

THE SHADING OF 33 AWNINGS EFFECTS EXISTING IN CLIMATE OF DEZFUL AND LEGITIMACY DUE TO CLIMATIC RELIABILITIES

Mehdi Makvandi*, Zeinab Khodabakhshi, Saadat Esfandiari Nejad,
Mehrnoush RostamiGhahvarokhi, Meysam Khodabakhshi

Department of Architecture, College of Art, Design and Architecture,
Islamic Azad University, Omidieh branch, Omidieh (IRAN)

*Corresponding author: Mt2.vivace@yahoo.com

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ABSTRACT

Dezful is a city with warm and semi-moist climate and one of the factors which shall be considered in this district is to establish areas that protect people from exposure to direct sun light, therefore an area is created which is called awning. Nowadays, it is not considered in construction of building due to that it is a specific climatic usage and in today's engineering regarding to saving energy slogans, lack of using such structures depending to individual's environmental comfort in new texture of Dezful have created questions in mind. In this article it is tried to scrutinize the legitimacy lied in them in field of climatic reliabilities by recognition of different kinds of such awnings in historical form of Dezful. The existence of dominant orientation of eastern north-western south caused the increase of shading more than one meter along passages and such permanent presence of inside the warm and humid climate of this area will help create and exacerbate Kuran and as a result it will help adjust environmental temperature through Evaporative cooling. For this purpose and by using descriptive research method based on the principles of climatic design subject and by relying on data collection with method of using internet-library to draw the attention of engineers in considering the importance of such permanently effective micro-climates in today's structures.

Keywords: Shadow, awning, climatic design, old form of Dezful

1. INTRODUCTION

Ancient city of Dezful that its central core is old form, observes different elements in its structure which are designed wisely based on its specific warm and semi-humid climate. The warmth which is dominant on this area most of a year requires a coordinated form in order to control the ideal temperature for creating comfort area for residents. Such purpose creates shadows by establishing cohesion and solidarity between components and ultimately shadings of areas like awning during summer and it intensifies whether changes and temperature difference of creating Kuran and causes cooling of inside area and also in winter it keeps warm weather of the environment (Pirnia,2013). Since the definition of awning relates to human relaxation and also it is his competency and creativity in optimized utilizing from natural resources such as sun against its most exhausting heat in order to analyze energy consumption and it is one of today's new engineering challenges, the purpose of this study is to measure all 33 awnings shadows of old form Dezful and the impacts of that specific climate of this area to reveal the usage of such kind of less regarded, highly significant structures by studying the orient of awnings and the way of their shading based upon sunlight angle.

2. METHODS AND MATERIALS

Scientific researches are divided into three fundamental, practical applied categories based on purposes (Hafeznia,58.2004).Therefore,current study is fundamental one.Also methodology of this research is descriptive-analytical on the basis of conducted field studies regarding investigated issues and existence in location of the study,the effects of 33 awning shadowing available in Dezful's old tissue has been examined.Materials of the study in this research were electronic and library documents.

3. DEFINITION OF AWNING

What is formed in minds about awning is the cover placed on tracks by the purpose of creating shadow and wind. The definition of awning in books generally follows similar framework: a part of pass-way area which is covered and it has ceiling, is called awning. Covered alleys and pass-ways that the purpose of creating them is to protect desert overheated man against sunlight and giving him an opportunity to rest under its shadow by considering correctness of mentioned definitions, in this research we are trying to review and determine the impact of using such shading on this area in form of their orientation and also determining the depth of their shadows in old urban structure of Dezful by a comprehensive attitude (Masaheb,2004)

4. NATURE OF DEZFUL AWNINGS

One of vivid features of old neighborhoods urbanization of Dezful is its covered alleys and pass-ways which are called "awning"(Moeen,2004). The purpose of designing and implementing awning is to protect overheated people under shadows against sunlight for a while. The way of placing awnings is such that a waling person in his way is locating within proper sequence of shadow. In most of awnings, entry of several houses has been collected and it is significant in terms of increasing the sense of neighborhood and local consistency. Awning is a tool against seasonal winds. Usually, the roof of

awnings are used by nearby units that in some cases it is displayed as a room overlooking the alley, in some dead-end alleys awnings are implemented which in its entry a strong door were placed. Such kind of areas are called Darband which totally is effective in increasing the security for alley's residents.

Awning is a roofed alley and pass-way which were many in old form of Dezful city. High temperature, severe sunlight made righteous people to create awnings and also they used the area above awnings for construction. Awning which is local language is called سوياط or سعياط is an alley between two walls of houses which are separated from each other that the ceiling of this alley is covered by wooden poles of tamarisk tree. On the roof of alley, there is obtained a space for building new rooms by righteous people, and the alley became an awning that the passers and the members of neighborhood came under it in order to escape from heat, wind and rain and specifically sunlight during summer. Ancients say: awning is Dezful is not only a safe corridor against heat and coldness also it is the place for dispute resolution, news interpretation and thinking (Noghrekar 1996)

5. DEFINITION OF SHADOW IN ARCHITECTURE

Shadow in architecture is one of intervening elements in design of space and creating shadow in architecture were usually a view of climate and it is one of effective factors in designing.

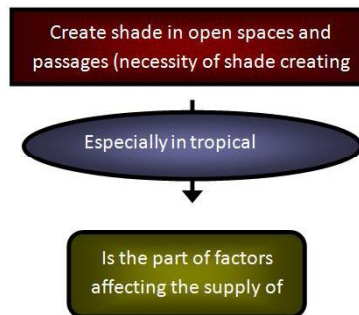


Fig. 1. Source: authors

Along with innovation of shadow-making architecture samples, regarding to climate changes of areas and change of sun position in the sky during different hours and days of year, below questions pop: 1. how can we determine shadow when it is required within a year for an intended climate? 2- How we can fulfill required shadow during these days such without being deprived from sunlight during coldness? First question: studying climate status of an area. Second question: determining required moments for shadow, third question: designing proper canopy for open spaces. Fourth question: assessing the performance of canopy for one year. The point that we can point out now is that we can save energy by creating shadows.

6. THE METHOD OF CALCULATING THE LENGTH OF THE SHADOW

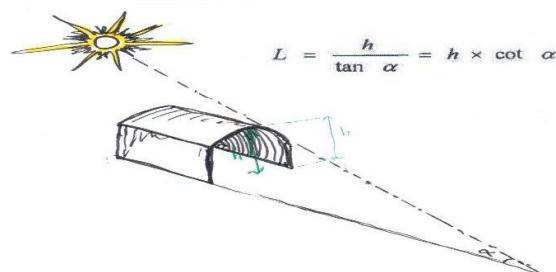


Fig. 2. Source: the authors

Length of shadow (L) will be calculated by height and angle of sun's height according to figure 3.

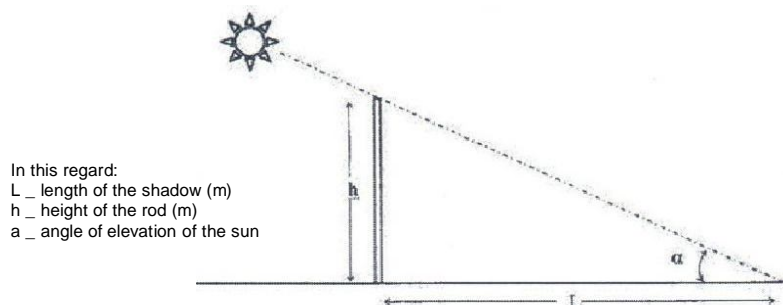
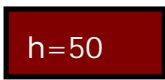


Fig. 3. Source: Qyabkaloo, Zahra. 1381

Compass angle of sun within hours of 9 am and 3 pm determines the left and right limitations of shadow pattern. Also in order to establish more simplicity of such scopes we can draw them by angle of 45 degrees to be close to compass angle of such in such period of a year. It is clear that such actual boundaries are a little different based upon different geographical latitudes. In order to simplify and speed up, instead of measuring length of shadow for all hours, we can measure it only for hours 9 am, 12 and 3 pm. It is considerable that the pattern of shadow movement before 12 and after it is symmetry, and it is enough only to measure shadow length for 9 am and 12 o'clock, since at 3 pm the length of shadow will be the same size at 9 am. The angle of sunshine in Dezful city is 50 degrees regarding to geographical latitude of area (32) and according to below formula. T – time of day, d – the angle of earth rotation (season), L – geographical latitude (intended point), h – angle of sunshine

$$= \sin(L) * \sin(d) + \cos(L) * \cos(d) * \cos(t) \quad \sin(h)$$

$$\sin(h) = \sin(32) * \sin(23.5) + \cos(32) * \cos(23.5) * \cos(45) = 0.76$$



To obtain the depth of shadow, calculation of the radiation should be considered:

$$\sin(z) = \sin(L) * \cos(d) / \cos(h) \quad \sin(z) = 1$$

$$t=45 \quad d=23.5 \quad h=50 \quad z=90$$

For obtaining measured times which here they are considered 9, 12 and 15, we use below formula in order to obtain unknown of time in current formulas (Ghobadian, 2008).

$$t = |12 - T| * 15 \quad T = 45t \quad 12 = \text{official time} \quad T = \text{Desired time}$$

15= Distance between two orbits of Earth's surface

Regarding to the measurements, determination of the orientation and angle of sun shine, regarding to above measurements, now we can clarify the depth of shadow of all available awnings in old Dezful (they are totally 33 awnings) regarding to measurements (amounts: length, width, height). In this research, first we have identified 33 awnings of old Dezful and we have clarified their orientations indicated in table 1. The things which is significant in this table, is the dominant orientation of 19 awnings to east north – west so

	Awning names	Awning direction	Length	Width	Height	Positioning angle relative to the axis
1	Moghadmian Awning	Northwest-southeast	26.54	Larger aperture 5.31 smaller aperture 4.67	Height of Larger aperture 4.50 Height of smaller aperture 2.60	76 degree
2	Awning behind Mahdavi	Northeast-southwest	9.54	Larger aperture 2.53 smaller aperture 2.26	Height of both apertures is 2.60	155 degree
3	Seilani Awning (Paakaarzadeh)	Northwest-southeast	14.63	Larger aperture 4.96 smaller aperture 3.16	Height of both apertures is 3.60	52 degree
4	Halvaei Awning	Northwest-southeast	13.10	Larger aperture 4.41 smaller aperture 3.32	Height of Larger aperture 3.10 Height of smaller aperture 2.80	42 degree

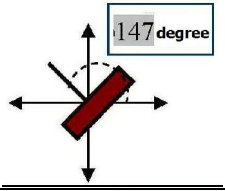
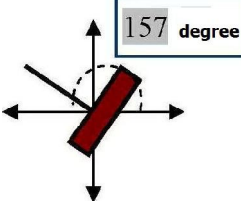
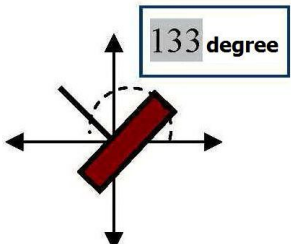
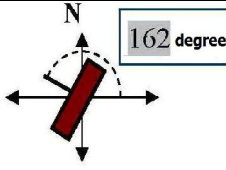
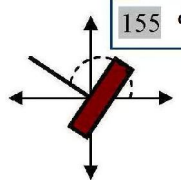
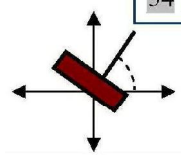
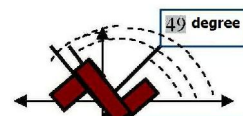
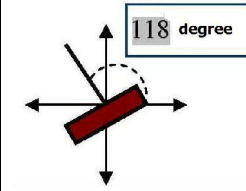
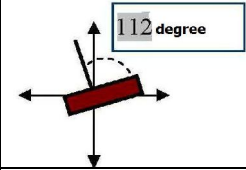
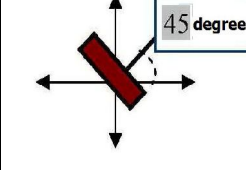
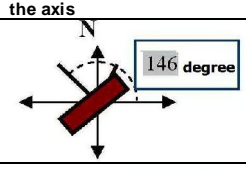
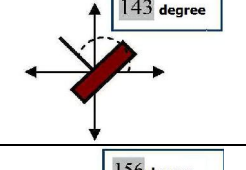
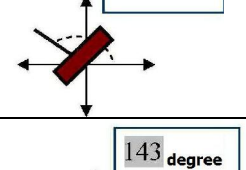
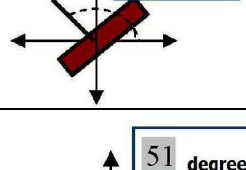
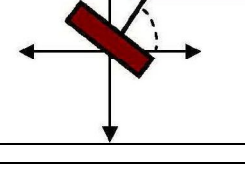
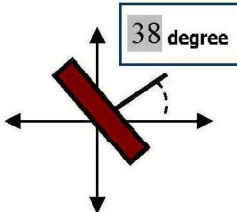
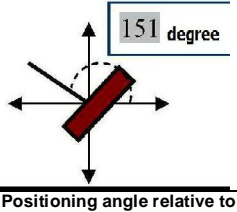
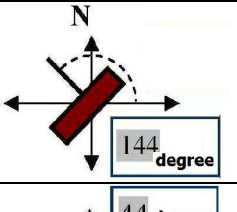
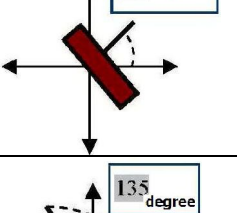
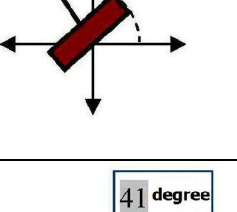
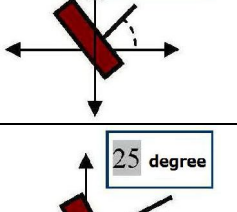
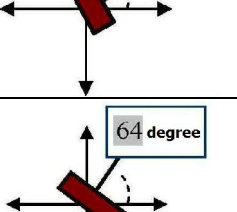
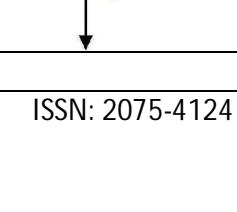
5	Kish Awning(Moosa Ebrahim)	Northeast-southwest	17.90	Larger aperture3.64	Height of Larger aperture1.85	
				smaller aperture3.27	Height of smaller aperture1.55	
6	Zarshenas Awning	Northeast-southwest	17.35	Larger aperture3.42	Height of both apertures is 2.55	
				Smaller aperture2.80		
7	Sabion Saraab Awning	Northeast-southwest	19.33	Larger aperture3.56	Height of Larger aperture2.90	
				Smaller aperture1.60	Height of smaller aperture2	

Table 1. Direction of 33 Awning existed in Dezful old tissue

	Awning names	Awning direction	Length	Width	Height	Positioning angle relative to the axis
8	Shekaripour Mirab Awning	Northeast-southwest	11.14	Larger aperture3.01	Height of Larger aperture3.30	
				smaller aperture2.29	Height of smaller aperture2.77	
9	Mashnabi Ghaghari Shideh Awning	Northwest-southeast	6.16	Larger aperture2.56	Height of both apertures is 2.60	
				smaller aperture2.46		
10	Aboutorabi Awning	Northwest-southeast	12.57	Larger aperture2.15	Height of both apertures is 2.90	
				smaller aperture1.62		
11	Zarnegar Awning	Northeast-southwest And Northwest=southeast	12.83 13.52 9.93 36.28	first aperture2.23	Height of first aperture2.40	

				second aperture1.17 third aperture 1.01	Height of second aperture2.37 Height of third aperture2.03	
12	Saakia Awning	Northeast-southwest	17.41	Larger aperture4.19	Height of Larger aperture3.80	
				smaller aperture2.14	Height of smaller aperture3.79	
13	Bigdeli Awning	Northeast-southwest	19.91	Larger aperture4.56	Height of both apertures is 3.20	
				Smaller aperture4.38		
14	Siahpoush esmaeili Awning	Northwest-southeast	15.28	Larger aperture6.31	Height of both apertures is 5.50	
				Smaller aperture3.61		

	Awning names	Awning direction	Length	Width	Height	Positioning angle relative to the axis
15	Zaran Awning	Northeast-southwest	14.50	Larger aperture5.01	Height of Larger aperture2.50	
				smaller aperture2.13	Height of smaller aperture2.20	
16	Masoumi Awning	Northeast-southwest	12.54	Larger aperture3.69	Height of both apertures is 3.26	
				smaller aperture2.27		
17	Marghabnar Awning	Northeast-southwest	9.87	Larger aperture1.87	Height of both apertures is 2.71	
				smaller aperture1.86		
18	Laami Awning	Northeast-southwest	16.81	larger aperture3.54	Height of larger aperture3.35	
				Smaller aperture02.23	Height of smaller aperture2.34	
19	Nahid Awning	Northwest-southeast	19.48	Larger aperture5,24	Height of Larger aperture3.78	
				smaller aperture4,61	Height of smaller aperture3.77	

20	Baghelion Awning	Northwest-southeast	10.87	Larger aperture4.33	Height of Larger aperture2.92 Height of smaller aperture2.35	
				Smaller aperture3.67		
21	Karvan Awning	Northeast-southwest	23.49	Larger aperture4.51	Height of Larger aperture3.00 Height of smaller aperture2.64	
				Smaller aperture4.17		
	Awning names	Awning direction	Length	Width	Height	Positioning angle relative to the axis
22	Salim rismanbaf Awning	Northeast-southwest	24.50	Larger aperture3.23	Height of Larger aperture2.85 Height of smaller aperture2.75	
				smaller aperture2.81		
23	Ghafoorian Awning	Northwest-southeast	21.52	Larger aperture5.21	Height of Larger aperture3.85 Height of smaller aperture3.40	
				smaller aperture3.57		
24	Malekasaa Awning	Northeast-southwest	15.71	Larger aperture4.94	Height of both apertures is 3.50	
				smaller aperture3.53		
25	Majdi Awning	Northwest-southeast	14.80	larger aperture4.54	Height of larger aperture3.30 Height of smaller aperture3.29	
				Smaller aperture 2.07		
26	Raaji Awning	Northwest-southeast	10.92	Larger aperture2.67	Height of Larger aperture3.03 Height of smaller aperture3.29	
				smaller aperture2.06		
27	Ahangaran Awning(Bazaaghadim)	Northwest-southeast	4.96	Larger aperture3.00	Height of Larger aperture3.00 Height of smaller aperture2.70	
				Smaller aperture2.70		

28	Bangeshton Awning	Northwest-southeast	14.78	Larger aperture3.29	Height of Larger aperture5.30	
				Smaller aperture3.10	Height of smaller aperture5.29	
	Awning names	Awning direction	Length	Width	Height	Positioning angle relative to the axis
29	Pirnazar Awning	Northwest-southeast	11.85	Larger aperture4.12	Height of Larger aperture2.44	
				smaller aperture4.08	Height of smaller aperture2.43	
30	Ahmadi Awning(sedar)	Northeast-southwest And South East West -North	28.87	First aperture4.05	Height of Larger aperture3.40	
			16.94	second aperture3.73	Height of smaller aperture2.90	
			45.81	third aperture 3.22		
31	Mostofi Awning	Northeast-southwest	12.57	Larger aperture4.14	Height of both apertures is 3.30	
				smaller aperture3.89		
32	Mirzakion Awning	Northwest-southeast	13.68	larger aperture4.63	Height of Larger aperture2.50	
				Smaller aperture 3.51	Height of smaller aperture2.20	
33	Banei nejad Awning	Northwest-southeast	10.70	Larger aperture3.97	Height of both apertures is 3.10	
				smaller aperture3.20		

Continue Table 1. Direction of 33 Awning existed in Dezful old tissue (Source: the authors)

7. CONCLUSION

The things which is indicated from previous studies is that totally there are 35 awning arms in old Dezful that two of them are the combination of four arms. 15 awnings are orienting western north – eastern south, 1 awning is western north – eastern and 19 awnings are orienting eastern north – western south. In these studies also 10 awnings were ended to house which are no more considered as pass-ways.

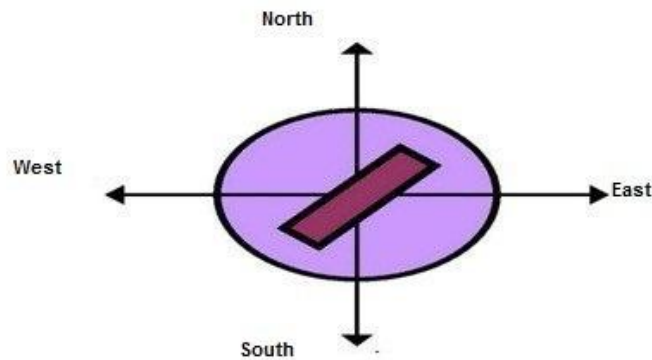


Fig. 4. (Source: the authors)

The findings which are obtained by statistical studies of awnings' orientations in old Dezful (such orientation is measured regarding to eastern-western axis) indicate that most of awnings in this texture, regarding to hypothetical eastern-western axis, are having an average between 135-150 and in another significant part, there are awnings with 45-60 degrees of angle (Diagram 1).

Dominant degree of Awnings toward the east-west axis in of Dezful's old tissue																			
0-15	15-30		30-45		45-60		60-75		75-90		90-105	105-120	120-135	135-150	150-165	165-180			
	25 Degree	N 26	42 D	N 4	45 D	N 14	64 D	N 27	76 D	N 1		118 D	N 12	133 D	N 7	147 D	N 5	155 D	N 5
			38 D	N 20	52 D	N 3	73 D	N 27	84 D	N 9		112 D	N 13	B=145 D	N 11	157 D	N 6		
			44 D	2 23	54 D	N 10					112 Degree	N 33	C=42	N 11	162 D	N 8			
			41 D	N 25	A=49 D	N 11							146 D	N 15	156 D	N 17			
					51 D	N 19							143 D	N 16	151 D	N 21			
					58 D	N 29							143 D	N 18	150 D	N 32			
					56 Degree	Awning No. 30							144 D	Awning No. 22					
													135 D	N 24					
													A=149 D	N 30					
													140 D	Awning No. 3					

Diagram 1. (Source: the authors)



Most of Awning in tissue have mean between 135-150 With respect to the imaginary East- west axis

8. LENGTH OF EXISTING AWNINGS

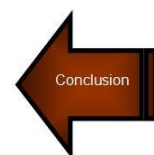
Regarding to statistics resulted from studies, the dominant arm in such texture had length of 12-14 meters and such length was having most variable of 9 to 20 meters. We can see such status in table 3 clearly. In this series of Zarnegar awning (awning no. 11) was formed by three arms which its first arm was 9.93, the second one 12.83 meters and the third arm was 13.52, and totally they covered 36.28 meters. Ahmadi awning or third awning in (Awning no. 30) is formed from two arms with three entries (with three different width: first 3.73, second 3.23 and third 4.05) and these two arms are totally covering 45 meters.

9. MEASUREMENT AND CALCULATION LENGTH OF THE AWNING EXISTED IN DEZFUL'S OLD TISSUE

Length of available Awnings in Dezful's old tissues																							
0-9m		9-10m		10-12m		12-14m		14-16		16-18m		18-20m		20-22m		22-24m		24-27m		26-27m		27-29m	
4.96	N 27	9.54	N 2	11.14	N 8	13.10	N 4	14.63	N 3	17.90	N 6	19.33	N 7	21.52	N 23	23.49	N 21	26.50	N 22	26.54	N 1	28.87	N 30
6.16	N 9	9.93	N 11	10.85	N 20	12.57	N 10	14.50	N 15	17.35	N 6	19.91	N 13										
		9.87	N 11	10.92	N 26	12.83	N 11	15.71	N 24	17.41	N 12	19.48	N 19										
				10.70	N 33	13.52	N 11	14.80	N 25	16.81	N 18												

Diagram 2. (Source:authors)

As can be seen in the above table, the longitudinal dominant arm is about 14-12 meters.



10. MEASUREMENT AND CALCULATION HEIGHT OF THE AWNING EXISTED IN DEZFUL'S OLD TISSUE

The calculated depth of shadow of 33Awning in Dezful's old tissue																					
2.5-3		3-3.5		3.5-4		4-4.5		4.5-5		5-5.5		5.5-6		6-6.5		6.5-7		7-8		8-9	
Koh	h 12	Amoochin	h 11	zomnagar	h 6	zomnagar	h 6	H 6	H 9	H 9	H 9	Shodroge ar	H 10	Gafkourt an	H 10	Meejindk mean	H 4	Bang shir h	35	Speelies (meh)	25
	2.60	KSHI	3.11	zomnagar	3.99	Poshtim hidaki	3.07	2	4.71	4.66	4.88	Gafkourt an	H 8	Shankh an	6.06		7.20		8.93	9.26	
			h 12	Baghlio om	3.56	Pinevor	4.11	3	4.66	4.88	H 11	Monofi	ZI	Gafkourt an	6.42						
				Zaen ken	3.70	Maghleh mah	4.30	H 4	4.56	4.56	7	Ahmad	H 22	Nahid	6.37						
				Mizali ken	2.60	Zahie mab	4.31	13	4.50	4.50	H 5	Lami	ZI	Shahla n	6.40						
						Kaen	4.44	H 16	4.63	4.63	H 5	Mokic mahfi	26								
						Zaen	4.21	H 19	4.88	4.88	14	Bagdali	31								
						Mizeh ilian	4.21	H 27	4.92	4.92	H 15										
						Shi ed	4.21	H 33	4.88	4.88	H 22										
									4.55	4.55	H 26										

Diagram 3. (Source: authors)

Height that has been taken from field data has been used further and it is About 2.5 to 3 meter.

Regarding to previous studies about the length of awnings (length, width, height), their orientation and dominant degree of them regarding to hypothetical axis and also measuring the orientation of radiation and angle of radiation, regarding to such inventories rather than measuring depth of 33 awnings' shadows regarding to the formula of depth of the shadow which is pointed out below we can measure them.

The formula for calculating the depth of shadow (Kasmaei, page 53)

$$h=D*\tan B/\cos(Z+N)$$

D: the depth of Awning in meters (the height)

TanB = angle of radiation

Z= direction of sunrise =N

The angle between line perpendicular to the window and true south

Based on above formula, the measurement of 33 awnings of old Dezful has been done and it is indicated in table 5. Regarding to measuring all existing awnings, it means 33 awnings of old Dezful, the things which is obtained from most of them is that the depth of shadow is between 4.5 to 5 meters that by more statistical concentration we can consider it variable between 4 to 5 meters.

Diagram 4. Depth of calculated shadow of 33 Awning in Dezful's old tissue

(Source: authors)

Modeling by Sketch Up program and conclusion

In this study, first different types of awnings in historical formation of Dezful are introduced and then their principles about climatic reliabilities were studied. At the end, it is tried to measure the length of shadows by using Sketch Up program and by considering some of parameters like the geographical latitude of the intended zone and also intended hours and months. Regarding to such characteristic in modeling which is obtained through Sketch Up program, from some of awnings which are having more statistical majority in comparison with other awnings (in accordance with available statistics in this study). It is obtained such that the dominant orientation of eastern north – western south caused one meter increase of shading along with pass-ways and created shadow depth of 4.5-5 meters that such permanent presence of shadow in warm and semi-humid climate of this district will end to intensification of Kuran and as a result to balance environmental temperature through evaporative cooling. At the end, it is necessary to appreciate support of Azad University, Omidieh unit and specifically its architecture department for preparing this study.

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