

## Architectural Traditional Tissue in Cold and Mountainous Regions Climates of Iran

Zaynab Karkheh Abadi (PHD)<sup>1</sup>, Ali Gholamzade Doab<sup>2</sup>, Qasem Kordi<sup>3</sup>

<sup>1,2,3</sup>, Department of Geography, college of human science, Semnan Branch, Islamic Azad University, Semnan, Iran

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### ABSTRACT

The significant impact of climate on architecture will require doing of comprehensive research and studies in this field. Especially in our country that it is evident in condition climate the diversity. Doing extensive research in this area is inevitable.

The main issue in today's contemporary architecture is disconnecting between domestic architecture and modern the needs. It is necessary to use methods in the ancient world remembered as a symbol of green solutions that Then, they will adapt to the new world by the technological progress of the present age. One symbol of Sustainable Architecture is the Iranian traditional architecture, it was responsible to the ecological issues and energy efficiency both the low first price of and in the low price of a currency and building functional. Because of the need to review the existing solutions for adapting to hard climatic conditions, this is that the architecture of those days was the result of a process of ongoing domestic architecture that passed on from generation to generation over the long run and position and the linkage was tested by trial and error over hundreds of years. This paper used documents a study of techniques used for data collection and also to compare the results of the analytical methods. This article investigates aspects such as building form, material type, urban and villages body and other items associated with colder climates. The result of this article is presented in the format of the building features in the cold climate.

**KEY WORDS:** traditional architecture, climate, cold, Sustainability development

### 1-INTRODUCTION

Different characteristics of each climate have a very impact in shaping of the city and architecture composition this the region So exact determining of climate zones across the country and access to different climatic zones approaches is very important in giving the designs of appropriate and coordinated with every the regional climate. Factors that affect upon the climate condition one region included angle of solar radiation, latitude, means distance or near the equator, current strength and direction of seasonal winds, water, moisture and vegetation in the area and finally the height above sea level and the surface roughness The art history Iranian architecture are of ancient And whenever hands are capable, creative minds and taste of art, like the land has been making The phenomenon tremendous In many cases principle of it have been the root architecture of world Some of the corners of the vast country of Iran is the story of the magnificent architecture of the thousand-year periods based are kept on the height of buildings.

In traditional Iranian architecture of buildings according to Iranian identity and culture have shaped ethnic and Iranian and never mix and the architecture of the building is contrast to cultural beliefs, religious and ethnic people of it area. Even application decorating are the pillars of architecture secondary that that have been no exception In this building, while preserving the cultural identity in the construction have regarding five principle was always on the people love to avoid idleness, introversion, Neyarsh and the use of native elements. The religion and the people of Iran people making has been effective a centuries old architecture building (Shams et al, 2010).

#### Background of research:

Fatemeh Hashemi et al. (2011) in an article have been paid to review the operation of the yard and winter climate in cold Iran areas.

Dr. Majid Shams and colleagues (2010) In an article have been paid to review the traditional cold climate climatic architecture (Sanandaj). This article have paid to discusses the architecture of the traditional about cold and dry climate in the context of Iran.

Shahreyar shaghghi et al (2008) in an article have been paid to review the relationship between sustainable development and design of cold dry climatic zone buildings (Tabriz).

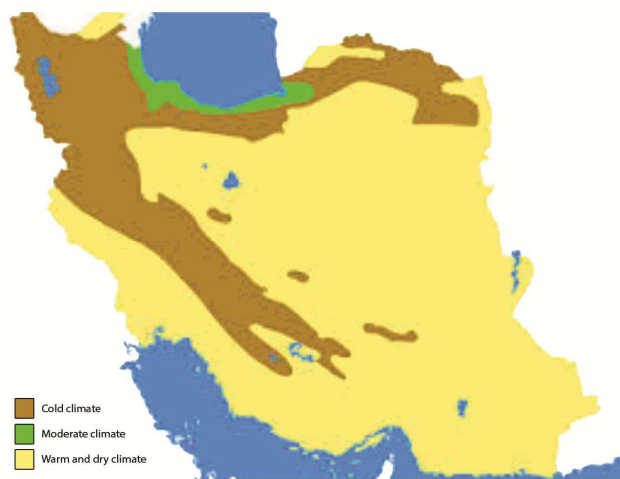
Alireza rezaei (2005) in master thesis. He have been paid to review the role of climate in urban planning with emphasizing Hamadan architecture. Soraya babakhani and colleagues in a paper have been to review the application of Windward planfor ventilation and cooling in cold and mountainous climate of Iran (Kermanshah).

## 2- MATERIALS AND METHODS

### 2-1-the study area:

#### 2-1-1-conditions of climate and climatic characteristics of the area:

Alborz and Zagros mountain chain were separate the central areas of Iran from the Caspian Sea in northern and the plain of Mesopotamia in the West. there are the mountain also a single form, central and eastern Iran Including Mount taftan, mountain lion and ...Western mountain that around the scopes of Western of mountains central plateau of Iran and the Zagros Mountains and come to cold areas country (majedi, 2003: 45).



#### 2-1-2-the climate general of this area is as follows

- Extreme cold in winter and moderate air in the summer
- More difference of Air temperature between the temperature of night and day
- Heavy snowfall
- Low air humidity
- The average of temperature of the air in the hottest climate in this year with more than 10 ° c and The average of air temperature in the coldest months years of less than-3 ° c.
- Temperature fluctuations during the day and night is more as well as in the mountainous areas further .In this climate the valleys in the summer are very warm and temperate in the winter .The amount of sunshine in the summer in this region and in the winter is very low. Winters are long, cold and hard and up to a few months of the year the earth is recovering icy, and spring is short and it does apart the winter and summer. Since early December starts cold and it more or less until late April, continues.

Throughout this region of Azerbaijan was taken up to Fars Province, the winters are extremely cold.

In this area, the amount of rainfall in summer and in winter is too, and falling is more snow. The snow covers most of peaks successive. always there are Snow in the high elevations, 3,000 meters and this mountain comes from subterranean and rivers are considered in the country. Falling the Snow in northern areas and Northwest regions are more than of the South-western area . Despite abundant rainfall, humidity is low in this climate. As well as a series of mountain ranges in the West are like dam obstacle moist air influence of Mediterranean into the plateau of Iran and the relative humidity have hold only on its slopes .Unlike Iran's Caspian Sea coast and North areas that air concentrations due to high to reason of rainfall and ground mail . In a cold climate, it has less concentration and the same subject reduces the amount of use of natural ventilation the air.

### 2-2-research methods:

in this paper has been used of study of the documents techniques for data collection as well as for the analysis of data have been used from the analytical method by descriptive .this article is investigated dimensions like based on the size of construction the form, element type, city body and village and other items associated with cold climate.

### **3- DISCUSSION**

#### **3-1-Construction Form:**

Cooling too much cold weather in the bulk of the year, in the cold and mountainous areas has caused use up to a maximum of sunshine, enjoying the daily temperature fluctuations, maintain heat and cold winter winds of the abatement is imperative in residential areas. Therefore, according to construction the form in order against with the extreme cold it can be designed and implemented. In following we'll pay to explain the General characteristics of construction form in this climate. (pirnya, 2008).

#### **3-1-1- Introverted the buildings with the central courtyard:**

Traditional buildings in cold climates such as the central Iran plateau area have been the central courtyard and other parts are arranged the yard around. Room located on the north side of the courtyard is larger than the other episodes The living room or the main hall the House is also located on this side of the yard till use the direct radiation from the Sun and heat in the cold winter season. The South front of the building due to being short and mild summer will be handled less. Therefore, the South and the East and West rooms – if any – have application as service spaces such as warehouses or as crew room or toilets

Unlike temperate area and humid, southern shores of the Caspian Sea in these areas, often have a short roof with underground at the bottom are the Winter Consort due to its air of coolness, in the summer apply to work and goes home to comfort residents (Kasmaee, 2010)

#### **3-1-2-the use of porch and small yard in construction:**

Since in most days of year mountainous regions is the cold or very cool, most everyday activities done in the rooms. Therefore, in this the areas the yard dimensions smaller than the central plateau regions of Iran. The buildings in this climate have a porch. but the depth of there are far less country then the porch of the southern regions and The Caspian region the porch not living application and are used to maintain of construction the entries from the snow and rain merely. The other point is being low as the floor of the courtyard of Cold climate buildings is the size of 1 to 1.5 meters from the pedestrian level So can be ride current the water in the Creek and stream upon garden of courtyard or located in water storage in underground and on the other hand, the Earth such as thermal insulation around the building surrounds, prevents thermal exchange between the building and surrounding environment of it and it is caused keep the heat inside the building (pirnya, 2001).

#### **3-1-3- construction form, and how to get it:**

In the field of the cold climate and mountainous, buildings are dense and have a plan. The form must be based on that contacting level it less down with outside cold. So less heat is transferred from within to outward .So volumes like the cube or cuboid used till the ratio of the external surface reduced to the interior and it will keep at least possible. the buildings are will be based between 20 degrees and 45 degrees to the West side to the East side and in the shadow of the wind each other and out of the shadow of the Sun, in the North – South axis (kasmaee, 2010).

#### **3-1-4-small rooms with low altitude:**

In cold and snowy areas, should be To create avoided of large spaces inside the room and Because with increasing levels of exposure to the cold outer space, It would be difficult to warm up the space. So in this area , rooms the ceiling of the room Consider below the same rooms in other areas of the climate till room size is reduced and the external surface then to volume ratio is so minimal. down the ceiling height in the halls and main chambers of arches and stores of markets of this area is famous (Kasmaee, 2010).

#### **3-1-5-small: openings:**

In these areas to prevent heat exchange between the inside and the outside of house have been used of small the openings and few number. But the large windows it is required to using awnings . Openings elected on the south side of the sun for much larger and more elongated. Also, the openings location should be avoided of the cold winds. Double-glazed windows are more appropriate for conveying heat exchange to a minimum. In addition, in order to prevent blast making in inside and outside of internal heat burning to outside of the building, amount of the changing inside air of and natural ventilation air must be brought to a minimum. Compared to hot and dry climate of the openings dimensions in the field of climate has risen for using thermal energy from the sun (Kasmaee, 2010).

### 3-1-6- relatively thick walls:

Large diameter of walls it turn to prevent from the heat exchange between the building interior and exterior environments of the building. architectural standards related to Warm and dry cold climate and mountainous are nearly identical and the only difference is the source of heat that the climate is hot and dry in the cold climate of the source of the exterior and interior building space. This should in this the climates to help of the Building material increases walls the diameter. To the walls of the building to act as a heat store. Thick-walled, heat and sunlight a day during the night to maintain and help to adjust the temperature inside the building. The native architecture of the area trying as possible by naturally or with the use of steam and heat from the people, cooking or animals hot the building (Kasmaee, 2010).

### 3-1-7- flat roof:

Traditional buildings in northern foothills of the Alborz mountain ranges are flat roofs that often steep and mountainous regions. Sloping roof, if appropriate coverage is much better than flat roofs because the rain water to ease far the roof. But if thatched roof cover will be greatly weakened its power against moisture and rain and especially the snow. Because water from the gradual melting snow entering to the thatch roof it is so moist and wet. That's why as soon as snow, shoveling it out on the roof and a small stone roller and pulling again roof with roller till cover of the re-compacted mud and holes blocked caused by water intrusion. Select a flat roof is not a problem in cold climates why to keep snow on the roof using of it as thermal insulation. In contrast, cold outside air is several degrees lower than the temperature used snow. And the space truss structure that is used for storage, Good insulation will be constructed between the interior and exterior. However the double roof is being built in this climate it is important to keep the heat (Ghobadian, 2005).

### 3-2- How to establishment of residential tissue in highland regions:

One way to reduce heat exchange through walls is putting them into the ground, because the temperature changing inside ground occurs very small and slower. On the other hand for using cold or the conduct of cryogenic cooling of the earth shall be attached to the floor of the building. Construction of parts of buildings into the soil can be much help to provide comfort in this area the air inside of earth in the periods of hot is cool and in the periods of cold is warmer from ground level. This cause cool basement space in summer and warming in winter than space is made towards the ground (Shateryan, 2008).

### 3-3- The materials type:

Materials used in traditional buildings in cold and mountainous regions is like other areas of continental in the region's material. These materials have to have the capacity and good heat resistance till the heat built up in the preserve the interior space.

The body of the building is the stone (or wood, thatch mortar, bricks and bricks) and wooden beams and thatch roof and the roof. in foundation use stone for building materials resistant and heavy. In some places, the Chinese seat with heavy duty materials used to prevent moisture, however in general buildings in these areas are built on the ground. In this connection it can be named Javanrood and surrounding villages in the western region of the Zagros mountain range and 95 km North West of Kermanshah. Stone buildings in the area given beauty perspective and coordinate to the entire city and the countryside tissue. there are stone in Mountain by abundant this area and are used as the carcass or slates in the thick walls of the buildings. The regional climate is relatively cool and wet buildings flattened and covered with wooden beams and thatched roofs of. Although most of new the building's roof in Javan Rood are truss has wooden and gable roof covering (the Shah Hosseini, 2000).

### 3-4-urban and rural body:

Urban and rural tissue related to cold climate and cool mountain areas have been shaped in order to cope with the extreme cooling. Urban and rural properties in the region include:

1. compacted and dency tissue
2. small and confined spaces.
3. using of ways of the sun and the earth. (As the determining factors for the establishment and development of urban and rural landscape).
4. Narrow streets to parallel line parallelism from the ground. Due to the cold climate and mountainous region in Iran and in order to prevent heat loss and air turbulences, building and made compacted and bound together till the contact level the outside heating spaces residential with cold environment decreases. However buildings are so well put together that will enclose each other. And urban spaces as small as possible so as to influence the flow of cold air into the small spaces and the radiation of heat from the exterior walls heated of buildings decrease to confined small spaces, urban their cool air.

Another point of view in these cities, Narrow streets and slim design for better using of heat and prevent the exchange of heat and cold. Usually in this type of climate, biological complexes establishment in the middle of high domain the

mountains and to the south and on the floor or on the walls of the heat capacity of the body to raise the Northern and increased of internal volume than the outer surface.

In fact as village establishment in the valley below firstly there are the risk of flooding and destruction of villages the village. Secondly, the heavy cold air infiltration into the valleys at night will increase the severity of the cold. Thirdly northern side of the mountain is always in the shade and cool as villages and towns have to maximize the use of sunlight will be built the valley and the sun.

Fourthly, due to increased surface roughness and wind at the top of the mountain and access to water sources and rivers are flowing in the lower elevations, the rural and urban tissue on top of the mountain is not correct (Babakhani, 2013).

### **3-5- stone buildings**

Due to the abundance and availability, the main material of construction stone was used in mountainous areas. Now Stone is also used in many rural areas. Must be confess that traditionally stone buildings has were built in the mountains and foothills, and stone buildings dating back to prehistorically. The excavations have been conducted in Azerbaijan several works have been found these areas prehistoric architecture Geology Board DeMorgan, French has learned in his book . "

These elementary buildings have built with large boulders have and without the use of mortar Under the generic are known name Dolmen in most parts pre the world history we faced with multiple samples of it.

In Islamic architecture of Iran for Important buildings can be seen Use smaller stones and stone material more used for walls, columns and buildings foundation for larger openings is used ram fasten cap strap used for openings with larger mouth and also for the arches of the arch, vault or dome of stone. In the villages for mud and stone wall is used mud mortar or plaster. This type of mortar in walls are without insulation absorb moisture and can be wall loosening. In past for the main buildings is used of "charv Bitumen " charv Bitumen is strict mortar and it resistance is good against water.

In mountain villages wall with dry stone (without mortar) as fence used gardens around and or enclosure for housing. wall without mortar with dry stone is not sufficient strength and should it be used as load bearing walls. However, in areas found with lots of rock and soil are to be low, Villagers also was used from the wall of the building One interesting example of dry wall without mortar .Can be saw around the river and the village of the same name In the south-western city of Marivan in Kurdistan province. In this mountainous region, even to three-story building administer with stones . The mountains in the province of Khuzestan nomads building their summer houses in province mountains with body stone and without mortar . These buildings are called "Lear," (Memariyan, 1996).

### **3-6- Market of mountainous regions and high plateaus:**

In these areas, especially in the North and North West regions, Cold and blizzard are important factor in determining the shape of the buildings. So stories of the market in large cities in this area are generally brick arches. But here within stores width orders height floor to soffit is less than other markets in hot and dry the region and arch and prevent excessive heat exchange between the inside and outside orders and the relatively small dimensions of width and height can be orders

In order to limit the temperature is comfortable and acceptable for humans. Heat caused by the activities of people, lights and heaters inside the chamber of the Market will suffice to provide the desired temperature in cold winter areas. In order to provide light and ventilation in streets of stories there are relatively small pores are at the top of the arch. Although this opening, causing the hot air out of the box marketing However, due to the high thermal mass market orders are executed entirely with the Building .

And also because the walls are load bearing and their thick from view heavy weight arches is much pretty, The holes in the top of the arch are not significant at temperatures disrupt the market. The natural lighting of the arches in addition to providing light a perfect rhythm and normal orders are created in the whole space and beauty scale is a orders the third dimension .

In general, markets for economic and social activities of citizens and designed and built to human scale pedestrian. Man this place is lively as well as watch and exchange a variety of goods And various activities in the context of the market, there are arches beautiful roof and continuous sequence of rows and sunshine roof skylights and coordination in all three enjoyed a market order Market along the road to a long and sometimes do not bother. In cold and temperate climates, dry areas, materials used in commercial centers like other building materials market was the Building material and domed or arched arches are mostly implemented in the two districts Some businesses have been basement Its function mainly as storage of goods And some rest and temperatures have been relatively stable for those rooms. (Me'marian, 1996).

### **3-7- mosque in cold and mountainous areas :**

In mountainous areas unlike warm-dry mountain areas , using maximum design from temperature and keep it on any climate designing . In order to set the desired temperature and environmental conditions to provide human comfort conditions, the following notes on design and operation respected and implemented in most mosques in the area.

- Building materials such as stone, brick, clay that include the high thermal mass was used to build mosques. It is also economical and available materials will adjust the temperature inside the building for the night and day are maintained temperatures. Also, since roof most of the major mosques in the area of tile And the shape of a dome or vault is , So these roofs need to have a base of thick stone or brick . Which in turn increases the thermal mass and reduced heat dissipation.
- Height most of mosque these areas is relatively short. So keep the heat inside building and the warm interior spaces because of less contact with the outside world a better place.
- Dimensions of the opening in the nave of these mosques are often small, and the low number To the heat exchange with the outside atmosphere and prevent heat loss.
- Some of the inn (like Gambvsh) have been taken half of the earth In order to reduce the contact area between the warm air inside and the cold outside effective.
- Opening of these buildings are very small and small and entrance house through a porch against shielded from the cold outside. Thus, less air is moved from inside to outside and vice versa. It should be noted that we have tried always at that the entrance are not of the inn from the cold winds of winter.
- In most of the inn has a few openings in the upper arch and light and ventilation requirements of the building is provided by ways . Of course night and long times the valve is closed stormy periods (Qobadian, 2005).

### **3-8- school in mountainous regions and high :**

In the mountainous areas and highland plateau, schools are largely under central courtyard. In these areas by the cold air , entering and leaving to the chamber have done through the hallway back rooms students such as "School Talbeyh" in front of the Mosque of Tabriz Jameh or through an adjacent rooms corridor Such as "Mirza Ali Akbar Ardabil school" and done school and mosque of Urmia. In some schools, such as school Jafaryeh Safavid that is located near the mosque Tabriz's Jameh, and access the rooms is done directly through the central courtyard. Note that in most schools in the area can be seen no porch on the front of the chamber because of the relatively cool air in the summer, the patio is not much use.

In late solar 1981 a theological school was built in the central courtyard Urmia mosque although this school climate in terms of the volume of the cube-shaped and relatively small openings suitable for cold region, but due to the space occupation by the mosque's central courtyard of the school, It is also not compatible with adjacent historic buildings Contrary to Islamic religious monuments and symbols cannot be accepted view (Shateryan, 2008).

### **3-9- Reliance and hosseiniye in the mountainous areas and highland:**

in the mountainous areas and highlands of Muharram decade mourning is the most important ceremonies however in this areas by severe cold in late autumn and during winter moons of mourning ceremony - except moving mourning groups - often enclosed in buildings and indoor are done Such as mosques and Tkaya and hosseinye . In Ardebil this ceremony takes place usually in mosque, although there are some small hosseinye to perform this ceremony in city. In Zanjan Mourning processions moving in front of the mosque and Tkaya and Come together in one of the two City Shrine.

One of the prominent characteristics of Iran was cities adjacent commercial and religious buildings is in the heart of the city or neighborhood So that the two parts are inseparable from the core cities and neighborhoods. One of the interesting examples in tajresh market observation in the southern foothills of the Alborz . At the back end two of the market is relatively small, there are two tekya (Timcheh) In the name of are known "tekya up" and "tekya down". The economic performance of the market during the year and during the Ashura decade have religious practice and high tekya is more economist and there are the adjacent Saleh shrine And on down tekya is the East side of the market. In the Muharram decade stories around both tekya the holiday and are held mourning ceremonies. Both tekya are wood truss and gables roofs and therefore during the winter very cold of tajresh and as well as in other months of the year, lower heat exchange have done between the interior and exterior space tow tekya.

During the months of Muharram and Safar Bazaar of Hamadan like other black markets in Iran And parts of the market space such as streets related to market , Timcheh and inn allocated to the funeral service. tasoua and Ashura days in Inns' sharife (related to naser al din Shah Qajar period) located in town the market of Cold is established Mourning ceremonies . Men have a gathering in the central courtyard of inn and surrounding areas and women stand the second floor and watch from inn (pirniya , 2001).

### **3-10- water storage in mountainous areas:**

Although in mountainous areas are more rainfall than hot and dry areas relatively and often in these areas flowing permanently or seasonally springs and streams But to store potable water, are usually used for water storage Water storage in mountain areas, especially in areas with good climate and forest, is flat With wood and thatch coating. Reservoir this type of water storage point of view in the roof coating is a cube or a rectangular cube. In Hamadan, at the foot of Mount Alvand houses were mostly well. Of course in some houses were built on the Hungarian underground aqueducts, could be used from subterranean water directly. In these houses, the route of aqueduct were passing the underground t where they

making the room called spring house with beautiful arches and brickwork this place was very cool in the summer and was used for the rest. It also has been referred to the springs place. On most Tuesday roads and regions city centers may also have access to aqueduct water (Ghobadian, 2005).

### **3-11- Underground glaciers**

Another type of glaciers was making in Iran's the central north area, like Tehran and Saveh and North West regions such as the like Zanzan, and Tabriz and Houdan that it functions like a dome refrigerator, but shaped body is different. Much of the body of this species of glaciers were in the Earth's. Its thick walls made of stone or brick and mortar. Blue such as lime sand mortar and concrete. Often ceiling or roof is as the brick or metal arch. After they are frozen, ice is poured into the soffit vents to glaciers then, each time water was poured on the ice till the mass of the ice might be integrated. In this glacier not covered between layers of ice and the ice upon with straw. Because climate of the relatively cool inside cause ice has remained frozen in the summer.

In cold areas, The use of natural ice range of mountains which were shadowed location, is common, as in Hamedan in place called Angel Springs at the foot of Mount Alvand found ice always. One example of an underground glacier that remains relatively intact, in the southeastern city of Saveh is south garden Jouzqy that by Mirza Mahmoud Hakim was founded. Width the glacier is about 3.5 meters and long is 12 meters, it is 5 meter from height of the glacier is lower from the natural ground level. It is about 80 cm thick walls. It made with dimensions of  $25 \times 25$  cm Kazakh brick and mortar made of sand, lime and ash distances. Roof of the arch is about 3 meters away from each other.

Most underground glaciers like Glacier Dome due to have been the large dimensions and needed a relatively large area to produce ice and because ice the price is relatively cheap, So point of view the economically necessity that in the suburbs that land prices were cheaper (Ghobadian, 2005).

### **3-12- inn in mountain area and high:**

Inn in the cold mountainous regions to deal with the extreme cold winter, often been lacking in the central courtyard and instead of a central courtyard, with a large hall are to accommodate passengers. In order to keep livestock in had great the corridors around it. These physical characteristics inn caused by climatic conditions and to maintain the temperature formed indoors, in general, is:

- The ratio of height to length and width of the room is low, especially Height stable is in most cases is too short to require less to fuel for provide the heat.

- By placing the central hall or rooms of travelers in the middle of the building and stables surrounding area stables as buffer space between the heating medium that should be in the range of human comfort and serve operation cold environment.

- Space heater and fireplace in the inn was much larger than the other inn and have more important.

And in the stables part there is a wall heater for cattle on a smaller scale. The relatively large size of livestock and many of them cause warming stables and heaters are turned on only when it is very cold outside.

- Base and walls of this inn is mostly rock it was taken from surroundings inns and materials used in some of the inn brick arches arc (INN Shebli) and others (such as Hashim shrine and Gambvsh inn) are stonic.

. Therefore, since the arch was built with masonry need to base and thick walls for load bearing arch and thus the thermal mass of the body inn is high. Which to control the indoor temperature during the day and to reduce the conduction of heat exchange between interior and exterior is very effective.

- The safety aspect against the caravan raiders and pirates, this inns has been almost entirely confined to the cube in fact Contact surface of the outer shell of the building with outside space and thus decreases and less heat exchange is done between the inside and the outside (Rezaie, 2005).

### **4- Conclusion:**

In this study, we tried to examine the features of traditional architecture of Iran in the dry and cold climate. So that the relationship between the past architecture with the climates for using energy and Sustainability refers to the study of vernacular architecture, efficient use of renewable energy such as air, light, sun ... the was intended construction. moreover have tried the construction has minimal impact on the environment. Based on the foregoing, we can conclude that the city and its buildings to suit climate type are different dimensions from architecture. In other words architecture building in cold climate is different from warm the climate.

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