

The role of the Context in the internal form of the roof of Akbari Mosque

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ABSTRACT

Background and contextualism in traditional Iranian architecture are one of its inseparable features. However, in the contemporary era after the emergence of modernism in the West, attention to the field intensified. One of the types of contextualism is climate contextualism, which pays special attention to climate strategies. Iran has different climatic regions, so each region creates its climate. This climatic context has greatly contributed to the sustainability of old buildings and cities. Lahijan Akbariyeh Mosque is one of the traditional Iranian buildings that was built during the Qajar period. In the name of this mosque, like the nave of the hot and dry mosques of the country, the inner roof of the building has an arch and a dome. Meanwhile, the climatic background of Lahijan is sloping due to heavy rainfall. The question is what ventilation in the internal form of the roof of Akbarieh Mosque in Lahijan has to do with the characteristics of the climatic background? What is the positive or negative role of this roof form in interior ventilation? This article states with a descriptive-analytical method that the internal form of the roof of Akbarieh Mosque in Lahijan in terms of internal ventilation does not follow the principles of climatic contextualism in the Gilan region and also does not have a negative impact on the process of internal ventilation.

Keywords: Architectural contextuality, Climatic background, Natural ventilation, Roof form

1. Introduction

Attention to context and contextualism has intensified since modern architecture came to a standstill, and since then, postmodern architecture has become commonplace. The context has various characteristics that briefly include historical, cultural, physical and climatic dimensions. Sustainability and adherence to the context are the principles of traditional Iranian architecture. In Iranian architecture, special attention has been paid to climatic contextualism, which has manifested itself in different forms according to the geographical situation. The coastal cities of Iran, especially the southern shores of the Caspian Sea, always have high humidity and in some areas, its level reaches over 80%. One of the most important things in the architecture of buildings in these areas is the removal of moisture using natural ventilation and air blinds around and inside the building. The internal and external body of the building has a significant effect on the natural

air blinds. Among the places with general use in Iran are mosques. The forms of mosques and buildings in different regions of Iran are different due to the influence of climate, culture, etc. Akbariyeh Mosque is located in the Gabneh neighbourhood of Lahijan, which has a nave with a double roof and the inner body of the roof is dome-shaped and the same concave side of the dome, but the external form of the roof is sloping. Lack of proper knowledge of the native architecture of the region, climatic factors and the role of natural ventilation in the design of current buildings in the temperate and humid northern regions of the country has had many consequences; Including reduced building life, lack of user comfort and high energy consumption. The background architecture of each region contains important points of climate design, and the lack of sufficient research on these points has led to misguidance and often a blind imitation of Western architecture. By properly analyzing the indigenous and traditional buildings of each region, the reasons for using climatic design methods in the architectural works of the past can be extracted so that designers can design with more knowledge of these analyzes. In this article, we analyze the role of the internal form of the roof of Akbarieh Mosque in Lahijan in comparison with the climatic characteristics of the region and try to express the existence or non-existence of the internal form of the roof with the characteristics of the roof in the climatic field.

In the field of contextualism, several works have been seen that have been viewed from different perspectives. In explaining this background, it has been examined thematically. In this regard, the book *Oriental Architecture* by C. Brent Brolin examines the category of architectural styles and how to create coordination between adjacent buildings, related to different periods or styles (Brolin, 2007: 13).

In the book *Principles of Climate Compatible Architecture Design in Iran* with an approach to mosque architecture, the climatic principles used in the old mosques of Iran and their characteristic features have been studied (Tahabaz, 1390: 5). In several articles, the buildings of the past were analyzed from various aspects. In an article to find contextual factors in the houses and the ancient texture of Sanandaj, the characteristics of the Vakil-ol-Molk mansion have been studied (Bahmani, 2016: 7).

Another study entitled *The study of natural ventilation of buildings with arched roofs and its comparison with flat roofs* has been written to study the effect of arched roofs and openings in it. These models have been investigated in two dimensions using the solution of Neuer Stokes equations along with turbulent modelling by the k- ϵ method. And the result indicates the existence of differences between the performance of these two types of roofs in ventilation (Rahmatmand, 1389: 9).

Investigation of the role of roofs in the natural ventilation of residential houses in Mazandaran, which is modelled by Design Builder software and analyzed by clyd anlys, shows that sloping roofs with openings have a significant effect on the natural ventilation of buildings compared to flat roofs. It has a dome (Format, 1394: 2). Despite numerous sources on the study of traditional Iranian architecture and considering that the Gilan region has high relative humidity, it needs more comprehensive and significant research on the flow of natural roof ventilation in the building, taking into account the climatic context of Lahijan.

This article answers the question of whether ventilation in the internal form of the roof of Akbarieh Mosque in Lahijan has to do with the characteristics of the climatic background? What is the positive or negative role of this roof form in interior ventilation? Data collection was done by reviewing library texts including books, articles and field observations prepared in the field of traditional and contextual Iranian architecture.

2. Theoretical foundations

1-2-Contextualism in architecture

Venturi completely rejects the international style and instead believes in contextualism. That is, each building must be designed and executed based on cultural, social, historical and physical contexts and the specific conditions of the site and building. It can be called local or indigenous style. Modernists saw architecture as a technological issue. Technology has a general character and follows the same rules and principles around the world. But postmodernists have a cultural attitude to architecture and culture in each region is different from other regions (Ghobadian, 1393: 54).

Hegel, Herder, and Arthur Twain point to the relationship between man and his environment and recognize the importance of his natural environment, but at the same time emphasize man's ability to respond and shape the world. It is clear that man builds not only nature but also himself, society and culture. One of the basic principles of Marxism is that man as a biological being is a part of nature and man's place reflects, completes, and institutionalizes the construction of his understanding of his environment. Understand a text and then design it according to the circumstances. The design should be based on a realistic approach to environmental information, and the building should interact properly with its building, as Ando puts it: "Architecture is the discovery of the building that the site demands, in his view architecture and context in interaction." Bilaterals are the founders of architecture. In contextual architecture, architecture works not only for location and not for space, but also the reproduction of environmental force and its metaphysical complement. Contextual architecture is an architecture that leads to the creation of more desirable and sublime works in the balance of the environment. Architecture, while implicitly considering the distinction of place, explicitly demands the continuity of physical and non-physical values of the existing place or context, yet does not negate the creation of new values. The main approach of contextualism is to understand the values of the context and continuity in the future. Contextualism is based on the principle that a phenomenon can not be imagined separately from its surroundings, and phenomena are not only monopolized by their inner forces, essence and characteristics but also affect the environment and the environment around them. They are also affected and interact with each other. The whole universe is interconnected, and each component is effective in the whole, and any change in the component will have a definite effect on the whole universe. To understand the spirit of place, Schultz introduces the concepts of "meaning" and "structure." The meaning of each object is rooted in its relationship to other objects. "Structure" instead refers to the formal features of a set of relationships. In general, contextualism is an adaptation to the physical, historical and socio-cultural context according to which the contextualist designer must be able to identify the characteristics of the place and make it part of his design process (Tulaei, 2001: 34).

Contextualism was initially interpreted as eclectic historiography, merely formalism, and a return to history. A superficial look at the context and only in the context of history led thinkers and architects to study other dimensions of the context such as site, culture, society and other factors that emphasize the locality and localization of place and architecture. Factors that emphasize the connection between the building and the field in all dimensions and create places and spaces related to the field and its history; But contextualism did not just stick to the ideas of the time, and later with the discussion of sustainability and the use of natural energy in buildings; Expanded the idea of "species" sustainability in space under the headings of sustainable and climate-friendly architecture. Attention to the climate and natural features of the place in terms of sustainability

and reliance on the context, changed the intellectual approach and creative ideas of this attitude (gharedaghi tirabadi, 2013: 24).

There are four types of contextualism in architecture: climatic, historical, cultural, and physical contextualism. Considering the climatic study of the roof ventilation in the building of Akbari Mosque, we will continue to express climatic contextualism.

1-1-2-Climatic contextualism

Climate, as one of the main pillars of the natural environment, has a tremendous impact on the type of shapes, forms and architecture of the region, so that the ideas that shape the architectural form of each place are organized according to the climatic and climatic conditions of that place. "Species in a climatic view is an object that has common architectural-climatic features of a group of buildings in a similar climate" (Hashemi, 1998: 41).

Paying attention to the background climate and climatic factors in which we architect can be a springboard to fly towards sustainable architecture. Attention to this important way leads to the use of natural forces such as sun, wind, water, etc. and minimizes the use of fossil resources, so pay attention to climatic factors in the region such as climatic characteristics of each wind, rain, night temperature changes and day, air temperature, airflow, sky condition, sun, radiation, etc. are essential (Rapaport, 1977: 56).

2-2-Ventilation

The entry and exit of air from a closed space are called ventilation. Natural ventilation means the process of moving indoor air with fresh air outside the building, without the use of installation devices and fossil energy consumption. (Razjouian, 1379: 63) According to the cyclic analysis and obtaining the relationships governing the natural airflow in the building, the three factors of internal temperature (heat received), wind speed (amount and direction of the wind) and the size of inlet and outlet sections play a very important role They have buildings in natural ventilation (Moghimian, 2002: 127).

2-2- 1-Principles of natural ventilation

Natural ventilation is created in three ways: one-way (one-way) ventilation, transit ventilation and suction ventilation in the building.

Ventilation on one side (one-way ventilation): Compared to other strategies, it has a low ventilation speed and air ventilation does not penetrate the far space. One-way ventilation to a depth of 2 to 2.5 times the floor-to-ceiling height is effective.

Ventilation: at a depth of 5 times the height from floor to ceiling is effective.

Suction ventilation: 5 times the height of the floor to ceiling from the entrance to where the air comes out is effective. The principle of ventilation is based on the level of the ventilation system and can be either transit or suction. The result of air movement throughout the occupied space is an increase in heat and pollutants. As a result, transit ventilation can effectively reduce the depth of space (Kelvin, 1389:42)

2-2-2- Physical solutions to create natural ventilation

Physical solutions to create natural ventilation in terms of location can be divided into three types: physical arrangements on the roof, physical arrangements on the facade and body of the building and a combination of the two. To use natural ventilation, different solutions are used. Common

solutions for natural ventilation include windbreaks, wind chimneys, solar chimneys, single-sided or double-sided ventilated windows, double-skinned facades, and the use of a chimney-based atrium.

2-2- 3- The role of the roof in natural ventilation

In natural ventilation, the roof is very important because the warm air tends to move upwards due to its lightness. In addition, the air currents that pass through the roof surface are stronger and more stable. Natural roof ventilation is also suitable for low-rise and enclosed buildings, where the airflow is low, as well as buildings around which there is a lot of noise and air pollution. (Ahadi, 1393: 33). The roofs of buildings are always located in the roof suction area. Of course, in the case of sloping roofs, this is true when the slope of the roof is low. Windward surfaces of steep slopes are located in the pressure zone and their backward wind surfaces are in the suction zone (Kasmaei, 2013: 66).

2-2- 4- Ventilation of the space between the roof and the ceiling

There is a significant difference between the performance of the interior air conditioning of a building and the air conditioning between the two layers of two-layer roofs, the interior air conditioning of a building has a direct physical impact on its occupants. However, air conditioning between the roofs of two-layer roofs indirectly affects the residents of a building by affecting the heat of the roof and the amount of heat from the roof to the inside (Hashemi, 1390: 80).

2-2- 5- Local and central entry and exit routes

Through air inlet and outlet, it is possible to understand the circulating air conditioning between the external and internal spaces of the building. The input and output paths are divided into two categories, local and central. A central inlet path means that one or more occupied spaces are serviced by a device, and a central outlet path means that the used air is collected from one or more occupied spaces and exits from the same point. Thermal renewability is possible when the inlet and outlet path is central. The detached duct and atrium are examples of central inlet paths, and the chimney box, which acts as a chimney, is a central outlet path. In contrast to the central input and output paths, the local input and output paths do not have a single distribution system. Air enters and exits directly from the wall openings of the building; Opening windows and openings in the façade are examples of local entry and exit routes (Kelvin, 89:43).

2-2- 6- Difference between domed and sloping roofs in internal ventilation

The results of natural ventilation modelling in the inner part of the two types of sloping and domed roofs show domed and curved roof, how hot air moves to the top of the arch, which is collected in the upper part, so by installing a valve in that part It moves and the air flows. The volume and speed of ventilation in the model have more opening and ventilation performance is better. In modelling sloping roofs, the wind speed is zero in the lower parts of the floor and maximum in the upper parts under the roof. The presence of a vent in the upper part of the roof increases the volume and speed of ventilation and airflow are done in almost all places. (Opportunity, 1394: 10)

2- 3- General information about geography and climate

Geographical location: Lahijan city is located in the eastern part of Gilan between the Caspian Sea and the high Alborz mountain range. The area of the city is equal to 584.3 square kilometres and

the longitude is 49 degrees 45 minutes to 50 degrees and 14 minutes, latitude 37 degrees and 5 minutes to 37 degrees and 24 minutes north and altitude is 2 meters (Azimi Do Bakhshari, 2006):. 126).

2- 3- 1- Climatic information of Lahijan city:

Climate table:

Lahijan Monthly Climatic Information (Meteorological Organization of Iran, 2008-2017)

Decem ber	Novem ber	Octo ber	Septem ber	Aug ust	July	June	May	Apri l	Marc h	Febru ary	Janu ary	Year
۹,۶۷	۱۳,۱۳	۱۸,۴ ۶	۲۳,۷	۲۶, ۹۶	۲۷, ۰۲	۲۵, ۱۸	۲۱, ۱۴	۱۵, ۰۷	۱۱,۲ ۸	۷,۵۴	۷,۹۹	Averag e tempera ture
۱۲۴,۴ ۷	۱۸۲,۴	۳۰۹, ۲۵	۱۷۰,۹ ۸	۷۱, ۴۳	۷۵, ۱۳	۵۶, ۲۶	۲۴, ۷۳	۶۹, ۲۷	۱۲۱, ۸۱	۱۲۸, ۸۱	۱۱۹, ۲	Averag e total rainfall (mm)
۷۷	۷۸	۸۲	۸۰	۷۳	۷۰	۷۲	۷۷	۷۶	۷۹	۷۶	۷۹	relative humidit y
۲۰۴	۲۰۴	۱۸۵	۱۴۵	۱۱۲	۹۶	۱۳۰	۱۷۶	۱۶۹	۱۹۹	۲۰۹	۲۴۵	wind directio n
۱۲,۱	۹,۸	۱۱	۷,۹	۷,۶	۷,۶	۸,۴	۸,۶	۱۰, ۹	۱۲,۷	۱۱,۲	۱۱,۴	wind speed

2- 3- 2- Elements of climatic architecture of Gilan

Continuous rain and high relative humidity of the region are the main factors in the formation of indigenous architecture and urban planning in this land. In such an environment, the construction of the building must be done with precise solutions so that it can resist various penetrations of moisture into the building (moisture from the floor and ceiling) (Diba, 1372: 16). There are three common methods in the past architecture of the north of the country in terms of roof construction, which include galoshes, lathes and pottery. According to the method of construction of each, often flat roofs are made in their internal form and a few cases in the attic, the external sloping form is also implemented in the inner form of the roof (Darbandi, 1394: 57). The existence of an opening for ventilation in the roof was possible through the construction of a clay roof of the house.

2- 4- Akbarieh Mosque in Lahijan

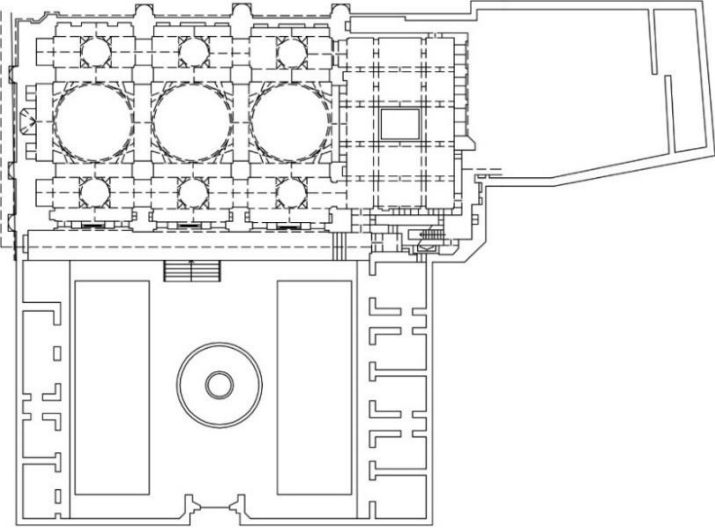
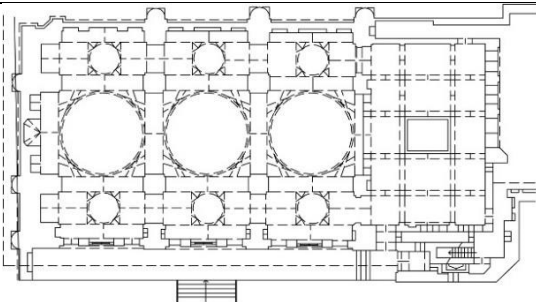
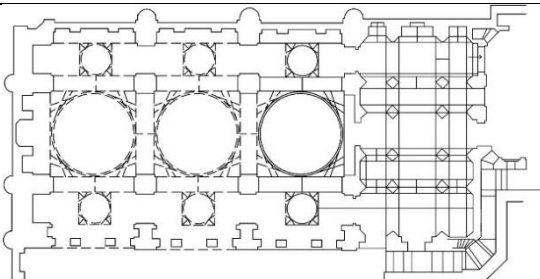
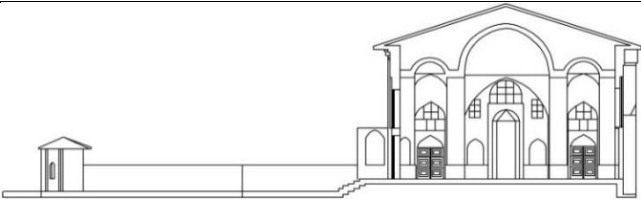
Akbariyeh Mosque is located in the old neighbourhood of Gabneh, Lahijan, in front of Imamzadeh Seyed Ibrahim. It was built during the reign of Fath Ali Shah Qajar. The mosque remained half-built in its time. The mosque consists of three long arches that are built on six main pillars. The distance between the main foundations of the building is 7 meters and the width and length of each foundation are 120 centimetres. The sides of these three main arches are three small arches, and the sum of all three side arches is almost like a corridor (Table 1). The interior of the building is old thin bricks and its mortar is plaster and soil. On the sides of the altar, two small warehouse-

like applications have large.

doors. The walls are tiled from a distance of eighty centimetres from the ground and all the tiles are built on the mosque at the same time. The complex has just been renovated. On the north side, three large entrances have been installed to the area where the ablution pool and water well are located. The crown and the part of the building that is placed under it have not been rebuilt (Sotoudeh, 1351: 96).

In this building, the inner part of the roof has a dome shape and the outer part of the roof has a sloping roof according to the climatic principles of the region (Figure 1).

Table 1 - Plan and section of Akbarieh Mosque in Lahijan

	<p>Site plan</p>	<p>plan</p>
	<p>ground level</p>	
	<p>First Floor</p>	
	<p>Longitudinal section</p>	

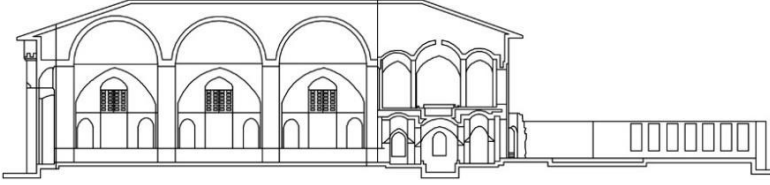
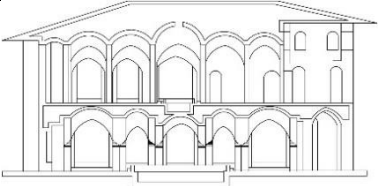
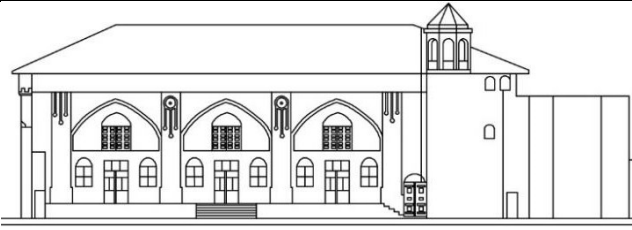
	Longitudinal Section	Section
	Transverse Section	
	Longitudinal elevation	elevation



Figure 1- Difference between the internal and external form of the roof of Akbarieh Mosque in Lahijan (Source: Authors)

3. Analysis of findings

Since the climatic background method of the Gilan region in terms of roof construction follows the sloping form, but in the building of Akbarieh Mosque in Lahijan, there is a difference in its internal form with the climatic background. Although the sloping roof in these areas, its connection to the interior is done with a flat cover, the inner roof of the mosque is built in the form of domes (without holes in the upper point). The existence of the dome form is specific to the hot and dry regions of the country, which is built to adjust the temperature and the apex at the top for ventilation. Analysis of existing modelling comparisons of ventilation in domed and arched roofs with sloping roofs indicates that sloping roofs in the northern regions of the country have a more adequate ventilation rate; However, the dome and arch type of the roof does not hurt the internal ventilation process of the building.

4. Result

Based on the results obtained from the library and field study method and studies, the internal form of the roof of Akbarieh Mosque in Lahijan in terms of internal ventilation does not follow the principles of climatic contextualism in the Gilan region and there is no contextual relationship between the two. Due to the climatic background of Lahijan, due to heavy rainfall and high relative humidity, the roof needs to be sloping. The lack of openings in the roof of this building does not have a positive effect on ventilation, but the existence of this type of roof in this building does not hurt the internal ventilation process. As a result, designers can use this type of roof form in the design according to their design wishes, and for air conditioning in the interior, an aperture can be installed at the top of the arched and domed form of the roof, which is not located in the direction of Gilan climate.

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