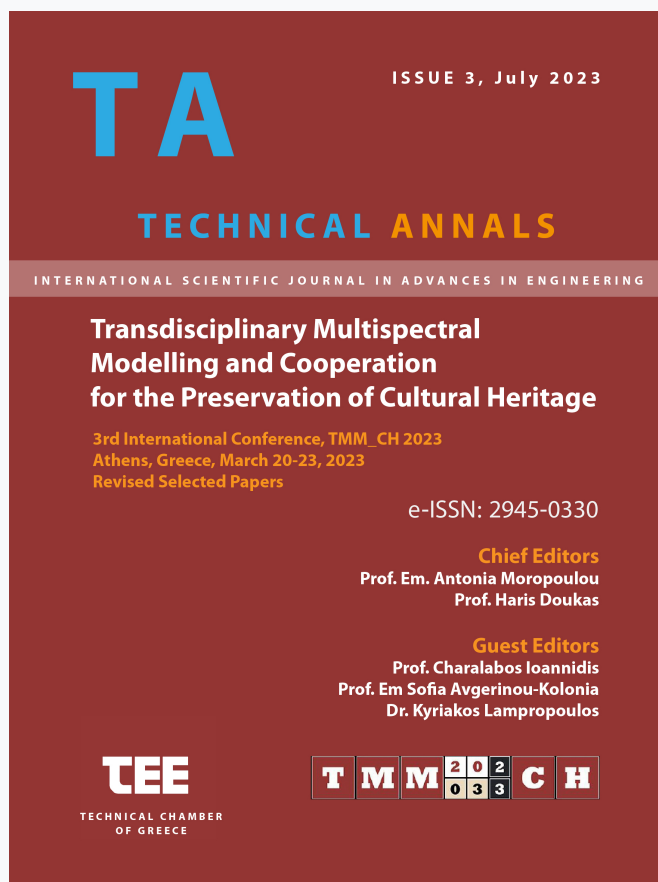


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Murat Reis complex: Survey, Documentation and Restoration of the Mosque

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Abstract. At the northern end of the new city of Rhodes, just outside the medieval city an 8-acre "dead zone" includes the cemetery and the "Murat Reis" complex. Murat Reis the Elder, after whom the complex takes its name, was one of the important corsairs that served the Ottoman Navy during the Suleiman reign. Shortly after the death of Murat Reis in 1609, a complex of important monuments was created around his tomb, which includes the mosque, the purification fountain and the tekke accommodation buildings. The subject of this work was the historical and architectural documentation, the constructional analysis, the recording of the pathology and the elaboration of a proposal for the restoration of the mosque. Compared to the other mosques of the city, the Murat Reis is a special example with characteristics of the Ottoman Baroque era with the introduction of neoclassical elements. In addition, the mosque stands out for the morphology of its minaret, which is not found in any of the other mosques of Rhodes. In this study, the main findings of a detailed research are first presented, regarding the historical development of the city and the zoning rearrangements that took place during the Ottoman period in Rhodes. In the next stage, the historical, architectural and structural documentation of the mosque is carried out, as well as the understanding of the pathology and the qualitative diagnosis of the main causes of damage. On this basis, an intervention proposal was drawn up, aiming at the architectural and structural restoration of the mosque, as well as the highlight of the history, function and value of the Murat Reis complex as a single entity.

Keywords: Rhodes city, Ottoman period, Mosque, Cemetery Complex, Restoration

1 Introduction

At the northern end of the new city of Rhodes, just outside the medieval city, today an 8-acre "dead zone" includes the cemetery and the "Murat Reis" complex. (Fig. 1).

This paper attempts to highlight the methods and procedure of documentation, analysis, diagnosis, assessment and restoration of this important monument, as part of a wider area that should be preserved and promoted. It is based on a relevant thesis [1]

realized in the framework of the interdepartmental postgraduate program "Protection of Monuments", of N.T.U.A.

The first stage of the project comprises archive research regarding literature on the historical development of the city and the zoning rearrangements that took place during the Ottoman period on the island. Having collected the above data, the research focused on the evolution of the area where the Murat Reis complex is located, as well as on the recording and evaluation of its current architectural and structural characteristics.

The second stage includes the recording process, and systematic surveys, accompanied by the photographic documentation of the mosque. To this end, multiple visits to the monument were necessary, in order to further examine and verify various hypothesis that arose during the study. At the same time, the research also focused on other mosques of Rhodes in order to find information, concerning the historical construction techniques that could have been applied, as well as the methodological approaches that were applied in the following years in their research, documentation and restoration. [2,3,4]

The final stage was the investigation of the architectural construction phases of the building and the formulation of a restoration proposal, including the general principles adopted and the objectives of the intervention and a detailed description of the required works.



Fig. 1. Aerial photography of Murat Reis complex and cemetery
(Google EarthPro)

2 Historical context

In 1522 AD the Ottomans occupied the city of Rhodes, bringing serious rearrangements to the island. Many existing buildings were adapted to the needs of the oriental way of life, and churches were converted into mosques, while at the same time, 7 new mosques were built. The fortified slope surrounding the walls of the medieval city, turned into an extensive Muslim cemetery (Fig. 2) The area was constantly expanding since the Islamic tradition forbids the exhumation of the dead [5].

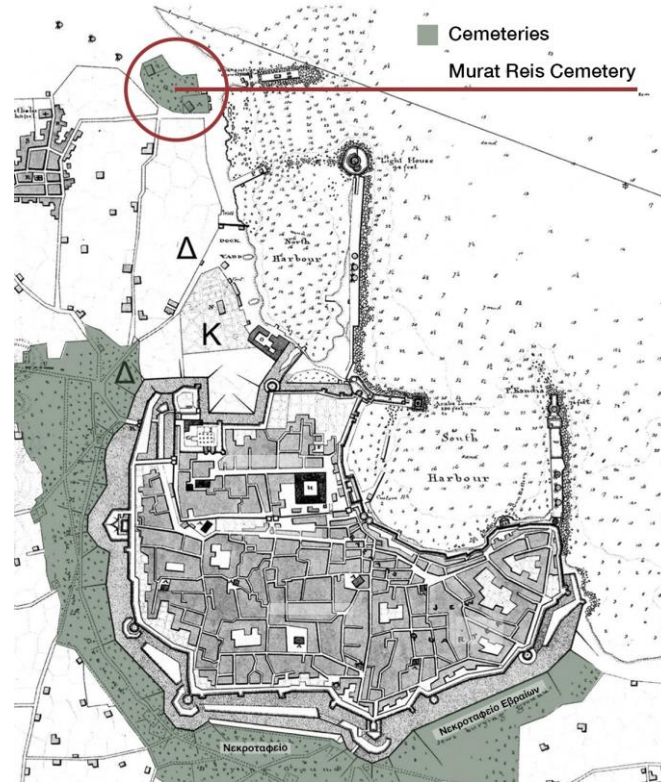


Fig. 2. Urban planning of the city during the Ottoman rule. Cemeteries are marked with green color. Murat Reis Cemetery is marked with red circle.

Ottoman rule, came to an end with the arrival of the Italian army in 1912. The Italian authorities began to carry out projects that decisively shaped the urban planning of Rhodes. As for the medieval city, the aim was to isolate it with a ring road system, and to turn the cemeteries around the walls into green spaces, which were designated as a "monumental zone" [6].

Of the vast area occupied by the cemeteries, only Murat Reis was preserved, due to the fact that important personalities of the Ottoman period were buried there. [5]

2.1 The Murat Reis complex

It is located on the North East end of the Rhodes City, close to the administrative center, which includes important public buildings such as the courthouse, the town hall, etc. Murat Reis, today perceived as a cemetery, is actually a "külliye", i.e., a complex of buildings with various functions centered around an institution.

Murat Reis the Elder, after whom the complex takes its name, was one of the important corsairs that served the Ottoman Navy during the Suleiman reign. Having taken part in numerous campaigns during his life, he died in 1609 during the siege of Avlona in Albania and his body was buried in Rhodes [7]. Shortly after his death, it was

believed that his tomb had the ability to answer prayers, and thus Murat Reis was canonized. In the following years, his tomb became an object of worship for the Muslims of Rhodes and the opposite coast of Anatolia, who visit it till this day, leaving some tribute (usually clothing) [8].

During the Ottoman rule, certain orders began to operate on the island, such as the Mevlevian dervishes and the Nakşibendi. The Ottomans, following the model of the big cities of the Ottoman empire, wanted to attach their tombs to charitable and religious facilities, in the form of a complex. Thus, shortly after the death of Murat Reis, came the establishment of the mosque and the purification fountain, while a Sheik was assigned to live in a space within the cemetery and thus the tekke was established [9].

The complex, today, consists of an important monumental ensemble (Fig. 2), that extends around the mausoleum of Murat Reis and includes:

- The mosque, which was originally built in 1636 by Ebu Bekr Pasha, but over time was destroyed and rebuilt in 1797 by Murabid Hasan Bey in the form we know it today [8].
- The purification fountain, which was built by Mabeyinci Hamdi Bey in 1845-46 AD. with the donation of Sultan Abdülmecid [9].
- The tekke accommodation buildings, in which eight different historical phases have been recorded, from approximately 1700 to 1925 AD. In 2009, the buildings were restored and today they house the Municipal Conservatory of the city of Rhodes [10].
- The Guardian's Residence
- The mausoleums (türbe)

The cemetery area contains today a small portion of preserved tombstones, about 237, that reveal that Murat Reis complex was a burial place for Ottoman officials and Khans of Crimea, as well as their families [11, 12]. As part of the general conversion of Muslim cemeteries into green spaces during the Italian occupation, the tombstones were moved and placed in closely spaced rows behind the tomb of Murat Reis [9].



Fig. 3. General plan of the Murat Reis complex

3 Survey and documentation of the mosque

3.1 Architectural analysis

The mosque was built to serve a small community of dervishes, as well as worshipers visiting the tomb of Murat Reis. Following the typology of the Bursa's mosques in its simple form, it consists of a prayer hall with a square floor plan (Fig. 4) with internal dimensions of 7.80 x 7.80m and a height of 9.00m. The hall is covered with a hemispherical dome supported by arches, squinches and pendentives, forming an octagon.

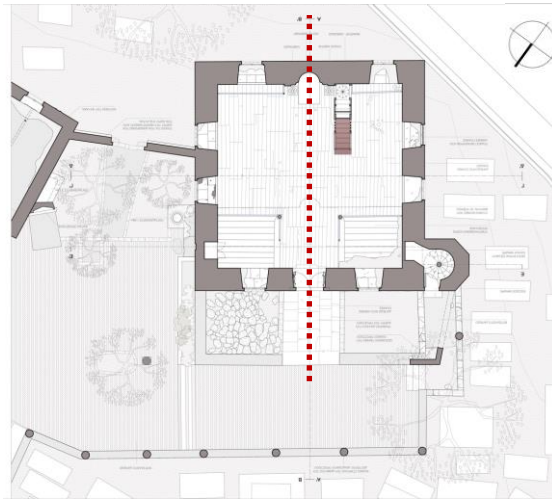


Fig. 4. Plan of the Mosque. The mihrab is located directly opposite the entrance door following the symmetry axes of the square floor plan.

The southeast wall of the hall is called “kibble” and symbolizes the direction to Mecca. In its center is the mihrab, that is, the prayer niche towards which the faithful must face when they pray. The mihrab of the Murat Reis Mosque, is entirely painted over, while the fact that verses from the Koran are absent is surprising.

To the right of the prayer niche is placed the “minber”, the pulpit where the imam ascends for the preach. It is a wooden structure with steps leading to the seat, which is covered with a polygonal canopy. It is one of the larger pulpits found in the mosques of Rhodes. Its length is 3.00 m and its height reaches 5.00 m. The entrance is formed by two wooden columns carrying a painted panel, and it does not have shutters to close it, like that in the wooden minbers in the Turkish mosques.

The length of the north-west wall of the hall is occupied by the mezzanine, (Fig. 5) which is accessed through the inner stairs of the minaret. It is characterized by privacy, as the screen of crossed wooden plates is so high that it prevents anyone from seeing the worshipers praying. Usually, the mezzanines are reserved for praying women, however there is no official document confirming that this mezzanine was a place of prayer for women.

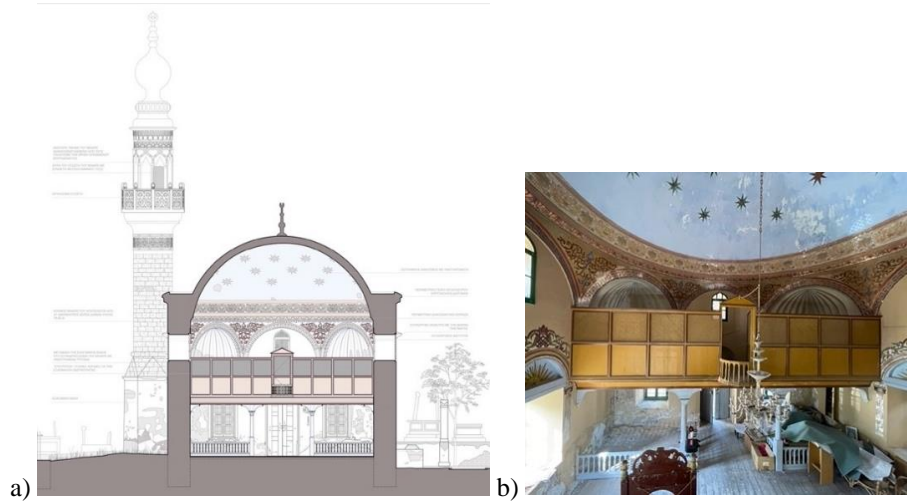


Fig. 5. (a) Section of the Mosque looking to the NW, where the mezzanine is also shown, (b) View of the mezzanine from the SE (March 2022)

The painted decoration (Fig. 6) of the mosque, is a typical example of the trend that appeared in the 18th century in Ottoman buildings, known as Turkish baroque. The influence of Western architectural forms, led to the replacement of traditional Arabic or Persian themes with decorative reliefs and Western motifs. All these decorations were executed with watercolors on top of the first coat of plaster.

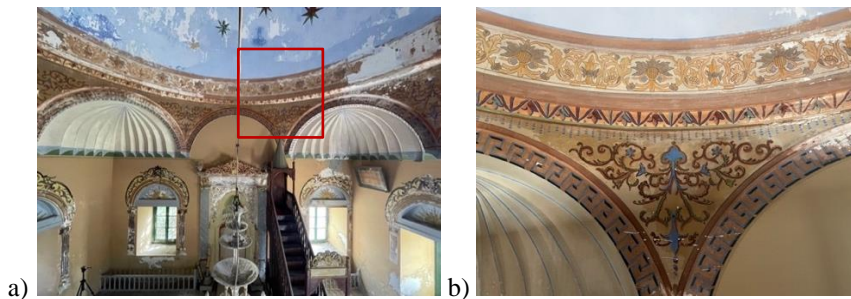


Fig. 6. a) General view of the painted decoration with floral motifs between the arches. b) Detail of floral motifs

Before the entrance of the mosque, there was a stone arched porch, the "revak", which is considered as the outer extension of the prayer hall. From the part that is preserved in the western area of the temple, as well as from the springer of the arch in the east, it seems that the façade of the porch was constructed with three consecutive arches. (Fig. 7a). This assumption is also confirmed by the photographic archives (Fig. 7b). The porch was covered with a flat roof, which is confirmed by the beam sockets on the northwest wall of the mosque and by the preserved section of the porch.

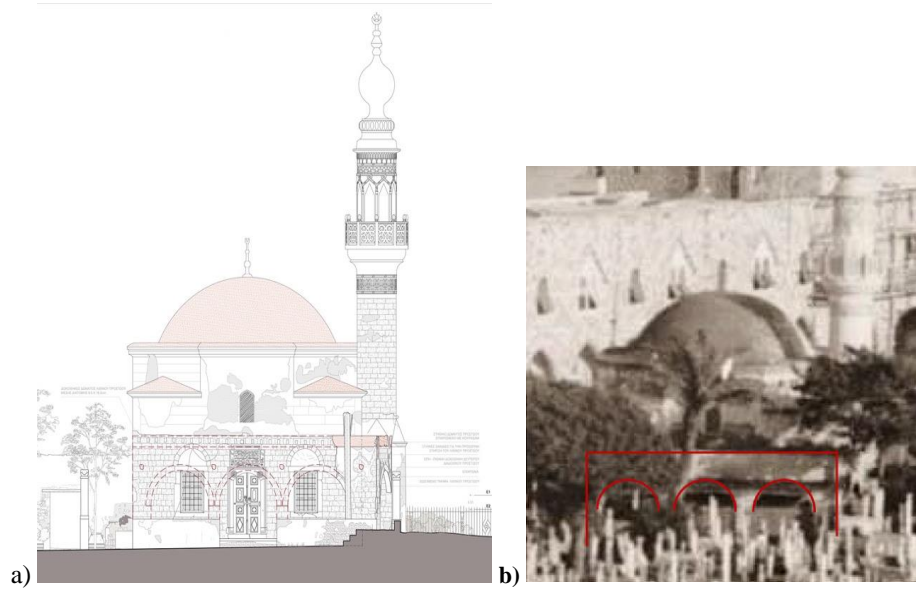


Fig. 7. (a) Representation of the porch's façade. (b) Photo of the Mosque in 1927, on which the porch is shown with red lines. [Reproduced from the archive of Stavros Georgallidis]

A drawing by Balducci (1931) (Fig. 8a), shows a second porch - probably wooden, which was attached to the colonnade of the courtyard, in front from the aforementioned stone porch [13]. Its existence is also confirmed by photos from the Italian archive (Fig. 8b).

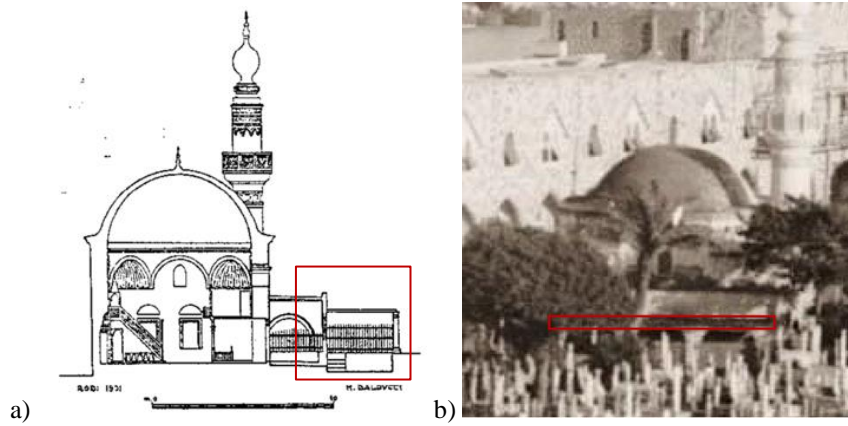


Fig. 8. (a) Drawing by Balducci (1931) showing the second porch [10]. (b) Photo from the Italian archive

In addition, a hole measuring 15 x 17 cm that can be seen in the surviving part of the stone pediment, directly opposite the corner column of the courtyard, reveals that there

were probably joists in which the beams of the wooden porch were placed transversely. The surviving hole (Fig. 9a) seems to be an opening, which confirms the scenario that the wooden porch was built later to meet the prayer needs of the believers. Based on the position of the columns of the yard and the existing hole, it seems that there were 4 beams that were based on the columns and in the beam-holes between the arches (Fig. 9b). It is possible that there were also secondary beams that were placed perpendicular to the main ones in order to support the flat covering of the wooden porch.

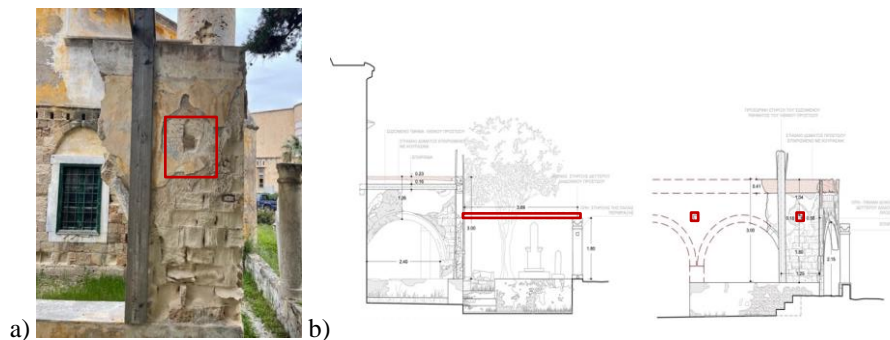


Fig. 9. (a) Photo of the existing part of the porch showing the hole (march 2022). (b) Representation of the second wooden porch.

Externally, the monument reveals its strict internal structure. The central rectangular space rises to the level where eight arches forming an octagon permit the transition to the dome's hemispherical shape.

On the northwest façade, where the plasters and renders are missing, we can distinguish the marble window frames and the arched lintels, which on the other sides have been covered with render and plaster. Thus, the façades of the mosque were originally designed and built with ashlar masonry without any renders and plaster, which were added later, probably in the 19th century.

On the southwest side is located the 19 m high minaret. The original minaret, which had a conical top, as was customary in the Muslim mosques of Rhodes, suffered severe damage from bombings and/or earthquakes and was rebuilt during the Italian occupation in the form we know it today. At that time, elements of orientalism were used abundantly, due to Italian interest for the Middle East and Africa. The access to the original minaret was through the mosque, from an internal arched opening, which was later closed and the access moved outside. The upper part of the minaret, which includes the balcony, has plaster decorations with geometric and floral motifs.

3.2 Description of the structural system

The Murat Reis Mosque seems to be constructed with three-leaf stone masonry¹, having a width of 0.95m. As can be seen from the areas where the plasters are missing the stonework, is composed on its outer face of ashlar masonry. Internally, from the partial detachments of plaster, it appears that ashlar stones were used to shape only the corners and the frames of the openings, while the rest of the walls were built with rubble masonry. According to documentation deriving from similar Mosques in Rhodes [2,3,4], the inner infill of the stone masonry is probably filled with relatively good quality of infill material, consisting of big pieces of rubble stones and mortar without many voids.

The masonry seems to be reinforced with a horizontal timber system (xylodesia). Specifically, underneath the load bearing elements of the mezzanine (i.e., as bedding for its timber beams) and above the openings (level of lintels), 3 timber wooden laces of 11x9 cm were found. The position of these laces suggests that they are part of a wooden horizontal framing system for the tying and confinement of the building. Due to the plasters, it was not possible to document their existence at other levels. As documented from other similar structures, the possible positions of wooden frameworks are above the openings, at the base of the masonry, at the level of springing of the arches and at the base and the top of the tympanon of the hemispherical dome. A better presentation of their possible position in the structure of Murat Reis Mosque is given in the drawing of Fig. 10.

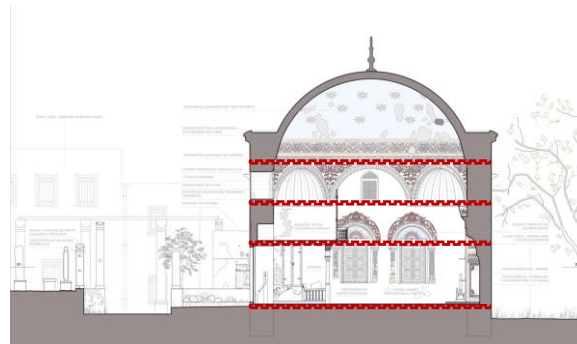


Fig. 10. The possible position of the horizontal timber laces system (xylodesies)

The hemispherical dome rests on arches, squinches and pendentives; through which the loads are transferred to the perimeter walls. They are made of carved sandstone and the final finishing of their edges is done by plastering. The dome is also made of local sandstone and is plastered with kourasani (hydraulic mortar consisting of lime, pozzolan and crushed bricks).

¹This was not possible to be documented in situ, but is it presumed due to the thickness of the wall and the available information regarding similar Mosques in Rhodes, as for example the Recep Passa Mosque [11].

The floor of the mosque is wooden, without regularity in the placement of the boards, which differ from each other in size. The wooden planks are nailed onto joists with a section of about 9x9 cm and the space between them is filled with pebbles and mud.

The load-bearing structure of the mezzanine (Fig. 11), consists of wooden beams with an average cross-section of 8 x 10 cm, which rest on one end on the external NW masonry and on the other end on a large beam of dimensions 18 x 23 cm, which rests on the masonry of NE and SW walls. The large beam is supported by two wooden columns on either side of the central entrance area and two corbels in contact with the walls.

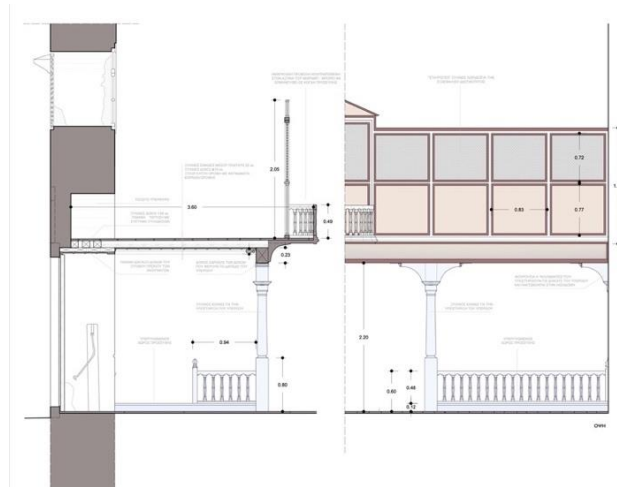


Fig. 11. Constructional details of the mezzanine

From the in situ existing part of the stone-arched porch, it appears that it was made of a single row of sandstones. The arches were connected on the NE side to the load-bearing wall of the mosque and on the SW side to the base of the minaret. Its flat roof was made of 29 wooden beams of medium dimensions 8x16 cm. which were based on the beams of the NW side of the mosque and the beams of the porch. To protect from the inflow of water, a final coating with a highly cohesive material, called "patelia" in the local dialect, was used over timber planks. It is a clayey soil, usually mixed with algae or oleanders, which provides waterproofing for a certain period of time [6].

The minaret has a hexagonal base which touches the SW face of the mosque without being connected to it. Its body consists of 21 concentric rows of stones, 19-20 cm high. The cohesion of the construction is enhanced by the use of mortar between the joints of the stones, (Fig. 12)

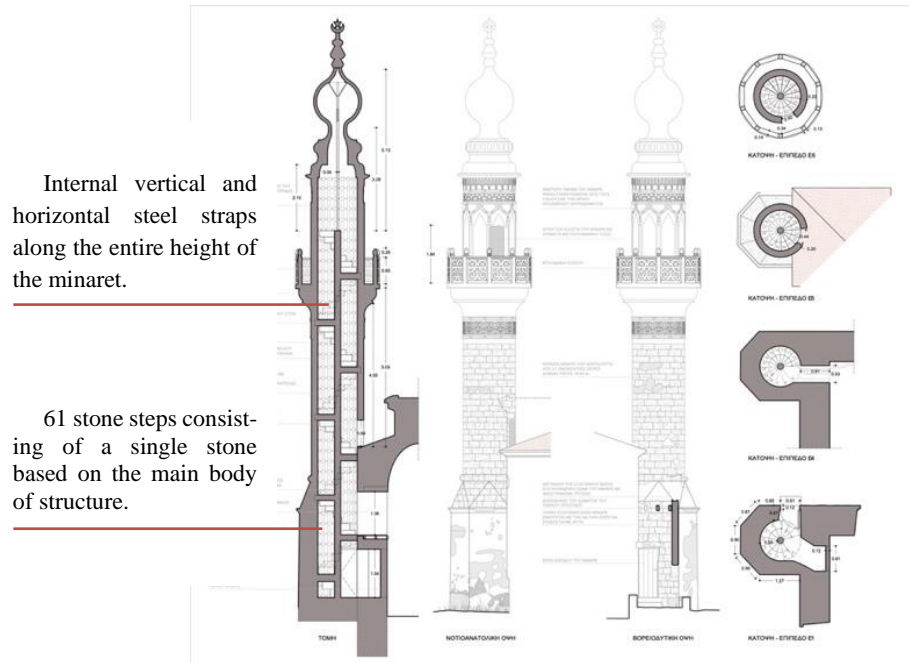


Fig. 12. Constructional details of the minaret.

The staircase of the minaret is formed by 61 stone steps. Each step consists of a single stone, which is shaped like a 'trapezium'. This 'trapezium' moves circularly by one position per level. The way the steps in the minaret were put together, could not be precisely determined, however, the most common way is for the step to be based on the main body of structure or even to be a part of the body. The staircase is a very important structural element for the stability of the minaret, due to the significant weight that adds to the center of gravity of the structure, as well as due to the continuous connection of the cylindrical external masonry to the core of the minaret, along its height (Fig. 13).

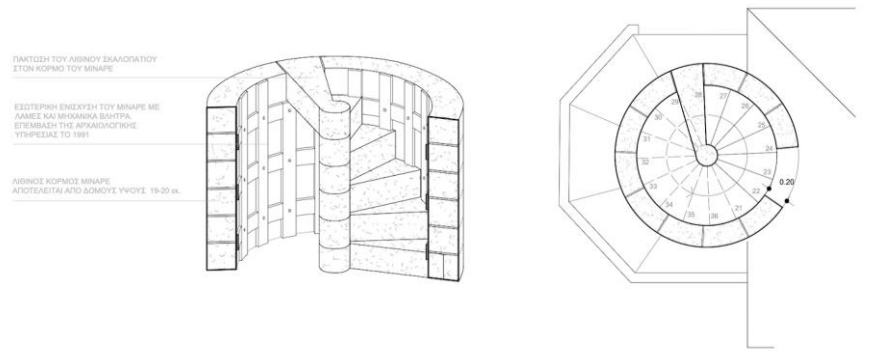


Fig. 13. Construction detail of the staircase of the minaret. The internal intervention with metallic vertical and horizontal steel straps is also shown.

In the following years, important repair and strengthening structural interventions were carried out in the minaret. Internal vertical and horizontal steel straps were placed, using bolts and special cement mortar. Repairs and repositioning of the collapsed upper part were made too and a stainless-steel metal tube was installed to the last step of the ladder, in order to strengthen the stability of the upper part. More information about the date and type of the applied interventions will emerge after further investigation.

3.3 Architectural-construction phases and historical pathology reconstructions and alterations

According to the historical, architectural and constructional analysis, an attempt is made to clarify the architectural and constructional phases of the mosque accordingly, as well as the major interventions and modifications due to its historical pathology.

Two main phases of construction can be distinguished

- 1st phase 1636 AD: Construction of the original mosque by Ebu Bekr Pasha.
- 2nd phase 1797-1798 AD: Reconstruction of the mosque by Murabid Hasan Bey in the form we know it today.
- 3rd phase (probably during the 19th century): The facades of the mosque were plastered.

Additionally, the following important collapses, reconstructions and modifications should be mentioned:

- 1912 AD: Collapse of the upper part of the minaret by the bombardment of the Italian troops.
- 1912-1920 AD: Reconstruction of the upper part of the minaret by the Italians in its current form. It is possible that along with the reconstruction of the minaret, the second porch was added.
- 1943-1957 AD: Collapse of the porch possibly due to the bombings or the 1957 earthquake.

3.4 Pathology and qualitative evaluation of the main causes of damage

The unsafe condition of the mosque forced its closure since 2000, thus increasing the damage due to the lack of use and maintenance. The prayer hall does not face serious structural problems. In particular, vertical cracks of small width are observed at the key area of the arches of the squinches. These cracks are connected to the structural behavior of the hemispherical dome, which transfers horizontal thrusts on its base. Thus, the eight arches of the octagon formed underneath the circular base of the dome transfer this thrust to the rectangular perimeter walls. As expected, cracks appear also at a lower level, between the base of the arches of the octagon and the key areas of the arched window lintels.

Apart from the above pathology, it has to be mentioned that, the main problems faced by the prayer hall, are related to the aging of the materials due to the lack of maintenance, rising moisture from the ground to the masonry, but also descending from the dome, resulting in partial collapses of plastering and the painted decoration of the dome.

In addition, the accumulation of moisture in the walls resulted in the rotting of the timber horizontal reinforcements, compromising their utility.

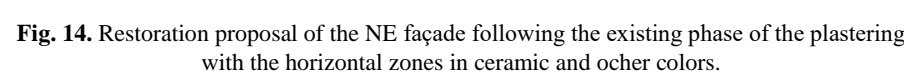
The most important structural problems faced by the mosque are found in the area of the porch, which has collapsed and has been temporarily propped up with wooden elements. By its nature the porch is a vulnerable structure seismically compared to the mosque and is exposed to the environmental conditions at a faster rate. The stones of the porch, due to the loss of the renders and plasters, are exposed to descending moisture, direct effect of rain and soluble salts transported from the sea. Thus, they suffer surface erosion in the form of sanding, which progresses from the outer surface to the inner, reaching a great depth. As a result, in addition to the weakening of the mechanical strength of the stones, wear develops unevenly between adjacent stones.

The minaret, due to its height and slender proportions, is also one very vulnerable part of the mosque. In the cylindrical body of the minaret, the stones have crumbled and in some places the building mortar has deteriorated. At the same time, vertical cracks are observed, some of which have been roughly cemented. In addition, the entry of rainwater into the interior, led to oxidation and decay of the internally added steel splint (vertical and horizontal straps connected to the masonry).

4 Presentation of the mosque restoration proposal

The main proposals for the morphological restoration of the mosque are the following:

- The preservation of the phase that the mosque was plastered and the revealing of the morphological elements of the openings that have been covered with the plaster. (Fig.14)
- The opening of the inner access of the original minaret to the southwest wall of the hall and the addition of a rigid metallic frame with glass in the arched opening.
- The reconstruction of the stone porch according to its original form, as documented in this work.
- The reconstruction of the wooden successive porch in the form of a pergola, as its original form could not be fully documented.



Regarding the foundations, from the geometry and pathology surveys, there is not any indication for the need of extensive strengthening interventions. It is more likely that it will need to be locally repaired by applying deep repointing and grouting to fill possible void space due to timber elements degradation as well as interventions to possibly existing timber elements. To deal with the rising humidity on the perimeter walls, the construction of a drainage ditch is recommended. In all cases in situ inspection and investigations are recommended, in order to determine the necessary intervention scheme.

In all masonry perimeter walls, is proposed to initially remove the deteriorated plasters of the façades in order to reveal the stone masonry and the window stone frames. Subsequently, it is necessary to examine the quality of the jointing mortar, remove any cement mortar and apply re-pointing using a lime-pozzolan composition to be determined on the basis of analysis of the characteristics of existing stones and mortars. Stones that show a lot of wear will be replaced with new ones with the same physico-chemical, mechanical, color and texture characteristics. Based on the data we have so far, it seems that there is no need to strengthen the entire masonry with systematic grouting, which may be necessary for the repair of the cracks in selected areas. However, before the restoration works, in situ investigations should be carried out to better document the building materials and the type of construction of masonry in its face and in its width (one leaf, three-leaf, quality of infill material, percentage of voids, etc.) On the basis of such an investigation and the results of the structural analysis to be realized for the entire monument, the decision of applying systematic grouting will be taken.

In case of decayed timber reinforcements embedded in masonry, it is recommended - where possible - to re-install wooden beams, which will be connected to each other with bolts and stainless-steel plates. The new beams will be re-positioned from the corners of the walls of the mosque, after the sporadic removal of the ashlar and the cleaning of the voids left by the timbers, in order to facilitate their insertion into the holes.

If timber reinforcements are not found at the upper levels, or if the aforementioned solution is not technically feasible, an external confinement of the masonry, using adequate stainless-steel elements will be applied, based to the results of the structural analysis, that has to be performed.

The most important operation is the reconstruction of the porch. Due to the high percentage of worn stones and loss of material, the surviving section will be removed and reconstructed from new carved sandstone. The new wooden beams of the flat roof will be reinstalled in the existing nests of the NW face. On top of the beams the wooden sheathing will be nailed consisting of timber planks (ceiling) and a layer of marine plywood plates over them, in order to improve the diaphragmatic behavior of the roof. To connect the diaphragm to the NW wall of the mosque, a stainless-steel L type beam is placed above the wooden beams around the perimeter and in contact with the masonry, which is connected to it through rods that are anchored to its inner side. The L type stainless steel element is screwed on all the timber beams completing the connection of the diaphragm with the NW wall of the mosque. The roof's small inclinations are formed with wooden elements of varying height on which a second layer of marine plywood plates is nailed. The surface is smeared with bituminous emulsion and the final coating is done with a waterproofing membrane with fine aggregates. At the end, a mortar finishing of kourasani is applied (Fig. 15).

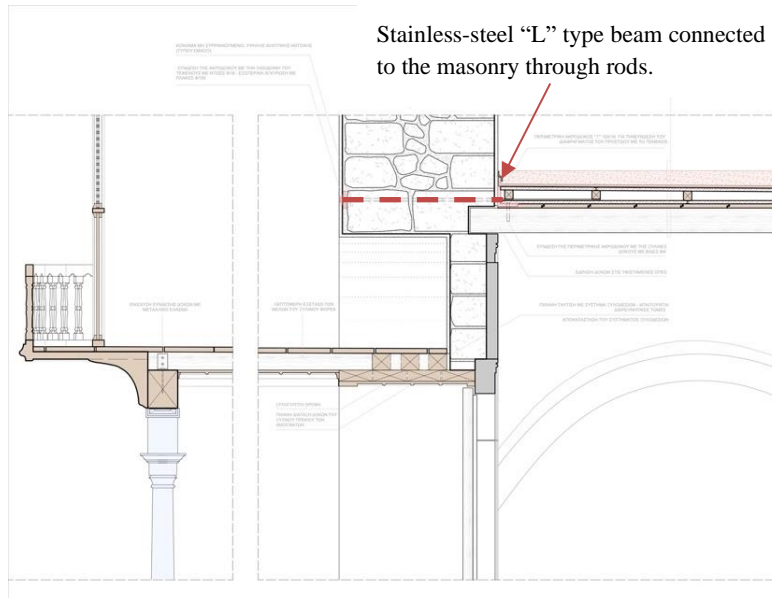


Fig. 15. Construction detail of the restoration proposal of the porch.

The wooden 2nd porch, since there is no sufficient documentation of its original form and structure, is proposed to be constructed in the form of a pergola (Fig. 16). For its construction, 4 wooden beams of 15x17 cm will be used, which will be based on a timber main beam over the colonnade of the courtyard. The connection with the timber main beam and the columns will be reinforced with L-shaped metal elements. In the other direction, the beams are placed in the beam holders of the porch. Across the main beams every 30 cm secondary wooden beams of 9x8 cm are nailed. The shading of the pergola will be completed with arbors.



Fig. 16. Representation of the restoration proposal of the porches

For the minaret, the in-situ documentation of the geometry and the quality of the historic construction (stones, mortars, possible internal metallic connecting elements, etc.) and the interventions should be first carried out, including the connections of the reconstructed upper part with the underlying masonry and of the internal metal construction with the perimeter masonry. The static and dynamic behavior before and after the 20th c. interventions should then be analyzed, in order to identify the main causes of past damage and collapses, assess the behavior of the minaret in its current situation (with the reconstructed upper part and the internal metallic straps) and verify its bearing capacity under vertical and horizontal actions. On the basis of such a study, the decision will be taken for retaining the past interventions or for their removal and replacement with new interventions to be indicated by the aforementioned study. In this framework, alternative solutions should also be examined, to improve the current situation, as in some cases the demolition and reconstruction may be questionable and quite harmful for the adjacent parts of the historic structure. In case the internal steel straps intervention would be proved efficient, by the structural study, the sanitization of the metal elements is recommended by thoroughly cleaning and then coating them with anti-rust and anti-corrosion materials. Then it will be primed and repainted.

Regarding the masonry of the minaret, systematic repointing and grouting may be necessary after cleaning the loose mortars with a specially shaped blade, but this is also to be decided on the basis of the in-situ investigations findings.

Finally, in order to deal with the rainwater inside the minaret, it is proposed to install glass shutters with a metal frame in all openings.

5 Conclusions

The Ottoman architecture that developed in the city of Rhodes applied forms according to the rules of the capital of the Ottoman Empire. The mosques of Rhodes mostly followed the Bursa typology adapted to the traditional techniques, tool equipment, available materials and climatic conditions of the island. Their morphological variations are related to the architectural trends of the time each mosque was built, or to the reconstructions of the minarets from time to time, both in the Ottoman and Italian periods.

The monument under consideration belongs to the square hall type with a dome without openings. Compared to the other mosques of the city, the Murat Reis is a special example with characteristics of the Ottoman Baroque era with the introduction of neoclassical elements. In addition, the mosque stands out for the morphology of its minaret, which is not found in any of the other mosques of Rhodes. Its restoration is considered imperative, as it is one of the few cases of mosques that still exist outside the medieval city limits.

Since the mosque is only a part of an important historical complex and a landmark, the overall protection and promotion of the ensemble are critical and important. Taking into account its special character and the need for integration into the contemporary life of the city, the accessibility to all social groups must be ensured. In this direction, the

research aims to contribute as a starting point, to the protection and promotion of an important monument of Rhodes, the Murat Reis complex.

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