SOME TIPS OF SUSTAINABLE EVIDENCE CONFORMING TO TRADITIONAL IRANIAN ARCHITECTURE (WIND TOWER, WATERING PLACE)

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Abstract: Traditional tips in architecture and urban planning have unique features which not only take into consideration the aesthetic aspect and the conservation of the environment but also have full filled the climatic needs in any regions. Sustainability in architecture has been considered one of the important issues in recent decade and has always been hand in hand with energy, ecology and climate. A sub branch of sustainable architecture is the architecture which is climate friendly in which energy management is considerably important. Considering the issue of irreversibility of energy resources which is one of the concerns of us for the future. Natured energies can be used as a solution. The traditional and local architecture in Iran through different ways has had the ability the manage energy through intelligent use of natural energies. The present research aims to find answers for the following questions: (a) What considerations have been thought of in traditional architecture to make use of natural renewable sources of energy in hot and dry climates? (b) What has been the role of wind tower in the management and use of natural energy from wind in the local and traditional architecture in Iran and its application in the architecture of watering place? (c) What can be the role of traditional wind tower in contemporary situation?

Traditional Iranian architecture has been able to respond to ecological and energy efficiency issues due to its low primary price as well as its current price and performance. In traditional and local constructions, the use of renewable sources of energy such as air stream, light, sun, wind and etc. has always been paid attention to. To this aim, some strategies have been used including compact and continuous urban fabric, proper orientation of the city, being position a suitable wind direction, using appropriate construction materials, building walls with high thermal capacity, central yard, proper organization and hierarchy of space, being down from alley level etc. in order to provide cooling, and heating comfort needed for humans.

Wind towers are towers leading fresher, cooler, less dusty air in the highlands into the residential building or public watering place. Wind tower constructions have used thermodynamic, aerodynamic, heat transfer and thermal comfort parameters in designing wind tower. Also becomes of the effects of arid and semi-arid climate, water collecting places are created. These places were first made of holes that water was collected which evolved by civilization progress. In the process of water collecting places evolution, the ponds were covered and these covered were called water collecting places watering place. The brilliant combination of wind tower and watering places, the number of which has changed from one to six, is an outstanding example of stability. In other words the wind tower in residential parts in combination with ponds functional likes water coolers suitable for hot and dry climate. It functional as ventilator in watering

place, as well strategies used in traditional architecture have been in diverse scales in house, locality and city.

The research is the result of observation and library studies which describes the function of wind tower, alone and in combination with watering place. Through an objective analytical study, it tries to find out hidden angles of these elements in sustainable architecture and its relation with energy consumption and adaptability with climate ecological issues. Considering this fact that traditional architecture has a strong background in different aspects, the investigation of these characteristics in order to have the highest efficiency while having the least damage to the environment can serve planning, designing and providing the environment in today's life.

***Keywords**:* Sustainability, Sustainable Architecture, wind tower, watering place

INTRODUCTION

Iranian traditional architecture has a rich and valuable background of different aspects of sustainability, art and culture and is considered an important part of this art and culture itself. Investigating these characteristics can serve planning and designing today's life environment. The remains of traditional architecture and urban development indicate the adaptability of the structures with the creation system so that through mixing theory and action the concept of sustainability has truly been achieved without destroying natural resources. Traditional architecture has managed to form a life environment for human and benefit from the blessings of the creation without wasting energy while being equipped with the day's technology.

Offering solutions to avoid the emergence of problems such as the destruction of natural resources, the destruction of ecosystems, pollution, over population, the spread of inequality and deterioration of the quality of life are among the concept of sustainable development the main goals of which are satisfying basic needs, improving and raising the standards of for everyone, protecting and managing ecosystems and providing a safer, more prosperous future.

METHODOLOGY

This research which is conducted through observation and library studies explains the function of wind towers in traditional residential buildings and cisterns through a descriptive – analytic method and aims at recognizing the hidden aspects of this element in sustainable architecture and investigating its relationship with energy consumption and its adaptability with climate and ecological issues.

DISCUSSION

Settlement near desert whore the weather is hot and arid is only possible when the harsh climatic condition is moderated. Scorching days, hot sunlight, and large temperature fluctuation in day and night, boiling summers, freezing winters, insufficient rain full, water shortage and dust winds are among the problems of deserts. The investigation of the cities Yazd- Kerman – Kashan that have these characteristics show the structural characteristics of the mentioned cities are in harmony with nature and are considered a valuable collection of sustainability in different aspects. Traditional architectural pattern of these areas pave the way for reducing energy consumption considering the form of the structure or the appearance and distribution of different spaces in the building. In these areas there is a central courtyard in the middle of the building. In which there is a pond and a garden, all contributing to the increased humidity of residential area of the building.

Brick and cloy walls which can tolerate heavy arched and dome – like ceilings are built rather thick so that they reduce the fluctuation of temperature during day and night like a thermal condenser [1]. One of the other ways of reducing energy consumption is decreasing the surface of the structure which gets sun rays. This purpose is achieved through 2 condense and compressed textures. In addition the materials used in construction which is provided by local resources are very suitable since they absorb and lose energy very slowly so that the temperature is moderated and the fluctuation of it is reduced. One of the other common methods of reducing energy consumption is applying non-active systems and facilities such as wind towers, watering places, refrigerators and wind or water mills in cities near desert which are low-costing but effective.

Wind tower

In local architectures wind tower is an architectural element which has been built in hot and arid as well as hot and humid regions of Iran and appears in the form of a vertical duct. The architecture of towers and their function which have been highly effective in natural cooling of the buildings is a sign of genius of the architects who had a role in their design and manufacturing. Wind towers using natural, restorable energy of wind have been very effective in reducing the temperature to a degree comfortable for humans.

Background of wind tower

The research done in the world to estimate the age of wind tower indicates that is definitely dates back to before Christ. Wind tower as a traditional structure to ventilate has been observed throughout Middle East from Pakistan to North Africa – with different names and forms [3].

Figure 1: A kind of Wind Tower in Yazd

Figure 2: Watering place and Wind Tower in Yazd

What is significant is that a spite of different structures, all have the same function that means, all of them transfer the pleasant and dominant wind into residential spaces. Excepting Iran, wind tower has been observed in countries such as Egypt, Pakistan, Afghanistan, Iraq and Emirate. Also, a few wind tower, have been seen over the buildings in med iteration areas, such as Syria .Lebanon, turkey and Mesopotamia island. [3]Considering the fact that Egyptian papyruses belong to 1500 years B.c , therefore by referring to measure's investigations in flint hill , the background of constructing wind power in Iran dates back to 4000 B.c. [4].

Wind towers in Iran were built on roofs for air-conditioning , they were even built on top of watering places , the opening of mind , pubs and mosques to condition the air the areas and spaces in traditional houses in iron which were related to wind tower are rooms used in summer , underground or serdab , hall , pavilion and yard. Wind towers are made up of different parts some of which have aesthetic function while the other parts are extremely important in the functioning of wind tower. Analyzing these part helps understanding the structure of them. The structural parts of wind tower are (a) Shelf: the top of wind tower which has air transfer passages (b) Stem body: the part of the body between the shelf and roof. (c) Blade: blades are elements which consist of brick and clay and divide the air vend of the wind tower into smaller vents. (d) Main blade: the walls that continues to the center of the tower and divide the air vent of the wind tower into smaller vents. (e) Secondary blade: the walls that don't continue to the center of the tower and don't exceed the width of external walls. Secondary blade in the appearance of wind powers look like the blades of cooler vent. (f) Open and closed eyelets: in wind power any space between two blades (whether main or secondary blade) is called eyelet [2].

If an eyelet is open and air can pass through it, it is called open eyelet; otherwise, it is closed eyelet. Wind tower have different shapes and the shapes are designed based on the intended height and wind orientation the position of wind tower in the traditional houses, according to the designed plan, might have some effect, on their cooling function, and their position in three ways: (a) The location of wind tower behind the hall and in its axis of symmetry (b) The location of wind tower in corner of the (courtyard) in this kind, the wind tower is connected to the hall through pond space and is not linked directly to it. (c) The location of the wind tower in one of the north corners of the hall [6].

The plan form of the wind towers had had a significant role in the formation of wind tower. They have been seen in circular, hexagonal, octagonal, squarely, and rectangular plans. The circular wind tower is the rarest type in Iran.

Excepting the total form of the plan, they are different in the form of the internal blades as well. The main blades have mainly practical use and affect the function of the wind tower, but the secondary blades are situated in the entrance opening of the wind tower and have trivial function. These blades are more of aesthetic vole. while the main blades are not noticeable in the façade of the building, the secondary blade are not noticeable in the façade of the wind tower and the city view .the main blades start from the 1.5-2.20 (one and half to two point twenty meters above the floor and continue to the ceiling of the wind tower and divide the wind tower air vent into smaller passages. The internal blades come down up to one point half to two point half meter higher than the floor of the living room. Local architect built these blades as low as possible to create a usable free space beneath. In watering places (cistern), the blades wouldn't go down more than one meter below the holes so that the cross-sectional areas for passage of air were reduced and the speed was increased. The wind towers in Iran are divided into some type based on their shape: one – way wind towers, several – ways, several – way bladed, do oshkobe and pipe like [6].

Function and role of wind tower:

Wind tower used wind blow for moving good air in the building and at the same time uses the reaction force, which is suction, to let hot and polluted air out. When wind hits the obstacle or external foils has to come down. It's worth mentioning that the other vents of wind tower which are against the direction of the wind give hot and polluted air to wind and have a function of a fan or suction system. Functional system of wind tower is divided in to 3 parts of convection, air transfer and evaporation. Some wind towers cool the building just through air transfer while some other does this both through air transfer and evaporation. it should be noted that in hot and arid central parts of Iran that the weather is dry water evaporates very quickly , therefore , in addition to cooling the environment , wind tower also rather increases the humidity of the air and consequently reduces both the temperature and dryness of the air .

Wind tower generally have 3 main functions: (a) Changing hot and unconditioned air to cool and pleasant air (b) Changing dusty air to clean and light air (c) Symbolic function in the structure [1].

The other characteristic of wind tower is the effect of flue. When there is no wind, hot air comes in and through wind tower is led out. In this way there is always air current in the building although the intensity of it is always air current in the building

although the intensity of it is less than when there is wind blowing outside the building. [7].

The other function of wind towers is their usage in watering places. Watering places which are valuable structures have effectively mixed cultural and biological aspect, of the need for water with structural, climatic and aesthetic considerations. Watering places were first wells for saving water and then over time they developed along with civilization development. During the process of their development, watering, places, were covered, making cover for water tank was an effective and useful strategy which helped avoiding evaporation, pollution and heating the water. When watering places were covered, it was necessary to think of a conditioner. To this end wind towers and eyelets were used to condition the air in watering spaces. The number of wind tower in watering spaces has been different ranging 1 to 6 [8].

CONCLUSION AND RECOMMENDATIONS

Today, with regard to the environmental crisis caused by using fossil energy, saving energy resources, avoiding, soil and environmental pollution, reducing the consumption of fossil energy and adaptability with natural and climatic conditions are among the most important issues in architecture and urban development. Traditional architecture in Iran benefits from unique characteristics both in residential constructions and non-residential part. Even in the mixture of residential and non-residential parts, which make a city, the same unique characteristics are evident. today , through correct use of traditional methods and mixing them with new conditions of construction we can make the highest use of restorable energy such as solar and wind energy for air – conditioning .A part from their important role as cooling systems, wind towers also show flexibility in design in a way that the creativity of the designers is apparent in their architecture. There is a large variety of wind power in every particular climate. Moreover, wind power, benefiting from various structures, adds to the beauty of the city. This can be seemed in cities like Kerman, Yazd, and kashan. Investigating the characteristics of valuable traditional and local elements regarding their flexibility and wide range of application and mixing them with modern facilities can increase productivity while having the least harm for the environment and can serve planning and designing life environment.

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