Relationship between the Spatial Depth and Window Opening Amasya, Hatuniye District Rahduvanlar and Seven-Kazak Mansion Sample

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ABSTRACT
The main purpose of the study is to reveal whether or not the environmental factors which are important parameters in design were addressed in the traditional houses of Amasya by assessing the relationship between the spatial depth and window opening according to the CIE (S011/E) standard in terms of natural lightning.

In the first section of the study, brief information was given about the content of the study by summarizing the information of factors and user needs that affect housing design. Then, information was given about the study area under the title of Material and Method. Natural lightning in the Traditional Houses of Amasya was discussed. The relationship between the spatial depth and window opening of Traditional Houses of Amasya which the main theme of the study was assessed in terms of environmental factors.

In the Findings and Evaluation section, findings on the parameters that affect the spatial depth and window opening of 2 preserved houses of which one of them has street facade and the other have river facade, among the 154 registered houses in Amasya, Hatuniye District was revealed. The compliance of the natural lightning of houses according to the environmental factors to the CIE (S011/E) standard was determined by analyzing the data in the SPSS IBM Windows program.

In the Conclusion and Suggestions section, the design parameters that were observed in the study area were revealed and instructive suggestions were made for the housing designs that would be built at the present times within the framework of CIE (S011/E) standard.

Keywords: Factors affecting design, Spatial depth, Window surface opening, CIE (S011/E) standard

1. INTRODUCTION

Architectural space is a limited space where many functions are realized (Cimcoz, 2001). It is necessary to understand the user needs well to realize these functions. Understanding user needs is to know the behaviors of the people who will use the space and the reasons for these behaviors, which is possible to realize by presenting the relation manifested between people and their behaviors. The main purpose of human behavior is to satisfy essential requirements. In architecture, user needs comprise such actions as resting, eating, working and sleeping. User needs indicate a requirement and

an obligation. These requirements include users' comfort in terms of physiological, psychological and social aspects and all possible facilities and environmental conditions that will ensure their productivity while living. That is, user needs are indispensable conditions that the environment should offer for users to perform certain actions.

Determining the role of user needs in the design process is important in terms of evaluating the adequacy of the structure during the design and use phase. When the relationship between user needs and design is not properly established, the design will contradict the intended use. The accuracy rate of this relationship is higher for older structures than in today's structures (Şener, 2014). This compatibility is the result of the user needs and environmental conditions of the period when these structures were constructed.

Comfort is defined as the body of conditions with which a person is psychologically satisfied while spending minimum energy to adapt to the environment (Sezer, 2004). Comfort conditions in a space can be stated as climatic, auditory and visual conditions and they play an important role in sustaining physiologically and psychologically comfortable and healthy life.People feel physiologically and psychologically dissatisfied and disturbed when they are not comfortable in a building. However, physiological needs should be provided in order to provide psychological and social needs. These physiological requirements are related to spatial, thermal, visual, health and safety conditions. Visual comfort is an important parameter of the physiological requirements. Levels of lightning may differ for spaces that meet different functions within the structure, and visual comfort suitable to the function becomes important for this reason. Lighting helps people to see the details of their work as well as their working and living environment. Visual comfort is realized through natural and artificial lighting systems. If the intensity of light is low, it becomes difficult to see. The ideal lighting, that is, natural light is daylight. Daylight should be used sufficiently. However, it is not always possible. In this case, artificial light sources that will provide sufficient lighting are used depending on the nature of the work.

The sun, which is the most important source of natural lighting, has gained importance as a renewable energy source in today's design approaches in architecture. Since the beginning of design, the sun has been used as an important input factor in terms of natural lighting. Natural lighting is the process of providing the space with sufficient and required lighting with daylight in order to realize visual comfort conditions (Edwards et al., 2002).

2. OBJECTIVES AND IMPORTANCE OF THE STUDY

Natural lighting with daylight contributes to lighting even when the sun is not observed with the naked eye during the day. This means that artificial lighting is not needed for an average of 6-10 hours per day. Natural lighting is, therefore, important in terms of reducing artificial lighting use by making the most effective use of daylight. However, this is not sufficiently taken into account in today's design approach despite the fact that the traditional Anatolian structural architecture has many examples of natural lighting use. Amasya Traditional Houses is an important example of this, in that, they were planned and directed by taking natural lighting into account although they were constructed much earlier in comparison to today's technological conditions.

Certain lighting levels were determined in the studies conducted on lighting. These levels of lighting were evaluated as natural and artificial respectively. In general, natural lighting tends to be inadequate in designs not created with environmental factors in mind today. Daylight, however, creates dynamic spaces that support human health and performance as well as reducing the structure's energy requirement. Hence, the electrical energy consumption is reduced as artificial systems are used for shorter periods. It is known that visual comfort was taken into account using natural lighting in early periods although the technology was not advanced as it is today.

Amasya Traditional Houses, which date back to the 1900s, are also cultural heritage in this sense. As a result of the observations on the use of natural lighting, it can be seen that environmental factors were effective in creating facade opening design in Amasya Traditional Houses. Environmental factors can be categorized as natural-artificial factors and user-dependent factors. These factors that also affect the facade design of structures have raised the question of whether there is a relationship between window openings, depth, and direction of space. Therefore, this study focuses on Amasya Traditional Houses, which have been not been researched to this day. The aim of this study is to determine the relationship between facade and window openings in Amasya Traditional Houses in terms of natural lighting, as well as establishing the relationship between spatial depth and window surface area.

In addition, the relationship between window openings and spatial depth was compared with universal standards based on the findings with the aim of determining the similarities. This study is significant because it is the first dissertation study to draw attention to daylight use and daylight as a renewable energy source on this cultural heritage while the determined results can also be used for new structures. In this context, environmental factors that affect the design and user needs were first discussed. Then, visual comfort, natural lighting, factors that affect natural lighting, natural lighting in houses, standards, and regulations related to natural lighting and factors that affect natural lighting in Amasya Traditional Houses were evaluated.

3. MATERIAL AND METHOD

The traditional housing texture of Amasya with unspoiled architectural features is the main element that determines the character of the city. The traditional housing texture contains a great deal of historical information about the late Ottoman period. The relationship between the spatial depth and window opening of traditional houses in Amasya Hatuniye District was examined in the study.

3.1. Material

Mountains and deep valleys that split the mountains stand out in the general appearance of Amasya and its surroundings. There are plains and narrow passes along the reach of Yeşilırmak Valley which expands through the soils of Amasya. Amasya is located in the east and west banks of Yeşilırmak River. Since the settlement area between the castle ruins, king tombs, and Yeşilırmak River is narrow in the north bank of Yeşilırmak, the settlement demonstrates a narrow shape (Figure 1).

Figure 1. The Location of Study Area, Hatuniye District (GoogleEarth, 2018).

The settlement textures of site areas which were determined by the resolution of the General Directorate of Ancient Arts and Monuments and located in Hatuniye, Helkis, Hacı İlyas, Gümüşlü, Sofular, Mehmet Paşa, Pirinççi, Bayezid Paşa, Şamlar, and YakupPaşa districts are invaluable city elements which date back to late Ottoman period. Hatuniye

District, in particular, which is among these areas, was chosen as study area and located on the bank of Yeşilırmak constitute an urban focus. Furthermore, the houses in Hatuniye District which are located on the bank of Yeşilırmak and mountain foot have natural scenery.

The city landscape of Yalıboyu area differs when compared to others in terms of aesthetic value. Since these houses preserve their architectural form and construct although they were turned into cafeterias, hotels, and restaurants, they draw international attention with these features and privileged location.

There are 195 houses in Hatuniye District which preserve their historical and traditional texture. 154 of them were registered. Among the registered houses, Rahduvanlar Mansion which has river facade and Seven-Kazak Mansion which has street facade were examined within the context of the study (Figure 2).

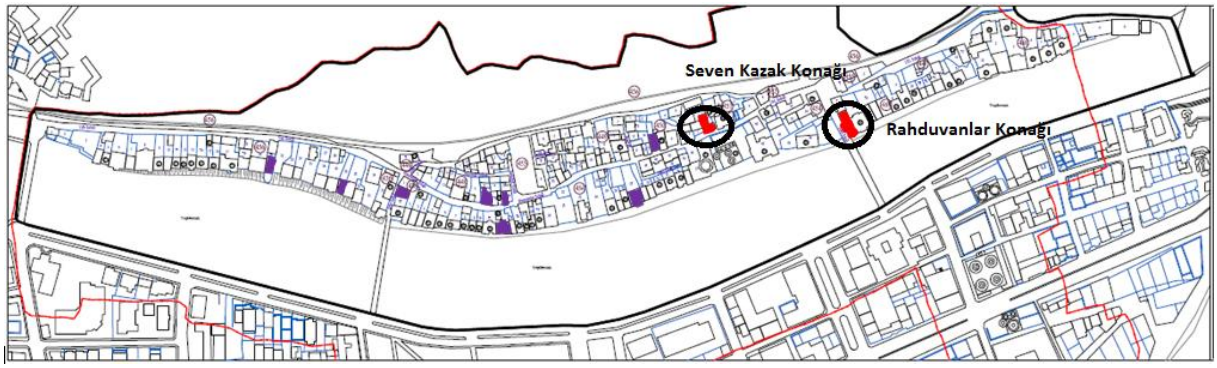


Figure 2. The Location of Sample Study Area Seven-Kazak and Rahduvanlar Mansion in Hatuniye District (Erbaş, 2018)

These samples were used as houses in the past, however, they were turned into hotel and cafe-restaurant. However, rooms, anterooms, guest rooms and kitchens in the original spatial pattern are still preserved.

3.2. Method

A thorough literature survey was conducted, previous studies and documents about the traditional houses in Anatolia were examined. In the literature survey, information was gathered about the relationship of design with environmental factors, the concept of house and natural lightning, the relationship between the spatial depth and window surface area was determined in accordance with the CIE (S011/) standard and the relationship between the window surface in traditional houses and room depth was examined.

In the second section, information was given about the Traditional Houses of Amasya which were chosen as the study area. The topographic structure, geographical condition, climatic data and the user profile of the area were mentioned. Within this context, the relationships between the user needs, environmental factors, comfort, and visual association were evaluated and presented as subheadings. Lastly, Rahduvanlar Mansion which has river facade and Seven-Kazak Mansion which has street facade were chosen for the fieldwork. The floor plans were drawn by taking the measurements on 01.06.2018. It was paid attention to choose 2 samples of which preserve their spatial construct and still used as houses. In the projects, dimensions of spatial depths and window openings were separated for the purpose of evaluating. The spatial depth-window opening relationship was examined according to the original function of the space.

In the CIE (S011/E) standard, certain standard values were introduced in accordance with the functions of the spaces. Spaces designed within these values are the samples in which natural lightning can be provided the best. Thus, certain comparisons were made in the spaces. One of them is window opening.

The main purpose of the study is to examine the compliance of the relationship between the spatial depth and window opening to the contemporary CIE (S011/E) standard. Therefore, initially, a function analysis was conducted on the houses in the study area. In this analysis, separate tables were created for each house by determining the topographic structure of the area, urban design, direction of the houses, room depths of the place and the rate of window openings. Furthermore, tables were formed by colorizing the compliance of window openings of spaces in the floors of chosen houses to the natural lightning according to the CIE (S011/E).

In the examination of the natural lightning of the houses, the closeness of the window opening and spatial depth rate to the values of CIE (S011/E) standard depending on the functional characteristics of the space was tried to be determined. IBM SPSS Windows 24 program was used in data analysis in order to perform this comparison. The purpose of choosing this program is to obtain number and percentage values by testing the relationships between the categorical variables with Chi-square test in order to make quantitative comparison between the samples. According to the results obtained from the Chi-square test, it would be possible to determine whether or not there is a significant relationship between the variables if $p<0.05$ or $p>0.05$.
In the study;

- Room depth-window opening
- Window openings of spaces on different floors
- Window openings of spaces which differ in terms of function
- The topography where the structures are located and window openings of spaces which differ in terms of landscape
- Window openings of spaces which differ according to their location in the zoning status of the structure (attached form-detached form) relationships which are affective in natural lightning were evaluated with Chi-square test.

The findings were compared in accordance with the CIE (S011/E) standard.

3.2.1. Analysis of Study Area Hatuniye District

Hatuniye District is one of the site areas which were determined by the General Directorate of Ancient Arts and Monuments. It has importance with its privileged location which is on the bank of Yeşilırmak River and constitutes an urban focus and its traditional houses, urban landscape, and aesthetic value.

- *The Location and Topography of Hatuniye District*

Hatuniye District which is located in the existent site area in Amasya province is bordered with Kurşunlu District in west and Helkis District in the east, Rock-tombs of Pontic Kings, Maidens' Palace and railroad in north. It is the area where Yeşilırmak River which separates the city in half is on the north, Meydan Bridge on the west and Hükümet Bridge on the east (Figure 3).

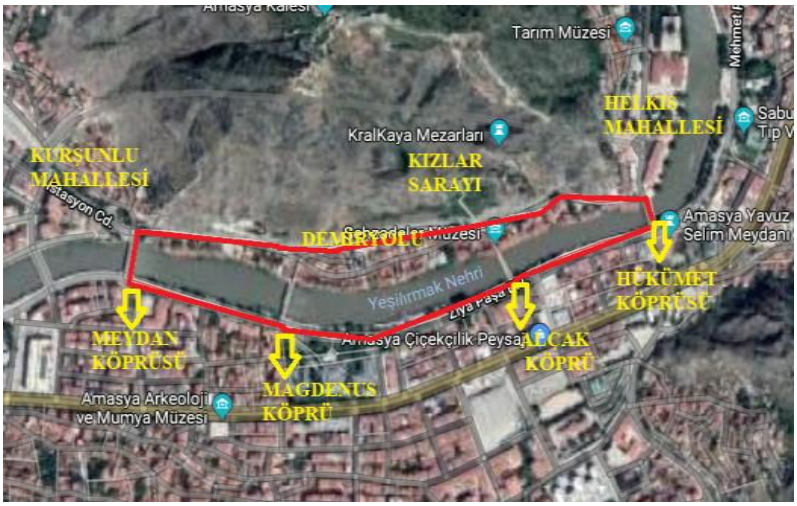


Figure 3. The Location of the Study Area (GoogleEarth, 2018)

In the areas where inhabiting is intense, the slope varies between 5-15% in the east-west direction. Within the area, the slope increases from the river to the north. In the streets which extend along east to west, the slope is 5% in east to west direction in TevfikHafız Street and Hazeranlar Street and 15% in east to west direction in Yalı Street (Yetman, 1981).

The slope reaches 30-40% in the steep rocky area of Yalıboyu. Steep slopes which can be observed in different areas and of which the slope varies between 30-40% prevents the district to develop towards this direction. These areas are used as recreational areas which can be easily accessible by the citizens. The areas which have suitable topographic structure towards development are quite limited (Haleplioğlu, 1988). Thus, as it is in Amasya province, settlements in Hatuniye District are mainly on the east-west direction where the slope is lower (Figure 4).

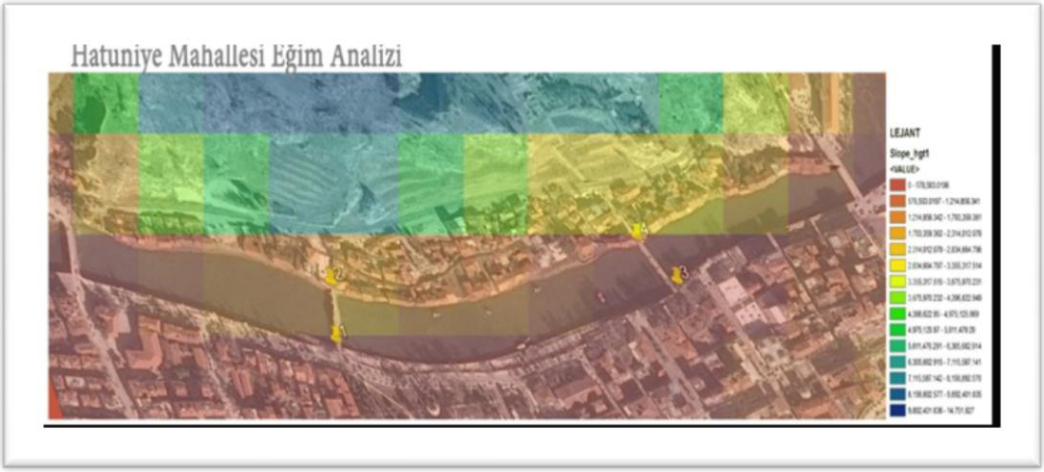


Figure 4. Slope analysis of the study area

• *Transportation and Land Use of Hatuniye District*
There are 4 different transportation axes in the first degreeto Hatuniye District as Hükümet Bridge, Alçak Bridge, Mağdenus Bridge, and Meydan Bridge which connect the old and new settlement in the east-west direction and the ZiyaPaşa Avenue which is on the southern bank of Yeşilırmak River to the northern bank. Mağdenus Bridge which provides this connection is a pedestrian-only bridge. The other bridges have sufficient wideness for both pedestrian and vehicle use (Figure 5).

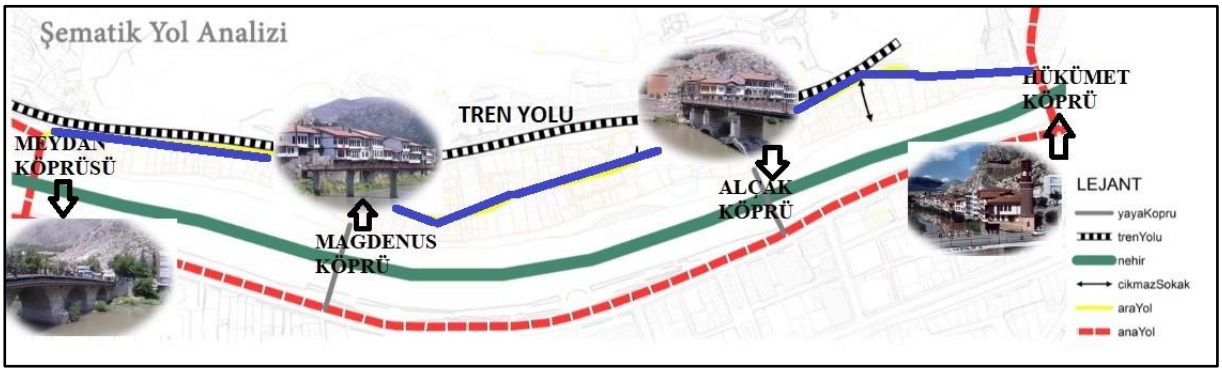


Figure 5. Transportation Axes to Study Area (Erbaş, 2018)

The common use of land in Hatuniye District is housing. The used buildings are; structures in which religious and commercial buildings, structures in which housing and commercial units exist together, ruins, fountains, hotels-hostels, museums, workshops, cafeteria-restaurant, and foundation-profession chambers.

Cafeterias and restaurants which are used commercially are located in Yalıboyu region where there is a landscape. Other land uses are green areas, playgrounds, blank undefined areas, parcels of demolished buildings, roads and squares. Houses in Hatuniye District are located along the southern bank of Yeşilırmak, on historical fortification wall, attached to each other and in compliance with the topography and street (Figure 6).

Figure 6. The silhouette of houses on the southern bank of Hatuniye District (Erbaş, 2018).

Plan Schemes of Houses in Hatuniye District

Architectural analysis study was conducted in order to determine the settlement and location orders, authentic architectural characteristics, alterations, structural and comfort conditions of the traditional houses of Hatuniye District.

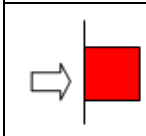
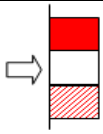
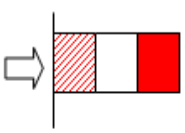
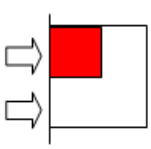
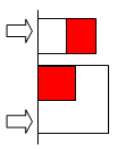
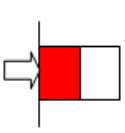
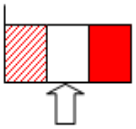
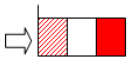
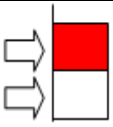
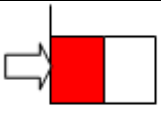
When the development of Amasya Houses is scrutinized, the traces of housing culture that Turks developed after they arrived at Anatolia can be observed (Yetman, 1981).

The concentration of traditional housing texture in the northern and southern slopes of Yeşilırmak valley caused certain difficulties in the compliance of housing-topography. Accurate solutions were developed to these difficulties in Hatuniye District which are caused by settling in the slope phenomena which can be seen in almost every Ottoman city. In addition to these solutions, housing with minimum intervention to the area was obtained by following the trend line for yard walls and houses. Amasya houses are generally built adjacent and attached and each house possesses a yard (Figure 7) (Türkoğlu, 2006).

Figure 7. House-topography compliance in the study area (Erbaş, 2018)

Entrances in Amasya housing typology differ according to having an anteroom and being in two parts (for women and men to sit separately) in terms of the plan design of the structure within the context of location, size, and settlement with slope, sociological structure, and cultural inputs. In this context, house types are as follows (Table 1).

Table 1. The house types of traditional houses in the study area (Erbaş, 2018)

Yardless Houses	Courtyard Houses				
	Houses Possessing A Room Reserved For Men		Houses Not Possessing A Room Reserved For Men		
Entrance to House from the Street	Entrance to House from the Yard	Entrance to House from the Room Reserved for Men	Entrance to House from the Street or Yard	Entrance to House from the Yard	Entrance to House from the Street
Structures in the Middle of Square					
					
Structures on the Margin of Square					
					
					

The houses usually have three floors as basement+ ground+ 1. However, there are one-story houses as well. When the distribution of numeric data on the number of floors are examined, 19% of the houses in Hatuniye District are one-story, 87% of them are two-stories, 8% of them are three-stories and 3% of them have three or more stories (Figure 8).

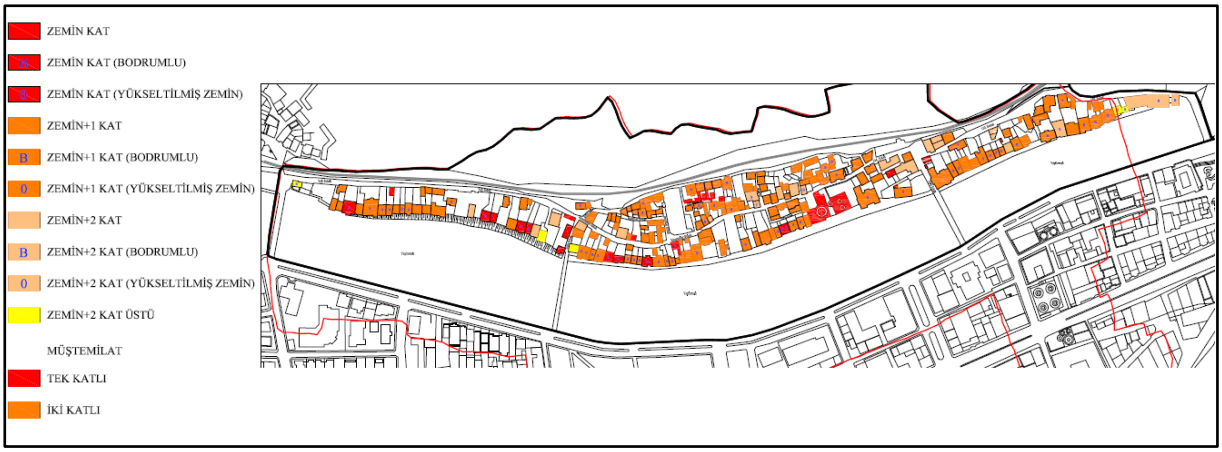
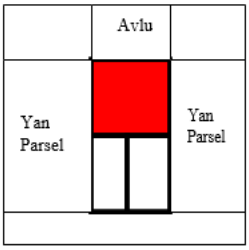
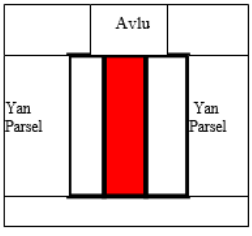
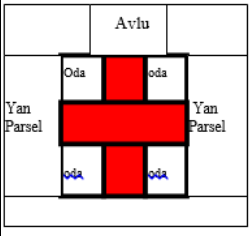
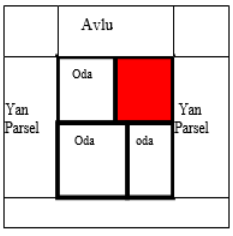


Figure 8. Number of Floors Analysis of Study Area (Erbaş, 2018)

While basements are usually used as storage, woodbin, etc., they are used as service spaces when they turn into commercial buildings. Ground and upper floors are where people continue their daily lives. While common use areas such as living room and kitchen are located on the ground floor, spaces such as bedroom and bathroom are located on the upper floors in buildings which are still used as houses. In buildings which were turned into commercial structures basement floors are used as bar or service spaces, ground floors are used as admission, breakfast and dining halls and upper floors are used as bedrooms.

The plan schemes of houses in the study area show similarities with the Traditional Turkish House. Entrances and rooms in the buildings determine the plan types. There are plan types as; without anteroom, interior anteroom, exterior anteroom, corner anteroom and middle anteroom (Table 2).

Table 2. Plan types of traditional houses in the study area (Erbaş, 2018)

Plan Schemes of Traditional Houses in Amasya Hatuniye District			
Exterior Anteroom	**Interior Anteroom**	**Middle Anteroom**	**Corner Anteroom**
			
ANTEROOM 			

In the study area, "room" which has great value since it is the smallest independent unit of the family within the context of traditional family life was designed as square-like or rectangular space. Rooms have multipurpose functions such as sleeping, sitting, and eating. Lightning usually provided with typical floor windows (Figure 9).

Figure 9. Typical Floor Windows (Erbaş, 2019)

Anterooms were placed in the best landscape direction and maximum daylight angle in these houses according to the location of the land. Upper floors were usually built with oriels and these oriels tend to overhang towards the street or Yeşilırmak River which is the direction of the landscape. Oriels facing the river were located over the river by exceeding the limits of the fortification wall with the water. It was aimed to make these spaces face to the landscape and sufficiently benefit from the natural light with these oriels in the anterooms and rooms. For this reason, they were generally built corbeled and terraces were built in front of the walls of anteroom (Figure 10).

Figure 10. The inclination of these spaces to the landscape and lightning with the oriels (Erbaş, 2018)

Oriel which is placed in the Amasya traditional housing architecture and known as the gazebo is the most special space of the structure which has windows on three sides and faces towards the street, yard or the river. The width and depth of oriel vary between 3-4 m and 8-10 m, respectively. Lightning and ventilation are provided with typical floor windows on the facade. These windows were designed in the same way with the windows that are used in the ground and upper floors in order to provide continuity (Figure 11).

Figure 11. Oriel which faces towards the street and windowed on three sides (Erbaş, 2018).

Due to the privacy phenomena, lower floors were designed inward, and upper floors were designed outward in the traditional Amasya houses. Within this context, lower floors were designed with the minimum number of windows and upper floors were designed with maximum number of windows (Figure 12).

Figure 12. Number difference of windows on the floors (Erbaş, 2018)

3.2.2. Natural Lightning Analysis of the Selected Houses

The landscape value in the space is related to the window sizes and room depth. It is expected the size of windows to increase as the room depth increases in order to provide sufficient landscape. The ratio of window area to the total surface of the wall gives the transparency ratio (CIE S011/E:2003). In Table 3, required transparency ratios for providing sufficient landscape depending on the room depth were given which were included in CIE S011/E.

Table 3. Relationship between the room depth and transparency ratio (CIE S011/E: 2003).

Room Depth (m)	Transparency Ratio (%)
8<	20
>8<11	25
>11<14	30
>14	35

Historical information was given about the Rahduvanlar Mansion which has river facade and Seven-Kozak Mansion which has street facade in Hatuniye District and building identity cards were created.

3.2.2.1. Evaluation of Rahduvanlar Mansion

As it can be seen from the black and white panorama of Amasya from 1917 (Figure 13), the construct complex, all of the parcel no 18 and a part of the parcel no 2 are single-storey on two axes. As it can be seen in parcel no 1, the iwan and the room in the construct complex was used as a dhikr room (Amasya Almanac, 1973).

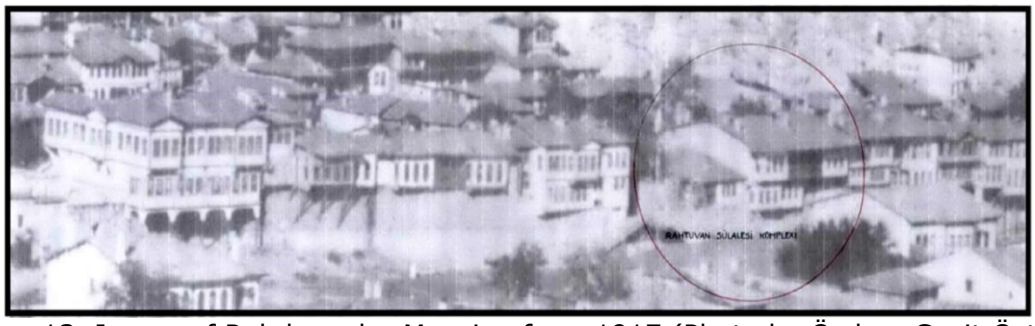


Figure 13. Image of Rahduvanlar Mansion from 1917 (Photo by Özden, Cavit Öztürk Archive)

A part of parcel no 18 and 2 and the parcel no 1 was used as soup kitchen, guest house and dhikr room which means it is a room reserved for men. Harem was a two-stories building with 4 axes which was built with traditional architecture and on parcel no 20, 21 and a part of parcel no 2. The Islamic monastery lost its function after the proclamation of the republic, however, dhikr room on parcel no 1 was preserved as a small mosque by separating from parcel no 18 in 60s and it was stated that it includes a tomb in it.

As it can be understood from the photos of the 1940s, the complex was completely demolished, and 3 structures were built with river facade. It was also stated that there was an oriel on the southern second axis (anteroom axis) of two-stories building with 4 axes to the road on the parcel no 18 (Figure 14) (Amasya Almanac, 1973).

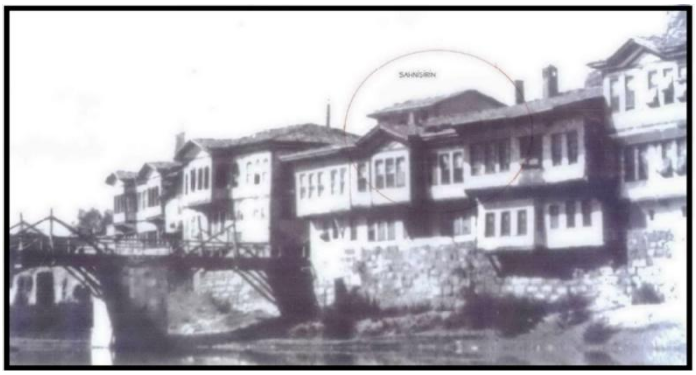


Figure 14. The image of Rahduvanlar Mansion in the 1940s (Photo by Özden, Cavit Öztürk Archive)

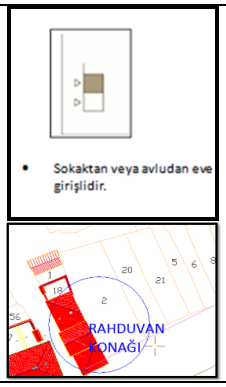
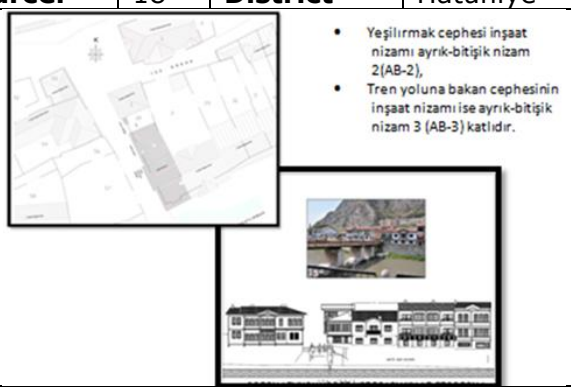
However, since the half-timbered structure didn't possess a structure with solid and thick woods that would carry the adobe filling, the oriel was demolished in the 60s (Figure 15).

Figure 15. The image of Rahduvanlar Mansion in the 1960s (Photo by Özden, Cavit Öztürk Archive)

Parcel no 1 was separated from parcel no 18, there weren't any changes on parcel no 2, parcel no 3 and 4 became parcel no 19 by merging and then in 60s, new structures were built with shared walls by demolishing the structure on the parcel no 19 and turning it into two parcels as 20 and 21 (Amasya Almanac, 1973).

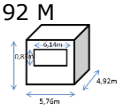
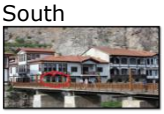
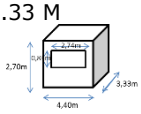
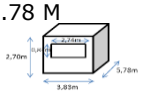
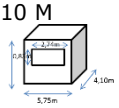
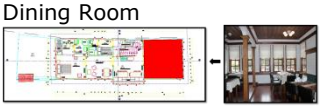
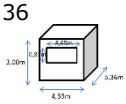
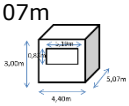
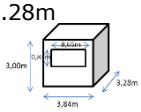
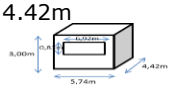
Building identity cards were created based on this information (Table4)

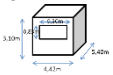
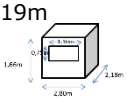
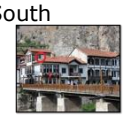
Table 4. Building Identity Card of Rahduvanlar Mansion

Building Identity Card					
Building Name			Rahduvanlar Mansion		
Square	469	**Parcel**	18	**District**	Hatuniye
Building Location					
Facade of The Building		Southeast			
Contemporary Photographs					
					

In the fieldwork, the compliance of the selected housing samples to the CIE standard was determined by taking the measurements and determining facades, window openings rate and room depth of the buildings (Table 5).

Table 5. Measurements of Rahduvanlar Mansion and Determination of Compliance to CIE Standard

Building Name	Rahduvanlar Mansion				
Square	469	**Parcel**	18		
Floor	**Space**	**Room Depth (M)**	**Window Opening Rate (%)**	**Window Direction**	**Compliance to Cie Standard**
Ground Floor	Lobby-Dining Room 	4.92 M 	Window Opening Rate (%) = Window Surface Area / Wall Surface Area X 100 Window Opening Rate (%) = 5.10m² / 15.55m² X100 = **32.75%**	South 	**Compliant**
Ground Floor	Accommodation And Restaurant Entrance 	3.33 M 	Window Opening Rate (%) = 2.27m² / 11.88m² X100 = **19,14%**	West 	**Incompliant**
Ground Floor	Service Entrance 	5.78 M 	Window Opening Rate (%) = 2.27m² / 10.34m² X100 = **21,99%**	West 	**Compliant**
Ground Floor	Kitchen 	4.10 M 	Window Opening Rate (%) = 2.27m² / 15.53m² X100 = **14,95%**	West 	**Incompliant**
First Floor	Dining Room 	5.36 	Window Opening Rate (%) 7.18m² / 12.90m² X100 = **55,27%**	South 	**Compliant**
First Floor	Anteroom 	5.07m 	Window Opening Rate (%) 4.31m² / 13.20m² X100 = **32,63%**	West 	**Compliant**
First Floor	Hobby Room 	3.28m 	Window Opening Rate (%) 4.31m² / 11.52m² X100 = **37,39%**	West 	**Compliant**
First Floor	Bedroom 	4.42m 	Window Opening Rate (%) 5.74m² / 17.22m² X100 =	North-West 	**Compliant**

			33,35%		
Second Floor (Şahnişirin)	Bedroom 	5.40 M 	Window Opening Rate (%) 4.43m² / 13.70m² X100 = **32,35%**	South- North-West 	**Compliant**
Second Floor (Şahnişirin)	Cleaning Room 	2.19m 	Window Opening Rate (%) 0.83m² / 4.65m² X100 = **17,75%**	South 	**Incompliant**

3.2.2.2. Evaluation of Seven-Kazak Mansion

The late Ottoman period structure which was inherited by 3 siblings was divided into three in terms of usage even though it was not actually divided in the cadaster. Annexes were added to the yard for wet areas. The arch, furnace, and cupboards were partially impaired in order to use the eastward rooms on the first and second floor as a contemporary kitchen and thus it lost its originality (Figure 16) (Amasya Almanac, 1973).

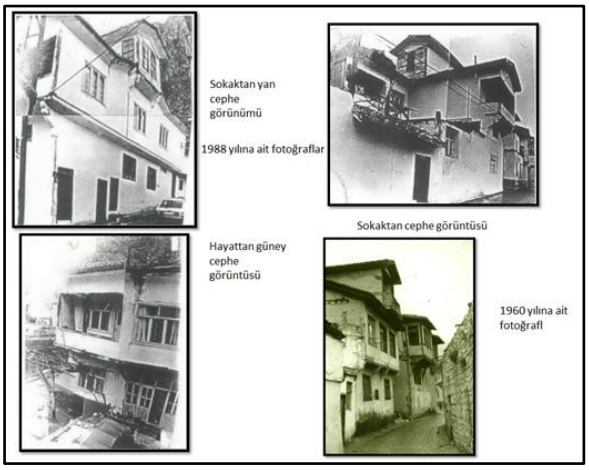


Figure 16. Historical Photographs of Seven-Kozak Mansion

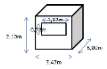
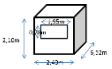
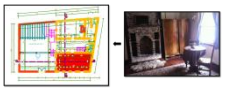
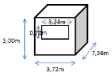
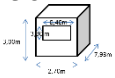
Basement and garden floors are used as a cafeteria and other floors are used as a hotel in the building.
Building identity card was created based on this information (Table 6).

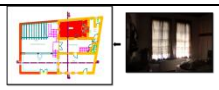
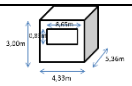
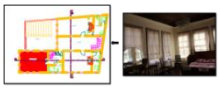
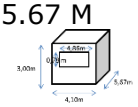
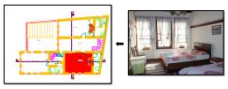
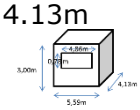
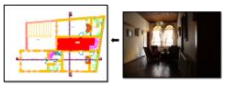
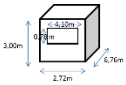
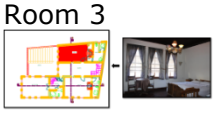
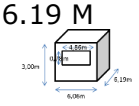
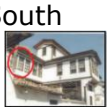
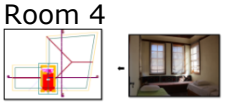
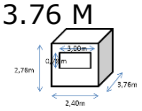
Table 6. Building Identity Card of Seven-Kazak Mansion

Building Identity Card					
Building Name			Seven-Kozak Mansion		
Square	449	**Parcel**	9	**District**	Hatuniye
Building Location					
Facade of The Building	South				
Contemporary Photographs					

In the fieldwork, the compliance of the selected housing samples to the CIE (S011/E) standard was determined by taking the measurements and determining facades, window openings rate and room depth of the buildings (Table 7).

Table 7. Measurement of Seven-Kazak Mansion and Determination of Compliance to CIE Standard

Building Identity Card					
Building Name	Seven-Kozak Mansion				
Square	449	**Parcel**	9		
Floor	**Space**	**Room Depth (M)**	**Window Opening Rate (%)**	**Window Direction**	**Compliance To Cie Standard**
Basement Floor	Closed Service Area 	8.00 M 	Window Opening Rate (%) = Window Surface Area / Wall Surface Area X 100 Window Opening Rate (%) 0.87m²/ 15.69m² X100 = **5,57%**	South 	**Incompliant**
Basement Floor	Kitchen 	6.52 M 	Window Opening Rate (%) 1.52m²/ 5.04m² X100 = **30,18%**	South 	**Compliant**
Ground Floor	Room 1 	7.36 M 	Window Opening Rate (%) 2.53m² /11.16m² X100 = **22,65%**	South-East 	**Compliant**
Ground Floor	Anteroom 	7.90 M 	Window Opening Rate (%) 1.32m² /8.10m² X100 = **16,30%**	South 	**Incompliant**
Ground	Bedroom	5.36	Window	South	**Compliant**

Floor			Opening Rate (%) 2.53m² /10.38m² X100 =**24,35%**		
First Floor	Suite 	5.67 M 	Window Opening Rate (%) 3.79m² /12.30m² X100 = **30,82%**	South-East And West 	**Compliant**
First Floor	Room 2 	4.13m 	Window Opening Rate (%) 3.79m² /16.77m² X100 = **22,60%**	East 	**Compliant**
First Floor	Anteroom 	6.76 M 	Window Opening Rate (%) 3.20m² /8.16m² X100 = **39,19%**	South 	**Compliant**
First Floor	Room 3 	6.19 M 	Window Opening Rate (%) 3.79m² /18.57m² X100 = **20,41%**	South 	**Compliant**
Second Floor (Şahnişirin)	Room 4 	3.76 M 	Window Opening Rate (%) 2.34m² /6.62m² X100 = **35,33%**	South-North And East 	**Compliant**

4. FINDINGS AND EVALUATION

In the examination of the natural lightning of the houses, the closeness of the window opening and spatial depth rate to the values of CIE (S011/E) standard depending on the functional characteristics of the space was determined by using IBM SPSS Windows 24 program in data analysis.

4.1. Findings on Rahduvanlar Mansion

The distribution of room depths according to the CIE (S011/E) lightning standard of Rahduvanlar Mansion is as follows (Table 8).

Table 8. The distribution of room depths according to the CIE (S011/E) standard of Rahduvanlar Mansion

	Group	n (number)	Average	Standard Deviation	Mann Whitney-U test	p
Room Depth	Incompliant with the Natural Lightning Standards	3	3.206	0.889	2.000	0.017
	Compliant with the Natural Lightning Standards	7	4.890	0.785		

It was determined that room depth values (x=3,206) which are not in compliance with Natural Lightning Standards (x=3,206) were lower than the room depth values which are in compliance with the natural lightning standards (x=4,890).

In the Mann Whitney-U test results which were conducted in order to determine whether or not room depth values show a significant difference according to the evaluation variable the difference between the group averages were statistically significant (Mann Whitney U=2.000; p=0.017<0.05).

The distribution of evaluations of rooms on different floors of Rahduvanlar Mansion is as follows (Table 9).

Table 9. The distribution of evaluations of rooms on different floors of Rahduvanlar Mansion

Evaluation	Floor						Total		X^2/p
	Oriel		First Floor		Ground Floor				
	n(number)	%	n(number)	%	n(number)	%	n(number)	%	
Compliant with the Natural Lightning Standards	1	50%	0	0%	2	50%	3	30%	X^2= 0.900 P=0.638
Compliant with the Natural Lightning Standards	1	50%	4	100 %	2	50%	7	70%	
Total	2	100 %	4	100 %	4	100 %	10	100 %	

There wasn't a significant relationship between the natural lightning and floor (X2=0.900; p=0.638>0.05). It can be observed that 2 (50%) of the rooms on ground floor are not in compliance with the natural lightning standards and 2 (50%) of them are in compliance with the natural lightning standards; 4 (100%) of the rooms on the first floor are in compliance with the natural lightning standards and 1 (50%) of the rooms on oriel floor are not in compliance with the natural lightning standards and 1 of them are in compliance with the natural lightning standards.

4.2. Findings on Seven-Kazak Mansion

The distribution of room depths according to the CIE (S011/E) lightning standard of Seven-Kazak Mansion is as follows (Table 10).

Table 10. The distribution of room depths according to the CIE (S011/E) standard

Group		n (Number)	Average	Standard Deviation	Mann Whitney-U test	p
Room Depth	Incompliant with Natural Lightning Standards	2	6.550	2.451	9.000	0.405
	Compliant with Natural Lightning Standards	8	5.462	1.312		

In the Mann Whitney-U test results which were conducted in order to determine whether or not room depth values show a significant difference according to the evaluation variable the difference between the group averages were not statistically significant ($p<0.05$).

The distribution of evaluations of rooms on different floors of Rahduvanlar Mansion is as follows (Table 11).

Table 11. The distribution of evaluations of rooms on different floors of Rahduvanlar Mansion

Evaluation	Floor								Total		X^2/p
	Oriel		First Floor		Ground Floor		Basement Floor				
	n(number)	%	n	%	n	%	n	%	n	%	
Incompliant with the Natural Lightning Standards	0	0%	0	0%	1	33.3%	1	50%	2	20%	X^2=4.000 P= 0.261
Compliant with the Natural Lightning Standards	1	100 %	4	100 %	2	66.6%	1	50%	8	80%	
Total	1	100 %	4	100 %	3	100%	2	100 %	10	100 %	

There wasn't a significant relationship between the natural lightning and floor (X2=4,000; p=0,261>0.05). It can be observed that 1 (50%) of the rooms on the basement floor are not in compliance with the natural lightning standards and 1 (50%) of them are in compliance with the natural lightning standards; 1 (33.33%) of the rooms on the ground floor are not in compliance with the natural lightning standards and 2 (66.66%) of them were in compliance with the natural lightning standards; 4 (100%) of the rooms on the first floor are in compliance with the natural lightning standards and 1 (100%) of the rooms on the oriel floor are in compliance with the natural lightning standards.

4.3. The Comparison of Rahduvanlar Mansion and Seven-Kazak Mansion

The room depths comparison of Rahduvanlar Mansion and Seven-Kazak Mansion were performed in terms of compliance to CIE (S011/E) standards in natural lightning.

When the compliance to CIE (S011/E) standards in natural lightning was examined between the mansions, the following findings were obtained (Table 12).

Table 12. The compliance to CIE (S011/E) standards in natural lightning between the mansions

Evaluation	Mansion Type				Total		X^2/p
	Rahduvanlar Mansion		Seven-Kazak Mansion				
	n(number)	%	n	%	n	%	
Incompliant with the Natural Lightning Standards	3	30%	2	20%	5	25%	X^2= 0.202 P= 0.500
Compliant with the Natural Lightning Standards	7	70%	8	80%	15	75%	
Total	10	100 %	10	100%	20	100 %	

There wasn't a significant relationship between the evaluation and mansion type (X2=0,202; p=0,500>0.05). It can be observed that 7 (70%) rooms of Rahduvanlar Mansion are in compliance with the natural lightning standards and 3 (30%) rooms are not; 8 (80%) rooms of Seven-Kazak Mansion are in compliance with the natural lightning standards and 2 (20%) rooms are not.

When the room depth averages between the mansions were examined, the following findings were obtained (Table 13).

Table 13. Room depth averages between the mansions

	Group	n (Number)	Average	Standard Deviation	Mann Whitney-U test	P
Room Depth	Rahduvanlar Mansion	10	4.220	1.193	36.500	0.040
	Seven-Kazak Mansion	10	5.734	1.608		

In the Mann Whitney-U test results which were conducted in order to determine whether or not room depth values show a significant difference according to the evaluation variable the difference between the group averages were statistically significant (Mann Whitney U=36.500; p=0.040<0.05). It was determined that the room depths of Rahduvanlar Mansion (x=4.220) were lower than the room depths of Seven-Kazak Mansion (x=5.734)

5. CONCLUSION AND SUGGESTIONS

The objective of daylight utilization has played an important role in the design of housing throughout history. As a result of the technological developments, electrical energy has started to be used for lightning purposes and it became widespread in time. This situation provides architects to be original in designs. However, the necessity of conscious consumption of energy sources is a fact that should be accepted by everyone. For this reason, producing solutions for the efficient utilization of daylight and reducing energy consumption in lightning have become one of the most important subjects of architecture.

There are certain main objectives in lightning the areas with daylight in terms of providing physiological and psychological comfort for users and reducing energy consumption. These objectives can be stated as;

- Efficient utilization of daylight,
- Providing as decent lightning as possible,
- Providing glaring control by protecting from direct sunlight,
- Establishing a visual connection with the external environment,
- Perceiving the qualitative and quantitative differences of external lightning levels in the daytime,
- Building a design which is in compliance with climate control, noise control and other physical environmental subjects,
- Providing energy save by reducing the artificial lightning load.

These objectives may have different priorities depending on the variables such as the climatic characteristics of the location, function of the building and usage hours. In this study, the relationship between the spatial depth and window openings of traditional houses which are located in Hatuniye District, dating back to 1900s and considered as cultural heritage was examined in terms of natural lightning. It was examined whether or not this relationship is in compliance with the CIE (S011/E) standard.

- It was determined that 60 registered houses examined within this context are located along the southern bank of Yeşilırmak, on historical fortification wall, attached to each other and in compliance with the topography and street
- It was determined that the topography of the houses, their design in terms of urban design and their landscape direction affected the window openings on the facades. It was determined that there were more window openings in houses which have Yeşilırmak landscape.
- It was observed that there were more window openings in spaces which have room depth more than 8 meters and side windows were built by creating oriels towards the landscape direction.
- Window openings in the spaces differ according to the locations of the houses.
- There were more openings in the spaces which were located in Yeşilırmak facade.
- Furthermore, window openings of spaces on ground floors which have street facade were usually towards the yard of the house due to the privacy phenomena.
- In addition to this, window openings varied according to the floors. There were more window openings on floors which include spaces such as living room and bedroom where people spend most of their days. However, there were scarcely any windows on the basement floor where places such as storage, shelter, and kitchen were located.
- It was observed that in houses which were turned into accommodation facilities such as hotels basement floors were used as bar-cafeteria or service spaces which are mostly used in the nighttime. Thus, it was considered that natural lightning didn’t matter in these spaces.

In conclusion, when the relationship between the spatial depth and windows opening of traditional houses in Amasya Hatuniye District were examined, it was observed that the houses were designed by considering environmental factors such as the natural and artificial environment.

Although daylight provides dynamic spaces which support human activities and health and reduces the energy need of the building, the natural lightning is insufficient in contemporary houses since they are built by ignoring the environmental factors completely.

Comfort conditions in a space can be stated as climatic, auditory and visual conditions and they play an important role in sustaining physiologically and psychologically comfortable and healthy life. People feel physiologically and psychologically dissatisfied and disturbed when they are not comfortable in a building. However, physiological needs should be provided in order to provide psychological and social needs.

It is considered that drawing attention to the use of sun and sunlight which is a renewable energy source in these textures which are cultural heritages would constitute an example for new buildings.

EXPLANATION

This paper is based on a PhD study titled "The relationship between the space depth and window opening in Amasya traditional houses"

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