SUMMARY

A STUDY ON TRADITIONAL HOUSES WITH DOMICAL VAULT ROOFS IN HERAT, AFGHANISTAN- THEIR TYPOLOGY AND CONSTRUCTION

By

Kawish Khojesta

In the desert areas from the eastern Iran to western Afghanistan, traditional houses have curved roofs. As modernization progresses, such traditional houses are gradually disappearing from the region. However, in Herat, an old city in Western Afghanistan, traditional houses with domical vault are still left in their original form within the urban area. This research study on traditional houses with domical vault roofs. The study include three main part. The first part examines the distribution of traditional houses with domical vault roofs in Iran and Afghanistan to determine their boundary. The scope of the study is to determine the types of roofs found in all capitals and several other cities/villages of each province in Iran and Afghanistan, as well as to examine the factors which impact the distribution of traditional houses with domical vault roofs. The types of roofs found in each city/village is investigated through satellite images. In the case of Iran, we searched for photographs where the traditional houses with domical vault roofs had assumedly already been replaced by new houses. In the case of Afghanistan, we conducted a field survey in areas for which we could not find suitable satellite images.

This is the first study that shows the distribution of traditional houses with domical vault roofs in both Iran and Afghanistan. By examining high-resolution satellite images, old photographs, and literature concerning Iran, it is found that the distribution of traditional houses with domical vault roofs spread through the central and eastern parts. By examining satellite images and conducting a field survey in Afghanistan, it is found that the distribution is spread throughout the western part as well as several northern and southern parts. The total combined area of the provinces which have traditional houses with domical vault roofs in Iran forms 78.9% of the country's total area; the total combined area of the provinces which have traditional houses with domical vault roofs in Afghanistan is 68.7% to the country. The total combined area of provinces which have traditional houses with domical vault roofs in Iran and Afghanistan makes up 75.9% of the combined areas of the two countries.

The regions of Iran and Afghanistan where houses with domical vault roofs are distributed were influenced by Persian culture and experienced less than 250 mm annual precipitation. Some areas with annual
precipitation of 250-400 mm are also included in the fringe zone of the domical vault distribution. Overall, 10 provinces with average annual precipitation of less than 250mm in Iran and 9 provinces in Afghanistan; 7 provinces with average annual precipitation of 250-400mm in Iran and 6 provinces in Afghanistan have traditional houses with domical vault roofs. As areas with dry climates tended to face a shortage of wood, building houses with sun-dried bricks and domical vaults was a rational decision. Conversely, the use of sun-dried bricks was unsuitable in areas which experience more precipitation.

The second part of the study examines architectural features of traditional houses with domical vault roofs in Herat. The scope of the study is to describe the construction method of traditional houses in Herat and examine case studies including some physical and social dimensions of houses in order to determine their tangibility. Firstly, interviews were conducted with traditional house builders in Herat in July 2016 and April 2017. Secondly, three case studies were conducted in Herat in July 2016. Residents of these houses were interviewed as well. This is the first study that shows details of ordinary houses in Herat based on field surveys. It was found that Afghanistan and Iran share a common technology for building traditional houses with domical vaults. The similarities are seen in the construction methods and construction materials used for domical vaults. There are six patterns for domical vaults in Herat area and some of them are seen in Iran, Turkmenistan and other part of Afghanistan. Differences are observed as well. Traditional builders in Herat use Pols on top of each wall in order to avoid tension of the walls, whereas in Iran, wooden beams are not used for connecting walls and domical vaults.

The findings from the case studies of three traditional houses with domical vault roofs can be summarized as the following. Common features are the construction methods and materials (sun-dried and fired-bricks) used to construct domical vaults. The standard size of sun-dried or fired-brick used by traditional builders and in the three case study houses is 300mm×300mm×50mm. Domical vaults in all three cases are constructed by using Pols on the top of the walls of the domical vault room. The walls are made of sun-dried bricks. The thickness of walls supporting domical vaults varies from 70cm to 120cm depending on the number of floors the walls are supporting, size of the rooms, the location of walls (exterior or interior), ceiling heights, use of tie-bars and the age of buildings. The height of domical vaults varies from 70cm to 120cm depending on the size of the rooms.

The third part of the study examines the historical development of Bagh-e Dasht in Herat city. Bagh-e Dasht, often known as Bagh-e Tasht, is the area situated in the northern part of Herat city. In comparison to other areas of the city, Bagh-e Dasht has the most well-preserved traditional landscape. According to our surveys conducted in 2018, the main architectural feature of traditional houses in Bagh-e Dasht are Dalans (covered walkways by vaults), sun-dried brick arcades located in residential areas. Another architectural feature of
Bagh-e Dasht is the houses constructed above Dalans. This study examines the transformation of the Bagh-e Dasht area with a focus on Dalans, where traditional houses with domical vault roofs have been well-preserved until today. The aim of the study is to examine the extent of physical changes to the area as well as changes to houses and the community. In this study, high-resolution satellite images of Herat (2017) were used in order to determine the study area. Based on an analysis of the satellite images, Bagh-e Dasht was identified as one of the areas in which traditional houses with domical vault roofs are concentrated in Herat. Moreover, it was determined that the area near Joy-e Injil (canal) was the best-preserved area in Bagh-e Dasht with the highest concentration of traditional houses with domical vault roofs. This area was therefore selected as the study area. The boundary of each building and space is determined by both a field survey and aerial photographs of the study area. A comprehensive field survey was then conducted to examine each space and building in the area. In addition, a questionnaire was distributed to the residents of the Dalan houses and interviews were conducted with the Wakil (Chief) of the area, a local historian, residents and traditional builders.

Through this part of the study, it is found that Bagh-e Dasht, which was only agricultural land plots at first, During Timurid Empire in the 15th century many gardens and palaces were created due to their cultural interest in green areas. Settlements in Bagh-e Dasht were began to be constructed in the Safavid Empire in the 16th century. This study found a distribution pattern where the Dalans and domical vault roof houses are located. The oldest part of Bagh-e Dasht area, the south, contains both Dalans and domical vault roof houses. The next oldest part, which is the north, only has domical vault roof houses. The rest of the area only has houses with modernized flat roofs. This observation provides an insight into the process of historical development in the Bagh-e Dasht area.
ABSTRACT

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In the desert areas from the eastern Iran to western Afghanistan, traditional houses have curved roofs. As modernization progresses, such traditional houses are gradually disappearing from the region. However, in Herat, an old city in Western Afghanistan, traditional houses with domical vault are still left in their original form within the urban area. This study as the first step examines the distribution of traditional houses with domical vault roofs in Iran and Afghanistan to determine its boundary as well as the factors that impact their distribution. High-resolution satellite images, old photographs and literature of Iran and satellite images and data from field surveys in Afghanistan were used to determine their distribution. The findings of the study include maps showing the distribution of traditional houses with domical vault roofs and suggest that climatic and cultural factors are significant in determining house roof types.

As the second step, the study examines features of traditional houses with domical vault roofs in Herat through interviews of traditional builders and case studies of three houses including field surveys and interviews conducted with residents. Through this research, it finds that the structures of walls and domical vaults vary depending on the time of construction, number of stories and size of rooms inside the houses. The study also finds that the materials used for walls and roofs differ according to the economic conditions of the families.

As the final step, this study examines the historical development of the Bagh-e Dasht area with a focus on Dalans, where traditional houses with domical vault roofs have been well-preserved until today. Bagh-e Dasht area is situated in the northern part of Herat, an old city in western Afghanistan located on the Silk Road which has received a strong influence from Persian culture. Initially, the Bagh-e Dasht area was developed for gardens and palaces near Joy-e Injil canal during the Timurid Empire in the 15th century. It is assumed Bagh-e Dasht became a settlement in the 16th century during the Safavid Empire. The oldest area is the southern part around the canal bank which is characterized by Dalans, sun-dried brick arcades above which houses are often constructed. Traditional houses in this area are built with domical vault roofs constructed with sun-dried bricks. Bagh-e Dasht is one of the best-preserved settlements of traditional
houses in Herat. The aim of the study is to examine the extent of physical changes to the area as well as changes to houses and the community. This research contains original results which have previously not been published in architectural history. The roof types of houses in the area are investigated through examining high resolution satellite images. The boundary of each building and space is determined by both a field survey and aerial photographs of the study area. A comprehensive field survey was then conducted to examine each space and building in the area. In addition, a questionnaire was distributed to the residents of the Dalan houses and interviews were conducted with the Wakil (Chief) of the area, a local historian, residents and traditional builders.