

Recognition of the Shading Elements in Traditional Houses of Dezful

Mohsen Taban^{a*} - Mohammad Mehrakizadeh^b - Sara Najjaran^c

^a Assistant Professor of Architecture, Faculty of Architecture and Urban Planning, Jundishapur University of Technology, Dezful, Iran (Corresponding Author).

^b Instructor of Architecture, Faculty of Architecture and Urban Planning, Jundishapur University of Technology, Dezful, Iran.

^c M.A. of Architecture, Faculty of Architecture and Urban Planning, Jundishapur University of Technology, Dezful, Iran.

Received 23 January 2017; Revised 29 May 2017; Accepted 16 September 2017; Available Online 22 September 2019

ABSTRACT

Architecture of every territory and every culture features its own specific properties that per se define the architectural identity of a land. In Iran's historical cities, many preparatory works are applied for creating comfort and elevating the environment quality and the study of the physical context and properties in these areas enables offering of a proper definition of them. The high temperature and intensive irradiation in the hot regions have caused the accompaniment of the physical conditions with many solutions for creating shades parallel to the supply of comfort. These solutions have been beautifully blended with the aesthetical aspects of the buildings and this same coordination has led to the creation of innovative works. In the present study, efforts have been made through concentrating on the physical and contextual environment of the historical texture in the city of Dezful to identify the irradiation control method and various factors for creating shade in the building level and in the interior spaces, on the one hand, and urban environment, on the other. To perform this study, a descriptive method was employed to select the study samples from amongst the traditional houses and historical texture areas with the lowest changes in their contextual forms following which their shading components were identified and integrated into a model. Based thereupon, considering the studies performed in this regard, a 3D model was created for better understanding of these elements according to the spatial details and shading factors in Sahrabedar Maghrebi Neighborhood and Suzangar Historical Houses area and each of these components were described in two groups of architectural shaders and urban shaders. In general, the shading components of the area's architecture can be defined in three-element sets, namely skylight, skylight- shader elements and shading elements. The proper recognition of these components and paying attention to their performance can lead to the understanding of the generalizable patterns regarding the control of the environmental conditions, on the one hand, and the spatial details for enhancing the aesthetical qualities of today's residential spaces, on the other.

Keywords: Old Texture of Dezful, Sahrabedar Maghrebi Neighborhood, Shading Elements, Environmental Control.

* E_mail: mntaban@jstu.ac.ir

1. INTRODUCTION

In hot regions, various strategies are applied for controlling the radiative energy's control in the exterior spaces. The use of bright colors for the exterior bodies, taking advantage of various shades and improvement of the thermal properties of the masonry used in the walls are amongst these strategies. In these regions, the amount of absorbed solar radiation causes the heightening of the surfaces' temperature and their ambient temperature that largely influences the thermal performance of the walls hence the peripheral residential spaces. Due to the same reason, in order to optimize the amount of irradiation received by the various surfaces, proper solutions should be applied for controlling the amount of shading on the walls otherwise the shade would be more than required when there is a need for irradiation and the irradiation would be more than required when there is a need for shade. "In many of the studies, spatial proportions and degree of enclosure have been identified as the primary factors of controlling shade in the physical environment" (Muhaisen & Gadi, 2006, p. 246). "Controlling the shade in the buildings brings about an improvement in the chilling and thermal loads and visual and thermal comfort. It is stated in a study that was conducted in this regard that shading and irradiation control bring about reductions by 31% in the consumption of energy (lighting, heating and cooling) in the buildings" (Tzempelikos & Athienitis, 2007, p. 381). In a similar study, "21% of the reduction in lighting and cooling energy consumption and 13% of the reduction in the cooling load peak have been reported on a sunny summer day" (Lee, Di Bartolomeo, & Selkowitz, 1998, p. 62). As for the effect of shade on the buildings, many studies have been carried out in various countries around the globe¹.

"The use of streets' configuration in such a way that more shade is created on the exterior surfaces of the buildings has been the focal point of attention in these climates since long ago. When a façade is in shade, its surface temperature will be low; therefore, lower heat is absorbed by the building thereof and there would be consequently less energy needed for cooling it. If the streets and pavements are in shade during summer, the medium radiative daily temperature would be brought down and the pedestrians will be accordingly provided with more comfort" (Steel, 1998, pp. 92-95). In Iran, as well, Razjouyan in 1988, Tahbaz in 2007 and Ghiabaklou in 2003 performed useful studies in this regard. As for the recognition of the city and the traditional houses' pattern in Dezful, there are valuable researches performed during the past years. In line with this, controlling of the irradiation in this area is carried out for achieving such a goals as the supply of adequate natural light to the interior and exterior building spaces, creation and regulation

of favorable air current and ventilation, creation of microclimate for comfort in the external environment, prevention of transferring the heat stemming from radiation onto the surfaces into the interior spaces of the building, cooling of the surfaces during the night via creating the possibility of irradiation towards the clear sky and creation of the possibility of passing air ventilation for lowering the mean daily temperature in the interior spaces.

The dense textures and interwoven spaces are considered as appropriate patterns for the creation of shade in the hot regions. The thing that is evidently seen in Dezful's urban texture and traditional architecture is that the creation of natural current and ventilation has been taken into account for repelling the moisture even with the attention paid to the creation of shade for preventing the direct irradiation on the surfaces. Therefore, architectural designing of Dezful neither features a dense texture like the central regions in Iran nor is it characterized by an incompact and open texture like the southern cities in the Persian Gulf's margin. In such a non-compact texture, shading compensation that could be otherwise done through compaction of the texture is supplied through multiplying the shading factors in the context of the building. The aspect distinguishing the architecture of this region from that of the arid and hot areas is the existence of many elements from the macro urban texture level to the trivial components of architecture like brick decorations and overhang frames, besides playing their primary role, also create shade in the building's context. Based thereupon, the present study deals with shading patterns in Dezful's architecture and the effect of these patterns on the reduction in the environmental cooling load.

2. STUDY QUESTIONS

In the present study, various methods of irradiation control in the architectural context of Dezful's historical texture have been explored. In line with this, the study questions for accomplishing the foresaid goal are as follows:

1. What are the contextual solutions for controlling the irradiation in Dezful's architecture?
2. To how many sets do these shading elements belong?

3. STUDY METHOD

The present study makes use of a descriptive method for recognizing and identifying the shading components in Dezful's architecture. For performing a field study, the study samples were selected from amongst the traditional houses and historical texture areas that had not been subjected to any new textural changes and attachments and/or the houses and the areas wherein the initial situation of the contextual components was

still identifiable even with the textural modifications through the study of the existent documents. After identifying the shading solutions, efforts were made to introduce the shading elements in urban houses and urban texture in an integrated model. Documentary search and field records were utilized for collecting the information.

4. POSITION AND CLIMATE OF DEZFUL CITY

Dezful County is situated between 32° 16' of the northern latitude and 48° and 25' of the eastern longitude. The weather in Dezful is hot and sub-humid and its summer temperature exceeds 50°C. Chart 1 illustrates the minimum, maximum and fluctuations of the temperature during the hot months of the year in this city. "In Dezful County, the liveable environmental conditions are only established only in short instants of the year and the need for shade and air circulation is tangibly felt in the majority of the months of the year" (Rahimie & Rabubi, 1974, p.194).

Meteorological station statistics of Safi Abad)

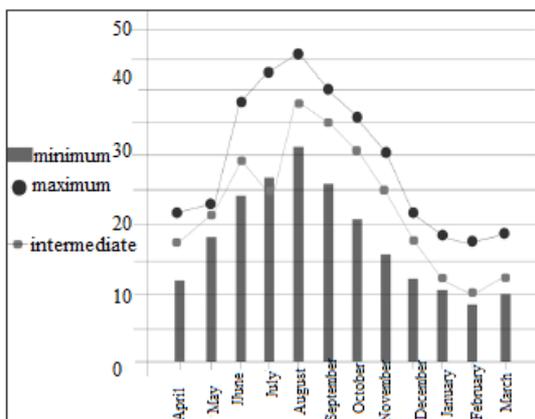


Chart 1. Dezful's Air Temperature Information for Hot Months of Year (Dezful, 2014)

"The calendar of the various cities' climatic needs, especially in hot climates, signifies that supplying appropriate shades is one of the main conditions giving rise to the comfortability during the hot seasons. The importance of the need for shade in every climate differs depending on the intensity of its hotness and it can account for more than two third to three fourth of the entire year in the tropical regions" (Tabbaz, 2007, p. 30). "The old texture of Dezful is intensively influenced by climatic issues. Climatic factors like the intensity and orientation of sun's irradiation, high air heat and favorable wind's direction along with natural and topographical factors have played considerable role in the formation and

complication of the old texture in Dezful" (Taban, 2008, p. 94). The climatic need calendar (Chart 2) has two vertical axes indicating the days of the year and hours of the day and enabling the investigation of the entire climatic needs during the year.

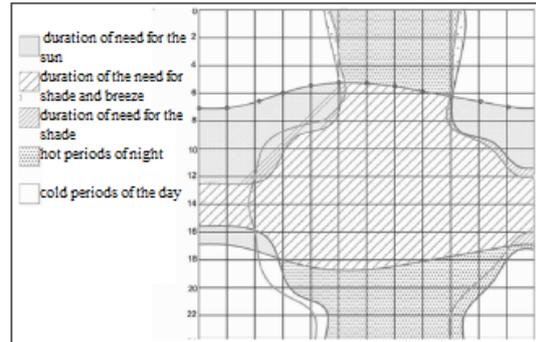


Chart 2. Dezful's Climatic Need Calendar Based on Pan Warden and Giovanni's Scale

It can be understood from the investigation of Dezful's climatic need calendar shown in chart (2) that there is a need in the majority of the months for shade as a means of creating comfortable conditions considering the high temperature in this region. In various studies, the emphasis has been made on the effect of shade on reducing the buildings' cooling energy. "It is stated in a study that the existence of shade influences the cooling load of the building up to 21%" (Lee, Di Bartolomeo, & Selkowitz, 1998, p.61).

5. SHADING

One of the methods of controlling temperature in the living spaces is the creation of shade on the walls and this is feasible via the use of urban and contextual architectural shades. The urban shading elements in Dezful's historical texture are divided into two sets of artificial and natural and each of them plays a considerable role in improving the residential conditions of the texture. The natural elements like trees and the artificial elements like passageways, buildings' protrusions and shelters each play a specific role and exhibit a unique performance for creating shade that has a large deal of effect on achieving the comfortability conditions in the public spaces. On the other hand, the effect of the architectural context and its constituents on the creation of shade is ponderable; because each of these elements forms Iran's traditional architecture and has had a great deal of effect on Iranian architecture's identity. So, it can be generally stated that architectural context can be divided in terms of shading elements into three sets of skylight elements, skylight-shading elements and shading elements. Skylight elements include Jam Khaneh [mirror room], Horno [skyhole], Pachang [orifice] and Tehrani [opening]; skylight-shading elements include Rowzan [orifice], Shabak [lattice], sash

window, pavilion and Fakhr and Madin. The shading elements of the Iranian traditional architecture, as well, can be studied from two aspects: the first group incorporates the main components of the building like portico, porch, veranda and terrace; the second group

are attached to the building in an accessory form like pergola, sun-block, door and latticed windows and so forth. The forthcoming section investigates each of these shaders in Dezful County.

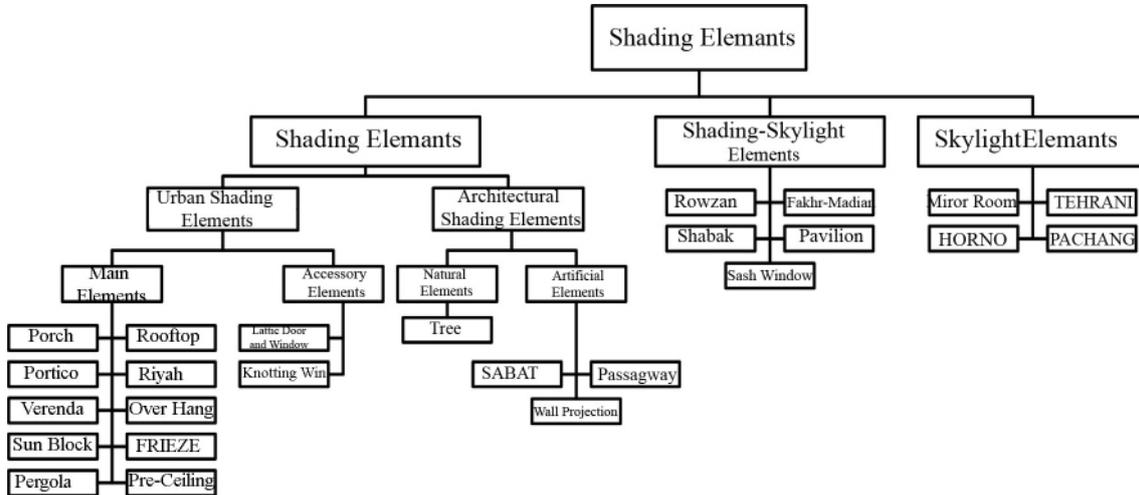


Fig. 1. Classification of Different Components of Shading in the Studied Area

6. SKYLIGHT ELEMENTS AND SKYLIGHT-SHADING ELEMENTS

In the traditional architecture of Iran, the light was not used uniformly rather light has always been moderated and then allowed to enter the space. To do so, the architects always endeavored to use innovative techniques and very simple elements to take advantage of the light in the best possible way. Building elements that have been applied for taking advantage of the natural light in the traditional architecture of Iran can be studied from two aspects: “the first group of the skylights is predominantly used for transferring the light into the interior spaces and the second group of the skylights control the light entering the building like pergolas and shades” (Gorgani, 2002, p. 318). Although these elements differ in terms of the material, type and place of use in the building, all of them are employed for allowing the light in. However, it has to be noted that, besides playing the role of admitting light and regulating the lighting, a number of these skylight elements also were utilized for ventilation and air circulation, as well. According to the studies performed in this area, the shading-skylight elements are not seen in the traditional housing architecture.

7. SHADING ELEMENTS

In the vernacular architecture of Dezful, many of the elements have been used for creating shade in residential environments. There are many solutions used for creating shade in the walls of the buildings

and thoroughfares for reducing the cooling load during the hot seasons of the year. These elements can be categorized as urban and architectural context elements.

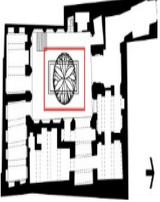
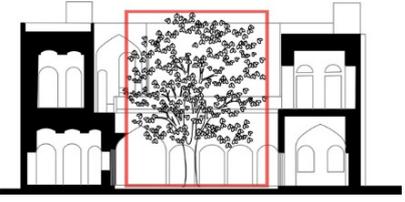
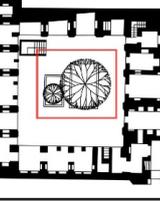
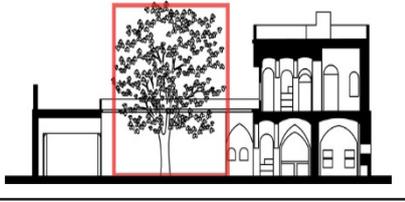
7.1. Urban Shaders

In this article, urban shades are divided into two groups of natural and artificial shades for separating the shading elements in Dezful.

7.1.1. Natural Shading Elements

One of the most important advantages of applying trees in urban spaces is the creation and supply of shade considering the climate and severe sun irradiations in the majority of the days of the year in many of the spots in Iran because the trees serve multiple functions and have more durability and efficiency and can be used for more purposes in respect to the artificial elements like pergolas. Considering the fertile lands and the ancient architectural history and the large number of the citrus trees' gardens in the periphery of Dezful, trees are sporadically seen in the study of the historical texture of less densely masses. However, some samples of jujube trees can be seen in the yard of many of the houses and a limited number of palm trees are found in the houses with large yards and adjacent units (Table 1). After land reforms and entry of the international industrial companies during the second Pahlavi Era to the northern regions of Khuzestan, citrus plants were sown in many of the houses.

Table 1. Trees' Shading in Dezful's Houses

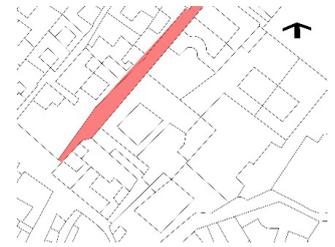
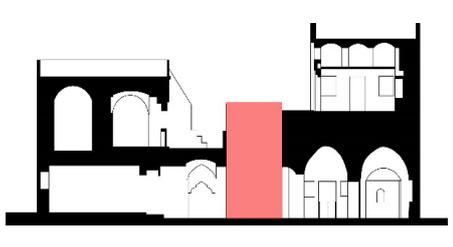
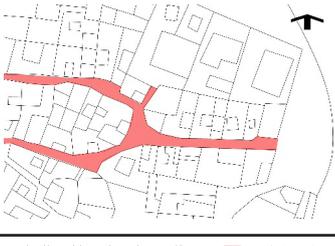
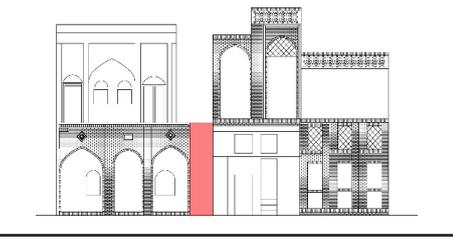
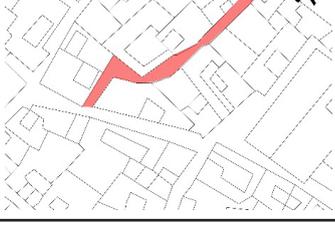
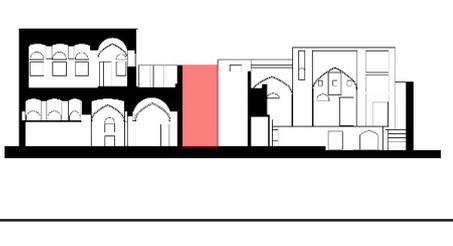
	Yard's Image	Siting in Plan	Siting in Cross-Section
Yek-khalilou House Qal'eh Neighborhood			
Mo'ezzi House Qal'eh Neighborhood			

7.1.2. Artificial Shading Elements

Passageway: passageways are the city's veins and are narrow routes connecting the houses to one another. "Passageways were usually constructed in the form of three alleys. Efforts were made in the past so as not to create junctures in the paths and there were instead made three alleys" (Pirmia, 2013, p. 4). In such

hot climates like Dezful, buildings were constructed with tall walls and the width of the passageways were narrow and this caused shading on the routes. The high enclosure rate of the passageways along with the surfaces' protrusions caused the creation of proper shading on the passageway's surface (Table 2).

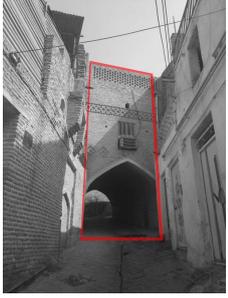
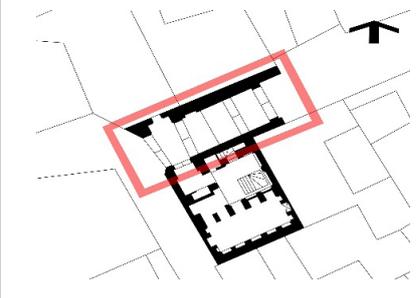
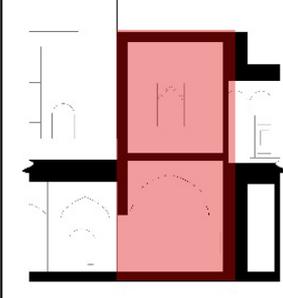
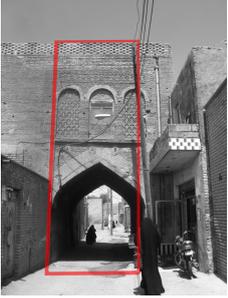
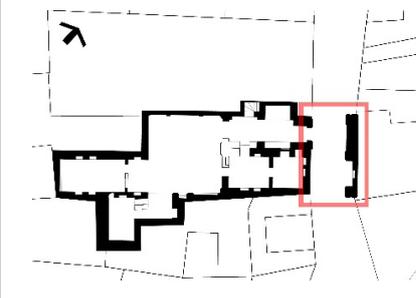
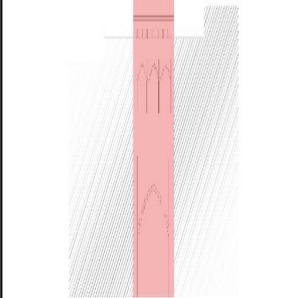
Table 2. Shading in the Passageways of Dezful's Historical Texture

	Passageway's Image	Siting in Neighborhood	Sighting in Cross-Section
Majdian Neighborhood			
Qal'eh Neighborhood			
Sarmeidan Neighborhood			

Sabat: it is a covered alley seen in the tropical and cold cities. In the tropical cities, the alleys were built narrow and with long walls and sabats were installed for shading. In Dezful, many sabats were commonly built (Table 3). Moreover, on desert roads away from

the cities and villages, part of the road was covered for the convoys to rest in. These sabats had several arcades and one cellar" (Memarian, 2008, p. 76). Besides creating shade, sabats also contributed a lot through pressure change to the air current.

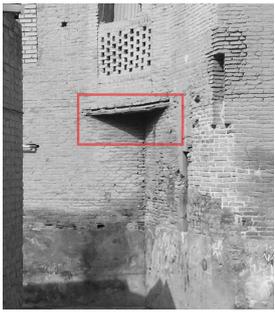
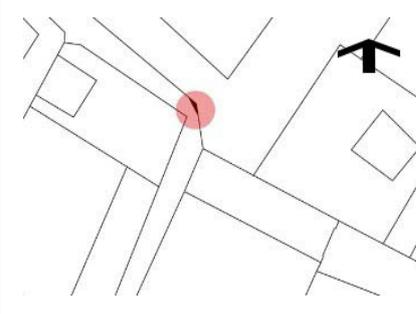
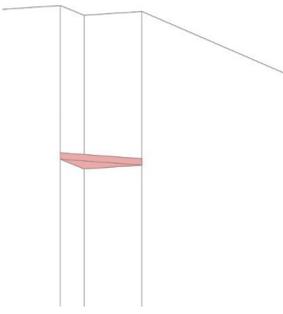
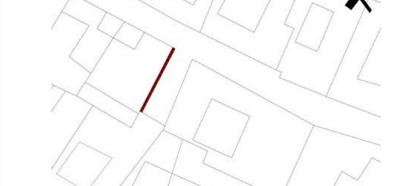
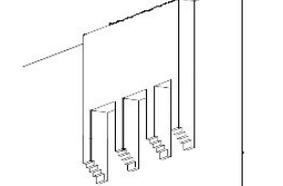
Table 3. Sabats' Shading in Dezful's Historical Texture

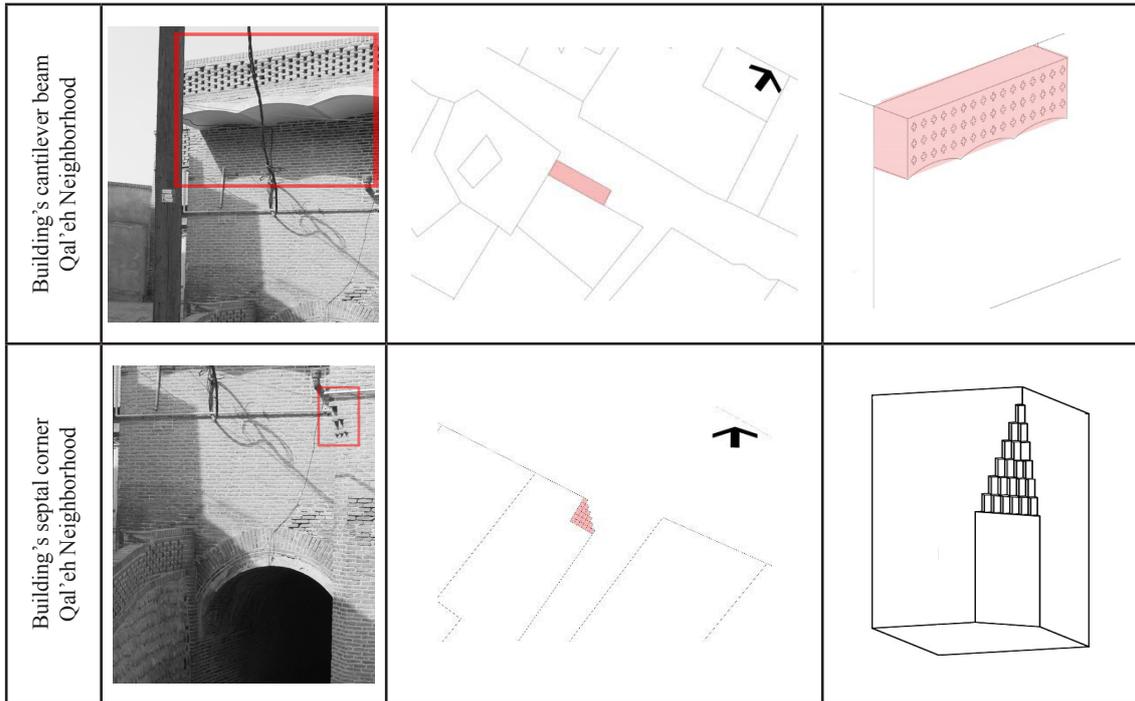
	Awning's Image	Siting in Plan	Siting in Cross-Section
Sabat of Hajivand House Siahpoushan Neighborhood			
Sabat in Esma'ili House Siahpoushan Neighborhood			

Projections of the Exterior Walls: in many of the architectural preparations applied in the construction of the houses in this region like muqarnas, corbel, alleys bevels and niches (septal angles) and the buildings' cantilever, shade creation on the vertical surfaces has been taken into account. "In local dialect, Tonjeh [corbel] or Hammalak [load-bearer] is used to refer to the protrusions on the walls. These processes are about

60 to 70 centimeters in thickness. Corbels are built in steps using wooden rows and brick layers in various kinds. On the other hand, the septal corner is made of brick rows that are placed one atop of the other in a delighting and calculated manner. The sun's irradiation on these septal corners during the various hours of the day causes the creation of very beautiful dark and light spaces" (Table 4)(Naima, 1997, p. 44).

Table 4. The Exterior Wall's Shading in Dezful

	Wall Protrusion's Image	Siting in Texture	Siting on Façade
Qal'eh Gousheh Saziha Neighborhood			
Corbel (Tonjeh or Tongeh) Miyandarreh Neighborhood			



Based on the abovementioned discussions, the creation of shade over the urban walls in the regions with high irradiation intensity during summer is of great importance. The use of streets' configuration in such a way that more shade can be created by them on the exterior surfaces of the buildings has been the focal point of attention since long ago. "When a façade is in shade, it would have a lower temperature hence lower heat is absorbed by the building from it and there would be consequently less energy needed for cooling the building. In the case of shading the streets and pavements in summer, the daily intermediate radiative temperature will be low and the pedestrians will be provided with more comfort" (Steel, 1988, p. 95). "Studies indicate that the daily summer temperature in the streets with height to width (H:W) ratio of 1:1 is four degrees higher than in the streets with a 3:1 height to width ratio (H:W)" (Ahmed, 1994, p. 48).

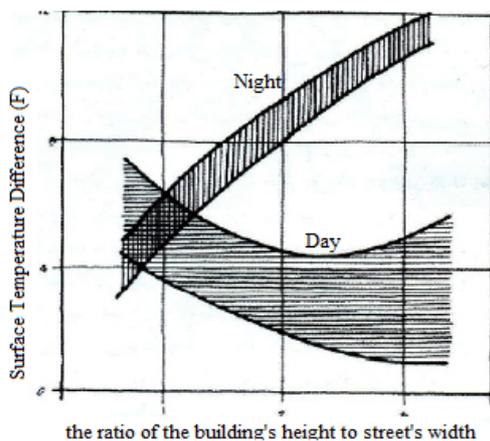


Chart 3. The Effect of Transversal Cross-Section of a North-Southward Street on the Surfaces' Temperatures

7.2. Architectural Shaders

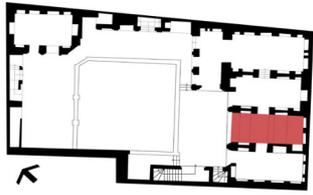
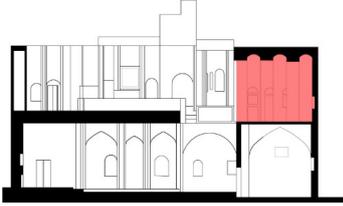
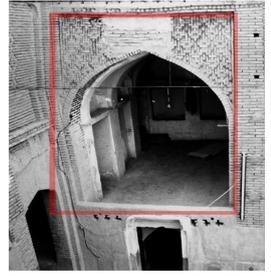
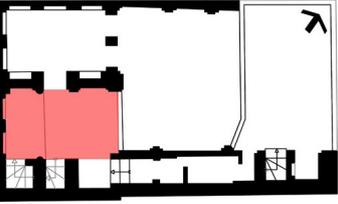
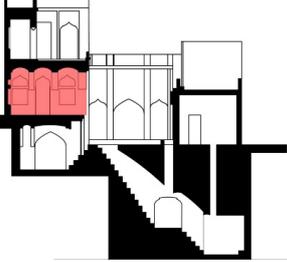
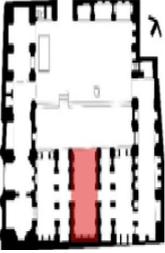
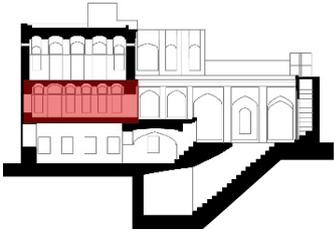
As was mentioned, many shading elements have been used in the vernacular architecture of Dezful. These elements can be categorized into two groups of main and accessory elements. The main elements incorporate the spaces that are the primary components of the architectural context. The accessory elements have also been used in decorative forms, as well.

7.2.1. Main Elements of Architectural Shading

Porch: it is an intermediate and semi-open space in the hierarchy of the buildings and enables access from open to closed spaces. The spatial element of the porch in Dezful's traditional houses has been applied according to the city's hot and subhumid climate for creating shade and preventing the sun's direct irradiation.

To do so, considering the method by which the passageways are connected and related to the entry space then to the yard as well as land's segmentation method, this important and elevated space can be seen in Dezful's traditional houses both on various floors (in the half-storey of the Shayegan and Tiznow Houses and in the ground floor of the Nilsaz House) and in various fronts and facades of the yard; however, considering the very large diversity in porch's placement in Dezful's traditional houses, siting of this spatial element has been more prevalently been in the southern front than the others. In Dezful's traditional houses, unlike those of the other spots in the country especially in the central plateau, porch is not at all followed by any space and the wall on its ending part has been decorated and stylized with shelves and built-in niches (Table 5).

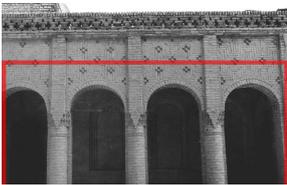
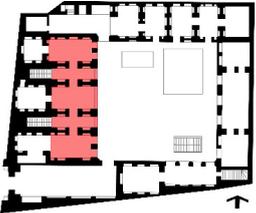
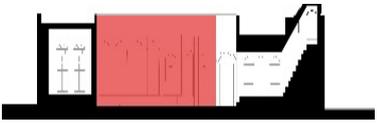
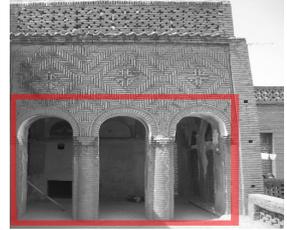
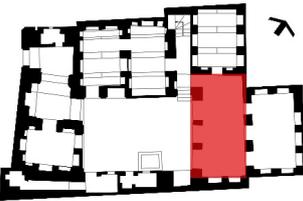
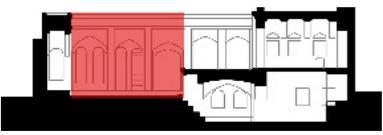
Table 5. Porch Shading in Dezful's Traditional Houses

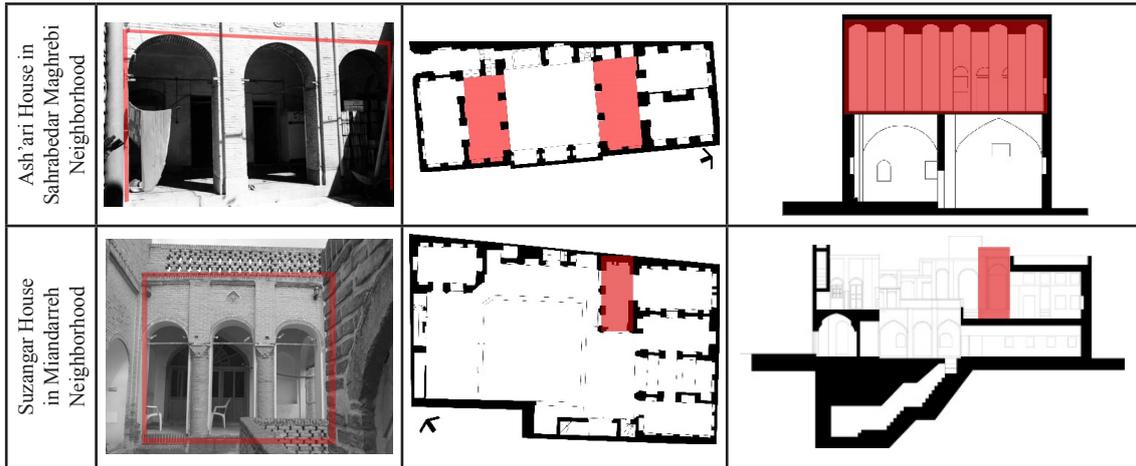
	Porch's Image	Siting in Plan	Siting in Cross-Section
Suzangar House in Miandarreh Neighborhood			
Shayegan House in Qal'eh Neighborhood			
Tiznow House in Qal'eh Neighborhood			

Portico: portico is a sort of porch that is constructed with diverse columns in front and an elevation equal to the roof but with a low width. Portico is also closed on three sides and open on one side and it keeps the human beings safe against the precipitations and sun's irradiation and it admits a favorable and mild light in regions with high intensity of light and

high temperature in which case the buildings are illuminated indirectly or in an intermediated and controlled manner. In Dezful's houses, portico is used as a pre-space for the eastern and western fronts' rooms; in a few of the houses, it is applied in the form of a connecting space in the floors between the northern and southern spaces (Table 6).

Table 6. Portico's Shading in Dezful's Houses

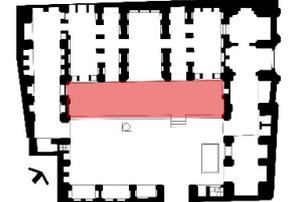
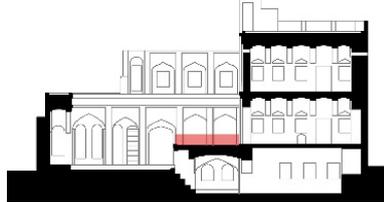
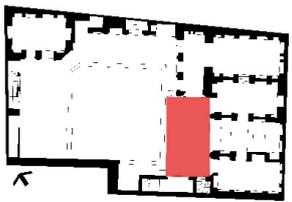
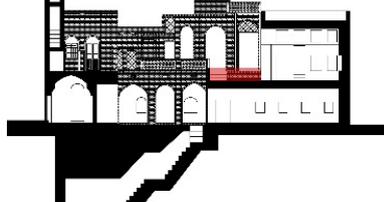
	Portico's Image	Siting in Plan	Siting in Cross-Section
Da'ei House in Kermasion Neighborhood			
Mia'asumi House in Sahrabedar Maghrebi Neighborhood			



Veranda (Mahtabi): “it is a roofless space placed in a small height to the yard; the walls of this space are decorated on the exterior parts and it resembles the porch having no roof. This space is usually closed on three sides and it is open on the fourth side” (Pirnia, 2003). Depending on its siting location, it is used during hours that the peripheral walls provide sufficient shade. It can be used in spring and fall during all hours of the day and in summer during the

nights. In Dezful’s traditional houses, this space is built on the ground floor and called Mahtabi; if it is placed on the first floor, it will be called pre-roof. It is a good place for resting and night sleeping due to the fact that it is always constructed in the shade of the building’s southern edge and also for it is cooled down by the passing wind and currents through the latticed shelters on the roof (Riya or the lungs of the building) (Table 7).

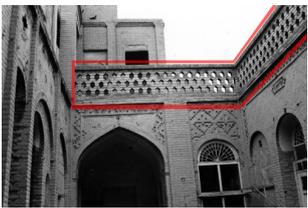
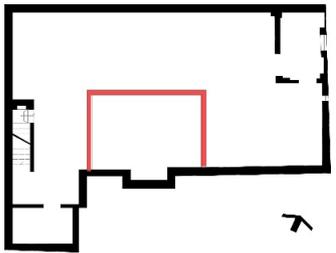
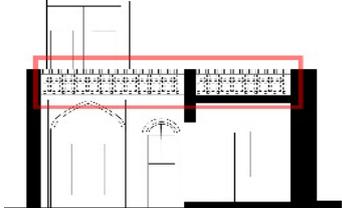
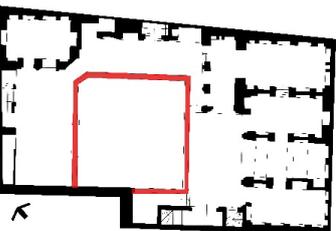
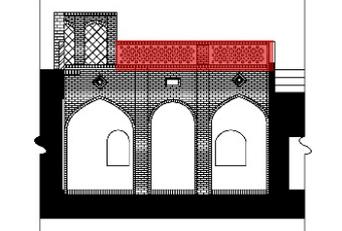
Table 7. Veranda’s Shading in Dezful’s Traditional Houses

	Veranda’s Image	Siting in Plan	Siting in Cross-Section
<p>Tiznow House in Qal’eh Neighborhood</p>			
<p>Suzangar House in Miandarreh Neighborhood</p>			

Riyeh (shelter): it is a handrail wall with latticed brickworks. The height of the roof’s latticed handrail is most often equal to the height of a person and it transforms the roof into a private and veiled yard. On the other hand, the latticed form of the brick-laid walls enables air recirculation. In Dezful’s houses, roof and

prerroof were used for sleeping, living and also as a service space in some months of the year. The roof handrail was constructed in the form of latticed layers of complete or half bricks; the ending section of the handrail was made in the conical form (Table 8).

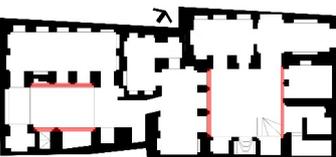
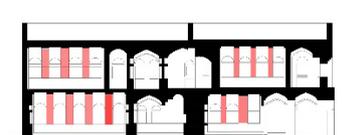
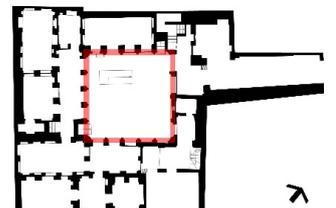
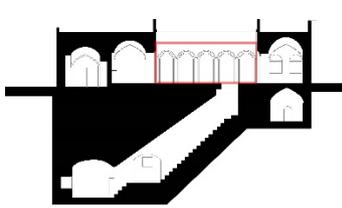
Table 8. Riya's Shading in Dezful

	Riya's Image	Siting in Plan	Siting in Cross-Section
Rakhsanfar House in Miandarreh Neighborhood			
Suzangar House in Miandarreh Neighborhood			

Sun-Block: "In the ancient houses, methods were used to prevent the scorching irradiation of sun from entering into the spaces. One of these methods was the use of sun block or sunray shield which was constructed with thin walls, 6 to 15 centimeters in diameter, around the orifices, windows and gates so as to put them in shade. The sun shields made on the transom of the entry doors or windows were called shadow heads or horizontal

sun blocks. The vertical sunray shutters were brick or gypsum walls constructed between two entry doors for a width of 60 to 70 centimeters and a thickness of 10 to 15 centimeters" (Memarian, 2008, p. 141). These walls were sometimes up to 5 meters in height and they were made using gypsum and canes by means of which shades were provided over the doors and glasses on them to prevent them from heating up (Table 9).

Table 9. Sun Block's Shading in Dezful's Houses

	Sun block's image	Siting in plan	Siting in cross-section
Nilsaz House in Masjed Neighborhood			
Shahroki House in Sahrabedar Maghrebi Neighborhood			

Shading elements like repetitive sun shields in the internal yard's walls, shelters (Riye) in pre-roof, veranda, porch and porticos in the traditional architecture of Dezful were applied in the interior spaces of the yard. The creation of shaded surfaces in the interior spaces of the yard during various hours of

the day causes a reduction in the radiative temperature of the environment during the day. The air convection between the shaded surfaces and sun-exposed surfaces causes the air circulation between the foresaid spaces and the prevention of the heat infiltration into the interior spaces.

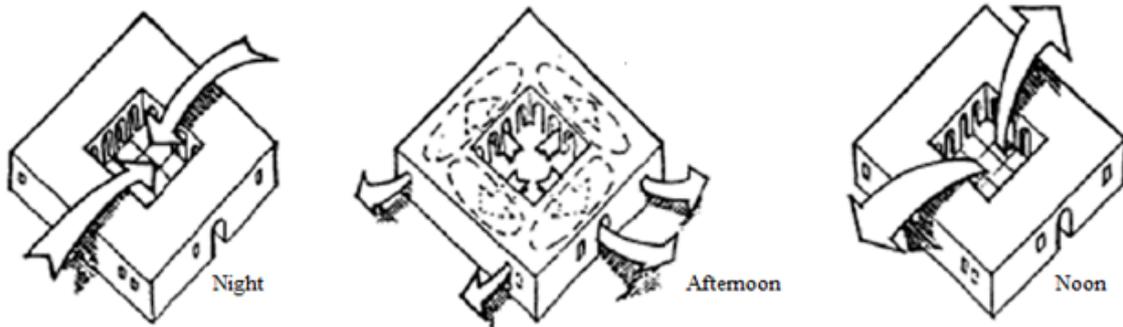


Fig. 2. Creation of Air Current in the Yard Under the Influence of Shaded Surfaces for a 24-Hour Time Span (Tailib, 1984)

Uncovered shaded spaces like yards enable the absorbed heat dissipation at night through reflectance into the clear sky. Figure 3 illustrates the method of microclimate formation inside the yard as a result of air circulation under the influence of sun's irradiation during the day and reflectance to the sky from the yard's surface and walls during the night.
Pergolas: creation of pergolas and shades over the windows prevents the sun from directly irradiating onto the window surfaces as a result of which the

heat stemming from the sun's irradiation behind the window is considerably reduced. Pergolas might have different effects such as control of the direct sun irradiation into the interior spaces, controlling the light and natural ventilation. Pergolas and shades serve various functions depending on their color and place of installation in respect to the window as well as the natural ventilation conditions in the building. Pergolas and shades can be divided into various kinds of fixed, movable as well as natural like trees (Table 10).

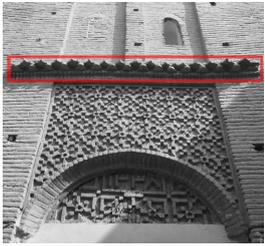
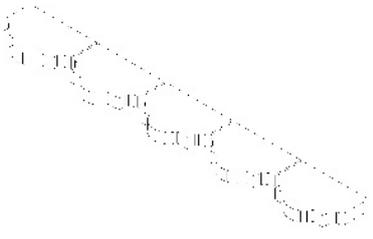
Table 10. Pergolas and Shades' Shading in Dezful

	Shade's image	Siting in plan	Siting in cross-section
Nafisi House in Masjed Neighborhood			
Mirshakar House in Sahrabedar Maghrebi Neighborhood			

Frieze: "In fact, frieze is the name of a motif above the column and it is usually presented in a painted form. Frieze is installed a little more ahead of the overhang frames and it is used as a protection for overhang frames against rainfall. Brick-laid Frieze is

usually constructed in two rows and it is shaped by hacking and wet-carving" (Table 11) (Naima, 1997, p. 58).

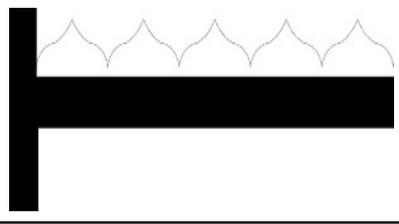
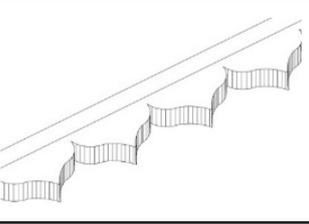
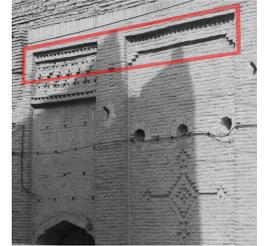
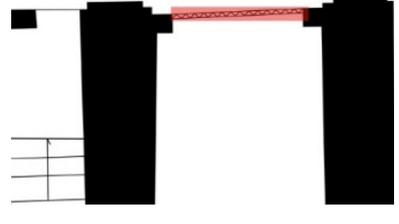
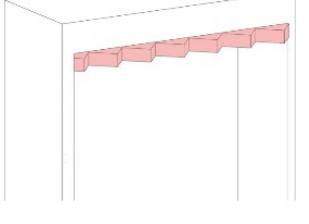
Table 11. Frieze's Shading in Dezful

	Frieze's Image	Siting in Plan	Siting in Cross-Section
Entry gate of Suzangar House in Miandarreh Neighborhood			

Rokhbam [rooftop]: the term “rokhbam” is comprised of two words: Rokh meaning face, visage and countenance that is metaphorically used to refer to the surface of a thing and the term “bam” meaning the entire exterior coating of the house’s roof or rooftop. The expression “rokhbam” in architecture points to a component of the building that is constructed for protecting the border at which the roof and façade meet and it was previously given a decorative form in the past for it was possible to see it in the building’s façade and it is indeed the decorative edge of the building’s roof. “Rokhbam is a long string of brick-laid course on the roof and it forms the last upper means of cornice” (Marzban & Ma’aruf, 1998). The

construction of Rokhbam in traditional architecture is one of the very extensive preparations for preventing the erosion of the roof’s wall and surface intersection so rokhbam or rooftops were constructed using a vast spectrum of simple constructional materials like clay-straw plasters, mud-straw plasters, rows of ordinary to special bricks, tiles and more expensive and more artistic decorations on the constructional materials like painting, woodworking and wood-carving that were covered in various states following which different methods of protection against moisture and repelling of moisture from the building’s façade were formed. Additionally, these are amongst the factors influencing the walls’ shading (Table 12).

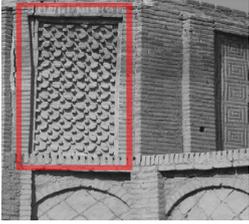
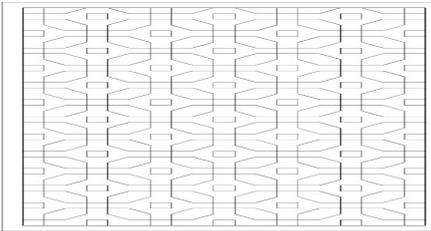
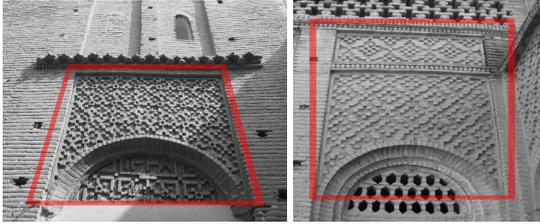
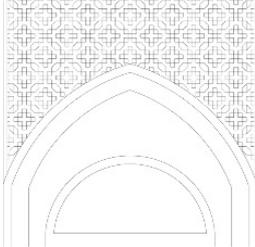
Table 12. Rokhbam's Shading in Dezful's Houses

	Rokhbam's Image	Siting in Plan	Siting in Cross-Section
Nilsaz House in Masjed Neighborhood			
A House in Qal'eh Neighborhood			

Xowun (Overhand Frame): it is a decorative brick-laid part with its thickness being used in the creation of various decorative knots on the façade. In fact, Xowun is a name in Iranian architecture that points to the decorative mosaic-like works installed on the building’s forehead” (Emam Shushtari, 1968, p. 42). In this type of brick-working, various segments of brick are juxtaposed for creating various ornamental knots. Some of the bricks that make the background are used a little more aback and the bricks that create the knots

are used a little more ahead². Each group of Xowun-laying embraces a scroll of the various images that are used according to the special tastes and coordination of the constructors. All of the images have a name completely interlaced with the Xowun’s shape. Some of these names are Dargol [flower scaffold], Bazuband [armband], Madakhel [entries], Kelidi [keys], Khoftah [asleep] and Ris [series], Band-e-Rumi [Roman Band] and Tofah [apple] (Table 13).

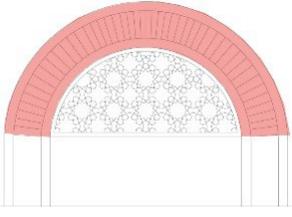
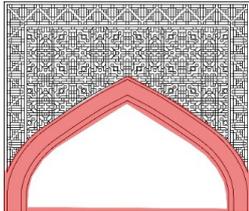
Table 13. Shading by Overhang Frames or Xowuns in Dezful City

	Image of Xowun	Exterior view of Xowun
Suzangar House in Miandarreh Neighborhood		
Suzangar House in Miandarreh Neighborhood		

Pre-roof: it is amongst the entry spaces in the traditional houses and historical textures and, besides creating a

welcoming sense, it is applied for shading and keeping safe of the rainfall (Table 14).

Table 14. Pre-roof's Shading in DezfulCity

Entry	Prerroof's image	Prerroof in façade	Prerroof in entrance cross-section
Sarmeidan Neighborhood			
Sahrabedar Maghrebi Neighborhood			

There is a significant difference between the walls with no brick decorations and the walls with brick decorations in terms of the walls' shading. Diagram (4) compares the shading amount by four samples of the brick decoration patterns (m2, m3, m4 and m5) with a higher frequency in contrast to the other patterns in the textural bodies with a wall specimen without decoration (overhang frame) using image processing software on the 1st of June. According to the results of the above comparison, the brick decorations in the walls cause an increase in the shade by 4.5 times over the surfaces³.

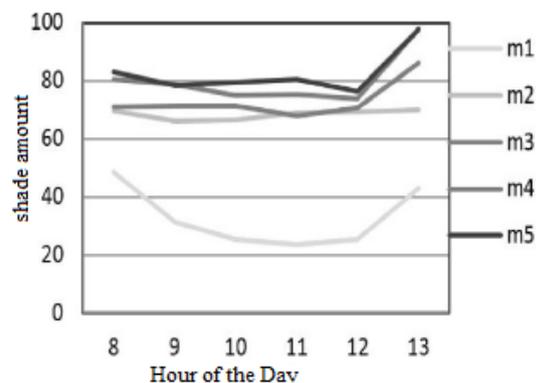


Chart 4. The Amount of Shade Created by Various Patterns on The 1st of June
(Taban, Pourjafar, Bemanian, & Heidari, 2012)

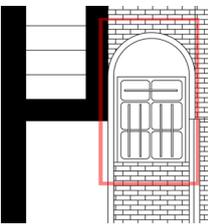
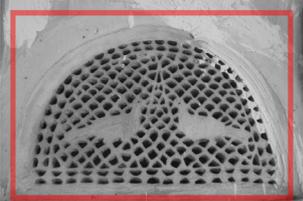
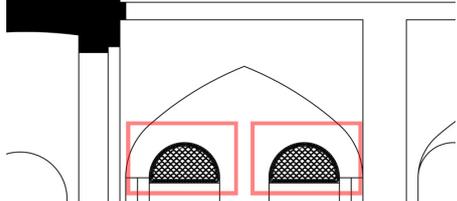
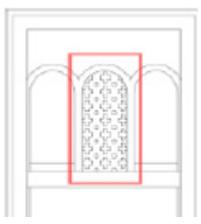
7.2.2. Accessory Elements of Architectural Shading

The use of such accessory elements as curtains, latticed windows with colorful glasses along with the construction of porches, pergolas and shades and sunblocks are amongst the solutions for controlling the depth and rate of sun's irradiation into the building during summer and winter according to the residents' needs for solar energy; it has to be stated in the meanwhile that the suitable angle of sun's irradiation during winter enables the favorable infiltration of the sunlight into the buildings.

Latticed doors and windows: windows are usually used for admitting light and air as well as the house residents' having a view without their privacy being compromised.

In regions with high sunlight intensity, the windows should be constructed and installed in proportion thereto. The latticed windows create a balance between the light outside and inside the house. This is a balance that blocks the intensive outside sunlight's entry into the house when looking from the inside and prevents the tiring of the eyes by the intensive outside light. The designs used for constructing the latticed windows are often in a form regulating the light inside the rooms. The latticed windows distribute and moderate the intensive outside light and allow all of the light to enter the house when it is not so much intensive. Glass is also occasionally used for the latticed doors and windows, as well (Table 15).

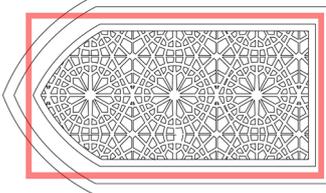
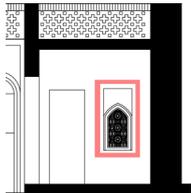
Table 15. Shading by Latticed Doors and Windows in Dezful City

	Image of the Latticed Doors and Windows	Latticed Doors and Windows' View from Outside
Ma'asumi and Shayegan Houses in Sahrabedar Maghrebi and Qal'eh Neighborhoods		
Ma'asumi House in Sahrabedar Maghrebi and Qal'eh Neighborhoods		
Zargarzadeh House in Qal'eh Neighborhood		

Windows' Strapworking: "one of the most important cooling solutions is the creation of shade and prevention of the sun's irradiation from entering into the interior spaces during summer. The effect of shades and pergolas over the windows and the natural ventilation is a lot more than the effect of the windows' orientation for the setting of a pleasant temperature inside building" (Moller, 2003). In southern, southeastern and western orientations, the horizontal shades are more effective than the vertical shades but the frame-like shades, composed of the vertical and horizontal shades, are the most effective types of the shadders in the aforesaid directions. In eastern and western orientations, as well, the use of frame-like shadders in the periphery of the window enables the creation of favorable shadow on the window. Strapworking (girihs) of the building's

windows can be considered as a sort of frame-like shadders in the form of a combination of horizontal and orthogonal elements. "In combinations of the brick facades in Dezful, some of the houses have gypsum-made plates that, meanwhile beautifying the façade, create images when passing light and air into the rooms; these plates are usually used above the doors and windows. They are built through needle-working and, after the gypsum plate was constructed, the paper map is placed on it and soft ash is poured on the paper and the plate is finally pierced based on the map using an iron chisel. The term "Gardeh Kari" [window strapworking or Garih working] means the plan and image of every work based on the same art in the Persian Language" (Naima, 1997, p. 64) (Table 16).

Table 16. Window Strapworks' Shading in Dezful

	Window Strapworking Image	Details of the Window Strapworking	Cross-Sectional View of Window Strapworking
Sahrabedar Maghrebi Neighborhood			

8. CONCLUSION

In regions with hot climate, the creation of shade is the most important solution for controlling the thermal conditions in the interior and exterior building spaces. The created shade reduces the temperature of the walls and the air layers in its periphery and causes the reduction of the temperature in the environment hence improvement of the thermal conditions in the peripheral spaces due to the creation of air currents and natural ventilation. In a general classification, the shading components can be categorized into architectural and urban shaders. In line with this, the shading elements are applied in the architectural designing of Dezful's historical texture in the form of accessory elements in the building and also as elements that are integral parts of the architecture's contextual structure. The studies are clearly indicative of the reality that, in designing of the contextual components from macro to micro levels (from physical elements of the urban texture

to the architectural decorations), attention is paid to the climatic conditions and adjustment of these conditions for all of the components as a secondary function besides to the proportion with the intended preliminary function. In order to offer an integrated model of the shading elements, a 3D model was offered for one of the historical texture areas that display these elements in two groups of architectural context's shaders (Fig. 3) and urban shaders (Fig. 4). The use of these shaders in the exterior buildings' bodies with a high cooling need causes the repelling of heat from the majority of the surfaces and reducing of energy consumption in line with the creation of climatic comfortability conditions. Besides creating favorable climatic conditions, these elements cause an improvement in the environment's visage and increase in the visual richness of the external spaces through creation of dark-light conflicts and diversity and this justifies the necessity of using them from aesthetical viewpoints.

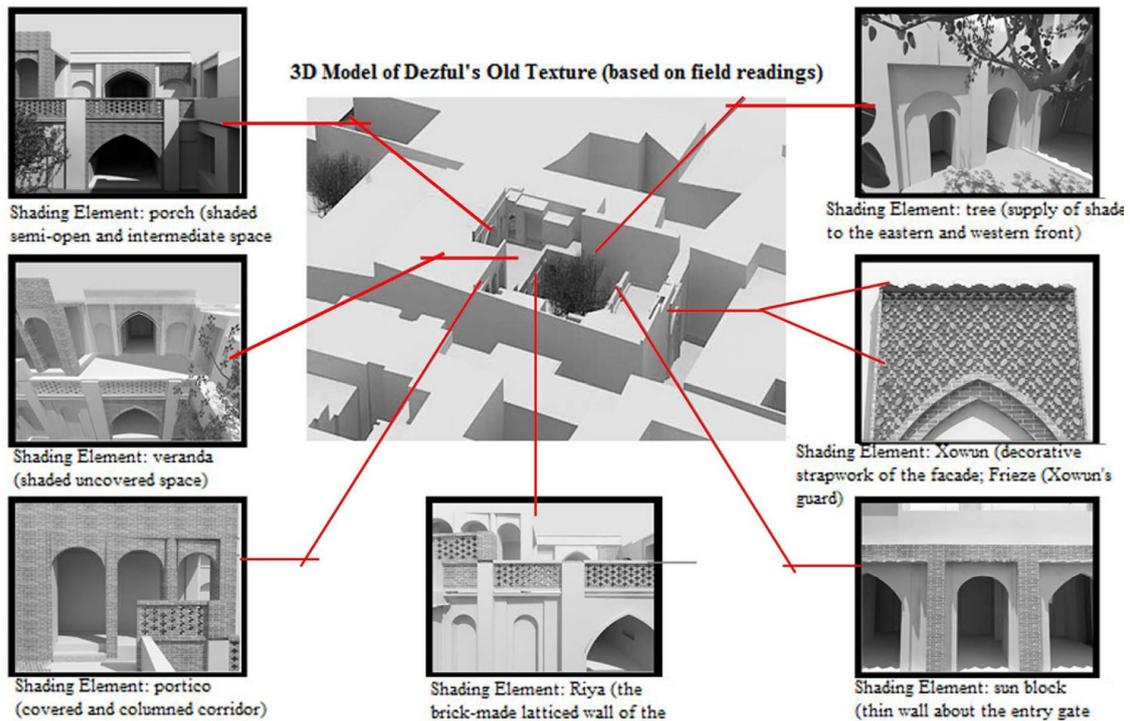


Fig. 3. Architectural Context's Shaders

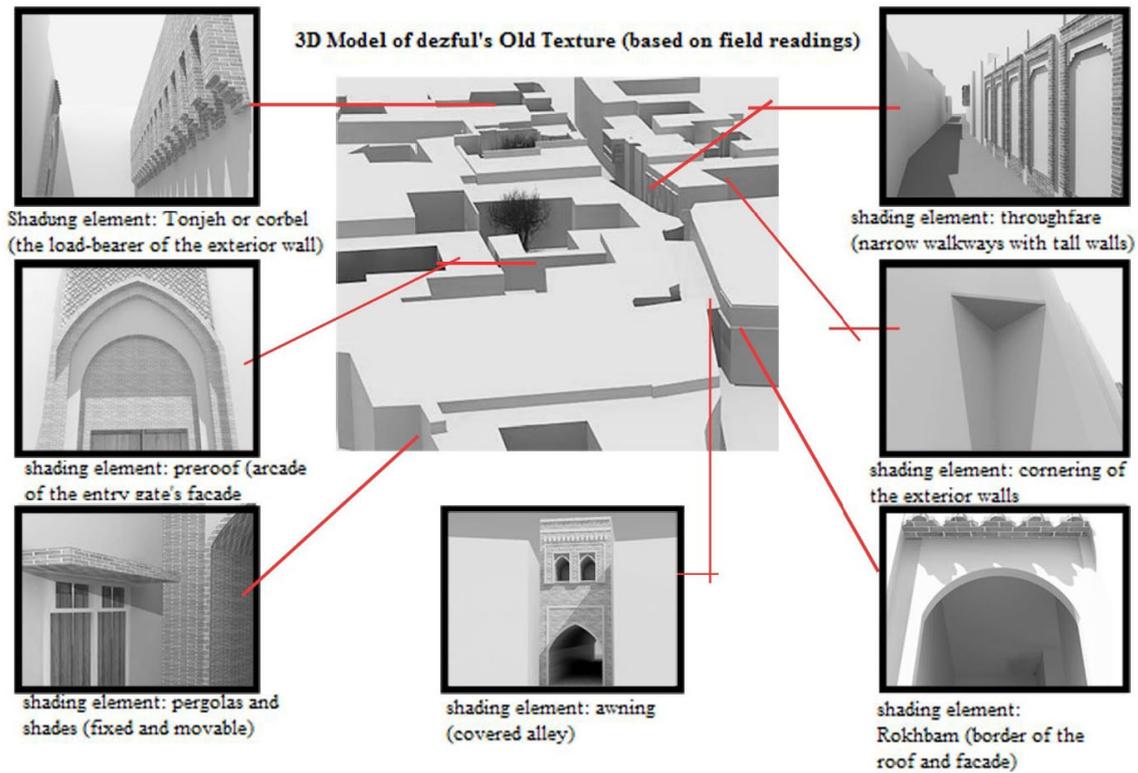


Fig. 4. Urban Wall's Shaders

ENDNOTE

1. For more study, please refer to Li D. H. W., Lam, J. C. & Wong, S. L. (2005), "Daylighting and its Effects on the Peak-Load Determination", *Energy Journal*, 30(10): 1813-1815; Reinhart, C. F. and Voss, K., (2003), "monitoring manual control of electric lighting and blinds", *lighting research and technology*, 35(3): 243; Rubin, A. I.; Collins, B. L. and Tibbott, R. L., (1978), "window blinds as a potential energy saver (a cases study)", *NBS Building Science Series*, no.112; and, O'Brien, W. Kapsis; K. Athienitis, A. and Kesik, T., (2010), "methodology for quantifying the performance implications of intelligent shade control in existing buildings in an urban context", fourth national conference of Ibpsa-USA, New York City.
2. In local terms, the bricks that are installed ahead are called "full" and the bricks that are installed aback are called "hungry".
3. For more information, please refer to the article by Mohsen Taban; Muhammad Reza Pourja'afar, Muhammad Reza Bemanian and Shahin Heidari under the title "the effect of climate on the form of architectural decorations with an emphasis on the shading amount of the brick-laid Xowuns in the historical texture of Dezful" that was published in the journal of *Naqshejahan*, 2(3).

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