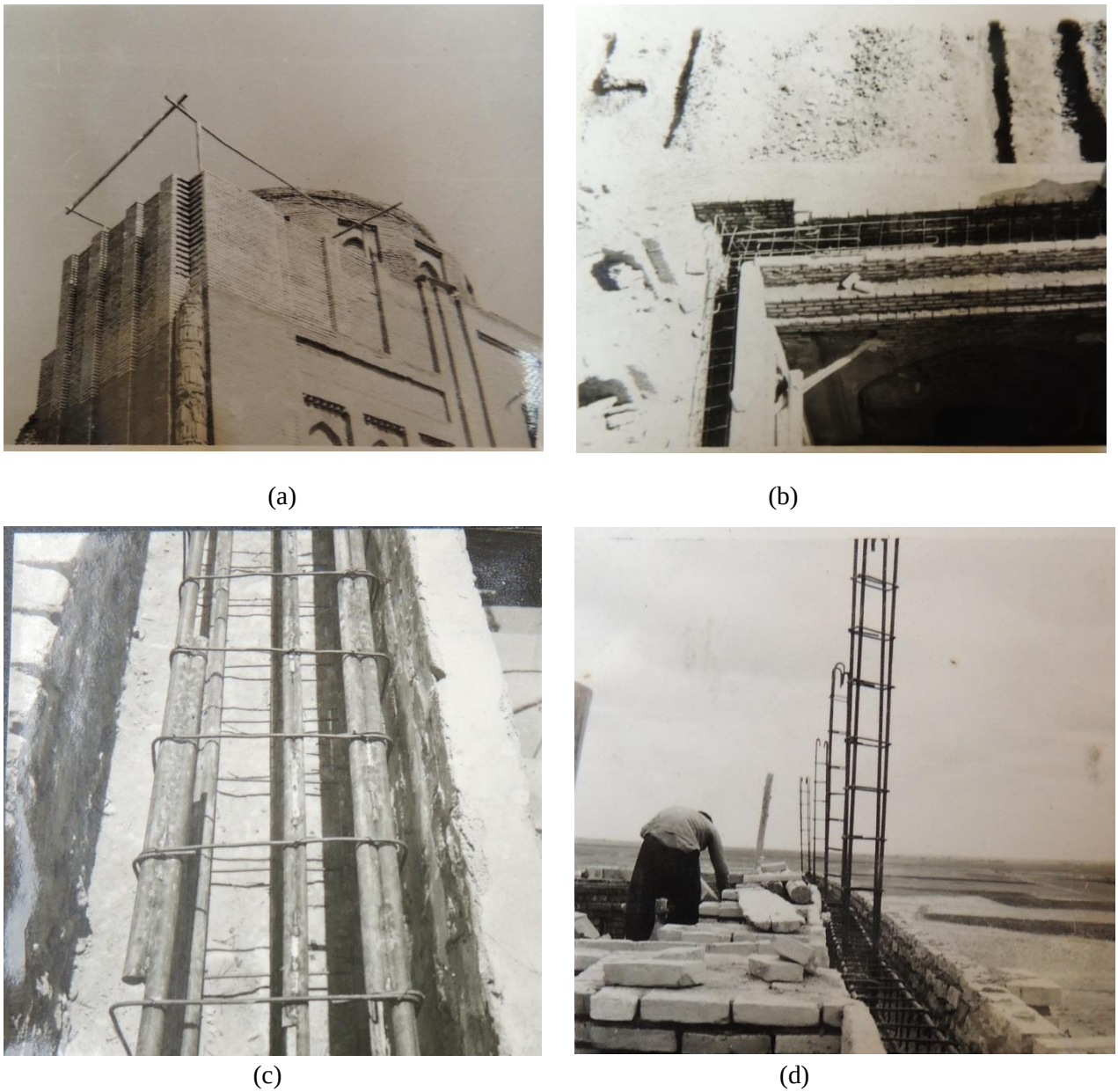


Figure 4.13 Implementation of steel structure in consolidation of Paien Khiyaban's Mosalla, 1973; insertion of steel column in the brick masonry.



(a) (b)

(c) (d)

Figure 4.14 Implementation of steel structure in restoration of Harun Dome, 1974; (a) Harun Dome, a public building in which the higher portion of the ruined brick wall is reconstructed, (b) making the formwork for reinforcement of concert on the roof using the rebar, (c) close-up image; steel reinforcing bars are tied together with wires, (d) linking between the horizontal reinforcement and vertical steel armature.

Regarding the reconstruction of facades, the integration of Anastylosis Restoration with innovative system should be accepted as an optional measure that aimed to respect the historical values of original materials. By reutilization of dismantled components, it is also attempted to preserve what have become part of history and architecture of the city.[245] However, the removal and relocation of

[245] UNESCO appreciated the reutilization of original and reused materials in restoration of Darugheh House; *"[..] the project preserved the original building's scale and footprint with a focus on the retention of original materials and reuse of materials from demolished adjacent buildings [..]. Amidst the rapid pace of development now transforming Mashhad, the restored Darugheh House provides validation for the continuing relevance of traditional spaces in contemporary urban life."* (http://www.unairan.org/2016/09/06/iran-among-unesco-asia-pacific-heritage-awards-winners/; accessed date: December 15, 2017)

structural-architectural elements in historical houses which have a certain destruction ahead could be defined as a last-resort for conservation. This proposed measure derives from the fact that protection of houses in their own sites is almost impossible in most cases due to urban development plans. Thus, sometimes displacement of buildings could be carried out entirely or partly for urban renewal purposes.


Figure 4.15 The bricks and decorative ceiling elements which collected from demolished houses and conserved for reusing. (Govahi 2014)

Even though according to restoration theories, removal or relocation of heritage in the whole or part of the architecture has been rejected, it is justifiable only in exceptional cases in which it is impossible or harmful to intervene with other means of conservation.[246]

For protection of buildings not recognized as national heritage, perhaps dismantling and reassembling could be a reasonable option. Such structures have monumental and historical values, yet they might not be registered due to existing laws and they would be demolished under the development pressure

[246] ICOMOS Charter 2003, 3.17. Venice International Charter, 1964; Art. 7; "*A monument is inseparable from the history to which it bears witness and from the setting in which it occurs. The moving of all or part of a monument cannot be allowed except where the safeguarding of that monument demands it or where it is justified by national or international interest of paramount importance*." (https://www.icomos.org/en/charters-and-other-doctrinal-texts; accessed date: November 5, 2017)
ICOMOS New Zealand Charter 2010; "*The on-going association of a structure or feature of cultural heritage value with its location, site, curtilage, and setting is essential to its authenticity and integrity. Therefore, a structure or feature of cultural heritage value should remain on its original site. Relocation of a structure or feature of cultural heritage value, where its removal is required in order to clear its site for a different purpose or construction, or where its removal is required to enable its use on a different site, is not a desirable outcome and is not a conservation process. In exceptional circumstances, a structure of cultural heritage value may be relocated if its current site is in imminent danger, and if all other means of retaining the structure in its current location have been exhausted. In this event, the new location should provide a setting compatible with the cultural heritage value of the structure*."
(https://www.icomos.org/images/DOCUMENTS/Charters/ICOMOS_NZ_Charter_2010_FINAL_11_Oct_2010.pdf; accessed date: November 5, 2017)

instead. Therefore, actions must be taken before the houses would be destroyed through a precise architectural survey and understanding of their structure and materials.

(a) (b)

(c) (d)

Figure 4.16 Dismantling process of the entrance materials in a traditional house located in Noghan district; (a) survey measurement, (b) dismantling the brick fragments, (c) coding and arrangement of materials on the ground by following the original pattern, (d) packing the components in separated boxes and transferring them to the warehouse. (April 12, 2017)

Fig. 4.16 shows the dismantling process of a traditional house before its demolition in April 2017 caused by creation of an urban road (Razavi Sharestan). Almost all the spaces including the courtyard, rooms and the octagonal lobby entrance have been measured and the bricks have been coded with an identifying number based on their shape and patterns so that each piece could be reassembled accordingly in another site. At the end of the process, the bricks were packed and transferred to the municipality warehouse.

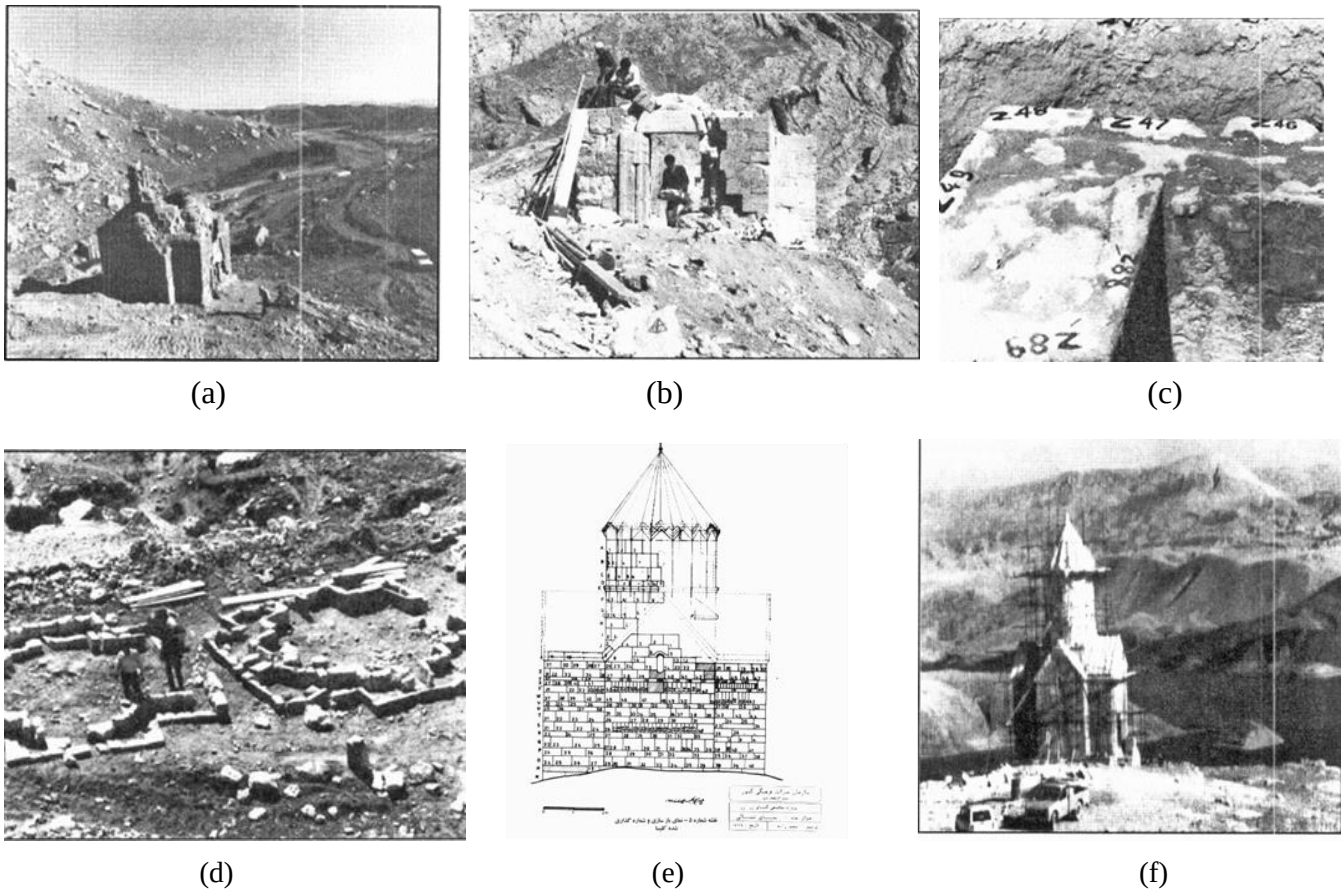
Figure 4.17 The state of the house and its location before and after the destruction. (May 1, 2017)

(a) (b) (c)

(e) (d)

Figure 4.18 Removal of the historical stuccoes, including; (a) Position of the elements on the wall, (b) Survey measurement, (c) Dismantling, (d) Executing the first maintenance in place, and (e) Packing for relocation.

The same method is also applicable for dismantling the decorative elements that are at risk of destruction. Fig. 4.18 presents removal of stuccoes that were only elements remained from earlier Mashhad police office which was built under I Pahlavi era (1925-1941). The building was demolished by the municipality for the construction of a subway line, however, these decorations were still on the sidewalk. The removal of stuccoes has been undertaken by survey, measurement process, removing, coding the pieces with different numbers and primitive conservation in place by using of wire mesh and gypsum mortar. In the end, it was departed to the warehouse of the municipality to be decided upon in a new place. In exceptional situations, relocation is preferable to demolition, however, the removal and re-erection should be the last option when all else conservation methods have failed.



(a) (b) (c)

(d) (e) (f)

Figure 4.19 The removal and relocation of Dzordzor Chapel; (a) Building in its original site, (b) Dismantling the stone fragments, (c) Coding, (d) Arrangement of materials on the ground by following the original pattern, (e) Renovating the facade and numbering the dismantled parts on it, and (f) View of the church after rebuilding. (Heidari, 2005)

The most well-known national examples of removal and reassembling are Armenian Chapel of Dzordzor located in West Azerbaijan and Rural Open-Air Museum in Gilan. Relocation of the Chapel of Dzordzor in 1987-1988 by the Iranian authorities was performed because of constructing a dam on the Zangmar River in the area of the church. At first, the intervention has included survey,

categorizing and coding the materials of the building. At the stage of the study, a separate plan and design was prepared for each row of the stones in the facade. The internal and external surfaces are divided in a checkered form and every piece is identified with a number or alphabetical letter highlighted with two different colors, red and black. To match the plans with dismantled fragments of stones, all of the elements were placed on the ground following the original module. The second stage contained the reconstruction of the chapel in the new site by reassembling the components on a concrete platform built to create a *mastaba* equal to the former cliff. Rebuilding has taken three months, in which, in addition to erecting all of the structural-architectural elements, the ruined dome was also reconstructed according to the Armenian Church.[247]

Gilan Rural Heritage Museum, the winner of Aghakhan award, is another national example of relocation and reassembling. The museum contains eighteen cottages from nine villages which have been removed and rebuilt between 2004 and 2008 on the new setting of Saravan Forest, near Rasht, north of Iran. The idea of creating this museum comes from the march of modernity as well as national disasters, notably the earthquake in 1990, to present traditional architecture and techniques of different areas in Gilan.

The separation of each rural house, has firstly begun after measuring and preparing the plans, facades and details of their components. After measuring all architectural,

structural and decorative fragments, identification of the parts begins with a specific number. Dismantling should be first started by removal of fragile elements as in decorations and then continued to large components.

The reconstruction must be undertaken in such a way that the building is in line with the original form with loyalty to the traditional construction technique. The reassembling was carried out based on the plan of the building implemented on the ground and the location of columns and walls. Placing the elements and materials are in accordance with the original design continued until the complete reconstruction of the building. Like similar techniques in Mashhad, in the re-erection of some parts, the reused materials collected from the ruined similar houses are employed because of compatibility between the materials. [248]

[247] Heidari Ebrahim, "A report on saving and displacement of the Dzordzor Chapel," *Athar Journal*, N. 37-38, (2005). (journal.richt.ir/athar/article-1-310-fa.pdf, accessed date: November 10, 2017)

[248] Taleghani Mahmoud, *Muosa zadeh House; The heritage of rural architecture in Gilan*, Tehran; Matn, 2011.

(a) (b)

Figure 4.20 The removal project of Muosa Zadeh House; (a) dismantling the mud walls, (b) identification of architectural components. (Taleghani 2011)

Figure 4.21 Rebuilding the dismantled pieces in a new site in Gilan Rural Heritage Museum. (Taleghani 2011)

Figure 4.22 The earlier state of Muosa Zadeh House before dismantling and its current state in the new site. (Taleghani 2011)

4.4 Conclusion

Presence of the burial place of the eighth Imam of the Shiites is the most important factor for which Mashhad turned into the second largest city in Iran from the small village of Sanabad. The fact that the city is along the Silk Road and near major cities such as Herat also made Iranian rulers select this town as one of the main centers for government. This choice led to the creation of the city core accompanying the sanctuary at the center, the first quarters and great public buildings. The growth and development of Mashhad from the 14th century onward changed it from a pilgrimage town into a relatively good economic center, to which many residents of neighboring areas migrated. With the population growth, gardens within the city wall were replaced by neighborhoods and dwellings. Upon the turn of the 20th century and arrival of modernity in Iran, the historical identity of the city has been disappearing and changing to the present era when modern architecture takes over the traditional buildings in the historic district of the city. These transformations are all aimed at attracting religious tourists and providing services to them and, as a result, improving the city's economic resources. The victims of current condition in Mashhad are both tangible and intangible cultural heritage, including traditional houses and craftsmanship which are respectively part of history and cultural identity of the city. As already mentioned, the new city's master plan is not the only cause of destructions of such habitations, the will of householders themselves also make a more contribution than the government in this regard. As a matter of fact, due to economic exploitation, owners convert their property into accommodations for pilgrims or warehouses for marketers 'merchandise. This changing of function brings a lot of damage to dwelling, increase the vulnerability of the building and reduce its durability. Undoubtedly, considering the existing laws and complications in the domain of registration of monuments, as well as recognition of these buildings as heritage cannot be a permanent solution to protect them from future destructions.[249]

Evidence shows that no specific guidelines can be defined to safeguard the survived houses which are at risk of demolition. Perhaps, the only applicable solution to deal with this issue is to encourage the community to collaborate with the government for conservation and revitalization of the traditional houses. Achieving this goal necessitates the creation of sensitivity in the general public to the protection of their cultural heritage. Awareness of destruction of a number of historical houses as tangible heritage and the disappearance of craftsmanship as a longstanding tradition should first start from the educational institutions, schools and universities.

Safeguarding the cultural heritage will be possible through the transmission of craftsmen's knowledge and skills to young generation, to focus on preserving craft fruits and historical buildings. To this end,

[249] Based on documents on elimination of registered houses, it can be concluded that the act of registering a building per se cannot guarantee its maintenance.

the existence of a series of activities in school lesson plans and academic knowledge would be essential. First of all, learning about guilds were vital units of Persian economic life which concluded variously specialized artisans who have spent long periods of time learning the craft before being entitled master.[250]

Secondly, the need would be met by means of learning skills and practicing the crafts within communities through integration of empirical knowledge of specialized artisans in educational institutions course plans. This integration not only increases students' abilities and improves artisans' livelihoods status but also may serve as a wake-up call to the community on preservation of their creations. So, any historical habitation is the creation of a traditional craftsmanship which must be appreciated and protected.

Considering Mashhad's current and specific condition, the conservation and revitalization process of the survived traditional houses requires a collaboration between the community (individuals and private sector) and the state (government organizations). In the meantime, owners, craftsmen and personal investors are categorized under the group of individuals and consulting engineering companies, general contractors, KH-CHHTO, and municipality are subordinate respectively to the private sector and government institutions.

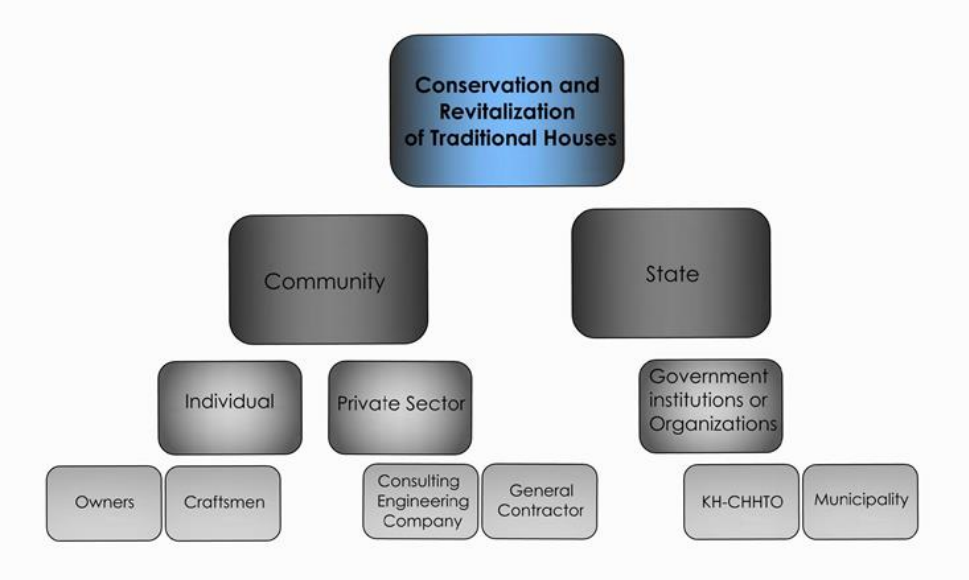


Figure 4.23 The collaboration between the community and the state in protection of heritage.

[250] *"Guilds were essential entities in Persian economic life and it was obligatory for every devoted craftsman to participate in them as a member. If a trader or craftsman wanted to make progress in his career in a guild, he would have to start as a pado – a child employed to do simple craft techniques and deliver small tasks. He would then become a shagerd (apprentice) after having spent enough time learning the craft before being qualified. Moving on, he can obtain permission from the head of the guild in his craft and pay him a sum of money so he can open his own shop as a master. Everyone could be a member in the guild. As a matter of fact, this whole process would be part of a family tradition or hereditary since every son would follow his father's trade instead of establishing his own different or desired field of profession*." (Scarce 2008, pp.896-897).

Each of the groups mentioned above carries a set of responsibilities in order to preserve the traditional-historical houses as follows:

- Owners: allowing the government to register their property as national heritage and acquiring permission from the KH-CHHTO for any structural and architectural operations in their properties.
- Craftsmen: training the new generations through learning about local construction methods to integrate the traditional techniques with innovative approaches in the conservation measures.
- Personal investor: he/she could sponsor the costs of restoration and preservation of traditional houses.
- Consulting engineering companies: this group would mainly include the architectural or engineering offices in which many experts in various fields such as architecture, restoration, and civil engineering present their professional and adopted projects to KH-CHHTO for restoring and consolidating the survived historical building.
- General contractor: restoration processes and conservation methods can be implemented under the responsibility of a private company or institute which collaborates with Cultural Heritage Organization.
- KH-CHHTO: due to the lack of government financial resources, the Cultural Heritage, Handcrafts and Tourism Organization must encourage public and private organizations or individuals to invest in restoration and revitalization of traditional houses.
- Municipality: it can preserve the city's historical and cultural identity through purchasing these houses and covering the costs of their revitalization. While the destruction of traditional houses has meant to provide facilities to pilgrims and create a source of income for the city, changing the use of dwellings from habitation into accommodations, cafés or museums can inspire the municipality to invest in heritage protection filed.[251] This change of use, in addition to revenue generation for the city, could bring a source of income for both owners and sponsors.

To sum up, by demolition of traditional houses in Mashhad, tangible and intangible heritage of the city are about to disappear. Therefore, in order to preserve these values, necessary actions have to be taken to revitalize the dwelling and prevent the loss of traditional craftsmanship through participation of state and community in heritage conservation at the same time.

[251] Currently, one of the registered houses (Balkhaseb) is in the process of being restored in cooperation with the owner and the KH-CHHTO. It is going to be used as the first traditional hotel in Mashhad next year. In other cities of Iran, including Kashan and Yazd, many similar traditional hotels can be found.

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APPENDIX I

SERIES 1501 AIR
SHEET NJ 40-16
EDITION 3

POPULATED PLACES
Over 100,000 ..... TEHRĀN
50,000 to 100,000 ..... KERMANSHĀH
10,000 to 50,000 ..... Abādān
2,000 to 10,000 ..... Jask

ROADS
Dual highway ..... 4 LANES DUAL
All weather, hard surface
More than two lanes wide ..... 3 LANES
Two lanes wide
One lane wide
All weather, loose or light surface
More than two lanes wide ..... 3 LANES
Two lanes wide
One lane wide
Fair or dry weather, loose surface
Cart track, trail

RAILROADS
Normal gauge 1.44M (4'8½") ..... Single track / Multiple track
Narrow gauge

BOUNDARIES
International
First-order administrative division
Second-order administrative division

HYPSOGRAPHY
Dunes: ripple; lateral
Sand

HYDROGRAPHY
Wadi
Underground aqueduct with shafts
Well; Spring
Reef; Limit of danger
Intermittent stream

VEGETATION
Woods
Orchard or vineyard

OTHER FEATURES
Landmark
Mine

TERRAIN ELEVATIONS
Spot elevation: normal; critical ..... •504 ▪1900
HIGHEST KNOWN elevation is 10371 feet at the following coordinates:
Geographic ..... 36°58'N, 59°21'E
Grid ..... GF 1094
The accuracy of all elevations shown on this graphic is not within 100 feet.

AERODROMES (Military or Civil)
Runway pattern known EDNA/50/s 725
EDNA–Name
50–Length of longest runway to nearest hundreds of feet
s–Soft or unimproved surface
u–Unknown surface
725–Elevation
Runway pattern unknown
HELIPORT/HELIPAD
HELIPORT/HELIPAD AT HOSPITAL

RADIO FACILITIES
RADIO RANGE LF/MF ..... RNG HURN
MULTIPLE RADIO FACILITIES ..... NDB-RNG PARIS

CONTROLLED AIRSPACE
ADIZ ..... ATLANTIC ADIZ

VISUAL AIDS AND OBSTRUCTIONS
Obstruction 1100 (259)
1100–Elevation of obstruction top, above sea level.
(259)–Elevation of obstruction top, above ground level.
Group obstruction
Radio facility obstruction
Power transmission line ..... <150ft ... ≥150 ft
Visual ground sign ..... M
Aero light; Marine light

CAUTION

Vertical obstructions, including powerlines, have been extracted from the most reliable sources available. However, there is no assurance that all are shown, or that their locations or heights are exact.

CAUTION

AIR INFORMATION CURRENT THROUGH
15 NOVEMBER 1999

Consult NOTAMS and Flight Information Publications for the latest air information; the NIMA Aeronautical Chart Updating Manual or MOD (U.K.) Aeronautical Chart Amendment document, for other chart revision information.

LINES OF EQUAL MAGNETIC VARIATION FOR 1995
(Annual rate of change, no change)

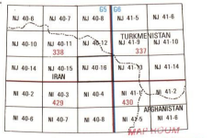
ATTENTION

THIS CHART CONTAINS MAXIMUM ELEVATION FIGURES (MEF)

The Maximum Elevation Figures shown in quadrangles bounded by ticked lines of latitude and longitude are represented in THOUSANDS and HUNDREDS of feet above mean sea level. The MEF is based on information available concerning the highest known feature in each quadrangle, including terrain and obstructions (trees, towers, antennas, etc.). In areas of extensive unreliable relief, the MEF is shown by a note spaced across the area.

EXAMPLE: 12,500 feet 12⁵

LOCATION DIAGRAM
(NJ INDEX SHOWN IN BLUE)
(WAC INDEX SHOWN IN RED/BROWN)



SCALE 1:250,000

MASHHAD, IRAN

SERIES 1501 AIR
SHEET NJ 40-16
EDITION 3

Prepared and published by the National Imagery and Mapping Agency
Compiled 1980. Revised October 1999.

CONVERSION OF ELEVATIONS

FEET	METERS	FEET	METERS
1500	457	30000	9144
1000	305	29000	8096
900	274	10000	3048
800	244	9000	2743
700	213	8000	2438
600	183	7000	2134
500	152	6000	1829
400	122	5000	1524
300	91	4000	1219
200	61	3000	914
150	46	2000	610
100	31	1500	457

COORDINATE CONVERSION WGS 84 TO ED 50:
Grid: Subtract 27mE., Add 181mN.
Geographic: Subtract 1.3" Long., Add 3.8" Lat.

THE DATUM AND ELLIPSOID FOR THIS AREA HAVE BEEN CHANGED. FOR ADJACENT AND OVERLAPPING SHEETS, THERE ARE NO SIGNIFICANT CHANGES IN GRID OR GEOGRAPHIC VALUES AT THIS SCALE.

SAMPLE 1,000 METER REFERENCE

1. Read across, identifying the 100,000 meter square in which the point lies ..... AB
2. Read large numbers labeling the NORTHING grid line left of point 1
Estimate tenths (100 meters) from grid line to point 2
3. Read large numbers labeling the EASTING grid line below point 3
Estimate tenths (100 meters) from grid line to point 4
Example AB1234

WHEN REFERRING OUTSIDE THE GRID ZONE DESIGNATION AREA IN WHICH THE POINT LIES, PREFIX THE GRID ZONE DESIGNATION.
Example 40SAB1234

ELEVATIONS IN FEET

JOINT OPERATIONS GRAPHIC (AIR)

SCALE 1:250,000

5 0 5 10 15 20 Statute Miles
5 0 5 10 15 20 25 30 Kilometers
5 0 5 10 15 Nautical Miles

CONTOUR INTERVAL APPROXIMATELY 330 FEET

BLUE NUMBERED LINES INDICATE THE 10,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONES 40 AND 41, WORLD GEODETIC SYSTEM 1984 ELLIPSOID.

USERS SHOULD REFER CORRECTIONS, ADDITIONS, OR COMMENTS TO THE NIMA CUSTOMER HELP DESK: 1-800-455-0986 COMMERCIAL 314-260-5022, DSN 490-5022, OR WRITE TO: DIRECTOR, NATIONAL IMAGERY AND MAPPING AGENCY, ATTN: CSD, MAIL STOP P-37, 4600 SANGAMORE ROAD, BETHESDA, MD 20816-5003.
(UK USERS) DIRECTORATE OF MILITARY SURVEY, MINISTRY OF DEFENCE, ELMWOOD AVENUE, FELTHAM, MIDDLESEX TW13 7AH.

ELEVATIONS IN FEET

GEOREF BASIC 15° QUADRANGLE

RJ
37° 38° PG 58°30' 59° QQ 60°

GLOSSARY

Cheshmeh ..... spring
Darreh ..... defile, gorge, ravine, valley
Kāl ..... valley, ditch
Kūh ..... mountain
Reshteh ..... mountain range
Rūd ..... stream
Rūdkhāneh ..... stream

ELEVATION TINTS

FEET	
	8860
	2955
	660

RELIABILITY OF THIS GRAPHIC
(as determined by standard practices)

1999

PLOTTING ACCURACY 90% ASSURANCE	
Horizontal ..... within 1277 ft.	
Contours ..... within 281 ft.	
GRAPHIC FEATURE	DATE OF INFORMATION
ALL FEATURES ..... See diagram	

Horizontal Datum: World Geodetic System
Vertical Datum: Mean Sea Level
Transverse Mercator Projection

NOTES

Road classification should be referred to with caution. On this graphic a lane is generally considered as being 2.5 meters (8 feet) in width.

Names for symbolized populated places are omitted where information is not available or where density of detail does not permit their inclusion.

The reliability of vegetation information is undetermined.

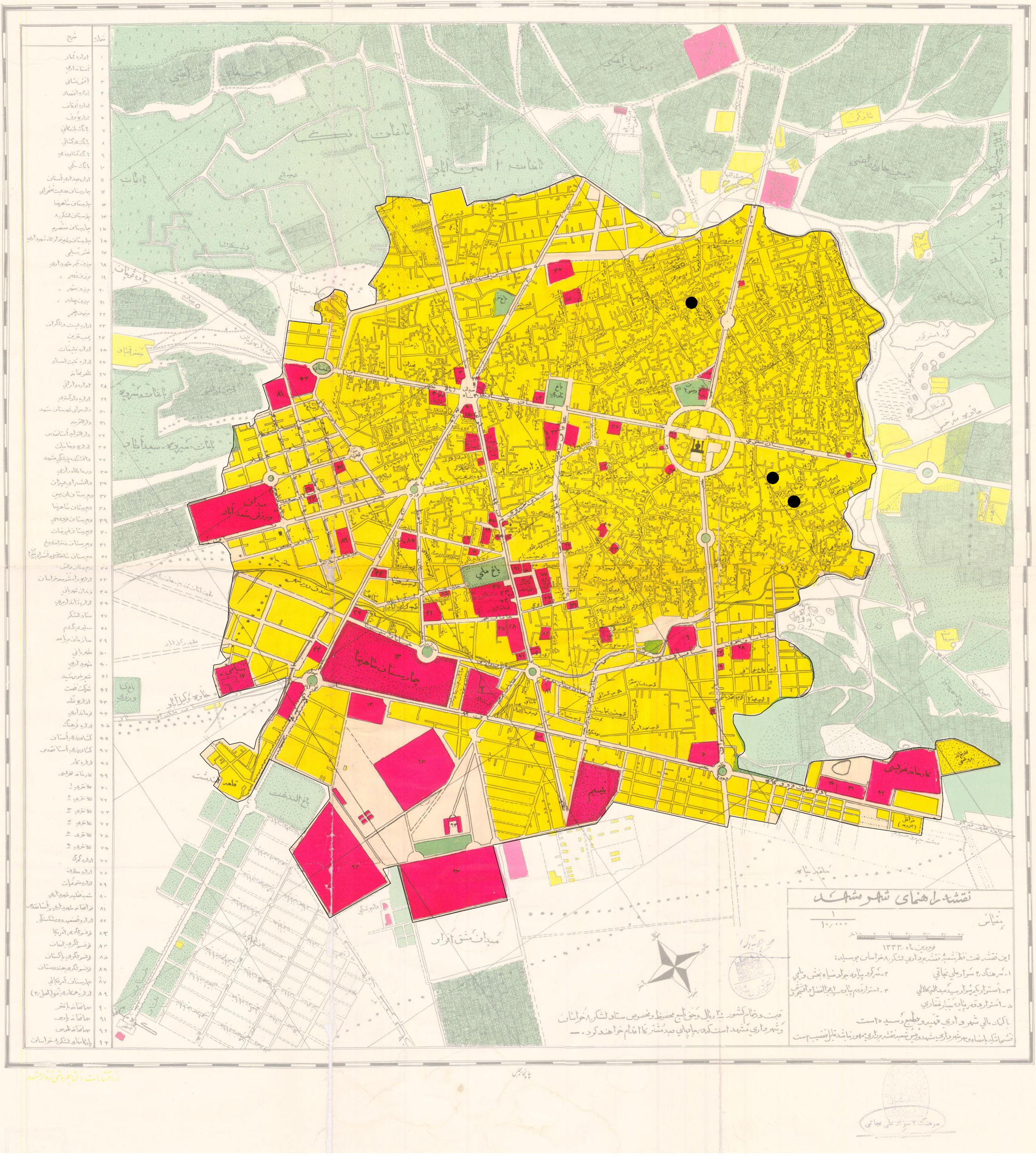
BOUNDARY REPRESENTATION IS NOT NECESSARILY AUTHORITATIVE.

Powerlines are shown except within populated place tints. Other obstructions are shown if they are 150 feet or more above ground level. See caution note.

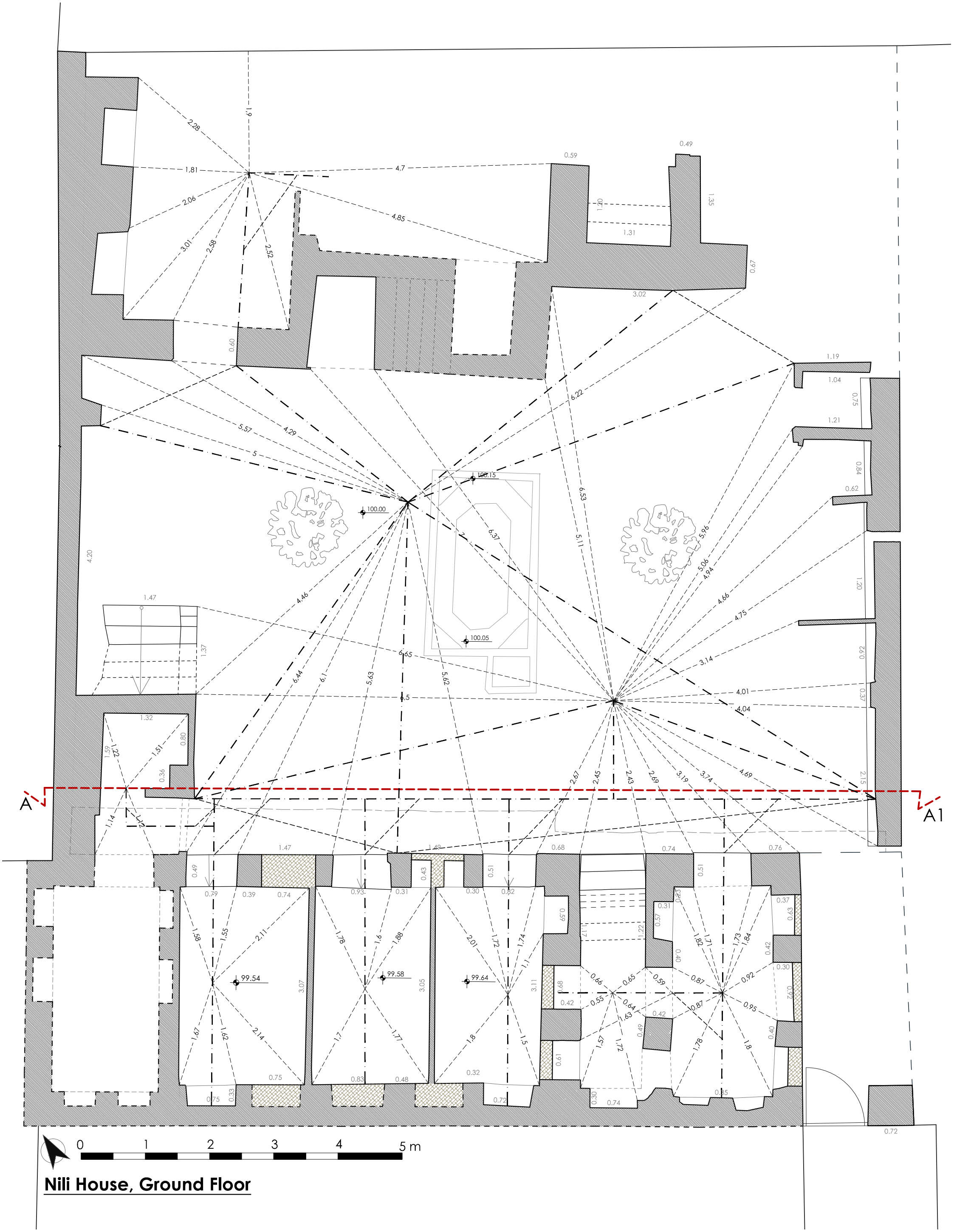
Lithographed by NIMA 03-00

NSN 7641014102456
NIMA REF. NO. 1501ANJ4016
ED. NO. 003

MASHHAD'S MAP,1954



APPENDIX II



Nili House, Ground Floor

A

A1

100.00

100.15

100.05

h:104.48
101.74

h:104.50
101.75

h:104.75
101.76

h:103.51
101.56

101.55

101.52

101.65

100.65

1.64

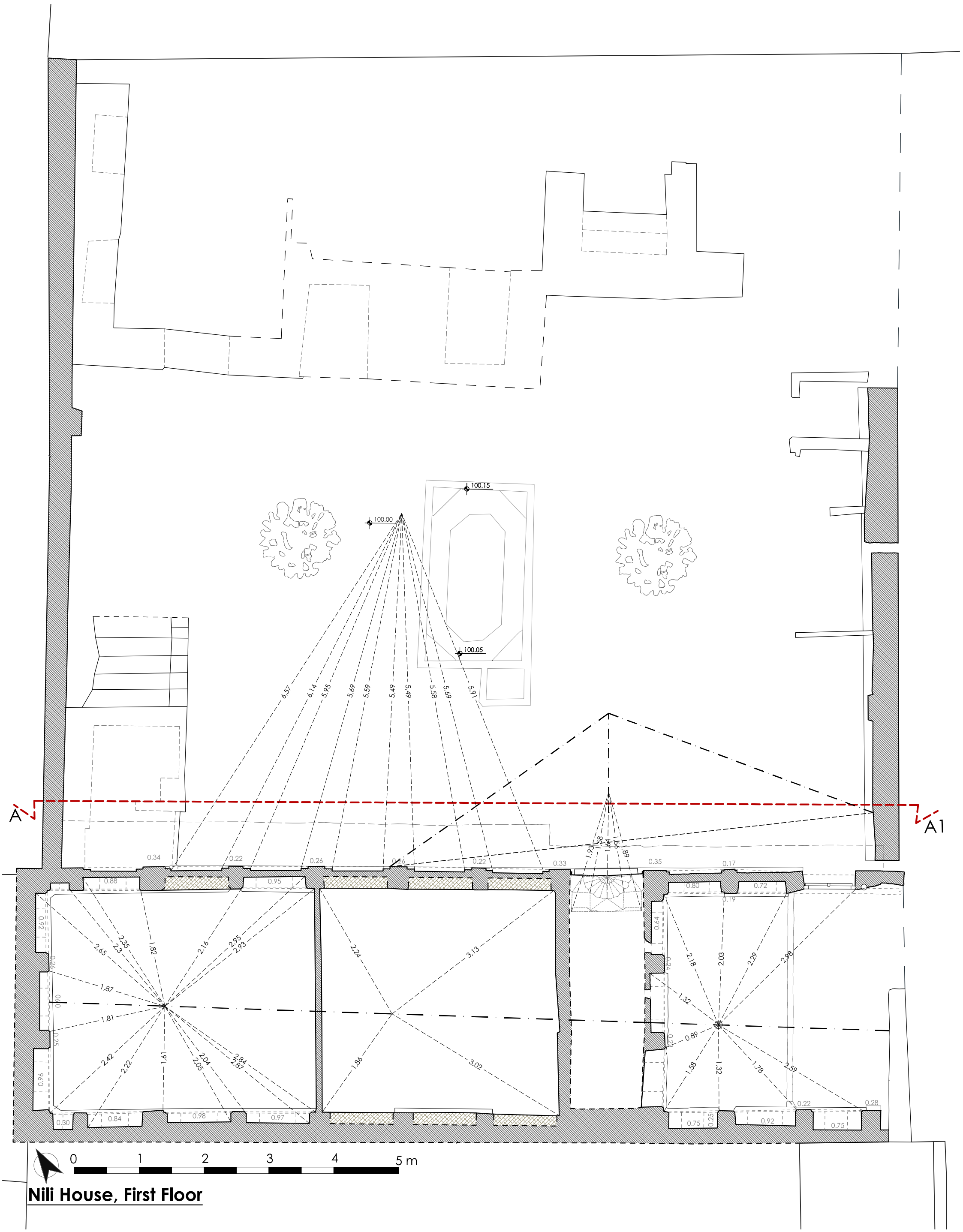
1.3

1.87

1.63

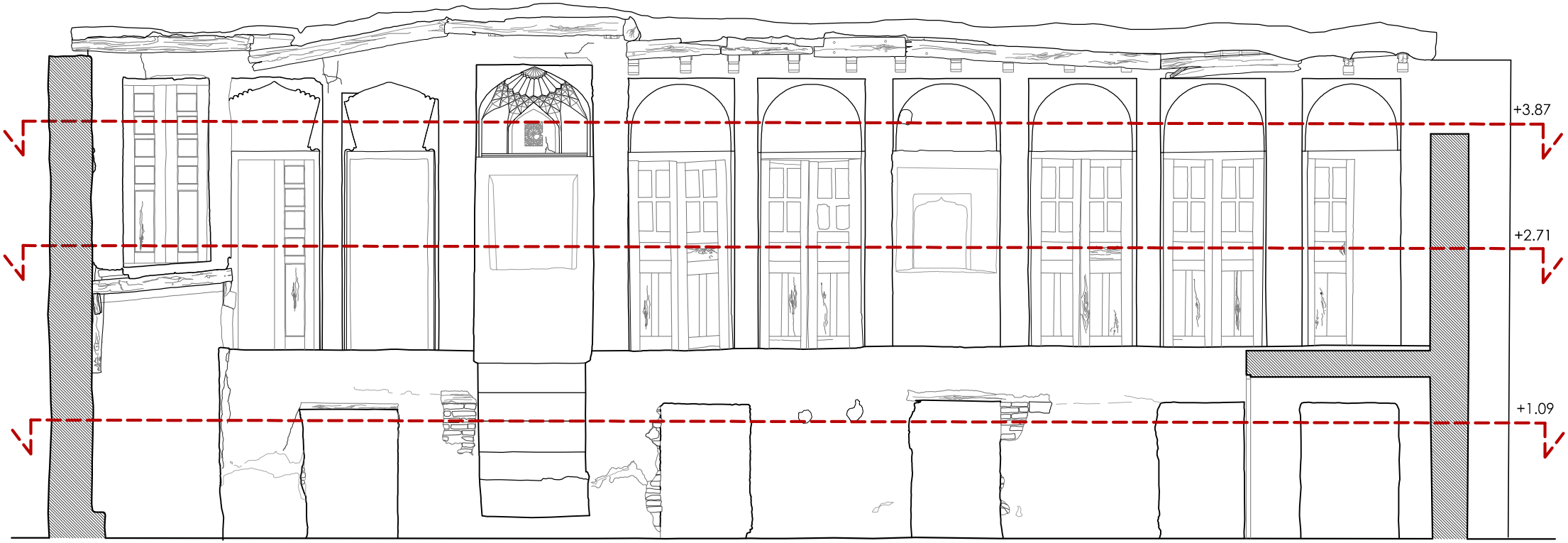
0 1 2 3 4 5 m

Nili House, First Floor

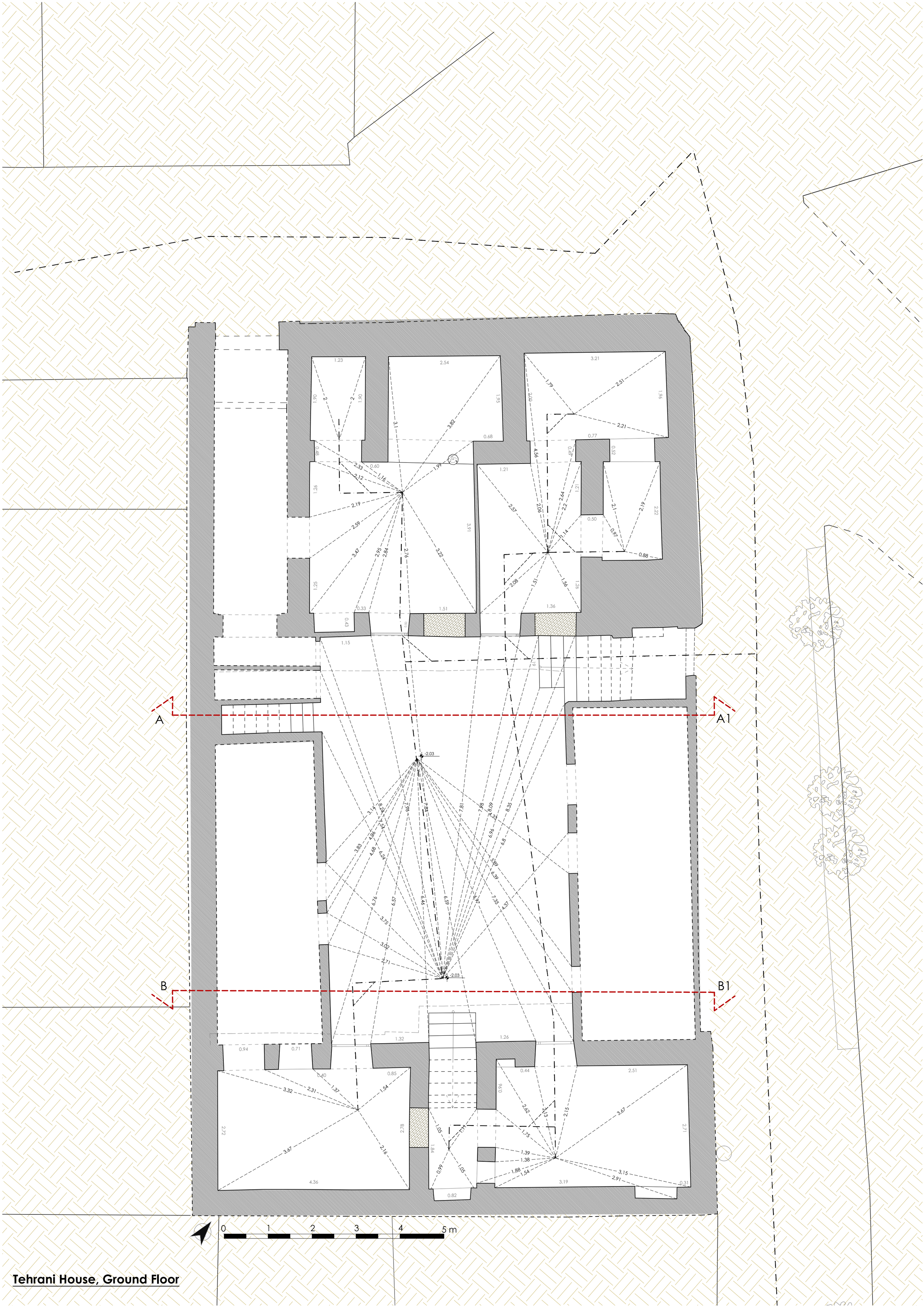


Nili House, First Floor

Nili House, SW Building Mass, Summer Quarter



A_A1 0 1 2 3 4 5 m

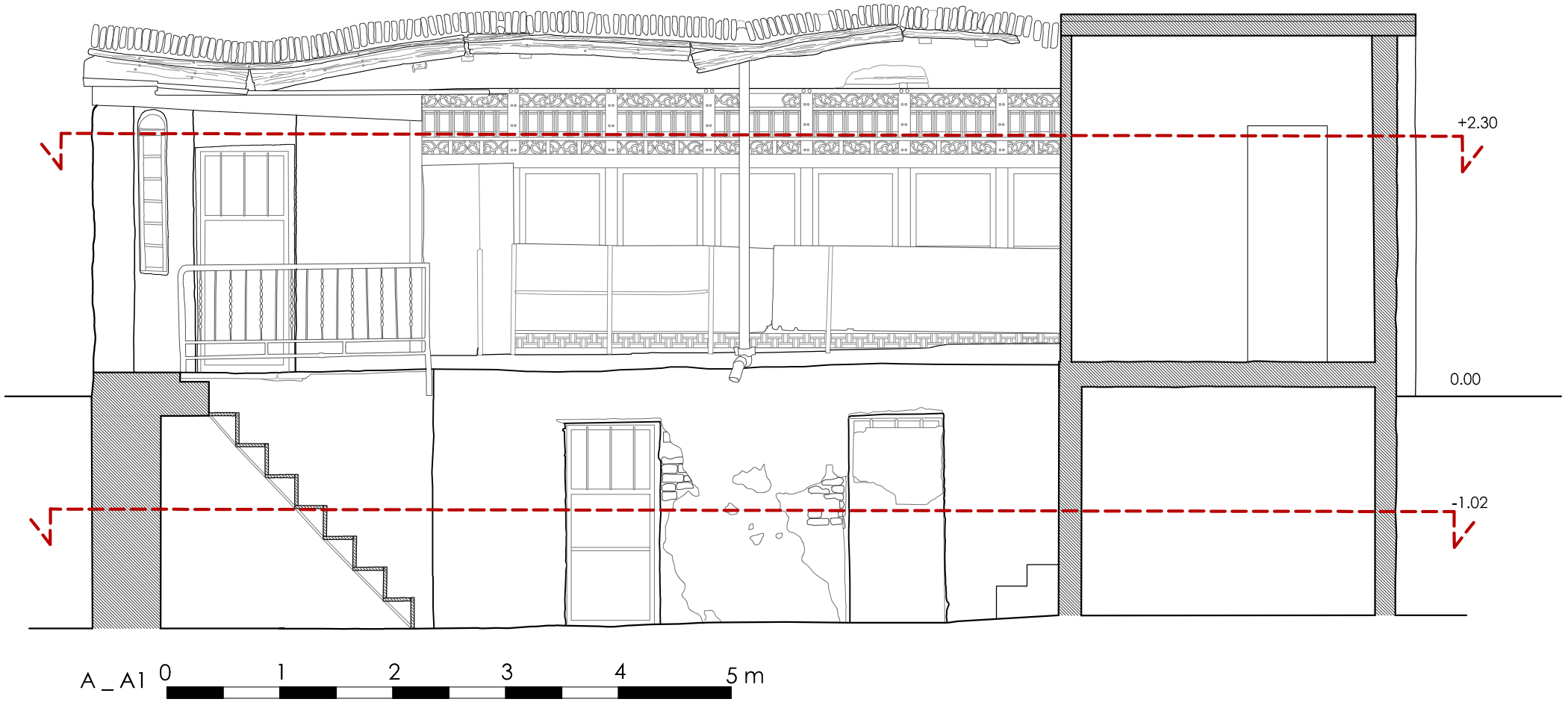


Tehrani House, Ground Floor

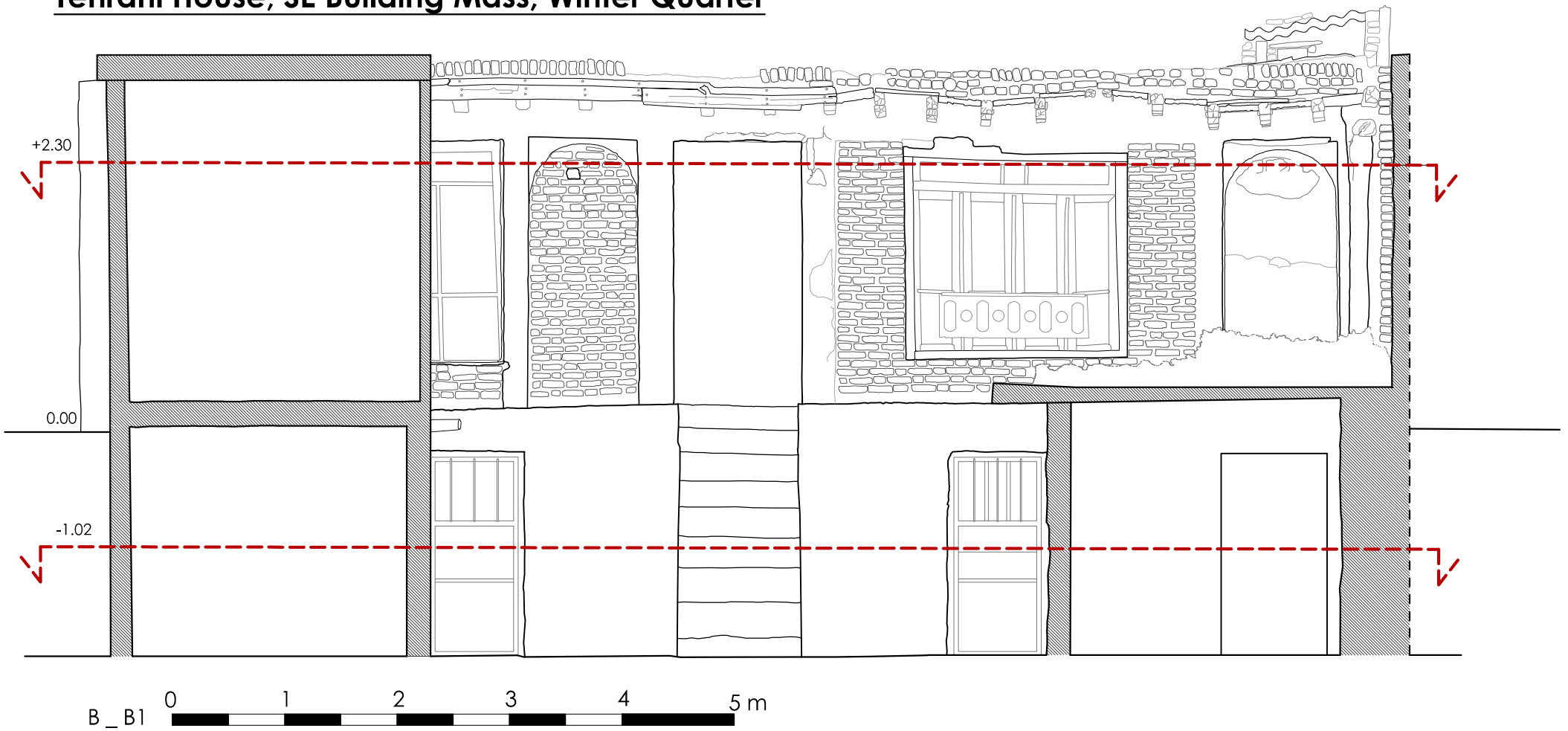
Aziz al-ahof Serai

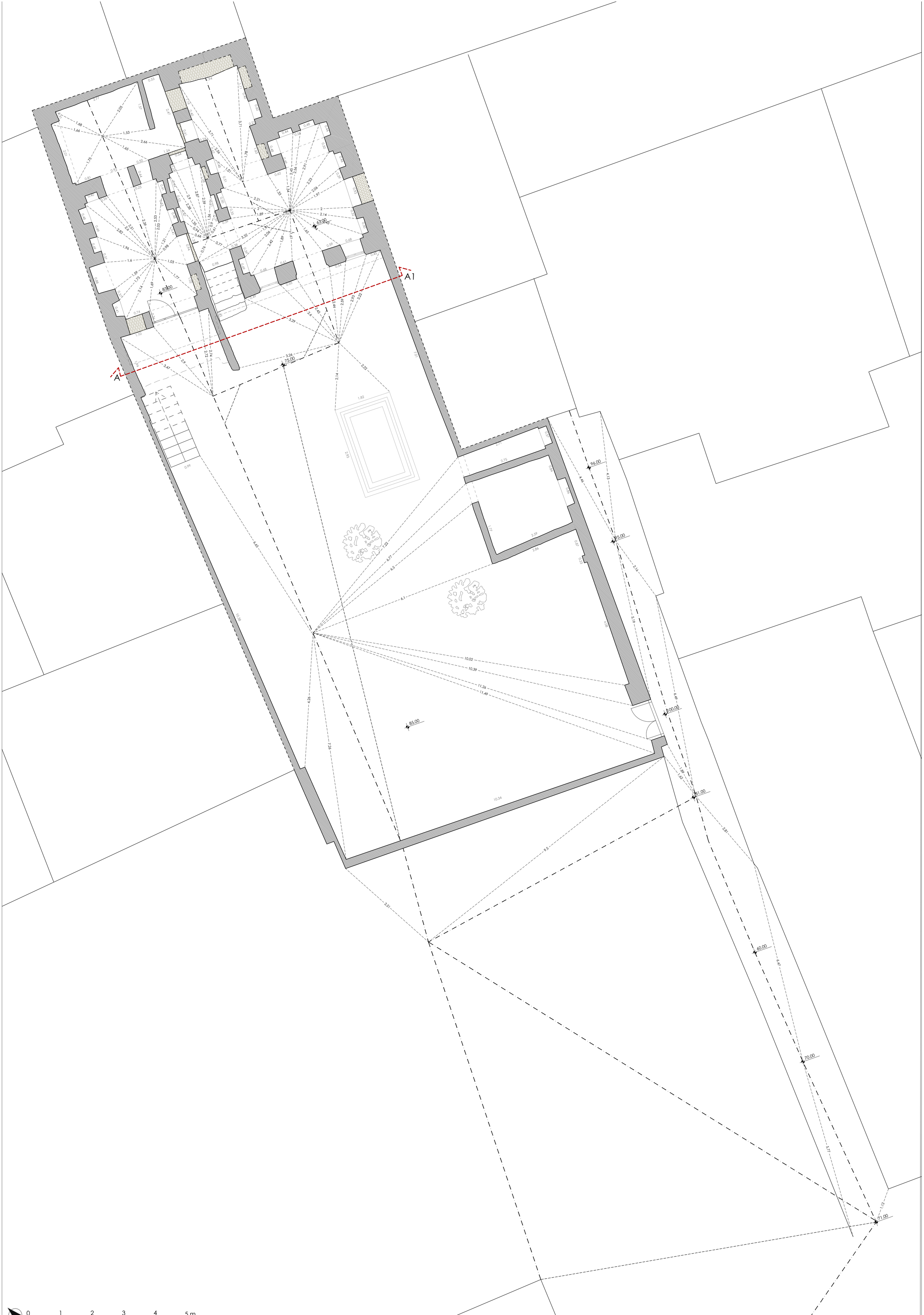
Tehrani House, First Floor

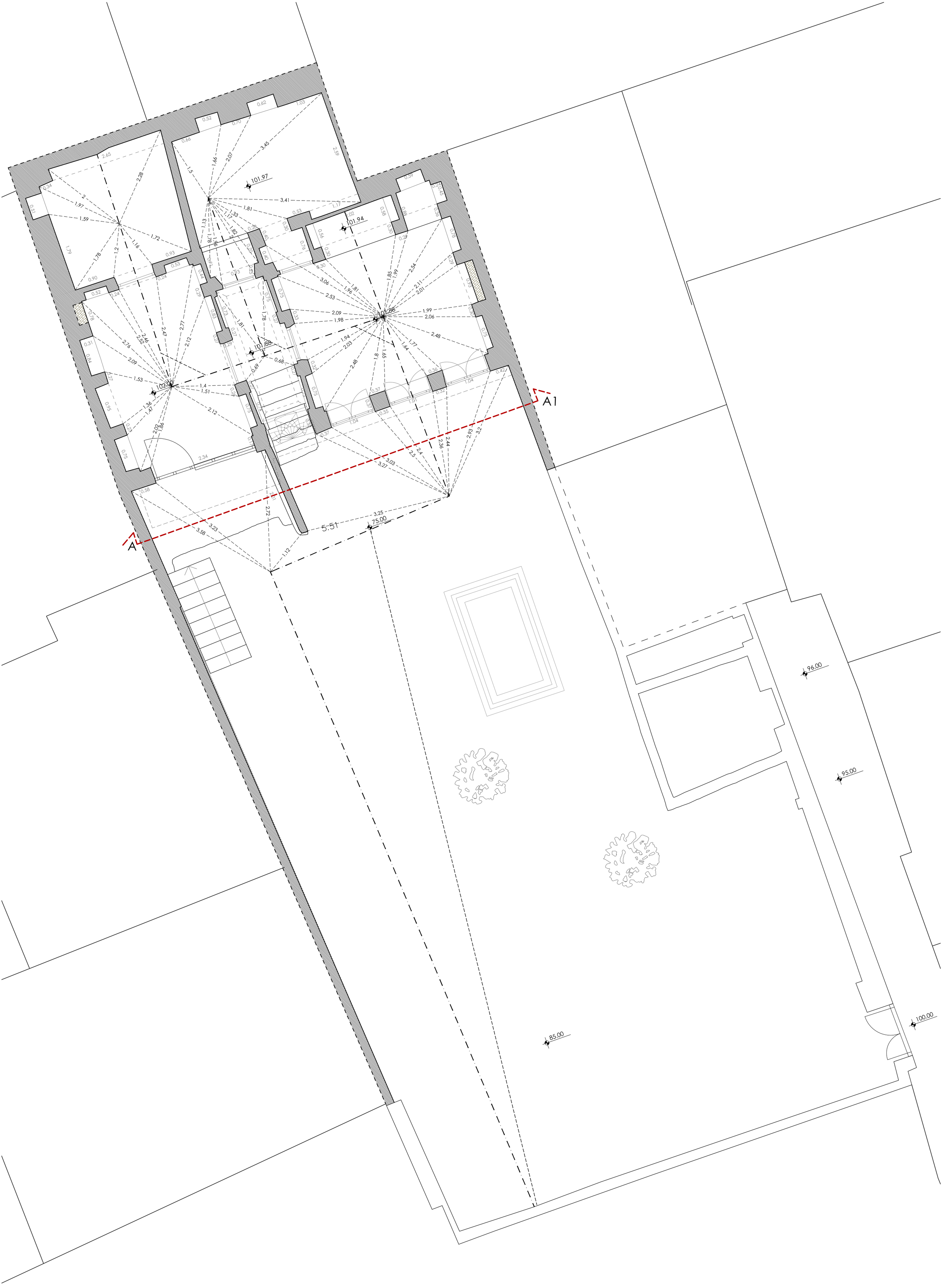
Tehrani House, NW Building, Mass, Summer Quarter



Tehrani House, SE Building Mass, Winter Quarter




A
A1
83.00
75.00
63.00
85.00
96.00
95.00
100.00
81.00
60.00
70.00
71.00
0
1
2
3
4
5 m

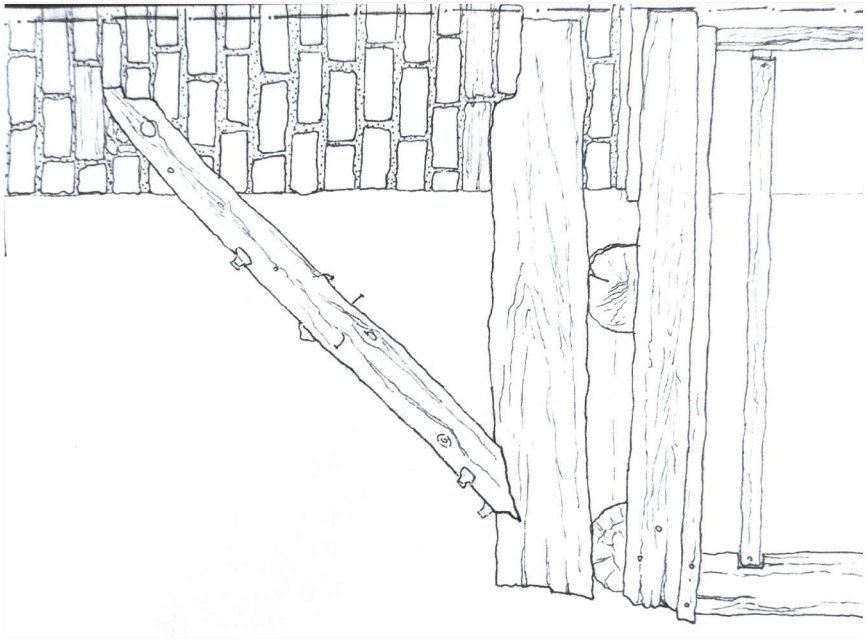


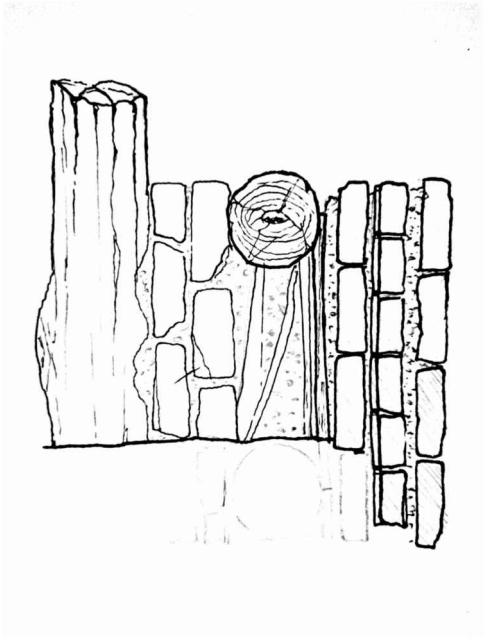
Bidari House,First Floor

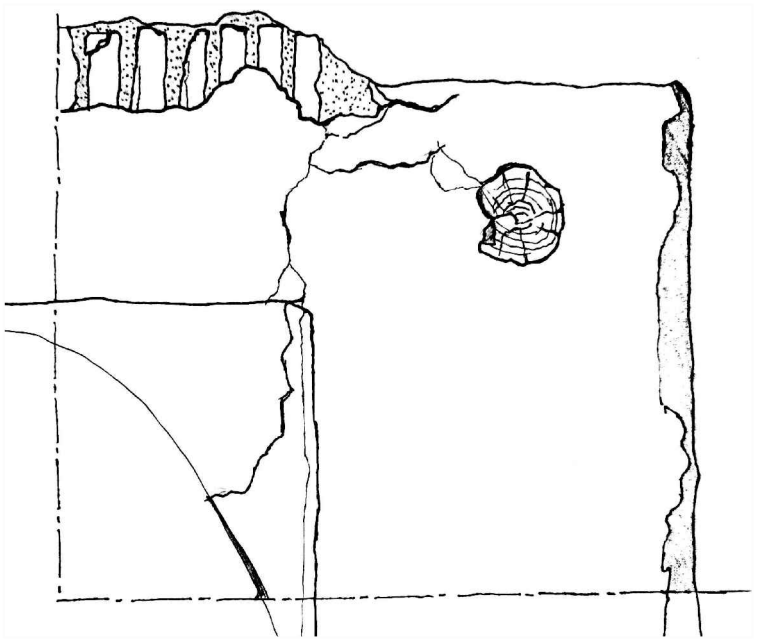
Bidari House, NE Building Mass

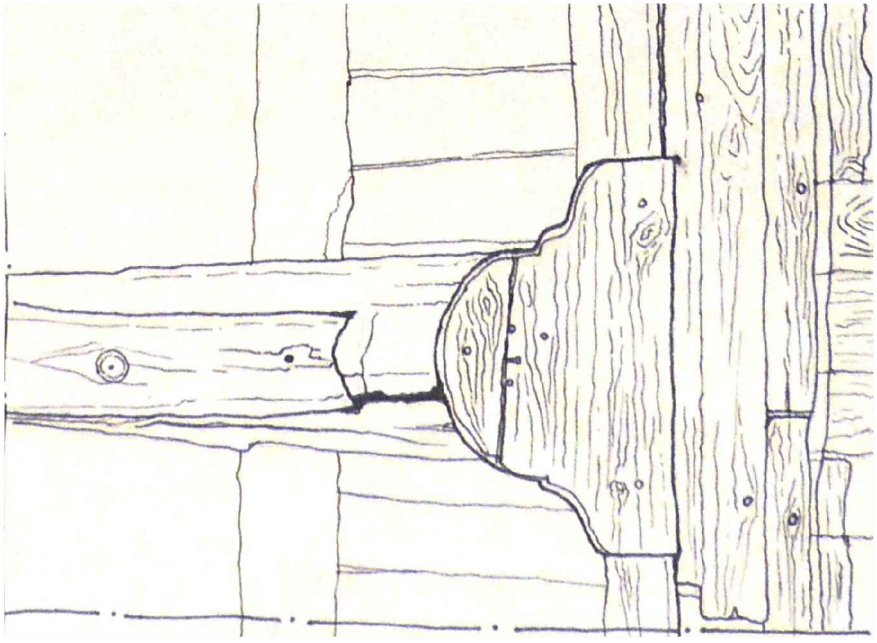
APPENDIX III

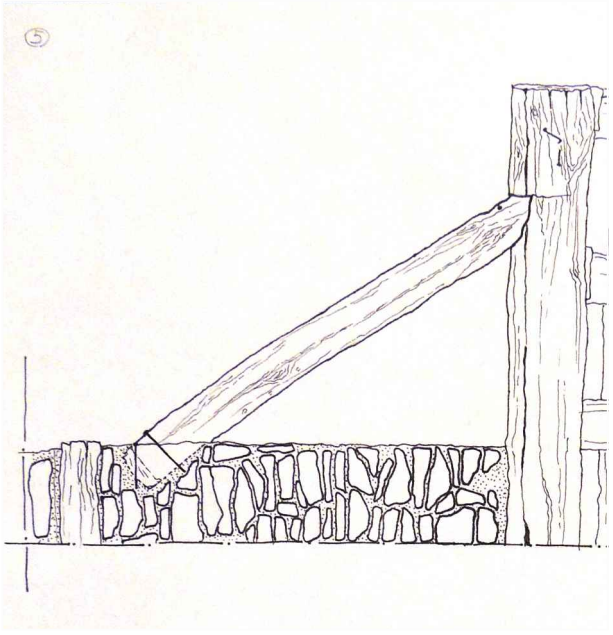
Rural and urban instances of brick-masonry or stone-masonry; Mashhad and Kang village

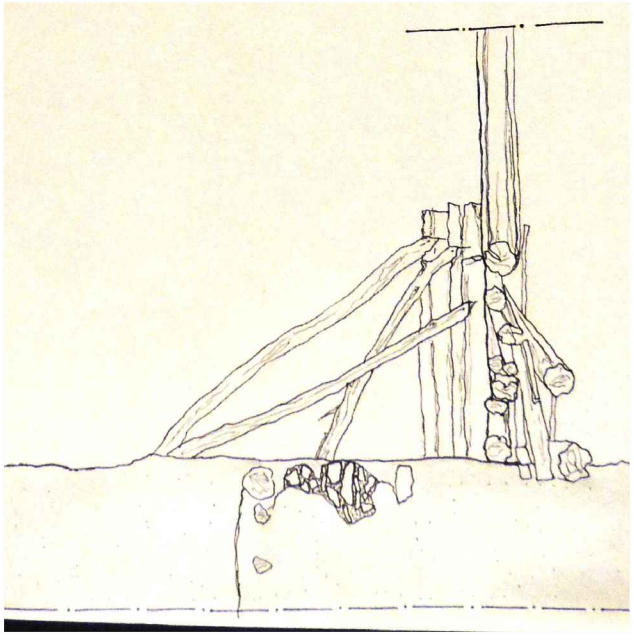




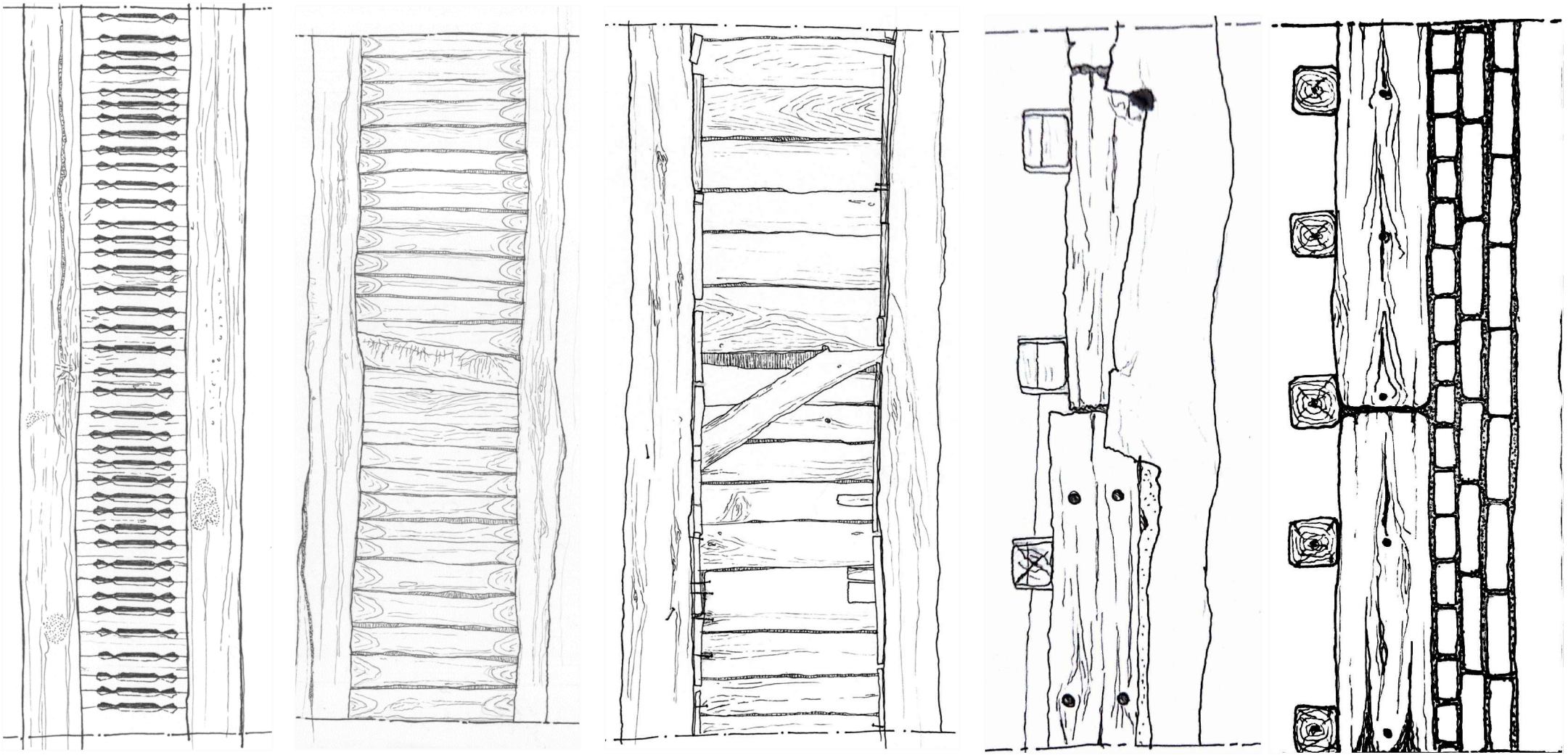






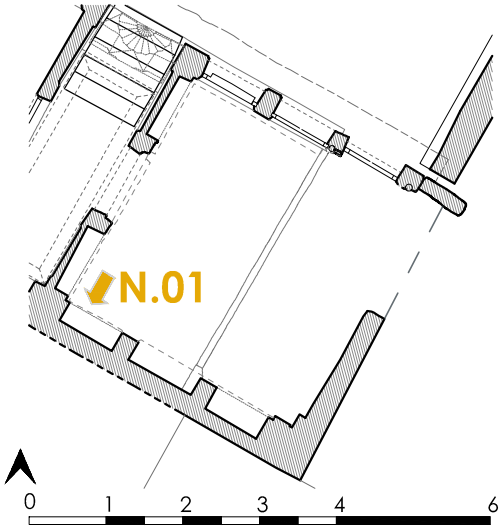


Examples of traditional construction of roof and wooden ceiling in Mashhad



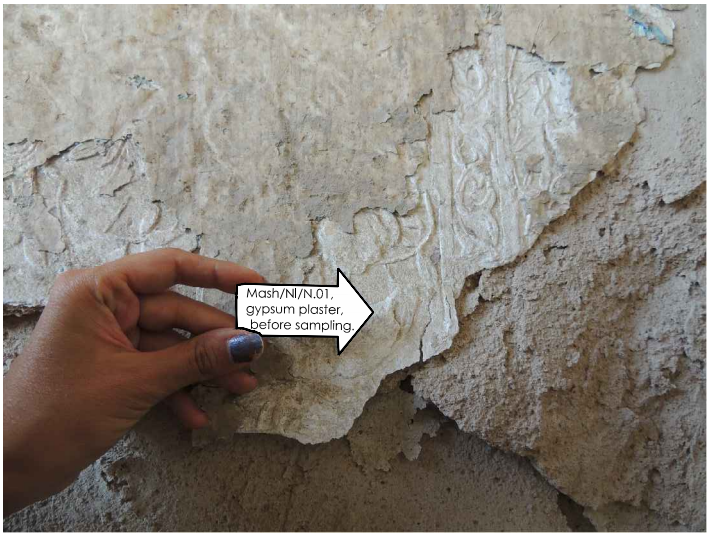
Mash/NI/N.01; Finishing Inner Plaster

Location: Nili's house, southwestern building mass, first floor, guest room, southwestern wall.



Nili's house, first floor, guest room.

Nili's house, first floor, guest room, southwestern wall.



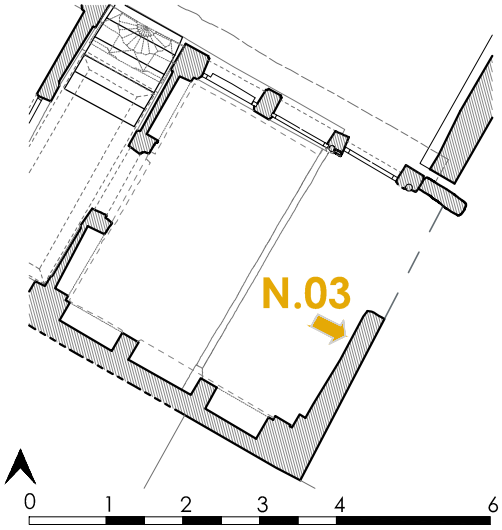
Nili's house, first floor, guest room, southwestern wall, Mash/NI/N.01. Sampling of gypsum plaster.

Nili's house, first floor, guest room, southwestern wall, after collecting sample Mash/NI/N.01.

Mash/NI/N.01; Inner Plaster. In the guest room, the plaster of the lower half in the SW wall was falling in the form of a thin crust because of blistering and delamination of the substrate layer. In fact, the expansions of the humidity bring loss of adhesion and strength in the soil-gypsum coat which makes the finishing plaster on the walls extremely fragile. Thus, during the separation, another small portion of that also fell.

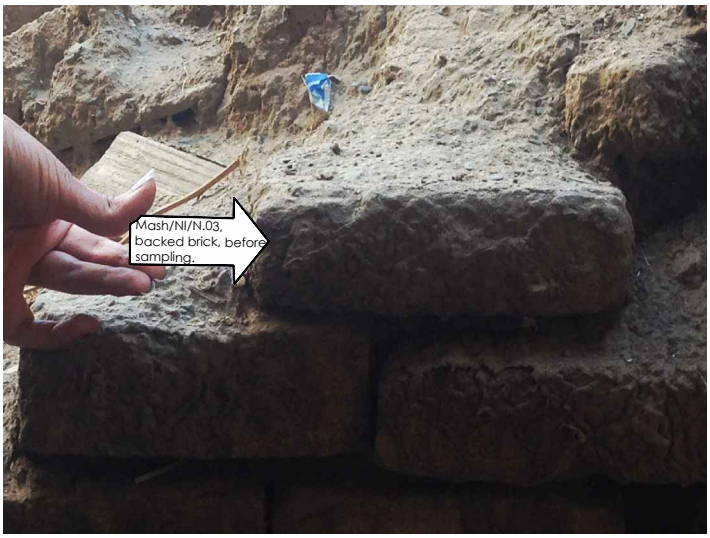
MASH/NI/N.03; Burnt Brick

Location: Nili's house, first floor, guest room, southeastern boundary wall.



Nili's house, first floor, guest room.

Nili's house, first floor, guest room, southeastern boundary wall.



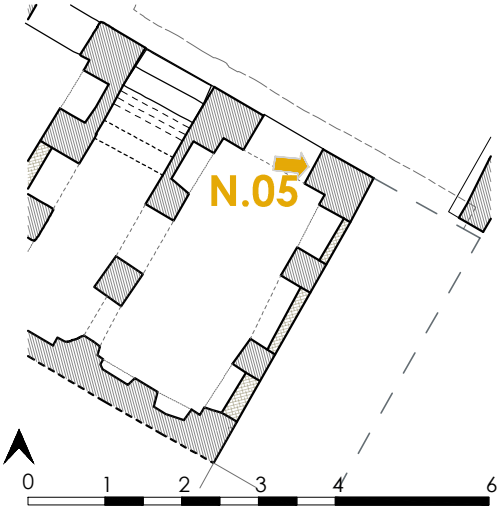
Nili's house, first floor, guest room, southeastern boundary wall, MASH/NI/N.03. Sampling of backed brick.

Nili's house, first floor, guest room, southeastern boundary wall, after collecting sample MASH/NI/N.03.

Mash/NI/N.03; Burnt Brick. The upper portion of the SE wall has collapsed due to demolition of the nearby building. Therefore, the brick in this wall has been selected for sampling. As a burnt brick of a load-bearing wall, it presented a high quality and resistance that made sampling difficult.

Mash/NI/N.05; Mortar Among Bricks

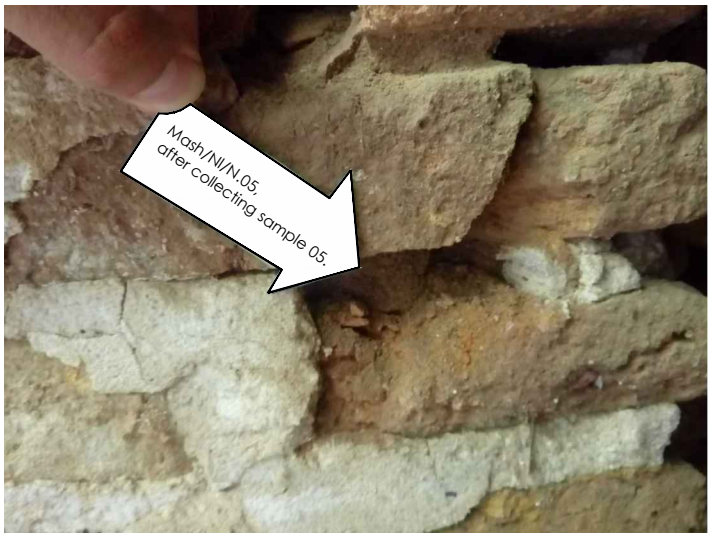
Location: Nili's house, southwestern building mass, ground floor, storage, northeastern column.



Nili's house, southwestern section, ground floor.

Nili's house, southwestern section, ground floor.

Nili's house, southwestern section, ground floor, Mash/NI/N.05, mortar bounded brick courses.

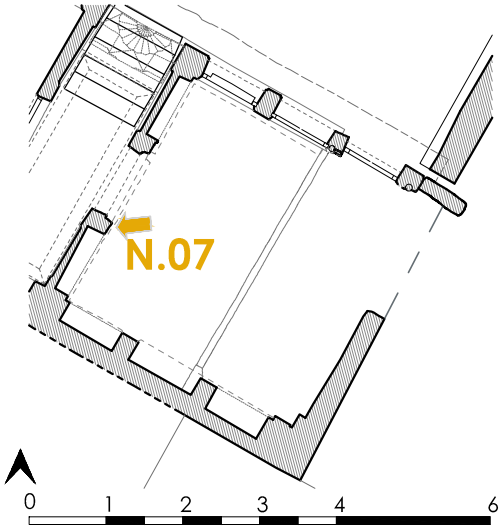


Nili's house, southwestern section, ground floor, after collecting sample Mash/NI/N.05.

Mash/NI/N.05; Mortar. The mortar between the bricks of the storage room is relatively weakened or lost due to moisture and passage of time. However, the sample was easily collected from the remaining parts. During the removal process, a portion of the brick that had suffered a severe decay was separated from its base along with the mortar.

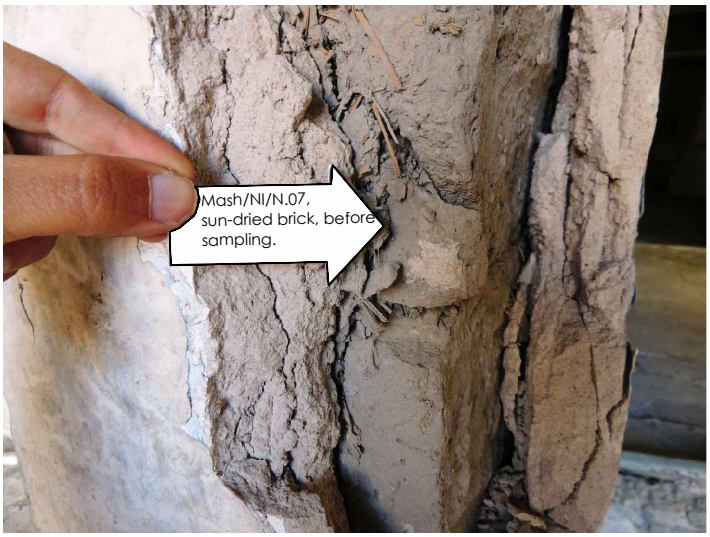
MASH/NI/N.07; Mud Brick

Location: Nili's house, first floor, guest room, northwestern wall.



Nili's house, first floor, guest room.

Nili's house, first floor, guest room, northwestern wall.



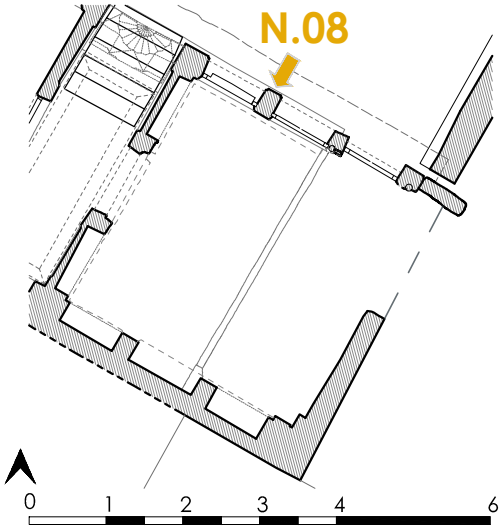
Nili's house, first floor, guest room, MASH/NI/N.07. Sampling of mud brick.

Nili's house, first floor, guest room, after collecting sample MASH/NI/N.07.

Mash/NI/N.07; Mud Brick. Mud bricks soaked up water and became eroded by humidity, losing their strength. Before the removal, a piece of raw brick was almost isolated from the base of the adobe. So, the detachment process was carried out quickly. This sample was not very resistant but when separated it came out as a relatively compact piece, without losing its solid form .

MASH/NI/N.08; Traditional Plaster of the Facade

Location: Nili's house, southwestern facade.



Nili's house, first floor, guest room.

Nili's house, southwestern facade.

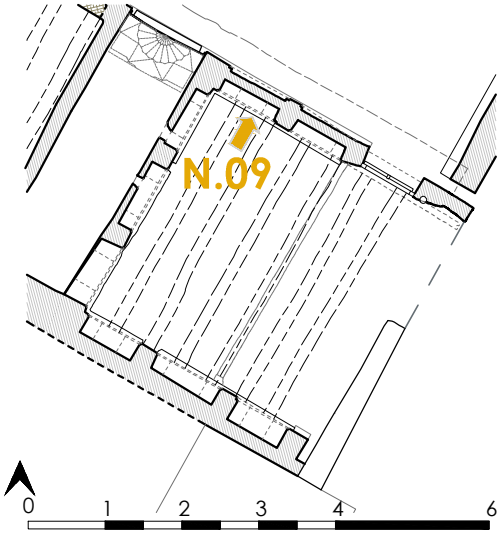
Nili's house, southwestern facade, MASH/NI/N.08. Sampling of plaster facade.

Nili's house, southwestern facade, after collecting sample MASH/NI/N.08.

Mash/NI/N.08; Traditional Plaster of the Façade. The southwestern facade was coated with a gypsum plaster. However, in some parts, the appearance of a plaster with dark red color is visible which was definitely the traditional finishing plaster of the façade. As the upper part had not seen much humidity, the removal of the sample was not done efficiently. It tended to remain durable and compact during the sampling process.

MASH/NI/N.09; Stucco.

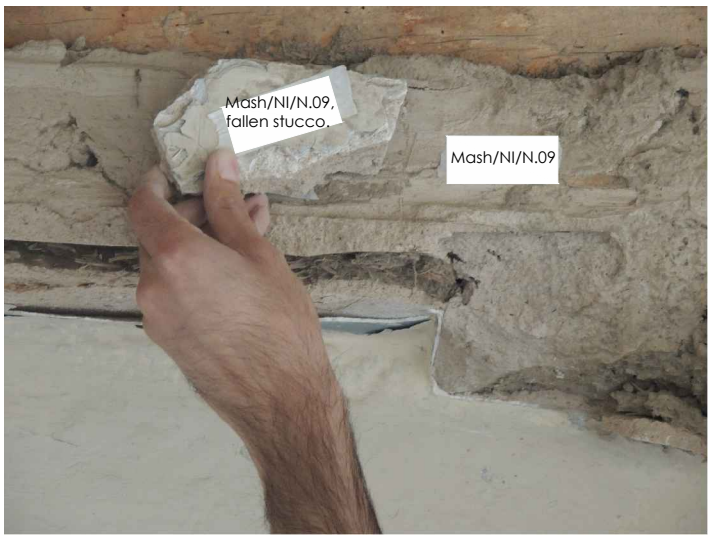
Location: Nili's house, first floor, guest room, northeastern wall.



Nili's house, first floor, guest room.

Nili's house, first floor, guest room, northeastern wall.

Nili's house, first floor, guest room, fallen decorative stuccoes.

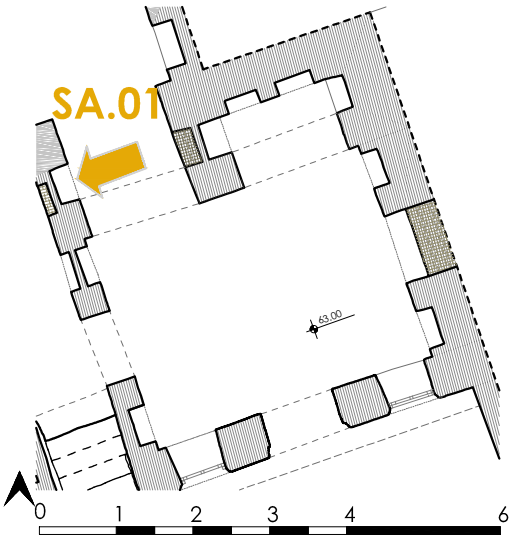


Nili's house, first floor, guest room, northeastern wall, Mash/NI/N.09, fallen stucco.

Mash/NI/N.09; Stucco. This sample is one of the fragments of the fallen stucco belonging to the walls of the guest room applied around the room as the frame. Following the cleaning process to remove the covering layers, the stucco was brought into the laboratory.

MASH/BI/SA.01; Mortar

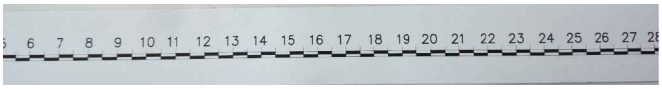
Location: Bidari's house, ground floor, storage.



Bidari's house, ground floor, storage.

Bidari's house, ground floor, right side room, Mash/BI/SA.0, sampling of mortar.

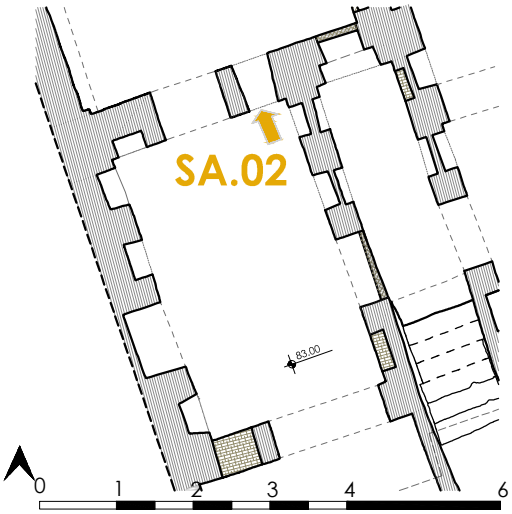
Bidari's house, ground floor, right side room, after collecting sample Mash/BI/SA.01.



Mash/BI/SA.01; Mortar. It seemed clear that a portion of mortar bounded brick courses almost detached from its place, as a result, the removal action has been quickly taken as can be seen in the image .

MASH/BI/SA.02; Burnt Brick

Location: Bidari's house, ground floor, cooking room.

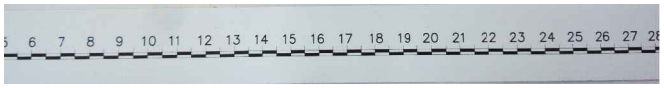


Bidari's house, ground floor, cooking room.

Bidari's house, ground floor, cooking room.

Bidari's house, ground floor, cooking room, Mash/BI/SA.02. Sampling of backed bricks 23 x 23 x 4,5 cm.

Bidari's house, ground floor, cooking room, after collecting sample Mash/BI/SA.02.



Mash/BI/SA.02; Burnt Brick. The sampling has not been easily taken because the brick (23 x 23x 4,5 cm) was very sturdy and durable, so the piece of brick (SA. 02) was removed in solid from its base.

APPENDIX IV

ICHO LAW

National Heritage Protection Act,

Date: Nov 3, 1930

Article 1 – Observing the Article 3 of this Law, all artifacts, buildings and places having been established before the end of Zandieh Dynasty era in Iran, either movable or immovable, may be considered as national heritage of Iran and shall be protected under the State control.

Article 2 – The State shall be obliged to build up an inventory including all the known and distinguished items of national heritage of Iran which possess historical, scientific or artistic respect and prestige; and enlist the newly discovered ones thereto. This inventory shall be published after being prepared.

Article 3 – Registration of properties in the List for National Heritage shall require the recognition and written permission of the Ministry of Education. In case the property to be registered is owned privately, the owner must have already been notified, and the registration would not be final unless the owner has been notified and his/her objection has been settled. The owner shall undertake the national heritage-concerned duties prescribed in this Law only after finalization of the registration.

Article 4 – The owner of an immovable property which according to this Law may be considered as national heritage, as well as anyone who finds out such property shall be obliged to inform the nearest pertinent governmental organization. In case the competent authorities assigned according to the executive by-law herein, certified that the property is among the national heritage items, it shall be registered in the List for National Heritage.

Article 5 – Persons who own or possess a property registered in the List for National Heritage may retain their right of ownership or possession. However they must not prevent the State from taking the measures it considers necessary to conserve the items of national heritage. In case the conservation operation involves expenses, the State shall not charge the owner in return. The aforementioned measures shall leave the ownership intact.

Article 6 – The operations mentioned below in detail shall be prohibited, and according to the

verdict passed by a court of justice, the violators shall be fined as much as 50 to 1000 Tomans, and also they may be condemned to pay compensation equal to the impairment they have caused to these properties.

A – Destructing or causing damage to national properties; covering them with plaster or paint; and engraving or drawing on them.
B – Any operation near a national monument, which makes the foundation of the monument unstable or disfigures the monument.
C – Taking possession or trading in the materials and objects belonging to the buildings included in the List for national Heritage without permission of the State.
Any attempt for restoration or reconstruction of a national monument possessed by persons must be performed by permission of State and under its supervision; otherwise, the violator may be subject to the aforementioned penalties.
Article 7 – The movable properties under private ownership must be registered in a separate inventory as regulated in Article 3 herein.

Article 8 – For each movable property registered in the List for National Heritage, there should be prepared two letters of identification - explaining description, origin, source and the circumstance under which it is discovered- with at least one picture enclosed. One copy of this letter of identification shall be deposited with the State Office for National Heritage and the other shall be given to the owner free of charge. This letter of identification shall be indispensable for the transfer of the property under any title. The transfer of ownership or possession shall evade none of the effects and liabilities resulting from registration of the property in the List for National Heritage.

Article 9 – The owner of a movable property - registered in the List for National Heritage - shall be obliged to inform the pertinent governmental organization in writing before selling the property to another person. In case the State intends to put the property among its collections of national heritage, it possesses the pre-emption right. In such cases, the government - within 10 days after the owner's written notification has been acknowledged - should notify the owner of its intent to purchase the property; otherwise the owner may sell the property to another person. Anyhow the owner should notify the government of the name and residence of the new

owner within 10 days after the property has been transferred.

The person who sells a property registered in the List for National Heritage without notifying the Ministry of Education or its representatives shall be fined as much as the selling price of the property. The government may withdraw the property from the new owner and refund the paid price to him/her. The purchaser too, if being aware of the registration of the property in the List for National Heritage, shall be penalized like the owner unless he/she himself/herself had been the one who notified the government of the deal.

Article 10 – Anyone who accidentally or by chance finds a movable property which according to this Law may be considered as an item of national heritage, though it has been discovered in his/her own property, shall be obliged to inform the Ministry of Education or its representatives as soon as possible; in case the pertinent State authorities recognize the property worthy to be registered in the List for National Heritage, half of the property or an equitable price as considered by qualified experts shall be transferred to the finder, and the State shall have the authority, at its discretion, to appropriate or transfer the other half to the finder without recompense.

Article 11 – The State has the exclusive right for land digging and excavation in sites to explore national relics. The State may operate according to this right directly or accredit this right to the scientific institutes, persons or corporations instead. A special license - explaining the location, extent and duration of discovery – shall be required for the accreditation. In addition, the State possesses the right to perform discovery operations in order to explore and identify the nature and the condition of national monuments anywhere it observes signs implying the existence of a cultural property, or deems proper to be excavated.

Article 12 – The excavation intended to discover national monuments and aid scientific researches shall be considered as scientific excavation; should an excavation is intended to trade in antiquities it is considered as commercial excavation. Only scientific institutes may be accredited for scientific excavations. In the buildings and immovable properties registered in the List for National Heritage, commercial excavation shall be prohibited.

Article 13 – Excavation in private lands shall require the owner's consent as well as the permission of the State. For the places which are registered in the List for National Heritage or

will be registered by the State after discovery operations, the owner shall not have the right to repudiate the excavation, instead he/she may claim for a compensation as much as the reduction in the rental value of the land resulted by the excavation, as well as sustained losses, and expenses required to restore the land to its previous condition.

Article 14 – During scientific and commercial excavations in one location and one season, if the State discovers the objects directly, it may appropriate them all, and if the discovery is performed by others, the State may choose and possess up to 10 items out of the objects of historical and artistic value; half of the rest of the objects shall be transferred freely to the discoverer, and the other half shall be appropriated by the State. In case all the discovered objects do not exceed 10 items and the state appropriate them all, the expenses of the excavation shall be refunded to the discoverer.
Monuments and the parts thereof are excluded from the above-mentioned procedure, and the State may take possession of the whole discovered items.

Note – By 'season' is meant one scientific period not more than a year.

Article 15 – The share of the state out of the objects discovered during a scientific excavation shall be kept in State collections and museums, and not be sold; and the discoverer's share shall be his/her own property. Among the share of the State out of the objects discovered during a commercial excavation, what is liable to be kept in museums shall be appropriated, and the rest shall be transacted by any means the state deems proper; the State shall put these properties to auction to be sold.

Article 16 – The violators of Article 10, those who perform excavation operations without the State permission and information, though in their own lands, as well as those who illegally take items of national heritage out of the country shall be fined as much as 20 to 2000 Tomans, and the discovered objects shall be confiscated in the interest of the State.
The excavation of lands and other such operations, not intending to discover antiquities, shall not be subject to the aforementioned penalties.

Article 17 – Those who intend to adopt dealing in antiquities as occupation should obtain permission from the State. Furthermore, taking the antiquities out of the country shall require

permission from the State. The registered objects in the list for National Heritage, if attempted to be taken out of the country without the permission of the State, shall be confiscated in the interest of the State. The objects transferred to the discoverer according to Articles 10 and 14 herein, if not registered in the List for National Heritage shall be eligible for export; and if registered in the List, shall be liable to the provisions of Article 18.

Article 18 – The State may avoid granting the permit for exporting the objects considered as national heritage, and may purchase the objects at the price declared by the exporter in the export request; in case the owner refrains from selling the objects at the declared price, export permit shall not be granted. In case export permit is granted, 5% of the equitable price as evaluated by the State assessor shall be received as export charges. A special commission whose establishment is provided for in the executive by-law of the present act shall settle any dispute arising between the owner and the assessor.
The export charges mentioned in this Article are different from the customs duties imposed on these objects. The export of the objects discovered during eligible scientific excavations and belonging to the discoverer shall under any title be legal and exempted from any charges or duties.

Article 19 – For setting the rules of trading in antiquities, as well as implementing all the regulations of this Law, special rules of procedure shall be prepared to be approved by the Council of the Ministers.

Article 20 – All the granted excavation licenses, which are inconsistent with this Law, shall no longer be valid.

The National Consultative Assembly has approved this Law, which includes 20 Articles, on Nov 3, 1930.

The Speaker of the National Consultative Assembly
Dadgar

ICHO LAW

National Heritage Registration Act

Date: Oct 23, 1973

Single Article – The Ministry of Culture and Art is hereby authorized to register – in addition to the properties subject to National Heritage Protection Act dated Nov 3, 1930 – the immovable properties which are important from the view point of history or national dignity, regardless of age and origin, among the national properties included in the mentioned Act. These properties shall be registered following the approval of the Supreme Council of Culture and Art. The properties mentioned herein are subject to the rules and regulations concerned with national heritage.

The Senate passed the foregoing Act including a Single Article during its session on Monday Dec 3, 1973 following the approval by the National Consultative Assembly during its session on Tuesday Oct 23, 1973.

ICHO LAW

Law on establishing the Iranian Cultural Heritage Organization (ICHO)

Date: Jan 30, 1986

Single Article - In order to:

A - Study and research on relics remained from the past for the purpose of presentation the concealed values thereof,

B- Research on the subjects regarding archeology, anthropology and traditional arts,

C- Survey, explore, register, and conserve national heritage which are of cultural and historical value, both movable and immovable properties,

D- Design and carry out plans for repairing and revitalizing the monuments, buildings and complexes of cultural and historical importance,

The Ministry of Culture and High Education is hereby authorized to establish "the Iranian Cultural Heritage Organization", as its affiliate, by integrating the following units:

1-The Iranian Archeology Center affiliated with the Ministry of Culture and High Education,

2- The General Office for Traditional Arts, affiliated with the Ministry of Culture and High Education,

3- The Center for Ethnology (social and cultural anthropology) affiliated with the Ministry of Culture and High Education,

4- The Office for Historical Properties affiliated with the Ministry of Culture and High Education,

5- Iran-Bastan Museum affiliated with the Ministry of Culture and High Education,

6- The Department for Conservation of Historical Properties in Towns and Cities, affiliated with the Ministry of Islamic Guidance,

7- The General Office for Museums affiliated with the Ministry of Islamic Guidance,

8- The General Office for Historical Monuments affiliated with the Ministry of Islamic Guidance,

9- The General Office for Palaces affiliated with the Ministry of Islamic Guidance,

10- Iranian National Organization for conservation of Antiquities affiliated with the Ministry of Culture and High Education,

11– The General Office for court palaces (Golestan Palace) affiliated with the Ministry of Economy and Finance Affairs,

Note 1 - All duties, powers, staff, movable and immovable properties, debts, obligations, claims, budget and credits of the above-mentioned units shall be transferred to the Iranian Cultural Heritage Organization.

Note 2 - The Ministry of Culture and High Education shall have the responsibility to gain control of what is historically or culturally valuable among the palaces of ex-courtiers and their dependents, as well as to conserve, revitalize and introduce them.

Note 3 - By a majority vote of a board composed of the Minister of Culture and High Education, Minister of Health, Treatment and Medical Training, and the superintendent of The Martyrs' Foundation, those palaces with no cultural-historical value shall be allocated to any ministry or institution deemed as the most proper.

Note 4 - The Ministry of Culture and High Education shall be obliged to pay the revenue - yielded by the Iranian Cultural Heritage Organization - to the Treasury.

Note 5 - Within 3 months from the effective date of this law, the Ministry of Culture and High Education, in collaboration with the State Organization for Administrative and Employment Affairs, is obliged to draw up the articles of association for "Iranian Cultural Heritage Organization", and submit it to the Islamic Consultative Assembly.

Note 6 - Upon the approval of this law, all inconsistent laws and regulations shall be repealed.

The Islamic Consultative Assembly passed this law including a Single Article and 6 notes in the

session held on Thursday Jan 30, 1986 and confirmed by the Council of Guardians of the Constitution on Feb 5, 1986.

The Speaker of the Islamic Consultative Assembly,

Akbar Hashemi