



# Comparison of Caravanserais of Azerbaijan and Isfahan Based on Ghanli Bolagh Caravanserai in Ardabil and Madar Shah Caravanserai in Isfahan

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**Abstract:** Iran of the Safavid period played a very important communicational role in international traffic. In this period, the northern route of the Silk Road, which was mainly a fixed route, began from China, passing through cities such as Azerbaijan and Isfahan in Iran, reached other countries, including Europe. Safavid kings, especially Shah Abbas, commanded to build a dense network of roads with numerous caravanserais for military and economic reasons. Due to the economic boom and communication with other communities such as Europe, export of a variety of goods such as silk was abundant in this period. For the prosperity of the caravan in this period, caravanserais with many roads such as Silk Road were reconstructed and built. Among these are caravansaries built in mountainous areas of Azerbaijan and central regions of Iran, especially Isfahan. The present study aims to compare the caravansaries of the two areas mentioned in terms of their plan and materials and investigate the effect of the different climate of these two regions on the construction of these buildings. According to the results of this study obtained from the case study of Ghanli Bolagh caravanserai of Azerbaijan and its comparison with Madar Shah caravanserai in Isfahan, the caravanserais of these two regions are different in terms of plans and materials that is because of the effect of different climates. Caravanserais in mountainous areas generally have a small central courtyard and a dense tissue to prevent the penetration of cold weather and building materials are mainly of stone and brick, while the caravanserais of the central region (Isfahan), for relatively dry climate, have a cistern and a large central courtyard and the main materials are clay and brick.

**Keywords:** Caravanserai, Architecture, Climate, Azerbaijan, Isfahan, Ghanli Bolagh Caravanserai, Madar Shah Caravanserai

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## 1. Introduction

Human civilizations and cultures are the topics of anthropological studies, and identification of the culture of human societies that lived in the past is only possible with the help of remnants and relics of those communities. Architectural vestiges and remnants such as books, writings, objects, tools and etc. are treasures containing valuable secrets of the ancients. Identification of these buildings makes it possible to acquire a better knowledge of the skills and knowledge, economic and transportation capabilities, power and etc. related to past civilizations. Although many needs have been met with the intellectual development and

progress of humans and societies, but the need for transportation and travelling has never been extinguished, rather it has increased and transportation, from a small-scale to large-scale, has been known as an inevitable component of human life.

Trade achieved development and flourishing in the Safavid period. In this period, trade increasingly thrived due to building roads, building bridges, caravanserais on main roads, and securing the roads. Based on the research researchers have done, it is found that caravanserais had a key role in trade. Therefore, the architecture of caravanserais and the effect of different climates on the plan and material of caravanserais have been investigated comparing the

caravanserais of the two regions of Azerbaijan and Isfahan. Based on the present study, caravanserais of Azerbaijan have a dense texture, courtyard, small rooms, and also great wall heaters due to the mountainous climate, but caravanserais of Isfahan have central courtyard and spacious rooms for travelers due to the relatively mild and dry climate and they also have cistern and deflector, which is due to lack of water.

## 2. The History Caravanserai

The history of the construction of caravanserai in Iran dates back to the Achaemenid period. During this period, the development of roads to handle this land was considered with the development of Iranian territory from the Caucasus to the Persian Gulf and Central Asia to Anatolia, the Mediterranean and North Africa. One of the most important roads was the royal road from Susa to Ephesus, the length which was 2683 kilometers and had 111 stations, each of which had spare fresh horses [4]. Usually a caravanserai was built every 30 to 40 km for the rest of the passengers [8]. Development of roads was continued during Parthian and Sassanid periods and given the fact that Iran was on the path of international trade between the Far East, the Mediterranean coast and Europe, creating safe roads and appropriate caravanserais and providing the security and prosperity of businessmen in this long path, which was an important source of government revenue, was considered necessary to run the country. After Islam, past political boundaries vanished, relationship between East and West changed, and traffic was easier, which were due to the integrated sovereignty of Umayyad and Abbasid Caliphate over Muslim lands, including the Arabian Peninsula, Mesopotamia, Persia, Transoxiana, the Caucasus, parts of Asia Minor, Syria, Palestine, North Africa and southern Spain. In this transformation, the land of Iran was the focus of the communication and caravanserais were of great importance. Although Mongol's invasions of Iran in the seventh century AD were associated with great

destructions, but political, commercial and cultural exchanges became more widespread with the establishment of sovereignty on the land of China and much of the Muslim lands [3].

## 3. Safavid Caravanserais

During the Safavid period, great attention was paid to the construction of caravan buildings in parallel to the repair and establishment of roads and strengthening road maintenance. The Silk Road was an international road that began from China and reached Europe passing through many countries [1] such as Iran. During the Safavid period, especially Shah Abbas, Iranians paid particular attention to trade that was because of security and economic growth. For this reason, for greater prosperity of travelers and business development, destroyed caravanserais across the country were reconstructed. At the same time, countless new caravanserais and cisterns were built on the way of country roads. For this reason, the Safavid era is considered the golden era of constructing large caravanserais [6].

Now with the introduction of Ghanli Bolagh caravanserai of Meshkin Shahr and Madar Sha caravanserai of Isfahan, the effect of climate on the plan and materials of the caravanserais of these two areas are covered:

## 4. Introducing Ghanli Bolagh Caravanserai

Shanli Bolagh caravanserai is one of the 999 Shah Abbas caravanserais exactly in the path of the Caucasus caravans to Iran and vice versa and it goes back to the Safavid period. The caravanserai is located at the border village of Ghanli Bolagh (home soldiers) and in the Arshagh area of Meshkin Shahr city in Ardabil province (*Figure. 1*).

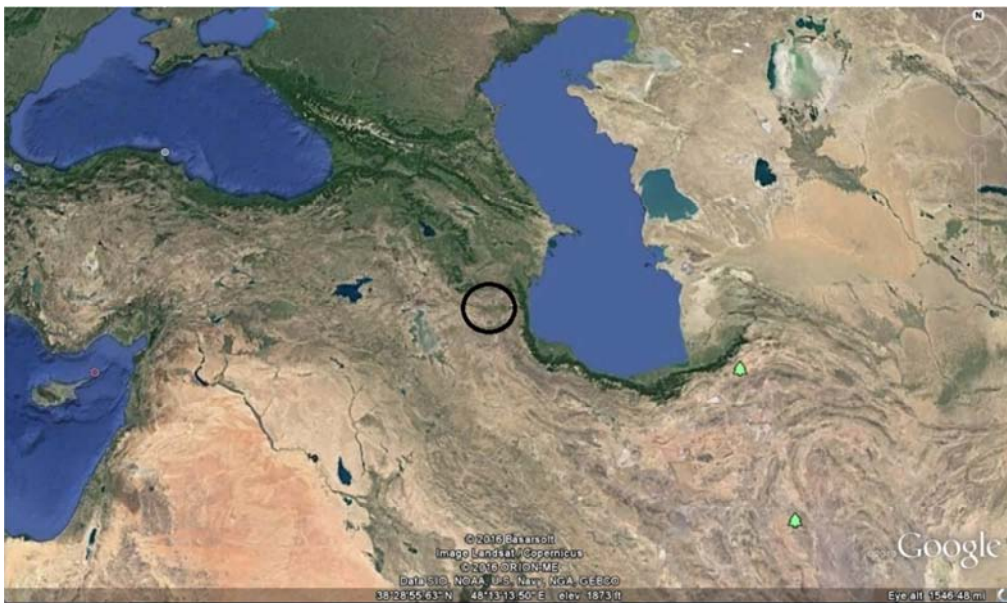
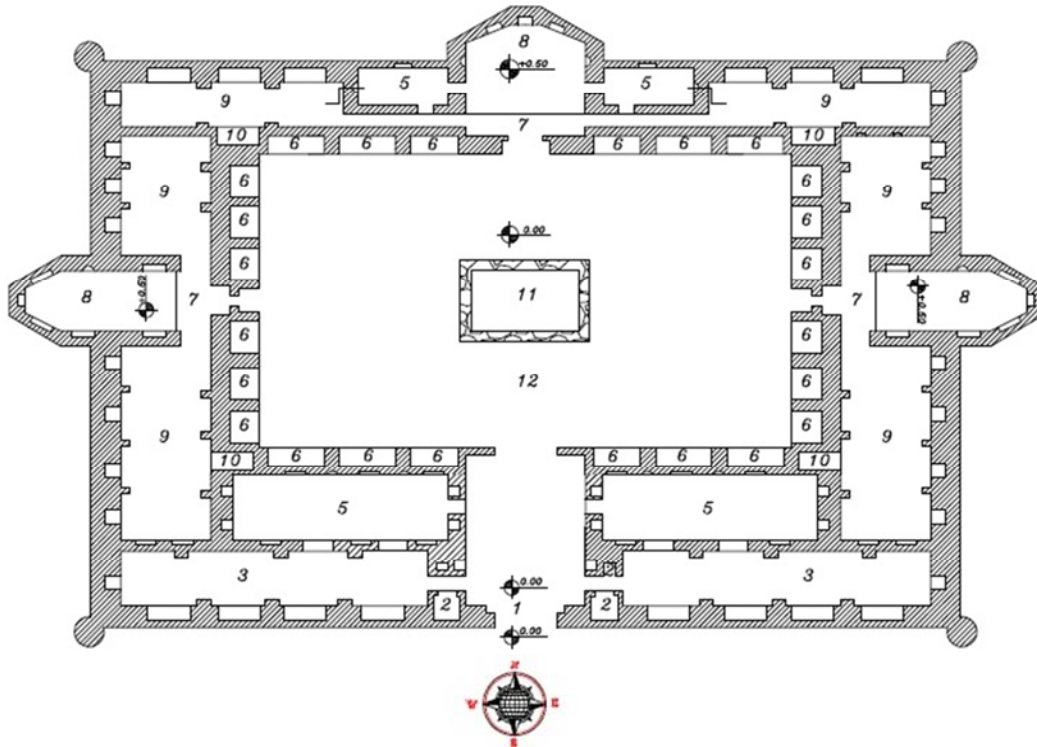


Figure 1. Ghanli Bolagh position on Google Earth.

**4.1. Caravanserai's Plan**

The building was built in the political calmness period during Safavid era during the reign of Shah Abbas using Four-hall style and is famous as Shah Abbasi Caravanserai. The total area of the caravanserai is 20247 square meters and the area of central courtyard is 640 square meters and the main door opens at the south porch. Like most caravanserais with stalls, central courtyard, rooms for passengers, and so

on [11], this caravanserai also has 24 rooms around the yard facing the courtyard that are symmetrically located on both East and West sides to exchange goods and for travelers' leisure. There are also 8 places for keeping camels and goods, 4 rooms for providing service, and 3 chambers between each two places of keeping camels that are designed for companions and guards to stay there (Figure. 2).



*Figure 2. Ghanli Bolagh Caravanserai's plan.*



*Figure 3. The role of yard in these caravanserais (Authors).*

#### 4.2. The Role of Yard in These Caravanserais

The floor of the caravanserai is located half a meter into the ground that is very effective in reducing the contact area of warm atmosphere inside and the cold atmosphere outside. When the yard floor is inside the ground, ground surrounds the building like a thermal insulation and prevents the heat exchange between the building and its environment and keeps the heat inside the building [7]. (Figure. 3).

Room size and location of the stalls: in this building, the ratio of room height to width is small and height of the stalls is very short so that they require less fuel to supply heat. Therefore, height of rooms in this caravanserai is about 3.60 m, 180 cm of which the height up to the floor and 180 cm is the height up to the vault tip. Buildings in this climate have a porch with far less depth than porches in central areas and like porches in Caspian region, porches of these climate are not used for living, rather they are only used to protect the building from the entrance of snow and rain [9]. Putting the central hall or passengers' room in the middle of the building and stalls around them, stalls act as a buffer space between warm environment inside the rooms that should be at the level of human comfort and the cold weather outside [7].

#### 4.5. Heater



Figure 4. The room gates of Eastern room, Western room, South room (in order from right to left) (Authors).

There was a heater in most rooms of the caravanserai. These heaters do not have much depth and their height is much greater than their width. It is likely that the heaters were made in terms of the room and they were less used to put the fire. In fact, their chimney was so narrow that just a plant could be burnt or a water pot could be heated. But in some mountainous caravansaries, there were great heaters which could heat the room. Wall heaters were not usually built in the stables, there were only small heaters where animal owners stayed. In such a case, the smoke went out through small windows at the top of the stables or at through holes at the top of the dome [7]. There were usually some large fireplaces in the center of the building to supply the heat for travelers and there were small-scaled wall heaters in stables for livestock [6]. The relatively large size and the

#### 4.3. Rooms for Camels

The mountainous and cold conditions of this area have caused rooms for keeping camels to have the following features:

1. The floor of these rooms should be aligned with yard floor.
2. These rooms have the thickest wall (120 cm) and their core is rubble.
3. In addition to walls, rooms for keeping camels have groins with a dimension of  $45 \times 63$  cm that are convexly performed from the wall and turned on walls and ceilings, and the average distance among them is about 3 meters in each room for camels.

#### 4.4. Small Openings

Openings of the rooms of this caravanserai are small and the cold weather is often avoided through a vestibule at the entrance of the building [5]. Thus, less air is moved from inside to outside and vice versa. It is worth mentioning that it was always tried not to locate entrance of the caravanserai in front of the winter winds. Most wind is blowing from Siberia, i.e. from the north area; that is why the openings are mostly in the South and East direction [6]. (Figure. 4)

large number of livestock in the stables caused to room to be heated up and stable heaters were fired only when it was too cold outside [9].

#### 4.6. The Impact of Rainfall on the Roof Covering

Snow is of great importance for Azerbaijan buildings, since snow imposes an additional burden on roofs. Non-condensing snow is light and its medium weight per cubic foot is 6.5 pounds, while dense snow becomes heavier when it is more dense and may even reach 30 feet per cubic meter.

Heavy snow causes the roof to collapse and therefore it is necessary to pay attention to it. Given the importance of this issue, although it is tried to raise the resistance of ceiling and roof, but the roof and building shape can also affect snow

density and thus increase or decrease of the risk. To deal with the threat of snow density, it is better to have slope roofs because slides due to the slope of the roof and collapses and thus does not become dense. Of course, in cold Western regions such as Azerbaijan, slope of the roof should be toward the south so as to benefit from the sun. The buildings' roofs in this region were built in the form of a cradle, like Ghanli Bolagh caravanserai.

**4.7. The Materials Used in This Caravanserai**

Materials used in this climate are those that are available. Therefore, it has always been stone for walls. But in this caravanserai, walls were made of brick and stone foundation. If stone buildings are made properly, they are of good strength and durability, and evoke grandeur and solemnity in the human mind. The disadvantage of stone buildings is their weight. Extra weight not only makes it difficult to implement the stone buildings, but the buildings are more vulnerable against earthquake forces than lighter buildings. In general, stone walls are thick that is because of heavy stones and bearing pressure of the upper layers of the wall on the lower layers. Stones are of good compressive strength, but are poor against tensile strength. That is why stone is not used as a horizontal column, and stone is only in some cases used for small openings as lintel beams (Figure. 5&6) [3]



Figure 5. A sample of brick.



Figure 6. Walls were made of brick and stone foundation (Authors).

The main building materials of this caravanserai were 20×20 cm brick and stone used with lime mortar. Stone has been used in foundation and base course, and also stones of about 50 x 50 cm are seen outside the building and inside the courtyard, which is the height difference between rooms and chambers from yard floor and rooms for keeping camels. In general, based on climate, caravanserais of Iran during Safavid period can be divided into three general categories that include: mountainous, central highlands and desert, and the Persian Gulf region.

Now the Madar Shah caravanserai of Isfahan that is one of the caravanserais with central courtyard is introduced. These caravanserais have a large yard built in the form of four porches. They mostly have cistern and deflectors, and their materials are clay and baked bricks. The normal distance between the greater caravanserais in the desert areas is 35 to 40 km. Through introducing the Madar Shah caravanserai, characteristics of this type of caravanserais will be mentioned.



Figure 7. The yard with 4 porches (Authors) of Madar shah caravanserai.



Figure 8. Aerial picture of Madar shah (Authors).

## 5. Madar Shah Caravanserai of Isfahan

With the economic boom of Iran in Safavid era, constructing massive and beneficiary buildings such as market, school, bridge, dam, cistern, mosque, and pigeon tower became prevalent. But the most significant monuments of that period is the collection of caravanserais. One of which is Abbasi Hotel in Isfahan with 320 years of history, which was built in the reign of last Safavid king, Shah Sultan Hussein. Shah Sultan Hussein gave the complex to his mother and that is why it is famous as Madar Shah Caravanserai (Figure. 7&8).

Shah Sultan Hossein's mother dedicated the caravanserai to Chahar Bagh School and its proceeds were used for maintenance of the school and support students. In addition to the stay of caravans and traders, caravanserais were used as a storage space for goods and trade exchanges [2].

### 5.1. The Role of Yard in Madar Shah Caravanserai

The caravanserai has a yard with 4 porches. In addition to creating unity between elements such as houses, barns, stables and so on, the yard creates a navigation connection between them that is usually connecting the entrance to other dispersed spaces such as barn or pens or it connects main parts of the house with the establishment of the main summer and winter areas in different directions. The yard was used as a hall and platform and living area for the afternoon and evening in warm and desert climates. Organizing different spaces according to affecting factors is one of the most important operations of the yard in architectural design. Given the impact of the circulation of the sun in different parts of the building, its creators have devoted each part to a specific season and hour. With regard to this issue, the part facing the sun was for winter stays, the part back of the sun was for summer stay, and western part was intended for hours of cold winter days. To avoid exposure to the sun in the eastern part, arcades are made in these areas in most cases. (Figure. 9).

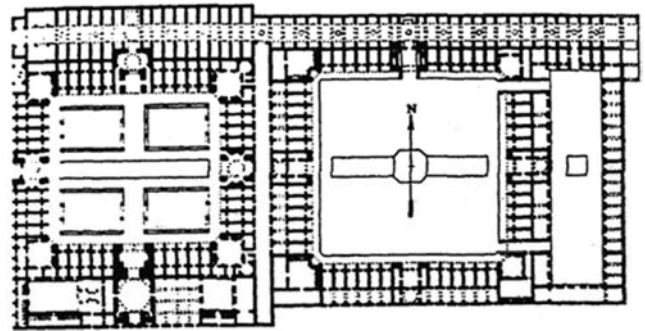


Figure 9. Caravanserai plan Madar shah.

### 5.2. Entrance of the Caravanserai

Entrance of this caravanserai was from the southwest. According to Siroux, there was beautiful tile work during the Safavid era. But now only a small part of it has been rebuilt and remained at the top of the entrance. Because the weather of this area is usually warm and dry, entrance and direction of rooms were made such that they do not face sun; therefore, this caravanserai is directed toward southwest - northeast [9].

### 5.3. Cistern

One of the prominent features of central and Isfahan caravanserais is cistern. Due to the dry climate, cistern was usually required for travelers' needs. The cistern of this caravanserai was next to the bathroom and is a special sample. The cistern is at an angle of nearly 90 degrees to the caravanserai and it was probably part of a collection that remains unfinished. Water tank consisted of thick columns that is located within the cistern and divides it into two parts. This water tank was considered to be used in two ways. First, they took water from the tap and second, there were two small windows at the top of the tank to take water with a bucket. At the top of the stairs and in front of the entrance, there was a small room that had a fine weather as a result of exposure to cool water in the water tank [9]. (Figure. 10).

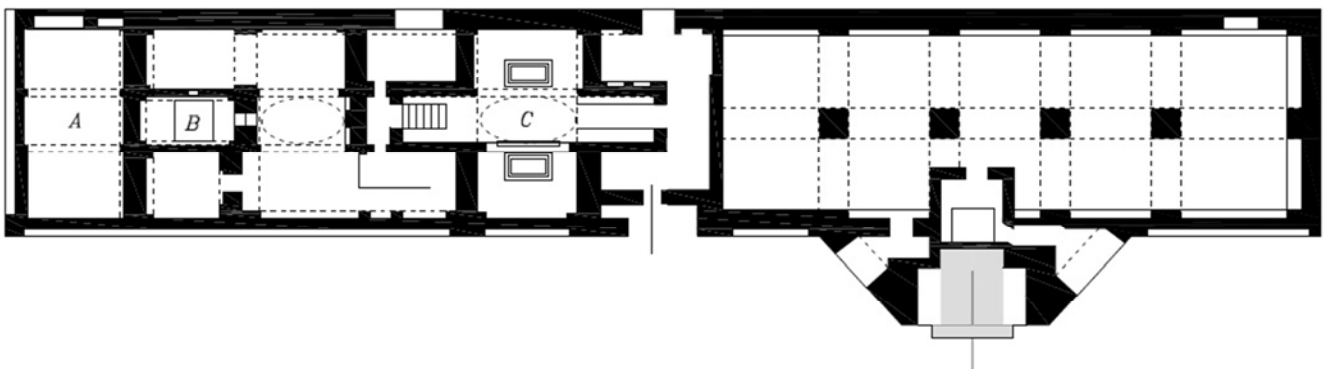


Figure 10. The Cistern plan Madar shah.

### 5.4. Rooms Around the Courtyard and Their Plan and Arch Type

Madar Shah Caravanserai's plan is rectangular with 128 meters long and 93 meters wide. It has a two-story building

with about 140 rooms. Arches used in these rooms are chevron vaults that have been used around the building. It seems the great hall has been a place for the reception of the king or foreign ambassadors. Unlike the mountainous areas,

rooms of these areas are larger. This is because the weather was hot in this region and there was no need to build smaller rooms so as to heat them easily and travelers' room was always built a few stairs upper than the yard so that the entrance of water and mud was avoided and it was far away from dirt of the courtyard floor. Light and ventilate of the rooms was provided through the window or openings. At each end of the central hall, there were small rooms and chambers that everyone will have one of them. These chambers are built along the sides three feet upper than the ground in one line and barns are in the back of rooms. Sometimes the stables are comfortably used for stay. Most travelers tend to stay in the stables in winter since they are hot. Stables, as halls and chambers, all have arches [9]. Unfortunately, these stables have been completely transformed today to accommodate more passengers.

Therefore, rooms were large because of warm climate and for accommodating more passengers. Stables were in the four corners of the building and behind the rooms. These stalls are divided into two categories, which will be explained further below.

### 5.5. Stables Around the Caravanserai

Stables were in the four corners of the building and behind the rooms that are divided into two categories. The first category is columned stables located at four corners of the building and their entrance took place through beveled edges. These stables are square and have plates on either side. There is a platform in the central space of these stables between the four square-shaped columns that along with the side galleries is used as a place for staying or storing goods. Siroux believed that these four columned stables were used to hold elephants that were used for the reception of foreign ambassadors. However, this should be mentioned with more caution since its use for keeping elephants didn't require constructing side galleries and central platform as spaces for keeping goods. Second category is two stables around the back of north and south of the yard and its sides are used for storing goods and keeping livestock. As pointed out by Maurier, stables had facilities such as bathrooms and cisterns; however, now these stables have had changed use and became chic rooms for travelers' staying at the Abbasi hotel [10].

### 5.6. Symmetry

Generally, symmetry has been one of the typical features of traditional architecture in Iran and repetition and symmetry under the title of architectural system in buildings eventually leads to the static building. In this case, the symmetry of the rooms of the two stories is observed and the North-South axis has 100% symmetry. However, the stairs and small rooms besides the steps do not follow the symmetry. According to field observations and the experiences of experts in this area, the caravanserai also has had an alcove above the main entrance corridor.

### 5.7. Material

Building materials used in this area are mainly mud, clay and brick. The reason for this is that these types of materials are abundant in this area, they are very inexpensive, and has a long history of use in these areas. The materials also have a good performance in terms of climate, because they do not become hot in the day and lose heat late at night, which offset fluctuations in temperature during the day in the building. In this region, wood is sometimes used for doors, windows, porch columns, and horizontal columns [3]. Stone is also used for foundation and base course. In Madar Shah Caravanserai, stone is used for the foundation of walls and brick has been generally used for exterior and interior walls (*Figure. 11*).



*Figure 11. The brick work of wall of Eastern room (Madar).*

## 6. Conclusion

Based on the study of Azerbaijan and Isfahan regions and case study of Ghanli Bolagh and Madar Shah Caravanserais and mentioning their features, the effect of climatic factors is so much that led to different plans and material use in these two caravanserais during Safavid era. Accordingly, Madar Shah Caravanserai of Isfahan was made of clay and brick because of the dry climate of central areas and the rooms and yard of this caravanserai were big to accommodate more passengers, which is because of its location in warm and dry region that didn't have a need for hot rooms. Also due to lack of water in these areas, cistern was used for water conservation and easy access of travelers to the water. Forms of buildings in these areas were fully enclosed and introverted, rooms' height was usually high, and arches were often vault and dome shaped. Relatively thick walls that were mostly made of mud and brick are features of traditional architecture in these areas. In many of these areas, deflector

was used to take advantage of favorable winds for ventilating spaces. But since Azerbaijan has a cold and mountainous climate, there was a need for warm spaces. Accordingly caravanserais of this area had small rooms and yard so as to prevent the entrance of cold weather and easily heat up rooms. One of these caravanserais is Ghanli Bolagh caravanserai is Meshkin Shahr. The yard of this caravanserai is small and is located lower than the outer area, which prevents the entrance of cold weather. Each room and stable had a brick wall heater to heat them up. Materials used in this region were all native of Azerbaijan, which was more stone and brick. Thus, on the basis of the foregoing conditions, various caravanserais that have different cultural commonalities and functional ways have emerged. In other words, their "diverse collection" has a systematic unity that has emerged to respond to the contrast of culture and nature and geography and economic needs.

Of the main materials used in the caravanserais of Azerbaijan and Isfahan are stone and brick, respectively. With the investigation of these two regions and case study of the two mentioned caravanserais, it was concluded that the materials used in the construction of caravanserais were mostly native. For example, stone has been used in most caravanserais of Azerbaijan that is because of its climate, its abundance, and resistance toward snow and cold weather. However, in Ghanli Bolagh caravanserai, brick has been used for walls and stone has been used for wall foundation. But brick and clay have been used in most caravanserais of central areas. This is because the most available material in this region is clay and the use of clay and brick is suitable for these regions because of adjusting dry and relatively desert weather. These materials cool up during the days and heat up houses during nights.

Due to the different geographical conditions of these two regions, these conditions have an impact on the plan of these areas' caravanserais. To cope with the extreme cold and long winters in the mountainous regions, most caravanserais don't have central courtyard, rather they have a large hall to accommodate travelers and corridors around it were intended to maintain livestock. Accordingly, yards of these caravanserais were smaller than central regions' caravanserais and were about half a meter shorter than the outer area so as to prevent direct penetration of cold weather.

Physical characteristics of mountainous caravanserais formed as a result of climate and in order to keep heat inside the building are:

1. The ratio of rooms' height to width is low. Especially the height of the stables is low to minimize the need for fuel and heat up easily.

2. The location of the central hall or rooms in the middle of the building and stables around it so as to make the environment warmer by creating a buffer space between rooms and stables.

3. Space for heater or fireplace in this caravanserai is more important and larger than other caravanserais. A large fireplace in the central hall for public use and a small heater

being prepared for stables in emergency situations and extreme cold weather were essential in this caravanserai.

But in central areas of Iran, including Isfahan, fluctuations in temperature is very high and the humidity is less than human comfort. The sun and heat in summer cause a warm and burning environment and dusty desert winds that are underway in many days of the year are troublesome. Therefore, creating a central courtyard in the middle of the building and the garden and pond increased moisture in the living area and thick brick and clay walls, that are due to bearing heavy load of arches and domes, act such as a thermal capacitance and decrease temperature fluctuations during the day. Finally, placing all openings in the face of a relatively humid space of the courtyard and blocking the outer layer of the building, except for the entrance door, cuts the connection of the interior space with exterior space and creates a small and suitable climate for human comfort in a warm and dry climate of the region. Therefore, caravanserais of Isfahan city have specific plans because of its warm and dry climate. In this regard, they have large courtyard and rooms that are suitable to accommodate travelers in hot weather. Since the region is somehow desert and there are difficulties to meet water needs, cistern has been used and most caravanserais have deflectors.

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