The Wooden Roofed Churches in the Troodos Mountains, Our Unique World Heritage

A detailed study of the Type, Construction and Morphology of these churches

Antonis Kypridemos

Cover image: Front facades of the five wooden roof churches included in the UNESCO list

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Abstract

Some of the most outstanding and significant Byzantine and Post-Byzantine churches are located in Cyprus, a small island in the Mediterranean Sea. This study focuses on these churches that are listed in the UNESCO world heritage list and specifically on the ones with a wooden roof that is a unique and absorbing characteristic. The aim is to examine in depth these churches, including their typology, construction and morphology information (especially of the wooden roof). The study uses different methods of conducting research, including visits on the sites and relevant libraries, an extensive use of books and websites, as well as, interviews with many people working in the field, like architects and Byzantinologists. It also makes use of plans, other technical drawings and photos. The aim is to prove that these churches are rightfully listed in the list of UNESCO and to sensitize everyone's interest in these churches.

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CHAPTER 1

1. Introduction

1.1 Heritage

'Heritage is our legacy from the past, what we live with today, and what we pass on to future generations. Our cultural and natural heritage are both irreplaceable sources of life and inspiration.'[1]

What can be more precious to a civilization than its Heritage? Indeed, this is a question that has only one answer. 'NOTHING'. Especially when that heritage is 'Our Unique World Heritage.'

Cyprus is an island in the Mediterranean Sea usually known as the Island of the Saints. The reason for this is the enormous number of churches that are spread all over the island. However, what is fascinating and significant is that ten of them are listed in the UNESCO[2] World Heritage List making them eventually a heritage site that belongs to all the people of the world thus having a universal application. The area of the Troodos Mountain is hosting all ten Byzantine churches.

'[C]ommon understanding for the preservation of monuments with the conviction that culture forms a solid foundation for tomorrow's Cyprus.'[3]

In this dissertation, it has been decided to deal specifically with only the Wooden Roofed Churches of the list.

Although there are many Byzantine Churches built worldwide and a lot of them, have a wooden roof, the ones I am going to examine here have been constructed in an exceptional way that makes them Unique. 'Our Unique World Heritage'. Those churches are the most remarkable traces left from the Byzantine Period and are estimated many centuries ago, resulting as one of the few important things Cyprus has to offer.

'Places as unique and diverse as the wilds of East Africa's Serengeti, the Pyramids of Egypt, the Great Barrier Reef in Australia and the Baroque cathedrals of Latin America make up our World's Heritage.'[4]

[1] UNESCO Centre, "UNESCO World Heritage Centre - World Heritage", Whc.unesco.org, 2016 <http://whc.unesco.org/en/about/> [accessed 11 January 2016].
[2] UNESCO stands for The United Nations Educational, Scientific and Cultural Organization. It was founded in 16 November 1945, in Paris. Its main scope is to support the recognition, conservation and protection of any natural or even cultural heritage all over the world.
[3] The Technical Committee On Cultural Heritage In Cyprus, 2015.
[4] UNESCO Centre, "UNESCO World Heritage Centre - World Heritage", Whc.unesco.org, 2016 <http://whc.unesco.org/en/about/> [accessed 13 October 2015].

Similarly to the quote, those wooden roof churches are Cyprus's unique places and our heritage. The number of churches with the wooden roof in Cyprus is estimated to be one hundred twenty-seven.[5] However, only five of them are listed on the UNESCO Heritage List each one bearing the UNESCO symbol just next to the main entrance (fig.1.1).

fig. 1.1 UNESCO symbol next to the main entrance of the church

The ten churches outlined in the UNESCO Heritage List are (fig. 1.2):

1. Church of Saint Nicholas of the Roof at Kakopetria
2. Church of the Virgin of Asinou near Nikitari village
3. Church of the Virgin of Arakou at Lagoudera
4. Church of Saint John of Lampadistis at Kalopanagiotis
5. Church of the Holy Cross at Pelendri
6. Church of the Virgin of Moutoullas
7. Church of Archangel Michael at Pedoulas (fig. 1.3)
8. Church of the Virgin of Podythou at Galata (fig. 1.4)
9. Church of the Holy Cross of Ayiasmati at Platanistasa
10. Church of the Transfiguration of the Saviour at Palaichori

The last five listed above are those having the typical 'Cypriot style'[6] wooden roof.

[5] Athanasios Papageorgiou, *"Οι Ξυλόστεγοι Ναοί Της Κύπρου (The Wooden Roof Churches Of Cyprus)", in "Απόστολος Βαρνάβας" ("Apostle Varnavas")*, 1st edn (Nicosia, 1975), p. 378.

[6] The term 'Cypriot style' is given by architect Andreas Philippou in his book Byzantine Architecture of Troodos mountains.

fig. 1.2 Map showing the location of the ten Byzantine churches

fig. 1.3 Church of Archangel Michael at Pedoulas

fig. 1.4 Church of the Virgin of Podythou at Galata

1.2 UNESCO, the criteria and the unique roof

In nineteen seventy-two, UNESCO has adopted a convention that focuses on the protection of the world cultural and natural heritage. Until nowadays, this convention is still the most widely known one. As the president of the Cyprus National Commission for UNESCO, Loukia Loizou Hadjigavriel said:

'The cultural heritage becomes a mirror for mankind to look into its own face in an effort to define itself and search for its roots, and at the same time to assess its developmental course and achievements.'[7]

A recording of this heritage, as well as, preservation, is essential to protect something with this significant value for the humanity. The increasing threats to these important archaeological sites and monuments of nature pushed UNESCO for the adoption of this necessary convention, which was ratified by the Republic of Cyprus just three years later, in nineteen seventy-five.[8] Following that, in nineteen eighty-five, nine of the Byzantine churches were recorded and inducted in the UNESCO's list, while, in two thousand and one it

[7] Thekla Papantoniou and Barbara Cornwall Lyssarides, *Μνημεία Και Χώροι Παγκόσμιας Κληρονομίας Στην Κύπρο (World Heritage Sites In Cyprus)*, 2nd edn (Nicosia: The Cyprus National Commission for UNESCO, 2012), p. 9.
[8] Whc.unesco.org, "Cyprus", 2016 <http://whc.unesco.org/cyprus2009/> [accessed 14 October 2015].

has included the last one, the church of the Transfiguration of the Saviour at Palaichori.[9] The criteria for this induction were three. The first one is that the art from these churches demonstrates and gives some answers and evidence on the relationship between Eastern and Western Christian art. Especially when the Frankish Lusignan kingdom, which was a primary link in the sequence of the eastern and western artistic connections, was preceded by these monuments. The second criterion is about the frescoes of the Troodos region. These provide an excellent evidence and testimony of the Byzantine civilization at the time of the Comnenus. The last but not least criterion is the importance of these monuments as examples of the ecclesiastical architecture of the countryside, which are kept in an excellent condition, too.[10]

As these criteria do not deal entirely with the wooden roof itself, at this point is important to emphasize the uniqueness and the role of the roof. It is made of wood, which is available from the nearby forests. The unique characteristic of these churches is the construction and morphology of the roof. It is very steep. The main reason behind that, are the climatic conditions. Snow and heavy winds and waterfalls are very ordinary phenomenal in the Troodos mountains. So their primary role is the protection from the weather. All these will be explained later in this study (fig.1.5).

fig. 1.5 Heavy snow covers the village Pelendri in Troodos Mountain

[9] Unesco.org.cy, "CYPRUS NATIONAL COMMISSION FOR UNESCO - Βυζαντινές Εκκλησίες Του Τροόδους", 2016 <http://www.unesco.org.cy/Programmes-Byzantines_Ekklisies_toy_Troodoys,GR-PROGRAMMES-04-01-03-02,GR> [accessed 14 October 2015].
[10] UNESCO Centre, "Painted Churches In The Troodos Region - UNESCO World Heritage Centre", Whc.unesco.org, 2010 <http://whc.unesco.org/en/list/351> [accessed 14 October 2015].

1.3 The site of Troodos Mountains

At this point, it is important to set the scene and say a few things about the area, which it has a significant role in the process and the details that this study will focus. Cyprus is the biggest island in the Mediterranean Sea after Sicily and Sardinia. It is in the middle of three continents, Europe, Asia and Africa. Thus, through the years, Cyprus as an island at the crossroads of a different number of civilizations, was occupied many times and affected by them. As a result, it has a rich and diverse cultural heritage which acts as a witness in the

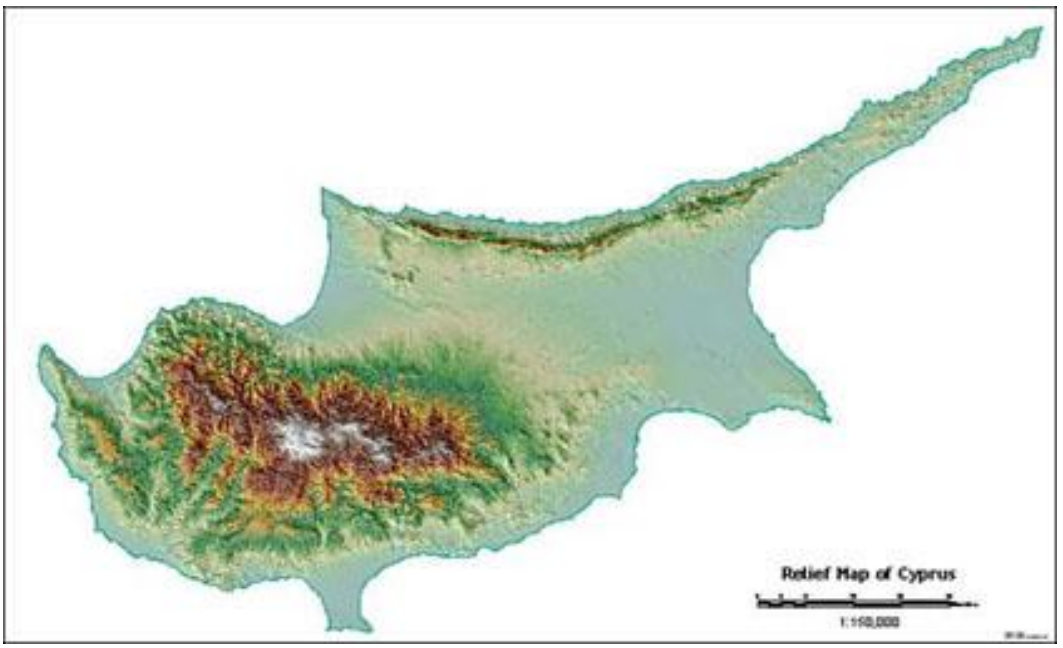


fig. 1.6 Topographic map of Cyprus showing Troodos range

past.[11] In the centre of Cyprus and expanding to the west, is Troodos mountain range, the biggest on the island. It has a variety of mountain peaks that are isolated from the plain (fig.1.6). The highest one is at one thousand nine hundred and fifty-one meters, called Mount Olympus.[12] In general, Cyprus and Troodos are famous for the enormous areas of forests and wood. There are different kinds of trees and shrubs. However, most of them are cypress, cedars and various types of pines. The climate there is cool, and the temperature can drop from zero to minus four Celsius. Whereas this drop in Olympus Mountain can be even greater reaching minus twenty Celsius. In general, Cyprus has low levels of rainfall, but in Troodos rainfall is something common. So it is obvious that Troodos is much different compared to the remaining Cypriot land, having a big quirky environment. Lastly, it is important to mention here that Troodos is the area that has the most Byzantine churches and monasteries

[11] The Technical Committee On Cultural Heritage In Cyprus, 2015, p. 2.
[12] Charis Fereos*, Ξυλόστεγος Φραγκοβυζαντινή Αρχιτεκτονική Της Κύπρου (Wooden Roof FrankoByzantine Architecture Of Cyprus)* (Nicosia: Holy Archbishopric of Cyprus, 2009), p. 3.

in all Cyprus. People of Cyprus faced many threats in the past from enemies who believed in other religion.

As a result, Cypriots were moving away from the threatened coastline to the safe mountains, to live and build their churches. Thus, the area of Troodos is known for its Byzantine art and houses the ten churches under UNESCO list, as well as, many wooden roof churches.

1.4 Historical details and background information

Before continuing to the main body of this study, is obligatory to set the chronological table and say a few things about the periods that this research is focusing on understanding what

PERIOD	DATE
Byzantine - Arab raids	mid 7th century - 965 A.D.
Byzantine	965 - 1191 A.D.
Frankish	1191 - 1489 A.D.
Venetian	1489 - 1571 A.D.
Ottoman	1571 - 1878 A.D.

fig. 1.7 Chronological table of different periods in Cyprus

was going on during the periods that these churches were constructed (fig.1.7). As said before, different civilizations and empires conquered Cyprus and left their trace. The geographical position of Cyprus played a significant role in this phenomenon.

Cyprus became part of the Byzantine Empire which lasted from mid-seventh century until 1191 A.D. A series of Arab raids, earthquakes and crusades occurred during that period, leading to many problems. Especially the Arab raids (649 - 961) that were more than twenty, shocked the peaceful life of the island and stopped its development. After these catastrophic raids had ceased, Cyprus was involved again in the regeneration of the Byzantine world.[13] This period is called Middle-Byzantine period (965 – 1191). As expected, the raids destroyed many buildings and churches. Therefore, an extensive constructional work began with the leaders bringing craftsmen from Constantinople for the reconstruction. Many new types of cathedral and churches appeared that period.

Then, the Frankish (or Lusignan) period started on the island. It lasted from 1191 to 1489 A.D. Different influences appeared and the Gothic style was introduced. However, the Byzantine architecture was still in use. The prelates were choosing their architects or

[13] Demetra Papanikola-Bakirtze and Maria Iakovou, *Βυζαντινή Μεσαιωνική Κύπρος (Byzantine Medieval Cyprus)* (Nicosia: Bank of Cyprus Cultural Foundation, 1997), pp. 13, 23.

craftsmen for the construction of cathedral and churches being influenced by the gothic style this time.[14] The vital thing to say here is that the unique type of wooden roof appeared only in the area of Troodos during the Frankish period.[15] At the end of the fourth teen century, Lusignans started to weaken in power.

Moving on, from 1489 to 1571 A.D. the Venetian period takes place.Some more earthquakes occurred and with the fear of the rapidly rise of the Ottoman Empire, Cyprus started upgrading its walls and creating new defences. Before they finish the walls, the Ottomans arrived and took control of the island. So from 1571 and onwards the Ottoman (Post-Byzantine) period has started and the time when the architecture and other arts faced their biggest decline.

Now, that we have explained the periods that concerns our churches and research, we know the different influences and facts that occurred during their construction and use.

1.5 Other works on the field

Throughout the years, there have been many studies and documentation on these churches. Dr, Christodoulos Hadjichristodoulou has written excellent individual books for each one of those churches, documenting various aspects explaining the paintings, the usage and the structure. Architect Dr, Charis Fereos has completed a study focusing specifically on all the wooden roofed churches all around the island. Architect Mr Andreas Philippou has published the book 'Byzantine Architecture in the Troodos Mountains' who through drawings, sketches and watercolours have presented an analysis, with a unique approach, of the Painted Churches of the Troodos Mountains. Moreover, more Cypriots and non-Cypriots made their pass writing books, articles and other stuff, such as David Talbot Rice and Athanasios Papageorgiou.

Adding to what already has been done, this study will focus specifically on the five Wooden Roofed Churches that are also part of the UNESCO World Heritage list. It is a new movement for Cypriots and the whole world that tries enhance the image of these churches for more protection, recognition and respect. What is exceptionally interesting is their structure, the way they have been built and the fact that they are so different but at the same time so similar. In this dissertation, I will deeply explain what I have studied during my visits to these churches, what I have seen, noticed and examined.

This study begins with the analysis of the type of these churches and their sub-divisions along with examples and illustrations. Followed by an extensive report on the construction of the roof, masonry and dome, as well as, morphological characteristics.

[14] Gwynneth der Parthog, *Medieval Cyprus* (Cyprus: Moufflon Publications, 2006), p. 220.
[15] Fereos, p. 16.

CHAPTER 2

2. Typology

2.1 The origin, concepts and characteristics of this type

Cyprus is known for its extensive amount of churches all over the island. It is also called the 'Island of the Saints.' As a consequence, a variety of types of these churches has been found over the years. At the Troodos region, the typology is changing a lot comparing to the other lowland parts of the island. On one hand the massive wood found in the forest and, on the contrary, the absence of lime in the area, which would allow the dome and vaulted construction, are the reasons for the creation of this different type. However, as mentioned before, the main cause of this change is the climatic conditions. The fact that this particular type does not exist in flat areas proves this.[16] This wooden type construction is dated to the eleventh century, being developed in later years and is not found anywhere else in the world.[17]

The main concept behind the design of the plan for this type is the enclosing of a building using very thick walls from another similar structure so that one or more corridors enclose the church. The corridors are later additions and at some cases, these were used as areas for women while the main nave was for men.[18] Corridors were covered by the extension of the external (at most cases) roof. According to the morphology of the ground, they were taking the decision as to on which side they were going to build the corridor or corridors.

The leading characteristic of this type is the steep double (internal and external) wooden roof. The details and construction of this roof are critical for this study, and we will report this in a later chapter. Other characteristics are the few openings on the walls. The doors are only located on the west, north and south sides of the church, and their number or location is different from each church, depending on the size of the church and the morphology of the ground externally. Windows in most cases do not exist and when these occurs are usually later additions. There are only some small openings on the west and east pediments and on the apse of the sanctuary that are mainly for ventilation.[19]

[16] Various Authors, *Ιερά Μητρόπολις Μόρφου : 2000 Χρόνια Τέχνης Και Αγιότητας (Holy Bishopric Of Morfou: 2000 Years Of Art And Holly)* (Nicosia: Holily Archbishopric of Cyprus, 2000), p. 75.
[17] Andreas Philippou, *Βυζαντινή Αρχιτεκτονική Στα Βουνά Του Τροόδους (Byzantine Architecture In The Mountains Of Troodos)* (Nicosia: [publisher not identified], 2006), p. 45.
[18] Philippou, pp. 45,47.
[19] Fereos, p. 145.

2.2 The sub-divisions of this type - examples

There are three types of this churches. Single-aisle, two-aisle (fig.2.1) and three-aisle churches (fig.2.2). This study will concentrate on the single-aisle type since the wooden roof churches listed on UNESCO's list are of this type.
The single-aisle churches are also sub-divided into smaller forms that will be examined onwards.

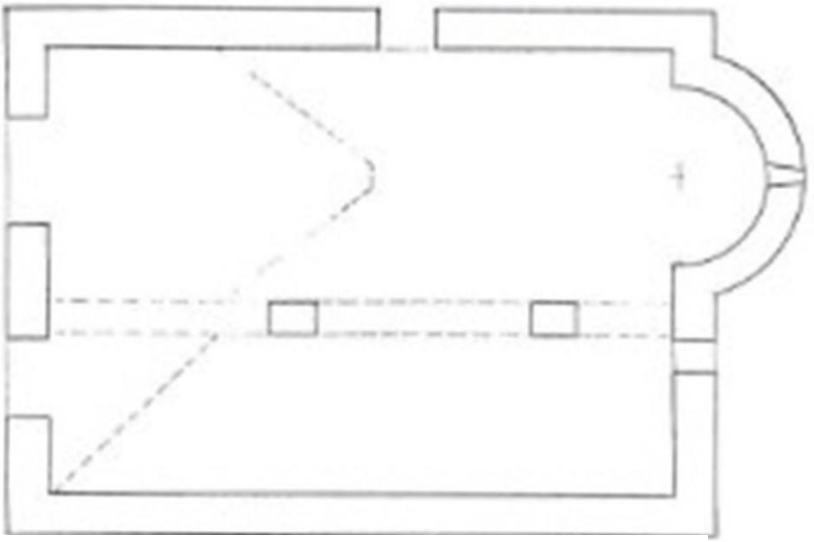


fig. 2.1 Plan of a two-aisle church

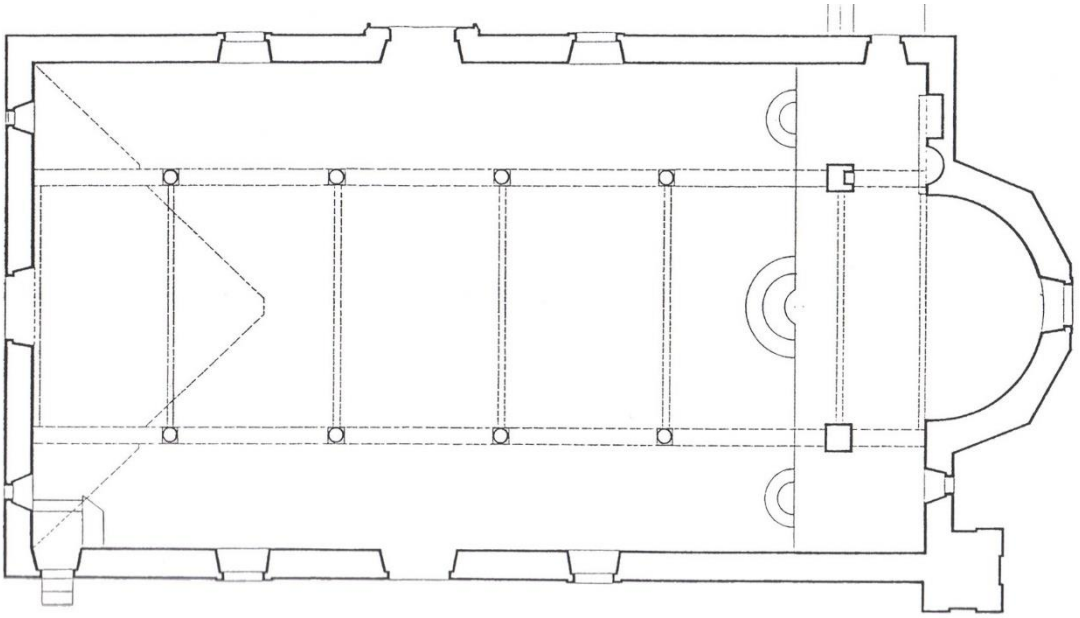


fig. 2.2 Plan of a three-aisle church

Single-aisle church without a corridor

The first simplest type is the single-aisle (without any corridors) (fig.2.3). This kind of church is the most common one and appears in many wooden roof churches. It is the predecessor of the other types. It consists of one main nave with small dimensions and the sanctuary on the east side. The iconostasis[20] divides the two parts that have a difference in height. The plan is rectangular. The ratio between length and width is 1:2, 1:2,5 or 1:3 confirmed during my visits there.

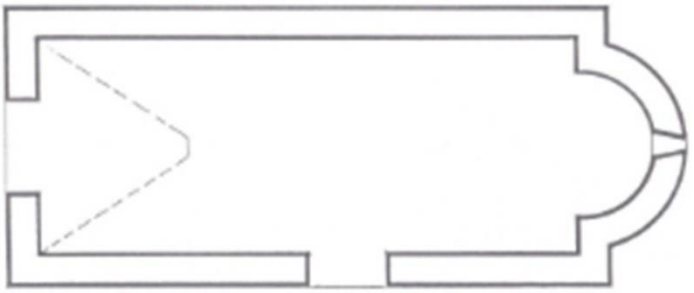


fig. 2.3 Plan of a single-aisle church

This form can be sub-divided again in the single-aisle with narthex (fig.2.4) and the single-aisle with burial chamber. The first one has a narthex on the west side of the church attached to the nave and separated with a wall having the same width as the nave. This wall has a door in the middle which connects the two spaces. The narthex has its own door as well, either on the west or the south side. It seems that for utilitarian reasons they later attached the narthex. The second one has a space covered with the external roof of the main nave at the north side where they used to bury people. These could be the owners of the church or the Saint of the church himself![21] An example of

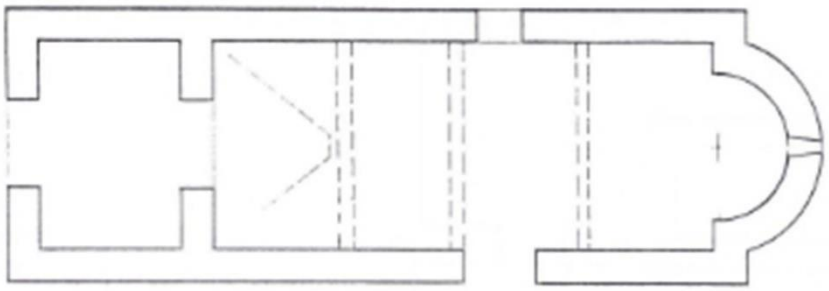


fig. 2.4 Plan of a single-aisle church with a narthex

fig. 2.5 The Church of the Transfiguration of the Saviour at Palaichori

[20] The iconostasis is an icon stand covered with important icons in between the nave and the sanctuary. It usually has three doors and in Orthodox churches it symbolizes heaven.

[21] Various Authors, *Ιερά Μητρόπολις Μόρφου : 2000 Χρόνια Τέχνης Και Αγιότητας (Holy Bishopric Of Morfou: 2000 Years Of Art And Holly)*, p. 78.

this simple form is the church of the Transfiguration of the Saviour at Palaichori, built in the sixteenth century (fig.2.5). A plan appears in Appendix 1.

Single-aisle church with a covered corridor on one side only

The next type is the single-aisle with a covered corridor on one of the long sides (fig.2.6).

This type is not common as it is found only on three churches with wooden roof, which are not in the UNESCO's list. The symmetry in this case no longer exists. The only corridor is placed either on the north or the south depending on the morphology of the ground, with the same length as the nave, but with a smaller width. A door that is placed in the middle of the wall between the nave and the corridor connects both.

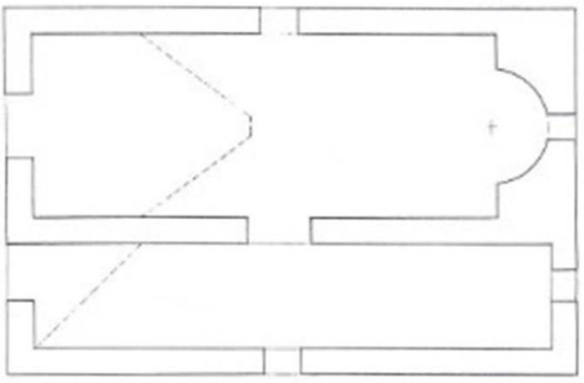


fig. 2.6 Plan of a single-aisle church with corridor on one side

Single-aisle church with a covered corridor on two sides

The third type has the corridors doubled. These could be on the west and south side or the west and north side of the church (fig.2.7). The roof of the main nave covers both and as in the previous types, the location of these corridors depends on the morphology of the ground and where the positioning could happen. The width of the north and south corridor is always smaller than the west corridor. The UNESCO list includes two wooden roof churches of this type. The church of the Virgin of Moutoullas (1280) (fig.2.8) and the church of Archangel Michael at Pedoulas (1474). Appendix 2 and Appendix 3 present a plan of each one respectively.

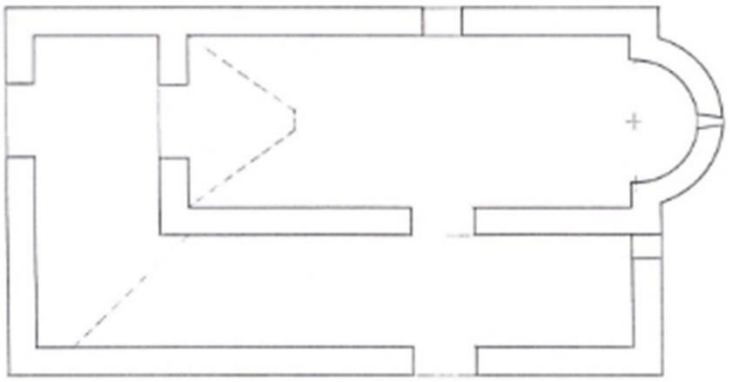


fig. 2.7 Plan of a single-aisle church with corridors on two sides

fig. 2.8 The church of the Virgin at Moutoullas Village

Single-aisle church with a covered corridor on three sides

Churches can also be found with three corridors on the west, south and north sides (fig.2.9). The extension of the roof from the main rectangular shape to the three corridors is giving the symmetry again. There are only two churches of these form, from which one of them is the church of the Virgin of Podythou at Galata (1502). A plan appears in Appendix 4.

Single-aisle church with a covered corridor on all four sides

The last form is the single-aisle church with corridors on all its four sides (fig.2.10). The roof on the north and south sides is an extension of the external roof of the main nave while on the west, and east sides is an extension of both the internal and external one.[22] There is only one example of this form, and this is the church of Holy Cross of Ayiasmati at Platanistasa (1494) that has the main door on the west side and two additional doors on the north and south sides (fig.2.11). A plan appears in Appendix 5.

[22] Fereos, p. 156.

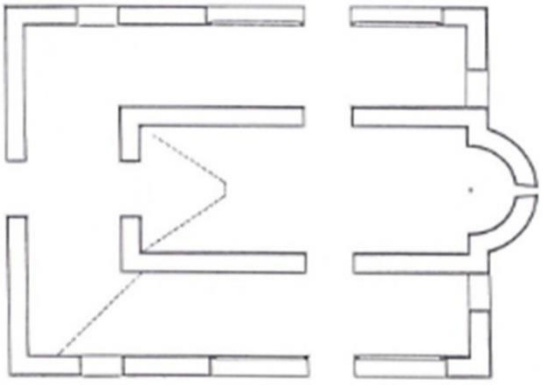


fig. 2.9 Plan of a single-aisle church with corridors on three sides

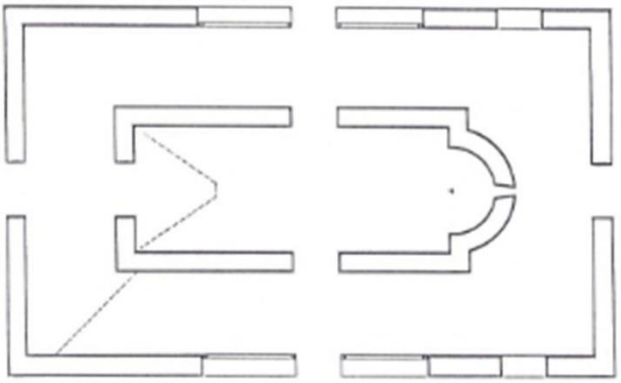


fig. 2.10 Plan of a single-aisle church with corridors on four sides

fig. 2.11 The church of Holy Cross of Ayiasmati at Platanistasa

Analysing the typology was essential, it helps and makes easier to understand the next chapters. From the next chapter, we will start examining the roof and give emphasis (firstly) on the internal one.

CHAPTER 3

3. The wooden roof and its internal construction

3.1 Introduction to the wooden roof

Undoubtedly, the roof construction is the key and primary element of the whole church, both regarding construction and morphology. That is why this study is going to focus on the building of the roof in much more details than any other aspect of this study. The first thing that someone will notice when watching these roofs is that they are very steep and gabled. Furthermore, there are cases, like the church in Pedoulas, where the roof reaches the ground (fig.3.1)! Apparently, the wooden roof was not founded in Cyprus, neither Cypriot craftsmen were the first to build roof from wood. In other places, such as the North and Central Europe or England and France there are also examples of wooden roofs, especially during the period of Gothic architecture.[23] However, it is something very impressive and a unique accomplishment, taking in mind the shabby tools, equipment that the Cypriot builders had and the circumstances or the technology used during that period. The Cypriot construction of the roof cannot be found anywhere else, not even in Turkey, Greece or any other Balkan country.[24] Troodos is an isolated area, far away from any significant civilizations. The techniques of the construction and this style was expressed and blossomed through the religious and spiritual feelings of the Cypriot builders and people of the area. To conclude, although, this construction was already known in Cyprus is not stem from the other European wooden roofs or any other influences like the Franks but the people of Troodos themselves and their deep feelings (fig.3.2).

fig. 3.1 The church of Archangel Michael at Pedoulas with its distinctive roof reaching the gound

fig. 3.2 Church of the Virgin of Moutoullas during construction

Before starting analysing the construction is obligatory to explain that the whole roof system consists of the internal and the external roof. To make it easier, firstly the internal roof will be described and in the next chapter the outer one. It will be necessary to explain even the small details of their construction because according to the Cypriot architect Andreas Philippou:

[23] Philippou, p. 179.
[24] Philippou, p. 181.

‘the strength of this timber roof rest upon the joints of the various parts and the resistance of the load bearing construction.’[25]

3.2 Construction of the internal roof and constructive details

The internal roof has the most beams and the planking that is visible from the inside of the church. The main characteristics of the internal roof are the wall plates, the tie-beams, the rafters, the ridge purlin and the planking. These are the elements that will be explained with illustrations starting with the main wall plates and concluding to the planking (fig.3.3).

1. Wall plates
2. Tie-beams
3. Rafters

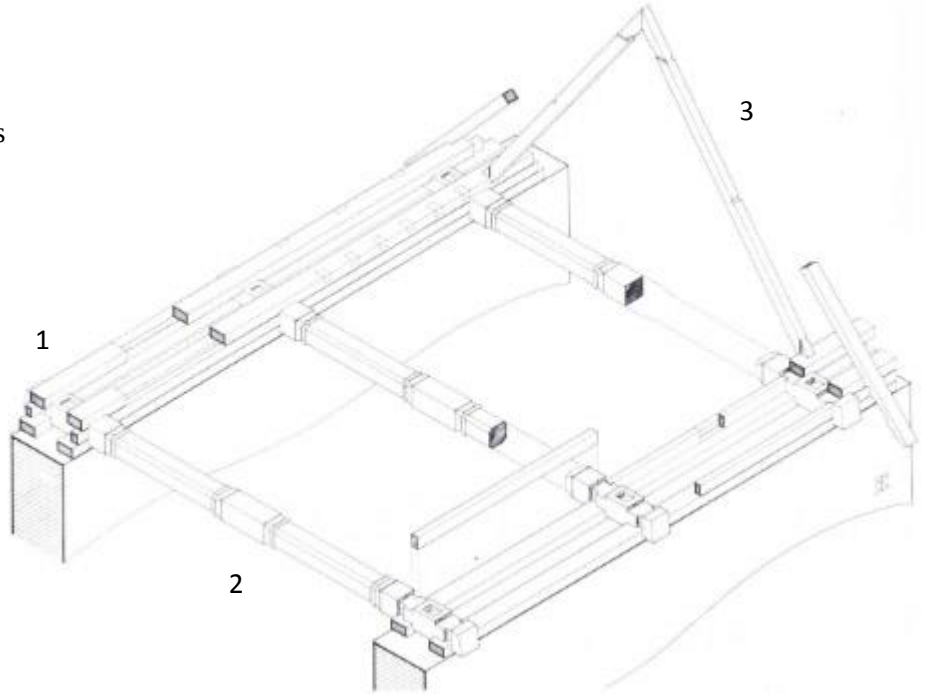


fig. 3.3 Representation of the internal roof construction

Wall plates

The wall plates are located in the lower part of the whole skeleton, and these are important as they take the load and transfer it to the side walls. They are placed on the top of these long side walls (south and north) following all its length. Usually, they consist of two pairs of wooden beams. In total, they are four beams, two down and two up. The lower pair is seated directly on the wall masonry. The reason of having two pairs instead of one is because there are two roofs, as well. So the two beams being placed on the internal side of the wall support the internal roof and the opposite happens with the external roof, which is supported on the beams that exist on the outer side of the wall. The second upper pair of the wall plates is

[25] Philippou, p. 181.

fig. 3.4 Details showing the four wall plates

placed on top of the tie-beams (fig.3.4). For the tie-beams, more details exist in the upcoming paragraph.

The voids left between the upper, and lower pair of wall plates were covered with thick planks that were essential for the insulation of the interior space. The planks were pinched and rabbeted on the tie-beams. The surface of the wall plates and the planks should be seen as one. Apart from filling the voids, the planks gave more reinforcement to the wall plates.

That is the reason for their thickness.[26]

The height of each wall plate is around twenty-three to thirty-five centimetres. The dimensions of their rectangular section vary. Typically, the upper ones who take the loads are bigger than the lower, but always their larger side is placed horizontally. The length was not standard, too. Depending on the available timbers there are different lengths, so many pieces were bonded together to form the whole length of the wall plate.[27] The joint was made with the zig zag method. As mentioned before, the roof was extended to the east above the apsidal chapel and the dome, but also on the West for protection. These extensions were followed by the wall plates, too.[28]

Tie-beams

It is already known that the tie-beams are located between the upper and lower pairs of wall plates. These are perpendicular to the wall plates that span from the north to the south side walls. They are wooden beams, too (fig.3.5). A notch was created on every meeting point between the wall plate and the tie-beam, holding them in place and achieving immobility. Tie-beams were placed every two metres. Their section is square (approximately twenty by

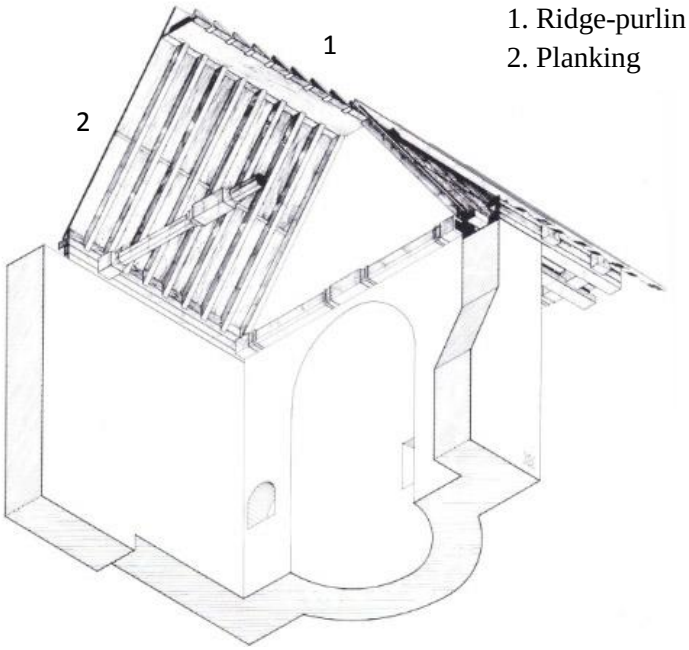
[26] The thickness of the planks between the two pairs of wall plates is seven centimetres and the height from seven to ten centimetres.
[27] In an extreme case, in the church of Holy Cross of Ayiasmati at Platanistasa, there is a big wall plate covering the whole side wall with the length of eleven metres. Located in the north.
[28] Fereos, pp. 107-111.

twenty centimetres), except the two tie-beams at the ends that are attached to the east and west walls. These have a rectangular section and bigger dimensions. This is happening because the loads at these points are quite big.

fig. 3.5 View from the inside showing the tie-beams that connect horizontally the wall plates together

Their length was the same as the length of the church, including the thickness of the two side walls.[29]

Taking everything into account, from what was told before, the lower structure or part of the skeleton for the internal roof construction is a strong and stable system consisting of many wooden beams (wall plates or tie-beams). It is important to be able to withstand the loads and face any tensile movements from the higher parts of the roof (fig.3.6).



1. Ridge-purlin
2. Planking

fig. 3.6 Representation of the internal roof construction

Rafters

These elements are placed in pairs, but their only meeting point is on the top (fig.3.7). They are positioned on the top inner wall plate. The general weight of the roof is large, so the craftsman needed to place rafters very dense.[30] They are quite small elements with sectional dimensions of seven by nine and eight by ten centimetres. Their long side was placed vertically. Again, they used notches of right angles, with the difference that this time the notch was on the rafter and not on the wall plate.[31] The joint on top will be clarified later.

[29] Fereos, pp. 111-112.
[30] Every twenty eight to thirty centimetres a pair of rafter was placed.
[31] Fereos, pp. 113-114.

fig. 3.7 Dense position of the rafters in the internal roof construction

Rafters continue to exist on the extension of the roof to the west and above the dome on the east. To avoid any movement to the right or the left, they used to insert small upright planks between two pairs of rafters. These are called wall plate battens, and the surface of these elements along with the surface of the wall and the wall plates continues.[32]

Ridge-purlin

The ridge-purlin can be seen as one primary beam at the top that links all the rafters together. The vertical simple joint that a pair of rafter creates on top of their connection point is not strong enough to hold them in place, so is enhanced with the ridge purlin. The two pediments support this element on the west and east sides of the church. Its role is not to withstand any loads or transfer them, but to hold in place the whole skeleton of the roof. Any incisions to connect the ridge purlin with the rafters are again made on the later ones. Battens exist here as well. Along the whole length of the rafters, there are the ridge purlin battens that have the same role as the wall plate battens.[33]

Planking

The space between the rafters was filled with wooden planks that were nailed directly on top of them. The planks were the ceiling of the church (fig.3.8). Their width was twenty-six to twenty-eight centimetres and the thickness only two centimetres. Regarding the length, this was not enough to cover the whole distance from the lowest to the highest part. So two planks were used. The joint

fig. 3.8 The rafters holding the planks and the ridge-purlin on the highest part of the internal roof

[32] Interesting is the fact that no wooden or metal nails were used for the most of the joints and supporting elements in any of the roof construction part, except the planks. However, more nails can be found nowadays, but these are later additions.
[33] Fereos, pp. 114-117.

between the two planks was made with another small triangular batten.[34] All these elements still to exist on the two extensions on west and east, same as the previous ones.

With the planking, the parts of the internal roof are completed (fig.3.9). Next step is the external roof.

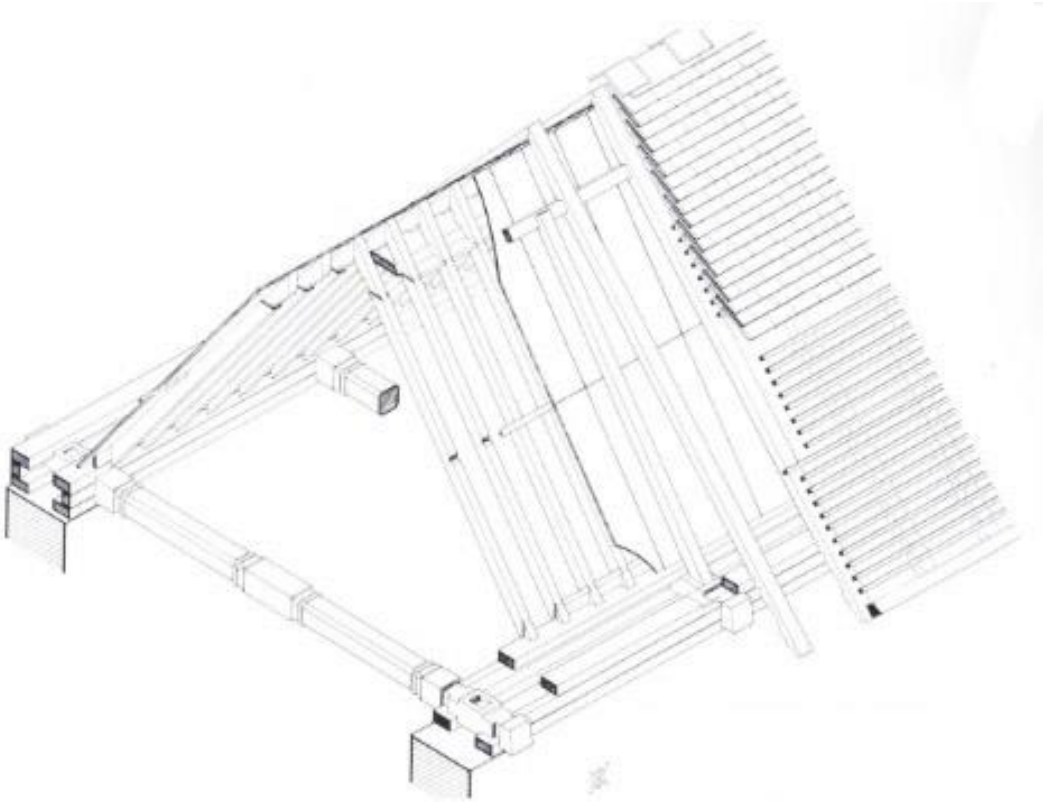


fig. 3.9 Complete representation of the roof system with all the constructive details

[34] Fereos, pp. 117-118.

CHAPTER 4

4. The external roof construction, some variations and the roof differentiation above side corridors

4.1 *Construction of the external roof and constructive details*

First of all, the outer roof was mainly constructed for protection from the weather conditions and was completely independent. So, it has to be able to encounter the heavy rain, snow and winds on the highest mountains of Cyprus. The steep angle helps in this case. The external roof was the element of the church that used to be replaced many times.[35] Only three components need to be described more since the main parts of the timber roof were already explained. Similarly to the internal roof, there are more rafters, some purlins and on top of them the final elements that are the tiles (fig.4.1).

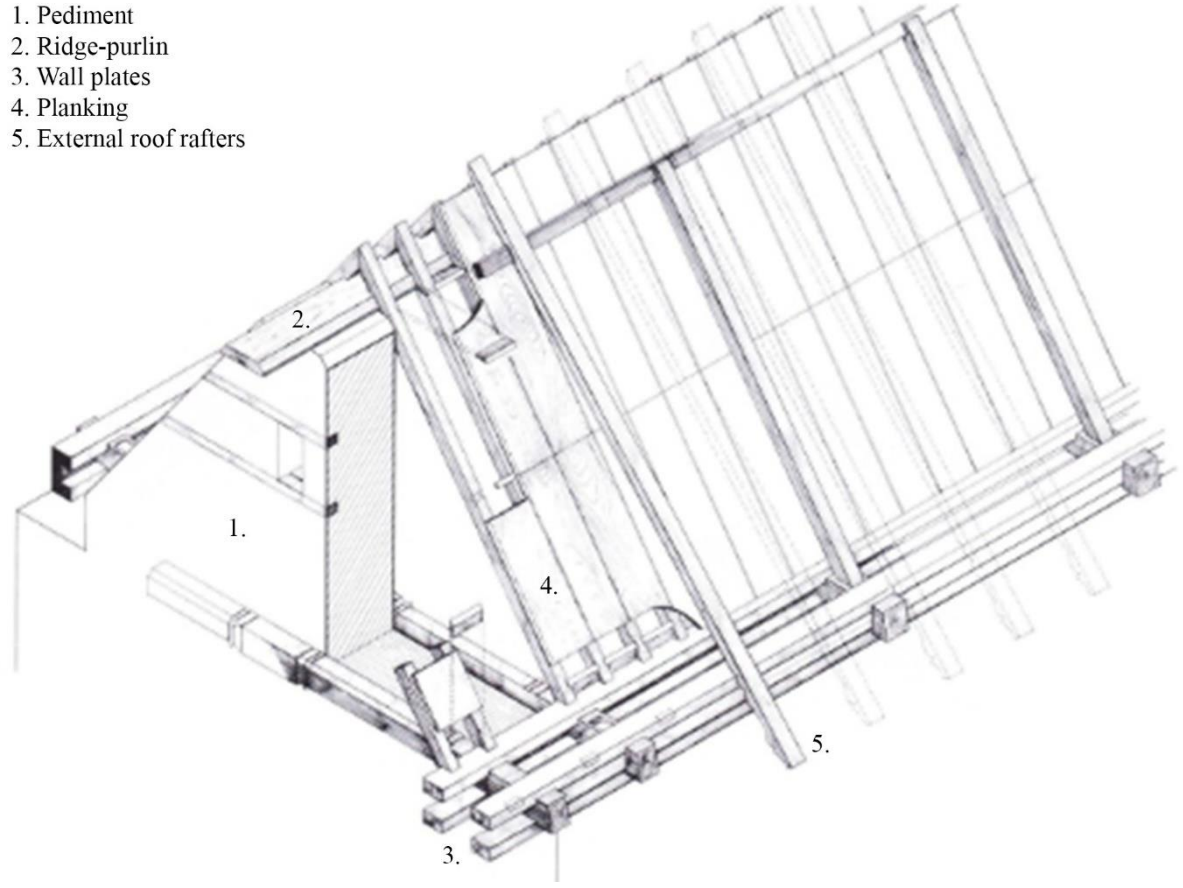


fig. 4.1 Representation of both the internal and the external roofs

Rafters[36]

The rafters of the external roof are supported in their lower part from the outer, upper wall plate on the two long walls of the church. In contrast to the internal roof, the rafters are not completely in pairs, as they do not have any contact point on the top. The supporting elements

[35] Today, no church has the original external roof. They have all been replaced in later years.
[36] The word is referring for the rafters being placed only on the external roof construction.

are again two more purlins (one on each side) located around fifty to sixty centimetres below the roof. The purlins rest on top of the planks from the internal roof. The incisions for the joints were made on the rafters.[37] Though, in a few cases, the incisions for the lower joint can exists in both the rafter and the wall plate for better results (fig.4.2).

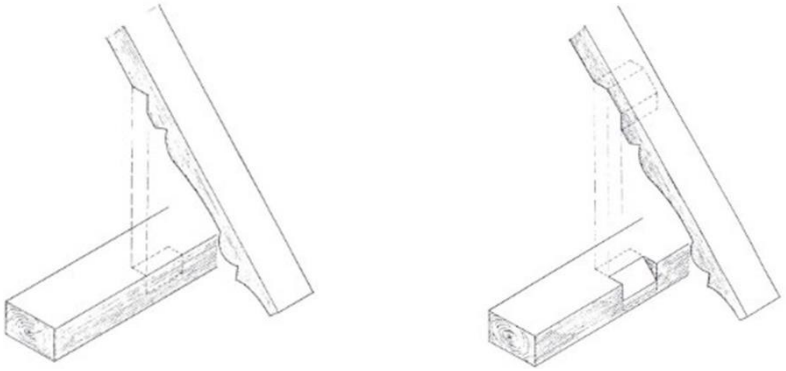


fig. 4.2 Incisions

These rafters are placed at greater distances than the ones used for the internal roof.[38] Their sectional dimensions are bigger, too (eight by twelve centimetres). As in the internal roof, some wall plate battens were placed to stop any unwanted movements from the lower part of the rafters. It is essential to say that the rafters do not stop at the joint between them and the wall plate, but they are extended around fifty to sixty centimetres lower for the protection of the wall and the wall plates (fig.4.3).[39]

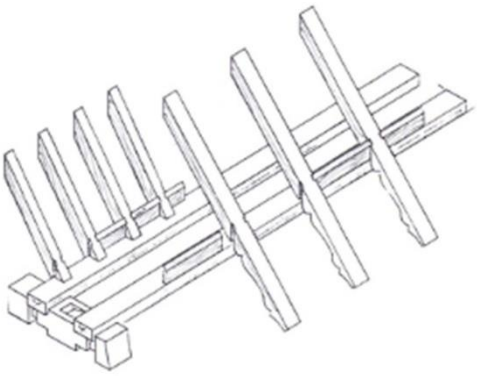


fig. 4.3 Internal and external rafters

Purlins

Following the rafters, are the purlins that will support the tiles. These are tiny (three by four centimetres in section) and are being placed every ten to twelve centimetres (fig.4.4). The dense positioning is not randomly. The reason will be explained in the next paragraph. Purlins are extended on the east and west from the last rafters by ten centimetres so the tiles can protect these rafters.

fig. 4.4 Detail showing the perlins supporting the tiles

[37] In general, most of the incisions and the notches were made on the rafters and not on any other constructive elements, like the wall plates.
[38] Fifty centimetres is the distance from one rafter to another in the external roof construction.
[39] Fereos, pp. 120-122.

Tiles

The custom-made flat hooked tiles are placed on top of the purlins. They are all flat with a small extension (hook) on their form so that they can stay in position (fig.4.5). Their length is thirty centimetres. This fact, combined with the ten centimetres distance of each purling from the other, means that each tile covers the next tile by its two/third. So if someone cuts vertically, the cut line will cut through three different tiles!

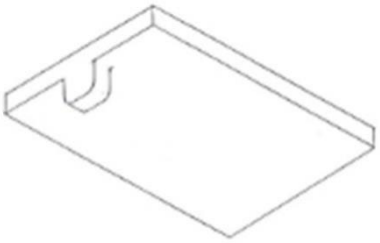


fig. 4.5 Hooked tiles

Finally, on the topmost part of the roof, some more tiles are positioned (fig.4.6).

Their form is a dihedral anchor. Specifically, the builders used two layers of these tiles. The first layer was a line of tiles, one next to each other. The second layer consisted of the same form of tiles, but with a smaller length. Nevertheless, this time, they placed them only on the points where there were connections of the tiles from the layer below to make the roof entirely waterproof (fig.4.7).[40]

fig. 4.6 The tiles on the roof of the church at Platanistasa

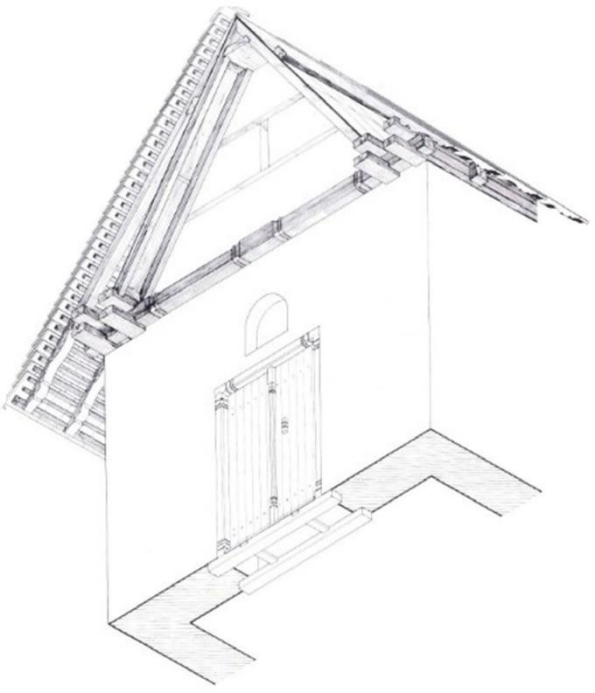


fig. 4.7 Representation of the extension of the roof on one of the pediment

[40] Fereos, pp. 122-123.

4.2 Variations of the roof

The construction of the wooden roof is not in all the cases the same. Some small alterations and changes in the roof construction can exist, but of course, the main concept remains the same. The first variation is the most important. It is the case where instead of four wall plates, there are only two (fig.4.8). The inner rafters supported by the inner wall plate and the opposite happens with the outer ones. The tie-beam sits on both wall plates, and the battens still exist. The next example is when the wall plates from the inner side are two like the standard roof, but on the outer side, there is only the lower wall plate (fig.4.9).[41]

Lastly, some more variations are just illustrated, because they all came from churches of later centuries and were not in the boundaries of this study (fig.4.10).

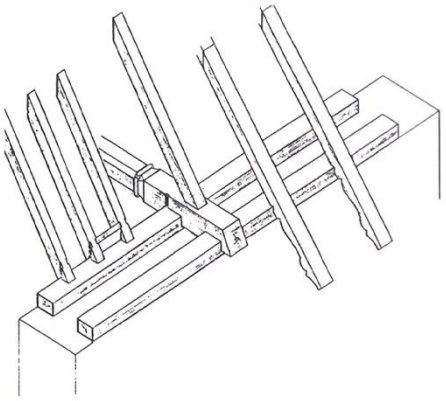


fig. 4.8 Variation with two wall plates

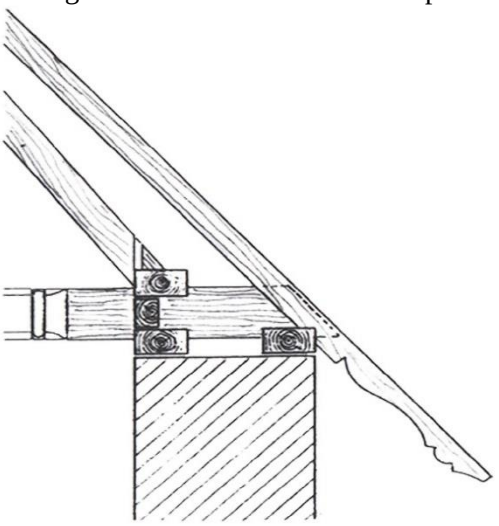


fig. 4.9 Vatiation with three wall plates

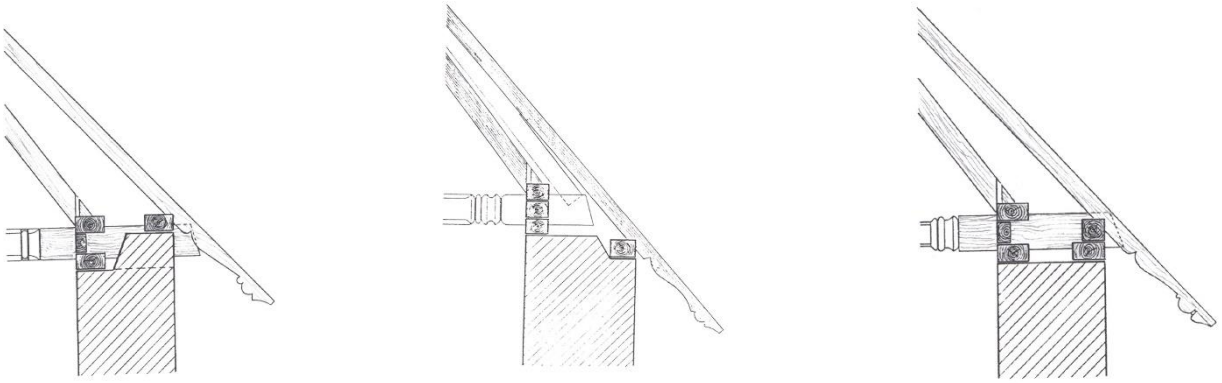


fig. 4.10 Other variations

[41] Fereos, pp. 124-125.

4.3 The wooden roof of a church with one or more side corridors

As already described, all the five churches that are our focus have one or more side corridors. Until now, the construction of the roof was explained when there are only the main nave and nothing else in the perimeter. What happens when there are side corridors and how the construction of the roof changes?

The roof covering the side corridors is an extension of the roof that is covering the main space, and this can happen by extending only the external roof or both of the roofs (fig.4.11). This choice was not random. In the case where the side corridors did not have a primary role or were not part of the main space, and they worked as menial spaces, and then only the external roof was used. On the other hand, when these were ritual spaces then the internal and the external were used.[42]

fig. 4.11 Examples of the extension of the roof to the side

[42] Fereos, p. 127.

Starting with the first case, the rafters of the outer roof were stretched to the side, and they now sit on the new wall plates on the top of the new side wall. With the difference that the new wall plates are only two, placed directly on top of the side wall (fig.4.12).

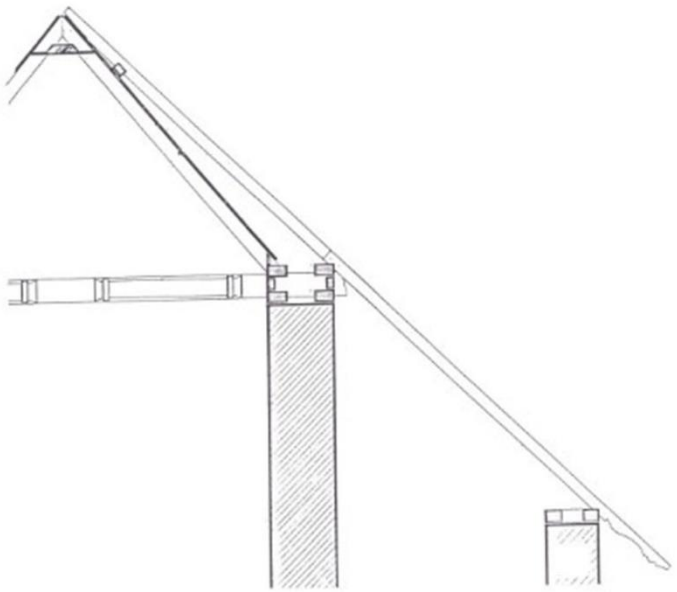


fig. 4.12 Extension of the roof to the side corridors using only the external roof

These new wall plates can be called side wall plates. The joint at this point was made with either incision on both rafter and wall plate or with the only one incision on the rafter.[43] Obviously, the length of the new extended rafter is too big to be covered only by one piece of wood. So instead of one beam, two beams were used as rafter being joined at the point where the main wall plates are.[44] This joint was made with simple methods as illustrated (fig.4.13).

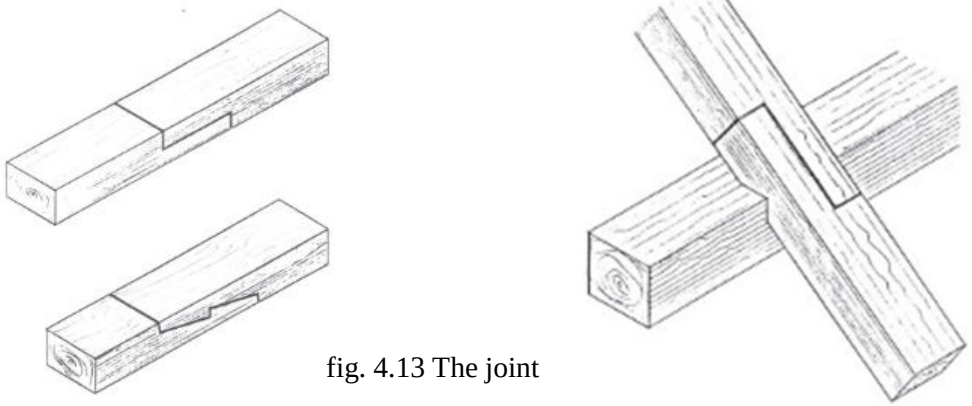


fig. 4.13 The joint

[43] At the church of the Virgin of Podythou at Galata the joint is with incision only on the rafter. For this reason the rafters were made thicker.
[44] Fereos, pp. 127-128.

Moving on to the second case, the strategy remains the same. Both of the rafters were extended. The internal ones sit on the inner side wall plates while the rafters used for the external roof sit on the outer side wall plate (fig.4.14). Finally, the tiles and the planks are placed in the same way as in the main space.[45]

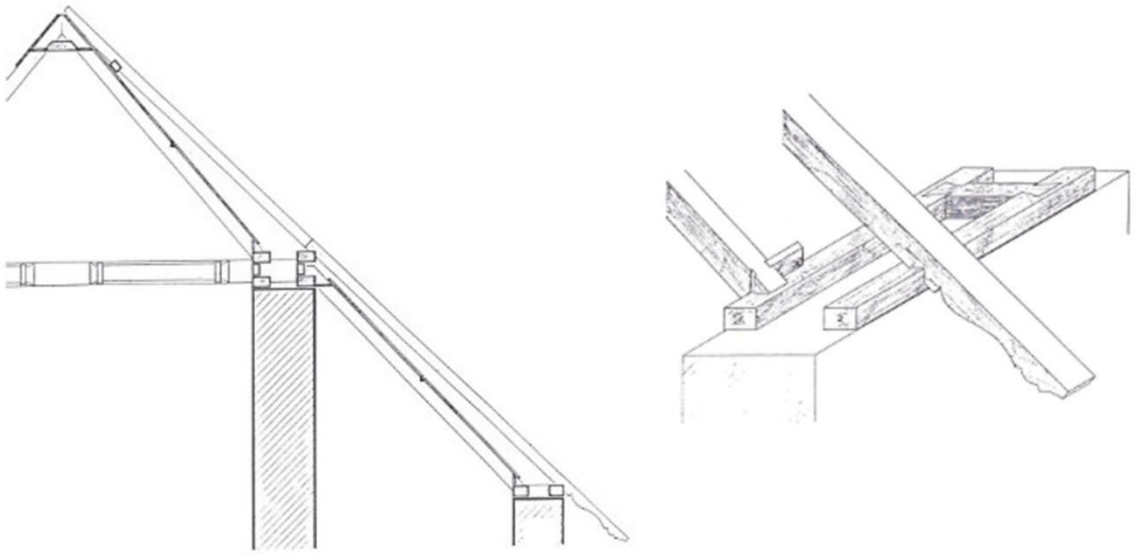


fig. 4.14 Extension of the roof to the side corridors using both roofs

Before closing this chapter, something interesting and worth mentioned is the wish of the builders to make the roof on the side corridors even higher. This is logical as the height of the side corridors could be very short because of the steepness of the roof. The question here is why they did not make just the side walls higher? The answer is because then the rafter would not be rectilinear. So if they wanted to make more space, they should also make the rafters somehow higher using different techniques and methods, such as the additions of more beams. For this study, some of these techniques will be just illustrated (fig.4.15).

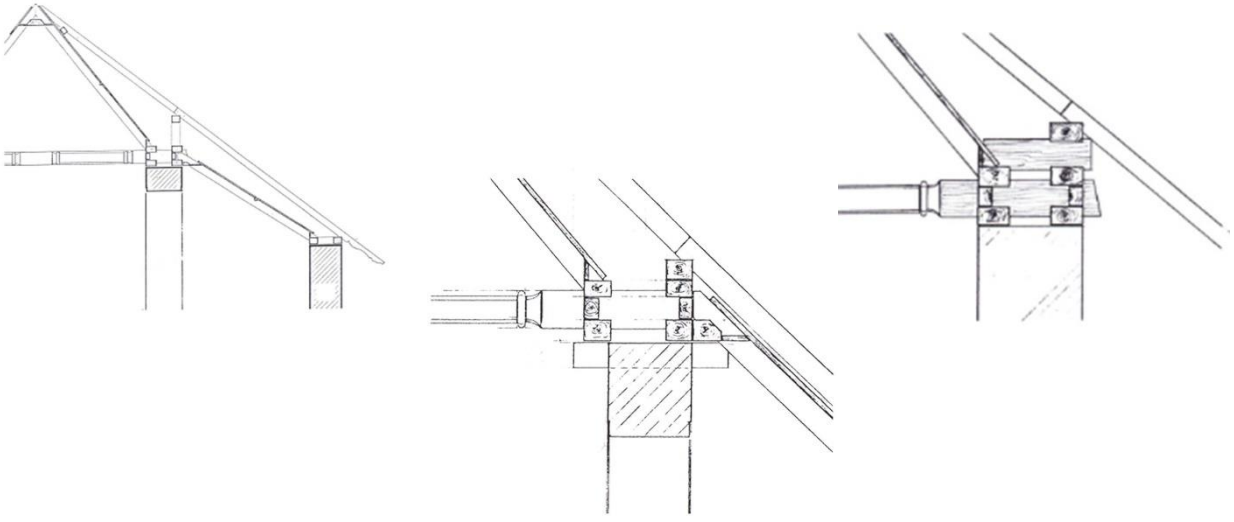


fig. 4.15 Methods of making the rafters higher

[45] Fereos, p. 130.

The next and final chapter has to do with the morphology of the roof. Also, to complete the constructional part of the churches, the masonry and dome construction, that are the secondary most important elements after the roof will be introduced.

CHAPTER 5

5. Morphology of the roof and to other church architectural construction elements

5.1 Internal and external roof morphology

The final aspect of this attractive wooden roof is its morphology. Now that the construction is explained, and the main parts are known, it is easier to speak about some morphological details.

Starting with the view of the roof from the inside, think of someone standing exactly in the middle of one of our five churches looking the wooden roof (fig.5.1). What are the things that

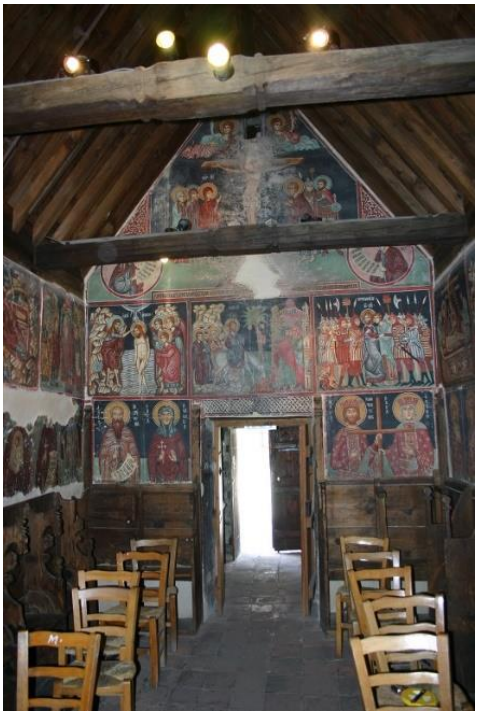


fig. 5.1 Internal views of the churches

one will notice and what thoughts will make? Regarding the appearance, not only the roof but also its connection with the walls and space, in general. One thing that is observed is the contrast of horizontal versus vertical. If the main elements of the roof are inspected in detail, they can be divided into two groups. In the first one are the wall plates, the rafters, the planks and the ridge purlin (verticality) and in the second one the tie-beams (horizontal) (fig.5.2).

There is a continuity in the surface of all the elements of the first group. From the bottom to the top. The wall plates are directly attached to the walls. Then from the wall plates, through the wall plate battens, the continuity moves on to the rafter's surface and on the inclined surface of the planks. Finally, it reaches the top where it meets the ridge purlin and the battens. The whole movement is in a sense vertical and straight from the bottom of the walls to the top of the roof. In contrast, at the height of the wall plates, the tie-beams give the horizontal perception in space. In fact, these are the most significant and decorative elements in the church. They are independent of their rhythmic order. The movement to the sanctuary is emphasised from the tie-beams, and these divide the main nave into aesthetic spaces.[46] They are highly decorated with colours and are carved. Their morphological treatment is done with care. Even more decorative are the tie-beams placed near the doors on the sides to highlight the entrance into the church. The next most decorative element is the ridge purlin and less decorative the wall plates and the rafters.

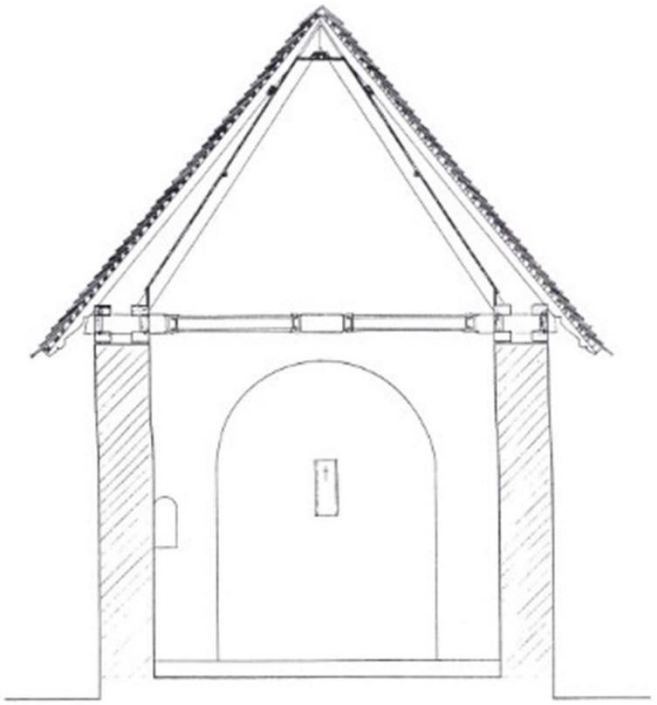


fig. 5.2 Sectional representation

The exterior view and morphology of the wooden roof are at its bigger surface covered by the hooked flat tiles. The only points where the other features of the roof are visible (and completed) is on the two pediments on the west and east (fig.5.3). As already mentioned, the roof on both sides is extended. When someone looks on the two elevations of the pediments, it is easy to recognise that the

fig. 5.3 View on the east and west pediments

[46] Fereos, pp. 163-164.

rafters sit on the wall plates, and their pair is connected and tightened on the top along with the ridge purlin. All the constructive details on these pediments are visible except the planks for the ceiling. It is easy to realise that the whole roof is made of two parts, one internal and one external when looking the two pediments (fig.5.4).

fig. 5.4 Morphology of constructive details on the roof

To conclude, regarding both the internal and the external morphology of the roof, on most of its parts there is countersink engraving[47] along the whole length of the wooden beams. It is more underlined on the wall plates and is divergent from the planks (fig.5.5).[48]

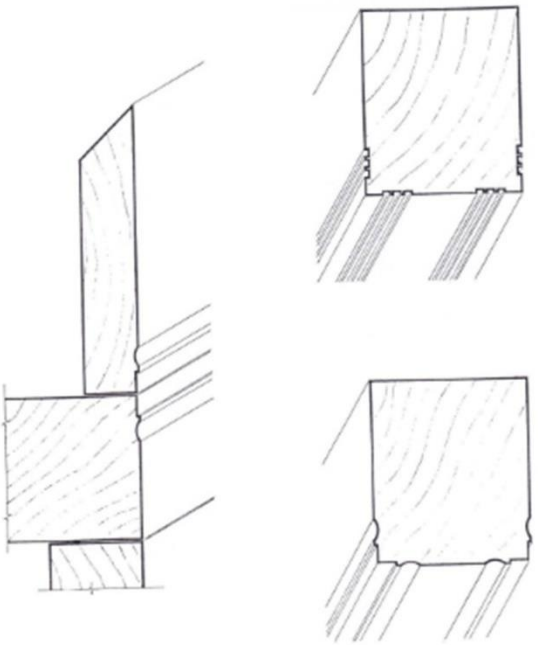


fig. 5.5 Examples of countersink engraving

[47] This engraving exists as a decorative feature in other parts of the church, like the doors.
[48] Fereos, p. 170.

5.2 Masonry construction

What is impressive to say about the masonry is that the materials used, like stones and wood, are all made locally and gathered from nearby areas.[49] It is simple rubble with relatively big thicknesses from forty to sixty centimetres. The builders thought that by increasing the mass of the walls, this could counter the earthquakes.[50] Also, they had the masonry cover the perimeter walls and the apsidal chapel of the sanctuary. Pilasters for the reinforcement of the walls do not exist. Ashlar is a very rare case used only in apses and niches, as all the stones have an irregular shape. The hardness of the stone makes them impossible to be curved. To achieve a good result and to bond these stones together effectively, the builders were using pebble or ceramic scrap. So these small pieces would cover every void left by the uneven shape of the stone.[51]

The shades of grey colour from the stones combined with the red colour from the ceramics give a pleasant impression. In all the cases the stones are placed horizontally and never vertically. Their durability and form are achieved by the small pebbles and scraps. They use clay for the welding. A few masonries have straws to combine the clay resulting in an increased durability (fig.5.6).

An essential element of the masonry construction is the wall plates, mentioned before. These wooden beams that are placed horizontally can span all over the perimeter of the church, and they give more reinforcement to the construction. They have a variety of widths. It is important to remind that there are always two beams in pairs, in both the internal and exterior sides of the masonries.

fig. 5.6 A photo of the masonry showing clearly the materials, the colours and the textures. In this case, it looks like there was one door opening being covered later with masonry

[49] Papageorgiou, p. 385.
[50] Slobodan Ćurčić, *Middle Byzantine Architecture On Cyprus* (Nicosia: Bank of Cyprus Cultural Foundation, 2000), p. 10.
[51] Fereos, pp. 101-102.

Different incisions are used to connect them together and especially on the four corners of the walls.[52] In some cases, it is interesting that the wall plates are the lintels of the openings, doors or windows. More wall plates exist in the two pediments on the west and east sides of the churches, as a result of the steep angle of the roof (fig.5.7).

fig. 5.7 One of the two pediments of the church at Moutoullas with the wall plates and the masonry being constructed until the top following the steep angle of the roof

Finally, there are no significant openings in the masonry. The few openings that exist are mainly the small doors or the tiny openings on the pediments and the apsidal chapel of the sanctuary (fig.5.8).

fig. 5.8 Windows were in most cases a later addition and were placed on the long side of the church when there were not any door. The size is very small and the lintel here is the wall plate

5.3 Dome construction

It would be a mistake if the construction of the dome were left untouched from this study. In general, the dome is something crucial and thus an essential part of a church. However, in the case of the wooden roof churches on UNESCO's list, the dome is not something unique or impressive with intricate construction details. It is located where the apsidal chapel of the sanctuary is, and its form is mainly divided into three groups. Firstly, the spherical form, secondly the parabolic and thirdly the random form.[53] Nevertheless, all the five wooden roof churches have their dome being spherical and in a semi-circular form (fig.5.9). A part of the dome is prominent from the eastern wall of the church, and usually, the roof from the east side is extended to cover the apsidal chapel with the dome. In the case of the

[52] Fereos, pp. 102-103.
[53] Fereos, p. 103.

church of Holy Cross of Ayiasmati at Platanistasa the dome is of course completely covered, not because of

this natural extension, but because as mentioned before the church is single-aisle with corridors on all its four sides. As a result of this, the dome and the apsidal chapel are enclosed from the four corridors around the perimeter of the main nave, and all are covered by the external roof that it extends. The apsidal chapel where the dome is, was made from stones with small dimensions, and the final thickness is no more than twenty-five centimetres. The stones were placed in a radial form. The end of the apsidal chapel inside the church was determined by an apse construction (fig.5.10).[54]

fig. 5.9 The apsidal chapel with the dome externally from the church of the Virgin of Podythou at Galata (above) and the semi-circular dome from the inside of the church (right).

fig. 5.10 The dome of the church in Pedoulas. A part of it is covered by the roof.

[54] Fereos, p. 103.

CHAPTER 6

6. Conclusion

This dissertation is an effort to explain the reasons why the wooden roof churches in Troodos mountains are worth to be considered as our Unique Heritage. The study has shown their real value and their key features, explaining their typology and exposing[55] their best weapon, the wooden roof. Through an extensive argument and details on the construction and morphology of the roof (both internal and external), the aim was to bring to the table this achievement to be known to everyone. Also, more general details about the churches, such as their location and historical background, their masonry and dome or the criteria for their induction to the UNESCO's list were all required for a better understanding and to be able to finalize a complete image of them.

The question, after all these, is if this type of church is indeed unique regarding its origin. The answer is not simple and needs a lot of research. Many people gave different answers through the years and studied the origin of this roof, but nothing is known for sure or is clear. Nonetheless, they are all very important for Cyprus and the world. People from and outside Cyprus need to know details about them and respect their value. That was the main aim of this study. To explain why everyone should be interested and why they are so special to the world.

Their importance is dated many years ago and still exist nowadays with an enormous amount of people and tourists visiting them.

Currently, they are protected by the Department of Antiquities of Cyprus, which has the responsibility for their restoration and maintenance, too.[56] Some of them are in the heart of their village, and others are more isolated, like the church at Galata. In any case, most of the days are open to the people, and they can even be operated on particular days. They are proud monuments of Cyprus and especially the people in those villages.

Sadly, Cyprus and its treasures are threatened by the world and people. The reality is painful, and Cypriots try to protect their culture and heritage. As Skevi Louca said in a letter to UNESCO and an article on the website:

'[E]very inch of this country of ours, hides an ancient secret, a monument, an artifact. […] Our goal as Cypriots, is to demilitarize our island.'[57]

Through this study, I have tried to promote these churches as one of the many treasures of this

[55] The word expose is used to emphasize the fact that these churches are basically hidden and unknown from the world. Only some Cypriots know and to expose them worldwide is necessary.
[56] Various Authors, *Ιερά Μητρόπολις Μόρφου: 2000 Χρόνια Τέχνης Και Αγιότητας (Holy Bishopric Of Morfou: 2000 Years Of Art And Holly)*, p. 193.
[57] Change.org, "UNESCO: Declare The Island Of Cyprus An UNESCO Heritage Site." <https://www.change.org/p/unesco-declare-the-island-of-cyprus-an-unesco-heritage-site?recruiter=23649813&utm_source=share_petition&utm_medium=facebook&utm_campaign=autopublish&utm_term=des-lg-share_petition-reason_msg&fb_ref=Default> [accessed 11 January 2016].

island to the world. Their value is not counted only towards the generic population, but moreover, to the world of architecture. The wooden roof construction is the strongest part and a unique characteristic.

There are a lot that can be done in the future. Hopefully, this is only one small step. Positively, things will get better and more people will start recognizing the value of these masterpieces. More protection and care is necessary for everyone.

'Encourage participation of the local population in the preservation of their cultural and natural heritage.'[58]

And…

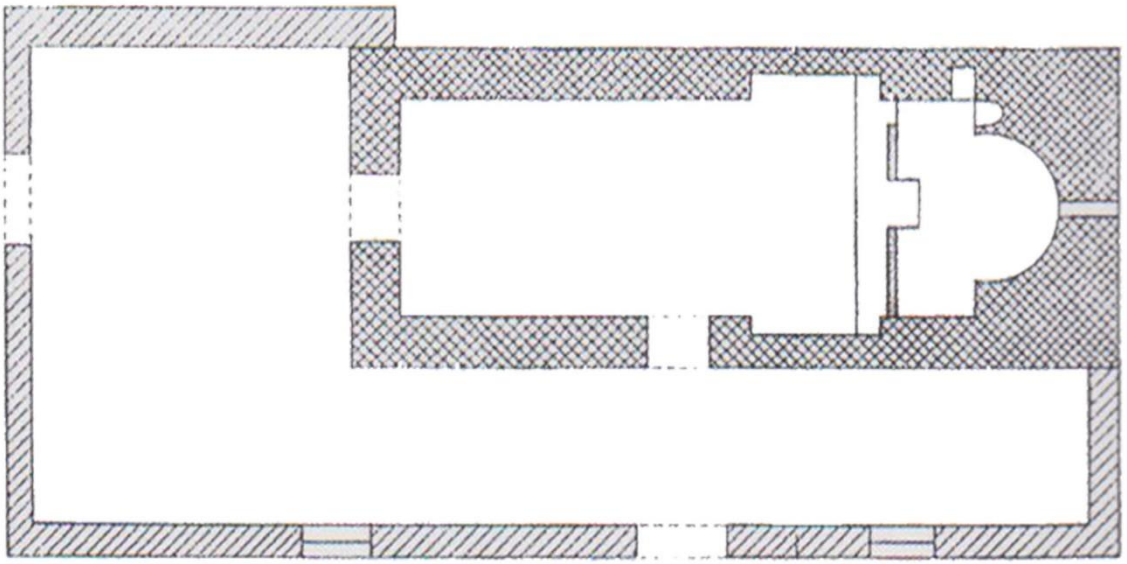
'Encourage international cooperation in the conservation of our world's cultural and natural heritage.'[59]

[58] UNESCO Centre, "UNESCO World Heritage Centre - World Heritage", Whc.unesco.org, 2016 <http://whc.unesco.org/en/about/> [accessed 11 January 2016].
[59] UNESCO Centre, "UNESCO World Heritage Centre - World Heritage", Whc.unesco.org, 2016 <http://whc.unesco.org/en/about/> [accessed 11 January 2016].

APPENDICES

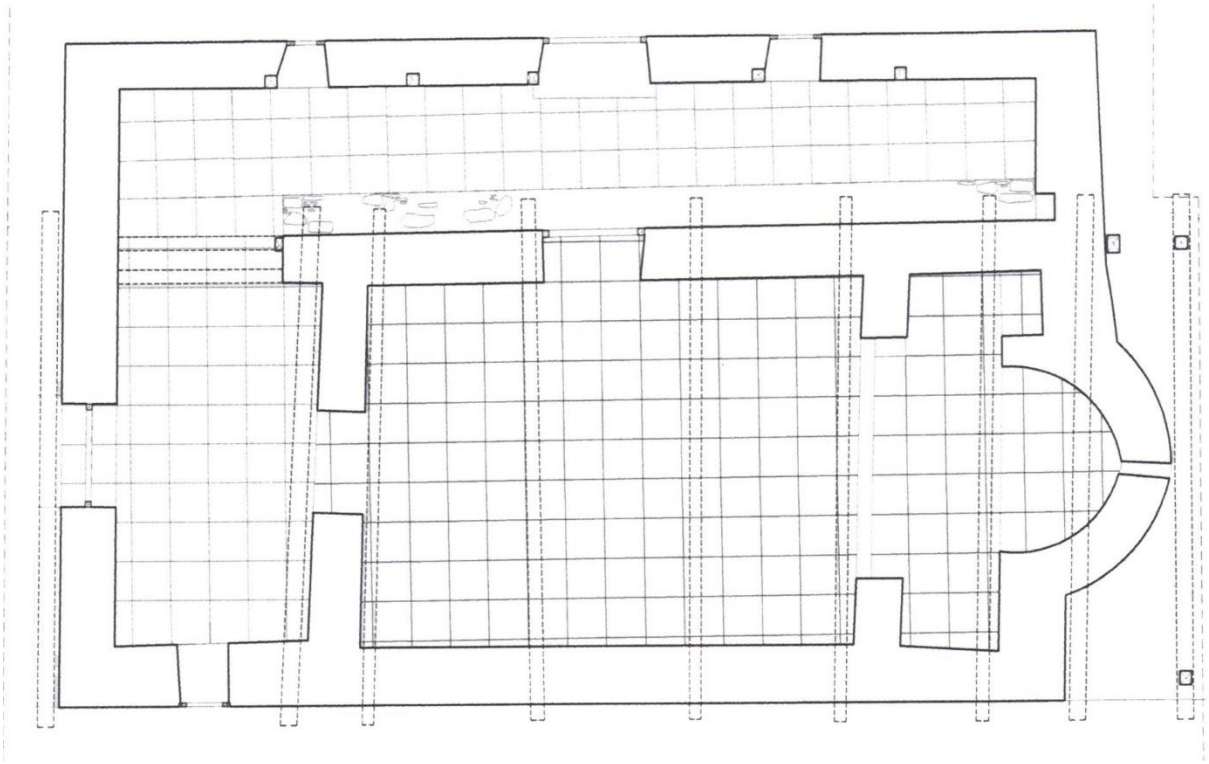
Appendix 1

Plan
Church of the Transfiguration of the Saviour at Palaichori



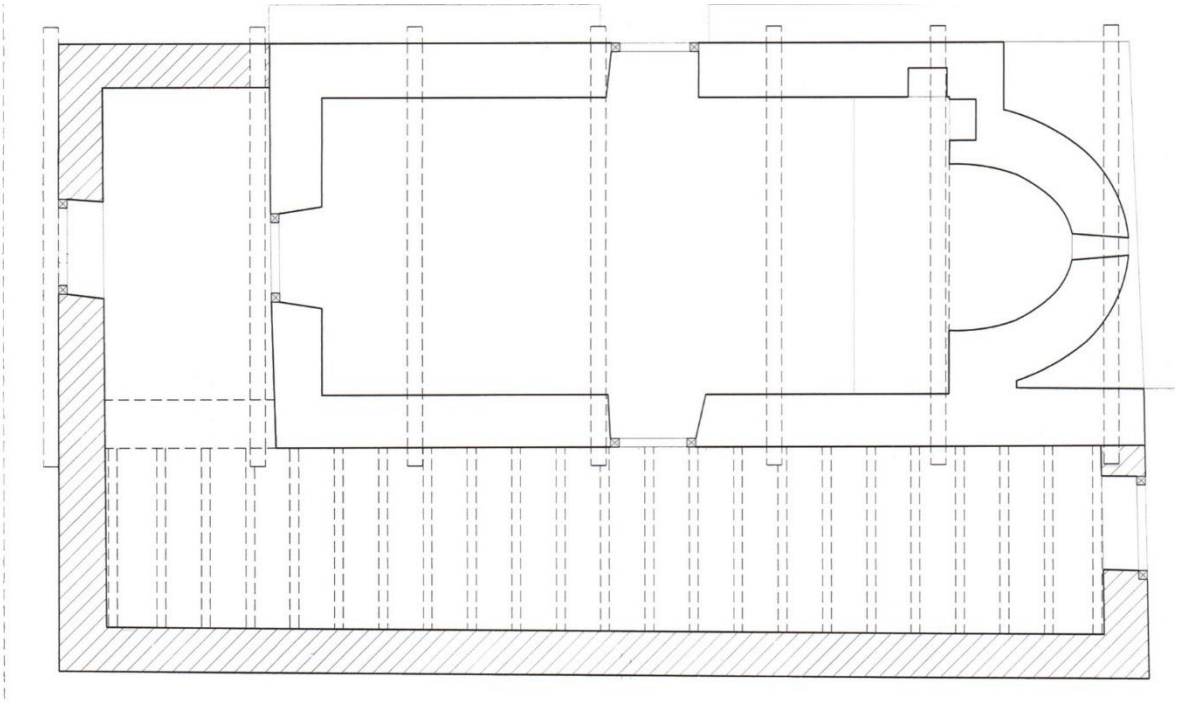
Appendix 2

Plan
Church of the Virgin of Moutoullas



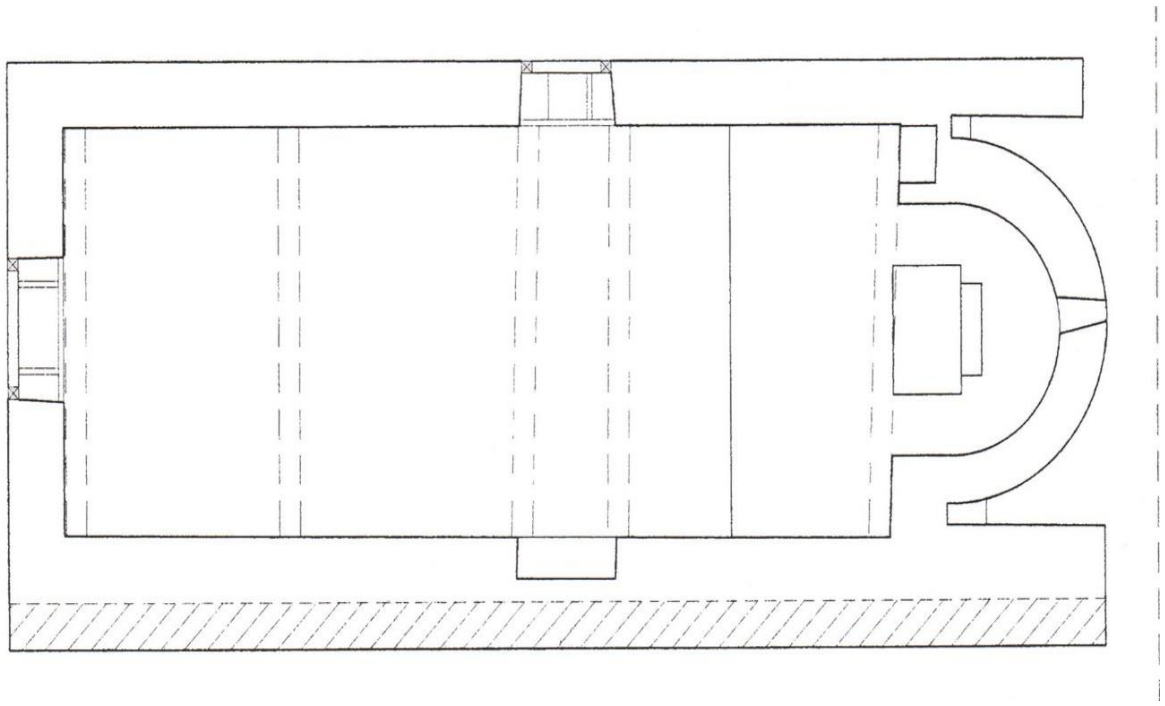
Appendix 3

Plan
Church of Archangel Michael at Pedoulas



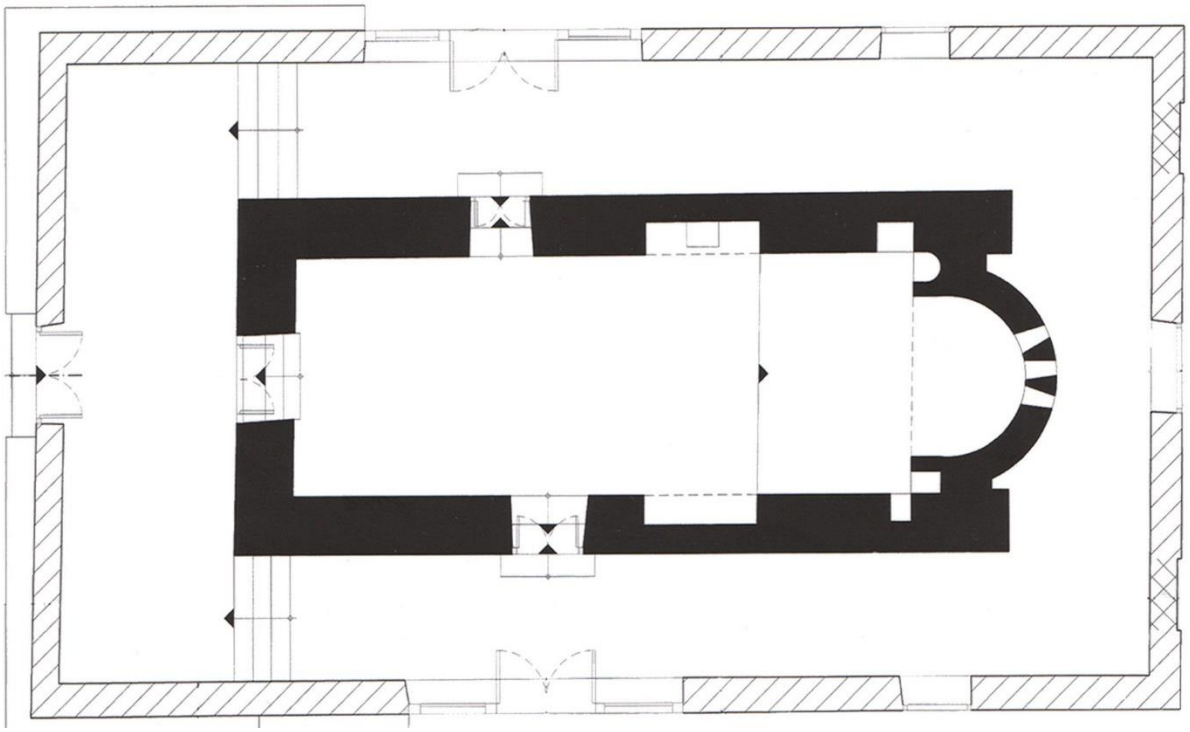
Appendix 4

Plan
Church of Virgin of Podythou at Galata



Appendix 5

Plan
Church of Holy Cross of Ayiasmati at Platanistasa



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