

# Benchmarking of the Design Principles of Traditional Architecture

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**ABSTRACT:** Even though sustainable designing is the main discussion of nowadays architecture, all principles are practically concerned by our predecessors in ecological architecture. Traditional architecture of Iran considers tranquillity of interior space without utilizing energy consuming and pollutant devices and this architecture is very much capable of offering methods to use these kinds of energies and can be used for designing new monuments. Advancement in technology and improper use of this advancement has caused these techniques to be ignored and the non-recyclable fossil fuels to be used excessively. To replace clean energies with fossil fuels, regarding their high expenses and the risk to humans' life, and to achieve sustainable architecture, old architecture of Iran shall be studied and their methods be used regarding the needs of present society.

**Keywords:** Ecological, Traditional, Clean Energy

TECHNICAL NOTE

## INTRODUCTION

Overall study of intellectual and rational designs of traditional architecture in their remaining works proves their attention to tranquillity of the user, knowledgeable considerations of natural and ecological matters, consistency with outer space and climate, compatibility with nature, etc. Nowadays by development of technology, to relatively provide peaceful state for the residents constructed monuments need more and more fossil fuels. Localized experiences of architecture and engineering all over Iran's plateau and during thousands of years are shaped in financial poverty and energy scarceness. Iranian architects succeeded to invent designs and methods regarding climatically characteristics, which are called model of traditional architecture of Iran at present time, and they are not only gratifying but are also consistent with the last achievements of sustainable architecture and energy conservation. At present time, widespread use of fossil fuels and easy access to national resources have obsolesced the methods of traditional architecture ,and consumption of natural gas, oil, petroleum and electricity to provide a suitable temperature with no regard to efficient use in different seasons of year have become a replacement for inactive and structural methods of the past.

### Principles of traditional architecture

- Utilization of ecological masonry
- Architectural design consistent with climate (positioning and placement, size of openings, awnings, wind form)
  - Use of functional elements of architecture to provide suitable temperature (wind catchers, garden cavity, summer house, winter house, central yard, etc.)
  - Use of green space to create shade, clean air, etc.

In spite of space limit and non-availability of most elements of traditional architecture in present architecture, there are considerable capacities that could be used to provide heat tranquillity together with efficient use of natural resources. Among these capacities are the followings:

- Specifying direction of positioning
- Natural light necessary for spaces
- Form and volume shape of monument
- Technology and utilization of new materials in architecture
  - Heat insulation
  - Size and limit of windows
  - Natural ventilation
  - Awnings
  - Nature

### Specifying direction

One of the characteristics that the architects considered much in the past, and no one concerns it in the present is the matter of RON. RON means direction in architectural term and was concerned in constructing cities and monuments and was the first step to efficiently control environmental conditions in designing. According to Pirnia (peace be upon him), in the past, regarding weather, sun shine, location of mountains and wind direction, the Iranian architects set up a direction for city using hexagonal shape which included 3 RON or direction. Rasteh RON, which is eastern north-western south direction; Kashan, Tehran, Yazd and Tabriz are in this direction which is almost facing Gibla. Esfahan RON, which is western north-eastern south direction; Esfahan, Estakhr, Takht Jamshid and Fars are in this direction. Kerman RON, which is east-west direction; Kerman, Hamedan and most of west Azarbaijan cities are in this direction. Since the cities' expansion is disorganized nowadays and correct directions (RONs) are

not regarded in city planning, positioning of monuments is not suitable as a result and does not suit environmental condition and this important potential for designing has faded away; therefore, it is necessary to consider this important principle in city planning and new architecture. Another important factor in supplying heat and cold needs in ecological architecture is the planning of winter and summer houses.

### Winter house

The northern spaces of the yard make the winter house, which is placed on the main axis, and for more entrance of sunlight, windows are made big and to control sunlight they are ARSI shape.

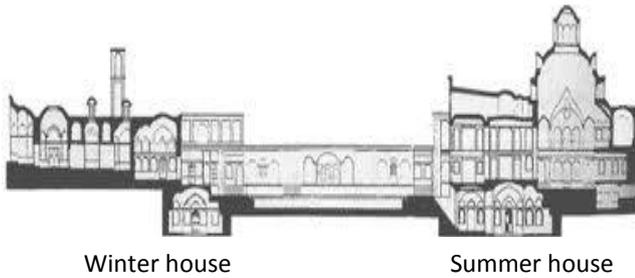


Figure 1. section of Brojerdiha house in Kashan

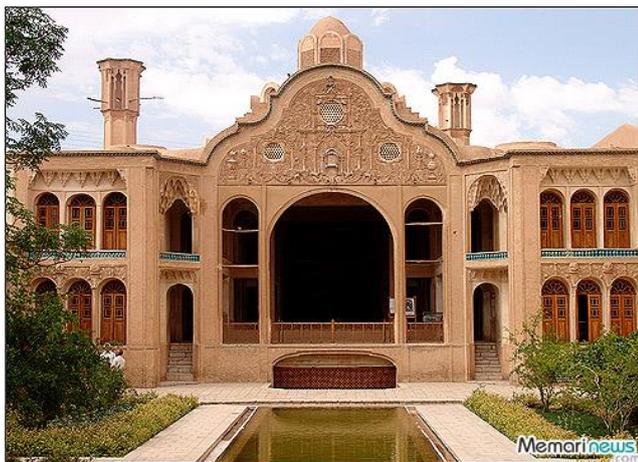


Figure 2. Summer house of Borojerdiha house in Kashan



Figure 3. Winter house of Abasiyan house in Kashan

### Summer house

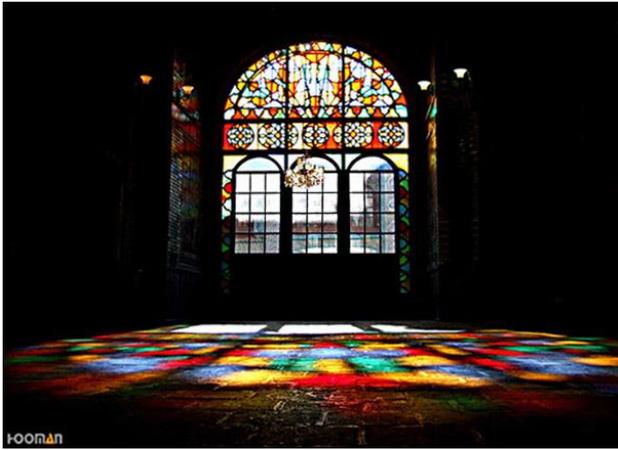
Summer house are similar to winter houses, the only difference is their location which is in the southern side to prevent from direct sunlight in summer. On their main axis, half-open or chambers are usually located. Chambers and balconies were the most important space except in very cold weather and since they were open and the dust could enter, they had no special decoration. In cold cities such as Tabriz, Zanzan and Ardebil, the summer house is removed from monument and they do not have the half-open space of balcony. Due to the increase in land price, decrease in metrical size of residential spaces and some other factors, it is not possible to construct summer or winter houses. Thus, new techniques such as arrangement of spaces according to sun movement in the interior shall be improvised to help efficient use of natural sources of energy; to achieve this interior space of building is divided into main and minor parts; where main parts, the ones which need more heat and are used mostly during day time, should be in the southern side and the other spaces be set up in proper places based on the planning need. The positioning of minor spaces in north is another factor to preserve the generated heat inside the houses; this action lessens heat transfer of main spaces with cold wind of winter.

### Utilizing new materials in architecture

In the ecological architecture of Iran, the principle of ecological materials is considered as one of the principles of monument's consistency with nature and the materials were always available in case of need for repair; the sample of which can be seen in garden cavity, the soil extracted from garden was used to construct the same monument. The main materials used in ecological architecture of Iran include: clay, thatch, adobe, brick and wood. Even though, using clay and thatch showed financial poverty and energy scarceness, clay is one of the most sustainable and recyclable building materials. At the same time, since these materials can store heat in them and have higher heat capacity, they functioned well in supplying heat energy of sun. The heat and cold in the space can be stored in the element with higher heat capacity and returned to it in case of need; this will help less temperature fluctuation in inner environment. Heat capacity depends on the kind and thickness of the used materials in the monuments; in ecological architecture one of the reasons to make the walls thick was to supply heat capacity regarding the used material in order to provide environmental tranquility.



Figure 4. Garden cavity Aga Bozorg mosque and school in Kashan



**Figure 5.** Examples Orsi

To select architectural materials in present time, the issues such as climate condition, heat conduction coefficient and ecological materials shall be considered like ecological architecture and technologies and new ideologies in architecture and discussions about strengthening, lightening and industrializing the monument will offer new material to fulfill the aims of this architecture.

Heat insulation

- Panam
- Orsi
- Size and scale of windows

Panam or monument insulation had a special place in ecological architecture; ecological architecture insulated the constructions against both heat and moisture which is explained in the discussion of using clean energies in the part heat insulation of ecological monuments. In ecological architecture the two-layer thick walls of clay and two-layer cover of roof prove the heat insulation of ecological monuments.

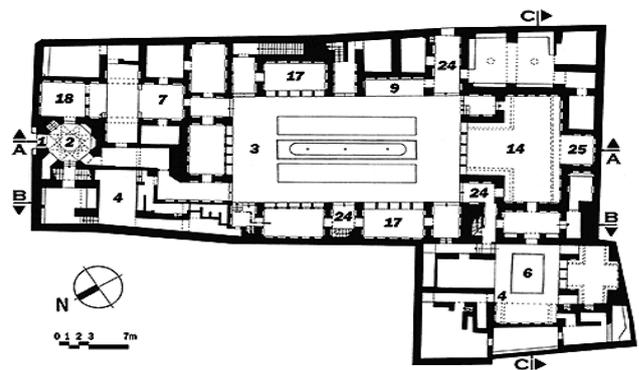
Orsi windows in ecological architecture have the same function of heat insulation. Orsi is prevalently seen in the monuments of cold areas; glass part is reduced in size and is made with least glass. Because glass is not a good insulator and two layer structure of Orsi performs as sound and heat insulator. But, nowadays, in contrast with ecological architecture in cold and hot areas, monuments are constructed with big window, which are discussed as big energy consumers. Through modeling ecological architecture, heat insulation of monuments, using two-layer windows and utilizing current materials an important step can be taken to exploit clean energies and preserve these natural energies in the interior spaces.

### Nature

Empathy and respecting nature have deep root in culture and ecological architecture. Green natural space have different forms in Iranian architecture, one of which is setting up a central yard, where different architectural modules are arranged surrounding a yard; which first shows introversion and secondly, the spaces in connection with nature and seasons surrounding a central yard provide tranquility for the users regarding environmental and climate conditions. The south facing balcony is a device to control sunlight and in other words is considered as pleasant ventilation; the planted with tree central yard is one of the effective factors in making moisture and

providing chilled air in the interior. In the middle of this open space a pool is established, which in addition to refining air, absorbs the dust of desert floods and facilitate cleaning and washing gardens. Fruit and decorative trees were planted in the middle of yard' their branches and leaves would prevent sunlight to directly enter the rooms in summer, but in winter, once the leaves fell, the sunlight directly entered the room. In desert areas utilizing windcatcher for ventilation and cooling interior were of great importance.

In addition to central yard, roofs had an important role in ecological architecture and it can be said that they were considered as a dwelling space; in some houses 1.5 meter walls were constructed around the roof which created a kind of yard in roof and was used for sleeping in summer nights. At the same time through providing shade in different times of a day, these roofs had secondary climate role.



**Figure 6.** Central yard of Aligodarz house in Yazd

### CONCLUSIONS

Harmony with nature, concerning tranquility of residents, intellectual utilization of natural and ecological materials, consistency with outer space and climate are some of the issues which can be noted in remaining works of the past. The architecture of past concerned most of the natural necessities and preserved natural environment and at the same time paid attention to sustainability principle. But, nowadays by industrialization of architecture, traditional architecture is changed regarding both quality and design. Costly fossil fuels and environmental damages caused by them including: heating atmosphere, destroying underground resources, ozone depletion and polluting cities which threaten human life and the technological developments in the field of fossil fuels without providence regarding quality and quantity of their resources, have also affected architecture. In such a condition, it is necessary that the architects have a practical approach to consider traditional and climate architecture. This does not mean to exactly use the methods of traditional architecture, because new factors such as construction technology, new materials and new perspectives would be affective in design. The goal is to use styles of traditional architecture with industrial methods and rationally combine them to design monuments based on the principles of sustainable architecture.

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