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Surrounding Wall of Mimar Sinan's Mosques: Components and Construction Techniques

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Abstract
The aim of the study is to determine the original characteristics of Mimar Sinan's mosques' surrounding walls in Istanbul by examining their material, construction technique, and formation properties and also to document their construction technology for conservation. The surrounding walls, that define the boundaries of the structures, have been used in civil architecture for security and privacy purposes. In monumental architecture, it was used to determine the land borders without interrupting the relationship of the structure with its periphery and also to define the spiritual boundary according to some researchers. In the first stage of the study, the location of the surrounding walls and changes in the plan schemes in the historical process were examined with archival documents and its components explained. In the next stage, the components of nine Sinan mosque's windowed surrounding walls and their relations with each other were examined depending on their material, size, and shape, and presented with visuals. As a result, it is seen that the formation properties of the surrounding walls are differentiated depending on their location, topography, visual concern, and interventions. However, their construction techniques, materials, and components are similar.

Keywords
Mosque surrounding wall • Construction technique • Masonry wall • Coping • Iron grilled window • Mimar Sinan

Mimar Sinan Camilerinde Çevre Duvarı: Bileşenleri ve Yapım Teknikleri

Öz
Çalışmanın amacı, Mimar Sinan'ın İstanbul'da bulunan külliye camilerinin çevre duvarlarının malzeme, teknik ve biçimlenme özelliklerini inceleyerek özgün niteliklerini belirlemek ve yapım teknolojisinin korunması için belgeleme yapmaktır. Yapıların arazideki sınırlarını belirleyen çevre duvarları sivil mimaride güvenlik ve mahremiyet amaçları ile kullanılmıştır. Anıtsal mimaride ise yapının çevresi ile ilişkisini tamamen kesmeden hem yapının arazideki sınırını belirleyen hem de bazı araştırmacılara göre manevi sınırı tanımlamak amacıyla kullanılmıştır. Çalışmanın birinci aşamasında çevre duvarlarının arazideki konumu ile tarihsel süreçte plan şemalarında meydana gelen değişimarşiv belgeleri eşliğinde incelenmiş, çevre duvarlarının bileşenleri anlatılmıştır. Sonraki aşamada ise çalışma kapsamında ele alınan dokuz Sinan külliye camisinin pencereli çevre duvarlarının bileşenleri ve birbirileriyle olan ilişkileri malzeme, boyut ve biçimlerine bağlı olarak arşiv belgeleri ve saha arştırmaları eşliğinde incelenmiştir. Elde edilen veriler sonucunda, çevre duvarlarının biçimlenme özelliklerinin konum, topografya, görsel kaygı ve müdahalelere bağlı olarak farklılaştığı görülmüştür. Bununla birlikte, inşaat teknikleri, malzeme ve bileşenleri benzerdir.

Anahtar Kelimeler
Cami çevre duvarı • Yapım tekniği • Duvar örgüsü • Harpuşta • Lokma parmaklıklı pencere • Mimar Sinan

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Genişletilmiş Özet

Çeşitli işlevlerdeki yapılar ve yapı topluluklarının arazideki sınırlarını belirleyen, arsa, bahçe, avlu gibi açık mekanları çevresinden ayırmak amacıyla yapılmış, yapıyı çepeçevre saran duvarlar "çevre/ihata duvarı" olarak tanımlanmaktadır. Çevre duvarları sivil mimaride bu özelliklerinin yanı sıra güvenlik ve mahremiyet amaçları ile de kullanılmıştır. Anıtsal mimaride ise bunlara ek olarak bazı araştırmacılar tarafından yapının manevi sınırlarını tanımladığı düşünülen çevre duvarları sivil mimariden farklı olarak kesin bir ayrım oluşturmaz, yapının çevresi ile ilişkisini tamamen koparmazlar.

Kapı, mekana girişi sağlayan bir eleman olarak yapının fonksiyonu ne olursa olsun çevre duvarının değişmez bileşeni olmasına rağmen pencereler yapının çevre ile ilişkisini sağlayan öğeler olarak çoğunlukla anıtsal mimaride kullanılmıştır. Çevre duvarları hangi amaçla yapılırsa yapılsın, yapıdan önce algılanan ilk kısım olma özelliği ile yapısal odak ve çevre ilişkisinde sınır koyucu, çevreyi şekillendirici bir özelliğe sahiptir. Geleneksel peyzajın ayırt edici öğelerinden biri olmasının yanı sıra dönemin toplumsal yaşam biçimine ilişkin bilgi veren tarihi belge niteliği taşırlar. Anıtsal mimaride çevre duvarları, mescit, medrese, türbe gibi küçük ölçekli yapılardan büyük ölçekli külliyelere kadar pek çok yapıda kullanılmıştır. Bu çalışma kapsamında dönemsel sınırlama yapılsa bile anıtsal yapıların tamamının ele alınması mümkün gözükmediğinden çalışmanın kapsamı karşılaştırma olanağı sağlaması açısından Sinan'ın İstanbul'daki külliyelerinin camilerini çevreleyen duvarlar ile sınırlandırılmıştır. Çalışmada bu camilerin pencereli çevre duvarlarının yapım teknolojisinin korunması için belgelenmesi amacıyla bileşenleri, bileşenlerinin birbirleri ile ilişkisi, boyut, biçim ve malzeme özelliklerine bağlı olarak incelenmiştir.

Bugüne kadar Mimar Sinan külliyeleri ve/veya camileri ile ilgili pek çok araştırmacı tarafından pek çok çalışma yapılmıştır. Bunlar içerisinde çevre duvarlarını başlı başına ele alan çalışma bulunmamaktadır. Bu doğrultuda dokuz cami belirlenmiştir. Çalışmada öncelikle çevre duvarlarının yeri ve tarihsel süreçte plan şemalarındaki değişiklikler arşiv belgeleri eşliğinde incelenmiştir. Bu aşamada ayrıca duvarların bileşenleri sunulmuştur. Sonraki aşamada, çalışma kapsamına alınan yapıların çevre duvarlarının bileşenleri ve bileşenlerin birbirleriyle olan ilişkisi, arşiv belgeleri eşliğinde malzeme, boyut ve biçim özelliklerine bağlı olarak incelenmiştir. Çalışmadan elde edilen veriler, karşılaştırmalı tablolar ve görsellerle birlikte duvar örgüsü, harpuşta ve lokma parmaklıklı pencere başlıkları altında sunulmuştur. Kapılar çevrede duvarlarının sabit bir parçası olmasına rağmen, farklı bir çalışmanın konusu olabilecek detayda olmaları nedeniyle kapsam dışında bırakılmıştır. Çalışmada literatür taramasının yanı sıra çevre duvarlarının güncel rölöveleri ve yerinde yapılan incelemeler ile arşiv belgelerinden yararlanılmıştır.

Çalışma kapsamında incelenen yapılar İstanbul'da ve genellikle sıkışık parsellerde, organik kent dokusu içerisinde yer alır. Bu nedenle her yapıda, yapıların etrafını tamamen çevrelemez, bazı yönlerde külliyede yer alan diğer yapılar ve/veya komşu parseldeki yapı veya çevre duvaları ile bitişiktir. Bu durumlarda duvarların plan şemaları parsele göre belirlenmiştir. Selatin camilerinde oldukça büyük olan dış avlu, iç avlu ve cami kapalı mekanını bazen de bunlara ek olarak hazireyi çevreler. Zemini toprak olup genellikle içerisinde yeşil alan ve yaya yolları bulunmaktadır.

Çevre duvarları duvar örgüsünün haricinde genel olarak; kapı, pencere, harpuşta ve korniş elemanlarının birleşiminden meydana gelmiştir. Duvarların bileşenleri çoğunlukla benzer malzemeler ile yapılmış olup benzer biçimsel özelliklere sahip olmasına ragmen bazı yapılarda farklı malzemeler ile çeşme, sütun, kemerli geçiş gibi farklı öğelerin kullanıldığı da görülmektedir. Duvar örgüsünde kullanılan malzemeler çoğunlukla yapının önemine ve inşaat için ayrılan finansal kaynağa göre değişmektedir. Bazı yapıların farklı cephelerine, cephenin konumuna ve önemine bağlı olarak farklı malzeme ve işçilik uygulanmıştır. Çalışmada incelenen dört caminin çevre duvarlarının tamamı kesme taş, bir yapının tamamı derzli kesme taş, bir yapının ise tamamı kaba yonu taştan yapılmıştır. Diğer üç caminin çevre duvarlarında ise farklı teknikler bir arada kullanılmıştır. Bu üç yapının bir veya daha fazla duvarı kesme taş olacak biçimde, diğerleri derzli kesme taş, kaba yonu ve kesme taş ile tuğla almaşık teknikte uygulanmıştır. Çevre duvarlarının ana caddeye veya türbe gibi yapılara bakan kısımları malzeme kullanımı ve teknik bakımından daha özenlidir.

Harpuşta, incelenen duvarların tamamında eğimli olan çatı kısmı ile kornişten meydana gelir ve incelenen yapıların tamamında harpuştaların malzemesi küfeki taşıdır. Şehzade Mehmed Camisi, Süleymaniye Camisi ve Zal Mahmud Paşa Camilerinin harpuştalarının çatı ve korniş kısımlarının arşiv kayıtları ve saha araştırmalarına göre bağımsız yapılmış olduğu görülmektedir. Diğer yapılarla ilgili kesin kayıtlara ulaşılamamış ta olsa korniş ve çatıyı meydana getiren taşların uzunluklarının farklı olması, parçaların birbirinden bağımsız olduğunu göstermektedir. Korniş silmeleri; kaval, kepçe, asaba, armudi ve 45 ˜ lik pah'ın farklı boyut ve biçimlerde birleşiminden meydana gelmiştir. İncelenen duvarlarda beş farklı şema kullanılmıştır. En sık kullanılan şema asaba ve 45 derecelik pahtan oluşur. Çatı kısımı ise çoğunlukla eğrisel üst kısım ile asabadan meydana gelmiştir. Şehzade Mehmed Camisi ve Haseki Camisinde ise, çatı asabasız olup eşkenar üçgendir.

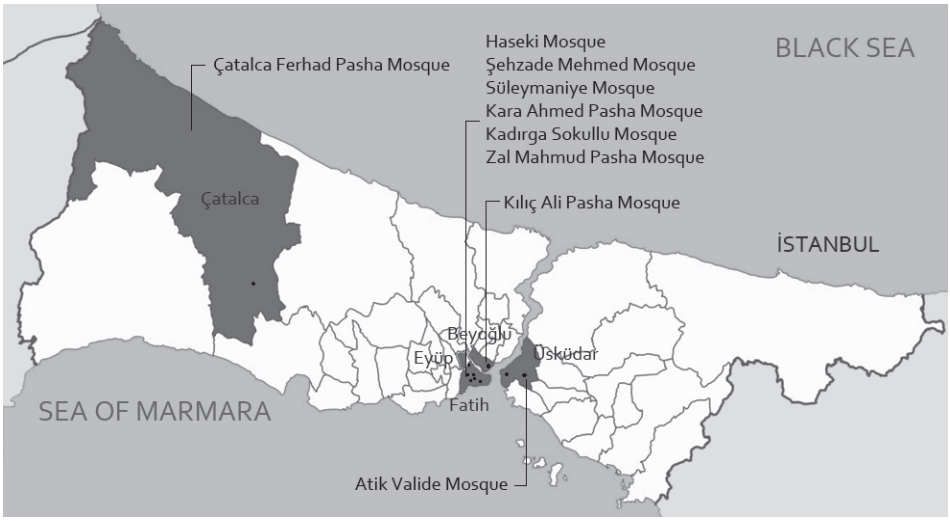
İncelenen pencerelerin boyutları farklılaşmasına rağmen tamamı lokma parmaklıklı olup çoğunlukla dikey dikdörtgen biçimlidir. Pencere yüksekliklerinde belirli bir standart bulunmamasına rağmen, yüksekliklerin iç avlunun dışarıdan görülmesine olanak sağlayacak yükseklikte inşa edildiği görülmektedir. Böylece aynı zamanda yapı ve çevresi arasında ilişki kurulması sağlanmıştır. Söveli, duvar örgüsünde ya-

pılmış söveli ve sövesiz örnekleri bulunmaktadır. Kılıç Ali Paşa, Kara Ahmed Paşa, Süleymaniye, Atik Valide ve Zal Mahmut Paşa Camilerinin pencereleri eşit boyutlarda ve eşit aralıkla tekrar eden belirli bir düzene göre biçimlenmiştir. Ancak diğer yapılardaki pencerelerin büyüklüğü, şekli ve tekrarı düzensizdir. Özellikle Şehzade Mehmed ve Zal Mahmud Paşa Camilerinin türbe önlerindeki çevre duvarlarına farklı dönemlerde açılmış pencereler farklı boyut ve biçimlere sahiptir.

Çalışma kapsamında ele alınan duvarların biçimlenme özelliklerinin, konum, topoğrafya, görsel kaygı ve yapının geçirdiği müdahalelere bağlı olarak farklılaşmasına rağmen, yapım tekniği, malzeme ve bileşenlerine bağlı olarak benzerlik gösterdiği görülmüştür. Duvar kimliğinin kent için tamamlayıcı bir değer olarak sürdürülebilirliğinin sağlanması, yapım tekniklerinin ve malzemelerinin korunmasına bağlıdır. Tarihsel önemlerinin yanı sıra, kenti bütünleyen bir değer olarak sürdürülebilirliklerinin sağlanarak korunmaları, gelecek nesillere aktarılmalarını sağlayacaktır.

Introduction

The walls, determining the boundaries of the buildings, which are designed to separate the open spaces such as lands, gardens, and courtyards from their surrounding areas, are defined as the surrounding wall (*ihata wall*)[1]. In civil architecture, besides these features, those walls were used for security and privacy purposes, too. According to Tayla,[2] surrounding walls, which defined the spiritual boundaries in the monumental architecture, do not create a definite distinction unlike civil architecture and do not completely break the relationship of the structure with the environment[3]. Although no matter what the function of the structure is, the door is a constant component of the surrounding wall, windows were mostly used as the elements that connect the structure with the historical environment in monumental architecture. Regardless of what the surrounding walls were designed for, they have a limiting characteristic in the relationship between structural focal point and environment with the feature of being the first part perceived before the structure. In addition to being one of the distinctive elements of traditional landscape, they are historical documents that give information about the social lifestyle of their period.



F. 1. The map of İstanbul (Redrawn from Google map, 2018)

In monumental architecture, surrounding walls have been used in many buildings ranging from small-scale structures such as masjids, madrasas, and tombs to large-scale complexes. In this study, it is not possible to examine all structures even if there is a periodic limitation. For this reason, the scope of the study was limited to the mos-

1 Metin Sözen, Uğur Tanyeli, **Sanat Kavram ve Terimleri Sözlüğü**, İstanbul 1994, p. 111.

2 Hüsrev Tayla, **Geleneksel Türk Mimarisinde Yapı Sistem ve Elemanları**, İstanbul 2007, p. 286.

3 Jale Nejdet Erzen, "Osmanlı Estetiği", **Osmanlı Kültür ve Sanat**, Ed. G. Eren, V.10, Ankara 1999, p. 45.

ques' surrounding walls of Sinan's complexes in Istanbul. These are Haseki, Üsküdar Mihrimah Sultan, Şehzade Mehmed, Süleymaniye, Kara Ahmed Pasha, Kadırga Sokollu, Atik Valide, Çatalca Ferhad Pasha, Zal Mahmud Pasha, and Kılıç Ali Pasha Mosques, which were all built in the 16th century, also known as the Ottoman Classical Period (Fig.1). In this study, in order to determine the specific characteristics and to document the construction technology of the surrounding walls, their components have been examined depending on size, shape, and material properties.

Many studies have been carried out by researchers to identify Sinan's architecture until today. However, there is no study dealing with only the surrounding walls of these. Tayla's publication[4], that presented the building elements of traditional Turkish architecture, is the most detailed work that contains the surrounding walls. In this publication, the copings of the courtyard and surrounding walls of traditional Turkish civil and monumental architecture were examined in different samples without any periodical limitation. In the publications of Barkan[5], Çelik[6], and Kolay and Çelik[7], the surrounding walls of the Süleymaniye Complex were examined through archival documents according to material, size, and shape characteristics. In the publication by Orman[8], the change throughout the history in the surrounding wall of the Şehzade Mosque was examined. This is the first study that investigates the surrounding walls' construction techniques of Sinan's mosques in this detail.

In addition to the literature review, restoration reports and photographs, historical photos (Robertson & Beato and Ali Saim Ülgen)[9], historical maps (German Blues and Pervititch Maps)[10], the measured drawings, and on-site examinations of the walls were used in this study. Limited information was obtained about the surrounding walls from repair documents of the mosques which are in the Archives of the Republic of Turkey Prime Ministry Directorate General of Foundations and No. II Istanbul Immovable Cultural and Natural Heritage Protection High Council. However, some mosque repair photos, dating back to the middle of the 20th century which would be helpful to understand of surrounding walls construction technologies, have been reached. As a result of the study, it was seen that although the formal characteristics of the surrounding walls were differentiated depending on the location, topography,

4 Tayla, **op. cit.,** p. 286.

5 Ömer Lütfü Barkan, **Süleymaniye Camii ve İmareti İnşaatı**, V. 2, Ankara 1979.

6 Serpil Çelik, **Süleymaniye Külliyesi Malzeme, Teknik ve Süreç,** Ankara 2009.

7 İlknur Kolay, Serpil Çelik, "Malzeme ve Teknoloji", **Bir Şaheser Süleymaniye Külliyesi**, Ed. Selçuk Mülayim, Ankara 2007, pp. 125-147.

8 İsmail Orman, "Şehzâde Camii Haziresi: Osmanlı Mezar Geleneğine Aykırı Bir Hazîre Gelişimi", **Sanat Tarihi Araştırmaları Dergisi**, No.15, İstanbul 2000, pp. 22-37; İsmail Orman, "Şehzade Külliyesi İstanbul'da XVI. Yüzyılın İlk Yarısı Sonunda İnşa Edilen Külliye", **TDV İslam Ansiklopedisi**, V. 38, 2010, pp. 483-485.

9 http://hdl.handle.net/10020/96r14_ref16792_tbp; https://saltonline.org/ Access Date: 02.10.2019.

10 **Alman Mavileri 1913-1914 I. Dünya Savaşı Öncesi İstanbul Haritaları**, Prepared by İbrahim Dağdelen, İstanbul 2006; Pervititch, **J. Jacques Pervititch Sigorta Haritalarında İstanbul**, Istanbul 2000.

visual concern, and structure interventions, the construction technique, materials, and components were similar. In addition to their historical significance, ensuring their sustainability as a complementary value of the city and their transfer to the future generations are important. At this point, this study, which is a document containing the data of the current state of the surrounding walls, will be a source that will provide data in order to make possible decisions in future conservation studies.

Methodology

In this study, the windowed surrounding walls with similar components defining the outer boundaries of the mosques were investigated. Firstly, nine mosques were determined in this context. Then, the location of the surrounding walls and the changes in their plan schemas throughout history were examined with archival documents. In the next stage, the components of these surrounding walls and the relationship of these components with each other were examined depending on the properties of their materials, size, and shape accompanied by archival documents. The data obtained from the walls were presented by comparative tables and visuals under the headings of the masonry wall, the coping, and the iron grilled window.Although the doors were fixed parts of the surrounding walls, they were left out of the scope because they had such details that could be the subject of a different study[11]. The tables are designed to allow the comparison of the size, shape and material properties of the surrounding walls and/or their components. The position of the wall and its components in the structure are shown on the mosque current plan. Letters and abbreviations are used in the tables and indicated in the upper right corner of the table.

The Components and the Construction Techniques of Surrounding Walls

The characteristics of the surrounding walls and their relationship with the mosque and their surroundings vary according to the structures. The outer courtyards, which are quite large in sultan (*selatin*) mosques, include the inner courtyards and the mosques. The ground is soil and usually contains green areas and pedestrian paths leading to various gates. In smaller-sized structures, the parcel's form is decisive in the surrounding walls' shape. The mosques examined within the scope of the study are located in Istanbul and are usually in congested parcels within the organic urban texture. For this reason, in some structures, the surrounding walls are adjacent to the other structures of the complex and/or the buildings or the surrounding walls of neighbouring parcels. In these cases, the plan schemes of the walls are determined according to the parcel. Table 1 shows the shape of the surrounding walls and the relationship between

11 Doors are quite comprehensive building element with the components (wall coverings, arches, door wings, components of wings, and coping or top cover etc.) Some walls have more than one doors which are different from each other (for example, the Süleymaniye Mosque surrounding walls have ten doors) and some of them (such as Süleymaniye Mosque and Kılıç Ali Pasha Mosque) have a structure with domed.

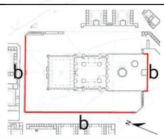
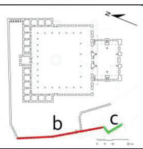
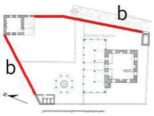
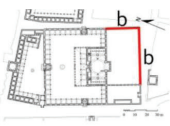
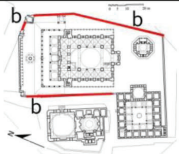
the mosques. The parcel shape was decisive in the surrounding walls' shape of most mosques examined in this study (Table 1). For example, the surrounding walls in the south-west and south-east directions of Şehzade Mosque are parallel to the streets. Because there is no delimiting parcel or street in the north-west direction, the surrounding wall is shaped parallel to the mosque courtyard. These surrounding walls are adjacent to the other structures of the complex in the north east side (Table 1). The surrounding walls of Çatalca Ferhad Pasha Mosque are shaped parallel to the streets in the north-east and north-west directions and are connected to the primary school in the northwest corner of the parcel. The walls in other directions are parallel to the building and are adjacent to the other parcels (Table 1).

According to the literature and archival documents, the surrounding walls of some mosques have differentiated throughout history. One of these is the Şehzade Mosque surrounding wall in the south-west direction (Wall "b" shown in Table 1). In the publication by Orman[12], restitution plans are presented which show the conditions of this surrounding wall at the time it was built and in subsequent years. According to this, as tombs were added to the mosque's graveyard at different times, new windows were opened on the wall in order to increase the visibility of these tombs, so this has changed the original look of this particular surrounding wall[13]. Another example is the south-western sorrounding wall of Kara Ahmed Pasha Mosque. Yüksel states that the entrance in the surrounding wall was shifted. The previous wall can also be seen on the German Blue and Istanbul maps (Table 1)[14].

12 Orman, **op. cit**., pp. 23-24.

13 The first examples are twin marble fountains that is considered to be opened in connection with the tomb of Emine Hanim in 1722-23. The other examples are two sebil window. They were associated with Gevher Sultan who died in 1694 and Safiye Sultan who died in 1682. See Orman, **op. cit**., pp. 30-32; Semavi Eyice, "Çeşme", **TDV İslam Ansiklopedisi,** V. 8, 1993, pp. 277-287; Doğan Kuban, "Şehzade Külliyesi", **Dünden Bugüne İstanbul Ansiklopedisi,** V.7, 1994, pp. 152-155. Cerasi, suggests that quartet windows in Şehzade Mosque belongs to Sinan period too. See Maurice Cerasi, "The Urban and Architectural Evoluation of tge İstanbul Divan Yolu", **Muqarnas: An Annual on the Visual Culture of the Islamic World**, No. 22, pp. 217-218.

14 Müller Wiener, **İstanbul'un Tarihsel Topografyası**, İstanbul 2001, p. 487.

mosque	wall: types of bonds a	b	c	d	thickness	stone heights	current plan	maps	photographs
Şehzade Mehmed Mosque		+			73 cm	19-28 cm			
	+				75 cm	17-25 cm			
Süleymanive Mosque		+			98 cm	14-27 cm			
Kara Ahmed Pasha Mosque		+			65 cm	23-42 cm			
			+		52 cm	12-24 cm			
Kadırga Sokollu Mosque	+				68 cm	20-27 cm			
Çatalca Ferhad Pasha Mosque		+			72 cm	13-23 cm		-	
Haseki Mosque	+				70 cm	11-23 cm			
Zal Mahmud Pasha Mosque				+	73 cm	16-30 cm			
		+		+	80 cm	25 cm			
Atik Valide Mosque		+			65 cm	13-23 cm			
Kılıç Ali Pasha Mosque		+			62 - 64 cm	20-35 cm			

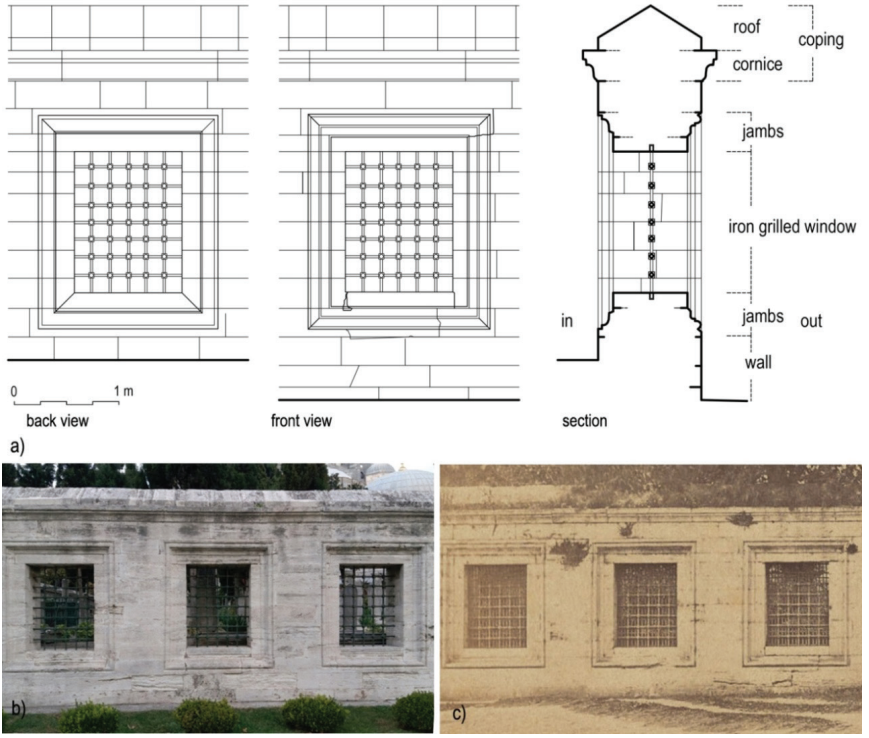
a: cut-stone (with joint)
b: cut-stone (without joint)
c: rough cut-stone
d: cut-stone + brick alternating

monochrome: Pervititch Map

color: German Blue Map

Table 1. Surrounding walls of the mosques (Sources of mosques current plans: Çatalca Ferhad Pasha Mosque (Ülgen, 1989), the others (Necipoğlu, 2005); Pervititch Maps, 1922-1945 (Pervititch, 2000); German Blues, 1913-1914 (Dağdelen, 2006); photographs (Author, 2018).

One more example is the surrounding walls of Kılıç Ali Pasha Mosque. A part of the surrounding walls of Kılıç Ali Pasha Mosque was destroyed by road works in 1958 and re-constructed according to the Construction Zoning Law, No. 6785 of 09.07.1956, and the Land Acquisition Act, No. 6830 that were approved with the aim of to relieve the traffic in the city and to open up the surroundings of squares and mosques[15]. Also, the Pervititch Maps (1922-1945) shows the eight shops (not available today) that abutted the north wall (Table 1). On the other hand the photos of Süleymaniye Mosque, dated mid-19th century and 2018, show that the dimensions and form of the wall components are similar (Fig. 2).



F. 2. The south-eastern surrounding wall of the Süleymaniye Mosque; a) measured drawings show components of the wall (Author, 2019), b) 2018 (Author), c) between 1853 and 1857 (Robertson & Beato, http://hdl.handle.net/10020/96r14_ref16792_tbp Access Date: 02.10.2019)

In Ottoman mosque architecture, the surrounding walls generally are composed of a combination of doors, iron-grilled windows, copings, and the wall structure itself. However, these components may vary depending on the walls. For example, the jamb

15 Behçet Ünsal, "İstanbul'un İmarı ve Eski Eser Kaybı", **Türk Sanatı Tarihi Araştırma ve İncelemeleri Dergisi,** V. 2, 1969, p. 46; Hans G. Egli, **Sinan An Interpretation,** İstanbul 1997, p. 133; Wiener, **op. cit.**, pp. 430-431; For visuals see: Cornelius Gurlitt, **Die Baukunst Konstantinopels**, Berlin 1912, drawing 27f.

is not present in all windows, and in some cases, the walls have wider base. Moreover, although it is known that wooden beams and iron clamps are used in the walls in order to improve the stability of masonry walls, no information about their usage has been found in the site examinations and literature review[16].

In addition to these common components, some walls have different elements such as fountains, sebils, columns, and arched passages for various purposes (Fig. 3). Orman[17] and Egemen[18] stated that, on the surrounding walls of the Şehzade Mosque, theseelements were constructed to the sides or wall thickness of the windows (*hacet penceresi*) which were added in later periods for viewing tombs (Fig. 3). Furthermore, according to Erzen, these additions provided a connection between the structure and the city. [19]

F. 3. The window details of Şehzade Mehmed Mosque; a) Safiye Sultan window *sebil*, b) twins fountains, c) the arcades in the wall thickness of the quadruple windows, d) Gevher Sultan window *sebil* (Author, 2018)

Masonry Wall

Stone and brick were used as the main material of the examined walls. The parts of the surrounding walls facing a main street or structures such as a tomb were constructed using a cut-stone material that is more elaborate in terms of materials and techniques. On the other hand, for secondary facades, alternating stone and brick work (*almaşık*) or a rubble stone masonry technique was used. Lime or khorasan (*horasan*)

16 Müfit Yorulmaz, Zeynep Ahunbay, "Sinan Camilerinde Taşıyıcı Sistem Konstrüksiyon", **II. International Congress on the History of Turkish and Islamic Science and Technology,** V. 3, 1986, p. 129; Neslihan Sönmez, **Osmanlı Dönemi Yapı ve Malzeme Terimleri Sözlüğü**, İstanbul 1997, p. 56; Hüsrev Tayla, **Geleneksel Türk Mimarisinde Yapı Sistem ve Elemanları**, İstanbul 2007, pp. 276-284.

17 Orman, **op. cit.,** 2000, pp. 22-37.

18 Affan Egemen, **İstanbul'un Çeşme ve Sebilleri**, İstanbul 1993, p. 782-783.

19 Erzen, **loc.cit**; Jale Nejdet Erzen, **Mimar Sinan Cami ve Külliyeleri, Mimar Sinan Cami ve Külliyeleri Tasarım Süreci Üzerine Bir İnceleme**, Ankara 1991, p. 100.

mortar was used as a binder. The thickness is approximately the same throughout the whole wall and varies between 52 and 98 cm (Table 1). Mortar thickness varies between 1.5 and 2.5 cm. However, the dimensions of the stones differ from structure to structure and even within the same structure, so it is not possible to mention a standard size for stones. The surrounding walls of the nine mosques were constructed with three different techniques:

- **Cut-stone (ashlar) bond:** It is the most commonly used technique. Two different cut- stone bonding techniques were observed in the studied surrounding walls; a fine cut-stone bond (*akçe geçmez*[20]) and a cut-stone bond:

  Cut-stone bond (without joint): Instead of mortar, iron clamps are used to bind cut-stones. . Stone heights vary between 11 and 42 cm[21] (Table 1).

  Cut-stone bond (with joint): Mortar is used to bind cut-stones. Stone heights vary between 11 and 23 cm and mortar thickness is 2.5-3.5 cm (Table 1).

- **Cut-stone/brick alternating bond:** This technique was only used in Zal Mahmud Pasha Mosque (Table 1). A part of its west and northeast wall has been constructed by repeating three-rows of brick and a row of cut-stone. Stone heights are 25 cm, brick sizes are 30 x 3.5 cm, and mortar thickness is 2.5-3 cm (Table 1).

- **Rough cut-stone bond:** This technique was only used on the western surrounding wall of the Kara Ahmed Pasha Mosque facing the graveyard (*hazire*) (Wall "c" (green) in Table 1). Brick material was used in a very small amount and irregularly in the wall. Among rough cut-stones, poorly regulated bonds were formed with 1.5-2.5 cm joints with mortar (Table 1).

The surrounding walls heights vary between the mosques and/or in the same mosque depending on the following reasons:

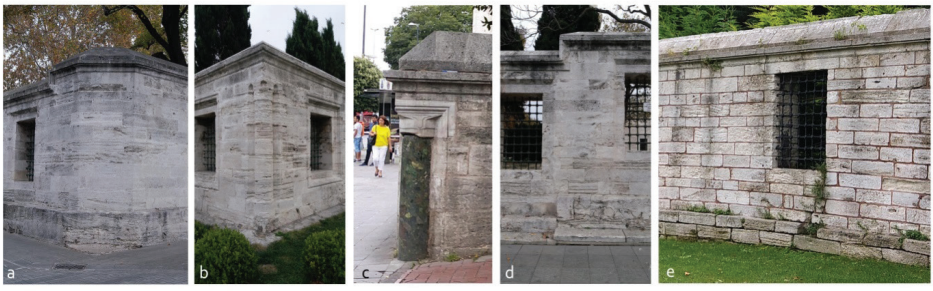
Visual concern: The positioning of the surrounding wall near a landscape, a main road or an important structure such as a tomb has caused the wall heights to be differentiated at these points. Two such examples of this are the increases in wall height in the Sehzade Mehmed Mosque's western wall's windows and Zal Mahmud Pasha's eastern wall's windows, which are both located in front of a tomb (Fig. 4). Another example is the surrounding wall in the north-east direction of Süleymaniye Mosque. The wall's height was reduced in this direction in order to see the Golden Horn.

20 Tayla, **op. cit.,** p. 241.

21 Because the stone lengths are quite variable, the exact dimensions cannot be given.

F. 4. a) Şehzade Mehmed Mosque, b) Zal Mahmud Pasha Mosque (Author, 2018)

Interventions throughout history: The surrounding walls' heights were differentiated depending on the repairs made in the historical process.[22] For example, in the road works of 1958, the reconstructed surrounding wall was built 50 cm below the original height. Therefore, the windows became very close to the pavement level and their ratio had changed.[23]



F. 5. The corner turns (*çal köşe*); a, b) Süleymaniye Mosque, c) Şehzade Mehmed Mosque, and the wall base (*duvar pabucu*); d) Süleymaniye Mosque' west surrounding wall, e) Şehzade Mehmed Mosque's north surrounding wall (Author, 2018)

On some walls, it is seen that different elements have been used in order to soften corner turns called "*duvar pahı, köşe pahı,* or *çal köşe*"[24] (Fig. 5a-b). However, some of them have made an impression in the urban memory with their decorative features. For example, there are assumptions that the green porphyry (*somaki*) column located at the intersection of Dede Efendi and Şehzadebaşı Streets (*Divanyolu*) of the Şehzade Mehmed Mosque pointed to the geographic centre of the city rather than softening

22 For drawing see: Ali Saim Ülgen, **Mimar Sinan Yapıları (Katalog)**, Ankara 1989, Plate 123.

23 Ünsal, **op. cit**., p. 46; For the old view of the Kılıç Ali Pasha Mosque's eastern wall's height see: Ünsal, **op. cit.**, p. 49.

24 Celal Esad Arseven, "Duvar Pahı", **Sanat Ansiklopedisi**, V.I, İstanbul 1983, p. 496.

the corner[25] (Fig. 5c). The corners of the western and northern surrounding walls of Suleymaniye Mosque are chamfered (Fig. 5a). On the other hand, there are columns at the corners of the southern surrounding wall of the mosque (Fig. 5b). In addition, in some walls, a wall base (*duvar pabucu)* was used at the bottom[26]. This formation is seen in the Süleymaniye, Kılıç Ali Pasha, and Şehzade Mosques (Fig. 5d, e).

The Coping

The coping (*harpuşta, duvar semeri*) is an element attached to a wall's upper part to protect the wall that is open to the climatic effects.[27] In traditional Ottoman architecture, the copings were made with plaster, mud mortar, reed, pantile, classic brick, rubble stone, flat (*plaque*) stone, and cut stone.[28] In classical period monumental architecture, although the copings were mostly made of limestone cut-stone, some were made with brick. The copings generally consist of two parts. The first is the sloped upper part that allows the water to flow, and the second is the cornice that allows the water to be removed from the wall in the part where it sits on the wall (Table 2). These two parts are mostly made of separate stone blocks and of the same material. However, the Kılıç Ali Pasha Mosque's copings were made from a single stone block (Table 2).

The copings were usually made of sloped-cut limestone and their heights varied between 40 and 50 cm (Fig. 2). There are samples with and without mortar. However, depending on the size, width, and height of the coping, its slope also differs. Cornice moldings occur from the combinations of the fillet (*asaba*), the hollow section (*kepçe*), the bead section (*kaval*), the pear-shaped (*armudi*), and 45° chamfer (Table 2). The coping schemas are symmetrical in all of the structures examined.

The copings of the surrounding walls which are located on sloping terrain were formed in three different ways:

- **The windows and the copings are the same height on the whole wall, only the floor is inclined.** Accordingly, there is a height difference between the beginning and the end of the wall. This formation is seen on Kilic Ali Pasha Mosque's eastern wall and the level difference between the two points is 85 cm (Fig. 6a). There is a similar formation in Haseki and Çatalca Ferhad Pasha Mosques. Although the land was not inclined in the eastern wall of the Çatalca Ferhad Pasha Mosque, the stepped entrance continued towards the south direction, and it caused a difference of 50 cm between the north and south of the walls.

25 Gülru Necipoğlu, **Sinan Çağı,** İstanbul, 2013, p. 264.

26 Celal Esad Arseven, "Duvar Pabucu", **SanatAnsiklopedisi**, V. I, İstanbul 1983, p. 496.

27 Sözen and Tanyeli, **op. cit.,** p. 110.

28 Celal Esad Arseven, "Duvar Semeri", **SanatAnsiklopedisi**, V.I, İstanbul, 1983, p. 496; Sedat Hakkı Eldem, **Yapı**, İstanbul, undated, B2/6-7; Tayla, **op. cit.,** p. 286.

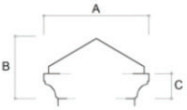
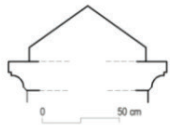
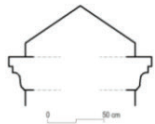
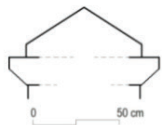
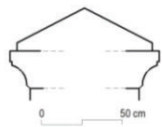
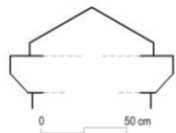
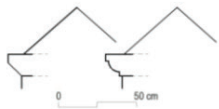
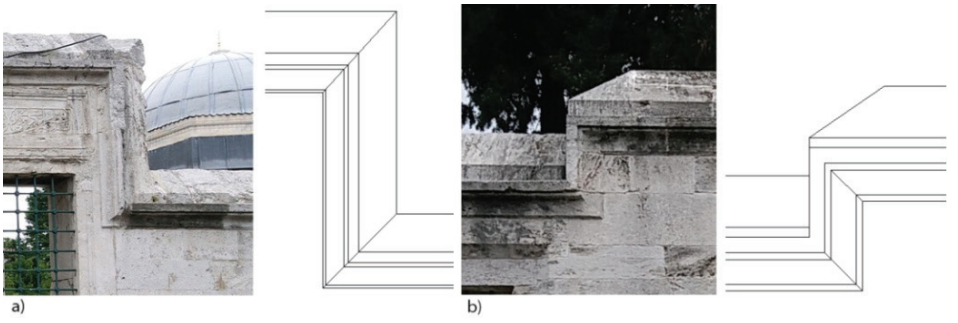
mosque	wall location	A	B	C		
						
Şehzade Mehmed Mosque	south west + south east	102 cm	55 cm	18 cm		
Süleymaniye Mosque	north west + south west + south east	125 cm	75 cm	29 cm		
Kara Ahmet Pasha Mosque	south west	87 cm	45 cm	16 cm		
Kadırga Sokollu Mosque	north east	92 cm	50 cm	23 cm		
Çatalca Ferhad Pasha Mosque	north east + north west	95 cm	45 cm	20 cm		
Haseki Mosque	north	86 cm	44 cm	14 cm		
Zal Mahmud Pasha Mosque	west	88 cm	45 cm	16 cm		
Atik Valide Mosque	south East + north east	82 cm	42 cm	16 cm		
Kılıç Ali Pasha Mosque	south west + north east + east	90 cm	50 cm	21 cm		

Table 2. Coping measurements and material features (Photos source: Author, 2018; measured drawings source: Author, 2019)

- **The coping is gradually shaped in the direction parallel to the road slope.** In the Süleymaniye Mosque, the coping of the north and west walls is cascaded in parallel to the road slope. In the base section of the wall, a similar step has been made (Fig. 6b). Also, there is a similar gradual descent in the Eyüp Zal Mahmud Pasha, Kadırga Sokollu, and Çatalca Ferhad Pasha Mosques. With this type, the coping were made in two different shapes. In the first example, the roof part of the coping continues to rotate vertically (Fig. 7a). In the other example, the roof ends at the upper elevation and does not continue vertically (Fig. 7b).
- **The coping is formed parallel to the ground slope.** Accordingly, the windows are also cascaded in the direction of slope. This formation is seen in the Kadırga Sokullu Mosque (Fig. 6c).

F. 6. The coping formation; a) the eastern surrounding wall of the Kılıç Ali Pasha Mosque, b) the western surrounding wall of the Süleymaniye Mosque, and c) the eastern surrounding wall of the Kadırga Sokullu Mosque (Sources: Author, 2018)

Also, it is seen that different formations are used together in some walls. For example, the eastern surrounding wall's coping of Kadırga Sokullu Mosque are both inclined parallel to the road and cascaded. Especially in long walls such as the eastern and northern walls of the Süleymaniye Mosque, where the height of the wall is highly increased due to the slope, this formation was preferred.



F. 7. The coping shapes in cascaded wall; a) Şehzade Mehmed Mosque, b) Süleymaniye Mosque (Photos source: Author, 2018; measured drawings source: Author, 2019)

F. 8. Şehzade Mehmed Mosque, 1958; a) Şehzadebaşı Street view; b) the corner detail of coping (Source: https://saltonline.org/, TASUH3937 Ülgen Family Archives Access Date: 02.10.2019)

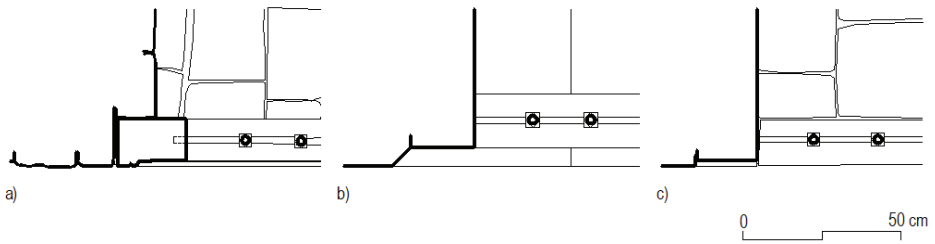
F. 9. a) Şehzade Mehmed Mosque, the coping in the intersection of Şehzadebaşı Street and Dedeefendi Street, 1958 (https://saltonline.org/, TASUDOC0190 Ülgen Family Archives Access Date: 02.10.2019),
b) Şehzade Mehmed Mosque, coping detail in Dedeefendi Sokağı, 2018 (Source: Author), c) Edirne Beyazıt II Complex, coping detail in surrounding wall, 2000 (Source: Tayla, 2007),
d,e) restoration photo of a wall in Süleymaniye Mosque, 1957-1961 (Source: https://saltonline.org/ Ülgen Archives Access Date: 02.10.2019),
f) Zal Mahmud Pasha Mosque, 2018 (Source: Author)

Figure 8 and 9 show that the roof parts, which are missing or standing in an irregular manner, are monolithic and have been constructed independently from the cornice.

The Iron-Grilled Window

The window openings generally consist of the lintel, the jamb, and the iron (knotted) grille (*lokma parmaklık*), but not all of these elements are present in all the wall samples. Some of them were built simple while some more ostentatious. It can be said that these formal differences are directly proportional to the importance of the space where the wall is located. In all windows, a lintel was used for structural requirements and a knotted grille to close the window opening. However, some of them do not have jambs. Accordingly, the iron grilled windows are divided into two, with or without jambs:

a. **The windows with jambs:** All of the windows of the Çatalca Ferhad Pasha and Zal Mahmud Pasha Mosques, some of the windows of the Şehzade Mosque and the Kara Ahmed Pasha Mosque have jambs. The thicknesses of the jambs are in the 18 cm to 28 cm range. Marble and limestone were used as materials. The moldings were generally made of bead, fillet, and hollow sections in different sizes and forms (Table 3, Table 4). Because some windows jambs of the Kara Ahmed Pasha Mosque are missing, junction details of the jambs and walls can be seen (Fig. 10a, Fig. 11b). A similar situation can be seen on restoration photographs dated 1957-61 of the Süleymaniye Complex. The jamb sits in the groove that was made on the edges of the window opening. However, connection details cannot be seen on-site examinations.



F. 10. The jambs details of surrounding wall iron grilled window;
a) KaraAhmed Pasha Mosque, b) Kılıç Ali Pasha Mosque, c) Haseki Sultan Mosque (Author, 2019)

F. 11. Connection details of the jambs with the wall;
a) A restoration photograph of a wall in Süleymaniye Mosque, 1957-1961 (https://saltonline.org/ Ülgen Archieve Access Date: 02.10.2019), b) The south-western wall of Kara Ahmed Pasha Mosque, 2018 (Author)

b. The windows without jambs: We can split these into three sections: windows made with 45° chamfer or molding, windows made by lowering the wall surface, and windows made completely without jambs:

- *Windows made with 45° chamfer or molding*: In these examples, the masonry was beveled as a jamb on the edges of the windows. This can be seen in the windows of the Süleymaniye Mosque's western and northern surrounding walls, and all surrounding walls of the Kılıç Ali Pasha Mosque (Table 3, Table 4 and Fig. 10b). The chamfer detail is not always equal in dimensions and shapes on each side. For example, the Kılıç Ali Pasha and Süleymaniye Mosques' windows have a 45° chamfer at the top and sides, but there is no chamfer at the bottom (Table 3, Table 4).
- W*indows made by lowering the wall surface*: This example is seen in the windows of the Haseki Mosque's north-east surrounding wall (Table 3 and Fig. 10c).
- *Windows completely without jambs*: Some windows consist only of a window opening and have not any jambs. Examples of this can be seen in some of the windows of the Kara Ahmed Pasha, Şehzade Mehmed, Haseki, Atik Valide, and Kadırga Sokullu Mosques (Table 3, Table 4).

A further component of the windows, the knotted grille was used in all of the examined windows. Their dimensions are similar, and the distance between the bars, that are mostly 15 cm, varies between 12 and 18 cm. Due to broken stones, the part of the iron grille that entered 4 cm inside the wall can be seen in the Şehzade Mosque's quadruple windows (Fig. 12a-d).

F. 12. Connection details of iron grilles with jambs;
a) Kara Ahmed Pasha Mosque, b-d) Şehzade Mehmed Mosque (Author, 2018)

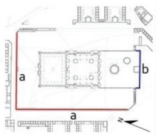
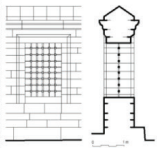
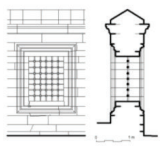
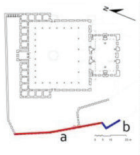
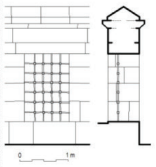
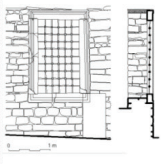
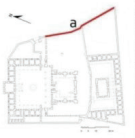
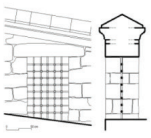
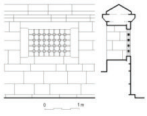
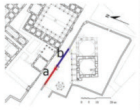
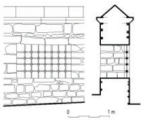
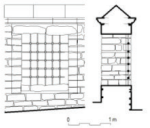
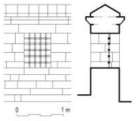
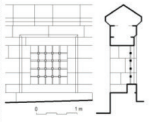
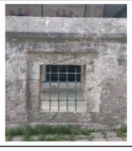
mosque	window location	window	jamb					Window dimensions	marble:M limestone:L		photographs
			with jambs		without jambs	in wall	material		a	b	a/b
			in	out							
Süleymaniye Mosque		a				+	L	116x172 cm			
		b				+	L	102x134 cm			
Kara Ahmed Pasha Mosque		a			+			93x142 cm			
		b	-	+			L	100x180 cm			
Kadırga Sokollu Mosque		a			+			83x126 cm			
Çatalca Ferhad Pasha Mosque		a	-	+			L	80x120 cm			
Haseki Mosque		a			+			132x81 cm			
		b			+			116x 116 cm			
Atik Valide Mosque		a			+			58x75 cm			
Kılıç Ali Pasha Mosque		a				+		92x95 cm			

Table 3. Window dimensions (dimensions are given from inside the jambs) (sources of the mosques current plans: Çatalca Ferhad Pasha Mosque, Ülgen, 1989; the others, Necipoğlu, 2005; source of the drawings: Author, 2019; source of the photographs: Author, 2018)

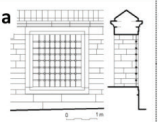
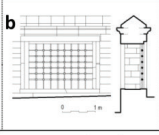
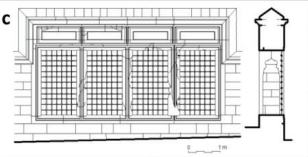
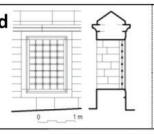
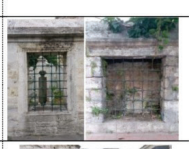
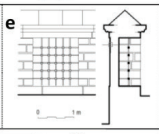
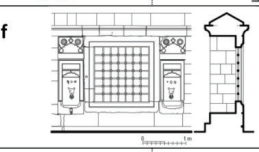
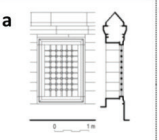
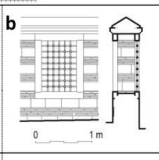
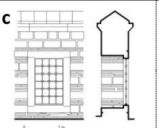
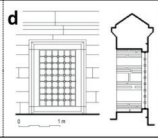
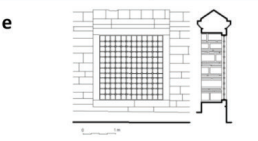
mosque	window location	window	jamb: with jambs – in	jamb: with jambs – out	jamb: without jambs	jamb: in wall	jamb: material	window dimensions	marble: M limestone: L	photographs
Şehzade Mehmed Mosque		a	-	+			L	157x170 cm		
		b	-	+			M	192x136 cm		
		c	-	+			L	110x205 cm (each window)		
		d	-	+			L	92x134 cm		
		e			+			127x135 cm		
		f		+			L	125x125 cm		
Zal Mahmud Pasha Mosque		a	-	+			M	95x148 cm		
		b	+	+			L	62x92 cm		
		c	-	+			L	90x140 cm		
		d	-	+			M	90x138 cm		
		e	-	+			L	195x198 cm		

Table 4. Window dimensions (dimensions are given from inside the jambs) (Source of the mosques current plans: Necipoğlu, 2005; source of the drawings: Author, 2019; source of the photographs: Author, 2018)

Evaluation and Conclusion

The following results are achieved with the data obtained from this study:

- The materials of the surrounding walls vary according to the importance of the structure and the financial resources allocated for their construction. According to this, different materials and level of craftsmanship have been applied to different facades of some structures, depending on the position and importance of the facade (Table 1). All surrounding walls of four of the mosques were constructed with cut-stone, one mosque was constructed with cut-stone with joints, and one mosque was constructed with rough-cut stone. Different techniques were used together in the surrounding walls of the remaining three mosques. In each mosque, one or more walls were constructed with cut-stone, while others were constructed with cut-stone with joints or rough cut-stone and alternating cut-stone and brick (Table 1).

- Although the sizes are different, five different cornice schemes are used in the surrounding walls. The most commonly used schema consists of the fillet and 45° chamfer (Table 2). Only in the Şehzade and Haseki Mosques are the roof parts equilaterally triangular with no vertical parts (Table 2). In the archives of the Süleymaniye and Şehzade Mehmed Mosques, it was stated that the cornice and roof parts were monolithic. Although there is no such information in the other mosques' archives, it is determined from site examinations that these parts are independent of each other in terms of stone length differences of the roofs and cornices.

- Although there is no specific standard in the window heights, it is seen that the window heights were built in such a way that to allow the interior to be seen from the outside. Thus, the relationship between the structure and the environment was established. The windows are mostly vertically rectangular. The Kılıç Ali Pasha, Kara Ahmed Pasha, Süleymaniye, Atik Valide, and Zal Mahmud Pasha Mosques' windows are formed in a certain order. However, in the other structures, the windows' sizes, shapes, and repetitions are irregular (Table 3, Table 4). The window jambs are mostly used on the exterior sides of the surrounding walls, except for all the windows of Suleymaniye Mosques and some of the windows of the Zal Mahmud Pasha Mosque.

The surrounding walls of each mosque examined in this study are shaped depending on the mosque's size and material features. It was seen that the formation properties of the surrounding walls were differentiated depending on their location, topography, visual concern, and the restorations. However, their construction techniques, materials, and components were similar. Ensuring the sustainability of the integrity of the wall as a complementary value to the city depends on the preservation

of its original construction techniques and materials. This study is important in order to draw attention to the surrounding walls' original materials and components that need to be preserved.

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