Continuity and Change in Etruscan Domestic Architecture

Paul M. Miller

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Abstract

Etruscan architecture underwent various changes between the later Iron Age and the Archaic period (c. 800-500 BC), as seen in the evidence from several sites. These changes affected the design and style of domestic architecture as well as the use of raw materials and construction techniques. However, based on a supposed linear progression from inferior to superior building materials, explanations and interpretations often portray an architectural transition in Etruria from 'prehistoric' to 'historic' building types. This perspective has encouraged a rather deterministic, overly simplified and inequitable view of the causes of change in which the replacement of traditional materials with new ones is thought to have been the main factor.

This book aims to reconsider the nature of architectural changes in this period by focussing on the building materials and techniques used in the construction of domestic structures. Through a process of identification and interpretation using comparative analysis and an approach based on the *chaîne opératoire* perspective, changes in building materials and techniques are examined, with special reference to four key sites: San Giovenale, Acquarossa, Poggio Civitate (Murlo) and Lago dell'Accesa. It is argued that changes occurred in neither a synchronous nor a linear way, but separately and at irregular intervals. In this monograph, they are interpreted as resulting mainly from multigenerational habitual changes, reflecting the relationship between human behaviour and the built and natural environments, rather than choices between old and new materials. Moreover, despite some innovations, certain traditional building techniques and their associated materials continued into the Archaic period, indicating that Etruscan domestic architecture did not undergo a complete transformation, as sometimes asserted or implied in other works. This study of building techniques and materials, while not rejecting the widely held view of a significant Etruscan architectural transition, argues for a more nuanced reading of the evidence and greater recognition of the nature of behavioural change during the period in question.

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Chapter 1: Introduction

The purpose of this book is to examine the nature and extent of changes in building techniques in the domestic structures in Etruria from 800-500 BC. Where a transition is demonstrable, the degree and possible reasons for change are examined. To fulfil this purpose, it is necessary to identify the building techniques used in domestic structures in Etruria and interpret how and why they were used through time. The framework established by the environment-behaviour relations model of architectural theory (see section 2.1.1), as well as the broader theories of behavioural archaeology, governs these interpretations. The identification of building techniques is conducted through descriptive analyses of structural features and associated evidence. Identified techniques are then interpreted using the *chaîne opératoire* approach and comparative analysis.

Both introductory textbooks (e.g. Bartoloni 2012a: 266–267; Becker 2014: 9–12; Donati 2001: 321–324; Ridgway 1988: 666) and in-depth studies (e.g. Brandt and Karlsson 2001b; Colantini 2012; Izzet 2001a, 2007: 143–164; Steingräber 2001a) commonly assume a transition in building technology and architectural style in the seventh and sixth centuries BC. Of the publications that recognise the supposed transition, the seminar proceedings edited by Brandt and Karlsson (2001b) is most significant. The title of their volume, *From Huts to Houses: Transformations of Ancient Societies*, sums up the widespread perception of the architectural transition. In their introduction to the volume, they assert that a transformation occurred in "building material and technologies" (Brandt and Karlsson 2001a: 8). Accordingly, they state that the common use of the terms 'huts' and 'houses' arose in the literature to distinguish between structures supposedly resulting from the use of different materials and technologies (Brandt and Karlsson 2001a: 7–8).

As noted by Brandt and Karlsson (2001a), the transition in the domestic architecture of Etruria is thus commonly recognised through terminology as a transformation in building materials and technologies (e.g. Colantini 2012; Colonna 1986; Izzet 2007: 152–154; Steingräber 2001a: 26; Torelli 1985). The terminology used to characterise the transformation, particularly the terms 'huts' and 'houses', creates a simplified system for the interpretation of architectural features. Typically, structures made from wood, wattle and daub and thatch are referred to as 'huts', whereas structures made from mud brick, stone and terracotta roof tiles are 'houses'. However, the terminology also paints the transition as one of linear evolution based on the adoption of superior materials. Domanico (2005) is one of the few authors to criticise this approach for inaccurately diminishing the complexities and variety of techniques in earlier structures. Based on this linear depiction of the transition, one technology is replaced by another, as evidenced by the appearance of new building materials. From such a depiction it is not clear how building techniques (which are the learned behaviours of architectural creation, maintenance, demolition and reuse; see section 2.1.2) fit into the perceived transition, if they do at all.

The architecture of an individual structure varies based on the surrounding built environment and the behaviours of the builders (Rapoport 1977, 2000, 2006; see section 2.1.1). If a shift in the structural evidence is archaeologically apparent, then the built environment or the behaviours (including building techniques) of the builders changed. The identification and interpretations of building techniques attempt to understand architectural change as a product of behaviour. Rather than identify the transition based on the appearance of new or different building materials, an investigation of the building techniques forces a reconsideration of how (via identification) builders interacted with their surroundings and why (via interpretation) change in behaviour is evident.

This approach departs from the identification and interpretation of Etruscan architectural features based on building materials and technology. Identification is relatively straightforward in the traditional, terminological classifications. In Etruscan studies, the typical evidence for change in architecture is primarily based upon: the presence of different building materials (both raw and manufactured) between contexts in the archaeological record, the interpretation of artefacts with architectural features (e.g. cinerary urns) or the architectural descriptions in Classical sources (e.g. Vitruvius). Interpretation of architectural features, particularly of the seventh and sixth centuries BC, often relates in some way back to the transition in materials (e.g. Izzet 2007: 152–154; Steingräber 2001a: 25–27). Many interpretations also use evidence for material change in other contexts to understand the supposed architectural transition (e.g. Bartoloni 2012a: 266–269; Torelli 1985). The resulting depiction is thus a linear, evolutionary progression from inferior to superior materials that is often reliant on non-architectural contexts.

Making a transition in building materials and technology the focal point of interpretation has in effect created the common perception of significant architectural change between the Iron Age and the Etruscan period. Continuity of tradition is only rarely proposed as a continuation of traditional architecture (e.g. Damgaard Andersen 2001; Karlsson 2006: 142–144; Ö. Wikander 1990). Instead, similar building techniques are viewed altogether differently based on the different materials being used. For instance, walls made of self-supporting pisé are typically interpreted as inferior and fundamentally different from ashlar stone, despite their similarity as walling techniques and their function in buildings.

Furthermore, the interpretations of the transition in Etruscan domestic architecture have changed considerably over the last forty years (see section 2.3). Initially, the transition was interpreted as a result of the spread of the superior Greek and Near Eastern manufactured materials, artisans and artistic motifs to the western Mediterranean (e.g. Pallottino 1975: 174). A decade later, the transition was explained as the rise of an élite class who used new, foreign materials to display their wealth (e.g. Torelli 1985). More recently, the use of new building materials (particularly of terracotta tiling and stone) is often associated with urbanisation and the need to use space in new ways (e.g. Izzet 2007: 143–164; Rohner 1996).

Altering the interpretive focus from building materials and technology to building techniques shifts the common perspective of architecture from a discussion of new materials and technologies to one of identified behaviours.[1] A focus on techniques emphasises the behavioural tendency toward habit and the maintenance of tradition rather than the more noteworthy appearances of change (see section 2.1.3). In effect, this shift of interpretive focus encourages the identification of differences in building behaviour rather than instances of technological progress.

Moreover, with its basis in technique, the recognition of change becomes more dynamic. Changing techniques, following psychological and sociological theories of behaviour (see section 2.1.3), can be recognised as habitually or actively innovative. The distinction is based on a number of factors, the primary factor being the relationship between habitus and choice. Interpretations following a *chaîne opératoire* approach can recognise the subtleties separating the habitually and actively innovative techniques through the comparison of the different operations over time (see section 2.2.2).

One of the main problems with the ways that scholars have engaged with domestic architecture is the relativism in the definitions it uses when discussing and describing the evidence. There is often little standardisation in defining architectural features. Simple differences between, for instance, what is and is not considered structural, where foundations end and walls begin and what makes a building a hut as opposed to a house are rarely directly addressed. Even how to identify certain techniques using material evidence is not immediately clear or even wholly accurate (as is the case, for example, with pisé; see

1 The terminological difference between a building technology and technique is subtle. Described further in the Glossary, 'technology' refers to the know-how and ability to apply calculated, practical and mechanical ideas to create an end product, as opposed to a 'technique', which is a pragmatic operational sequence often (though not necessarily) associated with a specific technology (Oxford University Press 2014). A technique, as a specific set of actions, is a behaviour (see section 2.1.2), whereas a technology is typically a concept or group of concepts.

section 5.1.1). Definitions of any technique based on material evidence are essentially relative to intra-site standards or to comparable cases elsewhere, which themselves are caught up by similar insecure definitions.

The ambiguity of discussion regarding the evidence has produced a muddled use of architectural terminology. The same ambiguity has also led to the misrepresentation of evidence. Widespread, vague assumptions about building features seem to be used by scholars as an attempt to support findings defined by unclear terms. This imprecision has given rise to models of architectural development that are not well-founded. Similarly, incorrect, outdated or unclear terms have made it difficult to recognise specific materials or techniques (a common problem when discussing the foundations of later, sixth-century BC structures; see section 4.1.2). Some terminology is even left out or changed because of how a term is perceived (as is likely the case with the use or, rather, neglect of the term 'timber' for wall structures in early Etruscan buildings; see section 5.1.1). This use of terminology corresponds with the common use of a similarly outdated evolutionary taxonomy, which has been critiqued since the 1970s (Abrams 1989: 50–51; Athens 1977; McGuire 1983; McGuire and Schiffer 1983; Wenke 1981; Yoffee 1979).

In this work, therefore, the evidence from sites across Etruria is described according to a strict definition of terms. This is intended to help clarify the material evidence. It also helps to reveal what direct evidence for building techniques and technologies exists and what else has merely been assumed. To build specific definitions for terms used in this book, it was essential to look beyond archaeology to vernacular architecture and structural engineering. Incorporating the definitions used in these fields for common terminology into specific archaeological definitions creates the boundaries for the terms necessary for a meticulous evaluation (for a full list of defined terminology, see Glossary).

Examining building techniques with clarified terms allows for the recognition of the building process through time, with all of the continuances, modifications, adaptations, adoptions and innovations involved in each step of that process. By contrast with the focus on building material and technology, this approach makes it easier to identify the persistence of tradition and the dynamism of change. Whether that change is revolutionary and caused by radical alterations to the social fabric or part of a gradual, centuries-long development where the visible aspects of the change appear at irregular intervals (or even some point in between these two), analysing the construction process is essential in order to establish a more reliable interpretation of architectural development in Etruria from 800-500 BC.

1.1 Book outline

There are seven chapters in this book, including this introductory chapter. Chapter 2 presents the major sites in this study and the theoretical and methodological foundations for this work. In the first section, behaviour and the environment-behaviour relations are reviewed. The focus on behavioural theories throughout the book emphasises the relationship between domestic structures and the people that created, used and destroyed them within a social context. A behavioural archaeological approach is intended to free the interpretations here from the wider ideographical concepts commonly used in the literature. The first section also examines the causal nature of actions with reference to habitus, structuration and the dual-process theory.

The second section details the methods employed in this research. It outlines the descriptive reconstruction process used to identify techniques. Then, it describes the *chaîne opératoire* approach and why it is an increasingly necessary method for interpreting past building techniques. Along with comparative analysis, the *chaîne opératoire* approach forms the basis for interpretations and is therefore discussed in some detail, including an examination of the limitations and problems with the approach.

The third section of Chapter 2 asserts how the research presented in this study corresponds to the established historical context. Along with a summary of broader socio-cultural development from 800-500 BC, the third section examines the state of scholarly discourse on Etruscan architecture. In particular, it considers how certain approaches to the general study of central Italian society and culture have formed the prevailing perceptions of Etruscan architecture. In the conclusions to this book, the wider concepts discussed and raised in this section will be considered in relation to the results of this study and architectural change.

The final part of Chapter 2 reviews the literature on four sites that have greatly influenced the overall discussion of domestic architecture. San Giovenale, Acquarossa, Lago dell'Accesa and Poggio Civitate are the most extensively excavated sites with domestic architecture for the period in question (Izzet 2001a). As Brandt and Karlsson (2001a) note, the excavations and publications by the Swedish Institute, in particular, have been essential to the overall concept of architectural transformation. The end of Chapter 2 therefore critiques both the excavation reports of these sites and discusses their wider impact on the literature.

Chapters 3 and 4 consider foundation techniques. Chapter 3 focusses on the early types of foundations that appeared up to 625 BC and Chapter 4 focusses on those types that appeared following 625 BC. Chapter 3 also explains the terminology and classification system used in both chapters. Foundations, being the most likely to survive archaeologically, are perhaps the best part of a building to analyse when attempting to understand changes in building technique. By defining the foundations of buildings based upon their typical features (i.e. ground preparation, wall footings, flooring and roof supports), building techniques can be identified through time. As detailed in Chapter 3, the foundation techniques have been grouped into 'types' based on evidence for similar operational chains. Grouping techniques into larger 'types' allows for a broader recognition of change over time, which in turn leads to a more rigorous evaluation through comparative analysis.

The investigation of architectural features continues in Chapter 5 with walls and roofs. Supposed material and technological changes suggest a transformation in walling and roofing in the seventh and sixth centuries BC. Based on these material and technological changes, many scholars use a model of evolutionary progression in wall construction from wattle and daub and pisé to mud brick and, finally, stone. Chapter 5 challenges this evolutionary progression by calling into question the evidence for material and technological change. The subsequent identification of walling techniques suggests the need for rethinking the standard interpretations. It is suggested that continuity of tradition is more evident than generally asserted.

Roofing techniques are also discussed in Chapter 5. The identification and interpretation of roofing techniques contrasts with the earlier examination of the walling techniques in the chapter because, in comparison, roofing evidence is clearer in the literature. Yet, interpretations of roofs are, akin to walls, based on some false assumptions. The appearance of terracotta roof tiles in domestic contexts has been suggested as evidence for a marked change in technology, possibly spurred by foreign influence (e.g. Torelli 1985). A number of scholars (e.g. Damgaard Andersen 2001; Ö. Wikander 1990, 1993) have offered dynamic interpretations of the transition in materials but the appearance of terracotta tiling is the major factor in most interpretations. While the roof covering techniques are identified and discussed, the section on roofing techniques broadens the focus by also identifying the structural roofing techniques. Interpretations of roofing in Chapter 5 attempt to create a holistic understanding of roofing that recognises the entire roof, not just the covering materials.

Chapter 6 examines interpretations of architectural change based on raw and manufactured building materials. Further to discussions of technique, the chapter examines the procurement, manufacture, use and reuse of building materials and how these facets of the *chaîne opératoire* affected building techniques. Chapter 6 also discusses the progression of building materials, indicating noticeable changes to procurement, manufacture, use and reuse with reference to possible causes for change. Based on this approach, it is argued that there was consistency in building material procurement, manufacture, use and reuse over time. Ultimately, local traditions, rather than the choice of superior foreign over inferior native building materials, appear to have been the key factor in the progression of material procurement, manufacture, use and reuse.

The conclusions presented in Chapter 7 offer both a summary of the key points of the individual chapters and an interpretation of the changes to domestic architecture from 800-500 BC. This interpretation allows for a conclusive answer to the main research question of this book: how did the use of building techniques in the domestic structures of Etruria change from 800-500 BC? Further discussions of the implications of transition are also presented in Chapter 7, focussing on the interaction between the maintenance of and innovation to building techniques over time. Finally, possible areas for further research are suggested, highlighting some of the limitations of the current evidence and this work.

Chapter 2: Theory, methods and a review of the literature

This chapter provides the theoretical and methodological framework for this study. It outlines the procedure by which research was conducted, as well as the differences with the scholarly literature in theory and approach. The following sections on theory and method argue for a re-interpretation of the evidence that accounts for the development of architectural traits from within a system of behaviour. Architectural interpretation is perceived differently in this book than in the wider literature on Etruscan architecture. Building upon the concept that a technique is a learned behaviour, interpretation in this research uses methods that accentuate different stages of building and that recognise the causal nature of change to behaviour and its resultant material culture.

While the first two sections in this chapter are dedicated to the theoretical and methodological approaches of this study, the third and fourth sections in this chapter review the literature, both in terms of the wider historical context and the Etruscan sites important to this book. The narrative of architectural transformation discussed in Chapter 1, including the apparent divide between Iron Age and Etruscan architecture, is discussed in greater detail in the third section. Importantly, the common approaches used to understand, not only architecture, but also Etruscan society and culture are identified in the third section, thereby contextualising the approaches outlined in the first two sections of this chapter (not to mention the following chapters). The final section relates how the identification and interpretation of Etruscan architecture is primarily a result of the excavation of four sites: San Giovenale, Acquarossa, Lago dell'Accesa and Poggio Civitate. The assessment of the site publications alongside the theories and methods used in this work is intended to display the narrow application of the traditional interpretive approaches of previous studies and show the value in the approaches advocated in this study.

2.1 Theory

The theories of behavioural archaeology were chosen to support this investigation into Etruscan architectural change. Partly, the choice to frame this study within behavioural theories stems from a desire to grasp change on an individual level and yet achieve a society-wide, empirical understanding of change. As the primary advocate of the behavioural school of archaeology, Schiffer (1996: 644–645) notes the intentionally diverse applicability of the behavioural viewpoint, which is neither tied to ideographical (specific historical) nor nomothetic (general) research questions or interpretations. Instead, behavioural theories in archaeology are concerned, first and foremost, with the comprehension of "people-artifact interactions", which are meant to be "a basis for formulating researchable questions about variability and change" (also, O'Brien and Bentley 2011: 310; Schiffer 1999: 166, 1996: 644–645, 2005: 486). In architectural studies, statistical outliers could be early indications of change. It is therefore critical that the theories used in this study are flexible enough to maintain the broader statistical and empirical frame while still accepting and understanding the outlier.

Furthermore, with the multigenerational use of the cultural materials being analysed here, the underlying theories must recognise and provide ways for understanding the processes of reuse and abandonment before and after deposition in the record. The factors of reuse and abandonment greatly affect archaeological perception of ancient architecture, often preventing a wholly objective view of the evidence at its creation (and, in turn, the initial goals of the builders) (Gilman 1987: 539–540; Kent 1990a, 1990b, Schiffer 1985, 1987; Steele 2007: 44–45). However, architectural change from creation to abandonment within a single structure can be as revelatory about behaviour as the change between the creations of two separate structures. It is thus essential to focus on reuse and abandonment and use theory that appropriately acknowledges them.

However, the main reason for adopting behavioural theories is discussed more thoroughly below. As previously stated, the goal of this book is to better define the commonly noted transition in Etruscan architecture by focusing on the inherent techniques of construction. Since techniques are learned behaviours (as described in more detail below), it is necessary to use behavioural theory to discuss the use and appearance of techniques. The complex connection between building techniques and the behaviour of the builders has long been understood in anthropology and, following the spread of Rapoport's concepts about architectural behaviours (e.g. Steadman 1996: 68–72), has gradually been recognised in archaeology.

2.1.1 Amos Rapoport and Environment-Behaviour Relations

Since the 1980s, archaeologists writing on domestic architecture have often referenced the work of Amos Rapoport (Steadman 1996: 68–72). An emissary between architecture and anthropology, Rapoport is an influential figure in the debate over whether form or function is the primary motivator in the creation of built environments (Kellet and Napier 1995: 11–12; Lawrence and Low 1990: 458–459). Since his landmark publication of 1969, Rapoport (1969, 1977, 2000, 2006) has focussed on understanding the system by which the environment and behaviour affect the creation of structures. This system, so-called environment-behaviour relations (EBR), is considered by Rapoport to be responsible in determining nearly all aspects of vernacular architecture.[2]

Rapoport (2000: 146–147) explains that the environment in EBR is more than simply the physical setting. Instead, he considers the environment as an edification of the cultural landscape by the associated culture, wherein that culture's interpretation and construction of the setting are paramount. This cultural landscape is combined with socially-determined organisations of space, time and meanings, as well as the other culturally-contextual features of the environment, such as quality or style (Rapoport 2000: 146–148). Put together, these complex components comprise what is known as the built environment.

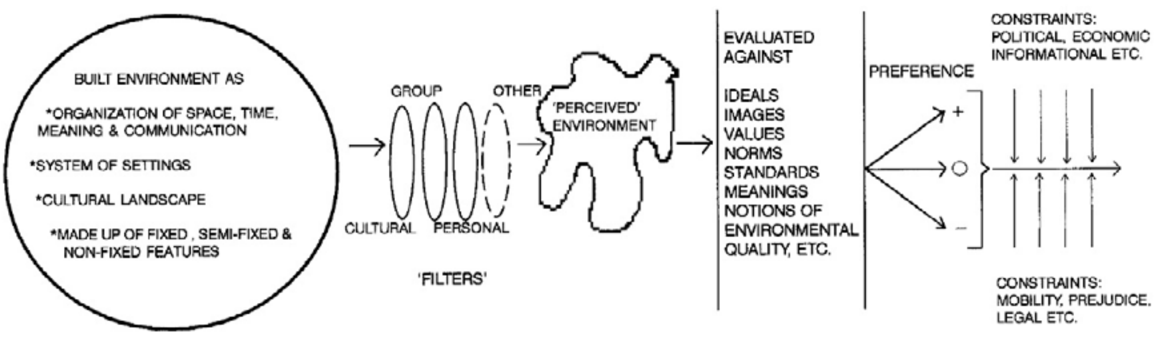

Figure 2.1. The "model of evaluative process", used in EBR studies (Rapoport 2000: 146).

Rapoport (2000) gives the behavioural part of EBR an even more complex description than he does the built environment. Behaviour, for the most part, assumes the definition it is given in social theory, where it is the temporal sum of certain habitual and conscious actions in reaction to external catalysts and stimuli (see subsection 2.1.3). In Rapoport's "model of evaluative process" (a model used to visualise and

2 Furthermore, a growing number of archaeologists working with Etruscan architecture, including Izzet (2007) and Dolfini (2013) seem to agree, if not on EBR, then on Rapoport's conception of behaviourally- and culturally-determined household form.

interpret EBR), the behaviour of the builder(s) is therefore seen as a reaction to both the built environment and wider political, economic, ritual and social influences, albeit in different fashions (Rapoport 2000: 146–148; Figure 2.1). Behaviour is also significantly affected by agency, particularly individual preference (Rapoport 2000: 151). These influencing factors directly restrict how the builder(s) acts during planning and construction, which accordingly moulds the form of the finished structure.

Critically, between built environment and behaviour are "filters" through which the builder(s) perceives and then reacts to the built environment (Rapoport 2000: 145–146). Similar to the typical influencing factors on behaviour, the perception filters described by Rapoport limit the perception of the built environment based upon outstanding cultural, social and personal influences. Rapoport's acknowledgement of the built environment outside of the normal causal system of behaviour allows the perception of built environment to be considerably more deterministic of architectural form. Although the product of EBR (i.e. the built structure) is by necessity a combination of two variables (i.e. environment and behaviour), recognition of EBR underscores that the behaviour of the builder(s) in construction continuously reacts to the perception of the ever-changing environment without direct commixture (Rapoport 2000, 2006: 59–60).

Borrowing from the study of EBR, archaeologists have developed a clearer understanding of the motivations behind structural form (e.g. Dolfini 2013; Kent 1990a; Steadman 1996). However, in contrast with Rapoport (1990: 18–19, 2006), who can approach the builder(s) and study their behaviour along with the influencing factors of their culture, archaeologists must first infer the likely behaviours of the builder(s) via activities that resulted in material culture. According to Rapoport (1990: 18), such inferences can be accomplished through the thorough descriptive reconstruction of the architectural remains, so long as the architecture is considered as a part of the wider built environment. Working backward from the end product, the techniques (or, more generally, activities) employed in construction must first be identified. Identifying the techniques reveals part of the behaviour of the builder(s) and from them it is possible to glimpse the reasons for certain behaviours in construction. Add a diachronic comparison of the building techniques and the behaviours of builders are fleshed out as the reactions to certain stimuli. Researching the behaviours via the archaeological, architectural evidence reveals some of the wider influencing factors and perhaps even the builders' perception of the built environment.

2.1.2 Behaviour

In order to determine the wider changes to architecture in the archaeological record, it is necessary first to recognise the processes by which behaviours are distinguished using archaeological evidence. As witnessed in the discussion of Rapoport's EBR theory (see subsection 2.1.1), understanding the reasons for architectural form and function (and changes to it) results from a programmatic analysis of human behaviour and the stimuli affecting the builder(s). This study therefore operates on a number of behavioural theories, which are explained in this subsection. Despite the outline of theory here, the social theories on human behaviour are complex, filling countless books with explicit psychological and sociological detail. Unfortunately, this subsection cannot be so long and must accordingly be based on the more typical theories that form the basis of behavioural archaeology.

Behaviour can be broken into two intermutual categories: individual and group (commonly described in anthropology as individualism and collectivism, respectively; Segall et al. 1999: 206–214). Individual behaviour is a term that describes a pattern of actions made by the individual, either with specific qualities (i.e. in response to certain stimuli, as in sociology's "drive model") or as an overall documentation of individual actions through time, as in psychology (Jabes 1978; Kimble 2000). Group behaviours are similarly defined: they are the patterns of actions of a defined group of individuals (Emirbayer and Johnson

2008: 4; Kirst-Ashman 2007: 45–46). They are also representative of patterns of individual actions, though the pattern is inclusive of more than a single person and may indeed include collective actions (depending on whether wholly collectivist action is possible; e.g. McPhail 2006).

Group behaviour is significantly more complex than individual behaviour in a number of ways, especially in group formation and group dynamics (e.g. Kirst-Ashman 2007: 47–77). Sociologists and other social scientists agree that individuals in a group act differently depending on the composition of the group (Aguirre et al. 1998; Erchak 1992: 32–54; Kirst-Ashman 2007). Thus, an individual in a group may adjust their actions to fit group behaviour regardless of their own previous individual behaviours. The pressure to conform in a group is highly variable and based upon a system of influence by which social pressure and conformity are processed by an individual (Zollman 2010). Socio-cultural influence on individual action is therefore a major complexity in understanding behaviour (particularly with regard to the maintenance of traditions) and is discussed further in the subsection 2.1.3 in the context of changing behaviour.

It is important to note that in archaeology there is rarely enough data to collate a respectable dataset of the individual actions of a single person to offer any insight on distinct, individual behaviours (which is Binford's (1979: 259–260, 1983a: 215–216) reasoning for a systematic, top-down approach). While examples of individual action exist, without explicit evidence it is nearly impossible to trace enough of an individual's actions with material evidence to describe fully the behaviour of a single person.[3] Production, use and abandonment of materials reveal only a fragmentary picture of individual behaviour but when these fragments are combined, the diagnostic pattern that is group behaviour appears.

Diagnostic group behaviour of the sort revealed in material evidence is best comprised of evident techniques (i.e. techniques of creation, techniques of use and techniques of destruction). A technique is the product of a repeatable group of actions that seek the same end goals – a distinctly specific form of learned behaviour.[4] Because these specific, learned behaviours are repeatable, it is possible to create a definable dataset essential for the comprehension of creation, use and destruction in the material evidence. Moreover, the specificity of their end goals and the resultant, archaeologically-evident products (i.e. materials) can be more accurately interpreted compared to other, less-specific actions and broader behaviours that do not create a recognisable pattern (Bleed 2001).[5]

Wider behavioural understanding in archaeology is thus the result of interpretations of specifically-defined, learned behaviours with a demonstrable pattern of material production. Narrowing the scope from unspecific group behaviours to these more specific, learned behaviours (techniques) thus restricts the investigation of behaviour to the study of the creation, use and destruction of quantifiable end products (material evidence). From this narrower scope, it is possible to add temporal perspective, whereby the

3 The Beazley Method and its specific reference to Attic painters is a good example of the use of archaeological evidence to establish an individual's actions. Yet, even the Beazley Method is neither without error nor on the level of the individual (Metzger 1987; Smith 2005).

4 Defining techniques and skills as learned behaviours in archaeology has long been argued (at least since Binford's proposition of middle-range theory where the products of repeated activites are considered as evidence of overall behaviour; Binford 1978a: 358–360, 2001a; Kosso 1991: 622–623; Tschauner 1996: 3–5), typically in discussion of early prehistoric technological adoption and change. Over the last two decades, Bleed (2008), Dobres (1999; Dobres and Hoffman 1994) and Roux (2003) have been at the forefront of the discussion. Between them, the concept of variation in skill, social influence and the introduction of dynamic systems have been argued for as a key to understanding technological change in prehistory. The effect of their work has been twofold: to archaeology they applied anthropologically based methods for understanding technology and technological change developed in the late 1980s and early 1990s by those such as Lemonnier (1986, 1996) and Pfaffenberger (1988, 1992) and broadened the narrow, technology dominated reasoning for change via the administration of postmodern concepts of human behaviour.

5 For the word 'technique', significant terminological differences (mentioned in more detail in the Glossary) appear throughout archaeological literature. In this book, because of its focus on architectural technology, the word 'technique' has been used. Its use is not particularly common. Instead, depending on the type of research conducted, variations on the word 'technique' are used, sometimes revealing the degree of skill of the artefact's creator or the context of the artefact within an assemblage. Bleed (2001) perhaps best recognizes the overall theoretical similarities between terminologies.

changes to actions over time are discerned in a comparison of techniques from different times. The results of these comparisons can be used to analyse the apparent transitions to wider group behaviours.

Finally, it is important to note transform processes in the investigation of behaviour. As Schiffer (1988: 469–474) explains, material evidence, once it has reached the archaeologist, is often the product of cultural and natural transform processes (c- and n-transforms, respectively), whereby, prior to and after deposition, materials are changed from their initial purposes and uses. Multi-generational cultural materials (e.g. structures) are therefore not necessarily used in the same ways as intended upon creation. In particular, transform processes can radically alter how archaeologists perceive techniques used in building creation, as evidenced by the archaeological interpretations of Grasshopper Pueblo and Broken K Pueblo in the American southwest and Fournou Korifi on Crete (Reid and Whittlesey 2005; Schiffer 1975a, 1985: 22–23; Whitelaw 2007). Attention to these later transform processes has caused some of the interpretations given in this book to differ substantially from the existing ones.

2.1.3 Traditional, habitually innovative and actively innovative behaviours; the process of changing behaviour

Since behaviour consists of a pattern of actions, noticeable changes to behaviour (often explained as a reaction to explicit catalysts) result from the appearance of new or different actions that break from previous patterns in the chronology. Human actions, as with behaviours, are the result of a complex system, defined within a narrower scope by (primarily) cognitive functions (D'Andrade 1995: 231–232).[6] In this work, the system of action is based on the dual-process model and on the sociological works inspired by Bourdieu's (1984, 1977, 1998, 1990) Theory of Practice and supplemented by Giddens' (1986, 1979, 1984) concepts of structuration. This is by no means the only way of conceptualising human action but is instead one of the more common forms of behavioural theory for motivation in archaeology (and is well-critiqued by Dobres and Robb 2000; also, Dornan 2002).

A dynamic, constantly updated theory, the dual-process theory states that there are only unconscious (Type 1) and conscious (Type 2) actions (Allen and Thomas 2011: 109; Deutsch and Strack 2006; Evans 2010a, 2014; Evans and Stanovich 2013; Stanovich 1999). In fact, in psychology there is a recent movement, particularly in the cognitive branch of the study, to dismiss the role and importance that actions based on conscious reflection have on human behaviours, stating instead that humans typically act intuitively (most outspoken of which is Dijksterhuis et al. (2007: 52), although Allen and Thomas (2011: 115) argue that the creative thinking process uses both Types 1 and 2 throughout; also Bargh 1997: 52; Baumeister et al. 2011: 332; Wilson 2002: 107).[7] The dual-process theory does not leave room for actions resulting from the subconscious, which makes the distinction between habitual and choice-based action (a mainstay of Bourdieu's (1977: 72–73) presentation of behaviour) a distinct split between the unconscious and the conscious (a split ultimately critiqued by Noble and Watkins (2003)). Despite this hard divide, it is clear that the increased importance of behaviours resulting from the unconscious has caused renewed interest in the differences between innate and acquired forms of unconscious action, the acquired form of which is discussed herein.

6 It is important to note here that there is a form of unconscious action that falls outside of this system. Although passé in modern philosophy, what is colloquially called 'instinct' bypasses the complex cognitive system of action altogether and is generally the result of stimuli that provoke an unconscious action (Baumeister et al. 2011; Evans 2008; Herrnstein 1972). By definition, instinct or, more formally, innate unconscious action operates outside of learned behaviour and therefore is not relevant to this study, which seeks to interpret techniques.

7 Furthermore, the term subconscious was originally used here in this research but since it is seemingly an out-of-date leftover from psychoanalysis and psychopathy (at least where dual-process theory is concerned) it has subsequently been dropped (e.g. compare Hilgard (1980: 20) and Allen and Thomas (2011)).

The system of action, loosely defined by the dual-process theory and sociology, is as follows. Stimuli start the system of action and stem from an unending procession of motivators continuously affecting the agent (Baumeister et al. 2011: 333–336). These stimuli each have a kind of nature (e.g. political, economic, social) and references to these natures will occasionally be made within this book but they are merely meant as representative, not as defining. Stimuli that begin the system of action are inputs in the causal chain that were originally outputs themselves resulting from earlier actions or processes by the individual, by the group/society or by the environment (Bandura 1977: 192–193).

The system of action begins with a stimulus, sparking the need for action. The individual then (generally unconsciously) perceives the stimulus, regardless of its nature, through a mesh of interwoven, influencing factors (described individually in cognitive anthropology as a "schema"; D'Andrade 1995; Strauss and Quinn 1997; Vaisey 2009). Schemata, similar to the influencing factors described by Rapoport (2000) in EBR, act as filters through which the individual agent determines the relevance and bearing of the stimulus in relation to his or her culture. Schemata have similarly descriptive characteristics to stimuli. Yet, in contrast with stimuli (which are specific, definable and sequential input values), schemata are vague, fluid and omnipresent variables (D'Andrade 1995).

Following perception, the stimulus is interpreted against habitus. Habitus (akin to yet kept separate from the schemata here due to their structural nature) is (at least in part) an engrained form of behavioural dispositions within the cultural apparatus (Bourdieu 1977: 72). A sort of internal, amorphous and unconscious cultural moderator, habitus dictates to every individual the accepted cultural norms, including ways of acting. Upon its interpretation against habitus, a stimulus is typically resolved in an optimal system in one of three ways:

1. If the established habitus offers a solution (via the resultant action) to the stimulus, then a habitual action is born – except in the case outlined in point 3, below.

2. If the stimulus requires a solution that is not explicitly part of the established habitus but is also, following its perception through the schemata, of a relatively negligible value, then the stimulus is unconsciously denied or ignored and no action is made.

3. Finally, if a stimulus is recognised by the agent as significant following its perception through the schemata, then, regardless of a solution from the established habitus, the resultant action is dependent on conscious choice (Bourdieu 1977, 1990; Giddens 1984; Haugaard 2008; Searle 1995).

This third path of stimulus through the habitus is perhaps the most complex (and ultimately controversial; Noble and Watkins 2003) since it is, by necessity, determined by agency (Haugaard 2008: 193). If a stimulus achieves conscious awareness or reflection, then the individual agent must make a choice that is reliant on context and how well a solution from habitus resolves the stimulus.

Three primary outcomes are possible from the conscious choice. The individual chooses either to act in line with established habitus or to resolve the stimulus using a solution that operates (at least partially) outside of habitus (Crossley 2001: 97, 111–112; Ermakoff 2010). Indeed, the decision to simply not resolve the stimulus is equally feasible (Albarracin et al. 2011).

Two different types of action are therefore possible based upon this system of action: habitual actions and choice-based actions. As in all habitual actions, a choice-based action may actually be (and according to Bourdieu (1990: 52–55) and Crossley (2001: 112) is usually) in line with the expected behaviour of established habitus.[8] However, the conscious choice to act based on the culturally dictated norm is distinct from the unconscious nature of habitual action. Such choice-based action adds a separate and distinct form of agency – a conscious acceptance of, essentially, tradition (Crossley 2001: 111; Noble and Watkins 2003).[9]

Innovation in behaviour begins first within this system of action. For change to occur, an action must respond to stimulus in a way that is different from past behaviour. Within the system of action, habitus is (apart from choice) the most significant factor in discerning whether the resultant action adheres to the norm or breaks from it (Crossley 2001: 96, 111–112). More complex than simply the culturally standard behaviour, habitus prescribes a tacitly agreed upon way for acting based upon underlying social traditions and cultural values (Bourdieu 1977: 81, 1990: 53–54; Dornan 2002: 305–306; Gartman 2007). It thereby promotes traditions and is the primary force preserving group behaviour (Barrett 1994: 13–14; Bourdieu 1977: 167, 1990: 56–59; Osborne 2008: 283–284). Acting according to the habitus, more often than not, will maintain traditional behaviour, meaning that individual habitual actions are usually not a factor in change. Essentially, choice-based actions that break from the ways of the established habitus are typically the progenitors of behavioural innovation.

Behavioural innovations are the descriptive value of the change away from behavioural tradition and can be split into two categories: active and habitual innovations. Active innovations describe shifts in behaviour that usually occur (relatively) quickly. In individual behaviour, an active innovation stems from the establishment of choice-based actions that sharply break from the ways of the established habitus.[10] In group behaviour, active innovations appear where a demonstrable portion of the group has consciously chosen to act in contrast to traditional behaviours (Archer 2010; Burns 2007: 469). This often requires a climate of innovation, where individual actors are encouraged by the society to reject the norm (Scott

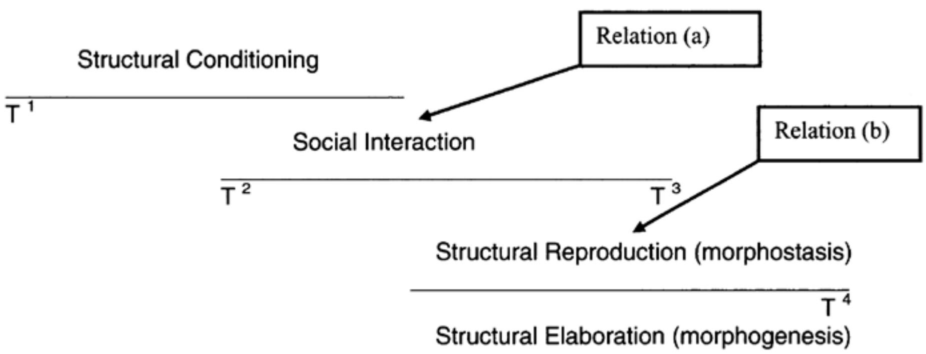

Figure 2.2. This sequence of morphogenesis in cognitive structures (e.g. habitus) outlines how the individual or the group alter the established habitus. 'Relation (a)' is the social conditioning on the agent and 'Relation (b)' is the unconscious or conscious decision to reproduce or elaborate upon the existing structure (Archer 2010: 275).

8 Bourdieu's conception of habitus has long been considered deterministic. Jenkins (1982, 1992: 61, 110–115) notes that Bourdieu's work, in its objectivist and structuralist tone, inevitably restricts the agent to act within or according to the habitus. Some, such as Crossley (2001) and Noble and Watkins (2003), revise Bourdieu's work, allowing the general Theory of Practice, including its habitus-determined structuration, to account for agency outside of habit via habituation.

9 Bourdieu (1977: 87) distinctly separates the habitual actions of the agent from intention, wherein awareness and even reflection upon habitual action does not preclude one from acting habitually.

10 The concept of a type of individual behaviour that is an "active innovation" directly rejecting habitual structures is a more recent addition to the Theory of Practice. The newer concept stems from a reaction in the early 1990s to the heavily deterministic roots of social theory from whence Theory of Practice grew. Giddens' (1986) work, in particular, supposed that the individual had far more agency to act outside of predetermined structures, changing the term 'habitus' to 'practical consciousness'. The Theory of Practice has slowly been adjusted to suit this new direction.

and Bruce 1994). Schiffer (2005) has also pointed to the specific invention processes associated with any widespread instigation of technology-driven active innovations.

Habitual innovations, on the other hand, are the product of a far more complex process. Put simply, they are the product of changes to the habitus. The process of habitus change is reliant on contextual change, where the system of acculturation and the codification of cultural norms (the "structured structures") gradually respond to the impact that active innovations and the progressive alteration to the perceived collective history of the group have on society and the categorisation of group affiliation (Bourdieu 1990: 54–60; Gartman 2007: 391–392). This change to habitus results in changes to the culturally accepted way to act, too. Over time, then, certain habitual actions are gradually modified. While these changes may not be apparent to the individual at any given time, it is visible from a diachronic perspective (Archer 2010; Bourdieu 1990: 60–61). As a result, the changes witnessed by habitual innovations are gradual and more easily seen in group behaviour than in individual.

The underlying system that generates action is crucial to the overall behaviour of both the individual and the group. Both the maintenance and change to behaviours are products of the cause-and-effect nature of individual action, from which comes the supposedly reactive character of behaviour (Bourdieu 1990: 56–57; Dybicz 2010; Haugaard 2008: 193; Kimble 2000). The irregularity of agency and individual choice promise that any archaeological investigation of behaviour based on those factors is nearly impossible. Instead, causal stimuli and the various schemata of perception are the values and variables in the system of action that are more likely to be observed through analysis of archaeological evidence (Schiffer and Skibo 1997). Some of the habitus can be seen using diachronic analyses that recognise not only the maintenance of traditional behaviours but also the gradual changes to them. Uncovering these values and variables in the system of action allows for an archaeological interpretation that more accurately reproduces the original behaviours of the target culture.

2.1.4 Conclusions

The use of theory rooted in the study of behaviour in connection with the establishment of certain forms of architecture is a primary way of perceiving how and why architecture is created, used and destroyed. Behavioural theories such as the EBR demonstrate the usefulness of behaviour-based interpretations of architecture since they indicate specific, non-technical qualities of structural construction. In essence, behavioural theories explain the tenuous relationship between form and function.

The recognition of behaviour, in addition to each of the operations within the creation of the pattern that behaviour represents, can lead to a fundamental understanding of the motivators and influences that produce the architectural product. Recreating the system of action, wherein the essential components of the function are present and accounted for in the description (i.e. the initial stimulus, the schema, the habitus and choice), can reveal the underlying reasons for change to behaviour. A description of behaviour along with an outline of the specific ways that the behaviour changed or remained the same (i.e. as a habitual or an active innovation or a tradition) can, when in comparison with other behaviours, replicate the causal system that results in certain products (such as buildings).

These anthropological theories can be applied to archaeological architecture, albeit in a slightly reformed manner. As opposed to witnessing the process of building first-hand, a system for recognising the actions through completed architecture is necessary. Furthermore, perhaps due to the inverse nature of the archaeological perception of the system of action (from product to stimulus rather than vice versa), the scope must be widened beyond the individual to the group. This widening, out of necessity, cannot provide as rigorous an understanding of the agency of a builder (i.e. individual agent) but does allow for more accurate descriptions of behaviour and the overall, established behavioural norm.

In all, the behavioural theory that is described here and that underlies the research in this book best recognises the inherent value of the techniques employed in Etruscan architecture. With the focus on building techniques, the theory also supports the main research questions regarding the reliability of the current narrative on the changing architecture of Etruria from 800-500 BC. Through my research I have sought to understand Etruscan building techniques not as a facet of a material progression but instead as representative of learned behaviours or, more accurately, a pattern describing a causal system of actions.

2.2 Methods

In practice, the behavioural theories outlined above and used in this book are reliant on the demonstrable establishment of patterns of learned behaviours. In the case of the architecture discussed within this research, these learned behaviours (techniques) are best recognised in the remains of structural features. Therefore, to investigate architectural change in Etruria using behavioural theories, the evidence must be analysed in order to distinguish any likely, comparable patterns of action over time. Specific methods for identifying and interpreting building techniques were used in this research and are described in this section.

2.2.1 Identifying Techniques

There are three methods (descriptive reconstruction, the *chaîne opératoire* approach and comparative analysis) used to identify and interpret building techniques in this study. This subsection outlines the first: the identification of techniques through the descriptive process. Identification of the building techniques from archaeological evidence is necessary to form broader interpretations of Etruscan architecture. The following method aims to identify not only which techniques are likely to have been used by Etruscan builders but also which techniques are not apparent in the evidence and can therefore only by hypothesised.

As described later (see section 2.4), many of the important sites for early Etruscan domestic architecture were excavated over 30 years ago and the excavators' interpretations of the evidence has since formed the groundwork for how those sites are understood. The common perception by many of these excavators, that materials are assumed to be synonymous with technique (as opposed to simply evidence for possible techniques), has also become part of the wider concept of Etruscan architecture (see section 6.1). A re-identification of techniques is therefore the crucial first step in creating a more objective and accurate dataset.

In the literature, identification is often unintentionally assimilated with the broader interpretations. As part of the re-identification process, it is necessary to deconstruct this assimilation. I do not deny that identification and interpretation are inexorably linked in archaeology (e.g. Hodder 1991) as many features or artefacts associated with a structure undoubtedly bear immediate interpretive connotations (such as terracotta tiles and roof covering or beaten earth and floor preparation). Yet, beyond these obvious contextual assumptions, interpretation is considered here to be the more explicit evaluation of the processes behind a technique (i.e. how and why a technique was used), while identification is associated with defining a technique in context (i.e. what, where and when a technique was used).

To this end, distinct methods are used for identification and interpretation, respectively. A simple process of descriptive reconstruction (following the basic outline of description in middle-range theory; Binford

1977, 2001a; Gardin 1967; Kosso 1991: 622) was used to identify techniques, the process and results of which are described in the next three chapters. In the descriptive process, evidence was loosely categorised based on characteristics of formation, as well as temporal and spatial contexts (e.g. Barceló et al. 2002).[11] Most evident in Chapters 3 and 4, these categories distinguish visible characteristics of use as the primary indicator of technique as opposed to just their material composition (Schiffer and Skibo 1997: 29). Since techniques are learned behaviours, evidence for comparable, visible characteristics between different structures indicates physical evidence of similar behavioural conditioning and common needs of the builders.

For instance, the physical characteristics of channel-cut wall footings, although often different in size and style, are defined by similar physical characteristics: bedrock-cut channels in the foundations of structures. Their purpose, to effectively transfer the building stresses on the walls into the ground, is achieved using similar methods, too. It indicates that, besides being similar in appearance, they attempt to fulfil the same goals. In this way, building techniques are similar to other objects and can be grouped based on visible characteristics, purpose and methods for achieving that purpose.

Broadly speaking, interpretation follows identification through a process of comparative analysis. The variables compared in analysis are usually techniques with similar purposes that are achieved in wholly different ways. For example, bedrock-cut channels and ashlar stone socles, although different in time and material, are both wall footing techniques. Comparisons of these techniques, which appear to be so dissimilar, reveal the reasons for the use of certain techniques (such as how wall footings were used to transfer the stresses of the structure into the ground). Similarities suggest the relative importance of certain features of technique, while differences point out where external stimuli and socio-cultural schemata likely affected behaviour.

However, the comparison of the end products of each technique only works to establish similarities and differences in the ultimate purpose of the technique, with the assumption that the products (i.e. structural evidence) as we see them now retained their initial intent from their creation until the present day. To prevent distorted data, the comparative analyses used in this study thus needed to take into account the effects of c- and n-transforms on the evidence, as well as any interpretations based therein. To do so, the interpretative process includes a stage of explanation of the operational sequences in manufacture, the so-called "*chaîne opératoire*".

2.2.2 Working from concept to abandonment; chaîne opératoire and architecture

First outlined by Leroi-Gourhan (1993) in 1964, the *chaîne opératoire* plays a key role in anthropology and archaeology. Used to identify and describe the processes behind technology and material culture, Leroi-Gourhan (1993: 230–231) recognised the responsive nature of actions over time and that learned behaviour results from a sequential process of trial-and-error. He identified that *chaînes opératoires* are formed on each level of human consciousness. Learned behaviour in a rational unconscious form is evident in many animals and in an irrational unconscious form it is evident in most. Yet, humans are a rarer species that have progressed to a point of conscious learned behaviour.

11 The breakdown of different techniques by characteristics of formation and context (e.g. Gardin 1967), in addition to following a descriptive analysis of action via temporal and spatial contexts as outlined by Barceló et al. (2002), indirectly fulfils components of Schiffer's behavioural chain analysis (Schiffer 1975a: 106–112; Schiffer and Skibo 1997: 30). Loosely followed throughout this book, in order to sustain the interpretations of the techniques (and the wider society based thereupon), the various components of activity comprehension often supplement the more abstract "high-degree" descriptive reconstructions of the past (Kosso 1991; Schiffer 1988: 462).

Chaîne opératoire represents the sequential chain of actions that result in a recognisable, learned behaviour (Dobres 1999; Leroi-Gourhan 1993: 231–234; Sellet 1993). The sequence of actions as a part of learned behaviour seems to be an underlying consideration of the habitus, in that the constancy of actions within a learned behaviour appears predetermined as a matter of course. However, the *chaîne operatoire* is more accurately considered a descriptive function rather than a determinant (Audouze 2002: 287). It is in fact better described as recognition of the habitual pattern (as determined by habitus) by an impartial observer (Dietler and Herbich 1998: 244–248).

Chaîne opératoire is descriptive of the process of action regulating learned behaviour. It recognises the procedural, formulaic progression of actions, allowing for predictive patterns to be understood. Establishing *chaîne opératoire* can, on the one hand, reveal certain socially- or culturally-determined influences on an end product, while on the other hand provide insight into the *raison d'être* of specific behaviours.

Leroi-Gourhan (1993: 237–264) uses both language and tools as primary examples of *chaîne opératoire*. In particular, a tool allows for humans to consciously adapt to their environment and needs as an extension of the self (Leroi-Gourhan 1993: 242–243). In itself, the tool is evident of the actions it was meant for within the operational sequence. Without any other evidence, a tool can act as a guide to specific *chaînes opératoires* since it is itself the result of a sequence of actions and is, subsequent to its manufacture, used to perform other actions (Lemonnier 1986: 154; Leroi-Gourhan 1993: 242; Sellet 1993: 107).

The work of Leroi-Gourhan and *chaînes opératoires* has thus made its way, most notably, into the study of prehistoric material culture, primarily of stone tools, where it has become inextricable from the analysis of technique and the comprehension of skill and style (Bar-Yosef and Van Peer 2009; Boëda et al. 1990; Johnson 2007; Sellet 1993; Shott 2003). Some have even developed a common method for analysing techniques through the *chaîne opératoire*, which are sometimes called the 'life history' method (Dobres 1999: 128; Walker and Schiffer 2006: 70–71) or 'design theory' (Hayden 1998: 3–11). In essence, the common *chaîne opératoire* method is a procedural way of uncovering behaviour through materials.

The archaeological procedure, as outlined by Sellet (1993), has three main steps. First, the archaeologist investigates raw material procurement, seeking to understand the local physical environment and the possible trade networks and supplies. Next, the chronological steps of the manufacture of an end product are considered, with emphasis placed on comparison of diacritical elements in artefacts. From there, a study of the finished product is conducted, whereby use, maintenance and discard/abandonment are traced chronologically using not only evidence of wear but also through a review of possible refining and re-use. Critical to this method's procedure is an intimate knowledge of the likely transform processes, developed through comparison and a detailed understanding of context (Sellet 1993: 107).

Essentially, recreating the operational sequences behind the creation of tools and their eventual use develops a more accurate and multifaceted picture of the material culture. Such a method, due to its nature, stresses environmental concerns (e.g. procurement) and technological concerns (e.g. structural integrity) when analysing an artefact. These concerns are certainly a regular (although a relatively diminished) part of the descriptive reconstruction process but the *chaîne opératoire* method emphasises them as conditions of learned behaviour, framing the 'how' and 'why' of material creation through behavioural processes that include these concerns (Dietler and Herbich 1998: 244–248).

With conscious learned behaviours integral to human operational sequences, recreating the *chaîne opératoire* also accesses some aspect of the cognition of the creator and users of an artefact. Recognising the operational sequences underlying the creation of certain tools allows for an understanding of the techniques used and the reason for their use (Bar-Yosef and Van Peer 2009: 105; Boëda et al. 1990; Cresswell 2003; Leroi-Gourhan 1993: 238–239). This understanding includes the more subtle designs of the behavioural pattern and, due to its schematic portrayal of the habitus, the *chaîne opératoire* method reveals not only the application of specific techniques but also the socio-cultural underpinnings of which they are products (Cresswell 2003).

Using a diachronic, comparative analysis between like artefacts that result from different techniques (as described previously) is more productive using the *chaîne opératoire* method. Change to behaviour over time in a description of the *chaîne opératoire* appears as an alteration in sequence (Dietler and Herbich 1998: 254). Alterations of this type are visible through diachronic comparison. Where obvious differences in sequence appear, innovation likely occurred (Boëda et al. 1990; Lemonnier 2004: 2). Dependent on the difference in time and space, radical differences in sequence suggest an active innovation whereas subtle differences suggest habitual innovation.

Thanks to its ability to distinguish techniques in this way, the *chaîne opératoire* method has seen widespread use in prehistoric tool analysis (Andrefsky, Jr. 2009: 66–68; Bleed 2001; Sellet 1993: 106–107). However, it is less often seen in architectural analyses. This discrepancy seems to result primarily from the differences in available sample and the relative sizes of the cultural objects (Ryan 2012: 33–35). It also results from a general recognition of the complexity of operational sequences of building construction when compared to the sequences of manufacture for smaller artefacts (Ryan 2012: 33–35). Taken as a whole, a completed structure is the result of several different end products, all of which are used, revised and abandoned in different ways, often over a multi-generational lifespan. Furthermore, a built structure is usually recognised as a subset feature of the cultural environment as opposed to a tool, allowing for a descriptive reconstruction of form and function in relation to other cultural materials but rarely for a comparative analysis of inherent techniques.

Despite the apparent discrepancy, a few studies have expanded the use of the *chaîne opératoire* method to architectural interpretation. According to some (e.g. Dietler and Herbich 1998; Kearns 2011; Ryan 2012; Sanders 1990), the *chaîne opératoire* method is integral to the recognition of the development of social spaces and the creation of boundaries. The traditional method for interpreting architecture, where an archaeologist typically acknowledges the relevant aspects of aesthetics and style, is certainly essential to evaluating environmental context. However, this common method is more superficial; it is an interpretation of the static end product that is necessarily relative (Dietler and Herbich 1998). In some cases, the common method results in a diffusionist interpretation due to this relativity (with the examples of so-called 'Orientalising' style a key component of the argument for the Etruscan adoption of Greek and Near Eastern techniques; see section 6.4). Structures are, in themselves, the end products of explicit gestures (Ryan 2012: 44). They therefore must be considered from the technological perspective of the *chaîne opératoire* to better understand the physical and socio-cultural necessities of their creation and the underlying behaviours inherent in their production.

This can certainly lead to one of the more fundamental problems with using the *chaîne opératoire* method. Most problematic of all is the necessarily overt focus on creation and initial use, as noted by Skibo and Schiffer (2008: 20–22). The unequal focus on creation and use over reuse and abandonment has been one of the primary critiques of (what is seen in the behavioural school as) the overly narrow conception of the *chaîne opératoire* by those such as Lemonnier (1992, 2004). According to Skibo and Schiffer (2008: 21–22), Dobres (2000a, 2000b, 1999), Bleed (2001), Gifford-Gonzalez (2011: 301–302) and Roux (2003: 4), unequal focus on the earlier stages of material evidence overshadows the later processes affecting our impressions of it.

Furthermore, this supposedly narrower conception of the *chaîne opératoire* method bases its interpretations of technique too greatly on the primary use of the material. This narrowing of interpretive possibilities denies possible secondary uses for materials and also has a tendency to limit the importance of socio-cultural influences on behaviour. Before the broader conception of the *chaîne opératoire* method appeared over the last decade, the method was known to produce interpretations of techniques that were rooted in practicality and tool specialisation.

Certain modifications to the *chaîne opératoire* method are therefore necessary when applied to architectural features. The basic three-step procedure described by Sellet (1993) remains the same, where the procurement, the manufacture and the use, reuse and abandonment of the cultural material are each examined. However, even this relatively broad conception of the *chaîne opératoire* method must be modified to avoid both specific problems inherent in the architectural use of the method and general, interpretive problems recognised by critics of the method.

One such modification remedies the specific problems caused by the technical complexity of a structure. Since a domestic building is the combination of separate concerns that happen to work toward a common goal, those separate concerns must first be identified, their constituent elements recognised. This book thus separates the overall *chaînes opératoires* in the building of Etruscan domestic structures between three primary concerns: foundations, walls and roofs. This bands together techniques with similar goals as part of distinct structural concerns of building. They are also arranged within this book in the typical order of construction, from the foundations to the walls to the roofs.

The wider problems with the *chaîne opératoire* method are addressed in three ways. First, attempts are made to chronicle the entire life history of each building, including the later c- and n-transforms, based on the broader versions of the *chaîne opératoire* method described by Dobres (2000b: 155–156). Taking place primarily in the descriptive, identification part of the analysis, the context, condition and make-up of the material evidence (along with a critical look at the ways that evidence was discovered) is viewed in a diachronic, non-static way. Acknowledging the reuse and abandonment of structures alters the ways certain techniques are seen, especially with regard to foundations (e.g. whether level ground was created or reused from earlier structures; see sections 3.1.1, 3.2.1, 4.1.1, 4.2.1).

Acknowledgment of the role of reuse and abandonment in structural *chaînes opératoires* is combined with the recognition that multiple interpretations of techniques are possible. In fact, in each concern (foundations, walls and roofs) the evidence is rarely so clear that a single technique can be guaranteed. Approaching the interpretative process with the intention of recognising as many technical interpretations as possible prevents the over-validation of a single purpose of the archaeological feature or artefact. Avoiding the single purpose broadens the applicability of the *chaîne opératoire* method to include secondary uses and thus more accurate interpretations of associated techniques used in the creation and use of the material (as recommended by Skibo and Schiffer (2008: 22)). A good example of the multiple purposes of techniques is seen in walls, which act as both a structural component of a building and a physical delineation of social spaces.

Finally, once individual techniques have been identified via their end products, a comparative analysis can occur between like techniques within each concern. Drawing from the concept of *chaîne opératoire* and utilising the *chaîne opératoire* method, the comparative analyses therefore first compare the operational sequences of directly relatable (via time and space) techniques and then broaden the scope within each concern (i.e. foundations, walls or roofs) to tease out evidence for technological innovations.

Combining the *chaîne opératoire* method with a comparative analysis has the added benefit of drawing out the unique qualities of structures, particularly in the completion of certain operations. Rather than offer wholly technology-based reasons for disparity between structures, the broader application of behavioural theory on the methods used here serves to reinforce socio-cultural influences. Ultimately, widening the *chaîne opératoire* method beyond the technological, as proposed by a number of behavioural archaeologists, promotes a multifaceted conception of change. In this way, the *chaîne opératoire* method is essential to the elucidation of behavioural change throughout the study.

2.2.3 Conclusions

Throughout the research for this book and as a main part of its structure, three pragmatic methods have been adopted. The first method is intent on re-establishing the dataset through a process of identification of building techniques. Following the identification of techniques based on questions such as 'what' and 'how', interpretations of the techniques used (that is, why the techniques appear in each example) are offered. Two other methods, the *chaîne opératoire* approach and comparative analysis, have been implemented so that any interpretations made in the study are as accurate as possible. These two methods are intermutual; the *chaîne opératoire* method establishes specific operations for each recognised technique and the comparative analysis reveals the contrast between techniques through time.

The methods used are meant to accomplish two things. First, they illustrate the significant differences between identification and interpretation and, in so doing, indicate how the available architectural evidence can be used to understand the underlying behaviours of builders and their society. Second, they are useful in the clarification of the behavioural theory described above, wherein they provide discernable direction and procedural order in an effort to visualise and contextualise the causal system of group behaviour. Ultimately, with these methods in place, a distinct interpretation of Etruscan domestic architecture based on behavioural changes from 800-500 BC is presented, with conclusions that also have implications for other aspects of Etruscan society.

2.3 Domestic architectural change in context

Since the majority of this book is concerned with an examination of Etruscan architecture at the level of individual buildings, it is necessary to provide a brief background of socio-cultural development in Etruria from 800-500 BC here. This background forms a critical part of environment-behaviour relations since both the environment and the creation of behaviour is heavily determined by societal and cultural stimuli. Moreover, since it is clear that architectural change did not exist in a vacuum, changes to Etruscan society and the proposed reasons for those changes are crucial to a full comprehension of changes in domestic architecture.

Therefore, this section presents a summary of social changes to Etruscan society from 800-500 BC, both in a broad sense and in relation to architecture. It includes discussions on possible stimuli for changing society, with specific analysis of the reasons proposed in the literature. The intention of this section is to provide context for the forthcoming detailed discussion of changing domestic architecture, and many of the concepts discussed here will be reconsidered in the book conclusions (see section 7.2).

2.3.1 Socio-cultural changes in the broader historical context

Evidence for societal changes in Etruria from 800-500 BC is archaeologically prominent and it is clear that many aspects of Etruscan life changed significantly over the course of a few generations. Societal changes in the Orientalising (720-580 BC) and Archaic (580-400 BC) periods have been evident from the monumental chamber tombs of the larger urban centres. However, over the last twenty years, scholars have recognised that evidence for societal changes appears in the Early Iron Age (900-720 BC). As a result, there is some debate over the broader stimuli for societal changes, primarily resulting from how the evidence is compiled and presented. Therefore, the following summary will take into account the most common methods of presenting the evidence and provide some discussion as to how those methods affect understanding of change.

2.3.1.1 Changing society in Early Iron Age Etruria

In the Early Iron Age, society in central Italy challenged the norms established over the course of the Recent and Final Bronze Age. The so-called 'Villanovan' culture represents a broad shift in the socio-cultural makeup of Etruria. The broader reasons for the socio-cultural shift are debated, with the different sides of the debate grounded in opposing scholarly traditions (Iaia 2009: 71–72). Although the extent of the differences between Final Bronze Age and Early Iron Age cultures is currently debated (briefly summarised by Riva (2010: 11–13)), evidence for change is especially prominent in funerary rituals.

Perhaps the most notable changes in the Early Iron Age have been recognised in funerary contexts. Although the term 'Villanovan' is now generally used to describe a broad set of customs and material culture throughout Etruria, originally it was used to describe a certain set of funerary rituals, including the presence of biconical, impasto urns in cremation tombs (Bartoloni 2013: 79). At the beginning of the Early Iron Age, Villanovan funerary ritual was defined by the lack of social stratification. Indeed, in comparison to north and north-central Italy (i.e. the Po Plain) where cremations similar to the *Urnenfeldern* cultures north of the Alps included weapons (Iaia 2009: 72–74), cremations in Etruria appear to have lacked burial goods that distinguished social status through weaponry. Instead, early Villanovan burials were distinguished by family or tribal grouping (Riva 2010: 30), with burial goods largely determined by gender (although not necessarily by sex; e.g. Toms 1998), age and, in some instances, social role (e.g. Sepulchre PF1 of Le Rose at Tarquinia, noted for the appearance of helmets as lids; Pacciarelli 2000: 242–250). This style of burial amplifies a tradition of so-called 'horizontal' differentiation begun in the Final Bronze Age (Riva 2010: 30).

However, the vertical differentiation of burials becomes more prominent over the course of the Early Iron Age, where social hierarchy outside of the established family or tribal grouping is made plain. Such vertical differentiation varies in appearance from settlement to settlement, but the change away from horizontal differentiation is generally conspicuous in both tomb architecture and grave goods (Riva 2010: 30–31). One of the more noticeable changes to Villanovan burials in Etruria is the gradual appearance of so-called 'hut' urns in second half of the ninth century BC (Riva 2010: 30), a phenomenon previously common further south in Latium (Bartoloni et al. 1987: 247–263; Damgaard Andersen 2001: 246). Although tombs with hut urns contain no discernible difference from the more typical biconical urns, their relative rarity (i.e. approximately one hut urn to one-hundred biconical urns) is suggestive of their importance (Bartoloni 2013: 86). In addition, greater rates of inhumation in earthen trenches (*fossa*) or, as is the case at Populonia, in chamber tombs, further indicates the growing vertical differentiation of funerary ritual.

By the eighth century BC, the vertical differentiation in funerary ritual is clear: throughout Etruria, a small contingent of graves began to contain an increased number of goods, including those from elsewhere in the Mediterranean, that distinguish them from the more common (not to mention more homogeneous) burials (Bartoloni 2013: 88–89). Of particular note is the appearance of weapons, including spearheads and swords, as well as hunting and warrior insignia (Iaia 2009: 79–90). The appearance of these distinct burials suggests that the traditional, "egalitarian" funerary ritual of the ninth century and earlier had been altered, possibly reflecting the emergence of an élite class (Bartoloni 2013: 88; Riva 2010: 30).

Settlement patterns also changed significantly over the course of the Early Iron Age. In the Bronze Age, settlements had formed gradually at both naturally defended sites and open, undefended sites (Pacciarelli 2000: 94). In the Final Bronze Age, many of these settlements, particularly those at defendable sites, grew in population and organisation, becoming village communities or proto-urban settlements (Pacciarelli 2000: 103). As early as the last century of the Final Bronze Age, previously undefended, open villages began to amalgamate into more populous defended urban centres (Leighton 2013: 134–135; Rajala 2013; Riva 2010: 11–29). Synoecism of the sort seen in the Final Bronze Age is far more prominent in the Early Iron Age to the point that a majority of the smaller, undefended settlements of the Bronze Age were completely abandoned.

As opposed to many of the Bronze Age settlements, Early Iron Age settlements often continued to be occupied in later periods (Bartoloni 2013: 79–80; Riva 2010: 13–18).[12] A majority of the Early Iron Age settlements developed into major urban centres, such as Populonia (Cambi and Acconcia 2011), and Veii (Bartoloni 2006; Ward-Perkins 1959). As a result of the later occupation, the necropoleis are generally better understood than the settlements. Nevertheless, from a compilation of the available settlement evidence and the data from the necropoleis, a number of scholars have developed interpretations of these urban centres, including how they were organised and their possible demographics.

The discovery of Area Alpha in the Area Sacra at Tarquinia, for instance, has led Bonghi Jovino (2006a: 408–410, 2010: 163–168) and others (Bartoloni 2012b: 98, 2013: 83–84; Riva 2010: 23–25) to propose that the proto-urban community of the Civita plain had developed centralised, communal rituals. Although significant for possible ritual practices in preceding periods, at the start of the eighth century BC, Area Alpha appears to have been intentionally delineated for the practice of "religious activities" by the placement of timber posts (Bonghi Jovino 2010: 165). The burial of an epileptic, albinic child with deer horns and a bronze pendant, as well as the unceremonious interments of men without grave goods, has further encouraged Bonghi Jovino's interpretation of communal rituals.

The centralisation of communities is further recognised in the distribution of surface finds at Tarquinia (Bonghi Jovino 2006a: 402–403; Mandolesi 1999: 186–192). Traditionally, based on the location of adjoining necropoleis, it was thought that proto-urban settlements of plateaux were separate entities or "villages" (Riva 2010: 23). However, based on field-walking surveys at Tarquinia and Veii, the traditional interpretation has given way to an interpretation where Early Iron Age settlements were centralised around single loci. Although it is clear that there were clusters of settlement separated by open, unsettled land, Mandolesi (1999: 213) suggests that open areas must be considered as part of a functioning, centralised settlement. He argues that open areas were intentionally separate "zones" used for outdoor activities, such as growing crops or husbandry. This interpretation is based on the relative occupation density discovered in survey, with the regular distribution of finds dating to the Early Iron Age both uniform and homogeneous.

Additionally, the surveys and excavations of Calvario, Infernaccio, Acquetta and Corneto-Sant'Antonio on the adjacent Monterozzi hillside further indicates the centralisation of the proto-urban settlement at Tarquinia. Not only were the Monterozzi settlements separated from Civita by significant open space but they also used their own, separate necropoleis (Iaia et al. 2001b; Mandolesi 1999: 213). Yet, Mandolesi (1999: 186–213) suggests that the Monterozzi settlements were indeed dependent on the settlement of the Civita plain, at least economically if not in agricultural production. The position of the Monterozzi hill between Civita and the coast, where another settlement, Saline di Tarquinia, was located, made it a strategic place for control of trade routes and the coastal plain. Interestingly, at the end of the eighth century BC, a reorganisation of the urban settlement at Civita may have been the root cause of the abandonment of settlements on Monterozzi and their eventual reuse as necropoleis.

12 Although many Bronze Age settlements were abandoned in the ninth century BC, a number of the larger Etruscan urban centres were settled in the Final Bronze Age, if not earlier (Leighton 2013).

Proto-urban settlements of the Early Iron Age grew in both population and in size from their Bronze Age counterparts, with smaller outlying settlements gradually concentrating at defensible sites. Alongside the concentration of population, the apparent centralisation of both ritual and economics changed the traditional settlement patterns of the preceding periods. Recently, scholars such as Mandolesi (Iaia and Mandolesi 2010; 2014, 1999; Mandolesi et al. 2012) and Pacciarelli (2000), argue that the rise of these proto-urban centres transformed society and culture, creating organised, communal zones of both ritual and outdoor activities within settlements, as well as establishing local control of trade and agricultural production. Sudden centralisation, as opposed to ethnogenesis (as initially proposed by Pallottino (1975) in 1937), resulted in the shift in Early Iron Age society and the characteristics attributed to the Villanovan culture.

While the concentration and centralisation of settlements is generally recognised to have played an influential role, some scholars, such as Bartoloni (2012a, 2013), Camporeale (2000) and Riva (2010), suggest that the emergence of Villanovan culture results more from the unification (based upon a common material and ritual culture) of a pre-existing ethnic group centred in Etruria than on the sudden centralisation of populations. As evident in funerary contexts, the growing economic interaction with other regions and the (possibly subsequent) rise of an élite class based on trade and exchange progressively created an urban society unlike those of the previous periods (Bartoloni 2013: 91; Riva 2010: 5–6). The Villanovan culture in this interpretation is the result of a gradual increase in complexity from the loosely affiliated ethnic group of the proto-Villanovans into early states (Iaia 2009: 71–72; Riva 2010: 6).

Despite the debate over the root cause of the emergence of Villanovan society, it is clear that there was a gradual shift in the makeup of societies in Etruria during the Early Iron Age. This shift included a number of changes to both material culture and settlement patterns. Such changes indicate both growing socio-economic competition for resources and an alteration of traditional rituals and socio-cultural roles. Ultimately, it is likely that the stimulus for the gradual shift in society may be directly related to the concentration of populations and the centralisation of socio-economic control of resources.

2.3.1.2 Changing society in Orientalising and early Archaic period Etruria

The debate over what instigated the rise of Villanovan society affects the discussion of later societal change in the Orientalising and early Archaic periods. On the one hand, those scholars who subscribe to the ethnogenesis of Villanovan culture typically recognise the interaction with foreign cultures and the appearance of élite goods as a progression in the increased complexity of the Etruscan ethnos. On the other hand, those scholars who see the concentration and centralisation of populations in the Early Iron Age as the stimuli for societal change often continue to recognise the role that centralised, organised communities play in the further changes in society. Certainly, the juxtaposition presented here is oversimplified, especially when one considers the general consensus that the Etruscan culture did not emerge as a result of a strict adoption of foreign ideas. However, this division in scholarly discourse is relevant because it impacts the presentation of evidence (i.e. what type of evidence is viewed as consequential), which in turn alters the conception of the society and, most important to this study, the built environment.

The Orientalising and early Archaic period material evidence indicates an efflorescence of the ideas developed in the Early Iron Age (Riva 2010: 39–40). Further changes to the material culture in the Orientalising period, particularly in funerary contexts, have traditionally marked the end of the Villanovan culture and the beginning of the Etruscan culture. Significantly, the extent of interaction, exchange and trade between the Etruscans and foreign cultures throughout the Mediterranean (but particularly those cultures from the eastern Mediterranean, including the Phoenicians, Greeks and Egyptians), grew at the end of the eighth century. Although the extent of its effects on Etruscan society is debated, it is clear that the increased foreign interaction is a factor, either as a stimulus or as a result, of societal change.

As with the preceding periods, the primary source of material evidence comes from funerary contexts. However, Orientalising and Archaic period material evidence has also been discovered in other contexts, such as shipwrecks (e.g. Bon Porte, Pointe du Dattier and Cap d'Antibes; Turfa 1986: 75–76), religious structures/temples (e.g. Edificio Beta at Tarquinia, Building Alpha at Roselle, Belvedere Temple at Orvieto [Volsinii], Temple B at Pyrgi; Bocci Pacini et al. 1975: 21–33; Bonghi Jovino 2010; Izzet 2007: 122–142; Serra Ridgway 1990) and habitations (see section 2.4). These other sources of evidence have traditionally acted as supplemental to the story told by the funerary evidence (e.g. Barker and Rasmussen 1998: 117–134; Cristofani 1985; Sannibale 2013: 105–106), although recent interpretations of the material evidence are more balanced (e.g. Cerchiai 2012; Perkins 2005: 114–116).

During the Orientalising period, previously unseen funerary practices emerged in Etruria, defined not only by the presence of new grave goods but also by the changes in burial method, tomb architecture and iconography. Most recognisably, the change in the foremost form of burial from cremation to inhumation at all levels of society (in Populonia in the ninth century BC, southern Etruria during the eighth century, and parts of northern Etruria by the seventh century; Barker and Rasmussen 1998: 121–122; Bartoloni 2013: 87; Riva 2006: 123) was combined with a multigenerational elaboration in the architecture of larger tombs.[13] By the seventh century, these larger tombs (which were large enough to house multiple interments and were often reused by members of the family or tribe, possibly reflecting older traditions; Iaia 1999: 121–122; Riva 2006: 116), began to contain images of prestige, including banqueting, the house, weaponry, chariots and, in some cases, thrones (e.g. the Tomba della Cinque Sedie at Caere; Barker and Rasmussen 1998: 127–128).

Riva (2006: 120–125) argues that the image of the house, in particular, is a significant element in the changes to funerary ritual. Although others (e.g. Bartoloni et al. 1987) have noted the presence of hut urns

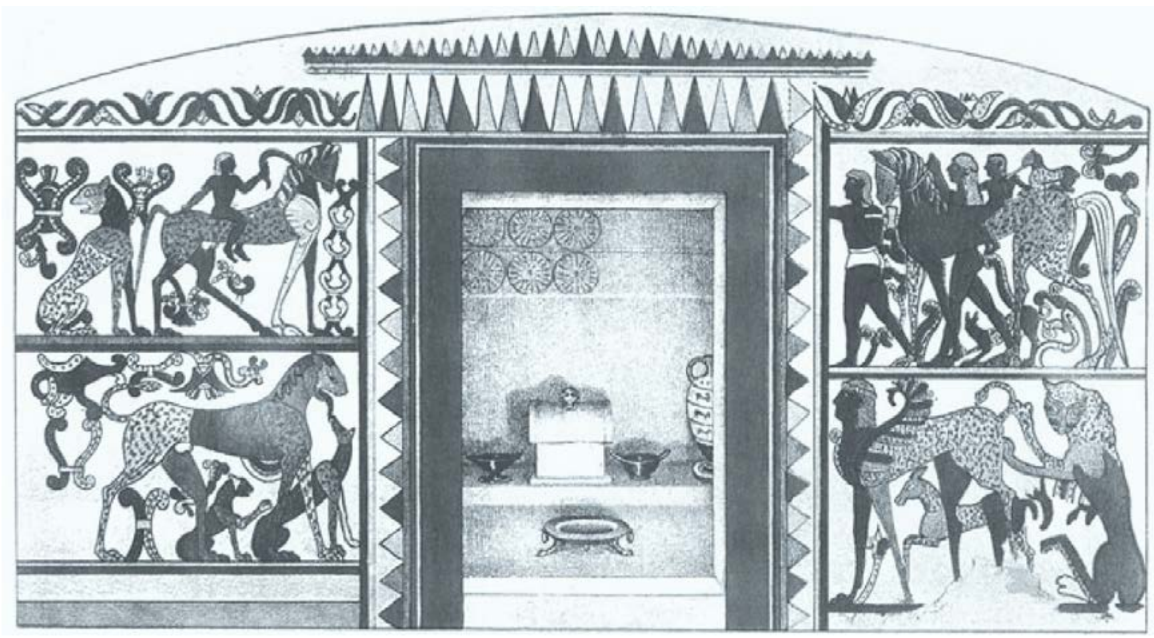

Figure 2.3. Tomba della Campana at Veii based on Canina's (1847: pl. 31) inscription (Leighton 2005: 376).

13 Despite the prevalence of inhumation burials in Etruria by the seventh century, there are outliers where cremation remained dominant, such as the Archaic canopic urns of Chuisi (Leighton 2005: 363).

as a key element in the vertical differentiation of Villanovan burials, Riva notes that the continued use of house motifs in later tombs is suggestive of the role of the house in the political prestige of the individual in both death and life. The use of the house in tomb architecture, as identified by Riva (2006), fits broadly into the wider depiction of the emergence of the hierarchical family or tribe as a critical component in the shift from Villanovan to Etruscan culture (Colonna 1986: 395; Izzet 1996). Some, such as Colonna (1986: 395) and Torelli (2000: 196–197), have even suggested that the beginning of the system for establishing hierarchical family relations seen later in central Italy, most notably in the Roman *nomen gentilicium* and the *pater/mater familias*, is on display in this household iconography.

In addition, metal vessels and *bucchero*, not to mention imported Greek ceramics (Turfa 1986: 69–70), became common in the larger tombs with increasing regularity over the course of the seventh and sixth centuries BC (Barker and Rasmussen 1998: 132–134). Banqueting grave goods, particularly with foreign (i.e. Greek and Near Eastern) iconography stand out (Berkin 2003: 119–127; Riva 2010: 142–176; Turfa 1986; Warden 2008). At the beginning of the seventh century, the use of foreign iconography extended to tomb paintings, such as the Tomba della Campana at Veii (Riva 2010: 59–60). Many scholars (Barker and Rasmussen 1998: 136; Ridgway 1988: 654–655; Turfa 1986: 69–71) suggest that foreign artisans, rather than local, were responsible for the introduction of foreign iconography, with some suggesting that these foreign artisans had even introduced new technologies to the Etruscans, such as terracotta tiling (Torelli 1985: 25–32).

From the differentiation in wealth witnessed in grave goods and tomb architecture, it is clear that funerary ritual was drastically transformed during the Orientalising period. Although the vertical differentiation of grave goods is apparent in Early Iron Age contexts, throughout the Orientalising period and into the early Archaic period, the display of wealth via foreign goods and prestige objects, not to mention the elaboration of tumuli, starkly distinguishes the élite classes from the rest of Etruscan society. Generally, the change in funerary ritual is perceived as a self-determined alteration to social custom by the élite class (Naso 2001a; Riva 2006), possibly as a reflection of their growing influence over politics or local economies (Barker and Rasmussen 1998: 123; Torelli 2000, 2001a). Some argue that this self-determination derives from the growth of a Mediterranean-wide culture of trade, where local and regional élites throughout the Mediterranean displayed their power and wealth through a newly shared culture of authority and entitlement (Perkins 2005: 115; Riva 2006).

Aside from funerary evidence, elements of settlement and urban development also suggest that society had changed significantly during the Orientalising period. The synoecism of proto-urban communities that defined the Early Iron Age resulted in the growth of several larger urban centres. In the Orientalising period, it is likely that urban centres, such as Tarquinia, Caere and Veii, had begun to reorganise, as evidenced by the centralisation of ritual spaces in permanent structures (e.g. Edificio Beta at Tarquinia and the Piazza d'Armi at Veii; Bartoloni and Acconcia 2012; Bonghi Jovino 2010) and the further separation of necropoleis from growing residential areas (Leighton 2013: 138–140; Steingräber 2001a: 8, 10, 17). By the early Archaic period, the shift toward centralised urban communities that had begun as early as the late Final Bronze Age were fully realised. As early as the beginning of the seventh century, major urban centres, such as Tarquinia, Caere and Veii, likely controlled local and regional production and trade, if not politically, then economically.

Nijboer (1998) produced one of the most important studies on both the rise of centralised, urban communities and the increased specialisation of material culture in the Orientalising period. He argues that the growing complexity in Etruscan society from 800-400 BC, including social stratification, urbanisation, early state formation and the creation of political systems of ownership were the result of growing populations in urban centres (Nijboer 1998: 238). This population growth in urban centres, according to Nijboer (1998: 238–239), resulted from economic centralisation, which occurred naturally around resources, natural harbours, sanctuaries or "homesteads of the élite". He further identifies social and political centralisation as the origin of the differences between the proto-urban settlements of the Orientalising period (and before) and the urban settlements of the Archaic period. Those centres that had sufficiently centralised became primary centres, such as Populonia and Caere, while those that had "insufficient social and political centralisation", such as Poggio Civitate and Acquarossa, declined or were abandoned (Nijboer 1998: 239–240). To become sufficiently centralised, Nijboer mentions a number of elements, including the nucleation of industry, the internal administration of economics and politics by élite families and the improved control of trade and import both locally and regionally.

Cerasuolo has recently studied the possible extent of control by the larger urban centres. Based on the presence of what he calls "fortifications and defensive structures", Cerasuolo (2012: 122) suggests that the extent of regional control held by urban centres can be understood based on smaller, defensive settlements and structures near or on known trade routes. In particular, he has focussed on defensive structures in the Monti della Tolfa due to their significant geological and geographical location between Caere and Tarquinia. While a number of the settlements that he recognises as under the hegemony of Caere and Tarquinia were settled prior to the Orientalising period (e.g. San Giovenale, Luni sul Mignone and Castellina del Marangone), he argues that the appearance of defensive structures at these settlements (as well as the growth in local resource procurement and the use of iconography that reflects the styles of one major urban centre over another) signals the growing control of larger urban centres in the Orientalising period. However, Cerasuolo is careful to point out that it is difficult to ascertain not only which of the smaller settlements were under the influence of the larger urban centres at any one time, but also the method of control, whether political, cultural, economic or otherwise.

What develops from the centralisation of populations in larger urban centres clearly reflects the material evidence found in funerary contexts. Regardless of the stimuli for changing society, the seventh and sixth centuries BC are characterised by growing political or economic control (particularly concerning resource exploitation) fused with an ever-expanding network of interaction and trade. Yet, it is critical to bear in mind that how scholars perceive the stimuli for change alters the interpretation of how and why changes occurred. On the one hand, élites, borrowing from a foreign but increasingly shared iconography of power, encouraged the dissemination of new ideas and concepts (whether intentionally or unintentionally) thus changing the society. On the other hand, the inevitable synoecism of population centred upon dynamic economic motivators instigated societal complexity. Indeed, this dichotomy is not so sharply divided; many realise that these stimuli overlap and likely worked in conjunction to produce societal change. However, as seen below (see section 2.32), the choice in how to present stimuli for change has significantly affected the perception of architecture, and has led to the development of the commonly accepted approach for investigating architecture described in Chapter 1.

2.3.2 Socio-cultural changes in relation to architecture

The traditional view of Etruscan architectural change results from the concept of Orientalisation, thanks in large part to the value it is ascribed in Pallottino's work (Pallottino 1975). Orientalisation disproportionately affects our understanding of architecture because many Etruscologists since Pallottino (e.g. Bartoloni 2012a; Ridgway 1988, 1992; Steingräber 2001a; Torelli 1985, 2001a: 22) regard Greece, the eastern Mediterranean and the Near East as the source for Etruscan knowledge on superior manufactured materials, such as ashlar stone, mud brick and terracotta roof tiling. *Ex Oriente Lux* models and the concept of 'Orientalising' have thus remained influential in the interpretation of the early Etruscans. Claims that architectural changes derived from the intentional choices of superior materials are therefore deterministic and rooted in the diffusionist background of an evolutionary-progression outlook.

Interestingly, Pallottino is typically acknowledged as the chief proponent of the central Italian origins of the Etruscans (Bagnasco Gianni 2013; Drews 1981: 133). Rebuking the most extreme versions of Orientalism, Pallottino (1975: 78–81) rejects the idea that the peoples who would become the Etruscans left Lydia or other points in the East and settled in central Italy in the eighth or seventh centuries BC. To Pallottino, such Orientalism was untenable, not because it devalued the Etruscan experience but because of the overwhelming archaeological evidence for the continuance of the Villanovan culture (Pallottino 1975: 80–81).

However, despite his dissatisfaction with proposals of Etruscan eastern origins, Pallottino stresses that the basis of Etruscan culture lies in the Greek tradition. He strongly dismissed any Etruscan independent innovation of art, architecture or engineering, stating that:

> One of the commonest errors into which hasty amateur historians and even the occasional professional tend to fall is to attribute to the Etruscans an original conception of town-planning or a unique experiment in hydraulics, to speak of 'Etruscan technology' in the working of metals, or of 'Etruscan medicine', 'Etruscan dress', etc. as if these aspects of knowledge and life were in effect exclusive or typical to Etruscan civilization when in fact they … were for the most part little more than provincial reflexes of the inventions and conquests of Greek civilization (Pallottino 1975: 174).

Pallottino's negation of independent innovation directly influenced interpretations of Etruscan architectural changes, particularly in the decades following its publication.

For instance, Drews (1981) takes Pallottino's position to heart, applying Pallottino's argument for Etruscan provincialism to the development of Etruscan architecture. Similar to Pallottino, Drews (1981: 154) claims that the central Italians inherited their conceptions of art, architecture and engineering from Greece. In particular, the appearance of new architectural materials in the seventh century reflects the Italian adoption of other "borrowed" Greek concepts, such as the alphabet and black figure pottery. The assumption that the impressive new materials would have been an "incomprehensible phenomenon" to the seventh-century Italians further underscores the provincial nature of Drews' conception of the Etruscans (Drews 1981: 155).

According to Drews (1981: 154–157), rapid changes to the architecture of Etruscan houses, brought on by this reflexive adoption of superior materials introduced through Greek contact, resulted in urbanisation and the formation of "masonry cities". This evolutionary model where progress occurs in leaps and spurts (so-called punctuated evolution) challenges what Drews calls the "evolutionary spirit" of modern archaeology. To be clear, Drews' criticism of the "evolutionary spirit" is not a disavowal of the concept of cultural evolution, rather Drews (1981: 134) criticises the growing emphasis that archaeologists (of that time) gave to localised, gradual progression. In fact, the punctuated evolution of Drews, by incorporating the intrinsic Orientalism of Pallottino, stands out as perhaps the most extreme of those advocating an evolutionary progression of Etruscan architecture.

Ridgway (1988: 666–667) also points to the Hellenic influences of Etruscan architecture in a similar way to Drews. Using Pliny's story of Demaratus as a guide, Ridgway argues for a transformation of Etruscan architecture that resulted from the introduction of manufactured materials from Corinth or elsewhere in Greece. According to Ridgway (1988: 666–667), this transformation led to the widespread urbanisation of Italy. Etruria acted as the conduit of Hellenic ideas, which spread to the Latins, Campanians and the peoples of the Po valley.[14] Thus, the Etruscans and the rest of Italy evolved from the crude "hut-settlements" of the pre-Hellenic eighth and seventh centuries to the Hellenic "masonry cities" of the sixth.

Torelli adapted this concept of emerging "masonry cities" in his writings on Etruscan urbanisation (Torelli 1985). He focusses on the emergence of the "masonry city" as a result of the imposition of superior materials from outside Etruria, emphasising the contact between the Etruscans and the Greeks, particularly the Euboeans who settled in Campania. He claims that introduction of terracotta tiling by the Euboeans to the Etruscans was pivotal in the subsequent Etruscan revolution in architectural conception (Torelli 1985: 24–25). It is a part of his broader argument that the Etruscans adopted the concept of the Greek polis. This adoption, according to Torelli (1985: 25–32, 2000: 196–197), resulted in the widespread urbanisation of Etruria in the seventh and sixth centuries. Manufactured building materials in the Greek mould were chosen over the traditional materials as they better reflected the preferred concept of the Greek polis. Therefore, in Torelli's use of a material-based evolution of architecture, the huts of the Villanovan village were replaced following the adoption of Greek concepts of material use, resulting in the masonry houses of the Etruscan city-state.

Torelli forwards the argument that the Etruscans adopted foreign concepts of material use and chose "superior" materials but disagrees that the reason for the choice was purely technological. He argues that local aristocrats, the so-called *principes*, chose Greek architectural concepts as a way to solidify their power in conjunction with a recognition of the superiority of foreign building materials (Torelli 2000: 196–197). Therefore, as with Pallottino before him, Torelli openly presents an Etruscan architectural revolution that resulted from a choice in superior materials and Greek influence. However, in contrast with Pallottino, Torelli emphasises the socio-political position of local Etruscan aristocrats in the adoption of Greek traditions. By referring to local socio-political stimuli, Torelli at least acknowledges how local building traditions might have been replaced by foreign concepts.

Over the last thirty years, Torelli's version of architectural change, where adopted Greek concepts of material use were chosen by Etruscan aristocrats, has been distinctly influential in interpretations of Etruscan architecture. Donati (2001: 321–323), for instance, emphasises the seventh-century changes to architecture and the Greek roots of that change. In contrast with Drews, Donati does not directly address the choice of materials as the stimulus for an architectural transition. However, the influence of Torelli is clear, as Donati (2001: 323) emphasises the role of Etruscan aristocrats in the adoption of Greek architectural styles in Etruria. Interestingly, similarly to Ridgway (1988), Donati (2001: 322–323) includes Pliny's story of Demaratus in his summary, which leads to his affirmation of the argument that a change in building materials altered the face of architecture throughout Etruria. He argues that the adoption of terracotta tiling as a building material in Etruria was part of the wider adoption of Greek concepts that ultimately revolutionised the Etruscan city.

Steingräber (2001a), similarly to Torelli and Donati, emphasises the change in materials as part of the process of urbanisation. While he is less an advocate of material change as the root of urbanism than either Torelli or Donati, he outlines how Greek concepts influenced urbanism and, even more importantly, how the architectural transition of the seventh century is obviously the result of material change (Steingräber 2001a: 10–11). Indeed, he is less emphatic about Greek influence on material change but his suggestions for Greek influence throughout form the impression that Steingräber sees the root of architectural change in a similar way as Torelli.

The diffusion of Greek concepts of architecture and the polis has thus led to a common understanding of

14 Although he proposes a Hellenic origin for architectural technologies in his summary of the Etruscan civilisation in Cambridge Ancient History, Ridgway has since advocated the possible Etruscan independent innovation of terracotta roof tiles based on the evidence from Poggio Civitate (Ridgway and Serra Ridgway 1994).

Etruscan architecture where changing ideas about material use, brought on by Greek contact, resulted in an architectural revolution (as in the recent synthesis by Becker (2014: 11)). Unfortunately, this understanding of architecture is flawed. Purcell (2006), in his discussion of the concept of 'Orientalising', points out the primary flaws in the Orientalising approach, an approach which resembles the common understanding of Etruscan architecture. Purcell (2006: 23–24) argues that the instance of cultural transformation is obvious archaeologically when compared to the invisible (or, at least, less visible) changes that preceded it. The background of an architectural transition, including its origin, is therefore diminished in the brightness of the transition itself. Whether materials were adopted, adapted or innovated independently is not immediately evident, particularly when only following the most obvious instances of transition. Moreover, the chronological vagaries of Greek contact and of the rise of new material use, along with the question of responsibility for certain concepts and ideas, limits how reliably Greek influence fits as the stimulus for material change and therefore architectural change.

Besides borrowing from questionable, diffusionist models of adoption and adaptation, a transition in architecture based in conscious denial of traditional building materials directly conflicts with anthropological research on building traditions. Certainly, the value of participating in the Mediterranean-wide, maritime elite culture prompted an assimilation of sorts with that culture (Herring 2008).[15] However, anthropology tells us that domestic architecture, as well as the materials used in its creation, is more fundamentally habitual and tied to tradition than many other aspects of culture (e.g. Bourdieu 1982; see section 2.1). The result is often a direct denial of supposedly superior materials due to cultural affiliation. Moreover, this rejection has been shown to be more entrenched when the new materials come from the outside.

Rapoport's work, in particular, demonstrates how habituation can prevent adoption based on conscious choice (Rapoport 1969: 18–24, 1973, 1980a: 158–162). His analysis of architectural traditions suggests that cultures are more likely to maintain the usage of disadvantageous building materials even when an option of more conducive materials exists. The maintenance of disadvantageous materials does not exclude change altogether. Instead, adoption generally occurs gradually, resulting from unconscious choices. These unconscious choices are usually part of a series of unrecognised changes in habit of the kind emphasised by Bourdieu (1977, 1982, 1990).

Change in building material use is different in cases of colonisation, however. In cases of colonisation, the colonised are often made to adopt the culturally accepted building styles of the colonisers (Rapoport 1969; Reid et al. 1997). When adoption of building materials is the result of colonisation, the change in material use becomes a conscious choice, an action (or, more accurately, an active reaction) usually based on socio-political concerns (Rapoport 1969: 22–23). In that conscious choice, recognition of so-called superiority is possible but, even then, tradition typically defines the course of material adoption (e.g. Chatty 1986, 1996).

Colonisation of the Etruscans by the Greeks did not happen, either culturally or in the modern economic or political sense (particularly considering that even in southern Italy the concept of Greek colonisation before the sixth century BC is debatable; Herring 2008: 113–115). However, the lingering notion of Greek colonial influence, gone from many other areas of Etruscan study, still remains in discussions on architecture. This remnant of diffusionist thinking is most obvious in the identification of a categorical architectural change resulting from a conscious adoption of supposedly superior materials. There is no denying that changes to architecture and building traditions occurred in Etruria from 800-500 BC but

15 Riva (2010: 39–71) outlines the concept of Etruscan participation in a Mediterranean elite culture (as opposed to the Pallottino's portrayal of indoctrination by it) through funerary and elite artefacts. In particular, she emphasises the presence and role of Homeric tales and the stories of the *Argonautika* in early Etruscan and Greek society as evidence of such a shared culture. However, Purcell (2006: 28) argues against using a monolithic term like Mediterranean-wide culture since it is so difficult to define it.

those changes were unlikely the result of a conscious material adoption of the kind advocated by Torelli (1985, 2000).

Although most prominent, the introduction of foreign technologies and manufactured materials as the stimulus for architectural change is not the only perspective. Those who recognise the centralisation of settlements as the driving force behind broader societal changes in Etruria from 800-500 BC also identify centralisation as the stimulus for architectural change. Recently, proponents of this alternate perspective have been successful in relating the role that population growth in urban centres had on the changes to architecture. Therefore, while discussion remains centred on the development and use of manufactured materials, rather than on building techniques, the influence of foreign concepts is significantly reduced.

For instance, Leighton (2013) suggests that the increase in the permanence of the built environment during the Orientalising period resulted from population growth. In part, he argues that buildings of stone and terracotta tile become more prominent than timber structures in the urban centres because their builders were making long-term land investments, perhaps in a similar display of "dynastic claims to power" recognised in the concurrent, multifamily chamber tombs (Leighton 2013: 139). Moreover, he notes that the demographic changes to urban centres likely affected the availability of easily procured, local timber, further incentivising the use of alternative materials (Leighton 2013: 138–139).

Similar to Leighton, Nijboer (1998: 24, 243) argues that the building materials (especially the terracotta tiling) used in structures from the second-half of the seventh century BC onward were the product of "urbanisation". With the growth in population in the urban centres came growth in industry. According to Nijboer (1998: 243) centralisation of population created new economic models, which inevitably diversified the socio-economic makeup of urban centres. With diversification came both grander, more-permanent residential structures and workshop buildings (Nijboer 1998: 71–76, 243). Nijboer (1998: 29–33) contends that the market demand for building materials grew, which likely led to the same forces that, in later periods, caused the import of inter-regional and foreign building materials to Latium. Nijboer (1998: 243) therefore sees the increased foreign contact as a market force, where the growing demand for increasingly intensive, specialised materials spurred foreign interaction and trade, ultimately altering the architecture.

To some extent, centralisation of population as the stimulus for architectural transformation has been adopted by the more traditional evolutionary perspective. Some, such as Bartoloni (2012b: 88–93) and Riva (2010: 23–29) acknowledge that the centralisation of settlement plays a role in the establishment of the élite. However, they do not present centralisation (and the subsequent socio-economic intensification and demand for new building materials) as the immediate cause of architectural transformation. Instead, they argue that synoecism allowed for élites to centralise power, and led to the institution of exchange networks built upon a "socially exclusive ideology" (Bartoloni 2012a: 258–266, 271–278; Riva 2010: 41–44). These exchange networks, in turn, encouraged changes to society at every level, including in building materials. While the difference in articulation may appear subtle, by focussing on the role of the élite lifestyle, architectural transformation becomes part of an inevitable evolutionary progression in Etruscan ethnic complexity associated with foreign influence, rather than on case-by-case socio-economic diversification driven by craft specialisation, market forces and core-periphery relations.

Therefore, although the traditional perspective is nonetheless the most common way of both conceiving and displaying the architectural changes that occurred between 800-500 BC, it has been gradually modified by scholars such as Bartoloni (2012b) and Riva (2010), and challenged outright by others (e.g. Leighton 2013; Nijboer 1998). As a result, the common presentation of the stimuli for changes in building materials and technology recognises that they were not strictly determined by the élite and their direct choices of superior foreign crafts. Instead, the conspicuous lifestyle choices of the Etruscans, particularly those in the emerging aristocracy, encouraged the use of new manufactured materials via Mediterranean-wide exchange networks. While this perspective is nevertheless rooted in traditional, *Ex Oriente Lux* concepts of change, it now succeeds in portraying some of the complexity of the stimuli that underlie change and the independent, habitual choices of the indigenous population.

2.4 A review of the literature on four key sites

Four sites are especially significant in the current conception of Etruscan domestic architecture from 800-500 BC. San Giovenale, Acquarossa, Lago dell'Accesa and Poggio Civitate have together helped to form the narrative for the beginnings of Etruscan domestic architecture and its progression away from the architecture prevalent in the Iron Age (Figure 2.4). While these sites are not the only ones in the whole of Etruria with architectural features (domestic or otherwise) during this time, they are the established building blocks by which the architectural finds of other sites are measured.

Figure 2.4. Map of Etruria (after Catalli 2001: 89).

In addition to playing a crucial role in the understanding of Etruscan architecture, these four sites are the most thoroughly published of the Etruscan settlements from 800-500 BC, at least where domestic architecture is concerned (Izzet 2001a, 2007: 144–145). Other sites, such as Tarquinia or Veii, certainly have domestic architectural finds from this time but the publication of them has rarely been of primary focus for their excavation teams (although this is changing: e.g. Bartoloni 2009a; Bartoloni and Acconcia 2012). Furthermore, the extensiveness of publication in addition to their overall effect on the perception of Etruscan architecture is not only well known but also of primary importance to this study.

In this study, past interpretations of building techniques are a vital component in understanding the development and change in Etruscan architectural traditions and establishing how the architecture has been previously identified. It is therefore considered necessary to review the publications of these four influential sites in an attempt to acknowledge how the excavators and other scholars interpret the evidence. Within each of the following subsections, the excavators' interpretations of the site and its architectural features are discussed first and are then followed by a look at widely accepted scholarly interpretations. Through a review of the previous publications, it is hoped that discrepancies in interpretation are made apparent, as well as how those discrepancies might be rectified.

2.4.1 San Giovenale

The ongoing publications of the excavations at San Giovenale extensively detail the site, and in particular, the archaeology of its seventh- and sixth-century BC structures. Excavations took place at San Giovenale from 1956 to 1965, and since then the Swedish Institute at Rome has published 17 monographs (Karlsson 2006:21-23). With the release of publications by Karlsson (2006), Pohl (2009) and Nylander (2013), the focus of the monograph series has shifted noticeably towards the results from domestic contexts.

Although comprised primarily of the specific results, layer-by-layer, of both Area F East and the Borgo (lit. neighbourhood), the recent publications on San Giovenale offer some interesting conclusions about the development of the site as a whole (Karlsson 2006: 137–164, 2013a: 151–153; Pohl 2009: 225–226; Figures 2.5, 2.6). The publications provide architectural phases for each building at their respective sites, as well as proposed room use (Karlsson 2006: 30–57; Nylander 2013: 58–136, 148–150; Pohl 2009: 19–27, 71–73, 93, 131). Karlsson and Nylander often go further than Pohl, including both how the excavators saw the uses of each room and how those initial interpretations changed following the application of formation processes. Karlsson (2006: 144–145, 148–150, 157, 161, 163) also includes a few illustrations of possible building reconstructions for each phase of occupation.

Karlsson's (2006: 145–163) conclusions about the buildings at Area F East contain the most interpretation of the recent publications. Karlsson's process of interpretation is rather straightforward. He begins his interpretations by sequencing the architectural remains, which develops a relative chronology of building phases (Karlsson 2006: 137–164). By creating a relative chronology between features and structures, he better clarifies the relationships between rooms and buildings. From there, he remarks on the function of spaces (both inside and outside buildings) based on the artefact depositions and on their associated features. This process of interpretation has created a clear account of the development of Area F East, although at times Karlsson's interpretations seem unduly speculative.[16]

Moreover, Karlsson (2006: 142–154) devotes more attention to the Period 2 (675-625 BC) developments of House I than those of other periods. Although somewhat problematic when trying to understand the complex relationships between the three houses in the latter half of the sixth century, the descriptions

16 For an instance of one of Karlsson's speculative interpretations, see his proposition that House III may have been owned by House I's brother (Karlsson 2006: 160).

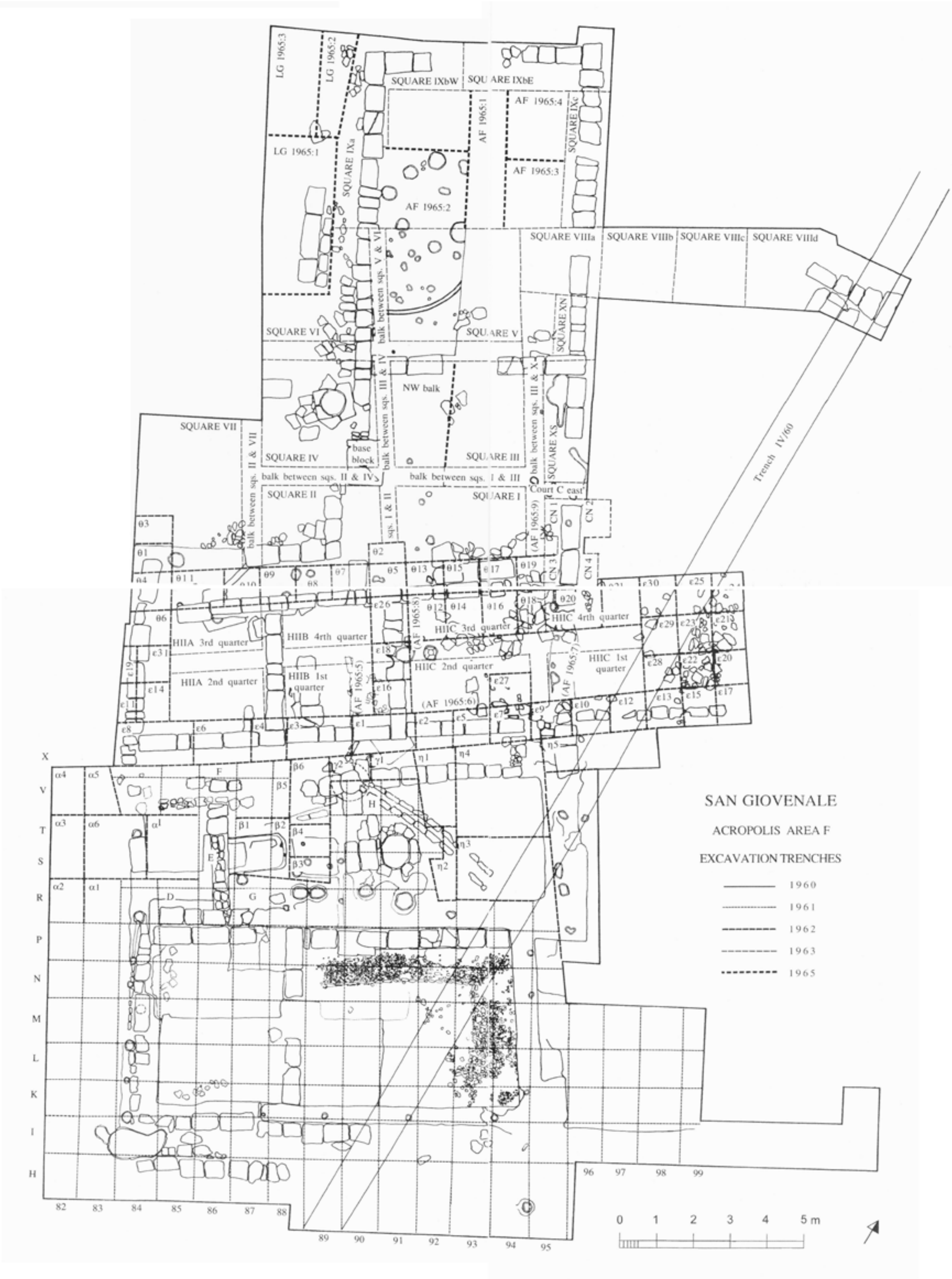

Figure 2.5. Plan of San Giovenale Area F East (after Karlsson 2006), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

of House I provide crucial information on architectural developments in a less well-known period for domestic archaeology. Despite this focus on Period 2 House I, Karlsson's conclusions contextualise the otherwise data-oriented catalogue.

By contrast, conclusions on building use and architectural phases are somewhat less clearly laid out in Pohl's work. Making use of the artefact focus of the catalogue, Pohl (2009: 193–224) offers a typological assessment of each artefact in her discussion section that tends to reveal her interpretation of building use. In so doing, her interpretations of the Borgo are different from Karlsson's on Area F East but are equally informative.

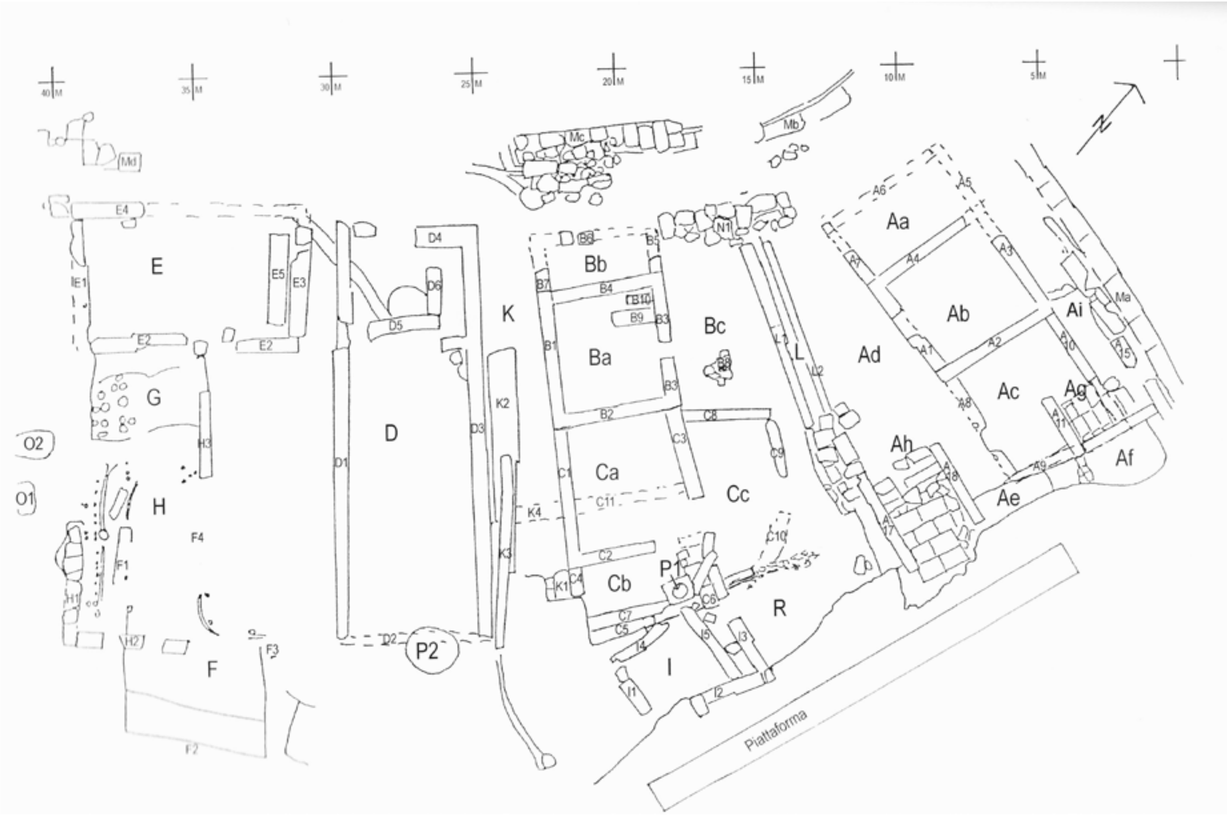

Figure 2.6. Plan of the Borgo quarter at San Giovenale (Pohl 2009: pl. 114), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Compared with Karlsson's work, Pohl's is not intended to focus on the houses themselves. Rather, it is a presentation of the stratigraphy and the artefacts (Nylander 2013: 25). The contextual information and analytical conclusions presented by Pohl only include architectural developments and possible room use when applicable to an argument on stratigraphy or artefacts. However, aside from the much more detailed analyses of specific artefacts, Pohl does not contribute as much as Karlsson does to the discussion of the Etruscan domestic developments at San Giovenale because she intentionally does not relate the artefact analyses to domestic contexts. All interpretations instead rely on the typology of items and their relative, temporal appearance. For instance, Pohl (2009: 20) notes the difference between two key building phases based on the appearance of an Attic 'eye-cup' or Etrusco-Italic black glaze without providing a specific account of how the structures were altered between phases. Although a catalogue of artefacts and not an analysis of the site as a whole, interpretations of the development of the structures at the Borgo are therefore narrowly applied and defined.

Nylander's (2013) most recent volume on the architecture of the Borgo is more akin to Pohl's (2009) work than to Karlsson's (2006). Apart from its thorough summary of the complicated excavation history of the site, Nylander (2013) appears to be more concerned with precise architectural cataloguing than composing a narrative. Yet, in developing the catalogue of architectural features at the site, he manages to identify both the likely techniques used in foundations and the changes (i.e. transform processes) affecting the site over time. Following the cataloguing of each identified building or structure, Nylander (2013: 58–137, 143–149) uses the stratigraphy and subsections called "chronological developments" to relate his interpretations of individual structures as well as the site more broadly.

In addition to Nylander's contribution, Karlsson (2013b: 50–57, 2013a: 151–154) provides succinct reports at the beginning and at the end of the publication that tie Nylander's (2013) site-based identifications and interpretations to the wider San Giovenale project. More specifically, Karlsson (2013b, 2013a) connects Nylander's work to Pohl's (2009) and his own monograph on the acropolis (Karlsson 2006). With the addition of the appendices, especially the paper by Ö. Wikander (2013) on roof tiles, the architectural analyses of the Borgo are further brought together with the rest of the site. The recent publication on the Borgo thus refocuses the series of San Giovenale publications.

Despite the considerable benefits of Nylander's (2013) work, there are some shortcomings, of which the most significant is the lack of a conclusive summary tying Pohl's (2009) associated work on small finds with his volume on the architectural features. While the catalogue of architectural features and the short, associated interpretations of them are significant (particularly to a book reliant on architectural data), the work does not quite reveal how the Borgo affects wider issues concerning Etruscan architecture. Nylander (2013: 27), aware that some might realise this shortcoming, admits that the work intentionally omits the wider historical context, stating that he hopes, "Others will … assess and discuss the place of the Borgo quarter and its evidence in broader Etruscological and other contexts." This quote is perhaps iconic of the wider Swedish publications on San Giovenale, indicating that their role as excavators is to present the data and leave the creation of a comprehensive, interpretive account to others.

Yet, the need for a comprehensive account is even more essential given the earlier publication of the findings at Area E (Pohl 1977; Figure 2.7). One of her first works, Pohl's description and analysis of Area E lacks the precision and focus of her more recent work on the Borgo. This criticism is especially true of the description of the "architectural elements" which appears prior to a description of the stratigraphy (Pohl 1977: 13–32). The description of the architectural features, because it is given before any relevant, archaeological context, leads to some confusion. This confusion peaks in the discussion of the supposedly later, ephemeral structures where the relationship between the earlier and later structures is not entirely clear (Pohl 1977: 21–25, 27–32). Problems with the poorly-defined context are further compounded with a surprising amount of supposition, which the later, comparatively short architecture section does little to support (Pohl 1977: 94–95).

Despite these shortcomings, the monograph on Area E reveals a considerable amount about the early architecture at San Giovenale. It also presents the first clear chronology of the earlier habitation at San Giovenale. Prior to the Area E publication, the Swedish Institute at Rome stuck closely to the earlier chronology based on material culture history. The culture history chronology sharply distinguishes between the Tolfa-Allumiere culture and the subsequent Etruscan, creating a barrier in the overall discussion of San Giovenale. Pohl (1977: 35–83) further differentiated the pottery typology in the catalogue of the work, a typology widely used in the San Giovenale and Acquarossa publications from that point on.

The monograph on Area E is therefore complicated to review. On the one hand, it presents entirely new information while expressing both the chronology and the pottery typology in a way that would heavily influence later publications. On the other hand, the narrative is confusing and many of the interpretations of the architecture are speculative. By adding so much to the overall narrative in terms of new information, it is an asset to the understanding of San Giovenale but it comes at the cost of uncertain architectural interpretations.

Nevertheless, a thorough account of San Giovenale has been constructed by the Swedish Institute at Rome over time. Since it has taken the Swedish Institute some time to publish all of their findings at San Giovenale, they have (whether intentionally or unintentionally) created a continuous system of re-interpretation and validation. Through that system, the model of Etruscan life at San Giovenale proposed by Boëthius (1962a) has been honed, providing a basis by which more specific interpretive models can develop (e.g. Karlsson 2006; Nylander 2013; Pohl 2009).

The earliest publications on San Giovenale produced by the Swedish Institute at Rome closely resemble their latest works. Most of that earlier work (but especially Thomasson's (1972) "General Introduction") focuses on the specifics of each area of excavation instead of giving a general outline of site development. As is exemplified in the contrast between Pohl's (1977, 2009) works on Area E and the Borgo, a varied range of architectural interpretations can be assembled from these specifics.

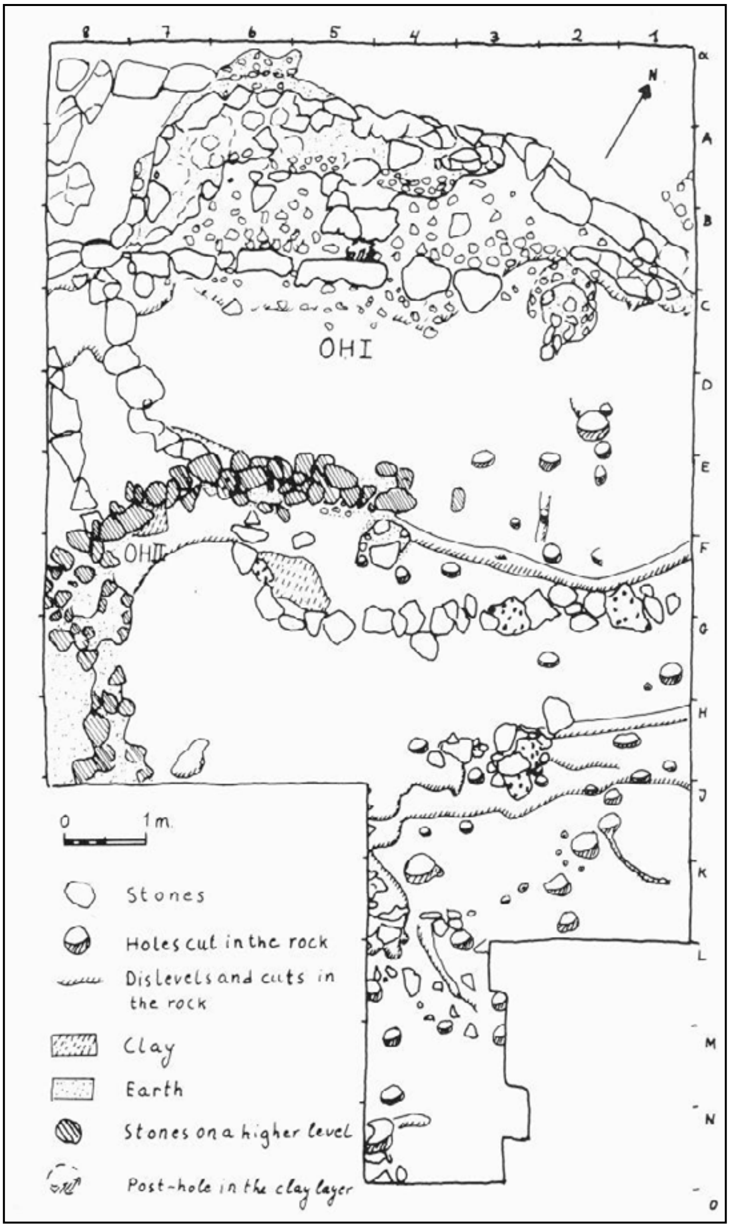

Figure 2.7. Plan of San Giovenale Area E at the end of excavation (Pohl 1977: fig. 1, p. 14), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

However, one of the early publications breaks this trend and produces a clear interpretive model for the entire site. Although not entirely useful as an academic text, *Etruscan Culture: Land and People*, which is aimed at non-specialist readers, supplies ample examples of the excavators' interpretations for the site (Boëthius 1962a). As editor, Boëthius (1962b: 1–2) introduces the volume as a guide for understanding San Giovenale and its place within Etruscan Italy. While some of the chapters are long-winded, the book as a whole encompasses not only how the excavators pictured San Giovenale's place in the archaeology of Etruria at the time of excavation but also their theoretical perceptions. In fact, Boëthius (1962b) compiles the broadest interpretations of the site currently available.

Similar to Boëthius (1962a), Forsberg and Thomasson (1984) produced a conference proceedings volume, which contains a range of discussion on methods and finds both at and nearby the site, as well as the only explicit descriptions of the excavations of Area D (Figure 2.8). Malcus' (1984) description of the structural

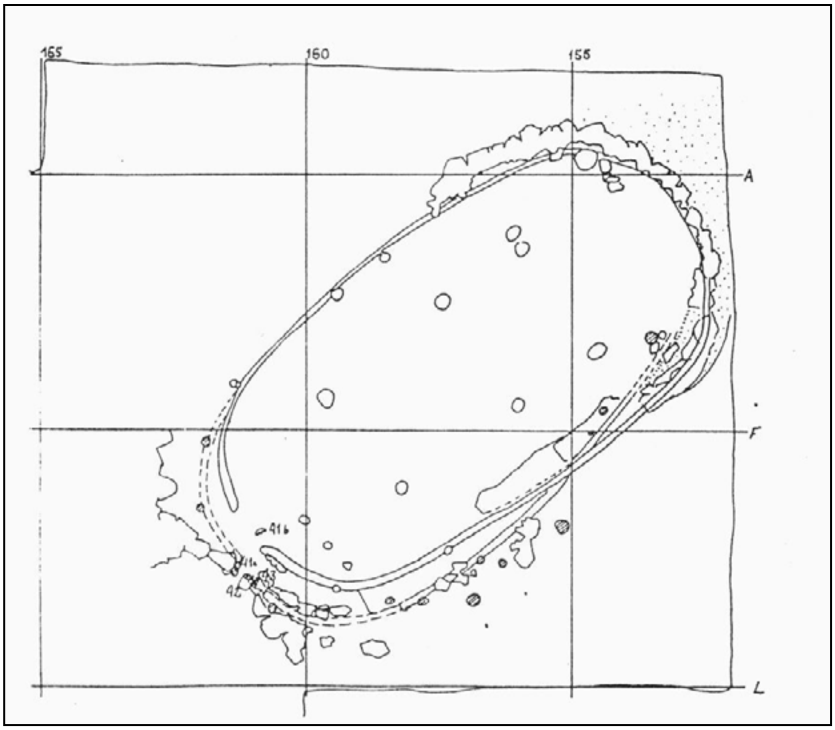

Figure 2.8. Plan 3 of Capanna I at San Giovenale Area D (Malcus 1984: fig. 21, p. 50), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

finds in Area D is particularly detailed. While Malcus is necessarily brief in some areas (such as on the composition of the floor or differences between Capanne I and II: Malcus 1984: 38), the interpretations of each feature and of the phasing of the structural finds form a detailed account. His account avoids extensive speculation, with any interpretations given of the wider purpose of the structures secondary to the interpretations of the features as they were discovered.

However, the fact that a report on Area D has appeared only in conference proceedings has been somewhat problematic. The limited nature of the publication prevents a more rigorous understanding of the more complex relationships between the structures, the (apparently gradual) addition of features connected with the wall footings or a better description of the more ephemeral features in the area. Despite its limits, Malcus' (1984) descriptions of Area D have been referred to in numerous interpretations of Iron Age architecture (Dolfini 2002a: 638; e.g. di Gennaro 2004: 123) and have been a primary influence on the conception of the Iron Age as one of the best examples of Iron Age architecture at the site (and in Etruria, more broadly speaking: Domanico 2005: 528–531).

Apart from the Swedish Institute at Rome's publications, several articles and analyses from the last half-century have used the structural evidence at San Giovenale to support wider interpretations of Etruscan architectural change (Boëthius and Ward-Perkins 1970; Cerasuolo 2012: 130–135; Izzet 2007; Rohner 1996: 123–125; Steingräber 2001a). For instance, referring to the evidence at San Giovenale, some have maintained the possible class distinctions suggested by the excavators. However, in the majority of cases, examples from San Giovenale's architectural history contribute to descriptions of the wider Etruscan progression in urban development (e.g. Donati 2001; Steingräber 2001a).

For instance, the Borgo has a more compact layout than other architectural features at San Giovenale, such as at Area F East on the acropolis of the site (Nylander 1986a: 50). A relatively dense population is the commonest form of interpretation for the compact layout of the Borgo (Nylander 1986a: 50). Furthermore, materials and food waste tied to elite consumption, found throughout the acropolis, were relatively absent at the Borgo (Pohl 2009: 226). Despite being partially based on an *argumentum in absentia*, a compelling interpretation combined the high population density and lack of elite consumption, presenting the Borgo as a less-affluent residential and (perhaps) commercial workshop district at San Giovenale (Nylander 2013: 72; Pohl 2009: 226; Steingräber 2001a: 21).

Comparisons of San Giovenale to other, similar sites exist and they provide insight on the formation, establishment and disuse of cities. Many comparisons appear in a similar form to Steingräber's (2001a) comments on the development of orthogonal city-planning (Donati 2001; Izzet 2007), although explicit comparisons of San Giovenale to contemporary sites are few and far between. The Swedish Institute at Rome, having conducted both the excavations at San Giovenale and at Acquarossa, have used their advantageous position to compare features at the two sites in detail (Wikander and Roos 1986). The comparison is presented in such a way as to highlight certain types of features, first at San Giovenale and then at Acquarossa. This type of presentation allowed the editors to present the finer points of each feature for each urban centre in greater detail.

Yet, the recent publications by Karlsson (2006), Pohl (2009) and Nylander (2013) include so much new data that they overshadow older works, particularly the comparisons between San Giovenale and other sites. Indeed, even the appendix by Ö. Wikander (2013) provides significantly more in both data and interpretation on the roof tiles found at the Borgo than ever before (e.g. Wikander and Roos 1986). The newer publications will allow others "to assess and discuss the place" of San Giovenale and its evidence "in the broader Etruscological and other contexts" (Nylander 2013: 27), thus allowing for new perspectives and interpretations.

2.4.2 Acquarossa

The Swedish Institute at Rome has also published accounts of their findings on the excavations at Acquarossa. However, in contrast with San Giovenale, where recent publications highlight specific details of individual areas, publications on Acquarossa have been less numerous in recent years and are based on aspects (such as architectural terracottas and surface finds) of the whole site more often than on excavation areas. In fact, the only area-specific report was of "Zone A" and appeared four years before the project ended (Lundgren and Wendt 1982).

Besides the reports published by Swedish Institute at Rome, there have been a number of works that assess the architectural styles and spatial relationships of buildings (Izzet 2001a: 43–44, 2001b: 188, 2007: 155–158; Meyers 2013; Rohner 1996). These works tend to be rather broad and often look to place Acquarossa (often alongside the Upper Building at Poggio Civitate) within a model of later residential, palatial developments (Meyers 2013: 58–61; Rohner 1996; Torelli 1985: 28). This view positions Acquarossa as a sort of prototype for more complex houses of later date. Several interesting associations and comparisons to other sites have therefore appeared that discuss Acquarossa's unique buildings. Of the unique buildings, the "*edifici monumentali*" (consisting primarily of Houses A and C in Zone F: Figure 2.9) have received the most attention.

Strandberg Olofsson (1984: 81–82, 1986: 97) explains that much of the primary debate over the function of the *edifici monumentali* revolves around the discovery of clay wall-reliefs found in and around the buildings' courtyard. Although no longer a popular theory, some claimed that the mythological nature of the reliefs, coupled with certain architectural features, proved that the *edifici monumentali* were temples, or at least religious in nature (Andrén 1971: 11). Today, many are convinced that the *edifici monumentali* could not be a temple complex since the excavations failed to find any other religious materials typical of temple sites, such as votives (Meyers 2013: 46).

Besides the theory of religious function, two other theories are prevalent in the debate. Based on the work of Colonna (1973: 50), Torelli (1981: 83–87) and Cristofani (1978a: 193–195), many see the buildings as palaces, akin to the *Regia* at Rome, where the social élite both resided and official civic, administrative functions took place. In contrast, many argue that the *edifici monumentali* functioned as purely civic and administrative buildings that incorporated community tasks of religious, social and political natures

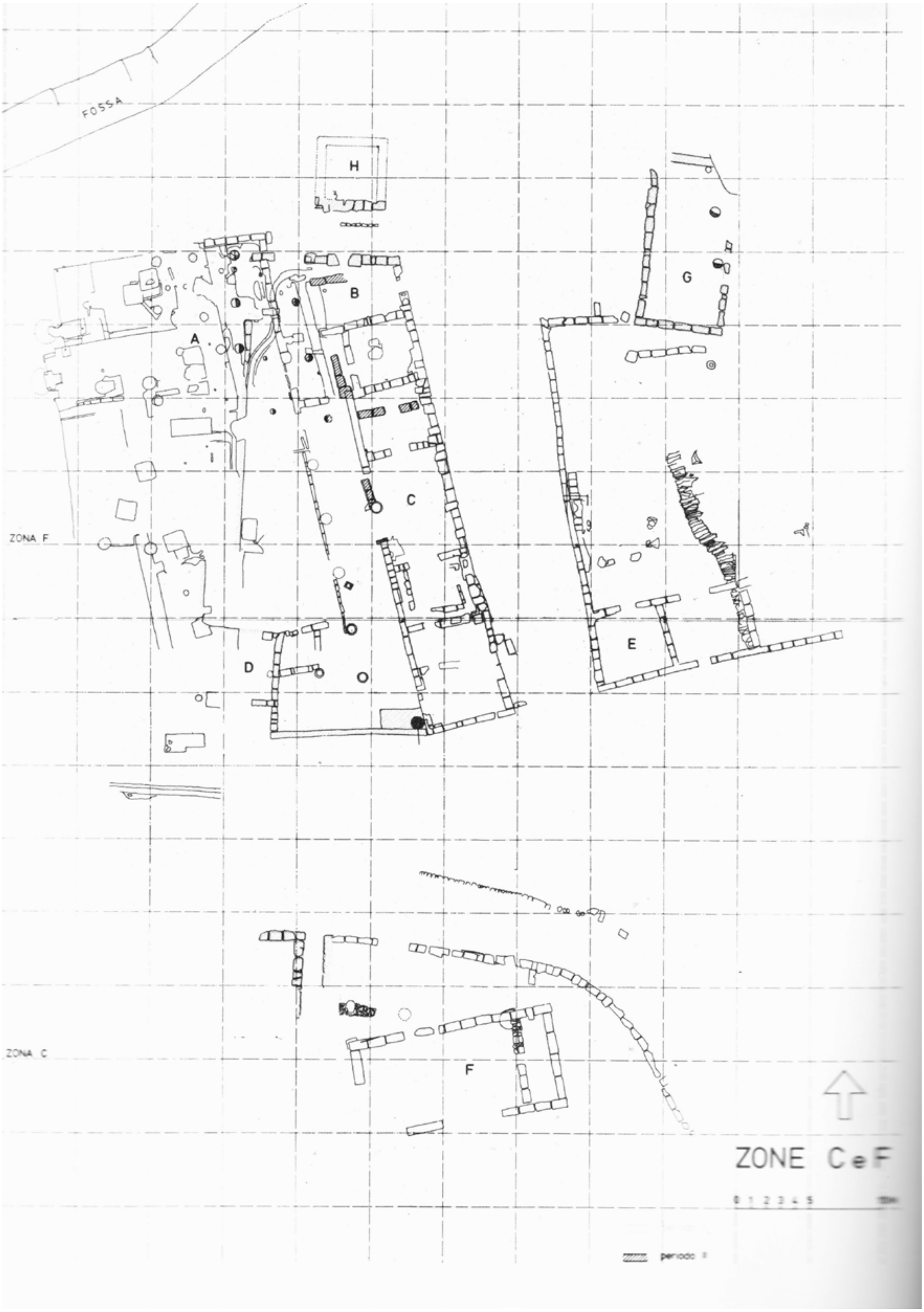

Figure 2.9. Plan of Acquarossa Zones C and F (Persson 1994: fig. 6, p. 297), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

without any residential function.[17]

Out of these positions, arguments that the *edifici monumentali* had a palatial function are particularly common throughout the literature on Acquarossa and, more broadly, Etruscan architecture. Much of this is due to the well-argued positions of Torelli (1985) and, more recently, Meyers (2013, 2012), who draw parallels between the *edifici monumentali* at Acquarossa, Poggio Civitate and the contemporaneous changes to élite representation. For Torelli (1985, 2000) especially, if Zone F at Acquarossa was a palace complex, then it fits well into his overall concept of growing social and economic stratification in the sixth century BC.

Torelli's influence on the perception of monumental architecture in the sixth century is not limited to Acquarossa. Parallels drawn between the *edifici monumentali* at Acquarossa and other large complexes in Etruria, such as those at Poggio Civitate (Murlo) and Roselle, are common in the wider literature (e.g. Donati 2001: 324; Naso 2001a: 128; Turfa and Steinmayer 2002), although not without scepticism (Steingräber 2001a: 19). The fact that the *edifici monumentali* have become inextricably linked to these other sites (especially Poggio Civitate) is crucial to understanding the popularity of this theory.

In her conclusions, Strandberg Olofsson (1986: 88–92) states that while there are some interesting parallels between the *edifici monumentali* and Poggio Civitate, there are categorical differences in architecture and placement of the respective complexes. She explains that the evidence does not clearly support the proposition that the buildings functioned as a palace complex. She argues that much of the basis for that proposition (namely the comparisons to other types of evidence and sites as well as the understanding of the iconography) has traction but lacks appreciable archaeological data to conclusively denote function. She concludes that any future discussion requires, among other things, a full analysis of artefact distribution to determine function. Strandberg Olofsson's conclusions remain valid.

Despite the lack of the comprehensive monograph on the evidence from Zone F envisioned by Strandberg Olofsson, several works by the Swedish Institute at Rome were published since the end of excavation that more clearly present the architectural features of Zone F. Strandberg Olofsson (1989), for her part, produced an analysis of the distribution of roof tile finds throughout Zone F, with particular focus on Building A of the *edifici monumentali*. Her work provides a thorough overview of the architecture of Zone F and replaces the dominant interpretation by Östenberg (1975a). Wikander and Wikander (1990) followed Strandberg Olofsson's (1989) paper with a thorough interpretation of the so-called Early Monumental Complex (the phase of building directly prior to the *edifici monumentali*).

Of the publications on Acquarossa, Ö. Wikander's (1986, 1993) analyses of roofs are foremost. His work is essential to this study and provides a welcome description of the engineering in the erection of sixth-century buildings. More than a catalogue, it is a widely-referenced guide to the composition of and differences between terracotta roofing materials in Etruria. It presents a clear picture of the unique designs used in Etruria, among other extraordinary findings.

Ö. Wikander's (1986: 14) catalogues often leaves out the decorative terracottas of the roofs at Acquarossa (of which there are many). Instead, he explicitly details functional tiles and other practical roofing materials. These roofing materials, when given a logical order, offer a unique insight into the form of each house and have been used since to better understand roofing techniques at Acquarossa (e.g. Wikander 1988) and at

17 Since Strandberg Olofsson's (1986) discussion of this debate, Riva (2010: 181–183) and Meyers (2013: 46–47) have produced detailed summaries of the debate. Riva (2010: 182) suggests that the debate continues between the advocates of the two theories, while Meyers (2013: 47) argues that the debate has been won by those who argue that the *edifici monumentali* were an élite residence. Meyers (2013) also recommends that the modern connotations of the term 'palace' not be compared to Torelli's use of '*palazzo*', a term which does not have the same associations in Italian as it does in English.

other important sites (e.g. Camporeale 1985a: 130–131, 1997: 30–33; Turfa and Steinmayer 1996: 3).[18]

Further publications on the roof tiles at Acquarossa have focussed on the decorated terracottas (Rystedt 1983; Strandberg Olofsson 1984; Wikander 1981a, 1988). These works discuss more the artistic and social status of the buildings rather than roofing techniques. Following those publications, Acquarossa has been defined as a sort of type-site for elaborate roof decorations, particularly antefixes and *acroteria*. The *acroteria*, in particular, are compared to the findings at Poggio Civitate by Rystedt (1983) and together the two sites form the basis of our understanding of the late Orientalising and early Archaic decorative architectural features.

In the interpretation of structural features at Acquarossa, a particular note of interest for the development of stone architecture in Etruria is the likelihood that some houses continued to use wattle-and-daub walls well into the sixth century. Dissimilar to sites such as San Giovenale where the transition to stone architecture occurs somewhat definitively at the end of the seventh century,[19] in the sixth-century houses at Acquarossa, particularly House A in Zone D, partial remains of the wattle-work walls were recovered (Wendt 1986: 58–60). This form of wattle-and-daub, referred to by Vitruvius (and, subsequently, the excavators) as *opus craticium*, utilised a system of wood posts and stone foundations.

The fact the residents of Acquarossa exploited *opus craticium* in wall structure suggests a diverse approach to changing architectural culture. However, many Etruscologists pay little attention to this finding, noting it as a passing curiosity of the site. For instance, Izzet (2007: 152–154) seems to be aware of the implications of sixth-century half-timbering in her discussion of structural materials of domestic buildings. Yet, she does not comment further on the implications of this evidence, maintaining the concept of a timber-to-stone walling transition (see section 6.4).

Acquarossa embodies the best and worst of the archaeology of Etruscan domestic architecture. The excavation reports and analyses of specific aspects of buildings, particularly of the *edifici monumentali*, are important to understanding the domestic architecture at the site and Etruria more broadly. Unfortunately, in the production of these detailed reports, they fail to create a comprehensive interpretation of the architecture at the site. By not releasing monographs on the excavation, stratigraphy and chronology of each zone (such as at San Giovenale), they have ultimately reduced the applicability of the more specific reports. It is unclear (besides in Zone F) how the results of the specific reports relate to the overall structural development of each zone. Many of the zones (such as Zones L and N) are mentioned as important to the overall understanding of the site, but no thorough overview of those zones has been produced and readers are left piecing together information from disparate analyses and older exhibition volumes (e.g Östenberg 1975a; Wikander and Roos 1986). Moreover, the wider archaeological community fails to support, or even justify, the more detailed work of the Swedish Institute at Rome with analyses of their own beyond where evidence from Acquarossa supports their own broader models.

2.4.3 Lago dell'Accesa

Recent publications on the Etruscan domestic contexts have begun to focus on Lago dell'Accesa, another site with domestic structures dating to the seventh and sixth centuries BC. Since the geography of Lago

18 Note that Camporeale (1985b) mentions Ö. Wikander's (1981a, 1972) earlier, preparatory work on roof tiles at Acquarossa and San Giovenale and not his full catalogue, which came out after *L'Etruria mineraria*.

19 Although, Karlsson (2006: 159–160) points to a structural similarity between House III on San Giovenale's acropolis and House A in Zone D at Acquarossa. In a few of House III's foundation stones, vertical holes were drilled into their centres presumably as fittings for wood wall posts. This technique harkens back to the need to structurally fortify wattle-and-daub walls, such as appears at Acquarossa. The technique is described in more detail in Chapters 4 and 5.

dell'Accesa is significantly different to that of southern Etruria, the site provides an interesting counterpoint to sites in southern Etruria. Unfortunately, besides the publications by the excavators, little analysis of the site has been conducted. Although many of the problems that affect the literature of San Giovenale and Acquarossa (namely, over-generalisation in the application of broad-temporal models) appear in the sparse literature on Lago dell'Accesa, the unique nature of several features at the site as well as its location distinguish it from those sites.

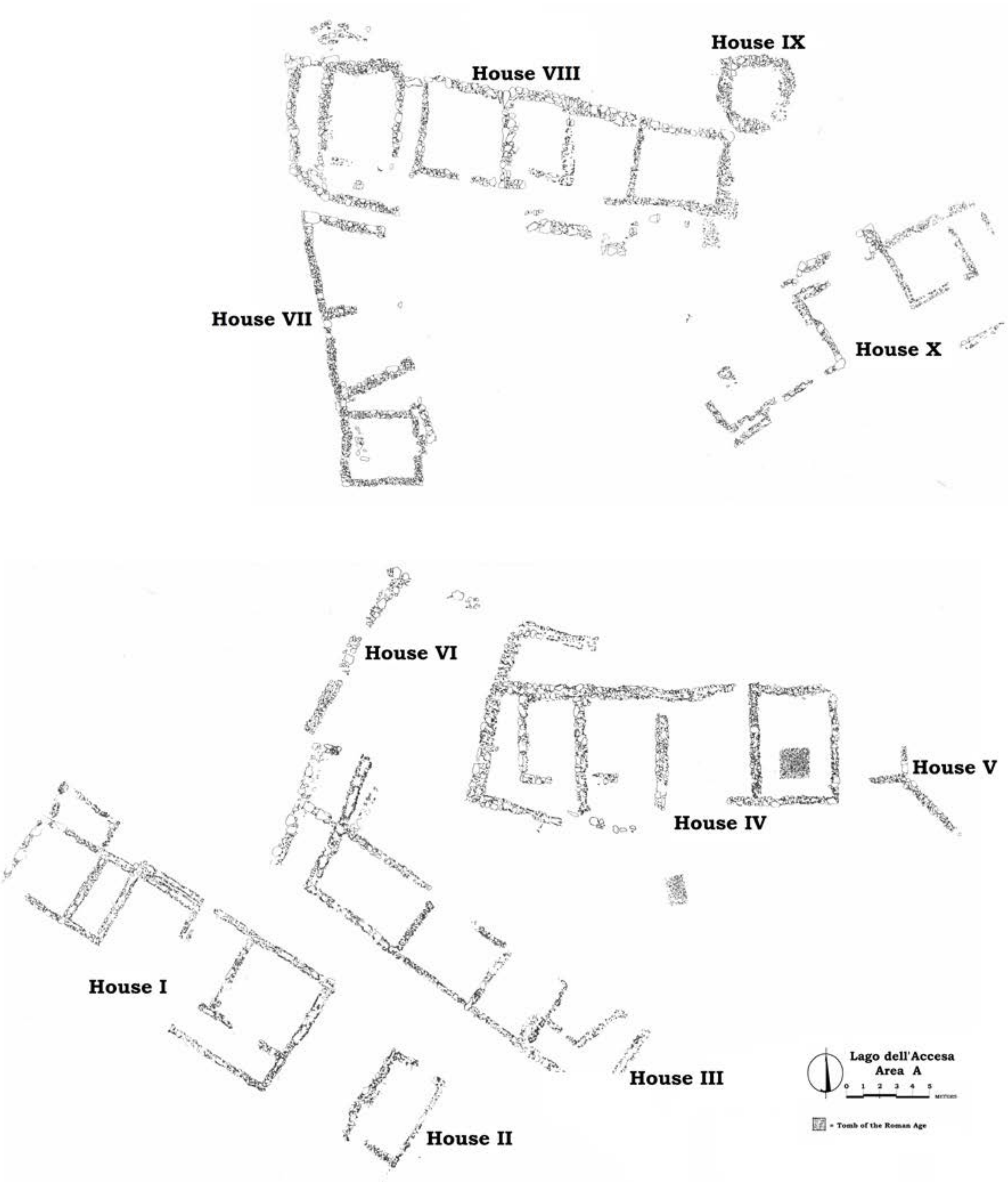

Figure 2.10. Plan of Lago dell'Accesa Area A (after Camporeale 1985: 132–133).

Camporeale's (1997, 1985b) catalogues of the finds at Areas A and B at Lago dell'Accesa and convincing analyses of the wider site are comparable to San Giovenale and Acquarossa. Camporeale (1997: 28–33, 1985a: 130, 169) recognises the relevance of those southern sites as he often mentions findings at both San Giovenale and Acquarossa. Furthermore, he adopts a system of recording reminiscent of Ö. Wikander's (1986, 1993) catalogues of roof-tiles, particularly in *L'abitato etrusco dell'Accesa* (Camporeale 1997: 30–36). By comparing the findings at Lago dell'Accesa with the Swedish Institute at Rome's reports, Camporeale establishes both how he wants the site to be viewed and the direction he wants analyses to take.

The report of Area B's findings is extensive. Similar to Pohl (2009), Camporeale (1997) is primarily concerned with cataloguing the small finds by context. Yet, he bolsters the descriptive portions of the book with well-argued and well-presented introductory and supplementary materials. One such supplementary section looks closely at the formation of the lake and the geology of the surrounding hillsides (Salvi 1997: 9–13). Through the supplemental material, Camporeale establishes credible support for his site interpretations, with Salvi's (1997) geology supplement revealing the homogeneity and local procurement of building materials. This section also strengthens Camporeale's (1985a: 135; Camporeale and Giuntoli 2000) interpretations that the inhabitants at Lago dell'Accesa were likely part of the same social stratum.

Camporeale (1985a: 170; Camporeale and Giuntoli 2000: 14) states that the purpose of Lago dell'Accesa is related to the economy of northern Etruria and, in particular, to nearby mining operations. Although it is possible that the dwellings were the homes of the miners, Camporeale (1985a: 135) advocates that the settlement housed either the mine's owners or overseers. He bases this on, among other things, the presence of fine domestic wares, especially the proliferation of *bucchero*, and the general lack of evidence for industrial activities. His interpretation hints at a distinct social and associated economic stratification, which is recognised by Nijboer (1998: 242) as an interesting part of the development of industrial specialisation and workshops.

Two other publications, one by Camporeale (2010) and the other by Harrison et al. (2010), consider the environmental reasons for different architectural changes at the site. The recent paper by Camporeale (2010) describes, among other things, the effects of the settlement on the water drainage at the site. The paper furthers a number of the concepts alluded to in the earlier texts, namely the idea that direction and additional wall footings were meant to protect the interiors of buildings against landslip and water run-off (Camporeale 1985b). Concerns about the human effect on the environment are similarly discussed by Harrison et al. (2010), with specific focus placed on the negative effects caused to the water table by metallurgy and mining. They argue that the abandonment of the site was caused by unhealthy drinking water.

These studies, focussed specifically on the settlement at Lago dell'Accesa fit into wider analyses of the vicinity by palaeobotanists and palaeoecologists (Buonincontri et al. 2013; Drescher-Schneider et al. 2007). Recently, Wiman (2013: 16–19) describes this work on the palaeoecology of the Colline Metallifere, where it intersects with the settlement at Lago dell'Accesa, as crucial to understanding the environment and therefore the resources available to the Etruscans. With the palaeoecological data and the interpretations of the purpose of the site by Camporeale (1997, 1985b), Lago dell'Accesa has a broad impact on the conceptualisation of the Etruscan way of life in the late seventh and sixth centuries.

Lago dell'Accesa also plays a key role in the presentation of Etruscan architecture. Generally, Lago dell'Accesa is associated with the architecture of San Giovenale and Acquarossa, mostly because they are contemporary. The site is usually presented as a conceptual link between the Iron Age, oval structures of San Giovenale and Luni sul Mignone and the late Orientalising and Archaic period structures at San Giovenale, Acquarossa and even Marzabotto. The progression of architecture, at least in form if not in technique, is therefore represented by the finds at Lago dell'Accesa. Steingräber (2001a) and Becker (2014), in particular, use Lago dell'Accesa in this way.

Slightly removed from this, Izzet's (2001a, 2007) works highlight some of the key differences and problems posed by the settlements at Lago dell'Accesa. As a part of her description of the increased concern for boundaries and divisions of space over time, she compares the development of Acquarossa and Lago dell'Accesa directly. Her argument for the growing demand for dedicated spaces in a house is one of the few (outside of the analyses and interpretations of the excavators) that assesses the data and proposes reasons for changing architecture for the site the data came from.

Other than the summaries by those such as Steingräber (2001a) and Becker (2014) and the analysis of space by Izzet (2001a, 2007), a systematic interpretation of the architectural features at Lago dell'Accesa is uncommon. In fact, the most in-depth interpretations of architecture are from the initial study by Camporeale (1985b). Thanks to the thorough publication of the site by the excavators, a clear picture of the structures of Areas A and B has developed. Along with the overall understanding of the purpose of the site, the architecture at Lago dell'Accesa is arguably the best presented for Etruria. However, a critical analysis of the building techniques, left open to question by Camporeale (1997), is still required. Furthermore, the remaining areas of the site (Areas C and D) await publication, leaving much of the site unknown to the wider academic community.

2.4.4 Poggio Civitate (Murlo)

Excavations by Bryn Mawr College, the University of Pennsylvania and, more recently, the University of Massachusetts Amherst at Poggio Civitate have been the subject of a number of publications in a wide variety of forms. Initially, Phillips published annual field reports from 1967-1977 (1975-1977 with Nielsen) in the *American Journal of Archaeology*. These reports closely follow the discoveries of the team and their subsequent interpretations, with changes in perceptions apparent from year to year. Phillips' final interpretations of the site appeared posthumously (Phillips 1992). However, the most explicit architectural interpretations made by Phillips and the Bryn Mawr excavators appeared in Phillips and Nielsen's (1985) contribution to *Case e palazzi d'Etruria*.

Since they document work season to season, the annual reports explicitly reveal the methods used by the excavators each year, as well as hint at the reasons behind many initial interpretations. Some reports leave evident the broader concerns of the excavators and offer projections for the coming year that emphasise both the interpretations already made and how the excavators understood the site. From the reports, it is possible to establish not only what sort of architecture was found at the site but also the ways in which the excavators initially interpreted what they found.

Although helpful in establishing the methods used by the excavators, the reports contain limited detail and leave a number of specific questions about the site unanswered. Most of the architectural interpretations given in the reports are tentative, as is typical of preliminary reports. Emphasis is often put on the findings of each season and little room is therefore given for broad interpretation or even, in many cases, context. Therefore, when read together, the reports are indicative of the methods and immediate interpretations of the excavators but are deficient when trying to form a cohesive understanding of architecture on the site.

Phillips (1992) helps to clarify some of the broader issues not addressed by the annual reports. He compiles the key discoveries of the Poggio Civitate excavations (up to that point) and offers his interpretations of the architecture from a social perspective. He proposes that aspects of the architecture indicate that Poggio Civitate's place as a form of politico-religious seat of power or meeting-place, similar to Livy's fabled

Fanum Voltumnae (Livy 4.23). He also includes some interpretations of the interior post system and summarises the findings of mud brick. Despite this, the intent of the book is clearly not to interpret the architecture beyond how its size and style supports Phillips' wider conclusions on the society and act as a sort of introduction to the excavations.

Of the earlier publications on Poggio Civitate's architecture, the most important is by Phillips and Nielsen (1985). Their work identifies key structural components in a much more concrete way than in the annual reports and in a more detailed fashion than in Phillips' later work. Phillips and Nielsen's account fits within the wider arguments made throughout the volume about the appearance of élite residences. To this end, they look at the building materials and techniques and how they relate to building form (Phillips and Nielsen 1985: 65–67). The specifics of architecture are thus interpreted as a part of the overarching theme of the volume. In essence, Phillips and Nielsen present their interpretations of building techniques (i.e. the use of pisé in walling) but do not offer rigorous examination of those interpretations.

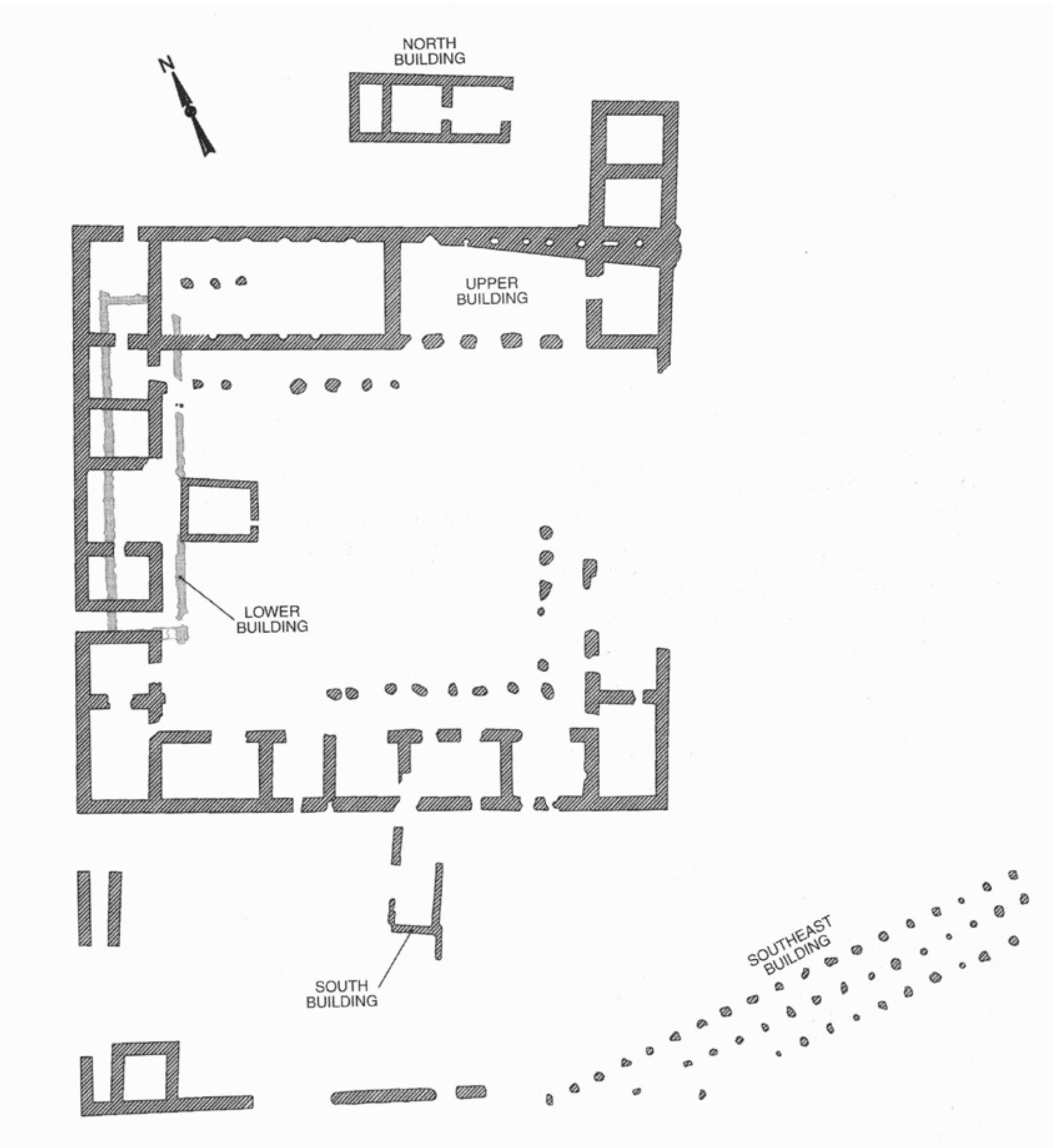

Figure 2.11. Plan of Poggio Civitate (Berkin 2003: 9), courtesy of J. Berkin.

De Grummond (1997) recognised a number of substantial problems with these original interpretations, from a simple lack of continuity and process in the identification and presentation of structures, to the assumptive claims made on unclear evidence. Thanks to this review of the earlier literature, de Grummond's paper is particularly useful for any discussion on Poggio Civitate and acts well as a common point of reference.

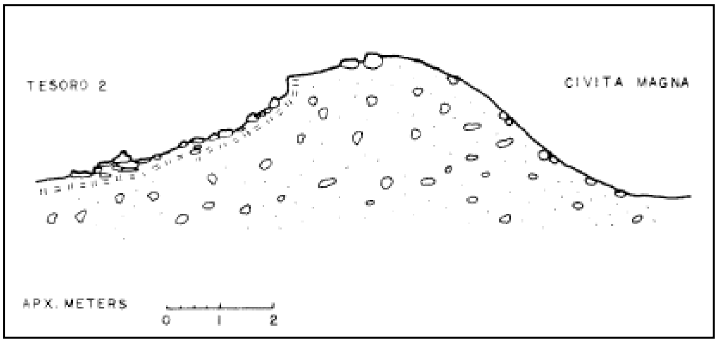

Figure 2.12. Section of the agger at Poggio Civitate (Phillips 1967: fig. 20), courtesy of American Journal of Archaeology and Archaeological Institute of America.

Moreover, the interpretations given by de Grummond (1997) identify the architectural traits of the site, while challenging the assertions of the earlier excavators. She singles out the confusing architecture-identification process used in the literature (de Grummond 1997: 29–30). With no overall plan, summary of excavation or strict architectural analysis given by the excavators, the architecture at Poggio Civitate is difficult to assess, with even supposed walls and rooms/'rectangles' appearing in some plans and not in others (de Grummond 1997: 29).[20] This inconsistency in the more easily discerned features is even more apparent in the features such as the *agger* (Figure 2.12), the man-made mound of earth and detritus that was a central feature of the excavations. Despite the annual reports and the subsequent publications, a full survey or plan of the *agger* only appears early on and is only preliminary in nature. Even though it is poorly documented, the *agger* forms a key part of Phillips' (1969: 332, 1992: 5; Phillips and Nielsen 1985: 64–65) interpretation of the site based on its supposed control over access.

De Grummond's scepticism appears to have forced (whether intentionally or otherwise) a response by those closely involved with the site. Among the various articles and books on small finds and terracottas from the late 90s and early 2000s (i.e. Berkin 2003; Flusche 2001; Gleba 2000; Tuck 2000, 2009; Tuck et al. 2010; Tuck and Nielsen 2008), an article on the Upper Building at Poggio Civitate by Turfa and Steinmayer (2002) stands out. Following their paper on the monumental architecture of Greece and Etruria (which presented a number of interpretations on the roofing techniques used in the Upper Building: Turfa and Steinmayer 1996), Turfa and Steinmayer offer a thorough synopsis of the interpretations of Poggio Civitate. This includes a number of the interpretations given previously by Phillips and Nielsen but they elaborate on them by providing explicit detail on the major components of the site. Turfa and Steinmayer (2002: 19–20) ultimately disagree with Phillips, suggesting that in its final phase Poggio Civitate was a mercantile centre with certain administrative functions and artisan production.

Turfa and Steinmayer (2002: 8) also highlight the dimensions and the scale of each of the definite rooms in the Upper Building. These data appear in previous publications but are discussed here with reference to use. Other important features of the architecture are mentioned, for instance: the possible portico over the courtyard, the level of security offered by the supposed height of the wall, room access and the associated small finds for each room. These features of the architecture had all been alluded to previously but never presented as part of a coherent, conclusive interpretation.

Yet, Turfa and Steinmayer (2002) neither comprehensively identify the building techniques used at the site nor provide detailed interpretations of the building techniques. Mentions of specific techniques,

20 The differences between plans in the annual reports are apparent. Assuredly, differences are understandable and can be chalked up to changing interpretation as new information emerged. Yet, even the plans within the single paper in *Case e palazzi d'Etruria* are inconsistent – see Phillips and Nielsen (1985: fig. 3.2, 3.5).

particularly mud brick walling, appear throughout the paper but at no point do the authors explain how the techniques were recognised. While an argument could be made that the identification of such techniques is in the earlier reports, the majority of the previous publications fail to present conclusive identifications one way or another.

The only case where conclusive identification and interpretation had previously occurred is in the earlier Turfa and Steinmayer (Turfa and Steinmayer 1996) article on monumental architecture. Their identification of certain roofing techniques, primarily with regard to the largest room in the Upper Building, is not based on comparison or assumption but on specific architectural guidelines. Turfa and Steinmayer (1996: 22–24) identify the use of tie-beam trusses in the roofs of the Upper Building, which (if correct) is the first known example of that roofing technique in Italy. The identification of the tie-beam truss technique and the possible technological reason for its use is based on a presentation of some of the previously underreported facets of the structure (such as the flat column bases in Room 5).

Lastly, Tuck and Nielsen (2001) published a report on the Lower Building, as well as the surrounding structures of the same phase. The report is relatively thorough, although the paper is more concerned with interpretations of use than with a presentation of data. That aside, a number of key data are presented on the Lower Building, the Southeast Building and a newly recognised tripartite structure (so-called Orientalizing Complex Building 3), paramount of which are dimensions and chronology (Tuck and Nielsen 2001: 38–40, 45). In the course of discussion, Tuck and Nielsen (2001: 41–44) also detail the make up of the ground preparation and hint at the original consistency of the wall footings. Although more akin to the simpler annual reports than a conclusive publication of the structures, this article is particularly useful, clarifying important parts of the less-recognised early structures.[21]

The literature on Poggio Civitate is different from the other important sites investigated in this book. As with the others, Poggio Civitate has played a crucial role in the overall understanding of both architecture and the Orientalising period. However, in contrast with Poggio Civitate, other sites, such as San Giovenale and Lago dell'Accesa, have seen catalogues and monographs of differing quality and scope devoted to the built structures. Without this form of summary, when it comes to the architecture, the large bibliography of Poggio Civitate is difficult to assess as a whole. Until the release of a monograph, any comprehension of the architecture at Poggio Civitate must rely on the vast number of interpretations and limited information published to date.

2.4.5 Conclusions

The four sites included in this literature review vary widely in both style of interpretation and available publication types. Despite their evident variation, it is clear that the questions of building function are of greater concern to scholars than the details of building materials and techniques. Discussions of the architecture are usually confined to an interpretation of the materials used or the form displayed and publications rarely expand on the techniques.

At San Giovenale, the Swedish Institute at Rome has produced a series of monographs that seek to present information about the excavation and finds. Interpretations, however, are generally brief and where they exist they are often unspecific about how certain building techniques were identified. Where interpretations of techniques occur, the methods used vary from speculative inferences based on context (i.e. Pohl 1977: 27–32) to comparative analysis (i.e. Karlsson 2006: 144–146, 159–160) to a descriptive catalogue (i.e.

21 For more on the purpose of the site, see: (de Grummond 1996; Meyers 2013; Strandberg Olofsson 1986: 131–132; Torelli 1985; Turfa and Steinmayer 2002).

Nylander 2013; Pohl 2009: 19–22). From the recent, detailed publications about Area F East and the Borgo, there is an opportunity to create new interpretations of not just building function but also building materials and techniques.

The literature on Acquarossa differs from that of San Giovenale. While the main publications by the Swedish Institute also present information about the excavation and its discoveries, the information is given not by area (as is the case at San Giovenale and at Lago dell'Accesa) but by specific feature or artefact type. The shift in presentation has favoured the presentations of discoveries from the excavation over the details of the excavation itself. This difference has not ultimately changed the interpretations of building techniques but, due to its specificity, it allows for a more rigorous interpretation of the evidence. Meticulous interpretations of the possible roofing used at Acquarossa have therefore been made available, with explicit reasons for how techniques were identified.

However, the interpretations of building function, especially for the *edifici monumentali*, dominate discussion in the literature on Acquarossa. From the work on the *edifici monumentali*, some, such as Strandberg Olofsson (1989) and Wikander and Wikander (1990), have interpreted building technique from within that broader focus on function. As a result of the focus on the specific feature or artefact type, the less-remarkable architectural features uncovered in excavation often go unmentioned. Exhibition catalogues are the only publications to mention these less-remarkable zones of excavation (Östenberg 1975a; Wikander and Roos 1986). Even then, the architectural features are merely presented, with associated techniques rarely identified. Interpretations of building techniques at Acquarossa are therefore inconsistent at best, with some aspects, such as roofing, well represented and others nearly completely absent.

The literature on Lago dell'Accesa offers perhaps the most thorough presentation of domestic finds in Etruria. Yet, the identification of architectural features is vague when compared to the small finds, particularly in the main excavation catalogue of Area B (Camporeale 1997). Specific reference to features in the foundations of buildings, along with the phasing of those foundations, is often unclear (Camporeale 1985b, 1997). Despite this, the main catalogues offer considerable data for the reader to draw his or her own conclusions. The architectural section in the catalogue of Area B neatly ties the broadly expressed identification of features at Lago dell'Accesa with contemporary architecture, proposing simple interpretations. In conjunction with the interpretation of the site's purpose and environs, a much clearer picture of the basic architectural situation at the site is revealed. Therefore, while presented without particular detail, the overall picture of the architecture is quite clear and, in general, more accessible than in the literature at comparable sites.

Interpretations of Poggio Civitate are perhaps the most widely varied of the four sites mentioned here. Overall, the site is critically important in the wider discussion of not only Orientalising period Etruria but, more importantly, Etruscan architecture. Much of its importance stems from the wide variety of publications and the perceived significance of the Upper Building. Yet, no encompassing summary of the excavations has been produced. Lacking this, many of the architectural interpretations of Poggio Civitate rely on the temporary field interpretations of the initial reports. Yet, with the diverse publication history, it is possible to piece together some of the building techniques identified by excavators and the reason behind such identifications.

2.5 Conclusion

Three key components of my research have been outlined in this chapter. The first concerns how and why behavioural theories are used. Then, methodology was described, detailing how the different strands of behavioural theory are incorporated within a methodological perspective. Last, the literature review contrasted the main interpretations of Etruscan domestic architecture.

Behavioural theories characterise the approach in this study. A distinctly causal system of interpretation, where building techniques result from influence and habit, results from the behavioural theories, particularly when combined with the methodology. Change is therefore seen as alteration to group behaviour, where individual actors are influential in the innovation and the alteration of tradition.

Interpretations of the behavioural causal chain are the product of distinct methods: descriptive reconstruction, *chaîne opératoire* and comparative analysis. These three methods are necessary in the interpretation of techniques. Identification of building techniques in the evidence through detailed descriptive reconstruction produces both a dataset from which to interpret behaviour and information on what the possible environmental circumstances required of the structural design. The *chaîne opératoire* method and comparative analyses of techniques through time permit the examination of causation and the possible reasons for apparent changes to the architectural composition of Etruria.

Finally, it was essential to include a review of the publication history of the more prominent domestic sites in Etruria. Due to the new perspective on Etruscan architecture brought forth by the behavioural theories and methods, the interpretations contained within necessitated the re-examination of previous interpretations. Generally, the literature is focussed on interpreting building function. The interpretation of architectural techniques is typically secondary to function.

The theoretical and methodological framework outlined in this chapter, alongside the differences with the scholarly literature in theory and approach, provide evidence for the necessary re-interpretation of the evidence. The goal of this chapter has been to establish how interpretation with a focus on techniques is carried out in this book and then juxtapose it with the interpretations based on building function common in the study of Etruscan architecture. The following chapters aim to readdress what is known about Etruscan domestic architecture and what changes to those techniques say about the culture.

Chapter 3: The foundations of early Etruscan buildings, 800-625 BC

The primary aim of this chapter is to identify early Etruscan foundation techniques using a descriptive reconstruction of published archaeological evidence. The sequence that produces foundations has four independent operations (ground preparation, wall footing, flooring and roof support) that typically result in archaeologically visible evidence. The techniques that comprise each of these four operations are reviewed in descriptive analyses, where they are grouped based upon similar characteristics. Comparative analysis of these groups (called here 'foundation types') suggests that by the beginning of the Orientalising period there had been a transition in the dominant techniques used to create foundations in permanent domestic buildings. This chapter (in conjunction with the next chapter which uses the same methods to identify foundation techniques in the Orientalising and early Archaic periods) thus builds a dataset for the re-interpretation of architectural change through time.

Although a thorough definition and discussion of the term 'foundation' appears in the Glossary, it will be helpful to describe briefly here how the term is applied in this study. Foundations, based on modern engineering literature, are best described in relation to function. They exist as the distributor of the weight of a building into the ground in a way that prevents deformation of the soil (Simons and Menzies 2000: 87). The foundation is a mediator, dispersing the stresses that were created within the building into the ground. In engineering literature, foundations clearly differ from other parts of the building (e.g. floors or walls) following this rule, yet these differences are often less clear in the archaeological evidence.

Arguably, a modern definition of 'foundation' works well when describing Etruscan buildings. Every building constructed in Etruria between 800-500 BC shows concern for stress, soil structure and weight distribution. However, compared to modern building foundations, early Etruscan buildings had shallow foundations and, as seen in many of the cases below, these foundations also relied on the wall footings and floors to distribute the weight of the building into the ground.

Therefore, in this book, the term 'foundation' includes all parts of a building that transfer the weight of the building above into the ground through direct contact or otherwise help to prevent soil deformation. Applying this functional definition for the term allows a part-by-part analysis of foundations that both preserves the overall integrity of the functional intent of the term and acknowledges the symbiotic relationship between the foundations and the other parts of the structure. Parts of a building which might typically be considered separate from the foundation will therefore be analysed here as a part of the process of building a foundation.

This chapter and the following chapter have main sections (three in the former and two in the latter) that examine eighth- to fifth-century BC buildings from sites across Etruria (Table 3.1). Buildings within these main sections are grouped into types based upon similar foundation techniques. The determining techniques of each type are as follows:

- Foundation Type 1: set into bedrock, bedrock-cut channel wall footings;
- Foundation Type 2: set upon prepared soil, stone socle wall footing;
- Foundation Type 3: set into bedrock or soil, no discernible wall footings, semi-subterraneous;
- Foundation Type 4: set upon/into prepared soil, wall footings with outer skins made of larger stones around an interior rubble and earth deposit;

- Foundation Type 5: set upon bedrock or into soil, ashlar wall footings often of a few courses.

Foundation Types 1-3 are discussed in this chapter and Foundation Types 4-5 are discussed in Chapter 4.

Importantly, these ‘foundation types’ do not constitute a formal typology. That is, these types and their associated characteristics are not intended to be rigid groupings or a doctrinal classification system. Rather, these types aim to show how different techniques are reflected in a number of foundations at roughly similar times.

Site	Type 1	Type 2	Type 3	Type 4	Type 5	Total No. of Buildings
San Giovenale	3	2	1	0	16	22
Luni sul Mignone	0	3	1	0	1	5
Lago dell'Accesa	0	15	0	9	0	24
Veii	1	0	0	0	4	5
Murlo	0	0	0	2	0	2
Podere Tartuchino	0	0	0	1	0	1
Acquarossa	0	0	6	0	20	26
Total	4	20	8	12	41	85

Table 3.1. Examples of building foundations from 800-500 BC by type and site.

Identification of these foundation types is based on the descriptive reconstruction of the ground preparation and wall footing operations mentioned above. Ground preparation techniques are usually the first step in the foundation sequence. Their primary function is the establishment of a level building surface, including the removal or addition of soils and stones. Sometimes, the creation of the floor of a building occurs at the same time as ground preparation. In those cases, the relationship between ground preparation and flooring will be examined.

Wall footings are typically the first elements of the foundation to denote the superstructure of a building. They usually follow ground preparation in the building sequence but this is not always clear (see section 4.1.2). Their purpose is to provide foundational support for the walls and act as a visual indicator delineating the physical extents of the building itself. Regardless of their similar purpose, wall footings can differ markedly based on the techniques involved in their creation. Therefore, in this book, a wall footing is any element of the foundation that explicitly transfers the load stress of the walls into the ground. In particular, this includes trench deposits, bedrock channels and stone socles.

Flooring and roof support operations are also considered in each main section since they form key parts of foundation creation and use. In this study, they are secondary to ground preparation and wall footing in importance due to their typical state of preservation. In many cases, evidence for floors or roof supports has not survived. For a number of structures, roof supports are also within (and are therefore not distinguishable from) walls. This ambiguity in the evidence prevents significant interpretations of the architectural change based on these techniques individually. However, floors and roof supports supplement interpretations of ground preparation and wall footings, secondarily enriching the wider interpretations made in this book.

Sample size is a noteworthy factor in this book, particularly in this chapter. Although some sites have a significant number of domestic buildings, increasing the variability between foundation techniques (Table 3.1), the 32 domestic buildings dating from 800-625 BC includes 15 structures from Lago dell’Accesa and 6 structures from Acquarossa that date to the second half of the seventh century. The identification of eighth-century building techniques is therefore reliant on 10 structures, which ultimately reduces diversity in the dataset. Furthermore, of the 85 buildings (dating to 800-500 BC) in this study, 56 of them were excavated before 1980. As a result, there are some specific points to be made about the sample and its relation to the study of foundations.

First, due to the relative scarcity of sites, it is often difficult to appreciate whether differences in foundations between sites are representative of broader social, cultural or technological differences. Indeed, whether or not the foundations are a product of local variability or a general trend is difficult to ascertain using buildings that date to 800-500 BC. The possibility that the variability in foundations exists due to geology and the practical adaptation of the geography is as likely as any other reason based upon the available sample. For instance, the effects of geology are undeniable in the differences between foundations in northern Etruria, which is notable for its variety of bedrocks, including sandstone and shale, and southern Etruria, which is primarily tufaceous (see section 6.2).

In order to narrow the possible reasons for differences in foundation from site to site, two different methods have been adopted. Since buildings dating to 800-500 BC do not always provide a large enough sample, when possible, the chronological scope of the sample has been expanded, particularly for the earlier types (i.e. Foundation Types 1, 2 and 3), in search of a wider architectural tradition. Building foundations from earlier sites are therefore compared to the extant foundations from 800-500 BC, often as a way of demonstrating the antiquity of certain techniques.

The second method for addressing the concerns of the sample size is investigated thoroughly in Chapter 6 (see section 6.2). There, procurement strategies for materials used in the creation of buildings are assessed. Alongside this assessment is a geographical review of the geology at each of the major sites considered in this book. From there, the possible causes of regional difference will be considered in full.

Another concern with regard to the sample is whether or not it is representative. Does it give us a complete picture of typical building foundations during the 800-500 BC range? Based on the evidence found at each site, it is likely that the sample is not wholly representative. For example, in and among the buildings that date to 800-500 BC, there are numerous examples of unassociated post holes and floors, particularly at multi-phase sites (e.g. Pohl 1977: 18–22; Ward-Perkins 1959: 50) . These less robust features might well be part of one or more of the foundation types mentioned above or exemplify a completely different foundation process altogether that has not otherwise survived. Less robust features are often not substantial enough to be identified and yet they act as a reminder of the robust nature of the foundation types that do survive. This reminder is particularly important for discussions of the social implications of buildings and their context.

Particular attention has been paid to the limits of the sample. Regional variability and limited survivability are key factors that have heavily influenced the available data. Nevertheless, the goal of the two foundation chapters is to document transitions between traditional and innovative techniques in building foundation. Therefore, while the conclusions of Chapters 4 and 7 weigh the evidence along with these factors, the main body of the foundations chapters attempts to identify the techniques and the changes to those techniques present in the data – often irrespective of regional variability and limited survivability.

Finally, the foundation chapters are split into two based primarily on theme. This chapter focuses on 'huts', as they are frequently called, identified as such based on evidence for thatched roofs, non-stone walls and unclear internal divisions for rooms. In the next chapter, the foundations of later structures ('houses') are described. Dividing the two *foundation* chapters based on the evidence for walls and roofs is intentional. Showing the division between hut and house without the defining characteristics of that division and examining only the techniques in the foundation encourages a discussion on whether a transition between 'hut' and 'house' is real or imagined. This discussion appears at the end of the next chapter.

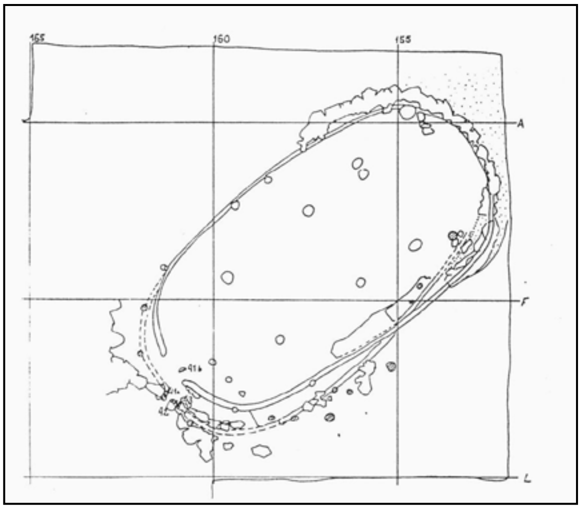

Figure 3.1. Plan of Capanna I at San Giovenale Area D (Malcus 1984: fig. 21, p. 50), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

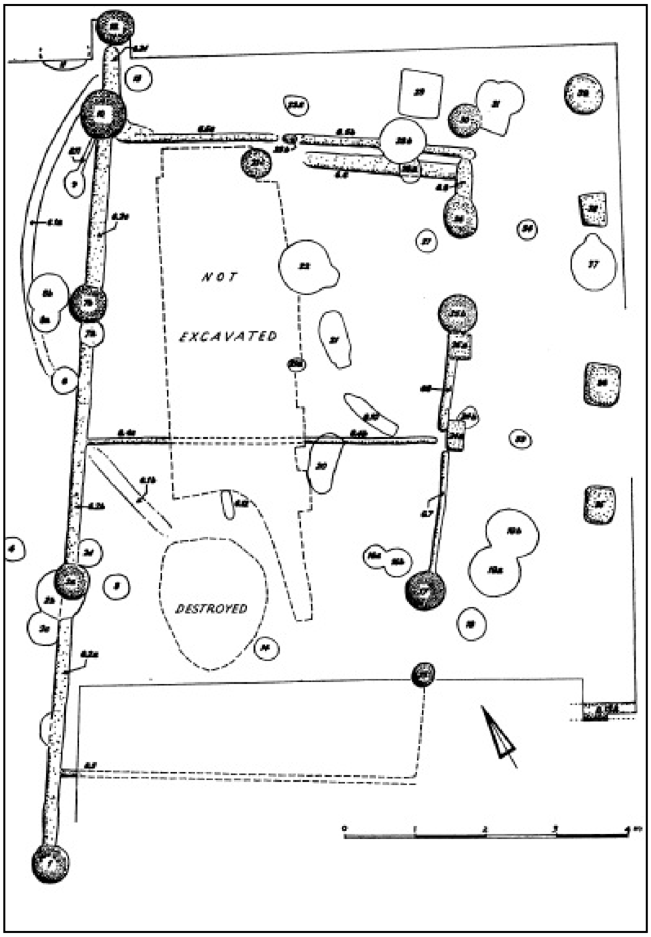

Figure 3.2. Plan of the Rectangular Timber Building under the fifth century BC rampart at Veii (Ward-Perkins 1959: 51).

3.1 Foundation Type 1

The foundation techniques found in this section are traditional in character, meaning that they are directly comparable to the dominant techniques established in prior generations. Every example from this type was built directly upon bedrock. Foundations of this type are characterised by bedrock-cut channels that function as the wall footings and by bedrock-cut post holes of various sizes and alignments. The floors of these buildings were either the smoothed bedrock surface or, as is more likely the case (at least in multi-generational buildings), made of layers of tiny tufa stone fragments (*tufetti*) or other small stones and pressed clay.

Sixteen examples of Foundation Type 1 appear in this study (Table 3.2). However, only four of them were built after 800 BC. Three are from San Giovenale: Capanne I and II from Area D and Oval Hut I from Area E (Malcus 1984; Pohl 1977; Figures 3.1, 3.3).[22] The other, the Rectangular Timber Building, is from Veii near the Northwest Gate (Figure 3.2).[23] Alone, the examples built after 800 BC are hardly representative of common techniques for the entire region. They are, undoubtedly, too few and too localised to indicate a wider tradition. However, these structures evoke older, traditional foundation techniques. In fact, these examples from San Giovenale and Veii are likely among the last iterations of an architectural tradition that reached its apex in the Final Bronze Age and Early Iron Age (Domanico 2005: 526; Pohl 1977: 96–97).

22 Evidence of four partial structures with Type 1 foundations was discovered at San Giovenale Area F East (Figure 3.4). Karlsson (2006: 138–141) noted that radiocarbon dates suggest that one of the structures was occupied as early as the fourteenth century BC but due to their unclear contexts the other structures could date to as late as the eighth century. They have not been included as a part of the 16 primary examples of Foundation Type 1 since they are not completely excavated.

23 An earlier building from before 750 BC, the so-called 'Timber Structure from the Earliest Age' (Figure 3.6) likely had Type 1 foundations, also. It is possible the Timber Structure was a previous iteration of the Rectangular Timber Building and survived only in part following the erection of the Rectangular Timber Building. It is also not included as a primary example due to its incomplete nature but is relevant to the overall chronology of Foundation Type 1 (as discussed below).

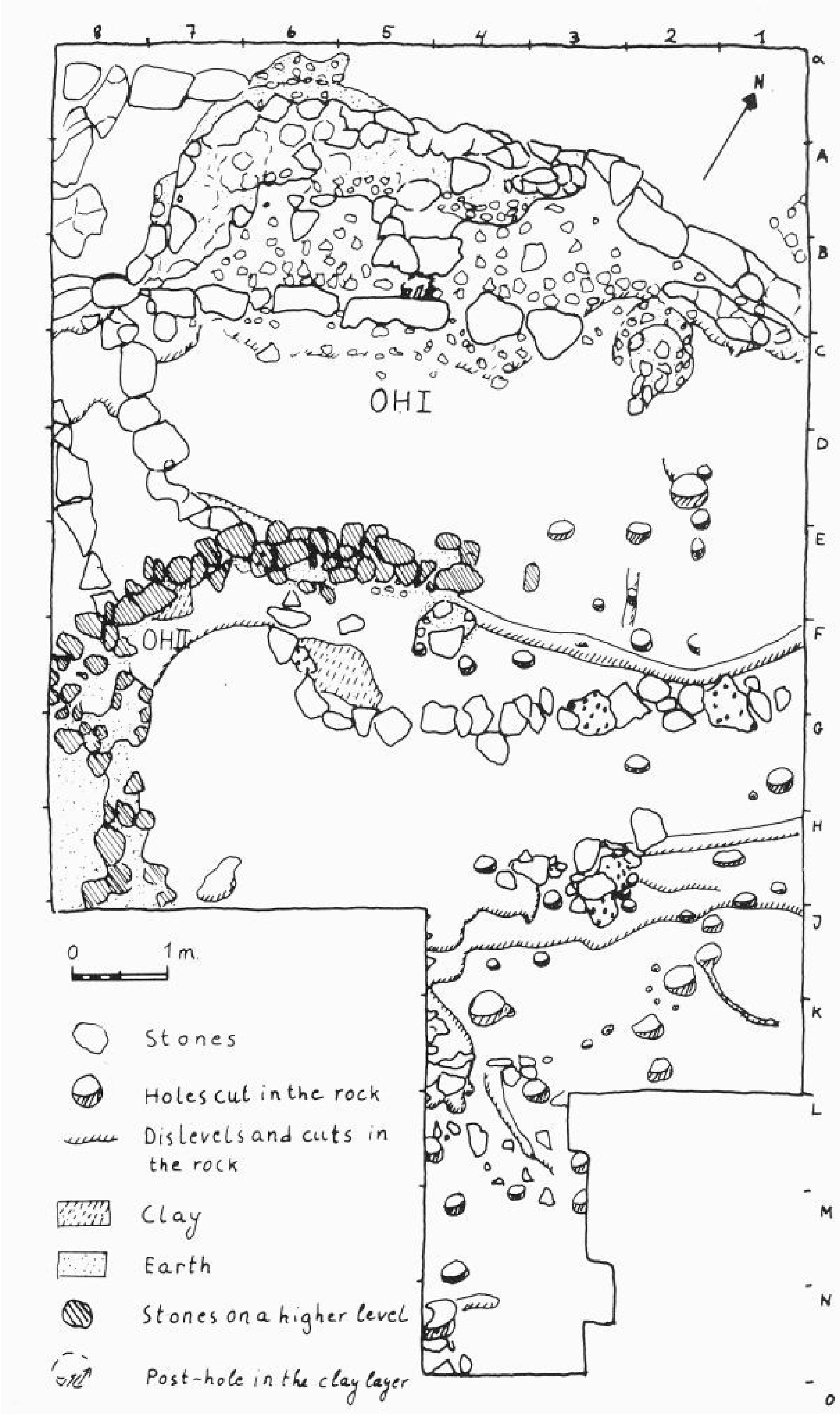

Figure 3.3. Plan of San Giovenale Area E at the end of excavation (Pohl 1977: fig. 1, p. 14), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

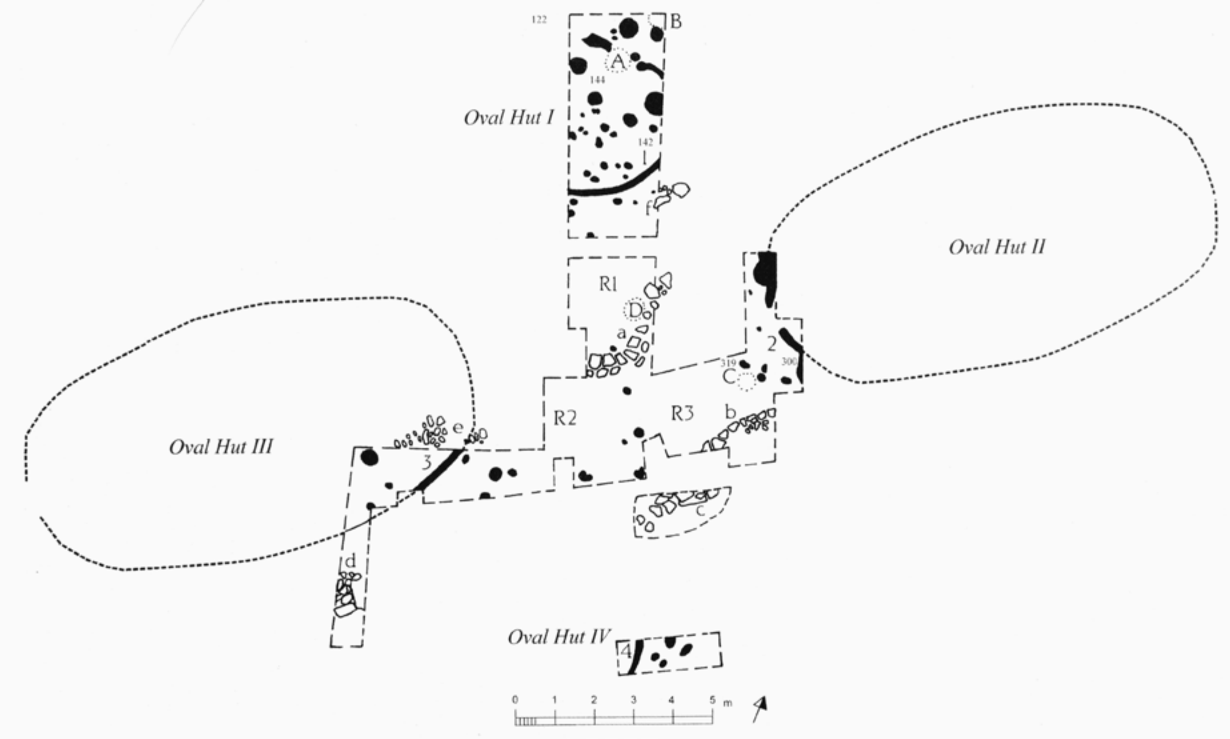

Figure 3.4. Plan of San Giovenale Area F East during the Iron Age (prehistoric remains) (Karlsson 2006: fig. 264, p. 139), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

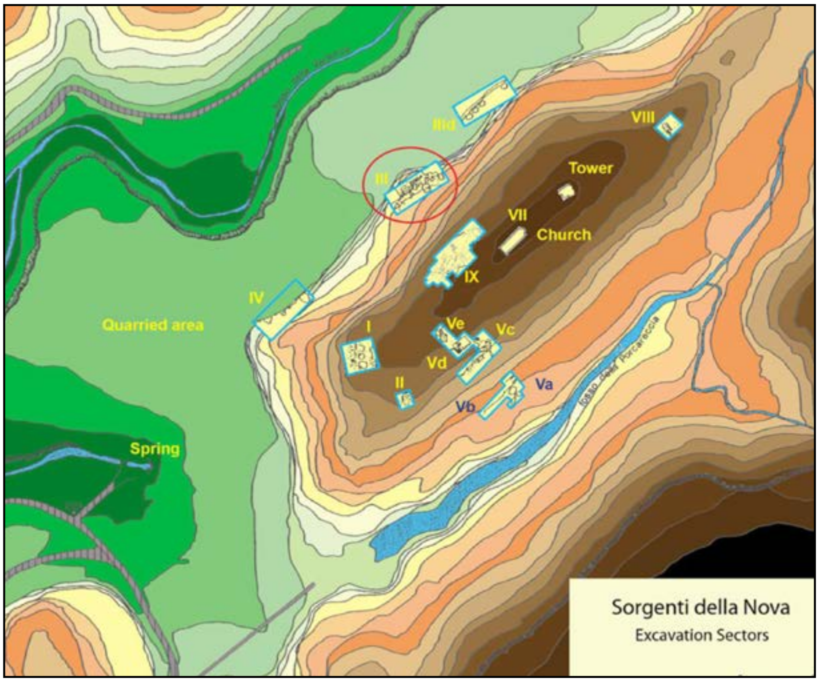

Figure 3.5. Site map of Sorgenti della Nova with Section III encircled (Dolfini 2013: 136).

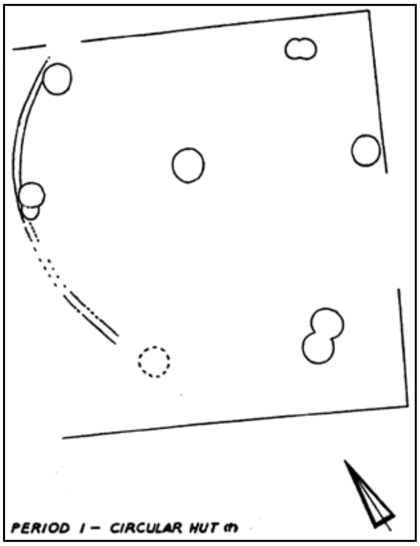

Figure 3.6. Plan of the so-called "Timber Structure from the Earliest Age" (Ward-Perkins 1959: 52).

Site	Building Name	Period	Dates
San Giovenale Area D	Capanna I	Late Tolfa-Allumiere	c. 800-725 BC
San Giovenale Area D	Capanna II	Late Tolfa-Allumiere	c. 800-725 BC
San Giovenale Area E	Oval Hut I	Late Tolfa-Allumiere	c. 800-725 BC
Veii, Beside the NW Gate	Rect. Timber Building	Early Etruscan	c. 750-700 BC
Sorgenti della Nova Sec. Vc	Ab. a Pianta Ellittica	Final Bronze Age	c. 1100-900 BC
Sorgenti della Nova Sec. III	Abitazione 1	Final Bronze Age	c. 1100-900 BC
Sorgenti della Nova Sec. III	Abitazione 2	Final Bronze Age	c. 1100-900 BC
Sorgenti della Nova Sec. IX	Abitazione 4	Final Bronze Age	c. 1100-900 BC
Sorgenti della Nova Sec. IX	Abitazione 5	Final Bronze Age	c. 1100-900 BC
Sorgenti della Nova Sec. IX	Abitazione 6	Final Bronze Age	c. 1100-900 BC
Tarquinia Calvario sui Monterozzi	Capanna 3	Early Iron Age	c. 880-750 BC
Tarquinia Calvario sui Monterozzi	Capanna 7	Early Iron Age	c. 880-750 BC
Tarquinia Calvario sui Monterozzi	Capanna 13	Early Iron Age	c. 880-750 BC
Tarquinia Calvario sui Monterozzi	Capanna 14	Early Iron Age	c. 880-750 BC
Tarquinia Calvario sui Monterozzi	Capanna 33	Early Iron Age	c. 880-750 BC
Tarquinia Calvario sui Monterozzi	Capanna 48	Early Iron Age	c. 880-750 BC

Table 3.2. The examples of buildings with Type 1 foundations by site.

The other 12 examples in this section were built prior to 800 BC. Six complete examples come from the Bronze Age site Sorgenti della Nova and six others are from Early Iron Age Tarquinia. Occupation at Sorgenti della Nova (Figures 3.5, 3.7) began in the eleventh century BC and ended in the ninth century BC (Negroni Catacchio 1995: 407–409; Negroni Catacchio and Dolfini 2000). Type 1 foundations at Sorgenti della Nova are thus the oldest examples used in this study, dating 250-350 years before the examples from San Giovenale and Veii. At Tarquinia, an excavation on the Monterozzi plateau revealed six complete buildings and traces of approximately a dozen more (Linington 1982: 246; Figure 3.8). The buildings at Tarquinia interested the excavators because they not only expanded understanding of the early settlement at Tarquinia but they also provided a wide range of building forms. Rectangular and square forms, in particular, were known from modern capanne and cinerary urns but were essentially absent from the archaeological record to that point (Boëthius and Ward-Perkins 1970: 18; Close-Brooks and Gibson 1966).

The dates of the examples from Tarquinia are uncertain. The excavators thought that the buildings were all in use at the same time and that differences in building form represented functional differences, not difference in chronology or technology (Linington 1982: 251; Linington et al. 1978). Pacciarelli (2000: 170) questions this view and, based on Colonna's (1986: 390) comparison to the other known elliptical and rectangular structures in Etruria, suggests that the different forms could be representative of different chronological phases. This debate will be discussed further below. For now, the dates given for the examples from Tarquinia, regardless of form, are based on the entirety of supposed Villanovan habitation on the Monterozzi plateau: 880-750 BC (Iaia et al. 2001b; Mandolesi et al. 2012).

With the characteristics that define it less apparent after c.750 BC, Foundation Type 1 may appear to be irrelevant to the description of foundation techniques from 800-500 BC. However, the long history and prevalence of the techniques defining Foundation Type 1 represent an established, traditional way of constructing foundations. Given their predominance in southern Etruria, in particular, Type 1 foundation techniques are the basis for later innovations in the area, including a number of techniques that define Foundation Type 5. It is therefore essential to include Foundation Type 1 in an analysis of foundation

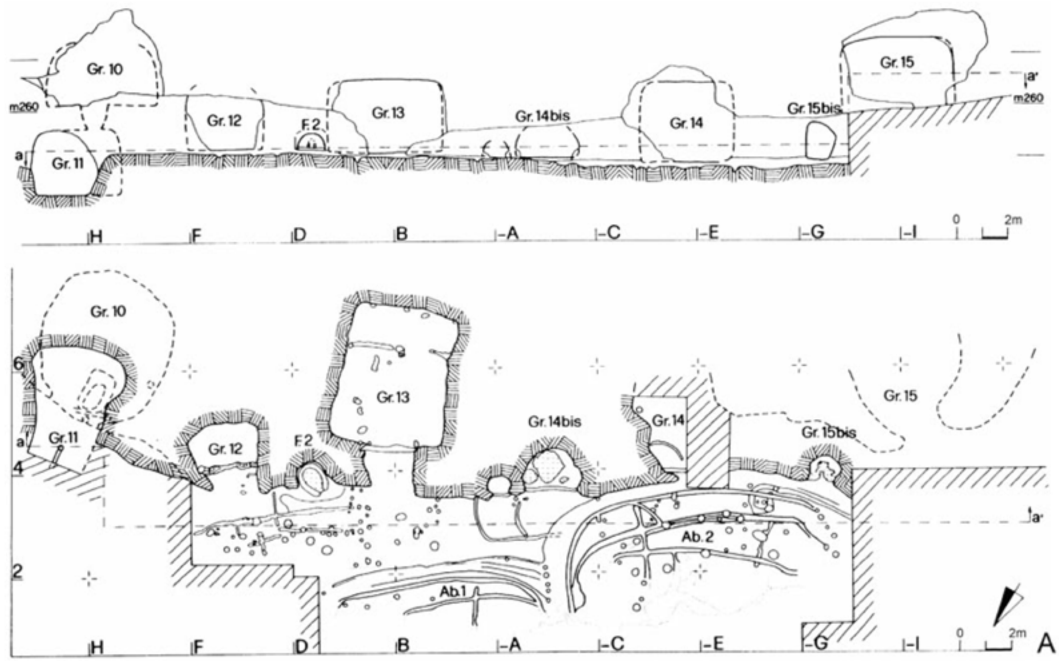

Figure 3.7. Section (top) and plan (bottom) of Sorgenti della Nova Section III (Negroni Catacchio 1995: 96); courtesy of Istituto Italiano di Preistoria e Protostoria.

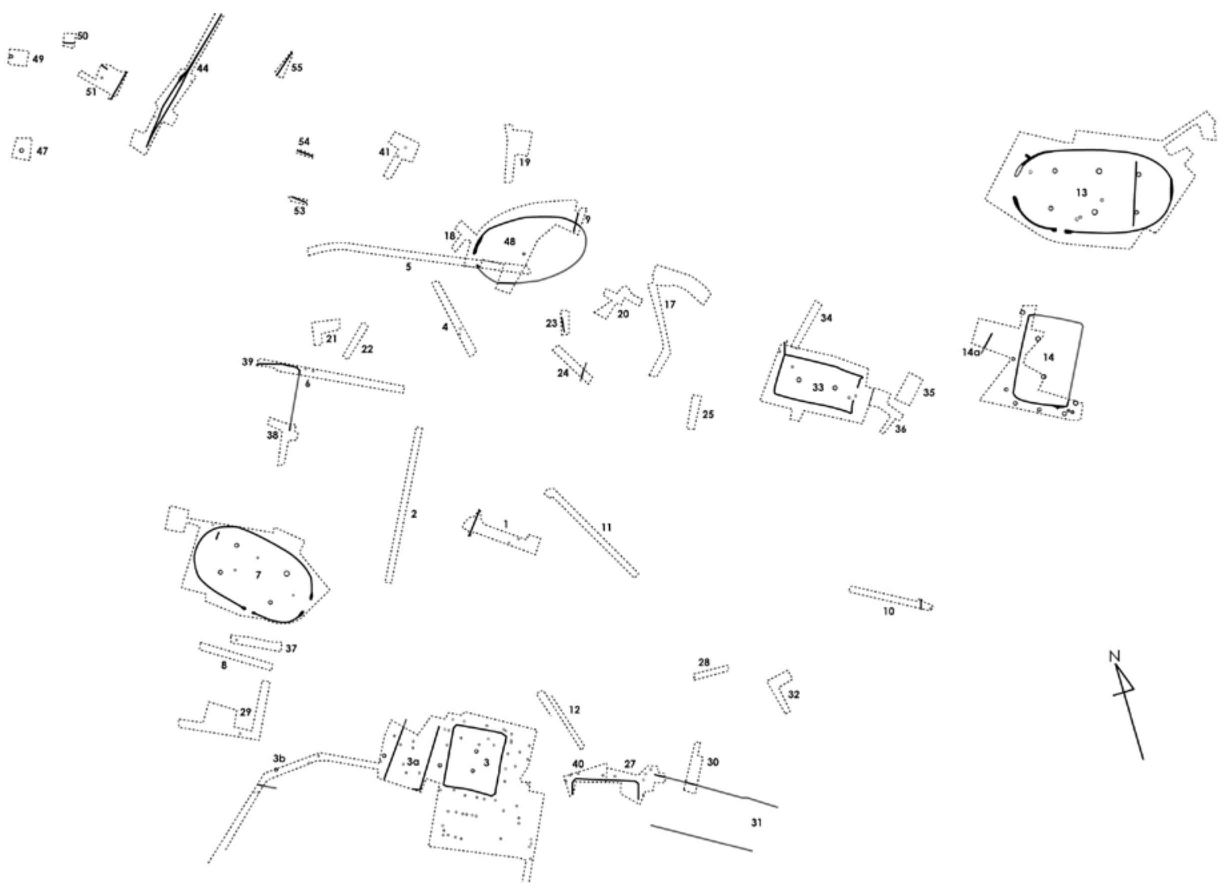

Figure 3.8. Plan of Calvario sui Monterozzi at Tarquinia (after Linington 1982: 252).

Figure 3.9. Channels of the southern end of Abitazione 2 from Sorgenti della Nova Section III, including several postholes and exterior channels of uncertain function (Dolfini 2002: 21), courtesy of Centro Studi di Preistoria e Archeologia.

techniques from 800-500 BC because of what they represent and how their influence continues through until the end of the sixth century.

3.1.1 Ground preparation

It is not entirely clear how the ground was prepared in Type 1 foundations. However, several factors indicate that the removal of soil to expose the bedrock was essential. For instance, the strata associated with building interiors are generally quite thin and close to the bedrock, as seen in the examples from San Giovenale (Karlsson 2006: 139–144; Pohl 1977: 14). Moreover, in foundations at both San Giovenale and Sorgenti della Nova (Figure 3.9), there is an intentional levelling, and even terracing, of the bedrock and ground to place the channel wall footings at an even height. This, along with

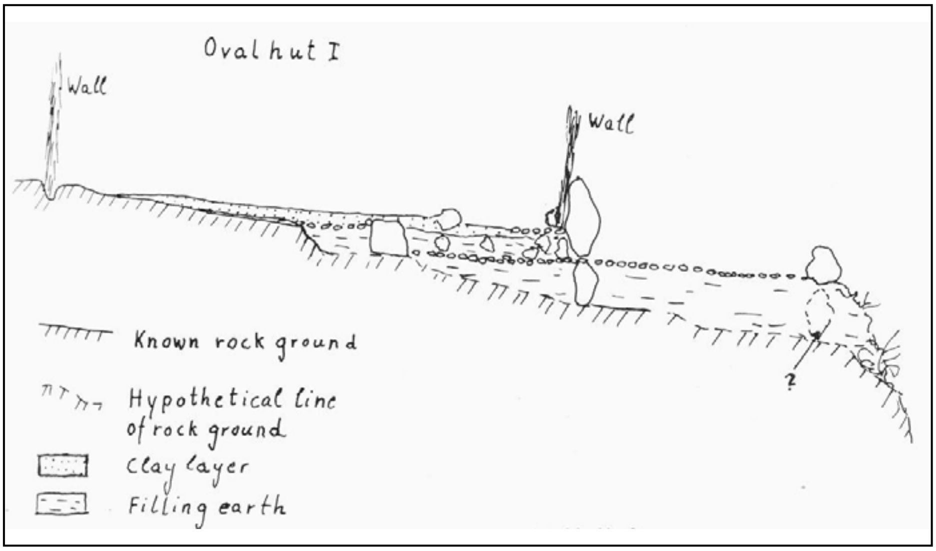

Figure 3.10. Section of San Giovenale Area E's Oval Hut I (Pohl 1977: fig. 7, p. 18), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

the evidence of carved features in the floors of Capanna I at San Giovenale Area D (Malcus 1984: 38), suggests that the initial preparation included stripping the ground of soil.

A ground preparation technique that appears to be associated with Foundation Type 1 is the use of terracing. This is particularly true of the Type 1 foundations built on slopes and near cliff edges. At San Giovenale, Oval Hut I from Area E (Figure 3.10) best demonstrates this technique (Pohl 1977). While the southern half of the building stood on the tufa bedrock, the northern half of the building had been built upon an earthen deposit. At the point in Area E where the earthen deposit begins, the plateau that forms San Giovenale's acropolis tapers downhill at an approximately 30° angle as it approaches the site's cliff edge. To counteract the slope, the builders of Oval Hut I created an artificial earth terrace. This terrace was likely supported with a stone retaining wall approximately a metre from the northern wall of Oval Hut I. It is unclear whether the erection of Oval Hut I was the reason for the creation of the terrace, but it seems likely based on the excavator's section (Figure 3.10).

Figure 3.11. Abitazione 6 from Section IX at Sorgenti della Nova during excavation (Negroni Catacchio and Cardosa 2007: 111), courtesy of Centro Studi di Preistoria e Archeologia. Note the erosion on the bedrock at the right side of the picture.

Evidence for similar terracing techniques, where nearly half of the foundation was cut into bedrock and the other sat upon an earth terrace is found at Sorgenti della Nova Section III. For instance, ground preparation techniques for the foundations of Abitazioni 1 and 2 likely accommodated the steep slope through terracing (Dolfini 2002b: 17, 229). Most of the foundation elements (wall footings, post holes and floors) were still built on bedrock (Dolfini 2002b: 32; Negroni Catacchio and Gaiaschi 2010), as is also apparent in Section IX Abitazioni 4, 5 and 6 (Negroni Catacchio 1995: 274–278). Unfortunately, erosion and modern quarrying has caused most of the artificial terrace and some of the bedrock on the west-northwest side of Abitazioni 1 and 2 to disappear (Dolfini 2002b: 26; Figure 3.11).

The reason for terracing is made obvious based on the last example. One of the constant threats to sites on cliffs and steep slopes would have been the power of erosive forces. Creating the terrace not only provided more space but also prevented the weakening of foundation integrity due to erosion. Placing and maintaining the earthen barrier between the cliff and Area E at San Giovenale or the steep slope and Section III at Sorgenti della Nova strengthened the foundations and provided structural stability.

Another characteristic of Foundation Type 1 ground preparation, as in Capanna I from San Giovenale Area D, is carved bedrock. Malcus (1984: 38) describes how along the inside of the channel wall footing was a 10-15 cm high bank or platform in the carved tufa. This bank of carved tufa was replicated in other places along the interior of the channel wall footing using white stones (Domanico 2005: 527). While it is not necessarily clear what the purpose of the bank is, Malcus (1984: 38) proposes that it has something to do with creating a level floor surface (a proposition that will be considered further in the subsection on flooring, below). Based on the data from Capanna I and the terracing techniques mentioned above, it is likely that in the preparation of Type 1 foundations the bedrock was exposed, at least prior to the setting of the floor.

The exposure and carving of the bedrock is evident in other, non-Type 1 foundations at Fidene. While the types of foundations, as well as the use of carved tufa banks, are different in these examples, the general preparation of the ground for building the foundation appears to be similar. Bietti Sestieri and De Santis (2001: 217) claim that the ground of a number of buildings (Capanna C, in particular) had been carved to create a sort of bench (Figure 3.12). The purposes of these carved tufa benches, according to Bietti Sestieri and De Santis (2001: 213), might have been to prevent water run-off from coming into contact with the *pisé* walls and might explain similar features at San Giovenale.

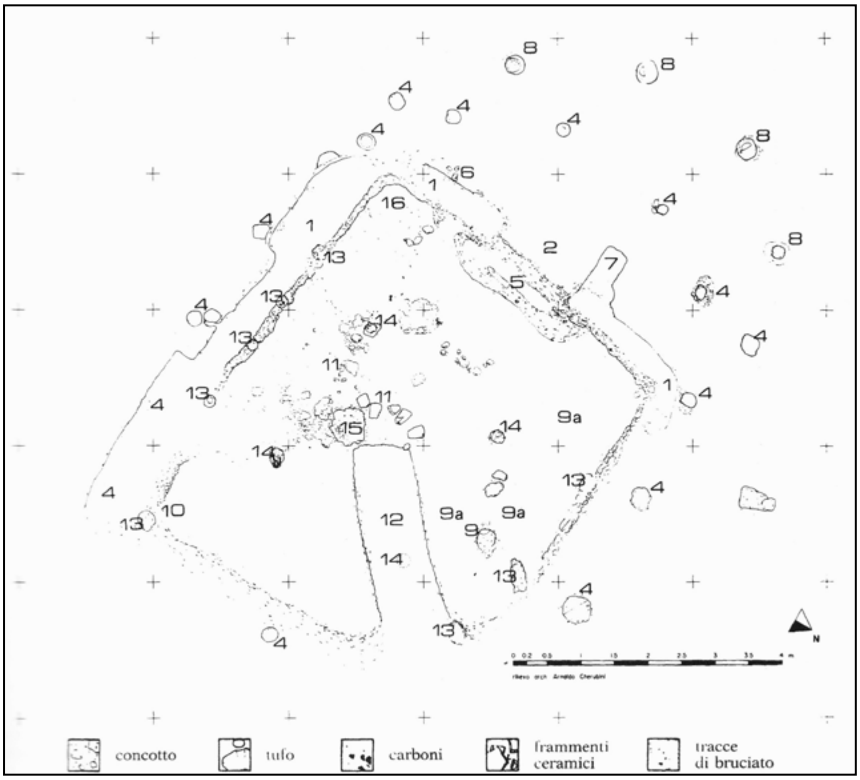

Figure 3.12. Plan of the Iron Age capanna at Fidene. Areas marked with the number 1 on the plan indicate the presence of the tufa bench/bank (Bietti Sestieri and de Santis 2001: fig. 3, p. 213), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

It was advantageous for the builders of Type 1 foundations to remove the soil completely. By removing the soil and setting the foundation on and into the bedrock, the builders had secured it against the threat of soil deformation, a major solution to one of the most important engineering challenges in constructing a new building. A foundation built on bedrock, while not immune to all of the problems caused by earthquakes, would also not be subject to soil liquefaction, further underscoring the advantages of bedrock ground preparation.[24]

Another advantage of soil removal is that the building was less likely to be exposed to damp. With much of the building material used in structures liable to rot or degrade when in contact with water, foundations, regardless of type, were often made to separate the other parts of the structure from water. In Type 1 foundations, clearing away the soil eliminated one of the potential harbourers of water. When compared to soil, bedrock is typically water-resistant (Hellström 1975: 67). Moreover, bedrock can be carved in such a

24 Earthquakes and their effects on the creation and use of building techniques certainly needs to be considered given the known impact of significant seismic activity on buildings at San Giovenale (Blomé et al. 1996; Blomé and Nylander 2001; Karlsson 2006: 162; Nylander 2013: 138–142).

way as to direct water away from the buildings (Bietti Sestieri and de Santis 2001: 213).

Ground preparation in Foundation Type 1 included the removal of the soil, the manipulation of the bedrock to create a level surface and, when necessary, the creation of an artificial terrace made of earth to strengthen the ground against erosion. These techniques, as seen in the examples from Fidene, are not necessarily exclusive to Foundation Type 1. They are, however, evident of a consistent style and process of ground preparation, continuing from the Final Bronze Age examples at Sorgenti della Nova through to the examples at San Giovenale from the end of the Iron Age.

3.1.2 Wall footings

Once the ground had been prepared, channels were cut into the bedrock outlining the shape of the structure on the ground. The width and the depth of the channels vary greatly from building to building, but they are usually 10-20 cm in width and 15-30 cm in depth. These channels are typically the only remnants of wall footings in a Foundation Type 1 building. If another aspect of the wall footings existed (e.g. a horizontal wooden runner), then no evidence of its existence remains. Foundation Type 1 wall footings are surprisingly well understood compared to the walls that sat atop them. Not being able to fully understand how the walls were built does hinder comprehension of the wall footings. However, the basic concepts – how and why the wall footings were made the way they were – are both well known.

Channels were used as wall footings for a number of reasons.[25] Evidence of dissolved clay supports the conventional wisdom that the bedrock-cut channels were wall footings (Negroni Catacchio 1995: 302; Pohl 1977: 14). Often found above, in and around the channels, the layer of dissolved clay is thought to be the remnant of clay-rich pisé walls or the unfired daub that bound and protected wattle walls (see section 5.1.3). Alternatively, the clay remnant could also be evidence of the unfired clay in the bricks of a mud brick wall. Once exposed to the elements (either through the destruction or the abandonment of the building), the walls disintegrated, leaving clay residue above the wall footings. Sometimes, the destruction of a building resulted from fire and, instead of the residue, the clay became hard and was thereby preserved (Karlsson 2006: 135–136). Clay remnants have thus been taken as evidence for the use of bedrock-cut channels as wall footings.[26]

The most essential reason for bedrock channels as wall footings is the stability afforded the wall through the channel. The weight of the roof on a load-bearing wall is not immediately dispersed into the ground through a single vector at the bottom of the wall alone (Yeomans 2009: 86–90). Instead, a load-bearing wall is faced with different types of stresses throughout its structure, most obviously caused by horizontal and eccentric stresses. The channel cut into the bedrock might actually have been used to help brace the sides of the wall at the bottom, helping to maintain its structure and reduce strain (Yeomans 2009: 101–105). Although shallow, walls sited in channels would be much more stable than those placed directly on the ground surface. In a wall placed directly on the surface, the effective length (i.e. the upper-limit at which any greater length would buckle under stress) of the wall is less than that of a wall fixed into the ground (Mrema et al. 2011: 126–129). The wall set into a channel, even a relatively shallow channel, could therefore bear a substantially greater load without buckling than a wall of the same thickness set upon the ground surface.

25 While they were most likely used for the wall footings, since no walls have been found in these channels *in situ*, the channels could have had some other, unseen purpose, especially in buildings with multiple channels (Negroni Catacchio and Gaiaschi 2010: 272).

26 For instance, in his section "Domestic Architecture", Stoddart (2009:69) describes wattle and daub as the *de facto* wall construction in early buildings (see also Bartoloni et al. 1987).

Figure 3.13. Modern reconstruction of an Iron Age capanna at Fidene (Bietti Sestieri and de Santis 2001: fig. 2, p. 212), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Furthermore, a building would have been much more structurally sound with wall foundation channels cut into the bedrock. Bedrock has a much higher bearing capacity than soil since it can withstand a higher amount of stress (Liebing 2011: 240). Therefore, the use of bedrock channels substantially reduced the possibility of structural failure, not only through the high bearing capacity of bedrock but also by bracing the wall against strain.

In one particular example, the builders appear to have adapted the Foundation Type 1 wall footing technique to the soil. Due to its earthen terrace (mentioned above, see subsection on ground preparation), the wall footing channels of Oval Hut I at San Giovenale Area E (Figure 3.3) could not be entirely made of bedrock. The result of the terrace fill was a half-bedrock/half-earth building foundation. For the southern half of the building, excavators uncovered the channel-cut bedrock common of Foundation Type 1 buildings. Pohl (1977: 17–18) does not note how deep the channel was but based upon the sections and area photos, at its widest, the channel measured 25 cm and at its deepest, 20 cm. The majority of the southern wall footing was identified by this channel alone. By the southwest and southeast ends of the building, tufa stones began to follow along the outside of the channel. Even when the channel abruptly ended in the building's eastern and western curves, the stones continued along the same ovoid trajectory.

From the point that the channel disappears, the wall footings of Oval Hut I rested on earth. This was confirmed in excavation when the curved line of tufa stones continued on the soil (that is, above the bedrock) and at the same level as the channel in the building's south (Figure 3.10). Pohl proposes that the stones had been laid around the outside of the earthen-half of the building's foundation out of structural necessity (Pohl 1977: 13).

The stones, however, were not part of a socle as is common in later foundation types. According to Pohl, as with the retaining wall to the north of the building, the stones along the northern foundation were a part of a system that held the terrace and Oval Hut I's floor in place (see below for a discussion of the foundations of Oval Hut I's floor). Moreover, Pohl suggests the stones were not the only component of the wall footings but were part of a sort of mock channel. The mock channel in the north of Oval Hut I was created from a niche between the tufa stones on the outside, small, clay-lined cobbles on the inside and hard packed pebbles and clay at the bottom.

This idea of a mock channel is interesting because it shows that the builders of Oval Hut I attempted to match the stability of the channel foundation and its role in protecting against collapse of both the building and the ground the building sat upon. However, Pohl's conceptual drawing of the foundations, particularly of the wall footings, calls her identification of this faux channel into question (Figure 3.10). In her diagram, nothing (besides the weight of the stones themselves) holds the stone outline of the wall footing in place. The stones in her picture are placed vertically – a far less stable position – yet, they are not placed into the ground nor are they braced by other stones. Therefore, while I agree with Pohl's hypothetical reconstruction of the wall footings, it is not without reservation. Alternative reconstructions of the footings, especially with regard to any faux channel, are necessary.

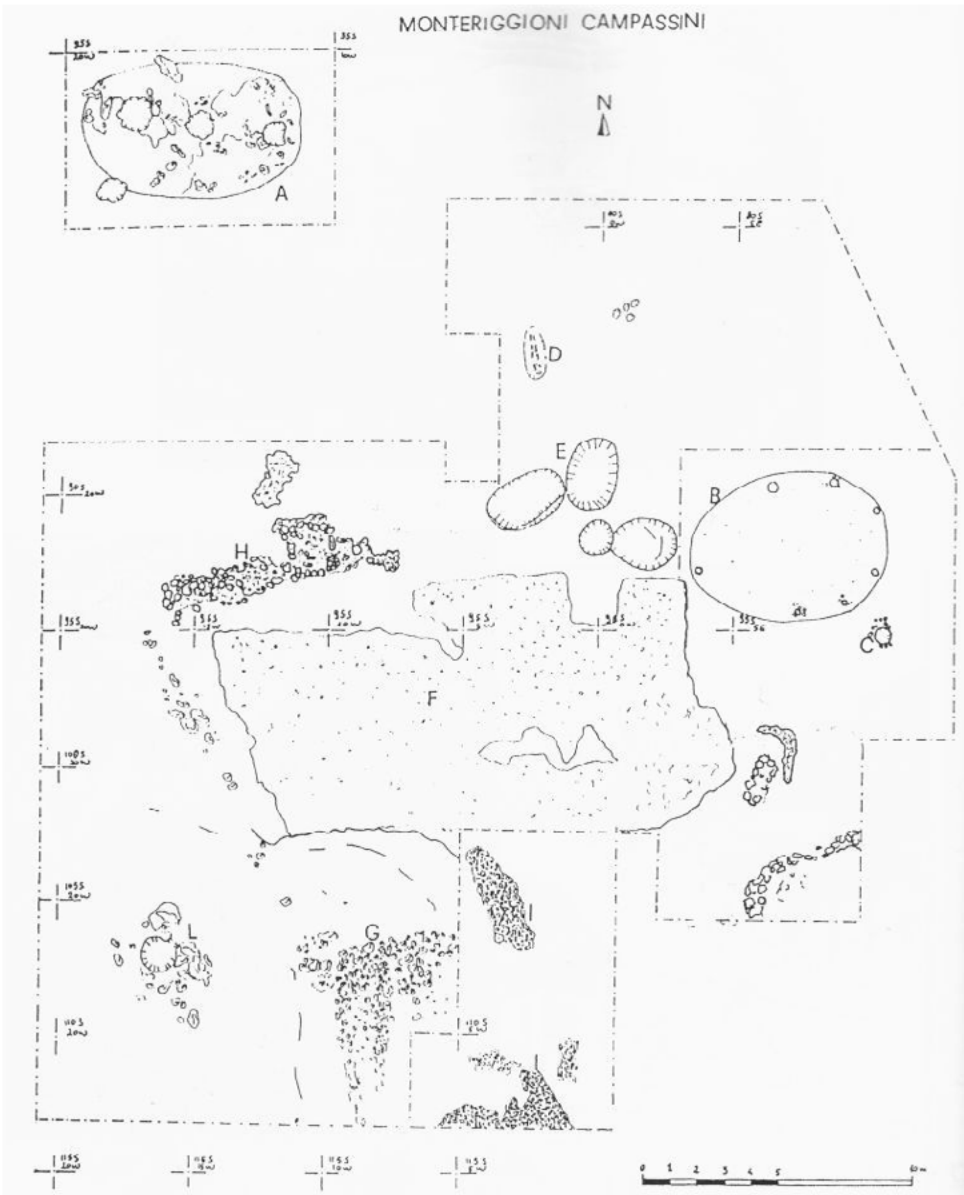

Figure 3.14. Site plan of Montereggioni-Campassini (Bartoloni 2001: fig. 7, p. 364), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Although this will be covered more extensively in Chapter 5 (see section 5.1.1), it is necessary to briefly discuss here the composition of walls in the examples above. For San Giovenale, both Pohl (1977: 14) and Malcus (1984: 39) indicate that clay was found above the wall footings. In the case of Oval Hut I from Area E, Pohl suggests that the disintegrated clay is evidence of a wattle and daub construction, although no fired pieces of daub were discovered to confirm her impressions. Malcus did find fired clay above the wall footings for the first phase of Capanna I at Area D. He does not indicate whether the fired clay has the impressions of wattle. The excavations at Veii found a substantial amount of daub and organic material in and above the wall footings of the Rectangular Timber Building and its predecessor (Ward-Perkins 1959: 55, 60; Figure 3.2).

The composition of the walls at Sorgenti della Nova and Tarquinia are also unclear. At Sorgenti della Nova, Negroni Catacchio (1995: 302–303) admits that there was no evidence for disintegrated clay above or in any of the wall footings. She suggests that it is possible that the buildings could have had wattle walls without the binding daub. According to Locatelli (2001: 31), buildings in the Area Sacra at Tarquinia had wattle and daub walls, yet it is unclear whether or not there was any direct evidence for them.

Therefore, it is impossible to tell whether the bedrock-cut channels, in addition to supporting the wall once built, also assisted in the construction of the walls. No doubt, the experimental construction of a *capanna* at Fidene (Figure 3.13) is a useful resource in conceptualising the building process (Bietti Sestieri and de Santis 2001). However, Type 1 foundations are dissimilar from the examples at Fidene. In fact, the foundations from Fidene resemble those found at Monteriggioni-Campassini or Satricum more than they do the Type 1 foundations at San Giovenale (compare Figure 3.12 and Figure 3.14).

Despite being unable to tell if they were useful in the construction of the building, a number of things can be said about the wall footings. By creating a channel for the base of the wall, the foundation allowed the construction of a more stable building with walls that did not need to be as robust to bear the load. The Foundation Type 1 wall footings also provided some protections against damp and, by sitting in the bedrock, were less likely to fail than if the wall was footed in a similar way on soil.

3.1.3 Flooring

It is possible to identify common flooring techniques in Type 1 foundations. Flooring evidence survives unusually well (for at least one phase of occupation) in many structures, partly because it is distinct from evidence of ground preparation. The identified flooring techniques briefly described here aid the interpretation of Foundation Type 1, showing the overall ubiquity of techniques used while recognising the seeming importance of local materials and topography.

The initial preparation of floors is similar in most examples. With the soil already stripped away, the exposed bedrock was carved to create a smooth, even finish (e.g. Negroni Catacchio 1995: 241).[27] Evidence has often been found at sites throughout Etruria for an added floor layer placed on top of the smoothed bedrock. At Sorgenti della Nova, for instance, a number of buildings (i.e. the *capanna* of Section Ve, the *struttura monumentale* of Section Vb and Abitazione 2 of Section III) all have a floor layer of crushed pumice above the bedrock (Negroni Catacchio 1995: 241). For many of these buildings, the basic pumice floor was enhanced and made more level using 10-20 cm of beaten earth primarily constituted of *tufetti*

27 Sometimes, this smoothed bedrock, without anything on top of it, has been considered the floor, as by Karlsson (2006: 137–138) for the Oval Huts at San Giovenale Area F East. Although Karlsson seems to believe that the Oval Huts did not have an additional layer of flooring, there is some evidence for hard-packed earth mixed with stones above the bedrock (Karlsson 2006: 53–55). That layer of earth and stones may well be the floor of the Oval Huts but it is not made clear in text whether it is associated directly with Oval Hut I (as Karlsson (2006: 54) mentions) or if the layer continues across the site.

(crushed tufa stone) (Negroni Catacchio and Gaiaschi 2010: 272–273).

Although the use of a floor layer above the bedrock is generally ubiquitous, the same type of floors at Sorgenti della Nova do not seem to have been used in the examples at San Giovenale. Instead of pumice and *tufetti*, Pohl (1977: 14–19) describes a pressed, hardened-clay floor lining the bottom of San Giovenale Area E Oval Hut I. She also mentions that there was evidence for pebble flooring in the north of the building that could have run the length of the building or served as platforms or 'benches' (Pohl 1977: 14; for pebble benches: see section 3.3.2; Karlsson 2006: 142). Similarly, Malcus (1984: 38) describes a level of pressed clay and small stones for floors at Area D.

Besides the similarity of material at San Giovenale, the flooring at Area E and Area D were not the same. With the bedrock dropping dramatically to a lower level halfway underneath the building, the builders of Area E Oval Hut I created a second terrace on top of the primary terrace (for the description of the primary terrace see Ground Preparation, above) so that the floor surface was level. Therefore, between the faux channel in the north of the building and the point where the bedrock drops off in the middle of the building, the builders packed earth and small stones (Figure 3.10). Then, the layer of clay pavement described by Pohl was put over both the secondary terrace and the bedrock simultaneously.

While the deposit between the bedrock and the floor level may have been unique, the clay floor in Oval Hut I was probably not, at least at San Giovenale. At Area D, Malcus (1984: 38–39) reports a relatively well-preserved clay pavement approximately 20cm above the tufa bedrock in Capanna I. This floor level, however, appears to be part of the second phase of use in Capanna I and there is some evidence that the original floor laid on the bedrock itself (based primarily on the presence of a raised platform; Malcus 1984: 38).

Flooring was a common feature in Type 1 foundations, with similar flooring techniques relatively common at each site. Local material availability and topography is the likely cause of variation between sites but it is possible that a clay pavement is a feature of later structures. Although pervasive, Foundation Type 1 flooring techniques do not appear to have greatly affected the structural integrity of buildings. Overall, Foundation Type 1 flooring techniques suggest widespread use of similar techniques, altered only by local material availability and topography.

3.1.4 Roof supports

Roofing techniques in early Etruscan structures are not thoroughly understood. Most of what is known about roofs is based on both modern examples (Brocato and Galluccio 2001; e.g. Büchsenschütz 2001; de Grummond 1996) and central Italian funerary 'hut' urns (Bartoloni et al. 1987; see section 5.2.2). However, since the post holes that held major (and sometimes minor) roof timbers often remain cut into the bedrock, Type 1 foundations provide clues to better understand roofs.

Büchsenschütz (2001; 2005) proposes a useful typology for interpreting roofing techniques in Iron Age structures in Etruria. Although more significant for its implications of roofing interpretation (see section 5.2.2), the typology divides roof supports based on their positioning in a structure. His typology recognises the differences between different post hole systems and builds evidence for comparative analysis. Identifying roof supports using the Büchsenschütz typology also ties post holes found in foundations to roofing techniques, providing a more complete interpretation of buildings as a whole. Identification of roof supports in Type 1 foundations using the Büchsenschütz typology suggests a common system of roof supports. It is also possible that the common system begins to change based on later examples of Foundation Type 1.

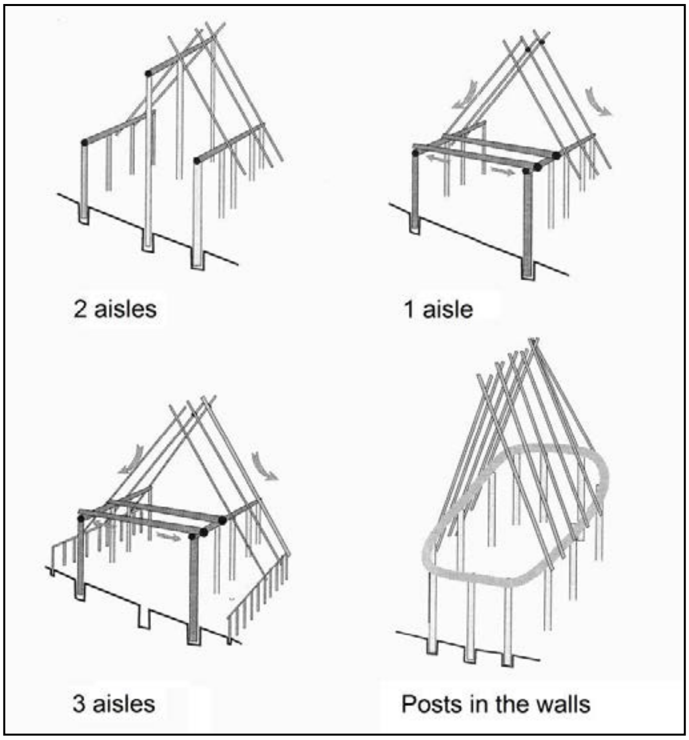

Figure 3.15. Diagram of four different types of roof supports (after Büchsenschütz 2001: fig. 6, p. 226), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Following Büchsenschütz's typology for Iron Age roofs, there are four common types of roofs (Figure 3.15) based upon the use of posts (Büchsenschütz 2001: 226–227, 2005: 53–57). Of the four, one type has no interior posts. Instead, posts in the walls of the building support the roof. A single-aisle type roof also lacks internal posts and is supported by tie-beams and wall plates. A three-aisle type is similar to the single-aisle type except for a line of additional, exterior posts. Finally, a two-aisle type roof is built with a line of central posts to hold up the main ridgepole.

Büchsenschütz's (2001, 2005) work is a good starting point. However, since his designated types exist only as a way to convey the different types of stress and weight distribution afforded each roof type, it is simplified and does not satisfy all of the variations found in foundations throughout Etruria. For instance, Abitazione 2 at Sorgenti della Nova Section III (Figure 3.16), which generally fits to Büchsenschütz's three-aisle type, has two more post holes than expected in the last row of supports (Negroni Catacchio 1995: 302–307). Büchsenschütz provides a good outline, nonetheless, for what roof supports should be archaeologically detected in Type 1 foundations.

For instance, two of Büchsenschütz's types appear to be in use at San Giovenale. In Area D, Malcus (1984: 38–39) notes a number of post holes in the bedrock but the likelihood of a three-aisle plan for Capanna I is high, particularly for the second phase of that building (Figure 3.1) where six of the post holes create clear divisions of space. The roof supports for Capanna I are therefore similar to Abitazione 2 at Sorgenti della Nova Section III (Figure 3.16).

The picture from Area E is more complicated. Pohl (1977: 14) suggested a two-aisle plan of Oval Hut I based on two post holes uncovered in the excavation (Figures 3.3, 3.17). However, based on the placement of the post holes, a two-aisle plan seems unlikely.

The easternmost of the two post holes fits the description commonly found in Foundation Type 1 (e.g. Dolfini 2002b: 18–20; Malcus 1984; Ward-Perkins 1959: 50–53). Yet, as with many of the characteristics of Oval Hut I, the opposing, westernmost post hole is uniquely placed in partially rock-lined soil.[28] If the western post hole was the second of the two-post scheme, then the ridge pole of Oval Hut I would have been diagonal to the main axis of the building. A ridge pole placed diagonally to the long walls would

28 Out of the two post holes in Oval Hut I described by Pohl, at 40 cm in diameter, the eastern post hole is most recognisable. Unlike the western post hole, the eastern was cut into the tufa bedrock. The western post hole, located in the secondary "floor" terrace, was cut through the clay-hardened layer and extended through the fill to the bedrock below. The diameter of the hole is not explicitly stated by Pohl' (1977: 14–15) but based upon her site plan it appears to be comparable to the eastern hole. Possibly for added support, the hole was located between a row of tufa stones to the south (which delineated the beginning of the secondary terrace) and a large tufa boulder to the north (which supported the hardened clay floor surface).

have significantly more weight and stress on the southwest part of the building where the distance from the ridge pole and the wall was at its greatest.

In addition to the problems caused by weight, the angles involved in building a sustainable roof with a diagonal roof beam can be problematic. Regardless of the direction of the ridge pole, a high angle is often needed to ensure rainwater drains from a thatch roof. This angle, in some cases, can be as steep as 60° but in Etruscan roofs may have been as low as 35° (Damgaard Andersen 2001: 245). Generally, buildings with pitched roofs have ridge poles that align with the main axis as best as possible. If the direction of the ridge pole diverts from the direction of the walls, then the angles of the roof between central roof beam and wall become uneven. While not as difficult to accommodate as a tile roof with a diagonal ridge pole, a thatched roof with uneven angles risks low walls, an abnormally tall supporting post, a substandard angle for rainwater runoff or a mixture of the three.

To support her suggestion of a two-aisle building, Pohl (1977: 14) reasons that the use of a diagonal ridge pole resulted from the odd nature of the foundation. It is possible that one of the "difficulties" she alludes to was distribution of weight. For instance, the amount of weight the southern walls (with bedrock-cut foundations) could maintain might have been higher than that of the northern walls (with earth and stone foundations). Moving the western post north, required less material to cover the distance between the ridge pole and the northern walls. Perhaps the builders, based on a type of cost-benefit analysis, reasoned that the difficulties caused by a diagonal ridge pole were ultimately manageable for a secure northern wall.

However, this scenario is debatable and contrasts with the other examples. Based on the position of the western post hole, it is possible to project other roof designs for Oval Hut I but only with the addition of more posts. Unfortunately, from the Area E monograph, it is unclear whether other post holes were found in the interior of the building (Pohl 1977). According to Pohl (1977: 14), the other post holes in Oval Hut I were found near the eastern post hole and are dismissed as part of an earlier structure. If Oval Hut I had more posts, then they either rested on bedrock or on the stones used in the secondary floor terrace. Otherwise, it is possible that the excavators entirely missed them.

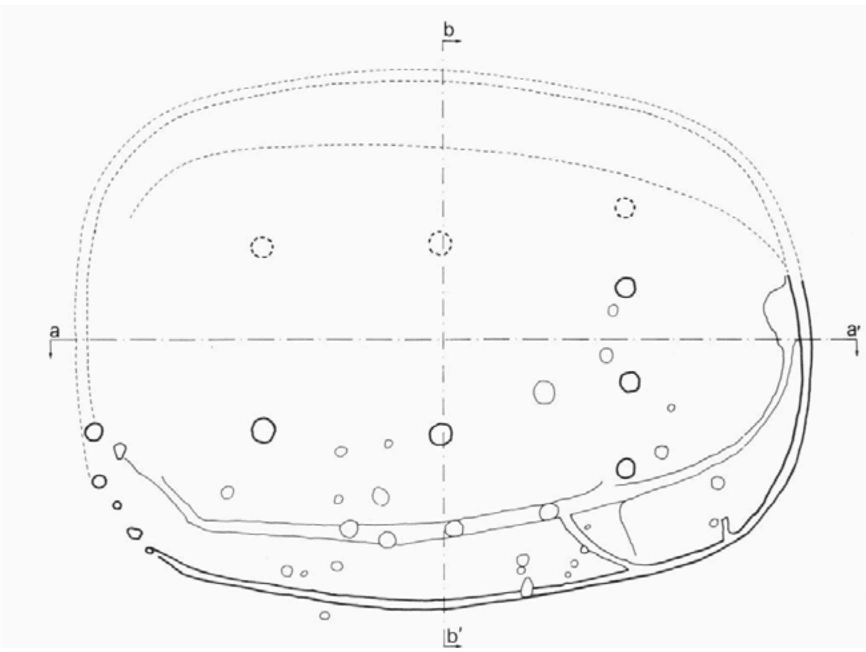

Figure 3.16. Plan of Abitazione 2 from Section III at Sorgenti della Nova (Negroni Catacchio 1995: 306), courtesy of Istituto Italiano di Preistoria e Protostoria.

Finally, excavators found a single-aisle type in the Rectangular Timber Building at Veii. With its large post holes cut into the wall footing channels, the Rectangular Timber Building is unique for Type 1 foundations. In fact, its foundations display the possible influence of other, innovative techniques appearing just after its relatively late (second half of the eighth century BC) construction. Since roof support techniques in structures of the seventh century and later (e.g. Type 2 foundations at Lago dell'Accesa, see below) are not usually archaeologically visible, the roof supports of the Rectangular Timber Building suggest that, if load-bearing posts were used in later structures, then they were within the walls and upon socles. The appearance of the roof supports within the walls in the single-aisle type is also emblematic of certain advanced forms of roofing (see section 5.2.1), which allow for larger interior spaces without compromising the integrity of the walls.

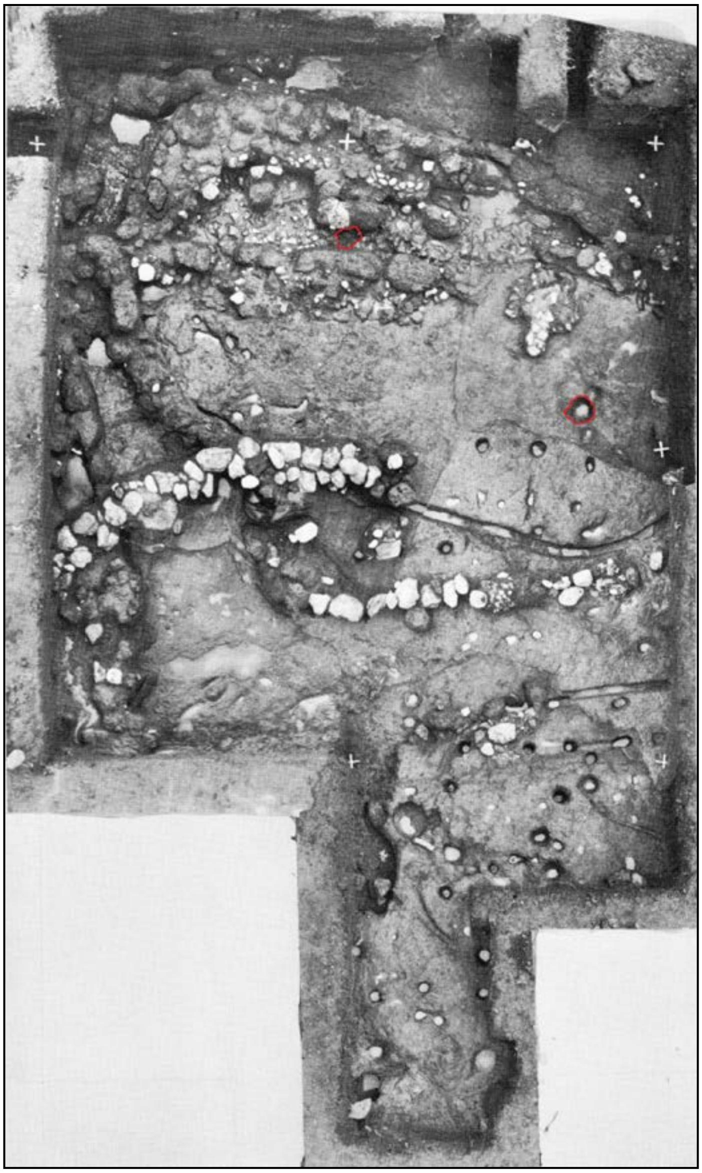

Figure 3.17. San Giovenale Area E during excavation (after Pohl 1977: fig. 2, p. 15), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Post holes in Type 1 foundations suggest that a three-aisle type of roof support was widely used. Such consistency in the Foundation Type 1 examples indicates that this shared, traditional technique was closely associated with the other Type 1 foundation techniques. There are possible examples of other roof support techniques at San Giovenale and Veii but only the late Rectangular Timber Building at Veii provides enough evidence to support identification of a different roof support type. Changes to the traditional roof support techniques are perhaps evident in the Rectangular Timber Building but with the Foundation Type 1 example alone, no broader evidence for roof support change over time appears.

3.1.5 Rectangular Foundation Type 1 buildings

Frequently, rectangular buildings in Etruria are regarded as an innovation of the Orientalising period that signal an increased appreciation of space (e.g. Izzet 2007: 31–41) or greater structural expertise (e.g. Donati 2001: 318–325). However, an evolutionary progression based on building shape is untenable given the presence of rectangular buildings throughout central Italy dating back to the Bronze Age, if not earlier (e.g. Cattani 2010: 56, 65). Iron Age examples of rectangular buildings are known from the Foundation Type 1 buildings at Tarquinia and the Rectangular Timber Building at Veii (Linington 1982: 250; Ward-Perkins

Figure 3.18. A modern capanna in Giovita (Brocato and Galluccio 2001: figs. 19-20, p. 292), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

1959: 59). Early rectangular forms are also found in buildings with Type 3 foundations (see below), where rectangular building forms of the twelfth-century BC Apennine culture appear as late as the eighth century.

Despite a continuous presence of rectangular buildings, the majority of the examples considered so far have been elliptical. In part, the focus on elliptical buildings in the discussion of Type 1 foundations is a product of the sample, in which evidence from Sorgenti della Nova figures prominently. This focus on elliptical buildings also results from the juxtaposition at Tarquinia of rectangular and elliptical buildings, with debates over function and phases of building/occupation occasionally relying on different building forms. In fact, Pacciarelli (2000: 170) argues that the rectangular buildings at Tarquinia are not only later than the associated elliptical buildings but are also an example of the progression from elliptical to rectangular.

Rectangular examples of Foundation Type 1 largely exhibit the same general traits in foundations as their elliptical counterparts. For instance, the rectangular buildings of Linington's Type II, IV and (possibly) III, were built on levelled bedrock with narrow channel wall footings (Linington 1982: 249–250; Figure 3.8). Is it therefore possible to identify significant differences in foundation techniques between elliptical and rectangular Type 1 foundations? Roof support techniques indeed demonstrate possible differences between elliptical and rectangular buildings as the evidence of roof supports in the rectangular buildings at Tarquinia and at Veii fit well into Büchsenschütz's two-aisle and single-aisle type, respectively (see above).

Evidence in the foundations of rectangular buildings suggests that the differences in roof support techniques resulted from architectural necessity. The shape of a building affects the ways that weight and stress are distributed through the walls. Contrary to a rounded wall, a long, load-bearing, flat wall of a rectangular building often needs bracing. This can be done through the frame of the building, particularly at perpendicular junctions with end walls (sometimes called 'quoins'). However, the further away the wall is from a perpendicular bond, the weaker it becomes. Add any horizontal stresses to a long wall without braces and it is likely to fail.

A good indication of the concern for this stress is apparent in the frame of the Rectangular Timber Building at Veii. Post holes in the corners of the building and beside entrances, suggest that the builders recognised the weaknesses of the rectangular shape. Compared to the average post hole at Sorgenti della Nova (or even the earlier elliptical building underneath the Rectangular Timber Building), the average diameter of the posts in the Rectangular Timber Building is 10-15 cm greater. Anticipating the weight of the roof, builders appear to have used larger posts, not to mention more of them, in the Rectangular Timber Building than comparable elliptical buildings.

In contrast to the frame solution used in the Rectangular Timber Building, a number of small, shallow holes were found all the way around the outside of Capanna 3 at Tarquinia (Linington 1982: 247). As Brocato and Galluccio (2001: 292–293) describe based on a modern example in Giovita (Figure 3.18), it is possible that support poles, running diagonally from the top of the posts inside the wall to the ground, produced the small post holes (or *toccaterre*) found around the buildings at Tarquinia. In the building at Giovita, the poles act as a brace against the outward, shear and horizontal stresses on the wall.

Although a possible solution to stress, in the few examples of the technique at Tarquinia, diagonal pole use appears to vary. For instance, the *toccaterre* of Capanna 3 are significantly smaller and more numerous than those of Capanna 14. This may be a result of the size of the buildings (Capanna 14 is considerably longer than Capanna 3, which led Linington (1982: 247–249) to suggest that they are different types of buildings), where the bigger *toccaterre* of Capanna 14 hint at the larger diagonal posts necessary to support the longer walls of the building.[29]

Building function might also have affected how the diagonal pole technique was used. Large diagonal poles might have been used for buildings with significant outward stresses on the wall. A number of factors can cause horizontal stresses, from the temporary (e.g. people leaning against the walls) to the more persistent (e.g. wind). The weight of storage pressing against the walls could also cause a constant, outward horizontal stress, although, according to Linington (1982), the buildings with *toccaterre* at Tarquinia did not contain evidence of storage.

Different roof support techniques in rectangular buildings thus appear to be a symptom rather than a cause of changing form. The key elements in the foundation process are essentially the same for the rectangular and the elliptical Type 1 foundations. Certainly, the current chronology suggests that rectangular form and the different roof support techniques are elements in a broader change in architecture. From a technological viewpoint, however, the most important parts in the foundations are alike between elliptical and rectangular buildings. Variation in Foundation Type 1 shapes (and perhaps the continued round structure of tumuli among other examples) indicates that round, rectangular and elliptical forms were common to the same cultural context. While the increased evidence of rectangular buildings in cities and towns could well indicate new perceptions of space, urban property and social preference, the key foundation techniques used in building creation remained the same regardless of shape.

3.2 Foundation Type 2

Foundation Type 2 is defined by stone socle wall footings. In contrast with Foundation Type 1, Type 2 wall footings were placed upon earth and not into bedrock. However, the examples of Foundation Type 2 are similar to Foundation Type 1 in layout and use. The late eighth-century examples of Foundation

29 Admittedly, the difference between Capanne 3 and 14 could also be the result of a different building style, with Capanna 14 built with external upright posts like in the reconstructed building at Fidene (e.g. Bietti Sestieri and de Santis 2001). These external upright posts would have performed a similar function as diagonal posts, protecting the wall from failure by further distributing the load of the roof.

Site	Building Name	Period	Dates
San Giovenale Area E	Oval Hut II	Late Tolfa-Allumiere	c. 725-675 BC
Luni sul Mignone	Hut A	Late Tolfa-Allumiere	c. 775-750 BC
Luni sul Mignone	Hut B	Late Tolfa-Allumiere/proto-Villanovan	c. 750-725 BC
Luni sul Mignone	Hut C	Early Orientalising	c. 725-675 BC
Lago dell'Accesa Area A	Complex I	Orientalising	c. 625-575 BC
Lago dell'Accesa Area A	Complex II	Orientalising	c. 625-575 BC
Lago dell'Accesa Area A	Complex III	Orientalising	c. 625-575 BC
Lago dell'Accesa Area A	Complex IV	Orientalising	c. 625-575 BC
Lago dell'Accesa Area A	Complex V	Orientalising	c. 625-575 BC
Lago dell'Accesa Area A	Complex VI	Orientalising	c. 625-575 BC
Lago dell'Accesa Area B	Complex I	Orientalising	c. 625-575 BC
Lago dell'Accesa Area B	Complex II	Early Archaic	c. 575-525 BC
Lago dell'Accesa Area B	Complex V	Orientalising	c. 625-575 BC
Lago dell'Accesa Area B	Complex VI	Orientalising	c. 625-575 BC
Lago dell'Accesa Area B	Complex VII	Orientalising	c. 625-575 BC
Lago dell'Accesa Area B	Complex VIII	Orientalising	c. 625-575 BC

Table 3.3. The examples of buildings with Type 2 foundations by site.

Type 2 from San Giovenale and Luni sul Mignone are elliptical, while the seventh- and sixth-century examples from Lago dell'Accesa are rectangular. Based on the small finds, as with Foundation Type 1, examples of Foundation Type 2 were domestic and were probably habitations. Although the foundations are similar in appearance, the techniques involved in the creation of the foundations are almost entirely different, suggesting an underlying transition in architectural technology from Type 1 to Type 2 foundation techniques.

There are sixteen examples of Foundation Type 2 (Table 3.3). The examples have much in common, particularly in the techniques and materials used in ground preparation and wall footings. However, there are a number of slight variations between them, primarily found in flooring and roof supports. Perhaps the most obvious non-technical difference is that some examples are elliptical while others are rectangular. However, this does not necessarily represent a significant difference in the techniques used to construct foundations.

Another difference is chronological. Although ancient, dating to at least the Early Bronze Age (Domanico 2005: 514–515), Type 2 foundation techniques only become prevalent when evidence for Foundation Type 1 declines (Negroni Catacchio and Gaiaschi 2010: 279–280).[30] Since they are so few in number, the chronology for the earliest Type 2 foundations is generally based upon the typological, relative dates from San Giovenale. According to the typology developed by the Swedish Institute at Rome (Karlsson 2006: 138), the associated finds of 'advanced' and brown impasto wares and 'primitive' impasto bowls with rounded shoulders date the Foundation Type 2 buildings at San Giovenale and Luni sul Mignone to the second half of the eighth century BC. Even so, Hellström (1975: 97) points out that Huts A and B from Luni sul Mignone could have been constructed earlier based upon an earlier 14C date and the appearance of local imitations of Protocorinthian ceramics (Östenberg 1967: 62–64). A few of the finds at San Giovenale Area F East date the destruction of the last phase of Foundation Type 2 buildings to as late as the first quarter of the seventh century BC.

30 There are some indications that buildings with Type 1 foundations continue in urban areas into the sixth century BC (e.g. Rathje and Magagnini 1985: 164), which highlights the gradual nature of any transition between Foundation Types 1 and 2.

Figure 3.19. Section of Huts A, B and C at Luni sul Mignone (Wieselgren 1969: 109).

Later, rectangular Foundation Type 2 buildings are even less well dated. The buildings from Lago dell'Accesa are generally considered to be from the first half of the sixth century (Izzet 2001a: 46). However, Camporeale (1985a: 169, 2010: 145) has made it clear that the earliest habitations excavated at Lago dell'Accesa may well have extended back to the last decades of the seventh century.

Furthermore, the eighth-century examples differ geographically from the seventh-century examples of Foundation Type 2. The eighth-century examples are from southern Etruria, namely San Giovenale and Luni sul Mignone. At these sites, much of the evidence of the foundations themselves has not survived the later occupation. Of the buildings at San Giovenale, only Area E Oval Hut II (Figure 3.17) was found more-or-less intact (Karlsson 2006: 137–142; Pohl 1977: 25, 94–95). Even then, the wall footings of Oval Hut II were partial and damaged by subsequent buildings evident in later floor levels. This later occupation caused significant damage to the overall understanding of much of the building (Pohl 1977: 94–95).

The buildings in Area F East (Figure 3.4) fared less well. There is a clear, stratigraphic difference between buildings with Type 2 foundations and later structures (Karlsson 2006: 138–140). The stratigraphy bolsters the already rigorous and diagnostic chronology developed by the Swedish Institute (Karlsson 2006: 115). Yet, the remains of most of the Foundation Type 2 examples appear to have been damaged in the erection of seventh-century buildings. As a result, no Foundation Type 2 examples are used from Area F East.

At Luni sul Mignone, two of the buildings, Hut A and Hut B (Figure 3.19), appear to be the successive phases and rebuilds of the same building (Wieselgren 1969: 8–15). The third, Hut C, built almost on top of the other two, is likely another phase but the architecture of Hut C appears to differ slightly from the previous two iterations (Wieselgren 1969: 14–15). With continuous rebuilding in the same location, the

Figure 3.20. Plan of Complex III of Lago dell'Accesa Area A (Camporeale 1985: 141).

stratigraphy is confusing and the wall footings of the three buildings are not intact. Nonetheless, the floors of these buildings are clear and survive better than the wall footings.

While eighth-century examples come exclusively from the region of the Mignone, the seventh-century examples come from just one site, Lago dell'Accesa. Most of the Type 2 foundations at Lago dell'Accesa have been lost in a similar way to those from southern Etruria. However, at Lago dell'Accesa, later foundations sometimes incorporated the previous foundations, preserving the Type 2 foundations to some extent. Later iterations of Area A Complex III (Figure 3.20), for instance, reused the older footings as a basis for a new building (Camporeale 1985a: 143–144). Furthermore, in some cases (e.g. Area A Complex V: Area B Complex VIII; Area E Complex V; Figure 3.21), the remains of the wall footings were possibly left intact as a retaining wall (Camporeale 2010: 149).

Beyond their initial publication, the literature on buildings with Type 2 foundations is sparse. It remains to be seen whether or not the northern, seventh-century examples of Foundation Type 2 from Lago dell'Accesa are a regional variation of the southern examples from the Mignone region or if they are a part of a wider, archaeologically underreported phenomenon leading to Foundation Type 4. Due to the possibility of regional variability and its longevity, it may seem odd to group these foundations together.

However, there are three reasons for doing so. First (and most importantly), the examples presented here share a relatively similar foundation process, despite the differences that might be apparent in other aspects of building. Second, the apparent rise in Type 2 foundations clearly fits (by chronology, style, technique and material) between earlier Foundation Type 1 and later, Orientalising and Archaic period foundation types (i.e. Foundation Types 4 and 5). Third, much of what is known about later Orientalising period domestic architecture comes from San Giovenale, Luni sul Mignone and Lago dell'Accesa. Identifying these similar techniques together as Foundation Type 2, despite the possible regional variability, is thus critical for defining a period and style of architectural technology that is often overlooked and underreported and yet plays a major role in understanding the wider Etruscan architectural tradition.

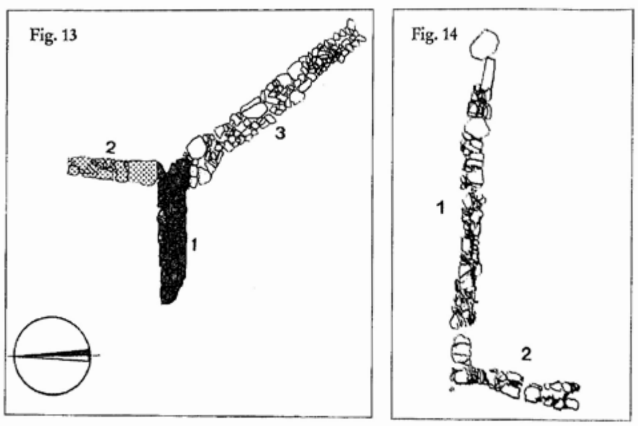

Figure 3.21. Plans of Lago dell'Accesa Area A Complex V (left) and Area B Complex VIII (right) (Camporeale 2010: 150).

3.2.1 Ground preparation

Type 2 foundations were built upon the soil as opposed to the bedrock. These foundations, however, were not laid out on an unprepared or unaltered ground surface. Instead, foundation plots often show signs of levelling and the presence of a specific type of soil that formed the layer of the foundations. This layer, since it is laid early in the foundation process, is often later manipulated by the creation of floors and can be difficult to see archaeologically in multi-phase sites (e.g. Wieselgren 1969: 8–13; Figure 3.19). Unfortunately, in excavation reports, there is often a lack of description and discussion of the soils in and beneath the foundations, aside from the cursory description of the wider site stratigraphy. From those descriptions, it is possible to glean some idea of the earliest stage of the foundation process (although it unfortunately does not a present a particularly clear picture).

Karlsson's (2006: 45–57) description of the stratigraphy at San Giovenale Area F East provides good data for ground preparation in the eighth-century Type 2 foundations. As noted above, it is not possible to fully reconstruct the buildings in Area F East with Type 2 foundations (Figure 3.4) but the remnants of the foundations provide interesting clues. The Type 2 foundations found under the later, Archaic period Houses II and III were uncovered within strata 3B and 4A. Of those strata, stratum 4A is likely the stratum containing the initial preparation of the Type 2 foundations. Stratum 4A under House III, according to Karlsson (2006: 52) is a layer of "black, greasy and humid soil mixed with clay, charcoal, river-stones, *tufetti* and some hard, stone packing...". The inclusion of the packed stones and *tufetti* (tufa stone rubble), along with clay and charcoal, suggests that stratum 4A was an artificially created layer of earth and therefore possibly part of the (since-destroyed) Type 2 foundations.

This description of stratum 4A by Karlsson is similar to Pohl's (1977: 33) description of stratum IIIA at Area E. Pohl (1977: 33) describes stratum IIIA as "[...] a thin layer of dark black-brown earth, sometimes with [...] ashes above the real ash layer, stratum III". Stratum IIIA only appears to have covered the area where Oval Hut II and 'floor 2' were sited, with the wall footings of Oval Hut II clearly upon stratum IIIA. Pohl (1977: 33) sees stratum IIIA as a natural deposit that formed above the 'ash layer' (stratum III) that was levelled and mostly cleared by the building of Oval Hut II. Pohl's interpretation of the deposition of stratum IIIA seems credible. However, when considered in conjunction with stratum 4A in Area F East, a different picture emerges. Both stratum 4A and stratum III consisted of an inclusion of charcoal and dark, clay-rich soils. As noted in the floor description of Oval Hut II (Pohl 1977: 25; see below), there were small, packing stones in the interior of the building. With these stones included in the description of stratum IIIA, the description of stratum IIIA is nearly identical to stratum 4A.

The evidence from Area F East offers another interpretation for the preparation of Oval Hut II. Rather than a natural deposit, the earth of stratum IIIA was an intentionally laid deposit. In this circumstance, the 'ash layer' resulted from the burning of overgrowth in a controlled way. The soil and stones from stratum IIIA could then have been brought in and packed above the ash. This interpretation would help to explain the amount of earth (~75 cm) that accumulated above Oval Hut I in the short chronological gap between Oval Huts I and II (refer to Tables 3.2 and 3.3).

Regardless of the interpretation, these examples of ground preparation from San Giovenale are the clearest of the Type 2 foundations. Consider Wieselgren's (1969) report on Huts A, B and C at Luni sul Mignone, where the nature of the site prevents precise interpretation of ground preparation despite the relatively clear descriptions of the stratigraphy. Factors affecting his interpretation included erosion and the inclusions of various earthen layers throughout the palimpsest. Despite these factors, Wieselgren (1969: 8–9) claims that a small layer of clay preceded the laying of the floor for each building, which might have been a suitable ground preparation. His account does not describe any form of artificial terracing or levelling, however, which is likely to have taken place given the location of Huts A, B and C on the edge of a cliff.

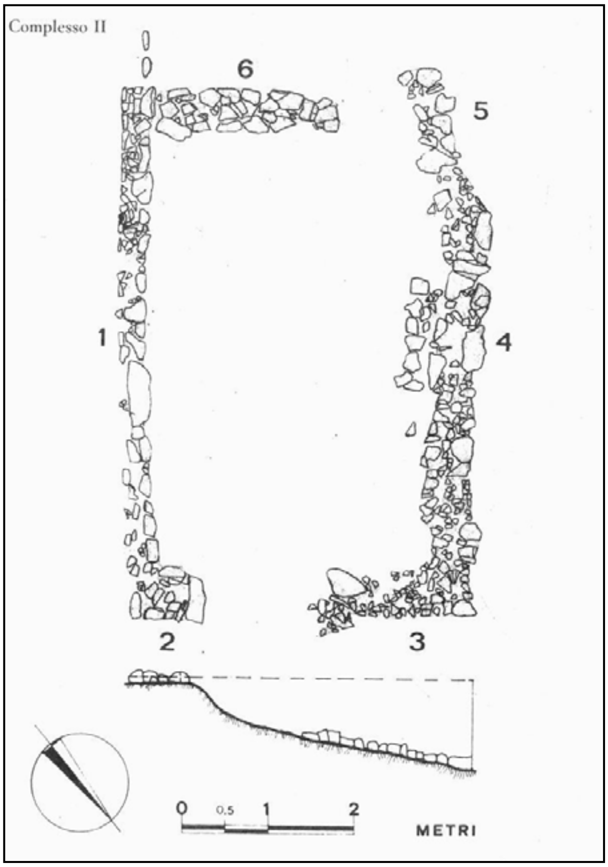

Figure 3.22. Plan of Complex II at Lago dell'Accesa Area A (Camporeale 1985: 142).

Camporeale's descriptions of the later Type 2 foundations are significantly less clear than those of San Giovenale and Luni sul Mignone, particularly for the foundations in Area A (Camporeale 1985a: 127–170, 1997: 27–30, 243–369). Nevertheless, based on his descriptions of the occupation levels of buildings, such as Area A Complex II (Figure 3.22), Camporeale (1985a: 130) establishes that there was no identifiable deposition layer in the Type 2 foundations. Instead, since many of the buildings at Lago dell'Accesa were built on a slope, Camporeale (1985b: 130, 1997: 27) hints at a significant alteration to the ground level through the removal of soil, an alteration undertaken to create a level floor surface (see below) *after* the setting of the wall footings rather than before.

Yet, Camporeale remains vague when describing the ground preparations in the foundations at Lago dell'Accesa. He states that the difficulty of the excavations, particularly when deciphering the floor levels, prevented a better understanding of building interiors (Camporeale 1997: 27). He then suggests that there are likely many structural interpretations that can be conceived of besides his own.

Despite his reluctance, Camporeale does present two versions of ground preparation for the Type 2 foundations and the Type 4 foundations, respectively. In a specific description of Complex II from Area A, Camporeale (1985a: 142) explains that, based on the discovery of artefacts at the downhill part of the foundations, the ground level must have been lowered to the level of the downhill wall footing (Figure 3.22).[31] Based on this version, the uphill side of the slope would have been cut vertically within the outline of the building, that is, on the inside of the uphill wall footing. The vertical cut continued until it reached the level of the downhill outline of the building. Camporeale (1985a: 130) does not make clear how the ground was prepared for further construction (particularly how the vertical cut on the interior of the building could maintain its structure and retained the slope) but he mentions wood, clay and *massicciata* are involved in the maintenance of the foundation soils.

It is thus unclear whether Complex II is an outlier or the norm given the incorporation of the Type 2 foundations in the later buildings. Unfortunately, this is all that is known about the earliest stages of the foundation process for every building (regardless of phase) at Lago dell'Accesa. Based on the known hydraulic engineering and retaining walls on site, significant terraforming (reshaping of the natural topography, generally for human occupation) occurred on the hillside above Lago dell'Accesa.[32] Yet, little is said by Camporeale about the individual building plots and manipulation of the land, particularly in the earliest settlement of the site.

Foundation Type 2 ground preparation can be divided, then, between the eighth- and seventh-century examples. To create a level surface, the eighth-century examples from San Giovenale have a layer of artificially deposited clay-rich soil. In contrast, removing the ground to create a level surface seems to have been the preferred technique in the seventh-century examples from Lago dell'Accesa. With the limited dataset, it is possible that the difference is based on site geology rather than social or technological factors. As described in more detail in Chapter 6 (see section 6.2.1), the geology of Lago dell'Accesa is comprised of siliceous limestone and sandstone intermixed with blades of shale (Salvi 1997: 11). The majority of the site is also on a (in some cases, quite significant) slope. Conversely, the acropolis of San Giovenale is a relatively level tufaceous outcrop (Karlsson 2006: 21). The resulting difference between the two sites is likely the product of practicality where the specific manipulation of the earth at each site is summarily easier and thus used in the creation of the buildings.

Therefore, as opposed to a lengthy analysis of the differences between them, attention to the similarities between the preparations is useful. In Foundation Type 2, the ground is not cleared to the bedrock and then manipulated to create a level surface. Instead, the soil is manipulated to create a level surface. Foundation Type 2 ground preparation for permanent, long-term buildings departs from traditional techniques. If traditional ground preparation techniques are evident in Foundation Type 1, then ground preparation techniques present in Type 2 foundations are innovative by comparison, particularly at San Giovenale.

3.2.2 Wall footings

Of the features that make Foundation Type 2 distinct from Foundation Type 1, none are more characteristic than the cobble or rubble stone socles used as wall footings.[33] Although the general technique used in their

31 Neither the stratigraphy nor the deposition process of the artefacts is made clear, which calls Camporeale's interpretations into question. Given the pointedly difficult stratigraphy in building interiors, the slope and the evident sixth-century reuse of the seventh-century structures, any number of formation processes could have altered the relationship between the artefacts and the structural features.
32 See Camporeale (2010) for a thorough description of the engineering projects undertaken by the inhabitants at Lago dell'Accesa.
33 Cobbles are naturally formed stones of between 64-256 mm following the Udden-Wentworth sedimentary grain size scale (Blair and McPherson 1999). Rubble is irregular, undressed and typically broken from a larger source (Oxford University Press

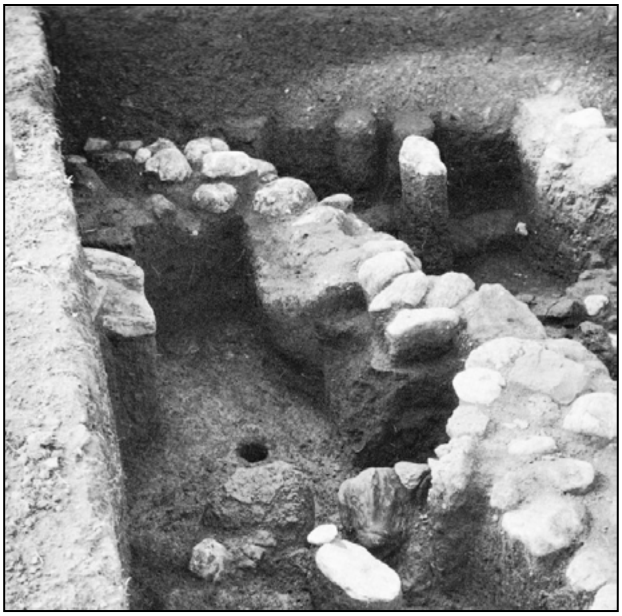

Figure 3.23. Wall footing of San Giovenale Area E Oval Hut II (Pohl 1977: fig. 18, p. 26), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

creation was the same, these socles vary markedly in execution.

The wall footing for Oval Hut II in San Giovenale Area E, for instance, is a 35-45 cm-wide line of primarily limestone conglomerate (i.e. lithified, as opposed to non-lithified gravel) cobbles laid out in an ellipse (Pohl 1977: 25; Figures 3.3, 3.17, 3.23). Similar wall footings appear to have been used at Area F East except that a tufa stone rubble mixed with pebbles was used in the place of limestone cobbles (Karlsson 2006: 54, 138–139).[34] Wieselgren (1969: 8–9) reports that the same tufa rubble was used for Hut B; however, the footing itself is wider, 50-55cm for Wall B2 and a substantial 80-90cm for Wall B1 (Figure 3.24). The Foundation Type 2 rectangular footings at Lago dell'Accesa are similar in size to that of Wall B2 from Hut B at Luni sul Mignone. As in the wall footings at San Giovenale, the material in the Lago dell'Accesa socles is made up of limestone, although the primary stones are either *alberese* (in Lago dell'Accesa Area A) or *palombino* (in Lago dell'Accesa Area B), both local, white limestone (Camporeale 1985a: 142–143, 1997: 12).

Socle wall footings were intended to protect walls composed of organic material or mud bricks. As in the bedrock channels of Foundation Type 1, a socle maintains the dryness of the wall, preventing structural weakness due to damp and rot. However, in contrast with bedrock foundations where the soil in the vicinity of the building was removed to ensure dryness, a socle protects the wall by acting as a buffer between the soil and the bottom of the wall.

Besides keeping the wall dry, the socle also helped to disperse the weight of the building across the ground surface. With the structure built on soil, the builders of Type 2 foundations needed to consider the possibilities of structural failure due to soil slipping and movement. The socle, while not an ideal dispersant of force, provided a solid, relatively consistent surface for the weight of the building to disperse. The compact, hard surface of a socle thereby broadened the transmission of downward forces through a greater distribution of contact points with the soil and, although it was still susceptible to failure via the earth underneath it, the chances for instability were greatly reduced.

In some cases, large stones were used in some of the Foundation Type 2 socles at Lago dell'Accesa, either as a way to better defend the walls from running water or to protect the slope against landslip. Perhaps a result of their effectiveness, these early socles were often found reused in sixth-century complexes as retaining walls (or "*muro di contenimento*"; Camporeale 2010). Wall 1 from Area A Complex II (Figure 3.22) is a good example of the use of larger stones in the socle (Camporeale 1985a: 142). Using larger stones, according to Camporeale (1985a: 142, 2010: 149–152), prevented the soil from slipping downhill. However, larger stones do not necessarily make Wall 1 more robust; it is narrower (45cm at its widest) and

2011). For more on these and other terms, see Glossary.

34 Pebbles are naturally formed stones of between 4-64 mm following the Udden-Wentworth sedimentary grain size scale (Blair and McPherson 1999). For more on this or other terms, see Glossary.

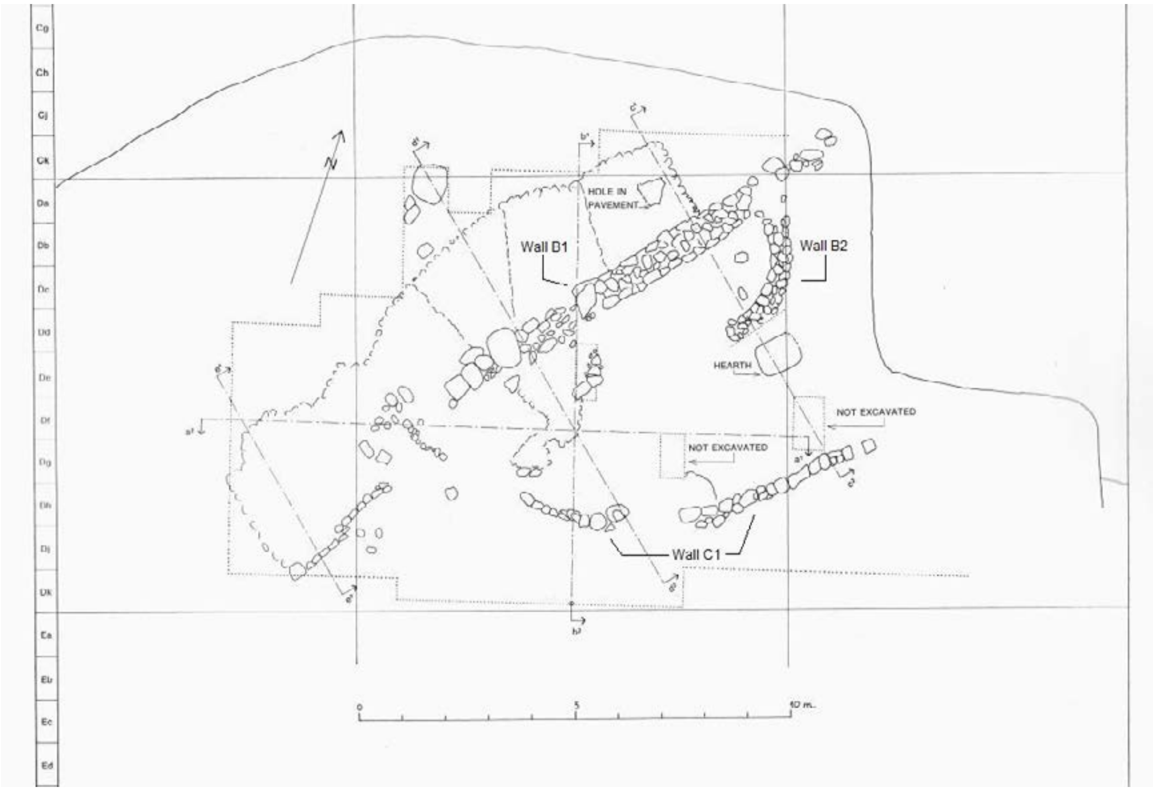

Figure 3.24. Plan of Iron Age Huts A, B and C at Luni sul Mignone (after Wieselgren 1969: 110).

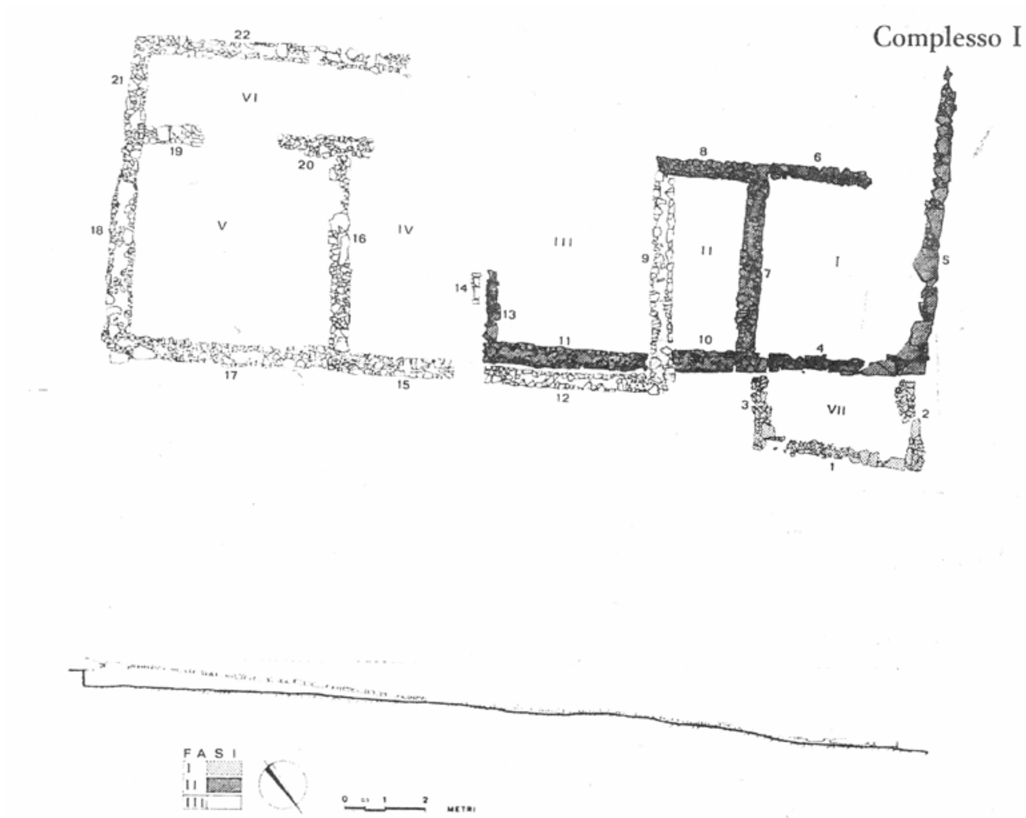

Figure 3.25. Plan of Complex I at Lago dell'Accesa Area A (Camporeale 1985: 136).

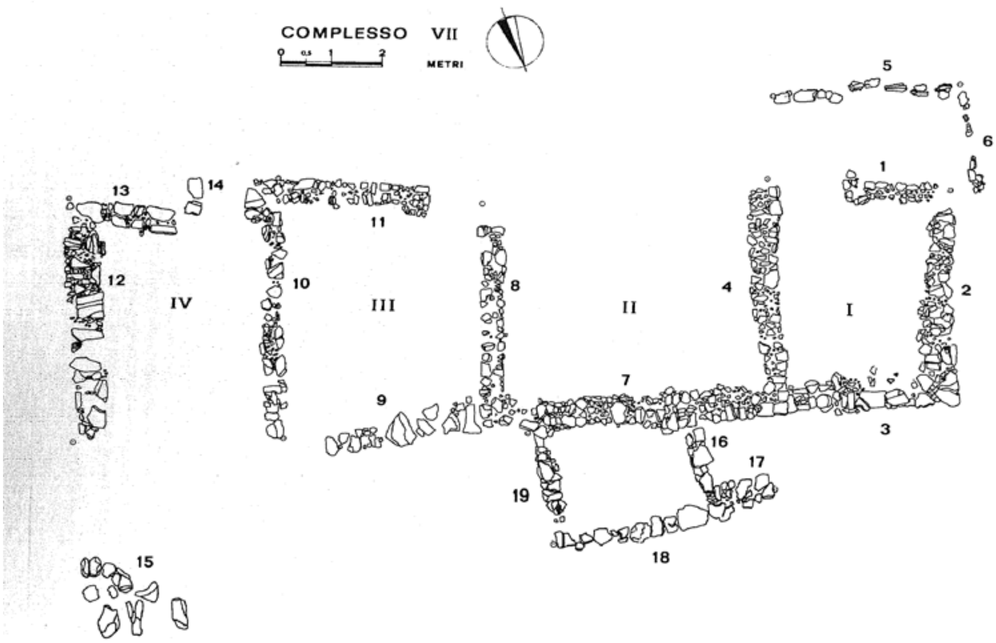

FIGURE 3.26. PLAN OF COMPLEX VII AT LAGO DELL'ACCESA AREA B (CAMPOREALE 1997: 322).

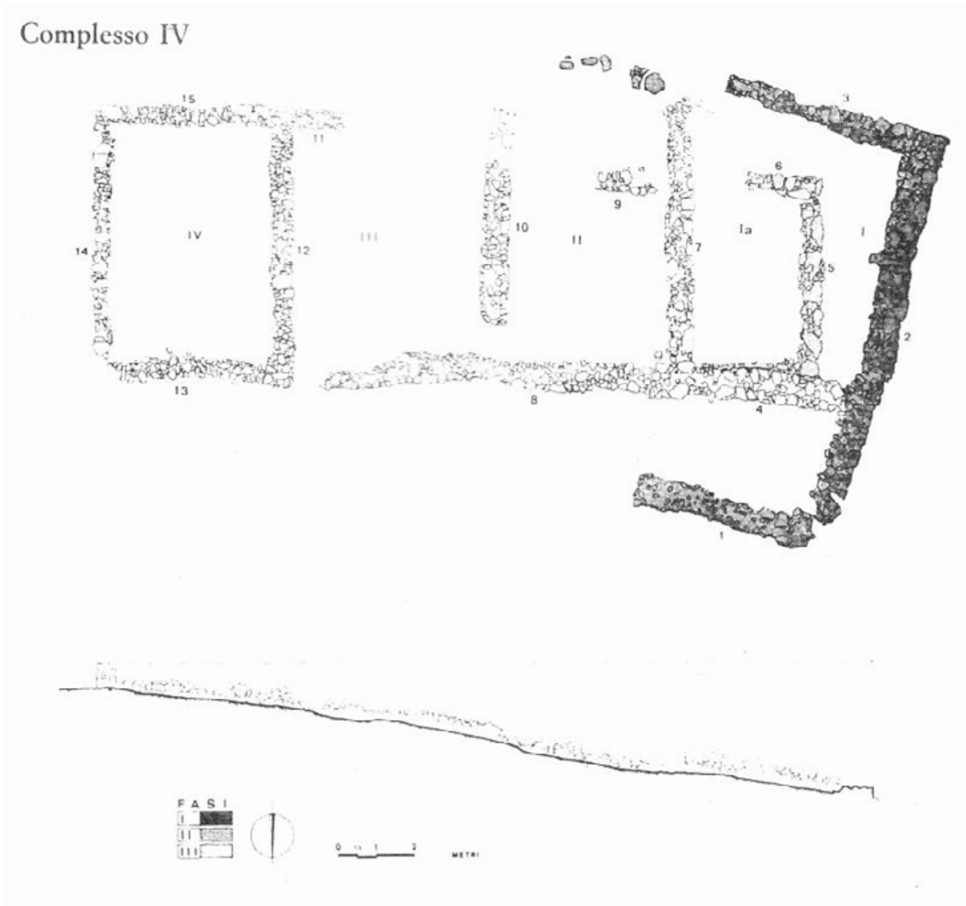

FIGURE 3.27. PLAN OF COMPLEX IV AT LAGO DELL'ACCESA AREA A (CAMPOREALE 1985: 149).

more evenly constituted than Wall 4 (nearly 90cm at its widest), the opposing, downhill wall, of Complex II (Figure 3.22).

Apparently, the use of larger stones in the Foundation Type 2 socles at Lago dell'Accesa was not restricted to so-called retainment. In a number of examples, the larger stones appear at the corners of wall footings (e.g. Area A Complexes I and VI and Area B Complex VII; Camporeale 1985a: 136–155, 1997: 304–317; Figures 3.25, 3.26). However, this is not necessarily true of all socles since a number of walls contain a random assortment of larger stones (e.g. Area A Complexes III, IV, VII and VIII and Area B Complexes VI and VII; Camporeale 1985a: 143–157, 1997: 304–317).

Therefore, it is difficult to tell the extent to which large stones were added to the Foundation Type 2 socle as a direct response to engineering challenges. There are some clues that the quality of the socle, as in Wall 1 of Complex II and others (e.g. the first phase walls of Area A Complex III [Figure 3.20], Wall 3 of Area A Complex IV [Figure 3.25] and Wall 1 of Area A Complex V), was more compact and straight than in other socles. However, the quality of the socles might have more to do with later upkeep (as discussed by Camporeale (2010)) or the reuse of early socles in later foundations (as with Area A, Complex IV; Camporeale 1985a: 149; Figure 3.27).

3.2.2.1 Robust and refined socles: a sign of technological sophistication?

Over time, there is a slight difference in size and composition in the examples of Foundation Type 2 socles. The differences in socles suggests that the narrower socles comprised of pebbles and small cobbles, which generally appear later than the wider socles comprised of larger cobbles, represent refinement in the wall footing techniques used. A good example for the difference between these refined and robust socles is apparent in successive structures at Luni sul Mignone.

Wieselgren (1969: 12) notes that the Foundation Type 2 socles in Walls B1 and B2 from Hut B at Luni sul Mignone are preserved to two and, in some cases, three courses. These socles are rather robust in comparison to the other Type 2 examples (e.g. Oval Hut II at San Giovenale Area E; Pohl 1977: 25). The walls of Hut B were also likely constructed on a clay-rich stratum of soil, further strengthening the building against failure. Wieselgren (1969: 14) accounts for the width of Wall B1, arguing it is a retaining wall set against the slope, despite the position of the socle upon and not within the earth.

Hut C, built nearly on top of Hut B, differs from this robust version of Foundation Type 2 wall footings (Figures 3.19, 3.24). Larger tufa stones were used throughout the socle and in some places there are inclusions of limestone cobbles that are similar to those in Oval Hut II (Wieselgren 1969: 15). However, when compared to Hut B, the socle of Hut C was a narrower wall footing despite the size of its stones. The socle of Hut C is more like Type 2 foundations at San Giovenale than Hut B. Since some of it has fallen off the side of the plateau, Hut C is unfortunately even more comparable to the examples from San Giovenale in that only part of its wall footing survives (Wieselgren 1969: 9).

It is possible that the socle seen in Wall B2 of Hut B is representative of an older, robust socle technique. The robust socle of Wall B2 might have been replaced by the newer, refined socle represented by the wall footings of Hut C and the buildings at San Giovenale. As opposed to this evolutionary interpretation of the socles of Huts B and C, it is possible that the differences between the socles are due to the contexts of the respective walls with the slope. This example is a microcosm of the wider interpretive problems facing architectural features. Without further data, it is problematic to see a refinement of socles over time between Type 2 foundations.

3.2.3 Flooring

The floors of the eighth-century examples of Type 2 foundations vary, but generally, floors were created by extending a layer of clay over the soil within the interior space, followed by a layer of pebbles or cobbles which was followed once more by another, thinner layer of clay. The floor level generally sat at the same level as the socle or just below it.

This type of clay-lined, cobbled floor was most obviously used in Huts A and B at Luni sul Mignone. However, there are some signs of disturbance to the floor cobble in Hut B, which Wieselgren (1969: 14) suggests might be signs of a transition to clay flooring without cobbling. The remains of the Foundation Type 2 buildings at Area F East also appear to have had these cobble floors at some point and Karlsson (2006: 137) admits that the evidence points to cobble flooring at the time of the buildings' destruction in the seventh century.

Regarding the composition of Foundation Type 2 floors, the evidence from Pohl's excavation report of San Giovenale Area E Oval Hut II is slightly different from the others. It is unclear whether this is due to an actual difference in composition or in the level of description. Pohl (1977: 25) describes the floor as a mix of both tightly-packed 'tufa chips' and a mix of 'tufa chips', earth and pebbles. She adds, however, that the floor has degenerated significantly.

A final note on eighth-century Type 2 flooring: Hut C of Luni sul Mignone is an outlier of sorts. Distinct from the rest of the early Type 2 examples, Hut C had a floor of so-called 'tampered' clay, which suggests a form of beaten clay floor (Wieselgren 1969: 15). Wieselgren notes that some of the clay was also fire-hardened, although this is likely the result of a structure fire. This floor type may reflect the later date of Hut C since it is similar to many of floors of the later Orientalising and Archaic buildings.

As with Hut C, a beaten clay floor has been found in the seventh-century Type 2 examples. In addition to this, the floor levels generally lay below the footings, sometimes up to 25cm lower and in certain cases, maybe even up to a meter (Camporeale 1985a: 130, 142). Again, the best example is Lago dell'Accesa Area A Complex II (Figure 3.22). Camporeale (1985a: 142) describes the floors as 'beaten' (*calpestio*) and likely at the level of the lowest wall, Wall 4. With the floor at the level of Wall 4, almost a meter of space must have separated the floor from the bottom of the footings on the south and east sides of the building. Camporeale does not discuss how the exposed ground between the footing and the floor was treated in antiquity but he does suggest that steps made of organic material likely allowed access from the outside to the inside (Camporeale 1985a: 130).

Besides Complex II, later occupation largely destroyed the other examples of Type 2 floors at Lago dell'Accesa, making interpretation of the earlier phases difficult. For instance, in Area A Complex IV (Figure 3.27) the original seventh-century interior had been reused in the final, mid-sixth-century phase of the site. Similarly, in Area B Complex VII (Figure 3.26) the later building destroyed the earlier, Type 2 foundations erasing flooring evidence (Camporeale 1985a: 149, 1997: 324).

To further complicate matters, in his introduction to Lago dell'Accesa Area B, Camporeale (1997: 27) describes a layer of small pebbles underneath the beaten layer of clay. It is unclear whether this phenomenon, which is similar to the floors of eighth-century Type 2, exists for every room during every building phase or if it is particular to just Area B in the final phases. The general lack of floor level descriptions in the more specific architectural analyses amplifies this confusion.

3.2.4 Roof supports

Evidence for Foundation Type 2 roof supports is nearly nonexistent. Most of the buildings are incomplete and suffer from later disturbances. The position of the foundations on soil has made identification of post holes difficult, especially at multi-phase sites. Despite the lack of evidence, it is possible that the eighth-century Foundation Type 2 examples had earth-cut post holes that held major interior posts, such as those in Foundation Type 1 buildings. This reasoning is based on the structural integrity of the interior post system of Foundation Type 1 and the continuity of building form from Foundation Types 1 to 2. Furthermore, building evidence from the Final Bronze Age site at Scarceta, which exhibits characteristics similar to the early Type 2 foundations at San Giovenale and Luni sul Mignone, suggests traditional roots for an interior post system in Type 2 foundations (Poggiani Keller et al. 2002).

As with the evidence for eighth-century BC Type 2 foundations, no evidence for post holes was found in the seventh-century Type 2 foundations at Lago dell'Accesa. The lack of evidence could be due to general deficiencies in preservation or in excavation (as in the eighth-century Foundation Type 2 examples) but it is more likely that a roof support technique that did not leave evidence of post holes is responsible. The later sixth-century Type 4 foundations bolster this alternative where walls were used for roof support.

Büchsenschütz (2001, 2005) presents two types of roof support techniques that use walls instead of interior posts: the single-aisle type (e.g. the Rectangular Timber Building at Veii; see section 3.1.4) and the post-in-wall type. However, in contrast with the Büchsenschütz typology (which is based primarily upon post holes) the load-bearing timbers of the roof support system were either placed directly on the socle without an anchor or socketed into sleeper beams. Sleeper beams would have run the length of the wall footing and thus masked otherwise substantial post holes. Alternatively, the walls of buildings with Type 2 foundations might have been self-supporting (see section 5.1.1). Camporeale (1997: 28–29) argues for self-supporting walls in the case of the later, sixth-century buildings but it is unclear whether he thinks the seventh-century buildings also had self-supporting walls.

It is not possible to securely identify the roof support techniques used in Foundation Type 2 examples. The post hole evidence, used to identify roof supports in Foundation Type 1, are not evident in Type 2 foundations. Despite the lack of post holes, the roof support techniques of both eighth- and seventh-century Foundation Type 2 can be inferred based on comparative examples from other periods. Although helpful for conceptualising the structure of buildings with Type 2 foundations, these inferred roof support techniques are inaccurate and are therefore not used in the broader interpretations of Etruscan architecture in this book. As a result, the lack of identified roof support techniques for Foundation Type 2 forms a consequential gap in the broader interpretations below.

3.3 Foundation Type 3

Foundation Type 3 represents a group of buildings (Table 3.4) that are, for lack of a better term, semi-subterranean. These buildings have interior floor levels cut into either the soil or the bedrock that are significantly lower than the surrounding wall footings. This section covers two of the four types of Bronze and Iron Age building types described by Domanico (2005). Domanico describes smaller semi-subterranean buildings as "*habitations à base encaissée*" and separates them from the so-called long houses (*maisons allongées de grandes dimensions*), exemplifying the diversity in size and function of semi-subterranean buildings. However, when based on the foundation techniques used, both *habitations à base encaissée* and *maisons allongées de grandes dimensions* are similar, hence their grouping here as a single type.

Site	Building Name	Period	Dates
Acquarossa Zone K	Building A	Early Orientalising	c. 725-675 BC
Acquarossa Zone K	Building B	Early Orientalising	c. 725-675 BC
Acquarossa Zone K	Building C	Early Orientalising	c. 725-675 BC
Acquarossa Zone K	Building D	Early Orientalising	c. 725-675 BC
Acquarossa Zone K	Building E	Early Orientalising	c. 725-675 BC
Luni sul Mignone	The Large Iron Age Building	Late Tolfa-Allumiere/proto-Villanovan	c. 725-675 BC
San Giovenale Area F East	House I	Orientalising	c. 675-625 BC

Table 3.4. The examples of buildings with Type 3 foundations by site.

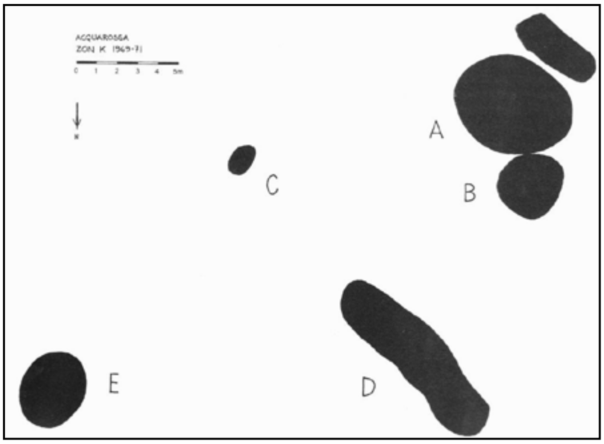

Figure 3.28. Plan of Acquarossa Zone K (Rystedt 2001: fig. 1, p. 24), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Despite being generally similar, not all Foundation Type 3 techniques are completely alike, with slight variations in execution evident. Some of the buildings, for instance, are cut into earth (or, more specifically, *terra vergine*, the term Östenberg (1983) and Rystedt (2001) use), while others are cut into bedrock. In another instance, one example has carefully carved, thin bedrock socles for wall footings and others have no footings at all. This variability makes defining a typical example of a Foundation Type 3 building impossible. In fact, the semi-subterranean nature of the buildings in this foundation type is the critical, shared component; it is a foundation technique that ultimately defines the Type 3 foundations.

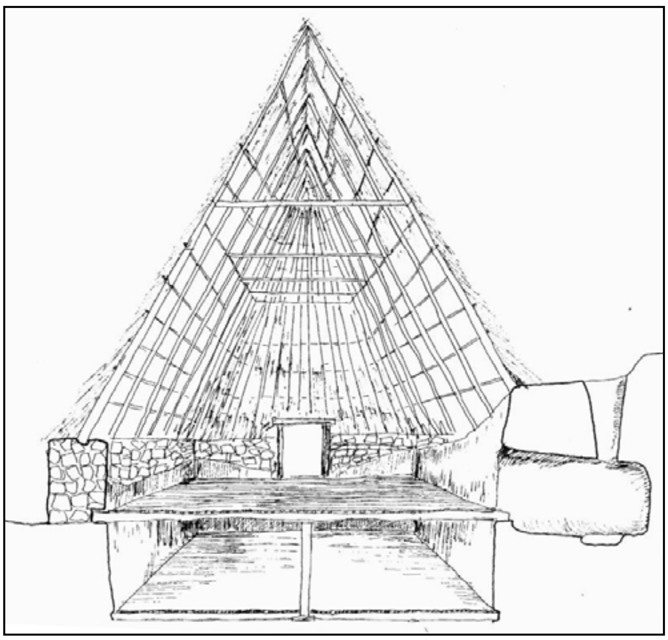

Figure 3.29. Illustrated reconstruction of the Large Iron Age Building at Luni sul Mignone (Hellström 2001: fig. 4, p. 166), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Yet, semi-subterranean interiors represent more than a single shared technical component. The longevity of this structural style and the possible connotation of status of the buildings in question indicate a shared cultural tradition. In this regard, it is critical to view these semi-subterranean buildings as part of the same phenomenon. Their semi-subterranean foundations therefore help make these buildings alike, despite the variety in execution.

There are two versions of the Foundation Type 3 buildings discussed here: those cut into *terra vergine* and those cut into bedrock. The primary examples of the buildings cut into *terra vergine* come from the five excavated at Acquarossa Zone K (Figure 3.28). Interpretations of these buildings vary, although the most recent one suggests that the five buildings were a part of one homestead (Rystedt 2001). It is probable that the buildings are from as late as the seventh century, even though neither Östenberg (1983)

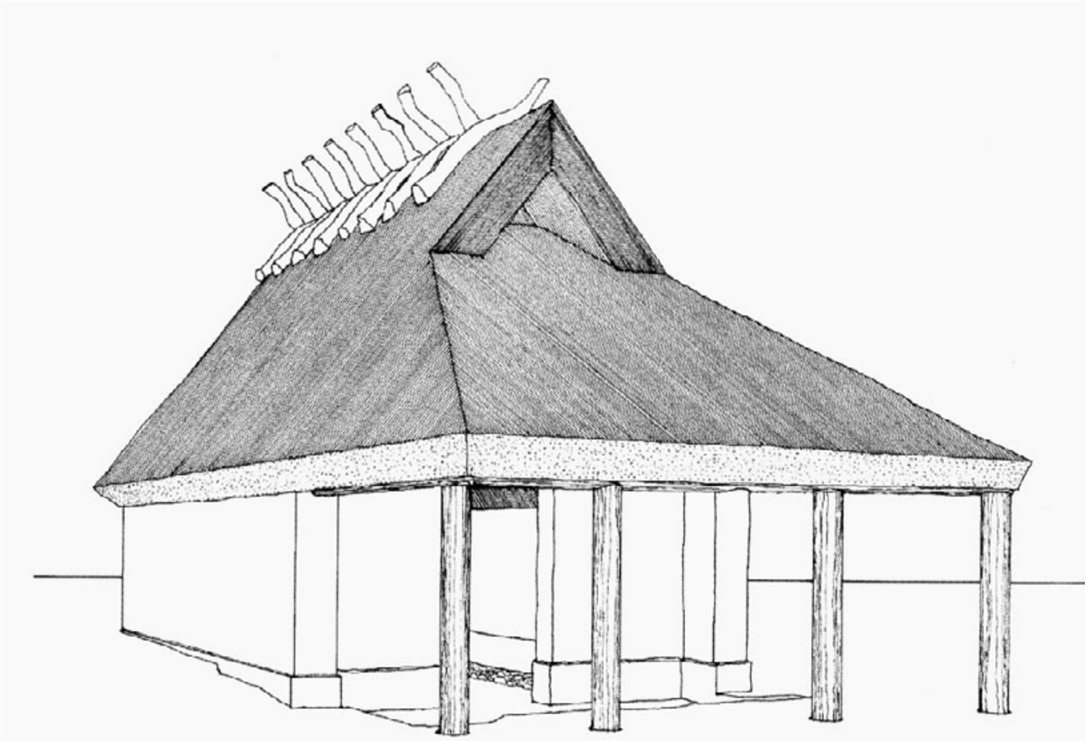

Figure 3.30. Illustrated reconstruction of House I at San Giovenale Area F East (Karlsson 2006: fig. 277, p. 150), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

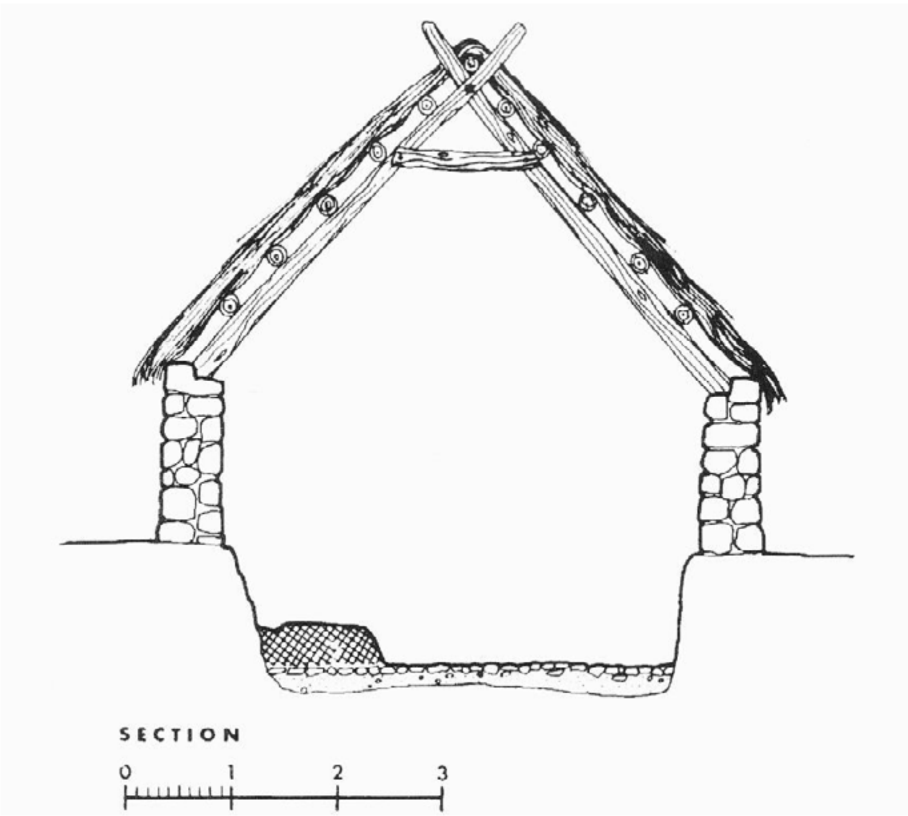

Figure 3.31. Illustrated reconstruction of Northern Bronze Age Building at Luni sul Mignone (Hellström 2001: fig. 5, p. 167), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

nor Rystedt (2001) are more specific.

For the buildings cut into bedrock, the primary examples used here will be the Large Iron Age Building from Luni sul Mignone (Figure 3.29) and House I from San Giovenale Area F East (Figure 3.30). The Large Iron Age Building and House I date from the end of the eighth and the beginning of the seventh century, respectively. They represent the tail end (or possibly a reflorescence) of an Apennine culture building tradition dating back to the Recent Bronze Age (Domanico 2005: 519, 524; Hellström 2001: 166–167; Östenberg 1967: 256–257; Figure 3.31). Therefore, as for Foundation Type 1, the focus of this section will remain on the most recent examples with perhaps a few references to the older examples.

Furthermore, the ground preparation stage of the Type 3 foundation process is predominantly part of the other stages in the process. Not only does the ground play an active role in the construction of the floors but it is also a critical part of the walls and even the roofs. Little can be said here on the ground preparation in its own right without it being repeated in the later, more specific subsections on wall footings, flooring and roof supports. Therefore, no subsection on ground preparation appears in the Foundation Type 3 section. Many of the features typically discussed in the ground preparation subsection are instead found in the other Foundation Type 3 subsections (see sections 3.3.1, 3.3.2 and 3.3.3).

There is abundant evidence for Foundation Type 3 buildings, especially following the volume by Karlsson and Brandt (2001b). Nevertheless, the data pool is limited, even when buildings from earlier than the eighth century are considered. As in the contemporary buildings with Type 2 foundations, the dataset is biased to southern Etruria and therefore the seventh-century Foundation Type 3 buildings could be a regional variation. Despite this possibility, the evidence from the protohistoric buildings at Satricum, the longevity of the techniques and the reports of many of these buildings, allow for a consideration of the techniques used in this influential foundation type.

3.3.1 Wall footings

Wall footings for Foundation Type 3 buildings are difficult to assess. Due to the nature of Foundation Type 3 buildings, it is not clear that wall footings were used. It is generally assumed that the walls of these buildings sat above the dugout interior. This meant that the ground in the interior had to be moulded or carved and acted, in a sense, as a component in the walls of buildings. Therefore, with the ground acting as at least part of the wall, the wall did not necessarily need a footing to distribute its weight to the ground.

Of the examples of Foundation Type 3 buildings, the majority do not have wall footings, at least in the sense of the foundation types discussed in previous sections. The buildings at Acquarossa Zone K, although they appear to have been built with wattle and daub walls, do not have any evidence for wall footings of any kind (Rystedt 2001: 24). Foundation Type 3 buildings at Satricum and Luni sul Mignone echo the lack of wall footings at Acquarossa (Heldring 1998: 13; Hellström 2001: 163).

3.3.1.1 The interaction between bedrock and rubble in the Large Iron Age Building

The Large Iron Age Building at Luni sul Mignone makes for a good example of the non-existent wall footings common in Foundation Type 3 buildings. During its excavation, a number of ‘field-stones’ were found as a part of the destruction layer in the interior, dugout area of the building. Hellström (2001) discussed his impressions of this layer in his report, stating that the field-stones were discovered on the floor, at the bottom of the destruction layer. From their position, Hellström (2001: 163–164) reckons

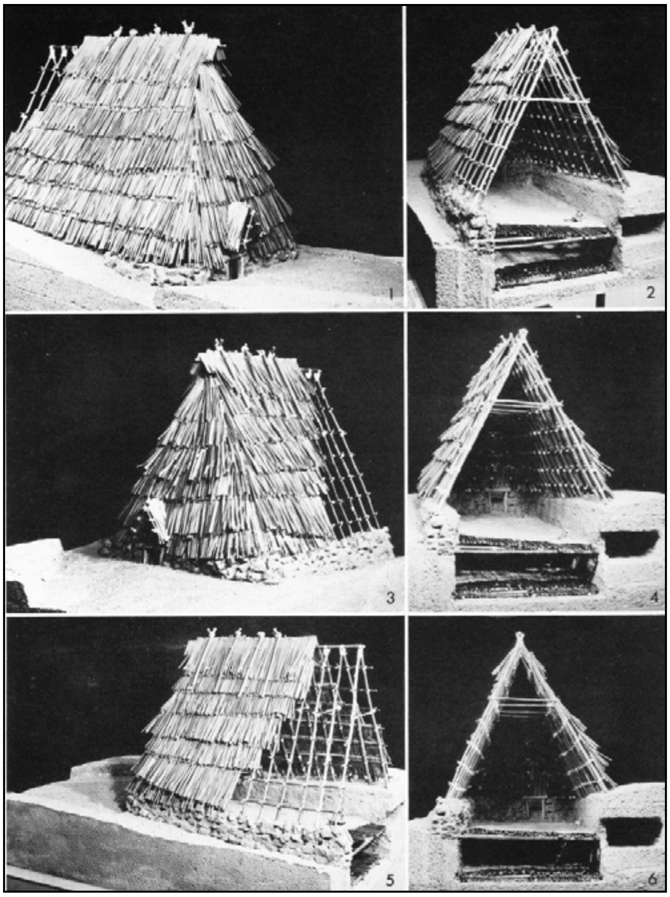

Figure 3.32. Model reconstruction of the Large Iron Age Building at Luni sul Mignone at the Chalmers University of Technology at Göteborg (Hellström 1975: pl. 14), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

that the building had rubble walls of various heights, at least in part (Figure 3.29). The rubble from the walls ended up in the interior of the building upon its destruction. His interpretation is consistent with Östenberg's reconstructions of the semi-subterranean buildings at Luni from the Apennine culture, where the buildings are described as being constructed with rubble walls (Hellström 2001: 167; Östenberg 1967: 105–109, 141; Figure 3.31).

The rubble wall remnants, such as the wattle and daub remnants of Acquarossa Zone K, do not appear to have had any footings at all. If the walls are along the edges above the interior dugout as Hellström proposes, then they rose from the uneven bedrock. As the imagined reconstruction of the Large Iron Age Building (Figure 3.32) indicates, these short walls would have varied in height to compensate for the level of the bedrock. In the southern corner of the building, the bedrock rises to a level which, according to Hellström (2001: 164), negates the use of a wall entirely. In fact, the use of a wall in the Large Iron Age Building must have been to create an even level from which the roof could be erected.

Despite the rubble found in the interior of the building, if the Large Iron Age Building had rubble walls, then those walls must have been around the outside of the dugout, directly above the carved interior. The reason that the walls were probably outside of the dugout is due to the likelihood of a wood floor that separated the dugout into upper and lower spaces (for a discussion of the wood floor, see the sub-section on 'Flooring' below). With cavities for the wood floor cut into the bedrock walls of the interior, it is unlikely that the rubble walls continued alongside the interior of the bedrock cut.

FIGURE 3.33. PROFILE OF HOUSE I AT SAN GIOVENALE AREA F EAST WITH EXCAVATION UNDERWAY. NOTICE THE CUT BEDROCK SHELVES IN THE FOREGROUND, LYING UNDERNEATH THE LATER TUFA STONES (KARLSSON 2006: FIG. 14, P. 33), COURTESY OF THE EDITORIAL COMMITTEE OF THE SWEDISH INSTITUTES AT ATHENS AND ROME.

3.3.1.2 The shelf wall footings of San Giovenale Area F East's House I

Compared to the majority of Foundation Type 3 buildings, the footings of House I are relatively well discernible. Based on the wall footings, it is easier to assess the construction process of the building than for other Foundation Type 3 buildings. This is in part thanks to the well understood context of the building (Figure 3.33). House I was built into the bedrock but, in a style that differs from the Large Iron Age Building at Luni sul Mignone, the bedrock was cut at approximately the same height around the building.

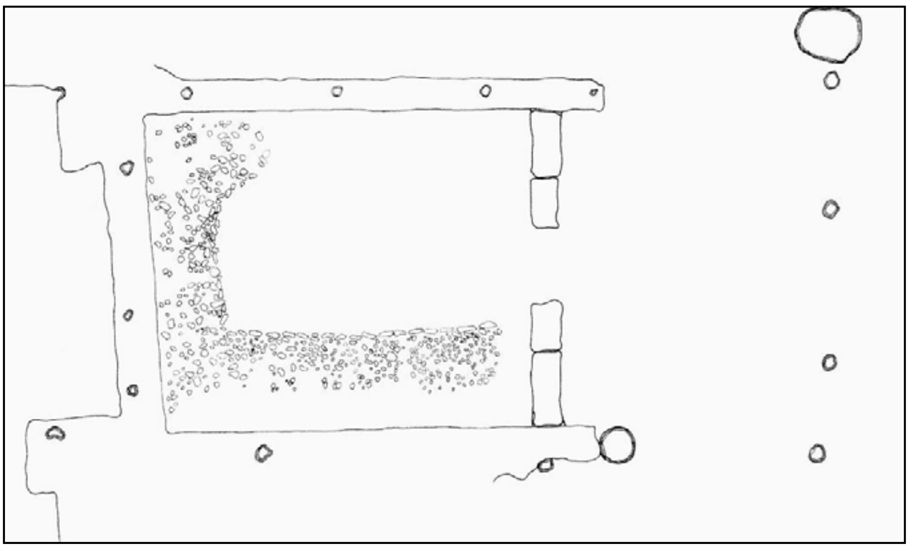

FIGURE 3.34. PLAN OF HOUSE I PERIOD 2 AT SAN GIOVENALE AREA F EAST (KARLSSON 2006: FIG. 267, P. 143), COURTESY OF THE EDITORIAL COMMITTEE OF THE SWEDISH INSTITUTES AT ATHENS AND ROME.

Although carved into the bedrock, the wall footings of House I were dissimilar to the channel wall footings in Foundation Type 1. Rather, the wall footings were 'shelves' cut into the bedrock that ran alongside the deep, interior dugout cuts (Karlsson 2006: 32, 144). These shelf wall footings, particularly on the south and east sides of the building, were intentionally cut higher than the surrounding bedrock, to create a sort of pedestal. Footings for House I's walls were discovered on three sides of the building; the fourth, southwest side was left uncarved to allow for an *in antis* portico (Karlsson 2006: 142–146). Within each of the wall footings' shelves, generally in the centre, a line of small post holes was found (Figure 3.34), a sign that hints at both the walls' structural composition and the roof supports (see sub-section below on Foundation Type 3 roof supports).

The shelf wall footing of House I exemplifies two critical concepts in the interpretation of Type 3 foundations. First, the footing guarantees that the base of the wall and the subterranean interior are protected from water, a common concern in previous foundation types. Second, the shelf wall footing displays the important connection between the wall and the ground. In this instance, the wall of the interior is the bedrock, on both sides of the wall. The stone does not continue for its entire length, as evidenced by the post holes and daub fragments, but it continues upward in one direction right along the edge of the dugout interior.

3.3.2 Flooring

Continuing the theme established by the wall footings of House I, the semi-subterranean nature of Type 3 foundations essentially defines the flooring techniques. In the majority of the examples, the floors are cut out of the ground. A good example of this is the carved and pressed earth floors of Building D at Acquarossa Zone K (Figure 3.35). These floors were moulded in such a way that the excavators could recognise possible interior divisions in the soil (Rystedt 2001: 25). The semi-subterranean buildings built into bedrock also had floors made on the carved ground. Yet, both the Large Iron Age Building and House I had additional components to their floors than just the carved bedrock.

In the excavation of House I, a 1.25m-wide, U-shaped platform or "bench" of river stones was found along the three interior walls of the building, directly on the bedrock (Karlsson 2006: 142; Figure 3.34). Although disturbed by the later iterations of House I, the platform resembled the interior of the Tomba della Capanna (Figure 3.36). This resemblance suggested to Karlsson a similar function for the stones; namely, the river stone platform was a "bench" intended to prop up mattresses or pillows (Karlsson 2006: 147). He uses the riverstone platform to suggest that furniture was not used in House I and that the floor was made functional by the addition of these river stone benches to accommodate their lack.

FIGURE 3.35. BUILDING D AT ACQUAROSSA ZONE K (RYSTEDT 2001: FIG. 2, P. 25), COURTESY OF THE EDITORIAL COMMITTEE OF THE SWEDISH INSTITUTES AT ATHENS AND ROME.

While it is possible that the bedrock interior of the Large Iron Age Building at Luni sul Mignone was used as a floor, Hellström (1975: 67) argues that this was not the case (Figure 3.37). Within the bedrock walls of the dugout, cavities were cut into the stone near the very bottom of the dugout. Hellström (1975: 67–68) posits that the cavities may have supported small beams that held a straw and clay floor above the tufa bedrock. This proposition is based on his interpretation of two floors in the interior and that the lower, bedrock floor may have

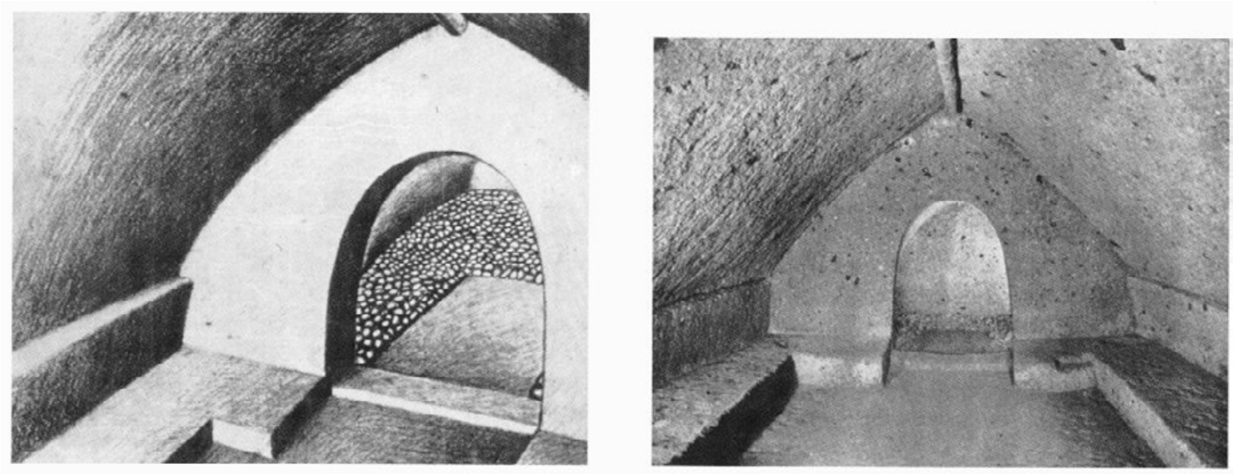

Figure 3.36. Illustrated reconstruction (left) and photograph (right) of the Tomba della Capanna at Caere (Karlsson 2006: fig. 270, p. 145), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

been used for storage. The placement of a straw and clay floor, according to Hellström (1975: 68), would resist dampness, a threat to stored foodstuffs.

The two-floor theory for the Large Iron Age Building is well-argued by Hellström. According to Hellström (1975: 67–69, 2001: 164–166), the building had both a living area and a basement storage area. This was made possible through the addition of a wood floor 3-3.5m above the dugout floor (Hellström 1975: 68, 2001: 166; Figure 3.37). The wood floor was comprised of a system of supports, primary and secondary beams and probably upright posts (Hellström 1975: 68–69, 101–103). The supports were held up using cavities found in the bedrock walls and by the probable use of a line of central upright posts (Hellström 1975: 68, 2001: 166). Hellström's model also includes a layer of earth or clay on top of the secondary beams to create an even surface.

The majority of the evidence for Hellström's model does not remain. However, a significant amount of charcoal was recovered during excavation, revealed upon analysis as the remnants of beech, elm, hornbeam, ash and oak timbers (Hellström 1975: 71). Hellström argues, using the evidence collected from

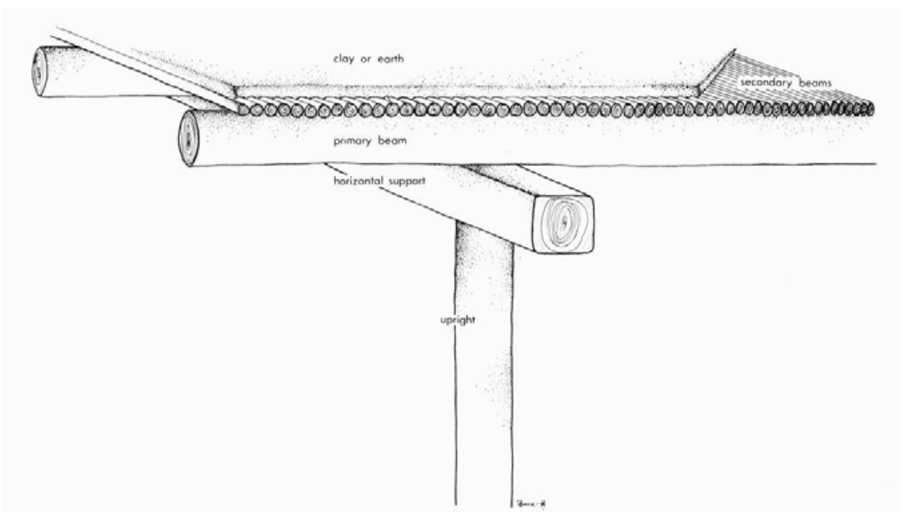

Figure 3.37. Possible design of the floor structure in the Large Iron Age Building at Luni sul Mignone (Hellström 1975: fig. 1, p. 68), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

modern *capanne*, that a thatch roof did not need these large timbers, particularly since the building does not seem to have the roof supports for a heavy roof. Coupled with the bedrock cavities, it is likely that two floors were in use at the Large Iron Age Building: a straw and clay floor that covered the bedrock in the lower, storage space and a large timber and earth/clay floor that could support up to 100 people (Hellström 1975: 69).

Hellström's two-floor theory, while a perfectly plausible scenario based upon the evidence, makes the Large Iron Age Building unique. In general, Etruscan building remains do not usually provide enough evidence for multiple floors. Combine the evidence for the multiple storeys with the large size of the building, and the Large Iron Age Building is a unique building at Luni if not in the region of the Mignone. The unique nature of the building calls into question the relationship that the Large Iron Age Building had with the other, contemporary buildings at Luni and whether or not Foundation Type 3 buildings are in fact domestic at all (see section 3.3.4, below).

3.3.3 Roof supports

No evident internal roof supports exist for the majority of Foundation Type 3 buildings. This is a trait that is apparent not only in the later buildings that are described here but also dating back to the buildings of the Apennine culture at Luni sul Mignone (Östenberg 1967: 105–109). However, it is possible that there is evidence for roof supports in the wall footings of House I.

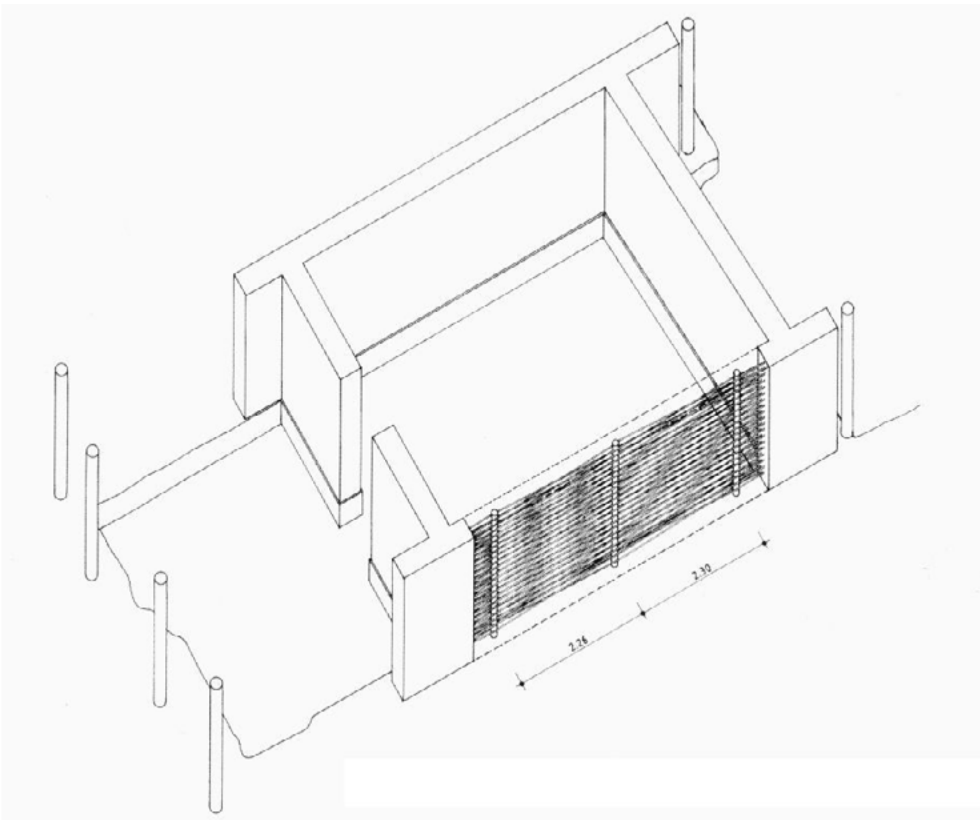

Figure 3.38. Illustrated reconstruction displaying the graticcio walls and roof supports possibly at use in House I at San Giovenale Area F East (Karlsson 2006: fig. 270, p. 145), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

As mentioned before, small post holes were discovered in the shelf wall footings of House I (Figure 3.34). These post holes, according to Karlsson (2006: 147), are the evidence for a *graticcio* or *opus craticium* wall. A *graticcio* wall in House I would have had small wood posts running upward from the small post holes in the wall footings and, if Karlsson's assumption is correct, they would have held wood wall plates in place atop the weaker wattle and daub (Figure 3.38). Karlsson's *graticcio* model for House I, based on the roof supports, explains how the roof could cover the relatively large (~11.80 x 5.70m) building without internal supports. However, Hellström (1975: 70) explains how the roofs of large *capanne* need not be excessively robust to cover such an area.

3.3.4 Élite residence or communal building? A discussion of function and social stratification

Monumental buildings, such as the Large Iron Age Building at Luni sul Mignone, have often been highlighted and ascribed the status of élite dwellings or administrative centres in an attempt to relate the trend found in funerary remains to that of the residential (Bartoloni 2002: 69–70; Hellström 2001: 168). A persistent theme of the scholarly discussion on the eighth and seventh centuries is the emergence of the *principes* and the transformation of the supposedly egalitarian society of the Villanovan period. This concept of emergent social élite in the eighth century has had a lasting effect on the comprehension and interpretation of buildings (starting with, perhaps, Torelli (1985); see section 2.3).

However, the function of many of the larger buildings is still somewhat unclear. In the consideration of Type 3 foundations, it is critical to note here that not every scholar agrees that the monumental structures were domestic. If the subset of monumental buildings were removed from the sample, then the character of Type 3 foundations as they are described above would, out of necessity, change. Indeed, without the monumental structures, the ground preparation techniques would be less permanent and sited primarily on soil, as in the examples from Acquarossa Zone K. Although the author understands these structures as a form of domicile, this subsection is included here as a form of caveat, acknowledging that the ambiguous nature of evidence regarding function might impinge upon the choice of sample.

The Large Iron Age Building, for example, is relatively well understood from an architectural point of view but the function of the building is still somewhat unclear. As in a number of other semi-subterranean buildings (Maffei 1987; e.g. Negroni Catacchio and Domanico 1995), the small finds point to domestic use. From loom weights to grinding stones to domestic pottery, the Large Iron Age Building contains the same types of finds expected of domestic (rather than a sort of cult or administrative) context (Hellström 1975: 72–76, 2001: 166–167).

If the Large Iron Age Building was a domestic building, then why was it so large? Monumental construction could have served a number of functions, as Hellström (2001: 167–169) points out. At Monte Rovello, for instance, the Foundation Type 3 building (Figure 3.39) was interpreted as a dwelling for multiple family groups (Maffei 1987). This was based upon the discovery of ten hearths on the floor. Alternatively, the largest buildings (with Type 1 foundations) at Tarquinia might have been used (at least according to Linington (1982)) for storage or stabling (Hellström 2001: 168; Figure 3.8).

The Large Iron Age Building is harder to interpret than the others. Compared to the Foundation Type 3 building at Monte Rovello, no hearths were found at the bottom of the Large Iron Age Building (although the absence of permanent hearths certainly does not preclude the use of portable hearths). In addition, the design of a Foundation Type 3 building (i.e. its semi-subterranean construction) makes its use as a stable impractical. Furthermore, the domestic finds, particularly those associated with the preparing and eating of food, make it unlikely that the building had a purely storage function.

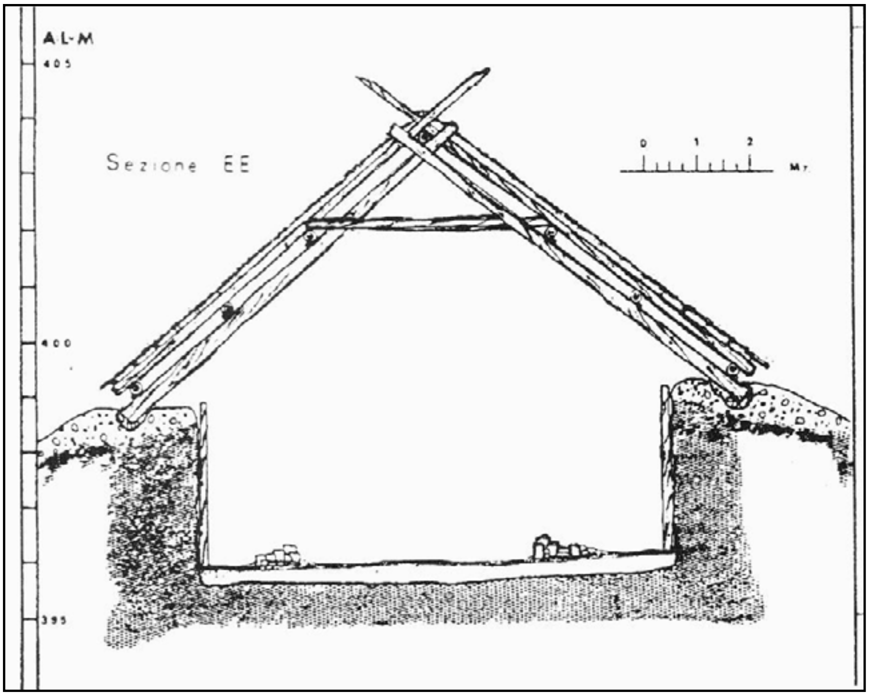

Figure 3.39. Illustrated reconstruction of the Foundation Type 3 building at Monte Rovello (Hellström 2001: fig. 5, p. 167), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Despite the fact that the Large Iron Age Building does not have some of the key features that Maffei (1987) and Linington (1982) use to interpret their respective buildings, Hellström (2001) incorporates their concepts into his own two-floor theory. As mentioned above, according to Hellström (2001), the building consisted of a living space and a storage space with the former on the upper floor and the latter on the bottom floor. The two-floor theory explains how the building could have been both a storage building (such as at Tarquinia) and a living space (such as at Monte Rovello). Coupled with Hellström's suggestion that the attached cave served as a cooking area, the Large Iron Age Building could have serviced multiple families (e.g. Monte Rovello) without multiple hearths. Combining these concepts with his two-floor theory, Hellström (2001: 169) proposes that the Large Iron Age Building was more likely a residence for an élite group of families than a public hall.

The temptation to attribute élite status to the building is understandable. Hellström's (2001) arguments are highly persuasive and his combination of traditionally different building functions is a clever way of solving the question of domestic monumentality. Despite this, one cannot conclusively ascribe élite status to the Large Iron Age Building. No direct evidence of multiple family habitation exists for the Large Iron Age Building and the architectural similarities between it and Monte Rovello do not mean that they had functional similarities (Hellström 1975: 93–97, 2001). No concrete examples of multiple family habitation within Foundation Type 3 buildings exist besides the one at Monte Rovello.

To be clear, Hellström (2001: 169) clearly indicates that it is his opinion that the building is an élite, multi-family habitation. However, there is no doubt that Hellström considers the Large Iron Age Building a sign of centralised power – another result of the non-egalitarian society evident in the burial customs in the Mignone region (Hellström 2001: 168). The larger picture influences his eventual emphasis on the building's élite function (whether correct or incorrect). Nonetheless, he provides no evidence for why this large (even monumental) building was not used in some communal way.

The notion that size and refined craftsmanship denotes élite status, as with Hellström's (2001) perception of the Large Iron Age Building, is common in the discussion of building function. This is particularly true for the buildings of the later foundation types. In many of the later cases, ascribing élite and administrative status to buildings is predicated on the known surrounding buildings or on specific élite goods, such as the *edifici monumentali* at Zone F of Acquarossa or the Upper Building at Poggio Civitate. However, as in the case with the Large Iron Age Building, the claims to élite or administrative status are also the result of comparisons and assumptions based entirely on size and architectural technology. The examples of the *edifici monumentali* and the Upper Building will be discussed in greater detail in the following chapter (see section 4.2).

3.4 Conclusions

This chapter presents three foundation types. Distinguished through a descriptive reconstruction of the archaeologically evident remains of permanent domestic structures, these types gather evidence of similar techniques together. The types are then used to interpret broader foundation operation processes. A number of conclusions can be drawn based upon these identifications and interpretations. The conclusions here, added to those drawn in the next chapter (see section 4.3), use the technological evidence for foundations to shed light on Etruscan architectural change.

Evidence of traditional building techniques from the Bronze Age (and earlier) appears at Iron Age and early Etruscan sites in Foundation Types 1, 2 and 3. However, a continuity of techniques is misleading as the evidence suggests a gradual shift from one foundation operation to others over time. The traditional techniques used in each of these forms also vary, as does the amount of evidence.

This is no more evident than in Foundation Type 1. A limited amount of evidence for buildings on bedrock with channel footings is found in eighth-century BC (or later) contexts. Generally, the eighth-century evidence resembles the Final Bronze Age foundations at Sorgenti della Nova and elsewhere (e.g. Domanico's (2005: 526–532) "*habitations à fondations en tranchées parallèles*"). Through comparison to the more extensive evidence at Sorgenti della Nova, identifiable techniques are evident in the eighth-century foundations.

The consistent use of similar ground preparation and wall footing techniques continues from Bronze Age Sorgenti della Nova to Iron Age San Giovenale and Tarquinia and then to early Orientalising period Veii. Bedrock provided builders of permanent structures with noticeable advantages, such as a reduced chance of structural failure from soil deformation, rot and erosion. The benefits of these techniques may even have encouraged some builders to use them despite unsuitable topographical settings, as in Oval Hut I at San Giovenale Area E. At Tarquinia and Veii, Type 1 ground preparations and wall footings continue to be relevant well into the eighth century BC, despite possible changes to building shape (and their causes).

Studies of Italian building shape indicate that rectangular building forms became more common over time and replaced the elliptical forms as the dominant shape in a gradual progression from the beginning of the Recent Bronze Age (c. 1350-1200 BC) onward (Cattani 2010). The effects of this progression in building shape are witnessed in the Type 1 roof support techniques. The traditional roof support techniques evident in the elliptical Type 1 foundations are three-aisle type roof supports. The rectangular buildings at Tarquinia and Veii, likely for reasons of structural integrity, do not have the three-aisle type. Instead, a two-aisle type is used at Tarquinia and a single-aisle type is used at Veii. Given the likelihood of the progression from elliptical to rectangular building shapes, this difference in roof support techniques breaks from tradition and is significant evidence for changing architecture over time.

The identification of techniques and the subsequent interpretations of Foundation Type 1 reveal that the traditional techniques of Foundation Type 1 were used continuously from (at least) the twelfth to the end of eighth century BC. Despite the longevity of Foundation Type 1 techniques, evidence for change appears in the later examples, with the appearance of various roof support techniques most obvious. Although these conclusions seem generally apparent, the evidence presents a number of limitations. Most notably, the sample of Type 1 foundation evidence from 800 BC onwards is relatively small. There is also a significant gap apparent in the chronology between the archetypical Type 1 foundations from Sorgenti della Nova and those from San Giovenale and Tarquinia. Few features from central Italy date to the ninth century BC, which has resulted in considerable reevaluation of dating for the Italian Early Iron Age writ large (Bartoloni and Delpino 2005; Bietti Sestieri 2006: 402–406; Pacciarelli 2010). The scope of the evidence, which is limited to a few sites in southern Etruria, also narrows the applicability of the conclusions. It begs the question: was the supposed dominance of the Foundation Type 1 techniques a result of regional diversity and manipulation of local resources or an architectural tradition throughout Etruria? This question will be addressed further in Chapter 6 (see section 6.2).

As with Foundation Type 1, a number of conclusions can be drawn based on the identification and interpretation of Type 2 foundations. Between the ground preparation and wall footing techniques, it is possible to infer innovation in foundations, at least at certain sites. Although evident at Scarceta in the Bronze Age (and at a number of other southern Italian and Sicilian sites besides; (e.g. Leighton 2012: 71; Malone and Stoddart 2000: 471–472; Sturt et al. 2007: 47–53)), stone socles on prepared soil appear to replace the dominant techniques of Foundation Type 1 in the eighth century BC in Etruria. San Giovenale best exemplifies the change, with evident stratigraphic transitions in foundation techniques observed in numerous areas.

It is unclear why there was a change from bedrock to stone socle and soil, especially when considering the technologies involved. Foundation Type 1, with its position on bedrock, is more structurally secure than the Type 2 foundation techniques. Permanent structures built on soil must be prepared against soil deformation. Otherwise, the building risks failure due to geological changes in the subsoil. Yet, even with the pressure of tradition and access to malleable bedrock, buildings of the eighth century at San Giovenale appear to change away from the more secure Foundation Type 1 to Foundation Type 2.

Unfortunately, evidence for Foundation Type 2 is limited. Only three sites in Etruria contain evidence for Type 2 foundations built between 800-625 BC. There is also a chronological gap between eighth- and seventh-century examples, which prevents a more specific interpretation of the prevalence of the foundation process over time. It is thus unclear whether or not the transition between Foundation Types 1 and 2, evident at San Giovenale, is a regional phenomenon or a wider change in architecture. The appearance of Type 2 foundations at Lago dell'Accesa, in northern Etruria, and at San Giovenale and Luni sul Mignone, in southern Etruria, is suggestive of a wider change. Yet, without evidence from other sites and, perhaps more importantly, from between 700-625 BC, it is difficult to confirm an architectural transition from the dominant Foundation Type 1 to Foundation Type 2.

Type 3 foundations, perhaps more than Foundation Types 1 and 2, indicate the continuity of certain foundation techniques from the Bronze Age through to the early Orientalising period. Of all the types, Type 3 foundations group together the most diverse techniques. In fact, the semi-subterranean ground preparation technique is the only shared technique. However, the semi-subterranean ground preparation technique defines how the other aspects of the Foundation Type 3 are created. Variety in wall footing and flooring techniques is not in itself evidence for innovation or an indication of change. Instead, the variety in techniques results from the use of the traditional ground preparation technique in different settings. For instance, the uneven ground level at Luni sul Mignone appears to have caused the use of hybrid bedrock and rubble stone walls/wall footings. Construction of the wall/wall footings in the Large Iron Age Building was a particular response to the difficulties arising from the traditional semi-subterranean ground preparation technique.

Grouping these diverse foundation techniques together raises some problems. Although the buildings are similar from a technological viewpoint, this grouping does not account for differences in size and setting between buildings. Therefore, future interpretations based on economic, social or cultural stimuli must recognise the similarity in foundation process between these structures, analysing the Type 3 foundations without reliance on differences in scale and setting.

The development of Foundation Type 3 is summarily different and intentionally traditional when compared with Foundation Type 2. However, while evidence for Type 1 foundations declines beyond the mid-eighth century BC, evidence for both Foundation Types 2 (with its innovative techniques) and 3 (with its traditional techniques) remains. The persistence of Foundation Type 3 as Type 1 foundations fade from prominence is just as difficult to explain as the possible transition from Foundation Type 1 to Type 2. It is likely that other stimuli besides technology encouraged architectural changes in foundation.

Therefore, from the evidence for foundation techniques, it is possible to see a gradual transition in architecture. By the end of the eighth century BC, one of the dominant types of foundations (Foundation Type 1) disappeared, while another (Foundation Type 3) continued in various guises. Another type of foundation (Foundation Type 2), although apparent in earlier contexts, becomes more common by the seventh century, where it appears to replace the previously dominant type. Other aspects of transition are apparent as well. The gradual, nearly millennium-long change in building shape likely altered the ways certain elements of the foundations were created. Despite the overall appearance of a transition, the limited sample for the eighth century ultimately prevents thorough confirmation of that transition. However, this tentative transition in foundations fits in context with the later evidence and helps to account for subsequent changes in architecture.

Chapter 4: The foundations of Orientalising and early Archaic period Etruscan buildings, 625-500 BC

As in the previous chapter, this chapter discusses the main foundation techniques of a number of structures across Etruria. The division of the examples between the chapters was intentionally chronological, with the last chapter representing buildings commonly considered 'huts' and this chapter 'houses'. The purpose of these two foundation chapters is to identify traditional and innovative foundation techniques through time. By recognising the innovations in foundation techniques, an assessment of the stimuli for change can be undertaken. This is included toward the end of the chapter and includes a discussion of the foundation types that appear from both this and the previous chapter.

In this chapter, Foundation Types 4 and 5 are discussed. As in the last chapter, both types are given their own section, which are broken into four subsections based on broad attributes associated with foundations: ground preparation, wall footings, flooring and roof supports. Of these attributes, the first two, ground preparation and wall footings, help to define the 'type' since they were, generally, essential to structural integrity. Again, it is critical to point out that the 'types' discussed here are not intended as a cut-and-dry typology. It is perhaps more important in this chapter than in the last to recognise that the foundations grouped together here are done so as a method for pointing out similarities in foundation techniques and not as a formal system for classifying foundations. Furthermore, concerns raised about the sample in the introduction of the last chapter remain valid for this one but to a lesser extent. The sample size of the foundations is still relatively small, particularly when considering the amount of published detail for some of the foundations.

4.1 Foundation Type 4

The techniques used in Type 4 foundations share many similarities with Foundation Type 2 and are likely derived from those earlier, traditional building techniques. The similarities are particularly evident in the typical ground preparation and wall footing techniques in Type 4 examples. However, there are several differences that separate Foundation Type 2 wall footings from Type 4. Foremost of these differences is the way that the socle is constructed (compare Figure 4.1 and Figure 4.2). In Type 2 foundations, socles contained a random assortment of stones that, in general, had no consistent order. Contrary to this randomness, Foundation Type 4 socles, broadly speaking, were specifically organised with the system of outer skins and inner fills, described below.

Another difference between the construction of Foundation Types 2 and 4 wall footings is the height of the socles. Generally, the socles in the Type 2 foundations were one or, perhaps, two courses deep (Camporeale 1985a: 142; Pohl 1977: 25). This is significantly different to, for instance, the Foundation Type 4 wall footings of the Upper Building at Poggio Civitate, which had several 'courses' of rubble (Phillips 1967: 135). In conjunction with greater height, Foundation Type 4 wall footings have a greater presence of mortaring agents (e.g. clay or earth) holding stones together.

Furthermore, socles in Foundation Type 4 extend below ground. In comparison, it is unclear in Foundation Type 2 examples whether the wall footings were intended to be completely surrounded by soil or simply sit partially embedded in the soil. Given their relative height, the Foundation Type 2 wall footings were most likely resting on or partially embedded in the ground (see section 3.2.2) in order to provide

Figure 4.1. Foundation Type 2 socle of Complex II from Lago dell'Accesa Area A (author's image).

Figure 4.2. Foundation Type 4 socle of Complex IV from Lago dell'Accesa Area A (author's image).

Site	Building Name	Period	Approx. Dates
Lago dell'Accesa Area A	Complex I	Early Archaic	575-500 BC
Lago dell'Accesa Area A	Complex III	Early Archaic	575-500 BC
Lago dell'Accesa Area A	Complex IV	Early Archaic	575-500 BC
Lago dell'Accesa Area A	Complex VII	Early Archaic	575-500 BC
Lago dell'Accesa Area A	Complex VIII	Early Archaic	575-500 BC
Lago dell'Accesa Area A	Complex X	Early Archaic	575-500 BC
Lago dell'Accesa Area B	Complex I	Early Archaic	575-500 BC
Lago dell'Accesa Area B	Complex III	Early Archaic	575-500 BC
Lago dell Accesa Area B	Complex VII	Early Archaic	575-500 BC
Poggio Civitate (Murlo)	Lower Building	Orientalising	650-610 BC
Poggio Civitate (Murlo)	Upper Building	Late Orientalising	600-550 BC
Podere Tartuchino	Farmhouse Phase 1	Early Archaic	550-500 BC

Table 4.1. The examples of buildings with Type 4 foundations by site.

separation between the wall and the ground. Yet, they were not put into foundation trenches nor were they significantly deep in the ground.

Therefore, the inherent complexity in Foundation Type 4 wall footing construction methods clearly separates them from Type 2. The differences in wall footings suggest that some traditions continue from the earlier, 'hut' style buildings to the more complex 'house' buildings. Perhaps, in order to build larger buildings with heavier roofs, the common socle used in the Foundation Type 2 buildings had to be made more robust, resulting eventually in Foundation Type 4. At a site where both types of socles appear (i.e. Lago dell'Accesa), the differences were even used by Camporeale to create a relative chronology. The differences in wall footings are thus a major factor when tracing the continuity of traditional techniques and the innovations of them, a concept that will be discussed in more detail later on.

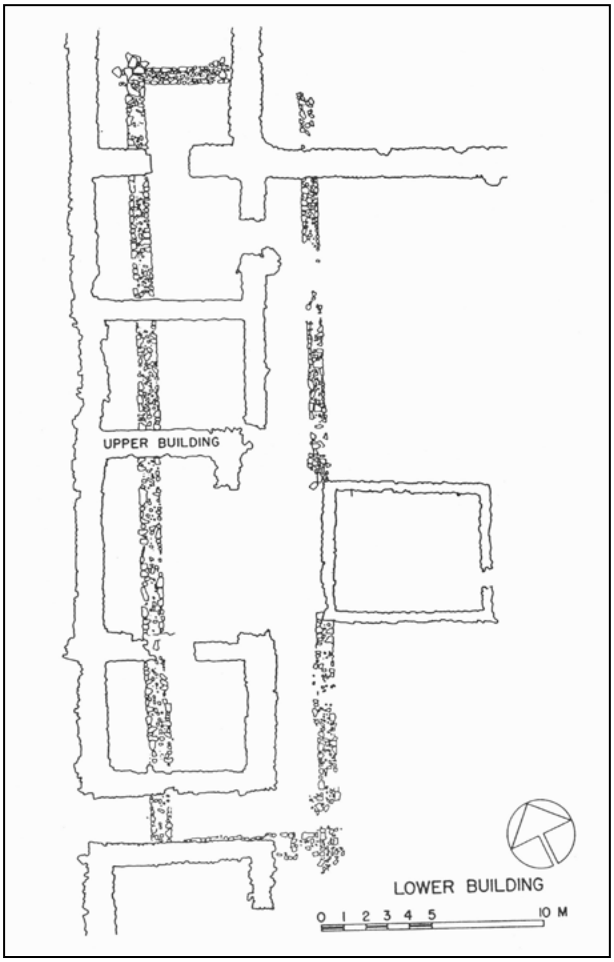

Figure 4.3. Plan of the Lower Building from Poggio Civitate with the Upper Building superimposed (Nielsen and Phillips 1986).

Twelve examples of Foundation Type 4, from Lago dell'Accesa, Poggio Civitate (Murlo) and Podere Tartuchino, are present here (Table 4.1). All of the examples date to the sixth century BC except for the Lower Building at Poggio Civitate (Figure 4.3), which was built around 650 BC (Phillips and Nielsen 1985: 64). Following the Lower Building's destruction around 610 BC, the Upper Building was constructed above the Lower Building in the first quarter of the sixth century (Figure 4.4). The Upper Building was deliberately destroyed between 550-530 BC (Phillips and Nielsen 1985: 64). The examples of Type 4 foundations in Areas A and B

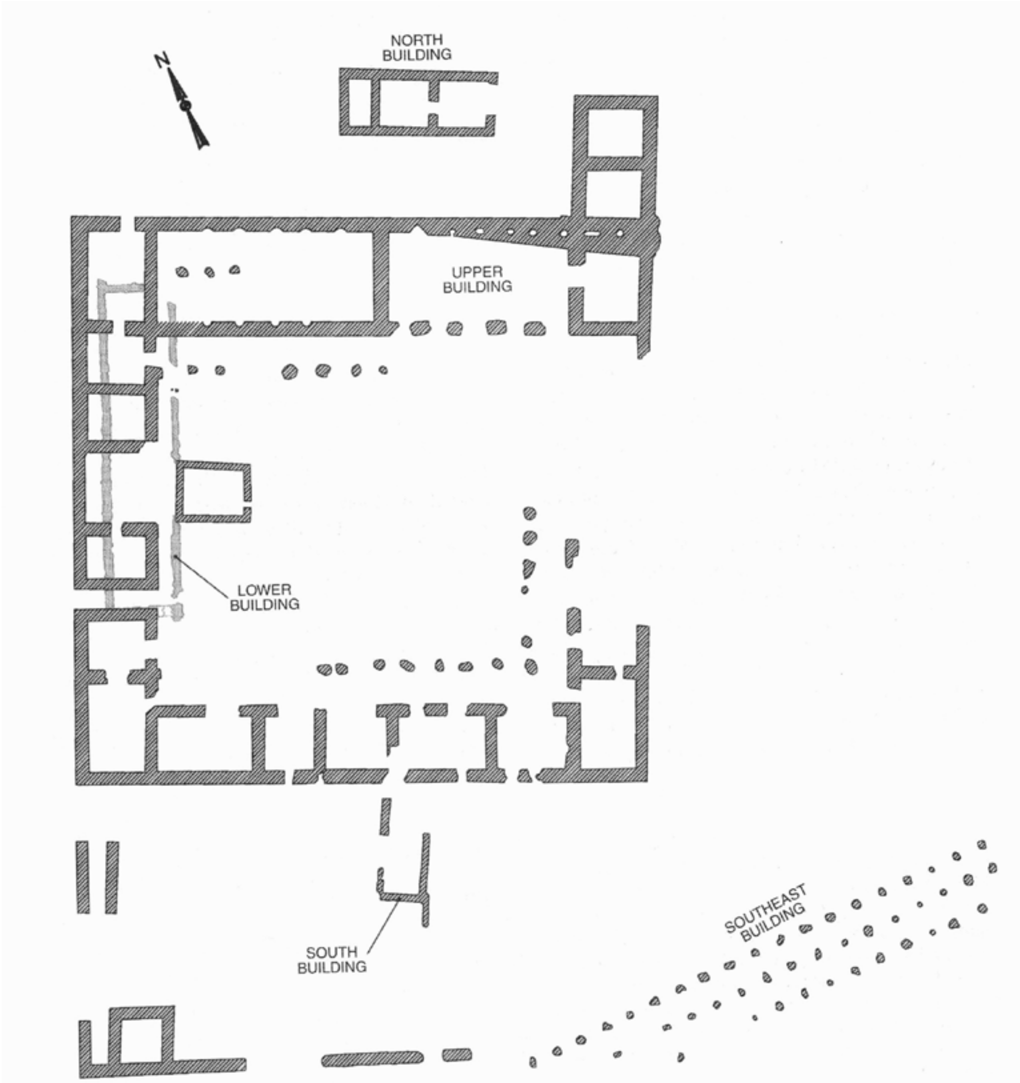

Figure 4.4. Site plan of Poggio Civitate (Berkin 2003: 9), courtesy of J. Berkin.

at Lago dell'Accesa (Figure 4.5) were loosely dated by Camporeale (1985b, 1997) to around the first quarter of the sixth century, with rebuilding and occupation continuing into the fifth century. Finally, the first phase of the farmhouse at Podere Tartuchino (Figure 4.6) was built sometime in the second half of the sixth century (Perkins and Attolini 1992: 76).

The dates given for the majority of these examples put Foundation Type 4 later than the types from the previous chapter. This is not true of the Lower Building at Poggio Civitate, however. Buildings with Type 2 foundations at Lago dell'Accesa date to the end of the seventh century, which places them after the Lower Building was constructed and practically contemporary with the Upper Building at Poggio Civitate. Examples of Type 4 foundations thus differ chronologically as well as geographically.

Foundation Type 4, perhaps more than any of the previous types, appears in the broadest range of sites and contexts. Surprisingly, despite the evident differences in their function and status, the foundation techniques used were similar. Few roof supports survive but there is some evidence for colonnaded porticoes in nearly every example. There are also cases of floors surviving in the examples of Foundation Type 4 but they are more likely a continuation of techniques seen in earlier examples, such as beaten earth and stamped clay.

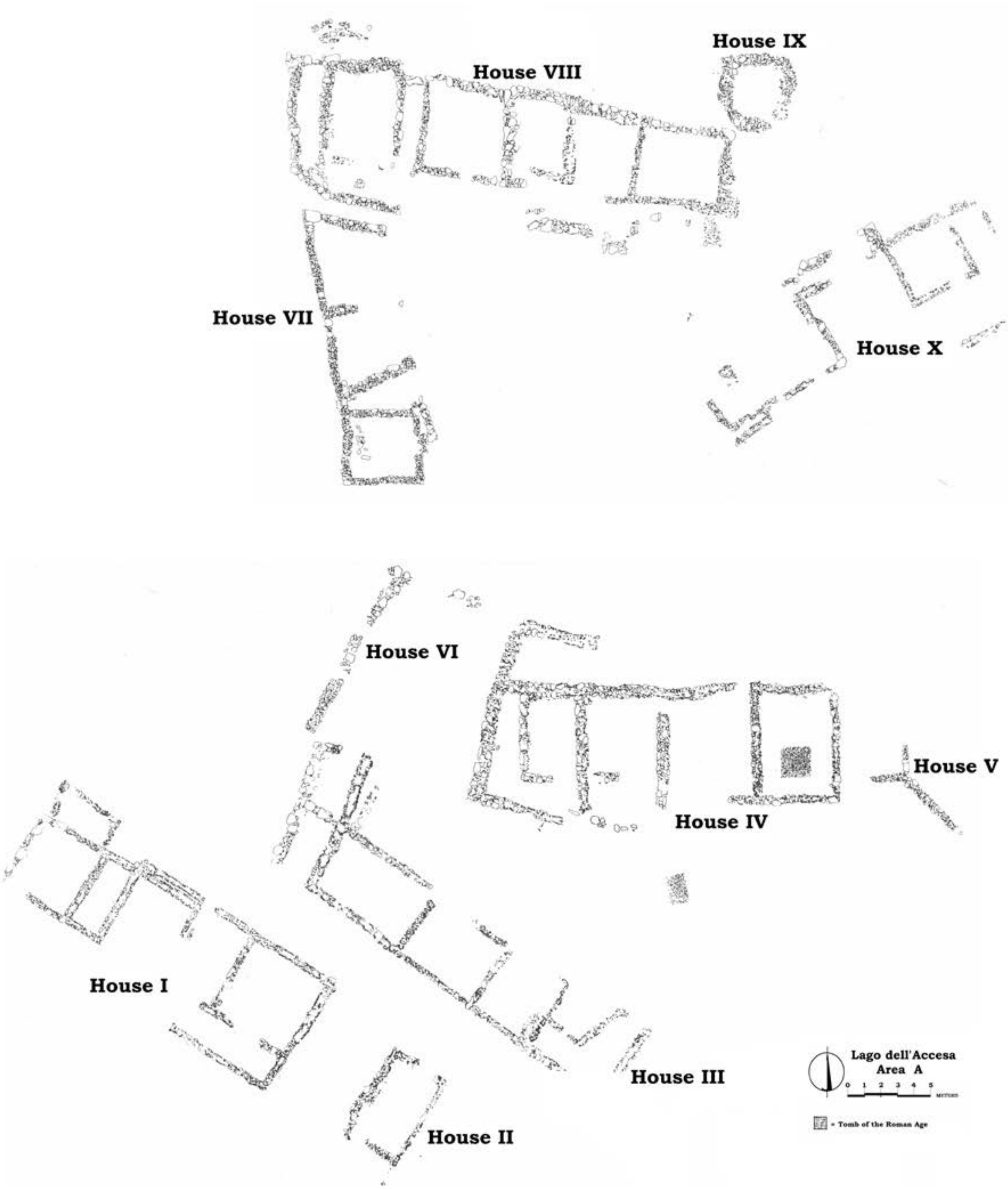

Figure 4.5. Site plan of Lago dell'Accesa Area A (after Camporeale 1985: 132–133).

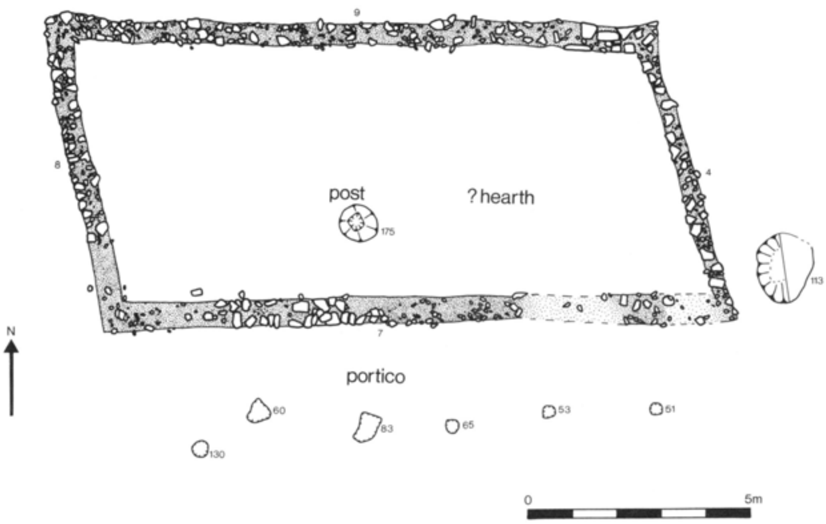

Figure 4.6. Plan of the first phase of the farmhouse at Podere Tartuchino (Perkins and Attolini 1992: 80).

Did Type 4 foundation techniques result from the enhancement of the Type 2 foundation process throughout Etruria? Or were they an innovation deriving from separate traditions? These questions are examined throughout and discussed in more detail at the end of this chapter.

4.1.1 Ground preparation

Descriptions of Foundation Type 4 ground preparation techniques in individual domestic buildings are generally limited in details in the literature. Excavators tend to note artificial changes to site topography but often only produce a simplistic view of those changes with regard to building construction. Rarely are descriptions of topography related to single structures. Instead, the ground preparation of individual structures is often related to the other structures on the site (e.g. Camporeale 2010; Nylander 2013; Pohl 2009). In some cases, the result of these descriptions creates an interpretation of either an overarching community plan or a rigid development pattern where the changes to buildings (i.e. the reiteration, reconstruction or expansion of older dwellings) resulted from the communal changes to the local terrain.

Camporeale's (1985b, 1997) descriptions of Lago dell'Accesa, particularly of Area A, often follow this pattern. For example, in his discussion of rainwater diversion systems, he emphasises the relationship between artificial changes to the local terrain and individual buildings (Camporeale 2010). However, he rarely mentions the ground preparation for individual buildings. When he does, ground preparation appears as a site-wide generalisation of only the most recent iterations of buildings. For instance, Camporeale (2010: 152) describes how *massicciata*, a type of pressed clay and rubble, was used in the foundation of every building in Area A.

In the earlier excavation reports on Areas A and B, Camporeale (1985b, 1997) highlights the engineering and broader artificial changes to the landscape but spends little time describing foundations (besides wall footings) of each of the buildings. In fact, his descriptions of some of the buildings mention that the terrain underneath a building might have affected its construction but do not provide any examples of what the builders did to adapt to local topography. A good example of this is his description of Area A Complex VII (Figure 4.7), where he outlines how the building was founded more on the steep slope than on the clay surface typical of the more level spots in Area A (Camporeale 1985a: 155–156). Rather than discuss the ground surface and how the builders adapted their construction techniques to create Complex VII on the slope, he instead discusses the collapse of the building and the chronology established from that collapse.

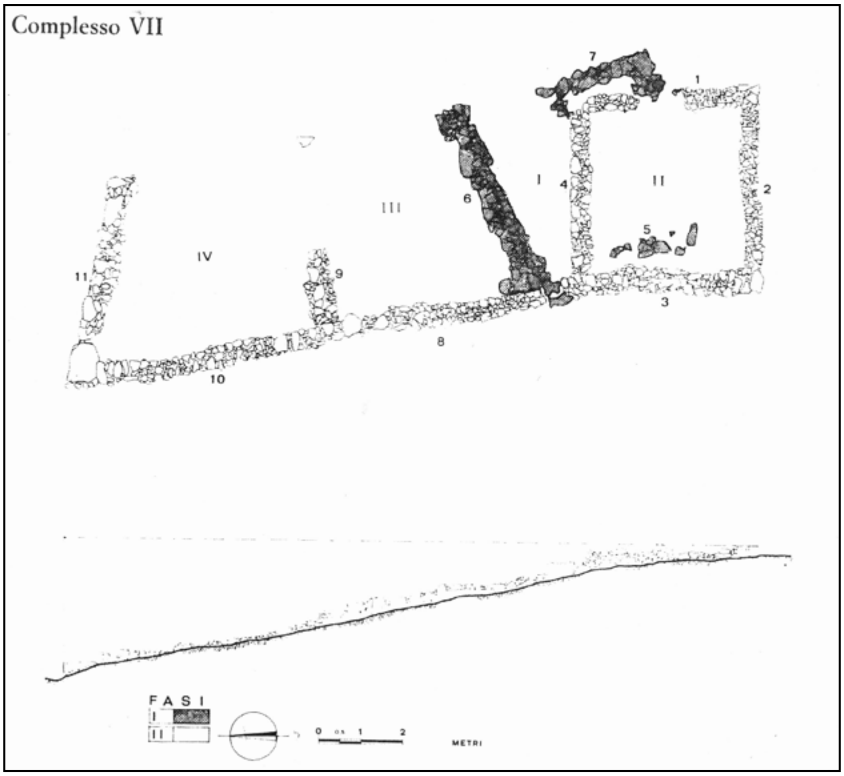

Figure 4.7. Plan and section of Complex VII from Lago dell'Accesa Area A (Camporeale 1985: 155).

Despite a lack of information on the individual buildings, the publications on Lago dell'Accesa contain relatively thorough information on local topography. For instance, in describing rainwater diversion systems, Camporeale (2010) often acknowledges artificial changes to the topography (such as the purpose built channels west of Area A Complex VIII; Figure 4.8), which are thought to have been designed to prevent rainwater runoff from destabilising the foundations and getting into buildings. This sort of description combines with his earlier views, such as his description of the *massicciata*

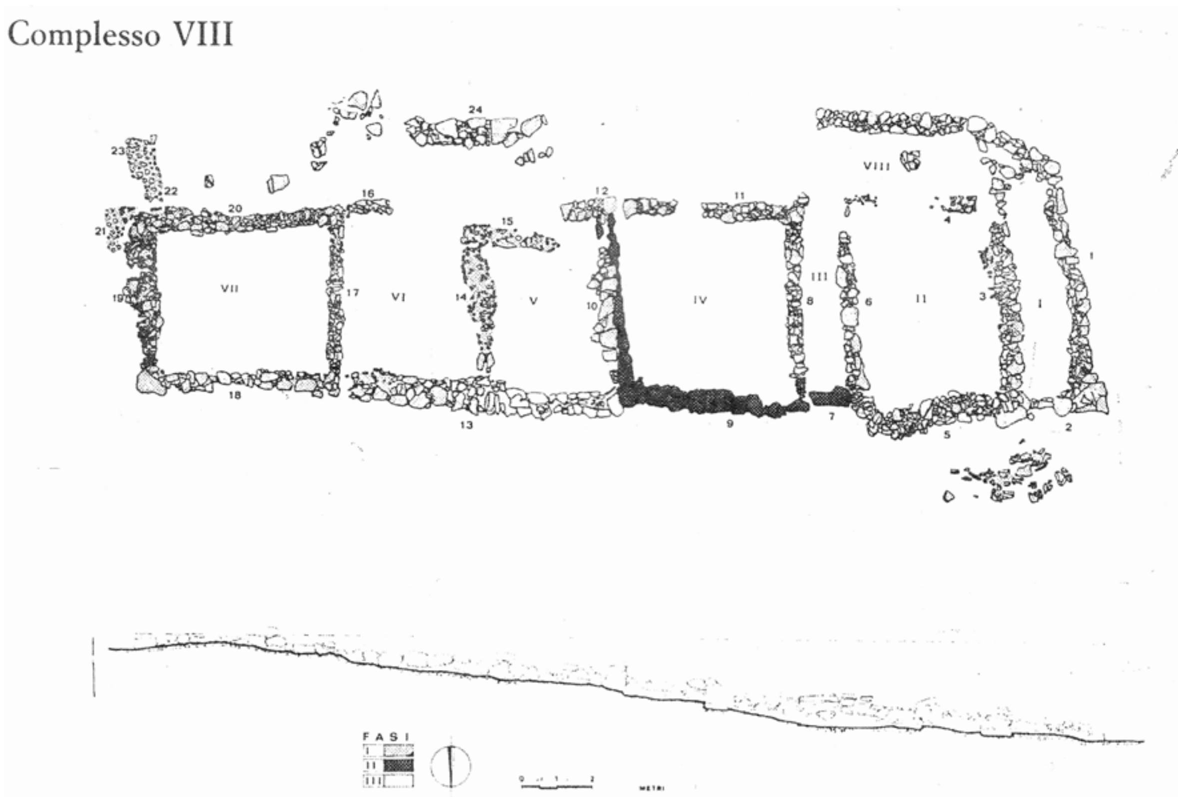

Figure 4.8. Plan and section of Complex VIII from Lago dell'Accesa Area A (Camporeale 1985: 156).

found throughout Area A. (Camporeale 1985a: 169).[35] However, these sorts of general topographical descriptions appear only when a substantial amount of slope is a factor.

Of all of the Type 4 foundations, ground preparations for the Phase I farmhouse at Podere Tartuchino (Figure 4.6) are clearest. Although changes to the subsoil since the building's abandonment made it difficult to interpret, Perkins and Attolini (1992: 76) suggest that the ground was not prepared prior to the laying of the wall footings. Instead, the wall footings were laid on virgin soil and the ground was raised around the socle. Their assessment is based on evidence that the footings were not placed within a foundation trench. However, Perkins and Attolini (1992: 76) admit that it is possible that the foundation trenches were precisely filled by the wall footings, leaving behind no archaeological trace of their existence. There is no mention of any artificial changes to the wider site topography in the development of and changes to the structure over time.

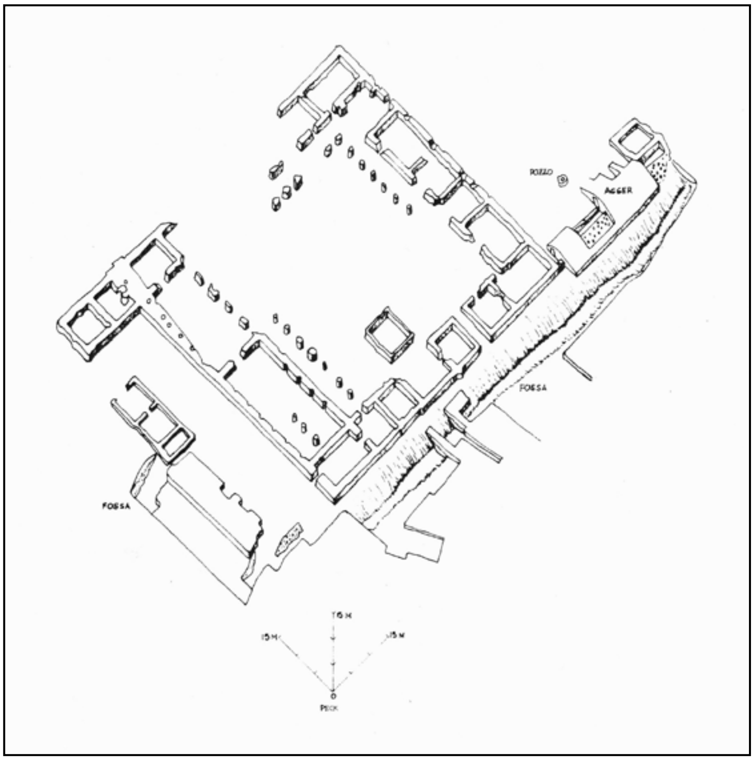

Figure 4.9. Partial reconstruction of the Upper Building at Poggio Civitate (Phillips and Nielsen 1985: 67).

Compared to Podere Tartuchino, descriptions of the ground preparations in the Lower and Upper Building at Poggio Civitate are less detailed (e.g. Phillips and Nielsen 1985: 64–69). Although he gives a good description of the setting of the wall footings, Phillips (1992: 13) does not include any indications of whether the ground was levelled or lowered to harder soil or bedrock. In his excavation reports, Phillips (1967: 135) notes that the wall footings were placed on either bedrock or virgin soil. Yet, he does not give any indication whether those footings were placed in a foundation trench or if the soil for the entire area was cleared and then replaced following their laying.

Berkin (2003) clarifies some of the confusion caused by the general omission of details on ground preparation at Poggio Civitate when he details the three strata associated with the Lower Building. He explains that the lowest stratum of the three was a clayey soil that might have been the "pavement" of the Lower Building (Berkin 2003: 20). While Berkin is not clear about whether this "pavement" rested below or above the wall footings or whether or not it was some sort of floor, the lowest stratum of the Lower Building was thin and, in some places, directly above the bedrock. This "pavement" suggests that the ground was prepared for the Lower Building, perhaps by removing the soil. Alternatively, there may have been little accumulated soil on the site to begin with and the "pavement" of clayey soil was laid on top of the bedrock and naturally thin soil layer.

Compared to the lowest stratum, which was disturbed in the destruction of the Lower Building, the upper stratum was preserved following the destruction of the Upper Building (Berkin 2003: 18). This stratum

35 The broader changes to site topography indicates to Camporeale (2010: 156) a communal plan, though that plan is still relatively 'organic' or, at least, non-orthogonal.

sealed the layer containing the Lower Building's destruction (the stratum that lay between the lowest and highest strata). According to Berkin (2003: 18), the upper stratum was another "pavement" and it was created in the process of the Upper Building's construction during the levelling of the destruction layer. Directly above the upper stratum were the plaster floors of the Upper Building.

Berkin (2003) includes his summary of the stratigraphy more for his discussion on the *bucchero* finds than as a summary of the architectural features proper. Therefore, his summary does not elucidate the relationship between the strata and the wall footings. Nevertheless, his summary can be combined with Phillips' (1967, 1992) statements about the construction of the building to suggest that the ground was levelled before the construction of both the Lower and Upper Buildings. It is also probable that the ground was levelled prior to the placement of the Upper Building's wall footings given the evident disturbances to the Lower Building's destruction layer described by Berkin (2003: 18) and the wall footing technique described by Phillips (1992: 13).

The only significant discussion of artificial changes to the wider site topography involves the *fossa* or dry moat that runs along the western and (part of) the northern ends of the Upper Building (de Grummond 1997: 32–33; Nielsen 1991: 245–250; Phillips 1992: 12; Figure 4.9). Nielsen (1991: 245–250) interprets the Upper Building as a stronghold, complete with fortified walls. To Nielsen, the *fossa* is part of the system of fortifications and evidentiary of the purpose of the Upper Building. Phillips (1992: 12) follows Nielsen's interpretation, though he downplays the extent of the fortification. The *fossa*, based on the interpretations of Nielsen (1991) and Phillips (1992), was an addition to (or perhaps built at the same time as) the Upper Building and did not affect the ground preparation of the Upper Building.

Similar to Poggio Civitate, the ground preparation in the construction of individual buildings at Lago dell'Accesa is puzzling based on the available literature. Camporeale (1985b, 1997) is unclear in his descriptions of the ground below the floors in each building (as noted previously for Foundation Type 2;

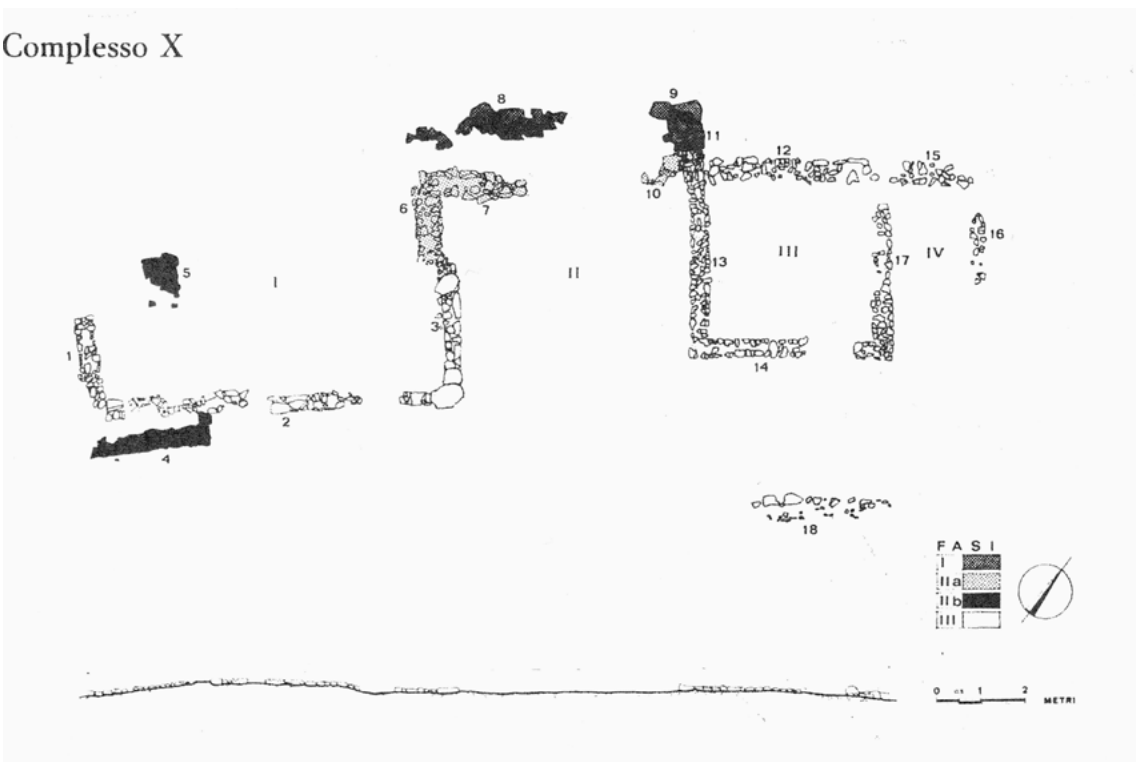

Figure 4.10. Plan and section of Complex X from Lago dell'Accesa Area A (Camporeale 1985: 162).

Figure 4.11. Plan and section of Complex III from Lago dell'Accesa Area A (Camporeale 1985: 143).

see section 3.2.1). He suggests that the ground underneath the building was levelled prior to the setting of the floors (but following the wall footings) using a type of *massicciata* as a deposit between the uphill and the downhill walls (Camporeale 1997: 27).

Camporeale's description, which is inspecific for Type 2 foundations such as Area A Complex II, is more forthcoming for buildings with Type 4 foundations. Some of the buildings in Area A, such as Complexes VIII and X (Figure 4.10), and most of the buildings in Area B appear to have been founded on relatively flat ground. This is not the case for all of the examples. For instance, the wall footings along the lengths of both Complex III and Complex VII (Figure 4.11) are more than 12° from horizontal. This angle places the interior wall footings at significantly different heights from one another, even within the same room.

Camporeale's (1997: 27) suggestion that a *massicciata* deposit levelled the gap between the natural ground surface and the floor level is problematic. Generally, wall footings were found at the same angle as the natural ground surface, which suggests that they were put in place before the *massicciata*. In a building where the wall footings are relatively level (e.g. Area A Complex VIII), filling the gap between the natural ground surface and the wall footings is not problematic since the *massicciata* might not have risen above the socle footing. Yet, in buildings that have a marked discrepancy between the uphill and the downhill wall footings (e.g. Area A Complex VII), the *massicciata* deposit would have risen above the socle, even if separate deposits were used to create different floor levels for each room in the building. Camporeale's (1985a: 129–130, 1997: 27) excavation reports indicate that the socles found *in situ* were typically not more than three courses. Based on these *in situ* remains, Camporeale's suggestion for a levelling *massicciata* deposit is untenable unless, of course, the walls were designed to come into contact with the proposed *massicciata* deposit or the floors themselves were built unevenly with a noticeable incline.

Despite their similarity, there is not a single version of techniques used in the ground preparation of Foundation Type 4. At Podere Tartuchino, the wall footings were likely set before the ground was made level. A variation of this technique could have been used at Lago dell'Accesa as well but in some cases this must be examined further due to the severity of the slope. It is difficult to tell whether the creation of a level surface at Poggio Civitate occurred prior to or following the construction of wall footings, although ground levelling probably occurred first in the Upper Building based on the debris from the Lower Building.

4.1.2 Wall footings

In contrast with the slightly variable nature of ground preparation, the wall footings of Type 4 foundations exhibit clear similarities that suggest the use of comparable techniques. Part of what makes it possible to paint such a clear picture of the techniques used in the Foundation Type 4 wall footings is the way detailed descriptions are given by the excavators. While nowhere near as comprehensive as their discussions of the walls, both Phillips (1992) and Camporeale (1985b, 1997, 2010) reveal their thoughts on the creation of the socles at Poggio Civitate and Lago dell'Accesa, respectively. Perkins and Attolini (1992) also describe the wall footings used in the farmhouse at Podere Tartuchino but, based on the nature of evidence, identify a slightly different process than in the other Foundation Type 4 examples.

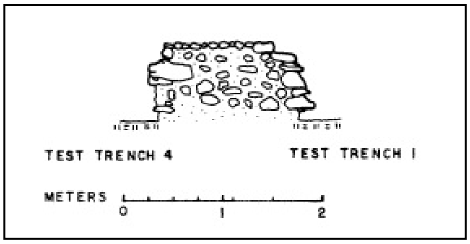

Figure 4.12. Section of a wall footing from the Upper Building at Poggio Civitate (Phillips 1967: fig. 6), courtesy of American Journal of Archaeology and Archaeological Institute of America.

The wall footings in both the Upper and Lower Buildings at Poggio Civitate have been well documented. According to Phillips (1967: 134–135), the wall footings of the Upper Building were made of rubble mortared together with slightly larger stones on the outer faces as a sort of skin (Figure 4.12). Wider at the base than at the top, the deep foundations were set into 1.50 m wide foundation trenches and appear (based on Phillips' section of the footing) to have been nearly 0.50 m in height (Phillips 1967: 134–135, 1992: 13). On top of the socles of the Upper Building, fragments of pottery or roof tile were placed for, as Phillips' calls it, a "levelling course" (Phillips 1992: 13). This "levelling course" of tiles appears to be the only other difference (besides the width) between the Upper and Lower Buildings and Phillips suggests that

Figure 4.13. Wall footing in Complex IV from Lago dell'Accesa Area A (author's image).

the fragments came from the debris of the Lower Building's destruction.

Phillips (1967:134-135, 1993:13), when describing how the socle of the Upper Building was constructed, notes that the foundation trenches were cut into the destruction layer. If the stratigraphy presented by Berkin (2003: 18) is accurate, then those foundation trenches were also dug through the levelling deposit made of clay and plaster that sealed the destruction layer. However, if the beaten clay floor discussed by Phillips (1967: 135), which appears to respect the foundation trenches, is Berkin's levelling stratum and not the Upper Building's flooring (as has been assumed here), then the wall footings were set before any of the other ground preparation features.

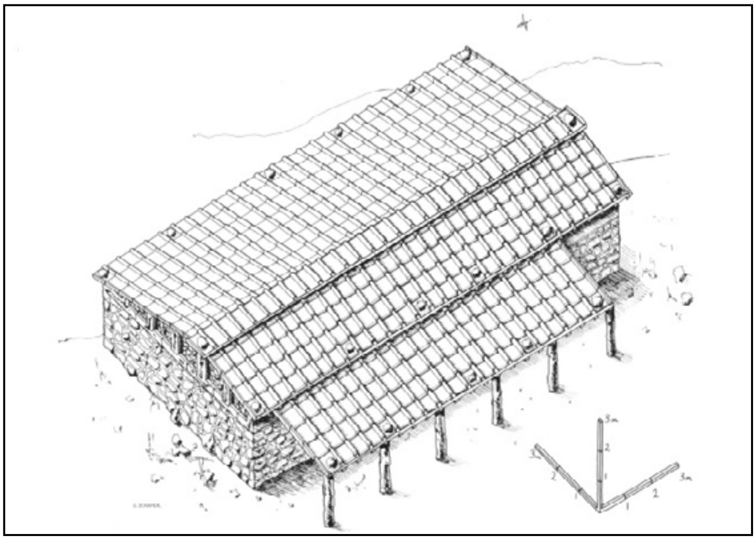

Figure 4.14. Reconstruction of the farmhouse at Podere Tartuchino in its first phase (Perkins and Attolini 1992: 112).

The wall footings of the Foundation Type 4 examples at Lago dell'Accesa are subject to similar uncertainty. Camporeale (1985a: 129–130, 1997: 27) identifies the wall footings (Figure 4.13) and details their composition but does not discuss how he supposes they were constructed. Socles at Lago dell'Accesa differ from those at Poggio Civitate, primarily in scale. The socles from Lago dell'Accesa are smaller in width and height.[36] Due to this difference in scale, some of the larger stones in the wall footings at Lago dell'Accesa actually span the width of the socle causing the coursing of the stones to appear less ordered than the comparative wall footings at Poggio Civitate.

The composition of the wall footings also differs, although this could be the result of opposing terminology or the perceptions of the excavators. At Poggio Civitate, Phillips (1967: 135) suggests that the rubble within the socles of the Upper Building were mortared together with clay and earth. Camporeale (1985a: 129, 1997: 27) insists that the stones in the wall footings at Lago dell'Accesa were set dry, which suggests that mortar was not used. However, Camporeale (1985b: 129) elsewhere describes how the larger stones in the more advanced socles (i.e. the Type 4 footings) formed exterior skins, which, after being set dry, were filled in between with small stones and argillaceous earth.

The interiors of socles at both sites were thus bound by an argillaceous, earthen deposit with pebbles and rubble. The differences between Poggio Civitate and Lago dell'Accesa result from the use of foundation trenches (or lack thereof). Camporeale (1985b, 1997) hints that foundation trenches were not used.[37] Based on Camporeale's (1985b: 129) description, the socles at Lago dell'Accesa would have required the larger, dry-set stones in order to remain upright and intact during the construction process in the absence of foundation trenches. This construction method differs from Poggio Civitate, which used the foundation trench to bind the rubble and mortar.

36 Foundation Type 4 socles at Lago dell'Accesa are two or, sometimes, three courses and upward of 0.90 m in height, compared to the 1.40 m high footings at Poggio Civitate and are, on average, merely 0.40 m wide (Camporeale 1985b: 129).

37 Camporeale (1985b: 129) explains that they were put "resting directly on the clay". In this instance, the clay he appears to be referring is what he calls '*massicciata*'. According to Camporeale's description, since they were resting on this artificial layer, the socles were not put in a foundation trench but were built above ground on the *massicciata*.

This socle construction method at Lago dell'Accesa resembles that of the farmhouse at Podere Tartuchino, save for one essential difference. As at Lago dell'Accesa, the wall footings in the farmhouse were likely built above ground before being surrounded by a levelling layer of soil (Perkins and Attolini 1992: 76). They also had a core of small stones bound by an outer skin of larger stones, with some of these larger stones extending the width of the wall footing.

However, according to Perkins and Attolini (1992: 111), the techniques that were used only in the wall footings at Lago dell'Accesa extended throughout major sections of the walls of the Tartuchino farmhouse (Figure 4.14). The evidence for this wall type is not entirely clear and Perkins and Attolini (1992: 111) explain that no stone wall collapses were discovered and that evidence for mud-brick or *pisé* was found throughout. Based on this description, it is as likely that the farmhouse at Podere Tartuchino had a stone socle wall footing under a mud-brick or *pisé* wall (such as at Lago dell'Accesa) as it is that it had a stone wall that extended through to the ground as a foundation.

The identifiable characteristics of Foundation Type 4 wall footing techniques consist of a socle of cobble stones and rubble, sometimes mortared together using a clay or earth binder. In every example, some of the socle would have been placed below ground level, either within a foundation trench or by raising the ground around the wall footing itself. However, it is unlikely that any of the wall footings would have been entirely below ground.

4.1.3 Flooring

The techniques used to create floors in Type 4 foundations were normally no more complex than in previous foundation types. Based on excavation reports, the typical flooring techniques used in Type 4 foundations were made of beaten earth or stamped clay. However, despite the seeming similarities in the evidence, the discovery of apparent floors *in situ* is generally atypical (as noted in numerous excavation reports; Camporeale 1985a: 149; Perkins and Attolini 1992: 76–77), with excavators often relying on little more than intuition when deciphering what are frequently quite obscure floor levels. As mentioned in Chapter 3, flooring evidence is often affected by destruction associated with multiple occupations and post-depositional n-transforms. Therefore, some of the apparent variations between the examples may in fact point to greater dissimilarity in flooring techniques, such as those seen in the contemporary Type 5 foundations (see section 4.2.3).

One variation, as mentioned in the ground preparation subsection above, is the possible use of plaster in the floor of the Upper Building. Berkin (2003: 19–20) briefly mentions that a plaster-clay admixture made up the floor of the Upper Building. This expands upon the account given by Phillips (1967, 1969: 121–122, 1992: 6), in which he claims that the floors were made of compact, sandy, yellow earth (also Phillips and Nielsen 1985: 65).

Camporeale (1985b: 130) gives a relatively clear description of the stratigraphic succession of floors within the houses at Lago dell'Accesa, including their composition. In nearly every example, a floor of stamped clay was discovered about 0.20-0.25 m below the level of the wall footings and directly above the *massicciata* ground preparation. While Camporeale is clear about floor locations and composition, the relationship of the slope and the ground preparation layer with the wall footings and floors is not particularly well described. As explained above, although the materials and techniques used are indicated, ground preparation and wall footing techniques are not. This makes it nearly impossible to reconstruct the position of the floors.

In contrast with Lago dell'Accesa and Poggio Civitate, floors of the Phase 1 farmhouse at Podere

Tartuchino were nearly non-existent (Perkins and Attolini 1992: 76–77). With the erection of the second phase of the farmhouse, all of the interior floors were destroyed. What was found of the floors from the first phase comes from the space between the south wall and the line of six post holes considered to be the portico. Based on the floor of the portico and the Phase 2 floors, the floors of the Phase 1 farmhouse were made of beaten earth. They also were lower than the top of what remained of the wall footings. Beyond this, it is difficult to say more about the flooring at Podere Tartuchino.

Therefore, while the excavators seem sure of the composition of floors and their context with regard to the other parts of the foundations, the conclusions about Foundation Type 4 that can be drawn from the evidence are far less certain. At Poggio Civitate, excavators indicated that the floor layers were made of beaten yellow earth but this has since been clarified with Berkin (2003) noting that the floor layers are clay plaster. With the overall confusion of structural context at Lago dell'Accesa caused by the slope and the *massicciata* ground preparations, the context of the stamped clay floors within the structure of the buildings remains uncertain. Identification of floors in the Phase 1 building at Podere Tartuchino is reliant on the floor of the portico and a later iteration of the building, which is indeed suggestive of the floor techniques, materials and context but are not conclusive. Following the review of the evidence, it can be argued that pressed earth or stamped clay was the typical flooring in Foundation Type 4, although other types of floor may also have existed.

4.1.4 Roof supports

In the case of Foundation Type 4 roof supports, the layout of the buildings, particularly with regards to the walls, limits the amount of evidence for roofing that can be found archaeologically. Examples from Lago dell'Accesa and Poggio Civitate were built with evenly spaced, internal walls. The footings for these internal walls were built in a similar way to the exterior walls, which indicates that they could have been load bearing along with their exterior counterparts. Given the overall lack of post holes within the interiors of buildings, the roofs were likely supported by the walls. Exactly how the walls would have held the roof (e.g. whether the walls supported a truss or a simple couple roof) is unclear but will nonetheless be discussed further in the next chapter (see section 5.2.1).

In the Upper Building at Poggio Civitate, Room 5 appears to have had a roof support system of interior posts, despite the fact that all other rooms depended on interior walls to support the roof (Figure 4.15). Since Room 5 had the largest surface area on the site, it lacked the interior, load bearing walls necessary to roof it without additional support. Three small socles of the same type of construction as the wall footings were discovered in excavation at the west end of the room that evoke a central line of post holes, which likely supported the ridge beam. Even more curious than the central line of platforms, two lines of post holes ran, partly embedded, along both the northern and southern walls of the room. Phillips (1992: 14) suggests that the post holes held oak columns that, in turn, held architraves and may have added strength to the *pisé* walls.

The use of interior posts to support the ridge beam is not unique in the examples of Foundation Type 4. At Podere Tartuchino, the first phase building had a single post hole near the centre of the building (Figure 4.6). This post, compared to the ones in Room 5 of the Upper Building at Poggio Civitate, was not directly in the centre of the building. Instead, the post is closer to the southern wall than the northern. Perkins and Attolini (1992: 111) suggest that the post held up the ridge beam and therefore gave the roof an asymmetrical pitch.

Another similarity between Phase 1 at Podere Tartuchino and the Upper Building at Poggio Civitate is the near certainty that the buildings had some sort of portico façades. At Podere Tartuchino, Perkins and

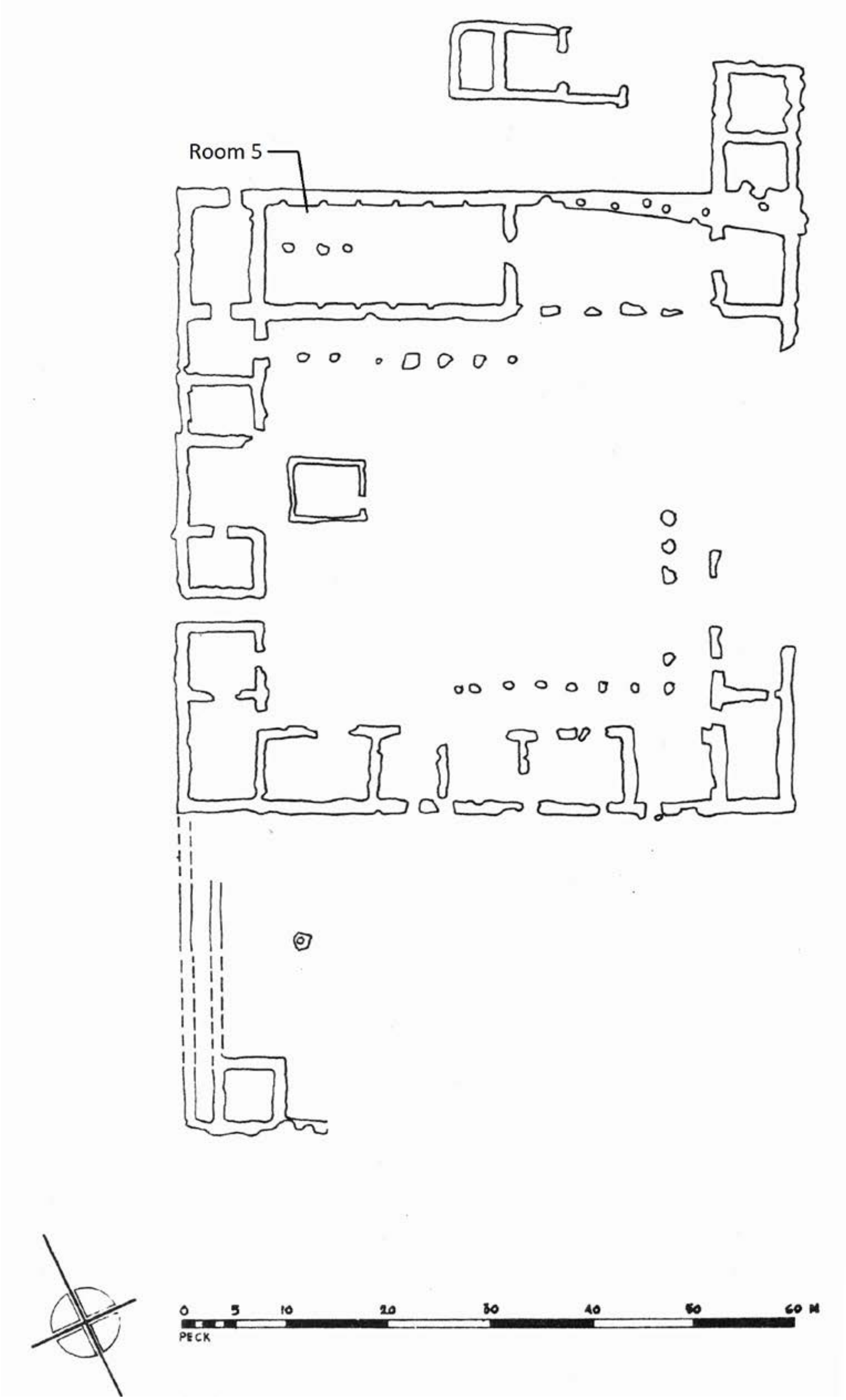

Figure 4.15. Plan of the Upper Building of Poggio Civitate (after Phillips and Nielsen 1985: 66).

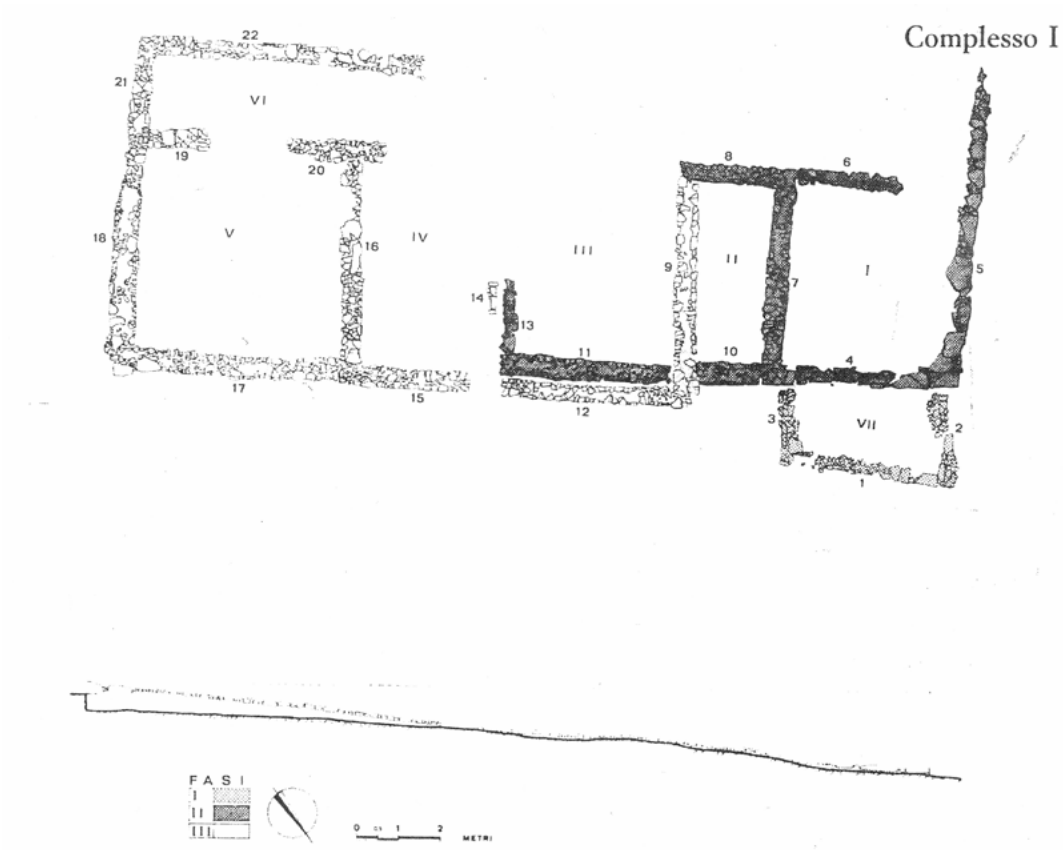

FIGURE 4.16. PLAN AND SECTION OF COMPLEX I FROM LAGO DELL'ACCESA AREA A (CAMPOREALE 1985: 136).

Attolini (1992: 76) found a line of six post holes a couple of metres to the south of the farmhouse. These post holes followed the direction of the southern wall of the first phase farmhouse and were filled in following the erection of the second phase building, tying them directly to the Phase 1 building.

In the Upper Building at Poggio Civitate, a number of small socles, similar to the ones found in the centre of Room 5, were also found along the northern, eastern and southern edges of the central courtyard (Figure 4.15). Their presence indicates that the courtyard was colonnaded on those three sides. The lack of columns on the west side is explained by Phillips (1992: 9) as the result of the possible ritual nature of a small enclosure that sat in the courtyard directly before the centre of the western flank of rooms. Phillips (1972: 251) also suggests that, in all likelihood, the columns held up a portico.

The Lago dell'Accesa examples of Foundation Type 4 may also have had porticoed entries or even courtyards with colonnaded porticoes. However, the evidence for porticoes at Lago dell'Accesa is weak compared to the evidence from Podere Tartuchino or Poggio Civitate. In contrast with the other examples, the foundations at Lago dell'Accesa do not have post holes or small, intermittent socles. Instead, four complexes have extensions of socles that appear to enclose the front of the buildings creating a sort of vestibule. For instance, Area A Complex I (Figure 4.16) had one of these enclosing socles (comprised of structures 21, 22 and the southern extension of 5). While it is possible that these socles held walls, the narrow vestibule that would be created by the enclosed space lead Camporeale (1985a: 137) to doubt this scenario.

Recently, Camporeale (1997: 275, 2010: 145–149) suggests that these socle extensions were purposefully built to prevent water runoff from flooding the interiors of buildings. A number of other types of these prevention techniques have been recorded at Lago dell'Accesa, such as the drainage channel in front of

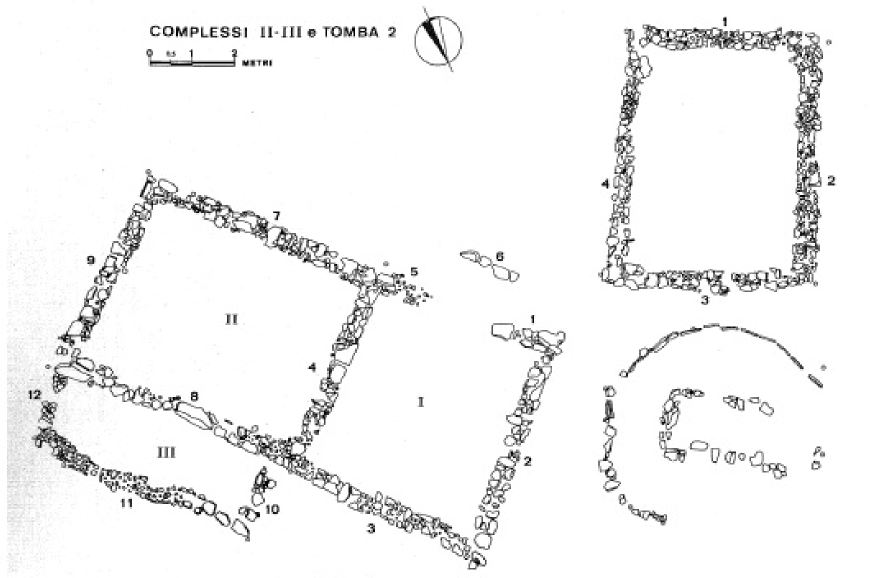

Figure 4.17. Plan of Complexes II and III and Tomb 2 from Lago dell'Accesa Area B (Camporeale 1997: 276).

Area B Complex III (Figure 4.17). Furthermore, many of the remaining socle extensions were found on the uphill part of the building. In Area A Complex I, for example, structures 21 and 22 were robust (when compared to the downhill socle, structure 5) and uphill from most of the building. Due to the damage caused by a (now removed) tree, it is unclear if structure 22 continued to meet structure 5, completely enclosing the space in front of the building. If it did continue, then the builders of the final phase of Complex I intentionally maintained the length of structure 5, which was built in the previous phase.

The other possibility for the socle extensions, as initially interpreted by Camporeale (1985a: 137, 157, 163, 169), is that the socles served as the bases for columned porticoes. While direct evidence cannot confirm the existence of porticoes, comparative evidence supports the possibility. The width of the space created by the extended socle is nearly two metres, similar to the distance between the portico post holes and the southern walls of the farmhouse at Podere Tartuchino. The extended socles, if they were indeed porticoes, also resemble the portico of the farmhouse in style, as well as the examples of porticoes (in Foundation Type 5) at San Giovenale and Acquarossa.

Of course, the two possibilities are not mutually exclusive. An extended socle could have served the dual purpose of preventing flooding and supporting a portico. Despite the lack of evidence, the extended socles are suggestive of porticoes and, based on comparisons to buildings from the similar period and foundation type, that some buildings at Lago dell'Accesa had porticoes with extended socle footings.

4.1.5 The importance of the courtyard and the appearance of the building unit

Compared to the foundation types in the previous chapter, a number of Foundation Type 4 examples are centred about an open area (called a 'courtyard' here for convenience). Although the most obvious one is the central court of the Upper Building at Poggio Civitate, a number of the buildings at Lago dell'Accesa appear to have courtyards as well. Buildings such as Complexes VII and VIII of Area A create a single unit that is set around a triangular open space by forming the shape of an 'L' against the slope of the hill

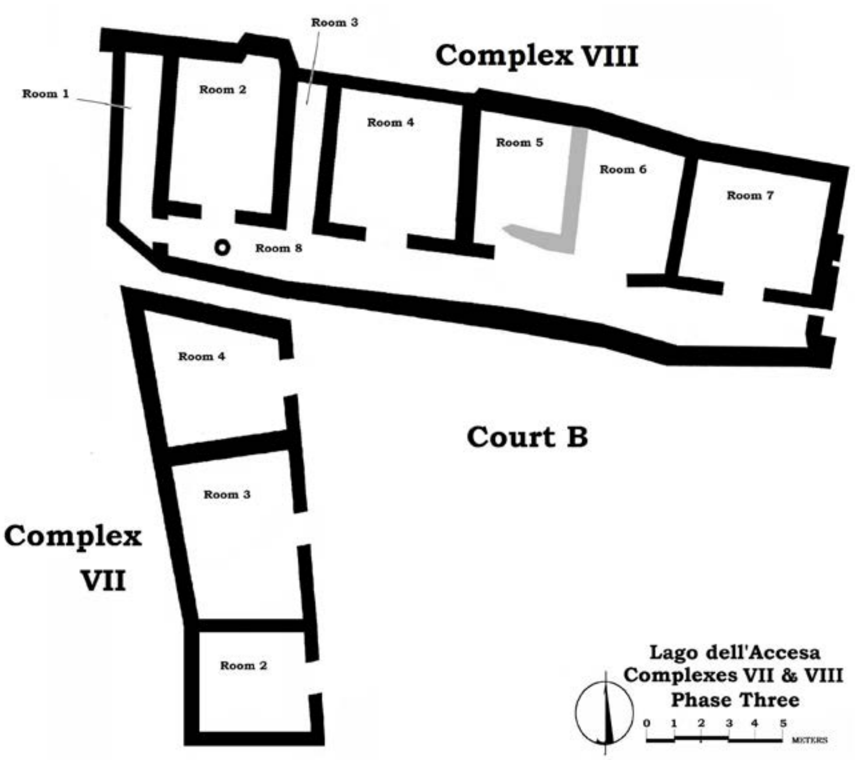

FIGURE 4.18. HYPOTHETICAL PLAN OF COMPLEXES VII AND VIII FROM LAGO DELL'ACCESA AREA A (AFTER CAMPOREALE 1985: 132).

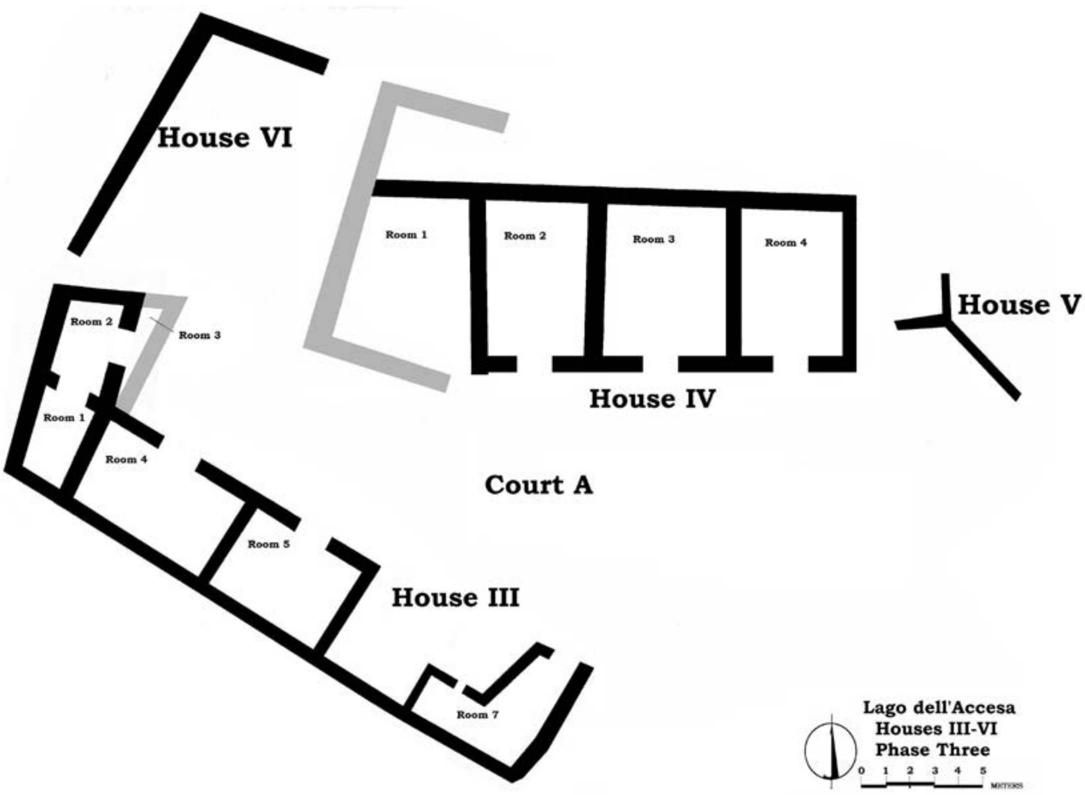

FIGURE 4.19. HYPOTHETICAL PLAN OF COMPLEXES III AND IV FROM LAGO DELL'ACCESA AREA A (AFTER CAMPOREALE 1985: 133).

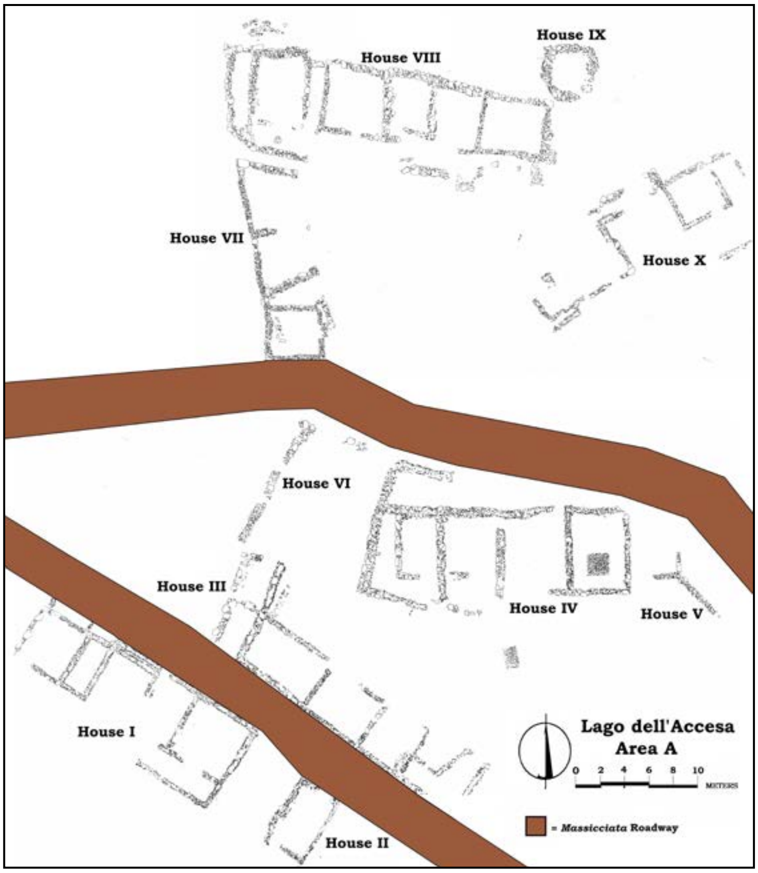

Figure 4.20. Plan of Lago dell'Accesa with the possible massicciata roadways indicated (after Camporeale 1985: 132–133).

(Figure 4.18).

From an architectural standpoint, the Type 4 foundations are no longer just the foundations of individual buildings but are also the foundations of the surrounding open spaces. For example, thanks to Camporeale's (2010: 154) analysis of rainwater diversion systems, it is clear that the open space in front of Complexes VII and VIII was modified to channel rainwater through the gap between the two buildings (Figure 4.18). If Complexes VII and VIII were built as a single unit, then the prepared ground of the open area in front of those buildings was not necessarily the result of the wider community altering the terrain. Rather, the courtyard in front of Complexes VII and VIII was prepared in tandem with the foundations of the buildings or, at least, modified for an individual cause as opposed to the settlement as a whole.

The increased area of individual domestic space prompts questions about the foundations of possible perimeter walls and the overall extent of building units. For instance, the old wall footings of Complex VI of Lago dell'Accesa Area A appear to have been reused in the later period as a perimeter wall for the unit of Complexes III and IV (Figure 4.19). However, the wall footings of Complex VI on their own are better described as Type 2 foundations. This description complicates the overall definition of Foundation Type 4, particularly if the manipulation of the entire domestic space is considered in the definition of a type.

Furthermore, the investigation of the extent of the foundation of a unit leads to an examination of site-wide foundation techniques for evidence of "public" works. At Lago dell'Accesa Area A, the rough *massicciata* running between Complexes I and III could be considered a road and therefore a public space (Figure 4.20). Yet, it is unclear whether the *massicciata* roadbed was actually public at all since a road does not necessarily need to be accessible to the entire community. The only evidence that the road might have been public is through an interpretation of building entrances, in which entrances were purposefully turned away from (and that unit perimeters were intentionally blocking access to) the road. However, such an interpretation is based on a sort of circular argument where public spaces are indicated based on entrances that are in turn based on public spaces.

In contrast, interpretations of access serve well for recognising the private/public separation of courtyards that are visibly closed off from the outside, as in the Upper Building at Poggio Civitate (Figure 4.15). There, the foundations of the Upper Building are separate and identifiable from other structures at the site (Berkin 2003; Phillips 1992; Tuck and Nielsen 2001), where the easily defined unit of the Upper Building has often led to various interpretations of control and defence. Identifying the building unit is thus a relatively easy task, especially when compared to Lago dell'Accesa.

Not all Type 4 foundations are characterised by courtyards or extended building units but there are cases where the definition of Foundation Type 4 includes spaces that extend beyond the individual structure. These cases, while in the minority, have altered the discussion of most of the Type 4 foundations so that less is often said of the techniques in the foundations of an individual building and more is said of the foundations of the site as a whole. The effects of the courtyard and the building unit thereby radically change the way Type 4 foundations are understood, perhaps more than in any other foundation type besides Foundation Type 5.

4.2 Foundation Type 5

In contrast with every other type in this study, buildings with Type 5 foundations used ashlar masonry. This style of construction clearly defines the type and separates it from the others. However, the examples of Foundation Type 5 are highly variable in the techniques used. Despite the variability throughout the Foundation Type 5 process of foundation construction, there are similarities between the techniques that form an underlying conceptual origin. Variations from this concept were then made based on the particular situations.

Type 5 foundations were prepared by levelling the ground, which often included bedrock cutting, soil clearing, soil deposition/terracing or, as was often the case, a mixture of the three. The preferred wall footings were a socle of ashlar tufa blocks set into a foundation trench that reached the bedrock. Roof supports, in addition to occasional post holes and column bases for the colonnaded porticoes, appear near the centre of many of the larger buildings.

Flooring materials and techniques are generally more advanced in Type 5 foundations but, of those that survive, floors appear to have been variable, even within the same building at the same time. There is, therefore, no common concept of flooring techniques in Type 5 foundations. It is also important to note

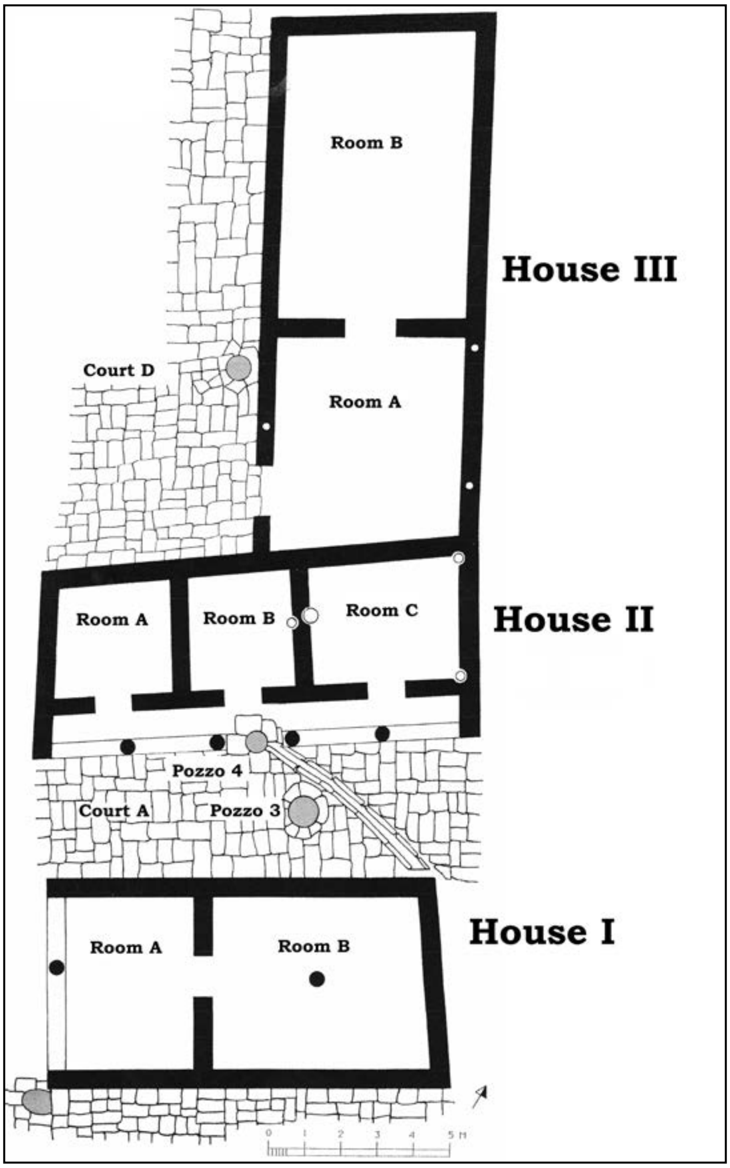

Figure 4.21. Hypothetical plan of San Giovenale Area F East in Period 3 (after Karlsson 2006: fig. 290, p. 156), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Site	Building Name	Period	Approx. Dates
San Giovenale Area F East, Period 3	House I	Orientalising	625-530 BC
San Giovenale Area F East, Period 3	House II	Orientalising	625-530 BC
San Giovenale Area F East, Period 3	House III	Orientalising	625-530 BC
San Giovenale Area F East, Period 4	House I	Early Archaic	530-275 BC
San Giovenale Area F East, Period 4	House II	Early Archaic	530-275 BC
San Giovenale Area F East, Period 4	House III	Early Archaic	530-275 BC
San Giovenale Borgo, Period I	Building A	Orientalising	650-530 BC
San Giovenale Borgo, Period I	House B	Orientalising	650-530 BC
San Giovenale Borgo, Period I	House C	Orientalising	650-530 BC
San Giovenale Borgo, Period I	House F	Orientalising	650-530 BC
San Giovenale Borgo, Period II	Building A	Early Archaic	530-450(?) BC
San Giovenale Borgo, Period II	House B	Early Archaic	530-450(?) BC
San Giovenale Borgo, Period II	House D	Early Archaic	530-450(?) BC
San Giovenale Borgo, Period II	House E	Early Archaic	530-450(?) BC
San Giovenale Borgo, Period II	Building H	Early Archaic	530-450(?) BC
Luni sul Mignone	The Etruscan House	Unknown	Unknown
Veii Piazza d'Armi, Area I	Structure A	Late Orientalising	610-525 BC
Veii Piazza d'Armi, Area I	Structure B	Late Orientalising	610-525 BC
Veii Piazza d'Armi, Area I	The oikos	Late Orientalising	610-525 BC
Acquarossa Zone B	Building A	Early Archaic	575-550 BC
Acquarossa Zone B	Building B	Early Archaic	575-550 BC
Acquarossa Zone B	Building C	Early Archaic	575-550 BC
Acquarossa Zone B	Building D	Early Archaic	575-550 BC
Acquarossa Zone B	Building E	Early Archaic	575-550 BC
Acquarossa Zone B	Building F	Early Archaic	575-550 BC
Acquarossa Zone C	Building F	Early Archaic	575-550 BC
Acquarossa Zone D	House A	Early Archaic	575-550 BC
Acquarossa Zone F, Early Monumental Complex	Building C	Late Orientalising	600-575 BC
Acquarossa Zone F, Early Monumental Complex	Building D	Orientalising	625-575 BC
Acquarossa Zone F, Early Monumental Complex	Building H	Orientalising	625-550 BC
Acquarossa Zone F, Early Monumental Complex	Building J	Orientalising	625-575 BC

Site	Building Name	Period	Approx. Dates
Acquarossa Zone F, Edifici Monumentali	Building A	Early Archaic	575-550 BC
Acquarossa Zone F, Edifici Monumentali	Building B	Early Archaic	575-550 BC
Acquarossa Zone F, Edifici Monumentali	Building C	Early Archaic	575-550 BC
Acquarossa Zone F, Edifici Monumentali	Building D	Early Archaic	575-550 BC
Acquarossa Zone F	Building E	Early Archaic	575-550 BC
Acquarossa Zone F	Building G	Early Archaic	575-550 BC
Acquarossa Zone N	Building A	Early Archaic	575-550 BC
Acquarossa Zone N	Building B	Early Archaic	575-550 BC
Acquarossa Zone N	Building C	Early Archaic	575-550 BC
Acquarossa Zone N	Building D	Early Archaic	575-550 BC

Table 4.2. The examples of buildings with Type 5 foundations by site.

here that many of the examples of Foundation Type 5 saw at least two phases of occupation, which meant secondary 'ground preparation' phases and floors within the same wall footings.

There are forty-two examples of Foundation Type 5. However, that number is partially inflated. Many of these examples were the result of the extensive rebuilding of previously existing buildings with the same foundation type. Take San Giovenale Area F East (Figure 4.21), where Houses I-III were initially built with Type 5 foundations and then rebuilt around 530 BC with the same type of foundations. Since those that rebuilt the buildings in the second phase chose to reuse their Type 5 foundations, the second phase buildings have been considered as separate examples here despite their nearly identical layout.

Furthermore, some of the examples clearly identify as Foundation Type 5 but have not received thorough attention in publication. The Etruscan House described briefly in Östenberg's work on Luni sul Mignone (Östenberg 1967: 105) and the general description of the architecture provided for many of the 'excavation zones' of Acquarossa are good examples of this. For instance, Wendt (1986: 58–60) provides specific examples of foundation techniques for only a few of the zones. Then she states that similar foundations were found throughout buildings in every zone from the last phase of occupation at Acquarossa. This was verified elsewhere by Persson (1994: 294–300), albeit in a rather vague manner.

Therefore, while the number of examples is high, only a few publications were detailed enough to give precise data on foundation techniques. Based on Wendt's (1986) and Persson's (1994) descriptions of the architecture, the more explicit examples at Acquarossa, namely those from Zones D and F, are presented here as the archetypes for Acquarossa. Furthermore, examples from Veii and Luni sul Mignone have been detailed a bit more than the majority of buildings from Acquarossa but the excavators have not focussed on the details that clearly reveal the foundation techniques.

All of the examples of Foundation Type 5 are thought to have appeared around the same time. However, this is not definite, particularly since a chronology has been difficult to establish at Acquarossa given the few datable finds (Rystedt 1986: 99–108). A comparison of the architectural terracottas of primarily Zone F with art from throughout Etruria (including the terracottas at Poggio Civitate) was created in order to establish a chronology at Acquarossa. Based on the comparison, the first phase of buildings with Type 5 foundations began around the last quarter of the seventh century BC. This date corresponds with the proposed start of Period 3 at San Giovenale Area F East and the erection of the first houses on the initial

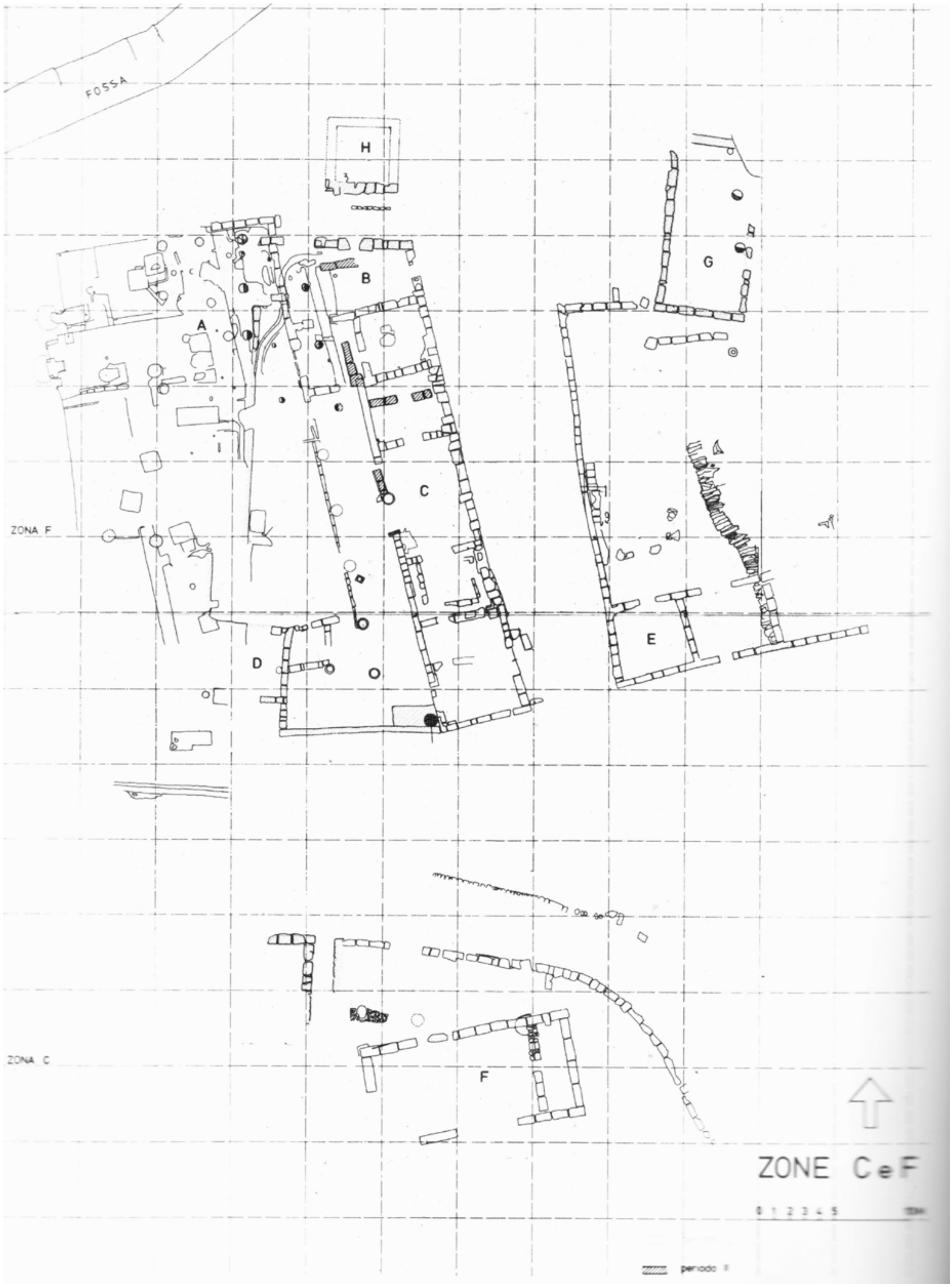

Figure 4.22. Plan of Acquarossa Zones C and F (Persson 1994: fig. 6, p. 297), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

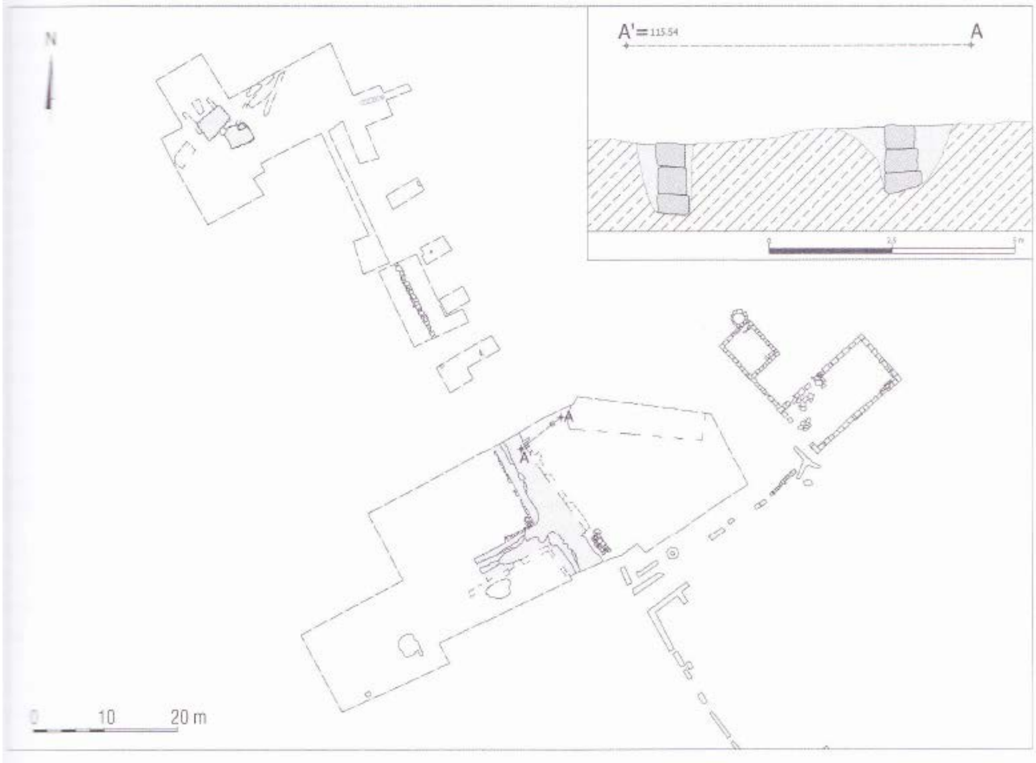

Figure 4.23. Plan of the excavations of Areas I and V in the Piazza d'Armi at Veii (Acconcia et al. 2009: 31).

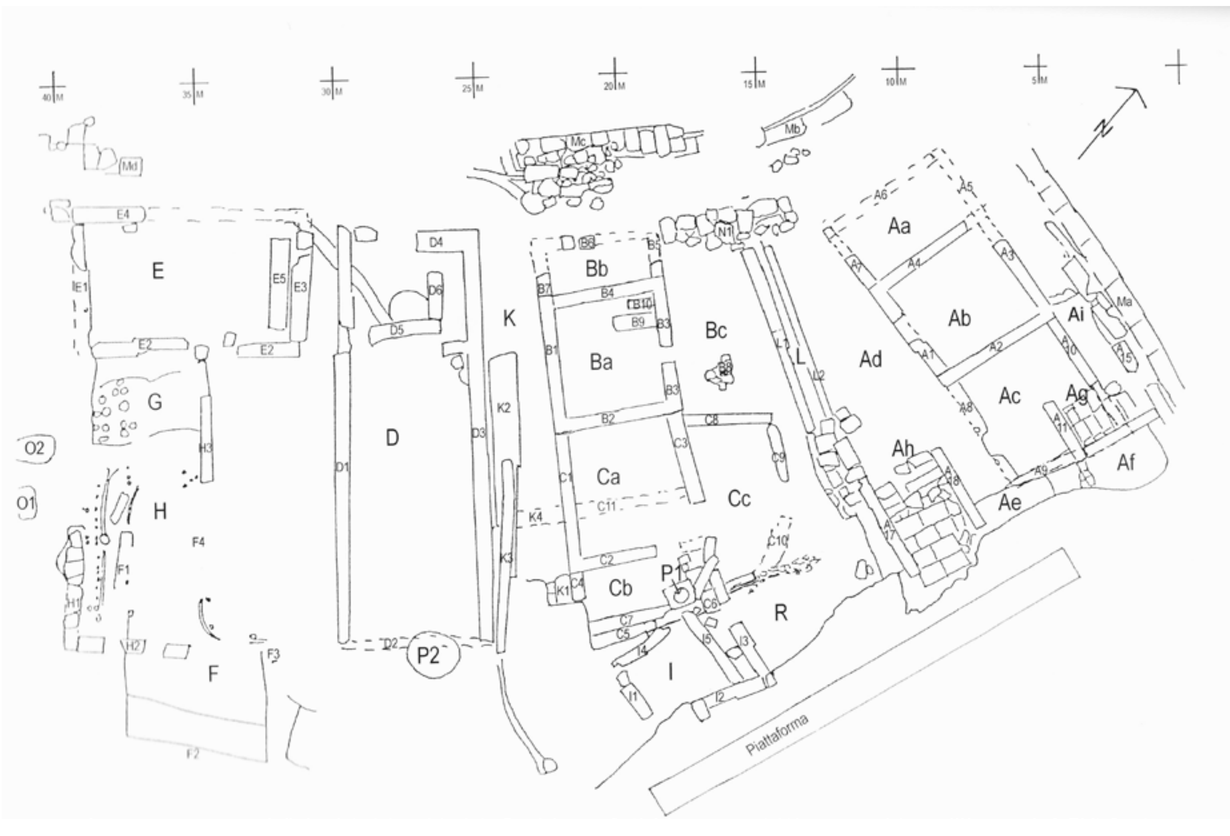

Figure 4.24. Plan of the Borgo at San Giovenale (Pohl 2009: pl. 114), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

terrace at the Borgo of San Giovenale (Karlsson 2006: 155; Pohl 2009: 225). Construction of the first buildings with Type 5 foundations at Veii might have begun slightly earlier than at Acquarossa and San Giovenale, with evidence pointing to the middle of the seventh century (Acconcia et al. 2009: 20).

Moreover, based on the comparison of terracottas, the second phase reconstruction of the so-called '*edifici monumentali*' of Acquarossa Zone F (Figure 4.22) took place in the first quarter of the sixth century (Rystedt 1986: 99–108; Wikander and Wikander 1990: 189). The reconstruction at Acquarossa coincided with the major expansion of buildings at Area I of the Piazza d'Armi at Veii (Acconcia et al. 2009: 20–21; Figure 4.23). The rebuilding at Zone F and the Piazza d'Armi was earlier than the second phase reconstruction of buildings at San Giovenale, which occurred in both Area F East (Figure 4.21) and the Borgo (Figure 4.24) following a possible earthquake around 550/530 BC (Nylander 2013: 138–142).

Without doubt, the examples of Foundation Type 5 are some of the most complex domestic buildings uncovered in Etruria. This complexity makes the study of the foundations all the more important. While quite a bit has been said of other parts of the buildings, particularly the roofs at Acquarossa and the walls and yards of the Borgo, the method of foundation says a significant amount about the way in which a builder conceptualises the building. As much as in the previous sections, if not more so, the data from this section provides a starting point for the discussion of traditions and innovations through the identifications of foundation techniques and the variations in these techniques from building to building.

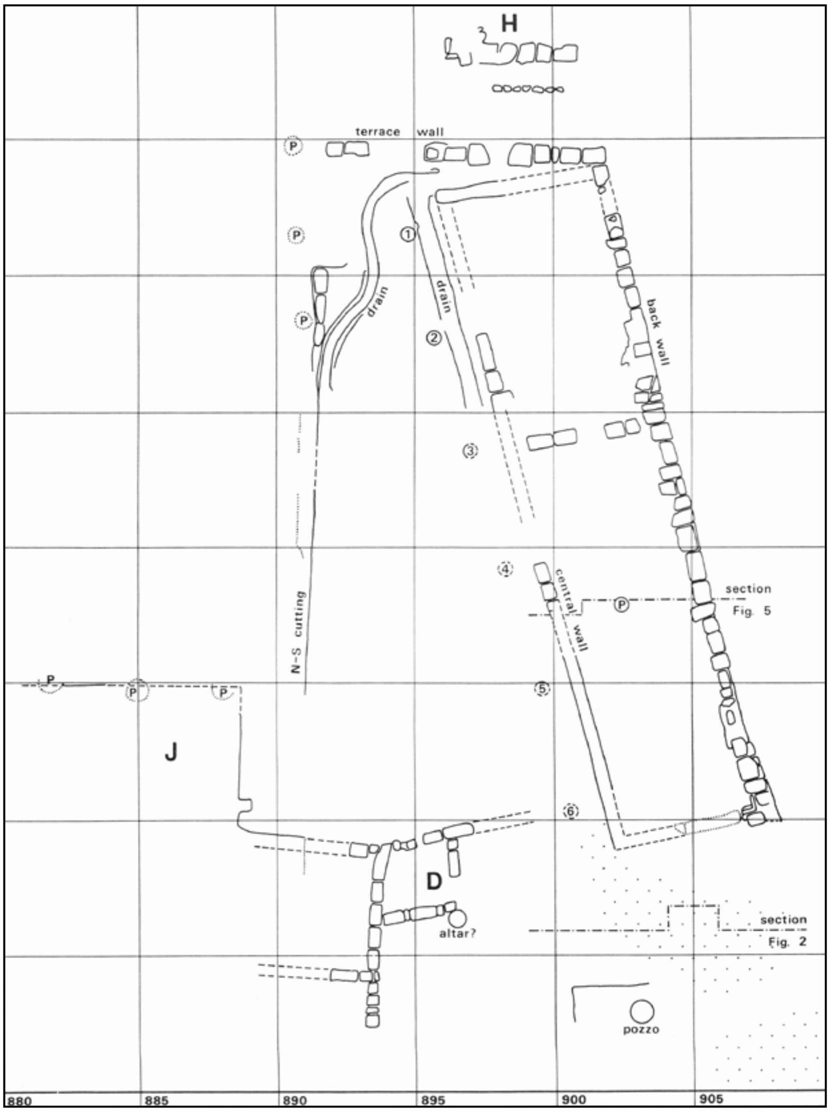

Figure 4.25. Plan of the early monumental complex from Acquarossa Zone F (Wikander and Wikander 1990: fig. 9, p. 199), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

4.2.1 Ground preparation

In many cases, the buildings with Type 5 foundations were the cause of (and sometimes a result of) significant manmade alterations to the landscape. Not only was the ground under individual buildings changed to benefit construction in one way or another but often the broader topography of a site was also modified. In the most extreme examples, entire hillsides were reshaped in order to create level footings for building.

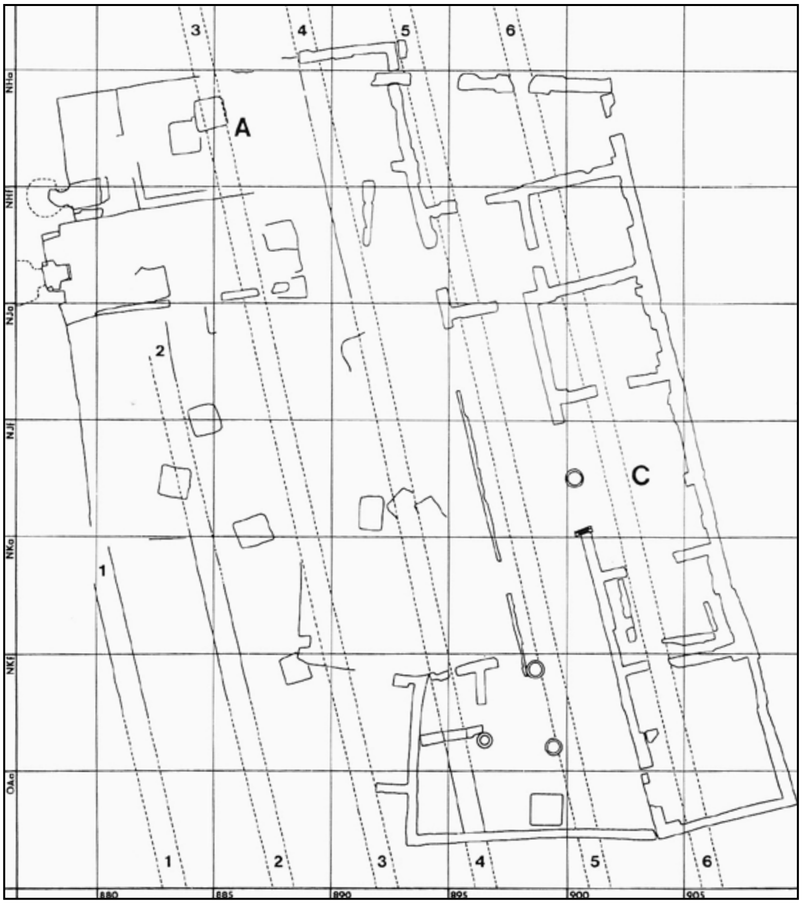

Figure 4.26. Plan of Acquarossa Zone F with plough damage indicated (Strandberg Olofsson 1989: fig. 17, p. 173), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

As is sometimes the case with Foundation Type 4, the large scale ground preparation of Type 5 foundations receive a significant amount more attention than the changes under individual buildings due to their often radical nature.

However, as opposed to Foundation Type 4, the nature of individual buildings with Type 5 foundations, as well as the excavation reports and discussions of them, has elicited specific interest in how each building was erected. For instance, the final phase of the so-called '*edifici monumentali*' of Acquarossa Zone F, particularly Building A, has received significant amounts of attention for the buildings' position against and cuts into the tufa on the western flank of that zone. Much of the attention comes from the fact that, during the excavation of the zone, the excavators were curious about whether or not the court was flanked by buildings on all four sides as at Poggio Civitate (Strandberg Olofsson 1986: 131–132). According to Strandberg Olofsson (1989: 163–166), the jutting tufa rock to the west and southwest of the court was the natural ground level of Zone F before the erection of the *edifici monumentali*.

Wikander and Wikander (1990: 189–191) confirm Strandberg Olofsson's conception of the ground level in the last phase of Zone F. Wikander and Wikander further state that it is unclear how the ground in the previous phase of building in Zone F (which they call the 'early monumental complex') was prepared for the entirety of the zone. Apparently, the preparation of the western side of the zone in the final phase (i.e. the cutting and levelling of the tufa bedrock) removed any trace of building that occurred there before that phase. However, in the eastern end of the zone (Figure 4.25), the natural level of the bedrock drops significantly and much of the building foundations from the earlier phase survived. The stratigraphic makeup of this palimpsest site is confusing due to modern plough damage but Wikander and Wikander provide sections for the eastern end that are particularly useful (Figure 4.26).

From the eastern side of Zone F, Wikander and Wikander (1990) establish how the ground for individual buildings in the early monumental complex was prepared. In so doing, they also provide some key insights on the foundation techniques used for the *edifici monumentali* of the last phase since many of the foundations for the *edifici monumentali* stem from those built in the earlier phase, as is the case for Building C (Wikander and Wikander 1990: 191–192, 200–201; Figure 4.25). Below Building C, the bedrock shifts in height from just below to nearly a metre below floor level. In no place is the bedrock

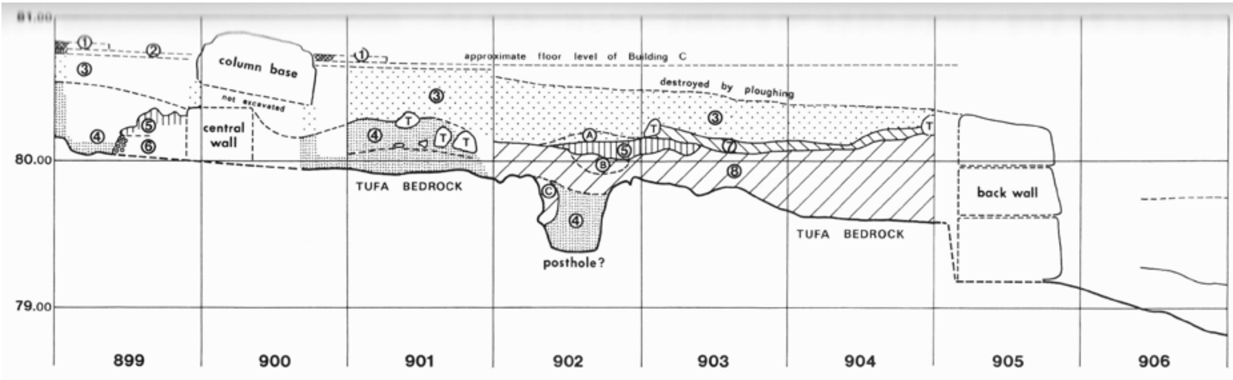

Figure 4.27. Cross-section of Building C from Acquarossa Zone F in the first phase (Wikander and Wikander 1990: fig. 5, p. 195), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

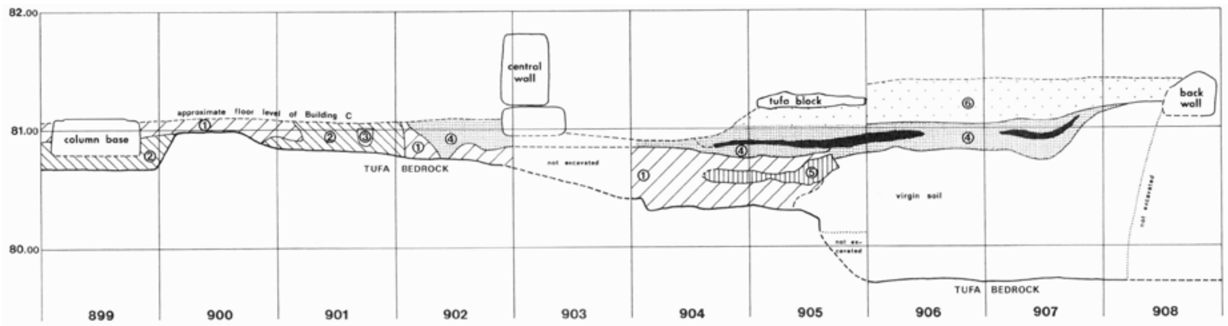

Figure 4.28. Cross-section of Room 5 in Building C from Acquarossa Zone F in the second phase (Wikander and Wikander 1990: fig. 2, p. 192), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

surface entirely consistent. However, the bedrock at the northern end of the building is more level (Figure 4.27), in a general sense, than the southeast end of the building where it significantly drops to more than a metre below the proposed floor level (Figure 4.28). Due to the fluctuation in the level of the bedrock, the builders of the initial iteration of Building C set the tufa block wall footings on the bedrock and then used an earthen deposit in the interior of the building to create a level surface.

This ground preparation technique is used throughout Building C except in the foundations of Room 5 where the tufa block wall footings of the eastern wall were not placed on bedrock (Figure 4.28). Instead, the wall footings were placed on virgin soil, possibly because the bedrock drops significantly at that point. Furthermore, the southern wall footings for Room 5 were placed on the earthen fill that covered a well from an earlier period. Wikander and Wikander (1990: 200) suggest that this change in ground preparation techniques, along with the arrangement of the portico post holes in the first phase of the building (as discussed below), is evidence that Room 5 was an extension built as a part of the later *edifici monumentali*.

The ground preparation of Room 5 in Building C could therefore be indicative of the sort of ground preparation used in the *edifici monumentali* of the last phase. Sections of Building A, for instance, show that the bedrock on the eastern side of the structure drops off in a way that is similar to the ground under Room 5 (Strandberg Olofsson 1989: 165–166). Unfortunately, due to plough damage (Figure 4.26), the eastern portion of Building A could not be better evaluated and it is unclear whether or not the same techniques used in Room 5 of Building C were used at the east of Building A. Strandberg Olofsson (1989: 166–171) indicates that, although there is little evidence for the entire building, tufa blocks in the northern wall associated with Building A continued in a cutting in the bedrock eastward into the plough damage (Figure 4.22). Though it is rather thin evidence, this extension of the northern wall of Building A suggests that the ground preparation techniques used in Room 5 of Building C were unique to that room and should not be considered as the norm for the last phase of Zone F.

The overall techniques used in ground preparation from both monumental phases of Acquarossa Zone F are, despite the plough damage, consistent. Besides Room 5 of Building C where the different ground preparations resulted from unique circumstances, the ground for each building in Zone F was levelled in both phases using a combination of bedrock cutting and earthen deposits. For some of the buildings located near the west end of the zone, such as Buildings A, D and J, cutting the bedrock to a level platform was the primary type of ground preparation. Buildings not founded entirely on the bedrock platform, particularly Building C, had their tufa stone footings placed in cuts on the uneven bedrock. The space in between the footings (i.e. the interiors of the buildings) was packed with an earthen deposit to create a level surface. Wendt's (1986: 59) and Persson's (1994: 294–300) architectural summaries of the site confirm that this style of ground preparation was used not only in Zone F but also in Zones B, C, D and N (Figure 4.29).

Compared to Acquarossa, the bedrock on the acropolis of San Giovenale was naturally level (Figure 4.30). In fact, the terrain actually aided in the construction of buildings since less preparation for the entire site was required when laying foundations (Nylander 1986a: 47). Of course, the ground was usually altered in some way before the erection of new buildings but this was done on an individual basis.

Figure 4.29. Plan of Acquarossa Zone B (Persson 1994: fig. 5, p. 295), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

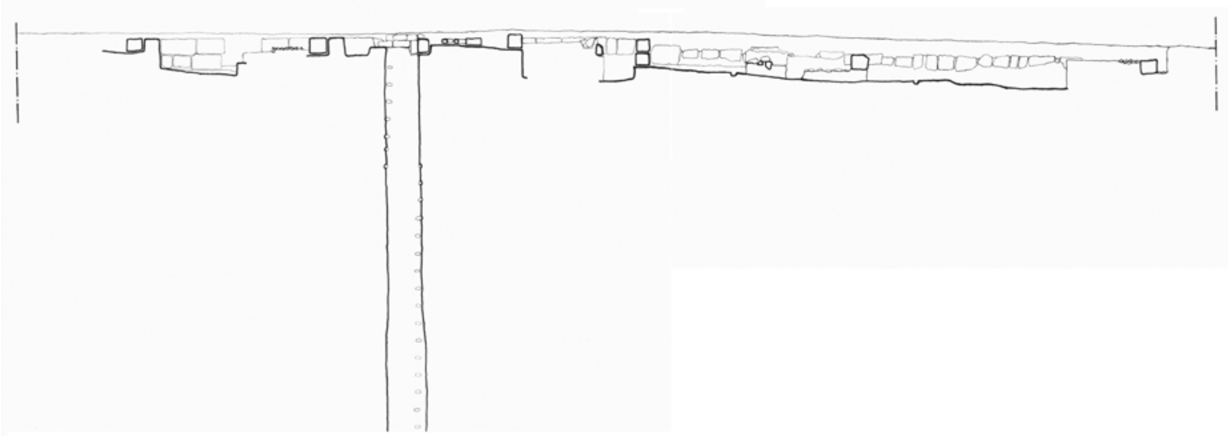

Figure 4.30. North-south section of San Giovenale Area F East, with north toward the right (Karlsson 2006: fold out plan 2), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

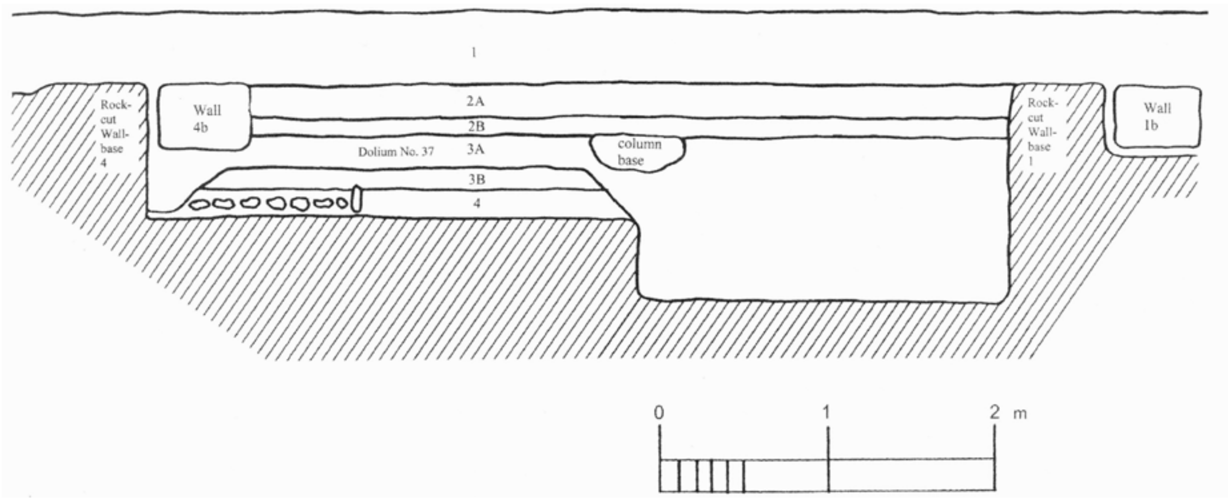

Figure 4.31. North-south section of House I from San Giovenale Area F East with north toward the left (Karlsson 2006: fig. 34, p. 47), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

In particular, at Area F East, the second phase of House I did not immediately reuse, repair or add to the ground preparations laid in its first phase (Figure 4.31). Rather, following the destruction of the first phase, a quarry was excavated at the centre of the old floor. The quarry is of a significant size, large enough for Karlsson (2006: 155) to propose that the tufa blocks in the second phase structure came from it. However, once the quarry had fulfilled its purpose, the interior of House I was filled with soil, which in some places was nearly a metre in depth thanks to the quarry and Type 3 foundations of the previous phase.

Other buildings in Area F East did not have quarries beneath them but had what appears to be a levelling layer of earth below their floors. Under Houses II and III lay the remains of the Iron Age buildings with Type 2 foundations (Figure 4.32). In a style reminiscent of the ground preparations at Poggio Civitate, the destruction layer of the Iron Age buildings (stratum 3B) was modified prior to the setting of the foundations for Houses II and III (Karlsson 2006: 49–55). The layer above the destruction (stratum 3A) appears to be a type of deposit, consisting of tufa gravel. Directly above and sealing the tufa gravel in both Houses II and III were the first phase floors (Karlsson 2006: 49, 51–52).

In Period 4 of Area F East (i.e. the third phase of House I and the second phase of Houses II and III), the ground preparation used in the rebuilding of the structures on the acropolis is similar to the first phase

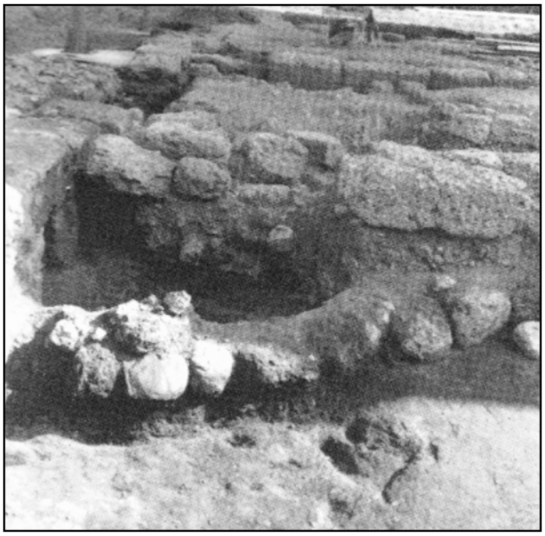

Figure 4.32. Section of the Foundation Type 2 rubble socle wall footings beneath Room A of House III and below the wall footings of House II (Karlsson 2006: fig. 26, p. 42), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

ground preparation of Houses II and III. The layer above the floors of Period 3 (stratum 2B) was a mixture of the occupation and destruction of the previous phase, some *tufetti* and a soil deposit (Karlsson 2006: 45–52). The soil deposit was added to and packed with the destruction of the previous buildings to create a level ground surface for the flooring of Period 4 (stratum 2A). In contrast with the previous period, the ground preparation deposit was laid with the wall footings still intact, which means that the only foundational purpose of the ground preparation in Period 4 was to create a level floor.

The ground preparation techniques used at San Giovenale Area F East differ slightly from those of Acquarossa. Whereas the majority of buildings at Acquarossa Zone F were situated on manipulated tufa bedrock, the tufa on the San Giovenale acropolis was not a key component of the ground preparation, except tangentially for the quarry in the lowest levels of House I. Nevertheless, a similar ground preparation technique was used both in the Period 4 foundations from San Giovenale Area F East and the examples in the eastern part of Acquarossa Zone F, where layering levels of soil were used between the wall footings to create an even floor surface.

This technique, where soil deposits are used to create a level surface, also appears in the Borgo at San Giovenale (Figure 4.24). Yet, the ground preparation of buildings in the Borgo clearly differs from the acropolises of San Giovenale and Acquarossa. The location of the Borgo, on the side of a steep slope, necessitated the use of artificial terracing (Figure 4.33) and changes to the natural topography (Nylander 2013: 72–87; Pohl 2009: 19–20; Figure 4.34). Therefore, while many of the techniques used for the individual houses resemble the ground preparation in parts of Acquarossa and San Giovenale Area F East, artificial terracing underlies all of the Borgo and is an underlying component in the foundation of each building.

Two earthen terraces were built beneath the Borgo. One was built around 650 BC and was a significant undertaking that expanded most of the habitable area of the slope, none more so than the so-called West

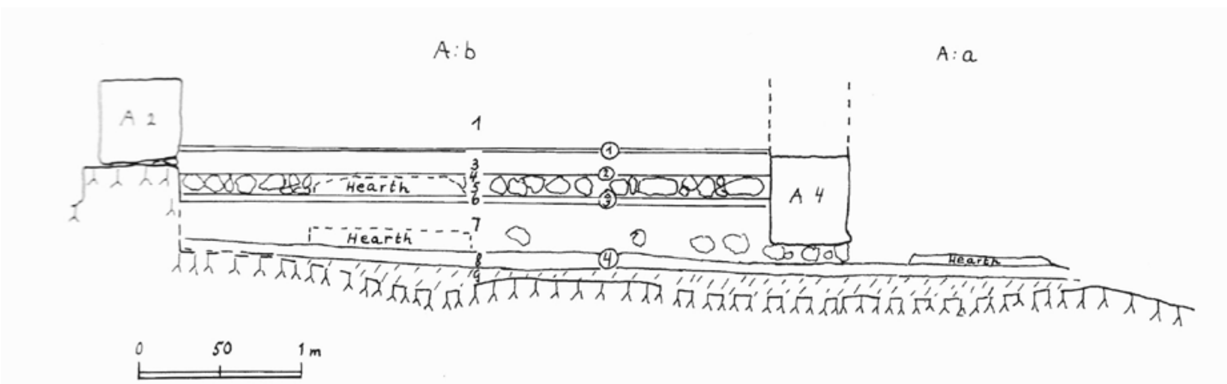

Figure 4.33. East-west cross-section of Building A from the Borgo at San Giovenale with east toward the left (Pohl 2009: fig. 3, p. 26), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Area. As Pohl (2009: 19) points out, this first terrace was probably intended to raise the level of the West Area to the same ground level as where Building A was eventually constructed as well as to create an extended area for the construction of buildings and yards. The deposit of earth was contained by a retaining wall that encircled the Borgo and was built out of metre-wide blocks of tufa (Figure 4.34).

The second terrace was a rebuild of the original terrace in the West Area around 550/530 BC following a possible earthquake, called 'The Great Terrace Fill' by Pohl (2009: 138; for more on the possible 550/530 BC earthquake: Karlsson 2006: 162; Nylander 2013: 138–142). In addition to the reconstruction of the terrace, the Great Terrace Fill was expanded to fill a tufa quarry that, prior to 530 BC, lay between the West Area and the buildings to the north (Nylander 2013: 75–77; Pohl 2009: 138). The expansion allowed for the construction of House D (Figure 4.24), which, as opposed to the other buildings, might have aided in the retainment of the Great Terrace.

Both of these terrace deposits were significant parts of the ground preparation of the individual structures, particularly nearer to the West Area where the terrace was most profound. Building A and House B, part of the northern group of buildings, were some of the buildings founded partially on the terrace extension (Nylander 2013: 87–92, 110–112, 151–152; Pohl 2009: 25–27, 71–73). In contrast with House C, which was founded above the terrace with a slightly different method of ground preparation, the builders of Building A and House B needed to accommodate both the earth deposit and the natural tufa bedrock (Nylander 2013: 104; Pohl 2009: 93). In this regard, Building A and House B are similar to Building C in Acquarossa Zone F.

A closer look at House B (Figure 4.34) reveals that ground preparations in the first phase differed from the second and that the position of the rooms on or off the terrace influenced changes made to the ground over time. In the first phase, House B's eastern room, Room B:a, rested primarily on modified tufa bedrock, shaped and cut to form a level step (Pohl 2009: 72). The western room, Room B:b, on the other hand, extended – at the same floor level as Room B:a – horizontally over the artificial terrace. The ~0.12 m flooring in this first phase, different in each room (and discussed below), was placed directly above the two different types of prepared ground.

The rebuilding of House B following 530 BC saw a change in the ground preparation similar to that of Period 4 at Area F East. Preparation of Room B:a was not the same as Room B:b. A 0.30 m stratum of earth, admixed with small tufa stones and clay, was found between the floors of phases 1 and 2 in Room B:a (Pohl 2009: 72). When compared to the deposit in Room B:b, the second phase of ground preparation

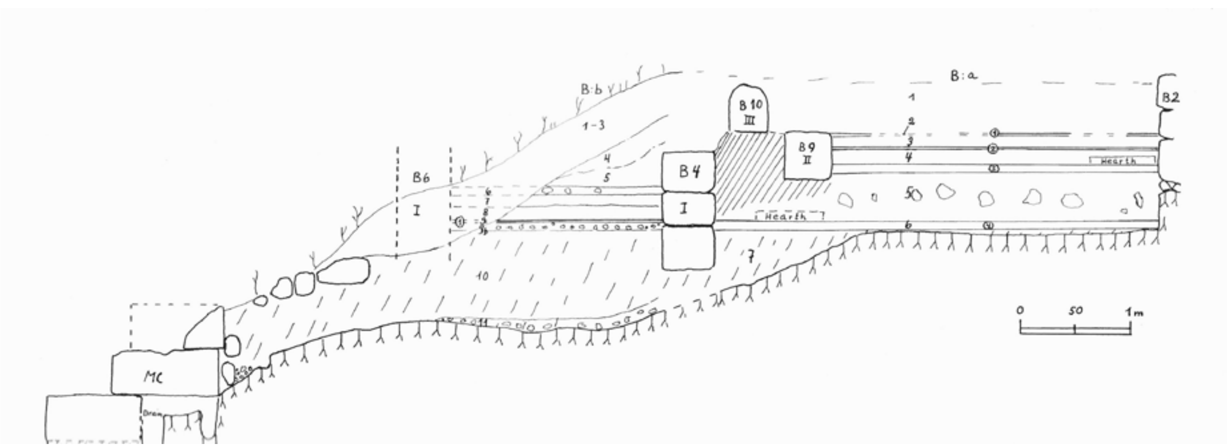

Figure 4.34. East-west cross-section of Building B, Rooms A and B, from the Borgo at San Giovenale with east toward the right (Pohl 2009: fig. 7, p. 72), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

in Room B:a is deeper but less robust. Pohl (2009: 72) emphasises the robustness of the second phase ground preparations in Room B:b, stating that the deposit was “no mere earth fill”, instead it was composed of two layers of different clays.

The setting on the artificial terrace suggests that the builders intended to strengthen Room B:b in the second phase. With the other modifications to House B, the changes might be the result of some sort of earthquake-proofing (see section 6.4.1). Alternatively, the risk of the terrace collapsing due to a landslip could well have been the reason for laying the watertight clay layers in the second phase deposit. In either case, it is clear that by the end of (or, perhaps, during) the second phase occupation, Room B:b fell victim to erosion and was not replaced in the fifth century rebuild (Pohl 2009: 72).

At first glance, the ground preparation techniques of Foundation Type 5 do not indicate a consistent pattern. Natural topography and geology are obvious reasons for differing techniques. However, much of the variation is the result of the human alterations of the topography. In two of the areas with examples of Type 5 foundations, Acquarossa Zone F and the Borgo of San Giovenale, the manipulation of the natural topography is different in scale than in other foundation types. Wide-scale changes to the topography forced specific decisions in the ground preparations when constructing the foundations for each of the buildings individually, resulting in variety.

Yet, when all of the Foundation Type 5 examples are compared, a clear trend of similar techniques develops for the ground preparation in each individual building. Generally, in Foundation Type 5 examples, where it was uneven and near the surface, the bedrock was cut and shaped to create a level plane before setting the floors. Furthermore, in the rebuilding of structures, it appears to have been common practice to incorporate debris from the destruction of the previous building into a deposit, followed by a levelling layer of some sort, all within the remaining wall footings.

Despite these similarities, there is a wide variety of different materials, styles, depths and apparent construction methods that separate the ground preparation techniques. The differences are so great, it is impossible to truly label any one technique as either archetypically or atypically Foundation Type 5. It is even more evidence that the foundation types are not always sharply distinguishable since it is clear that, based on ground preparation alone, Foundation Type 5 could be broken into any number of subtypes, subcategories or even entirely new types. However, the identification of innovation and innovative techniques in ground preparation are recognisable in the variation. The abundance of different ground preparation techniques of this chronologically latest foundation type noticeably contrasts with earlier, more traditional foundation types.

4.2.2 Wall footings

Tufa ashlar masonry is the evident wall footing technique of Foundation Type 5. Despite their recognisable nature, the wall footings of Foundation Type 5 vary in their construction methods. As with the ground preparation techniques, topographical context appears to have been influential, affecting construction on a case-by-case basis. Furthermore, the relation of the wall footings with the walls might have been a determining factor in construction, leading to further variation.

Of the shared similarities, none is more relevant or obvious as the ashlar stone footings. In every case, the wall footings were comprised of ashlar tufa blocks cut in nearby quarries (see section 6.2.1; Figure 4.35). A good example of this is in the Period 3 House I at San Giovenale Area F East (Figure 4.31), where the quarried stone for the walls of the building came from a quarry within the house (Karlsson 2006: 155). Further discussion of the building material and its wider effect on Etruscan architecture can be found in

Chapter 6.

While the wall footings had similar construction and materials, they varied in both the setting and in relation with the rest of the wall. The wall footings for the first monumental phase of Acquarossa Zone F, for instance, were all set on modified bedrock, regardless of the relative distance between the bedrock, earthen deposits and the natural ground level (Wikander and Wikander 1990: 200; Figure 4.27). After they had been set, the space between the wall footings (i.e. the interior of the buildings) was made level with an earthen deposit. No foundation trenches were required. This variant of the setting of wall footings also appears at Veii in Piazza d'Armi Area I during Phases V and VI (Figure 4.23) and for some of the houses in the Borgo at San Giovenale, such as House C (Acconcia et al. 2009: 22; Pohl 2009: 93; Figure 4.33).

Figure 4.35. The Borgo at San Giovenale facing northwest (author's image).

An alternative setting technique was a foundation trench into the soil with one or two courses of the wall footing inside. Of course, this setting technique was common in areas with deep soil fills or where the bedrock was significantly lower than the natural ground level. The wall footings of the Etruscan House at Luni sul Mignone and some of the wall footings at Acquarossa (e.g. Room 5 of Zone F Building C; Figure 4.28) and the Borgo (e.g. Room B:b; Figure 4.34) were set on deep earthen deposits and share this setting technique (Östenberg 1967: 105; Pohl 2009: 72; Wikander and Wikander 1990: 200). However, San Giovenale Area F East has the best examples of this variation in setting technique. The wall footings of Houses II and III were set into or, possibly (according to the excavator's notes), on top of the levelling stratum rather than on the bedrock which lay about a metre below the top of the levelling stratum.

In a sense, Houses II and III at San Giovenale Area F East and the Etruscan House at Luni sul Mignone may be outliers. In general, the preferred way to set a stone wall footing was to place it on bedrock. This preference is witnessed in the majority of buildings, even those sited on a deep earth deposit have most of their wall footings on bedrock when possible. House D in the Borgo (Figure 4.36), despite the Great Terrace Fill separating the artificial ground surface and bedrock by more than a metre, had its southern wall on bedrock (Pohl 2009: 138). This trend is replicated in Houses A and C in Acquarossa Zone B and Buildings A and C in Acquarossa Zone F (Figure 4.28), where the rear walls of the buildings (excepting the extension to Building C in Room 5) were placed a metre below the natural ground surface on a modified bedrock shelf (Strandberg Olofsson 1989: 165–171; Wendt 1986: 59; Wikander and Wikander 1990: 200).

Even the wall footings of Period 3 House I at San Giovenale were shifted to take advantage of the Foundation Type 3 bedrock shelf wall footings from the previous period. Fahlander's reconstruction of House I in its second phase (Figure 4.37) shows how a single course of ashlar tufa wall footing was placed beside the older, carved wall footings (Karlsson 2006: 157). While the northern wall footing was set on the

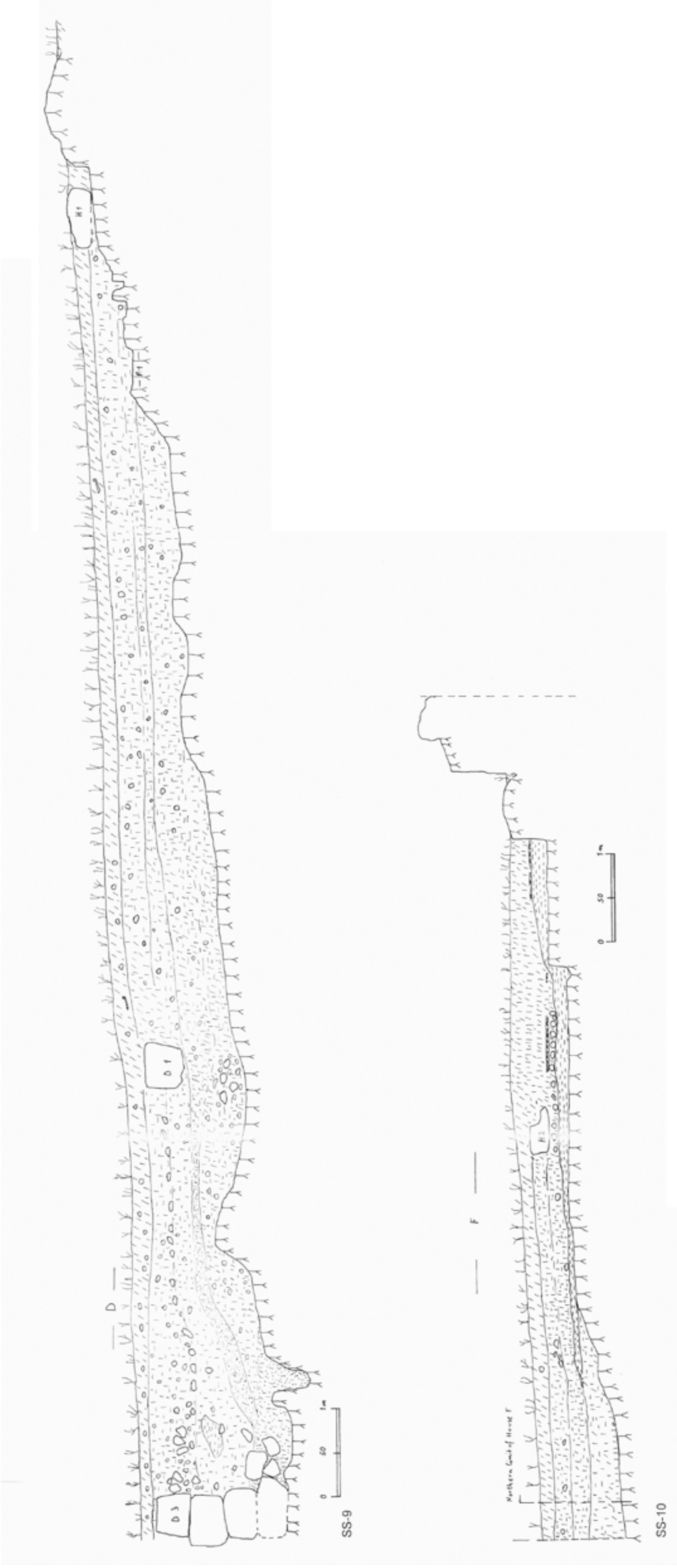

Figure 4.36. Cross-sections of Houses D and F in the Borgo at San Giovenale (Pohl 2009: pl. 113, SS-10), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

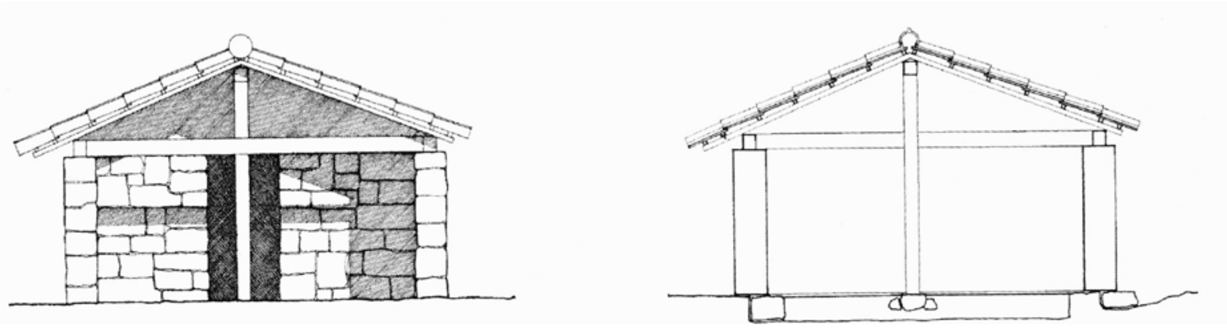

Figure 4.37. Fahlander's reconstruction of House I from San Giovenale Area F East in Period 3 (Karlsson 2006: fig. 293, p. 157), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

soil deposit of the building's interior, the southern wall footing was shifted south of the Period 2 building and placed against the rock-cut wall footing from that period. House I from Period 3 therefore had three of its four wall footings set on bedrock and, thanks to the reuse of the older wall footings, the wall footing on the soil deposit shared its weight with the bedrock.

Based on the apparent tendency for wall footings on bedrock, setting wall footings in foundation trenches cut in the soil was likely a secondary option, used only when the bedrock was out of reach. The reasons for the bedrock being out of reach differ for each example. For instance, at the Borgo, setting the western wall footing of Room B:b on bedrock would have either negated the purpose of the terrace deposit or required extensive foundation trenches with wall footings of multiple courses (Figure 4.34). As opposed to House B, Houses II and III at San Giovenale Area F East were founded on relatively flat land. Yet, removing the metre of soil between the ground surface and the bedrock would have significantly altered the topographical relationship of those buildings with the others in the area. The two different setting techniques of Foundation Type 5 therefore exist because of the complexity of natural and artificial topography and possibly the socio-cultural context of the buildings (see section 7.2.1).

The other major variation in Foundation Type 5 wall footings has less to do with the foundations than the walls themselves. There are two discernible variants of wall footings based on their relationship with the wall. In many cases, the wall footings of Foundation Type 5 buildings are merely continuations of the ashlar wall, albeit often with a rougher finish. This first variant is often assumed in excavation until evidence for the second variant is found. The second variant, often associated with Acquarossa, is best described as an ashlar socle (which looks nearly identical in an archaeological setting to the first variant) with a non-stone wall, such as mud brick, *pisé* or *graticcio* (Nylander 1986b: 56; Wendt 1986: 58–60; see section 5.1.1, 5.1.2).

The first variant is best exemplified by the walls of the Borgo. The nature of the artificial terrace and the hillside meant that a significant number of courses in the walls of Building A and Houses B and C were found *in situ* (Figure 4.35). House B, for instance, had walls with up to seven courses remaining (Blomé 1986: 56). Some of the blocks in these walls were intended as foundations since, besides their position below the floors and ground preparations, they were more roughly shaped than the higher courses. However, based on Blomé's (Blomé 1986) discussion, the interchange between the wall and the wall footings were generally difficult to notice. This is best exemplified in Room A:c of Building A (Figure 4.33), where the walls may not have had discernible wall footings at all since the walls appeared to be free-standing on the bedrock (Pohl 2009: 25–26).

The second variant was best described by Wendt (1986) based on the finds at Acquarossa. Essentially, a number of the wall footings were dressed on the top as well as on the sides, which created an even surface across the entire wall footing. In several instances at Acquarossa, the remains of mud brick and daub were

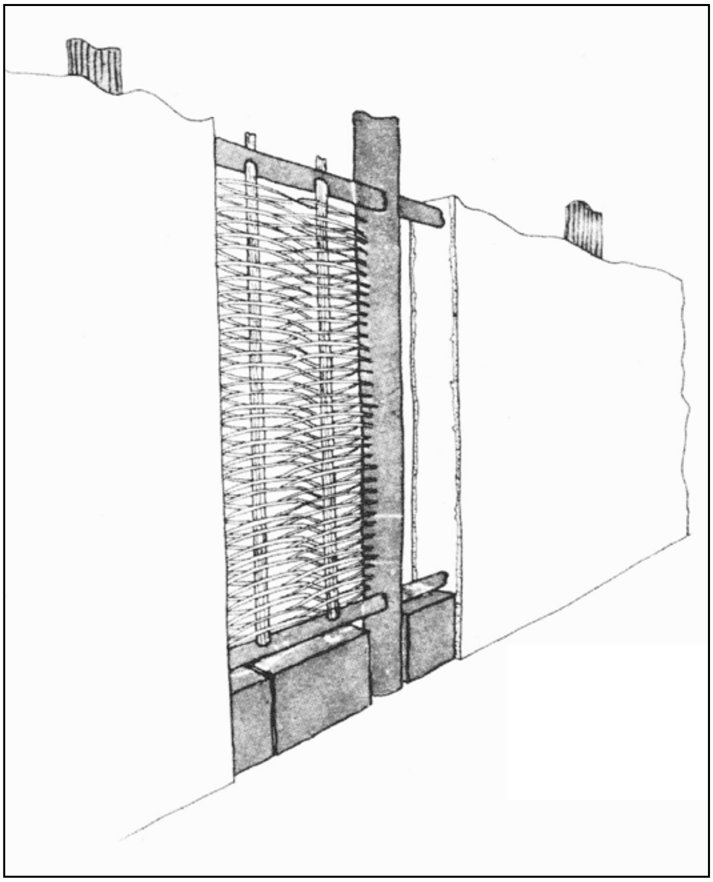

Figure 4.38. A hypothetical reproduction of the wall proposed by Wendt for House A of Zone D (Wendt 1986: 60).

also discovered (Wendt 1986: 59). Wendt claims that, in conjunction with the mud brick and daub, these dressed wall footings held *palancato* (a sort of half-timbered wall, also known in Vitruvius (*De Arch*. 2.8.20) as *parietes craticii*) or *graticcio* walls. She hints that these walling techniques were most common at Acquarossa.

Despite Wendt's claims that it occurred in many buildings at Acquarossa, definite evidence for *graticcio* walls was only found in House A of Zone D (Wendt 1986: 60; Figure 4.38). In the wall footings of House A, several holes were found both in and between the top of the tufa blocks, an indication that the wood frame was staked into the wall footings. Due to the thin evidence for the *graticcio* technique, however, Wendt (1986: 60) proposes quite a few non-stone alternatives that will be discussed in the next chapter rather than here (see section 5.1.1), especially since Wendt's alternatives do little to change the identification of wall footings.

In another case, it was initially thought that Houses II and III of Area F East were similar to those in the Borgo or even the nearby House I, all of which were constructed with wall footings of the first variant. This was reconsidered by Karlsson (2006: 158–161). Evidence was found for post holes in the wall footings of both Houses II and III but the holes in House III (Figure 4.39), in particular, were similar to those in House A of Acquarossa Zone D (Karlsson 2006: 159). Despite the similarities with buildings in Acquarossa, Karlsson (2006: 158–159) suggests that the walls of both Houses II and III were built of ashlar masonry. He admits that the walls of House III might have been *graticcio* but, based on what was found in the Borgo, he perceives walls of ashlar blocks perhaps interposed with wall posts.

To Karlsson (2006), it seems that all of the buildings at San Giovenale were of the first variant of wall footings. However, with the evidence clearly mirroring that of Acquarossa, it is interesting that Karlsson chooses the Borgo, which is different from San Giovenale's acropolis in a number of architectural ways (not to mention the possible socio-economic differences) to base his version of architecture on the acropolis. While it is possible that the stones from these buildings on the acropolis were destroyed by ploughing (as described by Nylander (1986a: 47–50) or pinched and used in the castle or other buildings of the medieval period, no evidence found in the excavation of Houses II and III (or for that matter, House I) indicate the use of ashlar stone outside of the foundations.

Even the evidence for the use of the first variant of wall footings in House I of San Giovenale Area F East during the third and fourth periods relies heavily on the comparison to the Borgo. Although for Houses II and III he mentions the differences that make the buildings similar to the second variant style of wall footings at Acquarossa, Karlsson (2006: 155) does not discuss whether House I might have been subject

Figure 4.39. Tower photograph of House III from San Giovenale Area F East. Note the holes in the centres of two of the blocks in the southern room (Karlsson 2006: fig. 25, p. 41), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

to a different type of wall construction than ashlar stone. In fact, he underscores the original excavators' vision for stone walls in House I, using the quarry under the foundations of the building as evidence (Karlsson 2006: 155; see ground preparation subsection, above). Yet, little reason (other than the quarry) is given for why House I was built in the style of the first variant.

When considered further, the stones removed from the quarry were used in both in the foundation of House I (and, possibly, the walls in their entirety) and also in the wall footings of Houses II and III. Since all three buildings seem to have been built at the same time as a part of a building unit and that the majority of building materials would have had a local source, the stones for the three buildings likely came from the same source, especially since no similar quarry was found for Houses II or III (for the chronology and relationships between the buildings: Karlsson 2006: 155–164; for quarries: Blomé 1986). If that is indeed the case, then it is unlikely, given the size of the quarry, that House I was a building with the first variant of wall footings.

Therefore, based on the examples from Acquarossa and the uncertain evidence from San Giovenale Area F East, it should be assumed that the wall footings of Foundation Type 5 were an ashlar socle with finished tops and, on occasion, holes for *graticcio* posts. In some instances, as at the Borgo or possibly at Veii and at Luni sul Mignone, the stone wall footings were less a socle and more a continuation of the wall. Importantly, it is the minor technical difference in the finishing of stones of the socle, rather than a major technical difference, such as the setting of the stones in the ground, that separates the two variants of wall footings.

For the Type 5 foundations, then, there is a primary style of wall footings. The primary style was defined by the ashlar stone socle placed onto the bedrock and surrounded by a deposit of soil. On occasion, this primary style saw alterations that fit the geology, social custom or the wall type. Since these alternate techniques were generally context-based, the changes to the primary style were typically individual, that is, if the building had a stone wall, then the wall footing would change from the socle (as it was now unnecessary) but would maintain the bedrock setting. A critical outcome of the Foundation Type 5 wall footings is the recognition of more context-based changes, where the primary style is altered, sometimes dramatically, in order to achieve the desired end product.

4.2.3 Flooring

Compared to previous types where one or two different flooring techniques are identifiable, Foundation Type 5 examples display a wide variety of flooring techniques. Many of the floors reflect new techniques and materials that differ from the other foundation types. These differences often relate directly to both the preparation of the ground and the setting of the wall footings. In a similar way to the wall footings, Foundation Type 5 flooring techniques change, sometimes even within the same building, to accommodate the peculiarities of their contexts.

The case that best demonstrates the specific, local nature of flooring techniques in Foundation Type 5 is that of the floors of House B in San Giovenale's Borgo (Figure 4.34). As discussed previously, most buildings in the Borgo, including House B, saw different ground preparations on room-by-room basis due to their situation on the Borgo's artificial earth deposit and shaped bedrock. In a similar way to the ground preparation mentioned above, the builders (and re-builders) of House B changed the materials and techniques in each room of the building based on the nature of the underlying terrain.

For the first phase, Room B:a (i.e. the room over the prepared bedrock) had a fine layer of pozzolana, a type of volcanic rock/ash, upon a layer of clay that held the softer pozzolana in place. Pohl (2009: 72) suggests that the clay may have also kept out any damp rising from the small (0.02-0.03 m) layer between the carved bedrock and the floor. This pozzolana type of flooring, can degrade quickly with erosion, as seen in the yards of Building A, and is significantly less robust when compared to the first phase flooring of Room B:b (Pohl 2009: 26–27, 72).

In Room B:b, which extended over the artificial earth terrace, a layer of hard, possibly fired clay was uncovered underneath tightly packed tufa stones and *tufetti*,. In contrast with the pozzolana floor of Room B:a, Room B:b's flooring technique with its combination of *tufetti* and fired clay must have been used to secure the floor on the earthen terrace, providing a strong surface for occupation upon the less-sturdy soil deposit.

Perhaps the best way to prove that the different, more robust technique of Room B:b was used to secure the floor on the terrace is to compare it to the phase that followed its construction. In the next phase, as discussed above, the floor levels of House B were raised significantly and Room B:b featured the deposit consisting of watertight clay layers. As opposed to the first phase floor, which sat directly upon the relatively loose earth terrace, the second phase floor was laid upon a robust, deposited layer of earth. The strength of this underlying layer must have replaced the need for as robust a floor surface in the second phase. Instead of a *tufetti* and fired clay floor surface, the builders of the second phase House B used a flooring technique that best resembles the first phase floor of Room B:a – a pozzolana layer above a clay insulating layer.

Interestingly, the pozzolana flooring did not reappear in the second phase of the Room B:a. Instead, a tufa stone floor not dissimilar to the first phase of Room B:b was set upon the second phase earthen deposit. However, there were some significant differences between the second phase floor of Room B:a and the first phase floor of Room B:b, such as the use of a thick clay layer (rather than a thin, fired clay layer) between the tufa stone layer and the earthen deposit. Further, the tufa stones were less tightly packed in the second phase floor of Room B:a. While less robust than the first phase floor of Room B:b, the concept of a sturdy floor strengthening or, perhaps, securing the ground above an earthen deposit remains the same.

From the floors of House B, it is clear that in some cases the floors were adapted to fit their contexts. When a floor was situated on a stable ground surface, it was likely made of a softer, less robust material such as pozzolana since the floor was not made to secure the ground surface. Alternatively, when situated on a ground surface that was itself less secure, the floor became more robust, made to strengthen and stabilise the ground for occupation.

These techniques are apparent, although not as obvious as in House B, in many Foundation Type 5 examples. For example, House II from San Giovenale Area F East had a robust tufa gravel floor in its first building phase that sat upon a loose soil and *tufetti* deposit. Then, in the second phase, a floor comprised of a layer of hard beaten clay upon a layer of tightly packed *tufetti* was laid above the second-phase deposit, which, as with the previous deposit, was made of loose soil.

Unfortunately, due both to the documentation and the survival of flooring in the Foundation Type 5 examples, it is impossible to tell whether the style of flooring described above was the normal practice in all the Foundation Type 5 buildings. For the most part, at Acquarossa and Veii, floors were destroyed by ploughing and little has been said about those that survived. Lack of thorough documentation of the flooring materials and consistencies also hamper the understanding of floors at both Luni sul Mignone and the acropolis of San Giovenale; however, Karlsson (2006: 45–57) clarified the relatively unclear documentation at San Giovenale Area F East.

Nevertheless, the materials and techniques used in flooring of even just the Borgo were so variable that an overall picture of the flooring for Foundation Type 5 is hard to discern. In contrast with the previous types where a single dominant type of technique, such as pressed clay floors, could be seen in the majority of examples, in Type 5 foundations, the flooring varies even between buildings built at the same time in the same kind of terrain. Building A at the Borgo (the neighbouring building to the north of House B) had floors of the same material and technique in the first phase of the building, despite the different ground surfaces under the floors. This changed in the second phase, where the flooring techniques responded to the associated ground level. However, it is clear that even the use of flooring techniques based on specific local terrain is not a given for Foundation Type 5.

4.2.4 Roof supports

Evidence for roofs in Type 5 foundations is generally limited to the bases or post holes of columns in the porticoes of buildings. Besides the evidence for colonnaded porticoes, a couple of the Foundation Type 5 socles from Acquarossa and the acropolis at San Giovenale have small post holes within the stones that could be evidence for *graticcio* (or, possibly, *palancato*: see Glossary), as mentioned in the wall footing subsection above. Other than these limited examples, evidence in the foundations for roofs is non-existent, because the load of the roof was carried by the walls. However, the roofs of many of the buildings with Type 5 foundations have been reconstructed and discussed at length using other sorts of evidence, all of which will be presented and commented on in the next chapter (see section 5.2.1).

Perhaps the most striking of the roof supports found in Type 5 foundations are those of Zone F at Acquarossa. The monumental complex, of both the early and final phases, had colonnaded porticoes surrounding the centre courtyard. For the early monumental complex, Wikander and Wikander (1990: 199–201) argue that the post holes nearer to the central long wall of Building C are indicative of a narrow portico in front of the western entrances of the building (Figure 4.25). Three holes were discovered and recorded at the north end of the building and two more were discovered further along the building to the south but not recorded. Wikander and Wikander (1990: 200) claim that excavators could not find any evidence that the line of post holes continued beyond Room 4, which further indicates that the line of post holes and the southernmost Room 5 were of separate constructions.

Wikander and Wikander (1990: 200) use the narrow distance between the central wall of the building and the columns to suggest that the roof of the early phase of Building C was a hybrid of both the saddle and shed types. Essentially, with a normal saddle roof (as in a 'classical' stoa building), the ridge beam sits above the central long wall and the supports (generally the outer walls or columns), that are typically equidistant from the ridge beam, hold up the ends of the roof (Hansen 1971: 226–227; for a further discussion of saddle roofs, see section 5.2). With the narrow distance between the central long wall and the colonnade, the roof of Building C could not have been built in the Classical saddle roof style.

Instead, Building C would have had a ridge beam not located above the central wall (thereby switching away from a simple couple roof or king post truss to a queen post truss or the like) or the hybrid roof system proposed by Wikander and Wikander. In the model by Wikander and Wikander (1990), the ridge beam would not have run above the central long wall; rather, it would have been short and run longitudinally over the centre of the inner rooms, likely over the wall between Rooms 2 and 3. This longitudinal saddle roof would have covered the inner rooms of Building C alone and not the portico. For the portico, a lower shed roof would have extended from below the gable of the saddle roof.

Moreover, in the final phase of the monumental complex of Zone F, Strandberg Olofsson (1986: 81–97, 1989: 163–183) argues for a similar type of roofing over Building A (Figures 4.40, 4.41). As opposed to Wikander and Wikander, who use the narrowness of the portico alone to argue for the hybrid roof, Strandberg Olofsson suggests a hybrid roof based on both the position of the colonnaded portico and the

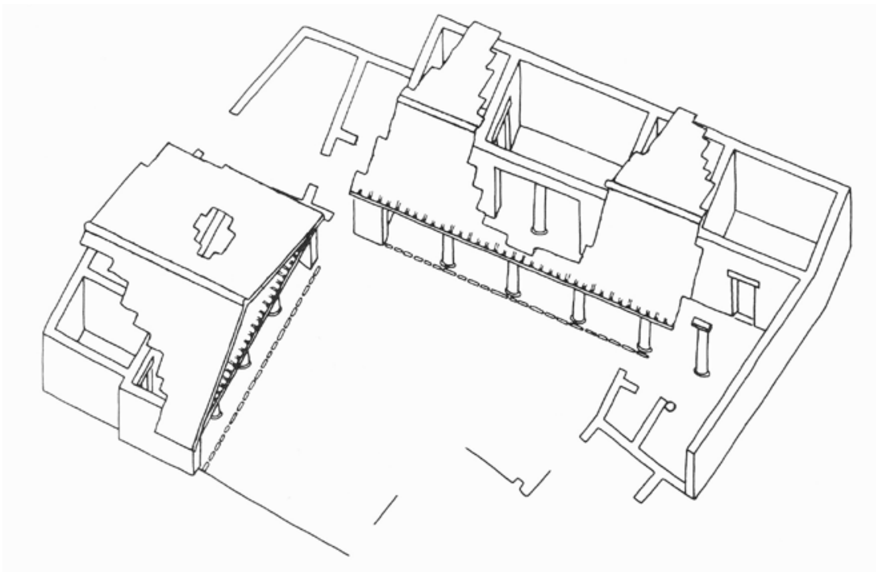

Figure 4.40. Hypothetical reconstruction of the edifici monumentali from Acquarossa (Strandberg Olofsson 1989: fig. 25, p. 180), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

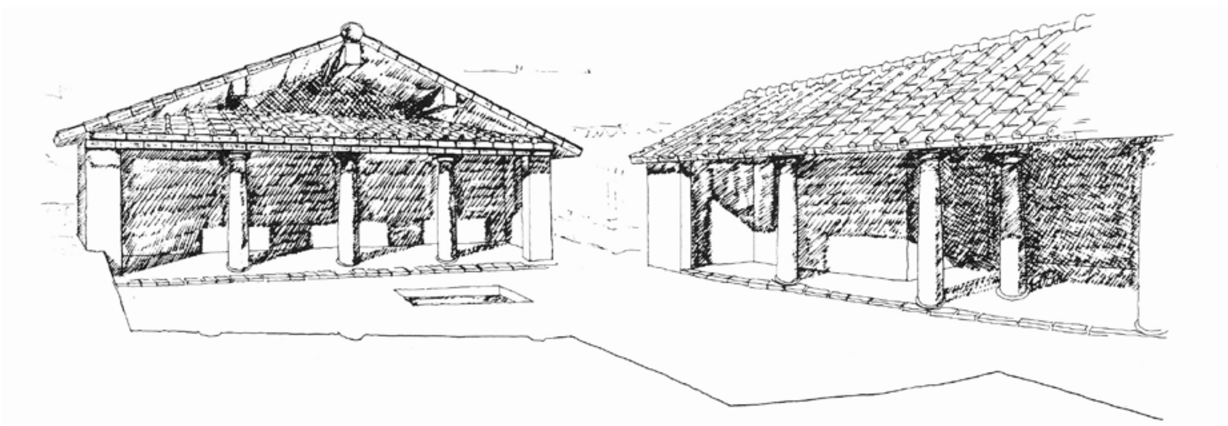

Figure 4.41. Hypothetical reconstruction of the edifici monumentali from Acquarossa Zone F (Strandberg Olofsson 1989: fig. 26, p. 181), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

distribution of roof tiles. While the most convincing part of her argument is the distribution of the roof tiles (see section 5.2.1), the position of the columns in the portico in her reconstruction, based on the discovery of two post holes in the western end of the building, helped her to gauge the size of the building (Strandberg Olofsson 1989: 180–181; Figure 4.22). Since Building A was damaged rather extensively by ploughing, the discovery of these post holes provided a number of interesting clues, particularly that the portico was narrow (in a similar way to the earlier Building C; e.g. Strandberg Olofsson 1989: 166).

While the hybrid roof style of the early Building C is also used in the final phase Building A, it does not appear to have been used again in Building C in the final phase. Strandberg Olofsson (1989: 180–182), for her part, agrees with the initial assessment of Östenberg (1983) and the other excavators that Building C had the 'classical' saddle roof, with a ridge beam centred over the central long wall (Figures 4.40, 4.41). This assessment of the roof is based, primarily, on the distribution of roof tiles (Strandberg Olofsson 1989: 182; also Wikander and Wikander 1986: 71). Yet, the location of the roof supports in the foundations of Building C also point to the 'Classical' roof.

Two column bases were discovered *in situ* at the southern end of the Building C in the final phase, with the possible location of the other three noted in excavation (Strandberg Olofsson 1989: 166; Figure 4.22). With the position of the column bases known, it is clear that the distance between the supporting columns and the central long wall was significant enough to allow for a saddle roof. However, the slope of the pitch would not have been even on both sides. The columns on the west and the back wall on the east of the building are not equidistant from the central long wall. If the central wall did indeed represent the position of the ridge beam (a likely proposition given the column base found *in situ* at the centre of the central wall) then, with the shorter distance between the colonnade and the central wall, the slope of the roof over the portico would have been sharper than the other side.

Figure 4.42. Hypothetical reconstruction of San Giovenale Area F East showing House II with a high, saddle roof (Karlsson 2006: fig. 295a, p. 161), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

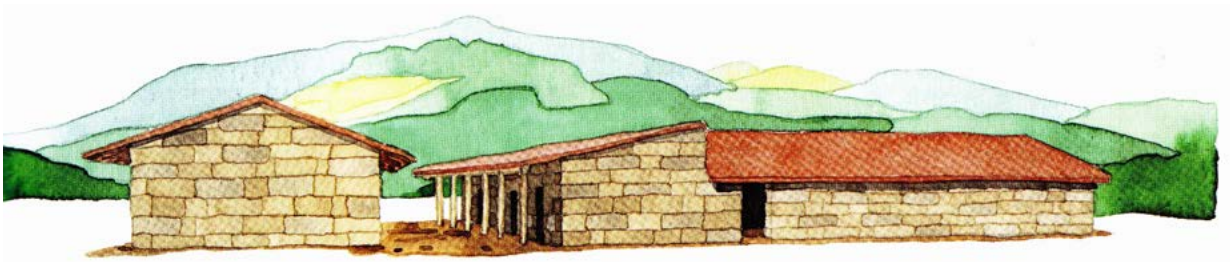

Figure 4.43. Hypothetical reconstruction of San Giovenale Area F East showing House II with a shed roof (Karlsson 2006: fig. 295b, p. 161), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

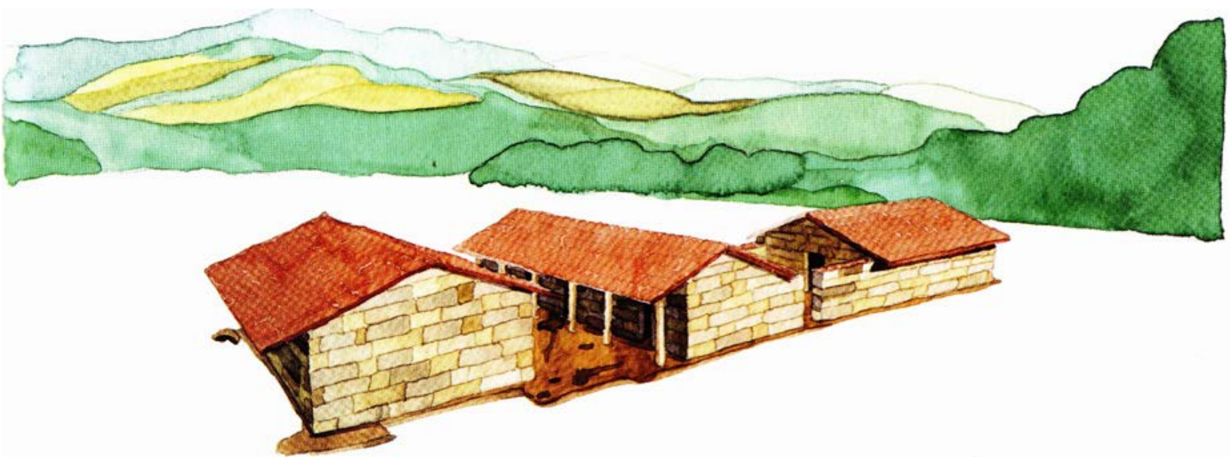

Figure 4.44. Hypothetical reconstruction of San Giovenale Area F East showing House III without a roof over Room A (Karlsson 2006: fig. 295c, p. 161), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

The roof supports in the foundations of Acquarossa Zone F are significantly more helpful in solving the complex roofing problems presented by the archaeology than in any of the other examples of Foundation Type 5. At San Giovenale Area F East, for instance, all of the buildings with Type 5 foundations were found with some sort of roof support. These roof supports, however, cannot (on their own) be used to understand the relationship between Houses II and III. Houses II and III are particularly difficult to reconstruct because of the way that they are bonded together in their wall footings (Figures 4.42, 4.43, 4.44). It is possible that both the large post holes in Room C of House II and the smaller post holes in the socle of Room A of House III play some role in the junction of the roof. Alone, however, they are not enough to suggest the nature of said junction.

However, one possible reconstruction can be discounted. In Fahlander's third depiction of Area F East in Period 3, Room A of House III is left unroofed (Karlsson 2006: 16; Figure 4.44). Given the post holes in the wall footings of Room A, this third depiction is unlikely since the added support of the post holes must have allayed the stress of the roof. In fact, a *graticcio* style wall (see section 5.1.1), is intended to hold up a wall plate as much as is intended to brace the wall, which suggests that Room A was roofed.

Although not helping to understand the more confusing relationships of the buildings, the other roof supports found in Area F East provide some clues as to how the roofs were constructed. For House I, a post hole in the west of the *in antis* portico (Room A) lined up with a stone 'pillar' in the centre of Room B (Karlsson 2006: 155; Figures 4.21, 4.37). This line of posts allows Karlsson to propose that House I had a saddle roof made of heavy tiles and held up with a king post system. Furthermore, Karlsson (2006: 158) interprets the stones laid in a line ~0.85 m to the south of House II as the footing for the wooden columns of a portico. One stone in particular, a flat white river stone, is similar to the so-called pillar in Room B of House I.

The roof supports of Foundation Type 5, typically the post holes and column bases for porticoes and, occasionally, the ridge beam, can be revelatory in themselves. The reappearance of the central post in some of these buildings, indicates that, while the roofs are covering larger spaces, complex roofing trusses (as apparent in later temples; Hodge 1960; see section 5.2.1) were not yet used to support the ridge beam. However, the roofs were far from simple, as evidenced by the hybrid roofs of some of the buildings in the monumental complex at Acquarossa.

4.2.5 Variability in Type 5 foundations

A consistent factor throughout the discussion of Type 5 foundations has been the amount of variation apparent in the techniques. Examples of the variability can be seen, for instance, in the ground preparation of the above examples. The purpose of each of the techniques used was to create a (relatively) level and stable ground surface. Yet, in practice, slightly different techniques were used, from the combination of bedrock cutting and earth deposits in Acquarossa Zone F and the Borgo at San Giovenale to the primarily earth deposits of the acropolis at San Giovenale, Veii and Luni sul Mignone. Wall footings were subject to the same variability, with a general goal apparent but different ways of achieving it. Variability is even more apparent in the sometimes scanty flooring and roof support evidence of the above examples.

Overall, the examples of Foundation Type 5 share a number of similarities, which is why they have been included together as a 'type'. The diversity of Type 5 foundation techniques is an extreme example of the variability seen in all types and with further evidence it could indicate the presence of more than a single type. Yet, Type 5 foundations appear to be a part of the same general operation sequence and that sequence not only displays variation in itself but also deviation from tradition.

In large part, variation in Type 5 foundation techniques seems to result from the size of buildings and, perhaps more importantly, the increased importance of the building unit. For all of the separate operations of the foundation sequence, the techniques used in foundations had to adapt to meet wider ground plans. Granted, size was not a factor in every variation (such as in the Borgo at San Giovenale) but the fact that some of the foundations used slightly different techniques to the others can be, at least in part, ascribed to their size.

A good example of this is the foundation of the *edifici monumentali* at Acquarossa, particularly in the final phase (Figure 4.22). The bedrock ground surface on the west side of the zone had to be significantly altered to accommodate both Building A and the courtyard. Furthermore, the extension of Building C meant that the southern part of the zone had to be raised with a soil deposit so that the ground surface of Room 5 met that of the rest of the building. The extension of Building C is also likely the cause for the addition of the roof support in the centre of the building. The space that the larger building covered was too long to be spanned by a ridge beam made of one timber. Two timbers must have been used and the column in the centre of the building could well be the evidence for it.

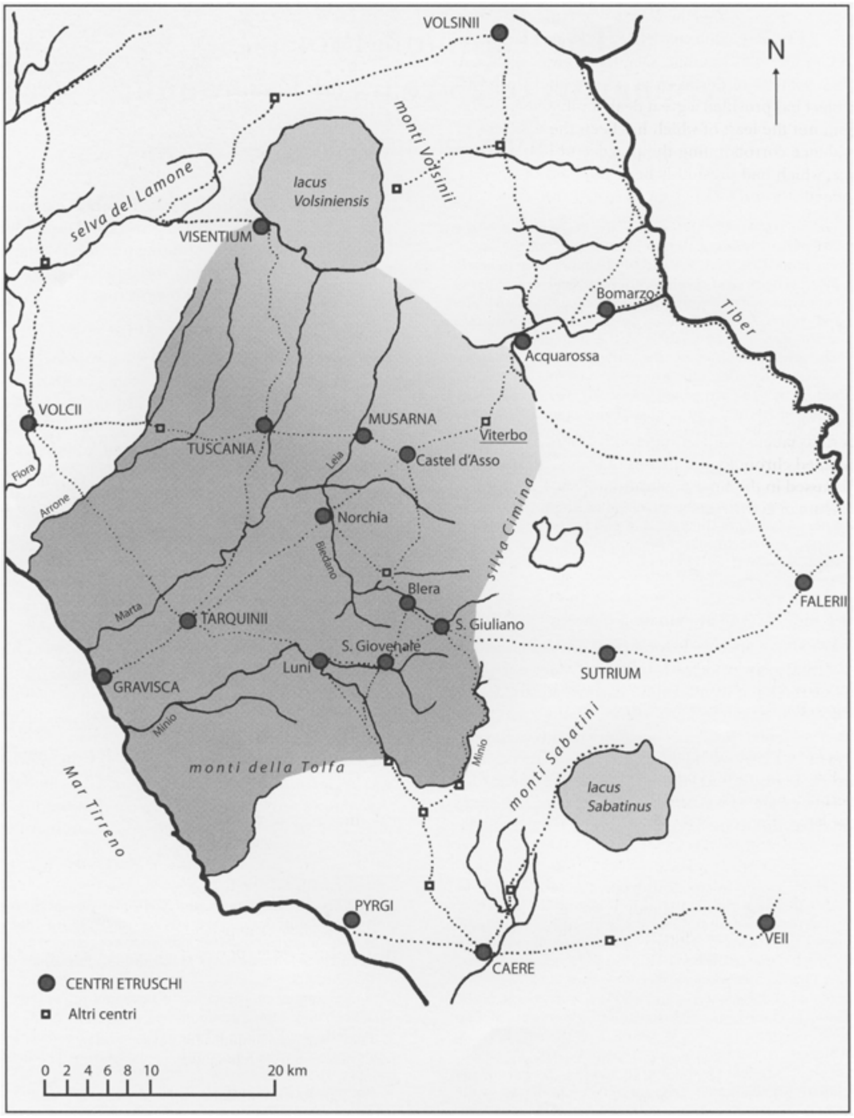

Figure 4.45. Map of the areas Tarquinia may have had greater influence (Bonghi Jovino 2010: fig. 1), courtesy of M. Bonghi Jovino, American Journal of Archaeology, and Archaeological Institute of America.

Figure 4.46. A comparison of the ground plans of major, monumental buildings from relatively contemporary urban centres (Wikander and Wikander 1990: fig. 11, p. 203), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

The increase in variability caused by the size of the building unit is also, perhaps, visible in the ground preparation of Houses II and III at San Giovenale Area F East. It is probable that Houses I and II were a part of a domestic unit (Figure 4.21). House III, being bonded to House II, may also have been a part of this unit. House I and most of the courtyard that separated House I from House II, Court A, were on or, at least, not far above bedrock. Yet, much of the wall footings of Houses II and III sat on a deposit of soil nearly a metre deep in some places. Of course, it is possible that the ground had been intentionally prepared in a way that allowed Houses II and III to sit above the remains of the earlier buildings due to some unknown socio-cultural or ritual reason. However, with Houses II and III part of a larger domestic unit, it is more likely that the buildings were set on the soil deposit to keep those buildings level with (or possibly higher than) House I.

Furthermore, the location of these sites might have been influential in the adoption of new, innovative techniques, thereby increasing the variability witnessed in the foundations. All of the Foundation Type 5 examples come from areas with well-known trade connections. Acquarossa, San Giovenale and Luni sul Mignone were satellite cities that, if not politically affiliated, were economically tied to the city of Tarquinia and overland trade with Vulci and Caere (Bonghi Jovino 2001: 12, 2005; Cerasuolo 2012; Cerasuolo and Pulcinelli 2005, 2008; Figure 4.45). Outside influences may have played a significant part in the adoption of new techniques and the location of these sites would have placed them in contact with concepts and ideas from larger centres.

A possible indication of the effects of interchange and interaction with other cultures can be seen in the shared aspects of many of the Type 5 foundation layouts. In the conclusion of their paper on the early monumental complex of Acquarossa Zone F, Wikander and Wikander (1990: 201–205) continue a long-standing discussion about the similarities between Zone F in the early period and Building A from Satricum (also Maaskant-Kleibrink 1987: 99; Turfa and Steinmayer 1996). They mention the previous arguments by Ampolo (1971: 443–460) and Scheffer (1990: 185–191) about the relative similarities between the Roman Regia, Athenian Agora, the Upper Building at Poggio Civitate and Building A at Satricum. Wikander and Wikander (1990: 202–203), for their part, appear to consider the early monumental complex as a part of the same architectural style and, perhaps, the requisite, Mediterranean-wide princely culture that went with it (Figure 4.46).

Many of the concepts discussed in this subsection reveal the wider issues that fit together to create the variability of what, on the surface, appears to be merely architectural in nature alone. While these concepts have been brought forth here, they go beyond the foundation techniques themselves and are a part of a longer, more detailed discussion of the stimuli behind architectural change – a discussion that can be found later in this book. Nevertheless, it was necessary to point out the existence of these concepts here, in this subsection, since their effects on Foundation Type 5 are so pronounced.

4.3 Conclusions

Two different foundation types have been presented in this chapter. As in Chapter 3, these types are composed of foundations that display similar techniques. Techniques are identified using descriptive analyses of archaeologically evident remains of permanent domestic structures. Along with identification, broader interpretations of the foundation sequence are made by comparing types. From identification and interpretation, the technological evidence for foundations lead to wider conclusions about Etruscan architectural change.

When interpreted alongside the findings of Chapter 3, a transition is apparent in the foundation evidence of the late-seventh and sixth centuries. Many of the techniques of Foundation Types 4 and 5 imply the continuation of traditional architecture, reflecting the continuity of foundation techniques from the Bronze Age architectural traditions to the Iron Age and early Orientalising period (i.e. Foundation Types 1, 2 and 3). Yet, both habitual and active innovations of technique are archaeologically visible and identifiable in the evidence of Foundation Types 4 and 5.

As explained in Chapter 2, a change in technique or technology is the result of a combination of stimuli that influence individual action (see section 2.1.3). Through the identification of techniques over time, change to behaviour in relation to architecture can be documented. Moreover, it is possible to uncover the stimuli that instigated these documented changes through broader comparison and interpretation of building techniques.

The following conclusions are divided between the identifiably traditional and innovative techniques within each foundation type. Recognising the maintenance of techniques on the one hand while noting the altered/new techniques on the other marks the ways in which changes to the operational sequence of foundation creation and use resulted in an archaeologically visible transition. Following on from the conclusions on Foundation Types 4 and 5, the discussion is broadened to answer whether there is a transition between the 'hut' and the 'house'.

4.3.1 The traditional and innovative techniques of Foundation Type 4

Type 4 foundation techniques are, for lack of a better term, an evolution of Foundation Type 2. In nearly every way, the traditional techniques, which in this case characterise Foundation Type 2, were expanded on and reengineered to create the innovations seen in Foundation Type 4. These innovations changed the applicability and the capacities of the traditional techniques, distinguishing the two types.

Despite their adaptation, traditional techniques are still present. A number of the differences to the traditional foundation techniques, namely in the wall footings, have already been highlighted above. Underlying these differences are a number of similarities that point out the traditions behind the Type 4 foundation techniques. For instance, while the ground preparations of the individual Type 4 foundations were not exactly the same from site to site, the general concept behind Foundation Type 2 ground preparation techniques continued in the Type 4 foundations.

Every Foundation Type 4 example was built with a soil deposit. At some sites, of course, this meant setting the wall footings on virgin soil and then building a levelling layer of soil up around them, while at others the levelling deposit was built first and then cut into when the wall footings were laid. Regardless of the differences in the interplay between ground preparation and wall footing (which, in itself, is substantially more complex than Foundation Type 2), none of the Type 4 foundations were sited on bedrock. Furthermore, prior to the Type 4 foundations, only examples from Foundation Type 2 were built using levelling soil deposits. Although the Foundation Type 3 examples from Acquarossa were indeed built on soil, they did not contain a levelling layer of soil but were instead cut into virgin earth.

Little about wall footing techniques seems the same between Foundation Types 2 and 4 besides the obvious: both have cobble socle wall footings. Even the composition of the socles was more complex in the Type 4 foundations than those in Type 2. The layouts of the buildings are also different, with many of the entrances to Type 4 foundations in the long ends of the building instead of the short ends.

Despite these differences, by using the same socle wall footings on the exterior of buildings as in the interior room divisions, Foundation Type 4 continues a tradition begun in the rectangular versions of Foundation Type 2 at Lago dell'Accesa. In every example of Foundation Types 1, 2 and 3, except for the Type 2 foundations at Lago dell'Accesa, the internal walls footings (where they existed) were less robust than their external counterparts and are therefore not generally considered to be load-bearing. In the later Type 2 foundations, as seen most explicitly in Complex II of Lago dell'Accesa Area A, the interior walls footings were composed in the same way as the exterior, suggesting that they may have been load-bearing. The utility of the interior walls in the support of the roof as a concept appears to continue (or even evolve) in the Foundation Type 4 examples. These two concepts, levelling the ground surface with soil deposition and the use of interior walls as roof supports, join the cobble socle as the main traditions adopted from Foundation Type 2 in Foundation Type 4.

In comparison to the differences between Foundation Types 1 and 2, the innovations to Foundation Type 4 techniques were usually not conceptual. Instead, Foundation Type 4 incorporated the traditional concepts with innovative design and construction, creating something altogether new. The development of new designs and constructions in Type 4 foundation techniques allowed for buildings that could not have been constructed in Foundation Type 2. This sort of habitual innovation in foundation techniques might have been caused by a desire to increase the efficiency of foundations, especially since the underlying concepts had not changed from tradition. However, the efficiency of the technology is not the only obvious reason for innovation. Rather, the need for better efficiency perhaps alludes to other possible stimuli.

In ground preparation, the soil deposit of most Type 4 foundations was done on a wider scale than traditionally. The innovation to the design of ground preparations is clearly evident at sites such as Lago dell'Accesa and Poggio Civitate. Essentially, rather than design the ground surface for an individual building, in Foundation Type 4, the design incorporates the development of a building unit and therefore the foundations of more than a single structure.

The reason behind the change in design appears to be the social concept of a building unit, already discussed above. In some cases at Lago dell'Accesa and at Poggio Civitate, around the beginning of the sixth century BC, multiple buildings set around an open space appear to be used as a single domestic unit. This use of structures and the preparation of the ground surface for more than the buildings themselves (in what is referred to above as a courtyard) is a radical departure from (what appears to be) the single structure unit of tradition. The reasons for the new social conception of domestic space in settlements that resulted in the multiple structure building unit is complex change to the built environment explained further in Chapter 7 (see section 7.2.1).

As in ground preparation, the design of wall footings changed substantially from tradition. Part of this change to design was the alteration of how socle wall footings were constructed. Functionally, the innovations in the design and construction of Foundation Type 4 wall footings (i.e. the addition of the number of courses and the use of larger stones as the outer skins, respectively) made the wall footings more efficient as a foundation. With the extra courses below ground and a stronger overall structure, stability in walls increased, which in turn allowed for greater weight.

Buildings with Type 4 foundations generally differed from their traditional counterparts; they show evidence of tile roofing (Camporeale 1985a: 130–131; Perkins and Attolini 1992: 76; Phillips 1992: 19). Heavier roofs may therefore be the reason for making wall footings more efficient. Phillips (1992: 15), in particular, alludes to the weight of tiles and the roof structures that held them. Since the majority of the Foundation Type 4 examples did not have roof supports besides the walls, the weight of the roof would have been transferred directly through the wall footings.

Efficiency of the techniques used in the Foundation Type 4 is thus a stimulus behind the habitual innovation in the design and construction of wall footings and roof supports. This efficiency was required in order to match the change in architectural technology. Interestingly, this change in technology, the tiled roof, is an innovation itself and the result of another set of stimuli. The next chapter, which discusses the techniques used in roofing, will describe the reasons behind that architectural innovation.

4.3.2 The traditional and innovative techniques of Foundation Type 5

While a number of the Foundation Type 5 innovations were previously discussed, comparatively little has been said regarding the apparent architectural traditions. In the evidence for Type 5 foundations, there is a surprisingly small amount of obvious traditional influence. However, a number of the basic concepts for building foundations seen in previous types seem to have some influence in the creation and use of Type 5 foundation techniques. Of course, these conceptual similarities could ultimately be applied as 'traditional' in the discussion of many domestic buildings in the western Mediterranean.

For ground preparation, the hybrid nature of the techniques used in Foundation 5 was not necessarily traditional. Despite the difference in nature, the manipulation of bedrock to create a level surface is reminiscent of Foundation Types 1 and 3, while the creation of soil deposits and terraces are evidenced in Foundation Types 2 and 4. The only other distinctly hybrid case of ground preparation in traditional examples is Oval Hut I from San Giovenale Area E. In fact, a number of similarities between Oval Hut I and buildings in the Borgo, such as Building A, are apparent. Both buildings were on the edge of their respective plateaus and made level using a terrace of soil with a retaining wall. However, the terracing and bedrock levelling of Oval Hut I was significantly less intensive than at the Borgo, which suggests that although the concept may have been the same, the design and construction were significantly different.

The ashlar masonry style wall footing used in the Type 5 foundations also differed in nature from previous types, although some traditional concepts are evident in the examples. For instance, in many of the bedrock settings for the stones, a shallow groove was cut to house the wall footings, as in Building A of Acquarossa Zone F (Strandberg Olofsson 1989: 166–171). If the wall footings were also set into a foundation trench cut through the soil, as many of the examples appear to be, then the setting of wall footings was not entirely different in concept from the Foundation Type 1 channels. Yet, this comparison between Foundation Types 1 and 5 is a bit extreme, considering that foundation trenches were a relatively common method for creating wall footings.

If, as discussed earlier in this chapter, the Foundation Type 5 wall footings were indeed more often a socle rather than just the base of full walls, then perhaps Foundation Type 5 was a further adaptation in the design and construction of Foundation Type 2 wall footings. The same architectural stimulus behind the Foundation Type 4 innovation in wall footings drove the innovation of ashlar socle wall footings. Evidence for the weight of the roofs can be seen in the addition of a central line of columns in many of the buildings with Type 5 foundations. Both Strandberg Olofsson (1989) and Karlsson (2006) consistently refer to the weight of tiles as a factor in the construction of buildings on the acropolises of Acquarossa and San Giovenale.

As for the other innovations of Type 5 foundation techniques, the variability in the creation of Type 5 foundations indicates that the stimuli for innovation were usually based on specific individual contexts. For many of the buildings, the adoption of new or different techniques is an architectural necessity often caused by building location. Reasons for innovation based on the nature of the terrain ties the creation of Type 5 foundations once again with Oval Hut I from San Giovenale Area E and its hybrid foundation. As with Oval Hut I, many of the Foundation Type 5 examples were innovations of necessity, created by replicating previously preferred techniques (i.e. traditional techniques) in an innovative way.

Moreover, the reason the context of the building becomes complicated enough to provoke innovation is due, in most cases, to social stimuli. The extension of Building C in the last phase of Acquarossa Zone F forced the builders to set the wall footings of Room 5 on a soil deposit, a variation of the usual Foundation Type 5 wall footing resulting from the local terrain. However, the extension of Building C is the result of the vast expansion project that created the *edifici monumentali*. It is possible that the extension of Building C was done because it better enclosed the central courtyard created in that final phase. Regardless of the social reasons for its addition, the setting of Room 5 on soil kept the entirety of Building C at the same level as the rest of the complex.

The *edifici monumentali* are not exclusive examples of the social stimuli behind the variation in Foundation Type 5. The settings of Houses II and III at San Giovenale Area F East in Period 3 were not on bedrock (as expected of Type 5 foundations) but were instead set up to a metre above the bedrock either out of ritual deference to the buildings that once occupied that location or (as is more likely) so that they were at an even level with the surrounding buildings, particularly House I. Therefore, in both of these examples (and for the variability in other buildings besides), the increase in Foundation Type 5 variability over time is a product of social stimuli stemming from the relation of the new foundations to other, nearby buildings.

Foundation Type 5 is a critical phase of architectural innovation in the domestic buildings of Etruria. Although affected by many of the same stimuli as Foundation Type 4, the concepts that created Type 5 foundation techniques were not the product of habitual innovations derived from earlier traditions. The techniques used in Type 5 foundations were often based on the nature of the specific local environment and the active innovations seen in Foundation Type 5 seem to react to the changing makeup of society.

4.3.3 Is there a discernable difference in the foundations between a 'hut' and a 'house'?

The increased complexity of building foundations in Etruria over time is witnessed in the discussion of foundation techniques described both in this chapter and in Chapter 3. Innovations in the foundation techniques over time fall into two main categories. The first category is comprised of habitual innovations, which incorporate the traditional concept underlying the foundation technique but then alter its design or construction. For instance, in Foundation Types 4 and, possibly, 5, the socle wall footings were alterations of the design and construction of the traditional Foundation Type 2 techniques. The second category is made up of active innovations that do not have a traditional derivation, at least in prior Etruscan domestic foundation techniques. An example of this is the ground preparation techniques used in Foundation Type 2, where the addition of soil to level the ground surface was not common in Etruria prior to the development of Type 2 foundations.

The presence of traditional techniques can be followed through time either in the continuance of their construction or in their appearance in the underlying concepts of habitual innovations. A simple line of progression can be traced from the earlier to the later types through the recognition of the traditional techniques in each foundation type. It is where the active innovations are found (i.e. when a foundation technique appears that has no traditional derivation) that a fundamental shift in architecture might be said to have occurred. This shift could be fundamental enough to be considered as the transition from 'hut' to 'house'.

Some of these shifts help define types and separate foundations with innovative techniques from other types, as in the use of ashlar masonry in the wall footings of Foundation Type 5. Since many of the types are defined based on innovations in ground preparation and wall footings, some of the major shifts in other foundation attributes often appear to have made little difference to the designation of type. The best example of this is the portico roof support foundations in Period 2 House I of San Giovenale Area F East. It is the only Foundation Type 3 example with evidence of a portico (Karlsson 2006: 142–153; see section 3.3). The shift is critical to understanding the building overall but has only a secondary effect on the foundation techniques overall, which is why it was not a factor in the original designations of type.

In summary, the eighth-century BC examples from both Foundation Types 1 and 3 displayed traditional techniques in ground preparation and wall footings, except for the carved bedrock shelf wall footings of House I, which are unique. Ground preparation techniques in Type 2 foundations were actively innovative in their addition of soil deposits. Conversely, Type 2 wall footing techniques are traditional, although the layouts of the wall footings in early Type 2 foundations look similar to that of Foundation Type 1 examples. Foundation Type 4 ground preparations and wall footings were habitually innovative, derived from Foundation Type 2. It is also possible that Foundation Type 5 wall footings were habitually innovative but their preferential setting on bedrock indicates an active innovation. Although the typical ground preparation of Foundation Type 5 incorporates earlier traditions, the overall variability indicates active innovation.

Both of Foundation Types 4 and 5 have innovative techniques in ground preparation and wall footings. The earliest types, Foundation Types 1 and 3, were traditional. Yet, Foundation Type 2 is perhaps the most interesting due to its innovative ground preparation. Despite the fact that the Foundation Type 2 buildings could be considered 'huts', their use of innovative ground preparation techniques in tandem with evidence that they replaced the traditional Type 1 foundation techniques suggests that Foundation Type 2 was itself a transition away from tradition.

Based on foundations alone, it is possible to recognise a clear difference between earlier 'huts' and later 'houses'. Within the space of a hundred years, the traditional forms of foundation are replaced by Foundation Type 2. By the beginning of the sixth century BC, Foundation Type 1, which was the traditional form of architecture for hundreds of years, does not even seem to factor into the conceptualisation of foundations. Foundation Type 2 techniques can be viewed as the transitional form of foundations that led to the further innovations of Foundation Types 4 and 5.

Chapter 5: The walls and roofs of Etruscan domestic structures, 800-500 BC

Typically, interpretations of walls and roofs are used to describe and classify Etruscan domestic architecture. Yet, as opposed to foundations, walls and roofs do not survive particularly well. This chapter initially assesses how techniques used in the creation of walls and roofs have been identified and interpreted. Following on from this assessment, I consider the treatment of the archaeological evidence in the literature and attempt to re-evaluate it. Building on this re-evaluation, I discuss the value of the common explanations for technological shifts, endeavouring meanwhile to show the apparent traditional and innovative techniques used in the walls and roofs of domestic buildings. This chapter, as those before it, acknowledges the supposed transition from 'hut' to 'house' and tracks the ways in which technological change signals an evolving society.

As was pointed out in Chapter 3, defining the different parts of a building can be difficult given the interdependency of the constituent parts of a structure. In this study, foundations have been defined as including all building components that transfer the weight of the building above into the ground through direct contact or prevent soil deformation. Wall footings, therefore, are considered as foundations. This distinction fits well with the modern definition of wall: "(a) wall may be defined as a vertical load-bearing member, the width (i.e. length) of which exceeds four times its thickness" (Punmia et al. 1993: 321).

Walls, for the purposes of this study, take on the informal definition, "each of the sides and vertical divisions of a building" in addition to the more technical, architectural definition given above (Oxford University Press 2013). The result limits walls to essentially the intermediary surface between the wall footings in the foundation (which are archaeologically intact) to the wall plates in the structure of the roof (which are more or less assumed: Wikander 1988: 49–50). Despite its seemingly simple definition, there are a variety of ways in which a wall can be constituted. Based on recognising trends in the various wall-building techniques, previous interpretations that view variation as changing complexity in walls over time have led to an overall narrative for the development of early Etruscan architecture. Re-evaluating the evidence for walling techniques tests these interpretations and thus challenges our conceptions of architecture.

Defining the parts of the building that make up roofs is also straightforward. Any technique used to cover a structure is a roofing technique. As with the definition of foundations, this definition includes techniques that work in conjunction with the walls (i.e. wall plates are a reflection of the wall footings). Distinguishing roofs from walls (and even from foundations) in this way does not signify separation in the operational chains of building construction. Rather, these building concerns are subsets of the greater whole (as explained in section 2.2.1).

This chapter is divided into two, based on walls and roofs. The first section on walls is significantly longer than the second. Its comparative length is the result of two factors. First, the identification of techniques used in walling (both the methods and evidence used in identifications) is often unclear in the literature and needs to be clearly defined. Second, many interpretations of walling techniques must be re-examined, partially as a result of the focus on identification. While walls are certainly more thoroughly discussed in this chapter, roofs are not considered less relevant or less important to the overall understanding of Etruscan domestic architecture.

5.1 Walls

A variety of wall building techniques are described in the literature. Usually, these techniques have been associated with two broad categories: walls made of wattle or pisé and walls made of mud brick or stone. These categories have gradually become rigid classifications over time, justifications of an architectural transition between the 'hut' and the 'house'. As Domanico (2005: 513) explains, a problem with the study of ancient architecture in central Italy is one of terminology where "la cabane étant une structure provisoire construite en bois, la maison, au contraire, une structure solide construite en pierres ou en briques." Therefore, this section aims to clarify the techniques of wall building. As will be made clear, this clarification tests the dichotomy between 'hut' and 'house' by breaking down commonly held concepts and applying a clarified terminology to the available archaeological evidence.

5.1.1 Defining non-stone walling techniques

Based on the published literature, the non-stone walling techniques used in Etruscan buildings are difficult to define (and thus to identify), particularly compared to their stone counterparts. The prevailing interpretation of Etruscan walling is partly to blame. Traditionally, walling is thought to have progressed in evolutionary steps from wattle and daub to mud brick and stone (Boëthius and Ward-Perkins 1970: 27–28; Prayon 1975: 128–129, 178–179; Torelli 1985: 21–32). Although challenged recently, this evolutionary progression of walling underlies nearly every discussion on walls.[38] In order to support this progression, the literature often emphasises materials and attempts to discern a material transition (see section 6.4). From this material-based understanding of walling, the building techniques are secondary. Confusing terminology has resulted.

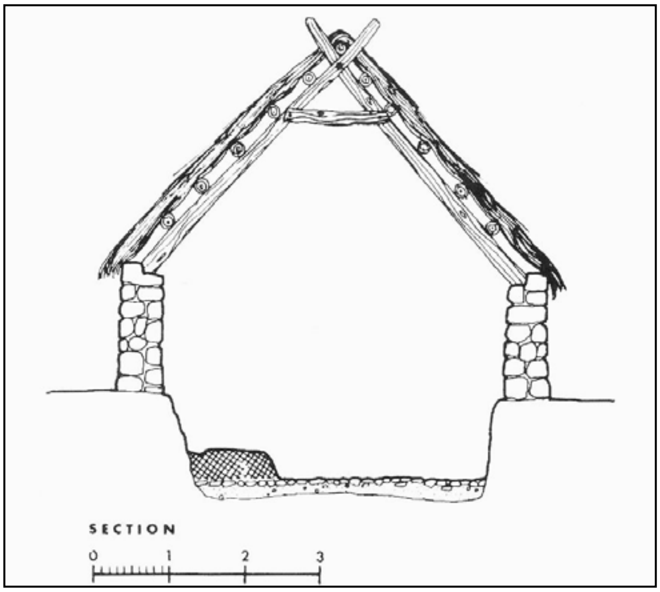

Figure 5.1. Illustrated reconstruction of the self-supporting walls of the Northern Bronze Age Building at Luni sul Mignone (Hellström 2001: fig. 4, p. 167), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Important in any discussion of walls is an analysis of the structural techniques that not only support the wall itself but also hold the building (and most vitally the roof) upright. Unfortunately, the other component in walling, infilling, usually receives more attention since the published literature is often based on material composition. Three types of structural techniques were used in non-stone walls: self-supporting, timber framing and a combination of self-supporting and timber framing. Self-supporting walling techniques are relatively self-explanatory (Figure 5.1). They carried their own weight, as well as any extra stresses found in the rest of the building (Genovesi 2001). Timber-framed structures were notably different (Figure 5.2). Timber posts and beams bore the brunt of the building stresses, carrying the weight of the wall and the roof (with one of the best, *in situ* examples from the Bronze Age structures at Nola; Livadie et al. 2005). The remaining type of structural techniques

38 Some, such as Donati (2001: 321–323), represent variety in walling techniques as a result of the functional nature of material procurement and use more than as a choice of mud brick and stone over earth and wood.

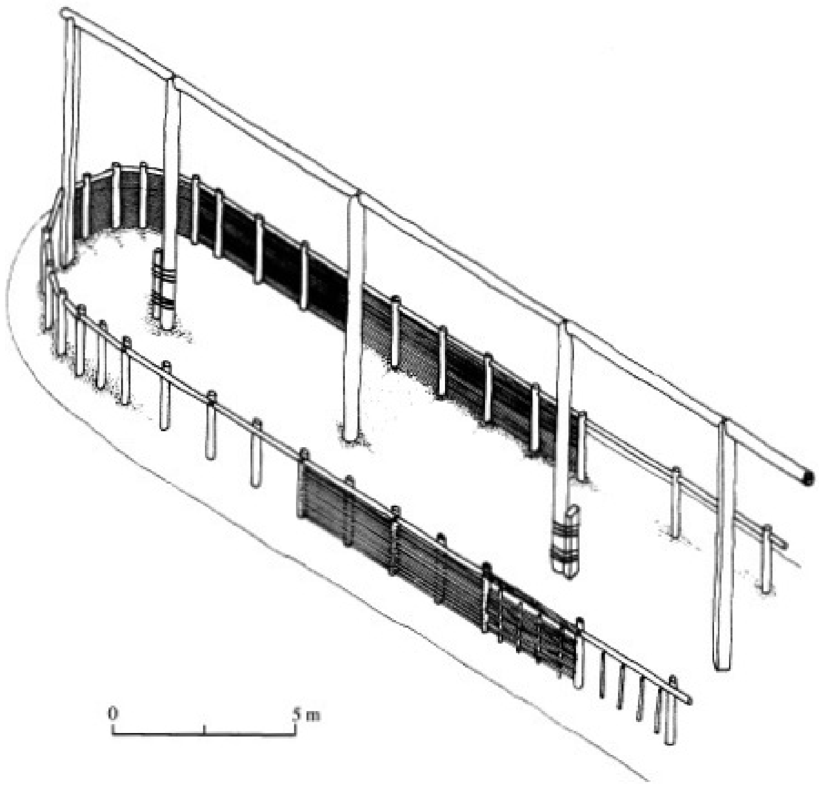

Figure 5.2. Illustrated reconstruction of the timber frame of House 4 at Nola (Livadie et al. 2005: 205).

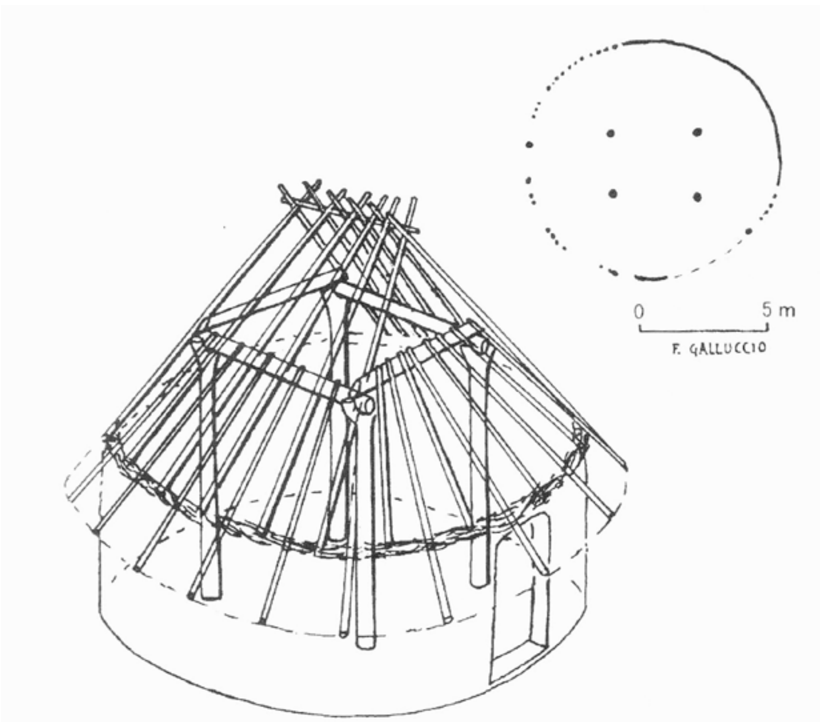

Figure 5.3. Illustrated reconstruction of Capanna D at Ficana with both self-supporting walls and timber frame roof support (Brocato and Galluccio 2001: fig. 36, p. 307), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

also supported the weight and other stresses of the building using timber posts and beams but this timber 'frame' was separate from the walls (Acconcia et al. 2009: 23–25; Brocato and Galluccio 2001: 306–308; Figure 5.3).

Along with the design of the structural components, three main infilling techniques, often defined by their material composition, comprise non-stone walls. Their definition has been debated between those wishing to combine alternate (and, often, quite different) techniques together under a simple heading (e.g. Stoddart 2009: 69) to those who encourage differentiating walls based on both structural and infilling techniques, as well as by strict definitions (e.g. Bartoloni 2012a; Donati 2001). Here, the infilling techniques are split into three broad types: wattle, pisé and mud brick. In addition to defining the infilling techniques based on their composition and the typical building materials associated with them, evidence of their use with structural techniques is also described. Defining the different techniques used in non-stone walling allows for clearer identification of the techniques in the evidence later in the chapter.

5.1.1.1 Wattle

Analyses of wattle as a walling technique are not common in literature on Etruscan architecture. Frequently, scholars have combined wattle with similar infilling (and even structural) techniques, making wattle a heading for non-stone buildings in general. Alternatively, it has been assumed as a component in other walling techniques. Primarily, it has been viewed as an inferior technique used only in primitive structures. These issues, along with the use of the term 'wattle' itself (a term for a wide range of associated techniques that can be significantly different from culture to culture), led to such a muddled definition.

The definition used here is based on studies of central and southern Italian wattle from different periods. In Italy, wattle was generally made of a line of interwoven, dry stalks of cane (*Arundo donax*) or thin poles of wood (Ammerman et al. 1988: 125–128; Brocato and Galluccio 2001: 288–289, 297–299; Erixon 2001: 453). In a timber frame structure, the resulting latticework was then placed between the main structural posts of the wall (Figure 5.2). Finally, the wattle was (in most cases, although not all; e.g. Negroni Catacchio 1995: 302–303) covered in an argillaceous daub between 14-18 cm thick, a process meant to shield the wattle from rot (Ammerman et al. 1988: 127).

In a number of works, particularly in older texts on Etruscan architecture (e.g. Boëthius and Ward-Perkins 1970: 13–15; Malcus 1984: 38–39; Pohl 1977: 13–27), it is unclear which structural techniques were used in buildings with wattle walls. Evidence provided by research on modern structures overwhelmingly suggests that a structure supported by walls of pure wattle and daub would be nearly impossible. Instead, a timber frame, either within or in conjunction with the wattle walls, was the structural component required to sustain building stresses.[39]

A timber frame, in the context of wattle walls and Etruscan domestic buildings in general, does not create a wall that is predominantly composed of timber, such as in a log cabin. To Vitruvius (*De Arch.* 2.1.4), for example, such use of timber in construction was (quite literally) foreign and could only occur in places outside of the Mediterranean where there was a vast abundance of large hardwoods. Timber frames associated with wattle walls were restricted by local wood supply (see section 6.2.2) and the structural requirements of the building style (e.g. Brocato and Galluccio 2001; Erixon 2001: 455–457).

The timber frames of wattle walls are mentioned in recent literature. For instance, Donati (2001: 317)

39 Direct evidence of the extensive use of timber in wattle structures was found in the well-preserved site at Piana di Curinga (Ammerman et al. 1988: 126–128). The use of timber is further demonstrated in the modern *capanne* described by Brocato and Galluccio (2001: 288–294).

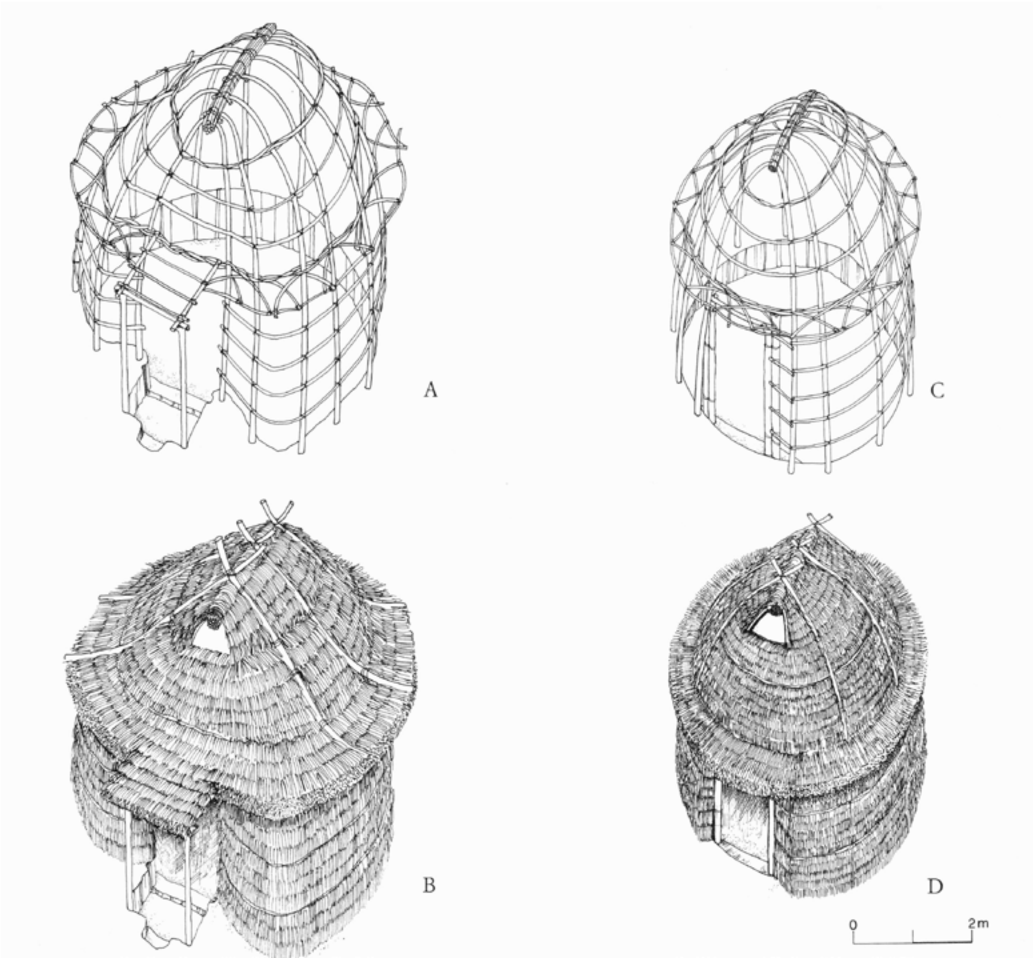

Figure 5.4. Illustrated reconstructions of Capanne 1 and 2 at Sorgenti della Nova Section I, with timber frame (Negroni Catacchio 1995: 318), courtesy of Istituto Italiano di Preistoria e Protostoria.

regards the creation of the wooden posts and beams in the wattle walls as critical in carrying the stresses of the roof. Bartoloni (2012a: 255) echoes Donati and further describes evidence for an extra wooden superstructure found as, what is often assumed to be, a structural reinforcement of the roof. Even older texts (e.g. Boëthius and Ward-Perkins 1970: 16) note the use of wooden posts in the support of the roof, yet they rarely discuss a wooden frame *per se*.

Although there are descriptions of timber frame structures throughout the definition of wattle as a walling technique, the term 'timber frame' itself rarely appears. The reason for this omission might be purely the result of terminology, especially since most of those writing on Etruscan architecture do not argue for the existence of self-supporting wattle walls. Compared to the prepared timbers used in later Etruscan (especially ritual) architecture (Hansen 1971: 226; Hodge 1960; Turfa and Steinmayer 1996), the timbers in an Iron Age *capanna* are often portrayed as hardly prepared beyond shaping and trimming. In Etruscan scholarship, proponents of an evolutionary progression advocate that the use of advanced timber framing styles (i.e. paling and half-timbering) in the seventh century is evidence for a drastic architectural transition away from non-stone structures (e.g. Bartoloni 2012a: 266–267; Izzet 2001a: 42, 2007: 152–153; Steingräber 2001a: 26). Their reaction to advanced timber framing techniques indicates that there is a possible avoidance of the term 'timber frame' for earlier structures in order to distinguish the development of the structural technique in the established progression.

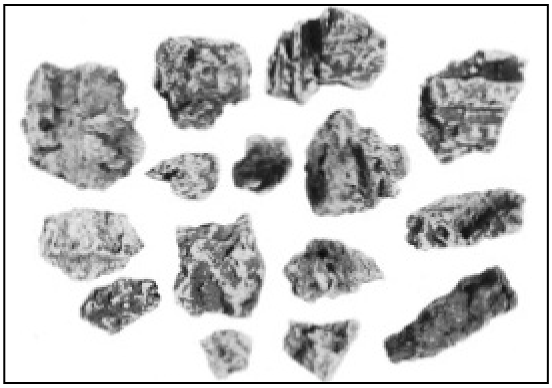

Figure 5.5. Fragments of daub from House I at San Giovenale Area F East (Karlsson 2006: fig. 272, p. 147), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

5.1.1.2 Wattle vs. graticcio

The problem with the common definition of wattle extends beyond the insufficient referencing of timber framing. However, the problem remains one of terminology and, to a large extent, how to identify advanced timber framing when discussing wall composition. Differing descriptive terminology for half-timbering between Italian and other languages (primarily English) is one of the reasons why it is so difficult to define wattle and its place with regard to timber framing.

'*Graticcio*' is the Italian word often used to describe half-timbering. Similar to its Latin root, *craticium*, '*graticcio*' describes an advanced timber frame that uses secondary beams and posts throughout the structure. In the literature, it is distinct from the timber frame used in early *capanne*, appearing chronologically later than those early structures (e.g. Bartoloni 2012a: 266; Donati 2001: 317). However, '*graticcio*' is dissimilar to 'half-timbering' or '*opus craticium*', which describe only the advanced timber frame. '*Graticcio*', in contrast, describes both the timber frame and its non-structural infill, which in nearly every case appears to be wattle.

This association of wattle with a particular form of structural component results in an often misleading description of walling techniques, such as in one of the monographs on Acquarossa and San Giovenale (Wikander and Roos 1986). Vidén (1986: 56) frequently uses the term '*graticcio*' when describing half-timbering alone but, later in the same volume, Wendt (1986: 58–59) uses '*graticcio*' primarily in her description of a wattle infill in loose connection with half-timbering. This definition of '*graticcio*' is also seen in Camporeale's (1985a: 129–130) work on Lago dell'Accesa and in Donati's (1994: 33, 93) on Roselle where the word refers to both wattle and half-timbering interchangeably. In those instances, the positioning of '*graticcio*' next to 'pisé' and 'mud brick' ('*mattoni crudi*') makes it unclear whether those sections analyse structural components or the entire composition of the walls, especially since evidence of pisé, mud brick and even stone infilling for walls with half-timbering techniques exists (Bietti Sestieri and de Santis 2001; Conway and Roenisch 1994: 127–128; Davies and Jokiniemi 2008: 181).

Wattle is therefore often *implied* by the term '*graticcio*' although not necessarily intended. This confusing mixture of wattle with half-timbering is usually the result of the use of the term '*graticcio*' or its translation to English. However, there are other reasons for the mixture of the two, including an inclusion of non-stone techniques under the name 'wattle and daub'. Stoddart's (2009: 3, 69–70) description and use of 'wattle and daub' is a prime example of this problem, particularly in the description of architecture where he refers to wattle and daub as a catch-all phrase for all walls constructed in timber or, at least, all walls constructed before the widespread use of stone. The result of this broad application of the term 'wattle' creates confusion of a different and, in fact, opposite kind to that of the problems with '*graticcio*', where the infilling techniques of a wall are given at the expense of an understanding of the complexity of its structure.

In contrast, Karlsson (2006: 146–148) is one of the few to recognise that half-timbering and wattle walls are independent techniques used in the construction of a wall. Writing about House I at San Giovenale Area F East, he points out that a wattle and daub infill would have been used in tandem with a half-timbered structure. His stance is partly justified by the evidence found at San Giovenale, which points to the use of cane in the wattle lattice rather than the larger, likely wooden, posts that would have formed *opus craticium* walls.

Perhaps in order to avoid confusion altogether, most of the publications on Sorgenti della Nova do not use the terms '*graticcio*' or 'wattle' (Cardosa and Passoni 2004; 2002a, 2002b; Massari 2003; Negroni Catacchio 1995; Negroni Catacchio and Domanico 2001). Instead, the proposed walling techniques are described in full, structure by structure. Addressing the definition of each technique in this way creates a clear separation between wattle as a wall fill and timber framing as a load-bearing component. In doing so, the prevalence of differing forms of wattle has been highlighted and, furthermore, the results suggest that daub is not always an associated feature (Negroni Catacchio 1995: 301–307).

Although the terminology is undoubtedly problematic, perhaps this misleading combination of wattle and half-timbering is indicative of the complementary uses of the two techniques. The technique of half-timbering (as seen in ancient examples such as Herculaneum and in modern *capanne*) significantly reduces the gap between the main structural posts in the frame and thereby decreases the required amount of materials in a wattle lattice, or any other infill for that matter (Harris 2006: 13–23; Livadie et al. 2005; Wallace-Hadrill 2011; Figure 5.6). The combination of half-timbering and wattle may therefore have been a result of resource management, at least in part.

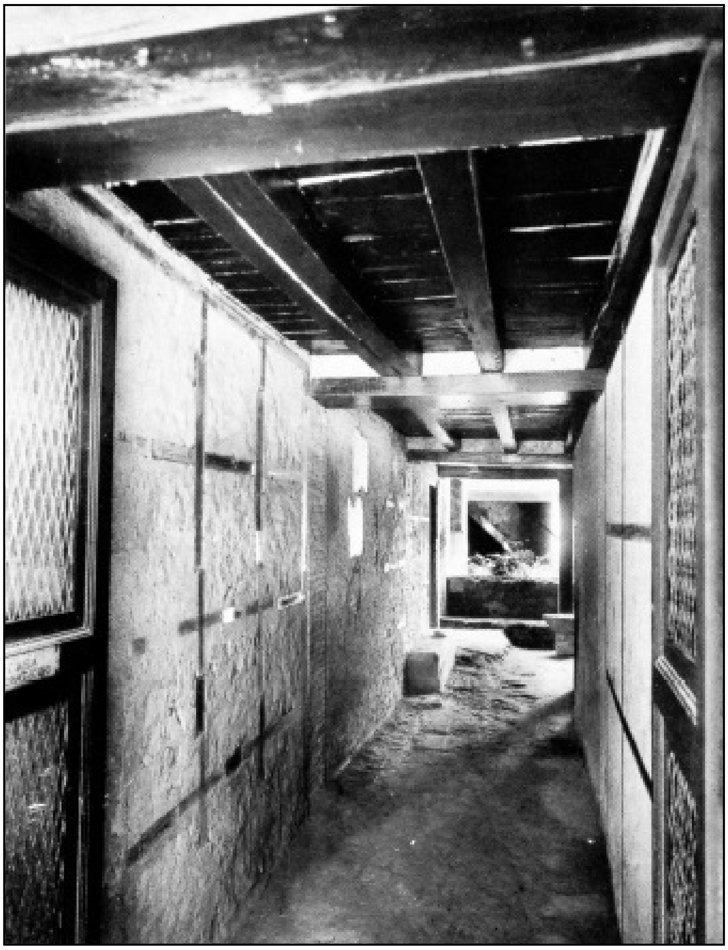

Figure 5.6. An interior hallway in the House of Opus Craticium at Herculaneum (Meiggs 1982: pl. 8).

Regardless of their complementary nature, half-timbering and wattle were not one and the same. On a technical level, half-timbering is not necessary to create wattle walls; a simpler timber frame suffices (as in the timber frames of Capanne 1 and 2 at Sorgenti della Nova; Negroni Catacchio 1995: 318; Figure 5.4). Even when a half-timber frame is used in a wattle wall and even with a significant number of half-timber posts in the frame, the form of wattle is still not defined by the half-timbering since it must have used other vertical or horizontal components within its own structure to create the plaited lattice. Without poles made of cane, the wattle could not be made as a lattice, reducing it from wattle to a simple hurdle of brush. Therefore, it is possible and was, in fact, common to have the two techniques in tandem (both wattle as a main infill technique and half-timbering as a structural technique) but it is also possible to have wattle without half-timbering (as in the case with earlier structures with timber frames) (e.g. Negroni Catacchio 1995: 318).

5.1.1.3 Pisé

The suggestion that pisé was a common walling technique used in non-stone architecture has recently gained traction within Etruscan scholarship. Led by the evidence, modern examples and the arguments of its proponents, pisé has been inserted into the traditional evolutionary progression as an alternative of sorts to wattle and as a possible sign of adoption of foreign (namely Greek) building concepts. The definition of the technique, at least in the ways it was constructed in Etruscan contexts, is more straightforward than that of wattle. The traditional definition of pisé is rammed earth where, during construction, wooden boards are used to brace and mould the sides of the wall while earth is pressed downward from the top (Genovesi 2001: 314; McHenry 1984: 100–104; Wendt 1986: 60; Figures 5.7, 5.8). However, application of the term has been broadened from its original use, typically as a way to fit the known archaeological evidence, and it is therefore not immediately clear what 'pisé' actually means in every instance.

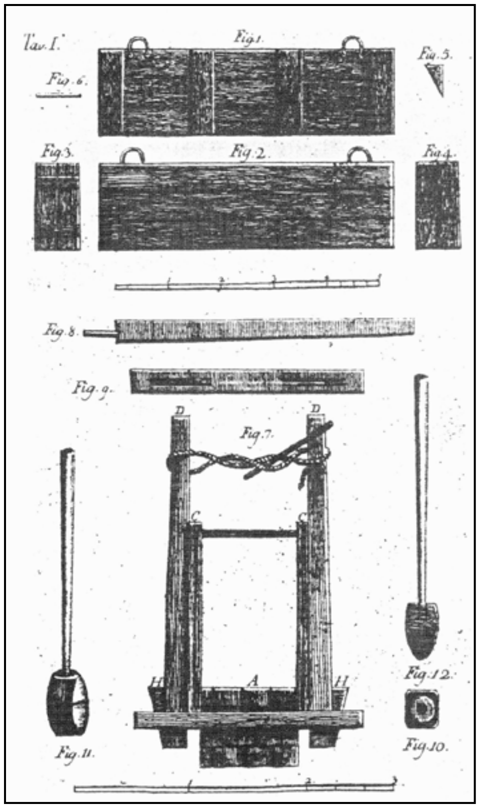

Figure 5.7. 1793 illustration of traditional tools used in the creation of pisé walls in Tuscany (Genovesi 2001: fig. 3, p. 314), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Camporeale (1997), for instance, discusses the use of pisé at Lago dell'Accesa but gives a slightly different definition for the technique. As in the traditional form of pisé, the walling technique described by Camporeale (1997: 28–29) was pressed into form between a framework of wooden boards, left to dry in the sun and finished with plaster or daub. Yet, in Camporeale's description, the pisé was not just made of any sort of earth. Rather, if pisé was indeed used at Lago dell'Accesa, then it was made of clay with branch and reed inclusions. Donati (2001:

Figure 5.8. The construction of pisé walls at Allumiere using traditional techniques (Genovesi 2001: fig. 2, p. 314), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

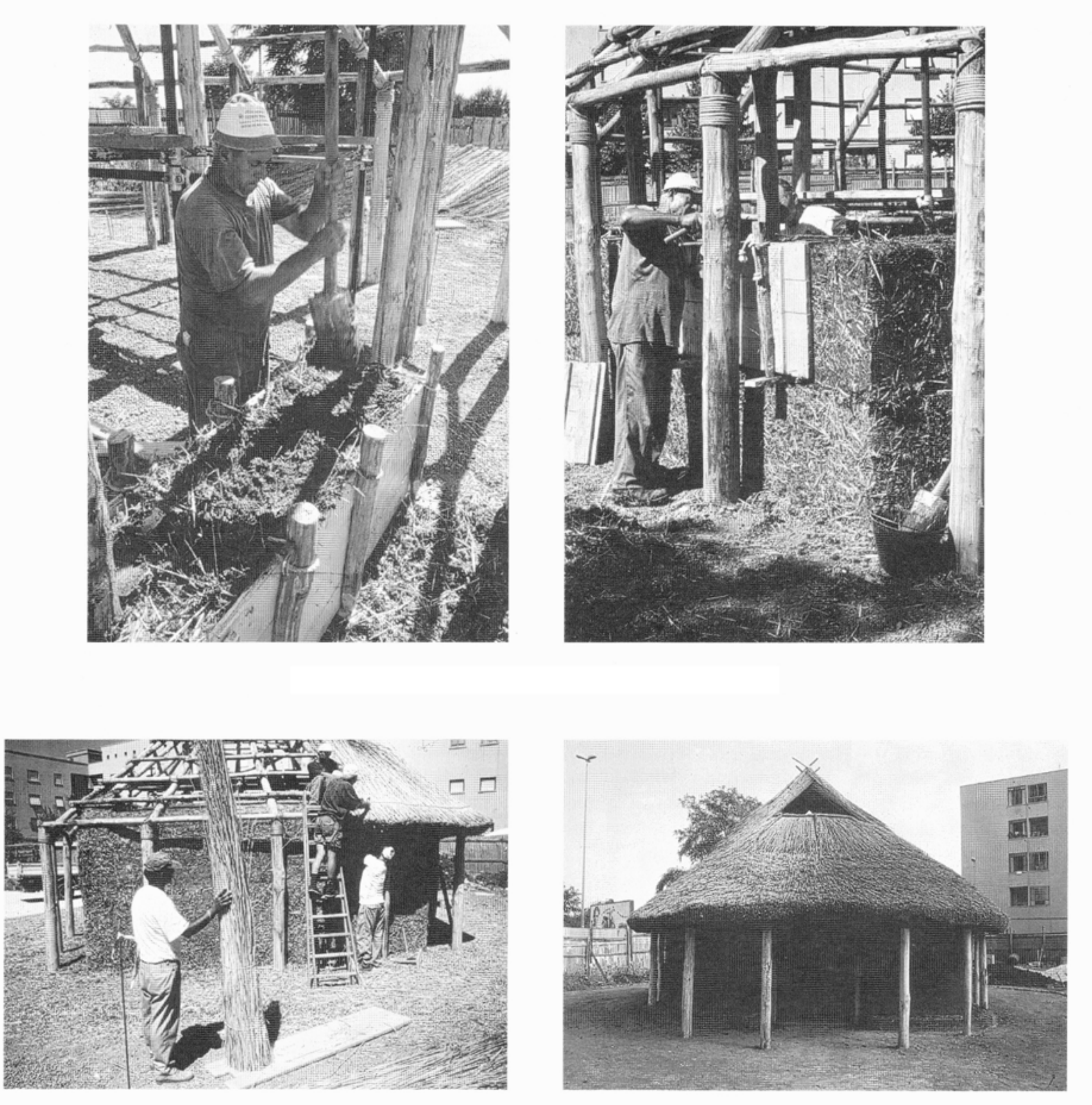

Figure 5.9. The reconstruction process of the Iron Age structure at Fidene (Bietti Sestieri and de Santis 2001: figs. 13-14, p. 218), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

316–326) defines pisé in a similar way. He states that the pisé wall was constructed in Etruria using mud and organic inclusions (a common description of pisé) but interchanges the word "clay" with "mud", which suggests that he considers earthen walls argillaceous.

Genovesi (2001: 315) describes pisé differently from Camporeale or Donati. At Allumiere, Genovesi and a team of architects and archaeologists constructed experimental "Etruscan" buildings using various methods, including pisé walls. He notes that, while clay is present and used for its cohesive properties in a pisé wall, it cannot be used in excess and must be limited to prevent the friability in the wall. Local, "earthy" materials must be used instead, according to Genovesi, and are best when homogeneous in type and structure.

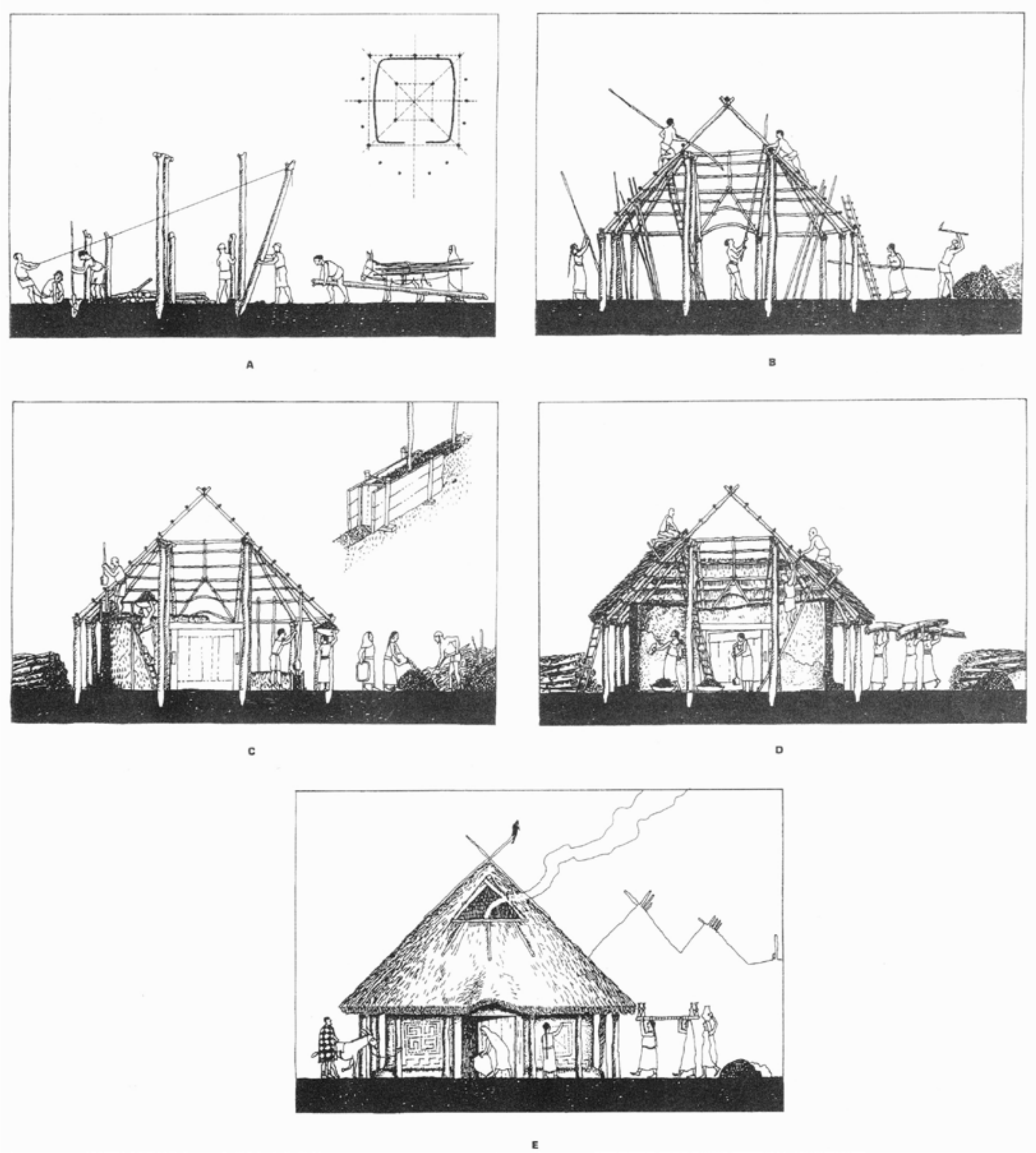

Figure 5.10. The construction process of a timber-framed structure with pisé walls as imagined by R. Merlo (Bietti Sestieri and de Santis 2001: fig. 8, p. 216), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

As in the discussion on infill techniques, the process of construction for pisé walls is generally agreed upon in the literature. Pisé walls are different from wattle walls in that they have the inherent structural integrity to cope with both their own stresses and the rest of the superstructure, such as the roof. Genovesi (2001: 314–317) shows at Allumiere that pisé walls could withstand and transfer the weight of heavy clay/terracotta roof tiling without the need for a timber frame of load-bearing posts. This suggestion that pisé was structurally self-supporting is archaeologically apparent elsewhere in Europe (e.g. Andreou et al. 1996; Mauger 2005; Willcox 2000) and has been used by Camporeale (1997: 28–29) and Wendt (1986: 60) as a possible explanation for the absence of post holes in the wall footings at Lago dell'Accesa and Acquarossa, respectively.

Although pisé walls can be self-supporting, the problem Genovesi (2001: 314–317) discovered with a pure pisé wall was that the walls were weakened by compression stress at the joints of a rectangular structure.

Due to this weakness and the inherent difficulty in joining two pisé walls together, wedges of added pisé were needed in the corners of the buildings. This solution relies on added material to compensate for the stress, which is unnecessary in a timber frame where the stress is not on the pisé but on the posts of the frame, particularly in the joints.

Not all pisé walls were self-supporting. In fact, the discovery of preserved pisé walls in an Iron Age structure at Fidene shows that timber-framed pisé walls were used in central Italy (Bietti Sestieri and de Santis 2001). The reconstruction, described by Bietti Sestieri and De Santis (2001: 217–219), showcases how the timber frame worked to secure the pisé infill in both construction and dispersal of weight (Figure 5.9). It is important to note that it is difficult to show that there was widespread use of pisé in the Iron Age *capanne* of central Italy. For instance, the case at Fidene was only recognised thanks to unusually good preservation (Bietti Sestieri and de Santis 2001: 219). However, it is reasonable to assume that pisé was as viable an infill of timber-framed structures as any other non-stone walling technique (Figure 5.10). The Iron Age building at Fidene may therefore be unique in its use of timber-framed pisé walls but it is likely evidentiary of a more widespread phenomenon.

5.1.1.4 Wall footings and the identification of non-stone walling

The identification and interpretations of wall footings often influences how wall techniques are identified. The transition from the ground surface (i.e. Foundation Types 1 and 3) to stone (i.e. Foundation Types 2, 4 and 5) in the construction of wall footings substantively changes the interpretation of walls. For pisé walls, whether the walls were self-supporting or timber framed is more or less determined by the wall footing. The remains of the Iron Age building at Fidene (Figures 5.9, 5.10), for instance, did not have stone wall footings and displayed clearly discernible post holes for a timber frame within the walls, as well (Bietti Sestieri et al. 1995: 251–256; Bietti Sestieri and de Santis 2001: 211–216). On the other hand, the Foundation Type 4 wall footings at Lago dell'Accesa Area A suggest to Camporeale (1997: 28–29) that, if pisé walls were used in the structures, then they were self-supporting, particularly given the lack of obvious post holes.

Do stone wall footings, particularly where evidence for post holes is scarce, automatically denote self-supporting walls? Technically, post holes in the wall footings were not required to create a timber frame. For example, one way to build a timber frame without post holes is to place a runner or sill beam along the top of the wall footing and then socket the posts of the frame into the sill beam (Conway and Roenisch 1994: 127–128; Harris 2006: 16–17). Based on this alone, it is unlikely that lack of post holes constitutes enough evidence to suggest a self-supporting wall. Self-supporting pisé on stone footings, such as those at Allumiere, is but one of the possible ways to build the pisé walls used in Etruria in the seventh and sixth centuries BC. However, if modern examples are comparable, then the assumption that most pisé walls with stone footings were self-supporting cannot be far from the mark (McHenry 1984: 100–104).

The impact of footings on the identification of walling techniques is also evident in wattle walls. The division of the foundations between non-stone and stone underpins the earlier discussion about the terminology of wattle and *graticcio* (where wattle is a "primitive" technique replaced by *graticcio*). Yet, as opposed to pisé where the evolution of pisé from a timber frame to a self-supporting structure appears to be a genuine representation of the (limited) evidence, the splitting of wattle walls into categories of simple and advanced timber frames based on the use of stone in the footings is inappropriate.

As noted before, the adaptation and advancement of timber framing techniques has caused many to combine wattle with half-timbering conceptually despite the fact that the two techniques are not necessarily associated. Although the mixture of the two terms is predicated on the appearance of half-timbering, in discussion, the simple, early wattle walls (built before stone footings became commonplace or on non-stone footings after the fact) are not considered to have had a half-timber frame (Bartoloni 2012a: 255). Conversely, stone wall footings are expected in every instance where a structure from the seventh and sixth centuries is said to have had *graticcio* walls (with wattle implied) (e.g. Bartoloni 2012a: 266).

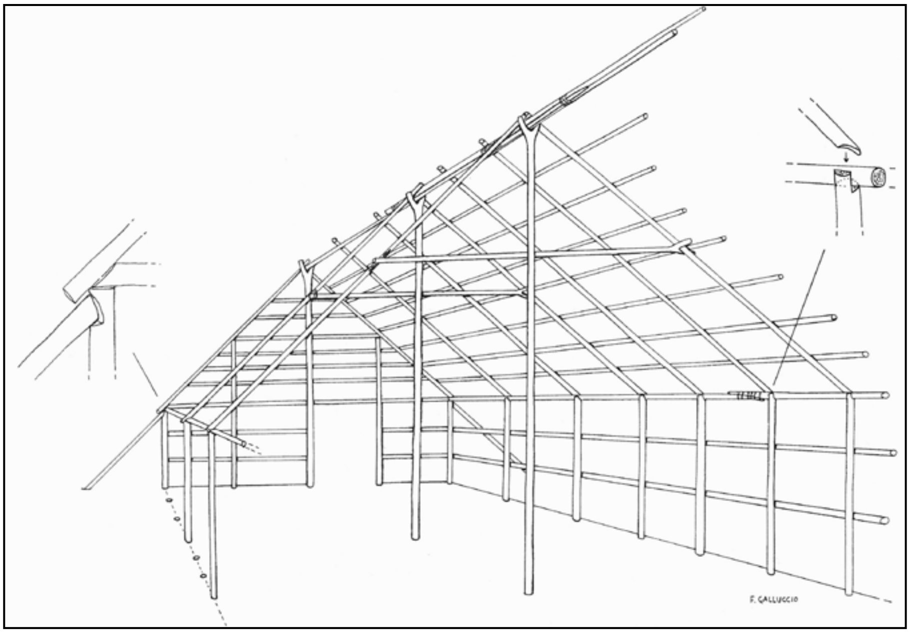

FIGURE 5.11. ILLUSTRATION OF THE HALF-TIMBER FRAME OF A MODERN CAPANNA IN GIOVITA (BROCATO AND GALLUCCIO 2001: FIG. 22, P. 293), COURTESY OF THE EDITORIAL COMMITTEE OF THE SWEDISH INSTITUTES AT ATHENS AND ROME.

This imagined division between non-stone and stone is possibly the result of modern conceptions of half-timber structures. Most modern timber structures today have stone or, more typically, concrete foundations (Charlett 2007: 173–174; Reynolds and Enjily 2005: 7). These modern structures contrast with the rural *capanna*. Identification of wattle-walled buildings based on their foundations therefore replicates this modern dichotomy, invoking the provincial nature of walls on non-stone footings and the urban nature of those on stone wall footings.

While undoubtedly different conceptually (as argued throughout this book), it is unclear whether such a dichotomy between non-stone and stone wall footings was appreciated by the Etruscans of the seventh and sixth centuries BC. Izzet (2007: 152–154) certainly argues that they did, suggesting that the conceptual change in the use of space is evident in material change. She argues that the rise of new social definitions of urban space required a modification in architecture. The primitive wattle walls in the *capanne* would have been seen as rural or “primitive” by those living in an urban setting and immediately recognised as such against the *graticcio*-walled structures on stone footings.

Although this argument is echoed in the literature by many (Cerchiai 2012: 143–144; Colantini 2012; Steingräber 2001a), one should be wary of its universal acceptance and application. True, the nature of wall footings and their change could be the result of social stimuli related to urbanisation. However, it is not altogether transferable to the adaptations of wattle walling and timber framing. Quite substantial timber-framed structures were used on top of Foundation Type 1 wall footings in the Final Bronze Age examples (e.g. Abitazione 2 at Sorgenti della Nova: Dolfini 2002b: 26–30), if not earlier. In later examples, such as the Rectangular Timber Building at Veii, non-stone footings appear in structures obviously made of timber, even substantial amounts of timber (Ward-Perkins 1959: 50–57). In fact, with the perishable nature of both wattle and timber, an evolutionary progression from lesser timber frames to advanced forms (i.e. paling and half-timbering) as indicated in the literature is overemphasised given the limits of the evidence. In any case, wattle wall techniques should not be separated by footings in the same way that pisé walls are.

The biggest impact that wall footings have on the discussion of wall techniques is not on the use of timber frames in pisé walls nor is it on the meaning of *graticcio* and the creation of a false dichotomy of structural techniques in wattle walls. Wall footings, particularly the division between non-stone and stone, strongly influence how mud brick walling techniques are discussed. In fact, although other factors are involved, wall footings are a primary reason for the association of mud brick with stone techniques rather than with non-stone counterparts. This association alters the way in which both the chronology of walling techniques and the structural composition of mud brick walls are identified and interpreted.

5.1.1.5 Mud brick

Compared to wattle and pisé, mud brick is typically mentioned in the literature only in conjunction with stone wall footings, based (at least in part) on the available archaeological evidence. However, there is also a link between stone foundations and Greek influence in the traditional evolutionary progression of walling techniques. Torelli's (1985: 21–32) comments on early Etruscan architecture are perhaps the most evidentiary of this perspective. He describes Greek influence on the Etruscan development of architecture and the related arts, hinting that the use and development of both mud brick and *graticcio* was an evolutionary step brought about by the adoption of Greek customs and techniques (Torelli 1985: 24–26).

This view on mud brick influences the broader interpretation of the technique. For example, Izzet (2007: 152–153) regards mud brick not only as an alternative to other non-stone walling but also, together with *graticcio*, as representative of the shift in how buildings were perceived by their builders. As others have noted (Donati 2001: 327–329; Steingräber 2001a: 18–28, 2001b: 307–308; Torelli 1985: 24–26), urbanisation and contact with other cultures in the seventh century BC may have caused substantial changes to building form, resulting in the rectangular edifices prominent in sixth-century structures. Izzet (2007: 152) advances the theory that technology is witness to urbanisation and the materials and technology used in domestic structures change as a result of (that is, in reaction to) changing perceptions of space. By appearing only in conjunction with stone footings, mud brick fits into a neat chronology that allows it to act as a representative of the changing perceptions of space.

In a similar way to her description of wattle walls, Izzet's description of mud brick reflects the rigidity of both the classification of mud brick construction and the chronology of its use. Mud brick, because of its place as a step in the evolutionary progression, is therefore set alongside stone-built walls rather than non-stone walls. Bartoloni's recent work exemplifies the connection between mud brick and stone built walls; they appear together in the same section without much detail on the differences between them (Bartoloni 2012a: 266).

Wall footings are vital to the conceptualisation of mud brick walling techniques thanks to their place in the argument that rigidly confines them to an evolutionary step. This restriction affects the analysis of domestic structures and the definition of the mud brick walling techniques. Yet, as described in the next subsection, wall footings are not the only things that have been used to define the mud brick walls of domestic structures so rigidly.

For all the debate on the more detailed definition of mud brick in the Etruscan domestic context, including when it was first used and how it came to be a common walling technique, its basic definition is generally accepted and straightforward.[40] The definition of mud brick is not so different from the argillaceous

40 Outside of the work by Genovesi (2001), little compositional analysis or testing of mud brick has been done in Etruscology. However, substantial work on the composition of mud bricks and their use in walling has recently been conducted at Hattuša (Seeher 2007). It appears to corroborate the general definition applied to Etruscan architecture.

version of pisé described by Camporeale (1997: 27–29). Using a wooden mould, bricks were formed out of a clayey soil mixed with water and organic inclusions, such as straw or reed. Once dried, the bricks were assembled and then plastered over either with daub or a lime coating. The assembled wall, based on both Camporeale's (1997: 27–29) and Genovesi's (2001: 314–315) descriptions, would have been self-supporting but, as with pisé, could have also been used as an infill of a timber frame.

This definition of mud brick is nearly universal, although some have likened it to wattle and use the term 'wattle and daub' as though mud brick was a derivation of that technique, even when the evidence for mud brick as a wholly different concept is archaeologically clear. Stoddart (2009: 3), for instance, directly states that the mud bricks found at Acquarossa were a sort of wattle and daub and he is not alone in his inclusionary treatment of mud brick. Izzet (2007: 152–154), Donati (1994: 33, 93) and Wendt (1986: 59–60), spend little time discussing the architectural viability of mud brick and often assume wattle and daub construction in early contexts where non-stone wall footings appear without pause to consider a mud brick alternative.

In contrast, Camporeale (1997: 27–28) devotes significant attention to mud brick as a walling technique. His discussion of mud brick use highlights the prevalence of mud brick in city walls (e.g. Canocchi 1980: 32–50; Donati 2001: 323–324) and in structures on non-stone wall footings (e.g. Laviosa 1970: 212–215), forcing a reassessment of non-stone walls in Etruria. In fact, based on the description given by Camporeale, an argument can be made that Etruscology has been too quick to assume that the clay detritus found above non-stone and stone wall footings alike constitutes clear evidence for wattle and daub (as many of the excavators at San Giovenale have; Malcus 1984: 39; Pohl 1977: 14) when so many different techniques use clay and could have yielded clay detritus.

Genovesi (2001: 315) also points out the viability of mud brick as a wall in Etruria on the basis of the experimental buildings at Allumiere. Donati (2001: 321), too, mentions that domestic houses were as likely to have mud brick walls as wattle and daub. To a lesser extent, Wendt (1986:60) describes mud brick in context at Acquarossa, which highlights mud brick in context in a similar way as the excavations at Poggio Civitate (see below). Yet, Camporeale's discussion goes beyond these other cases, asserting that there was widespread use of mud brick in addition to known archaeological examples where mud brick is found *in situ*, as at Acquarossa and Poggio Civitate.

So far, little about the chronology of walling technologies and materials in non-stone structures has been mentioned but, with the influence that that debate has on the assessment of mud brick, a short summary of the argument is required here. Torelli (1985: 24–25), for example, gives the contact with the Euboeans as a starting point for changes in architectural tradition. The view of wall building (and the infilling techniques used in timber structures, in particular) as evolutionary is deeply tied to this broader scholarly tradition in which authors such as Torelli (1985: 32, 2000: 193–196) and Riva (2010: 41–59) propose that the changing architectural traditions are evidence of wider cultural contact. However, it is unclear whether walls give us a chronology for architectural adaptation or, for that matter, help us identify the contacts that inspired the new trend of stone as a building material.

Many see the choice in technique between wattle, pisé and mud brick in functional terms rather than in cultural or social terms, as proposed by those who adhere to the gradual evolution of wall technology. For instance, Donati (2001: 321–322) emphasises the practical aspects of wall construction, where builders were constrained by such factors as resource management and economy. Alternatively, Camporeale (1997: 27–29) underscores the value of the evidence, which indicates a variety of building options available in the seventh and sixth centuries BC. Relying on the apparent evidence for the variety of wall building techniques, Camporeale (1997: 27–30) points to a number of similarities between certain stone wall techniques and timber examples, expanding the argument beyond the evolutionary progression of non-stone walling techniques to a discussion of the timber-to-stone transition. In doing so, he weakens the argument for an evolutionary progression of domestic architectural technology by undercutting the traditional chronologically based conception of walls where timber is replaced by stone.

5.1.2 Defining stone walling techniques and the debate over the timber-to-stone transition in Etruscan architecture

Buildings with stone walls are less controversial in Etruscan scholarship, owing in part to the survivability of stone in the archaeological record. Numerous stone wall types have been suggested for domestic structures, although none so much and so frequently as walls of ashlar masonry. Ashlar itself, in the context of Etruscan architecture, is the use of blocks of stone measuring, on average, 1 x 0.5 x 0.5m (as seen at San Giovenale, Acquarossa and Cerveteri), quarried and cut so that the stones fitted snugly together (Blomé 1986: 56; Karlsson 2006: 31–43; Maggiani 2001: 121–122; Wendt 1986: 59). By attaining a high level of surface-to-surface contact, the friction between stones helped bonding and reduced or eliminated the need for mortar (Punmia et al. 1993: 221–223). Furthermore, based on examples from the sixth century, the walls of domestic structures that were made in ashlar usually did not require any other form of structural support, such as pillars or posts, at least in order to carry their own weight (e.g. the buildings from the Borgo at San Giovenale; Nylander 1986a: 49–50; Pohl 2009: 19–21).

Figure 5.12. Modern capanna with dry stone walls at Monti Lepini (Almagià 1966: 257).

The prevalence of ashlar stone in discussions of Etruscan domestic architecture stems from two factors. First, domestic architecture is often put together with ritual architecture and the discussion on the appearance of temples with ashlar-built walls in the sixth century BC has been generalised as the standard for *all* architecture (e.g. Boëthius and Ward-Perkins 1970: 25–83; Donati 2001: 327–333; Prayon 1975: 178–181). Second, the discoveries at San Giovenale contribute greatly to the perception of domestic architecture.[41] With the evidence at the Borgo coinciding with the appearance of seventh and sixth centuries BC temple-building techniques, the importance of ashlar masonry has been inflated.

Comparatively little attention is therefore given to other forms of stone wall. Many of these are ubiquitous but rarely receive more than the label 'stone' in the literature (e.g. Hellström 1975: 69–70). In fact, two other types of stone wall can be recognised besides ashlar. The first type is comprised of a mixture of large and small, unfinished stones mortared together. The second type is similar but appears to have used a higher

41 Many of the modern syntheses, in their discussion of domestic architecture, use the Borgo as a case example. Barker and Rasmussen (1998), Haynes (2000) and Izzet (2007: 149–158) all point out the building style and how it is a sort of step in the progression of Etruscan architecture. Notably, Bartoloni (2012a: 259–260) describes the finds at San Giovenale as distinct; yet, she only briefly mentions the Borgo, discussing the simplicity of its buildings rather than its materials.

proportion of mortar to bind rubble and cobbles. The stones of the second type are significantly smaller when compared to the stones from the first. Dry stone walls, without mortar, are also apparent in modern examples of *capanne* (Brocato and Galluccio 2001: 299; Figure 5.12). However, few Etruscologists have mentioned dry stone as a possible technique for building at any site.

Stone walls can therefore be divided into three main types: ashlar, mortared unfinished stones and mortared rubble/cobbles. Based on the limited evidence, the appearance of any of these types is relatively uncommon in the seventh and sixth centuries BC. Furthermore, the use of stone walling techniques is not a new development of the seventh century. In fact, these two factors have forced scholars to reconsider the traditional, seventh-century timber-to-stone transition when describing Etruscan walling techniques. As a result, some have moved toward a more nuanced description of architectural change.

For instance, Bartoloni (2012a: 254, 266–267) identifies the presence of stone in the walls of structures from both the earliest *capanne* to the later 'houses'. Notably, she mentions mud brick and *graticcio* as early, rectangular 'house' wall types alongside mortared, uncut stone. This appears to reject the uncompromising timber-to-stone argument. However, she also undervalues non-stone walls, mentioning Vitruvius' distaste of *graticcio*. Although she presents a different view of the chronology for materials used in domestic architecture, she also argues in favour of a hypothesised transition in floor plan (where rectangular buildings appear chronologically later than elliptical structures) that is usually concomitant with the timber-to-stone transition.

Therefore, even though she broadens the traditional transition from non-stone to stone walling, the traditional evolutionary progression still appears in her evaluation of sixth-century BC architecture. As in many of the summaries of architecture given elsewhere (e.g. Barker and Rasmussen 1998; Donati 2001; Riva 2006: 120–125), Bartoloni associates ritual architecture with domestic architecture, discussing general architectural changes to temples and tombs as part of uniform change. The result depicts the architecture of the seventh and sixth centuries in evolutionary terms where, although materials did not evolve, techniques and technology did. With her modified depiction of an evolutionary progression, Bartoloni consistently points out evidence that contradicts a timber-to-stone transition and also the traditional evolutionary progression. However, her staunch defence of an evolutionary progression where techniques and technology evolved from inferior to superior in perceivable steps, along with the retainment of the elliptical-to-rectangular transition (which itself appears without acknowledgment of any reasons for such an explicit division), reveals the dominance of the traditional ways of interpreting architectural change.

Bartoloni's version of both a timber-to-stone transition and evolutionary progression is more nuanced than that of others. For instance, Izzet and Steingräber, although argued from different standpoints, propose that the change from timber to mud brick and stone walls, in particular, is key to Etruscan urbanisation. To Izzet (2007: 152–154), the concept that stone was adopted to replace timber is fundamental to the social creation of spaces and is at least as important as the supposed evolution from wattle and daub to mud brick. Moreover, Steingräber (2001a: 19–20, 25–27) assumes that a transition from timber-to-stone is evidence for planning and forethought in the developing urban centres. By underscoring a timber-to-stone transition, both Izzet and Steingräber risk perpetuating stereotypes about the worth of stone structures compared to timber emphasised in everything from Vitruvius to the fairy tale, 'The Three Little Pigs'.

Yet, Izzet recognises that the evidence for a timber-to-stone transition is not always clear-cut and is aware of its potential pitfalls. Izzet (2007: 153) thus rejects the argument that stone is structurally superior (e.g. Drews 1981). She emphasises that while there are evolutionary steps in wall building away from wattle and daub (in particular) toward first mud brick and then stone, the change has less to do with permanence (and the worth associated with permanence as hinted at by Steingräber (2001a: 26) and explicitly stated by Drews (1981: 148)) than with the ability of materials to fit the social perceptions of the inhabitants. According to her, stone and mud brick may have been adopted due to their creation of sharp edges that clearly separated spaces in ways that wattle and daub could not.

Although she disputes the common reasoning used to support a timber-to-stone transition, she does little to explain the continuation of 'hut' walls into the sixth century (e.g. walls at Lago dell'Accesa and Poggio Civitate), beyond mentioning that it occurs, using Torelli (1985: 24) as an example. Whether the continuation of non-stone walling was an open rejection of modernity (e.g. Rystedt 2001: 26) or some other motive is left for the readers to decipher. Regardless of Izzet's position on form as a dictate of social perception, her description of wall building techniques and technological reasons for material adaptation lacks a clear presentation of the evidence (besides the theoretical positions of scholars from a generation ago) for the evolutionary model of walling technology that she promotes.

In the literature, the weight of the traditional timber-to-stone argument and an evolutionary progression of walling technology affects the discussion of chronology most notably. Adherents to tradition see the evidence for wall construction as an evolution where stone (and occasionally mud brick) was a more advanced way to create walls and was therefore preferred to the timber-based wall types by the end of the seventh century. As more evidence appears, the less clear the evolutionary-progression stance is. Clearly, the available evidence needs review to see whether or not any trends can be recognised.

5.1.3 Evidence of wall types

To clarify what evidence actually exists for Etruscan domestic walling techniques, this subsection examines the cases where evidence for walls was found *in situ* and juxtaposes them with evidence that has been presumed or suggested to be one type of wall or another. In so doing, unclear evidence can no longer support certain views without concrete examples. Furthermore, this subsection intentionally separates the domestic from the ritual in the hope that any undue influence from the ritual sphere may be avoided. Finally, this subsection tests the argument for a timber-to-stone transition by reconstructing the chronology of domestic architecture (as a separate entity from other forms of architecture) using the *in situ* evidence.

5.1.3.1 Direct evidence of wall techniques

Evidence for the walls of domestic structures in Etruria from the seventh and sixth centuries BC is not abundant, particularly when intact and *in situ*. The list of sites with direct evidence for walls is short and the evidence therefore limits this subsection. Direct evidence for non-stone walls suffers from n-transforms, especially erosion. Only in the cases of burning or favourable soil chemistry does non-stone walling survive for posterity, *in situ*. Even then, the evidence must survive c-transforms such as building and ploughing by later people.

For wattle walls, the best evidence for its use in structures is left behind in fragments of fired daub. These daub fragments, fired in the burning of a daubed structure, occasionally retain imprints of wattle that has long since disappeared (also Ammerman 1990; Gjerstad 1953: 48; e.g. Karlsson 2006: 135–136). From these fragments, excavators often assign wattle and daub walls to nearby, associated foundations with some confidence. However, as Ammerman (1990: 638) contends, the re-deposition of daub fragments from other contexts is possible and should therefore be considered with caution.

Three sites have examples of daub fragments with wattle impressions dating to 800-500 BC. From Lago dell'Accesa, Camporeale (1997: 29) notes that evidence for wattle found within daub fragments was discovered only in direct association with Area B Complex I. Fired daub fragments were also uncovered at Luni sul Mignone in the excavation of Hut C (Wieselgren 1969: 15). The final examples come from San Giovenale Area F East where 14 daub fragments with impressions were found in and around House I (Karlsson 2006: 135–136; Figure 5.5).

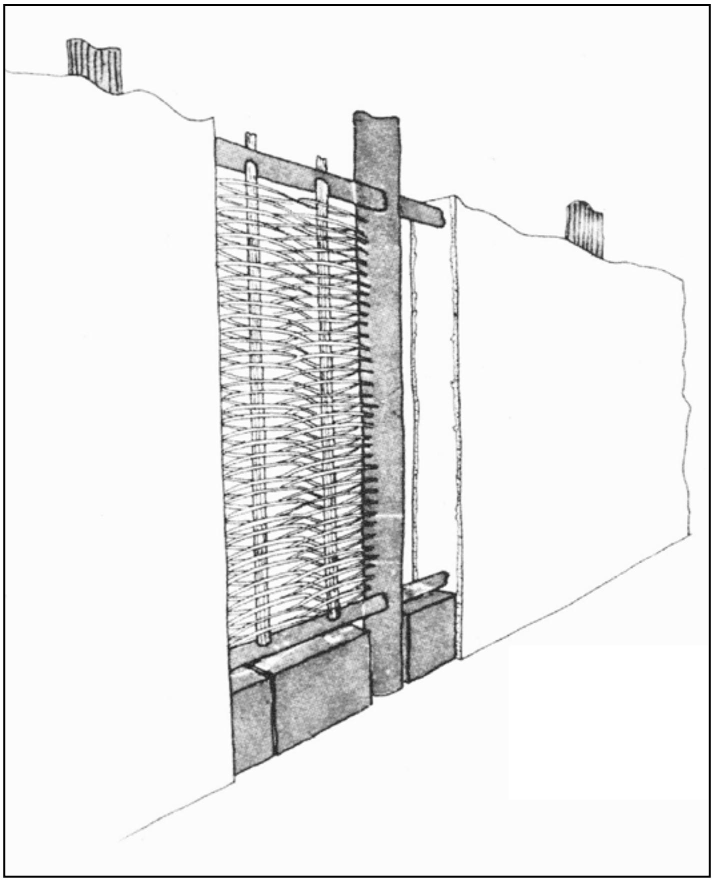

Figure 5.13. Illustration of the half-timber walling system proposed by Wendt for House A at Acquarossa Zone D (Wendt 1986: 60).

As noted above, Karlsson uses the wattle impressions together with the post holes in the wall footings of Period 2 House I to infer the use of wattle and daub in conjunction with half-timbering. Further recognition of evidence for half-timbering can be found in Wendt's (1986: 60) description of House A from Acquarossa Zone D (Figure 5.13). In fact, Wendt's proposition that the ashlar (Foundation Type 5) wall footings in House A held a half-timber frame leads Karlsson (2006: 156–160) to suggest that the walls of House III and, possibly, House II at San Giovenale Area F East also had walls with half-timbering (Figure 5.14). Karlsson's adoption of Wendt's wall model is more consistent with the evidence than the previously proposed ashlar, self-supporting walls mentioned by Nylander (Karlsson 2006: 157; Nylander 1986a: 47–50).

Although half-timbering is apparent in structures at both Acquarossa and San Giovenale, as well as at Veii (e.g. Ward-Perkins 1959), the evidence for it is limited. Nevertheless, the holes found in some footings suggest a half-timbering support frame. The frame of San Giovenale Area F East House I appears to have symmetrical panels and secondary support posts that differ from the timber framing more common in earlier periods. House I, as well as the Rectangular Timber Building from Veii (Figure 5.15), provide the clearest evidence of secondary posts.[42] Yet, these examples fail to reveal the alignment of secondary beams and the dimensions of the panels since only their foundations survive. Therefore, while it is likely that half-timbering was used, it is not clear how advanced it was.

Direct evidence for pisé comes from Poggio Civitate. During the excavation of the Upper Building, it became clear that parts of the walls were intact. Phillips (1967: 135, 1968: 121, 1969: 334–335, 1970: 242) commented on the formation and possible building techniques used. Originally thought to be comprised of mud brick, then solely of pisé, it was revealed that a substantial length of intact pisé walling was found alongside mud brick (Phillips 1970; Figure 5.16). Phillips (1992: 13–14) later summarised these findings

42 It is interesting to note that the best evidence for half-timbering appears in examples dating to the late eighth and early seventh centuries BC. This predates its suggested widespread use in the late seventh century and further undermines *graticcio*'s placement in the evolutionary-progression model.

and stated that the majority of exterior walls were made of pisé, while interior walls were a mixture of mud brick and pisé. However, as noted in Chapter 2 (see section 2.4.4), the findings have only been summarised and no lengthy report or analysis on the pisé has been published.

As mentioned before, Camporeale (1997: 28–29) also found evidence of pisé walling at Lago dell'Accesa. Fragments of a clay admixture found in and around the foundations of structures in both Areas A and B supposedly attest to the widespread use of the technique. However, as opposed to the finds at Poggio Civitate, the fragments found at Lago dell'Accesa are (based on Camporeale's descriptions) more similar to daub fragments than pisé. Furthermore, his reasoning for the use of pisé relies less on the clay fragments than on the fact that post holes were not found in the foundations.

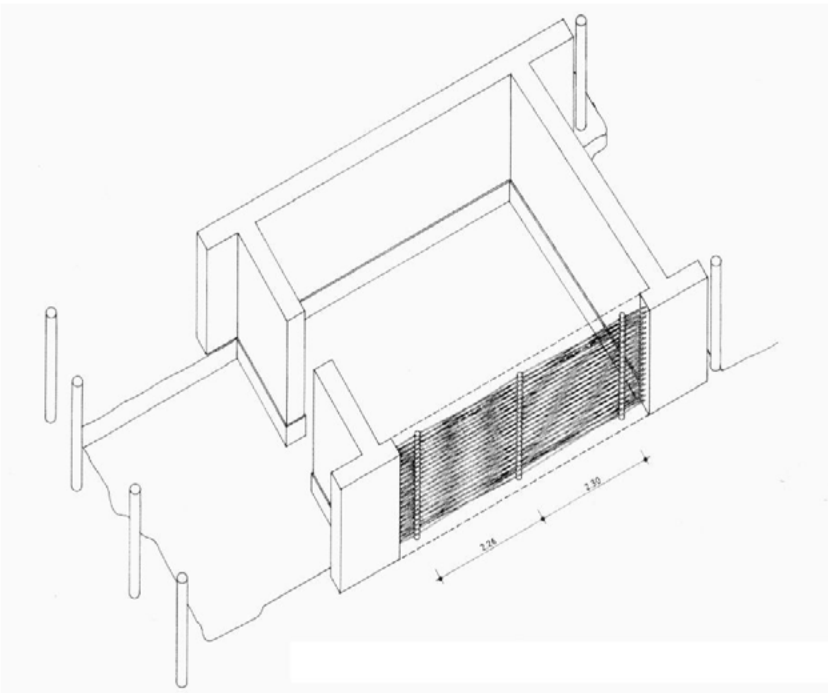

Figure 5.14. M. Fahlander's illustrated reconstruction of House I at San Giovenale Area F East displaying the graticcio walls (Karlsson 2006: fig. 269, p. 145), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Their stated hypothesised nature is not the only problem with Camporeale's assertions. As noted earlier, clay cannot be used in excess or as the main constituent material in a pisé wall without risking structural failure. If the fragments Camporeale describes are indeed primarily clay-based, then it is unlikely that they were actually part of a pisé wall. These doubts are also raised by Camporeale's own claim that pisé walls at Lago dell'Accesa were self-supporting. In order to be self-supporting, the pisé would have needed to be as robust as possible to carry the heavy, tiled roofs. Self-supporting pisé walls are thus unlikely given the inherent fragility of the argillaceous composition of the fragments. The fragments that were found at Lago dell'Accesa cannot, therefore, be taken as direct evidence for pisé walling, at least not with the same level of confidence as in the case of Poggio Civitate.

By contrast with the direct evidence for wattle, half-timbering and pisé, very few intact finds indicate the presence of mud brick in domestic structures. Wendt (1986: 60–61) states that pieces of mud brick were found at Building A of Acquarossa Zone L. As in most of the evidence for wattle, a destructive fire baked the mud brick walls and left behind direct evidence of both the mud bricks and, possibly, a half-timbered frame.

Mud brick as an exterior wall, similar to that found in Acquarossa Zone L, is also present at Lago dell'Accesa Area A. Camporeale (1997: 27–28) states that fragments of mud bricks similar to those discovered at Roselle and Pyrgi were found in the wall footings of Complexes VIII and X. While he notes that the finds are fragmentary in comparison to the examples from Roselle (where Laviosa (1970: 214) could describe the dimensions of a fired brick), Camporeale is confident that the burnt fragments from Complex X, in particular, signify the (perhaps widespread) use of mud brick in the most recent structures at the site.

For all its prevalence in the discussion of mud brick, the House with Two Rooms at Roselle did not have exterior mud brick walls. Fragments of unfired mud brick, however, were found inside the structure. Laviosa (1970: 214) and Bocci Pacini et al. (1975: 23) estimate that this discovery points to the use of mud brick in an interior dividing wall. As for the exterior walls, the House with Two Rooms is an example of stone walls made from mortared rubble.

Direct evidence of the other types of stone structures, namely ashlar and mortared uncut stone, exists as well. Ashlar is best represented by the *in situ* walls of the Borgo at San Giovenale where a significant number of courses were identified (Nylander 1986a: 47; Pohl 2009: 19–23; Figure 5.17). The so-called '*edifici monumentali*' of Acquarossa Zone F appear to have been built of ashlar tufa and peperino, according to the scattered and *in situ* stones found in excavation (Wendt 1986: 58–59; Wikander and Wikander 1990: 200). Many other structures from Etruria, and even from San Giovenale and Acquarossa, have been designated as having walls in ashlar based on their surviving foundations. However, as will be shown later in this section, these designations are questionable and so will not be discussed further here.

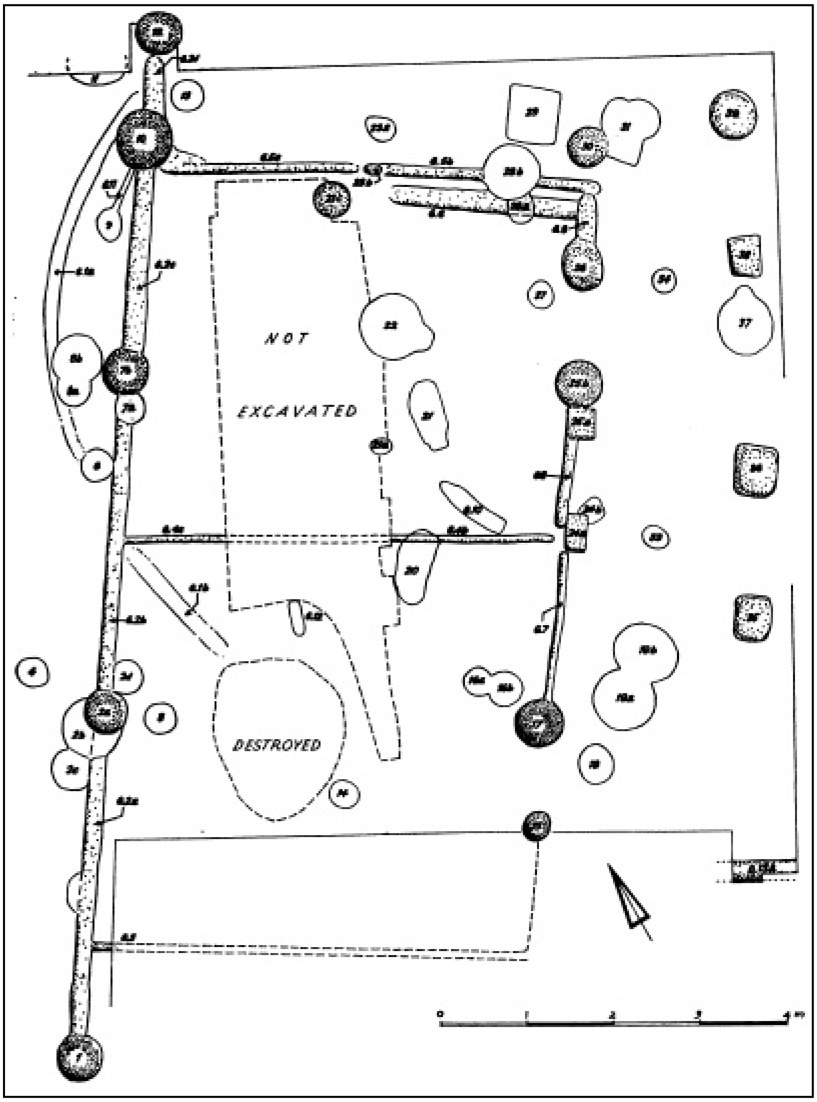

Figure 5.15. Plan of the Rectangular Timber Building beside the North-west Gate at Veii (Ward-Perkins 1959: 51). Note the post holes in the wall lines; they are some of the best evidence for half-timbering found in Etruria.

Two buildings, one at Luni sul Mignone and the other at Podere Tartuchino, had significant amounts of unfinished stone found in association with the wall footings. In the case of the Large Iron Age Building at Luni, the stones were thought to belong to a higher part of the structure, a continuation of the carved rock wall cut into the bedrock (Hellström 2001: 164–166). At Podere Tartuchino, the stones discovered with the first phase farmhouse constituted more substantial walls than those of the Large Iron Age Building. However, Perkins and Attolini (1992: 111–113) note that they also found clay detritus in high quantities associated with the wall footings, which suggests to them that the walls of the farmhouse were not wholly stone but a hybrid of pisé and stone in a half-timber frame (Figure 5.18). Stone walls are therefore as

Figure 5.16. Stratigraphic section of a mud brick wall from the Upper Building at Poggio Civitate (Phillips 1970: fig. 9, drawing by H. Lindén), courtesy of American Journal of Archaeology and Archaeological Institute of America.

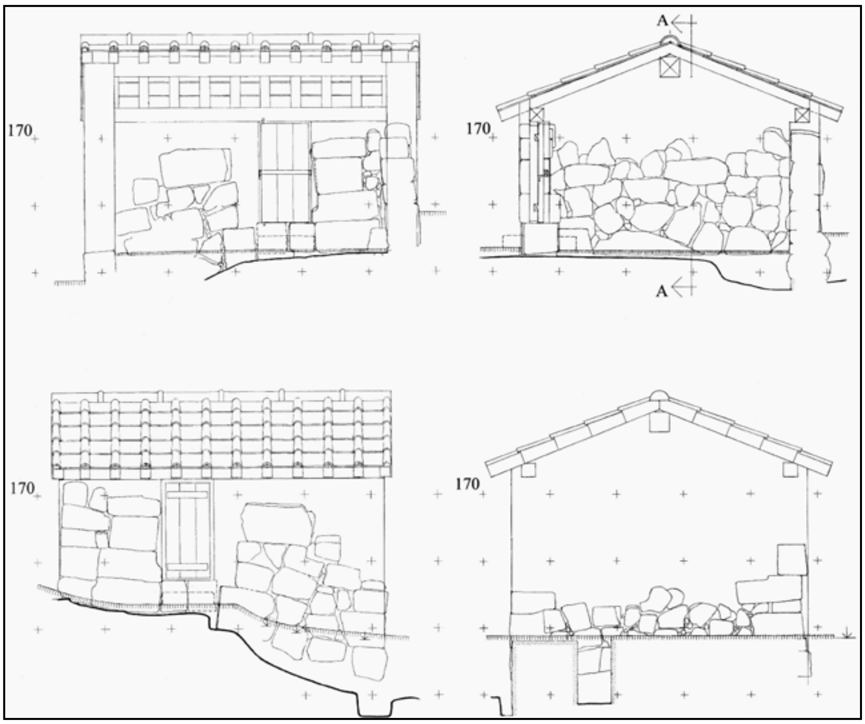

Figure 5.17. Sections of the Borgo's House B at San Giovenale with an illustrated reconstruction overlay (Blomé 2001: figs. 2-5, pp. 242-243), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

securely identified (and not necessarily more, as expected by their relative survivability) archaeologically as the other, non-stone walling techniques.

Apart from the wall footings, it is rare to find remains of the walls of Etruscan domestic structures. What little is found intact has been used recurrently to establish an overall impression of Etruscan architecture. These examples of direct evidence thus show that certain wall techniques definitely existed during the seventh and sixth centuries. Yet, on the basis of direct evidence alone, it is difficult to see the architectural transitions or progression argued in the literature.

5.1.3.2 Circumstantial evidence of walling techniques

The majority of evidence for walling techniques in domestic structures is what I call here 'circumstantial' because it relies on comparisons to other structures found with more conclusive direct evidence. Alone, this evidence is not usually sufficient to confirm the existence of particular walling techniques except, perhaps, in the difference between non-stone and stone walls. Just because evidence is circumstantial does not mean that it is not useful or that it cannot reveal what these walls were like. However, the circumstantial evidence must be considered as such; it is secondary and less reliable than direct evidence.

The most common use of circumstantial evidence concerns the identification of wattle. The presence of wattle, which almost never survives in the archaeological

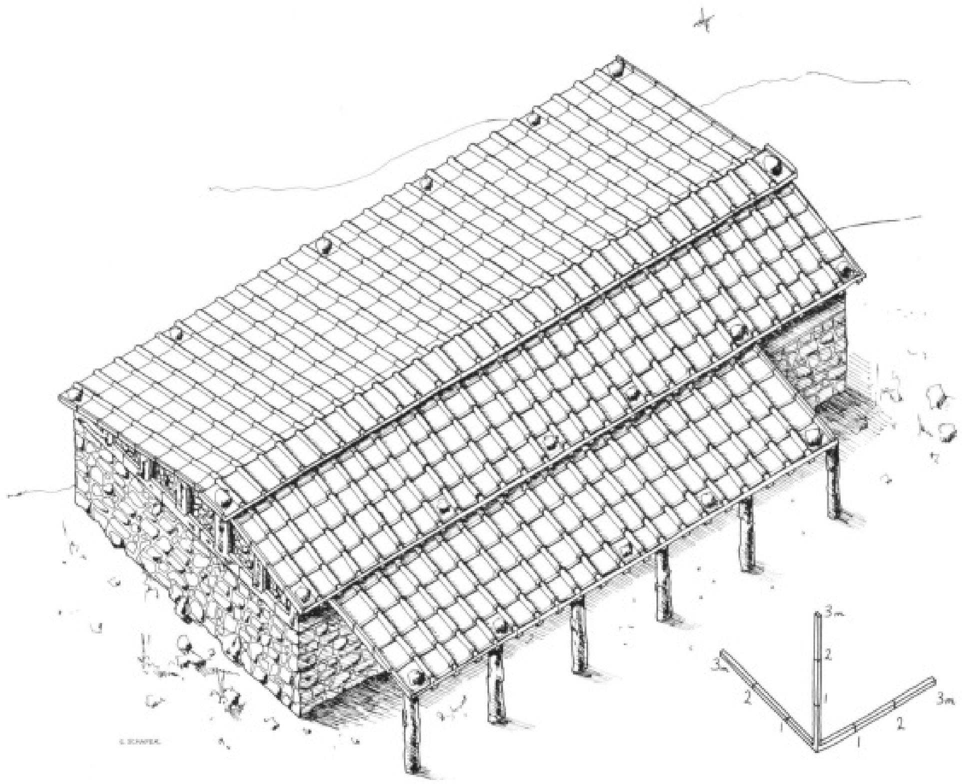

Figure 5.18. Schafer's illustrated reconstruction of the farmhouse at Podere Tartuchino in the first phase (Perkins and Attolini 1992: 112).

record of central Italy, has been indirectly inferred at a number of sites. The daub used in wattle walls has been identified in structures such as San Giovenale Area E Oval Hut I from a layer of clay detritus found directly above the wall footings (Pohl 1977: 14). The assumption that the clay detritus is dissolved daub is supported through a comparison of building foundations between those buildings with only the detritus and those with direct evidence for wattle from fired daub. Those that use the circumstantial evidence of clay detritus candidly state that the wattle and daub walls they suggest are merely *assumed* (Pohl 1977: 14, 25; Wieselgren 1969: 14–15).

Negroni Catacchio (1995: 301–307) clearly articulates the problem with this assumption. By revealing that clay was not found in the Bronze Age buildings at Sorgenti della Nova (despite the fact that narrow channels and all comparisons to contemporary buildings suggest wattle walls) she (perhaps inadvertently) calls the value of clay detritus as evidence for wattle into question. According to Negroni Catacchio (1995: 302–303), wattle walls at Sorgenti della Nova were not daubed. She (and others such as Cardosa and Passoni (2004) and Dolfini (2002b)) instead presents a number of possible versions of wattle walls without daub. If wattle walls can be used without daubing (also Brocato and Galluccio 2001; e.g. Negroni Catacchio 1995) then clay detritus is insufficient as circumstantial evidence for wattle walls.

Camporeale (1997: 27–30, 1985a: 129–130, 168–169) also undermines the assumption that clay detritus is a confirmation of a wattle and daub wall. He argues that clay detritus is instead evidence for pisé and mud brick. Yet, no significant direct evidence of pisé or mud brick has been found at Lago dell'Accesa, either, which means that the interpretations of walls at Lago dell'Accesa are also based on circumstantial evidence.

Likewise, the majority of the Lower Building at Poggio Civitate is thought to have been pisé and, to a lesser extent, mud brick. This is based on the excavated, *in situ* walls of the Upper Building, some intact walls in the sealed deposit below the Upper Building and a layer of clayish-earth directly above the foundations of the Lower Building (Berkin 2003: 18; Phillips 1974: 268). The evidence for pisé walls for the entirety of the structure of the Lower Building therefore comes through the comparison of direct and circumstantial evidence.

Circumstantial evidence has been influential in the identification of non-stone walls, both in positive and negative ways. Clay detritus found above wall footings conveys the presence of a non-stone wall. Building on this likelihood, circumstantial evidence can be used to distinguish one infilling technique from another but only when used together with direct evidence, as with the Lower Building at Poggio Civitate. The common pairing of clay detritus to wattle and daub walling without any direct evidence is thus misleading and inherently problematic. The ubiquity of this practice forces us to re-evaluate not only how we see walling for the structures where wattle is assumed but also how non-stone architecture is represented in the literature. Therefore, based upon the evidence in domestic structures from 800-500 BC, wattle cannot be said to have been used more than the other non-stone infilling techniques.

5.1.3.3 Stone walling techniques and circumstantial evidence

The use of circumstantial evidence for stone walls is as prevalent (and as problematic) as for non-stone walls. Since stones are rarely found *in situ*, many scholars use both the style of wall footings and the scale of buildings to infer stone walling in domestic structures. For example, Nylander (1986a), Vidén (1986) and Blomé (1986) boldly envisage the majority of domestic structures on the acropolis of San Giovenale as stone-built, essentially for three reasons: (1) the footings of the buildings on the acropolis, most notably in Area F East, are two, sometimes three courses of squared stone; (2) the comparable structures in the Borgo had ashlar walls; and (3) a tufa quarrying was discovered near the Borgo, in the valley of the Pietrisco. These considerations, as well as the relative scale of the buildings in Area F East, led Nylander, Vidén and Blomé (also Karlsson 2006) to identify stone walling techniques throughout San Giovenale.

Nevertheless, their view of ashlar-built domestic structures on the acropolis of San Giovenale can be challenged. For instance, the acropolis has few ashlar blocks left and those remaining are the *in situ*, Foundation Type 5 wall footings. Nylander (1986a: 48) explains that the scarcity of stones results from ploughing and later scavenging for building material, particularly to build the nearby medieval castle. However, the *in situ* wall footings could be regarded as complete, still in place as socles meant to support non-stone walls rather than as a continuation of (now missing) stone walls. Not only do Houses II and III in Area F East have evidence for a sort of half-timbering but House I was also non-stone in its earliest iteration (Karlsson 2006: 137–164). The rebuilt House I with stone foundations (Period 3) might have had stone walls but this breaks from tradition and is hard to reconcile with either the previous iteration of the building or the non-stone walls used in the adjacent Houses II and III. Further discussion of the buildings of Area F East and their wall footings (particularly in regard to their 'second variant' style of Foundation Type 5) can be found in Chapter 4 (see section 4.2.2).

Circumstantial evidence was also used in the identification of walls in the Early Monumental Complex and the *edifici monumentali* for that matter. Similar to the Lower Building at Poggio Civitate, the Early Monumental Complex predates the later, supposedly elite buildings of the *edifici monumentali*. As in the Lower Building, the use of similar walling techniques has been suggested for both the Early Monumental Complex and the *edifici monumentali*. The back wall of Building C plays a crucial role (Figure 5.19) since it is used in both phases of building in Zone F and exemplifies reuse between the early and the monumental phases (Wikander and Wikander 1990: 200–202).

The back wall, together with the other walls in Building C (which in any other context might be seen as footings alone) were compiled as circumstantial evidence for ashlar walls in both phases of Building C. Together with unassociated scattered ashlar blocks and plough damage and the reasoning for ashlar walls in Building C is sound. Although the evidence for Building C is sound, evidence for ashlar walls in the other buildings of the Early Monumental Complex is not. Primarily due to the plough damage but also a result of the later building of the *edifici monumentali*, it is unclear whether stone was used in the walls or even in the foundations. The general assumption that the circumstantial evidence of Building C illustrates a widespread appearance of stone walls at Acquarossa Zone F is unconvincing.

Figure 5.19. Excavation of Acquarossa Zone F with Building C on the right (Wikander and Wikander 1990: fig. 4, p. 194), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

Imprudent use of circumstantial evidence has consistently been part of the identification of wall techniques. While sometimes used along with direct evidence, identifications are more often the result of assumptions and vague comparisons of circumstantial evidence. The arguments for the use of certain wall techniques are therefore supported but the basis for that support is unsubstantial. Certainly, circumstantial evidence can be (and has been) broadly useful, particularly in the recognition of non-stone walls. Yet, its power is far more limited than its typical application and identification of specific techniques (e.g. wattle, pisé or mud brick) should not be entirely dependent on it.

5.1.4 Conclusions on walls

A re-evaluation of the architectural evidence from 800-500 BC suggests that the common interpretation of walling in Etruria is unsound. The prevalent view proposes a step-by-step, evolutionary progression from wattle to mud brick to stone based on building materials. However, the assumption that building materials and techniques are interchangeable as evidence for walls fails to appreciate the intricacies of walling techniques. Terminology, as noted by Domanico (2005), belies a clear interpretation of the walling evidence. Therefore, in addition to the identification of techniques, this section has sought to clarify the terminology of walling to form a more accurate interpretation.

Direct evidence does not support an evolutionary progression in walling techniques. Timber framing appears to be the most common of the structural techniques. In fact, the evidence supports an interpretation where timber-framed structures were as common in the seventh and sixth centuries BC as in the eighth. Even infilling techniques, which are associated with the common interpretation, appear to be relatively consistent. Direct evidence for wattle walling (i.e. daub fragments with wattle impressions) cannot justify its common attribution to early structures (e.g. Stoddart 2009: 69). Instead, in most structures from 800-500 BC, the evidence is too vague to suggest one specific non-stone wall infilling technique over another. It is more accurate to state that non-stone walling techniques were used than to ascribe specific infilling techniques such as wattle, pisé or mud brick.

Ashlar stone, perhaps the most substantial change in building materials from 800-500 BC (see section 6.2.1), is introduced in domestic structures at the Borgo and at Acquarossa by the end of the seventh century BC. Yet, it is not the most prevalent form of walling in urban contexts, with evidence for non-stone walled, urban domestic structures seen throughout Etruria well into the sixth century (and later). Most notably, the walls of the Upper Building at Poggio Civitate, a ‘monumental’ structure often compared to the contemporaneous *edifici monumentali* at Acquarossa, did not have stone but pisé walls.

The evidence for the identification and subsequent interpretation of domestic walling techniques is based primarily on inference. Inference is not inherently problematic. Yet, stripping assumption (which has been taken as fact for so long) away from the overall interpretation of walling gives us a clearer, albeit starker, vision. It is perhaps possible to observe a general progression in walling techniques since timber frame structural techniques indicate gradual enhancement over time. The introduction of new infilling techniques, such as mud brick and ashlar might have also affected how structural techniques were used. However, with the evidence available, the most accurate interpretation of walling techniques from 800-500 BC is one of consistency: traditional walling techniques were maintained.

5.2 Roofs

Compared to many other features of a domestic structure, there are no *in situ* roofs but there is direct and circumstantial evidence of roofing techniques. From the evidence, identifications and, in some cases, interpretations of roofing techniques are possible. The basic structure, progression of technological adaptation and stylistic influences of roof tiles are documented and are generally accepted throughout Etruscology, primarily as a result of Ö. Wikander’s (1986, 1993) catalogue and synthesis of roof tiles at Acquarossa. Despite Ö. Wikander’s definitive work, the unknowns of domestic roofing techniques are still prominent, particularly in thatched roofs and the earliest period of tile roofing. As with the other features of an Etruscan building, comparisons to ritual architecture and artistic depictions have influenced the perception of roofing. Specifically, the Etruscan depiction of roofs in miniature models and in tomb construction is an extensively used example of architectural style. Such a reliance on comparison is product of the nearly non-existent evidence for roofing besides the tiles themselves.

In this section, I review established concepts about seventh- and sixth-century BC roofs and embrace the C. Wikander model. Then, I detail how the advancement in roofing was not necessarily a sharp change from thatch to tile but a gradual adoption of new structural techniques. To accomplish this, I use the evidence of post holes in Iron Age structures and the analyses of Damgaard Andersen (2001), in addition to a discussion on the possible roofing styles of seventh-century structures. The purpose of this section is to point out that, despite the unknowns of domestic roofing, roofing techniques (and the changes to them) can be established based on the available direct evidence.

5.2.1 Ö. Wikander's typology and C. Wikander's model: The established concepts of seventh- and sixth-century tile roofing

As Ö. Wikander (1993: 158–160) emphasises in his conclusion to his monograph on roof tile typology at Acquarossa, the Della Seta period system, which is based on tile decoration and led many to believe that roof tiles in Central Italy were no older than 600 BC, is unreliable. The excavations at Poggio Civitate and especially Acquarossa pushed the date for tiled roofing back into the seventh century – no later than 630 BC, according to Ö. Wikander (1993: 160). In some ritual contexts at Veii and Tarquinia, the date for pan tiling is even earlier. Some roof features therefore date to the seventh century, providing insight on the roof technologies used for a majority of the period studied in this study.

In conjunction with the recognised antiquity of the roof tile, stylistic differences apparent in Ö. Wikander's typology signal a gradual progression in tile manufacture. This stylistic progression centres around c.590/575 BC where tiles made earlier are functional but (relatively) undecorated and tiles made later are decorative as well as functional. Furthermore, Ö. Wikander (1981b: 71–76, 1993: 27–30) recognises two types of pan tiles in his typology of which "Type I" is not only more common (in the seventh and sixth centuries) and earlier in date but also cruder in concept. As expected, during the course of the sixth century, pan tiles became more efficient (from Type IA to Types IB and IC).

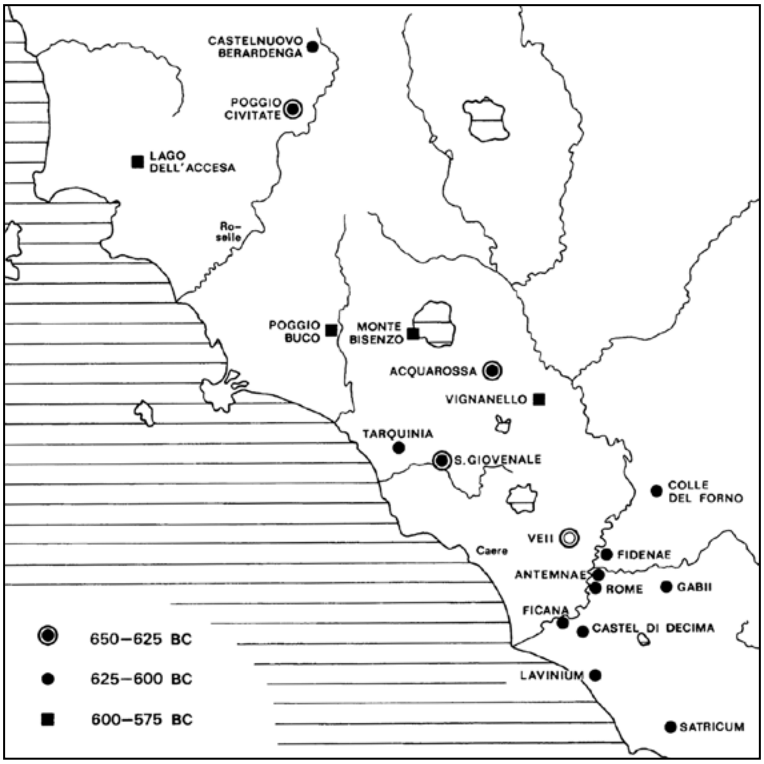

FIGURE 5.20. MAP OF EARLY ETRUSCAN ROOF TILE DISTRIBUTION IN CENTRAL ITALY (WIKANDER 1993: FIG. 61, P. 161), COURTESY OF THE EDITORIAL COMMITTEE OF THE SWEDISH INSTITUTES AT ATHENS AND ROME.

Ridge tiles, too, follow a crude-to-efficient progression. Type I ridge tiles are early variants of Type II and Type II ridge tiles are in turn joined by a wholly different Type III (a possible regional variation) around the end of occupation at Acquarossa in the middle of the sixth century BC (Wikander 1993: 67–69). This progression of crude-to-efficient should be expected, then, of cover tiles, especially considering their concomitant usage. Ö. Wikander (1993: 54) dispels this expectation, however. Showing that the more efficient Type III cover tiles appeared in the seventh century at Zone B House E and that Type I is as common as Type II in the seventh century, he reluctantly admits that if a progression of technical evolution in cover tiles existed, then that evolution occurred in full by the end of the seventh century.

Architecturally decorative tiles, such as *simas*, *akroteria* and antefixes, do not begin to appear at Acquarossa until the last generation of building on site. This appearance of so-called decorative tiles at Acquarossa fits into the wider chronological scheme of decorative terracotta found through Etruria, save at Poggio Civitate where the tiles of the Upper Building slightly predate the rest by 10 years or more (Wikander 1993: 160; Winter 2006: 128). The resultant chronology from Acquarossa gives a whole spectrum of tile technologies

Figure 5.21. Photo (taken 1991) of a modern tiled roof with tiles resting directly on the rafters (Wikander 1993: fig. 50, p. 123), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

and decoration and has performed as the backbone to site comparisons of wealth, distribution, trade and even of adaptation to urbanisation. Nevertheless, the insecure chronology of the cover tiles should serve as a warning to those willing to overly rely on an Etruria-wide architectural terracotta progression.

Perhaps the most important concept to come out of the Ö. Wikander typology is the relative similarity of tile technology throughout Etruria (Figure 5.20). Variation from site to site is noticeable but relatively small. In fact, overall styles are comparable enough that some, even Ö. Wikander (1993: 137–139, 162–163), have proposed the appearance of standardised tile manufacture and workshops by the mid-sixth century BC at the latest (Cristofani 1981). The most famous is said to be Poggio Civitate, with some asserting that its apparent wealth derived from the production and local distribution of tiles and moulds as early as the 610s BC (Berkin 2003: 12–14; Phillips 1992: 81; Ridgway and Serra Ridgway 1994).[43] The similarity of tiles and the possibility of an artisanal class of tile makers fits with the apparent rapidity in tile efficiency witnessed in cover tiles and overall adoption of tiles for even simple domestic structures.

C. Wikander's (1988: 49–55) synthesis of the architectural scheme of the roof builds on Ö. Wikander's (1993: 100–139) typology and provides the structural context for the roof tiles. While Ö. Wikander's chapter on how modern roofs can be used to prove the overall context of tiles is helpful, particularly since it is joined by discussions on type and technology, C. Wikander's summary of possible woodwork used in roof construction is one of the most thorough attempts at addressing how the structure of an Etruscan tiled roof might have looked. Although not without speculation, the argument relies first on the direct evidence of the tiles and their distribution before using comparisons to fifth-century temples and Vitruvian models.

The typical building at Acquarossa according to C. Wikander, had a rather simple roof structure. She argues that buildings, regardless of their walls, would have had wall plates (that is, long timbers running along the tops of the walls) on all four sides of the building (C. Wikander 1988: 49–50). The most common roof type, she supposes based upon the common presence of ridge tiles, raking simas and *akroteria*, is the saddle roof with equal slopes on each side (C. Wikander 1988: 50). Ridge tiles also suggest the use of a ridge pole, although it is not entirely necessary. Pan tiles likely rested directly on the rafters, particularly the ones with decorated undersides (Figure 5.21).

More speculatively, C. Wikander (1988: 51) suggests that the eaves and gables extended beyond the walls in a noticeable way based on votives and cinerary urns modelled on buildings. She supports this claim with the head antefixes of Zone F Building C, which were found a considerable distance from the walls of the structure and indicate projected eaves. However, she argues that this may only hold true

43 A summary of the debate is given by Riva (2010: 182–185) and Berkin (2003: 12–14).

for the more monumental buildings. It is possible that less-grand, private buildings aimed for even greater simplicity and had shorter eaves.

A difference between monumental and plain architecture is also the reason given for the architectural simplicity of the meeting point between the short side walls and the roof. In monumental structures, such as temples or the buildings in Zone F, the short sides had a decorated tympanum, as suggested by the decorative elements noted by Strandberg Olofsson (1989: 176–178; also Wikander 1988: 52). A decorative tympanum would need wooden supports and the create on of a truss at the top of the wall. C. Wikander (1988: 52) argues that in a simpler building the short side wall continued to the ridge pole, supporting the ridge pole itself rather than using a wooden truss and decorative tympanum and it is therefore likely in most buildings at Acquarossa.

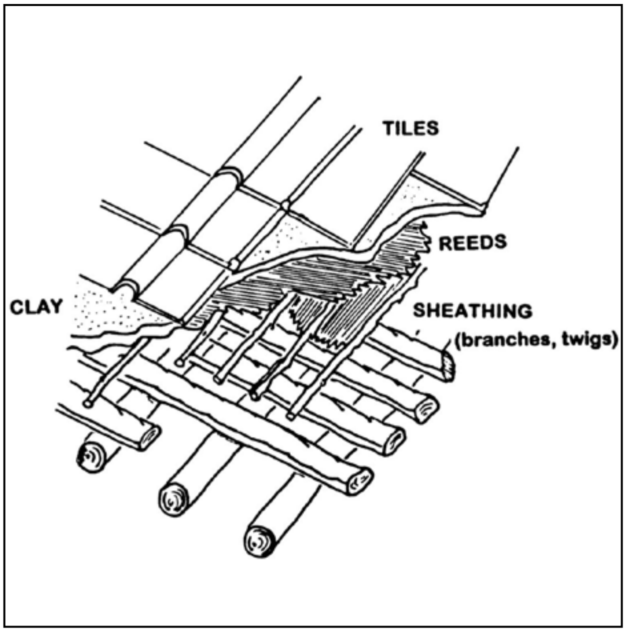

Figure 5.22. Conceptual reconstruction of an Etruscan roof in the Gaggera style (Turfa and Steinmayer 1996: 20). The C. Wikander model roof rejects the use of sheathing and clay revetment for a simpler alternative.

At her most speculative, using revetment plaques and raking simas as a guide, C. Wikander (1988: 54) dismisses the so-called Gaggera Roof. The Gaggera Roof is a system where a large number of thin purlins on the rafters support the weight of the tiles (Figure 5.22). Thicker, spaced-out purlins were possible but C. Wikander supports a scheme where the rafters were rather robust and the use of purlins was minimal (Figure 5.23).

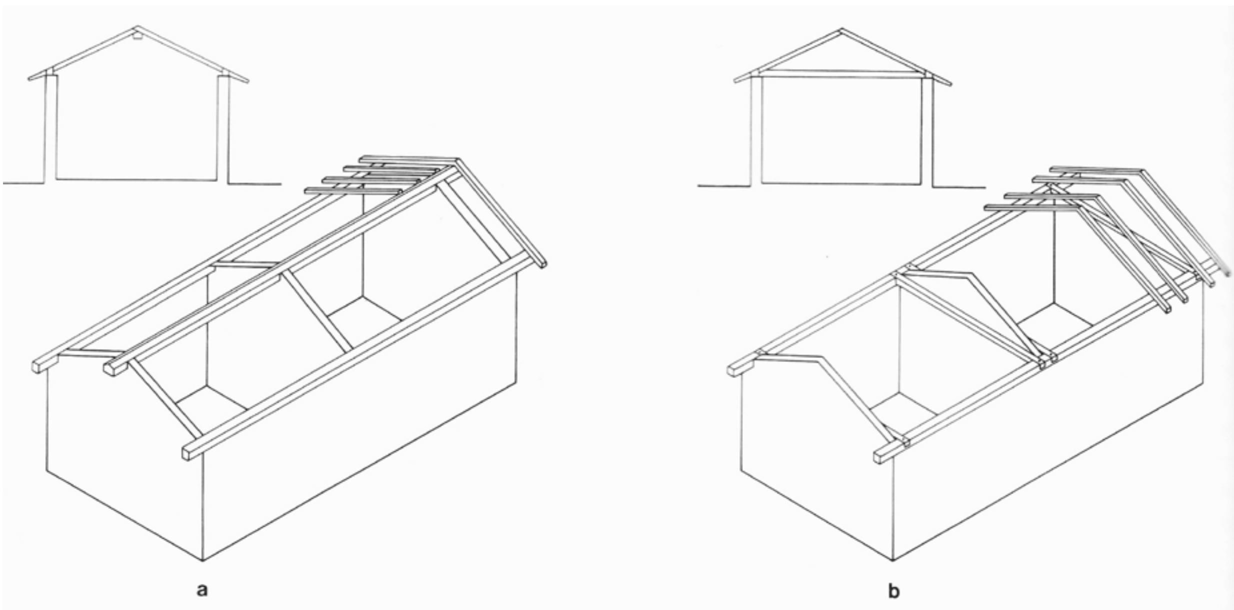

Figure 5.23. Two variants of the C. Wikander model roof (Wikander 1988: fig. 11, p. 50), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

The C. Wikander model roof is relatively simple overall. The basic structure is a couple saddle roof with or without (although more likely with) a ridge pole evenly supported by the walls through wall plates (Figure 5.23). Rafters were robust and carried the weight of the tiles directly, although they could have been supported by purlins. From the Wikander model, one gets a sense of the robustness of the wood used. Essentially, the refined king post (or even queen post) truss system mentioned by others (most notably in an influential architectural text by Hansen (1971: 226)) is not seen in the evidence from Acquarossa. Instead, based on the evidence, the C. Wikander model represents a more traditional tiled roof scheme used in domestic structures in the seventh and sixth centuries BC.

C. Wikander's model fits for more than just the structures at Acquarossa. Given the wide applicability of Ö. Wikander's typology in seventh- and sixth-century contexts and the design of roof supports in late seventh and early sixth centuries BC domestic structures (Foundation Types 4 and 5), it is clear that the C. Wikander model works for buildings throughout Etruria. Ö. Wikander (1981b: 69) points out the similarity in finds and possible design between Acquarossa and the Borgo at San Giovenale. Furthermore, Camporeale (1985a: 130–131, 1997: 30–33) suggests the use of Ö. Wikander's typology and hints at C. Wikander's model for roofing at Lago dell'Accesa, even though the site has fewer tile finds.

Given the meagre amount of roofing evidence in the foundations, a widespread issue in Foundation Types 4 and 5, it may seem difficult to support the C. Wikander model based on foundations. Yet, one thing the foundations do tell us is that complex trusses were not commonplace in the seventh and sixth centuries BC. As noted before, some structures have evidence of posts designed to help support the ridge pole. House I at San Giovenale Area F East, Room 5 of the Upper Building of Poggio Civitate and the farmhouse at Podere Tartuchino all appear to have had posts directly supporting the ridge pole (Figures 5.24, 5.25). This system of support suggests that king post trusses were not being used, although a system of tie-beams against the walls is a possibility in some cases (e.g. the Tomb of the Painted Lions; Turfa and Steinmayer 1996: 27–28). Even though it is possible that floor length posts were decorative, their function alludes to both the weight of the roofs and of the absence of techniques for distributing weight more efficiently. The evidence provided in foundations underscores C. Wikander's emphasis on simplicity in roof structure.

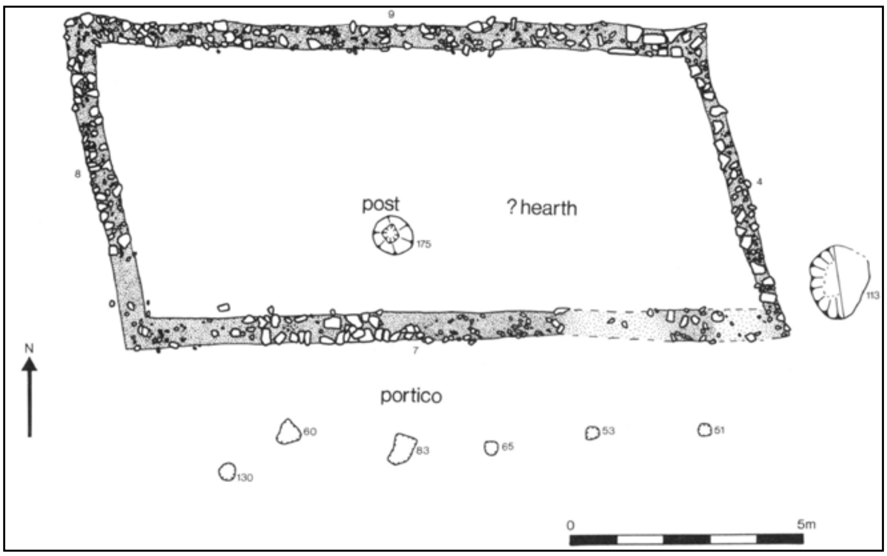

Figure 5.24. Plan of farmhouse at Podere Tartuchino, Phase I (Perkins and Attolini 1992: 80). Note the central post hole, which likely held the ridge pole.

However, this model of the simple woodwork of early tiled roofs conflicts with some broader concepts of roofing. Turfa and Steinmayer (1996: 22–24), in particular, emphasise the use of tie-beam trusses in monumental buildings, such as Room 5 of the Upper Building at Poggio Civitate. Their argument (alongside the one made by Turfa (2000: 113) later on) is that the complex technique, unseen in the roofs of Greece, explains how large roofs could have covered larger expanses, particularly in buildings with non-stone walls. Yet, even in Room 5 of the Upper Building, little evidence exists to support the widespread use of tie-beams or king post trusses. Room 5, for instance, has a central line of posts as well as posts running alongside the walls, supposedly to brace the ridge pole and the walls, respectively. While the flat bases of the columns (which reveal that the central posts were not anchored in the ground) may indeed point to the use of tie-beams as Turfa and Steinmayer (1996: 24) suggest, a roof without tie-beams, trusses or the mortise-and-tenon joints proposed by Turfa (2000: 113) is just as likely and, in fact, less fanciful based on the foundation evidence.

Nevertheless, Turfa and Steinmayer's argument that the central posts could easily have been knocked over (since they were not anchored in the ground) and that the walls were not protected against side-thrust is pertinent (Turfa and Steinmayer 1996: 23–24). Their argument, however, relies on the presumption that new techniques had been created to counter the problems of monumental tiled roofs. Although they are just as speculative, there are other ways to interpret the evidence that does not result in a new technique. For instance, it is possible that the builders of Room 5 realised that the walls would be affected by side-thrust and that their response was not to use a truss but to reinforce the walls and secondarily support the ridge. The colonnades running along each side of the room support this interpretation. It is further likely that the weight of the roof obviated the need for the secondary support posts running through the centre of the room to be anchored into place since the friction at the point of contact prevented substantial movement.

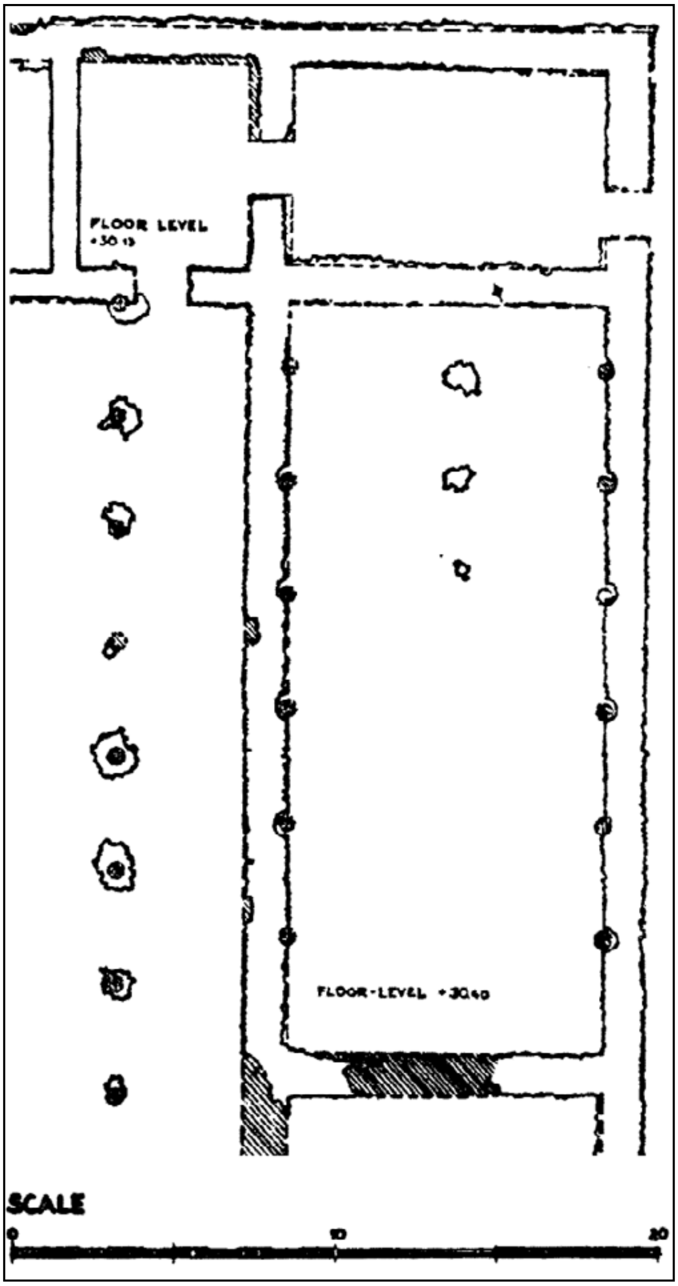

Figure 5.25. Plan of the Upper Building at Poggio Civitate, Room 5 in detail (after Phillips 1972: ill. 1, drawing by H. Lindén), courtesy of American Journal of Archaeology and Archaeological Institute of America.

While this interpretation goes against a modern assessment of architecture (e.g. Mindham 2006: 235), it suits the Etruscan architectural tradition. Posts in the walls (or alternatively against the walls) and posts in a building's interior predominated in the largest structures up to the construction of the Upper Building (e.g. Abitazione 2 of Section III at Sorgenti della Nova; Dolfini 2002a, 2002b; Figure 5.32). As noted above, the use of timber frames with posts in the walls appears in the comparatively large Period 2 House I at San Giovenale Area F East and the sizeable Rectangular Timber Building at Veii to support walls that otherwise would have had no roof supports. Even the collar beams that were prevalent in the hipped roofs of earlier structures (as in Östenberg's reconstruction of the Bronze Age building at Luni sul Mignone; Figure 5.1) are unnecessary with the

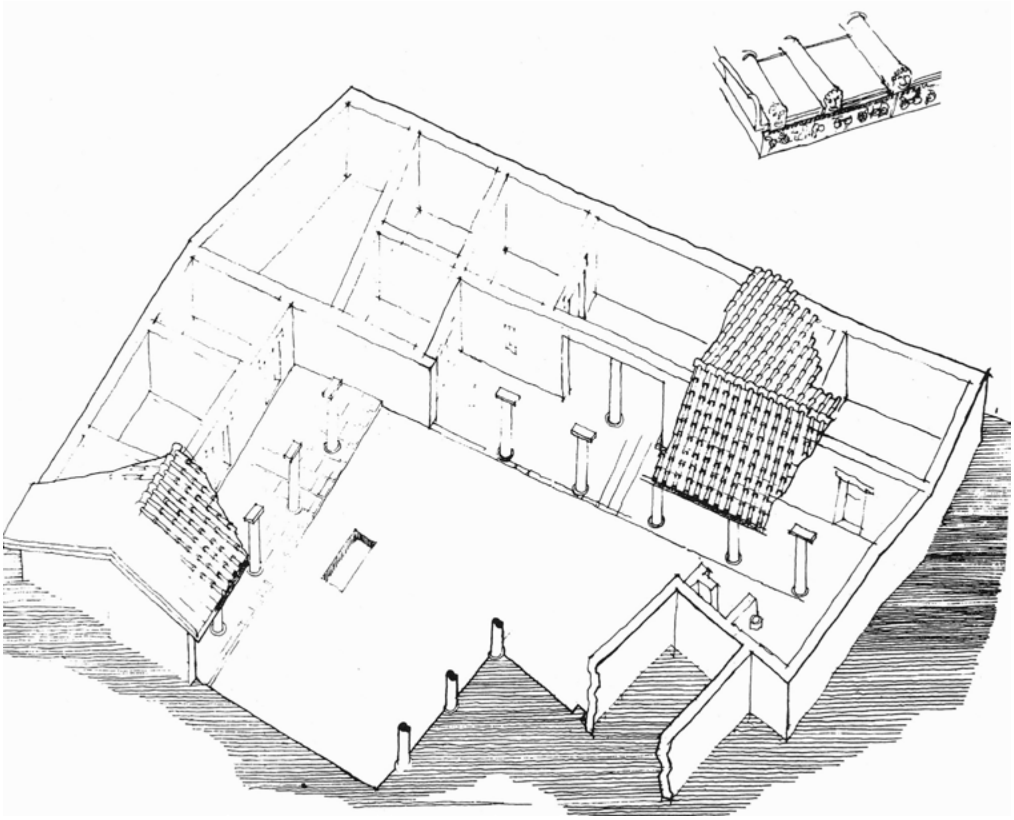

Figure 5.26. Östenberg's illustrated reconstruction of the edifici monumentali at Acquarossa Zone F (Strandberg Olofsson 1989: fig. 16, p. 170), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

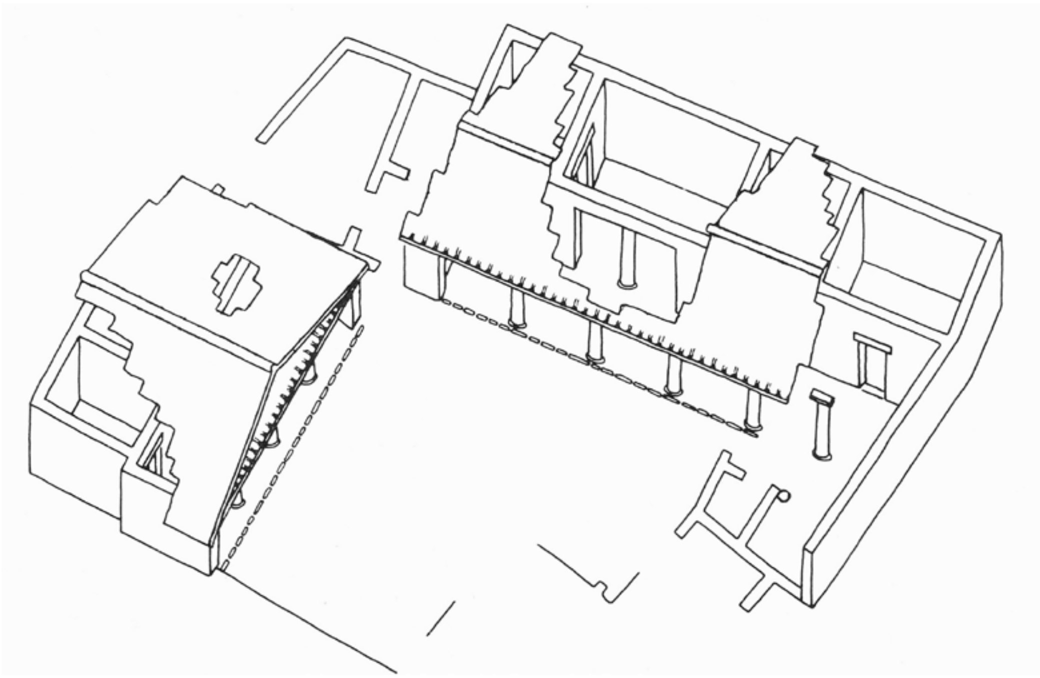

Figure 5.27. Strandberg Olofsson's illustrated reconstruction of the edifici monumentali at Acquarossa Zone F (Strandberg Olofsson 1989: fig. 25, p. 180), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

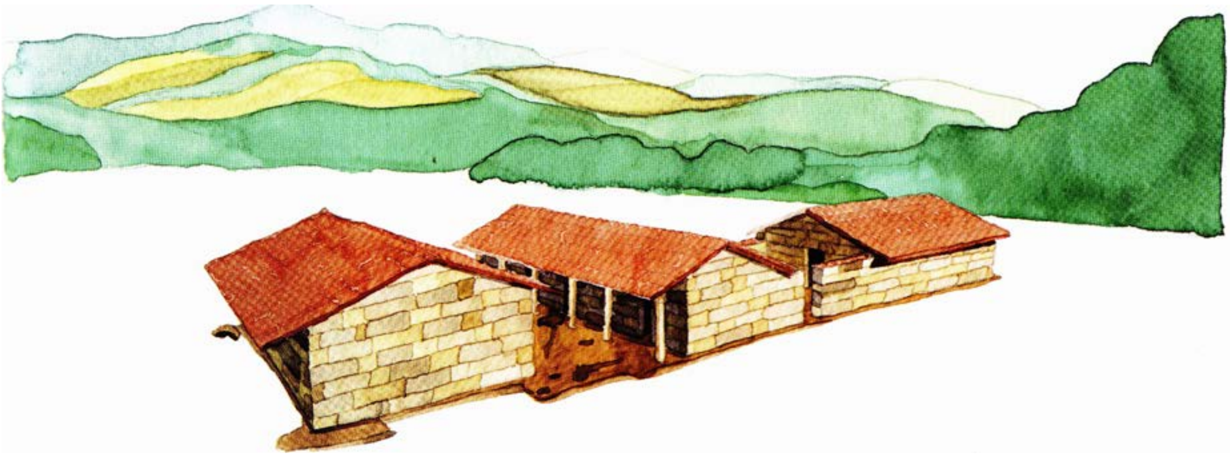

Figure 5.28. One of Fahlander's illustrated reconstructions of San Giovenale Area F East (Karlsson 2006: fig. 295c, p. 161), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome. Houses II and III are shown here unconnected; however, the gap in the wall between the two buildings is entirely imagined.

widespread adoption of saddle roofs (see section 5.2.2).

Either interpretaton is possible but Turfa and Steinmayer (1996) interpret the roof of Room 5 in the Upper Building at Poggio Civitate in such a way that the roof becomes evidentiary of an architectural innovation. Since there is no apparent evidence for the use of tie-beams available prior to this supposed case in the Upper Building (the only evidence for the use of tie-beams appears in funerary contexts in the sixth century BC and in temples in the fifth; Turfa and Steinmayer 1996: 24–31), its use in the Upper Building is unique and, as Turfa and Steinmayer argue, is therefore a breakthrough in technology that defines later Italic roofs. Besides the somewhat similar evidence from Period 3 of San Giovenale Area F East's House I, most domestic buildings do not reflect the monumental designs of the Upper Building and no other evidence from domestic contexts directly supports the tie-beam truss suggested by Turfa and Steinmayer. With the notable exception of Building A at Acquarossa Zone F, the C. Wikander model is certainly more widely applicable.

Strandberg Olofsson and her reconstruction of the *edifici monumentali* uses the find locations of the decorative roof tiles and terracotta, to show that Building A of the *edifici monumentali* was not built with a simple roof as others, such as Östenberg (1975a) and Torelli (1986: 263–267), previously suggested (Figure 5.26). Instead, the finds indicated that, among other things, the ridge of the roof ran parallel with the short walls of the building. This led her to propose that the main frame of the roof was a hybrid with a smaller, shed roof covering the portico underneath the eave of the main roof (Figures 5.27, 5.31).

The result of Strandberg Olofsson's work with Building A is the only strong case for a hybrid roof and one of the only tiled roofs from the sixth century that does not necessarily fit the C. Wikander model. The other instances are the roofs of House II and House III at San Giovenale Area F East (Karlsson 2006: 161–162; Figure 5.28; see section 4.2.4). The complicated building foundations make attempts to reconstruct the roofs of the buildings difficult. In contrast with Acquarossa Zone F, where tile distribution could be and was analysed to give the layout and direction of the roofs, the tile fall of each of the buildings cannot be clearly identified. Given the recording of artefacts during the excavation, a similar reconstruction is unlikely.

Houses II and III at San Giovenale Area F East illustrate the overall ambiguity of roof structures. Although the available evidence allows the creation of models such as C. Wikander's, the evidence is heavily reliant on speculation. The C. Wikander model works well as a starting point in the discussion of tile roofing

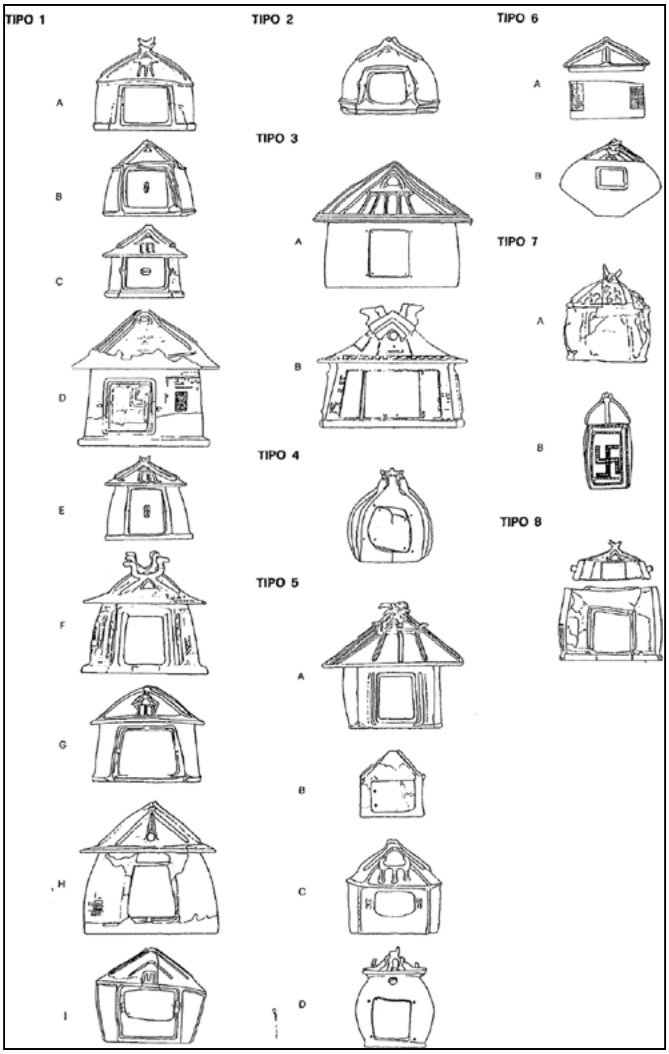

Figure 5.29. A typology of hut cinerary urns as described by Bartoloni et al. (1987:123-133). Note the hipped roofing style, as well as the prevalence of roof decoration.

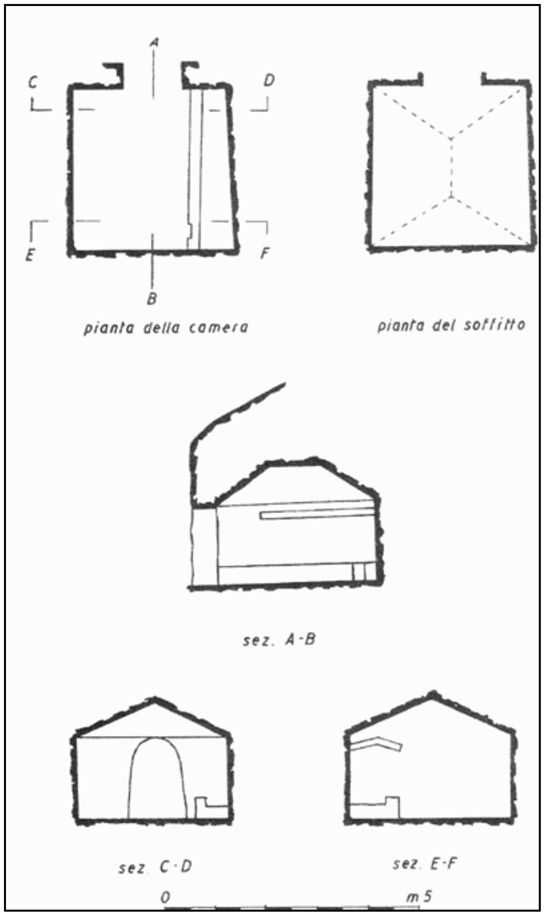

Figure 5.30. Plans and sections of the early seventh-century, Prayon (1975:168) type B1 Tomba delle Antare, notable for its depiction of a hipped roof (Damgaard Andersen 2001: fig. 12, p. 254), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

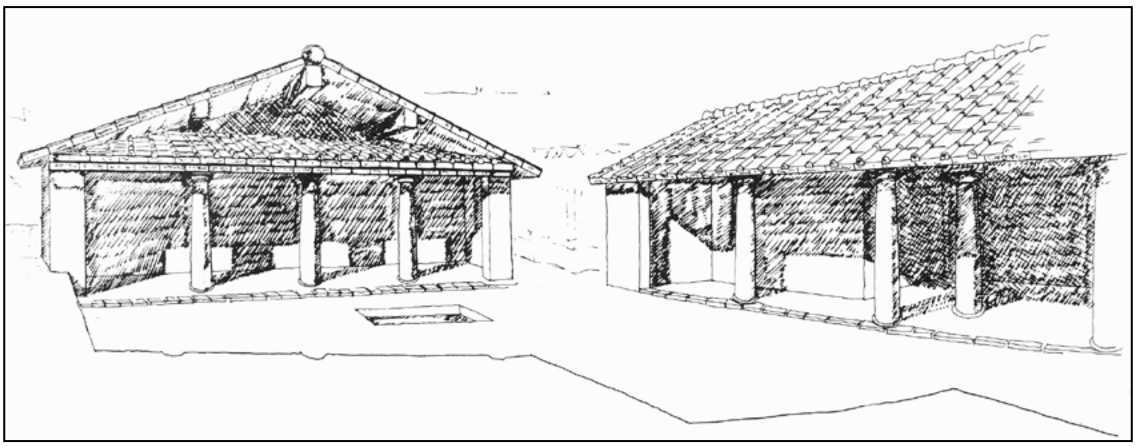

Figure 5.31. Illustrated reconstruction of the edifici monumentali of Acquarossa Zone F (Strandberg Olofsson 1989: fig. 26, p. 181), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome. Building A, on the left, is shown with a portico extending below the eave of the saddle roof in a possible reflection of the traditional hipped roof.

structures and fits for many buildings at Acquarossa but is not effective for all tiled roofs. Notwithstanding the ambiguity in roof structures, with the aid of the Ö. Wikander typology and the C. Wikander roof structure model, the central concepts of Etruscan tile roofing techniques are apparent and give us something to work from when interpreting roofs.

5.2.2 The transition between hipped and saddle roofing types

In general, the non-tiled roofs are harder to identify than their tiled counterparts. Roofing materials, as seen above, are the primary reason tiled roofs are understood. Instead of roofing materials, all direct evidence of the roofs of non-tiled structures is tied to the foundations with comparisons to artistic depictions and the roofs of modern *capanne* filling the gaps in the evidence.

Damgaard Andersen (2001) uses these comparisons to substantiate her arguments on roof designs of non-tiled structures. Her purpose, besides a re-interpretation of so called "hut" urns (Figure 5.29), is to identify the structural differences in roof angles between a thatch and a tile roof. However, she goes further, summing up thought on Etruscan non-tiled roofing in a systematic way.

Damgaard Andersen (2001: 245–246) notes how different the "hut" urns are from modern *capanne* and even the archaeological examples. She stresses that the shape of urns makes little to no difference in how they are roofed. This differs from modern *capanne* where the roof style is dependent on the shape of the building. According to Damgaard Andersen, circular urns are also the dominant shape despite the archaeological paucity of circular ground plans in archaeological contexts. More revelatory, up to 40% of the urns have roof decoration, while few if any modern *capanne* have decorations at all.

Upon establishing the differences between the comparative evidence, Damgaard Andersen (2001: 246–254) reports that the prevalence of hipped roofs in both urns and the tombs said to represent huts (Figures 5.29, 5.30). Hipped roofs are far more common in the depictions of thatched roofs, with most depictions of tiled roofs showing saddle roofs. Damgaard Andersen does not give a reason for the apparent transition from hipped to saddle roof style but a number of reasons may explain the transition, including: the shorter necessary length of the ridge pole in

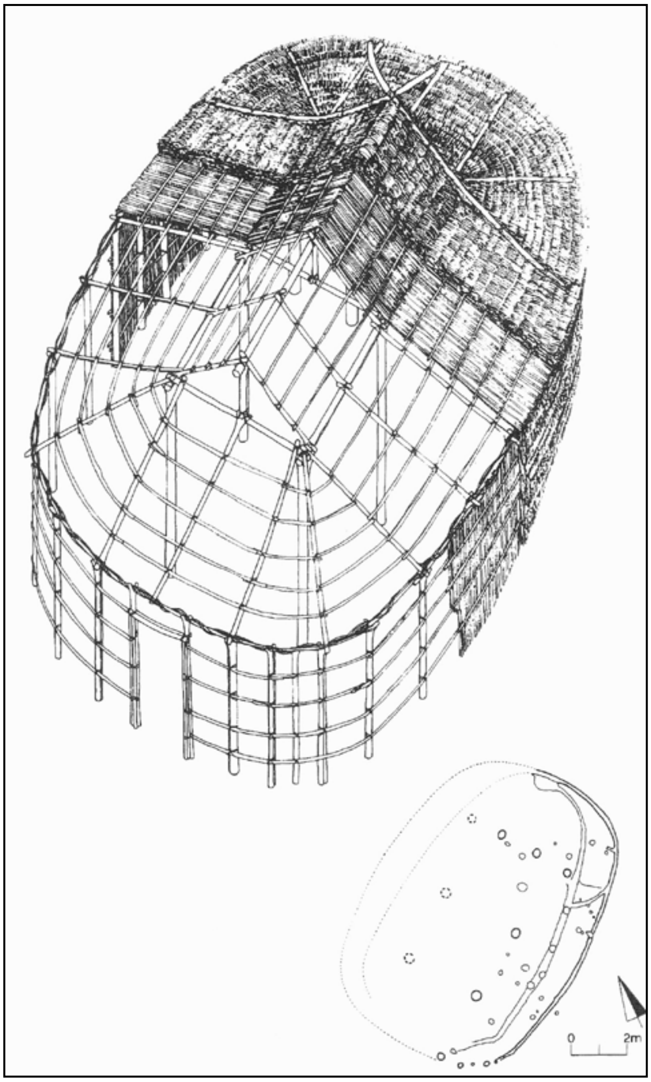

Figure 5.32. Abitazione 2 from Section III at Sorgenti della Nova (Negroni Catacchio and Domanico 2001: fig. 3, p. 342), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

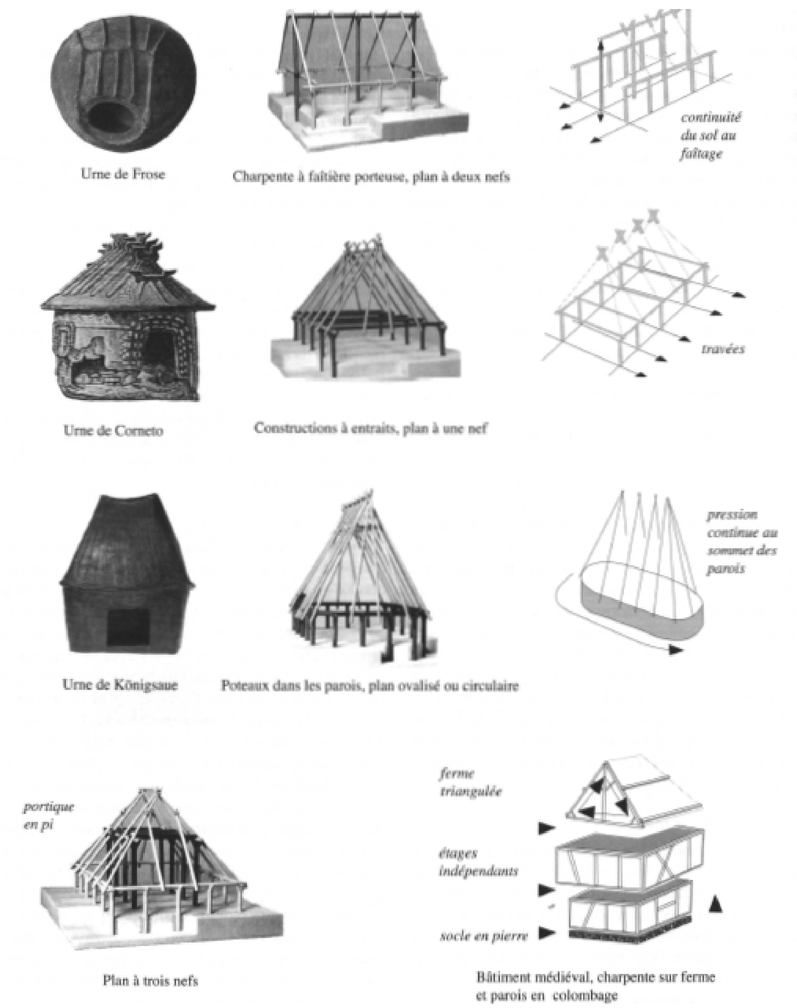

FIGURE 5.33. DIAGRAMS OF BÜCHSENSCHÜTZ ROOF SUPPORT TYPES (BÜCHSENSCHÜTZ 2005: 56).

a hipped roof, the difficulty/cost of corner (or oblique) tiles on the hip or the common use of 45° angles (an angle too steep for the weight of the tiled roof) in hipped roofs (Damgaard Andersen 2001: 252; Gross 1998: 62–65). Only the more monumental tiled roof buildings appear to have needed corner tiles and, with Building A at Acquarossa Zone F possibly reflecting the hipped roof with its "recessed gable" in the hybrid roof (e.g. Strandberg Olofsson 1989; Figure 5.31), their use may have intentionally emulated the traditional hipped roof.

The hipped roof fits well with the archaeological evidence. *Toccaterre*, found in association with the early structures at Tarquinia, run on all four sides of the building and hint at the extended thatch of a hipped roof (Brocato and Galluccio 2001: 292–293; Linington 1982: 247–249). The Büchsenschütz (2001, 2005) three-aisle posts in many of the examples, such as Abitazione 2 from Sorgenti della Nova Section III and Capanna I from San Giovenale Area D, are also ideal for supporting a hipped roof (Büchsenschütz 2001, 2005: 55; Dolfini 2002a; Malcus 1984; Mauger 2005; Figures 5.32, 5.33). A rectangular frame of purlins/collar beams could be held in the joints by the posts, better supporting the hips seen in the models, reaching a single ridge at the top. Although the three-aisle posts could have held up a saddle roof in a similar way, the lack of direct support for a ridge pole (as in the two-aisle) and the narrow distances between the two lines of posts suggest the hipped frame style.

In the Büchsenschütz (2001, 2005) two-aisled type of roof supports, found in the buildings, such as

Oval Hut I at San Giovenale Area E and the rectangular Structure 33 at Tarquinia, could the transition between hipped and saddle roof have already occurred? The archaeological evidence is perhaps too thin to substantiate such a claim. Yet, the examples of the two-aisle type begin in the mid-eighth century BC (Linington 1982; Pohl 1977) and, although three-aisle structures continue into the eighth century (e.g. San Giovenale Area D and possibly the 'Timber Structure from the Earliest Age' at Veii), they are no longer found in the second half of that century (Malcus 1984; Ward-Perkins 1959: 59). This possible transition away from the three-aisled plan, occurring a century before the first terracotta tiles appear in Etruria, might indicate the change from hipped to saddle roofs in domestic buildings seen in the cinerary urns.

An intermediary factor in the transition between hipped and saddle roofing might have come from the use of clay revetment in the protection of the thatch. Damgaard Andersen (2001: 254) mentions the use of paint and the Vitruvian (*De Arch.* 2.1.3) example of clay waterproofing as a possible factor in the lower-than-expected roof angles in the urns. Archaeological evidence may also support the use of clay revetment on thatch roofs. Karlsson (2006: 135–136) describes the appearance of a special type of "daub" fragment found in House I at San Giovenale Area F East. These pieces of "daub" are dissimilar to the others, they are noticeably lighter, for one, and they are far less dense than the others found in the same stratum. This suggested to Karlsson that these daub fragments were in fact decorative or a possible waterproofing revetment of the thatch.[44]

The faint outline of a roofing transition appears using the multivariate sources. As Damgaard Andersen (2001: 254–255) describes, the tradition of hipped roofs is a powerful cultural marker, where, even when the saddle roof becomes commonplace, efforts are still made in tombs and monumental architecture to recognise the tradition. That tradition may have been innovated upon as early as the mid-eighth century. The change in roof supports away from a three-aisle to a two-aisle structure as well as the possible appearance of clay revetment of thatch encourages an interpretation where roofing techniques gradually changed from the mid-eighth century until the adoption or development of terracotta roof tiling sometime in the mid-seventh century. Unfortunately, given the limit in the number of roof supports during this proposed transition, it is difficult to do more than conjecture at this stage.

5.2.3 Conclusions on roofs

The typology presented by Ö. Wikander (1986, 1993) took the direct evidence of roofing at Acquarossa and produced a quantitative evaluation. That evaluation succeeded in recognising that the antiquity of roof tiling in central Italy extended to the domestic setting nearly as early as it had the ritual. It also revealed (albeit with some caution) the gradual progression of tile technology from robust to refined styles.

Also building on the evidence from Acquarossa, C. Wikander's (1988: 49–55) model demonstrates the structural roofing techniques of domestic structures, although her model is a bit more speculative than Ö. Wikander's quantitative typology. It advocates the relative simplicity of most domestic structures, pointing out the rarity of the features alluded to by the tiles of the *edifici monumentali*. In fact, the C. Wikander model underscores the uniqueness of the roof of Building A of the *edifici monumentali* that Strandberg Olofsson (1989) detailed via comparison. Moreover, the existence of this simplified roof structure divides domestic roofs from their usual description based in ritual. Separating them from ritual roof structures is crucial to understanding early domestic tiled roofs in their own right. It leads to discussions about the differences between roofs in the domestic sphere, with examples such as Building A of Acquarossa Zone

44 For further detail on the ways in which thatch could be made waterproof through clay revetment, see a thorough description of the process in Fenton and Walker (1981: 59–68). Though they describe Scottish roofing, the techniques discussed, particularly with regard to clay waterproofing, is insightful.

F standing out in comparison to the C. Wikander model perhaps due to the wealth or status of the building.

This model, essentially based on an assumed simplicity in the early tiled roofs, is likely to be viewed as overly cautious. As displayed in the discussion on tie-beams in the Upper Building at Poggio Civitate, a number of scholars have tried to find evidence of structural roofing techniques in the early buildings as a way to pinpoint the antiquity and possible traditional natures of techniques found in ritual contexts of later periods. Yet, with the evidence as insufficient as it is, it is inaccurate to describe early roof structures using the depictions and specialised construction methods seen in different contexts and later periods. The C. Wikander model may indeed underestimate the craft of some roofs but it also grounds the inevitable speculation in relatively quantifiable terms based on the average roofs at Acquarossa.

Damgaard Andersen (2001), in dealing with the differences between urns and modern *capanne*, also questions the use of comparative analysis between non-related contexts. She contrasts the elaborate decorations pervasive throughout the catalogue of cinerary urns with the comparably austere modern hut. As well as indicating the possible simplicity of the domestic building compared to its ritual counterparts, Damgaard Andersen stresses the prevalence of hipped roofing in depictions of thatched roofs. She points out that there is a possible transition dating to around the adoption of roof tiling from hipped to saddle roofing, demonstrating that the change in pitch angle of the roof might be a relevant indicator of this transition.

Although she fails to describe the impetus for the transition between the traditional hipped roof to the innovative saddle roof, Damgaard Andersen's aim is clear. Technology is the driving force in the change, with tiled roofs necessitating the new style to accommodate their weight. Damgaard Andersen even reveals that the cultural significance of the hipped roof appears in ritual contexts or in buildings of high status for some time after the supposed transition.

The hard archaeological data even seems to support a change in roofing styles in the last half of the eighth century. With the possibility of a heavy, clay revetment altering the traditional weight distribution of the roof structure and the predominance of two-aisled posts at Tarquinia at the beginning of the seventh century, hipped roofing may have already been replaced by saddle roofing in the early seventh century. The C. Wikander model, emblematic of late seventh and early sixth centuries BC roofing structures, is therefore the product of a gradual development in structure that started sometime in the eighth century BC.

5.3 Conclusions

Although the identification and interpretations of walling and roofing techniques come from somewhat similar (and often speculative) datasets, their current state of representation in the scholarship could not be more different. Scholarship founds its definitions of walling techniques and technology within a framework of material change and a supposed evolutionary progression. While some (e.g. Bartoloni 2012b) have pushed the model away from being strictly material-based, the concept of progress in building ability from primitive and rural to refined and urban remains. Along with it, the typically speculative, circumstantial evidence, manipulated in the past to fit this evolutionary progression, retains its position as an integral basis for the identification and interpretation of domestic architecture.

The influence of evolutionary progression is also seen in the scholarship on roofing techniques and technology but, in contrast to walls, the scholarly discussion on roofs is divided between those seeking to simplify the representation of domestic roofs and those seeking an overarching continuity. From the division, specific focus on direct evidence has been critical in the basis of any interpretation, with even the most extreme claims arguing over minute details in the evidence. Such a specific focus on direct evidence forces scholars to acknowledge the precise limitations of their roofing technique interpretations, as well as to continuously re-establish common terminology.

A significant part of the problem with the scholarship on walls is unclear terminology caused by poorly defined techniques and technologies and their requisite evidence. Non-stone walls are plagued with terminological issues, the definition of wattle giving the greatest amount of trouble. With the common description of the circumstantial evidence over-emphasising the presence of wattle and daub and the confusion of half-timbering with wattle, buildings before c.625 BC are generally seen as wattle and daub even when no direct evidence for wattle exists. This false identification is significant since it gives greater prominence to the direct evidence for pisé and (more disrupting to the chronology) mud brick – their rare appearances stand out from the presumed ubiquity of wattle and daub. Some, such as Camporeale (1997: 28–29), argue for the wider application of the other non-stone walling techniques and their arguments have altered the strict view of these techniques as uncommon rarities introduced by foreigners. Nevertheless, the majority of the literature still identifies pisé and mud brick as an evolutionary step in the architectural progression rather than as traditional alternatives to wattle.

The problem of terminology and evidence extends to stone walls, too, where ashlar masonry is often considered the dominant, representative evidence for changing Etruscan architecture. Undue value has been given to the ashlar-built walls in discussion as (even in some of the case examples) it is unclear the extent of ashlar use beyond the foundations of buildings. Ashlar walls undoubtedly existed and their appearance is notable in the discussion of building techniques and technology but the division of non-stone and stone walls inherent in an evolutionary progression undervalues non-stone techniques and neglects the evidence for stone walling prior to the use of ashlar.

An evolutionary progression in architecture is a potentially misleading view of changes in walling techniques. It tries to contextualise centuries-long changes in architecture and in so doing it relies heavily on broad speculation and circumstantial evidence. The tendency for scholars to take evidence and make it fit the progression, even when other interpretations are possible (or better) produces inaccurate interpretations and a potentially distorted overall narrative. In contrast with roofing techniques, the reliance on circumstantial evidence for walling techniques misrepresents the specific details present at each site by amassing the findings into a grand scheme, which is an inherently problematic method when a simpler, direct approach better fits the evidence. Everything from terminology to the overall understanding of the Etruscan architectural progression would benefit from a narrower, detail-oriented representation of the involved techniques and technologies.

For this chapter, the main conclusions are significant. The direct evidence of walls does not support the common interpretation of Etruscan walling techniques over time. Stone walls appear before the introduction of ashlar stone as a building material, weakening arguments based on a timber-to-stone transition. Non-stone walls were the most common in domestic structures but rarely does the direct evidence provide enough information to identify specific infilling techniques. By comparison, specific roofing techniques have been thoroughly defined, identified with direct evidence and interpreted. It is possible to see a general trajectory of modification and innovation to roofing techniques and technologies. The impact of these conclusions will be further assessed in the final chapter using the findings from the previous and next chapters.

Chapter 6: Material Procurement, Production and Use

In contrast with the preceding chapters, which looked at specific building techniques, the intention of this chapter is to identify and interpret the procurement, manufacture, use and reuse of building materials in Etruscan domestic structures. Hitherto, building materials have been secondary in the identification and interpretation of techniques, generally used only as part of the descriptive analyses. Leaving the identification and interpretion of building materials to this chapter is intended to distinguish building techniques as *gestures* (Leroi-Gourhan 1993: 237–243). Techniques are thus separate parts of the operational sequence from the procurement and manufacture of materials. As seen in Chapter 5 (and discussed below), the common interpretation of Etruscan architecture uses building materials as evidence for a transition in building techniques and technology. Now that building techniques have been discussed, it is possible to examine them within the broader operational sequence for evidence of such a transition.

The first part of this examination is a review of the common terminology. As evidenced in the discussion of walls (see Chapter 5), materials and the techniques that use them to create structures are not always well defined in the literature on Etruscan buildings. In addition, the differences between raw and manufactured materials are not often mentioned. Clarifying the differences between raw and manufactured materials and between materials and techniques helps to clarify several issues, which in turn allows for more accurate interpretations of architecture and architectural change over time.

Following the clarification of terminology is the identification of building material procurement, manufacture, use and reuse. A more direct method of *chaîne opératoire* is used in the identification of materials than in the earlier identification of techniques. Beginning with a discussion of the available raw materials, procurement and local access are considered for each material type (timber, stone, clay and cane), as well as how certain raw materials were used or even reused in building without prior manufacture. The section following the raw materials identifies manufactured materials. In contrast with the identification of raw materials, manufactured materials are considered chronologically with an emphasis on recognising changing production and use instead of procurement and access.

Throughout the identification of materials, an assessment of the prevailing interpretations is conducted. Changes in material procurement, manufacture and use therefore receive special attention. In fact, the chronological arrangement of the identification of manufactured materials is intentionally aimed at uncovering a progression of material manufacture and use over time. Toward the end of the chapter, a section on the introduction of new materials appears, with the intention of recognising possible changes resulting from innovation and foreign influence. The main goal of this chapter is to distinguish changes to architecture via a systematic discussion of the evidence.

6.1 The difference between building materials and building techniques

In discussions of architecture, the term 'building material' is often used as a catchall, representing components of a structure in an imprecise fashion (e.g. Becker 2014: 11; Donati 2001: 317–321; Edlund-Berry 2013: 700). While not necessarily problematic when a simple description is the goal, if the term is used in descriptive reconstruction without specific reference to its context, then the result of the analysis can be as imprecise as the initial description. Such analyses can lead to sweeping conclusions about material procurement, production and use that are ultimately untenable and, more often than not, confusing (e.g. descriptions of *graticcio*; Camporeale 1985a: 129–130; Donati 1994: 33, 93; Nylander 1986a; Wendt 1986; see Chapter 5). Contextualising the term 'building material' by classifying the types of building materials in analysis is crucial and often overlooked in the discussion of architectural features.

Generally, structural engineers split the description of building materials into two broad types: raw and manufactured materials (Ward-Harvey 2009: 1–2; see Glossary). The first type, 'raw materials', represents the unprocessed elements of structural components. The other type, 'manufactured materials', represents the synthetic (i.e. manmade) parts of a structure. Although separate terms, these material types are representative of processes and are therefore not mutually exclusive, considering that manufactured materials are produced from raw materials.

The application of such terminology can be observed in the description of an ashlar block of tufa stone. Describing the block as a raw material recognises in the first place its composition (tufa stone) and also, to varying levels of accuracy, its provenance (a specific tufa source). In contrast, describing the block as a manufactured material qualifies it by its process of manufacture (carved ashlar masonry). Identifying its manufacture establishes that, in contrast with other manufactured materials comprised of stone, an ashlar block is both physically and conceptually different.

Failing to acknowledge the distinction between the two terminological types can lead to a confusion of building materials with building techniques. A building technique is the practical use of a material (be it a raw or a manufactured material) in a structure (Oxford University Press 2009). Since they are not raw materials, without the specific classification of 'manufactured materials', manufactured materials can be (and have been) mistaken for building techniques and vice versa (as seen in more detail in the next section). For instance, wattle is a manufactured material comprised of the raw materials cane (*Arundo donax*) and wood. It should be considered a manufactured material because it has a discernible crafting process and although it is most often used in walling, its use in construction is not defined by its manufacture. The process of using that wattle as a specific component in the construction of a structure is a building technique. Therefore, the wattle walling *technique* is a separate process from wattle as a *manufactured material*, even though that distinction is not often realised in the literature.

In contrast, half-timbering is not a manufactured material. Rather, half-timbering is a building technique that describes the use of certain manufactured materials in the process of construction. Those manufactured materials are produced in independent processes from the construction itself and are, namely, shaped timber beams and posts as well as an infilling, such as wattle or mud brick. While these manufactured materials are made for an explicit purpose (i.e. to be used in walling), they themselves are the product of a completed operational sequence, to be used within a wholly separate operation (i.e. in conjunction with other products in a building technique).

Furthermore, not allowing for a distinction between material type and technique has played a major part in the confusing combination of wattle and half-timbering in the literature. Recognition of half-timbering as a building technique is common, such as Vidén's (1986: 56) and Wendt's (1986: 59) descriptions of San Giovenale and Acquarossa, respectively. Yet, their inclusion of wattle in the description of half-timbering is confusing because there is a failure to identify wattle as a separate manufactured material used in the half-timbering technique. Instead, when describing the infill of the half-timber frame, many refer to the make-up of the infill (the raw materials) rather than the wattle or mud brick (the manufactured materials) used in the half-timbered structures (e.g. Bartoloni 2012a: 266–267, 274; Nylander 1986a: 56; Wendt 1986: 59). By not realising the distinction between the raw and manufactured materials, the half-timbering appears as though it were a manufactured material itself as opposed to a way of using building materials in a structure.

The distinctions between material types and between materials and techniques are therefore critical because they decouple procurement from production and production from construction. Vagueness in discussion leads to confusion in interpretive analysis, as seen in the presentation of the supposed, seventh and sixth centuries BC transition in building materials. Steingräber's (2001a) account of Etruscan architectural change is a good example of the confusion. He states that, "the definite transition from the hut to the rectangular house, from transitory to more solid structures and materials including new building techniques (roof terracottas, *opus craticium*, clay bricks, walls with stone pillars) took place" (Steingräber 2001a: 26). The conflation of "structures and materials" with "building techniques" is unspecific. Does Steingräber think that the availability of new building materials drove the transition to permanent structures or that the transition to permanent structures forced the adoption of new materials? The "new building techniques" certainly seem to result from the use of "more solid structures and materials" but what Steingräber identifies as material and what he identifies as a building technique is unclear given his addition of "roof terracottas" and "clay bricks" along with his list of building techniques.

His use of "clay bricks" reveals the confusion of terms particularly well. Mud bricks are manufactured materials made of the raw materials soil, water and straw (Genovesi 2001: 315; Rael 2009: 113–115). Only when the mud bricks are added together and used to construct a wall are they then a building technique. Without giving the descriptive value of the building technique (in this case 'walling'), Steingräber risks the conflation of the material mud brick with the technique mud brick walling.

The conflated terminology may have resulted from naming a building technique after the manufactured material that comprises it, as Steingräber does above. As seen in the previous chapter, the associated naming of techniques has created a problematic focus on building materials, particularly in the discussion of walling. Via association, changes to techniques and even structural form are directly tied to the building materials of a structure. From this associative focus, any perceived change to building technique directly results from the materials they are associated with.

Building materials are basic elements in the discussion of architecture and it is therefore necessary to maintain clarity in terminology to prevent confusion in analysis. Splitting the discussion of materials into more clearly defined types dispels much of the confusion between procurement and production. The remaining confusion between manufactured material and building technique is less easily rid of. However, with strict adherence to the accurate use of terminology and an awareness of the distinction of materials and techniques, the confusing combination of completely separate processes can be avoided. An example of the analytical clarity this recognition provides can be seen in forthcoming sections of this chapter.

6.2 Was there a transition in raw material procurement, composition or use from 800-500 BC?

Changes to the use of raw materials found in architecture appear in the archaeological record from 800-500 BC. These changes, while significant, are nowhere near as profound as a complete transition in material use as, for instance, a transition from timber to stone. Nevertheless, noticeable shifts occur in the use of primary raw materials (i.e. stone, timber, clay and cane/reed). By discussing the appearance of these raw materials, each one individually within this section, the overall trend in changing use, as well as any reasons for changes resulting from procurement strategies, can be analysed. This analysis will consider how changes to raw material use occurred in the seventh or sixth centuries BC.

6.2.1 Stone

Changes to stone use are the most recognisable of the changes to raw material used in domestic architecture besides the transition from cane and reed to clay in roofs. The appearance of (primarily) ashlar tufa wall footings in the late seventh and early sixth centuries BC (as seen in Chapter 4) has been noted as one of the major indicators of the transition in materials (Becker 2014: 15–16; Izzet 2001b: 152–154). Despite the importance given to the appearance of tufa masonry, tufa and many other forms of stone had been used in building foundations long before its use in ashlar footings (Malcus 1984; e.g. Ward-Perkins 1959: 50–61). However, the procurement, preferred composition and use of stone did change over time, often in line with the appearance of new techniques.

Although present, tufa stone was not the primary raw material in stone socles from the eighth and seventh centuries BC (i.e. from Foundation Type 2 examples). Instead, San Giovenale Area E Oval Hut II (Figure 6.1) had a socle of white (highly calcareous) limestone (Pohl 1977: 25). While not present at the site (which is on an outcrop of tufa), the significant amounts of limestone in the hills adjacent to San Giovenale indicate the local procurement of stone (Judson 2013: 38). Furthermore, in the results of the geological survey of Lago dell'Accesa, Salvi (1997: 12) suggests that the foundations of structures at the site were comprised primarily of sandstone and secondarily of *palombino* (a local, highly calcareous limestone) or *galestro*, (argillaceous schist). In contrast with San Giovenale and Luni sul Mignone, no instances of tufa or other igneous stones were discovered in structures.

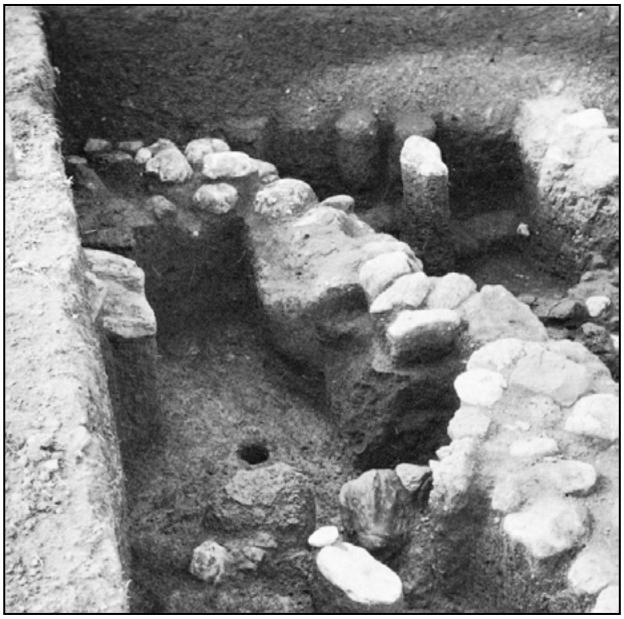

Figure 6.1. Limestone socle wall footing of Oval Hut II at San Giovenale Area E (Pohl 1977: fig. 18, p. 26), courtesy of the Editorial Committee of the Swedish Institutes at Athens and Rome.

This use of local sandstone continues at Lago dell'Accesa well into the sixth century. As the building foundations become more complex (i.e. as Type 4 foundations become the norm), the use of sandstone, *palombino* and *galestro* continues (Salvi 1997). The sandstone used in the foundations at Lago dell'Accesa was cut from nearby outcrops around the lakeside (Salvi 1997: 12). Although cut locally, there does not appear to have been a formal quarry and dimension stone was not produced at Lago dell'Accesa. The fissile nature of the local sandstone, caused by the high shale content, prevented the creation of dimension stones.

Therefore, Salvi (1997: 12–13) proposes that the appearance of less available travertine and *calcare cavernoso* in the later foundations at Lago dell'Accesa results from a desire by the builders to achieve a smooth, tailored finish on the visible parts of the structure, such as the entryways of buildings. The finish of the travertine and the *calcare cavernoso*, in his opinion, is more appealing than that created by the local sandstone, *palombino* or *galestro*. While relatively local instances of these stones are available (Salvi 1997: 9–11), they are somewhat rare, which suggests that they came from some distance.

The finds from the survey of Doganella reflect those of Lago dell'Accesa. Perkins and Walker (1990: 20–21) describe how numerous structural stones were discovered throughout the site, often gathered up by field workers. Most stones were locally procured sandstone and limestone but some stones were made of local travertine and hydrothermal limestone.[45] Although uncommon, Perkins and Walker (1990: 21–22)

45 Sources of travertine, although not located at the site, can be found approximately 2 km away from the survey-site (Phil Perkins, personal communication 2014).

also describe the occasional facing of some stones, similar to those at Lago dell'Accesa, which indicates their possible value.

In contrast with the stone used at Lago dell'Accesa and Doganella, the use of limestone in foundation socles ceases in the seventh century at San Giovenale (Karlsson 2006: 137–142). Tufa became the primary material in foundations, with local quarries providing dimension stones for ashlar masonry. Quarried tufa stone in the foundations of domestic buildings appears in the seventh century throughout some of the larger urban centres of southern Etruria, such as Tarquinia, Veii and Caere (Bonghi Jovino 2010: 167; Maggiani 2001: 121–122; Ward-Perkins 1959: 62–65). Quarries appear to have been local. At Caere, for instance, one of the quarries was in the centre of town, later reused in an Archaic period structure (Cristofani and Boss 1992: 5–19; Maggiani 2001: 122).

Despite its seemingly sudden appearance in the seventh century, the use of tufa had been constant for the majority of southern Etruscan urban centres for some time. Except for the appearance of predominantly non-tufa eighth-century socles, tufa was the primary raw material used in the creation of foundations for many of the known structures in southern Etruria from as early as the Bronze Age, if not earlier (Malone 2003: 257–261; Negroni Catacchio and Domanico 2001). As described in Chapter 3, the traditional form of architecture at the start of the eighth century had foundations set into the tufa bedrock. The tufa, although not quarried, was the primary raw material in these Type 1 foundations.

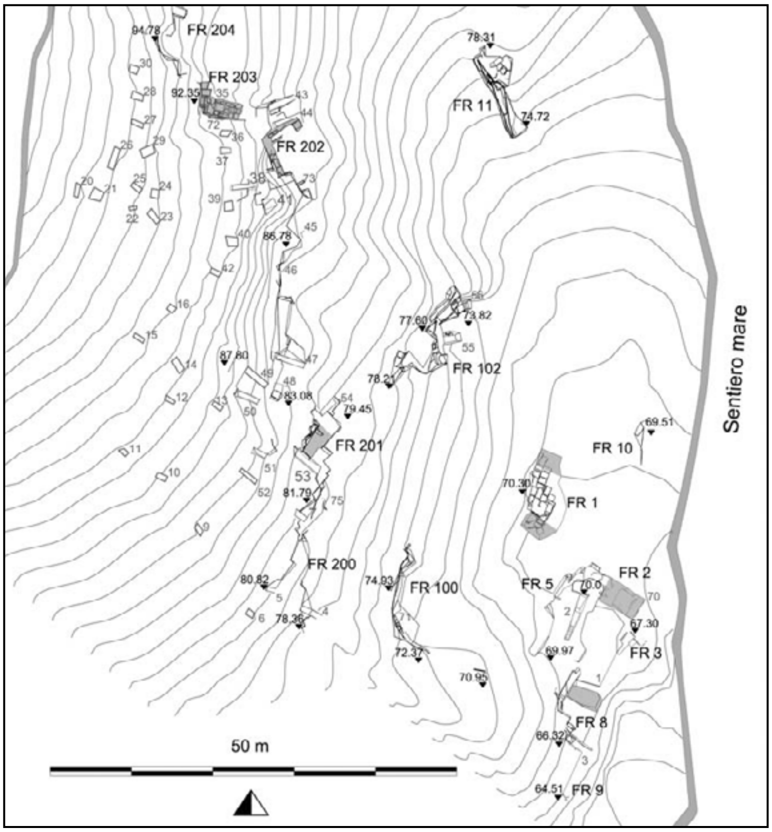

Figure 6.2. Site plan of the necropolis at Populonia (Baratti and Coccoluto 2009: 39).

For instance, the extensive use of tufa on the acropolis at San Giovenale, after an apparent hiatus of up to three centuries, reappears in the foundations of House I in its first iteration (Karlsson 2006: 142–154). A sort of 'missing link', the use of tufa in House I reflects the limestone socle of Oval Hut II of Area E and the ashlar tufa socles common at San Giovenale later in the seventh century. Yet, the foundations also imitate the earlier tradition with its stationary tufa wall footings and 'dugout' interior (Karlsson 2006: 144–146).

When broadened to include the use of stone in the fixed environment, a continuum in the use of tufa as a raw material is apparent in southern Etruria. This continuum is perhaps most evident at Veii, where the various structures below the Northwest Gate utilise first the stationary tufa bedrock surface of the plateau and then transportable ashlar tufa stones as wall footings (Ward-Perkins 1959). Broadly, the composition of stone used in the foundations of southern Etruria was predominantly tufaceous. Small changes, attested in the limestone socles at San Giovenale Area E and Luni sul Mignone were, at least where composition is concerned, relatively minor deviations from the general continuum.

The primary change to the use of stone as a raw material in southern Etruria did not have to do with composition. Instead, the change to the procurement process, namely from adaptation and use of fixed, raw tufa to the quarrying of tufa into a transportable, (and subsequently) manufactured material, is the most prominent change. Changing procurement strategies resulted from the development of new styles of manufactured material, which in turn resulted from new building techniques (as detailed in the next section).

It is unclear, however, whether this general assessment of a change in raw stone procurement fits for all of Etruria. At most of the sites in northern Etruria, the typical composition of stone in structural foundations was not tufaceous (Baratti and Coccoluto 2009: 39–42; Perkins and Walker 1990: 21–22; Salvi 1997). Nonetheless, stone at Lago dell'Accesa was procured from impromptu quarries by the seventh century, similar to many southern sites (Salvi 1997: 12). Furthermore, findings at Cetamura del Chianti suggest that the early northern settlements on sandstone outcrops used the raw stone in a similar way to the early southern settlements on tufa (de Grummond et al. 1994). In addition to Lago dell'Accesa and Cetamura, the Archaic period calcarenite quarries at Populonia (Figure 6.2), the extensive amount of limestone and sandstone at Doganella and the prevalence of sandstone construction at Volterra might suggest a shared history of raw stone use at many of the northern urban centres.[46] However, due to the relatively unknown construction methods in northern Etruria during the Iron Age and early Etruscan period, it would be imprudent to make general conclusions on the procurement, composition and use of raw stone for all of Etruria.

6.2.2 Timber

Extensive alterations to the basic procurement, composition and use of the timbers found in domestic structures do not occur from 800-500 BC. The only substantive change that can be inferred from the evidence is that, during these three centuries, the Etruscans increased the amount of wood used in structures due to changing architectural styles and techniques. Although procurement and timber types did not change in any significant way, some have suggested the overall reduction of some types of wood as a result of environmental changes (Hughes 1997; Hughes and Thirgood 1982).

As noted in Chapter 5, the use of new walling techniques in the seventh century BC, particularly half-timbering, required more wood than previously used techniques. Even self-supporting walls (a fairly new concept in the seventh century) would still have used timber in wall plates and portico supports, as in the replica buildings constructed at Allumiere (Genovesi 2001). Additionally, the roofs of later structures used timbers in new ways that required significantly more wood than ever before. This increased use of roofing timbers is well-represented in the C. Wikander model roof, where rafters and (perhaps) king posts are common features (Turfa and Steinmayer 1996; Wikander 1988: 49–55). Popular walling and roofing techniques of the seventh and sixth centuries thus indicates continuity (if not increased use) of timber in domestic architecture.

Despite its extensive use, timber composition in Etruria is relatively unknown from direct, structural evidence. Samples taken from charcoal at Acquarossa suggest the use of oak (*Quercus petraea* and *Quercus robur*), as well as maple (*Acer opalus*), beech (*Fagus sylvatica*), elm (*Ulmus* sp.) and manna ash (*Fraxinus ornus*) (Östenberg 1975a: 4). However, while it is assumed that the charcoal from Acquarossa is the result of structural fire, it is unclear whether or not all of the wood types found therein were structural. Despite the relative scarcity of direct evidence for structural timber composition, recent studies on the

46 For more on the building stones at Doganella, see Perkins and Walker (1990: 21–22). For the quarries of Populonia, see Baratti and Coccoluto (2009). For building stones at Volterra, see Cateni and Furiesi (2005).

palaeoenvironment of central Italy are helpful in understanding the timber resources available to the Etruscans.

An insightful study conducted by the University of Perugia on remains of Bronze Age structures at the site of San Savino identified a settlement of three stages extending over Lake Trasimeno (Angelini et al. 2014). Remnant wood from the pile dwellings, preserved in the lakebed, was discovered in excavation and studied in lab using radiocarbon dating, microscopic analysis and mass-spectrometry (Angelini et al. 2014: 4–7). Based on the radiocarbon date, the piles were procured in the last half of the second millennium BC (between 3303±137 BP and 2904±27 BP). The team concluded that the majority of the piles were made of oak (*Q. robur* and *Q. petraea*) and, to a lesser extent, elm (*Ulmus* sp.) timbers (Angelini et al. 2013:7-9). Further to this, the pollen studied at San Savino corresponds with the wider palaeoenvironmental data from inland and lowland central Italy, which suggest that much of Etruria was covered in a dense, mixed oak forest (Angelini et al. 2014: 9–11).

The abundance of oak in inland Etruria is also acknowledged in the palaeoenvironmental study of the Ombrone alluvial plain by Biserni and van Geel (2005). Their study concluded that, prior to extensive human settlement, the entire lowland coastal plain was covered in a similar mixed oak forest to that found around Lake Trasimeno. Further south, findings taken from core samples in and near the marshland of Lagaccione near Lake Bolsena (and the settlement of Monte Bisenzio) confirm the similar predominance of mixed oak forests (Magri 1999).

In comparison to the coastal and lowland regions of Etruria, the pollen record of the highland areas, particularly in the northern stretch of the Apennines and hills of modern Tuscany, reveals a more varied environmental history. With the warming associated with the beginning of the Holocene, deciduous trees, primarily oak (*Quercus petraea*) and beech (*Fagus sylvatica*) encroached upon the fir (*Abies alba*), pine (*Pinus pinea*) and juniper (*Juniperus communis*) dominant forests of the highland areas over the course of a few millennia (Alessandrini et al. 2010: 123–124). By the Bronze Age, beech trees replaced coniferous trees as the most common in highland areas, including the Colline Metallifere, the Tolfa Mountains and the Apennines (Scoppola and Caporali 1998; Vescovi et al. 2010: 43).[47] Although noticeably decreasing in number (with decrease in fir trees most evident), evergreen trees were still prominent in the highlands as late as the first century BC, enough to merit mention by Vitruvius (*De Arch.* 2.9).

The palaeoenvironmental data demonstrate the abundance of timber in central Italy in the first millennium BC. To understand timber procurement, composition and use in central Italy, Meiggs (1982) gives the best analysis in his landmark work on timber in the ancient world. Although primarily focussed on timber procurement as a way of understanding Roman use, Meiggs' conclusions are not based on an overly Roman dataset. Instead, he emphasises the longstanding, central Italian nature of timber supplies for early Rome, thereby creating a suitable narrative for the Etruscans. According to Meiggs (1982: 242), oak was a primary building material, despite the difficulty in creating a manufactured timber. In particular, the inability to produce even, untwisted lengths of manufactured oak timbers greater than nine metres was an obvious limitation to ancient builders (Meiggs 1982: 242). For these longer spans, alternatives could be used, especially fir timbers, which Vitruvius (*De Arch*. 2.9.6) highly recommends.

An inscription from Puteoli corroborates the written evidence. Dating to 105 BC, the inscription is a contract detailing timber procurement and its proposed usage in a ceremonial doorway (Meiggs 1982: 242–243). For the main structural supports (i.e. the doorposts, corbels and lintel), oak timbers were planned, while fir was ordered for the boards and battens (i.e. the parts of the doorway that needed to be even and straight). It is impossible to suggest that this inscription is wholly representative of wood use in central Italian structures but its alignment with Vitruvius' preferences and the resource availability seen

47 For more on the spread of beech in highland areas, see Alessandrini et al. (2010: 123–124) and Burrascano et al. (2008).

in the palaeoenvironmental data demonstrates how oak, as the most abundant hardwood available locally was predominant in construction.

The procurement, composition and use of raw timber are therefore better understood than the surviving structural data suggest. Unfortunately, this understanding is primarily circumstantial. Except for the few examples from Acquarossa, San Savino and possibly Luni sul Mignone (Hellström 1975: 68–69, 101–103; see section 3.3.2), it is impossible to be sure that oak was the primary building timber with elm and fir (not to mention hornbeam, maple and ash) used in ancillary ways (Angelini et al. 2014; Östenberg 1975a: 4). Given the known Etruscan building techniques and the relative abundance of hardwood, one thing is certain: the use of timber in construction did not decrease in the seventh or sixth centuries BC. Instead, by all accounts, timber procurement and use was as substantial in the seventh and sixth centuries as it had ever been previously.

6.2.2.1 The environmental impact of timber procurement and its effect on Etruscan domestic architecture

Although the Etruscans might not have been cognisant of it, timber procurement had a growing impact on the environment, witnessed through pollen and soil sampling in particular. This change to the environment directly affected the ways in which some Etruscans built their structures and could be the reason for many of the site abandonments of the sixth century BC. Were procurement, composition and use of timber affected by the changing environment as well?

Palaeobotanists studying central Italy consistently note the changes to flora at the inception of agriculture in Italy. Minimal at first, changes amplified over time (Angelini et al. 2014: 10–11; Celesti-Grapow et al. 2010: 20–25; Drescher-Schneider et al. 2007: 295–297). Pollen samples dating to the Iron Age show that flowering plants and cereals reached previously unseen levels, which represents to many palaeobotanists the growing human impact on the environment, resulting from centralisation of settlements and a greater emphasis on resource production and extraction (Angelini et al. 2014: 8–11; Drescher-Schneider et al. 2007: 297; Sadori et al. 2004: 13). Undoubtedly, forests in some areas of Tyrrhenian central Italy were in decline as agriculture and timber use expanded (Angelini et al. 2014: 10–11; Drescher-Schneider et al. 2007: 297).

Recent palaeobotanical research conducted at Lago dell'Accesa supports the possibility that environmental change caused displacement and decline in Etruscan settlements. According to Drescher-Schneider et al. (2007: 296), from the end of the Bronze Age until the Etruscan period (i.e. prior to permanent settlement) evergreen oak (*Quercus ilex*) declined in favour of flowering shrubs (*Erica arborea* and *Arbutus*). The decline of evergreen oak mirrors the natural decrease in evergreens elsewhere in highland Italy and could therefore be a sign of low human impact (Buonincontri et al. 2013). However, Drescher-Schneider et al. present the proportional rise in smaller timbers, such as juniper and pistachio, as evidence for human impact on forest populations. Smaller timbers, inefficient for fuel or construction, filled in gaps caused by the clearances of larger, more-efficient oaks. Even so, before settlement at the lake, timber populations were stable with only occasional and inconsistent cutting.

With the seventh-century BC settlement at Lago dell'Accesa, significant changes to the pollen record appear (Drescher-Schneider et al. 2007: 296). Clearance of old-growth stands of deciduous oak (*Quercus pubescens* and *Quercus cerris*) likely occurred, possibly for use in structures (Drescher-Schneider et al. 2007: 296; also Mariotti Lippi et al. 2002: 163–164). Furthermore, the decline in *Erica arborea* populations and the related charcoal evidence at Lago dell'Accesa (and elsewhere in central Italy) is widely associated with metal production; the wood was an efficient fuel (Drescher-Schneider et al. 2007: 296; Mariotti Lippi et al. 2000: 289–292). The palaeobotanical data from Lago dell'Accesa indicates that humans heavily impacted their immediate environment.

The human impact on the environment, according to Camporeale (1997, 2010) and Harrison et al. (2010), may have directly (though unknowingly) caused settlements such as Lago dell'Accesa to change. Camporeale (2010; also Camporeale and Giuntoli 2000: 19) states that the hills above Lago dell'Accesa were liable to landslip in torrential rain. In fact, he suggests that the sixth-century changes to building direction and layout, as well as the addition of drains, channels and porticoes, were in reaction to run-off (Camporeale 2010: 149–152). Harrison et al. (2010: 172) further suggest that increased woodcutting associated with the settlement would have encouraged erosion, making the landslips more intense.

Furthermore, a number of Etruscan sites, including Poggio Civitate, Lago dell'Accesa and Acquarossa, were abandoned by the end of the sixth century BC (de Grummond 1997: 33–35; Riva 2010: 180). Similar to arguments that ecological problems were complicit in the fall of the Roman Empire (e.g. Hughes 1997), Harrison et al. (2010) propose that generations of ecological mistakes resulted in an additional stimulus for the abandonment of provincial Etruscan towns. In conjunction with deforestation and subsequent erosion around Lago dell'Accesa (and possibly the others sites mentioned above), the groundwater became contaminated with heavy metal pollution, a by-product of mining and iron working (as shown at Fenice Capanne; Mascaro et al. 2001). Based on the level of arsenic in soil samples and human remains, Harrison et al. (2010) argue that the Etruscans from these sites fled the pollution and possibly settled nearby (as at Acquarossa and Ferentum; Harrison et al. 2010: 177; Turfa and Steinmayer 2002: 23). Although an intriguing hypothesis, the proposal that town abandonment was caused by ecological contamination requires further corroboration.

While the human impact of timber procurement may have indirectly altered the creation of buildings in some settlements, it is unlikely that the use of timber in construction was ever affected by timber shortages. Roman and Greek sources, writing on the geography of central Italy, note the abundance of woodland in Etruria. Strabo (5.2.5), in particular, remarks that the longest and straightest trees came from the Tuscan hillsides. Theophrastus (*HP* 5.8.3), the chronologically nearest source writing on the subject, commented in his fourth-century BC botanical works that central Italy was reputed to be heavily wooded. The picture of abundant woodland in these Classical examples illustrates that, whatever effects timber procurement had on the environment, timber supplies were not considered to be dwindling in antiquity, even centuries after the first effects of environmental change began (Wiman 2013).

Therefore, clear signs of change to the environment, including the recognisable effects of deforestation, did not affect the procurement of timber for structures (or, for that matter, fuel). The effects of deforestation also did not affect usage since (as stated earlier) building techniques from 800-500 BC progressively called for more timber in construction. However, deforestation may well have impacted some Etruscan settlements directly, as seen at Lago dell'Accesa. Despite the considerable human impact of timber procurement, change to timber procurement, composition and use did not occur until long after 500 BC.[48]

6.2.3 Clay and cane

Few building materials were more commonly used in Etruscan domestic architecture than clay or cane. Clay was consistently a necessary commodity throughout Etruscan history and the period from 800-500 BC is no exception. Clay is not only a primary raw material in the creation of daub and terracotta tiling

48 The first notable sign of changing timber composition and use may be recognised in the apparent popularity of chestnut timber, which begins to replace fir as the wood of choice by the first century AD (Di Pasquale et al. 2010; Meiggs 1982: 240–241).

but it has also been suggested as a primary component in Etruscan pisé and mud brick, although the extent of its use in these cases can be contested (see Chapter 5). Cane (typically *Arundo donax*) had many uses as well, notably as the primary constituent of wattle and thatch. Despite their common appearance in building, little research into them as raw materials, particularly concerning procurement, has been conducted.

The limited record of discussion regarding the procurement of clay is similar to that of timber (as addressed in the previous subsection). As with the abundant oak forests, clay is both common and easily accessible in central Italy, particularly in northern, inland Etruria (Battaglia et al. 2011; Bollati et al. 2012; Wikander 1993: 100–102). Over the last two decades, geologists have been drawn to the unique nature of clay in central Italy. Different geological samplings and surveys of northern Etruria have been conducted intent on understanding the formation processes of the so-called 'badlands' (or '*calanchi*'), the minor, clay-rich plateaux that define much of the inland areas of modern southern Tuscany, especially in the Ombrone and Era River Basins (Battaglia et al. 2011; Bollati et al. 2012; Varekamp 1980: 493; Zanon 2005: 685). The badlands are composed of a type of fine-grained Pliocene blue clay and have distinct patterns of erosion that are thought to have heavily influenced land use (Battaglia et al. 2011: 15; Bollati et al. 2012: 2; Bozzano et al. 2006).

Poggio Civitate is located in the heart of the Ombrone River Basin and within the badlands. Its intriguing location in this clay-rich region may actually help to explain the peculiar use of building materials at the site. As opposed to Lago dell'Accesa or the other northern Etruscan sites, Poggio Civitate does not appear to have had extensive, local access to sandstone.[49] Restricted access to and procurement of locally available resources might have influenced the composition of the socles of the Upper and Lower Buildings, resulting in their high amount of clay-earth binding (see Chapter 4). The terracotta production associated with the Southeast Building may also have been tied to the local accessibility of abundant, fine-grained clays.

Supplemental geological surveys of clays are less common for modern Lazio. Clay was by no means absent from southern Etruria. For instance, Judson (2013: 38) states that clay was easily accessible and abundant at San Giovenale in the Vesca valley and above the tufo. However, soil samples and the known prevalence of volcanic geology in the landscape suggests that unweathered, fine-grained Pliocene-Pleistocene deposits of clay were not as prevalent in south-central Etruria as in the Ombrone or Era River Basins (Bozzano et al. 2006: 162). Although less prevalent, deposits of fine-grained "stiff and jointed" blue clay can be found, for example, in Valle Ricca just northeast of Rome (Bozzano et al. 2006).

The circumstantial evidence for the relative abundance of clay, especially in the Ombrone and Era River Basins, reveals that procurement of clay was immediate and that local, good-quality clay could be found at or nearby almost any site in Etruria, as at Poggio Civitate and Volterra. This abundance of raw clay may explain its prevalence in domestic structures. In fact, in contrast with the use of cane, clay continues in use for walling *and* roofing from 800-500 BC. While it may have been used in different manufactured materials over time, the amount of raw clay procurement and use was consistent and may have even increased with the introduction of terracotta as a process of clay manufacture.

In contrast, raw cane procurement and use changed substantially over time. Based on the building techniques used and developed between 800-500 BC, the widespread use of cane decreased over time. In 800 BC, thatch, a manufactured material derived from cane, is assumed to have been the dominant manufactured material in roofing (Bartoloni 2012a: 256; Becker 2014: 8–9, 13). Furthermore, given the use of pisé and mud brick in walling as early as the eighth century (see section 5.1.1), wattle may not have

49 Sandstone nearby Poggio Civitate is a conglomerate variety and access is overwhelmed by badlands clay (Carmignani et al. 2013; van Wesemael et al. 1995).

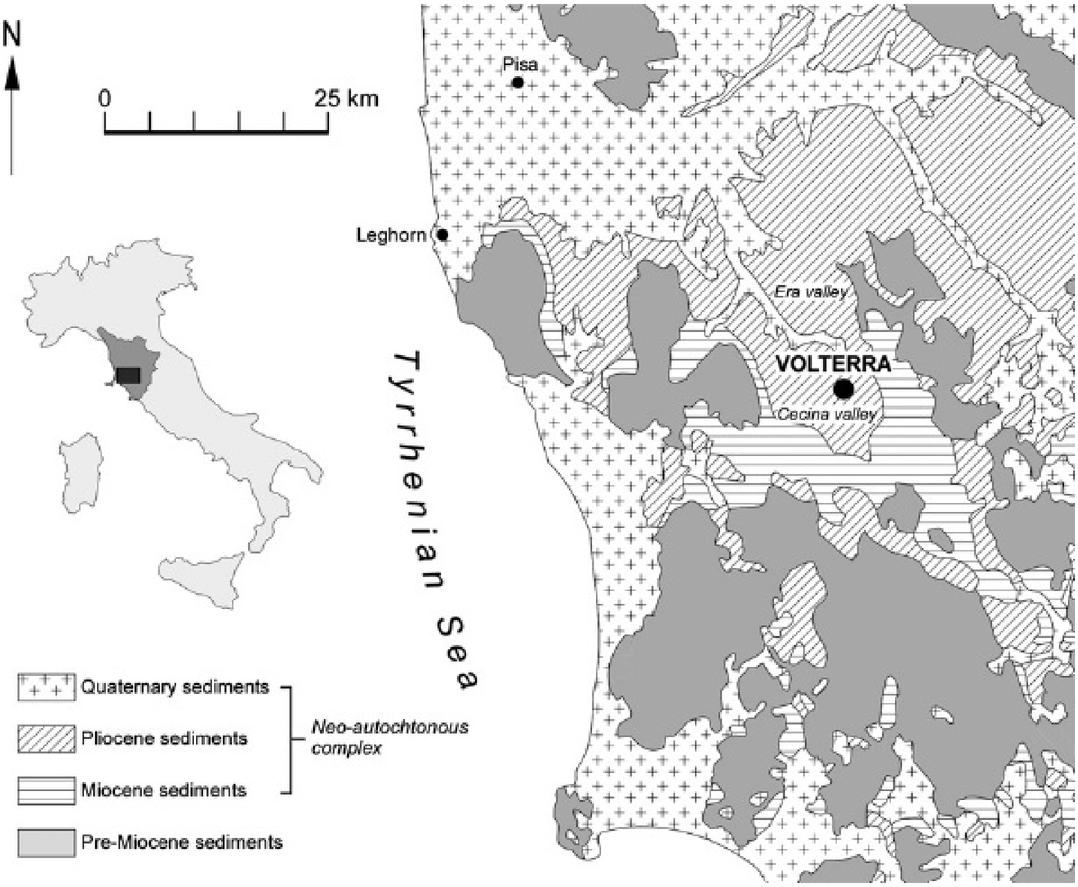

Figure 6.3. Map of the clay deposits in the so-called badlands of northern Etruria (Battaglia et al. 2011: 15).

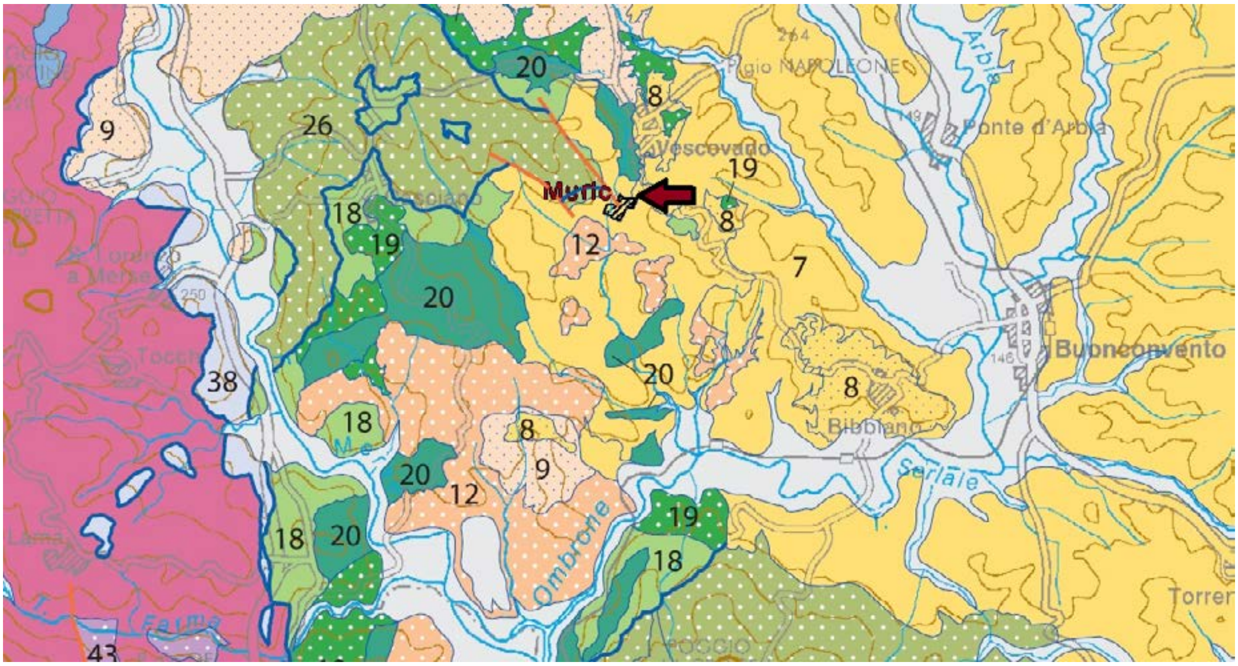

Figure 6.4. Geological map of the Ombrone basin around Poggio Civitate (Murlo) (after Carmignani et al. 2013). Numbers 7, 8, 12 represent Pliocene clay deposits and the number 26 represents a conglomeration of argillaceous siltstones, shale and calcareous sandstone.

been entirely ubiquitous in walls of the Iron Age but the prevalence of wattle (which, as with thatch, was composed of cane) points to a widespread use of cane in building (Bartoloni 2012a: 256; Brocato and Galluccio 2001; Erixon 2001). Besides these larger, exterior building elements, wattle may have been used in interior dividing walls in the larger domestic structures (Bartoloni 2012a: 255; Negroni Catacchio 1995), which would have required further cane use.

In the seventh and sixth centuries, the Etruscans likely curtailed the use of cane in building. It did not diminish entirely, however, particularly in walling since wattle never disappeared as a primary manufactured material. In fact, wattle (and therefore cane) may have seen continued, if not increased, levels of use (see below). Instead, where the use of cane nearly entirely disappears is in roofing. Along with the widespread appearance of terracotta roof tiles at the end of the seventh century, thatched roofs are generally assumed to have been marginalised (Becker 2014: 13–14; Donati 2001: 322–323). If the C. Wikander model roof is taken as an archetype, then it is unlikely that cane was even used as sheathing between the tiles and rafters (although, as discussed in Chapter 5, this is based on examples where pan tiles were decorated on their undersides; (C. Wikander 1988: 53)). Cane use definitely changed, therefore, from a necessary material in every structure to a less critical role as the primary constituent for wattle. Based on the overall availability of *Arundo donax* throughout central Italy (Danin 2004: 362), change to the use of cane is directly tied to changing techniques and not a result of resource depletion or other raw material-based stimuli.

Clay and cane as raw building materials therefore share a symbiotic relationship throughout time. As preferred manufactured materials and building techniques changed, raw material use changed as well. However, as discussed in the next section, the increase in clay and decrease in cane was not an immediate transition nor was it an evolutionary step from inferior to superior material type. Instead, the change in clay and cane use was the result of a gradual increase in clay and gradual decrease in cane derived from changing preferences in manufactured materials and building techniques.

6.2.4 Conclusions

Changes to Etruscan raw material procurement, composition and use occurred from 800-500 BC. Generally, there was a gradual increase in the procurement and use of raw materials stemming from the widening appearance of different manufactured materials and techniques. No discernable, widespread transition in raw materials occurs and the changes to raw material production, composition and use are not indicative of an evolutionary progression. Even the fact that cane use in roofs ebbed in the seventh century BC does not mean cane was no longer a typical Etruscan building material.

Most importantly, there is little evidence suggesting the widespread replacement of one raw material with another, except in the case of roofs with clay and cane. Far from diminishing, timber procurement and use increased, as did cane for use in walls. When the focus is on raw materials and not manufactured materials, a long-standing continuity in stone use is apparent.

Procurement of raw materials was an almost entirely local process. With stone, the local tufa was used in southern Etruria and sandstone was obtained in northern Etruria. Timber procurement was the same throughout Etruria, with oak the most common. Based on the availability of local, quality sources, both clay and cane were also likely obtained locally. In fact, importation of raw building materials appears to have been rare with the only known examples of import come from the use of non-local travertine and *calcare cavernoso* at Lago dell'Accesa in the mid sixth century BC.

Raw building material procurement, composition and use can each be defined for the period from 800-500 BC. Procurement was not only local but increasing in scale. While some deviations from the norm are apparent, particularly in stone materials of the eighth century, the composition of primary materials tends to be consistent, with secondary materials (such as the finishing stones at Lago dell'Accesa) expanding upon local primary materials. Raw material use was also consistent in nature and broadening in scope. With new manufactured materials and building techniques appearing throughout the eighth, seventh and sixth centuries BC, raw material use expanded to cover burgeoning possibilities and reacted to the new, rather than caused it.

6.3 How did the production and use of manufactured building materials change from 800-500 BC?

The following section identifies manufactured materials and interprets their production and use over time. New manufactured building materials were produced and used in Etruscan domestic architecture over the course of the three centuries between 800-500 BC. The goal of this section is to determine the relationship between manufactured materials, the raw materials they were produced from and the building techniques they were employed in. In addition, this section seeks to recognise whether the supposed replacement of older manufactured materials with new ones was the result of conscious or habitual choices of superiority over inferiority.

To achieve these goals, the section has been arranged in a chronological progression. Each subsection discusses the common manufactured materials over a hundred-year span. Organising the materials in this way allows the manufactured materials to be discussed together with other contemporaneous material types. It also more directly addresses the concept of change over time by sequentially following the production and use of the manufactured materials. Where evident change appears in the sequence of one manufactured material, it is immediately compared to the sequence of the other contemporaneous materials. From comparison, an interpretation of the overall sequence, as well as the patterns of change witnessed therein, is elaborated.

6.3.1 800-700 BC

The eighth-century production of manufactured materials, in a way that becomes a trend in later centuries, relied heavily on local raw materials and, in all likelihood, domestic labour (see below). As stated above, the prominent manufactured materials in the eighth century were wattle, worked timbers, thatch and (possibly) mud brick. All but mud brick had long been traditional building materials by the eighth century, with examples of their use in central Italy extending well back into the Neolithic (Ammerman et al. 1988; Malone et al. 1992: 61–62; Shaffer 1985; Tagliacozzo 2005: 430).

Although ancient, traditional materials were not necessarily simple. Both wattle and thatch required specialised knowledge for their production (e.g. Ammerman et al. 1988: 124–128; also McConnell 1992; McIntosh 1974: 163). However, wattle and thatch are not typically artisanal. Instead, based upon ethnographic evidence, they are the products of domestic labour. Brocato and Galluccio (2001) confirm the domestic production of modern central Italian *capanne*. Their findings reflect earlier studies by Erixon (2001) and others researching *capanne* creation (e.g. Caselli 1980; Close-Brooks and Gibson 1966). Furthermore, research conducted on pastoral and nomadic societies emphasise the applied knowledge of households and small communities for the domestic-level labour and production of traditional manufactured building materials (e.g. McIntosh 1974; Steadman 1996).

A similar style of production to wattle and thatch was used for worked timber posts and beams. Certainly, the production of worked timber, as opposed to wattle and thatch, would have required woodworking tools and a specialist selection of raw timber. However, woodworking and its associated tools were already part of the domestic toolset and were used more broadly than in building material production (e.g. Yerkes and Barkai 2013). Therefore, it is not unreasonable to assume that timber manufactured materials were also produced in a domestic, non-artisan setting, with domestic tools and labour (as a product of domestic craft specialisation; (e.g. Hendon 1996: 52–55)). Anthropological case studies confirm that production of timber manufactured materials for use in domestic construction rarely results from artisan labour but is instead the product of the household (Fawcett 1988: 74; Wills 2001).

Compared to the other manufactured materials of the eighth century BC, mud brick differed slightly since its production required specialised tools and selection of raw materials (Genovesi 2001; Morgenstein and Redmount 1998; Nodarou et al. 2008). In contrast with the tools used in the production of timber manufactured materials that could have been employed in other ways, the tools for mud brick, particularly the moulds seen in modern versions of manufacture, could only really have been used for the production of mud brick alone. Furthermore, specialised knowledge of the constituent raw materials in mud brick, with a fundamental knowledge of compositional integrity based upon certain percentages of raw material use, indicates a more complex system of background knowledge than a majority of the other manufactured materials of the period (Genovesi 2001: 315; Nodarou et al. 2008).

Yet, despite the likeliness of greater complexity and specialisation, no evidence from the earliest stages of mud brick production conclusively rules out domestic labour at the household level. To be clear, the direct evidence for mud brick does not appear until the seventh century (although circumstantial evidence suggests that mud brick could have been used in the eighth century, if not before; see Chapter 5). Standardisation and specialisation is possible given the direct evidence from Poggio Civitate and Roselle but without direct evidence from earlier than the end of the seventh century, it is impossible to know how (or even if) mud brick was produced in the eighth century.

Manufactured materials from the eighth century were the product of local raw materials and domestic labour. It is important to note that the eighth century was not when these manufactured building materials first came into production. These materials (besides, perhaps, mud brick) continued into the eighth century following hundreds of years of similar production and use (Bartoloni 2012a: 266; Donati 2001: 319–323). As the building techniques began to change at the end of the century, the production and use of these materials continued unabated and likely unchanged. This unchanging tradition included the procurement of local raw materials, domestic labour in manufactured material production and adapted uses of traditional manufactured materials to fit changing building techniques.

6.3.2 699-600 BC

The production and use of the common, domestically manufactured building materials of the eighth century BC continued well into the seventh. However, over the course of the seventh century, archaeologically visible changes to these traditional manufactured materials appeared, most notably in the addition of terracotta tiles and ashlar blocks to the Etruscan architectural repertoire. Their appearance in the seventh century is traditionally regarded as a turning point in Etruscan architecture that is further established in the architecture of the sixth century. While undoubtedly a turning point, it is likely that any transition in the domestic architecture of the seventh century has more to do with production than with the materials themselves or even the building techniques that they are employed in.

In the seventh century BC, subtle alterations in the uses of the traditional manufactured materials indicate that production of manufactured materials gradually changed. Change is most obvious in roofing, where terracotta replaces thatch. Yet, other manufactured materials show distinct signs of complementary changes, too. For instance, a transition in the use of wattle and worked timber began at the start of the century and became more noticeable in the archaeological record by the end.

In fact, already by the start of the seventh century BC, indications of the half-timbering building technique appear in the archaeological record (although direct evidence is lacking, see Chapter 5). Half-timbering as a building technique called for an increased amount of manufactured timber materials and required greater technical expertise in use, as well as a wider range of finished timber shapes and sizes (Harris 2006; Vasconcelos et al. 2013). While the origin of the term in English is debated, it is possible to trace 'half-timbering' to the production of the manufactured timbers the technique employs (Harris 2006: 3). Rather than using a full-size timber wall post (as in more traditional examples), by increasing the number of timbers used, the half-timbering technique could use timbers that had been halved or quartered and still maintain tension stress through wider dispersal (Vasconcelos et al. 2013).

Associated with changing timber use, the requisite material infill of the walls was adapted to accommodate the new, half-timbering technique, with significant changes to wattle use in particular. Wattle would have needed to be quite substantial in more traditional timber framing so that it could cover entire walls, post-to-post and wall-plate-to-footing. In a half-timber frame, wattle would only need to fill a panel between half-timbers. The resultant wattle panels would have covered less area than in traditional timber framing but, with the increased number of panels (as well as the eventual growth in building sizes), the use of finished wattle products increased.

6.3.2.1 Clay-revetted thatch and the early manufacture of terracotta tiles

Changes to roofing technology are more notable and, thanks in part to the survivability of terracotta, a more discernible transition in material use than that of wattle and timber. At the start of the seventh century, the primary manufactured material used in roofing was thatch. Yet, by the end of the century, terracotta completely replaced thatch as the roofing material of choice, at least in urban areas. Although often described as a major shift in technology and thought brought on by contact with foreign civilisations (e.g. Torelli 1985), this transition may indeed be more similar to the gradual changes seen in the use of other manufactured materials in the seventh century.

Karlsson (2006: 135–136) made an interesting discovery at San Giovenale in his reanalysis of Area F East. Although tentative, some of the clay fragments recovered from House I previously labelled as 'fired daub fragments' are the best physical remains of the clay revetment of thatching (Karlsson 2006: 136). As opposed to other daub fragments, Karlsson discovered that 11 fragments were decorated with relief cordons in a similar fashion as the apex of later *kalypteres* roof tiles. He describes them as "too light and porous to be storage vessels" and concludes, based upon comparison to finds at the pre-Augustan Temple of Castor and Pollux, that the clay fragments must be an early form of roof cover (Karlsson 2006: 135–136).[50] The clay fragments are by no means conclusive evidence for clay revetment, however. If the clay fragments are in fact remnants of clay revetment as Karlsson (2006: 136) concludes, then the apparent suddenness of the transition to terracotta may have an explanation.

The clay fragments certainly resemble dried clay revetment. The clay waterproofing of thatch, as seen in modern examples from northern Europe, closely resembles daub (Fenton and Walker 1981: 69). Applied with the thatch already in place, the daub-like clay mixture is spread while still wet and considerably wetter than daub (Fenton and Walker 1981: 69–71). The liquid nature of the clay mixture allows it to

50 The finds of the pre-Augustan Temple of Castor and Pollux were published by Nielsen and Poulsen (1992) but the comparable clay fragments were presented by Gundager Bilde at a conference in 1997.

thoroughly fill spaces in between the cane strands while also coating the exposed thatch. When dry, the clay revetment therefore mimics daub (if fired during a conflagration of the structure) but is substantially lighter and more porous, which matches Karlsson's (2006: 135) description.

Around the middle of the seventh century and clearly by the last quarter of it, terracotta had replaced (possibly clay-revetted) thatch as the primary manufactured material used in domestic roofs (Wikander 1993: 158–163). Although the transition between the two seems sharp, the beginning of terracotta use in roofs is at best predicted and otherwise assumed. As Purcell (2006) recognised, the emergence of a technology as archaeologically visible as terracotta obscures and overshadows its predecessor (which in this case did not leave visible remains). With degradation of roofing materials before the mid-seventh century typical, archaeologists have only been able to detect an impression of material use. The possibilities introduced by Karlsson (2006: 135–136) of clay-revetted thatch, particularly as evidence for a gradual transition away from cane-based to clay-based manufactured roofing materials, underscores the inherent ambiguity of roofing evidence in the seventh century.

The seventh-century transition from thatch to terracotta may have therefore been a long process of changing raw material use in the production of manufactured roofing materials. Manufactured roofing materials, based on this kind of gradual change, incorporated clay to a point where it replaced cane as the primary material. Cane was eventually relegated to use as a spacer between tiles and the rafters as the production of roofing materials shifted from cane to clay.

Terracotta tiles that survive from the seventh century BC exhibit a gradual change. Ö. Wikander (1986, 1990, 1993), in his analyses of roof tiles at Acquarossa (as well as the broader Mediterranean), mentions the crude composition and firing of early tiles. He suggests that the process of early tile manufacture had not been as expertly crafted as in the later examples. Variation in the shapes of Type 1A pan tiles, for instance, had led some to suggest further "typologizing".[51] Ö. Wikander disagrees. Instead, he proposes that such variation is not representative of one production over another; Type 1A tiles are actually relatively similar in width and overall concept, just not in execution (Wikander 1993: 36).

This inconsistent execution contrasts with Types 1B and 1C (as well as Type II) pan tiles, which were not only more efficient in design but also in implementation (Wikander 1993: 36). Although still quite different in thickness, the execution and shapes of these later pan tiles are far more standardised than the earlier tiles. Ö. Wikander (1993: 37–38) goes so far as to consider the Type II pan tiles as uniform replacements of all Type I pan tiles. However, Ö. Wikander (1993: 38) cautions against a wholly evolutionary chronology, even though the chronology given for Type I pan tiles based on typology is currently accurate. Therefore, while Types IB and IC pan tiles are uncommon before the sixth century BC (and Type II is uncommon before the last half of the sixth century), their appearance in earlier contexts has not been ruled out.

The beginning of workshop production is one of the interesting conclusions drawn by Ö. Wikander (1993: 36–43) about the Type I pan tiles at Acquarossa. It explains the suddenly discernible distinction between thatch and tiles in the late seventh century. Based on measurements of Types IA and IB, he deciphered four pan tile variants. By the appearance of Type II pan tiles, these four variants appear to have been standardised to one size (Wikander 1993: 36–38). Despite the early variation in dimensions, the similarities between Types IA and Type IB led Ö. Wikander (1993: 36) to consider that all Type I pan tiles could have been made by the same workshop. He argues that variation in size was possibly a product of the workshop adjusting or even specially tailoring manufactured materials for individual buildings or neighbourhoods. It is possible too that competing manufacturers using the same production methods arose in different areas of the town (Wikander 1993: 36–38).

51 For the sake of consistency, the term 'pan tile' has been used here and, as in the works of Ö. Wikander (1986, 1993), is the same as the more-specific Italian term '*tegula*' or Latin term '*imbrice*'. For further clarification on terminology, see Glossary.

Although the exact method of manufacture is somewhat unclear, the pan tiles from Acquarossa characterise a gradual process of standardisation starting in the late seventh century BC. Standardisation supports a conclusion that tile workshops began producing manufactured roofing materials. This style of production differs from that of the beginning of the seventh century, which by all accounts was domestic in nature. Changing labour in production may explain the seemingly sudden, widespread appearance of terracotta tiles in the last quarter of the seventh century. Standardisation, already apparent in the earliest tiles, suggests that the change to artisan labour in the manufactured roofing material production was dependent on or, at least, interrelated with widespread terracotta adoption.

A transition based on a shift in production as opposed to a choice of superior raw materials (clay over cane) fits the gradual change in raw material suggested by clay revetment. The appearance of clay revetment in an early seventh-century context indicates that the use of clay in roofing was not unique to the late seventh-century terracotta. The switch to workshop terracotta tiles does not necessarily result from recognition of superior raw materials. Instead, the transition from clay-revetted thatch to terracotta tiling came as a result of shifting socio-cultural factors, which resulted in increased artisan production.

6.3.2.2 Why does ashlar tufa stone production and use stand out?

By the end of the seventh century, the first widespread use of ashlar stones appears in the archaeological record. These manufactured materials differ from the typically unprocessed stones found in the socle footings that are most prominent in the seventh century (i.e. Foundation Types 2 and 4; see Chapter 4). The best evidence for the earliest use of ashlar stones in domestic architecture comes from mid-seventh-century contexts at the Borgo at San Giovenale. Extensive use of ashlar does not appear until the end of the century at sites such as Acquarossa (Izzet 2007: 152). Moreover, ashlar masonry is not common at every site and, as mentioned in the previous section, was heavily reliant on local resources.

There is a notable difference between ashlar stones and the contemporary raw stone alternative, as seen in the socles of buildings (e.g. Complex II at Lago dell'Accesa Area A). Traditionally, stones were gathered in their raw form and then used as a part of a building technique, such as a socle wall footing or even as walling itself. This tradition was far-reaching and continued into the sixth century at Lago dell'Accesa and Poggio Civitate (see Chapter 4). In comparison, ashlar stones were a product of a manufacturing process; they were finished manufactured materials that, once finished, could be put to use in a socle or into other building techniques, such as stone walling or pillaring.

Despite this difference, the overall concept of ashlar stone production and use as a manufactured material is not so different from the raw alternative. As with many of the stones used in Foundation Types 2, 3 and 4, ashlar was quarried, likely at nearby sources. At San Giovenale, for example, the seventh-century tufa quarries on the slopes above the Pietrisco were the source for the building stone in the adjacent Borgo (Blomé 1986: 56; Nylander 1986a: 49; Pohl 2009: 21). The bedrock beneath House I, in between its first and second building phases, was also a source of raw tufa material (Karlsson 2006: 34, 48–49, 155). The resulting ashlar was used in (at least) the socle in the second iteration of House I (Karlsson 2006: 155). Proximal quarrying of tufa continued well into the Archaic period and evidence for city-centre quarrying at Caere is a good representative of such procurement (Cristofani and Boss 1992; Maggiani 2001).

In southern Etruria, tufa stone was easily malleable and accessible, which may have been at the root of its production as a manufactured material (Cifani 2001; Jackson and Marra 2006; Judson 2013). The tufa of southern Etruria itself is a geological phenomenon associated with the highly volcanic past of central Italy. Although commonly called "tufa" when discussed in connection with building and archaeology, the stone used in masonry is more accurately identified as a breccia tuff formed from a layer of rapidly cooled volcanic ash (Capaccioni and Sarocchi 1996: 81–84; Ciccioli et al. 2010: 235–238; Zanon 2005: 693–694). Even this definition covers a broad category of geological material, with some tuff containing more sedimentary material (often when in contact with the sea) or, alternatively, igneous material (depending on the exploded material the ash came from) (Varekamp 1980: 497; Zanon 2005). Depending on this composition, the speed of compression, cooling and contact with the air, the tuff can be fissile or robust, not to mention porous or nonporous, and all types in between (Capaccioni and Sarocchi 1996: 81–89; Ciccioli et al. 2010: 230–232; Varekamp 1980; Zanon 2005).

However, the Pleistocene (Calabrian and Ionian) ash flows of the Apparato Vulsino and, more importantly, the Vico-Cimino complex provided extensive ignimbrite/rhyolitic tuff material throughout the region along the south and east of Lake Bolsena and north and west of Lake Vico (Capaccioni and Sarocchi 1996; Ciccioli et al. 2010; Varekamp 1980). When compared to the stone of other regions of Etruria (e.g. the tuff of the Pian de Celle eruption near San Venanzo: Zanon 2005), this ignimbrite/rhyolitic tuff may have been commonly used due to its durability but also thanks to easy to cut consistency, a result of the fineness of its component ash (Capaccioni and Sarocchi 1996; Ciccioli et al. 2010). Therefore, Vulsinian and Vican tuff was ideal for the manufacturing process, a trait long-understood in Etruscan architectural traditions.

In the earliest domestic structures with ashlar masonry, a certain level of standardisation is apparent in production. At Acquarossa, despite some variation, the majority of ashlar blocks fit standard dimensions: 1 x 0.5 x 0.4 m (Wendt 1986: 59). On the acropolis of San Giovenale, the majority of stones in House I measure to around 1 x 0.45 x 0.3 m (Karlsson 2006: 31–33). The other two houses have a mix of these whole-length blocks and other, half-length (0.5 x 0.45 x 0.3 m) blocks. This standardisation of size and shape is also apparent in the earliest ashlar in the Borgo (Blomé 1986: 56; Pohl 2009). Given the localised nature of the quarries, it is surprising that such a general standard, particularly in the length and width of blocks, existed between sites in the region.[52]

The contrast between local quarrying and the general standardisation of ashlar tufa raises questions about labour. On the one hand, the nearness of quarrying locations (particularly on the acropolis of San Giovenale where evidence for the extraction of one or two stones from the bedrock beside the buildings points to immediacy) suggests that the quarrying, production and use of ashlar blocks were the result of on-site labour and indicates domestic labour. On the other hand, the intra- and inter-site production and use over time is not dissimilar to a system of artisan labour, as seen in the contemporaneous production and use of terracotta tiles. Given standardisation, one might suggest that specialisation existed and was a product of artisan labour. With evidence for artisan labour in the production of other contemporary architectural manufactured materials likely, it is not unrealistic to recognise standardised ashlar production by the end of the seventh century resulting from artisan labour or, at least, knowledge.

The manufacture of stone building materials in the seventh century was innovative since the refinement of standardised, transportable raw stone building materials was previously uncommon. However, the production and use of ashlar masonry was not far removed from the other uses of stone material in the seventh century (as evident in House I at San Giovenale Area F East where the carved, immobile tufa wall footings reflect later socles in Houses II and III). The refinement of tufa was not a new concept in southern Etruria, only the creation of standardised blocks was. The eighth-century expansion of the socle wall footing building technique changed how stone materials were used by essentially triggering widespread transportable stone use in foundations. By the seventh century, the use of transportable stone had become tradition. As shown in Chapter 4, this traditional foundation style was honed throughout the seventh century. The late seventh-century appearance of ashlar blocks therefore resulted from the honing of the

52 Indeed, the dimensions of ashlar blocks at both Acquarossa and San Giovenale may reflect the introduction of standard units of length as noted by Rottländer (1993). According to Rottländer (1993), the so-called 'Etruscan foot' measures 27.5 cm, suggesting that these ashar blocks are essentially 3 x 1.5 x 1 Etruscan feet.

wall socle building technique, the incorporation of a traditional, easily produced local raw material and, possibly, the emergence of standardisation due to an emergent class of specialised labour.

The relatively sudden appearance of terracotta tiles and ashlar tufa blocks in the archaeological record undoubtedly represents alterations in the architectural history of Etruria. However, they do not represent an immediate shift in manufactured material production and use. Instead, they represent changes in both earlier building techniques and sources of labour. The appearance of these manufactured materials are products of the gradual improvements and replacements of innovations made earlier in the eighth century.

Many structures dating to the seventh century BC are defined by later manufactured materials, in large part resulting from their survivability or supposed foreign genesis. Critically, manufactured materials from the majority of the century were the product of local raw materials and domestic labour, as they had been in the preceding centuries. The tradition of local raw material use continues to be the norm throughout the century. Yet, by the middle of the century, labour appears to shift away from domestic to artisan production and, by the end of the century, many of the domestic buildings in Etruria use standardised, artisan-made manufactured materials.

6.3.3 599-500 BC

As a result of earlier innovations in building techniques, the use of artisan manufactured materials, such as terracotta tiling and ashlar stone, expanded in the sixth century BC. Expanding use of these artisan materials appears to have spurred further standardisation and specialisation in their production. Artisan-manufactured materials of the sixth century therefore follow on from innovations in building techniques and production.

Although generally recognised for the establishment of changes brought on by reciprocal innovations in techniques, technology and manufactured materials in the sixth century BC, invariable concepts regarding manufactured materials continue from previous centuries. Of these concepts, local procurement of raw materials for manufactured material production is most obvious. However, the production and use of manufactured materials such as timber, wattle and mud brick continued into the sixth century, as well (e.g. at Acquarossa (Wendt 1986), at Murlo (Phillips 1992; Turfa and Steinmayer 1996), at Lago dell'Accesa (1997, 1985b)). As expected, a general expansion in the scale of domestic construction in the sixth century altered material procurement, which must have risen to meet demand. Furthermore, it is likely that specialised labour replaced domestic labour in the production of timber, wattle and mud brick, but this is more difficult to prove based on archaeological evidence alone. In comparison, terracotta manufactured materials achieve a level of noticeable refinement in production and use during the sixth century. Ö. Wikander (1993: 38) remarks that the last types of pan tiles in use at Acquarossa (before the demise of the town in the second half of the century) closely resemble the types of tiles common in central Italy until the Augustan period thus following a general trend where refined tiles became increasingly typical in Etruria by the middle part of the century.

At Acquarossa, this refinement also includes greater overall standardisation in the second quarter of the century than ever before. Ö. Wikander (1993: 38) notes that the mid-sixth-century replacement of Type I pan tiles at Acquarossa with the refined Type II was the result of an adaptation or even pure adoption of more refined northern tiles, represented by those found in early sixth-century contexts at Poggio Civitate. This shift between early and late types at Acquarossa is almost absolute, with the noticeable variation in pan tile sizes disappearing entirely by the mid-sixth century as the new standard became dominant.

Northern-inspired Type II pan tiles at Acquarossa contrast with those found at Poggio Civitate in one regard (Wikander 1993: 37–38). Whereas variation between tile size and shape disappears at Acquarossa by the mid-sixth century, variation in tile dimensions is the norm at Poggio Civitate (Wikander 1993: 38). It suggests that, at Acquarossa, everything from style and shape to the dimensions of pan tiles was standardised, perhaps even artificially set by a single workshop. Given the similarity between northern tiles and the new tiles of mid-sixth-century Acquarossa, it is possible that artisans drew from some form of wider technical influence. Otherwise, ideas from northern workshops or the northern artisans themselves spread southward.

A quick note on decorative and architectural terracottas: the beginning of production and use of these tiles in the sixth century has been addressed (Edlund-Berry 1989; Strandberg Olofsson 1984; C. Wikander 1981; Ö. Wikander 1976, 1981, 1988, Winter 2009, 2013), with the gradual development of tiles well documented and discussed for both Acquarossa and Poggio Civitate, in particular (e.g. Rystedt 1983). However, it is important to note the increased refinement of decoration on functional tiles, especially when those decorations are functional themselves. The appearance of more advanced, decorated tiles, such as the Type III ridge tiles at Acquarossa or the widespread use of lateral simas, hints at the increased specialisation of mid-sixth-century BC workshops (Wikander 1993: 67–72).

One of the functional outcomes of greater specialisation in the production of tiles is the increase in technological adjustments to waterproofing. Decorative elements, such as the spouts on lateral simas or the intentional gaps in Type III ridge tiles that were intended to fit over cover tiles (not to mention the more cohesive connections between pan tiles and between cover tiles with the adoption of the refined northern standards) better seal the building against the elements besides their greater decorative specialisation (Wikander 1993: 72). The overall progression of tiling toward a more water-tight roof indicates the value placed on waterproofing and emphasises the foremost function of terracotta tiles in the sixth century BC.

Refinement on the basis of function in the sixth century is primarily noticeable in terracotta tiling but can also be seen in the stones of buildings with Type 4 foundations. By the sixth century at Lago dell'Accesa, the sandstones used in wall footings show signs of processing before use, with regularity and even some shaping more apparent than in earlier contexts (Salvi 1997: 12–13). The processing of these stones and their refinement so as to form a more cohesive and sturdy socle is an indication of Foundation Type 4 and is part of the overall sophistication of technique compared to Type 2.

Although refined, it is unclear whether a standardised process of manufacture, where the stones were no longer strictly raw materials but categorically shaped before their use, took place. The sixth-century stones in use at Lago dell'Accesa that are most likely manufactured materials are the travertine and *calcare cavernoso* (noted in the section above). Given the distance of the source of the travertine and *calcare cavernoso* from the site and their finish, these stones, in contrast with the local sandstone, must be considered manufactured since they were shaped, finished and intentionally brought to the settlement prior to their use in the socles. This production stage is not as clear in the local sandstones, which means that, without further evidence of production, sandstone at Lago dell'Accesa in the sixth century is less certainly a manufactured material.

The refinement of stone and the overall expansion in the use of stone at Lago dell'Accesa broadly reflects greater refinement in terracotta production and use. However, as opposed to terracotta, this refinement of manufactured materials does not appear to result from a concern with material function and greater specialisation. Instead, it seems to be more the product of changing building techniques, which in turn may have influenced the procurement of specially-chosen raw materials and the use of non-local manufactured materials.

In contrast with the stones at Lago dell'Accesa or the terracotta tiles more widely, in the sixth century there is little evidence of refinement in production of ashlar. For example, the same dimensional standards apparent for blocks of the seventh century BC continue in the sixth century (Karlsson 2006: 31–44; Wikander and Wikander 1990). Nevertheless, a more extensive use of whole-size blocks in some buildings and half-size blocks in others could represent functional necessity analogous to terracotta refinement (e.g. House II at San Giovenale Area F East; Karlsson 2006: 36–39). In fact, few differences are apparent between seventh and sixth-century ashlar. Constancy of block dimensions and manufacturing standards and reuse of building stone actually makes it nearly impossible to date buildings to either the seventh or sixth centuries by their stones alone. Wikander and Wikander (1990: 200–201), for instance, lament the difficulty in assessing the building phases of the *edifici monumentali*, pointing out that if not for clear changes to building techniques (i.e. the different ground preparation techniques between phases) between the different iterations of Building C, the earlier building would not have been decipherable by its materials. In comparison, it is unclear whether the foundations of a building to the north of the *edifici monumentali*, the so-called Building H, was a part of the earlier (seventh century) or later (sixth century) building phases of Zone F.

Furthermore, by the end of the sixth century BC at San Giovenale, it is difficult to see a difference in stone manufacture. Following a destruction event widely thought to have been a sizeable earthquake in around 550/530 BC, the rebuilt versions of structures on the acropolis and the rebuilt or new structures in the Borgo maintained the same standards for ashlar manufacture as in the seventh century, with only slight changes to use (Blomé and Nylander 2001; Nylander 2013: 143–147; Pohl 2009). For example, the addition of the southwest wall (Wall 2) to House I of San Giovenale Area F East in Period 4 (after 550/530 BC) follows the same ouHoustandards of manufacture as those produced in Period 3 (625-550 BC). The blocks in Wall 2 may be slightly more refined in length, measuring 0.9 x 0.43 x 0.28 m on average, compared to reused Period 3 stones in the other walls, which measure 1 x 0.45 x 0.3 m (Karlsson 2006: 38).

Karlsson (2006: 163) explains that following the destruction of House I in 550/530 BC, the structure was entirely rebuilt, with a mixture of clearing and levelling identified. However, the stones were extensively reused and it is therefore difficult to assess whether or not the seventh-century standard was broadly continued (and not refined) in the sixth century or if new walls (such as Wall 2) were made to match the previous stones for aesthetic reasons. Nevertheless, based on the fifth century BC and, more broadly, Archaic period ashlar, it is possible to recognise certain manufacturing standards that were established in the seventh continue well beyond the sixth century, as at Veii and Caere (D'Alessio 2001; Maggiani 2001).

Something that does change about ashlar masonry in the sixth century is the extent of its use. Adoption of ashlar at sites such as Acquarossa becomes widespread in the sixth century, which is evident, for instance, in many of the buildings in Zones L and N (Östenberg 1975a; Wendt 1986). The expansion in ashlar use is also seen at Veii and Caere (Bartoloni 2012a: 275–276; D'Alessio 2001; Fusco and Cerasuolo 2001; Maggiani 2001), even though some of these expansions are obscured by more recent (fifth-second centuries BC) structures. Expansion in the use of ashlar occurs in existing buildings as well, as in House I at San Giovenale Area F East in Period 4 and Building C at Acquarossa Zone F in its second iteration (Karlsson 2006: 155; Wikander and Wikander 1990).

Building expansion in the sixth century BC may also have altered other manufactured building materials. Although difficult to prove based on the available evidence, changes likely occurred in the sixth century to the production and the associated labour (as well as use) of timber, wattle and mud brick. Despite the lack of direct evidence for an increase in use, circumstantial evidence (i.e. post holes and daub fragments, not to mention the gradual growth in the dimensions of average structures) is emblematic of a conditional increase in manufactured material use. Since structures appear to have grown incrementally (e.g. Lago dell'Accesa; Camporeale 1985b), it is possible that this increase in material use was equally gradual, particularly in wattle or mud brick. However, thanks to the new structural dimensions, a proportional increase in timber use, more than the other materials, was significant when compared to earlier, seventh-century use.

Production and labour, too, changed with increased buildings sizes. Specialised knowledge, while not required for many seventh and even early sixth-century buildings, was likely necessary for the more complex structures. The Upper Building at Poggio Civitate, Casa dell'Impluvium at Roselle and the *edifici monumentali* at Acquarossa Zone F may well be outliers but their complex use of colonnades, wall reinforcements and (at least in the case of Building A at Acquarossa Zone F) hybrid roofs go beyond the traditional skill set of domestic labour as it is known before the late seventh century. Even less complex buildings, such as the combination of Houses II and III on the acropolis of San Giovenale or Complexes VII and VIII at Lago dell'Accesa Area A, have junction points and angles that make even modern reconstruction difficult to consider (Karlsson 2006: 160–162). The slopes at both the Borgo at San Giovenale and Area C at Lago dell'Accesa show signs of hill retainment and, as buildings grew in size, the complexity of building on such a slope while maintaining an even roof (if nothing else) both would have required at least communal cooperation or a specified, specialised labour force (Camporeale 2010; Pohl 2009).

In connection with a gradual progression toward non-traditional shapes and sizes in buildings occurring throughout Etruria in the sixth century, it is likely that the production of manufactured materials also changed from domestic to specialised labour. However, a proposed shift in labour is hypothetical. Due to the perishable nature of timber, wattle and mud brick, a shift can only be corroborated through the changes in labour apparent in other, non-perishable manufactured materials. Therefore, use of perishable manufactured materials increased based on the circumstantial evidence but production can only be assumed to have changed away from domestic toward artisan labour.

The sixth century BC saw changes in building techniques and labour further affect the production and use of manufactured materials. Production of terracotta was refined to further the new functional (as well as decorative) goals of architectural development. The substantial change in labour recognised in terracotta and ashlar in the seventh century BC exemplifies how production of all other manufactured materials were produced, too, as seen in the stones of Type 4 foundations and the expanded use of perishable materials. Expansion in average building sizes and the appearance of new building layouts also indicates increased use of manufactured materials in the sixth century. Standardisation continues to occur as well in manufactured material production, with functional terracotta tiles becoming widely standardised, possibly based on northern Etruscan designs. These changes and the establishment of seventh-century BC concepts undoubtedly alter the overall perception of the sixth-century manufactured materials, allowing a portrayal of them as an evolution from the manufactured materials of previous centuries.

6.4 Were changes in architecture a result of new materials?

As discussed in the preceding chapters (see section 2.3), building materials have been an essential component of the argument for a timber-to-stone transition and for an evolutionary progression of architecture in Etruria. Focus on a supposed, seventh- and early sixth-centuries BC material transition produced a view where superior materials replaced inferior ones. Not only considered a witness of the domestic architectural changes in this period, the transition from inadequate to viable also prevails as the primary reason for all architectural changes. According to some archaeologists, such as Torelli (1985) and Ridgway (1988), as well as Pallottino (1975) before them, conscious decisions on material choice, made throughout central Italy, triggered the architectural changes purportedly recognised archaeologically. Accordingly, the intentional choices of superior construction materials altered the domestic architectural fabric, allowing for greater diversity in architectural design.

Based on research into the adoption of new technology, it is unclear how much the changes in manufactured material production and use resulted from a choice of material superiority. This is especially evident in the Etruscan archaeological record. Traditional manufactured building materials from the eighth century and earlier (such as timber and wattle) are still as significant in the sixth century as they had been in the eighth. However, those who see the appearance of new architectural styles as part of an evolutionary progression base their arguments on the notion that superior materials triumphed over inferior materials in due course. Based on recent studies of traditional building materials, even this assumption, where new manufactured materials were a superior choice, is untenable.

Nowhere is the superiority of one manufactured building material over another clearer than in the advantages of timber-built over stone-built structures in earthquake prone regions. A number of case studies in Turkey and Greece note that stone, steel and concrete structures fail more often following seismic events than their timber counterparts (Doğangün et al. 2006; Gülkan and Langenbach 2004; Langenbach 2003; Makarios and Demosthenous 2006). While timber structures were by no means safe from damage, their overall elasticity and stress resistance prevented collapse at a much more significant rate than buildings without a timber frame.

The advantages of timber built structures in central Italy are apparent in the archaeological evidence, too. Demonstrable damage to ashlar tufa stone has been found at San Giovenale (Blomé and Nylander 2001; Nylander 2013: 138–142). This damage attests to the 550/530 BC earthquake that struck southern Etruria. These seismic events are blamed for the roof fall of House II in Area F East, in particular, as well as the destruction of many of the other houses at the Borgo and the acropolis (Blomé and Nylander 2001; Karlsson 2006: 163–164; Nylander 2013: 138–142; Pohl 2009: 20–21). As many modern structural engineers now realise, it is clear that extensive use of ashlar masonry and possibly also terracotta would have been less architecturally sound in an earthquake than the traditional manufactured materials (Langenbach 2003; Vasconcelos et al. 2013).

On top of the seismic analyses, a number of engineering articles indicate the weaknesses of historical, self-supporting ashlar walls to vertical compression stress and shear stresses (Foti 2013; Lourenço 1998; Valluzzi 2007; Vasconcelos et al. 2013). In comparison, timber-built structures are more likely to withstand these pressures (Vasconcelos et al. 2013). Subsequently, systems of internal worked timber beams and posts have been widely suggested for reinforcement in building conservation of stone-built structures (Valluzzi 2007; Vasconcelos et al. 2013).

Thatch, too, should be seen as an equally suitable, if not superior, roofing material to terracotta tiling, particularly in the seventh century. With clay waterproofing and consistent maintenance, thatching can survive intact for upwards of a century in some cases (Hall 1982: 23). Although by no means a light material, thatch is also significantly lighter than terracotta, making for less vertical compression stress on the walls and therefore greater structural stability (Damgaard Andersen 2001: 255; Wikander 1993: 162). If kept dry, then thatch is essentially watertight and rot free, especially when clay-revetted (Fenton and Walker 1981: 69; Ö. Wikander 1990).

Flammability is the main problem with thatch and the only truly superior aspect of terracotta. Since it must be kept dry, interior heat (i.e. through hearth fire and smoke) must be maintained (Ley 1995: 5; Ö. Wikander 1990). Although slightly less-flammable when clay revetment is added, the dangers of flammability are omnipresent in thatched buildings (Ley 1995; Ö. Wikander 1990, 1993: 161–162). Archaeological evidence supports the known flammability of thatch, with destruction events by fire evident in the Iron Age buildings on the acropolis at San Giovenale (Karlsson 2006: 137–142). However, buildings with tile roofs were not safe from fire either, as seen in the destruction of the Southeast Building at Poggio Civitate (Tuck and Nielsen 2001, 2008).

Ö. Wikander (1990: 289) suggests that the vulnerabilities of thatch might be a possible cause for the widespread adoption of terracotta. Rather than arguing that terracotta was somehow a more permanent (e.g. Steingräber 2001a: 20, 26) or desirable (e.g. Izzet 2007: 153–154) manufactured material, he proposes that increased urbanisation created the driving motivator for the change in manufactured roofing materials. Due to the known flammability of thatch and the increasing density of settlements starting at the end of the eighth century, Ö. Wikander (1990: 289) contends that, by the late seventh century, fire in a single domicile was no longer limited to that domicile but was instead a threat to the community. Starting with temples (the most culturally valuable or, at least, expensively produced structures), he suggests that by the sixth century, urban buildings had adopted terracotta not because it was more permanent or visually appealing but because it was safer in the new, urban environment.

This alternative motivation for changing production and use of manufactured materials is illustrative of possible influences besides technological superiority in the appearance of terracotta roof tiles in the seventh century BC and their subsequent widespread use. Urbanism, as argued in a sense by Steingräber (2001a, 2001b) and Gros and Torelli (1988), in fact played a crucial, formative part in changing production and use of manufactured building materials but it is not based on material superiority. Instead, the economic and social changes of urban environments led to the adoption of materials that were not superior to the traditional materials in themselves but better suited to changing residential contexts.

Even with the appearance of terracotta tiling, many traditional (and also in some ways technically efficient manufactured materials), namely timber, wattle and mud brick remain the primary manufactured materials used in buildings from 800-500 BC. Therefore, despite all the changes to manufactured materials brought on by urbanisation, use remains relatively constant. What changed appears to have been the methods of production. By the late seventh century, the production of manufactured materials was no longer a domestic affair but was instead conducted by specialists. Shifting production of manufactured building materials fits well with the wider literature on manufactured ceramics and metals (Nijboer 1998, 2006; see Chapter 7). This change in production altered the use of manufactured materials, where increased standardisation and quantity became the norm by the sixth century.

6.5 Conclusions

A systematic discussion of the building materials used in Etruscan domestic architecture, separated from building techniques, has been the purpose of this chapter. Material use in architecture is not the same as technique and the association of the two has led to a problematic conception of architectural innovation. The placement of the chapter on materials near the end of the book, as opposed to the beginning, directly conflicts with the ideal *chaîne opératoire* method but it has removed some of the constraints of a material-based interpretation of the architectural evidence.

Eliminating the association between material and technique allowed the evidence for the procurement, production and use of materials to be discussed in detail. Separating the evidence between raw and manufactured materials pointed out the significant difference between procurement and production. Clarity in terminology is critical; the strict use of accurate terminology is necessary to ensure that the separation between the different material processes is maintained. From the clear distinction, a different kind of interpretation of the building materials in domestic architecture can be made that focuses on the different trends of each process.

This different perspective directly rejects many of the ideas that support an evolutionary progression of architecture. The argument that there was a material transition from ‘hut-settlements’ to ‘masonry cities’ over the period from 800-500 BC is unhelpful since it combines raw and manufactured materials together with techniques. Moreover, the concept that the traditionally-used building materials of central Italy were abandoned immediately upon the appearance of foreign, superior materials is flawed. Diffusionist thinking of this kind underestimates the cultural distinctiveness of the Etruscans and fails to address the strength of local traditions. This is not to say that changes to building materials did not occur in Etruria from 800-500 BC or that foreign influence was not involved. Instead, it is argued here that those changes were not the result of some conscious overhaul of material procurement, production and use.

Such a stance is compelling, considering the evidence of raw material procurement, composition and use for the period. By contrast with the common view, which implies that material use evolved progressively, it is clear (when procurement and composition are examined with use) that there was not a major transition in raw materials. From 800-500 BC, raw materials were procured locally and that procurement increased in scale. Large-scale changes to composition and use of raw materials were uncommon and, based on what changes are apparent, were in response to the changes in manufactured materials and building techniques.

In comparison, there were notable changes to the production and use of manufactured materials. However, the majority of the manufactured materials that were common in the eighth century, such as wattle and worked timber, were still common materials in buildings in the sixth. Thatch was the only manufactured material that appears to have been replaced by another manufactured material, terracotta tile, in urban buildings. Even then, the change to terracotta was gradual, with the robust tiles of the mid-seventh century possibly overshadowing the long development of tiles as a manufactured material.

The most notable change in the building materials is in the overall production of manufactured materials. At the beginning of the seventh century BC, the production of manufactured materials was the result of domestic, household labour. Then, throughout the seventh century, new manufactured materials and a greater number of the traditional manufactured materials appeared, signalling the gradual shift in labour to the workshop or otherwise surplus, non-household labour. By the mid-sixth century, the production of manufactured materials was refined, with evidence of specialisation apparent in a number of examples.

Therefore, the seventh-century BC transition in labour is perhaps the most demonstrable and influential change to building materials from 800-500 BC. Indeed, craftsmen and surplus labour had existed prior to the seventh century but it is unlikely that they had been significantly involved in the construction process of ordinary dwellings. Despite this major, albeit gradual, shift in labour, the building materials in domestic architecture were relatively constant. For the most part, the materials found in the sixth century would not have been unfamiliar to a builder in the eighth century or vice versa. In this way, more than in any other, materials differ from the techniques that used them.

Chapter 7: Conclusions

The previous chapters have examined the nature of changes in building materials and techniques in the domestic structures of Etruria from 800-500 BC. Throughout this examination, the recognition of building techniques using direct evidence is argued to be significant to the interpretation of domestic architecture. Building materials therefore fit into a broader scheme of identification and interpretation of technique (see section 6.5), wherein the conception of changes to material is subsequent in the interpretative process to the recognition of changes to techniques. As a result, this book suggests that the transformation in domestic architecture that is widely assumed in the literature is a product of gradual alteration of building techniques over the course of multiple centuries.

Neither a steady progression from one style of architecture to another nor driven by the evolution of a single influencing factor, the gradual alteration of building techniques resulted from numerous habitual and active innovations to traditional group behaviours in relation to the built environment. Six distinct transitions, where permanent changes to the operational chain of construction appear, were prompted by innovations of building technique. In chronological order, they are:

1. The mid-eighth-century transition in dominant foundation process from Type 1 to Type 2, including the actively innovative modified soil ground preparation (see sections 3.1, 3.2);

2. The late-eighth-century transition in structural roofing techniques that resulted in the common use of a saddle roof with a ridge pole (see section 5.2.2);

3. The centuries-long transition in central Italy from primarily elliptical to rectangular building shapes culminating in the early seventh-century, which includes significant changes to roof support techniques (see section 3.1.5);

4. The transition beginning in the mid-seventh century from non-tiled to tiled roof covering techniques (see section 5.2.1);

5. The century-long (c. 750-650 BC) transition in the foundation process from Types 2 and 3 to Types 4 and 5, resulting from habitual innovations to the scale and scope of ground preparation and wall footing techniques as well as the active innovation of ashlar stone socles on bedrock (see Chapter 4);

6. The habitual refinement of roof covering techniques in the sixth century, incorporating alterations to the manufactured material (see sections 5.2.1, 6.3.2).

Importantly, this is not a comprehensive list of all of the innovations in domestic building techniques from 800-500 BC. Rather, this list denotes the transitions from one predominant chain of construction to another. Within these six transitions are often multiple innovations in technique, which broke from the previous tradition at different times and places. Furthermore, this list is incomplete. It only contains those transitions where the operational chain of construction is conspicuous with direct evidence. Yet, simply because they cannot be confirmed through available evidence does not mean that they were insignificant or nonexistent. In fact, these difficult to recognise techniques serve as a reminder of the limits to the results presented here as well as of the inherent complexity of architectural change.

In this chapter, previously identified and interpreted techniques are considered in the wider context of domestic architecture. In part, this includes interpretations of how techniques changed in relation to tradition and habit, as well as how innovations might have occurred. A discussion of the limitations and implications of the results of this study follows these interpretations. This includes an evaluation of outstanding problems and suggestions as to how they may be approached in the future.

7.1 Reasons for change; building techniques in Etruscan domestic architecture from 800-500 BC

Building techniques result from the influence of the built environment and behaviour formed through conditioning. Generally, change has been defined in this book as a product of a causal system where alterations to the evident building techniques over time stem from individual actors acting contrary to established behaviours (see section 2.1.3). When a group acts contrary to tradition, the manufactured materials produced are visibly altered, with the significant splits from tradition more apparent.

Changes to the prominent architectural techniques were usually gradual. Gradually formed innovative techniques typically result from modifications to the habitus (Archer 2010; Bourdieu 1990: 60–61). They are products of multi-generational, context-based "improvements" (which are not necessarily technological but could be based on economic, social or other influences) where the actors unconsciously implement slightly different ways of achieving a task than is traditional (Bourdieu 1990: 52–55; Crossley 2001: 111–112; Noble and Watkins 2003). Over time, these improvements can take hold within the group, themselves becoming tradition.[53] In direct contrast with habitual innovations, active innovations result from actors acknowledging traditional behaviour and acting in opposition to it, sometimes causing the complete reformation of operational steps in the *chaîne opératoire* (Giddens 1986; Lemonnier 1986: 154–155; Schiffer 2005). Active innovations are therefore less subtle archaeologically and often occur more quickly than habitual innovations.

This theoretical and methodological framework, introduced in Chapter 2, has been useful in a number of ways. Shifting the focus to behaviour encourages investigation of the more nuanced aspects of architectural change. Reviewing the older identifications and interpretations from this new perspective confirms that the commonly noted transition in the domestic architecture of Etruria occurred. However, the transition itself is more complex than is usually recognised. Moreover, the transition in architectural style belies the overall constancy of techniques, materials and technology from 800-500 BC.

7.1.1 What instigated the innovations in foundation techniques?

Based on the examination of building techniques in Chapters 3 and 4, it appears that traditional techniques were habitually replaced over the course of the eighth and seventh centuries BC, if not otherwise supplanted by entirely new, active innovations. Operational chains of foundation construction that were prevalent in the early eighth century become less archaeologically apparent in later contexts to the extent that, in sixth-century contexts, few of the techniques present in earlier contexts appear. In some cases, the impetuses for such changes are easily recognised, typically as the product of technological stimuli. Yet, not all of the reasons for innovation are understood. In order to better understand these innovations, it is vital to consider here the role of the wider built environment and the possible instigating factors in changing building techniques.

Many of the techniques that had become tradition by the early eighth century BC were developed in the

53 The rate of change to habitus and the establishment of a habitual innovation differ from culture to culture (Crossley 2001: 111; Noble and Watkins 2003). Typically, change occurs more rapidly in cases where the society encourages innovation (Scott and Bruce 1994).

Bronze Age and, in some cases, were commonly used as late as the seventh century. These traditional techniques are most obvious in Type 1 foundations (see section 3.1) where the use of bedrock in ground preparation and wall footing techniques (i.e. at Veii in the Orientalising period) is part of a tradition witnessed in foundations nearly two centuries earlier (i.e. at Sorgenti della Nova in the Final Bronze Age). Semi-subterraneous Type 3 foundations (see section 3.3) also suggest a continuation of traditional techniques from the Bronze Age into the seventh century, particularly in the ways that they manipulate the ground surface.

Nevertheless, indications of innovation are present in the eighth century BC. As noted in Chapter 3, in southern Etruria, the prevalence of evidence for Type 1 foundation techniques (especially ground preparation and wall footings) in eighth century contexts diminishes in favour of Type 2 foundations (see section 3.2). Based on the evidence (see sections 3.1 and 3.2), a mixture of habitual and active innovations spurred this transition, with active innovations in ground preparation and wall footing techniques coinciding with habitual innovations to building form and roof support techniques.

In ground preparation, the transition away from the use of bedrock to the use of deposited soil preparation layers does not appear to be the product of a habitual innovation. Until the eighth century BC, a prepared soil setting had been uncommon, at least in more permanent building foundations. Although buildings set in soil are commonly found throughout Italy in semi-subterranean, Type 3 foundations (or the *habitations à base encaisée*; also Bartoloni 2001; Cattani 2010; Domanico 2005), the ground preparation technique of Foundation Type 2 modified the ground by adding soil rather than by removing it. The lack of evidence for a traditional basis and the apparent speed of its adoption suggest that the Foundation Type 2 ground preparation technique was an active innovation.

However, it is not clear what provoked the innovation. The bedrock-based ground preparation techniques of Type 1 foundations are inherently more stable than foundations built on deposited layers of soil. As opposed to bedrock, foundations built upon soil are subject to the processes of soil deformation, which, if not properly accounted for in the distribution of building stresses into the ground, could cause the building to subside or even a wider landslip (Liebing 2011: 240; Simons and Menzies 2000: 2–3, 57–64, 87–88). Therefore, it is unlikely that the innovative ground preparation technique used in Foundation Type 2 resulted from a technological enhancement to the foundation operation. Instead, other stimuli (i.e. social, economic, ritual or cultural) are more likely.

One possible stimulus for the innovative ground preparation technique of Type 2 foundations is related to the eighth-century BC demographic shift toward urban centres. With the increase in population, the larger urban centres witness a sort of reorganisation (see section 2.3), which saw changes in the use of urban space (Iaia and Mandolesi 2010; Iaia et al. 2001b; Mandolesi 1999, 2014). Alterations in the urban built environment would have instigated changes to the traditional uses of ground in the establishment of domestic buildings as they related to the use of space (e.g. Izzet 2007: 160–164). This in turn might have been the immediate stimulus for innovation in ground preparation technique. While the use of traditional techniques significantly altered the surrounding space resulting from the removal of soil and levelling of bedrock,[54] the deposition of soil could be applied without significant changes (whether perceived or real) to neighbouring areas. In effect, as a product of the increasingly limited space of the urban centre (limited by population inflation, socio-political divisions or both), previous techniques might have been too difficult to undertake without significantly affecting neighbouring structures.

Moreover, the fact that settlements expanded into previously unused areas due to the increase in population

54 Although the product of later ground preparation techniques, an example of the effects of creating a level bedrock surface can be seen at Acquarossa Zone F where the creation of the edifici monumentali greatly altered the surrounding area, with numerous buildings on the west side of the complex all but erased.

(and, subsequently, the number of structures), helps to explain why the majority of Type 2 foundations are found above the more uneven bedrock of promontory edges and hillsides rather than at the centre of settlement (e.g. Oval Hut II at San Giovenale Area E and Huts A, B and C at Luni sul Mignone). With bedrock more difficult to build upon in the expanded settlement areas, the innovation in ground preparation technique likely occurred to accommodate more challenging settings. The uneven bedrock of the newly settled areas might well be an underlying technological stimulus for the widespread adoption of Type 2 foundations, in conjunction with settlement expansion.

As opposed to the Foundation Type 2 ground preparation technique, in wall footings, it is possible that the transition from bedrock-cut channels to stone socles stems from a purely technological stimulus. According to a number of sources (Ciccioli et al. 2010: 238–239; Hellström 1975; Jackson and Marra 2006: 405; Judson 2013: 38), tufa bedrock allows for the accumulation of moisture due to its porosity. When placed on tufa bedrock, walls made of organic material are thus subject to rot. Certain Foundation Type 1 flooring techniques (i.e. intersticed layers of clay and pebbles) were developed to prevent damp, which is suggestive of the role stone socles played in Type 2 foundations. However, it is still unclear why the transition to stone socles happened in the eighth century BC and not before. The appearance of the mud brick walling technique in the eighth century might be related to this but the other walling types (wattle and daub and pisé) are just as susceptible to degradation through damp as mud brick (see section 5.1.1). It is suggested, therefore, that the transition to socles was instigated by some other stimulus, necessitated either by the previously unnecessary protection of the wall against damp or some non-technological factor.

Dissimilar to the active innovation of ground preparation and wall footing techniques, the change in roof support techniques between the three-aisle type (common in Foundations Type 1) and the two-aisle type (common in Foundation Type 2) suggests a gradual change, where the use of new walling and roofing techniques (see sections 7.1.2 and 7.1.3), in tandem with the growing prevalence of rectangular building form, were better supported by a central line of roof supports than by the traditional roof support technique. In part, this transition from three- to two-aisle types appears to be the result of the long-term shift in building form from elliptical to rectangular shapes witnessed throughout central and northern Italy from the Recent Bronze Age until the sixth century (e.g. Cattani 2010). Both three-aisle and two-aisle types are witnessed in the eighth century at the same sites (e.g. Tarquinia and San Giovenale), not to mention that the two-aisle type is found in both Foundation Type 1 and 2. The use of different roof support techniques in the eighth century suggests a habitual innovation instigated by a technological need to address alterations in building shape as well as walling and roofing techniques over the course of a few generations.

The Type 4 and Type 5 foundation techniques developed in the seventh century BC, following the eighth-century change in predominant foundation processes and the active innovation of modified soil ground preparation. The majority were habitual innovations of Foundation Types 1 and 2. For instance, the century-long change to ground preparation apparent between Foundation Type 2 and Types 4 and 5 is striking. By the last half of the seventh century, the foundation process for buildings extended beyond the construction of the individual structure to the wider built environment. Some of the reasons for the change are technological; Camporeale (2010) argues that the production of effective drainage systems was necessary at Lago dell'Accesa and Nylander (2013: 72) states that the terracing of the Borgo at San Giovenale was required to allow for complex workshops. Yet, these technological reasons for the changing scale and scope of ground preparation techniques are only part of the picture. Other factors, certainly influenced the change in behaviour, especially considering the appearance of the courtyard in the late seventh century BC and the need for a dedicated sector for workshops.

Furthermore, some of the Type 5 foundation techniques were active innovations without obvious local precedents. Of the active innovations of Foundation Type 5, the preferential placement of wall footings on bedrock is significant. Indeed, the necessary alteration of the built environment to set wall footings on bedrock might have resulted in the widespread variation in Type 5 ground preparation techniques. This significant innovation is likely the result of a technological stimulus, particularly concerning the beneficial stability of bedrock over soil. With many of the buildings with Type 5 foundations located near to the bedrock, builders gradually altered ground preparation and wall footing techniques to suit the environment.

Yet, the creation of buildings at the Borgo at San Giovenale, which by all accounts required substantial modification of the bedrock (Nylander 2013: 72–87), indicates that other stimuli might be accountable for the Type 5 innovation of ground preparation and wall footing techniques. Given the systematic reorganisation of the quarter in the mid-seventh century BC (Pohl 2009: 225–226), the use of the innovative Type 5 foundations might have been a manifestation of the socio-political centralisation of urban settlements at that time. Similarly, if the *edifici monumentali* of Acquarossa Zone F acted as an élite residence in the same fashion as the Regia in the Roman Forum, as suggested by Wikander and Wikander (1990: 200–202) and Scheffer (1990), then it is possible that the significant manipulation to the bedrock in Foundation Type 5 ground preparations was conducted as a show of control akin to construction of the Orientalising chamber tombs. Additionally, the habitual growth in scale and scope of ground preparation and wall footing techniques seems to demonstrate growing concern with the use of urban space, possibly as a function of the division between public and private described by Izzet (2007: 170–173) and Rohner (1996).

Besides the clear indications for technological stimuli, socio-political alterations to the built environment appear to have instigated many of the innovations to the operational chain of foundation construction. These socio-political changes have been presented here as a result of two primary factors: the shifting demographic landscape of Etruria beginning in the early eighth century BC and the coincident projection of control by an élite class of an unclear (whether social, political or economic) nature. Therefore, two significant transitions in the construction process occurred in foundations between 800-500 BC as a result of changing technological needs, the population growth of urban centres and the increased projection of power via the control of urban spaces. First, in the mid-eighth century, the dominant construction process (from Type 1 foundation techniques to Type 2) was modified as a result of the active innovation to ground preparation and wall footing techniques. Then, in the last half of the seventh century, the primarily habitual innovations to the scale and scope of ground preparation and wall footing techniques visibly altered the architecture of Etruria.

7.1.2 Is there evidence for innovation in walling techniques?

The recognition of innovative walling techniques is muddled by terminological and methodological issues with the evidence, as described in Chapter 5. In contrast with the results gained from the investigation of foundation techniques, the evidence for walling techniques makes interpretation difficult, particularly when attempting to address the behavioural changes that result in an archaeologically visible architectural transition. Identification of walling techniques is also challenging, a consequence of imprecise terminology and limited preservation.

Indeed, a widespread misidentification of non-stone walling techniques is noticeable. Wattle and daub walls are often suggested in the literature for structures in contexts dating earlier than 625 BC (Bartoloni 2012a: 255; Donati 2001: 316–318; Stoddart 2009: 69). The basis for this identification is often the appearance of a layer of clay detritus above wall footings (e.g. Malcus 1984: 39; Pohl 1977: 14). Yet, the direct evidence of wattle (e.g. impressed in fired daub such as was found in House I of San Giovenale Area F East; Karlsson 2006: 135–136) is rarely found in situ. With clay possibly used in the other non-stone infilling techniques (not to mention the fact that the wattle infilling technique does not require daub; Brocato and Galluccio 2001; Negroni Catacchio 1995: 301–307), clay detritus above the wall footings of a structure is only evidentiary of a non-stone infill walling technique and is not explicit evidence for the use of daub.

Additionally, the attention paid to the materials used in walls has over-stated the importance of ashlar masonry to walling and, more broadly, the creation of structures. Certainly, the appearance of ashlar in the seventh century BC is noteworthy from a material perspective (see section 6.3.2). However, the emphasis on ashlar in the discussion of walling has, in the first place, diminished the importance of non-stone infill walling techniques and, in the second, misrepresented the progression of structural walling techniques. Despite the appearance of ashlar, non-stone infills remain predominant in domestic structures into the sixth century (and beyond at sites such as Marzabotto; Staccioli 1967; see section 5.1.3). Structurally, the use of self-supporting walling was not introduced along with ashlar but was used with mud brick as early as the eighth century (with self-supporting pisé walls a possibility much earlier; Bietti Sestieri and de Santis 2001: 213; Genovesi 2001: 312).

Much of the traditional interpretation of walls is thus incorrect or questionable. With clearer terminology and the discussion of walls centred on techniques and not the materials used in them, it is clear that walls did not evolve in a progression from wattle and daub to mud brick and then to ashlar stone. Instead, a more accurate interpretation indicates the overall permanence and persistence of traditional walling techniques through time.

Even so, infill walling techniques such as mud brick and ashlar masonry may have been innovations. Mud brick could be an eighth-century BC active innovation in contrast to the traditional wattle and pisé infills, with ashlar a habitual innovation derived from mud brick (via the gradual alteration and, perhaps, enhancement of materials used) if not an active innovation in its own right. However, the evidence for mud brick and for early non-stone walling is ephemeral, leaving little room for such a definitive interpretation. Besides, clear evidence of the non-stone infill techniques, particularly wattle, continues beyond any supposed transition in the seventh century.

Based on the state of the evidence, the results of this study with regard to walling techniques are twofold. First, without a greater amount of unambiguous, direct evidence (especially of the sort that allows for the identification of specific comparative differences in behaviour), it is impossible to better understand the walling techniques used in domestic structures from 800-500 BC, including the possible innovations to mud brick infill techniques in the eighth century and ashlar infill techniques in the seventh century. Second, the material-based transition in walling often asserted in the literature is problematic and misleading due to inconsistent terminology and a reliance on circumstantial evidence to form interpretations. Therefore, while it is probable that significant innovations to the operational chain of wall construction occurred between 800-500 BC, the evidence for such innovative techniques is lacking, preventing a more precise interpretation of the architectural transitions in walling.

7.1.3 What triggered the transitions in the construction of Etruscan roofs?

At least three significant transitions in the operational chain of roofing construction occurred between 800-500 BC: a transition in structural roofing techniques at the end of the eighth century, a transition in roof covering techniques during the seventh century and a further transition in roof covering techniques by the mid-sixth century. The evidence for these changes stems from both direct sources (such as roof supports in the foundations and roof tiles) and from circumstantial and indirect sources (such as tomb architecture and cinerary urns). Similar to the transitions in foundation construction, transitions in roofing primarily appear to be instigated by technological stimuli. Yet, as before, certain elements of each transition indicate broader social, political or economic stimuli.

The transition in roof covering techniques in the seventh century BC from non-tiled to tiled certainly appears to have been triggered by the introduction of a new manufactured material. Technologically, the use of terracotta tiles appears to be an active choice of superior material, if not for their longevity and waterproofing capabilities (which is debated by Ö. Wikander (1990)), then for their reduced chance of fire (see section 6.4). The subsequent, conscious adoption of the techniques for applying the new manufactured material must then be considered in light of their supposed technological superiority.

However, certain social stimuli must also be considered in addition to the proposed technological ones. For instance, Izzet (2007: 173–174) argues that the creation of sharper divisions of space in urban areas (e.g. between public and private or ritual and profane) was established through visible distinctions and regularisation of surfaces. Changing distinctions in the display of surfaces, she argues, created crisper, more rigid edges and may have led to the adoption of certain materials, such as terracotta tiles (Izzet 2007: 153–154). This social stimulus for altering the built environment to adhere to new concepts of urban differentiation certainly could have worked in tandem with other technological concerns, leading to the widespread, active innovation of roof covering.

Ö. Wikander's (1986, 1993) work on roof tiles identifies a change from robust to refined styles in roof tile technology over the course of the late seventh and early sixth centuries BC. It suggests that a form of habitual innovation in the roof covering technique occurred. Simpler aspects of roof covering, such as the protection of the building interior from the elements, were enhanced not only through the standardisation and refinement of the materials but also as a result of their application. New tile types, such as Type II cover tiles and Type III ridge tiles, achieved greater cohesion with extended flanges that fitted together more securely. Importantly, Ö. Wikander (1993: 80–81) notes that raking simas (which formed an extended tile border along the sloped edges of the roof to protect the outsides of the walls underneath: see Glossary) appear in the mid-sixth century in contexts with the more refined tiles. Refinement of the technology and the implementation of new tiles to protect the sides of the buildings are indicative of a habitual innovation in roof covering technique.

While the production of gradually more refined tiles was likely spurred on by a habitual process of technological improvement, the role of an altered urban economy appears to have also played a role in the transition. As noted by Nijboer (1998: 86–89, 106–107, 112–113, 121) and Ö. Wikander (1993: 160–163), associated investigations of kilns and pottery workshops throughout central Italy (such as at Satricum, Caere and Acquarossa) produced evidence for an altered form of production based on the broader appearance of sedentary craftsmen in workshops. As early as the mid-seventh century BC, these workshops began to standardise the production of terracotta tiles, with evident artisan specialisation appearing alongside other forms of standardisation in the Etruscan economy (Nijboer 1998: 207–237). Arguably, these changes to production encouraged an environment of innovation where competition and demand prompted the creation of tiles with more refined qualities, as indicated by Ö. Wikander (1993: 161–162).

In contrast with this transition in roof covering techniques, Damgaard Andersen's (2001) and C. Wikander's (1988: 49–55) interpretations of eighth- and seventh-century BC roofs suggest that the late-eighth-century transition in structural roofing techniques was an active innovation. The structural roofing techniques of the eighth century resulted in a hipped style, with a high roof angle and no central ridge pole. A number of buildings found in late eighth-century contexts at Tarquinia and San Giovenale suggest the appearance of ridge poles based on the position of their roof supports (Linington 1982; Pohl 1977). Indirectly strengthened with the evidence from tomb architecture and cinerary urns, it is possible that an active innovation in roof structure occurred, with a subsequent transition to the saddle roof style. The saddle roof style, visible in the C. Wikander (1988) model, defines late seventh- and early sixth-century structural roof techniques.

Technological stimuli might be behind the active innovation in the roofing structure. Damgaard Andersen (2001) suggests that the angle of the roof needed to change in order to accommodate the increased weight of roofs. As suggested in section 5.2.2, the transition from hipped to saddle roofs occurred prior to the introduction of tiles, so it is not exactly clear what could have changed the weight of the roof at the end of the eighth century. However, it is proposed by Damgaard Andersen (2001: 254) and Karlsson (2006: 135–136) that the roofs increased in weight because of the addition of clay revetment to the thatch roof covering as a sort of precursor to the terracotta roof tile.

Alternatively, the stimulus for the change to roofing structure could be related to the transition seen in roof support techniques (see section 7.1.1). As with roof support techniques, the ridge pole might have been adopted as a response to changing building forms. Technologically, the use of a rectangular building form allowed for larger, multi-roomed structures (as compared with elliptical structures where the roof span is relatively limited; Hodges 1972: 528–529). The introduction of the ridge pole therefore might have further increased the overall roofed, internal spaces of structures, in turn promoting the use of saddle over hipped roofs. However, Izzet (2007: 148–150) argues that this technological stimulus diminishes the significance of socio-cultural influences. Based on Izzet's argument that the Etruscans sought to create visibly distinct divisions in space, the use of a ridge pole and saddle roof might instead be a further manipulation of surfaces, creating sharper contrast between spaces via the distinct edges of the roof at the short ends of the building.

In addition, it is likely that there are significant changes in roofing techniques from 800-500 BC that remain undiscovered. The proposal by Turfa and Steinmayer (1996) that the Upper Building at Poggio Civitate used innovative structural roofing techniques is a good example. However, with the evidence as limited as it is, the C. Wikander (1988: 49–55) model should be assumed as the archetypical structural technique for all saddle roofs due to its simplicity and basis in Ö. Wikander's (1986) evidence for roof covering. Even with this simple model adopted, the C. Wikander model of roof structure is a habitual innovation, itself an enhancement and change from the initial saddle roof structure indicated by Damgaard Andersen (2001). Yet, based on available evidence, any other roofing techniques are too ambiguous to identify.

While technological stimuli certainly had an effect on the transitions in roofing construction, the innovations to the operational chain were also spurred on by socio-cultural and economic factors. These factors include the growing distinctions of particular urban spaces through the regularisation of surfaces and the establishment of workshops that hosted resident artisans. The transitions in roofing between 800-500 BC recognised here were therefore triggered by elements of technological refinement, the influence of standardisation through workshop production and changing perceptions of urban space.

7.1.4 Summary of primary results

The methods used in this study, based on wider theories on environment-behaviour relations and architecture, shifted the focus to the techniques involved in the creation, use and reuse of architectural features. Shifting the focus from materials to techniques encourages the recognition of minor architectural changes. The results found here suggest that rather than one transition in the seventh century based in changing building materials, at least six separate transitions in building techniques occurred from 800-500 BC. These transitions do not appear to have been part of a unique, synchronous transition as is usually portrayed. Instead, this book shows the complex, irregular morphology of architectural change through time as a consequence of behaviour and the built environment.

The majority of change accounted for in the six major transitions listed above resulted from the habitual enhancement of techniques to fulfil explicit technological concerns. This is exemplified, at least in part, by the transition in dominant building form from elliptical to rectangular, which was instigated by the potential for larger roofed spaces and may have simultaneously caused both the habitual innovation of roof support techniques and the active innovation in structural roofing techniques. Similarly, technological stimuli played a role in the majority of active innovations, as is the case, most recognisably, in the transition in roof covering techniques from non-tiled to tiled. In that instance, the introduction of the new material – tiles – radically altered the process of roof covering, where traditional techniques based upon thatch were no longer suitable.

Yet, despite recognisable technological stimuli for innovation in building technique, there are clear instances where the broader changes to society also affected the operation of construction. The habitual change in building form, for instance, seems to reflect a change in the use of roofed, private spaces, as suggested by Rohner (1996). This increase in the division of private and public, including the appearance of courtyards, may also have played a part in the habitual increase in the scale and scope of ground preparation in the seventh and sixth centuries BC. Alternatively (or perhaps simultaneously), the increased range of domestic building construction via ground preparation techniques was part of the visual institution of prominence by élite individuals or families comparable to other instances of displays of power and wealth at the time. The increased number of buildings with features meant to be visibly impressive (indicated in the scale and visual impact of materials, not to mention the scope of both the active and habitual techniques of seventh and sixth centuries) certainly indicates that the social makeup of urban centres impacted the built environment in ways that initiated innovation.

Although these innovations in technique are significant to a broader understanding of the Etruscan built environment, the focus here on the apparent transitions inevitably distorts the importance of change in the architectural progression. It is crucial to remember that, while the period from 800-500 BC is considerably rich in terms of change, traditional techniques are maintained throughout. This is particularly obvious in walling, where the evidence suggests an enduring use of non-stone infilling techniques. Even where evidence for change occurs, it is more often the result of habitual changes gradually unfolding over decades and, occasionally (i.e. the transition in building shape), centuries than it is a rapid change brought on by active innovation. Therefore, despite the importance of recognising these innovations critically, transitions in architecture should be considered as much a part of an unconscious yet progressive continuity as radical, conscious departures from tradition.

7.2 The broader implications and limitations of this book

This section is divided into two. The first subsection places the above results in context with the wider understanding of Etruscan culture. In particular, it highlights the role that the built environment and socio-cultural influences on architectural style have played in the literature and suggests how to incorporate this study with the literature. In the second subsection, both the limits of the evidence and the suggested improvements to the research design are discussed.

As stated in section 7.1, the results of this book suggest that social, economic, political and technological changes deeply affected two key aspects of the Etruscan way of life: the built environment and the behaviour of individuals and groups. Conceived within a reciprocal system of causality, where causes produce effects which in turn produce further effects *ad infinitum*, these multifaceted stimuli transformed the behaviours of builders, forever altering the built environment and future behaviour. As a result, some of the techniques that had been used to create domestic structures in previous centuries were innovated upon, profoundly changing the appearance of buildings and the nature of construction.

Yet, how does this conception of a complex, irregular transformation in domestic architecture deepen our broader understanding of Etruscan culture? By underlining the overall constancy of building techniques through tradition and habitual innovation, this study directly negates the theories about changing Etruscan domestic architecture that are based on the singular adoption and adaptation of foreign architectural technology and urban planning. In this manner, the evidence presented in previous chapters reinforces the growing appreciation for the demographic changes occurring between 800-500 BC. Although demonstrative of the increasingly dynamic effects of shifting populations over the period, this book also supports some elements of the more traditional perspectives on architectural changes.

This section articulates how this work might be incorporated into the literature on both Etruscan architecture and, more broadly, the Etruscan culture. It is divided into two. The first subsection places the above results in context with the wider understanding of Etruscan culture. In particular, it highlights how the above conclusions on innovations and their stimuli support some previously held models of development while undermining others. In the second subsection, both the limits of the evidence and the suggested improvements to the research design are discussed.

7.2.1 The place of this book within the scholarly literature; The broader implications of research on building techniques

Examining the nature and extent of changes to building techniques in Etruscan structures revealed demonstrable transitions in domestic architecture that rejects the commonly accepted, distinct transformation in building materials and technologies of the seventh century BC. Although architecture and the built environment were transformed so that by the end of the sixth century Etruscan settlements looked substantially different from those 300 years prior, the typical depiction of a linear evolution of building technology by materials inaccurately presents the changes to domestic architecture. Prehistoric structures of wood, wattle and daub and thatch were not directly replaced by typically Etruscan structures made of mud brick, stone and terracotta tiles.

Despite rejecting the accepted presentation of domestic architectural changes, the evidence discussed in this book broadly supports the scholarly literature in terms of complex alterations in Etruscan society between 800-500 BC. The stimuli for innovative construction techniques certainly adhere to wider concepts of societal change, which suggests that the innovations presented in section 7.1 are evidence of such concepts. Therefore, it is imperative that this subsection relate the previously discussed techniques and their stimuli against the background of socio-cultural changes in the broader historical context. In so doing, it is necessary to come to terms with the division in the literature between those that favour change as the result of an alteration of traditional ritual and socio-cultural roles with those that identify the growth of urban centres as the key motivator for change.

Certainly, based upon the stimuli described above, both perspectives could be supported. In a number of cases, the development of new forms of social divisions based on economics and politics are suggested. Take, for instance, the innovation of ground preparation technique in the late seventh century BC, where buildings such as the Upper Building at Poggio Civitate and the *edifici monumentali* at Acquarossa Zone F significantly altered the built environment by creating expansive courtyards. It is suggested both here and elsewhere (Phillips 1992; Scheffer 1990; Strandberg Olofsson 1986; Torelli 1985; Wikander and Wikander 1990) that the creation of these larger, enclosed complexes reflect growing dynamism in the projection of power in urban centres.

Discussed in greater detail in section 2.3, there are a number of influential theories on socio-political changes in central Italy. For instance, according to Torelli (Torelli 1985, 2000: 196–197), changes in central Italian culture, including those to architecture, were part of a growing disparity between an emergent élite class or '*principes*' and the rest of Etruscan society. Relying on the differentiation of material evidence, Livy and other Roman historians and earlier arguments by those such as Pallottino (1975: 133), Torelli (2000: 200) proposes that in contrast with the framework of early Rome, an aristocratic oligarchy was the political organisation of the majority of Etruscan centres from 800-500 BC. Furthermore, Torelli (2000) suggests that, under these oligarchies, small Villanovan period villages unified into polities, similar to the city-states of Greece, by the Orientalising period. These city-states dramatically changed the former political makeup of the region, as power fell into the hands of the emergent class of élites. The emergent élites established power systems reflecting the royalty of the Near East or the oligarchies of Greece, which is evident in the establishment of larger building complexes (Torelli 2000: 196–197).

Although the evidence for a century-long development of larger building complexes using innovative ground preparation techniques supports the rise of a new socio-political organisation as outlined by Torelli (2000), some of the traditional techniques, such as the ground preparations in Foundation Types 1 and 3, could contradict this. Despite the elaboration seen in funerary evidence (see section 2.3.2), what has become less clear with time is whether or not the emergence of an élite class began in the eighth and seventh centuries BC. With the evidence at some of the important Bronze and Iron Age sites of Etruria displaying a similar social hierarchy (albeit with a peasant-agricultural economy where wealth was based on control of storage rather than on foreign luxury goods; Bonamici 2001: 73–74; Hellström 2001: 169), it is unclear exactly whether a change in socio-political system described by Torelli occurred.

Instead, it is possible that the assertion of lateral ground preparation in multi-building complexes was a new facet of emphasising power and control through property conducted by the same class of people who had for centuries used traditional ground preparation methods. Between the Bronze Age and innovative seventh- and sixth-century ground preparation techniques, the most significant change was to the scale and scope of foundations laterally across urban spaces. The traditional techniques used in large buildings prior to the mid-seventh century (e.g. House I at San Giovenale Area F East and the Large Iron Age Building at Luni sul Mignone) dramatically altered the ground surface but in ways that did not extend much beyond the wall footings of the building. By the end of the seventh century, ground preparation included multiple buildings and open spaces beyond the layout of a single structure. In this light, it is possible to recognise elements of what Mandolesi (1999: 213) describes as the reorganisation of space in eighth- and early seventh-century urban settlements, as a direct result of the increased population at urban centres and the focus of the settlements around single loci rather than the rise of a new élite class.

Indeed, Izzet's (2007: 143–164) suggestion that population growth resulted in progressively clear-cut designations of space, especially between public and private, encourages a reading of the evidence where demographics rather than socio-political change resulted in the noticeable alterations to urban centres in the seventh century BC. According to Izzet (2007: 155, 157–160), the appearance of courtyards, the multiplication of interior spaces and the supremacy of rectangular-shaped ground plans were elaborations in the built environment resulting from a growing emphasis in society on separate spaces, perhaps even based on function in interior, domestic spaces (also Rohner 1996: 128). However, Izzet (2007: 152–154) points to the material-based transition in architecture and indicates that changing materials resulted from the elaboration of ritual divisions in space, directly contrasting with the theme of this book.

In addition, the appearance of terracotta tiles has long been used as evidence for the Greek influence on the wider transformation of Etruscan culture in the seventh century (Bartoloni 2012a: 268; Ridgway 1988: 666–667; Torelli 1985: 24–25). As a means of either displaying imported styles or adopting foreign craftsmen and their crafts (e.g. Torelli 1985: 25–32, 2000: 196–197), the active innovation of terracotta techniques was supposedly a choice of superior material, as well as evidence for the establishment of new power systems. However, there are two significant problems with the typical portrayal of the appearance of terracotta tiling. First, the appearance of terracotta tiles extends as far back as the early seventh century BC, nearly as early as their first use in Greece (Wikander 1993: 160; see sections 5.2.1, 6.3.2). Such an early adoption of the technology belies the harkening to established, royal styles of architectural elaboration by a newly formed class of Etruscan élites.[55] Second, the terracotta-tile technology was not altogether superior to thatch, either in longevity or in protection against rot (Ö. Wikander 1990; see section 6.4).

Certainly, the innovative use of terracotta tiles in roofs appears to be further evidence of a reaction to the increased density of settlements than of a change in socio-political systems (see section 6.4). The flammability of thatch, as noted by Ö. Wikander (1990: 289), was increasingly hazardous as open spaces in urban centres decreased. Additionally, Izzet (2007: 173–174) identifies the crisper nature of tiles as an example of her argument about the sharper division of spaces. Terracotta tiling, therefore, should be considered as evidence for a seventh century alteration to the use of urban spaces, alongside the lateral expansion of property, rather than an elaboration of a new socio-political system.

Moreover, a number of other innovative building techniques provide solid evidence for the effects that the demographic shift to urban centres had on Etruscan society. Nijboer (1998) presents the centralisation of population in proto-urban and urban settlements as a key factor in the development of workshops and a new economic system driven by standardisation, centralised power and sedentary craftsmen (see section 2.3.2). This emergent economic system is evident in a number of the innovations noted above, though perhaps none so much as the habitual innovation of roof covering techniques and materials of the early sixth century BC. The lateral expansion of ground preparation also provides evidence for the increase in differentiated labour associated with workshop production. The establishment of the Borgo quarter using innovative ground preparation and wall footing techniques (not to mention the possibly innovative ashlar walling) exemplifies the necessity for the extension of permanent areas of sedentary manufacture in the mid-seventh century resulting from settlement expansion at San Giovenale.

Finally, due to the attention given to building techniques here as opposed to materials, it is clear that the demographic shift toward urban centres fundamentally altered the built environment. The majority of the innovative techniques provide evidence for such changes in the built environment, as many resulted from technological solutions to the new urban landscape. For instance, the innovative ground preparation techniques in southern Etruria during the eighth century BC indicates that domestic construction was occurring beyond the optimal locations for building where easily accessible, level bedrock could be attained. Builders were required to adapt to more difficult terrain, leading to the use of Type 2 foundations at southern Etruscan sites.

The results of this study therefore have a substantially wider impact than suggested by the primary aim. Certainly, the rejection of the previously held notion that changes to domestic architecture were part of a singular, evolutionary transformation of building materials is the most important impact produced by this book. Such a rejection should encourage a more nuanced approach centred on the behavioural elements of change and the understanding of architecture in relation to behaviour and the built environment. Yet, in addition to this primary impact, the identification of domestic architectural transitions, as well as the interpretations of how and why such innovations occurred, provides further evidence for the broader socio-cultural changes between 800-500 BC. This evidence certainly appears to support models where complex changes to Etruscan society ultimately resulted from demographic shifts toward centralised urban settlements over the first half of the first millennium BC.

55 Winter (2013) suggests that the western Greek influence on tiles is only apparent at the beginning of the sixth century BC. She does not clarify whether or not the Greeks influenced tile manufacture and use from before 600 BC; instead, she focuses on the native Etruscan artistic characteristics of seventh-century tiles.

7.2.2 Limitations of this study

The results presented here are limited primarily by the sample. As noted throughout this book, in nearly every facet of research the re-examination of the predominant evidence of architectural features is hindered due to unclear terminology and varying detail in publication. Although these limits have been discussed (e.g. sections 2.4, 5.1, 6.1), they reduce the potency of the results.

7.2.2.1 Limits of the evidence

Although by far the most representative of the building process, the evidence for foundation techniques is limited. The sample size for the earlier foundation types (i.e. Foundation Types 1, 2 and 3) is relatively small, especially when compared to the later foundation types (i.e. Foundation Types 4 and 5). Specifically, the gap in the chronology between the archetypical Type 1 foundations from Sorgenti della Nova and those from San Giovenale and Tarquinia diminishes the clarity of the eighth-century BC transition in foundation process. The sample of permanent Iron Age domestic structures is limited, particularly those that date to the ninth century BC. The sample of earlier foundation types is also limited to southern Etruria, which, in comparison to evidence from northern Etruria, favours the transition in foundation process. Therefore, the transition in foundation process is not securely dated to the eighth century, depending on the revised chronology. It could have occurred in the late ninth century and may only have occurred in southern Etruria where the geography and geology allowed for bedrock-cut foundations.

In addition, evidence for Type 2 foundations is limited. Only five examples of Type 2 foundations have been found in eighth-century BC contexts, while the remainder are from the second half of the seventh century. This chronological gap between eighth- and seventh-century examples, as in the ninth-century gap in evidence for Type 1 foundations further obscures the transition in dominant foundation process, as well as the transition in structural roof techniques.

The uncertainties of chronology and relative lack of eighth-century evidence for the earlier foundation types also affects the perception of the transition in structural roofing techniques. The ninth-century BC gap muddles the transition between the three-aisle and two-aisle roof supports in the Type 1 foundations. The inadequate eighth-century evidence, particularly for Type 2 foundations, also restricts a more specific identification of the appearance of two-aisle roof supports. Moreover, the gap between the eighth- and seventh-century evidence denies further clarification of the change away from the two-aisle type to wall-supported roofs. Without Damgaard Andersen's (2001) supplemental, indirect evidence, it would be difficult to recognise not only when the transition in roof structure occurred but also how it affected building construction overall.

Comparatively, the evidence for the seventh- and sixth-century BC transition in dominant foundation processes is drawn from a more secure dataset. However, the weaker evidence for the earlier foundation types impedes any attempts at a fluid description of the habitual innovations in techniques over time. As techniques transitioned from Foundation Type 2 to Types 4 and 5, there are hints of the transition, particularly in the Type 2 foundations at Lago dell'Accesa. Yet, the fact that later foundations are recognisable has in part prevented more thorough recognition of the transition, as with the evidence for Type 2 foundations at San Giovenale Area F East (Karlsson 2006: 138–140). Therefore, the case of the seventh- and sixth-century transition in dominant foundation process is heavily reliant on the identification of habitual enhancements of traditional foundation techniques in the later evidence.

The distinction in the sample between evidence from eighth century BC (and earlier) and evidence from seventh- and sixth-century contexts is even more distinct for walling and roofing techniques. As noted above (also section 5.1.4), the limited direct evidence for walling techniques, particularly for the eighth-century contexts, coupled with confusing terminology has prevented the establishment of any significant results. In fact, in this case, the limitations found in the evidence led to the conclusion that specific interpretations of walls, even one based on a supposed evolutionary progression of materials, is misleading.

Direct evidence of roofing techniques is virtually non-existent from before the mid-seventh century BC. The lack of conclusive evidence for roof covering techniques of the first half of the seventh century and earlier confines the identification of techniques to secondary, indirect evidence (Damgaard Andersen 2001). Thatch was almost certainly the manufactured material used but, without more direct evidence, the thatching techniques used are enigmatic. The clay revetment of thatch is a good example of the limits of the evidence, with Damgaard Andersen (2001: 254) and Karlsson (2006: 135–136) both hinting at clay revetted thatch without definitively confirming its use.

As in the case of the roof covering techniques, there is a lack of direct evidence for structural roofing techniques. Fortunately, from the foundations and indirect evidence, the structural techniques are more visible in eighth-century structures. With the appearance of terracotta tiling, it is possible to identify the style of the roof as well as its basic structural features, following the works of Strandberg Olofsson (1989) and C. Wikander (1988), respectively.

The appearance of new roof covering materials in the last half of the seventh century BC is perhaps the most recognisable of the transitions in building techniques. The well-preserved evidence from Poggio Civitate and, more importantly, Acquarossa allow for specific understanding of roofing techniques, as demonstrated by Ö. Wikander (1986, 1993). This contrasts greatly with the limitations of the evidence prior to the transition. As seen in the identification of foundation techniques, the evidence for roofing techniques after the mid-seventh century tends to overshadow that from before. It creates an unbalanced view of the transition and encourages an overly dramatic interpretation where the stimuli that influenced a change in technique were unprecedented.

Due to meagre direct evidence and the gaps in chronology, the sample allows the identification of only the most overt architectural transitions. Furthermore, the interpretations of the transitions are skewed in favour of the better-evidenced techniques, which might have led to the overambitious designation of active innovation. By interpreting some techniques as active innovations, the system for change is altered where the influencing factors and stimuli on the individual become important enough to cause a conscious choice to act contrary to habit and tradition. The interpretations of techniques and some of the resultant transitions are thus likely to be seen here as more revolutionary than they were in actuality.

7.2.2.2 Other weaknesses in the evidence

Besides the limits of the evidence, some problems derive from the descriptive reconstruction process used to identify techniques. Such a method requires detailed understanding of the cultural materials (i.e. the architectural features). While the excavators at most of the sites have maintained the wall footings (e.g. Lago dell'Accesa Areas A-C, the Borgo and Area F East at San Giovenale or Acquarossa Zone F), the majority of the evidence for techniques was destroyed during excavation.[56]

As a result, identification of techniques through descriptive reconstruction is heavily reliant on the initial interpretations of the excavators. Their recognition (and hopefully subsequent acknowledgement in notes

56 Except for, notably, the Borgo at San Giovenale where Nylander (2013: 25) left baulks in situ in the 1960s for later investigations, which took place primarily in the late 1990s and early 2000s.

or publication) of specific techniques (e.g. subtle differences between strata, minor post holes or a remnant of degraded clay above the wall footings) has been influential in the identification of techniques here. However, barring an excavation of new architectural features with the established aim of identifying techniques via descriptive reconstruction, the reliance on the older material is inevitable. Clarification of terminology and the focus on direct evidence (as opposed to circumstantial or indirect evidence) has therefore been required. Perhaps one of the benefits of such a reliance on older material is that the adoption of the descriptive method used here allowed for the use of deductive as opposed to inductive reasoning, as suggested by Barceló, Pelfer and Mandolesi (2002: 42).

Conceptually, attempting to identify techniques using material evidence can also be problematic. If techniques are a specific form of learned behaviours (see section 2.1), then they are the composite of actions. Even if the majority of those actions are focussed on the production of material culture, only a fraction of the totality of actions involved in a technique will be evident in that material. Techniques described in this book have been characterised based on outcomes; they have only been accurately described in relation to the resultant feature.[57] With the impact of other c- and n-transforms following creation, it is impossible to precisely identify the actions of a technique in full.

Although recognised only as an outcome in material evidence, the techniques used to create structures differed from material procurement, manufacture and use. This study highlights the differences in order to establish that building materials do not represent, in and of themselves, how buildings are constructed. However, briefly summarising the broader concepts of material procurement, manufacture and use prevented a more thorough investigation of the techniques used to create individual building materials or the operational sequence of materials from procurement to destruction/deposition. More in-depth analyses of the materials, including compositional analysis, would complement this book and perhaps provide interpretations of building techniques that are more inclusive of materials.

The *chaîne opératoire* approach is another way that this study has attempted to interpret transition via techniques. As noted in Chapter 2, technological stimuli and influencing factors are more often discussed in changing techniques, particularly in habitual innovation. Architectural changes based on social, economic, political and ritual reasons are inseparable from the change in technique and there are places that present socio-cultural influences as impetuses for the eventual changes to technique (e.g. section 5.1.1). However, technological stimuli received greater attention based on the application of the *chaîne opératoire* approach.

Despite these limitations and possible improvements to the research design, the book presents results that both confirm that building techniques changed and acknowledge the complexity of those changes. Identifying and interpreting techniques makes for a better understanding of how the evidence changed as well as why the buildings from the sixth century BC differ from those of the eighth. Overall, this offers a different narrative of architectural change in Etruria from 800-500 BC.

57 For example, in wall footing technique, the bedrock-cut channels of Type 1 foundations are the outcome, yet the outcome defines the technique.

Glossary

- **Antefix:** Antefixes are terracotta plaques, often decorative, used to cap the open end of the *cover tile* on the edge of the *roof*. Ö. Wikander (1993: 73–77) describes seven types of antefix in his typology of roof tiles at Acquarossa, commonly used in the assessment of early Etruscan roof tiles. See section 5.2. Further reading: Andrén 1971; 1980; Flusche 2001; Phillips 1974: 266; Rystedt 1983: 109, 134–38; Strandberg Olofsson 1984; Ö. Wikander 1993: 73–77; Winter 2009; 2013.

- **Ashlar:** A type of stone masonry, the term 'ashlar' is used to describe *dimension stones* specifically cut to fit together in a dry stone wall. In Etruscan buildings, evidence for the use of ashlar appears in contexts dating to as early as the mid-seventh BC in the Borgo at San Giovenale. See section 5.1.2. Further reading: Blomé 1986: 56; Boëthius and Ward-Perkins 1970: 25–83; Donati 2001: 327–333; Foti 2013; Karlsson 2006: 31–43; Maggiani 2001: 121–122; Prayon 1975: 178–181; Punmia et al. 1993: 221–223; Wendt 1986: 59.

- **Behaviour:** There are multiple definitions of behaviour, all of which are dependent on the field of study. In this book, behaviour is defined as a pattern of actions repeated either by an individual or by a group of individuals. See section 2.1.2. Further reading: D'Andrade 1995: 231–232; Jabes 1978; Kimble 2000; Segall et al. 1999: 206–214.

- **Built environment:** As defined by Rapoport (1969, 1977, 2000, 2006), the built environment is the human manipulation of the natural environment along with the development and use of built forms. Construction of new built forms is always affected by the built environment at both the small-scale (other built forms in the vicinity of the new building) and the large-scale (the regional use of the natural environment by humans). Furthermore, the built environment is not necessarily tangible, but includes built forms that are conceptual and based on socio-cultural designations of spaces (e.g. for certain activities or as ritual). See section 2.1.1. Further reading: Kellet and Napier 1995: 11–12; Kent 1990a; Lawrence and Low 1990: 458–459; Rapoport 1969, 1977, 2000, 2006.

- ***Chaîne opératoire*:** Originally influenced by the works of Mauss (1935), Leroi-Gourhan (1993) explained that the process of tool creation is the result of a specific operational chain or *chaîne opératoire*. At each link in the operational chain, matter, energy, object, gesture and knowledge interact, spurring distinct actions that influence the end product (Dobres 1999: 125). The result of the operational chain is a *manufactured material*. Some, such as Bleed (2001), Dobres (2000b) and Skibo and Schiffer (2008: 22), argue that the operational chain continues (due to retouching and repurposing) until deposition of the *manufactured material*. See section 2.2.2. Further reading: Audouze 2002: 287; Bleed 2001; Boëda et al. 1990; Dietler and Herbich 1998; Dobres 1999, 2000b, Lemonnier 1983, 1986, 1992, 1996, 2004, 2012; Schiffer 2005; Sellet 1993.

- **Cobble:** Based on the Udden-Wentworth grain size scale, an international standard, a cobble is a naturally formed stone of between 64 mm and 256 mm. Cobbles were often used in early Etruscan buildings, typically as part of the *foundations*. See section 3.2.2. Further reading: Blair and McPherson 1999; Tanner 1969.

- **Conglomerate:** In a geological sense, a conglomerate boulder, *cobble*, *pebble* or granule is the lithified (compressed and cemented sedimentary rock without porosity) alternative to gravels, which are non-lithified (uncompressed rock). See section 3.2.2. Further reading: Blair and McPherson 1999.

- **Couple roof:** A couple roof is a type of roofing where the weight of the roof cover (i.e. tiles or thatch) and *rafters* is supported in the horizontal members, such as the *ridge pole* and *wall plates*. C. Wikander (1988) suggests that couple roofs were common at Acquarossa, and may have been typical of early Etruscan buildings, particularly from the seventh century BC onwards. See section 5.2.1. Further reading: Punmia et al. 2008: 430; Wikander 1988: 52.

- **Cover tile:** A semi-cylindrical terracotta tile, a cover tile or *imbrex* generally fits upon *pan tiles*. Cover tiles are intended to cover the gaps between *pan tiles*, thus protecting the *rafters* and the building's interior from weather and sunlight. Ö. Wikander (1993: 45–58) names three types of cover tile in his typology of roof tiles at Acquarossa, commonly used in the assessment of early Etruscan roof tiles. Type I tiles are functionally simplest, where one end of the tile is tapered to fit underneath another cover tile. Type II tiles are similar to Type I, but with the covered end distinctly lower than the uncovered one. Type III tiles are distinct, with the tapering of the other types replaced with a clear flange. See section 5.2. Further reading: Wikander 1986, 1990, 1993.

- **Crossbeam:** A horizontal member in a *roof*, a crossbeam is often used as part of a *truss*. Typically, a crossbeam runs perpendicularly between the tops of two parallel walls. There is some debate over whether or not the Etruscans employed crossbeams or the *truss*. See section 5.2.1. Further reading: Turfa 2000; Turfa and Steinmayer 1996, 2002; Wikander 1988.

- **Daub:** A clay mixture used as both a binding agent and an insulator, evidence for daub is often associated with *wattle*. See section 5.1.1. Further reading: Ammerman et al. 1988: 125–128; Brocato and Galluccio 2001: 288–289, 297–299; Erixon 2001: 453; McConnell 1992; McIntosh 1974.

- **Dimension stone:** Dimension stones are *manufactured materials* specifically quarried and cut based on their durability and hardness, as well as the desirability of their colour, texture or finish. See section 6.2.1. Further reading: Allaby 2013: 169; Colella et al. 2001; Kopper and Rossello-Borcloy 1974.

- **Dual-process theory:** An overarching theory of human *behaviour*, dual-process theory refers to two states of cognition and the resultant *behaviours* of individuals. So-called System 1 processes are unconscious, automatic cognitive processes, whereas System 2 processes are conscious, deliberative processes (Evans 2008: 256). *Behaviours* resulting from either system are generally distinguishable based on their relation with memory, *habit* and rule-based abstraction. See section 2.1.3. Further reading: Allen and Thomas 2011: 109; Deutsch and Strack 2006; Evans 2010a, 2014; Evans and Stanovich 2013; Stanovich 1999.

- **Foundation:** In the context of architecture, Merriam-Webster's dictionary defines foundations as: "an underlying base or support; especially: the whole masonry substructure of a building." Engineering literature goes further, defining the function of foundations. Foundations exist as the distributor of a building's weight into the ground in a way that prevents deformation of the soil (Simons and Menzies 2000: 87). Based on its function, a foundation is a mediator, transferring to the ground the stresses that were created within the *superstructure* of a building. Foundations include all parts of the building that transfer the weight of the building above into the ground through direct contact or help to prevent soil deformation. See Chapters 3 and 4. Further reading: Fang 1991; Simons and Menzies 2000.

- ***Graticcio*:** An Italian term for a *manufactured material* similar to *opus craticium*, *graticcio* refers to both the *structural* and infilling components of a *half-timbered wattle wall*. It is not to be confused with either the *half-timbering* or *wattle* walling *techniques*. See section 5.1.1. Further reading: Bartoloni 2012a: 266; Becker 2014: 9; Donati 2001: 317; Vidén 1986: 56; Wendt 1986: 58–60.

- **Habit:** The descriptive result of *habitus*, habit is an unconscious action or *behaviour* that conforms to the *habitus*. See *Habitus*.

- **Habitus:** "Structured structures predisposed to function as structured structures" (Bourdieu 1977: 72), habitus is made of systems of unconsciously formed dispositions that regulate human *behaviour*. These systems are "collectively orchestrated" without a "conductor" and do not require conscious actions or choices in order to convey mastery of a specific kind of *behaviour*, such as a *technique*. Habitus generally produces *habits* and *behaviours* that follow *tradition*. See section 2.1.3. Further reading: Bourdieu 1977; 1982; 1984; 1990; 1998; Crossley 2001; Dornan 2002; Gartman 2007; Haugaard 2008: 193; Noble & Watkins 2003.

- **Half-timbering:** Half-timbering is a *structural* walling *technique* used in timber frame buildings. Timbers between load-bearing posts and *wall plates* are used to create a lattice of intersecting frames. The timbers of a half-timber wall are usually smaller (by up to half-size) in width than the load-bearing members of the timber frame of the building, giving the *technique* its name. Infilling walling *techniques*, such as *wattle* and *daub*, is then used within the frame as a non-*structural* component. In Italian, the combination of the *structural* half-timbering *technique* and the infilling *wattle* and *daub technique* is referred to as *graticcio*. See section 5.1.1. Further reading: Harris 2006; Karlsson 2006; Staccioli 1967; Vasconcelos et al. 2013.

- **Hipped roof:** A hipped roof is a style of roof structure where every side of the *roof* slopes from the apex to the *walls*. Therefore, a hipped roof does not have gabled ends. Hipped roofs are often depicted in Etruscan cinerary urns and are commonly thought to have been the usual style of *roof* in central Italy prior to the seventh century BC. See section 5.2.2. Further reading: Büchsenschütz 2001, 2005; Damgaard Andersen 2001; Dolfini 2002a; Noble 2007: 160.

- ***Imbrex*:** Latin name for *cover tile*, not to be confused with the Italian term '*embrice*', which generally refers to a *pan tile*. See *Cover tile*.

- **Innovative:** Innovative *behaviours* are the result of an individual or group acting counter to the established *habitus* via either conscious reflection or the imposition of unconscious variables and limitations in the social structure. In order for innovation to occur, a number of factors must be present, including a capable agent(s) and a social structure(s) that encourages enhancement and change. See section 2.1. Further reading: Bourdieu 1977, 1982, 1984, 1990, 1998; Burns 2007; Crossley 2001; Dornan 2002; Gartman 2007; Giddens 1979, 1984, 1986; Haugaard 2008; Lawrence and Low 1990; Noble and Watkins 2003; Robb 2010; Schiffer 2005; Scott and Bruce 1994.

- **King post:** A king post is the key element in a king-post *truss*. Unlike in a *couple roof*, in a king-post *truss* the *ridge pole* is directly supported by the king post, which runs between the *ridge pole* and *crossbeams* in the lower roof structure. There is some evidence that the Etruscans used king posts. A number of tombs feature carved reliefs that appear to depict the woodwork of an imagined roofing structure. However, C. Wikander (1988: 52–53) argues that the Etruscans may not have used king posts and *trusses* based on the likeliness of *mutuli* in roofs at Acquarossa. She also states that *trusses* would be unnecessarily complex for most early Etruscan structures. See section 5.2.1. Further reading: Punmia et al. 1993; Turfa and Steinmayer 1996, 2002; Wikander 1988.

- **Lateral sima:** Similar to *raking simas* but with water spouts, lateral simas were used on the horizontal edges of a *saddle roof* and acted as a gutter. Many lateral simas were decorative. Compared to Greek roofs, lateral simas were not commonly used in Etruscan roofs, with a few exceptions (Wikander 1993: 82–83). See section 5.2. Further reading: Damgaard Andersen 1990; Phillips 1990; Ö. Wikander 1986, 1993, Winter 2009, 2013.

- **Manufactured material:** In contrast with *raw materials*, manufactured materials are products of a system of manufacture, with an express purpose of use. Manufacture is defined by *chaînes opératoires*, or the operational chains of production and use. See section 6.1. Further reading: Lemonnier 1983, 1986, 1992, 1996, 2004, 2012; Schiffer 2005; Sellet 1993; Ward-Harvey 2009.

- **Mud brick:** In central Italy, evidence from Poggio Civitate and Roselle, along with modern reconstructions at Allumiere, suggests that the mud bricks of Etruria were primarily comprised of earth admixed with sand, clay and straw. According to Camporeale (1997: 27–30) and Genovesi (2001: 314–315), mud bricks were *manufactured materials* produced using moulds. Once dried, these bricks were used in the infilling walling *technique* of the same name, where mud bricks were stacked and then possibly coated in a *daub* or plaster. See section 5.1.1. Further reading: Camporeale 1997; Canocchi 1980: 32–50; Donati 2001: 323–324; Genovesi 2001; Laviosa 1970: 212–215; Morgenstein and Redmount 1998; Nodarou et al. 2008; Rael 2009; Seeher 2007.

- ***Palancato*:** Similar to *graticcio*, *palancato* is an Italian term for walls constructed using the paling *structural technique*. As in *half-timbering*, reduced timbers are placed between load-bearing posts. However, unlike *half-timbering*, no horizontal timbers are used in walls of *palancato*. The resultant *wall* is thus comprised of long, vertical frames. See section 4.2.2. Further reading: Östenberg 1975a; Wendt 1986.

- **Pan tile:** A flat (Corinthian) or slightly concave (Laconian) terracotta tile, a pan tile is the primary component of a tiled roof. Ö. Wikander (1993: 45–58) names two types of pan tile in his typology of roof tiles at Acquarossa, commonly used in the assessment of early Etruscan roof tiles. A Type I tile has raised borders along its long edges, which end early on the upper edge to accommodate the layering of another pan tile. Type II tiles are slightly more complex, with indentations and tapering included to achieve greater cohesion between tiles. See section 5.2. Further reading: Ö. Ö. Wikander 1986, 1993, 2013.

- **Pebble:** Based on the Udden-Wentworth grain size scale, an international standard, a pebble is a naturally formed stone of between 4 mm and 64 mm. Pebbles are commonly found in the *foundations* of early Etruscan buildings, especially as a constituent of flooring. See section 3.2.3. Further reading: Blair and McPherson 1999; Tanner 1969.

- **Pisé:** Produced by stamping earth between two vertical frames, pisé is a walling *technique*. Evidence for pisé has been noted at a number of sites in central Italy, with a well-known example at Fidene (Bietti Sestieri and de Santis 2001). In the reconstructions at Fidene and at Allumiere, pisé has been shown to work as both an infilling *technique* in *timber-framed walls*, as well as a *structural technique* in *self-supporting walls*. See section 5.1.1. Further reading: Bietti Sestieri and de Santis 2001: 217–219; Camporeale 1997: 28–29; Donati 2001: 316–326; Genovesi 2001: 314; McHenry 1984: 100–104; Wendt 1986: 60.

- **Purlin:** Horizontal elements in a roofing structure, purlins typically sit upon the primary *rafters*. They are generally used to secure both the *rafters* and elements of the roof covering, such as sheathing and tiles. See section 5.2. Further reading: Punmia et al. 1993: 468–469; C. Wikander 1988.

- **Queen post:** Queen posts and queen-post *trusses* are slightly different from *king posts*. Instead of one post running from the *ridge pole* to a *crossbeam*, two posts run from the *crossbeam* to the principal *rafters*. Often, a second horizontal beam runs between the principal *rafters* and the junction point (nodes) with the queen posts. Queen posts are mentioned by Hansen (1971: 226) in connection with later Etruscan roofs, but C. Wikander (1988) suggests the *king-post truss* or the *couple roof* as simpler, more plausible alternatives. See section 5.2.1. Further reading: Hansen 1971; Punmia et al. 1993: 475–476; C. Wikander 1988.

- **Rafter:** An essential feature of the roofing structure, rafters run from the top of the *walls* to the apex of the *roof*. C. Wikander (1988: 54) argues that Etruscan rafters were likely made of rather robust timbers based on the terracotta tiles found at Acquarossa. For early roofs, it is unlikely that thin, closely spaced rafters and *purlins* (the so-called Gaggera roof) was used. See section 5.2. Further reading: Punmia et al. 1993: 467; C. Wikander 1988.

- **Raking sima:** Made to protect the *walls* on the gabled ends of the *roof*, raking simas are some of the oldest features of terracotta tiling (Ö. Wikander 1993: 77). They prevented water from running off of the gabled edge of the *roof*, acting as a conduit of water similar to a modern gutter. Due to their visibility, raking simas were often decorated but Ö. Wikander (1993: 80–81) explains that in central Italy plastic decoration was uncommon before the mid-sixth century BC. Instead, early raking simas were generally short and painted rather than tall and moulded to include figures in relief. See section 5.2.1. Further reading: Ö. Wikander 1986, 1993, 1994, Winter 2009, 2013.

- **Raw material:** A raw material is any substance that is procured for human production, consumption or use that is not the result of the manufacture process. Unlike *manufactured materials*, raw materials do not have an inherent purpose for use and can therefore fill a number of roles. See section 6.1. Further reading: Andrefsky, Jr. 2009; Johnson 2007; Lemonnier 1983, 1986, 1992, 2004, 2012; Schiffer 2005; Sellet 1993; Ward-Harvey 2009.

- **Ridge pole:** Running along the apex of the *roof*, a ridge pole is often used to secure the *rafters* against angular and horizontal movement. The ridge pole is often assumed, particularly in *saddle roofs*, although not always necessary. In her discussion on roofing structure, C. Wikander (1988) explains that ridge poles are likely in early Etruscan roofs, but not entirely necessary, noting the *couple roof*. However, the evidence for roof supports from the mid-eight century BC onwards indicates the presence of ridge poles in a number of buildings, suggesting ridge poles are a common feature of Etruscan roofs. See section 5.2. Further reading: Punmia et al. 1993: 467; Turfa and Steinmayer 1996; C. Wikander 1988.

- **Ridge tile:** Ridge tiles covered the apex of both *saddle roofs* and *hipped roofs*. Used exclusively in tiled roofing, some examples appear to have been made to fit over *cover tiles*. Many ridge tiles are also decorated, likely resulting from their visibility and position. See section 5.2.1. Further reading: Ö. Wikander 1986, 1993, Winter 2009, 2013.

- **Roof:** All elements that cover a building, including the *structural* frame that directly supports it, are considered part of the roof. This includes elements such as the *wall plates* which are also considered part of the *walls*. See section 5.2. Further reading: Damgaard Andersen 2001; Hodge 1960; Punmia et al. 1993: 463–510; Turfa and Steinmayer 1996, 2002, C. Wikander 1988, 2001, Ö. Wikander 1986, 1993, 1994, Winter 2009, 2013.

- **Rubble:** The Oxford English Dictionary (Oxford University Press 2011) states that the word rubble is typically used to describe irregular, broken stones, resulting from either manmade or natural causes. The use of rubble, along with *cobbles* and *pebbles*, was common in Etruscan building, particularly as part of the *foundations*. Smaller rubble stone was often used in flooring, while larger rubble was used in socle wall footings. See section 3.2.

- **Saddle roof:** A saddle roof is a style of roof structure where only two sides of the *roof* slope from the apex to the *walls*. A saddle roof therefore has gabled ends. Saddle roofs appear to be a more common style of roofing in central Italy from the seventh century BC onwards, in part thought to be due to the adoption of tiled roofing. See section 5.2. Further reading: Hansen 1971: 226–227; Strandberg Olofsson 1989; 2002, 1996; C. Wikander 1988; Wikander and Wikander 1986, 1990.

- **Socle:** The term 'socle' is widely used in Classical architecture and in most cases refers to a multi-course, raised stone platform artificially constructed to separate the *walls* from the ground and the building *foundations*. Typically, the term is used in later periods, where it appears in the description of monumental buildings such as temples and tumuli. However, the term is also used in the description of smaller structures to define artificial, mediating platforms of *cobbles* or *rubble* between the *walls* and the ground that are discernibly above ground, such as in Fagerström (1988) or McConnell (1992). Further reading: Bylkova 2007; Fagerström 1988; Malacrino 2010: 45, 52, 209; McConnell 1992; Papaioannou 2007.

- **Self-supporting wall:** As opposed to a *timber-framed wall*, which uses a system of posts, beams and *wall plates* to distribute building stresses into the *foundations*, self-supporting walls are comprised of the same materials as their infill and do not use any other system of distributing the stresses of the building. See section 5.1. Further reading: Foti 2013; Genovesi 2001; Lourenço 1998; Valluzzi 2007; Vasconcelos et al. 2013.

- **Structural:** In this book, a material or *technique* is considered structural if it is a load-bearing component or acts to stabilise the building against shear stress.

- **Structuration:** The concept of structuration as proposed by Giddens (1984) defines the creation of social structures as the result of a relationship between agent and structure, where the agent, through reflective monitoring, rationalise the outcomes of their *behaviours* against existing structures. As opposed to earlier behavioural theories, such as the Theory of Practice and *habitus*, structuration gives the agent potency to affect outcomes and change/deviate from the social structure. See section 2.1.3. Further reading: Dornan 2002; Giddens 1979, 1984, 1986; Haugaard 2008: 192; Lawrence and Low 1990: 489–490; Robb 2010: 495.

- **Superstructure:** According to the Oxford English Dictionary (Oxford University Press 2012), all parts of the building not in contact with the ground or part of the *foundations* of the building are considered part of the superstructure. Generally, this includes all components of the *walls* and *roofs*.

- **Technique:** A technique is a *behaviour* specifically relating to the gestures of tool creation or use. It is the product of an operational chain(s) (*chaînes opératoires*) of actions that allows for the systemisation of the *behaviour*. Many techniques are *traditional*, resulting from unconscious cognitive systems and *habitus*. However, some are *innovative*, resulting from the active reflection (conscious cognitive systems) of the agent in accordance with the agent's competence, capabilities and (cognitive and environmental) limitations. See section 2.1. Further reading: Lemonnier 1983, 1996, 2004, 2012; Lemonnier and Pfaffenberger 1989; Leroi-Gourhan 1993; Roux 2003; Simondon 2006.

- **Technology:** A technology refers to the ability of an individual or group to apply calculated, practical and mechanical ideas to create an end product. Technologies are thus conceptual, referring to the potential for creating *manufactured materials* and then using them as tools for specific purposes. See section 2.1. Further reading: Dobres and Hoffman 1994; Lemonnier and Pfaffenberger 1989; Leroi-Gourhan 1993; Pfaffenberger 1988, 1992; Roux 2003; Schiffer et al. 2001.

- ***Tegula*:** Latin name for *pan tile.* See *Pan tile*.

- **Timber-framed wall:** A timber-framed wall is comprised of a system of posts, beams and *wall plates* made of worked timbers and an infill, such as *wattle* or *pisé*. The system of timbers is intended to act as the *structural* element of the wall, carrying the loads and passing the stresses of the *superstructure* into the *foundations*. The infill is a non-*structural* element, instead intended to act as insulation. See section 5.1.1. Further reading: Cointe et al. 2007; Gülkan and Langenbach 2004; Harris 2006; Meiggs 1982; Vasconcelos et al. 2013.

- **Traditional:** Traditional *behaviour* is the result of *habitus* and the social structure, where an individual or group engages in acts according to the perceived norm. Often, traditional *behaviours* are unconscious *habits*, but an agent(s) can also reflect on their actions and consciously choose to perform in accordance with tradition. See section 2.1. Further reading: Bourdieu 1977, 1982, 1984, 1990, 1998; Crossley 2001; Dornan 2002; Gartman 2007; Giddens 1979, 1984, 1986; Haugaard 2008; Lawrence and Low 1990; Noble and Watkins 2003; Robb 2010: 495; Schiffer 2005; Shils 1971.

- **Truss:** Used primarily in roofing structures (although also seen in *timber-framed walls*), in buildings a truss is formed by creating a planar triangle. A simple truss, for instance, uses simply a *crossbeam* and *rafters*. The truss is used to counteract tensile and compressive stresses apart from where the elements of the truss meet (nodes). It is unclear when trusses were first used in Etruria, but C. Wikander (1988) suggests that trusses were not necessarily used at Acquarossa in the sixth century BC. Yet, Turfa and Steinmayer (1996: 22–24) argue that trusses were in use at Poggio Civitate at the end of the seventh century BC. See section 5.2.1. Further reading: Punmia et al. 1993: 473–486; Turfa and Steinmayer 1996, 2002; Wikander 1988.

- **Wall:** The Oxford English Dictionary (Oxford University Press 2013) defines walls as all elements that constitute the sides of a building, including the vertical divisions of the interior. Structurally, a wall is usually responsible for bearing the weight of the *roof*. Walls also have a role in dividing spaces both inside and outside of a structure. See section 5.1. Further reading: Acconcia et al. 2009: 23–25; Bartoloni 2012b; Boëthius and Ward-Perkins 1970; Brocato and Galluccio 2001: 306–308; Colantini 2012; Donati 2001; Genovesi 2001; Harris 2006; McIntosh 1974; Punmia et al. 1993: 321–355; Vasconcelos et al. 2013.

- **Wall footing:** Wall footings are often used in building *foundations* as a mediating surface between the *walls* and the prepared ground. Typically, the juncture of a *wall* with the ground is subject to the load carried by the *wall*. In order to avoid the collapse of the ground due to (primarily) shear stress, wall footings made of a robust material are added to protect against soil deformation and disperse the building load. In Etruria, wall footings appear to have been relatively uncommon until the eighth century BC, particularly in southern Etruria where bedrock ground preparations were used. From the end of the eighth century onwards, stone wall footings on soil ground preparations were common throughout Etruria. At southern Etruscan sites in the seventh century, stone wall footings incorporated *ashlar* as a replacement of the *socle* of *cobbles* that was prevalent from the late-eighth century. *Socles* of *cobbles* remained common at northern Etruscan sites into the sixth century and beyond, although their construction became more complex with time. Further reading: Liebing 2011: 239–240; Simons and Menzies 2000: 87–106.

- **Wall plate:** A type of beam, wall plates run horizontally along the tops of *walls*. In *timber-framed walls*, they are *structural* members that help to distribute the load of the *roof* into the load-bearing posts and spread the shear and compression stresses caused by the contact of the *roof* and the *wall*. If they are fixed to the wall posts, then the wall plates are sometimes called post plates. Most importantly, wall plates allow the *rafters* to be fixed to the *wall*, securing the *rafters* against movement in the horizontal plane. Wall plates are often assumed in Etruscan buildings, particularly those thought to have had *timber-framed walls*, although C. Wikander (1988: 49–50) notes that *mud brick* walls may not have needed wall plates. Stone walls, on the other hand, likely required wall plates because of the difficulty caused by mortaring the *rafters* to the *wall*, according to C. Wikander (1988: 50). See section 5.2.1. Further reading: Punmia et al. 1993: 467–468; Wikander 1988.

- **Wattle:** Typically a latticework of cane (*Arundo donax*), wattle is often considered the most common infill used in early Etruscan walling. Wattle is generally thought to have been covered in *daub*, but evidence from Sorgenti della Nova suggests non-daubed wattle was also used (Negroni Catacchio 1995). Evidence for this *manufactured material* is rare since fired *daub* fragments with wattle impressions are the only direct examples of the use of wattle. In this study, the direct evidence of wattle is present at three sites: Lago dell'Accesa, Luni sul Mignone and San Giovenale. See section 5.1.1. Further reading: (Ammerman et al. 1988: 125–128; Boëthius and Ward-Perkins 1970: 13–15; Brocato and Galluccio 2001: 288–289, 297–299; Erixon 2001: 453; Malcus 1984: 38–39; McIntosh 1974; Negroni Catacchio 1995: 301–337; Pohl 1977: 13–27).

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