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Earthen Heritage
New Technology, Management
7th International Conference

5-7 September 2019
Köyceğiz, Muğla, Turkey

HASAN KALYONCU UNIVERSITY

VOLUME

II

Proceedings for the
Seventh International Conference
Kerpiç'19
Earthen Heritage, New Technology, Management

5-7 September 2019
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Hasan Kalyoncu University & Kerpiç Network

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New Technology, Management

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- Studies on Information and documentation Systems
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- Protection against environmental effects and disasters, evaluation of risk
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- Heritage site planning and management
- Case studies
- Cultural heritage education, skill development and communication by innovative systems
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- Sustainable architecture

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Over thirty years, Kerpiç–network is carrying researches on durability, seismic response and production techniques on earthen construction material. Durability researches are based on gypsum & lime stabilization of earth, called "alker"; seismic response researches are based on horizontal energy dissipating surfaces in the load bearing walls and production techniques are based on shotcrete and compacting production of earthen walls. www.kerpic.org, info@kerpic.org We are pleased to announce the Call for the 7. international conference on kerpiç'19 "Earthen Heritage, New Technology, Management" and the workshop on production: 5,6,7 September 2019 Organized by Kerpic Akademi and Kerpic Network.

The conference scope will focus on using earth for housing, "Earthen Heritage, New Technology, Management", The study will range from the graduate programs, together with the academics and professionals to exchange results and experience. It will be an opportunity to understand the strategy and the advances how to use the contemporary construction technology, using earth-based material.

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Documentation Studies and Material Researches of Ramazan Semseddin Mosque in Ankara


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ABSTRACT

Adobe has been used by the human being as a building material since the first settling ages in Anatolia. It was preferred as an economical building material that could easily be found in the immediate surroundings. Especially in the inner parts of the country, mudbrick was used in the construction of many historical buildings. In this context, it can be said that adobe was a preferred building material for a period of time in Ankara.

If the development of Ankara is examined in the historical process, it is understood that Ankara is a city which covers the urban spaces and structures belonging to the previous periods. In and around the citadel, which is the center of the city throughout history, the structures of the Roman Period, as well as Seljuk, Ottoman, and Republican Periods can be seen together.

After the city became a Turkish land, many buildings with commercial, social and religious functions were built. Some of these structures couldn't survive and some survived by losing their architectural properties and historical value. A large number of mosques were built in the city during the construction activities carried out in the Ottoman period.

Ramazan Şemseddin Mosque, which is located in the inner citadel in Ankara, is one of those religious buildings constructed during the Ottoman period. According to the researches, it is estimated that the mosque was built in the early 17th century. It is understood that stone was used in the construction of the wall foundations of the mosque and the upper parts were built by using mud bricks and its supported by wooden beams.

In this study, some part of documentation studies of Ramazan Şemseddin Mosque, its conservation problems, material researches and results of the analysis are presented.

Keywords: Mudbrick, adobe, Ramazan Şemseddin mosque, conservation, material analysis.

1 INTRODUCTION

Ramazan Şemseddin Mosque, located in the Inner Citadel/ İç Kale district was registered as an immovable cultural asset with the decision dated 14.10.1972 and numbered 6691 of the High Council of Real Estate Antiquities and Monuments. In 2008, the structure was documented within the scope of the conservation project and the change of the structure in the historical process was researched. Besides, material research was conducted to understand better the structure.

During the project period, the publications of the authors who made researches about the structure were also examined and that valuable information was used. İbrahim Hakkı Konyalı

included Ramazan Şemseddin mosque in his book on Ankara Mosques. One of the structures that Gönül Öney evaluated among the religious and social structures of Turkish age in Ankara is the mosque which is the subject of this study. Ali Kılcı, the researcher, examined the mosques built in the city in different periods and recorded the repairs implemented to those structures in his book, Altındağ's Spiritual Geography.

While Emine Erdoğan examining the settlement of historical Ankara according to Tahrir books in her research, Seyit Ali Kahraman and Yücel Dağlı translated the travelogue of Evliya Çelebi into today's Turkish.

In this study, documentation studies, monument's conservation problems and the results of the material researches are summarized and shared with researchers.

2 ARCHITECTURAL FEATURES OF THE MOSQUE

2.1 Plan Features

The triangular-shaped entrance section was added to the east side of the building. This space hasn't any historical value in terms of materials and design. A double-winged door leads to the original part of the mosque. In the right and left sides of this door, there are sets about 40 cm high, covered with wood, while the floor of the entrance hole, covered with modern tiles. The dimensions of the harim, which is the main gathering place of the mosque, are approximately 7.25 m x 7.75 m and the floor is covered with wood and carpet. The walls and wooden ceiling are plastered and painted in white. In the center of the ceiling, there is a wooden hexagonal shaped and profiled core which is painted brown color. There are gilded leaf motifs which are oriented to four sides inside the core.

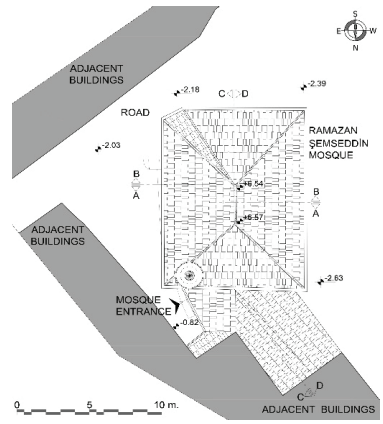


Figure 1. The location of the mosque and the entrance of the castle.
Figure 2. Site plan.

In the south (qibla) wall, there are 2 rectangular-shaped windows at the bottom and 3 rectangular windows at the top. This wall also has mosque elements such as mihrab and minbar. In the eastern wall, there are 2 windows and 2 niches at the lower level. The 3 top windows are smaller than the lower windows.

In the western wall, there are 2 windows at the lower level and 1 window at the top. All the windows in this wall have wooden frames and painted with oil paint. Some of the original window shutters on this facade do not exist in their original place.

The lower level windows in the south and east walls are decorated by using mural paintings. Ornamentation elements weren't used around the upper windows. Also, there isn't this type of decoration around the windows of the western wall.

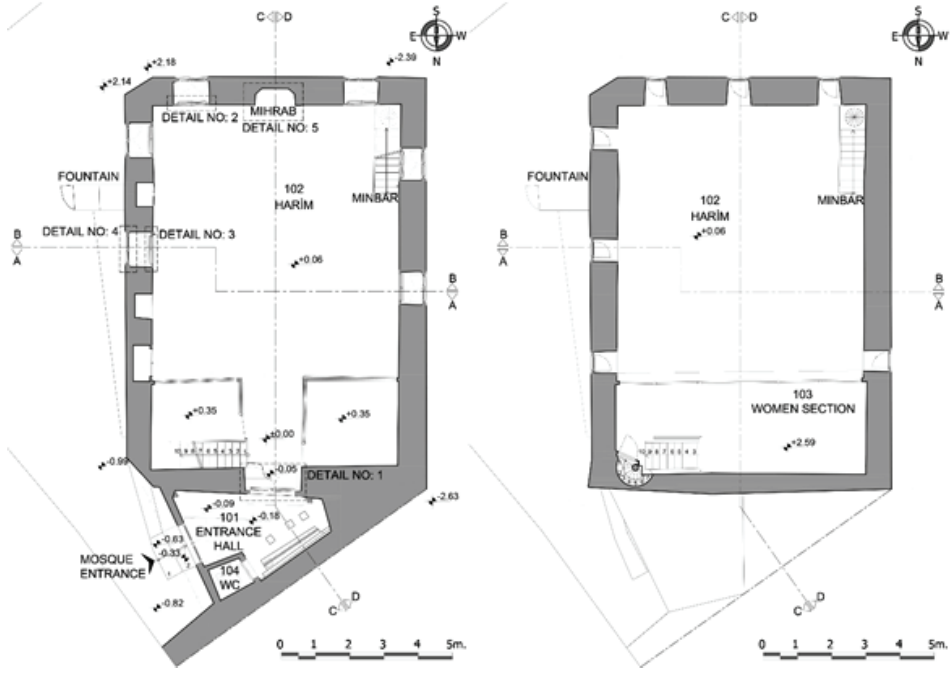
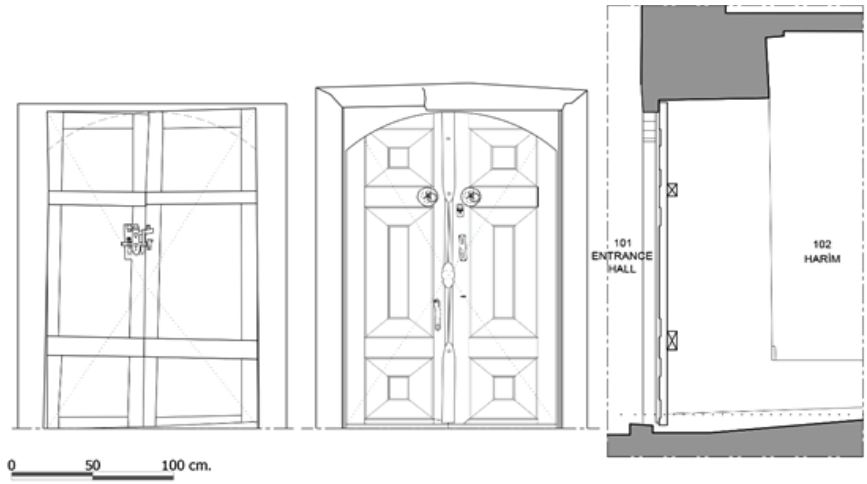


Figure 3. +1.20 level plan.
Figure 4. +3.30 level plan.

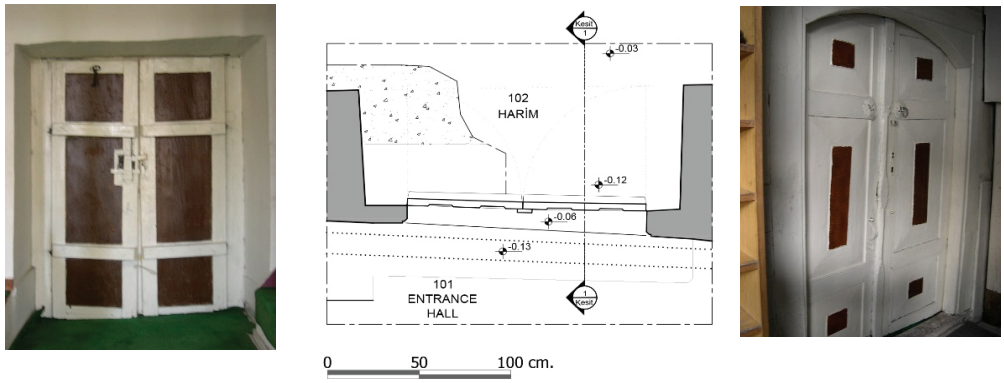
In the east wall, carnations, pomegranate flowers, and hatayi motifs are observed in the frames of the windows, while the southern wall windows have rose blossom, pomegranate flower, and leaf motifs. Motifs are dominated by red and green colors. Kelime-i tevhid "Lâ ilâhe illallah Muhammedün resûlullah" from the Koran is written on the top part of all windows.

The door which provides entrance to the harim is arched and the door sill is made of stone. Wooden door wings have three-table and are painted in white and brown. The door is mounted to the frame with ring-shaped interlocking hinges.

Figure 5. Decoration of the windows on the eastern wall (Detail no: 2, 3).



Back elevation Front elevation Section

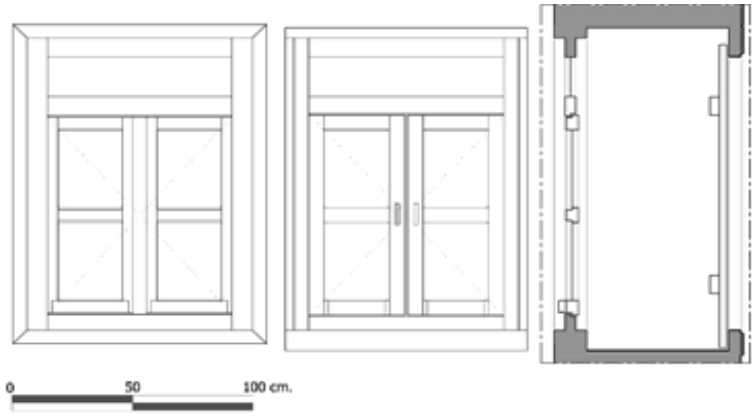


Back elevation photo Plan Front elevation photo

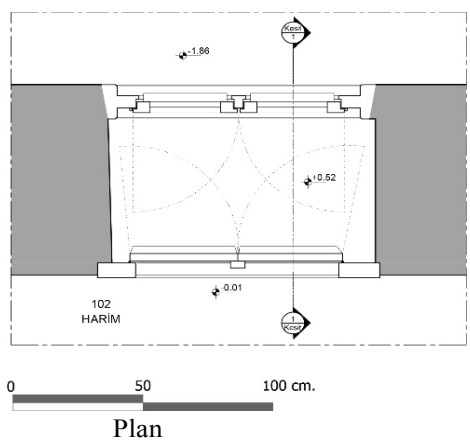
Figure 6. Detail of the entrance door (Detail no: 1)

The women section is located in the north direction of the harim and is carried by four wooden posts. There is a wooden staircase on the east side of the entrance, adjacent to the north wall to reach to the women section. The gallery overlooking the harim has plain wooden railings. There is also a gate to the minaret on the northeast corner of the place.

Figure 7. Ceiling decoration.
Figure 8. View of the north wall of the Harim.



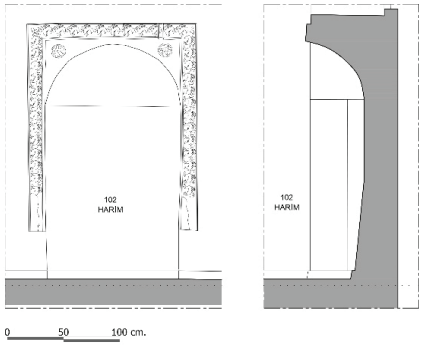
Back elevation Front elevation Section



Plan

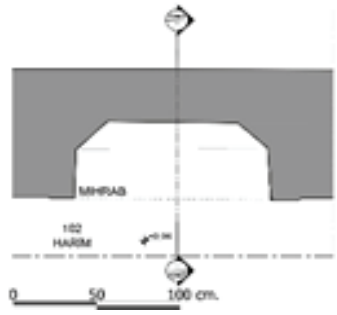
Figure 9. Window detail (Detail no: 4)
Figure 10. East elevation and fountain.

The rounded arched mihrab in the qibla wall was decorated with herbal-style embossed motifs and painted with gilding paint. The side panels of the minbar were made of wood in a rectangular shape. The same arrangement can be seen on the side surfaces of the kiosk. The kiosk has a pointed cone on top of it.



Elevation Section

Figure 11. View of the south wall of the Harim



Plan

Figure 12. Mihrab detail (Detail no: 5)

2.2 Exterior Features of the Mosque

The foundation of the building was built with rubble stone while the mudbricks were used for the upper part of the structure. The building is supported by wooden beams used at certain levels. The roof is covered with tiles. A wooden minaret rises through the roof, in the northeast corner of the structure.

The mosque hasn't the last prayer hall. On the eastern facade, the left and right corners of the original walls are chamfered. The windows are located on two different levels, as bottom and top. The rubble stone wall at the bottom of the facade was grouted using cement.

Figure 13. South elevation of the fountain
Figure 14. South and east elevation

A corner of the southern facade is orthogonal, but the other corner is chamfered. There are 2 windows in the lower part and 3 windows in the upper part and these windows have the same characteristics as the windows on the east and west facades. The western facade of the building has 2 windows at the upper part and 1 window at the bottom part.

An additional entrance section with no windows was added to the north facade of the building. The wooden minaret on the northeast corner of the building is quite plain without decoration. There is a stone fountain adjacent to the building. Although it does not have an inscription, it can be dated to the end of the 19th century and early 20th century according to the construction style [1]

3 BRIEF HISTORY OF THE BUILDING

There isn't a historical document such as an inscription or written document which gives full information about the construction date of Ramazan Şemseddin Mosque.

In a survey conducted based on Şer'iye registers that Ramazan Şemseddin district was set up inside the inner castle of Ankara at the end of the 16th century. In that period, the neighborhoods in Ankara either arose around a religious building or arose as a result of the wishes of some of the occupational groups or those gathered around the same religious belief and tradition [2]. This perspective strengthens the thesis that the mosque was built in the name of Şemseddin at the end of the 16th century or more probably early in the 17th century.

In the study of Ceylan and Aydın, "When the 17th century period of the Ottoman Classical Period came to an end, two buildings of Şerefeli (Resul Efendi) Mosque (1674-75) and Ramazan Şemseddin Mosque (Kale Pazarı) were built in the 17th century. It is possible to say that this period mosques continue the style of Ankara [3].

Gönül Öney also states that the building was built in the 17th century by Ramazan Şemseddin. Another information given by Öney about the mosque is the complete renovation of the building on the old foundations in 1954-56 [4]. However, the original elements existing in some parts of the structure and an old photograph suggest that the structure was renovated but not completely demolished in that period.

Researches show that most of the mosques in Ankara Castle and its surroundings were built without a minbar and minaret [4]. In this respect, it is considered that Ramazan Şemseddin Mosque had no minbar and minaret originally. Evliya Çelebi gives information about Ankara mosques in the travelogue. "Mosques covered lead are a few. Mosques are covered with clean earth. The rest are neighborhood masjids." [5]. The Kurşunlu Mosque, located on the Anafartalar Street in Ankara, next to the Altındağ City Hall and the Cenabi Ahmet Paşa Mosque in Ulucanlar Street are examples of mosques with domes covered lead in the 16th century [1]. It is also an indication that the soil roof is not used in all the buildings and different systems and materials were applied. The use of earth roofs in mosques and masjids in Ankara decreased after the 15th-16th century. The wooden roofs of the mosques and masjids built in the 17th and 18th centuries were carried by wooden constructions and walls [4].

The examples of ornamented wooden ceilings with hexagonal cores appear in the Hacıbayram Mosque and Hacı Musa Mosque in the 15th century [1]. Increase number of this type of examples in 16th-17th century indicate that the change in the ceiling systems of the mosques in Ankara. Comparative studies suggest that the minaret and minbar of the mosque were added in the 18th century. According to the existing fountain construction style, it was built in the late 19th or early 20th centuries.

It is known that the mosque was repaired in 1956 and 1984 [1]. The unqualified applications and the entrance section of the mosque must have been implemented during these repair works. A book on Ankara Foundation Works was published by Ankara Development Agency and short descriptions concerning the current situation of the structure were made in that publication [6].

4. DOCUMENTATION METHOD AND GENERAL EVALUATION OF DETERIORATION ANALYSIS

4.1 Documentation Method

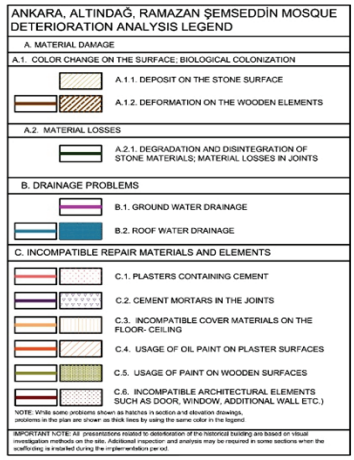
Within the scope of the survey, topographic measurement system (TPS) was used. Where the TPS system was not available, the manual triangulation measurement method was preferred for the measurement. The mural paintings around mihrab and lower level windows of the structure were drawn by using the photogrammetric data.

4.2 General Evaluation of Deterioration Analysis

In the process of detecting the damages occurring in the building, analytical drawings were prepared as a result of the two-stage work performed on-site and in the office. The building was

examined by visual methods on-site and the information obtained was processed with hatches and notes on analytical drawings. Problematic areas of the structure were photographed in detail.
The damages detected during the fieldwork were transferred to the analytical drawings using the 'Mapping Method' in the office. Each problem and damage was indicated by hatching in a different color and these hatches were identified by a legend. Thus, it was aimed to identify similar and different problems in various parts of the structure.

Damage Assessment Analysis Legend was created under 3 main headings as; * Material Damages, * Drainage Problems, and * Incompatible Interventions.



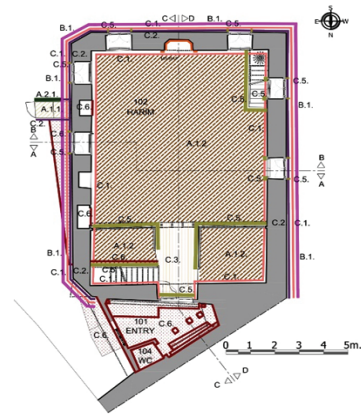
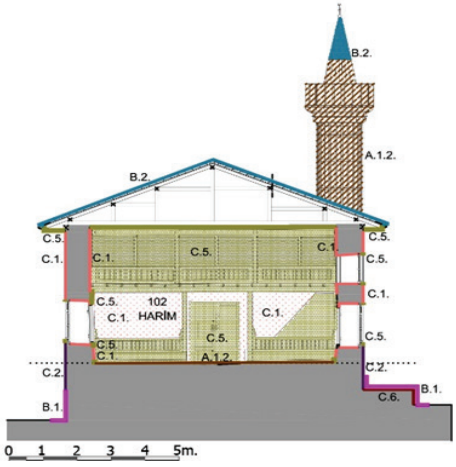


Figure 15. Deterioration analysis legend
Figure 16. +1.20 level plan



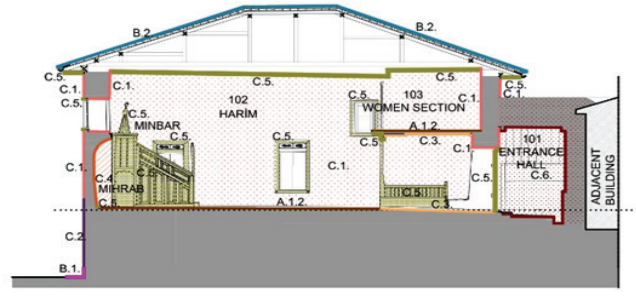


Figure 17. A- A section.
Figure 18. D- D section.

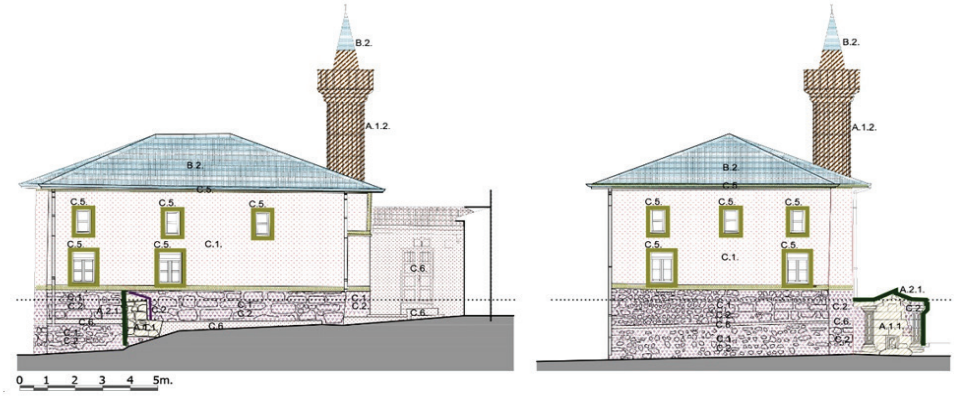


Figure 19. South elevation
Figure 20. East elevation

4.3 Explanations of Methods Used for Material Analysis

To investigate the properties of the mud brick and plaster used in the construction of the mosque, attention was paid to the selection of the samples from the departments with the least material degradation. Both visual analysis and experimental analyses were carried out during the studies and the results were evaluated. Soil Texture, XRD, and WD-XRF Analyses were performed by using the facilities of Turkish Atomic Energy Authority, Sarayköy Nuclear Research and Training Center in Ankara.

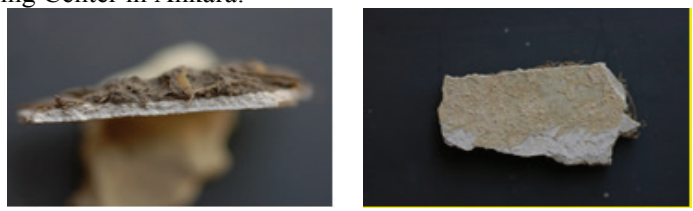


Figure 21. The appearance of mud plaster and painted layer on lime plaster
Figure 22. Close-up view of the lime plaster

Figure 23. Scaled photo of mud plaster and lime plaster as two layers
Figure 24. The appearance of mud plaster

4.3.1 Texture Analysis Method
Texture analysis is defined as the relative amount or distribution of the mineral groups of various sizes in the soil. Migrometer method is used in the texture analysis of soil material. In this method, the soil sample is sieved to a particle size of 2 mm, solution is prepared and then the measurement is made by hydrometer. According to the measurement results, the material is classified as follows;
* If the particle size is <0.002 mm, "Clay soil",
* If the particle size is in the range of 0.02 - 0.002 mm "Silt soil",

* If the particle size is between 2-0.02 mm, it is called "Sandy soil".

4.3.2 X-Ray Diffraction Diffractometer (XRD)

X-Ray Diffractometer (XRD) is one of the most important methods used in the structure analysis of powder and solid materials. X-ray powder diffraction analysis is performed using Bruker D8 Advance model.

With the copper-targeted X-ray tube, phase analysis and crystal structure analysis of materials are carried out in a temperature range of -180 ° C to + 1600 ° C and information is given about the main minerals in the material.

4.3.3 Wavelength Distributed X-Rays Fluorescence Spectrometer (WD-XRF)

- Geological, environmental, biological and archaeological samples in solid, powder, liquid form from Boron to Uranium are analyzed simultaneously (up to 50), accurate, sensitive, reliable and non-destructive.

4.3.4 Moisture and Organic Material Ratio

The samples which were pounded in a pestle and purged in a drying oven were dehumidified and weighed. In a crucible, it was heated up to 500 ºC in the oven and the organic substances were destroyed, the mixture was weighed by cooling above room temperature and the ratio of organic matter in the sample was calculated from the difference.

4.4 Results

4.4.1 Texture Analysis Method

Table 1. Texture analyses results of the samples of Mud Brick and Mud Plaster

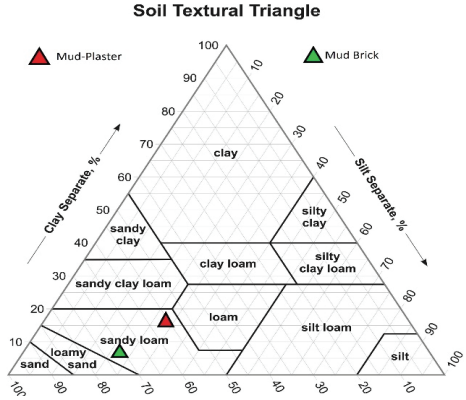
SAMPLE	SAND %	SİLT* %	CLAY %	STRUCTURE CLASS
Mudbrickk	76,6	13,8	9,6	SL**
Mud Plaster	53,4	28,7	17,9	SL

Definitions

* Silt: Non-organic, granular and highly fine (coarse than clay, but smaller than sand) material classified by grain size separation. According to the distinction accepted by the International Society of Soil Science, Silt grain size is given as 0.02 - 0.002 mm diameter.

** SL: Sandy Loam (Qualified soil type with sand, shaft, and clay.)

Table 2. Texture Triangle Diagram of Samples.



According to the triangle diagram, the samples both mud brick and mud plaster are in the area of "SANDY LOAM".

4.4.2 Ramazan Semseddin Mosque X-Ray Diffraction Diffractometer (XRD)

Table 3. XRD Result of Mud Brick sample.

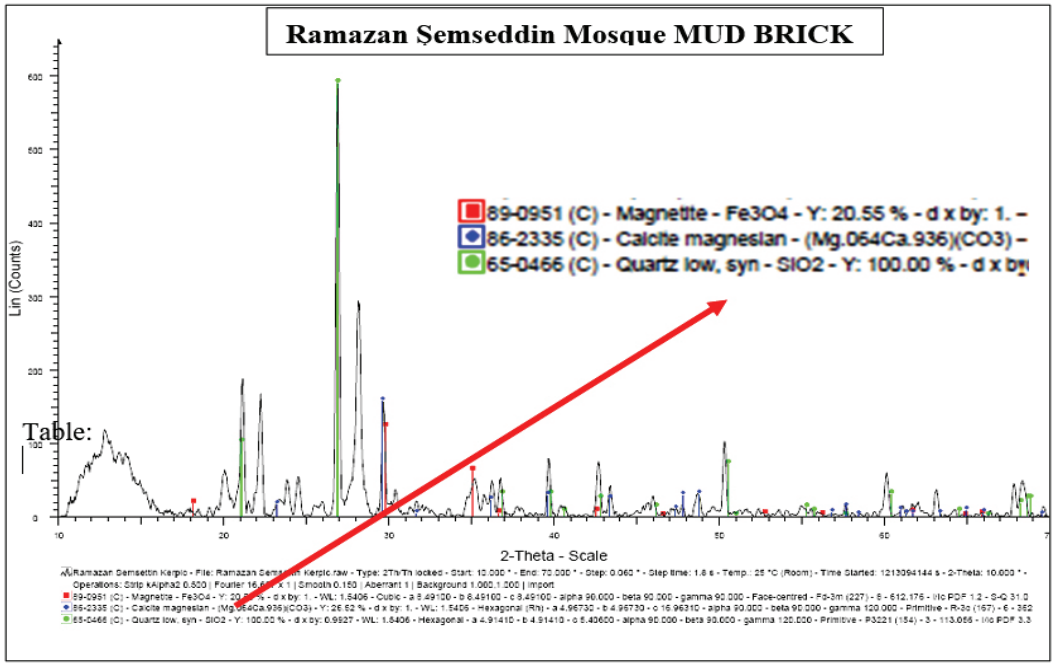


Table:

Table 4. XRD Result of Mud Plaster Sample.

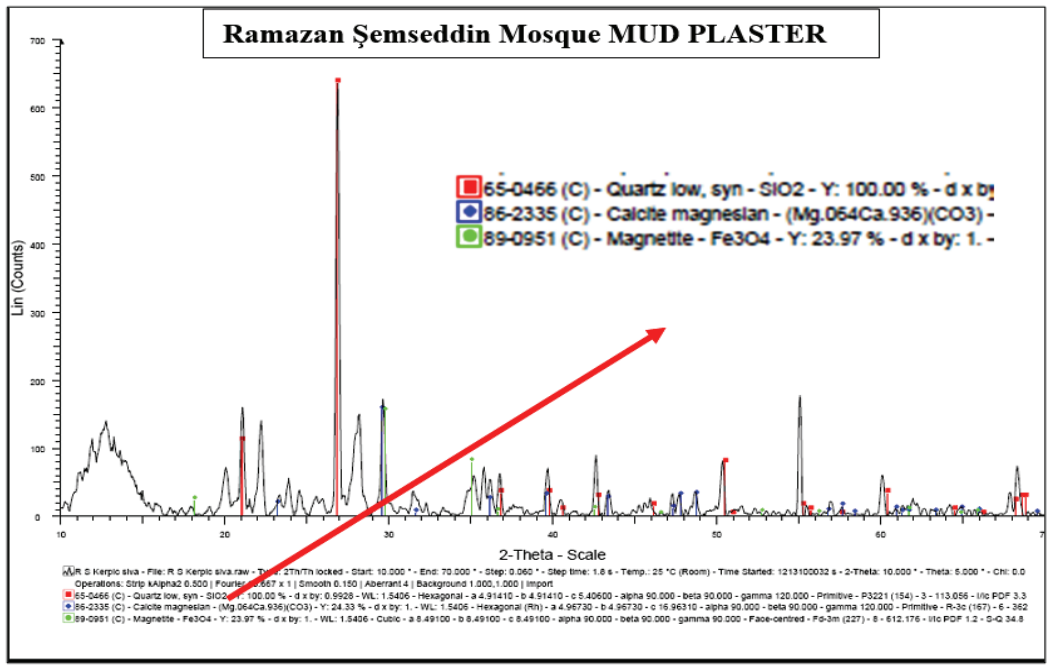
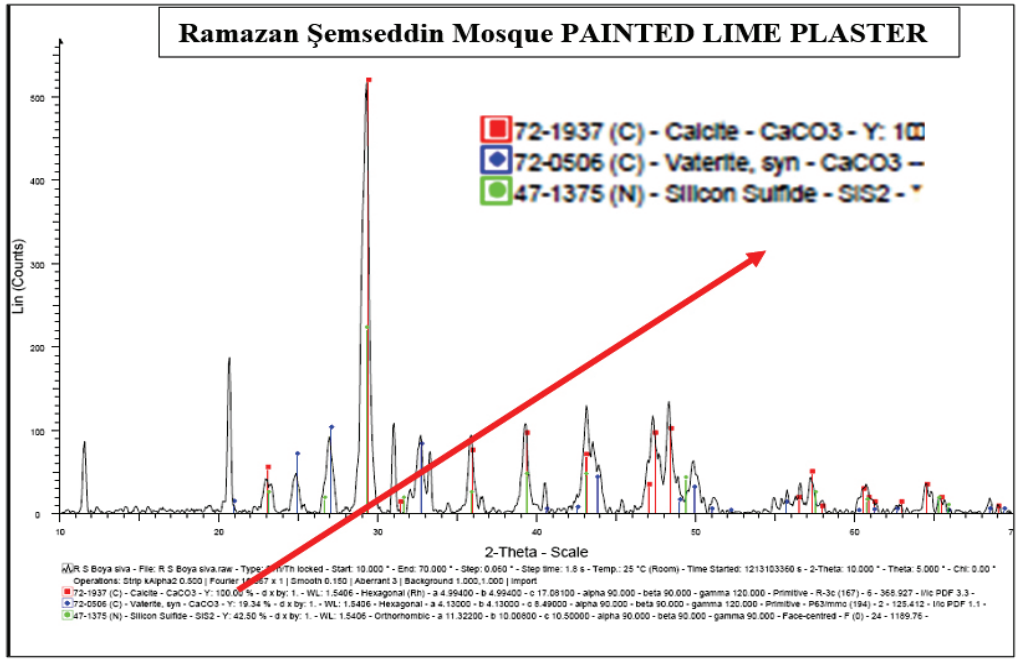


Table 5. XRD Result of Painted Lime Plaster Sample.



4.4.3 Ramazan Semseddin Mosque XRF (X-Ray Fluorescence)

MUD BRICK	
Compound	**Concentration (%)**
Na2O	1.07
MgO	2.258
Al2O3	20.211
SiO2	50.595
P2O5	2.219
Cl	0.453
K2O	2.737
CaO	8.92
Ti	0.419
Cr	0.018
Fe2O3	9.611
Ni	0.005
Cu	0.019
Zn	0.017
Ga	0.003
Br	0.002
Rb	0.01
Sr	0.05
Y	0.003
Zr	0.016
Nb	0.002
Ba	0.137
Pb	0.01
SO3	1.215

MUD PLASTER	
Compound	**Concentration (%)**
Na2O	0.902
MgO	2.222
Al2O3	19.774
SiO2	50.438
P2O5	2.617
Cl	0.329
K2O	2.707
CaO	9.554
Ti	0.44
Cr	0.013
MnO	0.019
Fe2O3	9.523
Ni	0.006
Cu	0.023
Zn	0.027
Ga	0.001
As	0.003
Rb	0.008
Sr	0.054
Y	0.003
Zr	0.02
Nb	0.002
Sn	0.005
Ba	0.136
Pb	0.016
SO3	1.156

PAINTED LIME PLASTER	
Compound	**Concentration (%)**
Mg	0
O	0
Na2O	0.848
Al2O3	1.011
SiO2	1.635
P2O5	0.081
Cl	0.808
K2O	0.082
CaO	80.048
Ti	0.018
MnO	0.024
Fe2O3	0.775
Zn	0.044
As	0.002
Sr	0.174
Pb	0.003
SO3	14.446

4.4.4 Results

When the samples taken from the Ramazan Şemseddin Mosque are examined, it is thought that the same type of soil may have been used in the production of adobe and adobe plaster since the XRF analysis results contain similar values.

Table 6. Comparison Graph of the XRF Results on Mud Brick and Mud Plaster samples

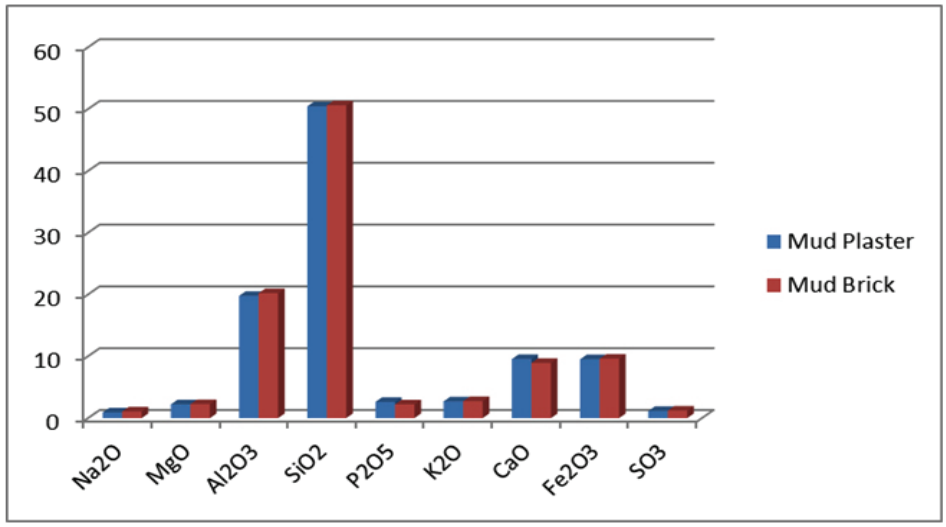
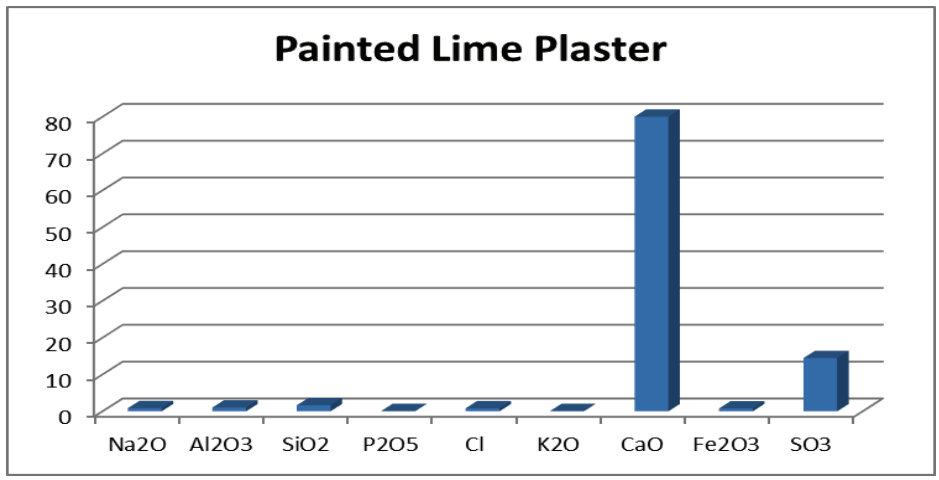


Table 7. XRF Result Graph of Painted Lime Plaster.



When the plaster sample is examined under the stereomicroscope, a layer of mud plaster is seen on the mud brick and two layers of lime plaster are seen on it. The outermost plaster is thinner than the other. The paint on the surface of the plaster is silicone-based and it is thought that the paint may have been used during repairs.

5 CONCLUSION

Today, the approach of the protection of cultural assets requires to follow a scientific procedure within its own ethical rules. This protection approach consists of studies such as documentation, analysis of material's features, diagnosis of its problems and development of preservation interventions. During the restoration works, it is important to use repair materials that is compatible with the original materials of the historical buildings.

It is known that Ramazan Şemseddin Mosque lost some of its originality due to the repairs made in the historical process. Due to the limited written resources of the building, it was difficult to access information and documents regarding the original condition of the building. However, the main approach adopted in the restoration project was to propose interventions aimed at preserving the original values of the building in terms of design, architectural features, construction system, material quality, and usage. Therefore, in all interventions to the material, it is aimed to protect the original material in place and minimum intervention principle is adopted. However, if this is not possible for structural reasons, it may be possible to replace the original material which has deteriorated with the new material.

In this research, as well as documentation of the structure, also detailed material researches about mud brick, mud plaster, and lime plaster were conducted. Then, material proposals were developed for the production of mud brick and mud plaster for the restoration implementation. According to the results of the research given above sandy loam was used for the production of both mud brick and mud plaster.

Mud Brick Production Proposal
It is recommended to use soil containing values as the mixture of 76% Sand, 14% Silt (Loam), Clay 10% for the production of mud brick. Also, since the mud brick contains approximately 9% organic material found in the analyzes, it is recommended to add 9% organic material (straw) into the mortar during the new mud brick production.

Mud Plaster Production Proposal
Likewise, for producing mud plaster, it is proposed to use 53% Sand, 29% Silt and 18% Clay. Additionally, since it is determined that the plaster material contained about 12.6% organic material in the analyzes, it is recommended to add 13% organic material (straw) into the mortar during the new mud plaster production.

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