Saabaat Analyses in Iranian Sustainable Traditional Architecture

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Abstract:
In the past, Iranian architects tended to provide ecological comfort macro and micro levels in urban buildings and textures by considering the ecology of the region, in order to respond to human needs. Using Saabaat as a ventilation element was one of the distinguished implemented strategies in arid regions which were affected by the ecology, construction and socio-cultural factors. Saabaat is a fully enclosed passageway which causes effective decline of temperature in semi enclosed urban spaces by operative shadowing passageways which lead to thermal comfort for passersby, but besides its ecological benefits it was also used for its constructional, security and energy efficiency performances. Saabaat is used in passageways, markets and other traditional urban spaces especially in cities of Yazd, Kerman and Naeen cities.

Key-Words: - Culture, Architecture, Sustainability, Saabaat, Construction

1 Introduction
Inspired by the nature, Iranian architects designed the architectural sustainable element of Saabaat as an Iranian cultural, ecological and spatial symbol in order to provide thermal comfort for passersby.

2 Saabaat
Saabaat- the symbolic, functional element of Iranian traditional architecture- is a roof coating over the urban passageways which were built for shadowing and wind direction [1]. Besides its aesthetical aspects, there are proportions in Saabaat design which are followed by architects such as lateral forces such as wind direction and solar radiation. By exact analysis of these hidden factors and using them in architectural urban designs, it is possible to use Saabaat in urban spaces. The reasons for developing Saabaats are: a) increasing roof coated urban spaces in order to provide comfort for passerby b) shading over alleys c) possibility of developing extra residential space on Saabaats d) connection, cohesion and alliance of the urban spaces.

3 Form and Function of Saabaat
Saabaats are divided into two categories of single and connected according to their shapes. Single Saabaats can be found as a single element in urban passageways.
Mostly they can be found along with passageways, this collection which is made of single Saabaats is also known as single Saabaat. Connected Saabaats is made of a combination of single Saabaats with the same roof. These kinds of Saabaats have roof usability; this usability is devoted to one or two neighbors on two sides of the passageway and in front of each other. In some cases the usability of roof in Saabaat is a public space and can be accessed through the passageway itself. In historical age of Bam in Iran which is an example of this type of Saabaat, a space is organized for passengers’ one night rest which can be accessed through stairs. Saabaats, single or connected, are divided into two classes of round arches and lancet arches based on the shape of their arch [2].

3.1 Saabaat Classification based on Their Roof
Saabaats are divided into flat and vaulted roofs:
   a) Saabaats with flat roof: in flat roof Saabaats wooden posts and mat were used for keeping the roof and passageway walls played wall porter role.
   b) Saabaats with curved roof: these Saabaats could transmit the weight of the roof, even if it was very heavy, to columns, walls and then to the earth due to static matters. These Saabaats had roman bricking approach.

In the second sort of classification, our focus is on the usability of roof in Saabaats which are divided into two parts: a) Saabaats which had a roof with residential usability and normally had a room with one or two doors and a proper view towards the alley; b) Saabaats which only keep the roofs weight and probably were used as the ways to connect the houses located on two sides of alley.

3.2. Functions of Saabaat
Providing comfort: the urban texture in arid regions is dense and its passageways are narrow, unorganized and twisting. Twisted ways which are continued along with a cursive specify the wind direction and wind is canalized and guided through Saabaats so that in summer the difference in temperature leads to wind movement and this cause weather getting cooler inside Saabaat rather than outside, but in winter because of more surrounded space inside Saabaat, it is warmer than outside. With a gradual change in the width of the passageway, the wind speed has increased (according to Venturi Effect) and as a result the friction of air molecules with bottom surfaces of passageway increases, air molecules absorb the heat from the wall mass and consequently the temperature of the wall decreases. By this method Saabaat increases the movement of airflow and decreases the stored temperature in body of passageways in addition for shading [3].

Material type selection in Saabaats was based in their adaption and was in line with ecology of the region from color and material perspective so Saabaat materials are local, accessible things such as brick, clay and thatch. Saabaat helped air movement in summer that makes a cooler air inside Saabaat than outside space and the quality of being semi covered helps it to be warmer during winter.

3.3 The symbolic Presence of Saabaat
In some important public places, Saabaat was used to define the entrance space.

Figure 2: Saabaat makes calm, safety and cool places in urban texture.

Figure 3: Saabaat in Jame Mosque of Ardestan in Yazd province is an example of this presence.
Saabaat had a symbolic presence and was used for introducing the construction to the urban space.

3.4 Developing the Sense of Neighbor and Neighborhood Integrity
Because of restrictedness, being roofed and the difference in height with the general space of the passageway, it turns into a place for gatherings of people in neighborhood or the entrance space of one or more houses. Usually Saabaat roofs are used by surrounding houses which shows itself in some houses in the form of a room towards alley.

3.5 Structural Function
Thatch as a common architectural material in Iranian traditional architecture in hot-arid regions has less tensile and compressive resistance so for compensating structural weakness and, more and better transmission of forces to the foundation of building Saabaat as a structural and ecologic element was used [4].

On the other hand Saabaat caused comprehensiveness and stability of the adjacent buildings and structural resistance in walls so that in many cases with the destruction of a Saabaat adjacent houses were damaged or even destroyed.

3.6 Cultural Function
Besides its physical functions, Saabaat has other important functions such as socio-cultural functions which are much more important than the first type. Linkage and integration that Saabaat develops in a neighborhood lead to empathy among neighborhood residents. In the past, Saabaat was a place for gatherings of people in the neighborhood and these meetings caused the neighbors to know about each other's problems and thus were coming together to solve problems[5].

Figure 5: Renovated Saabaat in Dezful City, Iran.

3. Saabaat Functions
One of the main functions of Saabaat is presenting shadow and cool air to passersby who have come to it after walking through long alleys in annoying and overwhelming heat of the south. Weather summer or winter, the temperature inside Saabaat is always favorable so that in summer the difference in temperature inside and outside the Saabaat lead to air movement and as a result the weather inside Saabaat gets cooler than outside, but in winter due to the restriction of the space inside Saabaat, the weather is warmer than outside[6].
4 Case Study: Saabaats of Historical Texture of Birjand

Urban texture of Birjand is very dense with narrow and twisted alleys so that sometimes the widths of the alley is that narrow in which only one person can pass at every moment. Alleys are like vessels in this texture which make the stream of life possible. They are narrow alleys with high walls which are generally covered with thatch. Narrow widths of the alleys are according to human scales and have visual coherence and unity of form, color and type of material. In some alleys sort of Saabaats are formed that intelligently develops a combination of light and shadow [7]. These Saabaats, in addition to their role in reducing the temperature of the walls, have structural roles. A Saabaat increase the resistance of the construction against any horizontals force and like a bridge connects the buildings on two sides of the alley.

Figure 6: A Historical Saabaat in Birjand City, Iran.

5 Conclusion

Iranian traditional architects, tended to provide favorable conditions in urban spaces by considering the ecology, element of Saabaat and its multifunctional use in arid regions. Saabaat is affected by climate, socio-cultural and security factors (defense against invaders). Saabaat is a sustainable solution against horizontal forces such as earthquake, wind and also horizontal forces caused by adjacent constructions. Saabaat’s visual beauty and symmetry is admirable which in accordance with ecology provides the thermal and structural comfort for residents.

As a result, updating and using this intelligent element in modern urban designs can meet the environmental needs of the Contemporary urban residents.

References: