

The Bell – tower of Saint Barbaros in the medieval ‘Borgo’ of Potamos in Corfu: historical documentation and multi-disciplinary proposal for its preservation.

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Abstract: Having been built at the beginning of the 17th century the historic bell tower of Saint Barbaros in Corfu belongs to the post-byzantine Church of The Mother of God of the Life-Giving Spring and St. Barbaros. It is considered to be a representative case of a surviving monument with occidental, Venetian architecture elements, techniques and masonry in the Ionian Islands. There are severe construction and static issues identified and today’s state of the monument is considered to be at risk. A study customizing all the components through non-destructive techniques, providing a preventive maintenance and assessment proposal for restoration and interventions is our first priority to save the monument. The bell tower belongs to the category of tower constructions. Through preliminary ‘in situ’ examination and the analysis of the documentation we come to the conclusion that the constructions’ masonry belongs to different historical phases and there is severe damage caused mainly by natural disasters such as earthquakes, but at the same time by human activity such as periodic interventions. An attempt is made to decrypt the direct and indirect historical documentation for the identification of evidence regarding the hidden construction phases and severe damage that the building suffered. Historically the destructive factors mentioned induced its partial collapse in different historical periods. The answer to the vulnerability of this cultural heritage structure is a sustainable preservation of St. Barbaros bell tower in Corfu through a Transdisciplinary Project and Cooperation for effective Protection of Cultural Heritage in the Ionian Islands. Having considered the importance of the new findings and evidence according St. Barbaros the Myrrh-Effusing, connected to the cult of the homonymous saint and the post-byzantine Church of The Mother of God of the Life-Giving Spring and St. Barbaros, we ring the alarm bell for efficient preservation of the bell tower, a monument of cultural heritage of the Ionian Islands.

Keywords: bell-tower; St. Barbaros, structural system; masonry, cultural heritage; preservation; transdisciplinary project; Corfu.

1. Introduction

For centuries, bell towers played a crucial role in the religious life of people and at the same time served defense strategies to protect Corfu island against the Ottoman sieges at the end of 16th - 18th cent. Having been used from ancient times as *semanthro* [3], the high constructions were conspicuous in the distance between the other buildings serving at the same time as sailors’ orientation. While assisting the community’s needs the bell towers were part of people’s everyday life, of their joys and their griefs, until today. Having been considered as the highest of the kind in Corfu, this particular bell tower reaches 35 meters high and it might be spotted with the naked eye in the wider area of Potamos suburb, the Town, the New Fortress and the villages around.

The bell tower of St. Barbaros (Fig.1,2.) of The Mother of God of the Life-Giving Spring Church is located in ‘borgo’ Potamos, a large suburb of Corfu Town situated 4 km north. There is a

river crossing through the area, the largest and most important in Corfu. The two banks of the river are joined by a stone bridge dated to the middle of the 19th cent. Potamos comprises mainly rural areas and extends to the sea in Alykes.

The tower constructions in Corfu mostly dated from the post-Byzantine period. It is noteworthy to mention that historic bell towers are located in Corfu scattered through the island, with different density and characteristics. In fact, we have not found yet architectural plans or other information about the way they were built or about their dating. Although, there are differences in their morphological and typological characteristics. These constructions mostly are considered to be 'independent' and admittedly their main feature, the height, offers to the construction a unique peculiarity.



Fig. 1. Bell tower of St. Barbaros, Church of The Mother of God of the Life-Giving Spring (phot. Kastamonitis, E.).



Fig. 2. Bell tower of St. Barbaros, 1839-40, Gennadius Library - American School of Classical Studies at Athens (ASCSA).

The bell tower of St. Barbaros was named by the homonymous *martyr* whose relics were brought to the Mother of God of the Life-Giving Spring Church so people could pray and the sick be healed. The Christian Orthodox cult of St. Barbaros was cultivated considering that Barbaros came from Africa or the Arabian world. According to D. Zakythinos' [13] and H. Delehaye's [12] studies, there are four different versions of the Martyrdom of St. Barbaros (Logos of Constantine Acropolites [2], BHG 220 [18], the Bulgar version [12] etc.) and different historical periods. Having considered Saints' Synaxarion [6] we are informed that in 1571 while travelling by ship on their way to Venice a Venetian military man named Sklavounos, who took part in the naval battle of Naupactus, suddenly fell ill with a deadly disease. Having had a vision of St. Barbaros, who invited the patient to worship the martyr's tomb, with the aim of being healed, the sick soldier reached the Saint's tomb, worshiped reverently and immediately was healed. Willingly to honor St. Barbarus the Myrrh-Effusing, he recovered his relics, in order to transport them to Venice. On the 15th of May, while sailing, in need for refueling, the ship stopped near to Corfu town, passing through Potamos River. There, a paralyzed young man was cured. After the miraculous event the Corfiot people decided to name their church after St. Barbaros the Myrrh-Effusing and celebrate on the 15th and 23^d of May. In the festive icon of St. Barbaros in the Northern part of the church we consider, there are presented the first known artistic depiction of the village Potamos and saints' miracles signed by the artist Georgios Chrysoloras, dated on 1720 (Fig.3). The bell tower of the church Mother of God of the Life-

Giving Spring and St.Barbaros the Myrrh-Effusing, probably built in 1605, is rendered in an almost faithful form (Fig.4).



Fig. 3. The epic icon of St, Chrisoloras, Barbaros the Myrrh-Effusing, tempera painting, G., 1720, (phot. Polymeri, E.)

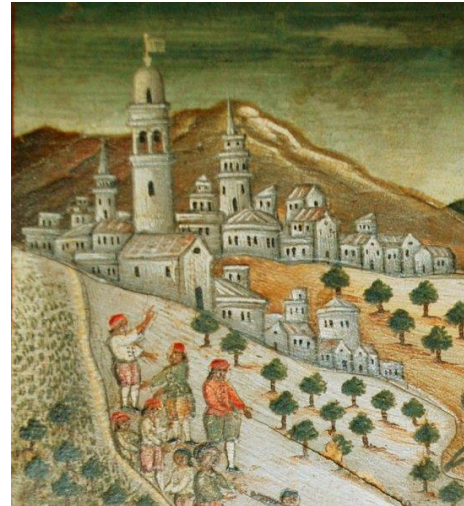


Fig.4. Detail of the epic icon of St. Barbaros the Myrrh-Effusing, tempera painting, Chrisoloras, G., 1720, (phot. Polymeri, E.)

Having analyzed another important source, such as Vincenzo Coronelli's book published in 1699, we found 'Capo Barbaros' (Cape Barbaros) location mentioned in the text. In the following pages there is a map of Corfu island (Fig.5) testifying both 'St.Barbaros' and 'Capo Barbaros'(Fig.6). We believe that the location might be identified with today's area between 'Avlaki' and 'Eremitis', in front of 'Caparelli' (islet with the lighthouse). While considering Coronelli's map we might come to the conclusion that St. Barbaros was venerated not only in Potamos, but generally in Corfu island and the places where the ship anchored were named by the Saint (the same as with Saint Nicolas in Corfu island).



Fig.5. Isolario dell' p. Coronelli, 1696, pp.68-69



Fig.6. Detail, Isolario dell' p. Coronelli, 1696, p.69.

The location 'St.Barbaro' is testified too, by Charles Louis Fleury Panckoucke's (1780-1844) map of Corfu island and Territory of Butrinto (Buthrotum), Siege 1798-99, published in 1818 (Fig.7).

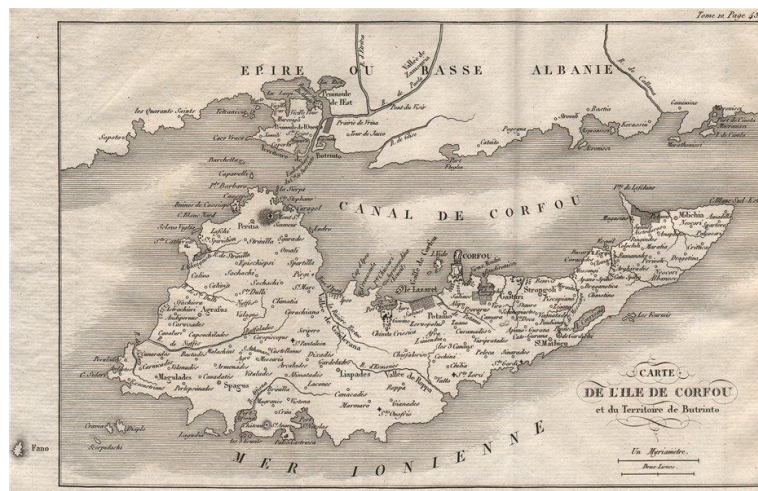


Fig.7. Map of Corfu island and Territory of Butrinto (Buthrotum), Siege 1798-99, Charles Louis Fleury Panckoucke, 1818.

2. Methods and Materials

The bell tower of St. Barbaros [Fig.1,10] in Potamos suburb was built from limestone produced by local quarries on a mighty square pyramidal base with a floor plan of approximately 5m x 5m. The total height to be reconstructed from the findings was thus once approximately 35 m. Having been identified there are different types of assessments in the construction – for example in some part lime stone, in other there are bricks and plaster, lime mortar and at the base, the oldest, clay mortar etc. According to the sources the mortar was prepared adding egg yolk to the mixture. In the middle of the 19th century we find that the coating of the exterior facade of the bell tower was painted in *celest blue* dye. The fact is documented by the paintings of Edward Lear (1855) (Fig. 8) and Aggelos Giallinas (1900) (Fig.9). The paintings of both artists are considered by art critics as mostly realistic and naturalistic.

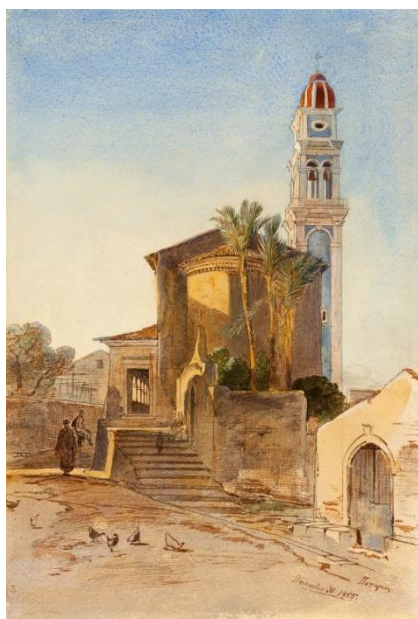


Fig. 8. St.Barbaros bell tower painted in *celest blue* dye, Edward Lear, 31.12.1855, Collection of the Gennadius Library.

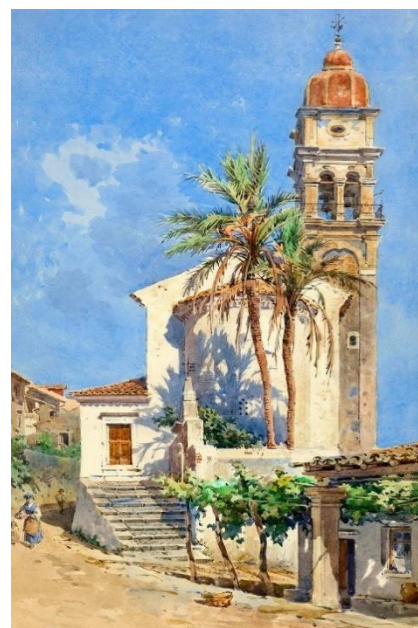


Fig. 9. St.Barbaros bell tower traces of the *celest blue* dye, Angelos Giallinas, 1900, Collection of the Municipality of Corfu.

A visually accentuating, striking profile cornice is executed above the pyramid step of the bell tower. Particularly, noteworthy in its west facade, in local yellowish-white coarse limestone, designed baroque passage portal in the style of the neo-Renaissance, the one indicated here on the keystone. There is an engraved inscription up to the entrance, above the pyramidal step cornice of the bell tower: 'Built in 1605' (Fig.11). The date was placed by the priest of the parish in the 1980s. The key of the cornice in the entrance gate has an engraved Latin cross and immediately after embossed decoration. For the construction of the staircase in the interior of the bell tower were used mainly wood and some metallic parts.



Fig. 10. Bell tower of Saint Barbaros, Church of The Mother of God of the Life-Giving Spring (phot. Kastamonitis, E.)



Fig.11. Entrance of St.Barbaros bell tower, Potamos Corfu (phot. Polymeri E.)

According to the date of construction, through our research, we come to the conclusion that the bell tower didn't exist before 1571. There is a map by an unknown author dated back at the beginning of 16th cent. indicating that during the Ottomans' siege in 1537 (Fig.12), the church of St. Barbaros was displayed without the bell tower, which means that the high construction was built later, strengthening our theory.



Fig.12. Unknown, 1537, Corfu in the period of the Ottoman Siege, 1537, in circle 'borgo' Potamos.

At the end of the 16th – early 17th century in order to strengthen its presence and claim its supremacy the Most Serene Republic of Venice proceeded in the construction of great

architectural works such as palaces, buildings and very high bell towers in its capital, Venice, for example San Marco's bell tower, and at the same time in other cities of Italy, as well as the Ionian Islands, such as Corfu, Zakynthos and Cephalonia. To strengthen the same purpose the bells were carefully selected, so the result would be auspicious and in case of enemy threat to signal alarm. An example is considered to be the case of the bell tower of St. George of the Greeks Church in Venice (Fig.13) which was erected in September 1587, a few years before that of St. Spyridon in Corfu. Having had regard to the bold work of the Venetians, Marmoras notes Corfu may compete worthily the most beautiful bell towers of Italy [25]. Having considered the architectural category of bell tower constructions we might argue that it is probably the oldest of its kind appearing in Corfu at the end of 16th century with reference to the bell tower of Saint Spyridon's Church in the Old Town of Corfu (year of construction 1590) [1] (Fig.14).



Fig.13. Church of Saint George
Greek, Venice, Italy.



Fig.14. St. Spyridon Bell tower,
1857, phot. Major John
Davenport Shakespear, RHA.

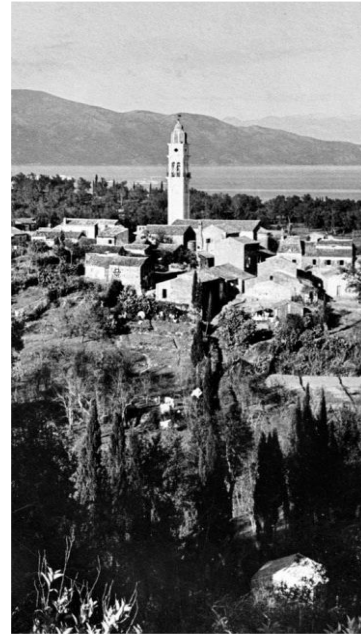


Fig.15. View of St. Barbaros bell tower,
phot. Rudolf Eder, 1908-1910

The symmetrical shape of St.Barbaros bell tower (Fig.15) in and its strong vertical axis lead to almost "free building" with architectural and static autonomy. This means that no fixed rule is observed in terms of its location and the way it is arranged seems to follow the possibilities offered by the surrounding area of the church serving its functional needs. It is located to the northwest of the church on the outskirts of Potamos, it is a very high and closed building. This 'opus maximus' project construction requires advanced knowledge and know-how to be designed and executed at the same time. It also has vents, balconies and a domed end. On the north side the foundation rests on a retaining wall, and it is not clear if it was built together with the bell tower. However, this wall is made of stone. In the bell towers of the Ionian Islands, the ratio 1: 6 to 1: 8 (ratio of base side to total height) is applied, while in mainland Greece the ratio decreases respectively to 1: 4.

Apart from the trunk, which is made of stone and testifies to the date of its construction, the rest of the bell tower is made of brick and we find the existence of at least two subsequent interventions. Due to the development of the phenomenon of corrosion, the mortar is fragile and part of the binder material has been detached together with part of the bricks, creating a gap in the masonry, thus affecting the statics of the building.

The tower system belfry of St. Barbaros is divided into three parts, the lower part which is the base in the shape of a truncated pyramid, followed by the trunk, which includes, inside it, the winding staircase and the upper part with the insert of the first balcony in which the bells with

the capitals and a second balcony are placed on top, perforated on all four sides. The third and last part is the crown of the bell tower, it has the shape of a dome with the insertion of a drum and a pillar. An iron cross with a weather vane is placed at the top of the construction. That part is dated to the modern period and we consider that in different historical periods damage was caused and it collapsed, (we are not aware how many times) mainly due to natural disasters such as earthquakes. Seismic parameters and remarks according the most destructive earthquakes in Corfu and the Ionian Islands area recorded mainly by J. Partsch (Tab.1) in his book 'The island of Corfu: geographical monography' [31].

Table 1. Seismic parameters and remarks according the most destructive earthquakes in Corfu and Ionian Islands area recorded mainly by J. Partsch [31].

| Year | Month/date | Magnitude | REMARKS |
|------|--|-----------|---|
| 1650 | 26 th February | 6.0 | Destructions/St. Athanasios fort, Town and villages. |
| 1666 | November | 6.2 | Extensive earthquake. |
| 1674 | 16 th January | 6.5 | Extensive destructions. |
| 1704 | 11 th November | 6.6 | |
| 1732 | March | 6.5 | Very Strong. Destructions/walls, parts of the fortifications. |
| 1743 | 20 th February | 7.1 | Very Strong. Destructions/buildings: Latin Archbishopric Residence, the Palace of ' <i>Proveditor General da Mar</i> , and bell tower of ' <i>Annunziata</i> '. |
| 1745 | 3 ^d April | 6.2 | Strong. Destructions/govern. buildings |
| 1756 | 13 th February | 6.3 | Building destructions |
| 1767 | 22 nd July | 7.2 | Very strong. Major disasters/buildings, town and villages around |
| 1773 | May | 6.4 | Very Strong. Destructions/buildings |
| 1786 | End of January-5 th of February | 6.6 | Very strong, 120 dead, and buildings collapsed, such as the Palace of the governor. |
| 1809 | 3-4 th May | | |
| 1813 | December | | |

According to the surviving base of the bell tower [Fig.11], we strongly believe that it belongs to the first phase of the monument, which might be the beginning of the 17th century. The large and smaller stones as well as the style of the masonry and the mortars refer to constructions of the same period (see fortification works '*fronte bastionato*' planed by the great Venetian architect Michele Sanmicheli [1], [33]). Today's coatings and interventions with modern mortars are due to the occasional repair work without any particular plan. The part built by bricks seems to accord to the modern period.

3. Church St. Barbaros and of The Mother of God of the Life-Giving Spring

The Orthodox church of St. Barbaros and of The Mother of God of the Life-Giving Spring, in the form that survives today, is a simple single-aisle basilica plan, timber-roofed church of purely so-called Ionian type, formed under the influence of the western church. Its plan (Fig.16.) consists of an elongated rectangle, slightly crooked, with a protruding semicircular arch of the sanctuary. The total length of the Northeastern side of the church is approximately 21.64 m., 22.08 m., the Southwestern side 22 m. and its width reaches in the West, 9.36 m. and in the East, on the side of the sanctuary approximately 12.15 m. The proportions of the sides of the rectangle are 1:2, characteristic of the single-aisle churches of Corfu during the Venetian period.

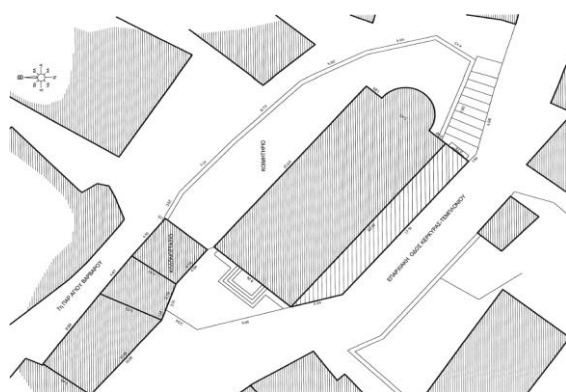


Fig.16. Plan of the church and the tower bell (1:200)



Fig.17. Detail of the old wall at the foot of the bell tower, (phot. Polymeri E.)

During the reconstruction works inside the church which took place in 1999-2000, by chance fragments of frescoes covering part of the hereon on the east wall of the sanctuary were revealed. The mural depicts scenes in which the so-called liturgical cycle unfolds, including, among others, the representation of the Communion of the Apostles and the Liturgy of the angels. At the top depicts in medal Christ Enthroned in Glory and below the Holy Shroud with Jesus Christ up to the base of the neck and rich hair. This depiction is considered rare and mainly used in conservative provinces' iconographic program. The monumental painting of the church reminds us of an earlier phase of the church, in fact it proves that it was larger in size and that there was financial prosperity so that outstanding artists could be assigned the work of designing and finishing the painting of the decoration. The technique of the fresco fragments is of fine quality and the colors are quite vivid. But there are serious problems related to the high levels of dampness. The frescoes revealed probably belong the earlier phase of the monument. Today parts of the mural are at risk.

On the other hand, references to archival documents of the 15th century of the church of The Mother of God of the Life-Giving Spring and St. Barbaros reinforce the view that the church not only pre-existed, but was also quite richly imposing in the space.

The church, as an autonomous building, together with the same autonomous bell tower in the heart of the 'borgo' Potamos, comprise a high quality and very interesting architectural ensemble. In the courtyard of the church, the floor is made of stone, and has large limestone slabs of local origin. On the surface of the stone slabs we observe, by country, engraved inscriptions or monograms, and in the center, we locate sloping metal handles. During the research, it was found that, in an earlier phase, the stone slabs covered the graves that had been placed in the courtyard of the temple. Later, mainly for reasons of hygiene, burial was forbidden in the areas around the church.

Externally, to the NE, the church and its bell tower are surrounded by a high wall which follows the slope of the ground and rises accordingly (Fig.17). After an 'in situ' investigation, it was found that part of the preserved wall reflects earlier phases of the monument, in fact, it seems that there were many. The diversity and variety of building materials and mortars found in the masonry testify to some phases of the monument. The church is recorded, according to archival

sources, in the published list of churches of Corfu by Spyridon Papageorgiou 1920 [30], as the monuments included in this list are dated before 1750.

4. 'Jus Confraternita'

The ownership state of the church of St. Barbaros and of The Mother of God of the Life-Giving Spring in terms of its legal status, belonged to the religious Confraternity [30], which means it was under the patronage of more than one prominent family. The decisions on the financial, land and property issues of the church in general, the religious liturgical issues and other matters of the church. In their duties were included the construction and other works for the preservation of the church and the bell tower, the purchase and care of its equipment, as well as the care for its regular function. As for the property issues, we know from the notarial documents and manuscripts that the church was quite rich financially and in property. According to archival sources (Fig.18, a, b.), the church owned areas with olive trees, land, buildings, houses, etc. which were handled by the respective administration of the patronage.

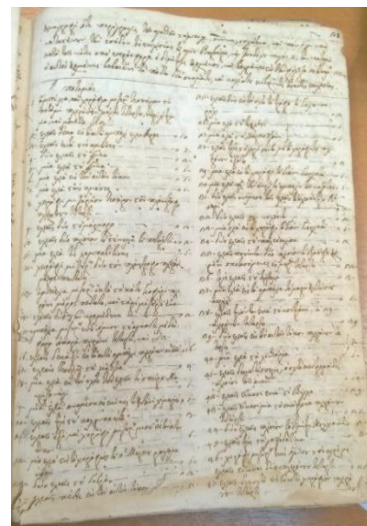
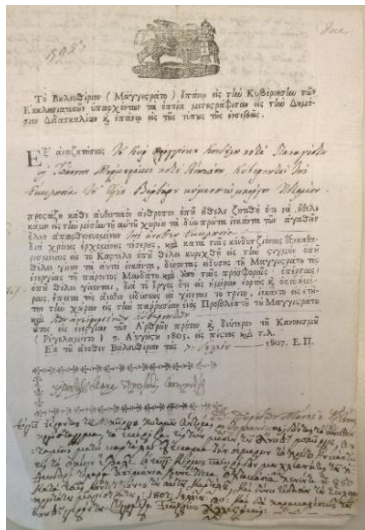


Fig. 18. a), b). Church Documents/ Πρωτοπ., Φ/466., Δ.218, G.S.A (Γ.Α.Κ.)

Having had the inheritance rights in possession the members of the Churches' Council could legally pass it to their descendants, or appoint successors without seeking the approval of the ecclesiastical authority. The Confraternities were built on the acquisition of patronage rights of a church, equal to all the patrons.

Note: It should be noted that the Greek Church remained in Corfu under the spiritual leadership of the Great Archbishop (Μεγάλου Πρωτοπαπά), surrounded by episcopal jurisdiction. The ownership state of churches and monasteries in the Venetian-occupied areas of the Ionian Islands such as Corfu, Zakynthos, Cephalonia, Lefkada, starting from the first years of the Venetian conquest, were divided into four categories: a) di Confraternita, which means the ownership belonged to many families or even guilds (there were two categories of Confraternities: 1. patronage and 2. ktetoric [17]). b) Jus Patronato Privato, the church founders, the ownership belonged to individuals, c) the monastic ones and d) Jus Patronato Pubblico the ownership belonged to founders of Public Law [19], [20]. The detailed presentation of these distinctions is registered by the General Proveditor, Augustinos Sagredos, on August 26, 1754. In the list of churches described, we find the church of St.Barbaros and of The Mother of God of the Life-Giving Spring in 'borgo' Potamos.

5. Assessment of the seismic response of the bell tower

The exact geometry of the bell tower, as determined through survey and photogrammetry, as taken into account for the investigation of the seismic response of the tower (Fig. 19). Two crucial elements affecting the response of the structure are the unequal height of its foundation, as well as its being in full contact with the neighbouring building (Fig. 20). Furthermore, it was observed that there are two distinct material phases above the upper face of the pyramid. It should be noted that the vertical projections at the corners of the facades were constructed at a later time, since the masonry is in front of the stone masonry of the upper part of the pyramid. The initial configuration of the bell tower did not include these projections, leading to the conclusion that the initial tower of 1605 collapsed during a strong earthquake, possibly due to the event of 1743 [35]. The damage occurred above the pyramid, and afterwards the tower was rebuilt in its present form with the solid bricks.



Fig. 19. The bell tower today



Fig. 21. Foundation level

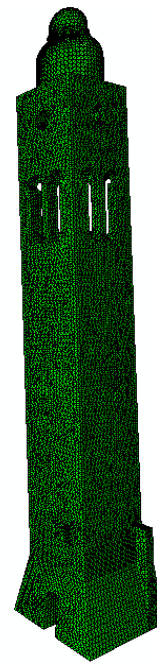


Fig. 20. Meshed 3D model for numerical analysis

Seismic hazard analysis was carried out and time histories were selected for the numerical analysis of the bell tower at Ultimate Limit State (ULS) and Near Collapse (NC) limit state. A 3D model was developed (Fig. 3), the solid elements of which had dimensions equal to the respective dimensions of the masonry unit plus the mortar joint thickness, considering the masonry as homogenous material. The developed 3D model is shown in Figure 21. For ULS, the failure criterion was based on principal stresses, while for NC the criterion was the interstorey drift. An exceedance of masonry tensile strength was shown at various locations, with damages concentrated at the base and top of the arches of the bell tower. Based on the above, an in-depth study of the monument is proposed.

Conclusions

The answer to the vulnerability of this cultural heritage structure is a sustainable preservation of St. Barbaros bell tower in Corfu through a Transdisciplinary Project and Cooperation for effective Protection of Cultural Heritage in the Ionian Islands. Having considered the importance of the new findings and evidence according St. Barbaros the Myrrh-Effusing, connected to the cult of the Christian martyr and the post-byzantine Church of The Mother of God of the Life-Giving Spring and St. Barbaros, *we ring the alarm bell for efficient preservation of the bell tower, a monument of cultural heritage of the Ionian Islands and an in-depth study of the monument is proposed.*

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