

## Study on the architecture of Iran by new perspective to future

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**ABSTRACT:** Today, the necessity of energy saving is one of categories to be noticed more than before. Accurate controlling the amount of energy consumed in building and providing the required designing criteria to save energy is quite vital. Traditional architecture as applied in Iran is of a great value for its extensive capabilities to provide solutions for effective use of energy. So, by taking advantage of collective wisdom of the architects of precedent generations as well as historical experience, an Iranian architect has achieved to this capability and contemporary artists could be inspired by this achievement to design new and modern buildings. Since, Zavareh is one of ancient cities of Iran and comprehensive studies have not been made on this city, then desirable recognition of climatic aspect of this city may be valuable to know the Iranian local /domestic architecture. In the present paper, the residential architecture of this city is going to be studied to provide reasonable solutions for designing. Then, by application of these solutions, designing regulations, optimized materials and architectural regulations consistent with the climatic conditions of this city will be established and finally an effective measure to achieve a lasting architecture is taken. This paper will mainly focus on studying typology of residential constructions of it and checking its climatic features against sustainable architectural factors and those elements specific to sustainable and climatic architecture of it. The methodology applied in this research is based on a descriptive and analytical approach and the documents complied are documentary resulting from many field studies. To do this, many of the constructions built in this city have been visited. The theoretical framework of this research demonstrates that the conditions of traditional architecture in each region have been affected by climatic conditions.

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## INTRODUCTION

The tranquility of those people who resided in different four regions of Iran has been always disrupted due to humidity or aridity and high temperature or high coolness and the traditional architect could overcome these difficulties and could establish innovative methods taking advantages of available facilities and employing the natural forces and the energy existing in the nature. Today, these have been forgotten.

One of the most important features of desert regions is comparing the residential buildings with the region the city is located therein. Since, this city is treated as a city with desert climatic features, then compliance of residential units with environmental conditions is quite inevitable. In the present paper, to examine the climatic-based architectural qualifications of housing development in it, 9 houses as indicators located in this city were selected and the climatic-based architectural qualifications of the foregoing city as a desert-based city the houses built therein are consistent with climatic conditions were examined. We are going to provide the solutions of architectural designing with this city to

establish the appropriate designing regulations and criteria. These actions may have a significantly effect on heating- cooling energy saving. It is worthy to note that the world is developing and the natural resources are diminishing. Given the resources found in it, five types of houses are identified. The general characteristics of housing varieties of this city were reviewed.

It is as an ancient city is 119 Km from northeastern of Isfahan province and it is located in a hot and arid region. Given the arid nature and undesirable soil texture, extensive salt lands and broad sandy places, the vegetation density of this region is very poor and it is mostly of desert step type. From ecological point of view, this region is undesirable for residency. From water network point of view, its region is treated as a poor region. Given the climatic condition and natural location, there are not permanent surface water network in this region (Consulting Engineers, 2006). The water supplied by Ghanat. In the past, the water required for city was supplied by glacier and some cisterns.

## CLIMATE STUDY

Given the data and information on temperature, humidity and precipitation as registered for this city, we found that different features of desert weather such as low precipitation and fluctuation of temperature during in one day and low humidity are the most important environmental limitation of this city. (Municipality of Zavareh, 2009) and this environmental limitation may play a significant role to form the environment. The environmental conditions can be summarized as follows: this city has a cold winter and warm and dry summer and the average temperature reaches to 17.7°C (Consulting Engineers, 2006). The minimum temperature is -9°C and the maximum temperature reaches to 44°C in July-August. The temperature fluctuates within the range of 25°C during in one day in summers. Given these data, the weather dryness is demonstrated. This dryness will cause the water to be evaporated in this region and may have a significant effect on crops, as well. The blowing of warm wind may intensify the dryness (Ghaffari, 2000).

The most degree of relative humidity is registered in December with 6.3% and the least degree of relative humidity is registered in June with 25.8% (Consulting Engineers, 2006). The annual precipitation is 103 mm on average.

Low precipitation may result in barren lands and these lands are covered by the sands carried by the dry winds from the desert. The occurrence of frost during more than three months is likely and it may be intensified by the blowing of cold and ruthless winds.

The blowing of dry and burning winds usually accompanied with dust will intensify the dry and harsh heat of the summer. Under such conditions, the blowing of some winds will relieve the heat of the desert weather (Ghaffari, 2000).

Wind is one of important weather factors and elements in this region which play an effective role in positioning the urban elements and proper direction of housing and other urban spaces. In general, by taking advantage of shadow, achievement of tranquility conditions and desirable spaces cannot be guaranteed. However, air flowing. Taking advantage of desirable winds and avoiding undesirable winds in this region may be the most influential factors. In general, no scientific research was made on the winds blowing in it. Given the climatic studies of here, we have to reach some applied solutions for human comfort in this city by taking advantage of climatic-architectural facilities including providing effective ventilation, protecting the walls and windows against sunlight and undesirable winds, preventing heating of internal air during summer days and minimizing it in the night.

## THE STRUCTURE AND TEXTURE OF THE CITY

In addition to climatic factors, some probable risks such as earthquake and water shortage have given rise to innovation and evolution of constructional forms such as dome, arch, windbreak and the cover of some parts of roof as hollow and using mud-bricks. Paying attention to aesthetics issues in application and composition of these forms and controlling the filled and vacant spaces are one of the features of buildings in valuable texture of the city.

The texture of this city has a checkered grid with an organic order and the courses are consistent with this grid. The existence of alley and roofed and indirect passages and narrow alleys with high walls provide the minimum sunlight and the maximum shadow for the people. Since, the grid is placed against the windward, the blowing of undesirable winds are prevented. In consequent of this type of urban planning, the hierarchy of observing the bounds and social fields are established.

The skeleton of it has two main axes which in its intersection, the city's gravity center with concentration of main architectural elements have been conceptualized and then the city can be divided into different places.

Historically, it is treated as an ancient city and most of its old-textured houses have architectural and cultural values and they are still used for living. The houses have a single unit and the yard and the spaces surrounding it have an ordered pedestal with geometrical shapes. Most of these houses have a separate and splendid yard. According to studies made on these houses, they are classified into three categories in terms of spatial arrangement: single- central yard, two-central yard and three-central yard and sometimes one of the open spaces have been designed as in the form of garden.

The most of houses are built in one level, and they have a basement and sometimes a windbreaker connected to the basements. The people spent their times in the deep and cold basements during the summer. Some of these houses have a two-level basement. The most of houses had a compact and inner plan and the external surfaces were minimized to lower heat exchange. The existence of dome has caused a part of roof to be protected by direct sunlight. During studying the houses, it was found that the most of houses with fountain and Hasht Behesht have two unilateral windbreakers. These facilities caused the air to be flowed and ventilated naturally within the internal space of the house.

While contacting with moisturizing elements such as fountain, flowerbed, trees and the wall of basement, the air flow could compensate the moisture shortage and

provide the comfort conditions for the residents during warm and arduous days of summer (Ghahramani, 1996).

In houses with Hasht Behesht, in addition two windbreakers, two general elements with rectangle-shaped section of 20\*70 are extended by the roof.

The red tape of entering the house from the alley and the arrangement and organization of spaces: door, front yard some of them were common with two or three adjacent house, entrance hall, yard, veranda and the closed space, separate the building from the outer life stream. The entrance hall of the houses is usually a semi-opened space which is connected to the yard through the dark and tortuous corridors.

The corridors play the role of connection of entrance hall with yard(s) and or connection of other elements of the house with each other. In houses with fountain for instance, the lobby and lateral spaces are connected by the corridor. This phenomenon will increase the purification of these spaces and the designing of niches has visually improved the quality of this space.

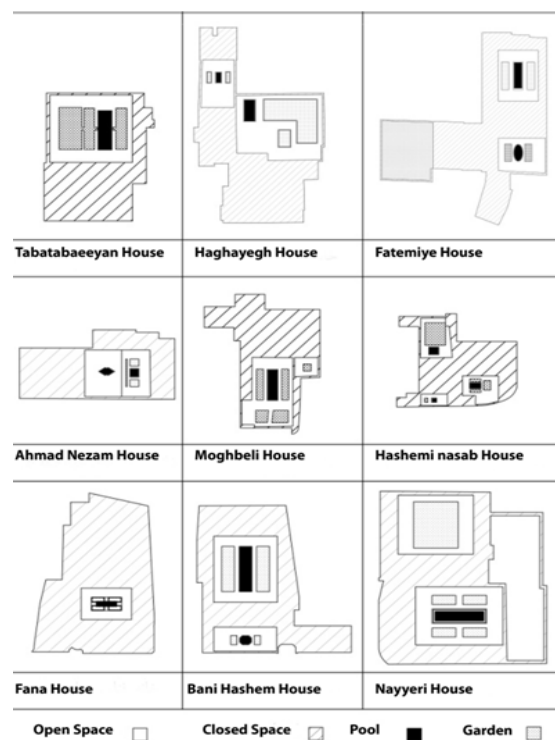
Veranda is a semi-opened space and it faces the yard. It is a place for sitting, sleeping and a part connect the different spaces of the house with the yard and it is higher than the yard and it is located in the outer section of the residential buildings in the southwestern side of the building. By providing the shadow, the veranda prevents entering sunlight to inner space of the house. In wintertime, the veranda causes the sunlight to be penetrated as inclined. There is a veranda in southeastern side of the yard and it is used as a canopy for adjacent house. In accordance with the results of studies, the ratio of filled and vacant spaces is 3 to 2. The results of studies are given in figure1.

Yard is an integral part of the houses built in this city. Having geometrical shape (square or square-rectangle), they have many functions. The yard has a central function in all of these houses and acts such as the heart of the house. Different spaces of the houses such as room, veranda, corridor, terrace, portico and platform with a defined arrangement are located around the yard. All spaces are indirectly or gradually related to the yard. Four fronts of the yard, even those parts which form the walls are defined.

In terms of spatial feeling, the yard will act such as unroofed room which the most daily tasks of the housewives are performed there. In general, the yard makes possible the free connection with the nature. Since they have not any view, they are used easily. In each of sides of the yard, the height of roof of fountain, storeroom, veranda, room with tree doors and room with five doors are different from each other which is very influential to direct recognition of the spaces.

Using the topography and vegetation density is the simplest form to provide the natural shadow. During the

climatic examination of Iranian traditional buildings, Ghobadian states that a large oak tree and or the grass with an area of 500 sq. m may have a significant role in cooling the air during a sunny day in summertime. It is equal to operation of a cooling system during 20 hours for ten rooms. As the existence of water resources in the region may moderate the temperature during a one day, it is able to diminish the temperature fluctuation as a small climate inside the building (Ghobadian, 2004) Water basin and the flowerbed are integral parts of the yards.



**Figure1.** Location of garden and pool in samples houses

## RESULTS

Given the points mentioned in this paper, it is time to develop the designing regulations and criteria for this city. To use the pattern of neighboring and local garden, a green space to be able to provide the desirable shadow with its mass trees will have the most effective role during hot hours a day. To create a green space to be able to provide the humidity and tranquility in its environment is one of the objects of such spaces (Consulting engineer, 2006). While absorbing the sun rays, the green surfaces prevents reflection the rays again and unwanted heating (Haghpanah, 2009). To plant the trees in the eastern and western sides to protect against sunlight (Ghobadian, 2004). Due to evaporation of water, the plants have a significant role in cooling the environment (Hamzehlou, 2006).

One of the characteristics of the plants is to direct and diminish the violence of the wind. By planting the tress, burning, cold and dusty winds are prevented. Furthermore, sound transmission is prevented, the air is filtrated, the temperature is moderated and the biological desirable conditions are met (Farokhyar, 2008).

- To cultivate the plants such as the bushes of tamarisk for stabilization of running sands and prevention of dust.
- To plant the trees with long roots for prevention of soil movement in desert lands with running sands.
- To avoid the blowing of the wind by planting trees. The trees shall play the role of windbreaker in wintertime (Saied sadr, 2001).
- To plant the long trees in lines by observing the distances by the vicinity of the building to direct the air flow (Farokhyar, 2008). In addition to increasing the relative humidity, the trees make the shadow during the summer (Hamzehlou, 2006). Specifically, by planting the autumn trees in the southern side of the building, we can use their shadows as well as sunlight during wintertime (Ghobadian, 2004).
- To cover the external margin of the building using the bushes and ever-green plants to diminish waste of energy.
- To provide a proper distance between the external walls and the bushes and the leaves and branches of adjacent trees to make possible the heat reflection from these walls (Consulting engineer, 2006).
- In addition to the cases as mentioned above, the plants can be used to communicate with architectural context as discussed below:
- To use the tree for a desirable landscape and use of the tree to prevent the view.
- To use green space with vegetation diversity compatible with the climatic conditions of the city may be employed as an architectural element for designing the urban spaces. These are classified into autumn and ever-green tress in terms of length and different types of them are used on the basis of the dimension and function of space. In this way, a combination of urban context with green space appropriate with its function is provided.
- Due to the dryness of the environment, we shall do our best to increase the air humidity. To do this, the following points shall be observed:
- Providing the water basin in the context may increase the humidity (hamzehlou, 2006).
- Sprinkling the yard and the plants in afternoon will evaporate the water and may be effective in cooling the weather and diminishing the air dryness.
- It is recommended that the waterscapes are placed in the places that their humidity is directed toward the building (Farokhyar, 2008).
- Due to rapid evaporation, the accumulation of water shall be avoided in the places exposed to the sun and or the water shall be directed inside the building and or a proper space shall be provided between the water and the building (Saied sadr, 2001).
- To cause the air to be flowed in the distance between the compressed limits of vegetation and building limits for taking advantage of its humidity.
- For taking advantage of the coolness and heat of the ground, the buildings shall to be constructed on the ground floor (Farokhyar, 2008).
- To make use of the current of cold air and take advantage of natural air conditioning, the following points shall be observed:
- By proper designing the area, scheme, construction form and ceiling and application the solutions such as ups and downs or land features and or walls or adjacent building as wind protector or wind direction, the desirable wind blowing in the region may be lead to the desired direction or the undesirable wind may be avoided (Yazdi, 2009).
- Using duct for air ventilation and air exit and providing free spaces to create and move the cold air (Ghobadian, 2004).
- Using the direction of wind blowing to make coolness and direction toward the building.
- To avoid the wind as tunnel- shaped forms.
- To take advantage of proper wind blowing and to place the water basin in its direction to reach a desirable breeze (Saied sadr, 2001).
- Openings shall be place in pressurized and suction place and the height of the bottom of window from the ground of the room shall be 0.5 to 1.5 m.
- To increase the height of a part of central space for chimney and to direct the warm air upward and outside the building.
- To use one-level buildings and low height in the fronts exposed to severe and harsh winds during wintertime.
- To provide external spaces for taking advantage of desirable breeze (Keshtkaran, 2009).

- To provide airproofs or doubled entrance or entrance yard and to heighten the entrance surface against external finished ground.
- To construct the building within the land on the foothills behind the wind and to cover the faces exposed to the wind using soil and to get light from internal yards.
- To use integrated and isolated doors in the facades exposed to the wind and to seal all doors, windows and openings.
- To minimize the number of entrance doors and to place the main entrance door in direction of windward and to fully protect the main entrance door by the tree (Watson, 2003).
- To predict the compact plans and to develop the settings with compact texture.
- To install air vent with automatic apertures and to install the aperture or cap on the chimney.
- To take advantage of air flow for air ventilation in the spaces (Moradi, 2005).
- To place the openings horizontally for controlling the wind blowing and current of cold air toward the inside of the space (Farokhyar, 2008).
- To provide mesh-like guards opposite the facades against the wind and to construct the thick walls for the buildings exposed to wind.
- To install the aperture or moving grid of thermal insulation at the back of the windows or to use internal staircases.
- To consider the direction of wintertime winds and to prevent constructing the single buildings in the field and unprotected areas.
- To provide steep roofs and to establish the steep slopes in wind direction (Consulting engineer, 2006).
- To erect the building in direction of radiation of minimum sun energy in warm conditions.
- To use the common walls in constructional complex and to form a compact texture.
- To provide a bounded parking in the western side of the building.
- To open the main spaces toward internal yards or open spaces located in the shadow.
- To provide the spaces under the roof to be ventilated and doubled roof or using thermal insulation on the roofs.
- To avoid providing the window for the roof, except for the summertime which in this case it shall be fully covered by the shadow.
- To avoid providing window for eastern and specifically for the western facades, otherwise to limit the number and area of such windows and to provide a vertical canopy for them.
- To take advantage of roof projection and roofed veranda or balcony to create the full shadow on the external surface of the glass-made window, detachable and walls exposed to the sun.
- To take advantage of the proper canopies (external canopy, as possible) for glassed surface and detachable and to provide the gap in connection point of the canopy above the window and related façade.
- To use wooden aperture or insulated moving grid at the back of the windows (Consulting Engineers; 2006).
- To use the soil as thermal insulation due to its trivial variation against temperature variations by constructing the building inside the land, to embank at the back of the walls and to cover the external margins of the building using bushes and ever-green flowers to create a desirable and ideal environment and condition when the natural temperature of the environment is not favorable (Varmaghani, 2009).
- To avoid constructing the building on negative gradients and indented parts.
- To consider the southern wall to provide the heating. This point forms the basis of those buildings referred to solar buildings (Farrokhyar, 2008).
- To erect the interconnected buildings in the middle parts of southward slopes.
- To erect the building toward the direction of maximized sunlight under cold conditions.
- To provide heat generating spaces such as kitchen in the center of building plan and to provide insignificant spaces such as storeroom as thermal insulation in the walls or cold parts of the building (Rashidi, 2009).
- To develop underground construction with central yard in such a way that its roof is one meter lower than the ground level. In this way, light, sun's heat and fresh air will be transferred inside the building.
- To take advantage of stone-made foundation beneath the rooms to save the additional heat and to restore the saved heat in the night (Varmaghani, 2009).
- To use the proper thermal insulations in the external walls specifically in the roof.
- To avoid installing the large windows on the facades of the building.
- To take advantage of doubled-wall windows and even three-wall ones and to provide the thermal insulated sheets inside of the detachable parts.



- To take advantage of all types of curtains, moving insulated grid for preventing heat loss of the building through the detachable parts.
- To organize the plan in such a way that sunlight to be shined on the internal spaces.
- To leave southern frontier of the building at least by 30 degree from each side.
- To allocate the southward space for living and to allocate insignificant spaces in southeastern and northwestern parts of the building.
- The depth and the position of the window on the façade shall in such a way that enough sun shining inside the internal spaces is met.
- To Take advantage of general windows installed on the southern facades or the windows and ceiling skylight (to prevent heat loss through these windows, required measures are to be taken) (Consulting Engineers, 2006).
- To provide proper canopies for the windows assisting sun shining during winter and preventing sun shining during the summer.
- To provide the reflective surfaces in the grounds in the vicinity of the sunshade windows.

### Conclusion

Zavareh is often sunny during the year and a significant amount of energy may be saved in the environment. Then, through making the scientific studied on using this energy, it can be utilized ideally. One of the common methods to use this energy is direct sun radiations together with direct radiation. In this method, the sun's light shines on the building and after passing through the window's glass, the internal spaces will become warm. For indirect sun radiations, these radiations will shine on the absorbent mass placed between the sun and inside the house. When this mass becomes warm, the absorbed energy will transfer to the rooms. A body or intermediate space such greenhouse, sunshade space provided under the roof and or thermal wall may play the role of this mass. The greenhouse is better to be used in the southern side of the building. To prevent heating the greenhouse, the construction material with high thermal capacity and dark- colored surfaces shall be applied.

Undoubtedly, the material used in the buildings shall be of heavy and compact material. The thermal insulation with bright colors and smooth surfaces shall be used on the roof surface and external walls exposed to the sun. To minimize the heat, it is recommended that proper materials to be used for the area of the building.

The old city has maintained its relation with the nature and a reasonable and logical relationship between the human and its surrounding environment is always seen thanks to the order and harmony. While architecture has

been forced to manipulate the nature to construct the building, it has not destroyed the nature and has been able to establish a good balance in this relation.

While absorbing the sun rays, the green surfaces prevents reflection the rays again and unwanted heating. To plant the trees in the eastern and western sides to protect against sunlight. Due to evaporation of water, the plants have a significant role in cooling the environment.

In each region, proper selection to erect the building is the first and the most important measures to be taken for designing appropriate with that region. In this case, we can take advantage of climatic factors such sunlight and wind during winter and summer seasons to protect the building against the sunlight and to decrease the heat loss. Furthermore, natural condition, need to private spaces, control and decrease sound are some other factors that may influence the erection process of the building.

To allocate the least side to southeastern and northwestern sides and to place the proximities in these sides and to avoid selecting the eastward or westward slopes for constructing the building.

Due to increasing the air and environment temperature in the afternoon, the eastward turning of the building will cause the western side to be exposed to sun shining very short.

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