CONSTRUCTION TECHNIQUES OF TRADITIONAL HOUSES IN CUMALIKIZIK VILLAGE, BURSA (TURKEY)

A THESIS SUBMITTED TO
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RESMİYE TUĞBA KIZILKUŞAK

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CONSTRUCTION TECHNIQUES OF TRADITIONAL HOUSES IN CUMALIKIZIK VILLAGE, BURSA (TURKEY)

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ABSTRACT

CONSTRUCTION TECHNIQUES OF TRADITIONAL HOUSES IN CUMALIKIZIK VILLAGE, BURSA (TURKEY)

Kızılkuşak, Resmiye Tuğba
Master of Science, Conservation of Cultural Heritage in Architecture
Supervisor: Prof. Dr. Neriman Şahin Güçhan

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The choice of materials, their properties and selected construction techniques undoubtedly play important role in the survival of historical buildings for centuries. They do not only give information about the lifestyle and spatial reflections of their periods, but they also provide traditional knowledge filtered through experience in construction techniques and material use. Understanding buildings together with this traditional construction knowledge is important both for correct interventions and for ensuring continuation of this knowledge to future generations.

For this reason, the aim of this study is to generate information by understanding and documenting the construction techniques of traditional houses in Cumalıkızık Village which is one of the earliest Ottoman rural settlements.

To achieve this purpose, a literature survey focusing on history and conservation practice in Cumalıkızık was conducted. In addition to this, in the municipality and related institutions, archival study was carried out in order to gather the already prepared measured drawings of the houses and to understand architectural and technical characteristics of Cumalıkızık houses. Then at the initial stage of the thesis, a site survey was done to select the buildings that keep their authenticity and of which construction systems can be observed and to be studied.

After site survey, three groups of buildings were selected for detailed study. Group A consists of 8 buildings that maintain residential function, keep authentic construction details and building integrity. Group B consists of 1 building that is dismantled from the roof to the foundation within the scope of the conservation practices carried out in the site. Group C, on the other hand, is composed of 8 ruins that have lost the integrity of the building but provide details. In the study, which examined 17 buildings in total, the construction technique of the buildings in Group A and B was examined as a whole from the foundation to the roof, while the construction technique of the buildings in Group C was evaluated as partial according to the original remaining detail.

This gathered information was categorized so that the variety of construction techniques and material usage and the frequency of use of different solutions were investigated.

Keywords: Traditional House, Construction Technique, Ottoman House, Cumalıkızık, Bursa, Turkey

ÖZ

CUMALIKIZIK KÖYÜ'NDEKİ GELENEKSEL EVLERİN YAPIM TEKNİKLERİ, BURSA (TÜRKİYE)

Kızılkuşak, Resmiye Tuğba
Yüksek Lisans, Kültürel Mirası Koruma
Tez Danışmanı: Prof. Dr. Neriman Şahin Güçhan

Aralık 2019, 282 sayfa

Malzeme seçimi, seçilen malzemelerin özellikleri ve yapım tekniği, tarihi yapıların yüz yıllarca ayakta kalmasında şüphesiz önemli rol oynar. Onlar sadece dönemin yaşam tarzı ve mekansal yansımaları hakkında bilgi vermez, ayrıca yapım tekniği ve malzeme kullanımı ile ilgili deneyimle süzülmüş geleneksel bilgiyi de taşırlar. Yapıları bu geleneksel yapı bilgisiyle birlikte anlamak hem doğru müdahale kararları üretmek hem de bu bilginin gelecek kuşaklara aktarılmasını sağlamak açısından önemlidir.

Bu yüzden, bu çalışmanın amacı, en erken Osmanlı kırsal yerleşimlerinden biri olan Cumalıkızık Köyü'ndeki geleneksel konutların yapım tekniklerini anlayıp belgeleyerek bilgi üretmektir.

Bu amacı gerçekleştirmek için Cumalıkızık'ın tarihçesine ve koruma tarihine yoğunlaşan bir literatür taraması yapılmıştır. Ayrıca, belediye ve ilgili kurumlarda, alandaki yapılar üzerinde daha önce yapılmış çalışmaları toplamak ve Cumalıkızık evlerinin mimari ve teknik karakteristiğini anlamak üzere arşiv çalışması yapılmıştır. Tezin çalışmasının ilk aşamasında, özgünlüğünü koruyan ve konstrüksyon sistemi okunabilir ve çalışılabilir olan yapıları seçmek için arazi çalışması yapılmıştır.

Yapılan arazi çalışması sonrası, ayrıntılı çalışmak üzere üç grup yapı seçilmiştir. A grubu, konut işlevini sürdüren, özgün yapı detaylarını ve yapı bütünlüğünü koruyan 8 yapıdan oluşmaktadır. B grubu, alanda gerçekleştirilen koruma uygulama çalışmaları kapsamında, çatıdan temele kadar sökümü izlenen 1 yapıdan oluşmaktadır. C grubu ise, yapı bütünlüğünü kaybetmiş ancak detay bilgisi veren, 8 yapıdan oluşmaktadır. Toplamda 17 yapının incelendiği çalışmada, A ve B grubundaki yapıların yapım tekniği, temelden çatıya kadar bir bütün olarak ele alınırken, C gurubundaki yapıların yapım tekniği, özgün kalan detaya göre kısmi olarak değerlendirilmiştir.

Seçilen yapılar, yapım tekniğini anlamak ve karşılaştırmak için hazırlanan çalışmaların okumalarına dayanan detaylı bir belgeleme sistemi ile analiz edilmiştir. Toplanan bilgi, yapım tekniklerinin çeşitliliği, malzeme kullanımı ve farklı çözümlerin kullanım sıklığı araştırılacak şekilde kategorize edilmiştir.

Anahtar Kelimeler: Geleneksel Konut, Yapım Tekniği, Osmanlı Evi, Cumalıkızık, Bursa, Turkey

To my lovely family

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Firstly, I should express that I am very happy since I can write these sentences. It has been a long journey for me. From this point, when I am looking to the past, I am full of a sense of gratitude for all experiences I had, and I thank all people who are a part of this process. My first special thanks are for my family, especially for my mother; Ülker Kızılkuşak. She has always supported me with an endless love. I also thank my brother; Tolga Kızılkuşak. And I want to commemorate my father; Zekeriya Kızılkuşak and my grandmother; Hatice Özemri with love and craving.

Secondly, I thank my supervisor Prof. Dr. Neriman Şahin Güçhan with all my heart for her approach, guidance, selfless work and endless support. She always believed and encouraged me. It was a great pleasure to know her more closely and study with her.

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Moreover, I am so grateful to Pınar Aykaç Leidholm for her big heart, friendship and great help in translation and proofreading.

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INTRODUCTION

1.1. Problem Definition

Traditional houses in Turkey have been the subject of many studies, that have been carried out since 1920s. The authors have named traditional houses diversely such as Turkish House, Ottoman House, Turkish Hayat House, Anatolian Vernacular House. They also approached to the issue of traditional house typology in different manners. While Eldem (1954), Kuban (1982), Küçükerman (1973, 1991) and Asatekin (2005) concentrated on plan organization and spatial features of the houses, Aksoy (1963), Kuban (1966), Tanyeli, Kazmaoğlu (1979) and Eriç (1979) focused on the regional characteristics affecting the construction technique and material choice. On the other hand, Arel (1982), Cerasi (1998, 2001) and Tanyeli (1996) analyzed historical development of traditional houses and their relationship with the culture (Şahin, 1995; Güçhan, 2007).

In order to understand traditional house in Turkey with its context, it is essential to read comprehensively all approaches in a variety of scales from different point of views. A building is a whole with its spatial characteristics, its environment, its users, its materials, construction techniques, its economic and social context. It gives information about traditional knowledge, technology, workmanship, economic and social structure, sensitivity toward environment, and aesthetic values of its period. For this reason, the building has a soul and it implies the life.

Construction techniques together with the choice of material can be considered as the construction language of a building. The understanding of this language is the basis for appropriate interventions to the building not only for their compatibility with the traditional building but also for the transfer of traditional knowledge to the future generations.

Today, in Turkey, the authentic construction details and techniques of traditional buildings have rapidly been disappearing due to improper restoration implementations, unconscious alterations and lack of proper maintenance.

Cumalıkızık, one of the early Ottoman rural settlements located in the east of Bursa, is under the threat of rapid restoration and uncontrolled tourism activities. Restoration works have accelerated after the settlement was inscribed as World Heritage Site in 2014. These works started with street rehabilitation, which involve reorganizing altered facades of traditional buildings. Since 2011, restoration and comprehensive repairs of registered buildings have continued. The restoration and comprehensive repair work generally adopt a similar approach. After the registered buildings are documented in detail, they are disassembled since the construction materials like timber and binding material of stones are severely deteriorated and have lost their mechanical properties. After the disassembly, these buildings are reconstructed by using same or similar stones, new timber (chestnut) elements, and mudbrick, mortar and plaster that are produced on site.

Another risk factor for Cumalıkızık is uncontrolled tourism activities, which concentrates on gastronomic facilities at the courtyards of the buildings and the sales of handmade products along the streets especially on the weekends. This uncontrolled tourism puts a great pressure on the users of buildings. Instead of conserving their traditional lifestyle based on agriculture, most of the house owners tend to turn their courtyards into commercial spaces by new additions and alterations.

It should be noted that other reason leading people to commercial activities instead of agricultural facilities is the attitude of dwellers of Değirmenönü and Yiğitler districts, which are located near the agricultural lands of Cumalıkızık. Villagers complain about these dwellers since they collect the agricultural products of villagers and damage fruit trees. Therefore, the villagers, who cannot maintain their life standards with, abandon agricultural activities and engage in tourism activities to provide an income.

There are many studies like thesis, reports on architectural competitions, projects, workshops, and summer school activities focusing on the settlement, tourism activities and the conservation history of Cumalıkızık. Some of them are mentioned below.

Cumalıkızık, which was designated as a conservation site in 1981, has a conservation history of nearly forty years. In addition to conservation activities such as designation, registration or the preparation of conservation development plan, many activities have been realized aiming to raise awareness and attract interest of the public. The scholarly research, led by the master's thesis of Recayi Coşkun (1980) continued with many articles, summer schools, design studios, workshops, and master's theses. While there are theses on Cumalıkızık focusing on its social life, culture, rural tourism, plant and animal species in the region, the majority of them focus on the architectural features and conservation problems of the settlement.

The master's thesis of Recayi Coşkun, prepared in 1980, is the first study on the history of Cumalıkızık, its urban fabric and the architectural features of its buildings. The thesis does not include survey or analyses in settlement scale but rather concentrates on architectural documentation of single building (2819-1-9-dismantled structure), including plan, facade and section drawings.

After this master's thesis, Cumalıkızık was designated as a conservation site in 1981[1], whereas the mosque, public bath, cemetery, 54 residential buildings and two monumental trees are registered in 1990.[2] In 1991, three master's theses were prepared on the characteristics of the traditional fabric of Cumalıkızık and the architectural features of its traditional buildings.

[1] 12730 / 12.11.1981
[2] 1372 / 14.10.1990

Sevil Polat (1991) and Nural Aydoğan (1991) focus on the characteristics of the settlement and architectural features of the traditional buildings, whereas Nevhiz Deniz (1991) focus on the structural system, material use and connection details. Construction system and details have been defined for the first time in a general frame. Sevil Polat's master's thesis (1991) prepared survey sheets for 27 traditional buildings and plan and facade drawings of 7 buildings for the first time. The theses of Polat and Aydoğan conducted settlement scale surveys for the first time under the headings of 'number of storey', 'construction system', 'architectural significance', 'color', 'pavement'. Moreover, these theses also include plan typologies of the residential buildings in the settlement, based on schematic drawings of the first-floor plans. While Polat has studied 11 buildings, Aydoğan's study includes 21 buildings. The first classification regarding the position of the building in the lot was done within the scope of Recayi Coşkun's master's thesis, the other theses included building-lot relationship through schematic drawings. The architectural elements of traditional residential buildings, which are included in all three theses, is supported by drawings in Nevhiz Deniz's thesis. Window typology was included in Polat and Aydoğan's thesis, projection typology was included in Aydoğan and Deniz's theses, whereas only Aydoğan's thesis has door typology. Polat and Aydoğan also identified the problems of the settlement and proposed suggestions about the conservation of the traditional fabric and principles for new buildings.

'Bursa Local Agenda 21 – Cumalıkızık Conservation and Revitalization Project' was initiated in 1997, with the partnership of central government, local government, universities, NGOs, village representatives and volunteers. A summer school and architectural studios were carried within the scope of this project and continued with master's theses in universities involved in the project.

In the fall semester of 1998-1999 academic year, students of METU Department of Architecture Graduate Program of Conservation of Cultural Heritage worked in Cumalıkızık within the scope of Rest507-Design in Restoration III course. This study aimed to determine the physical features, typological characteristics, change status of the selected area within the settlement and to develop solutions to area-scale conservation problems.

The master's thesis of H. Serhat Yılmaz, prepared in 1999, concentrates on the conservation of historic settlement, identifies values and problems of Cumalıkızık and suggests proposals regarding the sustainability of the settlement. Ayşenur Kandemir's master's thesis, dating to 2000, focuses on the issue of maintenance-repair guides in historical environments, and prepares a guide for the maintenance and repair of windows. In her master's thesis finished in 2003, Nilüfer Gürer concentrates on the interaction of traditional rural architecture and tourism. Sevgen Perker's master thesis, prepared in 2004, concentrates on the causes of deterioration of timber elements in historic fabric and makes suggestions for their conservation.

The master's theses prepared in this period have focused on specific topics within the settlement. While general information about Cumalıkızık, the features of its traditional fabric and architectural characteristics of buildings have been included in all of these studies, survey and typology studies have not been conducted in settlement scale in all studies.

The master's thesis of Kandemir and Gürer include the inventory works regarding the present state of the settlement. Typology studies are included in the thesis studies of Yılmaz and Kandemir. Facade typology of traditional residential architecture of Cumalıkızık is first conducted by H. Serhat Yılmaz in 1999. Ayşenur Kandemir, who focuses on windows in her thesis, prepared a detailed typology study on windows as well as lot, plan, facade and projection typologies. Kandemir, who surveyed 29 buildings for plan typology, presented plan and facade drawings of 7 of these buildings in her thesis.

After 2004, Cumalıkızık had not been the subject of theses for a long time. After Bursa Metropolitan Municipality revived the candidacy process for the inscription of Bursa and Cumalıkızık on UNESCO World Heritage List in 2009, and the establishment of site management directorate in 2011, the settlement once again came to the agenda.

Narin Kılıç, in her Ministry of Culture and Tourism expert thesis in 2012, evaluates conservation development plans, decisions of the Conservation Council and the conservation process of the settlement.

In 2014, Cumalıkızık village was inscribed on UNESCO World Heritage List under the title of 'Bursa and Cumalıkızık: The Birth of the Ottoman Empire'. After this date, a PhD thesis was prepared on the architectural features of the settlement. In her PhD thesis finished in 2016, Derya Adıgüzel Özbek concentrates on the understanding, making sense and analyzing of architectural space and Cumalıkızık is the case study of the thesis. Interviews are conducted with users of the buildings for making sense of architectural space.

When theses on Cumalıkızık is evaluated, the inventory studies on the present state of the settlement are conducted by Sevil Polat (1991), Nural Aydoğan (1991), Ayşenur Kandemir (2000) and Nilüfer Gürer (2003). Typology studies are made by Sevil Polat (1991), Nural Aydoğan (1991), Nevhiz Deniz (1991), H. Serhat Yılmaz (1999) and Ayşenur Kandemir (2000). The only thesis that aims to understand the material and construction system of buildings in the settlement is conducted by Nevhiz Deniz (1991). The theses of Recayi Coskun (1980), Sevil Polat (1991) and Ayşenur Kandemir (2000) include the plan and facade drawings of the traditional buildings in the settlement as well as plan typologies, made by schematic plan drawings.

All the above-mentioned sources are examined. Among these sources, especially the theses prepared by Coşkun (1980), Polat (1991) and Kandemir (2000), and the 1998-1999 studio work of Cumalıkızık by METU Graduate Program in Conservation of Cultural Heritage are utilized. In addition, Neriman Şahin Güçhan's photographs from 1998, architectural survey drawings of Piray Architecture and Tures Architects from 2008 and their photograph archives contributed to a great extend to this study.

1.2. Aim and Scope of the Study

The aim of this thesis is to generate detailed information by understanding and documenting the construction techniques of traditional houses in Cumalıkızık. Gathering information on the construction technique is significant since it is principally a detailed record of traditional knowledge, which has been transferred through several generations and it can be used as a basis for future conservation studies. Furthermore, the information on the construction techniques of Cumalıkızık traditional houses can be a part of a larger study, which covers the construction techniques used in traditional houses in Turkey and their variety.

Based on this aim, Cumalıkızık was selected as the case study for the following reasons;

- It is one of the oldest rural settlement dates back to the early Ottoman Period.

- It is one of the well conserved settlement, since the village was not demolished by the earthquakes, fires or occupation and it was designated as urban site in 1980.

- The village maintained its social and economic structure until the Republican Period, since it was a waqf village connected to Orhangazi Waqf.

- In 2014, Cumalıkızık was inscribed as a “World Heritage Site” together with the complexes of Ottoman sultans in Bursa city centre.

- Ongoing conservation studies in the settlement offer a two-fold situation. They generally threaten the authenticity of the traditional houses in Cumalıkızık since the major approach is reconstructing these houses after they are being dismantled. On the other hand, the dismantlement also provides an opportunity for the observation of the construction system in a more detailed manner.

For this reason, one of the building to be studied comprehensively is chosen among the buildings to be dismantled. While deciding on other buildings to be studied, some principles were taken into consideration. These principles can be listed as follows:

- the buildings having different typological features,
- the buildings having original constructional details,
- the buildings whose construction techniques can be observed easily,
- the buildings in ruinous condition.

The buildings selected for this thesis can be categorized in three groups. (List of selected buildings were given in Appendix A.) Group A is composed of eight buildings which are selected according to the principles mentioned above and studied comprehensively in detail. Group B consists of one building, whose dismantling process could be monitored on-site. Group C is composed of eight ruinous buildings in different physical conditions, which are studied partially to understand the construction system of Cumalıkızık houses in a holistic manner.

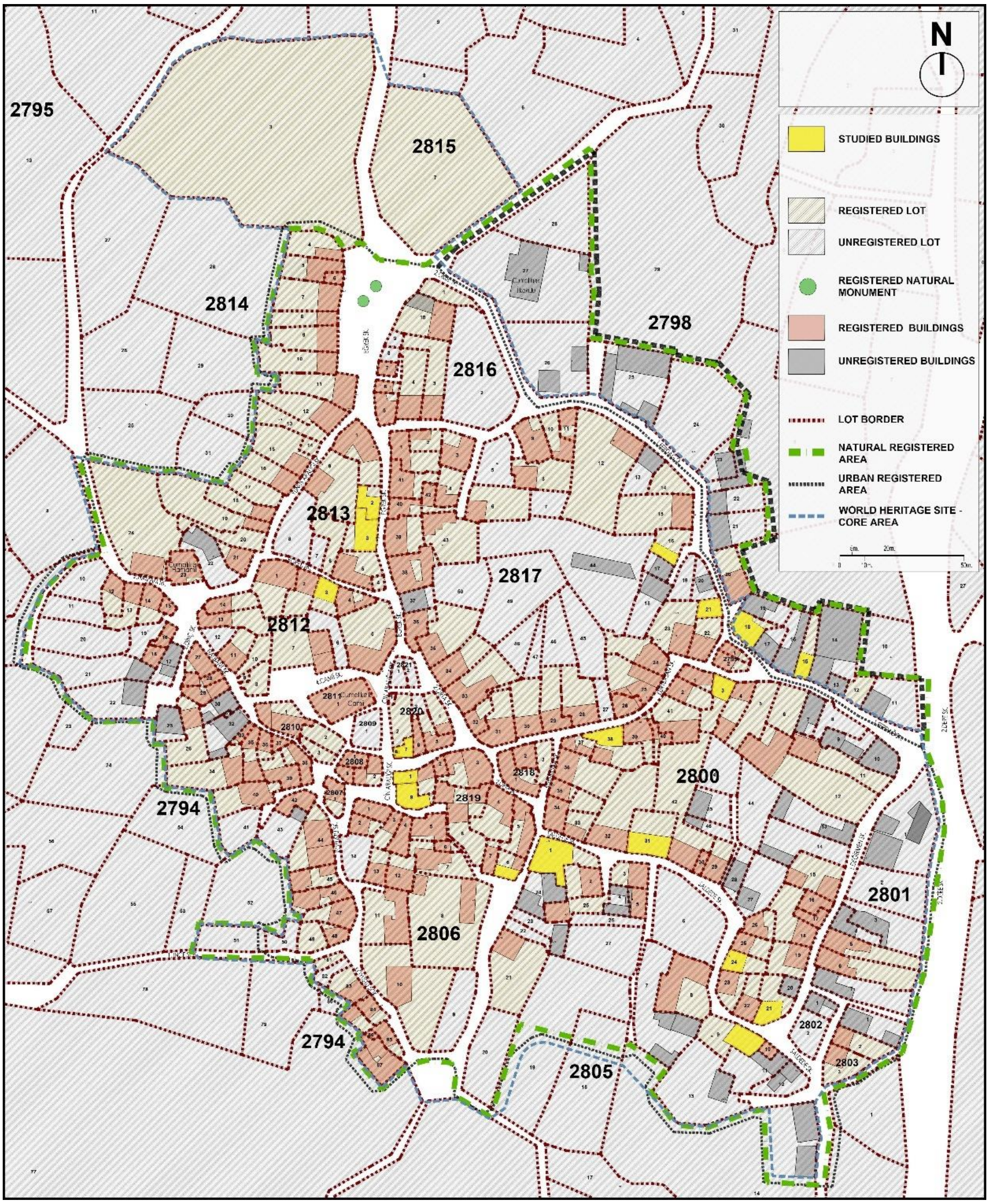


Figure 1.2. Studied buildings

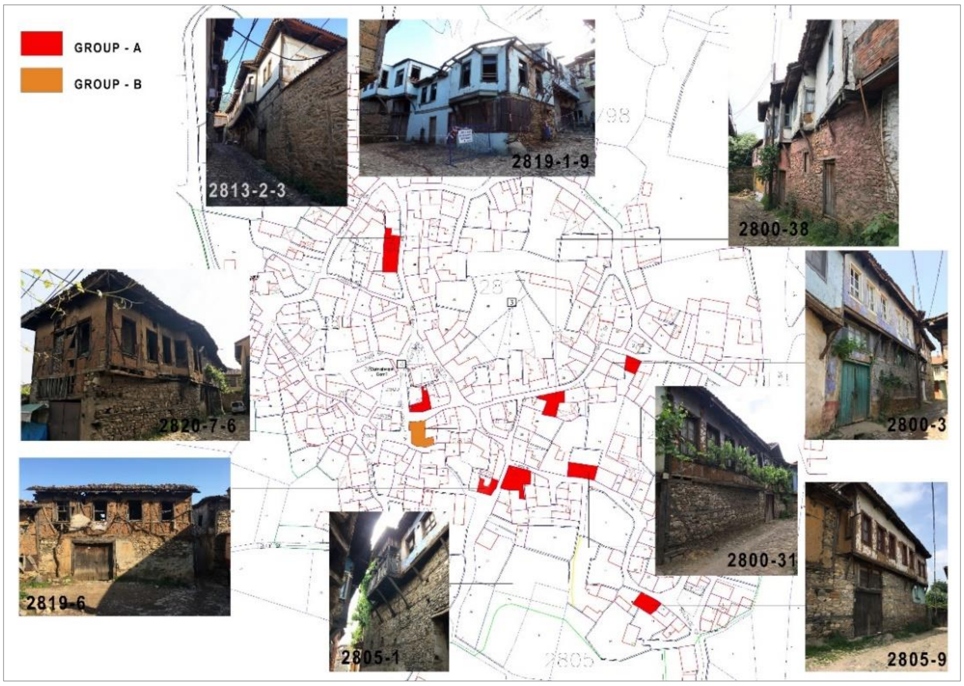


Figure 1.2. The buildings selected for comprehensive study

Figure 1.1. The ruins selected for the studying of partial construction details

1.3. Methodology

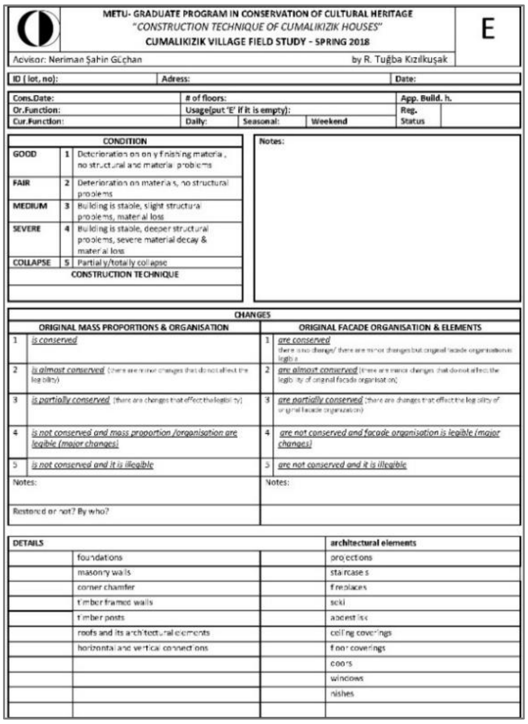
This thesis is composed of four phases. At the first stage, literature survey is conducted, covering the history of Cumalıkızık, and the urban development and the conservation history of the settlement. The studies on the traditional residential buildings in Anatolia, traditional construction techniques and materials used in especially rural sites are also studied. Parallel to the literature survey, archival research was held in Bursa Regional Council for the Conservation of Cultural Properties. Council decisions, conservation development plans and their reports related to the settlement are collected. Cadastral and current map of Cumalıkızık were taken from Yıldırım Municipality. Theses on Cumalıkızık and its traditional settlement were also gathered from libraries and online thesis centre. Archival documents of Studio Work of Rest 507 Design in Restoration III, 1998-1999 (METU) and personal photograph archive of Neriman Şahin Güçhan are also examined.

During the first site survey, the dismantling of the building (lot number: 2819-1-9) was monitored. The construction site was visited for five weeks and the details of the building were documented through photographs, partial drawings and measurements. Also, detailed measured drawings, prepared by the construction company, were obtained.

Figure 1.2. Dismantling of the building 2819-1-9 (Group B)

Figure 1.3. Photographs from first site survey: dismantling of the building 2819-1-9 (Group B)

During the second site survey, conducted to get information about the entire settlement, the settlement was visited eleven times on the dates between 5th-21st May 2018. Before the second site survey, a documentation sheet and a base map was prepared. On the site, registered buildings were examined from their exterior and information was obtained on their building heights, number of floors, functions, construction techniques, conditions and changes in time. The buildings to be studied in detail were selected based on the information obtained during the second site survey. For the selection of the buildings, the principles mentioned above (the state of change and condition of the structure, eligibility of the construction system) were considered. After the selection of the buildings, measured drawings of selected buildings were obtained from architectural firms Piray Architecture and Tures Architecture that worked on the site in 2008-2009.



METU- GRADUATE PROGRAM IN CONSERVATION OF CULTURAL HERITAGE
"CONSTRUCTION TECHNIQUE OF CUMALIKIZIK HOUSES"
CUMALIKIZIK VILLAGE FIELD STUDY - SPRING 2018

E

Advisor: Neriman Şahin Güçhan — by R. Tuğba Kızılkuşak

ID (lot, no):	Adress:	Date:

Cons.Date:	# of floors:			App. Build. h.
Or.Function:	Usage(put 'E' if it is empty):			Reg. Status
Cur.Function:	Daily:	Seasonal:	Weekend	

CONDITION		
GOOD	1	Deterioration on only finishing material, no structural and material problems
FAIR	2	Deterioration on materials, no structural problems
MEDIUM	3	Building is stable, slight structural problems, material loss
SEVERE	4	Building is stable, deeper structural problems, severe material decay & material loss
COLLAPSE	5	Partially/totally collapse
CONSTRUCTION TECHNIQUE		

Notes:

CHANGES			
ORIGINAL MASS PROPORTIONS & ORGANISATION		ORIGINAL FACADE ORGANISATION & ELEMENTS	
1	*is conserved*	1	*are conserved* there is no change/ there are minor changes but original facade organisation is legible
2	*is almost conserved* (there are minor changes that do not affect the legibility)	2	*are almost conserved* (there are minor changes that do not affect the legibility of original facade organisation)
3	*is partially conserved* (there are changes that effect the legibility)	3	*are partially conserved* (there are changes that effect the legibility of original facade organization)
4	*is not conserved and mass proportion /organisation are legible (major changes)*	4	*are not conserved and facade organisation is legible (major changes)*
5	*is not conserved and it is illegible*	5	*are not conserved and it is illegible*
Notes:		Notes:	
Restored or not? By who?			

DETAILS			architectural elements
	foundations		projections
	masonry walls		staircases
	corner chamfer		fireplaces
	timber framed walls		seki
	timber posts		abdestlik
	roofs and its architectural elements		ceiling coverings
	horizontal and vertical connections		floor coverings
			doors
			windows
			nishes

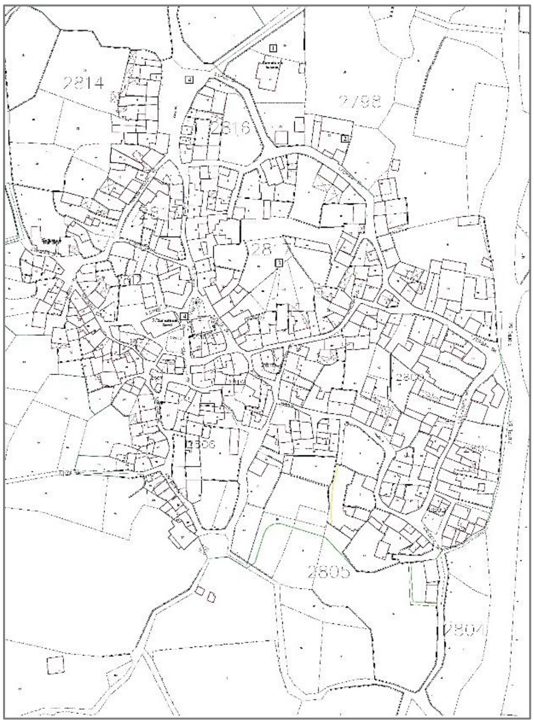


Figure 1.4. Second site survey: survey sheet (left), base map (right)

Subsequently, in the second stage, selected buildings are examined in detail. Facade measurements were done by surveying rods (posts with metric reference) placed on the facade’s surface. Facades were photographed comprehensively, and sketches of system sections and construction details were drawn in site. After collecting data, a set of drawings, composed of site plan, floor plans, system sections, elevation, were prepared for every building in AutoCAD. An information sheet was prepared for every building, which is composed of the set of drawings mentioned before, photographs of general aspects and details, and archival documents related to the building like old photos or registration sheets prepared by the conservation council. (See Appendix B) These information sheets were prepared for each selected building together with the dismantled building (nine buildings in total).

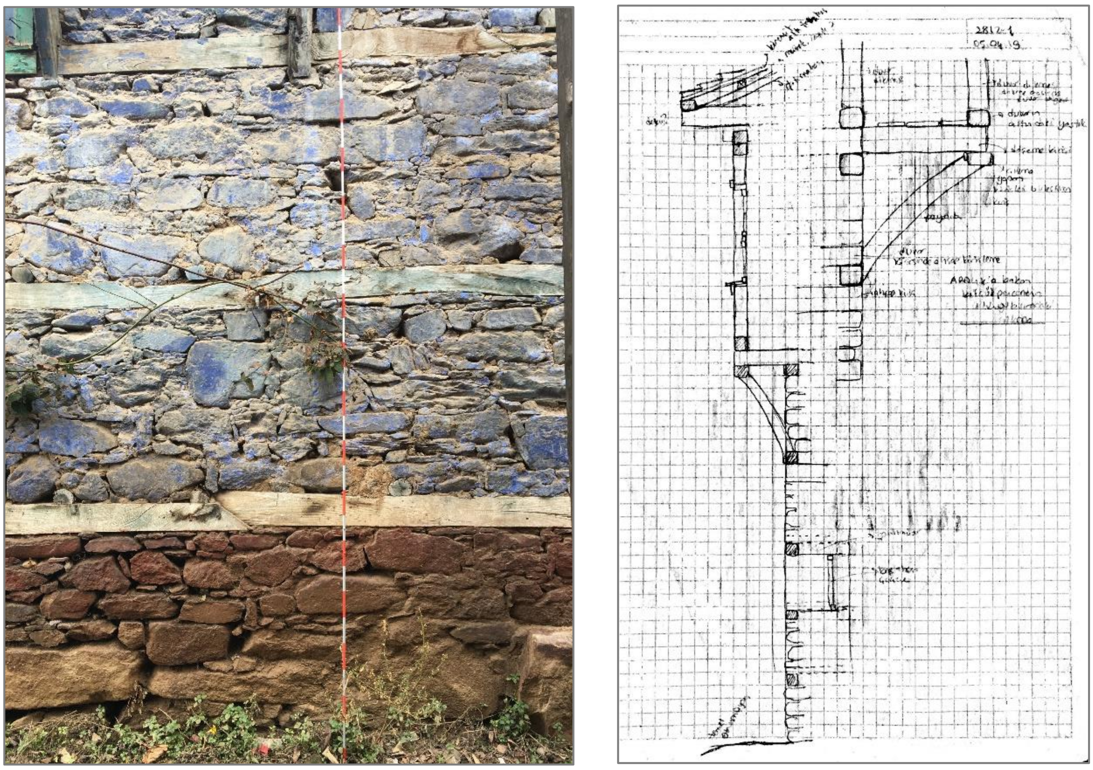


Figure 1.5. Second stage: measuring facade by surveying rods (left), sketch of the building: 2812-1 (right)

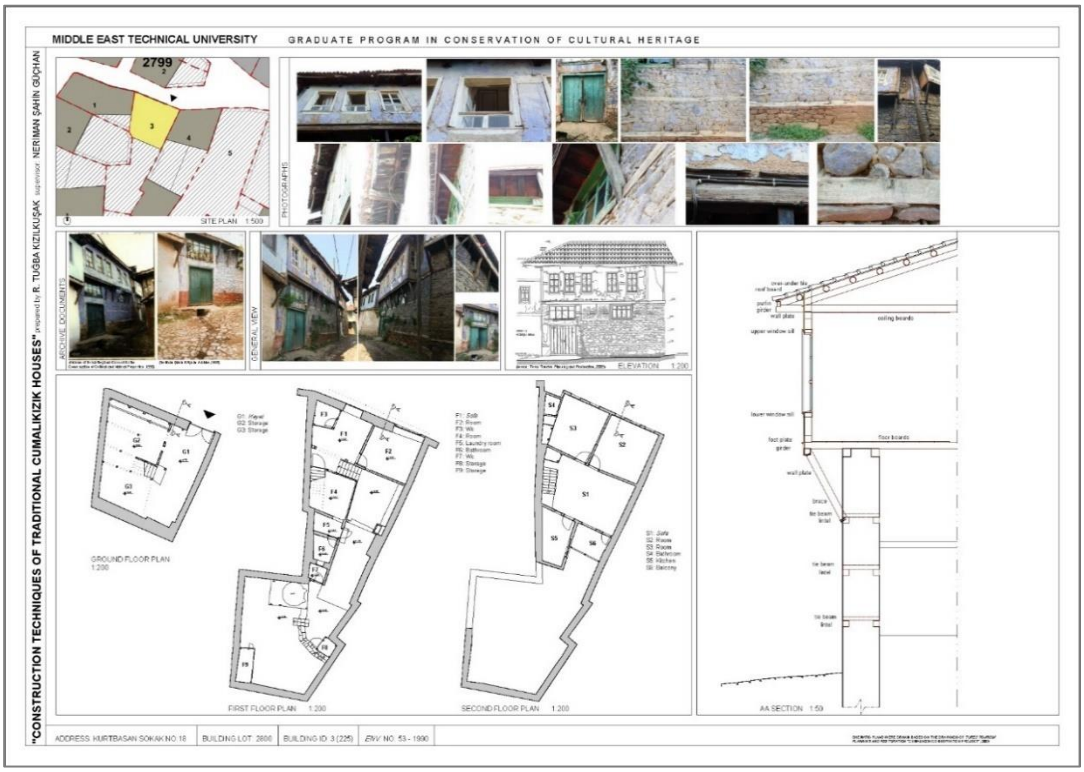


Figure 1.6. Second stage: information sheet prepared for Group A and Group B buildings

In the third stage, the construction techniques and the material use which form traditional Cumalıkızık house were described based on the information gathered in detail. This information was categorized in such a way that the variety of construction techniques and material usage and the frequency of different details and solutions are investigated. For this classification, the coding system developed by Filiz Diri in her master's thesis titled "Construction Techniques of Traditional Birgi Houses" was used for and adapted to the case of Cumalıkızık. These codes, developed for Cumalıkızık, were mapped with the help of a table, showing which detail is seen, how often it is used and in which building it is observed.

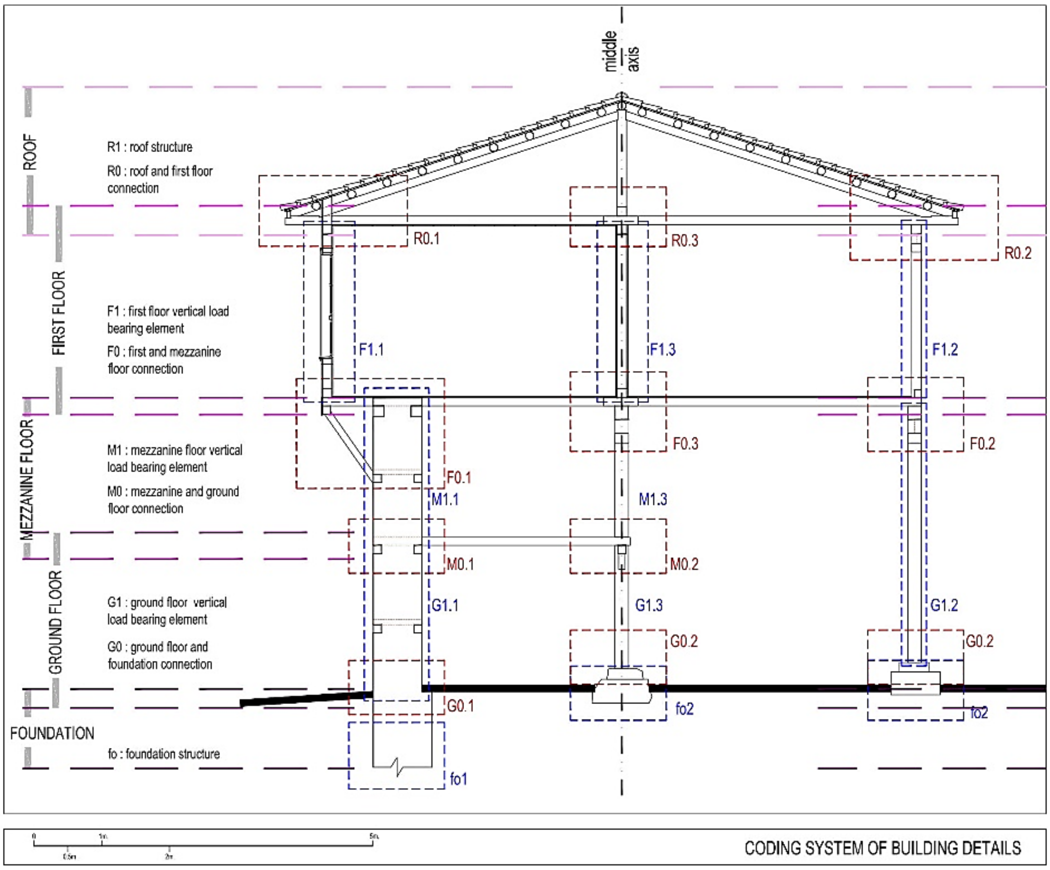


Figure 1.7. Schema of building coding system

BUILDING CODE	LOT-BUILDING ID	FOUNDATION (fo)					MASONRY WALLS (mw)								TIMBER FRAMED WALLS (fw)	
		Composite Foundation					Change in Wall Thickness (mw.a)		Timber Elements in Stone Masonry (mw.b)			Corner Chamfer (mw.c)		Spolia (mw.d)	Construction (fw.a)	
		Continous Foundation (fo.1)			Discontinous Foundation (fo.2)										connection detail of main post and foot plate	
		with rubble stone masonry	with rock	with monoblock stones	with stain stones	with rubble stones	no change in wall thickness	decreasing wall thickness	with timber lintels	with timber lintels and posts	with timber lintels, posts and braces	with flat projection	with corbelled projection		lap joint	butt joint
		fo.1.a	fo.1.b	fo.1.c	fo.2.a	fo.2.b	mw.a.1	mw.a.2	mw.b.1	mw.b.2	mw.b.3	mw.c.1	mw.c.2	mw.d	fw.a.1	fw.a.2
A-1	2800-3							•	•							
A-2	2800-31				•		•				•					
A-3	2800-38				•			•		•					•	
A-4	2805-1				•	•		•	•					•		
A-5	2805-9				•		•			•						
A-6	2819-6						•		•			•			•	
A-7	2813-2-3				•			•	•						•	
A-8	2820-8-7				•			•		•					•	
B-1	2819-1-9				•	•		•	•				•		•	•
C-1	2798-15							•	•							
C-2	2798-18								•		•					
C-3	2800-21								•						•	
C-4	2800-24				•		•			•						
C-5	2800-36							•	•							
C-6	2812-3							•	•							
C-7	2817-16								•							
C-8	2817-21							•	•						•	
*	2794-42															
*	2812-8-9	•	•	•												
*	2817-1															

BUILDING CODE	LOT-BUILDING ID	TIMBER FRAMED WALLS (fw)										TIMBER POSTS (p)				ROOF (R1)				
		Infill (fw.b)						Finishing (fw.c)				Size of Cross Section				Form (R1.a)		Construction (R1.b)		
		no infill (fw.b.1)	mudbrick (fw.b.2)		brick (fw.b.3)		wattle and daub (fw.b.4)	plaster on the whole surface (fw.c.1)	lime plaster on the joints (fw.c.2)	plaster on the covered surface (fw.c.3)		ground floor (G1.p)		first floor (F1.p)		gable (R1.a.1)	hipped (R1.a.2)	no roof girder (R1.b.1)	with roof girder (R1.b.2)	
			yellowish mudbrick	reddish mudbrick	Ottoman brick	solid brick				covered with bagdadi	covered with timber planks	17x17-27x27cm	10x10-15x15cm	13x13-15x15cm	10x10-12x12cm				extending as a pair	extending as one piece
		fw.b.1	fw.b.2.a	fw.b.2.b	fw.b.3.a	fw.b.3.b	fw.b.4	fw.c.1	fw.c.2	fw.c.3.a	fw.c.3.b	G1.p.a	G1.p.b	F1.p.a	F1.p.b	R1.a.1	R1.a.2	R1.b.1	R1.b.2.a	R1.b.2.b
A-1	2800-3		•	•				•				•	•		•	•				
A-2	2800-31			•				•				•			•	•			•	
A-3	2800-38		•					•				•	•		•	•		•		
A-4	2805-1	•	•							•		•		•	•		•		•	
A-5	2805-9		•					•				•			•	•			•	
A-6	2819-6			•				•					•		•	•				•
A-7	2813-2-3		•					•				•		•		•			•	
A-8	2820-8-7	•		•			•			•	•	•		•		•				•
B-1	2819-1-9	•	•			•				•		•	•	•	•	•	•		•	•
C-1	2798-15															•				•
C-2	2798-18		•					•					•		•		•		•	
C-3	2800-21		•					•												
C-4	2800-24		•					•				•								
C-5	2800-36		•				•	•				•				•			•	
C-6	2812-3																			
C-7	2817-16															•				
C-8	2817-21																			
*	2794-42				•				•											
*	2812-8-9																			
*	2817-1				•				•											

Figure 1.8. Table showing variety and frequency of the construction details in studied buildings

In the fourth stage, the process of construction of Cumalıkızık houses are described hypothetically in phases, in the light of all the knowledge gathered during the previous stages. The description is supported by 3D model showing the construction phases of Cumalıkızık houses.

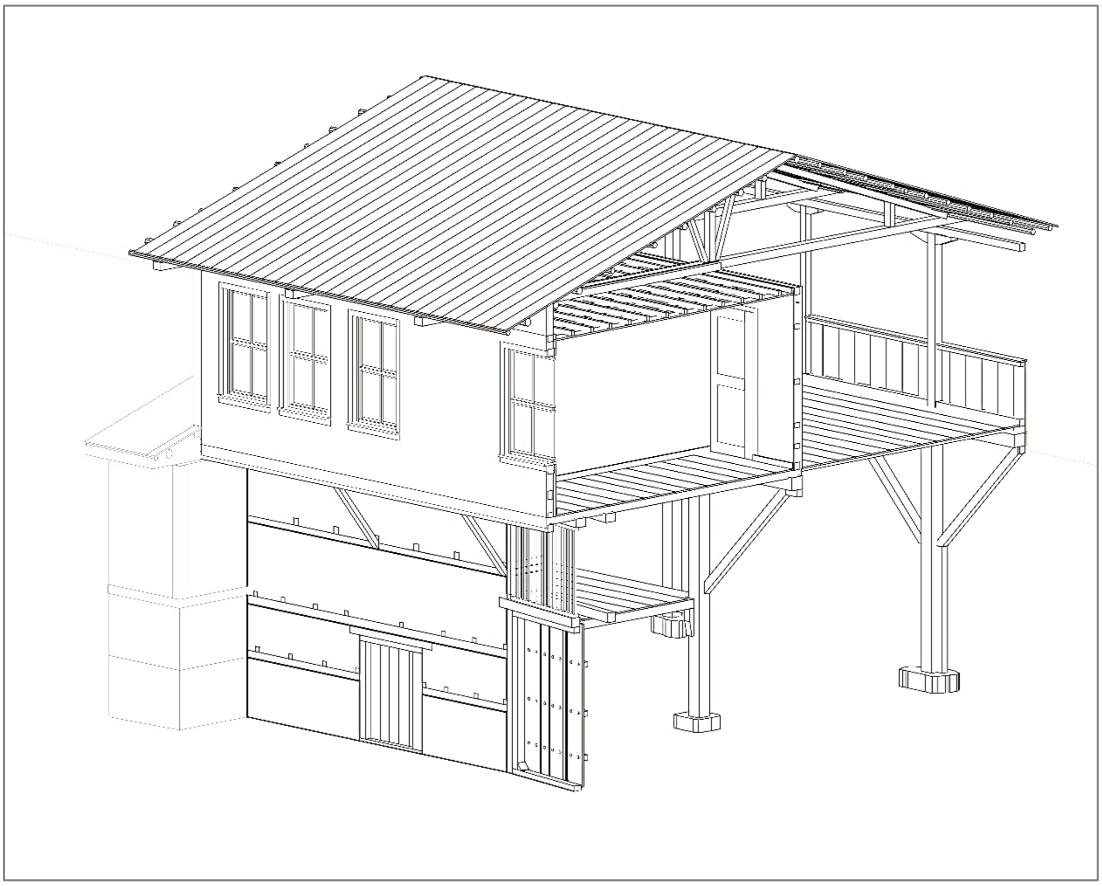


Figure 1.9. 3d model showing the construction phases of Cumalıkızık houses

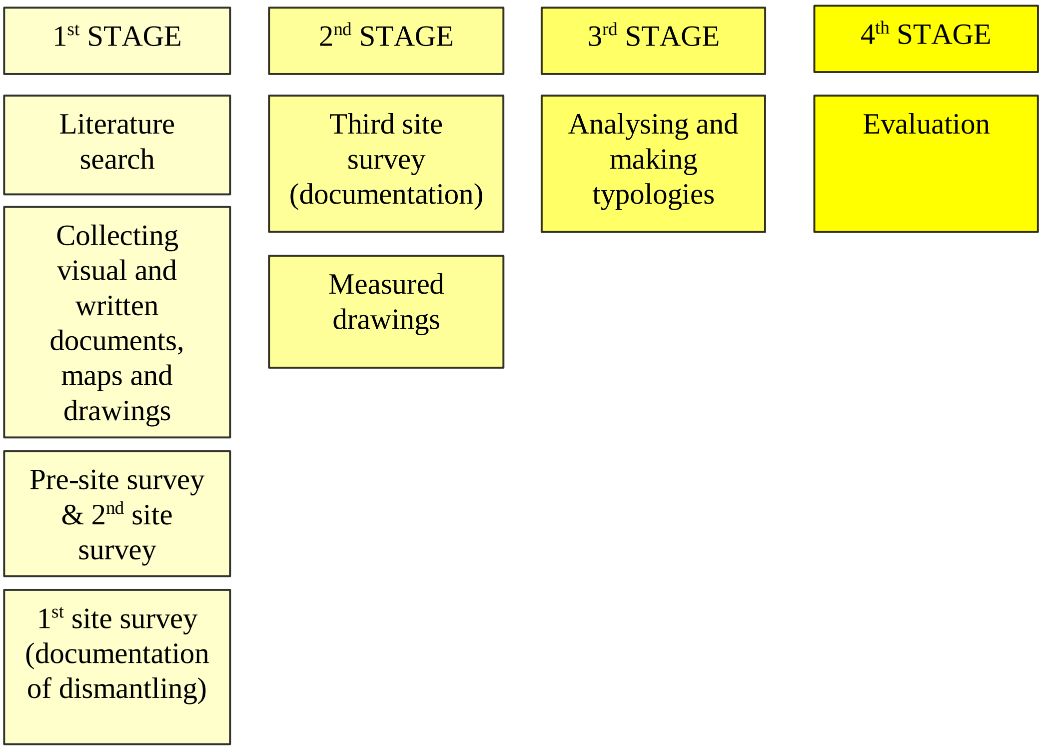


Figure 1.10. Chart showing the methodology of the thesis

CHAPTER 2

GENERAL CHARACTERISTICS AND HISTORY OF CUMALIKIZIK

2.1. General Features of Cumalıkızık

Cumalıkızık is located in the Yıldırım district of Bursa province in the south Marmara Region. It has the geometrical coordinates of 40°10'29.04" northern latitude and 29°10'19.49" east longitudes. The settlement, which is 13 km away from the city centre, was established on the northern outskirts of Uludağ, in the east of Bursa. Cumalıkızık is neighbour to 75. Yıl in the west, Hamamlıkızık in the east and Yiğitler in the north. 75.Yıl and Yiğitler quarters are new settlements formed by migration.

Figure 2.1. Location of Cumalıkızık (Source: Google Maps, accessed 01.08.2019)

The fertile farmland of Cumalıkızık, bounded naturally by the Kilise River in the east, the Küçükbalıklı River in the west, and chestnut, oak, pine and beech forests of Uludağ in the south, dispersed within the residential fabric. The agricultural lands extending to the forest area in the south cover a wider area in the north. Most of the agricultural areas in the north, which was once almost bordered by the Bursa-Ankara highway, was sold to the immigrants from the eastern Anatolia due to economic crisis caused by the disease that dried out all chestnut trees. Therefore, new settlements were established in this area.

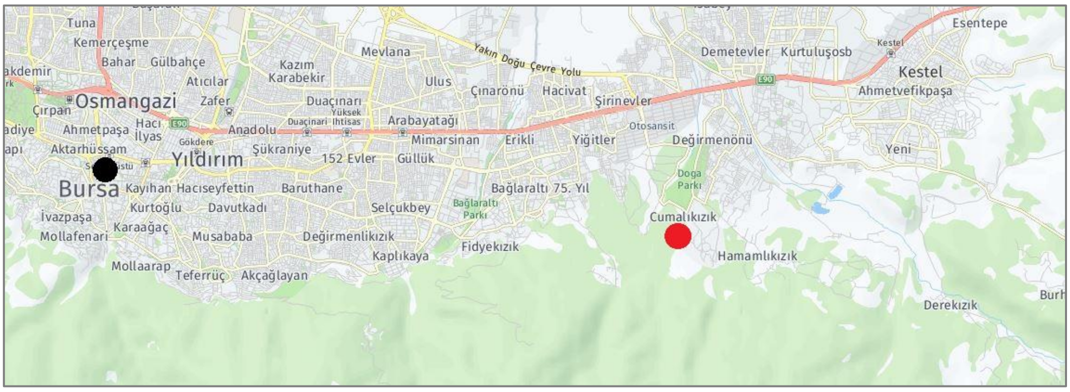


Figure 2.2. Cumalıkızık and Bursa City Centre (Source: http://kbs.yildirim.bel.tr/?sistem=kent_rehberi, accessed on 03.09.2019)

The settlement, which is 340 m high above the sea level, has a sloping topography. The elevation difference between the entrance part of the village where the cemetery is located, and the upper point of Köyüstü Quarter exceeds 40m.

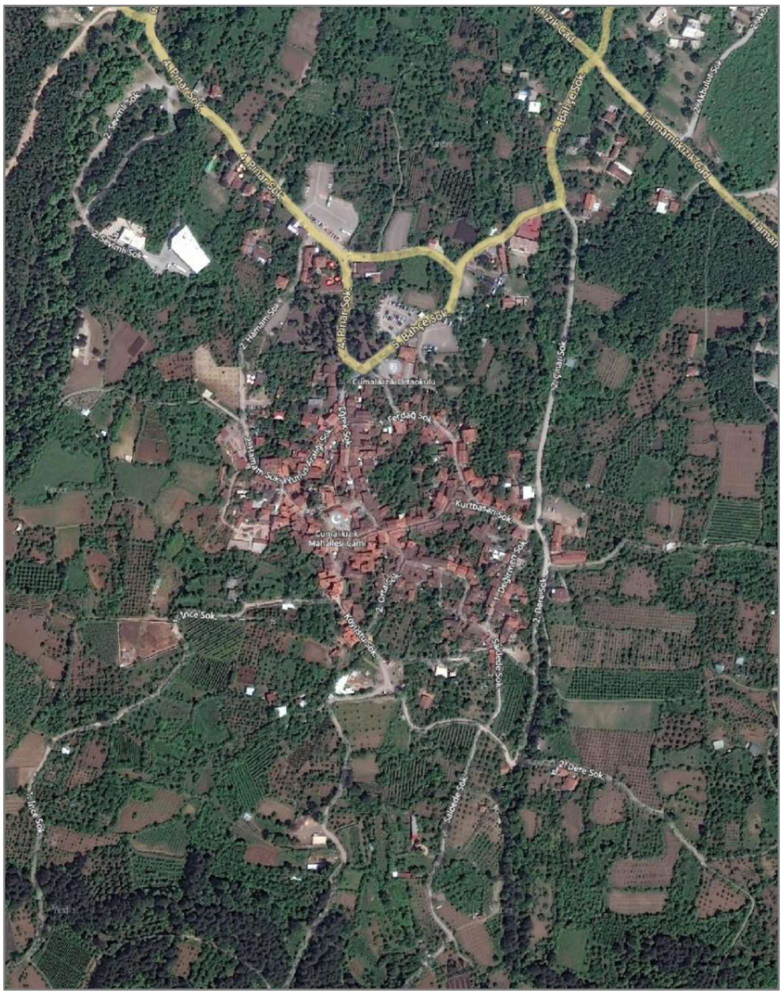


Figure 2.3. Aerial photo of the settlement (Source: Google Earth)

Figure 2.4. Settlement on the skirts of Uludağ (Source: Google Earth)

Social and Economic Structure

The economy of the village has been based on agriculture since 14th century. Due to its location on the hillside of Uludağ between two rivers called Kilise River and Balıklı River, the village is rich in terms of water sources, wood and fertile soils. It is known that it was a waqf village belonging to Orhangazi waqf and Cumalıkızık had a special tax status, since it provided food to the people in the city. (Sevim, 2011)

The main income sources of the villagers were silkworm breeding, chestnut and tobacco production. However, since 1950s, the villagers have lost their main sources of income. Today, a variety of fruits like blackberry, cherry, plum, black mulberry, mulberry, raspberry etc. are cultivated.

Cumalıkızık is also famous for its gastronomic facilities. Women from the village sell their handmade products like jam, *tarhana*, *erişte*, bread, tomato paste, knitting works on the stands in front of their houses or in Eğrek Square. The householders especially whose houses are near Eğrek Square, use their courtyards to serve breakfast and pancakes for tourists.

Figure 2.5. Commercial activities in Cumalıkızık

Although the village is known as a popular destination for daily tourism, it also has accommodation facilities, which are two hotels within the settlement.

2.2. History of Cumalıkızık

There is not any information about the foundation of the village. However, the remains of a church and a fountain, from the Byzantine period, were found 2km south of the village, at Ihlamur locale of Uludağ. (Coşkun, 1980) It is known that Uludağ, formerly known as 'Mysea Olympos' (Olympus ad Mysea) or 'Olympus' is famous for lots of monasteries and churches it houses. Monks lived there since Roman Empire accepted Christianity and they continued to exist after Orhan Ghazi captured Bursa. So, during Ottoman Period, Uludağ was called as '*Keşiş Dağı*' (The Mount of Monks). (Uludağ, 2007) Many travelers like Strabon, Charles Texier, Elisee Reclus, Vitel Kine, Lami Çelebi, Evliya Çelebi and Mehmet Ziya Bey visited Uludağ and gave information about the mountain. (Uludağ, 2007) If there were many monasteries or churches in the hillside of the mountain in Roman and Byzantine period, it is not ridiculous to think that there were also small villages where the monks could reach and meet their needs when necessary.

Figure 2.6. Marble basin near bath building

Cumalıkızık (Ortakızık) village is firstly mentioned in a document related to Yıldırım Bayezid Foundation Charter dating from 1400. When Yıldırım Complex was intended to be built on the lands (Süşteri Bahçesi) owned by the Orhan Ghazi Waqf in 1390s, another land had to be found for agricultural income. (Öcalan, Sevim and Yavaş, 2013) Cumalıkızık Village is the land, which was allocated to Orhan Ghazi Waqf in exchange for the land of Yıldırım Complex. By this date, Cumalıkızık village became a waqf village. However, this document also reveals that Cumalıkızık village had already been existed in 1400. (Sevim, 2011)

EL-EMR-İ HAYSUMA ZÜKİRE Fİ E'S-SEYYİD MEHMED E'L MEVLEVİ
HİLAFE TEFTİŞ-Ü'L-EVKAF Bİ-MEDİNE-İ BURSA NEMELAHU FAHR..... ....AFI ANHU

KIZLAR AĞASI HAZRETLERİNİN NEZARETİNDE(1)OLAN VAKIFLARDAN BURSADA BULUNAN SULTAN ORHAN VAKIFLARININ YAZIM VE DENETİMİ İÇİN(2)BANA HİTABEN(ESSEYİD MEHMET-ÜL MEVLEVİ)YAZILAN PADİŞAH FERMANINA GÖRE,BEN KİTAB EKİNDE İSİMLERİ YAZILI MÜSLÜMAN CEMAAT İLE ANILAN VAKIF KÖYLERİNDEN(3)BURSAYA BAĞLI CAMİLİKIZIK ADLI KÖY TOPRAĞINDA BULUNAN BALIKLI ADLI VADİYE GİDİP EVVELCE ŞER'İ DURUŞMADA BULUNDUKTAN SONRA ANILAN VAKIFLAR(4)MÜTEVELLİSİ FAHR-ÜL AKRAN AHMET EFENDİ OĞLU MUSTAFA AĞA DA HAZIR BULUNDUĞU HALDE SÖZKONUSU KÖYLER HALKINDAN HACI HÜSEYİN OĞLU HACI EBUBEKİR VE HACI HÜSEYİN OĞLU ZEYNEL ABİDİN(5)VE HACI ABDÜLKERİM OĞLU HACI FEYZULLAH EFENDİ VE TİMURHAN BEŞE OĞLU MEHMET VE HACI ALİ OĞLU OSMAN VE HACI MUSTAFA OĞLU HACI HASAN VE HACI HÜSEYİN OĞLU MEHMET VE ABDÜLKADİR OĞLU MUSTAFA(6) VE HÜSEYİN OĞLU MUSA VE HÜSEYİN OĞLU MEHMET KETHÜDA VE VEYSİ OĞLU İBRAHİM ADLI KİMSELER VE BAŞKALARI YAPILAN DURUŞMADA İFADE VERİP ANILAN KÖYÜN HİZASINDA ULUDAĞDA(7)BULUNAN KIRKPINAR ADLI YERDEN İŞBU BALIKLI ADLI VADİYE AKAN SUYUN DAĞ TARAFINDAKİ KAYNAĞINDAN DOĞU TARAFI ANILAN KÖY(CAMİLİKIZIK)VE BATI TARAFI FİDYEKIZIĞI(8)ADLI KÖYLER TOPRAĞI OLUP DOĞU TARAFTAKİ KAYNAĞINDAN ÇIKIŞINDAN SONRA TAMAMEN KÖYÜMÜZ ARAZİSİNDE İŞBU BALIKLI ADLI VADİDE AKIP YAZ GÜNLERİNDE ESKİ GÜNLERDEN BERİ(9)YARISI İLE BİZİM BAHÇELERİMİZ VE BOSTANLARIMIZ VE TARLALARIMIZ SULANIP DİĞER YARISIYLA FİDYEKIZIK HALKININ BOSTANLARI SULANIP(10)ANILAN SULTAN ORHAN VAKFINA ADI GEÇEN SU SEBEBİYLE SENEDE ONBEŞ BİN AKÇE KADAR BOSTANLARIN ÖŞRÜ ÖDENİRKEN VE KIŞ GÜNLERİNDE ÇOĞU ARAZİMİZİ TAHRİP EDİP(11)DİYETİNİ ÖDEMEK BİZE İSABET EDERİKEN ELİMİZDE PAYLAŞMAYA DAİR ŞER'İ MAHKEME KARARININ BELGESİ VE PADİSAH FERMANI VAR İKEN FİDYEKIZIK KÖYÜ HALKI ESKİ ADETE MUHALİF OLUP PAYLAŞMAYA RAZI(12)OLMAYIP ADI GEÇEN SUYU YAZ GÜNLERİNDE MÜSTAKİLEN ZAPT EDİP VAKFIMIZ VE KÖYÜMÜZ HALKINA ÇOKÇA ZARAR EDERLER MEVCUT DURUM ETRAFTAKİ KÖYLER HALKINDAN (13)ÖĞRENİLİR VE KARARLARI YAZILMAK İSTEĞİMİZDİR DEDİKLERİNDE ADI GEÇEN İKİ KÖY YAKININDA OLAN DEREKIZIK ADLI KÖY SAKİNLERİNDEN MEHMET OĞLU HACI HÜSEYİN(14)VE MÜEZZİN MUSTAFA OĞLU AHMET HALİFE VE ABDÜLKERİM OĞLU ABBAS VE İSABEY ADLI KÖY HALKINDAN İMAM YAKUP OĞLU RECEP HALİFE VE HACI AHMET OĞLU MEHMET VE HÜSEYİN OĞLU PİRİ(15)VE İSMAİL OĞLU MUSTAFA VE SAMANLI ADLI KÖYDEN MUSTAFA OĞLU HALİL VE HAMAMLIKIZIK ADLI KÖYDEN HÜSEYİN PEHLİVAN OĞLU MEHMET VE MUSA OĞLU ŞEYHİ BEŞE VE HACI MUSTAFA OĞLU MUSLİ(16)İMAM MUSTAFA OĞLU EBUBEKİR EFENDİ VE HASAN OĞLU RAMAZAN ADLI KİŞİLER HABER VERİLMEKLE DURUŞMADA HAZIR OLUP GERÇEĞİ ARAŞTIRIP(T İSBU BALIKLI ADLI VADİDE AKAN SUYUN YAZ GÜNLERİNDE ESKİ GÜNLERDEN BERİ İLK YARISI CAMİLİKIZIK KÖYÜ HALKININ BAHÇELERİ VE BOSTANLARI VE TARLALARI (18)SULANIP KALAN YARISIYLA FİDYEKIZIK KÖYÜ HALKININ BOSTANLARI SULANAGELMİŞTİR DİYE HERBİRİ USULÜ ÜZERE SAHİTLİK EDİP ONDAN BASKA(19)TALEP ÜZRE YAZILDI(20)SENE 1130 13 SEVVAL (1685)

SÜLEYMAN AĞA BİN MUSTAFA AĞA	SÜLEYMAN EFENDİ BİN ABDÜLKERİM KATIB-İ ORHAN	ABDULLAH BEY BİN ALİ BEVVAB-İ SULTANİ	FAHRÜ'L MÜDERRİSİN Ü'L KİRA ABDÜ'N-NEBİ EFENDİ BİN VELİÜ'D-DİN
ŞAHİN BEY BİN ABDULLAH	SÜLEYMAN BİN RECEP	OSMAN CELEBİ BİN MUSTAFA	EL-HAC HÜSEYİN EFENDİ BİN SÜLEYMAN

Figure 2.7. The waqf document dated 1685 (Source: Coşkun, 1980)

There is also another waqf document dating from 1685 related to a disagreement between two kızık villages; Cumalıkızık and Fidyekızık about water resources. In this document, Cumalıkızık (Camilikızık) was also mentioned as a waqf village.

2.3. Conservation History of Cumalıkızık

Cumalıkızık village was designated as an urban site in 1981 by the decision (12730 / 12.11.1981) of the High Council of Immovable Antiquities and Monuments (GEEAYK). The council clearly mentioned in their decision that it is compulsory to apply to council both for the repair of existing buildings and for constructing new buildings with the required documents and projects in order to conserve Cumalıkızık.

In 1990, a mosque, a bath, two plane trees, cemetery and 57 residential buildings were registered by the decision (1372 / 14.10.1990) of Bursa Regional Council for the Conservation of Cultural and Natural Properties. A year later in 1991, the council (by the decision no: 1624 / 25.02.1991) designated the borders of Cumalıkızık urban site and natural site. By the conservation council decision (3508 / 24.10.1993) in 1993, 65 residential buildings were registered, 1/1000 scale conservation development plan and plan decisions, 1/500 scale Conservation Development Plan were approved, together with building silhouettes and typology studies of architectural elements.

In 2010, by the Council decision (5640 / 28.04.2010) 47 more residential buildings were registered. The same year, 1/1000 scale Cumalıkızık Urban Design Project, Eğrek Square Arrangement Project, Mosque Square Arrangement Project, Coffee Square Arrangement Project and Stream Square Arrangement Projects, which were prepared within the scope of *Living Cumalıkızık in 3rd millennium,* were approved by the conservation council (by the decision: 5881 / 11.06.2010). Moreover, the council demanded the revision of the 1993 conservation development plan according to the approved Cumalıkızık Urban Design Project.

As part of world heritage list nomination, Cumalıkızık management plan was prepared in 2014. The same year, Cumalıkızık was inscribed as a World Heritage Sites together with the commercial districts of khans, *kulliyes* of Bursa under the title “Bursa and Cumalıkızık: The birth of the Ottoman Empire”.

Figure 2.8. Registered plane trees in Eğrek Square

Figure 2.9. Registered cemetery

Figure 2.10. CumalıkızıkMosque, registered in 1990

Figure 2.11. Cumalıkızık Bath, registered in 1990 (Source: Neriman Şahin Güçhan Archive, 1998)

Figure 2.12. Cumalıkızık Bath

Figure 2.13. Conservation Development Plan, 1992 (Source: Achieve of Bursa Council for Conservation of Cultural and Natural Heritage)

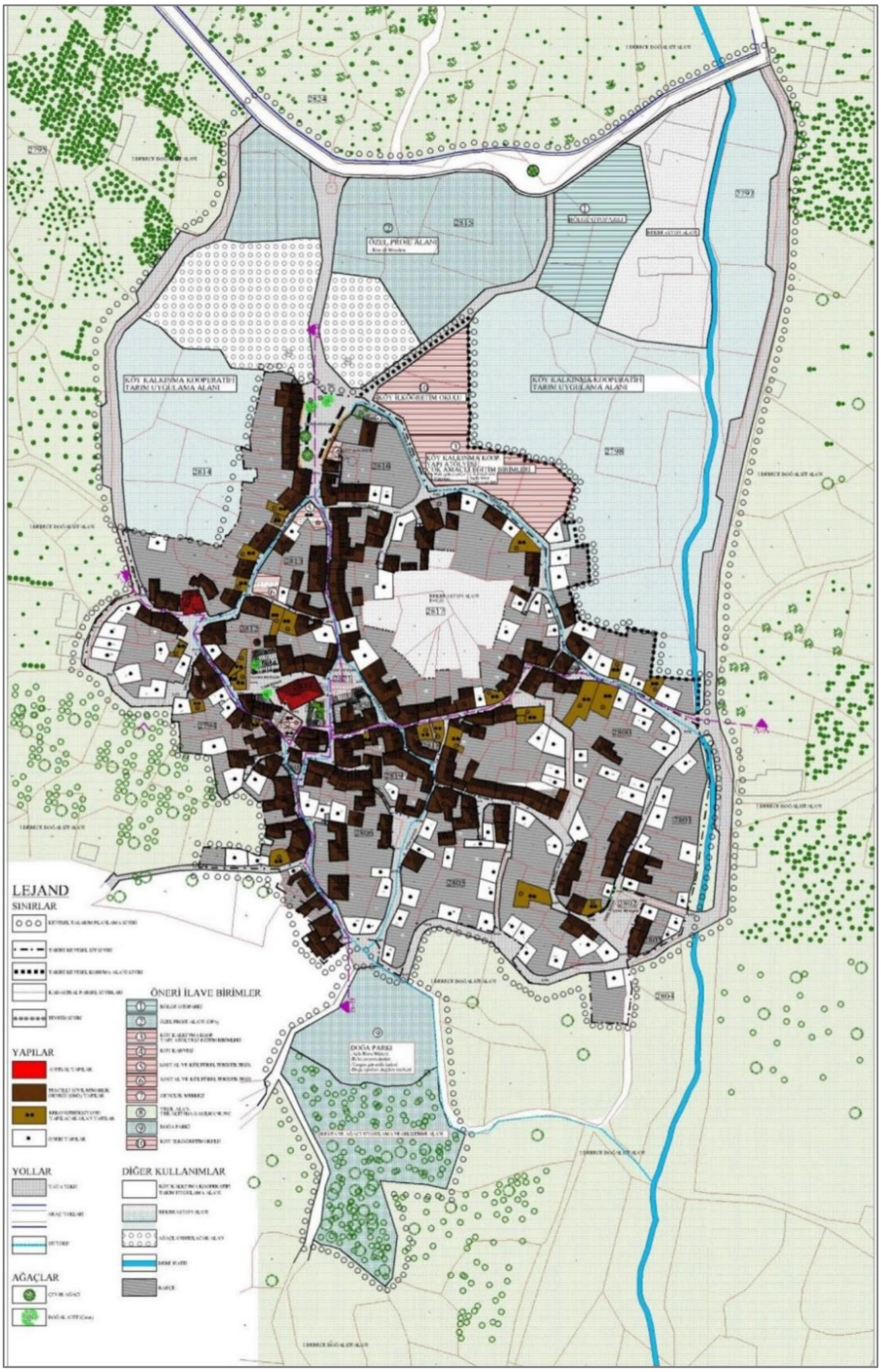


Figure 2.14. 1/1000 scale Cumalıkızık Urban Design Project, 2015 (Source: Cumalıkızık Conservation Development Plan Report)

In 2015, the revision of the 1/1000 scale Cumalıkızık Conservation Development Plan was approved by the conservation council.

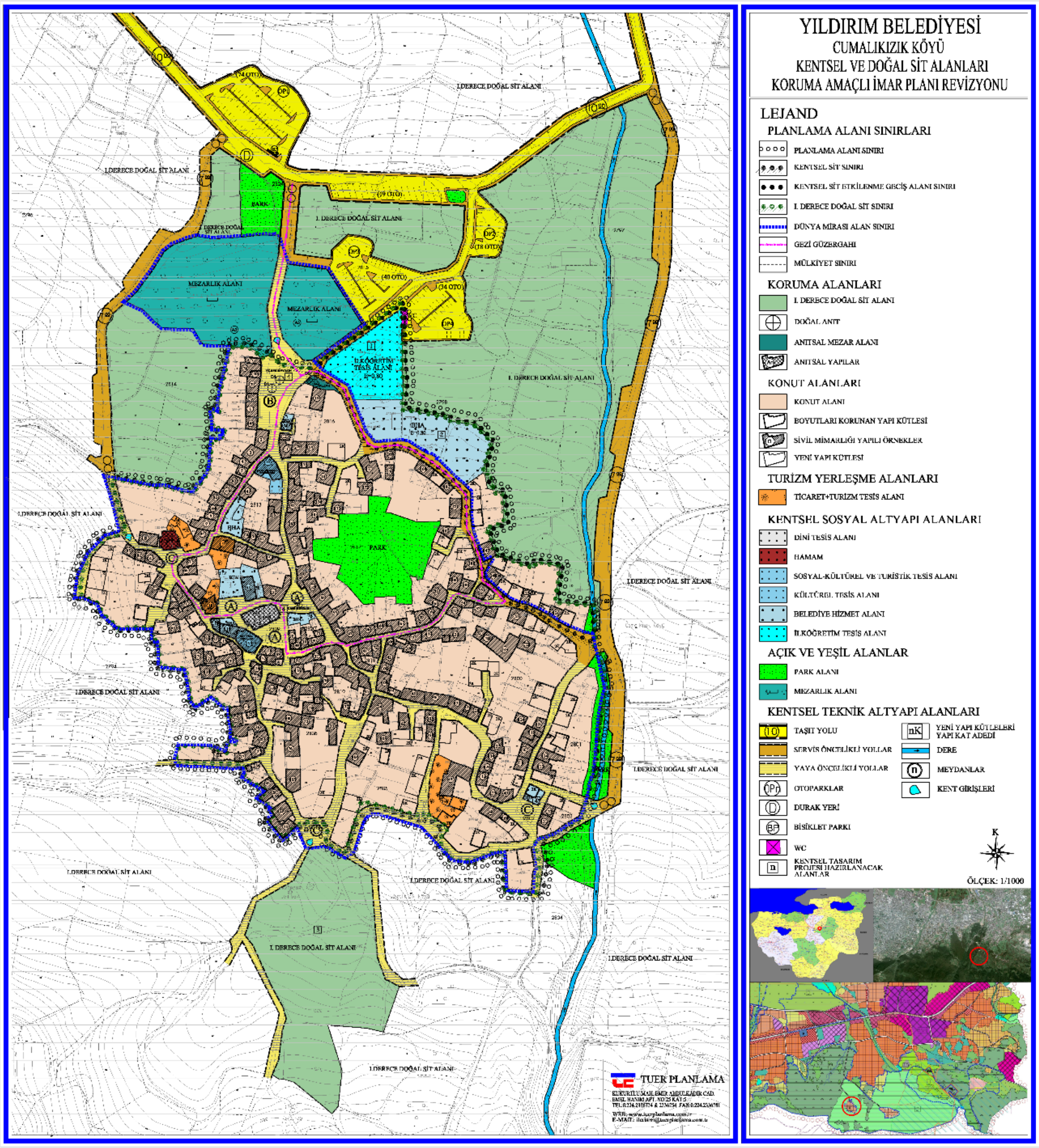


Figure 2.15. Revision of the Conservation Development Plan, 2015 (Archive of Yıldırım Municipality)

2.4. Settlement Pattern and Architectural Characteristics of Traditional Cumalıkızık Houses

2.4.1. Settlement Pattern

Cumalıkızık is located on a sloping topography on the northern outskirts of Uludağ. Surrounded by forest and agricultural lands, the settlement has an organic street pattern with narrow and curved streets.

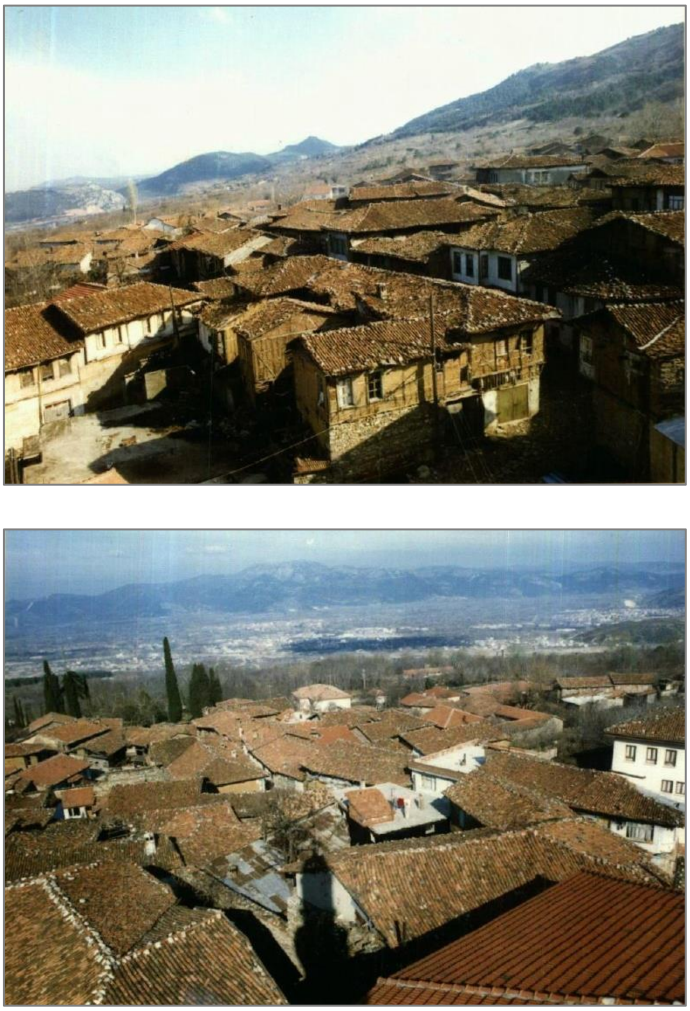


Figure 2.16. General view of Cumalıkızık (Source: Archive of Bursa Regional Council for the Conservation of Cultural and Natural Properties, 1990)

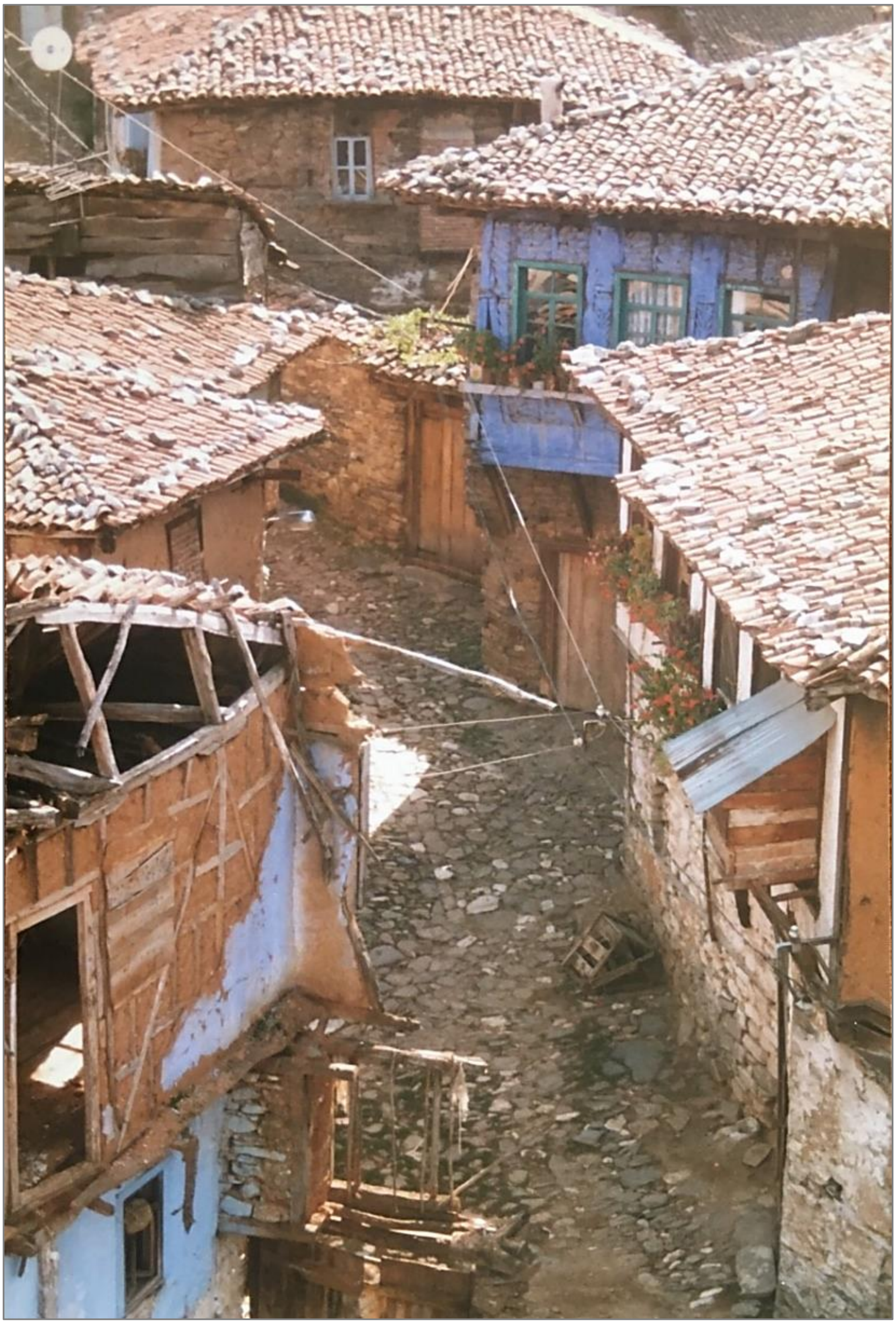


Figure 2.17. Street pattern of Cumalıkızık (Source: Neriman Şahin Güçhan Archive, 1998)

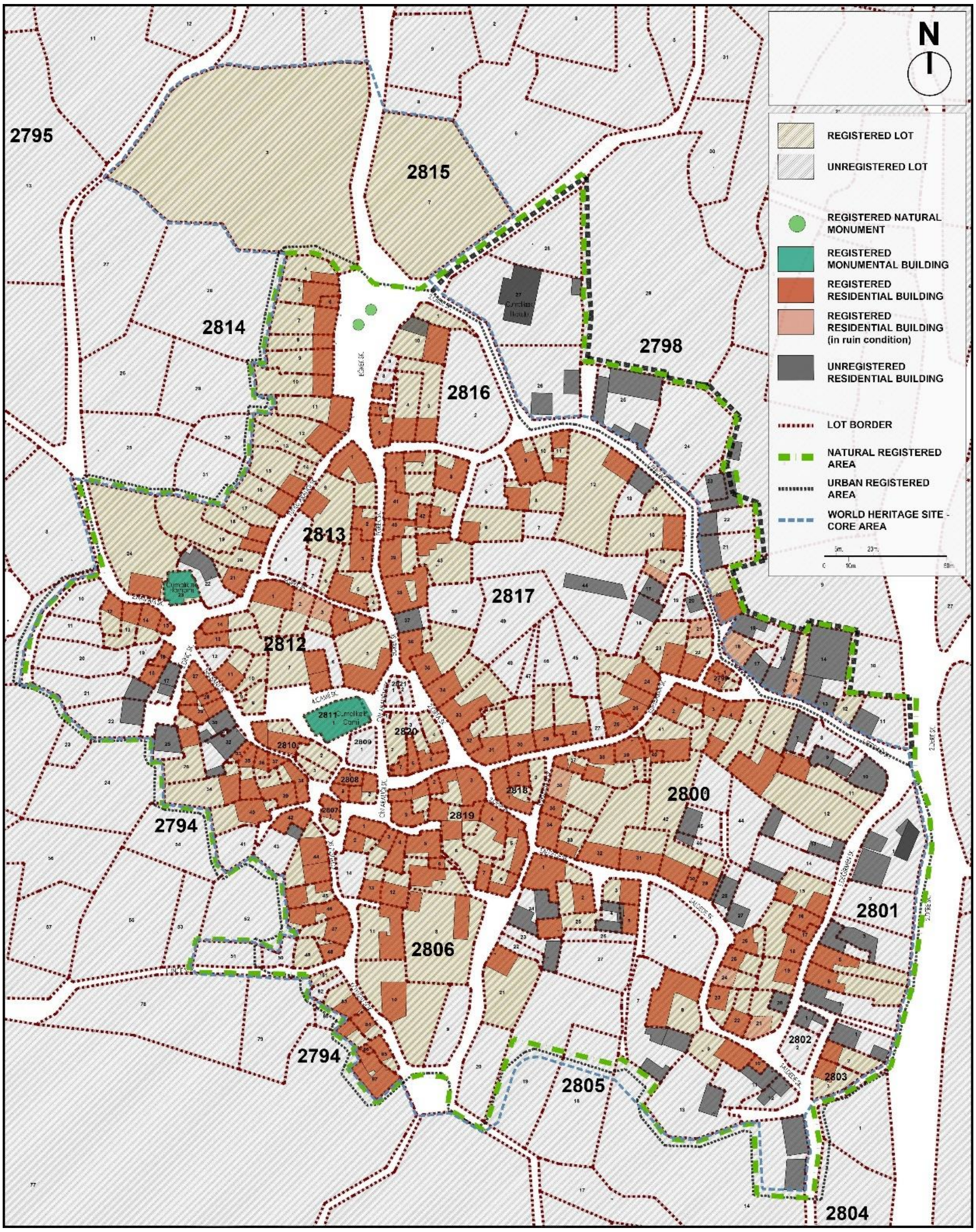


Figure 2.18. Cumalıkızık Settlement Plan

The centre of the settlement, which is reached from the lower levels, is the Mosque Square in the north where Cumalıkızık Mosque, museum, office of mukhtar (village head), cooperative building and cafes exist. In addition to the Mosque Square, there are two other squares in the settlement. One of them is the Eğrek Square at the entrance of the village and the other is the Hamam Square in front of the historical bath building. In the south of Eğrek Square, the main street divides into two. While the street in the west (Yunus Aralığı Street) climbing towards south reaches to the Hamam Square and the one in the east (Eğrek Street) reaches to Mosque Square. The Mosque Square and the Hamam Square are connected to the Nalbant Street.

Figure 2.19. Eğrek Square

Moreover, these streets which are used extensively, are the main pedestrian axes of the settlement, that collect and distribute the pedestrian flow. Since, vehicular traffic is not allowed inside the village, other streets are also pedestrian. While the streets in north-south direction are inclined, the ones in east-west direction, which are parallel to the topography, are almost flat. Moreover, cul-de-sacs are a part of the settlement pattern, as it is seen in many traditional Ottoman settlements.

Figure 2.20. Eğrek Square

Figure 2.21. Mosque Square and café of the village

Figure 2.22. Cumalıkızık Mosque

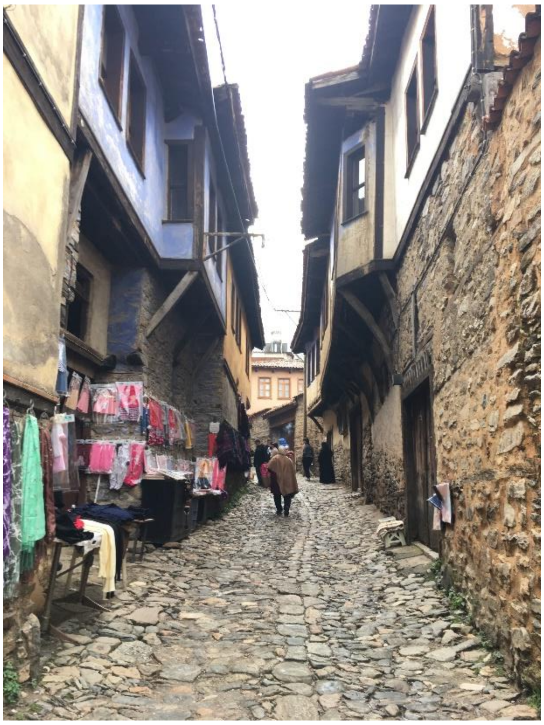


Figure 2.23. Eğrek Street, one of the main pedestrian axes

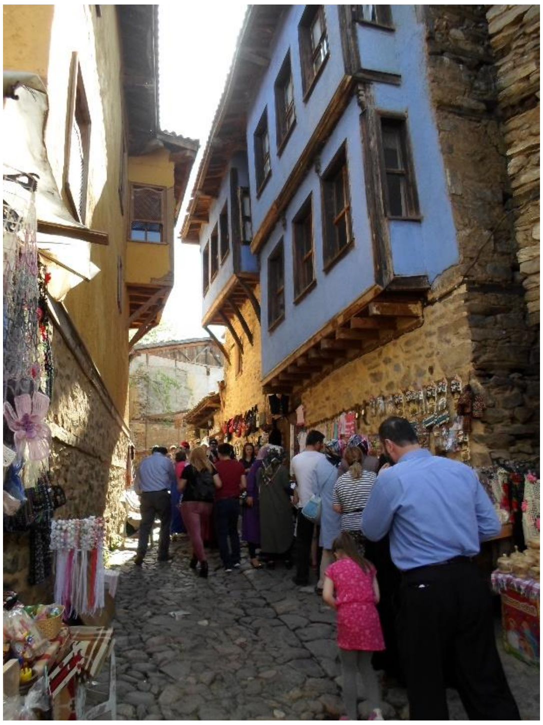


Figure 2.24. Yunus Aralığı Street, one of the main pedestrian axes

Figure 2.25. Cumalıkızık streets

Figure 2.26. Cumalıkızık streets

Figure 2.27. Small squares created by street junctions

Figure 2.28. Rocks on the street

Figure 2.29. Iwan and projections with braces (2805-1)

Figure 2.30. Projected fireplace and top windows (2819-3) (Source: Piray Architecture, 2008)

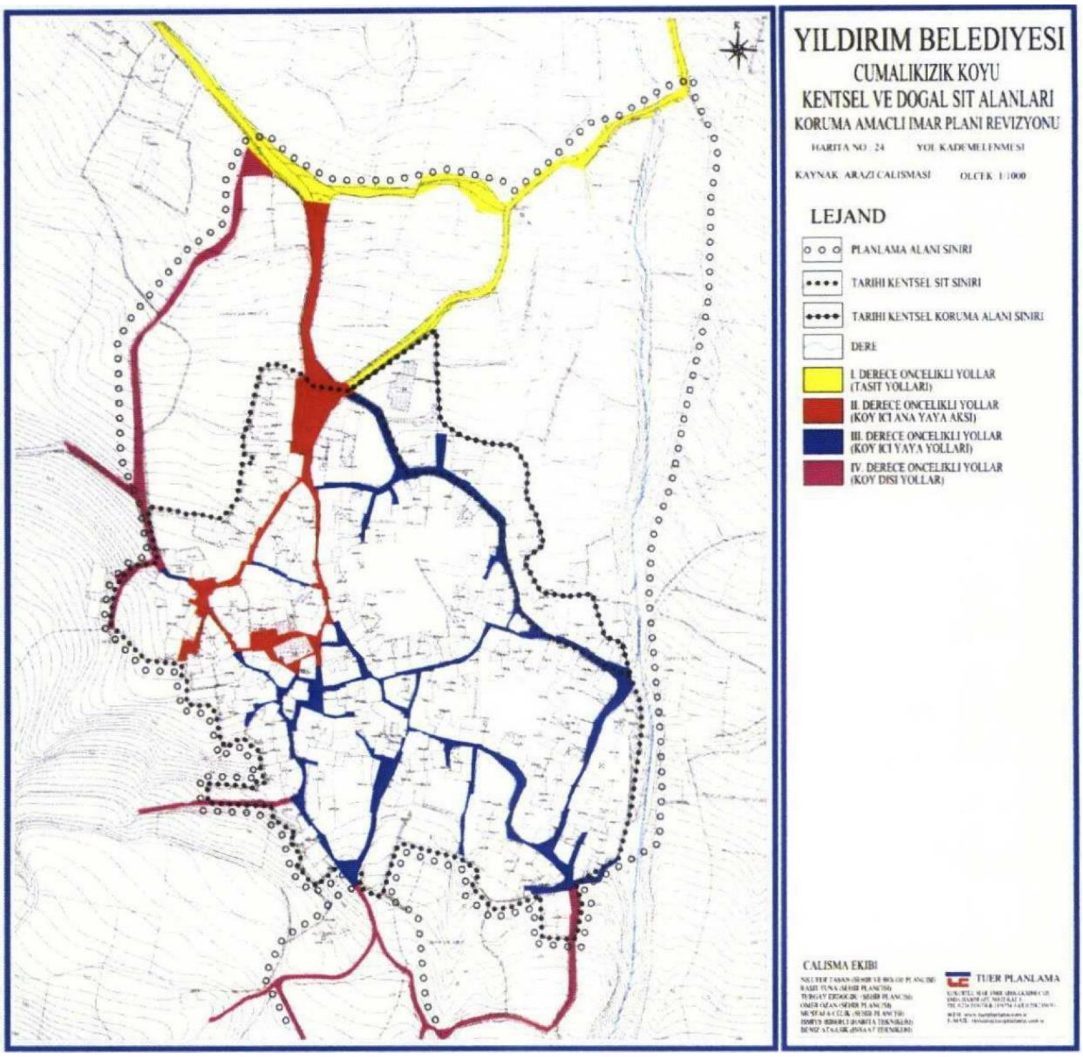


Figure 2.31. Road analysis (Source: Cumalıkızık Conservation Development Plan Report, 2015)

When the street characteristics of Cumalıkızık Street are analysed, it is observed that they are narrow (maximum 2.5m.). They were formed for the use of humans and pack animals, not for vehicles. The width of Cin Street, which is one of the narrowest streets, is approximately 60 cm.

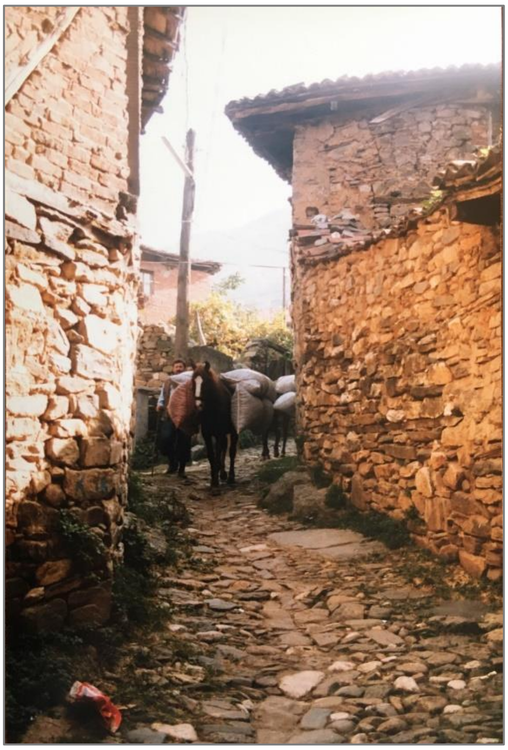


Figure 2.32. Narrow streets for the scale of human and load animal (Source: Neriman Şahin Güçhan Archive)

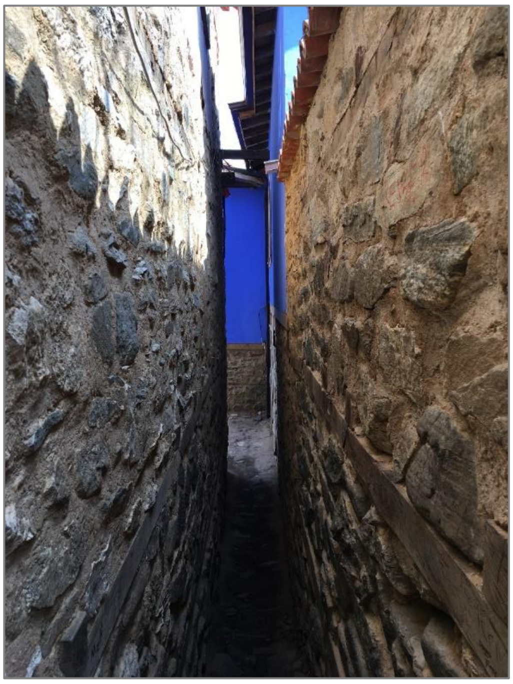


Figure 2.33. View from Cin Street

The pavement of the streets is slate stone. The streets are inclined towards their middle axis for the drainage of rainwater. There is a sewer line under the middle axis of the street. The sewage system of the village can be reached by removing two opposite slate stones, placed in the middle line of the street. In addition, the traditional wastewater outlet of the buildings can be observed at lower levels on the facades of some traditional houses. The streets are framed on both sides by high stone masonry walls of buildings or courtyards. They are protected from rain and are shadowed by projections and wide eaves of the buildings. Corner chamfers are used in the settlement in order to ease the turns at the intersection of the streets. Fountains and projected fireplaces of the buildings are elements enriching the street pattern. In the settlement, there are not any trees along the streets but flowers in the windows and the vines can be considered as natural elements of the streets.

Figure 2.34. Street pavements with slate stone

Figure 2.35. Corner chamfer (2800-34)

Figure 2.36. Wide curvilinear eaves (2805-1)

Figure 2.37. Fountain on the facade (2800-41)

Figure 2.38. Vines on the facade (2817-38)

Cumalıkızık is composed of seven quarters, which are Eğrek, Okul, Hamam, Orta, Dere, Değirmenyeri, Köyüstü. While the Eğrek and Okul Quarters are in the northern part of the settlement, at the lowest level, the Köyüstü and Değirmenyeri Districts are in the southern side, at the top level. The Orta Quarter defines the centre of Cumalıkızık, the Hamam District describes the vicinity of the bath building and the Dere Quarter refers to the neighbourhood of the Kilise River.

Figure 2.39. Inclined streets towards the middle axis

When lot sizes in the settlement are examined, it is seen that the lots covering a large area (550 m2 and above) are concentrated around the periphery of the settlement and used as agricultural lands, except the two lots where cemetery is located. Most of the lots in the village have a size of 0-300m2, whereas there are lots with sizes of less than 75 m2. There are buildings at many locations in the settlement, whose facades cover two, three or more lots. Therefore, many lots and buildings, which we see today, have been divided probably by inheritance. Hence, the lots with sizes less than 75 m2 can be considered as lots, which have been divided by inheritance and left to daughters as the ‘girl's right’.

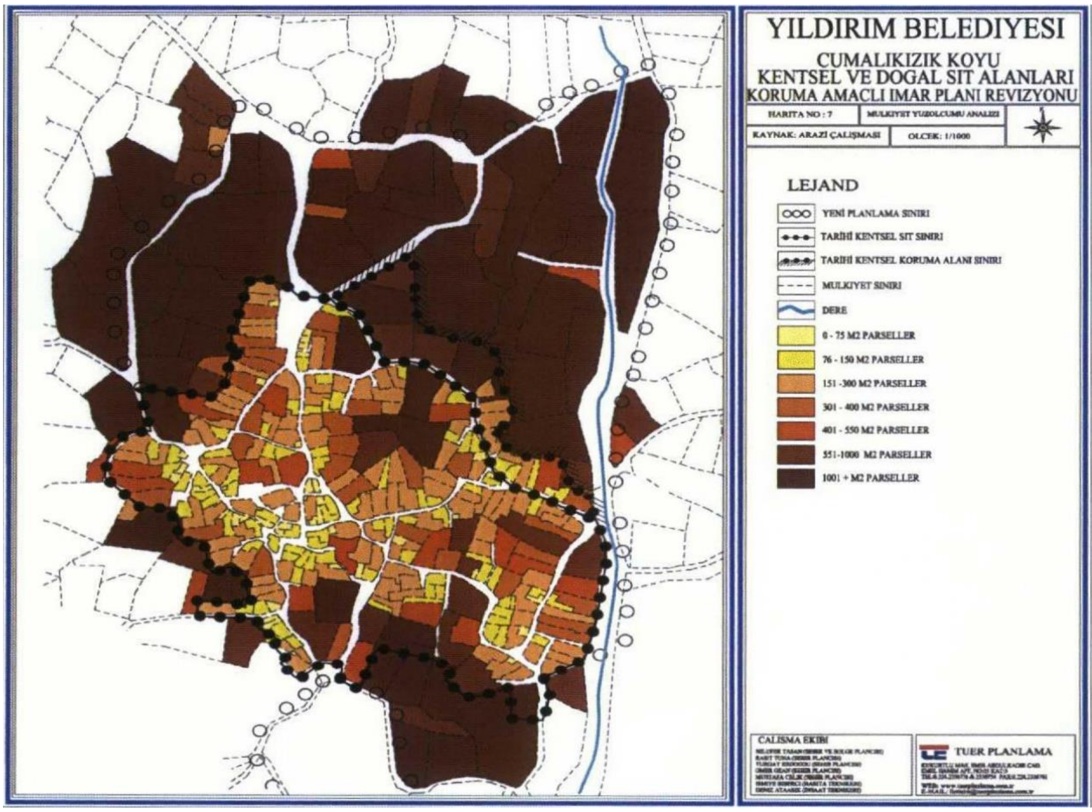


Figure 2.40. Lot analysis (Source: Cumalıkızık Conservation Development Plan Report, 2015)

The settlement has an organic pattern, and lots do not have regular geometric forms. However, there are elongated rectangular lots with narrow sides facing the street and extends backwards. The narrow sides facing streets suggest the possibility that these lots have been divided. The large lots at the periphery of the settlements do not have any regular geometric form.

When the open and built-up areas within the lots are considered, there is a dense built-up area due to service units in the courtyard. However, since these service units are single storey semi-open spaces at the ground level of the main buildings, they do not affect the mass perception to a great extent. The buildings are generally located on the edge of the lots facing the street, in an adjacent order. The stone masonry walls, which continue at the ground floor level, form the character of the streets.

The majority of the built-up areas in Cumalıkızık is composed of residential fabric. Along with this residential fabric, there are public buildings such as mosques, schools, the office of mukhtar, museum, and village cooperative. Buildings with commercial uses are the baths, convenience store (*bakkal*), coffeehouses, hotels, and restaurants. In addition, the ground floors of many residential buildings are used for commercial purposes such as restaurants or shops. Along with the built-up areas, the public open spaces of the village also serve intensively commercial functions. The villagers open stands in Eğrek Square and along the streets closer to the centre.

Figure 2.41. Bazaar in Eğrek Square

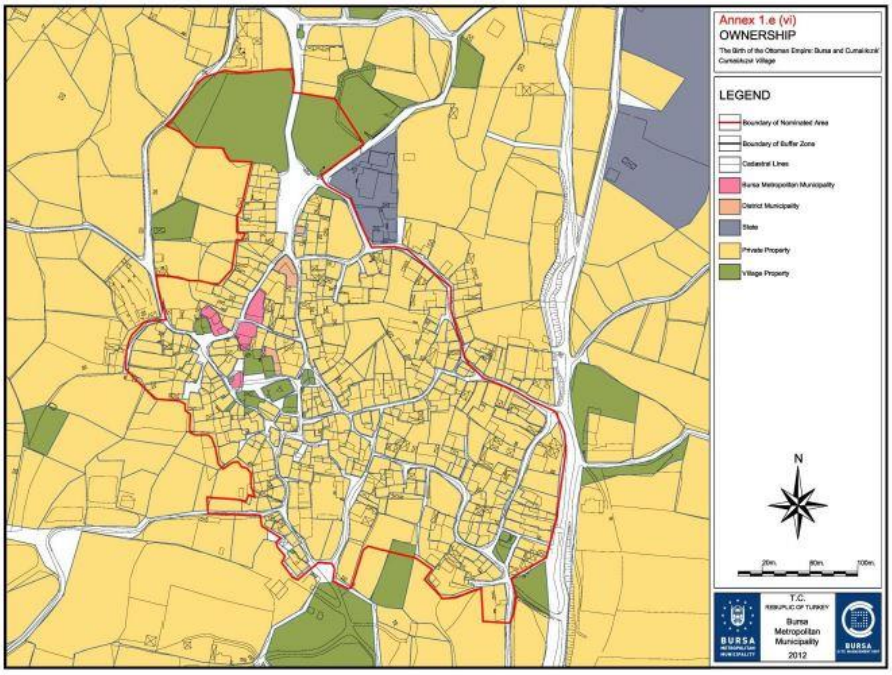


Figure 2.42. Ownership Analysis (Source: Cumalıkızık Management Plan Report, 2013)

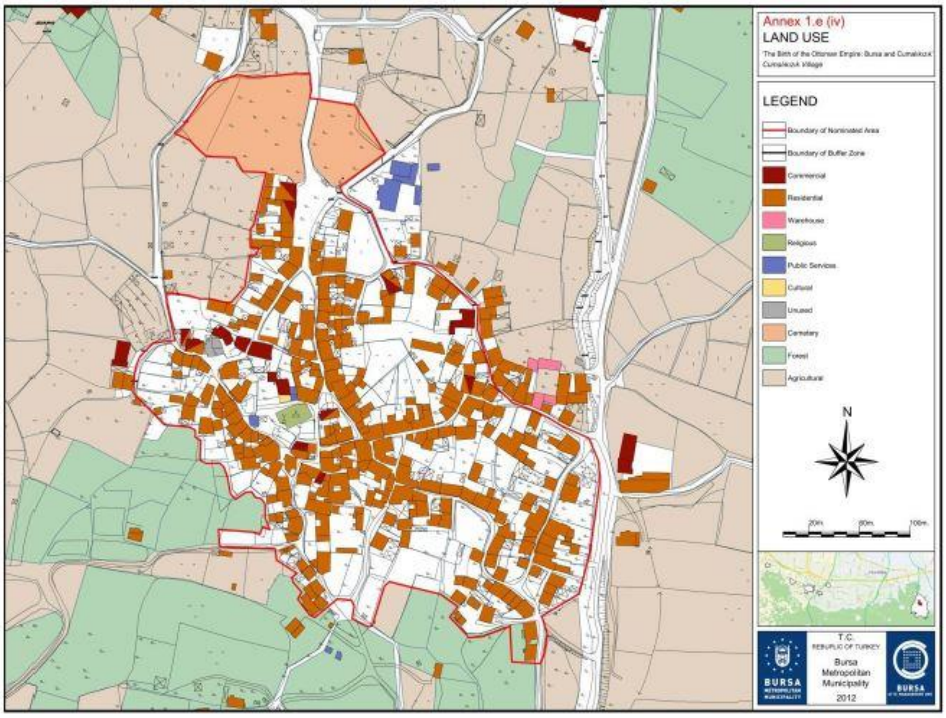


Figure 2.43. Land use Analysis (Source: Cumalıkızık Management Plan Report, 2013)

2.4.2. Architectural Characteristics of Traditional Cumalıkızık Houses

The building-lot relationship of the residential fabric in Cumalıkızık has three types (See Fig. 2.5).

In Type A, the building is situated in the front part of the lot, covering the entire street facade, whereas the courtyard is situated at the back. Entrance is provided through a double-winged door opening in the ground wall of the building. The building is reached directly from the street (See Fig. 2.6, 2.7).

In Type B, both the building and courtyard have a street facade. The entrance is provided through a double-winged door opening, with an eave, usually located in the courtyard wall. From the street, one enters first to the courtyard and then the building (See Fig. 2.8)

In Type C, the building is located at the back, and the courtyard is in the front of the lot. The entrance is provided through a double-winged door opening, with an eave, located in the courtyard wall. (See Fig. 2.9) The building's location behind the high courtyard walls is advantageous in terms of both privacy and security. It is known that this type of building-lot-street relationship, which can be considered as introverted and protected, is the characteristics of early Ottoman residential fabric (Şahin Güçhan, 2017).

The most common building-lot type seen in Cumalıkızık is the type in which the building is located in the front of the lot, covering the entire street facade, whereas the courtyard is located behind (Type A).

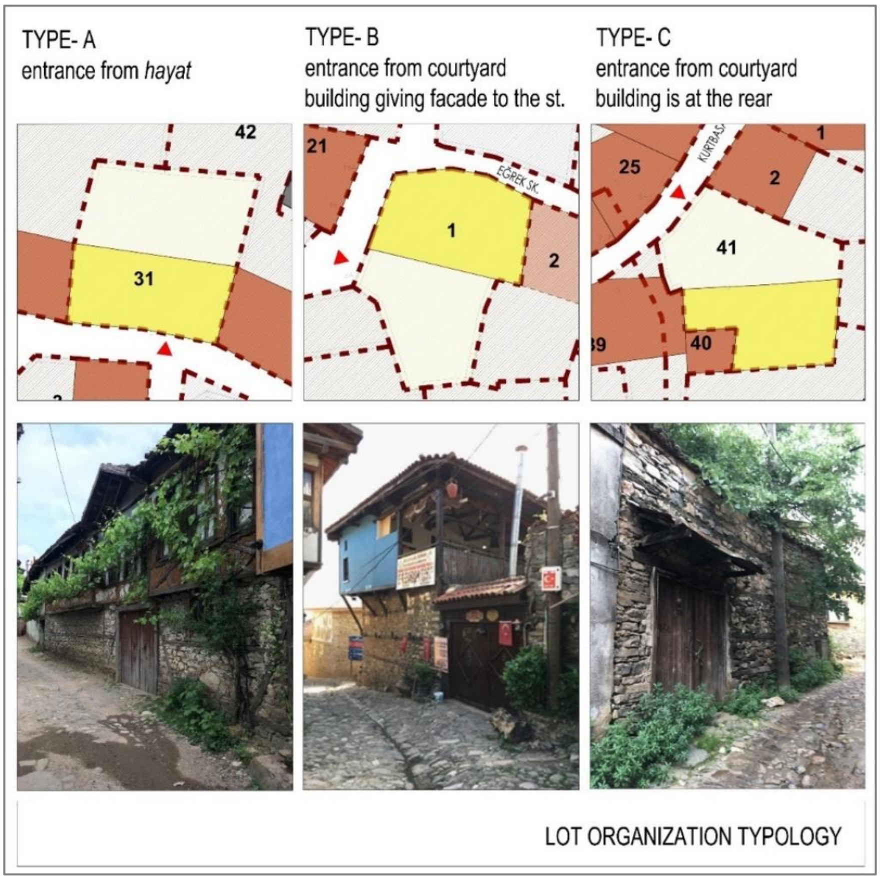


Figure 2.44. Building – Lot typology

Figure 2.45. Example of Type A. (2814-9)

Figure 2.46. Example of Type B (2805-3)

Figure 2.47. Example of Type C (2805-25)

Mass Characteristics

The residential buildings in Cumalıkızık have two or three storeys. These buildings are composed of a blind, massive, stone masonry ground floors, following the organic street pattern, and an illuminated, light, timber frame upper floor(s), aligned geometrically with the projection. This type of composite structure, began to be seen in the Ottoman residential buildings from the 17th century onwards in Istanbul, is called "*hımış*" structure. (Şahin Güçhan, 2017) The "*hımış*" structures seen in Cumalıkızık, can be categorized into two groups.

The characteristics of the first group are their ground floor heights, which are more than 3 m (approximately 4-5 m.) These buildings do not have a timber frame second floor. In some buildings, however, there is a low mezzanine floor within the ground floor height. These mezzanine floors, not exceeding 2.5 m in height, are placed on barn and used as winter floors. The high masonry floor walls, which do not have openings looking to streets, also refer to the early Ottoman residential building with their introverted character.

The second group are two or three storey buildings, with ground floor heights of approximately 3 m. Since their ground floors are not high, these buildings do not have mezzanine floors. It can be said that the mezzanines in the first group of buildings have evolved into independent floors constructed with timber frame system in the second group of buildings.

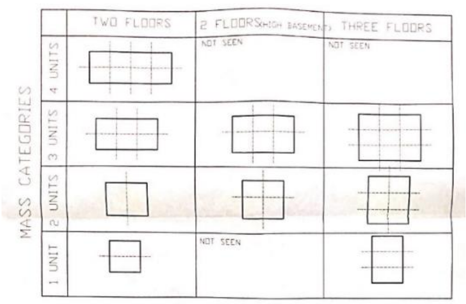


Figure 2.48. Mass Categories (Source: Studio Work of Rest507 Design in Restoration, METU,1998-99)

Plan Organization and Spatial Characteristics

Like any other settlement, traditional Cumalıkızık houses reflect the culture and lifestyle they are part of. Cumalıkızık was established at the foot of the mountain away from the city center. Agriculture and animal production, which forms the basis of rural life, has always been at the forefront in Cumalıkızık. Therefore, the houses are not only 'living spaces' but also 'production and cultivation centers'.

The ground floor, which is hidden from the street with high stone walls, is composed of *hayat* (the semi-open space underneath the main mass), courtyard and service spaces such as *dam* (barn), storage, *aşhane /aşane* (kitchen), hayloft, poultry coop and toilet. Daily works such as cooking and washing are carried out in the courtyard where the furnace and kitchen is located. Moreover, sorting, stacking, drying, and storing products also take place in courtyard during the harvest season. The living floor rests on timber posts with stone bases placed on the ground floor that has an open and semi-open space character apart from service spaces.

Figure 2.49. Courtyard facade of 2817-34 (left), 2800-41 (right)

The plan organization of the ground floor can be categorized in two different groups according to the location of the building in the lot and the entrance. In the first group where the main building is located at the back of the lot and courtyard is entered from the street, service spaces such as toilets and depots are in the courtyard near the entrance. In the second group where the main building gives a facade to the street and the street entrance is opened to the *hayat*, service spaces such as toilets and depots are in the *hayat* underneath the main building. In addition to these two types, there are examples where the main building faces the street, but the entrance is from the courtyard. In this type, also, the toilet is located in the courtyard, not in the *hayat*. When we consider the evolution of traditional Ottoman houses, as mentioned before, since privacy and security are more important in the early period houses, the building is situated within the courtyard in these examples (Şahin Güçhan 2017). In Cumalıkızık, most of the buildings face streets and the entrances are from the street and opening to the *hayat*. The least common examples are the ones where the building is situated in the courtyard at the back of the lot.

The architectural elements on the ground floor are double winged entrance doors, service doors, small sized windows opening to the street, the fireplace in the *aşhane*, and furnace used for baking bread or laundry and the staircase connecting the ground floor to the upper floor. The courtyard floor is usually covered with slate stones, and in some cases compressed earth is also used. The ceiling of *hayat* and service spaces are not covered. Some buildings have fountains on the street facade.

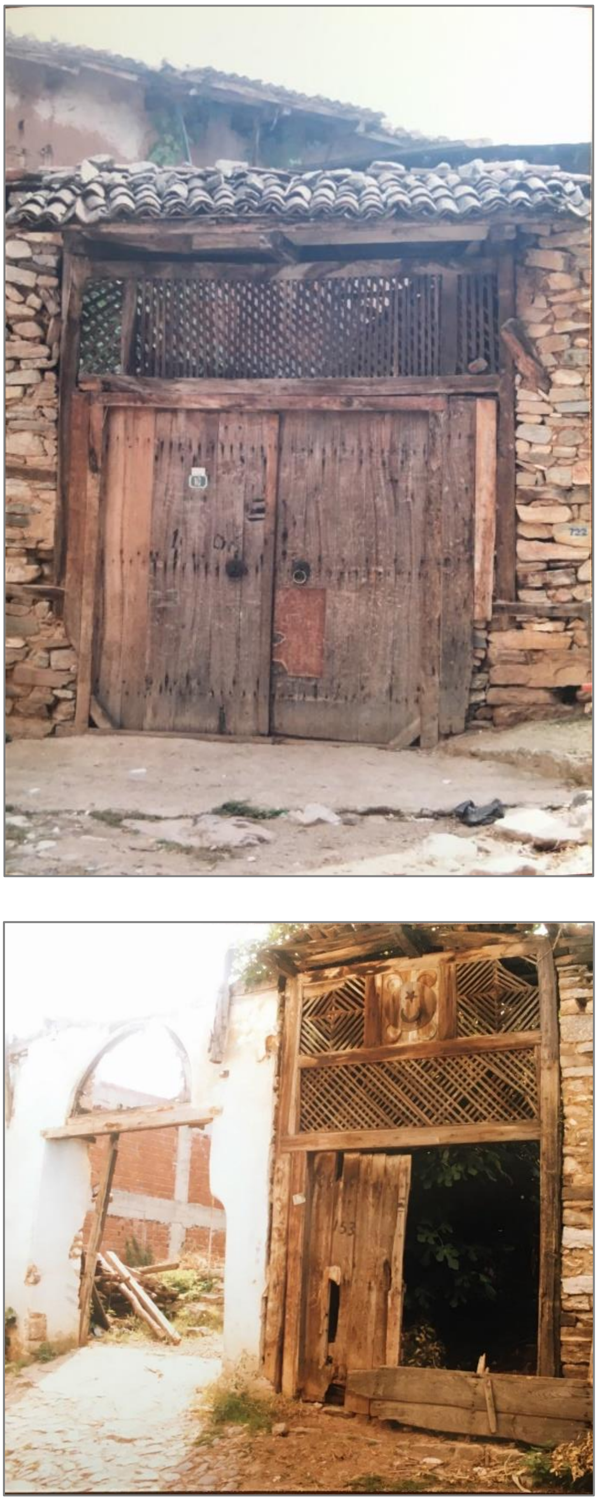


Figure 2.50. Double winged entrance doors (Source: Neriman Şahin Güçhan Archive, 1998)

Figure 2.51. Ocak and niches in *aşhane* (2817-34)

Figure 2.52. Fırın in the courtyard (left: 2819-1-9) (right: source: Neriman Şahin Güçhan Archive)

Figure 2.53. Slate stone floor covering in courtyard and *hayat* – 2800-38 (above), 2800-3 (below)

Although the mezzanine floor is used as a winter floor in some buildings with a low floor height, there are also examples where it is used as a semi-open storage area[3] facing the *hayat*.

The upper floor, which can be described as a living space, consists of a *sofa* (main hall) and rooms. The open *sofa* / *çardak*, which has a semi-open space character facing the courtyard, is shaped in different ways according to the number and arrangement of rooms around it. A plan typology has been prepared by analysing 55 buildings, the information of which are obtained from theses, articles, survey drawings taken from two architectural firms, and studio project conducted within the scope of 'REST507 Design in Restoration III', at METU Graduate Program of Conservation of Cultural Heritage (See Fig. 2.2.) The plan typology of Cumalıkızık houses are based upon their upper floor plans, whereas the ground floor plans are also included in the table (See Fig.2.56, 2.62).

According to the plan typology, the buildings are first divided in two groups, '**with *sofa* / *çardak***' (main hall) (Type 1) and '**without *sofa / çardak***' (main hall) (Type 2) (See Fig. 2.55). Among the 55 buildings, only 2 buildings have plans 'without a *sofa'* (Type 2) (See Fig. 2.55, 2.56, 2.62). In these buildings constructed with traditional materials and techniques, it is seen that the *sofas* lost their function and have been replaced by a circulation area like a corridor.

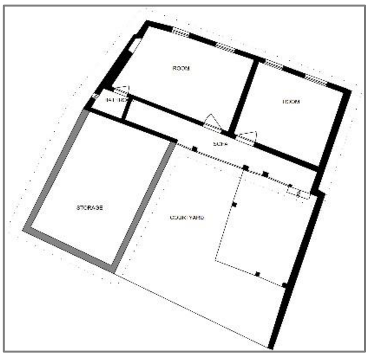


Figure 2.54. Plan type without sofa 2819-6 (Source: Piray Architecture)

[3] In that case, it is called '*kat*'.

The plans ‘with *sofa*’ (Type 1) are divided into two groups as ‘**open *sofa***’ (Type 1.A.) and ‘**enclosed *sofa***’ (Type 1.B.) (See Fig.2.55, 2.56, 2.62). In the buildings with ‘enclosed *sofas’*, the rooms are placed on opposite sides of the *sofa*. It is thought that the building with a building block-lot number 2794-38 had an open *sofa* when it was first constructed. For other two buildings, it can be said that once they had upper floor plans ‘with open *sofa*’, but later the *sofa*s transformed into enclosed *sofa*s with the addition of two rooms on the opposite sides of the *sofa*. However, these three buildings are categorized as having plan type with ‘**enclosed *sofa***’ (Type 1.B.) (See Fig.2.55, 2.56, 2.62).

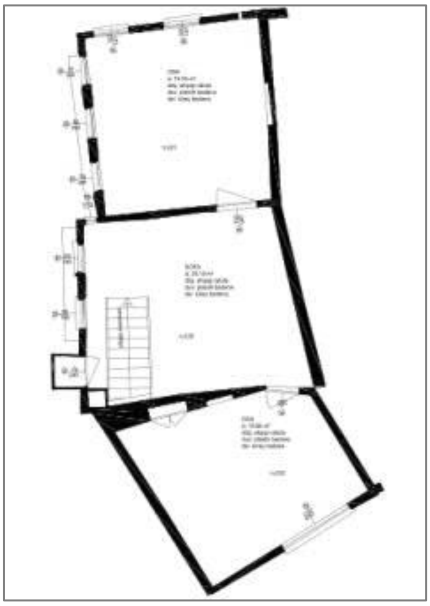


Figure 2.55. Plan type with enclosed sofa 2794-38 (Source: Piray Architecture)

All the remaining buildings have ‘open *sofa* plan’ types (Type 1.A.) (See Fig.2.56, 2.62). Although some of these open *sofas* are closed by windows or addition of rooms, these buildings are categorized in the ‘open *sofa* plan’ type since their original plan organizations can be observed. The ‘open *sofa* plan’ type, which dominates Cumalıkızık houses, has been used efficiently in the settlement since it provides the opportunity of modular growth.

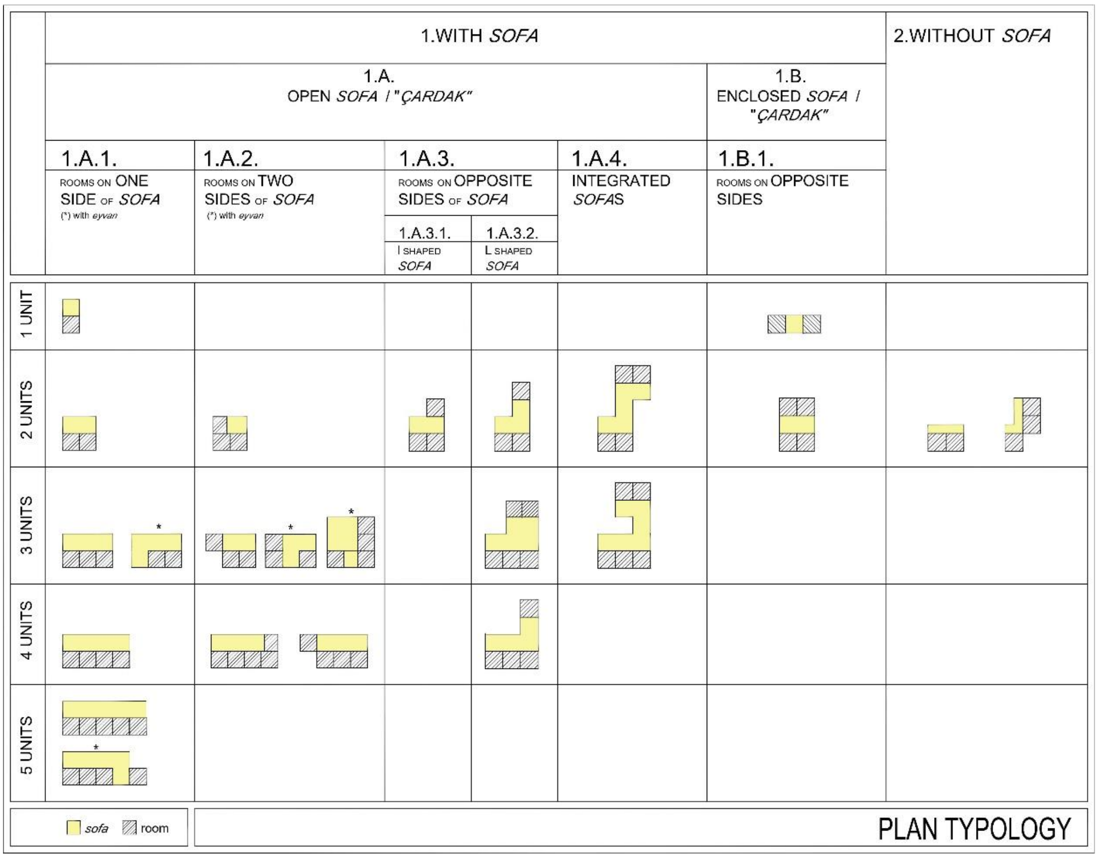


Figure 2.56. Plan typology

The buildings with open *sofas* are grouped according to the position of the rooms in relation to the *sofa*. The most common type is the one where the rooms are arranged on **one side of the *sofa*** (Type 1.A.1) (See Fig. 2.56, 2.57, 2.61). Within this type, the examples with ‘two rooms and a *sofa’* in their front, considered as ‘two units’, are the most common plan organizations. There are only two examples with ‘one room and a *sofa’* in their front, considered as ‘one unit’. Accordingly, the majority of Cumalıkızık houses have open *sofa* plan organizations with two rooms. In time, these houses grow, as the family grows, by the continuation of the sofa or adding rooms on the short or long edges of the sofa according to situation of the building and lot.

In Cumalıkızık houses, there are examples where *eyvan*s (iwans) are located in between rooms or *köşk*s (kiosks) facing the courtyards. There are not any kitchens on the upper floors in the original plan organization. There are, however, architectural elements such as *ocak*s (fireplaces) and *abdestlik*s (water basins) in the *sofas*.

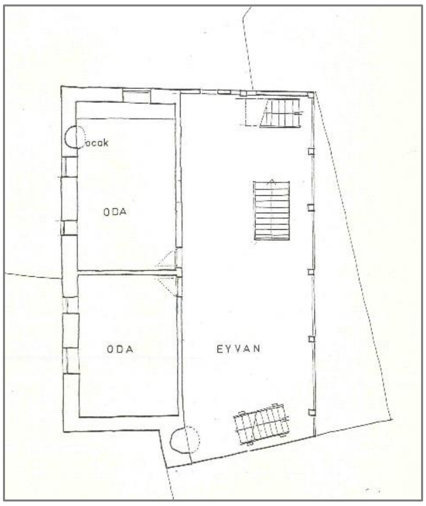


Figure 2.57. Plan type with rooms on one side of open sofa – 2794-25 (Source: Kırayoğlu Archive)

When the evolution of upper-floor plan organization is evaluated, the plan type with rooms arranged on 'one side of the *sofa*' is considered as the simplest plan type. The number of rooms increases according to the wealth of their owners. The plan types with '**L-shaped *sofa*s**' (1.A.3.2.) (See Fig. 2.56, 2.61), where rooms surround the sofa in two directions, are variations of the main type in later periods. The plan types with enclosed sofas, where rooms are arranged on opposite sides, indicate later periods (Şahin, 1995). Moreover, narrow and elongated service spaces are seen in between the rooms in two buildings. (2800-36)

Apart from *abdestlik* (ablution basin) and *ocak* (fireplace), in *iwan*, *köşk* or sofa, *seki* (elevated floor) can be seen in a few buildings in Cumalıkızık. Other architectural elements located in the upper floors are the *sedir* (sitting platform), the *yüklük* (cabinet), the *gusülhane* (bathing cabin), the *sergen* (shelf), the *niş* (nich) and the cupboard. Moreover, windows, doors, staircases and projections are the architectural elements of traditional Cumalıkızık houses. Windows have special elements such as *kepenk* (shutter), *bel tahtası*, *parmaklık* (wooden balustrades) and *kafes* (lattice). It is understood from the archive photographs that in early period buildings, two rows of windows with *revzen*s (top windows) were used. In the upper floor, the floor is covered by wide timber planks (30-40cm.) and only ceilings of the rooms are covered mostly by ceiling boards.

Figure 2.58. Iwan and *sofa* of the building: 2805-1

Figure 2.59. Room with *sedir*, *sergen*, floor boards and ceiling boards (2817-34)

Figure 2.60. Top windows, doors and cupboards opening to *sofa* in 2819-3 (Source: Archive of Bursa Regional Council for the Conservation of Cultural and Natural Properties, 1990)

Figure 2.61. Ocak; one of the architectural elements in *sofa* (2817-34)

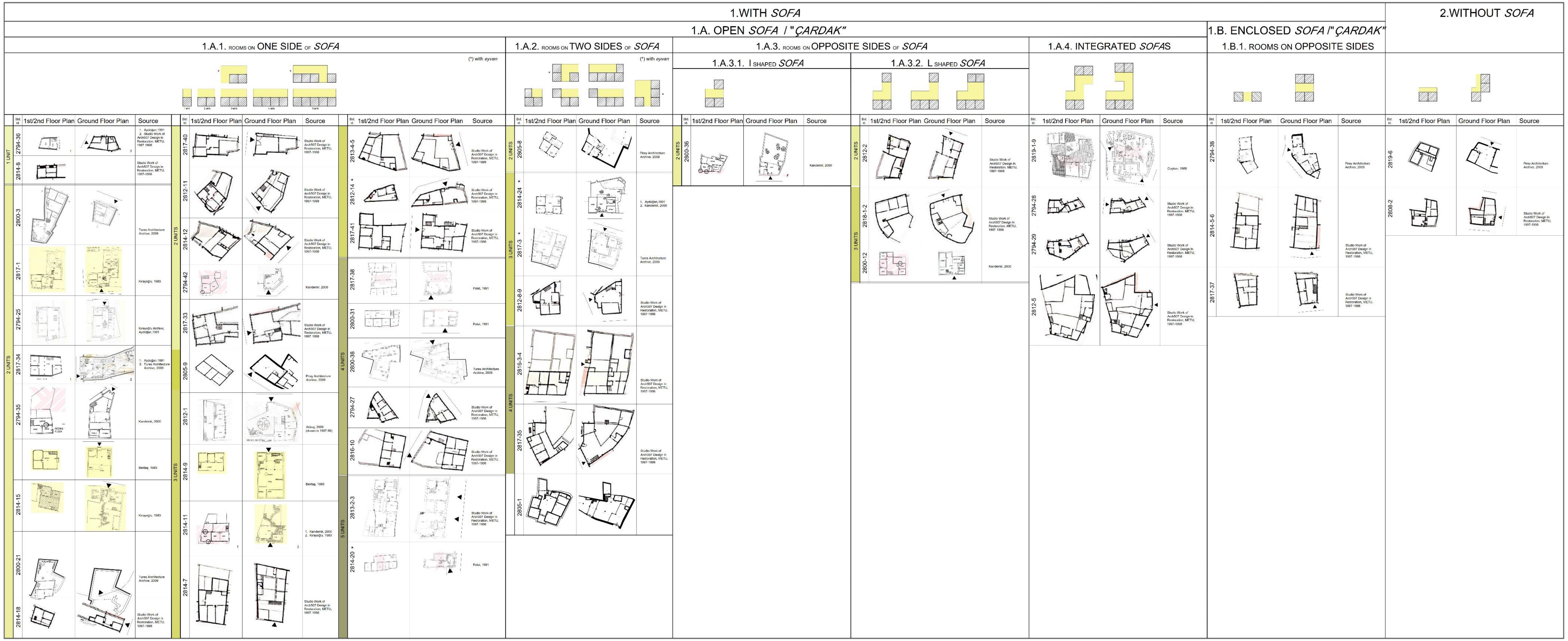


Figure 2.62. Plan Typology of Cumalıkızık houses

Figure 2.63. Kündekari door and cupboard in 2800-36 (Source: Tures Architecture, 2008)

Figure 2.64. Sofa, *seki* and wide floor boards in 2800-36 (Source: Tures Architecture, 2008)

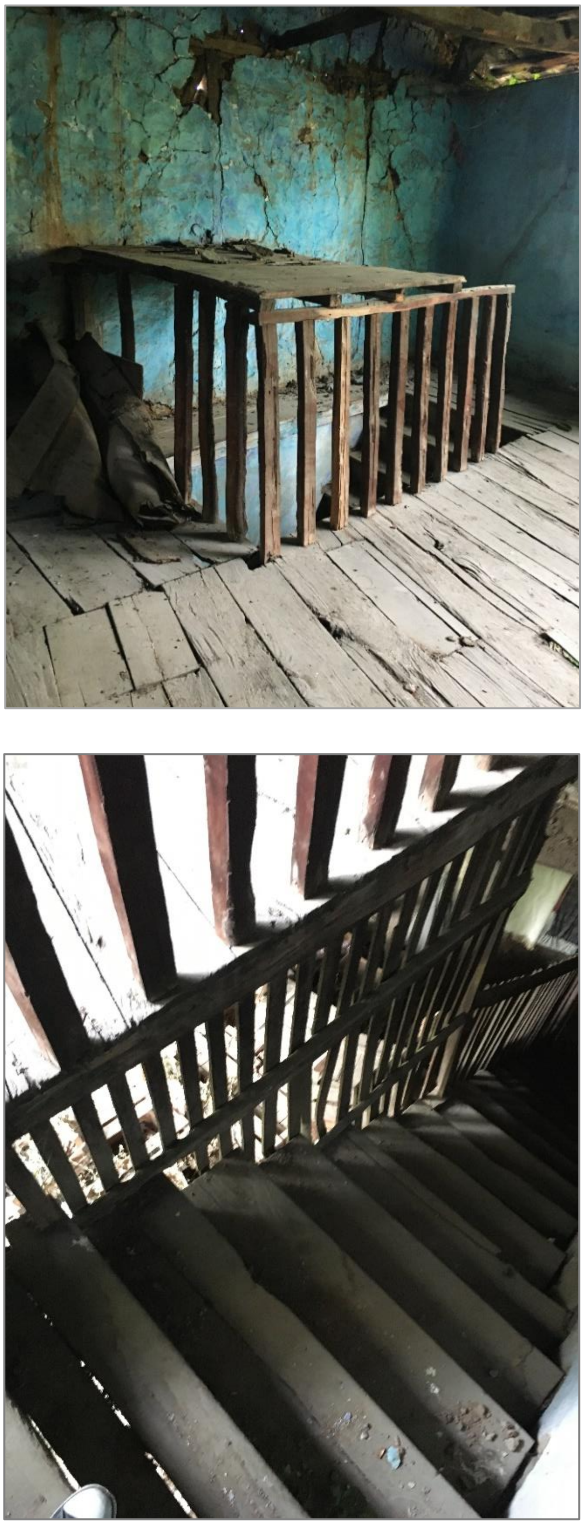


Figure 2.65. Timber staircase in 2817-34

Figure 2.66. Abdestlik in 2806-8 (above), 2800-38 (left), 2805-1 (right)

Facade Characteristics

As it is mentioned in the previous section of mass characteristics, traditional Cumalıkızık houses are two or three storeys. Along with the number of storeys, the height of the storeys is another factor affecting the facade organization. Especially the height of the ground floor is a significant factor. The ground floor heights of one group of buildings varies 2.60-3m., whereas the ground floor heights of the other group of buildings are about 4m. While buildings with higher ground floors have mezzanine floors, they do not have a second timber frame floor. The building with an approximate ground floor height of 3m. generally have one or two storey timber frame floors on top of their ground floors.

Projections are another factor affecting the facade characteristics of Cumalıkızık houses. When the buildings are categorized as the ones with projection and without projection, the buildings without projections are not very common in the settlement. On the other hand, the buildings with projections are very diverse in terms of the location of the projections on the facades and their geometries. According to the facade typology prepared by Kandemir (2000), the types of projections and their locations on the facades vary according to the height and number of storeys. (See Fig.2.69, 2.70) In this typology, rooms are considered as the unit elements affecting facade organization.

The study on the facade organization of Cumalıkızık houses, conducted within the scope of the studio project of “REST507 Design in Restoration III” in METU Graduate Program in Conservation of Cultural Heritage, examines window types on the upper floors and entrance doors on the ground floors, considering rooms as the unit elements.

There are corner chamfers in some of the corner buildings. These corner chamfers not only ease the turns but also creates small squares at the intersection of the streets.

The buildings have eaves with widths of 80-100cm. In corner buildings, the eaves continue from one facade to the other in a circular manner. Although they are mainly lost, the fireplaces projecting from the facade surfaces also contribute to the facade characteristics. In the buildings with open sofa *plan* types, these open sofas usually face the courtyard. The facades of open *sofas* are composed of timber posts and balustrades. Large timber lattices and occasionally timber planks are used for privacy. These timber elements are also used in the buildings where the narrow side of the open *sofa* faces the streets.

In Cumalıkızık houses, the ground floors have blind stone walls. The upper floors are articulated by projections, illuminated by windows, and colored with ochre paints. The top windows, shutters, carved transoms and lattices, which are almost lost in the settlement, are the characteristic elements of the facades.

While braces with different patterns carved on are still observed in the settlement, the geometric patterns formed by flat Ottoman bricks and lime plaster, or the decorations painted on plaster on the facades have been lost.

Figure 2.67. Decorated braces – 2812-1

Figure 2.68. Geometric patterns formed by flat Ottoman bricks and decorations painted on plaster - 2817-1 (Source: Neriman Şahin Güçhan Archive, 1998)

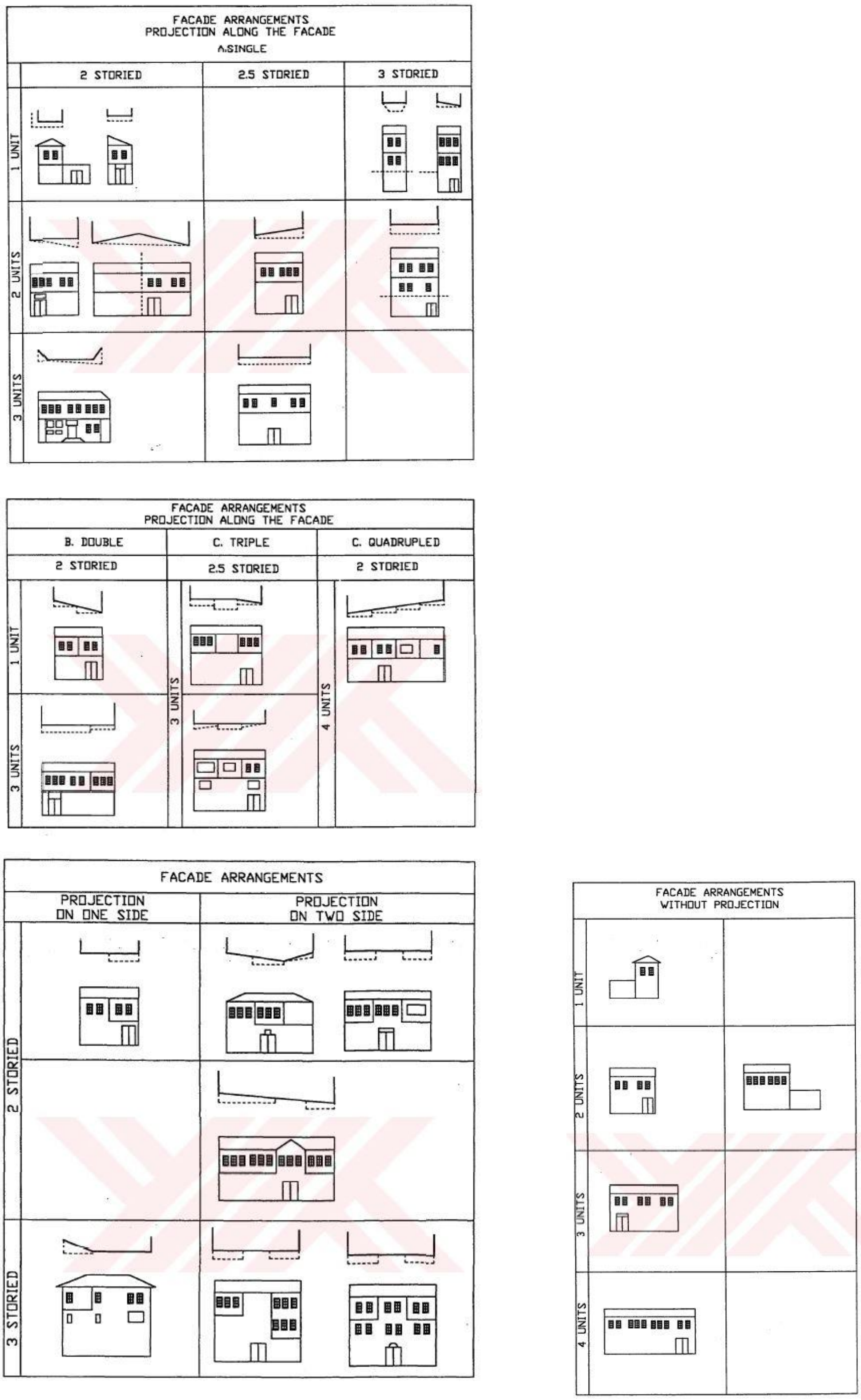
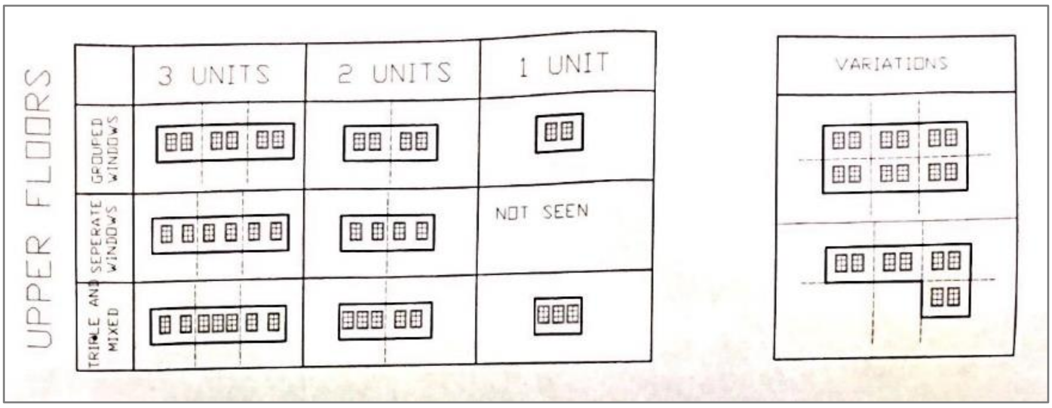


Figure 2.69. Facade & projection typology of Cumalıkızık houses (Source: Kandemir, 2000)



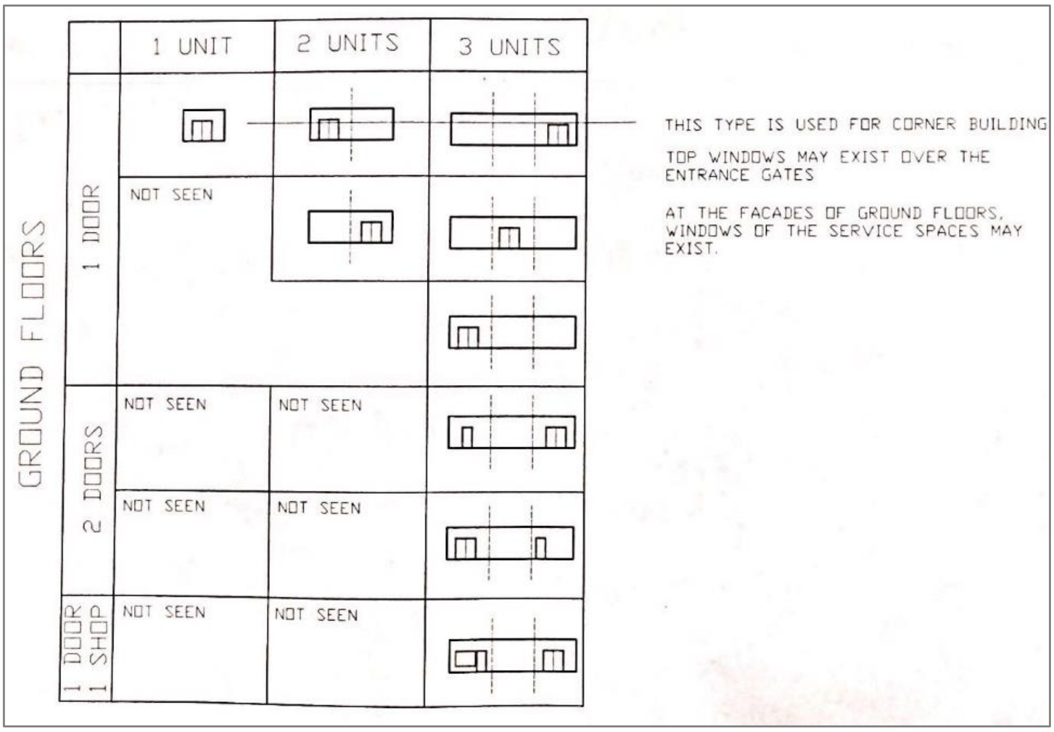


Figure 2.70. Window groups and door location in facade organization (Source: Studio Work of REST507 Design in Restoration, METU,1998-99)

CHAPTER 3

CONSTRUCTION TECHNIQUES OF TRADITIONAL CUMALIKIZIK HOUSES

In this chapter, construction techniques of traditional Cumalıkızık houses are examined systematically from the foundation to the roof. A coding system which was developed by Diri (2010) is used to categorize different construction details. While the code (1) is assigned to the vertical load bearing elements of different floors and foundation, another code (0) refers to the connection details between floors.

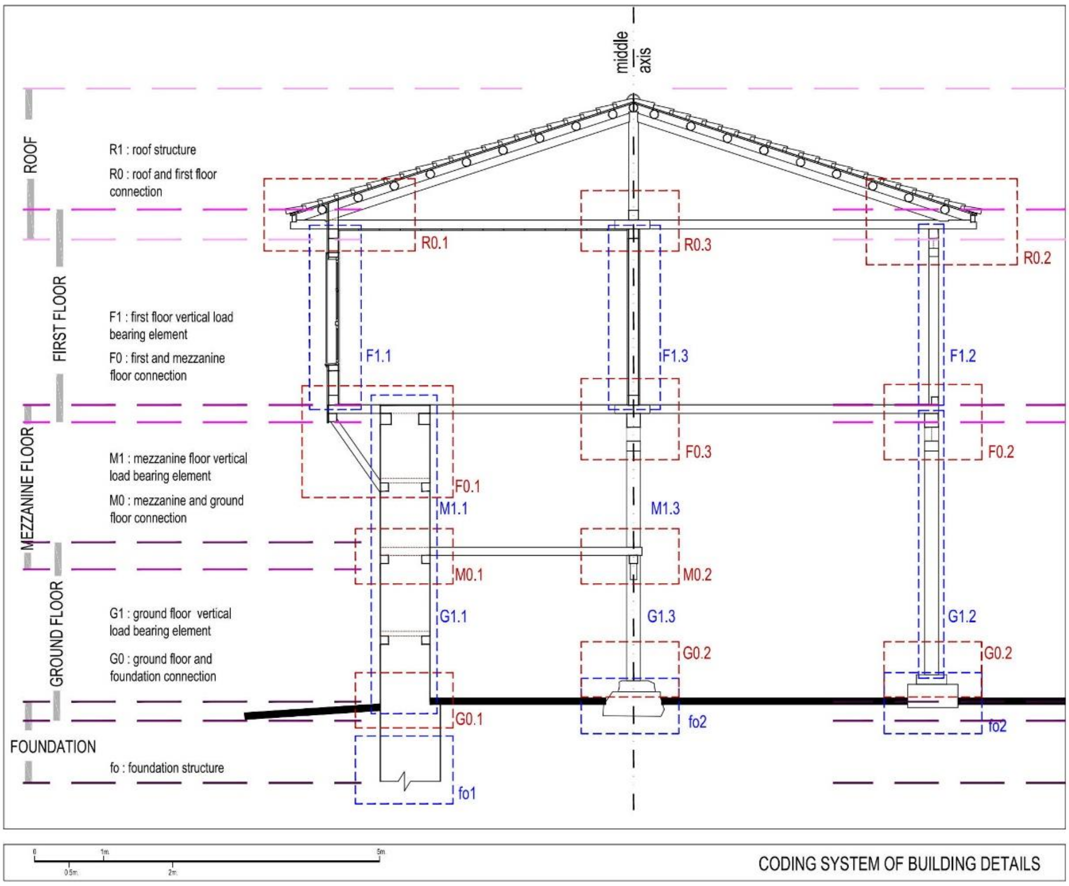


Figure 3.1. Schema of building coding system

3.1. Foundations

The settlement, located on the northern skirts of Uludağ, is thought to sit upon a rocky terrain. The rocks, upon which the buildings sit, can also be observed on the ground in some streets. It can be stated that almost all traditional buildings in Cumalıkızık have composite foundations as a result of *hımış* building type. While continuous foundation (Type 1.A) is seen under the stone masonry walls facing to the street, discontinuous foundation (Type 1.B) is used in the courtyard, under the main timber posts that carry the load of upper floor(s).

Continuous foundation is constructed in three different ways. It can be built by using rubble stone masonry technique with a larger cross section than the ground floor walls. (Type 1.A.1) It is the most common way. According to the earth type or existing of stones in big size in the surrounding, other construction techniques can be preferred. When there is a huge rock at the level of foundation, foundation or ground floor wall is built on it. The rocky ground is levelled by stones with varying sizes. (Type 1.A.2) A foundation excavation in Cumalıkızık showed that formed huge stone blocks are also used in the foundation construction. (Type 1.A.3)

In *hımış* buildings only the line of the stone masonry walls is dug to built continuous foundation. Timber posts at the courtyard sit on separate stone bases. They are not connected to the foundation of stone masonry walls. In this type of foundation, two different applications are seen. In the most common type, timber post sits on the slate stone(s). (Type 1.B.1) However, there are some examples in which timber post sits on a rubble stone masonry base. (Type 1.B.2)

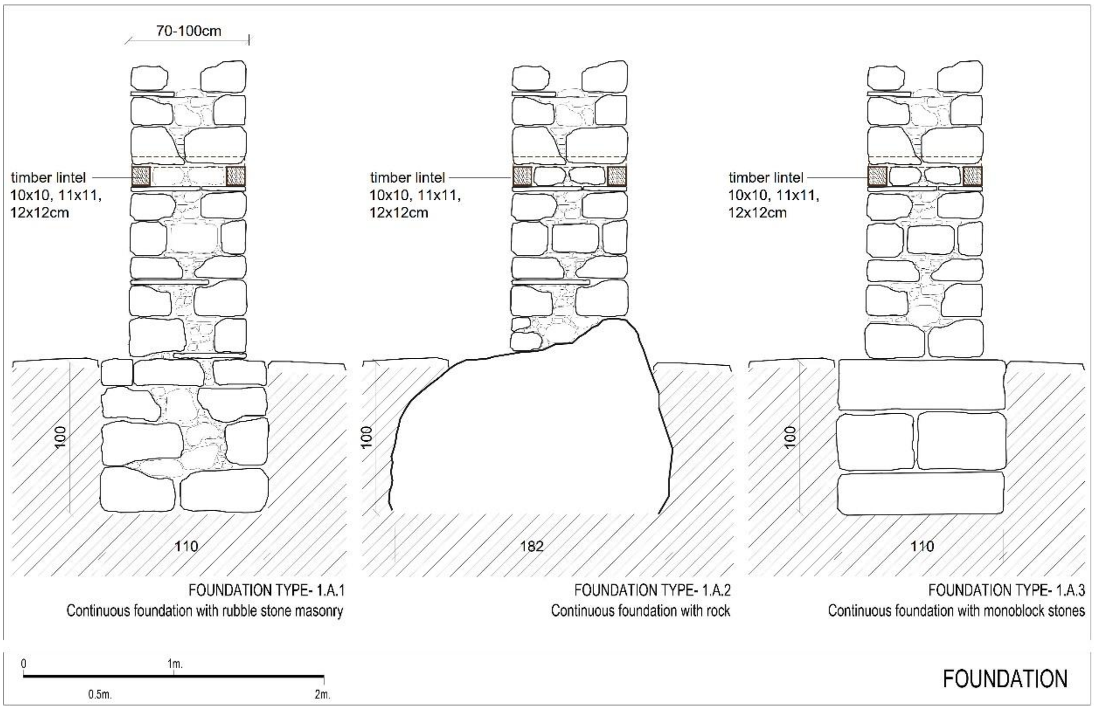


Figure 3.2. Detail of foundation Type 1.A

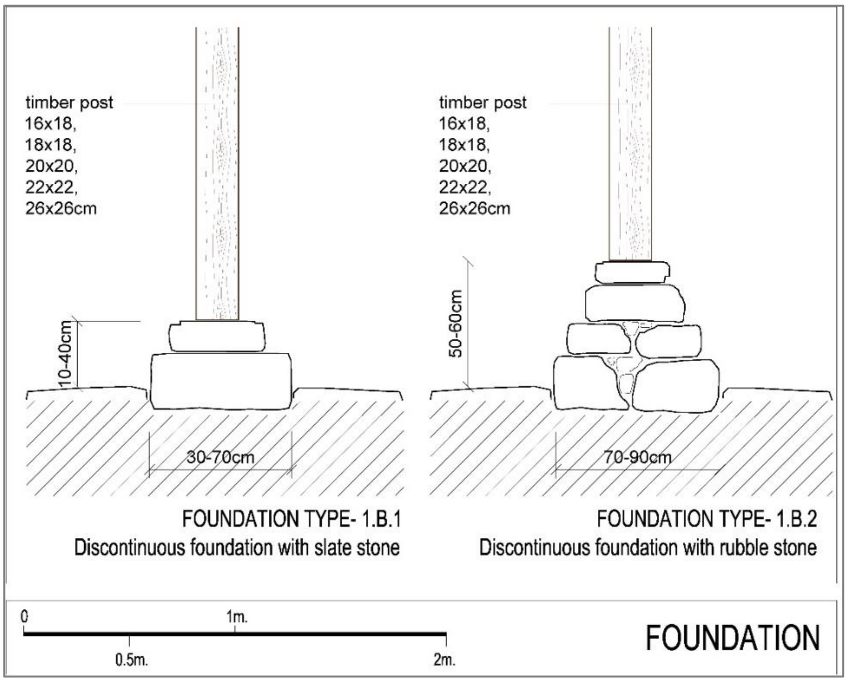


Figure 3.3. Detail of foundation Type 1.B

Figure 3.4. Foundation and stone masonry wall section

Figure 3.5. Foundation excavation in the site for reconstruction

3.2. Masonry Walls

Traditional Cumalıkızık houses are rural manifestations of “hımış” building tradition, which are widely seen in the territories of the Ottoman Empire. The masonry walls, on which the upper timber frame wall(s) sits, are constructed as rubble stone masonry with timber lintels.

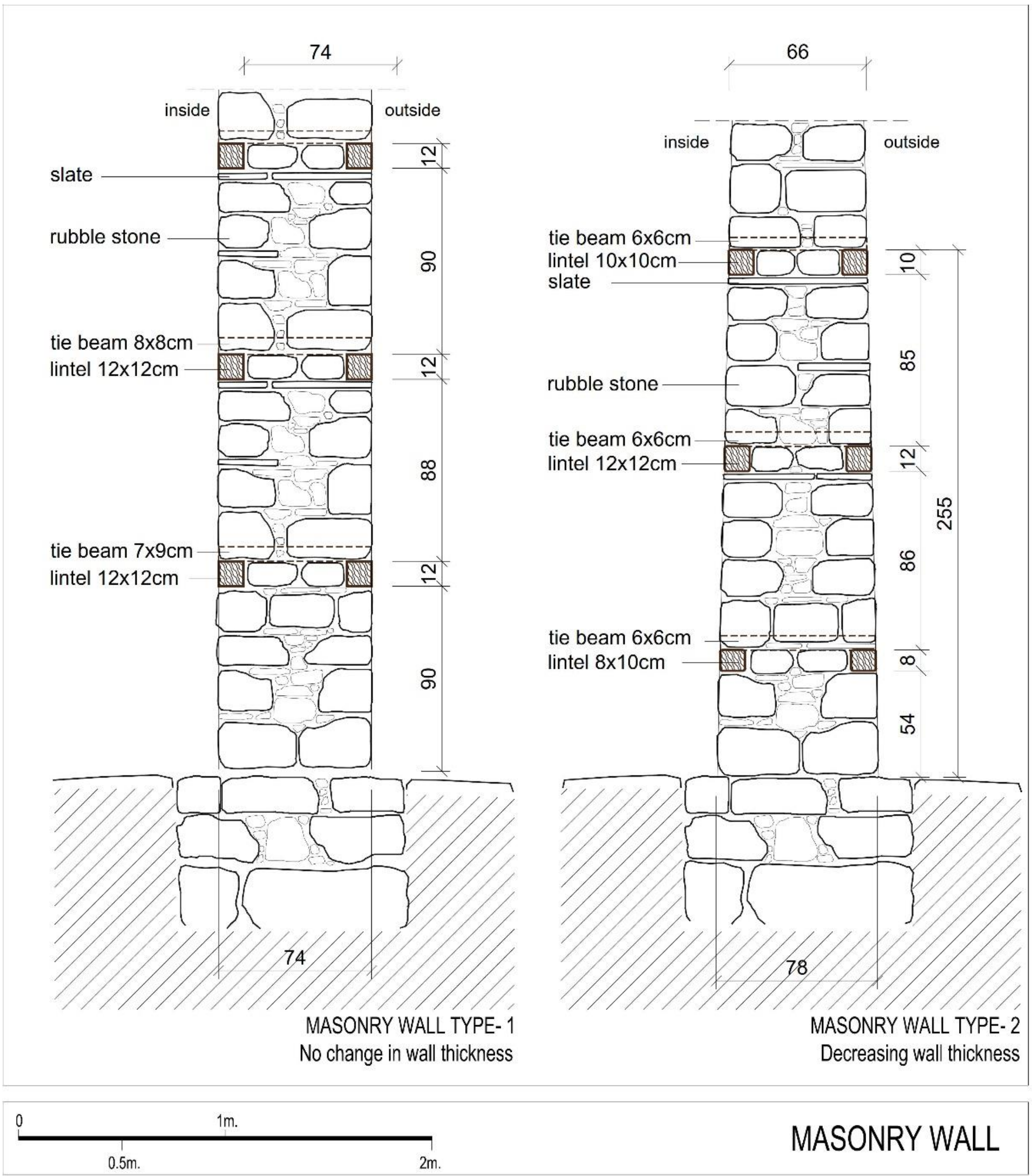


Figure 3.6. Detail of stone masonry walls

The rubble stone masonry walls with timber lintels generally runs along the ground floor, whereas in some examples the walls extend to the roof on one facade or on certain section of the facade. The ground floor heights vary in the settlement. In the first group of buildings, the ground floor is single storey high and ends at the upper level of the entrance door (2300-31, 2819-6, 2820-7-6). In the second group, the ground floors can reach up to 1,5 floors high (around 4 m.). The use of mezzanine floors is quite common in this group (2800-3, 2800-38, 2805-9, 2819-1-9, 2812-2-3). In the third group, the ground floors are 2 floors high (around 6 m.) (2805-1) (See Fig. 3.7).

Timber lintels, with cross-sections of 10*10, 11*11, and 12*12 cm, are placed in two rows for the ground floor walls below 3m in height. For the walls with an approximate height of 4 m, these lintels are generally placed in three rows. Four or five rows of timber lintels are also observed in certain examples. For the walls that are approximately 6 m high, the rows of timber lintels can go up to six (See Fig. 3.7).

These rows of timber lintels are placed both in the exterior and interior faces of the walls at the same level. These two rows of timber lintels, which are placed horizontally at intervals of 80-90 cm, are connected perpendicularly by timber tie beams, forming a frame. These tie beams have rectangular, square, semicircular or circular cross-sections with dimensions of 8*8, 9*6, 9*7, 7*7 cm, and are placed at intervals of 50-60 cm (See Fig. 3.7). The height of the timber lintels at the lowest level varies between 10-120 cm from the ground level. In some of the buildings, which are sitting on a slopy land or have ground floor height lower than 3 m, the timber lintels are closer to the ground level.

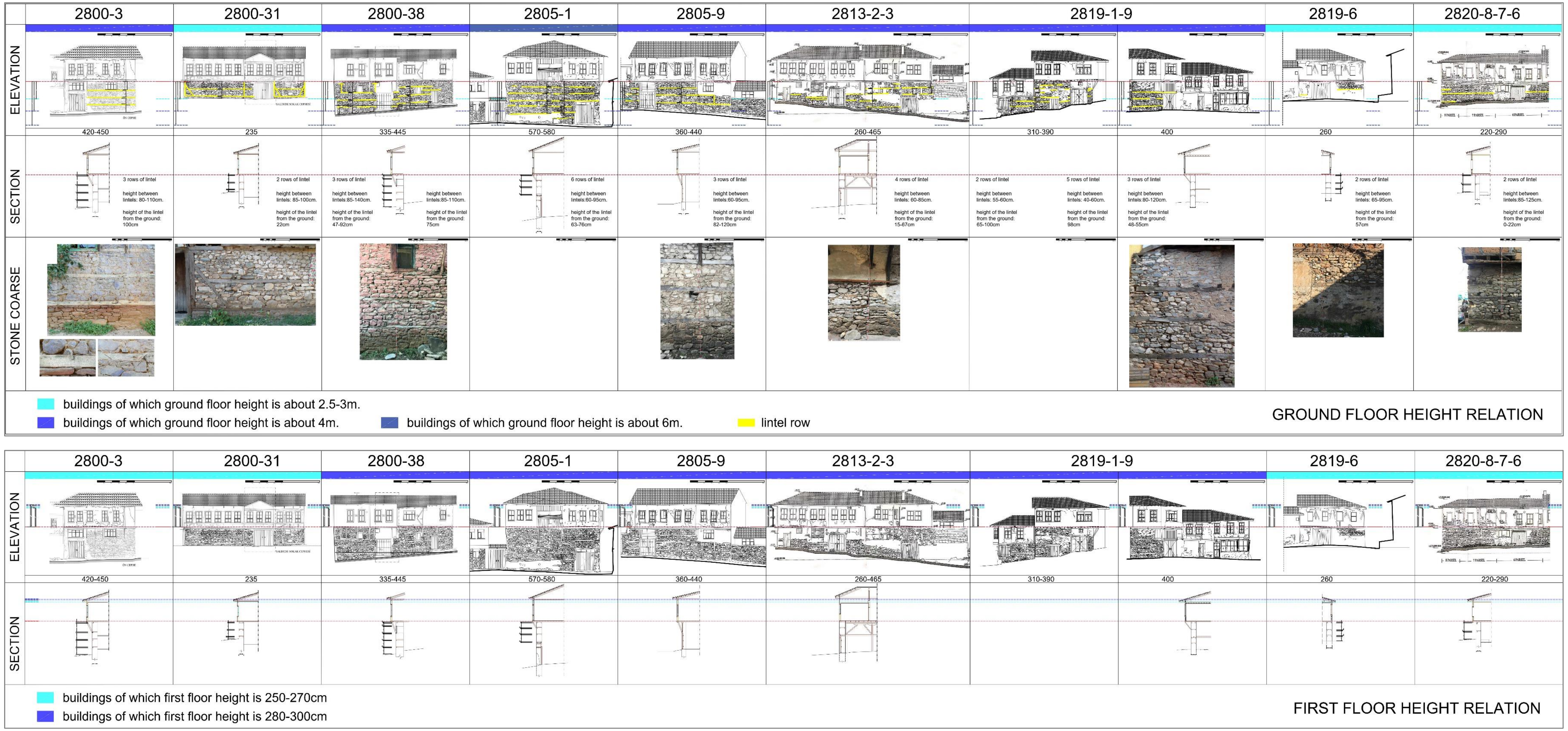


Figure3.7. Ground floor and 1st floor height relation, timber lintels in stone walls and stone coarses

In the examined buildings, timber lintels are observed at the upper level of the entrance doors, its middle and near its lower level, independent of the topography, on which the building sits. It can be said that the entrance door constitutes a reference point in the general arrangement of the entrance facades (See Fig.3.7).

All masonry walls are built by rubble stone. When the wall sections are examined, it is seen that large stones with smooth surfaces are used in the exterior, whereas small stones are used in the interior (See Fig.3.8). The thickness of the stone wall varies 65-100 cm, depending on the height of the wall, the soil structure, and the building’s position on the slope.

Among the buildings examined, two types are observed according to the changes in the wall thickness along the height. In the first type (Type-1), the thickness of the rubble stone masonry wall does not change as the height increases, whereas in the second type (Type-2), the thickness of the rubble stone masonry wall decreases.

River stones with different sizes, slates and mud mortar as binding material are used in the construction of rubble stone masonry walls with timber lintels (Deniz, 1991, Perker, 2004). There are not any significant differences in the courses of stone masonry walls in Cumalıkızık houses. Rubble stones, placed irregularly, are surrounded by small rubble stones and slates, which draw attention with their elongated forms. Since these slates continue along the wall thicknesses at certain points, they also serve as lintels (See Fig. 3.11). Large stones are used at the lower levels. Although very subtle, the stone sizes get smaller as the wall rises. Stones generally do not have a regular geometry, but rectangular and square-like stones are also seen in the masonry courses (See Fig. 3.12).

The stone walls in Cumalıkızık are not plastered from the exterior. In the interior, however, plaster or lime wash is seen on the stone wall surfaces, depending on their location (See Fig.3.14).

In Cumalıkızık, timber lintels are always used in stone masonry wall construction. However, in some buildings in the settlement, timber posts are used within the stone masonry walls. In other examples, timber braces are used together with timber posts in stone masonry walls. The buildings with these timber elements can also be examined under three groups.

In group A, timber elements are only used as lintels in the stone masonry wall. In group B, there are timber posts at the ends of the walls and in the corners without any braces (2805-1). The timber posts within the masonry wall courses are not placed systematically. (See Fig.3.15). Güçhan (1995) defines this group as 'framed masonry'. In group C, the vertical and diagonal timber elements form a system together with the timber lintels. The posts placed at the end of the walls, the braces supporting these posts, and lintels extending along the building's facade form a frame. The timber posts in the corners, and the posts on both sides of the door openings do not directly sit on the ground, but they are rather placed on a stone base on top of the lowest row of timber lintels (2800-31) (See Fig.3.16).

Figure 3.8. Section from rubble stone masonry wall with timber lintels and tie beams (lot no:2800-36)

Figure 3.9. Detail from rubble stone masonry wall with timber lintels (lot no:2800-36)

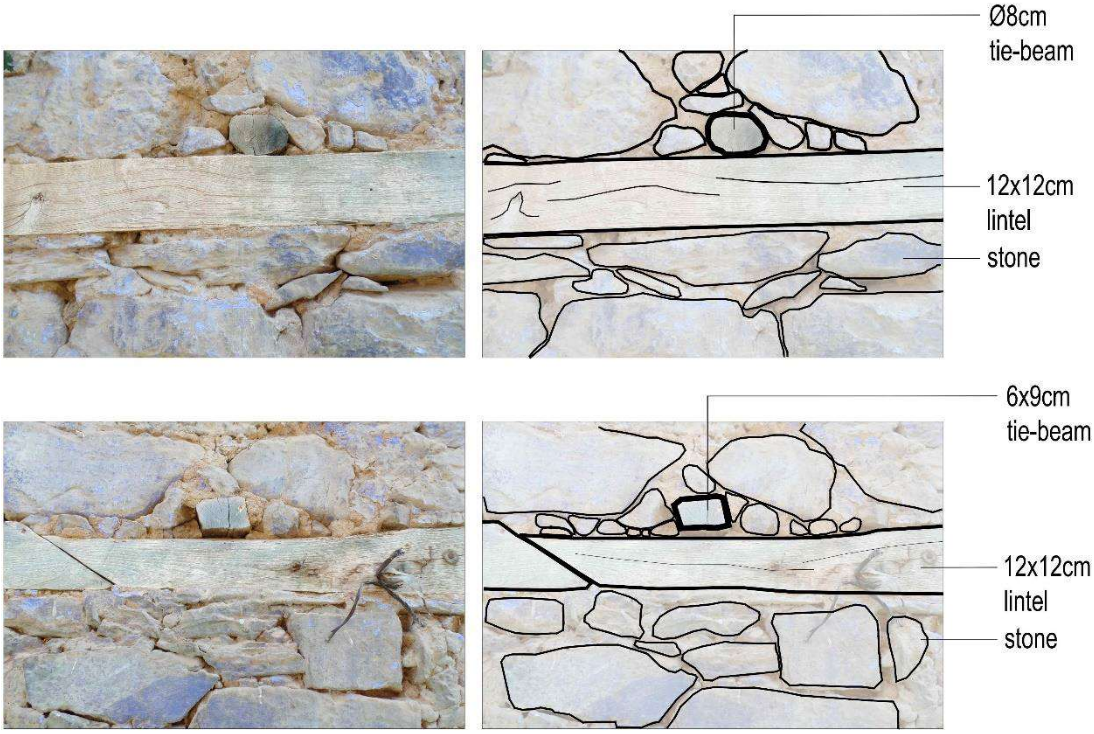


Figure 3.10. Masonry stone wall with timber lintels and tie beams in different forms (lot no:2800-3)

Figure 3.11. Slate stones extending through the section of rubble stone masonry wall (lot no:2800-36)

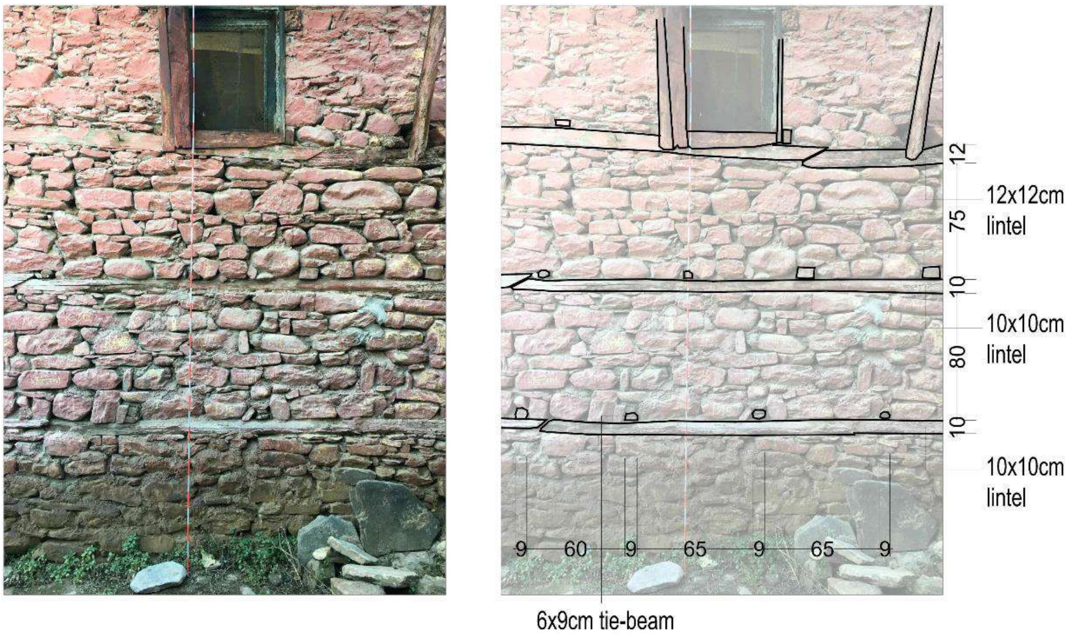
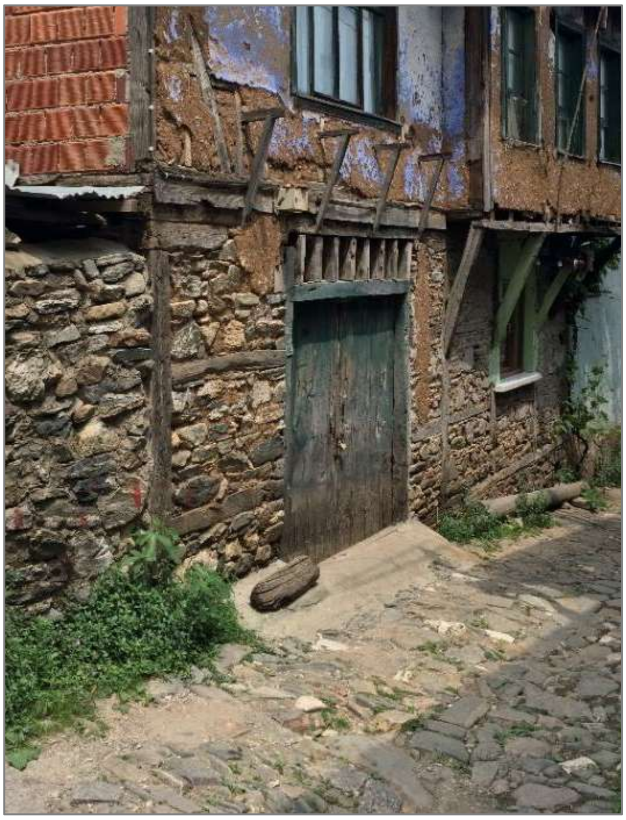


Figure 3.12. Rubble stone course in masonry wall – 2800-38

Figure 3.13. Corner connection of rubble stone masonry wall – 2800-1

Figure 3.14. Plastered interior surface of wall (left, middle) Washed surface of wall (right)– 2819-1-9



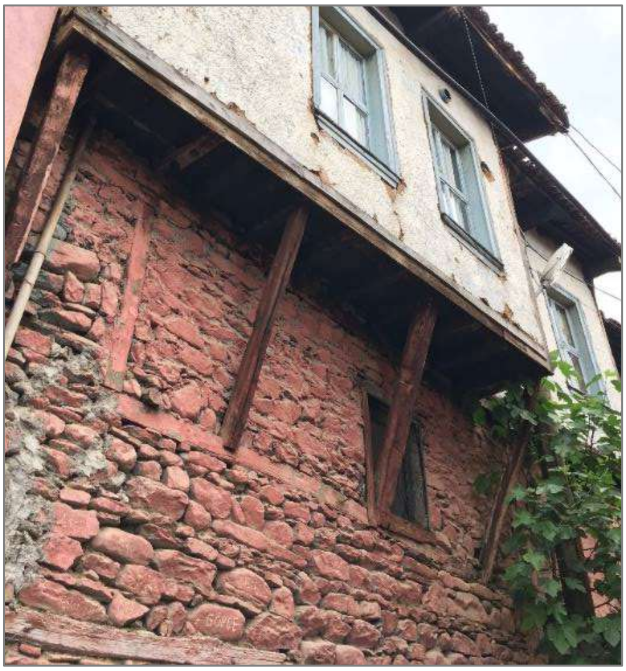


Figure 3.15. Timber posts in stone wall – 2800-19 (above), 2800-38 (below)

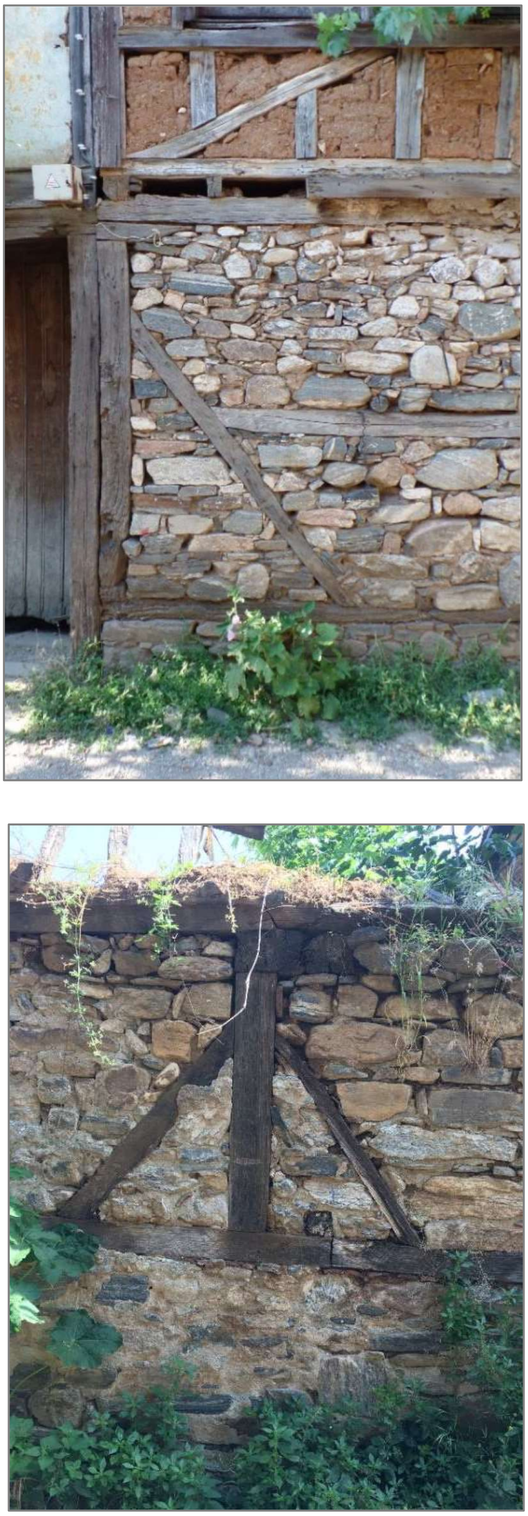


Figure 3.16. Timber posts and braces in stone wall -2800-31(above), -2798-18 (below)

3.2.1. Corner Chamfer

In Cumalıkızık, the corners of some buildings are chamfered. As it is mentioned before, these corner chambers ease the turns and also creates small squares at the intersection of the streets. There are two different groups of corner chamfers.

In the first group, the ground floor is chamfered up to the first-floor level, whereas the first floor sits directly on the chamfered ground floor wall, forming a triangular projection at the first-floor level.

In the second group, the chamfered corners end with a right-angle wall below the first-floor level with the help of corbelled projections. These corner chambers are formed by the overlapping of timber elements. Slates are also used in some examples, together with the timber lintels (2800-34). The number of corbels vary between 2 to 4.

Steppingstones are observed near the ground levels of the corner chamfers, particularly in some buildings from the first group (2794-38, 2807-1).

Figure 3.17. Side view and reflected ceiling view of corner chamfer in the building 2813-4-5

Figure 3.18. 1st group corner chamfer in the building 2819-6 (left), 2794-38 (middle), 2807-1 (right)

Figure 3.19. 2nd grup corner chamfer in the building 2800-34 (left), 2800-1(right)

3.2.2. Spolia in Stone Masonry Wall

Elements and fragments of buildings from the pre-Ottoman period are also observed in Cumalıkızık. These elements are reused in the walls without being processed. Some of these elements are placed in visible areas of the buildings such as on top of the entrance door, whereas the others are merely placed in the wall courses.

Figure 3.20. Re-use of spolia in stone masonry walls - 2805-1 (left), 2794-44(right)

Figure 3.21. Re-use of spolia in stone masonry walls - 2794-38 (left), 2812-1(right)

3.3. Timber Framed Walls

The upper floors of the buildings are constructed with timber frame skeleton. The heights of the first floors of the buildings examined in the settlement vary between 250-300 cm. Among these buildings, the ones with a height between 253-266 cm (2800-3, 2800-31, 2819-6, 2820-8-7-6) can be considered as one group, whereas in the other group the heights range between 286-300 cm (2800-38, 2805-1, 2805-9, 2813-2-3). The ground floor heights of the buildings in the first group, with lot numbers of 2800-31, 2819-6 and 2820-8-7-6, are below 3m. (See Fig. 3.7)

Timber frame wall construction is composed of main elements such as the wall plate, foot plate, main posts and main braces, and complimentary elements such as the window post, door post, studs, upper window sills, lower window sills, upper door sills, tie beams and braces. Moreover, bolsters are generally seen above the main posts. (See Fig.3.23)

Figure 3.22. Timber frame wall construction – 2819-1-9

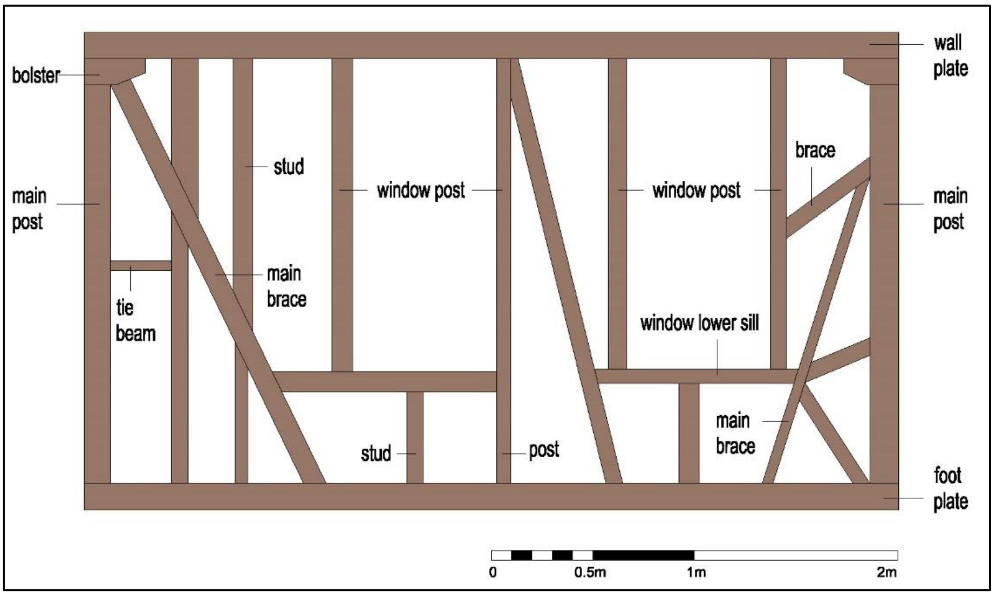


Figure 3.23. Elevation of a timber frame wall construction (edited from the drawing of dismantled wall of 1st floor of the building: lot no: 2819-1-9 prepared by Sama İnşaat, 2018)

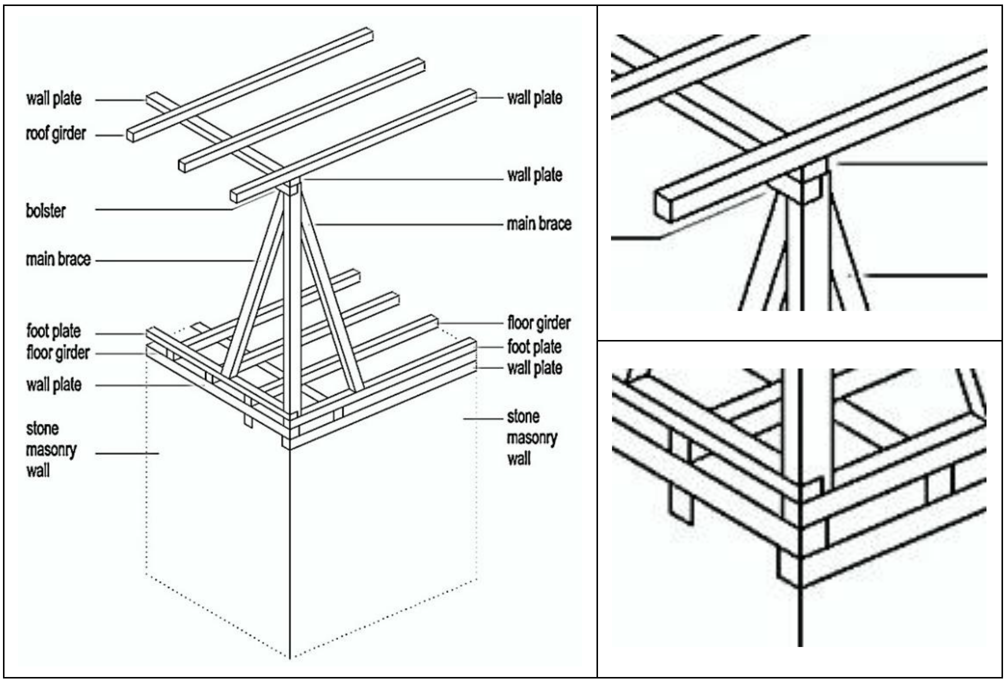


Figure 3.24. Axonometric view of timber frame wall skeleton

The main frame of the skeleton is formed by foot plates, wall plates and main posts, and supported by main braces. The bolsters are used to connect main posts to wall plates. The main posts, placed in the corners and junction points, have square or square-like cross-sections. The dimensions of these cross-sections are generally 15*15, 14*15, 13*13 cm, but there are also examples of 10*10 cm size. The foot plates also have square or square-like cross sections, usually 10*10 cm in size.

In the first type of timber frame wall construction, lap joints are used to connect main posts and foot plates with the help of forged nails (See Fig. 3.24, 3.25, 3.28). In the second type of timber frame wall construction, main posts directly sit on foot plates without joints. (See Fig. 3.26, 3.29) While the wall plates of the timber frame system are plastered on the exterior facades of the walls, main posts and foot plates are generally cladded by timber planks. In later examples or interventions to facades, decorative laths or neoclassical column capitals are also used for cladding (See Fig. 3.27).

Another important element of the timber frame walls is the main brace. Main braces have square or rectangular cross-sections, with varying sizes such as 10*10, 12*10, 12*13, and 12*15 cm. These elements connect main posts and foot plates diagonally in order to stabilize vertical and horizontal axes. In Cumalıkızık, it is observed that main posts are not only used in the corners or at the junctions, but also within the frame. The intervals between these posts range between 1-2.5 m, is commonly around 2 m. The frequent use of main posts also increases the frequency of main braces. In some facades, it is observed that the main posts in the middle of the rooms are supported by braces instead of the main posts in the corners. The angle between the main post and the main brace varies. In the examples with multiple openings, main braces are either not used at all or placed quite horizontal like its upper point would correspond with the lower parts of the main post (2819-6). Although not common, there are also main braces placed in the form of crosses in some of the examples.

Figure 3.25. Lap joint connection of foot plate and main post -2800-38 (left), 2799-1-2 (right)

Figure 3.26. Direct connection of foot plate and main post with diagonal nails – 2819-1-9

Figure 3.27. Timber planks on main posts and foot plates, decorated laths and neo-classic capitals - 2800-38 (left), 2313-2-3 (middle), 2800-3 (right)

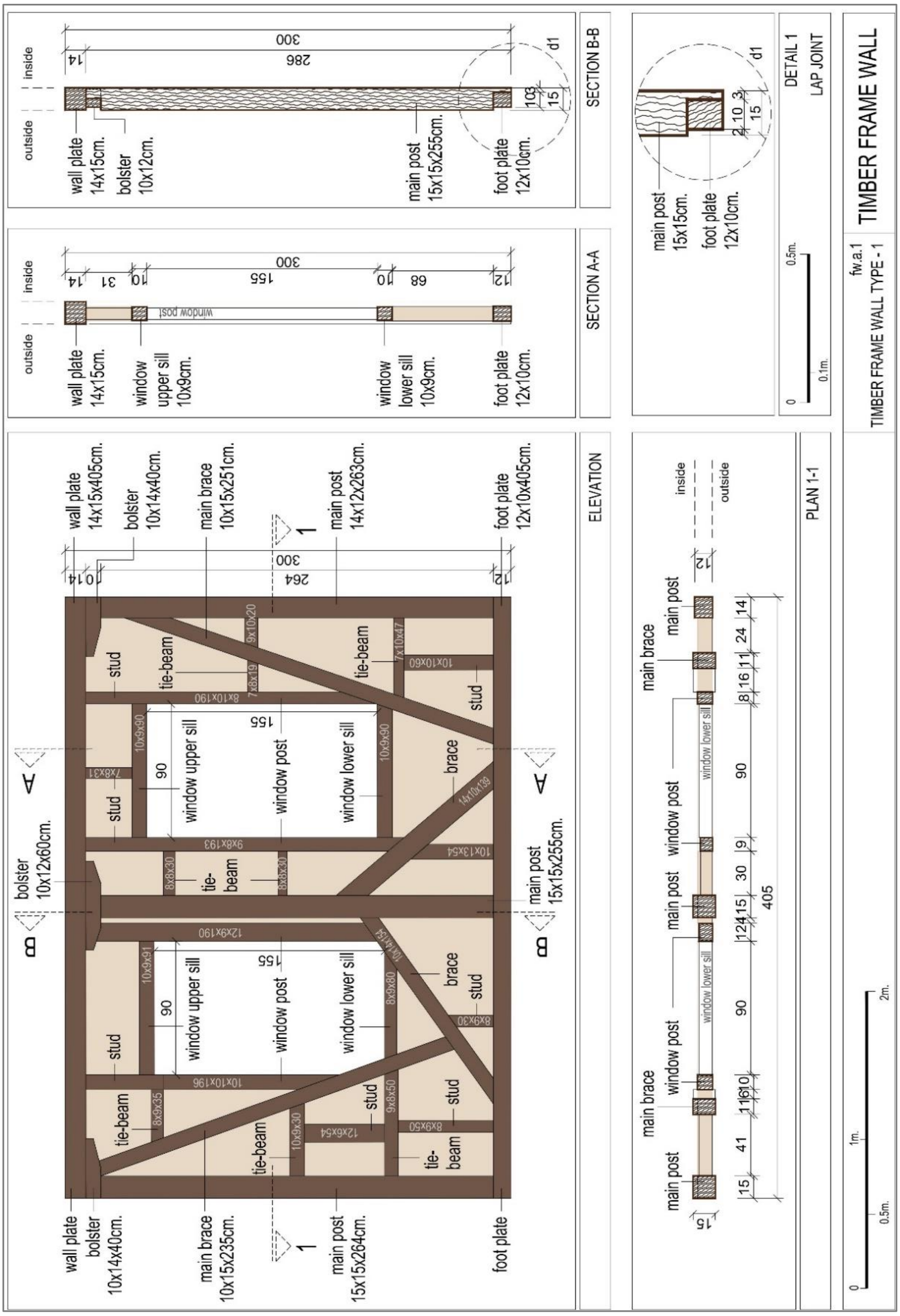


Figure 3.28. Detail of Timber Wall Type -1

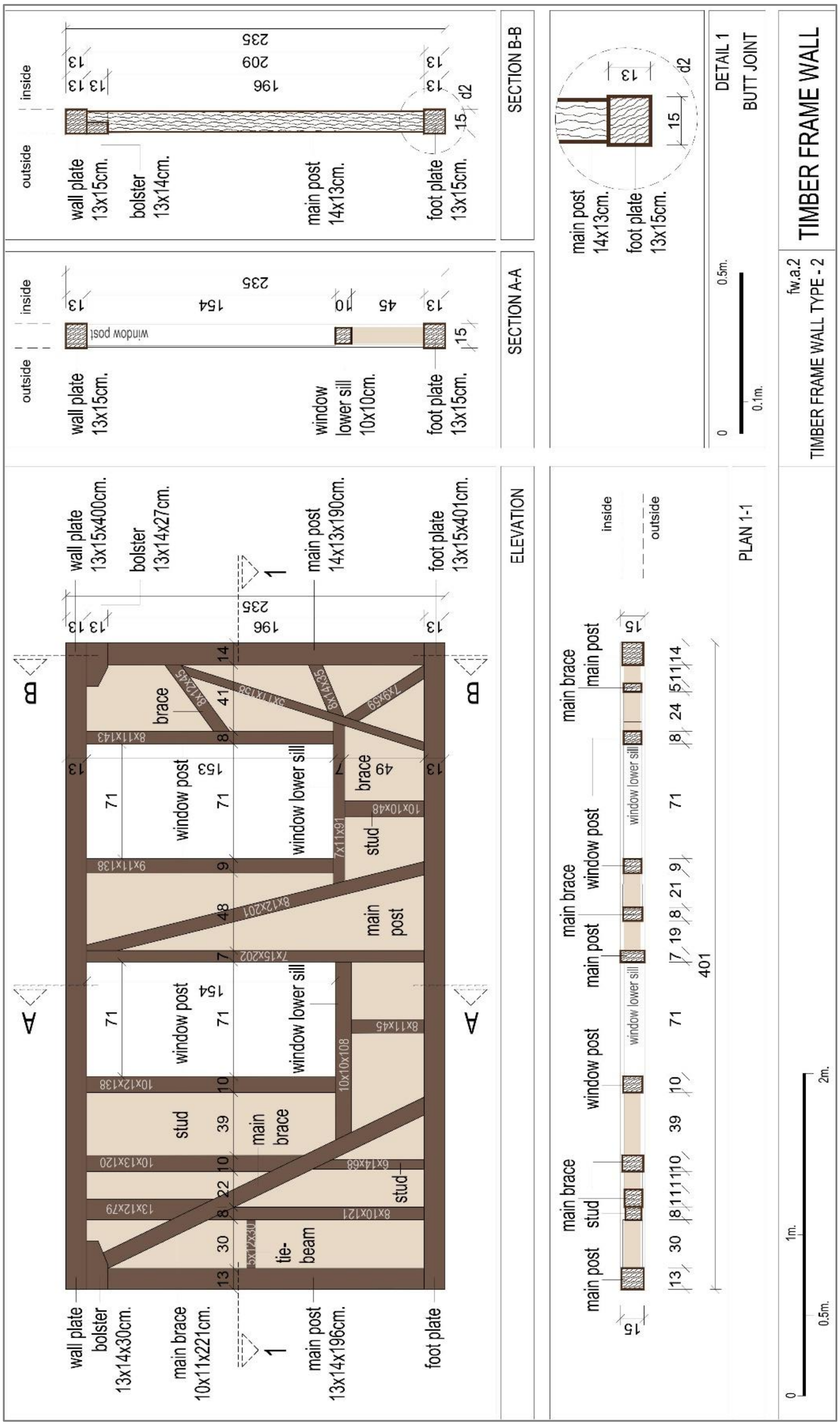


Figure 3.29. Detail of Timber Wall Type -2

Figure 3.30. Lap joint connection of main post and bolster – 2819-1-9

Figure 3.31. Connection of main post, bolster and wall plate 2819-6 front view (left), side view (right)

After the main frame of the timber frame wall is installed, vertical elements like window posts or doors posts, and horizontal elements like upper and lower window sills and upper door sills are placed within the frame, which determine the location and size of the window and door openings. Afterwards studs, tie-beams and braces are placed to prepare the frame for wall infill. These elements have square or rectangular cross-sections, with dimensions varying from 5*5 to 10*12 cm. When the partitioning of the frame is examined, it is seen that the floor height is divided horizontally into three or four parts, whereas the width is divided into five or six, depending on the distance of the two main posts. In some examples, it is seen that logs are used for the secondary elements of the timber frame (window posts, door posts, window sills, door sills, tie-beams, and studs), including the main braces. The main braces and other secondary elements are connected by nails. Lap joints are not observed in the studied examples.

It is observed that timber frame system is also used in the interior partition walls of the ground floor. The upper floors are also built with timber frame system, as part of the 'hımış' construction tradition. Masonry walls extending up to the roof level are also observed in the buildings. The continuation of walls to upper elevations as rubble stone masonry on the sides of the buildings adjacent to the neighbouring structures suggest fire precautions. The fireplaces, niches and cupboards in these masonry walls indicate that they are also used as service walls. While fire precaution walls became common in the 19th century, it is known that service walls extending up to the roof level are also used in hımış construction tradition (Şahin, 1995, Şahin Güçhan, 2017).

Timber frame skeleton, constructed with timber elements, is filled with materials such as mudbrick, brick, and stone. Especially in the interior partition walls, the timber frame skeleton is left unfilled and both sides are covered with wood laths, which is known as *bağdadi* technique. Another technique to cover the interior partition walls is the use of hazelnut or chestnut branches. These branches are knitted in opposite directions and fixed to the skeleton to form a vertical plane.

Figure 3.32. Bağdadi technique -2819-1-9 (above), 2805-1 (below)

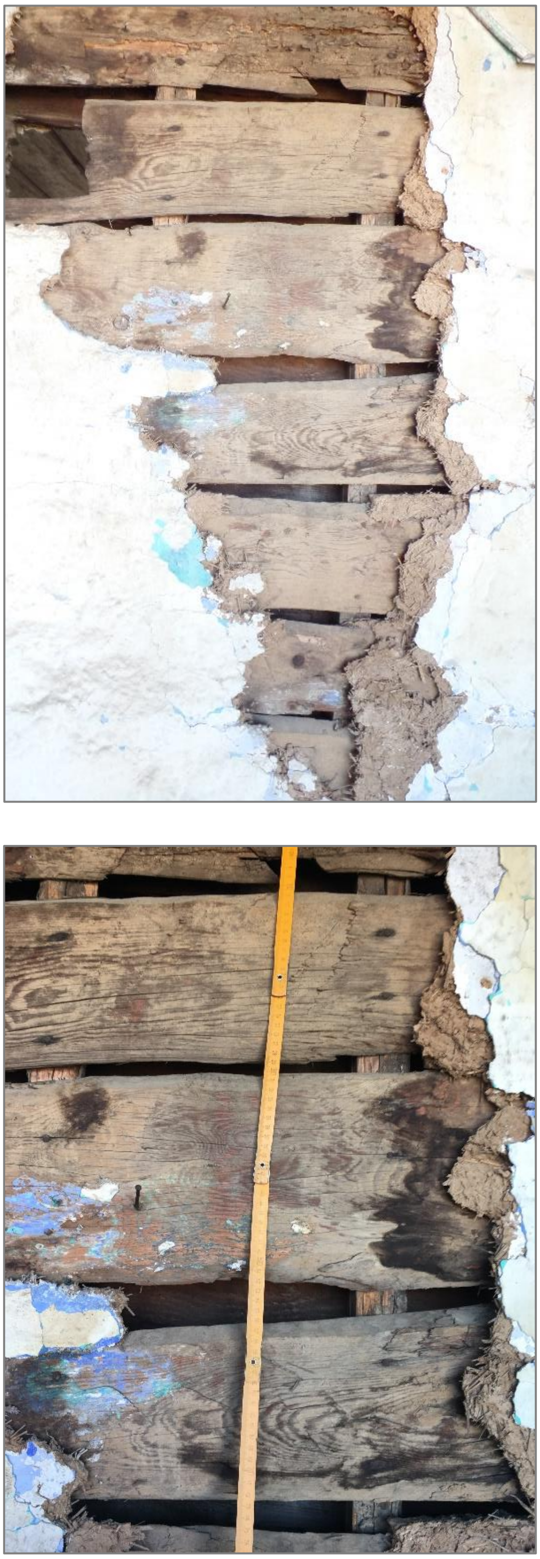


Figure 3.33. Timber planks covering of timber frame walls with no infill (2820-8-7)

In Cumalıkızık houses, timber frame system can be examined in four groups according to their construction techniques.

Group 1: Timber frame construction without infill (fw.b.1)

In timber frame walls without infill, the skeleton formed by horizontal, vertical and angled timber elements is not filled, and the wall is covered from both sides. It is generally preferred in the interior walls. This technique is seen in the wall of a room looking to the sofa, which has undergone an alteration during the onsite examination of the dismantled building. The covering, which is formed by placing thin and long wood laths from their ends on top of each other, is called *bağdadi* technique. While there are not any bracing behind the *bağdadi* in the examined building, the frame is formed by posts with 5*10 cm dimensions and placed at 45 cm intervals.

Apart from bağdadi, In one building (2820-8-7), it is seen that timber planks are used to cover the empty timber frame from both sides.

Group 2: Timber frame construction with mudbrick infill (fw.b.2)

In Cumalıkızık houses, mudbrick is mostly preferred as an infill material of the timber frame construction. Color and size differences are observed in mudbricks. One group of mudbricks is more yellow and contains more straws, whereas the other groups redder and contains less straws. According to the measurements taken onsite, most of the mudbricks have dimensions of 24*8 or 30*8 cm. It is stated the mudbricks are poured into mold, which are called frame molds (masa kalıbı in Turkish) and dried for 15-20 days in the meadow located in the upper part of the village (Deniz, 1991). Mud mortar is used as binding material between mudbricks. It can be said that the color of the mortar varies from yellow to red like mudbrick. When the pattern of the mudbrick infill is examined, there is not a certain order and mudbricks are rather placed horizontally, vertically or diagonally.

Figure 3.34. Timber frame construction with mudbrick infill– 2819-1-9 (left), 2800-31(right-above), 2819-6 (right-below)

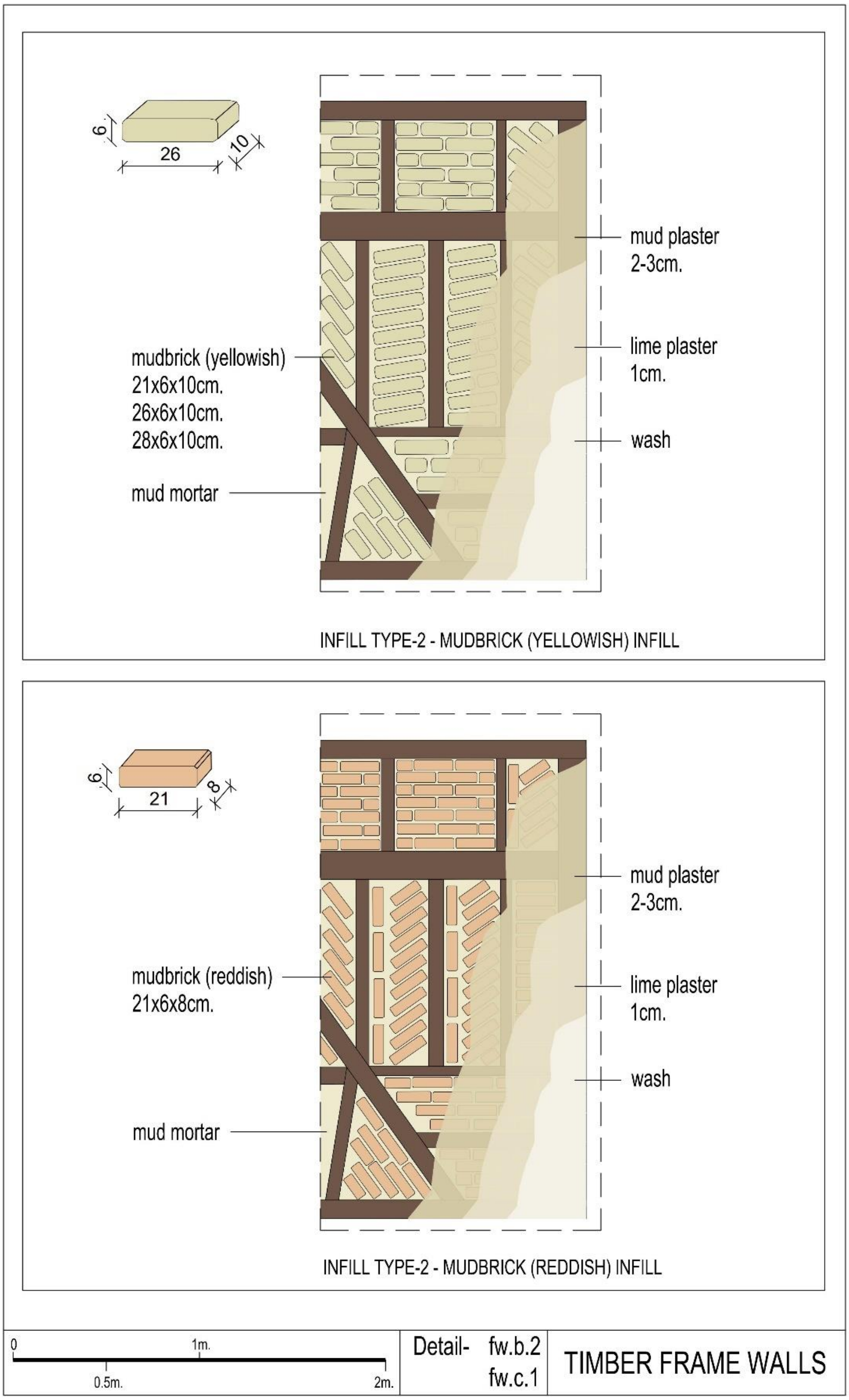


Figure 3.35. Detail of timber frame walls with mud brick infill

Group 3: Timber frame construction with brick infill (fw.b.3)

It is known that the production of brick is quite difficult compared to mudbrick (Şahin, 1995). The proliferation of the use of bricks in towns or privately-owned buildings dates to the second half of the 18th century and to the 19th century (Kafesçioğlu, 1955, Sahin Güçhan & Karakul, 2016). Therefore, the brick infill observed in Cumalıkızık is either from later period buildings or indicates later interventions.

In Cumalıkızık, brick infill used in timber frame construction has two types. In the first type, solid bricks with dimensions of 21*10*6 cm are used and they are randomly placed since the surface will completely be plastered. This type of infill is mostly seen in service buildings and in later interventions.

The second type of brick infill is encountered in the archival documents. In this type, bricks are placed in timber frame system with lime mortar to form various patterns, especially on the exterior facade since they are not plastered. Very thing bricks are used in this type with dimensions of 3*12, 3*15, and 3*25 cm. The bricks are not placed too frequently, and at least one brick thickness is left between them. Both of the buildings with this type of brick infill have undergone restoration and therefore their original brick infill has been lost.

Figure 3.36. Timber frame construction with brick infill – lot no: 2819-1-9

Figure 3.37. Brick decoration & infill in timber frame construction -lot no: 2794-42 (Source: above left: Neriman Şahin Güçhan Archive,1998, above right: Piray Architecture Archive, 2008) lot no: 2817-1 (below) (Source: Neriman Şahin Güçhan Archive, 1998)

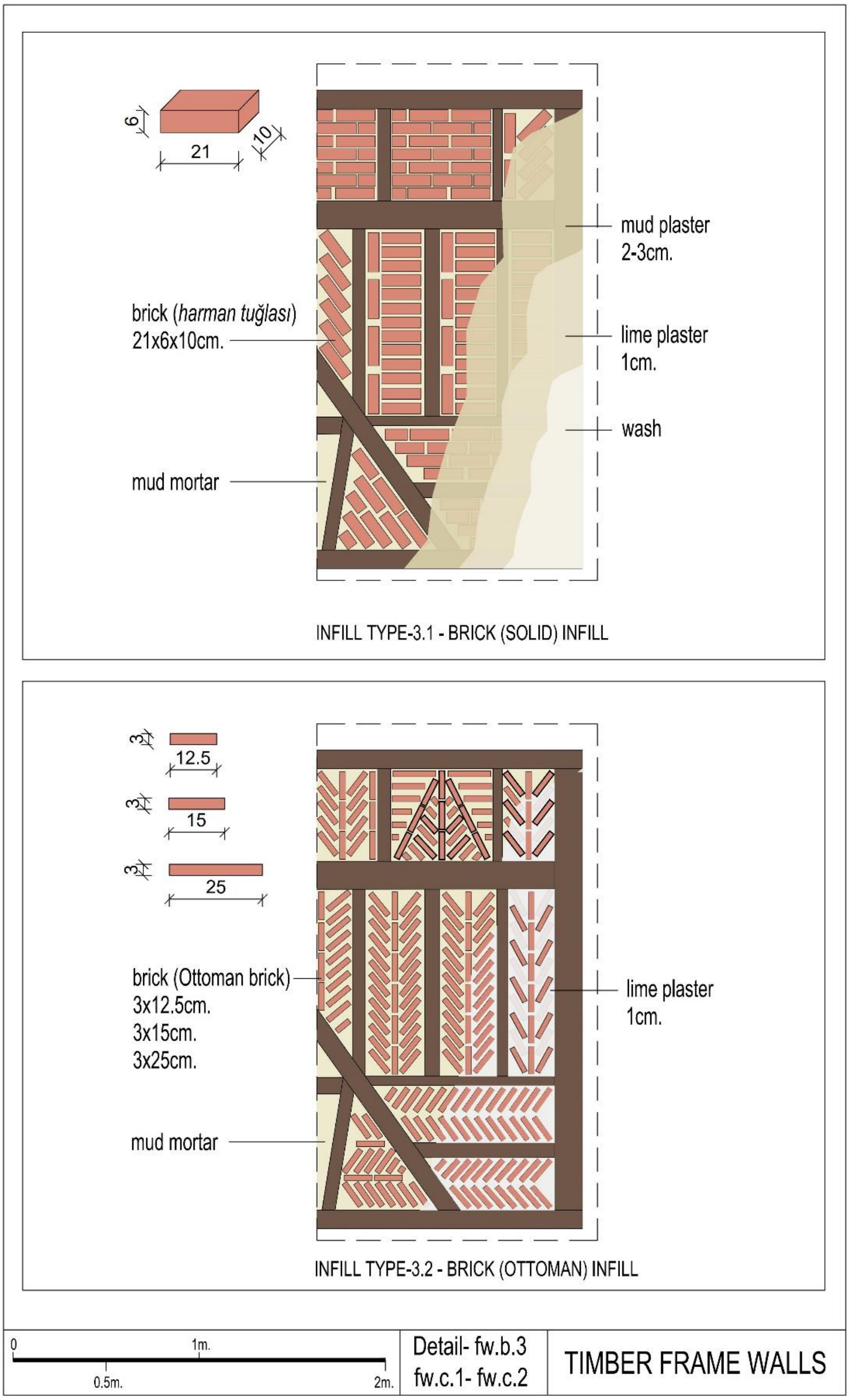


Figure 3.38. Detail of timber frame wall with brick infill

Group 4: Timber frame construction with wattled and daub technique (fw.b.4)

This type of infill is formed by vertically placing three pieces of branches with appropriate length in the center and two sides of the gaps in the skeleton, and then fixing the thinner branches to these three branches by wattling technique. These wattled branches are then filled with mud mortar both from the interior and exterior. The wattled branch technique, which is a very old technique, is used without filling in warehouse structure, where air flow is required, in the Black Sea region (Şahin Güçhan, 2017). It is generally preferred in simple structures like huts (Günay, 2002). While this technique is partially observed on one wall of a building in the village, it is learned from the villagers that it is also used in other buildings. Although Kafesçioğlu states that this technique is only used in the interior walls, it is observed in the settlement that it can also be used as an infill in the exterior facade of the timber frame skeleton (Kafesçioğlu, 1949).

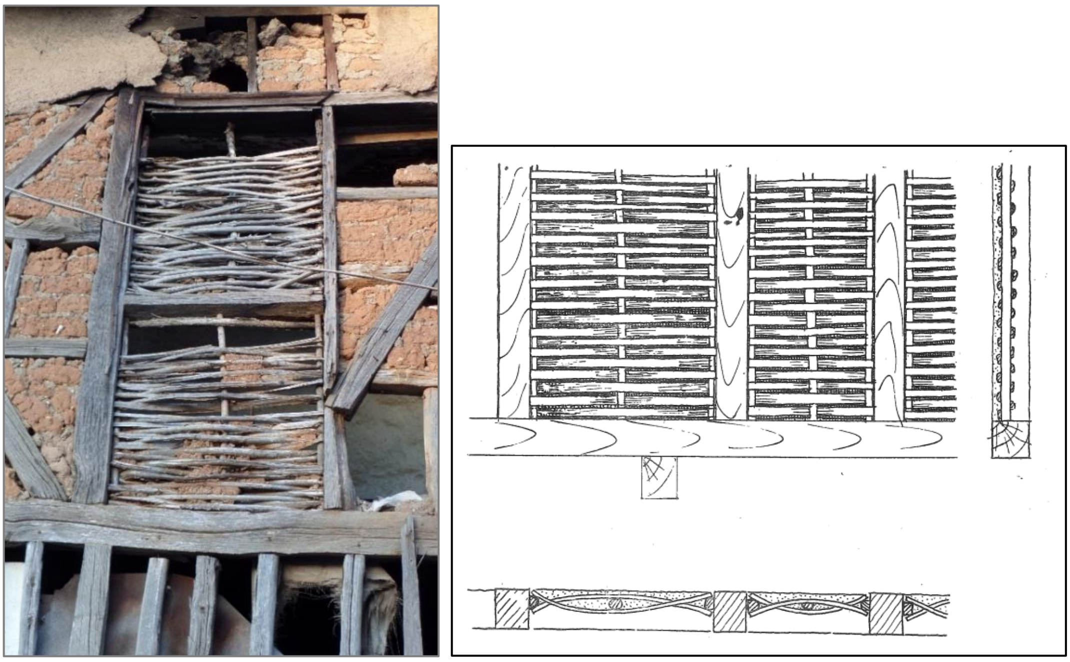


Figure 3.39. Infill with wattled chesnut or hazelnut posts – lot no: 2820 -8-7 (left), detail drawing of infill with posts and mud mortar (Source: Kafesçioğlu, 1955) (right)

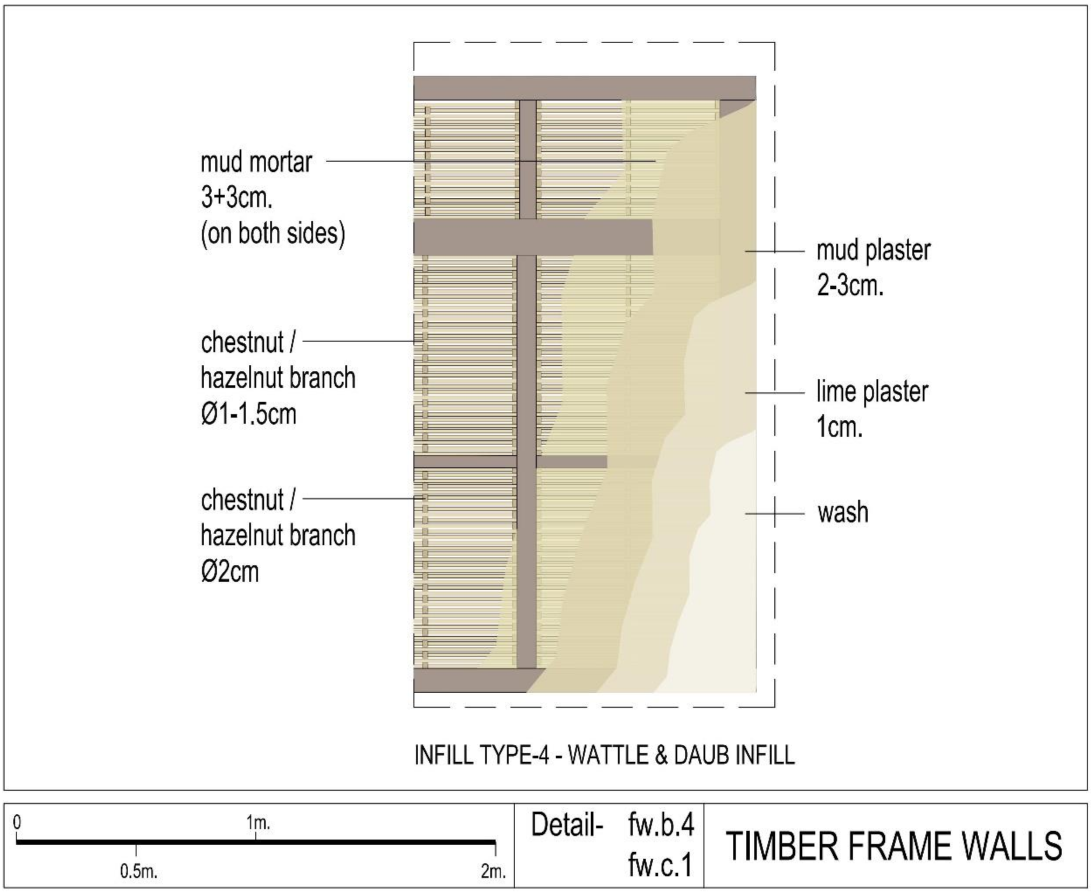


Figure 3.40. Detail of timber frame walls with wattle and daub infill

Timber frame walls in Cumalıkızık can be examined in three groups according to their finishing:

<u>Type A: Wall with mud plaster (fw.c.1)</u>

It is common practice to coat timber frame wall surface with mud plaster. The walls with brick infill without ornamentation, mud brick infill and formed by weaved branches technique are coated with mud plaster. Two types of plaster layers, which have a thickness of 2-3 cm, are observed.

In the first type of mud plaster, which is commonly encountered, there is no stratification. There are straw pieces that are visible in size, and the plaster is rougher. Wash is applied directly on this layer without smoothing out the plaster.

In the other type, mud plaster has been observed both on the interior and exterior facades during the onsite examination of the dismantled building (lot no: 2819-1-9). This plaster consists of two layers. At the bottom there is a rough mud plaster with straws, whereas at the top is a homogeneous and smooth fine plaster layer. Wash is applied on this smooth fine plaster layer.

Moreover, it is observed that wire laths are used on one facade of the dismantled house (2819-1-9). Wire laths are put along the facade to form horizonal lines and are fastened to the elements of the timber frame skeleton with nails. Wire laths have been observed in buildings since the end of the 19th century (Günay, 2002).

Figure 3.41. Rough mud plaster with lime wash (above) -2820-7-6 (left), -2800-31(right). Fine mud plaster with lime wash (below-left) – 2819-1-9. Wire under the plaster (below-right)– 2819-1-9

Type B: Only joints with lime plaster (fw.c.2)

Since brick is a water-resistant material, the brick infill walls with lime mortar can be used without plastering (Kafesçioğlu, 1955). However, in Cumalıkızık, it is seen that various patterns are made in walls with brick infill and mud mortar and then only joints are plastered with lime plaster. As it is mentioned above, various patterns such as herringbone or leaves are formed by the laying of bricks in Cumalıkızık. Bricks with a thickness of 3 cm are used in this type.

Type C: Covering timber frame system with *bağdadi* or timber planks (fw.c.3)

In the first group of timber frame wall construction technique, as mentioned above, both sides of the timber frame are covered horizontally with wood laths, which are 2.5-3 cm wide. 1cm gap is left between the wood laths. While these walls do not have infill, they are plastered with mud and lime plaster. Timber planks are also used in big sizes in order to cover the timber frame wall surfaces.

In Cumalıkızık, wide timber cladding boards are also used to cover the facades of open *sofas*, facing the street or the fascia walls. The cladding boards, placed either horizontally or vertically, are nailed to the outer face of the timber frame skeleton. Wood laths, which are placed vertically, are also used on the facades of the *sofa* facing the street along with the large cladding boards (See Fig.3.44, 3.45).

Figure 3.42. Bağdadi wall technique with mud plaster and lime plaster (2805-1)

Figure 3.43. Timber planks covering timber frame walls with no infill (2820-8-7)


Figure 3.44. Timber boards on facade -2812-1 (left), 2806-8 (right) (Source: Neriman Şahin Güçhan Archive, 1998)


Figure 3.45. Timber boards on facade -2819-3 (left) (Source: Piray Architecture Archive, 2008). Vertical timber laths on facade – 2819-5

3.4. Timber Posts

The solid mass, which faces the street, is composed of rubble stone masonry ground floor and timber frame upper floor with or without projection. This solid mass hides the open and semi-open spaces at the back, opening to the courtyard, as well as *hayat* and open *sofa*. The introverted Cumalıkızık houses appear lighter, spacious, and permeable from the courtyard, contrary to the heavy and solid appearance of the exterior. This contrast of the mass characteristics is due to the large semi-open spaces such as *hayat* and open *sofa*, facing the courtyard facade. This permeability of the semi-open spaces is formed by timber posts and timber frame system carrying the upper floor(s) and roof.

Figure 3.46. Timber post with stone base, bolster and braces. -2819-1-9

Timber posts are structural elements, and they transfer load from the roof and upper floors to the foundation and the ground. The timber posts, used in the *hayat* and open *sofa,* generally have square or square-like cross-sections and their dimensions vary between 10*10 cm and 20*20 cm. The dimensions of 15*15 cm and above are more common. The heights of the timber posts vary between 150 cm and 530 cm, depending on the height of the ground floor and the presence of a mezzanine floor. Braces are used when the height of the posts exceed 3.20 m. These braces are connected to the posts from their bottom and to the beams, carried by the posts, from their top. In some examples, small timber elements can used to connect the braces to the posts. In other examples, vertical timber elements with small cross-sections are also used, which go all the way down to the stone bases.

Almost all timber posts have bolsters. These bolsters are connected to the posts by 'lap joints' and wrought nails. These columns are called 'papaz başı' (priest's head in Turkish) in Cumalıkızık. The timber posts on the ground floor sit on stone bases. There are not any joints between posts and stone bases. The post sits on the stone base with the weight of the building. Some of the stone bases cannot be observed since they are currently underneath the screed poured on the original floor covering.

The posts have large cross-sections, and they do not have a smooth surface and have traces of adze, indicating that they are hand-cut elements, dating from an earlier period. Timber posts, with large cross sections and a length of 5.5 m are particularly noteworthy.

Figure 3.47. Stone base of timber post (left), bolster and girders on top of the post -2189-1-9

Figure 3.48. Auxiliary element in order to connect the brace or the beam to the timber post -2819-1-9

3.5. Roof Construction

It is seen that pitched roofs are used in Cumalıkızık houses. Although gable roof is more common due to the adjacent order of the urban pattern, hipped roofs are also used substantially.

Figure 3.49. Aerial view of Cumalıkızık houses (Source: Neriman Şahin Güçhan Archive, 1983)

On top of the wall plate, roof girders are placed, along the shorter side of the building and on the axis of the main post (approximately 2 m apart). These roof girders have square or rectangular cross-sections and their dimensions range from 10*10 cm to 15*15 cm. While the roof girders with large cross-sections are rough-cut and dark colored, the ones with cross-sections of 10*10 cm are fine-cut and light-colored. The roof girders with large cross-sections indicate an earlier period building (Şahin Güçhan, 2017). It is also observed that the elements previously used elsewhere in both the timber-frame wall and roof construction are reused in the roof. Roof girders, generally projecting 50-90 cm from the walls, also determine the width of the eaves.

The main post, placed in the middle of the roof girder, has a square cross-section with dimensions of 10*10, 12*12, and rarely 14*14 cm. The middle post is connected to the roof girder in two ways. In some connections lap joints and nails are used between the post and the girder, whereas only nails are used in others. The upper points of the posts are notched in two directions.

Figure 3.50. Roof girders, following the axis of main post and brace -2812-1 (Source: Neriman Şahin Güçhan Archive, 1998)

Figure 3.51. Roof girder and main post connection detail -2798-18 (left), -2819-1-9 (right)

Unlike contemporary rafters, the rafters used in Cumalıkızık are parts of the main load-bearing frame and have thick cross sections. While they are connected to the posts from their top, they are connected to the roof girders from their bottom, completing the frame. The rafters, which are generally rectangular, have cross-section of approximately 10*15 cm. The rafter and the roof girder are either connected with nails only, or the rafter sits on the notching on the purlin and nailed. The rafters end 25-30 cm behind the end point of the roof girder. Thus, the first purlin is placed on top of the roof girder, at its end. Subsequent purlins are lined up along the rafter at 40-50 cm intervals. The ridge purlin is placed on top of the post.

Figure 3.52. Connection detail of post and rafters -2800-22 (left), 2819-6 (right)

Figure 3.53. Roof girder, post and rafters create main frame of roof construction -2819-6

The purlins have square cross-sections with dimensions ranging between 6*6 and 10*10 cm. The purlins, continuing from the roof girder to the top of the post, not only connect the rafters but also prepare a surface for the roof boards.

If the roof is pitched roof, the angle rafter extends from the roof girder at the end to the king post in the corner. This angle rafter is fixed on top of the level where posts and rafters meet. Thus, the purlins fixed on rafters, the angle rafter and the ridge purlin follow the same surface so that the roof boards are easily laid on this surface.

Figure 3.54. Roof skeleton – 2812-1 (Source: Neriman Şahin Güçhan Archive, 1998)

Figure 3.55. Angle rafter is placed on the king post and rafters -2819-1-9

Since roof boards are placed on top of the purlins, they are not laid horizontally as is most common, but vertically. The roof boards end with the last purlin. A horizontal timber board or a thin branch piece is placed in between the end point of the roof board and the tiles.

Over and under tiles are used as roof covering. The tiles exceed purlins approximately 10 cm. In Cumalıkızık houses, timber fascia boards or gutters are not used. A decorated timber fascia board is only observed in one house (2800-31). The ornamentation of the fascia board resembles dovetail, which is a very common motif in Cumalıkızık.

Figure 3.56. Roof girder, rafter, purlins, roof boards and tiles -2819-6

Figure 3.57. Decorated fascia board -2800-31

In Cumalıkızık houses, the roof girders are not put in frequent intervals. Therefore, the use of ceiling girders becomes a necessity for rooms with ceiling coverings. Ceiling girders, placed underneath the roof girders to carry ceiling coverings, have the dimensions of 5*5, 5*6, and 5*7cm in examined buildings.

Figure 3.58. Roof construction -2819-1-9

Figure 3.59. Ceiling girders under roof girders – 2819-1-9

3.6. Horizontal and Vertical Connections

Transition from foundation to ground floor (G0)

In traditional Cumalıkızık houses, continuous and discontinuous foundation types are used together. While rubble stone masonry walls have continuous foundation, main timber posts have discontinuous foundation. In this section, transition from foundation to ground floor is examined individually.

<u>Detail- G0.1 - Transition from masonry to masonry</u>

As it is mentioned before, the most reliable information regarding foundation construction was gathered from the foundation excavations of a ruined building within the scope of its reconstruction. The connection between foundation and ground floor wall was also investigated for the other buildings in the settlement. According to these observations, it can be said that stone masonry wall of the ground floor gets thicker at the foundation level and extends deeper to the rock level.

Like the ground floor wall, when the foundation is built by rubble stone masonry technique, there is no difference in the stone courses except for the wall thickness. Nevertheless, the shaped monolithic stones (35*110*35cm, 60*100*60cm, 90*60*110cm. in dimension) and the rock as a part of earth (180*100*70cm. in dimension) that are observed during the foundation excavation of the building (2812-8-9) indicates that both of them are also used in the foundation construction.

The rocks similar to the ones used at the foundation level are seen in the stone course of the ground floor wall. This gives an idea about the connection between the rock and the rubble stone wall. The natural rocks and the course of rubble stone masonry wall are incorporated by the help of small rubble stones.

The connection between the well-shaped monolithic stones (thought to be spolia) utilized in the foundation construction and rubble stone masonry wall could not be seen in the settlement. However, large monolithic stones are thought to be used under the rubble stones and just above the solid ground to obtain a homogeneous base with a wide surface.

Figure 3.60. Section showing foundation and ground floor

Figure 3.61. Relation of rock and foundation or ground floor wall

Figure 3.62. Shaped stone blocks removed from foundation level of a building

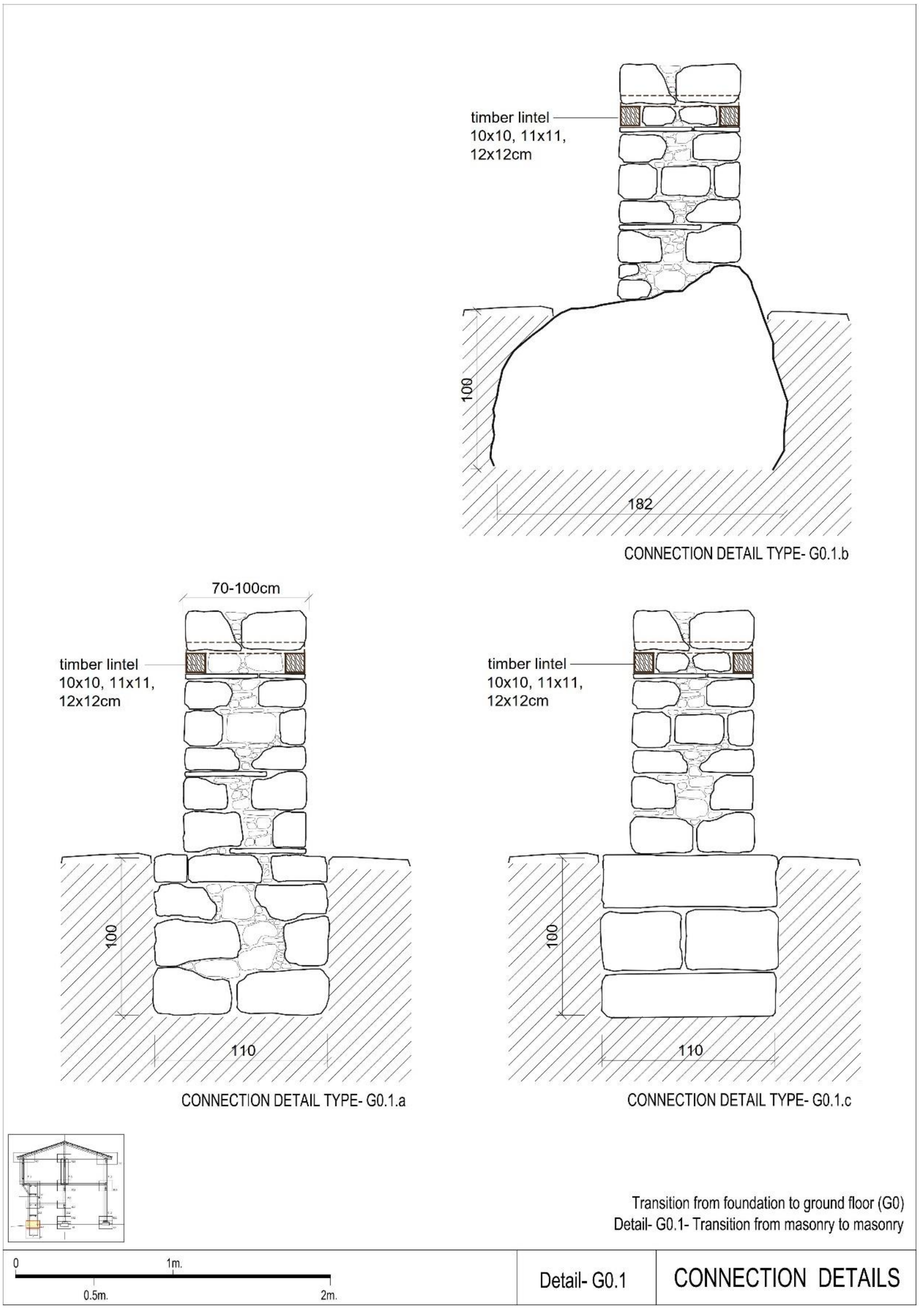


Figure 3.63. Detail of G0.1

Detail- G0.2 - Transition from masonry to timber post

The main timber posts carrying the load of upper timber frame floor(s) sit on stone bases in the courtyard. The base, functioning as discontinuous foundation, is composed of one or several stone blocks with a smooth surface. The height of the base differs according to the slope of the ground or the length of the post, ranging between 20cm. and 60cm. In this way, timber posts are protected from water and moisture. There are not any connection details between the timber post and the base. Timber post sits on the stone base by the weight of the upper structure.

Figure 3.64. Timber post and stone base 2805-1(left), 2819-1-9 (right)

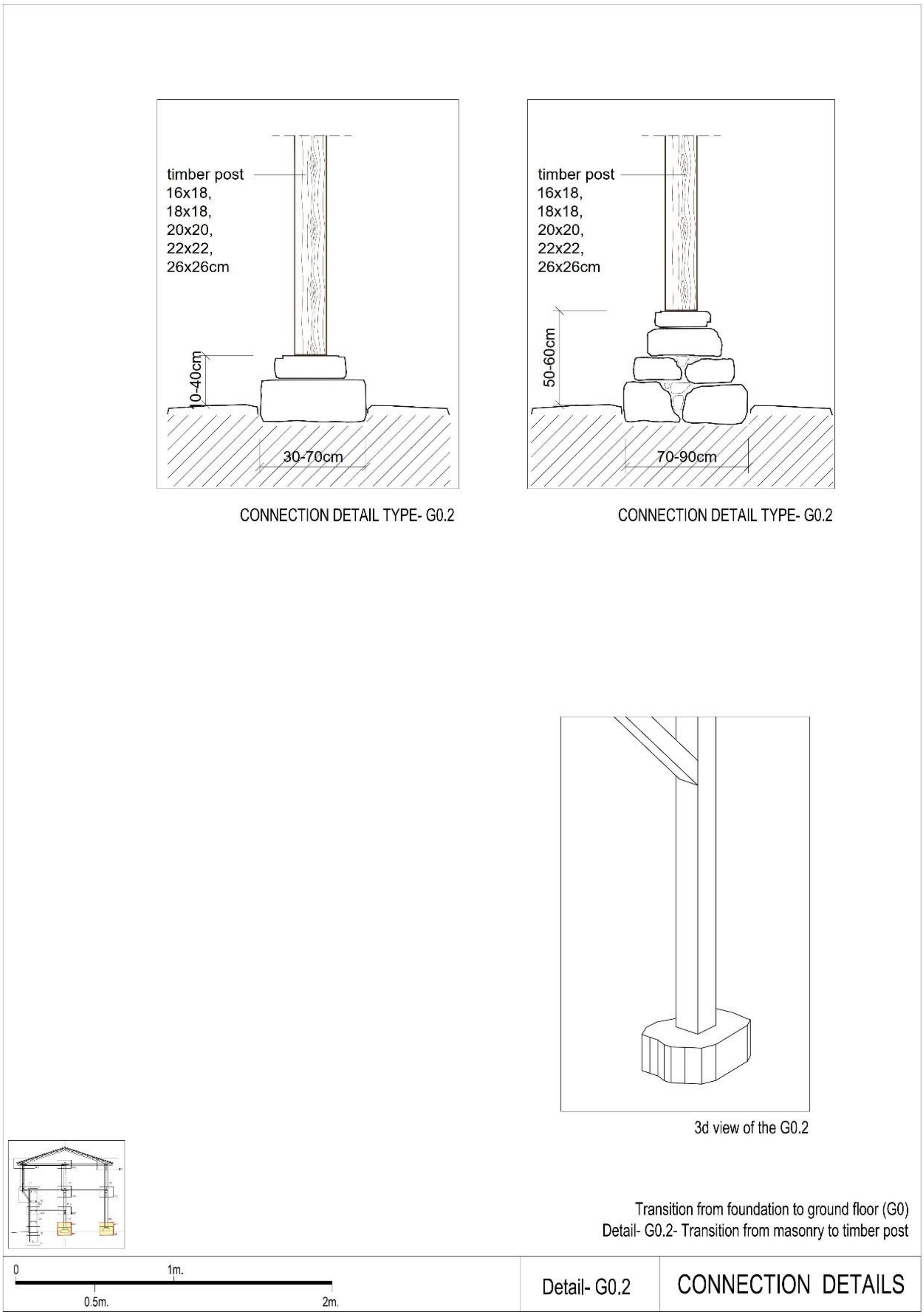


Figure 3.65. Detail of G0.2

Transition from ground floor to mezzanine floor (M0)

In traditional Cumalıkızık houses, rubble stone masonry wall continues up to the first floor. Main timber posts, which carry the upper timber frame floor, are once-piece, continuing up to the first floor. In the buildings, ground floor height of which is above 3m., frequent use of mezzanine floor is observed. Two different details are used at two distinct points in the transition from ground floor to mezzanine floor. One of them is the detail of M0.1, which is the connection of rubble stone masonry wall and the mezzanine floor construction. Other one is the detail of M0.2, which is the connection of mezzanine floor construction and the main timber post in the courtyard.

Detail- M0.1 - Transition from masonry to masonry

The rubble stone masonry wall, which continues up to the first floor with rhythmic rows of timber lintels, creates a connection detail at the point where it meets the mezzanine floor construction. According to the direction of the floor girders, two different details are used.

If the floor girders extend perpendicular to the stone wall, the floor girders siting on the timber lintel in the stone masonry wall either move along the wall thickness and act as tie-beams or end up within wall thickness.

If the floor girders are in the same direction with the stone masonry wall, the main girder carrying the floor girders is inserted into the wall. The main girders, which have larger cross-sections than the floor girders, have a spot connection with the stone masonry wall. The main girder sits either on the row of timber lintel or on a separate timber lintel.

The course of rubble stone masonry wall continues upwards after the main girders or floor girders are inserted. The same connection detail is also seen at the point where floor construction integrates with the stone masonry wall extending to the roof.

Figure 3.66. Floor girders of mezzanine floors extending perpendicular to the stone wall

Figure 3.67. Floor girders of mezzanine floors extending parallel to the stone wall

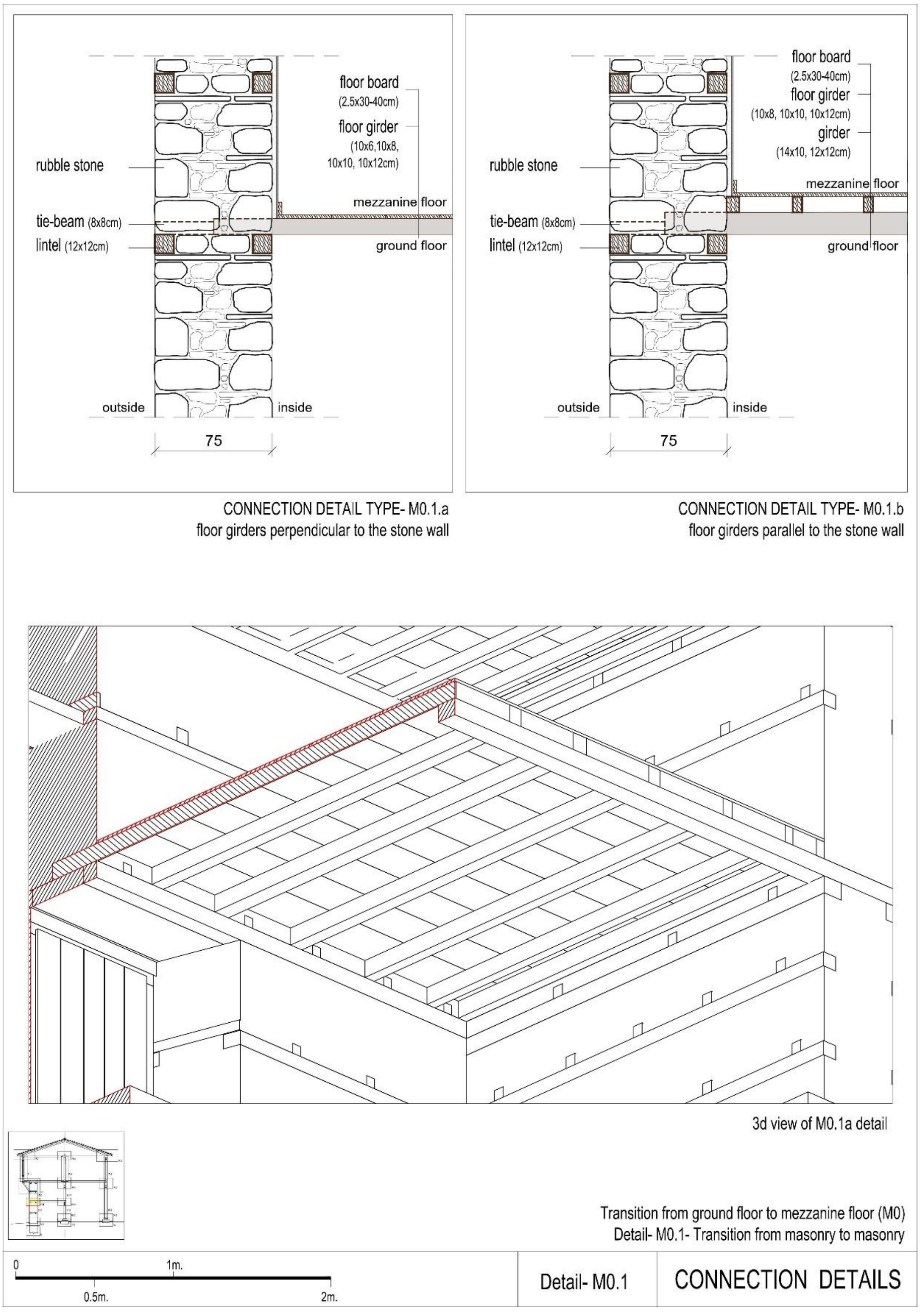


Figure 3.68. Detail M0.1

Detail- M0.2 - Transition from timber frame system to timber frame system

While one side of the mezzanine floor construction is placed on the stone masonry wall as mentioned above in Detail- M0.1 section, other side is connected to the main timber posts by auxiliary timber elements. The auxiliary timber elements are attached to the main posts and main girders of the mezzanine floor construction sit on these auxiliary elements. Floor girders are placed on the main girders. These auxiliary connection elements not only support the main girders but also floor girders.

It is observed that the mezzanine floor, which is often used as a *kat* for storage purposes, functions as a winter floor. When it is used for storage purposes, the floor opens to *hayat* or courtyard by gallery. When the mezzanine floor is used as a living space, it is divided by timber frame walls.

Figure 3.69. Mezzanine floor girders in 2805-1

Figure 3.70. M0.2 connection detail

Figure 3.71. M0.2 connection detail

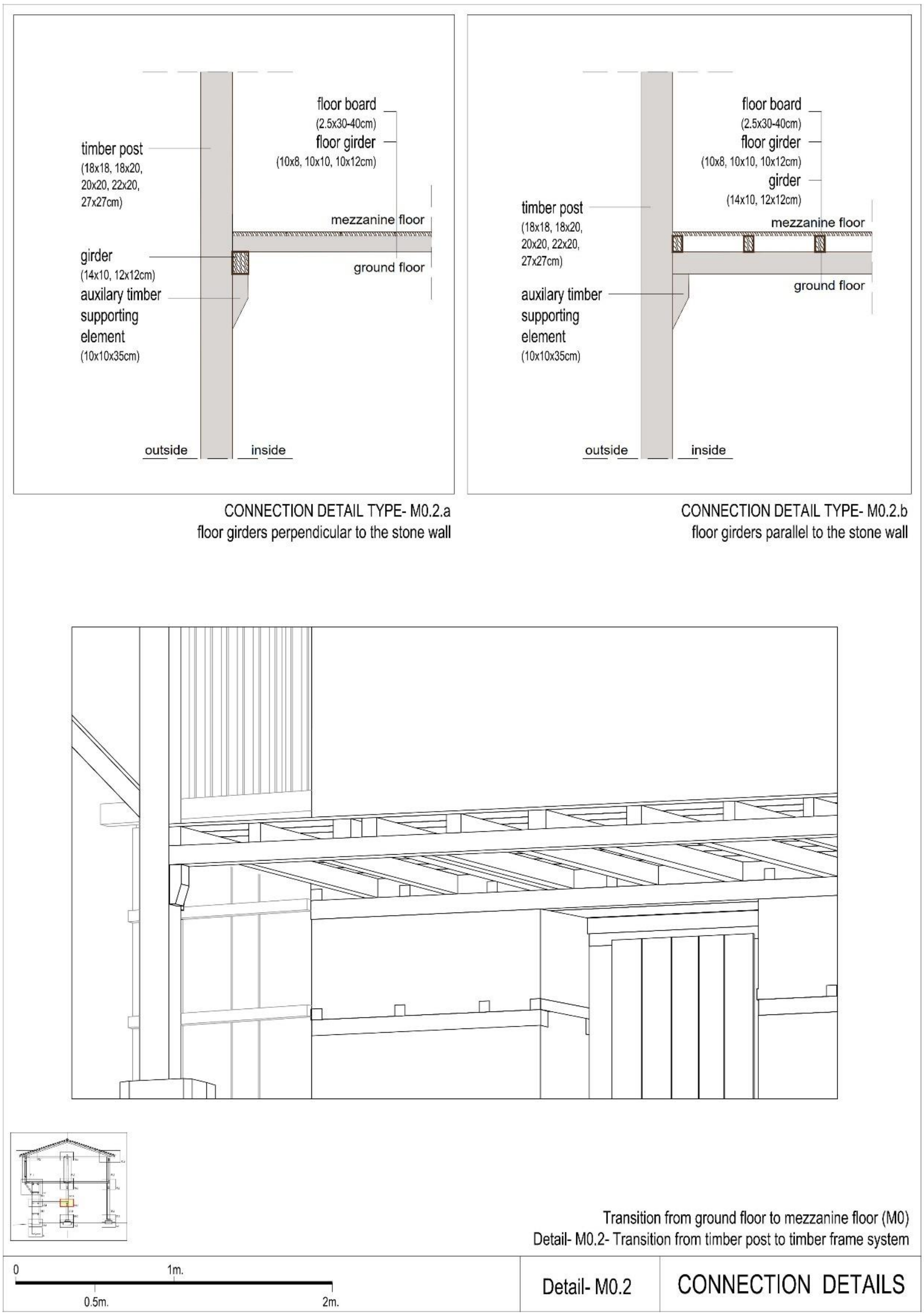


Figure 3.72. Detail M0.2

Transition from ground/mezzanine floor to first floor (F0)

In transition from the ground or mezzanine floor to the first floor, three different connection details are used at three separate points. The F0.1 detail is on the street facade; the F0.2 detail is on the courtyard facade and the F0.3 detail is used on the middle axis, separating the rooms and the main hall / *sofa*.

Detail- F0.1 - Transition from masonry to timber frame system

First floor that is placed on rubble stone masonry wall and timber posts is constructed by timber frame system. The connection detail between the rubble stone masonry wall and timber frame floor are made in two different ways, depending on the direction of the floor girders.

Detail- F0.1.a

The floor girders extending perpendicular to the stone wall sit on the timber lintel in stone masonry wall. Foot plate is placed on the floor girders, in the opposite direction. Timber posts, braces and secondary frame elements of the timber frame sit on the foot plate. The main post and the foot plate are connected by lap joints. (See Fig.3.xx)

Detail- F0.1.b

If the floor girders extend parallel to the stone wall, main girders carrying the floor girders are placed on the timber lintels in stone masonry wall. Floor girders are fixed on the main girders at 40-50cm. intervals. Main post sits on the foot plate, which is placed on the floor girders in the opposite direction. (See Fig.3.xx)

If the first-floor wall is in the same direction with floor girders, brace and the wall infill are put directly on the floor girder. If it is perpendicular to the floor girders, brace and infill of the wall sit on the foot plate.

In traditional Cumalıkızık house, timber frame upper floor projects over the stone masonry ground floor. The projections seen in different parts of the facade with different forms are created mainly by extending the floor girders towards the street. If the floor girders are parallel to the stone masonry wall, the main girders carrying the floor girders project. Floor girders sit on the main girders. If the span of projection is less, supporting elements like braces are not used. Braces are used when the span is wide. The braces are attached either to the first or second row of timber lintels on the stone masonry wall, depending on the width of the span. If the floor girders of projection extend perpendicular to the stone wall, the brace is connected either directly to the floor girders or to the horizontal timber element, placed under the floor girders in opposite direction. If the projection is created by projecting main girders instead of floor girders, the brace is connected to the bottom part of the main girder. The buildings from later periods in the settlements have braces covered by either profiled planks and wood laths.

In the transition from stone masonry ground floor to timber frame upper floor, elevated floor construction / *seki* is seen in the *eyvan* space facing the street.

Figure 3.73. Main timber girders sitting on timber lintels on stone masonry wall (2819-1-9)

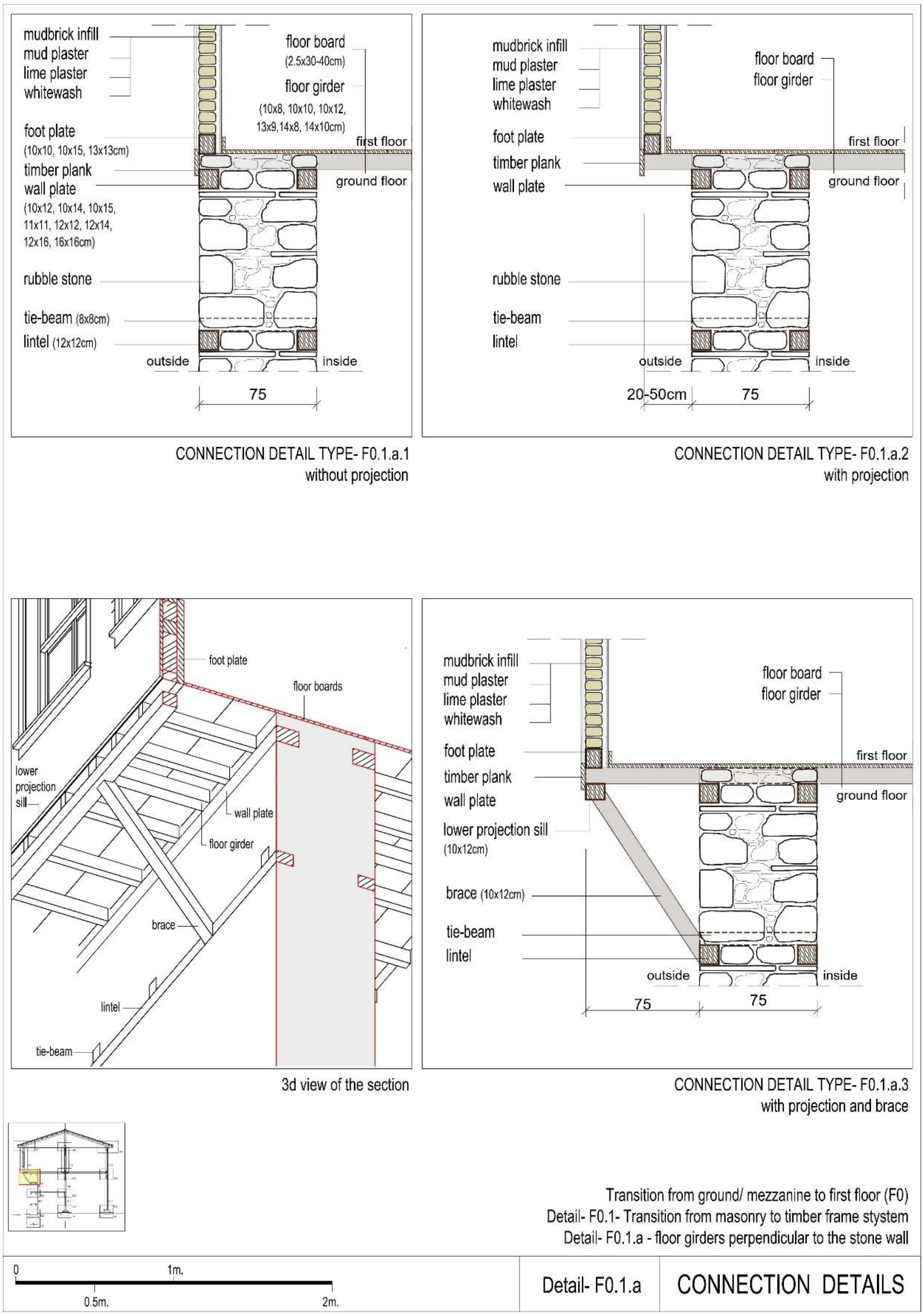


Figure 3.74. Detail F0.1a

Figure 3.75. Stone masonry wall and timber floor connection

Figure 3.76. Stone masonry wall and timber floor connection

Figure 3.77. Stone masonry wall and timber floor connection

Figure 3.78. Different connection details of timber braces - 2799-1-2 (left), 2819-8 (right)

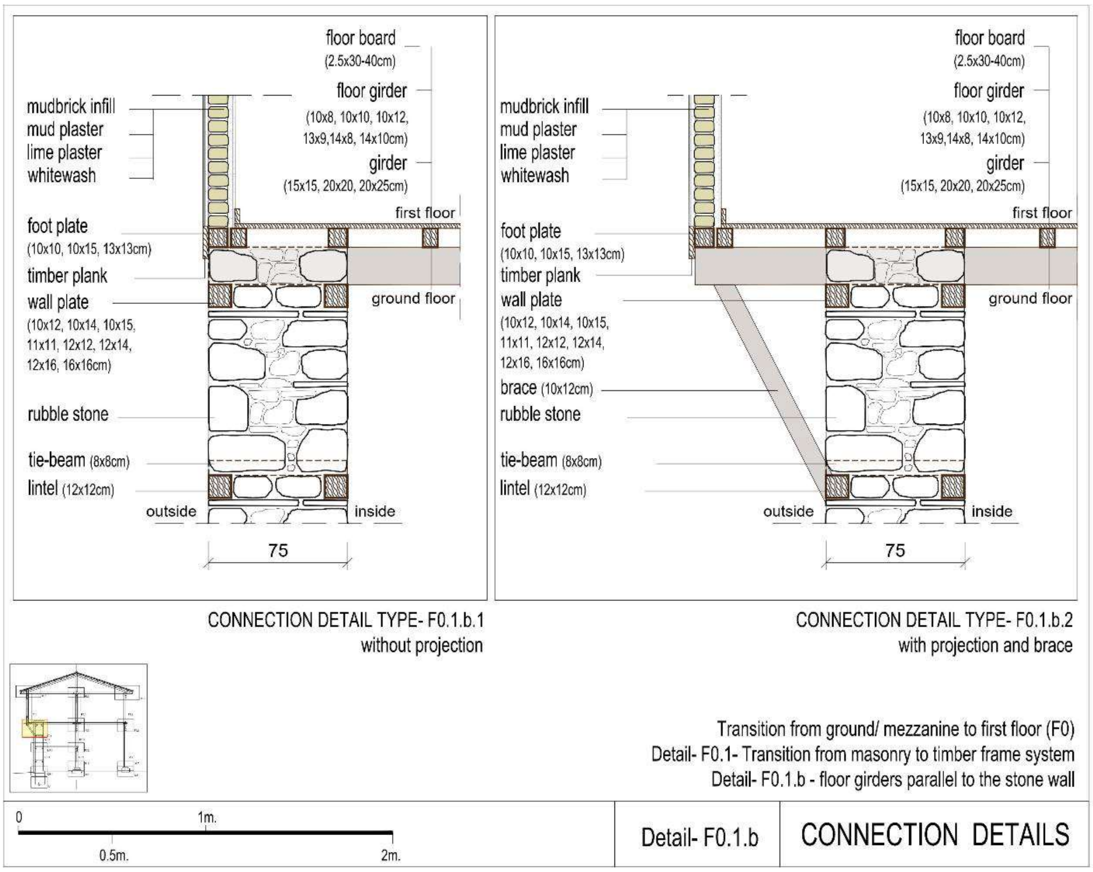


Figure 3.79. Detail F0.1b

Figure 3.80. Floor girders of first floor extending parallel to the stone wall- 2800-34 (left), 2800-38 (right)

Figure 3.81. Main timber girders sitting on partial timber lintels on stone masonry wall (2794-27)
(Source: Piray Architecture-2008)

Detail- F0.2 - Transition from timber frame system to timber frame system

The connection between the ground floor and first floor has a different detail on courtyard facade. The main post, which has a cross section of 20x20cm, sits on the stone base and extends up to the first floor as a single piece. There are timber bolsters on the main post, which are connected by lap joints. The main timber girder with a cross section of 15*20cm – 20x20cm is placed above the bolster in the same direction. On this main girder floor girders with cross sections of 8x12cm, 7x11cm are placed in the opposite direction at intervals of 30-40cm. Foot plate is put on the floor girders, in the opposite direction. The timber post of the first floor, with a cross-section of 15x15cm is placed on the foot plate in the axis of the main timber post of the ground floor. The main post is connected generally by lap joint. The main timber posts and girders are supported by braces in the buildings with the ground floor heights above 3m.

Figure 3.82. F0.2 detail (2800-31)

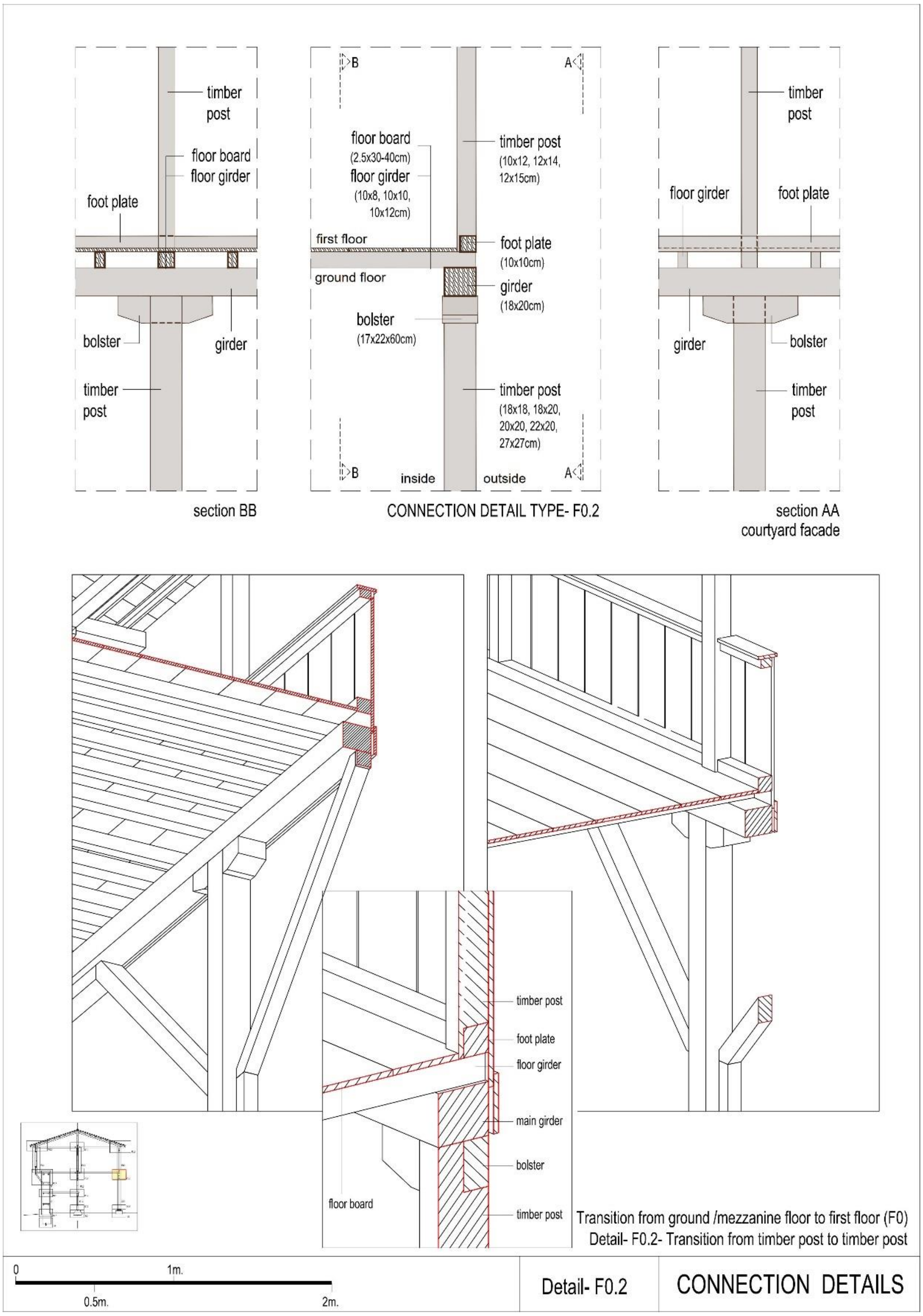


Figure 3.83. Detail F0.2

Figure 3.84. Timber post and floor connection (2819-1-9)

Figure 3.85. Timber post and floor connection (2819-1-9)

Figure 3.86. Timber post and floor connection (2820-8-7)

Figure 3.87. Timber post and floor connection (2819-6)

Detail- F0.3 (Transition from timber frame system to timber frame system)

The third connection detail between the ground floor and first floor is the connection of two different walls in separate directions and the floor construction on the middle axis. The relationship between the timber frame wall separating the rooms and the main hall / *sofa*, timber floor construction and the main timber post and girder of the ground floor is coded as F0.3.a. The relationship between the timber frame wall separating the rooms, timber floor construction and the main timber post and girder of the ground floor is coded as F0.3.b. As it is mentioned before, the wall in the same direction with the floor girders is placed on the floor girder, the wall in the opposite direction with the floor girders is placed on the foot plate which is placed in the opposite direction above the floor girders. If the wall sits on the floor girder, one more floor girder is placed on both sides of the floor girder in order to fix the floorboards.

Figure 3.88. F0.3 detail- 2800-24

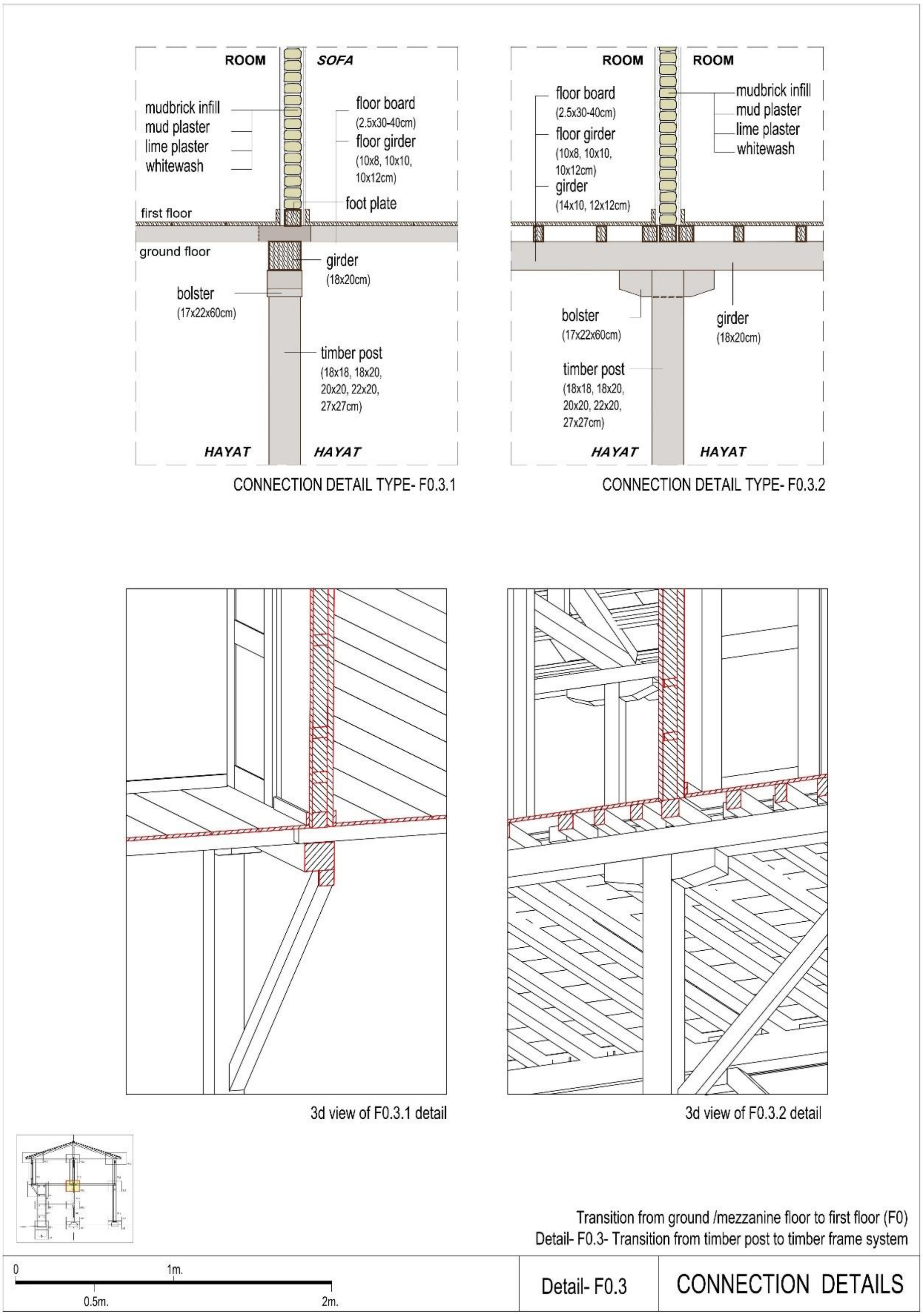


Figure 3.89. Detail of F03

Figure 3.90. F03.1(left) , F03.2 (right)

Figure 3.91. F03.1(left) , F03.2 (right)

Transition from first/second floor to roof (R0)

The connection detail between the first/ second floor and the roof is examined at three points. The first detail R0.1 is on the street facade, which is the connection detail between the timber frame wall, ceiling construction and roof. The second detail R0.2 is on the courtyard facade, which is the transition between the timber post and roof. The third detail R0.3 is on the middle axis, which separates the rooms and the main hall, which is the connection detail between the timber frame wall, ceiling construction and roof.

Detail- R0.1

On the street facade, two different details are observed in the connection between the upper floor timber frame wall and the roof.

Detail- R0.1a

The detail of R0.1.a is frequently used in traditional Cumalıkızık houses. Roof girders, which extend perpendicular to the wall, are placed on the bolsters of the main posts of the timber frame wall. The main rafters, top points of which are fixed to the roof post, are placed on the roof girders, which also determine the width of the eaves.

The rafters are located 20-30cm. behind the end point of the roof girder. The connection of the roof girder and the rafter is formed either by cutting the end of the rafter according to the surface of the roof girder or by indenting the roof girder according to the end of the rafter. While the first purlin is placed at the end of the roof girder, the remaining purlins are fixed on the rafter at an interval of 40-50cm. The roof boards, on the other hand, are placed on the purlins in the opposite direction. While the purlin ends in line with the roof board, the over and under roof tiles project 8-10cm outside the line of roof boards. At the end of the eaves, a piece of branch or timber plank is placed in the opposite direction with the roof boards between the roof boards and the roof tiles. In Cumalıkızık, wide eaves are used and usually they are not covered. The roof girders, which are usually placed on the axis of main post, are also placed on the intermediate axis in some buildings. The space between the wall plate and roof board is filled with wall infill.

Detail- R0.1b

The roof girder is not used in the detail of R0.1.b, which is seen in very few buildings (2800-38). The main rafters are fixed to the wall plate of the timber frame wall and extend towards the street. Purlins are put on the rafters. Roof boards are placed on the purlins. Over and under roof tiles are placed on the roof boards.

Another factor affecting the connection detail of wall, floor and roof on the street facade is the ceiling construction. In Cumalıkızık, ceiling covering is only used in the rooms. It mostly consists of ceiling boards and moldings. In one of the studied buildings, wattle and daub technique is used in the ceiling construction.

Figure 3.92. R01.a

Figure 3.93. R01.b (2800-38)

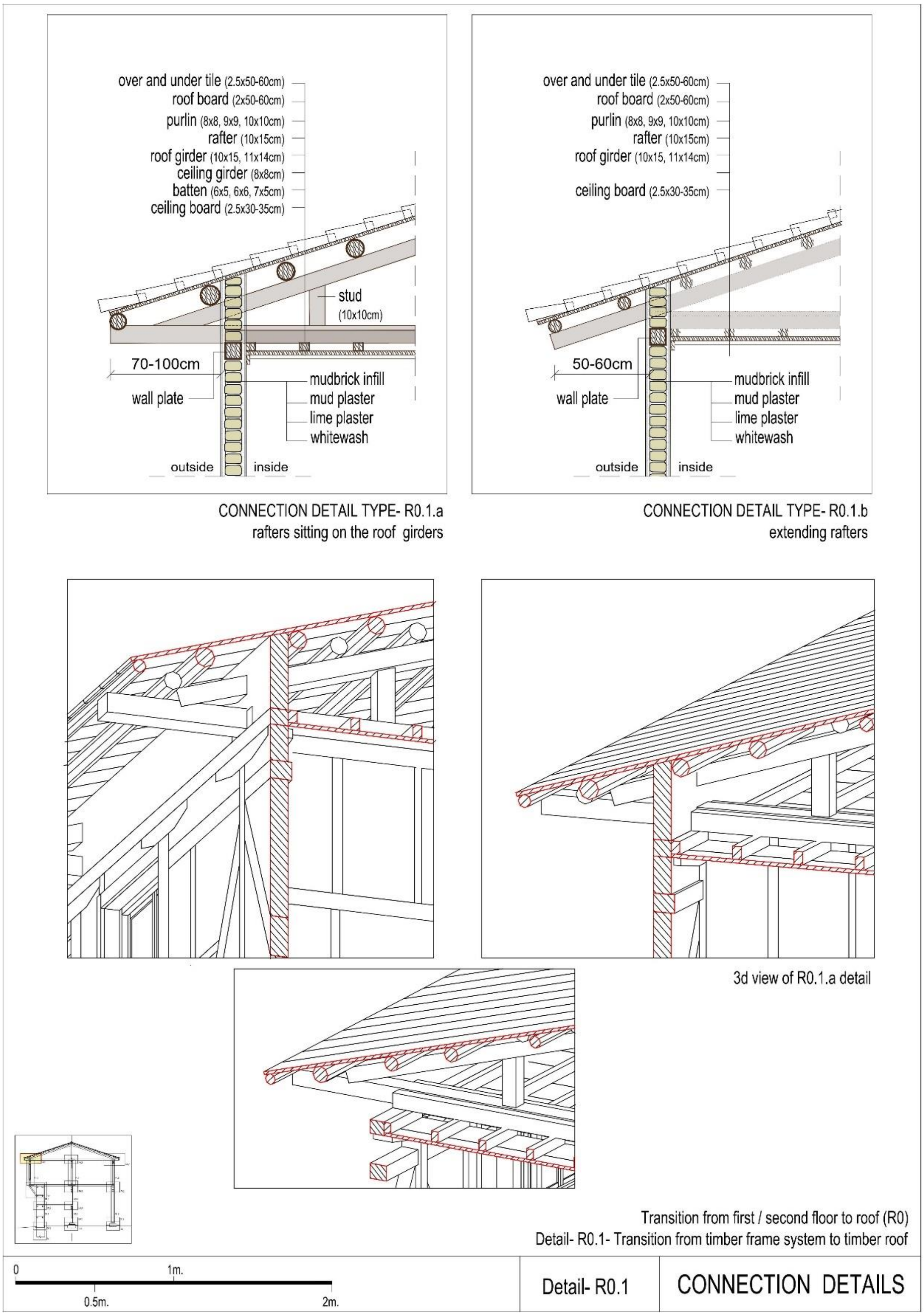


Figure 3.94. Detail of R0.1

Detail- R0.1.1

In this type, ceiling covering is composed of ceiling boards and moldings. Ceiling girders are placed on both sides of the roof girders, extending towards the street. They sit on the wall plate of the timber frame wall. Timber battens are fasted to the ceiling girders from the bottom in the opposite direction. Ceiling boards are nailed to the battens in the opposite direction. Geometric patterns are created with the help of the moldings used to fill the gaps between the ceiling boards. Plain ceiling covering is used more frequently.

Figure 3.95. R01.1

Figure 3.96. R01.1

Detail- R0.1.2

In one building, plaster is used as ceiling covering. Ceiling construction is composed of chestnut or hazelnut branches that are connected by wattle technique between the timber battens. These wattled chestnut or hazelnut branches are plastered from the bottom by mud mortar and lime mortar.

Figure 3.97. R01.2_2820-8-7

Figure 3.98. R01.2_2820-8-7

Figure 3.99. Plastered branches on the ceiling (2820-8-7)

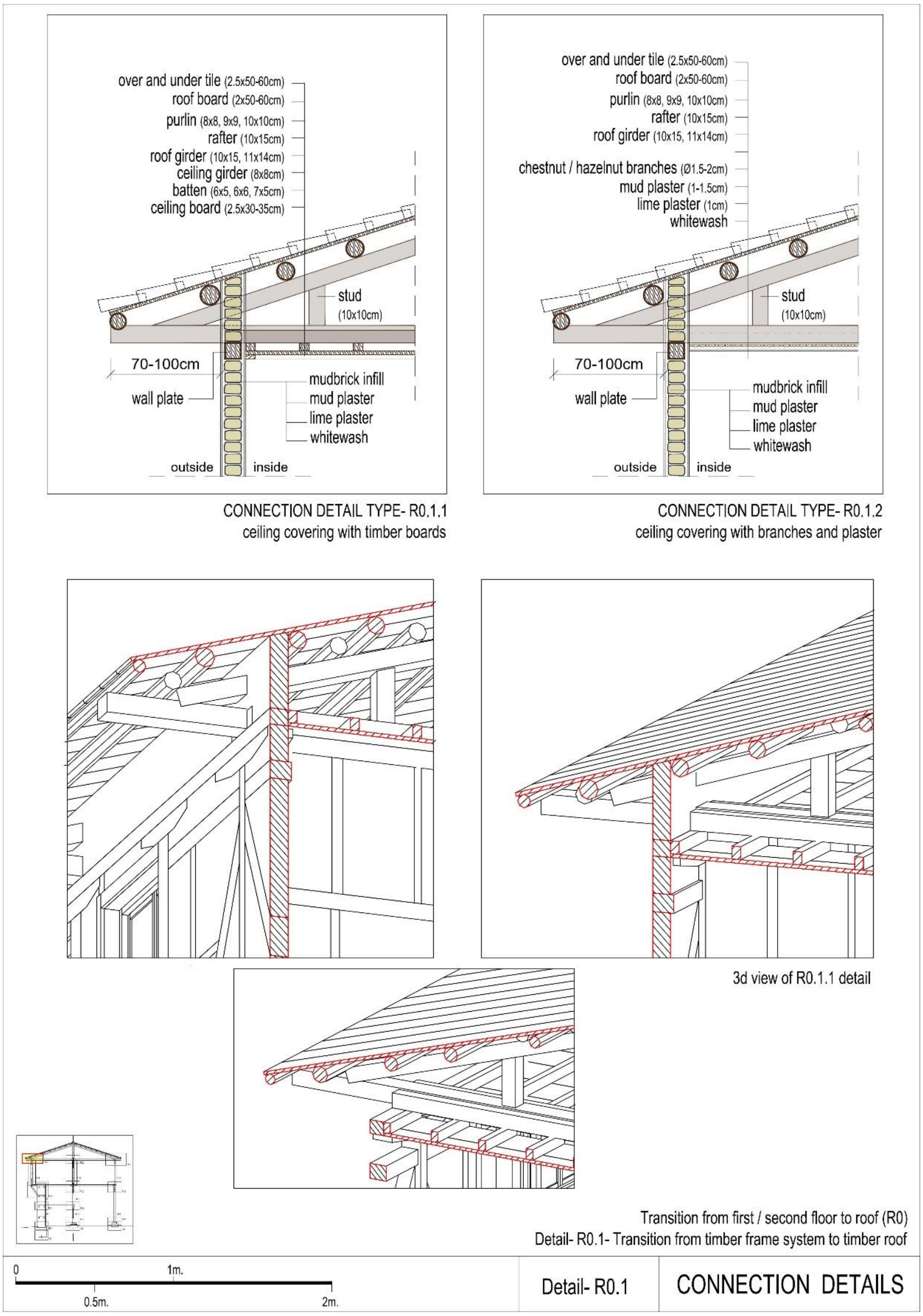


Figure 3.100. Detail of R0.1.1-R0.1.2

Detail- R0.2

The connection detail between the timber post and the roof does not differ on the courtyard facade. The roof girder, which extends from the middle axis to the courtyard facade and determines the width of the eave, sits on the wall plate on the bolster of the timber post. Like the connection detail on street facade, the roof girder is usually placed on the axis of timber post on the courtyard facade. Unlike the detail of R0.1.a, wall infill is not used on the courtyard facade.

Figure 3.101. Detail - R02 _2820-8-7 (left), 2800-31 (right)

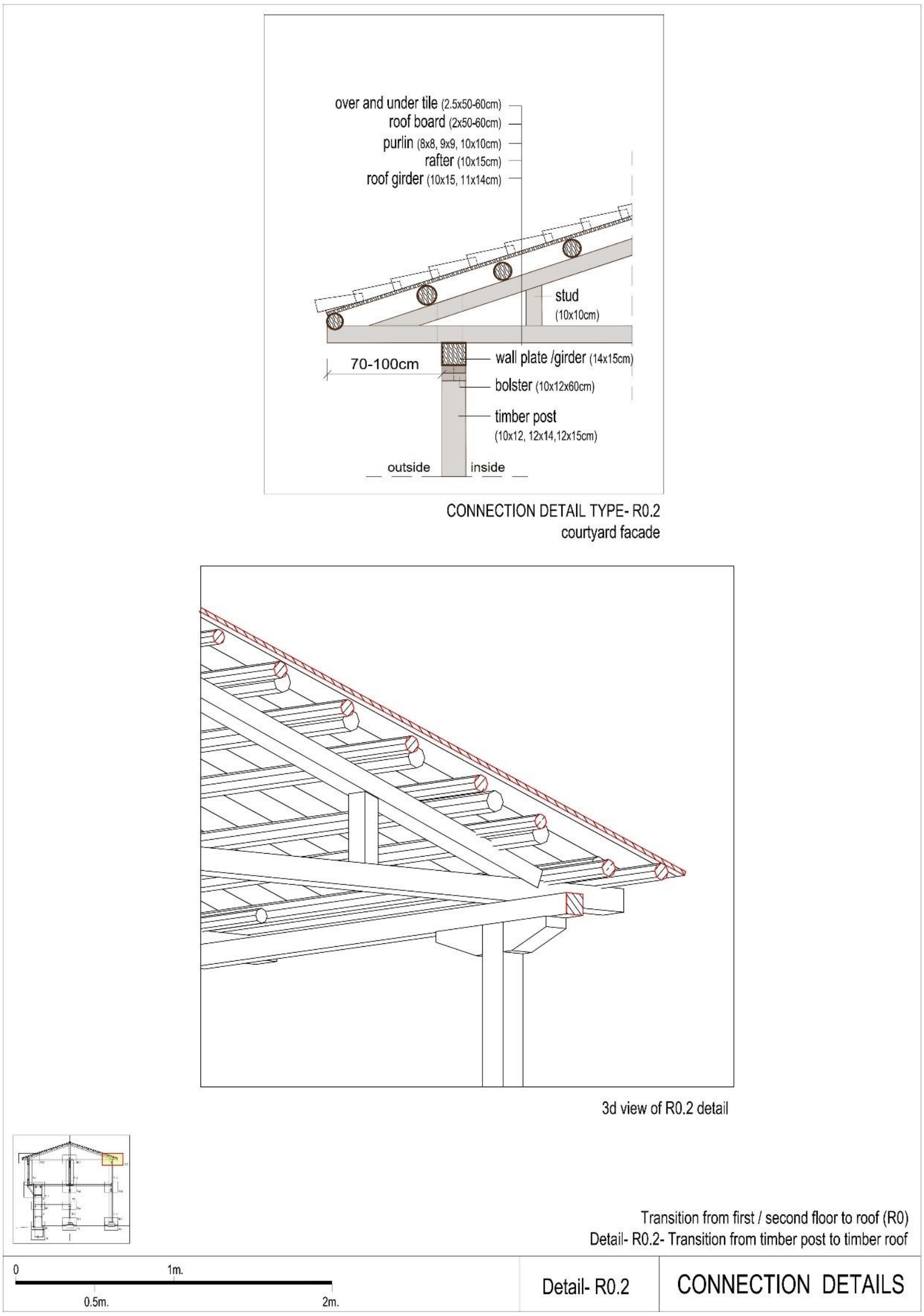


Figure 3.102. Detail of R02

Detail- R0.3

The detail of R0.3 is seen on the middle axis where the roof generally reaches the highest point. One of the roof beams, usually used as pairs, extends to the street facade and the other extends to the courtyard facade. Two roof girders meet side by side on the middle axis and on the axis of timber post. A horizontal timber element is put on the roof beams on the middle axis. Roof posts are placed on top of the horizontal timber element, on the axis of the timber posts of upper floor. In some buildings, lap joint is used at the connection point of the roof post and the horizontal timber element. One end of the main rafter sits on the roof girder, other one is connected to the top point of roof post. In this connection, either the roof post is indented according to the rafter or the rafters intersect over the roof post. Ridge purlin is placed either on the rafters or on the roof post. Roof boards and roof tiles are placed on the ridge purlin.

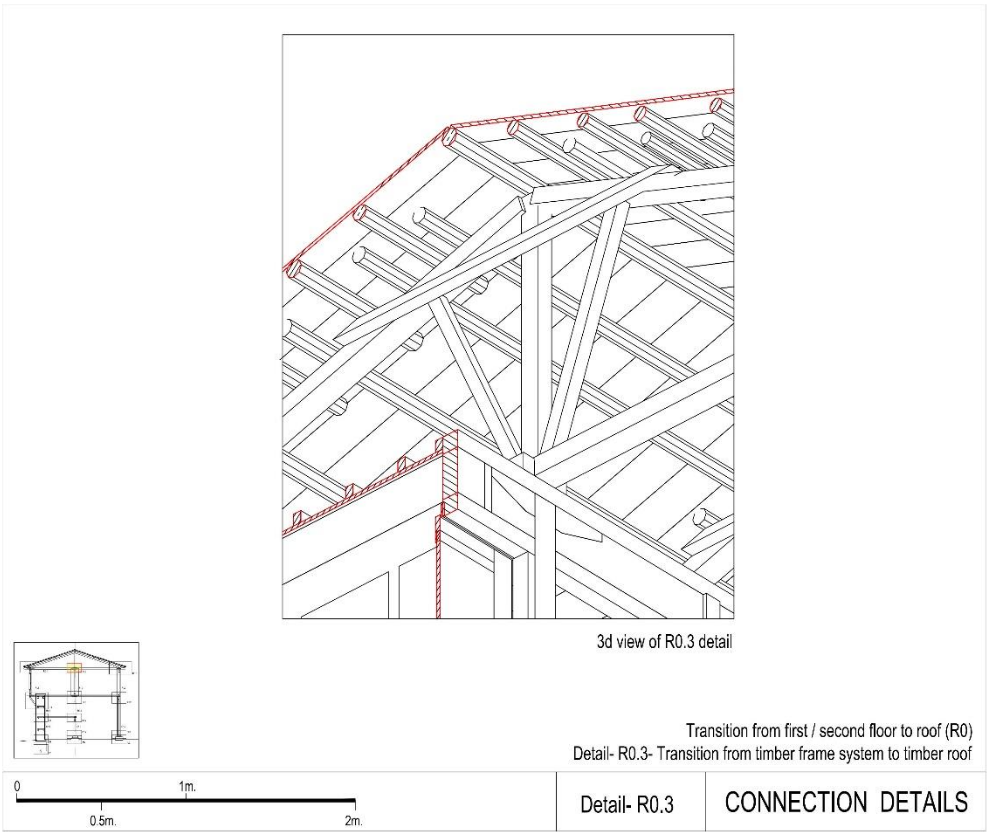


Figure 3.103. Detail of R0.3

Figure 3.104. Detail - R03 _2800-31

Transition from first floor to second floor (S0)

Traditional Cumalıkızık houses are composed of rubble stone masonry ground floor and timber frame upper floor. The height of the rubble stone masonry ground floor is around 3m or higher (4-6m). The number of timber frame floors that sit on the masonry ground floor is generally one. In a small number of buildings, ground floor heights of which are around 3m, two timber frame floors are seen on the stone masonry ground floor. In the settlement, there is only one building consisting of high ground floor and two timber frame floors. These buildings, which concentrate around Eğrek Square, have architectural features of late-period buildings with symmetrical composition, curvilinear openings, cladding under the projections and eaves and cladded braces. These are first buildings restored in the settlement by Çekül within the scope of street rehabilitation. Therefore, these buildings are not included in the detailed examination within the scope of this thesis since they are restored, and their construction techniques cannot be read. However, in this section where the connection details are explained, the transition between two timber frame floors is defined with the help of photographs obtained from archives.

<u>Detail- S0.1 (Transition from timber frame system to timber frame system)</u>

When the archive photographs of Neriman Şahin Güçhan dated to 1998 are examined, it is observed that “one-way double foot plates timber frame system” is used in the mentioned buildings similar to the other buildings of the settlement. In this system, floor girders of the second floor extending perpendicular to the street facade sit on the wall plate of the timber frame wall of the first floor. On the floor girders of the second floor, the foot plate of timber frame wall is placed. Main posts and braces of the second floor are fixed to the foot plate. When second floor projects over the first floor, braces or cladded braces are used on the axis of main posts, whereas load is transferred to the timber frame.

Figure 3.105. S0.1 connection detail (Neriman Şahin Güçhan Archive, 1998)

Other connection details

Transition from ground / mezzanine floor to first floor in case of having fireplace

The connection detail of rubble stone masonry wall, timber frame floor construction and rubble stone masonry wall differ when a fireplace is placed within the thickness of the stone masonry wall. Two details are used in order to support the hearth of fireplace, which is placed on the floorboards. In the first detail, two horizontal timber elements, which are connected to the rubble stone masonry wall, projects right under the floor girders in the opposite direction to the floor girders. The distance between the floor girders is 40-50cm. The area between the floor girders is filled by horizontal timber elements. In the second detail, the floor girders carrying the hearth of the fireplace are supported by a pair of braces. The lower ends of these braces are attached to the stone masonry wall and their top ends are connected to the floor girders. Based on the on-site observation of the dismantled building, it can be suggested that the hearth of the fireplace is composed of stones projecting from the rubble stone masonry wall and extending over the timber floor boards. However, the entire projection could not be seen during the dismantling process. Only the stones extending outside from the stone wall could be observed.

Figure 3.106. Stone masonry wall, timber floor and chimney connection

Figure 3.107. Stone masonry wall, timber floor and chimney connection

CHAPTER 4

EVALUATION OF THE CONSTRUCTION TECHNIQUE AND PROCESS OF TRADITIONAL CUMALIKIZIK HOUSES

4.1. Assessment of Architectural Characteristics and Construction Techniques of Traditional Cumalıkızık Houses with Reference to Ottoman House Discussions

This section discussion traditional Cumalıkızık houses in the framework of the discussions regarding Ottoman residential architecture. The tradition of single storey masonry houses, which had continued until the end of the 16th century, was interrupted with the introduction of the timber frame floors on top of the masonry floor in the 17th century. The main characteristic of the Ottoman house, which is also referred to as '*Hımış*', is the combination of ground floors with heavy, solid and high stone walls and timber frame upper floor(s) that are articulated with projections and illuminated with windows. This contrast in the mass organization is also manifested in the difference in the usage of the floors. The ground floor consists of the courtyard, *hayat*, and service spaces, whereas the upper floor(s) include the living spaces that is the room and the sofa.

Another important feature of the Ottoman house is the organization of open, semi-open, and indoor spaces. If we consider the street as part of the building, open spaces are differentiated as public and private open spaces. This leads to the concepts of **'interior'** and **'exterior'** that shape the Ottoman houses. On the ground floor, the building is closed to the street/public open space/outside with high stone masonry walls, whereas it completely opens to the courtyard/private open area/inside with semi-open spaces such as hayat and taşlık. The spatial connection of the ground and first floor is through the courtyard (private open space). The courtyard/private open area/inside also serves as a binder. On the first floor, the open sofa, which has a semi-open character, is related with the courtyard/private open area/inside. The room, which has an enclosed character, is related with the street/public open space/outside. This interior-exterior relationship, which dominates the Ottoman house, is reflected in the flow between open, semi-open and enclosed spaces.

In the early period Ottoman houses, these features mentioned above and the contrast between the ground and upper floors and the interior and exterior are evident. Therefore, in early Ottoman houses, the service spaces are located in the ground floor and living spaces are on the upper floor. The building is closed to the street with high stone walls and introverted. The only facade of the building is the courtyard facade and has an open sofa plan type.

In later period Ottoman houses, the use of the ground floor is completely changed after the service spaces are placed inside the main building, and the sofa is closed and narrowed down as a middle hall. The ground floor starts to resemble the upper floor and the courtyard is used as a backyard. Thus, the difference and contrast between the lower and upper floors and the interior-exterior, which are the main features of the Ottoman house, have disappeared.

Accordingly, Cumalıkızık house has features of early Ottoman houses spreading to a wide geography from the 17th to 20th century, with its open sofa plan type, high stone walls that are closed to the street and the functional differentiation of the lower and upper floors.

Lot Organization

Similar to other Ottoman residential architecture, the buildings in Cumalıkızık is located in the lot in three different ways. The examples where the building is located behind the high courtyard walls facing the street with entrance taken from the courtyard can be seen in early period (17th century) when privacy and security are given more important (Şahin Güçhan, Karakul, 2016: 177). In Cumalıkızık, this lot type where buildings are located at the back of the lot are very few. The examples where building faces the street facade dates back to the middle of the 18th century. In this type, the building faces the street, but the entrance door still opens to the courtyard. In later examples, building again faces the street and has a courtyard at its back, and the entrance door opens to hayat, the semi-open space underneath the building (Şahin, 1995). In Cumalıkızık, the lot organization of traditional houses mostly carry the characteristics of the late period. In the settlement, however, there are buildings facing the street and has entrances from the courtyard. Moreover, in some buildings it is possible to determine the historical periıds that the building has undergone through the change in the lot organization as in the case of lot 2800-38. The building, which originally takes its entrance from the courtyard and has a street facade, soon had another entrance from the *hayat* after a later addition in front of its original entrance. All the buildings selected for detailed investigation has a street facade with an entrance from the building to the *hayat*. Therefore, the effect of the change in lot organization on the construction technique cannot be studied.

Figure 4.1. Lot organization- 2800-41(left), 2817-3 (middle), 2800-3(right)

Spatial Organization

In the Ottoman houses from earlier periods, the ground floors consist of open, semi-open spaces, and service spaces, whereas the upper floor or floors have living spaces.

The lower and upper floors do not repet but rather complement each other (Şahin Güçhan, 2017: 3). The building opens to the courtyard through life on the ground floor and an open *sofa* / *çardak* on the upper floor. The open-sofa plan organization is also the characteristics of early-period (17th century) Ottoman houses (Eldem, 1968). The widespread use of the spatial organization of early Ottoman houses in Cumalıkızık indicate that the lifestyle based on production (animal and agricultural) has continued until recently. The open sofas of buildings that are still in use today are covered with windows or walls, and kitchen and bathroom volumes are add to the sofa. Since animal husbandry is no longer carried out in the village, the dams and depots are converted to rooms on the ground floors, and the mezzanine floors originally used as depots or for drying chestnuts are turned into living spaces. Their open-sofa plan organization, however, can still be read in most of the buildings.

As shown in the plan typology in Section 2.4.2, apart from the plan type with sofa, there are a few buildings with plan types without sofas (2808-2, 2819-6, 2820-8-7). In these buildings, the semi-open space, which is located in front of the rooms, has lost its usage as sitting, laying or drying products but rather function as a circulation area with narrow and elongated geometry. In later period buildings where sofa loses its multifunctional characteristics, a decrease in agricultural production is observed together with the change in rural lifestyle.

However, it is wrong to assume that all these buildings having these characteristics are constructed in the same period. These buildings most likely have undergone major changes (division of lots, fires, etc.) during this period.

In Cumalıkızık, apart from plans with open sofas and without sofas, there are buildings with enclosed sofas. This plan with enclosed sofas has evolved from open sofa plan type, and has completely lost its open, semi-open, closed space arrangement. The spatial organization in the late Ottoman houses have been formed by adding rooms to the courtyard facade of the open sofa (2814-5-6) or by closing the iwan (2794-38).

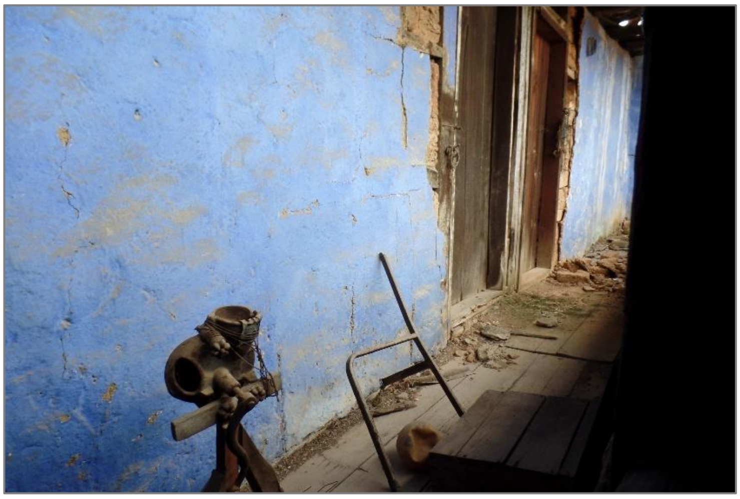


Figure 4.2. Examples from plan type "without *sofa*" 2820-8-7(above), 2819-6 (below)

The most common plan typology in the settlement is open sofa plan type, which consists of rooms arranged on one side of the sofa and is mostly composed of two units. Moreover, the open sofa plan types vary based on the relationship of the sofa and the rooms. The rooms can surround the sofa in L-shaped or U-shaped, can be located on two opposite sides of the sofa or arranged in both sides of an L-shaped sofa. The number of rooms depends on the lot size and orientation

Most of the buildings selected for the investigation of construction technique have open sofa plan types, whereas the buildings numbered 2819-6 and 2820-8-7 have plans without sofa. The buildings with enclosed sofa plan type are excluded from this study since their original details cannot be observed.

When construction techniques and plan organization are evaluated together, the main post and beams have smaller cross-sections in the building numbered 2819-6 that has a plan without sofa. The roof girder extends from the street façade to the courtyard facade. The posts of the timber frame wall forming the street facade of the first floor, and the posts of the courtyard façade are not on the same axis. Mudbrick composed of red clay are used as infill of the timber frame walls and the rafters are connected to the ridge purlin on the post in the middle.

Moreover, barrel vault is used as the superstructure of the building at the corner of the lot. While there are not any interlocking connections in the roof, lap-joints are used to connect the foot plates and main posts and main posts and bolsters. The ground floor wall was built with masonry rubble stone technique with timber lintels. The corners of the buildings are chamfered without corbelling.

When the building without a sofa (2820-8-7) is evaluated, there is not any significant difference in the cross-section of the timber posts and beams on the ground floor compared to the early-period buildings. Red clay mudbrick is used as infill material of the timber frame wall. Unlike other buildings in the settlement, wattle and daub system is seen in the building as wall infill, as well as wattle and daub ceiling with plaster. The timber frame partition walls have no infill, and either are covered with timber laths or wide timber planks and plastered. The buildings, which is located in a corner lot, has hipped roof. While it was originally part of a large single building, it was divided after the division of the lot. Unlike the building numbered 2819-6, its original structural elements and details are preserved. Moreover, the traces are visible showing the changes and it is seen that the building could not be completed due to economic inadequacies.

Mass Organization

In the settlement, which is almost homogeneous in terms of plan organization and lot layout, the buildings can be classified according to their mass organization. The ground floor height and number of floors are the two main aspects affecting the main character of Cumalıkızık houses. The buildings in the settlement can be classified into two, ground floor heights that are around 3m or around 4m and above. Mezzanine floors are only observed in the second group. In the buildings with high ground floors, a timber frame floor is placed on the masonry ground floor, whereas in buildings with lower ground floors, one or two storey timber frame floors can be placed on the ground floor.

Security and privacy are significant in Ottoman houses. The early-period Ottoman houses are surrounded by high courtyard walls, whereas they only have courtyard facades and introverted life. In time, the houses started to have street facades with small openings, and these openings increase and enlarge, together with the addition of projections (Kuban, 2017: 65). The introverted character of the buildings gives information about the period of the buildings.

In this respect, the high ground floor walls, providing introverted life, refer to earlier periods. Mezzanine floors, which are used as winter floors in early examples, are seen in buildings with high ground floors. With the addition of windows to the upper floors, these mezzanine floors began to be used throughout the year for storage or drying chestnut.[4] Considering that Cumalıkızık Village had produced significant amount of chestnuts by making use of the dense chestnut forest in its environs, these mezzanine floors were significant in the past.[5]

Figure 4.3. Buildings with lower ground floors; 2800-31 (left), 2820-8-7 (right)

The buildings, which face the street and have ground floor heights around 3m, are thought to be from earlier periods. These buildings can be divided into two as two-storey and three-storey buildings. While two-storey buildings are common in the settlement, the three-storey buildings with two timber frame floors are rare and concentrated around Eğrek Square, Eğrek Street and Yunus Aralığı Street. In addition to the early examples with blind lower floors facing the street, the three storey buildings such as the house of Bey’s son show architectural characteristics of later

[4] Based on the verbal information in Adıgüzel Özbek’s thesis (2016), chestnuts are laid on the *kat* and kept there until January.

[5] Cumalıkızık Village leads the production of chestnuts with Hamamlıkızık, Fidyekızık and Derekızık villages. It is known that the chestnuts produced were exported since the Ottoman period. (Karaesmen, 1935: 47, Ersevinc Akkus, 2009: 107)

period compared to two-storey houses. The mezzanine floor with low ceiling, seen in the early period buildings, is transformed into a living space as a high timber frame floor in these examples. The increase in the number of rooms, large projections, cladded braces and bottom part of the projections and timber facade decorations indicate that these buildings are constructed with fine workmanship for the rich families of the village.

In the selected examples whose construction techniques are examined, there are buildings with high ground floors (2800-3, 2800-38, 2805-1, 2805-9, 2812-2-3, 2819-1-9) as well as buildings with ground floor heights around 3m (2800-31, 2819-6, 2820-8-7).


Figure 4.4. Building examples with high ground floor 2805 (left), 2800-1 (right)

Among the buildings with ground floor heights of 3m, two of them have plans without sofa (2819-6 and 2820-8-7), and their differences in construction techniques are evaluated under the title of spatial organization. The difference in the rubble stone masonry wall technique is noteworthy in the other building with a low ground floor

(2800-31). The rubble stone masonry wall with timber lintels are framed with timber posts and braces. The timber posts and braces sit on the bottom row of timber lintels of the rubble stone masonry walls, which consists of three rows of timber lintels. While the middle row of lintels continues in between posts and braces, the upper row is placed at the end of the wall. Timber braces in the wall supports the post, whereas the post with bolster supports the lintel row at the top. The cross-section of the timber posts varies between 17-20 cm, they sit on stone bases, as in the early-period building. Since the floor height is low, braces are not used in between timber posts in courtyard. The bolster carrying the upper floor is notched at one point where it touches the main beam. In the building, which has open sofa plan type with iwan, the rooms are located on one side of the sofa and a spiral staircase leads to the upper floor. Red mudbrick infill is used in the timber frame wall facing the street. In the facade, which has many openings, the braces support the secondary posts at the lower level instead of supporting the corner posts.

The building, which has adjacent lot order, has gable roof. The roof girders are used as a pair meeting on the central axis. The rafters are connected to the roof posts closer to their upper point, ridge purlin is placed on the roof post.

The building numbered 2800-31, differs from the rest of the buildings in the settlement with its triangular pediment above the entrance, its timber ceiling with core and timber fascia with motifs. Carved ornamentation is seen at two levels on the timber posts carrying the upper floor. It is learned from the owner[6] that this building had suffered from a fire about 100 years ago and was rebuilt after the fire. The owner also stated that the ceiling core and timber fascia with motifs were made by the same master builder.

Similar to the building numbered 2800-31, the buildings with ground floor heights of 3m do not have braces between the posts on the ground floor. It is not known whether

[6] Hanife Kuş

there is a connection between the low floor height and the accessibility of timber posts having 4 or 5m length in these buildings, which are constructed later.

In the early period houses with high ground floors, rubble stone masonry wall technique is reinforced with timber lintels and tie beams. Corner chamfers with corbelling are seen in some buildings located at the corner lots. The cross-sections of main timber posts carrying the upper floors are 20x20 cm, whereas in one building they are 27x27 cm. All of the timber posts have bolsters, which are connected with lap-joints. The dimensions of bolsters and main beams are similar to the cross-sections of the main posts. Main posts and beams are supported by braces and lintels. These braces and lintels are connected by notching technique. In early period buildings, the dimensions of posts, braces and wall plates can reach up to 14-15 cm. However, since only one building's dismantlement is observed, comparisons int terms of dimensions and connection details of the timber frame cannot be made. Mudbrick is mostly used as the infill material of the timber frame. In the intervened sections or in-service buildings, *bağdadi* (wood lath), timber cladding or bricks are also used. The roof girders and other elements have larger cross sections in early period buildings.

Facade Organization

In this section, architectural elements on the facade and their organization are discussed in addition to the facade features described above.

Projections

Projection is often used in the traditional Cumalıkızık house. The reason behind this frequent is to create rectangular geometries on top of the ground floor walls following the organic street pattern. However, there are a small number of buildings without projections in the settlement.

When the construction dates of Ottoman houses are evaluated according to projections, projections were not used in the earlier period buildings located within the courtyard (17th century). In time, the building began to be located on the street facade, and firstly the main room projected on the street and soon followed by the projection of other rooms (Kuban, 2017: 159-161). The projections vary in time with their positions in the facade and forms. The spans of the cantilever increase in later periods.

Among the houses examined, the building numbered 2805-1 has a projected iwan can be an example of large span projections with a span of 140 cm. This building differs from other structures by its large iwan projection above high stone walls reaching up to 6 m. The high walls and large projection span contradict in terms of the architectural features of different periods. Similar contradictions are observed between the monumental facade and simple interior organization. The building does not have any cupboards, sedirs or niches, whereas it has elevated platform (seki) and ablution basin. The upper floor is reached by a staircase with two flights. In addition, at the end of the stone wall with timber lintels and tie beams, timber posts with large cross-sections are placed on both sides of the wall, which continue to the foot plate of the first floor. All these features indicate a later period building, suggesting 'tower mansions' defined by Tanyeli (1999b: 457). Although the building's scale is far from a mansion, the building may be constructed by a rich family as a symbol of status in the 18th century.

Figure 4.5. 2805-1 with wide iwan projection, timber post at the edge of the stone wall

Windows

Windows are probably one of the most changed architectural elements. In the buildings dating to early periods (17th-18th century), there are narrow and small openings for ventilation on the ground floor, whereas upper floor has small windows without glass but shutters and top windows (Şahin, 1995: 169). One or two windows opening from the rooms to the sofa are also features of earlier periods (Kuban, 2017: 119). Unfortunately, windows without shutter or other elements indicating window openings without glass are not seen today. While small windows suggest earlier periods, high windows suggest later periods (Şahin Güçhan, Karakul, 2016: 181). The height of the windows from the floor level gives information about the period of the building. After the introduction of sheet glass in the 18^{th} century, first large-sized sash window and later windows with wings replaced the windows with shutters (Şahin, 1995: 169, Tanyeli, 1999b: 460). Top windows continued to be used for a while since they were regarded as status symbol, but they were then closed (Tanyeli, 1999b: 460). The sliding lattices, which are widely used in Cumalıkızık houses, are thought to be added later together with window sash for sheet glass. Today, the most common window type in Cumalıkızık is single-wing window. The cross-sections of the sashes vary between 3-3.5 cm, and the connection details of the sashes are interlocked.

Doors

In Cumalıkızık, the main entrance doors, whether they are in the courtyard wall or hayat, are double winged. If the entrance door opens to the courtyard, it has a porch. The doors, which are produced by nailing 2.5-3 cm wide timber boards from three levels, are connected to the timber frame on both sides with iron elements. The door lock and the bar at the back to tighten up the door are also iron. There is a door sill outside the door. In some examples, short diagonal elements are seen in between the door ill and the door frame on both sides. In the buildings with low ground floor heights, the first floor starts over the upper level of the door, whereas in the buildings with ground floor heights around 4m either there are small or large windows on top of these doors or stone masonry wall continues above lintels on top of the doors.

The other doors open to the dam or haystack. These doors are low, single winged, and nailed. The doors of the service buildings are also nailed.

Panelled doors are generally used on the upper floors. Single winged room doors are separated from the sofa by door sills. In some buildings, panels are used on top of the doors. An example of kündekari technique, which is used in early period buildings, is only seen in the old photographs of a demolished building (2800-36).

Eaves

The eaves in the early Ottoman houses are wide and reach up to 1 m. The purlins, which are placed on the roof girders extending from the facade to the street are rounded off in the corners. Traditional Cumalıkızık house also has such large eaves, but their bottoms are not covered. The fascia boards are not used except for the building numbered 2800-31.

Architectural Elements

Some of the architectural elements also give information about the building's history. One of these elements are timber floorboards.

In Cumalıkızık, floorboards are placed directly on the floor beams. In early period building, floorboards that have widths ranging between 30-40 cm with thicknesses of 2.5-3 cm are used. In later period buildings, the width of the floorboards varies between 20-25 cm.

The staircase leading up to the upper floor usually has single flight in Cumalıkızık. The first few steps are stone and there is a door at the beginning of the timber staircase. This door is used to prevent chickens and cats in the courtyard from going up. The facade of the staircase, which frequently changed place during the lifetime of the house, is closed intermittently with wood laths. It is tought that spiral stairs or stairs with two flights indicate later period.

In Cumalıkızık, sekis (elevated platforms) are only seen in three buildings. Two of them are in the iwan, whereas the other is in the sofa that is seen in the old photographs of a demolished building.

In traditional Cumalıkızık houses, fireplaces are seen in the rooms, sofas, and the *aşhane* on the ground floor. The fireplaces, which are originally used both for heating and cooking, are either demolished or closed after stoves become widespread. Fireplace examples are only seen in buildings that have not been used for a long time.

Sedirs are removed like fireplaces after the introduction of movable furniture. The heights of the sedirs also indicate the period of the buildings, as it is mentioned in the windows section. While lower sekis indicate earlier periods, higher sekis are seen in later periods.

In the traditional Cumalıkızık house, the ablution basin seen in the sofa is both used for ablution with pouring water and serves as a small kitchen niche. The wastewater is drained to the courtyard. The ablution basins, which resemble niches cladded with timber boards facing the courtyard, have often disappeared.

Cupboards and gusülhane are seen only in one building (2800-3). In another house that has not been used for a long time (2817-34), there is a white area on top of the timber floorboards framed by wood laths with a dimension of 5x5 cm. This area, which is covered with a carpet today, is thought to be used for ablution. Referring to simple forms of *gusülhane*, Tuluk (2010: 64) mentions a similar arrangement with curtains in Bitlis and Avanos houses, which are called ‘çol’.

<u>Ornamentation</u>

Building facades in Cumalıkızık are generally plain. Symbolic decorations carved on braces are noteworthy. Some sources refer to the cross motif as the stamp of the Kızık tribe.[7] In some of the buildings, decorative cut is observed on the ends of the roof

[7] Yusuf Halaçoğlu, "Damga", TDV İslâm Ansiklopedisi, https://islamansiklopedisi.org.tr/damga (18.12.2019).

girders forming the eaves. The decorative arrangement of the Ottoman bricks, which does not exist today, indicates early periods in terms of material use. Profiled timber elements on timber posts and floor moldings belong to the neoclassical period, which are features of later periods. The painted decorations, which are not existing today but only seen in archive photographs[8], also date to later periods (Kuban, 2017: 166).

4.2. Construction Process of a Traditional House in Cumalıkızık

In Cumalıkızık, the master builders who know the construction tradition, construction process, material resources and ingredients have not survived to the present day. Therefore, traditional knowledge about the material resources and ingredients, preparation and construction process have been lost.

This section, however, describes hypothetically the construction process of a building in Cumalıkızık based on site observations, literature review, and oral information obtained from the villagers. For this purpose, a 3D model was prepared for the building, of whose dismantling project was observed on-site (lot number 2819-1-9), is selected to explain the construction process in phases. The written description, however, draws a general framework for the construction process of Cumalıkızık houses rather than focusing on a single case.

Constructing Masonry Base

The construction process starts with **excavation for foundation walls**. The excavation continues until the rocky /solid ground is reached. The excavation does not last long and ends around 80-100 cm depth, since the village is located on the northern slope of Uludağ. For the composite foundations in Cumalıkızık, the foundation excavation is carried out only in the section where the masonry walls are built. There are not any foundation walls underneath the timber posts, which carry the load of the upper floors. The timber posts in the courtyard are placed on individual stone bases. The ground

[8] Neriman Şahin Güçhan Archive

level of the courtyard and *hayat* is inclined or stepped in line with the natural topography.

The **foundation walls** are constructed in rubble stone masonry with mud mortar and are thicker than the exterior walls of the building. Stones, such as gneiss, amphibolite and slate – forming the rock structure of the region – are used in the construction of stone walls. Apart from slates, stones used in the walls are small and do not have a regular geometry. The rocks already within the building's lot are also used as they are at the basement levels or at lower elevations. However, large rectangular stones are observed at the foundation level of a demolished building in the village during the foundation excavations conducted within the scope of its reconstruction. These stones likely belong to the structures of a former settlement in the region before Cumalıkızık. Therefore, it can be stated that the existing remains of former buildings or foundations are incorporated during the construction of new buildings.

After the completion of the foundation, **stone masonry walls** are constructed at first. Since "hımış" building tradition dominates Cumalıkızık, the ground floor walls of the buildings are constructed as masonry rubble stone walls. Timber beam system, used at certain intervals in the stone masonry, provides strength against lateral loads and makes the walls more durable (Bağbancı, 2013: 477). Continuing on the foundation walls of the same technique, the thickness of rubble stone walls ranges from 70 cm to 100 cm. While larger and regular stones are used on the inner and outer surfaces of the walls, smaller stones are used in the middle. Mud mortar is used as the binding material between rubble stones. Moreover, small slates extending along the wall thicknesses between rubble stones serve as binders in masonry. Larger stones are mostly used at lower levels.

The stone walls are levelled with timber lintels at certain height, and a flat surface is formed by using slate before placing the timber lintels. After the placement of timber lintels, the upper section of the masonry wall is built with same technique by placing relatively larger stones on top of these lintels.

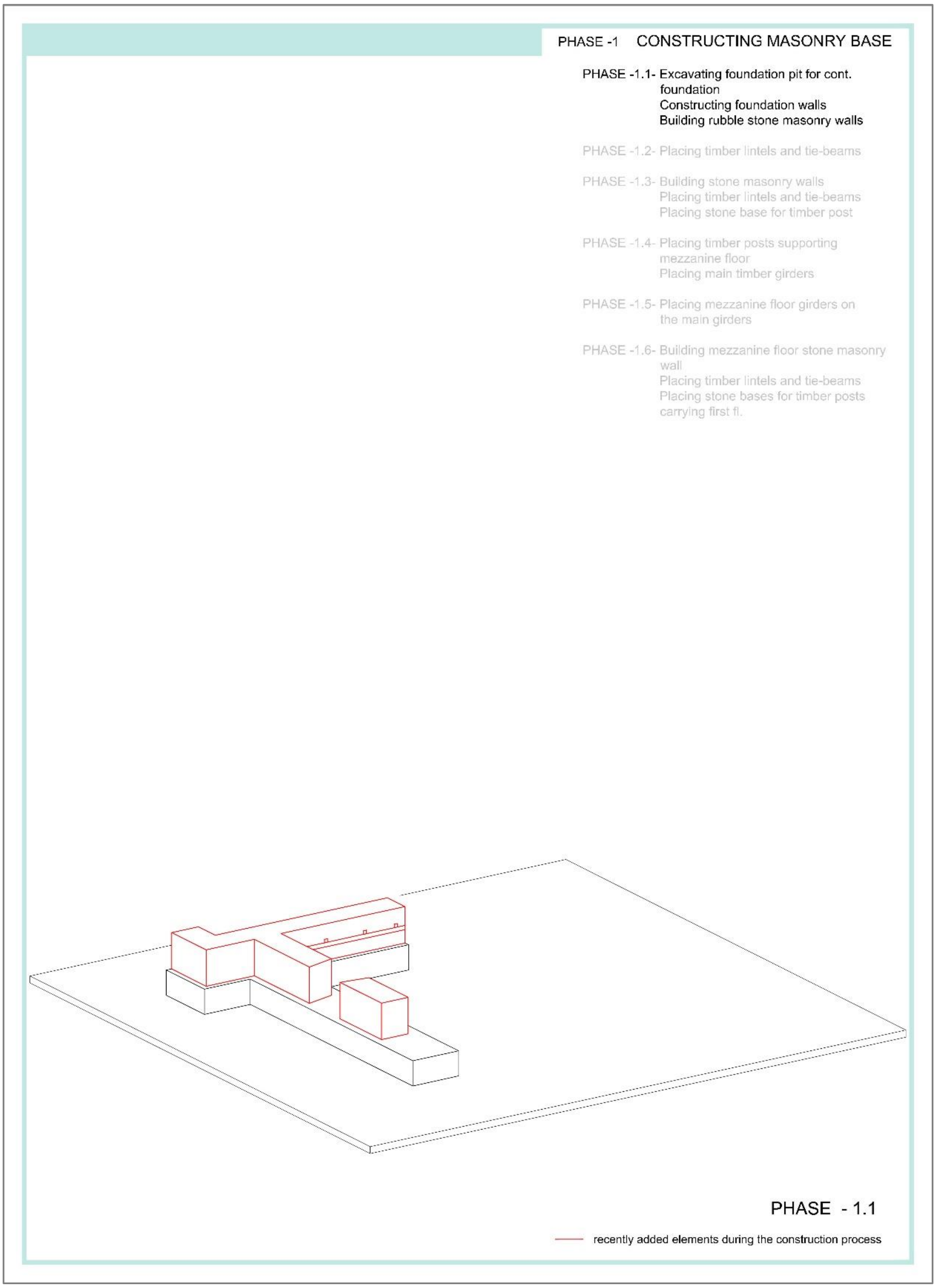


Figure 4.6. Phase-1.1.-Constructing masonry base

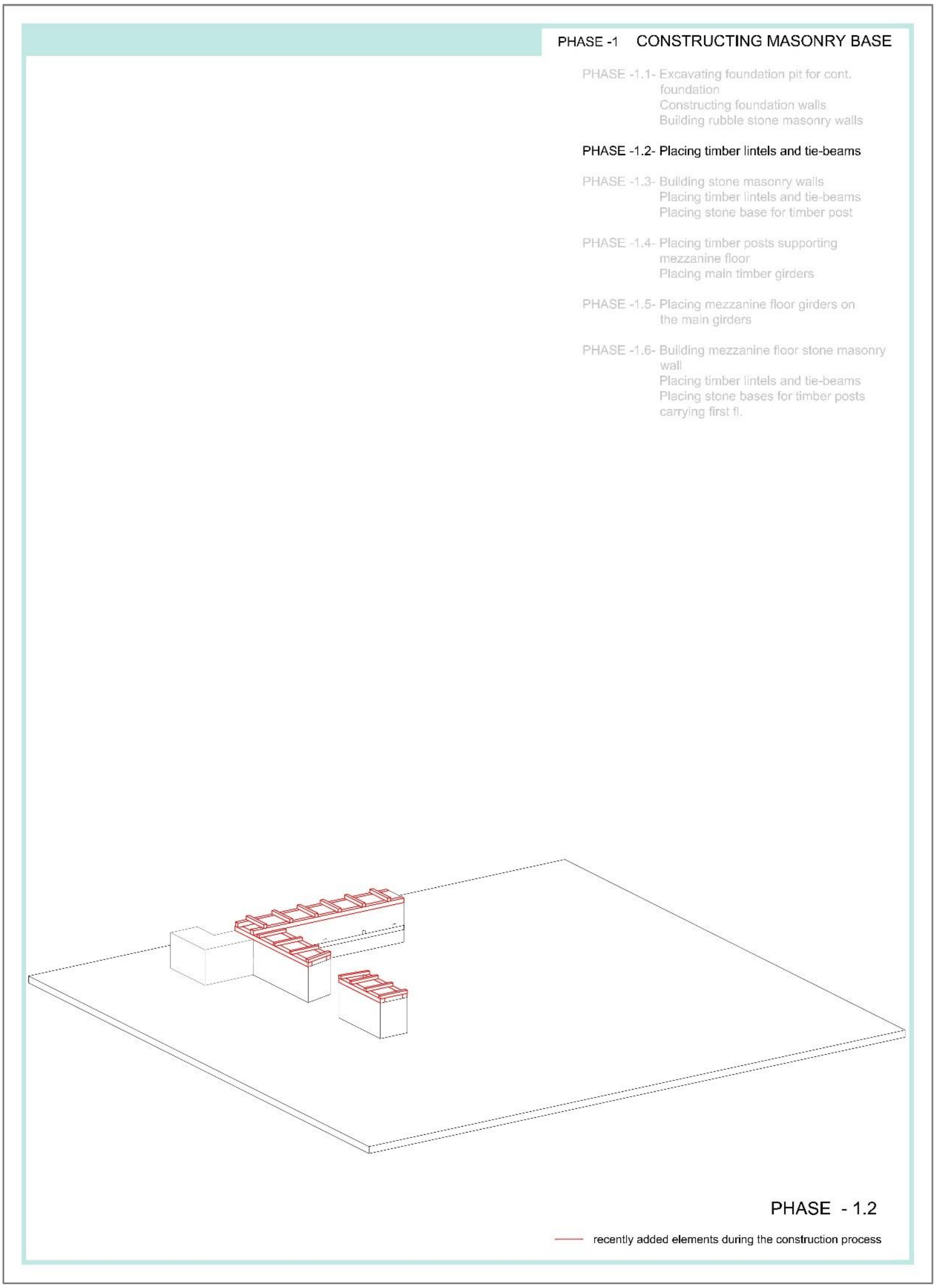


Figure 4.7. Phase 1.2- Constructing masonry base

Masonry wall construction proceeds synchronously across all intersecting stone walls of the building. Therefore, timber lintels also follow one another. At the intersection of the walls, timber lintels are either interlocked by lap-joint technique and continue at the same level on each wall or nailed on top of the other. While distance between the lintels along the wall height varies from building to building, it generally ranges from 50 cm to 100 cm. They have a certain rhythm in every building.

Timber lintels in the rubble stone masonry are used as pairs at the same level. One of them is placed in the exterior surface of the wall, whereas the other in the interior surface. Timber elements are placed perpendicularly at certain intervals on top of these lintels, with cross sections of square, rectangle, circular or clipped circle. These timber elements are called “tie beams”, and the intervals between them ranges from 60 cm to 70 cm. Timber lintel system is composed of timber lintels placed on both sides of the stone wall and tie beams with smaller cross-sections connecting these lintels along the wall thickness. Stone wall construction is carried out with the help of timber scaffoldings. The points where these scaffolding are connected to the wall are still visible in some walls as small niches or voids. Slates are used on top of these small niches as lintels.

The life is introverted on the ground floors of Cumalıkızık houses. The **major opening** in the stone walls, which define the boundary between the public open space (street) and the private open/ semi-open space (courtyard /*hayat*) is the door opening. In addition, some stone walls have a few small window openings for ventilation purposes.

Door opening, which start from the ground level, has four or five timber lintels on their top. These lintels have cross-sections of square, rectangle, or they are not shaped, and they continue along the wall on either side of the openings. If ground is one storey-high (approximately 3m.), timber-frame floor starts above the door opening. If the ground floor is higher, there are different arrangements between the door opening and the flooring of the upper floor. One arrangement is leaving this section as a void. This void is soon completed either by timber lattices, iron bars or covered by wood laths.

In another arrangement, stone walls continue on timber lintels. In a different arrangement, opening is used in combination with wall above the door opening. In this case, brick infill is used instead of stone wall above the door opening. Single-winged doors opening also have timber lintels on their top, extending into the stone walls. These doors, which are used as *dam* or storage doors, are shorter and stone walls continue above them.

Window openings in the ground floor walls are for ventilation purposes and are smaller in size and above the ground level. These rectangular windows are basically two types. The first type has narrow and elongated geometry. The depth of the opening extends along the wall thickness towards the interior. It is usually located between two timber lintels in the stone wall system. The second type has a wider opening, either square or rectangular in shape. A timber casing is placed within the opening. While iron bars are connected to these casings in some cases, shutters are used in others. Both openings have timber lintels. Additional lintels are used for the openings, which do not correspond to the lintel system of the walls.

Rubble stone masonry construction continues along the ground floor up until the flooring of the timber-frame, as described above. However, some walls of the structure (shared walls or service walls) may rise as stone wall up to the roof level.

In addition, a low **mezzanine floor** can be seen in some buildings, which have a ground floor height of more than 3m, between the ground and first floors. The mezzanine floors are used in two different ways in Cumalıkızık. The floor, which is used for laying products, hay for animals or storing straws are named as '*kat*'. The floor, which is closed to the street except for small ventilation windows, opens to *hayat* with a gallery. This floor does not cover the entire upper level boundaries. This space does not have stairs but is reached by a sailor ladder from the first floor.

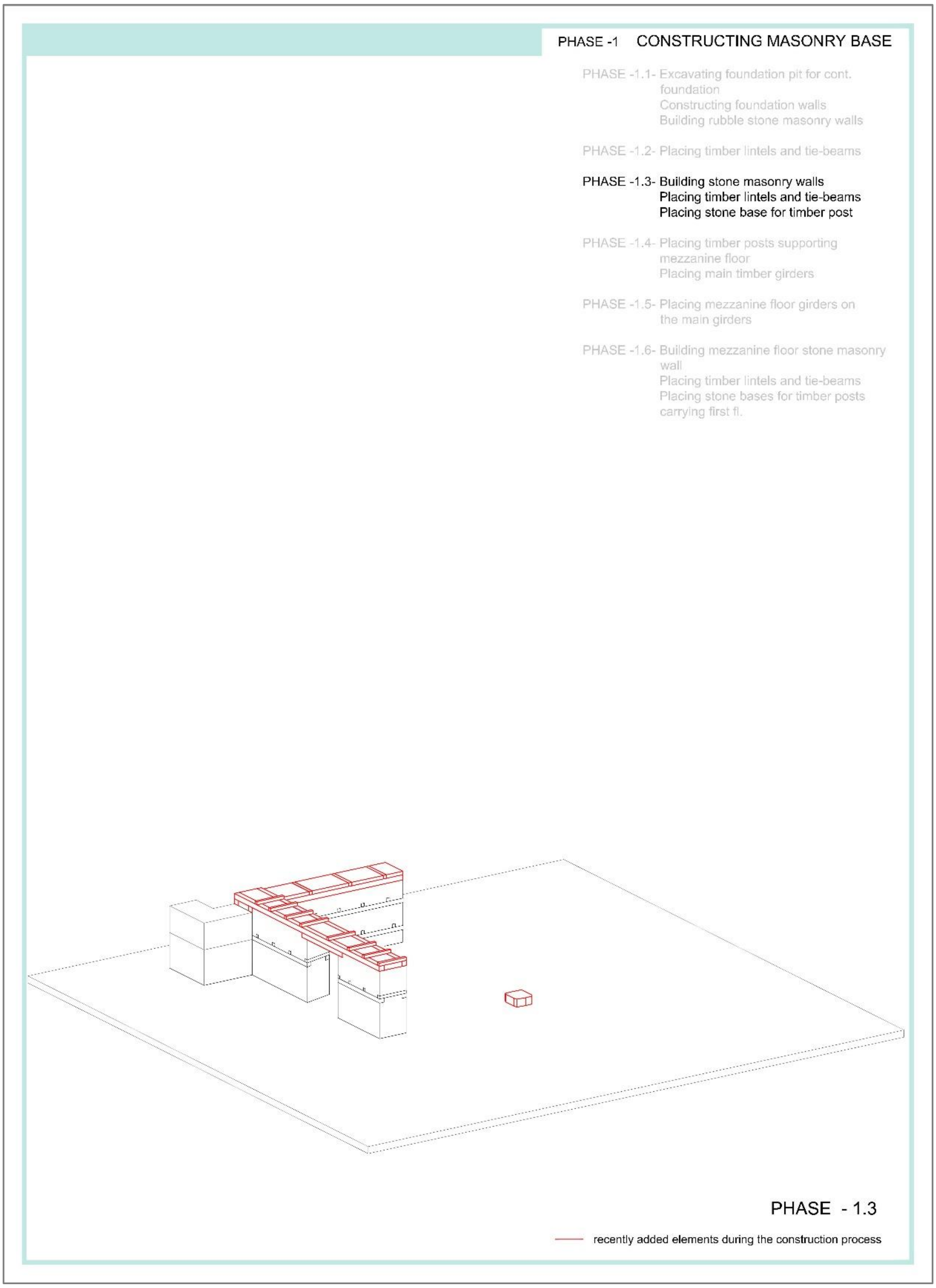


Figure 4.8. Phase 1.3. - Constructing masonry base

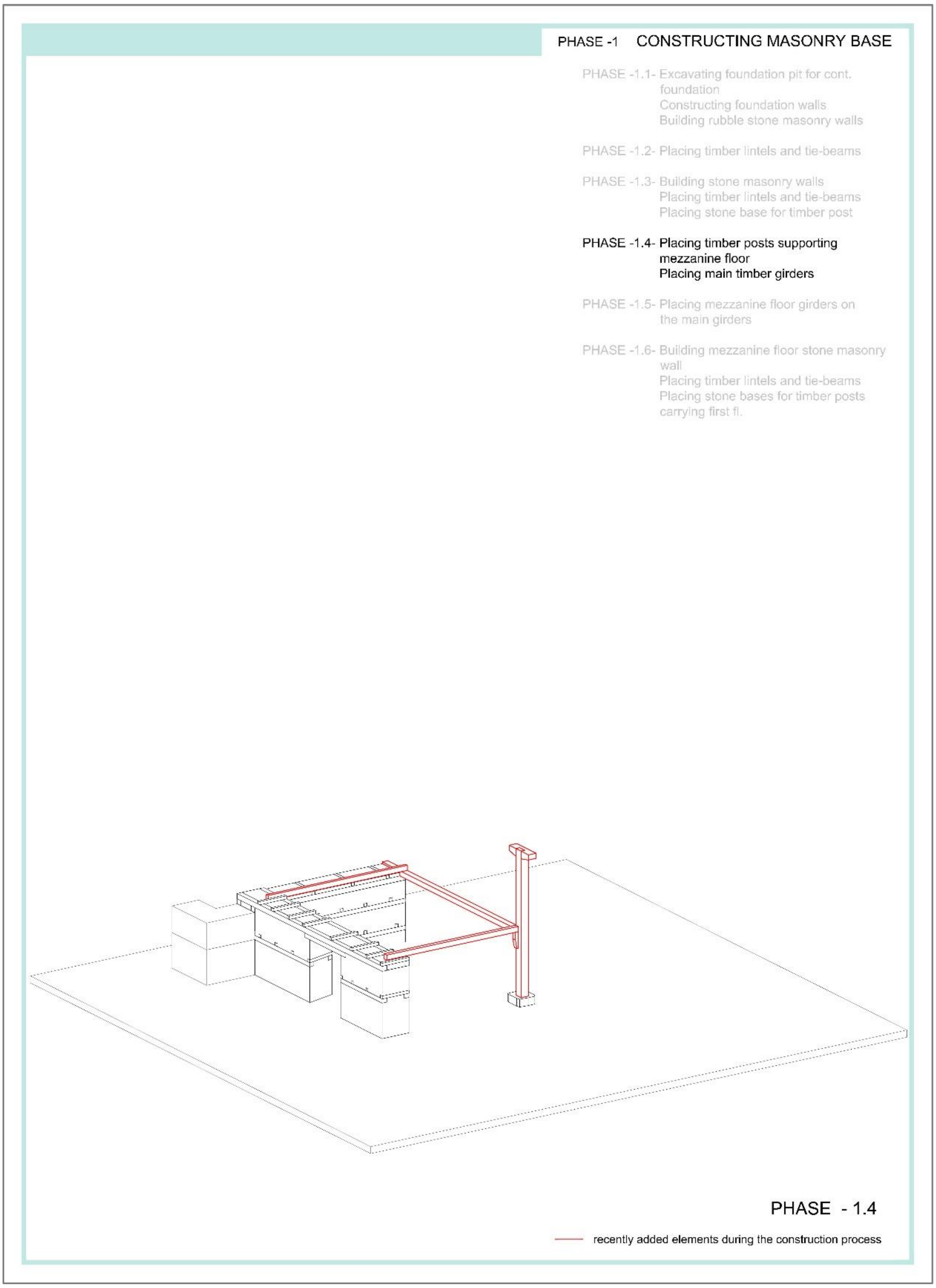


Figure 4.9. Phase 1.4.- Constructing masonry base

The mezzanine floor is also used as a ‘winter floor’. The rooms, placed on top of the *dam* and barn, warm up quickly due to their low floor height and stone masonry walls. Open-sofa plan type is also seen in this floor. This winter floor is connected to the courtyard and the first floor by a staircase. This floor can follow the boundaries of the first floor. In some cases, a mezzanine floor is added later to the building, which can be understood from the relationship[9] of the flooring of the mezzanine floor with the main structural elements of the building (masonry rubble stone walls, timber posts and braces). Considering this relationship, it can be suggested that the entire mezzanine floor has been added later or the existing floor has been converted into a winter floor, which is seen in Cumalıkızık.

In the buildings with mezzanine floors in their original organization, the masonry stone wall construction is interrupted at the level where the flooring of the mezzanine floor starts. A pair of timber lintels, which are part of the stone wall construction, are placed first.

If the timber floor girders of the mezzanine would be perpendicular to the stone wall, the floor girders are placed on top of the pair of timber lintels. These floor girders either extend along the wall thickness and act as tie beams, or they end within the wall thickness and are not seen on the facade.

If the timber floor girders of the mezzanine would be parallel to the stone wall, the main beams carrying the floor girders are connected to the stone wall rather than the floor girders. These main beams, which have a larger cross-section than the floor girders, are either placed on the timber lintels of the wall or on individual lintels placed in the rubble.

[9] The photos of building with block-lot number of 2800-36 reveals that the bracing, connected to the main post and extending to the flooring of the first floor, tears through the floor covering. In the building with block-lot number of 2800-3, the floor beams of the mezzannine floor extending perpendicular to the stone wall are not connected to the stone wall but rather carried by timber posts and beams right in front of the inner face of the stone walls.

In the courtyard or *hayat* facades, the floor girders of the mezzanine are carried by main timber beams. These beams are connected to the main timber posts of the building extending to the first floor. Therefore, the main posts related to the mezzanine should be placed in the courtyard floor before the construction of the mezzanine's flooring.

There is a stone base under each timber post. There is not any connection between the timber posts and the stone bases, which function as individual foundations. Timber post sits on the stone base with the weight of the building. During the construction of the mezzanine flooring, the main posts, to which the flooring would be connected, are placed on the pedestals and lifted. These posts, which are held in upright position with supports, are connected to each other with timber beams.

The connection of the main beam and posts are provided by secondary elements (timber gussets), which are nailed to the posts at the lower level of the beams. Floor girders of the mezzanine floor are placed on the main timber beam at intervals of 40-50 cm and fixed with iron nails. Consequently, the flooring of the mezzanine is completed except the floor boards.

The construction of rubble stone masonry walls continues with rhythmic rows of timber lintels up to the flooring of the first floor and ends with a row of lintels beneath the timber frame floor. In the examples where the mezzanine floor is used as a winter floor, the timber frame walls sits directly on the beam if the walls are in the direction of floor girders. If timber frame walls are perpendicular to the floor girders, they sit on foot plates, placed on floor girders. The main frame of the walls is formed by the foot plates, posts, braces, and wall plates. Partitions, infill, and plaster are done later.

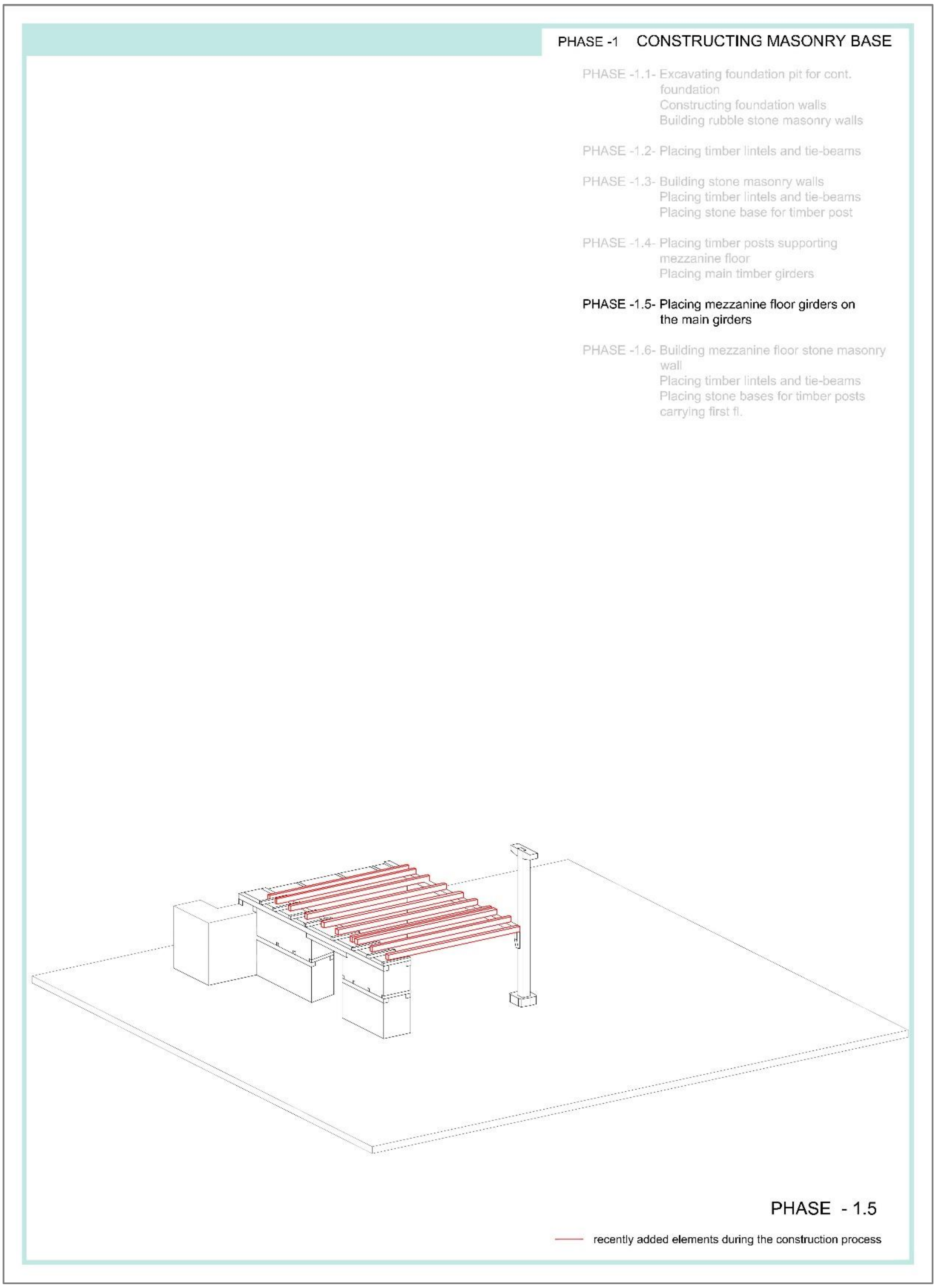


Figure 4.10. Phase 1.5. -Constructing masonry base

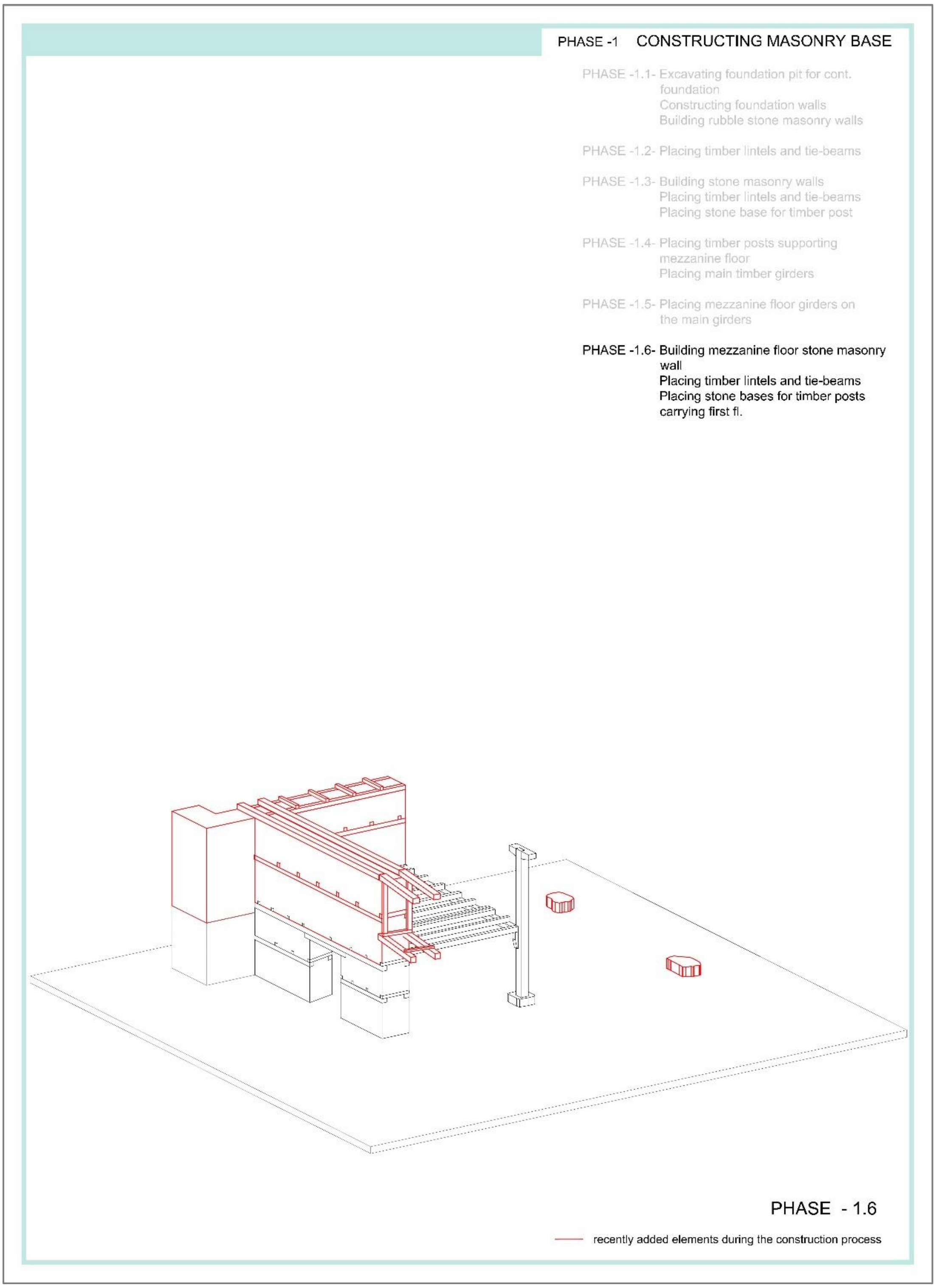


Figure 4.11. Phase 1.6.-Constructing masonry base

Constructing Timber Frame Floors

The first floor's floor girders generally extend perpendicular to the rubble stone masonry wall. While the ends of the floor girders on street side sit on the timber lintels of the wall, their ends on the courtyard side sits on the main beams, which are part of the timber frame system. Therefore, the main skeleton should first be set for the construction of the flooring of the first floor. The timber posts are lifted after placing them on stone bases, whereas the bolsters that are interlocked to the main posts are connected on the ground.

These bolsters placed at the points where timber posts are connected to beams are called "*papaz başı*", whereas the beams are called '*salma*' in Cumalıkızık. The timber posts, brought to upright position by supports, are connected to each other by main beams resting on the bolsters. The bolsters, connected to the posts by lap-joint technique and iron nails, and are connected to the beams with long iron nails from the bottom. In some examples, the beams are notched at the junction points of bolsters (2800-31).

The timber frame resting on stone bases is supported by timber braces in most buildings (especially for the ones with a ground floor height of more than 3m). These braces are connected to the main posts from their lower ends, whereas their upper ends are connected to the timber lintel below the main beam and lock the system.

The main posts and beams, together with the stone walls, form the axes of the building. Main beams are generally laid in one direction and are parallel to the stone wall. The building extends two axes from the stone wall towards the courtyard. The distance between these axes is 4-5m. In the most common plan type, there are rooms in between the first and second axes and an open sofa in between the second and third axes.

These main beams, placed parallel to the stone wall, are connected to each other by floor girders placed in the opposite direction. In both examples where the main beams are parallel or perpendicular to street facade, if there is a stone wall at the end of the axis, the main beams are inserted into the stone wall. If there is not a stone wall or if

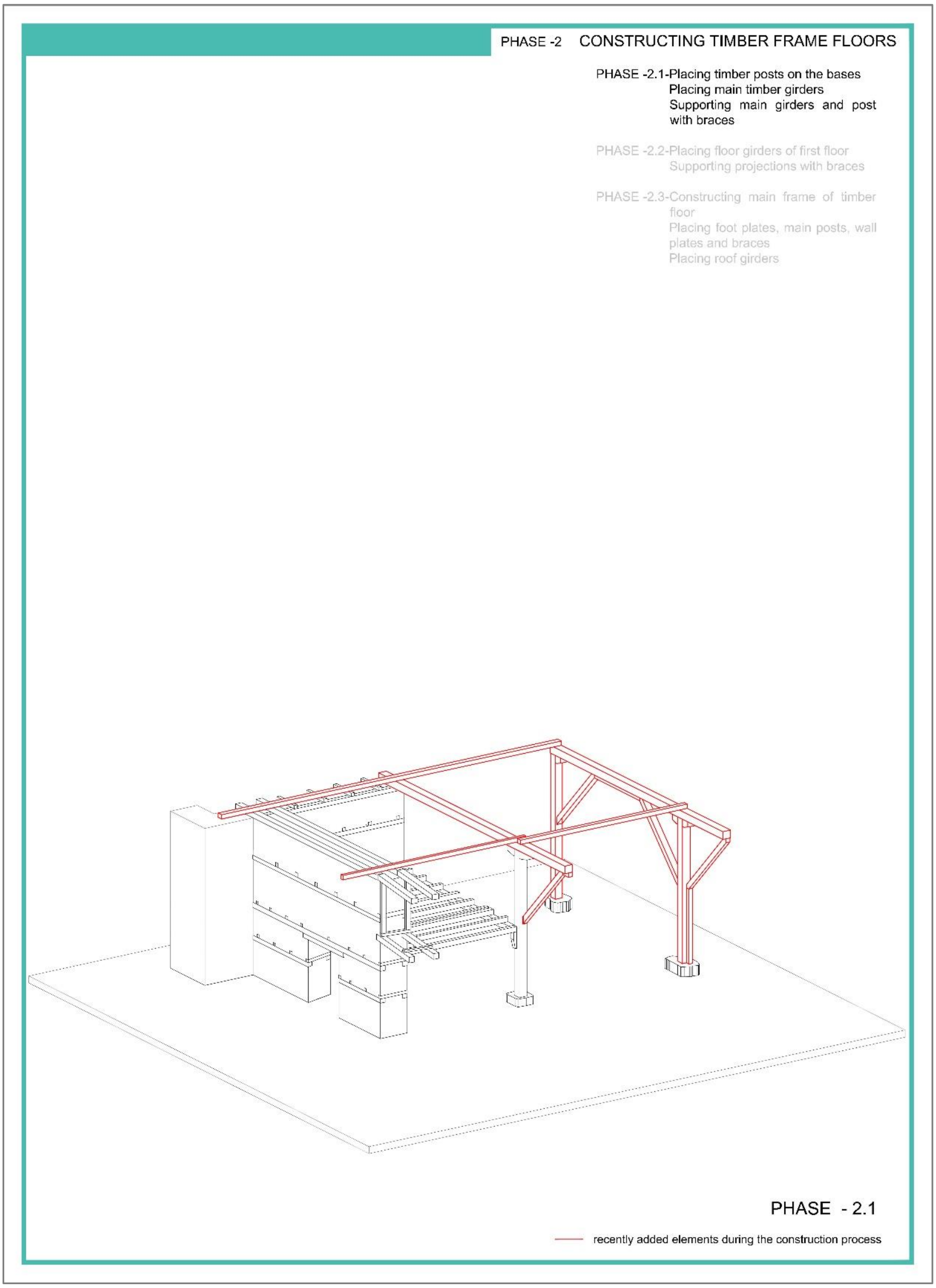


Figure 4.12. Phase 2.1.- Constructing timber frame floors

the wall of the neighboring building constructed before, timber posts are placed at the end of the beams and are connected to the beams (2800-3, 2817-33).

In some corner buildings (such as 2805-1), the beam system in one direction is interrupted by one or two main beams at the same level but in other direction. In these examples, while the main beams in one direction sit on the bolsters of the main post,the beams at the same level but in the other direction are carried by secondary elements nailed to the post.

In Cumalıkızık, there are not any secondary elements between floor girders and the floorboards. Only in spaces like iwan or *taht* where the floors are elevated by *seki*s, horizontal or vertical timber elements are used between floor girders and floorboards to increase the floor height (2805-1, 2800-1).

In Cumalıkızık, the **projections** can be triangular, rectangular or polygonal in form, and can be situated in the middle of the facade, on one side, on both sides, along the entire facade or in the corner. These projections are generally formed by the extension of the floor girders towards the street.

In examples where floor girders are not placed perpendicular to the stone walls, the main beams carrying the floor girders extend as cantilever. The floor girders are again fixed on the main beams. Timber braces are used to support wider projections. In the cases where main beams are projected as cantilevers, the upper end of the brace is connected to the main beam and the lower end is connected to the timber lintel of the stone wall. In the cases where floor girders are projected as cantilevers, the braces can either be directly connected to the bottom of the floor girders or connected to a horizontal timber element placed underneath these girders in the opposite direction. The latter cases are more common in the settlement.

Both connection points of the braces are notched according to the elements they are connected and fixed with long iron nails. In some buildings, covered braces are used. Wood laths placed in certain profiles to cover braces are seen in later period examples

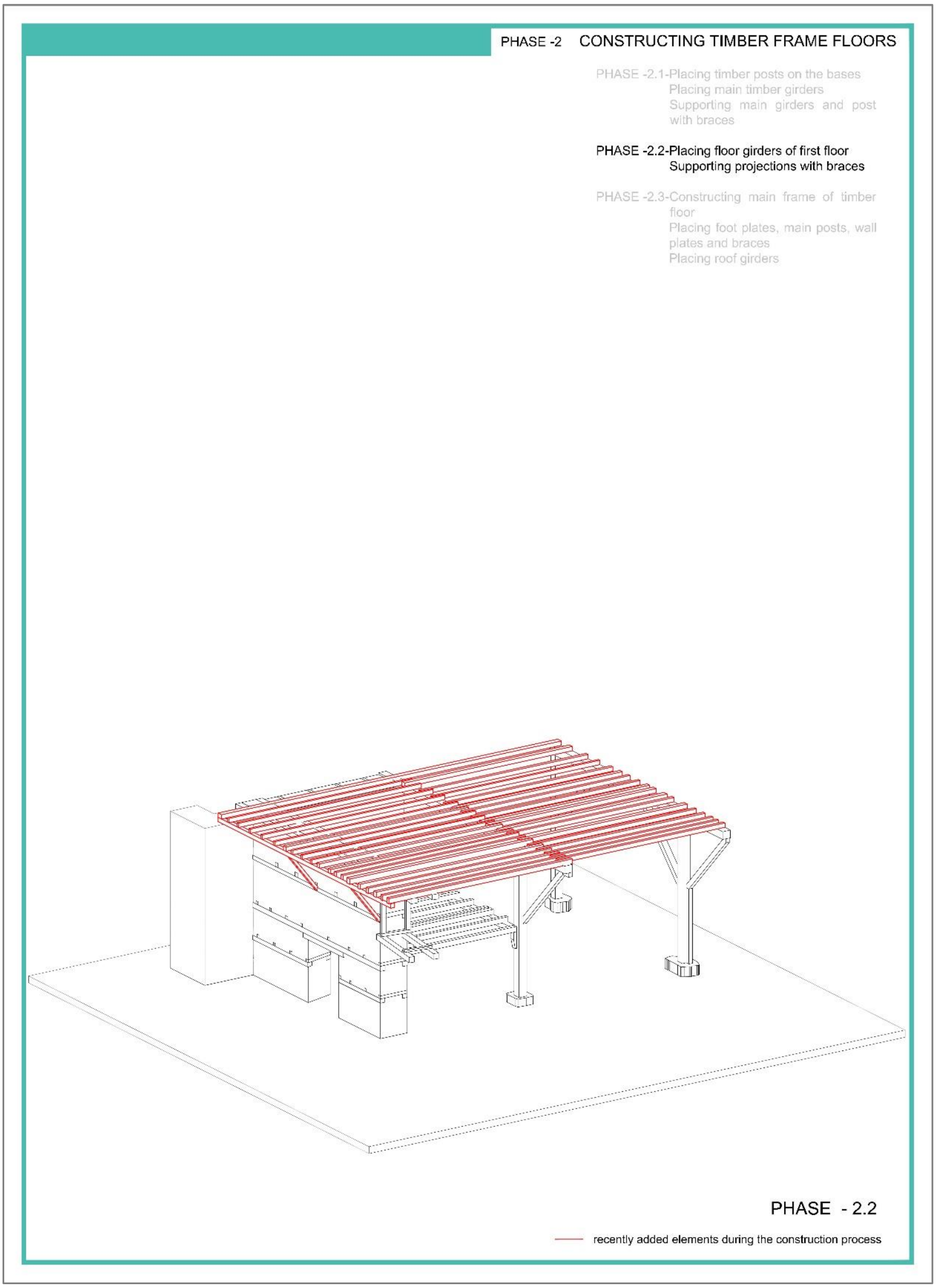


Figure 4.13. Phase 2.2.- Constructing timber frame floors

with masonry ground floors and two timber frame floors, where lower part of the projections is cladded.

In the examined buildings in Cumalıkızık, double floors, extending in one direction, are observed. Therefore, if the timber frame wall of the first floor is in the opposite direction to the floor girders, foot plates are placed perpendicular to the floor girders. At the corners of the spaces, posts are placed on the foot plates. These posts are

connected to the foot plates by lap-joint technique and long iron nails. Bolsters are used in all main wall posts. The bolster and the post are both interlocked and nailed as it is seen in the main timber frame system. The wall plate is placed on top of the bolster. The connection of the wall plate and post is done with the help of these bolsters. The main frame of the wall is finished by braces, with their upper ends fixed to the post and the lower ends fixed to the foot plates.

On the other hand, if the timber frame wall is in the same direction as the floor girders, additional foot plates are not used. Floor girders act as floor plates.[10] The walls in this direction also do not have wall plates since the roof girders, which extend to the central axis of the building or the courtyard facade and determine the length of the eaves, act as wall plates.

Since the roof girders would sit on the wall plates of the walls in the opposite direction, firstly the main frames of the walls that are perpendicular to the floor girders are completed. With the construction of the first floor's flooring and the walls perpendicular to the floor girders, the foot plates and corner posts of the walls in the same direction are also completed. Afterwards, middle posts with bolsters and braces are placed. With the placement of the wall plate, which is the roof girder, the roof construction begins.

[10] In these cases, since the wall construction sits on the floor girders, another beam is placed adjacent to floor girder carrying the wall so that the floor boards can be nailed.

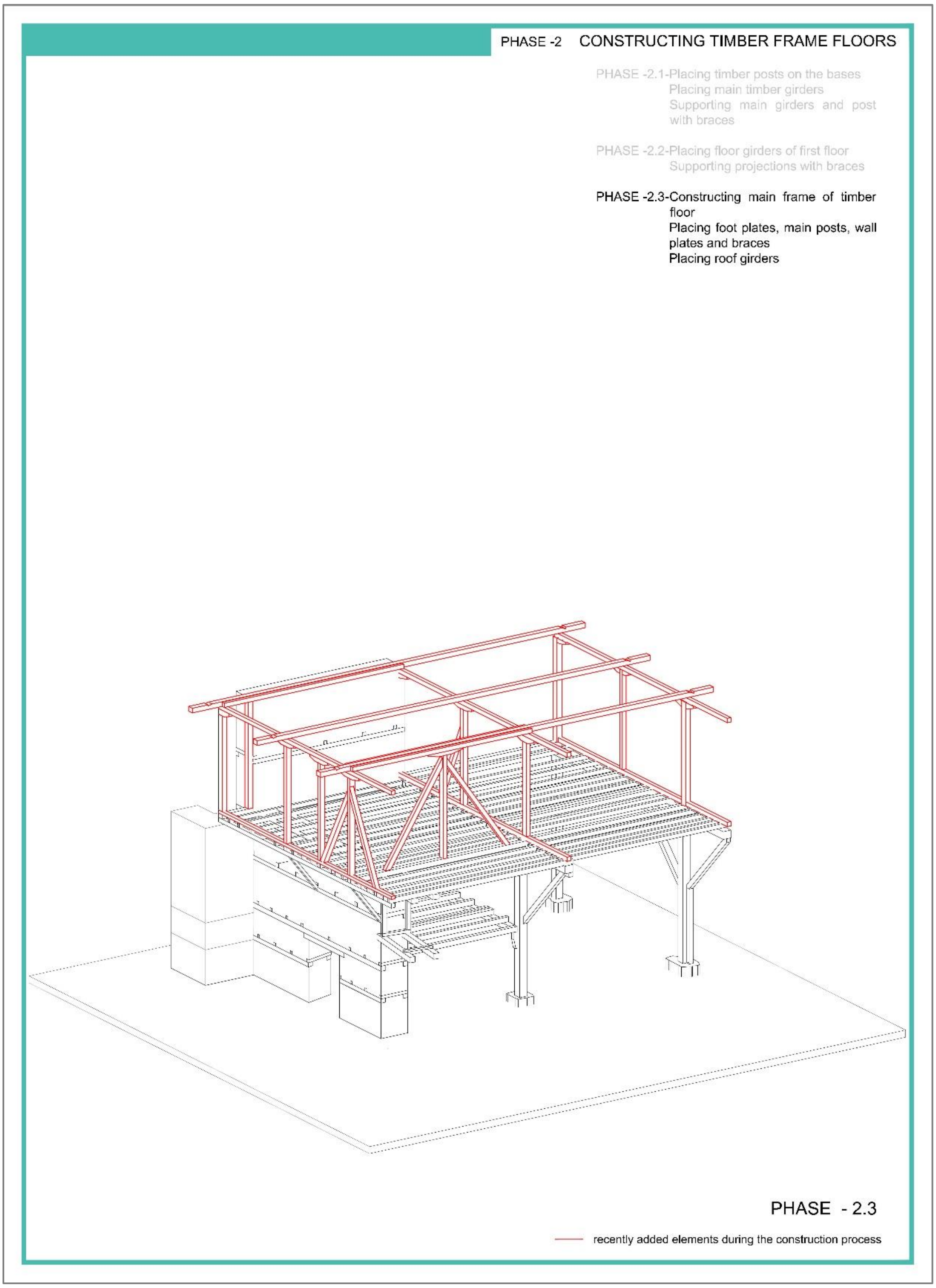


Figure 4.14. Phase 2.3. - Constructing timber frame floors

The central axis of the building is the axis of the wall separating the room from the sofa. The facade of the sofa facing the courtyard is open. The foot plates sit on top of the floor girders, extending perpendicular to the courtyard facade. Timber posts are placed on top of the foot plates, corresponding to the axis of the ground floor posts. The posts have bolsters on their top. The wall plates are placed on top of the bolsters.[11] Timber frame of the courtyard facade does not have any diagonal elements since it will not be covered.

The side faces of the sofa vary depending on the position and orientation of the building and its neighboring lots. Privacy is the most important factor affecting the openings. If the neighboring lot is not visible from the side facade of the sofa, they can be left open; whereas if these sides face the neighboring lots, they are closed. In between traditional Cumalıkızık houses, which are generally built in adjacent order, there are rubble stone masonry walls rising up to the roof. These walls not only provide privacy but also used as service walls for fireplaces and niches. Moreover, they also serve as fire walls preventing the spread of fire easily.

Side facades of the sofa are open like its courtyard facade when the building is located either in the corner lot or at the rear of the lot, without facing the street. In the corner buildings, the open sofa facing the street is covered with timber laths or boards.

The fireplaces can be built within the thickness of the rubble stone masonry wall of the first floor or the mezzanine floor. In these examples, the fire-resistant stone of the fireplace hearth on the floorboards are supported by additional beams in two ways. In the first technique, a pair of timber beams projects from the rubble stone masonry wall right below the floor girders, in opposite direction and the area between the floor girders is filled with timber elements. In the second technique, the floor girders carrying the stone floor of the fireplace are supported by two braces, fixed to the timber lintels of the stone wall.

[11] In the cases where the foot plates or wall plates extends with additions, two pieces are brought together with a bevel of 30º -45º. The joint always corresponds with the axis of the main post.

The building described in this chapter is two-storey high. The majority of the buildings in the settlement are two-storeys. The few remaining buildings are three-storey high, with a rubble stone masonry ground floor and two timber frame floors. Almost all three-storey buildings in the village have been restored and some of them have been reconstructed. Therefore, even though some construction details remain original, they cannot be observed in the structure. However, when archive photographs are examined, the construction techniques of two-storey buildings are also used in three-storey buildings. When the second timber frame floor is placed on the first floors, the timber lintels in the masonry walls carrying the floor girders of the first floor are replaced by the wall plate of the first floor. The remaining parts repeats the construction technique of the first floor. The floor girders of the second floor are placed on top of the wall plates of the first floor, in a perpendicular manner. Foot plate of the second floor is placed on top of the floor girders. Main Posts with bolsters and wall plates are placed on top of the foot plate. The frame is supported with diagonal elements. The second floor can have a projection over the first floor. Braces or covered timber braces, used to support the projection, are placed on the axis of the main posts.

Constructing Timber Roof

Two or three storey buildings also do not differ in terms of their roof construction. Pitched roofs are used in the traditional houses of Cumalıkızık. The roof forms of the buildings, generally located in adjacent order, are either gabled or hipped. Gutters are not used in the roofs, and rainwater is practically directed to the street and the courtyard. The roof girders, carrying the roof, are generally function in pairs. The roof girders that are placed side by side on the wall plate of the first floor (on the middle axis), separating the rooms from the sofa. One of the girders extends towards the street facade and sits on the wall plate, the other extends towards the courtyard facade and sits on the wall plate carried by bolsters of the main posts.

The roof girders following the axis of the main posts not only form the wall plates of the walls extending along the street and courtyard facades but also defines the width

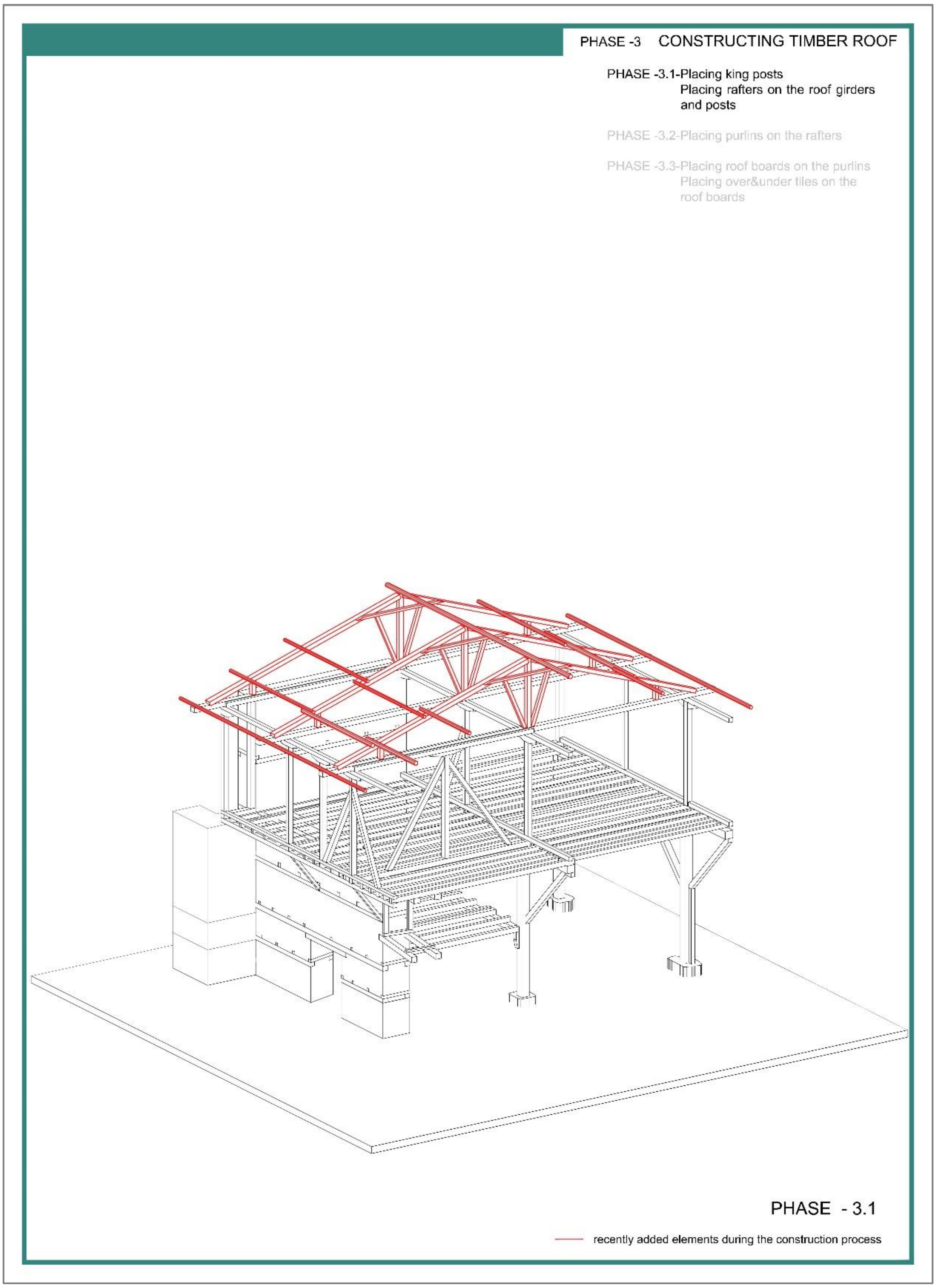


Figure 4.15. Phase 3.1. - Constructing timber roof

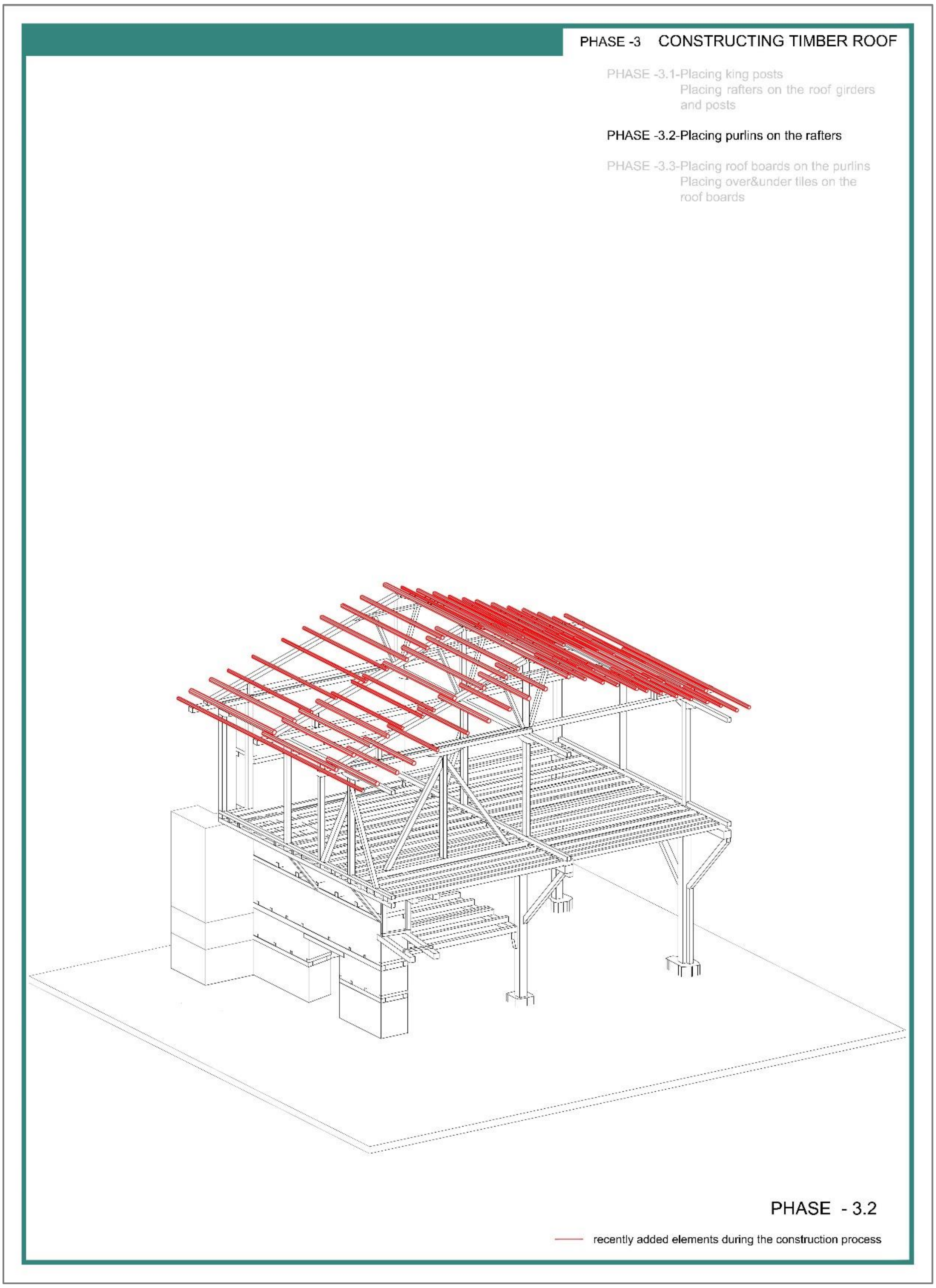


Figure 4.16. Phase 3.2. - Constructing timber roof

of the eaves. The girders, which project from the facade at the width of the eaves, also extend from the middle axis in the interior. With these extensions, the length of the roof girders becomes around 5-6m. In o of the examined buildings (2819-6, 2820-8-7), the roof girders extend in one piece from the street facade to the courtyard facade. In these buildings, the length of the roof girders is again 5-6m. However, the wall separating the rooms and the *sofas* are not located on the middle axis of the building since *sofas* are rather narrow almost like a corridor.

A timber beam is placed on top of the roof girders, which are put side by side on top of the wall plate on the middle axis. King posts are placed on top of this beam, on the axis of the roof girders. It is observed in some examples that the king posts are connected to the beam with half-lap joints (2805-1), (2819-1-9).

The upper ends of the posts are generally notched to connect the rafters. The upper ends of the rafters, giving the slope of the roof, sits on the king posts, whereas their lower ends sit on the roof girders. The roof girders are also notched for the connection of the rafters. The rafter is not placed at the end of the roof girders but rather 20-30 cm behind. The purlins are not generally shaped. The first purlin sits on top of the roof girder, whereas the others are fixed on the rafters at intervals of 40-45 cm. The ridge purlin is placed on the roof posts.

In the roof constructions, timber elements are also used to support the main frame. The braces, extending from the roof girders to purlins are used in between posts. Collar beams are also connected to the posts and rafters, on the same axis, from their front. It is seen in some examples that the king posts are connected to each other horizontally with thin timber elements, and secondary posts are placed between roof girders and rafters.

If the roof is hipped, rafters are connected to the king post in two directions and to the corner posts in three directions. In this way, the angle rafters and the purlins sitting on the rafters can follow the same surface. The roof boards, which are 2-3 cm in thickness, are fixed to angled rafters and purlins. Over and under tiles, ending in line with the

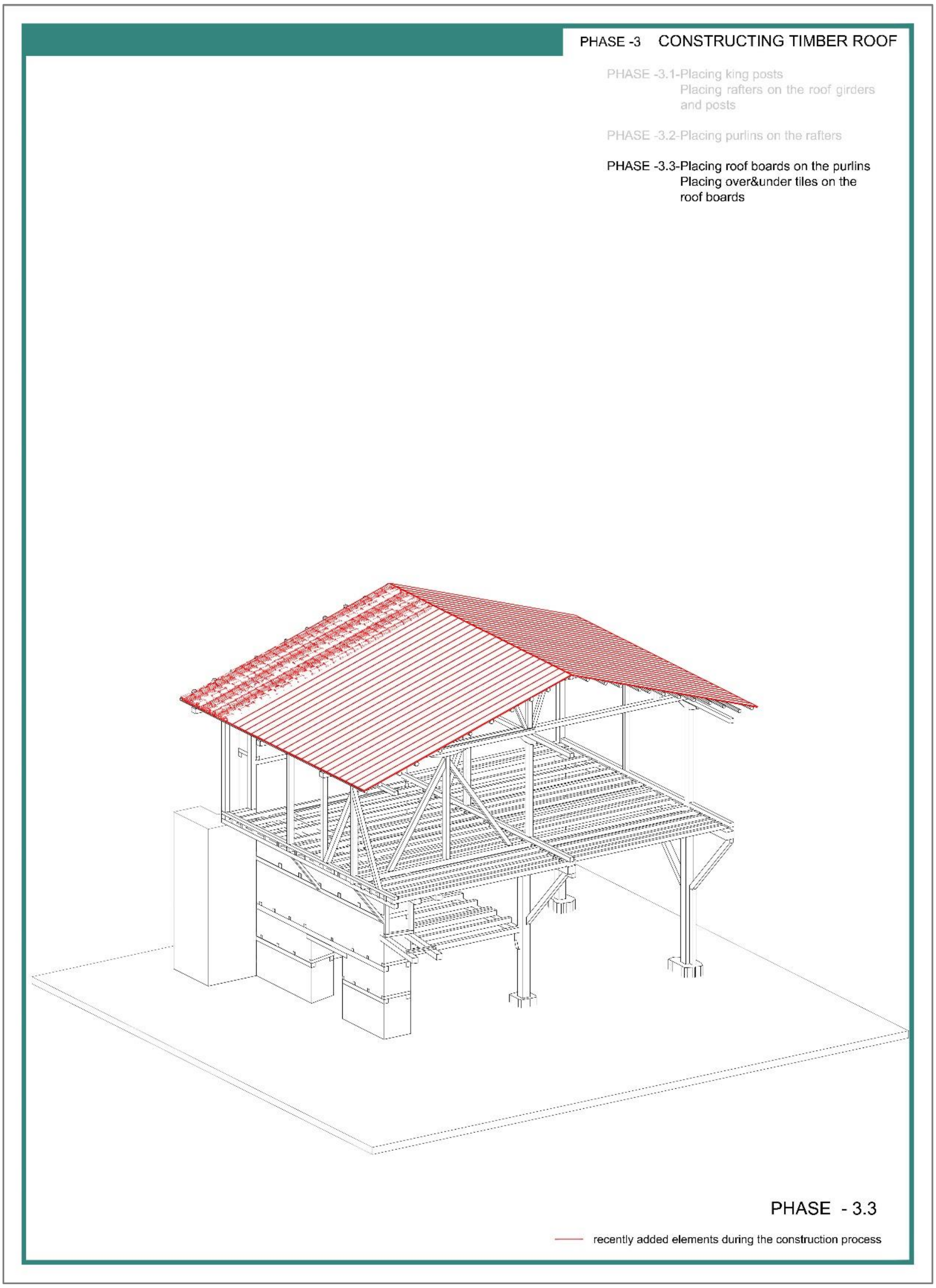


Figure 4.17. Phase 3.3 - Constructing timber roof

purlins, are laid over the roof boards. At the end point of the eave, a timber plank or branch pieces are placed in between roof boards and the tiles projecting 10 cm from the end of the roof boards.

In this way, the roof is finished, and the construction is protected from environmental conditions, including rain and snow. Partitioning of the timber frame walls, preparation of openings, wall infills, floor or ceiling boards, the insertion of architectural elements, plaster and wash works are all done after the roof of the building is finished.

Completing Finishing Works

The main frame of the timber frame wall, which consists of main posts, foot plate, wall plate, and main braces, are finished by the insertion of secondary elements such as window posts, door posts, upper and lower window sills, door sills, studs, braces, and tie-beams. Partitioning is formed according to the openings in the wall and the infill material. Accordingly, first the posts and lintels of the door and window openings are placed within the frame. The remaining studs and tie-beams are placed later. The horizontal, vertical and diagonal timber elements generally have square, rectangular or circular cross-sections. They are not shaped in some cases. The connection between them is made with iron nails.

There is a variety of material and techniques in the infill of timber frame walls in Cumalıkızık. While the period is an important factor in the variety of materials and techniques, the economy and availability of the materials also have a great impact. The first decision to be made during the completion of the timber frame wall is whether to use infill or not.

If the walls would not have infill, the timber frame wall is covered with wood laths or timber planks on both sides. Timber planks are placed horizontally and have 1-2 cm gaps between them. The covering of the timber frame with wood laths of 3-4 cm and plaster is called *bağdadi*. This technique, which has been used for centuries, has

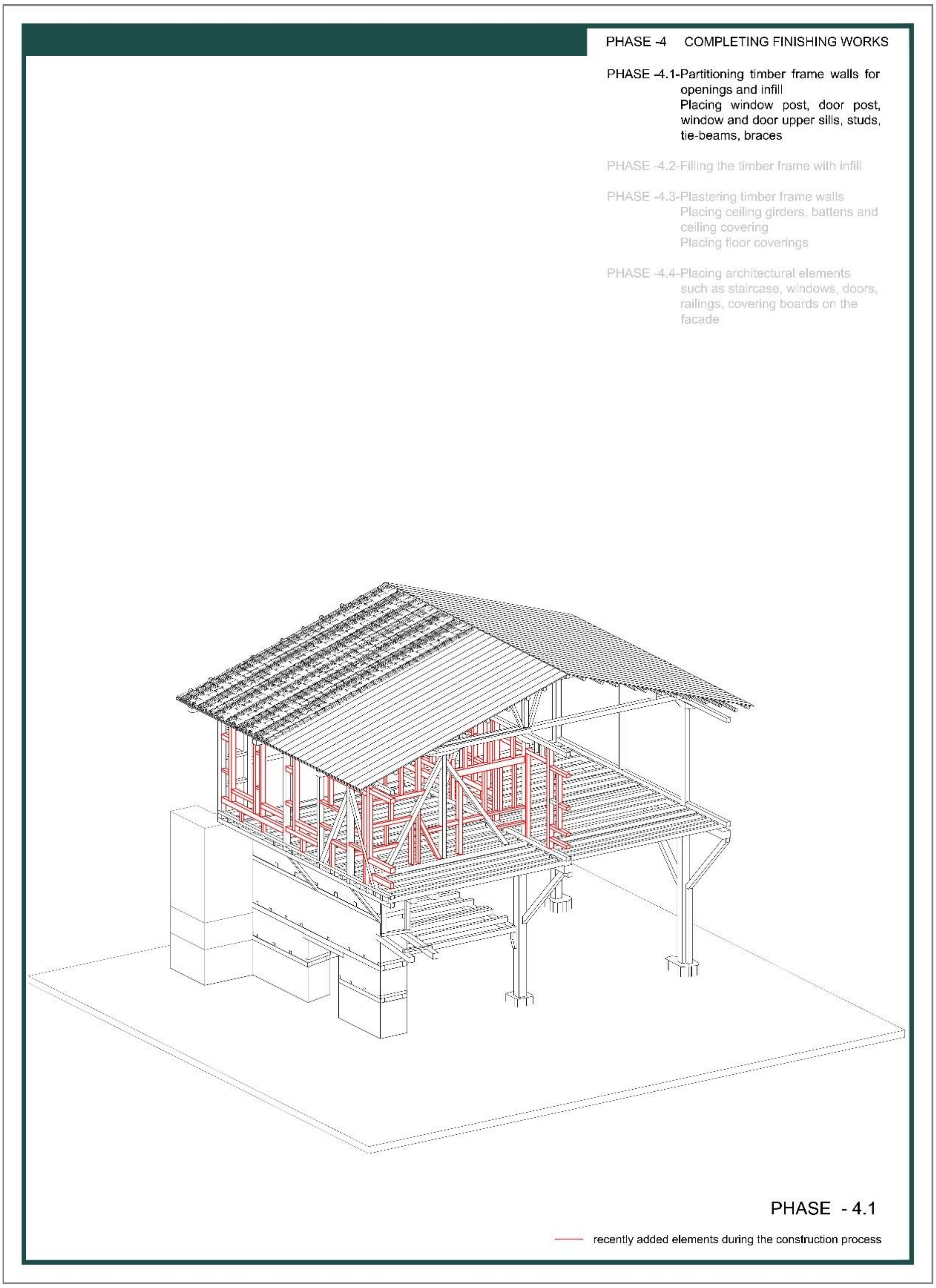


Figure 4.18. Phase 4.1.-Completing finishing works

started to be used on the timber frame walls only in the 18th century (Kuban, 2017-227).

In some buildings, a similar technique is applied by using timber planks or log boards instead of wood laths (2820-8-7). Most probably this technique is used to reduce workmanship and costs. However, since timber planks or log boards have large surfaces compared to wood laths, the mud plaster cannot attach properly to the walls, causing the loss of plasters in a short period of time. *Bağdadi* and timber planks are generally used in the interior walls, whereas they are observed in the exterior walls in some examples. The use of *bağdadi* technique only in certain sections of the exterior walls can indicate a later period intervention. (2805-1)

In the timber frame walls with infills, not only mudbrick or bricks are used as infill material but also branches of hazelnut or chestnut are used by wattle and daub technique.

The most common infill material is mudbrick. Mudbricks are composed of earth, water, and straw, and dried in the sun and become ready for construction shortly after they are cut (about 15 days), making them economic and easily accessible (Kafesçioğlu,1949: 9).

Two types of mudbricks are seen in the village. The first type is made with yellow soil and the other is with red soil. While mudbrick composed of yellow soil has relatively rough corners, the mudbrick composed of red soil is smoother and homogeneous, having the appearance of bricks. Kafesçioğlu (1949) states that the excess of straw in the mudbrick make them rough and hollowed. From this point of view, it can be said that the mudbrick with yellow soil contains more straws than the other. In addition, the stone pieces seen in some of the yellow mudbricks indicate that the soil is not homogeneous. According to the information obtained from the villagers, both types of soil are used to make mudbricks. When buildings where mudbricks with red soil are observed, it is seen that all three buildings have ground floor heights of below 3m. Moreover, two of these buildings have a “plan type without *sofa*”, meaning that the

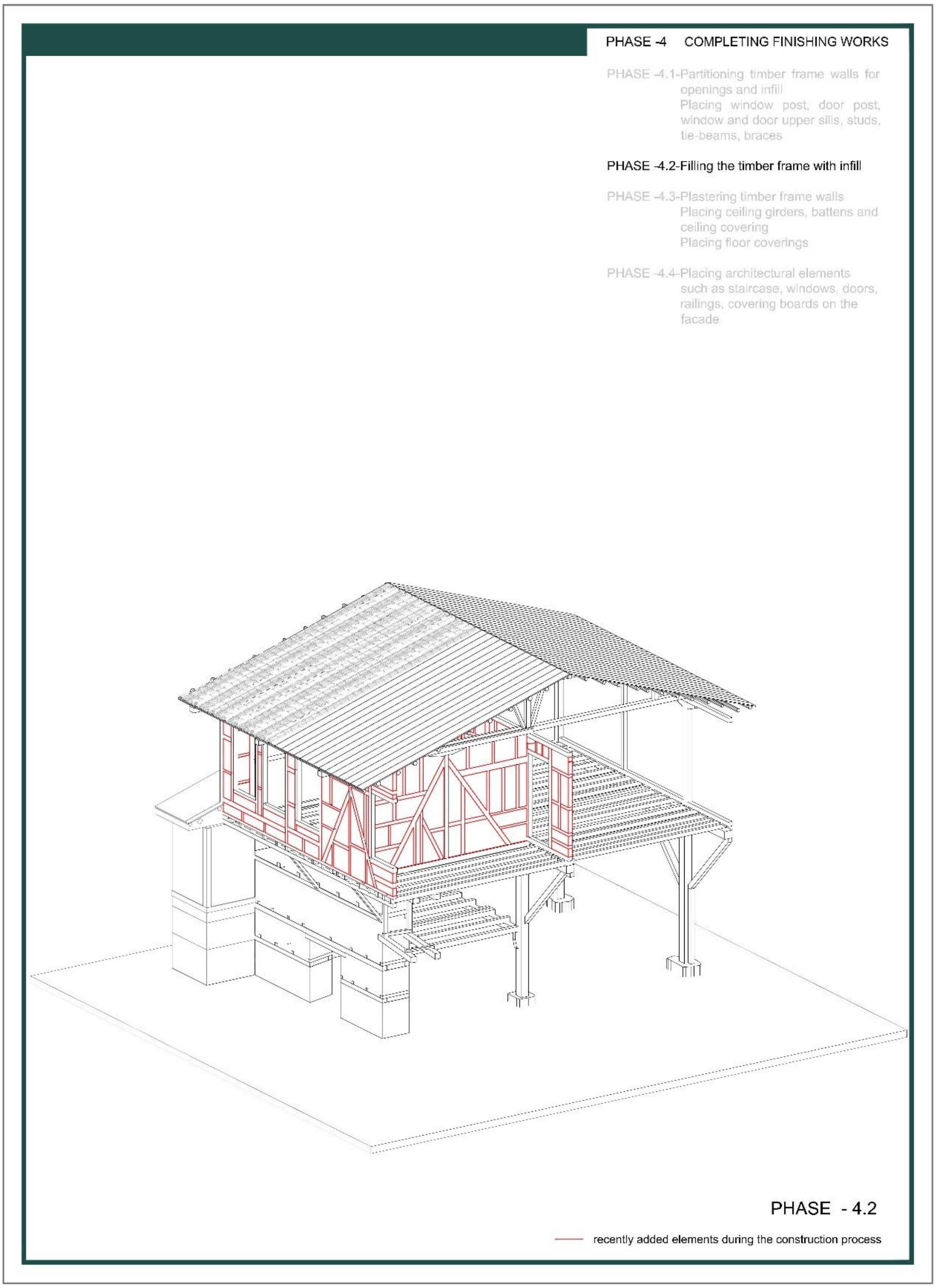


Figure 4.19. Phase 4.2.- Completing finishing works

semi-open space where the rooms are opened is more like a corridor than a sofa. Considering that these buildings are constructed at a later period, it can be said that red soil is preferred over yellow soil in later periods in the production of mudbricks.

The source of both soils is the ‘Çamlıklar’ region on the mountain side of the village. Again, on the mountain side, there is a region called ‘Kerpiçlik’[12] where mudbricks are poured into molds called “*masa*” and kept in the sun (Deniz, 1991: 57-58). The mudbricks are inserted into the timber frame wall with the help of mud mortar. Like mudbrick, mud mortar also consists of soil, water and straw. It is important to note that there are no stones in the mortar that is kept overnight before it is used in the construction (Davulcu, 2013: 1032). Although it is known from the sources that gypsum is mixed into the mud mortar to adhere the mud brick infill to the timber frame in some buildings, there is not any information whether this technique is used in Cumalıkızık (Kafesçioğlu,1955: 92). Since mudbricks are plastered, the pattern of the mudbricks is not taken into consideration.

The other infill material used in the timber frame walls is brick. Two types of bricks are used in Cumalıkızık. One type is the flat brick known as the ‘Ottoman brick’, whereas the other is solid brick. The Ottoman brick is used mainly for decoration purposes in a few buildings and only in certain sections of the facades. These bricks are used with mortar joints with almost the same thickness of bricks. Geometrical patterns are created on the facade by placing the bricks in a certain order**.** It is thought that water resistant lime plaster is used between these bricks since the decorated facades are not plastered but rather left exposed.

The use of solid brick is different. Solid bricks are generally used as infill material underneath the plaster layer like mudbricks. The use of bricks, which became widespread in the 19th century, is seen in later period buildings, later interventions or repairs in Cumalıkızık (Şahin Güçhan & Karakul, 2016:189-190). The brick, which is expensive and requires more workmanship compared to mudbrick, is water resistant

[12] Information is obtained from the interview with Şerife Uludağ (1958) in 2019.

unlike mudbrick. Since brick is also fire-resistant, it is especially used in fireplaces, chimneys, and furnaces.

Another infill technique used in Cumalıkızık is the wattle and daub technique, which dates to ancient times.[13] This infill technique is formed by wattling three pieces of branches which are vertically placed in the empty space of timber frame with thinner branches in horizontal direction. The branches on both sides are fixed to the posts of the timber frame with thin nails. Hazelnut or chestnut branches (called hazelnut or chestnut stick in the village) are used in this technique. Tightly wattled branches are later covered with thick layers of plaster on both sides. This technique, which is not common in the settlement, is seen both in the exterior and interior walls. (2820-8-7, 2800-36)

After the infills and coating are finished, plaster is applied on surfaces. Since the master builders could not be reached in the settlement, the evaluations regarding which plaster is used in which infill, plaster layers and the contents of the mixture are made based on visual observations on site and literature review.

It is observed in the settlement that mud plaster and lime plaster are applied as two layers. The first plaster layer is mud plaster, applied on all coating and infill systems apart from the one with Ottoman bricks. Various additives such as animal blood, eggs, sugar, salt, oil can be incorporated into the plaster composed of soil, straw and water. However, since these additives cannot be identified visually, only the color of the plaster, size of the straws and general structure and fineness of the mixture are observed.

Generally, the first layer of plaster, applied both in the interior and exterior surfaces, is yellow in color and contains large pieces of straw. Fine homogenous and yellow-gray plaster with small amount of straw is only observed in the building, whose dismantling phase was observed on site. It is known that during the preparation of the

[13] Tikkanen, A. & Lotha, G. (2018) "Wattle and Daub", Encyclopedia Britannica, https://www.britannica.com/technology/wattle-and-daub (23.12.2019)

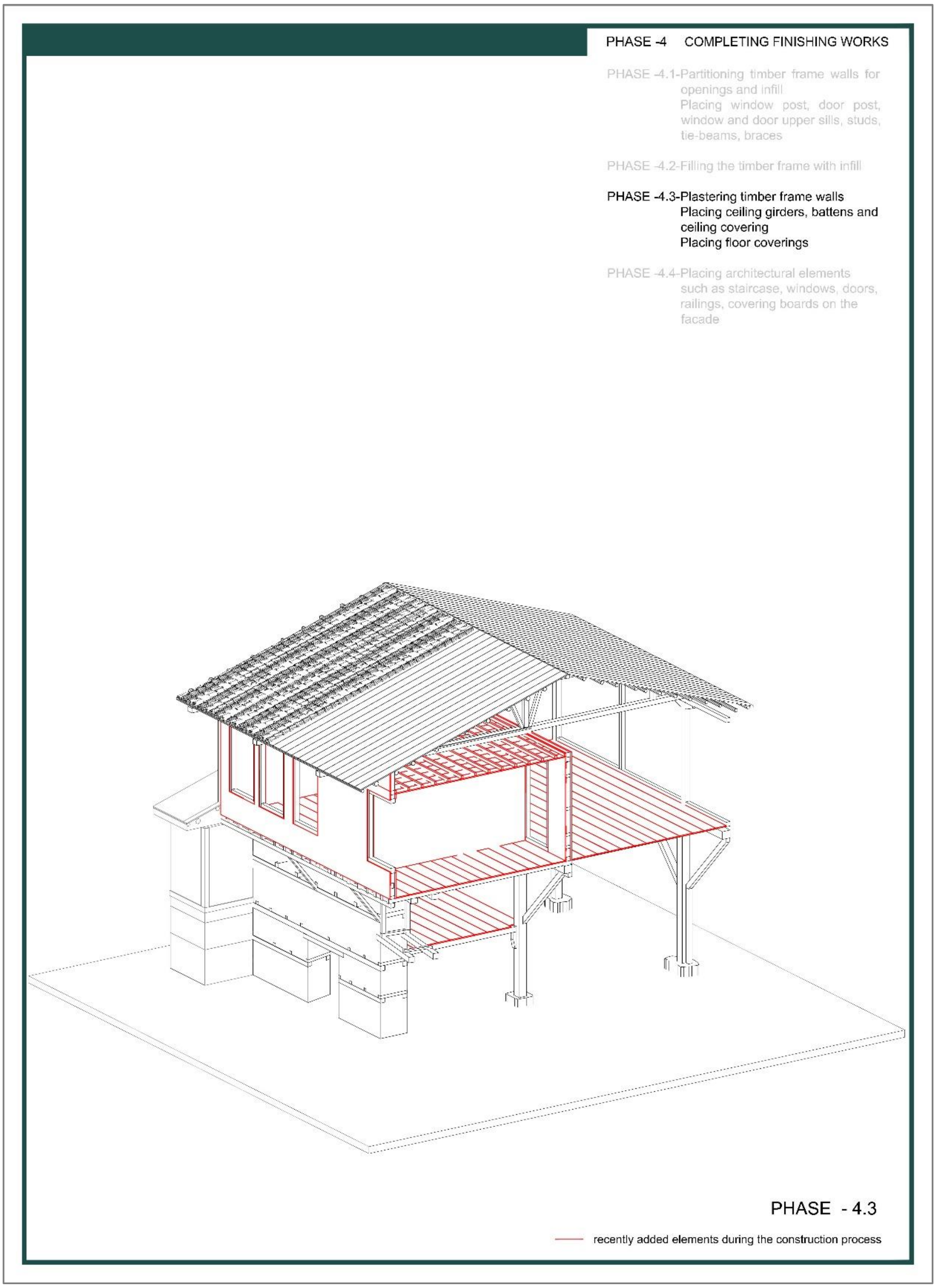


Figure 4.20. Phase 4.3.-Completing finishing works

mud plaster, the soil is sieved, and water is added to the mixture of soil and straw, and this mixture waits for a few days like the construction of mudbrick and mortar (Günay, 2002:146). After the plaster is applied to the wall surface, it is necessary to wait until it dries. Although the waiting period is stated as a season in some sources, this is valid only for lime mortar, no such time is required for mud mortar. (Üredi, 2009: 27) In fact, the plaster to protect the wall, hence mudbrick and mud mortar should be applied in a short time. Otherwise, these materials made from soil begin to deteriorate rapidly as they take water. For this reason, the plaster is renewed or repaired almost every year in the buildings where mud mortar and mud plaster are used with mudbrick wall.

The measurements for the architectural elements such as windows, doors, cupboards, and *sedirs* are taken by the carpenter before the wall infill starts and these architectural elements are prepared parallel to the infill works.

While mud plaster is drying, ceiling and floorboards are built. The priority is given to ceiling boards. In Cumalıkızık, only the ceilings of the rooms are covered. Ceiling boards are not used in the sofa, in *hayat*, or in-service spaces. While most of the ceilings are covered by timber panels, there are examples of ceilings covered by branches and plaster.

Timber ceiling boards are generally plain and composed of flat boards. Caisson ceiling is observed only in one room of a building.[14] Since roof girders are put at the level of the posts, the ceiling boards also form a structure. As it is mentioned above, before the infill works of the wall, ceiling girders are put on top of the wall plates adjacent to the roof girders. Ceiling girders are nailed from the bottom of the roof girders in the opposite direction with intervals of 40-50 cm. These ceiling girders are covered by ceiling boards both from the bottom in the opposite directions. The ceiling boards are connected at 45º angle at the corners. Profiled laths are nailed onto the ceiling boards to cover the gaps between the ceiling boards. The laths, which have plain profiles,

[14] Since this building is damaged by fire, it was rebuilt above a certain level about 100-120 years ago.

come together to form a two-dimensional geometric composition. The most common composition is rectangles inscribed in one or two frames.

The construction underneath the plastered ceiling formed by branches cannot be observed. However, the chestnut or hazelnut branches are plastered from the bottom.

After the ceiling boards, the floorboards start to be laid. Except the ground floors, floors of all spaces on the upper floors are covered by large floorboards. The floorboards are nailed directly on the floor girders, with the exception of elevated platforms (*seki*). The ground floors of the service spaces like courtyards, *hayat*, storage spaces and dam, are covered with slates. Slates have varying thicknesses and are directly placed on the earth ground. Slates are placed vertically in places where it is necessary to direct water for drainage. The floor is left as earth in some spaces.

Staircases, risers, railings and their covers are completed after the ceiling and floor works. Consequently, architectural elements such as windows, doors and cupboards are placed.

After completely dry, mud plaster is wetted, and lime plaster is applied on mud plaster. Lime plaster is applied as a thin layer. Aggregates such as salt or adhesive are used instead of sand. Lime wash is composed of lime and oil and is colored with earth paints and applied on lime plaster before it dries (Günay, 2002-147).

After lime plaster and wash is applied, the ironworks of the doors, jambs, skirting boards, and the corner and floor moldings are completed.

Considering that the service spaces and elements in the courtyard are built after the main building, the spaces such as *aşhane* (kitchen), *dam,* storage, fireplace, and furnace are built with the same construction process.

The construction season is from spring to autumn. Master builders (dülger) are responsible for the construction of the buildings. Master builders can construct the structure either by coordinating the masters such as stonemasons, brick masons or lime craftsmen or can construct the building together with their assistants. The carpenter is responsible for the construction of architectural elements such as stairs, windows, doors, cupboards, shelves and hood of the fireplace. Although it is said that the construction of the buildings in Cumalıkızık was held by Greek (Rum) master builders living in Gürsu settlement near the village, there is not any information supporting this statement. It is known from the interviews with master builders in other settlements that there are rituals about the construction process. (Üredi, 2009). However, the rituals specific to Cumalıkızık are not known.

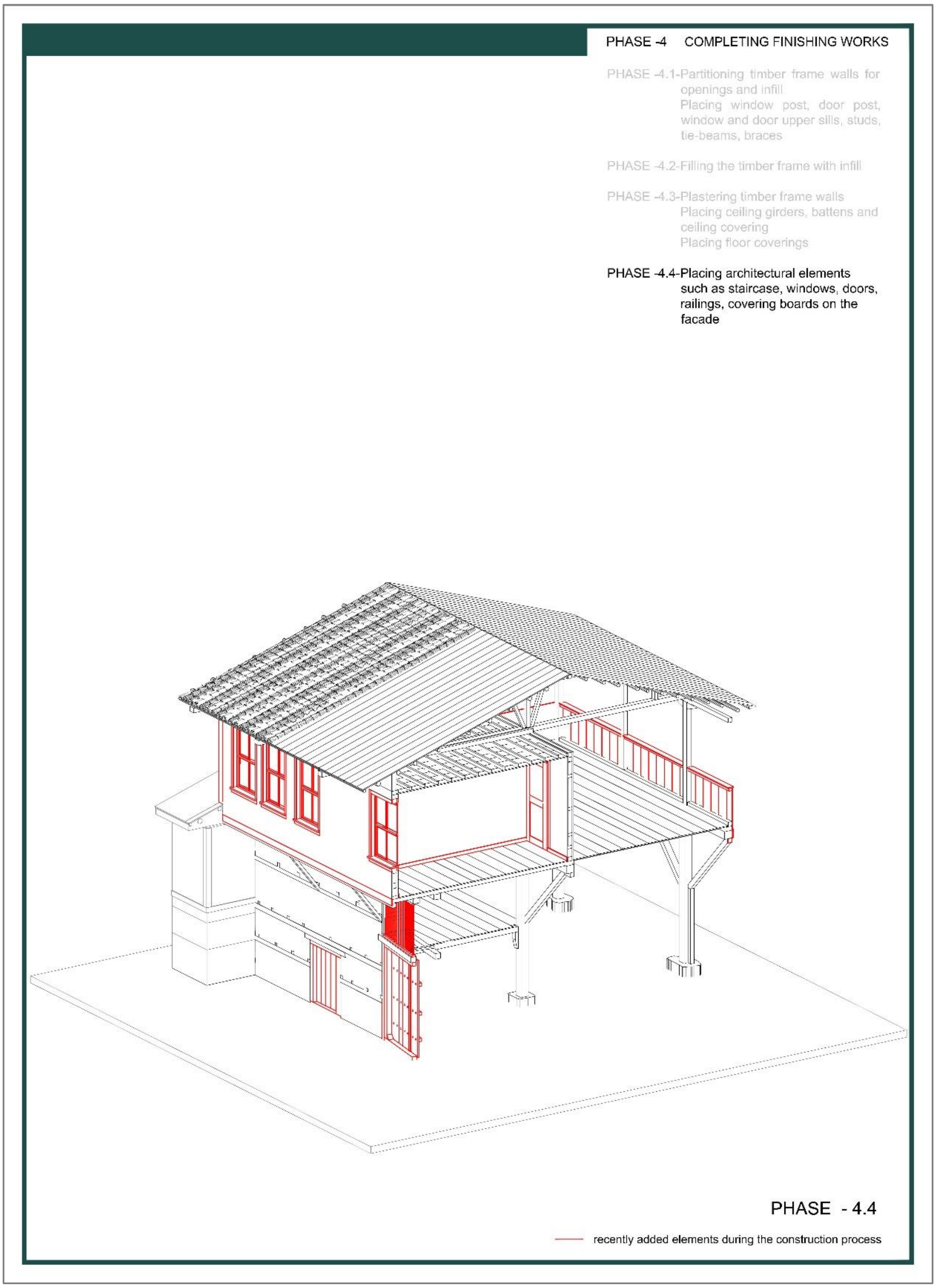


Figure 4.21. Phase 4.4. - Completing finishing works

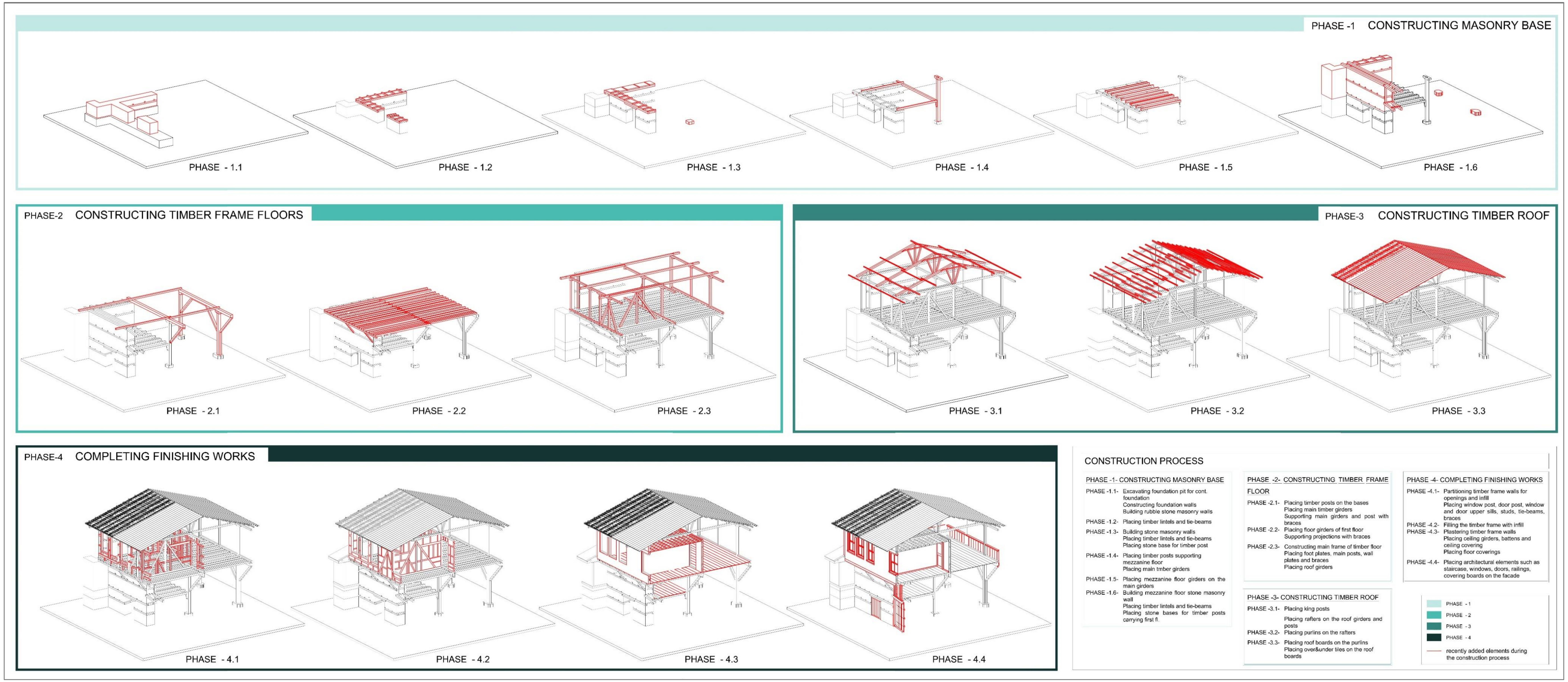


Figure 4.22. Phases of the construction

CHAPTER 5

CONCLUSION

The importance of this thesis and its contribution to the conservation of Cumalıkızık

The main problem of this thesis is defined as the rapid loss of original architectural details and character of traditional Cumalıkızık houses due to changing lifestyle, intense tourism pressure and conservation works. The scholarly work, summarized in Section 1.1, focuses mainly on the general and architectural features of the settlement, whereas information about construction technique and material properties is only studied in one source. The topic, which is not studied systematically with selected cases studies, gives rather a general information about the construction techniques used in Cumalıkızık houses.

As a conclusion, this thesis conducted following studies in addition to scholarly work done so far as follows:

- The planimetric characteristics of traditional Cumalıkızık houses have been demonstrated by a comprehensive study based on the architectural survey of 55 buildings.
- The architectural characteristics of traditional Cumalıkızık houses, their construction techniques are analyzed together with the existing knowledge in literature and traditional Cumalıkızık houses are evaluated within the context of the Ottoman house tradition.
- The construction techniques of traditional Cumalıkızık houses have been systematically examined, classified and documented from the construction of the foundation to the roof, through photographs, drawings and written

explanation on three groups of buildings selected from different types of buildings.

Documentation is crucial in settlements, which are losing their original features rapidly despite conservation works like Cumalıkızık. Even today, many architectural elements including fireplaces, cupboards, *sedir*s, *abdestlik*s (ablution basins) and top windows are either lost or about to disappear. Almost all open sofas are closed, and wet spaces are added to the sofas. The original building details and architectural elements are seen almost exclusively in abandoned buildings. These building are also in danger of demolishment due to negligence.

Along with the additions or alterations of the users, conservation works in the settlement also lead to the loss of original building details and architectural elements. The dilapidated original elements have been replaced with new ones and facades has become standardized by street rehabilitation works, overlooking interventions in different periods.

After Cumalızık was inscribed on the World Heritage List, conservation works have been intensified. The remaining buildings have been dismantled to a certian level of the foundation or stone wall and rebuilt within the scope of conservation works. During the meticulous dismantling works, the building is documented layer by layer, timber frame wall facades, floor construction plans, roof trusses and purlins are measured, drawn, and photographed.

Original building materials (chestnut tree, mudbrick, mud mortar, mud plaster) are used in the reconstruction of the buildings. However, because of the use of the tree before it dries sufficiently, the insufficient information regarding the ingredients of mortar, plaster, and mudbrick, the forged iron nails that are not implemented today, th standardized structural elements, the overlooking of climatic conditions, rapid reconstruction process and non-compliance with waiting times for drying, the reconstructed buildings do not carry the characteristics of original buildings.

Although the new details are based on the original building details, the dimensions and implementations differ. The nails can only be used as decorative elements. While the reconstructed buildings do not provide information regarding the original building and details, they also prevent the opportunity to evaluate some of the information that we cannot make sense of today in the future.

In addition, the original structural and architectural elements of dismantled buildings are not stored. Therefore, the information such as which section of the tree is used for structural elements and how they are cut, how they are connected to each other, the amount of straw or water in the mortar and plaster is lost. Minimum interventions without dismantling and reconstruction should be the most important restoration principle for the conversion of traditional Cumalıkızık houses.

In cases where original building elements cannot be used, the original building details documented by this study will serve as a basis and reference for the restoration works.

Understanding the construction technique at the end of the study

Cumalıkızık Village, whose known roots date back to the 13th century, has been overlooking the plain of Bursa on the outskirts of Uludağ. For at least seven hundred years, it has been living and producing together with stone, soil and water, which exist in this terrain for 250-300 million years. Cumalıkızık people, who has been living at the outskirts of this mountain surrounded by forests for seven hundred years, has learned the stone, earth, water, and trees in the region primarily in order to survive rather than for construction.

It is this traditional knowledge, accumulated and distilled for hundreds of years, that made this culture and these buildings reach the present day. Ineffective against nature, human beings learned from earthquakes, floods, fires, storms and has reflected what they had learned to their lives. Today, the fine construction details and solutions that we try to make sense of through deduction are only a small and fragile part of these experiences and the complex of life knowledge, most of which has unfortunately been lost.

As the beginning of the conclusion of this study on the construction techniques of traditional Cumalıkızık house, this section is intended to present the distilled information obtained from the bibliographical survey, site visits, interviews with villagers and the understanding and interpretation of the author.

In Cumalıkızık traditional houses, the most remarkable, most impressive aspect is the harmony of buildings with nature and the "place". This harmony is so strong that, unlike today's sensitive, environmental-friendly person or structure, the traditional structure or the builder is in a “state of being one (one body) in a familiar whole (nature)” Stone is the stone of the region; the earth is the earth of the region and the trees; are the trees of the region. In order to exist in nature, the structure /humans learn from nature for generations, integrates with nature, and becomes whatever nature is. They choose to exist with nature, not in spite of nature. Instead of forcing the materials or conditions, the builders act in line with the potentials of the site. They are subjected to the rhythm and time flow in nature. As well as knowing the right time, they know waiting. Nature teaches humans the same thing when planting crops, raising chickens, making bread, yogurt, pickles: the right time, to work and to wait. In the structure constructed by these three principals that are the realities of life. Humans wait for trees that are cut at the right time to dry, the soil mixed with water and straw to ferment, mudbrick and mud mortar to dry.

Flexibility and dynamism are other astonishing features of the structure. The structure, which clearly reflects the life, is similar to nature and the ability to develop, change and adapt to nature. In a building that is open to growth and change, "need" is the determining criteria, and change indicates that the building is alive. Knowing that one or more of the plan schemes that we give different names in typology studies have been experienced in the history of a building or seeing that a building taking its entrance from the courtyard transformed over time into a building taking its entrance from the *hayat* by the mass placed over the courtyard, reveals peaceful coexistence of the building's periods and perceiving it as a whole with its story. When the same holistic view is directed to the entire settlement, the distinctions become blurred and colors appear.

Cumalıkızık, which was designated as an urban site in 1981, has a conservation history of nearly forty years. In addition to conservation efforts such as conservation council decisions about the site protection and building registration, studies such as conservation development plans, raising public awareness, interest and curiosity, have been carried out in the settlement. The scholarly works led by Recayi Coşkun with his thesis continued with many articles, summer schools, studio works, workshops and master's theses. Although there are theses about Cumalıkızık concentrating on its social life, culture, rural tourism, plant and animal species in the region, they generally focus on the architectural features and conservation problems of the settlement.

Further Study

In Cumalıkızık, the construction tradition of houses does not continue, and therefore there not any practising master builders at present. This situation has led to the loss of historical knowledge of the construction process of traditional buildings, the sources, content, preparation and implementation of the traditional construction materials.

Therefore, information regarding traditional master builders, traditional building materials and construction process could not be obtained within the scope of this thesis. Nevertheless, questionnaire-based interviews can be conducted with the village elders, and the information about the materials and construction process can be studied further.

Architectural elements of traditional Cumalıkızık houses and their construction techniques are excluded from the scope of this study. The visual and written information collected during this study will be published as an article in the near future.

The thesis is based on three groups of buildings. The first group is composed of eight buildings, which have preserved their original architectural characteristics and structural integrity, the second group is composed of the dismantled building and the third groups comprises eight ruinous buildings. Further studies that would increase the number of buildings will deepen and enrich the research. Moreover, observation of the future dismantling works within the scope of conservation works will provide detailed information on the construction techniques of traditional Cumalıkızık houses and the changes in these construction techniques.

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APPENDICES

A. List of Studied Buildings

Table A.1. *List of studied buildings in Group A*

BUILDING CODE		ADRESS	OLD PHOTO*	NEW PHOTO**	LOT-BUILDING ID	REG. NUMBER	REG. DATE	OLD PARCEL NUMBER
A	1	Kurtbasan Sok. no:18			**2800-3**	53	1990	225
A	2	Bozdemir Sok. no:5			**2800-31**	46	1990	245
A	3	Kurtbasan Sok.			**2800-38**	43	1990	219
A	4	Keçecioğlu Sok. no: 3			**2805-1**	34	1990	196
A	5	Bozdemir Sok. no:16			**2805-9**	48	1990	204
A	6	Engin Sok. no: 22-24			**2813-2-3**	16	1990	12—13
A	7	Keçecioğlu Sok. no:14			**2819-6**	74	1993	58
A	8	Kurtbasan Sok. no:1-3			**2820-7-6**	39	1990	45-46

*Source: Bursa Council for Conservation of Cultural and Natural Heritage Archive
**Source: R. Tuğba Kızılkuşak Archive, 2018

Table *A*.2.List of studied buildings in Group B

BUILDING CODE		ADRESS	OLD PHOTO*	NEW PHOTO**	LOT-BUILDING ID	REG. NUMBER	REG. DATE	OLD PARCEL NUMBER
B	1	Kurtbasan Sok. no: 4			2819-1-9	38	1990	53

*Source: Bursa Council for Conservation of Cultural and Natural Heritage Archive
**Source: R. Tuğba Kızılkuşak Archive, 2018

Table *A*.3.List of studied buildings in Group C

BUILDING CODE		ADRESS	OLD PHOTO*	NEW PHOTO**	LOT-BUILDING ID	REG. NUMBER	REG. DATE	OLD PARCEL NUMBER
C	1	Kurtbasan Sok. no:25			2798-15	122	1993	283
C	2	1.Ferdağ Sok. no:17			2798-18	148	2010	286
C	3	Bozdemir Sok.			2800-21	49	1990	258
C	4	Saldede Sok. no:19			2800-24	126	2009	261
C	5	Kurtbasan Sok.			2800-36	42	1990	250
C	6	İsimsiz Sok.			2812-3	63	1993	22
C	7	1.Ferdağ Sok. no:26			2817-16	167	2010	194
C	8	1.Ferdağ Sok. no:32			2817-21	181	2014	

*Source: Bursa Council for Conservation of Cultural and Natural Heritage Archive
**Source: R. Tuğba Kızılkuşak Archive, 2018

B. Drawings of Studied Buildings

Figure B.1. Information sheet of building A-1: 2800-3

Figure B.2. Information sheet of building A-2: 2800-31

Figure B.3. Information sheet of building A-3: 2800-38

Figure B.4. Information sheet of building A-4: 2805-1

Figure B.5. Information sheet of building A-5: 2805-9

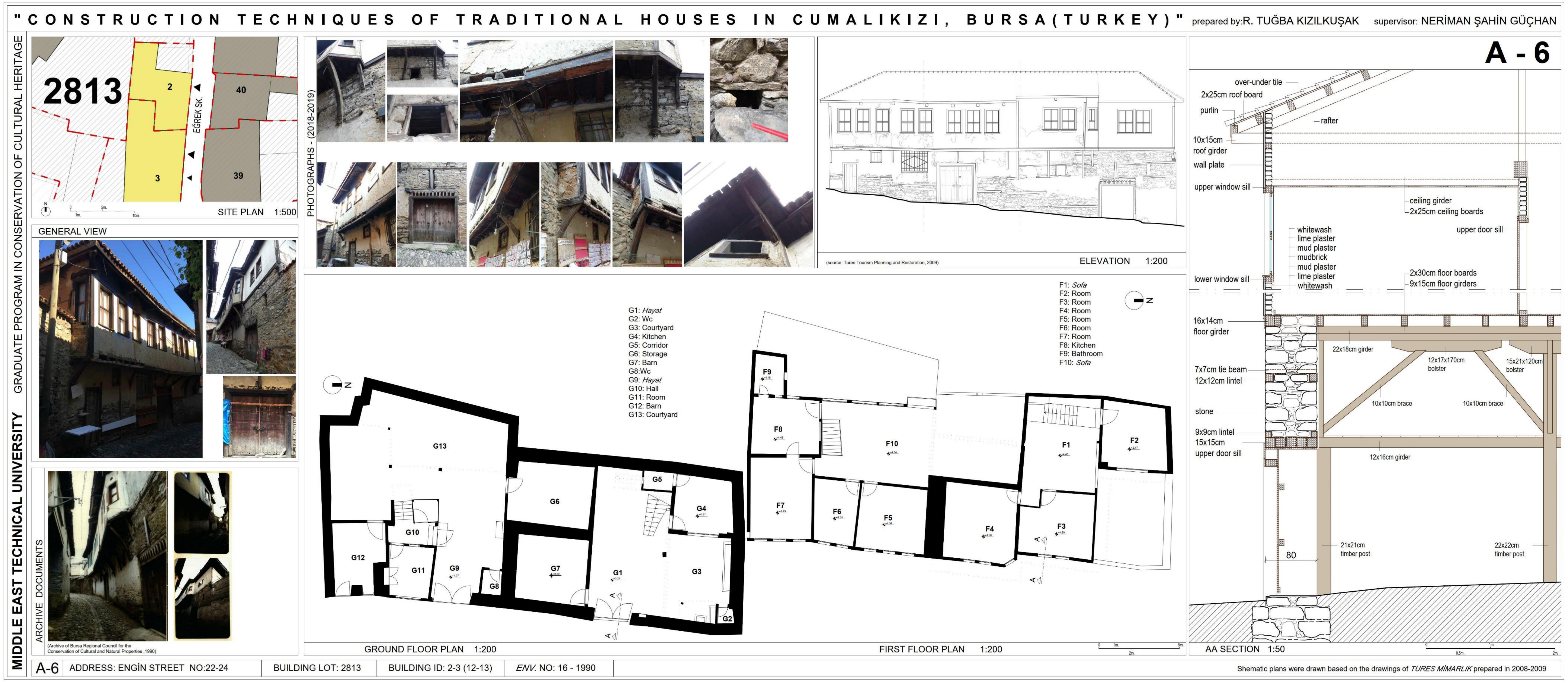


Figure B.6. Information sheet of building A-6: 2812-2-3

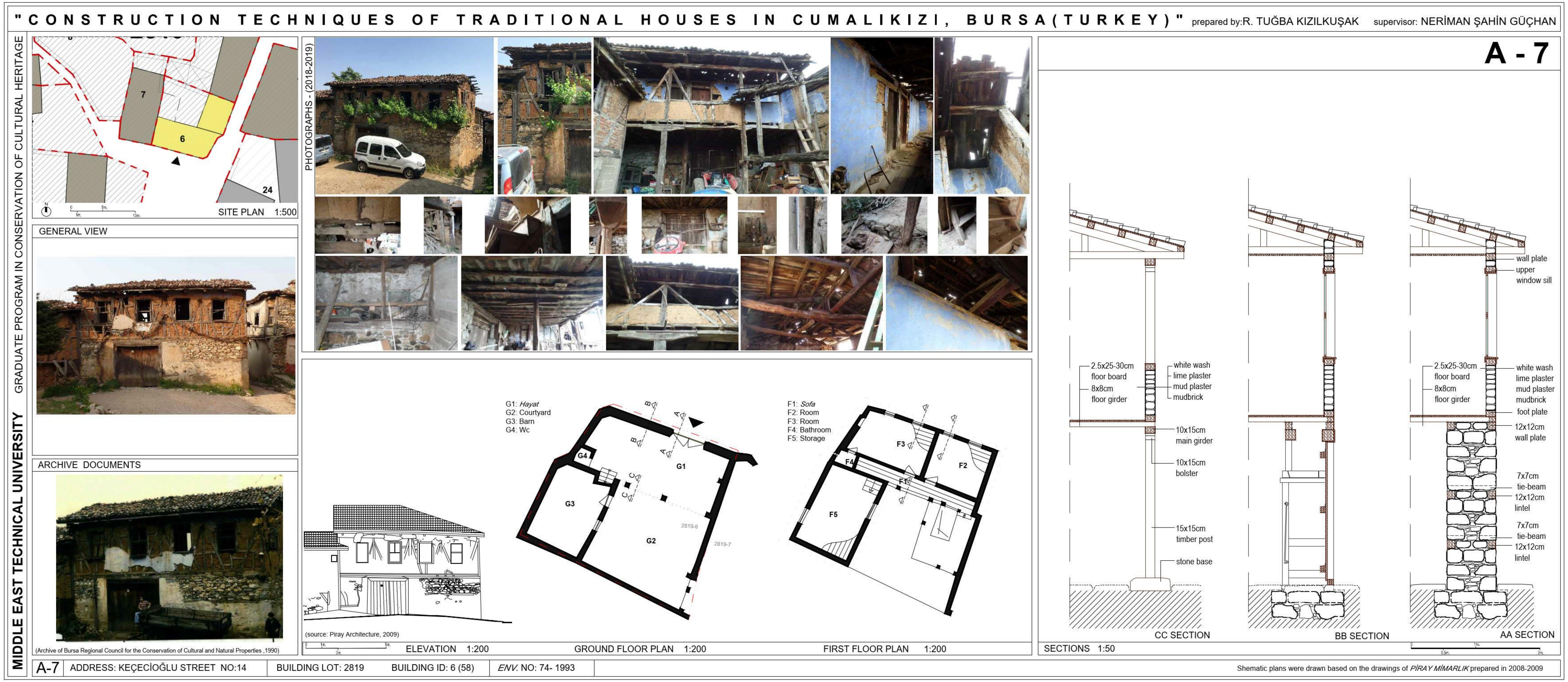


Figure B.7. Information sheet of building A-7: 2819-6

Figure B.8. Information sheet of building A-8: 2820-8-7

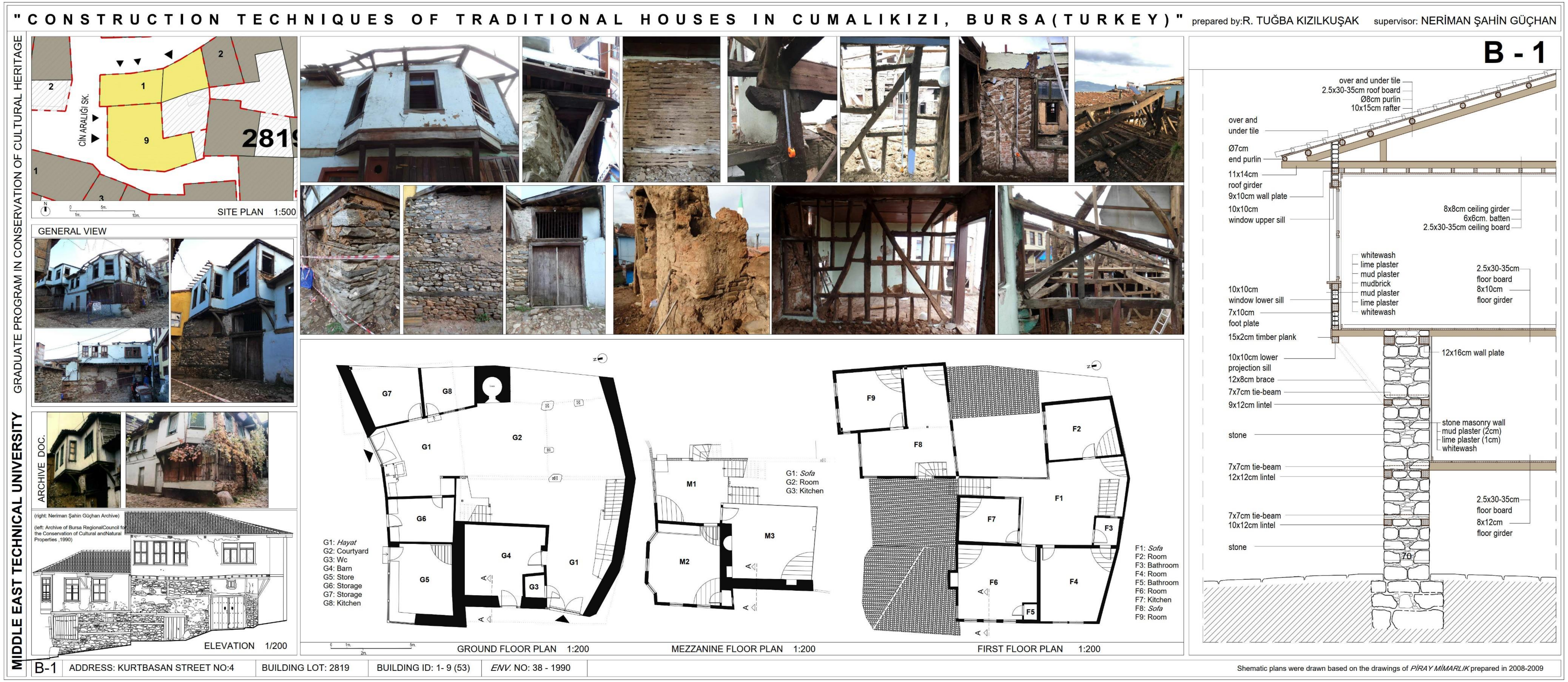


Figure B.9. Information sheet of building A-9: 2819-1-9

C. Evaluation of the Studied Houses with Reference to Coding System

fo Foundation

fo.1 Continuous Foundation

f0.1.a with rubble stone masonry

f0.1.b with rock

f0.1.c with monoblock stones

f0.2 Discontinuous Foundation

f0.2.a with slate stones

f0.2.b with rubble stones

mw Masonry walls

mw.a Change in wall thickness

mw.a.1 no change in wall thickness

mw.a.2 decreasing wall thickness

mw.b Timber elements in stone masonry

mw.b.1 with timber lintels

mw.b.2 with timber lintels and posts

mw.b.3 with timber lintels, posts and braces

mw.c Corner chamfer

mw.c.1 with flat projection

mw.c.2 with corbelled projection

mw.d Spolia

fw Timber frame walls

fw.a Construction- connection detail of main post and floor plate

fw.a.1 lap joint

fw.a.2 butt joint

fw.b Infill

fw.b.1 no infill

fw.b.2 mudbrick

fw.b.2.a yellowish mudbrick

fw.b.2.b reddish mudbrick

fw.b.3. brick

fw.b.3.a Ottoman brick

fw.b.3.b solid brick

fw.b.4 wattle and daub

fw.c Finishing

fw.c.1 plaster on the whole surface

fw.c.2 lime plaster on the joints

fw.c.3 plaster on the covered surface

fw.c.3.a *bağdadi*

fw.c.3.b timber planks

p Timber Post (Size of cross section)

G1.p Ground floor post

G1.p.a 17x17cm - 27x27cm

G1.p.b 10x10cm – 15x15cm

Fw.p First floor post

F1.p.a 13x13cm – 15x15cm

F1.p.b 10x10cm – 12x12cm

R1 Roof

R1.a Form

R1.a.1 gable

R1.a.2 hipped

R1.b Construction

R1.b.1 no roof girder

R1.b.2 with roof girder

R1.b.2.a extending as a pair

R1.b.2.b extending as one piece

Horizontal and Vertical Connection Detail Codes

G0 Transition from foundation to ground floor

G0.1 Transition from masonry to masonry (street façade)

G0.2 Transition from masonry to timber post (courtyard façade)

M0 Transition from ground floor to mezzanine floor

M0.1 Transition from masonry to masonry (street façade)

M0.2 Transition from timber post to timber frame system (courtyard façade)

F0 Transition from ground / mezzanine floor to first floor

F0.1 Transition from masonry to timber frame system (street façade)

F0.2 Transition from timber post to timber post (courtyard façade)

F0.3 Transition from timber frame system to timber frame system (middle axis)

R0 Transition from first / second floor to roof

R0.1 Transition from timber frame system to roof (street façade)

R0.2 Transition from timber post to roof (courtyard façade)

R0.3 Transition from timber frame system to roof (middle axis)

BUILDING CODE	LOT-BUILDING ID	FOUNDATION (fo)					MASONRY WALLS (mw)							
		Composite Foundation					Change in Wall Thickness (mw.a)		Timber Elements in Stone Masonry (mw.b)			Corner Chamfer (mw.c)		Spolia (mw.d)
		Continous Foundation (fo.1)			Discontinous Foundation (fo.2)									
		with rubble stone masonry	with rock	with monoblock stones	with slate stones	with rubble stones	no change in wall thickness	decreasing wall thickness	with timber lintels	with timber lintels and posts	with timber lintels, posts and braces	with flat projection	with corbelled projection	
		fo.1.a	fo.1.b	fo.1.c	fo.2.a	fo.2.b	mw.a.1	mw.a.2	mw.b.1	mw.b.2	mw.b.3	mw.c.1	mw.c.2	mw.d
A-1	2800-3							●	●					
A-2	2800-31				●		●				●			
A-3	2800-38				●			●		●				
A-4	2805-1				●	●		●	●					●
A-5	2805-9				●		●			●				
A-6	2819-6						●		●			●		
A-7	2813-2-3				●			●	●					
A-8	2820-8-7				●			●		●				
B-1	2819-1-9				●	●		●	●				●	
C-1	2798-15							●	●					
C-2	2798-18								●		●			
C-3	2800-21								●					
C-4	2800-24				●		●			●				
C-5	2800-36							●	●					
C-6	2812-3							●	●					
C-7	2817-16								●					
C-8	2817-21							●	●					
*	2794-42													
*	2812-8-9	●	●	●										
*	2817-1													

BUILDING CODE	LOT-BUILDING ID	TIMBER FRAMED WALLS (fw)												TIMBER POSTS (p)				ROOF (R1)				
		Construction (fw.a)		Infill (fw.b)						Finishing (fw.c)				Size of Cross Section				Form (R1.a)		Construction (R1.b)		
		connection detail of main post and foot plate		no infill (fw.b.1)	mudbrick (fw.b.2)		brick (fw.b.3)		wattle and daub (fw.b.4)	plaster on the whole surface (fw.c.1)	lime plaster on the joints (fw.c.2)	plaster on the covered surface (fw.c.3)		ground floor (G1.p)		first floor (F1.p)		gable (R1.a.1)	hipped (R1.a.2)	no roof girder (R1.b.1)	with roof girder (R1.b.2)	
		lap joint	butt joint		yellowish mudbrick	reddish mudbrick	Ottoman brick	solid brick				covered with bagdadi	covered with timber planks	17x17-27x27cm	10x10-15x15cm	13x13-15x15cm	10x10-12x12cm				extending as a pair	extending as one piece
		fw.a.1	fw.a.2	fw.b.1	fw.b.2.a	fw.b.2.b	fw.b.3.a	fw.b.3.b	fw.b.4	fw.c.1	fw.c.2	fw.c.3.a	fw.c.3.b	G1.p.a	G1.p.b	F1.p.a	F1.p.b	R1.a.1	R1.a.2	R1.b.1	R1.b.2.a	R1.b.2.b
A-1	2800-3				●	●				●				●	●		●	●				
A-2	2800-31					●				●				●			●	●			●	
A-3	2800-38	●			●					●				●	●		●	●		●		
A-4	2805-1			●	●							●		●		●	●		●		●	
A-5	2805-9				●					●				●			●	●			●	
A-6	2819-6	●				●				●					●		●	●				●
A-7	2813-2-3	●			●					●				●		●		●			●	
A-8	2820-8-7	●		●		●			●			●	●	●		●		●				●
B-1	2819-1-9	●	●	●	●			●				●		●	●	●	●	●	●		●	●
C-1	2798-15																	●				●
C-2	2798-18				●					●					●		●		●		●	
C-3	2800-21	●			●					●												
C-4	2800-24				●					●				●								
C-5	2800-36				●				●	●				●				●			●	
C-6	2812-3																					
C-7	2817-16																	●				
C-8	2817-21	●																				
*	2794-42						●				●											
*	2812-8-9																					
*	2817-1						●				●											

(blank box) DOES NOT EXIST

(grey box) NOT SURVEYED

* These buildings are not studied, but their archival photograps or excavation process assisted in terms of construction techniques that can not be seen in other buildings.

(fo) : foundation **(mw)** : masonry wall **(fw)** : frame wall **(p)** : post **(R1)** : roof **(G1)** : ground floor load bearing element **(F1)** : first floor load bearing element

Figure C.1. Comparison of studied buildings in terms of building codes

BUILDING CODE	LOT-BULDING ID	G0		M0				F0								R0						
		G0.1	G0.2	M0.1		M0.2		F0.1					F0.2	F0.3		R0.1				R0.2	R0.3	
				M0.1.a	M0.1.b	M0.2.a	M0.2.b	F0.1.a			F0.1.b			F0.3.1	F0.3.2	R0.1.a	R0.1.b	R0.1.1	R0.1.2		R0.3.a	R0.3.b
								F0.1.a.1	F0.1.a.2	F0.1.a.3	F0.1.b.1	F0.1.b.2										
A-1	2800-3		●							●			●	●	●	●		●		●		
A-2	2800-31		●						●				●	●	●	●		●		●	●	
A-3	2800-38		●							●		●	●	●	●	●	●	●		●		
A-4	2805-1		●	●	●	●	●			●			●	●	●	●		●		●	●	
A-5	2805-9		●	●		●				●			●	●	●	●		●		●	●	
A-6	2819-6		●					●					●	●	●	●		●		●		●
A-7	2813-2-3		●	●		●					●		●	●	●	●		●		●	●	
A-8	2820-8-7		●						●	●			●	●	●	●		●	●	●		●
B-1	2819-1-9		●	●		●				●		●	●	●	●	●		●		●	●	●
C-1	2798-15																					●
C-2	2798-18		●					●			●					●		●		●	●	
C-3	2800-21									●												
C-4	2800-24		●										●	●								
C-5	2800-36		●		●		●			●			●	●	●	●		●		●	●	
C-6	2812-3																					
C-7	2817-16		●								●		●									
C-8	2817-21							●														

DOES NOT EXIST

NOT SURVEYED

(G0) : Transition from foundation to ground floor
(M0) : Transition from ground floor to mezzanine floor
(F0) : Transition from ground / mezzanine floor to first floor
(R0) : Transition from first / second floor to roof

Figure C.2. Comparison of studied buildings in terms of building codes

D. Documentation Sheet and Base Map for the Site Survey

	METU- GRADUATE PROGRAM IN CONSERVATION OF CULTURAL HERITAGE *"CONSTRUCTION TECHNIQUE OF CUMALIKIZIK HOUSES"* **CUMALIKIZIK VILLAGE FIELD STUDY - SPRING 2018**	E
Advisor: Neriman Şahin Güçhan	by R. Tuğba Kızılkuşak	

ID (lot, no):	**Adress:**	**Date:**

Cons.Date:	**# of floors:**			**App. Build. h.**	
Or.Function:	**Usage(put 'E' if it is empty):**			**Reg.**	
Cur.Function:	**Daily:**	**Seasonal:**	**Weekend**	**Status**	

CONDITION		
GOOD	**1**	Deterioration on only finishing material, no structural and material problems
FAIR	**2**	Deterioration on materials, no structural problems
MEDIUM	**3**	Building is stable, slight structural problems, material loss
SEVERE	**4**	Building is stable, deeper structural problems, severe material decay & material loss
COLLAPSE	**5**	Partially/totally collapse
CONSTRUCTION TECHNIQUE		

Notes:

CHANGES			
ORIGINAL MASS PROPORTIONS & ORGANISATION		**ORIGINAL FACADE ORGANISATION & ELEMENTS**	
1	*is conserved*	1	*are conserved* there is no change/ there are minor changes but original facade organisation is legible
2	*is almost conserved* (there are minor changes that do not affect the legibility)	2	*are almost conserved* (there are minor changes that do not affect the legibility of original facade organisation)
3	*is partially conserved* (there are changes that effect the legibility)	3	*are partially conserved* (there are changes that effect the legibility of original facade organization)
4	*is not conserved and mass proportion /organisation are legible (major changes)*	4	*are not conserved and facade organisation is legible (major changes)*
5	*is not conserved and it is illegible*	5	*are not conserved and it is illegible*
Notes:		Notes:	
Restored or not? By who?			

DETAILS			**architectural elements**
	foundations		projections
	masonry walls		staircase s
	corner chamfer		fireplaces
	timber framed walls		seki
	timber posts		abdestlisk
	roofs and its architectural elements		ceiling coverings
	horizontal and vertical connections		floor coverings
			doors
			windows
			nishes

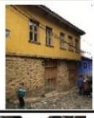
Figure D.1. Documentation sheet for the site survey

Figure D.2. Base map prepared for the site survey (drawn on the cadastral and current map of Cumalıkızık collected from Yıldırım Municipality archive)

E. List of Registered Buildings

Table E.4. *List of all registered buildings in Cumalıkızık*

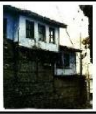
ADRESS	OLD FOTO*	NEW FOTO**	BULDING LOT ID	REG. NUMBER	REG. DATE	OLD PARCEL NO
Engin Sok. no:12			2814-09	1	1990	80
Engin Sok. no:16			2814-11	2	1990	82
Levent Sok. no:2			2814-12	3	1990	83
Levent Sok. no:4-6			2814-13	4	1990	85
Levent Sok. no:4-6			2814-14	5	1990	86
Levent Sok. no:16-14			2814-19	6	1990	93
Levent Sok. no:16-14		RUIN	2814-20	7	1990	94
Hamam Mah. no:2			2814-24	8	1990	98
Levent Sok. no:13			2812-01	9	1990	32
Levent Engin Sok. köşesi			2813-01	10	1990	11
Engin Sok. no:9			2816-05	11	1990	10
Engin Sok.			2816-06	12	1990	9
Engin Emek Sok. köşesi			2816-10	13	1990	3

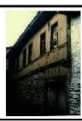
Ferdağ-Çıkmaz Sok. köşesi no:4			2817-03	14	1990	147
Ferdağ-Engin Sok. köşesi no: 11			2817-01	15	1990	145
Engin Sok. no: 22-24			2813-02—03	16	1990	12—13
Engin Sok. no: 19			2817-38	17	1990	154
Üçlü Sok.		RUIN	2812-08—09	18	1990	26
Üçlü Sok. no: 5		RUIN	2812-10	19	1990	27
Üçlü Sok.			2812-11	20	1990	28
Üçlü Sok. No:2-4			2794-28-29	21	1990	112-113
Üçlü Sok.			2794-36	22	1990	121
Yüksel Sok. no:4			2794-38	23	1990	124
Yüksel Sok. no:6			2794-42	24	1990	127
Yüksel Sok. no: 10			2794-45	25	1990	129
Yüksel Sok. no:12			2794-46	26	1990	130
Yüksel Sok. no:12			2794-47	26	1990	131

Yüksel Sok. no:16		RUIN	**2794-49**	**27**	**1990**	**133**
Şahin Sok. no: 24			**2794-84**	**28**	**1990**	**140**
Şahin Sok. no: 26			**2794-85-86**	**29**	**1990**	**141**
Şahin Sok. no:28			**2794-87**	**30**	**1990**	**142**
Şahin Sok. no:21-21A			**2806-01**	**31**	**1990**	**62**
Şahin Sok. no: 15			**2806-05**	**32**	**1990**	**65**
Keçecioğlu Sok. no:20			**2806-08**	**33**	**1990**	**68**
Keçecioğlu Sok. no: 3			**2805-01**	**34**	**1990**	**196**
Bozdemir - Keçecioğlu Sok. no: 12			**2819-05**	**35**	**1990**	**57**
Kurtbasan Sok. no: 3			**2819-03**	**36**	**1990**	**55**
Kurtbasan Sok. no: 6			**2819-02**	**37**	**1990**	**54**
Kurtbasan Sok. no: 4			**2819-01**	**38**	**1990**	**53**
Kurtbasan Sok. no:1-3			**2820-05**	**39**	**1990**	**47**
Kurtbasan Sok. no:1-3			**2820-06**	**39**	**1990**	**46**

Kurtbasan Sok. no:1-3			2820-08—07	39	1990	45
Kurtbasan Sok. no:			2800-36	42	1990	250
Kurtbasan Sok. no:			2800-38	43	1990	219
Bozdemir Sok. no: 1			2800-33	44	1990	247
Bozdemir Sok. no:3			2800-32	45	1990	246
Bozdemir Sok. no:5			2800-31	46	1990	245
Bozdemir Sok. no:			2805-08	47	1990	202
Bozdemir Sok. no:16			2805-09	48	1990	204
Bozdemir Sok. no:			2800-21	49	1990	258
Ferdağ Sok. no: 64			2800-18	50	1990	255
Kurtbasan Sok. no:20			2800-06	51	1990	228
Kurtbasan Sok. no:18			2800-04	52	1990	226
Kurtbasan Sok. no:18			2800-03	53	1990	225
Kurtbasan Sok. no:16			2800-01	54	1990	224

Kurtbasan Sok. no:			**2799-01—02**	**55**	**1990**	**143-144**
Kurtbasan Sok. no:13			**2817-24**	**56**	**1990**	**174**
Emek Sok. no:24			**2817-15**	**57**	**1990**	**193**
Ferdağ Sok. no:1(230)			**2816-03**	**58**	**1993**	**4**
Engin Sok. no:5			**2816-04**	**59**	**1993**	**5**
Engin Sok. no:			**2816-07**	**60**	**1993**	**8**
İsimsiz no:			**2813-04—05**	**61**	**1993**	**14**
İsimsiz no:28			**2812-04**	**62**	**1993**	**21**
İsimsiz no:			**2812-03**	**63**	**1993**	**22**
İsimsiz no:			**2812-02**	**64**	**1993**	**23**
Özoğlu sok.			**2812-07**	**65**	**1993**	**25**
Üçlü Sok. no:17			**2812-13**	**66**	**1993**	**30**
Levent Sok. no:15			**2812-14**	**67**	**1993**	**31**
Dinç Çıkmazı			**2794-26**	**68**	**1993**	**117**

Şahin Sok. no:2			2808-02	69	1993	39
Şahin Sok. no:1			2820-02	70	1993	44
Keçecioğlu Sok. no:2			2820-04	71	1993	49
Kurtbasan Sok.			2818-03	72	1993	52
Bozdemir Sok. no:10			2819-04	73	1993	56
Keçecioğlu Sok. no:14			2819-06	74	1993	58
Şahin Sok. no:19			2806-03	75	1993	63
Yüksel Sok. no:129			2806-11	76	1993	71
Engin Sok. no:2			2814-04	77	1993	75
Engin Sok. no:4			2814-05	78	1993	76
Engin Sok. no:8			2814-07	79	1993	77
Engin Sok. no:6			2814-06	80	1993	78
Engin Sok. no:10			2814-08	81	1993	79
Levent Sok. no:6			2814-15	82	1993	87

Levent Sok. no:10		RUIN	2814-17	83	1993	90
Levent Sok. no:18			2814-21	84	1993	95
Huzur Sok. no:7			2794-12	85	1993	100
Huzur Sok. no:5			2794-13	86	1993	101
Hamam Meydanı 1		RUIN	2794-16-18	87	1993	104
Dinç Çıkmazı			2794-27	88	1993	111
Yüksel Sok. no:12			2794-44	89	1993	128
Engin Sok. no:13			2817-41	90	1993	149
Engin Sok. no:15			2817-40	91	1993	151
Yüksel Sok. no:22			2794-83	92	1993	138-139
Engin Sok. no:23			2817-36	93	1993	156
Keçecioğlu Sok. no:3			2817-34	94	1993	159
Keçecioğlu Sok. no:5			2817-33	95	1993	161
Kurtbasan Sok. no:1			2817-30	96	1993	168

Keçecioğlu Sok. no:9			2817-31	97	1993	169
Keçecioğlu Sok. no:7			2817-32	98	1993	170
Kurtbasan Sok. no:9			2817-26	99	1993	173
Kurtbasan Sok. no:15			2817-23	100	1993	175
Emek Sok. no:34			2817-22	101	1993	176
Emek Sok. no:22		RUIN	2817-14	102	1993	192
Bozdemir Sok. no:10			2805-03	103	1993	198
Keçecioğlu Sok. no:19			2805-21	104	1993	212
Bozdemir Sok. no:6		RUIN	2805-25	105	1993	215
Kurtbasan Sok. no:6			2800-37	106	1993	218
				107	1993	229-230
Bozdemir Sok. no:1			2800-34	108	1993	248
Bozdemir Sok. no:13			2800-35	109	1993	249
Ferdağ Sok. no:54-55			2800-16-17	110	1993	253-254

Ferdağ Sok. no:62			2800-19	111	1993	256
Bozdemir Sok. no:23			2800-23	112	1993	260
Ferdağ Sok. no:43			2801-06	113	1993	271
Ferdağ Sok. no:41		RUIN	2801-05	114	1993	272
Yüksel Sok. no:3			2810-02—03	115	1993	34
Şahin Sok. no:11			2819-09	116	1993	61
Üçlü Sok. no:14			2794-37	117	1993	123
Özoğlu Sok. no:7-9-5			2810-01	118	1993	33
Üçlü Sok. no:10			2794-33-35	119	1993	119
Kurtbasan Sok. no:36		RUIN	2800-05	120	1993	227
Kurtbasan Sok. no:29		RUIN	2798-12	121	1993	279
Kurtbasan Sok. no:25			2798-15	122	1993	283
Kurtbasan Sok. no:14			2800-02	123	2009	223
1.Değirmen Sok. no:10			2800-15	124	2009	251

Saldede Sok. no:23			**2800-22**	**125**	**2009**	**259**
Saldede Sok. no:19			**2800-24**	**126**	**2009**	**261**
Saldede Sok. no:15			**2800-26**	**127**	**2009**	**263**
Saldede Sok. no:9			**2800-29—30**	**128**	**2009**	**239**
Kurtbasan Sok. no:12			**2800-41**	**129**	**2009**	**222**
Saldede Sok. no:7			**2800-42**	**130**	**2009**	**243**
Saldede Sok. no:29-31			**2803-03**	**131**	**2010**	**265**
Saldede Sok. no:27			**2803-02**	**132**	**2010**	**266**
Kurtbasan Sok. no:10			**2800-39—40**	**133**	**2010**	**220**
Saldede Sok. no:17			**2800-25**	**134**	**2010**	**262**
1.Değirmen Sok. no:4		RUIN	**2800-12**	**135**	**2010**	**233**
Köyüstü Sok. no:16		RUIN	**2794-81**	**136**	**2010**	**138**
Köyüstü Sok. no:10			**2794-48**	**137**	**2010**	**132**
Köyüstü Sok. no:20			**2794-40**	**138**	**2010**	**120**

Köyüstü Sok. no:18			**2794-39**	**139**	**2010**	**122**
			2794-30	140	2010	114
Köyüstü Sok. no:2			**2794-44**	**143**	**2010**	**128**
Yunus Aralığı no:12			**2814-18**	**144**	**2010**	**92**
Yunus Aralığı no:8			**2814-16**	**145**	**2010**	**89**
Eğrek Sok. no:14			**2814-10**	**146**	**2010**	**81**
1. Ferdağ Sok. no:13			**2798-20**	**147**	**2010**	**288**
1.Ferdağ Sok. no:17			**2798-18**	**148**	**2010**	**286**
Yunus Aralığı no:1			**2813-09**	**149**	**2010**	**19**
			**2813-06**	**150**	**2010**	**16**
Eğrek Sok. no:32			**2812-05**	**151**	**2010**	**20**
Cin Aralığı no:8			**2808-03**	**152**	**2010**	**40**
Cin Aralığı no:2			**2808-01**	**153**	**2010**	**38**
Cin Aralığı no:12			**2807-01**	**154**	**2010**	**37**

Köyüstü Sok. no:9			2806-10	155	2010	70
Cin Aralığı no:13			2806-04	158	2010	64
Köyüstü Sok. no:1			2806-02	159	2010	74
Saldede Sok. no:20			2805-10	160	2010	205
Saldede Sok. no:8			2805-05	161	2010	200
Saldede Sok. no:4			2805-02	162	2010	197
Eğrek Sok. no:15-17			2817-39	163	2010	153
Kurtbasan Sok. no:5			2817-29	164	2010	167
Kurtbasan Sok. no:5/1			2817-28	165	2010	166
Kurtbasan Sok. no:9-11A			2817-25	166	2010	172
1.Ferdağ Sok. no:26			2817-16	167	2010	194
1.Ferdağ Sok. no:18			2817-12	168	2010	190
1.Ferdağ Sok. no:16			2817-11	169	2010	187
1.Ferdağ Sok. no:14			2817-10	170	2010	186

1.Ferdağ Sok. no:12			**2817-09**	**171**	**2010**	**185**
1.Ferdağ Sok. no:10			**2817-08**	**172**	**2010**	**188**
1.Ferdağ Sok. no:8			**2817-06**	**173**	**2010**	**183**
1.Ferdağ Sok. no:6			**2817-04**	**174**	**2010**	**148**
1.Ferdağ Sok. no:2			**2817-02**	**175**	**2010**	**146**
Cin Aralığı no:9			**2819-08**	**176**	**2010**	**60**
Kurtbasan Sok. no:24/1			**2819-07**	**177**	**2010**	**59**
Nalbant Sok. no:		RUIN	**2794-34**	**178**	**2014**	
1.Değirmen Sok. no:2		RUIN	**2800-11**	**179**	**2014**	
Köyüstü Sok. no:3			**2806-12—13**	**180**	**2014**	
1.Ferdağ Sok. no:32			**2817-21**	**181**	**2014**	
2.Orta Sok. no:1			**2817-35**	**182**	**2014**	
			**2817-43**	**183**	**2014**	
2.Hamam Sok. no:5			**2794-14-15**	**141-142**	**2010**	**102-103**

			**2806-06—07**	**156-157**	**2010**	**66-67**
Bozdemir Sok. no:4 Kurtbasan Sok. no:			**2818-01—02**	**40-41**	**1990**	**50-51**

*Source: Bursa Council for Conservation of Cultural and Natural Heritage Archive
**Source: R. Tuğba Kızılkuşak Archive, 2018