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DETERMINIG THE FORM OF SCHOOLS IN WARM AND DRY CLIMATE BY USING SHED PATTERN

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ABSTRACT
In the present study, it has been attempted to examine changes and developments of the architecture of schools, which have been emerged due to being affected by culture and climate of the warm and dry regions and by utilizing and modeling the shed style that eventuate specific climate, a sample is presented as a proposed design. Since the design of schools and educational areas are affected by certain factors such as culture, climate, economy, etc., review and design of such spaces are not possible just by a quick glance to the culture and climate of that region.
In an attempt to find ways for meeting the needs of students and creating spaces in accordance with these climates, the tendency towards changing the form and structure of educational facilities seems necessary. Therefore, it is necessary to consider some of the standards and requirements of educational facilities and legitimacy of methods of designing, commensurate with factors affecting culture and climate in educational facilities. Therefore, in this paper, in addition to studying the climatic factors and features of warm and dry regions and their effect on educational areas, we will discuss the principles of sustainability in traditional schools and by taking into account the advantages and disadvantages of the shed style, we will present a proposed design of schools in the warm and dry climate by using shed pattern.

KEYWORDS: Form of schools, Shed style, Warm and dry climate.

INTRODUCTION

When climatic and economic issues are proposed together, some changes occur during the design and construction of buildings that this may lead to change of the form and structure of buildings. These changes in warm and dry climate are greater than any other climate. Proposing projects that are in compliance with cultural and educational requirements and needs of the residents and considering the impact of regional climate on the architecture of spaces have significant importance. In the course of this study, in order to achieve an appropriate architectural model of educational spaces in shed/slum dwelling areas, we have studied the basic theories of climatic and vernacular architecture of these regions and also the shed structure and a model is proposed for the design of educational areas of shed-dwelling cities and it has been tried to answer the following questions throughout this article.

- How has been the process of evolution of the architectural structure of the schools in shed-dwelling areas?
- What were the characteristics of patterns in traditional schools?
- How would be the school design process of warm and dry climate in the case of being affected by the shed pattern?

RESEARCH METHODOLOGY

In the present study, in order to collect the necessary data we have used the relevant sources and resources. Using of libraries organizations, scientific and research centers to gather theoretical studies and also examining the bylaws and regulations related to the construction and design of educational facilities, using the internet and other research database, case studies and visiting the site for comprehensive survey of the current status in the field of the design and construction of schools in warm and dry climates, the use of visual data and tables to complete data and specification of examined schools and evaluation of their construction and design on the basis of the shed pattern.

The impact of culture in formation of the schools

Buildings and monuments have been one of the eternal and novel innovation and artifacts of man in every culture and civilization and given that they must represent the national culture, traditions and customs of the region, they are of great importance.
Today the factor of culture should be studied align with the climate factor and it is one of the factors affecting the shape of the building. Geographic location is one of the most effective indispensable factors in the diversity and formability of the civilization and culture of educational system of each nation. Hence, lifestyle, civilization, culture of social institutions and systems are different. Therefore cultural and climatic diversity of Iran, during different periods, have

created valuable forms in terms of architecture and urbanism. Consequently, the transformation and development of cultures within a geographic area with different climatic conditions are not the same. At the present age schools are considered as one of the most important social, training and educational institutions that have been established to meet the educational and educative needs of human. School is an institution that has been created in line with a number of complex intentions and it is not merely a structure. Since construction of a school is a cultural phenomenon, as a result the shape and form of this building is strongly influenced by cultural environment.

The impact of climate in formation of the schools

Understanding the comfort and types of materials in architectural design of buildings and in particular in the schools is of great importance that it has been considered on the basis of basic and fundamental needs of individuals. One of the most influential climates of Iran is the warm and dry climate, which has caused the creation of its specific architecture. Since the southwest and northwest winds are moving towards the equator, in many of these areas the weather is dry and hot. Because the humidity is low in this region and there are no clouds in the sky, the air temperature range of this area is very high. For example, Kerman is located in warm and dry climate of Iran, south part of it has a hot and humid weather is. This has led to the growth of trees like palm tree. Therefore foliage and stems of palm trees are found abundantly in this area and they are an ideal material for the construction of buildings in the area. This type of materials can be used in open and semi-open educational spaces to modify the excessive heat.

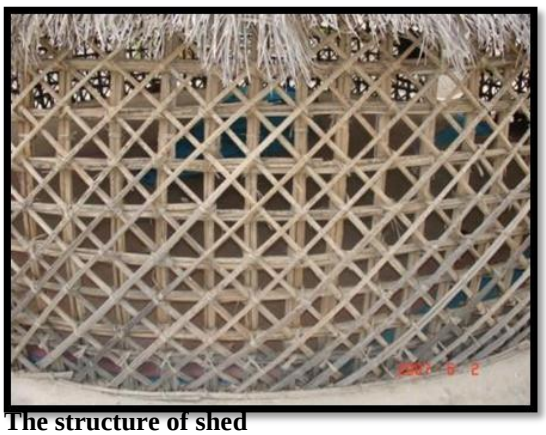
Shed pattern and its application in architecture of schools

Shed/slum dwelling has become the part of the life of people, who are living in hot and dry regions, in a way slum dwelling is a part of the tradition, culture and lifestyle of the people, such a way that many people still tend to live in sheds. In fact, the place of living of this people is a compilation of the shed and modern buildings. In these areas, usually in organic form, most of the requirements have been formed on the basis of the circumstances of time, and the schools have traditional state and the schools have been scattered around the contexts according to their number.

Shed, is the name of a type of canopy resort which is widely used in southern parts of Iran and also hot areas in the western part of the Hormozgan province, south of Kerman, Zahedan and Bushehr. Local residents of these areas built sheds for daily rest and using the shadow underneath it, especially those who in summer and hot weather went to back of the river and stayed for several months in their palm groves, at the season of fructifying of palm, built several sheds, one for sitting underneath its shadow and the other for cooking, also they built sheds next to their agricultural lands and sometimes the reason of building sheds was low income, because they couldn't afford money to build a house. Sheds are vernacular structures that are found in warm and dry climates where the palm trees can grow, that poor people in areas where reeds grows and also near the groves live in these sheds. Shed, as part of the vernacular architecture, is a type of compliance between human and climatic conditions of these regions. Sheds are cooler than buildings and tents and they facilitate the tolerance of heat.

The form of sheds

In construction of the sheds, for stability against the natural and abnormal disasters spherical and oval forms are used, these forms have aerodynamic form and can easily pass the wind through them and still do not get damaged and also juxtaposition of branches should be in way that makes the ceiling sustainable and prevent its destruction towards the inside.



The structure of shed

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Shed structure is made up of long reeds or the medial branches of palm leaves that are tied together and are known as canes and their diameter is about 10 to 15 cm and by the conjunction of the vertical and horizontal canes, the frame structure of the building is prepared. For the coverage the use the reed of (papyrus) plant which is the thinnest reed and final coating is of straw woven from reeds and palm leaves which is called mat. The floor of the room is rammed earth that sometimes they cover it by a layer of thatch and carpet it with mat.

The way of building a shed

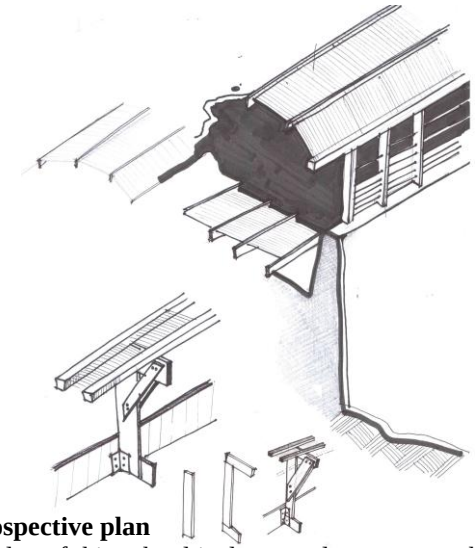
4 trunks of palm trees are cut down and placed on the surrounding short walls and the branches of palm trees are placed among 4 branches that are on the ground in a square or rectangle form and then they are weaved together by using dorrani (rope) and its surrounding and the top area is covered by sevend (made of palm tree leaves), and consequently a shed is built for creating shadow and optimal use of its users.

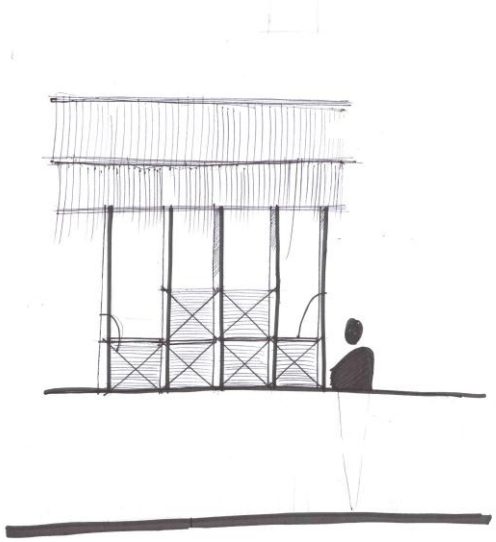
Materials used in the construction of the shed

The materials used in the construction of sheds are reeds grown next to the pond or leaves of palm trees.

Indigenous knowledge used in architectural design of schools

The proposed design of this school was presented by using indigenous knowledge and traditional architectural elements that in following part some examples of them will be briefly mentioned.





Introspective plan

The plan of this school is dense and compact to the extent possible and it has been tried to make the external surface of the building smaller than its volume. The density and compactness of the plan minimizes the amount of heat transfer through the external wall of the building whether in summer or in winter. In this way, most shadow may be created on the outer wall. Introversion and arrangement of space around a central courtyard, in addition to the spatial organization is also used as a cooling space in warm and dry climates. During the hot days these spaces provide shade and at night hot air rises up and gradually it is replaced by cool air of night which is at the top of the yard. The shadow which is created throughout the day makes educational activities more pleasant.

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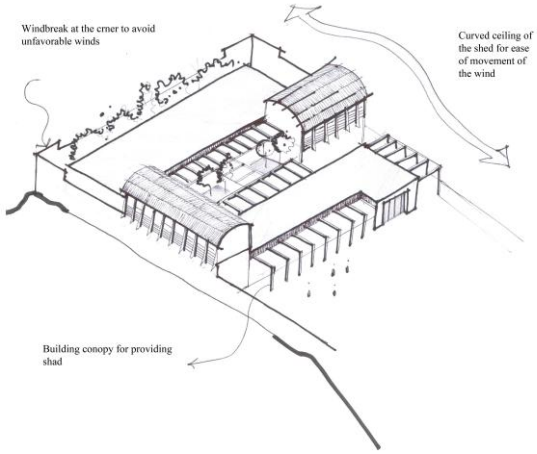
Wall

In order to further reduce the heat of the walls, that is generated as a result of sunlight, the external surfaces are covered with thatch and in some places short walls are embedded with wooden timbers for air ventilation and optimal use of the wind and are covered with palm fiber.



Window

One of the principles of climatic and vernacular architecture is determination of appropriate direction of dimensions and proper orientation of windows to take advantage of sunlight and one of the main requirements of the educational spaces is the heating radiation of the sun inside the classroom rather than fluorescent lights. In designing this educational space windows are considered to make maximum use of sunlight. The number and size of windows in this building is reduced to minimum and in order to prevent the penetration of light reflected from the surface of the earth, a horizontal canopy is placed in the upper part of the window and a vertical canopy is mounted over the windows. The main task of canopies is to create shades on the windows in the months of October and November. (Kasmaee, 2010)

As far as possible, it should be tried to use small windows in the design. Double-glazed windows are suitable for this climate. It is recommended to predict windows area close to 30 percent of the façade area or 15 percent of classroom area.

Yard and planting trees and plants

School spaces should have ideal evolution and also reasonable relationships with the nature. Maximum use of blessings and natural resources, the way of coordinating with other surrounding areas, the method of teaching students and their accommodation in educational spaces and the fact that these schools are as an educational environment and their living environment and considering the building structure and outdoors by taking into account the natural and climatic conditions of life in traditional cities and the use of full spaces as the layout of spaces of traditional schools play an important role in it. In the design of this school, yard has been considered as a defined and quietly natural space, which has the most straightforward relationship with the nature and also as the center of gravity and beating heart of indoor spaces and its centrality, has been intensified by creating direct connection with main areas and it has been considered as unity factor in total. One of the main points that can be considered in the design of outdoor space of this school is the climatic conditions of this area and also educational period of students at the time of year when they cannot use the space. The scorching sun during some days of year or precipitation such as rain and snow in this region elevates the need of using open spaces, as auxiliary space of the area. Construction of enclosed areas and awnings in the place can be considered as meeting and playing spaces and can be useful in enhancing the visual quality. Planting of trees and plants reduce dust, temperature and undesirable wind speed around the buildings.

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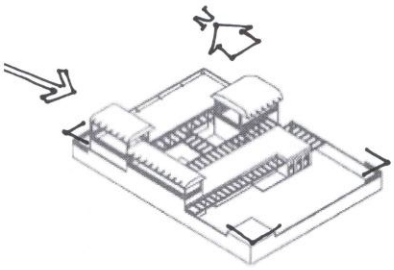
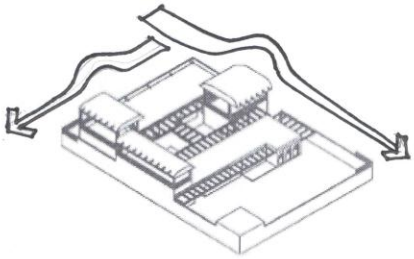
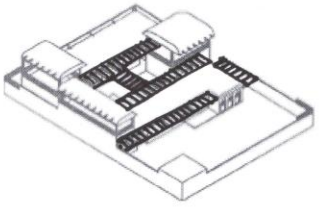


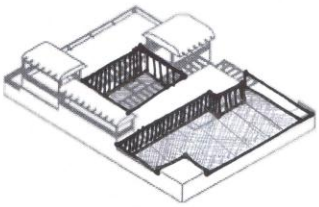
Windbreak at the corner to avoid unfavorable winds



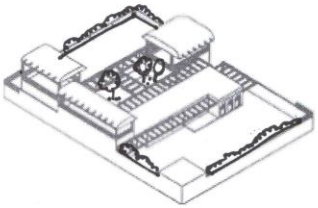
Curved ceiling of the shed for ease of movement of the wind



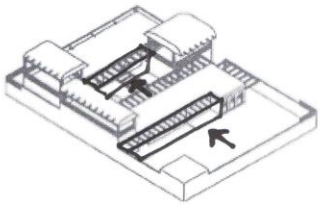
Building canopy providing shade



The central courtyard (in accorance with warm and dry climate)



Yards with gardens. providing green space around the school



Northern and southern veranda for shading

Direction of building and its coordination with the site

The direction of the establishment of the building is south or southeast, that this direction is the most appropriate direction in terms of controlling and minimizing the influence of radiant heat of solar radiation on the afternoon into the building. As a result the orientation of building is in east-west direction, consequently northern and southern sides of it are greater than western-eastern sides in terms of appropriate lighting. Architecture of the schools of Iran, like other traditional buildings of this territory, is organic architecture and buildings have been constructed in complete conformity with the site. The structure of central courtyard building and the geometric order is internal which have been located in irregular mass and conformity with the site.

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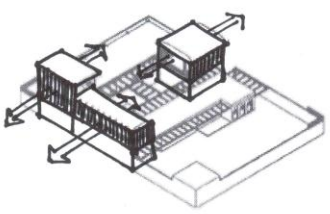
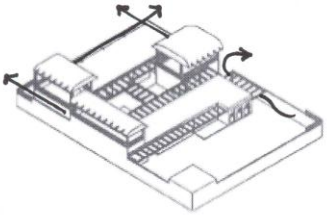
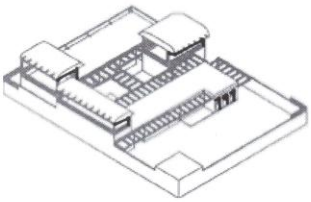


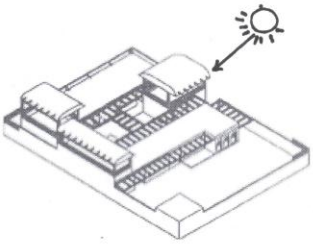
Some space are two-storeyd for the movement of heat and ventilation



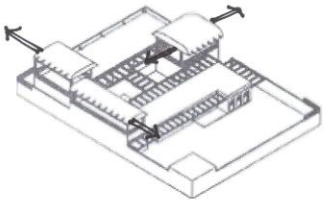
Narrow and shading corridors



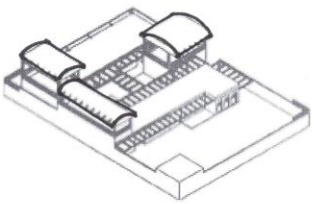
Creating shading for windows facing the sun



Being two- storeyd against sunlight in warm seasons of the year



Open seaces of second floor work as insulation for the movement of wind, ventilation and cooling of space



Tent form (sheds of second floor) to tolerate the intense heat of summer

Form

Every building is made of any material and form that needs to be firm and stable against normal and abnormal incidents. The most appropriate form for the educational function is cube-shaped form. Although spherical and oval shapes have aerodynamic state and can easily pass the wind through them and not get damaged, but they are inappropriate for use in schools and in general layout of spaces they are inappropriately placed next to each other. In this design it has been tried to use curved forms in ceiling to facilitate the movement of the wind. Given that the best forms for the educational spaces are the square and rectangular, spaces have been constructed with a combination of rectangular form and curved ceilings.

The use of renewable materials

In the past time local materials were used. The building materials which are mainly brick and clay are among local and renewable materials that due to the high thermal capacity act as insulation in these buildings. The main materials used in the traditional schools of Iran are brick and tile which are easily replaceable and elevate the need for additional costs such as transfer to the place. In most of the areas due to shortage of rain and accordingly lack of tree cover, ceilings are

formed in dome shape and exterior and interior ester of the houses are made by the mix of mud and straw of wheat or barley and cover the surfaces with the thickness of 3-5 cm. In the design of this school, in addition to mud and brick, the use of palm fiber makes this ester protective against the corrosive elements of wind and water. As a thermal insulation layer it works from the outside towards the inside of the building and vice versa and also increases the structural strength. In the covering of the ceiling we can use long reeds or the medial branches of palm leaves that are tied together and are known as canes.

CONCLUSION

Like other places, in the design of educational facilities of each region the abundance of local materials and economic issues should be considered. The design of buildings in accordance with these climates will be popular and acceptable when it has been formed on the basis of criteria arisen from that region and the requirements of its users. If we believe that the kind of defining elements of space have significant importance in the overall impact of space on its perception by the human or if we believe that materials have a great influence on the space form, undoubtedly, in the selection of materials commensurate with the educational spaces the necessary care must be taken. Materials, beyond their technical characteristics have also symbolic values. Therefore use of soft and flexible materials by applying the appropriate life for primary educational spaces.

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