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Review Article

RESIDENTIAL COMPLEXES DESIGNING WITH FOCUS ON KERMAN NATIVE ARCHITECTURAL APPROACH

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ABSTRACT
Residential architecture, due to having a close, intrinsic link with life of people of every class, has a significant importance. As a result of the direct relationship that residential architecture has with natural environment and cultural-social considerations, development of architecture in the form of an eco-construction, compatible with environmental and cultural matters can lead to formation of residential complexes that are long-lasting and idea for habitation. Therefore, this paper seeks to deal with design elements of such residential complexes with focusing on native architecture of Kerman city. Since the architectural patterns in Kerman's native architecture pattern originates from respond to natural environment, it is possible to develop a pattern, through discernment of expressional elements, that not only helps to maintain native cultural values and meet the inhabitants' needs in the minimum amount of area, but to develop compatibility between residential pattern and climate.

Keywords: *Native Architecture, Kerman, Residential Pattern, Cultural, Climatic*

INTRODUCTION
Human inherent needs and preoccupation for addressing them have always been a major goal along history. 'Housing' and being concerned to build houses that satisfy human innately is a prime example of such basic needs. In a continuous period of time, this has functioned as a endogenous process in formation trend of housing, in that when population grows and consequently needs start to change, this mindset and its reflection on formation of culture and traditions has exerted notable influence. Therefore, natural environment, human mindset and its reflection has exerted great influence of formation process of culture and traditions. Natural environment awards some facilities and humans tend to use them, according to their natural patterns, when it comes to choosing where to live and how to meet needs. Every place that is possible to be chosen for living, it is necessary for humans to develop compatibility with environment by default. This, in turn, ends in alterations in his habits and habit which is mirrored by its culture and traditions. It can, therefore, be said that human culture comes from communal thoughts, traditions, habitation and places that are man-made. So, architecture is a matter of habitation of a community. On the other hand, architecture of every community, in any historical period it be, is reflective of that community's social, cultural and economic features and is formed by culture and traditions of that community.

In native architectural culture, house architecture is of great importance because it has close, endogenous link with people's lifestyle. Further, because house architecture follows native pattern, it complies with certain set of rules and its formation is determined by two basic elements: 'environment' and 'cultural-social concepts'. This can also add to the merits and survival of the house, such that an architectural monument may induce to a visitor special meanings that have roots in a particular culture and are shared among native inhabitants of that place, even though it has been built several decades ago. So a housing architecture can end in creation of proper houses when it is compatible with the native styles and environment as well as cultural features of that community.

As a biome which forms native residential pattern in our paper, Kerman has peculiar environmental properties including high temperature sways in different seasons and even in different hours of a day, extreme dryness of air, cold winds in winter and extreme hot weather in summer. The elements that form this region's native architecture pattern emanates from architectural responds to natural eco-construction which, due to lack of technology at the time such patterns were taking forms, such elements were paid

great attention when it came to creating living space. The relationship among members of inhabitants of an area together with the internal space of their houses which comply with native patterns, as long as they live in them, form culture of that area. This paper focuses on Kerman 'culture' and 'biome climate' On the other side, apartment habitation can be regarded as a notable development in human's urban life. Habitation areas that once were supposed to be formed in green and beautiful space with lesser dense turned gradually into densely populated apartment complexes.

Industrial advancement, growing population, modern means of production and vertical development are among the main factors that contribute old housing into modern apartment housing. In pace with growing inclinations towards apartment housing in Iran, mass development of housing in the form of apartment complex was found to be a solution in response to meeting the need for housing (Farajzadeh *et al.*, 2003). However it must be noted that such complexes are built without taking biome and cultural-natural needs of their inhabitants into account. But since this pattern of housing (apartment) has been well-accepted by Kerman people and also due to the importance of native architecture, a model that is combination of both is recommended as solution. Because apartment form of housing has the advantage of populating small places with higher numbers of people. This paper seeks to devise a habitat-oriented pattern for contemporary residential mode of Kerman; a pattern that can meet natural needs of today's inhabitants of Kerman and also carries native elements endogenously.

A main reason for fading environmental merits away from residential designs is architects' inclination to put rich cultural values aside in the period when they are departing from their own culture; a trend that has been experienced in Iran for a long time (Razjouyan, 2009). It is by this trend that imported cultural values begin to extend in architecture and urbanization. In the contemporary era, it is impossible, from different aspects, to evaluate housing as being genuine. It is therefore essential to lay down a basic concept of durability for contemporary housing through habitat-oriented patterns; in fact we must design today for long years from now.

This paper is important in that it conducts a basic study for the purpose of formulating the climatic and cultural concepts of warm and dry regions in order to achieve a habitat-oriented residential model. It is possible to use expressive elements to devise a model that not only satisfies cultural criteria but can meet the need of inhabitant's best. Native techniques grew in a gradual course in line with architecture and culture and socio-economic conditions and have been melting into architecture such that it is impossible make a distinction between architecture and technology. State- of – art technology removed the central role of materials to provide an international model for construction, and so as a result of unconformity with the place, they have been misused which led to harms to environment and identity as well as the merits of native spaces.

Native Architecture

Today, a notable challenge of Iranian and world architecture is that growing production has turned humans' mindset into mechanical and instrument-based mindset in which technology decides everything, pushing native culture, environmental properties etc., aside. Native architecture has correspondence with environmental considerations, and so they are fully dependent on the considerations and the sources of the place. They are concerned with the best solutions that can meet the needs of construction and native construction technology has become intermixed with local cultures (Eppich *et al.*, 2013; Eirajia, 2011).

A definition that has been given for native architecture says: 'native architecture is a term which is meant to classify construction methodology in which local sources and traditions are employed to meet local needs. Local architecture evolves in time to reflect environmental location and historical-cultural background (Eppich *et al.*, 2013).

In fact, local architecture can be stated to be a form of architecture that takes forms based on construction techniques and methods; or a form of architecture which comes from native technology; a generalized designing method that evolves from popular architecture. It can be considered as an advanced form of architecture that belongs to a particular spot which has a link with climate, culture and construction materials. In such a form of architecture, 'scale' functions as a decisive factor (Erfanizadeh, 2010). Native architecture is referred to a set of architectural-urban units that come together in a particular location and

share a common feature such as harmony in background, sizes, applications, colors and tone as well as building materials and systems (Bodach *et al.*, 2014).

Confusing traditional or climatic design for native design is a possible mistake that may be made here. Although native design is far from being merely repetition of what which had once been common in the past, it is possible to follow traditional design processes. Climatic design is merely a part of native architecture not the native architecture itself. Traditional policies have ended to shelters that have survived along centuries, but now they are unable to keep pace with today's modern sources. Finding alternative solutions and policies that can actually survive have proved difficult.

Although most of traditional patterns are compatible to native resources, they conform to the needs of people best. However, factors that encompasses statistical growth, conversion of rural areas to urban areas, shrinkage of natural resources and meaningful changes in people anticipations and lifestyle come together to wear out traditional patterns of residence (Eduardo Peris Mora Life Cycle, 2007). That is to say that a myriad of traditional solutions exist for the purpose of meeting needs, although a number of them are now ineffective. Today people need to a different form of houses; houses that are built quickly and those which match to their occupant's financial affordability.

What which is certain is that a building method that has worked well in the past be very hard to maintain and upkeep and it must also not work well to meet today's needs. It will increasingly become evident that an alternative must be sought. It is important to focus on methods, skills and equipment that are accessible and usable in the region.

Furthermore, understanding of environment and architecture is possible only by understanding what man is doing in his surrounding word. Indeed, architecture's goal can be considered as creation of a human paradigm into a body shape. So if we accept that architecture is a body to reflect human life – life with all its related aspects (such as needs, believes, thoughts, and generally the values etc.), we ought to discover that our today and yesterday architecture could not be irrelevant to our past architecture (Eduardo Peris Mora Life Cycle, 2007; KakNilson, 2009).

There are a number of socio-economic relationships with natural environment and cultural symbols that are reflected skillfully in the course of native architecture formation. Such architecture can cater for the needs of a community in its relation with natural factors and men's moral wants (Foruzanmehr and Vellinga, 2011).

Native Architecture of Warm & Dry Parts of Iran

Near 120 million hectares out of Iranian total 165 million hectares surface area are located in dry and desert climate. About 40 million hectares are moderate and 5 million are high, mountainous areas (Rahbar, 2001). That is why Iran is characterized by diversity of climate. Such a characteristic has exerted profound impact on the appearance of Iranian cities and habitations-whether large of small they are. It has, thus, given a sense of locality and nativity on the surface.

Iran's warm and dry areas are important for both their extension over Iran and their role as being habitation places. Therefore, native architectural patterns and criteria of such areas are of great significance. Now we are going to elaborate on human habitat and how to handle environment and landscape in biomes of Iranian desert areas.

Warm and dry climate predominantly covers eastern and central parts of Iran and share the following characteristics:

- ✓ Being hot and dry in summer and cold and dry in winter
- ✓ Having low rains
- ✓ Having low air humidity
- ✓ Having meager plant vegetation
- ✓ Having notable temperature difference in day and night (Kasmaee, 2003).

In warm and dry area, there is a notable difference in temperature of days and nights as a result of dusty winds, low humidity and long distance from sea. So it is hard places to live because water is insufficient for agriculture and domestic usage and also soil and dust is everywhere. Since trees are hardly found in such areas, it is difficult to build a house. However, Iranian traditional architecture reflects that a

satisfactory compatibility has been developed in response to such climatic characteristics. Introverted, extroverted, direction, getting deep into soil, four-seasonal houses, green space, proper materials, insulation as well as the role of water in Iran's traditional architecture are considered to be of great factors that can help achievement of convenience in Iran's traditional architecture particularly in hot and dry spots (Esmaeil and Noushin, 2013).

In such spots, buildings are predominantly dense and compressed in form; i.e. outer surface of the building seems to be minimized compared to its size. Density and compression of plans minimizes heat transfers in winter and summer causing extension of shadow over building surface. Most of the windows are built faced to central yard which is hardly exposed to harsh conditions of the outer space. The type of materials that are used in construction of buildings have notable tolerance to heat. They are light in color and their direction is southward to southeast. The following are solutions that can be used in hot and dry areas:

- Buildings were formerly constructed in a direction that attract minimal amount of sun heat. According to Koch Nielsen in his book titled 'climate compatible architecture', larger surfaces must be built in north-south direction until they attract minimum amount of warmness. Surfaces that are built westward suffer the harshest conditions due to being exposed to sun light, particularly in afternoons' (KakNilson, 2009). Therefore it is better to avoid building large surfaces in the said directions.

Also it would be better to build houses in the vicinity to each other in a collective form, because such as compressed form helps creating shadow and so lowering warmness. For creating a compressive, collective form, it is better to partition buildings through common walls.

In hot and dry areas, it is recommended to build the main parts of the building in a way that they open into internal yard space or open spaces that are covered by shadow. Such central yard can function as a very useful space and efficient part for inhabitants. Also light colors must be used on the surface of roofs and outer walls that face to sun in order to avoid extreme attraction of sunlight (Farajzadeh *et al.,* 2003).

To minimize the effects of temperature sways along days, following techniques were used to be resorted. In a paper titled 'Iran's traditional houses', Afshar writes: 'in hot and dry areas, extreme temperature difference between day and night does not allow the area to be ideal place for human habitation' (Razjouyan, 2009). To solve this problem, people were used to have underground spaces (that they were using in summers and winters), or they were used to build a part of the main building underground in order to be able to function as a insulation for keeping off the impacts of temperature sways (KakNilson, 2009).

Also it was common to use heavy and dense materials with high capacity to tolerate heat. Such materials could decrease temperature sways. Thick brick walls were prime example which functioned as a heat capacitor that could reserve cold weather at night and released it gradually amid the day which it was hot (Farajzadeh *et al.,* 2003).

To minimize heat waste, it was common to separate the parts of buildings that were used in winters from those which were used in summers: southern sections that were built back to sun were used in summers because they had maximum amount of shadow in summer. Northern sections that were exposed to sunlight were used in winters. It was further common to build a particular section of the building faced to sunlight in order to use them at any time that weather was cold. This was a method to capture sunlight as an energy to consume in cold weather (Farajzadeh *et al.,* 2003).

In hot and dry areas architecture, buildings are constructed in introverted and surrounded form (Farajzadeh *et al.,* 2003). For instance, all spaces are located in the vicinity of yard space in order to make diverse capability in internal space for attracting heat and light. Depending on how much the building is exposed to sunlight, yard can be designed with double usage (for summer and winter) (Razjouyan, 2009).

In such areas, all buildings, except public bathrooms, have a central yard and many have basement, terrace and vent. Yard space is common in buildings that are constructed in hot and dry areas. The yards must be designed in a direction that the geographical direction that has better geographical advantages be back to the yard. Yet the internal elements must be focused. All doors and windows are recommended to be opened into yard space and outer surfaces must be simple with no or strictly limited number of

windows. In this design, separated yard creates a calm, convenient space for inhabitants. Furthermore, yard is important in creating a cool, pleasant outer space which has capability to direct cool weather into the internal parts of the building (Farajzadeh *et al.*, 2003).

Basements are optimal parts that can benefit houses in hot and dry climates. While temperature may reach near 45 degrees in summers, the basement temperature does not exceed 25 degrees. Such a difference is due to low-land yards, water-view, trees and plants inside the building and above allvents that are, in a sense, architectural masterpieces. Ventis a four-sided structure that extends from the roof until a particular height in order to direct seasonal winds.

So, in this design there are two channels for inbound and outbound air current. Hot air currents that drift from hot desert and directed by the wind blow passes through vent openings and is directed into the internal space reaching to basement where a pool filled with water exists. The water is cool because it has constantly been away from sunlight (KakNilson, 2009). The inbound hot current, containing much moisture, passes over the pool becoming pleasantly cool and then starts to circulate through multiple channels and a mesh structure that has already been designed for basement. The circulated current starts to become heavy and is replaced with a fresh air that is cooler and lighter in weight. The details that are designed in the structure of vents make the building seem attractive from outside (Razjouyan, 2009).

Floor of the buildings, particularly in yard space, are lower than pavements. This characteristic not only cause a sizable portion of the building be lower than standard land, soil functions as a heat insulation keeping off extreme warmth. Roofs are in arch and dome forms; a shape that is, indeed, a solution for attracting warmth particularly in Iran's hot and dry areas (Farajzadeh *et al.*, 2003). This form, in addition to having conformity with architectural considerations and building materials available in such areas, is thermodynamically optimal for avoiding decrease of transferred heat, because firstly their circular and convex shapes are ideal for streaming the sunlight and so makes cooling more convenient long night. Secondly, half of the dome is under the shadow of the other half along the day [in mornings and evenings]. This property plays an important role in decreasing the temperature of ceiling. In addition, due to being projected, a dome ceiling is increasingly exposed to wind and it prevents extreme affection of sunlight. Walls are slightly thick. The thickness of walls in Iran's hot areas reaches near one meter. High thermal capacity of brick locks heat into the wall, rendering meager heat changes ineffective. Along night, walls start to release their wall through transfer process and so they create a convenient, pleasant atmosphere for inhabitants. In this way, soil functions as a heat insulation making a sort of independence in inside and outside areas as a result of its remarkable heat capacity (KakNilson, 2009).

Native Architectural Characteristics of Kerman City

Kerman city, as capital city of Kerman province, is located in latitude of 30.15 and altitude of 56.58, extended in a desert of 2400 to 2500 meters high (Kasmaee, 2003). It has a dry climate, characterized by dry weather, low humidity, and high temperature both in day and night, extreme sunlight and evaporation, extreme summer warmth and winter cold, movement of shifting sands etc. Kerman city has been locked in a certain natural and geographical conditions, no matter of the season. It's long centuries that it is striving for survival. Maybe Kerman is more humble, than any other Iranian desert cities, to nature and its violent conditions. This has no choice but to cope with hot weather in summer and cold weather in winter as well as extreme temperature, extreme dryness of air, very cold winds in winter and very hot winds in summer. Put it simply, Kerman is a city that lives in an extremely violent natural conditions that never has been gentle. In such climates, residential complex can function as a shelter to save men from violent nature. Numerous researches have studies that just how much traditional houses have been influenced by natural conditions in Iran. Because a sizeable portion of Iran is covered by hot and dry climate, traditional architectural patterns have remained unchanged in the most parts. It is certain that climate, just like many other Iranian cities, has exerted profound impact on the structure of Kerman city which can be observed by its traditional residential places. Old architects, due to being deprived of our modern technology, have always been thinking about how to develop compatibility with nature. However, it is unfortunate that with the spread of western architectural styles, inexpensive fossil fuels, advancement of construction technology and departure from native culture towards non-native cultures have put traditional architecture

subject to vulnerability. Traditional architecture of Kerman, thanks to having an ancient native pattern, has remarkable values to be concentrated. According to the aged persons, this city has always been experiencing extremes and floods in the past. It has been said that this city had even observed extreme rains and snows in winters. Climatology studies indicate that the temperature of Kerman, in harsh summers, exceeds 40 degrees of centigrade; while in winters it has experienced a low temperature of -20 degrees as well. Existence of deep, narrow and roofed alleys protect passers from direct sunlight. Sunshades on the narrow alleys guarantee shadow on the alleys (Eduardo Peris Mora Life Cycle, 2007). Sunlight reflection from hot, dry soil of deserts is a basic issue of which Kerman people are aware. That is why they built their city on a green, cold belt of farms and gardens. Proper direction has been another basic principle that Kerman people have cared about when they were constructing their city. Extremely dry and hot winds that blow oppositely from southward and cold winds from westward made them to build their city faced to pleasant winds that blow from north and northwest sides (Esmaeil and Noushin, 2013). Not letting cold and hot winds that blow oppositely into habitation places of the city has been another factor that native inhabitants had taken into consideration. Thanks to living a long time in violent natural conditions made native people aware that if houses are united, just as people do, they can overcome extreme conditions imposed to them by nature. That is why habitation places of Kerman city has a compressed and densely populated structure. Other principles that have been used in construction of Kerman native architecture is protection of passers inside the city's paths. Existence of indirect paths and twisted ways, from one hand, prevent the penetration of interrupting winds and, from other hand, provide maximal amount of shadow due to having low land.

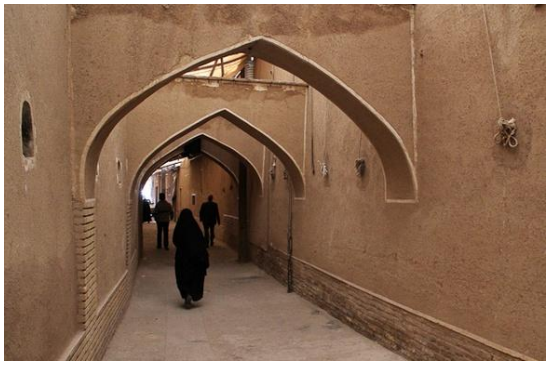

Figure 1: Roofed paths in one of old neighborhood of Kerman city

Due to extreme weather of Kerman city, ensuring cool, pleasant air flow in houses has been a major problem, which can be guaranteed by protecting low-land yard space and building the houses in compressed form. Being surrounded from every side, yards function as low-land places to provide cool weather at nights. Having low-lands lets yards to have such function.

Figure 2: A yard with a pool filled with water in order to provide pleasant air in MousaKhaneh monument- Kerman

Dry air and the ensuring to provide cool weather through water evaporation is another technique that has been observed when constructing Kerman city. This technique can be seen in the small domestic gardens and pools and water fountains inside houses. Further, guiding peasant air in open areas inside houses and rooms is another technique. Northern and northwestern winds in Kerman city are pleasant which helps Kerman inhabitants particularly in summers. Native Kermani architects made it possible through vents. Since such winds, in many cases, are a little warm their warmth could be decreased by directing the wind, in summers, over vent and then over the water. Rooms that are built faced to south and southeast have the best position in terms of attracting sunlight in winters. In the meantime, windows functioned as entrance to guide air flow into the room when the weather was cold. Keeping the room space cool in summer and warm in winter is hard to achieve in such naturally violent climates. An interesting point about native architecture of this city is the proper materials that occurred in the region and were used for building purposes. Designing the walls as being thick and brick as well as curve roofs had been the only materials that seemed to be available.

CONCLUSION

Native architectural principles in Iran's dry and hot area seem to have their basis on strong grounding.
In these areas, such principles have long been observed by ensuring compatibility to natural environment and utilization of sustainable forms of energy such as sunlight, wind etc., and using the main natural elements such as water, soil, plant etc.
In utilization of native architectural solutions for dry and warm areas, human physical and emotional considerations have been taken into account. Such form of architecture takes into consideration climatic, cultural and social factors in line with caring about human's relationship with environment and also human factors that develop sense of attachment to natural environment and habitation places.
Kerman native architecture mirrors this reality that people's preferences and convenience has been taken into consideration in compatibility with environment. Therefore, a sufficient method for achievement of strategic principles for designing climate-oriented houses is to focus on the existing climate. Such approach and models can also be used in future. Designers ought to recognize the merits of our old architectural elements and try to use them in their designs.
In this regards, following recommendations are made:

- ✓ To focus on spatial arrangements and direction of house
- ✓ To apply engineering principles to control environmental conditions and to manage and plan for reduction of costs both in terms of construction costs and maintenance costs
- ✓ To care about form of buildings and materials to be used in constructions
- ✓ To use special innovations in architecture in order to reduce energy demand or save energy such as green roof, green windows, using trees etc.
- ✓ To care about climate and sub-climate in site designing
- ✓ To use native, durable and renewable materials in constructions etc.

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