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**Neolithic building technology and the social context of  
construction practices: the case of northern Greece**

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## Abstract

This thesis addresses building technology and the social implications of house construction contributing to the understanding of past societies. The spatiotemporal context of the study is the Neolithic period (ca. 6600/6500–3300/3200 cal BC) in northern Greece (Macedonia and Thrace).

All available evidence from various excavations in the region is assembled and synthesised. The principal house types (semi-subterranean structures and above-ground dwellings) and their technological characteristics in terms of materials and techniques are discussed. In addition, the building remains from the late Middle/Late Neolithic settlement of Avgi (Kastoria, Greece) are thoroughly examined. Their study highlights the potentials of a detailed, micro-scale investigation and puts forth a methodology for the technological analysis of house rubble in the form of fire-hardened daub. The data deriving from both the survey of dwelling remains in northern Greece and the case study are examined within their wider sociocultural context.

The technological repertoire of the region, although indicating the sharing of a common ‘architectural vocabulary’, reveals alternative *chaînes opératoires* and variability in different stages of the building process. Variability and patterning are more pronounced during the later stages of the Neolithic. The distribution of architectural choices does not suggest the existence of established and region-wide shared architectural traditions. However, the circulation of specific techniques and conceptions points to the operation of overlapping networks of technological and social interaction.

At the site-specific scale, sameness and standardisation in building technology are the prominent themes. Nevertheless, different trends towards standardisation or variability are observed and are approached in terms of social interaction and intra-community dynamics. What is more, domestic architecture is not necessarily static in the long term. Change occurs and is often associated with the transformation of these dynamics. Occasional evidence of intra-site variability in building techniques and the more pronounced anchoring into space during the later stages of the Neolithic period are considered as a result of the changing relationship between social units and the community. The appearance of stone and mud(brick) architecture in Late Neolithic central Macedonia is approached in these terms.





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# 1. Introduction

This dissertation is concerned with the question of architectural practice and its many-sided implications. It is an attempt to incorporate equally balanced technological and sociocultural perspectives into the analysis of domestic dwellings, developed from the starting point that building technology can yield useful insights into the social dynamics of prehistoric house-based communities. The spatiotemporal context of the study will be the Neolithic period in northern Greece, namely the period from the mid 7th millennium till the late 4th millennium cal BC in the regions of Macedonia and Thrace.

Although somewhat arbitrary in terms of its geographic and cultural boundedness, northern Greece is often studied as an entity, especially as opposed to adjacent and, probably, better defined entities, such as Thessaly, Anatolia and the Balkans. During the last few decades, intensive fieldwork in the form of rescue excavations or more systematic projects has considerably enriched the architectural record of the region. A large number of settlements, and therefore dwellings, have been uncovered so that Thessaly is no more the only geographical area in Greece offering the potential for a regional analysis of house construction (see Elia 1982, 1). Neolithic houses, either seen as singularities or as a series of repeated, almost identical units (Bailey 2005a, 96), stand out as the most prominent features in a landscape where expressions of monumentality (ritual or funerary) outside the settlements are virtually lacking (Souvatzi 2008a, 47). It can be easily inferred that their remains constitute a meaningful category for the investigation of Neolithic societies.

In the archaeological discourse, prehistoric dwellings have been approached in a multitude of ways stemming from diverse theoretical standpoints and considerations. The schemes employed for the interpretation of their remains range from high-level, generalising ones to micro-level analyses of site- or house-specific assemblages (Bailey 1996, 143; Whittle 1996a, 13). The plethora of the methodologies and the interpretative approaches emphasises their multi-faceted and indissoluble components. These do not merely involve walls and designs, but also the patterning of activities ranging beyond sheltering, eating and sleeping, as well as various symbolisms and metaphors that are significant for social configuration and the creation of worldviews (see Hodder 1990; Stevanović 1996, 57).

Domestic buildings as spatial and organisational features divide space into inside and outside; they channel movement and generate a more or less fixed background for social interaction (Robb 2007, 87, 90). Rather than simple containers, they should be perceived as

instruments of human life (Durkheim 1901). They constitute both the media and the context or *foci* of social production and reproduction by creating discrete levels of interaction, shared experience and senses of identity or relatedness (Robb 2007; Stevanović 1996; Whittle 1996a). In certain occasions, it is proposed that houses may be approached as ‘living entities’ with an active role in the generation, maintenance and alteration of social reality (Bailey 1990; 1996). In any case, houses as key analytical social units are considered to be much more than a household incorporated in a certain architectural plan. Their visual and tangible characteristics may also be viewed as the objectification of collective bodies or social institutions encompassing expressions of symbolism, cosmological order and social relations (Borić 2008, 110) that are significant for reconstructing past beings-in-the-world (*sensu* Heidegger).

In addition to the perspectives described above, research in the Balkans and elsewhere has suggested that dwellings should also be perceived as artefacts or products of social choice. The study of their remains constitutes an appropriate field for the application of technological approaches that focus not only on built forms and spatial features, but also on the construction process. This process, being embedded in social relations, is not restricted to its purely materialistic aspects. Rather than that, it should be considered as driven by social action and perceptions formulated during the continuous engagement of people with the material world.

## **1.1 Aims and objectives**

The primary goal of the thesis is to trace and highlight the entwined technical and social components of house construction in Neolithic northern Greece. The effort will be to approach the building process as essentially embedded within the wider socioeconomic context and to demarcate the many-sided aspects of variability and/or homogeneity in the architectural record. Issues of scale and chronological perspective (see Bailey & Whittle 2008; Whittle 1988; 2003) will be among the main concerns of the research. The objective is to trace the workings of building technology at different analytical scales (including regional, local and site-specific ones) which also coincide with the multiple, interrelated contexts of social experience and interaction. Micro-scale studies are often considered to offer fine-grained insights into social action and relations at the community or the inter- and intra-household level (see Bailey 1996; Stevanović 1996, 66; Tringham 1991). Nevertheless, the results of site-specific analysis should also be examined at broader scales, lest evidence of wider issues is overlooked (Whittle 2003). In addition, different

chronological perspectives, ranging between long- or short-term and synchronic ones should be incorporated in both the micro- and macro-analytical scales.

In terms of the database, the attempt will be to assemble all accessible evidence relating to dwelling remains and associated structures. Although of a heuristic value in many respects, the priority here is not limited to the creation of an exhaustive catalogue of sites. Rather than that, it is mainly to present and synthesise the available information in a way that will allow inferences about the technological considerations of Neolithic inhabitants and the social dynamics between and within different communities. A detailed overview of the dataset, even if fragmentary in several occasions, provides to the researcher the opportunity to better evaluate the assemblages and to realise the controversies and potentials of the endeavour. Besides, it is argued that the ‘pooling’ of information from a selected number of sites, even if efficient, runs the risk of masking the range of technological variability which constitutes a central issue in the present study.

From a technological point of view, site- and house-specific analyses offer the advantage of a thorough study of building materials, techniques and relevant features that contribute significantly into the identification of intra-site variability and social dynamics. The objective of micro-scale analysis in the present research is to propose a rigorous methodology for studying building remains and, especially, superstructural debris (house rubble in the form of fire-hardened daub) that is often abundant in northern Greek excavations. This involves the conduction of a detailed database comprising multiple variables for the description of the material and its distribution. Apart from a macroscopic study, the attempt will be to incorporate microscopic observations into the analysis of building materials. The reconstruction of the exact form of the end-product is not the main objective here as it is commonly compromised by the preservation status of the data. However, it is possible to recognise the basic building techniques employed during the different stages and ramifications of the building process. These, when presented in an operational sequence format, are expected to allow better informed intra- and inter-site comparisons of technological choices.

More significantly, this thesis aims at proposing and prioritising a set of questions that should be put forth when excavating, analysing and interpreting building remains, be it at the site level or within their wider geographical or cultural context. It is an attempt to demonstrate the potentials of integrated technological and social perspectives and to put the main research results into the test of future inquiry.

## 1.2 Organisation of the thesis

In order to correspond to the scopes of the study described above, the present thesis is organised into six chapters (excluding the Introduction). These contribute to the setting of the main questions, the presentation and bringing together of the relevant data, and their interpretative approach.

**Chapter 2** addresses the main theoretical perspectives that will contribute to the analysis of Neolithic houses and the social context of the building process. Different ideas, concepts and schemes deriving from architecture, anthropology, ethnography, archaeology and other social sciences will be discussed in three sections. The former section will bring forth some of the most influential approaches employed in the study of domestic architecture, the built environment and the use of space. The focus will then turn to the multiple attributes and manifestations of houses linked to the creation of worldviews, social perspectives and institutions. The latter section will attempt to define the context of a technological analysis by reifying the concept of technology as embedded in social action and by delineating the ways in which buildings may be perceived and interpreted as technological products.

Following the setting of the theoretical background, **Chapter 3** will seek to outline the geographical, chronological and cultural context of the research. One of the central positions of this thesis is that the construction of the built environment does not take place in a vacuum neither can it be studied as such. On the contrary, the structuring of domestic space comprises an integral part of a wider material, social and symbolic context. As a result, this chapter aims at introducing certain features of the Neolithic period in northern Greece. To begin with, it will provide a short review of the history of research in the region so as to highlight the major concerns and advances of the work undertaken since the early 20<sup>th</sup> century. Furthermore, a brief synopsis of the chronological schemes employed will contribute to the clarification of the framework used in the present study. Attention will also be drawn to the environmental background of the region that is commonly perceived as an important variable in the shaping of domestic architecture. Following a brief description of the pre-Neolithic background and the Mesolithic/Neolithic transition, the focus will turn to the Neolithic period itself. The discussion will revolve around three main themes, including the identification of habitation patterns and settlement types, the subsistence strategies followed, and certain aspects of the material culture. These issues will yield fruitful insights into the wider context of building practices, especially in terms of inter- or intra-regional influences and socio-economic considerations.



**Chapter 4** comprises a thorough survey of the domestic architectural record of Neolithic northern Greece. The primary goal is to assemble and synthesise the available evidence from all published or partly published sites in the region. Moreover, the aim is to provide an accurate and, whenever feasible, detailed description of ground plans, raw materials and construction techniques. The various data will be presented in four sections referring to particular geographic sub-regions. More attention will be paid to better recorded and better preserved sites. Following this, the remaining part of the chapter will pivot on the principal characteristics of the regional architectural vocabulary, including the main dwelling types and built forms represented in the northern Greek record. The discussion will contribute to the subsequent analysis of house construction within its wider social context.

Moving to **Chapter 5**, the architectural evidence from the Neolithic settlement of Avgi (Kastoria, Greece) will be used as a case study for a micro-scale approach. Following a brief discussion on the preliminary results of the ongoing excavation project, the remains of three buildings will be thoroughly examined. These belong to the earlier habitation phase of the site dated to the second half of the 6<sup>th</sup> millennium cal BC and were preserved in the form of extensive areas of fire-hardened rubble, burned surfaces representing floors, and occasional postholes. The methodology employed for the recording and the analysis of the assemblages will be described and the results relating to building materials and techniques will be presented in detail. The analysis of three structures from a single building horizon will allow an in-depth comparison of their technological characteristics. This will significantly contribute to the understanding of house construction at the site-specific level.

The information assembled in the previous chapters of the thesis will be synthesised in **Chapter 6** that focuses on the social implications of building technology. Throughout this chapter, insights from social theory, anthropology and ethnography will be incorporated into the analysis of the archaeological record. Taking into consideration their diverse spatial, chronological and cultural context, ethnographic and anthropological counter-examples will be primarily used to open up possibilities of interpretation (David & Kramer 2001, 47–8; Whittle 2003, xvi).

The first part of the chapter will discuss the technological characteristics of house construction in Neolithic northern Greece following a *chaîne opératoire* framework. Rather than focusing exclusively on materials and technical features, the attempt will be to trace the social and symbolic meanings or perspectives that may have been involved in the construction, maintenance and destruction of Neolithic houses. The second part will

discuss the sociocultural and socioeconomic inferences of building technology by tacking between different scales and axes of analysis. Standardisation and diversity in materials, techniques and technological conceptions will be examined under the lens of social agency and inter- or intra-community dynamics. The discussion on technological continuity, innovation and change will further contribute to the identification of social tendencies and perspectives.

The final chapter of the thesis (**Chapter 7**) will review the results of the analysis and will provide an outline of the main conclusions drawn. Its primary objectives are to offer a synopsis of the argument and to highlight issues for future research.

### **1.3 Limitations of the research**

Following the description of the key objectives and the structure of the thesis, it is essential to bring forth certain limiting factors that compromise, up to an extent, the quality of the dataset and its interpretative potentials. These mainly refer to the nature of the dwelling remains themselves, the objectives and methodologies of the archaeological practice in the region, and the rigorousness of the architectural record in terms of documentation.

Beginning with the nature of the material under study, the heavy reliance of Neolithic building technology on perishable materials, such as earth, timber and various plant resources, has a direct impact on the preservation status of *in situ* architectural remains. Regional environmental conditions and post-depositional activity constitute additional damaging factors. Even when more durable resources, such as stone, are employed, their reuse in construction practices leads to a more or less fragmented picture. In any case, the preservation of certain features, including walls and roofs, depends highly on specific conditions related to the end-life of dwellings. This refers primarily to their destruction by fire and their concomitant preservation in a fire-hardened form, as well as to the preservation of waterlogged structural timbers in exceptional cases.

In terms of post-depositional activity, modern mechanised agriculture and land development play an important role in the loss of valuable information. In addition, the intensive occupation of certain localities for considerable periods of time leads to the disturbance of underlying deposits and, therefore, dwelling remains. Levelling and clearing practices by the inhabitants or later occupants, the incorporation of building materials and/or remains into new buildings, disturbances by later cuttings, such as pits and trenches, all contribute to the compartmentalisation of the record. Moreover, the vertical

nature of mound or tell-like settlements rarely allows the extensive uncovering of a single habitation phase (Elia 1982, 13–14).

In many cases, there are no complete structures or ground plans recognised, while the identification of well-defined groups of dwelling remains is limited. The latter observations necessarily pose problems in the comparative study of the material, either at a site-specific or an intra-regional scale. They are also inextricably linked to the ways in which the archaeological endeavour is conducted in the region. As will be noted later in this thesis, certain archaeological projects were carried out in response to contemporaneous disciplinary concerns not always prioritising the extensive excavation of habitation horizons, while others were necessitated by construction works taking the form of rescue excavations. Whether aiming exclusively to define stratigraphic sequences or being subjected to time and budget restrictions, a considerable number of excavations represent small soundings that allow limited access to an overall understanding of house construction. On the other hand, large-scale developmental projects during the last decades have offered the opportunity for the extensive excavation of certain settlements and their architectural remains.

The incompleteness of the picture, inherent in many respects, is further strengthened by the varying quality of data documentation and publication. As is the case for other Greek regions, most of the evidence at hand is included in preliminary excavation reports or conference papers, while fully published sites are extremely rare. What is more, the information provided is often too general and the recording definition, as well as the terminology used, varies a lot from site to site and report to report. Descriptions are primarily focusing on general layouts, negative imprints (i.e. postholes and foundation trenches), and spatial characteristics. Other features, including building materials and techniques, are presented in a non-detailed, descriptive manner. The burned superstructural material, for instance, has not been studied in its full potential, even though research in the Balkans and elsewhere has shown that it may yield vast amounts of information (see Shaffer 1983; Stevanović 1996). As a result, descriptions and reconstructions are commonly based on empirical field notes juxtaposed to ethnographic parallels and the better preserved examples from the adjacent regions. Nevertheless, the attitude against this significant corpus of architectural evidence seems to have changed during the last few years.

The limitations stated above may temper certain aspects of the following thesis, particularly those entailing the comparative analysis of the material at different spatiotemporal scales.

However, by no means do they restrict the significance of the endeavour. On the contrary, they emphasise the need to summarise all available information, to attempt a synthetic approach of the subject, and to suggest alternative sets of questions. This will allow, in hindsight, to revise the evidence and rephrase the objectives and methodologies employed, as well as to delineate new avenues worth exploring.

## **2. Domestic architecture: theoretical perspectives**

### **2.1 Architecture, the built environment and the use of space**

The study of architecture is undoubtedly an interdisciplinary enterprise. This is emphatically demonstrated by the amount of different approaches employed in the subject. Architectural research has to encounter various related topics with multiple theoretical ramifications referring, among others, to the concepts of space, dwelling and the built environment. Many of these approaches present a great deal of overlap and can be treated in a complementary way, as they share common concerns. However, a complete analysis of all different theoretical schemes and perspectives is beyond the scope of this study. In addition, there is no intention to make extensive comparisons between alternative procedures, as they usually belong to diverse paradigms and prioritise different questions. This chapter aims mainly at presenting a general outline of some significant ideas and schemes while taking a critical stance on their validity and appropriateness in the archaeological context. Furthermore, this synopsis will demarcate and emphasise selected subjects, so as to open up possibilities of interpretation.

#### **2.1.1 Architecture as an evolving phenomenon**

Since the 18<sup>th</sup> century architectural space had been commonly described and classified according to aesthetic and functional qualities based on the doctrine of established, ahistorical and acultural, architectural canons (Lawrence 1983, 19–20). Whether from a pure formalistic or typological approach, the dominant interpretation had been selective, by generally focusing on constructions of a monumental kind and by ignoring the vast majority of architectural space. A more inclusive concern can be traced back to the 19<sup>th</sup> century, coinciding with the first formalization of theories of cultural evolution. Such approaches (e.g. Ferree 1890) considered architecture as an evolving phenomenon occupying a space-time continuum (Lawrence & Low 1990, 454; Lawrence 1983, 21), while the remains of earlier cultural constructions were taken as evidence of evolutionary status. Moreover, these approaches were closely linked with ideas of ‘adaptation’, progressivism and environmental determinism (Cutting 2005, 7). Interpretation of the distribution and variation of built forms was often focusing on prominent physical factors influencing the exterior façade or the size of structures, such as the availability of building materials or the topographical and climatic context. In addition, the development of architecture was

primarily approached in terms of environmental change or of social and geographical diffusion (Lawrence 1983, 22–3). Similar considerations might seem rather simplistic in nature and inadequate on an explanatory level (Rapoport 1969, 15). Their major disadvantage lies in their general implication that the architectural process is an entity of its own, and that human action is, more or less, determined by external constraints and adaptive requirements (Cutting 2005, 7). However, their impact can still be traced in contemporary thinking, especially in neo-evolutionary theories and theories of social evolution.

### **2.1.2 Architecture as the ‘representation’ of social organisation**

While earlier ideas were not abandoned during the 20<sup>th</sup> century, the underlying question of the exact nature of the relationship between architecture and society persisted in many anthropological and ethnographic concerns. Following Durkheim’s and Mauss’ assertion that the built environment should be seen as an integral part of social life, a significant body of literature has focused on examining the interactions of architecture with social organisation and spatial behaviour (Lawrence & Low 1990, 460). These approaches came soon also to be associated with the idea of ‘adaptation’, which views culture and its manifestations as the extra-somatic adaptive responses of the human organism to changes in the environment and in adjacent cultural systems (White 1959, 8, cited in Binford 1962, 218). Humans seek to adapt their built environment to their occasional behavioural needs and functional requirements taking into account the limitations of their physical environment. As a result, there has to be a degree of ‘fit’ or congruence, possibly identifiable through universal characteristics, between particular built forms and specific features of social organisation. Not only was the architectural form perceived as a product of social organisation, but also as a direct representation of the social form itself. Thus, a great interest was shown in the physical attributes of buildings, especially in disciplines such as archaeology where the material remains seem to comprise the most accessible elements of study. These overall functional principles led often to deterministic approaches, not entirely isolated from perspectives of social evolution.

Moving beyond environmental deterministic explanations of the built form, many scholars turned their interest from the broad limiting environmental factors to more specific socio-cultural influences (Rapoport 1969). In trying to explore the interaction and the ‘fit’ between social and spatial organisation, various theoretical considerations prioritised different factors as having the major modifying influence on architectural plans. Some of

these approaches linked patterns of social behaviour and spatial organisation by focusing on activity areas and the use of space. According to Rapoport (1990, 11), since built environments are created to be supportive of the activities and lifestyles of people, form tends to respond to systems of activities actually occurring in systems of settings. Kent (1984; 1990) argues that the use of space, as a matter of cultural organisation, determines the architectural form (e.g. the ratio of functionally restricted to multipurpose and gender-specific to non gender-specific activity areas). By emphasizing behaviour as the major component of the interaction, she suggests that the segmentation of architecture is indicative of the segmentation in the use of space which, in turn, indicates the degree of socio-political complexity of a society (Kent 1990, 127). However, she admits not having explored other variables, such as degrees of mobility, severe space constraints and acculturation (Kent 1990, 150). McGuire and Schiffer (1983, 278) synthesise similar approaches and argue that in order to explain architectural design we must examine the design process and identify the general causal factors that influence human goals and choices by focusing on the activity sets of production, use and maintenance. Among these factors they postulate those relating to social structure (social differentiation and social inequality) and adaptation (residential/household mobility and settlement longevity) to be more directly interacting with the built form. An alternative approach, proposed by Wilk (1990), is the examination of the built form as the outcome of people's choices based on economically conditioned 'consumer' decisions.

In accordance with these ideas, various approaches seek to understand how economic or gender relations, kinship patterns, the developmental cycle and other aspects of the social system influence the built environment through household processes. A number of studies suggest that a degree of 'fit' between households and their domestic unit is an ethnographic fact and an assumption necessary for the reconstruction of past social organisation (David 1971, 111). Such studies consider that variability in household composition and size, as well as in the socio-economic cooperation of the co-resident group, is expressed in the dwelling form. In the discipline of archaeology, theoretical perspectives of social evolution have adopted similar implications by relating building morphology and settlement patterns to series of socio-evolutionary stages (Byrd 2000; Flannery 2002; Kuijt 2000). Physical attributes, such as built forms (size, plans and the existence of upper storeys), domestic equipment, spatial differentiation, building aggregations and measures of privacy are commonly used to identify changes in the importance of household units and social organisation (Cutting 2005, 9). A basic assumption of these perspectives, therefore, is that

changes in architectural form somehow correlate with changes in household organisation and size. However, David (1971, 117) underlines that this relationship varies greatly (even within a limited area) according to social, cultural, economic and environmental factors, so that the nature of the 'fit' between buildings and their occupants is a matter of cultural definition. Moreover, recent anthropological and ethnoarchaeological studies have revealed that such equations could be misleading, as the social and physical boundaries of household units do not necessarily coincide (Lawrence and Low 1990, 461; Souvatzi 2008a, 11–12).

According to social organisational approaches, the physical characteristics of the built form, as well as the traces of spatial behaviour that it encloses, can be seen as literal manifestations of social structure. This view is not unrelated to notions of modernism in architecture and other disciplines, which focus on the pure purposive-functional form (Bloch 1997, 42) and emphasise the utilitarian ends and requirements of a 'soulless container architecture' (Leach 1997, xii, 3). In addition, there is an underlying connection with the traditional view of space as a fixed, passive arena for activity and adaptation (Stevanović 1996, 51). Although functionalist approaches contributed greatly in encouraging new ways of looking at architectural material, their emphasis in identifying universal characteristics and producing overarching models of explanation may mask cultural variability and lead to reductionist conclusions (Kent 1990, 149).

In measuring spatial characteristics and boundaries, we often forget that architecture may be segmented or divided both physically and conceptually (Kent 1990, 148). In archaeological contexts the low visibility of spatial segmentation due to poor preservation of fixed or semi-fixed elements (Rapoport 1990, 13; David 1971, 120–1) poses additional problems. Above all, as Adorno (1997, 4) notes, functionalism in architecture can never be pure functionalism, as even the functional may attract the symbolic. Symbols are born of the need to identify with one's surroundings and humans attach symbolic significance to even the most technical objects. Consequently, architectural space should be examined as imbued with meaning that transcends its 'purely functional' characteristics and constitutes more than a secondary source of influence.

### **2.1.3 The 'symbolically loaded' built environment**

From a symbolic perspective, spatial layout can be seen as an expression of culturally shared perceptions and embodied meanings. These meanings, rather than being intrinsic to a set of physical characteristics, should be examined in association with other forms of



patterning (Whitelaw 1994, 229), such as social relations, classifications, cosmologies, conventions and 'predispositions' of the inhabitants (Lawrence 1982).

Among the more developed and influential theoretical approaches in the symbolic analysis of architecture is that of structuralism. As a result of an interdisciplinary movement owing its origins to the work of the linguist Ferdinand de Saussure, structuralist approaches became highly popular in the 1960s and 1970s by postulating underlying mental structures that are realised in various sociocultural manifestations (Leach 1997, 156; Lawrence and Low 1990, 467–8). According to the pioneer anthropologist of this movement, Claude Lévi-Strauss (1963), there seems to be a structured collective unconscious capable of generating and giving meaning to people's cultural behaviour. These mental structures comprise systems of paired opposites or 'binary oppositions' (e.g. inside/outside, periphery/centre, male/female, cooked/raw) that can explain, among others, settlement plans, kinship relations and myths. Referring to spatial arrangements, Lévi-Strauss observes that in many cases there is an obvious relationship between the social and spatial structures. However, he also notes that spatial configuration is not always the mirror image of social organisation, as this depends primarily on the amount of meaning that each culture invests in its spatial arrangements (Cutting 2005, 11). In short, structuralist analysis seeks to identify homologous structures in different aspects of everyday life and considers cosmological meaning as a significant determinant of the built form (Lawrence and Low 1990, 469). In archaeology, structuralist studies (see Hodder 1982) have attempted to interpret the meaning of spatial patterning through the investigation of contemporary societies and the use of structural, rather than formal, analogies (Moore 1982, 74).

A common critique to structuralism refers to its static, synchronic view of culture that pays little attention to social or historical change and undermines the role of individual agency. Moreover, there is always the danger that the cultural meanings and structures take on a life of their own and impose their own order on the material record. One possible move beyond these problems is Bourdieu's (1977) 'theory of practice' and Giddens' (1984) 'theory of structuration'. Bourdieu, in trying to transcend the objectivist-subjectivist dualism, formalises the role of human action (*praxis*) in the production and reproduction of meanings and structures. Though he does not reject the existence of binary symbolic oppositions in his study of the Kabyle house, he is opposed to the mechanistic applications of structuralism. According to his theory, space comes to have meaning through practice. The key concept is *habitus*, a system of durable and transposable dispositions that acts as generative and structuring principles of regulated improvisations (Bourdieu 1977, 72).

Concerning the spatial dimension of action, Bourdieu tries to reconcile space and time in social theory.

Similar implications can be found in Giddens' 'theory of structuration'. According to this approach, which focuses on social practices ordered across space and time, the relationship between structures (as embodied in traditions and social rules) and human actions is dialectical ('the duality of structure'). The repetition of the acts of individual agents reproduces social structures through space and time, while at the same time structures constrain the actions of agents. Although these theoretical schemes have provided a useful conceptual framework, they should not be treated uncritically. Jenkins (1992, 115) argues that Bourdieu still remains firmly rooted in objectivism and that his approach, using often the language of positivist empiricism, may lead to deterministic models of social process. Moreover, both Bourdieu and Giddens are probably better at describing how social order reproduces itself, rather than at explaining social change (Whittle 2003, 11).

Moving to different directions, some structuralist ideas have found applications through the discipline of semiology (Leach 1997, 156). The central hypothesis of semiotics is that if all cultural phenomena are systems of signs and if culture is to be understood as communication, architecture is one of the fields in which this theory undoubtedly finds itself most challenged (Eco 1997, 173–4). The major concern lies in the exploration of semantic architectural codes that involve denotative and connotative meanings in function or ideology. The better these codifications are defined and interpreted, the better we can perceive the meanings and functions of past objects (Parker Pearson & Richards 1994a, 29). However, Eco (1997, 181) suggests that there are certain limitations in 'reading' the architectural plans, as the codes and functions are in flux and may connote diverse things in the course of history. In archaeological studies, the principles of semiotics have been employed in conjunction with theories of personal space, such as the theory of *proxemics*. Hall's research on *proxemics* (1968) postulates that humans have an innate, culturally modified, distancing mechanism which helps to regulate social contact<sup>1</sup>.

Another corpus of studies with structuralist connotations comprises approaches employing the theory of 'space syntax'. Such approaches (Glassie 1975; Hillier & Hanson 1984) try to interpret the built environment by testing a series of recursive rules of geometrical

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<sup>1</sup> Sanders' (1990) study of prehistoric Myrtos combines the semiotics with theories of personal space and other distancing mechanisms in order to identify culturally conditioned patterns and behavioural conventions in space.

properties, thus developing a descriptive spatial syntax. According to Hillier and Hanson, space syntax is a set of techniques for the representation, quantification and interpretation of spatial configuration in buildings and settlements. By graphically representing spatial properties, such as access patterns, it is possible to distinguish spatial 'genotypes' or tendencies that can be associated with patterned cultural perceptions, intrinsic 'social logics', values and attitudes (Hillier *et al* 1987; Plimpton & Hassan 1987, 439). Boast (1987, 451), while accepting the usefulness of this theory, argues that through such topological representations the form is deformed, reduced or even manipulated. In other critiques, syntactic techniques are accused for making unwarranted assumptions by ignoring the variability in symbolic meaning and by systematically abstracting symbols from their historical and social context (Parker Pearson & Richards 1994, 30; also Samson 1990, 6). Although 'space syntax' postulates a symbiotic relationship between space, movement and human behaviour, its assertion that there are 'rules' between spatial configuration and patterns of social behaviour flirts with 'deterministic' perspectives (Cutting 2005, 12). In addition, this highly codified theory tends to ignore the significance of conceptual boundaries, while in archaeological contexts its appropriateness is often limited due to poor preservation and the level of definition required.

While the perspectives described above focus on the exploration of the symbolic meaning through the study of formal properties, some anthropological theories have turned their interest to the primacy of metaphor as a cultural expression. Approaches to metaphor suggest that it is through metaphors that people argue over the appropriateness of rules, plans and world views, and thus create order and symbolic meaning in their universe (Lawrence & Low 1990, 472). Metaphors, being both interpretive and strategic, link memory and expression with cosmology, myth, and social or spatial structure. According to Fernandez (1988), metaphorical ways of thinking and speaking turn spaces into place. In turn, place becomes transformed into a set of attitudes and practices taken toward its inhabitants. We come to understand a place in those terms and consequently develop feelings of solidarity or divisiveness toward that place and its peoples. Thus, the metaphorical way of speaking or thinking may transform into a 'metonym', that is an integral part of that place. This can also explain how people construct their sense of identity as strongly bounded in place (Fernandez 1988, 31). In anthropology, similar conceptions attempt to trace the metaphorical symbolism of architectural features in their bodily meanings, thus explaining house forms as anthropomorphic symbolisms (Lawrence & Low 1990, 472–3; Parker Pearson & Richards 1994, 20–2).

A promising, although not straightforward, direction for the interpretation of the architectural environment is the application of phenomenological perspectives. According to some phenomenologists, like Bachelard, Heidegger and Lefebvre, space is not to be perceived as abstract and neutral, but as the space of the individual's lived, embodied experience of being-in-the-world. They suggest a move beyond linear and visual perspectives and towards multiple subjective sensory experiences, in order to reclaim an ontological dimension of the built environment (Leach 1997, 80; Lawrence and Low 1990, 475). Bachelard (1997, 88) suggests that interpretation should go beyond mere description and the limited constraints of a realist conception, and that the architectural features should be perceived as inhabited places, physically inscribed in individuals. For Heidegger (1971, 143–61) the problem of man's situatedness in the world is inextricably bounded with the question of dwelling. In his approach, the act of building does not only allow for the possibility of dwelling, but it is also part of that dwelling and a means of making the existential 'world' visible (Leach 1997, 94). Richardson's ethnographic study (1982) shows that the way in which embodied space is experienced communicates the basic dynamics and meanings of culture (Lawrence & Low 1990, 476; Low 2009, 28–9).

Drawing on these perspectives, a number of studies (Tilley 1994; Cummings *et al* 2002) suggest that archaeological remains cannot be understood without a human presence, as meaning arises in the embodied human engagement with material conditions. However, the extent to which the researcher's engagement can encounter a past being-in-the-world has been questioned (Barrett & Ko 2009; Fleming 1999; 2006). Moreover, the lack of a homogeneous and systematically developed philosophical position within the phenomenological movement (Audi 1999, 664), may lead to debates on whether, for example, Husserl's phenomenology or Heidegger's existentialism is (or could be) applied to the study of non-living societies (Barrett & Ko 2009, 284–5).

Further theoretical schemes could be included in this study. Theories of ritual (see Bradley 2005), for instance, offer an alternative explanation of how prescribed symbolic activities or ritual performances infuse both animate and inanimate features of culture with meaning. In sum, approaches to symbolism have offered valuable interpretative stimuli. However, the question that arises is how we could possibly recover and decode mental structures, cosmologies, metaphors and cultural specific meanings of past societies without imposing modern perceptions and metaphors of space (Barrett 1994, 88).

#### **2.1.4 Concluding remarks**

The study of architectural space reveals a great variety of procedures and theoretical considerations. Only a part of these theories was selected in this summary and, possibly, not all of them were ‘categorised’ or criticised in the most appropriate way. The reason for this is that the main objective was to underline general tendencies and schemes with a certain degree of influence in archaeological thinking. Though most of these perspectives were not initially formulated by archaeologists, it is remarkable how mutually shared the concerns are among various disciplines. A common feature in many of the approaches described is that their analysis focuses primarily on the formal and spatial characteristics of given built forms (e.g. ground plans and façades), whether from a functionalist, structuralist, phenomenological or other standpoint. Less interest is shown in the many-sided aspects of the building process itself and the construction practices that produce and reproduce architectural idioms. Even though the significance of the design process is sometimes noted (McGuire & Schiffer 1983), not many theoretical perspectives have been concerned with it as an act of daily sociality (McFayden 2007), as an embodied experience which influences built forms by (re)generating social relations and symbolic meanings.

## **2.2 The social aspects of domestic architecture**

The study of domestic architecture is among the most fundamental components of the attempt to reconstruct past societies. By focusing on dwellings, this section seeks to underline certain aspects of domestic architecture, so as to better conceive its social function and meaning. The main objectives are to evaluate the significance of dwellings in the structuring of a Neolithic way of life, to reveal their varying manifestations within the wider social context, and to highlight their role in the formation of identities, social units and institutions.

### **2.2.1 The creation of Neolithic worldviews and lifestyles**

Contrary to what may be assumed, the construction of sheltered spaces is not a distinctive characteristic of Neolithic societies *per se*, as both ethnographic and archaeological evidence indicate<sup>2</sup>; neither does the ‘Neolithic mode of production’ constitute a prerequisite for sedentism. It is, however, significant that during this period the built environment seems to

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<sup>2</sup> Evidence of architectural constructions comes from deep within the Palaeolithic, while during the Epi-palaeolithic/Mesolithic of south-west Asia and south-east Europe there is a considerable number of seasonal camps or more permanent settlements with more or less substantial domestic architecture.

comprise a central component of a new being-in-the-world. But how was this centrality achieved? In what ways did the emergence of dwellings contribute to the creation of alternative worldviews and lifestyles?

Wilson's (1988) well-known study focuses primarily on the consequences following the adoption of the practice of living in permanent dwellings and settlements. While not explaining why people adopted the built environment as their context of living, he argues that this choice had a major impact on the human senses (e.g. visual attention) and the ways in which spatial structure and society grows out of them (Wilson 1988, 2, 5). The practice of constructing and inhabiting dwellings was followed by a series of intended and/or unintended consequences, including the materialisation of worldviews, social relations and concepts. Such concepts refer to a strong sense of a private versus a public or social space that leads to notions of closure, exclusion and ownership, activities of display and exhibition, and to the creation of new cosmologies and social roles. Furthermore, the time-space relationship was transformed as time became repetition and recursiveness and the ideas of continuity and stability became explicit features (Wilson 1988, 64).

Following analogous but distinct paths, Hodder (1990) tries to identify the broad temporal and social processes that unify the cultural developments within the Neolithic, and to explain these processes in terms of the interplay of symbolic structures and underlying principles (O'Shea 1992, 752). During the long-term trajectory proposed, houses became the central metaphor and mechanism for the imposition and manipulation of new cultural categories (Hodder 1990, 30; Helms 1998, 16). The main principle introduced is the *domus* (Hodder 1990, 38, 44; 1994, 80). This is described as a set of practical activities and abstract concepts which focus on the house and constitute the very fabric of Neolithic societies. The term attempts to capture the dual nature of domestic structures as material and economic on the one hand, and social and ideational on the other (Hodder 1998, 86). Its opposing conceptual principle is the *agrios*, the wild and untamed world of nature, while the remaining highlighted term, the *foris*, refers to the boundaries between these two domains. According to Hodder, the interplay of this set of structuring principles can be traced throughout the Neolithic period of Europe. Their long-term durability and reproduction can be understood as a result of their very general and simple definition, and of their internal 'logic' that was implicitly embedded in practices (Hodder 1998, 100).

Both approaches mentioned above do not go without criticism and failures (see Halstead 1999, 82; Whittle 1996b, 69–70). The analytical value of the *domus/agrios* opposition, for

instance, has been criticised due to its abstract and flexible nature (Bailey 1996, 144; O'Shea 1992, 752). Even so, it is possible to outline several major impacts of the domestication process by drawing attention to their basic assumptions. Regarding the perception and use of space, the inhabiting of a built environment generates fixed points of orientation, or an *axis mundi*, by imposing structures and constraints in human action. This is not to say that mobile societies live in a homogeneous, uninterrupted and amorphous space without a sense of place or location (Eliade 1957, 20; Waterson 1995, 57–8; Helms 2007, 488). On the contrary, they appear to inhabit a cognised world, differentiated conceptually and richly imbued with meanings, even if flimsily bounded by architectural barriers (Whitelaw 1994, 236). Rather than that, living in a more permanent environment implies that as the *axis mundi* becomes more fixed, people and their activities become more spatially defined and determined. Moreover, architecture incorporates time into space and the past into the present, thus making possible the (re)production of group histories and collective memories, as well as the spatiotemporal anchoring of people through notions of belonging and ownership (Beck 2007b, 7; Carsten & Hugh-Jones 1995b, 26; Gillespie 2000a, 3).

Consequently, the most prominent impact of the adoption of domestic architecture was the gradual transformation of social organisation and relations. The domestic dwelling, the house, led to a move beyond the fluid and flexible relationships of mobile societies (Wilson 1988), to the emergence of a spatially defined and ordered social unit, the co-residential group. This group of people became often so indissolubly connected with the physical form it inhabits that in many cultures the term 'house' defines not only a dwelling or a spatial locus, but also the group of kin (or the kin-like unit) who are living in it or who can claim membership in it (Waterson 1997, 142; Gillespie 2000a, 6; Kahn 2007, 199)<sup>3</sup>. Therefore, the significance of the domestic dwelling itself seems to exceed its tangible form and boundaries, as it becomes the basis of whatever unity exists and of the performance of routines (Wilson 1988, 168–9). It should be viewed as a socially meaningful 'product' that greatly contributed in the emergence of social structure and an alternative being-in-the-world.

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<sup>3</sup> In many cultures the very existence of a pre-domesticated 'family' is a paradox (at least a linguistic one). A characteristic example is the Greek word '*oikos*', which describes the domicile as well as the 'family' unit, and from which derives the modern word '*oikogeneia*' (the group of people that is 'created' within the '*oikos*').

### 2.2.2 The possibilities of domestic architecture

After having sketched out the significance of the built environment in the structuring of a Neolithic way of life, this part will challenge the various forms and meanings that domestic architecture may take. This research will primarily focus on the archaeological remains of architectural forms that are supposed to serve as the centres of a certain range of actions, usually termed as ‘domestic’. Among the various terms commonly used in anthropological studies to describe related structures, the terms ‘domicile’ and ‘abode’ could be applied as alternatives or even synonyms. On the contrary, others, such as ‘home’ or ‘house’, may have quite different implications and their meaning is not always to be taken for granted. More specifically, the term ‘home’ refers to a place that is closely associated with memories or notions of belonging and can also take the form of a piece of land, a place in the landscape or a territory of a mobile hunter-gatherer community. Similarly, the term ‘house’ may carry a great deal of connotations, ranging from the physical structure to a social institution or an abstract entity. For these reasons, the term ‘domestic dwelling’ seems more suitable in order to emphasise the physical structures themselves and to avoid misinterpretations.

Nevertheless, the attributes of domestic dwellings, even the more tangible ones, are far from being standardised. Using living societies as signifiers of this complexity (Allison 1999, 3), it becomes apparent that the interpretation of the archaeological record is not a one-way enterprise. In many societies, houses take the form of medium-sized, free-standing buildings and this seems to be the case for the majority of dwellings in Neolithic south-east Europe and elsewhere. However, this trend is not universal. The domestic building complexes in Neolithic Anatolia (e.g. Çatalhöyük), the multi-roomed structures of the Near East (Banning 1996), the longhouses of the central European *Linearbandkeramik* and others, are substantially diverse material expressions of domestic architecture. Even within the same settlement different types of houses may co-exist, as it is the case for the free-standing buildings and the multi-roomed structures at Neolithic Sesklo in Thessaly (Kotsakis 2006). Various ethnographic examples indicate that certain structures may follow considerable different notions of size, orientation, segmentation, crowding, and privacy. Dwellings can be permeable to external visual attention<sup>4</sup> and movable<sup>5</sup> or seasonally

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<sup>4</sup> The open-walled dwellings of the Peruvian Yagua are permeable to external visual attention, as they follow different material and conceptual conventions (Duly 1979, 69)

<sup>5</sup> Examples include the Malay house in Langkawi or the longhouses of several tribes in the American Northwest Coast (see Carsten 1995, 107; Duly 1979, 58).



inhabited<sup>6</sup>, even when made of more or less durable materials and labour-intensive techniques.

Subsequently, the comprehensive description of the physical characteristics of these structures is not adequate. In order to yield a better understanding, domestic dwellings should not be studied in isolation from their wider context, as this will only provide limited access to their actual meanings and workings. Rather than being autonomous units, they should be viewed as integral parts of wider aggregations. Attention should be paid not only to the primary structure, but also to other features of the broader domestic unit that are associated with it. Such features may take the form of granaries, storages, dormitories, workhouses or open work areas, temporary shelters for visitors, kennels, menstruation huts and others (Duly 1979, 18; Rivière 1995, 191–192). Additionally, as ethnography confirms, domestic units may form distinct groupings, such as neighbourhoods or compounds (pieces of undivided house land), that work as entities bounded by kinship or kin-like relationships<sup>7</sup>. These parameters should be taken into consideration when dealing with the construction practices of the Neolithic communities, as they may influence decisions on the location or even the design of a building. Besides, most Neolithic villages comprise serial repetitions of identical features that form specific arrangements (Bailey 2005, 96). These arrangements provide a spatial perspective which orientates experience and from which certain characteristics of the world can be apprehended and reproduced (Barrett 2006). This can clearly be demonstrated in some traditional villages (e.g., the Dogon of Mali or the Bororo Indians of Brazil), where the layout of buildings and the settlement as a whole interacts strongly with cultural perceptions and anthropomorphic symbolisms (Duly 1979; Lane 1994).

A further component in the understanding of domestic dwellings and their forms refers to the co-residential group and its relationship with other social units, such as the family or the household. Though frequently these entities coincide, it should be noted that the idea of the identification of a single structure or a domestic unit with a small, autonomous, nuclear-family household is a recent one (Coupland & Banning 1996b, 1). A plethora of anthropological examples, along with various studies in the subfield of household archaeology, indicate that the relationship between the co-residential group and the

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<sup>6</sup> See for example the large dwellings of the Panare Indians in Venezuela that are abandoned throughout the summer hunting period (Duly 1979, 18).

<sup>7</sup> This trend can be traced in the villages of the Dogon of Mali, the Tiv of Nigeria, the Fulani and others (Duly 1979).

household is not a clear-cut one. The household is a social unit or formation that has wider social and cultural boundaries and may pervade, transcend, or indeed encompass other units or formations, such as co-residential groups and families (Souvatzi 2008a, 1–2). Therefore, even though co-residence may be a pertinent component, it seems that the spatial dimensions of the domestic dwelling and the household do not necessarily coincide. Co-residential groups can exist at different levels within the same society and may not carry key functions of the household such as consumption and reproduction (Souvatzi 2008a, 11; see also Allison 1999, 4–5; Yanagisako 1979). Moreover, they may change markedly over time going through temporal cycles, thus posing additional problems to archaeological research and the definition required (Cessford 2010, 136).

As ethnography implies, in many traditional communities more than two dwellings can be parts of a larger household. When structures are grouped into settlement segments or compounds they can be regarded as extensions of a house or as enlarged houses that share domestic activities (or even a common property). Conversely, a domestic dwelling may contain more than one household, as is the case for people that live in large or ‘big’ houses (Coupland & Banning 1996a). The longhouse of the Kelabit (Borneo) or the *maloca* of the Tukanoan (Northwest Amazonia) is divided into private areas or apartments built by different households or ‘hearth groups’ (Janowski 1995, 88; Hugh-Jones 1995). Furthermore, in certain cases, a single dwelling may encompass the whole village or, alternatively, the whole village, comprising several dwellings, may form a single household, as it stands for the Serbian *zadruga* (Souvatzi 2008a, 11). It, thus, becomes obvious that, whatever similarities one may uncover between the layout of such diverse formations (Rivière 1995, 192–3), their social, economic and symbolic significance is of a different kind and degree.

Following the account above, it can be argued that the various expressions of domestic architecture are far too heterogeneous to be studied under the same lenses. In each case, the basic characteristics of specific domestic dwellings, as well as the activities enacted in them, should be clarified in relation to broader units and social entities. In addition, further implications of their meaning can be illustrated when examined as social formations or institutions within the wider social context.

### **2.2.3 House-societies and the notion of the ‘social house’**

Despite the growing attention to the house as an important cultural category since the beginnings of the 1970s, it was Claude Lévi-Strauss who introduced the notion of ‘house-

societies' (*société "à maisons"*) as a type of social structure and formulated the concept of the 'house' (*maison*) as the organising principle and a specific analytical category (Beck 2007b, 4–5; Gillespie 2000a, 6–7; Waterson 1997, 138)<sup>8</sup>. According to his definition (1982, 174) the 'house' is "a corporate body (or a 'moral person') holding an estate made up of both material and immaterial wealth, which perpetuates itself through the transmission of its name, its goods, and its titles down a real or imaginary line, considered legitimate as long as this continuity can express itself in the language of kinship or of affinity and, most often, of both". In outlining its irreducible aspects, the 'house' should be viewed as a bounded participatory entity that projects the image of unity and connects the individual and the collective body (Borić 2007, 99–100; 2008, 111). The key features embodied are the ideals of continuity and perpetuation, which are assured not only through the succession of its human resources, but also through the transmission of its material (e.g. buildings, heirlooms, ceremonial ornaments) and immaterial (e.g. names, titles, myths, origin narratives) property (Waterson 1995, 49–50; Carsten & Hugh-Jones 1995b, 7)

Apart from these general aspects, however, it is difficult to define the more specific characteristics of the concept. One thing to be pointed out is that the 'house-society' model was originally devised to deal with the so-called cognatic societies<sup>9</sup> so as to move beyond traditional kinship theories, taxonomic approaches and divisions (Gillespie 2000a, 20; 2000b, 23; Lévi-Strauss 1987, 127, 151–153). Therefore, 'house-societies' were considered as a transitional form between kin-based and class-based social orders (Carsten & Hugh-Jones 1995b, 10) that are situated at the boundary between elementary structures of kinship and more complex structures (Lévi-Strauss 1987, 173). The diacritical, status-marking significance of houses' property seem to imply that the constituent units of society are somehow hierarchically ranked (Carsten & Hugh-Jones 1995b, 7; Düring 2007, 133; Gillespie 2000b, 49). However, other writers argue that such hierarchical principles are not necessarily embedded in systems of social stratification and economic or power relations (Waterson 1995, 56; see also Gillespie 2007, 29).

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<sup>8</sup> Lévi-Strauss explored the role of 'houses' in a course of lectures from 1976 to 1982 at the Collège de France. Essays, reviews and reports related to the concept are included in his revised edition of *La Voie des masques* (1979; English trans. 1982), *Anthropology and Myth* (1987) and a dictionary entry in 1991 (see Gillespie 2000b, 23). The concept was initially picked up by French anthropologists (Macdonald 1987) and was further refined in Waterson's (1997) seminal study of south-east Asian architecture, as well as in four major volumes (Beck 2007a; Carsten & Hugh-Jones 1995a; Joyce & Gillespie 2000; Sparkes & Howell 2003) with inputs by anthropologists and archaeologists.

<sup>9</sup> In anthropology, the terms 'cognatic', 'bilineal' or 'non-unilineal' refer to those societies that follow systems founded on an equal recognition of both lines of descent (Lévi-Strauss 1987, 127).

An important aspect of ‘house-societies’ is that the ideology of the bounded social entity is not necessarily materialised in the physical dwelling (Helms 1998, 15). The ‘house’ that locates a *personne morale* both spatially and socially is often a residence but is not always shared by all house members, who may be dispersed among various dwellings or localities (Gillespie 2000b, 47; 2007, 34). Rather than the physical domicile *per se* it can also be a hearth (Janowski 1995; Borić 2007), a tomb (Bloch 1995, 71), a temple or altar (Helms 1998, 18; McKinnon 2000), a shrine (Howell 1995), a ‘noble’ or ‘origin’ house (Waterson 1997; 2000), a palace, a set of regalia or other features (Gillespie 2000b, 47–8; 2007, 34). Moreover, the possibility of viewing the ‘house’ as a ‘*maison-fétiche*’, rather than as a concrete group or building (‘*maison-institution*’), renders conceivable the notion of a ‘house-society’ existing in the absence of any actual physical structures (Waterson 1995, 50)<sup>10</sup>.

Recent critique reveals some problems at the very heart of the concept, such as the unwarranted assumption that kinship is prior to forms of association based on residence or other factors (Carsten & Hugh-Jones 1995b, 19; Wilson 1988, 168–9). Moreover, it seems that by incorporating highly structured and diverse societies the model becomes at once too specific and too general so that it may confuse matters and virtually include every kind of society (Carsten & Hugh-Jones 1995b, 20; Howell 1995, 150; Gillespie 2000b, 40)<sup>11</sup>. Despite these criticisms, it has also drawn attention to the heuristic significance of indigenous concepts and terms, and has provided new insights into the study of a wide range of societies (Carsten & Hugh-Jones 1995b, 20; Howell 1995, 169; Waterson 1995, 68). Furthermore, as Gillespie (2000b, 31) argues, the notion of the ‘house’ contributed to a broader understanding of how social relations emerge from practical action, in the sense of Bourdieu’s (1977, 37) ‘practical’ kinship.

In contemporary archaeological discourse the concept is utilised as a heuristic device to overcome problems of interpretation concerning intangible issues, such as kinship relations, metaphorical representations and individual actions (Gillespie 2000a, 15; Helms 2007, 491). Being enriched by diachronic perspectives, the Lévi-Straussian model opens the path to different analytical scales ranging from the individual and small-scale to the

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<sup>10</sup> According to some approaches, the role of the ‘house’ can be symbolically performed by islands, as in the boat communities of the Moken sea nomads in Thailand, or by the various named cleared areas in the forests that the Nahua villagers of Amatlan call ‘houses’ (Waterson 1995, 50; Sandstrom 2000). An archaeological example of this scenario is proposed by Kirch (2000) for the explanation of the Polynesian *marae* (open ritual spaces).

<sup>11</sup> The authors in Macdonald 1987 suggest that only a small minority of societies could be thought of as ‘house societies’ in a strict sense. However, other scholars find it necessary to refine the whole concept by adopting a looser definition and to apply it in its most abstract and metaphorical sense (Waterson 1995, 50).

collective and long-term (Borić 2007, 97–98; Gerritsen 2007, 169). Archaeologists are, therefore, encouraged to examine the outcomes of group actions by focusing on the enduring material components of ‘houses’ (Gillespie 2000a, 15; Beck 2007b, 6). Attention is often paid to the physical structures or other tangible manifestations of continuity, such as the incorporated portions of previous structures (Tringham 2000; Düring 2007; Gerritsen 2007) and the transmission of heirlooms or the literal remains of the ‘ancestors’ (Joyce 2000; Gillespie 2000c; Borić 2007; Düring 2007).

The continuity of the house location, rather than being a result of social or ecological constraints, can be viewed as part of an ideology that serves to localise the social group, to organize kin-like relationships and to secure group rights to a specific material property (Gillespie 2000a, 16)<sup>12</sup>. Consequently, the model may be applied to interpret such mundane practices as the continued rebuilding of dwellings in the same location or practices of deliberate house burning (Chapman 1999; Stevanović 2007). Other types of material culture, commonly associated with the historical memory of the ‘house’, include certain objects of symbolic value that are described as prestige items, ritual attractors or ceremonial regalia. Not all of them can be interpreted as wealth objects taken out of circulation for ritual purposes; they are often regarded as heirlooms<sup>13</sup> that provided the ‘house’ with its tangible durability (Helms 1998, 164). Such goods are connected to key strategies through which ‘houses’ forge relationships with other ‘houses’ and situate their members in reference to shared history and individual status (Beck 2007b, 9–10). Comparable explanations have been proposed to interpret certain burial practices, such as the inhumations under or around houses and the curation of skeletal remains, which may indicate ancestral veneration or the desire to maintain perpetuated links to deceased members for legitimising house rights to contested resources (Beck 2007b, 8; Gillespie 2000a, 19).

In general, most archaeological approaches do not seem to retain the specificity of the Lévi-Straussian concept. Although offering useful insights into the interpretation of dwellings, they often use a ‘broadened’ or looser definition of the ‘house’ concept, thus making ‘weak’ instead of ‘strong’ analogies (Düring 2007, 133–4) and obscuring alternative explanations. Regarding the continuity of house location, for instance, the need to control

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<sup>12</sup> Bailey (1990), though not using the concept of ‘house’, also connects the repetition of floor plans with individual or group strategies to prove their rights to settle, occupy, and control their territory.

<sup>13</sup> However, not all of these objects should be necessarily treated as heirlooms as there are other ways in which they could have acquired their biographies (see Whitley 2002b, 226; also Sherratt 2010).

vital resources should also be taken into account. The role of the Neolithic garden economy (Jones 2005; 2010; see also Joyce 2007, 66–7) and the arrangement between houses and gardens or arable land (see Chapman 2010, 75–6) may have contributed greatly in the creation of stable places and the repetition of spatial arrangements. Similarly, even though ancestral cult and mortuary rituals may speak the language of inter-generational property transmission, their messages are too complex and can be misleading (Morris 1991)<sup>14</sup>. The location and types of burials may vary according to various beliefs and cultural conventions (Binford 1971).

Bearing in mind the anthropological debate on the issue, it is apparent that its application to non-living societies runs into serious difficulties. If emphasis is to be placed on the general aspects of the ‘house’, rather than its exact nature and its classificatory status, one wonders about the heuristic utility of the terminology adopted. Does this stance reinforce the interpretative value of the model or does it muddy the waters by turning the whole concept into a too all-embracing category? Current archaeological research, rather than attempting to redefine and adopt debatable terminologies, can exploit some useful implications of the Lévi-Straussian concept or house-centric approaches, while concentrating on the understanding of the material data in their own terms.

The most significant implication to be exploited is the notion of the ‘social house’ (or the ‘living house’ – see Bailey 1990). This refers to the possibility of ascribing dwelling remains with social properties that unite its residents and reflect their strategies and world perspectives. Moving beyond the physical forms and boundaries, domestic dwellings should be viewed as structures embedded with meaning and as active representations of embodied practice (Heitman 2007, 266). Their physical and social nature locates people within a complex web of categories and relationships that can be mapped against defined spaces (Gillespie 2000a, 18). Co-residence and identification with a structure help the creation of collectivities and shared identities, hence the delineation of an “Us” qualitatively different from “Others” (Helms 1998, 17; Gerritsen 2007, 158). Houses become the fetishisation of a social relation, the materialisation and perpetuation of which archaeologists seek to understand. However, the form of this relation is not clear-cut;

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<sup>14</sup> A common problem that can confuse matters is the treatment of the mortuary rituals or the burial remains and the veneration of ancestors as being much the same thing. On the contrary, when referring to ancestors more distinctions should be made (Morris 1991, 150; Whitley 2002a, 125). A useful distinction might be that between the ‘emergent house ancestors’ and the ‘precedent first-principle ancestors’ as proposed by Helms (1998, 37–9).

neither can its role in socio-political transformations be studied out of the specific cultural or historical context. In each case, it is argued that the social context of the end-products of construction practices influences decisions, formal properties, as well as other aspects of their construction and maintenance.

### **2.3 Technology and house construction**

One of the main concerns of this study is to incorporate technological perspectives into the analysis of domestic architectural remains. This does not simply refer to the analysis of the technical aspects of house construction, but also to the social implications of the process, including the socialities involved, the multi-faceted meanings communicated and the social dynamics reflected and/or generated. In order to do so, it is necessary to disengage the term ‘technology’ from its modern conceptual underpinnings that lead to various conflations and dichotomies.

The word ‘technology’ came into regular use during the 17<sup>th</sup> and 18<sup>th</sup> century and it was further reconceptualised during the outset of the Industrial Revolution (Dobres 2000; Ingold 2000; Mitcham 1979). In this historical context the meaning of the word became equivalent to the application of the objective principles of mechanical functioning to the ends of art (Ingold 2000, 294). These principles were considered to be the outcome of knowledge derived through pure scientific inquiry and not through some abstract thinking or practical activity. This notion led to the conceptual partitioning of practice from ‘true’ knowledge and the distinction between construction and design (Dobres 2000, 51; Ingold 2000, 295; 299–300). Further implications include the progressive withdrawal of the craftsman from the centre to the periphery of the productive process and the reduction of human agency and making activity to a ‘purely technical’ execution (Ingold 2000, 289, 314; Pfaffenberger 1992, 502).

Recent anthropological and archaeological literature (e.g. Dobres 1995; 2000; Dobres & Hoffman 1999; Lemonnier 1986) seeks to redefine the concept of technology and to reconcile the oppositions created by its techno-centric approach. One possible move towards this goal is to focus on the contradictions between the two Greek roots of the word (*tekhne* and *logos*) and their modern hybridisation. More specifically, the term *tekhne* describes not only the kind of art, skill and craft we usually associate with fabricative activities, but also includes abstract principles, practical knowledge, understanding and awareness (Dobres 2000, 52). This terminology implies that technology — the *logos* or the

ontological structure of *tekhnē* — may be viewed as a body of distinct, systematic knowledge that co-exists in a two-way relationship, without presupposing dependence on science (Ingold 2000, 297). It constitutes a never-ending process driven forward by the routine activities and the perception of the practitioners, their continuous engagement with the properties of the material world (Renfrew 2001; also Ingold 2007), as well as by imitating and teaching. Everyday activities, human agency, traditions, individual or group identities and experience can all be seen as significant components of the process.

### 2.3.1 Technology and society

The relationship between technology and the social, economic and political structures within which it is practised constitutes one of the fundamental questions in technological studies. The archaeological discussion on the subject is, unsurprisingly, linked to broader theoretical debates and schemes in both archaeology and other disciplines. Stemming from notions of evolutionism and ideological progressivism, early accounts treated cultural or social evolution as a stadial transition from simple to more complex societies. Technology was viewed not only as coinciding with the enlargement of human control over brute, external nature (Childe 1944, 18), but also as the major determinant or presupposition for the development of civilisation and social organisation (Carneiro 1974, 179). Within this context of ‘technological determinism’, technological discoveries and applications seem to occur according to an inner necessity, governed by predictable law-like regularities, and they unilaterally affect social reality (Dobres 2000, 39, 234; Pfaffenberger 1988).

According to Leslie A. White (1949), the form of social organisation or system is an outwardly directed response to material technology and the extent to which a society’s technology utilises energy (Carneiro 1974, 181; Dobres 2000, 31). Similar deterministic views can be traced to the work of V. Gordon Childe who emphasises the significance of technological advance and the monodirectionality of cause and effect by identifying modal technological sequences corresponding to different stages of cultural evolution. However, Childe (1944, 17) underlined that these modes are not *homotaxial*, as they do not always follow one another in the same order. He recognised the possibility of a substantial discrepancy between the level of technology and the degree of sociopolitical development (Carneiro 1974, 181).

The opposition to technological determinism, which can be described as ‘organisational determinism’, emphasised the fact that technology is not unrelated to societal requirements and demands. Changes in social organization and institutions seem to precipitate



technological changes rather than vice versa. Instead of being the prime cause and a prerequisite for cultural evolution, technology should be considered as a proximate cause or a concomitant of civilisation. Nevertheless, its significance was not to be downplayed, as it was still regarded as the catalyst that accelerated the process of certain social formations (Carneiro 1974, 182–3). In short, technological and organisational determinism share a lot in common as they both conceived the relationship between technology and society as a one-way relation between cause and effect.

Evolutionism and determinism broadly influenced the ideas of the so-called New Archaeology and, especially, systems theory. According to this doctrine, culture should be viewed as a thermodynamic system of integrated sub-systems ‘seeking’ homeostasis and functioning according to law-like regularities (Dobres 2000, 42–3). The technological sub-system was defined by the activities which result in the production of artefacts and its main components were the producers, the material resources and the finished products. On the other hand, the social sub-system was described as encompassing inter-personal behaviour patterns and social institutions, clearly distinguished from the subsistence and technological spheres (Renfrew 1972, 22–3). The relationship between society and technology, rather than being a simple cause and effect one, was viewed as two-directional between different sub-systems. The terms ‘socio-technic’ and ‘ideo-technic’ (see Binford 1962, 219), describing artefacts having their primary functional context in the social or ideological component of culture, were employed to overcome an absolute dichotomy between technology and the social system. However, these were still conceived as different parts of the same system. Although both parts played an important role in how cultures maintain their balance or change (e.g. through the notion of the ‘multiplier effect’), technology was considered as a more knowable and quantifiable component, more directly responsive to external, environmental stimuli (Dobres 2000, 44). Therefore, it took centre stage in the cultural system by representing its most significant materialist core and by constituting society’s ‘extrasomatic means of adaptation’ (White 1959; also Binford 1962).

The more recent anthropological debate on the subject has offered alternative insights into the study of technology. Whereas not subscribing to a common body of theory (Killick 2004, 571), social constructionist approaches — especially those referring to practice theory, agency and materiality — move beyond the conceptual framework of past theoretical schemes. Their main objection to the deterministic and systemic views is that the relationship between society and technology is not an interaction between different parts or spheres. On the contrary, technology should be viewed as a dynamic phenomenon

embedded within social interaction, reproduction and worldviews and, therefore, relevant studies need to enmesh technical practice and social action within the same relational matrix (Dobres & Hoffman 1994; Ingold 2000, 314; Killick 2004, 573; Sinclair 2000, 196). The relationship proposed, being an indissoluble one, allowed the refinement of the concept of technology which was not merely restricted to its materialist core. In short, according to current theoretical schemes, the main disadvantage of former approaches was the acceptance of a deficient concept that led to a factitious dichotomy between the material and non-material (including agency) aspects of technology.

### **2.3.2 Buildings as technological products**

It was suggested earlier in this chapter that the bulk of theoretical approaches exploited by archaeology for the analysis of architecture favour the spatial or formal aspects of domestic buildings and that less attention is commonly paid to their technological characteristics. This can be, by and large, attributed to the artefact-oriented tradition in archaeological research and the conception of the house as ‘an entity beyond the artefact’ (Stevanović 1996, 71–2). Houses are commonly perceived as containers of multiple activities, artefacts and features. However, they also constitute technological products in themselves that can be subjected to analytical schemes similar to other artefact categories. These refer to the technological aspects of house construction, comprising the exploitation and transformation of certain material resources, as well as the techniques and skills employed in the shaping and maintenance of built forms.

The refined concept of technology, being embedded in social relations, further highlights the potentials offered by the technological analysis of houses. Rather than restricted to the description of technical and morphological attributes, building technology may be used to make inferences about the social dynamics and politics of prehistoric societies, including a plethora of meanings, perspectives, values, tendencies and expressions of social inequalities or tensions. The focus should be on the socialities and dynamics involved in the decision making process, the transmission of technological knowledge and, especially, the organisation of production in terms of the control of and access to resources, labour force, techniques and skills.

One promising way to approach building remains as technological products is by applying a *chaîne opératoire* or relevant framework adjusted to the circumstances of the material under study. Stemming from ideas that link the corporeal and the social body, already expressed by Mauss (1935; see also Schlanger 2006), the concept of *chaîne opératoire* has been

commonly employed to trace the tangible and intangible aspects of the socially embedded and embodied technological practice. According to the leading spokesmen of the approach, A. Leroi-Gourhan (1993) and P. Lemonnier (1983), the techniques and processes of raw material transformation are organised by a true syntax into sequences of technical gestures and mental operations (Perlès 1987, 23; Sellet 1993, 106). Their reconstruction, by using schematic diagrams or flow models, allows the delimitation of the material contours and the strategies underlying technological practice on both the technical and the conceptual level (Dobres 2000; Pelegrin *et al.* 1988).

Similar frameworks have been proposed by behavioural archaeology, operation process management, and information system analysis (Miller 2007, 242). Although often encompassing different theoretical standpoints and methodologies, it is possible to reconcile certain implications of alternative models (see Sellet 1993). Following Schiffer's (1976; 2004; Schiffer *et al.* 2001, 731) 'behavioural chain', for instance, a technological study may be enriched by focusing on all activities and processes taking place during an artefact's life history (procurement, manufacture, use maintenance and discard) and not just the operational sequences of manufacture.

In the case of building technology, the application of a strict *chaîne opératoire* methodology may pose certain difficulties. This is due to the fact that the building process entails a plethora of culturally and environmentally determined alternatives, not always traceable or preserved in the archaeological record. Houses are necessary complex artefacts comprising diverse materials and techniques that, in turn, present their own *chaînes opératoires* before being incorporated into the structure. Unlike other material categories, such as lithics or pottery, house construction involves a series of reductive, transformative and additive processes that are either beyond reconstruction or are combined in various ways without necessarily altering the end-result. The segmentation of these processes in a strict sequential order and the identification of all constituents influencing decision-making and technological choice are not always possible. Nevertheless, the employment of the *chaîne opératoire* concept in its wider sense offers useful insights on various strategies and stages of material exploitation and transformation, while moving beyond the purely descriptive character of a typological or formalistic approach.

However, in order to move away from the description of operational sequences and towards a better understanding of social dynamics, it is necessary to conceptualise technical action as social agency. Tools, raw materials, gestures, techniques and desired end-points,

all constitute components of stocks or 'constellations of knowledge' that are transmitted and embodied in the course of social practices (Sinclair 2000, 196). Whether viewed as subjected to underlying cognitive and corporeal schemas or culturally transmitted dispositions, technological sequences are engendered and essentially enmeshed in social interaction. The reproduction of their normative templates, as well as their manipulation and alteration through time and space, should be examined as the result of individual or group strategies and world perspectives. It is for this reason that norms and variations, even if subtle, constitute expressions of social agency that should be approached at different scales and axes of analysis (Dobres 2000).

### **2.3.3 Variability and change in building technology**

In trying to enhance our understanding of past technological practice, the issues of homogeneity/standardisation, variability/diversity, continuity and change should constitute the research's focal point. Following an agency-oriented agenda, the degree of homogeneity and/or diversity in different stages and ramifications of house construction, maintenance and destruction may be informative about prevailing perspectives and dynamics. This is not to say that material constraints or pragmatic limitations imposed by the environment and the landscape are not responsible for architectural variability. However, it can be convincingly stated that climate, geography and materials are broad-limiting factors dictating solely the outside limits, and not the end-results, to architectural design (Waterson 1997, 73). The ways people envisage these constraints and the appropriateness of the solutions applied to overcome them are still embedded in social perceptions and interaction.

According to the cultural-historical or normative paradigm, inter- or intra-regional technological variations should be considered as direct measures of the degree of interaction and cultural distinctiveness (Jones 1996; Sackett 1986, 632–3). The predominance of a distinctive house type or technology in a region could be approached as reflecting unity, while the co-occurrence of different house types may be attributed to cultural or natural transitions (Fuson 1964, 190). The significance of the Neolithic house as the physical expression of social units and various symbolisms renders it possible that the isochrestic variations observed in the architectural record are, by and large, idiomatic or diagnostic of cultural identity (Sackett 1986, 630).

However, ethnographic studies suggest that a straightforward approach to architectural variability comes not without problems. Different types of dwellings are commonly used

within the same culture even if one of them is regarded as the 'proper' one (Rivière 1995, 191). Lemonnier (1986, 158), based on his study of the *Anga* houses in Papua New Guinea, notes that perceptible intra-cultural differences could sometimes be greater than those between groups belonging to different cultures (see also Donley-Reid 1990; Jones 1996; Lebbal 1989). Moreover, certain accounts reveal that the 'cultural markers' in traditional architecture may deviate a lot from the structural characteristics represented in the archaeological record. Other features or decorative elements, which could be considered as non-functional or superfluous, may be more significant for the identification of a common cultural background.

Therefore, rather than translating homogeneity and variability into cultural affinity or distance, the focus should be on the circulation of certain technological conceptions and solutions at different scales of analysis. These may refer to the fundamentals of house construction and their alternative manifestations or to the circulation of specific features and techniques employed in different stages of the building process. The distribution of technological choices, rather than built forms or archetypes, allows approaching variability in terms of different networks or settings of communication and interaction. These networks, although playing a significant role in the shaping of cultural identity, are directly associated with social action and experience and should not be perceived as essentially well bounded or stable.

At the site-specific scale, technological diversity is commonly submerged into summary statistics used in regional comparative analyses (Kuhn 2004, 566), while homogeneity is often viewed as reflecting the establishment of well adapted archetypes. Nevertheless, the analysis of house construction as embedded in certain production or social relations (Chourmouziadis 1995, 227) offers insights into various facets of social organisation. In terms of the organisation of house construction, labour division and specialisation or the differentiation in tasks often lead to increasing architectural diversity (McGuire & Schiffer 1983, 286–7). This can also be expressed in the unequal access to material resources or labour force among different members or groups of the community. In addition, the degree of observable homogeneity or variability may provide information about how technological knowledge is acquired and transmitted. Standardisation may point to the widespread sharing of skills and expertise following a horizontal transmission pattern, while variability between houses or groups of houses could be associated with the oblique/vertical transmission of micro-traditions (see Bentley & Shennan 2003).

In terms of social differentiation and dynamics, it is noted that technological choices between alternatives are related to the passive or active communication and manifestation of various meanings and cognitive processes (Miller 2007, 193–4). Standardisation or variability in architectural technology reflect and generate perspectives of sameness or distinctiveness and equality or inequality between social units. Non-local building materials and techniques, for instance, may be exploited to reinforce social distance (Svensson 2008, 149), while less conspicuous deviations from traditional norms or the ‘popular trait’ may also reflect less overtly articulated social tensions (see Wilk 1983). Although the meanings expressed through architectural practice will be subjected to different readings by different social or gender groups, they still seem to reflect, up to a degree, the interplay between co-resident units and the community.

Moving to the issues of continuity and change, building technology is commonly thought to be relatively static and conservative in nature. Built forms, building materials and techniques are thought to be highly dependent on traditional norms or successful solutions that have been tested through time. Nevertheless, the persistence of traditional technologies or architectural styles is not to be approached in terms of passive conservatism and local backwardness (Johnson 1997, 17). Continuity may be viewed as the result of the verbal and practical or embodied transmission of technological know-how, leading to the repetition of practices and material or conceptual structures that are commonly associated with critical meanings, symbolic sanctions and ordering principles. In any case, the diachronic perspectives offered by archaeology suggest that change, either gradual or more rapid, occurs and that the attitudes towards conformism or innovation differ from society to society. However, it is still difficult to trace the short-term processes involved in architectural innovation and to situate them in their exact social and historical context.

Both external and internal stimuli may account for the adoption of technological innovations. The former mainly include environmental factors, such as changes in the climate or the landscape, which affect the availability of material resources or the suitability of certain techniques. In addition, intrusive adoption, involving the movement of people, or the diffusion of technological solutions and conceptions through contact, play a significant role in the transformation of building practices (Oliver 2006). Although diffusion has been characterised as “a sovereign recipe for evading a problem” (Mercer 1997, 11), it still constitutes an important factor influencing the transmission of technological knowledge and practice at the inter- or intra-cultural level. What remains to

be addressed is why contiguous or more distant societies decide to incorporate innovative features into traditional templates or to wholly replace their technologies.

According to behavioural theories of adoption, technological choices are made on the basis of comparisons, through feedback, among their performance characteristics (the ‘performance matrix’) in relation to given activities (Schiffer 2004; Schiffer *et al.* 2001, 733). A more socially integrated approach supports that adoption and change occur when all elements of the social and technological context have been modified so as to effectively accommodate them (Pfaffenberger 1988, 498). These may include alterations in the goals, the use requirements and dynamics between social units, as well as socioeconomic changes leading to the re-organisation of the labour force (McGuire & Schiffer 1983, 288–9; Miller 2007, 185–6). Yet again, the translation of technological innovations into social transformations or *vice versa* comes not without problems. In certain cases, the material components of a technology may change, while its social and symbolic components may be left alone (Pfaffenberger 1988, 249). Similarly, technologies may appear more conservative than the social unit or institution they aid (Larick 1999, 78).

Conclusively, it should be stated that the technological analysis of prehistoric buildings is not a straightforward process. Ambiguities emerge in any attempt to make inferences about social organisation, interaction and dynamics when not taking into account relevant information provided by other features of the archaeological record. The comparative analysis of building technology in relation to the wider socioeconomic context can shed light on the architectural record at hand. The following chapter aims at setting the context for the analysis of northern Greek building remains.

### **3. An introduction to the Neolithic period of northern Greece**

#### **3.1 History of research and the chronological framework**

##### **3.1.1 From the military to the excavation trench**

The history of research in Macedonia and Thrace has been primarily driven by three complementary forces, namely the historical conditions of the area with their political connotations, the main theoretical concerns of the archaeological discipline, and the perceptions imposed on the prehistoric record as a result of its comparison to the adjacent areas. Early interest on the prehistory of the region followed the pioneering research on the Neolithic period of Thessaly and further south (Gallis 1996, 26). The way had once again been paved by the surveys of A. Wace and M. Thompson (1909; Wace 1913-14), who compiled the first gazetteer of prehistoric settlements in Macedonia. However, work on a substantial scale was undertaken only after the annexation of Macedonia, and especially after the autumn of 1915 when the Entente army landed in Thessaloniki. In the following period, topographic surveys, surface collections and excavations were carried out by the British Salonika Force and the Archaeological Service of the French Armée d'Orient (SAAO), while the Greek archaeological service played a minimal official role. It would not, therefore, be inaccurate to suggest that prehistoric archaeology in the region “grew in the military trenches and reconnaissance trips of the Entente army in WW I” (Fotiadis 2001, 116–17).

In the years that followed, W.A. Heurtley became the prominent figure of prehistoric research in the region. His team conducted surveys and soundings at several sites in western and central Macedonia, while in 1939 he published his synthetic monograph which constituted the basic reference work for all subsequent inquiries (Grammenos 1991, 23–5; Gallis 1996, 26). Other research projects during the interwar period include the early excavations at Dikili Tash by the French Archaeological School, the excavation at Olynthos by the American School of Classical Studies (Mylonas 1929), the survey at the Neolithic sites of Akropotamos and Polistylo (Mylonas 1941), as well as the early excavations at the settlement of Paradimi in Thrace by S. Kyriakides and E. Pelekides. However, the departure of Heurtley's team in 1931 was followed by an almost 30-year period during which a minimum of fieldwork was carried out. In that epoch of unstable historical and



political conditions, the Neolithic was restricted to small-scale research which focused mainly on trivial issues of chronology and cultural affinities, and was undertaken sporadically as a by-product of major archaeological projects (Kotsakis 2005, 8). Furthermore, the Neolithic of northern Greece retained a marginal role, dominated by a strong sense of 'Otherness' seen against the prehistoric Aegean cultures (Kotsakis 1998, 47; Fotiadis 2001).

The beginning of the modern phase of prehistoric research was marked by the joint Harvard-Cambridge excavations at Nea Nikomedeia, directed by R.J. Rodden in the early 1960s. The new project was once again driven by the area's key location between western Asia and southeast Europe, although the context of research by that time was radically different. The set of questions and the methodology applied, strongly influenced by the emerging 'New Archaeology', were now focusing on the spread of the Neolithic 'mode of production' and the beginnings of farming in Europe (Andreou *et al.* 1996, 561–2). Even if the expectations raised were short-lived, the excavations at Nea Nikomedeia revived interest in the prehistory of the region and were followed by a number of research projects during the 1960s and 1970s. Among these, the renewal of the French and Greek excavations at Dikili Tash (Deshayes 1970; 1973), the important joint excavation project at the nearby settlement of Sitagroi (Renfrew *et al.* 1986), as well as the rescue excavations at Servia (1971-1973) by the British School of Archaeology and the Greek Archaeological Service (Ridley *et al.* 2000), necessitated by the construction of the Aliakmon dam, stand out. Other projects include the small-scale excavations at Paradimi by G. Bakalakis, the excavations at the site of Paradeisos near the river Nestos (Hellström 1987), as well as the research at the prehistoric sites of Dimitra and Vassilika C by D. Grammenos. Smaller soundings were also undertaken at the prehistoric site of Laphrouda by Rhomiopoulou, the cave of Maroneia by Pentazos and on the island of Thassos by C. Koukouli-Chrysanthaki. At the same time, a systematic surface survey was conducted by M. Fotiadis (1983) at the Serres basin.

While significant work was carried out during the 1960s and 1970s, this does not compare with the intensity of surveys and excavations conducted from the early 1980s onwards. It is true that during the last three decades, the number of excavations in northern Greece has multiplied. Similarly, more systematic surface surveys were conducted, while research objectives, which were in many cases exclusively oriented to issues of local ceramic typologies, were gradually changed (Efstratiou 1994, 425). Rather than trying to provide a catalogue of recent projects that have already been summarised elsewhere (see Andreou *et*

*al.* 1996; 2001; Grammenos 2010), I will try to demarcate the factors that acted as catalysts in this development. First and foremost, the excavation of the royal cemetery at Vergina by M. Andronikos in 1977 led to an abrupt shift of administrative concerns and archaeological attention to northern Greece. Although not targeting primarily the Neolithic period, the interest shown and the available funding permitted the subsequent burgeoning of prehistoric research. Moreover, this “archaeological cosmogony” led to the organisation of *AEMTH*<sup>15</sup>, an annual conference focusing on the archaeological advances in Macedonia and Thrace (Kotsakis 1998, 53–4). Equally important was the fact that during the last three decades there were certain periods of urban planning and reconstruction works that led to a large number of autopsies and rescue excavations (Grammenos *et al.* 1997, 89). In the meantime, Greek prehistoric research, that was for many decades partly ‘enclosed’ in the political borders of modern Greece (Touchais 2009, 103–4)<sup>16</sup>, is nowadays more aware of the research results in neighbouring regions and more open to the wider theoretical discourse on European prehistory.

### 3.1.2 Notes on chronology

For a considerable period of time, the chronology of the Greek Neolithic was, by and large, following the schemes and the terminology applied in the study of prehistoric Thessaly. This was the reasonable outcome of the paucity of systematic research and stratigraphic sequences in many regions of Greece. The first attempts at the establishment of a coherent chronological framework were made as early as the beginnings of the 20<sup>th</sup> century. In his fundamental work on the Neolithic ‘*acropoleis*’ of Sesklo and Dimini, Ch. Tsountas (1908) distinguished two main stratigraphic periods<sup>17</sup>. Although the chronology proposed at that time was rather late, this twofold distinction remained influential in the subsequent chronological schemes. Later publications by S. Weinberg (1947; 1954) marked a turning point in the terminology used with the establishment of a tripartite system subdividing the Neolithic period into an Early (thereafter EN), Middle (thereafter MN) and Late (thereafter LN) phase. In subsequent years, the stratigraphic investigations of D. Theocharis and V. Milošević in Thessaly contributed significantly to the identification of sub-phases within the three major divisions of the Neolithic (Gallis 1996, 26). Along with the basic tripartite

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<sup>15</sup> To Archaiologiko Ergo sti Makedonia kai Thraki.

<sup>16</sup> For a discussion on the role of politics and nationalist agendas in the ‘isolation’ of ethnic archaeologies in the Balkan area see Bailey 1998, Fotiadis 1995, Kaiser 1995 and Veseli 2006.

<sup>17</sup> Tsountas (1908, foreword, 159) had already warned for the existence of an even earlier phase but his observations were overlooked as this phase was not represented in the subsequent excavations of Wace and Thompson (1912) in Thessaly (Theocharis 1973, 39).

system, a linear cultural model based on Thessalian type-sites, such as Sesklo and Dimini, was proposed. The terminology used was not restricted to Thessaly but was adopted elsewhere in Greece where cultural affinities could be found. At the same time, similar terms, implying the existence of distinct cultural groups, were applied in parts of northern Greece (e.g. the ‘Paradimi culture’ in Thrace).

The scientific advances in absolute chronology led to a more precise dating of the Greek Neolithic. The calibration of data against recent evidence led to the extension of the Neolithic era in mainland Greece, now covering the period from the early/mid 7<sup>th</sup> to the late 4<sup>th</sup> millennium BC. In addition, it was further realised that the MN period was much shorter than previously thought (Theocharis 1973, 38) and that the LN period had a remarkably long duration. In order to provide more accurate subdivisions for the period between the late 6<sup>th</sup> and the late 4<sup>th</sup> millennium BC, the terms LN I, LN II and Final Neolithic (thereafter FN) or Chalcolithic<sup>18</sup> (*ca.* 4500–3200 cal BC) were employed.

<b><u>Archaeological phases</u></b>	<b><u>Years cal BC</u></b>
<b>Early Neolithic (EN)</b>	<b>6600/6500 - 5800</b>
<b>Middle Neolithic (MN)</b>	<b>5800 - 5400/5300</b>
<b>Late Neolithic (LN)</b>	<b>5400/5300 - 4500</b>
Late Neolithic I	5400/5300 - 4800
Late Neolithic II	4800 - 4500
<b>Final Neolithic/Chalcolithic (FN)</b>	<b>4500 - 3300/3200</b>
Final Neolithic I (Chalcolithic I)	4500 - <i>ca.</i> 4000
Final Neolithic II (Chalcolithic II)	<i>ca.</i> 4000 - 3300/3200
<b>Early Bronze Age (EBA)</b>	<b>3300/3200 - 2300/2200</b>

**Table 3.1 Chronology and phases of the Neolithic period in northern Greece.**

In the present research, the adoption of an appropriate terminology for the presentation of the material poses certain difficulties. Both chronological schemes, the ‘phasal’ and the ‘cultural’, and their combination may prove problematic. The well known tripartite division and other phasal models, even if of heuristic value, focus on certain aspects of the material

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<sup>18</sup> The term ‘Chalcolithic’ is sometimes used in northern Greek contexts, while the term LN is occasionally used to refer to the whole period (LNI-FNII) when further refinement is not possible.

culture, thus often becoming inappropriate on an interpretative level. The frequently arbitrary criteria used for the establishment of different phases or sub-phases may lead to factitious divisions and chronological hiatuses. Likewise, the ‘culture model’ ascribes chronological value to entities that are primarily defined on a spatial basis (Stanley Price 1979). This, besides causing problems for defining the upper and lower limits of different periods, also obscures cultural continuity and local variability. In the case of northern Greece, which is by no means a homogeneous environmental or cultural entity, the employment of generalising chronological schemes may impose further misunderstandings. Nevertheless, the refinement of the chronological framework is not among the objectives of this research. Acknowledging the complexity of chronological issues, the terminology adopted (**Tables 3.1, 3.2**) is primarily based on broadly accepted chronological schemes (see Andreou *et al.* 1996; Gallis 1996; Papadimitriou 2010; Souvatzi 2008a) that take into account recent evidence in mainland Greece and neighbouring regions. The archaeological phases and subdivisions will be referred to as mere chronological indicators without specific cultural connotations.

Period	Date (cal BC)	Western Macedonia	Central Macedonia	Eastern Macedonia	Thrace	Central & South Greece	South & Central Balkans	Balkan Periods
(Aceramic Neolithic?)	7000		Paliambela (EN)			Knossos X, Franchthi Cave	Lepenski Vir	Mesolithic
Early Neolithic	6500	Maropigi	Axos A, Giannitsa B Nea Nikomedeia			Argissa, Sesklo ('AN') EN I Prodromos, Makrychori I (dirches) Elateia, Knossos VIII-IX Achilleion I-II, Sesklo EN II-III	(Proto-)Starčevo (?) Starčevo I Anzabegovo I, Karanovo I	
Middle Neolithic	6000	Servia-Varytinides				Achilleion III, Otzaki, Platia Magoula Zarkou, Nea Makri, Lerna I, Knossos VII Achilleion IV, Sesklo MN I-II, Lerna II	Starčevo II, Podgone, Karanovo II Anzabegovo II-III Starčevo III	Early Neolithic
Late Neolithic I	5500	Servia I-V Dispilio Servia VI-VII Avgi I Megalos Nisi Galanis	Makryalos I, Stavroupolis I, Thermi B, Vassilika C Savroupolis II Makryalos II	Sitagroi I, Dikili Tash I	Makri I Paradimi I-III Makri II	Sesklo MN III Tsangli, Platia Magoula Zarkou, Makrychori I Knossos V-VI Arafi	Vinča A-Tordoš, Cakran, Karanovo III Anzabegovo IV	Middle Neolithic
Late Neolithic II	5000	Avgi II, Dispilio Avgi III	Mandalos I Mandalos II	Sitagroi II Promachonas I-II Sitagroi III Promachonas III Dikili Tash II	Paradimi IV	Galene, Ftelia, Salagos, Knossos IV, Ayia Sofia Dimini, Sesklo LN, Pefkakia, Mandra Alepotrypa Cave, Zas Cave Sesklo FN, Rachmani, Palioskala, FN Pefkakia, Platia Magoula Zarkou, Strofilas Ayios Dimitrios	Vinča B, Dunavac, Karanovo IV Mancia I-III, Maliq I, Vinča C-Pločnik, Karanovo V Vinča D, Maliq II, Karanovo VI Cmrobuki I-II, Varna Bubanj Hum	Late Neolithic
Final Neolithic I	4500					Kefala		Copper Age
Final Neolithic II	3500			Sitagroi IV		Mikrothebes	Cmrobuki III, Yagodina Telih	Transition
Early Bronze Age	3000						Ezero I, Baden, Maliq III	Early Bronze Age

Table 3.2 Chronology of northern Greek Neolithic sites in relation to the adjacent areas.

## 3.2 The environmental background

### 3.2.1 Geography and geology

Northern Greece is bounded to the south by Mt Olympus and the Cambunian mountains, to the west by the Pindos range, to the east by the river Evros and to the north by a mountain barrier, broken only by the major rivers of the region (rivers Aliakmon, Loudias/Moglenitsas, Axios, Gallikos, Strymon, Nestos and Evros). According to the geographical relief, the region is commonly subdivided into four parts. In modern geopolitical terms, western Macedonia is defined as the region between the Pindos range and the Axios river valley. Central Macedonia lies between the courses of river Axios and river Strymon, while eastern Macedonia lies between rivers Strymon and Nestos. The Aegean Thrace is defined as the area between the courses of river Nestos and river Evros. Nevertheless, the present study will follow alternative subdivisions based on the discrete units defined by the prevalent mountains and mountain ranges (see **Chapter 4**). This decision is based on the doctrine that major rivers and their valleys, rather than boundaries restricting communication, serve as locales of intense cultural interaction.

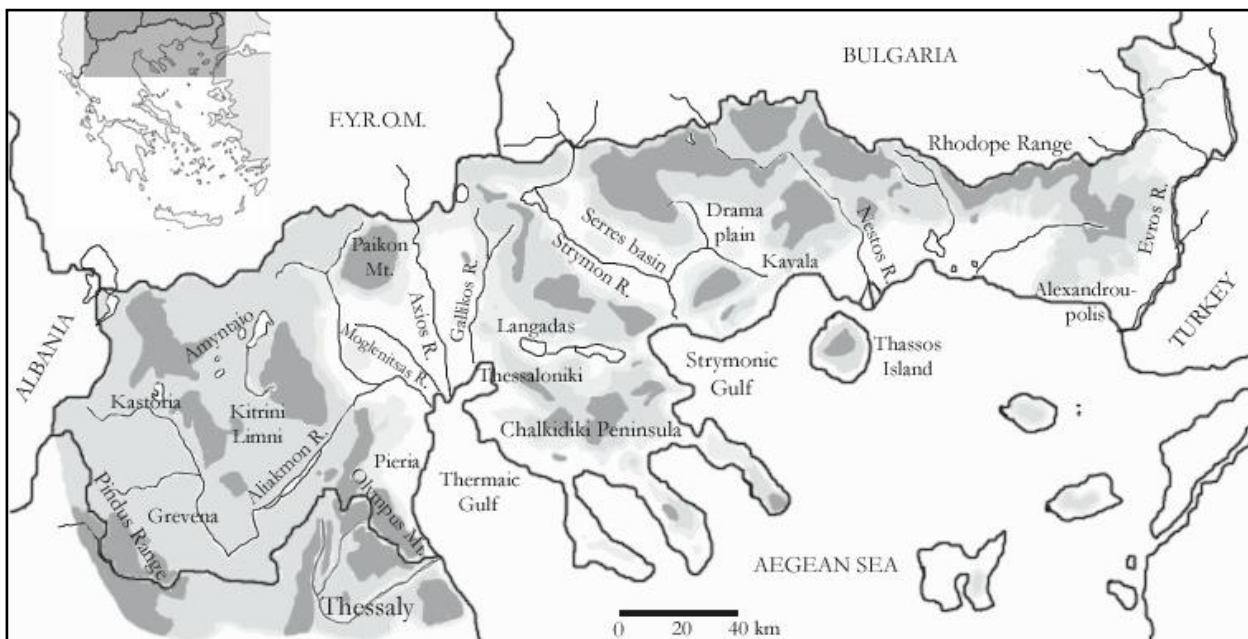


Figure 3.1 Geographical map of northern Greece.

The geography of the region is generally characterised by a succession of mountain ranges (<3000m in height) and Neogene grabens of NW/SE direction, produced by tectonic activity during a period of crustal extension (Higgins & Higgins 1996, 108). In the western part of the region this succession is mainly composed of mountains and high plateaux,

while the lower part comprises the coastal plains and lowland basins of the rest of Greek Macedonia and Thrace (Higgins & Higgins 1996, 106). The plains and basins are cut through by the major perennial rivers and their tributaries which drain into the north Aegean Sea. Smaller seasonal streams and springs are present, while the hydrography is also characterised by the existence of small or more sizeable lakes and marshlands formed by tectonic activity. Geologically, the region encompasses a wide range of different rocks and sediments from different isopic zones (e.g. the Vardar/Axios and Pelagonian zones) and massifs, including the mountainous Serbo-Macedonian and Rhodope massifs, as well as the Circum-Rhodope belt (Higgins & Higgins 1996, 106, 114).

The coastline of the region is generally smooth, with the exception of the three-pronged Chalkidiki Peninsula where a complex coastline with deep gulfs and promontories is formed. However, the present picture does not account for the most part of the Late Pleistocene and Early Holocene. Reconstructions of the paleo-coastline based on bathymetric data and sea level curves (van Andel & Shackleton 1982) indicate that at the end of the Last Glacial Maximum (c.18000 BP) a broad coastal plain (incorporating the northern Aegean islands) was extending from northern Anatolia to the present Thermaic Gulf and Thessaly. The subsequent postglacial sea level rise (from 15000 BP till the late 8<sup>th</sup>/early 7<sup>th</sup> millennia BC) resulted in the rapid reduction of this lowland and the insulation of Samothrace and Thassos, as well as the formation of the Strymonic and Thermaic Gulf. The latter extended further inland than today, thus making a number of Early Neolithic sites coastal. During the late Holocene, further changes due to eustatic fluctuations, tectonic activity and, especially, sedimentation led gradually to the present state of the coastline (see also Bintliff 2012, 24).

### **3.2.2 Climatic conditions**

Although not homogeneous throughout the region, the climate of northern Greece can be generally described as transitional between two distinct climatic zones, the Mediterranean, prevailing in southern Greece, and that of central or continental Europe (Valamoti 2004, 6). The coastal lowland areas are characterised by a terrestrial Mediterranean climate with hot, dry summers and mild, wet winters. The mean annual rainfall, mainly occurring during winter months, is 400-600mm, while the mean temperature ranges from 14°C to 16°C. In contrast, the climate of the interior upland areas turns more similar to that of the continental zone, with increasing rainfall throughout the year (600–800mm or even higher in mountainous Thrace) and a greater variability between winter and summer temperatures.

The mean temperature is at least 2°C to 4°C lower than near the coastline, while snowfalls occur more frequently. This is primarily the result of the prevailing cold winter winds penetrating from the northern valleys of the Balkan Peninsula.

Considering the climate during the Neolithic, no hard evidence exists. Although little detailed work has been done, it has been suggested that during the early postglacial period the climate could have been marginally 2–3°C warmer than present day and probably more humid, with the effects of increased precipitation being more pronounced in mountainous areas (Willis 1992, 151, 153). During the fifth millennium BC, summers in the upland areas of western Macedonia may have been warmer than today by up to 4°C, while cooler conditions, approximating to those of the present, became progressively prevalent during the last two millennia BC (Andreou *et al* 1996, 562). In addition, in certain areas of eastern Macedonia, the climate is likely to have been less Mediterranean, with less severe summer drought and more frequent frost (Rackham 1986, 60). However, it should be noted that no substantial climatic change (comparable with that of the Boreal-Atlantic transition of NW Europe) has been confirmed (Andreou *et al* 1996, 576). The pollen diagrams provide no clear evidence of a major climatic event, although minor changes or fluctuations should not be excluded (Greig & Turner 1975, 203; Turner & Greig 1974, 193).

### **3.2.3 Vegetation history**

Modern vegetation in northern Greece varies due to diverse climatic and soil conditions, as well as due to the differential impact of human activities on the landscape. It is generally characterised by a richness of plant communities that are common to transitional climatic zones. These often form dense or light open deciduous woodlands, mainly dominated by oak, ash and hornbeam, with the occasional addition of species typical of either the Mediterranean or the central European region (including hazel, elm, plane, pear, olive tree etc.). Aquatic plant formations, including rushes, sedges and other water-loving species, are limited to areas near rivers, lakes and marshes, while shrubs ('maquis') and 'phrygana' or 'garrigue' vegetation are present in a variety of settings (Bintliff 2012, 20; Valamoti 2004, 8).

Regarding past vegetation, pollen diagrams and charcoal analysis constitute the main body of evidence. In the case of northern Greece, the existing data are not sufficient for an accurate reconstruction of vegetation history. What is more, palynology has certain limits (Bottema 1999, 15; Gerasimidis *et al.* 2006, 240; Willis 1992, 153), especially when applied to areas with contrasting ecological conditions and land-use history (Gerasimidis &



Athanasiadis 1995, 109). Similarly, the charcoal analysis can be of limited value when trying to identify absolute frequencies of species in the landscape (Vernet 1999, 26).

Nevertheless, the available data favour a full scale increase in biomass, especially in lowland areas with steppe vegetation, after the late glacial/postglacial transition. The Mesolithic evidence indicates the predominance of forests rich in deciduous species in mountainous areas, as well as the existence of mixed oak woodlands with open grounds in the lowlands. During the subsequent millennia and throughout the Neolithic, changes in vegetation include the establishment of certain species, such as hazel (*Coryllus avellana*), pine (*Pinus*), elm (*Ulmus*), lime (*Tilia*), birch (*Carpinus betulus*), ash (*Fraxinus*) and alder (*Alnus*). The diversity of woodlands was further emphasised by the gradual expansion of Greek fir (*Abies cephalonica*) and hornbeam species (*Carpinus orientalis*/*Ostrya carpinifolia*) around 7500-6300 BP, probably connected with environmental phenomena (Bottema 2003, 48). Oak continued to constitute the dominant species, while conifers were less important components before the Subboreal and Subatlantic periods (Gerasimidis & Athanasiadis 1995, 113). The general patterns of woodland evolution find parallels in profiles from the neighbouring Balkan region (Bozilova & Beug 1992; Tonkov 2003). Moreover, charcoal analyses in Neolithic sites in northern Greece seem to support the emerging picture of surrounding landscapes dominated by more or less open, mixed oak woodlands (Ntinou & Badal 2000; Ntinou 2008).

As far as the anthropogenic influence on natural vegetation is concerned, this seems to be minimal during the Neolithic. Willis (1992, 146) notes a decrease in woodland density and diversity around 6300 BP in Epirus. However, the lack of supporting evidence from other sites, as well as the re-expansion of the forest vegetation in the subsequent period, seem to favour a regional climatic event. It is, thus, commonly argued that human intervention in the natural ecosystem through herding or felling does not become prominent until the Early Bronze Age or even later (Bintliff 2012, 20; Gerasimidis 2000). This is also reinforced by Balkan diagrams (Bozilova & Tonkov 2000), as well as by the overall composition of the faunal spectra in several sites (Hubbard 1995).

### **3.3 The setting of the scene**

Although remaining a *terra incognita* in many respects, the Palaeolithic period of northern Greece is nowadays much better known. Evidence, although scarce considering the time-depth of the period, comes from across the region, thus confirming that the area had been

attractive to early hunter-gatherer groups in terms of resources and environmental conditions (Efstratiou 1995; Efstratiou & Ammerman 1996; Efstratiou *et al.* 2006; Kourtesi-Philippaki 1992; 1993; 1996; Macclennen *et al.* 1999; Trantalidou 1996a; Trantalidou & Darlas 1995). Nevertheless, the crucial period between the latest Upper Palaeolithic and the Early Neolithic period remains missing<sup>19</sup>. The closest sites belonging to this period are the cave of Theopetra in north-west Thessaly (Kyparissi-Apostolika 2000), the Mesolithic sites of Epirus, Corfu and Albania to the west (Runnels *et al.* 2004; Runnels & van Andel 2003; Sordinas 2003), the site of Pobiti Kamuni in Bulgaria (Gatsov 1995), as well as the ‘Agaçli-type’ sites of Eastern Thrace and NW Anatolia (Özdoğan 1999). Further to the south the sites of Attica, the Aegean islands and Argolid fill in the Greek Mesolithic evidence numbering no more than a dozen sites (Galanidou & Perlès 2003), while to the north evidence derives mainly from Serbia, Montenegro and the Danube Gorges (Bailey 2000).

The scarcity of Mesolithic finds in the Balkans has been approached in various terms. These include the submergence of sites due to sea-level rise or extensive alluviation, the lack of diagnostic lithic traits and the poor preservation of organic remains in certain environmental contexts (Ammerman *et al.* 2008; Bailey 2000, 35; Fotiadis 1991, 43; Merkyte 2003, 311; Tringham 1971, 36). Moreover, research biases, such as the absence of systematic surface surveys, the ‘obsession’ with the excavation of caves, as well as the possibility that Mesolithic habitation have not taken place in the better surveyed areas of Neolithic settlement (Bailey 2000, 33; Tringham 1971, 68; Runnels *et al.* 2004, 24), may have played a decisive role in its low visibility. It should, therefore, be noted that the lack of Late Pleistocene/Early Holocene sites in northern Greece, although striking, is by no means an exceptional feature.

In terms of pre-Neolithic lifestyles, it is possible to sketch out emerging trends by drawing on the available information from the wider geographical context. It has been stated that Mesolithic habitation was mainly congregated in the convergence areas of various micro-ecological zones (Tringham 1971, 62–3). The increasing focus of activity on river valleys and coasts, as well as the marked increase in the exploitation of aquatic or large forest animal resources, seem to reinforce this assertion. Moreover, the repeated use of certain localities, already noted towards the end of the Upper Palaeolithic, is further demonstrated

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<sup>19</sup> The Mesolithic nature of some finds in the highland zone of Grevena (Efstratiou *et al.* 2006) has not been confirmed.

by the structural role of hearths in the partitioning of space and the construction of artificial shelters (Galanidou 1997, 139). Evidence for offshore fishing (e.g. Franchthi Cave) and, especially, the circulation of raw materials, such as Melian obsidian, honey flint and graphite, indicates the existence of wide networks of material acquisition covering areas of several km in distance (Bailey 2000, 34; Merkyte 2003, 311). The degree to which the early establishment of such networks, the shaping of a more developed sense of place, and the emergence of new ways to express identity (Bailey 2000, 37) contributed in the subsequent development of the Neolithic society, remains under discussion (see Kotsakis 2003a; Perlès 2001; also Budja 2004, 44–5).

The issue of the Neolithic transition in Greece has been traditionally a field of intense theoretical debate. One-direction models of both indigenous developments (Theocharis 1973; Dennell 1983) and colonisation/diffusion from the east have been occasionally supported (Lewthwaite 1986; Perlès 2001; 2003), based on different readings of the archaeological record (Kotsakis 1992; Halstead 1996a). The region of northern Greece has been the focus of relevant enquiries due to its key location between Anatolia, Thessaly and the Balkans. In recent decades, alternative theoretical schemes that move beyond an absolute Mesolithic/Neolithic dichotomy and emphasise the multi-faceted nature of the transition have been proposed (Kotsakis 2001; 2003; 2005).

The initial stages of Neolithic occupation have so far been detected in western Macedonia, the earliest sites being dated to the mid 7<sup>th</sup> millennium BC. EN sites have been identified in the province of Grevena (Wilkie & Savina 1997), the middle Aliakmon riverine zone (Kokkinidou & Trantalidou 1991), the Ptolemais system of basins (Fotiadis & Hondroyanni-Metoki 1997; Karamitrou-Mentesidi 2009; Ziota *et al.* 1993, 93) and the Giannitsa Plain (Chrysostomou 1997a). By contrast, the evidence remains patchy for the nature of occupation prior to the mid 6<sup>th</sup> millennium BC in the part of the region east of river Axios. This pattern and the similarities observed in material culture have led some scholars (van Andel & Runnels 1995; Wilkie & Savina 1997) to postulate an initial migration of Neolithic groups from central to northern Greece, following the course of major rivers. The presence of EN sites on the main routes of communication between Thessaly and Macedonia further emphasises such an assumption. Moreover, the traces of Mesolithic habitation in Theopetra Cave make it possible that the pre-Neolithic substratum played an important role in the early expansion of the Neolithic (Kotsakis 2003a; Kyparissi-Apostolika 1994; 2000). The transformation of pre-existing groups and lifestyles through contact and frontier interaction (Zvelebil 1986; 2000; Whittle 1996b), either stationary or

mobile, should not be precluded. However, the already technologically advanced nature of the EN material culture and the paucity of the Mesolithic record seem to promote a folk migration or infiltration model.

Nevertheless, it should be stressed that the available database is, by and large, biased by research objectives, methodologies and post-depositional factors. Current research shows that the hypothesis of migration from Thessaly to western Macedonia, and the concomitant diffusion of the Neolithic eastwards, is inaccurate. EN occupation levels were recently identified at Dikili Tash (Drama plain) and probably Makri (Thrace) through geological coring (Lespez *et al.* 2013; Ammerman *et al.* 2008, 148). Following a diffusionist approach, this could support alternative routes of endemic movement or movement of ideas and commodities, supposedly from the east (see Özdoğan 2011). Besides, Thessalian influences in the material record of EN northern Greece constitute but one component among others. Whatever the case may be, the evidence suggests a complex picture requiring interpretative schemes that are inclusive of culture and social agency (Kotsakis 2005, 11). Rather than postulating well-defined borders, mono-directional trends and bipolar dichotomies between discrete lifeways, neolithisation should be understood as a multifarious process involving multiple local frontiers and directions, dynamic interaction and various simultaneous occurrences (Kotsakis 2005; Özdoğan 2011).

### **3.4 Settlement patterns in Neolithic northern Greece**

Neolithic habitation in Macedonia and Thrace presents a diverse pattern, partly justified by the fact that northern Greece is not a homogeneous environmental or cultural entity. More significantly, the current picture seems to be the outcome of multiple research and environmental biases. In terms of methodology, there is a general lack of area-intensive surveys combining controlled sampling and geomorphological investigations (Andreou *et al.* 1996, 574). Even in better surveyed landscapes, research has been primarily conducted as a by-product of major excavation projects or necessitated by construction and developmental works. What is more, research objectives were for many decades biased towards certain settlement types, environmental settings and/or chronological periods. The persistent focus of regional surveys on mounds (see Renfrew & Hardy 2003, 469) lying in the largest basins and river valleys of the region constitutes a characteristic example. This practice, besides obscuring the distribution of less conspicuous site formations, has probably compromised research in locales that are thought to be less favourable for

Neolithic habitation, such as upper terraces or (semi-)mountainous areas (Kotsakis & Andreou 1995, 35; Kotsakis 2009, 30).

Post-depositional factors, affecting the pedology and hydrology of the region during the last few millennia, further underline the ambiguity of the archaeological record. The formation and expansion of lakes, such as Kitrini Limni, Orestias and Vegoritis in western Macedonia, and Vistonis in Thrace, may have rendered a number of prehistoric sites invisible (Efstratiou 1994; Fotiadis 1988, 51; 1991, 42; Fotiadis & Hondroyanni-Metoki 1997, 21; Ziota *et al.* 1993). The same can be argued for the role of eustatic changes and the dynamics of the coastline (Ammerman *et al.* 2006, 6; Chrysostomou & Chrysostomou 1993, 171). Moreover, several episodes of erosion and alluviation may have resulted in the extensive burial or removal of sites. Such episodes are documented throughout the region, including the central Macedonian plains, the Drama plain and the deltas of river Strymon and river Nestos (Andreou *et al.* 1996, 585; Atherden *et al.* 2000; Koukouli-Chrysanthaki *et al.* 1997a, 652; Lespez *et al.* 2013, 41). Finally, recent human activity, either small or more substantial in scale, has frequently resulted in a radical transformation of the landscape.

#### **3.4.1 Settlement location and distribution**

Bearing in mind the biases underlined above, it would seem that any effort towards the identification of wide-ranging habitation patterns risks generalisations. Nevertheless, some broad-spectrum trends can be identified. These mainly include the varying density of occupation in different sub-regions or chronological periods and the diverse settlement locations selected in each case. In western Macedonia, Neolithic occupation seems to be highly concentrated in the Ptolemais-Vegoritis system of basins and the longitudinal valley of Middle Aliakmon. Almost 21 sites belonging to different phases have been located in the lakeland area of Vegoritis. These are shallow mounds or flat sites with an average size of 2ha and a minimum distance of approximately 2km (Kokkinidou & Trantalidou 1991, 98). A similar pattern is attested in the area of Kitrini Limni, where a considerable number of sites ranging from 2 to 8.5ha are clustered in a 30km<sup>2</sup> area, while in the Servia region sites are located in an average distance of 0.5-1km (Andreou *et al.* 1996, 566). The sizeable basins of Kastoria and, especially, Amyntaio may reveal comparable evidence.

Moving to central Macedonia, a substantial number of tell-like or dispersed settlements have been identified during the last decades. In certain cases, such as in the Giannitsa plain and the wider area of Thessaloniki, sites are located in short distance to each other. Further to the east, Neolithic sites are densely distributed within the major basins of Serres and

Drama (Andreou *et al.* 1996, 587). In the northern part of the latter region, settlements belonging to the later stages of the Neolithic form clusters at an average distance of 4 or less km (Blouet 1986), while the remaining parts seem to be thinly inhabited. Finally, in Aegean Thrace the number of known mounds and flat extended sites is limited, probably due to the more restricted research.

As far as settlement location is concerned, habitation during the early stages of the Neolithic (mid-7<sup>th</sup> to mid-6<sup>th</sup> millennium cal BC) was mainly restricted to fertile plains, small basins holding lakes or marshlands, and river valleys. Low terraces and natural ridges in the lowest parts of the landscape seem to have been preferred due to their close proximity to groundwater, stream watercourses or springs (Andreou *et al.* 1996, 575)<sup>20</sup>. This seems to be the case for a number of EN/MN sites located in the small basin of Kitrini Limni, the lakeland area of Vegoritis (Kokkinidou & Trantalidou 1991, 98) and the Giannitsa plain (Chrysostomou 1997a). However, an alternative pattern is hinted at in the area of Grevena. In a landscape dominated by deeply incised terraces and narrow flood plains, the majority of EN sites occupy terraces and flat areas at an altitude of 160 to 200m above (and within a few km of) river Aliakmon and its tributaries (Wilkie & Savina 1997, 204–5). Therefore, a more significant criterion for the selection of early sites may have been the relative proximity to a number of differing ecological niches (riverine lands, woodlands, alluvial fans and marshlands) that could have sustained a more diversified subsistence economy.

Although the above mentioned criteria seem to maintain their relative importance during the following periods, the utilization of a greater variety of locations is more commonly demonstrated from the late 6<sup>th</sup> millennium BC onwards (Andreou *et al.* 1996, 575; Blouet 1986, 135). Along with the habitation of fertile lowland areas and coastal plains, sites are now established further inland in areas of higher altitude, some of them in locations that could be characterised as ‘marginal’ in either environmental or economic terms<sup>21</sup>. In western Macedonia this pattern is witnessed in a number of sites located on hill slopes overlooking the plain of Kitrini Limni, as well as in the relatively dry Tertiary zone north of

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<sup>20</sup> This pattern would have been extremely profitable for early farming communities, as they could have exploited the suitable surrounding lands, while, at the same time, their settlements would have been protected by extensive humidity and flooding (Fotiadis & Hondroyanni-Metoki 1997, 19–20; Ziota *et al.* 1993, 93; Andreou *et al.* 1996, 568).

<sup>21</sup> However, not knowing the exact workings of the period’s socio-economic system, the characterisation of such sites as ‘marginal’ may be elusive and of no interpretative value (Coles & Mills 1998; see also Fotiadis 1997, 77).

the Middle Aliakmon valley (Andreou *et al.* 1996, 566–7, 575). In the plains of Giannitsa and Drama some of the newly established settlements are found in less favourable areas (Chrysostomou & Chrysostomou 1993; Chrysostomou 1997; Blouet 1986, 135), while in the Langadas basin LN habitation is testified in the semi-mountainous area of Pente Vryses (Kotsakis & Andreou 1995, 353). Finally, a number of early and later sites situated near natural passages or river fords render possible the strategic foundation of settlements or stations with regard to important trails of a regional network (Andreou *et al.* 1996, 575; see Blouet 1986, 140–1; Hondroyanni-Metoki 1993, 116; Ziota & Hondroyanni-Metoki 1997, 34).

The dispersal of LN occupation to a variety of locations in northern Greece and elsewhere has commonly been connected to a considerable expansion in site numbers (Andreou *et al.* 1996, 575). This general pattern has been approached in terms of population pressure and changes in subsistence strategies (Blouet 1986; Demoule & Perlès 1993) that led to the segmentation of early settlements and the dispersal of Neolithic communities to less favourable locations. Although an increase in site numbers does not necessarily reflect demographic growth (see Cavanagh 2004), the parallel increase in settlement size reinforces such an interpretation. Nevertheless, regional diversity is again indicated by the rarity of MN and LN sites in the area of Grevena, once densely occupied by EN populations (Wilkie & Savina 1997, 206). Furthermore, the picture of a continuous habitation growth seems to resolve gradually when moving towards the FN II period (Aslanis 2010, 47–8). The limited number of sites belonging to the 4<sup>th</sup> millennium cal BC could be related to a decrease in population or the emergence of diverse expressions of territoriality, while the foundation of settlements on hills and naturally protected sites (Andreou *et al.* 1996, 583–4) may be related to the socio-historical conditions at the end of the Neolithic period. The appearance of stone enclosures from the LN II onwards, along with the continuous use of ditches since the EN period, could be viewed in similar terms (Kokkinidou & Nikolaidou 1999; Runnels *et al.* 2009). However, it should be reminded that these are only broad-spectrum trends, highly biased by current research, and that intra-regional variability should not be overlooked.

### **3.4.2 Tells and flat extended sites: a problematic dichotomy?**

The two dominant settlement types in the northern Greek Neolithic landscape are the so-called *toumbas* (mounds or tell-like formations) and the flat extended or dispersed sites. For a considerable period of time, *toumbas* were viewed as the major (if not the only) type of

settlement in the region. The reason for this misconception lies, by and large, in their greater visibility, as opposing to the inconspicuous character of ‘open’ dispersed sites, which resulted in a long term bias in Greek prehistory (Andreou & Kotsakis 1986, 66). During the last decades, the expansion of rescue excavations and the application of more intensive survey methods have dramatically changed the prehistoric landscape (Pappa 2008). The emerging picture indicates that the flat extended type is at least as common, while the existence of intermediate or different settlement formations, such as lakeside (e.g. Dispilio, Anargyroi III and Limnochori II) or more mundane sites (e.g. Drossia), points to a more complex and varied settlement system.

The exact formation processes of mound settlements are not always straightforward (Andreou & Kotsakis 1986; Evans 2005, 120). Nevertheless, there are some commonly accepted requirements to be met, such as the intensive use of large quantities of mud in the construction of buildings, a high degree of stability in the location of the settlement through time, and the concentration of buildings into a coherent unit (Sherratt 1983, 192). To these unambiguous elements one should add certain house replacement practices, such as the infilling of older floors and foundations without disposing the rubble, the vertical or near-vertical superimposition of later dwellings, as well as the construction of retaining walls and terraces (Kotsakis 1999; 2006, 209–10; Matthews 2005; Tringham 2000, 117). These practices result into the more intense and rapid accumulation of deposits, which eventually leads to the formation of the anthropogenic mound. In contrast, most extended sites show relatively shallow deposits, even if inhabited for a considerable period of time.

According to Chapman (1989, 38), the main difference between the two settlement types lies in the differential arrangement between the dwellings and the arable land. By focusing on the ratio of built:unbuilt space and the minimum inter-building distance, he suggests that tells are densely occupied, with no arable or grazing land within the settlement area. On the contrary, in dispersed sites the dwellings are spaced in wider intervals, with arable land lying in their immediate vicinity, thus forming what he refers to as a ‘house and garden complex’ (Chapman 2010). This spatial differentiation can be approached in several ways. Traditional accounts (Tringham 1971; Tringham & Krstić 1990, 587) consider the formation of tells as an adaptive response to particular topographic restrictions. In the case of northern Greece, land use practices, as well as the selection of different soil types for cultivation, have been considered as alternative explanations.



Demoule and Perlès (1993, 363–4) argue that tells are situated on fertile agricultural land, favouring the horizontal expansion of the fields and the vertical growth of the site, while the extended sites, located in more wooded areas, encourage the opposite trajectory. A similar approach (Kotsakis 1999, 72–3) suggests that extended sites were located in areas with a highly water-retentive soil, hard to be worked by farmers relying on human labour. A solution could have been to make the top horizon of the soil more amenable to cultivation by the continuous input of manure, kitchen refuse and labour, thus requiring close proximity of household production units to land. On the other hand, mound settlements in the area are situated on the fringes of vertisols and alluvial fans, where soils are more easily worked, thus offering greater potential for the expansion of cultivation. However, the natural ecology of northern Greece cannot always explain the variability in site formation processes (Andreou & Kotsakis 1986, 82). The available palynological evidence do not support the assumption that mounds have necessarily occupied less wooded lands, while a marked variation in agricultural practices between the two settlement types has not been confirmed (see Valamoti 2004).

A social explanation for the formation of tells is offered by D.W. Bailey and other scholars. According to his concept of the ‘living house’ (Bailey 1990), house replacement practices indicate strategies to maintain or express lineage (or ‘house’) continuity beyond the limits of human biology. These strategies further indicate an increasing competition for access to land and residence on the mound. A similar approach implies that the process of tell formation through successive rebuilding would have been observed by Neolithic inhabitants, who could have read a conspicuous mound or dwelling as an indication of continuity in time and space. Therefore, tells could represent a deliberate (communal or household based) effort to project status and property claims (Chapman 1990, 37–8; Halstead 1999, 87; Kotsakis 1999).

Tringham (2000, 119–20) agrees that the institutionalized attachment to a place is a significant variable to the formation of a tell. However, she argues that ‘open’ sites, such as Opovo and Selevac, are not necessarily without such claims or feelings of attachment. Therefore, the major component is the alternative ways in which continuity and social memory are expressed and established through the manipulation of the built environment. Moreover, the two settlement types seem to reflect diverse perceptual definitions of dimensional order (Chapman 1989, 35) and chronotypic tensions (Bailey 1993). Whether deliberately built or the unintended result of certain strategies and daily routines, tells have been considered as prominent marks in the landscape, as ‘monumental agents’ in the

creation and manipulation of the socio-political and productive reality of Neolithic life (Bailey 2003, 97; Chapman & Gaydarska 2006, 40). On the contrary, flat extended sites have been much less theorized in analogous terms (see Kalogiropoulou 2013; Pappa 2008).

In northern Greece, excavations in a number of mound settlements have brought to light densely spaced clusters of buildings that are commonly rebuilt in the same location for a considerable period of time. Dispersed settlements indicate a spatial organisation characterised by the existence of wide open spaces between buildings and discontinuous occupation. Although covering large areas, they seem to follow a shifting occupation pattern (Kotsakis 1994; 1999), thus not supporting the existence of large population aggregations<sup>22</sup>. Consequently, the general theoretical schemes proposed may seem to be, more or less, in accordance with the available evidence. However, a thorough look at the archaeological record indicates that a theorisation, even if an elaborate one, based on an absolute dichotomy between settlement patterns comes not without problems.

In most cases the distinction between mound and flat extended settlements is not a clear cut one. Especially in the earlier stages of occupation, the presumed difference in spatial organisation may not be that great (Chapman 1989; Halstead & Kotsakis 2002, 94). Furthermore, the characterisation of many Neolithic sites as *toumbas* seems to reflect their subsequent evolution into Bronze Age tells, rather than a radically distinct habitation pattern during the Neolithic (Andreou & Kotsakis 1986, 77; Valamoti 2004, 11). In any case, the visibility of the site, in terms of elevation, is not necessarily the ultimate criterion. Extended sites, such as Vassilika, may have deposits of a considerable height reaching up to 4,5m, while tell-like settlements may form low mounds with a height as low as 1,5m (Andreou & Kotsakis 1986, 78). In addition, the impression that tells are denser occupied can be deceptive, as can be the assertion that tells are related to more permanent occupation or a higher degree of sedentism (Kotsakis 1999, 71; Bailey 2003). As a result, it may be assumed that the distinctive characteristic of tells lies primarily in their limited extent (Kotsakis 1999, 68). In fact, tell-like settlements rarely occupy an area that exceeds 2ha, while extended sites may reach 50ha (or more) in size.

The exact relationship between the two different site types has not been examined in its full potential. The examples of Sesklo in Thessaly and Polgár-Csőszhalom in Hungary indicate that the two types may co-exist as two components of the same settlement (Kotsakis 1994;

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<sup>22</sup> According to Andreou and Kotsakis (1986, 84), such aggregations would have undermined the coherence of the egalitarian social structure of Neolithic groups. However, Fotiadis (1997) does not agree with this view.

2006; Raczky & Anders 2008). Further investigation of the circum-tell landscape (Bailey *et al.* 1998) may reveal intermediate or more complex patterns than the ones imagined when following a dichotomy based on universal models of settlement. In any case, both terms have to be conceived as describing archaeological categories of a heuristic (but not necessarily interpretative) value based on stratigraphic features. Their role in a settlement system and their socio-cultural inferences should be discussed individually for each and every geographical or cultural region<sup>23</sup> (Link 2006, 93).

### 3.5 Subsistence economy

The subsistence economy of Neolithic northern Greek communities was primarily based on arable agriculture and animal husbandry. Although the published archaeobotanical and archaeozoological evidence remain patchy, it becomes clear that the primary species of the so-called “Neolithic package” constituted the major components of Neolithic staple nutrition. In the case of plant resources, cereals, such as einkorn, emmer, bread wheat and barley, as well as pulses, including lentils, grass pea, bitter vetch and millet, have been identified. Domesticated animals include sheep, goat, pig and cattle, while canines are also present in minor proportions.

The predominance of glume wheats over free-threshing ones, rather than a result of preservation biases, is generally considered to be a prominent feature of Neolithic south-eastern Europe (Kroll 1991; Margariti 2004, 817; Valamoti 2004, 113). In addition, with the exception of a few sampled sites, such as Mandalo, Dimitra and Servia, einkorn seems to constitute the dominant glume wheat crop (Housley 2000; Renfrew 2003; Valamoti 2004). This pattern, which finds parallels in the wider Balkan area (Marinova 2009), comes in stark contrast to the Thessalian and southern Greek record, where emmer wheat is by far the commonest cultivated cereal (Trantalidou 1996b, 97). Barley is commonly represented in limited quantities, although it forms one of the principal cereal crops in EN Nea Nikomedeia and FN Sitagroi IV (Renfrew 2003, 13; van Zeist & Bottema 1971). Pulses, especially bitter vetch and lentils, were important in the inhabitants’ diet (Housley 2000, 302, 313; Renfrew 2003, 15; Valamoti 2004, 115). Among other plant resources, flax seems to be cultivated in a number of LN/FN sites (Valamoti 2004, 115), while the possibility of

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<sup>23</sup>For instance, Sherratt’s (1983, 191–3) hierarchical model of a gradually expanding ‘core-periphery’ system cannot be supported in northern Greece, where both site types co-exist with no marked differences in subsistence strategies and material culture.

an incipient form of vine and fig cultivation during the LN has also been suggested (Housley 2000, 297; Renfrew 2003, 12; Valamoti 2004, 128).

The ovicaprids constitute the most numerous species within the faunal assemblages, while sheep are far more frequent when a distinction is possible. Despite regional fluctuations, the ovicaprids remain dominant throughout the Neolithic, while a noticeable decrease in their numbers does not take place before the FN/EBA (e.g. Sitagroi IV-V). The percentage of pigs and cattle is generally lower, although they could have been equally important in terms of meat yields. What is more, the percentage of cattle may vary from 4–5% (MN/LN Dispilio) to 27–30% (LN/FN Sitagroi), while an increase in the importance of pig is occasionally evident when moving from the earlier to the later stages of the Neolithic (Bökönyi 1986; Halstead 1999; Watson 1979).

Agricultural practices suggest small-scale, labour-intensive cultivation<sup>24</sup>. Judging from the broad crop repertoire of the northern Greek assemblages, a considerable degree of diversification had been achieved at the village- or household-specific level. The exploitation of a wide range of crops and utilised plants seems to reflect the principal risk-minimising strategy. In addition, crop rotation between cereals and pulses, and the deliberate cultivation of maslins have been proposed (Margariti 2002, 818; Perlès 2001, 164; Valamoti 2004, 130) on the basis of samples of mixed composition and the co-existence of winter- and spring-sown crops (Valamoti 2004, 121). However, the available evidence seems inadequate as it is subjected to a wide range of interpretations (Jones & Halstead 1995). Regarding the storage of agricultural products, either as a buffering or control device, it seems to be quite limited during the early stages of the Neolithic period (Perlès 2001, 166). From the LN onwards, the greater visibility of storage facilities could be related to an intensification of production, although redistribution practices seem to be more relevant to this development. Furthermore, the existence of some sort of specialisation is hinted by the prevalence of emmer over einkorn in sites including Mandalo and Dimitra or the storage of certain crops in specific areas at Arkadikos and elsewhere (Valamoti 2004, 129). Whether these latter features reflect the changing role of certain agricultural products in the communicative systems of the region or their gradual transformation into exchange commodities cannot be easily assumed.

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<sup>24</sup> According to Sherratt (1980, 313–5), the distribution of early sites in Greece and the Balkans suggests a form of fixed plot (garden type) horticulture dependent on ground- and surface-water.

Current evidence on animal husbandry strategies seems to support small-scale household herding (Halstead 1996b; Perlès 2001, 170). According to Halstead (1989), the predominance of sheep in the wooded landscape of Neolithic northern Greece could be an indication that animal husbandry was restricted in scope and limited to cleared agricultural land. However, intra-regional variability in grazing patterns and other practices can be attested (Valamoti 2004, 127). Mortality profiles and sex ratio indicate that exploitation strategies were primarily tuned to meat production (Trantalidou 1996b, 100; Perlès 2001, 167). Household specialisation on one particular species cannot be supported. Moreover, there is no definite evidence for an emphasis on secondary products that could reflect large-scale, specialised pastoralism for exchange or transhumance (Halstead 1996b, 31–32; Trantalidou 1996, 100). The analysis of pottery samples from central Macedonian sites (Evershed *et al.* 2008) gave low proportions of sherds with ruminant milk fats. Nevertheless, the exploitation of secondary products or the use of certain animals for traction before the EBA should not be omitted. The dispersal of occupation in agriculturally marginal locations and the increasing use of caves (see Trantalidou *et al.* 2007) during the LN may hint an increased emphasis on pastoralism, although no clear bioarchaeological evidence supports this assertion.

The limited presence of wild resources indicates that gathering, hunting and fishing have probably served a restricted, supplementary role in the subsistence of Neolithic communities. Although variation due to diverse strategies or local environments exists, the use of wild plants is generally scarce. This can be attributed either to the adequate productivity of domesticated species (Demoule & Perlès 1993; Valamoti 2004, 13) or to the density of settlements in certain areas which would have precluded their intensive exploitation (Perlès 2001, 164). However, from the LN period onwards, there is evidence for a greater contribution of wild fruits and nuts in staple nutrition (Renfrew 2003, 15). Furthermore, the storage of certain species (including must, apples/pears/*Sorbus*, acorns and figs) in LN/FN sites, such as Dikili Tash, Mandalo, Sitagroi and Olynthos implies their deliberate harvest (Valamoti 2004, 123).

Regarding wild animal resources, their total percentage in faunal assemblages rarely exceeds 10%. Cervids (red deer, roe deer and fallow deer) predominate, while wild boar, auroch, hare, hedgehog and other mammals are represented by fewer samples. Apart from the meat, bones and horns are processed for the production of tools and ornaments, while the occasional presence of bear, wolf and fox may indicate a very limited exploitation of fur-bearing animals (Trantalidou *et al.* 2007, 51). Among other species exploited, various

species of birds, land snails, reptiles, as well as fishes and molluscs are included. Although aquatic resources are common in settlements near the sea coast or lakes, both fishing and fowling seem to have been of limited scope (Perlès 2001, 171; Stratouli 1996). During the later stages of the Neolithic, a marked increase in the percentage of wild animals is recorded in a number of sites including Makriyalos II, Sitagroi III and Paradeisos (Collins & Halstead 1999; Halstead 1999; Hamilakis 2003). This picture, which is consistent with the Thessalian record, has been interpreted in socio-economic terms of animal and property relations. According to Halstead (1999), the increase in predation activities is connected to the progressive isolation of the household, which led to a decrease in sharing obligations. In addition, the expansion of extensive animal husbandry closer to the habitats of wild game could have led to this development<sup>25</sup>. Hamilakis (2003, 242–3), on the other hand, suggests that the relative increase in the exploitation of wild animals points to the engagement of certain individuals or groups in the socially meaningful practice of hunting that was associated with authority and gender. However, the latter interpretation does not take into consideration the seemingly parallel increase of wild plant resources.

### **3.6 Material culture and the organisation of production**

The northern Greek Neolithic record reveals a wide range of material culture, including tools, utensils and ornaments made of a variety of organic and inorganic materials. Although chronological and regional diversity, partly corresponding to differential levels of technical advance, sedentism and communication, exist, an overall sense of uniformity may be postulated (Souvatzi 2008a, 56). Moreover, most artefact categories present affinities with the archaeological record of neighbouring regions, thus implying the existence of extensive networks of mutually tangible material manifestations.

Pottery seems to constitute the most appropriate artefact category for tracing intra- and inter-regional influences. EN pottery assemblages present regional and local variation in many respects (Hitsiou 2003, 12; see also Dimoula 2014). However, stylistic similarities in shapes and decoration are often considered to support interaction and the lack of sharp cultural boundaries (Souvatzi 2008a, 180; Perlès 2001, 219). Affinities with the contemporaneous cultures of the adjacent areas (Proto-Starčevo, Proto-Sesklo) can be drawn in terms of both shapes and styles. Certain pottery types, such as the pink slipped

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<sup>25</sup> I thank Professor K. Kotsakis for bringing this scenario to my attention.

and impresso ware, are also attested in sites belonging to the first phase of the Anzabegovo-Vršnik culture and the southwest Balkans respectively, while red-on-white pottery and burnished wares with mottled decoration present affinities with Thessalian examples (Aslanis 1992; Koukouli-Chrysanthaki 1996). Other categories, including variations of the white or red painted ware, are compared to similar pottery styles that are more widely distributed from Thessaly to the Danube region (Hitsiou 2003, 12).

During the subsequent phases, a more pronounced differentiation, roughly corresponding to two geographically determined ceramic traditions, may be observed (Koukouli-Chrysanthaki 1996). In western and central Macedonia the presence of Sesklo type pottery, the so-called Servia ware and scraped ware emphasises contacts with Thessaly, while other types of decoration, including the impresso and cardium ware, indicate influences from the southwest Balkans. At the same time, the eastern Macedonian and Thracian pottery finds parallels in the Stara Zagora plain (Karanovo III-Veselinovo culture), as well as in sites belonging to the early phases of the Vinča culture.

Variability and distinctiveness seem to become the prominent themes during the later stages of the Neolithic (Kotsakis 2010; also Hitsiou 2003, 16). Although following in many respects EN/MN traditions, vase production is characterised by the predominance of pots with dark surfaces and more angular profiles, as well as by a noteworthy expansion of the stylistic repertoire. Although certain ceramic styles, such as the black-topped ware, are widespread throughout northern Greece, others indicate a more localised or regionally restricted distribution. The so-called Akropotamos type pottery, the graphite-painted ware, as well as the black-on-red decoration, which present affinities to the southeast Balkans, appear regularly in eastern Macedonia and Thrace but only sporadically in central Macedonia. On the contrary, in western and central Macedonia the Thessalian Pre-Dimini and Dimini painted wares are quite common, while Cakran-type incised and Arkaden-barbotin pottery indicate closer relations to the Tordos phase of the Vinča culture.

The tool ensembles consist mainly of stone, bone and antler tools used in a range of diverse domestic or non-domestic activities. Most of the chipped stone tools were simple and blade-based, mainly intended for cutting or piercing and made of either local (quartz, siliceous limonite, various types of cherts, etc.) or non-local (obsidian, honey flint) raw materials. The general typology, which includes sickle blades, scrapers, splintered pieces, projectile points and others, shows very limited traces of stylistic variability. A similar impression emerges for the ground stone toolkit which includes bladed tools (small axes,

adzes and chisels), perforated objects ('mace-heads'), as well as a variety of passive abrasive and percussive tools, commonly made of metamorphic or volcanic rocks by sawing, pecking and grinding. As for the bone and antler tools, types include pointed (needles and awls) and cutting tools suitable for various activities, such as weaving, sewing and the processing of animal skins and vegetable fibres, as well as hafting tools made of deer antler. The basic manufacture techniques display a great deal of uniformity throughout the period (Moundrea-Agrafioti 1996, 105). However, this overall uniformity cannot always be sufficiently interpreted in terms of their functional character or the constraints imposed by raw materials. As noted by Perlès (1992, 141), in other European contexts toolkits have revealed themselves to be good *fossile-directeur*. Therefore, the similarities observed should, at least partly, correspond to some sort of technological and social interaction between the Neolithic communities of northern Greece and the adjacent areas.

Clay items, such as spindle-whorls and loom-weights for textile production (Tzachili 1996), as well as sporadic clay tables, spools and ladles, fill in the domestic equipment of Neolithic households. In addition, clay stamps or seals appear as early as the EN, sometimes in large numbers (e.g. Nea Nikomedeia). As is the case for the wider south-east European context, they usually bear geometric patterns, possibly associated with pottery or weaving motifs, and are interpreted either as ownership and prestige items or as pintaderas for body decoration (Onassoglou 1996). Ornamentation consists of a variety of stone, bone/antler, shell and metal objects, such as beads, pins, bracelets made of the *Spondylus gaederopus* seashell or marble, bone or gold finger rings, as well as stone and metal pendants. Among other artefact categories that are commonly perceived as non-utilitarian in nature, figurines of different types and materials often receive special attention. They are made of fired clay, marble or bone and can be either naturalistic or more schematic, such as the acrolithic figurines of central Macedonia (Treuil 2010). Whether figurines are interpreted as religious or cult objects (Gimbutas 1982), ideographic symbols of an early 'writing' system (Chourmouziadis 1973) or everyday objects with a non-ritual character, they reveal multiple ways in which individual or group identities are perceived, manipulated and expressed. Anthropomorphic figurines, as well as anthropomorphic vessels, animal figurines and miniature objects find parallels in the wider Balkan region, thus implying shared conceptions on the representation of the natural and domestic environment (see Bailey 2005b).



### 3.6.1 Craft specialisation and exchange

The emergence of early craft specialisation in Neolithic Greece has been commonly hypothesized on the grounds of technical achievements and the high standards of certain artefact categories, as well as the existence of supplying and exchange networks covering considerable distances. Concerning pottery, the technological level seems to be already advanced since the early stages of the Neolithic (Koukouli-Chrysanthaki 1996). According to several scholars (Bjork 1995; Perlès & Vitelli 1999; Vitelli 1993), the high labour input and low annual production in EN Nea Nikomedeia (Yiouni 1996), as well as the preference given to fine wares, indicate that pottery making was a specialised, socially and ritually valued activity, probably restricted to particular individuals within the community (Perlès 2001, 218). During the MN and LN further technical achievements are reflected in various categories of decorated wares, while the total output of pottery making is dramatically increased. The bitumen-painted pottery (Urem-Kotsou *et al.* 2002) produced in a number of MN and LN sites (including Paliambela, Apsalos, Promachon-Topolnica, Makriyalos and Stavroupolis), the graphite-painted pottery of eastern Macedonia, the widely distributed black-topped ware of the LN and the use of clay containing fossilised shells in Makriyalos I for the production of cooking pots (Urem-Kotsou 2006), constitute characteristic examples of the labour input and the expertise achieved during the period.

The existence of production centres in the form of sites-central markets and specialised workshops cannot be confirmed. In the case of the black-on-red pottery of eastern Macedonia four probable production centres were recognised (Kilikoglou *et al.* 2007), while similar centres for the production of certain ceramic types have been identified in LN Thessaly (Kotsakis 2010, 70; Pentedeka 2008). In terms of the exchange networks, it is commonly assumed that the maximum distances for the circulation of ceramic products are measured in mere tens of kilometres (Perlès 1992, 146). This would imply short-distance circulation between neighbouring communities or regions within the logic of home-base or boundary reciprocity (Grammenos 1997a, 315; Renfrew 1984). However, physico-chemical analyses imply the circulation of pottery in larger distances. Examples include the grey-on-grey ware of Servia originating from the region of Grizana (NW Thessaly) in a distance of c.70km (Schneider *et al.* 1991, 48), the Dimini-type bowls from Makriyalos which point to a direct importation from the settlement of Dimini (Hitsiou 2003), and the presence of black-on-red pottery in the ceramic assemblage of Pefkakia near Volos indicating long-distance trade (>200km), possibly following sea-routes (Perlès 1992, 146; Renfrew 1973).

Whether these examples should be considered as exceptions or the result of a down-the-line trade associated with socio-economic practices cannot be safely deduced.

Lithic tool production further supports the early establishment of part-time specialisation. As far as the chipped stone assemblage is concerned, the supplying networks of northern Greece seem to be mainly organised around local or regional resources, such as chert, quartz and limonite. Even though systematic surveys are rare, raw material sources have been located in the Serres basin as well as in the area of Petrota in Thrace (Efstratiou & Fotiadis 2000). In both instances the by-products of all stages of the *chaîne opératoire* indicate on-site manufacturing and transportation of products (either finished or preformed) to the nearby settlements (Fotiadis *et al.* 2003, 16) and beyond (Kambouroglou & Peristeri 2006). In addition, the possible presence of a quarry and local workshops for siliceous limonite in the area of Thessaloniki, as well as the increased total output in sites such as Thermi, renders possible the existence of production and redistributive centres working at a local or regional scale.

Although local production was principally in play, the importation of high quality honey-flint, obsidian and Thessalian jasper (Skourtopoulou 1999) as already flaked blanks is also attested. The trade of exogenous rock materials in the Aegean has commonly been connected to the existence of a small number of manufacturing groups whose output was utilised over vast areas (non-regionalised group production). Regarding Melian obsidian, the stability of the total output of production, the general absence of regional stylistic variations, the standardisation and the techniques used seem to fit with an itinerant model of supply. However, in the case of Macedonia and Thrace, the minor proportions of Melian obsidian, as well as the limited quantities of Carpathian and Anatolian obsidian in FN Mandalo and Sitagroi respectively (Kilikoglou *et al.* 1996), encourage a different approach. It is probable that the region belongs to a boundary zone marking the maximum expansion of various distribution circles, extending not only to the south but also to the north. What is more, the system of supply and the coexistence of skilled techniques in both exogenous and local raw materials, favours the exercise of skilled craftsmanship at a regional or even intra-site level (Skourtopoulou 1999, 126; Kourtessi-Philippaki 2008).

A similar pattern can be postulated for the ground stone tool production, even though detailed technological and provenance analyses are lacking. For the most part, it seems that local or regional resources were utilised (Alisoy 2002, 583; Stroulia 2005). However, in a number of sites (including Makri and sites in the area of Kitrini Limni) the presence of

non-local resources point to a wider system of material acquisition and exchange (Melfos *et al.* 2001). Moreover, it could be supported that the production of at least certain tool types was carried out in specialised ‘workshops’ at the settlements’ area or their periphery (Perlès 1992, 130). This seems to be confirmed in the case of the ‘stone-axe workshop’ found at the Neolithic site of Makri in Thrace (Efstratiou & Ntinou 2004). According to the excavators, the identification of high quantities of ground stone artefacts, representing the whole *chaîne opératoire* of axe production (but see reservations by Stroulia cited in Bekiaris 2007, 79), as well as the lack of similar activity areas at the site, reinforce the idea that this was a communal workshop area, where a number of specialised craftsmen were manufacturing stone-axes for the community. In any case, the presence of manufacturing areas in the neighbouring region of NW Turkey (Erdogu 2000; Ozbek 2000) supports the existence of production centres in an area characterised by the abundance of good quality metamorphic rock sources (Efstratiou & Ntinou 2004, 4).

Among other artefact categories, metal-working and the production of certain shell ornaments are commonly thought as favouring part-time specialisation and the establishment of exchange networks. In northern Greece, a number of copper, malachite or gold artefacts, either hammered or cast, have been found in several excavations. Most of them are small, although a few more sizeable ones present typological similarities with Balkan examples. The existence of copper deposits in northern Greece renders possible the organisation of production around local resources, although no ore mines parallel to the ones found in eastern Serbia (Runa Glava) or Bulgarian Thrace (Ai Bunar) have been located. It is, therefore, difficult to assume the existence of metallurgical centres where metal objects were manufactured and/or redistributed (Todorova 1978). Nevertheless, the presence of clay crucibles at Sitagroi III, Mandalo and Promachon-Topolnica, as well as copper smelting remains at Makriyalos and elsewhere (Zachos 2010), indicates on-site production, at least at a limited scale.

Regarding shell artefacts, the distribution of *Spondylus* ornaments (mainly bracelets, but also beads and buttons), possibly originating from the Aegean Sea, in the Balkan region and central Europe points to long-distance trade relations, potentially following the Axios rivercourse or the Dardanelles passage (Karali 2004). The exact form of product circulation in such vast distances cannot be safely deduced. It may have followed a pattern of potlatch trade between established partners, similar to the *kula* of the Trobriand Islands (Malinowski 1922; Mauss 1966, 20–5). Alternatively, shell ornaments could have been exchanged in return to food or other resources in times of shortage (Halstead & O’Shea 1982). Their

distribution pattern indicates that these were probably prestige or symbolically loaded items manufactured in Greece for exportation northwards. The evidence for on-site production in a number of sites, including Makriyalos, Stavroupolis, Dimitra, Sitagroi and Dikili Tash, could support the existence of production centres and specialised ‘workshops’, although the latter have not been securely identified. In any case, the techniques applied in the collection and manufacture of other shell ornaments, as well as the association between raw materials and types of ornaments, point to a specialised activity (Miller 2003; Souvatzi 2008a, 185; Veropoulidou 2011, 464). It should be further noted that the comparative study of the Makriyalos and Paliambela assemblages renders possible that the former site could have played a central role in the production and distribution of shell ornaments within the wider area (Veropoulidou 2011, 464–5).

### **3.7 Discussion: community and household**

The regions of Macedonia and Thrace are more or less densely populated in most periods under study. As is the case for south-east Europe as a whole, settlements in the form of clusters of free-standing dwellings and other domestic structures represent the dominant features of the landscape. Although differences in environmental settings, settlement types, sizes and intra-site arrangements are evidenced, the Neolithic village constitutes the key formation in which individuals or groups of people organise their everyday experience. This becomes more emphatically demonstrated in the case of settlements enclosed by ditches or walls.

In the case of northern Greece, the evidence from a number of excavated sites seems to indicate year-round occupation (Halstead 1999, 78; 2005). Moreover, the richness of material culture and resources supports the idea that Neolithic communities were, up to an extent, self-sufficient (Fotiadis 1997). Nevertheless, the density of occupation in several areas, as well as the similarities observed in the material culture and the subsistence strategies followed, encourages the idea that, instead of being autonomous, these communities were taking part in a wider settlement system within each micro-region and beyond. Whether this system was somehow hierarchically organised (e.g. around prominent sites in a ‘core-periphery’ model) cannot be safely deduced. The long-term occupation of certain sites, their location near communication routes, as well as their proximity to raw material sources, may have contributed to their higher significance. In any case, it seems apparent that interaction between neighbouring settlements or territories, stimulated by either economic or social concerns, played an important role in the establishment of shared

cultural perceptions and material manifestations. It can further be argued that certain environmental settings, such as plains or valleys well bounded by mountain ranges, enhanced the creation of local networks and regional identities.

At the site-specific scale, the household is commonly perceived as the basic unit of social production and reproduction. However, the exact nature of inter- and intra-household relations is difficult to define. The emerging picture for the Neolithic society of northern Greece does not favour the existence of sharp inequalities. Subsistence practices, including intensive-labour horticulture and small-scale herding, seem to be compatible with a relatively self-sufficient household production model that is not tuned to produce accumulation. Domestic assemblages do not support the unequal distribution of certain goods or prestige items that could hint at the establishment of hierarchical relations between social units. In addition, mortuary practices (Fowler 2004; Triantaphyllou 2008) do not provide definite clues for vertical social differentiation.

In terms of social differentiation, it is commonly accepted that it did not take the form of institutionalised hierarchy and centralisation before the advanced stages of the Bronze Age. Inter-household competition and tensions, especially in times of crisis (Halstead 1989), should have been controlled by social restrictions entailing notions of commensality and sharing (Tomkins 2004, 44). These are reflected in the widespread location of thermal structures in open spaces, the production of fine table-ware, as well as in the existence of communal storage, work and ritual areas. Evidence for the existence of buildings or areas with a communal or ritual focus comes from EN Nea Nikomedeia, LN Promachon-Topolnica, LN Limenaria and LN Makri. Furthermore, the establishment of marriage alliances and exchange partnerships hinted by the circulation of certain products, the undertaking of projects (e.g. the construction of enclosures) at a more collective scale, the disposal of the deceased in public community places (Triantaphyllou 1999; 2008), as well as participation in large-scale feasting, constituted mechanisms by which social coherence within the village community and beyond was sustained (Halstead 1999; Tomkins 2004; Urem-Kotsou & Kotsakis 2007; Souvatzi 2008a). Regarding the latter feature, the evidence from the large pit 212 at LN Makriyalos I attest to a huge consumption episode that may have even transcended the communal level (Pappa *et al.* 2004; 2013, 84).

Household morphology was not necessarily identical in all settlements; neither did its role remain static throughout the period under study. On the contrary, it was subject to

repeated renegotiation influenced by changing social imaginaries (*sensu* Castoriadis)<sup>26</sup>, socio-economic conditions, as well as by the transformation of individual or group values and interests. According to Halstead (1989; 1995; 1999), the progressive isolation of households is observable during the later stages of the Neolithic. This is expressed in the relative increase in the proportions of wild resources, the possible intensification of agricultural production at the household-scale and the gradual appearance of storage facilities within dwellings. In addition, the more prominent subdivision of settlement space by walls or ditches, the lower permeability of LN/FN households and the development in architectural form and/or building materials seem to reinforce this assertion. However, it should be noted that Halstead's hypothesis is, by and large, referring to the Thessalian evidence. The data from northern Greece are not conclusive and a similar narrative remains to be challenged.

Whatever the case, the interplay between houses, households and the community can be perceived on multiple levels, including both socio-economic and symbolic ones. According to Kotsakis (1999; 2003b; 2006; 2009), diverse social realities and symbolisms are embedded in different habitation patterns and certain architectural practices within settlements. The intensive use of habitational space and the successive rebuilding of houses, perhaps more commonly evidenced in tells or tell-like sites, stress on the unchanging continuity of the individual household and mark the gradual shift from reciprocal communality (Kotsakis 1999; 74; 2006, 218; Nanoglou 2008, 147). The latter is more prominent in sites presenting an extensive habitation pattern. In the case of tells, the emphasis on the continuity of households, as well as the monumentality of the settlement formation itself, act as ideological mechanisms that are imbued with symbolic meaning. It is further supported that the individual household takes over a significantly more important ideological role during the course of the Neolithic period. On the other hand, Nanoglou (2008) argues that the spatial segregation of LN 'pseudo-tells', such as Dimini and Sesklo, rather than reflecting the strengthening of independent households, provides the picture of a compact unit with a single reference point (either a central area or building). As a result, the independent house or household was not necessarily the nodal point in the constitution of social identities (Nanoglou 2008, 154). It would, therefore, seem that diverse readings of

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<sup>26</sup> Castoriadis (1987) uses the term 'imaginary' (or 'radical imaginary') to refer to the fundamental conceptions upon which the main aspects of each society are founded. These are expressed in myth, law and the formation of social institutions.

settlement space reveal different ways of approaching the dialectic between the collectivity of the settlement and the individuality of the household.

The social implications of building technology in relation to both the household and the community will be discussed in later chapters of the thesis. The focus of the following chapter will be on the identification and description of the physical manifestations of houses as these are preserved in the domestic architectural record of northern Greece (**Fig. 3.2**).

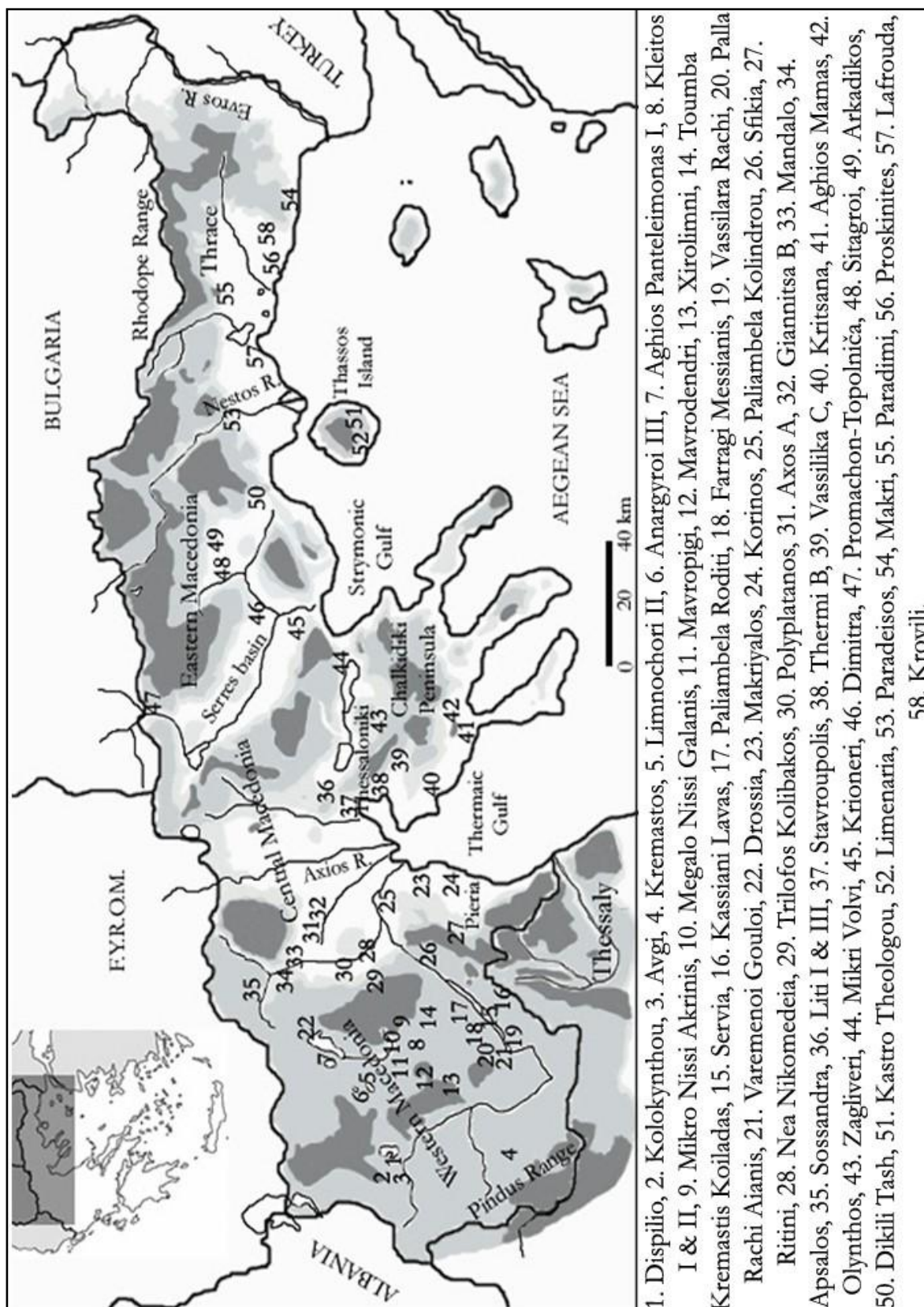


Figure 3.2 Map of northern Greek sites mentioned in Chapters 4–6.



## **4. A survey of building remains in Neolithic northern Greece**

This chapter summarises the architectural record of northern Greece by focusing on the remains of dwellings and associated structures. The main objective is to provide a detailed account of the preserved features in terms of built forms and ground plans, raw materials, building techniques and relevant information that will contribute to a fruitful discussion in the following chapters of the thesis. The architectural record will be presented in four sections, each referring to a particular sub-region. Even though these sub-regions are not always defined by strict geographic or cultural boundaries, they correspond to the needs of site presentation.

### **4.1 The architectural record of Macedonia and Thrace**

#### **4.1.1 Western Macedonia**

Research in western Macedonia has offered a wide array of information on architectural practices. The site of Servia remains the only adequately published site of the region. The excavations at Dispilio have provided valuable insights into the different techniques and architectural solutions employed. Additional data derive from the areas of Kitrini Limni and the middle course of river Aliakmon, while other projects and smaller soundings have enriched the architectural record under study.

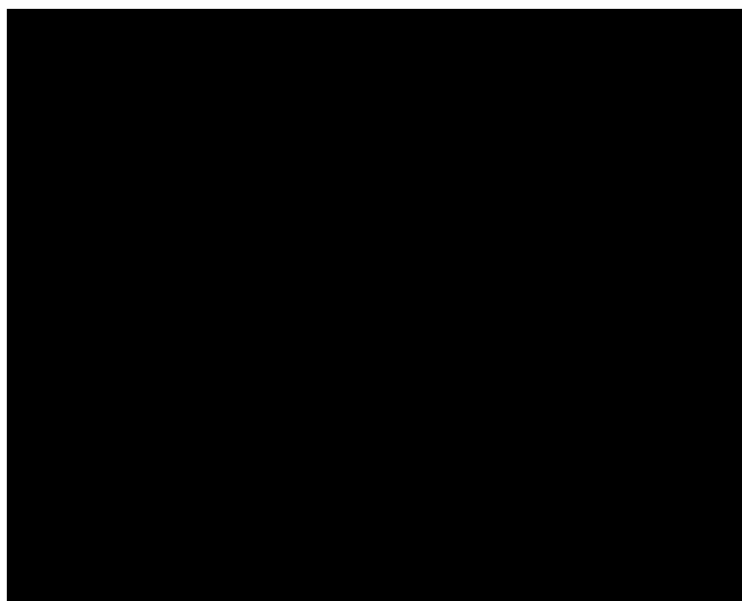
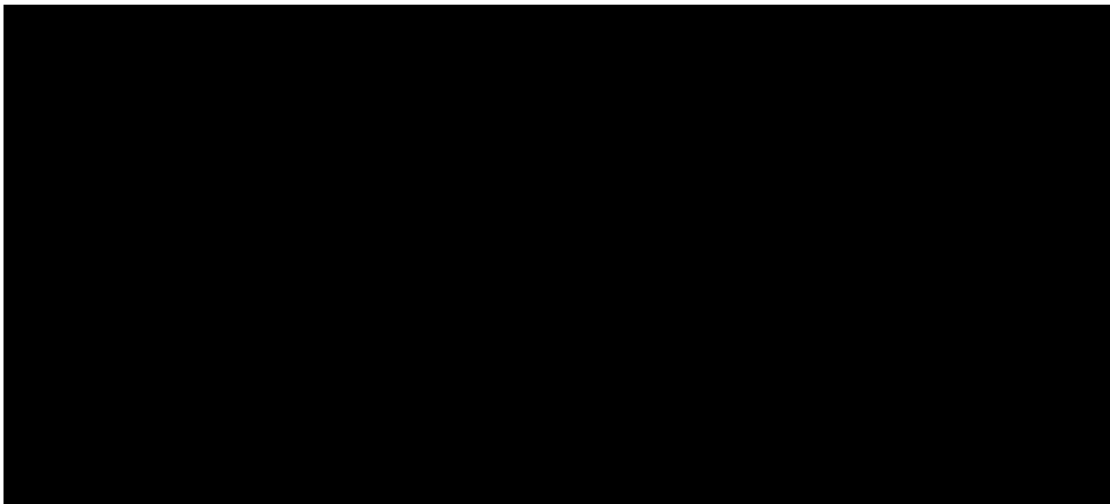


Figure 4.1 Dispilio: aerial view of the excavation (Sofronidou 2008, 15, fig. 5).

The site of **Dispilio** (**Fig. 4.1**) at the coast of Lake Orestias has brought to light significant evidence for the architecture of lakeside settlements (Chourmouziadis 2002). According to the excavators, three main occupation episodes can be distinguished. The earliest phase VI has been uncovered in the so-called area  $\Gamma$  and has offered the richest architectural and artefact assemblage. Although the reconstruction of ground plans was not possible, the considerable amount of postholes, waterlogged timbers, plastered surfaces and structural debris points to the existence of timber and mud post-framed structures. Stratigraphic observations indicate that some of the vertical timbers belonged to the load-bearing elements of the superstructure, while others have served for supporting raised timber platforms or floors. The overall picture could have been comparable to the solutions applied at the Alpine foreland and other parts of Europe (Chourmouziadi & Yiagoulis 2002, 74; Coles & Coles 1989; Menotti 2012 – **Fig. 4.2**).

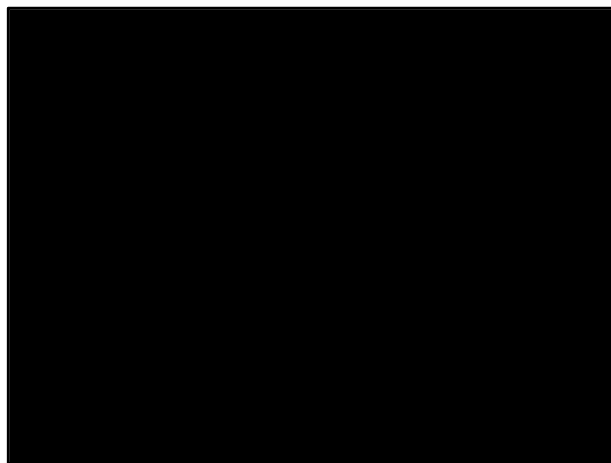


**Figure 4.2 Dispilio: view of the open-air museum (Grammenos 2010, 33, fig. 2-2β)**

The following phases (III-V) uncovered in Area B are characterised by a large number of vertical elements, either in the form of postholes or waterlogged timbers. Their irregular distribution prohibits the identification of specific spatial-organisational features. The rarity of horizontal timbers from phase V onwards points to a more restricted use of platforms. Pile-dwellings could have been built close to the lakeshore but well protected by the water. During a later stage (phases I-II) the settlement was gradually moved further away from the shore. In Area A, lines of postholes delimit structures with rectangular or even ellipsoid ground plans (Chourmouziadi & Yiagoulis 2002, 73). These are usually shallow (ca. 10cm), cut directly into the subsoil, and are commonly clay lined. The floors were clay plastered, sometimes in successive layers showing renovation. Well-polished floors made of clayey

earth on a substructure of gravel and/or sand are probably associated with thermal structures. Finally, during the later occupation period, a shallow trench could have served as a spatial-organisational feature or was related to the protection from water (Chourmouziadi & Yiagoulis 2002, 73).

The study of architectural debris, mainly deriving from Areas A and F, adds to a more accurate reconstruction of dwellings. At the later levels of the site mudbricks are reported to be extensively used for the construction of superstructures, although no information is provided on their shape and dimensions. In Area B the fragments of construction earth are quite rare. This may reflect the restricted use of mud or the fact that the dwellings were not destroyed by fire. The latter assumption is reinforced by the identification of patches or stains of clayey earth (dissolved material) in the soil (Chourmouziadi & Yiagoulis 2002, 62–3). In any case, a large amount of daub fragments has been found at the earliest levels of the site. They commonly bear impressions of round timbers and reeds pointing to the application of the wattle-and-daub technique and alternative methods comprising closely set stakes and split or plank-shaped timbers (Chatzitoulousis 2006, 456; Chourmouziadi & Yiagoulis 2004).



**Figure 4.3 Dispilio: waterlogged timbers and postholes (Chatzitoulousis 2008, 94, fig. 1).**

The most interesting aspect of the Dispilio excavations is the exceptional preservation of waterlogged wood that has offered a unique opportunity for studying the *chaîne opératoire* of timber elements (Chatzitoulousis 2006; 2008 – **Fig. 4.3**). Based on the analysis of preserved timbers and postholes, it is reported that the diameter of the vertical posts ranges between 3 and 40cm, although their mean diameter is estimated at 8-18cm and the most common one measures ca. 12cm. The depth in which posts or stakes are sunk into the soil ranges between 5 and 35cm, probably reflecting the diverse position of each timber in the

structure and the instability of the site's subsoil. The plotting of all available information has revealed three major areas with differences in post distribution, depth and diameter (Chourmouziadi & Yiagoulis 2002, 59–62). However, the reconstruction of house or platform ground plans was not successful. The same stands for the macroscopic study of the horizontal timbers found in situ. These could be linked to platforms, floors or even collapsed walls but no further evidence is provided.

In terms of materials, the analysis of waterlogged timbers and charcoal remains indicates the common exploitation of black pines and junipers (Chatzitoulousis 2006; Ntinou 2010, 54; Ntinou & Badal 2000). Moreover, the selective use of standard-sized timbers reflects a technology that takes into account not only the durability of structures, but also the convenience in the cutting, manufacture and transportation of the available resources (Chourmouziadi & Yiagoulis 2002, 57). The macroscopic study of daub fragments indicates variations in the inclusions of the construction earth used. Coarse inclusions, whenever visible, comprise small stones or pebbles and tempering materials, including straw and crushed shells. The varying proportions of certain inclusions in different parts of the structures seem to be related to the desired qualities, thus showing expertise in the basic properties of construction earth (Chourmouziadi & Yiagoulis 2002, 63).

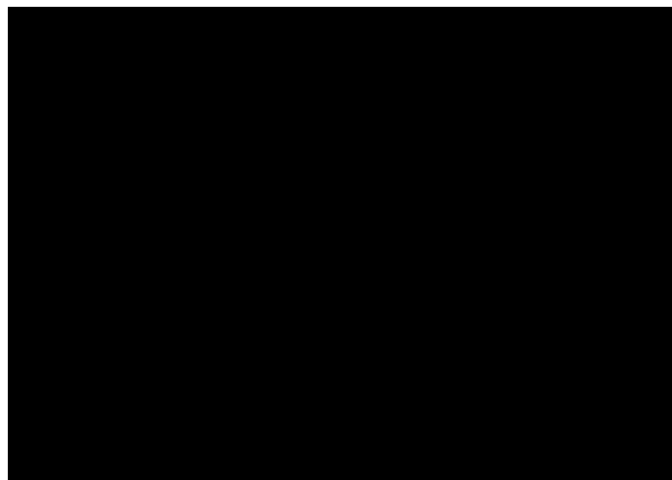
The site of **Kolokynthou** is situated approximately 6km to the west of Dispilio. Due to its proximity to the riverbed of Aliakmon the prehistoric layers have been heavily eroded, while a later clayey alluvium has covered the ancient deposits. The pottery assemblage led to the identification of two main habitation phases, belonging to the late MN/early LN and the FN period respectively (Tsouggaris *et al.* 2004, 628, 630). The architectural remains of the site consist mainly of negative imprints, such as postholes and pits, cut into the natural subsoil, as well as burned daub fragments from the superstructure of domestic structures.

The pit features seem to date to the earliest habitation phase and they present varying depths (15-70cm), sizes and shapes. Although larger pits following irregular plans (up to 4.5x2m) have been identified, it is very uncertain whether these were used for habitation. Postholes have been occasionally cut in their fill but they probably belong to a later phase. Only in one case were postholes found in the pit's perimeter suggesting the presence of a roofed structure. According to the excavators, two features with pebbled floors should be interpreted as storage pits, while most of the remaining ones could have initially been cut for the procurement of clay (Tsouggaris *et al.* 2004, 628). It is worth noting that several

cuttings were covered with burned superstructural debris, probably as a result of a levelling episode.

The architectural record of the later phase is equally compartmentalised (**Fig. 4.4**). Although up to 70 postholes were found, their distribution does not allow the reconstruction of ground plans. The excavators suggest that they belong to small, almost rectangular, post-framed dwellings. The postholes were grouped in mid-sized (0.08-0.10m) and larger (0.15-0.19m) ones, while smaller sidelong stake-holes (0.02-0.03m) may represent extra support for the superstructure, inner partitions or other structural elements. Their depth ranges between 5cm and 50cm. In certain cases, pebbles, probably for support, have been found in their lower part, while in three post-holes part of the timber itself was preserved (Tsouggaris *et al.* 2004, 630).

It is not clear whether a *pisé* (rammed earth) or a wattle-and-daub technique was applied for wall construction. Evidence derives mainly from burned daub fragments that are not described in detail. According to the preliminary report, some bear impressions of timber, plant tempers (straw or chaff) and pebbles. Few samples, probably belonging to the outer wall surface, have relatively smooth surfaces with a whitish/whitish blue finishing plaster. No floors were identified with the exception of surfaces made of small stones, pottery sherds and clayey earth suitable for protection against humidity (Tsouggaris *et al.* 2004, 630).



**Figure 4.4 Kolokyntou: structural debris and postholes (Tsouggaris *et al.* 2004, 638, fig. 2).**

Recent excavations at the so-called area of the four lakes (Amyntaio basin), have brought to light several Neolithic sites spanning the entire chronological sequence of the Neolithic period. The architectural remains include single- or two-storied, post-framed dwellings with one or more rooms and thermal structures in their interior. They were commonly

organised in groups of five or six buildings defined by enclosures or ditches. In **Aghios Panteleimonas I** a square house and part of a second post-framed building were identified, while in **Anargyroi III** the timber floor of a post-framed structure measuring ca. 5m<sup>2</sup> was uncovered. In addition, remains of pile-dwellings with wooden platforms were excavated at the lakeside settlement of **Limnochori II** (Chrysostomou in press; Soueref 2012, 219–20; Whitley *et al.* 2007, 48).

The settlement of **Kremastos** at the north-west edge of the Knidi valley is dated to the late EN period, while it may have also been occupied during the early LN period (Toufexis 1998, 19–20). No ground plans or definite floors were identified during the brief rescue excavations in 1993. Nevertheless, a large amount of structural debris pointed to the use of timber and mud for the construction of dwellings. The burned daub fragments are tempered with straw and small sticks or branches, and they commonly bear impressions of the timber frame. According to the excavator, the main technique applied was wattle-and-daub (Toufexis 1998, 18). However the description of the impressions (stakes/posts and thick branches) seems to support a framework of closely set stakes or the combination of different techniques. Moreover, impressions of planks or split timber set in parallel rows have been interpreted as belonging to walls, roofs or floors. What remains problematic is the absence of postholes or relevant features that could shed light on the foundation techniques (Toufexis 1998, 18).

Moving to the area of Kitrini Limni, the rescue excavations conducted during the last decade at the site of **Kleitios I** brought to light an extended settlement with well-preserved architectural remains (Ziota 2012 – **Fig. 4.5**). Although the study of the material is ongoing, general information on the spatial arrangements and the building techniques is already available. The LN settlement was probably encircled by a system of ditches and post-framed enclosures, while a vertical internal ditch indicates a centre-periphery organisation. At least ten post-framed free-standing dwellings were uncovered at the western part of the site. At the eastern part the remains of five sizeable structures in the form of postholes and plastered surfaces have been interpreted as seasonal or special activity areas (Ziota *et al.* 2013).



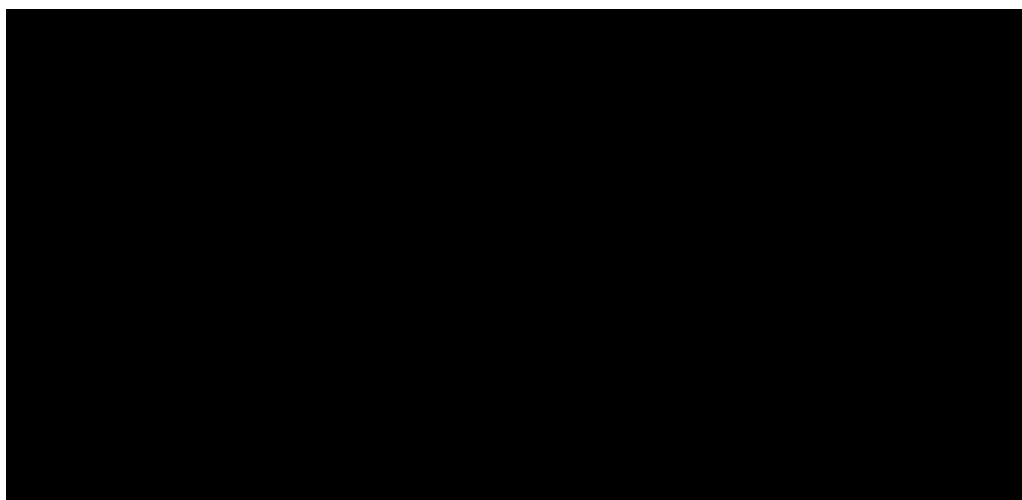
Figure 4.5 Kleitos I: aerial view of the excavation (Grammenos 2010, 34, fig. 2.3).

Three superimposed habitation phases were recognised. Some buildings were reconstructed at the same place, while others followed a horizontal replacement pattern. The levelling of structural debris for the erection of a new building was confirmed at the northern part of the site. The mean size of dwellings is estimated at 100–120/125m<sup>2</sup> and their foundations consist of narrow trenches and postholes. Superstructures are made of posts and closely set stakes coated with layers of clayey earth. Up to 10 successive coating layers have been recognised, while the decoration of certain surfaces with paint pigments or incised geometric motifs has also been documented (Ziota 2012; Ziota *et al.* 2013). Floors are commonly preserved in the form of black/dark greyish layers probably representing successive burned plasters. The construction of timber floors is also suggested on the basis of carbonised remains found below the collapsed wall material. Moreover, a number of impressions on daub could support the existence of floors made of parallel planks placed close to each other (Ziota *et al.* 2013). Alternatively, planks could be associated with wall construction. Evidence of internal partitions is scarce, while other domestic structures, such as hearths, ovens, platforms, pits and storage installations, were found both inside and outside dwellings.

In a short distance to the north-east of Kleitos I, excavations at the FN site of **Kleitos II** (Ziota *et al.* 2013) have brought to light a partially preserved floor (belonging to an earlier phase) and the remains of at least three buildings. Two buildings seem to follow an ellipsoid ground plan, while the third is rectangular measuring ca. 4x10m. Their

foundations consist of trenches with no postholes inside them. The floors are probably made of timbers plastered with mud, while interior features include thermal structures and half-sunk vessels or clay storage bins. Concentrations of structural debris may represent the collapsed superstructure of two more buildings. An open pebbled area at the centre of the settlement, a shallow ditch in its southernmost limit and a terrace wall (ca. 15m in length) fill in the architectural assemblage.

At the contemporaneous (FN) site of **Mikro Nissi Akrinis** buildings seem to have followed the wattle-and-daub wall construction technique, as indicated by impressions of weaving branches on burned wall fragments. The walls probably exceeded 20cm in thickness and were coated with a mud mixture containing chipped stone, pottery sherds, bones, charcoal and other incidental inclusions. Their presence indicates that the earth used originated from the habitation area, while the recycling of older decomposed building materials has also been suggested (Fotiadis 1991, 45). The microscopic analysis of the remains has showed that the concreteness of the materials used was not due to the composition of local clay (amounting 95% in the subsoil) as is the case in proper daub structures. On the contrary, the walls were plastered with a solid, calcareous mixture containing 75-95% sand. The lime and sandy stream sediments could have been procured from nearby or more distant watercourses (see Fotiadis 1991, 46).

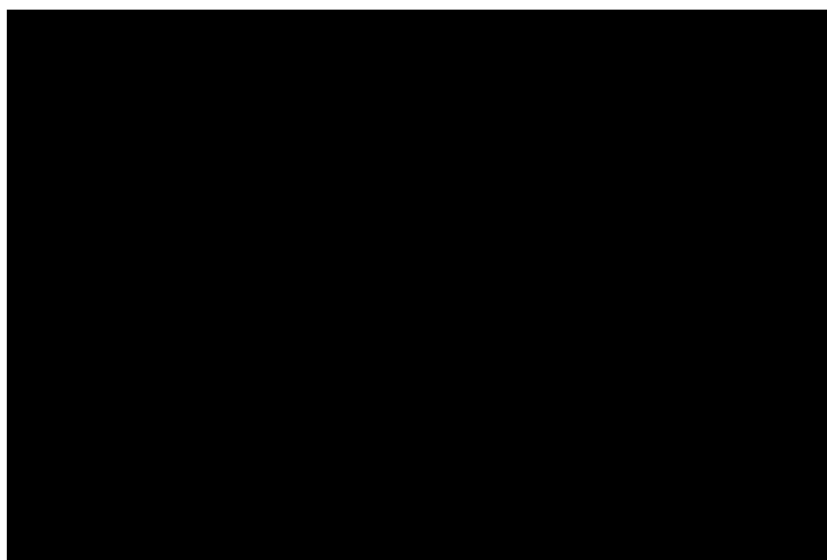


**Figure 4.6 Megalo Nissi Galanis: lump of unfired clay (left) and shallow pit/thermal structure (right)** (Fotiadis & Hondroyianni-Metoki 1997, 31, fig. 1–2).

A similar solid, potentially artificial, mixture was the basic building material at the neighbouring settlement of **Megalo Nissi Galanis**. During the LN phase of the site, dwellings were probably built in a *pisé* technique. Walls were occasionally covered with thin layers of whitish finishing plaster, while some surfaces could have been painted. The



deposits excavated included structural debris, a lump of unfired, yellowish clay (probably used for wall plastering or pottery manufacture), and a shallow pit containing successive layers of ash (**Fig. 4.6**). In the following FN period the mud used for wall construction seems to have contained more sand and lime thus resembling to the plaster used at Mikro Nissi Akrinis. Two successive FN floors and an associated posthole were identified. The lower floor was described as made of trampled clayey earth followed by a thin layer of ash, while the upper one was made of a fine clay plaster on a substructure of sherds and stones (Fotiadis & Hondroyianni-Metoki 1997, 27). Pebbles and lime stones, measuring up to 5cm in size, seem to have been transferred at the site by the inhabitants for structural purposes (Fotiadis 1991, 45). These could refer to the construction of open pebbled surfaces as there are no clues for their use in the foundation or superstructure of buildings.



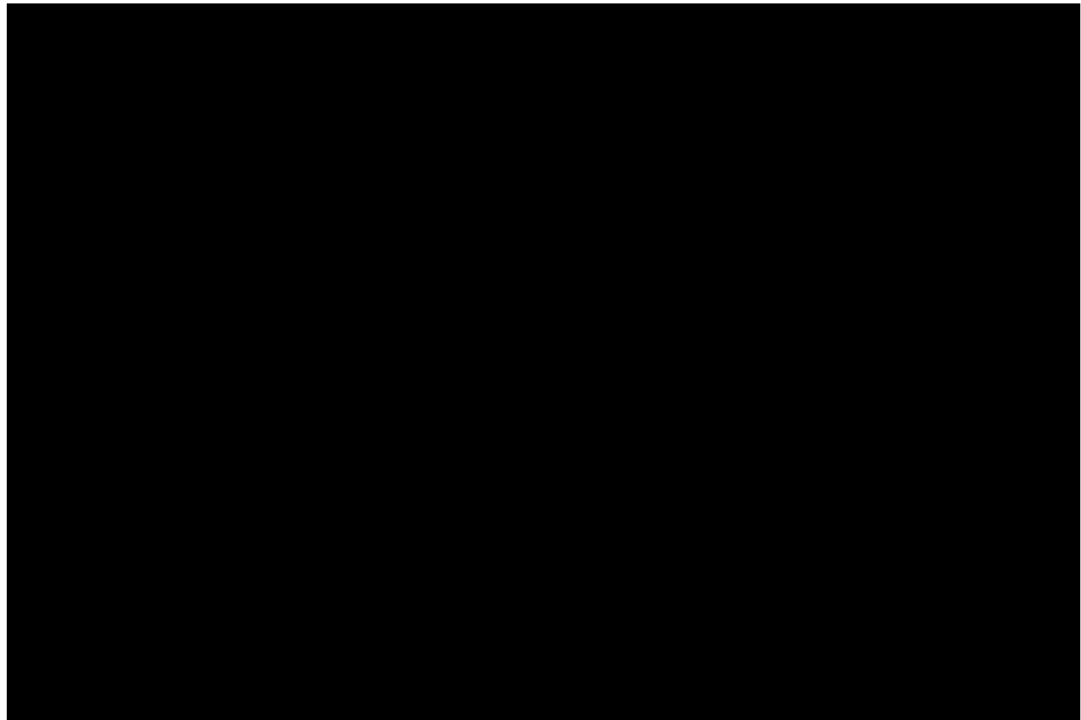
**Figure 4.7** Mavropigi: view of the excavation (Karamitrou-Mentessidi *et al.* 2013, fig. 3).

Research at the EN site of **Mavropigi Filotsairi** (thereafter Mavropigi) at the western edge of the basin has revealed habitational remains dating to the mid and late 7<sup>th</sup> millennium cal BC (Karamitrou-Mentessidi 2009; Karamitrou-Mentessidi *et al.* 2013). The excavation of the shallow deposits has brought to light at least eight sizeable structures that were interpreted as dwellings (**Fig. 4.7**). The central structure was initially built as a small-sized (ca. 25m<sup>2</sup>) subterranean feature that was succeeded by a larger semi-subterranean pit-dwelling. The structure was subsequently built as a ground-level, post-framed house exceeding 100m<sup>2</sup> in size. The thick (7–10cm) lime floor was preserved in an area of ca.15m<sup>2</sup> (Karamitrou-Mentessidi 2009, 124). The remaining features, comprising seven rectangular, post-framed dwellings, were identified around this central unit in an area of 0.4ha. They range between 50 and 90m<sup>2</sup> in size and seem to follow a N-S/NE-SW orientation.

Foundations consist of trenches and postholes. Interior postholes were attributed to internal partitions or to the support of double-pitched or hipped roofs. According to the excavators, walls were built in a *pisé* technique, although fragments with impressions of branches and reeds are also reported (Karamitrou-Mentessidi 2009, 124). Sizeable pits were commonly found adjacent to buildings, while refuse and storage pits, as well as hearths and other features, were identified both inside and outside the dwellings.

Daub fragments with impressions of branches, concentrations of stones and very few postholes were uncovered at **Mavrodendri** (Karamitrou-Mentessidi 2009, 117), while the excavations at the site of **Xirolimni** have offered further evidence on domestic architecture during the EN period. The remains of the latter site, located at the south-west edge of the basin, include a significant number of postholes, partially preserved stone socles and superstructural rubble. The excavators argue that walls were made of mudbricks or rammed earth (*pisé*) with or without stone footings. Roofs were probably covered with mud plastered reeds and thatch, while floors were made of trampled clay (Karamitrou-Mentessidi 2009, 119).

The LN/FN site of **Toumba Kremastis-Koiladas** situated at the south-east part of the Kitrini Limni basin has yielded remains of possible post-framed dwellings. These include a destruction layer with burned daub fragments and a possible post-hole (Ziota 2001, 539). Further to the south, in an area presumably lying at the periphery of the prehistoric settlement, rescue excavations brought to light over 300 pits (some of them of a 'ritual' character), two vertical V-shaped ditches forming a 'T'-ground plan and a number of cremation burials. Although the excavators preclude the existence of dwellings, a few dubious postholes (8–10cm in diameter) and a more sizeable pit filled with structural debris could support the existence of semi-subterranean structures (Hondroyianni-Metoki 2001, 404, 408).



**Figure 4.8** Servia: plan of the 1971-1973 excavations (Ridley *et al.* 2000, 12, fig. 1.4).

Research at the middle course of river Aliakmon has offered rich evidence on house construction. The main corpus of architectural remains derives from the site of **Servia** (**Fig. 4.8**) dated to the MN (phases I-V) and LN (phases VI-VII) periods. These include foundation trenches, postholes, carbonised remains, different types of floored surfaces, pebbled areas and yards, thermal structures and other installations that were preserved beneath a deep build-up of structural debris due to the frequent destruction of buildings by fire (Mould & Wardle 2000b, 71). The complete ground plans of five buildings were traced, while thirty partially preserved structures were identified in total (Mould & Wardle 2000b, 71). The publication of the material offers the potential for a detailed, phase-to-phase description of ground plans, spatial features, as well as foundation and flooring techniques, at the building-specific level. However, wall construction techniques are presented at the site-scale so that variability between structures in terms of certain technological aspects is impossible to trace.

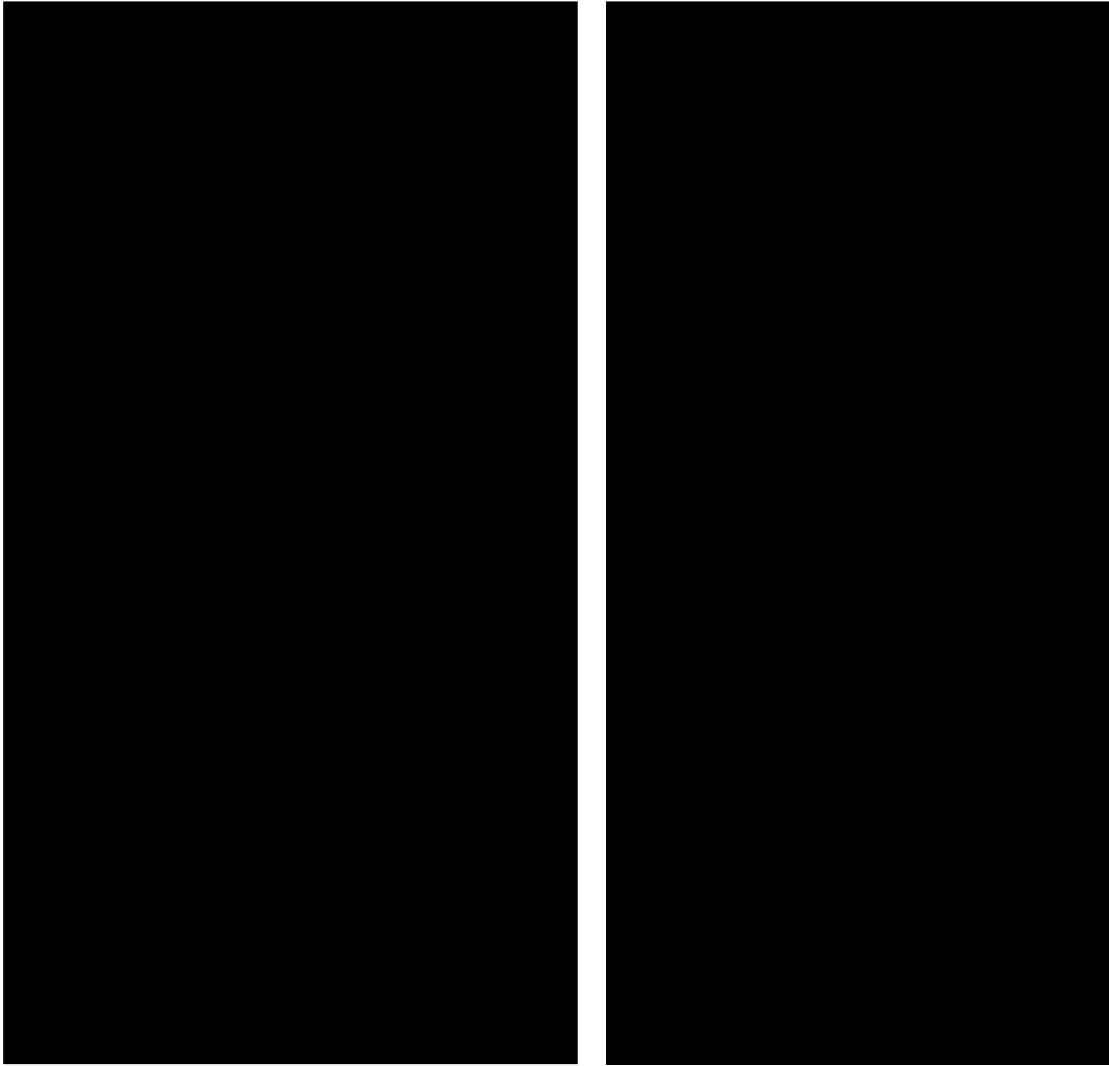


Figure 4.9 Servia: plan of phase I structures, Area F (Mould & Wardle 2000a, 24, fig. 2.1).

Figure 4.10 Servia: plan of phase II structures, Area F (Mould & Wardle 2000a, 26, fig. 2.2).

According to the stratigraphy of the site, five major construction episodes were discerned during the MN period (5800–5400/5300 cal BC). During the earliest phase I (**Fig. 4.9**), three structures following rectangular or roughly square ground plans and a NW-SE orientation were recorded. Their foundations consist of a combination of trenches and free-standing posts or stakes. Structure 1 preserves a “trampled clay surface” at its north half and a plastered timber floor at its south/south-west part. A burned pebbled area identified at the south-east corner of the structure is interpreted as a floor remake reflecting a long period of occupation and maintenance (Mould & Wardle 2000a, 23). A “trampled clay surface” has also been uncovered in Structure 2, while a burned timber floor was partially preserved in Structure 3 (Rhomipoulou & Ridley 1973, 421; Ridley & Wardle 1979, 195).

During phase II (**Fig. 4.10**) the orientation of the structures probably remains the same. Structure 2 is adequately preserved and seems to follow an irregular rectangular or roughly

trapezoidal ground plan. The east and south walls are represented by trenches and postholes, while its north and west limits are marked by two large postholes and two rows of stone respectively. The floor is described as clay plastered and is associated with a circular hearth. Both were rebuilt at a later stage. Structure 3 is almost square in plan (ca. 6x5.5m) and presents a lot of affinities in terms of foundation and flooring techniques.



Figure 4.11 Servia: plan of phase III structures, Area F (Mould & Wardle 2000a, 31, fig. 2.3).

Figure 4.12 Servia: plan of phase IV structure 7, Area D (Mould & Wardle 2000a, 39, fig. 2.6).

The picture is much more compartmentalised during the subsequent phase III (**Fig. 4.11**). Most of the ground plans are undiagnostic and the foundations are only occasionally represented by lines of posts and/or internal buttresses. The better preserved structure 3 follows a roughly rectangular plan and its foundations consist of lines of posts, internal, centrally placed, buttresses for roof support, as well as a small foundation trench representing its south wall. Postholes were cut into the trench which was packed with stones and clayey earth. An innovation is evident in phase 3 flooring techniques. The floors of the Area F structures are described as ‘sunken’ and plastered with yellowish/yellowish brown clay. These were created by cutting the foundations and floors down into earlier deposits, at a depth of ca. 0.50m (Mould & Wardle 2000a, 30), and were initially interpreted

as “basements” (Ridley & Wardle 1979, 198). In the case of Structure 3, a later clay floor remake with matt impressions was also recorded. No internal partitions or features, such as thermal structures, have been uncovered inside the dwellings. Finally, a poorly preserved structure with a clay plastered, but not sunken, floor has been identified in Area H.

Moving to the following phase IV, building remains become more abundant. In Area F five structures were recorded, although not all of them were occupied at the same time. According to the excavators, the new building episode followed the levelling of the previous remains. Lines of postholes represent the foundations of most structures, while a foundation trench marks the east wall of Structure 4. The floors are clay plastered with the exception of a timber floor identified in structure 4. The excavation of Structure 2 revealed a succession of floor remakes that continue into phase V.

Building remains in the form of partially preserved clay plastered floors, central postholes and a possible wall have been found in Area H. However, the most substantial remains of the phase were uncovered in Area D in the form of *in situ* wall faces and burned daub. Structure 7 (**Fig. 4.12**) measures at least 8x3.30m and has been heavily disturbed by a Bronze Age ditch. Its foundations, consisting of trenches and postholes, had been cut down 0.50-0.60m into the preceding levels (Mould & Wardle 2000a, 36). Large posts were set along the walls for the extra support of the roof and the superstructure, while additional posts, sometimes inside post-pits and arranged in pairs, were found inside the building area. According to the excavators, if these represent central posts they could imply a total width of 3.50m. On the other hand, if they represent two internal rows of postholes the building's width could have reached 5.20m (Mould & Wardle 2000a, 37). A ridge on the east-central part of the floor suggests the existence of an inner partition. It is also argued that the structure could have had a second storey. This was primarily based on the distribution of posts and the large number of artefacts which seemed to have fallen from above.

Following an episode of widespread destruction at the end of phase IV (Mould & Wardle 2000a, 42), the focus of activity seems to have changed and certain areas were left vacant. Phase V buildings seem to be less substantial and the habitation less intense (Ridley & Wardle 1979, 202). Partially preserved clay floors, thermal structures and pits comprise the sole remains at the north part of Area F. Further to the south the remains of at least four successive, probably temporary, buildings were identified. They were constructed in different alignments and were later replaced by a more substantial building with a clay

plastered floor and a post-famed inner partition (**Fig. 4.13**). This was replaced by another rectangular building represented by foundation trenches with or without postholes cut into their base.

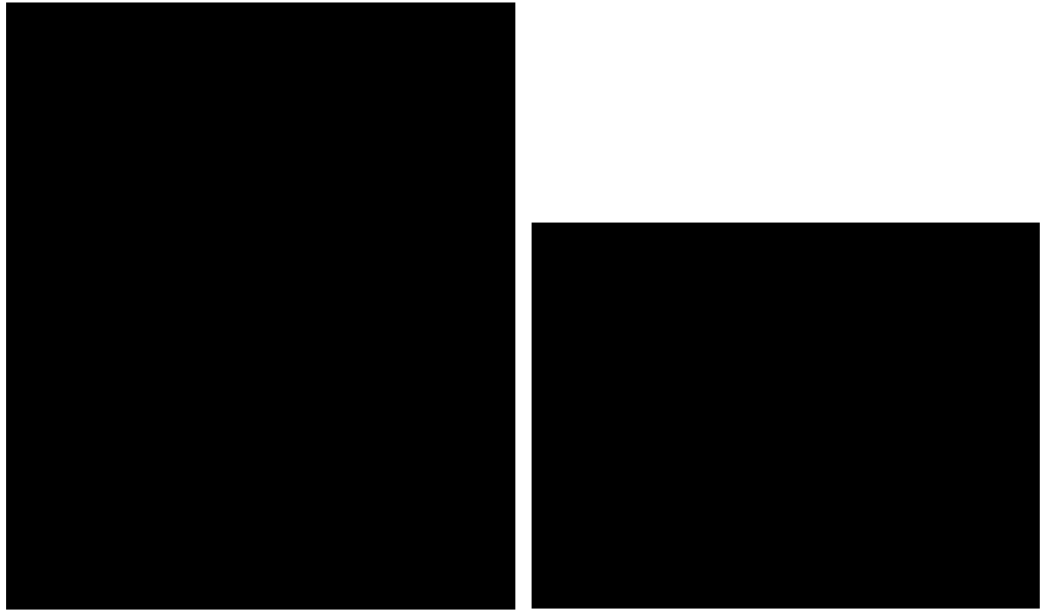


Figure 4.13 Servia: phase V structure 1, Area F (Mould & Wardle 2000a, 46, plate 2.6a).

Figure 4.14 Servia: phase VI structure 1, Area F (Mould & Wardle 2000a, 46, plate 2.6b).

Phase VI is characterised as transitional between the MN and LN occupation of the site. Structure 1 (**Fig. 4.14**) in Area F seems to have continued being occupied following a similar NE-SW orientation. The size of the building is estimated at 8x3.5m and the roughly rectangular ground plan is marked by foundation trenches and occasional postholes cutting into them. An off-centred internal posthole could have served for roof support. The remains were later disturbed by pits belonging to phase six as well as later phases. Their fill deposits indicate that domestic structures were constructed and maintained throughout this phase (Mould & Wardle 2000a, 47).

The remains of phase VII were more substantial. According to the excavators, the LN occupation ended rather abruptly, as shown by the preservation status of the structural debris and the amount of finds uncovered *in situ*. Once more, the bulk of evidence derives from Area F, supplemented by partly preserved features in Areas H and D. In Area F, the successive Structures 1 and 2 seem to have replaced the buildings of the earlier phases, thus indicating a vertical replacement pattern (**Fig. 4.15**). The south wall of Structure 1 is marked by a double row of irregularly spaced postholes, while the north wall is probably delimited by the extent of a “trampled clay” floor and an associated posthole. The west wall was marked by a single row of postholes. Two internal rows of irregularly spaced postholes of varying size have been identified. These may reflect roof supports or internal

partitions. The structure was further reinforced by five pairs of posts and two central posts, indicated by a double posthole (Mould & Wardle 2000a, 47). Although the walls of structure 2 were not preserved, a large part of a beamed floor indicated a minimum size of 8x2.5m and a NE-SW orientation (**Fig. 4.16**). The floor itself is described as covered with a clay deposit tempered with straw and plastered with mud (Mould & Wardle 2000a, 48; Rhomiopoulou & Ridley 1973, 422).

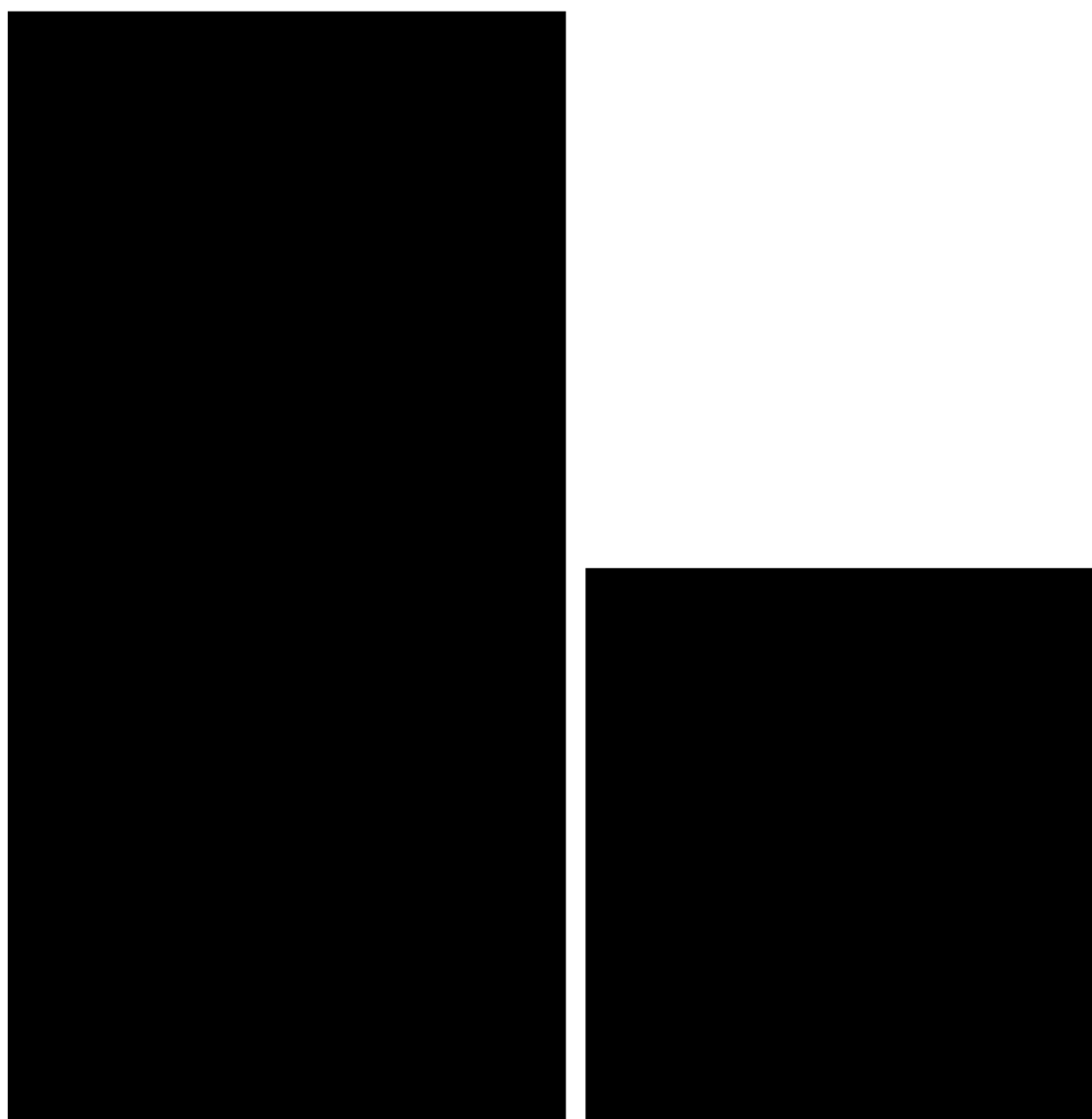


Figure 4.15 Servia: plan of phase VII structures, Area F (Mould & Wardle 2000a, 49, fig. 2.10).

Figure 4.16 Servia: phase VII structure 2, Area F (Mould & Wardle 2000a, 52, plate 2.7a).

At the north and south-west part of Area F remains of at least three structures comprise patches of clay floors, burned daub, postholes and foundation trenches. It is worth noting that the floors are sometimes partitioned by lines of postholes and that plank impressions were recorded in one case (Mould & Wardle 2000a, 50–51). Partially preserved floors, postholes, hearths, possible light lean-to structures, pebbled areas and pits were also



uncovered in Areas D and E, although the reconstruction of ground plans was not possible. Finally, in Area H a row of sizeable, regularly spaced postholes following a N-S alignment seems to represent the west wall of a structure. The daub packing of the wall, a series of clay plastered floors and an irregular line of postholes reflecting internal partitioning were partly preserved.



**Figure 4.17** Serbia: wall structure based on preserved daub impressions (Mould & Wardle 2000b, 80, 82–3, fig. 3.2, 3.4, 3.5).

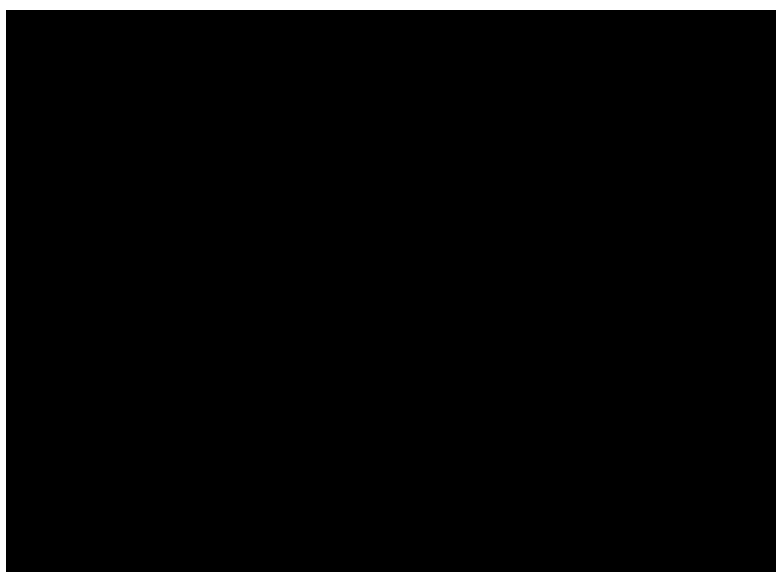


**Figure 4.18** Serbia: Closely packed reeds from wall partition (?) (Mould & Wardle 2000b, 81, fig. 3.3).

**Figure 4.19** Serbia: horizontal overlapping planks used as cladding (?) (Mould & Wardle 2000b, 84, fig. 3.6).

Information on wall construction practices derives principally from daub fragments bearing impressions of the timber frame. The macroscopic analysis of ceramified samples indicates that similar screening techniques were employed during the MN and the LN period. These included the use of thin poles or stakes (ca. 4cm in diameter) as uprights set little more than 1cm apart. Split and squared timbers, as well as wastage material from their manufacture, were used in place of stakes, while, in certain cases, a second row of poles was used for greater solidity and to prevent the natural movement of the frame (**Fig. 4.17**). Although it is likely that horizontal branches were used as transverses, no confirmation was provided.

The wall surface was packed with a thick (ca. 2cm) coat of relatively coarse, straw- and chaff-tempered mud and a finer finishing plaster of similar thickness (Mould & Wardle 2000b, 79). Internal partitions were probably constructed by vertically set and clay plastered bundles of reeds rather than in a typical wattle-and daub fashion (**Fig. 4.18**). Moreover, the production of proper planks or squared timbers has been associated with their use for uprights or as cladding (**Fig. 4.19**) fastened to a lighter structure (Mould & Wardle 2000b, 80, 82). Hubbard (2000, 339) notes that a plank or board measuring ca. 7x4cm is represented by a carbonised bit of poplar wood.



**Figure 4.20** Serbia: daub impressions of roofing materials (left) and reconstruction of roof cover (right) (Mould & Wardle 2000a, 87–8, fig. 3.8–3.9).

The roofs are thought to be pitched as indicated by the distribution of posts or buttresses placed at the centre of the building or close to the wall line. Load-bearing posts were normally measuring 25-30cm in diameter, although certain examples were set inside post-pits measuring 1m and cut up to 1.5-1.8m into the ground. The roof frame was probably constructed by beams and rafters covered by bundles of reeds and/or branches that were in turn plastered with chaff-tempered mud for waterproofing. A series of clay fragments preserving impressions of reeds was related to the roof covering (**Fig. 4.20**). Finally, large fallen stones that were occasionally found in the rubble were interpreted as weights for holding down lighter roofs (Mould & Wardle 2000b, 86).

More recent research in the middle course of river Aliakmon has supplemented the architectural record of the region. At the EN site of **Kassiani Lavas**, the remains of less durable timber buildings, possibly plastered with mud, were identified. Three small (diameter: 1.6-1.7m, depth: 0.10m) circular floor surfaces were found at EN **Paliambela**

**Roditi** and were interpreted as ancillary structures. Postholes, in one case clay-lined, were found at their periphery, while structural debris found between and above the surfaces confirms the exploitation of timber and mud. At the site of **Vassilara Rachi** near Velventos a number of postholes, a partially preserved plastered floor and part of an ellipsoid mud wall were dated to the FN period (Hondroyianni-Metoki 2012a; 2012b). Finally, excavations at the MN/EBA site of **Palla Rachi Aianis** have uncovered the remains of dwellings made of timber, mud and, possibly, stones (Karamitrou-Mentessidi 2009, 106).

More substantial information derives from the site of **Varemenoi Gouloi** where part of a wall made of posts and mud was dated to the EN period (**Fig. 4.21**). MN finds include the remains of post-framed, free-standing structures following, at least in two cases, rectangular ground plans and a NE-SW orientation. According to the dimensions of the preserved clay plastered floors (ca. 1.5x3m), their size was often restricted, thus probably weakening their interpretation as dwellings. The width of the walls is estimated at 30–40cm. Foundations include large posts (10–20cm in diameter) sunk into trenches that were later filled with earth and stones. The posts were set at regular intervals of 10–20cm, thus creating a sturdy framework for the superstructure. It is further argued that the more sizeable buildings could have been two-storied on the basis of a large posthole found at a wall corner. Internal features included pits that were occasionally used for storage (Hondroyianni-Metoki 2012a; 2012b).

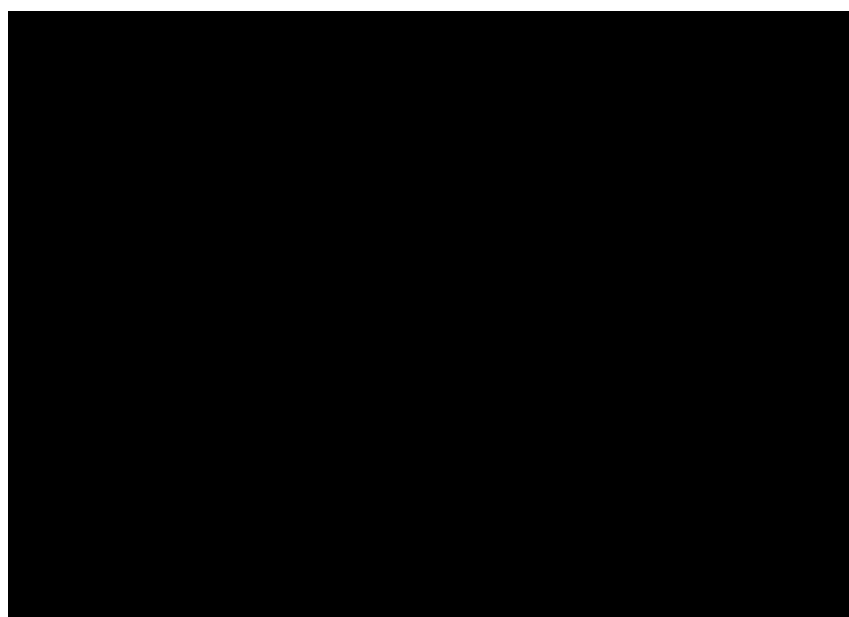


Figure 4.21 Varemenoi Gouloi: MN building floor and MN/LN pits (Hondroyianni-Metoki 2012b, fig. 3).

In the NW part of western Macedonia, architectural remains have been identified at the late EN/early MN site of **Drossia** near Edessa. The preserved part of the site approximates 1.4ha, although only a small sounding (12X4m) was excavated (Kotsos 1995, 195, 197). Research brought to light a burned reddish layer of clay that was initially related to the rubble of walls and other structures. Closer stratigraphic examination led to its interpretation as the “terracotta” floor of a dwelling (Oikia A) covering an area of at least 6x6m (**Fig. 4.22**). The upper surface of the floor was eroded, while the lower surface bore impressions of split timbers. The subsoil was black in colour, probably due to the burning of the timber substructure. A similar floor of a second dwelling (Oikia B) was found 12m to the north, but was heavily destroyed by modern construction works. Postholes representing the timber frame of the building were found in places, while a large rubbish pit to the south should be linked to Oikia B (Kotsos 1995, 197–8).

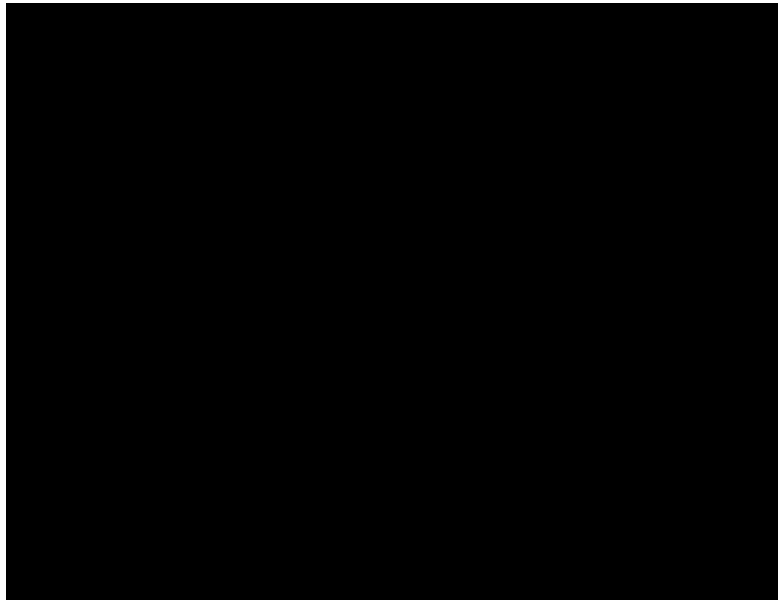


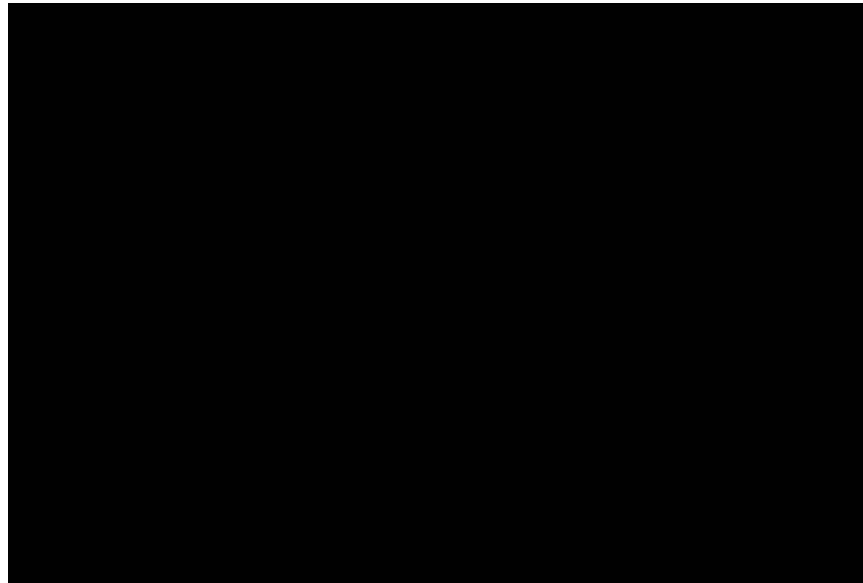
Figure 4.22 Drossia: plan of the ‘Oikia A’ floor (Kotsos 1995, 198, fig. 3).

#### 4.1.2 The central Macedonian plains and the Chalkidiki Peninsula

The central Macedonian record has been significantly enriched during the last decades due to intensive developmental works and rescue excavations. The evidence from a number of sites, including the flat-extended settlements of Makriyalos, Stavroupolis, Thermi B and others, was added to the information obtained by older projects, such as the excavations at Nea Nikomedeia and Olynthos. A better picture of the variability in house construction is now available.

The settlement of **Makriyalos** in Pieria is one of the most prominent sites in the region (Pappa & Besios 1999; Pappa 2008). Although being a rescue excavation, the large-scale

project undertaken not only uncovered a settlement of ca.50ha in size, but also offered insights into the understanding of the so-called flat-extended type of settlements (**Fig. 4.23**). The Neolithic site is located on the gentle slopes of a natural, heavily eroded hill, between two ravines (Pappa & Besios 1999, 179). The two main phases of occupation (MK I and MK II) cover opposite sides of the hill and only partially overlap, while the later phase is further divided into two sub-phases. All habitation episodes are securely dated to the LN period, while a few MN pottery sherds render possible an earlier occupation (Pappa 2008, 107–8; Urem-Kotsou 2006).



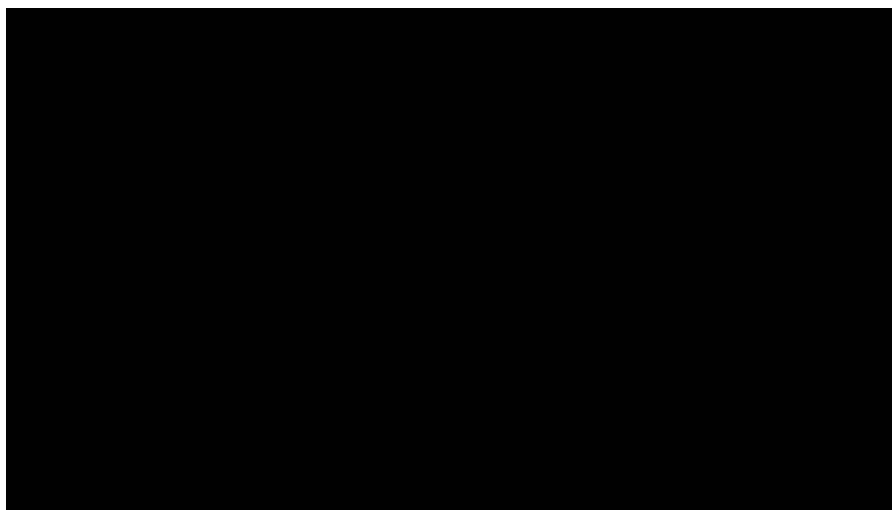
**Figure 4.23 Makriyalos: aerial view of the site (Pappa & Besios 1999, 180, fig.2).**

The architectural remains of Makriyalos I (5500/5400–5000 cal BC) are dominated by a system of earthworks, probably encircling the habitation area. More specifically, two curved and parallel ditches were partially excavated, while a third vertical ditch seems to have served as an internal partition between certain settlement areas. Other earthworks include a number of burrow pits with a diameter measuring up to 30m (Pappa & Besios 1999, 181–2). These are more or less round depressions created, possibly, by intentional earth removal. At a later stage some of them may have served for habitation, as suggested by partly preserved floors and thermal structures (Pappa 2008, 171).

Inside the 28ha area defined by the system of ditches, a considerable number of pits or pit-like features were found. Most of them follow circular, ellipsoid or irregular ground plans of varying dimensions. Small- and mid-sized features with a diameter up to 4m are dominant, while the more sizeable ones (4–8m in diameter) are less frequent (Pappa 2008, 195–6). According to the excavators (Pappa 2008, 173; Pappa *et al.* 2013, 77), eleven loosely

defined groups of pits can be distinguished on the basis of their proximity and arrangement. The empty areas between these groups may suggest the existence of garden plots, special activity areas or unused spaces.

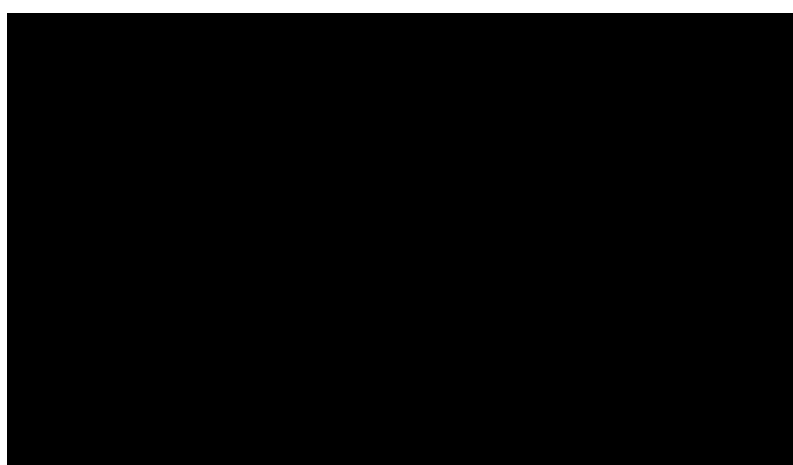
During the subsequent Makriyalos II phase (4900–4600/4500 cal BC) ditches of a less monumental form and burrow pits are still present showing common perceptions in the delimitation of space. Nevertheless, intra-site organisation presents differences (Pappa 2008, 209). It seems that the settlement had covered a smaller area (ca. 11ha) but was more densely occupied as shown by the 401 pits attributed to the earlier stage of the period. The features could be grouped in 19 clusters, although their identification is problematic due to the intensive use of space. The Makriyalos II pits are generally shallow and less sizeable. Examples of a larger depth and diameter (up to 5m) are also present, while smaller features (0.30-1m) could represent post-pits for the foundation of load-bearing posts (Pappa 2008, 229).



**Figure 4.24 Makriyalos: phase IIa pit dwellings and associated features (Pappa & Besios 1999, 187, fig.10).**

In both phases, the lack of other architectural evidence has led the excavators to support the existence of pit-dwellings, probably organised in compounds. The larger features were interpreted as semi-subterranean living spaces, while smaller ones could have served as ancillary structures (**Fig. 4.24**). In attempting a reconstruction of the dwelling form, it seems that the pit represents the lower part of a semi-subterranean structure. Although erosion could have caused the collapse of the sides, it seems that the walls of the larger pits were vertical and their floors were more or less flat. Features belonging to the superstructure are rarely preserved. The occasional identification of post-holes in the perimeter of some pits supports a timber frame of posts sunk directly into the soil. What is

more, a few pieces of daub with impressions of branches attest to the application of a wattle-and-daub technique (Pappa 2008, 295). No evidence for the central support of the roof was found. The presence of post-holes near the sides of pits may represent additional wall support or internal features. In Makriyalos II, a few pits are quite deeper, while some of them present a step-shaped entrance (**Fig. 4.25**). According to the excavators, this suggests the existence of fully subterranean structures or the use of the pit-area as a cellar. The latter reconstruction supports the existence of an above-ground living area with a wooden floor. Another possibility put forth to explain the rarity of post-holes, is the common roofing of nearby structures belonging to the same domestic cluster (Pappa 2008, 295).



**Figure 4.25 Makriyalos: phase IIa basement structure with preserved entrance (Pappa & Besios 1999, 188, fig. 11).**

During the later sub-phase (MK IIb), the building techniques seem to change radically. The construction of above-ground structures is indicated by a number of post-holes and foundation trenches (**Fig. 4.26**). The trenches measure ca. 0.40-0.50m in depth and follow an N/NW-S/SE orientation. They probably belong to the walls of rectilinear, post-framed dwellings, although a few curved ends may support the existence of apsidal forms (Pappa & Besios 1999, 185; Pappa 2008, 288). The exact ground plans are difficult to reconstruct. Buildings belonging to this sub-phase could have measured up to 12m in length and 5.00-5.50m in width. They were built parallel and in close distance to each other (1.00-1.50m), thus suggesting intense habitation pattern and, perhaps, central planning in the layout of the settlement. A number of pits that were associated with the dwellings could have served for refuse, storage or for the procurement of construction earth (Pappa 2008, 289).



Figure 4.26 Makriyalos: plan of sectors Eta and Theta, phase II (Pappa & Besios 1999, 185, fig. 8).

The better preserved structure of this habitation episode is a ‘megaron-type’ dwelling that was found in sector H (Pappa 2008, 289) and was initially thought to have an apsidal end (**Fig. 4.27**). The foundation trenches of the structure, measuring 0.30-0.50m in width and 0.12-0.25 in depth, indicate a total size of approximately 60m<sup>2</sup>. The building consists of a 3x4m porch with an entrance measuring 2m in width, and an 8x4.5m main room. A number of post-holes found inside the trenches or on their outer edge suggest the use of posts for the framing and the support of the superstructure. Internal features include four sizeable postholes that were symmetrically placed in the main room, forming a central square area. Two more were found to the north side, while one pair of postholes was excavated at each end of the long sides of the building.

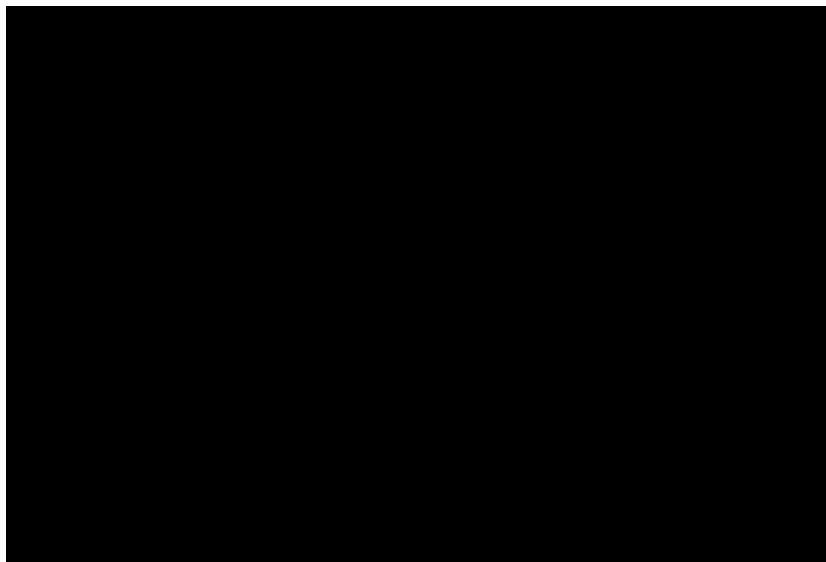


Figure 4.27 Makriyalos: ‘megaron-type’, post-framed building (Pappa & Besios 1999, 189, fig. 12).



The flat-extended (ca. 4ha) site of **Korinos** (locale 'Revenia'), a few km south of Makriyalos, has provided comparable architectural features dated to the EN period. The excavations in an area of 850m<sup>2</sup> have revealed postholes, ditches and 86 pits of varying size and shape. The latter were mainly grouped in two areas and are either circular/ellipsoid with a diameter ranging between 0.70 and 5.20m, or rectangular measuring up to 3.25x2.95m. The more sizeable ones, especially those preserving almost vertical sides and possible stepped entrances (e.g. pit 5 – **Fig. 4.28**), were linked to pit-dwellings. It was further proposed that the subterranean part represented the storage area of the building rather than the living space (Besios *et al.* 2005a, 436; Besios & Adaktylou 2006, 358; Pappa 2008, 31). Evidence for the superstructure derives from the fill deposit of two pits (72, 44) containing burned fragments of 'straw'-tempered earth bearing branch impressions, unbaked and 'fired'<sup>27</sup> mudbricks and unworked stones. Postholes found inside or outside the pits were commonly isolated without providing further clues. In any case, a similar reconstruction is supported for the rectangular pits. Two inhumations found in one of them (pit 11) seem to postdate its domestic use.



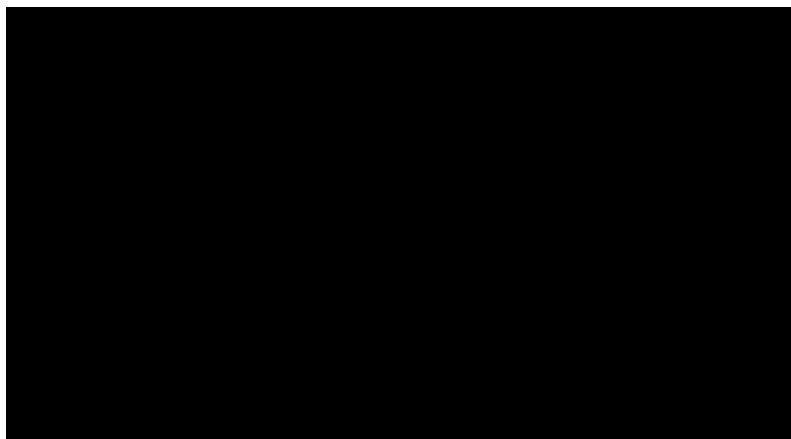
**Figure 4.28 Korinos: plan and view of pit 5 (Besios & Adaktylou 2006, 359, plan 1, 365, fig. 1).**

A group of 28 postholes identified at the north-east part of the excavation seems to define the boundaries of an above-ground, rectangular building with two or more rooms (**Fig. 4.29**). Similar ground plans of post-framed structures may be reflected by a group of 22 postholes found in the 150m<sup>2</sup> area in between the two pit groups. Finally, three ditches

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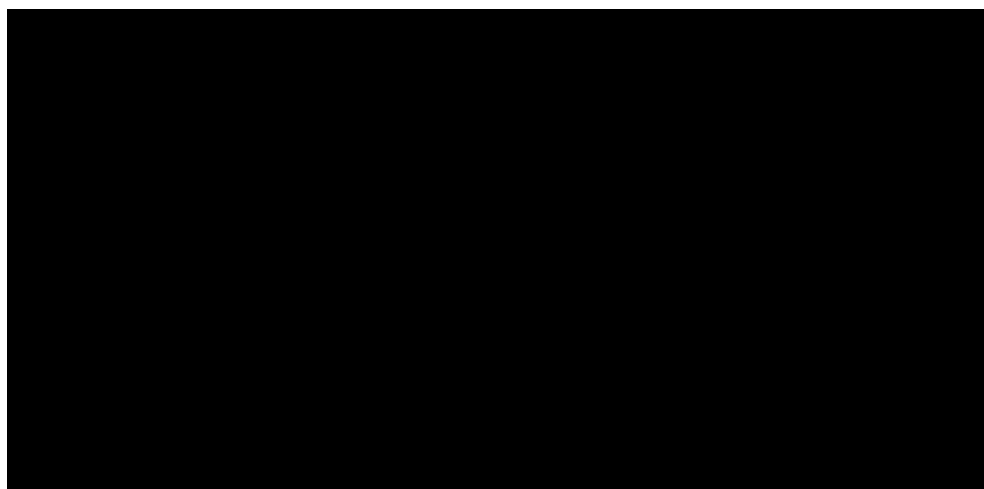
<sup>27</sup> In the excavation report (Besios & Adaktylou 2006, 361) these are described as fired bricks, although no evidence is provided for their firing as a result of their construction process.

were interpreted as possible foundation trenches, even though no postholes were found in their fill (Besios & Adaktylou 2006, 361–2). In sum, the site has provided architectural evidence for a wide range of building forms and techniques. Whether these were contemporaneous cannot be clarified. It is noted, however, that the study of pottery indicates two phases belonging to the EN period.



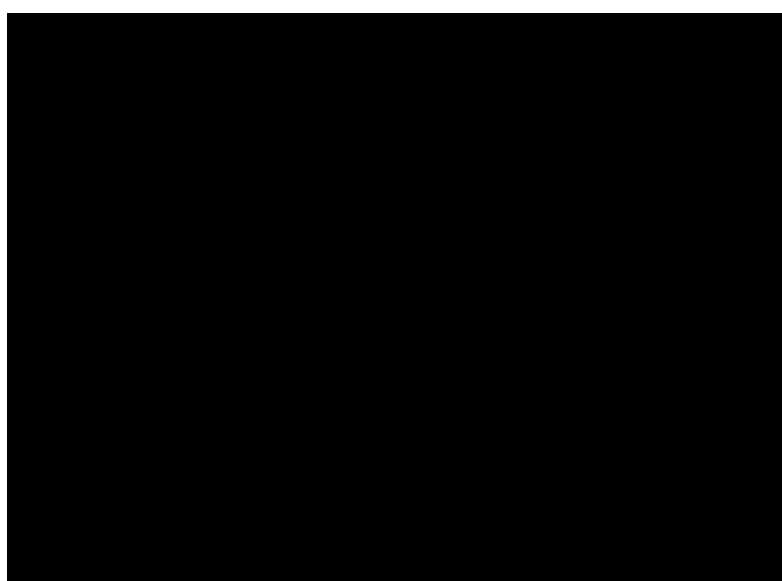
**Figure 4.29 Korinos: postholes of a rectangular building (Besios & Adaktylou 2006, 361, plan 2).**

Further to the north of the Pieria Prefecture, the excavations at **Paliambela Kolindros** (thereafter Paliambela) have offered the opportunity to explore the transformation of an extended settlement into a compact ‘tell’ mound of ca. 2ha (Halstead & Kotsakis 2001, 95; Kotsakis & Halstead 2004; 2007). The site’s deposits have revealed EN, MN and LN occupation. A series of ditches was probably encircling the MN settlement, while a concentrically organised system of stone circuit walls and ditches was built during the subsequent LN period (**Fig. 4.30**). These elements could have served as both retaining and demarcation structures (Halstead & Kotsakis 2002, 80).



**Figure 4.30 Paliambela: remains of stone-circuit walls**  
([http://temper.web.auth.gr/preliminary\\_results\\_en.html](http://temper.web.auth.gr/preliminary_results_en.html)).

The evidence from the EN deposits is limited to a series of possible pit-dwellings indicating a loose habitation pattern. In contrary to that, the MN evidence suggest that the settlement was densely inhabited with closely-set rectangular buildings separated by ‘yard walls’ (**Fig. 4.31**) and cobbled surfaces (Halstead & Kotsakis 2002, 80; Kotsakis & Halstead 2006, 91; 2007, 66). Dwellings were often reconstructed at the same place, although horizontal replacement is also evident. Postholes, burned debris and clay structures were found at the periphery of the site (Kaltsogianni 2008, 27, 88–89), while better preserved remains were uncovered at the top of the mound. These refer to a group of three or four structures that were destroyed by fire and were heavily damaged by modern ploughing (Kotsakis & Halstead 2006, 91).



**Figure 4.31 Paliambela: view of a ‘yard wall’ (Halstead & Kotsakis 2002, 80, fig. 118).**

Two MN buildings seem to follow a common E-W orientation. The first is poorly preserved and seems to overlay a layer of cobbles and burned clay fragments. The second structure presents higher preservation and its minimum dimensions were estimated at ca. 5.2/5.5x3.9/4m. The exterior walls were approximately 0.35-0.50m thick, while internal space was partitioned by a flimsier wall with a N-S direction. The north wall of the building was defined by a row of postholes, while at least one buttress was identified in association with the east wall (Kaltsogianni 2008, 26–27, 29, 101–102). The poor inventory of the house led the excavators to argue for its abandonment before destruction<sup>28</sup>. A small sondage into the house floor suggested that it overlays another burned house floor with

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<sup>28</sup> A similar explanation was proposed for the absence of storage vessels from the excavated MN dwellings (Kotsakis & Halstead 2007, 67).

richer contents. The abandonment of the earlier building could have been more sudden (Kotsakis & Halstead 2007, 66).

The macroscopic study of the rubble material (Kaltsogianni 2008) has yielded valuable information on the wall construction techniques employed. Identifiable impressions on daub indicate that wattles or reeds (diameter: 0.6-3.9 cm), stakes (diameter: <12.9cm) and planks or split timbers (maximum width: 10.3cm) were used for screening the timber frame. The walls were subsequently plastered with straw-tempered earth, while a thin finishing plaster made of finer, calcareous clay was sometimes added (Kaltsogianni 2008, 83)<sup>29</sup>. Even though the percentage of narrow, round impressions is high (46.4%), the weaving between uprights in a typical wattle-and-daub fashion was not confirmed. The common occurrence of stake impressions may imply a framework of closely set stakes sunk into the soil. The later assertion is problematic due to the rarity of postholes near the apparent wall lines (Kaltsogianni 2008, 87). Impressions of stakes may represent the remains of a second storey floor, while planks or round impressions could also be linked to a roof frame covered with mud plastered thatch (Kaltsogianni 2008, 105).

The LN architectural material comprises structural debris, enigmatic walls and cobbled surfaces. Although information is quite compartmentalised, it is suggested that the lower course of house walls consisted of shallow stone foundations. These were made of large stones with a packing of small cobbles originating from nearby streams. In one case, the foundations of a LN house were built on top of MN dwelling remains. The superstructure could have been made of a timber frame packed with clay rather than of mudbricks (Halstead & Kotsakis 2002, 80; Kotsakis & Halstead 2007, 66).

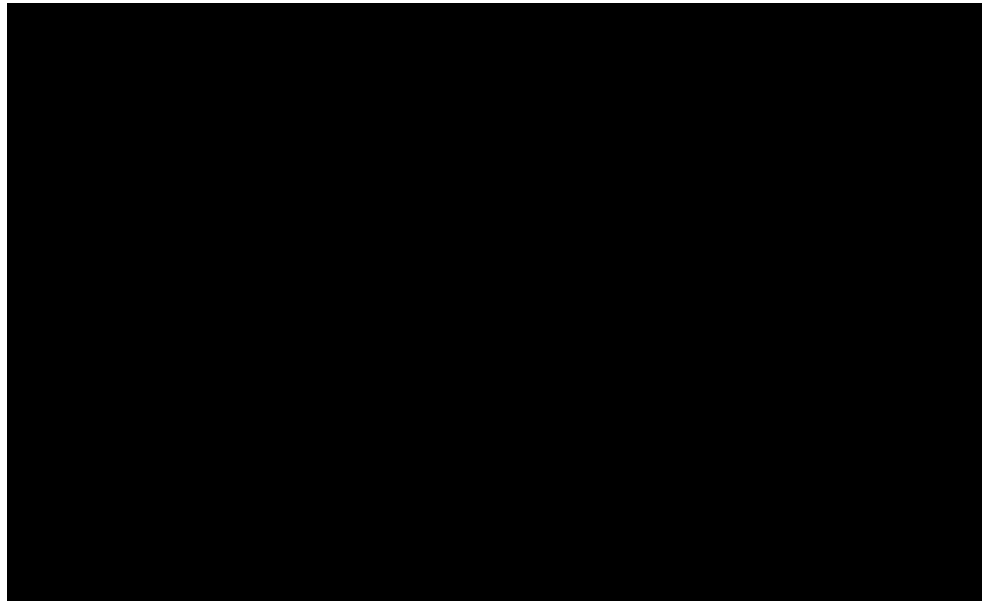
Research at the mountainous area of Pieria (bordering western Macedonia) has provided less substantial architectural evidence. A small sounding at the site of **Sfikia** (locale 'Keramaria'), located at an altitude of 650m, has revealed a possible MN pit-dwelling. This was cut into the natural bedrock and had the form of an elliptical semi-subterranean space (ca. 11m in length) with a pebble-floor at its north part. A roughly circular ancillary structure with two hearths was found adjacent to it, giving a maximum width of 8m (Kottaridi 2002, 531). In addition, excavations at the site of **Ritini** (locale 'Aghios Nikolaos')<sup>30</sup>, situated on the foothills of the Pieria mountains, have uncovered remains of a

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<sup>29</sup> According to Kaltsogianni (2008, 29), the restricted use of unbaked mudbricks is not precluded.

<sup>30</sup> This was probably a dispersed settlement occupied from the EN till the beginnings of the LN I period (Pappa 2008, 33).

rectangular, post-framed building, a deep (ca. 4.50m) pit, presumably used for the extraction of clay, and two later trenches (Besios *et al.* 2005b; Pappa 2008, 33).



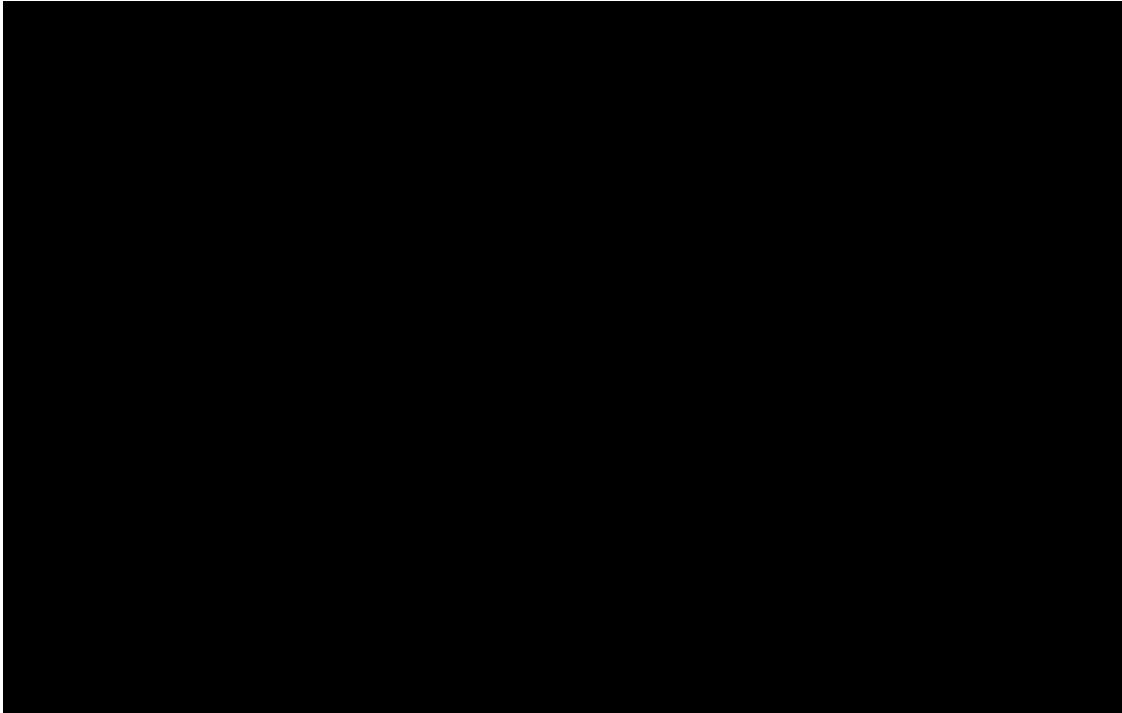
**Figure 4.32** Nea Nikomedeia: aerial view of the mound (Rodden & Wardle 1996, plate 3b).

Moving to the area north of river Aliakmon, the pioneering research at the low mound of Nea Nikomedeia has uncovered the remains of at least 24 roughly square or rectangular post-framed structures (**Fig. 4.32**). Unfortunately, the early date of the research and the fact that the publication of the material (Pyke 1996) was primarily based on the excavation notebooks, do not allow a detailed analysis of the rich architectural record.

According to the excavation plans, there are eight distinguishable groups of successive and partially overlapping structures (**Fig. 4.33**) that seem to belong to three main structural phases dated to the EN period. Another structure (9/3) was found at the easternmost side of the settlement. During the earliest phase, the size of the buildings ranges between 44 and 61m<sup>2</sup>, their average dimensions being 8.37x6.66m (Pyke 1996, 44). These estimations do not include the exceptional 11.78x13.64 structure 4/1 which was interpreted as having a special (communal?) function (**Fig. 4.34**).

Among the rest of the buildings, two were partitioned in two roughly rectangular rooms. In the following phase, there is much more variation in terms of preservation and building sizes. The latter ranges from 18.28m<sup>2</sup> (structure 8/2) and seems to exceed 101.67m<sup>2</sup> (structure 6/2). Several of the structures had partitions that divided the internal space into two equally or non-equally sized rooms. In the case of structure 4/2, the likely presence of two successive structures is noted (Pyke 1996, 45). The buildings belonging to the later EN

phase show similar characteristics. Their size ranges between 19.66m<sup>2</sup> and >80.92m<sup>2</sup>, while some of them were probably partitioned.



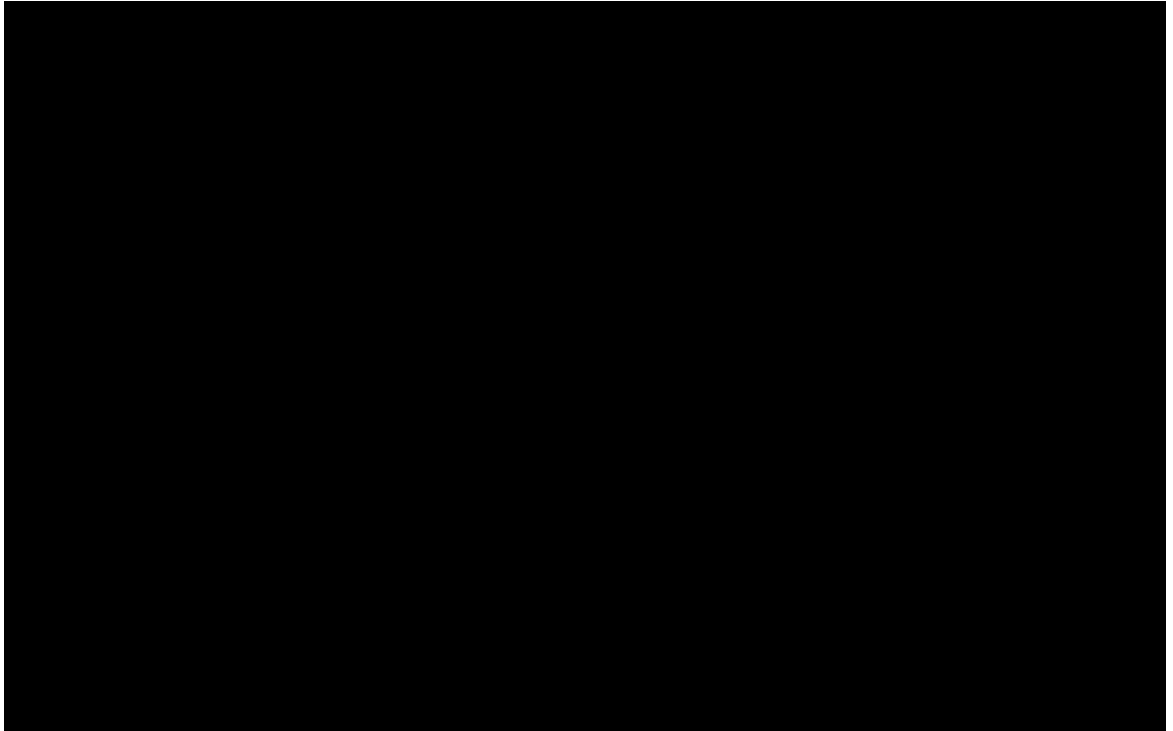
**Figure 4.33 Nea Nikomedeia: plan of the structural groups (Pyke 1996, 11, fig. 2.2).**

In all three phases, buildings were following an approximately E-W orientation. Their walls were mainly identified as foundation trenches, in the form of discoloured areas, and post-holes (Pyke 1996, 39). Moreover, concentrations of building rubble and carbonized timber from the posts themselves were found. The foundation trenches were commonly U-shaped, measuring up to ca. 0.62m in width and ranging between 0.34-0.50m in depth<sup>31</sup> (Rodden 1962, 269). Post-holes, measuring approximately 0.08-0.20m in diameter, were sunk down their centre at regular 1-1.5m intervals. This seems to have been the norm for the earliest structural phases. On the contrary, during phase 3, walls defined by postholes driven directly into the subsoil are not uncommon. Whether this change reflects more radical transformations in building technology cannot be assessed. Whatever the case may be, the use of posts was providing a stable timber framework for the construction of the superstructure. In the case of structure 3/2, the diameter of the post-holes measures ca. 0.20-30m. Moreover, the presence of two posts alongside the long walls could imply the use of buttresses to support cross-beams (Pyke 1996, 40). The post- and stake-holes were occasionally plaster-lined, while carbonised remains indicate that the load-bearing elements

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<sup>31</sup> According to Rodden (1962, 269), the original depth could have exceeded 0.91m.

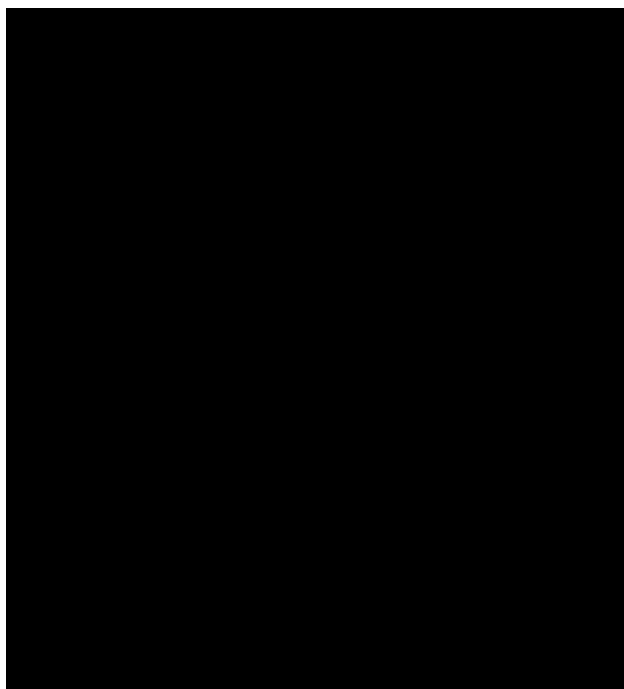
were mainly made of oak (Rodden 1965, 152). In certain instances, their distribution indicates the existence of subsidiary timber structures or enclosures.



**Figure 4.34** Nea Nikomedea: the structures of Group 4 (Pyke 1996, 23, fig. 2.10, plate 6a).

Regarding the collapsed building material, it consists of burned daub fragments and plasters from the superstructure or the roof. Their presence in pits near the foundation trenches reinforces their interpretation as collapsed material or can be ascribed to clearing/levelling episodes preceding the erection of new structures. The burned fragments sometimes bear impressions of reeds or wattles (Rodden 1965). Although these were initially interpreted as reflecting a typical wattle-and-daub technique, it is not confirmed whether they represent the actual weaving of small-diameter elements between uprights (Pyke 1996, 41). In the reconstruction attempted by Rodden, the walls are presented as made of bundles of reeds or branches, about one centimetre in diameter, which are vertically set between sturdy posts and are tied up together by horizontal branches (**Fig. 4.35**). The timber frame was plastered on both sides with chaff-tempered mud, with the probable addition of a 'white clay' (calcareous?) plaster on the outside (Rodden, 1965, 152; Pyke 1996, 42). However, the application of alternative techniques in different structures or different parts of the same structure cannot be precluded. Besides, Rodden refers to the identification of two burned mudbricks that, according to Pyke (1996, 41), should be ascribed to the Late Neolithic occupation of the site.

The preserved floors are usually described as clay plastered or made of ‘compacted clay’. In one case, the plaster was applied upon a pebbled surface, while in another occasion the substructure included a ‘matting’ of “broad-leaved marsh grasses or reeds laid on the clay subsoil” (Rodden 1964, 564; Pyke 1996, 43–44). Roofs are described as peaked pole-and-thatch ones supported by crotched uprights (Rodden 1965, 155). Although certain fragments bearing impressions of reeds or branches could be ascribed to roof construction, no definite evidence exists for their plastering.



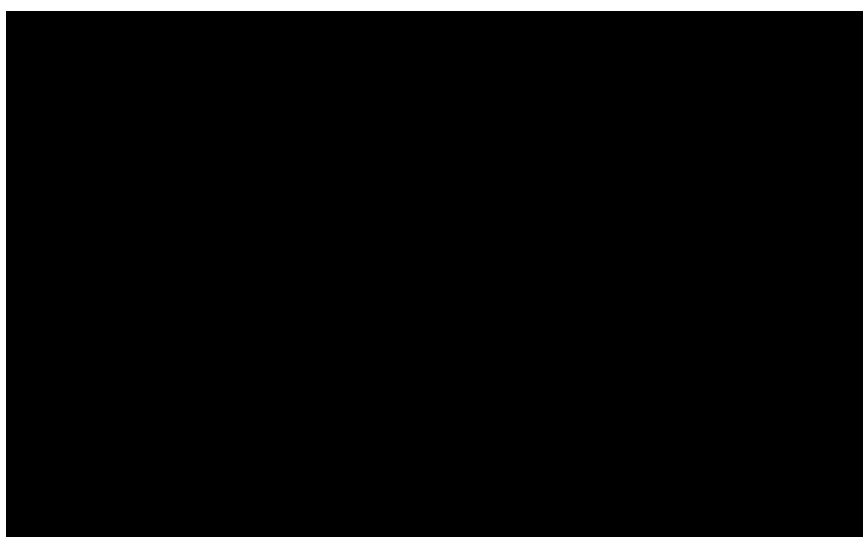
**Figure 4.35** Nea Nikomedeia: tentative reconstruction of a post-framed house (Pyke 1996, fig. 3.1 after Rodden 1965, 87).

Among other architectural features, thermal structures, pits and ditches were uncovered at the site. Hearths and ovens were identified both indoors and outdoors, although their exact location is not always clarified in the excavation notebooks (Pyke 1996, 51). The pits and pit-like cavities are, more or less, randomly scattered across the site. Some of them were clay-lined and could be associated with storage or other facilities, while a lot of deep, irregular ones were characterised as rubbish pits. According to Rodden (1962; Pyke 1996, 49), three large and shallow pits could have been originally cut to obtain construction earth. Finally, a number of partially excavated ditches could represent the settlement’s enclosure. Most of them are dated to the LN period, although two parallel narrow ditches at the east side of the site could be ascribed to the EN period (Pyke 1996, 52).

At a relatively close distance, the rescue excavations at **Trilofos Kolibakos** (thereafter Trilofos) have uncovered successive habitation phases dated to the LN period (Graikos



2008 – **Fig. 4.36**). Throughout the site, concentrations of burned structural debris, either in the form of shapeless lumps or bearing impressions of reeds, were found. At the south sector of the site, a wall section of compacted earth (2.80x0.30m) is associated with a vertical wall preserved in the form of a foundation trench, thus implying a rectilinear ground plan. At the eastern sector, concentrations of large stones and remains of circular or ellipsoid (post-framed?) structures are reported. Moreover, an ellipsoid (foundation?) trench found at the central sector measures 0.30m in width and ca.18m in length and defines an apsidal space with a W/SW-E/NE orientation. Similar trenches were identified further to the west/southwest, while a system of pits, occasionally with narrow plastered bottoms, seems to follow a rectangular arrangement.



**Figure 4.36 Trilofos: plan of the excavation (Graikos 2008, 801, plan 3).**

The excavations at the low, extensive (ca. 8ha) mound of **Polyplatanos** have revealed two habitation phases (Polyplatanos I and II) both dated to the mid-5<sup>th</sup> millennium BC (late LNII/ FNI). An earlier phase may also have been uncovered but was not further investigated<sup>32</sup>. The architectural remains indicate that the top of the mound and part of its southern side were densely occupied. They include debris from mudbrick walls, daub fragments, mid- or small-sized stones and successive buff-coloured floors. However, the picture is quite compartmentalised and no definite ground plans were possible to identify. At the top of the mound, a mud wall was preserved to a length of approximately 15m, while segments of a second wall were also found (Merousis & Stefani 2002, 558–9). More informative was the evidence from the south side of the mound. The 1997 excavations

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<sup>32</sup> A group of postholes found in 1998 probably belongs to this earlier horizon (Merousis & Stefani 2006, 459).

have uncovered the rubble of a building that could have measured 112m<sup>2</sup> in size and was dated to the Polyplatanos I phase. Daub fragments with impressions of the timber frame were linked to the existence of an interior wattle-and-daub wall, while an ellipsoid thermal structure with a mudbrick floor was also identified (Stefani & Merousis 1999, 95). Moreover, the identification of three successive house floors indicates renovation and repairing (Stefani & Merousis 1999, 98; Merousis & Stefani 2000, 387).

According to the available evidence, the use of foundation trenches or proper stone socles can be excluded. On the contrary, the widespread presence of small-sized stones and gravel in most trenches could be attributed to a substructure on which both the walls and the floors were laid (Merousis & Stefani 2006, 462). In the case of the building uncovered at the side of the mound, the substructure is described as a thick layer of clayey earth containing stones and sherds (Stefani & Merousis 1999, 96; Merousis & Stefani 2000, 386). The superstructure of dwellings was probably made of mudbricks as this would explain the extreme rarity of postholes (Merousis & Stefani 2002, 558). Daub fragments with impressions of reeds and round timbers (branches or thin trunks of young trees) reflecting a wattle-and-daub technique have been associated with the construction of interior walls/partitions or roofs (Merousis & Stefani 2006, 457–8). Finally, the floors are described as made of a buff-coloured mixture of clayey earth and limestone gravel (Merousis & Stefani 2006, 462).

Further information on house construction derives from the wider area of Giannitsa. The site of **Axos A** (**Fig. 4.37**) was first discovered in 1991 during surface surveys. Although its total size was estimated at 3ha, only a 10X10 trench was systematically excavated in 1996. Research revealed the existence of three occupation layers belonging to the EN period, thus providing important information on the earliest habitation of the Thermaic Gulf (Chrysostomou 1997a, 159). The architectural record comprises the remains of four post-framed buildings. According to the excavator, the earlier structure has a square ground plan and a pitched roof, as indicated by the distribution of post-holes. The identification of ceramified daub fragments indicates that it was destroyed by fire. The impressions of cereals and other plant additives suggest the plastering of the timber frame with strawed clay, although no detailed information on the superstructure is provided. In the following phase, the remains of two post-framed structures were found. These also follow a square ground plan and their floors are carefully constructed by trampled whitish clay over a layer of small limestones. Certain architectural developments can be traced in the later building belonging to phase 3. These refer to the use of foundation trenches for the erection of the

load-bearing posts and the identification of inner partitions. The ground plan of the building was almost square and a pot burial was found under the floor. The remaining features of the site include a large and deep circular pit that could have been initially used for the procurement of clay. The pit was later filled with burned rubble, probably rejected after a second conflagration episode (Chrysostomou 1997a, 162).

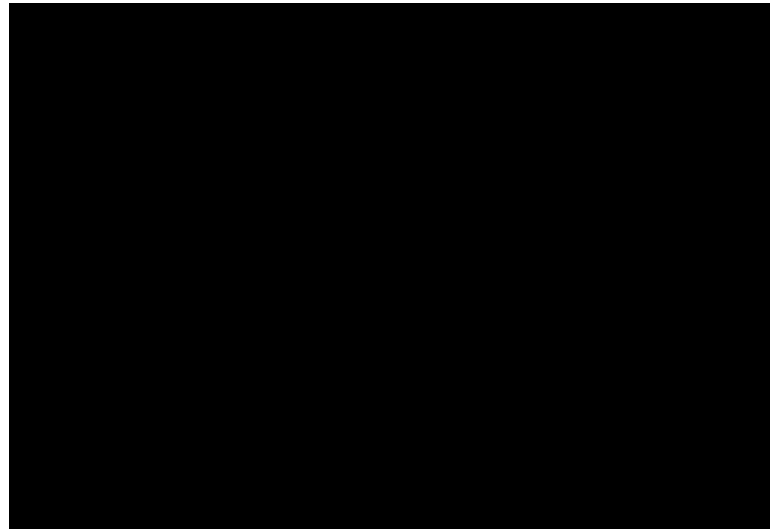


Figure 4.37 Axos A: view of architectural remains belonging to the earlier habitation phase (Chrysostomou 1997a, 171, fig. 5).

The Neolithic settlement of **Giannitsa B** is located at the south part of the city of Giannitsa. The pottery assemblage indicates that the settlement was inhabited during the EN and LN periods, while FN pottery was also found. Due to modern habitation the exact size of the site is difficult to estimate. It is suggested, however, that the EN I settlement did not exceed 3ha in size, while the LN one could have covered an area of 6-8ha (Chrysostomou 1992, 123; Chrysostomou & Chrysostomou 1993, 173; Chrysostomou 1994, 118; Chrysostomou 1997b).

Three EN habitation phases were identified in different blocks of the site. The remains of the earliest phase I (EN I) include part of an elliptical post-framed, (semi-)subterranean structure defined by a number of post-holes cut directly into the soil (**Fig. 4.38**). The post-holes are of varying diameter and depth, they have conical bottoms and they are commonly arranged in pairs. It seems that the erection of the structure was preceded by the levelling of the site with clayey earth. The walls were probably 0.8-1m wide and were preserved to 0.50m high. The entrance was quite narrow (0.50m) and was located to the west side of the building (Chrysostomou 1994, 111–12). According to the excavator, the walls were slightly curved, with bundles of reeds or branches either set horizontally or weaved between

uprights, while both sides of the timber frame were plastered. The roof was probably conical and made of rafters and parallel reeds or branches.



Figure 4.38 Giannitsa B: plan and view of the elliptical hut (Chrysostomou 1994, 112, plan 1 & 121, fig. 2)

During the following phase II (EN I) an architectural change is marked. This is supported by the remains of a post-framed structure following a square ground plan. The foundation techniques include the cutting of V-shaped trenches with a maximum width of 0.50m and a depth of ca.0.40m. The floor was plastered with a hard calcareous mixture and the roof was probably pitched as shown by the arrangement of postholes. A similar square, post-framed building with a 0.40-0.50m wide foundation trench was dated to phase III (EN II), while three postholes and a foundation trench of an E-W orientation may be attributed to another contemporaneous structure (Chrysostomou 1994, 113).

Among other architectural features of uncertain date, one may note a foundation of small or larger unworked stones with clay mortar that was preserved to a height of 0.50m and a width of over 3m. Whether this represented an enclosure is not clarified. Whatever the case may be, the excavation of two V-shaped cuttings indicates the existence of a system of double ditches at the south-east periphery of the settlement, probably belonging to the LN period. Other partly preserved walls of stone and mud, as well as thermal structures are also reported (Chrysostomou & Chrysostomou 1993, 176; Chrysostomou 1997, 165).

At the north-west of the Giannitsa plain, the Neolithic settlement of **Mandalo** was excavated from 1981 to 1988 in a total area of 170m<sup>2</sup>. It is a small mound measuring 7-8m in height and covering an area of 0.5ha. A number of radiocarbon dates indicate two major periods of habitation belonging respectively to the Final Neolithic (4600–4000 cal BC) and the Bronze Age (2900–2200 cal BC) periods (Papaefthimiou-Papanthimou & Pilali-

Papasteriou 1990; 1997, 143). The settlement, although restricted in size, has provided outstanding finds in terms of our understanding of Neolithic trade networks, metallurgy and material culture in general. These include the Carpathian obsidian blades, a number of metal artefacts and a clay crucible, as well as pottery, clay figurines and clay seals that present affinities with the Neolithic of Pelagonia (Kilikoglou *et al.* 1996; Papaefthimiou-Papanthimou & Pilali-Papasteriou 1993, 1209; Pilali-Papasteriou & Papaefthimiou-Papanthimou 1989, 25).

In terms of spatial organisation, the most prominent feature is the massive perimeter wall uncovered on the top of the mound (**Fig. 4.39**). This probably belonged to the latest Neolithic phase of the settlement as it was founded in FN deposits. The preserved height of the wall is 1.40m while its width ranges between 2.00m and 2.40m (Papaefthimiou-Papanthimou & Pilali-Papasteriou 1988, 174; 1991, 127; Pilali-Papasteriou & Papaefthimiou-Papanthimou 1989, 21). A parallel structure of irregular stones was partly uncovered at a distance of 3m to the north (Papaefthimiou-Papanthimou & Pilali-Papasteriou 1991, 131; 1997, 144). The whole arrangement recalls the stone enclosures found in several Thessalian sites, including Dimini, Sesklo, Magoula Chatzimisiotiki and Galini (Papaefthimiou-Papanthimou & Pilali-Papasteriou 1993, 1208).



**Figure 4.39 Mandalo: part of the stone perimeter wall (Papaefthimiou-Papanthimou & Pilali-Papasteriou 1997, 157, fig. 2).**

**Figure 4.40 Mandalo: postholes belonging to a post-framed building (Papaefthimiou-Papanthimou & Pilali-Papasteriou 1997, 157, fig. 1).**

Evidence on domestic architecture derives from building remains uncovered throughout the site. Unfortunately it was not possible to reconstruct complete ground plans. This was mainly due to the nature of the building materials and the density of the postholes. The irregularity in their distribution indicates that they belong to several building phases, as well

as to multiple reconstruction and repair episodes. The reconstruction attempted by Kotsakis (1987) indicated that two of the buildings had a similar N-S orientation, while one of them was probably rectangular (4x6m in size) with a central row of posts.

In both periods of the site the superstructure of the dwellings was probably made of rammed earth (*pisé*) reinforced by sizeable posts (Papaefthimiou-Papanthimou & Pilali-Papasteriou 1997, 144). The latter ones are preserved in the form of postholes (occasionally with carbonised timbers in their fill) that were located both inside and outside the rubble areas (**Fig. 4.40**). The use of mudbricks for the construction of walls and thermal structures is reported (Pilali-Papasteriou & Papaefthimiou-Papanthimou 1989, 452), although no further details on their morphology have been provided. On the contrary, it is reported that several burned fragments with impressions of stakes and reeds were found. These were mainly linked to the frame of mud-plastered roofs (Papaefthimiou-Papanthimou & Pilali-Papasteriou 1989, 20). The floors were lined with clay or whitish lime plaster. Nevertheless, the identification of a timber floor made of thin branches (1.5-2cm) is also reported (Pilali-Papasteriou *et al.* 1986, 454).

Rescue excavations at the MN<sup>33</sup> site of **Apsalos** (locale ‘Grammi’) have uncovered two ditches in a distance of 70m to each other that seem to constitute parts of an enclosure. A considerable number of pits were excavated in between. Daub fragments with timber impressions and carbonised remains were found both inside the ditches and the pits and they can be attributed to the refuse of building materials (Chrysostomou *et al.* 2002, 494, 496; 2003, 513–4). At least two sizeable pits were interpreted as (semi-)subterranean dwellings. One of them measures ca. 5x4.20m in size and is connected to a smaller pit probably serving as an ancillary structure. The walls and floor were clay-lined, while the superstructure and the roof were probably made of posts and branches. Moreover, a layer of burned rubble (2x2.5m) and a grid of postholes (**Fig. 4.41**) were attributed to a post-framed, above-ground structure. The postholes were occasionally quite deep (up to 80cm) and clay-lined, while their distribution indicates episodes of repair. Whether this structure was stratigraphically associated with the pits remains problematic (Chrysostomou *et al.* 2002, 497; 2003, 519). In any case, research at a nearby locale (‘Apsalos road junction’) has brought to light another possible pit-dwelling (ca. 3.70x3.30m in size) with an adjacent storage pit. A sizeable (ca. 60cm in diameter and 53cm in depth) posthole, supported by a

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<sup>33</sup> A single radiocarbon sample was dated to 5701-5622 cal BC (Chrysostomou *et al.* 2003, 514).

row of stones, was identified inside the latter pit. The pottery found in the structure's deposit suggests an EN chronology (Chrysostomou & Georgiadou 2003, 530–1).

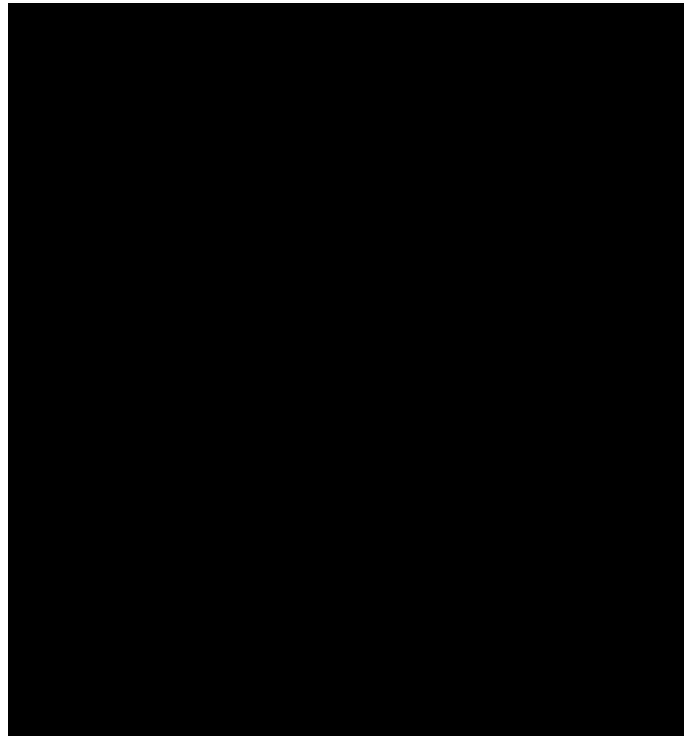


Figure 4.41 Apsalos: plan of postholes and pits (after Chrysostomou *et al.* 2003, 519, plan 6).

Recent rescue excavations at the site of **Sossandra** (Almopia basin) have brought to light the well preserved remains of a Neolithic house dated to the EN period (6066–5840 cal BC – Georgiadou 2013a, 81). This is a rectangular, post-framed building measuring ca. 9.20x6.30m in size and exhibiting a tripartite ground plan with a possible entrance at its large south side (**fig. 4.42-4.43**). The foundations included posts, occasionally clay-lined, sunk ca. 15-20cm into the soil. They measured 10-12cm in diameter and were set 1-1.5m apart. Extra support for the roof was provided by interior posts either isolated or identified inside sizeable (0.65-1.15m in diameter) post-pits as groups of two or three postholes. The walls were approximately 30-33cm thick and were made of mud-plastered, closely set stakes measuring ca. 7-9cm in diameter and preserved up to 40cm in length. Impressions on fire-hardened daub also indicated the use of split timbers in place of the round ones. The floor was probably covered with organic matting, while interior features included two thermal structures, a storage pit and a large number of *in situ* pots and grinding stone implements belonging to the household inventory (Georgiadou 2013a; 2013b).

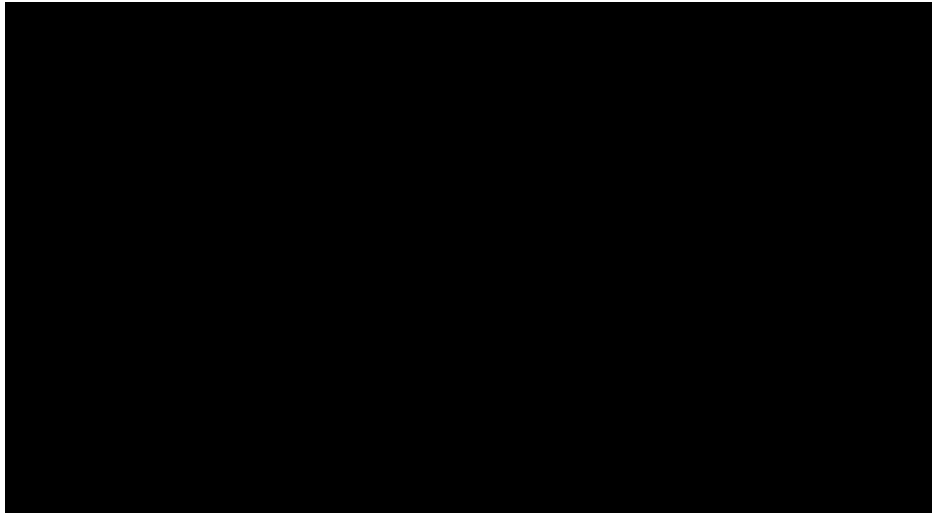


Figure 4.42 Sossandra: remains of the Neolithic dwelling (Georgiadou 2013a, fig. 3).

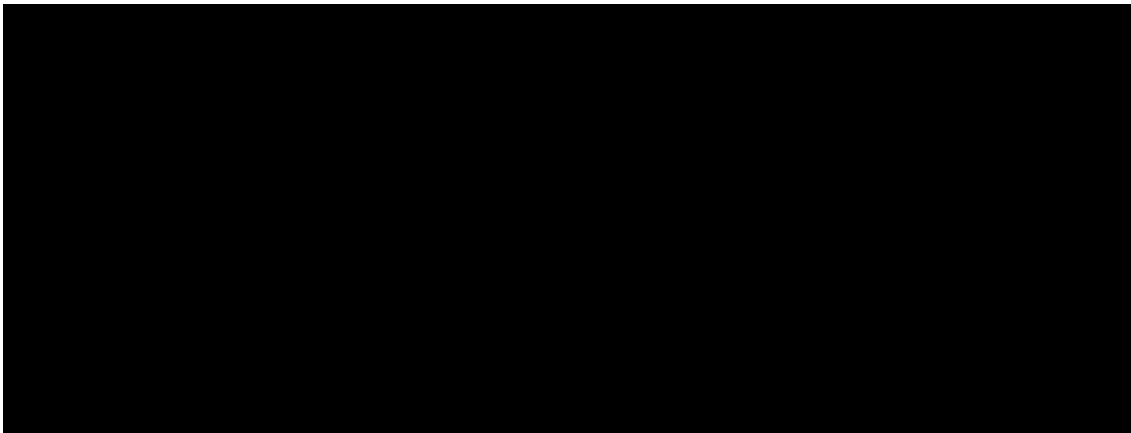


Figure 4.43 Sossandra: plan and tentative reconstruction of the Neolithic dwelling (Georgiadou 2013a, fig. 2a, b).

Moving to the wider area of Thessaloniki, the site of **Liti I** has yielded additional information for house construction practices during the late EN/early MN period (Tzanavari & Filis 2004; 2009). According to the excavations conducted, the settlement was extended in two areas and sparsely inhabited. Its boundaries were probably marked by V-shaped ditches that were partially uncovered at the NW part of the site. Within the enclosed area a number of pits were excavated. Among these, a sizeable pit with a maximum length of 5.50m and inclined walls could represent the subterranean part of a dwelling. The floor, which was found near the bottom, follows the ‘beaten earth’ technique and lies over a layer of ashes. Two smaller circular pits were found in close proximity and were probably organically associated with it (Tzanavari & Filis 2009, 269).

A second sizeable pit with a ca 6m diameter could also be interpreted as a domestic unit. Three pits or cavities and remains of a thermal structure were found in its fill, although they could belong to a later episode. No postholes were identified. However, the daub



fragments with impressions of branches that were discovered in the fill deposits could be linked to a wattle-and-daub superstructure (Tzanavari & Filis 2009, 370, 373). Another cluster of pits measuring over 3m in diameter was excavated in a distance of 800-900m. One of them with vertical walls reaches 1.70m in depth and was interpreted as a water reservoir. Nevertheless, the examples from Makriyalos show that its use as a dwelling cannot be precluded (Pappa 2008, 38).

Similar interpretations were ascribed to a cluster of three pits found at the nearby late EN/early MN site of **Liti III** (Tzanavari *et al.* 2004; Tzanavari & Filis 2009). Two of the pits are measuring ca. 2-2.5m in size and 1-1.57m in depth and were also associated with the collection of water. The third feature, measuring ca. 8x3m in size and 1m in depth, was more conveniently interpreted as the lower part of a semi-subterranean dwelling. The pit follows an irregular longitudinal ground plan and its walls are inclined due to erosion. Inside the pit three irregular cavities were found. The remains of a possible thermal structure in one of these cavities further support the domestic use of space (Pappa 2008, 39; Tzanavari & Filis 2009, 373).

More significant were the finds from the Neolithic settlement of **Stavroupolis** that constitutes a characteristic example of a multi-phase, flat-extended site, probably exceeding 10ha in size (Grammenos & Kotsos 2002; 2004; Kotsos 2013). Two main episodes of habitation were distinguished in a total excavated area of 0.4ha. The earlier phase (Stavroupolis I)<sup>34</sup>, belonging to the MN and the early LN period, is further divided into two sub-phases (Ia and Ib). Their deposits cover two main areas of occupation separated by an empty area that remained uninhabited till the following LN Stavroupolis II phase. In both periods the site was enclosed by ditches that were partially uncovered in different plots of the excavation (Grammenos & Kotsos 2004, 16–17, 20–21).

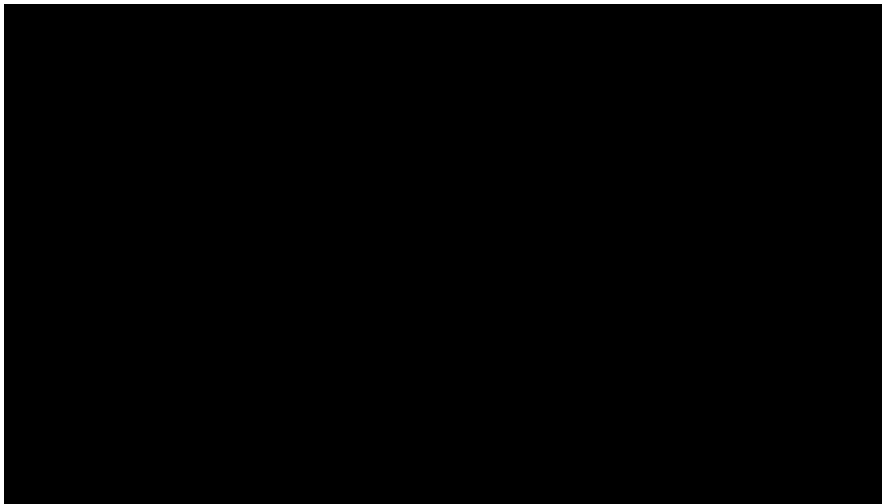
The architectural record of Stavroupolis Ia is dominated by a considerable number of pits and pit-like features. These commonly follow ellipsoid or irregular ground plans of varying dimensions, while their depth ranges between 0.50m and 0.80m (Kotsos 2013). The larger pits, measuring up to 4x6m, are commonly interpreted as semi-subterranean pit-dwellings. There are a few cases where post-holes have been traced either inside the pits or in their periphery (Grammenos & Kotsos 2004, 17). It should be noted, however, that the extreme rarity of post-holes, as well as the commonly inclined walls, is problematic for their

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<sup>34</sup> A number of radiocarbon samples dates the initial occupation and the earliest phases of the site to the first half of the 6<sup>th</sup> millennium (5890–5640 cal BC and 5697–5531 cal BC) (Kotsos 2013; Maniatis 2002).

characterisation as dwellings. Both features were attributed to soil pressures and erosion, while another unconfirmed hypothesis is that certain groups of pits could have been roofed together (Grammenos & Kotsos 2004, 18).

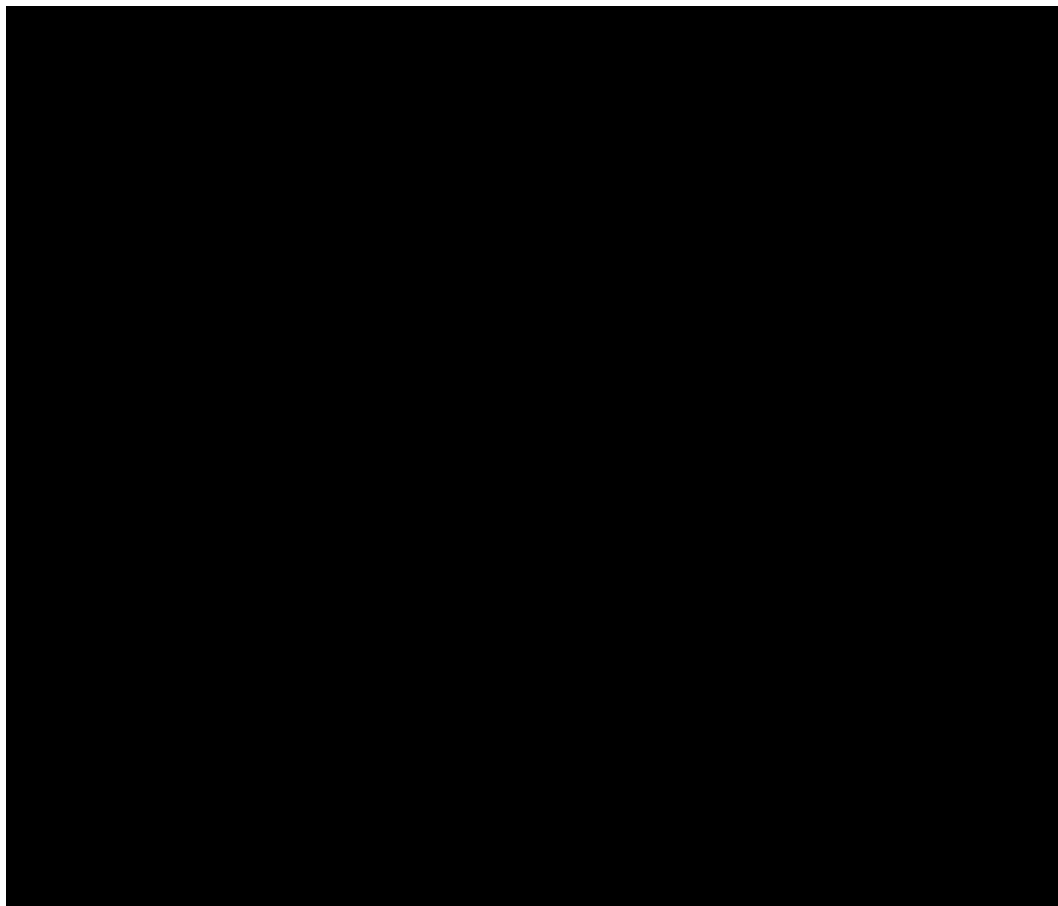
The reconstruction attempted by the excavators suggests that the pit constitutes the lower part of the structure, roughly representing 1/3 of its total height. It is argued that the post-framed walls of the superstructure were covered with unplastered plant materials, such as branches and reeds. Nevertheless, the general absence of wall fragments could be explained by the fact that the dwellings were not destroyed by fire. Concerning intra-site organisation, it is not uncommon for larger pits to be found in association with smaller and shallower ones (**Fig. 4.44**), probably serving ancillary purposes (storage, refuse, working areas etc.). In addition, thermal structures are found inside the pits or in a short distance (Grammenos & Kotsos 2004, 17–18).



**Figure 4.44 Stavroupolis: phase Ia semi-subterranean pit-dwelling and ancillary structures (Kotsos 2013, fig. 2).**

During the later stage of Stavroupolis I the tradition of pit-dwellings was abandoned and new building techniques have emerged. The house forms of phase Ib include above-ground structures made of timber and mud. Although no complete ground plans were revealed it was possible to reconstruct the basic building techniques. A considerable number of postholes surrounding areas of plastered or ‘beaten earth’ floors suggest that the dwellings were post-framed. Their ground plans were probably rectilinear as suggested by the right angle arrangement of certain rows of postholes (Grammenos & Kotsos 2002, 324). A few pieces of burned rubble point to the weaving of branches for the construction of mud-plastered walls (wattle-and-daub).

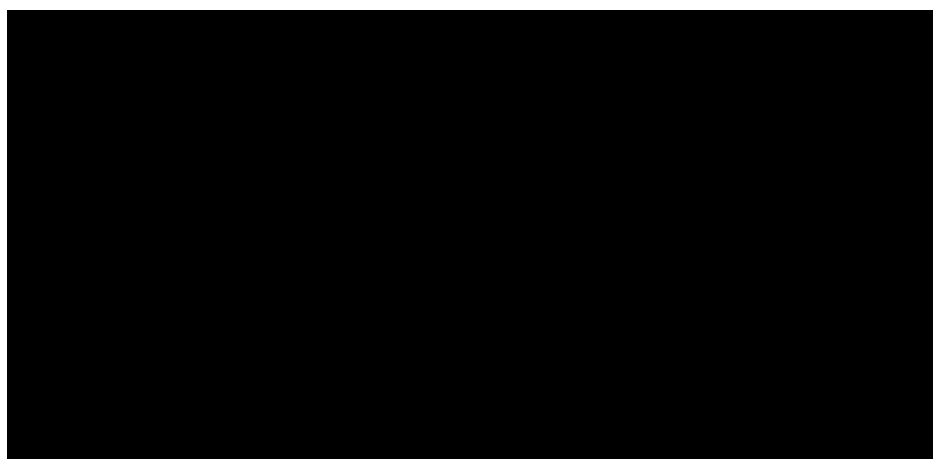
However, a different technique was also applied during this phase (Grammenos & Kotsos 2004, 19, 57–58). The walls of a dwelling found at the building plot of 14 Dagli Street (**Fig. 4.45**) were partly preserved up to 40cm in height and were made of rows of unbaked mudbricks set in a mud mortar. The mudbricks are described as ‘loaf-shaped’ and show varying dimensions ranging between 20x25cm and 25x30cm (**Fig. 4.46**). Rows of stones found in places seem to have served as footings. The total size of the house may have exceeded 7x7m, while the absence of internal partitions indicates that it was single-spaced. The remains of an oven floor were found near the centre of the building. The wall of another mudbrick structure was found further to the south, while elsewhere poorly preserved fragments of unbaked mudbricks, floors and thermal structures confirm the widespread application of the technique. During the same period, internal thermal structures and open working areas, partly paved with river pebbles, are not uncommon (Grammenos & Kotsos 2002, 324; 2004, 19).



**Figure 4.45** Stavroupolis: plan of the excavation at 14 Dagli Street (after Grammenos & Kotsos 2004, 204, plan 5).

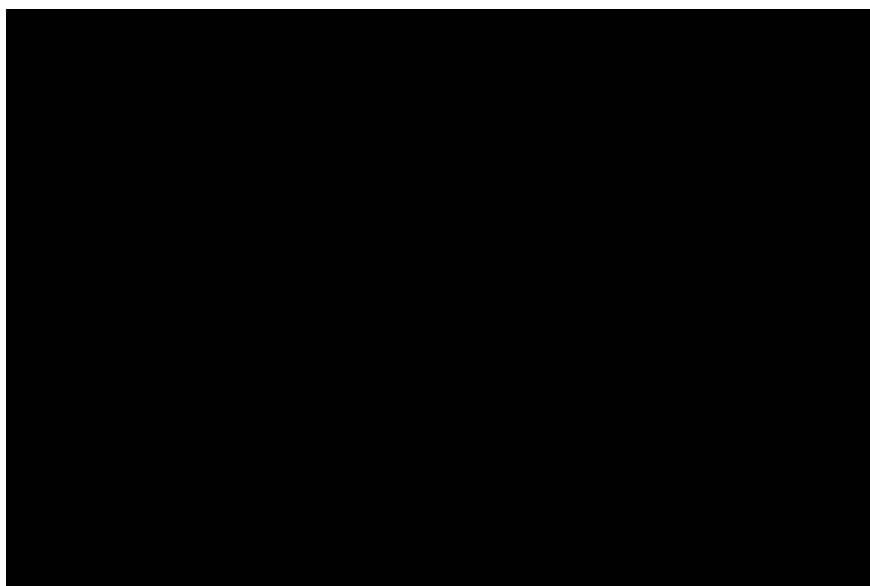
The architectural remains of the later phase of occupation (Stavroupolis II) are in many ways comparable to the preceding one. It seems that rectilinear buildings with plastered or

'beaten earth' floors still constitute the norm. Working areas are occasionally paved with river pebbles and thermal structures are found both inside and outside the dwellings. The main innovation of the period is the widespread use of stone for the foundation of walls or even enclosures. Rows of unworked stones measuring up to 30-40cm in size have been found in various building plots and have been interpreted as foundations for mudbrick walls (Grammenos & Kotsos 2002, 324–5; 2004, 19).



**Figure 4.46 Stavroupolis: part of a phase Ib mudbrick wall (Kotsos 2013, fig. 3).**

**Thermi B** is a MN/LN settlement belonging to the flat-extended type of sites, situated a few kms from Thessaloniki (Grammenos 1990; 1991; Pappa 2013). Contrary to the initial estimates, recent research indicates that the settlement's size was approximately 6ha and that only parts of the site were inhabited at each phase, leaving empty areas in between. The habitation does not seem to have been dense, thus strongly reminding other extended sites in the region (Pappa 2008, 70; 2013). The rescue excavations conducted revealed a number of features belonging to the MN and LN I periods (second half of the 6th millennium cal BC). Three main phases were distinguished. The remains of the earlier phase (Thermi 1), dated to the late MN period, are restricted to the NW part of field 469 and comprise a group of pits or pit-like features. Although their fill deposits occasionally include stones and daub fragments, these cannot be related to their use as living spaces due to their restricted size and the lack of other architectural features (Pappa 2008, 73).



**Figure 4.47 Thermi B: pit-dwelling and associated thermal structure (Pappa 2013, fig. 3).**

The remains of Thermi 2 (LN I) are mainly located in the eastern part of the site, in close proximity to the Bronze Age tomb (Thermi A) that was known since the expeditions of L. Rey (1921, 154–61) in the area. Architectural evidence include pit-like features, thermal structures and surrounding stone-paved areas. The exact nature of the pits is once again problematic. They commonly have vertical or slightly inclined sides, their mean size ranges between 2m and 4m, and their depth ranges between 0.40m and 0.90m (Pappa 2008, 94 – **Fig. 4.47**). The smaller cavities could be described as rubbish pits. It is argued that the diversity of the deposits indicates some sort of structured deposition or, more probably, certain strategies against wastage (Pappa 2008, 97). In any case, a restricted number of sizeable pits could be interpreted as living spaces. Although the finds are not conclusive there are certain characteristics that could support such an assertion. These include the presence of stones or rows of stones and burned rubble in the pits' deposits, the occasional identification of stone-paved floors (**Fig. 4.48**) and possible entrances, as well as the presence of stone-paved surfaces in relation to the pits that may have served as open yards or working areas (**Fig. 4.49**). Post-holes have only been discovered inside pit 34 as well as at the inner periphery of pit xxx (Pappa 2008, 94–95).

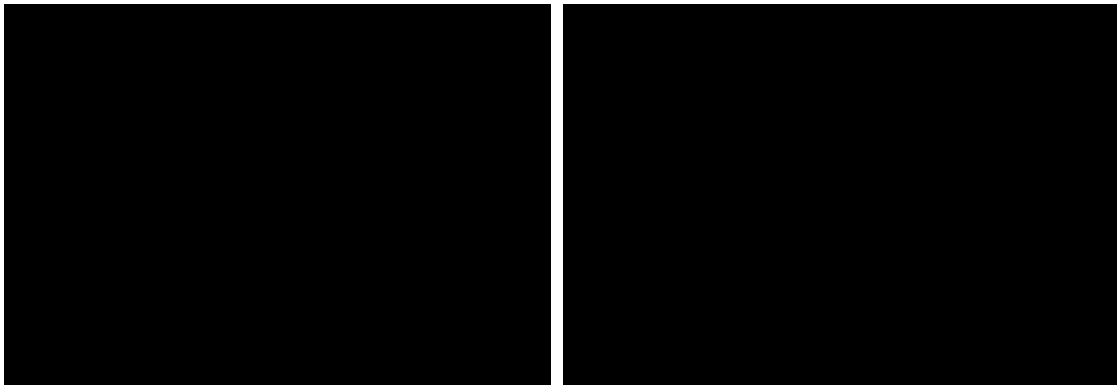
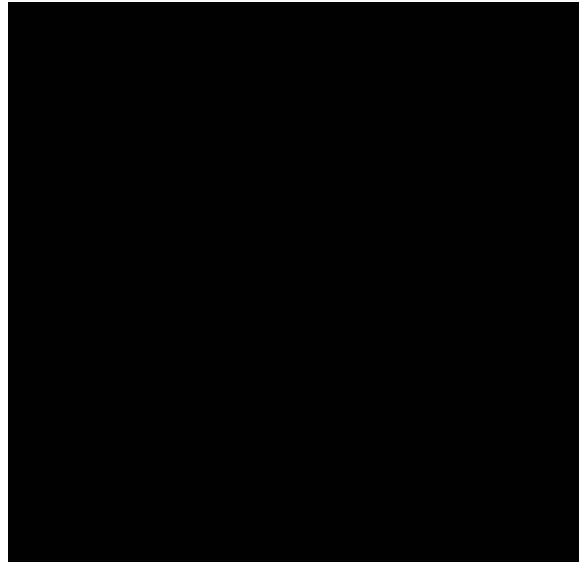


Figure 4.48 Thermi B: pit with stone-paved floor (Pappa 2013, fig. 4).

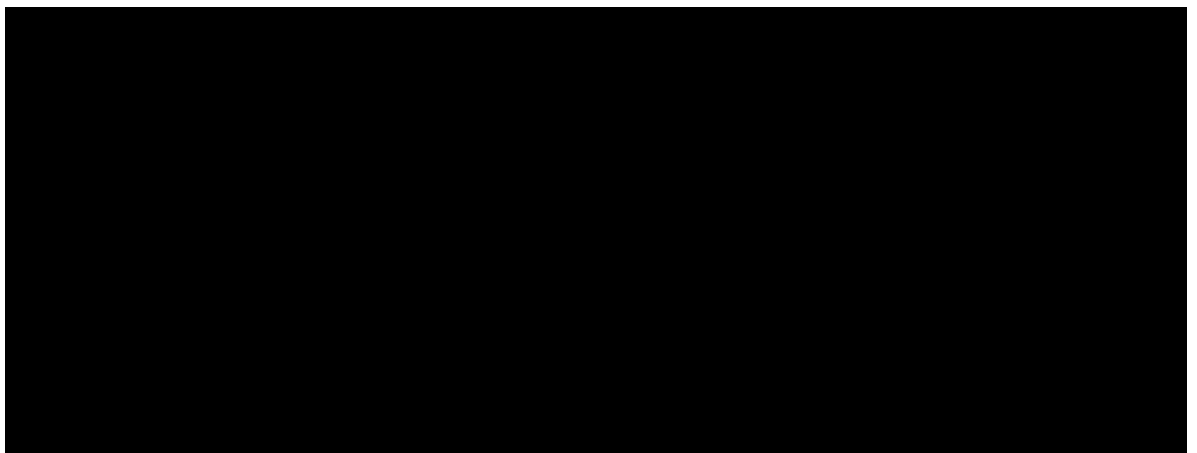
Figure 4.49 Thermi B: pit-dwelling and stone-paved open area (Pappa 2013, fig.6).

The latest LN Ib phase (Thermi 3) was mainly uncovered in two naturally or intentionally formed cavities (burrow pits) at the western part of the site. The stratigraphy indicates the existence of three separate sub-phases. The remains of the earliest sub-phase (IIIb) comprise extended stone-paved areas and a few clay features. The only evidence for the existence of dwellings is the presence of unbaked mudbricks. On the contrary, the remains of sub-phase IIIa include at least three plastered or 'beaten earth' floors. They seem to belong to post-framed buildings judging by the presence of a considerable number of postholes. These are commonly small in diameter (approximately 0.10m) and their distribution does not provide a clear ground plan. However, a number of more sizeable postholes (diameter: ca. 0.20m) seem to form a straight line. According to the excavators, the smaller postholes belong to inner partitions or interior features, while the more sizeable ones could belong to roof supporting posts. The exterior walls were probably post-framed, made of timber and mud. However, the construction of rectangular dwellings with stone socles is also documented during a later stage of phase IIIa. Evidence derives primarily from a wall that was made of two rows of unworked stones and mud and was preserved to a length of ca. 6m (Pappa 1990, 238 – **Fig. 4.50**). Even if its width (0.30m) is small comparing to other settlements, it probably served as the foundation or reinforcement of a superstructure made of unbaked mudbricks or rammed earth.



**Figure 4.50 Thermi B: plan of a possible stone socle (Pappa 1990, 239, plan 4).**

Further to the south-east of Thermi lies the extended, late MN/LN (second half of the 6<sup>th</sup> millennium cal BC) site of **Vassilika C**. Two small soundings were excavated during the years 1981-1983 and the results were briefly published a few years later (Grammenos 1991). According to the excavator, no architectural finds could be ascribed to the earlier MN phase of the site. On the contrary, the LN I remains were more substantial indicating the construction of above-ground, rectangular dwellings. Evidence on the ground plan is provided by the segments of two vertical walls belonging to the end of the LN period (**Fig. 4.51**). Another wall segment in trench II points to a probable NW-SE orientation.



**Figure 4.51 Vassilika C: stratigraphy of trench II (Grammenos 1991, fig. 4a).**

Building techniques include the use of large or mid-sized river stones for the construction of foundations that supported a mudbrick superstructure (**Fig. 4.52**). Concentrations of stones and sun-dried mudbricks were found in different parts of the excavation. The mudbricks were rectangular, approximately 0.07m thick, and were set in a thick clayey

mortar (Grammenos 1991, 36–7). The excavator also notes the possible presence of moulded fired bricks based on two partially preserved examples dated to phase III<sup>35</sup>. House floors are described as following the ‘beaten earth’ technique. Finally, the use of construction earth for the plastering of reeds or wattles is also reported. These could be linked to the construction of different parts of the superstructure or the roof.

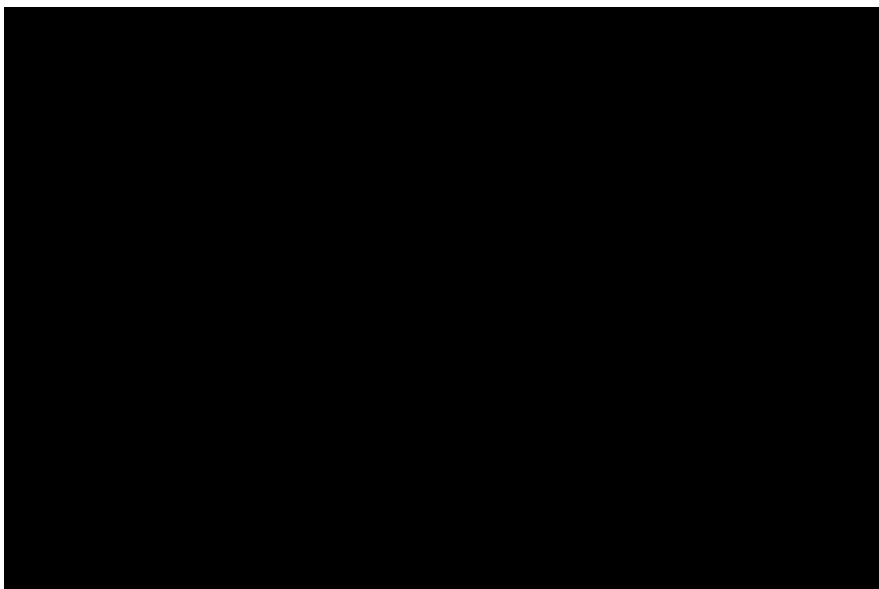


Figure 4.52 Vassilika C: remains of stone socles (Grammenos 1991, plate 2a, fig. 3a).

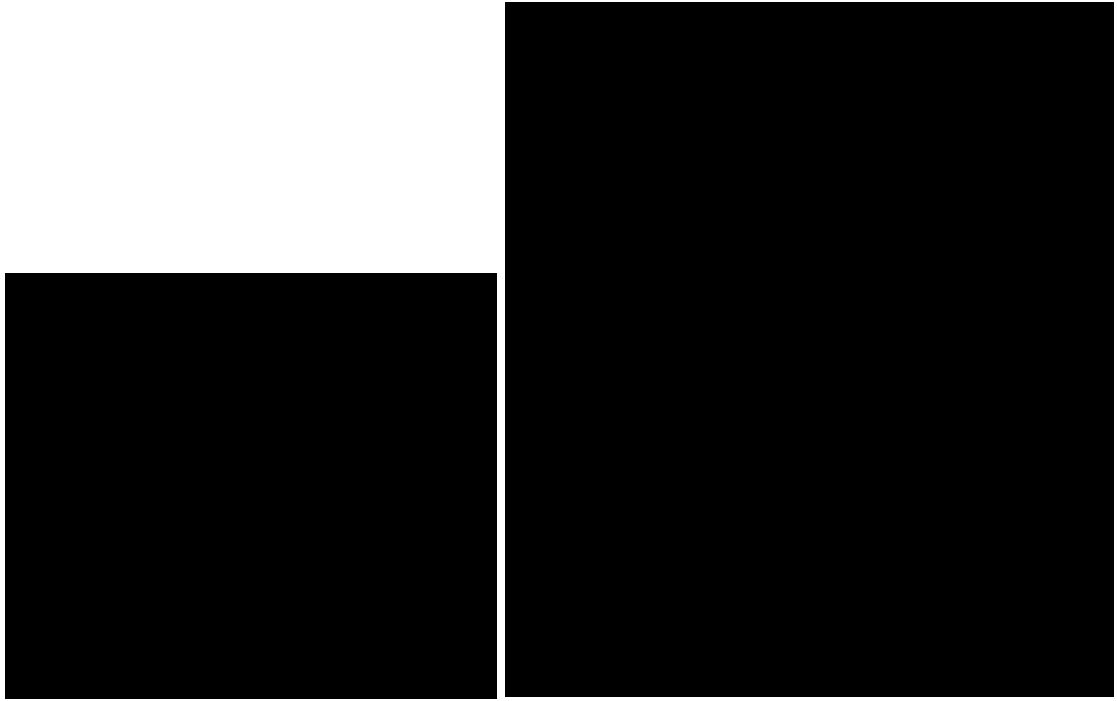
Additional information for house construction in the Chalkidiki Peninsula derives from the early 20<sup>th</sup> century investigations. Dwellings with stone foundations and a superstructure of mud plastered reeds and branches are reported at the site of **Kritsana** (Heurtley 1939, 21), although it is not clear whether the remains date to the Neolithic or the EBA period (Grammenos 1991, 36). Moreover, Heurtley (1939, 5) reports the identification of stone concentrations and dissolved mudbricks at the LN/FN site of **Aghios Mamas**. The excavations at Neolithic **Olynthos** (Mylonas 1929) have offered more substantial remains (Mylonas 1929 – **Fig. 4.53–4.54**). The site was excavated back in 1928 and is probably dated to the end of the LN or the FN period. Although heavily disturbed by classical and Byzantine buildings, it was possible to distinguish three habitation layers separated by different floor levels bearing signs of conflagration (Mylonas 1929, 2). In the lower stratum, the remains of a nearly trapezoidal, stone-footed structure (House A) were found. Its longer north wall measures 4.35m, the east and west ones measure ca. 2.90m, while the south wall reaches 3.10m in length. An opening in the middle of the latter wall, measuring

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<sup>35</sup> According to the excavator (Grammenos 1991, 37), the size of the ‘fired bricks’ is ca. 0.35m and were probably molded with the use of a leather container.



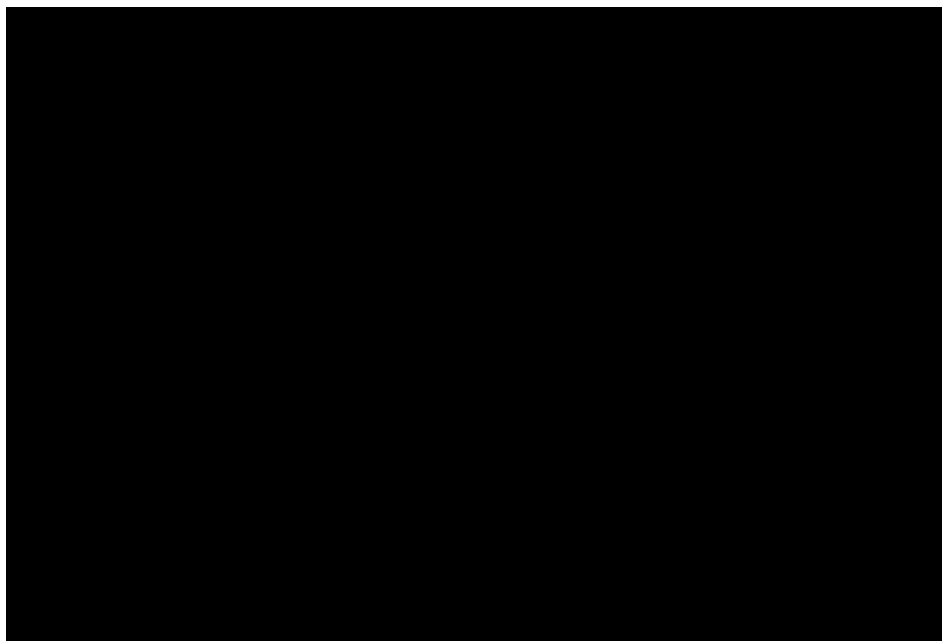
approximately 0.75m, may represent the entrance of the structure. The stone footings were built by small unworked river stones (measuring ca. 10x7x7cm). Three courses of stones laid in mud were preserved to a height of almost 0.20m, while the width of the footing averaged 0.80m (Mylonas 1929, 7–8).



**Figure 4.53 Olynthos: plans of Houses A (left), B and C (right) (Mylonas 1929, fig. 7 & 9).**

In the following stratum, well preserved remains of stone footings were also unearthed (Mylonas 1929, 9–11). These can either be approached as autonomous structures (Houses B and C) or as a complex building composed of different rooms. The building techniques applied affinities with House A. Stone footings made of flat or round river stones (ca. 0.25m) were occasionally preserved to the height of two courses. However, these were now laid on the levelled remains of the previous phase or on small foundation trenches measuring 0.40-0.45m in depth. The latter are commonly filled with stones, pebbles and pottery sherds. House B is a quadrangular structure with two rooms measuring approximately 2.40x2.40m and 1.50x1.40m respectively. Its stone footings are preserved to a height of ca.0.25m and their thickness ranges between 0.45 and 0.95m. No openings or doorways were found between the two rooms, although the northern part of the structure is missing. The thicker south wall also constitutes the northern wall of the third room or House C. This follows a rectangular ground plan with ca.3.20x1.80m inner dimensions. The thickness of its east, west and south walls averages 0.60m, while an opening of ca. 0.65m to the south represents an entrance. Another stone footing with a slightly N-S

direction abuts the west wall of House B. This can be attributed to a third structure (House D) that was heavily disturbed by later building activities. During the later building horizon, the corner of a rectangular structure built over the remains of the previous layer was identified in the form of a stone footing almost 0.50m thick (Mylonas 1929, 11).

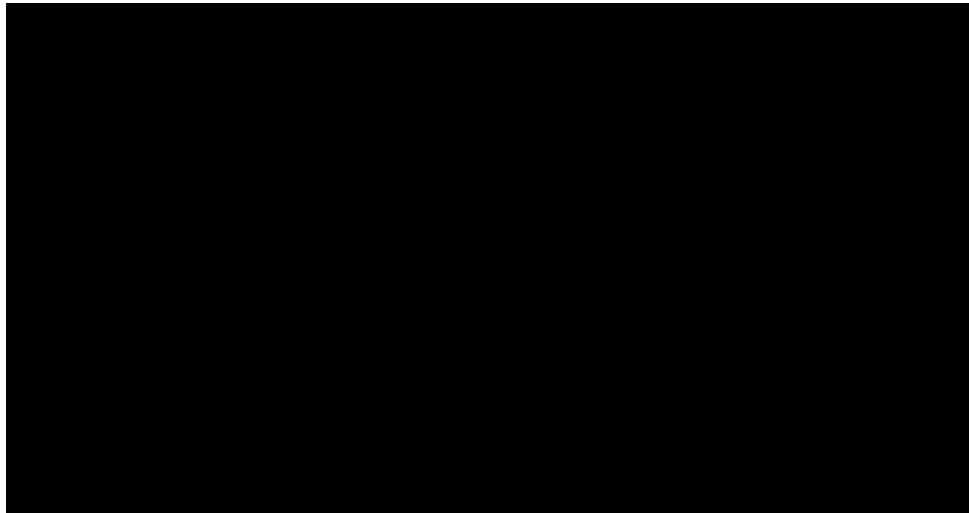


**Figure 4.54 Olynthos: view of the Neolithic building remains (Mylonas 1929, fig. 6).**

There is no concrete evidence for the construction of the superstructure or the roofs. Mylonas (1929, 8) has supported the use of sundried mudbricks. This assertion was primarily based on the absence of carbonised remains and daub fragments indicating the application of a wattle-and-daub technique, as well as on the insufficient amount of stones that could support the erection of stone walls. The roofs could have been made of perishable plant materials, such as twigs, branches and reeds (Mylonas 1929, 9). No postholes for supporting the roof or the superstructure are reported. However, the flat stones at the end of the eastern and the central wall of House B may have served as foundations for mudbrick pilasters (Mylonas 1929, 10). The floor of House A was the roughly flattened natural surface, while the floors of the following building phase occasionally contained river pebbles (Mylonas 1929, 12). Interior features, such as thermal structures or platforms, were not identified.

More recent rescue excavations at the site of **Zagliveri** have brought to light a sizeable (ca. 4.50x5.50m), roughly rectangular LN pit and sections of two others (Grammenos & Kotsos 2003, 51–2 – **Fig. 4.55**). The pit is ca. 0.50-0.60m deep and follows a W-E orientation. Its floor was generally flat with the exception of two small cavities that belong

to a later phase and contained stones and burned building materials (Grammenos & Kotsos 2003, 52). No thermal structures or internal features were uncovered. Moreover, the sides of the pit were inclined and no postholes were identified. However, the excavators suggest that this could have been the lower part of a semi-subterranean pit-dwelling on the basis of its morphology and size. The presence of the nearby pits may suggest that the settlement was organised in compounds (Grammenos & Kotsos 2003, 53).



**Figure 4.55 Zagliveri: plan of the excavated pit features (Grammenos & Kotsos 2003, plan 3).**

Further to the east of the region, the late EN/early MN settlement of **Mikri Volvi** near the north coast of Lake Volvi belongs to the flat-extended type of sites and covers an area of approximately 0.3ha (Lioutas & Kotsos 2008; Pappa 2008, 39). Research has uncovered 138 pits or pit-like cavities, as well as three above-ground structures. The diameter of the pits commonly ranges between 0.50 and 1.80m and their depth ranges between 0.30 and 1.20m. However, two roughly circular pits with a diameter of ca. 4m were interpreted as possible semi-subterranean dwellings. As for the above-ground features, these are post-framed structures made of timber and mud. Their ground plans are probably rectangular and their size could have exceeded 6x6m, while thermal structures were found inside two of the buildings (Lioutas & Kotsos 2008, 242; Pappa 2008, 39).

#### **4.1.3 The Serres basin and the plain of Drama**

The Serres basin is one of the better defined areas of northern Greece. Although a considerable number of sites has been identified during systematic surface surveys (see Fotiadis 1983), architectural evidence are limited to small-scale excavations undertaken at the sites of Krioneri and Dimitra. Additional information is provided by the joint Greek-Bulgarian excavations at Promachon-Topolnica on the north fringes of the region.

Architectural evidence from the plain of Drama is primarily drawn from the mounds of Sitagroi and Arkadikos at the western part of the plain, as well as from the site of Dikili-Tash at the south-east. The record of the region will be supplemented by the evidence from the island of Thassos lying less than five miles to the south of the Macedonian coast.

The settlement of **Krioneri** is situated on a smooth hill west of river Strymon. The site does not seem to have exceeded 0.3ha in size and its 3–3.50m deposits date primarily to the LN period. The occupation was probably dense and the boundaries of the site are marked by heaps of stones retaining dense red clay, thus forming a terrace with a functional and/or symbolic character (Malamidou 1999, 520). Several LN plastered floors have been partially uncovered. A late LN floor was plastered with whitish clay, while in many cases the replastering of floors, thermal structures and storage pits indicates repairing (Malamidou 1999, 514). The preservation status of the material did not allow the reconstruction of ground plans. The burned rubble excavated in trench V (**Fig. 4.56**) indicates that the main building materials were timber and plant-tempered daub. The excavator marks differences between structures or different parts of the same structure in terms of soil properties and the tempering materials added (Malamidou 1999, 516).



**Figure 4.56 Krioneri: view of trench V (Malamidou 1999, 521, fig. 4).**

Further to the NE of the Strymon Delta the settlement of **Dimitra** has offered sporadic evidence on house construction. Although the total size of the site was estimated at ca. 2ha, only a small area (32m<sup>2</sup>) was excavated between the years 1978 and 1980 (Grammenos 1997b, 31). According to the excavator, the form of the *toumba* reflects the long-term occupation during the Neolithic and Bronze Age periods, but is also a result of several

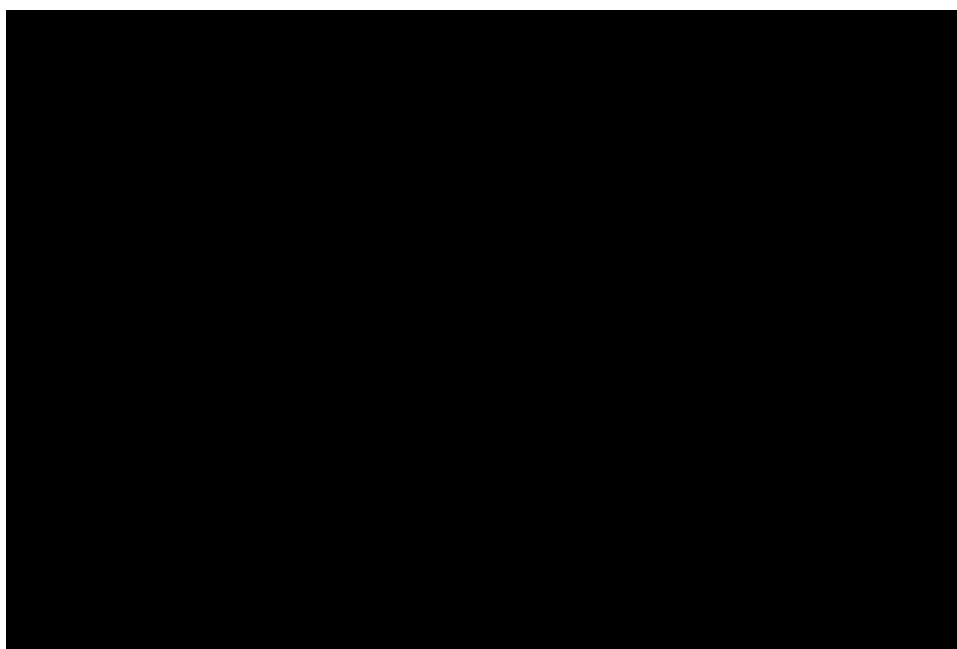
episodes of erosion. Remains belonging to a late MN/early LN horizon include pit and pit-like features, an ellipsoid hearth, as well as partially preserved floors of houses and other structures. The latter are either described as “beaten earth” or clay plastered ones, while in one case the floor plaster had covered a substructure of stone granules. More substantial were the remains of foundations uncovered at a lower level of trench II. Segments of a wall with a SW-NE orientation seem to form an angle with a third wall following an E-NW course. Other finds include concentrations of stones and unbaked, greenish yellow mudbricks (Grammenos 1997b, 55). It seems that walls, with or without stone footings, were made of mudbricks set in a thick clay mortar. However, plaster fragments with impressions of reeds are also reported (Grammenos 1991, 32).

The remains of the LN period comprise a number of pits, a probable post-hole, two thermal structures and fragments of other clay features (Grammenos 1997b, 50–3). Clay plastered or “beaten earth” floors, occasionally successive ones, were also found. Finally, the remains of a wall with a NW-SE orientation are reported but no further information is provided. The picture is quite ambiguous and the fragmentary nature of the finds does not allow the reconstruction of built forms. Nevertheless, the use of stone for the foundation of possibly mudbrick walls could be hypothesised.

A more concrete picture was brought to light at the settlement of **Promachon-Topolnica** that covers an area of ca. 4.5ha. Three habitation episodes belonging to the LN I (periods 1 and 2) and the FN periods (period 3) were recognised in the two sectors of the project. The former episode is further divided into two phases (I and II), while the latter episode (ca. 4250 cal BC) was probably preceded by a period of abandonment (Koukouli-Chrysanthaki *et al.* 2005, 91–2013). Architectural evidence derives mainly from the two earliest episodes of occupation as the period III deposits were heavily disturbed by ploughing. The remains of the latter period are restricted to pit-like cavities, a U-shaped thermal structure and burned daub fragments (Koukouli-Chrysanthaki *et al.* 1997b, 748–9). Two large stones with cavities on one side were interpreted as door pivots (Koukouli-Chrysanthaki *et al.* 1997c, 506).

The earlier period I of the site (5300–5070 cal BC) is characterised by the presence of semi-subterranean structures (Koukouli-Chrysanthaki *et al.* 1999, 551; 2005, 94–5). These were often small in size and were divided by the unexcavated natural soil which also served as the base for the foundation of exterior walls and internal partitions. According to the excavators, they may have been covered or surrounded by ground floor rooms made of big

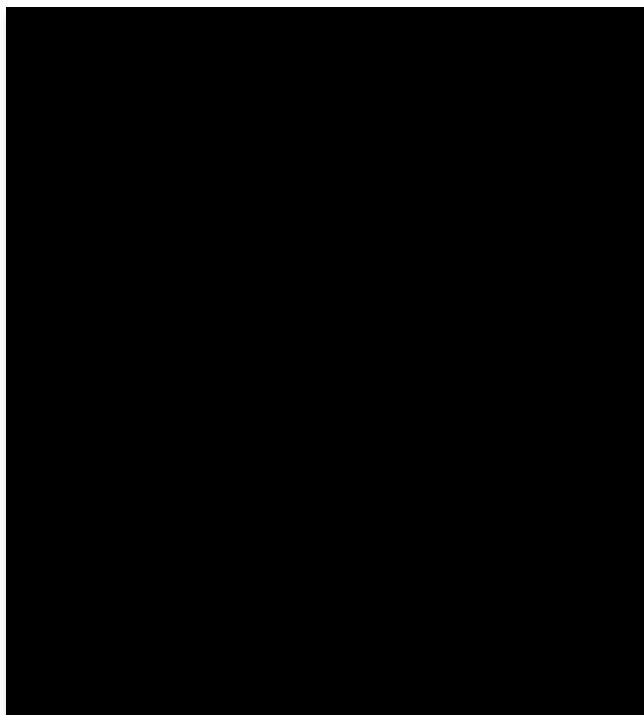
wooden piles, thus taking the form of two-storey buildings. Walls were probably made of woven branches plastered with clay ('wattle-and-daub' technique). The sizeable structure 2 of the Bulgarian sector (phase II) was reconstructed as a two-storey building with a pitched roof on the basis of clay house models found at the site (**Fig. 4.57**). The latter also indicate the decoration of wall surfaces with bucrania and incised or painted motifs (Koukouli-Chrysanthaki *et al.* 2013).



**Figure 4.57** Promachon-Topolnica: reconstruction of building 2 at the Bulgarian sector (left) and clay house model found at the site (right) (Koukouli-Chrysanthaki *et al.* 2013, fig. 5).

Among the four structures of the Greek sector, structures 1 and 2 were only partially uncovered. Structure 3 comprises a central, semi-subterranean space surrounded by small pits that may have served for the foundation of the timber frame or for supporting the ground-level floor. The most prominent feature is the sizeable structure 4 that was initially constructed during phase I (**Fig. 4.58** – Koukouli-Chrysanthaki *et al.* 2001, 112; 2005, 95; 2013). This is a roughly circular, semi-subterranean building with successive floor surfaces and walls lined with clay. Each floor had been burned and then covered with stones, reeds and branches before being replaced by a new one. In addition, thin layers of sandy soil between floors point to short periods of abandonment (Koukouli-Chrysanthaki *et al.* 2005, 95–6, 104; Souvatzi 2008a, 218). The large size of the building (ca.15m in diameter) and its rich inventory (including pottery for serving and storing food, 'ritual' vases, figurines, jewellery and large proportions of animal bones), could support its communal character. The identification of bucrania and two clay house models further reinforces this interpretation (Koukouli-Chrysanthaki *et al.* 2005, 100; Trantalidou & Gkioni 2008).

Besides, the periodic reconstruction/reoccupation of the structure has been linked to ritual practices similar to those evidenced at LN Makriyalos (Koukouli-Chrysanthaki *et al.* 2013).

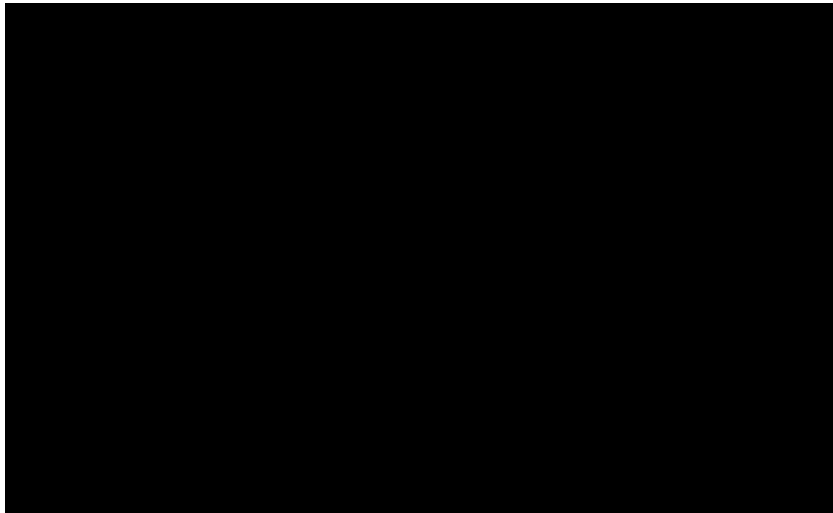


**Figure 4.58** Promachon-Topolniča: view of structure 4 at the Greek sector of the site (Koukouli-Chrysanthaki *et al.* 2013, fig. 4).

The architectural record of period II (first half of the 5<sup>th</sup> millennium cal BC) at the Greek sector comprises the remains of above-ground, post-framed dwellings with internal hearths and clay platforms (**Fig. 4.59**). Their foundations consisted of large posts sunk into the soil. They seem to have supported sidewalls and, probably, roofs made of mud-plastered reeds and woven branches (Koukouli-Chrysanthaki *et al.* 2005, 106). The dense distribution of postholes is indicative of successive repair episodes. Nevertheless, the identification of two buildings is reported. These are by and large defined by the presence of U-shaped ovens or hearths that also exhibit successive reconstructions. The house floors are described as made of “beaten earth” while the base of the walls was sometimes reinforced with large undressed stones (Koukouli-Chrysanthaki *et al.* 2000, 73). The ground plans were essentially rectangular as indicated by two preserved wall corners (Koukouli-Chrysanthaki *et al.* 2001, 550; 2000, 68).

Similar ground plans and building techniques were identified at the Bulgarian sector (Koukouli-Chrysanthaki *et al.* 1997b). The most interesting feature is a sizeable (8x5m) post-framed building that was dated to the earlier phase (IIIA) and was characterised as a ‘temple’. Its walls were plastered with mud and the interior surfaces were decorated with

four schematic, female figures<sup>36</sup>. The roof is thought to be gabled on the basis of a central, sizeable posthole. Further to the east, two parallel rows of large posts were identified. It is not yet clarified if these belong to the exterior wall of a nearby dwelling or if they represent the course of the east enclosure of the settlement (Koukouli-Chrysanthaki *et al.* 1997b, 750). It should be noted here, that the construction of a timber enclosure during phase IIIB falls within certain changes in the settlement's spatial organisation, including the extension of the habitation area and the common orientation of all buildings in a NW-SE direction (Koukouli-Chrysanthaki *et al.* 2013).



**Figure 4.59 Promachon-Topolnica: phase II remains of above-ground, post-framed buildings** (Koukouli-Chrysanthaki *et al.* 2013, fig. 9).

Moving to the plain of Drama, the excavations at prehistoric **Sitagroi** (1968–1970) have offered a wide array of architectural evidence (Renfrew *et al.* 1986, Elster & Renfrew 2003). Radiocarbon dates indicate that the site was continuously occupied from the late MN/early LN I period to the EBA (**Table 4.1**). Nevertheless, the main stratigraphic concerns of the investigations have resulted in a quite compartmentalised picture of the layout of the Neolithic component. The bulk of information comes from several soundings at the top or the slopes of the prehistoric mound.

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<sup>36</sup> The presence of plastic wall decoration and the identification of an anthropomorphic vessel outside the building's entrance present affinities with the so-called 'temple' at Parța in Romania (Lazarovici 1989).



Phase	Duration (radiocarbon years BC)	Duration (calendar years BC)	Chronological period
I	4600–4300	5500–5200	late MN/LN I
II	4300–3800	5200–4600	LN I – LN II
III	3800–2700	4600–3500	FN I – FN II
IV	2700–2400	3500–3100	FN II/EBA
Va	2400–2100	3100–2700	EBA
Vb	2100–1800	2700–2200	EBA

**Table 4.1 Chronological phases of prehistoric Sitagroi (after Renfrew 1986, 173, Table 7.3).**

In terms of their general characteristics, it seems that Neolithic dwellings were commonly made of mud applied on a timber frame (composite *pisé*). They are represented by sequences of hard backed floors, burned wall fragments and postholes. Structural remains of the earliest phases I and II have been mainly found in the deep sounding ZA. A well-defined floor was found bounded at its northeast side by a stretch of wall in the form of an area of pale yellow clay. The width of the wall was estimated at 0.20m, while its line was preserved to a height of ca. 0.30m. Yellowish fragments of collapsed wall material (daub or softened mudbricks) were found to the northeast of the wall (Renfrew 1986, 181). Further information was drawn from the small sounding in square KL where a wooden sleeper beam (**Fig. 4.60**) following an orientation to the NW of grid north was uncovered (phase I or II). The beam seems to have been square in section with dimensions measuring approximately 5.5x0.15x0.20cm (Renfrew 1986, 218). More scanty traces of floors in the form of clay patches, wall fragments, postholes, as well as charcoal or uncarbonized fibres were found in several trenches.

The remains of phase III are equally fragmented. They are restricted to postholes and horizontal patches of hardened pale clay that have been interpreted as floors. In squares ML and MM there were clearer evidence for the presence of a building. These include the irregular distributed daub fragments and a line of postholes (**Fig. 4.61**) which may represent the west wall of a house whose axis ran somewhat to the west of north. A well-preserved hearth, enclosed within a square daub structure to the southwest of the main rubble was probably connected with the putative house (Renfrew 1986, 212).

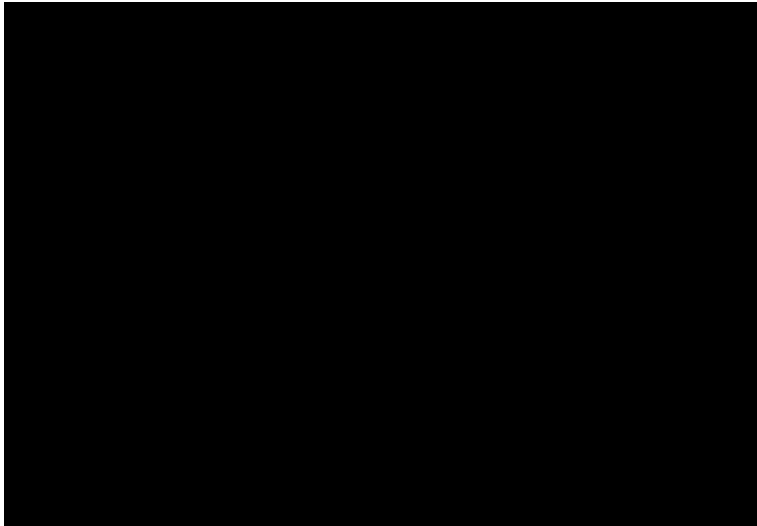


Figure 4.60 Sitagroi: wooden sleeper beam in square KL (Renfrew *et al.* 1986, plate XLIV1).

More informative were the remains of the FN phase IV. The remains of sounding ZA include the short stretch of a clay wall consisting of five baked clay slabs measuring roughly 0.24x0.12x0.05m, with a smooth interior surface (Renfrew 1986, 177). Although the rest of the remains are limited in number, there are clear indications for the presence of at least one house in this part of the site. Similarly, a group of finds in square ROC, including daub fragments and postholes running approximately east and west, a sequence of clay hearths and a number of loom weights, seems to represent part of a burned house belonging to phase IV (Renfrew 1986, 205). In area SL, evidence of flooring in the form of fire-hardened clay, and burned wall rubble suggest a long wall running along the main axis of the house to the northwest with an interior wall adjoining it at right angles (phase IV or V – Renfrew 1986, 210).

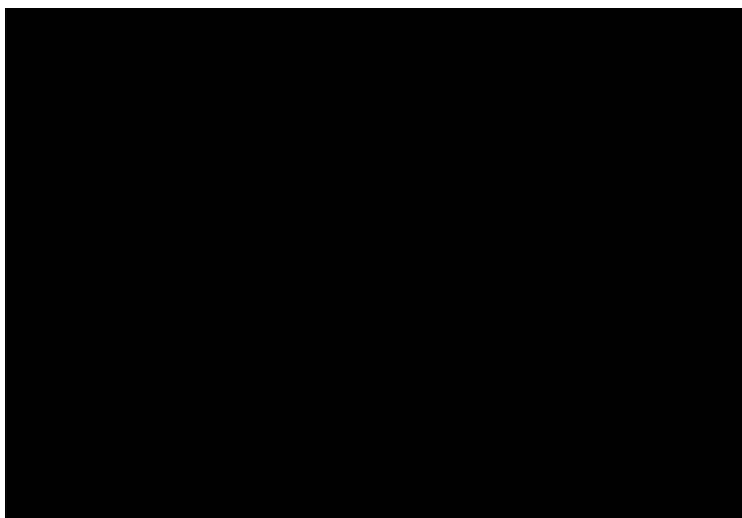
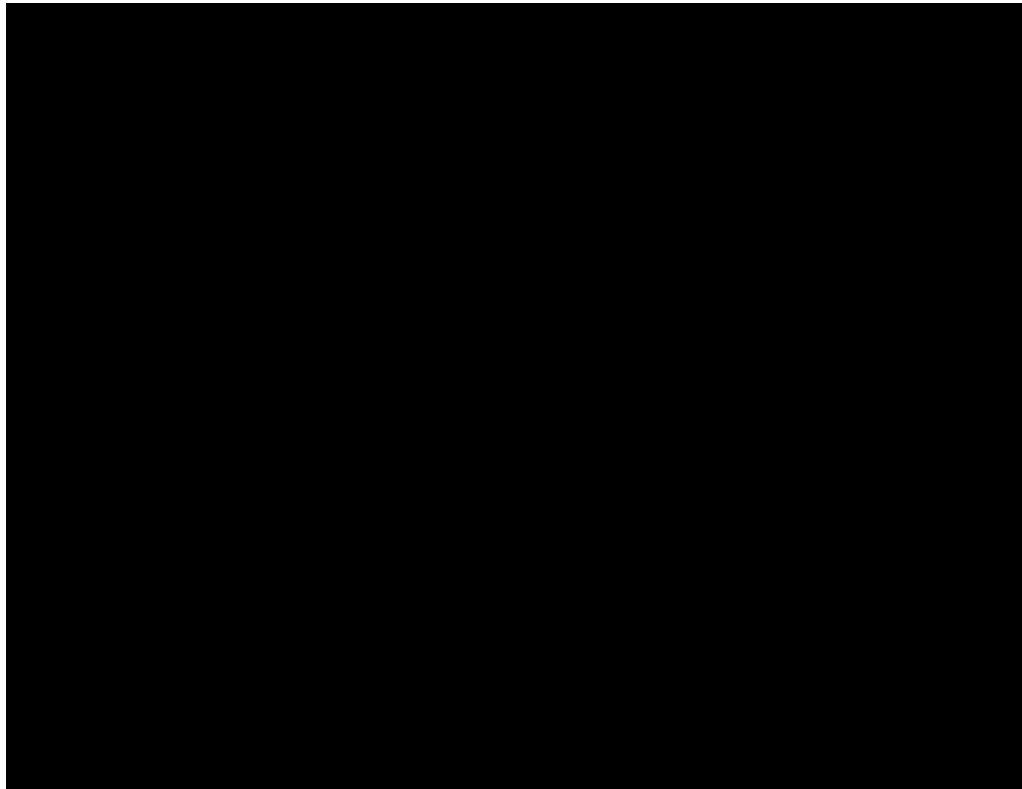
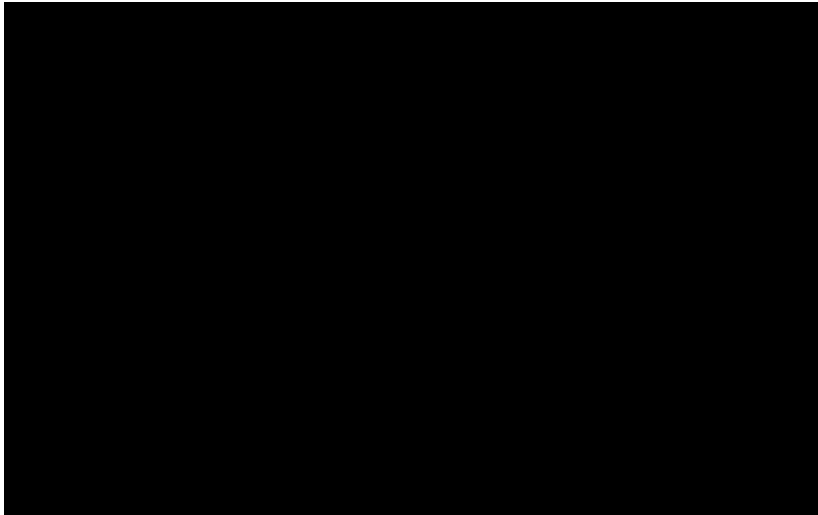


Figure 4.61 Sitagroi: remains of phase III structures in square MM (Renfrew *et al.* 1986, plate XXXVII2).

The most substantial Neolithic remains were located in area ZH (Renfrew 1986, 207 – **Fig. 4.62–4.63**). They include the relatively well-preserved parts of two long houses which lie parallel to each other and approximately 2.3m apart. Both houses follow the same W/NW orientation, which runs almost parallel to the EBA Long House of phase Vb (Renfrew 1986, 189), as well as to the sleeper beam mentioned above. Whether this pattern indicates a regular planning in the construction of houses throughout different phases is not clear. It should be mentioned, however, that the phase Va Burned House (Renfrew 1986, 190) follows a different orientation. In any case, the two Neolithic houses present different degrees of preservation. The west house, although eroded in its western part, preserves its east wall to a remarkable length of ca. 11.5m. Two ditches, identified at 12.5m and 13.5m from the north end, intersect this wall and are interpreted as foundation trenches for internal partitions, similar to the well-preserved wall 2.5m from the north end. The excavator argues that the east wall could have extended southwards, probably forming an unroofed space, as is the case for the EBA Burned House. However, the well-preserved flooring which accompanies the wall to its southernmost extremity stands against such an interpretation. The west end of the W wall is scantily represented by postholes (Renfrew 1986, 207).



**Figure 4.62** Sitagroi: plan of area ZH showing the remains of two phase IV houses (Renfrew 1986, 208, fig. 8.16).



**Figure 4.63** Sitagroi: remains of phase IV walls in area ZH (Renfrew *et al.* 1986, plate XXXIV2).

Evidence on house construction practices could be further supplemented by the well-preserved remains of the EBA (**Fig. 4.64**) as they seem to present affinities with the preceding structures. Both the Long House (ca.5.2x15.5m) and the Burned House (5.3x8m.) show apsidal ground plans with partitions and interior features, including hearths and bins, located at the apse. In any case, the superstructure of the former house was constructed on a timber frame of posts sunk into foundation trenches. The exterior, post-framed walls of the better preserved Burned House (Renfrew 1970; 1986, 190–91) were plastered with mud and were reinforced by smaller stakes set on the outside. However, different techniques were also attested. No plastering was found at the apse, thus suggesting that this was a timber structure with posts sunk into a foundation trench or set closely to each other. In addition, the use of plank-shaped timbers some 2–3cm thick and horizontal wattles has been confirmed in the construction of internal partitions. Roofs were probably made of horizontal beams supporting a crisscross pattern of wattles or reeds and plastered with mud (Renfrew 1986, 191). Whether similar ground plans can be hypothesised for the Neolithic dwellings is unclear. Nevertheless, they seem to share several technological characteristics in terms of building materials and techniques.

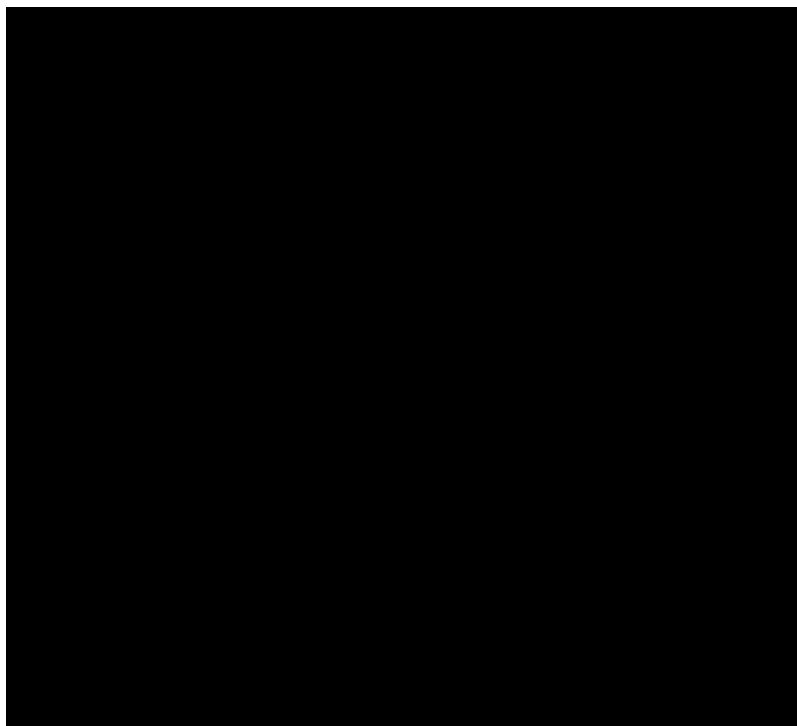


**Figure 4.64** Sitagroi: remains of the EBA Long House (left) and Burned House (right) (Renfrew *et al.* 1986, plates XXIII1, XXVII).

The neighbouring site of **Arkadikos** is located a few kms south-west of Sitagroi. This is one of the largest prehistoric mounds in the area, showing continuous habitation from the MN till the historical period. The excavation in different parts of the mound has revealed building remains belonging to the LN and FN periods. At the central part of the site, extensive remains of at least four post-framed dwellings were uncovered (Peristeri 2004, 134; 2006, 25 – **Fig. 4.65**). House A, dated to the LN I period, follows a NE–SW orientation and an apsidal ground plan that resembles the Burned House of Sitagroi (Peristeri 2004, 132–3). The total dimensions of the structure are estimated at ca. 9x6m. Internal space is separated into two rooms by a post-framed partition. Its partially preserved floor was made of clayey earth, while walls were probably made of rammed earth reinforced by posts set on either sides or inside them (composite *pisé* technique). Internal features include an oven that was found at the NE corner of the main room near the entrance, as well as a possible hearth and another thermal structure at a close distance (Peristeri 2004, 134). No structures were found in the apse, although the recovery of storage vessels, domestic pottery and millstones offers clues about its use.

Close to the south of House A, a second structure (House B) was partially excavated. It consists of two stretches of walls (ca. 1.50m in length) with a N-S orientation that are vertical to a third wall measuring 2.40m in length. Even if poorly preserved, the structure seems to follow the same apsidal ground plan. The west wall probably represents the outer wall of the building, while the easternmost one probably represents an internal partition. A similar ground plan is supported for House D that was uncovered west of House A. It is, therefore, argued that all three buildings shared common ground plans, orientation, dimensions and, presumably, building techniques (Peristeri 2006, 26–28). The remains of a later post-framed structure (House C) were found above the remains of House B (Peristeri

2006, 28). Its floor was preserved in an area of 8x3m, while six sizeable postholes (ca. 10–14cm) found at the north side of the floor seem to belong to the timber frame. Two of them reach 0.36m in depth and are interpreted as load-bearing elements. Smaller postholes (<0.5cm) were probably associated with the extra support of the superstructure or with internal features. The latter include the remains of thermal structures and clay platforms.



**Figure 4.65 Arkadikos: plan of the LN buildings (Peristeri 2006, 27, plan 2).**

Less substantial is the architectural record at the periphery of the site excavated during the 1991-1992 period (Touloumis & Peristeri 1994, 360; Vargas *et al.* 1995, 577). The best preserved remains belong to a post-framed building that was dated to the late FN/early EBA period (**Fig. 4.66**). Part of the ground plan is defined by straight walls of rammed earth following a NE-SW orientation. Postholes were found at both sides of the walls, as well as inside them, with a small square posthole measuring ca. 6x6cm. A partition wall following similar building methods, divides the internal space in two rooms of unequal size. The total dimensions of the structure seem to have exceeded 9x4m. According to the excavators, it resembles the EBA houses at Sitagroi, although an apsidal end has not been confirmed. No definite floor was found, while a number of burned clay fragments with impressions of reeds or branches could be attributed either to the superstructure or the roof. As for the postholes, it is suggested that the more sizeable ones (>12cm) represent load-bearing elements set at the corners of each room, while smaller ones (7-11cm) represent stakes for the reinforcement of the timber frame. Below the remains, the

excavation brought to light a considerable number of postholes (Vargas & Anagnostou 1994). Although their distribution was irregular, it was possible to partially reconstruct the ground plan of a rectangular building following a different orientation (Vargas *et al.* 1995, 578–9; Touloumis & Peristeri 1994, 361). The density and distribution of postholes do not only reflect interior features and secondary areas (Vargas *et al.* 1995, 581–2) but also successive episodes of repair and reconstruction.



Figure 4.66 Arkadikos: plan and view of the FN/EBA house at the periphery of the mound (Vargas *et al.* 1995, 578, plan 1; Touloumis & Peristeri 1994, 367, fig. 1).

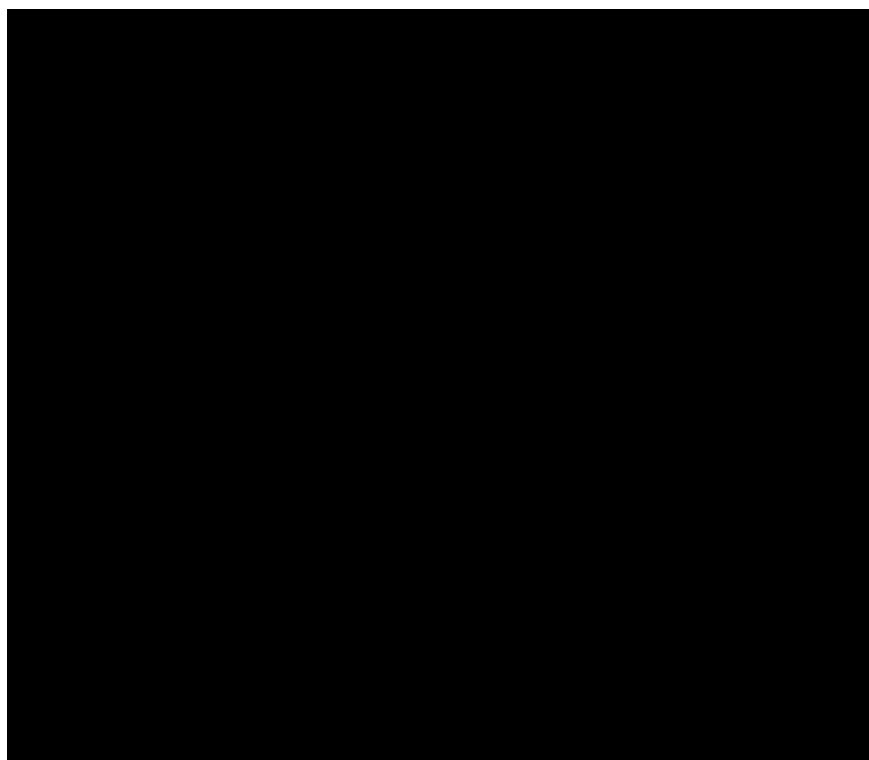
The systematic excavations at **Dikili-Tash** at the south-east part of the plain have brought to light two Neolithic building horizons (Dikili-Tash I and II) with successive sub-phases<sup>37</sup>. The earliest episode belongs to the LN I period (5200–4800 cal BC) and its deposits measure up to 5m in thickness. Evidence for the layout of the settlement and the ground plans of structures during that period is scanty. It seems that houses are aligned in a NE-SW axis with empty areas between them serving as walkways or passages for circulation (Koukouli-Chrysanthaki *et al.* 1997d, 686). The internal features of houses include ovens and thermal structures, platforms or benches and storage or refuse-pits. Thermal structures are also situated in open areas indicating that certain domestic activities were taking place in the open. The possibility of a ca. 30m<sup>2</sup> courtyard (either open or protected by a canopy) is reported in the eastern part of sector V.

Information on the building techniques followed during the earlier phase derives from sector V and other parts of the site. The distribution of postholes did not allow the

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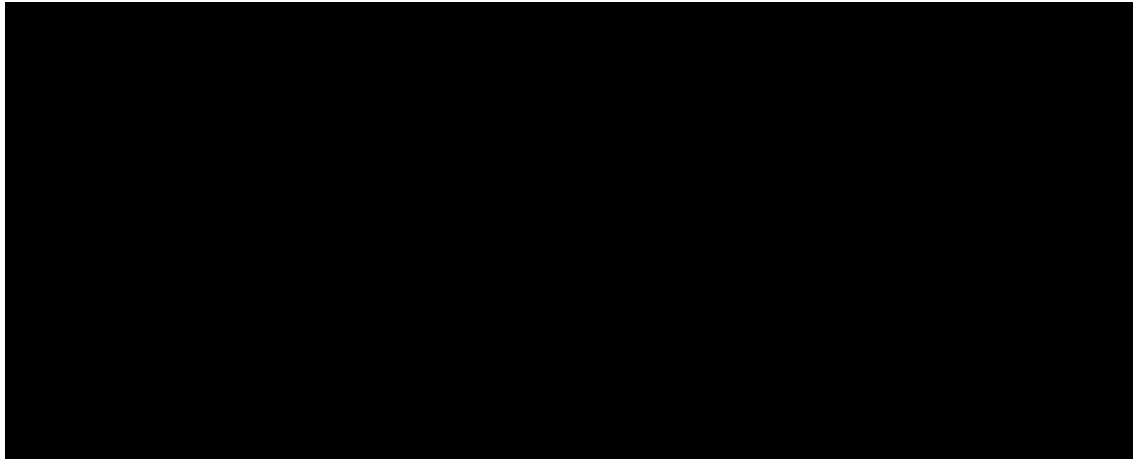
<sup>37</sup> A recent series of core samples has suggested that the initial occupation took place at around the second half of the 7<sup>th</sup> millennium and that habitation was continuous during the MN period (Lespez *et al.* 2013).

reconstruction of an actual ground plan. However, the excavators argue (Koukouli-Chrysanthaki *et al.* 1997d, 686) that houses were following rectangular, more or less complex, ground plans and that they were made of timber and earth (**Fig. 4.67**). Although preserved parts of still-standing walls are extremely rare (Treuil 1992, 39), the analysis of a considerable amount of burned daub fragments led to the identification of two principal wall construction techniques (**Fig. 4.68**). The first, described as the ‘typical’ wattle-and-daub technique, entails the weaving of thin branches or reeds around uprights. Walls following the second technique were constructed over a frame of round posts and split timbers joined together by crosspieces (Koukouli-Chrysanthaki *et al.* 1997d, 688; Martinez 2001, 64). The impressions of transversal elements (branches tied with ropes?), often oriented diagonally, imply that the fragments under study were not associated with upper storey floors (Martinez 2001, 64–5). In both techniques, wall surfaces were packed with daub and were either simply smoothed or coated with a thin finishing plaster. This could have been a soil mixture with less organic inclusions or of a different fabric (e.g. a yellowish fabric rich in quartz and lime or a fine plaster rich in iron oxides – Koukouli-Chrysanthaki *et al.* 1997d, 688).



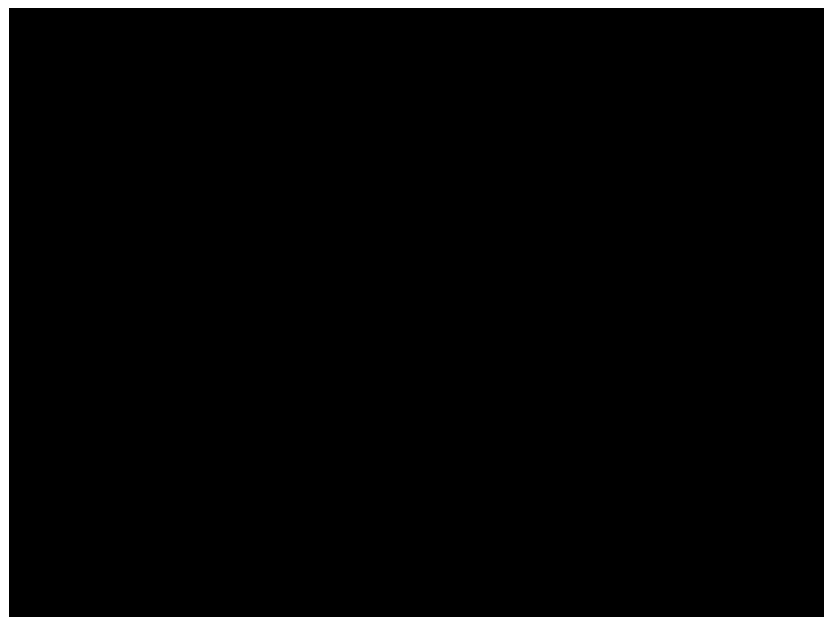
**Figure 4.67** Dikili Tash: tentative reconstruction of a LN I dwelling (<http://www.dikili-tash.gr/>).





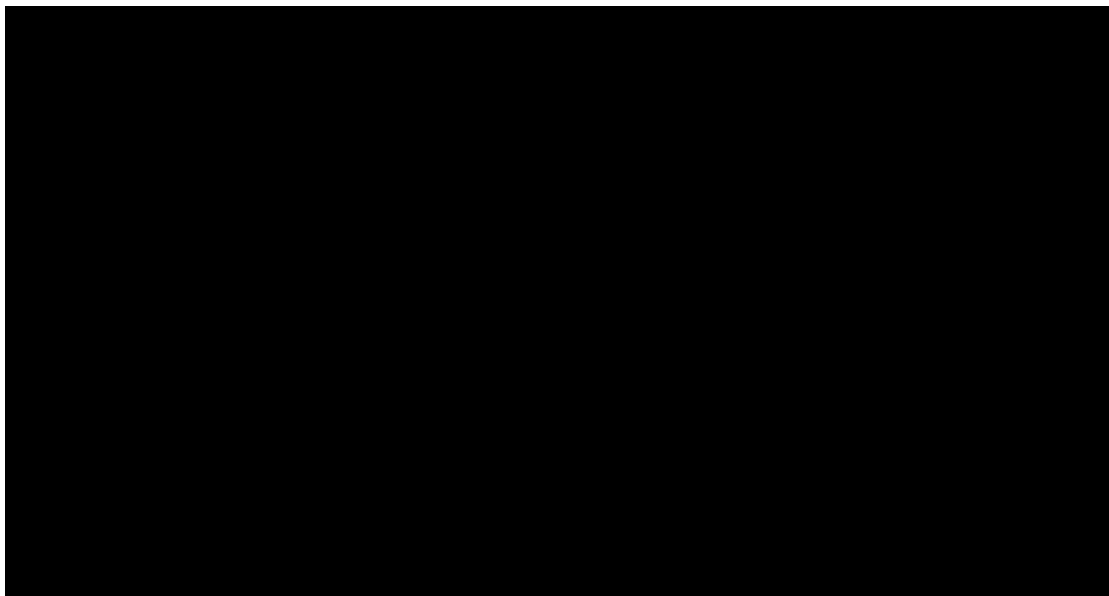
**Figure 4.68 Dikili Tash: burned wall fragments with impressions of closely set stakes (left) and weaved branches/reeds (right) (<http://www.dikili-tash.gr/>; Martinez 2001, 67, fig. 4).**

The micromorphologic analysis of burned daub samples revealed that the earth used for construction varied both in terms of mineral composition and tempering. Contrary to expectations, it was noticed that chaff was more frequently used than straw (Martinez 2001, 65). Moreover, it was possible to associate different fabrics with certain parts of the superstructure or other features, including floors, ovens and platforms. It seems that fabrics were quantitatively and qualitatively differentiated according to their intended properties, including plasticity for the walls, fire-resistance for thermal structures and waterproofing for the roofs. It is further argued (Koukouli-Chrysanthaki *et al.* 1997d, 687) that some of the soils exploited may have originated from sources that lie 15km from the site.



**Figure 4.69 Dikili Tash: building remains at sector VI (Koukouli-Chrysanthaki & Treuil 2008, 12, fig. 8).**

The remains of the second building horizon, dated to the LN II/FN I period (4700–4300/4200 cal B.C.), offer more reliable evidence on the intra-site layout and the form of dwellings. The deposits belonging to this phase are generally thinner (2–4m), although the size of the settlement was probably more extensive. The excavations undertaken in sector VI have uncovered the ground plans of four rectangular, post-framed dwellings arranged in almost parallel rows (**Fig. 4.69–4.70**). These are longitudinal, following the same NE-SW orientation, and are separated by open areas serving as pathways. Nevertheless, there are differences in terms of their dimensions, internal arrangements and their preservation status. The layout of Houses 1 and 2 shows a low degree of detail. Only the south part of House 1, measuring at least 30m<sup>2</sup>, is explored so far. A well-preserved floor, rich in *in situ* finds (such as pottery, stone and bone tools and carbonised grains), has been revealed. In addition, an oven was found near the back wall, probably facing the entrance. Further to the E and following a wide open area the west wall of House 2 is defined by a row of double post-holes arranged in a NE-SW axis. The dimensions of the dwelling are difficult to estimate as its southern part was disturbed and its northern part was not excavated thoroughly. However, part of a trapezoidal oven and other thermal structures were found on the floor level.

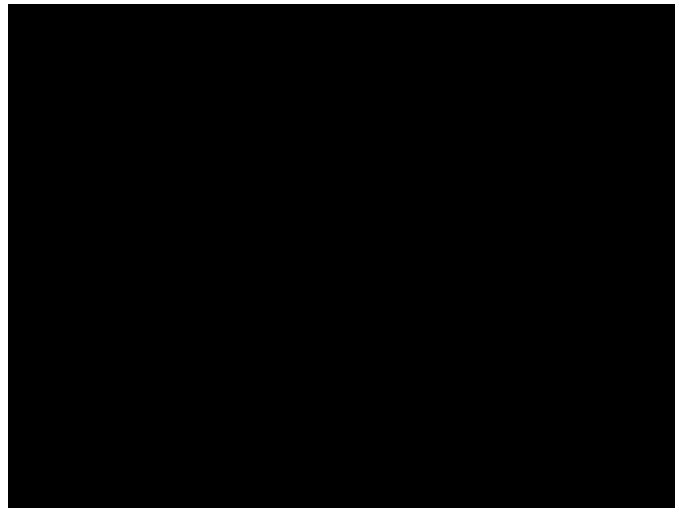


**Figure 4.70 Dikili Tash: view of the structures in sector IV (<http://www.dikili-tash.gr/>).**

A better picture is provided by the easternmost Houses 3 and 4 that are separated by narrow passages. The first structure measures ca. 9x5m and seems to be single-spaced as no internal partitions were found. A single thermal structure was found at the NW part of the house, almost adjacent to the wall. The floor was plastered with a whitish thin layer of

clay and was quite rich in finds. Among the daub fragments collected, there is one piece showing at least 14 successive layers of clay coating. As no indication for an upper storey exists, the excavators propose that this could belong to a flat roof. It should be noted, though, that pitched roofs are suggested for the rest of the dwellings. House 4 (**Fig. 4.71**) measures ca.11m in length and less than 6m in width. Although similarities in the general layout and orientation are evident, the house follows an alternative ground plan. Internal space is divided by walls in three separate places (A, B, C) with different entrances, lying probably to the SE, and an oven situated near the opposite wall. Storage vessels, benches and other finds are commonly associated with the thermal structures. Two rooms are almost square and have similar dimensions (25-30sq.m.), while the southernmost smaller room is only partially preserved. The arrangement of domestic space and the distribution of finds led the excavators to argue that each room was occupied by an independent household (Koukouli-Chrysanthaki *et al.* 1997d, 693).

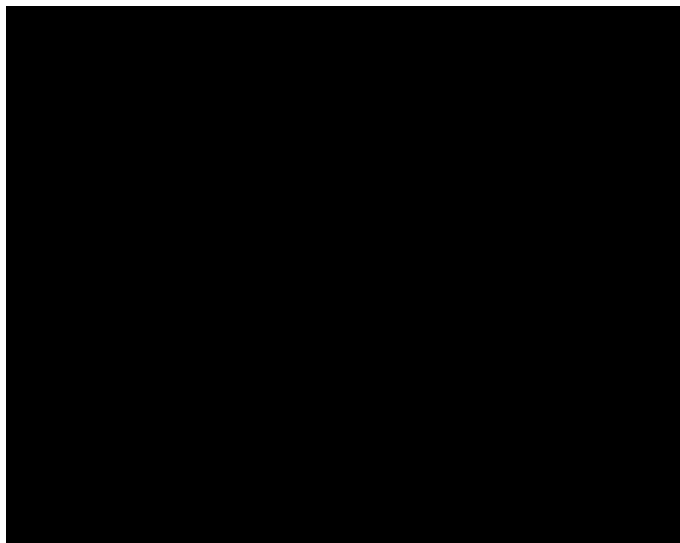
Research in different sectors of the site has provided general evidence on building materials and techniques. The excavation of postholes, structural debris and carbonised timbers led to the conclusion that building materials and techniques were comparable to the LN I ones. The foundations of structures include single or double rows of posts sunk directly into the soil. The walls are constructed over a timber frame, either of joined posts or interwoven wattles, packed with plant-tempered mud.



**Figure 4.71 Dikili Tash: reconstructed axonometric view of phase II house 4** (<http://www.dikili-tash.gr/>).

Evidence for Neolithic architecture on the island of Thassos comes from the sites of **Kastri Theologos** (thereafter Kastri) and **Limenaria**. Rescue excavations at the former site have brought to light a stratum of LN/FN pottery and remains of stone walls,

probably belonging to the foundations of dwellings (Koukouli-Chrysanthaki *et al.* 1984; 1988; Papadopoulos 2002, 104). The latter site was dated to the MN/LN I (5569–5255 cal BC)<sup>38</sup>, while it was also occupied during the EBA (Malamidou & Papadopoulos 1997; 1999; Papadopoulos & Malamidou 2002). The settlement was situated on a hillside terrace near the coast<sup>39</sup>. Excavations at its supposedly ‘outer area’ uncovered the remains of two long, post-framed buildings made of mud. The distribution of postholes (**Fig. 4.72**) suggests that one building could have had an apsidal ground plan (Malamidou & Papadopoulos 1997, 561). Their floors were identified in the form of successive layers of red or yellowish clay indicating renovation. Interior facilities, such as thermal structures and clay-lined storage pits, and outdoor refuse pits were also found.



**Figure 4.72 Limenaria: postholes of an ‘apsidal’ building (Malamidou & Papadopoulos 1997, 569, fig. 2).**

The ‘inner area’ of the settlement was initially occupied by a variety of structures, including hearths, storage pits, stone ‘benches’ or platforms and a well-constructed water well (**Fig. 4.73**). The subsequent phase is characterised by the erection of two, long post-framed buildings that were partly superimposed. One of them was measuring ca. 15m in length while both were associated with various clay and stone facilities (**Fig. 4.74**). Following their destruction, the area seems to have returned to its more ‘communal’ character, as indicated by the presence of a hearth and unusual pit interpreted as a possible pottery ‘kiln’ (Papadopoulos & Malamidou 2002, 26; Souvatzi 2008a, 173–4).

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<sup>38</sup> The excavators report that LN II pottery was also found within the early prehistoric deposits (Malamidou & Papadopoulos 1999, 588).

<sup>39</sup> Remains of retaining stone walls supporting the terrace should probably be linked to the EBA period (Malamidou & Papadopoulos 1999).

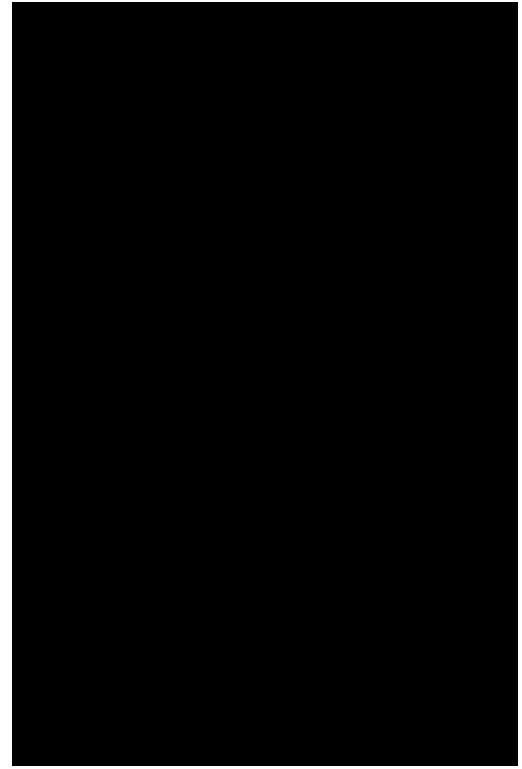
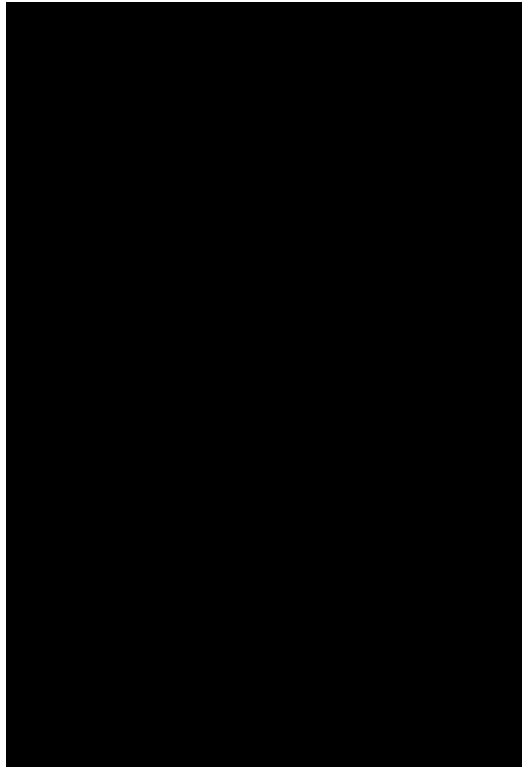


Figure 4.73 Limenaria: plan of structures belonging to the earliest habitation phase (Papadopoulos & Malamidou 2002, 29, plan 2).

Figure 4.74 Limenaria: plan of post-framed building and associated structures (Papadopoulos & Malamidou 2002, 27, plan 1).

#### 4.1.4 The Nestos valley and Aegean Thrace

The region east of the Drama plain consists one of the less well researched areas in northern Greece. The settlement of Makri, located on a coastal low mound near Alexandroupolis, has been systematically excavated since 1988 and has so far offered the most concrete evidence on Neolithic architectural practice. Additional information derives from the settlement of Paradeisos on the western bank of the river Nestos that was briefly investigated in 1976, as well as by the small-scale excavations at the site of Paradimi during the 1920s and 1965. Smaller soundings supplement the poor architectural record of the region.

The site of **Paradeisos** is a small hillock 25-30 km from the present coast. The settlement is dated to the 5<sup>th</sup> millennium BC (LN II/FN I) and its stratigraphy consists of six strata with a total depth of ca.1.30–1.50m. The architectural remains were scarce due to the restricted size of the excavation. Three major floor levels of hard-packed clayey earth were uncovered (Hellström 1987, 23–27). The lowest floor level was associated with an irregular roundish clay hearth. Another possible floor level was found in the lower Stratum 4. In all strata fragments of burned daub were collected.



Figure 4.75 Paradeisos: plan of the postholes identified in stratum 2 (Hellström 1987, 24, fig.10).

More substantial traces were uncovered in Stratum 2 (**Fig. 4.75**). A number of postholes form a grid indicating a roughly rectangular ground plan (Hellström 1987, 24). These were ca. 3.5cm in diameter, 10-15cm deep and were found filled with ashes and charcoal. Their restricted size indicates that, rather than representing load-bearing posts, they should be attributed to lighter features or to the frame of the non-structural wall. Their arrangement and interaxial spacing (ca. 1m) fit well with their use as uprights of wattle-and-daub walls. Finally, a fair amount of stones uncovered in stratum 3 (**Fig. 4.76**) renders possible the use of stone reinforcements for the protection of the lower parts of a house with a hard-packed earth floor. The walls were probably constructed in the wattle-and-daub technique, as indicated by a number of daub fragments with impressions of branches (Hellström 1987, 27).

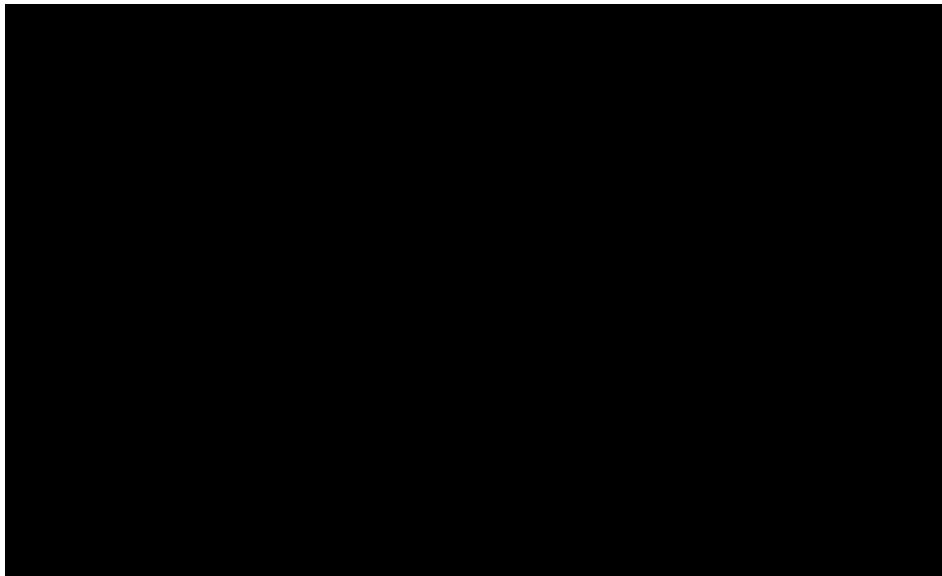
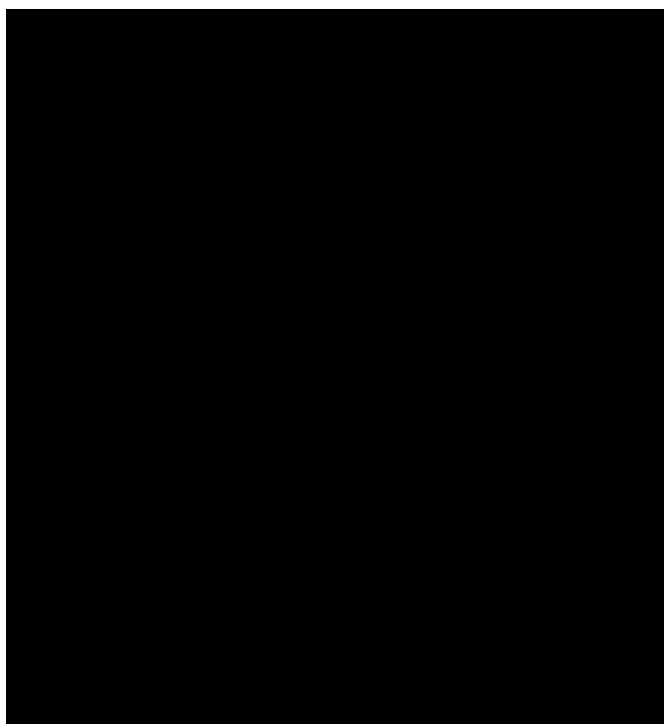


Figure 4.76 Paradeisos: view of trench B with concentrations of structural stones (Hellström 1987, 29, fig.12).



**Figure 4.77 Makri: topographic plan of the excavation sectors (after Efstratiou *et al.* 1998, 13, fig. 5).**

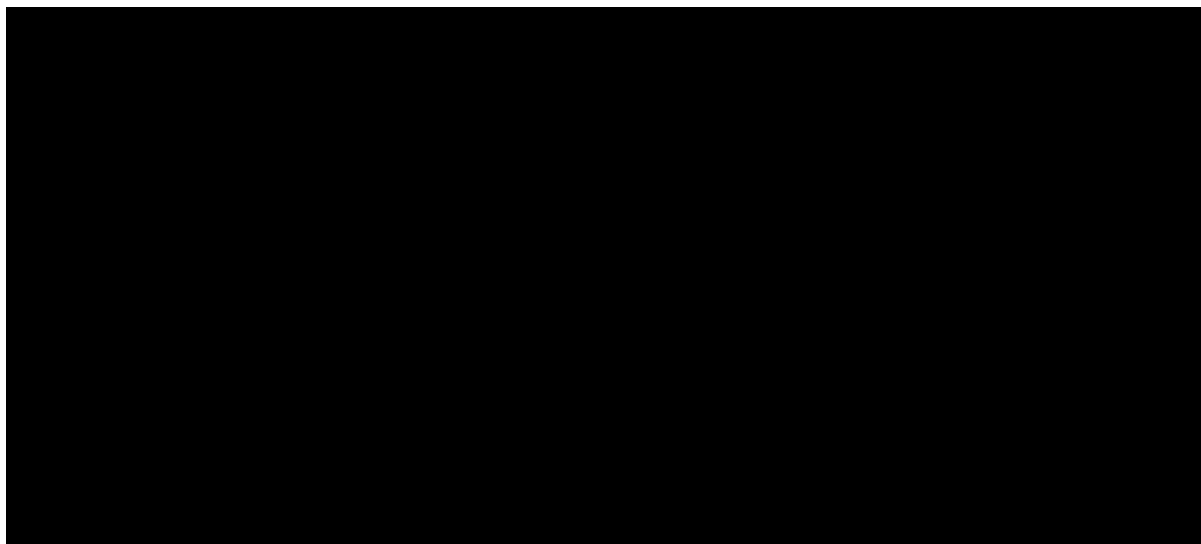
The Neolithic settlement of **Makri** seems to have covered an area of at least 0.2ha. However, the prehistoric deposits have been heavily disturbed in many parts of the site. Two distinct episodes, corresponding to two cultural periods and separated by a well-defined destruction layer, have been identified (Efstratiou *et al.* 1998, 15). The earlier Makri I episode belongs primarily to the MN period (ca. 5700–5400 cal BC)<sup>40</sup> and seems to be relatively short. Although there are successive layers of occupation, the deposits are quite shallow and limited to the centre of the mound. Moreover, the analysis of the sediments supports short periods of abandonment. Considering the architectural evidence, these are restricted to partially preserved floor surfaces, dissolved structural material (described as “dissolved mudbricks”) and a few clay-lined postholes that indicate the construction of post-framed structures and the probable use of unbaked mudbricks.

The LN Makri II horizon constitutes the main cultural period of the settlement and has offered extensive architectural remains. These are concentrated in the three principal areas of the mound (the top sector, the slope sector or residential area and the peripheral sector) and can be ascribed to four episodes of habitation defined by an equal number of well-constructed plaster floors (Efstratiou *et al.* 1998, 15). Remains of the earlier phase of Makri II have been uncovered above a destruction layer at the top of the mound, as well as at the

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<sup>40</sup> A more recent radiocarbon date (6400–6010 cal BC) from the basal layer of Makri pushes the initial occupation of the site back to the EN period (Ammerman *et al.* 2008, 148).

main residential area. No ground plans were identified and the evidence is restricted to floor surfaces following different construction techniques (e.g. thick floors of lime and red clay, as well as burned surfaces plastered with yellowish clay) and various structures, such as hearths and platforms (Gouma 2006, 50–51).



**Figure 4.78 Makri II: plan of phase II structures (after Gouma 2006, drawing 2).**

Phase II remains have been identified in all three sectors of the site. At the top sector, the architectural evidence consists mainly of partially preserved floor surfaces, pits and clay structures<sup>41</sup>. More substantial are the evidence from the residential area (**Fig. 4.78**), where remains of post-framed structures, well-preserved floors with successive plasters, storage and rubbish pits, as well as various structures were found. At the central part of the sector (squares  $\Delta 1$  and  $\Delta 2$ ) the so-called ‘axe-workshop’ was located (**Fig. 4.79**). This was a rectangular post-framed building following an E-W orientation. Its north and south walls are defined by two rows of regularly spaced postholes opened on a raised clay surface. A second row of postholes, set vertically to the previous ones, was found at a lower level and was interpreted as an internal partition (Efstratiou *et al.* 1998, 26)<sup>42</sup>. Information on wall construction derives mainly from the structural debris found inside the building. The presence of mudbricks, as well as of daub fragments with impressions of branches in different arrangements supports the application of both the wattle-and-daub and the mudbrick techniques for the construction of the superstructure. As for the roof, there are

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<sup>41</sup> Three burials and the traces of a fourth were excavated at the top of the mound and were probably linked to habitation areas. Two of the burials were found inside clay-lined pits, while the third one was found under a plaster floor (Efstratiou *et al.* 1998, 28; Gouma 2006, 56).

<sup>42</sup> However, it is equally possible that this was the western outer wall of the building and that its eastern extent is delimited by two vertically arranged rows of postholes found in trench  $\Delta 8$ . If this hypothesis is correct then the building could have exceeded 6x5.5m in size.



at least two large internal postholes that could have served as foundations for central posts supporting a light, probably thatched, pitched roof (Efstratiou *et al.* 1998, 26). The well-preserved floor of the structure is described as plastered with many thin reconstruction layers of clay (Efstratiou *et al.* 1998, 26). Storage or rubbish pits, storage vessels and other finds or installations have been located both inside and outside the structure (Gouma 2006, 53). A second post-framed structure was partially excavated less than 2.5m away (square Δ4). This must have followed similar building techniques, ground plan and orientation.



Figure 4.79 Makri II: remains of the ‘stone-axe workshop’ (Souvatzi 2008a, 184, fig. 6.13).

Figure 4.80 Makri II: the large long house found at the periphery of the mound (Efstratiou *et al.* 1998, 9).

Moving to the peripheral sector, a much larger post-framed structure was uncovered (**Fig. 4.80**). Two long rows of postholes, running in an approximately N-S direction, define the mud and timber walls of the building, while a number of internal postholes reflect the existence of a post-framed round structure. The layout of the building is not clear due to later disturbances. It is possible that this was a residential unit, as indicated by the finds and the renovation of the floor surface. Five successive layers of floor plaster were identified, while an infant burial was found under one of the floors (Efstratiou *et al.* 1998, 26; Gouma 2006, 57).

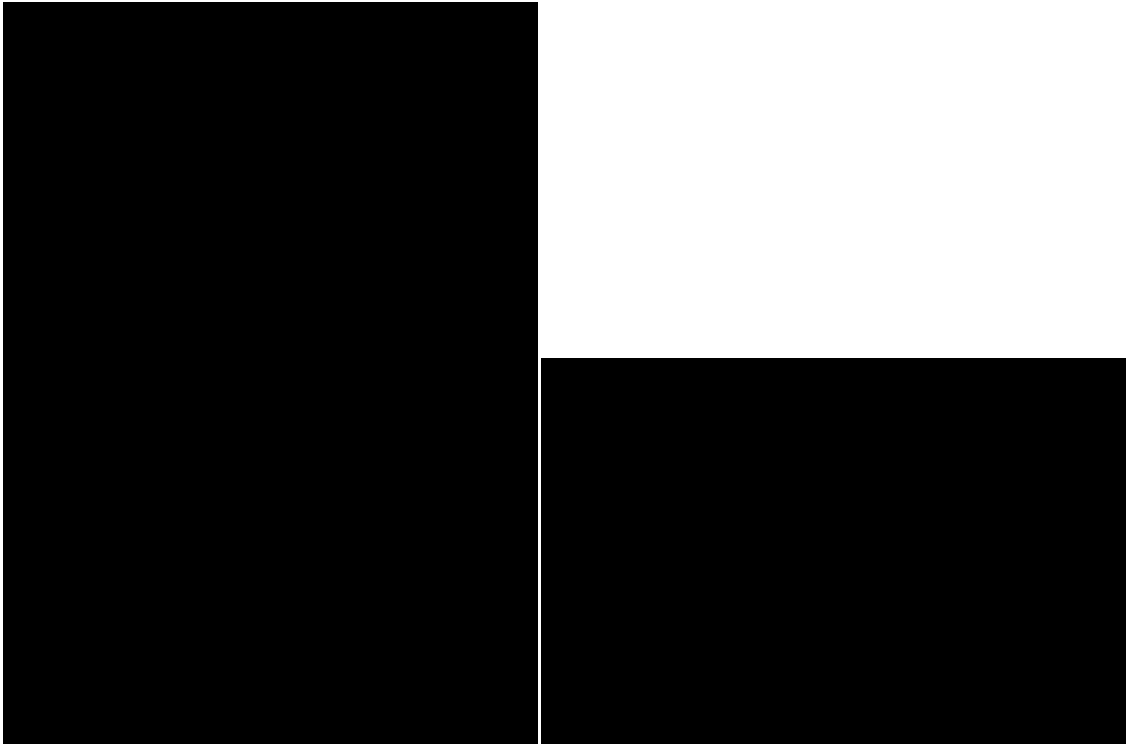


Figure 4.81 Makri II: plan of phase III structures (Gouma 2006, drawing 3).  
Figure 4.82 Makri II: view of the ‘complex area’ (Efstratiou *et al.* 1998, 27, fig. 22).

Phase III is poorly represented in the main residential area. The various floor surfaces and thermal structures excavated were the only remains found. Different techniques were recognised in the construction of floors, while in some cases successive renovations were evident. The fragmentary nature and the poor preservation of these surfaces may suggest that this was an open area for special activities (Gouma 2006, 63). Whatever the case may be, the most impressive architectural features were uncovered at the top of the mound (**Fig. 4.81–4.82**). These include plastered floors, postholes that were occasionally clay-lined, clay installations (platforms and clay-lined pits), half-sunk unfired vases and others (Efstratiou *et al.* 1998, 25). According to the excavators, the main feature of this “complex area” is a sizeable post-framed building, possibly with a second storey, following a NE-SW direction. The dense concentration of various structures and storage vases inside the building has led to the interpretation of the whole area as a special-function complex with a communal rather than a domestic character (Efstratiou *et al.* 1998, 26).

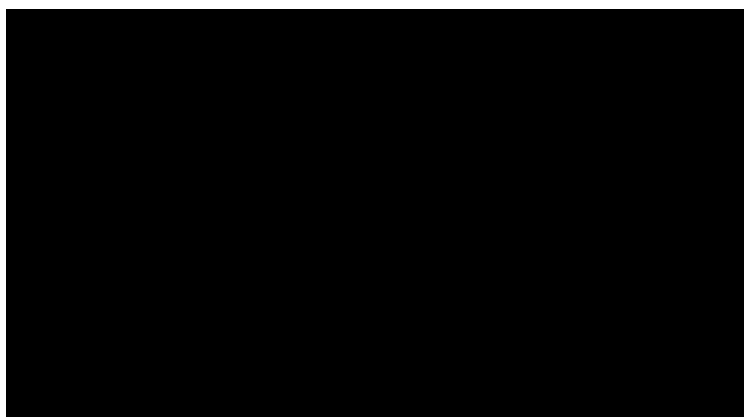


Figure 4.83 Makri II: remains of a post-framed, wattle-and-daub wall (photo: D. Kloukinas, permission: N. Efstratiou).

Although the exact layout of the building is not clear, a double row of postholes seems to define its N wall running in an approximate S/SW-N/NE direction and measuring at least 6.3-6.5m in length. Moving to the south, part of a post-framed wall is remarkably preserved to a length of ca. 1.4m (**Fig. 4.83**). The impressions of regularly distanced upright posts and branches reflect a wattle-and-daub technique. The timber frame was packed with mud containing plant tempers and shells, while both the inner and outer surfaces were coated with a thin finishing plaster. According to the excavators (Efstratiou *et al.* 1998, 25–26), the wall could belong to a post-framed structure encircling a certain section of the so-called “complex area”. However, further to the west and in an almost straight line, another poorly preserved wall part, defined by postholes and a similar packing (containing shells), has been partially uncovered. The same stands for a third smaller fragment to the east<sup>43</sup>. If these different parts co-exist, the presence of a sizeable wall (>5.5m in length) is implicated. Whether these remains belong to the same wall or whether they are associated with the double row of postholes described above is not clear. They could represent the west wall of the building or an internal partition. In any case, a considerable amount of daub fragments were found inside the building area. Many of them bear impressions of branches and stakes or uprights, thus further supporting the application of the wattle-and-daub technique for the construction of the superstructure. The floor is described as fine plastered with many thin layers of reconstruction (Efstratiou *et al.* 1998, 25), while no evidence is provided for the construction of the roof.

The latest habitation phase IV includes the deposits between the topsoil and the first floor at the top sector of the mound. The architectural remains include a well-defined lime-

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<sup>43</sup> These notes are primarily based on my fieldwork in 2010 after the permission of the director of the Neolithic excavations at Makri, Professor N. Efstratiou.

plastered floor that was, at least partially, renovated or reconstructed, as well as a few postholes, several structures (including hearths, ovens and storage installations) and pits. The overall picture is of an area where specific activities were taking place. This assertion is reinforced by the large number of structures and associated finds (including clay whorls, bone needles and stone axes). The restricted number and irregular distribution of postholes may suggest that the area was (partly?) roofed by a light post-framed structure (Gouma 2006, 70). Other architectural features of Makri II include the remains of a stone wall found in square  $\Delta 4$  that follows a NE-SW direction and could have encircled the settlement or part of it. Judging by its massive construction, the excavators argue that this was a dominant spatial-organisational feature that was in use during the Makri II phases I-III (Efstratiou *et al.* 1998, 26–27).

To the north-west of Makri, the settlement of **Paradimi** was for many years considered as the type-site of Neolithic Aegean Thrace covering the span between the late MN/early LN and the FN period. Nevertheless, the small-scale excavations and the publication of the site were heavily biased towards pottery and stratigraphic observations, thus offering limited information on building practices (Andreou *et al.* 1998, 592). The remains found in the 4.5m deposits of the Neolithic period (Paradimi I-IV) point to the existence of post-framed dwellings and the possible application of wattle-and-daub for wall construction. These include superimposed floors, burned wall fragments with timber impressions and a few postholes measuring, in one case, 13cm in diameter and 22cm in depth. The floor surfaces recognised are ca.4-6cm thick and are commonly described as made of clay (Bakalakis & Sakellariou 1981, 14, 18, 21; Theocharis, 1971, 21).

Regarding smaller projects, the excavations at **Proskinites** have revealed a ca.3–3.5m deposit that covers the span between the second half of the 6<sup>th</sup> millennium cal BC and the FN period (Efstratiou 1996, 571). The size of the site is estimated at approximately 8ha, although only two 4x4m trenches were excavated during 1986 and 1988 (Andreou *et al.* 1996, 592; Papadopoulou 2007, 27–31; Triantafyllos 1987). Architectural remains include large rubbish or storage pits, successive clay hearths and thermal structures, as well as stone-/pebble-paved areas. A few plastered surfaces containing gravel were interpreted as the possible floors of roofed areas but no definite walls were found *in situ*. Nevertheless, the identification of a few postholes could support the existence of post-framed dwellings made of timber and mud.

The architectural record of the region is filled in by subtle evidence deriving from the mounds of **Lafrouda** (ca.5300 cal BC) and **Krovili** (ca.5900–5300 cal BC). A small test excavation (6x2m) took place at the upper layers of the former site during the 1960s (Rhomipoulou 1965), while both sites were part of a small drilling project carried out in 2004 (Ammerman *et al.* 2006; 2008). The excavations at Lafrouda yielded burned fragments of straw-tempered clay bearing reed impressions (Rhomipoulou 1965, 462), thus indicating the application of a wattle-and-daub or similar technique. The marsh-like environment near the site supports the availability of reeds for construction (Macclennen *et al.* 1999, 621). In the case of Krovili, the cores have brought to light fragments of successive plastered floors and collapsed material of “mudbrick dwellings” (Ammerman *et al.* 2006, 5; 2008, 144). However, no further description is provided on the exact form or dating of the finds.

## 4.2 Discussion: house types and built forms

The following discussion will revolve around the two basic house types recognised in the architectural record of northern Greece. These include the (semi-)subterranean or pit-dwelling type and the surface-level or above-ground built forms. In the case of the latter category, the focus will turn primarily on certain morphological and spatial features such as approximate dimensions, ground plans and internal partitions. The analysis of the technological characteristics in terms of building materials and techniques will be presented in detail in Chapter 6.

### 4.2.1 Digging up the house: the (semi-)subterranean dwellings

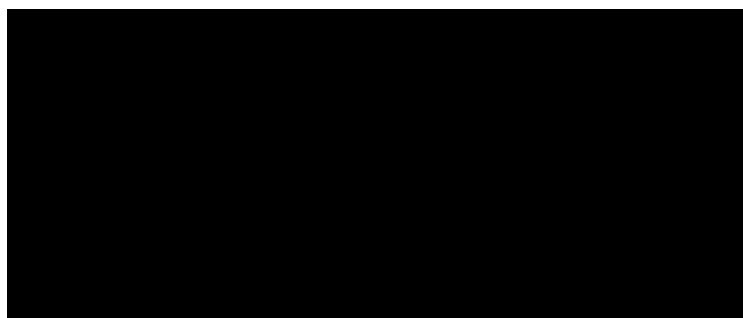
The existence of pit-dwellings during the Neolithic of south-east Europe is a long debated issue. The construction of less substantial living spaces has been supported on the basis of both ethnographic and archaeological data (Buttler 1936; Elia 1982, 140)<sup>44</sup>. It is commonly suggested that similar structures should be attributed to the earliest stages of the Neolithic or the initial stages of occupation at certain settlements (Bailey 2000, 264–7; Pappa 2008, 314 Rafferty 1985, 131). The simplicity of the circular or ellipsoid ground plan has often been thought to reflect the simplicity of the society that made it (Flannery 1972), while the concomitant adoption of rectilinear house-forms is considered to be indicative of the

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<sup>44</sup> Lichter (1993, 24) notes that descriptions in ancient sources (Tacitus and Xiphilinus) and the ethnographic record have influenced the idea of the existence of prehistoric pit-dwellings (see Childe 1949, 77).

emergence of new socio-economic structures and symbolic perceptions (Gheorghiu 2010a, 2; Pappa 2008, 315).

The identification of pit-like features as living spaces based on morphological characteristics presents difficulties. The criteria commonly used (Bryusov 1955; Pappa 2008) refer to the sufficiency of their size to accommodate a certain number of individuals, the presence of relatively vertical walls and flat floors, the existence of postholes and superstructural debris, as well as the presence of floor surfaces, artefact assemblages and facilities pointing to the domestic use of space. In most cases, however, post-depositional disturbances and the secondary use of pits may pose problems of interpretation. It would, therefore, seem that there is no *a priori* reason why certain features should or should not be interpreted as pit-dwellings (Elia 1982, 141). Several authors (e.g. Lichter 1993, 25–6; Tringham 1971, 86) argue that there is no positive evidence for the characterisation of most structures as dwellings, while Sinos (1971, 9–10) suggests that their construction was an efficient way to decrease the amount of vertical wall (**Fig. 4.84**) mainly adopted by communities with a low degree of technological expertise.



**Figure 4.84 Rakosszaba (Hungary): timber framework of a semi-subterranean hut (Buttler 1936, plate 2).**

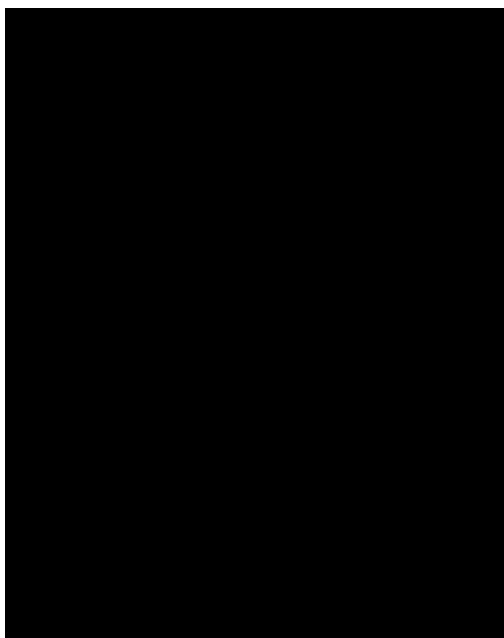
Regarding Greece and the adjacent areas, the existence of (semi-)subterranean huts has been supported for the earlier stages of the EN in Thessaly (Argissa, Sesklo, Soufli Magoula, Achilleion, etc.), as well as for the Starčevo culture of the south Balkans (Elia 1982, 142–8; Bailey 2000, 264–5)<sup>45</sup>. In the case of northern Greece, the excavations at Makriyalos have uncovered an extensive settlement with built forms following exclusively the (semi-)subterranean type. Pits and pit-like features did not constitute supplementary structures at the site's periphery, but represented the main living spaces and ancillary structures that were probably organised in compounds (Pappa 2008, 313). Stemming from

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<sup>45</sup> Further to the south, the sites of Nea Makri (Pantelidou-Gofa 1991) and Dendra (Protonotariou-Deilaki 1992) have offered comparable examples.

the Makriyalos example, a considerable number of sites with (semi-)subterranean structures have been added to the archaeological record of the region. They probably reflect a regional architectural tradition that, although presenting variability, seems to follow similar principles and technical solutions.

Although not unknown in other regions (e.g. Promachon-Topolnica I), the pit-dwelling phenomenon seems to mainly characterise the central Macedonian plains with sites such as Makriyalos, Thermi and Stavroupolis being among the prominent ones. In addition, it is primarily associated with extended rather than mound settlements. In terms of chronological patterns, the long-lasting idea that pit-dwellings were only built during the earliest stages of the Neolithic can be disputed. Their history extends from the EN/MN (e.g. Paliambela, Korinos, Liti I and III, Apsalos and Mikri Volvi I) well into the LN I (Makriyalos I, Stavroupolis, Thermi B, Zagliveri) and LN II (Makriyalos IIa) periods<sup>46</sup>. Similarly, the presence of pit-dwellings is not restricted to the initial occupation of a site, thus being related to temporary camps, and is not necessarily related to more mobile lifestyles (Halstead 2005)<sup>47</sup>. Finally, the co-existence with above-ground structures could be sustained in certain cases (e.g. Korinos, Apsalos and Mikri Volvi I), although the general trend is the simultaneous replacement of this house type.



**Figure 4.85 Divostin I (Serbia): reconstruction of an ‘earth cabin’ (Bogdanović 1988, 75, fig. 5.24).**

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<sup>46</sup> Recent research at the sites of Chalki I, Galene and Makrichori Magoula I indicates a similar situation in Thessaly (Batzelas 2006, 33)

<sup>47</sup> The faunal evidence from Makriyalos indicates year-round occupation without, however, precluding a significant degree of mobility for some of the inhabitants (Halstead 2005, 48).

The morphology of pit-dwellings does not present a strictly defined set of characteristics. The most widespread ground plans are the circular or ellipsoid ones (3-8m in diameter), although irregular and almost rectangular ground plans (e.g. Korinos and Zagliveri) are also evident. These are commonly accompanied by smaller pits or ancillary structures that are found either adjacent or close by, while sometimes they seem to form groups or compounds. The pits are thought to represent the lower part of the structures covering approximately 1/3 of the total height. Postholes, traces of floor paving and internal features are sporadically found at their periphery or interior. The occasional retrieval of burned debris may point to a mud and timber superstructure following a wattle-and-daub or a comparable technique (**Fig. 4.85**). At the site of Thermi B the use of stone for the foundation or reinforcement of the exterior walls could also be supported, while at Korinos the presence of unworked stone and mudbricks may indicate the parallel use of alternative techniques. In the case of Promachon-Topolnica, Makriyalos, Korinos and possibly elsewhere, a different reconstruction can be supported. The morphology of certain pits implies that these may have comprised the underground part of the dwelling. This was probably used for storage rather than as a living space and was 'roofed' with a wooden floor structuring the actual, ground-level living space of the structure. This technical solution for gaining interior space decreases significantly the distance of semi-subterranean features from the buildings that will be discussed below.

#### **4.2.2 Building above ground: preliminary notes**

The buildings examined in this section do not constitute a clearly defined category. The term 'above-ground' is primarily used as opposed to the (semi-)subterranean house type. In any case, ground-level or above-ground dwellings are the most recognisable house forms in northern Greece and the adjacent areas. They appear since the very beginnings of the Neolithic period in sites including Nea Nikomedeia, Giannitsa B, Axos A, Kremastos and others, and they gradually replace (semi-)subterranean buildings wherever identified.

In terms of ground plans, rectangular or roughly square structures are by far the most common in all regions and chronological phases. The geometry of the right angle and the rectangular plan seems to dominate the symbolic perception of dwelt space among the sedentary communities of northern Greece (see Gheorghiu 2010, 2)<sup>48</sup>. Nevertheless,

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<sup>48</sup> Following Lichter (1993, 32) and Shaffer (1983, 416), it is noted that the actual form of buildings was more commonly asymmetrical trapezoidal rather than perfectly rectangular, and that their corners were often rounded.



diverse ground plans are not entirely absent from the regional record. Traces of ellipsoid structures in the form of foundation trenches and postholes have been reported at the sites of Dispilio, Makriyalos IIb, Kleitos II, Vassilara Rachi and, probably, Trilofos. A trapezoidal building has been identified at FN Olynthos<sup>49</sup>, while apsidal dwellings have been excavated at Arkadikos.

Apsidal ground plans in south-east Europe seem to appear from the final stages of the Neolithic period, while they commonly occur from the EBA onwards (Warner 1979). Evidence derives from a number of sites, including Vučedol in Croatia, Karanovo VII in Bulgaria and Sitagroi V, while earlier examples are provided by FN Thessalian sites belonging to the so-called 'Rachmani culture'. The identification of a series of adequately preserved apsidal dwellings at Arkadikos and, presumably, Limenaria pushes the appearance of the house type back into the LN period. What is more, the possible erection of similar forms during the FN/early EBA period in Arkadikos and the neighbouring site of Sitagroi may suggest a localised architectural tradition in the east part of the Drama plain and the island of Thassos.

The great majority of dwellings are free-standing, separated by more or less sizeable open areas or lanes, while, in certain cases (e.g. Servia I-II and Limenaria), ancillary lean-to structures have been reported. The agglomeration of rooms at FN Olynthos (Houses B and C) seems to be an exception that corresponds to a spatial arrangement otherwise unfamiliar north of Thessaly (Mould & Wardle 2000b, 112)<sup>50</sup>. House 4 at Dikili-Tash II may also represent an unusual arrangement. As far as the adequately preserved remains are concerned, building size commonly ranges between ca.20m<sup>2</sup> and 65m<sup>2</sup>. Smaller structures (e.g. Varenemoui Gouloi and Olynthos House A) and more sizeable buildings, ranging between ca. 80m<sup>2</sup> and 120/125m<sup>2</sup> (or even 160m<sup>2</sup> in the case of Nea Nikomedeia structure 4/1) are also reported. In general terms, these dimensions seem to be comparable to the average range of dwellings from the neighbouring regions (Elia 1982; Lichter 1993; Souvatzi 2008b, 18; Tringham 1971, 86).

The internal arrangements are not always accessible due to the partial excavation or poor preservation of architectural remains. Judging by the better published examples, houses may be single-spaced, double-roomed, tripartite or otherwise partitioned. In certain cases

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<sup>49</sup> Similar ground plans of stone-founded dwellings have been uncovered at the settlement of Durankulak

<sup>50</sup> In the Neolithic/Chalcolithic period of the Balkan area agglomerations of rooms or 'house complexes' have been excavated at Yassatepe (Bulgaria), Parța (Romania) and Gorsza (Hungary), while the exceptional settlement of Polyanitsa (Bulgaria) presents similar characteristics (Lichter 1993, 34).

(Servia IV, Nea Nikomedeia, Makriyalos IIb, Arkadikos, Paliambela and others), the long walls were intersected by cross walls dividing space into two rooms of roughly equal or unequal dimensions<sup>51</sup>. These were commonly identified in the form of ditches/foundation trenches or postholes. A tripartite division created by a second cross wall is known from FN/EBA Sitagroi. In addition, at Nea Nikomedeia (Group 4/structure 2 and Group 9/structure 1) cross walls divided the interior space into three compartments by forming a corridor around two of the sides. The presence of central rows of postholes following the long sides has been reported in FN Mandalo, while the presence of two central rows of postholes is indicated by examples from MN/LN Servia. Internal postholes and other features have been identified in other sites (including Mavropigi, Axos A and Thermi B) but the picture provided is less coherent.

A considerable number of buildings seem to be single-roomed (sites include MN Servia, Nea Nikomedeia, Stavroupolis Ib, Dikili Tash II and others). Yet again, internal space could have been partitioned with features that are poorly preserved or are less visible archaeologically. Besides, the application of different flooring techniques defining different parts of the building's interior has been confirmed in the case of Servia. As for the possible existence of second stories or lofts, this has been occasionally supported on the basis of sizeable postholes or buttresses and the identification of artefacts that seem to have fallen from above.

The available data on ground plans, building size and internal arrangements have not led to the identification of clearly observable geographical or chronological patterns. Size fluctuations are evident throughout the period under study. The tendency for a gradual increase in the size or the length of buildings supported for south-east Europe (Lichter 1993, 38–9) cannot be confirmed (e.g. Mould & Wardle 2000b, 103). Information from a number of more or less extensively excavated settlements points to both inter- and intra-site variability in building dimensions and spatial arrangements. In addition, the number of rooms, partitions and other internal features (such as thermal structures or storage facilities) is not necessarily proportional to the building size. Small-sized buildings may be partitioned and can contain a variety of structures, while larger ones may be single-spaced

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<sup>51</sup> When the room size is unequal (e.g. Makriyalos IIb), the ground plan may take the form of the so-called 'megaron type' (a porch and a main room that are axially entered). The term, referring initially to the central units of Late Bronze Age palaces, has gradually come to encompass a great variety of built forms (Lichter 1993, 23–4; Warner 1979). Therefore, it is considered anachronistic and will not be used as a valid category in the present study.

with few internal features. According to Souvatzi (2008b, 20), this may imply that the architectural properties examined did not play an important role in household spatial or social definition. Nevertheless, it is noted that the more sizeable structures have mainly been identified in the area west of river Axios (sites include Kleitos I, Mavropigi, Nea Nikomedeia and Polyplatanos). Moreover, the fact that most ‘non-rectangular’ ground plans derive from LN and FN sites may imply a higher degree of experimentation and the adoption of new built forms during the later stages of the Neolithic.

The construction techniques recognised in northern Greek assemblages will be described in detail in the following chapters. Here it should be emphasised that there is a plurality of ways in which Neolithic builders chose to shape their living spaces. Although the presence of a certain ‘architectural vocabulary’ comprising sets of materials, techniques and architectural principles, may be supported, different degrees of homogeneity and/or diversity are evident at different scales of analysis. Regional, sub-regional and intra-community variability, probably depending on diverse environmental settings, raw material availability and socio-economic factors (Rapoport 1969), can be observed. The identification of technological variability and/or homogeneity at the site-specific level will be the focus of the following chapter examining the architectural remains from the Neolithic settlement of Avgi (Kastoria, Greece).

## 5. Case study: the Neolithic settlement of Avgi (Kastoria, Greece)



Figure 5.1 View of the east, central and west sectors of the excavations at Neolithic Avgi (Avgi excavations archive, permission: G. Stratouli).

### 5.1 General information about the site

#### 5.1.1 History of research

The site of Avgi was initially traced during the early 1990s as a result of non-systematic surface surveys conducted by the Dispilio excavation team (Touloumis 2002, 93). The widespread distribution of Neolithic material in an area of ca. 5-6ha (Stratouli 2007, 601) pointed to the existence of a significant settlement 500m north of modern Avgi (**Fig. 5.1, 5.2**). During the early 2000s the first small soundings were carried out at the site, while in the subsequent years (2002-2004), rescue excavations conducted by the IZ EPIKA<sup>52</sup> under the direction of Dr G. Stratouli uncovered an area of approximately 870m<sup>2</sup> (Stratouli 2004; 2011a–c). At the same time, geomagnetic surveys in an area of 2.36ha (Tsokas *et al.* 2007) and test trenches at the periphery of the site contributed to the identification of the settlement's boundaries (**Fig. 5.3**). Throughout this period, the main research objective was the reconstruction of the site's 'biography', that is the life-history of its individual architectural features and the investigation of households as the basic units of social organisation (Stratouli 2006, 666; 2013). During the following period (2005-2008), the excavation became more systematic covering a total area of ca. 0.2ha, while the preservation of certain parts of the site was added to the primary concerns of the project. A large group of field-archaeologists and research associates were gradually engaged in the

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<sup>52</sup> IZ'Ephorate of Prehistoric and Classical Antiquities (Ministry of Culture).

excavation and the study of the material. Study seasons focus on the analysis of various artefact categories, structural remains, faunal and micro-faunal assemblages, archaeobotanical and charcoal remains, as well as on the study of the site's geology and micromorphology. Although most of the studies are still in progress, the preliminary results have already offered fruitful insights into different aspects of the Neolithic community.



Figure 5.2 The modern village and the Neolithic settlement of Avgi (Kastoria, Greece).

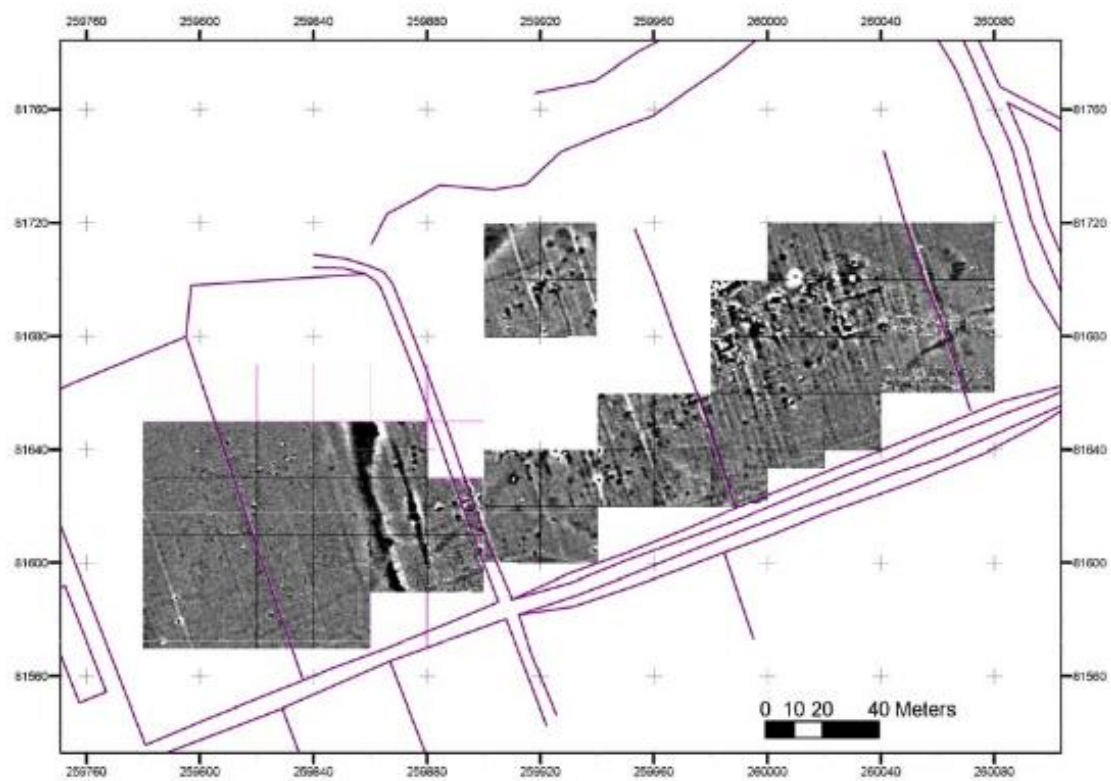


Figure 5.3 Geophysical map of the Neolithic settlement of Avgi (Tsokas *et al.* 2004, 18, fig. 3.4).



### 5.1.2 Site location and environment

Neolithic Avgi is situated 10km south-west of Lake Orestias and is developed on a low, oblong terrace surrounded by an eroded hilly terrain, rich in argillaceous formations (Stratouli 2006, 664 – **Fig. 5.4**). The site was bounded to the north and south by two streams that have deposited alluvial sediments forming three discrete river terraces during the Late Quaternary (Krachtopoulou 2009). The Neolithic settlement was founded on the oldest terrace. Geoarchaeological investigations indicated that the visibility of the wider area's surface is compromised by soil erosion and/or alluvial and colluvial sedimentation. Moreover, the archaeological deposits have been affected by post-occupational erosion attributed to the changes of stream-courses and modern cultivation (Krachtopoulou 2009).



Figure 5.4 View of Neolithic Avgi and the surrounding environment from north-east (Avgi excavations archive, permission: G. Stratouli).

The preliminary results of charcoal analysis (Ntinou 2008) have offered valuable evidence for the area's past vegetation. The spectrum of species identified indicates that oak (*Quercus* sp.) woodlands with deciduous trees (including *Carpinus*) were dominant in the immediate environment of the settlement, while willow/poplar (*Salix/Populus*), ash (*Fraxinus* sp.), hazel (*Corylus avellana*) and elm (*Ulmus*) were growing near the streams (Ntinou 2008; Stratouli 2004, 110; Stratouli & Bekiaris 2011, 9). Forests of black pine (*Pinus nigra*) and fir (*Abies* sp.) were present in higher altitudes, whereas the transitional zones were probably dominated by mixed deciduous and coniferous woodlands. These results are, by and large, consistent with the charcoal analysis of the nearby Dispilio sample (Ntinou & Badal 2000;

Ntinou 2002; 2010), as well as with the palynological investigations at Lake Orestias (Bottema 1974; Kouli 2002, 308–10). At the site of Dispilio, the vegetation remained, more or less, similar throughout the period under study, with the possible exception of the later stages of Neolithic occupation when human activity could have resulted in a woodland decrease (Kouli 2002, 310). Whether this was the case for Neolithic Avgi, remains to be investigated.

### 5.1.3 Human occupation in the wider area

The environmental and topographical background of the Kastoria basin seems to have offered favourable conditions for habitation. This is supported by the variability of environmental settings (alluvial plains, mountainous and semi-mountainous areas), the rich hydrography (Lake Orestias, river Aliakmon and its tributaries) and the availability of communication routes. The relatively poor Neolithic record of the region is mainly attributed to the lack of systematic archaeological surveys<sup>53</sup> and geological investigations aiming at locating those sites that could have been eroded or buried under later alluvial or colluvial deposits (Tsouggaris 1999, 19; Tsouggaris *et al.* 2004, 625). During the last decades, however, a number of rescue excavations and the reassessment of the research objectives have contributed to the emergence of a less compartmentalised picture. Apart from the already mentioned sites of Dispilio and Kolokinthou, traits of Neolithic occupation have been identified at the cave of Koromilia (Tsouggaris 2006, 657), the site of Valtos near Kolokinthou (Stratouli 2011a) and Kastro Nestoriou at an altitude exceeding 900m (Tsouggaris 1999, 25–26). Moreover, Neolithic finds are reported from a locale near the entrance of Kastoria (Touloumis 2002, 93–4), as well as from the sites of Krepeni (locale ‘Giole’) and ancient Vatinna (Tsouggaris 2006, 644; Tsouggaris *et al.* 2004, 625). It seems that Neolithic Avgi could have participated in a rich network comprising settlements and peripheral sites located in diverse environmental settings.

### 5.1.4 Notes on chronology and stratigraphy

The chronology of the site has so far been determined by a series of 12 radiocarbon dates deriving from charred wood samples (**Table 5.1**). According to the calibrated samples, the initial occupation can be traced to the late MN period (ca. 5600 cal BC), while the site seems to have been abandoned by the end of the LN II period (ca. 4500 cal BC). The

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<sup>53</sup> The investigations of Keramopoulos during the 1940s were only followed 50 years later by the research at the lake-side settlement of Dispilio (Chourmouziadis 2002).

relative chronology of the site, based primarily on pottery, is in accordance with the aforementioned results. Three major occupational phases, each including various episodes, have been identified (**Table 5.2**). The earliest Avgi I phase was founded on the virgin soil and covers the period between the late MN and the end of the LN I period (5600/5500-5000/4900 cal BC). The characteristic features of this horizon are the remains of post-framed structures that were destroyed by fire. These are preserved in the form of dense concentrations of ceramified daub fragments and occasional postholes. In addition, numerous artefacts, domestic structures (including hearths, ovens and pits) and food remains were excavated, thus confirming the intensive use of open areas for multiple activities (Stratouli in press; Stratouli *et al.* in press).

Trench	Context	Years BP	cal BC (2 $\sigma$ )	Phase
131.4	(?), east sector	6509 $\pm$ 76	5620–5320	Avgi I
254.1	destruction layer, Building 2a	6660 $\pm$ 40	5656–5511	Avgi I
284.3	Stratum 2, west sector	6130 $\pm$ 40	5211–4961	Avgi I-II
282.2	destruction layer, Building 5	6340 $\pm$ 50	5470–5220	Avgi I
139.2	destruction layer, Building 1	6310 $\pm$ 35	5357–5218	Avgi I
139.2	posthole, Building 1	6340 $\pm$ 30	5461–5222	Avgi I
224.3	posthole, Building 2 (?)	6430 $\pm$ 90	5550–5220	Avgi I
254.1	floor level (?), Building 2a	6320 $\pm$ 30	5359–5222	Avgi I
253.2–223.4	pit 1, Area 2	5925 $\pm$ 40	4927–4711	Avgi II-III
281.4–282.3	destruction layer, Building 5	6220 $\pm$ 25	5296–5069	Avgi I
284.1	Stratum 2, west sector	5710 $\pm$ 70	4720–4370	Avgi III
283.3	Stratum 2-3, west sector	6210 $\pm$ 80	5340–4950	Avgi I-II

**Table 5.1 Radiocarbon dates from Neolithic Avgi.**

Phase	Chronological period	Years cal BC
Avgi I	MN – LN I	ca. 5650–5000/4900
Avgi II	LN I – LN II	ca. 5000/4900–4700
Avgi III	LN II	ca. 4700–4500

**Table 5.2 Chronological phases of Neolithic Avgi (after Stratouli 2013).**

The following horizon (Avgi II) consists of an extended deposit (Stratum 2) that covers the Avgi I remains (Stratouli in press). It is mainly identified at the West Sector of the site and



seems to span the earliest stages of the 5<sup>th</sup> millennium. No definite building remains have been associated with this phase. However, the excavation of a considerable number of domestic structures, artefacts and refuse material indicates intense human activity. The later Avgi III phase has been highly eroded and disturbed by modern ploughing. It is mainly documented at the West Sector of the site in the form of negative imprints cutting into the underlying strata. The architectural remains comprise various types of cuttings, such as pits or pit-like features, foundation trenches and postholes indicating the presence of sizeable post-framed dwellings, as well as ditches or trenches of diverse functions. Moreover, a system of double ditches enclosing the habitation area seems to belong to this phase. Nevertheless, the contemporaneity of the aforementioned features is doubtful, as the Avgi III horizon probably incorporates several episodes dated to the later Neolithic occupation of the site.

### **5.1.5 Habitation and intra-site organisation**

Neolithic Avgi belongs to the flat-extended type of sites, although presenting certain characteristics that differentiate it from other extended sites in northern Greece and the adjacent regions. Three sectors (West, East and Central) have been excavated at the probable residential centre of the settlement, while another area (Area 8) has been investigated further to the east (**Fig. 5.5**). In addition, research at the limits of the site has shown that the LN II settlement (Avgi III), or at least part of it, was enclosed or bounded by a wide (>5.5m) and deep (ca. 3m) U-shaped ditch (Ditch A) defining a settlement area of approximately 5-5.5ha. Part of a second, relatively narrow (ca. 2.60m) and shallow (ca. 1.20m), cutting (Ditch B) was identified 10m to the east of Ditch A (Stratouli 2007; 2013).

During the earlier building horizon of the site (Avgi I), buildings had rectangular ground plans and were essentially free-standing, separated by each other by highly interactive open areas (**Fig. 5.6, 5.8**). These do not present the same orientation, although they generally seem to follow either a N-S or W-E axis. At the West Sector of the site, buildings 2a and 5 are separated by extended open areas characterised as ‘yards’. The presence of thermal structures (hearths and ovens of various types), as well as concentrations of tools, other artefact categories and refuse material indicates that certain domestic and non-domestic activities were taking place in the open. This is further reinforced by the scarcity of similar structures inside the dwellings. In addition, the fact that there are no clear archaeologically visible demarcations of the outdoor spaces may imply a certain degree of household ‘openness’ and sharing.



Figure 5.5 The sectors of the excavation at the Neolithic settlement of Avgi (Avgi excavations archive, permission: G. Stratouli).

The Central and East Sectors of the site provide a slightly different picture in terms of spatial organisation and the built:unbuilt space ratio. The remains of at least three buildings, namely Buildings 1, 3 and 7, are placed close to each other, leaving less sizeable open areas between them (Stratouli & Bekiaris 2011, 8). It seems that different attitudes towards space, potentially linked to diverse expressions of household organisation, could be traced. Yet again, one should bear in mind that not all buildings or structures belonging to this horizon were necessarily in use at the same time. It is argued by the excavator (Stratouli 2013) that the Avgi I horizon encompasses at least four successive building episodes. In terms of house replacement practices, horizontal displacement and partial overlapping can be supported at the East Sector of the site.



Figure 5.6 Building remains of Avgi I at the west (left), central and east (right) sectors of the excavation (Avgi excavations archive, permission: G. Stratouli).

The following phase (Avgi II) has not offered concrete evidence about building construction and the organisation of the settlement space. Certain activity areas are indicated by concentrations of artefacts and structures of various types. The question to be answered is whether these areas are linked with households that remain to be found, thus supporting the horizontal shift of the settlement's residential centre, or whether they reflect a total transformation of the site's character. Whatever the case may be, structures were occasionally built on top of the Avgi I rubble, rendering it possible that the older building remains were still visible or 'remembered' (see Tringham 2005, 108). In addition, the identification of a 'burial ground' comprising at least 10 burial urns at the Central Sector of the site supports the transformation of human activity in the excavated area (Stratouli *et al.* 2010; 2013).

The latest documented phase (Avgi III) comprises all the LN II habitation episodes that have been eroded or disturbed by modern ploughing (**Fig. 5.7, 5.8**). The only surviving evidence is provided by various features cutting through earlier deposits and representing the below-the-ground parts of structures. Among these, the rectangular ground plans of two neighbouring buildings have been identified in the form of foundation trenches, postholes and post-pits (Stratouli *in press*). The sharing of a common, roughly N-S, orientation and the parallel arrangement of Buildings 2b and 6 indicate significant changes in the organisation of the built environment. The open spaces seem to be more restricted in size, while the increased autonomy of structures is emphasised by the presence of trenches functioning as spatial boundaries between certain buildings or activity areas, and, possibly, serving for the better run-off of waters (Stratouli 2013; Stratouli & Bekiaris 2011, 8–9). These are identified in several parts of the excavation following the same N-S orientation, thus supporting a predetermined spatial organisational system. Traces of another structure in the form of an elliptical foundation trench were also uncovered at the West Sector of the site. This was attributed to the latest stage of the LN II occupation, probably postdating the rectangular buildings.



Figure 5.7 Building remains of Avgi III at the West Sector of the excavation (Avgi excavations archive, permission: G. Stratouli).

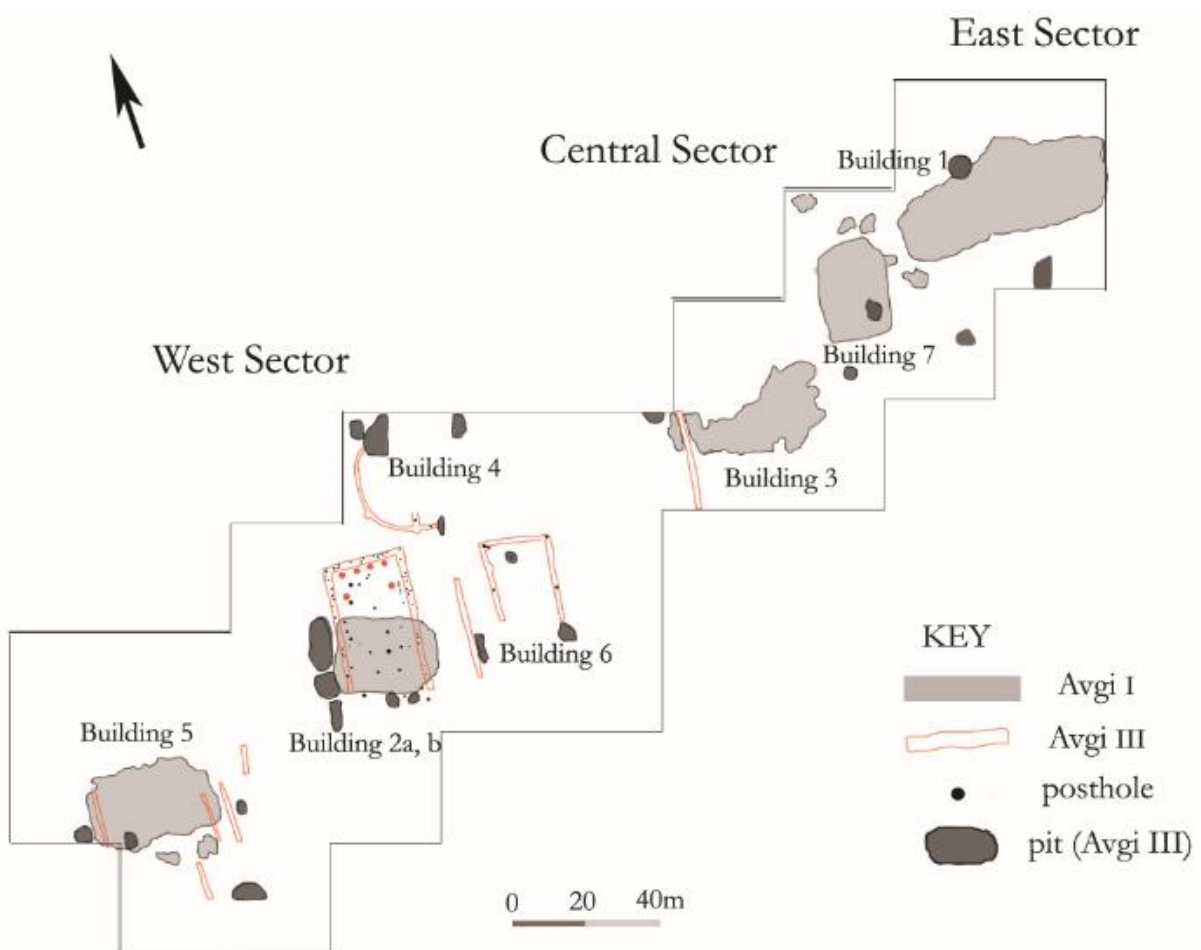


Figure 5.8 General plan of Avgi I and III building remains.



### 5.1.6 Material culture and subsistence

Preliminary analyses of the Avgi assemblage suggest that the site's material culture presents a lot of affinities with other MN/LN settlements in the wider region. Pottery comprises the basic categories documented in contemporary sites, including black-topped ware, black burnished and red burnished ware, brown burnished vessels and coarse ware associated with cooking and storing activities (**Fig. 5.9**). Among the types documented, bowls and jars of various sizes and forms are dominant. Other types include cups, storage vessels, plateaus and other cooking pots. The decoration repertoire comprises incisions and dotted impressions (that are occasionally combined), rippled decoration, as well as various elements such as lugs or knobs. Painted decoration with linear or geometric motifs is also present in small proportions.

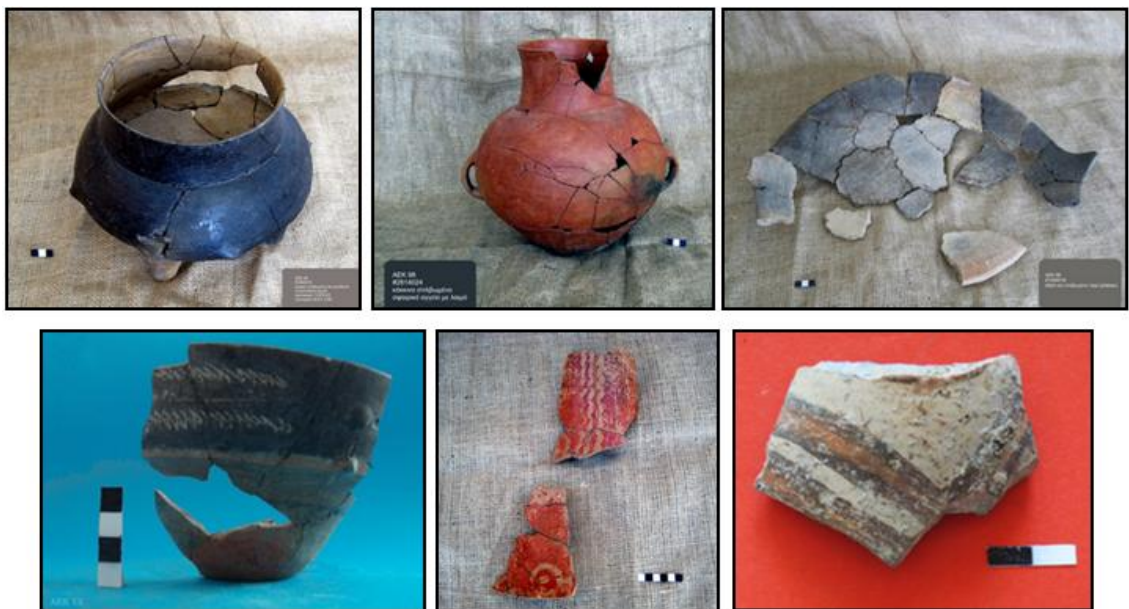


Figure 5.9 Neolithic pottery from Avgi (Katsikaridis 2012).

The stone assemblage consists of a large number of chipped and ground stone artefacts. The majority of chipped stone tools are made of chert, with the exception of a few obsidian pieces (Andreassen 2008; 2011). The activities reflected, including cutting, harvesting, scraping and perforating, are compatible with the permanent, agricultural character of the site. Technological and tool types include retouched blades, blade or flake-based borers, scrapers, flakes with simple retouch on one edge, as well as carefully shaped bifacial arrow points. There seems to be a heavy reliance on prismatic blades that were imported as ready-made tools or prepared cores. However, some *ad hoc* knapping with limited technical investment was also taking place within the settlement. Certain samples

exhibiting 'sickle gloss' along the cutting edges point to the intensive cutting of plant materials and an emphasis on cereal exploitation.

The study of the ground stone industry (Bekiaris 2012) indicates that grinding/abrasive tools, commonly related to food processing activities, constitute the dominant category. Edge tools, such as axes or chisels made mainly of serpentinite, percussive tools and various stone artefacts (such as mace-heads, ornaments, vessels, figurines, sling-shot bullets and others) supplement the ground stone industry repertoire. The presence of debitage and unfinished or redesigned specimens indicates that the secondary processing of tools was taking place within the settlement. There is a noteworthy contrast between the limited presence of ground stone in building collapse deposits and the numerous artefacts retrieved in open areas. Certain tools, such as grinders and grinding slabs are often associated with thermal structures, while a considerable number of samples were found inside the Avgi III pits. The remaining categories of material culture are comparable to the finds from other settlements in northern Greece and beyond. They include various ceramic objects, including figurines, clay stamps and spindle whorls, as well as bone tools and bone or shell ornaments. Most of the latter categories have not yet been studied.

Information about the subsistence economy derives mainly from the preliminary analyses of the archaeobotanical and faunal assemblages. Although the study of animal bones is still at its initial stage, it is clear that the majority of bone fragments belong to domesticates, dominated by sheep/goat and followed by pig and cattle. Only a few specimens of wild game and carnivores have been identified (Tzevelekidi 2013). The basic plant species represented are cereals, such as wheat (*Triticum monococcum*, *Triticum dicoccum*, *Triticum aestivum/durum*) and barley (*Hordeum vulgare*), legumes, including bitter vetch (*Vicia ervilia* L.), grass pea (*Lathyrus sativus/cicera*) and lentils (*Lens* sp.), as well as various fruits or nuts. The context of the samples under study seems to reflect small-scale, intensive agricultural practices near the settlement area (Margariti 2007). The existence of mixed crops can be supported by the co-existence of *Triticum monococcum* and *dicoccum* in a number of samples, while the presence of certain weeds (*Buglossoides arvensis* and *Lolium temulentum*) indicates that autumn was the probable sowing period for cereals. Evidence for small-scale storage of grains ready for consumption derives from Buildings 1, 2a and 5 (Margariti 2007, 7–8). The possible identification of house mouse (*Mus domesticus*) in the microfaunal record would reinforce the storage of agricultural products inside dwellings (Papayiannis 2008; pers. comm.). Finally, the presence of cereal processing by-products (primarily chaff) in pits and elsewhere could be linked to their use as fuel or construction material.

## 5.2 Avgi I: analysis of the building remains

The excavations at the Neolithic settlement of Avgi have yielded a massive amount of fire-hardened daub fragments that were preserved due to the conflagration of structures. These are mainly concentrated in rubble areas demarcating the presence of buildings, apparently dwellings, and associated domestic structures. The material under study derives from the collapse areas of three buildings belonging to the Avgi I horizon, namely Building 2a, Building 5 and Building 7. They represent the better excavated and studied buildings of the site so far. A notably large sample amounting to a total of ca.1300kg was examined by the author during a six-month period between the years 2010 and 2012 (**Fig. 5.10**). Approximately 598.5kg of daub, or 2302 sizeable ( $\geq 8\text{cm}$ ) samples, were recorded in detail, while another 701.75kg of smaller-sized fragments were also included in the analysis. The results of their study were juxtaposed to other available architectural information, such as postholes and floor surfaces.

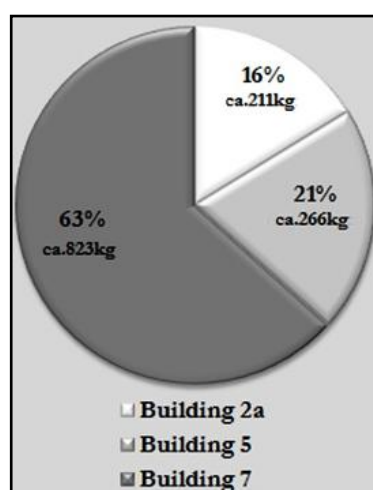


Figure 5.10 Proportions of rubble weight recorded per building.

### 5.2.1 Methodology: from the field to the lab

#### Methodological considerations

The methodology followed in the present analysis is highly reliant on the limitations and the methods applied during the excavation process. These, in turn, are by and large based on the research objectives and the changing character of the project. The excavation of building remains followed certain steps, including the uncovering of the rubble and the identification of its spread, as well as the gradual removal of the fire-hardened daub remains so as to reach the floor level. The overlaying deposits were carefully excavated and the exposed surface of the rubble was photographed and digitally drawn. The next step

involved the removal of small-sized and fragile fragments and the dissolved material in between the more solid parts of the rubble. Daub fragments of larger dimensions were left *in situ* as their size rendered them less liable to post-depositional displacement from what could be their initial position after the building's collapse (see Shaffer 1983). These were once again photographed and drawn before being eventually removed. The whole quantity of the collected daub, amounting to several tonnes, was kept and stored at the excavation's facilities for further analysis.

As for the removal and recording techniques, a micro-grid of 1x1m in size was used during the excavation of both Buildings 5 and 7. This practice has contributed to reconstructing the spatial distribution of the collected material. Its usefulness has been acknowledged in other projects aiming at studying the technological aspects of house construction. The squares of the micro-grid form collection units that allow the production of distribution maps for the possible identification of wall courses, openings and other features relevant to wall construction (Shaffer 1983, 152). In the case of Avgi, no unique co-ordinates or information about the direction of each piece were recorded, with the exception of very few characteristic samples. Nevertheless, detailed field notes and a rich photographic archive, providing useful information about the nature and the initial position of the collected material, were available. The early excavation of Building 2a did not follow the same micro-grid methodology due to the initial rescue character of the excavation. As a result, the location of the analysed samples can only be traced at the trench or excavation unit level. Another issue, referring mainly to Buildings 5 and 7, is that not all parts of the rubble were excavated to the floor level. Concentrations of burned daub are left in position, either because the excavation is still in progress or because the recent objectives of the project included the conservation of parts of the rubble. The study of these remains was conducted by the author in the field and significantly supplemented the results of the following analysis.

It becomes prominent that the methodology applied was neither identical for the three structures under study nor exclusively targeted to facilitate a technological study of the remains. The former statement has certain inferences for the comparative analysis of the material, while the latter summarises some of the restrictions already mentioned. Nevertheless, the material provides a fruitful ground to test the suitability of the methodology proposed, not only in assemblages excavated with a pre-scheduled and targeted methodology but also when methods deviate from what are considered to be the ideal ones. Besides, this seems to be the norm for the majority of past projects and rescue



excavations that provide the bulk of archaeological evidence in the Neolithic record of northern Greece.

### **The macroscopic and microscopic analyses**

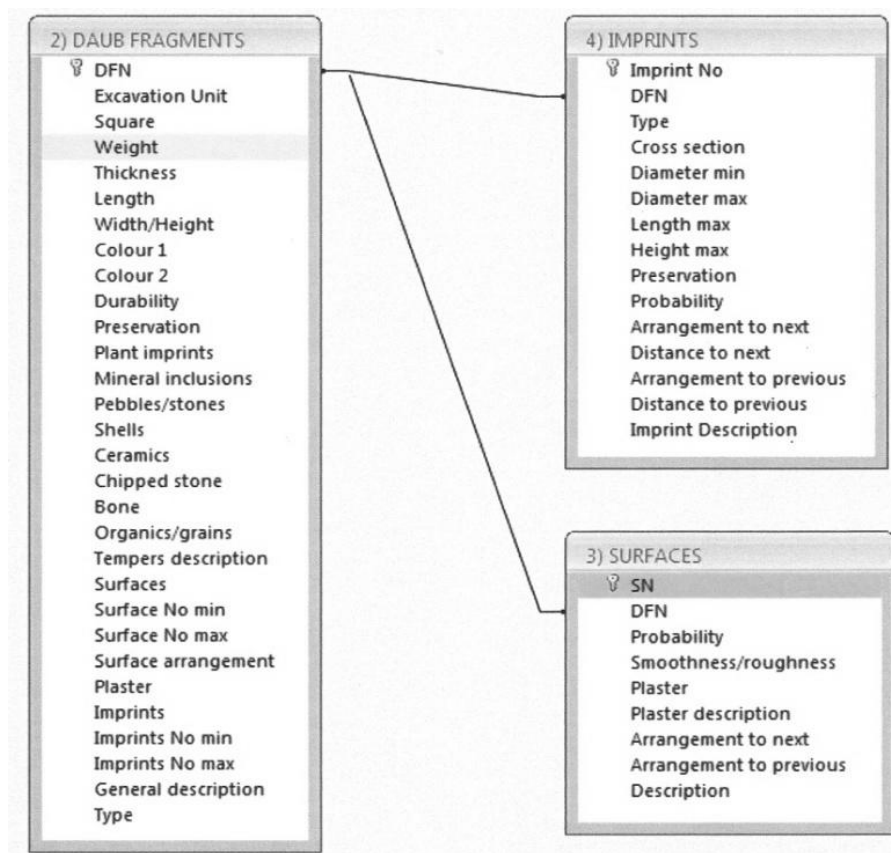
Following the collection and storing of the material, an efficient methodology for the study of the daub fragments had to be applied. The limited amount of relevant studies and the nature of the material, presenting diverse characteristics in terms of morphology and preservation status from site to site, precluded the application of a readily available, standardised methodology. Therefore, the creation of a basic methodological tool adapted to the specific assemblage, was one of the primary concerns of the present research. The first stage of this attempt was a short-term pilot study including the macroscopic analysis of material deriving primarily from Building 5. The observations made resulted in the formation of a basic typology and a database set that was appropriate for the detailed recording of all available evidence.

Among the preliminary conclusions of the pilot study was that not all samples offer equal amounts of information. Smaller sized samples are rarely well preserved and the evidence they provide is quite compartmentalised. Most of the critical information could be obtained by larger fragments. Following the observations made on the material itself, as well as the suggestions of previous studies (Shaffer 1983; Stevanović 1996), a criterion of 8cm was chosen to select the fragments that were analysed in greater detail. It was decided to create one database recording basic information for all the collected material, and a second one for those samples with at least one of their dimensions exceeding 8cm.

The main part of the analysis consists of three stages, including the macroscopic study and the creation of a general database per excavation unit or micro-grid square, the recording of the evidence deriving from the larger fragments ( $\geq 8\text{cm}$ ) in a separate, more detailed database, and the sampling of characteristic pieces for microscopic analysis. The former stage was highly based on a more or less flexible typology that will be described below. The general database per excavation unit or micro-grid square records basic information on the material collected. Fields include the total weight of fragments per type, the number of fragments belonging to different size classes ( $< 8\text{cm}$  and  $< 5\text{cm}$ ) and the dimensions of timber impressions whenever it was possible to calculate. The presence of extensively vitrified samples was recorded, while other notes referring to inclusions or other significant characteristics were added. The first field was considered important for the creation of distribution maps, while the second offers a general picture concerning the fragmentation

status of the collection unit. This can offer further clues about the degree of post-depositional disturbance and displacement.

The detailed recording of the analysed samples was made by using a database management system (Microsoft Access). The advantages of similar systems allow the user to insert vast amounts of information in interconnected tables with a variety of standard fields, to shorten the recording time with the use of macroinstructions and point-and-click options, and to easily retrieve and compare this information with the use of a query interface. All data is documented at the record (and not the spreadsheet) level, thus enabling the limitation of query results based on the values of each field.



**Figure 5.11** The main tables of the Avgi database and their relationships.

In the present study three main tables were created under the titles ‘Daub fragments’, ‘Imprints’ and ‘Surfaces’ (**Fig. 5.11**). These were connected via the DFN (Daub Fragment Number) field and were included in a database form presenting all the available information for each analysed sample (**Fig. 5.12**). The fields of the general form comprise:

- The unique number for every piece recorded (DFN).
- The basic spatial information available (excavation unit and micro-grid trench).

- c) The dimensions and weight of each fragment<sup>54</sup>.
- d) The basic colours of each sample. Although most of the fragments present multiple colourings due to the uncontrolled firing conditions, only the two dominant ones were recorded. Their description was made with the aid of Munsel Soil Colour Chart in non-natural light conditions<sup>55</sup>.
- e) The relative degree of durability and the preservation status of the sample.
- f) The general type in which the sample can be categorised (see **section 5.2.2**).
- g) A general description of each sample when relevant information was necessary to be added. This may include alternative possibilities when the identification of the sample is not secure, the status of vitrification and other exceptional characteristics.
- h) Information about the macroscopically visible inclusions and their relative proportions, including plant tempers, pebbles and granules, calcareous aggregates and anthropogenic inclusions, such as pottery sherds, chipped stone, shells, bone fragments and others.
- i) The presence or absence of timber impressions and their minimum and maximum numbers. Each impression was separately described according to its type, cross section, preservation status, as well as its arrangement to other impressions<sup>56</sup>.
- j) The presence of possible surfaces (flattened or smoothed), their minimum and maximum numbers, their overall arrangement, as well as the existence of successive coating layers or finishing plasters.

In certain cases, the recording criteria were quite arbitrary, based mainly on general observations during the recording process. Therefore, the terminology used (e.g. high/low preservation or durability, smooth/quite smooth/rough surface etc.) was consistent but not strict in the sense. During the recording process, photos were taken from the most representative or well preserved samples. In addition, a large number of fragments were kept separately for further analysis and examination. An additional objective behind this decision was to create a reference collection for the excavation archives. This will facilitate the work of future researchers focusing on comparable material from other sites in the region and beyond.

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<sup>54</sup> When timber impressions or surfaces were evident the thickness was calculated as the distance between the side bearing the impression(s) or the surface and the opposing side that could either be smooth or irregular. The length and height dimensions are quite arbitrary. In some cases (e.g. when vertical stakes or horizontal wattles are represented) it was easy to decide which dimension was which. When no distinctive characteristics exist, the larger dimension was characterised as length and the smaller as height.

<sup>55</sup> The primary objective was not to provide an exact match that would have been extremely time-consuming without offering critical information, but to offer an overall description by using a comprehensible terminology.

<sup>56</sup> The diameters of rounded or semi-rounded impressions were measured with the use of carton circles of given dimensions, while smaller diameters were calculated with the use of wooden calibres (sticks). Carton circles were preferred as they were more flexible for measuring impressions, especially when the diameter of the impression was not consistent throughout its height or length and when the cross section was not entirely round.

Figure 5.12 The database form used for the recording of analysed ( $\geq 8\text{cm}$ ) daub fragments.

The next step in the analysis was the sampling of representative daub fragments for the production of thin sections<sup>57</sup>. These were prepared from slices of the sampled materials that were resin-impregnated when friable, glued to a glass slide and ground to a standard thickness so as to become translucent to light (Courty *et al.* 1989, 56–62). Thin sectioning is applied in a wide variety of archaeological materials (Kempe & Harvey 1983). Soil micromorphology and ceramic petrography are the main fields using this technique extensively. The former method focuses on the study of soils and related materials in order to identify their different constituents and to determine their mutual relations and formation processes, in space and time (Stoops 2003, 5). Ceramic petrography encompasses the description and interpretation of ceramic fabrics in terms of the basic rocks or rock forming minerals, natural occurring inclusions (intrinsic/incidental) and tempering materials, as well as the determination of their provenience (Freestone 1995, 111;). The application of thin sectioning in the analysis of building materials (e.g. Matthews 2005; Shaffer 1983; Stevanović 1996; Tung 2005; Carneiro & Mateiciucová 2007) entails principles from both fields. The study of materials that were deliberately fired as part of

<sup>57</sup> In reality, the sampling and the microscopic study were conducted parallel to the last stage of the macroscopic analysis. This made possible to cross-check some of the basic macroscopic observations, as well as to update and refine the database in light of the microscopic evidence.

their construction process is, in many respects, similar to the study of ceramics. Other materials, such as mudbricks, plasters and daub, present affinities due to the addition of organic or inorganic tempers. However, they are also closely associated with natural sediments as they mainly consist of locally available, sun-dried earth retaining the characteristics of the soil used.

In the present study, 29 samples of ceramified daub were analysed<sup>58</sup>. The criteria for selecting the samples include their preservation status, their representative nature according to the proposed typology, and the ease to locate their initial position in the rubble. More than one samples for each type of daub was chosen from each building so as to facilitate an intra-site comparison. In addition, samples were taken from different areas of the rubble (both from the centre and its periphery) for comparative reasons. Their final number was considered adequate for challenging most of the questions raised. These refer to the description of the main clay fabrics used for house construction, their relationship with certain types of daub fragments, and their variability or standardisation between different buildings (see **Appendix**).

### **5.2.2 Description of daub fragments: a typological approach**

The study and the efficient recording of the material presuppose the categorisation of daub fragments according to their morphological characteristics. Seven basic types or groups of fragments were distinguished, although these do not exhaust the whole range of the sample's variability. The criteria used refer to the composition of the construction earth in terms of mineral inclusions and tempering materials, as well as to the presence or absence of timber impressions. The estimation of the relative proportions of tempering materials and incidental inclusions is not always possible as it depends greatly on the preservation and vitrification status of the sample. The latter criterion, however, is more straightforward as it probably reflects better the original position of each fragment in the superstructure. It should be noted here that almost 3/5 of the material bear impressions of the timber frame, thus allowing a detailed study of various structural characteristics. The following discussion will provide the general description of the types identified.

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<sup>58</sup> The preparation of thin sections took place at the Fitch Laboratory of the British School at Athens, while their study under a polarising microscope was conducted by the author at the Fitch Laboratory and the microscope laboratory of Cardiff University.

### Daub fragments with impressions of the timber frame

The dominant type of this category, namely **type B** (Fig. 5.13, 5.14), comprises daub fragments bearing (almost) parallel impressions of closely set cylindrical stakes or thin poles and split or squared timbers. These are commonly well fired and durable with an average thickness of approximately 6.5-7cm. The construction earth used is homogeneous, characterised by the absence or rarity of plant tempers and other organic additives. Most of the samples preserve one or two impressions, although up to five impressions of various types have been recorded. Round impressions of medium-sized (ca.5-12cm in diameter) timbers prevail (ca. 73%) followed by impressions of split timbers (ca. 11.5%) used in place of stakes. Other impressions, including branches or reeds, planks, more sizable round timbers (posts or beams?) and undiagnostic ones are less abundant. Finally, a limited number of more heavily plant-tempered samples presenting similarities in terms of timber impressions were categorised as **type B1**.



Figure 5.13 Avgi I: type B daub fragments.

The use of timbers set closely and parallel to each other could reflect the construction of timber floors plastered with mud. However, micro-stratigraphic observations do not support this interpretation, as the fragments are commonly found both covered by and covering other superstructural materials. Moreover, they were not found *in situ* covering a



specific area of the building. A case could be that they represent the floor of a second storey or loft. Nevertheless, no microlayers indicating the renewal of a floor surface were observed during the macroscopic or microscopic analysis. Following parallels from the region and beyond, type B fragments were related to wall construction and, more specifically, to the screening of the timber frame.

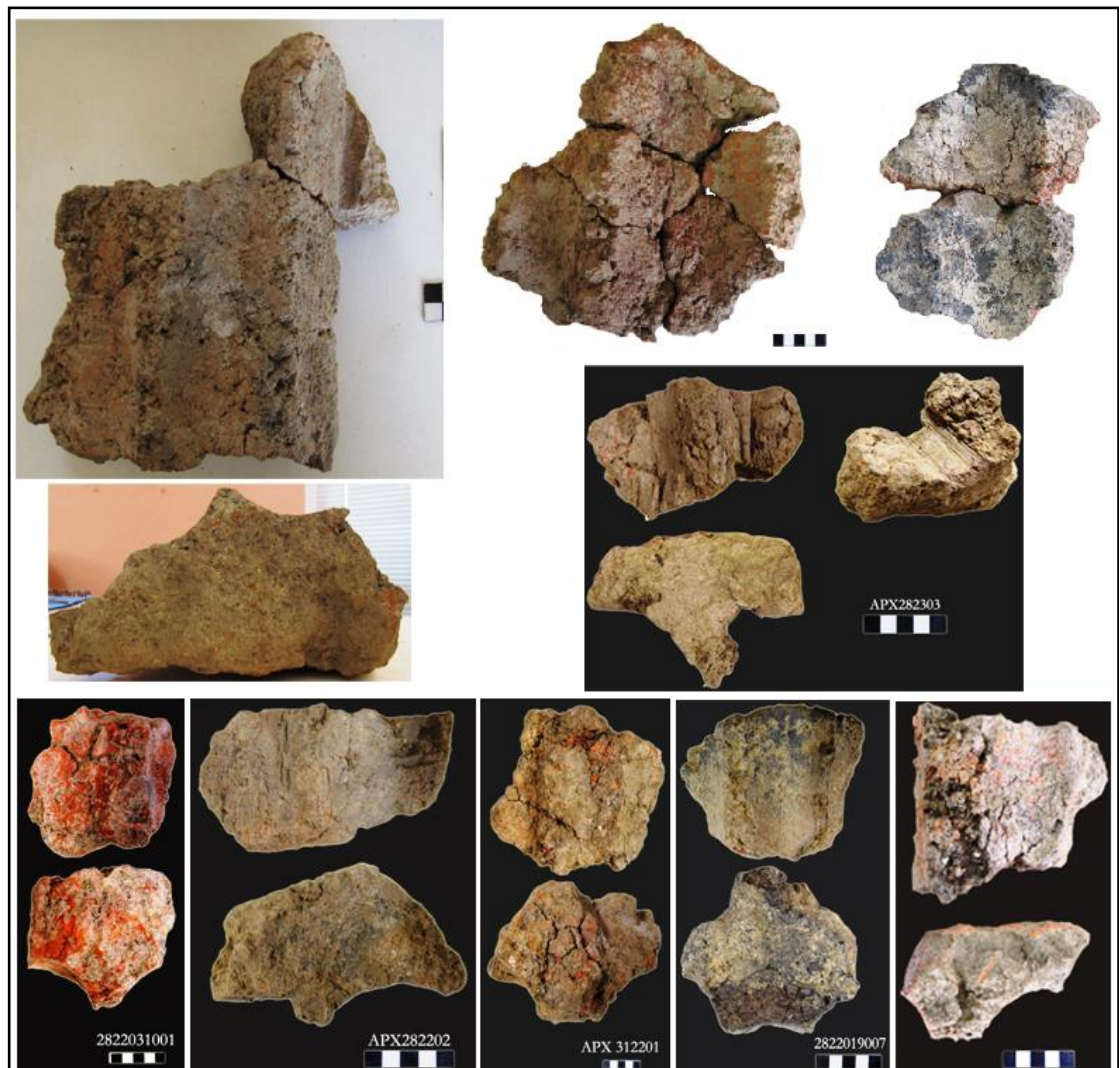


Figure 5.14 Avgi I: type B daub fragments.

**Type A** comprises daub fragments bearing round impressions of small-sized timbers (ca. 0.5-3cm) interpreted as twigs, thin branches or reeds (**Fig. 5.15, 5.16**). Flat or rectangular, narrow impressions found in place of the round ones were attributed to split branches or laths. The better preserved examples bear multiple impressions on one side, while the opposite one is relatively flat forming a more or less smoothed surface. A significant number of fragments confirm the final coating of the surface with a fine finishing plaster measuring ca. 0.25-1.4cm in thickness. The impressions are usually found at a short

distance from each other and are either arranged diagonally (20°–50°) or almost parallel. In certain cases, more sizeable impressions, either round or rectangular, are arranged vertically to them. The overall arrangement points to a wall framework built in the wattle-and-daub fashion.



**Figure 5.15 Avgi I: type A daub fragments.**

The earth used is described as sandy silt loamy containing calcareous aggregates and plant tempers. The latter are visible macroscopically in the form of elongated or round cavities measuring ca. 0.2-0.6cm and could be associated with crop plants (chopped straw) or grasses. Microscopic analysis has confirmed the presence of plant tempers that were preserved as elongated voids or in a silicified form (phytoliths). Other anthropogenic inclusions, such as pottery sherds, bone fragments and grains, are not absent. Their restricted proportions indicate that these were incidental inclusions related to earth procurement strategies rather than to intentional tempering. Small sized pebbles (<3.5cm) are also present.



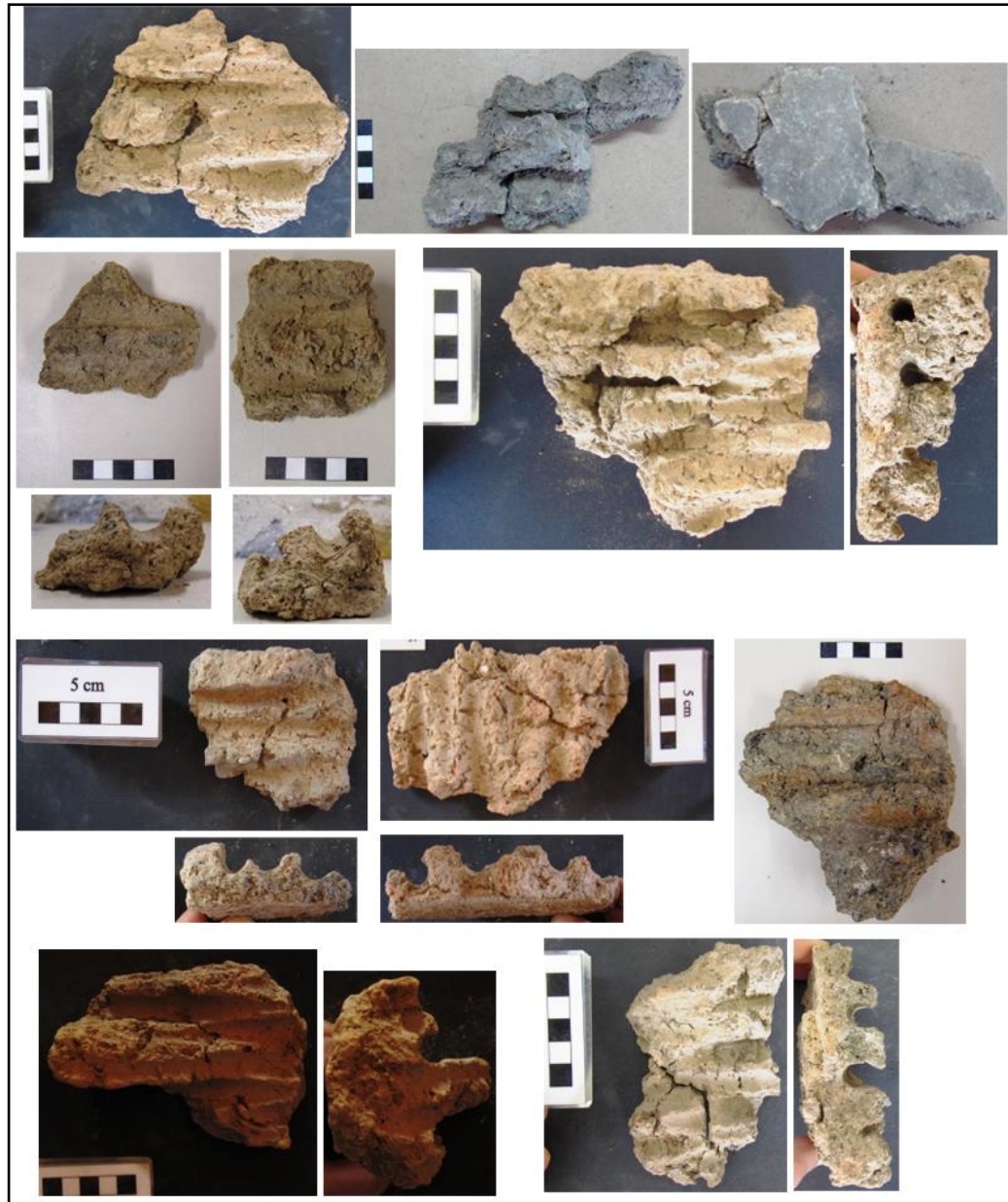


Figure 5.16 Avgi I: type A daub fragments.

Daub fragments bearing ‘wavy’ impressions of split or plank-shaped timbers were categorised as **type D** (fig. 5.17, 5.18). The earth used for plastering presents affinities to the previous type in terms of texture, mineralogy and tempering materials. Samples belonging to this type follow a specific morphology. They can be either of a prismatic or trapezoidal form with two opposing surfaces. One of the surfaces is relatively flat and smoothed, while the other bears rectangular, ‘wavy’ impressions. When multiple impressions are recorded these exhibit standard arrangements, including parallel impressions set next to each other and parallel to the opposing surface, impressions that are inclined to each other and to the opposing surface, and impressions that are inclined to each other but are also set at a different level indicating horizontal overlap. The latter

arrangement seems to be the most common when referring to the more sizeable and better preserved samples.



**Figure 5.17 Avgi I: type D daub fragments.**

The interpretation of type D fragments is quite problematic. It is possible that not all of them derive from the same part of the superstructure. Different options may include the use of ‘planks’ as floorboards for the construction of plastered timber floors. Nevertheless, this assertion is not adequately supported by their spatial and stratigraphic distribution. Furthermore, if planks were part of a flat floor substructure, more standardized arrangements would have been expected. Some of the analysed samples could be linked to squared timbers or laths used as common rafters or side purlins. Nevertheless, the most convincing interpretation is that they represent plastered boards/planks either let into panels or used as cladding. Whatever the case may be, it was observed that small diameter round impressions were occasionally set vertically to them in the form of ledgers or transverses.

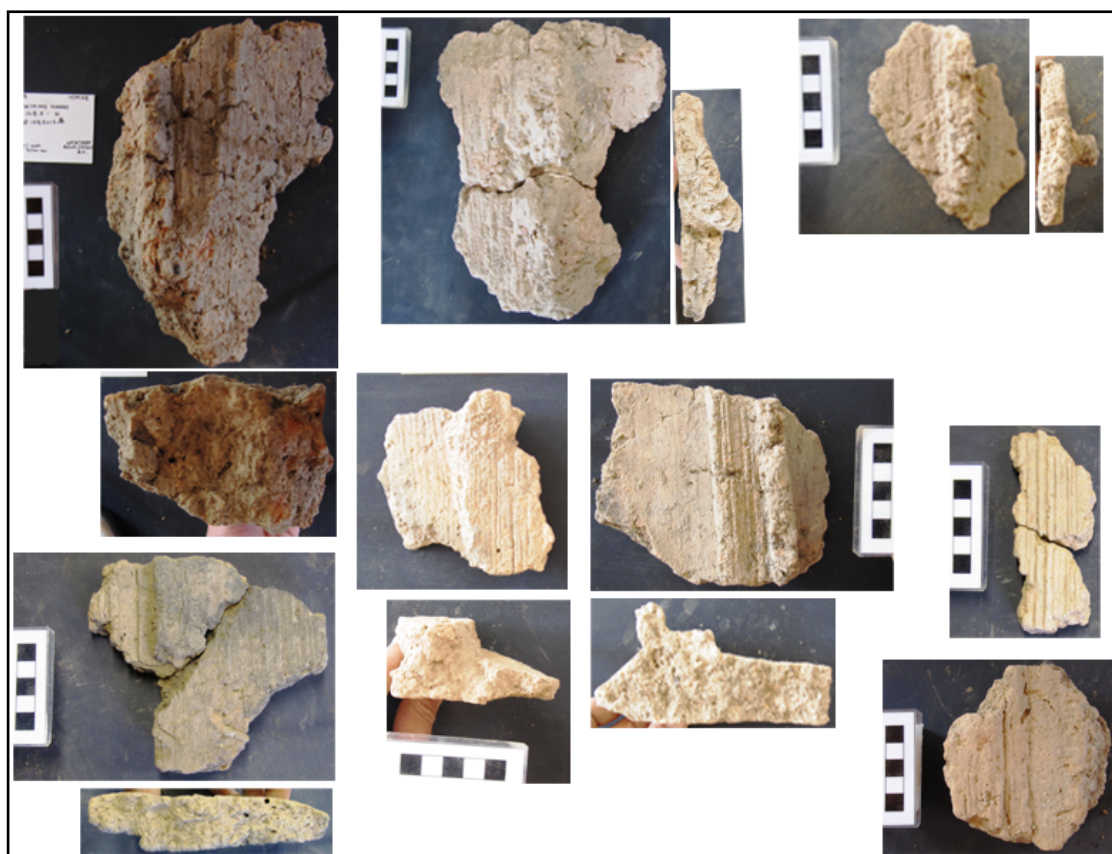


Figure 5.18 Avgi I: type D daub fragments.

#### Fragments with no visible timber impressions

**Type C** comprises fragments with smoothed surfaces (**Fig. 5.19**) presenting an average thickness of ca.3.5cm, although thicker pieces were also recorded. Almost all fragments are heavily plant-tempered and friable. Round and elongated voids measuring ca.0.2-0.7cm point to the tempering of daub with chopped straw or other plant additives. Calcareous aggregates are visible in many fragments, while incidental inclusions, such as pottery sherds, pebbles, chipped stone and probably grains are present in restricted proportions.

The most characteristic feature of type C fragments is that they have at least one smoothed surface. In addition, more than 50% of the samples under study exhibit a second opposing surface that is parallel/almost parallel to the first, thus presenting a 'plate-like' form. With the exception of very few poorly preserved, undiagnostic impressions, no evidence of the timber frame was recorded. It is, therefore, suggested that type C fragments represent a second layer of coating following the initial packing of the wall frame. Moreover, the identification of successive layers of plant-tempered earth indicates the occasional renovation of the wall surface. Finally, a limited number of fragments preserve a thin layer of fine, pale brown or whitish, finishing plaster (**Fig. 5.21** top).





Figure 5.19 Avgi I: type C daub fragments.

**Type G** daub fragments present strong affinities to the samples described above, in terms of their morphology and inclusions (**Fig. 5.20**). Nevertheless, they are usually more durable and thicker reaching up to 13.3cm. All samples under study preserve at least one smoothed surface. Depending on the status of preservation, a thin layer (ca. 0.2-0.6cm) of yellowish/pinkish white finishing plaster was sometimes recorded. The ‘underface’ can either be rough and irregular or relatively flat and parallel/almost parallel to the surface. The thickness of a few well preserved, sizeable (>10cm) samples had led to their characterisation as parts of a composite *pisé* or a similar technique used in between closely set timber elements. However, an interpretation similar to the one proposed for type C is also probable. The differences in thickness and durability may be the result of diverse firing conditions or their different position in the superstructure (e.g. at the lower part of walls that were more heavily affected by rain). Successive layers have been discerned in a small number of samples. Up to three layers reaching 4.6cm in thickness have been occasionally identified, while calcareous finishing plasters are not uncommon (**Fig. 5.21**).



**Figure 5.20 Avgi I: type G daub fragments.**

It should be mentioned here, that a number of type C and G fragments (grouped as types C1 and G1) with smoothed surfaces present a slight curvature or an angled profile. These could be interpreted as a second layer of coating deriving from the sub-rounded corners of rectangular buildings (see Shaffer 1983, 416). However, their small dimensions and their distribution in the rubble do not entirely support this assertion. Alternatively, they could be linked to internal features that are difficult to reconstruct.



**Figure 5.21 Type C (top) and type G (centre and bottom) daub fragments preserving thin finishing plaster.**

Apart from thin layers or crusts of finishing plaster preserved on type A, C and G samples, a few isolated finishing plaster fragments were grouped as **Type H**. These were obviously separated during the destruction of walls by fire and are extremely friable. Their colour spectrum ranges from pinkish/yellowish white to very pale brown. Their average thickness is ca. 2.1-2.2cm and they are commonly plant tempered. The earth used seems to contain high proportions of calcareous aggregates and the whole mixture seems to represent the finishing of the wall surfaces with a 'limewash' layer. Whether this refers to both wall surfaces cannot be confirmed.

Samples belonging to **type E** are characterised as 'floor fragments' (**Fig. 5.22**). They commonly have one smoothed flat surface with a very pale brown or light yellowish brown colour and a reddish yellow core. The possibility of an added slip or finishing layer measuring approximately 0.3-0.8cm in thickness has been noted in more than 60% of the well-preserved samples. However, thin section analysis has not confirmed the macroscopic observations. On the contrary, the fabric seems to be more or less uniform and the upper layer was probably smoothed as part of the construction process. The 'underface' is usually irregular and rough, sometimes bearing undiagnostic impressions or impressions of small pebbles. This supports the hypothesis that they were in contact with the ground or with a substructure made of pebbles as is the case for thermal structures found either *in situ* or in a disarticulated form throughout the site. Only two samples exhibit a flat 'underface' parallel to the upper surface, while a few samples only preserve the core part. The best preserved samples measure up to 5.5-6cm in thickness and do not exceed 115cm<sup>2</sup> in size.

The earth used for their construction is described as sandy silt loam with high proportions of mica and quartz. It does not contain plant tempers or any incidental inclusions as a result of mixing with the topsoil. It is, therefore, possible that the earth applied was strategically selected from certain sources providing the desired qualities. As for the interpretation of type E fragments, it is strongly suggested that they belong to some kind of floor plaster. Moreover, it is probable that their firing was not entirely related to the destruction of the associated buildings but was partly a result of their use or construction aiming at increasing their durability (Carneiro & Mateiciucová 2007, 272). The question to be raised is whether they represent the floor of the building or if they should be attributed to internal features, such as thermal structures or working surfaces. The former interpretation can be ruled out based on their restricted number and the fact that the micromorphological analysis has already identified the actual floors of dwellings. Besides, the samples that were microscopically studied did not confirm the existence of microlayers

that would have been expected in a floored area of a house that was periodically renovated. Rather than well-defined microlayers, ‘zones’ of different colourations were observed in one of the samples. However, their boundaries are not sharp and they could have been the result of differential firing through the thickness of the construction earth.



**Figure 5.22 Avgi I: Type E fragments and floor of a thermal structure.**

The interpretation of type E fragments as parts of ‘disarticulated’ working surfaces or thermal structures seems more convincing. This is further reinforced by the concentration of such fragments in specific areas of the rubble. The fact that they are less well-fired than the excavated thermal structures had led to their initial interpretation as working surfaces/platforms. However, the occasional presence of pebble impressions seems to point to their association to oven bases or baking surfaces with or without a pebbled substructure.

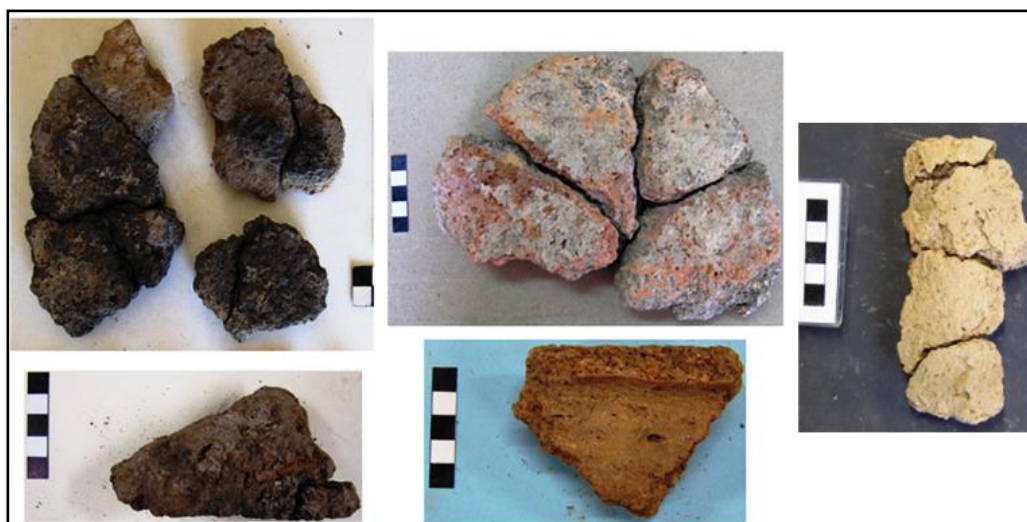
Finally, various daub fragments presenting ‘atypical’ features were categorised as undiagnostic. Among them, a restricted number of sizeable, undiagnostic samples of plant-tempered, more micaceous earth are included<sup>59</sup>. They bear one or two diagonally or vertically arranged, rough surfaces and could be associated with the corners of walls or other features. Moreover, a number of relatively thin and curved pieces with two opposing surfaces could be linked to internal furnishings or other features, such as storage bins and

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<sup>59</sup> These derive primarily from the rubble of Building 7 and were initially categorised as type F.



oven domes, made of plant tempered earth. A similar interpretation could be attributed to less sizeable fragments with an angular or irregular shape. However, the given shape could have also been the result of the timber framework and the breakage pattern. Other fragments can be associated with unfired or poorly fired pots, thus confirming their participation in household activities. Characteristic finds include the possible base of a pot, the body of a vessel bearing a mastoid lug, as well as a number of dark greyish joining fragments that could belong to the lower part of a vessel or portable structure (**Fig. 5.23**).



**Figure 5.23** Fragments of unfired pots and portable structures.

### 5.2.3 The assemblages under study

#### **Building 2a**

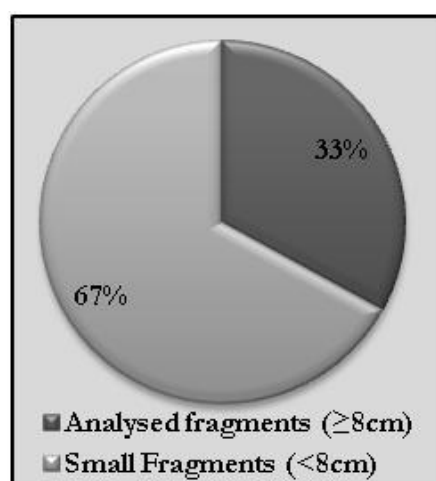
The so-called Building 2a at the West Sector of the excavation constitutes one of the first identified structures of the Avgi I building horizon. Its collapsed remains were mainly located at trenches 224.3, 254.1, 254.2, 254.3 and 254.4, and the adjacent sections (**Fig. 5.24**). The absolute chronology of the building has been established by two C14 samples deriving from the collapse area of trench 254.1. According to the excavators, the chronology of the first sample (ca.5656–5511 cal BC) allows ‘Building 2a’ to be one of the earliest Avgi I structures, probably pre-dating the other two analysed buildings. It is considered to be rectangular in ground-plan, following a roughly E-W orientation and measuring approximately 65–70m<sup>2</sup> in size (Stratouli & Bekiaris 2011, 5). The evidence deriving from the present analysis implies that the latter measurements could be high.





**Figure 5.24 Remains of Building 2a at the West sector of Avgi (Avgi excavations archive, permission: G. Stratouli).**

Although the study of the finds is still in progress, the domestic character of the structure can be effectively supported. The excavators have argued that the restricted number of finds retrieved from the collapse stratum point to the abandonment of the building prior to its conflagration (Stratouli & Bekiaris 2011, 6). The *in situ* finds comprise a probable storage pot and a small grinding slab at the centre of the rubble area, as well as pottery sherds and stone tools found elsewhere. These finds were commonly lying on the dark greyish thin layer that constitutes the floor surface of the building. This layer also includes a significant amount of archaeobotanical material. The identification of assemblages containing exclusively emmer wheat or bitter vetch indicates that certain agricultural products were stored separately inside the building (Margariti 2007; Stratouli & Bekiaris 2011, 5). No definite interior structures associated with food preparation were identified. Relevant evidence, provided by the study of the daub material, will be discussed below. In any case, a number of structures and artefact concentrations have been identified in the open areas around the Building 2a rubble. These could represent the *loci* of multiple domestic activities taking place outdoors, although their stratigraphic relation to the building cannot be safely deduced.



**Figure 5.25 Building 2a: proportions of analysed and small daub fragments.**

The spread of the Building 2a remains indicates that the superstructure had collapsed and sealed the underlying floor surface. When compared to the other Avgi I buildings, the general picture of the rubble is much more compartmentalised. The collapse layer is less thick and compact, while the samples collected present a higher degree of fragmentation. It is noteworthy that the analysed samples ( $\geq 8\text{cm}$ ) amount to less than 35% of the recorded material (**Fig. 5.25**). This may be attributed to the intense post-depositional disturbances and site formation processes. Among these, the cutting of pits, deep foundation trenches and postholes for the erection of the Avgi III Building 2b resulted in the loss of considerable quantities of daub.

It should be noted here that the Avgi I remains were initially associated with the collapsed superstructure of the later Building 2b. More systematic stratigraphic observations on the succession of building phases indicated that this assertion was problematic. It can be stated, however, that the remains of the later feature have gained the lion's share of attention. This had certain implications in the attempt to reconstruct the earlier structure. For instance, there is uncertainty when trying to differentiate between postholes that could be ascribed to each phase. Nevertheless, the collected samples still offer valuable information for the building materials used and the techniques employed.

It was argued above that the measurements of the building's size could be overestimated. Based on the spread of the rubble, the partial uncovering of the floor surface and the possible presence of postholes, I suggest that a size of ca.55-60m<sup>2</sup> is more probable. Although highly disturbed, it seems that the south wall of the building should be traced at the northernmost part of trenches 254.3 and 254.4. A possible line of three postholes, following a roughly W-E direction, could testify to the position of the building's external

wall. One of these postholes measures ca.25m in diameter, while the others present comparable dimensions. Similarly, the position of the north wall could be traced at the southernmost part of trenches 224.3 and 224.4, as well as at sections 224.3-254.2 and 224.4-254.2. The presence of a posthole measuring ca.20cm in diameter at the north-west corner of the rubble area may hint at the position of a load-bearing post. Other postholes were identified at the periphery or the centre of the rubble. However, their morphology and distribution do not allow their definite association with the Avgi I horizon.

The east and west sides of the rubble have been heavily disturbed by later cuttings. It is likely that the east external wall was lying at the eastern part of trench 254.2. However, no clear indications exist for the westwards extent of the rubble and the location of the wall line due to the cutting of a large Avgi III pit. The partial preservation of the floor surface does not offer additional information. It simply points out that the building's size does not exceed the extent of the rubble area. It would, therefore, appear that the major part of the superstructure had collapsed inwards or near its original position. What is more, the presence of thin layers rich in calcareous aggregates, especially at the north part and the south-east corner of the rubble, seems to reinforce the suggested position of the external walls.

### **Building 5**

Building 5 lies in the West Sector of the excavation (**fig. 5.26, 5.27**). The bulk of its remains were uncovered at trenches 282.1, 282.2, 282.3 and 282.4, as well as the adjacent sections and trenches. The building is securely dated to the Avgi I horizon as indicated by two C14 charcoal samples pointing to a LN I chronology ranging between ca.5300 and 5000 cal BC. It was founded on the natural surface of the site, in an area that seems to have been slightly elevated and presents declinations towards the east and the north (Stratouli in press). The rubble presents a lower degree of fragmentation comparing to Building 2a (**Fig. 5.28**). Its extent and the floor surface attest to a rectangular, free-standing structure measuring approximately 70-80m<sup>2</sup> and following a roughly E-W orientation.



Figure 5.26 Aerial view of the Building 5 remains (Avgi excavations archive, permission: G. Stratouli).

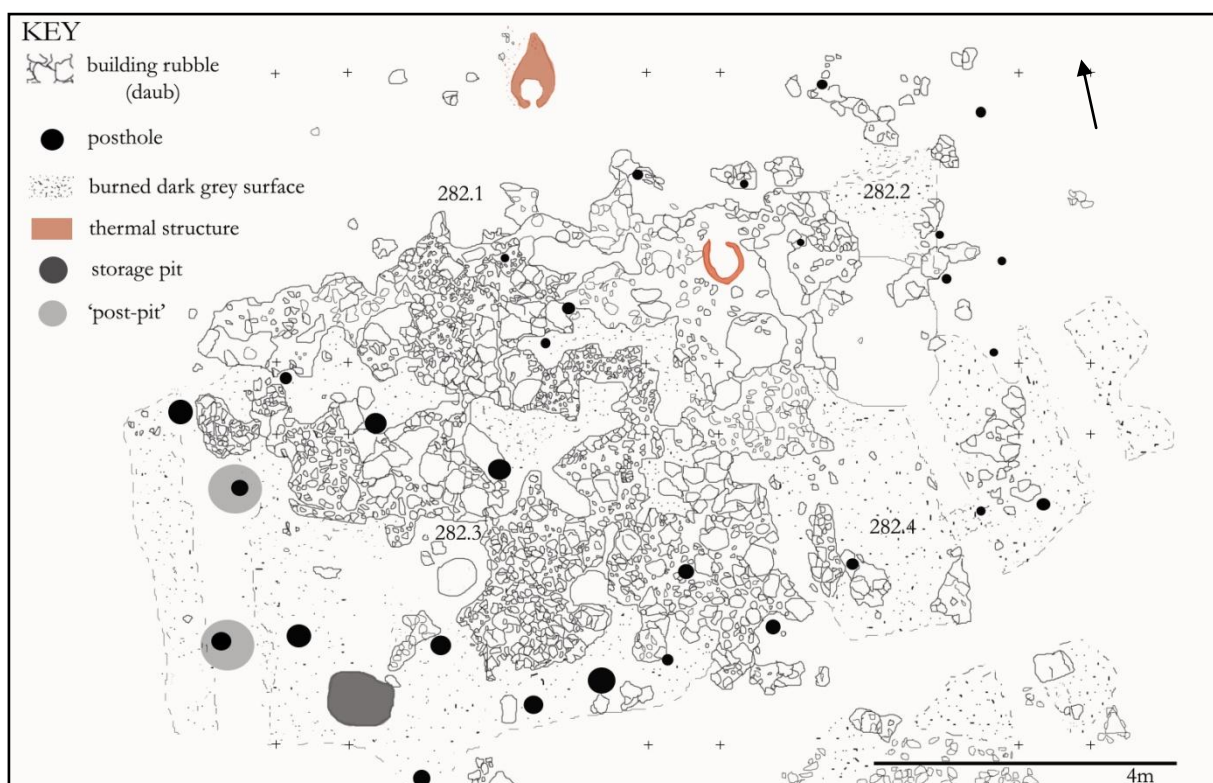
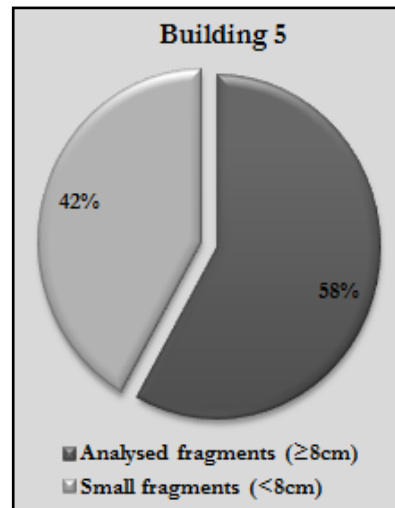


Figure 5.27 Plan of the Building 5 rubble.

The analysis of the finds deriving from the destruction layer is still in progress. For the most part, they seem to reflect a domestic character. The relatively restricted number of



finds deriving from the floor surface has led the excavators to argue for the clearing and abandonment of the building before its destruction (Stratouli *et al.* in press). Nevertheless, it is noted that a large part of the rubble has been left unexcavated and that the floor level was only partially reached. The presence of pottery sherds, various ornaments, a few chipped stone and ground stone implements, food remains, as well as the identification of unfired pottery, does not necessarily support the former assumption. More conclusive results on the subject will be drawn as soon as the whole assemblage will be analysed.



**Figure 5.28 Building 5: proportions of analysed and small daub fragments.**

The internal features comprise a small storage pit cut into the natural subsoil and located at what seems to be the south-west corner of the structure. Its contents included more than 10kg of emmer wheat that were probably charred during the building's conflagration (Stratouli *et al.* in press). The presence of large daub fragments bearing impressions of the timber frame inside its fill points towards the sealing of the pit (probably covered with perishable materials) during the superstructure's collapse. A small burned grinding stone, placed vertically near the wall of the pit, indicates that the implements for cereal processing were occasionally stored in the same context. The general picture indicates short-term storage at a domestic level. The quantity of the stored product does not support a large-scale storage activity that could be associated with the social storage of agricultural surplus or a more collective storage that supersedes the needs of the co-resident group.

The presence of thermal structures is quite ambiguous. The excavation of a structure (AE 2821282201), described as a domed oven, at the north-east extent of the rubble area has raised scepticism in terms of its stratigraphic association with Building 5. It is doubtful whether it should be considered as an internal feature or whether this is a later structure built on top of the remains under study. The argument favouring the latter interpretation is

mainly based on the structural characteristics of the feature and the postulated location of the wall line that would have restricted its access and use. However, it should be noted that the exact location of the wall line has not been securely identified and that the spread of the rubble does not necessarily reflect the building's boundaries.

The possible identification of a disarticulated feature at the central part of the collapse area further contributes to the discussion. It consists of more or less sizeable fragments of fire-hardened earth with one smoothed surface. The comparatively friable nature of the fragments and the absence of pebble impressions on the 'underface' had initially led to the idea that they were not linked to intense thermal action. As a result, they were interpreted as belonging to a working platform (Kloukinas 2012). Nevertheless, further macroscopic and microscopic analyses revealed striking similarities to fragments belonging to thermal structures that contain high proportions of mica and no plant tempers. Therefore, the existence of interior structures for food processing and preparation should not be omitted.

The presence of numerous thermal structures and artefact concentrations in the surrounding open areas indicates that a great part of domestic activities were also taking place outdoors. External structures include a subterranean domed oven of elliptical shape at the east of Building 5 and a cluster of three thermal structures approximately 7m north of the building rubble. The latter comprises two subterranean domed ovens (one bearing a vent-hole) and a hearth, indicating that the area was closely linked to food preparation and cooking (Kalogiropoulou 2013). In the same areas, a large number of pottery sherds, belonging to various categories and shapes, chipped stone tools used for agricultural purposes, and ground stone tools for the processing of plant resources, reveal a broad spectrum of activities and the refuse of materials in close proximity to highly active open areas.

## **Building 7**

Building 7 lies in the Central Sector of the excavation. Its remains were identified in the form of dense rubble concentrations covering trenches 168.2 and 138.4, as well as the eastern part of trenches 168.1 and 138.3 (**Fig. 5.29–5.31**). Loose concentrations or fragments of fire-hardened daub were also uncovered in the adjacent sections and trenches, although their connection with the main rubble is not always clear-cut. They could represent superstructural material that was separated from the main mass of the building's collapse, or features that either postdate or were contemporary with Building 7.

The various finds retrieved from the building's collapse layer and the surrounding open areas have not yet been systematically studied. However, they seem to include a considerable amount of pottery, as well as stone tools, organic materials and other categories of material culture, attesting to the domestic character of the assemblage. A number of almost complete ceramic vessels (such as footed bowls and plateaus) were found *in situ* on the floor surface, thus implying that the lower parts of the rubble were not largely affected by post-depositional disturbances (see also **Fig. 5.32**). In addition, they seem to support that the building was not long-abandoned and emptied before its final destruction and collapse. No internal features, such as thermal structures or working surfaces, could be identified. Further analysis of the material will provide a more accurate picture of the assemblage.

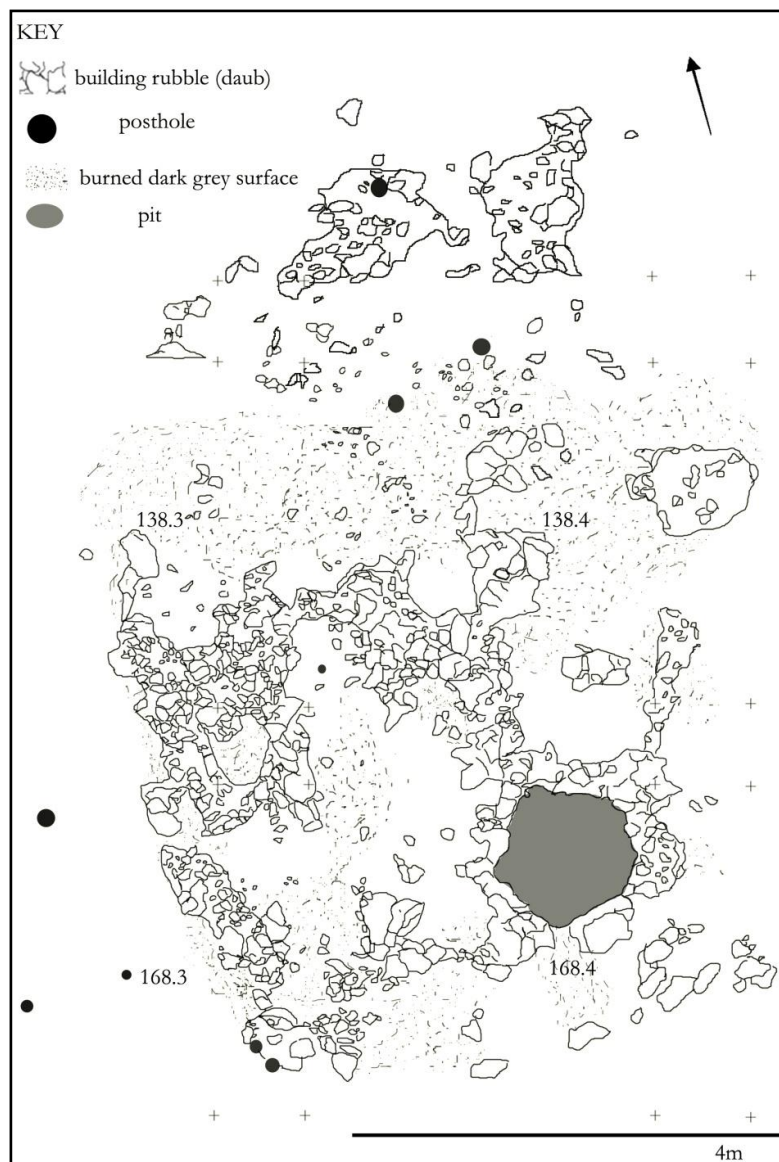


Figure 5.29 Aerial view of the uncovered Building 7 rubble (Avgi excavations archive, permission: G. Stratouli).



Figure 5.30 Aerial view of the Building 7 rubble during its excavation (Avgi excavations archive, permission: G. Stratouli).

Unlike the architectural remains excavated at the West Sector, the collapse layer of 'Building 7' was uncovered immediately below the ca 0.30m thick surface deposit. The total thickness of the collapse layer is estimated at approximately 0.30m. This refers mainly to those areas where the floor-level was reached. The rubble comprises dense concentrations of fire-hardened daub fragments of various types lying at different angles. These are generally quite compact and thick at the centre of the excavated area, thus indicating that the majority of external walls had collapsed inwards. However, no upright standing walls were preserved and no clear wall lines or openings were possible to identify.

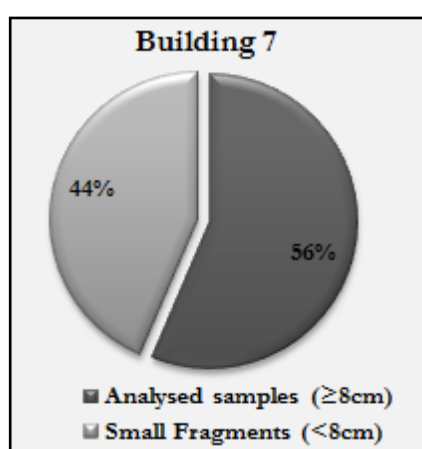


**Figure 5.31 Plan of the Building 7 rubble.**

A general picture for the position of the external walls is offered by the spread of the rubble itself. Its south and west limits are adequately defined due to the lack of dense daub concentrations in the surrounding deposits. The situation in the east side of the rubble was,



by and large, clarified after the gradual lift of structural remains in the areas between Buildings 1 and 7. On the other hand, the extension of the north wall is not entirely secure. Two layers of daub fragments were uncovered at the north part of the excavated area. These were separated by a thin layer of soil, while the lower layer of rubble presented a S-N declination. The initial interpretation was that the upper layer represents the collapse of structures that were located north of trench 138.4 and postdate the building. An alternative could be that the upper layer represents the northward post-depositional displacement of daub fragments from the centre of the main collapse area. Both approaches are plausible, although the comparable morphology of daub fragments seems to support the latter scenario.



**Figure 5.32 Building 7: proportions of analysed and small daub fragments.**

A restricted number of postholes, possibly associated with the foundation of the external walls, provide additional information for the approximate estimation of the building's size and ground plan. The first one, located at the south-west corner of the rubble area, could represent one of the major corner posts. It measures 16cm in diameter and its preserved depth was approximately 0.40cm. What is more, a similarly sized, very dark circular soil stain, very close to the first posthole, renders possible the use of double corner posts for the foundation and framing of the building. Two more postholes were identified at the northernmost limit of the rubble and could be linked to the line of the N external wall. The first (section 138.2-138.4) measures 25-30cm in diameter and ca.35cm in depth, while the second one (trench 138.4) measures 20cm in diameter and 26cm in depth. If they both represent external intermediate posts, a roughly E-W/NE-SW wall line is indicated. However, it is noted that their stratigraphic association with Building 7 is not entirely secure. A fourth, smaller-sized posthole (<12cm in diameter) at the south-west corner of trench 138.4 probably represents some sort of internal support or partition.

The floor surface was better preserved and easier to identify in the northern part of the rubble area. Its extent generally follows the spread of the collapsed superstructure, thus supporting the argument that the actual size of the building coincides, by and large, with that defined by the rubble. Finally, at the periphery, and especially at the west part, of the rubble area, a sub-stratum rich in calcareous aggregates seems to signify the boundaries of the building. According to the available information, it can be deduced that 'Building 7' was roughly rectangular in ground-plan, following a S-N/SE-NW orientation and measuring approximately 35-42m<sup>2</sup>.

#### **5.2.4 Daub fragment distribution**

The distribution of fire-hardened daub fragments provides evidence for several aspects referring to the construction, destruction and post-depositional history of the buildings under study. In the case of Avgi, the rubble of Building 5 and Building 7 was systematically excavated and a micro-grid, consisting of 1x1m collection units, was employed for the gradual lift of the remains. The reason for this was to elaborate the micro-stratigraphic observations and documentation of the excavation process, as well as to facilitate the study of the horizontal and vertical distribution of the daub fragments and other finds following their removal. The vertical succession of different daub types may provide valuable evidence for the structural characteristics and collapse pattern of certain parts of the structure, including the roof cover and possible storey floors. However, the remains of the Avgi I buildings were rarely found layered. More often, they comprised dense and irregular concentrations of various daub fragment types lying at different angles. This picture should be partly attributed to the collapse pattern itself, as well as to later disturbances (during the LN II period or more recent ones) affecting the rubble areas, especially those of Buildings 2a and 5.

The analysis of the horizontal distribution of the collected samples, using maps or diagrams, was more informative, although problematic in many respects. Both the analysed and the smaller-sized samples were included in this study. General distribution maps record the total weight of daub collected from each unit according to different weight classes, while type-specific maps were generated to provide a more coherent picture for the distribution of certain types of daub according to their morphology. The use of distribution or choroplethic maps has been, more or less, successfully employed for the identification of possible wall lines, gaps or openings and daub clusters representing partitions or other internal features (Shaffer 1983, 147). However, it should be noted that the overall

morphology of the rubble can be affected by many factors, including the materials and techniques employed, the varying temperatures reached during the building's conflagration, post-depositional disturbances and other site formation processes (Shaffer 1983, 151).

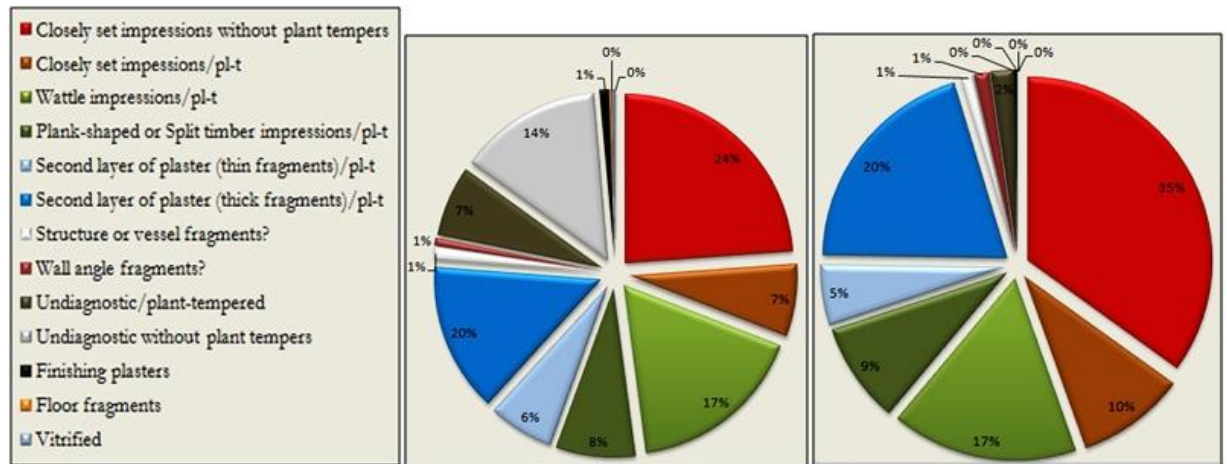


Figure 5.33 Building 7: proportions of daub fragments per type: total assemblage (left) and analysed ( $\geq 8\text{cm}$ ) fragments (right).

Building 7 has offered the most coherent information in terms of spatial distribution at the micro-grid level. This is mainly attributed to the excavation methodology employed, as well as to the fact that a larger amount of daub was lifted. The weight of the recorded material is estimated at approximately 823kg. Small-sized fragments constitute 44% (ca. 358.43kg) of the total weight, while 56% (ca. 464.36kg) belongs to the more sizeable, analysed samples (Fig. 5.32). All types of daub are represented in the assemblage, with type B, type G and type A fragments exhibiting the higher percentages in both the total weight and the analysed samples charts (Fig. 5.33).

It has been already mentioned that the morphology of the rubble indicates that the major part of the superstructure has either collapsed inwards or near its original position. The plotting of daub weight densities seems to be in accordance with this assertion, as high proportions of daub derive from the central squares of the micro-grid (Fig. 5.34). Unfortunately, it was almost impossible during the excavation process to identify well defined layers that could have contributed to a more accurate reconstruction of the collapse pattern. Having all research limitations in mind, it can be stated that no definite wall lines and openings were recognised. Nevertheless, it is possible that a wall line following a roughly W-E direction is represented at the northernmost limit of the grid. A less evident one, following a N-S direction and almost vertical to the former, could be represented at

the NW side of the rubble. It would, therefore, seem that the north-west corner of the building is represented in this area. Another possible wall line is indicated at the south limit of the rubble, approximately where the south wall of the building would have been expected. The situation in other parts of the rubble is even more fragmented and the clustering of daub does not offer conclusive information.

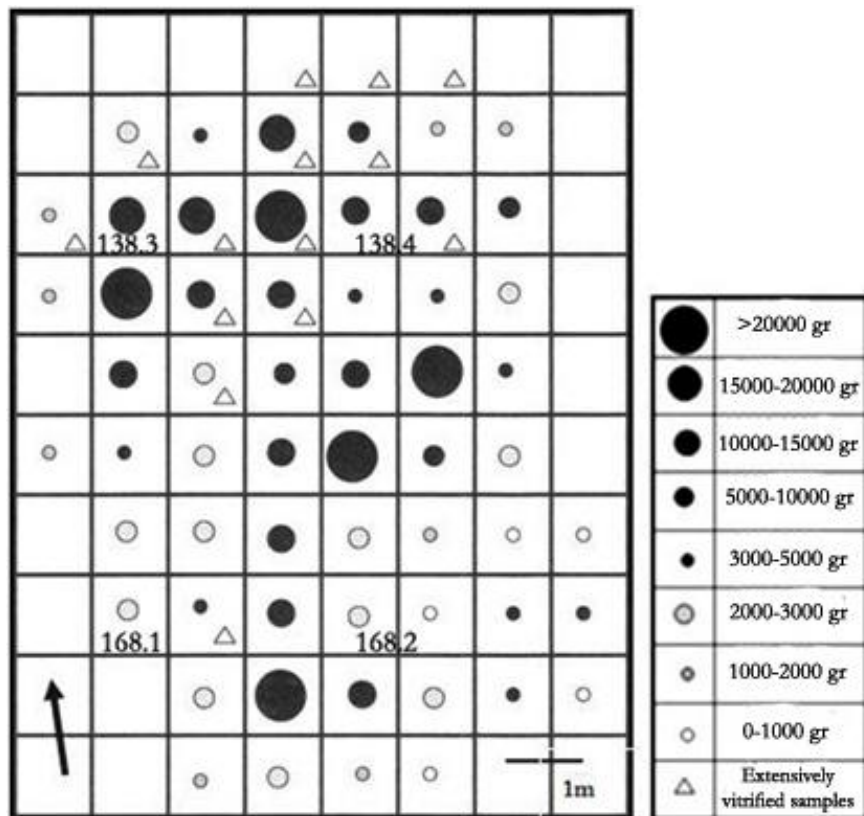


Figure 5.34 Bulding 7: schematic distribution of daub fragments according to weight classes.

When comparing different areas of the building's collapse, there is a clear diversity in weight densities between the northern and southern part of the grid. The larger amount of the recorded material derives from the north/north-west part of the rubble. This pattern can be approached in various ways. One possibility is that a larger amount of building materials, especially daub, was used in the construction of the north part of the building. This could also be indicative of diverse building techniques, although this interpretation is not adequately supported by the distribution of different types of daub. Post-depositional disturbances, either prehistoric or modern ones, offer a more tempting suggestion. Among these, the cutting of a later pit-like feature of unknown function at the south-east side of the rubble area has probably caused the loss of certain quantities of daub. In addition, modern soil disturbances may have contributed to the emerging pattern.

It has been recognised during the excavation of Building 7 and the surrounding area that there is a south-north declination of the underlying strata. As a result, it could be expected that the south part of the rubble, being at a higher elevation, was more effectively disturbed by mechanical ploughing. Certain amounts of daub could have been dislocated, thus further obscuring the overall picture. The same suggestion could also stand for the east side of the building collapse, as a slight W-E declination has also been noted in the excavation reports. Complementary to the latter approach is the argument that the quantities of preserved daub are directly associated with the temperatures reached during the conflagration process. The amount of ceramified daub would have been increased in those parts where the fire was more intense, while less material would have been produced in areas where lower temperatures were reached. Indeed, the higher temperatures seem to have been reached in the north/north-west part of the building. This is reinforced by the distribution of the extensively vitrified samples (**Fig. 5.34**), suggesting temperatures of at least 850/950°C for both calcareous and non-calcareous clays. What is more, the identification of the dark greyish burned floor surface was much more straightforward during the excavation of the north part of Building 7. This can also be attributed to the higher temperatures reached during the destruction of the superstructure, as well as to the lack of severe post-depositional disturbances in that specific area.

Moving to the type-specific distribution maps, the picture provided is open to different readings. The distribution of Type A and B fragments (**Fig. 5.35**) is significant as they probably represent the two basic wall framing techniques. It is evident that fragments bearing typical ‘wattle-and-daub’ impressions were mainly located at the periphery of the rubble area, especially at the westernmost and northernmost micro-trenches, as well as at the south-west corner of the spread. The main occurrence of type D fragments at the periphery of the rubble (especially the north-west corner and the southern part) points to the association of type A with samples bearing plank-shaped or split timber impressions. If type D is actually reflecting a weather-board cladding technique, it could be argued that this was applied in wall panels built in a ‘wattle-and-daub’ fashion.

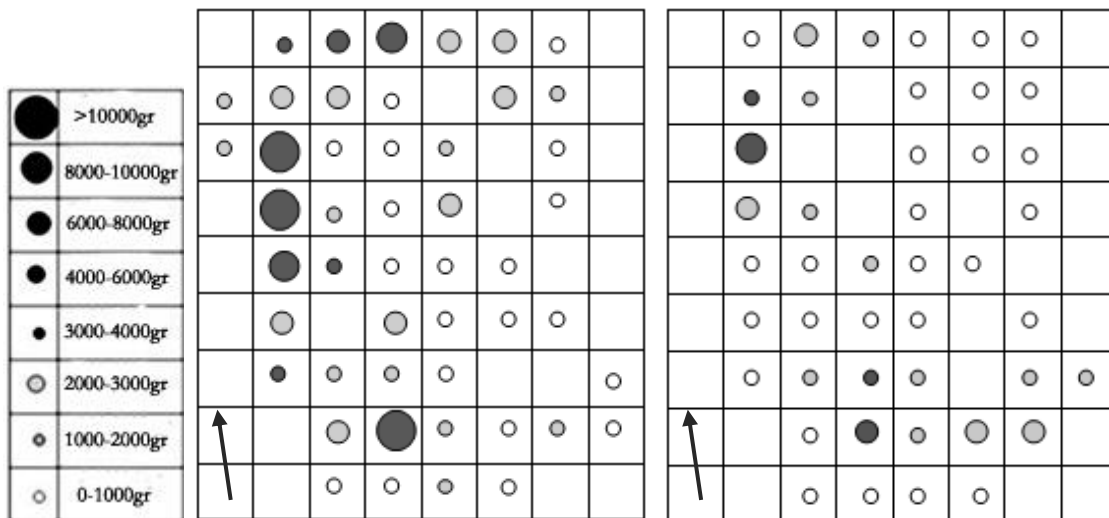


Figure 5.35 Building 7: schematic distribution of type A (left) and type D (right) daub fragments according to weight classes.

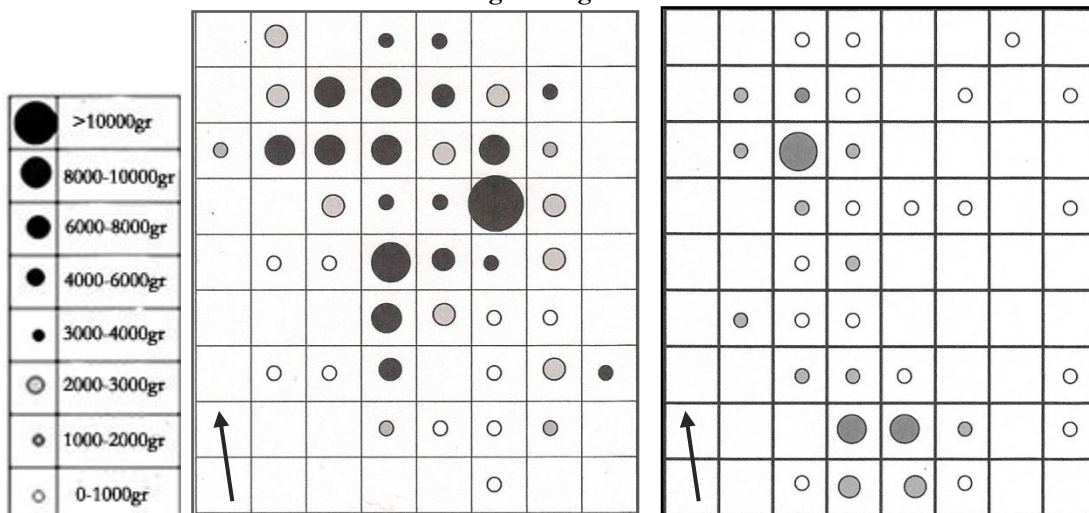


Figure 5.36 Building 7: schematic distribution of type B (left) and type B1 (right) daub fragments according to weight classes.

Contrary to the type A and D samples, daub fragments bearing impressions of closely set stakes or thin poles (type B) are predominant at the centre of the grid (**Fig. 5.36**). In addition, they are more abundant at the east side of the rubble. This pattern could reflect the application of different techniques in different parts of the structure. It could be suggested that a ‘wattle-and-daub’ technique was employed for the construction of the west wall or at least part of it, while a ‘closely set stakes’ technique was applied for the construction of the east and the north wall.

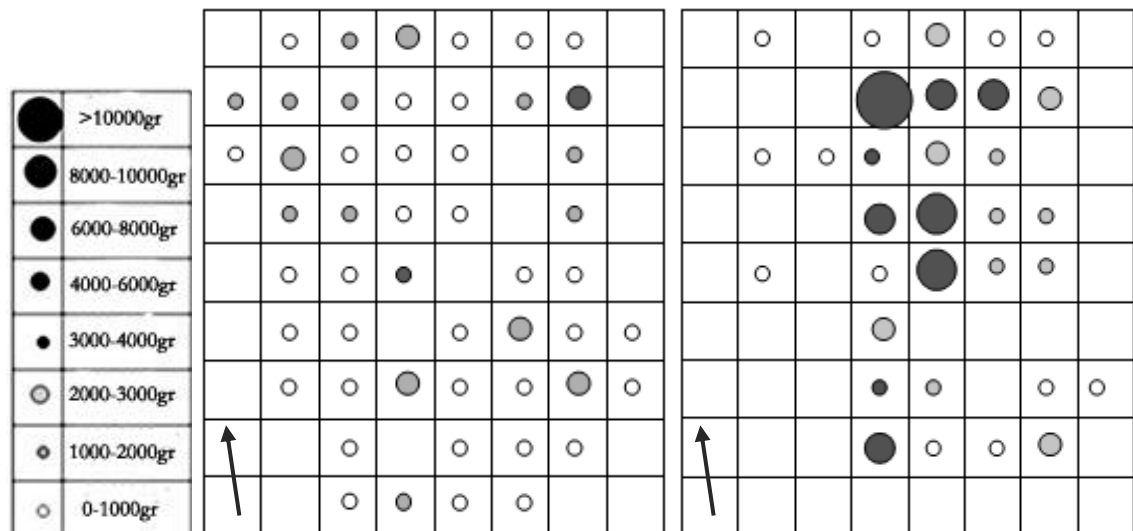


Figure 5.37 Building 7: schematic distribution of type C (left) and type G (right) daub fragments according to weight classes.

An alternative option worth exploring is that both techniques were combined in the construction of the same wall, either to fill different panels or representing its lower and upper parts. In the case of the north wall, the distribution of type B fragments near the postulated wall line may indicate that its lower part was made of closely set stakes and split timbers. The distribution of type A fragments at the northernmost part of the grid may imply the construction of a wattle-and-daub upper part (e.g. between the tie-beam and the roof) that had collapsed outwards. A similar reconstruction implied by the co-existence of type B1, A and D type fragments, could be supported for the south narrow wall.

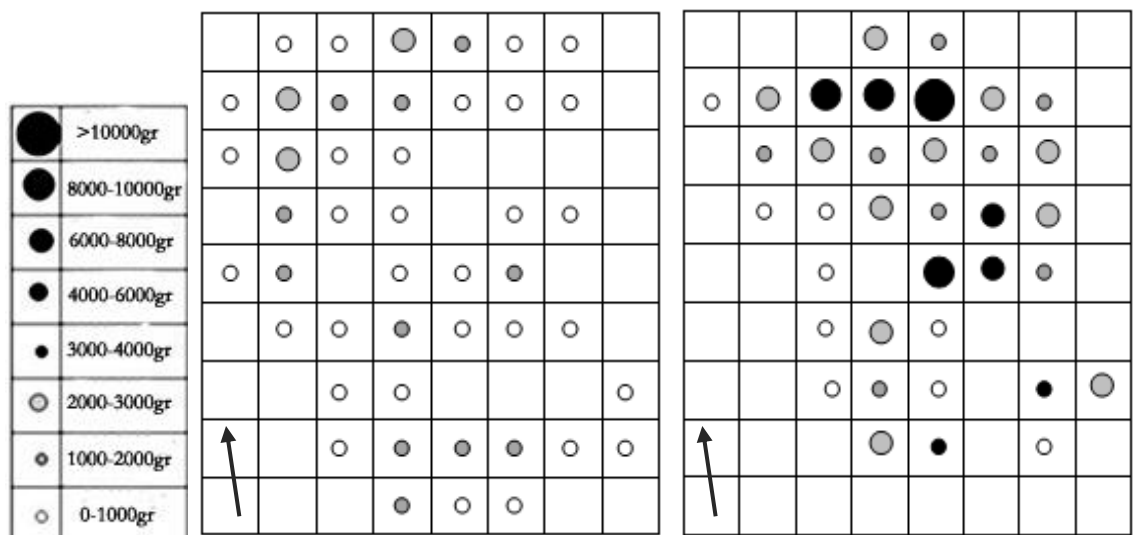
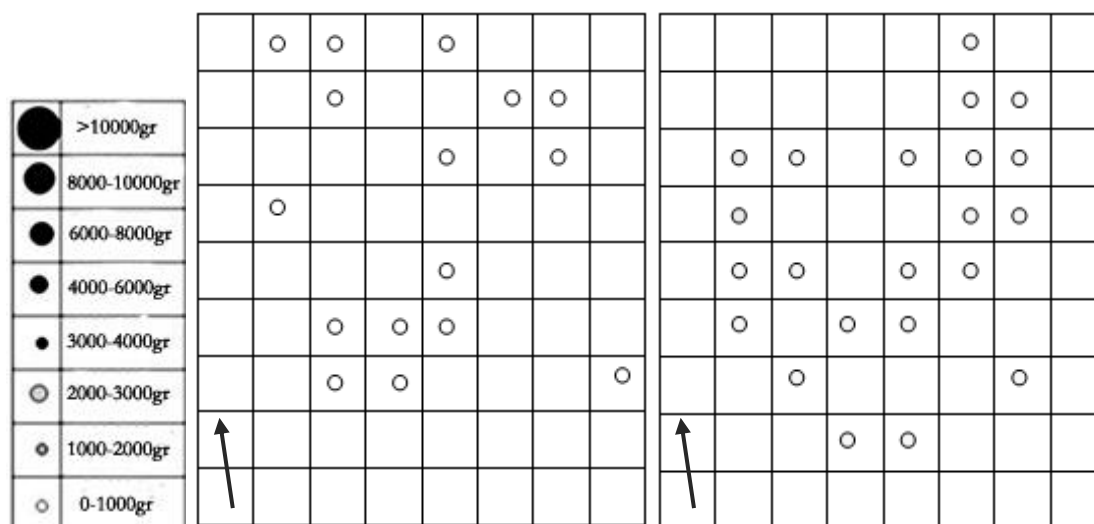


Figure 5.38 Building 7: schematic distribution of undiagnostic plant-tempered (left) and undiagnostic non plant-tempered (right) daub fragments according to weight classes.

Moving to those fragments representing a second layer of plaster, it is evident that type C samples derive mainly from the periphery of the rubble, while the type G ones are mainly

concentrated at the north/north-west part and the centre of the micro-grid (**Fig. 5.37**). Whether they should be associated with other categories presenting comparable distribution patterns is not clarified. In addition, no special patterns emerge when plotting the finishing plaster fragments (type H – **Fig 5.39**).

The distribution of undiagnostic samples shows that the larger proportions of plant-tempered daub derive from the periphery of the rubble and are directly associated with fragments belonging to type A, C and D (**Fig. 5.38**). Similarly, the distribution of non plant-tempered daub fits well with the distribution of type B fragments. Finally, type E samples representing the disarticulated floor of interior structures were mainly located at the north part of the building rubble (**Fig. 5.39**). Two areas have been marked for the possible presence of thermal structures or working platforms. Their association with several extensively vitrified samples could hypothetically hint at the location of an ignition point.



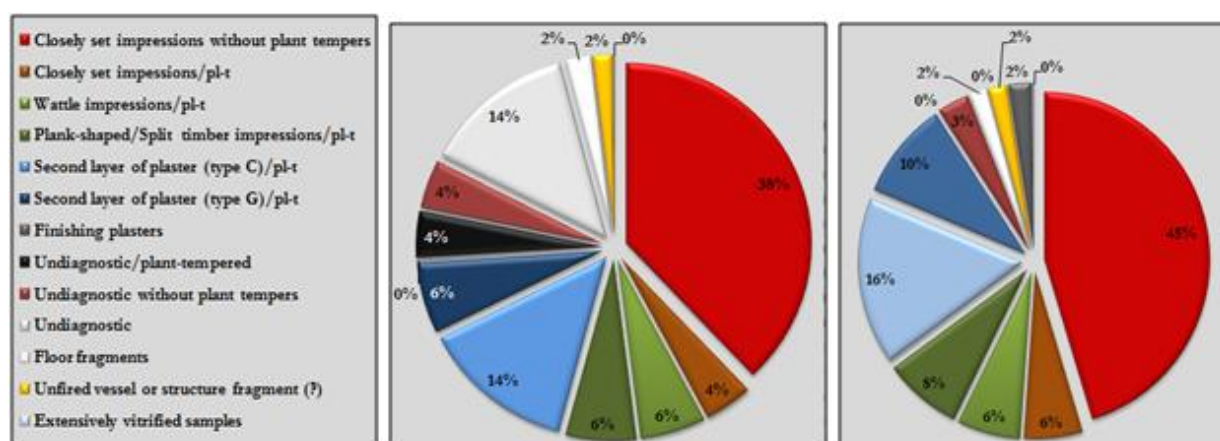
**Figure 5.39 Building 7: schematic distribution of type E (left) and type H (right) daub fragments according to weight classes.**

Moving to the analysis of Building 5, the macroscopic study of a large sample of the excavated material had resulted in the generation of distribution maps and charts offering valuable information about the structural characteristics of the building and the post-depositional disturbance of the rubble. However, the modification of the excavation objectives and the decision to preserve parts of the rubble *in situ* posed certain methodological and interpretative limitations. Therefore, it was necessary to juxtapose the evidence with the excavation archives and the field observations made during the subsequent years. For the most part, it seems that the typology of daub fragments and the



impressions of the timber frame, as well as their general distribution, do not alter dramatically when the fieldwork evidence is taken into account.

The total weight of the recorded material from Building 5 is 293.10kg. Approximately 122.58kg belong to small-sized fragments, while the weight of the analysed ( $\geq 8\text{cm}$ ) samples is ca.170.52kg (**Fig. 5.40**). Regarding the different types of daub represented, type B is dominant, especially when the more sizeable samples are taken into account. Fragments belonging to a second layer of plaster (types C and G) and undiagnostic ones follow, while types A and D, reflecting the application of the ‘wattle-and-daub’ technique and the use of plank/board-shaped or split timbers respectively, exhibit low percentages (see also **Fig. 5.45**).



**Figure 5.40 Building 5: proportions of daub fragments per type: total assemblage (left) and analysed ( $\geq 8\text{cm}$ ) fragments (right).**

The plotting of the material according to different weight classes indicates that the bulk of the collected samples derive from trenches 282.3 and 282.4 (**Fig. 5.41**). As is the case for Building 7, no definite wall lines or internal partitions have been securely identified. Nevertheless, the spread of the rubble area, the extensive identification of the dark greyish floor surface and the retrieval of possible postholes have shed light on the structure's boundaries. The picture emerging suggests that the north wall of the building should be traced at the southern part of trenches 282.1 and 282.2. The distribution of the superstructural remains and a series of postholes that follow a roughly W-E direction reinforce this assertion. The large quantities of daub deriving from the southernmost micro-trenches could represent the remains of the south wall of the building that had collapsed near its original position. This is also supported by a restricted number of postholes, probably belonging to the Avgi I horizon. The western limits of the structure are better defined by the extent of the floor surface, while the eastern boundary of the

structure has been heavily disturbed by later cuttings (including pit-like features and a system of narrow ditches). The overall distribution of daub according to weight densities is further obscured by the fact that a large amount of collapsed material is still left *in situ*.

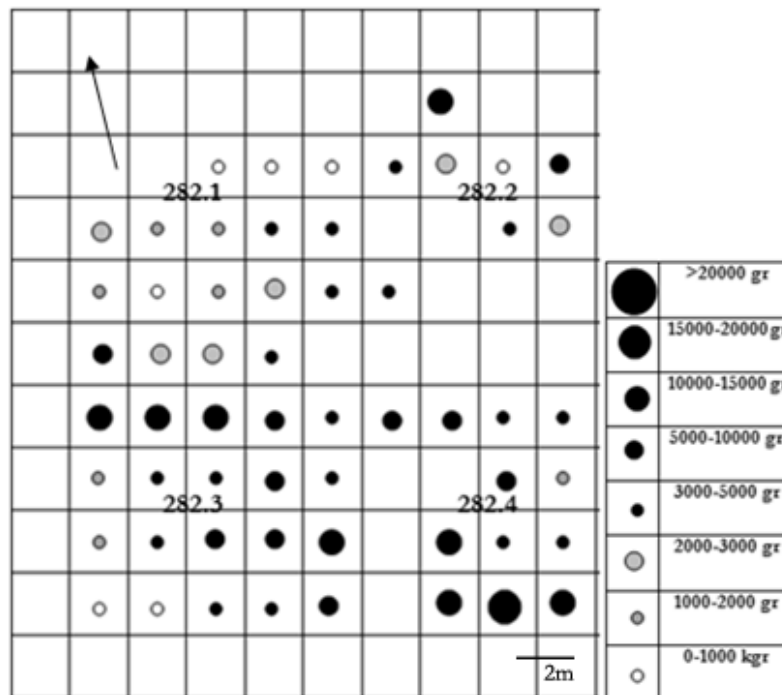


Figure 5.41 Bulding 5: schematic distribution of daub fragments according to weight classes.

Type-specific distribution maps reaffirm the overall dominance of type B fragments, especially at the central and southern part of the rubble (**Fig. 5.42**). It seems that the major part of the superstructure was built with a technique consisting of closely set stakes or thin poles and split timbers. On the contrary, samples bearing impressions of less sizeable timber elements (type A) present low proportions and no specific distribution patterns. Their weight density, as presented in the distribution maps and the charts drawn at a trench level (**Fig. 5.43**), seems to be comparatively higher at the north-west boundary of the rubble. Whether this pattern could reflect the southward collapse of a wall part or a panel built in a ‘wattle-and-daub’ fashion is not clear. Whatever the case may be, the observations made in the field are consistent with the more widespread, yet restricted, occurrence of type A fragments at the north-west and west periphery of the collapse area.

The distribution of samples belonging to the so-called second layer of ‘packing’ of the timber frame (types C and G) follows, by and large, the distribution pattern of type B fragments. This indicates their close association in the construction of the building’s superstructure. Type D fragments, on the other hand, are restricted in number and do not present any clearly observable patterns (**Fig. 5.44**). Finally, the distribution of floor

fragments (type E) has led to the identification of a possible disarticulated feature at the northern part of trench 282.3. This has been interpreted as an internal thermal structure or a working platform.

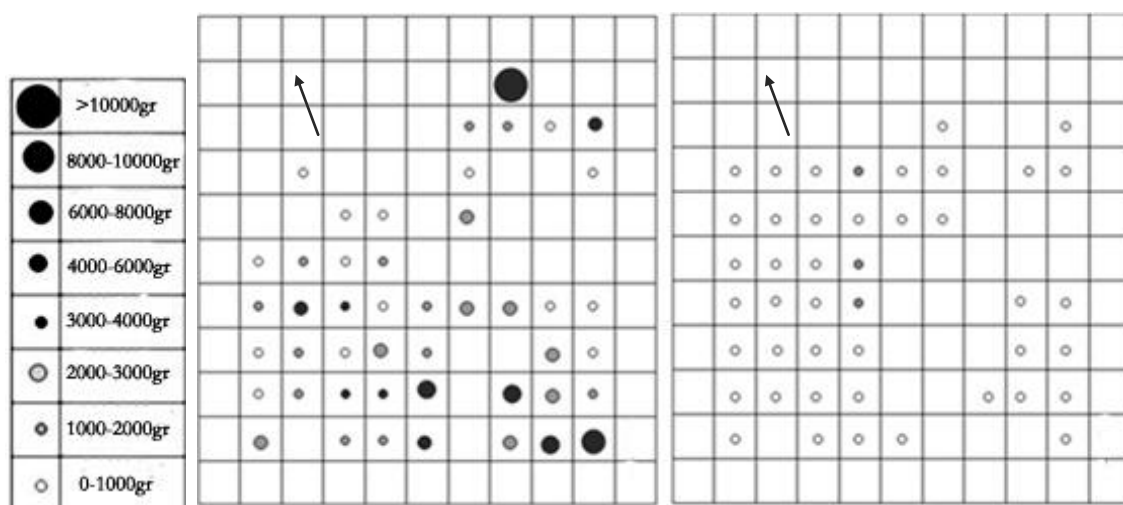


Figure 5.42 Building 5: schematic distribution of type B (left) and type A (right) daub fragments according to weight classes.

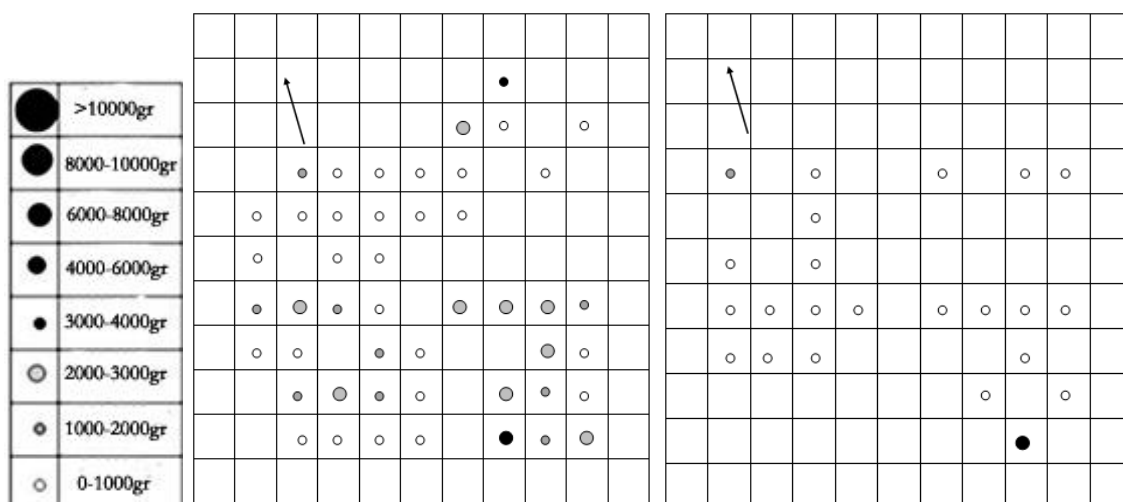


Figure 5.43 Building 5: schematic distribution of type C and G (left) and type D (right) daub fragments according to weight classes.

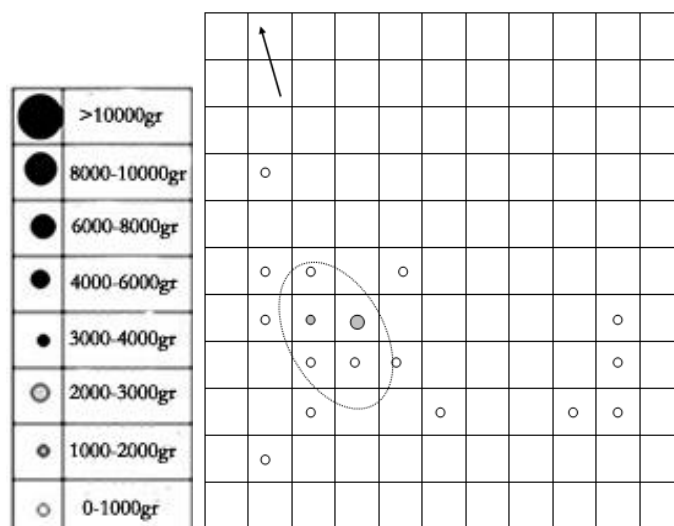


Figure 5.44 Building 5: schematic distribution of type E daub fragments according to weight classes.

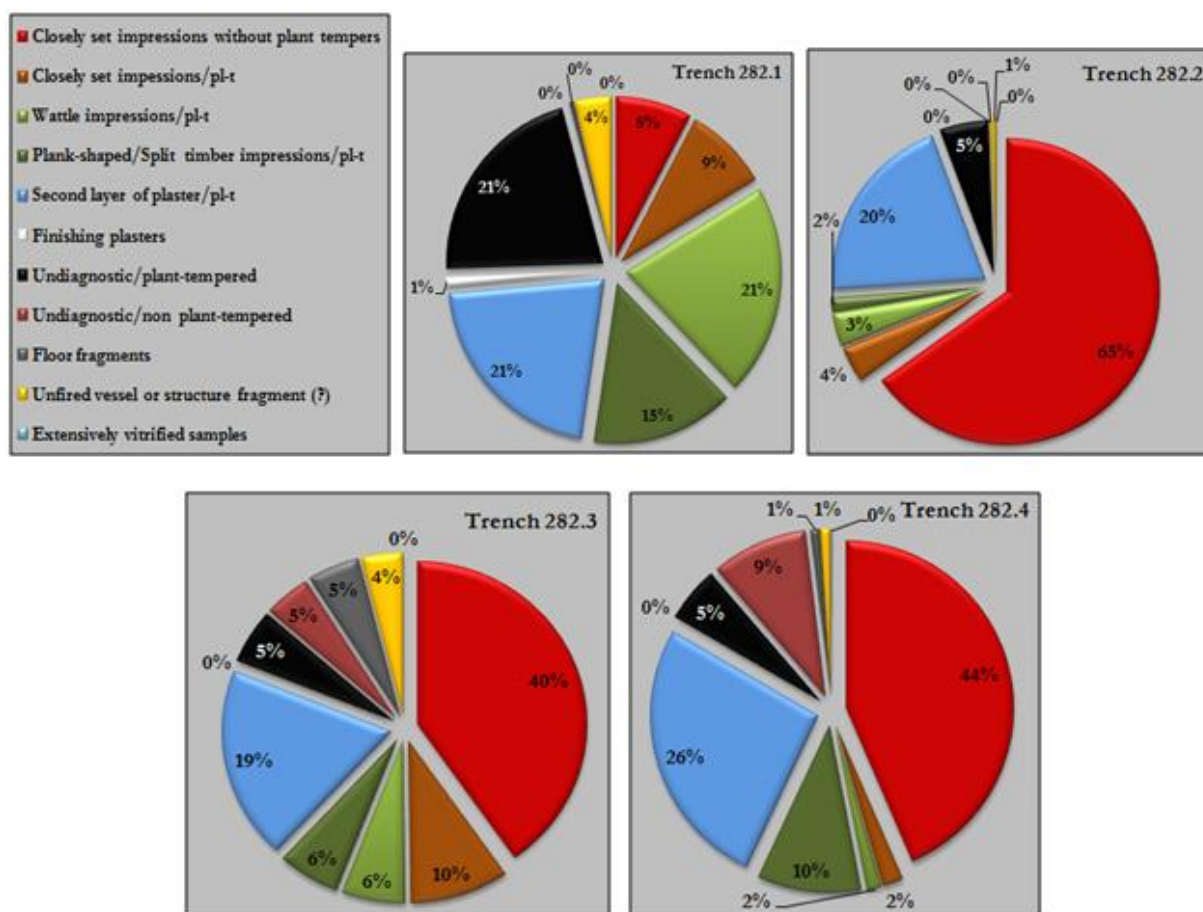
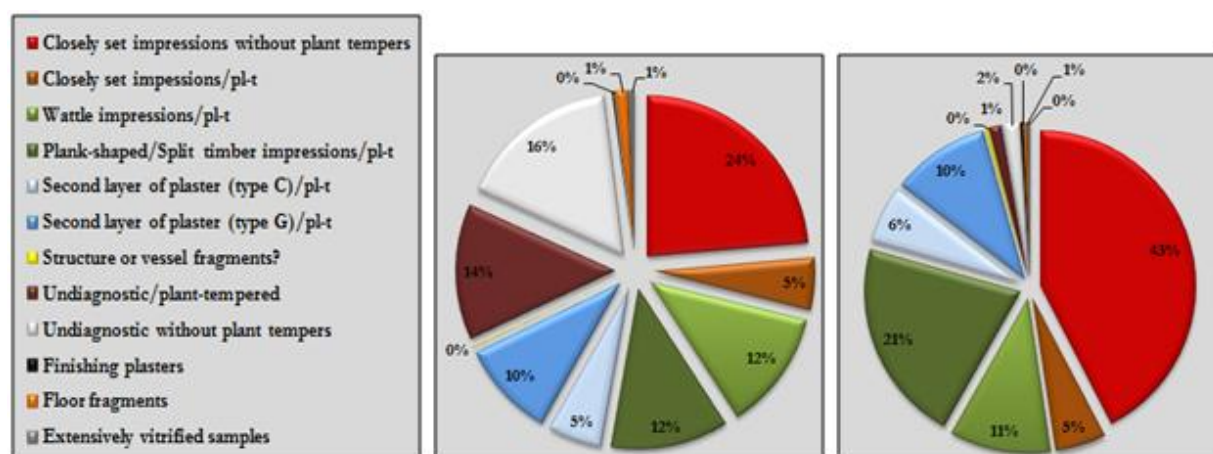


Figure 5.45 Building 5: proportions of daub fragment types at the trench level according to weight classes.

In the case of Building 2a, the early rescue character of the project has led to the application of an excavation methodology that proved, in many aspects, to be problematic for the detailed study of architectural remains. More specifically, no micro-grid or other spatial orientation system was used during the uncovering of the rubble or the collection of

the daub fragments. What is more, the photographic and digital documentation of the remains was often proved insufficient. Therefore, it is difficult to outline the distribution of the collected samples beyond the trench or excavation unit level.

The total weight of the recorded daub fragments belonging to the 'Building 2a' rubble is ca.209.65kg. Among these, 140.51kg comprise fragments measuring less than 8cm in size, while the total weight of more sizeable fragments does not exceed 69.15kg. The bulk of the material derives from the less heavily disturbed trench 254.1 (ca.117.02kg), while smaller quantities were collected from the remaining areas. The superstructural remains, being subjected to multiple disturbances and dislocations, cannot provide secure conclusions in terms of their distribution. However, the evidence presented in **Fig. 5.46** attests to certain patterns that can be discerned at the trench level.



**Figure 5.46 Building 2a: proportions of daub fragments per type: total assemblage (left) and analysed (≥8cm) fragments (right).**

It becomes obvious that almost all types of daub are represented in most parts of the excavated area (**Fig. 5.47**). Differences in their relative proportions indicate the predominance of type B samples at the central trenches (254.1 and 254.2) of the collapse area, while the percentages of type A and D daub fragments are comparatively higher at the north and south periphery of the rubble. This may imply that the east and west walls of the building were built in a closely set stakes' fashion, while the 'wattle-and-daub' technique was more extensively applied at the north and south external walls. Once again, the application of different techniques for the screening of different panels or the lower and upper parts of the walls seems plausible. Split or plank-shaped timbers may have been used for the screening or reinforcement of different parts of the superstructure, as their distribution does not reveal specific patterns. Finally, the comparatively increased



percentage of type E fragments with pebble impressions at the northernmost part of the rubble may indicate the presence of a thermal structure in the area.

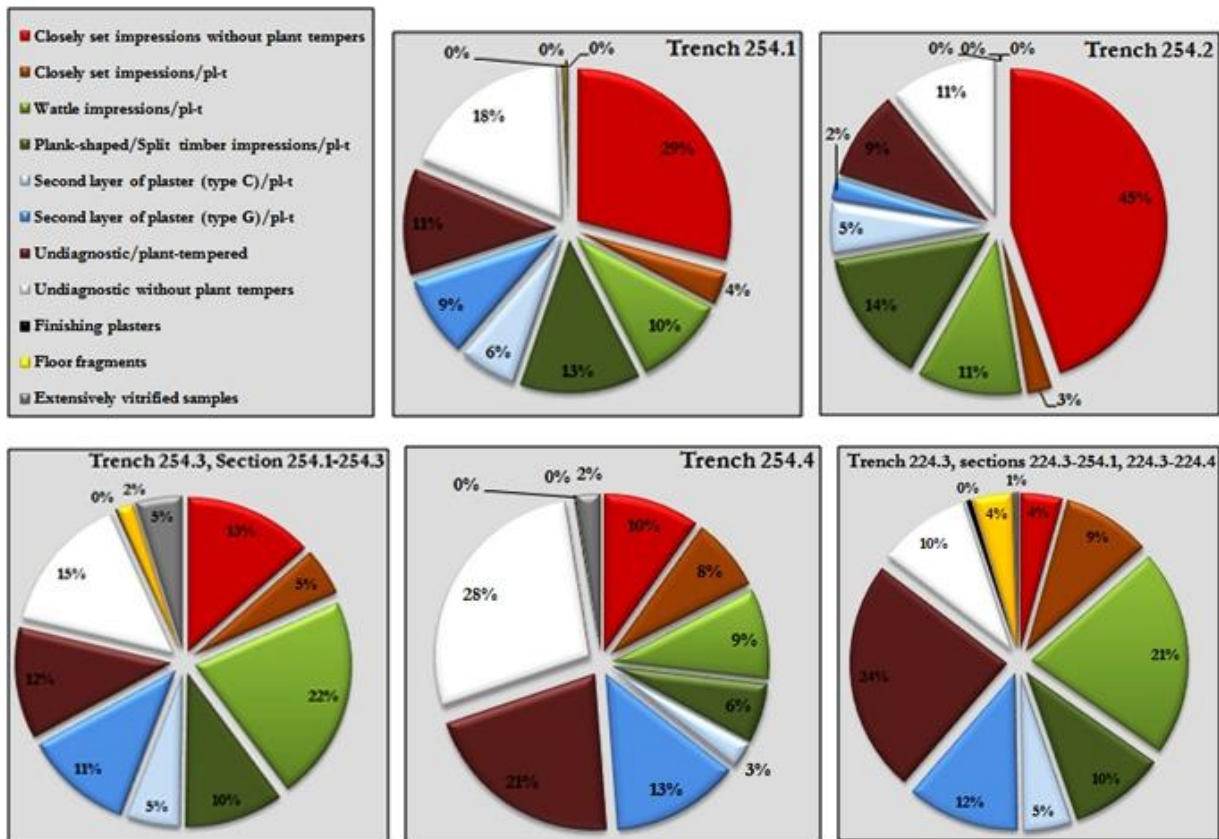


Figure 5.47 Building 2a: proportions of daub fragment types at the trench level according to weight classes.

### 5.2.5 Building practices at Avgi I

The main sources of information for the construction practices at the settlement of Avgi I derive from the numerous fire-hardened daub fragments and, to a lesser extent, from occasional postholes or charred wood remains. Charcoal analysis offers limited evidence on the exploitation of certain tree species. Most bits of charred wood collected during the excavation or water flotation of the deposits are very small in size. They cannot be securely linked to structural timbers as they may also derive from wood used as fuel or for the production of various artefacts and furnishings. Moreover, the puzzling rarity and problematic nature of the retrieved post-holes does not always allow their association with the load-bearing elements of the structures or the identification of their ground plans. Therefore, the main corpus of information for the building's frame comes from the multiple impressions preserved on daub.

The analysis and interpretation of the sample, although problematic in many respects, shed light on various aspects of the techniques applied. It should be noted that more than 59% of the analysed ( $\geq 8\text{cm}$ ) samples bear at least one impression, indicating that large proportions of structural timber were used (**Fig. 5.48**). Furthermore, another 6-7% bear possible impressions that were not adequately preserved. The most common occurrence is one to three impressions per analysed fragment, although up to seven or even 10 impressions have been recorded in larger and better preserved examples.

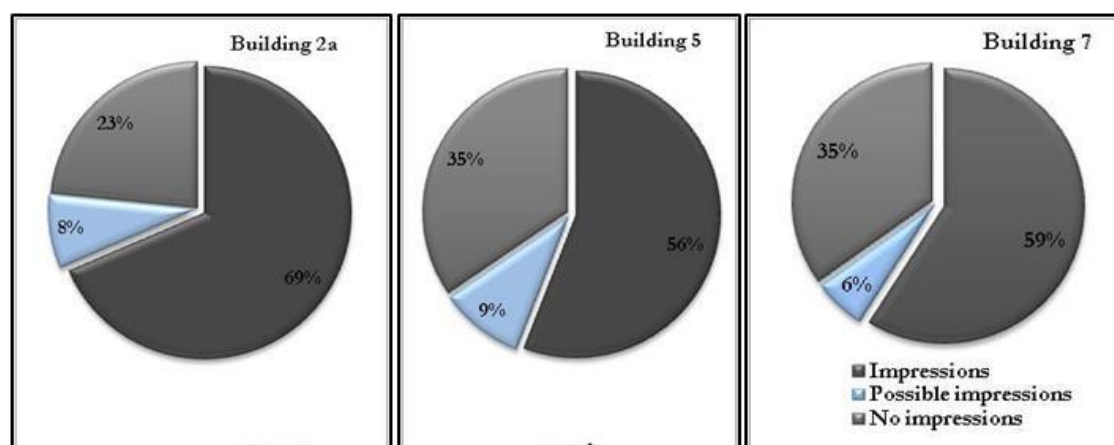


Figure 5.48 Proportions of timber impressions on daub per analysed building.

### Foundation and pre-framing: the post-holes conundrum

Although inconclusive in many respects, the evidence from Avgi I render it possible that at least small-scale levelling practices were occasionally employed. Stratigraphic sondages into the floor of Buildings 1 and 3 indicate the presence of a second collapse layer and floor surface. It is possible that the structures overlaid earlier architectural remains and that some sort of levelling was required. In addition, a substratum rich in calcareous aggregates<sup>60</sup>, occasionally uncovered below the floor level of certain buildings (**Fig. 5.49**), may have acted as a ‘packing layer’ for the foundation of the structure.

The foundations of the Avgi I buildings included upright posts sunk directly into the natural subsoil. The clayey and compact nature of the soil seems to have provided adequate stability and durability in order to deal with the different types of loads (such as the superimposed, self-weight and wind loads – see Brunskill 2007, 20–1) affecting the structure. It could be argued that corner, central and intermediate posts were placed at, more or less, regular intervals, while the possible existence of a double corner post is also

<sup>60</sup> Calcareous inclusions may have been formed by natural or by other processes including the dissolution of wall lime plasters.

indicated in the case of Building 7. However, the exact arrangement of the load-bearing elements is quite ambiguous.



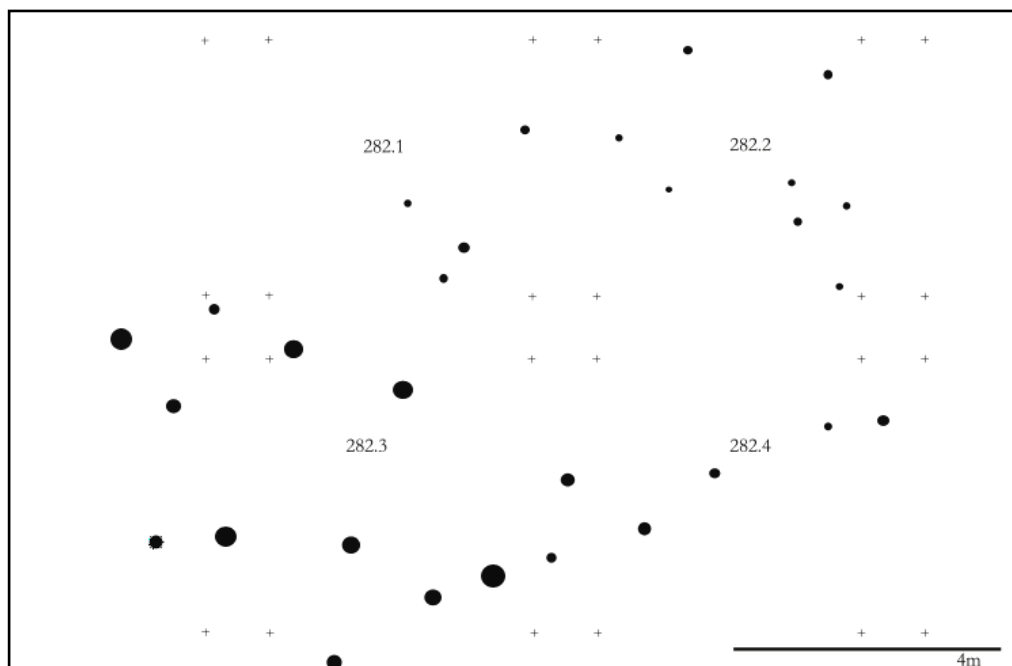
**Figure 5.49 Building 7: Microstratigraphic sequence at the NW part of the rubble (Avgi excavations archive, permission: G. Stratouli).**

Unlike other sites in the region and beyond, the identification of well-defined rows of posts was not possible. Postholes of various sizes were either found isolated or forming constellations that do not shed much light on possible wall lines and ground plans. In addition, it was often difficult to differentiate between elements belonging to the earlier and later building horizons. During the excavation of Building 7, a restricted number of possible postholes were identified and were associated by the author with the excavated rubble (see **Fig. 5.31**). In the case of Building 2a the picture was obscured by later disturbances, while the rest of the Avgi I buildings present similar problems. The rarity of preserved postholes may be partly attributed to pedological reasons and site formation processes, as well as in the restricted number of posts used for the support of the superstructure and the roof. In certain construction techniques the main frame can be developed from four corner posts and a single pair of posts at intermediate points.

The evidence from Building 5 presents a different, though equally problematic, situation. The postholes excavated there were commonly found as ‘empty spots’ at the periphery or the centre of the compact rubble area. As a result, they were considered to be later elements cutting through the Avgi I and the natural deposits. This was occasionally confirmed as certain daub fragments were clearly cut by later posts or pit-like features. Although this interpretation seems convincing, another option is worth mentioning.



Following the plotting of the recorded postholes, it was noticed that some of them define a roughly rectilinear area with a W/SW-E/NE orientation that fits quite well with the spread of the rubble under study (**Fig. 5.50**). It would, therefore, seem that these are either reflecting a later post-framed structure built on top of the earlier remains in a vertical replacement pattern, or representing the actual load-bearing and supportive elements of the 'Building 5' superstructure. The fact that the postholes were not always covered by the superstructural rubble does not necessarily rule out the latter scenario. It is possible that after the collapse of the structure, the lower, above ground part of posts remained in place up to a height, thus preventing the accumulation of fire-hardened daub and resulting in the creation of 'empty' circular areas.



**Figure 5.50** Postholes excavated in the area of Building 5.

Following the above-mentioned approach, it is proposed that at least some of the identified postholes should be linked to the earlier building horizon. Their average diameter ranges between ca. 14cm and 25cm (**Fig. 5.51**). These values are, by and large, consistent with the diameter range of round, sizeable impressions on daub that were characterised as possible posts<sup>61</sup>. Less sizeable postholes could belong to secondary elements for further supporting the superstructure or internal features and partitions.

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<sup>61</sup> It should be noted that the average posthole size is expected to be slightly larger than that of the actual post.

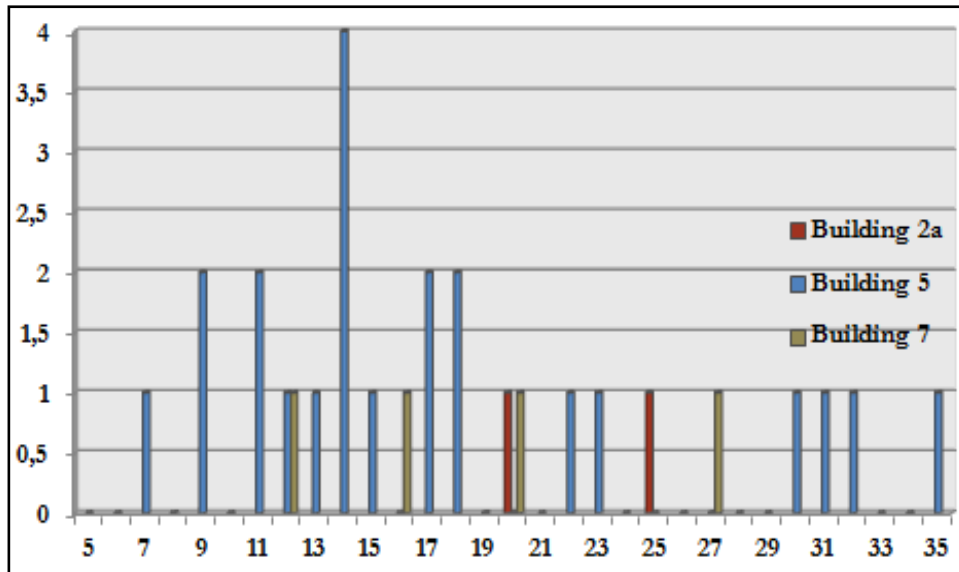


Figure 5.51 Diameters of postholes related to the rubble of Buildings 2a, 5 and 7.

### The screening of the timber frame

The erection of the load-bearing structure or the timber frame, comprising posts, beams, as well as intermediate vertical studs and shorter members, provided adequate support for the superstructure and the roof. The subsequent screening from wind and weather could have been achieved with the use of any combination of materials that was able to support its own weight (Brunskill 2007, 26). In the case of Avgi I, three main walling techniques were employed in the shaping of the so-called ‘non structural wall’, that is the space between the framing elements. These were recognised on the basis of the multiple impressions recorded on daub. The general morphology and dimensions of the impressions were used to differentiate between various types of structural timber. The two principal categories include a) concave, elongated impressions belonging to round timbers and b) relatively flat or wavy impressions with parallel running lines from inner tree tissues reflecting the splitting of timbers. A number of impressions were categorised as undiagnostic, while a few thin impressions represent possible natural ties.

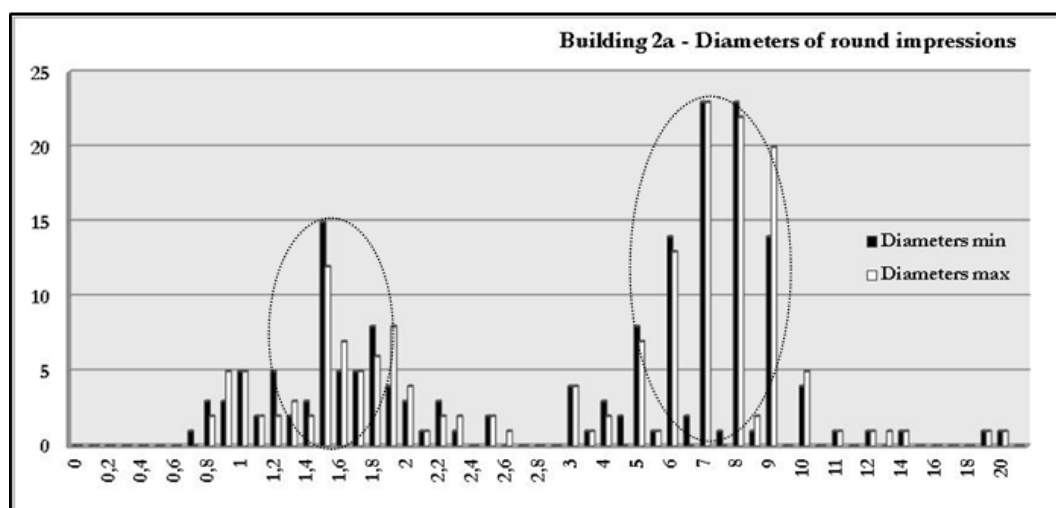


Figure 5.52 Building 2a: diameters of round impressions.

The diameters of round impressions for each building are presented in **Figures 5.52-5.54**. According to the peaks shown in the graphs, two main classes were discerned. The first refers to structural timbers measuring ca.0.5-3cm in diameter, apparently representing reeds, twigs or thin branches. The second class comprises timbers, probably thicker branches or thin trunks of young trees, with a diameter of 4-14cm. Impressions of larger volume, measuring more than 14cm and reaching up to 25cm in diameter, are much fewer and could be associated with the load-bearing elements of the superstructure. However, their preservation status is rarely satisfying and their large diameter may be the result of daub deformation during burning<sup>62</sup>.

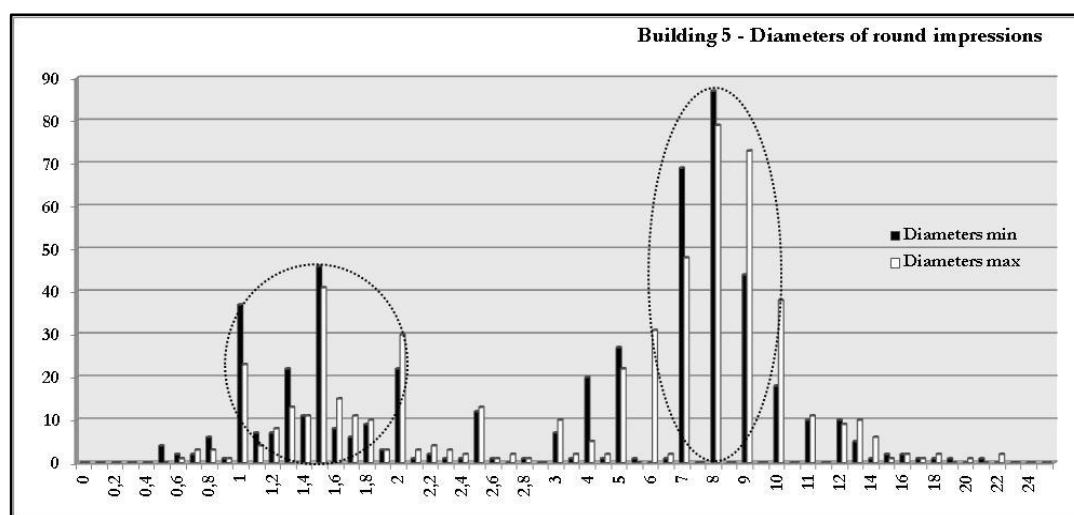
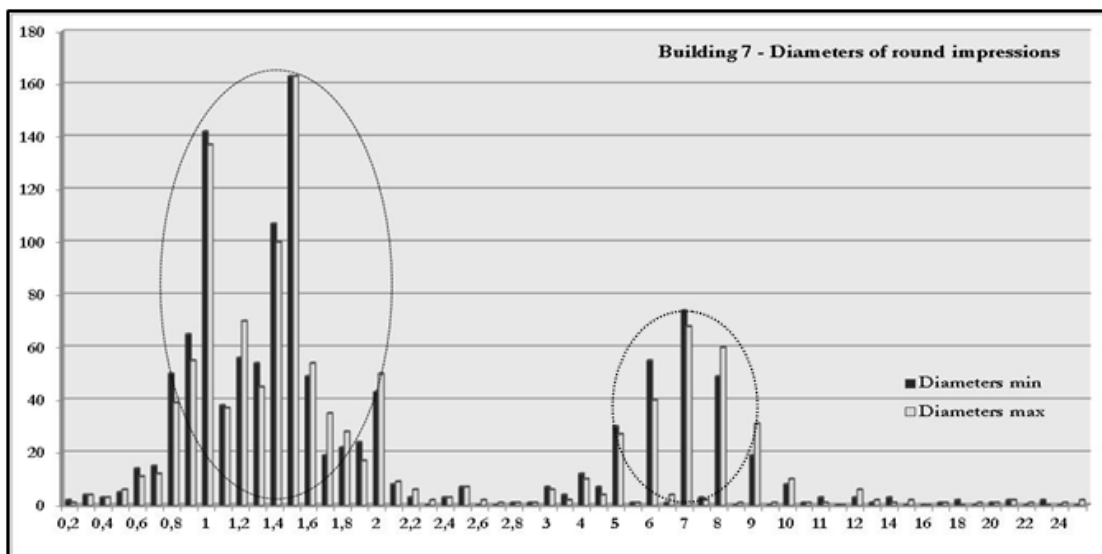


Figure 5.53 Building 5: diameters of round impressions.

<sup>62</sup> The major load-bearing timbers need not to be plastered with mud. However, their impressions could be preserved in ceramified daub fragments deriving from those parts of the screening walls that joint to the main frame.

When comparing the three buildings under study a remarkable standardisation of average diameter values is observed. Minor fluctuations in the range of small-sized timbers are directly associated with the quantity of impressions recorded in each case. Therefore, the average range in the Building 2a graph lies between ca.1.5cm and 1.9cm, while the graph of 'Building 7', comprising a larger amount of recorded samples, exhibits a wider range between ca.0.8cm and 2cm. The same does not apply for the medium sized impressions of round stakes. There is a striking consistency in the dimensions of the timber used in all three assemblages, with the Building 7 graph probably representing a slightly higher degree of standardisation. The more pronounced difference can be traced in the ratio between the small- and medium-sized impressions recorded. The predominance of small-sized impressions in Building 7 fits well with the more widespread occurrence of type A daub fragments in the rubble.



**Figure 5.54 Building 7: diameters of round impressions.**

Split or cleft timber impressions can also be categorised according to their general morphology. Although the estimation of their original dimensions is problematic, it was possible to differentiate between split wattles or thin branches ranging between approximately 1cm and 3cm in width, semi-cylindrical or flat split timbers measuring around 9cm, and split timbers with a width occasionally reaching up to ca.15cm. The first two classes comprise impressions that are commonly found in combination with small- or medium-sized round ones, while the third class mainly reflects split or plank/board-shaped timbers preserved on type D fragments. Due to the restrictions in calculating the accurate dimensions of a split timber by measuring its partially preserved impression, a comparative analysis between buildings was not feasible. Nevertheless, it may be observed that small-

sized split impressions present the lowest percentages in all three assemblages. The plank/board-shaped or split elements occur more frequently, with the exception of Building 5 where the more widespread use of split timber in place of round stakes is indicated. Finally, the high percentage of plank/board-shaped impressions in the analysed remains of 'Building 2a' may point to the more frequent use of worked timber for the construction of the wall 'infill'. The estimations made are associated with the techniques preferred in each case by the builders but are also subjected to the preservation status of the material.

In order to further elaborate the categorisation of the structural timbers, a number of additional criteria were taken into account. These include the typology of the daub fragments themselves, the arrangement of all impressions preserved on the same sample, and the walling technique that they reflect as a whole. The main categories recognised include:

- a) Twigs/withies, thin branches or reeds used for wattling and, occasionally, as horizontal ledgers for joining.
- b) Split branches of small dimensions used in place of round wattles.
- c) Round staves used as uprights for wattling.
- d) Split staves used as uprights for wattling in place of the round ones.
- e) Split or plank/board-shaped timbers probably used as cladding material.
- f) Round stakes or thin poles used in a 'closely set stakes' or 'close-studding' technique.
- g) Split timbers, semi-rounded or flattish, used in place of round stakes or thin poles.
- h) Possible posts belonging to the load-bearing elements of the superstructure.

The proportions recorded for each category are graphically presented in **Fig. 5.55**. It should be noted that the recorded quantities from the partially preserved daub fragments and their impressions do not depict the volume of each timber category used in the construction of the superstructure.

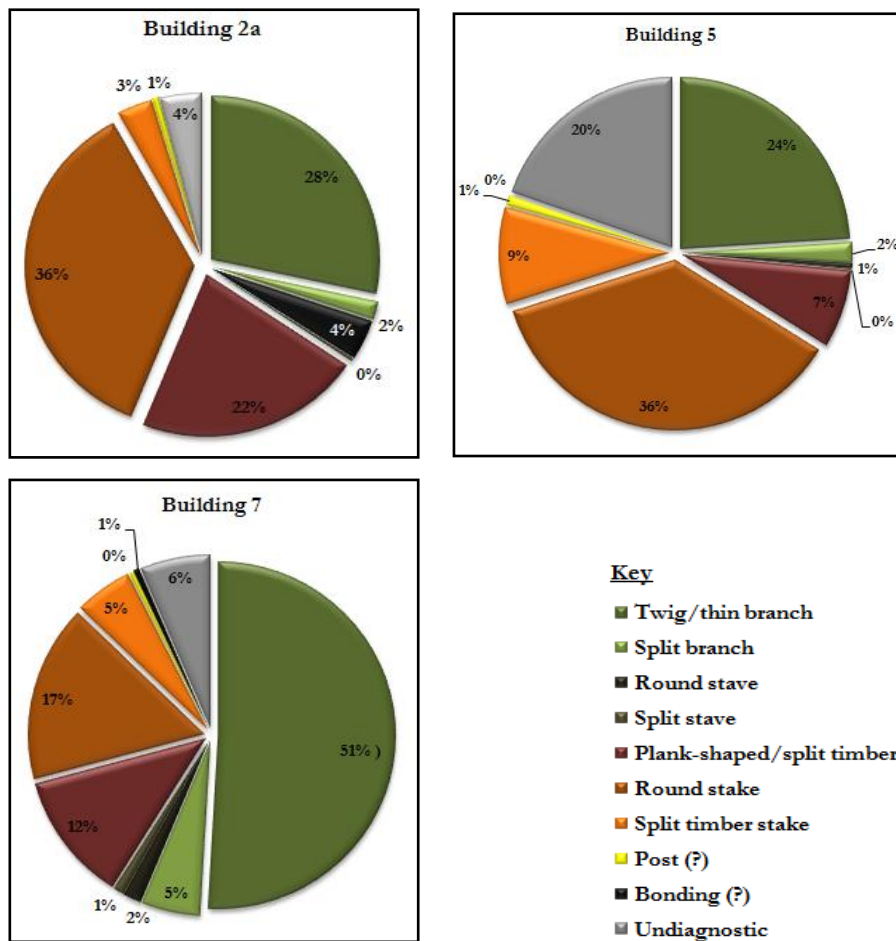


Figure 5.55 Percentages of timber impressions per type.

Among the main walling or screening techniques recognised, the most widespread one, as reflected by the daub weight densities, is represented by type B and B1 samples. As already mentioned, both types reflect a ‘close-studding’ technique of cylindrical stakes or thin poles and split timbers set parallel and next to each other in a distance of 0-4.5cm. Round stakes usually range between 5 and 9cm in diameter (Fig. 5.56–5.58). These values do not change significantly when the small-sized fragments (<8cm) are taken into account. What is more, the average diameters remain almost identical when comparing type B and type B1 samples, thus showing that both types represent a similar framework technique plastered with a different mixture of construction earth. The flattish or semi-cylindrical cleft timbers used in place of the round ones seem to exhibit comparable dimensions. The ratio between round and split timber impressions may offer a general picture for the use of each category in the framing of the wall. However, it should be emphasised that round impressions could also belong to halved timbers, thus further obscuring the estimations made. Other features, such as small diameter twigs, sticks and proper planks, were found set almost parallel to the stakes, probably for reinforcing the frame by filling the gaps between them.

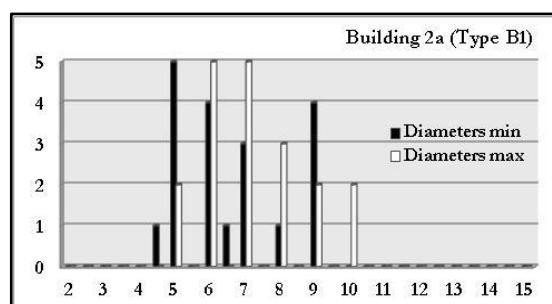
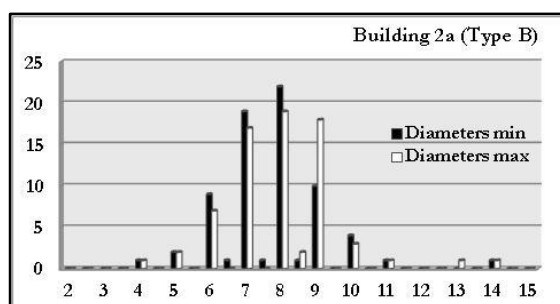
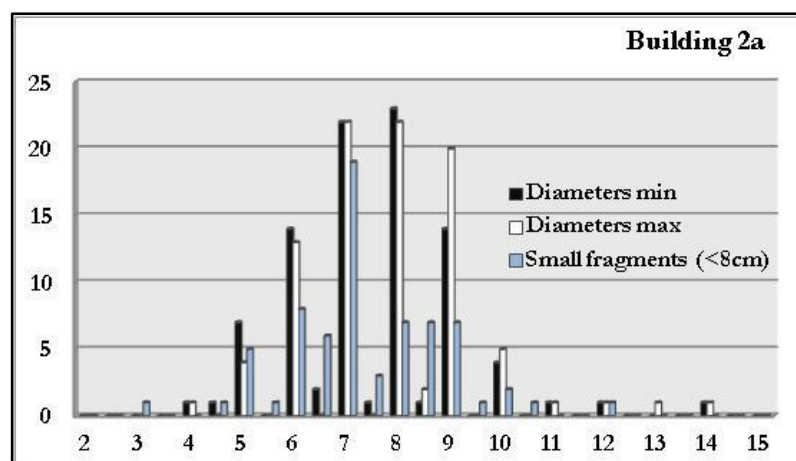


Figure 5.56 Building 2a: diameters of round stakes/thin poles.

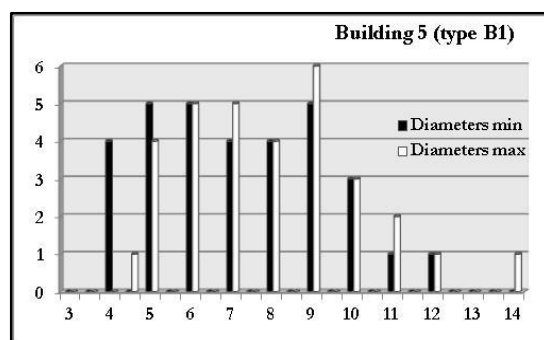
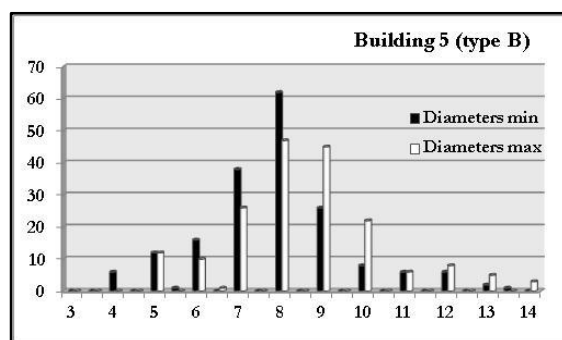
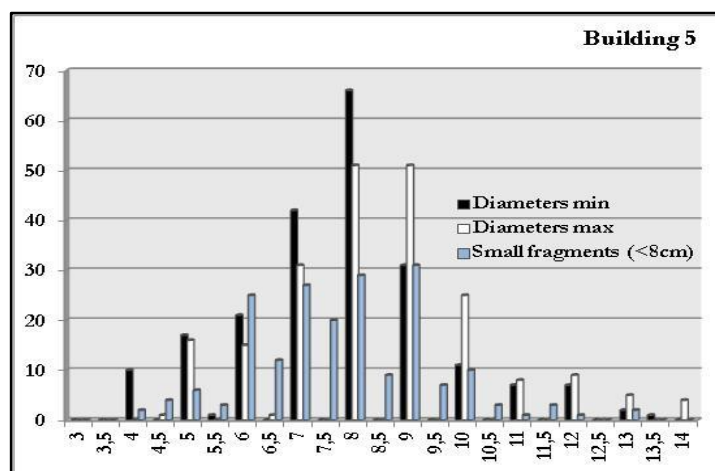


Figure 5.57 Building 5: diameters of round stakes/thin poles.

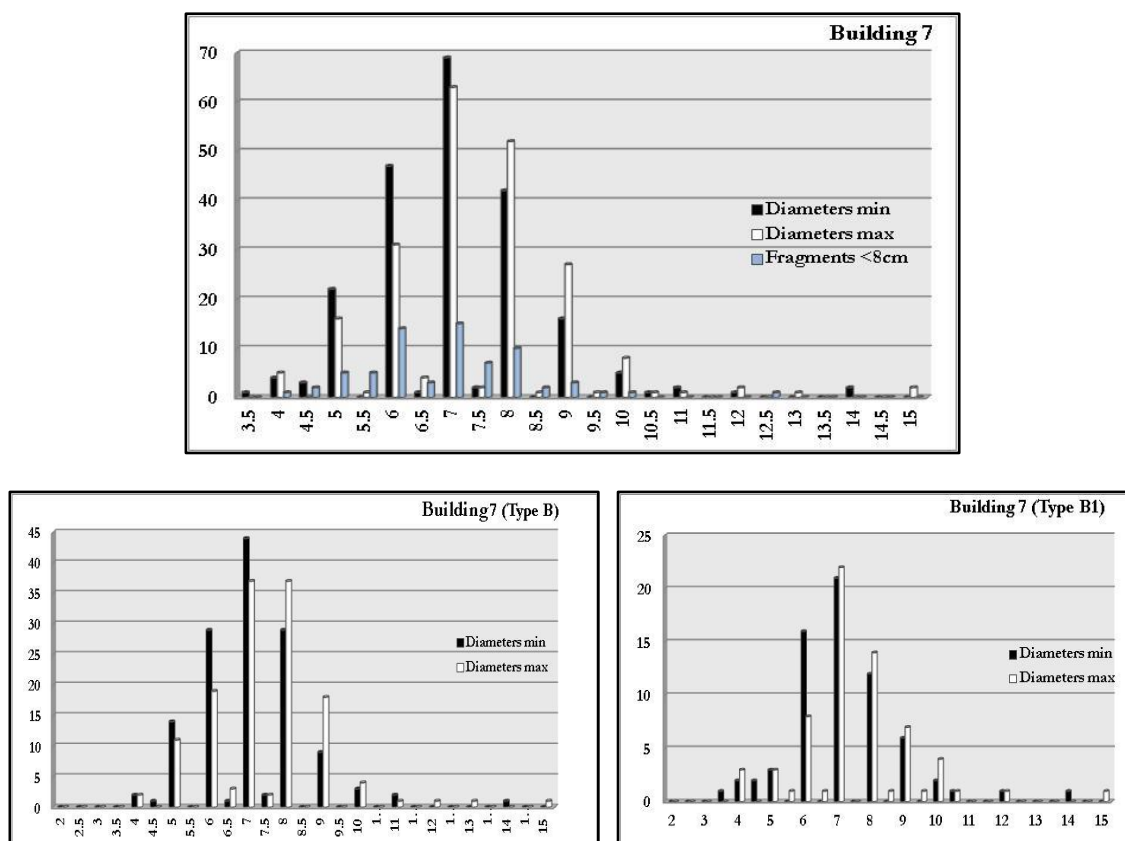


Figure 5.58 Building 7: diameters of round stakes/thin poles.

The attempt to reconstruct such walls comes not without problems. More precisely, it cannot be safely confirmed whether the timbers were arranged horizontally or vertically. The use of horizontally set timbers (**Fig. 5.59**) has been supported in the case of two Neolithic houses at the settlements of Sopot and Otok near Vinkovci (Slavonia). The construction method at the eponymous site of the ‘Sopot culture’ consisted of horizontally laid log halves, with no vertical posts or ditches. At the latter settlement, the horizontally laid logs were supported by vertical side posts (Balén 2010, 57).

The arrangements proposed for the Slavonian Neolithic houses – or historical houses built in the fashion of the ‘log cabins’ of North Europe and North America – would require limited investment in foundations, thus justifying the rarity of post- and stake-holes (see Brunskill 2007, 24–5; Oliver 2003, 111–13). Nevertheless, the horizontal logs, either halved or not, are usually more sizeable and their dimensions and arrangements are much more standardised so as to produce solid walls of mass construction with no need of plastering. In the case of the Avgi I samples, the irregular alteration of medium- or small-sized timbers and split elements, as well as the lack of clear signs of lateral compression, do not seem to



conform to the horizontal arrangement scenario described above. Besides, the absence of stake-holes can be attributed to the use of an earthen<sup>63</sup> or wooden foot (sill or sleeper beam) from which the vertical elements of the non-structural wall rise (instead of being sunk into the ground (Kloukinas 2012). The excavation of a sleeper beam at Sitagroi renders the latter explanation plausible.

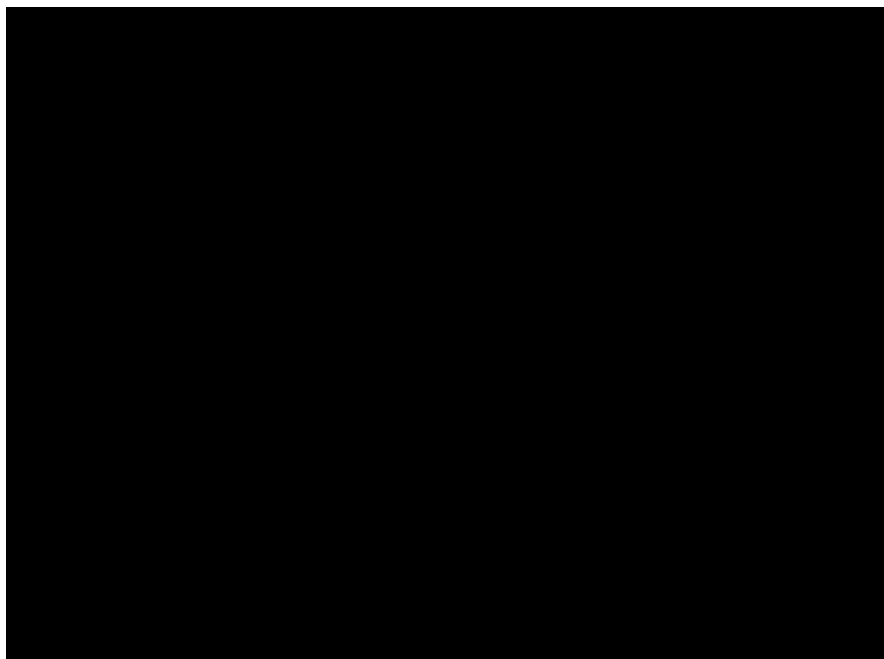
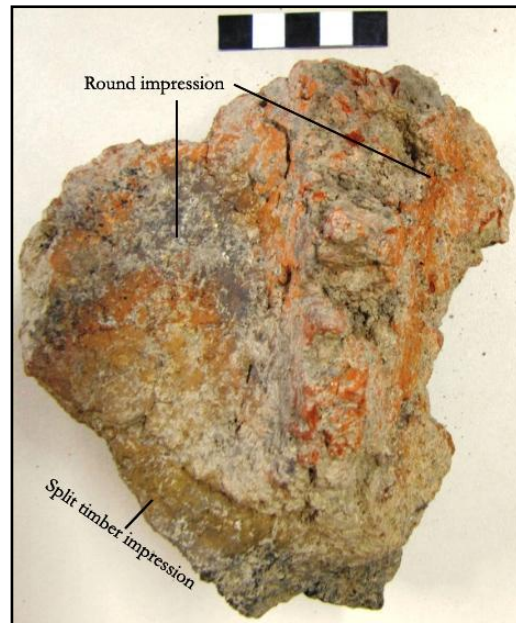


Figure 5.59 Sopot (Slavonia): experimental reconstruction of Neolithic houses (Balén 2010, 58, fig. 63).

The vertical placement of stakes has been supported in northern Greek sites that preserve similar impressions of the timber frame on daub. At the MN/LN settlement of Servia this seems to be the main walling technique. Likewise, at the LN site of Dikili Tash, the vertical placement of stakes was supported on the basis of occasional impressions of transversal elements, often oriented diagonally to them (Martinez 2001, 64–5). Such elements have not been definitely recognised in the Avgi material. However, in a single sample (Fig. 5.60) deriving from Building 5 a split timber impression arranged diagonally to a pair of parallel round impressions may support the use of transverses.

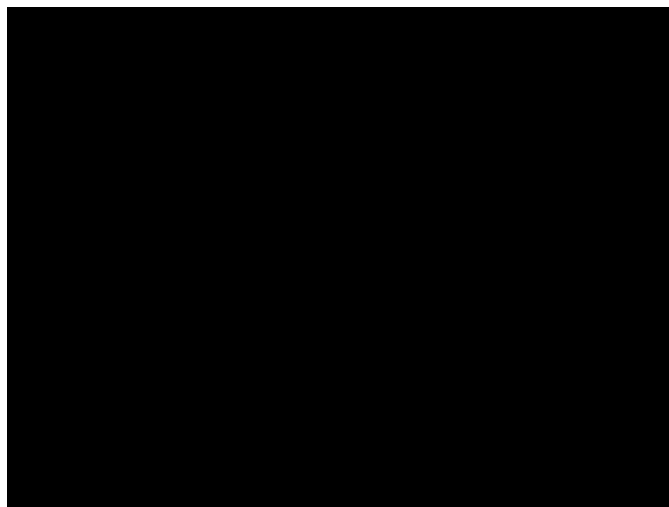
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<sup>63</sup> The use of a similar foot for the construction of mudbrick walls has been proposed in the case of Radovanu (Romania), while at Vădastra (Romania) the lower part of the wattle-and-daub walls was made of compacted earth (Lichter 193, 46–7 and footnote 185).

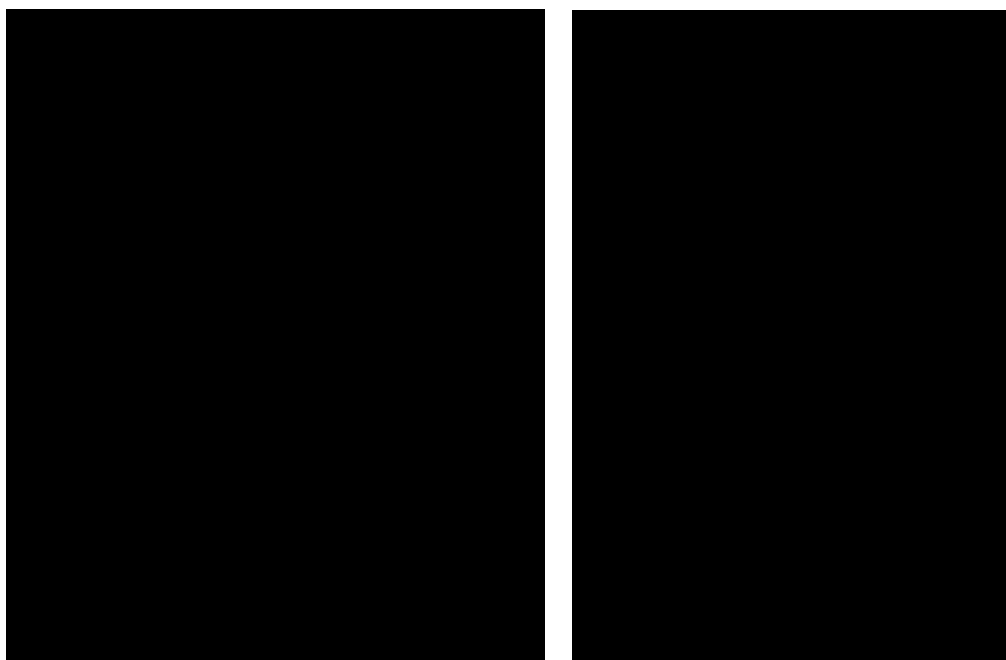


**Figure 5.60 Type B daub fragment with round and split timber impressions.**

Further evidence for the joining of the timbers to the frame, such as the existence of horizontal ledgers or mortice joints, have not been provided. This may be attributed to the fragmentation of the material that is commonly preserved to a height of a few cm. A restricted number of thin imprints running almost vertically to the round stake impressions were interpreted as possible cordage made of vegetal matter for the lashing of the screening wall. Yet again, their poor preservation does not allow safe conclusions. Whatever the case may be, ethnography provides various examples of wall-framing comprising vertically placed stakes that are either lashed or intertwined between horizontal poles generating a ‘fence wall’ (Efstratiou 2002; Oliver 2003, 109–11 – **Fig. 5.61, 5.62**).



**Figure 5.61 Traditional hut in Aegean Thrace (Efstratiou 2002, fig. 23).**



**Figure 5.62** Mayan houses in Yucatan, Mexico (Oliver 2003, 143, fig. 25, 110, fig.5).

The second wall screening method reflected in the material presents strong affinities with the so-called wattle-and-daub technique that was employed until recently in many parts of the world for the construction of external walls or narrow wall panels, internal partitions, fences, roofs and others. The typical wattle-and-daub entails the weaving of twigs, reeds or pliant branches between more sturdy uprights (**Fig. 5.63**). In the Avgi I sample, the first four categories of the recorded impressions seem to be the constituents of a similar building method. Their overall arrangement comprises horizontally placed wattles that are set parallel or diagonally (ca. 20°–50°) to each other. A considerable number of well-preserved daub fragments confirm that these were intertwined between round and split, medium-sized staves. In one sample deriving from ‘Building 7’ doubled staves for extra strength have been recorded.



Figure 5.63 Experimental hut at Sarakini (Rhodope, Greece) following the wattle-and-daub technique (photo: D. Kloukinas, permission: N. Efstratiou).

The diameters of the horizontal timbers are quite standardised, commonly ranging between 0.9-2cm (Fig. 5.64–5.66). Furthermore, impressions of small-sized worked timbers, probably representing split branches or laths in place of the round ones, exhibit similar dimensions. The majority of the upright staff impressions, deriving almost exclusively from the rubble of Building 2a and Building 7, measure between 4cm and 7cm (Fig. 5.67). These calculations remain, by and large, unaltered when the smaller sized daub fragments ( $\leq 8$ cm) are also taken into consideration.

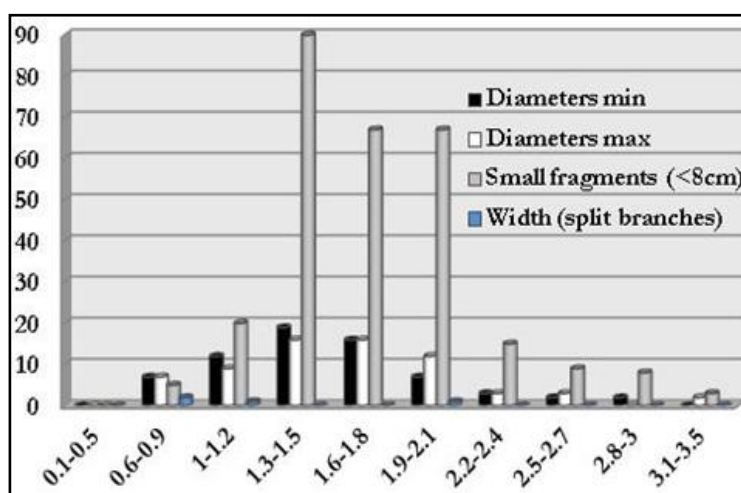


Figure 5.64 Building 2a: size of twigs/thin branches (type A).

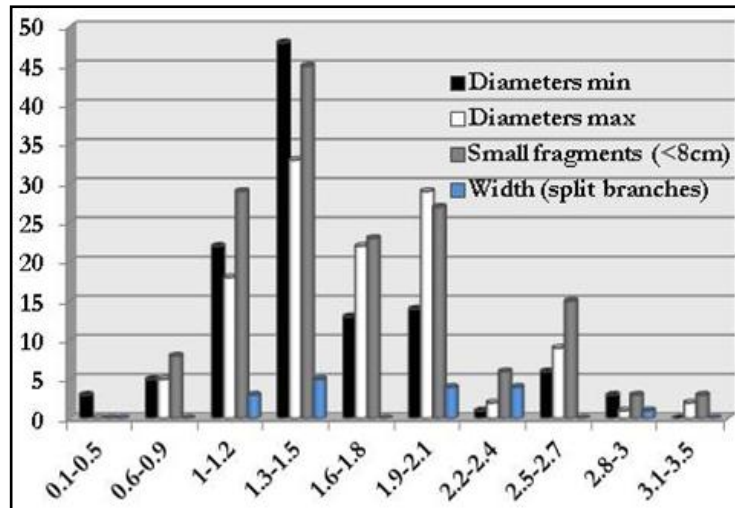


Figure 5.65 Building 5: size of twigs and/or thin branches (type A).

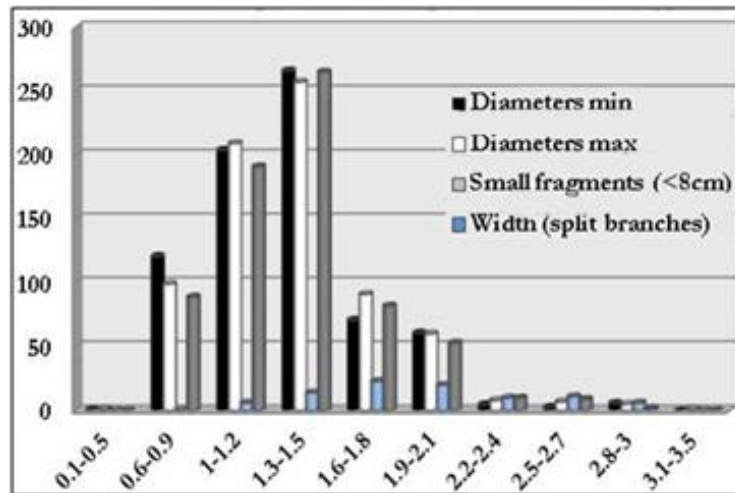


Figure 5.66 Building 7: size of twigs and/or thin branches (type A).

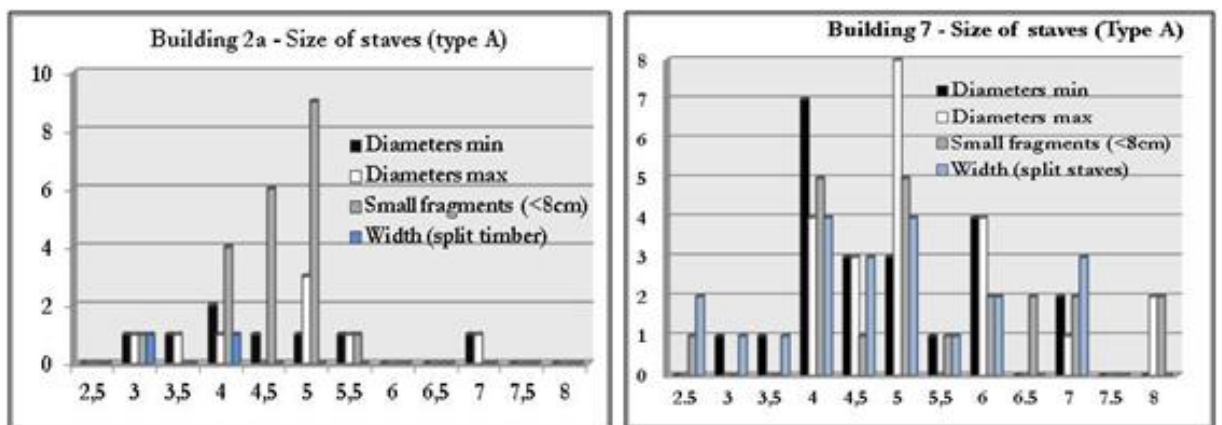


Figure 5.67 Size of upright staves from Buildings 2a (left) and 7 (right).

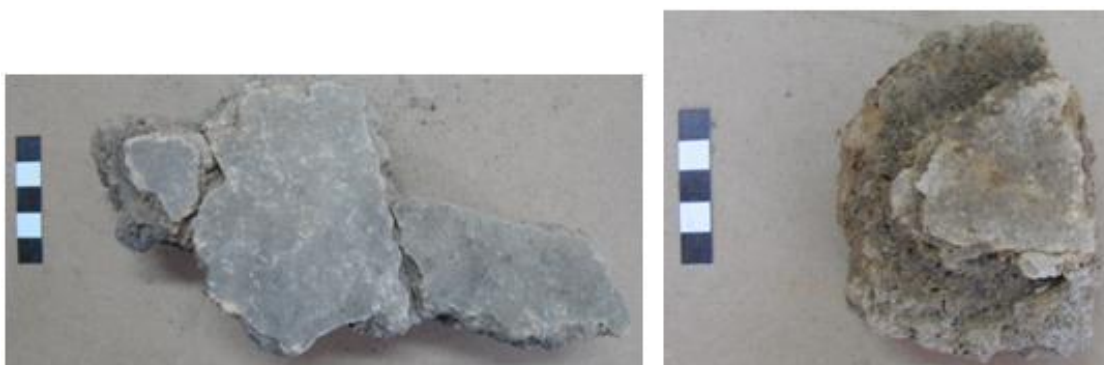
Additional structural characteristics are revealed by the closer examination of the impressions linked to the wattle-and-daub technique. Although based on a restricted number of samples, it is occasionally observed that more sizeable round stakes or

plank/board-shaped timbers are set horizontally in place of wattles. These could belong to intermediate rails and ledgers or to elements used for reinforcing and repairing the wall frame. What is more, there are very few impressions of diagonally arranged split or plank/board-shaped timbers that could be interpreted as diagonal transverses. Most of them measure approximately 4cm to 8cm in diameter/width. In addition, a restricted number of plank-shaped impressions could be interpreted as cladding, thus supporting a close relationship between type A and type D daub fragments.



**Figure 5.68 Building 7: type D daub fragments.**

A couple of small-sized samples deriving from 'Building 7' present a peculiar arrangement of timber impressions, comprising wattles that seem to run into notches or slots cutting through a vertically placed split timber member (**Fig. 5.68**). Although the sample is too limited, it renders possible the use of joints, such as cut grooves or augered holes. Furthermore, a number of thin (ca. 0.3-1.4cm), diagonally arranged impressions could be characterised as possible bonding elements. Once again, given their restricted number and inadequate preservation, this interpretation is quite uncertain. Besides, the weaving of flexible branches does not necessarily require the use of ties or fixings that would, in turn, involve a time-consuming cordage making process (Sunshine 2006, 11; Robb 2007, 84).



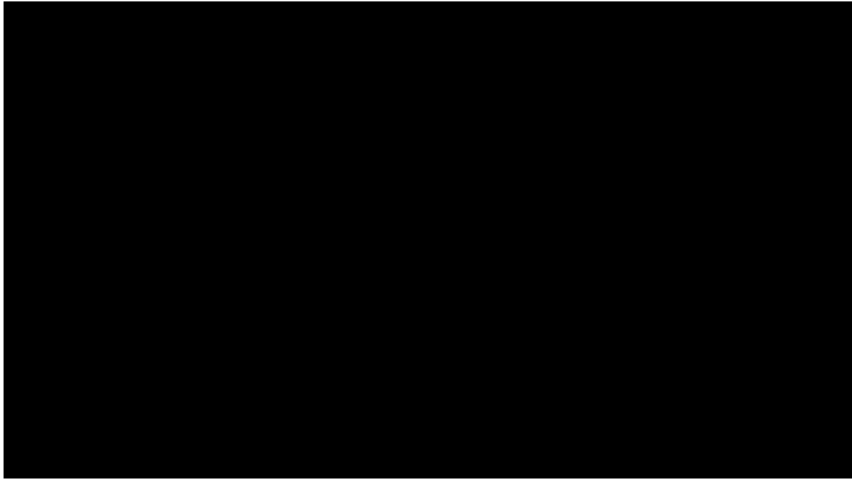
**Figure 5.69 Building 5: type A daub fragments preserving part of the finishing plaster.**



The wattle-and-daub was one of the earliest and more common building methods employed during the Neolithic of south-east Europe and beyond (Bogdanović 1988; Lichter 1993, 47). Variations of the technique can still be identified in the vernacular or traditional architecture in a number of different environmental and cultural settings. In the case of Avgi, its application seems to have been restricted comparing to the ‘closely set stakes’ technique. This is clearly documented by the analysis of the material collected from Building 2a and 5. More precisely, the average thickness of the samples and the occasional preservation of a fine finishing plaster on type A fragments (as opposed to other types of daub) from Building 5 (**Fig. 5.69**), has led to the assumption that the technique was applied in the screening of internal partitions and/or certain parts of the superstructure that were more effectively protected from the elements (Kloukinas 2012). The latter may include the upper part of the narrow walls between the tie-beam and the roof cover (**Fig. 5.70**). This reconstruction that implies the existence of gabled/pitched roofs was occasionally supported by the distribution of different daub fragment types. Nevertheless, the analysis of the Building 7 rubble supports a more widespread use of the technique, probably for the construction of the west external wall or, at least, part of it.



**Figure 5.70** The application of wattle-and-daub in a traditional Slavonian house (Balén 2010, 58, fig. 6.3).



**Figure 5.71 Types of weather-board cladding (after Brunskill 2007, 112).**

An alternative building method recognised seems to consist of planks or boards lashed into the main frame and in short distance to each other, probably forming a ‘fence-wall’ resembling weather-board cladding. The dimensions of the timbers used are difficult to calculate as they are only partially preserved. Minimum estimates indicate that some planks could reach up to 14-15cm in width and more than 1.5-2cm in thickness. These were either set parallel or, more commonly, in a way so as to overlap each other. Following traditional carpentry practices, both the horizontal and the vertical arrangement of the planks or boards seem plausible (**Fig. 5.71**). Nevertheless, the latter reconstruction is favoured due to the occasional presence of small diameter round impressions, probably belonging to twigs or thin branches, that are arranged vertically to the wavy impressions of worked timbers (see also Chatzitoulousis 2006, 457). They seem to represent horizontal transverses used for joining and offering stability to the structure. In addition, rare thin imprints arranged diagonally to the plank impressions have been interpreted as bonding elements or lashes.





**Figure 5.72** The use of planks for the reinforcement or screening of the timber frame at Omorfokklisia (Kastoria, Greece) (photo: D. Kloukinas).

It is not clear whether this method should be considered as an alternative for the construction of the timber frame ‘infill’ or as a technique closely connected to the wattle-and-daub described above. The second scenario is supported by the similar composition of the earth used for the plastering of both techniques, as well as by the co-existence of wattles and plank/board shaped elements in a number of fragments. In addition, no type D fragments preserve finishing plasters, thus showing that their impressions may constitute timber elements for the reinforcement or repairing of walls built in an alternative method. In any case, planks and worked timbers can find various applications in different parts of the superstructure (**Fig. 5.72**).









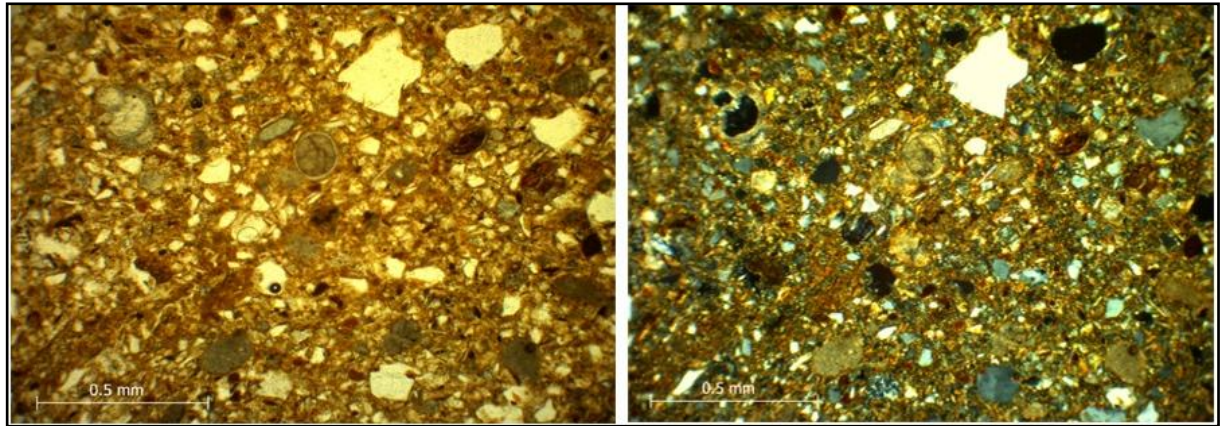






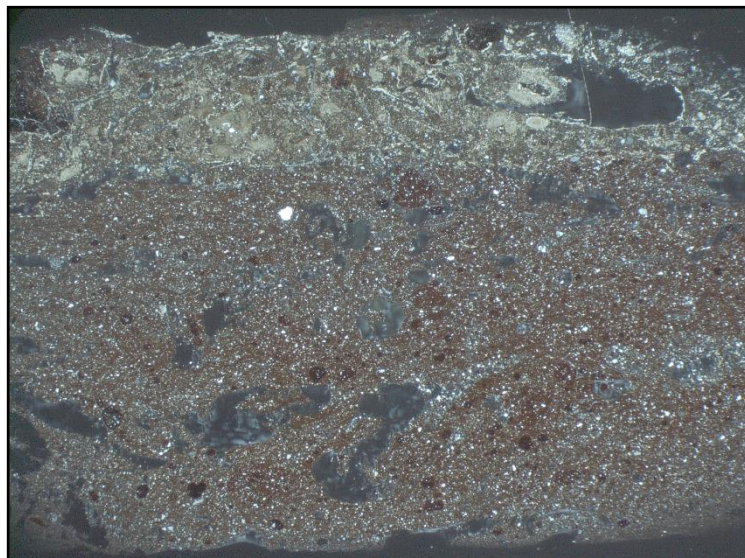


similarities in terms of soil composition and the lack of successive layers of coating. This provides a further clue for the close association of the techniques reflected by type A and D samples.



**Figure 5.82** Thin section of natural soil sample from Avgi: PPL (left) and XPL (right).

All wall surfaces seem to have been finished with the addition of a thin (ca.2cm) and fine calcareous plaster (in the form of limewash). This is represented by a restricted number of samples categorised as type H, as well as by thin layers of pale brown or yellowish/pinkish white finishing preserved on various daub fragments (**Fig. 5.83**). However, it seems that the largest part has been either eroded away or dissolved after the abandonment and collapse of the buildings. Lime plasters are used in mud wall construction to improve the water resistance of the surfaces and for protecting against atmospheric erosion, while also allowing ventilation during water evaporation.



**Figure 5.83** Thin section of a Type C daub fragment with finishing plaster (XPL).

Regarding wall thickness, only rough estimations can be made. In doing so, Stevanović (1996, 180–2) employed an idealised house model and created frequency charts presenting the full range and the average thickness of the daub fragments collected from the Neolithic site of Opovo (Serbia). In a similar attempt, Shaffer (1983) examined a considerable amount of daub from a Neolithic house at Acconia (Italy). He argued that the estimation of thickness is possible by “measuring the distance from a wall surface to a timber imprint, adding the radius of the timber, doubling the sum, and averaging the results for the daub samples available” (Shaffer 1983, 413)<sup>69</sup>. However, he recognised that these estimations are highly based on a series of hypotheses. These mainly include the taken-for-granted assumptions that the timbers were centred in the walls and that the wall frame was plastered on either side with equal amounts of daub. What is more, there are certain practical problems referring to the preservation status of the samples and, especially, the differential degree of sintering across the total wall thickness.

The example of Avgi further emphasises the inherent difficulties of such approaches. The presence of successive layers of mud that were separated during the building’s destruction and the identification of daub categories reflecting different techniques or belonging to different parts of the structure, indicate that general frequency charts of daub thickness are not providing an accurate picture. In addition, given the plethora of timber impressions and the frequent peculiarities concerning their preservation and arrangement, the employment of an idealised house model runs the risk of becoming an oversimplification. As a result, all aspects of building, including the prevailing framing and plastering techniques, should be taken into closer consideration.

In attempting to estimate the wall thickness of the Avgi I buildings, frequency charts were created per daub type (**Fig. 5.84–5.86**). Although still relying on various assumptions, the thickness of walls framed with closely set stakes was calculated by measuring the thickness of the analysed type B (initial packing layer), type C (second layer of plastering) and type H (finishing plaster) samples, as well as the mean size of the timbers<sup>70</sup> recorded. The results indicate an approximate thickness ranging between 15.5cm and 21cm. This estimate could be significantly increased if the plastering of the frame on both sides is postulated. However, no relevant evidence has yet been provided from the excavated material. In any

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<sup>69</sup> Similar estimations for the wattle-and-daub houses at Divostin (Serbia) indicated a wall thickness ranging from about 20.5 to 22.5cm (Bogdanović 1988, 74).

<sup>70</sup> This refers to the average diameters of timbers taking also into consideration their average arc preserved.

case, a total wall thickness exceeding 20cm is confirmed by a limited number of sizeable fragments that were left *in situ* and preserve two opposing, relatively smooth surfaces. As for the frameworks built in a wattle-and-daub fashion, there are several samples supporting that these were plastered on both sides. The walls or partitions following this technique do not seem to have exceeded 12cm in thickness.

It is conjectured from the above that large amounts of construction earth were used for plastering. This seems to be in accordance with observations made in the wider Balkan region for the use of larger quantities of daub in house construction during the LN period (Stevanović 1996, 164; 1997; Tringham & Stevanović 1990). Researchers, including Milisauskas (1972, 70) and Modderman (1973), have attempted to calculate the amount of clay used for plastering the walls of Neolithic LBK houses and have argued that the necessary quantities could have been procured from the nearby oblong pits found in several sites. In her study of the Opovo houses, Stevanović (1996, 184) suggests that the wood-volume to clay-volume ratio was approximately 1:10-1:12. Shaffer (1983), although emphasising the problems encountered in these sorts of calculations, attempts to estimate the weight of daub per cubic metre. Once again, it should be stressed that estimations of wall thickness and the quantities of materials used are quite ambiguous since, in most circumstances, the exact morphology of the superstructure and the ground plan cannot be reconstructed in great detail.

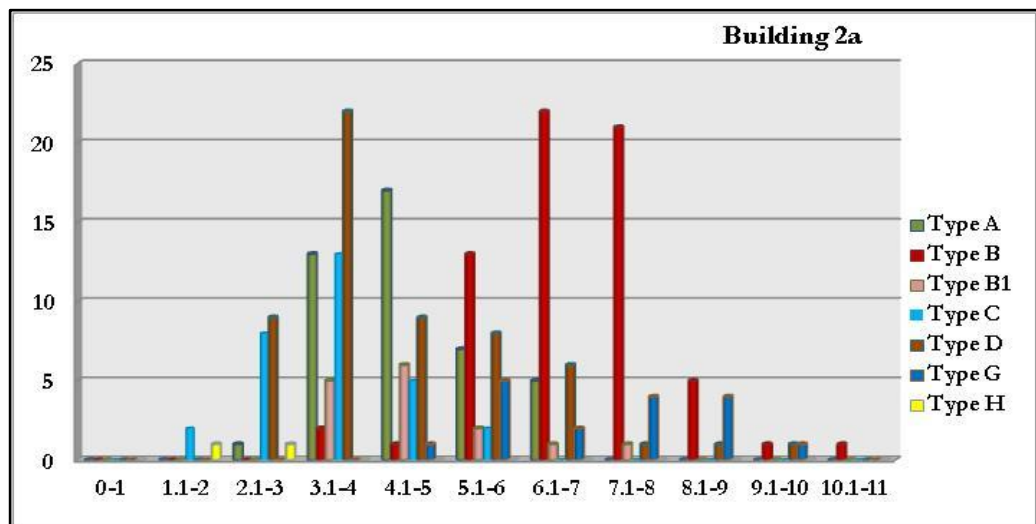


Figure 5.84 Building 2a: thickness frequency of analysed daub fragments per type.

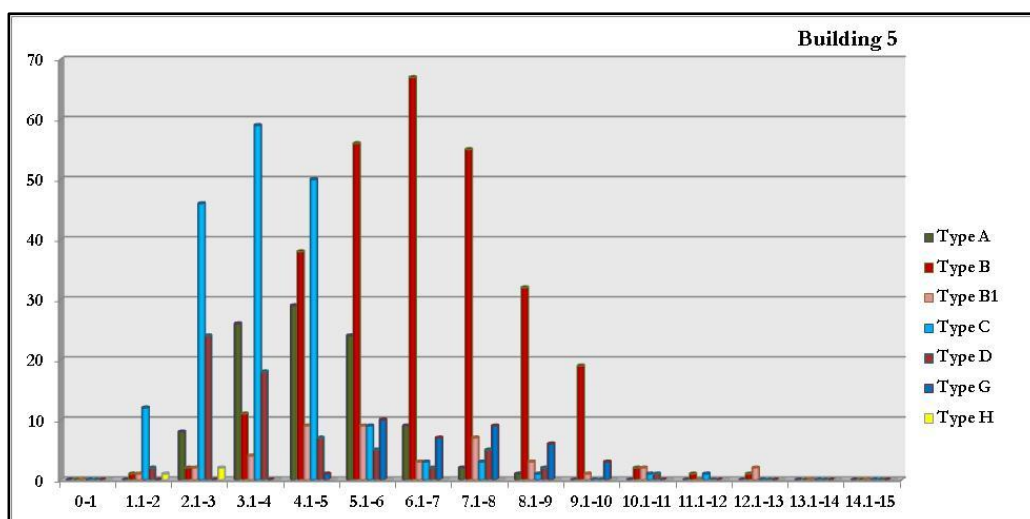


Figure 5.85 Building 5: thickness frequency of analysed daub fragments per type.

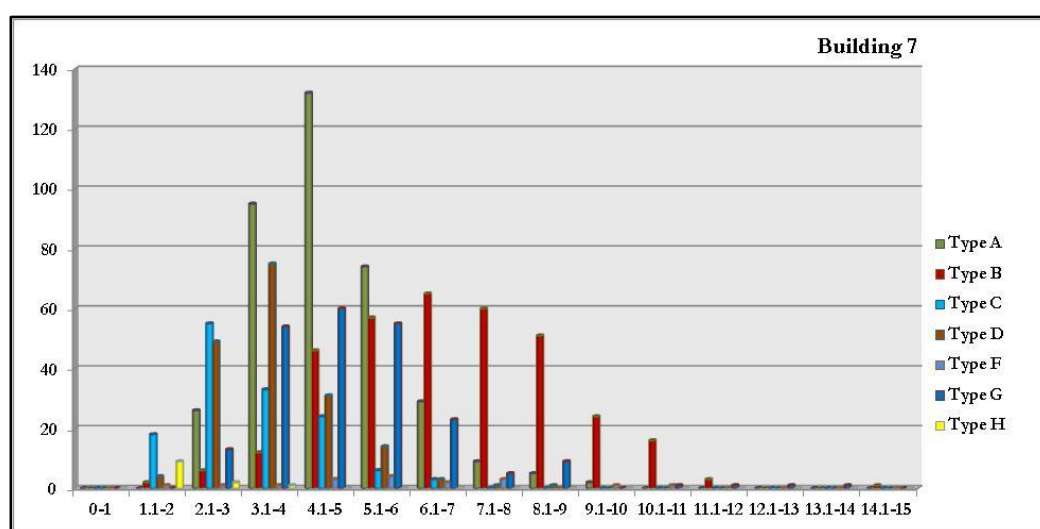


Figure 5.86 Building 7: thickness frequency of analysed daub fragments per type.

## Roof and floor construction

The Avgi I architectural material does not offer clear evidence for the construction of roofs. This is primarily due to the ambiguous identification of the load-bearing elements and the irregular vertical distribution of the superstructural remains. Following the information provided by contemporary sites in the wider region, as well as by ethnography and clay house models (see section 6.2.4), it could be supported that the roofs were either gabled or double-pitched. The limited presence of postholes may imply the construction of a simple structure comprising wall-plates on posts, tie-beams and coupled rafters producing light loads. The roof frame was probably covered with thatch made of various plant materials (including straw, grasses, branches and reeds) and was either plastered with mud for waterproofing or left unplastered. Although a few thin fragments bearing impressions



of plank-shaped timbers or parallel thin branches may support the plastering of the roof cover, no definite evidence exists.

The floors of the Avgi I buildings were identified in the form of extended burned, very dark greyish surfaces with a preserved thickness ranging commonly between 2cm and 5cm (**Fig. 5.87**). They seem to encompass successive thin layers of poorly constructed floors. Their composition is comparable to the natural subsoil. Micromorphological analysis indicates that the excavated floor and occupational surfaces preserve various organic and inorganic by-products of domestic activities (Kyrillidou pers. comm.). In the case of Building 2a, the excavation archives document the partial preservation of fire-hardened clay floor plasters of a more substantial nature. Nevertheless, the fieldwork conducted during the present research has not confirmed this information. For the most part, the patches or surfaces that were possible to identify should be linked to thin layers of collapsed wall plasters.



**Figure 5.87 Building 1: thin dark greyish layer (floor and occupation surface) below the superstructural rubble (Avgi excavations archive, permission: G. Stratouli).**

### **5.3 Notes on the Avgi III buildings**

Among the architectural remains of the LN II horizon of the settlement, three buildings have been uncovered in the West Sector of the excavations. Buildings 2b and 6 were found a few meters apart and almost parallel to each other, and they reveal strong structural affinities. They both follow a rectangular ground plan measuring approximately 70-90m<sup>2</sup>. The north, east and west external walls of the buildings were identified in the form of foundation trenches, while the line of the south narrow walls has not been securely established. It is probable that the foundations of the latter walls comprised posts sunk

directly into the soil. Furthermore, the application of a different foundation technique could be linked to the presence of an entrance.



**Figure 5.88 Aerial view of Building 6 at the West sector of Avgi (Avgi excavations archive, permission: G. Stratouli).**

The use of foundation trenches constitutes an innovative technological characteristic of the Avgi III phase. The reasons for its adoption cannot be easily approached. If issues of stability and durability are put forth, the use of foundation trenches could be related to the erection of more sizeable, potentially two-storied, buildings. However, it is also plausible that trenches were dug so as to ensure the sinking of the load-bearing posts into the natural subsoil lying beneath the earlier anthropogenic deposits. In any case, foundation trenches are commonly U-shaped with slightly inclined sides. Their preserved width ranges between 0.35 and 0.50m, while their initial depth may have exceeded 0.50-0.60m. The posts of the timber frame were sunk inside the trenches that were later packed with a mixture of clayey earth offering extra stability and waterproofing (Stratouli 2010, 11; 2013).





Figure 5.89 Aerial view of Building 2b at the West sector of Avgi (Avgi excavations archive, permission: G. Stratouli).

In the case of Building 6 (**Fig. 5.88**), the arrangement of postholes seems to reflect a timber frame comprising sizeable corner posts, occasionally double ones, and very few intermediate posts<sup>71</sup>. Building 2b reveals a different arrangement (**Fig. 5.89**). The postholes identified inside the foundation trenches were densely arranged in various configurations, including single and double rows of different sized timbers. A number of postholes and sizeable post-pits (ca. 0.50m in diameter) for the erection of posts or buttresses were found in the building's interior. Six of these post-pits were identified near the north part of the building and close to the foundation trenches. Their arrangement may support the existence of a loft or second storey. According to the excavator (Stratouli 2010, 12; 2013), the general morphology and the exceptional structural features of Building 2b could reflect a special status or its supra-household (communal?) function. Indications for the successive reconstruction of the building at the exact same place seem to reinforce this assertion.

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<sup>71</sup> With the exception of the foundation trenches, the arrangement of postholes could be similar to the one proposed for the Avgi I Building 7.

There is no available evidence about the construction of the superstructure, the floors and the roof. Daub fragments deriving from the Avgi III pits<sup>72</sup> and the surface layers exhibit similar characteristics to the samples retrieved from the earlier building horizon. It is, therefore, probable that the techniques used were not radically different from the ones described in the previous section. However, the differences in the foundation of the two buildings under consideration could be indicative for the employment of diverse wall construction methods. According to the excavator (Stratouli 2013), these may include a rammed earth or *pisé* technique for Building 6 and a wattle-and-daub or similar technique for Building 2b. In any case, suitable construction earth could have been obtained from the numerous LN pits excavated. Among these, the large, oblong pit near the west wall of Building 2b could have been initially cut for the procurement of clay.



**Figure 5.90 View of Building 4 at the West Sector of Avgi (Avgi excavations archive, permission: G. Stratouli).**

Further to the north of Building 2b, the identification of an elliptical foundation trench (**Fig. 5.90**) was associated with the presence of another building (Building 4) following an ellipsoid or apsidal ground plan. A second foundation trench, vertical to the former, may

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<sup>72</sup> These may also represent refuse material from the levelling of older deposits.



reflect the position of an internal partition. A single posthole belonging to the timber frame was found in each of the trenches. Although apsidal and ellipsoid forms are not unknown during the later stages of the Neolithic, the exact nature of the feature has not been clarified. It could either represent a later Avgi III building following similar foundation principles as Building 6, or even an enclosed open space.

## 5.4 Discussion

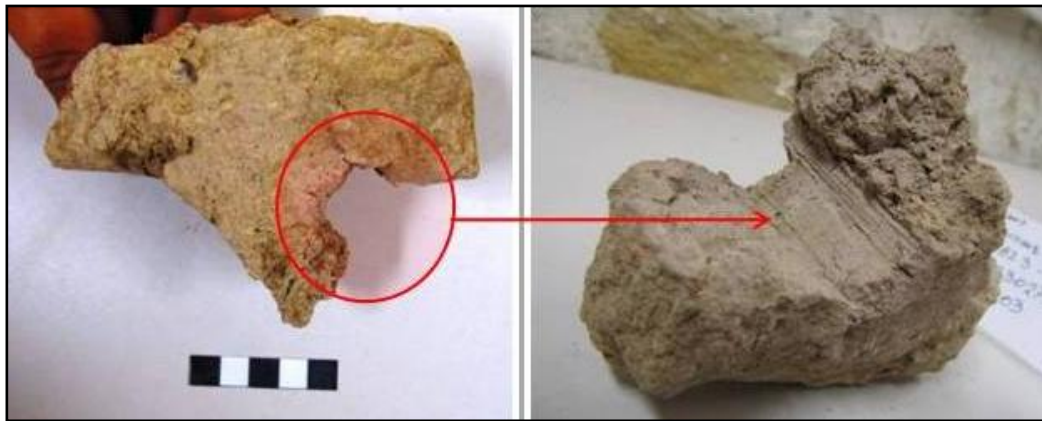
The analysis of the architectural data from the Neolithic settlement of Avgi sheds light on the many-sided aspects of the building process. At a regional or local level, the information obtained renders possible the comparative analysis of building materials and techniques between contemporaneous sites showing comparable features and degree of preservation. At the site-specific scale, the study of three assemblages belonging to the same building horizon allows the identification of intra-site variability and/or homogeneity in different stages and ramifications of the *chaîne opératoire*.

Throughout this chapter, the terms 'house' or 'dwelling' were avoided and the more neutral term 'building' was preferred due to the fact that the study of the floor contents is still in progress. Nevertheless, the overall picture of the collected material and the absence of alternative types of habitation structures affirm that the analysed buildings can be safely characterised as dwellings. Regarding their general morphology, all Avgi I buildings seem to follow similar, roughly rectangular ground plans and an orientation (E-W or S-N) aligned to the actual grid north of the site. The extent of the rubble areas and the preserved floors, the distribution of daub fragments and other spatial features made it possible to estimate the approximate dimensions of dwellings. Their size, ranging between ca.35m<sup>2</sup> and 80m<sup>2</sup>, was dictated, but only up to point, by the technology at hand. This refers to the restrictions posed by the available resources, the tool-kit and the carpentry skills necessary for the successful roofing of large spaces.

The building practices recognised demonstrate an overall homogeneity in terms of both the selected materials and the techniques employed. The material resources used by the Avgi builders indicate adaptation to the local environment. The standardised dimensions of the structural timbers attest to the substantial knowledge of the surrounding woodlands and the strategic exploitation of suitable tree species. Although minor deviations can be observed between the three analysed houses, there is no evidence for differential access to certain environments (such as primary or secondary woodlands) or specific timber

resources. What is more, the standard size of wattles or thin branches may be indicative of some form of woodland management.

The operational sequence for the production of appropriate timbers and their incorporation into the building's frame seems to have followed the same basic steps and principles. In all three cases, the use of squared timbers, boards and proper planks ( $\leq 2.5\text{cm}$  in thickness) points to a complex *chaîne opératoire* and a shared, advanced level of carpentry skills (**Fig. 5.91**). Moreover, the utilization of the wastage material produced during the time-consuming wood-working activities (in order to fill gaps or in place of round timbers) reveals certain attitudes in terms of resource exploitation (see also Mould & Wardle 2000b, 82).



**Figure 5.91** Impression of a plank-shaped timber on a type B daub fragment from Avgi.

Moving to the wall construction methods, the detailed analysis of a large amount of fire-hardened daub led to the identification of two or three main techniques. These include the ‘closely set stakes’ and the wattle-and-daub techniques, as well as some sort of weatherboard cladding. The distribution and quantification of different daub fragment types according to weight classes made possible to associate the former technique with the construction of the exterior walls. Parts of the same walls may have occasionally been constructed in a wattle-and-daub fashion, while inner partitions seem to have followed the same technique. In any case, the techniques recognised were identical in all three assemblages. In addition, the plastering of the wall surfaces seems to follow the exact same technology comprising layers of construction earth with diverse composition. The reason for this technological choice, lying probably in the properties required in different parts of the superstructure, is not entirely clear. However, the consistency of the methods applied supports a shared level of empirical knowledge on soil properties and the daub drying process.

Intra-site diversity is limited to the more widespread use of the wattle-and-daub technique in the construction of Building 7 that could reflect certain preferences or skills of the working group. Fluctuations in the approximate size of dwellings may be attributed to the varying size of the dwelling group or to a different socio-economic status. The differences observed do not correspond to the application of diverse techniques or materials. For the most part, they seem to be quantitative rather than qualitative in nature. The emerging picture is one of a highly standardised architectural tradition that survived throughout the Avgi I period. Bourdieu's (1977) concept of *habitus* and other theoretical schemes focusing on the social aspects of technology can be successfully employed to interpret how such traditions are generated and sustained.

The remains of the LN II building horizon (Avgi III) seem to reflect a somewhat different situation. Although the record is much more compartmentalised, more overt expressions of differentiation may be observed. These refer not only to the size of dwellings, but also to the diverse construction of the timber frame as this is implied by the arrangement of postholes found inside the foundation trenches. Diversity in building technology is also supported by the erection of buttresses and other interior features pointing to the possibility of a two-storied dwelling. If the late apsidal ground plan is taken into account, the picture of more pronounced variability is further reinforced.

The interpretation of intra-site homogeneity and/or diversity in building technology will be the focus of the following chapter of the thesis. Here, it should be noted that traditional architecture is highly influenced by culturally constructed needs and the ways in which the technological know-how is transmitted and shared between individuals or social units. Other social variables related to the perception of space, the composition of the dwelling group or the household and intra-community dynamics may also play a decisive role in the shaping of the physical house.

In the case of Avgi I, the lack of archaeologically visible spatial demarcations between buildings could suggest that the physical and social boundaries between dwelling groups were flexible or, at least, less rigid. In addition, the various structures and artefact concentrations located at the in-between open areas/'yards' could not be securely linked to specific buildings. It seems that several domestic activities, including food preparation, were not entirely secluded and that a certain degree of 'openness' or 'sharing' existed. The same could also be supported for the sharing of technological expertise and work-force in a number of activities relevant to house construction. In contrast to that, the arrangement of

buildings during the later Avgi III phase and, especially, the demarcation of their in-between space points to an emphasis on intra-community boundaries. Whether this is accompanied by the emergence of more bounded residential or social units cannot be confirmed.

The following chapter will attempt to challenge some of the questions posed by tacking between different scales and axes of analysis. The results of the case study will be examined in light of the evidence provided by other Neolithic settlements in the region. This will allow a better informed approach into the social context of technological diversity and/or homogeneity.

## 6. *Chaînes opératoires* and the social context of house construction

### 6.1 Introducing the subject

The rich, although compartmentalised, architectural record presented in Chapter 4, as well as the technological details from the case-study site of Avgi, offer valuable evidence for the building practices in Neolithic northern Greece. The various data collected in terms of ground plans, spatial characteristics, building materials and techniques, can offer useful insights when moving beyond their purely descriptive character. Nevertheless, the ways in which architectural remains may inform us about the social dynamics within a region or a community are far from self-evident (Johnson 1997, 13).

In the case of Neolithic domestic architecture, a comparative study of building remains needs to take into consideration some potentially problematic assumptions that are commonly imposed onto the archaeological record. These are accurately summarised by Wilk and Rathje (1982, 617) when arguing that as archaeologists “we must infer dwelling units from the material record; then we must infer households from the dwelling units”. First and foremost, it is frequently assumed that certain architectural features represent the remains of dwellings. Although their residential character may be convincingly supported on the basis of their internal features and inventories (Halstead 1999, 79), this is not always a straightforward process. Buildings of a different nature, such as structures for storage or even communal buildings, can be misleadingly read as being primarily residential in use. Besides, as suggested by ethnography, it is not unusual for such structures to be equipped with cooking, sleeping and working facilities (Efstratiou 1990; 2007, 32). In addition, special purpose or public buildings need not necessarily be strictly distanced from dwellings in terms of their structural characteristics.

Similar considerations have been expressed for the (semi-)subterranean pit-dwellings (see Elia 1982, 194). It is difficult to ascribe to them a temporal or seasonal character on the basis of technical investment as such correlations are not to be taken-for-granted (Whittle 1996b; 1997, 18). However, it is equally doubtful whether they constitute an alternative, year-round architectural form potentially reflecting different social organisational principles. Following Binford’s (1973) assessment, it should be realised whether the comparisons made are between diverse types of equivalent assemblages or between

functionally alternative, activity-specific complexes that are referable to a single population (see also Fuson 1964). In other words, in order for building remains to be informative, the object of inquiry should be the study of 'isochrestic variations' that is variations between equivalent in use alternatives (Sackett 1986).

The second erroneous assumption that should be avoided when interpreting the available data is that residential and social units are isomorphic with each other (Deetz 1982, 717; Souvatzi 2007, 25). The theoretical discussion in **Chapter 2** underlined to an extent the ambiguities lying behind the identification of the exact boundaries, workings and material manifestations of social units and collectivities. Although the heuristic validity of the Lévi-Straussian concept of 'house' was challenged, both the 'social house' and the 'household' concepts have significant implications for the study of archaeological remains. What needs to be stressed is that the identification of fundamental social units, as well as the ways in which they articulate with one another and with built forms, require an overall understanding of the socioeconomic organisation of a given community. This, in turn, presupposes the preservation of fine-grained data for a number of variables that are often not accessible in prehistoric assemblages (see Rathje & McGuire 1982, 709).

In the case of Neolithic northern Greece, only a limited number of sites are extensively excavated and published in a way that allows the extrapolation of well-informed assumptions on household structure and dynamics. Souvatzi (2008a) has thoroughly examined the available evidence from EN Nea Nikomedeia in her discussion of the Neolithic Greek household. Several other northern Greek sites were included in this comparative study, although information was much more fragmented. The overall impression deriving from their analysis suggests that there was a certain, although not absolute, degree of fit between the free-standing, above-ground dwellings and houses or households (see also Nanoglou 2008).

Following Halstead (1999, 80), it seems that the average size of Neolithic houses could have sustained some sort of family group. The LN Thessalian clay model of a house interior from Platia Magoula Zarkou (Gallis 1985) containing eight anthropomorphic (male and female) figurines may support this argument. The different size of the figurines, probably reflecting two adult couples and four children, point to a co-resident group organised in the form of an extended family (Souvatzi 2008b, 21). This does not suggest that the boundaries of the household and the family group necessarily overlap. However, where residential structures form recognisable and discrete units, it is tempting to make

one-to-one correlations (Horne 1982, 677; see also Halstead 1989, 72). In any case, diverse expressions of household organisation are also noted at the site-specific level, thus showing that the degree of fit is a matter of cultural definition (also David 1971).

## **6.2 *Chaîne opératoire*: technical, symbolic and social dimensions**

The heuristic value of the *chaîne opératoire* and relative concepts in the analysis of technological practice and social dynamics has been discussed in **Chapter 2**. Here, the concept will be used in its wider anthropological sense aiming to re-insert technical activity, meaning and sociality into the description of physical sequences of material transformations (Dobres 2000, 155). Strictly speaking, the following analysis will not focus on an accurate reconstruction of the operational sequence of manufacture, maintenance and destruction. Besides, the various techniques and materials evidenced are often associated with diverse *chaînes opératoires* indicating different considerations, expectations and skills. In addition, certain stages of the technological sequence are beyond reconstruction, while others do not always follow a definite sequential order. The main objectives are to designate the multitude of ways in which people carry out and conceptualise the building process, as well as to highlight a public character that is strongly embedded in the social and symbolic dynamics of the communities under study.

### **6.2.1 Notes on the socialities involved**

Before moving to the description of techniques and hypothetic flow models, attention should be paid to the socialities that may have been involved during house construction. It is true that little thought is usually given to the different bodies of individuals taking part in human activities (Whittle 2003, 43). This is primarily due to the difficulties, inherent in the study of prehistory, of peopling the past without speculating or imposing modern conceptions. However, a few comments could be made on the basis of social theory and ethnographic counter-examples.

Compared to other Neolithic craft categories, house construction was a considerably time-consuming enterprise. When the scheduling of the productive labour is considered, it seems to be one of the rare simultaneous, more or less complex, tasks employed (Wilk & Rathje 1982, 622). Therefore, the need for some sort of labour division within the working group seems reasonable. This would have probably been a ‘natural’ rather than a ‘social’ or ‘technical’ one. In other words, it would have been primarily based on a physiological foundation caused by differences in sex and age (see Marx 1995, 216; also Giddens 1982,

172). The exact nature of gender- or age-based labour divisions is not easy to define. The ethnographic record (e.g. Lebbal 1989, 37; Kus & Raharijaona 1990, 29) suggests that adult men may have been responsible for tasks that are more demanding in terms of strength and stamina, such as the digging of soil, the cutting and working of timbers, the building of the foundations and the erection of the timber frame and the roof. Women were probably involved in the transportation and mixing of the less heavy resources, such as water and plant tempers, while the plastering of the wall and floor surfaces could have referred to both sexes and, potentially, various age-groups. Gender-specific tasks based upon symbolic conceptions for woodland exploitation have been recorded among the Kelabit of Sarawak (Janowski 2003, 39). The *domus/agrios*, interior/exterior and female/male oppositions suggested by Hodder (1990) for Neolithic Europe may be relevant to this discussion. If the house's interior is considered as the woman's domain (Strathern & Stewart 2000, 69–70), it is possible that tasks related to its shaping and maintenance were more closely linked to women (Matthews 2005, 136). However, the existence of related structural oppositions cannot be confirmed by the available Neolithic Greek evidence (Halstead 1999, 82).

Following a rich anthropological and ethnographic corpus on traditional architecture, it is conceivable that the building process was a more or less collective endeavour. Communal house construction is still practised in many traditional societies, while it survived, until recently, in certain parts of the modern westernised world (see Brunskill 2007, 35; Jennings 2003, 145; Skafida 1994). The custom of communal building falls within certain socioeconomic practices of commensality, also including collaborative harvesting, intercommoning on the open pastures and others. The 'domestic mode of production' with its dependency on the household's relative and short-term self-sufficiency (Sahlins 1974) seems to have favoured mutual assistance and sharing when the requirements for simultaneous labour or food supply reached beyond the capabilities of a single co-resident or household unit. Intra-communal building can thus be considered as 'a capital of services rendered' (Bourdieu 1977, 60) that are part of wider coping mechanisms promoting social cohesion while counteracting domestic isolation and the concomitant risks of economic failure (Halstead 1989, 72–3; 1995, 16–17; 2007, 39).

The exact composition of the work group is hard to reconstruct. Ethnographic observations warn against simplistic inferences, as the group carrying out the building process may vary locally from a small number of individuals belonging to the extended household or the neighbourhood to the whole village. The choice is usually between the extension of the project temporally or socially (Robb 2007, 85). Even within the same



settlement, the number of people taking part in house construction depends highly on the labour force that a given co-resident group can motivate according to its kinship relationships, reciprocal obligations or status (Wilk 1983, 105). What is more, the size of the work group may vary a lot between different stages of the *chaîne opératoire*. In many societies, the co-resident group or the close kin are considered responsible for the acquisition and shaping of the timbers, while the raising of the load-bearing posts, the construction of the roof and the ‘daubing’ of the walls are carried out by a larger group, sometimes a village-wide one (e.g. Wilk 1983, 105). At the settlement of Makri, the excavators (Karkanas & Efstratiou 2009, 964) argue that the destruction and reconstruction of neighbouring buildings arranged around the central ‘complex area’ indicates co-operation and consensus at a supra-household or communal level. A similar case may be supported for settlements presenting comparable destruction and reconstruction episodes (e.g. Servia).

The creation of a new dwelling is commonly followed by festivities organised by the owners that include feasts prepared by the women (Brunskill 2007, 35; Jennings 2003, 145; Oliver 2003, 119; Wilk 1983, 105). The whole process may be seen as a major event in the life of the village offering the potential for the gathering of different bodies of people (Lebbal 1989, 36). It should, therefore, be evaluated as a social practice of individuals and groups to attach or reaffirm their belonging to wider collectivities while also promoting their own interests (Shilling 2005, 206).

The existence of specialised craftspeople does not seem very likely as the technical skills for dwelling construction would have been common knowledge. Although specialisation since the earlier stages of the Neolithic period has been supported for various craft activities (**section 3.6.1**), this is usually described as part-time and household-based aiming primarily at the exchange of goods as commodities or gifts<sup>73</sup>. In the case of domestic architecture no clear evidence exists. However, micromorphological analyses at the site of Makri suggested that at least floor construction was a non-specialised activity organised at the house level (Karkanas & Efstratiou 2009, 962). Similar conclusions may be drawn from the microscopic analysis of daub fragments from Avgi I. In addition, no specialised

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<sup>73</sup> According to Halstead (1995, 18), the distinction between commodities and gifts should not be overemphasised.

implements have been securely identified<sup>74</sup>. The tool-types that are commonly linked to house construction (Chatzitoulousis 2006; 2008; Shaffer 1983, 139) can be characterised as simple and generalised (see Miller 2007, 241). Nevertheless, the involvement of specific individuals with a prominent role in different stages of the *chaîne opératoire* cannot be precluded (Miller 2007, 245). These could have been people that were more talented or experienced in the material and symbolic properties of the process. According to ethnographic examples, certain individuals may have also been ascribed with a special status. Among the Betsileo of Madagascar, part-time, self-appointed ‘ritual specialists’ are responsible for planning and supervising house construction, as well as for guaranteeing the general well-being of the dwelling and the family unit (Kus & Raharijaona 1990, 28–9). The *oragi* of the Ara communities in South Sulawesi have similar expertise and responsibilities (Gibson 1995, 139–40), while in other traditional societies decision-making and coordination of labour are, by and large, in the hands of a group of elders or community leaders (see Efstratiou 2002). Emphasis is often drawn on what we would currently term as the symbolic aspects of building technology. However, in traditional societies symbolic and functional concerns are highly intersected and ritual is a key component of human practice (Kus & Raharijaona 1990, 31; Pfaffenberger 1992, 501; Shanks & Tilley 1987, 92; Waterson 1997, 73). This argument is relevant to many of the considerations and undertakings described in the following analysis.

### 6.2.2 Built at the right time and place

An important aspect of the *chaîne opératoire* is the decision-making process in terms of the timing of construction, as well as the choice of locality and orientation. It is often argued that house construction was seasonal, governed both by climate and the temporality of major subsistence activities requiring simultaneous labour, such as the mid- to late-summer harvesting (Robb 2007, 83). An ideal period would have been spring or early summer due to the relative warm and dry weather necessary for the drying of the mud-plastered walls or mudbricks. Moreover, this would have offered advantages in the exploitation and processing of timber<sup>75</sup>. Vegetal materials identified in building remains following similar techniques reinforce this assertion (Shaffer 1983). Another suitable period is the one

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<sup>74</sup> Specialised toolkits and techniques associated with woodworking have been probably identified in the Eneolithic of Bulgaria (Skakun 1993, 303–4 cited in Chatzitoulousis 2006, 484). Elsewhere, they do not seem to predate the Bronze Age.

<sup>75</sup> Although not strictly defining the temporality of woodworking activities, it is noted that the bark of timber is more easily peeled if the tree is felled during spring, when the sap is rising (Brunskill 2007, 28).

following the late summer harvest, when labour is available and the builders can exploit the by-products of crop processing (Matthews 2005, 133). Regarding the life-course of households and individuals, the creation of a new house is closely related to major events, such as marriage or the birth of a child<sup>76</sup> (Bloch 1995; Gibson 1995, 140; Wilk 1983, 105). Nevertheless, both practical and symbolic considerations may merely reflect the ideal conditions without necessarily imposing strict limitations on the temporality of construction practices.

The selection of the building's locality is another meaningful stage of the decision-making process that is commonly regulated and institutionalised through *habitus* or in the hands of 'specialists'. The houses themselves are essentially built in an already dwelt space. Their erection is dictated by already existing, culturally determined perceptions of space as background potentiality (McFayden 2007, 350) that produce and reproduce spatial divisions and interrelations. These are highly dependent on various factors that can be characterised as economic, pragmatic, social and symbolic at the same time. Among them, the spatial arrangement of gardens or arable land, kinship or inter-household relationships and the overall social organisation of the community play a prominent role. Furthermore, several conceptions on the social aspects of the physical house in relation to continuity and memory influence choices on house replacement patterns.

In the case of northern Greece, the restricted number of extensive excavations does not always allow safe conclusions or inter-site comparisons. It is noted, however, that both vertical/partially overlapping and horizontal replacement have been identified. The former pattern is more closely associated with tells, while the latter is viewed as characterising the more dispersed habitation of flat extended sites. However, this scheme refers primarily to statistical norms as both patterns often co-exist within different settlement types (sites include Kleitos I, Nea Nikomedeia, Paliambela, Thermi B III and others). Intra-site configurations provide clues on two principal patterns of spatial organisation. The first pattern refers to the more or less regular arrangement of dwellings around open spaces or courtyards that is evident in several sites, including Avgi I, Nea Nikomedeia, Servia, Makriyalos I-IIa and Thermi B.

The general impression is that these open spaces were dynamic locales of socialising where a range of domestic activities, such as the processing of food and cooking, were taking

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<sup>76</sup> Bloch (1995, 72) argues that among the Zafimaniry of Madagascar marriage and house construction are considered as one and the same process, in a way that marriage without a house is a contradiction in terms.

place. Intense social interaction between neighbouring houses should be viewed within the context of shared everyday practices and experiences. The selection of the building's locale was then highly influenced by social interrelations and daily routines organised at the household level. At Nea Nikomedeia and Servia (especially phases I-III), the continued rebuilding of groups of dwellings at the same location or building plot may hint at the less transient nature of both spatial and social relationships, presumably regulated by strict, kinship-based prescriptions. It also reveals an emphasis on land ownership and the continuity of the social unit (see also Mould & Wardle 2000b, 101). On the other hand, flat-extended sites seem to support more flexible social surroundings. Nevertheless, the underlying opposition between different settlement types should, once again, not be overstressed. The possible existence of less conspicuous boundaries, as well as the lack of evidence for house entrances in terms of number, location or their relocation through time, are major barriers in the attempt to recognise and evaluate the daily movements of people and the degree of inter-dwelling openness and cooperation (see Souvatzi 2008a, 69, 100–1)<sup>77</sup>.

A different expression of spatial organisational order is evident in a number of sites dated primarily (though not exclusively) to the later stages of the Neolithic period. The excavations of LN and FN layers at Makriyalos IIb, Dikili Tash II and Arkadikos have revealed the erection of dwellings in close distance and parallel to each other (see **Fig. 4.70**). Evidence from the settlements of Avgi III, Mandalo, possibly Paliambela, and elsewhere point to similar spatial arrangements. Dwellings are commonly separated by more or less narrow open lanes or pathways, while in certain cases their boundaries are also demarcated by spatial features, such as ditches or 'yard walls' (e.g. Avgi III, MN Paliambela). The overall impression is of a highly structured community space that is reminiscent, in certain respects, of the well-knit internal organisation of Bulgarian Neolithic and Eneolithic settlements, such as Karanovo III-IV, Azmak, Polyanitsa, Ovcharovo, Golyamo Delchevo and others (Todorova 1978, 48; Whittle 1996b, 89–90). Whether linked to collective decisions or centralised planning, the selection of the buildings' locality was organised at the suprahousehold level (Souvatzi 2008a, 95). What is more, the less pronounced sharing of external space may be viewed as indicative of the relative isolation of social units.

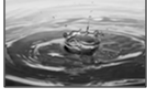



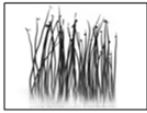





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<sup>77</sup> Souvatzi (2008a, 148), for example, argues that the location of entrances of the neighbouring structures H20 and H23 at LN Dimini (Thessaly) points against the shared used of the open area in between.

The orientation of buildings and entrances was probably governed by similar concerns referring not only to environmental stimuli, such as the direction of prevailing winds, solar radiation, heat absorption and light penetration (Duncan 2003; Topping 1996, 161), but also to the openness of the co-resident units to other social units or landmarks (see also Chourmouziadis 2009, 41). From a symbolic perspective, the alignment of structures or structural elements may be associated with broader classifications (Richards 1996, 171) and is sometimes considered as critical for ensuring the well-being of the residents (Kus & Raharijaona 1990, 29). Following this, the more or less standardised orientation of dwellings observed at the sites of Nea Nikomedeia, Arkadikos, Dikili Tash, Promachon-Topolnica, probably Sitagroi, and others, as well as its occasional persistence through time, may suggest the existence of symbolic notions and ritualised practices influencing the decision-making process.

### **6.2.3 House building materials: acquisition and exploitation**

The building technology of Neolithic northern Greece comprises a wide array of organic and inorganic materials (**Table 6.1**). These can be classified as source materials, acquired directly from the available natural resources, or as anthropogenic ones. However, natural resources also presuppose human involvement for their transformation into finished cultural products (e.g. wood into timber or soil into construction earth) before their incorporation into the structure. Clayey soil and timber seem to be the more vital resources throughout the Neolithic of southeast Europe and beyond. These were extensively used for the construction of foundations and floors, as well as for the framing, screening and shaping of the walls and the roofs. In addition, plant materials, such as reeds, straw, chaff and grass, were exploited for various purposes, including the tempering of clayey soils and the thatching of roofs. The use of stone, cobbles or pebbles for foundations or reinforcements was more limited geographically.

<b>Building &amp; tempering Materials</b>	
<b><i>Organic Building Materials</i></b>	<b><i>Inorganic Building Materials</i></b>
 <p><b>Water</b> (mixing of the construction earth)</p>	 <p><b>Clay/mud/calcareous soils</b> (construction earth for the plastering of the timber-frame, the floors and the roof; construction of mudbricks and mud walls; mortar; finishing plasters)</p>
 <p><b>Wood</b> (Timbers for the framework; screening of the walls and the roof; construction of timber floors)</p>	 <p><b>Stones/cobbles/pebbles</b> (construction of foundations and reinforcements; foundation 'filler')</p>
 <p><b>straw/reeds/sticks/grass/other vegetal materials</b> (screening of the walls and the roof; thatching; cordage making)</p>	
<b><i>Organic Tempering Materials</i></b>	<b><i>Inorganic Tempering Materials</i></b>
 <p><b>Straw/chaff/grass/reeds</b> (tempering of construction earth)</p>	 <p><b>Pebbles</b> (tempering? – tolerated material?)</p>
 <p><b>Shells/crushed shells</b> (tempering – tolerated material?)</p>	 <p><b>Sand</b> (tempering of construction earth?)</p>
	 <p><b>Pottery sherds</b> (tempering – tolerated material?)</p>

**Table 6.1 House building materials in Neolithic northern Greece.**

Focusing on the more heavy and bulky resources, including water, clayey earth, timbers and stones or cobbles, it is often assumed that these were, more or less, easily accessible by the inhabitants. This seems reasonable considering the means of transportation during the Neolithic period. The study of the palaeoenvironment supports the existence of water sources, such as rivers, streams and marshlands, in the vicinity of most settlements. Clayey earth is commonly considered as local, quarried with sticks and/or edged stone tools from nearby outcrops or the subsoil. The latter assertion is reinforced by the excavation of numerous pits or cuttings in the settlements' area or their periphery. The existence of clay-pits has been supported in a number of sites, including Avgi, Nea Nikomedeia, Makriyalos and Axos A (Chrysostomou 1997a, 162; Pappa & Besios 1999, 182; Pyke 1996, 49; Rodden 1962). What is more, in the case of Avgi III, Nea Nikomedeia, Drossia and Mavropigi large, commonly oblong, pits were associated with specific buildings, thus reinforcing the assumption that they could have been initially dug for the procurement of clay and were later used as rubbish pits. Similar practices have been supported for interpreting the abundant occurrence of pits and pit-like features in Balkan Neolithic settlements and beyond (Bakels 1978, 87; Milisauskas 1972, 70; Paret 1942; Stevanović 1996, 187), while the

practice of digging clay-pits had survived until recently in south-east Europe and elsewhere (Buttler 1936, 26; McIntosh 1974, 158–9).

The analysis of the architectural rubble at the sites of Avgi, Dispilio, Megalo Nissi Galanis and others, has revealed the incidental nature of various anthropogenic inclusions (such as pottery sherds, bone fragments and chipped stone), thus implying the exploitation and/or preparation of construction earth within the activity zone of the settlements. In any case, the occasional exploitation of more distant deposits should not be precluded. The excavators of Dikili Tash argue that some of the clays exploited may have originated from a distance of 12-15kms (Koukouli-Chrysanthaki *et al.* 1997d, 687). The evidence from Mikro Nissi Akrinis draws attention to another remarkable possibility. According to the excavator (Fotiadis 1991, 46), the Neolithic builders chose to produce an artificial mud mixture containing large proportions of sandy sediments, even though suitable clay soils were available in the area. It was further supported that the sand could have been located in watercourses situated many kms far from the site<sup>78</sup>. Even if similar indications are to be treated with caution, they reveal an advanced know-how of soil properties and the conscious exploitation of resources.

The deliberate nature of raw material exploitation is further emphasised by the use of different types of construction earth or tempers according to the qualities they offered. This is clearly demonstrated in a number of sites, including Avgi, Dispilio, Paliambela, Krioneri and Dikili Tash. In the case of Makriyalos, however, the relation of fabric type and function was not consistent (Joyner 2008), thus pointing to a more opportunistic exploitation strategy. Whether this pattern reflects more fundamental differences between pit-dwellings and above-ground buildings is worth investigating.

Although detailed accounts are rare, the mud used for building purposes is commonly described as plant-tempered or ‘strawed’. This suggests that chopped cereal straw was the basic vegetable temper added for providing cohesion and preventing the shrinkage of clay<sup>79</sup>. Nevertheless, the evidence from Dikili Tash indicates that chaff was more frequently used. Moreover, it is argued that grain husks were added exclusively in the mixture used for the roofs or ovens, and that the operational sequence, especially for combustion structures,

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<sup>78</sup> However, it is also noted that the hydrography of the area during the FN and EBA was radically different and that sand could have been available in nearby streams.

<sup>79</sup> Stevanović (1996, 191; 1997, 359) argues that the tempering of daub with a precious subsistence product may also have had a symbolic dimension.

was relatively standardised<sup>80</sup>. The common presence of chaff may also indicate that large quantities were stored for building purposes and that plant processing took place near the site (see Willcox & Fornite 1999, 24).

It is not sure if the straw used for tempering or thatching was gathered specifically for house construction. This assumption could imply the cultivation of specific fields for this purpose (Efstratiou 2002) or the application of certain harvesting methods, such as the cutting of stalks just below the ear (Bakels 1978, 88). In any case, the widespread addition of other tempering materials has not been confirmed. The use of shells or crushed shells is reported in the case of Dispilio and Makri, while the addition of coarse-grained sand at the sites of Megalo Nissi Galanis and Mikro Nissi Akrinis has already been discussed. At the latter site, Fotiadis (1991, 45) has also suggested the use of older decomposed materials (see also Ammerman & Shaffer 1981, 432). The remaining inclusions observed, such as pottery sherds or pebbles, were more probably tolerated in the construction earth mixture rather than deliberately added<sup>81</sup>.

The second vital material resource in Neolithic building technology is essentially timber. Different trees species were broadly exploited for the production of posts, beams, rafters, and other structural elements of the timber framework, as well as for the covering of the wall panels and the roof. Information on their availability and exploitation derives primarily from palynological research and charcoal analysis. Both methods, however, have to be pursued with caution as they only offer limited information for the actual use of natural wood as structural timbers (Bakels 1978, 81). The preservation of non-carbonised wood remains is much more informative, although their identification in well-defined contexts is extremely rare due to environmental conditions. Finally, indirect information may derive from fired-hardened material bearing impressions of the timber frame.

The dominance of mixed deciduous woodlands in the regional vegetation (**section 3.2.3**) would have offered a wide range of suitable resources to Neolithic builders. Oak seems to have been the obvious choice for the production of different types of timber due to its abundance and superior physical and mechanical properties. The durability of its heartwood against the elements and insect attack makes it appropriate for the most vulnerable structural parts, while its stiffness and compressive strength are ideal for the

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<sup>80</sup> <http://www.dikili-tash.gr/>

<sup>81</sup> There is no report so far for the use of animal dung as tempering material, although this practice is well known from mudbrick structures at Çatalhöyük and elsewhere (Tung 2005, 219).



production of load-bearing timbers (Bakels 1978, 83; Brunskill 2007, 27). The information obtained from northern Greece testifies to the high frequency of oak in various assemblages<sup>82</sup>. At Nea Nikomedeia load-bearing posts were made of oak-wood, while at the settlements of Sitagroi and Makri oak samples dominate the majority of charcoal collections (Efstratiou *et al.* 1998, 54; Rackham 1986, 59). A similar impression of systematic exploitation derives from Avgi and other sites<sup>83</sup>. In contrary to that, the preserved timber assemblage of the lakeside settlement of Dispilio is dominated by coniferous trees, such as pine and juniper. The latter species seems to have been widely exploited for the construction of the pile-dwellings' platforms. This choice can be attributed to the durability of juniper in wet, humid conditions, as well as to its rigid and straight trunk (Chatzitoulousis 2006, 463; Efstratiou *et al.* 1998, 54). In the case of Paradeisos, suitable tree species comprise oak, pine and buckthorn (Hellström 1987, 135–7), while at Servia four split carbonised timbers made of oak, pine and poplar were identified (Hubbard 2000, 339).

In any case, other broadleaf or coniferous trees (including birch, alder, ash, elm, hornbeam, lime and fir) would have been appropriate for the production of sizeable timbers (see Bakels 1978, 82; Ntinou & Badal 2000; Ntinou 2008). Moreover, certain species, such as juniper, pine and oak, would have been more suitable for the manufacture of split or plank-shaped timbers, while long willow withies, hazel rods or saplings were probably used, alongside reeds, for wattling and other types of wall or roof screening. Tree-bark, potentially from lime, elm or willow (Bakels 1978, 89), would have also been used for the manufacturing of cords or ropes. The making of cordage from bast-fibres would have been among the most-time consuming tasks.

The general picture emerging is that Neolithic builders were familiar with the properties of different types of wood, as well as with their availability in diverse micro-environments (such as primary or secondary woodlands and regenerating fields). According to the species spectra from various assemblages (Avgi, Dispilio, Makri), these must have included not only the nearby woodlands, but also more distant sources in different vegetation zones and altitudes. The well-developed, column-shaped trunks for the production of load-bearing posts were probably more easily available in dense forests that could have been located

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82 However, Bakels (1978, 81) notes that the dominance of oak can also be the result of the fact that its charcoal disintegrates slowly and remains recognisable for long periods.

83 Oak is extensively exploited in the settlements of Sofia Slatina (Bulgaria) and Vădastra (Romania) further to the north (Lichter 1993, 46).

beyond the settlement's immediate surroundings (Bakels 1978, 82). Besides, it is not uncommon for traditional builders to travel considerable distances for the acquisition of specific types of timber (see Efstratiou 2002).

The detailed analysis of waterlogged wood remains from Dispilio (Chatzitoulousis 2006; 2008) has revealed the complexity of the woodworking *chaîne opératoire* associated with the transformation of natural wood into structural timber. The various stages recognised refer to the tasks of tree-felling, branch removal, barking, chopping, sawing and hollowing. Experimental work and the study of toolmarks indicated the use of hafted polished stone axes and/or adzes with relatively narrow-edged concave blades (Chatzitoulousis 2008). Some of the stages of the technological sequence were essentially taking place away from the habitation area. However, the identification of natural wood and wood chips suggests that a number of operations (including branch and bark removal) were occasionally taking place within the settlement (Chatzitoulousis 2006, 468). Although no 'specialised' working or storing areas were recognised, certain techniques, such as the splitting of planks radially from the log with wedges, reflect a considerable degree of technological skill.

Unlike soil deposits, suitable timber resources are not inexhaustible even when recycled or available in vast quantities. The great dependency on specific types of timber (in terms of both properties and dimensions) that is more pronounced in the application of certain techniques may, thus, imply the need for some sort of woodland management<sup>84</sup>. Even if evidence is scarce, the possible employment of coppicing, pollarding or pruning has been supported by a single hornbeam specimen found at Sitagroi (Rackham 1986, 61), as well as an undiagnostic specimen from Dispilio (Chatzitoulousis 2006, 390). Indirect evidence for comparable practices may also derive from the highly standardised dimensions of timber impressions on daub. In certain cases, woodland management may have been the unintended result of everyday practices, such as animal grazing. However, the advantages offered could have been easily perceived and utilised by anyone in the habit of tree felling and woodworking. The *wattle-and-daub* technique, for instance, is often associated with the coppicing of nearby trees or shrubs a year or two in advance of building (Robb 2007, 82). However, the coppice cycles vary a lot depending upon the species and the number of times it had been cut (Hayman 2003, 147–8).

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<sup>84</sup> Woodland management for the procurement of coppiced oak wood has been firmly established in the case of Neolithic Hornstaad-Hörnle I in south Germany and other prehistoric sites (Billamboz 2004; Coles & Coles 1989, 105).

Comparing to clayey earth and timber, the exploitation of stone in Neolithic northern Greece is more restricted. Although detailed information is almost absent from the archaeological record, the large or mid-sized stones used for the construction of stone socles or reinforcements are commonly described as unworked. This observation seems to preclude the application of sophisticated masonry skills and techniques. On the contrary, it seems that readily available flat or round stones and pebbles were collected from nearby fields, streams or river-banks. These were probably selected carefully according to their shape and dimensions so as to facilitate their concomitant articulation (see also Skafida 1994, 185–6).

Another aspect worth mentioning when examining raw material exploitation is that this is often influenced by various attitudes and beliefs. The materials used in house construction may express cultural ideas and social values, as well as signal the diverse elements or spaces to which symbolic meaning is attached (Boivin 2008, 130; Strathern & Stewart 2000). Regarding timber exploitation, it is noted that woodlands with their multiple resources are an integral part of rural economy. Rather than being undifferentiated entities, they are enmeshed with symbolic meaning deriving from myth or their historical association. Distinctions between the sacrosanct and secular/profane parts of surrounding woodlands are not infrequent, while individual trees are also ascribed with special significance (Hayman 2003, 16). In any case, the felling of timbers and the gathering of underwood are commonly subjected to customary rights and symbolic perceptions evolving gradually through practice and renegotiated in the hands of specialists.

Although archaeologically inconspicuous, these attitudes influence timber exploitation to a considerable degree. Whether stemming from functional underpinnings or not, they define which parts of the landscape are to be harvested for utilitarian purposes. Among the Pa'Dalih Kelabit of Sarawak, for example, gender-specific sanctions allow men to exploit timber resources from primary woodlands, while women are only permitted to enter those parts that were already domesticated by men, such as cleared or secondary woodlands and cultivated fields (Janowski 2003, 39). Cultural conceptions of the symbolic properties of different tree species may also account for their employment or omission from the building process (Strathern & Stewart 2000). Similar perceptions influencing the selection and exploitation of specific soils are also recorded in the ethnographic record. Boivin (2008, 3–4) notes that the inhabitants of the Balathal village at Rajasthan ascribed certain types of soil with meaningful significance. This seems to derive largely from their materiality rather than their functional suitability.

#### 6.2.4 From matter to edifice: combinations and variations

Symbolism is by no means restricted to the acquisition and exploitation of raw materials. On the contrary, it permeates several stages and mundane aspects of building technology (Boivin 2008, 4). Among these, the digging of foundations and the construction of the roof are often invested with cultural meaning and various symbolic connotations. Furthermore, the significance of certain structural parts or stages of the *chaîne opératoire* is underlined by the employment of different names and meanings (Bloch 1995, 75; Domenig 2003, 1999; Howell 1995, 159; Waterson 1997, 88–9). These are commonly interlocked into cosmological and symbolic perceptions that emphasise the deliberate nature of the building process and facilitate the verbal transmission of technology (Oliver 2006, 113–4).

Foundation rituals are a recurrent theme in traditional architecture. These may include the sacrificial offering of animals, the deposition of special artefacts or the symbolic digging with specific implements, such as a new spade (Kus & Raharijaona 1990, 29). In mid-20<sup>th</sup> century Thessaly, for instance, the construction of foundations was preceded by the sacrifice of a rooster or lamb and the splitting of its blood so as to define the boundaries of the house (Skafida 1994, 186). Other symbolic practices, involving feasting and offerings to the builders, were taking place during roof construction. The purpose of these rituals is related to the purification of the new structure and the insurance of its residents' prosperity. They could be viewed as strategies promoting social cohesion while also offering the opportunity for pushing claims to higher status (Gibson 1995, 147; Kus & Raharijaona 1990, 30).

The recognition of symbolic construction practices in the archaeological record of northern Greece is quite problematic. There are no clear indications for foundation deposits, although their existence is hinted in neighbouring regions. At LN Dimini in Thessaly, the remains of five new-born dogs deposited in a small niche under the west wall of a dwelling were connected to a foundation rite (Halstead 1992, 36; Souvatzi 2008a, 144). What is more, the deposition of human remains or cremations within residential contexts may also be associated with foundation rituals. A restricted number of burials found under plastered floors (including a pot burial at Axos A and an inhumation of an infant at Makri) may be interpreted in analogous terms. However, it is not defined whether these were deposited before the construction of the house or during its use-life.

Moving to the specific building methods employed, the information from a number of sites suggests that preparation activities for the appropriation of the ground were occasionally

conducted. These may have included the flattening or clearing of older rubble as indicated by large quantities of structural debris found inside pits or ditches at several settlements and/or their periphery (**Fig. 6.1**). Similar practices may also reflect symbolic acts of closure and cleansing (see Tringham 2005, 108). Evidence for wider levelling episodes derive from MN Servia IV (Mould & Wardle 2000a, 34). More restricted practices may include the levelling of the ground with clayey soil (e.g. Giannitsa B), or the creation of a substructure of stones, gravel, sherds and clayey earth (e.g. Polyplatanos).

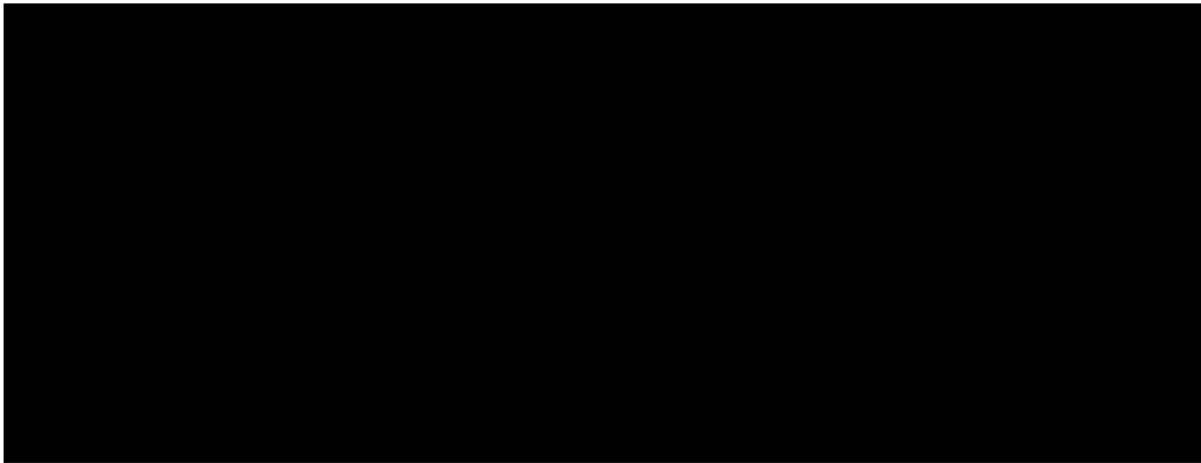


**Figure 6.1** Avgi: pit filled with rubble material (Avgi excavations archive, permission: G. Stratouli).

The archaeological evidence for foundation and wall construction exhibits a plethora of variations and combinations of different techniques from site to site. In attempting to delineate wider categories, two main *chaînes opératoires* can be recognised. These include the post-framed (or earthfast) construction and the ‘stone and mud’ building method (**Table 6.2**). The foundations of buildings belonging to the former category comprise wall-posts embedded in the ground. These had pointed ends (**Fig. 6.2**) and were either driven directly into the soil or, more rarely (e.g. Sossandra, Servia and Avgi III), into post-pits<sup>85</sup>. Sometimes pebbles were inserted in the fill of the postholes for extra stability (e.g. FN Kolokynthou), while their lining with fine clay (see Stevanović 1996, 169), probably for securing their base against decay, was also practised (sites include Dispilio, Nea Nikomedeia, Apsalos, Promachon-Topolnica II, Makri and others). The latter practice may also entail symbolic or cosmological meanings attached to specific elements that are considered crucial for the structure’s viability.

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<sup>85</sup> See Lichter 1993, 42 for the use of post-pits in south-east Europe.



**Figure 6.2 Different types of pointed ends on vertical waterlogged timbers from Dispilio**  
(Chatzitoulousis 2008, 98, 101–2, figures 5  $\alpha$ - $\delta$ , 7  $\alpha$ - $\beta$ , 8  $\alpha$ - $\gamma$ ).

An alternative foundation method was the upright placing of posts in a deep trench measuring approximately 0.40-0.50m in width. The trench was dug and then back-filled to provide stability to the structure. Rodden (1965, 97) argues that this technique was employed to prevent the frost heave and the wetness of the waterfront soil from affecting the buildings<sup>86</sup>. A similar explanation associated with the better runoff of rain and drainage is suggested by Renfrew (1986, 189). In the present study, it was supported that the Avgi III trenches were probably dug so as to ensure the sinking of posts into the compact, natural subsoil lying beneath the deposits of the earlier phases (see also Gheorghiu 2010b, 97). Nevertheless, the adoption of a building technique is not necessarily subject to a single functional explanation. Technological solutions, either consciously or unconsciously articulated, may present advantages reaching beyond their original purpose, while they may persist even when the needs for their employment are ceased. Whatever the case may be, both trenches and free posts were often combined for the foundation of a single structure. Inter- and intra-site variability can be observed in the exact alignment of the load-bearing timbers. These were closely spaced, either in single or double rows, or placed further apart. The narrower or wider gaps and wall panels created between uprights are related to the application of diverse techniques for their infill and the roofing of the structures.

The techniques for the screening of the ‘non-structural’ wall comprise different combinations of timber and construction earth. Among those already described in detail in Chapter 5, the use of wattles, thin branches or reeds plastered with plant-tempered mud

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<sup>86</sup> Reservations on this theory were expressed by Pyke (1996, 40, note 1) on the basis of the climatic conditions and the wetness of the ground during the Neolithic period.

seem to be the most widespread. The wattles are occasionally arranged in a typical *wattle-and-daub* fashion (**Fig. 6.3**). However, in many cases their actual weaving has not been confirmed. At the settlement of Nea Nikomedeia and elsewhere bundles of reeds and/or thin branches were set either vertically or horizontally and joined by transverses, while in other settlements the exact arrangements are not adequately described. A quite different framing method is the filling of the wall panels with a fence-like construction comprising closely set stakes or thin poles and split timbers (**Fig. 6.4**). The evidence deriving from the analysis of daub fragments from Avgi I, Sossandra, Dikili Tash I, Servia and possibly Paliambela suggests that this technique was probably more widespread than documented in excavation reports. In addition, the use of planks or split timbers is also attested. It seems unlikely, however, that exterior walls were built substantially by planks as it may be the case for south-east European sites, including Anza IV, Obre I and Yassatepe (Gimbutas 1974, 41; Lichter 1993, 47), or the Ripa Tetta house in Italy (Robb 2007, 82). More probably, plank-shaped timbers were used for the construction of partitions or as weatherboard cladding to provide extra stability and protection from the elements.

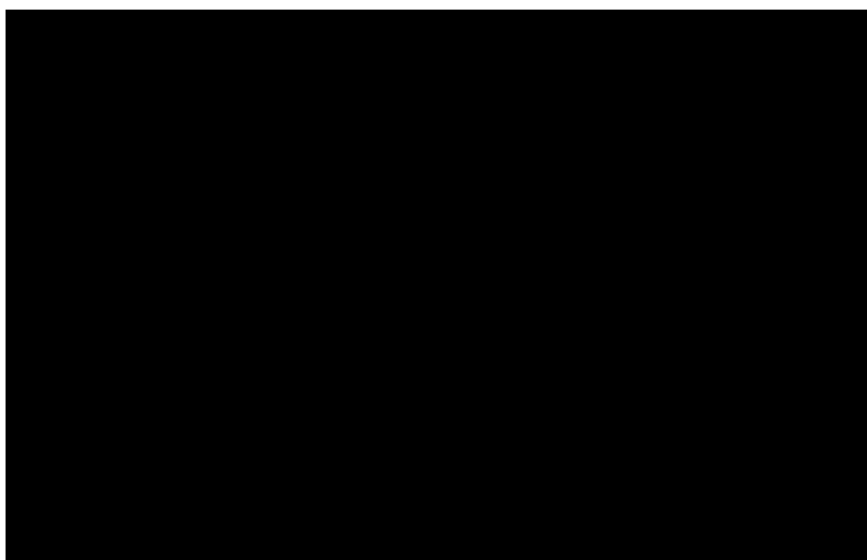


**Figure 6.3 Vădastra: experimental reconstruction of a Gulmenita wattle-and-daub house (Gheorghiu & Dumitrescu 2010, 130, fig. 15.2).**

**Figure 6.4 Dikili Tash: experimental hut following the ‘closely set stakes’ technique (<http://www.dikili-tash.gr/>).**

Moving to the construction of walls following a rammed earth or *pisé de terre* technique, this is sometimes associated with the filling of narrower spaces between vertical posts. From a technical perspective, this would have been an ideal way for economising on timber. The walls were probably built up in successive ‘lifts’ or layers of plant-tempered mud that were tamped down between some form of shuttering (McIntosh 1974, 159; Oliver 2003, 98–9).

Work would need to stop for a few days after each ‘lift’, in order for the wall to dry out and consolidate. However, a ‘quick-build’ method for mass clay walling requiring extra skills and experience is also reported in the vernacular architectural record (Jennings 2003, 144). Unlike modern versions of the method (**Fig. 6.5**), the evidence from northern Greek sites (including Arkadikos and Sitagroi) conforms to the basic principles of earthfast architecture. The identification of postholes both inside and at the sides of walls indicates the application of a composite technique comprising both solid mud walls and load-bearing or supporting timbers. This choice may be attributed to the fact that, although being appropriate for the production of solid walls, the *pisé* technique can be problematic for carrying the weight of a roof (Oliver 2003, 99)<sup>87</sup>.



**Figure 6.5 Construction of a rammed earth or *pisé* wall in Morocco (Oliver 2003, 99, Fig. 24).**

These techniques may also coexist in the construction of a single structure. It is not straightforward whether their application refers to the exterior walls or to internal partitions and other structural features. What is more, evidence for alternative techniques in a single structure may refer to its gradual ‘hardening’<sup>88</sup> and repair during its use-life rather than to the initial construction. For instance, the reinforcement or patching of deteriorating walls with plank-shaped timbers, wattles or even mudbricks would have resulted in a form that is much more complex than the idealised models often envisioned by archaeologists. In any case, when completed and dried out, the walls were given a protective finishing coat,

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<sup>87</sup> The early abandonment of a similar technique at Ilipinar has been attributed to the tendency of mud-slab buildings to sink away as a result of wall weight and the insufficient wall-strength (Roodenberg & Alpaslan-Roodenberg 2008, 9).

<sup>88</sup> The Zafimaniry houses at Madagascar are highly permeable to the outside when initially built. However, they gradually ‘acquire bones’ as massive wooden planks replace the woven bamboo (Bloch 1995, 79).



usually in the form of limewash (Jennings 2003, 147). The use of fine calcareous plasters for extra waterproofing and insulation has been recorded in various sites (such as Avgi, Nea Nikomedeia and Paliambela). Apart from functional suitability, aesthetic or symbolic considerations may also have been significant for the selection of plasters with specific colours or textures<sup>89</sup>. Nevertheless, it is not clear whether finishing coats were applied externally and/or internally. In the case of the well-preserved wattle-and-daub wall from Makri, both surfaces were plastered.

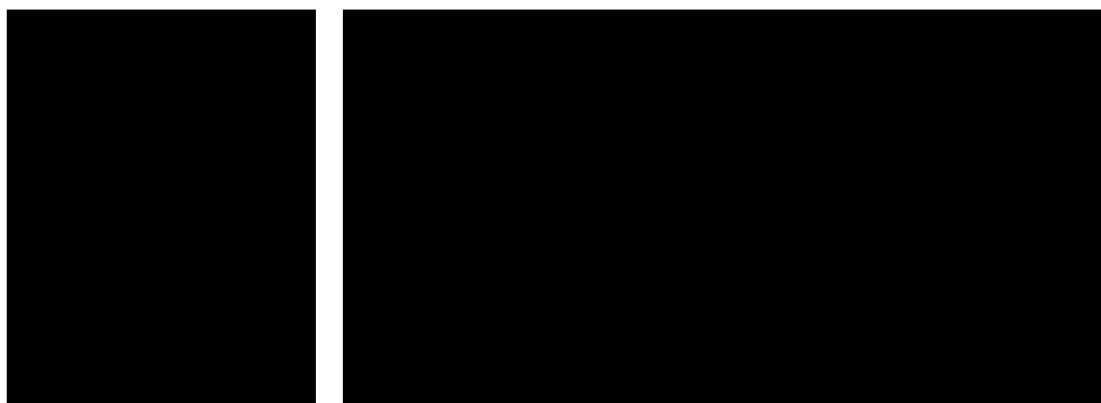


Figure 6.6 Schematic female figure from Promachon-Topolnica II (Koukouli-Chrysanthaki *et al.* 2013, Fig.10).

Figure 6.7 Incised wall decoration at Kleitos I (Papadimitriou 2010, 41, Fig. 3-3).

Further elaboration of wall surfaces is suggested by the occasional preservation of wall decoration in a limited number of sites. Plastic decoration in the form of four schematic female figures, potentially suspended on walls, has been identified at Promachon-Topolnica II (**Fig. 6.6**). Paint pigments and incisions have been found at Kleitos I (**Fig. 6.7**), while the possible existence of painted wall plasters has been supported in the case of Megalo Nissi Galanis. Although preservation is problematic, a more widespread use of painted designs, probably resembling pottery decoration motifs, for the elaboration of wall surfaces is reflected by various parallels from the adjacent regions (Grundman 1953, 13; Lichter 1993, 48–9) and clay house models.

Apart from their aesthetic properties, decorative or ‘non-functional’ elements were possibly imbued with various symbolisms and could have been regarded as essential to the structure’s strength and viability (Waterson 1997, 73, 88). They should be viewed as powerful means that can be exploited for communicating social identities and cosmologies (see Whittle 1996a, 21). This is, perhaps, more emphatically demonstrated in the case of the

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<sup>89</sup> In the Balathal village of Rajasthan, the white soil selected for the plastering of the wall’s exterior symbolised purity (Boivin 2008, 4).

bucrania found at Promachon-Topolnica I (Structure 4) and Dikili Tash I. These have been connected to wall decoration based on two clay house models found at the former site (**Fig. 6.8**)<sup>90</sup>. The example from Dikili Tash I is unique in the south Balkan region as it is covered with unbaked clay that reproduces the animal's features in low relief (**Fig. 6.9**). According to the excavators, it could have been placed in a vertical position on the wall or an internal support.



**Figure 6.8** House models from Promachon-Topolnica I with relief decorative bucrania (Papadimitriou 2010, 45, Fig. 3-5a, 118, cat.no 40).



**Figure 6.9** Bucranium covered with unbaked clay from Dikili Tash I (<http://www.dikili-tash.gr/>).

A different *chaîne opératoire*, in both quantitative and qualitative terms, was applied for the construction of dwellings following the stone and mudbrick building method (**Fig. 6.10**). The foundation of the walls included the use of stone socles or footings. Wherever these were identified in an articulated form, they comprised two or three rows of unworked stones, sometimes bound with clay mortar and a packing of small cobbles, while their width seems to have ranged from ca. 0.30m (Thermi B IIIa) up to nearly one metre (Olynthos). At the second building phase of FN Olynthos, the footings were laid in small

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<sup>90</sup> The bucrania deriving from the architectural debris of northern Greek buildings are reminiscent of the bulls' heads from Çatalhöyük, as well as of later examples of bucrania or plastic decoration found in the central Balkans (Trantalidou & Gioni 2008).

foundation trenches filled with stones, pebbles and sherds. This technical solution, also evident in Thessalian architecture (Elia 1982, 259), was presumably employed for providing greater lateral stability or for levelling purposes. In any case, the use of stone socles had the advantage of preventing ground water and damp from reaching the base of the mud walls.

The mudbricks used for the construction of the superstructure were laid in horizontal rows on top of the stone footing and set in a thick clayey mortar. Due to the lack of relevant information and the poor preservation of most samples, it is not clear whether their size was occasionally standardised, thus suggesting that they were formed in (wooden?) moulds<sup>91</sup>. The evidence from Stavroupolis Ib testifies against this scenario. The mudbricks found at the site are described as ‘loaf-shaped’ (therefore hand-made) with varying dimensions ranging between 20x25cm and 25x30cm. At the site of Vassilika C, however, their shape was roughly rectangular and they could have been moulded. Whatever the case may be, the production of non-standardised, hand-made mudbricks would have considerably increased the quantity of mortar required, as well as the overall duration of the building process.

According to ethnoarchaeological research in traditional Thessalian architecture (Skafida 1994), the construction of a house measuring ca. 30m<sup>2</sup> by a working group of 4–5 men and women could have lasted for at least 40 days. This refers to the whole timespan of the project, including the digging of pits near the structure site for the procurement of appropriate soil, the production and drying of mudbricks and the building of the foundations, the superstructure and the roof (Skafida 1994, 187). Similar estimations deriving from ethnographic and experimental studies indicate that a medium-sized working group (not exceeding seven persons) can raise a wattle-and-daub house in less than two weeks (Gheorghiu 2010b, 96).

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<sup>91</sup> Regarding the issue of mudbrick shape and construction, the information from Thessaly is equally inconclusive (Elia 1982). Further to the north, examples of varying dimensions come from Anza (plano-convex in shape) in FYR of Macedonia, and Măgura Jilavei (30x30x15cm) and Radovanu (40x32x8cm) in Romania (Gimbutas 1974, 41–2; Lichter 1993, 46 and footnote 185).



**Figure 6.10 Mudbrick buildings with stone foundations from Omorfokklisia (Kastoria, Greece) (photo: D. Kloukinas).**

Variations of the building methods described above can also be recognised, showing that the architectural repertoire of the Neolithic builders was neither standardised nor static across the region. The construction of rammed earth or composite *pisé* superstructures on stone footings is implied in a number of sites where no definite mudbrick-shaped samples were found. This could be characterised as an intermediate building method, combining a more restricted use of timbers and the compression strength of mud walls against vertical loads. The main difference with the ‘stone and mudbrick’ technique may have been the greater degree of technological skill involved in the construction of level courses using individual mudbricks (Elia 1982, 192–3). The use of mudbricks with no evidence of stone socles could be supported in the case of Thermi B (phase 3IIIb), Makri II, Mandalo and others. A similar building method is reflected in the construction of ‘clay slab’ walls at the FN settlement of Sitagroi IV. Finally, the erection of walls made entirely out of stone, similar to those suggested for Achilleion IVb in Thessaly (Gimbutas 1989, 65, fig. 4.43), has been rejected in the case of Olynthos (Mylonas 1929) due to the absence of adequate rubble material. Furthermore, the construction of proper stone walls would have probably required the application of advanced masonry skills that are not evident in the northern Greek record.

Roof construction practices are difficult to reconstruct due to the paucity of the available information. It is generally thought that Neolithic dwellings had gabled or hipped roofs with an adequate eaves overhang so as to allow for the better run-off of rainwater and to protect the wall surfaces. This is mainly based on the fact that precipitation and snowfall rates in the region are quite high during certain periods of the year. What is more, the morphology of the roof, probably including a chimney/smoke hole, is supported by a

series of clay house models found in Greece and the Balkan region (Toufexis 1996; Trenner 2010), as well as by various ethnographic parallels. Nevertheless, a flat roof has been hypothesised for House 3 at the settlement of Dikili Tash II based on a single fragment showing multiple layers of coating. In the neighbouring region of Thessaly, the use of flat roofs has been supported for the EN II house at Otzaki, as well as for the dwellings of MN Tsangli. At the former site, reddish layers separated by dark ashy lenses were interpreted as the remains of flat roofs constructed of alternate layers of organic materials and clay (Elia 1982, 168). In the latter case, the use of flat roofs was proposed based on the identification of substantial interior buttresses (Sinos 1971, 18)<sup>92</sup>. The possible presence of mudbrick pilasters on stone foundations at Olynthos may be interpreted in similar terms. Moreover, the potentials for both horizontal and vertical expansion offered in flat-roofed buildings (Palyvou 2005, 16) may explain the form of agglomerated rooms evident at the settlement. However, the available information is far from conclusive and does not rule out the use of pitched roofs.

In post-framed architecture, the weight of the roof was taken down to the ground independently of the walls, probably by using continuous wall-plates or tie-beams linking the tops of the vertical wall posts<sup>93</sup>. On the contrary, in mud or mudbrick structures the load-bearing walls provided a continuous upper surface for the bearing of the rafters' feet, thus carrying the weight in a more distributed way (Brunskill 2007, 25–6; Jennings 2003, 153). In both cases, a simple structure of parallel, coupled rafters producing light loads at close intervals, as well as side purlins, seems plausible (6.11). An angle of about 45°–50° corresponds to the roof pitch or slope necessary for effective waterproofing, although a lower pitch would have the advantage of needing smaller proportions of covering materials<sup>94</sup> (Bakels 1978, 90; Brunskill 2007, 60; Jennings 2003, 111–2). This, of course, depends greatly on the exact types of the roofing materials used. Unfortunately, the available evidence on the subject is scarce and ambiguous.

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<sup>92</sup> However, Elia (1982, 261, note 93) argues that the row of posts aligned along the central axis of the building should be related to the support of the ridge beam of a pitched roof.

<sup>93</sup> The use of tie-beams for linking opposite posts longitudinally may explain the identification of postholes that do not follow a perfectly straight line (Brunskill 2007, 26).

<sup>94</sup> At the MN settlement of Sesklo, a number of daub fragments indicate the construction of gabled roofs with a low slope estimated at approximately 25° (Elia 1982, 263; Tsountas 1908; Sinos 1971, 322, note 73).

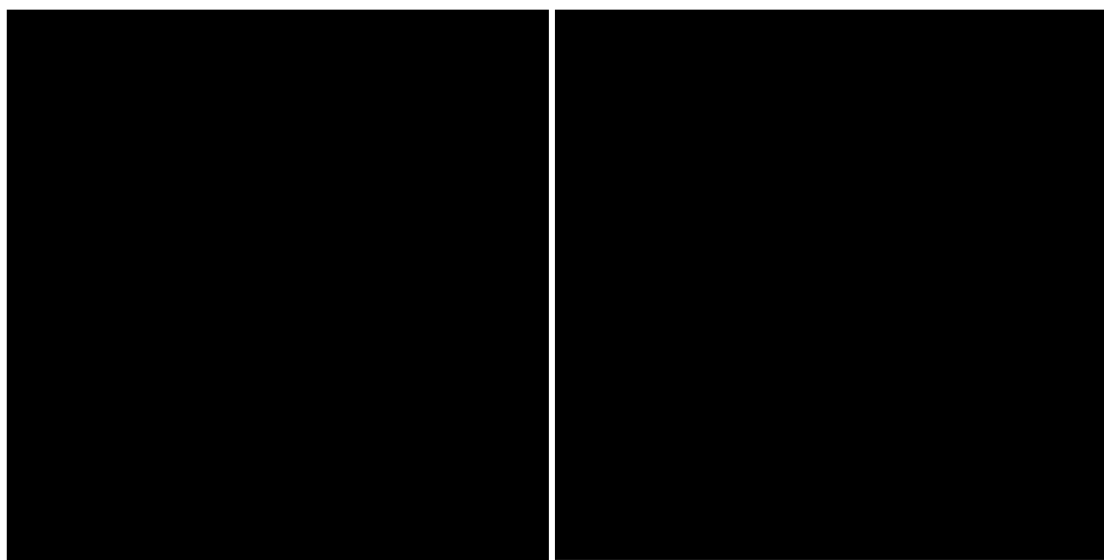


**Figure 6.11** Experimental hut at Sarakini (Rhodope, Greece): interior view showing the parallel rafters, side purlins and the thatch cover used for the roof (photo: D. Kloukinas, permission: N. Efstratiou).

The exceptional preservation of a collapsed wooden roof at the EN settlement of Prodromos II in Thessaly (Chourmouziadis 1971) has offered valuable insights into roof construction techniques. According to the finds, a naturally forked tree trunk served as the main interior support of the ridge beam. The framework of the roof consisted of sizeable, occasionally split, timbers and closely-placed light branches (**Fig. 6.12**). The identification of wooden pegs for jointing, as well as the use of large rectangular planks set over the branches, further emphasise the level of carpentry skills employed during the Neolithic period. Although the discovery of an almost intact roof remains unparalleled in northern Greece, a number of burned daub fragments with impressions of reeds and branches were found at the site of Servia and were attributed to a comparable roof framework (see **Fig. 4.20**). This interpretation was reinforced by stratigraphic observations related to the building's collapse pattern (Heurtley 1939, 53; Mould & Wardle 2000b, 86). Similar fragments bearing impressions of parallel or weaved branches, reeds and plank-shaped elements have been found at several excavations and were linked to mud-plastered roofs (sites include Nea Nikomedeia, Polyplatanos, Giannitsa B, Mandalo, Vassilika C, Promachon-Topolnica and others). At Avgi, and possibly elsewhere, the identification of daub fragments with impressions of overlapping planks can also be related to the roof frame or cover. However, in most cases no further stratigraphic clues are provided so as to disprove the association of timber impressions with walls or partitions. Besides, it is not certain whether the framework was always plastered with mud or left unplastered. A rich

ethnographic corpus indicates that both methods can be effectual in providing waterproofing and insulation.

Whatever the case may be, a thatch made of reeds, straw and/or grasses seems to constitute an obvious choice for the final covering of the roof's frame. Although reeds were probably available in many settlements lying in the vicinity of open, stagnant or slowly running water, the required quantities may have discouraged their exploitation (Bakels 1978, 90). The use of straw, either grown for that purpose or as a by-product of plant processing, may have been a better alternative for agricultural communities. Finally, the use of weights for holding down the roof's thatch has been implied at Servia where a number of large stones were identified in the architectural debris (Mould & Wardle 2000b, 86; see also Todorova 1978, 51).



**Figure 6.12** Remains of the collapsed roof found at EN Prodrornos II in Thessaly (Chourmouziadis 1971, 172–3, Fig. 12–13).

Moving to the construction of floors, different techniques have been recognised. These may co-exist within a single settlement or even structure, thus pointing to the differential shaping and division of the house's interior space. The so-called 'beaten earth' or 'trampled' floors recorded in a number of sites (such as Avgi, Servia, Xirolimni, Kleitos I, Megalo Nissi Galanis, Stavroupolis, Thermi B, Olynthos, Promachon-Topolnica, Dimitra and others) seem to imply a minor preparation of the surface. Sometimes they can be equated to the occupational surface formed as a by-product of frequent use rather than as a deliberately 'laid' feature (Mould & Wardle 2000b, 89). In other cases, however, micromorphological analyses have identified poorly constructed surfaces with a lime or clayey finishing, occasionally resembling the natural subsoil but with more organic

inclusions (Karkanias & Efstratiou 2009; Kyrillidou pers. comm.). In this respect, these floors do not differ significantly from the so-called ‘clay-plastered’ variants.

The latter category comprises floors that are more visible macroscopically and consist of laid deposits of clayey soils creating a level and durable surface. Such floors, either of a hard-packed or a more brittle nature, have been identified in various sites, including Dispilio, Servia, Nea Nikomedeia, Stavroupolis, Thermi B, Dimitra, Sitagroi, Arkadikos, Paradeisos and others. In rare cases, a substructure of pebbles, granules or sherds, either for levelling purposes or for providing cohesion, has been recognised (sites include Nea Nikomedeia, Kolokyntou, Megalo Nissi Galanis and Dimitra). What is more, the exploitation of calcareous soils and lime plasters (or lime gravel mixed with clayey soil) for creating a more impervious floor is indicated at the sites of Mavropigi, Axos A, Giannitsa B, Polyplatanos, Mandalo, Krioneri, Dikili Tash II and Makri. At the latter settlement, micromorphological analysis revealed that well prepared floors made of lime, domestic refuse and clastic sediment were alternating with layers of less coherent, informal surfaces. Moreover, the covering of floor surfaces with organic matting could be supported by the preservation of laminae of articulated phytoliths (Karkanias & Efstratiou 2009, 961). The possible existence of ‘matting’ made of broad-leaved marsh grasses or reeds is also reported at the settlements of Servia (structure 3, phase III), Sossandra and Nea Nikomedeia<sup>95</sup>, while similar evidence derives from EN Achilleion in Thessaly (Gimbutas 1989, 65–66, Fig. 4.44-4.45).

A less frequently observed technique comprises the construction of a solid wooden platform plastered with clay. Timber or beamed floors have been identified at the sites of Servia, Kremastos, Kleitos I and II, Drossia, Anargyroi III and Mandalo. However, considering that their preservation is subjected to decay and the salvaging of timbers for later use, a more widespread application of this technique should not be precluded (Mould & Wardle 2000b, 89). Besides, timber floors are known from various south and central Balkan sites, including Maliq in Albania, Divostin, Gomolava, and Kormadin in Serbia, Azmak and Kapitan Dimitriev in Bulgaria and many others (see Lichter 1993, 44–5). These could have been constructed either before or after the erection of the walls<sup>96</sup>. At MN-LN Servia timber floors consisted of halved or round poles with a diameter ranging

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<sup>95</sup> However, in the case of Nea Nikomedeia, Rodden (1964, 564) argues that organic matting was laid on the subsoil and was then plastered.

<sup>96</sup> When not spanning the entire surface of the house’s interior, their manufacture could have followed the construction of the superstructure.



between 6cm and 8cm (**Fig. 6.13**). These were compactly arranged on the ground, while slender transverse poles were used at intervals. Whether a shallow pit was dug for the setting of the timbers (see Todorova 1978, 51) is not clear. In any case, the whole substructure was covered with plant-tempered earth and was then surfaced with a layer of finishing plaster. At the FN settlement of Mandalo, the single timber floor identified followed a slightly different technique comprising thin branches plastered with clay. Finally, the occasional stone- or pebble paving of floor surfaces has also been reported (Servia I, Olynthos and Thermi B).

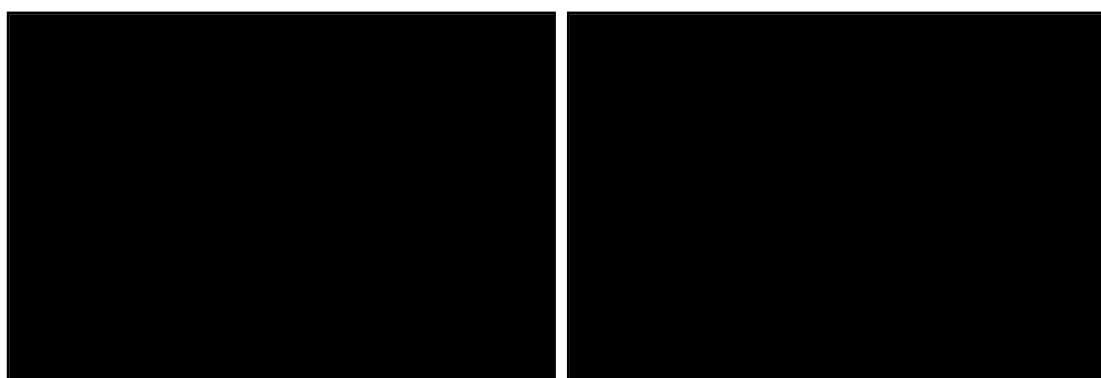


Figure 6.13 Clay surfaced beamed floor from LN Servia VII, structure 2 (Ridley, Wardle & Mould 2000, illustrations 20–1).

### 6.2.5 House maintenance and destruction

It is often assumed (see Hiller 1997, 65; Tringham & Stevanović 1990, 111–2) that the use-life of Neolithic dwellings in the Balkans may have reached or exceeded the life-span of one or two generations. In the case of Makri II, the excavators argue that dwellings were continuously renovated and occupied for a period of ca. 70 to 130 years (Karkanas & Efstratiou 2009, 964)<sup>97</sup>. In the absence of detailed dendrochronology studies<sup>98</sup>, it is difficult to define whether these estimations are accurate. The ethnographic record implies that they may be too high when referring to post-framed structures (e.g. McIntosh 1974, 160, 163). On the contrary, stone and mudbrick buildings, when properly maintained, could be occupied for longer periods of time (see Matthews 2005). Skafida (1994, 187) estimates that the life-span of Neolithic Thessalian houses could have reached 100 or even 150 years. Nevertheless, she notes that archaeological evidence indicates shorter periods of

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<sup>97</sup> This is based on the assumption that each phase of fine, lime floors re-occurs in the same period of time (ca. 33 years) within the 200 years of occupation indicated by radiocarbon dating (Karkanas & Efstratiou 2009, 964).

<sup>98</sup> Dendrochronology studies in the circum-Alpine region has shown that post-framed houses lasted for between six and twenty years up to ca. 3500 cal BC, while in the following periods their occupation was increased to several decades (Coles & Coles 1989, 105–6, 125; Menotti 2012, 138).

occupation. Therefore, the main difference between diverse building methods may not lie so much in the actual period of a dwelling's occupation, but rather in its expected longevity by the builders. Besides, the abandonment of a dwelling is often connected with socioeconomic factors and various events influencing the decisions of the co-resident group. What is more, the durability of structures is not primarily defined by the building materials used. The decisive structural factors are to be found in the details and mechanical properties of the building methods applied (Bei 2004, 3). The compartmentalised nature of the archaeological record gives access only to rough estimates of these aspects.

The occupants of the Neolithic dwellings would have to deal with various climatic-induced conditions undermining the structure's viability. These can be summarised in the multiple ways in which rainwater and the rising damp affect the mud walls and the load-bearing timbers, as well as in the daily or seasonal alterations in temperature (see McIntosh 1974). In the case of mud or mudbrick walls, the lower part is the most vulnerable, especially when placed directly on the ground. This is mainly because the pooling or the splash effect of rainwater causes the undercutting of the base which may lead to their actual collapse. Heavy rainfall may also lead to the eroding away of the unprotected wall's surface and the formation of preferential run-off channels and large cracks due to evaporation. In addition, the consistency of the mud walls is heavily affected by the capillary translocation of moisture and hygroscopic salts, as well as by the evaporation of the rising damp. In the case of post-framed architecture, soil humidity and the rising damp accelerate the rotting of timbers, while wood eating insects must be considered as an additional agent of decay (McIntosh 1974, 159–63). The analysis of charred beams from Makri has detected the existence of timber parasites, such as woodworms, indicating the deterioration of dwellings (Efstratiou *et al.* 1998, 54).

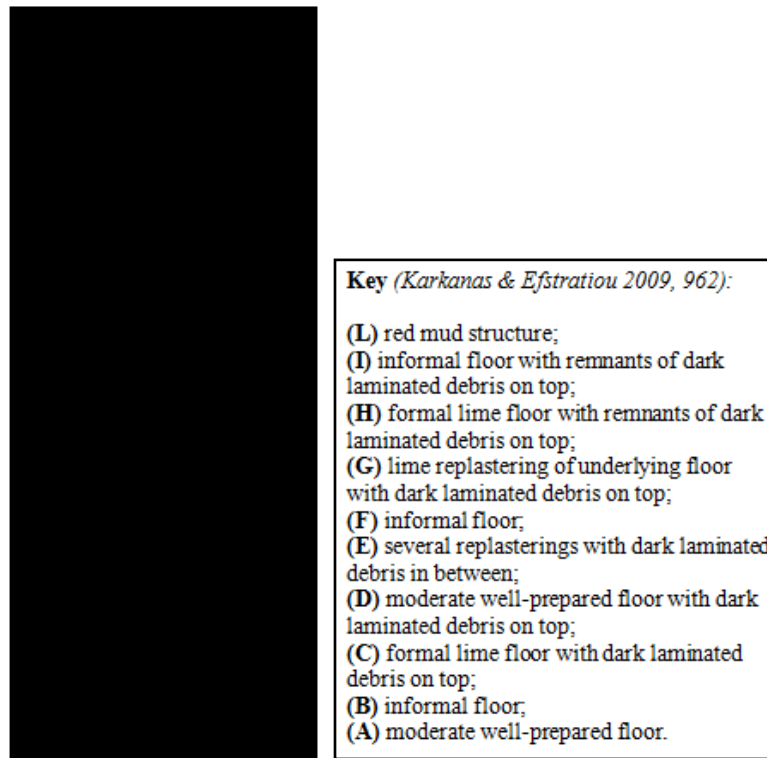
The building materials and techniques discussed in this chapter suggest that Neolithic builders were aware of these difficulties. The various solutions employed include the tempering of construction earth with plant fibres to improve cohesion, the construction of pitched roofs with eaves efficiently protecting the vertical walls from rainfall, and the use of stone socles or reinforcements so as to lessen the effects of undercutting and erosion through capillary action at the base of the walls. Open fires providing good ventilation and the finishing of the surfaces with fine clayey or lime plasters were also important for waterproofing and insulation. The plastering of floors or the construction of more or less impervious substructures prevented damp from the ground passing up into the house. Although potentially forcing it inside the walls, these could still 'breathe' as the plasters

used were not completely waterproof (Jennings 2003, 182). The identification of pebbled or stove paved areas around semi-subterranean dwellings or, more rarely, in association with above-ground structures, apart from defining activity areas, would have also protected the structures from rainwater erosion. Finally, the narrow paths or lanes between Neolithic houses would have facilitated the removal of water (Elia 1982, 367).

In addition to that, evidence for renovation or major repair works in the northern Greek record indicates that Neolithic builders were occasionally investing substantial efforts in the maintenance of their dwellings. The dense and/or irregular distribution of postholes observed in several sites (such as Mandalo, Mikri Volvi, Promachon–Topolnica, Arkadikos and Dikili Tash I) may be seen as the result of reconstruction or major repair episodes, involving the rebuilding of walls, internal features or the roof. Taking into consideration the durability of the heartwood of different tree species (Bakels 1978, 83, Table 6) and the longevity proposed for the Makri II dwellings, it is reasonable to assume the need for the replacement of certain structural timbers. The replastering of the timber frame is also evident by the identification of multiple successive layers of daub or finishing plasters at the sites of Kleitos I, Avgi and elsewhere. It is not certain if these should be connected with the annual or periodic renovation of wall surfaces, thus providing clues for the duration of occupation. They may also reflect the patching of the more vulnerable wall parts without necessarily entailing wholesale replastering. Similar indications derive from the identification of successive floor renovations or remakes in a number of settlements, including Servia, Krioneri, Polyplatanos, Promachon–Topolnica, Makri and others. The partial remake of a house floor at MN Servia I (Mould & Wardle 2000a, 23) may also be connected to transformations in the use of space during the building's use-life.

Here, it should be mentioned that maintenance practices are not exclusively driven by pragmatic considerations concerning the viability of the structure. Renovation of wall surfaces and floors may also be linked to various temporal cycles or particular events that are imbued with cultural significance, such as birth, marriage and death (Boivin 2008, 132–3, Table 4.1; Matthews 2005). The micromorphological analysis of plaster floor sequences from Makri II (Karkanas & Efstratiou 2009) indicated that formal or well-prepared lime floors occurred at regular intervals corresponding roughly to the lifespan of a generation (**Fig. 6.14**). They were, consequently, attributed to possible changes in residency or marital patterns. Moreover, their parallel reconstruction in neighbouring buildings may be viewed as reflecting important events of socioeconomic nature referring to larger groups or the

community as a whole. On the other hand, the informal floors seem to reflect smaller-scale temporal rhythms that are associated with annual life-cycles and the domestic lifestyle<sup>99</sup>.



**Figure 6.14** Resin impregnated slab showing series of ‘formal and ‘informal’ floors from Makri (Karkanas & Efstratiou 2009, 962, Fig. 5).

Evidence for repairing and renovation reveal the significance of house maintenance practices from both a functional and a social perspective. Eventually, however, the use-life of dwellings would have come to an end as a result of the resident group’s life-course or the deterioration of the structure, especially when renovation efforts were greater than those required for the erection of a new building. Nevertheless, the social life of architecture does not end with its abandonment or destruction. As long as the roof remains intact, a structure may still be used for a range of activities, including storage. On the other hand, if the roof collapses or deteriorates, then the walls will be rapidly washed away and their only conspicuous trace will be a low mound of weathered material (McIntosh 1977, 191). Yet again, the recycling and incorporation of old structural elements, and mainly timber, into later dwellings are feasible. Such practices may have been employed by the Neolithic inhabitants and may have involved symbolic meaning related to the ancestral

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<sup>99</sup> Comparable practices have been recorded in the case of modern Rajasthan and have been supported for Neolithic Çatalhöyük (Boivin 2000). A similar explanation, probably associated with an annual event, has been supported for the clay-lining of a large house’s timber floor in Sofia Slatina (Bulgaria) that was renewed at least fifty times (Nikolov 1989; Whittle 1996b, 58)

group or the community (see Matthews 2005, 146). However, this assertion cannot account for those buildings that have been destroyed and, therefore, adequately preserved by fire.

The excavation of a considerable number of extensively burned buildings in southeast Europe and beyond has drawn remarkable attention in the prehistoric archaeological agenda. House destruction has been subjected to various interpretative approaches focusing on the causes of fire. Among the potential causes of the phenomenon, hostilities involving outsiders, accidental fires from hearths or ovens, and deliberate burning practices have been addressed (Chapman 1999; Stevanović 1997; Tringham 2005; Verhoeven 2000). The former assumption could be sustained in certain contexts where a widespread conflagration episode is evident. The abrupt end of occupation at the LN Servia VII settlement may provide such an example (Mould & Wardle 2000a, 51). Moreover, this could be reinforced by the identification of enclosures, such as systems of ditches or stone walls, if these are considered to be defensive in nature. Nevertheless, enclosures are commonly thought of as features demarcating the social and symbolic dimensions of space (Kotsakis 1999, 71–2). Besides, following Halstead's (1995, 14) argument, the dense habitation pattern in certain northern Greek areas, as well as the homogeneity of various pottery styles over great distances, seem to imply a peaceful coexistence rather than a state of warfare and hostility.

The second hypothesis has been rejected through the experimental burning of structures following similar techniques (Ammerman & Shaffer 1981, 432; Bankoff & Winter 1979; Gheorgiu 2010b; Hansen 1961; Nielsen 1966 cited in Coles 1966–7, 13). The results of all conducted research seem to agree that setting fire to timber and mud structures was difficult (see also Gordon 1953; Verhoeven 2000) and that the proportions of sintered daub produced by “accidental” fires were considerably lower comparing to those often excavated. In addition, it is proposed that the intensity of conflagration would have allowed the inhabitants to put out the fire after the collapse of the roof, retrieve valuable items and restore the house to a habitable condition (Bankoff & Winter 1979, 13).

Stevanović' (1996, 2002) detailed study of the Opovo (Serbia) houses has suggested that building conflagration was carried out deliberately and under controlled conditions, probably involving the addition of extra fuel. Supporting lines of evidence include the fact that the temperatures indicated are too high to be explained by the amount of the structural timber, as well as the recognition of multiple ignition points indicating that the ignition did not start from the roof but at floor level. Moreover, the pattern of collapse seems to follow

an organised and strategic way for terminating the utilitarian role of houses (Stevanović 1997, 381–3). However, it should be noted that research results, especially those referring to experimental studies or arson investigation methodologies, are partly biased due to the use of ideal house reconstruction models. Is it possible that larger amounts of timber, combined with certain technical choices (such as the plastering of only one surface of the timber frame), could account for the extensive burning of certain Neolithic structures? In any case, the absence of bodies and the occasional identification of complete house inventories constitute another line of evidence against both raiding and accidental fires (Stevanović 1997, 382; Cessford & Near 2005, 174).

The intentionality of house conflagration has been approached in a multitude of ways ranging from purely functional explanations to others closely connected to symbolic meanings and perceptions. In the case of Piana di Curinga in Italy, the deliberate burning of partially standing houses (Shaffer 1993, 72) has been associated with the stockpiling of sintered daub and its subsequent incorporation in future structures (Shaffer 1983; Ammerman & Shaffer 1981, 432). Although cross-sections failed to reveal the recycling of daub as tempering material, this assertion may be supported by the distance of clay sediments in relation to the site. Nevertheless, in the case of most northern Greek and Balkan sites the availability of suitable soils indicates that such practices would not have improved the labour efficiency of the building process. Another functional cause could be the fumigation of houses to eradicate pests and insects (Stevanović 1997, 382). This explanation does not seem convincing as fumigation practices do not necessarily entail the total burning of the house. Furthermore, the tree species (and especially oak) used for the construction of the vital parts of the timber frame are particularly resistant to wood insects and decay (Bakels 1978, 83, Table 6). However, the symbolic infestation caused by (or linked to) death and disease could be viewed as an alternative ‘functional’ (from an *emic* perspective) explanation for house destruction.

Moving to the effects on the materiality of the building remains, it should be noted that fire, apart from destroying, transforms certain materials and makes them permanent. Stevanović (1997, 338) supports that deliberate burning was employed so as to mark the location of the abandoned house and to provide the foundation for the erection of a new one. This practice, which was widespread during the Vinča culture, is also related to social and mnemonic strategies for the legitimisation of land ownership and the continuity of the social house. Following this, overlapping house replacement patterns could be seen as efforts for the incorporation of the material and symbolic property of the older dwelling.

Cessford and Near (2005, 175) have argued that the burning of buildings and their rapid replacement at Çatalhöyük may imply some form of 'vertical competition' between different social units. It would have also constituted a vivid and memorable spectacle or an 'offering on a grand scale' (Cessford & Near 2005, 182) marking the ritual 'cleansing' or 'closing off' of the buildings. At the site of Sabi Abyad, the intentional burning of an extended settlement area has been connected with funerary rituals, probably referring to members of the community with a higher status. These were viewed as having an important integrative function providing a framework for social cohesion (Verhoeven 2000, 63–4).

The possible symbolic connotations deriving from the physicality of material resources and structural forms should not be overlooked. More specifically, the exploitation of 'living' materials in post-framed architecture, as well as the more or less symbiotic relationship between structures and their residents, may have led to the conception of the physical house as a 'living entity' subjected to a continuous cycle of generation, deterioration and regeneration (Waterson 2003, 48; Howell 2003, 31). Body metaphors referring to house construction, built forms and the use of space further emphasise this potential. The intentional burning by fire can, therefore, be linked to the symbolic death of the house or the household, marked by the actual death of its head or a prominent member. In fact, birth and death, endings and beginnings, are intimately connected to the house in many cultures, while the house itself is often perceived as the extension of the person (Carsten & Hugh-Jones 1995b, 2–3). In sites, such as Avgi, where cremations, the consumption and transformation of the human body by fire, have been identified, it is tempting to imagine the existence of binary oppositions connecting burial rites to the deliberate conflagration of dwellings (see also Verhoeven 2000). On the other hand, the very materiality of stone and mudbrick architecture may impose a different conceptual framework focusing primarily on the notions of stability and permanence. It is noted that the construction of rammed earth or mudbrick superstructures is often hypothesised based on the extreme rarity of non-dissolved superstructural material (and/or postholes) rather than their actual presence in a fire-hardened form<sup>100</sup>.

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<sup>100</sup> A similar situation is suggested by the preservation status of Thessalian mudbrick dwellings (Elia 1982, 259–60). In cases where extensive burning has been recorded (e.g. LN Dimini), this cannot be convincingly associated with the practices identified in southeast Europe (Souvatzi 2008a, 145).

Conclusively, it should be mentioned that there is no definite reason for adopting an overarching explanation or for assuming any true link between the functional, social or symbolic discourse of the phenomenon in different settlements or regions. Moreover, it is difficult to define how universal this practice was at the intra-site level, and whether its employment referred to specific houses or individuals as, probably, is the case for certain burial practices. Besides, destruction by fire is one of the principal reasons for the preservation and identification of timber and mud structures. As correctly pointed out by Cessford and Near (2005, 181), this fact is so deeply implicated in the creation of the archaeological record that it is difficult to be isolated and thoroughly discussed.

### 6.3 Sociocultural and socioeconomic inferences

After describing the decisions, materials and techniques associated with the construction process, the remaining part of the chapter will turn the focus on the social dynamics of Neolithic communities as these are portrayed in building technology. The discussion will revolve around the issues of homogeneity and diversity, as well as continuity and change, at different scales and axes of analysis. The set of underlying questions, posed according to an agency-oriented agenda (Dobres 2000, 179–80), can be summarised as follows:

- How widely shared are certain construction principles, practices or strategies within different spatiotemporal scales?
- How much variability was tolerated, favoured or discouraged?
- Does variability refer to specific stages or ramifications of the *chaîne opératoire* or is it more widespread in all stages of the process?
- In which phenomenological scales are variations more profound or less visible?
- What are the attitudes for or against continuity and innovation?
- What is the relationship between the context of technological change and wider sociocultural trajectories?

#### 6.3.1 Diversity and homogeneity: a bird's-eye view perspective

The analysis of the *chaîne opératoire* has demonstrated the multitude of ways in which Neolithic communities constructed their dwellings, as well as their possible social and symbolic connotations. In terms of materials and technological choices, similarities with the adjacent regions, such as the south Balkans, northwest Anatolia and Thessaly, can be traced in several aspects of the building process. This could point to the sharing of a general



consensus or a mutually tangible architectural vocabulary in terms of raw material exploitation and technological choices. Nevertheless, the coexistence of all of these aspects in northern and central Greece from an early date has no clearly identifiable parallel in the surrounding areas (Bailey 2000, 48).

At the regional level, the picture of a more or less straightforward and homogeneous architectural tradition seems to dissolve. There is, of course, a general inventory of building types and techniques influenced by the potentials and limitations of material resources. However, when looking at the process as a whole, it is hard to support the existence of strictly defined and widely shared prescriptions on how to build a house. Forms, ground plans, building methods and techniques show variability throughout the spatiotemporal context examined. In most cases, the differences observed do not present recognisable patterns. This is partly due to the fact that the area under study is primarily defined by modern geopolitical boundaries.

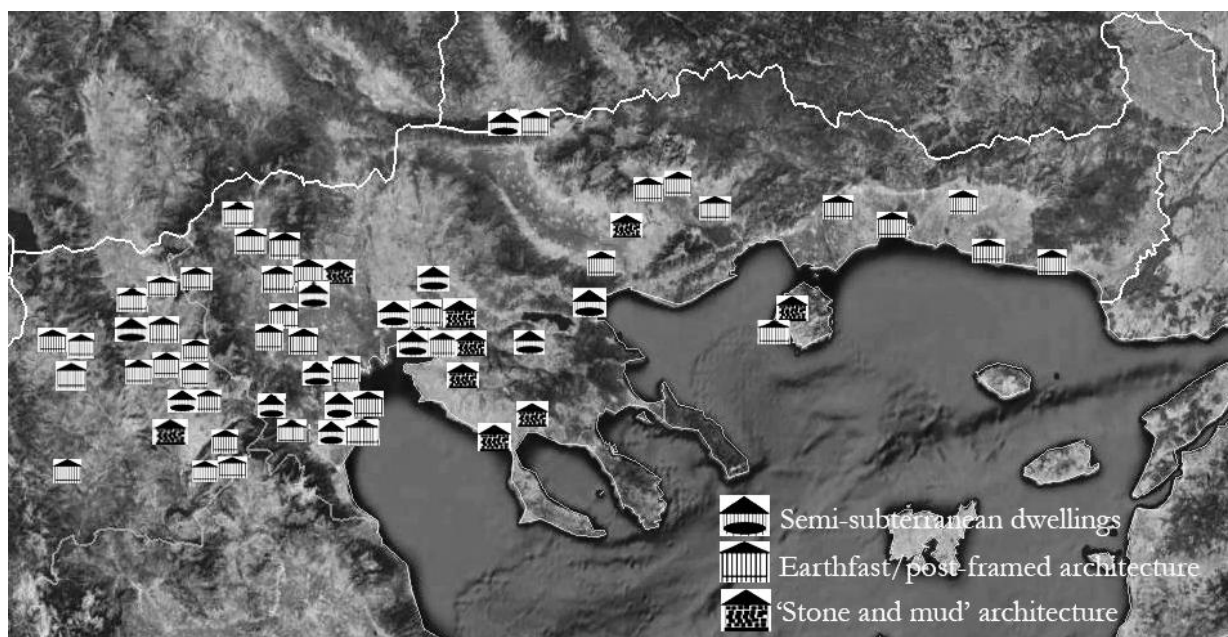
Intra-regional diversity and/or homogeneity are often perceived as decidedly influenced and constrained by local environments and the level of technical knowledge. Deterministic standpoints are echoed in Mould and Wardle's (2000b, 98) argument that construction style in earlier prehistoric contexts is determined more by the local availability of natural resources than cultural influences. However, the great variety in the employment of building materials and techniques in ecologically similar regions does not seem to justify this assertion. This is not to say that these variables are not integral in the employment of certain technological solutions. On the contrary, the relative absence of structural stone or the heavy dependency on timber may be approached in terms of material availability. This could explain, for instance, the differences between the northern Greek/south Balkan and the Thessalian/south Greek architecture.

In the case of Thessaly, the occasional absence of stone foundations in sites including Argissa, Magoulitsa, Prodromos I and II, Otzaki and others, has been attributed to the low availability of stone in the surrounding micro-environments (Elia 1982, 191; Skafida 1994, 181). Nevertheless, such explanations are not entirely compatible with the northern Greek evidence. The large- or smaller-scale exploitation of stone for the construction of massive enclosures, terraces or relevant spatial features in a number of sites, such as Mandalo, Krioneri and Makri, comes in stark contrast to its virtual absence or rarity in house construction. What is more, environmental deterministic perspectives cannot adequately

explain the parallel existence of both post-framed and 'stone and mud' architecture or the gradual replacement of the former method by the latter at the site-specific level.

It is, therefore, argued that the use of different materials and techniques, far from being strictly imposed by the environment and uninformative from a sociocultural viewpoint, should be seen in terms of cultural choices and affiliations to intra-regional networks and identities (Johnson 1997, 17). The distribution of certain techniques and structural features offers some clues in favour of this argument. It should be noted, however, that the emerging picture is highly biased by preservation and the inconsistencies in terminology and recording definition. These limitations allow access only to general characteristics that may divert attention away from less conspicuous, but still significant, forms of diversity (Stevanović 1996, 34). Nevertheless, it is still possible to sketch out certain trends when examining different kinds of difference and the differences in their distribution (Mercer 1997, 10).

The mapping of distinct house construction technologies (**Fig. 6.15**) suggests that the *chaîne opératoire* of earthfast, timber and mud architecture dominates the northern Greek record from the earlier stages of the Neolithic period. Besides, the significance of clay- and wood-working seems to characterise the *habitus* of Neolithic communities in the wider Balkan region. This is probably more evident in the case of western Macedonia. The methods employed in house construction point to the intensive exploitation of woodland resources and the application of a complex *chaîne opératoire* focusing on the production of suitable timbers. This is emphasised by the incorporation of split, squared and plank-shaped timbers in wall framing, as well as by the construction of timber floors. The high level of carpentry skills, probably portraying a regional tradition or 'dialect', is more pronounced in the architectural evidence from lakeside sites, such as Dispilio and Anargyroi III. The latter sites should also be compared to lakeside settlements located in the wider area, such as Dunavec, Garica and Maliq in south-east Albania (Grammenos 1991, 35; Prendi 1982).

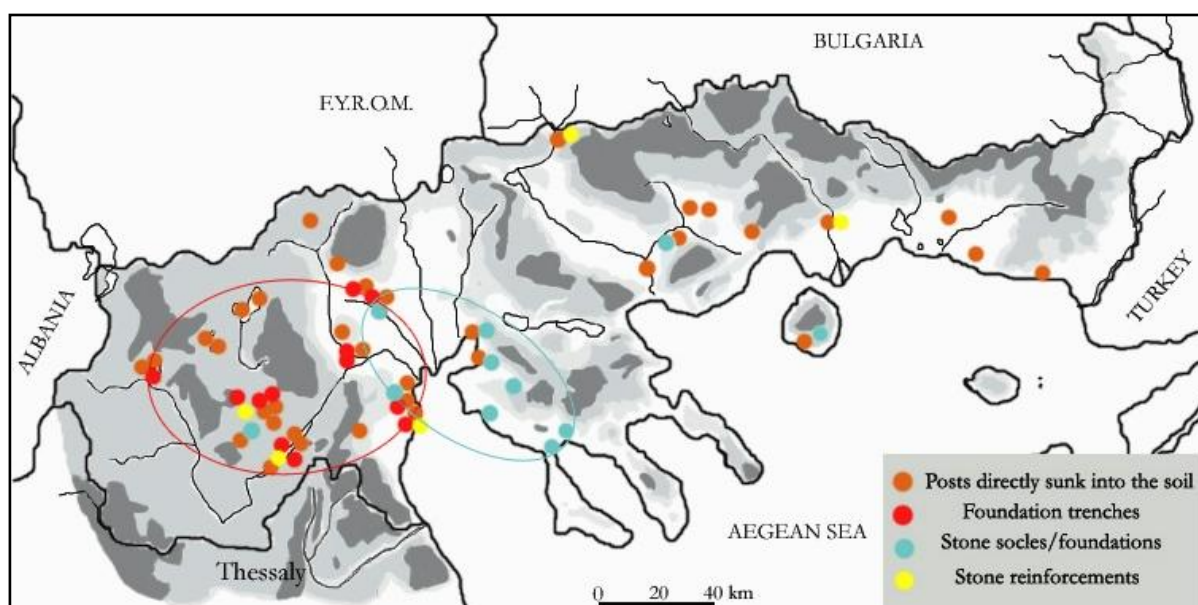


**Figure 6.15** Distribution of distinct house construction technologies in Neolithic northern Greece.

Moving to the late MN and the LN periods, earthfast architecture continues to prevail in most areas under consideration. In western Macedonia, the available evidence indicates the continuing dependency on various combinations of timber and mud, although innovations and variations at the site level may be observed. In eastern Macedonia and Thrace, the wattle-and-daub and rammed earth techniques are commonly employed. Variability in house construction is generally more pronounced in central Macedonia. Besides, this is the area where almost all building methods recognised in the current study have been identified. The construction of semi-subterranean dwellings continues till at least the end of the 6<sup>th</sup> millennium cal BC when they seem to be gradually replaced by above-ground structures. Post-framed architecture, presenting strong affinities with the architectural repertoire of the wider south Balkan region, continues till the later stages of the Neolithic. Nevertheless, the second half of the 6<sup>th</sup> millennium seems to mark the more widespread construction of dwellings with solid mud or mudbrick walls on stone foundations. These are mainly identified at settlements located around the Thermaic Gulf, although the evidence from EN Xirolimni and late MN/early LN Dimitra indicate that the application of this building method is neither temporally nor geographically strictly restricted.

The distribution of individual structural features referring to foundation, wall construction and flooring techniques provides comparable conclusions (**Fig. 6.16–6.18**). The emerging picture is one of a mosaic of different techniques presenting irregularity and a great deal of overlap. Among the features presenting a more regular distribution, the use of foundation trenches and timber floors is limited geographically to the area west of river Axios. The

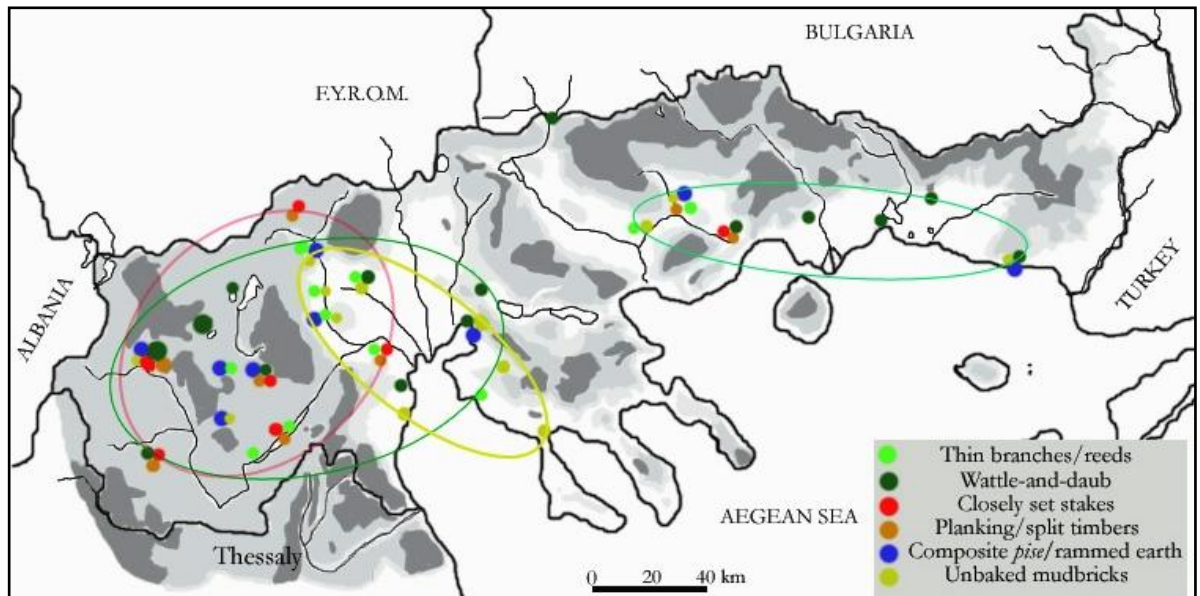
same may be true for the exploitation of certain framing techniques, such as the use of medium-sized and split or plank-shaped timbers. However, the analysis of the Dikili Tash assemblage indicates that finer-grained analyses of construction materials and techniques may alter this picture significantly. On the other hand, the use of stone foundations and mudbricks is primarily attested in the central Macedonian plains and the Chalkidiki Peninsula. Although the exploitation of stone is testified in other areas (Pontokomi, Servia, Paradeisos, Promachon-Topolnica II and Kastri), this is often associated with the reinforcement or facing of walls rather than with proper stone socles. Similarly, the presence of mudbricks or ‘mud-slabs’ in other micro-regions (sites include Dispilio, Dimitra, Sitagroi and Makri) does not necessarily reflect the prevailing wall construction technique.



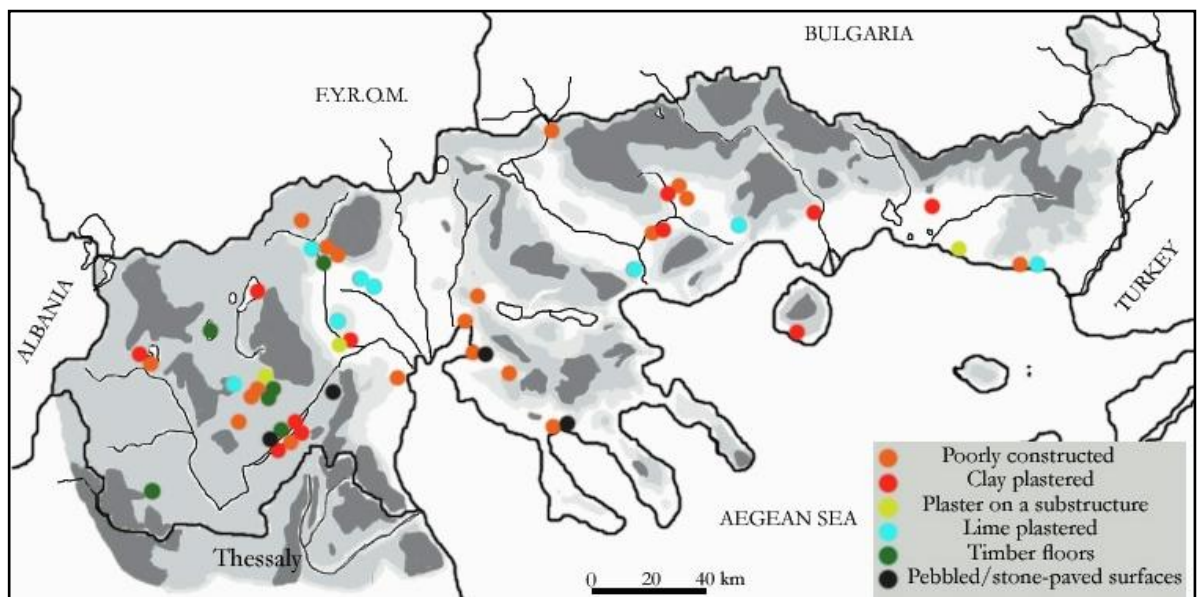
**Figure 6.16** Distribution of foundation techniques in Neolithic northern Greece.

In sum, the distribution patterns described reveal the existence of two possible (although ill-defined) ‘entities’ or settings of technological interaction and transmission. These include western Macedonia on one hand, and the region encompassing the Chalkidiki Peninsula and the wider area of Thessaloniki on the other. If this reading of the record is accurate, north Pieria and the Giannitsa plain could represent a boundary or transition zone where different technological features co-exist and intermingle. The relative paucity of the record does not allow similar inferences in the case of eastern Macedonia and Thrace. Regarding chronological patterns, the earlier stages of the Neolithic seem to be characterised by a higher degree of homogeneity and irregularity. Patterned variability and distinctiveness, potentially associated with the emergence of more bounded architectural traditions, are

more evident during the later stages of the period. A similar trend was observed in relation to ground plans (**section 4.2.2**), while comparable evidence derives from other aspects of the material culture.



**Figure 6.17** Distribution of wall construction techniques in Neolithic northern Greece.



**Figure 6.18** Distribution of flooring techniques in Neolithic northern Greece.

The analysis of various artefact categories in northern Greece indicates the existence of craft specialisation and extensive exchange networks since the early stages of the Neolithic (**section 3.6**). The wide distribution of certain pottery styles points to various influences at the intra- and inter-regional level. Affinities with the early Neolithic groups of the south Balkans and the lack of clearly defined cultural boundaries have been already pointed out.

Nevertheless, when moving to the later stages of the Neolithic, it is again possible to discern manifestations of regional diversity and distinctiveness, such as the appearance of characteristic, local ceramic styles. Although EN and MN traditions were still significant, this seems to be a period of change and variability (Kotsakis 2010; Souvatzi 2008a, 181).

The comparable trends noticed in the analysis of both architecture and pottery suggest that variability in house construction may also reflect wider issues operating at a regional level. It could be suggested that choices referring to the incorporation or omission of materials and techniques in certain areas were influenced by cultural perceptions and local identities. Nevertheless, the identification of intra-regional boundaries remains problematic as building methods and *chaînes opératoires* are commonly overlapping or replaced. This could imply that group identities, rather than being static, monolithic and well-bounded, were essentially fluid, dynamic and embedded in the context of social relationships and interaction (Diaz-Andreu & Lucy 2005; Insoll 2007). Therefore, it is suggested that the reference framework of the exact workings of building technology should be traced at finer analytical scales.

When focusing on certain micro-regions, homogeneity in the construction process of roughly contemporaneous settlements is more pronounced. Examples include pairs of neighbouring sites, such as FN Megalo Nissi Galanis and Mikro Nissi Akrinis (Kitrini Limni), EN Axos A and Giannitsa B (Giannitsa plain), and LN/FN Arkadikos and Sitagroi (east part of the Drama plain). The circulation of technological conceptions and the adoption of almost identical techniques between contiguous societies points to the exchange of technological knowledge and expertise through networks of social interaction. These could be viewed as ‘moral networks’ (Whittle 2003, 17, 68–9) operating at a local, although not necessarily bounded, level and encompassing common perceptions, as well as notions of mutuality and belonging (also Gosden 1994).

### **6.3.2 Intra-site analysis: building technology and social dynamics**

The detailed analysis of the Avgi I architectural remains allowed the comparison of construction practices at the site-specific level. The methodology applied and the variants used for recording were specifically targeting at identifying traces of diversity in the employment of different materials and techniques. Yet, as already described, the high degree of standardisation in all stages of the *chaîne opératoire* was hard to contradict. Variability between the three extensively analysed assemblages was limited to the estimated size of buildings, as well as to the relative density in the application of the different

techniques at hand. The latter observation may reflect individual preferences and skills, or the uneven preservation of the superstructural rubble.

A similar picture, although less coherent in terms of detail, emerges from a number of adequately exposed sites throughout the region. Standardisation in construction practices and dwelling forms seems to be the prominent theme. Most structures belonging to the same building horizon of a single site present a great deal of homogeneity, thus reinforcing the view that the range of variation decreases significantly when moving from a 'bird's-eye view' analysis to finer analytical scales. At the EN settlement of Nea Nikomedeia, technological standardisation is particularly evident in the application of common foundation, and possibly wall construction, techniques. The preliminary reports on the architectural remains of LN I Kleitos I point to a similar direction. Intra-site homogeneity is more pronounced at the LN I settlement of Arkadikos where domestic dwellings follow common apsidal ground plans, dimensions, orientation and building techniques. The analysis of the LN I Dikili Tash remains has revealed comparable technological choices not only in the application of building techniques, but also in the exploitation of specific material resources. Equally remarkable is the use of similar building methods at the LN I settlement of Makri, as well as the widespread use of stone socles for the foundation of mudbrick superstructures at the LN I settlement of Stavroupolis II. Further evidence may be obtained by a number of sites that are either providing limited comparative material or have not been exposed on an adequate spatial scale, such as Axos A, MN Paliambela, Drossia, LN Sitagroi and FN Olynthos. What is more, the exclusive identification of the (semi-)subterranean type of dwelling in settlements, including Makriyalos I and IIa, Thermi B 2, Stavroupolis I, Promachon-Topolnica I and others, reinforces the community-wide standardisation of the architectural process.

The question to be addressed is how this observable trend can be approached in order to tell us something interesting about the communities under study. Intra-site homogeneity could be misleadingly interpreted in terms of local environmental constraints and static, established archetypes. Such a deterministic view masks the social dynamics involved and cannot adequately explain diversity when observed nor change when it happens. Approaches focusing on the organisation of production, on the other hand, support that standardisation is the outcome of the equal ability of households or co-resident groups to mobilise materials and labour for production. This could also indicate the comparable composition of the work group(s) throughout the different stages of the *chaîne opératoire*. Moreover, uniformity may point to the absence of social labour division, differentiation or



inequalities (Chourmouziadis 1995, 227; McGuire & Schiffer 1983, 286–7)<sup>101</sup>. A similar reading would suggest that sites exhibiting a high degree of homogeneity in architectural practice reflect the mutual sharing and horizontal transmission of the required technological knowledge and skills. This, of course, does not preclude a gender-based division of labour. Neither does it prohibit the existence of part-time ‘ritual specialists’ during certain stages of the *chaîne opératoire*. On the contrary, standardisation may as well reflect a meaningful, formalised and highly ritualised behaviour (see Boivin 2000, 382) with various symbolic connotations shared by the community members.

The approaches described above offer valuable insights into the social aspects of building technology. However, reservations may be expressed about the underlying notion of a direct fit between the organisation of building technology, the form of the end-product and the social organisation of the community. As is the case for other categories of material culture, domestic architecture can be purposefully manipulated in order to either conceal or emphasise the existing social dynamics. Under this lens, uniformity in building practices, often accompanied by subtle differences in household inventories, may be viewed as a conscious or unconscious tendency to suppress overt expressions of social differentiation or relations of domination. This is, by no means, necessarily indicative of an egalitarian or un-ranked society. Anthropological studies suggest that the concept of extreme egalitarianism is a result of viewing the ‘ideal system’ of certain groups as opposed to the real one (Kent 1990, 132). Besides, the emergence of widespread inequality and notions of private ownership is often considered to go hand in hand with the development of small-scale sedentary communities (Byrd 1994, 642).

Nonetheless, status inequalities, especially when transient and not institutionalised, do not preclude the existence of strongly egalitarian values (Halstead 1995, 13, 16). These do not refer to some abstract principles or sets of rules but can be associated with a ‘logic of honour’ (Bourdieu 1977, 14–5) comprising cultivated dispositions inscribed in the schemas of body and thought, and strategically reinforced through practice to promote individual or group interests. Rather than a symbol of social asymmetry, the house seems to constitute the potent symbol of community solidarity and equality (see Wilk 1983, 112). In other words, uniformity may indicate that house construction was not conceived as an

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<sup>101</sup> However, Bourdieu (1977, 63–4) suggests that homogeneity in the mode of production of *habitus* produces an homogenisation of dispositions and interests which, far from excluding competition, may sometimes engender it.



appropriate field for the display of social differences, but as an undertaking to prove the competence of the resident group in doing things the ‘right’ way.

Nevertheless, standardisation and uniformity are not equally encouraged in all sites. Evidence of intra-site diversity, either subtle or more pronounced, are still manifested in the archaeological record, thus showing that different technological considerations and social dynamics may have been involved throughout the spatiotemporal context of this research. In an attempt to ‘categorise’ expressions of variability in the Neolithic northern Greek record, one may recognise four prevalent trends, including a) small-scale variability, b) variability in dwelling size, c) variability in structural elements visible from the inside, and d) variability in externally visible elements (including diverse ground plans and building types).

Small-scale variability is a general category encompassing various structural irregularities or minor deviations. These include, for instance, the more or less frequent use of stone for the reinforcement of post-framed structures at the settlements of Servia, Promachon-Topolnica II, and probably Paradeisos. Variation in the foundation of post-framed buildings has also been observed at the sites of Nea Nikomedeia, Servia (different combinations of foundation trenches and postholes directly sunk into the soil), Dikili Tash II, Avgi III (single or double rows of postholes) and others. For the most part, these subtle but lively expressions of variability in traditional architecture seem to constitute diverse design decisions made in response to culturally defined, pragmatic concerns, such as the stability of the structures in different terrains and soils or the maintenance and protection of certain parts of the superstructure from the elements (see Oliver 2006, 123). This is the reason why, although possibly reflecting different preferences and skills, such variations do not deviate a lot from the community-wide accepted norms and technological principles.

Dwelling size, wherever this was possible to estimate and compare, constitutes one of the most clearly observable differences at the site-specific level. Variability is already evident at the EN settlement of Nea Nikomedeia, where dwellings’ dimensions range between 18.28m<sup>2</sup> and >101.67m<sup>2</sup>, and 19.86m<sup>2</sup> and >80.92m<sup>2</sup> during phases 2 and 3 respectively<sup>102</sup>. Minor or major fluctuations have also been attested in a number of sites, including Mavropigi, Avgi I, Dikili Tash II, MN Servia, Makri II and others. From a ‘purely technical’

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<sup>102</sup> The exceptional size of structure 4/1 comparing to the remaining ground plans of phase 1 is commonly associated with special, possibly communal, functions. The same stands for the sizeable semi-subterranean structure 4 at Promachon-Topolnica I.

perspective, size variation points to the exploitation of different quantities of material resources, as well as to the possible application of diverse or more elaborate techniques in certain stages of the *chaîne opératoire*. The latter observation refers, for instance, to the differential level of technological skills required for the roofing of more sizeable spaces. Although not irrelevant, an approach of dwelling form and size as strictly dictated by technological constraints (see Mould & Wardle 2000b, 72) seems to be of limited interpretative value.

Anthropological and ethnographic research has pursued intracultural variation in the size and quality of houses in order to identify general rules or correlates that can be either supplementary or conflicting. The varying dimensions of dwellings have been viewed as a result of the differential household size, social status and longevity (Wilk 1983, 101). Approaches based on the former correlate are usually influenced by the theory of *proxemics* and research focusing on the relationship between the total size of roofed or floored spaces and the members that they can accommodate (see Narroll 1962; Flannery 1972). In reality however, human requirements and responses in regard to space and crowding are culturally defined (Casselberry 1974, 120–1), and past proxemic systems are difficult to approach by generalising schemes.

Inequalities in social status may be more relevant to the diverse dimensions between houses on a single site. Investment in materials, house size and architectural form is commonly exploited as a means of differentiation and status projection in both pre-modern and modern societies (Netting 1982; Rivière 1995, 191; Waterson 1995, 58). This approach could explain, for instance, the comparatively larger dimensions of specific structures in MN Serbia (structure 3/phase I and 7/phase IV) that were also associated with an unusual number of small finds (Mould & Wardle 2000a, 25; Wardle 2000, 109) or the rich assemblage, including ‘ritual’ or ‘elite’ objects, retrieved from the sizeable structure 1/group 4 at EN Nea Nikomedeia<sup>103</sup>. Whether the latter structure is interpreted as a ‘shrine’, a communal building or the residence of a household of higher status, the only perceptible difference refers to its size.

Ethnographic examples (Lea 1995; Wilk 1983), however, warn that such correlations are not straightforward, especially due to the fact that the markers or attributes of a particular social position are not necessarily translated into material property. What is more, Wilk

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<sup>103</sup> However, it is possible that the contents of the building were the result of a ‘packed’ effect of material belonging to two different floors (Pyke 1996, 22; Souvatzi 2008a, 71).

(1983, 108) supports that among the *Kekchi* Mayans the *emic* perception of size variation denies any kind of connection between dwelling size and wealth, status or power. However, it is still possible to trace ‘cryptic’ relationships between house construction or size and socio-economic inequalities. The significance of this case-study lies not in the identification of a fit between domestic architecture and forms of social differentiation. On the contrary, it highlights the possibility to trace social tensions and how overtly or publicly these were expressed in different communities. Variability in structural elements visible only from the inside offers further stimuli in this discussion.

In terms of specific structural characteristics, intra-site diversity is frequently traced in the construction of floors and internal spatial features, such as partitions, central posts and buttresses. The latter elements can be observed in sites where a number of ground plans have been adequately preserved (such as Nea Nikomedeia, Servia and Dikili Tash II). The coexistence of various flooring techniques, such as ‘beaten earth’ or ‘clay plastering’, as well as ‘pebbled’ and ‘timber’ floors, is reported in sites including MN Servia, Stavroupolis Ib, FN Mandalo, Kleitos I and others. The application of different techniques, sometimes combined inside a single structure, is indicative of the different skills, efforts and preferences involved in the elaboration of internal space. As is the case with size variations, the differential energy investment in the structuring of the house’s interior may hint social inequalities. However, the perceptible homogeneity of structures in their external appearance would have generated an experience of sameness among the inhabitants (see Hestflått 2003, 72). Expressions of social differentiation seem to have been generally concealed and addressing to specific ‘audiences’.

Variability, however, is by no means restricted to the layout of internal space. The coexistence of structures following different building techniques, commonly associated with diverse *chaînes opératoires*, is supported in a limited number of cases. A representative example comes from the late LN I Stavroupolis Ib settlement. Although the picture provided is quite compartmentalised, it is suggested that dwellings belonging to the same building horizon were following different wall construction techniques, including post-framed structures plastered with mud and the use of mudbricks occasionally founded on rows of stones. Different wall construction techniques have also been identified at the late LN I site of Thermi B (post-framed and mudbrick architecture), while both a ‘mud-slab’ and the composite *pisé* techniques were probably in use during the FN II/EBA period of Sitagroi (phase IV). The fragmented architectural remains at the settlements of Polyplatanos and Dimitra may point to similar conclusions. The possibility of diverse roof

construction techniques could be supported on the basis of the diverse arrangement of internal postholes and buttresses. In addition, at the FNI settlement of Dikili Tash II, the possibility of a house with a flat roof, as opposed to the pitched roof suggested for the rest of the dwellings, is worth-mentioning. Last but not least, the identification of ‘decorative’ elements in the form of paint pigments, incisions, plastic decoration and suspended bucrania, may hint meaningful variability in the final shaping and appearances of (exterior?) wall surfaces. Decoration should be approached as embodying and codifying social relationships and symbolic meanings (Layton 2003, 450). However, the rarity of relevant evidence does not allow systematic comparisons.

The contemporaneity of different ground plans and building types has not been firmly established. However, the evidence from Makriyalos IIB, Kleitos II, Avgi III and Dispilio renders possible the coexistence of rectangular and ellipsoid built forms. What is more, the identification of both semi-subterranean and above-ground architecture in sites including Mikri Volvi, Grammi Apsalou and, probably, Toumba Kremastis Koiladas, suggests the employment of radically different building methods and conceptions. Nonetheless, it should be stressed that, even if the coexistence of various architectural forms at the building horizon level is to be translated into relative contemporaneity, their isochrestic character is far from self-evident.

Evidence of intra-site variability concerning the quality of the structures and the building methods employed is not uncommon in the surrounding regions. A characteristic example comes from the site of Ilipinar in NW Turkey, where the simultaneous application of different construction methods has been identified (Roodenberg 1999, 196)<sup>104</sup>. At the EN settlement of Otzaki in Thessaly (Milojčić 1971), remains of both mudbrick and wattle-and-daub structures were identified. Houses built in the former method may have also been associated with larger quantities of painted pottery (Halstead 1999, 88). A comparable picture emerges from the MN settlement of Sesklo (Halstead 1999, 88; Kotsakis 1999, 69–70; 2006). Here, the large and sturdy free-standing houses of the tell site (Sesklo A) were artificially separated with a ditch and retaining walls from the flimsier room clusters of the

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<sup>104</sup> Post-wall and mud-slab buildings were excavated at the early levels of the site (ca. 6000-5700 cal BC), while further variations in construction practices were observed by the analysis of the wall-coating mud (Roodenberg 1995, 37).

flat-extended component (Sesklo B)<sup>105</sup>. Once again, it seems that the presence of painted pottery on the so-called ‘acropolis’ is more pronounced (Kotsakis, 1994, 129; 2006, 215).

The examples from Thessaly support the idea that perceptible variability in house construction could be associated with the existence of different social groupings and intra-community inequalities. The ethnographic record provides similar lines of evidence. Among the *Mopan* Mayans of Belize, the varying quality of materials and building techniques seems to reflect distinct social strata. The physical house is viewed as an “overtly sociotechnic artefact” for the public expression of social differences (Wilk 1983, 112). Similarly, at the modern village of Hani in western Ghana, the wattle-and-daub dwellings were considered as reflecting the lower status of their inhabitants comparing to the ones following the *terra pisé* technique. One of the reasons for this conception was the more temporary nature of wattle-and-daub houses due to their tendency to decay sooner (McIntosh 1974, 162–3). Whether comparable hypotheses are sustainable for northern Greek settlements remains to be challenged by the detailed comparison of specific house assemblages. Unfortunately, the publication of the material from extensively excavated sites is commonly preliminary and rarely contextually presented. In any case, it is compelling to correlate the use of more durable materials and techniques with a more overt display of social inequality.

In sum, different sorts of variability seem to reflect different social dynamics and strategies (**Table 6.2**). The majority of Neolithic northern Greek communities present a high degree of homogeneity in terms of techniques and external appearances, while intra-site variability is often restricted to the house’s interior. They seem to reflect an egalitarian ethos, probably imposed by social sanctions against the public display of status differences even if they exist. Following Wilk (1983, 111–3), this situation could be linked to a ‘closed village economy’ within which the emerging social differentiation remains ‘concealed’ or un-institutionalised, and is primarily based on the differential access to resources within the community production system. On the other hand, settlements exhibiting more overt expressions of differentiation may be connected to a more open socioeconomic system within which social inequalities derive mainly from the differential access to external systems of exchange. The fact that such expressions are mainly referring to the later stages

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<sup>105</sup> Research at Polgár-Csőszhalom (Hungary) indicates differential uses of space between the tell and flat components of the site. However, these are not accompanied by perceptible diversity in house construction (Raczky & Anders 2008, 41).

of the Neolithic seems to support the idea of the progressive isolation of social units (Halstead 1995; 1999). However, the relevant evidence derives primarily from a limited number of sites and does not seem to represent universal trends. Besides, the relationship between house construction and the economic basis of society is not a clear-cut one. Intermediate situations and diverse manifestations of social status should also be taken into account.

<b>Intra-site architectural variability</b>		
<b>Pattern of variability</b>	<b>Manifestations in house construction practices &amp; forms</b>	<b>Possible significance and interpretation</b>
High degree of homogeneity	<i>Overall standardisation of built forms and techniques</i>	<ul style="list-style-type: none"> <li>• Prevalence of an 'egalitarian ethos'</li> <li>• Sanctions against overt expressions of differentiation</li> </ul>
Small-scale variability	<i>Variations in foundation techniques and maintenance</i>	<ul style="list-style-type: none"> <li>• Different responses to 'pragmatic' concerns following traditional architectural principles</li> </ul>
Size variability	<i>Variations in the dimensions of dwellings</i>	<ul style="list-style-type: none"> <li>• Differences in the size, status and longevity of the resident or social unit</li> <li>• More overt expression of inequality</li> </ul>
Variability in internally visible elements	<i>Diversity in floor construction and the arrangement/ construction of internal features (e.g. partitions)</i>	<ul style="list-style-type: none"> <li>• Diverse preferences in the shaping of interior space.</li> <li>• 'Concealed' expressions of inequality</li> <li>• Predominance of a community-based socioeconomic system (?)</li> </ul>
Variability in externally visible elements	<i>Diverse building methods for wall and roof construction, adoption of different building types and chaînes opératoires, decoration of exterior surfaces</i>	<ul style="list-style-type: none"> <li>• Overt display of social inequality</li> <li>• Distancing from traditional norms</li> <li>• More 'open' socioeconomic system reflecting the differential access to external systems of exchange (?)</li> </ul>

Table 6.2 Expressions of architectural homogeneity and/or variability and their possible significance.

### 6.3.3 Continuity and change in building technology

The synchronic analysis of the architectural record supports the existence of varying degrees of uniformity in conjunction with variability that fluctuate both spatially and temporally. A diachronic approach at the site level can also reveal different tendencies or pressures towards conformism or innovation from one community to another. Such a perspective inevitably revolves around the issues of tradition and change, as well as the transmission of technological knowledge, in architectural practice.

It can be generally accepted that the employment of building practices and methods presents a considerable degree of continuity. In archaeological terms this may range from

the lifespan of a few generations, commonly translated into a discrete building horizon or phase, to several hundreds of years spanning several chronological phases or periods. Long-term continuity in raw materials and techniques is suggested at a number of multi-phase settlements, including Dikili Tash and Arkadikos at the plain of Drama, Makri in the Aegean Thrace, Mandalo, Axos A and Nea Nikomedeia in central Macedonia, as well as Servia and Dispilio in the area west of the Pindus mountain range. Other multi- or single-phase sites also demonstrate significant continuity through time.

Stability in house construction can be linked to the conservatism of both means and methods, and the unwillingness in exploiting alternative choices. Oliver (2006, 123) states that vernacular builders are highly depended on the authority of tradition and that they deal with problems 'pragmatically' on the basis of their experience. The key part of his argument is that a problem and its solution must first be conceptualised. In traditional architecture, however, the technical weaknesses are not always perceived as problems to overcome, but as limitations within which construction has to occur (Oliver 2006, 114, 119). From a behavioural perspective, long term stability indicates biases in favour of conformism (see Bentley & Shennan 2003) and a great dependency on the repetition of known and tried techniques which become a bulwark against change. This can also be associated with what Giddens (1984, xxiii) terms as the sense of 'ontological security' promoting the conscious or unconscious reproduction of structures through routinisation (see also Whittle 2003, 22–3).

The focus on the transmission of technological knowledge in prehistoric societies offers further insights. Although the verbal aspects of the process cannot be challenged, standardisation may hint that certain structural elements or stages of the *chaîne opératoire* were ascribed with different names and/or meanings (Kus & Raharijaona 1990, 23; Waterson 1997, 88–9). What is more, clay house models, either seen as icons or symbols (see Layton 2003, 460), may have constituted non-verbal, mnemonic devices. Such models, with or without a roof, have been found, for instance, at the settlements of Promachon-Topolnica, Sitagroi and Dimitra. Similar finds derive from Thessaly and central Greece, as well as from the F.Y.R. of Macedonia, Bulgaria and elsewhere (Toufexis 1996; Trenner 2010). Examples focusing on the building's exterior reflect the basic aspects of known house forms such as ground-plans and roof shape. Occasionally, more specific structural characteristics are reflected, including incisions and relief motifs for the representation of the timber frame and the ridge beams, or plastic decoration with bucrania. Their primary use as 'replicas' of actual structures, either dwellings or communal ones, cannot be

confirmed. Nevertheless, following Bailey's (2005b) argument on the role of Neolithic figurines, they may have unconsciously promoted the establishment of wider perceptions on house construction and form (see also Oliver 2006, 160).

In any case, it is argued that in societies lacking elaborate recording and objectifying instruments the inherited knowledge survives primarily at its embodied state without necessarily attaining the level of discourse (Bourdieu 1977, 87, 218, note 44; Schiffer *et al.* 2001, 731). It is through the corporeal experience and the practical cognition of a technology's 'rationale' that technological know-how is transmitted. The incorporation of Bourdieu's and Giddens' theories into the dialectic of structure and social agency in technology (Dobres & Hoffman 1999; Dobres 2000) offers a suitable framework for explaining the reproduction of construction practices as something more than the result of conservatism and local backwardness. According to these schemes, the routinisation of technological practice results in the structuring of durable dispositions that regulate social agency. Therefore, stability and continuity in domestic architecture may be viewed as the outcome of the practical transmission of technological knowledge and skill in Neolithic communities.

How can then one interpret change when it happens? It is obvious from the northern Greek record that long-term stability does not necessarily preclude small- or larger-scale innovation born out of specific questions and needs (Forbes 1958, 337) as these are perceived and defined by culture (Pfaffenberger 1992, 502). First and foremost, it has been argued that traditions can only be meaningful by their sustainers if they are open to renegotiation and the incorporation of new elements and symbols (Kus & Raharijaona 1990, 31–2; Waterson 1997). Moreover, according to the theory of 'structuration', human practices modify the structures even as they are reproduced. In certain instances, technological innovations may be incidental and not consciously articulated by the builders (Johnson 1997, 17), thus posing problems in terms of their interpretation. More often, however, they could be viewed as the result of experimentation dealing with the improvement of labour efficiency and the 'performance characteristics' of structures.

This may explain, up to a degree, the observed transformation of foundation techniques in sites including Axos A, Giannitsa B, Nea Nikomedeia and Avgi III, or the adoption of an artificial mud mixture during the FN phase at the settlement of Megalo Nissi Galanis. The use of a comparable mixture at the nearby, contemporaneous site of Mikro Nissi Akrinis testifies to the sharing of technological choices through networks exceeding the community



boundaries. A similar conclusion may be drawn by the almost parallel adoption of foundation trenches at the neighbouring sites of Axos A and Giannitsa B. Besides, this pattern of transmission or intra-cultural diffusion between contiguous societies accounts for the development of local traditions discussed earlier in this chapter.

While ‘pragmatic’ considerations are significant, an externalist approach would rather focus on the wider socioeconomic changes which are inextricably linked to technological practice. Modifications in foundation techniques, for instance, may point to the need for more sizeable and stable dwellings that could, in turn, reflect alterations in the social organisation, intra-communal relations and group interests. At the settlement of Dispilio, the gradual replacement of pile-dwellings by ground-level, post-framed architecture reflects the changing relationship between the built environment and the lake, probably accompanied by changes in socioeconomic structure. A similar interpretation could be addressed to explain the appearance of sunken floors, and possibly second stories, at the MN settlement of Servia (phase 3). The exclusive application of this technique at Area F may also imply that certain practices or concerns were not shared by the whole community and that the transmission of know-how may have followed more restricted paths<sup>106</sup>. In addition, the absence of sunken floors during the subsequent phases confirms the fact that technological innovations may eventually be abandoned or rephrased (Oliver 2006, 146–7; Schiffer *et al.* 2001, 733).

The examples provided so far refer to specific stages of the *chaîne opératoire* affecting limited aspects of the architectural design. Rather than fundamentally deviating from traditional norms and conceptions, they seem to constitute technical alternatives arisen from solutions pre-existing within the technological repertoire of the builders (Larick 1999; Pfaffenberger 1992). In other cases, however, the architectural record indicates radical replacement of construction practices, built forms and/or *chaînes opératoires* that could have been either rapid or more gradual<sup>107</sup>. The most characteristic examples come from a number of late MN/LN I settlements lying at the central Macedonian plains, such as Makriyalos, Stavroupolis, Thermi B and Giannitsa B. At these sites the tradition of (semi-)subterranean dwellings was eventually replaced during the course of the LN period by above-ground architecture following either the ‘post-framed’ or the ‘stone and mud’ technique.

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<sup>106</sup> The more widespread occurrence of stone reinforcements at the ‘Heurtley’s stratum’ (Mould & Wardle 2000a, 70, fig. 2.16) may point to similar assumptions.

<sup>107</sup> It should be stressed, however, that the archaeological evaluation of technological change as ‘small-’ or ‘large-scale’ and ‘rapid’ or ‘gradual’ runs the risk of addressing models of present thinking (Johnson 1997, 18).

The exact workings of this change are not clear. It is possible that wider transformations in the community and the household organisation acted as catalysts for a more pronounced anchoring into space. This may be associated with changes in basic architectural variables, such as the degree of intra- or inter-household mobility and the expected longevity of the structures (McGuire and Schiffer 1983, 288–9). The fact is that above-ground architecture was already present in nearby settlements since the EN and that it was probably not adopted throughout the region until the socioeconomic settings were appropriate. A similar transition from semi-subterranean to above-ground buildings is also evident at the site of Promachon-Topolnica.

The appearance of ‘stone and mud’ architecture during the LN period provides another example of fundamental architectural transformation in terms of materials, techniques and conceptions. An environmental approach focusing on the decrease of timber availability could partly justify the adoption of building methods that were less heavily depended on timber resources. Circumstantial evidence for the degradation of the surrounding woodlands comes from the palynological record of Dispilio. This could also be connected to the possible use of mudbricks during the later stages of the settlement’s life. Nevertheless, the fact that the vegetation history in the rest of northern Greece does not offer comparable clues – at least not ones predating the Bronze Age – suggests that widespread environmental change or extensive clearings should be precluded (Halstead 1996a, 304; 1999, 84).

In the case of ‘stone and mud’ architecture, a reflex diffusion hypothesis from adjacent areas or cultures seems intriguing. It is true that this architectural tradition is absent or rarely represented in the south Balkan (Lichter 2003)<sup>108</sup> and the EN/MN northern Greek record. On the contrary, it is already known from EN contexts in Thessaly (sites include Argissa, Achilleion and Sesklo), while it dominates the architectural record during the subsequent phases. Elia (1982, 362) suggests that the development from wattle-and-daub, to *pisé*, and finally mudbrick can be traced during the EN I-III phases. Such an evolutionary trajectory is not evident in northern Greece, where post-framed architecture remains dominant till the later stages of the Bronze Age. House construction in stone and mudbricks is reported at the EN sites of Korinos and, probably, Xirolimni. However, a

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<sup>108</sup> The use of sturdy stone foundations for the erection of mud walls is mainly evident at settlements on the Black sea littoral, such as Durankulak (Todorova 1978, 53), while a more restricted application has been reported in the case of Anza II and III (Gimbutas 1974, 41).

more widespread adoption of 'stone and mud' architecture does not occur before the mid-sixth millennium. Whether this reveals Thessalian influences following specific channels of communication along the river valleys and trade routes of central Macedonia is difficult to trace. It is noted, however, that the LN period is characterised by the dispersal of occupation into a variety of locations and is associated with the establishment of wider inter- and intra-regional networks.

The movement of people or the circulation of craft specialists, although offering a plausible explanation for the appearance of new technologies, cannot be adequately supported. On the contrary, the intra-site co-existence of diverse *chaînes opératoires* and the non-standardised application of the technique, reflected in the identification of both 'loaf-shaped' (hand-made) and rectangular (moulded?) mudbricks, favour a scenario involving adoption of ideas and skills through increasing contact. This assumption is also supported by the lasting period of intra-site diversity and experimentation preceding the community-wide adoption of new technologies in the sites of Stavroupolis and Thermi B. Why was, then, this new technology adopted or rejected in particular sites or areas?

In western Macedonia, the presence of both pre-Dimini and Dimini painted wares in a number of sites (such as Servia and Mikro Nissi Akrinis), as well as the observed similarities in figurine manufacture (Karamitrou-Mentesidi 2009, 119–20) and other artefact categories, point to inter-regional contact and interaction with central Greece. The concentration of settlements at the natural passages to Thessaly (e.g. the Servia region) further emphasises the potentials for communication. Nevertheless, the basic elements of LN Thessalian architecture were not shared by northern Greek communities. In addition, the restricted use of stone and/or mudbricks seems to conform to local architectural principles. Once again, rather than approaching this trend in terms of passive conservatism and backwardness, it should be viewed as a dynamic response referring to cultural perceptions on group identity and the concept of Otherness. It would seem that both exchange and resistance – especially to those aspects that were thought as crucial for cultural or group association – were in operation. This is probably more pronounced in those regions where the boundaries of diverse technologies overlap (e.g. the central Macedonian plains). In any case, the 'normative' approach of architectural diffusion as a direct reflection of the interaction rate between cultural groups is not confirmed. Alternative explanations should be traced instead.

Following a ‘performance matrix’ rationale (Schiffer *et al.* 2001; Schiffer 2004), the motivations driving architectural change and the notions underlying certain technological choices could be approached in terms of the advantages offered within the specific socio-historical context. In this respect, ‘stone and mud’ architecture would have provided stability, efficiency in maintenance and repair, and would have, potentially, restricted the time requirements by economising on timber resources and woodworking activities. In addition, it could be associated with the notion of a more pronounced marking or anchoring into space that is evident during the later stages of the Neolithic period (Bailey 2000). Similar trends are reflected in the construction of massive perimeter walls or boundaries in sites including Mandalo, Paliambela, Giannitsa B, Stavroupolis and others<sup>109</sup> and could be approached as means by which claim was laid to place (Whittle 1996a, 23).

Nevertheless, the geographically restricted adoption of the ‘stone and mud’ building method highlights the fact that certain communities or co-resident units evaluated differently the ‘performance characteristics’ of competing technologies according to their conceptions, strategies and social organisation. The question that needs to be answered revolves around the culturally and historically determined nature of the criteria involved. In approaching this aspect, various social stimuli should be taken into account.

Returning to the site-specific scale, it was supported that different settlements present different biases for or against homogeneity, as well as that varying pressures against novelty are evident. What is more, intra-site diversity was probably related to more overt expressions of social differentiation. Having in mind that inter- and intra-cultural diffusion primarily emanates from within a society and that technological change cannot be sustained unless compatible to given socioeconomic settings, the adoption of new technologies should be seen as reflecting prevalent social dynamics. This refers mainly to the changing relationship between individuals, social units and the community.

It has been argued earlier in this research (**section 3.7**) that evidence for divisive tendencies or the progressive isolation of household units can be traced in the region of Thessaly. A similar trajectory could be hypothesised in the case of certain northern Greek sites, although the analysis of the available information is less fine-grained and conclusive. Following Halstead (1999), the increase in the consumption of wild animal and plant resources, the intensification of surplus storage, as well as the presence of intramural

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<sup>109</sup> Although enclosures and internal boundaries in the form of ditches are evident from the EN period, the use of stone for the marking of community space is mainly attested from the LN period onwards.

storage and cooking facilities, all support the gradual decrease in sharing obligations and a greater emphasis on hoarding (Halstead 1995). In the case of Makriyalos, the more dense and restricted habitation pattern during the later MK II phase has been related to an emphasis on the domestic versus the collective (Pappa *et al.* 2013, 78). Moreover, the more formalised layout of certain LN settlements represented by closely spaced dwellings in ordered rows point to the same direction.

These trends seem to mirror the emergence of a more pronounced inter-household competition and differentiation, probably stemming from the inherent weaknesses of the domestic mode of production. Moreover, they may have encouraged the establishment of alliances or exchange relationships within wider social networks, implied by the distribution of certain ceramic styles. Within this context, the use of ‘stone and mud’ architecture in central Macedonia could be associated with the intention to underline the unity and stability of the social unit. What is more, the adoption of the new building technology could be interpreted as a strategy to emphasise differentiation by distancing from traditional practices and by drawing on ‘foreign’ notions of prestige or external sources of reference (see also Whittle 1988, 138). Besides, it is broadly acknowledged that changes in technology are more rapidly assimilated by social groups of a higher status (Oliver 2006, 175; Thomas 1998, 430). Eventually, however, the prestige- or conformist-biased transmission of technological practice, as well as the incorporation of ‘foreign’ materials and techniques into local cultural schemas<sup>110</sup>, would have led to their establishment as accepted traditions in themselves.

The absence of ‘stone and mudbrick’ architecture from the majority of northern Greek sites does not imply that similar tensions were not in operation. On the contrary, social differentiation and the focus on household unity and continuity can be expressed in a plurality of ways, not necessarily involving the introduction of new technologies or the modification of the physical house. The *in situ* rebuilding of houses, perhaps more regularly employed in mound settlements, may be viewed as an alternative strategy for promoting claims to ownership and ancestry (Kotsakis 1999, 73; 2006, 218), while the deliberate conflagration of dwellings in both ‘tells’ and ‘open’ sites may also reflect concerns with the continuity of place and memory-making (Tringham 2000). Such claims and considerations

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<sup>110</sup> Similar processes of *de*-localisation and *re*-localisation of building materials and techniques are discussed by Thomas (1998).

would have been exploited within the context of inter-household competition and social inequality.

## 6.4 Discussion

The discussion above has attempted to approach the social context of building technology at both a synchronic and a diachronic level. The tacking between different scales of analysis (regional, local and type-specific) was considered essential in order to realise the multifaceted implications and the interpretative potentials of the available evidence. From a certain point of view, this endeavour may constitute, as Halstead (1999, 81) puts it, “an impressionistic and optimistic attempt to see pattern in a patchy data set”. Nevertheless, the main objectives of the discussion were to extract well-informed assumptions that could be juxtaposed to relevant ideas dominating the northern Greek archaeological debate, as well as to propose lines of inquiry for future research.

The regional analysis of the material suggested that the different building methods and techniques employed do not present easily accessible patterns. However, when examining their fundamentals in common, it is feasible to identify distinct house construction technologies and comment on their distribution. The mapping of these technologies reveals the general prevalence of post-framed architecture across space and time, as well as the more limited employment of the semi-subterranean and the ‘stone and mud’ architectural traditions. The latter building methods were, by and large, geographically restricted to the central Macedonian plains and the Chalkidiki peninsula, although they are not entirely absent from the surrounding regions.

From a chronological perspective, it was argued that the wide sharing of a mutually tangible architectural vocabulary is implied during the earlier stages of the Neolithic. It was further argued that during the subsequent phases intra-regional patterning and distinctiveness, probably pointing to more localised traditions, are more pronounced. This assertion seems consistent with the trends observed in the distribution of ceramic styles and the possible expansion of exchange networks during the LN. Therefore, rather than a result of environmental constraints, this pattern was associated with the negotiation of social relations and identities that presupposes the active engagement of communities with other groups that were considered as qualitatively different (Lucy 2005, 97, 100). It should be noted, however, that this trajectory is heavily based on coarse-grained descriptions that may impose a factitious degree of homogeneity and/or variability in the architectural record.

Turning to the intra-site level, different expressions of uniformity and variability were sketched out and approached in terms of diverse social dynamics. For the most part, 'diversity-in-homogeneity' seems to have been the prominent theme. However, the degree to which technological standardisation and variability were encouraged or tolerated varies from site to site. Homogeneity or 'small-scale' diversity was related to the predominance of an egalitarian ethos within the community, while perceptible variability in external appearances was linked to more overt expressions of social differentiation and, possibly, to the employment of diverse socioeconomic practices. In both cases, dwellings seem to have acted as symbols, reflecting the interplay between sociocultural norms and the decisions, interests and identities of individual co-resident units or households (Souvatzi 2008a, 198).

It was not argued here that houses or building technologies are to be perceived as direct reflections of specific patterns of socioeconomic organisation and change. However, the more or less standardised ways in which houses are constructed, as well as their repetition or transformation through time, constitute means by which inhabitants create new attachments to place and senses of group identity (Whittle 1996a, 26). House construction and physical appearances tend to generate embodied experiences of sameness or distinctiveness, proximity or distance, and equality or differentiation. They create various perspectives from which certain characteristics of the world could be apprehended, maintained or manipulated (see Barrett 2006). It is these perspectives that offer some glimpses on the social dynamics involved within different Neolithic communities.

The varying attitudes for or against conformism and innovation at the intra-site level confirm that house construction should be seen as a creation or process that was not static and conservative by definition. Alterations, innovations and the adoption of technical solutions can be observed at different stages of the process and are usually incorporated into pre-existing traditions. In some cases, however, technological change seems to be more radical leading to the adoption of different principles or *chaînes opératoires*.

At this point, it should be noted that no definite patterns of either intra-site variability or change could be correlated with specific regions, temporal phases or settlement types. This implies that the workings of building technology were, by and large, carried out and negotiated within the daily context of embodied experience and social interaction. However, certain trends may be reflected by the greater emphasis on permanence and durability, and the more common occurrence of overt expressions of differentiation when moving towards the LN and FN periods. The former development is clearly evident in the

gradual replacement of the less substantial semi-subterranean dwellings, as well as in the adoption of the ‘stone and mud’ building method in a number of sites. The latter can be primarily supported on the basis of the co-existence of diverse techniques or *chaînes opératoires* at the site-specific level. Both trends could be associated with an increasing emphasis on the anchoring to space that is evident in the northern Greek record and beyond. In addition, they can be approached in terms of household strategies influenced by socioeconomic considerations and pointing to the progressive isolation of social units during the later stages of the Neolithic.

Nevertheless, this trajectory concerning building technology is far from widely applied throughout the region. The available evidence derives from a limited number of sites that are primarily concentrated in a specific geographic area, namely central Macedonia. Alternative attitudes pointing to similar considerations approached from a different angle, as well as contrasting information from various sites, exist. The emerging picture seems to be much more complex and inconclusive for making mono-directional deductions.



## 7. Summary and conclusions

The present study has addressed the Neolithic dwellings in northern Greece and the plurality of ways in which Neolithic inhabitants constructed their built environment. Building remains have been primarily treated as technological products or artefacts enmeshed within social practices and multiscalar dynamics. Various sections and chapters of the dissertation were devoted to theorising, analysing and interpreting domestic dwellings as more than shelters or spatial organisational features. Their technological aspects have been thoroughly described and the social context both of the building process and of the end-products (the physical houses) has been challenged.

The latter objective, referring also to the extraction of sociocultural and socioeconomic inferences, stemmed from the belief that even the mundane remains of the archaeological record (such as daub fragments and postholes) may be informative about past choices and perceptions and may enhance our understanding of various aspects of the Neolithic reality. The presupposition for this is to put forth an appropriate theoretical framework or set of questions treating architectural remains as an important category of material culture.

Much of the thesis has been devoted to introducing the reader to the main characteristics of the Neolithic period in northern Greece. This was considered crucial for approaching the wider sociocultural background of house construction, for clarifying the chronological framework of the study and for describing the state of archaeological research in the region in terms of undertakings, considerations, research biases and methodologies.

The detailed survey of the architectural record of northern Greek sites, although compartmentalised in many ways, has offered the opportunity to examine all available evidence and to realise the full extent of intra-regional variability that is necessary for a rigorous comparative analysis. The assemblage of building remains and associated structures is expected to constitute a significant contribution to the study of Neolithic architecture in northern Greece and the adjacent areas presenting comparable sets of data.

At the site-specific scale, the case study of Neolithic Avgi has revealed the potentials of an in-depth analysis of architectural remains. The methodology and terminology employed, adjusted to the circumstances of the assemblage under study, are not to be used as a handbook or a widely applicable set of rules. Rather than that, they should be seen as general guidelines for the efficient recording and analysis of the data.

## 7.1 General results of the study

Following the theoretical discussion in **Chapter 2**, the synthesis of the regional archaeological record (**Chapter 3**) has attempted to reconstruct the main aspects of the Neolithic period in northern Greece. Several lines of evidence were used to gain insights into the wider sociocultural context of house construction. More importantly, they underlined the fact that Neolithic life was experienced within different settings and scales following and generating multiple networks (local, regional and inter-regional) of social communication, interaction and configuration. It is argued that the interplay between the household, the community and wider aggregations played a significant role in the shaping and development of Neolithic architecture.

The household seems to have been the key unit of social production and reproduction. Evidence from various assemblages suggests that subsistence economy and craft-production were household-based and that forms of specialisation were not primarily tuned to surplus accumulation or exchange. Although the social unit and the dwelling were not necessarily isomorphic, the centrality of the household is also expressed in the physical properties of the house and other features. These include the investment of labour for house construction and maintenance, the morphology of dwellings, commonly taking the form of well bounded, free-standing structures, certain replacement or abandonment practices, as well as the occasional burials under house floors and the identification of clay house models.

The workings of the Neolithic households were necessarily closely linked to the community. This could be either attributed to the inherent weaknesses of the ‘domestic mode of production’ promoting co-operation and sharing obligations, or could be approached as a result of kin-like social ties between the inhabitants, occasionally manifested in mortuary practices. The settlement and its surrounding environment seem to have constituted the primary context of social experience and group association. In terms of architecture this is often emphasised by the demarcation of settlement boundaries, the spatial arrangement between dwellings and the standardisation of building techniques at the intra-site level. Although not precluding mobility at various spatiotemporal scales (Halstead 2005; Whittle 1996b; 1997), most northern Greek settlements show year-round occupation and continuity through time, thus providing a stable *axis mundi* for their inhabitants. In any case, the relative degree of self-sufficiency and boundedness of Neolithic settlements does not equate with them being detached from wider settings or aggregations.

The analysis of the material culture and subsistence strategies in a number of sites has designated an overall sense of diversity-in-homogeneity at the regional level. Although local production was principally in play, the circulation of materials, artefacts or techniques indicates the existence of more or less wide networks of material acquisition and exchange. The dense distribution of settlements in certain geographical areas, combined with the lack of clear signs of conflict, the gradual inhabiting of varying (sometimes ‘marginal’) locales, as well as the identification of settlements situated on communication routes, further support the existence of networks operating at the supra-community level. These networks, ranging from local to regional, were probably driven more by social rather than by subsistence imperatives.

The synthesis of the architectural evidence from northern Greece (**Chapter 4**) led to the identification of the principal house types represented in the record. These include pit-dwellings or (semi-)subterranean structures, commonly forming groups or compounds, and above-ground dwellings following alternative building techniques and ground plans. The former type appears since the earlier stages of the Neolithic and is gradually replaced by more substantial structures from the late 6<sup>th</sup> millennium (LN I) onwards. What is more, it is primarily identified in the central Macedonian plains, thus implying a more or less geographically restricted architectural tradition. Although less conspicuous in nature, two possible variations of (semi-)subterranean dwellings were recognised, including structures with subterranean living spaces and structures with ground-level floors covering the subterranean (basement?) parts.

Above-ground architecture dominates the northern Greek record throughout the spatiotemporal context under study and presents considerable variability in both formal and technological properties. Rectangular or roughly square ground plans are by far the most common. However, elliptical, trapezoidal and apsidal ground plans have also been identified. These are primarily dated to the later stages of the Neolithic period (late LN II/FN). In terms of materials and techniques, timber and mud, post-framed architecture constitutes the most recognisable tradition in the region. Besides, this seems also to be the case for the concomitant Early Bronze Age period. Among the different building methods identified, wattle-and-daub, rammed earth (*pisé de terre*) and other framing techniques, such as the use of vertically set thin poles and split timbers or bundles of reeds, seem to have been applied since the EN period. An alternative building method is represented by a number of dwellings with stone socles or foundations and a superstructure made of unbaked mudbricks or rammed earth. This technique, which follows different architectural

principles, is occasionally applied during the earlier stages of the Neolithic but seems to be established from the late MN/early LN I period onwards. As is the case with (semi)subterranean structures, stone and mud architecture is more commonly identified in the central Macedonian plains and the Chalkidiki Peninsula, thus implying a more localised development.

In sum, the analysis of the regional record supports the parallel existence of a variety of forms and techniques throughout the period under study. Chronological trends point to more pronounced expressions of variability, experimentation and anchoring into space (replacement of pit-dwellings and use of sturdy stone foundations) from the mid/late 6<sup>th</sup> millennium BC onwards. These developments are more evident in central Macedonia than in other areas of northern Greece.

The technological study of the available evidence and, especially, the detailed analysis of the Avgi assemblage (**Chapter 5**) have shed light on various aspects of house construction. The relative continuity of building methods at the site or regional level indicates that the technologies employed were well adapted to local environments and the needs of the inhabitants. The high dependency on timber and earth corresponds to the availability of suitable tree species and sediments in the vicinity of most settlements. In addition, exploitation strategies highlight the familiarity of Neolithic builders with their immediate or more distant micro-environments. Although more opportunistic strategies were not precluded, evidence from a number of sites supports the deliberate nature of material exploitation and processing, revealing an advanced know-how of the basic material properties. This is indicated by the selection of resources according to the desired qualities without necessarily following a strict, 'least-effort' logic. Circumstantial evidence for woodland management and the recycling of wastage material further highlight the deliberateness of the building process.

The various choices made by Neolithic builders were also approached in light of archaeological, anthropological and ethnographic counter-examples (**Chapter 6**). Certain features and practices attested to the fact that house construction was a socially meaningful and symbolically loaded enterprise. These include the renovation of floors and surfaces, as well as the deliberate conflagration of domestic structures, that were potentially linked to various temporal cycles or events imbued with cultural significance. The stability in the orientation and the spatial arrangement of buildings in certain settlements, as well as the decoration of wall surfaces with geometric motifs, reliefs and bucrania, may also be related

to various symbolisms suggesting that the building process was far from being exclusively driven by technical or 'pragmatic' considerations. It was further argued that house construction was a non-specialised activity, even if certain individuals were more actively engaged in the decision-making or the building process. In addition, the erection of a new house was viewed as an important social event involving not only the household or the co-resident group but also wider bodies of people that co-operated by sharing labour, skills and perspectives while also promoting their own agendas. The whole process, including both household and supra-household operations and considerations, can be seen as a dynamic manifestation of the interplay between the social units and the community discussed earlier in this section.

The following synthesis of the data from various sites attempted to set the main framework for a technological analysis of building remains as products of social agency. The central themes discussed revolve around the issues of homogeneity and variability, as well as continuity and change, at different scales and axes of analysis. At the macro-scale, regional variability pointed to the existence of a wide architectural repertoire and the lack of strict or widely shared prescriptions on how to build a house. When looking at the application of diverse building methods, it was difficult to identify clearly defined patterns ranging beyond the site or micro-region level. This pointed to the lack of established and well bounded technological and cultural traditions. Patterned variability is more evident when turning the focus from complete *chaînes opératoires* towards the examination of specific materials and techniques referring to certain stages of the building process.

By mapping the distribution of foundation, wall construction and flooring techniques, it was possible to trace the circulation of specific technological solutions in wider geographical settings. These include the use of foundation trenches, stone socles, timber floors, unbaked mudbricks and the application of different framing techniques. Rather than markers of cultural identity, their distribution was approached in terms of mutually shared networks operating on local or more extended scales and reflecting common perceptions of the appropriate ways in which one has to deal with specific architectural problems. These networks, which are not unrelated to social interaction and configuration, seem to be overlapping and loosely defined. However, it was suggested that certain technological features appear almost exclusively to the area west of river Axios, while others are primarily concentrated in the central Macedonian plains and the Chalkidiki Peninsula. This observation is significant for the identification of intra-regional boundaries and remains to be challenged by a more holistic approach to the region's archaeological record.

At the intra-site level, different sorts of homogeneity or variability were interpreted as reflecting different expressions of conformism or distinctiveness and equality or inequality. The norm seems to be intra-site homogeneity in built forms and a high degree of standardisation in the application of building techniques. This was approached as a result of shared potentials, values and perceptions. The former issue refers to the equal access to building materials, labour force and, especially, technological know-how, which in turn implies the horizontal transmission of technological knowledge and the lack of institutionalised or overtly expressed social differentiation. The latter issues indicate an emphasis on the community and the predominance of an egalitarian ethos that is both expressed in and generated by architectural practice. Nevertheless, intra-community dynamics were neither static nor identical within different settlements. Diversity in mundane or more perceptible (size, wall decoration and externally visible technological variability) aspects of house construction reveals different tendencies towards distinctiveness or sameness. These tendencies were not possible to correlate to specific settlement types, geographical areas or chronological periods. The exception may be the predominance of externally perceptible variability in a number of LN/FN settlements characterised by the co-existence of different building techniques and, possibly, built forms.

The latter section of **Chapter 6** summarised varying biases towards architectural continuity or novelty. It was suggested that, although continuity in technological practice is a prominent theme, innovations can still be traced in the long term. These were commonly associated with 'pragmatic' considerations for improving efficiency that led to inventions deriving from pre-existing traditions or to the exchange and adoption of technological solutions between contiguous societies. Social interaction and considerations related to the transformation of social units and their requirements were also taken into account. In the case of stone and mud architecture in central Macedonia, the adoption of certain materials and techniques was associated with the diffusion of technological conceptions from the neighbouring region of Thessaly. This was not interpreted as an externally driven process stimulated by environmental change or the actual movement of people. Rather, it was primarily attributed to internal developments related to the existing intra-community dynamics. These were also associated with the tendency towards monumentality and anchoring into space reflected by the exploitation of more durable materials and techniques in the construction of dwellings and/or settlement boundaries. Furthermore, the architectural developments were related to the progressive isolation of the household and the distinctiveness of social units during the LN period.

## 7.2 Implications for present and future research

The present study has demonstrated the methodological and interpretative potentials offered by the technological analysis of architectural remains. It has further highlighted the problems and limitations posed by the quality and quantity of the available data, as well as by the questions prioritised during the analysis of the archaeological record. The last section of the thesis aims to explore avenues for a better informed research on the subject.

The enrichment of the database entails the incorporation of a different perspective into the excavation and recording methodologies. The horizontal expansion of ongoing or new excavation projects will offer a more complete picture about the spatial arrangements between houses or other features. More importantly, it will allow the comparative, intra-site analysis of building technologies at both a synchronic and a diachronic level. The techniques for excavating and collecting should be tuned to the salvage of as much detail as possible. Relevant methodologies for the excavation and collection of rubble material, comparable to that preserved in many northern Greek sites, have already been described in the archaeological literature (e.g. Shaffer 1983; Stevanović 1990; 2006). These include the use of micro-grid units for collection and micro-stratigraphic observations, detailed photographic and digital documentation and drawings during the different stages of the excavation and collection process, as well as the recording of co-ordinates, direction and other relevant spatial information for characteristic or sizeable structural parts. The application of these methods presupposes the treatment of building remains, including house rubble, as a valuable component of the material culture (Stevanović 1996, 84). Although the need for storage, preservation and study seems to be self-evident, rubble material is discarded in many excavations. Fortunately, during the last decade, a greater interest has been shown in its analytical and interpretative potentials.

The second step for the refinement of the database refers to issues of recording and publication. The present research and previous studies have proposed alternative databases with a plethora of variables that may be adjusted according to the nature of the material under study. The description of building remains should move away from generalised, empirical observations made on the field towards the application of a *chaîne opératoire* (or relevant) framework focusing on building materials, techniques and their transformation or combination during different stages of the building process. It is also important for a comparative analysis that the information collected is published at the building- and not the site-scale. What is more, greater attention should be paid in the terminology employed,

either in preliminary or final reports, as the use of inaccurate, inconsistent or generalising terms for describing architectural features and techniques confuses the architectural record and masks local and site-specific variability<sup>111</sup>.

Apart from the macroscopic study of the remains, microscopic and other analytical techniques should be added to the research agenda. These include micromorphological and chemical or elemental analyses (e.g. X-ray diffraction and X-ray fluorescence) for examining the properties of the construction earth, as well as archaeobotanical analyses of the plant resources used as tempers. In addition, the study of charred or waterlogged timbers will offer valuable information on the tree species exploited. These techniques will significantly enhance our understanding of technological choices and procurement strategies in relation to local habitats. Finally, radiocarbon dating and dendrochronological studies of well preserved assemblages will shed light on the duration of building occupation, thus generating a more accurate chronological context for the study of intra-site technological variability and continuity.

Although the abovementioned techniques are valuable in attempting to enrich the architectural record, the nature of modern archaeological projects does not always allow the employment of detailed methodologies. The dependency of the archaeological endeavour on construction works and rescue excavations poses both time and budget limitations. However, it is suggested that the quality of the data may be improved drastically by detailed digital and photographic documentation and extended sampling. Older projects that have not followed an ‘ideal’ methodology in terms of sampling and recording definition, can still offer valuable evidence on the subject. Their material, whenever stored or accessible in the field, may be informative if the different analytical tools are combined. I would further argue that the creation of a regional catalogue or database comprising the basic attributes of materials and techniques at the site- or building-specific level will offer a more complete understanding of architectural variability. This should necessarily include comparable material from neighbouring regions, in order to study the distribution and patterning of construction practices in a context that is not bounded by modern geopolitical divisions.

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<sup>111</sup> In northern Greece and elsewhere, for instance, the term ‘wattle-and-daub’ is often used to describe diverse timber and mud combinations, not necessarily entailing the weaving of reeds or branches, while the term *pisé* (*de terre*) is also used in an imprecise way. In addition, references to certain architectural elements, such as unbaked mudbricks, stone footings and foundation trenches, is not always accompanied by measurements or detailed morphological descriptions.



To conclude, it is once again noted that an efficient interpretative approach on the subject requires the reconceptualisation and restoration of building remains as important sources of information about past societies. It is hoped that the present thesis will contribute to this development.

## Appendix

### A microscopic study of building materials from Neolithic Avgi

Twenty-nine samples were selected for the production of thin sections and analysis under a polarising microscope. These belong to the main daub fragment types recognised during the study of Buildings 2a, 5 and 7, and derive from different parts of the rubble. The main objectives of the study were the characterisation of the fabric types used in construction practices, the determination of their consistency or variability in different assemblages, and the identification of the relationship between fabric types and the daub fragment types recognised during the macroscopic analysis. Five basic fabric groups were recognised based mainly on their composition and texture. It should be noted that most groups present similar composition in terms of the recorded key mineral types and that differences refer primarily to their structure and texture, especially the frequency and particle-size of calcareous aggregates. In addition, plant tempers are commonly added to certain fabric groups. These were considered as variants.

#### Fabric group 1

This group comprises two main variants, differentiated on the basis of the relative frequency or absence of vegetal tempers. The remaining textural features are very similar with minor fluctuations observed between different samples or different areas of the same sample. There seem to be two fractions, one finer and one coarser, that co-exist within the same fabric.

The texture of variant 1a (**Fig. 1**) is described as sandy silt loam with an undifferentiated or slightly active (crystallic) birefringence fabric in some samples<sup>112</sup>. The colour is commonly yellowish brown in plain polarising light and reddish or light brown under crossed nicols. Sand- and silt-sized particles are moderately sorted and present a porphyric related distribution. Voids in the form of vughs or, less often, elongated ones are very few or rare (some could be associated with vegetal tempers). The  $c:f_{0.06mm}:v$  ratio presents fluctuations and is estimated at approximately 15–20:75–80:5.

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<sup>112</sup> Different colouration and optical activity indicates varying temperatures and firing conditions through the thickness of the sample or between different samples.

The inclusions follow a random orientation and distribution pattern. Plant tempers are absent or rare (<5%), while calcareous aggregates are rare (<5%) and commonly distributed in particular areas of the fabric. Key mineral types include sand- or silt-sized grains of quartz (30–40% or more, common) and very few muscovite and biotite micas (<5%), while scarce feldspars (plagioclase, K-feldspar, microcline), epidote and chert were also recorded. Other features include iron mottles (ca. 5%), subrounded/subangular clay pellets with well defined borders and quartz and mica inclusions, as well as pedofeatures or nodules. Post-depositional alterations include the partial infilling of voids with calcitic coatings.

Variant 1b (**Fig. 2**) is similar to variant 1a in terms of composition and textural features, the exception being the occasionally higher frequency of calcareous aggregates (still very few) and, especially, the presence of vegetal tempers. The latter are preserved in the form of narrow elongated voids or phytoliths (silicified) and their frequency ranges between 15–25% (few/frequent). The c:f<sub>0.06mm</sub>:v ratio is estimated at approximately 15:60–70:15–25.

### **Fabric group 2**

This fabric group presents similarities with the previous one. The main difference is its coarser texture and the higher frequency of calcareous aggregates (**Fig. 3–4**). The texture is described as sandy silt loam with undifferentiated or slightly active birefringence fabric. The colour is yellow/yellowish brown in plain polarising light and reddish brown under crossed nicols. Sand- and silt-sized particles are poorly sorted and present a porphyric related distribution. Vughs and elongated voids representing vegetal additives are present. The c:f<sub>0.06mm</sub>:v ratio ranges between 40:50:10 and 60:25:15 in coarser or finer parts of the fabric.

The orientation of inclusions is random. Plant remains in the form of elongated voids or silicified ones (phytoliths) are few or frequent (10–20%). Coarse or finer calcareous aggregates are very frequent (20–25%). Among the key minerals recognised, angular/subangular grains of quartz are frequent, while muscovite and biotite micas and microfossils are very few. Iron or manganese mottles and clay pellets are very few to few (ca. 5%). Post-depositional alterations include the partial infilling of voids with calcitic coatings.

### **Fabric group 3**

The texture of most samples (variant 3a) is described as sandy silt loam with an undifferentiated or slightly active birefringence fabric (**Fig. 5–6**). The colour is light brown in plain polarising light and yellowish brown under crossed nicols. Sand- and silt-sized

particles are moderately to poorly sorted and present a porphyric related distribution. Voids are present in the form of vughs or narrow elongated ones associated with plant tempers. The  $c:f_{0.06mm}:v$  ratio is estimated at 20:70:10, although fluctuations between samples or different areas of the same sample were observed.

The inclusions follow a random orientation and distribution pattern. Plant remains, either in the form of elongated voids or silicified ones (phytoliths of straw and husk), are few or frequent (10/15–20%) according to the part of the thin section taken into consideration. Among the non-anthropogenic inclusions, calcareous aggregates present a percentage ranging between 10–15% (few) and 20–30% (frequent)<sup>113</sup>. The key minerals include angular or subangular grains of quartz (ca. 20–30%, frequent) and muscovite and biotite micas (10–15%, few), while rare grains of plagioclase, K-feldspar, amphiboles, pyroxenes, and, possibly, epidote were recorded. Inorganic remains of biological origin include microfossils (ca. 5%, few) that are common in the natural sediments of the area. Clay pellets and iron mottles are very few/rare. Finally, post-depositional alterations include the infilling of the void margins with calcitic coatings.

A variant of this fabric group (group 3b) is represented by three samples showing differences in particle-size (**Fig. 7**). These present a coarser texture with higher concentrations of calcareous aggregates (up to 50–60%, common/dominant). Whether this could be associated with the intentional manipulation or the natural properties of the sediment cannot be clarified.

#### **Fabric group 4**

The texture (**Fig. 8–9**) is characterised as sandy silt to silt loam with a crystallic (speckled) birefringence fabric. The colour is light brown in plain polarising light and yellowish brown under crossed nicols. The fine sand- to silt-sized particles and the rare medium sand-sized inclusions are moderately to well sorted and present a close porphyric related distribution. Voids in the form of vughs are rare and no vegetal additives have been observed. The  $c:f_{0.06mm}:v$  ratio is estimated at 8:90:2 with minor fluctuations in the coarse and fine inclusion percentages.

The inclusions follow a random orientation and moderate distribution pattern. Calcareous aggregates present a percentage ranging between 5 and 10% (few). Fine inclusions

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<sup>113</sup> The higher percentages are recorded close to the margins.

comprise subangular/angular grains of quartz (30%, common) and laths of muscovite and biotite micas (20–30% or more, frequent/common), as well as microfossils (<2%, rare) and feldspars (rare). Iron mottles (2–5%, very few) and a few random-sized clay pellets are also present. In general, the composition of this fabric is similar to the natural subsoil of the site but presents a finer texture.

### Fabric group 5

This fabric group comprises finishing plasters characterised by the predominance of coarse calcareous aggregates (**Fig. 10**). The related distribution of the particles is characterised as loose porphyric. They are poorly sorted and their orientation is random. Plant tempers are occasionally present (ca. 5% or more, few) in the form of narrow elongated voids or phytoliths. The c:f<sub>0.06mm</sub>:v ratio is estimated at 80:15:5, although fluctuations between different samples exist. Apart from the dominant calcareous aggregates, the key particles recognised comprise quartz (frequent to common) and microfossils (few to frequent). Iron mottles and clay pellets are rare.

### General results

The micromorphological analysis of the samples points to the exploitation of local resources. Similarities with the natural subsoil of the site in terms of mineral composition are evident in most of the fabric groups described. Nevertheless, variations in particle-size and texture between different fabrics or samples belonging to the same fabric group indicate that these were made from different sediments of slightly different origin. This could also imply the lack of specialised or centrally organised material exploitation (Tung 2005, 219).

<b>Fabric group</b>	<b>Variant</b>	<b>Daub fragment type (no of samples)</b>
1	1a	<b>Type B (6)</b> , Type G (1)
	1b	<b>Type C (3)</b> , Type G (1), Type B1 (1)
2		Type A (1), Type B1 (1), Type C (1), Type D (1)
3	3a	<b>Type A (6)</b> , Type D (2)
	3b	Type A (1), Type D (1), Type B1 (1)
4		<b>Type E (2)</b>
5		Type H - <b>finishing plasters (7)</b>

**Table 1 Fabric groups and their relationship to specific daub fragment types.**

The relationship between fabric type or variant and the daub fragment types recognised in the macroscopic study (**section 5.2.2.**) is consistent in many respects (**Table 1**). Thermal structure or platform floors (Type E) are made of a finer, micaceous mixture, while

finishing plasters commonly contain high percentages of calcareous aggregates. Poorly or non plant-tempered samples are associated with the initial packing of frameworks made of closely set stakes/thin poles and split timbers (Type B). On the other hand, vegetal tempers are commonly added to the second layer of wall plastering (Type C and, possibly, Type G) and to the packing of frameworks made of wattle-and-daub or plank-shaped timbers (Types A and D). The vegetal tempers are often preserved in a silicified form. Phytoliths and pseudomorphous voids associated with chopped straw and grain husks (**Fig. 11**) point to the use of tempers from different stages of plant processing.

In the case of certain thin sections the co-existence of different fabric groups indicate the plastering of wall surfaces with successive layers of construction earth deriving from different sediments (**Fig. 12**). In addition, a single sample has confirmed the (periodical?) renovation of wall surfaces with successive coating and finishing plaster layers (**Fig. 13**).

In sum, the analysis of the samples from Buildings 2a, 5 and 7 points to the sharing of technological knowledge in terms of material properties and their transformation, as well as to the relative standardisation of building techniques. Similar conclusions were drawn during the macroscopic analysis of daub fragments.



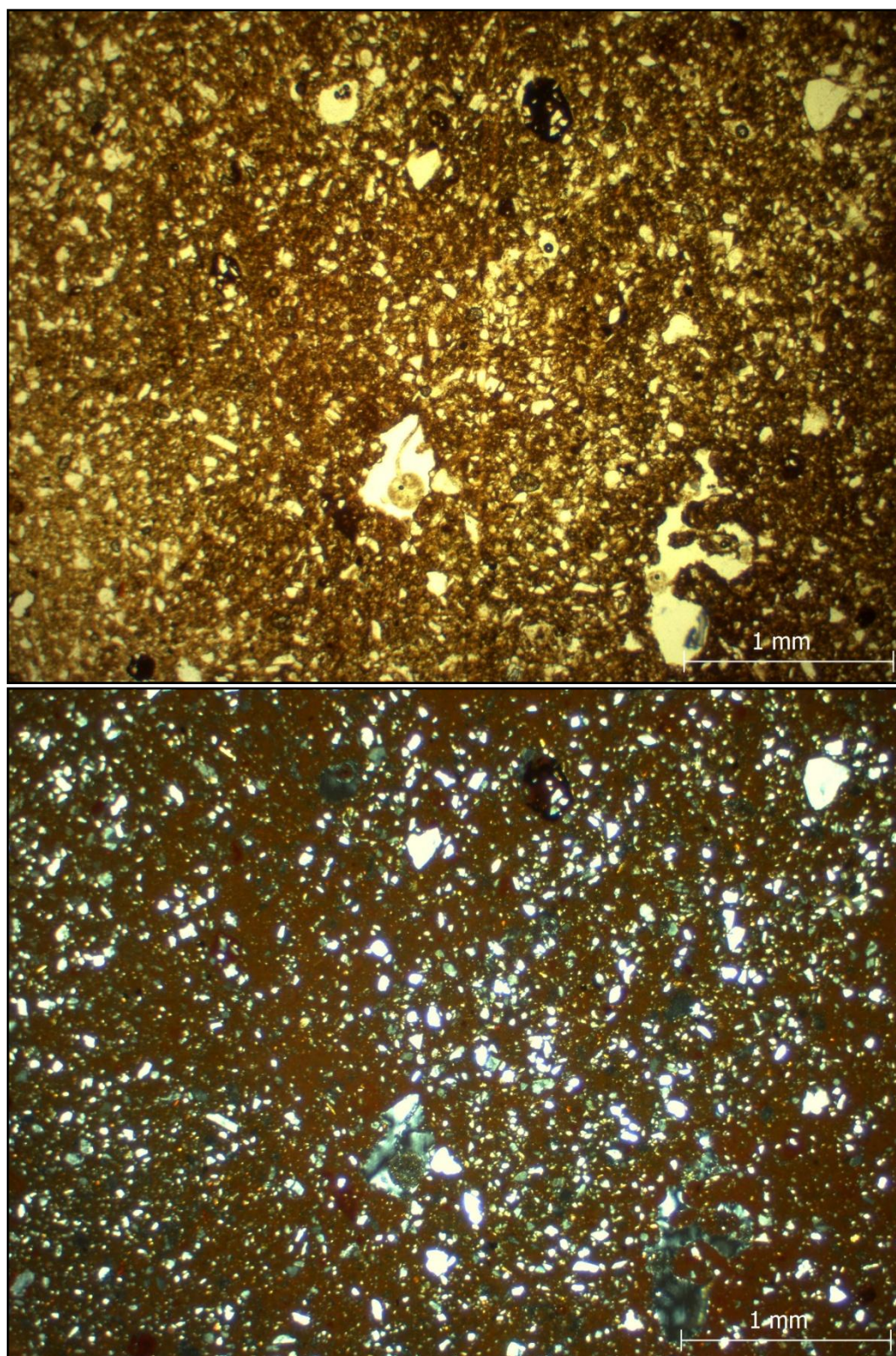


Figure 1 Fabric group 1, variant a: PPL (top), XPL (bottom).



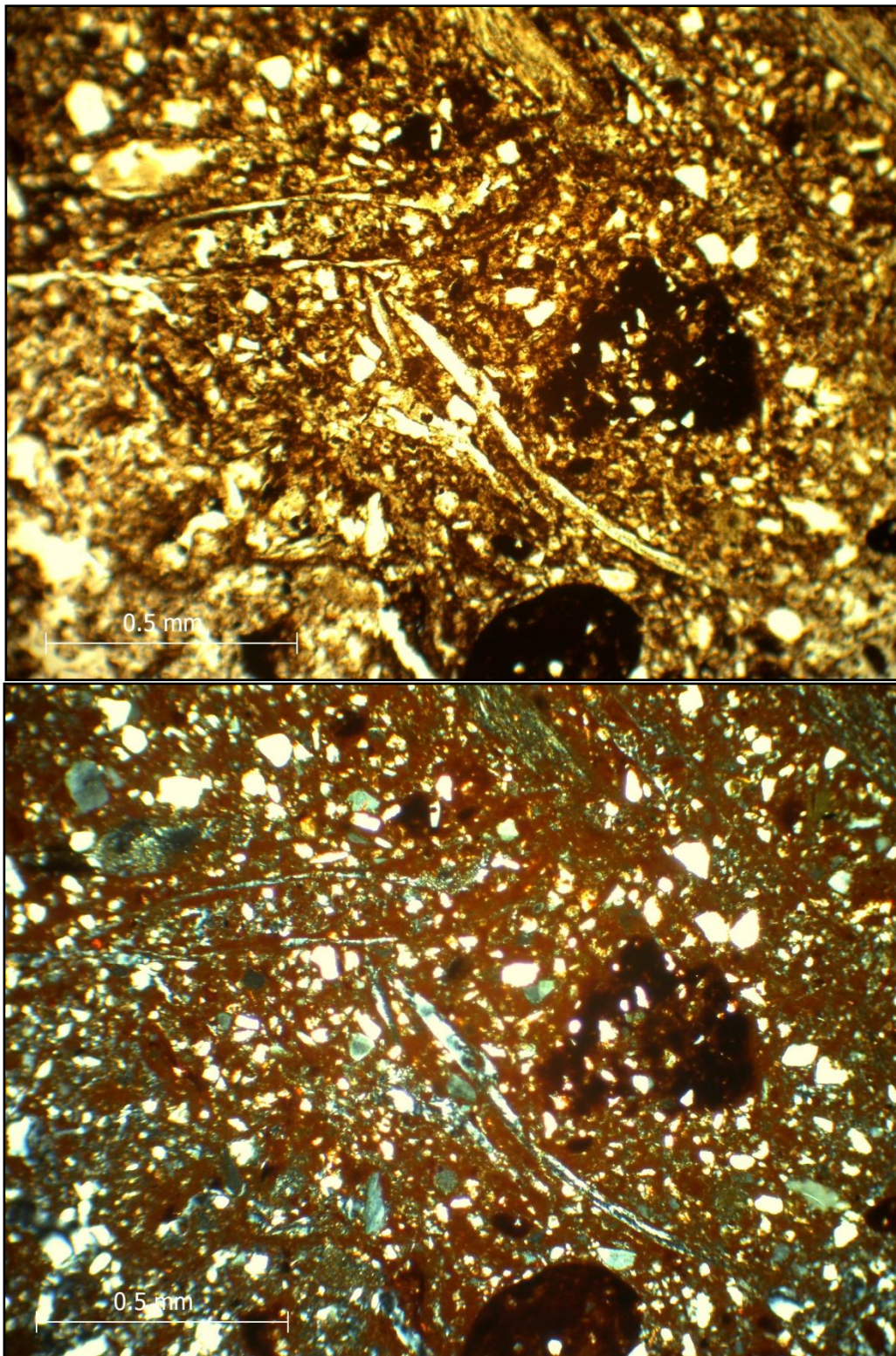


Figure 2 Fabric group 1, variant b: PPL (top), XPL (bottom).



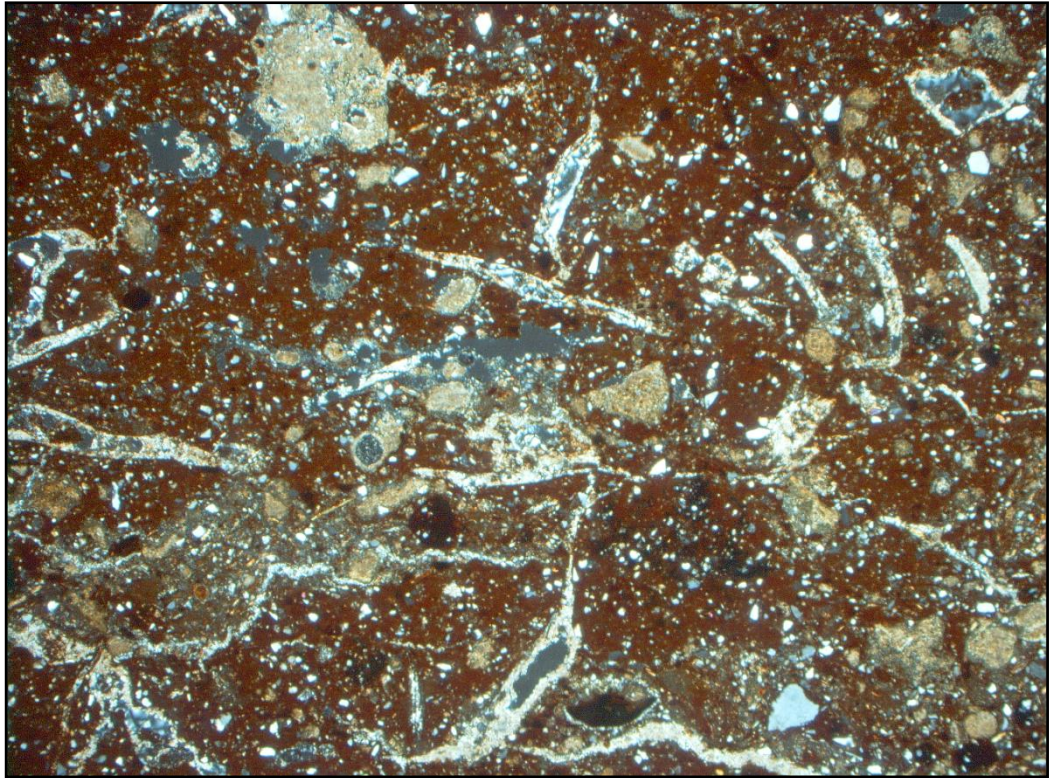


Figure 3 Fabric group 2 (25x).

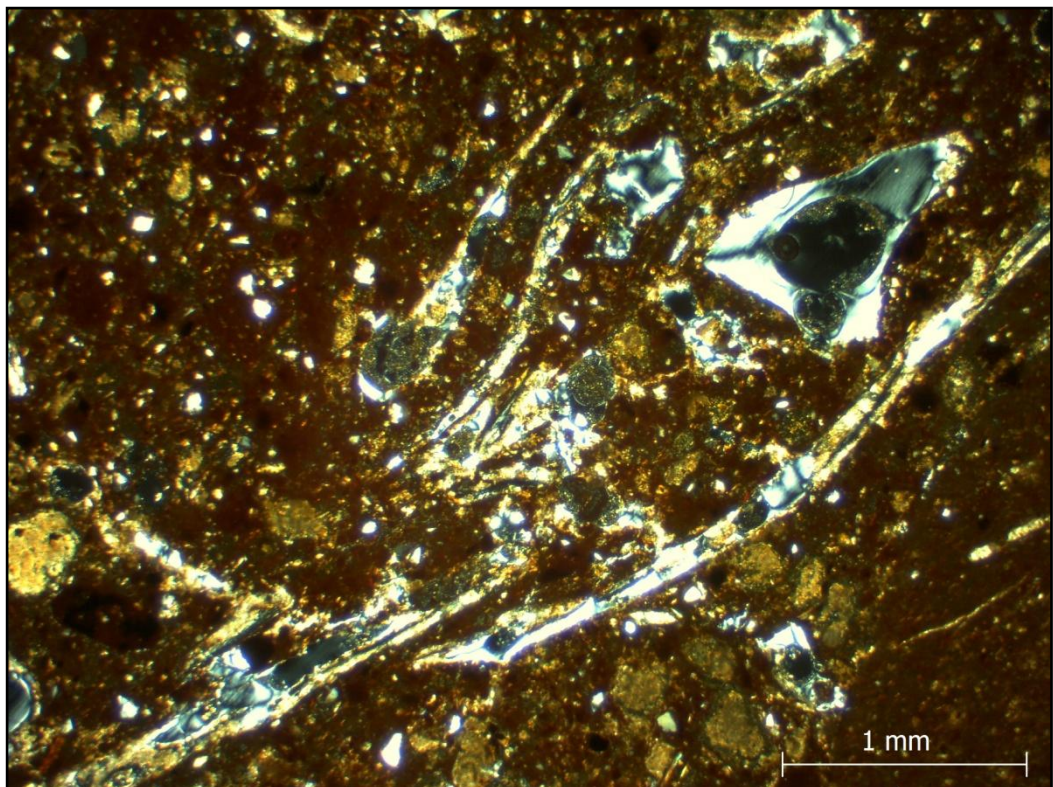


Figure 4 Fabric group 2: XPL.



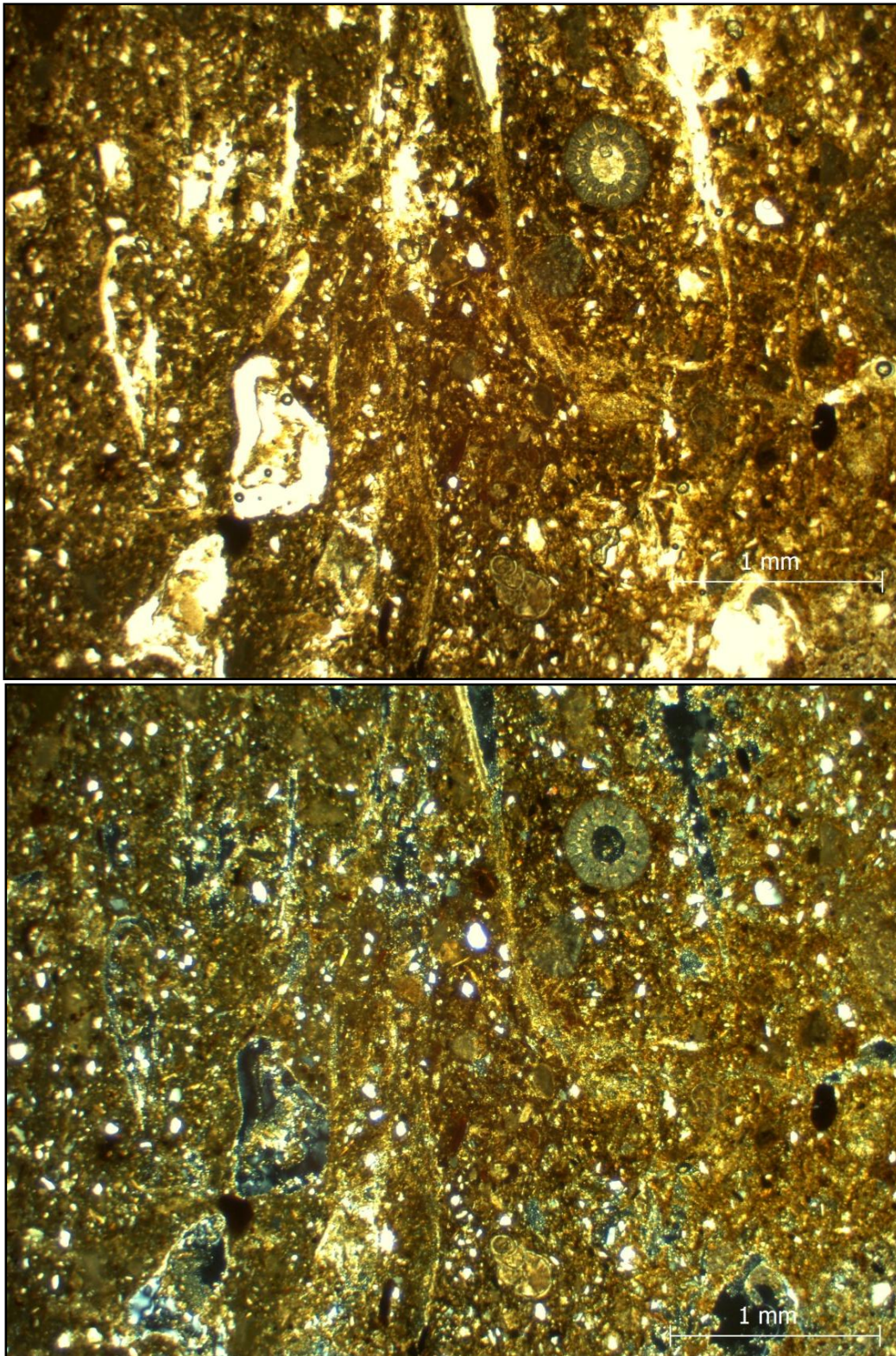


Figure 5 Fabric group 3: PPL (top), XPL (bottom).



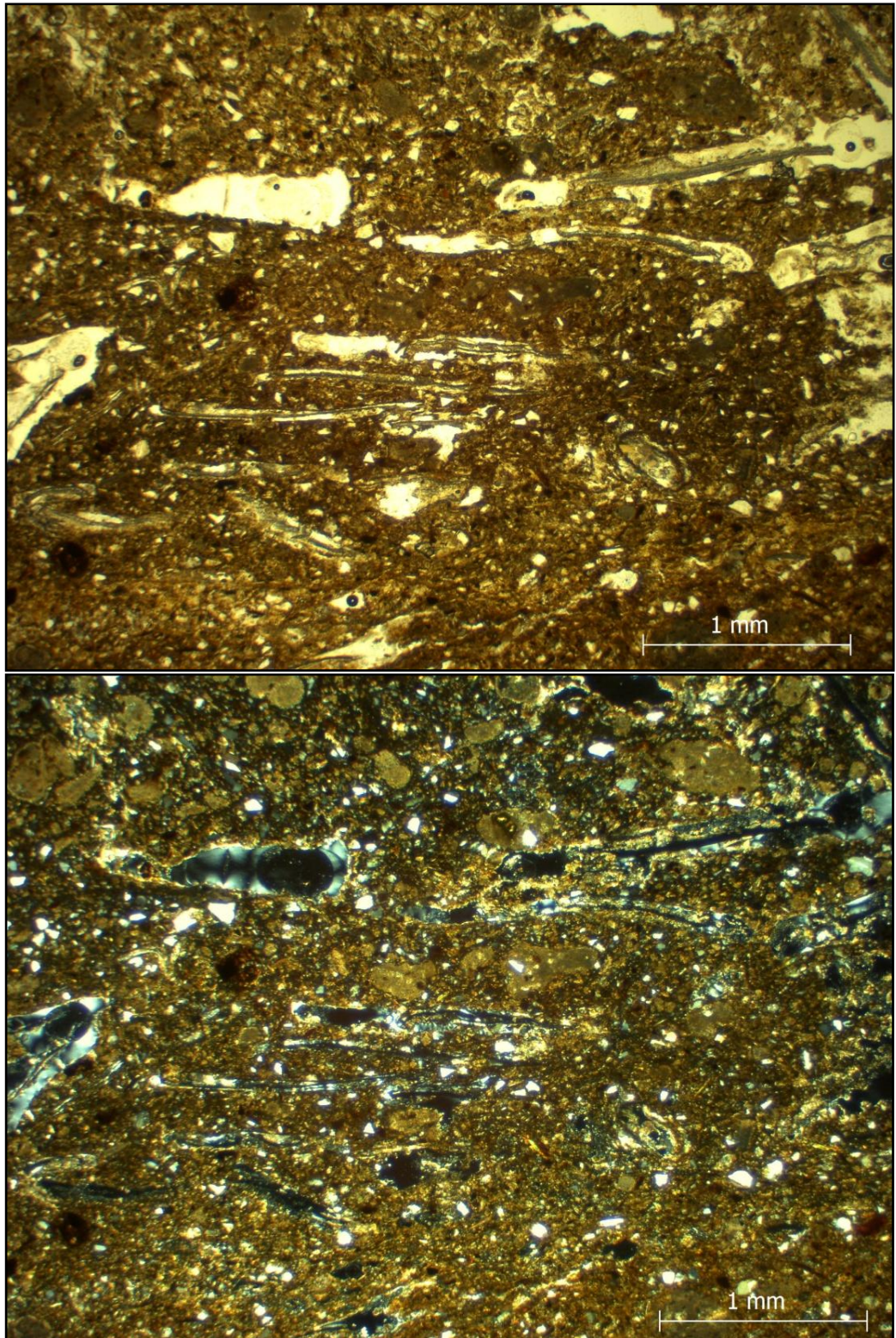


Figure 6 Fabric group 3: PPL (top), XPL (bottom).



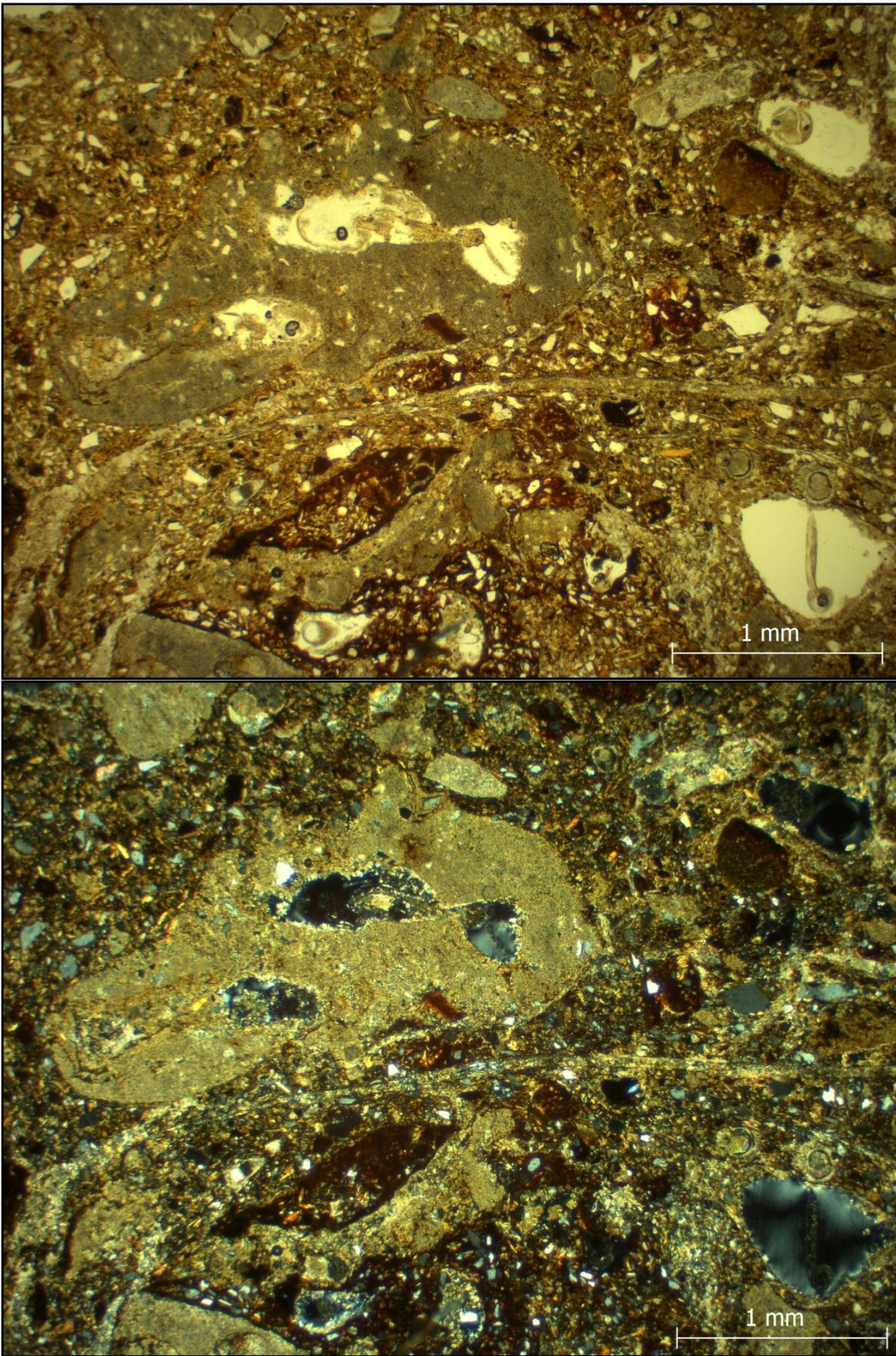


Figure 7 Fabric group 3, variant 3b: PPL (top), XPL (bottom).



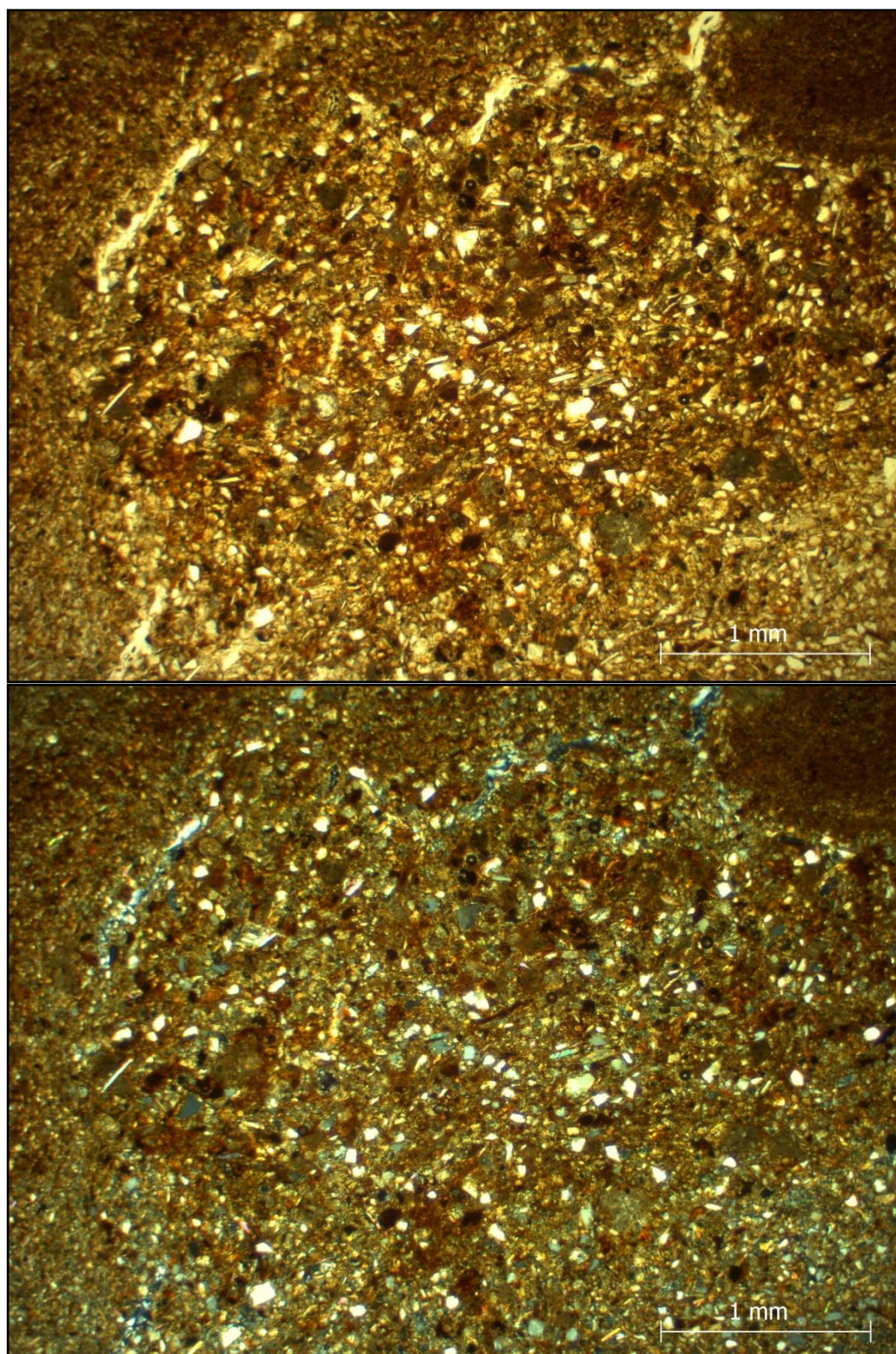


Figure 8 Fabric group 4: PPL (top), XPL (bottom).



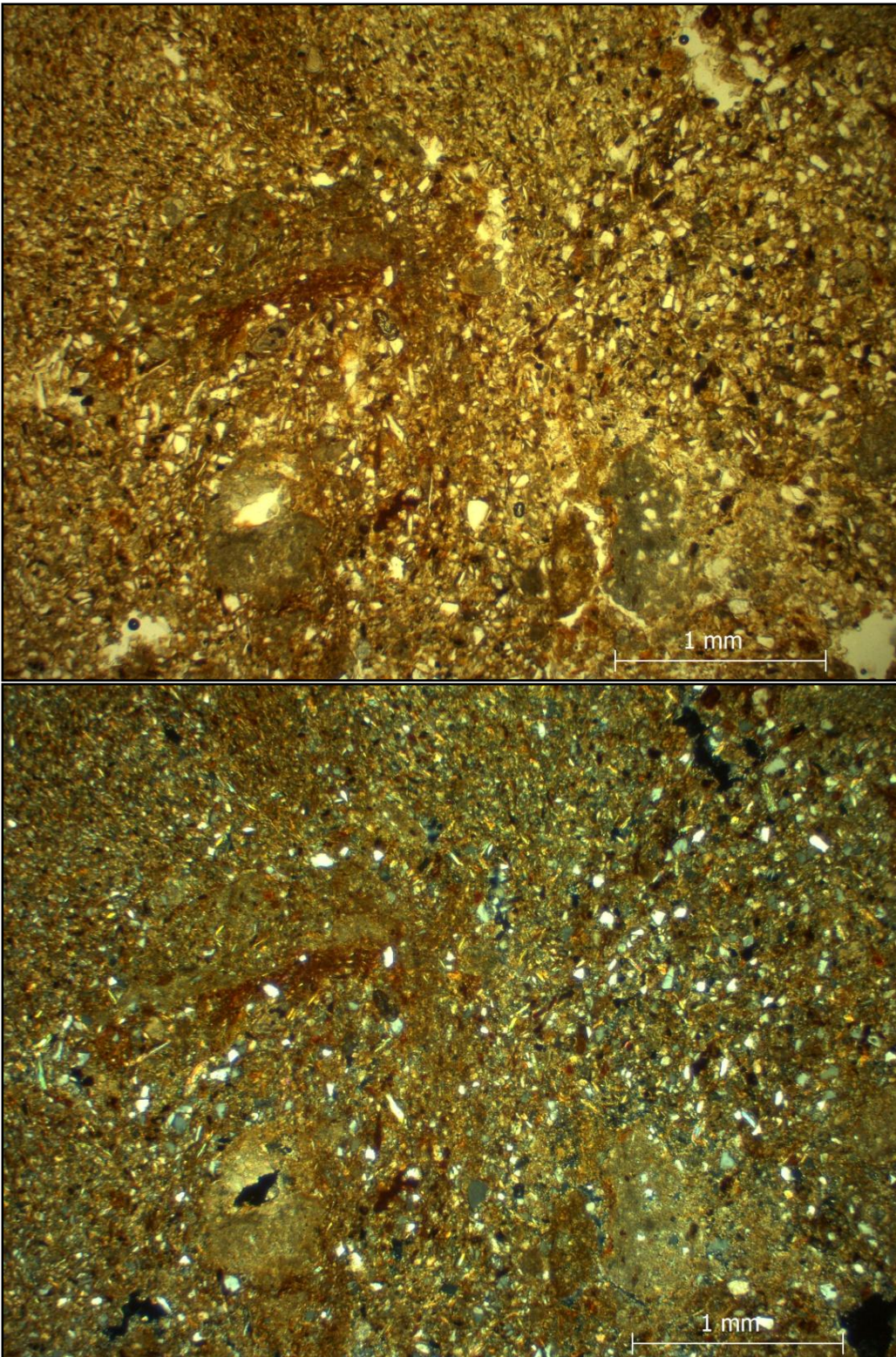


Figure 9 Fabric group 4: PPL (top), XPL (bottom).



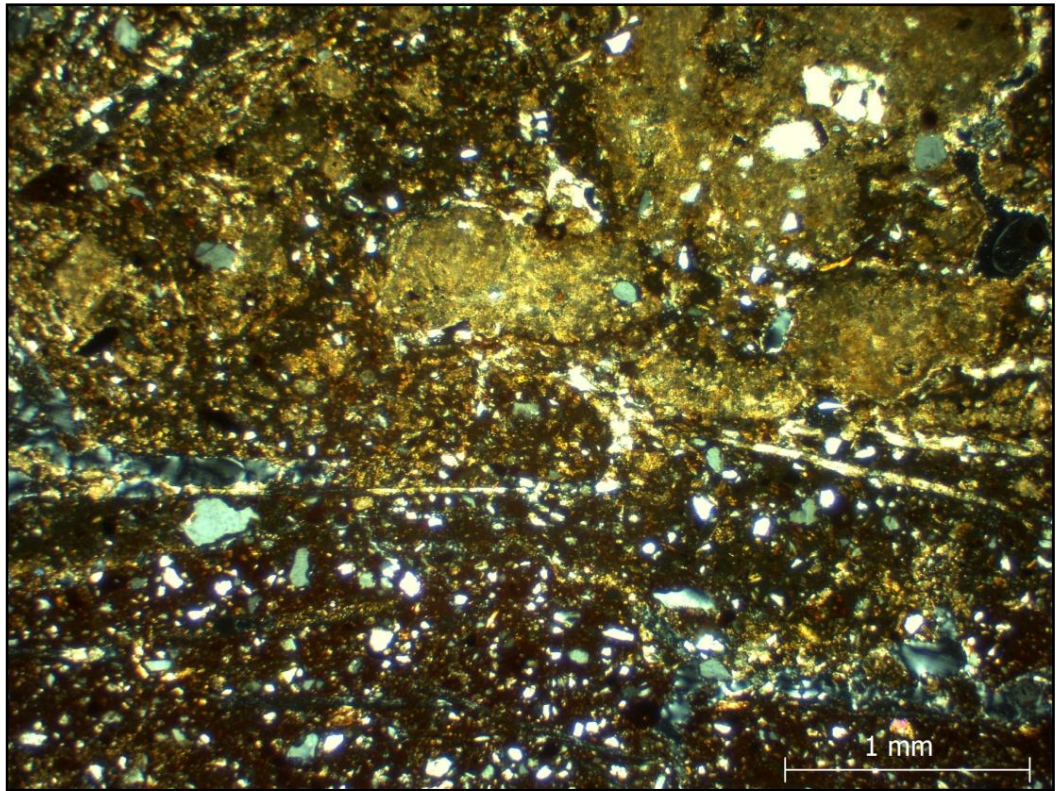


Figure 10 Finishing plaster in thin section (top half) (XPL).

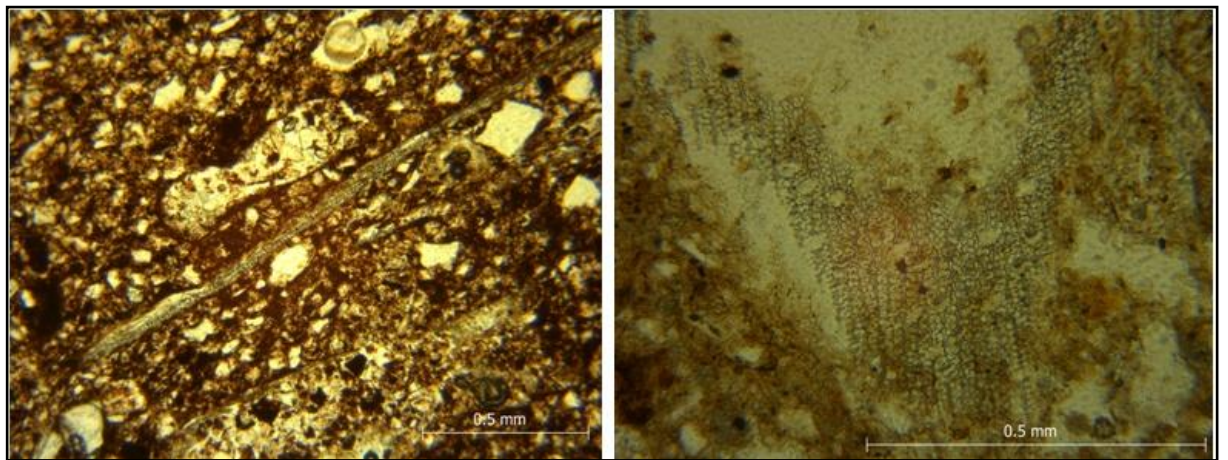


Figure 11 Silicified plant tempers: PPL.



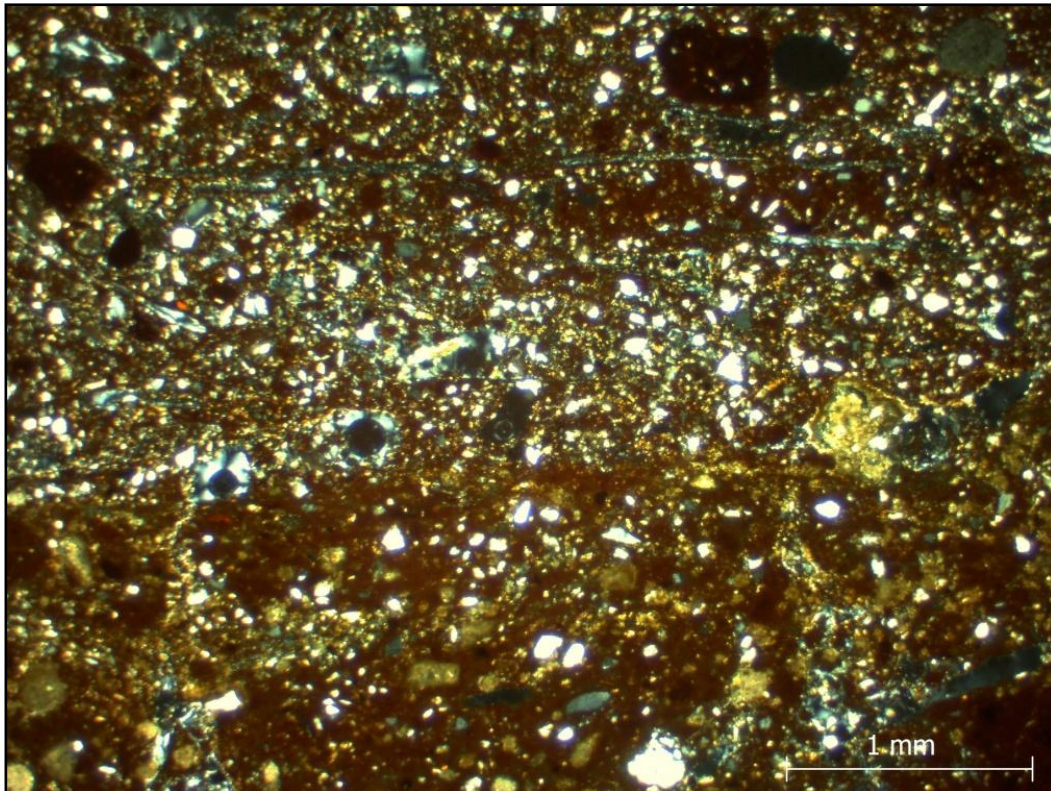


Figure 12 Thin section showing the succession of layers belonging to fabric groups 1a (top) and 2 (bottom) (XPL).

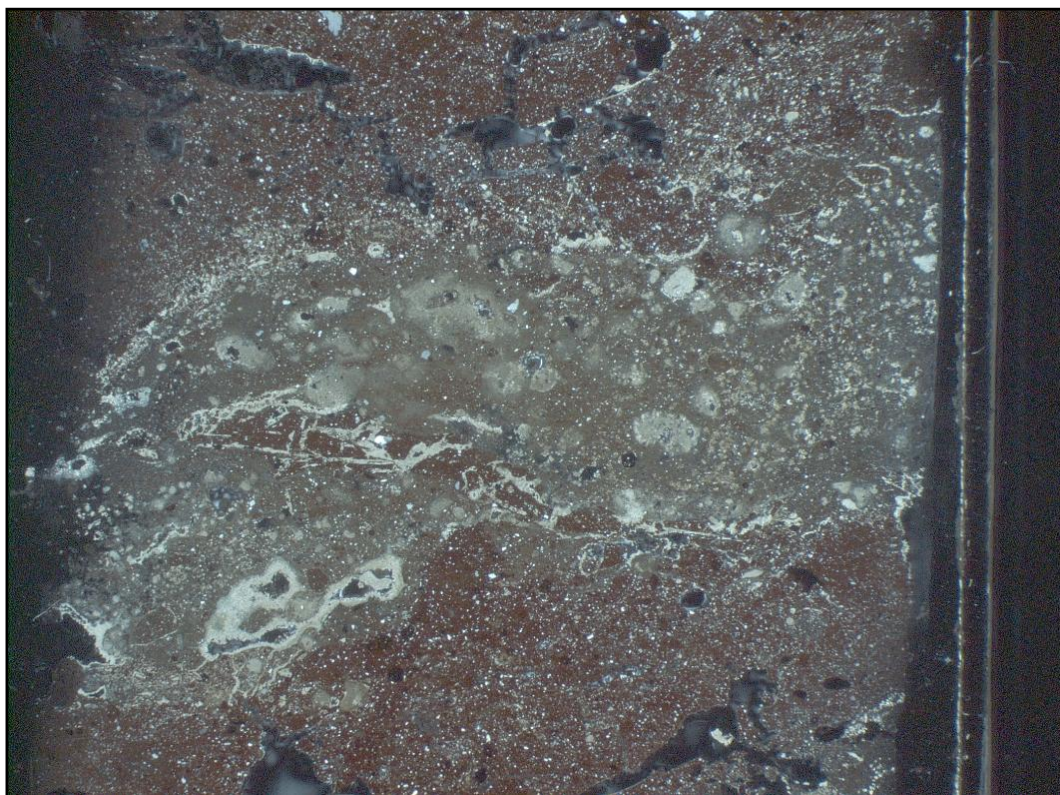


Figure 13 Thin section showing the succession of coating and finishing plaster layers (6.3x).



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