Earthen Architecture in Muslim Cultures

Arts and Archaeology of the Islamic World

Edited by

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Earthen Architecture in Muslim Cultures

Historical and Anthropological Perspectives

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Stéphane Pradines

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To my wife, Veronica
For her constant support in all my projects

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In this book, the transliteration of Arabic names and terms generally follows the IJMES transliteration system.

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Introduction: An Architecture for the Caliph and the Poor

Stéphane Pradines

This edited volume follows a panel, "Earth in Islamic Architecture", organised for the World Congress for Middle Eastern Studies (WOCMES), held in Ankara on 19 August 2014. Since this date, we received additional contributions reflecting the diversity of earthen architecture in Muslim cultures, so we decided to include these papers in the present volume.

While earthen architecture is well known among archaeologists and anthropologists whose work extends from Central Asia to Spain, little collective attention has been paid to earthen architecture within Muslim cultures. This book primarily aimed at scholars who specialise in Islamic architecture, and who seek information regarding earth buildings. The intention of this publication was to reach specialists in construction material who are not necessarily "Islamic studies" specialists, but simply interested in earth as a construction material. Unlike much of the literature on this subject, we have tried to extend the scope of earthen architecture beyond its technical and ethnographic aspects. Our book endeavours to share knowledge and methods of different disciplines such as history, anthropology, archaeology and architecture. The book's objective is to establish a link between historical and archaeological studies, with the understanding that Muslim cultures cannot be dissociated from social history. It is also of paramount importance to build bridges between past and contemporary approaches that relate to conservation and urban planning.

Initially, scholars of Islamic architecture focused on such prestigious monuments as palaces and mosques built by the great Muslim dynasties—from the Umayyads and the Abbasids, to the Ottomans. As a result, there was scant information or descriptions about the common people and vernacular architecture. Since the 19th century, anthropologists and archaeologists neglected to gather data on vernacular architectures. Very few Islamic art historians showed interest in construction methods and earthen architecture.[1] Art historians focused first on monuments made of stone or red brick in capital cities,[2] except in some areas of the world where mud bricks and adobe architecture were dominant, such as Mali and Morocco in West Africa (for example).

From the late 19th to the late 20th century earthen architecture was "forgotten", as a general deficiency in perception. In the past few years, the significance and potential of earthen architecture has regained the attention of architects and archaeologists, perhaps more than that of art historians. Europeans regarded earthen architecture as "primitive", and this was for two main reasons. Firstly, this architecture has been consigned to the sphere of ethnographic literature, classified as being built by primitive people during the pre- or proto- stage of historic development. Secondly, this "architecture without architects" was regarded as Eastern or exotic; such opinions were forged during the 19th century, on account of Orientalist preconceptions, that were then perpetuated by colonial rule during the early 20th century. Clichés exist for both these reasons. African architecture was often confined to earthen architecture. What of those few architects and archaeologists familiar with the coral limestone architecture of the Swahili cities,[3] or the sandstone or basalt architecture

1 Speiser, "Building material Material and Construction Methods", 101–105.

2 The most comprehensive study: is Hillenbrand, *Islamic Architecture: Form, Function and Meaning*.

3 Pradines *et al.*, "Songo Mnara. Etude architecturale d'une ville swahilie médiévale".

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in Ethiopia and Somalia? Past and present earthen architecture came to be rehabilitated in Europe, during the nineteen-eighties.[4]

Whether in West Africa, the *sahel*, or in North Africa, ethnic and vernacular aspects were highlighted. The Islamic aspect was pushed into the background, and the historical aspect of this architecture was often neglected.[5] Geographical and anthropological boundaries ought not to preclude us from describing and analysing earthen architecture. There is a strong connection between earthen architecture and the historical architecture within the vernacular Muslim countries. While this link is known, it does not receive the attention it merits. In all the *dār al-Islām*, Muslim territories have deep-seated traditions of earthen architecture and construction, from Pharaonic Egyptian, to Mesopotamian and Asian traditions.[6] Such pre-Islamic architectures included monumental architecture, such as fortifications, palaces, temples or ziggurats, pyramids and graves.[7] For example, the 5th century Sassanian palace of Ctesiphon had an influence on the later Abbasid architecture and, more generally, on the earthen architecture in Iraq. Mesopotamian buildings and ziggurats had the same impact on the early Muslim architecture in Iraq and Iran. In Egypt, buildings of Pharaonic antiquity and traditional Nubian architectures influenced key aspects of Fatimid architecture. In North Africa, the traditional Berber architecture[8] was similarly reinvented and adopted by Muslim communities. Thanks to the late Hassan Fathy, earthen vernacular architecture was finally accepted as an important heritage of cultures, particularly in Egypt.[9] Nobody can deny the role and the importance of earthen architecture nowadays. Earthen architecture is both recognised and well-published in many countries.[10] However, this architecture is still not exploited or studied enough, compared with other more monumental and better-preserved types of construction in most Muslim countries.

It seems that earthen architecture has been consigned to the periphery: agricultural areas, villages and oases. It seems cities didn't integrate earthen architecture in their development. Is this true? Can such a general statement be verified on the field? Clearly not, since most urban brick architecture is coated with plaster, and, thus, the materials are concealed. Who would imagine that upper portions of great Mamluk and Ottoman palaces, were built from red bricks coated with plaster? Almost all the Islamic dynasties, from the Abbasids, to the Fatimids, and even the Ottomans, used earthen architecture. Another point that is often neglected is the relationship between mud-brick and redbrick architecture. It seems that these architectures were contemporaneous, not successive in time. Historians' and archaeologists' typo-chronology approaches are still too often reductive.[11] According to their classifications, adobe and mud brick were replaced by red brick, which in turn was replaced by stone. This simplistic evolutionary model is not working anymore. Yet it is clear that the Fatimids used stone, fired brick, and mud brick—regardless of the building's date, period and function (whether it for palaces, mausoleums, or mosques). Although we observe a change during the late 12th century, Middle Eastern cities

4 With the work and publications of CRATerre: Doat, Hays, Houben, Matuk, and Vitoux, *Construire en terre*.

5 Rabbat, "Islamic Architecture as a Field of Historical Enquiry", 20–21.

6 Edwards, *Of Brick and Myth: The Genesis of Islamic Architecture in the Indus Valley*.

7 Yassin *et al.*, "Architecture in the Islamic Civilization: Muslim Building or Islamic Architecture", 52–53.

8 Prochazka, *Determinants of Islamic Architecture,* 82–84.

9 Fathy's *Architecture for the Poor: An Experiment in Rural Egypt,* as well as establishment of the Aga Khan Program for Islamic Architecture (AKPIA) at Harvard and the Massachusetts Institute of Technology during 1979.

10 Vegas, *et al.*, *Earthen Architecture: Past, Present and Future*.

11 Rabbat, "Islamic Architecture as a Field of Historical Enquiry", 20–21.

began to make more general use of stone in the construction of fortifications, mosques, and palaces.[12] This change seems to tie in with the end of the Caliphal dynasties and the advent of the sultanates. In Europe, a similar change can be observed during the 13th century with the Gothic architecture and the generalisation of stone castle fortifications. Nevertheless, earthen architecture was still in use, both in the Muslim capital cities, as well as in the provinces.

Earthen architecture includes technical issues. Which type of earthen architecture are we talking about: adobe, cob, mud brick, rammed earth,[13] mud render,[14] wattle, or daub? Are these architectures recognisable in primary sources? This publication provides an opportunity for the various contributors to describe precisely the different kinds of architectures, using a local and vernacular vocabulary, whether in Arabic, Berber, Persian and Turkish. Such a vocabulary is extremely interesting because it helps to establish cultural links with, and influences on, regions, people and periods.[15] The word "influence" was banned by the modern scientific community as, for a long time, it had connotations of diffusionism. Nowadays, with a norm tending toward regionalism, each culture seems to evolve autonomously without the ascendancy of any dominant culture. The increased interest in local identities is of course linked to a general trend in social science research. Our book demonstrates that such theories are dead ends, and that it is possible to talk about regionalism, cross-cultural contacts and cultural influences. Recognizing that cultures have no boundaries, it seems Islamic architecture has been under-theorised.[16] Notions of identity and heritage, syncretism and vernacular traditions, networks and stylistic influences, remain underestimated in the specialised literature on Islamic architecture.[17]

Algeria, Central Europe, Egypt, Iran, Mali, Morocco, and Yemen: the papers in this book demonstrate a diverse and varied earthen architecture in the Muslim context. Our objective is to delve deeper into historical and geographical aspects of this hitherto little-known architecture.

In "Earthen Architecture and the Technologies of Belief", Rolando Melo da Rosa engages earthen architecture documented in Qur'anic and other Islamic texts. Melo da Rosa wonders if an Islamic framework supported adobe buildings. Islam is viewed in terms of social networks and technologies of belief, enabling us to verify the connection between earthen construction and religion. The Qur'an and *Sunnah* refer to a relationship between human creation and the adobe *labin*. Whether past or present, religious evidence assesses the role of Islam in everyday building cultures. The study of vernacular earthen architectures enables us to try to give religious accounts of some building activities, ranging from the referential Masjid al-Nabī, to the present-day 'unorthodox' ethnographic contexts in Muslim territories—namely Gharb al-Andalus, in order to compare material culture and moral typologies. Whether in the Iberian or Arabian Peninsula, that which is credited as being "Islamic", is not necessarily Muslim. Melo da Rosa focuses specifically on what is *really* Islamic (and what is not) in earthen architecture.

Our survey of earthen architecture in Muslim cultures starts with West Africa and Mali. The Great Mosque of Dijinguere Ber in Timbuktu

12 They were at first social changes; see *Glassie, "Architects, Vernacular Traditions, and Society"* 17.

13 Lewcock, "Architects, Craftsmen and Builders: Materials and Techniques", 113; de Chazelles *et al.*, "La construction en *pisé* du Languedoc-Roussillon et de la Provence, du Moyen-Âge à l'époque moderne", 109–139.

14 Jaquin *et al.*, *Earth Building: History, Science and Conservation*.

15 See also Damluji *et al.*, *The Architecture of Yemen: From Yafi to Hadramut*, with a glossary of 1000 technical terms.

16 Grube, *Architecture of the Islamic World: Its History and Social Meaning*.

17 As an example of efforts by the Aga Khan Program for Islamic Architecture over the last twenty years, see Holod, *Toward an Architecture in the Spirit of Islam*.

recently underwent conservation as part of a project carried out by the Aga Khan Trust for Culture. In his study on the Great Mosque, Bertrand Poissonnier explains that excavations carried out during 2009 revealed an extraordinary succession of buildings, augmented over the course of seven centuries, comprising the largest earth set of buildings south of the Sahara. The architectural history of the Dijinguere Ber Mosque is complex, and reflects the continuous maintenance and repair work of such an earthen monument, which includes four main stages. With regard to the first stage, radiocarbon dating confirms an oral tradition that the Mosque was founded in 1327. The first building was remarkably well preserved to a height of 3.50m, by being buried underneath the sand of the current building. This earlier construction shows a moulded and coated earthen architecture, unparalleled in documentation from this period. It provides concrete evidence to demonstrate the earliest Sudanese architecture, and the first vaulted building in the Mali Empire. As part of the second stage, during the 15th century, there is evidence of enhancement on the previous building, using *banco* (raw, spherical bricks, mixed with limestone). The collapsed vaulted roof was replaced with a flat roof. In the third stage the creation of a huge building, during the 16th century, progress from a modest building to an impressive Great Mosque is evident. Finally, the fourth main stage, during the 18th century, showed evidence of rows of stone arches on top of the north and south walls, associated with a new *façade* with a *miḥrāb* opening onto a courtyard.

Sijilmasa, located in the oasis of Tafilalet, is a major archaeological site in Morocco. The city was a key trading point on the routes between sub-Saharan Africa and the *maghrib*. The city, which is often quoted in historical sources, flourished between the 8th century, when it was founded by a Berber dynasty and the 15th century, when it suffered a rapid decline. Since 2012, recent Franco-Moroccan excavations have begun to reveal the old fortifications and urban contexts. These first results showed the great variety of structures built of adobe and rammed earth reinforced with silt gravel or pebbles. Adobe is the traditional construction method of the Sahel area. It is remarkable that earlier architecture shows a much greater variability than modern architecture. It is the technological variability, rather than the typological and functional variability (foundations of walls, habitations within walls, fortifications and cisterns) that is most striking, and shows distinct differences in materials and construction methods and, consequently, different modes of conservation. These differences prompted François-Xavier Fauvelle and his team to characterise different ancient *pisés*, and to recognise chrono-cultural markers that are valid both locally and regionally.

In Morocco, the Draa Valley's vernacular architecture transports us back to the classical language of Mediterranean architecture, where models and styles are taken as useful idioms to understand symbolic spaces of heterogeneous communities like the Berbers. These models can be understood as a compendium of constructive and formal constructions. A sort of "Vitruvian treaty" passed on orally, visible on the palimpsest of physical territory and structured by elements, methods and the chronology of construction. These fortified houses (*tighremt*) are midway between conservation and dissolution. The *tighremt* have a very fragile architecture, made of rammed earth. They now face the threat from the weather and of abandonment. The paper of Marinella Arena and Paola Raffa attempts to verify, through objective data, the diffusion and conservation of the architecture of the *tighremt* in the Draa Valley. They have produced a comprehensive map showing the location of *tighremt* and *qṣūr* in the Draa Valley. They have been able to determine the relationship between territory, palm grove and *tighremt* with territorial sections. With sixteen examples, the survey carefully traces every detail of building, from how the position of the adobe bricks form symbolic decorations, to how the alignment and spacing of the construction holes reveal the measurement of the formworks

containing the rammed earth, and, consequently, the dimensions of the building. The aim of their study is to understand the architecture of the Draa Valley, and also to develop strategies for future works of conservation and development.

The *qṣar* is a type of human settlement found throughout the Sahara with many contemporary examples located in southern Morocco, southern Algeria, southern Tunisia, Libya, Mauritania and Mali. It is clear from an architectural model that this has the particular distinction of being widely spread at different periods, and of allowing similar construction methods and habitats adapted to the desert. The *qṣar* is generally built high on a rocky promontory near a *wādī*. The landscape on which it is built and its immediate environment (palm, erg, depression or rocky plateau) determine the building materials used, its overall shape and internal distribution of its spaces. The *qṣar* is a fortification system consisting of a wall flanked by towers and pierced with gates. It consists of a Great Mosque usually at the centre of the city (generally a Ḳaṣaba) as the palace for the local leader, a central patio, and sometimes a troglodyte habitat. It also has a market place (usually on the outskirts) demonstrating the function of the *qṣar* as a relay point on the routes of the trans-Saharan trade, and a regional trade and political centre reflecting social hierarchy in a territory. Twenty-six sites studied reveal the primacy of buildings built of local limestone with a local mortar, known as *timchent*. The mud brick adobe (*ṭūb*) is widely used in the habitat, fortification systems, and sometimes the Ḳaṣaba. From observations of the building materials and techniques of some *qṣūr* in southeast Algeria, Mounia Chekhab-Abudaya can highlight the importance of regional particularism linked to the environmental context of establishing such *qṣūr*.

In Egypt, recent archaeological excavations reveal new Fatimid and Ayyubid city walls. Some of these fortifications were built of limestone, others of mud bricks, and finally for the oldest, of rammed earth (*pisé*). It is not a simple diachronic succession of techniques and materials connected to a certain period. Excavations have shown that the reality was much more complex, and certainly reflected the diversity, of medieval Cairo's populations. Indeed, archaeologists have been able to prove that stone and earth were used for the same periods: earth was used to build the walls, and stone was reserved for the construction of the prestigious city gates. Based on the primary sources describing Fatimid society, Stéphane Pradines proposes a scheme of interpretation of architectural technologies. This interpretation is not based on natural resources, and not only according to the chronology, but according to the ethnicity of the different corps composing the Fatimid army. He was able to identify three groups at the origin of these technologies: the Berbers, the Nubians, and the Armenians. It is a revised history of the military architecture of Cairo between 969 and 1092 AD. This history emphasises the diversity of cultures and building materials in the Fatimid city.

Christian Darles' presentation of mud-brick architecture in the Ḥaḍramawt region of Yemen offers a unique source of cultural and technical knowledge. Architecture during the Quʿaiti and Khatiri Sultanates was a real asset in the local building sector and contributed to the national and Islamic sense of identity. Therefore, it was, until now, not only an ancient design, but also a valid 19th and 20th century architecture ideally suited to the local environment. Well-preserved cities of Shibām, Sayūn and Tarīm are representative of mud-brick architecture and are unique in two main aspects: complete city and quarters, planned and built over a period of more than 350 years, which still exist and are always inhabited. The same building techniques continue to be used throughout this period. Continued use of traditional materials means that the local building sector still relies on available, natural resources. This architecture is unique in the manner and degree to which the use of mud brick has been developed. These buildings may reach thirty metres and nine or ten storeys high. They incorporate complex features including vaults, domes, and others,

reflecting Western colonial and Neoclassical styles, all built in mud brick.

The 'Qatar Islamic Archaeology and Heritage Cooperative Project', a collaboration between the Qatar Museums and the University of Copenhagen carried out archaeological excavations at Al-Zubarah, Freiha and Ruweidah (all located near the shoreline of northwest Qatar), and its work has revealed both an intense use of locally-available building materials, including earth, soils and so-called beach rock, but also a need to import structural members such as timber. Moritz Kinzel focuses on findings from Al-Zubarah, Freiha, Ruweidah, and some other sites in the hinterland, to study the use of earth in different parts of the construction. Earth can be found as mortar and plaster material, as a kind of 'mud brick' in walls, as well as a roofing material. The use of materials differs quite considerably according to the role and function of the building members and the building itself within the settlement as well as from site to site, according to the availability of building materials. However, earth plays an important, often underestimated, role in all cases. The architectural remains in Qatar reveal a wide range of regional influences from both sides of the Gulf and how the different types of building traditions can coalesce to form 'local' traditions.

In Central Iran, the compatibility of adobe and clay with the arid climate has been the determining factor why these are the primary building materials of the region. Consequently, earthen architecture predominates as the vernacular construction technique for housing in villages, towns and major cities, and has served this purpose for centuries. Atri Hatef Naiemi examines the fortified residential compounds of Iran's Yazd province, which form a significant historical category within this type of architecture. Historically, these compounds served as desert settlements, offering protection against natural and human threats thanks to a complex network of walls, towers, and protected entrances. However, since the early 20th century they have been subjected to a gradual process of deterioration as evolving social conditions came to mean that living within walled compounds was no longer necessary or even economically logical. Accordingly, their inhabitants abandoned compounds and existing residential settlements that they had outgrown, thereby fractured their architectural integrity. Despite their outstanding historical and architectural values, we observe a great number of architectural remains going through their tragic process of destruction. Atri Hatef Naiemi focuses on these structures located around the fringes of the central desert of Iran, Dasht-e Kavir, and particularly the Yazd province. The research is two-pronged: firstly, it studies the large-scale that considers the distribution of enclosures in a broader geographic context and, secondly, the small-scale, which focuses on the key architectural elements of these structures. Identification of these complexes and examination of their physical and functional characteristics will achieve the main goal of this project: a preliminary typology of residential compounds in this Iranian province.

When considering developments of Islamic Architecture in Central Asia, the great Timurid tiled monuments of Transoxiana loom large in the mind's eye. Likewise, masterpieces of fired brick such as the so-called "Sāmānid Mausoleum" in Bukhara demonstrate the impressive decorative achievements of local building styles using solely unglazed materials. Monuments of unfired earthen architecture are comparatively less well known, in spite of the fact that throughout the history of Central Asia this has been the most widely used construction material. Paul Wordsworth examines the techniques of mud brick and rammed earth employed with the specific aim of creating monumental buildings. Decorative methods and architectural form were used together to produce a unique range of structures, which created a visible impact in the context of their specific surroundings. Owing to the small number of well-preserved examples, as well as the erosion that often obscures their original appearance, monumental

architecture in unfired clay has often been indiscriminately labelled as "defensive" or "military" in nature. By comparing archaeological and structural evidence, however, it is possible to detect a highly attuned architectural grammar. The resulting designs of these monuments thus played a pivotal role in the development of architecture in the eastern Islamic world. The selection of specifically local and recurring motifs, meanwhile, demonstrates key iconographic choices in the presentation of these buildings.

Adrienn Papp describes, through examples, remnants of Ottoman 'earthworks' discovered in Buda (1541–1686). Buda[pest], the capital of Hungary was the regional centre of a *vilayet* in the Ottoman Empire, and the city had a relevant connection with this cultural sphere for nearly 150 years (1541–1686), a time span during which the town has changed, creating a marked separation between the Christian medieval architecture and that of the subsequent Baroque Christian imperial city. In other words, these artefacts can be identified and dated accurately. Since its foundation in 1887, the Budapest History Museum has been engaged in urban history research, via the application of archaeological methods to focus on the occupation of Hungary by the Ottoman Empire as well. A substantial amount of written sources have proved helpful in the course of the research of this historic period; many of these describe the alteration of the Christian city. They also chronicle the crucial modification of the cityscape: the mediaeval stone palaces of the aristocrats disappeared and all of them were described as mud-plastered and neglected buildings. At the same time, the 17th century traveller, Evliyâ Çelebi, reports the city's beauty, and his descriptions depict a totally homey Ottoman city. The contradiction lays mainly in the different architectural nature of the two cultures that instantly strike the eye in the course of the archaeological excavations. Ottoman houses are timber-framed with mud brick walls and porches, rather than made of stone. The palace of the *pasha*s of Buda dating back to the 17th century might serve as the most typical example. The palace was altered from the most notable mediaeval aristocratic palace in Buda. However, a timber-framed palace with mud-brick walls and a porch was identified instead of just an edifice built of stone, which was the case up until then. This cannot be explained by the lack of stone materials or the wartime conditions; the reasons must be associated with cultural particularities.

Our survey of earthen architecture in Muslim contexts started with the Prophet, and the relationship between Islam and a particular kind of architecture. In our final chapter, Elizabeth Golden explores how building with earth in a contemporary city—situated in a region with a long and rich tradition of working with the material—could become an increasingly relevant solution for sustainable growth. While highlighting the significance of historic earthen architecture within contemporary Muslim cultures is essential, it is equally important to study how the craft traditions responsible for these buildings have changed, and must change, in order to remain relevant now and in the future. Over one million inhabitants live in Niger's capital, Niamey. Even as the pressures of modern development influencing Niamey's growth parallel those of other urban centres in West Africa, the city has yet to witness the same degree of expansion that is currently proliferating across the continent. Niger is a landlocked country with a limited amount of capital for building on the scale that is needed for its growing population. Most industrially produced building materials are imported into the country, which inevitability drives up the cost of construction, and limits the affordability of critical public infrastructure. Nevertheless, several sizeable projects are currently in their planning phase. Niamey is at a crossroads, and traditional ways of living and working are set to transform, along with the city's buildings and infrastructure. Housing will play an important role in Niamey's growth. Through the study of one housing project currently under construction, this article will reveal how building with earth

can be used to maintain cultural practices within a contemporary urban context. At the same time, Elizabeth Golden argues that the future of earthen construction in places such as Niger is contingent upon the evolution of traditional practices. Ways of engaging the material must be reconsidered in order to reflect the desires of contemporary society, conform to building codes, and provide an economic and durable alternative to industrially produced materials.

Finally, our book gives background and references for existing publications that are related (but normally restricted) to a contemporary architecture, or a specific field—whether in the crafts, social anthropology and archaeology. Most publications on earthen architecture are linked to conservation and or sustainable development.[18] There was no real attempt to situate medieval and modern earthen architectures in an historical process and to link them to Muslim cultures.

Earthen architecture in Muslim countries presents an amazing diversity and complexity. This kind of architecture deserves to be understood more clearly, especially within its Muslim context. Earthen architecture in Muslim cultures is not limited to the rural areas. This architecture was also monumental and prestigious with palaces, great mosques, and city walls. The functions of this architecture affect different ranges of social life. Earthen architecture can be domestic, religious, or military. Having examined the buildings' functions, it is the connection of the builders themselves to this kind of architecture that is important. Who were these builders? Where did they come from? It is possible to establish some links between certain types of earthen architecture and some populations, like for example, the Berbers, and the Nubians. These observations are a starting point to exploring regional patterns[19] and local technologies. These technologies remain confined within time and space, or they could expand outside of their original territory. It is therefore extremely interesting to explore the diffusion of earthen architectures in Africa, the Middle East, Central Asia and Europe.

Earthen architecture demonstrates the great variety of models in Muslim contexts and also demonstrates the impact of non-Muslim and pre-Islamic traditions. Earthen architecture is omnipresent in Muslim countries but most of these vernacular architectures are pre-Islamic. It is the reason why we prefer to speak of earthen architecture in Muslim cultures rather than Islamic earthen architecture.[20] One aim of our book is to demonstrate the historicity of earthen architecture in Muslim lands. Earthen architecture is not specific to the advent of Islam; this kind of architecture existed long before Islam.

Unfortunately, earthen monuments—which represent the past—are in danger.[21] They are in danger of being destroyed by modern constructions and urbanisation. They are in danger because nobody wants to live in them, with people preferring to live in modern concrete buildings.[22] Earthen houses are not maintained and, without conservation, fall into decay, as is the case in the Egyptian oasis of Kharga.[23] In emerging countries, in the Middle East, Africa and Asia, no attention is given to earthen architecture. Despite a worthy attempt by Hassan Fathy, even Egypt does not protect its earthen architecture, as is the case in

18 *Earthen Architecture in Today's World, Proceedings of the UNESCO International Colloquium on the Conservation of World Heritage Earthen Architecture.*

19 Petherbridge, "Vernacular Architecture: The House and Society", 176–192.

20 Petruccioli *et al.*, *Understanding Islamic Architecture*; Grube, *Architecture of the Islamic World: Its History and Social Meaning*.

21 Salam-Liebich, *Expressions of Islam in Buildings*.

22 Sevcenco, *Urban Housing.*

23 Author's observation, based on a ten years' survey in the Egyptian oases (2001–2012).

many oases like Siwa (for example). Earthen monuments are also in danger, because they represent different ideologies even within Islam, such as the famous Malian mausoleums of Gao and Timbuktu that were destroyed in 2012 as radical Islam refuses the "cult of saints".[24]

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24 Similar destruction was recorded in Tunisia as well. ISIS destroyed pre-Islamic monuments in Afghanistan, Syria and Iraq. See *Earthen Architecture in Today's World, Proceedings of the UNESCO International Colloquium on the Conservation of World Heritage Earthen Architecture*, 124–149.

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CHAPTER 1

Adobe as an Islamic Standard: Vernacular Cosmopolitics

Rolando Melo da Rosa

Qur'an Revelation and *Ḥadīth* Credibility

Despite all the questions about the revelation and inspiration of the Qur'an, "the permanent and perplexing binomial of Muslim philosophy, of the pure intellect—that answers to the immanent Qur'an and of the divine intellect, that answers to the Logos" rests on the "Uncreated Qur'an, from which derives, by revelation, the earthly Qur'an".[1]

Thus, the contrary assumption that is possible to construct the Qur'an is at odds with the eternal credit of its uncreated matrix and with its revelation learnt by heart,[2] as plainly stated by its own definition as a glorious recitation inscribed in a Preserved Tablet (Q 85:21-2), an archetypically celestial matrix—the Mother of the Book (Q 13:39)—that was written in Heaven by the Angels (Q 68:1-4).[3]

According to Hans Küng, however, "Muslims of the twenty-first century need not maintain the uncreatedness and therefore the perfection, infallibility and immutability of the seventy-eight thousand words of the Qur'an (and, indirectly, the words of the Sunnah of the Prophet and the Shariah)".[4]

The number of Muslims and non-Muslim specialists in Muslim studies that can agree with Küng may not be negligible, but if it is consensual that *Ḥadīth* can and should be disputed in terms of credibility, the matter of Qur'an is altogether different. The dividing lines between the revelation—historically unveiled and narrated through the Qur'an—and "what is regarded as Islamic law nowadays" result from the hybridization of references, building on centuries of juristic opinions.[5]

Ḥadīth can be emphasized to serve an anti-traditional orientation, a manifest peril since the outset of Islam, being the fabrication of reports to support this or that ruler or political leadership an age-old practice:

"*Ḥadīth* reports ('Tradition') form only a part of the actual Islamic tradition; that a stress on such reports may or may not indicate what is ordinarily called traditionalism in a man; that, in fact, a strict *ḥadīth*-mindedness, now as ever, may well imply an anti-traditional orientation in several respects."[6]

To take into account what we are debating, is of the essence. Each *ḥadīth* must be tested for credibility, i.e., for the strength of its connectivity in relation to Qur'anic and Prophetic standards. Striving to religiously[7] assess earthen architecture in Islamic terms, with an approach based on actor-network theory, one must test its eventual direct connection to Qur'anic and Prophetic standards, while following its actors and tracing them back, tracking down its trajectories.[8]

1 Gomes, *História da Filosofia Portuguesa,* 17.

2 Wadud, *Conspiracies against the Qur'an,* 98; Guellouz, *O Alcorão,* 102.

3 Lings, *Muhammad: His Life Based on the Earliest Sources,* 45.

4 Küng, *Islam: Past, Present, and Future,* 645.

5 Sardar, *Reading the Qur'an,* 287.

6 Hodgson, *The Venture of Islam,* 65.

7 Heeding Latour's advice, one must strive "to treat it [religion] on its own ground, so as not to speak 'of' religion but instead to speak 'in' a religious tone, or, using the adverbial form, religiously". Latour, "Will Non-Humans Be Saved?" 461.

8 Considered "the Qur'anic term most often used in connection with theft and murder"—*qisas*—and quoting with

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Our goal is to contribute to an understanding of "the role of the modifier 'Islamic' in framing the term 'Islamic architecture' at present",[9] recollecting an earthen frame of reference and checking its status *vis-à-vis* Al-Shāfiʿī's categorization of human actions (*wājib*, obligatory; *mandūb*, recommended but not obligatory; *mubāḥ*, indifferent but not obligatory; *makrūh*, disapproved but not forbidden; and *ḥarām*, prohibited)[10] and, in the process, mobilizing some of its non-human actors. This will be attempted by opening some black boxes[11] indexed to clay, namely regarding the Prophet's Mosque, whose actants would be tested in terms of their connectedness to the clay of Adam's creation in order to attain some effective religiously savvy concreteness:

"Concreteness does not come from choosing figuration over some other ones in the place of the actors, but from the increase, in the accounts, of *the relative share of mediators over intermediaries*."[12]

Islamic Architecture: The Raw and the Cooked

Although the exceptional quality of the land is directly indexed to the Creator in the Islamic tradition—one of the five human rights prescribed by Islam, as quoted by S.M. Ghazanfar, is the "right of ownership through labour",[13]—the recollection of man's usufructuary condition[14] differs among the believers; if not in frequency, then certainly in quality.[15]

Considering that "even if actants are separate from each other, it must be possible to link them through their *qualities*",[16] our task will consist of "drawing attention away from the irrelevant difference between what is constructed and what is not constructed, toward the crucial difference between what is well or badly constructed, well or badly composed".[17]

Vying to religiously assess earthen architecture, one attempts some "dislocation in the distribution of the sensible",[18] by drawing attention to the connection between Adam's clay, and the clay of the bricks of the Prophet's Mosque.

Religious Clay

There are three different Arabic words for clay—*ṭīn*, *ṣalṣāl* and *sijjīl*—as manifested in the context of the Qur'an.[19]

Al-ṭīn is the material used to bake the bricks mentioned in Q 28:38, wherein it is stated that the Pharaoh ordered Haman to kindle a fire to bake bricks out of clay, then build a tall building so that

respect to Abdel Haleem's commentary on his translation of Q 2:178, Ziauddin Sardar notes that the term has a wider meaning than the usual translation as 'retribution', "ranging from 'to pursue someone' to 'investigate by following one's footsteps'". Sardar, *Reading the Qur'an,* 257. It is precisely the aim of this paper to follow Islamic earthen architecture's footsteps with the traction of actor-network theory.

9 Rabbat, "What is Islamic Architecture Anyway?" 14.

10 Waldman, *Prophecy and Power: Muhammad and the Qur'an in the Light of Comparison,* 107.

11 "An intermediary can be taken not only as a black box, but also as a black box counting for one, even if it is internally made of many parts", being "what transports meaning or force without transformation: defining its inputs is enough to define its outputs". Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory,* 39.

12 Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory,* 61, emphasis in the original.

13 Ghazanfar, "Islamic Economics: Salient Features and a Critical Survey", 90n8; see also Mamede, *O Islão e o Direito Muçulmano,* 86.

14 Gheorghiu, *A Vida de Maomé,* 148.

15 Moving "from the role, from the essence, to an attribute, to a quality" (Campbell, *Getting to Know Waiwai: An Amazonian Ethnography*, 199) and considering that "God is far away insofar as His essence is concerned, but is near as far as His attributes are concerned" (Shahzad, "The Qur'an", 63).

16 Harman, *Prince of Networks: Bruno Latour and Metaphysics*, 47, emphasis in the original.

17 Latour, "Steps Toward the Writing of a Compositionist Manifesto", 474.

18 Highmore, *Ordinary Lives: Studies in the Everyday,* 47.

19 *Turāb*, usually translated as "dust", is also mentioned in Qur'an as the material of creation (3:59, 18:37, 22:5, 30:20, 35:11, 40:67).

he may climb up to Moses' God. In addition to the quoted aya, *al-ṭīn* is associated with "clay" in Q 3:49 and Q 5:110 in the context of one of Jesus' miracles, which was to make a bird out of clay, and give it life. Moreover, in Q 6:2, Q 23:12, Q 32:7 and Q 37:11, *al-ṭīn* is referred as the material of man's creation, although its attributes are difficult to translate. In Q 37:11, for instance, the clay in question is said to be *plastic, fermented, commingled with water,* or *sticky*.[20] *Al-ṭīn* is mentioned in Q 38:71 as the material of man's creation, as Allah refers it to the angels (symptomatically being the main reason evoked by Iblīs, which was created from the fire, as the motive not to bow down before Adam, an argument equally stated in Q 7:12, Q 17:61 and Q 38:76). Finally, *ṭīn* is mentioned in Q 51:33, as hard, like stone—*ḥijarat min ṭīn*—"stones of clay",[21] sent by Allah "for the wanton",[22] "marked for those who waste their substance"[23] (Q 51:34).

Ṣalṣāl, on the other hand, pertains exclusively to man's creation material, a dried and sounding clay formed from dark mud (Q 15:26). In Muhammad Asad's opinion, this definition "seems to contain an allusion to the power of articulate speech, which distinguishes man from all other animal species, as well as to the brittleness of his existence". In Q 15:33, *ṣalṣāl* is the clay that Iblīs reviles, while notably, in Q 55:14, it again defines the material of man's creation, a clay like pottery, earthenware.

Sijjīl, in turn, is akin to the baked clay (of the aforementioned stones) sent by Allah for the wanton (in Q 51:33 as *ḥijara min ṭīn*), referring in Q 15:74 and Q 11:82 to the punishment of Sodom. They were the stones that M. Asad rendered as "stone-hard blows of chastisement, pre-ordained" in his translation of the Qur'an, emphasizing its metaphorical character, while explaining that *sijjīl* means a "writing".[24] The materiality of said stones is more evidently endorsed in the edition of Abdel Haleem, who calls them "stones of baked clay", while Ahmed Ali's version reads "stones of hardened lava". Interestingly, the same expression—*ḥijara min sijjīl*—appears in Q 105:4, in the context of Allah's punishment of the "Army of the Elephant". However, while Asad keeps his interpretation, Haleem mentions "pellets of hard-baked clay", and Ahmed Ali considers them "stones of porphyritic lava".

All in all, *al-ṭīn* and *ṣalṣal* are earthen descriptors that generally point to the clay of man's creation; poignantly, Adam is the son of clay: *Ibn al-ṭīn*.[25] Nevertheless, *ṭīn* is also a descriptor of man's moulded clay, and is thus part of the lexical network of earthen architecture and its conceptual ontology,[26] with *ṭiyāna* being the art of working in or with *ṭīn* (particularly the art of plastering); *ṭayyān* a worker in or with *ṭīn*; and *maṭīn* a roof or flat house-top coated with *ṭīn*.[27]

Earthen Vernacular Architecture: The Prophet's Standard

The theory that the Prophet's mosque was initially only his private dwelling[28] has been questioned in recent years. In a recent doctoral thesis, Essam Abdelrahman holds that not being comparable to any other Arab house of the time, the sizable area of the structure "in itself implies that it was

20 Pertaining, respectively, to the translations of M. Pickthall, A. Ali, M. Asad, Y. Ali and A. Haleem, these last two opting for "sticky".

21 Pickthall, Y. Ali.

22 Pickthall.

23 A. Ali; in the rendering of Y. Ali, "for those who trespass beyond bounds". According to A. Haleem's translation, "marked by your Lord for those who exceed all bounds", and in the interpretation of M. Asad, "marked out in thy Sustainer's sight for (the punishment of) such as have wasted their own selves".

24 Some commentaries note that the clay in question was baked in Hell (*Sijjīn*). On the parallelism between *sijjīl*/*sijjīn*, see Lane, *Arabic-English Lexicon,* iv: 1311.

25 *Ibid.,* i: 263 and v: 1906.

26 Subscribing to Elias Muhanna's insight that meaning doesn't emerge exclusively from *difference*, but also from *similarity*. Muhanna *apud* Marks, "Words Dream of Being Flowers, Birds Dream of Language", 280.

27 Lane, *op. cit.,* v: 1906.

28 See, for instance, Grabar, *The Formation of Islamic Art,* 107–109; Hillenbrand, "The Mosque in the Medieval World", 35.

not a private dwelling".[29] Although the vernacular typology of the Prophet's Mosque is more or less well established, any conclusion to be drawn will largely depend on the quality in proximity to the translation one uses.

On the authority of Abū Salamah, a *ḥadīth* transmitted through Muslim about the Night of *Qadr* quotes the Prophet, as saying it should be looked for on an odd-numbered night among the last ten nights of Ramadan, something he perceived through a vision in which he saw himself "prostrating in water and mud": "I saw the Messenger of Allah prostrating in water and mud, until I saw the traces of mud [*āthār al-tīn*] on his forehead".[30] The explicit mention of a roof, made with palm branches, is particularly elucidative with respect to the vernacular architecture of the Prophet's Mosque; even more important to the scope of this paper are the "traces of mud", traces we intend to follow.

Considering as an exemplary standard the Prophet's Mosque at Medina—the second one, after Quba's, to be built *by* him—the *unbakedness* of its bricks would be lost in translation.[31] Because the word *brick* is also (or mostly) used to address the burnt one, it is often like a black box that one will attempt to open in order to review the controversy in question,[32] recalling that "in delegation (…) an action, long past, of an actor, long disappeared, is still active here, today".[33]

Actually, although Medina's vernacular building tradition in the Prophet's time was based on mud brick and stone,[34] all the recorded interventions since the inception of the Prophet's mosque in its bearing walls, and in said time span, occurred with recourse to *labin*, unbaked bricks. "According to tradition, the [walls of the] mosque of the Prophet was first built using a technique called *al-ṣāmit*. It was a *labinah*, 'one brick' above the other. As the Muslims increased in number, the Prophet rebuilt it using another technique, called *al-saʿīdah*. This made the thickness of the wall composed of one brick and a half. As the size of the congregation increased further, they asked the Prophet to enlarge it and he agreed. This time he built it in a way called *al-dhakar wa-l-unthā*, that is, making the thickness of the wall courses of two (pairs of) transverse bricks. They made the base courses (*asāsahū*) of stone to the height of three cubits. After this latter expansion, the mosque was a square 100 cubits per side".[35]

A different *ḥadīth* that tells of the building of the Prophet's mosque, states that "the Prophet himself started carrying unburnt bricks for its building and while doing so, he was saying: this load is better than the load of Khaibar, for it is more pious before Allah and purer and better rewardable".[36] Plain as it may be, the express singularity of the load of "unburnt bricks" eulogized by the Prophet is even more tellingly emphasized in a different narration, in which the Prophet compares himself to a *labina* in the metaphorical building context of the Prophethood.

29 Abdelrahman, *The Influence of Ḥadīth on the Architecture of Early Congregational Mosques,* 88.

30 Muslim iii, 263–264.

31 Lings and Gheorghiu's biographies of the Prophet mention the bricks of the Prophet's Mosque without further reference (Lings, *op. cit.,* 125; Gheorghiu, *op. cit.,* 182); also, some *Ḥadīth* that will be dealt with in the course of this paper.

32 Note the Biblical precedent. The book "Construire en Terre" by the Centre international de la construction en terre (CRAterre) quoted Exodus, Samuel 12:31, Judith 5:11, Isaiah 9:9, Ezekiel 4:1 and Nahoum 3:14 as exemplary Biblical references in terms of earthen architecture. Standard English translations (such as the King James Version) use *brick* or a similarly non-unequivocal unbaked referent (*tile*) to convey the same Hebrew word (*lebenah*), the *unbakedness* of which will be discussed with regard to its Arabic kin. See Doat, *Construire en Terre,* 109.

33 Latour, *Pandora's Hope: Essays on the Reality of Science Studies,* 189.

34 Abdelrahman, *op. cit.,* 105–106.

35 *Ibid*., 117.

36 al-Bukhārī v, 149–152.

The Prophet as a Brick: A Case for Adobe

In a *ḥadīth* narrated by Jābir b. ʿAbdullāh, and compiled by al-Bukhārī, the Prophet said the following: "My example and the example of the other Prophets is that of a man who has built a house completely and excellently, except for a place of one brick. When the people entered the house, they wondered at its beauty, and said: 'But for the place of this brick (how splendid the house will be)!' [So I am that brick—last (end) of all the Prophets]".[37]

Allowing us to assess the material culture that configured building standards sanctioned by the Prophetic tradition—and so morally sound—the question of what materials (origin, quality, name) were used should not be quickly dismissed as a minor one, for "even as textual entities, objects overflow their makers, intermediaries become mediators".[38]

Given that the Arabic *labina* is translated as "brick" in the aforementioned *ḥadīth,*[39] why isn't "adobe" more frequently used as the corresponding translation?

Ṭūb, although used as a synonym of *ājurr,* "fired brick", namely in Egypt,[40] "designates in the Muslim West, a lump of earth or an unfired brick, and it is furthermore in this latter sense preserved in Spanish in the form *adobe*".[41]

Whether in English or French, the word "adobe" (in the sense of unbaked, sun-dried brick), seems to have been imported from Portuguese and Spanish, in which it primarily fixated, due to their older and pronounced conviviality with the Arabic provenance of the term,[42] thus being universalized from the Muslim West's aftermath through the kingdoms of Portugal and Spain and their expansionist enterprises reaching English, the current *lingua franca*, in the raw sense in question.

If it is well established that the *labbān*, while a maker of "bricks and tiles"—of *labinah* (*bricklayer or brick and tile*)[43]—works exclusively with unbaked earth, *labina* is unmistakably an unbaked brick.[44]

Accordingly, the question of adobe's crudeness is, despite the Egyptian nuance, perfectly well established, namely in English, thanks in large part to the Iberian intermediaries. In the vernacular Portuguese context, *adobe* (or *adobo*) is undisputedly an unbaked brick. In Sabbagh's *Portuguese-Arabic Dictionary*, adobe is the unbaked brick (*tīn al-laban*), and two of the three

37 *Ibid.,* iv, 454; similarly narrated by Abu Hurayrah, cf. Muslim vi, 145.

G.T. Elmore says that "the original *ḥadīth* is perhaps based on *Psalms* 118: 22 and *Matt.* 21: 42 (*cf.* also *Eph.* 2: 19–22)". Elmore, *Islamic Sainthood in the Fullness of Time: Ibn Al-Arabi's Book of the Fabulous Gryphon*, 149. In neither of these passages of the Bible, in which Jesus quotes the Scriptures—"The stone which the builders rejected became the head of the corner" (Psalms and Matt.) and is named as the cornerstone himself (Eph.)—is the brick, the metaphor's referent. In Abdelrahman's opinion we will somehow try to reassess, "this *ḥadīth* shows not only the Prophet's awareness of building with *labin*, but also his appreciation of fine buildings", Abdelrahman, *op. cit.,* 203.

38 Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory,* 85.

39 In the Biblical precedents in respect to *labina*'s Hebrew counterpart, cf. n32. *Labina*'s thus a "contact term" (paraphrasing J. Clifford's "contact zone"). See Clifford, *Routes: Travel and Translation in the Late Twentieth Century,* 194–199.

40 Pellat, "Labin", 585; Lane, *op. cit.,* v:1888.

According to Agius, *ājurr*'s may have directly come from Persian *ājūr* 'burnt brick' borrowed from a Semitic origin (probably Aramaic), and can also mean 'floor' [or brick-floor]. Agius, *Arabic Literary Works as a Source for Documentation of Technical Terms of the Material Culture,* 190.

41 Pellat, *op. cit.,* 585.

42 Dethier, *Arquitecturas de terra: trunfos e potencialidades de um material de construção desconhecido,* 16; Oliver *et al.*, *Atlas of Vernacular Architecture of the World,* 25–26.

43 Ghibin, "The Role of the Muslim Institutions in Architectural Activity in Medieval Islam: The Case of Hisba and the Muhtasib", 8.

44 Lane, *op. cit.,* iv: 1430; v: 1898; vi: 2146; viii: 3007.

words indexed to brickmaker (*tijoleiro*)—*ballāṭ*, *ṭawwāb,* and *labbān*—are directly related to crude earth, *ṭawwab* and *labban* being the makers of adobe and *labin*, respectively.[45]

Even if we admit that comparison of believers to the bricks of a wall or house—"A faithful believer to a faithful believer is like the bricks of a wall, reinforcing each other"[46]—does not refer specifically to an adobe typology (which they do), it is beyond question that *labina* is the constructed unity of the referential mosque of the Prophet, in which case "adobe" is the best possible translation for *labina*.

Despite the fact that "adobe" seldom appears as a default English translation in the context of Islamic traditions pertaining to *labin*, such was not the case with the one that cites ʿAmmar b. Yasīr being praised by the Prophet in the context of carrying "the adobe of the mosque", for ʿAmmar carried two at a time while the other companions carried only one.[47]

Another translation of a *ḥadīth* that conveys "adobe" for the aforementioned *labin* while describing the Prophet's mosque architecture, and its succession through the first three caliphates is transmitted via al-Bukhārī, on the authority of ʿAbdullāh b. ʿUmar:

"In the lifetime of Allah's Messenger the (Prophet's) mosque was built of adobes, its roof of the leaves of date palms and its pillars of the trunks of date palms. Abū Bakr did not alter it. ʿUmar expanded it on the same pattern as it was in the lifetime of Allah's Messenger, by using adobes, leaves of date palms and changing the pillars into wooden ones. ʿUthmān changed it by expanding it to a great extent and built its walls with engraved stones and lime, and made its pillars of engraved stones and its roof of teak wood".[48]

Regardless of the significance for the community of the structures built by the Prophet, the adobe matrix of his mosque did not last very long. With the division his succession brought and despite (or thanks to) the relative stability of the *Rāshidūn* black box,[49] the first changes in the character of the referential mosque of Medina occurred.

The Prophet's Mosque and the First Caliphs: Placing Islam

After a strict observance of the material continuity in the constructed setting of the Prophet's Mosque under the first two caliphs, ʿUthmān's marked the first paradigm shift, namely replacing "adobe" for "engraved stone", and changing the wood used in the roof.

Though this process occurred amid open discontent, according to Maḥmūd b. Labīd's narration—"ʿUthmān b. ʿAffān wanted to rebuild the mosque, but the people objected to that, and wanted to leave it as it was"—it happened all the same. Moreover, it is ʿUthmān's answer to the claims of the people (as stated in the quoted *ḥadīth*, which became traditionally binding, notably through the Umayyad caliphate), paving the way to a different reading of the canonical architecture. He said: "I heard the Messenger of Allah say: 'Whoever builds a mosque for the sake of Allah, Allah will build something similar for him in Paradise'".[50] In Syed Ariffin's opinion, "the charm and rustic character of the Prophet's mosque, with its traditional-vernacular appearance, was then

45 Sabbagh, *Dicionário Português-Árabe*, 11; 446; *ballāṭ* refers to the ground surface and in the constructive sense means floor, paved with stones or baked bricks. See Lane, *op. cit.,* i, 249.

46 Narration by Abū Mūsā (al-Bukhārī i, 301). In Muslim, "The Messenger of Allah said: 'The believers are like a structure, parts of which support other parts'". Muslim vi, 450.

47 al-Bukhārī iv, 60. Guillaume's translation of Ibn Isḥāq's account, however, reads *bricks*. Gillaume, *The Life of Muhammad: A Translation of Isḥāq's Sīrat Rasūl Allāh*, 229.

48 al-Bukhārī, i, 285.

49 See, for instance, Madelung, *The Succession to Muhammad: A Study of the Early Caliphate,* 101–102.

50 Muslim, ii, 27.

transformed into a formal [building], and with a slightly grandiose expression".[51]

After ʿUthmān's rebuilding, the next shift in the Prophet's mosque was ordered by the sixth Umayyad caliph, al-Walīd (86–96/705–715); again, it was met with strong popular resistance, this time due to the order to pull down the houses of the Prophet's wives, so that their area should be incorporated into the mosque. In fact, Ibn ʿAṭaʾ al-Khurasānī (an eye-witness present when the letter of al-Walīd was recited, commanding the compartments to be merged into the mosque) said he had never seen more criers than that day, quoting Saʿīd b. al-Musayyab as saying: "I wish that they left it so that a comer would see what the Prophet was contented with in his life. It should have been a reminder for people not to boast and extravagate".[52] Surely the general mood for continuity was appeased with a reported keenness "to place any new structure in the same position as its predecessor"[53] dating back to ʿUthmān. Even though place was clearly consecrated,[54] and despite the operated architectonical shift, the original typology and materiality were not completely devoid of religious relevance. In effect, ʿUmar b. ʿAbd al-ʿAzīz, the eighth Umayyad caliph (99–101/717–719), while pulling down the mosque of the Prophet to rebuild it, "is said to have taken the *labin*, 'brick', of the old mosque, which was built by ʿUthmān, and those of the rooms of the wives of the Prophet, which were built by the Prophet, and reused them to build his own house at Harrah".[55]

Subsequently, during the restoration works of the Mamluk sultan Qāytbāy in 879/1474 and according to al-Samhūdī, as quoted by Abdelrahman, numerous antique bricks of two different sizes were taken out from the walls of the houses of the Prophet, possibly some of the adobes used in the time of the Prophet, "as they were fitted in a later wall made wholly of kiln-baked bricks, and they were kept there to invoke benedictions".[56]

Notwithstanding the ephemeral quality of the adobes of the Prophet's Mosque—and of his wives' abodes—alleged to defend the thesis of the unavoidability of rebuilding the Prophet's Mosque with different materials,[57] their relevance were systematically recognized, even by the rulers that enforced the above-mentioned architectonical shifts amid considerable *vernacular* discontent. What about today?

The Prophet's Mosque in the Present Age: Matters of Relatedness

Land, property, labour, and value are explicitly related in the Qurʾan and the *Ḥadīth*, frequently and notably at odds with 'modern-state' postulates, even or particularly if "Islamic".[58] Dubai's Burj Khalifa, the world's greatest obelisk (inaugurated

51 Ariffin, *Architectural Conservation in Islam: Case Study of the Prophet's Mosque*, 74.

52 Abdelrahman, *op. cit.,* 296–297.

53 *Ibid.,* 105.

54 See, for instance, Muranyi's description of the evolution of a spot "from a picnic place used by the Prophet to a celebrated place", where a mosque might have been built later, "probably by Abū Bakr". Muranyi, "The Emergence of Holy Places in Early Islam: On the Prophet's Track", 167.

55 Abdelrahman, *op. cit.,* 281–283.

56 *Ibid.,* 123. The material connection between benedictions and sound earthen architecture in a contemporary Muslim setting is eloquently featured in Marchand's account of a Djenné mason explaining that "it was acceptable to recycle mud bricks taken from properties where benedictions had been made by known masons, but it was risky to borrow materials from unfamiliar sites" for "abandoned houses often harbour evil spirits and *djinn* and it is highly possible that they will travel with the materials and defile the new building". Marchand, *The Masons of Djenné,* 110–111.

57 Abdelrahman, *op. cit.,* 137.

58 Although property controversies in Islam naturally predate modern times, being an "interpretation of the Qurʾān rather than acceptance of its rule" already patent in the days of Uthmān, whose "attempt to reconvert the communal land into crown property was a major step towards turning the caliphate into a traditional kingship". See Madelung, *The Succession to Muhammad: A Study of the Early Caliphate*, 85, 275.

in 2010) is a case in point, as it appears to replicate and update, symbolically and materially, the previously mentioned Pharaonic challenge quoted by the Qur'an (Q 28:38).

However, Dubai's Pharaonic tower is not a singular case in the context of the Arabian Peninsula, whose architecture (namely regarding the Prophet's Mosque and *al-Masjid al-Ḥarām*) has experienced successive expansions in area, height, and material culture. As of 1951, King Abdul Aziz b. Saud ordered a threefold expansion in comparison with the existent structure, an expansion that set the precedent of using concrete,[59] and would be furthered by his son Fahd. In describing King Fahd's expansion (1985–1994), and in striking contrast to the Prophet's localized adobe-moulding pattern, Fouad Al-Farsy states that "the land designated for the expansion of the Prophet's Mosque, even when cleared, was far from ideal and it was necessary to pile-drive some 8,500 steel-encased stakes into the ground down to the bedrock".[60]

Nowadays, the Prophet's mosque is undergoing yet another expansion under Saudi aegis, announced in 2012 as requiring some $6.6 billion in compensation alone for expropriation of land.[61]

Notably, among the buildings to be razed for the expansion work, as reported by Sami Al-Maghamsi in October 2014, quoting Muhammad Al-Amin Al-Khatri (of the Saudi Ministry of Islamic Affairs and Endowments) were 126 mosques;[62] a report published by *The Independent* 1 September 2014, cites Irfan al-Alawi (director of the Islamic Heritage Research Foundation) stating that "the consultation document for the al-Nabawi mosque in Medina (…) calls for the destruction of the rooms surrounding the [Prophet's] tomb", implying the removal of the Green Dome and "the ultimate removal of the Prophet's body to a nearby cemetery".[63]

Located just beside the *al-Masjid al-Ḥarām,* next to the existing Mecca Royal Clock Tower rising 607 meters above ground (second among the world's tallest completed buildings, just after Burj Khalifa),[64] the material network of the current expansion of the Prophet's Mosque will presumably be closer to the *pharaonic* amounts of concrete, high tensile steel, and gold[65] mosaic of the Royal Tower than to the Prophet's vernacular standard. This alone can and should be questioned regarding Q 8:34, the Kingdom's *fundamentalist* credentials and *modernity*, "for in modifying the scale and rhythm, the timings and the systems, increasing

59 Ariffin, *op. cit.*, 147.

60 http://www.kingfahdbinabdulaziz.com accessed 23 May 2015.

61 http://www.arabiangazette.com/saudi-king-medina-mosque-project/ accessed 23 May 2015.

62 http://english.alarabiya.net/en/News/middle-east/2014/10/13/126-mosques-to-be-razed-in-Saudi-Arabia-for-Madinah-mosque-expansion.html accessed 26 May 2015.

63 http://www.independent.co.uk/news/world/middle-east/saudis-risk-new-muslim-division-with-proposal-to-move-mohameds-tomb-9705120.html accessed 26 May 2015.

64 Let alone Abraj Kudai's mega-hotel, situated only 2.2 km south of the *al-Masjid al-Ḥarām* and scheduled to open in 2017, or indeed the Kingdom City development in Jeddah, under construction since April 2014, whose first construction phase—the Kingdom Tower—is expected to became "the world's highest observatory", at over 1,000 meters, "at least 173 meters taller than Burj Khalifa", according to a press release issued by Adrian Smith+Gordon Gill Architecture. A portent of the Hour? See the *Ḥadīth* of Gabriel, which quotes the Prophet stating that one of the portents of the Hour is "when the shepherds of black camels start boasting and competing with others in the construction of higher buildings". al-Bukhārī i, 81–82.

65 While the use of gold to adorn mosques is an acknowledged moot point in Islamic jurisprudence, it is interesting to recall a tradition that tells of Juraij, a pious man who was frequently absorbed in prayer in his hermitage, when wrongly accused, after exposing the truth to his accusers who came to him with "axes and shovels", declined their offer to rebuild with gold and silver what they had destroyed of his hermitage: "No, just put it back as it was, with clay". Muslim vi, 416–417.

the administration, it perhaps affected the ways of practicing the faith".[66]

Concluding Remarks

Considering earthen architecture, the respect and recognition of the raw-material character, and its convivial quality in building have to do with architectonical typologies as well as the issues of property and heritage. Therefore, the attempt to deal with the vernacular technologies and performance of contemporary earthen architecture will necessarily evince tangible economies and building morals. However, unless we confer upon the "Islamic" label a secularized and historically-contextualized categorical imperative, what would constitute Muslim architecture?

Regardless of whether we consider the Iberian or the Arabian Peninsula, what is deemed to be "Islamic" art or architecture, past or present, is not necessarily Muslim but bespeaks the need for qualitative comparison to the revealed standard, and the perfected practice, of religion. If to discuss their earthen-vernacular-traditional architecture is to debate a legacy, the "everyday" should then be the privileged *locus* in which to look for continuities, and sound *praxis*.

While not explicitly recommending earthen architecture, the Qurʾanic emphasis on the *clayness* of Adam and the *unbaked* connection between one of its descriptors and the Prophet's adobes may well be a powerful argument for vernacular architecture.

Accordingly, the Prophet's building standard epitomized vernacular architecture's definition as a "historical experience of inter-generational cooperation—learning over time what works, and passing this on by tradition and apprenticeship".[67] Recollecting al-Shāfiʿī's categorization of human actions,[68] could vernacular architecture be less than *mandūb*, being recommended but not obligatory?

Religiously following the adobes of the Prophet's mosque through the ages is akin to dealing with the trajectories of the building standard sanctioned by the Prophet as an acknowledged follower of only what was revealed to him (Q 6:50) and, from their localized making to its present *concrete* envelopment, Islam's very fabric.

Clay's connectivity—from man's creation of to man's building with—and the vernacular character of the Prophet's standard mosque can thus enable a religious reassessment of current Islamic architectonical performances, for the vernacular is indeed "much more than a style; it is a code of good manners".[69]

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66 Hammoudi, *A Season in Mecca: Narrative of a Pilgrimage,* 224.

67 Mitcham, "Thinking Re-Vernacular Building", 34.

68 Waldman, *Prophecy and Power: Muhammad and the Qur'an in the Light of Comparison,* 107.

69 Rudofsky, *The Prodigious Builders: Notes Towards a Natural History of Architecture with Special Regard to Those Species that are Traditionally Neglected or Downright Ignored,* 229.

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CHAPTER 2

The Great Mosque of Timbuktu: Seven Centuries of Earthen Architecture

Bertrand Poissonnier

The Great Mosque of Timbuktu was recently restored by AKTC (Aga Khan Trust for Culture) (fig. 2.1).[1] The restoration revealed several outstanding architectural remains that are very well preserved as a consequence of being deeply buried. A series of archaeological trenches dug at the end of 2009 showed remains spanning seven centuries, leading us to better understand what is often said to be the biggest and oldest visible earth construction in sub-Saharan Africa.

Hitherto, virtually no archaeological excavation has been undertaken in the town of Timbuktu. During 1996, T. Insoll made a survey, during which he found a Chinese celadon shard and a piece of glass bracelet on the *azalai* west of the Djingarey Ber mosque.[2] The author compares the bracelet to similar items in Quseir al-Qadim (Egypt) dated to the 14th century AD, and celadon from the end of the 11th or the beginning of the 12th century AD; however, as far as we judge from the published picture,[3] such a precise date seems uncertain, and could be as well a bit more recent. In 1998, the same archaeologist also opened five trenches of 2 × 2 m in town, but they yielded only a few recent artefacts, from the 18th century onwards.[4]

The Written Sources

The Great Mosque has been depicted several times since the Middle Ages, especially in the local chronicles, notably *Tarikh Es-Sudān*,[5] *Tarikh el-Fettach*[6] and *Tedzkiret en-nisiān fi akhbar moluk es-Sudān*.[7] Thus, a date for foundation of the mosque is clearly indicated: "El-Haj Musa [King of Melli] had built the great mosque returning from pilgrimage to Mecca, when he seized Timbuktu".[8] This is supported by the *Tarikh el-Fettach*: "[Kanka Musa] during his pilgrimage […] built the great Mosque of Timbuktu […]".[9]

Barth reported an inscription located above the principal door of the mosque, indicating that Mansa Musa, king of Melle, built it.[10] But the same author noted as well that this inscription was "somewhat illegible", and one can therefore assume that his "decryption" was more or less "helped" by tradition. This inscription however was not found during the recent restoration works. The principal door, in the 19th century at least, was certainly the one located farthest north of the eastern wall, much larger than the others. Eventually, one can see this feature by looking at the

1 In cooperation with the Malian *Direction Nationale du patrimoine Culturel* and the Muslim Community of Djingarey Ber.

2 Insoll, "Archaeological Research in Timbuktu, Mali", 415.

3 *Ibid.* 416.

4 Insoll, "The Archaeology of Post Medieval Timbuktu".

5 Es-Sa'dī, *Tarikh es-Sudan*.

6 Kâti, *Tarikh el-Fettach*.

7 Es-Sudān, *Tedzkiret en-nisiān*.

8 Es-Sa'dī, *Tarikh es-Sudan,* 91–92.

9 Kâti, *op. Cit.,* 95–96.

10 Barth, *Travels and Discoveries in North and Central Africa: Being a Journal of an Expedition Undertaken under the Auspices of H.B.M.'s Government In the Years, 1949–1855,* 323.

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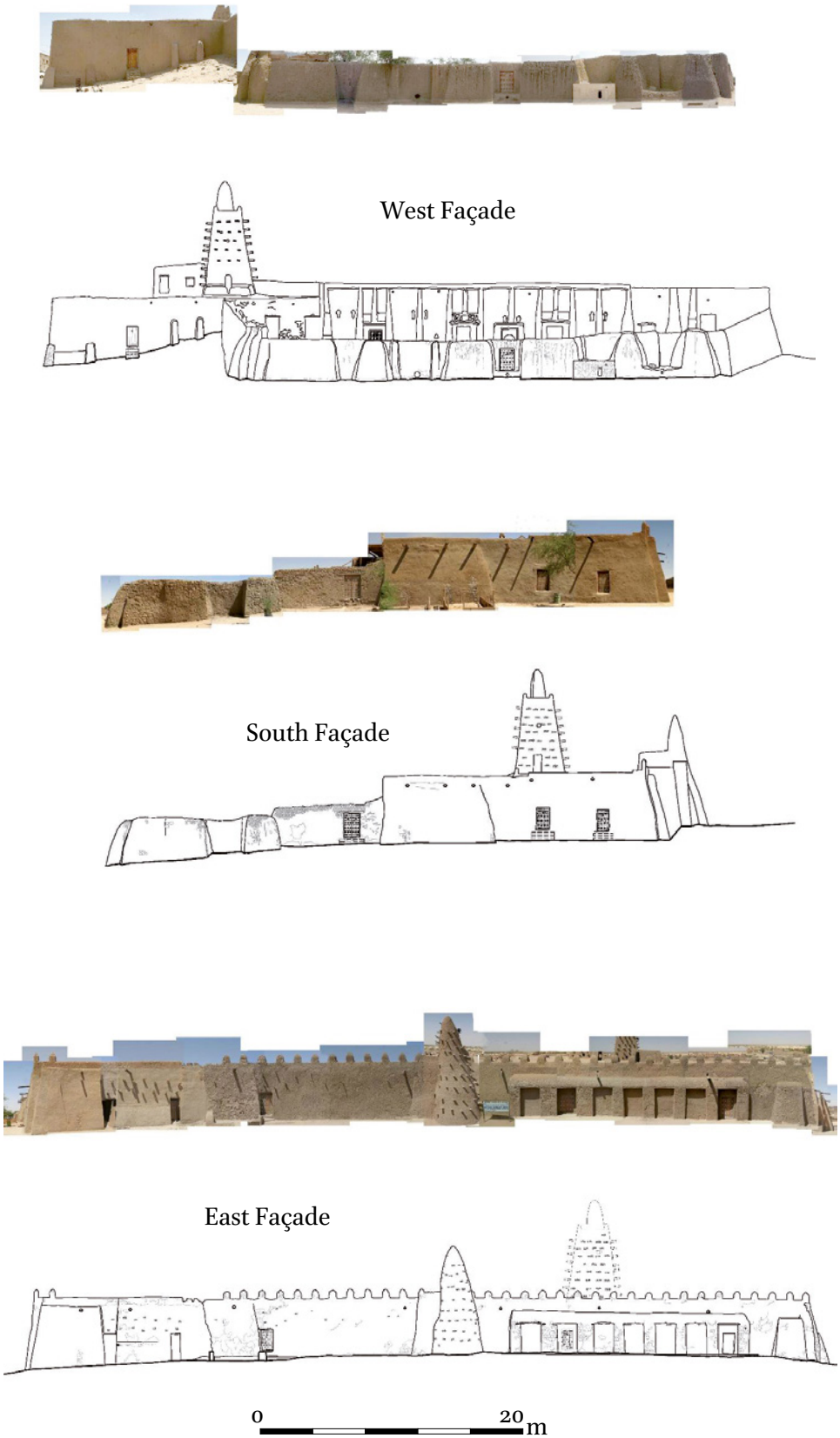

FIGURE 2.1 *Façades of the Great Mosque after restoration, 2007*
SURVEYED AND DRAWN BY LARA ISKANDER AND NEVILLE GEORGE, AKTC.

drawings left by Caillié in 1830:[11] "There is another version of this inscription: the mosque … was built during the reign of Mansa Musa, not by a great master of Granada (in the words of Leo Africanus), but by an architect from Marrakech named Ishaq-Essahily, as attested by the inscription above the front door".[12]

When Ibn Battuta went to Timbuktu, in 1353, he did not say a word about the mosque supposedly built 25 years before.[13] However, he said that Es-Saheli's grave was visible in Timbuktu[14] not withstanding that Ibn Khaldūn précised that his family settled in Walata.[15] When the present author arrived on the spot in 2009, it was said that this tomb was to be found in the minaret of the mosque of Djingarey Ber, but no registration was however visible.

No medieval architectural descriptions of this first mosque are available. However, Ibn Khaldūn described in 1382 a courtroom built by the famous architect under Mansa Musa, in his hometown of Malli.[16] The king wanted "a solidly built room and covered with plaster; because such buildings were still unknown in his country. Abu Ishaq-et-Toueidjen […] built a square room with a dome upon it. In this building, he showed genius. Once coated with plaster and decorated with arabesques in brilliant colours, he made it an admirable monument. As architecture was unknown in this country, the Sultan was delighted, and gave Toueidjen twelve thousand mithcals of gold dust […]".

At the very end of the 15th century, Hassan Al-Wazzan, who became Leo Africanus, came to Timbuktu. He later wrote that "there is a stone and lime temple divided by a great master of Granada and similarly a sumptuous palace […]".[17]

We know the 16th century via both *Tarikh al-Sudan* and *Tarikh al-Fettach*. It is learned that "it was the *seyyid* Abul Qasem" [died 935 (1528–1529)][18] "who created around the mosque the current cemetery" [that affects the mosque outside at the south side and at the west side],[19] "which replaced the former where space was lacking. He had it surrounded by a wall, but the wall was later demolished and there remained no trace".[20] "It was on his return from the pilgrimage that El-ʿAqib began the construction of the Great Mosque".[21] Specifically, "by the end of [the year 976], the *qadi* El-ʿAqib restored the mosque of Mohammed-Naddi and handed it in perfect condition." The work was completed during the month of *Safar* of the year 977 [16 July-14 August 1569]. "It was then that they began to bring bricks for the reconstruction of the great mosque; this work was inaugurated on the 15th of *Redjeb*" [24 December 1569]. "Demolition of the old walls was completed Sunday, 15 of the month of *dzul'hiddja* [21 May 1570] and the work of rebuilding began on Tuesday, 17 of the same month [23 May]. On his return [campaign against the Arabs], Askia Daud passed through Timbuktu and encamped in this city on the square that is behind the mosque […]. Since the construction of the mosque was not ended in time, the prince told the *qadi*: 'I will be in charge of all that remains to do, that will be my lot in participation in this pious work'. Then he gave everything he had on him that day, and immediately returned to Kàgho, he sent four thousand beams made from the tree called *kankao*. Construction of the mosque was completed that year".[22]

11 Caillié, *Journal d'un voyage à Tembouctou, et à Jenné, dans l'Afrique central.*

12 Schefer in Leon Africanus, *Description de l'Afrique,* III, 293 (quoted by Mauny, "Notes d'archéologie sur Tombouctou", 901, note 2).

13 Ibn Battùta, *Voyages,* III, 432–433.

14 *Ibid.,* III, 432.

15 Ibn Khaldūn, *Histoire des Berbères,* 112.

16 *Ibid.,* 113.

17 Quoted by Mauny, "Notes d'archéologie sur Tombouctou", 902, who recalls that Ibn Battuta calls precisely Es- Saheli *el-Gharnati*.

18 See Es-Sa'dī, *Tarikh es-Sudan,* 96.

19 *Ibid.,* 91.

20 *Ibid.,* 94.

21 Kâti, *op. Cit.,* 222.

22 Es-Sa'dī, *op. Cit.,* 177–179.

We know the seventeenth and eighteenth centuries through the *Tedzkiret en-nisiān fi Akhbar moluk es-Sudān* whose author (born during 1700) completed the writings in 1751.[23] Thus, we learn that "on Sunday 18 of the month of *djomada* 1089 [7 August 1678, that is to say in full rainy season], the minaret of the Mosque of Sankore collapsed and one entire side of the mosque was also destroyed".[24] It seems that the restoration works were delayed, since it was only 30 years later that "the clay necessary for the construction of the Great Mosque was brought. The building started at the end of the month of Muharram, the first month of the year 1121 [12 April 1709], ended the month of Safar [April 12-May 11]. The *pasha* Mohammed witnessed completion of the monument [...]".[25] "During the first month of 1149 [25 May 1736], one began to dig the foundations of the Great Mosque on the west side, behind the tomb of Sayyid Abu'l-Qasem And-Touati. This work started at the time of the flood of the river".[26] Perhaps to benefit from the proximity of the waterway to route waterborne materials? In any case, the work was completed 18 June 1736.

Remarkably, the 1828 narrative of R. Caillié—who managed to get into the building—documents the situation during the early nineteenth century.[27] We must immediately report that it is fairly common for this author to be mistaken in the cardinal directions. Although he was equipped with a compass, he couldn't use it in the open for he feared to "pass for a sorcerer". So when P. Viguier has recently tried to give back the route taken by R. Caillié through its Malian part, he highlighted frequent errors,[28] largely related to the material difficulties for him to take notes, which were eventually taken down in secret afterwards.

External walls, 15 feet high with a thickness of 25 to 26 inches, were provided with buttresses. They had either walk-in doors [two and five northeast], or were equipped with four steps to get into the building [south]. According to Barth who arrived in Timbuktu during 1853, giving only a few comments on the mosque which he could not penetrate, Caillié was mistaken: there were seven gates to the east instead of five today.[29] Northwest, Caillié did not report additional doors currently visible, but pointed out that the western part was in ruins. Moreover, there is some ambiguity with regard to the sector: he indicates that the *façade* of the western part was in ruins, a very old building made of dried bricks, with vaulted arcades with an entirely detached plaster. It seems it did not concern the external facade, but one that now overlooks the west courtyard, east of it. Immediately behind that *façade* (if true) Caillié described another "very old" part, with three galleries of ten arcades (ten feet tall), with a whitish coating, of 39 paces (currently 32.50 m on average, resulting in a mean value of 0.84 m for a pace of... René Caillié). According to our analysis, this part was not so old; he was probably misled about a recent repair of other sectors (at least a full surfacing), excluding that of the west.

The interior of the mosque in the eastern part had six galleries, with 19 pillars on the west side. One deduces that after 1828, some filler of the intermediate space joined the two most southern pillars of western row, observed during recent restoration work. The openings were 10 or 11 feet high. The work was "less careful than in the western part". Of the east, rows were two-and-a-half paces wide (currently 1.85 m to 2.35 m, which would make an average value of 2.10 m with the Caillié's pace previously estimated at 0.84 m). The problem is that these rows were said to have measured 104 paces long (c. 87 m). But now, even by integrating

23 Es-Sudān, *Tedzkiret en-nisiān*.

24 *Ibid.,* 57–58.

25 *Ibid.,* 16.

26 *Ibid.,* 158.

27 Caillé, *Journal d'un voyage à Tembouctou, et à Jenné, dans l'Afrique central.*

28 Viguié, *Sur les traces de René Caillié.*

29 Barth, *Travels and Discoveries in North and Central Africa: Being a Journal of an Expedition Undertaken under the Auspices of H.B.M.'s Government In the Years, 1949–1855.*

their extension to the north, beyond the arched doorways, one hardly gets a maximum of 68 m, corresponding to a pace of about 0.65 m. Barth criticized this measure of 104 paces.[30] He took measurements from an informant who did not use the same as Caillié (i.e. the internal dimensions), but the maximum dimensions of the building which gave him eventually a length of 262 French feet or c. 85 m (72 m today) for a width of 194 feet (or c. 63 m) (50 m today). These different numbers leaves the current reader puzzled.

The next three rows (west) measured 64 paces (45 m at present, which would still give another value to Caillié's pace: 0.70 m). Inside the eastern sector, he described the mihrab and the minbar, which look similar today. He noted applied decorations made of yellow earth (some already used) which started at one foot and a half from the ground, a detail which gives us valuable information about the ground level of the mosque in 1828, significantly higher than observed during 2009.

To the north, the courtyard (currently having a trapezoidal shape) was closed to the west by the ruins. The minaret is depicted as a large square tower ending with a small, truncated pyramid made of mud-bricks and topped with a terracotta pot. Its height was 50 to 55 feet. The interior staircase contained at least 32 steps, and was in poor condition. The exterior of the mosque on the eastern side is described, but is erroneously to the west side. He thus indicated the external location of the *mihrab* as a massive "conical" tower, on the "west" facade, about 30 feet high, with wood protruding outwards.

Barth reported this location to be erroneous, but he does not seem to have noticed any other errors.[31] Indeed, Caillié indicated that a *west* facade wall with a jagged summit with niches topped by terracotta pots similar to that of the tower. Judging by the drawings he gave, it certainly was the *eastern* facade, and as before, he did comment that the west facade was in ruins (therefore probably without his eventual coronation).

After Barth, the Austrian O. Lenz was the first European to stay in Timbuktu during 1880.[32] He could not enter the mosque either, merely copying Barth's description (without specifying), in noting that "the main part [...] contains nine ships of different sizes and diverse architecture; the western half, with three naves, is the oldest and probably dates from the time of Mansa Musa, king of Mellé, as can be deduced from barely visible inscription. Length of the building is 262 feet and width of 194".[33]

A Pile of Mosques

In the course of restoration work during 2009, G. Bicheron and J. D'Ilario, assisted by C. Vergara, unearthed exceptional architectural remains, which are both well preserved and deeply buried. These led the present author to intervene on site between 3 and 22 October 2009, in order to complete the archaeological study. We recorded a total of 13 trenches that have enabled us to reconstruct the dynamic history of the site from the early 14th century onwards (fig. 2.2).

The architectural history of the mosque of Djingarey Ber is complex, reflecting (in addition to the constant work of maintenance and repair of such earthen architecture) several steps. Among these, we isolated four stages (stages 1–4).

Stage 1: The Mosque in 1330

Five, deeply buried pillars show a remarkably smooth earth coating, bearing Arabic inscriptions, including verses from the Qur'an. We are clearly in a mosque, even if we do not know the full plan (fig. 2.3). The demolition level of this stage, evident in Trench 10, contained many branches from the

30 *Ibid.,* 323.

31 *Ibid.,* 323.

32 Lenz, *Timbouctou: Voyage au Maroc, au Sahara et au Soudan.*

33 *Ibid.,* 151–152.

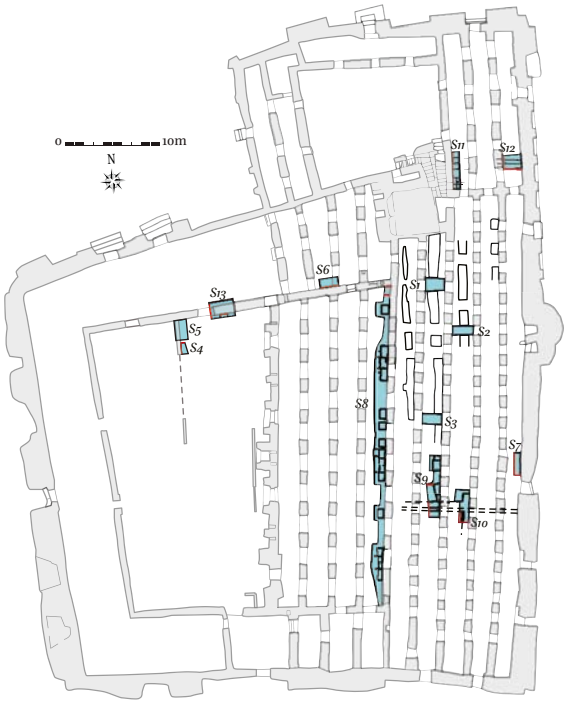

FIGURE 2.2 *Timbuktu, the Great Mosque. Location of the archaeological trenches (scale: 1/800)*
CREDITS: POISSONNIER.

collapsed roof of the building, embedded in sandy sediment with a lot of *banco* pieces.

The fact that the sides of the pillars facing north are more carefully made and shaped may imply a privileged access on the north side, which is actually the direction of current (and likely old) downtown area. The first floor related to this step was found at a height of –5.35 m in Trench 1, and –5.55 m in Trenches 2 and 3 (fig. 2.4). A very important sand invasion, materialized by multiple sedimentary strata, has led later to a building raising.

A piece of wood from the sandy layer immediately above the deeper and first floor (–5.97 m), corresponding to the earliest attendance of the mosque, yielded a radiocarbon dating (Beta-280829): 510 ± 40 BP, with two separate intervals of Cal AD 1330 to 1340, and Cal AD 1400 to 1450 (95% probability). This incredible result offers an unexpected accuracy, because only the first interval fits the recorded data. The significance of occupation layers before Stage 2, and the rebuilding of the mosque dated from the end of 15th century

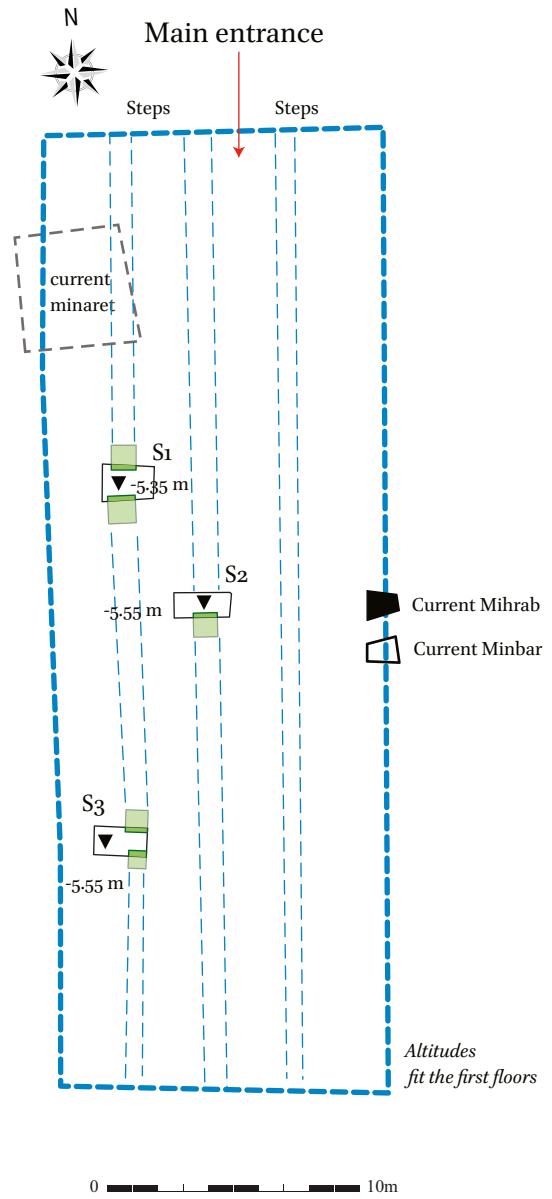

FIGURE 2.3 *The Great Mosque, stage 1 (scale 1/300)*
CREDITS: POISSONNIER.

to the early 16th century (as we'll see soon) make any second dating interval unlikely. According to posterior documents, construction of the mosque happened soon after Mansa Musa's return from pilgrimage to Mecca during 1325; the radiocarbon confirms that date.

If the current *mihrab*, attested for stage 3, was already at the same place from the beginning, then

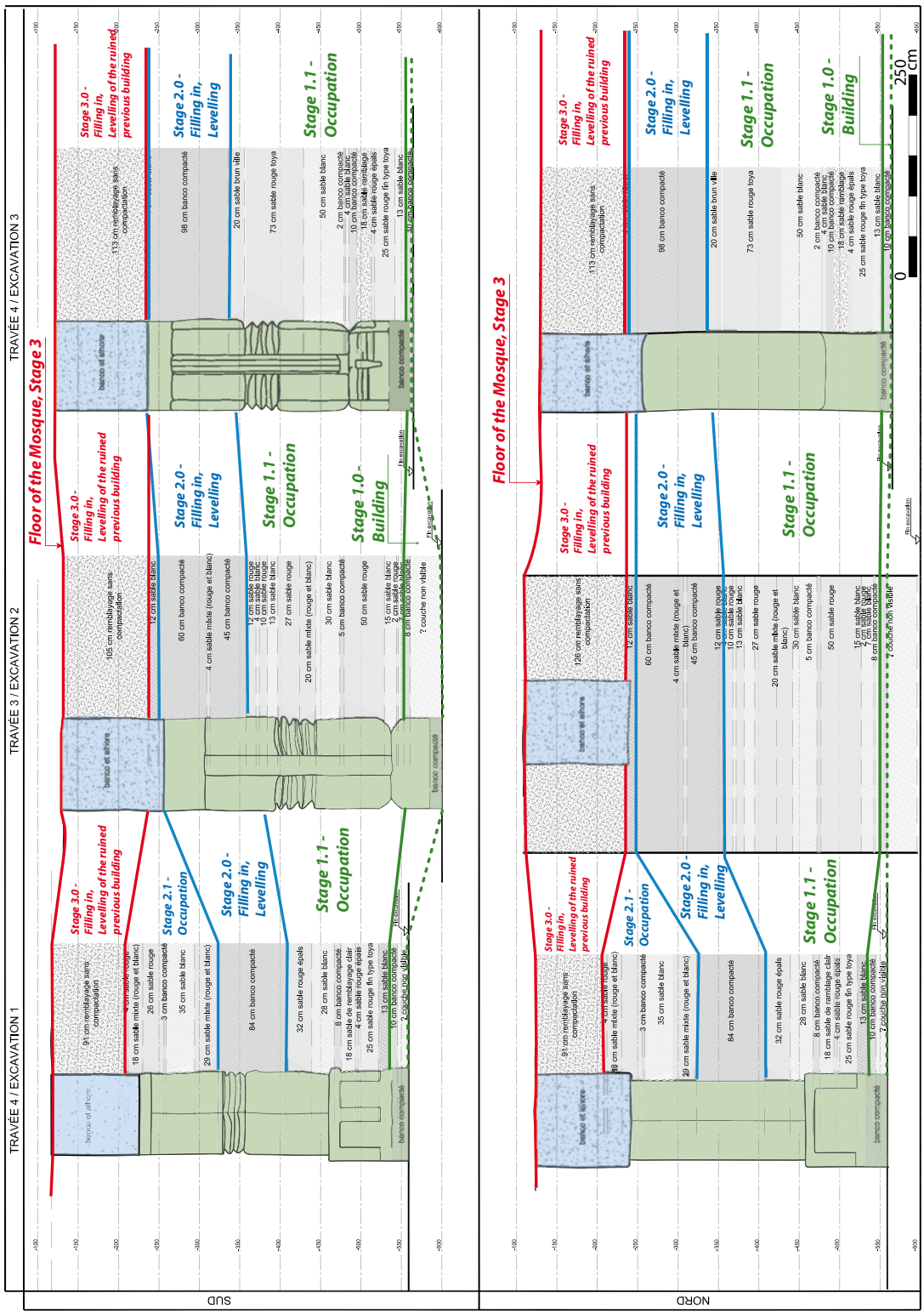

FIGURE 2.4 *The Great Mosque, synthesis of the stratigraphy from trenches 1 to 3*
CREDITS: POISSONNIER.

we obtain an elongated rectangular plan with four bays, *a priori* more or less centred on the *mihrab*, orientated north-south, measuring approximately 38 m by 13.50 m. The presence of a minaret at that time is very doubtful. A tradition, quoted above, says that it covers Es-Saheli's grave. Without mentioning this, L. Prussin considered as well the fact that this minaret was built on top of a tomb or mausoleum.[34]

The proposed plan (fig. 2.3) is close to that of another medieval mosque in Timbuktu, at least in its current state: Sidi Yahia. Its prayer room is fairly rectangular, measuring 30 m by 15 m, with its *mihrab* centred on the eastern *façade*. Three lines of pillars outline four bays. In addition, a minaret is contiguous to the northwest corner.[35][36]

The hypothetical plan for stage 1 of Djingarey Ber is a rectangular plan with bays parallel to the *qibla*, observed later in Mali or Mauritania in particular. In the great mosque of Agadez, S. and P. Cressier Bernus tried to identify and date the different stages of construction, based on the elevations.[37] The first step they consider prior to 1449 is characterized by an elongated building parallel to the *qibla*, as at Djingarey Ber or at Sidi Yahia, with four bays and a western court, but no minaret.

Concerning this architecture, nothing indicates clearly the hand of an Andalusian architect, rather, these earth pillars are clearly part of a Sudanese know-how. Was Abu Ishaq Es-Saheli indeed the architect? No testimony prior to the very end of the 15th century attests it. When Ibn Battuta went to Timbuktu, in 1353, he just said that Mansa Musa gave 4,000 ducats to Es-Saheli in one day,[38] without giving us any reason. In my opinion, this should be related to the construction of his courtroom in Malli. The fact that he reported this during his visit to Timbuktu could have contributed to assign the construction of the mosque at the same architect (said to be buried in this very city).

The courtroom built for Mansa Musa by Es-Saheli, according to Ibn Khaldūn who met his grandson during 1387, differs radically of what we have found. At the very end of the 15th century, Leo Africanus was the first to point out in Timbuktu "a stone and lime temple divided by a great master of Granada and similarly a sumptuous palace". If not confused with the courtroom, the depiction is somewhat strange. By chance, there is a 14th century depiction of what is likely the original mosque. Painted on the *Atlas catalan* map, stored in the Bibliothèque Nationale de France, made during 1375, it features earlier elements regarding Timbuktu. The (late) king Mansa Musa is seating on his throne; to his right, a building is captioned "Tenbuch" (fig. 2.5). Not like the other pictures of towns on this atlas (which are standardized), this one is unique and presents a *façade* for a quadrangular building covered by a series of rows of what looks like continuous vaults (fig. 2.6). The number of rows is uncertain, as the artist uses fishbone perspective, common at that time. A monumental staircase, rather than a podium, leads to the main gate surrounded by two windows, which completely fits the mosque we found with its main entrance, north. No minaret is depicted.

It's a big surprise. More than the nature of the masonry or the richness of the decoration, the introduction of continuous vaults in Sub-Saharan Africa may have been the genuine architect's stroke of genius.

FIGURE 2.5 Atlas catalan, *detail showing Mansa Musa, with the image of Timbuktu on his right* BIBLIOTHÈQUE NATIONALE DE FRANCE.

34 Prussin, "Sub-Saharan West Africa", 183.

35 With that said, G. Bicheron informed me that he thought there had been an expansion on the west side, around the minaret.

36 Mauny, "Notes d'archéologie sur Tombouctou".

37 Bernus *et al.*, "La grande mosque d'Agadez".

38 Ibn Battùta, *Voyages,* III:425.

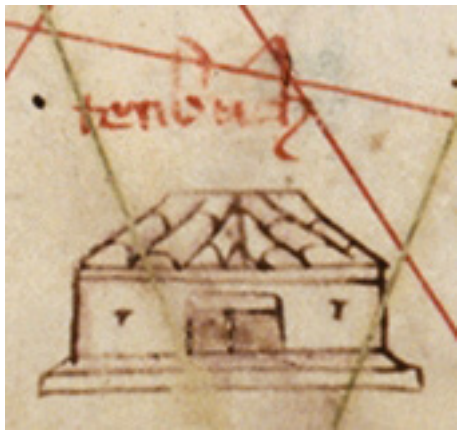

FIGURE 2.6 Atlas catalan, *detail showing the town of Timbuktu, which shows according to our hypothesis the north façade of the Great Mosque*
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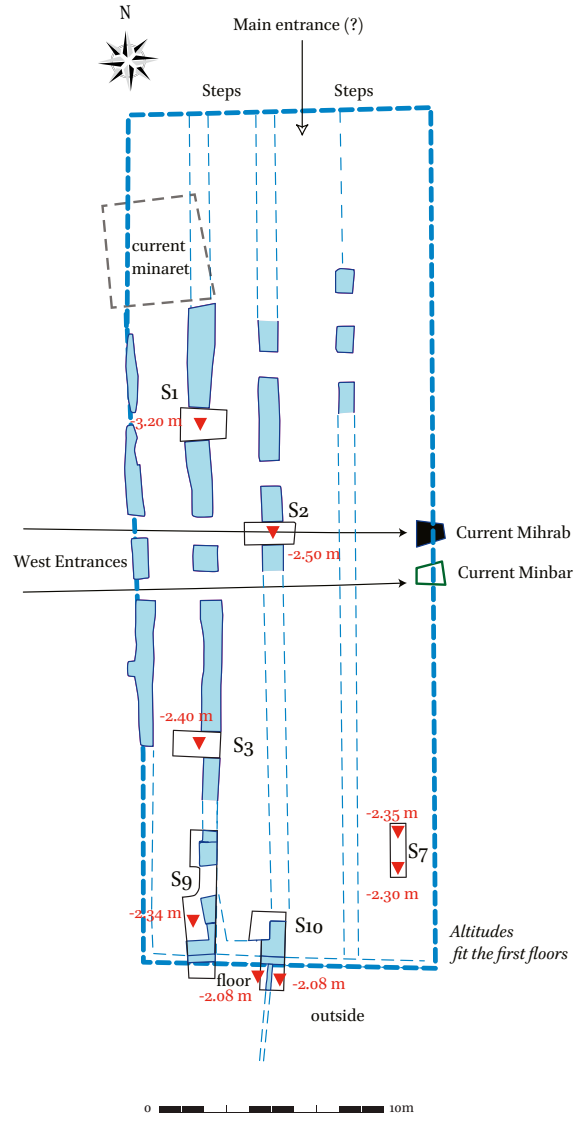

FIGURE 2.7 *The Great Mosque, stage 2 (scale 1/300)*
CREDITS: POISSONNIER.

Stage 2: Just an Enhancement?

The plan of the prayer room for stage 2 involves the same assumptions regarding the location of the *mihrab* previously mentioned (fig. 2.7). It shows an elongated rectangle with four bays, north-south orientation, measuring approximately 38 m by 13.50 m. Three lines of internally interrupted walls indicate the four bays, raising the stage 1 lines of pillars (after sand silting). This allows us to assume that the two plans were more or less superimposed; however, while under the southern double wall of the stage 2 building, we found no traces of an earlier wall, and since the lower levels contain the demolition of stage 1, we cannot assert the non-existence of the walls of this phase at this place. It is possible the two plans are not exactly alike.

The walls are built from *banco* and stones of *alhore* (a local kind of travertine). The recurring findings of potato-shaped unmoulded *banco* bricks in the demolition levels of this step, indicate the regular use of this type of material. A yellow-grey coating of *banco* with at least one inscription in Arabic was less well-executed than during the previous stage (S9). Large recesses were noticed at a height of 1.09 m above the first level of internal circulation (S9). They could have been used to support lamps.

There were gaps (whether doors or recesses) in the western *façade* and also at the base of a likely buttress, perhaps ornamental. In the middle, two (probably twin) doors were located in front of the gaps in the interior walls, opposite the mihrab and minbar. To the south (S9 and S10), the wall was double. A neat coat covered only the inside. Beyond the mosque, in the south, an adjacent wall,

oriented north south, separated an outer area to the east, with much kitchen waste, from an area with a floor (S10). The ground levels corresponding to the beginning of the occupation (stage 2.1) were identified in the surveys S1 to S3, S7, S9 and S10. Inside the building of stage 2, from north to south, altitudes range from –3.20 to –2.34 m, at –2.08 m immediately beyond the building to the south. This attests for (logically most important) external sand silting.

How to date stage 2? In all cases, this stage follows a long use of the previous one. Even if the deposits of the stage 2 floors are very low in the southern part of the building, outside of it, levels can observe a certain period of use before the next stage contemporary to an attached wall, then subsequent thereto after levelling.

Some branches—likely debris from a collapsed roof of stage 2—found in a thick demolition backfill (layer US5 in Trench S9) immediately preceding the rebuilding of Stage 3, yielded a radiocarbon dating with an unfortunately big interval (Beta-280828): 330 ± 40 BP; Cal AD 1450 to 1650 (95% probability). A second radiocarbon dating derived from a kola nut, intentionally inserted into the coating of the north pillar (trench 1, at the altitude of –4.15 m) so exactly at the bottom of the backfilling with compact *banco* at the beginning of stage 2. While, when originally removed from its original location the kola nut looked well associated to the coating, the dating shows clearly that it was carefully and precisely inserted later into the old plaster (perhaps as a kind of "re-foundation" deposit). This second dating is (Beta-280830): 290 ± 40 BP; Cal AD 1480 to 1660 (95% probability). Taking into account the assumed date of stage 3, matching historical sources, stage 2 may be dated from the late 15th/early 16th century.

Stage 3: Establishing of the "Great Mosque" in the 16th Century

There is no doubt that stage 3 is the principal stage of the site, and the quite modest building will then turn into the Great Mosque (fig. 2.8). The collapsed remains of a previous stage, and the resulting thick backfill still rich in wood from the roof construction made of adobe bricks and (big enough) *alhore* stones, were the foundation for the rebuilding of a new greatly-enlarged mosque. Sand invasion is a chronic and permanent phenomenon in Timbuktu, and rising is a common architectural response to this situation. In addition, rising implies a management of the different levels. Trenches 11 and 12 in the north-eastern part showed that wide staircases were built on (and in) the demolition backfill of stage 2, in order to bring in the construction material and to set the level construction with an acceptable altitude difference between both spaces created on either side of the former north facade. Thus, the new floor was at an altitude of –1.83 m to 4 m north of the west gate, the threshold is 0.75 m higher.

This northeastern part had a monumental gate, the most northerly of the eastern wall, which presented on both sides of the door some modelled and printed decorations applied of yellow earth.[39] This area (still a favourite of the Imam) is currently separated from the main prayer hall by three doors, bearing arches posterior to stage 3. It might have been an area privileged for some time, as can be seen in the Great Mosque of Agadez. There, in a very similar situation, a particular area, real *maqsura*, stands at the northeastern end at the eastern bay. A small room called "place of the Sultan" is reserved for the sultan who entered it through the north door.[40]

The roofs stand on pillars of quadrangular section. All masonries that we were able to check were built from *alhore* with banco. The coatings are twofold: at first hooking plaster (mud) was finger-grooved, then covered with a *Burem* earth coated finish (about 1 cm thick). Decoration was applied on this coating with impressions, stamping, and modelling.

39 This special earth coming from the region of Burem was used once again during the restoration process under the control of J. D'Ilario.

40 Bernus and Cressier, "La grande mosquée d'Agadez", 14.

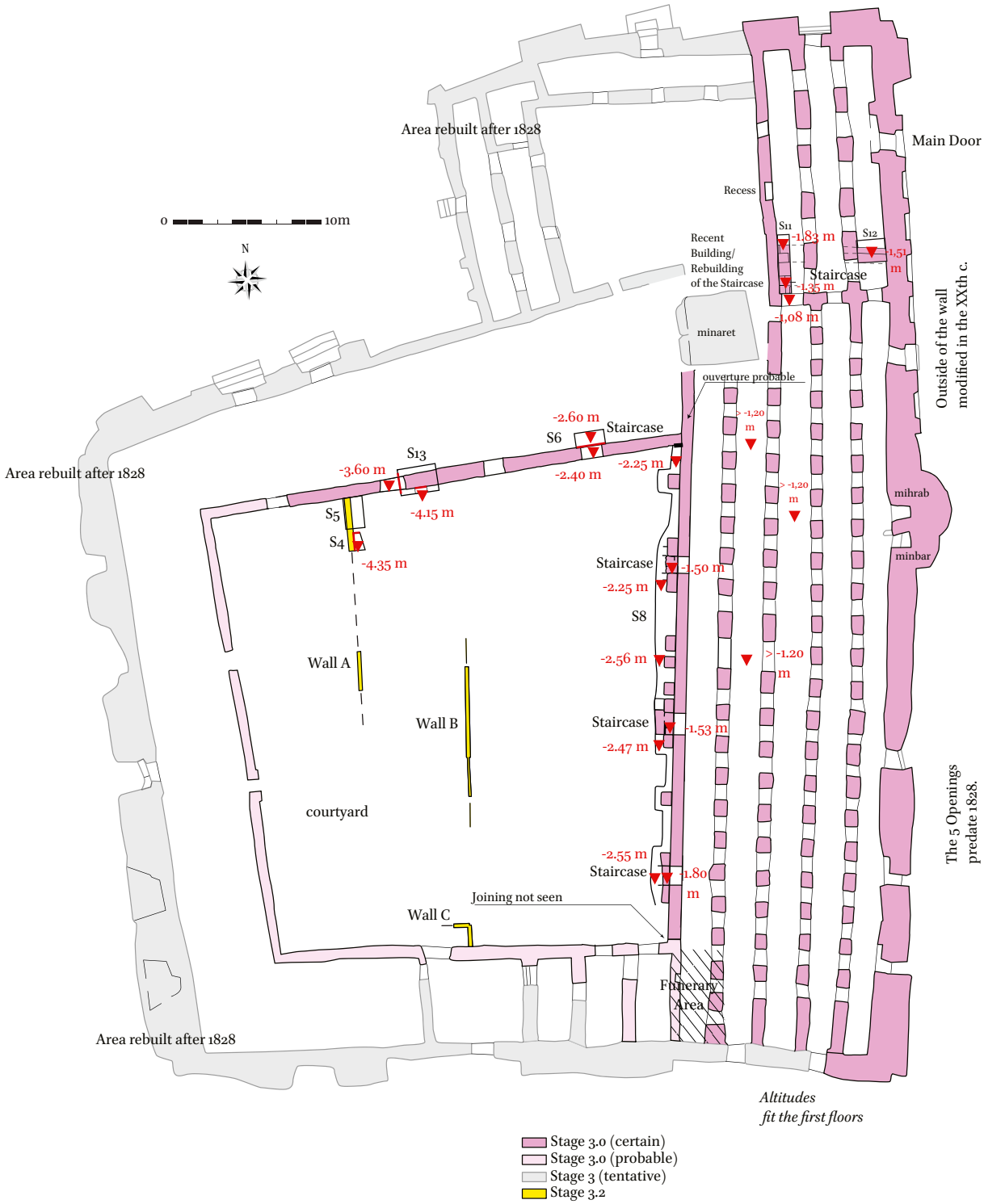

FIGURE 2.8 *The Great Mosque, stage 3 (scale 1/400)*
CREDITS: POISSONNIER.

The western *façade* was cleared over virtually its entire length, in the lower part (S8). The top was punctually identified, protruding from the roof, immediately south of the minaret on which it should have come to append. It includes a decorated *mihrab* and numerous inscriptions, decorated by projecting buttresses. Finally, three stairs allowed access to the western courtyard. Another staircase was discovered in Trench 6, where it led up to the level of the main prayer hall, near the foot of the minaret.

The western courtyard was inclined westward. The depths of the ground level in stage 3.1 vary from 2.25 at the foot of the *façade* up to 4.35 m in the western part. Once the main walls had been built, the courtyard experienced a period of occupation, which resulted, after a certain time, in abundant rubbish, i.e. caprine detritus, as well as that from poultry, fish, large ruminants, mixed with utilitarian ceramics. During a second part of stage 3, wall A and very likely wall B were built, and maybe wall C. Our still incomplete vision of the courtyard suggests a sort of median north-south passage between walls A and B.

L. Prussin recalls the fact that the Cadi used his own measurements of the Kaʿbah to make a model of the courtyard for the Mosque of Sankore in Timbuktu in 1581. According to Prussin, these measurements would be the same as for the courtyard of Djingarey Ber.[41] They would "thus honour the traditional domestic African spatial emphasis on open interior courtyards as conceptual centres of the universe, as the 'stomach of the house'". The dimensions of the Kaʿbah (about 12 m for one side) do not, however, match at all; in our opinion Prussin's comparison does not appear to be well founded.

The first floor related to this stage was found at an elevation of –0.20 to 0.40 m providing information concerning the level of silting up of the southern part of the mosque. This level was chosen as base for restoration.

The eastern wall was successively thickened and received buttresses in the twentieth century. Its internal face bears remarkable applied plaster ornaments, facing decorated pillars. The stamps used at the base of the western *façade*, dated to stage 3.0, find themselves identically on certain pillars, associated and certainly contemporary to other stamps. Consequently, I regard the western *façade*, the eastern wall, and decorated pillars as contemporary elements, and thus belonging to stage 3. In fact, the period of use of the same stamps seems to have been brief enough to be neglected in the subsequent stage (4) that however, still used the *Burem* earth as coating.

The minaret of stage 3 is certainly that of the current location, even if we could not get close enough to check this aspect. The western *façade* probably appended to it. The northwest area around the courtyard of the minaret, ruined during 1828, has since been rebuilt. While it might not possible to assign its plan to a given construction stage with certainty, it likely belongs to the same stage; however, the covered area located immediately west of the minaret postdates walls framing it in its present state. Additionally, a row of pillars stops just above the door studied in Trench 6 (which was not yet walled).

A funerary area is found in the southern (enlarged) part of the mosque. Two ceramic water containers are buried in the masonry. They were supposed to have stored water or relics from Mecca. On the ground, two other water containers were buried above the layer corresponding to the initial level of stage 3. Many bones were discovered at the foot of the southern wall's interior. Our investigation did not proceed further.Other human remains discovered at the bottom of Trench 6 could not be attributed to any particular stage.

How to date stage 3?

If we compare texts, the situation seems clear. Cadi El-ʿAqib is likely responsible for these great works. Once back from his pilgrimage, he began the construction of the *Great* Mosque, during 1569. He fetched bricks for "reconstruction". "Demolition of the old walls" occurred, followed by a rebuilding

41 Prussin, *op. cit.*, 184.

during 1570. It seems that construction took several years, and that Askia-Daoud conducted its completion, including a gift of "four thousand beams" (a considerable number supposed to give an idea of the richness of the roofs).

These details match our observations very well. In our opinion, the very term "Djingarey Ber" (the "great mosque" in Songhai) appear at this time. Until then, although its primacy on other mosques of Timbuktu due to its antiquity and its creation by Mansa Musa back from pilgrimage, it is clear that it did not overtake them. This was done from 1570 onwards.

Stage 4: The Taste of Arcades

The western arcades were added to the previous parts, after a reorganization of this area (fig. 2.9). The rows of arcades have rested on the northern and southern walls. A new *façade* was built, with its *mihrab* facing the courtyard. Stratigraphy in Trench 8 attests to a level of destruction corresponding to the collapse of the western *façade* during stage 3, related to an intense run-off prior to the constructions of stage 4. The northern front door does not open, and it is actually prohibited to do so. I was told on the spot that it had been closed after being used once by the Prophet and holy El Kader, to show respect.

Arcade rows were originally coated by *Burem* earth, but undecorated. The base of the wall from *Alhore* and *banco* was coated of *Burem* earth up to a certain depth where it connected to a stabilized floor (–3.80 m). Below, the foundation of *banco* and crushed *alhore* (thick 0.30 m) was built without any *Burem* earth plaster. At the foot of the northern gate, the staircase stopped at the level of the stabilized floor. At the foot of the next door, a remnant of wooden threshold was still in place at a level equivalent to the first step north side.

In the courtyard, stratigraphy recorded above this stabilized floor included:

- A layer of red sand, of varying thickness;
- An embankment similar to the demolition level of Stage 2, such as can be seen in the mosque;
- Another stabilized floor (–3.24 m at the foot of the *façade*, northern part);
- A layer of light-coloured sand (8 cm thick);
- A succession of layers (1.00 m thick).

The upper stabilized surface seems to fit the levelled wall A (–3.67 m). A trench dug in the northeast corner of the small northwest courtyard yielded the same stratigraphic sequence. Walls A, B and C were levelled during stage 4, and the resulting floor corresponds to a degree of levelling.

As mentioned before, on 7 August 1678, a whole side of the Great Mosque was destroyed, and the restoration works may have been delayed until the beginning of the following century, and to be completed on June 1736; however, the fact that the collapse occurred during the rainy season 1678 fits perfectly with what we recorded in Trench 8, where the western *façade* collapsed along with a heavy run-off that eroded coatings. Subsequently, works may have dragged, giving time to prepare the project—not of a simple restoration of the collapsed *façade*, rather of an original addition. Adoption of arcades (reflecting a Mediterranean taste) could well reflect a Moroccan presence. This construction could then correspond to the foundation in 1736. In all cases, this part of the mosque is old enough for what Caillié believed to be "the oldest" in 1828, probably having received new coatings in other areas.

Conclusion

The architectural history of the Great Mosque is complex. Four main stages have been identified. The first one fits the tradition and confirms a foundation around 1325–1330. This first mosque, buried 3.50 m under the current one, was a mud-brick rectangular building that represents Mali's very first building covered by continuous vaults. At the end of the 15th century, the second mosque was raised using mud-bricks and stones. Like today, the roof was flat. At the third stage, during the 16th century, a huge building justifies the calling

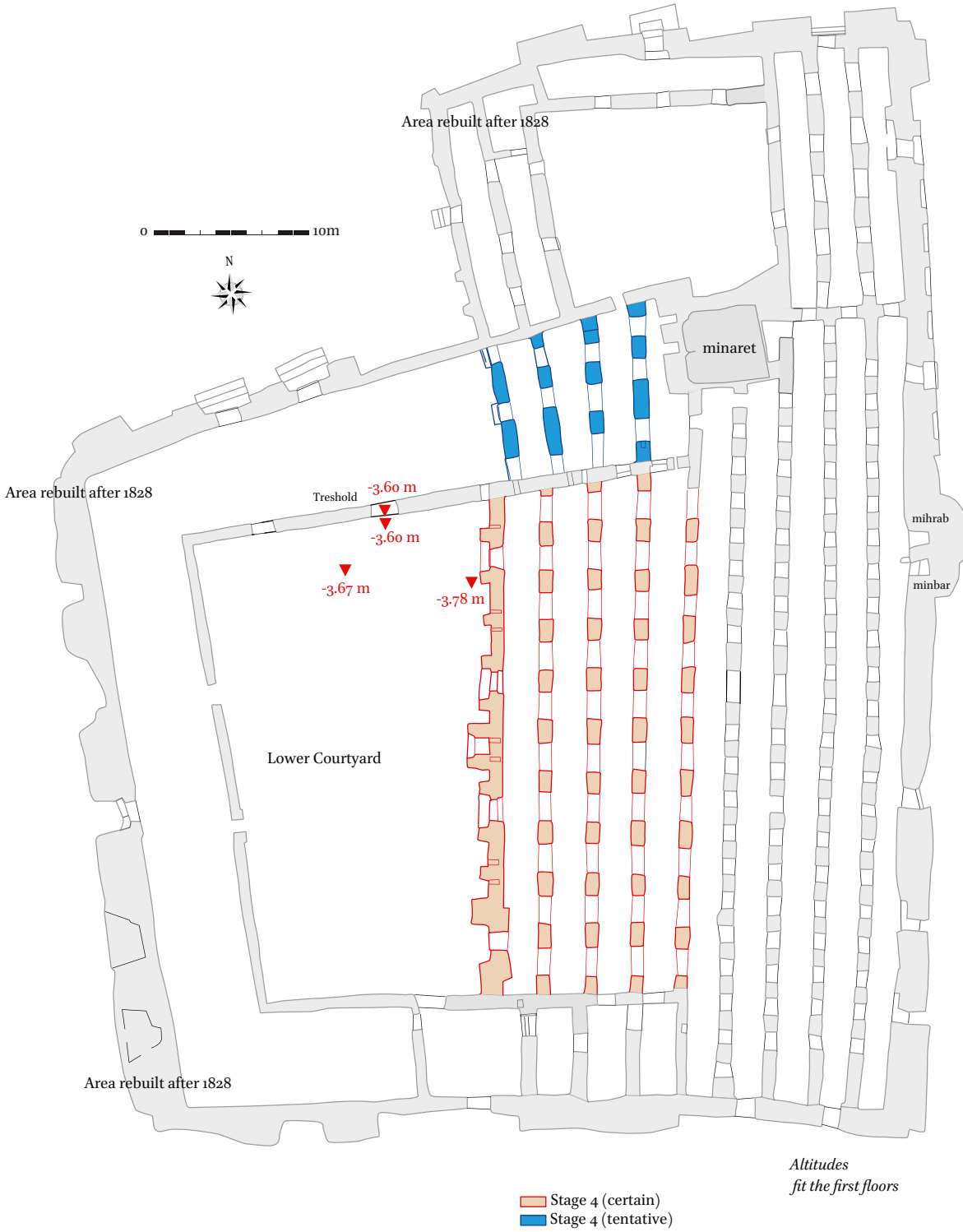

FIGURE 2.9 *The Great Mosque, stage 4 (scale 1/400)*
CREDITS: POISSONNIER.

of "Djingarey Ber". The remains of previous stages collapsed, with the thick backfill used to raise the whole area. The flat roofs were supported by rectangular pillars, like the previous ones, and were built with stones and *banco.* Coatings were twofold, and usually decorated. Likely during the 18th century, stone arcades were added, connected to a new *façade* facing the western courtyard (showing a possibly Moroccan influence).

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CHAPTER 3

The Periphery Walls of Sijilmāsa, a Medieval Islamic City in Morocco: Contribution to the Identification of Typological and Functional Variability of the *Pisé* Technique

François-Xavier Fauvelle, Elarbi Erbati, Romain Mensan and Axel Daussy

Introduction

Located in the Tafilalet oasis in southeast Morocco, Sijilmāsa is a key archaeological site in the medieval Islamic world (fig. 3.1).[1] Local populations never forgot the city, even though surviving remains (both buildings and artefacts) have suffered over time from different forms of physical and symbolic appropriation. These range from looting to popular or scientific speculating on the causes of the glory and decline of the city, as well as on different interpretations of the remains' function. Known since the late 19th century by specialists of the medieval Islamic world, the site has been subject to several archaeological excavations. Since 2012, a French-Moroccan team, working under the auspices of INSAP (Rabat, Morocco), with support from the Commission des fouilles of the French Ministry of Foreign Affairs, conducted new excavations within a month-long field season each year.

Many written sources provide information on the history of Sijilmāsa, allowing understanding of the site's different functions: as gateway and warehouse for medieval trans-Saharan commerce; as western platform for the Islamic world in its relations with both the *Bilād as-Sūdān* ("Land of the Blacks") and Mediterranean Basin; as an innovative political space on the periphery of Maghrebian powers from the time of the Khārijite Emirate (8th century AD) to that of the Berber dynasties (Almoravids, Almohads, Marinids) of the 11th–15th centuries; as cradle of the local Sharīfian lineages; and as birthplace of the modern ʿAlawīte dynasty.[2] While the origin of the sedentary settlement is not yet documented archaeologically, Arab sources state that the founding of Sijilmāsa in the 8th century by the Banū Midrār dynasty, of Khārijite (a variant of Islam) influence, replaced several urban cities that previously existed in the region.[3] Leo Africanus' testimony indicates that the medieval city of Sijilmāsa lay in ruins in the early 16th century, and that the deserted city had ceded place to a scattering of "castles" (*dixit* Léon), referring to fortified villages (*quṣūr*; singular, *qaṣr*).[4] Such architectural groups, built using the *pisé* (rammed earth) technique, are familiar: they form an architectural landscape for the oasis even today, and can be encountered in different forms (*quṣūr* in the strict sense, *qaṣaba*, etc.) in all southern Morocco's valleys, as well as more generally.[5] Each also corresponds to such social units as clans, expanded

1 We are grateful to the late Rebecca Miller for the translation of the article into English, to David Bramoullé for the transliteration of Arabic words, and to two anonymous reviewers for their comments.

2 Terrasse, "Sidjilmāsa"; Levtzion *et al.*, *Corpus of Early Arabic sources for West African History*, *passim*; Fauvelle, *Le Rhinocéros d'or; Histoires du Moyen Âge africain*, Chapter 16.

3 Monteil, "Al-Bakri (Cordoue, 1068); Routier de l'Afrique blanche et noire du Nord-Ouest: Traduction nouvelle de seize chapitres, sur le MS arabe 17 Bd PSS/902 du British Museum", 42. Localities mentioned as having previously existed in the region of Sijilmāsa are Tudgha (a two days' walk) and Zīz.

4 Léon l'Africain, *Description de l'Afrique, tierce partie du Monde*, ii: 429–430.

5 Terrasse, *Kasbas berbères de l'Atlas et des oasis; Les grandes architectures du Sud marocain.*

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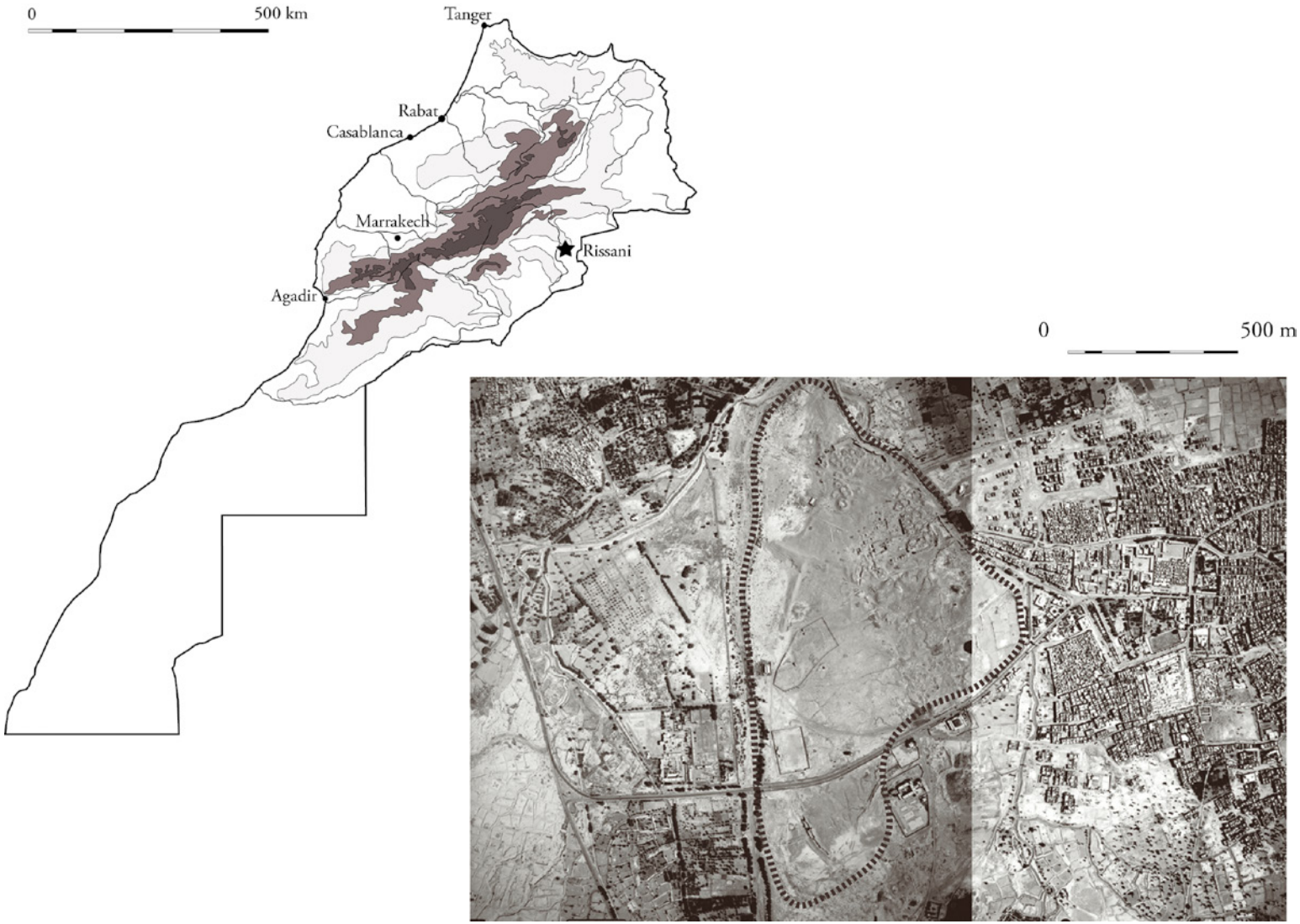

FIGURE 3.1 *Sijilmāsa: Location in Morocco (top) and aerial photo of the site (bottom; the dotted line delineates the main area containing medieval remains).* DAO: ROMAIN MENSAN 2015.

families with dependents, Sharīfian lineages, and Muslim brotherhoods.[6]

The end of the oasis' *urban moment*, meaning a transition between a true city forming a political and economic centre, and occupation dispersed among *quṣūr*, may suggest that this late 15th century transition was concurrent with a technological break (that of a transition from stone to rammed earth architecture). However, the few medieval Arabic comments available regarding architectural techniques, as well as the archaeological work done on site, indisputably demonstrate that medieval Sijilmāsa's building remains already used the *pisé* technique (although with greater typological and technological variability than that visible today). Construction using hewn stone is rare, and limited to wall beds topped by rammed earth; this is, incidently the technique already mentioned by al-Bakrī regarding the first wall of Sijilmāsa in the Midrārid period.[7]

Thus the concept of *urban transition* is now being questioned. Indeed, while earlier archaeological teams working at the site proposed several urban pattern hypotheses compiling different and sometimes diverging sources (archaeological GIS, oral information from modern inhabitants, surface survey for wall remains and pottery),[8] our current work raises questions about the very idea of continuous *in situ* development of a vast, dense, and compact urban centre. Based on a detailed chronostratigraphy of the occupation levels in the excavated sector, and on dated walls observed in others sectors of the site, our observations suggest existence of several urban groups with different functions and belonging to different periods.[9] Evidence presented in this chapter suggests that the city of Sijilmāsa, even during its urban (i.e. pre-16th century) phase, was always multipolar, its different components themselves being subject to a process of cyclic destruction and reconstruction using the *pisé* technique.

Pisé: Technological Aspects and Historical Implications

With respect to the archaeology, initial results from the French-Moroccan mission in the occupation sectors excavated reveal a variety of structures built of *pisé* (the French term used here to designate the construction method called *ṭabīya* in Arabic). A matrix of sediment is packed between lateral planks (or "wall forms"), then heightened as the lower beds dry.[10] During the construction phase, planks are supported by wood ties that—left in place or removed from the wall at the end of the construction phase—create typical "pigeon holes", sometimes consolidated by squared stone blocks. Once the construction is complete, the *pisé* technique leaves visible traces of horizontal lines corresponding to the successive beds of sediment loaded between the planks (fig. 3.2).

Pisé is a traditional construction mode in pre-Saharan zones.[11] Used in North Africa and on the

6 Mezzine, *Tafilalet. Contribution à l'histoire du Maroc aux XVIIe et XVIIIe Siècles*.

7 Monteil, "Al-Bakri (Cordoue, 1068)", 42. English translation: "its ramparts are of rammed earth [Arabic *ṭūb*], with lower sections in stone". The Arabic term *ṭūb* designates rammed earth or *pisé*/ *ṭabīya*.

8 Messier, "Sijilmāsa: Five Seasons of Archaeological Inquiry by a Joint Moroccan-American Mission", 85; Lightfoot *et al.*, "Sijilmāsa: The Rise and Fall of a Walled Oasis in Medieval Morocco"; Messier, "Le plan de Sijilmāsa révélé par GIS"; Messier *et al.*, *Last Civilized Place*, *passim*.

9 Fauvelle *et al.*, *Carte archéologique de Sijilmâsa* (*Maroc*)*: proposition de mesures de protection du site*; a preliminary version of this map was published in Fauvelle *et al.*, "Sijilmâsa: cité idéale, site insaisissable? Ou comment une ville échappe à ses fouilleurs".

10 The term *ṭabīya* is specific to the western parts of the Islamic world to designate both construction material and construction technique.

11 Jacques-Meunié, "Sur l'architecture du Tafilalt et de Sijilmāsa"; Boussalh, "L'inventaire systématique par photographies aériennes des architectures de terre des

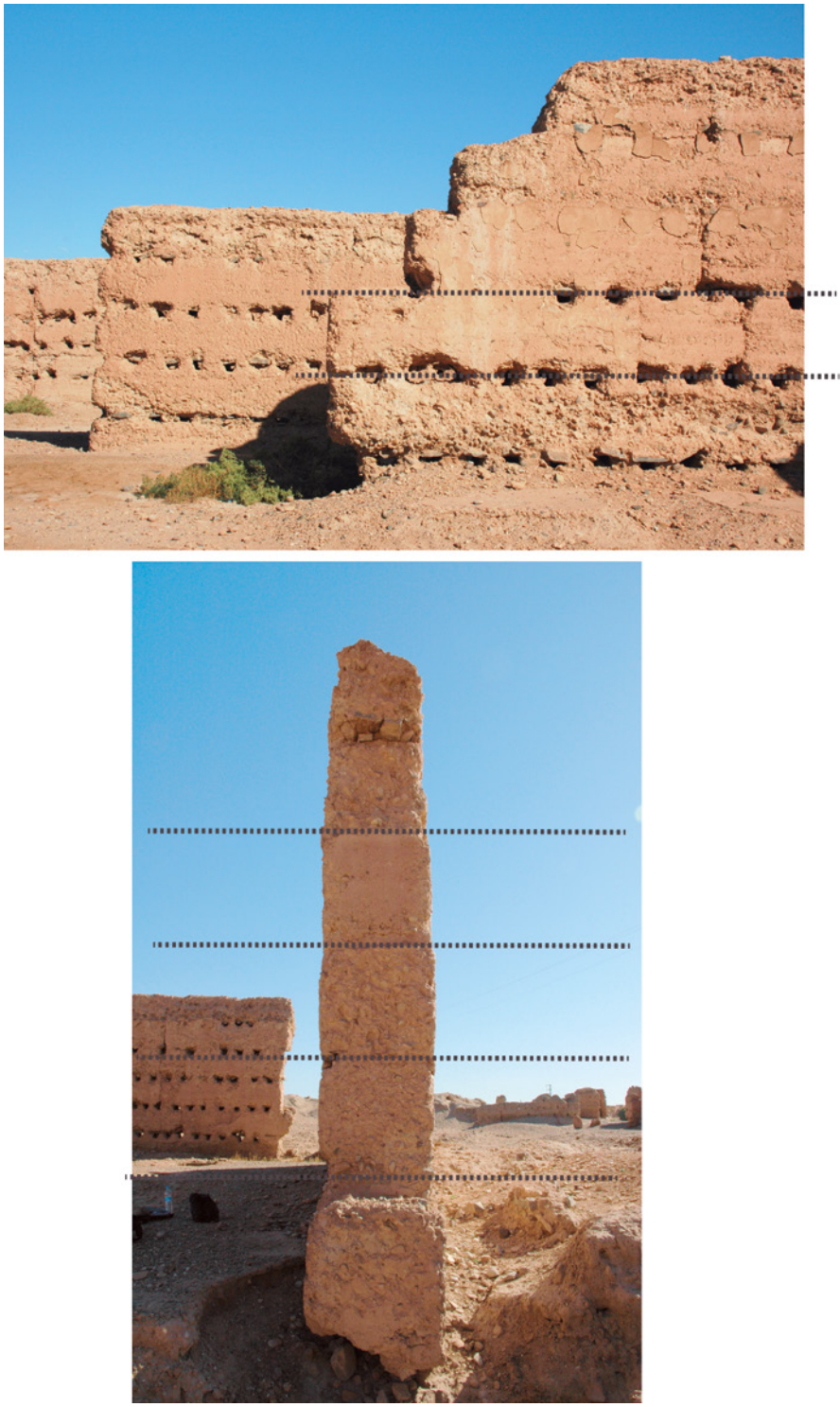

FIGURE 3.2 *Standing walls on the northeast part of the site (these walls date to the 16th–19th century, and the horizontal dotted lines superimposed on the picture point to the successive beds and lines of "pigeon holes" testifying to the* pisé *technique*).
PHOTO: F.-X. FAUVELLE 2012.

Iberian Peninsula since ancient times,[12] it is common in medieval and modern Islamic architecture, particularly in Yemen, Egypt, Morocco and al-Andalus, where it is used for both ramparts and elite residential buildings.[13] It is still in general use today in southern Morocco, except where it has been replaced by concrete. Despite the variety of functional uses of the *pisé* technique (enclosures. houses, *qaṣaba*, mosques, perimeter walls, etc.), we note a high degree of material homogeneity today: a matrix made of local greyish and friable earth with unsorted cobbles and gravel, as well as fragments of pottery and bone.

But it is of note that the older buildings still standing on the site, or exposed by excavation, show more variability than modern buildings. Beyond functional variability when it can be determined (walls, wall bases, ramparts…), material variability is quite striking, with very clear differences in the sediment used in the matrix (pure silt *versus* earth, presence/absence of lime), differences in the temper mixed with the sediment (gravel or cobbles *versus* ancient debris of all kinds, the size of the gravel and cobbles) and building mode (wall thickness). Thus, walls that belong to a vast *qaṣaba* dated to the 16th–19th centuries by several samples of wood ties, show *pisé* similar to modern buildings, with earthy sediment and random kinds of temper (fig. 3.2). At the other end of the chronological range, walls (or wall bases) exposed by our excavations in the 8th–9th century levels were made from a more compact, finer-grained, silty orange sediment that contains gravel and cobbles of regular size (fig. 3.3).

These visual differences, serving as *fossiles directeurs* during excavation, reveal different technological investments, depending on sector and period. Such forms of investment led to major taphonomic differences: some walls (the oldest) are relatively better preserved, while others (the most recent) are less well-preserved, due to lesser robustness and lowered resistance to natural and human-caused deterioration. It is not yet possible to attribute a function to each of these types of *pisé* in the sectors excavated, but these technological differences open the way to a future characterization of early *pisé* (like that done at Meknes for example)[14] with identification of chrono-cultural markers at the scale of the site. The rest of this chapter is a preliminary presentation of several sets of remains of known function—that of surrounding walls—from a typological viewpoint. Pending results from physico-chemical analyses of building materials, this presentation highlights the typological characteristics of periphery walls belonging to the period between the 10th and 14th centuries, while at the same time emphasizing the fact that they may belong to different urban groups.

Three Surrounding Wall Sections at Sijilmāsa

Three sections of surrounding walls have been identified in the archaeological zone of Sijilmāsa. Some of these have been methodically documented, with limited archaeological excavation and with direct dating of wood ties or charcoal samples. These are termed "sections" because they appear only along varying portions in different places on the site. Observations and hypotheses concerning the reconstruction of their respective perimeters (based on observations of concentrations of remains that appear to be associated and aerial or other imaging data) suggest that they belong to three different urban entities, built during different periods. However, there is (as yet) no

vallées présahariennes du Maroc"; Gentilleau, "Constructions en *pisé* dans la vallée du Draa au Maroc".

12 de Chazelles, "Témoignages croisés sur les constructions en terre crue: textes latins et données archéologiques".

13 Marçais, *Manuel d'art musulman*; Font Arellano, "La *tapia* dans les textes hispaniques"; Pradines, "Les murailles du Caire".

14 Ajakane *et al.*, "Caractérisation des matériaux de construction des remparts de la médina de Mèknes".

FIGURE 3.3 *Sijilmāsa; excavations of the French-Moroccan mission* (*this long wall in sector A1-A6 is stratigraphically associated with an 8th–9th century floor, and the foundation of this wall is made of very large cobbles*).
PHOTO: R. MENSAN 2014.

evidence to suggest that the three structures could not have partially co-existed in the landscape, or even that they were connected. They are designated Sections 1, 2 and 3 (fig. 3.4).

Section 1: A 10th Century Qaṣr *Periphery Wall*

A wall section had been exposed along ca. 20 meters before 2011 (our first visit) by backhoes used to collect eolian sand to make concrete in the town of Rissani. Over our excavation seasons, we began to realize that a long sand dune bordering the site on the west, which was formed above the line of the ancient wall, was being regularly exploited to obtain sand for modern buildings. This resulted (in May 2014) in the exposure of a rectilinear section about 300 m long, allowing us to observe newly-exposed (and thus weakened) remains now subject to a major risk for their preservation: during 2014, we could indeed see that this wall had been badly damaged by the backhoe buckets and that one of the towers flanking it was in danger of collapse (fig. 3.5).

In 2011 a small test excavation (Sondage S.001) was made at the base of this wall, permitting us to reach the bedrock after a depth of 1 m (measured from the base of the clandestine excavation). Here, the maximum height of the wall in its current state is 5 m., based on a foundation of hardened *pisé* (itself directly in contact with the rocky substrate, a conglomerate of cobbles corresponding to an ancient terrace of the wādī Zīz). Micro charcoal (SIJ-2011-E1) collected in the sediment of the *pisé* foundation yielded an AMS radiocarbon date of 1100 ± 30 uncal BP or cal AD 890–1020 (Beta 312418) calibrated to two sigmas (95%). It is clear that such a sample does not come from building wood (rather, is an organic remain perhaps mixed into the sediment), and so provides only a *post quem* date. However, other contextual elements (see *infra*) support provisional acceptance of this date.

Throughout the height of the wall, building material is orangeish silt with gravel, and small cobbles of similar size. Remains of lime plaster are visible on the eastern facing of the wall. At certain times of the day (as when the morning dew allowed a differential conservation of humidity), one can see a darker band on the surface of the dune. This corresponds to the line of not-yet-exposed ancient wall. This observation made it possible to locate a rectangular cross wall that extended towards the *wādī*. But it is the east side that seems to close the wall and the function of this cross wall still needs to be determined. At present, our ground observations (added to aerial photos and the observations made by the hydrogeologist Jean Margat during 1956–1958),[15] tend to support the hypothesis that this wall corresponds to the enclosure of an ancient *qaṣr* broadly rectangular in plan (fig. 3.6).

On the inside of this structure, in the northwest corner, a tower of *pisé* (in which the "pigeon holes" are still visible, beneath squared schist blocks) flanks the wall. No technological differences can be seen between the tower and the wall. The tower, formed of three orthogonal walls backing onto the periphery wall (yet not integral with it), is completely filled and similar to a buttress although it seems to be on the inside of the wall. This original disposition, if confirmed, has other examples in south Morocco.[16] The tower, supported by an accumulation of sand and spoil, is in danger of collapsing today. Another similar tower along the same wall, slightly to the south, is only a stump—since it was, to a large degree, damaged by a path cutting through the wall for trucks' passage.

If our hypothesis for the reconstruction of the plan of the structure is correct, it brings to one's attention this *qaṣr*'s proximity to two zones of archaeological interest. One of these is a thick archaeological tell on which the Jewish cemetery of Rissani was established (at an unknown, though likely modern) date. This is a dense concentration of ceramic sherds with or without glazing, the remains of kiln walls and copper-rich slag, suggesting a workshop for glazing pottery. In a second

15 Margat, "Note sur la morphologie du site de Sijilmāsa".

16 See for instance Jacques-Meunié, *Greniers-citadelles*, *passim*; *Architecture et habitat* (qaṣr of Skoura).

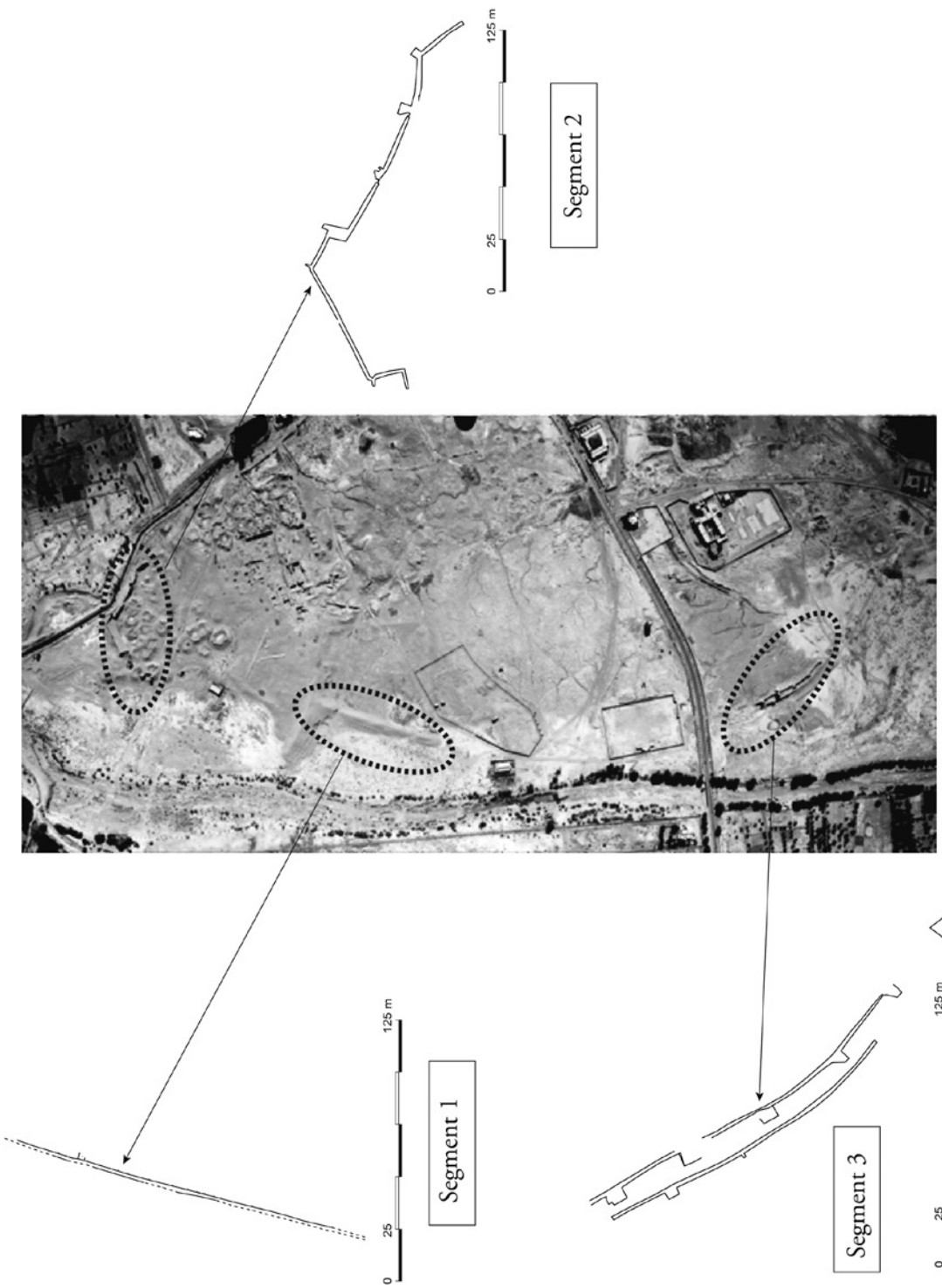

FIGURE 3.4 *Aerial image: detail of the three sections of periphery walls studied in this article.* DAO: *Romain Mensan 2015.* TOPOGRAPHIC DRAWINGS BY A. DAUSSY 2015.

FIGURE 3.5 *10th Century periphery wall* (*section 1 in this article; picture facing south, including a square tower in the foreground, and a truck and backhoe collecting sand in the background*).
PHOTO: ROMAIN MENSAN 2014.

zone, on the southeast side of this tell, a thick concentration of ashy spoil contains slag puddles. This is a waste zone (potentially associated with the workshop). Ronald Messier's American team excavated test trenches here during the 1990s (trenches T.21, 21A), yielding dates ranging from the 9th to 12th centuries.[17] While spatial association (between the *qaṣr* and the workshop and spoil zones) provides further support for the date obtained on the wall, we stress that this is still a working hypothesis that still requires confirmation.

Section 2: An Urban Surrounding Wall, 12th–13th Centuries

At the extreme north of the archaeological zone at Sijilmāsa, a 230-meter curvilinear wall section delimits the site's northern part, without other remains indicating how it encloses a perimeter. Seen from the exterior, it indicates the robustness of the city defences during this period (fig. 3.7). On the outside, the wall secured a large eolian sand dune; thick cones of sediment mixed with cobbles, gravel, and ceramic sherds are found on the inside. Some authors see these as the remains of basins, or reservoirs, built on the site after its abandonment.[18] Based on our initial observations, it is probable they were tall square houses which collapsed in place; later erosion carved the ruins into the form of craters (as is frequently seen in Yemen). Future archaeological work can confirm whether these structures were part of the urban

17 Messier, "Sijilmāsa: Five Seasons".

18 *Ibid.,* 65.

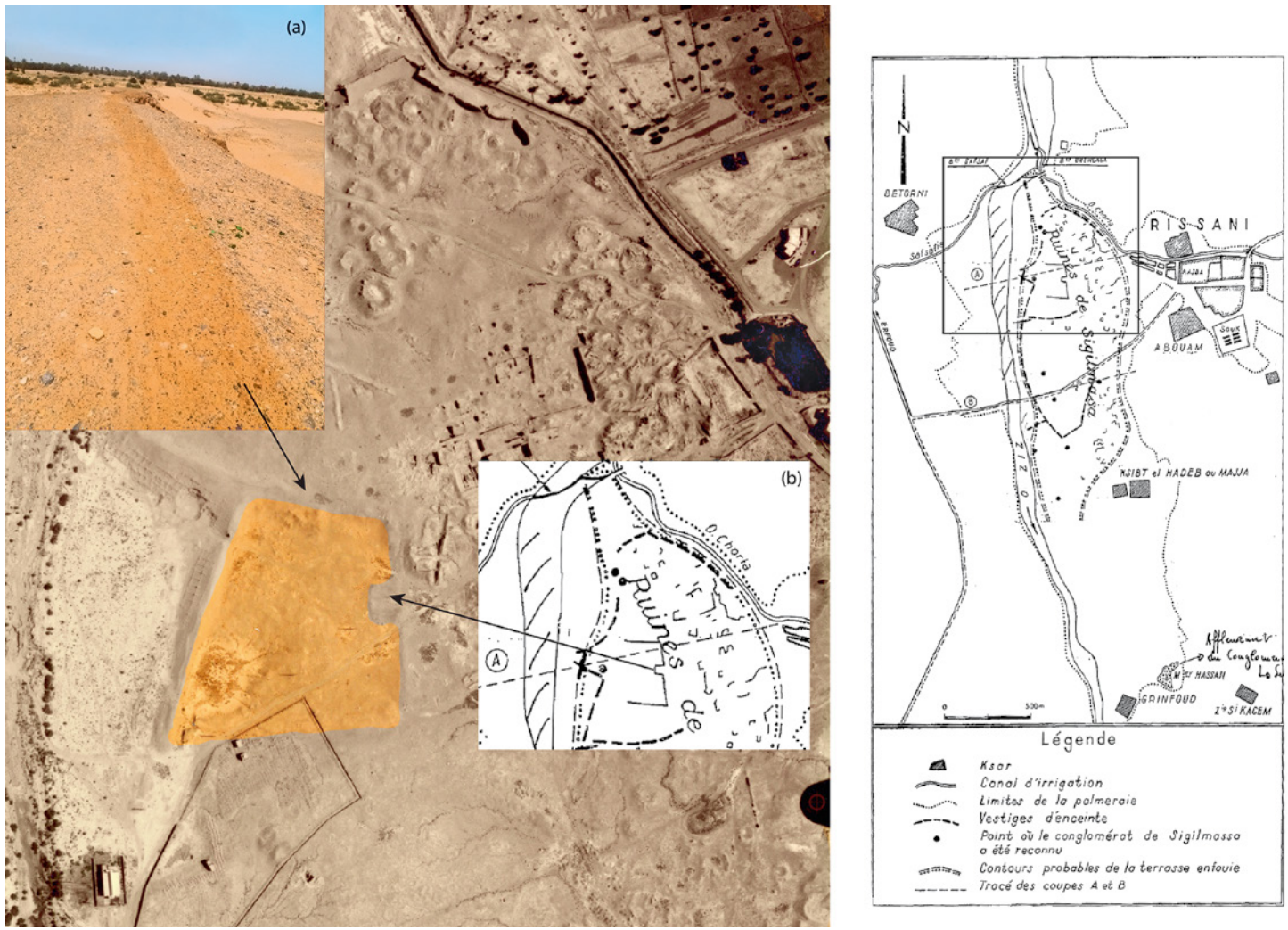

FIGURE 3.6 *Reconstructed layout (yellow) of the 10th century* Qaṣr *based on various data (aerial image, line of the wall exposed by the backhoe, along the west wall; field observations of the south wall, a dark band on the surface of the dune indicating the north wall, and previous* in situ *observations of the gate par Margat, 1959).*
DAO: ROMAIN MENSAN 2015.

FIGURE 3.7 *Panoramic photo facing south, of the north periphery wall (section 2 in this article, dating to the 12th–13th century).*
PHOTO: CATHERINE SCHEPENS 2014.

site associated to the periphery wall, or posterior to it.

The original height of the wall seems to have been preserved at one place (if it is not a more recent restoration that, to our knowledge, was not documented). The top part of the wall is formed of squared schist blocks laid with mortar. Whether this top is original (or not), it approximately indicates the original height of the periphery wall, on the order of 9 meters. Here, plaster cladding is also preserved (again, unless it was part of an undocumented restoration). Although the lateral facing of the wall was decreased due to erosion, the remains still evidence its remarkable robustness (fig. 3.8). Traces of wall forms and "pigeon holes" used to erect the wall, are visible in places. The building material is silt with gravel and decimetric cobbles but little lime.

A test excavation (S.018) at the interior base of the wall was done by our team during 2013. This shows that, as previously, the wall was based directly on the rocky substrate of the Zīz terrace. The original cladding made of thick white plaster is found at this foundation level, three meters below the modern ground surface. A wood fragment (SIJ-2011-E9) taken from a wood tie still in place in the wall yielded an AMS date of 880 ± 30 uncal BP or cal AD 1160–1260 (Beta 312420) calibrated to two sigmas (95%). A tower against the outer side of the wall was the focus of detailed documentation (fig. 3.9). Like the preceding example, it is formed of three *pisé* walls forming a quadrilateral that is not integral with the periphery wall. The tower is solid: the fill of earth and cobbles also appears to be original and does not show signs of eolian deposition or demolition. The *pisé* is preserved for 6–7 beds. On two faces, above the *pisé*, the construction preserves an *adobe* (unfired brick) wall around 2 meters high.

A structure that is not part of the wall, but appears to be topographically associated with it, was also found: on the interior side of the wall, one of the vast "craters" found in this sector of the site has a wall along one of its edges protruding from the mound of sediment (fig. 3.10). No similar examples have been found in this sector. This may have been the upper part of a house wall, that would have here been preserved (while everywhere else on the site, houses collapsed in place and formed demolition mounds having the characteristic form of craters naturally). The wall is oriented north/south. The very hard building material is earth containing lime, and fewer and more irregular cobbles than those found in the nearby wall (only a few meters away). "Pigeon holes" and the remains of wood ties still attached to the sediment are present, indicating the *pisé* technique, but there are no stone blocks in the upper part of the holes. The material forming the crater itself cannot be distinguished from that of the rest of the wall and could

FIGURE 3.8 *Photo of the north periphery wall (section 2 in this article; the schist top and the plaster cladding may be recent).*
PHOTO: ROMAIN MENSAN 2014.

thus indicate the demolition of other parts of the house. A wood sample (SIJ-2014-E1) from a wood tie solidly attached in the wall yielded an AMS date of 870 ± 30 uncal BP or cal AD 1050–1085, 1125–1140, 1150–1225 (Beta 396371) calibrated to two sigmas (95%). This date and the one obtained from the periphery wall overlap for the period from 1160 until 1225. While this does not, of course, prove that the wall is from a house, it offers initial confirmation of the chronological association of this remain with the wall.

Section 3: An Urban Double Surrounding Wall, 14th century

The third case study is a section of surrounding wall preserved for about 150 m and has a curved delineation oriented from northwest to southeast. It is likely this wall that Henri Terrasse saw and described during 1936, although the poor quality of photos accompanying his article prevents definite identification.[19] Despite fieldwork and aerial imaging, it was not possible to locate the rest of this wall, which is preserved only in the sector south of the Sijilmāsa field of ruins, south of the Rissani access road. A mausoleum dedicated to Muḥammad al-Aqwas is set against the interior part of the wall. The Muslim cemetery associated with the mausoleum, and the sanctification of this space, likely contributed toward preservation of the wall here, while everywhere else it has been eroded and leached into the current ground surface on the floodplain of the nearby *wādī* Zīz.

19 Terrasse, "Note sur les ruines de Sijilmāsa", 584.

FIGURE 3.9 *Tower against the north periphery wall* (*section 2 in this article*). PHOTO: ROMAIN MENSAN 2014.

This wall section retains its original architectural layout, in that two parallel walls form it. The inner wall (with respect to the curve of its delineation) is relatively thin (1.75 m) and consolidated by towers against it (several are conserved only as stumps). The outer wall is thicker (2.50 m) or better preserved and runs parallel to the inner wall (fig. 3.11). The tower found directly behind the mausoleum, that is, on the back of the inner wall, was documented in detail (fig. 3.12). It is formed by three orthogonal walls forming a quadrilateral leaning (by the unclosed side) against the external facing of the periphery wall, which is clearly visible in a long fissure formed by erosion that separates the wall and the tower. While there are no quoins in the lateral walls of the tower with the wall, this does not exclude the possibility that these could have existed at the foundation level, which could not be observed. The matrix of the tower walls in *pisé* consists of a very hard mortar

FIGURE 3.10 *A 12th–13th century house wall near the north periphery wall*
PHOTO: ROMAIN MENSAN 2014.

containing lime. The interior of the tower is filled with earth and cobbles which appear to be the original fill, not linked to deposition after abandonment. The upper part of the fill is constituted of broken *adobe* (likely derived from the collapse of a top row of unfired bricks) set above the uppermost bed of *pisé*, as is the case for the tower seen along the north wall. This layout suggests existence of an interior platform at the top of the tower. A palm wood tie fragment (SIJ-2013-E8), solidly attached inside a "pigeon hole" of the west wall of this tower, yielded an AMS date of 600 ± 30 uncal BP, or cal AD 1290–1405 (Beta 374008) calibrated to two sigmas (95%). As this fragment likely came from wood used in the construction of the tower, it dates this wall to the 14th century. Again, future dates can confirm or refute this initial result.

At the extreme northwest of the preserved section of the surrounding wall, the inner wall is abruptly truncated (fig. 3.13), without apparent cause. This break shows the thickness of the wall in a 4 m high section. The lower part of the wall is made of highly uniform orangeish silty sediment with contiguous cobbles, varying between 3 and 10 cm in size. The same sediment is used in the upper part but with much more disparate and non-contiguous cobbles. This variation in composition within the height of the *pisé* may reflect a desire to increase the density and solidity of the lower parts of the wall. Erosion caused the facing's lateral regression. The outer wall, much thicker, is also of *pisé* with the same orangeish silty sediment. The facing is again very poorly preserved and the volumetric gradient of the cobbles was not observed throughout the height of the wall.

FIGURE 3.11 *The south periphery wall* (*section 3 in this article, dating to the 14th century; photo shot from the top of the tower, facing southeast*).
PHOTO: ROMAIN MENSAN 2014.

FIGURE 3.12
Tower against the south periphery wall (*section 3 in the article*).
PHOTO: ROMAIN MENSAN 2014.

FIGURE 3.13 *Truncation of the south periphery wall* (*section 3 in this article; detail showing the material used*). PHOTO: ROMAIN MENSAN 2014.

Discussion

In the three wall sections described, two were unlikely to escape the notice of visitors while the third, which is the oldest, was only accidentally exposed soon before our arrival at the site. To new observations presented here, we add a hypothesis for the reconstruction in plan of this periphery wall of the *qaṣr*. These descriptions are also accompanied by direct dates made (except for one) on palm wood fragments from wood ties used during the construction phase of the buildings. These dates thus have the appearance of dating the construction event itself, clearly requiring future corroboration. For one example, the north periphery wall, its chronological attribution (12th–13th centuries) is supported by a similar date obtained on nearby built remains we interpret as a house. For the *qaṣr* wall, the charcoal date (10th century) is only *post quem*, and appears to be supported only by the synchrony of nearby archaeological remains.

With respect to typology and technology, building modes utilized in the three wall sections have aspects in common: silt used as material, little (or no) lime, and filled towers serving as buttresses against the three sections. Technological variations can be pointed out: lime-based mortar in the tower on the south wall, and a variable density gradient in cobbles from bottom to top of the inner wall of the south wall. While earth (as opposed to silt) has been used in modern walls since the 16th century (also in the wall of the assumed

house nearby the north surrounding wall), it offers an interesting counterpoint to the use of silt in the defensive constructions, revealing particular investment in the latter.

We note that the south surrounding wall has a higher degree of technical investment than the other two wall sections. While this is based on the technical variations mentioned above, it is also based on the presence of a double wall. It is likely this double wall that Henri Terrasse described in these terms: "The outer wall, which does not appear to have had towers, was only seven or eight meters in front of the principal curtain wall. […] The bastions of the main rampart were very large and thick: seven to eight meters on the front by four to five meters on the projection. […] The only bastion that can still be studied is a filled tower that is still six to seven meters high".[20] Incidentally: this description (if it refers to the same structure we have described) indicates a state of preservation similar to the site's today.

A double wall layout was not observed on the north wall. This supports an argument that these two wall sections belong to urban groups differing in space and time, which the dates also appear to confirm. However, while it is possible that these two walls were partially contemporaneous, it is also possible that the inner wall of the south periphery wall (or its buttresses in the form of filled towers) resulted from later additions to an initial state that would be that of the outer wall, which could also be contemporaneous with the north periphery wall. These hypotheses should be tested. In the present state of research conducted on the defence layouts at Sijilmāsa, three wall sections seem to belong to three successive, distinct urban contexts: a *qaṣr* in the 10th century, a strong north periphery wall from the 12th–13th centuries (possibly, enclosing houses), and finally a double south periphery wall from the 14th century.

20 *Ibid.,* 584 (our translation).

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CHAPTER 4

Draa Valley: *Tighremt* and *Igherm*, Morocco

Marinella Arena and Paola Raffa

Introduction

The Draa Valley's spontaneous architectures takes you back to the classical language of Mediterranean architecture, where models and styles are taken as idioms useful to configure symbolic spaces, capable of accommodating heterogeneous communities like the Berbers. These models are a compendium of constructive and formal packaging. A sort of Vitruvian treaty is passed on orally, visible on the palimpsest of physical territory and structured by elements, methods and timing of construction.

These constructions (fortified granaries or *tighremt*) hang in the balance between conservation and dissolution. The *tighremt* are very fragile structures, built from rammed earth. They are now threatened by weather and abandonment. This research consults objective data, seeking to verify the diffusion and conservation of Draa Valley *tighremt* and *igherm*. The employed methodology includes an analysis of some issues related to heritage, landscape and architecture. Fieldwork was designed to:

1. Produce a comprehensive map showing the location of *tighremt* and *igherm* in the Draa Valley.
2. Determine the relationship between territory, palm grove and *tighremt* with territorial sections.
3. Survey sixteen exempla. The survey drawing traces carefully every detail of building, showing how the position of the adobe bricks form symbolic decorations, or how the alignment and spacing of the construction holes reveal the measurement of the formworks containing rammed earth (and consequently the measurement of the building).
4. Analyse the typological system and the construction techniques of *tighremt* and *qṣūr*.
5. This study seeks to develop a system of information to the scientific understanding of the spontaneous architecture of the Draa Valley. Surveys and analyses describe a rapidly-changing situation (which can be a useful aid for future works of conservation and development).

The work here presented is a synthesis of Marinella Arena and Paola Raffa's research conducted at the Mediterranean University of Reggio Calabria, Department of Architecture and Territory. Measurements were checks performed by students of the Final Synthesis Laboratory "Mediterranean City" (2012) coordinated by prof. Massimo Giovannini, along with students of the Atelier of Thesis "Central High Atlas: *Ksour* and *Tighremt*" (2014) coordinated by Marinella Arena and Paola Raffa. The survey campaigns conducted during university workshops involved approximately seventy students. The surveys covered the four major rivers of the High Atlas: Ziz, Todra, Dades, and Draa. In the valley of the Draa, a total of 26 *qṣūr* and *tighremt* were recorded (fig. 4.1). The wide documentation obtained, inserted only in part in this study, is the basis for some reflections on the morphology of the recurring elements in the architecture of rammed earth.

Tamazight

It is really difficult to describe, in a few words, the Berbers' social complexity. This word in fact includes variations and mixtures, populace who have now disappeared resonating in our minds and they generate ancestral Mediterranean images:

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FIGURE 4.1
The Draa valley. Ksour and Tighremt location
MAP: ARENA.

Phoenicians, the Carthaginians of North Africa, and the Romans. Gabriel Camps, a specialist in the Berber culture, in his *Encyclopédie Berère*, argues that the Berbers inhabited North Africa, even before the advent of the Phoenicians. They had, and still have, mixed somatic traits.

In fact, with the green eyes and fair hair found in some girls, you can still feel the emotional wave of legends accompanying the birth of this nation. It is believed that in remote antiquity the Celts arrived to these latitudes and joined the local population. From the Caspian period, between 10,000 and 6000 BC, the use of geometric decorations developed (also present in the Phoenician Era), and the faces of the elderly Berber women are tattooed with signs that go back thousands of years. The Berbers mixed with the people who came from the East, the Arabs. They began to flood the *maghreb* during the eighth century BC, introducing cultivated plants, pets, and horses.

The Zeneti, oriental and semi-nomadic Berbers, moving from east to west, introduced the camel to the area. The *Bani Hilal* tribe, during the eleventh century AD, make the Arabization of vast areas predominantly Berber in the Roman Empire a fact, and has left many signs in the territory (in both language and customs). While some Berber tribes were inside the Roman *limes*, other, more combative and independent tribes, maintained their status as free men: the *Mazices* the Latin translation of the term Berber *Imazighen* or *Tamazight*.

Berber culture is full of legendary characters like Princess Kahena, a clairvoyant, who fought relentlessly against the Arabs until dying in battle around '700 AD. The princess gave her children to the winners, so they could grow up with the new creed. This event marks the complete conquest of the *maghreb* by the Arabs. Other characters in this long history are the Botr and Zeneti (both Nomadic Berbers), who soon bound themselves to the Arab conquerors.

During the X century, the Muslim religion suffered from schisms, evictions, and deviations, followed by internal struggles that decreed the success of one or more tribes. While some of the most important dynasties have Berber roots like the Al Aqsa, the Almoravids, the people of Ribat, the Almohad and again, already with less connotations from the Berber roots, the Hafsids, Marinids, and Abdelwadidi.

After this stage, the Berber culture is detectable among Tuareg, who resisted the process of arabization in the Sahara, and among the Zeneti living in the oases. Camps warns us not to confuse the Islamization of the *maghreb* with Arabization.

The latter, in fact, was a slower phenomenon and related to cities; rural communities, speaking Tamazight although Islamized, maintained for a long time their language and social order. In Morocco, in the areas of Upper and Middle Atlas, the use of the Berber language is at its greatest; other small areas where we can find it are: Matmata in Tunisia, and at *djebel* Nefousa in Libya.[1]

Documents of Spontaneous Architecture in Southern Morocco

The long introduction of the Berber people is only a pretext to enter into a world the boundaries of which are blurred, and where it is not easy to distinguish the origins of the different types of architectural and decorative styles. As was well known at the beginning of last century, *maghreb* countries were influenced by European colonialism. In particular, Morocco has come under the control of the French and Spanish since 1906.

At the end of the eighteenth century, in the Draa Valley, power was divided between the heads of three groups: the Caid Mohamed in *qṣūr*s Beni Hayoun, Cheik El Maati in Beni Sbih and Cheik

1 "En dépit du recul de leur aire historique d'occupation, on estime que les berbérophones sont aujourd'-hui environ seize millions, dont neuf millions au Maroc, cinq millions en Algérie, quatre cent mille en Mauritanie, deux cent cinquante mille en Tunisie et deux cent mille en Libye". Lugan, "Les Berbères, la mémoire des sables".

Aamaou in the upper part of the valley. In the peripheral areas of the country and in the countryside, there was a strong opposition to military and political subservience to the French; here were pockets of rebellion until 1930.

Around 1800 nomad Arab, Ghenama and Beni Mohammed, threatened the safety of these *qṣūr* and the tribes of the valley of the Draa invoked the protection of the Ait Atta tribe who extend their dominion over a wide area northeast of the valley, flanking territories controlled by Ait Sedrane. In this area you can see many guard towers lapping the heights of *djebel* Bou Zeroual. Studies on Berber *maghreb* architecture (including Moroccan) date back to the period of the French protectorate. In this period some French researchers, formed by the sophisticated culture of the continent, tried to understand new architectural and typological cultures. While these researchers, on account of their academic training, were looking for traces of great civilizations of the past (Egyptians and Carthaginians) and, above all, what the Romans had left.

The Eurocentric vision has led many of them, above all Henri Terrasse,[2] to imagine how alien the seed of the architectural culture of the Moroccan south, assuming sub-Saharan civilization influences. Nevertheless, the quality of studies, the complexity and dedication of these researchers produced precious materials that have been the basis for all subsequent study. After the independence of Morocco during the 1950s, such buildings (due to the strong urbanization and changes at the top of the Moroccan State) were forgotten, uninhabited, and gradually abandoned. Tourism during the 1970s, with inclusion of some *qṣūr* in the UNESCO Heritage List, generated a new course of studies with new analyses often coming from the Spanish school of architecture.

Draa

The *Encyclopédie Berbère* describes the "Draa" as the longest river in Southwest Morocco.[3] It is about 900 km long and 600 km flows underground. It starts near Ouarzazate and flows through the Anti-Atlas Mountains, passing Mansour Eddahbi Dam and M'hamid plain, until the Atlantic Ocean desert estuary, the Foum Draa. The mountain of Tazagourte, south of Zagora divides the valley into two parts: the Middle Draa, to north, bordered by high mountains; and the Lower Draa, Hamada Dra, in the south. The Draa is a perennial river, and there are six oases where approximately 1.35 million date palms grow. These are the oases of Fezouata, Ktaoua, Mezguita, Mhamid, Ternata, and Tinezouline. Besides the palm trees, olive trees, almond trees, apricot trees, and seasonal crops of wheat, barley, corn, henna and legumes are cultivated as well. It is said that about 170,000 people grouped in 360 villages populate the Draa Valley. The inhabitants are Arabs, Berbers, black people who were not slaves, descendants of African slaves, Garamantes, Harratins, Jews, and Tamazight (or Imazighen). Ethnic diversity explains the social structure and the village hierarchy. Arab domination has completely Islamized the Valley, with traces of Berber culture surviving in the language, in names, womenswear, and crafts. Already, he wrote that "in the valley, the *qṣūr* shine and dissolve" during 1970. During the XI century AD, El Bekri described gardens abundance of palm trees, and villages where weekly markets were held. The Draa Valley was a major route for the trans-Saharan and sub-Saharan caravan trade since the XVI century AD.

2 In *Kasbas berères de l'Atlas et des oasis; Les grandes architectures du Sud marocain*, Terrasse thanked researchers who preceded him by publishing other studies. Similarly, we report the works of André Paris' *Document d'architecture berbère: Sud de Marrakech*; Capitan Robert Montagne, *Les Berbèrs et le Makhzen dans le sud marocain*, and M.E. Laoust, *L'habitaion ches les transhumants du Maroc central.*

3 Riser, "Dra" in *Encyclopédie Berbère.*

This, along with the claim by local rulers, made it a place of bitter clashes. Under the Saadiens Government between the XVI and XVII centuries, the Valley is already "dotted with numerous forts". During the eighteenth century, Moulay Ech-Cherif (son of Sultan Moulay Ismail) governed the Valley, and built several fortified villages to increase social and economic development.

But the wars for power do not cease. Around 1725, Hamada Draa villages asked for help and protection from nomadic Ait Atta. The nomads claimed ownership of the oasis, imposing condition of payment on sedentary peasants. The state of insecurity that reigned in the valley, "forced communities to organize themselves as quickly as possible to complete the construction work before being surprised by natural disasters, rainfall, or human invasions. Villagers' techniques and building construction materials reflect region[al] segregation and a standard of living based on a subsistence".[4] Wars ended, when the French arrived.

Anthropic Elements in the Draa Valley

The oases' structure is made up of a few elements that are derived directly from the context: the presence of the Draa water; the heights of the High Atlas Mountains, the Sarhro and Bani mountains; the six oases where lush palm trees protect cereal crops from excess sun; the cultural and social development of these places.

In these areas the anthropic elements are the small rural fortified towns called *qṣūr* or *igherm*[5] and which contain some common elements: the mosque, the square, the collective bathrooms, the collective barns, houses and the "dominating houses".[6] The latter are indicated by different terms, the most well-known is *Kasbah* but we can also use the Berber term "*tighremt*" (in this case more appropriate). Outside the *qṣar,* we often find the mausoleum where the founder of the community (the *marabut*) rests, and all around is the cemetery.

Scattered throughout the territory, there are, however, individual settlements (*tighremt*) that have not been incorporated in a *qṣar*, which have maintained their shape. Around them, there are some elements that increase their geographical importance: fields, areas for threshing grain, the mosque (*masjid*), the wells (or, in some cases, architectural *qanat*). In other cases, the isolated buildings are the watchtowers (*aguddim*), for managing the most valuable asset—the water of the Draa—or for the defence of borders between oases, or for protection of barrages. In other cases, you can find small buildings that were used by the mills to grind grain products.

Tighremt

This study focuses on analysis of the *tighremt*. These have very simple floor plan: perimeter walls supported by corner turrets, surrounding the square courtyard. It is important to note that the *maghreb* architecture is introflexed, so that its its wealth and typology is not evident externally. In fact, walking in the Tunisian medina or imperial cities of Morocco, we can hardly distinguish one house from another, nor can we imagine the richness and complexity of the interior. In the whole region of the High Atlas, and in the Draa Valley, the typology of the *tighremt* is everted, showing clearly on the outside. The *tighremt*, in fact, are

4 Ait El Haj, "Kasbah et Ksour: un patri moine en ruine".

5 All *tamazight* words used in this research are referred to the "Glossary French/Tamazight" in Jacques-Meunié, *Architectures et habitats du Dadès, Maroc présaharien.*

6 Some *qṣūr* (which Jean-Louis Michon defines *qṣūr*s "dispersed") are actually combinations [*tighremt*]. See Michon, *Un patrimoine en danger: les architectures en terre du sud Marocain*.

fortified buildings, they are not granaries, such as "*igherm*" in the Middle Atlas areas, but rather "rural fortified houses". The issue of territorial control, the need for continuous defence (as we have seen) springs from conflicts of Berber tribes, and interference from nomadic Arab tribes who raided the territory. Furthermore, the Draa Valley is one trade route between the African coast and sub Saharan areas.

The typology of the *tighremt* can be summarized in three broad categories: the isolated *tighremt*, a small fortified farm (often located within the oasis, or in the immediate vicinity). The large *tighremt*, often an expression of the power of the Cadi, supported by the colonial power, was placed on the high ground to dominate the territory, and demonstrate its strength and power. In other instances, the *tighremt* are the so-called "dominant homes" placed within a *qṣar*. The *tighremt*, in fact, has high walls, up to five levels, rising among the houses that make up the *qṣar*'s urban fabric. In this regard we must make a small clarification (fig. 4.2).

While often the basis for the formation of *qṣūr,* isolated *tighremt* constitute the first core. Around this architecture there are other *tighremt*, one or two, and then more modest homes (*taddart*), with one or two levels with small courts, that are often covered. Boundary walls interspersed with defensive and structural turrets enclose all of them. It is important to note that often, all around the *tighremt* enclosure walls are made to define an area of relevance which, at a later date, become filled by other homes. On the ground floor, the *tighremt* has rooms for storing grain, *ahano* (stables), and of course, stairs leading to the upper floors. The first level revolves around the court, usually covered and very small. Around the court are rooms for family life during the hot summer days. Upstairs, is a terrace and other rooms utilized during the winter months. For its size and for the coverage, the central court (often elevated above the floor of the terrace) serves as a fireplace. It is capable of eliminating the hot air and cooling the entire home. A perimeter wall, 1.8 m high, surrounds the terrace, which protects the privacy of the residents and gives access to the rooms situated on the top level and to the corner turrets.

As we said before, the structure of the *tighremt* can be summed up in a few elements. The squared shape is predominant. The court (*taddawārīt*) in fact is usually squared and very small in the isolated *tighremt* and those that are placed inside the *qṣūr*. The court appears long, in those great *tighremt* belonging to the local *Cadi*. The dimension of the court is confirmed by the size of the turrets that are on average 3/4 meters wide. The perimeter walls (*agadir*) reaffirm the court's morphology and stand apart from this 2/3 metres, as much as the thin wooden structure that forms the attics permits. The rooms themselves are positioned against perimeter walls that are often completely closed on the lower floors, only showing some openings on the second or third level. The technique of construction (actually very simple) includes the use of *pisé* (*llōh*) for realization of the first levels, with blocks equal to 1.2 m wide, 0.8 m high, and 0.6 m depth. The blocks are made of *pisé* work, and dictate the dimension of the construction. The arrangement of the blocks and their overlap often generates small rectangular windows (*isirr*) useful for ventilation, while the size and structure of the blocks is visible in holes left by wood ribs. The top of the perimeter wall is built from bricks of raw earth (*ottob*), which often create geometric designs (*lassserift*). These are real emblems of the Tamazight culture.

In fact, they seem to follow geometrical decorations present in all Berber art that Gabriel Camps dates back to the Carthaginian culture. The internal *tighremt* decoration is concentrated on the upper floors it is decorated with horseshoe shaped arches. The arches in the *maghreb* often have no structural function (as has been pointed out many times by Titus Burckhardt, in his book *The Art of Islam*); in fact, arch type and materials make them unsuitable for a structural function. The arches

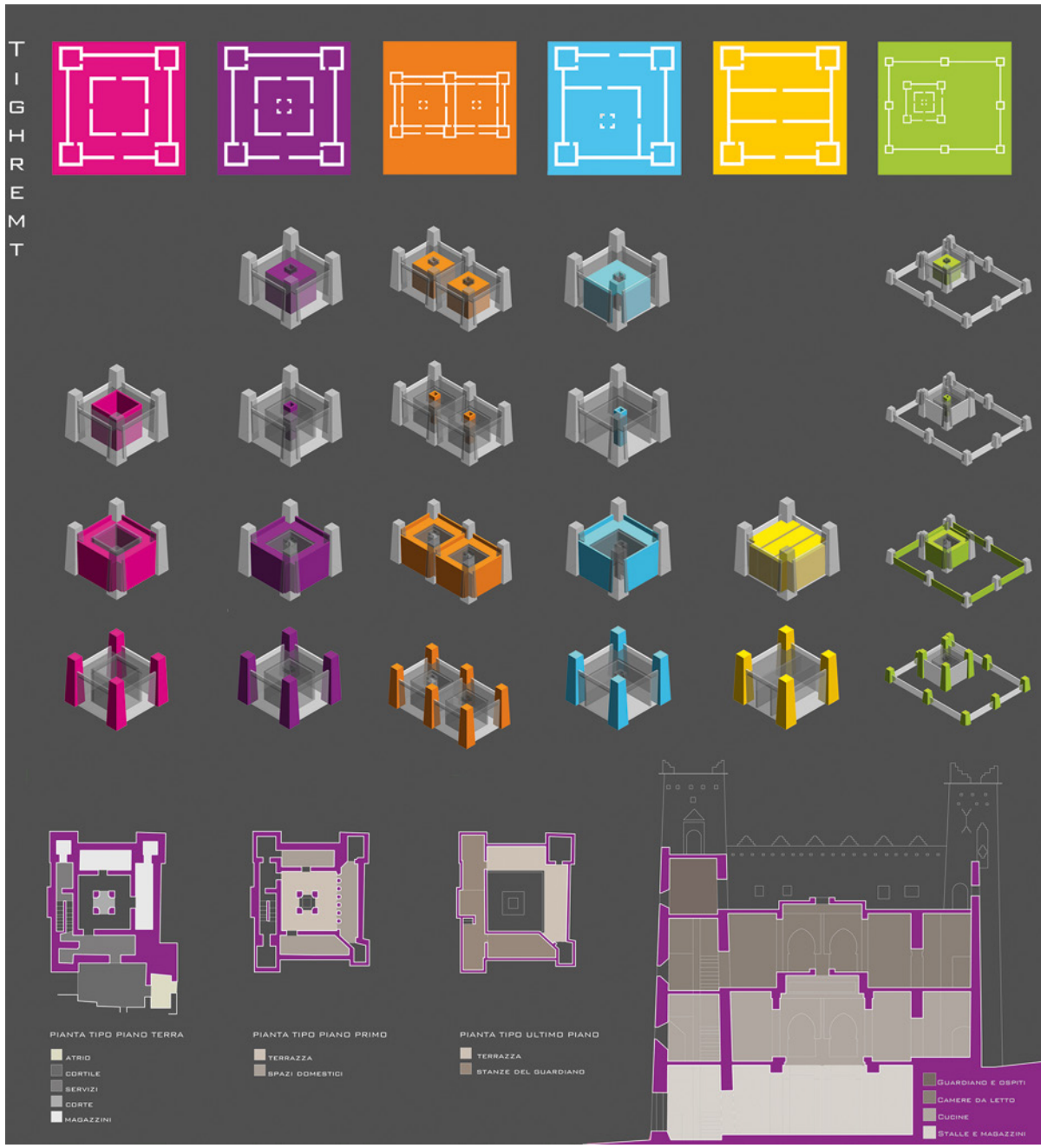

FIGURE 4.2 *The typology of the Draa valley* tighremt
DRAWINGS: GIORGIANNI, TAVILLA AND DE PASQUALE (2013).

have a rather formal and aesthetic value. They are often interrupted by a wooden element that acts as a chain, and also the characteristic protruding shape of the arch (which is due to the arrangement of the wooden supporting structures). The structure within the court is entrusted to the wooden beams of palm, and small wooden boards arranged so as to form small projections, on which

the bricks that form the decorations are arranged. The wooden structure within the court is hidden by plaster (*tamassalt*) which covers and protects it from rainwater.

Surveys

In the region of Draa Valley we surveyed more than ten *tighremt*, and an initial cataloguing of our findings is shown in the figure 4.3 (fig. 4.3). The importance of these buildings enables a thorough reflection on the quality of this architecture and on the conservation status of this fragile heritage. Many of the *tighremt* detected, in fact, have partially collapsed; in other cases, while the *tighremt* are still inhabited, the continuous restoration that these buildings require tend to change the appearance, and to cancel out delicate decorative elements, which are characteristic of these buildings. Some texts such as "Manuel de conservation du patrimoine architectural en terre des Vallées présahariennes du Maroc", published by CERKAS during 2005, with the support of UNESCO suggest not replacing the decorations with simpler ones during restoration. It asks you to use reliable graphic sources.

Instrumental surveys of these buildings allows users to record, with absolute precision, a moment in their development. It allows you to pass on the nature and morphology of the *façades*, the decorations, and the mouldings. It allows you to read deformations the buildings suffer, due to water seepage, or landslides of the sandy ground. These surveys are therefore essential documents for appropriate restoration, so as to pass on the quality of the architecture. Furthermore, measurements have allowed new reflections on the morphology and geometry of these buildings (figs. 4.4, 4.5 and 4.6). The study, still in progress, has tried to verify some assumptions—such as the structure of the corner turrets. The laser scanner survey and "clear view" visualization, which makes the walls transparent, allows you to understand both the inside and the outside at the same time, check what key points should be measured, and what the correlation is between the small slits decorating the crowing of the turrets and the floors.

Looking through this mode, we can check that they are actually the gargoyles that allow the elimination of excess rain. In other cases we can see where the wall tapers to accommodate the beams of the floor. The survey permits the understanding of the relationship between the towers and the perimeter walls that extend for a dimension equal to double, about 8 m between the turrets, in the small *tighremt*. In the *tighremt* with the wider court, Lakdima, Aslim, the pitch is equal to four times. The corner towers, in these structures, are often accompanied by other structures strengthen the high outer walls and contain the staircase. These latter are usually placed at the four corners of the plan. In the end the morphology of the towers and the courtyards was compared. Figure 4.7 shows ten *tighremt*, ranked from the smallest to the largest, and points out the system of the court and the turrets. The figure, in the lower part, shows the schematic dimensions of the analysed elements, so the dimensional and morphological comparison is more direct.

In the drawings the correlation between the size of the tower and the court is clear. In fact the smaller *tighremt*, Moquaddem, Ouled Othmane, Taakilte, Taghzout, Tamekasselt, and Tansik have the court of the same size as the tower, the module fluctuates around 4 metres. When the size of *tighremt* increases (as is the case of Aslim, Tamnoulgalt, and Tinzouline), the court widens, and the architecture becomes more sophisticated. Indeed, in the *tighremt* of Aslim or Tamnoulgalt, we find flamed arches, columns, and greater heights. It is important to note the construction technique strongly influences the morphology. In fact, even in the case of important buildings, arcs have modest spans, 2.5 metres like Aslim, and Tamnoulgalt. Grandeur is obtained with repetition of the same module. These courtyards have 5/6 arches on each side, and maintain, in the plan, the square shape of the smaller ones. The larger size produces

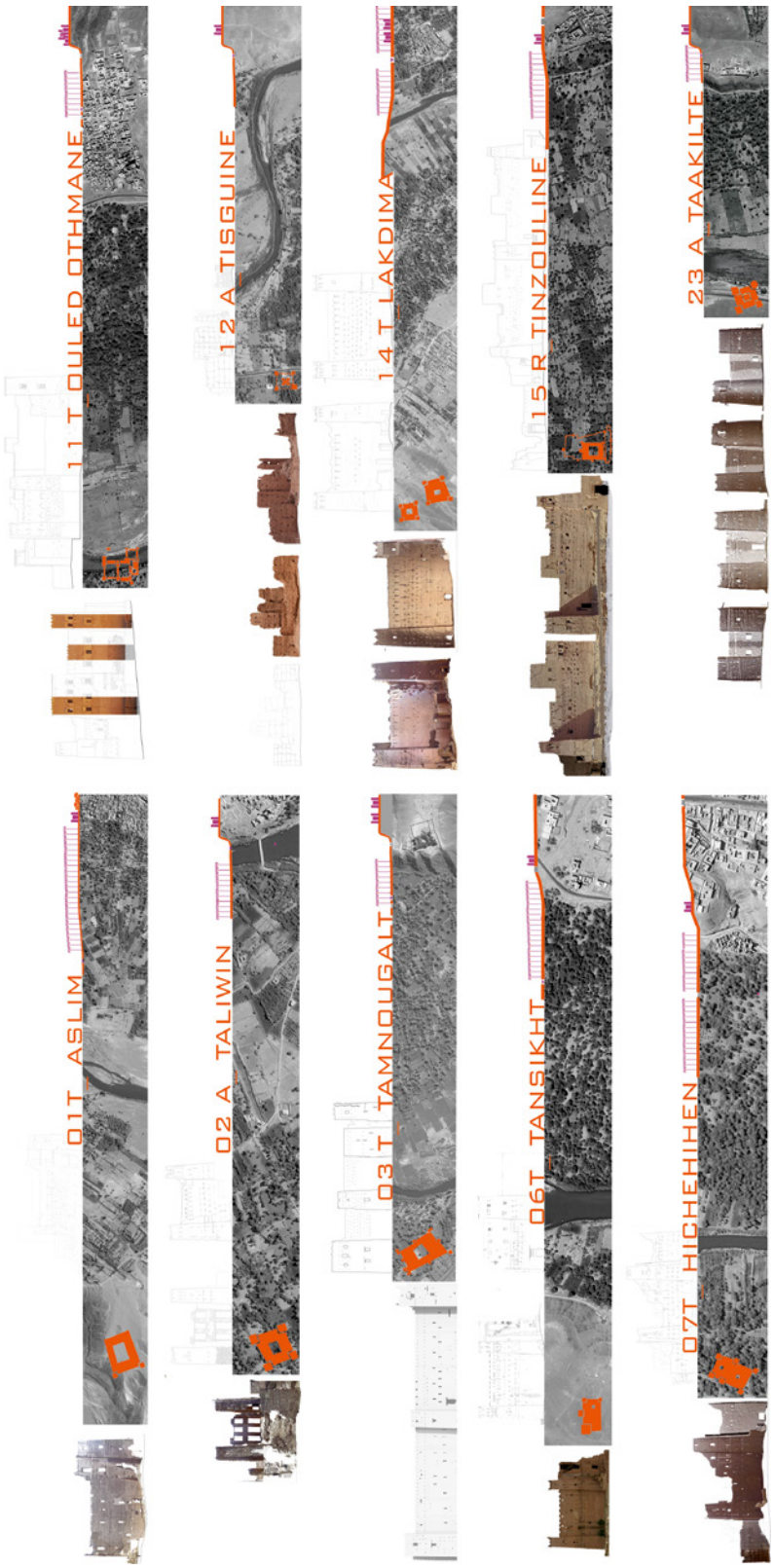

FIGURE 4.3 *First cataloguing of the Draa valley* tighremt
DRAWINGS: ARENA.

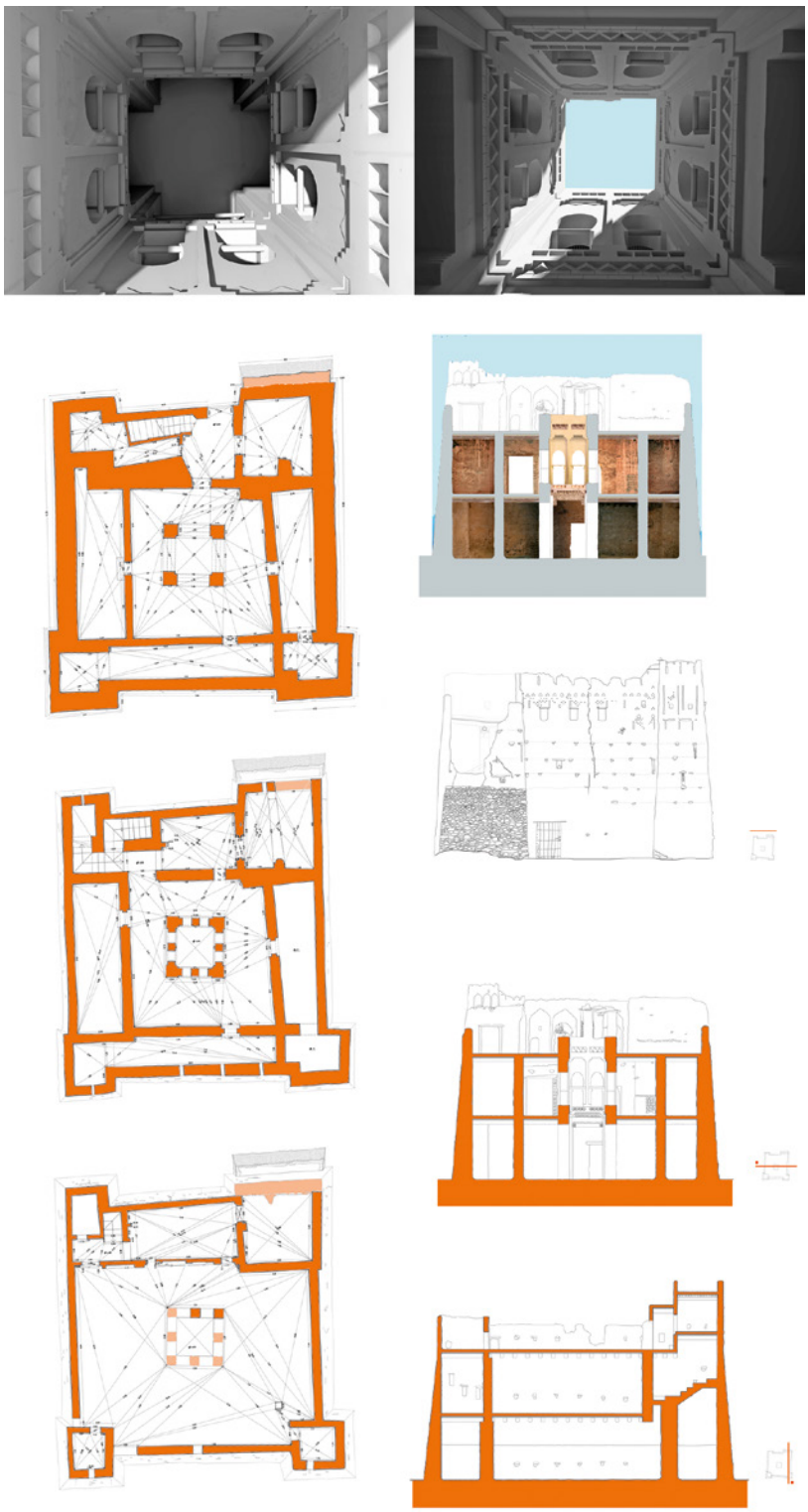

FIGURE 4.4 Tighremt *Moquaddem,* tighremt *Taghzout,* tighremt *Lakdima*
DRAWINGS: PIRRI, BELLA, BORRELLO, ROMATO, NAIMO, QUATTROCCHI, MACCARRONE, MANFRE AND CAVALLARO, 2011–2017.

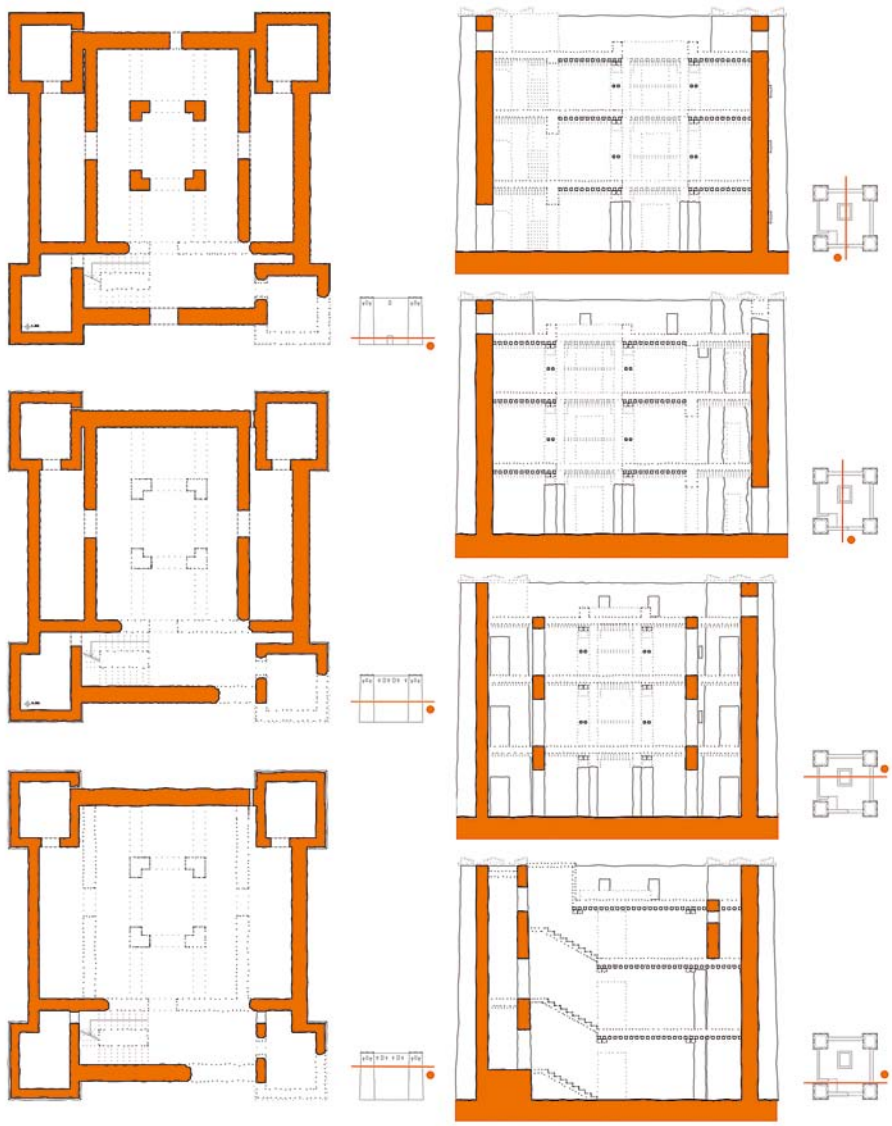

FIGURE 4.5 Tighremt *Moquaddem,* tighremt *Taghzout,* tighremt *Lakdima*
DRAWINGS: PIRRI, BELLA, BORRELLO, ROMATO, NAIMO, QUATTROCCHI, MACCARRONE, MANFRE AND CAVALLARO, 2011–2017.

thinner turrets, with a ratio, between base and height, equal to 4/5, as in Aslim and Tinzouline. Moreover, it is evident that the use of the arch is linked to the environment's decorative function. The ground floor in the smaller *tighremt*, destined to be a warehouse or animal shelter, is without arches. Horseshoe arches with the characteristic wooden chain (figs. 4.7, 4.8, 4.9 and 4.10) decorate the first level, even in the more modest buildings.

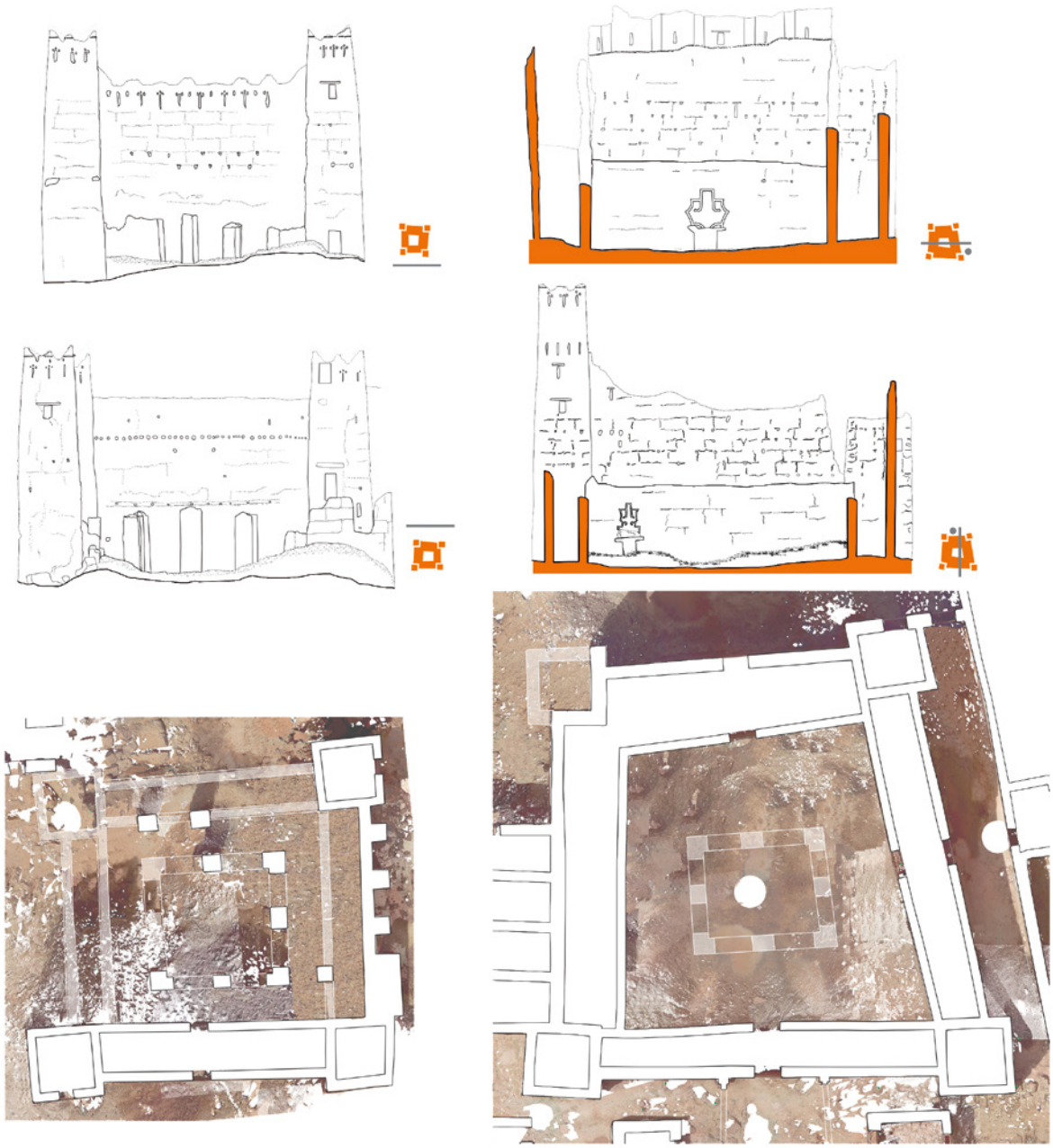

FIGURE 4.6 Tighremt *Moquaddem,* tighremt *Taghzout,* tighremt *Lakdima*
DRAWINGS: PIRRI, BELLA, BORRELLO, ROMATO, NAIMO, QUATTROCCHI, MACCARRONE, MANFRE AND CAVALLARO, 2011–2017.

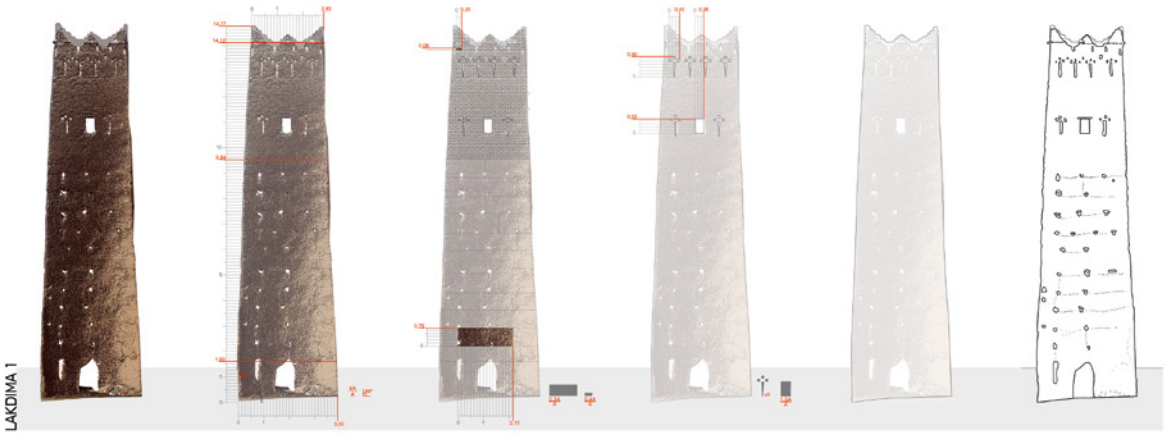

FIGURE 4.7 *Tower analysis*
DRAWINGS: GRASSO (2014).

Igherm/Qṣūr

The report made by Minister of Cultural Affairs for his visit to China, *L'architectures terres de dans le Sud Marocain,*[7] says that the concentration of earthen architecture in Dades, Draa, Southern Morocco, Toudgha and Ziz Valleys, can be explained by the geomorphological environment, economic reasons, and low cost construction. Villages located on the edge of the oases, are called *qṣar* in Arabic (plural *qṣūr*), the corresponding Berber word being *igherm*. In 1969, project report "Rural Habitat—Renovation"[8] says that *qṣar* "obey to the principles and rules of the local community self-sufficient and self-defence by outside".[9] During 1970, the PAM program funded restored of some villages; in rural areas, near main roads, new villages were built. While taking over architectural models of ancient settlements, the new villages are unable to maintain the prestigious architectural language and quality. Their *façades*, the proportions of the towers, and their construction techniques are modified and distorted. Old villages and great houses are abandoned.

The landscape south of Zagora, between Agdz and Tamegroute, is linear and continuous: a green band, little more than a kilometre wide, plows a valley with a constant morphology, and cross section with few characteristic elements. The water draws the geography of these places. The river separates two edges of cultivated land; at regular intervals, the ancient Berber settlements are distinguished by colour, contrast, and texture. Now, new agglomerations incorporate the ancient villages abandoned and crumbling, or are flanked in anonymous compositions. Along the valley there are more than three hundred *qṣūr* (or *igherm*), and Ḳaṣaba (or *tighremt*). The water builds a landscape of essential elements: the river, oases, and architecture. The variation of one element leads to the alteration of this environment. The three elements are repeated in their uniqueness, in their essence, and in the capacity to accommodate human groups. They create streams of things and people moving, once, from south to north, transporting merchandise and people from sub-Saharan Africa, Niger, Mali, and Mauritania.

7 Fadli *et al., L'architecture de terre dans le Sud Marocain.*
8 Mouline, *Habitats des qsour et casba des vallees presahariennes.*
9 Anonymous, "Habitat rural—Renovation".

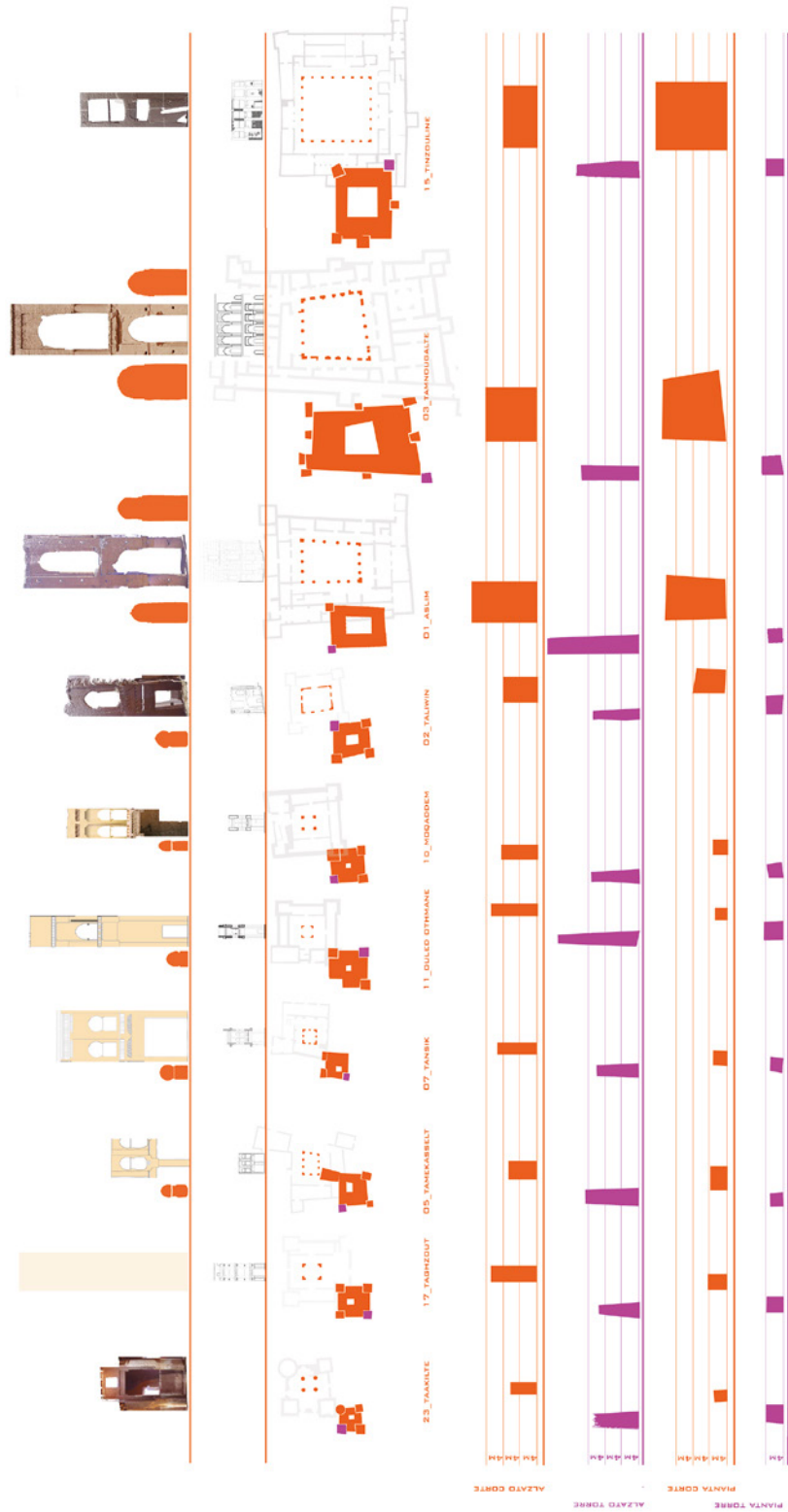

FIGURE 4.8 *The system of the court and the turrets*
SURVEYS: ARENA.

FIGURE 4.9 Tighremt *Lakdima. Surveys with laser scanner*
DRAWINGS: ARENA.

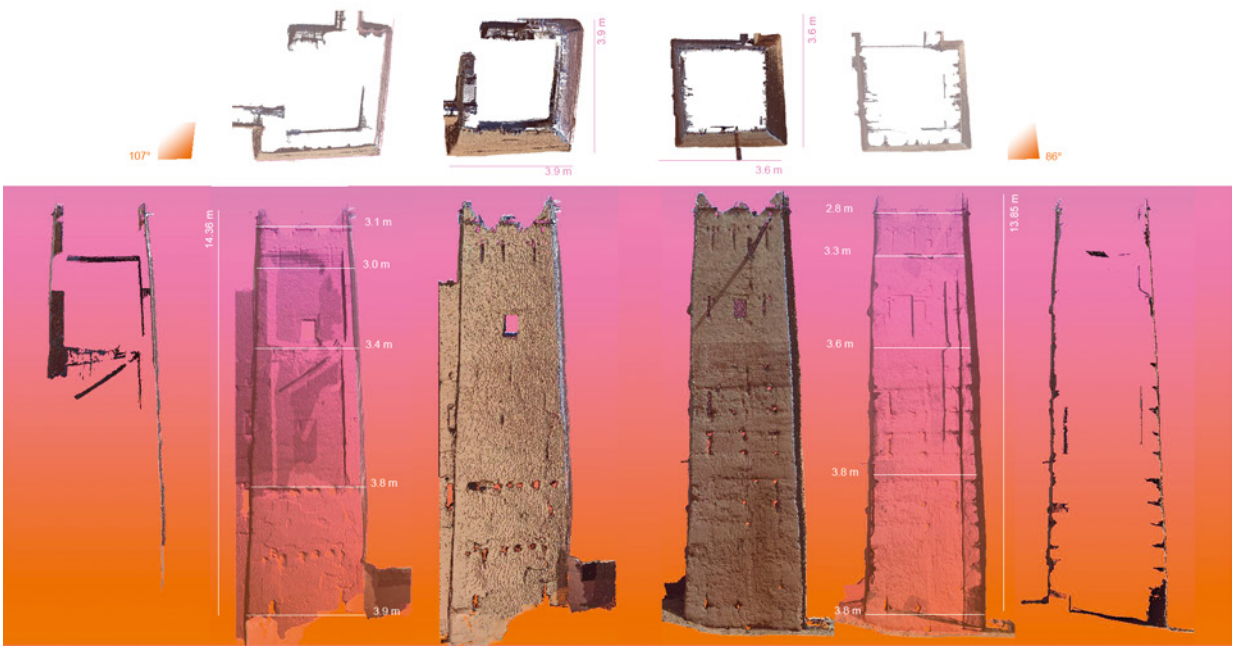

FIGURE 4.10 Tighremt *Lakdima. Analysis of the towers*
DRAWINGS: ARENA.

Today, people move in the opposite direction, from north to south, carrying "modern" materials, bricks, clothing and plastic containers. Few are, now, the things that the south exports towards north. *Igherm* and *tighremt* are works for a landscape built, as if invoking the saying "you can resist time for the time you can resist". City and houses live because "generations of men and families put their hand periodically continually rebuilding". Settlements ceases to withstand time when they are abandoned, in fact "when the house collapses you retrieve the precious wood [...] the walls with the wind and the water will melt. The land returns to where it was collected, a new home, a new village is built". In this way, there seems to be a loss of memory and constructive knowledge. New materials (modern and cheap) are used, materials that do not require frequent maintenance, which "withstand time". This loss of memory is also a lost social identity.

Drawing the Draa Valley Architecture

Identifying *Igherm* and *tighremt* in the Draa Valley, cataloguing for formal and functional categories, the choice of surveyed examples were the first steps that highlighted the quantity and quality of the architecture (fig. 4.11). Landscape sections made it possible to understand the relationship that exists between the village, the house, the oases' gardens, irrigation canals, and the river. Drawing also reveals architectural consistency of collapsed parts and those that still resist the passage of time. In my opinion, the drawings and surveys are starting points for search of useful elements to build the vocabulary and grammar forms, misrepresented and distorted by the inability to read the schedule of this territory. *Tighremt* drawings tell us about family structure and the *igherm* plan tells us about the social stratification of the inhabitants. This is not popular architecture. Who builds *igherm* is a community and the heads of the community and religion makes the decisions. Who builds a *tighremt* is a rich owner, the head of a wealthy family. The typology is regular, the geometry defined, the *décor* sumptuous. We are faced with signs that communicate social and religious symbols. Although *tighremt* architecture elements and *igherm* layout are clear and arranged in repeated form, the formal debate on the origin and composition is confused and unresolved. We identify elements attributable to Roman-Byzantine architecture for example: patio houses and *cardo maximus* of the cities. In fact, the *igherm* layout seems to evoke the classical Roman cities.

The rectangular fortified perimeter, the presence of a main road (*cardo maximus*) from the city gate, and the minor roads (*decumano maximum*) that aggregate housing, seem to have been influenced by cities such as Volubilis in northern Morocco, and Timgad in Algeria (to name examples geographically closer). In the urban setting, placement of buildings for public use near the entrance (with a clear separation from the area of housing, and the division into districts according to ethnic groups and hierarchical groups, social and religious) repeats the pattern of the large medinas of *maghreb* (fig. 4.12).

Igherm are near a water source; this ensures the cultivation of the oasis and the survival of the city. Draa Valley *igherm* can be divided into two main morphological categories: those in regular plan, probably the oldest, and those with an organic plan poorly defined, which are developed around a *tighremt*. The decision to use the term *igherm* (Berber, rather than *qṣar*, Arabic) is due to the note by Salima Naji about the choice of Henri Terrasse to use the term *Ḳaṣabas* for the title of his work, "it is interesting to note the paradoxical choice of using an Arabic term *Ḳaṣaba* to indicate Berber architecture".

Igherm is a village surrounded by defensive walls with surveillance towers. The walls are the main element of the *igherm* defence; they generate the fence, a boundary between the oasis and desert outer space and the village. *Pisé* is construction material, and its shape can have symbolic meaning to the village's social reality. Rows, heights, towers, and main door decorations transcribe tribal codes. Plans perfectly aligned, heights proportional *pisé* rows, about of 80 cm height. Wall height as the thickness derived by the length, since the time of the construction and location. *Igherm* built on plains are low and do not have very thick walls. Wall perimeter on each side is broken at regular intervals by towers, one in the middle, near the front door, two are placed at 2/3 of the length, etc., there are eight in Tissergate.

Draa Valley *Igherm* tower, unlike *tighremt*, are stubby: the ratio between base and height is 1:2 (and in some cases of 2:3). At about 1/3 presenting, a kind of *entasis* accentuates robustness. The verticality is emphasized by the proportion with the wall that emerges for about twice the height. Two-thirds of the tower is made in *pisé*, the top is made with adobe which allow decoration. To protect the top of the wall and the parts in adobe, subject to erosion by rain-washing, a row of rods sewn with a rope is placed under a layer of mortar that goes out about 15 cm from either side of the wall. To counteract the force of the wind, the corners and

FIGURE 4.11 Igherm *in the Draa valley*
DRAWINGS: RAFFA.

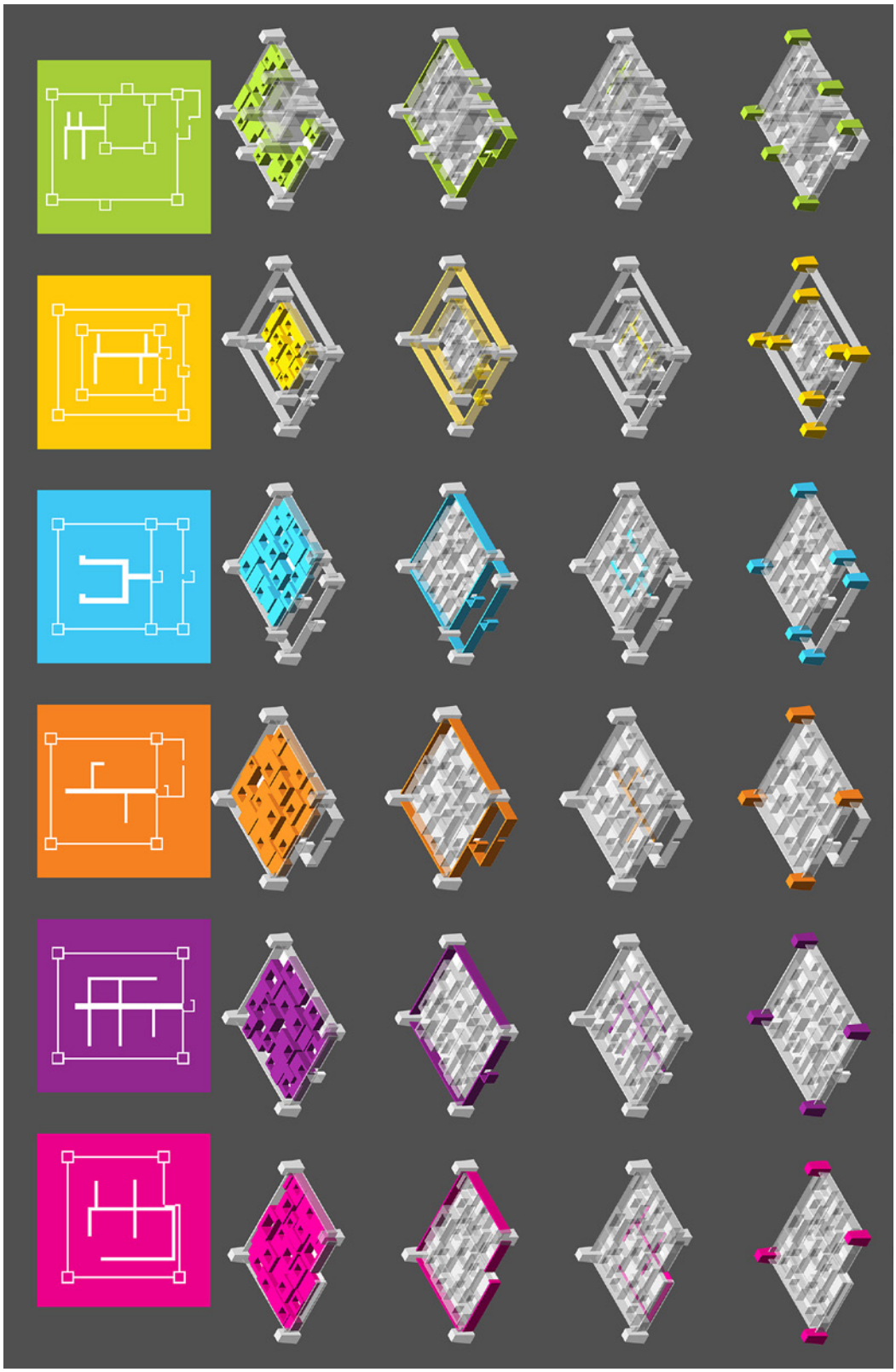

FIGURE 4.12 Igherm *analysis*
DRAWINGS: GIORGIANNI, TAVILLA AND DE PASQUALE (2013).

sides are reinforced with triangular battlements made with adobe brick. The wall is plastered with a mixture of earth and fine straw (fig. 4.13). The decorated main gate marks the entrance to the village and the prevailing direction of village, either inserted in the walls, or protruding outer wards. The entrance is one of the invariant features. An L-shaped wall often precedes a part protruding from the wall with an arched door.

The entrance is a rectangular room divided into two parts: one part on the porch (with arches and raised benches), the other the road (that leads inside the village). Stone benches, and jars for water, or fire for tea in the entry assumes the function of meeting place, where the most important people assemble, and in which travellers and merchants are housed. A second door leads into a large open space (*amalal*) where there is the market, the assemblies, and celebrations. Here there is a place for animals, common storage for cereals, water tanks, and a guardian lodging. From this open space, the road begins. The main street, wide and straight, divides the residential neighbourhoods. Near the entrance and the square small craft shops, bakery, a *fonduk*, and the mosque are located. Outside the walls is a cemetery with the mausoleum, and near-by a large free space for nomads' caravans on market days. All around are the agricultural fields that are redesigned on a wider scale according to the social structure of the city (figs. 4.14, 4.15, and 4.16).

A sacred place, in *igherm*, is a complex architecture that includes a prayer room, ablution rooms with cistern and baths, a fireplace to heat water, a ladder to reach the terrace from where the muezzin calls to prayer. Sizes of mosques varies according to the size of the village.

The Aslim mosque is located near the oasis, probably near a main gate. Accessed by a square, a portal with an arch jutting from the *façade* standing up to two levels, and marking the entrance. This is a room with a stone bench that leads into a hallway. The corridor leads to the stairs connecting to a terrace, to the prayer room, lower than the entrance, two rooms for ablutions, the school and the garden. The vast, rectangular prayer hall has 30 pillars aligned in 6 rows of 5 arches.

Arches between pillars are of various shapes, raised arches, horseshoe shaped, that are pointed. The *qibla* wall is marked by a row of small arched niches for candles one meter above the floor, and the *mihrab* is highlighted by a cover with two small arched loggias on either side. Next to the *mihrab,* a door leads to the garden overlooking the oasis, home to two tamarisk trees. Two ablution rooms flank the prayer hall. Systems of four pillars with horseshoe-shaped arches define the patio with the well. On the floor are low basins for washing, connected to the local water heating system. The *madrasa* is attached to the mosque, as in most *Igherm.* In other villages, the mosque is small with few rooms (fig. 4.17).

Between the houses, *Igherm* roads are spaced; they have no function other than that of the giving access to the neighbourhood, providing privacy, and security. Using gates, roads going in the district are closed at night. The road structure is minimal. Streets are narrow and blankets from the upper floors of the houses, covering them create shadows (fig. 4.18). Simply juxtaposed, houses are arranged next to each other. The rule of proximity fulfils the imperative, to occupy the smallest possible space. Each neighbourhood is distinctly separated and organized into hierarchies (for example, the ethnic neighbourhood of Jews, notables, slaves, etc.), and each occupies a privileged position regarding the mosque, the front gate. The *igherm* house is a courtyard type. Houses develop in height. On the ground floor, the entrance is a compartment that distributes a staircase that leads to upper floors and the service areas. A central room is meant for housing animals and tools, with rooms around the warehouses to preserve food. The first level is distributed around a courtyard, *assarag*, surrounded by a gallery with arches to double or triple height. The hole that emerges on the terrace is protected by a grid of wood or iron. From here, comes a soft light that protects it rooms of the house from the heat.

The first level is still a service plan, with an area for cooking, and furniture built into the perimeter

FIGURE 4.13 *The main gate of* Igherm
PHOTO: RAFFA.

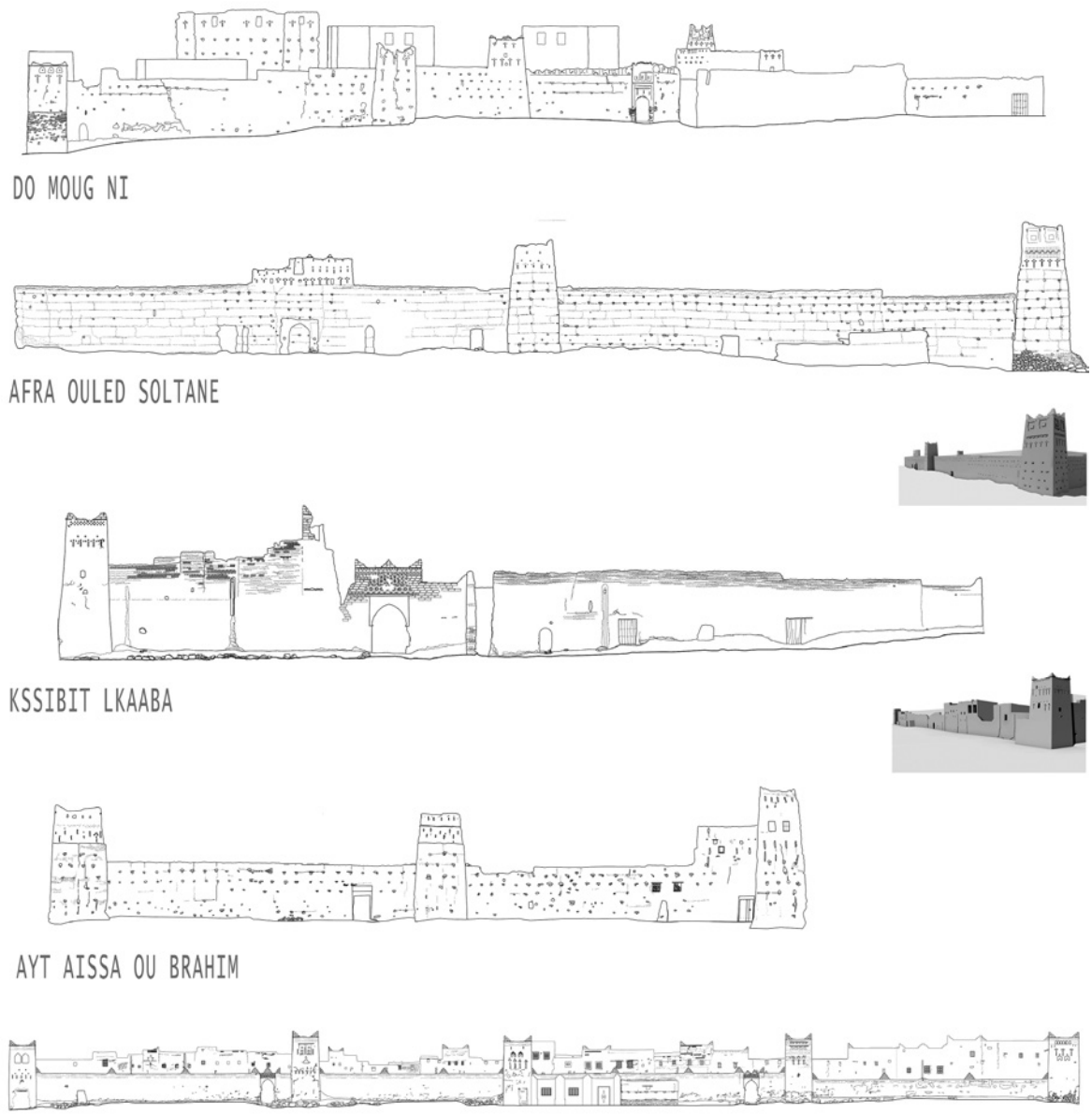

FIGURE 4.14 *Igherm's exterior walls*
DRAWINGS: PIRRI, BELLA, BORRELLO, ROMATO, NAIMO, QUATTROCCHI, MACCARRONE, MANFRE AND CAVALLARO, 2011–2017.

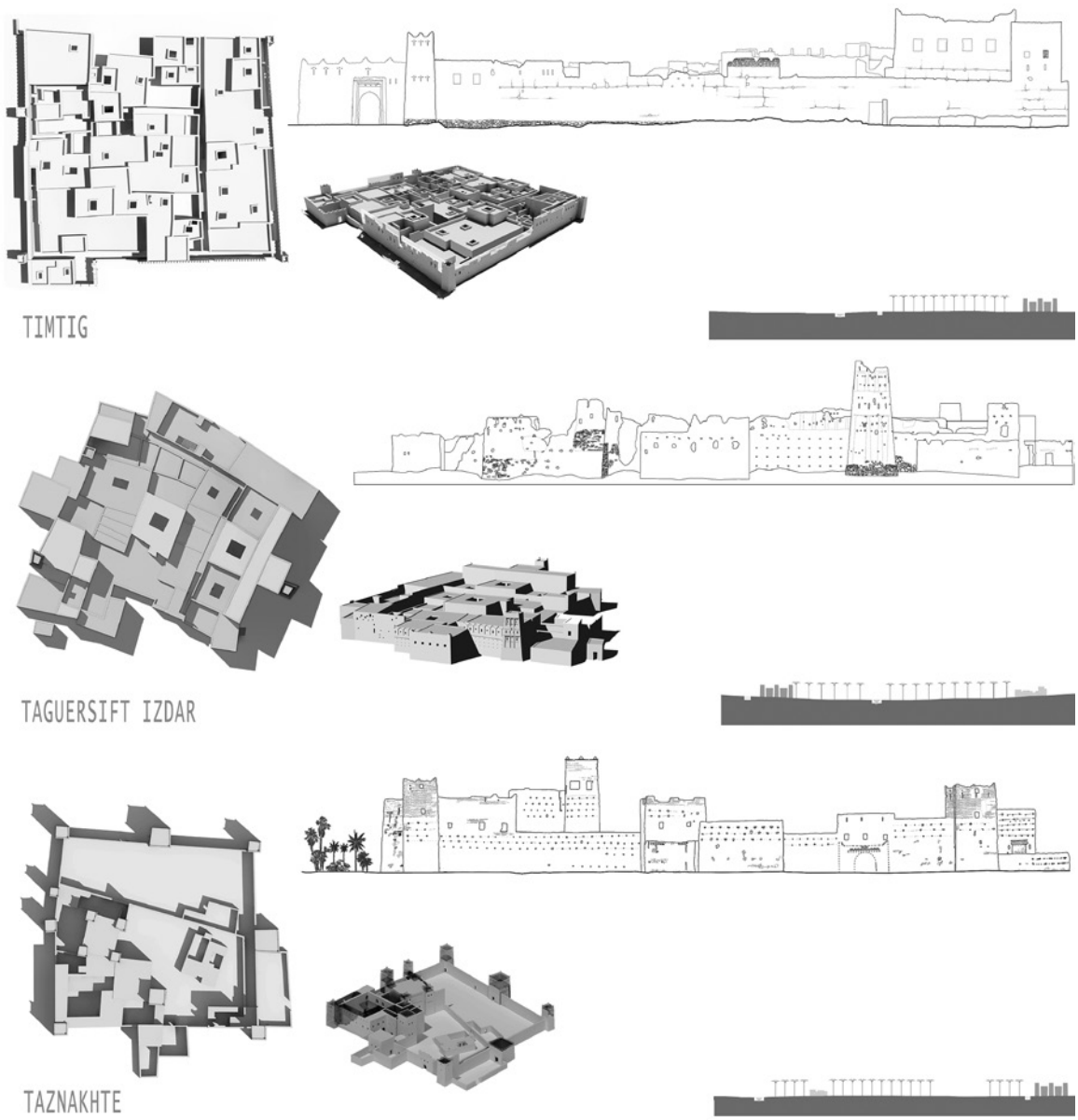

FIGURE 4.15 *Igherm's exterior walls*
DRAWINGS: PIRRI, BELLA, BORRELLO, ROMATO, NAIMO, QUATTROCCHI, MACCARRONE, MANFRE AND CAVALLARO, 2011–2017.

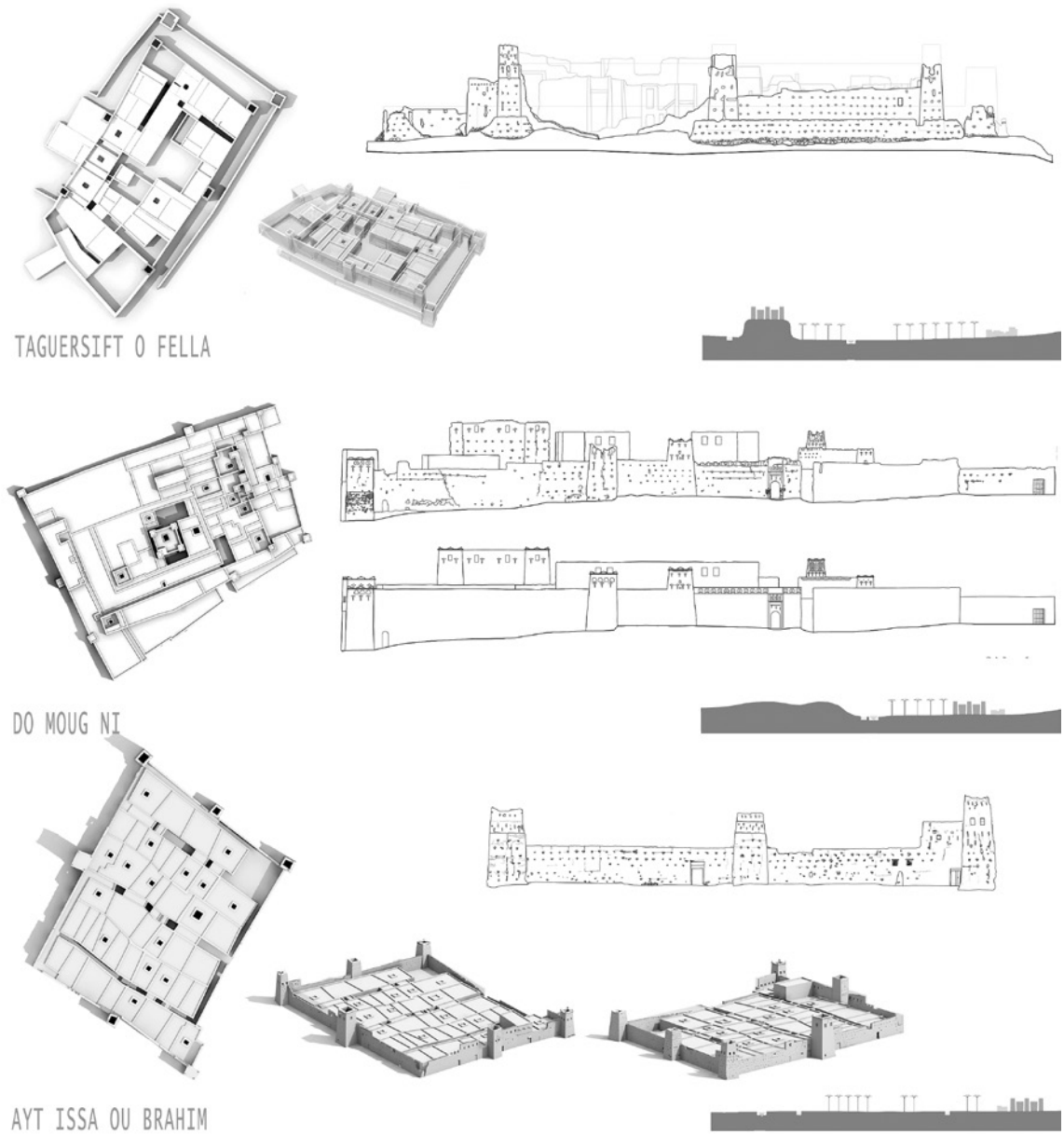

FIGURE 4.16 *Igherm's exterior walls*
DRAWINGS: PIRRI, BELLA, BORRELLO, ROMATO, NAIMO, QUATTROCCHI, MACCARRONE, MANFRE AND CAVALLARO, 2011–2017.

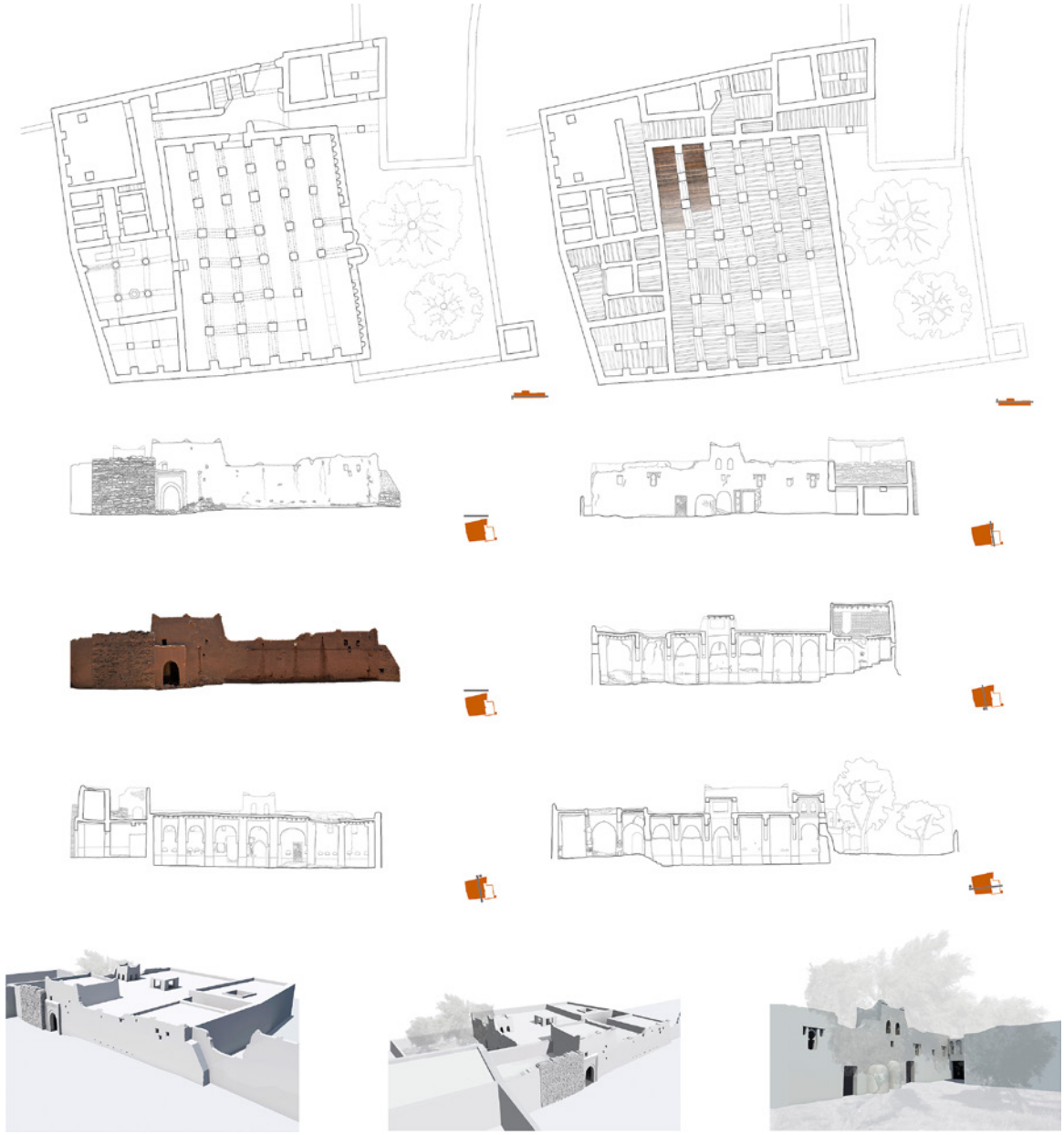

FIGURE 4.17 *The mosque*
DRAWINGS: GRASSO M., GRASSO R., MUSUMECI, LAURIA, FAZIO, INGEGNERI, D'AMICO, 2014.

FIGURE 4.18 *Igherm's streets*
PHOTO: RAFFA.

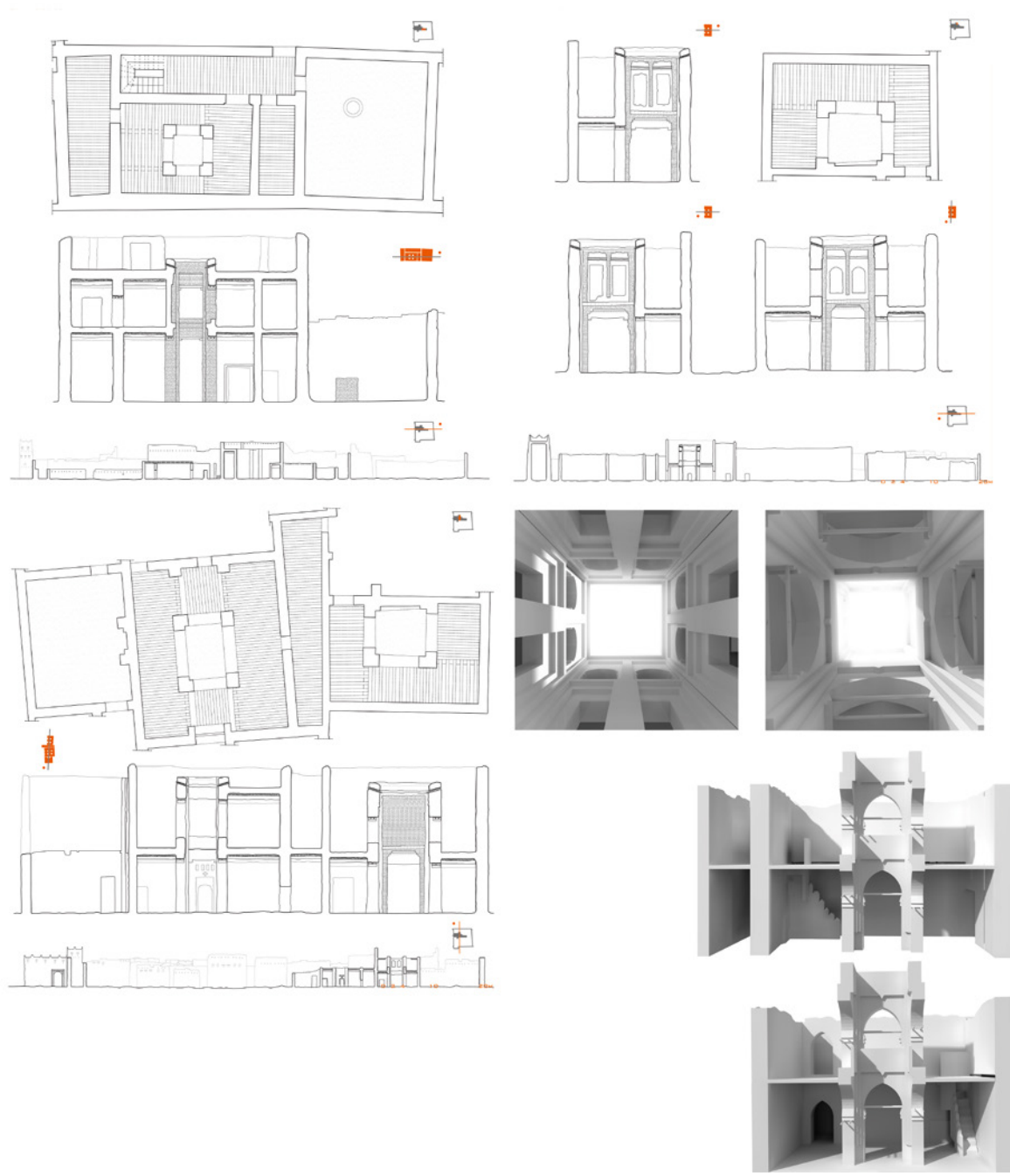

FIGURE 4.19 *Igherm's streets*
DRAWINGS: PIRRI, BELLA, BORRELLO, ROMATO, NAIMO, QUATTROCCHI, MACCARRONE, MANFRE AND CAVALLARO, 2011–2017.

FIGURE 4.20 *Courtyard,* assarag
PHOTO: RAFFA.

walls, and a hearth modeled from the floor. The second level is the living area, with rooms overlook the central courtyard. The last level is a terrace, important in all the dwellings. Even here, there are one or two rooms. Depending on the house size, surveyed types have two, four or six central pillars. Used for the construction of the perimeter walls, *pisé* is used for the construction of the ground floor walls and the adobe of the upper floors, columns and arches. While adobe helps organize geometric decoration in courtyard, inside rooms are decorated with paintings. When *igherm* reaches its maximum size, the expansion takes place outside, erecting walls juxtaposed on previous units or constructing another nearby. Some of wealthiest families choose to break away from the group, and found independent units inside these *tighremt* (figs. 4.19 and 4.20).

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CHAPTER 5

The Use of Earth in the Construction of the *Qṣūr* in Southeastern Algeria

Mounia Chekhab-Abudaya

The *qṣar* corresponds to a type of human settlement that is widely distributed in the Sahara desert, including many examples located today in Libya, Mauritania, and Mali, southern Algeria, southern Morocco, and southern Tunisia. This architectural model is characterized by its use over a wide-ranging time span—probably since the early first millennium BCE, according, to ancient structures recorded by the archaeologist Mattingly in the Libyan Fazzān.[1] This model might have given the scale for the construction of similar edifices that were adapted to the desert. This phenomenon has its origin in exchanges over long distances between populations of the Maghreb and the *Bilād al-Sūdān*, as well as between Africa and the *mashreq*. During the medieval period, a further influence is the Islamization of this geographical area, in particular the diffusion of the Ibāḍism movement.[2]

This type of settlement is also a direct reflection of a syncretism between the lifestyles of sedentary and nomadic populations. Based on a systematic analysis of twenty-six sites located in southeastern Algeria, and compared to similar constructions in the Sahara,[3] the *qṣar* can be defined as a fortified village, generally ovoid, built at a height on a rocky promontory (*gāra*, pl. *gūr*) and near a *wādī* (figs. 5.1 and 5.2).

The *qṣar* also presents a fortification system consisting of a wall punctuated by towers and gates. Urban planning of sites observed in southeastern Algeria shows first determinism related to the morphology of the land, as well as the immediate natural environment (palm grove, erg, depression, or rocky plateau). This environment directly influences building materials used in the construction, and how the spaces are distributed inside the city. Thus, proximity to a source of water forces people to adapt to the topography of the sites on which they settled. In addition, height occupies a crucial place in the organization of the plan. The *qṣūr* of the Rīgh and the Miya (except Gāra Krīma) were built at a low height, while those of the Gāra Krīma, al-Manīʿa, and Mzāb marry the shape of high isolated mounds (*gūr*) and sometimes extend below (fig. 5.3).

Whereas the Great Mosque is located at the center of the town, and is accessible only to the residents, the market is typically situated on the periphery,

1 Mattingly, *The Archaeology of Fazzān. 1*, 136–148. See also the recent Italian archaeological mission in the oasis of Ghāt in Libya dated 1st and 2nd centuries BCE, Castelli *et al.*, "A Preliminary Report of Excavations in Fewet", 195–216.

2 Ibāḍism is a doctrine established by a group founded in Baṣra under the name of *jamāʿat al-muslimīn* ("community of Muslims"), led by ʿAbd Allāh ibn Ibāḍ, who gave his name to the movement. This is one of the branches of Khārijism, which refers to the movement led by some of ʿAlī's supporters who refuted the legitimacy of succession put in place after Muḥammad's death and, particularly, arbitration (or *taḥkīm*) accepted by ʿAlī following different oppositions. Different currents of Khārijism developed in spite of repressions that took place starting from the Umayyad period. After its muzzling by the Abbasids, the movement started to extend in the Maghreb, while taking advantage of the Berber claims. Two branches developed: the Ibāḍīs Rustumids of Tāhart— founded in 143/761— and the Ṣufrīs with the Midrārids of Sijilmāsa. Prévost, *Les Ibadites, de Djerba à Oman,* 5–35.

3 This was part of my Master's, then PhD research, undertaken between 2005 and 2012.

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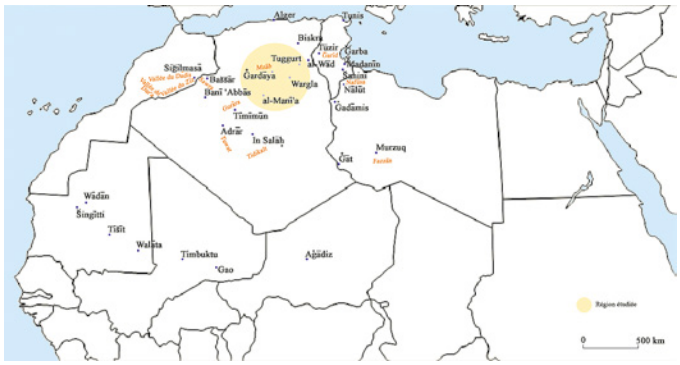

FIGURE 5.1
Map of North Africa featuring southeastern Algeria's Qṣūr *and other comparative main sites, 2011*
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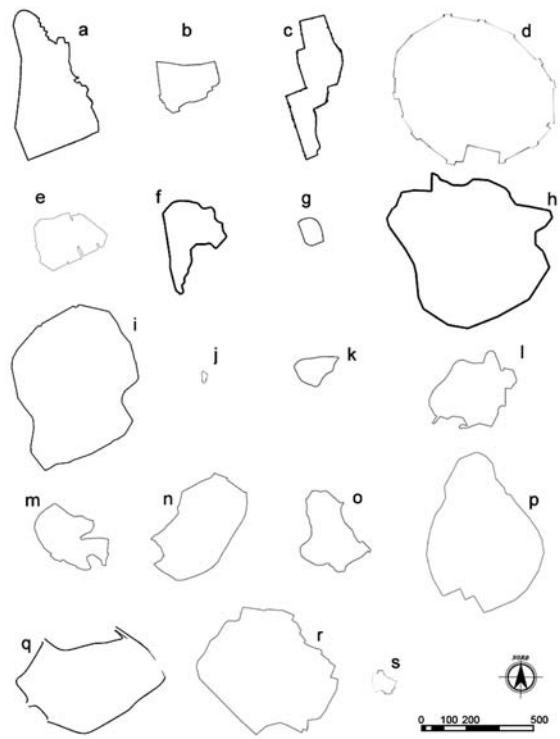

FIGURE 5.2 *Comparative table of the* Qṣūr *of ovoid shape, 2011. a) Nazla; b) Zāwiya Sīdī al-ʿAbid; c) Tibisbist; d) Mistāwa; e) Tammāsīn; f) Gāra Krīma; g) ʿAjaja; h) Rwisat; i) Wargla; j) Tal Azḍīt; k) Bābā Saʿd; l) al-ʿAṭf; m) Bū Nūra; n) Banī Izgan; o) Malika; p) Barriyān; q) Garrāra; r) Ghardāya; s) al-Manīʿa*
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revealing the wider role of the *qṣar* as a relay on the trans-Saharan trade routes. The *qṣar* usually includes a *qaṣba* as a place of power as well as a residency for the ruler. Spaces inside the *qṣar* are organized according to a tribal hierarchy, with specific districts and a complex lane network (fig. 5.4).

Data analysis observed on this corpus shows the primacy of construction built with limestone and a local mortar (*timshant*). Mud bricks (*ṭūb*) are used mainly in domestic architecture, fortifications, and sometimes the *qaṣba*.

After drawing briefly the historical context for the establishment of this group of *qṣūr*, this paper highlights the influence of earth in their construction, and the importance of the local particularism in this region, especially in relation to the environmental context of their creation, when compared with other regions of the Sahara.

Some Historical Elements for Understanding the Development of the *Qṣūr* in Southeastern Algeria

The first documents of the Islamic era for the region date back to the 3rd/9th century, and they have, thanks to textual sources, information regarding southeastern Algeria, which is commonly called the "Lower Sahara".[4] Until the arrival of Hilālī tribes, the Sahara is dominated by six groups of Berbers, among them the Zanāta, who

4 For a detailed study of the medieval history of the region, see Aillet *et al.*, *Sedrata, Histoire et archéologie d'un carrefour du Sahara medieval,* 1–71. See also Aillet, *Espaces et figures du sacré dans le bassin d'Ouargla,* 169–207.

FIGURE 5.3
Qṣar *of al-Manīʿa in 2005*
CREDITS: CHEKHAB-ABUDAYA.

FIGURE 5.4
Ghardāya in 2005
CREDITS: CHEKHAB-ABUDAYA.

inhabited this region during the medieval period and had joined the Rustumid power of Tāhart. Their origin is still unknown because of the migrations, contacts, and ethnic crossroads that animated the Sahara throughout its history. Arab writers gave the Zanāta various genealogies: sometimes affiliating them with Nilotic peoples, sometimes describing as descendants of the Arabian Peninsula, or of Goliath in sources like al-Idrīsī and Ibn Khaldūn.[5]

According to Ibn Khaldūn, who outlines the various branches of the Zanāta tribe, the Banū Rīgha of the *wādī* Rīgh come from the Maghrāwa;

5 al-Idrīsī, *al-Maghrib wa Arḍ al-Sūdān,* 57; Ibn Khaldūn, *Tārīkh al-ʿAllāma,* vol. 7, t. XIII, 3–4.

the Banū Wargla of *wādī* Miya belong to the Farīnī, the Banū Mzāb descend from the Banū Waṣīn. Al-Manīʿa is not mentioned, but the boundaries corresponding to the location of the Zanāta tribe make it possible to identify them as well in this area.[6] These genealogies are, however, problematic in the sense that Berbers operate on a matriarchal system (as opposed to what is mentioned by Ibn Khaldūn). The Zanāta are however described as *qawm raḥḥāla* (pastoral nomads) and *mutaḥaḍḍirūn* (sedentary farmers). These semi-sedentary factors highlight their role in the founding of the *qṣūr* and reflect indeed the lifestyle that is inherent in their construction.[7]

The fall of the Rustumid dynasty to the Fāṭimid armies during 296/909 led to the destruction of Tāhart, and the flight of the Khārijits to the Sahara.[8] Part of them gradually settled in the Miya, the Mzāb, and certainly in al-Manīʿa.[9] Biographies (*siyar*) established by al-Shammākhī (10th/16th century), based on the writings of Abū Zakariyyāʾ (5th/11th century), also mention many *shuyūkh* transiting the Rīgh and Wargla during (and after) the fall of the imamate, thus demonstrating the role of this region as a distribution pole of the *Ibāḍī* doctrine.[10]

Wargla is mentioned in the 5th/11th century (by al-Zuhrī, al-Bakrī for example)[11] under several names (Urjalān, Wārjalān, Wārqalān) and is depicted as a key step on the caravan trade routes with the *Bilād al-Sūdān*. Some questions remain about the role of the Zanāta in the region, regarding the foundation of some *qṣūr*, and about what location Wargla refers to in the texts (as it is sometimes described as "a country", sometimes as "a group of villages"). The country is mentioned through various historical episodes: ʿUbayd Allāh's military expedition,[12] the episode of the revolt of the Khārijite Abu Yazīd against the Fāṭimid power who sheltered in Wargla in 324/936 among some of the Maghrāwa,[13] as well as the anecdote staging Yaḥyā Ibn Ghāniya. Ibn Ghāniya, a Balearic Almoravid emir, mobilized against Almohad and Ḥafṣid powers, extending his power to the Saharan towns, which led to a coalition with the Hilālī (helping him capturing the *qṣar* of Wargla during 625/1228). The autonomy decreed by the Ḥafṣid sultan Abū Zakariyyā led him to annex more territories, including the Rīgh and the Miya. Abū Zakariyyā also founded a mosque bearing his name in Wargla during 626/1229, at the time he was chasing into the city Yaḥyā Ibn Ghāniya, who had fled into the desert (eventually assassinated during 630/1233). Thereafter, Wargla was given new fortifications in approximately 637/1240.[14]

Al-Bakrī—as well as the *Kitāb al-Istibṣār* (respectively in the 5th/11th and 6th/12th centuries)—

6 Ibn Khaldūn, *Tārīkh al-ʿAllāma* vol. 7, t. XIII, 4–5, 50, and 106.

7 Hamès, "Zanāta", 479–480.

8 Aillet *et al., Sedrata, Histoire et archéologie d'un carrefour du Sahara médiéval,* 20–23.

9 Ibāḍīs are currently scattered and remain only in a few places in the Maghreb: the island of Djerba in Tunisia, the Mzāb in Algeria, and Jabal Nafūsa in Libya. We can find them as well in the Arabian Peninsula, in Oman, within the Hināwī community, and on the African coast in the Zanzibar islands.

10 al-Shammākhī, *Kitāb al-Siyar*. Some of these scholars wore the *nisba* "al-Warjalānī" or "al-Sadrātī", which means that they probably originated from these places, or that they lived there enough time to take this *nisba*. Besides that, it is only under the *nisba* "al-Sadrātī" that Sadrāta appears in the text of Abū Zakariyyāʾ. In the introduction to the book, it is stated that this is the name of one of the tribes of Tāhart, mentioned in parallel with the Zanāta. Abū Zakariyyāʾ, *Kitāb siyar al-aʾimma,* 20.

11 al-Zuhrī, *Kitāb al-Jaʿrafiyya,* 184, 191 and 195; al-Bakrī, *al-Masālik wa-l-Mamālik,* 2: 746.

12 Abū Zakariyyāʾ, *Kitāb Siyar al-Aʾimma,* 165 and 171.

13 Ibn Khaldūn, *Tārīkh al-ʿAllāma,* vol. 7 t. XIII, 107. For a detailed analysis of these historical events, see Aillet *et al., Sedrata, Histoire et archéologie d'un carrefour du Sahara médiéval* 24–33. Aillet highlights the possibility of a fictional role given to Wārğalān as a "bastion of resistance" at the gates of the Fāṭimid and Zīrīd territories.

14 Ibn Khaldūn, *Tārīkh al-ʿAllāma,* vol. 7 t. XIII, 98; al-Darjīnī, *Kitāb Ṭabaqāt al-Mashāyikh,* 2:494.

refer to seven fortresses, the largest of which was called *Aghram An-Yakāmmin* (or *Aghram An-Yakmān*).[15] The term *aghram* is a Berber equivalent for *qṣar*. A large city of seven *qṣūr* surrounded by fortifications is described in these sources. Ibn Khaldūn recounts later the installation of the Athbāj in the Miya (a Hilālī tribe that forced the Ḥammādids to retreat in Bajāya).[16] It certainly put an end to the hegemony of the Banū Tūjīn.[17] During the 7th/13th century, al-Dimashqī also mentions the town of Wargla and its seven fortresses.[18] While Ibn Khaldūn also reported that the area was made up of several towns, including Wargla, and that they all eventually gathered to form a larger city, there is neither evidence of a date for construction of a city, nor its merger with neighboring settlements.[19] Since the modern period, the city has been divided into three districts, corresponding to the three ruling clans: the Banū Brāhīm in the northwest, the Banū Waggīn in the northeast, and the Banū Sissīn in the south.

Aillet rightly points out that there are many gray areas on the history of the Miya region during the medieval period. He identifies the medieval Wārğalān as the current archaeological site of Sadrāta, and argues that it was the destruction and abandonment of this site in the 13th century that originated the current *qṣar* of Wargla. The archaeological surveys on the site of Sadrāta do not yet allow us to corroborate such a hypothesis.[20]

After 884/1480, Tuggurt was governed by Sīdī Yaḥyā b. Muḥammad, an Idrīsid ruler, who was succeeded by a Marīnid from Fez, Hājj Sulaymān al-Marīn. Nicknamed al-Jallāb, he founded the Banū Jallāb dynasty, which lasted until the arrival of the French in Tuggurt, and which domination counted thirty-five sultans of the same lineage. At the same period, in Wargla, growing Sunnism, and expansion of Ṣūfī practices around *marabouts* favored the emergence of a tribe originating from the Tafilalt, the Filālī, and, in particular, a certain Mulāy Mūsā al-Filālī who was appointed as the sultan of Wargla.[21]

The traveller al-ʿAyyāshī passed by Wargla and Tuggurt in 1072–1073/1662–1663, and describes both cities in his *riḥla*. About Wargla, he said that entry was possible at that time by the *Bāb al-Sulṭān*, he also specified that the city had seven gates in its walls, which were surrounded by a moat full of water. The city measured a diameter of 1,500 miles.

He provided an interesting historical context, the accuracy of which allows us to get an idea of the relationship between Tuggurt and Wargla during the late 11th/17th century: while the two cities are in conflict, al-ʿAyyāshī mentioned the name of the Sultan ʿAllāhum who reigned over Wargla at that time, who was none other than the Sultan Aḥmad b. Jallāb's nephew.

Al-ʿAyyāshī took the opportunity, during his stay in Wargla, to pray in al-Mālkiyya mosque, which he described as "skilfully constructed" (*masjid mutqan al-ṣunʿa*), with floor and walls covered with plaster (*mujaṣṣaṣ*). While near the mosque gates, he also mentioned facilities for ablutions, where the water is heated, he was surprised to see no one using it. The faithful practiced the *tayammum* (dry ablution with sand or earth), normally intended to replace water if there is none. He was also surprised that the call for prayer was different from the Sunni practice, since the *muʾadhdhin* pronounced four times the formula *Allāhu Akbar* at the end of the call (instead of two). Al-ʿAyyāshī called them "heretics" or *rawāfiḍ,* sparing no criticism of

15 *Kitāb al-Istibṣār*, 224.

16 Ibn Khaldūn, *op. Cit.*, vol. 7, t. XIII, 107.

17 Yver *et al.*, "Wargla", 159–160.

18 al-Dimashqī, *Kitāb Nukhbat al-Dahr*, 239.

19 Ibn Khaldūn, *op. Cit.*, vol. 7 t. XIII, 106.

20 Aillet *et al.*, *Sedrata, Histoire et archéologie d'un carrefour du Sahara médiéval* 3 and 13–18. While Sadrāta was mentioned as a toponym for the first time during the Ottoman period, medieval sources are not homogeneous or even linear on what Wārjalān designates and the border between ethnonym and toponym is often too thin for both geographical terms. See also Aillet *et al.*, *Un carrefour du Sahara médiéval: Sedrata*, 106–135.

21 Côte, "Tuggurt", 633–634; Pelligra, *Système de relations nomades*, 27–28.

Ibāḍism: he considered them as a community that should be banned from the city but specified that their presence was useful in case of war.

He continued his journey to the Rīgh, where he quickly described Tuggurt as capital of the region. He seems to have been badly received there, and explained it once again by the intellectual decline due to the community's belonging to the Ibāḍī doctrine. Led by cousins of the sultans of Tuggurt, he passed through Tammāsīn, where houses and palm trees were plentiful. He depicted an imposing minaret in the city: a minaret of a hundred steps that bears the name of its commissioner, Aḥmad b. Muḥammad al-Fāsī, built during 817/1414.[22]

Regarding the Mzāb, Ibn Khaldūn provided a fairly accurate description of the social composition of the founding inhabitants of the Mzāb.[23] We learn that Berber populations who lived there were initially Muʿtazilīs; they were said to have converted to Ibāḍism after the arrival of Abū ʿAbd Allāh Muḥammad b. Bakr al-Nafūsī (d. 439/1048) who taught them the doctrine in the 5th/11th century, and founded around 409/1019 the *ḥalqa* of the *ʿazzāba*, which still forms with the *jamāʿa* one of the key institutions of the non-state political organization of the Mzāb.[24] While local legends are difficult to verify, they nevertheless provide a sociological context for the foundation of the *qṣūr*, mention pre-existing establishments to those that are now known today. According to Huguet, about twenty-five *qṣūr* constituted what he called the "dead cities of the Mzāb". According to our field observations, remnants of the walls of what is described as the first settlement near al-ʿAṭf, named Aghram Tal Azḍīt (the "*qṣar* of the wool handful" which, as stated by the local legends, dates from 291/904) and Aghram Bābā Saʿd near Ghardāya, are still standing. Huguet mentioned the names of these villages through local legends, explaining destruction of these *qṣūr* by conflicts between unconverted Muʿtazilīs and Ibāḍīs.[25] In his *Tāʾrīkh Banī Mzāb*, the Mzābī historian Hājj Saʿīd mentioned many locations corresponding to the first settlements in the Mzāb.[26] Local traditions commonly date the later *qṣūr* of the Pentapolis 5th/11th century (al-ʿAṭf would be the first *qṣar*)—except for Banī Izgan, built later (8th/14th century).[27]

Oral traditions report legends around the foundations of the *qṣūr* of the region, related to female characters. For example, Tgurt al-Bahāja was a young woman known for her beauty; she had many suitors, some who neglected their families for her. One day, village leaders gathered the *jamāʿa,* deciding to banish her for disturbing public order. She settled near a spring several miles away; in spite of her conviction, the suitors joined her, bringing women and children with them. They formed a camp, that soon turned into a new town, named after the woman said to have settled down as she grew older.[28]

In al-Manīʿa, local traditions estimate a founding date for the *qṣar* between the 3rd/9th and 4th/10th centuries, although no exact date of foundation or historical source supports this estimate. Zanāta Berbers, who first migrated to the north of the Sahara by the late 2nd/8th and early 3rd/9th century, built the first *qṣar* known as Tawurirt, the "fortress" (Berber equivalent of the Arabic term *qalʿa*). A sultana named Mbārka Bint al-Khāṣ was

22 al-ʿAyyāshī, *al-Riḥla*, 115–122.

23 Ibn Khaldūn, *op. Cit.*, vol. 7, t. XIII, 123–124.

24 Brahim Cherifi points out that, if a migration really occurred after the fall of Sadrāta and in the late 4th/10th century, these events would not have been unnoticed in the eyes of Abū Zakariyyāʾ who writes his chronicle precisely in 470/1078. Cherifi, *Études d'anthropologie historique*, 65.

25 Huguet, "Les villes mortes du Mzab", 583. The dating of these remains as well as that of the *qṣūr* of the Mzāb and al-Manīʿa is for the time being unverifiable without further in-depth field research. Local legends contribute to the understanding of the medieval and modern history of the *qṣūr* as well as historical sources, which veracity cannot be verified either. Medieval authors might have made partisan judgments based, for example, on their social or religious affiliations.

26 al-Ḥājj Saʿīd, *Tāʾrīkh Banī Mzāb*, 11–16.

27 Rouvilois-Brigol *et al.*, "Mzāb", 827–829.

28 Pelligra, *Système de relations nomades,* 23–24; Fontaine, *Touggourt*, 12.

head of the *qṣar*. Her name appears in al-Manīʿa but also in other Saharan localities. Originating from the *djebel* ʿAmūr, she was known for her exceptional beauty, and was the subject of other sultans' envy. A sultan of the *gharb* sent missionaries, accompanied with gifts, to ask her hand. She refused, triggering an attack by the sultan's troops. The *qṣar* was besieged for more than three months; through cunning, the sultana saved the city. Short on water resources, she decided to make external troops believe resources were still abundant within the enclosure. With the remaining water, she washed all the laundry, and fed a goat with barley. When besiegers shot the goat and discovered the grains, they came to believe that the city did not lack of anything. Resigned, the attackers decided to end the siege.[29] This local legend contributes to the understanding of spatial boundaries such as the *qaṣba*, a "noble" district where the sultana resided, whose house is still called *dār al-sulṭāna*.

Shaʿanba nomads originate from the tribe of the Banū Sulaym and are identified in al-Manīʿa as Ulād Mawāḍī, referring to the name of their ancestor.[30] The arrival of the Shaʿanba coincides with a last Hilālī inflow that arrived in North Africa during the 8th/14th century.[31] Following a conflict with the Zanāta founders of the *qṣar*, Tawurirt was again besieged for two months, with the help of the Shaʿanba of Wargla. According to oral history, they tricked the Zanāta by slaughtering sheep at the foot of the *qṣar*, inviting them to join them as a sign of truce. The inhabitants, having stepped outside the *qṣar*, were massacred by the attackers, or captured and enslaved.

Al-Bakrī mentioned al-Manīʿa as the *qalʿa* among different localities he cites in his geography.[32] Al-ʿAyyāshī is more accurate since, during his visit in 1072/1662, he describes the city as "a fortified village built on a solid rock [located] on a mountain slope, [and] separated from it". He reported that the area was then under the control of the ruler of Wargla, who placed a governor.[33]

This brief history of some of the *qṣūr* of the region allows us to make two remarks on the use of medieval Arabic sources for the analysis of this type of settlement on the margins of the *dār al-islām*. The sources are far from comprehensive and correspond mostly to succinct descriptions of routes, or only mention toponyms. While they rarely provide historical markers on date for the cities' foundation, they often prove their existence at a certain time, and sometimes give information about a city and its urbanism with rare descriptions of architecture. The discontinuity of the historical narrative also makes it difficult to assess lifestyles at the origin of the construction of the *qṣūr* and the identification of their evolution.

In general, the *qṣūr* underline the problem of dating such architecture on account of its numerous alterations and extensions, which range over several centuries. The sources highlight the historical context of implementation of these populations, and confirm that the development of the *qṣūr* corresponds to architectural phenomena known in these regions during medieval times. However, it is the use of systematic criteria for studying the components of these settlements (including the materials and techniques used for their building) that fosters their comparison and the development of a typology to identify common characteristics and define the *qṣar* as a form of urbanism within the *dār al-islām*.

29 Mbārka Bint al-Khāṣ appears in several Saharan legends. See Basset, "La légende de Bent El Khass", 18–34.

30 Dugrais lists 3,500 [members] during 1338/1920, divided into two tribes, themselves divided into fractions: the tribe of Ulād Fraj and Mawāḍī Dahra, and the one of Ulād Zīd and Mawāḍī. Dugrais, *Un séjour à El Goléa,* 28.

31 Idris, *et al.*, "Hilāl", 398–400; Ibn Khaldūn, *Tārīkh al-ʿAllāma,* vol. 6, t. XI, 120.

32 al-Bakrī, *al-Masālik wa-l-Mamālik*, 2: 746.

33 al-ʿAyyāshī, *al-Riḥla*, 112.

The Impact of Using Earth in the *Qṣūr* of Southeastern Algeria

According to various examples in the Sahara, earth is used as raw material in the majority of the *qṣūr*. Parts of the earthen construction appear to be solid supporting elements, adapted to the desert climate. The sustainability of this type of building is mainly due to the care and protection from the elements that constitute its fragility. The earth is chosen according to its nature and composition, which determines the techniques to be used, as earth plays some or all of the functions of construction, namely the body of the walls, the laying of mortar and the protective coating. In order to ensure that the cohesion and compression abilities are sufficient, the builder needs to balance fairly the loading and the binders that constitute the masonry. Earth used in construction of southern Algeria includes gravel, sand, silt and clay. Proportions are variable, because of the great diversity of earth, depending on the nature of the place, the structure of the outcropping rock, the climate, the hydrology, and the impact of changes on the soil by humans. Lime is a relatively expensive material, so builders need to save it, therefore using in the mortar a maximum of aggregates, or a large amount of earth as a binder. Eventually, such techniques allow building of high walls.

The most commonly used earthen technique in the Sahara is adobe, the use of calibrated mud bricks laid out by hand or in molds, dried in the sun then used to build walls, vaults or domes. The brick is made of clayey soil (about 30%) and sand to which water is added along with vegetal fibers (usually chopped straw) yielding a stiff dough. The brick, as a module, is always laid flat but in alternating positions for better situating within the elevation. The strength of any brick depends also on the quality of the soil. Because of the wide variety of earth, the use of this technique is not without any risk in construction and requires from the builder expert knowledge to assemble and test each module before the build.

In his *Faits et dires au Mzab*, Delheure collected information in 1372/1953 from an inhabitant of Ghardāya on traditional techniques that involved earth in the architecture of the Mzāb: "We wet the clay. We wet it well. We knead it with a hoe. We soak it well with water. We bring the wooden mold and we fill it with a large mound of clay. When filled up, we remove it, and we put another one next by, until we obtain the necessary amount for the planned work. Once the bricks are dry, we bring them to the construction site. We take clay that we wet, knead and we build. To do so, we put a layer of clay on which we place the dried brick, we place the bricks one against the other and we put clay in between, and so on, until the end. This is the way we build with mud brick and with clay".[34]

Mzāb's local geography allows extraction of limestone used in building materials. The stone is used in the form of rough blocks, associated with clay extracted locally. The stone is extracted from white limestone available in the valley. Blocks can be squared (or not) and therefore implemented as is, maintaining the shape they had in the quarry bedding. Stones were picked up close to the sites, often requiring no tools or shaping.[35] If the body of the building is made of stone, clayey sand is used only as mortar.

34 The text published by Delheure is bilingual, including the original transcription in Berber Mzābī and a French translation: "La brique d'adobe: On mouille la glaise. On la mouille bien. On la malaxe à la houe. On l'imbibe bien d'eau. On amène le moule de bois, on le remplit avec une grosse motte de glaise. Une fois rempli on l'enlève et on en pose un autre à côté jusqu'à ce qu'on ait obtenu la quantité nécessaire pour le travail projeté. Dès que les briques sont sèches on les rapproche du chantier de travail. On prend de la glaise que l'on mouille, que l'on malaxe et on construit. Pour cela on pose une couche de glaise sur laquelle on place la brique séchée, on place les briques l'une contre l'autre et l'on met de la glaise entre elles, et ainsi de suite jusqu'à la fin. C'est cela construire à la brique de glaise et à la glaise". Delheure, *Faits et dires au Mzab*, 95–96.

35 Didillon *et al.*, *Habiter le désert*, 87.

Concerning the combined use of stone and clay in the Mzāb, Delheure collected the following information: "As for the construction of stone and clay, it consists in digging the plot (of the future construction) on the ground, place the stone at the bottom with clay above. We put the stones of the next row by putting clay in the intervals (gravel or small stones). This is the work of stone and clay".[36] At al-Manīʿa, the *qṣar* was built of limestone with clay mortar and the clay corresponds to that of the *gāra* on which the *qṣar* was built. Masonry consists of stones implemented by regular beds, with the mortar being inconspicuous.

A petrographic study of al-Manīʿa's clays by Jacques Lapparent is the only one that gives details regarding the geology and the *qṣar*'s construction materials: "The old *qṣar* overlooking the oasis of El Goléa[37] is established in a thick slab of hard limestone rocks that covers the clayey body by the slopes of which we reach the summit. […] The clay is not pure clay. It is marly, and has the aspect of bunk beddings that are more or less calcareous and often gypsiferous. In some locations, however, it is possible to collect clays that are without or almost without any trace of limestone, a light green clay"[38] (fig. 5.5). We noticed a specific position in the *qṣar,* where some digging was clearly not intended for cave dwellings, but for extraction of clay used in construction.

In southeast Algeria, *timshant* (a kind of traditional plaster that is specially produced in the Mzāb), made from a hydrated gypsum of the valley, is used. This gray-coloured gypsum is directly extracted as horizontal strata or heaps in the limestone plateau (*ḥamāda*). It is then calcined with carbonate of lime and clay, in partially-buried kilns. The handling of the plaster is very easy, and is still applied mostly with bare hands, and without any tools. However, most of the fields are depleted, so it is now manufactured in factories (figs. 5.6 and 5.7).[39]

Delheure also gives information on the manufacture and use of *timshant* in the Mzāb: "When we want to do good work for posterity, we bring fine gravel, we make a heap, we add *soda* (desert plant), we take the lime that we put in the middle (five kilograms for a donkey load), we pour water that slakes it, but we spin it all well in order not to leave any lumps. We mix it well with gravel and we take it. The assistant mason puts it in a metal bucket that he takes to the master mason and puts it near the place he works. We dig the outline (the foundations), we put a stone on one side and one on the other, this is a wall with two sides in between which we pour the lime and we plumb it with a trowel. This is how we proceed".[40]

36 The original is as follows: "Quant à la construction en pierre et glaise, elle consiste à creuser le tracé (de la future construction) sur le sol, à placer la pierre en bas avec de la glaise par-dessus. On pose les pierres du rang suivant en mettant de la glaise dans les intervalles (du cailloutis ou de petites pierres). C'est là le travail à la pierre et glaise". Delheure, *op. Cit*., 95–97.

37 El Goléa corresponds to the name given to this city during the colonial period, a deformation of another name given to al-Manīʿa, *al-Qulayʿa* ('the Little Fortress').

38 The original text is as follows: "Le vieux *qṣar* qui domine l'oasis d'El Goléa est établi dans une dalle épaisse de roches dures calcaires qui recouvre la masse argileuse par les pentes de laquelle on en atteint le sommet. […] L'argile n'est pas purement argileuse. Elle est fréquemment marneuse sous forme de lits superposés plus ou moins calcaires et souvent gypsifères. En certains points cependant, on peut recueillir des argiles exemptes, ou à peu près, de calcaire, argile vert clair". De Lapparent, *Les argiles d'El Goléa*, 7.

39 Didillon, *et al., op. Cit*., 88.

40 The original text is as follows: "Quand on veut faire du beau travail pour la postérité, on apporte du gravier fin, on en fait un tas, on ajoute de la soude (plante du désert), on prend de la chaux que l'on met au milieu (cinq kilos pour une charge d'âne), on y verse de l'eau qui éteint la chaux, on délaye bien le tout pour qu'il ne reste pas de grumeaux. On mélange bien avec du gravier et on emporte. L'aide-maçon en met dans un seau en métal qu'il porte au maître-maçon et le lui pose près de l'endroit où il travaille. On creuse le tracé (les fondations), on met une pierre d'un côté et une de l'autre, c'est un mur à deux faces entre lesquelles on verse de la chaux et l'on met d'aplomb avec une truelle. C'est ainsi que l'on procède". Delheure, *op. Cit*., 95–97.

FIGURE 5.5
Use of the marly clay in al-Manīʿa, 2007
CREDITS: CHEKHAB-ABUDAYA.

One of the most important structural materials combined with earth is date palm. While builders occasionally use other trees (such as fruit) for cutting beams, it is rarer.[41] The specificity of the date palm is that it is useable in its entirety (the stem or trunk, the palm and the sheath), and its abundance throughout the area makes it significant. The stem, used for production of large beams, is sawn lengthwise in two, three or four parts. This length will determine the width of the rooms to be built. It is also cut into rough boards for carpentry. Palms are first dried, then can be reduced only to the rib, and are used to manufacture the ceiling lattice. The relatively-resistant sheath is often used as a structural element in the construction of arches and vaults, associated with clay or *timshant* (fig. 5.8). Its use is certainly convenient, due to its fibrous texture, but its poor resistance to bending gives it low strength, which makes it difficult to use.

Echallier, in his *Essai sur l'habitat sédentaire traditionnel au Sahara algérien*, confirms the presence of large amounts of date drupes in the

41 Didillon, *et al.*, *op. Cit.*, 87–90.

FIGURE 5.6 *The use of* timchant *in Malika, 2006*
CREDITS: CHEKHAB-ABUDAYA.

FIGURE 5.7 *The use of* timchant *in Wargla, 2009*
CREDITS: CHEKHAB-ABUDAYA.

FIGURE 5.8 *Use of date palms for the ceiling, Tammāsīn, 2009*
CREDITS: CHEKHAB-ABUDAYA.

mortar, which indicates the prosperity of the palm grove at the time of the building of the *qṣar* of al-Manīʿa, under the Zanāta. However, the deliberate introduction of drupes remains a hypothesis; the clay might have been extracted in the palm grove, and therefore contained them already.[42]

According to Petherbridge, construction techniques are regionalized: trunks of palm stems as a covering system can be found in the Fazzān, the Gurāra, Mauritania, southern Morocco, and the Tuwāt, while the vaults concern southern Tunisia, the Jabal Nafūsa and the Algerian Ṣūf.[43] This reasoning is verifiable because the major difference between the fortified granaries of southern Tunisia and those of southern Morocco, for example, lies in their covering system.[44] We add the Mzāb and the Miya to those areas using palm stems roofing system, although the domes are hardly

42 Échallier, *Essai sur l'habitat sédentaire traditionnel au Sahara algérien*, 159–160.

43 Petherbridge, "Vernacular Architecture: The House and Society", 13.

44 Despois, "Les greniers fortifiés de l'Afrique du Nord", 46.

frequent (there are only examples in Rwisat).[45] As for Ghadāmis, the houses often combine vaulted spaces and palm ceilings.[46]

We wonder why only the Rīgh presents more examples of domes (flat domes most of the time) than the Miya, the Mzāb, or other regions of the Sahara (fig. 5.9). It turns out that the Ṣūf has directly influenced the architecture of the Rīgh, especially for the use of this type of domes (which we find many examples in Tammāsīn) and for architectural decoration involving fired clay bricks.

If the flat dome is famous for its thermal qualities, we question why neighboring regions (such as the Mzāb and the Miya) rarely use this technique, especially since the *timshant*, which plays an essential role in constructing arches and vaults, is manufactured and used in all these regions. These architectural choices have been the result of a mimetic effect between the Rīgh and the neighboring Ṣūf, knowing that they were probably political and economic allies, since the advent of the dynasty of the Banū Jallāb (or maybe earlier). Beyond the Ṣūf, the Rīgh turned towards southern Tunisia, whose architectural influence is obvious. Mistāwa and Tammāsīn are the only places where evidence

FIGURE 5.9 *Domes in Tammāsīn, 2009*
CREDITS: CHEKHAB-ABUDAYA.

FIGURE 5.10 *Use of fired clay bricks in Tammāsīn, 2009*
CREDITS: CHEKHAB-ABUDAYA.

exists of the use of fired clay bricks, recalling Tunisian Jarīdī architecture—especially that of Tūzar, Nafṭa and al-Ḥāmma. Fired clay bricks are features in the *façade* decorations in the Jarīd, while they are limited to the minarets in Mistāwa and Tammāsīn (figs. 5.10 and 5.11).[47]

The dome has, in any case, the benefit of skirting constraints on use of palm stems.[48] First, use of the trunk requires palm trees that have already fallen, or male trees—and, despite the existence of palm groves, the wood remains a valuable material. Then, the trunk does not help in constructing extended areas, since the width of a room depends on its length, which rarely exceeds 3m.[49] As a result, buildings on palm frameworks are often

45 According to Rouvillois-Brigol, there is here a differentiation between nomads and sedentaries, as nomads would rather use domes, but this idea seems wrong if we just take the example of the Ṣūf. Rouvillois-Brigol, "La sédentarisation autour d'Ouargla", 140.

46 Le Quellec, *Maisons du Sahara: habiter le désert*, 96, 124; Aymo, "La maison ghadamsie", 158.

47 In Tamalaḥt (near Tammāsīn), we observed some *façade* decorations of fired clay bricks dating from the colonial period. However, this is a rare and isolated phenomenon, because of the high manufacturing cost (requiring to use palm wood as fuel for the bricks firing). For the case of the Rīgh, the bricks might have been imported from the Jarīd and implemented by skilled workers coming from the same region.

48 Palm ribs serve to manufacture formworks in the *timshant* technique.

49 This number corresponds to the maximum width of the widest streets in the *qṣūr*. The builders probably took this as a reference width, based on the streets that are covered with palm stems.

FIGURE 5.11 *Use of fired clay bricks in Tūzar in the Tunisian* Jarīd
PHOTOGRAPH BY AMANDINE LEFOL, 2010.

longer than wide (the most notorious case is the *dār al-sulṭāna* in al-Manīʿa) (fig. 5.12).

While the occasional use of other woods (often types of fruit trees) appears as an alternative to this constraint, such cases are rare. Even though we observed a house in Garrāra partly covered with ziziphus wood (fig. 5.13), its dimensions were not fundamentally different from those of houses of the Mzāb, which suggests that masons maintain the same techniques, even if materials offer greater freedom in the construction.

Finally, we should point out that in the Lower Sahara, lime is relatively rare—unlike other areas of the Sahara where its use seems more widespread (especially in the homes of Ghadāmis). In the Mzāb, for example, lime was applied by itself only on religious buildings in the 13th/19th century, having been supplanted by paint in recent decades. Iron, also rare in the Sahara, can only be found sporadically (for nail decoration on some doors of the mosques in Mistāwa and Tammāsīn, and exceptionally on the doors of some homes).

Particularity of the Materials and Techniques in Southeastern Algeria

To summarize, the *qṣūr* of the Lower Sahara are mainly built from limestone with *timshant* mortar. However, mud bricks (*ṭūb*) were very much used

FIGURE 5.12 Dār al ṣultāna *in the* Qṣar *of al-Manīʿa, 2007*
CREDITS: CHEKHAB-ABUDAYA.

locally (in Nazla, Sīdī Bū ʿAzīz, Zāwiya Sīdī al-ʿAbid, Tibisbist, Mistāwa, Tammāsīn, Ngūsa, and ʿAjaja), in the walls (Tammāsīn, Shaṭṭ, ʿAjaja, Wargla, Banī Izgan, and probably Ngūsa and Matlīlī), and sometimes in the *qaṣba* (Tammāsīn, and perhaps Wargla's *qaṣba* initially) (figs. 5.14 and 5.15).

FIGURE 5.13 *Ceiling with ziziphus wood in Garrāra, 2009*
CREDITS: CHEKHAB-ABUDAYA.

While few sites are built in *ṭūb*; this is the case of Zāwiya Sīdī al-ʿAbid, Tammāsīn, Gāra Krīma, Ngūsa, Shaṭṭ, and ʿAjaja, probably because of their implementation within the palm groves where clay is abundant (at least Tammāsīn, Ngūsa, Shaṭṭ, and ʿAjaja).[50] In al-Manīʿa, construction combines

50 Earthen architecture can be seen as ephemeral, if the buildings are affected by weather. This is an easy material to use that doesn't require any specific treatment prior to its use and is definitely adapted to the constraints of the Saharan climate. However, it requires regular maintenance and its resistance to climatic phenomenons is low. To strengthen buildings, some masons do not hesitate to mix the clay with other materials (other than sand that is common in the preparation of mud bricks): date drupes in al-Manīʿa, peach drupes in Banī ʿAbbās in the Sāwra, and sometimes fragments of pottery. Échallier mentions that there is no evidence that these materials were intentionally incorporated or if they were already present at the time of the extraction, if practiced directly in the palm grove. Échallier,

FIGURE 5.14 *Mud bricks in the* qaṣba *of Tammāsīn, 2009*
CREDITS: CHEKHAB-ABUDAYA.

FIGURE 5.15 *Mud bricks in the* qaṣba *of Tammāsīn, 2009*
CREDITS: CHEKHAB-ABUDAYA.

limestone with clay mortar, while in Tal Azḍīt, Bābā Saʿd and Garrāra, limestone is often replaced by the local red sandstone, probably bound with a clay mortar for the enclosure.

This information reveals the importance of environmental context to the establishment of the *qṣūr,* and techniques affiliated with them. The builders used local materials and (contrary to popular belief that associates the use of earth in architecture with poverty) its use results from a population's adaptation to its environment.[51]

There is a regional specificity in southeastern Algeria: the Mzāb, the Miya, and the Rīgh are homogenous in that limestone bound to *timshant* is the mainly-used material, on account of the immediate contact with the *ḥamāda*. While we could exclude al-Manīʿa from this group, we know that the *qṣar* is located near the *ḥamāda*, from which comes the limestone used in construction. Only the mortar changes: the large amount of gypsum in the Mzāb, the Miya and the Rīgh explains its significant extraction for manufacturing the *timshant*. At al-Manīʿa, clayey marls of the *gāra* served as binder. In this sense, there is here a geographical continuity between al-Manīʿa and the Gurāra, where sites are built of stone embedded in clay (like Aghlād and Kālī prospected by Barrucand[52] and those classified as type I, III, and V by Echallier in the Tuwāt- Gurāra).[53] Somehow, Al-Manīʿa represents a transition from which the *timshant* is no longer involved in the construction.

Echallier highlights the fact that the stone is important when associated with a solid binder, unless it already has a regular shape at the time of its extraction,[54] particularly true in the Lower Sahara. Most of the time, builders collect rubble from outcropping rock. The mortar also depends on the quality of the stone, which is known to be a soft limestone in the Rīgh and the Miya.

Building exclusively with stone is largely practiced in the Moroccan Anti-Atlas, the Huggār, and in cities like Timbuktu or Tīshīt in the *Bilād al-Sūdān*.[55] Rammed earth appears only along the Moroccan Darʿa, the Tafilalt and the Zīz, while

Essai sur l'habitat sédentaire traditionnel au Sahara algérien, 160.

51 This argument prompted the editors of Hassan Fathy's book, *Construire avec le peuple*, to publish it under the title *Architecture for the Poor* in English, based on the fact that Fathy highlights the benefits of earth in architecture and that this is usually associated in the minds with an archaic form of architecture and with the precariousness of its inhabitants.

52 Barrucand, "Prospection dans le Gourara-Touat", 192–193.

53 Échallier, *Villages désertés et structures agraires anciennes du Touat-Gourara,* 31, 38, and 48; However, in the Gurāra, houses are mostly built with mud bricks bound with dried clay, see Bisson "Le Gourara", 155.

54 Échallier, *Essai sur l'habitat sédentaire traditionnel au Sahara algérien* 162; in Tīshīt (Mauritania) for example, there are constructions with even foundations and without any binder.

55 Le Quellec, *op. Cit.*, 73.

mud bricks are used in the neighboring Dādis.[56] In the Tuwāt, the Sāwra and the Tidikalt, mud bricks are often used but some granaries were built with stone bound with *timshant*.[57] Architecture in the Gurāra is mostly built in stone. The Ṣūf is known for its domes (such as in the town of al-Wād), as they are made of a special mortar called *tafzna* composed of gypsum and sand.[58] The houses in this area are also made entirely in this mixed material, since gypsum is very abundant in this region.

Houses in Ghadāmis are made of *ṭūb,* with *timshant* plaster, and stone foundations. The *timshant* also serves to mount vaults, and can be found in some parts of the houses.[59] While originally in Awdaghust/Tagdawust, walls consisted of mixed stones with mud bricks with a clay binder, since the 4th/10th century, walls were built with stone exclusively, such is the case in Kūmbī Ṣāliḥ.[60] This list of examples is not exhaustive, and shows the impact of the environment on the mentality of the masons and their adaptation to the environments in which they build, creating then construction variants from the same materials as well as the difficulty of geographically classifying earthen architecture in the Sahara.

The impact of the environment on architecture does not necessarily reflect only an adaptation to the climate, even if this idea is often primarily put forward while presenting constructions in arid environments. While admittedly, outdoor and indoor temperature differences depend on the season, we cannot generalize and identify a particular technique as the most suitable for the climate. Delheure reported the following about houses in Wargla:

"Its construction is not adapted to the climate, sun or cold, as some claim, because in summer, the sun penetrates violently, it becomes a pot on the hearth, and in winter it is freezing like water from a collector ditch in the shade during winter".[61]

Terrace interpreted the particularities of southern Moroccan *qaṣabāt* by distributing materials used in architecture geographically: dry stone in the mountain, rammed earth in oasis. He admits exceptions: the Sūs is for example a rocky region but the poor quality of stones probably influenced the use of rammed earth instead.[62] While this distribution concerns southern Morocco, it appears to be incompatible with southeastern Algeria, where there is no real "mountainous area", and where mud bricks or rammed earth are not used systematically. Moreover, rammed earth is never encountered in this region.

On a wider geographical scale and with the idea of demonstrating continuity within architectural characteristics encountered in an oasis environment, if we compare techniques and materials used in southern Algeria with those of the Arabian Peninsula, while where one observes similar architectural phenomena adapting to the desert environment, its morphology is certainly closer to southern Moroccan architecture. This is particularly true for the vernacular architecture of the desertic and semi-desertic areas of present-day Saudi Arabia such as the Najd, ʿAsīr or Riyadh provinces, where fortified towns are built in height or in the middle of the oasis and in mud bricks.[63]

Other sites in Yemen are worth mentioning: those of Ṣaʿda or Radāʿ in the north of the country

56 Jacques-Meunié, *Architectures et habitats du Dadès,* 66, 84.

57 Capot-Rey, "Greniers domestiques et greniers fortifiés au Sahara, le cas du Gurāra", 141.

58 Gardi, *Sahara, monographie d'un grand desert*, 76.

59 It is locally called *tibsham*, most probably corresponding to a dialect variante sans doute dialectale. Aymo, "La maison ghadamsie", 158–159.

60 Vernet, *L'Archéologie en Afrique de l'Ouest, Sahara et Sahel*, 187–189.

61 Delheure, *Vivre et mourir à Ouargla/Tameddurt t-tmettant wargren,* 39. The original text is as follows: "Sa construction n'est pas adaptée au climat, soleil ou froid, comme certains le prétendent car, en été, le soleil la pénétrant violemment, elle devient une marmite sur l'âtre, et en hiver, elle est glaciale comme l'eau d'un fossé collecteur à l'ombre en hiver".

62 Terrasse, *Kasbas berbères de l'Atlas et des oasis; Les grandes architectures du Sud marocain*, 47.

63 King, *The Traditional Architecture of Saudi Arabia.*

are in the semi-desert plateau, where one sees geographical continuity with Saudi Arabia, but with the use of rammed earth techniques this time.[64] Other sites were recently highlighted by archaeologist Timothy Power who carried out several archaeological excavations and surveys in the oasis of al-Qaṭṭāra and Saara near Al-ʿAyn in the United Arab Emirates, and the oasis of al-Buraymī in Oman.[65] Although most cities of the Arabian Peninsula are architecturally representative with towering structures, a link can clearly be made in regards to the techniques used in both of these regions of the Islamic world.

Conclusion

The systematic analysis and comparison of *qṣūr* of southeastern Algeria (Rīgh, Mzāb, Miya and al-Manīʿa) reveals that common architectural features can be used to identify the *qṣar* in this region: a fortified village, built at a height, and generally with an ovoid shape, responding to an internal organization that helps understanding the *qṣar* as an urban phenomenon of the *dār al-Islām* established by a semi-sedentary or sedentary community. Some of these features can be defined as regional, and some are related to the belonging of these communities to the Ibāḍī doctrine.

Despite discontinuity within the historical narrative, the establishment of populations in this area of the Sahara appears much earlier than the medieval period, and the *qṣar* is certainly not a creation *ex nihilo* of the modern era. Because of their numerous modifications and extensions over several centuries, the *qṣūr* problematize the dating of such settlements. However, the comparison of its main components encourages development of a typology to identify some common characteristics that would help position the *qṣar* among urban planning of the *dār al-islām*.

The historical context and the dates given by Mattingly in the Libyan Fazzān, guide us to Berber foundations that evolved with the arrival of Islam. Some features can be attributed to Ibāḍism on one hand, and the expansion of Ṣūfī brotherhoods on the other. Religious architecture and the question of architectural decoration in these areas have regional characteristics: pyramidal towers and minarets with their pinnacles, the absence of *minbar* and decorations in the Mzāb, fired clay bricks and cupolas in the Rīgh influenced by the architecture of the Ṣūf and the Tunisian Jarīd, both under Ibāḍī influence in medieval times.

The qualification of "Ibāḍī architecture", however, is questionable since Mālikī architecture is inspired by it; the architectural reality often transcends religious communities. On one hand, the onomastic analysis of religious buildings reveals an important detail: mosques, known to have been founded at a time when Ibāḍism was a majority and where communities were only Berber, are named after women. On another hand, Ṣūfī movements have brought their batch of "Sīdīs" associated with specific mosques and other religious buildings, a sign that we could identify as a mark of Arabization of the religious architecture.

In his thesis, in the same way that he dates the typology suggested in his 1972 book, Echallier concludes that construction materials in the Sahara depend on the origin of the builders. His explanations are contradictory. He writes first that stone construction would be of "indigenous" origin in the Western Sahara, i.e. in the Tuwāt-Gurāra, in southern Tunisia (like Shaninī), in al-Manīʿa, and in Tīshīt and Walāta in Mauritania.[66] This suggests

64 Bonnenfant, "Unité, yéménité et modernité dans l'architecture domestique", 141–159; Hirschi, *L'architecture au Yémen du Nord*; Varanda, *Art of Building in Yemen*.

65 Power *et al.*, "The Origin and Development of the Oasis Landscape of al-'Ain (UAE)", 291–308. Power *et al.*, "First preliminary report on the Buraimi Oasis Landscape Archaeology Project", 233–252.

66 Échallier, *Essai sur l'habitat sédentaire traditionnel au Sahara algérien,* 213.

that earthen architecture would be "Arab" or would not be "Berber", since "Berber" is synonymous with "indigenous" in his words. Then, he specifies that among the earthen building techniques, mud bricks have an oriental origin while rammed earth is of Berber origin, which is confusing in comparison with his previous statements.[67]

It seems excessive to classify the *qṣūr* and other constructions of the Sahara by associating techniques with the origins of the builders systematically. When addressing techniques and materials involved in the build, it is essential not to separate the local and economical aspects. In other words, we must take into account the extraction and use of materials, geology and relief of exploited fields, the climate, conditions of transportation of the materials and several other criteria that would give a better understanding of this architectural phenomenon. These elements would provide a clearer way to approach the issue of the use of earth in the Sahara, and could help identify a larger scope for the analysis of its use in other regions of the Islamic world.

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CHAPTER 6

Identity and Architecture: The Fāṭimid Walls in Cairo

Stéphane Pradines

Introduction: 17 Years of Excavations in Fāṭimid Cairo

It may seem surprising to publish an article that links "ethnicity" and "architecture" as if "ethnic designs" exist. Rather than a case of returning to a classificatory or diffusionist system of a 19th century long since passed, this is a vision of the 21st century, that proposes to read earthen architecture as a cultural and technical solution of populations (that, although they have knowledge of stone architecture, do not always use it). This article is a presentation of new data based on a long-term project (2000–2016) and seems to be the essence of any archaeological research.[1]

Since 2000, the French Institute of Oriental Archaeology (the "IFAO") and the Aga Khan Trust for Culture (the "AKTC") have maintained a programme of study, excavation, and conservation of the medieval city walls of Cairo, with the institutional and administrative support of the Supreme Council of Egyptian Antiquities (the "SCA"). Our digs concentrate on four sites: the Darrāsa Car Park (2001–2009), Bāb al-Tawfīq (2004–2005), Burǧ aẓ-Ẓafar (2007 to the present day), and Bāb al-Naṣr (2012–2014). The first and most important problem centred on the study of the Ayyūbid enclosure wall, i.e. Salāḥ al-Dīn's city wall (1169–1178), as well as on the Fāṭimid city wall of Badr al-Ǧamālī (1087–1092).

Fāṭimid architecture is difficult to understand, as it is a melting pot of cultures and influences. Cairo was a combination of ʿAbbāsid style at first, with a mix of Berber, Nubian and Armenian architectural traditions, from the mud-brick mausoleums in Aswan (fig. 6.1), to the buildings of red bricks in Upper Egypt with the mosques and *ribats* in Luxor, Isna, Edfu and Aswan. During the second part of the Fāṭimid period (what we call the "Age of the Viziers"), more mosques were built in stone such as al-Aqmar and al-Salih Talai.

When we talk about Fāṭimid fortifications, specialists immediately evoke the walls and the gates built by the famous Vizier Badr al-Ǧamālī under the Caliph al-Mustansir. In fact, nothing is further from the truth. Fāṭimid fortifications remain known only by three monumental gates, and famous British architect Archibald Creswell based his own description on the works of Casanova who followed mainly the descriptions of al-Maqrīzī. Apparently, the Fāṭimid Walls were built in two periods. A first enclosure wall was made of mud bricks in 969–971 AD, and a new enclosure wall was built from limestone from 1087 to 1092. Before our excavation, it was all we knew about the Fāṭimid walls. Our recent research allows us to rediscover and highlight the relatively unknown Fāṭimid military architecture (fig. 6.2). Some of these fortifications were built of limestone, others of mud bricks, and the oldest of rammed earth (*pisé*). It is not a simple chronological succession of techniques and materials connected to a certain period. Excavations show that the reality was much more complex, and reflected the diversity of the populations and ethnicities in the Fāṭimid Empire. It is this new history of the Fāṭimid military architecture that I present in this article.

1 The author would like to extend heartfelt thanks to Hazel Le Goff who has assisted with the translation and editing of this article and the introduction of this volume.

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FIGURE 6.1 *Fatimid mausoleum, Aswan*
CREDITS: PRADINES.

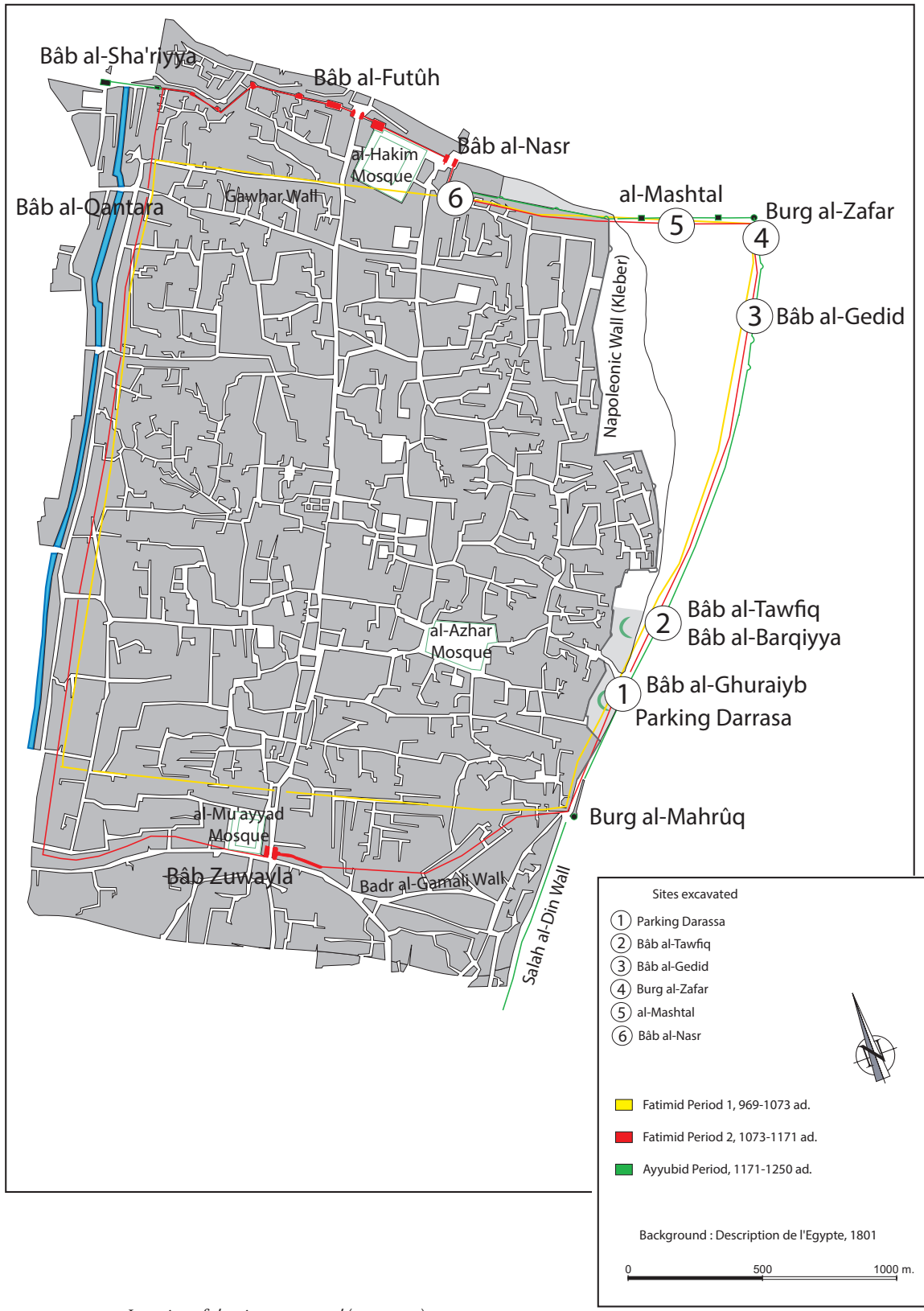


FIGURE 6.2 *Location of the sites excavated (2001–2015)*
CREDITS: PRADINES.

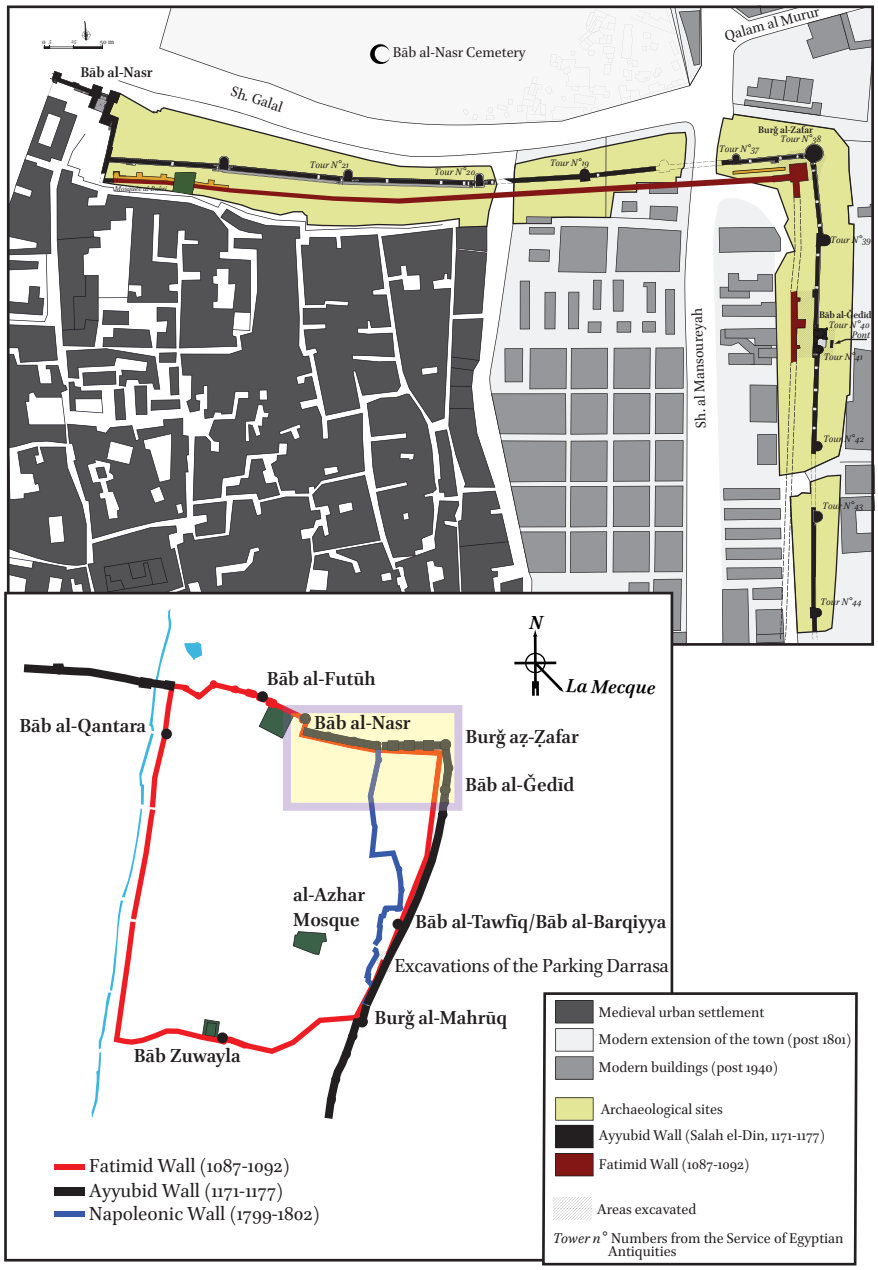


FIGURE 6.3 *The sites of Bāb al-Nasr and Burǧ aẓ-Ẓafar, the first Fatimid walls*
CREDITS: PRADINES.

A Large 10th Century Rammed-Earth Wall and the Role of the Berbers

In 2011, we made a major discovery in the C37/38 excavation area of the Burǧ aẓ-Ẓafar site, which turned out to be a wall that was parallel to the two fortifications, one of Badr al-Ǧamālī, and the other of Salāḥ al-Dīn. This masonry structure (UA 7626) linked to its layers of construction and occupation turned out to be the first settlement of the C37–38 sector of Burǧ aẓ-Ẓafar (fig. 6.3).[2] A little more than

2 US is "Stratigraphic Units", or archaeological layers; UA is "Architectural Units", or building phases.

29 metres of wall are preserved, to which must be added the few metres discovered during the 2008 mission. It extends a few metres to the south of the Salāḥ al-Dīn city wall, and forms an east-west axis (fig. 6.4). The wall is composed of successive clay beds. Measuring an average of 1.80 metres wide, it has preserved a maximum elevation of 1.20 metres. Seventeen postholes run all along the structure. Even though none could be seen on either side of the 10 metres covering the eastern section of the wall, 17 are preserved to the west in sector 2, (14 on its northern edge—US 7876, 7875, 7874, 7879, 7903, 7880, 7904, 7905, 7906, 7907, 7908, 7909, 7910, 7911—and 3 on its southern edge—US 7912, 7913, 7914). With all of them having a similar bowl-shaped profile, their depth varies according to their conservation (from 80 to 18 centimetres, with a diameter of no more than 20 centimetres). They are spaced with relative regularity, from 0.40 to 1 metre from each other (figs. 6.5 and 6.8). The purpose of these postholes, which were filled with clay using the same technique as that which formed wall 7626, was as an aid to the construction of the wall. Their filling (US 7861) was made up of the debris from the construction of the rammed-earth wall.

The rammed-earth wall shows, on all of the length that has been identified, five *caesures* (breaks) which are visible in plan and in section and all of which separate two sections of differing intensities of colour (fig. 6.6). Apart from one of these *caesures* (pit 7872 having destroyed the traces), they all have a posthole on their northern side. These relate to postholes nos. 7876, 7904, 7906 and 7908.

All of these digs accommodated posts intended to hold the wooden formwork needed for the method of construction known as "rammed earth". The formwork itself is fixed to the ground by the posts which have been dug up and which we have enumerated above, and without the prior installation of a raft foundation. The length of the casing varies, according to the blocks, from approximately 2 metres, to 5.50 metres. Once the formwork is installed, the clay is brought and then rammed in small successive beds, as is customary for this construction technique (from four to six clay beds, according to the blocks that have been found on sector C37–38) to a maximum height of 35 centimetres. This first layer of construction is the only one conserved of 7626 all over the surface excavated. On the plan that there are approximately 15 putlogs, struts, and joist post pipes which are quadrangular in profile and which go across the top of the structure. These post pipes are known as "reserves", and their purpose was to accommodate the cross ties that support the moulds, which helped construction of the second layer of installation (which has now disappeared). Measuring an average of 20 centimetres wide—the size of a beam—they are at more or less regular intervals, with distances between them varying between 45 and 90 centimetres. The unit of measurement must have been one cubit of 45 cm (fig. 6.7).

The choice of construction material, i.e. clay, probably depended upon its accessibility and its cost. Despite being very strong, it nevertheless suffers from one major weakness: water. The structure must be protected from stagnant, capillary-action, and splashing (spattering) waters. While this characteristic suggests that there was a protective facing on the *façade*, we have found no trace of this. But light rainfall and the installation of a structure on a sand soil probably convinced its builders that a stone foundation, of the sort normally used to protect the base from water infiltration from the soil, would be of no use. Many rammed-earth constructions are erected straight onto the soil. This technique has the advantage of allowing humidity contained within the soil to evaporate freely, thus preventing all traces of salts.

A second rammed-earth construction is next to wall 7626, which seems to have had the same function. This structure stands a little further than wall 7626. It covers level 7870, which intermixes with the layers of construction, 7861, of the first wall, then extending perpendicularly to the northern edge of wall 7626. Although eastern and western edges are partly identified (or able to be restored), the northern edge itself has been destroyed. Thus,

FIGURE 6.4 *Photography of the rammed-earth wall*
CREDITS: PRADINES.

FIGURE 6.5 *Photography of the rammed-earth wall*
CREDITS: PRADINES.

FIGURE 6.6 *Photography of the rammed-earth wall*
CREDITS: PRADINES.

FIGURE 6.7 *Photography of a detail of the rammed-earth wall*
CREDITS: PRADINES.

we know that the north/south length extends over at least 1.50 metres with an east/west width of 3 metres. No trace similar to the postholes or debris linked to the construction of the first clay wall 7626 was found during the excavations. Even on the structure, no post pipe or *caesure* could be observed. It is likely that this was a buttress against the main wall 7626.

It is interesting to note a perfect parallelism between the 7626 construction and the Salāḥ al-Dīn city wall to the north. Here we are in the presence of a construction that, by its establishment, contributed to a strong zonal structuring. Even if this construction (i.e. wall 7626) did not create the east-west axis, something impossible to verify because of the limited size of the area excavated from 2008 to 2011, it did follow such an axis, as did the second city wall of Badr al-Ǧamālī and that of Salāḥ al-Dīn. The monumentality of the structure and its *ex-nihilo* installation fuels speculation that the rammed-earth wall 7626 constitutes a section of the first Cairo city wall, founded by Ǧawhar. Even it is possible for us to confirm this observation due to our recent results on the site of al-Mashtal in 2016. Plus, the width and length of the structure excludes the function of a dwelling.

On both sides of the rammed-earth wall, the synchronous levels have been preserved. Wall 7626 does not cut across any archaeological level, which shows that it is an "*ex-nihilo*" installation in the excavated area. On the south side of wall 7626, levels 7628 and 7891 (comprising grey sandy silt) are laid straight on to the sandy natural substratum and accommodate a series of dwellings. These are also synchronous with the UA 7626 elevation. Four of them have an average diameter of 48 centimetres (US 7665, 7667, 7668 and 7673), while two have a diameter in excess of 1.20 metres (US 7669 and 7890). None of these exceed a depth of more than 12 centimetres, and each one contains only a few shards of ceramics. The pit 7666 is the best preserved and has the particularity of containing pottery crushed *in situ*, and dates from the Fāṭimid Period. This dating gives us a *terminus ante quem* of the usage of the rammed-earth wall 7626. All these dwellings had a domestic function, as shown by both their shape and size, and also by the animal bone waste found in dwellings 7663 and 7667. Dwellings are contemporaneous with a small ditch, 7663, which measures 38 centimetres wide by 65 centimetres deep. It is perpendicular to structure 7626 but cut by the foundation trench of the second Cairo city wall (trench 7917), with 1.50 metres of it identified.

Finally, the last element, a small rectangular basin (UA 7895) was built on layer no. 7628, right next to the southern edge of the rammed-earth wall 7626. Its foundation trench, dig. no. US 7896, cuts through US 7628 under the dwellings mentioned above. The basin spans four courses of baked brick, bound by a grey mortar. In plan, its north-south is 1.40 metres long by a preserved width of 60 centimetres. In fact, the structure is cut by foundation trench 7898 of the buttress of the second Cairo city wall 7884. Still in plan, a north-south oblong excavation in the central section can be seen, 23 centimetres from each preserved edge of the structure. In other words, all except the western edge are destroyed. The basin was built against the wall 7626 and post-dates it. Therefore, the rammed-earth wall 7626 pre-dates the Badr al-Ǧamālī city wall built between AD 1087 and AD 1092.

The Fāṭimid period was marked by the destruction of the rammed-earth wall 7626. Demolition levels are represented by US 7662, 7868, and 7887. These are made of very compact clay. This level of demolition is covered over, on the eastern section of rammed-earth wall 7626, by levels 7633, 7639 and 7854. This level, as well as sealing the prior levels to the construction of the Salāḥ al-Dīn city wall, had an abundance of shards and ceramics with complete archaeological shapes dating from the 12th century.

A few remains of the second Cairo city wall, that of Badr al-Ǧamālī, were also found, namely the curtain wall 7886 and the buttress 7884 built between the years 1087 and 1092. With regard to the curtain wall 7884, only a very flattened vestige located in sector 1 could be excavated in the

extension of the section discovered in 2008, as well as an elevation identified 80 centimetres towards the east and from the cut separating Sectors 1 and 2 (fig. 6.6). This is preserved to a height of 1.60 metres, including its foundations and is dressed with mud brick of brown clay. Its foundations come in the form of very large clay-bound limestone blocks, using the same technique as that of the mud-brick elevation, about 1 metre high. This last section leans against the north wall of foundation trench 7898. Courtyard 7884 runs towards the west, re-joining buttress 7886 (fig. 6.7), which comes in the form of a square, 2.70 metres on each side. The western edge is truncated by Mamlūk latrines, 7843. With that said, a buttress foundations of big limestone blocks have been identified under latrines 7843, enabling the dimensions of the original buttress. Only the foundations of the structure and its levelling course remain: this is made up of mud-brick nodules, quadrangular in shape but of irregular dimensions. As for the northern corners of the structure, these have an approximate elevation of 50 centimetres.

The rammed-earth wall approximately 30 metres long, is massive, being nearly 2 metres wide and, in places, preserved at a height of 1.2 m with the foundations (fig. 6.8). A meticulous excavation enabled us to find imprints of the wooden beams which held the formwork of the wall in place. These square-sectioned beams were positioned crossways in the thickness of the wall and were spaced out at an average of 45 cm. Moreover, vertical cracks in the *façade*s indicate that wooden formworks used were between 1.6 m and 1.9 m in length. Finally, in certain places, we found postholes in the natural sand and these holes were used to position the posts that were supporting the formwork. Foundations made of cob were laid directly on to the natural sand. This large wall thus uses an original construction technique debuted in Cairo, a wall built using the rammed-earth (*tabiyy*a) technique. A relative dating is possible, thanks to the stratigraphy. The small quadrangular basin made of baked bricks was constructed against the internal *façade* of the rammed-earth wall. Thus, this small basin postdates the rammed-earth wall. Later, construction of the mud-brick buttress of the Badr al-Ǧamālī city wall destroyed the basin. Thus, it is clear the rammed-earth wall is older than fortification from the end of the 11th century.

The function of the rammed-earth wall needs to be specified. What purpose could such a huge wall serve? Was it a funeral enclosure? Those of Iṣṭabl ʿAntar, to the south of Fusṭāṭ, seem less imposing. Was it a dwelling? This seems unlikely, considering the width of this wall as well as its length. Several elements arouse interest. Firstly, this wall is very old. Second, it follows an east-west axis which marks the northern limit of the Fāṭimid city. Finally, it is built using the *tabiyya* technique, something which was not used in Egypt for this period but frequently used in *Ifriqiya/maghreb*.[3]

As mentioned previously, our observations were confirmed by 2016 excavations on the site of al-Mashtal, between the sites of Bāb al-Naṣr and Burǧ aẓ-Ẓafar. The same rammed earth wall was found in between the two walls, in front of the Badr al-Ǧamālī city wall and behind the Salāḥ al-Dīn city wall, the one dating from the end of the 11th century and the other from the end of the 12th century (fig. 6.9). According to our stratigraphy, the rammed-earth wall was definitively identified as the first Fāṭimid city wall of Cairo: that of Ǧawhar. Thus, it would date from between 969–971.

This leads to the question of why Badr al-Ǧamālī chose to build his wall intramurally, behind that of Ǧawhar. These archaeological discoveries severely throw into question a widespread belief about the very first Fāṭimid city wall and, in particular, its location. Very little is known about this city wall, even from texts.[4] Probably, the Ǧawhar city wall was in such a state of decay that it could not be preserved intramurally. This is what Nāṣir-i

3 Or in *al-Andalous*; see Gil-Crespo, "Islamic Fortifications in Spain Built with Rammed Earth", 17–18.

4 Sayyid, *La capitale de l'Egypte jusqu'à l'époque fatimide, al-Qāhira et al-Fustât,* 146–151.

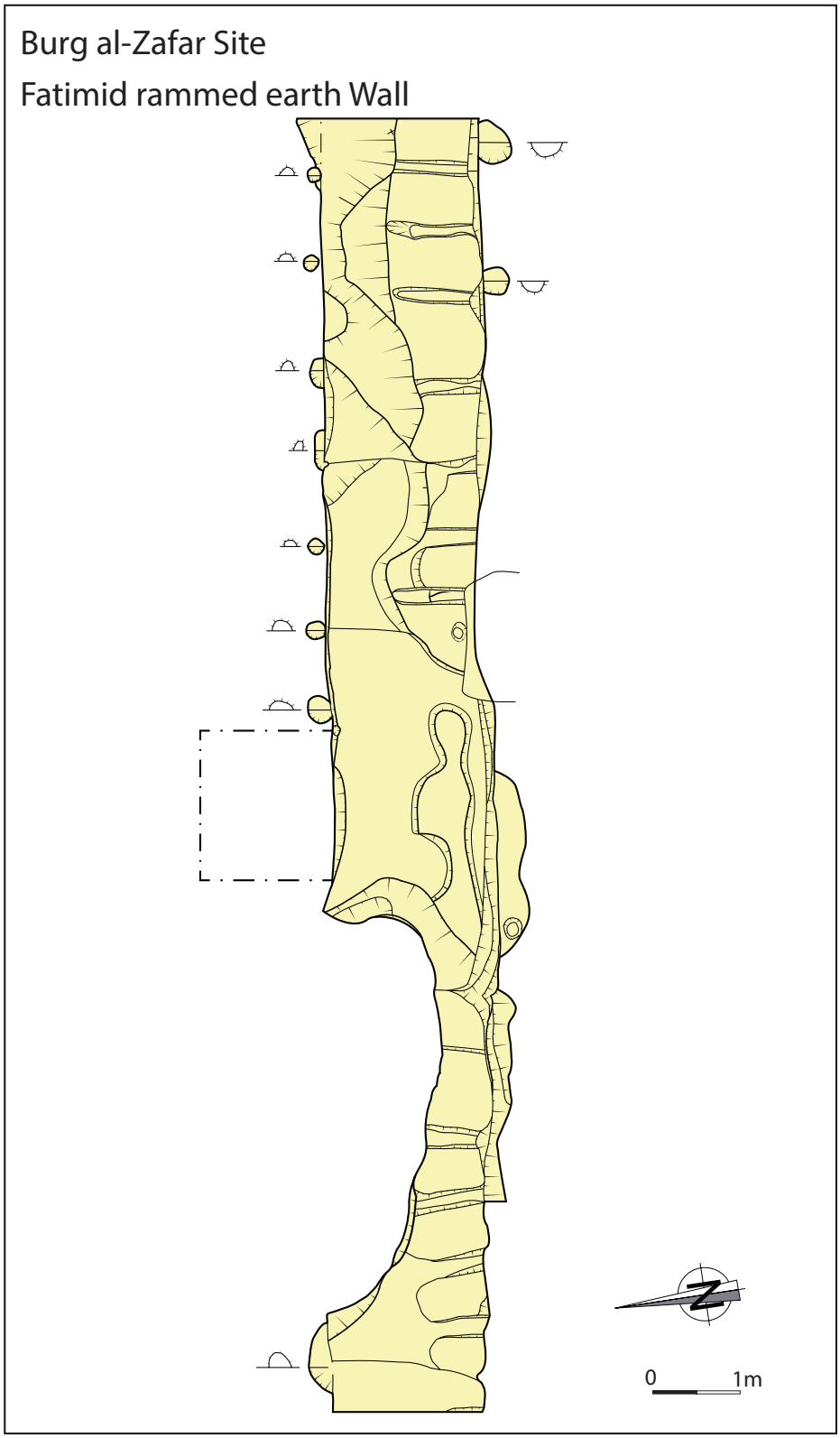


FIGURE 6.8 *Plan of the rammed-earth wall and the post-holes*
CREDITS: PRADINES.

FIGURE 6.9 *Photography of the Fatimid rammed-earth wall (969–971 AD) and the Fatimid mud bricks wall (1087–1092 AD) on al-Mashtal site*
CREDITS: PRADINES.

Khusraw indicates.[5] Consequently, Badr al-Ǧamālī left fragments of this old city wall in front of his own wall, as a sort of *faussebraye* (*faṣīl*). However, Vizier Salāḥ al-Dīn did the opposite. He decided, between 1169 and 1171, to leave Badr al-Ǧamālī's city wall behind his new stone city wall. The old mud-brick city wall was to be used in the Ayyūbid defensive system as a second rampart and was used as lice for circulation of troops, later the *bayn al-surain* of Maqrizi.[6]

The rammed-earth wall we found was probably built by a Berbers component of the Fāṭimid army, perhaps the famous Barqiyya tribe. While we cannot be certain about the exact origin of the builders, we are almost sure of the origin of this technique from the Maghreb. This technique is unusual in Egypt and unique for this period. Rammed-earth construction is rare, nearly non-existent, in Egypt. The rammed-earth wall is composed of earth tamped in wooden forms known as "moulds". Rammed-earth is generally a wet mixture comprising 30% clay and 70% sand, with the occasional addition of pebbles and gravel to improve cohesion. The mud is compressed by foot or by a wooden pestle. The earth is pressed down in layers of approximately 12 cm, which results in a height of 8 cm once it has been tamped, which is what gives the rammed-earth *façades* their laminated effect. Once the mould has been completely filled and the earth dried, it is disassembled and then reassembled at the side in order to continue building the wall. The width of this rammed-earth wall is approximately 60 cm. Generally, walls lie on a base of stones, brick, and pebbles: here in Egypt, the Fāṭimid builders used compacted mud.

With regard to the terminology of the vocabulary used to describe this earthen architecture, the *tabiyya* denotes the material that is enclosed within the mould, which is essentially rammed-earth. However, the term *tabiyya* also generally refers to the wall, the enclosure, as the *tabiyya* is a construction technique often reserved for city walls or for monumental architecture. The word *tūb* refers to the brick. Mud-brick is called *libn* according to al-Bakrî, or *tūb laban* according to Makrizi. Al-Bakrī uses the word *tûb* to refer to the mud brick, and he does use this word on quite a consistent basis, which could encompass other architectural realities.[7] This observation from Van Staevel tallies with our observations on Makrizi, who generally uses the terms *tūb* or *laban* to describe earthen architecture. Because of this, extreme caution is required when reading historical sources, since the vocabulary used by the medieval chroniclers is often linked to their place of origin, and does not necessarily reflect the techniques used. Thus, the rammed-earth wall we discovered could be described as "a mud-brick wall".

According to Georges Marçais, rammed-earth construction appears in the territories of the Berbers[8] and is not unique to the Aghlabid dynasty of Tunisia, as it dates back to, at least, the Umayyad period. Muslims built city walls using rammed earth and mud brick in Al-Andalus[9] and in the Maghreb, and this practice continued until the 10th and 11th centuries.[10] According to al-Bakrī, the original wall of Kairouan was built using mud bricks with a rammed-earth base in 144 H/ 761 AD. Thereafter, the Aghlabids were to build Raqada with walls of mud brick and rammed earth. This is important because it explains why the city wall uses two techniques, as in Tunisia, namely rammed earth for the foundations and mud brick for the wall. This theory reconciles written sources with archaeology: in Egypt the Fāṭimid walls were

5 Pradines, *et al.*, "Les fortifications fatimides du Caire: Bāb al-Tawfiq et l'enceinte en briques crues de Badr al-Ǧamālī", 238, n. 30.

6 *Ibid.,* 250.

7 Van Staëvel, "Réflexions à propos de la nomenclature médiévale de l'architecture de terre en Occident musulman: l'exemple du tâbiya", 100, 104.

8 De Chazelles, "Recherches sur les origines de la construction en pisé en Occident", 29–33.

9 The Umayyad fortifications of *Banos de la Encina*, dated 968 as per an inscription, marks an important milestone in this evolution in *al-Andalus*. See Gil-Crespo, "Islamic Fortifications in Spain Built with Rammed Earth", 3–8.

10 Marçais, *L'architecture musulmane d'Occident*, 39.

built with different techniques of construction (cob, rammed earth, mud bricks, and stones).

Bāb al-Naṣr, from Ǧawhar (969–971) to al-Ḥākim (1002–1013)

From the beginning of their dynasty, the Fāṭimids built their first capital, al-Mahdīa, during 914 using limestone, following Byzantine and Aghlabid coastal models.[11] In 946, the caliph Abu Tahir Ismail al-Manṣūr Billāh decided to build a new palatial city in the south west of the city of Kairouan. This second capital, al-Mansuriyya, was made of mud brick and red brick buildings, influenced by Mesopotamian architecture and the ʿAbbāsid cities of Baghdad and Samarra.

When General Ǧawhar al-Ṣiqillī (known as al-Saqlabī) conquered Egypt during 358/969, Prince Al-Mu'izz ordered him to construct a princely city: *al-Qāhira*, "the Victorious". The princely city was designed almost square in shape, measuring 1080 m from the north to south, and 1100 m from east to west.[12] The city ran parallel to the Trajan canal (Khalīǧ) on a north-south axis, which separated the city from the swamps and flood-prone areas on the edge of the Nile. The main focus of the City plan was both the *cardo* (north-south axis) and the *decumanus* (east-west axis) of the ancient cities, represented nowadays by the Fūtūh, Zuwayla, and Tawfīq gates.[13] The original al-Qāhira plan was influenced by Samarra, as well as by the city of Madinat al-Zahra in Andalusia. The Fāṭimid princely foundations of al-Mahdīyya and of al-Manṣūriya have also inherited characteristics from the Abassid and Tulunid cities of al-Askar in 132/ 750 and of al-Qatāi in 254/868. Few authors addressed the Cairo city wall, with the most important works still being those of Casanova and Creswell.[14] These studies were based on written sources (most often on those of Maqrīzī), so we know the difficulty of using historical material to reconstruct sites that have disappeared.

Archaeology often presents very different evidences from the stories provided by written sources. It is this new material history that we are expounding in this chapter. The city of *al-Qāhira* was protected by a city wall with eight gates, some of which, for example the gates of Bāb Zuwayla and Bāb al-Futūḥ, retained names from the city of al-Manṣūriya.[15] Bāb Zuwayla, named in honour of the Zuwayla tribe, is a double entrance incorporating two juxtaposed arches, an imitation of the gate that bore the same name at Sabra al-Manṣūriya. Today, the Ǧawhar city wall is no longer visible and has been completely covered by the present-day city. In fact, from 437–40 H / 1046–49 AD, Nāṣir-i Khusraw stated that the old city walls disappeared due to urbanisation.[16] Only some of the streets retain an imprint from the city wall in the urban fabric.[17]

We carried out three missions on the Bāb al-Naṣr site (2012, 2013 and 2014). The excavated site is located to the south-east of the monumental gate of Bāb al-Naṣr, and is surrounded by al-Utuf

11 Pradines, *The Tunisian Ribats.*

12 Sayyid, *La capitale de l'Egypte jusqu'à l'époque fatimide, al-Qâhira et al-Fustât,*. 141–171.

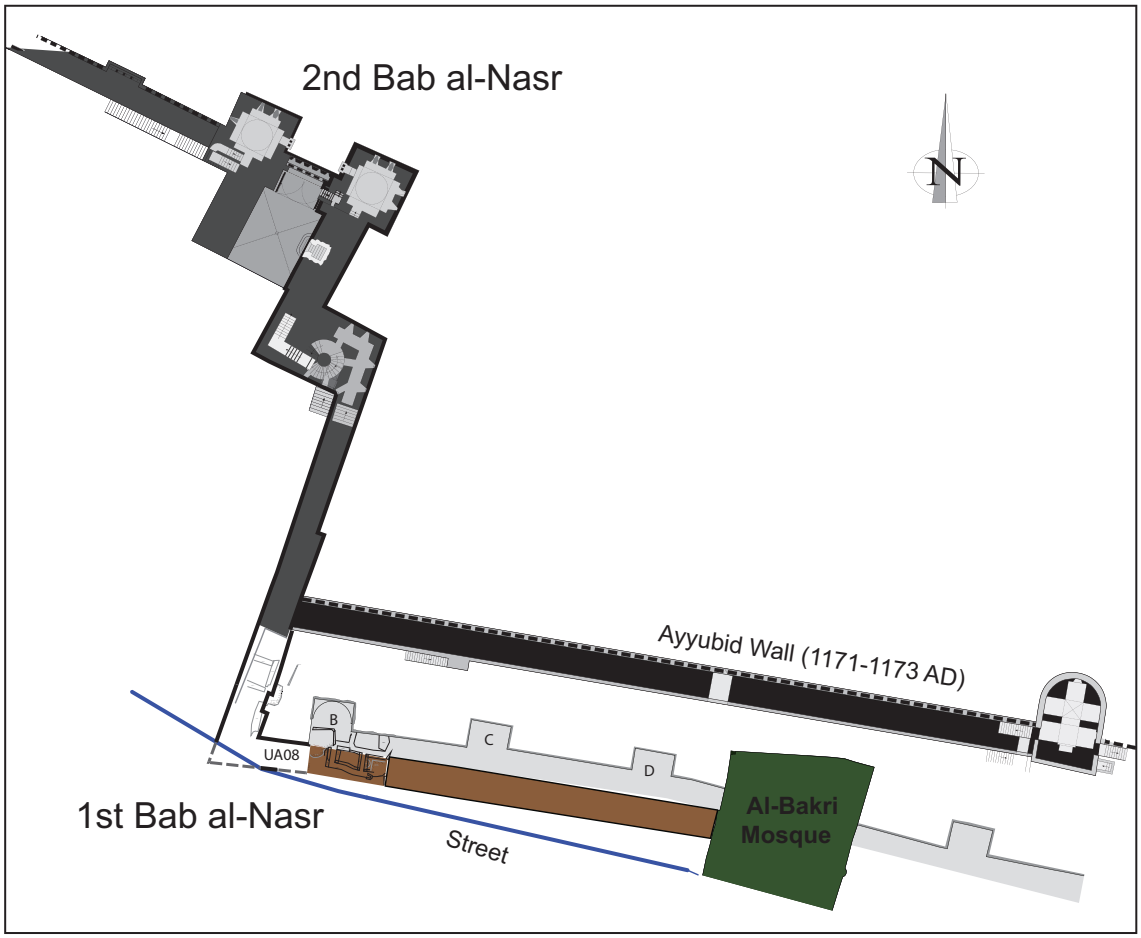
13 Excavations in Cairo city walls enable us to reinterpret the urbanisation of the city from its foundation until the Mamlūk period. The Fāṭimid Bāb al-Tawfiq and the large Ayubbid Tower of Barqiyya are witnesses to this east-west axis, still visible on the map of the *Description de l'Egypte*. Pradines *et al.*, "Bâb al-Tawfîq", 143–170.

14 Sha'i mentions the work of the SCA on Bāb al-Tawfiq and the discovery of mud bricks, فريد شافعي، قاهرة المعز كانت حصنًا لا مدينة، منبر الإسلام، العدد (9)، يناير 1965م in *Minbar al-Islam* 9, 1965, p. 121. see especially Casanova, "Histoire et description de la citadelle du Caire", 509–781; Creswell, "Fortification in Islam", 23–33.

15 To the north of the city wall, Ǧawhar dug a large ditch (*khandāq*) to ensure protection against the attacks from the Qarāmatīs perpetrated in 971, and again during 974. The ditch ran from the Muqaṭṭam hills to Munyat al-Asbagh (al-Maqrīzī, ed. al-Sayyid 2002: 582).

16 According to Nassir i-Khosrau, who visited Cairo in about 1049, there were no more traces of the first Fāṭimid city wall; Cairo had become an open city. Casanova, "Histoire et description de la citadelle du Caire", 525.

17 Abul Amayem, The Ǧawhar City Wall (year AH 358/AD 969)", 46–47, figs. 1 and 13.



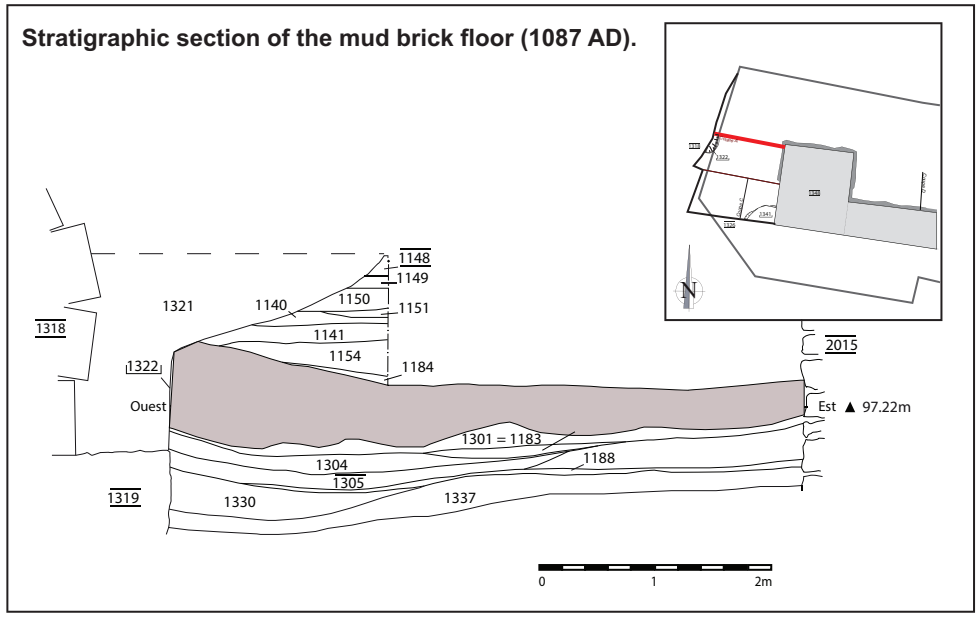


FIGURE 6.10 *Plan of the site of Bab al-Nasr and the first Fatimid gate*
CREDITS: PRADINES.

Street and the al-Bakrī Mosque (fig. 6.10). Several enclosure walls on this site were never been studied. First of all, a north-south wall which adjoins the Bāb al-Naṣr gate and dating from the Badr al-Ǧamālī era. Then, an Ayyūbid wall backs onto the Badr al-Ǧamālī city wall. Then, an east-west wall that is made up of a huge facing is identical to that of the north-south wall of al-Ǧamālī. The wall is connected to a mud-brick wall identical to the one discovered on the Burǧ aẓ-Ẓafar, Bāb al-Tawfīq, and Darrāsa sites.[18] This mud-brick city wall is built against an east-west stone wall, between the Badr city wall and the Salāḥ al-Dīn city wall (fig. 6.11). This wall is flanked by small quadrangular towers, except for the one furthest to the west, which is semi-circular in plan.

Earthworks, done by a local contractor in 2006 and 2007, revealed a totally new discovery of a wall.[19] These remains are mainly situated to the west and the east of the al-Bakrī Mosque, namely about 55 m from the wall to the west and 15 m to the east. The mosque covers 20 m of inaccessible wall. In total, we have a stone wall, hitherto undiscovered, measuring a total length of 90 m.

Towers flank this uncovered stone wall, interspersed at 15 m intervals. Four towers are visible on the site (three to the west of the al-Bakrī mosque, and one to the east). The towers are set out at regular intervals (there is no doubt that there is a tower underneath the mosque). The towers are catalogued from west to east under the labels B, C, D, E (under the mosque), and F. All the towers measure 4.8 m wide, and all are quadrangular in shape (except the semi-circular one on the far west of the site). These towers are very close together, which is not a characteristic that we have ever seen on the Badr al-Ǧamālī or the Salāḥ al-Dīn city walls. Another unprecedented characteristic of this wall is the very small size of facing slabs on the external *façade*. The curtain wall, the quadrangular walls, and the upper level of the semi-circular tower are made of tiles and header bonds measuring 40 cm and 18 cm wide respectively, and which form 20 cm-high courses. The square base blocks of the semi-circular tower are slightly larger, with 28 cm-high courses, and blocks of 20 cm to 35 cm wide on average.

The curtain wall measures 2.2 m thick (labelled UA 02 and 04). It appears between the two towers B and C at a depth of 130 cm. Three arrow-slit embrasures were identified conclusively on the curtain wall between B and C towers. While there were possibly five arrow-slits in the beginning, because sections of the wall near to the towers are in such a bad state (and are not high enough), this assertion cannot be proven. The original width of the three embrasures was not apparent simply because the arrow-slits were modified during the Mamlūk era. The openings of these arrow-slits were re-used as latrine overflows, in Mamlūk houses built on top of the wall. Some have large limestone lintels, which are characteristic of Mamlūk latrines of the 14th to 15th centuries. At this point, the tower C has an elevation of more than 3.5 m of the Fāṭimid fortification. The Fāṭimid wall was thus an integral part of medieval dwellings, which no doubt engulfed the city wall, as we had seen on the Darrāsa Car Park site.

The facing of the curtain wall is decorated with a magnificent large V-shaped herringbone motif consisting of small header columns on the facing (figs. 6.11 and 6.12). This decoration is situated between Towers C and D. There are five white marble columns in all, the lowest located 3 m above the level of the passageway (where the wall foundations start). Two are circular-section columns that measure 16 cm and 19 cm in diameter. The other three are octagonal-section columns, one measuring 18 cm from the side, and the two others 17 cm. This decorative motif on the *façade* is the only one found on the Cairo city walls and has probably never been seen before in the medieval neareast. Of course, this use of header columns is reminiscent of the Badr al-Ǧamālī city walls and its

18 Pradines *et al.*, "Les fortifications fatimides du Caire". 229–275. See below, Chapter 4.

19 During the process, they destroyed part of the Fāṭimid semi-circular tower.

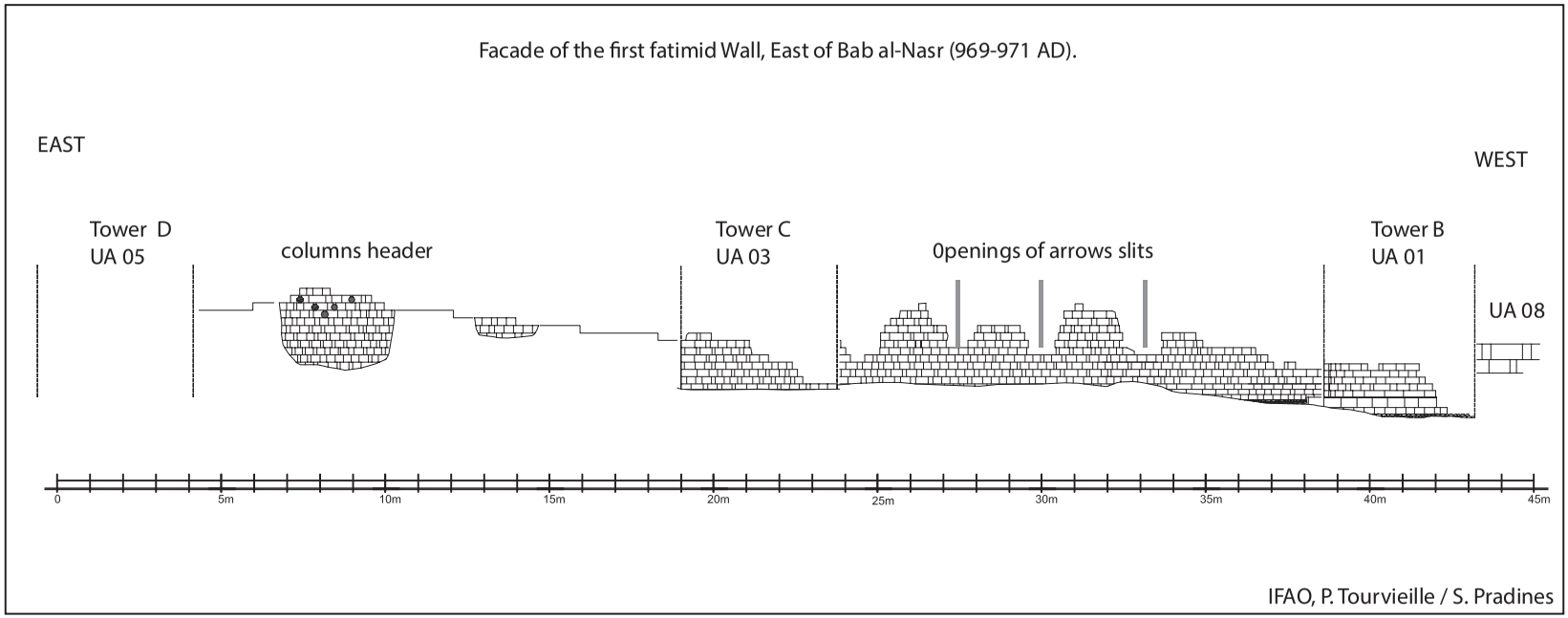


FIGURE 6.11 *Elevation of the Fatimid wall, circa 1000 AD*
CREDITS: PRADINES.

FIGURE 6.12 *Photography of white marble columns in the wall*
CREDITS: PRADINES.

FIGURE 6.13 *Photography of the excavations of the Fatimid wall beside Bab al-Nasr*
CREDITS: PRADINES.

FIGURE 6.14 *Photography of the semi-circular tower of the first Bab al-Nasr*
CREDITS: PRADINES.

built by Salāḥ al-Dīn. However, in the cases cited, it only concerns the columns that are arranged equidistantly and on the same course.

We are familiar with these architectural elements, with the small-scale, almost buttress-like, flanking quadrangular towers. Isn't the Fāṭimid city wall of Badr al-Ǧamālī also flanked by quadrangular towers, whether at the corners of the City as is the case at Burǧ aẓ-Ẓafar, or at the gates such as Bāb al-Naṣr and Bāb al-Tawfīq? Only the gates of Bāb al-Futūḥ (1087) and Bāb Zuwayla (1092) do not follow this rule, in that they are flanked by semi-circular oblong-shaped twin towers on a rectangular base and with a moulded *façade*. This is why Tower B immediately captured our attention. This tower, semi-circular in shape, rests on a square base and has a moulded salient on its eastern side, identical to that of the Bāb al-Futūḥ gate. The foundations of the semi-circular tower are slightly deeper and differ from those of the curtain wall, to which it is connected. Moreover, we notice a vertical crack at 50 cm to the east of the tower but which cannot be found on all of the preserved elevation. On the first three courses above the foundations, the slabs are slightly smaller than on the remainder of the elevation. These elements show with certainty that the tower was built before the curtain wall, as is often the case in military architecture.

The similarity between Tower B and the mighty Fāṭimid gates of Badr al-Ǧamālī leads us to think that this tower is in fact linked to a gate. The same plan was used for the twin towers that encircle the entrance that dominates the Bāb al-Qanṭara gate. Although this gate has now disappeared, it was published by Creswell while it was still evident.[20] Added to that is the fact that the passageway from the probable door is blocked by a totally different wall with a huge facing, identical to that found on the Badr al-Ǧamālī city wall. The courses of this wall measure 50 cm high and alternate on average from tiles of 70 cm and headers of 25 cm wide. We noticed that the foundations of the 1087–1092 wall were deeper than those of tower B. However, the huge wall postdates the tower, as revealed during the excavations. The facing of the large wall is carved in such a way that it backs onto and interlocks with the facing of tower B. The foundations of the huge wall are deeper because they follow the construction level of the Badr al-Ǧamālī curtain wall that adjoins the Bāb al-Naṣr gate.

The final architectural element excavated in 2012 was a mud-brick wall measuring 2.9 m wide (figs. 6.13 and 6.14). The measurement was taken in a section where this wall can be clearly seen. The mud-brick wall is located right on the axis of the huge facing wall and the back of the curtain wall is made of stone and incorporates B, C, and D towers. The thickness of the mortar joints and the size of the bricks are identical to those of the Fāṭimid wall that we dug up at Burǧ aẓ-Ẓafar, Darrāsa and at Bāb al-Tawfīq. The architectural similarity between this wall and the city wall of Badr al-Ǧamālī is striking. Moreover, this wall seems to be a continuation of the huge facing wall (*UA*08). However, we can date the *UA*08 wall as being from the same period as the north-south wall *UA*07, namely the time that the city wall of Badr al-Ǧamālī was built between 1087 and 1092.

The construction of the Badr al-Ǧamālī enclosure wall is indeed dated by the epigraphy of the inscriptions in situ and historical sources. The city wall was commenced to the north with Bāb al-Naṣr in 1087 and completed to the south with Bāb al-Zuwayla in 1092. The north-south and east-west walls of Badr al-Ǧamālī are part of the same construction programme, as the foundations of both walls are built by beds of rubble stone submerged in mortar with a very high ash content, which lie alternately one on top of the other, demonstrating the synchronous appearance of these constructions. The foundations of the north-south wall use Pharaonic blocks like those used on the Fāṭimid enclosure wall that was identified beside the new Midan opposite Bāb al-Naṣr. These blocks

20 Creswell, *Muslim Architecture*, 25.

were chosen for their large size, and also for their solidity, with most of them being made of granite.[21] They form an ideal foundation.

A mud-brick platform was discovered between the semi-circular tower and the Badr al-Ǧamālī city wall. This platform is a passageway linked to the foundation ledge of the enclosure wall dated AD 1087. This thick level was built using the waste material from the fabrication of the mud-brick city wall. It covered a level of waste material of limestone blocks, undoubtedly linked to the quarrying of the facing blocks of the Badr city wall. This stratigraphy allows us to say that the stone wall and the gate were built before the mud brick wall. This level covered thick and deep levels of fill from the foundation trenches of the two stone walls dated AD 1087. The mud-brick platform and all the fill levels of the foundation trenches stretch around the two walls around the undated stone city wall (figs. 6.15 and 6.16). These fills were made up of levels of debris and rubbishes from the Fāṭimid city, from its foundation in 969 until the wall construction in 1087. These levels are very interesting as they are sealed by the mud-brick platform that is clearly dated 1087.[22] The levels of the fill from the foundation trenches of the two stone walls of Badr al-Ǧamālī, clearly abuts the undated foundations of the stone wall. The same is true for the mud-brick platform that seals foundation trenches, corresponding to the passageway dated from the Badr al-Ǧamālī era (AD 1087–1092).

The foundation ledge of the undated enclosure wall is higher than that of the Badr al-Ǧamālī city wall. In fact, during the digs, we noted how very deep the trench was that was dug of the foundation of the Badr al-Ǧamālī enclosure wall. It was almost 3m56. Digging exposed the foundations of the earlier structures including the previous Fāṭimid fortifications. This earlier city wall was, undoubtedly, built before the end of the 11th century (1087). It is very difficult to consider that the undated wall may be contemporaneous with the Badr city wall, the construction techniques of which are different (whether it was built two techniques, mud bricks, or large dressed stones). Consequently, the city wall of might has been engirdled by al-Ḥākim during the construction of his Mosque that straddled the original city wall. The metrology of the blocks of the al-Ḥākim Mosque supports this interpretation.

Our excavations indicate four distinct defensive networks. First of all, a wall, namely the fortifications of Ǧawhar, dated from AD 969 to 971. This wall was made of mud bricks on rammed-earth foundations. A few years later, this wall was renovated during the construction of the al-Ḥākim Mosque. During this second phase, a stone wall was built in front of the old wall. This fortification comprises quadrangular towers. These are positioned very close together, and have small facing and header columns, which create a geometrical motif and one single semi-circular tower. The semi-circular tower would be the twin tower of the original Bāb al-Naṣr renovated by al-Ḥākim around 1010. This semi-circular tower appears to be linked to an entrance, the first Bāb al-Naṣr that may has been blocked later by the construction of the Badr al-Ǧamālī city wall. Thirdly, the Badr al-Ǧamālī city wall and the gate of Bāb al-Naṣr date from 1087. This wall starts at Bāb al-Naṣr towards the south and makes a sharp bend towards the east and seems to block the ancient gate. The composition of the Badr al-Ǧamālī city wall switches from large stone-work bond to a mud-brick work bond. This wall backs onto a much older wall and is twice as thick as that one. Finally, Salāḥ al-Dīn built a new city wall in front of the Fāṭimid fortifications. The wall was built later than the Burǧ aẓ-Ẓafar Tower (dated from 1169 to 1171), but which possesses unusual and archaic characteristics which likely date from 1171 to 1173 and which indicates that this section of the wall pre-dates the eastern city wall of

21 Two limestone blocks covered in hieroglyphics were discovered during 201.

22 Monchamp, "Céramiques fatimides de Bāb al-Naṣr, murailles du Caire (fin de Xe–XIe siècles)".

FIGURE 6.15 *Photography of the mud brick floor of Badr al-Gamali and the foundations of this stone wall*
CREDITS: PRADINES.

FIGURE 6.16 *Photography of the section of the mud brick floor of Badr al-Gamali lying against the foundation of the first Bab al-Nasr*
CREDITS: PRADINES.

Salāḥ al-Dīn, from Bāb al-Ǧadīd up to the Burǧ al-Mahrūq (1173/74 to 1177/78 AD).[23]

The presence of several city walls to the south of Bāb al-Naṣr confirms a hypothesis that Creswell suspected,[24] namely that Badr al-Ǧamālī sought to connect his fortifications to the primary boundaries of the city established by Ǧawhar in 969. Our findings will, undoubtedly, have a major impact on our understanding of Fāṭimid Cairo boundaries and its urban history. The al-Hâkim mosque was built over both sides of the Ǧawhar city wall (fig. 6.17). In fact, even if this wall had a southwest orientation, the mosque must have sat right on top of a section of the wall and not completely *extra-muros* as all the historians said previously. Moreover, it is important to note that if the al-Ḥākim Mosque was built over both sides of the city wall, 80% to 90% of the building remains outside the city walls and therefore, as far as the medieval chroniclers are concerned, this was a mosque outside the walls. No doubt that the huge towers of al-Ḥākim mosque reinforce our archaeological interpretation. The Aghlabid Mosques of Kairouan and Sousse were used for military purposes as well. Later the Fāṭimid mosques of Mahdiyya and al-Ḥākim share certain common characteristics: they straddle the city wall, and are flanked by heavily-buttressed towers.[25]

The Gates of Badr al-Ǧamālī, the Armenian Monumentality

Badr al-Ǧamālī, who was a Mamlūk of Armenian origin and who went on to become Governor of Damascus and then of Acre, led many victorious battles in the north of the Fāṭimid territories. Following his success, and at the request of the Caliph, he arrived in Egypt during 465 H/1073 AD with his Syrian troops. In order to restore order in the country, he was appointed "Supreme Commander of the Armies" and was known as the Emir al-Ǧuyushī. In fact, from the middle of the 5th/11th centuries, the Caliph al-Mustansir (426–87 H/1035–94 AD) was faced with unprecedented economic and social problems: the famine that followed a low Nile and decimated Egypt's population, as well as loss of control of the Mamlūk Turks, following rebellion among the Sudanese and Berber troops. Faced with the complete erosion of the caliphate power, Badr al-Ǧamālī was to prove to be the veritable Master of Egypt. He restored the Fāṭimid authority in the country's capital city and at its borders and he eliminated the rebellious factions and insurgents within his army.

Badr al-Ǧamālī was not only a ruler, he was also a great builder. He endowed Cairo with new fortifications enclosing the primitive Fāṭimid city which, in the end, extended outside the original city wall, as can be seen at the mosque of al-Hâkim. Undoubtedly, the most notable among the Vizier's[26] buildings were the large gates of Cairo (479–84 H/1087–92 AD): Bāb al-Futūḥ, Bāb al-Naṣr, and Bāb Zuwayla. Two gates pierce the northern side of the city: Bāb al-Naṣr to the east, and Bāb al-Futūḥ to the west. Bāb al-Naṣr is a straight entrance that measures 24 m wide, 20 m deep, and 21 m high (fig. 6.18). The entrance is protected by two square towers measuring 8 m on each side. Each tower has three storeys, two of which are filled in, and it is only the upper sections used for defence which are equipped with firing chambers. Bāb al-Futūḥ is a straight entrance, protected by murder holes. It is flanked by semi-circular, oblong towers 7.5 m wide, projecting forward 7.5 m. The entire gate measures 23 m wide, 25 m deep and 22 m

23 Pradines, *et al.*, "Excavations of the Archaeological Triangle". 177–219; Pradines, "Burǧ al-Zafar", 51–119.

24 Creswell, *Muslim Architecture.*, vol. I.

25 Pradines, *"The Tunisian Ribats".*

26 The Badr al-Ǧamālī mosque sits atop the Muqaṭṭam mountain and towers triumphantly above Cairo.

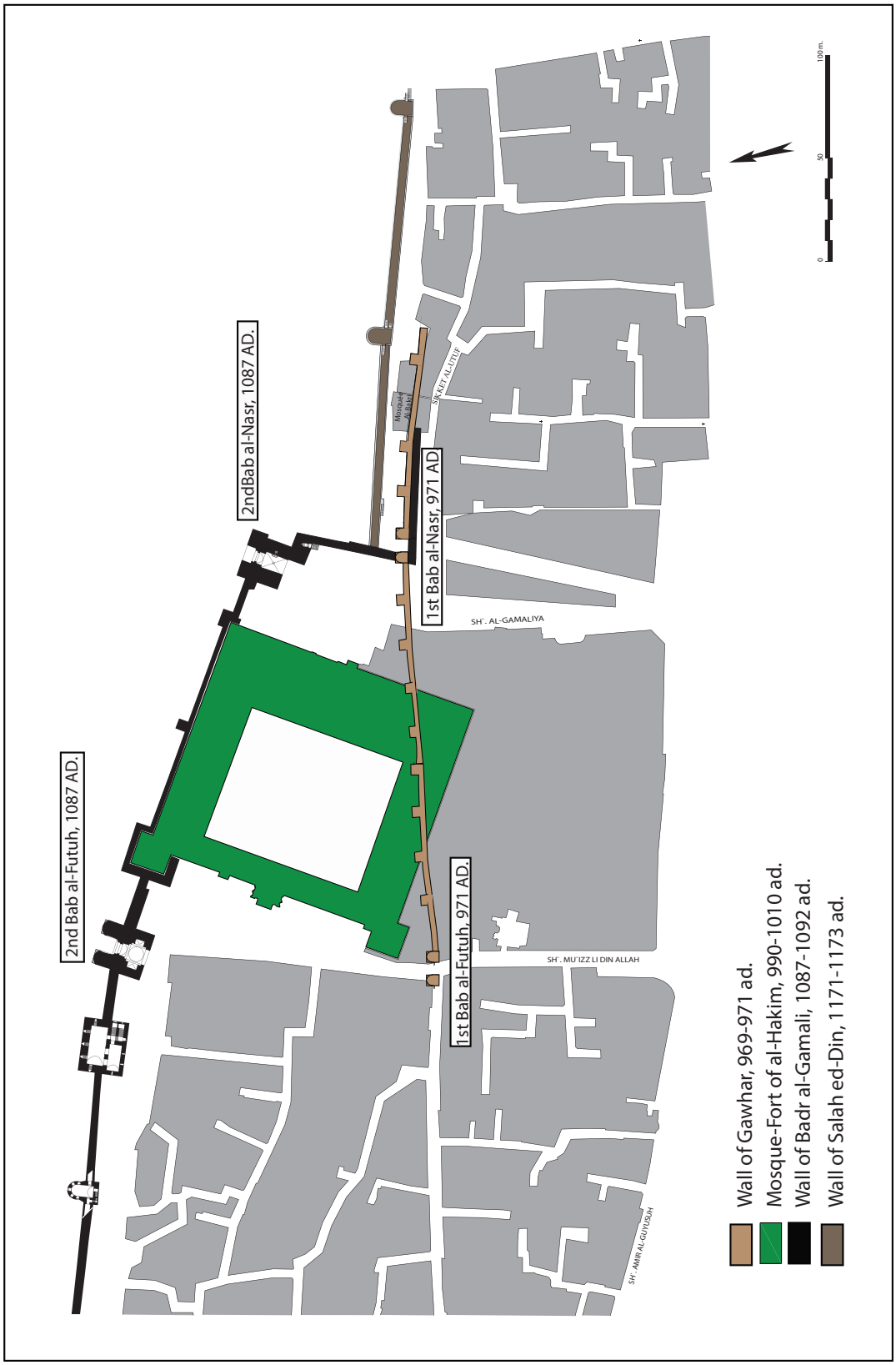


FIGURE 6.17 *Restitution of Gawhar and al-Hakim walls*
CREDITS: PRADINES.

FIGURE 6.18 *Photography of the second Bab al-Nasr (1087 AD)*
CREDITS: ALAIN LECLER, IFAO.

high. According to al-Maqrīzī,[27] Bāb al-Naṣr and Bāb al-Futūḥ were preceded and protected by barbicans (*bašhura*) which had been destroyed under the Mamlūks. These barbicans offered enhanced protection by means of a bent entrance. Bāb Zuwayla is the gate of the southern *façade* of the city, and it is located exactly on the north-south axis of Bāb al-Futūḥ. With their semi-circular, oblong towers, these two gates are similar without being identical. Bāb Zuwayla measures 26 m wide, 25 m deep, and 24 m high.

These three monumental gates possess architectural elements reminiscent of northern Syria, including arrow-slits that appear to be influenced by the regions of Edessa and Antioche, as proof of a direct and clear link according to Fourdrin.[28] All this is quite logical, as even before the arrival of the Great Vizier, the Armenians were an essential component of the Fāṭimid army.[29] They brought with them their arms and their art of war, including the art of building fortifications. When Badr al-Gamālī arrived in Egypt, with his Syrian troops and his Armenian master builders, he merely reinforced this process and brought it to its height with the construction of the new enclosure wall (fig. 6.19).

These monumental gates are exceptional, emblematic of the Fāṭimid city, and represent symbolic blazons of the Fāṭimid dynasty and the power of its Vizier. The gates' decorations play an essential role. There is no doubt that the shields which appear on Bāb al-Naṣr represent the two army corps, the infantry and the cavalry, and also represent the various ceremonies of investiture, important processions and military parades.[30] Above all, the inscription between Bāb al-Futūh and Bāb al-Naṣr glorifies the power of the Fāṭimids. This inscription band, made up of slabs of white marble, measures 50 metres long; these plates are supported by 42 bronze nails. The text, carved in foliated Kufic, shows great craftsmanship, commemorates the construction of the city walls that surround Cairo and mentions the commencement date of the works (480 H/AD 1087).[31] It is a unique inscription band and a tremendous propaganda tool for the Fāṭimids. Many researchers, such as Creswell, Bloom, Blair, and Bierman, took the example of Diyār Bakir as a means of comparing the inscription bands of this city with those of Cairo.[32] Most of the researchers refer to the influence that Diyār Bakir had on Cairo. In the end, everything would come from Northern Syria, whether it be architecture or monumental epigraphy.[33]

It was alleged (by Abū Sālih in his book, *Churches and Monasteries of Egypt,* and confirmed by al-Maqrīzī), that each of three Armenian engineers built one of the Cairo gates at the beginning of

27 Badr al-Ğamālī oversaw the construction of a barbican in front of Bāb al-Futūḥ. This barbican, which was installed between the two entrance towers, was destroyed at the time of the urbanization of the extramural area (al-Maqrīzī, *Al-Mawā'iẓ wa-al-i'tibār fī dhikr al-khiṭaṭ wa-al-athār,* vol. 2 274). Bāb al-Naṣr was also protected by a barbican, and this defence, which was very advanced, lasted right up until the reign of Sultan Barqūq, and it was he who decided to destroy it in order to build, in its place, his "*sabil*" (a public cistern and water dispenser) (al-Maqrīzī, *Al-Mawā'iẓ wa-al-i'tibār fī dhikr al-khiṭaṭ wa-al-athār,* vol. 2 271). Bāb al-Tawfīq and Bāb Zuwayla had a different sort of protection, by means of a glacis. Pradines *et al.* , "Les fortifications fatimides du Caire", 240–241 ; Abul Amayem, "Les murailles du Caire. The Ğawhar City Wall (Year AH 358/AD 969)", 46–47, figs. 1, 13.

28 Originally, the architects of the Fāṭimid city wall would have come from Edessa. Fourdrin, "L'association de la niche et de l'archère dans les fortifications élevées en Syrie entre le VIe et le XIIe siècle", 293–294. Yovitchitch could also see the architectural relationship between the gates of Cairo and the gates of Kharput and Mārdīn at Diyār Bakir. See Yovitchitch, *Forteresses du Proche-Orient; l'architecture militaire des Ayyoubides,* 242–243.

29 Halm, "Badr al-Ğamālī, Wesir oder Militärdiktator?" 121–127; Dadoyan, *The Fāṭimid Armenians: Cultural and Political Interaction in the Near East,* 127–139.

30 Sanders, *Ritual, Politics and the City in Fāṭimid Cairo*, 39–82; Nicolle, *Arms and Armour of the Crusading Era, 1050–1350,* 125–126.

31 *Arabian Epigraphical Records*, 2762 (1936).

32 Bierman, *Writing Signs: The Fāṭimid Public Text*; Blair, "Floriated Kufic and the Fāṭimids", 107–116; Bloom, "Walled Cities in Islamic North Africa and Egypt with Particular Reference to the Fāṭimids (909–1171)", 219–246.

33 The oldest inscriptions of the city walls of Diyār Bakir date to 1045 and 1088.

FIGURE 6.19 *Photography of the Fatimid northern walls (1087 AD)*
CREDITS: PRADINES.

the 13th century, and that they had collaborated with a Coptic monk.[34] While tradition has it that these three engineers were Armenian like Badr al-Ǧamālī; although Abū Sālih was quite precise in his reference to the geographical origin of the three brothers—namely the city of Edesse (al-Ruhā/Urfa)—he mentioned their social class or their religion in his text. The tradition of three Armenian brothers having each built one gate reflects the plurality of builders involved in these monumental works. It is also a myth, as the city wall of Badr was opened with numerous gates, of which at least two others were stone. The first is located to the northwest of the city, and is known as Bāb al-Qanṭara. This is the one on the bridge that crosses the canal (Khaliǧ), destroyed by the Cairo governorate in 1878. According to Ali *pasha* Mubarak, the gate had been removed and there was, apparently, an inscription in Kufic over the gate. Unfortunately this was not examined, and all that remains is a plan showing a straight entrance surrounded by oblong semi-circular towers.[35] Although smaller, the other Fāṭimid gate (known as Bāb al-Tawfīq) is located in the centre of the eastern side of Cairo. It measures 9 m high and is more commonly known by the name of Bāb al-Barqiyya, according to Fouad Sayyid.[36] Above the entrance is an inscription of five lines in floriated Kufic script mounted on a marble plate. The gate is protected by a ramp made of granite slabs uncovered during 2005. This ramp resembled the glacis—*zallāqa*—that was used as a defence for Bāb Zuwayla but which was dismantled by the Ayyūbids. Bāb al-Tawfīq was flanked by two quadrangular, mud-brick towers. The plan of this gate is not dissimilar to that of Bāb al-Naṣr (figs. 6.3 and 6.25).

In a monumental effort, a part of the northern and southern *façades* of the city were built partly in stone and the eastern and western *façades* in mud brick.[37] Out of the southern enclosure wall, only Bāb Zuwayla remains, and a small section of the curtain wall, with the city enclosure having been invaded and gradually destroyed by the mosques and the Mamlūk and Ottoman dwellings that were installed between this zone and Bāb al-Wazīr. The northern curtain wall between Bāb al-Futūḥ and Bāb al-Naṣr was built in stone and, up until now, has not been adversely affected by urbanization, due to the fact that the extramural space was only surrounded, to the north, by a necropolis. From all our observations, both archaeological and bibliographical, there are certain stylistic constants regarding the Fāṭimid fortifications of Cairo. The Badr al-Ǧamālī city wall is endowed with quadrangular towers and buttresses, and only the towers of the gates of Bāb al-Futūḥ and Bāb Zuwayla are oblong and semi-circular in shape. As from 1891, Van Berchem had already confirmed this layout.[38] The southern stone *façade*, to the side of Bāb Zuwayla, consists of a rectangular tower measuring 8 m by 7.7 m and two buttresses measuring 4 m by 3.4 m. The northern *façade* comprises two towers located between Bāb al-Futūḥ and Bāb al-Naṣr, one measuring 5 m by 4.7 m and the other 8 m by 4.7 m. The two towers that flank the Bāb al-Naṣr entrance can also be added to this list.

As a conclusion to this chapter, not only the gates, but also the northern and southern *façades* of the city, clearly demonstrate an Armenian presence. This presence is characterized not only by the size of the expertly-crafted stones which were adorned by the decorative lexicon so characteristic of the Byzantines, but also the types of arrow-slits and flanking works which were reminiscent of the ancient traditions. This architectural style clearly demonstrates the "known" role of the Armenians in the Fāṭimid army.[39] This role was to be further

34 Pradines *et al.*, "Bāb al-Tawfīq", 143–170.

35 In 1920, the architect Patricolo found a tower which, in style, resembled very closely that of Bāb al-Futûh and Bāb Zuwayla. It was called Bāb al-Qanṭara of the Badr al-Ǧamālī city wall, not of the Ǧawhar city wall as Creswell suggests. The gate was demolished by Qāsim Pāša, the Governor of Cairo in 1878. (Creswell, *Muslim Architecture,* vol. 1, 25–26).

36 Sayyid, *La capitale de l'Egypte jusqu'à l'époque fatimide, al-Qāhira et al-Fustât,* 418–431.

37 Pradines, "Les fortifications fatimides", 241.

38 Van Berchem, "Notes d'archéologie arabe", 411–495.

39 Canard, "Notes sur les Arméniens en Egypte à l'époque fatimide", 143–157; Dadoyan, *The Fāṭimid Armenians:*

strengthened, at the end of the 11th century, by the arrival of Badr al-Ǧamālī, with his engineers and his stonemasons.

The 1087–1092 Mud-Brick City Wall, and the Nubian Tradition

For Creswell,[40] the city wall of Badr al-Ǧamālī was merely an extension to the north and the south of the original city and, according to him, all of the city wall was made of stone, as were the monumental gates. This erroneous interpretation, which was linked to an incorrect reading of the boundaries of the city to the east,[41] misled generations of researchers studying Cairo.[42] Our excavations have proved that the layout of the eastern city wall covered an area greater than what was generally described and that this Fāṭimid city wall was made up solely of mud brick, with a gate, Bāb al-Tawfīq, in stone.[43] The sections of the mud-brick city wall that were discovered show that the Badr al-Gamālī fortification continued all along the eastern flank of Fāṭimid Cairo, from Burǧ aẓ-Ẓafar to Burǧ al-Mahrūq. Even the northern *façade* was, in part, protected by a mud-brick city wall. This city wall was found at an indentation of the Fāṭimid city wall, to the southeast of Bāb al-Naṣr and on al-Mashtal. This indentation in the stone city wall was made to ensure its integration into the old layout of the mud-brick city wall, which then runs towards the east in the direction of Burǧ aẓ-Ẓafar (fig. 6.3).

The city wall and the flanking works are very regular on all the sites that we dug, at Bāb al-Naṣr, al-Mashtal, Burǧ aẓ-Ẓafar, Bāb al-Ǧadīd, Bāb al-Tawfīq and on the Darrāsa Car Park (next to al-Azhar Park). They are either quadrangular towers measuring 7 to 8 metres on the sides alternating with buttresses from 3 to 4 metres on the sides (figs. 6.20 and 6.21). The city walls and the towers are plain, without arrow slits niches on the bottom storey, with the firing positions being on the upper storey, directly from the parapet. It is important to stress that the defensive elements, such as the projections on the curtain walls and the gates, follow a plan that does not take into account the composition of the construction materials, since sometimes it is mud brick and other times it is limestone for the north and south *façades* of the city. Although, now, it has been significantly levelled, the mud-brick city wall has an estimated height of six to seven metres. The height has been calculated using various criteria, such as the height of the smallest gate, Bāb al-Tawfīq, which is 9 metres. As the curtain walls are always lower than the gates, the city wall could not have been higher than 7 metres (fig. 6.22). Furthermore, the width of the Fāṭimid curtain wall measures 3.7 m, a thickness which is quite close in measurement to Salāḥ al-Dīn's city wall, which measures 4 m thick and reaches a height of nearly 6 m. The Fāṭimid city wall must have been impressive, with its appearance being reinforced by a yellowish render which covered the brick masonry.[44] Thus, the

Cultural and Political Interaction in the Near East. It was estimated that there were 7,000 Armenian troops camped out in the north of the Husayniyya quarter. These Christian soldiers, both infantrymen and cavalrymen, arrived *en masse* under Gamālī.

40 Creswell, "Fortification in Islam before AD 1250".

41 Ravaisse, "Essai sur l'histoire et sur la topographie du Caire d'après Makrîzî", 454, pl. 2.

The eastern boundaries of Cairo are represented by following the Napoleonic fortification on the map of the *Description de l'Egypte*. This fortification follows the outline of the Ottoman city, having nothing to do with the extension of the city during the Fāṭimid era (Pradines, "Napoleonic Fortifications in Egypt 1798–1801", 98–99).

42 Denoix, *Décrire Le Caire, Fusṭāṭ-Miṣr, d'après Ibn Duqmāq et Maqrīzī. l'histoire d'une partie de la ville du Caire, d'après deux historiens égyptiens des XIVe–XVe siècles,* 6–7; Raymond, *Le Caire*, 39.

43 Pradines, *et al.* "Les fortifications fatimides du Caire", 229–275. See also an earlier source regarding Maqrīzī's interpretation; Casanova, "Histoire et description de la citadelle du Caire", 524–534.

44 Pradines, *et al.*, "Excavations of the Archaeological Triangle", 202.

FIGURE 6.20
Photography of Badr al-Gamali's mud brick wall, beside Bab al-Gedid
CREDITS: PRADINES.

FIGURE 6.21
Photography of a detail of Badr al-Gamali's mud brick wall, beside Bab al-Gedid
CREDITS: PRADINES.

Cairo fortifications were smooth, massive and uniform in appearance.

The construction techniques that were used on the Badr al-Ǧamālī city wall were the same as those used on the first Cairo city wall, that of Ǧawhar (358–60/969–71). For Farid al-Shafi, who saw this mud-brick city wall in 1957, this was an extension of the Ǧawhar city wall by Badr al-Ǧamālī. Apparently, the powerful Vizier simply pierced the city wall with a monumental stone gate, Bāb al-Tawfīq.[45] This hypothesis was tempting but

45 Sha'i, فريد شافعي، قاهرة المعزكانت حصنًا لا مدينة، منبر الإسلام، العدد (9)، يناير 1965م, 119–121.

FIGURE 6.22
Photography of Bab al-Tawfiq and her Zallâqa
CREDITS: PRADINES.

did hold up in the face of the material evidence gathered by our excavations (fig. 6.23).[46] The mud-brick wall that was discovered during 2004–2005 was bounded to the stone gate, and it shares the same foundations as the gate and the glacis or ramp (*zallāqa*) in front of the door (figs. 6.24 and 6.25). This mud-brick city wall is perfectly linked to the stonework to the south of the gate. Our excavations have shown that the eastern mud-brick city wall is contemporaneous with the construction of the Fāṭimid gate, dated from 1087–1092. The city wall discovered to the south of al-Azhar Street on the Darrāsa Car Park, comprised a tower that stood on a mausoleum, a fountain and a garden dating from the beginning of the 11th century (figs. 6.26 and 6.27).[47] Therefore, it is not possible that this is the Ǧawhar city wall, which dates from the second half of the 10th century. Finally, we found a fragment of this mud-brick city wall behind Bāb al-Ǧadīd in the northeast of Fāṭimid Cairo. All the signs are that Badr al-Ǧamālī's workers used mud brick to protect the entire eastern side of the city of Cairo. This is also the reason why there are no longer any discernible remains, given that this

46 Pradines *et al.*, "Bāb al-Tawfīq", 143–170.

47 Pradines *et al.*, "Fāṭimid Gardens", 1–30.

FIGURE 6.23 *Photography of the Badr al-Gamali's mud brick wall connected to Bab al-Tawfiq*
CREDITS: PRADINES.

material is more fragile than stone. A part of this city wall was protected by conservation works, done by the Aga Khan Trust for Culture between 2011 and 2015 (fig. 6.28).

As for the composition of the construction material used for the city wall, namely mud brick, its use is in no way surprising. The ʿAbbāsids often used mud brick and baked bricks but it was a local criterion that was the primary consideration. Thus, the mud-brick city walls with monumental stone gates are constructions that have been well known in Egypt since the Pharaonic period.[48] The enclosure walls of Ancient temples resembled those of the forts and the cities, as, for example, the Buhen[49] Fort in Lower Nubia. These curtain walls could reach a height of 11 m, or even higher. The towers were semi-circular, oblong or quadrangular. The tradition of using mud bricks for city walls lasted a very long time, in fact right up until the Middle Ages when mud brick was used to construct the high and mighty walls that surrounded many of the Coptic monasteries. It is important to stress the fact that the use of mud brick is primarily a vernacular phenomenon. More than the environmental and economic factors, it is the cultural aspect that is of prime importance. Local technologies are used and this is probably because of the influence of the Egyptian contingent of the Fāṭimid army, soldiers from Upper Egypt and Aswan, the so-called "Black army".

Conclusion: The Ethnic Groups Have a History;[50] Do They Have an Archaeology?

Just like the Fāṭimid fortifications of North Africa, the Cairo City Walls were influenced by local techniques. Of course, Badr al-Ǧamālī did call upon experts who were from his milieu and his region of origin, particularly for the construction of the gates. Nevertheless, there were other contingents in the Fāṭimid army. One of these contingents was made up of Upper Egypt people, the Saʿīdī from the Nile valley, and Nubians from Aswan.[51] These people have used, and continue to use, an architecture in mud brick. It is these construction techniques that have been used for part of the city wall. The Cairo fortifications are in fact a complete social phenomenon in that they reflect the society and hierarchy of the people living at that time. In fact, the monumental stone gates are not only reminiscent of the power of the Caliph or the vizier, but also of the Armenian officers; while the mud-brick city wall is more rooted in the vernacular traditions of Upper Egypt.

48 Monnier, *Les forteresses égyptiennes. Du Prédynastique au Nouvel Empire.*
Vogel, *The Fortifications of Ancient Egypt; 3000–1780 BC*.

49 Emery *et al. The Fortress of Buhen: The Archaeological Report,* pl. 3.

50 Chrétien *et al.*, *Les ethnies ont une histoire.*

51 Bacharach, "African Military Slaves in the Medieval Middle East: The Cases of Iraq (869–955) and Egypt (868–1171)", 471–495.

FIGURE 6.24 *Photography of the Badr al-Gamali's mud brick tower connected to Bab al-Tawfiq*
CREDITS: PRADINES.

This can seem to be an astonishing remark, but the Fāṭimids, who were exogenous elements, always based their culture on that of the indigenous cultures. Thus, the Fāṭimids of Cairo have taken on the architectural traditions of Upper Egypt and Nubia, as well as the Mesopotamian traditions that were so entrenched in the country since the ʿAbbāsid occupation. At the end of the 11th century, a change occurred with the influence of the Armenian builders; however, this change only applied to the gates. The introduction of these techniques and plans, which emanated from the north of Syria, were to be carried on until the end of the 12th century, with Salāḥ al-Dīn.

To the question:[52] is it possible to link medieval archaeology, ethnicity and identity? The answer is "yes". We have been able to show that stone and earth were used by the Fāṭimids during the same period and for the same project: the city walls. Earth was used to build the curtain walls of Cairo and stone was reserved for the construction of the prestigious city gates. Based on the study of the historical sources, we have proposed an interpretation of the architectural technologies used. This interpretation is not based on natural resources or technical knowledge, but according to the ethnicity of the different corps composing the Fāṭimid army. We noticed three main techniques and groups at the origin of these technologies: rammed earth, mud brick and stone (respectively with the Barqiyya/Berbers/North Africa, the Nubians/ Upper Egypt and the Armenians/ Bilād al-Shām). More than the historicity of ethnicities who have worked for the Fāṭimid Empire, it is the cultural

52 Powell, *Architecture and Identity*; Curta, "Medieval Archaeology and Ethnicity: Where are We?" 537–539; Boissinot, "Que faire de l'identité avec les seules méthodes de l'archéologie?" 20–22.

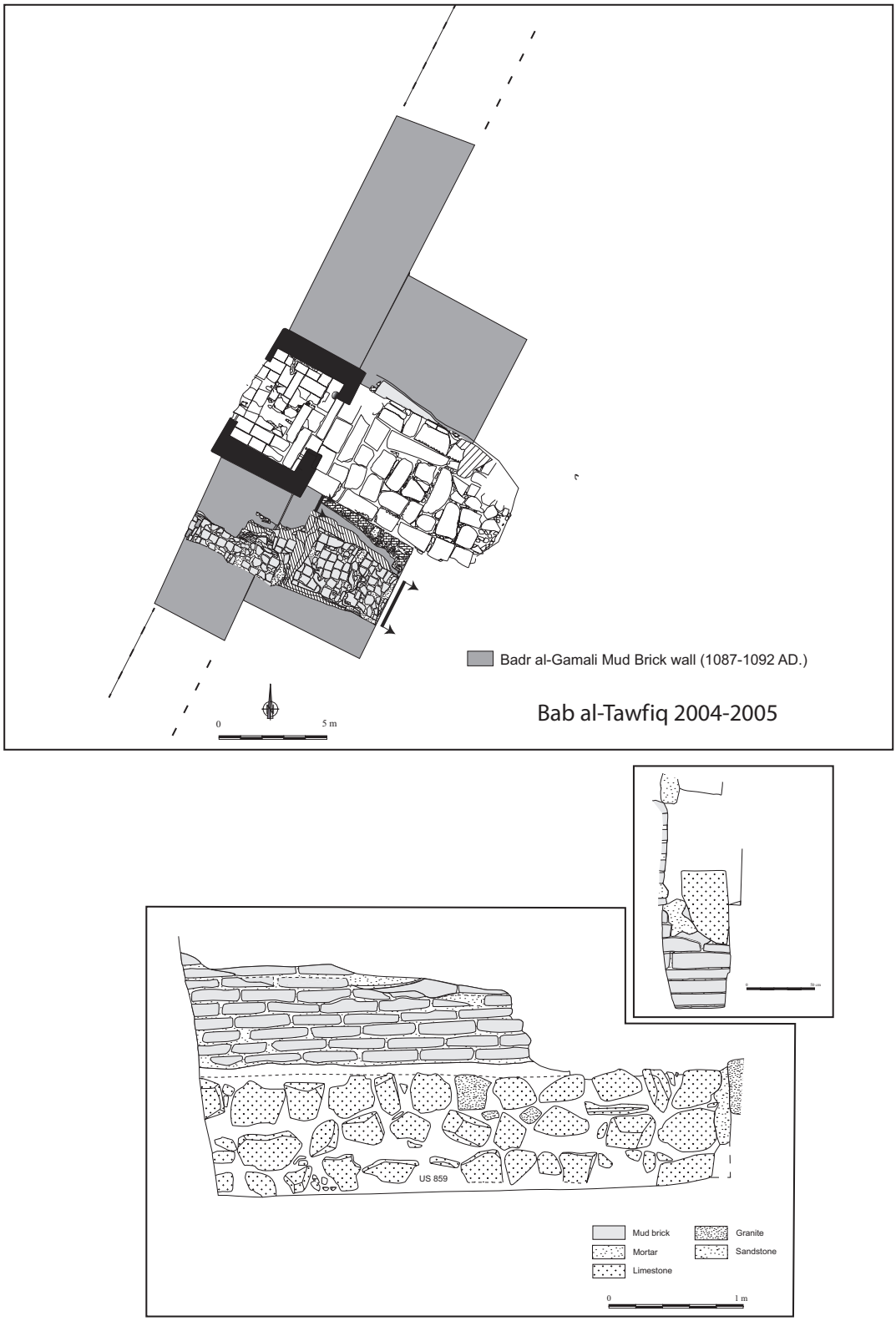
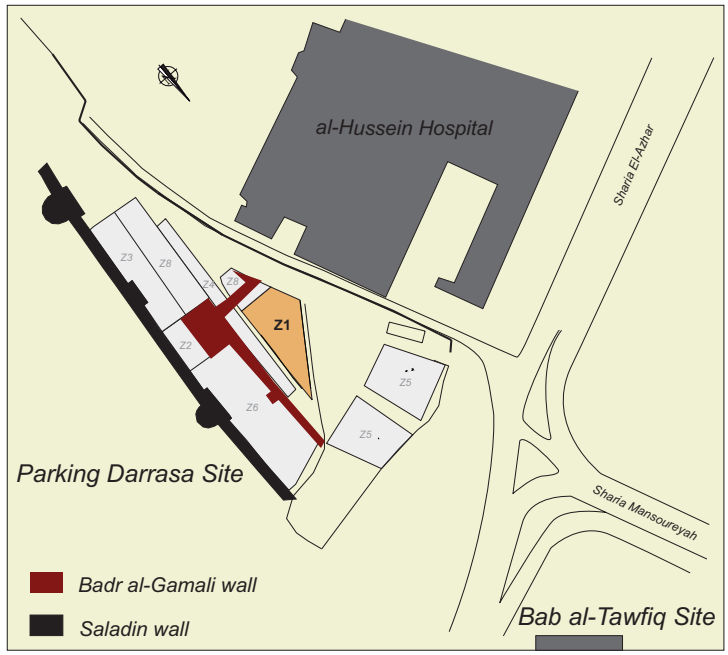


FIGURE 6.25 *Plan and section of the Badr al-Gamali's mud brick wall connected to Bab al-Tawfiq*
CREDITS: PRADINES.

FIGURE 6.26 *Photography of the Badr al-Gamali's mud brick wall on the parking Darrasa site*
CREDITS: PRADINES.



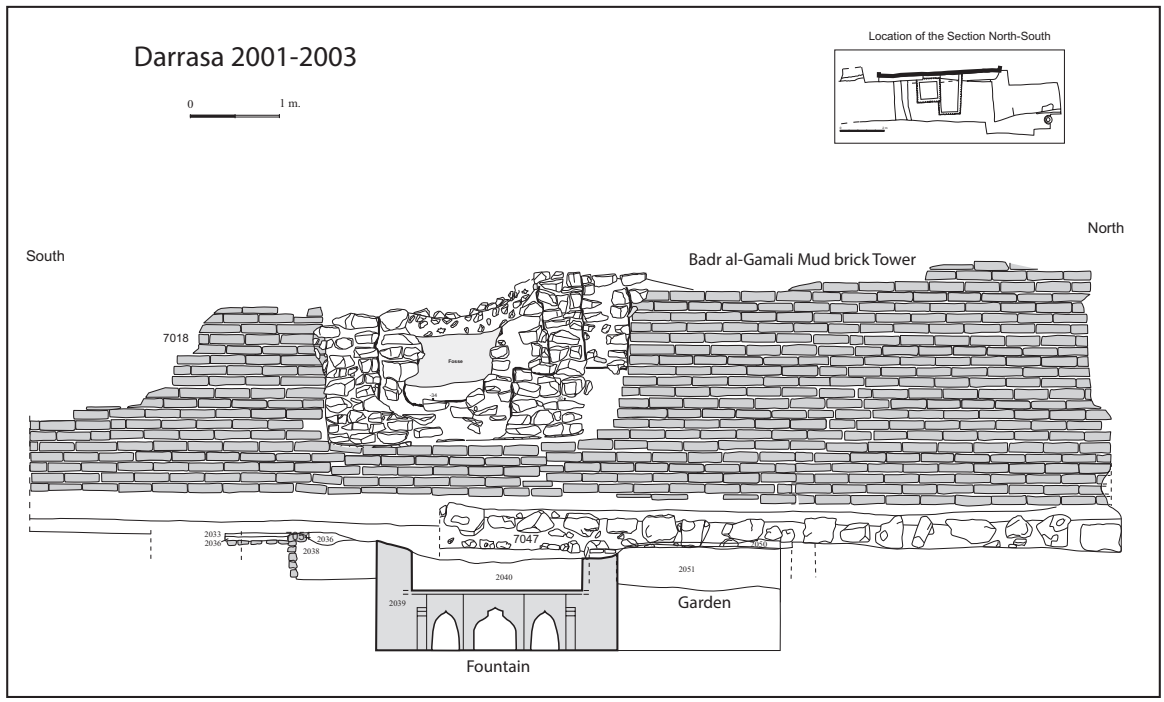


FIGURE 6.27 *Elevation of a Badr al-Gamali's mud brick tower built over a Fatimid fountain*
CREDITS: PRADINES.

FIGURE 6.28 *Photography of the Badr al-Gamali's mud brick tower conservation works*
CREDITS: PRADINES.

aspect of the architecture that was our main interest. More clearly, the Fāṭimid fortifications of Cairo are cultural choices that are not related to technical changes in siege warfare, technological knowledge or ecological determinism.

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CHAPTER 7

Mud Brick Architecture in Ḥaḍramawt-Yemen under the Quʿaiti and Kathiri Sultanates

Christian Darles

Ḥaḍramawt is a vast, semi-arid region in the South of the Arabian Peninsula, situated between the immense Rubal-Khali desert ("the Empty Quarter") and the Gulf of Aden.[1] Its geology is simple, comprising a vast tabular plateau of tertiary Palaeocene-Eocene limestones, the *jol*, deeply incised, down to Cretaceous sandstone layers, forming valley-oases. The average height of the plateau, above the valley floors, is three hundred meters.

The Yemenite power of Sanaʿa set up these last decades a massive immigration of north-Yemenite Zaïdite populations in an attempt to assimilate a historically Sunni territory. Al-Qaeda found a place in the Arabian Peninsula where it developed between refusal of Shiism and alliances with local tribes proud of their autonomy. We must also remember that the British who controlled the South of Arabia from Aden had tried to bring into conflict the Ḥaḍramawt populations gathered in an "Aden Protectorate" and the components of the "Federation of Southern Arabia". The two most important sultanates, the Quʿaiti Sultanate and the Kathiri Sultanate, of this Protectorate disappeared during 1967, as the other sometimes tiny entities: they possessed a flag and issued numerous emissions of postage stamps. Ḥaḍramawt tried, for a short while, to be independent, with the support of Saudi Arabia that sought an outlet to the Indian Ocean. The creation of South-Yemen (PDRY, the People's Democratic Republic of Yemen) allowed Aden politicians to reunite Southern territories, not without difficulty. During 1990, the general reunification of Yemen was made to the detriment of the South, and especially of Ḥaḍramawt.

Politically autonomous and separate from centres of power, it was the territory of one of the most powerful kingdoms of ancient Arabia, acting as an essential intermediary between the Mediterranean world and the still lesser-known Far East. The kingdom of Ḥaḍramawt, which controlled production of aromatic resins, also guaranteed the commercial traffic in precious items highly appreciated by the Mediterranean world which impacted on every coast of the Indian Ocean.

The trade in locally harvested frankincense and myrrh ensured it scarcely-equalled prosperity and fame, from as early as the middle of the first millennium BC. The centre of this caravan trade was the city of Shabwa, described by such ancient authors as Strabo. Located at the entrance to the wādī Ḥaḍramawt, the old *Sarīrān*, the city controlled all the routes leading towards Gaza, Petra, and Palmyra. The wādī flows from the high plateaus of western Yemen that rise to more than 3500 meters, crossing the desert of Ramlat al-Sabʿatayn underground, following a long course where it takes the name of Wādī Massilah, before flowing into the Indian Ocean. The wide and fertile valley divides the territory of Ḥaḍramawt into two zones. The first, in the North, is inhospitable, on the fringe of the desert; the other, in the South, between the wādī and the ocean, descends steeply towards a narrow coastal plain. Valley bottoms and piedmonts facing the desert were always cultivated and constitute the most important population centres along with the Wādī Ḥaḍramawt itself, facing east, which

1 We do not know exactly the origin of this name. During antiquity, we can find *ḥḍmt* or *ḥdrmwt* in south Arabian languages. In ancient times the name of Ḥaḍramawt seems to be in the Book of *Genesis* (X, 26) or in *Chronicles* (I,20), "*Ḥâṣarmāweth*". We find also the name of these people in Greek (Strabo) and *Atramitae* in Latin (Plinus).

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is the most important oasis with major tributaries such as the Wādīs Dūʿān, ʿAmd and ʿIdīm coming from the south.

Fertile alluvial deposits enabled the establishment of a sedentary population, proud of their values, which knew how to create and maintain large scale irrigation, the development of elaborate architecture and the creation of efficient commercial networks.

The population's tribal structure gave rise to several state entities, often in conflicts, such as, in the beginning of the 19th century, with the Quʿaiti Sultanate, including the city of Shibām, ruled from al-Mukalla and the Kathiri Sultanate, including the town of Tarīm, ruled from Sayʾūn (fig. 7.1). As great travellers, the Ḥaḍramis colonized numerous coastal regions, like their eastern neighbours in the present-day Sultanate of Oman. From Zanzibar to Gujarat, Kerala and the Malay Archipelago (Dutch East Indies), they established commercial counters, settled down, and were often involved in political activities, as in Timor and in Brunei. In competition with Chinese traders they made fortunes, from which their country of origin benefited greatly.[2] They often returned home at the end of their career abroad as "old notables", bringing with them all the modernities of the Victorian era, such as equipped bathrooms, automobiles, ventilators as well as fashions and architectural models that transformed the large houses of Tarīm and Sayʾūn into "Maharajah's palaces" (fig. 7.2), as illustrated by the palaces of the al-Kāf family (fig. 7.3).[3]

A city cannot be separated from its rural context and territories (Figure 7.4). Likewise, agriculture cannot be separated from the wādīs' flood management nor architecture from building construction techniques.

"Each irrigation network is associated with a house," wrote Pierre Gentelle about the agricultural soils of the lowlands around Ramlat al-Sabʿatayn.[4] Conversely, there is no construction without an irrigation system. The clay of raw bricks, or rather sunbaked bricks, comes from the muddy fields deposits. With each flood a very thin layer of fertile earth covers plots of land. Gentelle added: "It is the water that makes the field". This earth is inexpensive and processing it into a construction material is easy to do. Inconveniences are the duration of the manufacturing and the number of bricks that need to be produced.[5] A great advantage is close proximity to raw material and the manufacturing workshops usually associated with construction sites.

To construct buildings, the Ḥaḍrami mastered techniques necessary for using this easy available material that, nevertheless, had a limited time span and, therefore, required periodic renewal.[6] They developed an exceptional architectural type—the tower-house, found

2 "Of all parts of the Arabian Peninsula, Ḥaḍramawt is preeminently the land of emigration. In Dutch East Indias they have even, in earlier times, succeeded in founding sultanates (e.g. Siak, Pontianak), but now they content themselves with trades and money transactions. Some of them, having become wealthy, return to their own country, but others prefer to enjoy, away from the disturbances of Ḥaḍramawt, the pleasures that are there unattainable." van der Meulen *et al.,* VII.

3 On the same geographical territory, both sultanates are always in concurrence. They sit face to face. The border of the Quʿaiti territory is a quarter of an hour's walk from Shibam. Here is a custom-house, a white Kathiri military post (fig 4), shows an impassable line only after payment of an important toll. Van der Meulen and von Wissmann wrote also apropos of wādī Dūʿān: "…to the right in the far distance the lies the village of Ḥôra with a great castle and a watch tower on a hill. It is a small Quʿaiti island in the midst of a Kathiri sea". van der Meulen *et al.,* 88.

4 "…the inhabited house characterizes the network of irrigation… It disappears, irrigation stops and harvest dies, the field dries out and the canal disappears. there is only water which flows, dehumanized" (Gentelle, *Traces d'eau: un géographe chez les archéologues*).

5 From the highest Antiquity, the duration of manufacturing poses problems. Vitruvius and other authors insist on a specific duration of time bricks require to be made and dry.

6 Regularly, approximately every hundred and fifty years, inhabitants leave their house and let it fall in to ruin. Then they reconstruct a house of the same type in the same location.

FIGURE 7.1 *Map of Southern Arabia during the two Sultanates*
CREDITS: CHRISTIAN DARLES.

FIGURE 7.2 *Palace of the al-Kāf family*
CREDITS: CHRISTIAN DARLES.

throughout the whole of Southern Arabia, except for the Red Sea coast and the Indian Ocean (fig. 7.5 and 7.6).

The origin of this technique dates back to Antiquity. In Ḥaḍramawt, several ancient sites studied by archaeologists have provided information on techniques used in mud-brick construction. One finds this material used for building, and also for the construction of floors. The Institute of Fine Arts of New York University excavated at Jujah in the valley of Wādī Ḥaḍramawt for two brief seasons during 1994 and 1995 (Shabwa-Mission Archéologique Française au Sud-Yémen, 1974–2002), and the Russian Archeological Mission in Ḥaḍramawt was active at Raybūn, during 1980–1998. The site of Jujah revealed five levels of occupation. The oldest, a cultic building, was built entirely from moulded mud-brick. At Shabwa, a deep sounding was excavated in 2000 and 2002 that ranges from the 16th century BC to the 5th century AD. The earliest periods are characterized by domestic buildings constructed primarly of mud-brick. During this period, irregular clumps of not entirely mud were absent, excluded, especially from enclosed walls and floors. The fortification dating from the latter half of the first millennium BC comprises a large mud-brick structure faced with finely worked limestone. At Shabwa, for the first time, a composite architecture was recorded, comprising a wooden frame with mud-brick fill. At Raybūn, a Russian archaeologist studied several buildings constructed in this manner. Between the vertical elements of the wooden frame, the bricks were protected by a facing made from limestone slabs. All these sites indicate that mud-brick was used only above a basement or foundation. At Tamna further to the west, French and Italian archaeologists found a similar style of architecture, built on a foundation of granite.

Ḥaḍrami towerhouses were connected with the model of the fortified farmhouse (fig. 7.7), which shelter stored produces and animals in the lower levels, less exposed to the outside. Intermediate

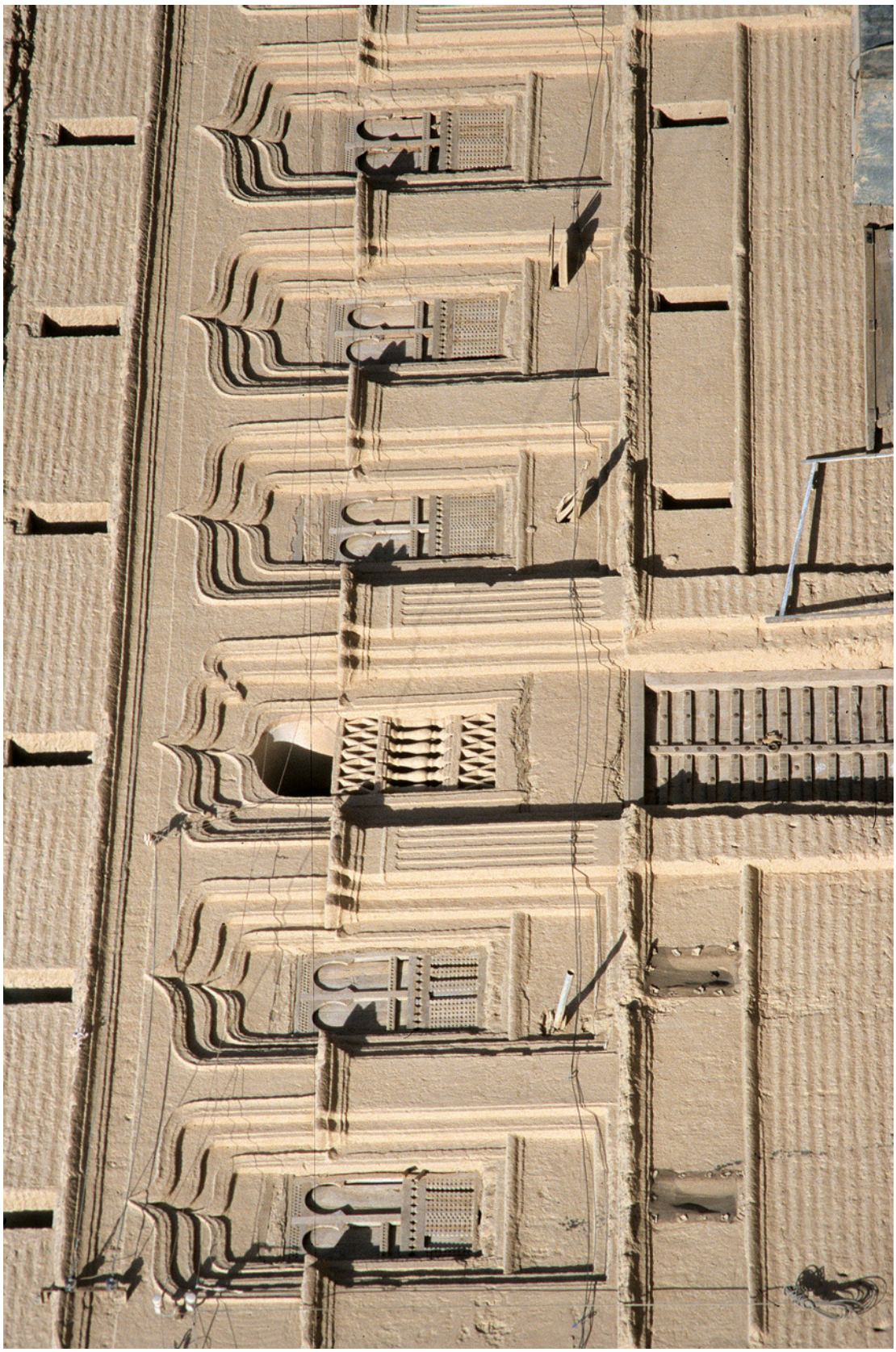

FIGURE 7.3 *Detail of one of the palaces of the al-Kāf family in Tarim*
CREDITS: CHRISTIAN DARLES.

FIGURE 7.4 *Custom house built by the Kathiri*
CREDITS: CHRISTIAN DARLES.

floors are reserved for residential areas while the upper level's inhabited terraces and lounges include the "mafradj", dedicated to the reception and the social life of the patriarch and his guests. This house, inhabited by one family, is autonomous. It is endowed with four decorated *façades* with appropriately placed windows when it stands isolated, and limits its openings, in a dense urban context, because of neighbouring buildings. There are no adjacent walls, so that when an owner buys a contiguous house, it is necessary to open up walls and establish interconnected floors.[7]

While this vertical construction is sometimes massive, most of the time high-rise and slender, it is strictly built with architectural *façades* whose arrangement and order of openings correspond as much to the uses of the rooms as to the strictness of the elevations. It is built with mud from local silts and takes climatic constraints into account, particularly those associated with monsoon rains that are often violent and can damage the moulded or modelled elements, making it necessary to protect them. Heaps of abandoned surplus bricks, melt in the rains, and after a few seasons transform again into building material.

During their history, the inhabitants of South Arabia learned how to use the earth/mud in numerous ways. According to regional and local availability, the Yemeni tower-house was built in mud, usually moulded or modelled bricks, baked or simply dried in the sun. In Saʿdah or in Mā'rib

7 Breton *et al.,* "Les maisons-tours dans l'Antiquité".

FIGURE 7.5 *Tower house of a rich family in Shibam*
CREDITS: CHRISTIAN DARLES.

FIGURE 7.6 *Façade of Shibam above the* Wādi *Hadhramawt*
CREDITS: CHRISTIAN DARLES.

as well as in Rawdah (north of Sanaʿa), builders always use the *zabour*. Zabour ("bauge") is made with pisés of clay. Sometimes a composite architecture combines several building techniques as at Māʾrib, not far from Ḥaḍramawt, where mud brick upper floors overlap lower ones built in stones, or in the wādī Bayhan or at Sanaʿa where raw brick is used over one or several levels constructed with volcanic stones or baked bricks.

Fertile silt from irrigated agricultural land supplies the earth for making mud. Sedentary inhabitants mastered the flood waters, which transport a large quantity of alluviums that feed fields while contributing to their raising. The surplus of earth from fields constitutes a homogeneous and finely sorted construction material. Since Antiquity, man built houses using the fertile earth from fields without conflict between farming and building. The only thing necessary is the transport to construction sites, by means of small donkeys, of dozens of baskets filled with this product that has become building material.

From ancient times until today, the use of raw bricks continues without notable changes in the manufacturing processes and implementation.[8]

The earth is usually collected near the place where it will be transformed into building material. An open area is cleared of unwanted debris and the brickyard is organized. When the construction site changes location, the brickyard moves according to needs. Earth is heaped in a first location, straw is stacked nearby and some old cans are filled with water. If a water well is distant, donkeys are used to carry goatskin containers. The place where the mixture is made remains the same until the time of a first manufacturing of bricks. Bricks being moulded flat, they occupy a large surface that is sanded beforehand (fig. 7.8). When this surface is too big, the mixing area is moved in order to bring it closer to the working place.

Once trampled and mixed by one or two labourers, with additions such as grass straw, two workers place the construction earth on a small stretcher and bring it to the place indicated by a worker who moulds it and is responsible for the construction site (fig. 7.9). They immediately put it down by his

8 Damluji, *The Architecture of Yemen: From Yafi to Hadramut*.

FIGURE 7.7 *A fortified farmhouse in the valley between Shibam and Seyhun*
CREDITS: CHRISTIAN DARLES.

side, generally to the right (fig. 7.10). The earth is hastily arranged into two chunks by a worker who must be able to measure the quantity and the exact location of the mixture. The site manager puts a double frame on the prepared chunks and moistens his hands. With a sure circular gesture, he equalizes the mixture so that it rests against the internal walls of the frame. He smoothes the convex top by marking some concentric traces with his hands. He quickly removes both bricks from the mould and repeats the operation. The manufacturing requires five people to whom must be added the drivers of the donkeys transporting earth, water and straw and who, at appropriate times, change the place of the sun-baked bricks in the storage area.[9]

As a rule, drying takes place in the shade to avoid cracking. Vitruvius, during the first century BC, recommended it be allowed to continue for two years, starting from spring or autumn.[10] In reality, the making of bricks is much faster in South Arabia (fig. 7.11), where drying of the moulded bricks does not last more than three weeks. Bricks dry flat at first (from six hours to three days), then are set on edge (from five to 15 days), then arranged vertically, in fishbone array and moved repeatedly to dry uniformly. Depending on progress at the construction site they can be used immediately afterwards or stored. In Ḥaḍramawt, nowadays they can be stored for several months (fig. 7.12 and 7.13).

The shape of moulded bricks differs slightly according to workshop. They can have specific dimensions according to destination or construction site. The shape can vary from square to elongate rectangle and the thicknesses are variable. In the same building, precise shapes can

9 Aurenche, *Dictionnaire Illustré Multilingue de l'Architecture du Proche-Orient Ancient;*Aurenche, *La maison orientale, l'architecture du Proche-Orient ancien des origines au milieu du quatrième millénaire*, 66; Guest-Papamanoli, "L'emploi de la brique crue dans le domaine égéen à l'époque néolithique et à l'Age du Bronze", 9, note 38.

10 Vitruvius, *De Architectura*, II: 3, 2.

FIGURE 7.8 *Worker from Shibam who is treading the earth*
CREDITS: CHRISTIAN DARLES.

differ, indicating that the origins are multiple and often implies possible re-use.

In Ḥaḍramawt, the generally plano-convex bricks are more than 40 cm in length by 25–28 cm in width and 5 cms in thickness while at Sanaʿa the dimensions are 25 cms by 18 cms and 10 cms in thickness. On each horizontal foundation, builders put a layer of earth mixed with grass straw intended to receive the following row. The bonding mortar generally comprises diluted clay. Used in

FIGURE 7.9 *Earth is mixed with straw*
CREDITS: CHRISTIAN DARLES.

FIGURE 7.10 *Mud bricks molds*
CREDITS: CHRISTIAN DARLES.

plastering, it fills the gaps between bricks as they are laid.[11]

The mud brick construction in the city of Shibām deserves to be described in detail, because it is representative of a building tradition that is common in this part of the world (fig. 7.14).

The act of building must fulfill several requirements and is marked with numerous rites. Horns of ibex (a rare and endangered animal) are often embedded in the external angles of the buildings

11 Breton *et al.*, "Shibâm".

FIGURE 7.11 *Bricks are molded flat and occupy a large surface*
CREDITS: CHRISTIAN DARLES.

FIGURE 7.12
Drying bricks arranged vertically for better ventilation
CREDITS: CHRISTIAN DARLES.

to ward off evil spirits and assure the household's well-being. The building techniques are (still today) maintained by skilled masters. For example at Shibām, tower-houses often replace a previous building that was voluntarily abandoned and collapsed because of structural disorders. Then, once all the pieces of wood are collected, from the floors, doors, windows and ceilings, the earth from the building is evacuated then mixed to some "fresh" silt to manufacture bricks.

At the beginning of the 20th century, the council agreed to limit building height to 35 m. The city thus possesses a scrupulously respected *velum* and buildings, by adapting themselves to the topography of the ground within the city, possess from five to eight levels. Terraces bordering reception rooms constitute important open spaces with no ceiling other than the sky above. They possess large windows and small openings allowing a view of the street activity and main door. These terraces are the archetypal places of family life, for women and young children. The outer ring of buildings that lead to the peripheral rampart wall of the city of Shibām form a second defensive fortification. The

FIGURE 7.13 *Storage of mud bricks before building construction*
CREDITS: CHRISTIAN DARLES.

FIGURE 7.14 *View of the southwest corner of the City of Shibam with a new destroyed house and the curtain wall* CREDITS: CHRISTIAN DARLES.

introverted city turns its back on its territory towards which it opens only by a single triumphal gate. The city only shows the rear *façade* of its houses.[12]

The walls of the buildings are constructed on earlier ruins and this requires precise skills. The foundations are built in trenches on a rocky surface, vary between 0,90 m and 1,10 m wide, consist of limestone blocks cemented with lime; bricks of raw earth are set on edge to cover this foundation rises slightly above ground level to form a base for the superstructure of bricks that rises more than thirty meters. This complex foundation does not exceed two meters high.[13]

The masonry of the walls is organized according to a rhythm of five courses, separated by mud mortar of the same nature as that of the bricks, so that the thickness of the joints is close to that of the bricks (fig. 7.15). Particular care is given to external angles and to connections between *façades* and supporting walls; only the supervisor (the *mua' allim*) who manages the team of workers (the *khaddamin*) can deal with the construction of these crucial parts.

Must used for plastering, fills the joints between bricks as they are being laid. Use of this kind of bricks, in the past as well as today, requires protection against humidity, rare run off waters, spray from roof spouts that splashes on the ground, and erosion caused by wind and ground water fluctuations (fig. 7.16 and 7.17).[14]

This filler is often covered by a layer of fat lime-based "*ramad*", which waterproof the upper parts and basements affected by water run off from roves (fig. 7.18).

Partition brick walls include a header and a stretcher (from 65 to 70 cm approximately) while the width of *façade* walls corresponds to three stretcher bricks *panneresse* or two heading-bonded bricks, 85 cms on average.

Every five courses, branches or timbles enable the clamping of the walls (fig. 7.19). The lintels have been rehabilitated, so that the inscriptions engraved on their faces allow dating of the house's most recent reconstructions. Reused wooden fittings were carefully taken to pieces, to be installed

12 Breton *et al.*, "Shibâm and the Wâdî Hadramaut".

13 Margueron, "Notes d'archéologie et d'architecture orientales".

14 *Ibid.*

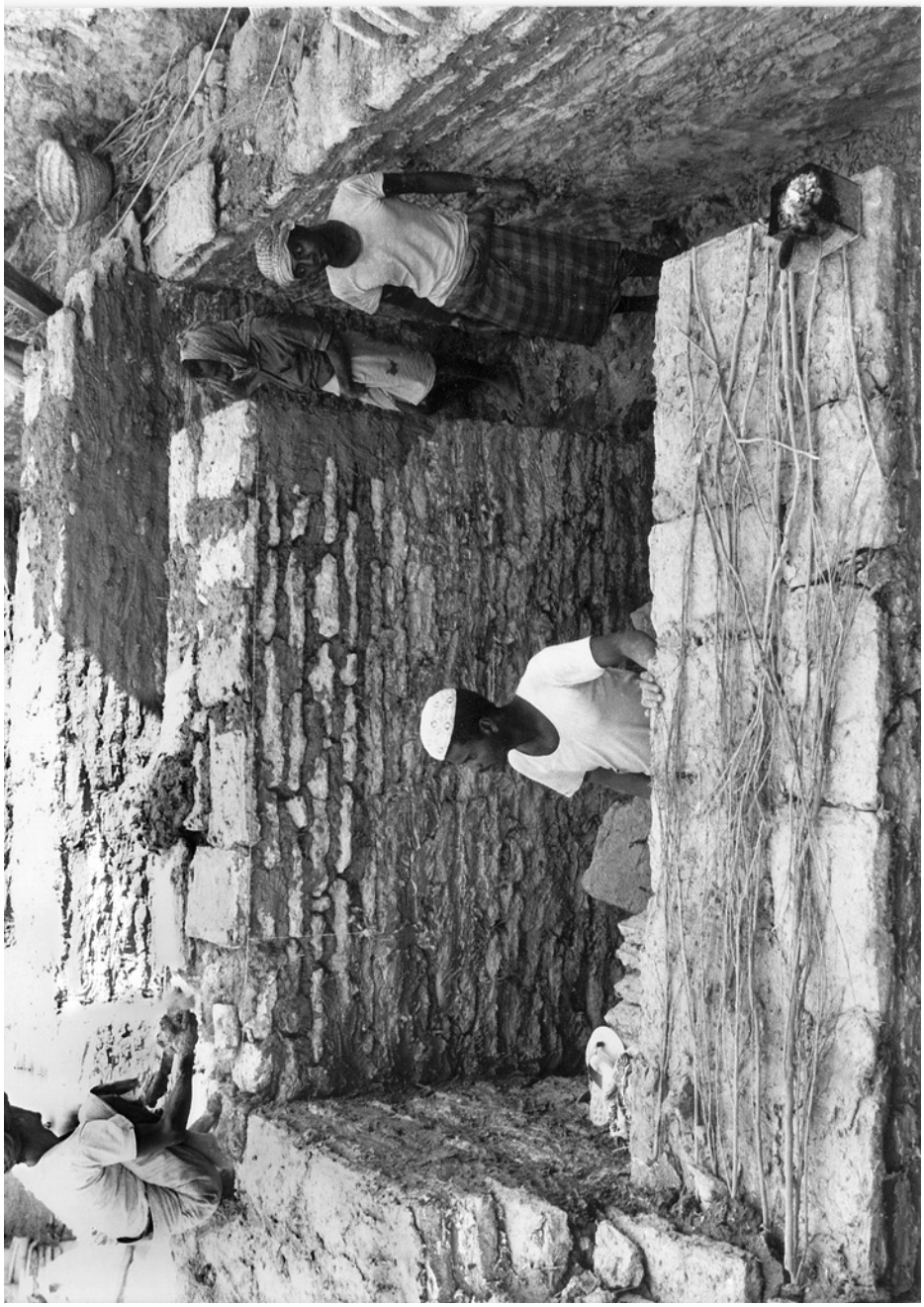

FIGURE 7.15 *Between every five courses of mud brick construction, the* Mua'llim *insert cut branches as a chaining*
CREDITS: CHRISTIAN DARLES.

FIGURE 7.16 *Plastering work of the* façade *of the tower houses*
CREDITS: CHRISTIAN DARLES.

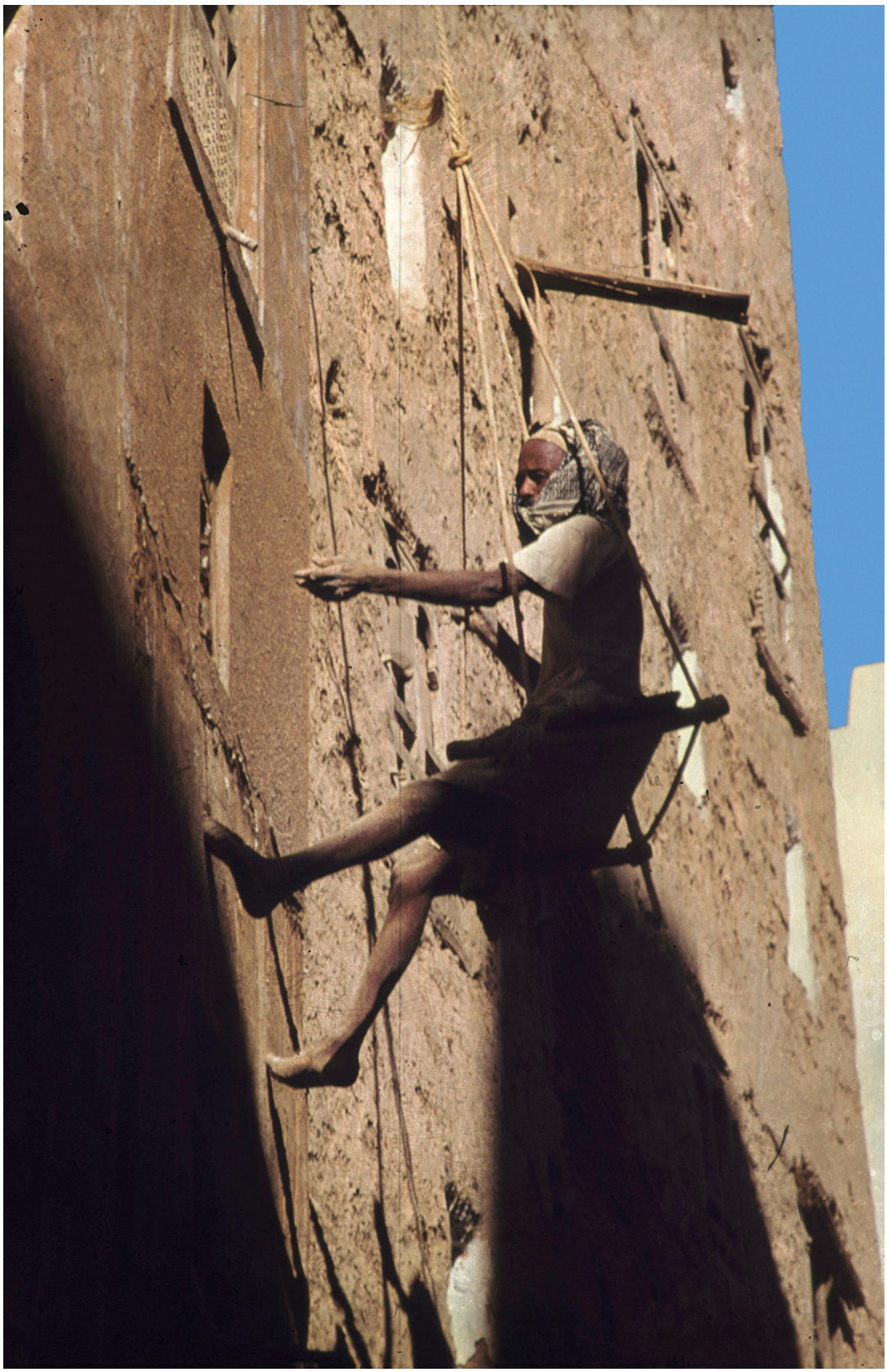

FIGURE 7.17 *Often suspended the worker is alone*
CREDITS: CHRISTIAN DARLES.

FIGURE 7.18 *Lime-based* Ramad *for waterproofing the upper parts and basements of the houses*
CREDITS: CHRISTIAN DARLES.

FIGURE 7.19 *Branches and timbles enable the clamping of the walls*
CREDITS: CHRISTIAN DARLES.

later, their location being temporarily walled up during the construction period. Floors are made of earth on a frame of beams and palm-tree wood joists topped with a layer of reeds. Internal walls, and floors as well, are covered by a thick filler with fat lime. This carefully polished filler covers the walls of the niches and shelves built with bricks arranged in console.

Lower levels with thick and close walls and very narrow rooms are common. In the upper floors, wooden posts increase the surface area of living rooms without increasing the bearing of horizontal timbers. This composite architecture combines wooden linear vertical carrier elements with raw brick-built walls, and allows the creation of bigger rooms as well as a lightening of the carrier structure. The walls of upper floors do not exceed 55 cms in thickness.

After the workers sacrifice an animal (most often a goat), the walls are coated for the last time and wooden fittings are installed. Then, only after paying the craftsmen, the owner can enter his house.

And so they built at Shibām in the Quʿaiti Sultanate and also at Sayʾūn in the Kathiri sultanate. At Sayʾūn however, the buildings are lower. At Tarīm, east of Sayʾūn, the great number of large, square palaces is noticeable (fig. 7.20). They are not ochre and white as in Sayʾūn and Shibām, but of all manner of striking colours. One of them is blue, yellow and pink and is, consequently, the most conspicuous: "a very high minaret (150 feet), not

FIGURE 7.20 *Indonesian palace of Tarim built by a rich Yemeni merchant in southeast Asia*
CREDITS: CHRISTIAN DARLES.

round but square in shape, and also plastered in a shade of blue, is a thing by itself. Tarīm is a town of many rich men: one can see that even from a distance".[15] The most beautiful house in all Tarīm was the one of Sayyid ʿUmar bin Shaikh al-Kāf, with a swimming pool. The outside was painted deep blue, and the stately rows of tall windows are bordered with a design in yellow. We have found use of pink and green. The style was more Indian than Ḥaḍrami.[16] These great palaces have a character quite of their own that one does not see in the other towns of the valley. They are massive, square building with a few extensions on the roofs, and decorative designs on the top of the walls or on the parapets.

In Ḥaḍramawt, since ancient times until today sun-dried mud-brick remains the dominant building material for an architecture that, at Shibām, for example, can reach thirty meters in height. Since the disappearance of the sultanates and the emergence of the Republic, during 1967, despite a notable conservation, the people of the Wādī Ḥaḍramawt combine mud with stone. It is only with the building of roads and the arrival of heavy vehicles that one sees the use of reinforced concrete with its preformed blocks and iron frames. More easy to put in place and less expansive than mud-brick, this new material has not entirely replaced the use of the more expansive mud brick.

15 van der Meulen *et al.*, *Ḥaḍramaut, Some of Its Mysteries Unveiled*, 131.

16 *Ibid.*, 135.

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CHAPTER 8

Building on the Shoreline: Insights into the Use of Earth in the Architecture of the Late 18th and 19th Centuries in Qatar

Moritz Kinzel

Introduction

The archaeological research carried out in recent years in Northwest-Qatar has enlarged our knowledge on the Islamic architecture and building construction in particular. The work of the Qatar Islamic Archaeology and Heritage project (QIAH)[1] a cooperation of Qatar Museums (QM) with the University of Copenhagen at e.g. Al Zubarah Archaeological site,[2] Freiha,[3] and Ruwayda,[4] all sites located near the shoreline of Northwest Qatar have revealed an intense use of locally available building materials, including earth, soils, "beach rock" and lime stone.

This contribution will present findings from Al Zubarah, Freiha, and some other sites in Al Zubarah's Hinterland (fig. 8.1) looking into the use of earth in different parts of the building construction. Although earth can be found as mortar and plaster material, wall bricks and as roofing material, there is not much research on the use of earth for late Islamic architecture in Qatar. This paper is an attempt to summarize the preliminary results of the ongoing research carried out by the Qatar Islamic Archaeology and Heritage Project.

The use of "wall stone" materials differs quite considerably according to the role and function of structural elements and a building itself within the settlement and also from site to site according to the availability of building materials. However, earth plays an important, often under estimated, role in all cases. The architectural remains of late 18th and early 19th century in Qatar[5] show a wide

1 The Qatar Islamic Archaeology and Heritage project (QIAH) was initiated in 2008 by Qatar Museums (QM) and the University of Copenhagen. The fieldwork at Al Zubarah and in Northwest-Qatar took place between 2009 and 2014. It was a holistic project taking all issues of archaeology and heritage into consideration. Site presentation, conservation and archaeological research were going hand in hand and were interlinked to reach a common understanding between the disciplines and involved agents (see as well the QIAH project website: http://miri.ku.dk/projekts/qiahp/ [31.3.2017]).

2 In place of the common transliteration *al-Zubarah* the transliteration *Al Zubarah* is used by the State of Qatar for the UNESCO World Heritage nomination. In this contribution the nominated property is referred to by the latter version. Al Zubarah Archaeological Site was inscribed on the UNESCO World Heritage list in June 2013 due to its almost complete preserved layout and structure of a late 18th century town; its key role in the formation of the nowadays Gulf States, and its major impact on the trade and pearl fishing industry in the region. The entire town—although in ruins—is preserved with its infrastructure and historic fabric. All are elements of a so-called "Islamic" city (Wirth, *Die Orientalische Stadt im islamischen Vorderasien und Nordafrika*) are present, e.g. mosques, living quarters with courtyard houses, a suq and harbour area, and fortified compounds; as well as a town wall with 23 towers set in a regular sequence. In addition Al Zubarah shows a regular grid system that clearly indicates a pre-planned layout (Kinzel Zubarah).

3 de Cardi, "Gazetteer of Sites and Finds", 187.

4 *Ibid.,* 187; Petersen *et al.,* "Palace, Mosque, and Tomb at al-Ruwaydah, Qatar"; Petersen *et al.*, "Qal'at Ruwayda and the Fortifications of Qatar".

5 Carsten Niebuhr was the first to put Qatar on a map by 1765 after his travels through the region. Although he travelled the east coast of the Persian Gulf, he gathered information about its western parts and placed names accordingly. Opposite the island of Bahrain he punt down "*Gattar*" as a name for a harbor town he was told of and which is believed to be the just founded "boom town" Al

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FIGURE 8.1 *Map of NW-Qatar, QIAH/University of Copenhagen*

range of regional influences from both sides of the Gulf and how different building-traditions can melt together to form a "local" building tradition lasting into the mid-20th century.

Al Zubarah town was founded around 1765 at the northwest coast of Qatar and is nowadays part of Al Zubarah Archaeological Site that includes the ruined settlement of Qal'at Murair and the modern Al Zubarah Fort.[6] Al Zubarah Archaeological Site was listed as an UNESCO world heritage in June 2013 as one of the best-preserved late 18s century cities of the Gulf region. In contrast to the general

Zubarah (Niebuhr, *Reisebeschreibung nach Arabien und anderen umliegenden Ländern*).

6 Richter *et al., Qatar Islamic Archaeology and Heritage Project, End of Season Report 2012*.

recognition of "organic grown" Arabic respectively Islamic towns, Al Zubarah shows a well-organized grid system and town planning. All important elements are present: e.g. a town wall with 23 towers and a number of gateways, mosques—five are identified so far—palatial compounds, and residential courtyard houses, as well as market and production areas. The town was destroyed in 1811 by troops sent by the Sultan of Oman and did not recover since then. It seems that only temporary dwellings were erected occasionally in the years after this event. From 1845 to 1885 it was resettled on 1/6 of the earlier town area re-using mainly the stone and plaster material from the earlier houses. But the later town did not reflect the rigid grid system of the earlier phase. After the final abandonment of the settlement the local Bedouin tribes only occasionally visited the ruins.

The archaeological site of Freiha is located ca. 6 km north of Al Zubarah and is a settlement of its own right. Freiha is contemporary to Al Zubarah but might date in some parts of the settlement earlier than the main occupation phase of Al Zubarah (fig. 8.7). Excavations by QIAH took place from 2010 to 2014. The archaeological works of QIAH concentrated on the mosque, some domestic structures and some midden areas.[7] Earlier excavations by the Qatar Museums Authority at Freiha focused on the Fort and some courtyard house structures south of the Fort.

Building Materials

The building materials used in Qatar are in general of local origin. But materials were also brought to Qatar by boat.[8] Some stone material, plaster and mortar binders as well as timber seem to be shipped to Qatar occasionally. There are a variety of stones that clearly cannot be found in Qatar that came most probably to places like Al Zubarah as ballast with the cargo vessels. It is still unclear how much material was actually imported from places like Bahrain that would be the natural place to seek various building materials, as it is less than a day-trip by boat to go there. Mouldable materials, e.g. anhydrite and clay material, seems to be sourced and transported across the peninsula of Qatar to be used in the building construction. Research is still on going to locate the actual sources. However, the general building material seems to have been rough (lime) stone, anhydrite or hemihydrate based gypsum mortars and plaster. This is not fully true as we can only look at those materials that have survived. From the survey of building stone material and building archaeological studies carried out at Al Zubarah we have to assume that 80% of the historic building material has fully disintegrated into its components and has "disappeared".[9] Especially walls build with the weak beach rock or mud bricks are not well preserved. Disintegrated into silt, gastropods, salt and lime particles the components are integrated into soil deposits or blown away with the strong north winds.

Stones

The principal rock types present in the buildings of Al Zubarah are beach rock, aeolianite, dolomitic limestone and gypsum concretions (gypcrete). Depending on the prevalent fossil type and particle size, the beach rock can be differentiated in mollusc and gastropod grain and/or rudstones. Appendix A.1 shows representative samples of each type. While the beach rock is variable with regard to the fossils, the particle size, the component/matrix ratio, the aeolianite, dolomitic

7 See Rees, "Excavations atFreiha" for 2010/2011, 2012, and 2013; Petzold, "The Freiha Mosque (FREP01)"; Horn, "Consolidation and Conservation Works (at Freiha)"; and Bystron, "Introduction and Methodology (Freiha pottery report)".

8 Hawker, *Building on Desert Tides: Traditional Architecture of the Arabian Gulf,* 90–95.

9 Paul Hofmann has carried out a survey to map building materials throughout Al Zubarah since 2012, to get a better understanding which materials were used for specific buildings and to complete the archaeological survey carried out in 2009 and 2010.

limestone, and gypcrete are structurally and mineralogically rather homogeneous.[10]

Earth and Soils

The results from on-going survey work suggest that clay material used for building was taken from so-called *rawdhah*—shallow, water-rich depression in the landscape with fine silt desert loam. *Rawdhah* areas are found in various spots in Al Zubarah's hinterland.[11] On the other hand at Al Zubarah also the mud extracted from the surrounding salt marshes, the *sabkha,* was used for mortars although it contains a very high percentage of salt. It seems that also at Freiha, Ruwaidah and the other sites presented here used primarily local resources for loam, clay and mud material. However, it cannot be fully excluded that clay material might be partly imported; e.g. from the close by island of Bahrain.

Wood and Palm Fronds

In the architecture of the late 18th century various building elements were made from imported timbers and local palm trees.[12] Various wood species are attested which show trade links to East Africa, where most of the so-called *danshal* is coming from, and to India, where larger beams made of e.g. *champak*[13] are originating. The particular determination of wood species is more complicated as currently a wide range of timber is traded using this term, but in general beams with a rectangular shape. The trade term *danshal* covers also a wide range of various hard woods with diameters up to 16 cm, including Mangrove (*Rhizophora spp.*) or R. *apicultata* as well as (nowadays) Eucalyptus timber. In Asia timber of *Malaima, Michelia, Manglielia* or *Talauma spp.* are traded under the term *champak*. Parts of palm leaves were used to reinforce decorated plasters and palm tree trunks were used as lintels for doors and windows. Doors and window sheds were made of tropical hard wood, e.g. teak (*tectona grandis*) and meranti (*Shorea spp.*). Although only little traces of wooden parts have survived at the palatial compound (ZUEP04) at Al Zubarah it seems that there were wooden window grills as they can still be found in the early 19th century town houses of al-Muharraq/Bahrain.[14] In floor and roof constructions woven mats made of palm leaves or cane, so-called *al manghrour*, were used to separate the *danshals* from the earth layer on top.

Palm leave mats were also the primary material for the so-called *Barasti—palm frond* huts that are prominent throughout the settlement history of Qatar.[15] Prominent presented in the Phase 4

10 Kinzel, *Conservation Handbook for Al Zubarah Archaeological Site*. Appendix 3: Sobott, "Report on the Building Materials of al Zubarah City (2011)"; Hawker, *Building on Desert Tides: Traditional Architecture of the Arabian Gulf*, 86–89.

11 Macumber, "Geomorphology and Geoarchaeology".

12 Hawker, *Building on Desert Tides: Traditional Architecture of the Arabian Gulf*, 93–95.

13 Timber samples are mainly from materials extracted from the mid-20th century structure Al Zubarah Fort. But the building archaeological research has revealed that most of the materials used at Al Zubarah Fort were extracted from the ruins of Qal'at Murair a settlement contemporary to Al Zubarah town and occupied until the first half of the 20th century (Fuchs, "Al Zubarah Fort", 69–77). Analyses were carried out for the timber survey (Schäfer, *Report on the Timber Survey Al Zubarah Fort/Qatar—Timber Constructions*; Weiß, *Test report—Microscopic investigations of samples from the historic Fort of al Zubarah / Qatar*) in preparation of the restoration of Al Zubarah fort.

14 See Yardwood *et al., Muharraq: Architectural Heritage of a Bahrain City*, as well as Kazerooni, *Gulf Islamic Architecture*. For detailed information on window features and wooden remains of the window frame [Loc. 4460 in space 3002], see Collie, "Al Zubarah Excavation Point 4", 42–43.

15 The palm frond architecture of Qatar has disappeared almost without notice, as it was not considered an important part of Qatar's architectural heritage. The *barasti* structures of Qatar are only evident in a few historic photos; no systematic records were taken before they disappeared. They are even not mentioned in al- Khulaifi, *Traditional Architecture in Qatar*. Piesik's *Arish: Palm-Leaf Architecture* shows how important it is to document these ephemeral buildings before they vanish. Due to the close connections to Bahrain information on *barasti* can be found as well in a 1960

structures at Al Zubarah between the main occupation phase (1765–1811) and the later settlement (ca. 1845–1885). *Barasti* are actually quite permanent buildings, despite the fact being regarded as very temporary structures (fig. 8.2). They were built by people who could not afford to build with stone. The existence of a *Barasti* does not tell anything about temporary or periodical use of the site or dwelling as they can be permanent (domestic) structures. Of these structures primarily the postholes of the main structural timber members are preserved; revealing the proportions, general layout and spatial organization of the ephemeral structures. *Barasti* structures were present throughout the town's existence. *Barasti* structures revealed at Excavation point 02 (ZUEP02) belonging to Phase 3 were obviously transformed into the stone build house structures of Phase 4.[16] The ephemeral palm frond screens were replaced by walls built of stone material extracted from the ruined houses of Al Zubarah. Traces of palm frond structures were also found in Phase 6[17] that seems to be chronologically before the main occupation, most probably the actual founding phase of Al Zubarah. Due to the very limited exposure of this phase until now, only in ZUEP02 and ZUEP01 the relation between the very early traces of these structures and the buildings of the main occupation phase 5 is still unclear. *Barasti* dwellings were also found along the town wall of the 19th century settlement in the excavation area ZUEP03.[18]

Mortars and Plasters

The primary attested material for mortars and plasters are based on anhydrites or hemihydrates, often a noted as gypsum-based. Actually gypsum is only the final product when the binding process is completed. Material analyses of mortar and plaster samples from Al Zubarah and Freiha show that mainly anhydrite-based mortars and plasters were used here. In addition mud respectively soil mortars and partially also mud render are attested. Especially the renders are hard to trace as in most cases only an undercoat render has survived which is hard to distinguish from the anhydrite based undercoat plasters.[19]

Mortars dating back to the construction of the buildings are generally anhydrite-based mortars. They were produced by burning gypsum at temperatures between 400–1000°C. The complete dehydration of gypsum results in the formation of anhydrite II, a complex mixture of anhydrite modifications with different water solubility. The reaction of anhydrite with water to form gypsum is very sluggish and requires an activator in order to have reasonable setting times in the range of a few days. Possible activators are sodium sulphate or calcium oxide (burnt lime). The formation of gypsum from anhydrite is connected with an increase in volume by 60.8%, the dehydration of gypsum to anhydrite by a loss of volume of 37.8%. Since the dehydration of gypsum starts at temperatures around 50°C this reaction could happen in gypsum wall plasters exposed to the sun. The repeated shrinkage and swelling of a surface layer of the plaster may eventually lead to its decay. The presence of anhydrite in plaster samples in the range of about 2 mass% was observed by X-ray diffractometry in various plaster samples from Al Zubarah and Freiha. The phase composition of the anhydrite mortar reflects the type of production. If pure anhydrite was used as binder and small fragments of anhydrite as aggregate then the corresponding X-ray diffractogram predominantly exhibits the diffraction peaks of gypsum. Other phases present may be quartz, calcite, anhydrite, and the ubiquitous halite. If the anhydrite binder

ethnographic study of a village dealing with the production process of rush mats; Hansen, *Investigations in a Shi'a Village in Bahrain*, 62–64.

16 House, "Al Zubarah Excavation Point 2 (ZUEP02)": 23–27, 24–36 and 141–164; house ZUEP02.

17 Yeomans, "Excavations at Excavation Point 1 (ZUEP01)", 7–16; House, "The Souq and Date Processing Area (ZUEP02)".

18 Collie, "Al Zubarah Excavation Point 3", 165–186.

19 See Sobott, "Report on the Building Materials of al Zubarah City", and "Al Zubarah Site—Mineralogical Analysis of Building Materials".

FIGURE 8.2 Barasti-*hut at Qal'at Bahrain*
PHOTO: M. KINZEL, QIAH/UNIVERSITY OF COPENHAGEN (BAH2014_0072).

was mixed with shell sand as aggregate then the corresponding X-ray diffractogram contains X-ray diffraction peaks of aragonite and Mg calcite as additional phases. The investigated historic anhydrite mortars and plasters contain practically no or only very little anhydrite which means that the anhydrite was more or less completely transformed to gypsum and that the reverse reaction of dehydration of gypsum due to insolation is not so common as would be expected on the basis of theoretical considerations.

The optical microscopy of thin sections reveals that a porous matrix that contains only little aggregate particles characterizes the anhydrite mortars. These may be quartz grains or sedimentary rock fragments. Usually the gypsum is cryptocrystalline but sometimes larger, recrystallized aggregates are encountered. It is not currently clear whether the production of the gypsum plasters took place locally, as no features allowing for the large-scale burning of the material have so far been identified.

Construction Design

In the following some general observations on building constructions are presented and discussed. The use of earth and soil appears in various structural contexts. The presented ones are all stemming from the main occupational phase at Al Zubarah or contemporary sites.

Foundation and Floors

Only in a few occasions the foundation of walls were revealed at Al Zubarah so far. In the palatial compound (ZUEP04) some soundings helped to understand the building process of the buildings in the late 18th century. The sounding in space 3031 in precinct 7 of the so-called palace showed that walls had been constructed directly upon the natural deposits and not within a foundation trench. The wall plaster was then applied to all the internal wall surfaces before the plaster floor was constructed. A friable layer of plaster overlaying the natural geology shows signs of the plaster-rendering work. Initially, this was believed to be an earlier plaster surface.

However, it was too friable, too uneven and far too degraded to be anything other than discarded plaster created when the walls were rendered. Actually this can be understood as waste material from construction and not a formal surface. The plasterwork surface was then deliberately covered with a layer of moderately silty sand. This elevated the floor level and, more importantly, provided a level foundation for the subsequent overlying flag stone floor foundation and plaster skim. Large tabular slabs formed the flagstone floor foundation. These stones were laid as pavement to support the subsequent plaster layer.[20]

In contrast to the construction at Al Zubarah we find at Freiha some wall foundations made of compacted clay as a capillary-breaking layer to avoid that humidity and additional salts can enter the wall core.[21] According to G. Rees the earthen wall footings were partial made of mud bricks.[22]

Wall Constructions

All wall structures are very similar constructed. The building stones are roughly dressed and set in mortar lumps. Although build with mortar the stones are set in the same way as a dry stone masonry with wedge stones. The walls are built with a solid core. Double-faced walls with rubble filled cores are rare. Wall widths around 55 centimetres are quite common.

During the main occupation at Al Zubarah (Phase 5) walls were made of well-dressed and set stones of various types. As pointed out above, locally available beach rock is of relatively poor quality. Nevertheless, the good insulation effect of the beach rock, due to its high porosity, should have resulted in a comfortable interior climate. The stones were set, using soil/mud mortars with

20 Collie, "The Palatial Compound (ZUEP04)", 29.

21 E.g. at three buildings in excavation trench FREP04 (space 32, Space 43 and Space 33); see Rees, "Excavations at Freiha", 47–55.

22 Rees, "Excavations at Freiha" (2012), : 49.

anhydrite as a binding material. In a few cases, traces of lime-based mortars are present as well. The wall structure was covered with a thick anhydrite-based render. In addition, mud-based renders are attested.[23]

During the later re-occupation of Al Zubarah (Phase 3), walls are characterized by re-use of stone material and plaster fragments. The use of poor and previously heavily damaged material results in flimsy and weak structures. In contrast to the earlier mason works, these walls are set with irregular courses and less accuracy. Due to the poor state of conservation, it is presently unclear what kind of plaster render was used. The mortar might be based on the highly salt-contaminated *sabkah* mud (see Appendix A.2.A/B/C).

Lintel and Arch

Latest findings from the palatial compound (ZUEP04) at Al Zubarah shed some light on the construction of windows and doorways. In precinct 7, currently under excavation, a series of collapsed arches were recovered and in space 3048 also a collapsed wall (14523) with a partly preserved window was found. The window showed traces of three joists—possibly of local origin-mangrove wood—as lintels.[24]

The arches found at ZUEP04 show the use of best stone available: aeolianite. At Al Zubarah aeolianite was used for building members of structural importance. It can be found at corners, door recesses, arches, pillars, etc. in "important" buildings, e.g. mosques or "wealthier" compounds. The geometry of the arches is a depressed pointed arch with a small reverse curve at the apex or an ogee arch (fig. 8.3).[25] Elaborated decorations made of gypsum can be found around wall openings as doors, windows and arches.[26]

Roof Construction

Ceiling fragments with imprints of reed and plant materials, mainly of woven palm leave mats, are frequently found at Al Zubarah during the excavations; e.g. at ZUEP04: space 3011. The imprints are found in the mud lumps and clay fragments originating from the traditional earthen roof and ceiling constructions.[27] The roofs or ceilings were constructed in the common, traditional way: *danshal* joist overspinning the shorter side of the room lay in a regular distance according to their size and diameter, roughly each 20cm. The archaeological findings from Al Zubarah or Freiha do not show yet the existence of *basjel* (split bamboo strips), used as the next layer throughout the 20th century.[28] In the traditional architecture, *basjel* forms decorative patterns and is laid down in various systems. The next layer can be made of *daoun*—palm fronds mats or *al mangrour* mats. *Mangrour* mats are woven of reed stem or palm leafs. The archaeological records show as stated above a clear evidence of these mats and their use in the context of ceilings.[29] The mats were covered with a hard compacted layer of earth (fig. 8.4 and fig. 8.5). In some cases the lower layers consist of small gravel and the upper layer is of mud or *tin* (clay). While archaeological findings give no clear indication how the final layer of the roof or ceiling was executed, it seems to be possible an anhydrite plaster was used. The gutters, found on the house *façades*, were all made of anhydrite-based plaster, although the rest of the *façade* was plastered with a mud render.

23 Sobott, "Al Zubarah Site—Mineralogical analysis of building materials".

24 Barański, "Weekly Report; Site journals 22.-27.11.2014".

25 For a more detailed discussion see Schneider et al., *Fragments of an Arch, Space 3530, Locus 4860*.

26 See Fuchs, "Assessment of Plaster Fragments".

27 For references to various traditional mud roof constructions see Kinzel, *Am Beginn des Hausbaus. Studien zur PPNB-Architektur von Shkārat Msaied und Ba'ja in der Petra-Region, Südjordanien,* 161–209.

28 al-Khulaifi, *Traditional Architecture in Qatar,* 41, 46, 232–236.

29 E.g. ZUEP02, space 19, locus (2215); House Excavation point 2: 159–160; ZUEP02, space 055; house EP02: 20–21, or ZUEP01, space 166, locus (7004); Yeomans ZUEP01:9–10.

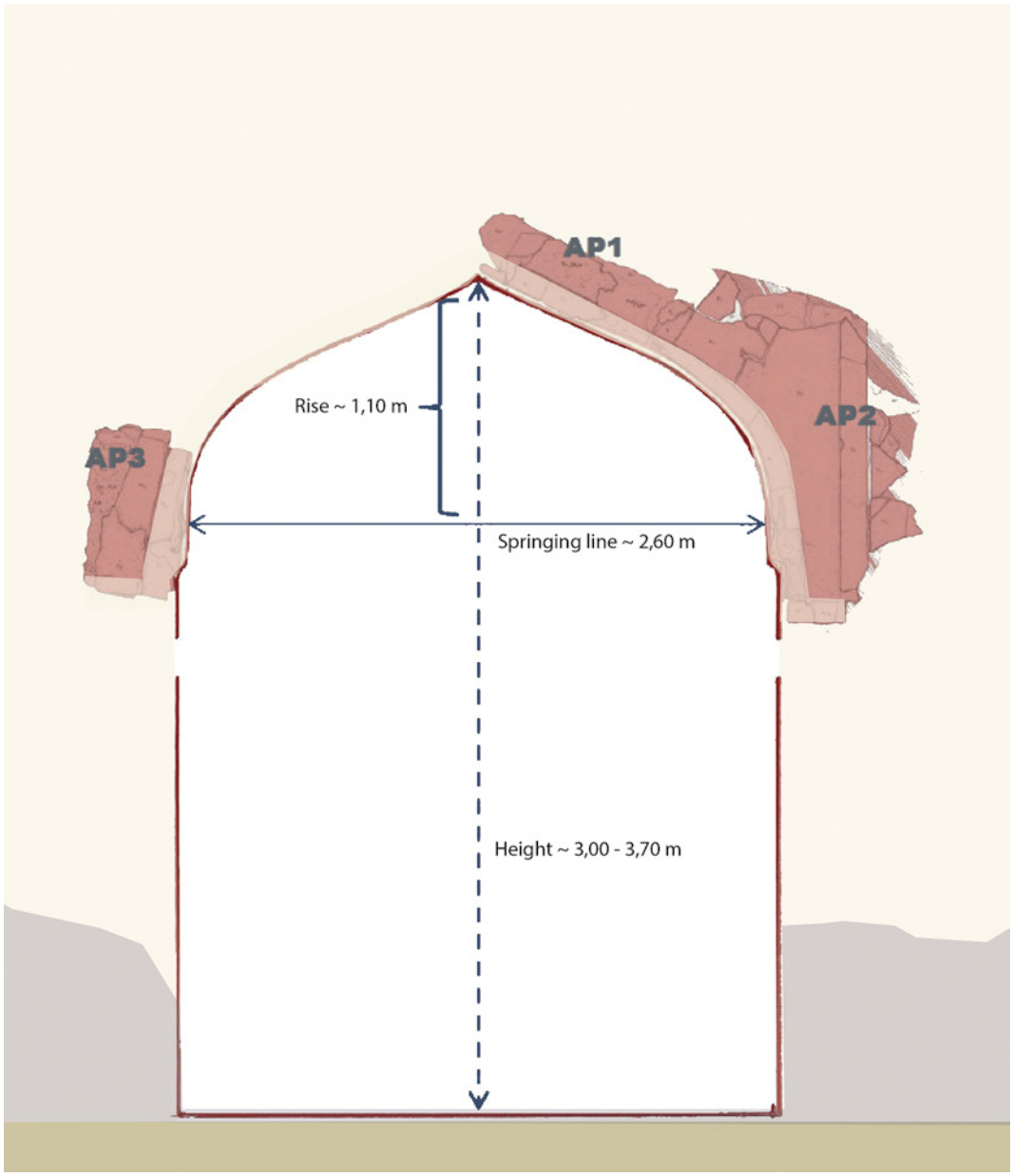

FIGURE 8.3 *Al Zubarah: Reconstruction of arch in ZUEP04, Precinct 7.*
DRAWING: M. KINZEL AFTER SCHNEIDER & ZIMMERMANN 2014; QIAH/UNIVERSITY OF COPENHAGEN.

Case Studies

The use of earth and soil in the late Islamic architecture of Qatar is until now quite underestimated. Thus the remains and evidence is limited some very prominent examples are still existing and were documented during the fieldwork of QIAH between 2009 and 2014. In the following some of the most significant cases are presented. These represent only "a sand grain in the desert".

Al Zubarah

At Al Zubarah, the predominant building stone is beach rock. Beach rock can be described as a recent, weakly cemented aggregation of fossil debris, quartz and feldspar grains. Weak cementation of

FIGURE 8.4 *Al Zubarah: charred roof matting from ZUEP02, Space 19, Locus 2204.*
PHOTO: A. PANTOS, QIAH/ UNIVERSITY OF COPENHAGEN.

FIGURE 8.5 *Al Zubarah: mat imprints in mud from (left) ZUEP04, Space 3011, Locus 4149 and ZUEP02, Space 35, Locus 2538.*
PHOTO: A. PANTOS, QIAH/UNIVERSITY OF COPENHAGEN.

the components is one reason these rocks break down under the strain of severe weathering conditions. Due to these characteristics, decay patterns are similar to adobe-mud brick structures.

Beach rock was used at all buildings, and even where nowadays other stones are visible on the surface, we must assume that a considerably amount of the building material has been beach rock (fig. 8.6; appendix A.2). Some of the beach rock blocks have such a weak structure, that it seems that they actually are mud bricks made of *sabkah* mud, mixed with gastropods collected at the beach. The state of preservation does not allow a more clear definition. It is remarkable that in the palatial compound (ZUEP04), with the exception of the arches, all walls are made of beach rock material. Large parts of wall surfaces along corridors or secondary courtyards were covered with a mud render, instead of the more elaborated anhydrite-based plasters used in the (more) representative parts of the building, or where the functional necessity was given, e.g. in *madbasa* installations.[30] Traces of mud render are recorded in QMA3 (sp. 0076; locus 165), an area excavated by QM during 2005.[31] At the town wall (ZUEP10; ZUEP13), some indications for mud render are found as well. It seems the upper parts of the wall were carried out with compacted soil. Although no material was found preserved *in situ,* accumulated deposits indicate earthen building parts.

A general practice seems to be the use of local materials or on the spot available materials to reduce building costs and to achieve a faster building progress. And still to produce an impressive and functional building complex. The palatial compound (ZUEP04) under excavation since 2010 can serve as a case study. The complex is partly erected on *sabkah,* ground that is when possible avoided as building ground, due to its weak and salty properties. Building material like the beach rock and *sabkah* mud was extracted on the spot, and most of the high walls were built with this material of poor quality. The weak beach rock was then covered with a simple mud mortar. This mud mortar survived on very few occasions and the preservation is very limited. Only in two cases actual final surfaces were found in ZUEP04 in Sp.3037, and in all other cases only traces of the undercoat render were uncovered (see Appendix A.2.D).

Freiha

Hard (dolomite) limestone found nearby Freiha is used throughout the settlement, yet mud seems to be also a common building material (fig. 8.7). Fine silt clay was used for the "*pisé* wall" footings at the domestic buildings in area FREP04.[32] Mud bricks were also used to form wall bases.[33] In some cases a low stone base was erected on top of the mud-made wall footing; followed by a mud wall structure on top of the low rubble stone wall (fig. 8.8). The building technique seems to be more similar to a wet loam technique called *zabur* or *tauf*[34] than to a classic (rammed earth) *pisé* (*moulé*) or mud brick (adobe) technique. According to this traditional wet loam technique clods of straw loam are shaped by hand and thrown with strong impact to build the wall in such a way that they are

30 At Zubarah's ZUEP02 over 21 *madbasas*—date presses were excavated so far (House Souq: 22).

31 Building materials and building archaeological findings were recorded during the state of conservation assessment in January/February 2011.

32 FREP04 (space 32, Space 43 and Space 33); Rees, "Excavations at Freiha, 2012:", 47–55

33 FREP04 (space 23); Rees, "Excavations at Freiha, 2012", 53.

34 Minke, *Building with Earth: Design and Technology of a Sustainable Architecture*, 72–73. The *zabur* technique, also called "*tauf*" or *pisé modelé* does not use a formwork to shape the wall. It should not be confused with a building technique known as *pisé moulé* that uses formwork. See Abdo *Zum Lehmbau im Jemen*, 80–89; Costa *et al.*, *Yemen: Paese di construttori,* 51–79. See also Braidwood *et al.*, *Prehistoric Investigation in Iraqi Kurdistan*, 40–42; Aurenche, *La maison orientale, l'architecture du Proche-Orient ancien des origines au milieu du quatrième millénaire*, 54–59; Kurapkat, "Bauwissen im Neolithikum Vorderasiens", 73–75.

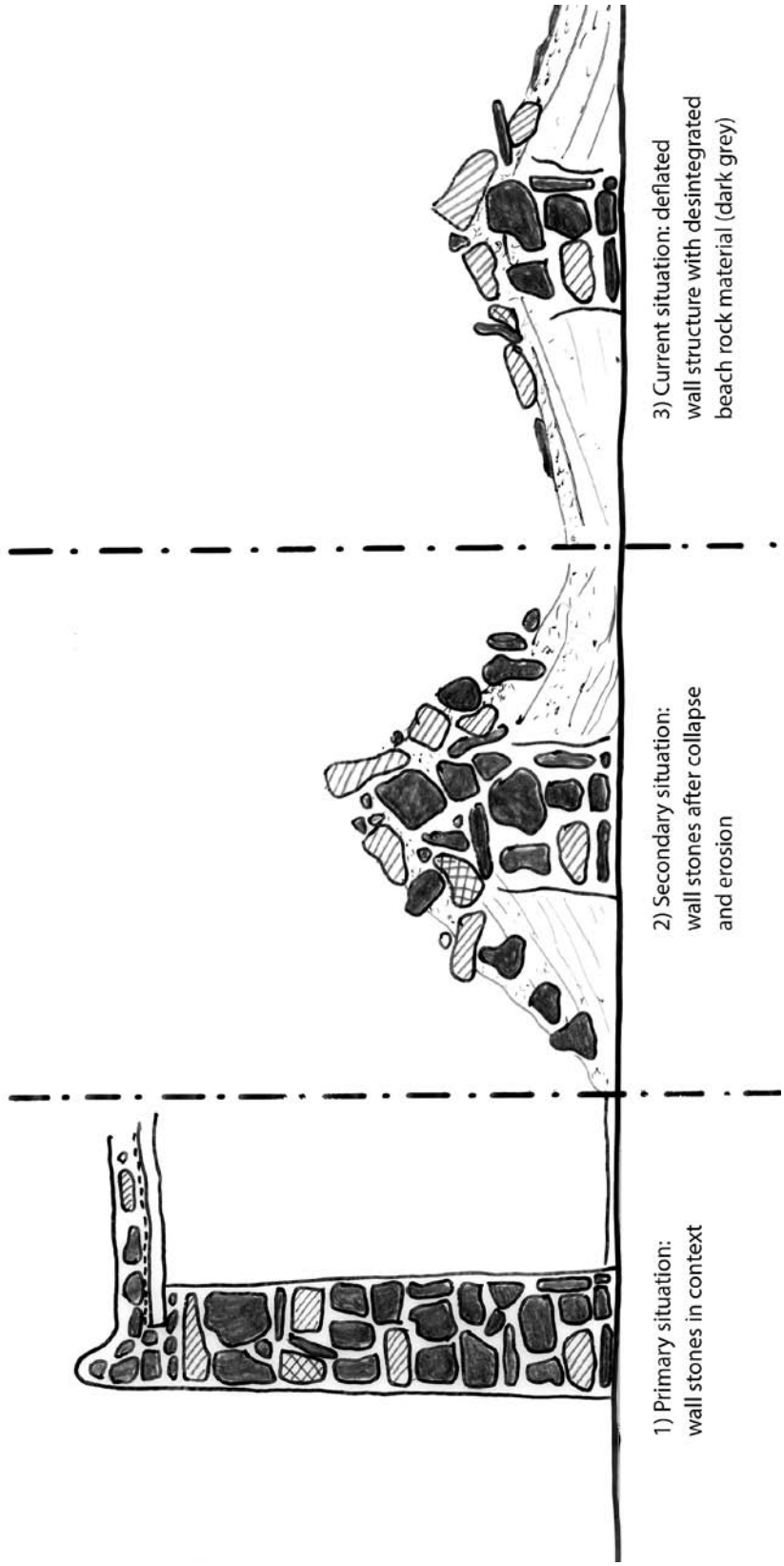

FIGURE 8.6 *Scheme: erosion process of beach rock walls at Al Zubarah.*
DRAWING: M. KINZEL AFTER P. HOFMANN, 2014, QIAH/UNIVERSITY OF COPENHAGEN.

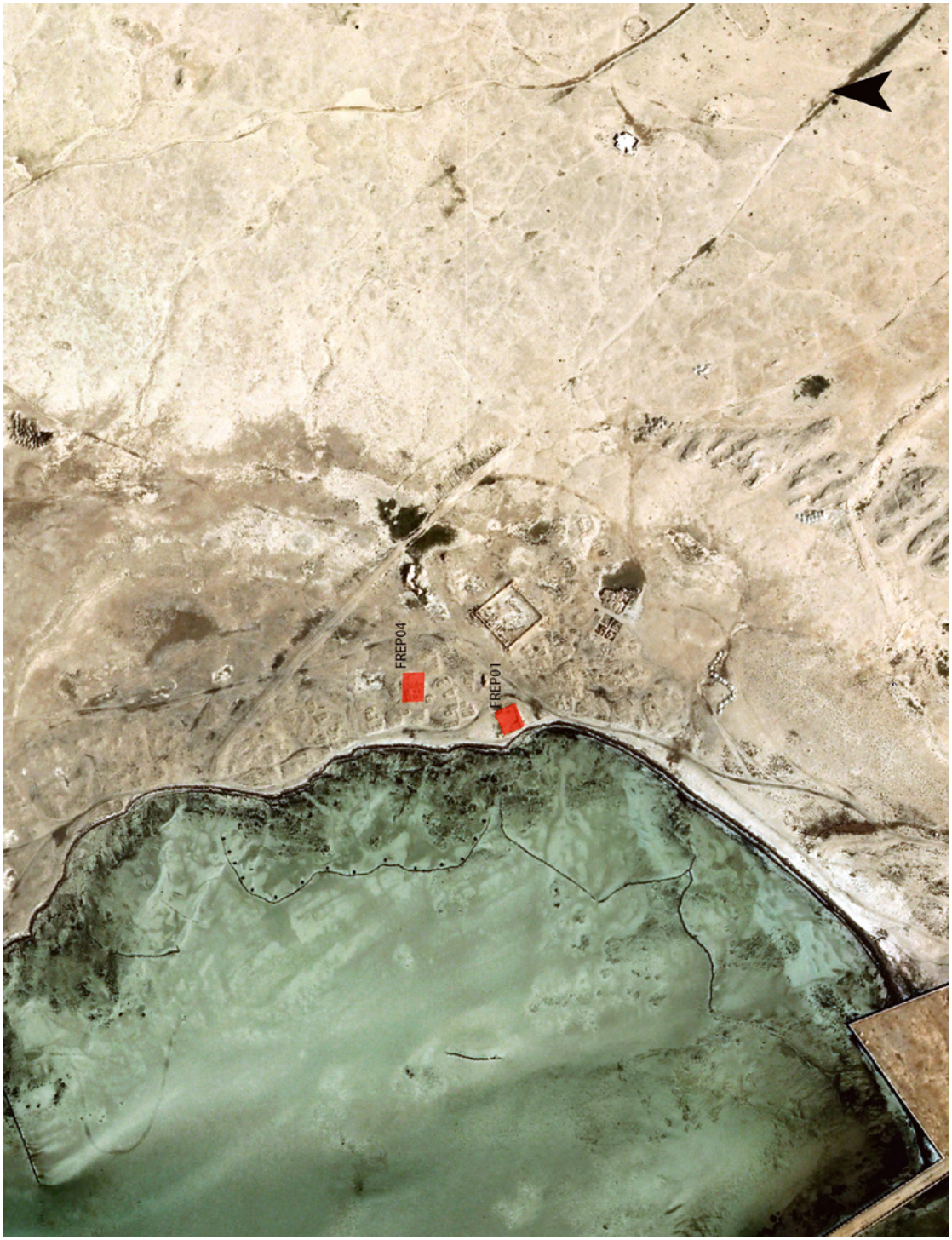

FIGURE 8.7 *Freiha aerial image.*
COURTEOUSLY OF CENTRE FOR GIS, STATE OF QATAR.

FIGURE 8.8 *Freiha: wall footing at FREP04, Space 23.*
PHOTO: A. PANTOS, QIAH/UNIVERSITY OF COPENHAGEN.

compacted and adhere to the base, forming a homogenous mass. The surface is in general beaten and compacted by hammering with a kind of wooden trowel, but without the support of a framework to shape the wall structure. The courtyard houses excavated seems to be very simple and show no elaborate features, e.g. north-facing *iwans*, arched doorways, etc. as they are known from Al Zubarah. On the other hand the poor state of preservation does not give any reliable information on the building features above the preserved remains.

On some walls of the mosque in Freiha[35] a complex sequence of different plasters and mortars can be observed: a double-layered gypsum plaster (10 and 11 in fig. 8.9) is underlain by a soil mortar (12), and all three layers cover a wall of which the aeolianite building stones are set with a mud mortar (22). The difference between soil and mud mortar is determined by the amount of clay minerals and the grain size of components. In Figure 8.9 the difference between the two is also emphasized by the brown colour of the mud. The analysis of a sample of the mud mortar has shown that the raw material does not originate from the immediate surroundings of Freiha.[36]

ʿAin Mohammad

In contrast to the town of Al Zubarah the abandoned village of ʿAin Mohammad (QNHER 10192) is situated in the hinterland approx. 2 kilometres inland from the seas. It covers an area of about eight hectares on the northern boundary of the UNESCO Buffer Zone for Al Zubarah Archaeological Site, around four kilometres northeast of Al Zubarah. Situated right east of the road to Al Shamal, there is a cluster of standing ruined buildings dating to the mid-twentieth century CE, comprising twenty stone and cement block house structures (fig. 8.10). Southeast of the ruins is an agricultural enclosure containing a well with the single-cylinder diesel-powered water pump of German origin still *in situ*, and close by are two walled cemeteries. The modern buildings, abandoned some forty years ago, overlie the remains of an earlier settlement, a small fort structure and a number of wells. According to a nineteenth-century source, ʿAin Mohammad was also occupied contemporaneously with Al Zubarah City, which is supported by surface ceramics at the site.[37] Nowadays the remains are frequently visited on weekends or national holidays for recreational purposes.

The small fort at ʿAin Mohammad (QNHER499) is a square structure by approx. 20 × 20 m with a round tower at its south corner.[38] The fort ruin still shows some very distinct remains of earthen construction: In the northern wing of the structure the remnants of three walls have survived. The preserved packed earth or *zabur* structure is still 55 cm high and ca. 26 cm wide.[39] It shows traces of heavy weathering and will be eroded in short time. The compacted earth sits on an approx. 50 to 55 cm wide and 50 cm high wall base made of the local dolomite lime stone (fig. 8.11; fig. 8.12). The compact earth wall remains clearly show layers of compacted soil of approx. five centimetres. The soil used is of local origin and contains various stone and shell materials. The basic matrix seems to be made of the local available clay. The few traces which could be recorded suggest that most of the Fort was built up with the construction

35 Petzold, "The Freiha Mosque (FREP01)"; Horn, "Consolidation and Conservation Works (at Freiha)".

36 Sobott, "Al Zubarah Site—Mineralogical Analysis of Building Materials", 13, 25–27.

37 Mackie, "Regional Survey", 66–69; Mackie "Geomatics and Regional Survey".

38 The fort is briefly mentioned also in Petersen *et al.,* "Qalʿat Ruwayda and the Fortifications of Qatar", 256–258.

39 Due to the state of conservation, it is difficult to define the used technique more accurately. What appears to be a rammed earth structure known as *pisé moulé* could also be interpreted as a bit less elaborated traditional wet loam technique known from Yemen as *zabur* as there are no traces of formwork recognizable. See "4.2. Freiha" in this volume, Minke, *Building with Earth: Design and Technology of a Sustainable Architecture,* 71–72; and Abdo, *Zum Lehmbau im Jemen*, 80–89.

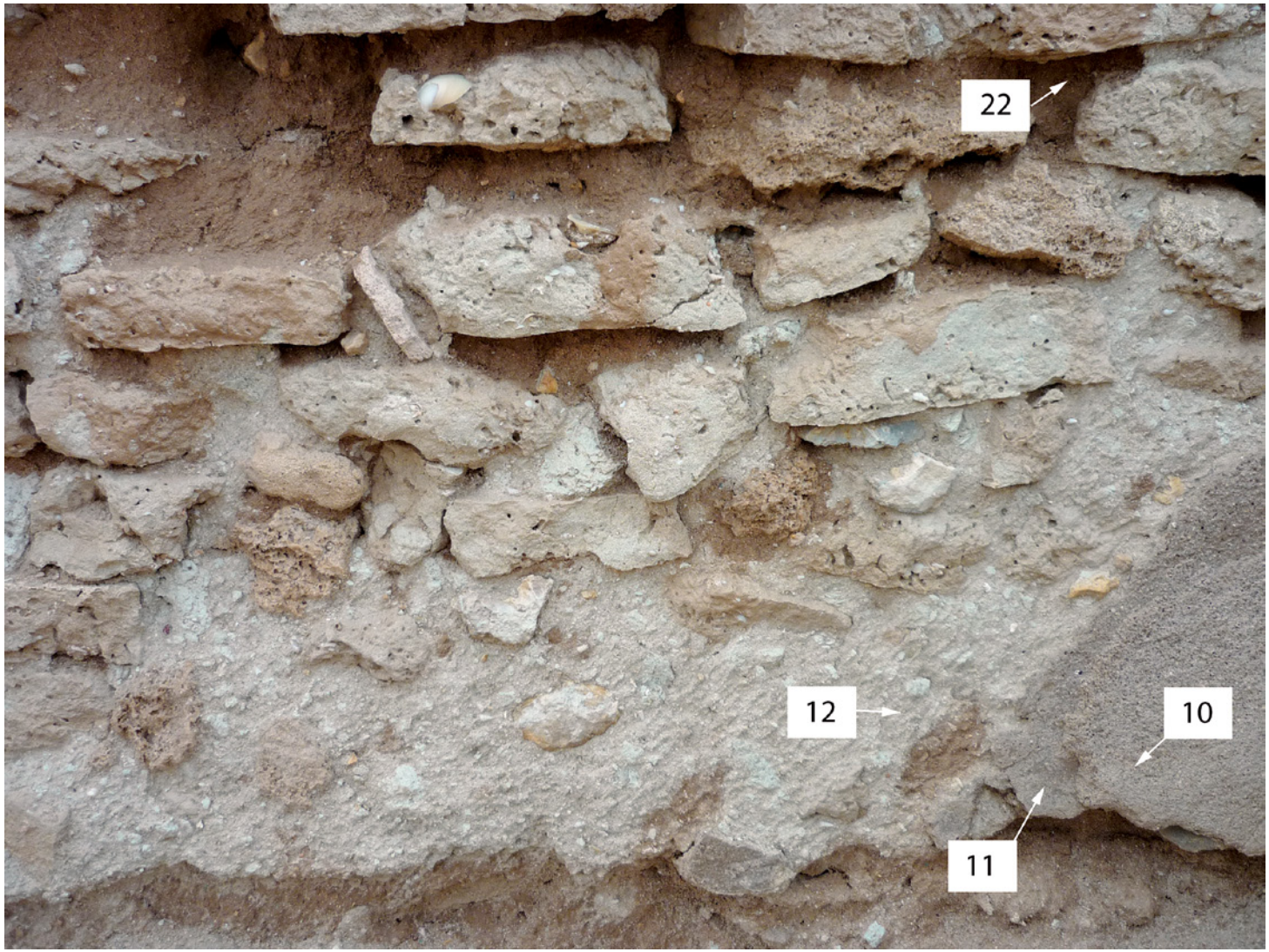

FIGURE 8.9 *Freiha: wall mortars and plasters at Freiha mosque (FREP01, Space 103, Wall 47); 10: gypsum plaster, 11: gypsum plaster, 12: soil mortar; 22: mud plaster.*
PHOTO: M. KINZEL AFTER ROBERT SOBOTT, QIAH/UNIVERSITY OF COPENHAGEN.

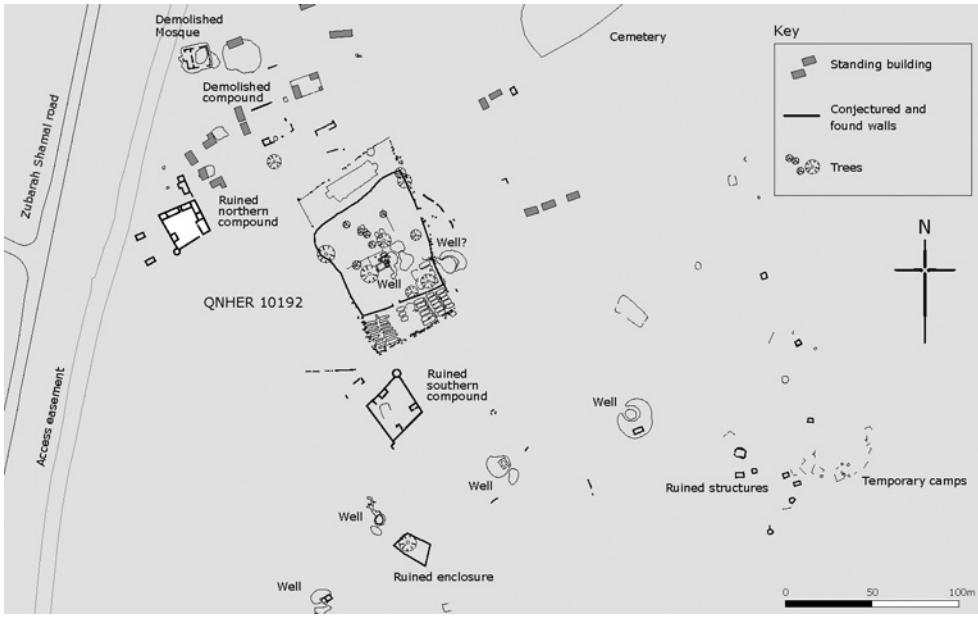

FIGURE 8.10 *ʿAin Mohammad: map of the site, fort structure marked in white.*
CREDITS: QIAH/UNIVERSITY OF COPENHAGEN.

descript above. The preserved low stonewalls and the visible remaining stones blurring our view on the actual predominating building technology of Qatar: earthen architecture.[40]

Qalʿat Shuwail

Remains of earthen architecture were also found at Qalʿat Shuwail.[41] Qalʿat Shuwail (QNHER10325) consists of a small ruined fort and a scattering of rectangular stone structures around the edge of a shallow, water-rich depression, the floor of which consists of a sandy desert loam (Ar: *rawdhah*).[42] It is located about 1.1 kilometres east of Al Zubarah Fort (fig. 8.13). The fort is square in shape with towers, one round and the other square, in north-eastern and southwestern corners respectively. The building measures c. 20 × 20m, with the entrance on the southeast side and includes two small buildings on the west side and one on the east side. Within the compound there are four rooms along the northwest wall with at least two along the southwest wall. A historical reference and surface scatters of pottery propose an eighteenth century CE date for the fort, making it largely contemporary with Al Zubarah at its peak. Perched on the edges of the *rawdhah* depression south and southeast of the fort are three clusters of rectangular stone structures, all significantly deflated. Associated with them are at least six wells

40 The extensive use of earth in Qatari architecture is not recognized until now. Mud bricks and earth were not commonly used in Qatar, according to Jaidah *et al.*, *The History of Qatari Architecture from 1800 to 1950,* 45.

41 de Cardi, *Qatar Archaeological Report,* reported this as site "13b Ain Al Shuwail", where she describes an 18th to 19th century fort amid several ruined buildings. Alongside the fort is a fine stone lined well 2m in diameter with water at a depth of 5.20m. The site was mapped as QIAH40–198 during the Qatar Islamic Archaeology and Heritage Project survey. See Mackie *et al.*, "Regional Survey and Mapping", 87. The site is also known as ʿAin Shuwail refers to the wells there. The fort is briefly described by Petersen *et al.,* "Qalʿat Ruwayda and the Fortifications of Qatar", 257–258.

42 For more detailed information on the geomorphology and the geological formations of Qatar, see Macumber, "Geomorphology and Geoarchaeology"; Macumber "An Examination of the Impact of Environmental Disparity on the Occupation of Qatar".

FIGURE 8.11 *'Ain Mohammad: kite-image.*
PHOTO: A. PANTOS, QIAH/UNIVERSITY OF COPENHAGEN.

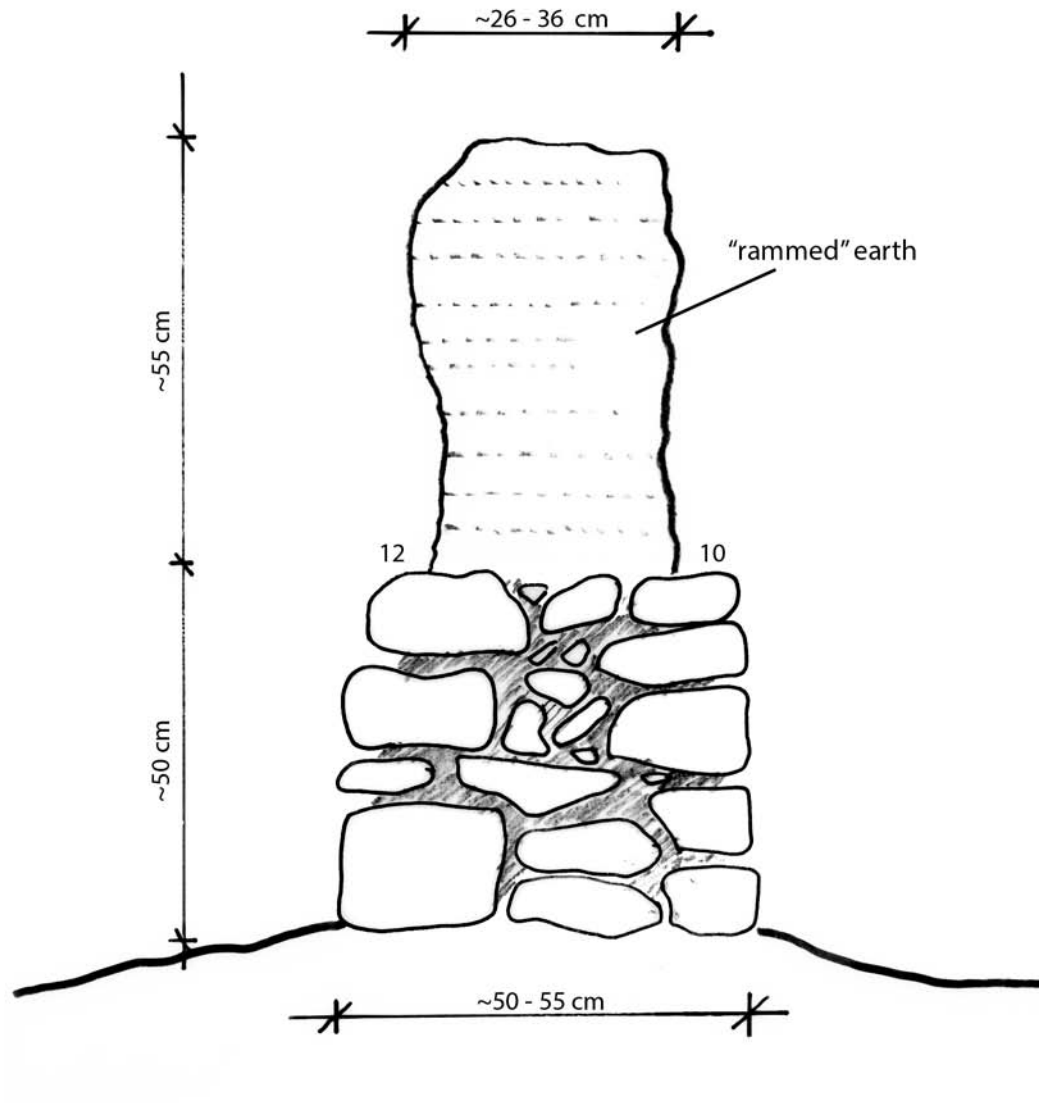

FIGURE 8.12 *'Ain Mohammad: section through last remains of earthen wall structure.* DRAWING: M. KINZEL, QIAH/UNIVERSITY OF COPENHAGEN.

extending into the centre of the *rawdhah*, as well as evidence for other silted or backfilled wells.

The rectangular tower on the west corner still has remnants of mud architecture surviving on a stone foundation.[43] The surviving mud wall has a height of about 1.50m. Due to the poor state of preservation it is not clear which construction technique was used here: rammed earth, wet loam techniques or mud bricks (fig. 8.14). However, it is clear that the superstructure of the Fort at 'Ain Shuwail, and probably most of the other buildings, were earthen structures.

43 Mackie *et al.*, "Regional Survey and Mapping", 116–118.

FIGURE 8.13 *'Ain Mohammad: earthen wall remains.*
PHOTO: M. KINZEL, QIAH/UNIVERSITY OF COPENHAGEN.

FIGURE 8.14 *Qal'at Shuwail: aerial images.*
PHOTO: A. PANTOS, QIAH/UNIVERSITY OF COPENHAGEN.

Umm al Qubur

The settlement remains at Umm al Qubur (QIAH40-383) were recorded during the hydrology survey carried out by QIAH in 2010. The settlement is situated on the edges of a larger *rawdhah* depression only a few kilometres northeast of 'Ain Mohammad (fig.8.15). The ruins resemble the typical ground plan of houses of the late 19th century with single room arrangements within an enclosed courtyard. Many of the structures have small rectangular air vents at the wall base, which is a wide spread feature on late Islamic sites in Qatar.[44] The still visible ruins seem to overlay an earlier settlement. So far no detailed architectural recording was carried out. Several wells are located within the settlement area.

At Umm al Qubur the same construction principles can be observed as at 'Ain Mohammad. On a stone wall base a mud superstructure is applied. In contrast to 'Ain Mohammad the earthen parts of

44 *Ibid.*, 85.

FIGURE 8.15 *Qalʿat Shuwail: rammed or traditional wet loam wall remains.* PHOTO: A. PANTOS, QIAH/UNIVERSITY OF COPENHAGEN.

the building at Umm al Qubur are still much better preserved although in a poor state (fig. 8.16). The ruins show clear, nicely set mud bricks with a regular shape. The mud bricks are made of *rawdhah* loam and are set with a mortar of the very same origin (fig. 8.17). As no archaeological excavations or detailed architectural records were carried out here, it is, at the moment, not possible to determine the original height of the mud brick walls and the buildings.

Qalʿat Rakayat

Qalʿat Rakayat (QIAH40-427) belongs to a series of inland forts protecting some nearby wells and gardens (fig. 8.18). The fort is situated approx. 4 km southeast of Ruwayda. It has a rectangular shape, approx. 12 × 20 m, with four corner towers. The southwest tower is of round shape; the other three rectangular. Its interior compromises two courtyards with rooms along the western, northern and eastern segments. In the southern wall a gate leads into the western courtyard. A small mosque, which seems to be a late addition, is located west of the gate, just outside the fort. The building was restored in 1988. During the archaeological works in relation to the restoration work a copper coin dating to the Abbasid period was found, indicating that the archaeological site related to Qalʿat Rakayat might date back to that period.[45]

The walls of the fort are built of lime stone rubble masonry and mud bricks (fig. 8.19). It is actually one of the best-preserved earthen buildings in Qatar. The lower parts of the walls, up to two metres, are made of limestone and the upper parts of

45 De Cardi, "Gazetteer of Sites and Finds", 188; al-Khulaifi, *Traditional Architecture in Qatar,* 80; Jaidah *et al., The History of Qatari Architecture from 1800 to 1950*, 44–51.

FIGURE 8.16 *Umm al Qubur: ruins of earthen buildings.*
CREDITS: QIAH/UNIVERSITY OF COPENHAGEN.

FIGURE 8.17 *Umm al Qubur: mud brick wall with stone base.*
CREDITS: QIAH/UNIVERSITY OF COPENHAGEN.

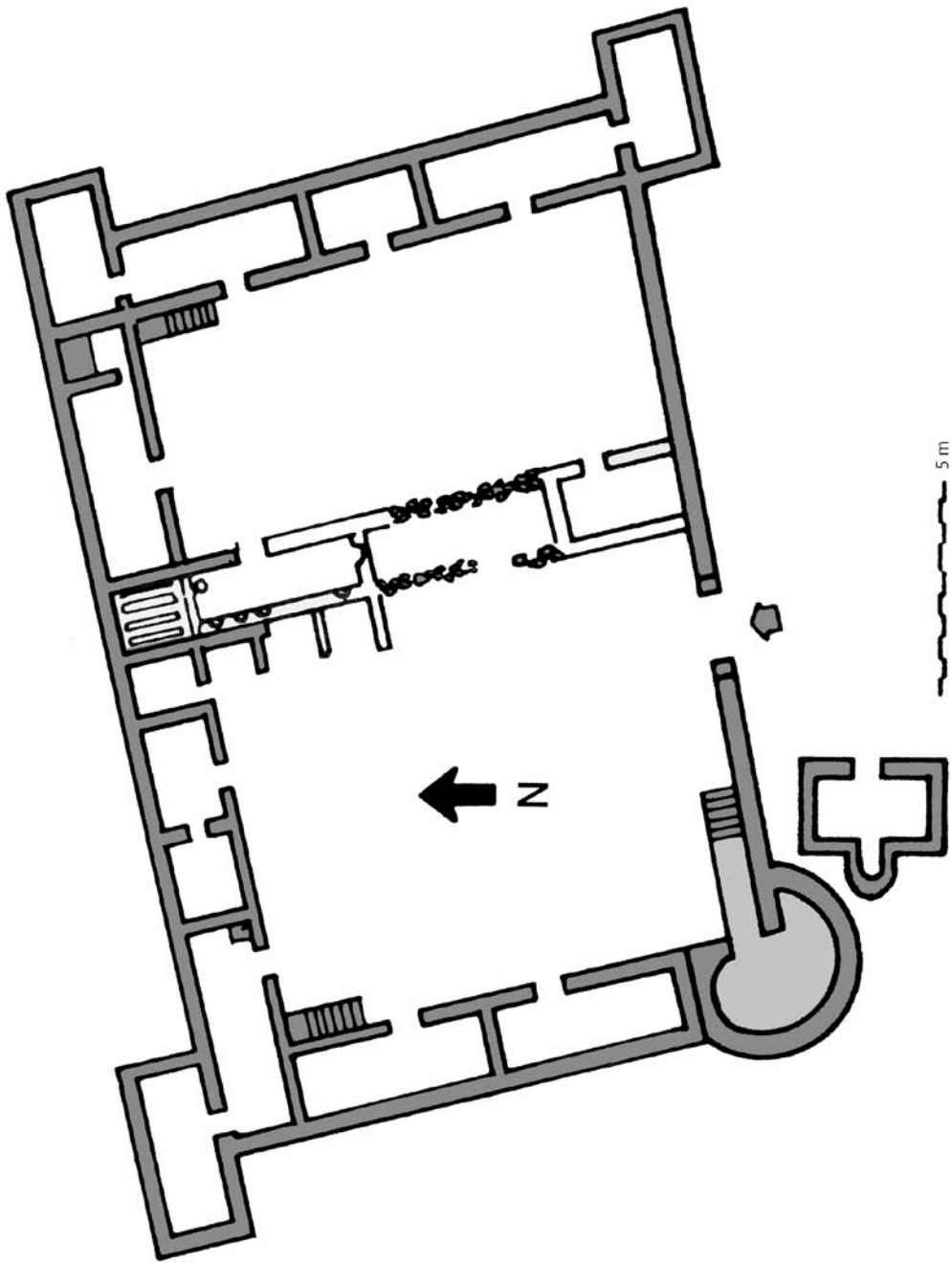

FIGURE 8.18 *Qal'at Rakayat: ground plan.*
CREDITS: KINZEL AFTER AL-KHOLAIFI 2006: PLATE 8.

FIGURE 8.19 *Qal'at Rakayat: exterior* façades.
PHOTO: M. KINZEL, QIAH/UNIVERSITY OF COPENHAGEN.

mud brick. This construction technique is a bit in contrast to other sites where the lime stone part of the wall is only about 1 metre high and main parts of the wall are built with mud (fig. 8.20).

During the 1988 restoration, traditional techniques and materials were used to rebuild the damaged and missing parts of the building.[46] In contrast to other restoration work at that time, the earthen parts of the building here were re-done using historic methods and materials. Only the mud render was slightly modified with the addition of limited amounts of lime and white cement to strengthen the render against weathering.[47]

Aspects of Traditional Building

The traditional architecture found in Northwest-Qatar shows influences from all areas around the Gulf and beyond: Kuwait,[48] Iran,[49] Saudi Arabia,[50]

46 The various materials and techniques are descripted throughout al-Kholafi's book on traditional architecture in Qatar. See al-Khulaifi, *Traditional Architecture in Qatar*. Qal'at Rakayat is in a poor state of conservation and will need a substantial consolidation soon to stop the dilapidation process that has started in recent years.

47 al-Khulaifi, *Traditional Architecture in Qatar,* 202–206, 230. Sobott, "Report on the Building Materials of al Zubarah City".

48 Al- Hijji, *Old Kuwait: Memories in Photographs*; Lewcock, *Traditional Architecture in Kuwait and the Northern Gulf*.

49 Rainer, *Anonymes Bauen im Iran*; Kazerooni, *Gulf Islamic Architecture*; Hawker, *Building on Desert Tides: Traditional Architecture of the Arabian Gulf*, 83–84.

50 King, *The Traditional Architecture of Saudi Arabia*; Facey, *Back to Earth: Adobe Buildings in Saudi Arabia*;

FIGURE 8.20 *Qal'at Rakayat: close up of wall face with stone base, historic mud bricks and restoration mud bricks (from 1988).* PHOTO: M. KINZEL, QIAH/UNIVERSITY OF COPENHAGEN.

Bahrain,[51] The Emirates,[52] Oman,[53] Pakistan and India,[54] as well as East Africa.[55] The various influences can be related to the strong trade connections to the various areas and the exchange of ideas, materials and technologies. On the other hand, especially for Al Zubarah, the origins of the inhabitants of the town, founded around 1765, gives a good idea of the various influences.

As the power of empires weakened considerably in the Gulf region during the eighteenth century, political and natural pressures pushed

Facey, *Dir'iyyah and the First Saudi State*; as well as Winner, *et al., Photographic Report 1977*.

51 Yardwood *et al.*, *Muarraq: Architectural Heritage of a Bahrain City*; Kazerooni, *Gulf Islamic Architecture*; Follad, *Earthwork: The Artistry and Craftsmanship of Pottery, Ceramics, and Gypsum in the Kingdom of Bahrain*.

52 Hawker, *Building on Desert Tides: Traditional Architecture of the Arabian Gulf*; Piesik, *Arish: Palm-Leaf Architecture*; Dostal, *The Traditional Architecture of Ras al-Khaimah;* Coles *et al.*, *Windtower*; Damluji, *The Architecture of the United Arab Emirates*, 148–307; Dubai Municipality, Rashad M. Bukhash, *Elements of Traditional Architecture in Dubai*: *The Reference Book*; Dubai Municipality and Bukhash, *Traditional Houses of Dubai*.

53 Bandyopadhyay, *Manah: An Omani Oasis, An Arabian Legacy; Architecture and Social History of an Omani Settlement;* Peterson, *Historical Muscat, an Illustrated Guide and Gazetteer*; Taylor-Soubeyran, et al., *Architecture vernaculaire au Sultanat d'Oman*; Damluji, *The Architecture of Oman*; and Dinteman, *Forts of Oman*.

54 Hawker, *Building on Desert Tides: Traditional Architecture of the Arabian Gulf,* 84–85.

55 Petersen, *Dictionary of Islamic Architecture,* 71–77.

the Arab tribes, including the Utub, away from Basra, Kuwait and also places like Bandar 'Abbas, with Al Zubarah—situated beyond Ottoman and Persian influence—becoming the destination of choice.[56] Building techniques and structural solutions of the home countries had to be adopted and modified to the local (environmental) conditions and the available building materials. There is a clear Persian influence on the arch design and the multi-domed mosque design at Al Zubarah and Qal'at Murair. The decorative geometric patterns used around doorways and niches along the walls in reception rooms are influenced from patterns used in India and what is now Pakistan.[57] The house design and layout refers to courtyard houses in Kuwait, Bandar-e Lengeh and Bandar 'Abbas,[58] while the town wall reflects the design of the town wall of Kuwait city,[59] as well as Saudi towns like Hufhuf.[60] It seems that there is a considerable change in the traditional architecture along the Arabian Gulf coast during the 19th and early 20th century. Due to the immigration of a lot of Persians very distinct architectural elements like wind towers were introduced.[61] They are a very late feature in the so-called traditional architecture. Wind catcher and air vents seem to be more common before. In addition also a revival of *barasti* buildings instead of actual tents seems had happen during the same period. It is might be also true for the use of mud bricks and other earthen building techniques.

Traditional building is characterized by periodical maintenance cycles, repairs, dilapidation and decay processes often in connection with temporary abandonment and hiatus. Whenever the cycle of maintenance is interrupted especially earthen buildings start to suffer and to erode. This phenomenon can be seen in the archaeological record at e.g. Al Zubarah and Freiha. There is a direct connection between the political and economic situation reflected in the findings and the state of the buildings respectively the care taking of necessary repairs or neglecting of maintenance due to insecure circumstances.[62]

Conclusion

This contribution focused on the use of earth in the architecture in Qatar during the Ottoman period in the 18th and 19th century. The earthen building tradition is not commonly remembered in Qatar due to the fact that only a few remains of Qatar's earthen architecture have survived. As most of the earthen parts of the architectural remains uncovered in archaeological excavations or recorded during survey work have vanished and literally are weathered away, our visual impression is biased so that we tend to see Qatar's architectural heritage per se as stone architecture. Earth and soil-so the common opinion- only appears as mortar, render, or roof material.[63] However, as shown in the presented case studies this is not the entire story: earth has played an important and vital role in the 18th and 19th century traditional building. Entire settlements were actually built of earthen structures

56 Nymann, "Boom and Bust: The Port of Al Zubarah in Northern Qatar in the 18th and Early 19th Centuries".

57 Vaughan, "Indien: Sultanate und Moghuln"; Memon, *Jharoka– Rawalpindi*; von Renz, *Geschichte und Stätten des Islam von Spanien bis Indien*, 646–730; Hawker, *Building on Desert Tides: Traditional Architecture of the Arabian Gulf*, 84–85.

58 Fuchs, *Al-Zubarah and Historic Residential Architecture in* Hormozgan.

59 Al- Hijji, *Old Kuwait: Memories in Photographs*.

60 Nippa *et al.*, *Unterwegs Am Golf/Along The Gulf: Von Basra Nach Muscat/From Basra To Muscat; Photographien von Hermann Burchardt*, 96–111.

61 Coles *et al.*,*Windtower*.

62 See Fenchel, *Ruins in the Age of Oil: The Abandoned Villages of Northern Qatar*; Schäfer, *et al.*, "Al-Jumail—Ein Fischerdorf aus der ersten Hälfte des 20; Jahrhunderts im Nordwesten Katars".

63 Nevertheless, such remains are disappearing on a regular basis wherever modern development takes place.

using stone material only for wall foundations. In the surveyed area in northwest Qatar various wall techniques were observed: a) with mud bricks; b) with *pisé moulé* technique; and c) a traditional wet loam technique (*pisé modelé*/*zabur*/*tauf*). In most cases a (low) stone base serves as a wall footing.

At Al Zubarah beach rock was used instead of mud bricks. The beach rock block were cut out directly out of the ground and then used in the same way. The properties of beach rock blocks and mud bricks are comparable; showing therefore very similar weathering and erosion patterns. Once the components of this weak stone material have disintegrated they are not distinguishable from the common soil deposits on the archaeological site. The building material vanishes and leaves only the more durable materials behind. And what has visually disappeared is hard to recognize and is easily forgotten. Without the archaeological research of the Qatar Islamic Archaeology and Heritage Project this would has been true also for Qatar's earthen Islamic architecture.

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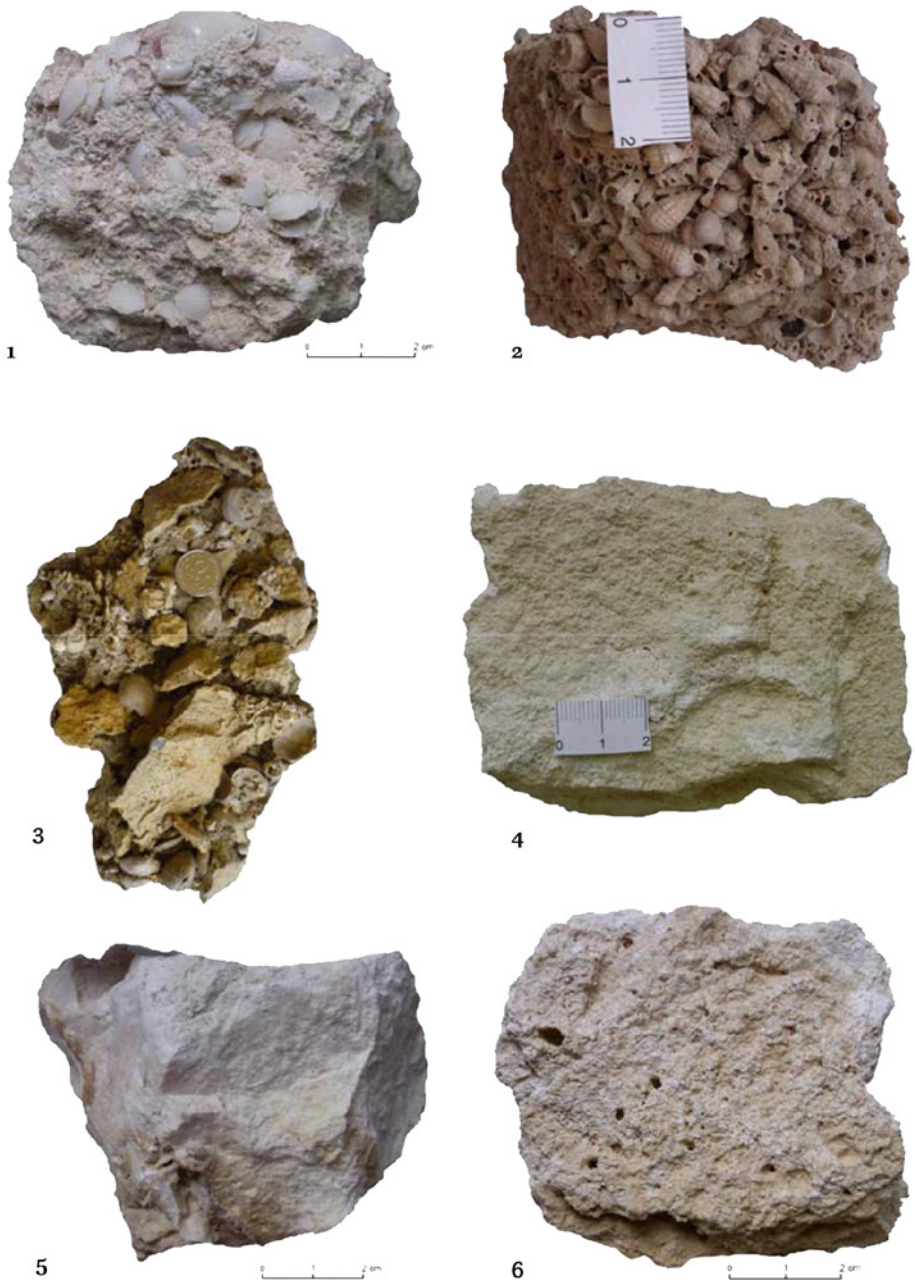

APPENDIX A.1 *Stones attested at Al Zubarah: 1: Beach Rock—Mollusc Rudstone* (AG)*; 2: Beach Rock—Gastropod Rudstone* (BJ)*; 3: Conglomerate* (KA *or* LA)*; 4: Aeolianite* (FR)*; 5: Dolomitic Limestone* (BL)*; 6: Gypsum rock* (BE).
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A

B

C

D

APPENDIX A.2 *Beach Rock Walls and Mud Plaster at Al Zubarah: A: ZUEP04, Space 3001, Wall 4091; B: ZUEP04, Space 3001, Wall 4084; C: ZUEP04, Space 3023, Wall 4069; D:ZUEP04 Space 3037 Mud Plaster.*
CREDITS: QIAH/UNIVERSITY OF COPENHAGEN.

CHAPTER 9

Residential Compounds: Earthen Architecture in the Central Desert of Iran

Atri Hatef Naiemi

Introduction

Earth has been accessible for centuries in geographically diverse regions across Iran. Its compatibility with the arid climate of central Iran has determined that it is the primary building material of this area. Therefore, earthen architecture predominates as the vernacular construction technique in different types of buildings such as houses, caravanserais, mosques, bathhouses, cisterns, etc., in villages, towns and major cities, and has served this purpose for centuries. This essay will examine the residential compounds that form a significant historical category within the earthen architecture of Iran.

Historically, these compounds served as desert settlements, offering protection against natural and human threats. Their complex networks of walls, towers, and protected entrances provided a safe place for temporary and permanent residency. These structures were distributed in different provinces such as Isfahān, Yazd, Simnān, and Khurāsān. They continue to present a unique settlement pattern in Iran, which is still insufficiently studied by scholars. Despite their common physical characteristics, these complexes exhibit a high level of spatial diversity and complexity. They show the ingenuity of people who applied their indigenous knowledge and local materials in order to erect strong structures that protected their inhabitants.

The great quantity and variety of these complexes all around Iran emphasize the need to study these residential-defensive installations. In the context of this volume, they are fitting examples of earthen architecture. They introduce the lesser-known features of this type of architecture, such as the potential for earth to be used as the main material in the construction of buildings that withstood threats and attacks throughout history. Furthermore, the bulk of scholarship published in both European languages and Persian has focused on major Iranian cities and has overlooked smaller urban centres. Therefore, conducting research on these structures is expected to contribute to the wider history of habitation across the central plains of Iran.

This essay will focus on the residential compounds located around the fringes of the central desert of Iran, *Dasht-i Kavīr*, particularly Yazd province. Initial analysis of satellite images of Yazd province reveals the location of approximately 80 complexes, thus showing the great richness of the architectural remains in the study area. The research is directed in two ways: the large scale that considers the distribution of enclosures in a broader geographic context, and the small scale, which focuses on the key architectural elements of these structures. Identification of these complexes and examination of their physical and functional characteristics result in establishing what sort of settlements they are and how they function, on their own and in relation to bigger settlements. Ultimately, this will achieve the main goal of this essay: a preliminary typology of residential compounds in this Iranian province. The typological

Note: This paper is the published version of my M.A. research paper, which I finished in April 2014 at the Department of Art History and Visual Studies, The University of Victoria, Canada. I would like to express my sincere gratitude to my supervisor Prof. Marcus Milwright for his supervision during the process of the research and his remarks on a previous version of this essay.

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categorization of these structures gives a clear picture of the numerous abandoned residential complexes that have been distributed throughout central Iran.[1]

Yazd Province

Yazd province is situated on the western edge of the central desert of Iran. The city of Yazd, the centre of the province, flourished in the medieval period due to its location on the trade route between Central Asia and the Persian Gulf.[2] The city was never a capital, however it has been deemed an influential centre for local construction traditions for centuries. Central Iranian vernacular buildings, characterized by thick, tall earthen walls, windcatchers, central courtyards, pools of water, and basements, culminate in the earthen architecture of Yazd. Responding well to the climatic needs, the buildings are able to adapt more simply to the hot and arid summers of the region.[3]

The study, conservation, and management of earthen architectural heritage have attracted the attention of scholars and specialists over the last few decades. While Yazd province has always been considered a significant centre of earthen architecture, not only in Iran but also in the world, the main focus of the recent studies has been mainly on the magnificent examples of earthen buildings found within the major cities of the province. However, the extramural modest structures—such as the residential compounds addressed in this essay—are also worth consideration on the subject of earthen architecture in the central desert of Iran. Along with the examination of physical and functional features of these desert settlements, this essay tries to uncover an important, but lesser-known type of earthen architecture in Iran, the buildings that face public (and in some cases scholarly) ignorance despite their architectural and historical values.

What are the Residential Compounds?

Human geographers consider the residential compounds to be a type of strongly fortified rural habitat in the open plains.

"… They are rectangular in layout, with high walls, corner towers, and a single large gateway dominated by a watchtower. The internal arrangement sometimes turns on a central street running from the gateway and flanked by houses."[4]

The origins of the fortified villages could be recognized in the "communal wall-dwelling" in Neolithic Persepolis and Khārazm in the second half of the first millennium BCE. However, these complexes were also present in other historical periods in this part of Asia.[5]

The title of the "desert" structures reveals that they were mainly located within the flat plains dominated by the surrounding hills. Therefore, they did not have the advantage of an ideal strategic situation. Particular natural geographical features, for instance the inaccessible strategic

1 In the study of residential compounds we are faced the challenging issue of dating. These structures have been reconstructed several times due to their main building material, clay and sun dried brick, being neither durable nor sturdy. Although they cannot easily be dated precisely at present, this essay seeks to understand how the sites relate to their environmental context chronologically. Some initial ideas for dating the case studies are suggested (according to historical accounts and architectural survey of the site); further archaeological studies are needed to reveal the hidden layers and clarify the issue of dating.

2 Bloom *et al.*, *The Grove Encyclopedia of Islamic Art and Architecture.*

3 Furūzānmihr *et al.*, "Vernacular Architecture: Questions of Comfort and Practicality", 276.

4 De Planhol *et al.*, "Geography of Settlement", 425.

5 While a fortified village appeared in Fergana during the 5th and 6th centuries, it was already common throughout this part of Asia at the time of Alexander, and was present (under Iranian influence) in Qarāqum during the Achaemenid period: De Planhol *et al.*, *op. cit.*, 425.

position on top of a rock intended to dominate the surrounding landscape, could reinforce the structures against external attacks or increase the ability of the inhabitants to resist. In other words, this type of habitat cannot be considered a powerful defensive base in a specific region. However, their earthen walls and towers were still able to protect the settled people against the desert brigands and less powerful invaders. Distribution of these fortified villages across Iran throughout history persuades the scholars to consider them an architectural pattern of construction rather than a type of settlement that conveys exclusively a sense of insecurity. Although the defensive features of these compounds emphasize their protective role, particularly in times of attack or siege, de Planhol diminishes the importance of the defensive elements of these structures, highlights their social aspect and introduces them as "a perfectly normal expression of Iranian culture … that originated essentially from clan-communities".[6] These complexes are believed by some scholars to represent an architectural pattern that is also reflected in the outline of the rural and urban houses with tall walls and central courtyards.[7]

Identification of residential compounds will not be possible unless they are studied both individually and in relation to their broader geographic context. To examine them in their environmental context, there are two significant factors that should be considered: routes and underground water systems. The distribution map reveals a vast number of residential compounds located throughout the study area. They show a higher density around the major cities than along the main roads. This pattern of distribution indicates a stronger connection with cities than routes (particularly main older cities rather than newly developed ones) (fig. 9.1). Providing water has been one of the greatest challenges faced by desert dwellers over time. *Qanāt*,[8] the underground water system, operated as a safe method of water transportation in these regions. Aerial photographs show the long lines of pits on the ground, indicative of well shafts. *Qanāt*s usually start in the foothills of mountains and end near the agricultural lands around the villages and cities. The residential compounds, like the other forms of desert settlements, benefited greatly from *qanāt*s. A complex network of parallel and intersecting lines of pits surrounding these enclosures shows their great dependency on *qanāt*s (fig. 9.2).

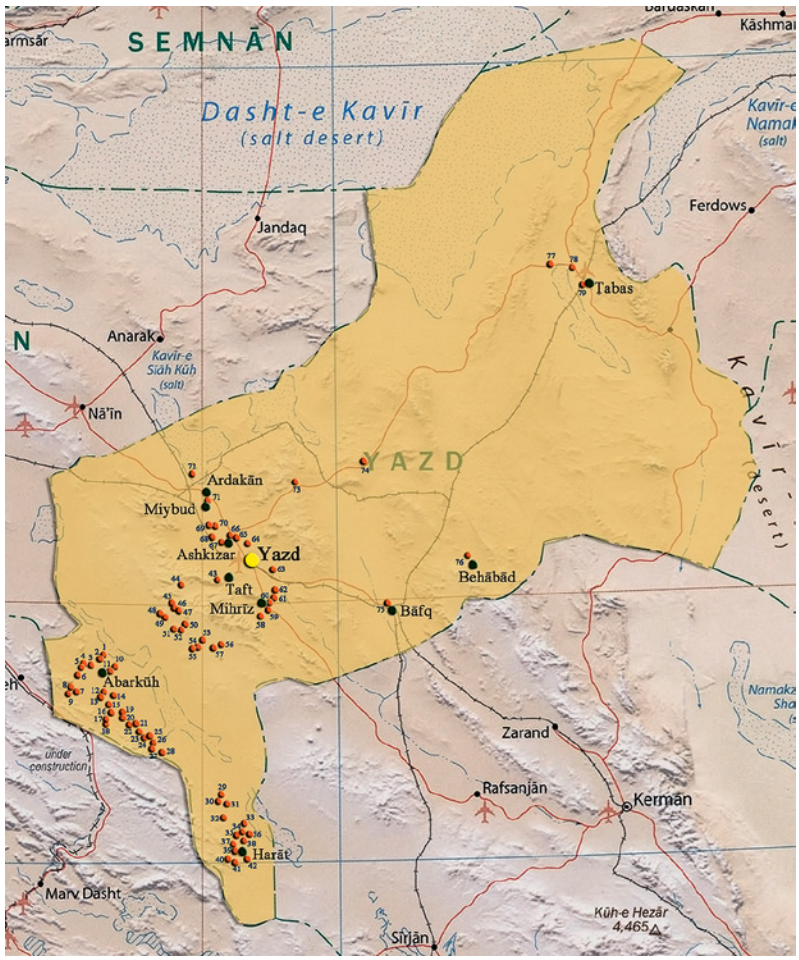
Methods

Since excavations have never been undertaken on most of the residential compounds throughout the study area, information on their architecture and physical layout, in this research, is derived from the examination of aerial photographs and satellite images (historical and current imagery), the study of literary sources, and comprehensive fieldwork that was accomplished during the summer of 2013. Since the proposed study area is extensive, doing fieldwork in the whole area is impossible. Accordingly, aerial photographs and satellite images are applied as substantial visual sources, which reveal key aspects of these sites including their location, dimensions, and main components. However, doing fieldwork in a few selected cases, and examination of architectural remains, leads to a determination of the evolution of these enclosures and the phases of their development over time. The physical evidence in the sites sometimes explains the relationship between these structures and the surrounding landscape. For example, shards of terracotta, which are

6 *Ibid.*, 426.

7 Nūrbakhsh, *Arg-i Bam and a Brief History of Urbanism in Iran*, 147.

8 *Qanāt* is an ancient water-supply system consisting of underground irrigation canals conducting water from the level of an aquifer, to the open air. They use gravity to distribute water to lower elevations. *Encyclopedia Iranica*, http://www.iranicaonline.org/articles/kariz_1 (consulted 01 March 2014).



1. Aḥmadābād
2. Fīrūzābād
3. Tījird
4. Qal'ih Bābak
5. Tīzuk
6. Untitled 01
7. Untitled 02
8. Untitled 03
9. Untitled 04
10. Shahrasb
11. Untitled 05
12. Shahrābād 01
13. Shahrābād 02
14. Untitled 06
15. Untitled 07
16. Untitled 08
17. Untitled 09
18. Untitled 10
19. Nuṣratābād
20. Untitled 11
21. Untitled 12
22. Untitled 13
23. Untitled 14
24. Untitled 15
25. Untitled 16
26. Qal'ih Nuh (Isfandābād)
27. Ḥājī Khān (Isfandābād)
28. Hārūnī
29. Javādābād
30. Marvast
31. Taqīābād
32. Harrābarjān
33. Ḥasanābād-i Harāt
34. Chākirī
35. Salīmābād
36. Ḥusaynābād-i Harāt
37. Shiykhābād
38. Hāshimābād
39. Malikī
40. Qadamgāh
41. Untitled 17
42. Qal'ih Harāt
43. Islāmīih
44. Abbāsābād-i Mīānkūh
45. Untitled 18
46. Untitled 19
47. Untitled 20
48. Untitled 21
49. Dihshīr
50. Untitled 22
51. Ardān
52. Untitled 23
53. Fakhrābād
54. Untitled 24
55. Untitled 25
56. Irnān
57. Kārīz (Bakh)
58. Khurmīz
59. Bāgh Diyhūk
60. Mihrpādīn
61. Saryazd
62. Haruftih
63. Khavīdak
64. Untitled 26
65. Untitled 27
66. Untitled 28
67. Untitled 29
68. Untitled 30
69. Sharafābād (Izābād)
70. Untitled 31
71. Mihrgird
72. Chāh Afḍal
73. Kharānaq
74. Sāghand
75. Bāqirābād
76. Jannatābād
77. Untitled 32
78. Untitled 33
79. Nuṣratābād-i Ṭabas

FIGURE 9.1 *The identified cases throughout the study area, Yazd province*
MAP: COURTESY OF THE UNIVERSITY OF TEXAS LIBRARIES, THE UNIVERSITY OF TEXAS AT AUSTIN.

related to water canals, give some useful information about the water systems associated with these settlements. Ceramics also help the researcher to estimate the phases in which the compound was constructed or abandoned. This essay does not intend to allocate extensive coverage to pottery studies but it is noteworthy that ceramics are valuable sources of information regarding these architectural remains.

Aerial Photographs and Satellite Images

In working with aerial photos and satellite images, in the first stage, 79 walled settlements were located throughout the study area. These are basically the complexes, surrounded by curtain walls and reinforced by several towers. The residential units are recognizable within these enclosures. More than half of the identified cases (46 out of 79) were known by their original (local) names, with the rest remaining untitled. Although the satellite views show the existence of a large group of fortified settlements throughout Yazd province, the examination of every single complex is certainly not feasible. Therefore, the list of all identified compounds was narrowed down from 79 to 33 specific case studies. The potential case studies

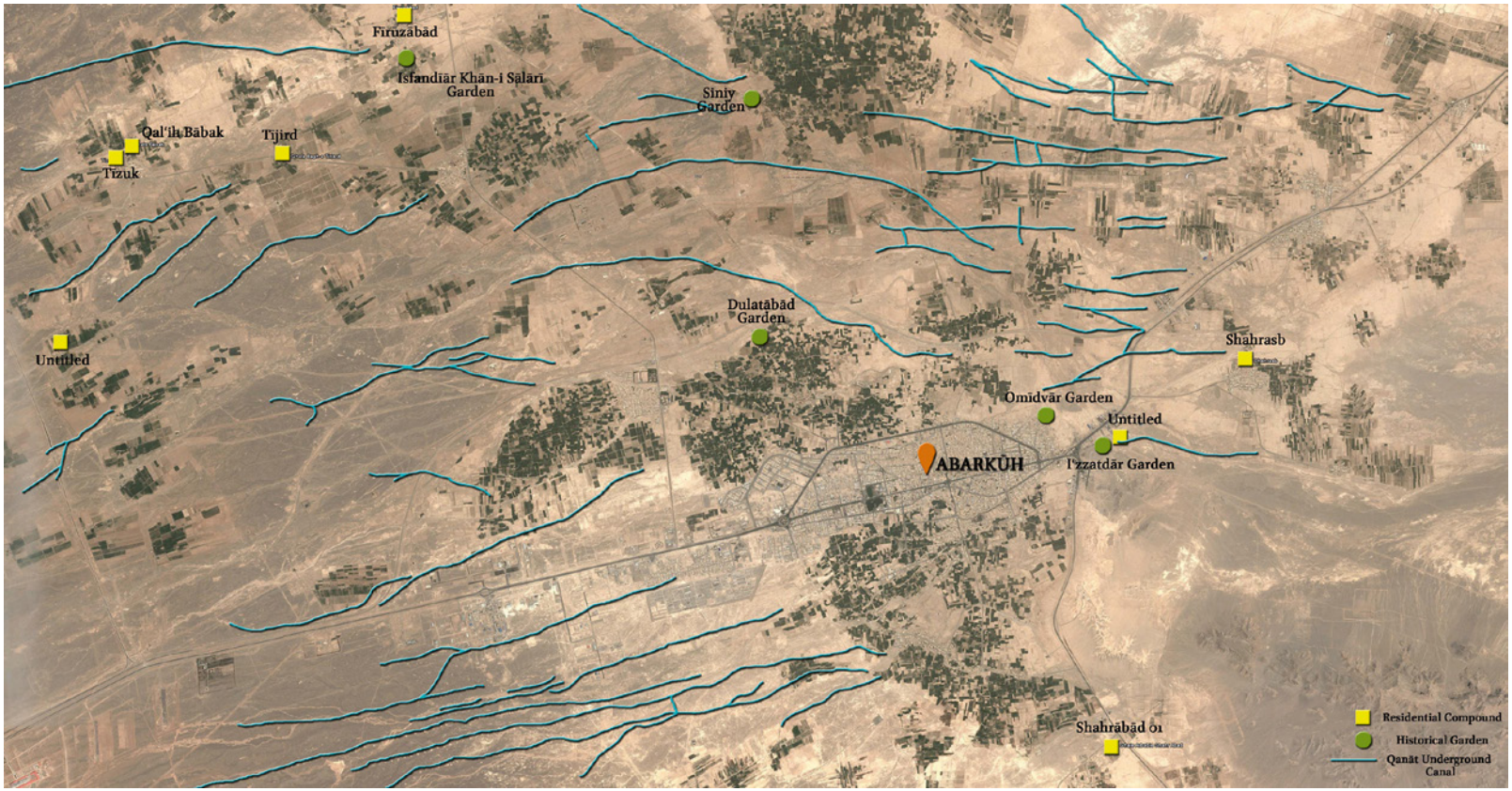


FIGURE 9.2 *The* Qanāt *canals, the identified residential compounds and the historical gardens around Abarkūh*
PHOTO: 2016 GOOGLE. IMAGE 2016 CNES/ASTRIUM. IMAGERY DATE: 12/27/2016.

were selected according to three criteria: first, the existent maps, historical photographs, and other essential information concerning the current and past situation of the case; second, the originality of the case that addresses the extent of interventions that have happened within the complex over time, (in some cases the original structure of the enclosure has been extensively affected by natural and human interventions to the extent that the recognition of their original elements is impossible); and third, the current conditions of the case which give (or do not give) the opportunity to conduct comprehensive fieldwork, (sometimes the general destruction of a complex limits doing an effective site survey). Consequently, 23 named and ten untitled cases were chosen.

To identify the selected case studies and to analyse their key architectural features, the satellite image of each individual case was provided in the same scale. The outline of the cases (including the curtain walls, the towers, and the main entrance) was drawn according to these images in AutoCAD software (figs. 9.3a, 9.3b, 9.4a, 9.4b). Drawing the outlines of case studies allowed the author to compare their dimensions, size, proportion, and orientation. The comparison of the outlines provided a proper context in which the preliminary categorization of the 33 cases was proposed. One outstanding case in each category was chosen for study and detailed analysis. These two stages—first, discussion of general characteristics/typology from a larger group of sites (33 cases); second, analysis of a small number of more focused case studies on specific sites—will be elaborated in the following pages. The examination of the larger group will result in the initial typology of the sites and the suggested typology will be confirmed and clarified by studying more focused case studies.

Architectural Analysis of the Case Studies

The main architectural features of the selected case studies such as the relative defensive qualities of their walls and gates; the number, form and size of the towers; the presence or absence of a moat; and the type and arrangement of residential units are examined through analysing the aerial photographs and satellite images of these enclosures. In addition to aerial views, close observation of some sites and talking to locals during the fieldwork allowed the author to understand the evolutionary process of the compounds and speculate about their different historical phases. In these cases, personal inspection can partially compensate for lack of secondary sources regarding the case studies.

A closer look at the main elements of the cases reveals some specific facts about their architectural features: they have rectangular and non-rectangular forms with different proportions; they are surrounded by towered walls; and the towers are located on main corners or on the middle of the sides. The towers have mainly circular and semi-circular forms with the exception of a few cases with a teardrop-shaped form. The curtain walls are different in height and width. In some sites they are enclosed by an outer wall, indicating the high defensive qualities of that walled settlement (fig. 9.5), whereas there are some cases with thin external walls, which can scarcely be considered as fortified structures. Regardless of the extent of the militarized quality of the building, the machicolations over the gates and arrow slits on the top level of the towers and walls can be seen in most of these cases. In other words, sometimes these defensive devices are not functional and are intended merely to impress the viewer with their imposing appearance (fig. 9.6). The main access to the building is the gate, which is typically located on the middle of the side. In some cases there is more than one gate; however, the others are considered as subsidiary entrances. Sometimes the gates are not revealed quickly since they are hidden within the towers (fig. 9.7). A rather wide channel can be seen around some of the cases that probably functioned as a moat. In some sites these channels have been filled in over time, as the necessity of such defensive elements disappears during peaceful times.

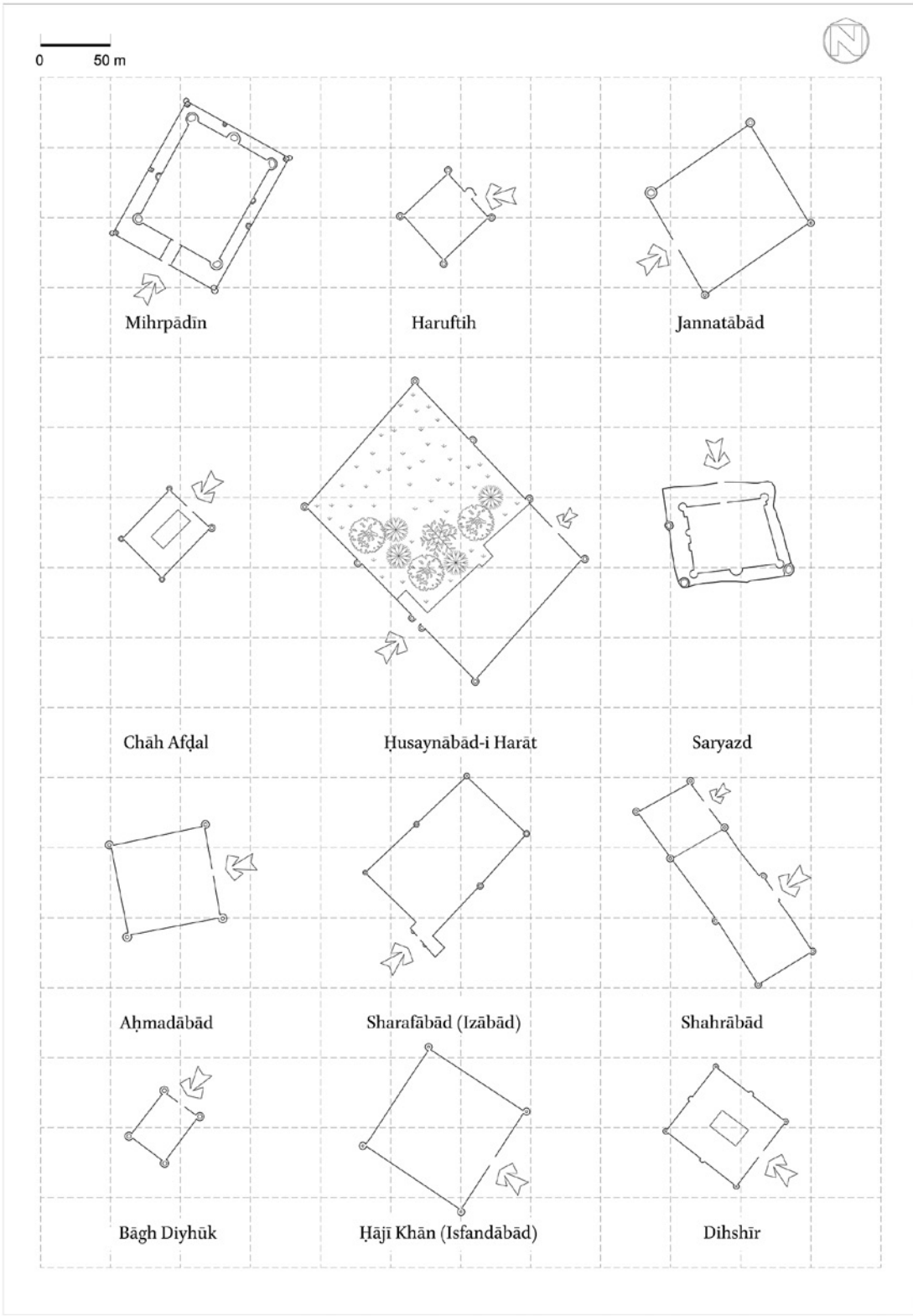


FIGURE 9.3a *The outline of 23 cases known by their original (local) names*
DRAWINGS: HATEF NAIEMI.

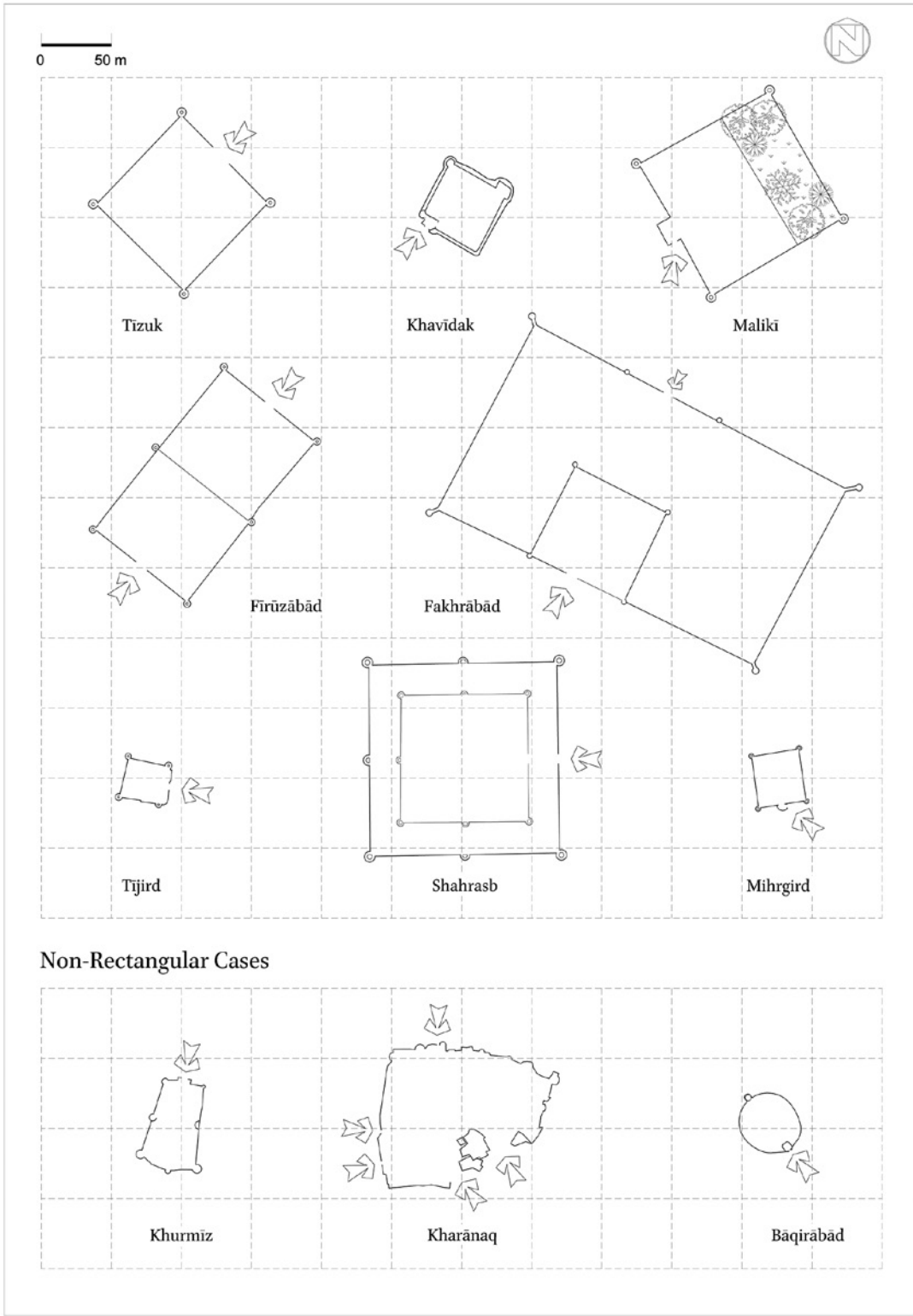


FIGURE 9.3b *The outline of 23 cases known by their original (local) names*
DRAWINGS: HATEF NAIEMI.

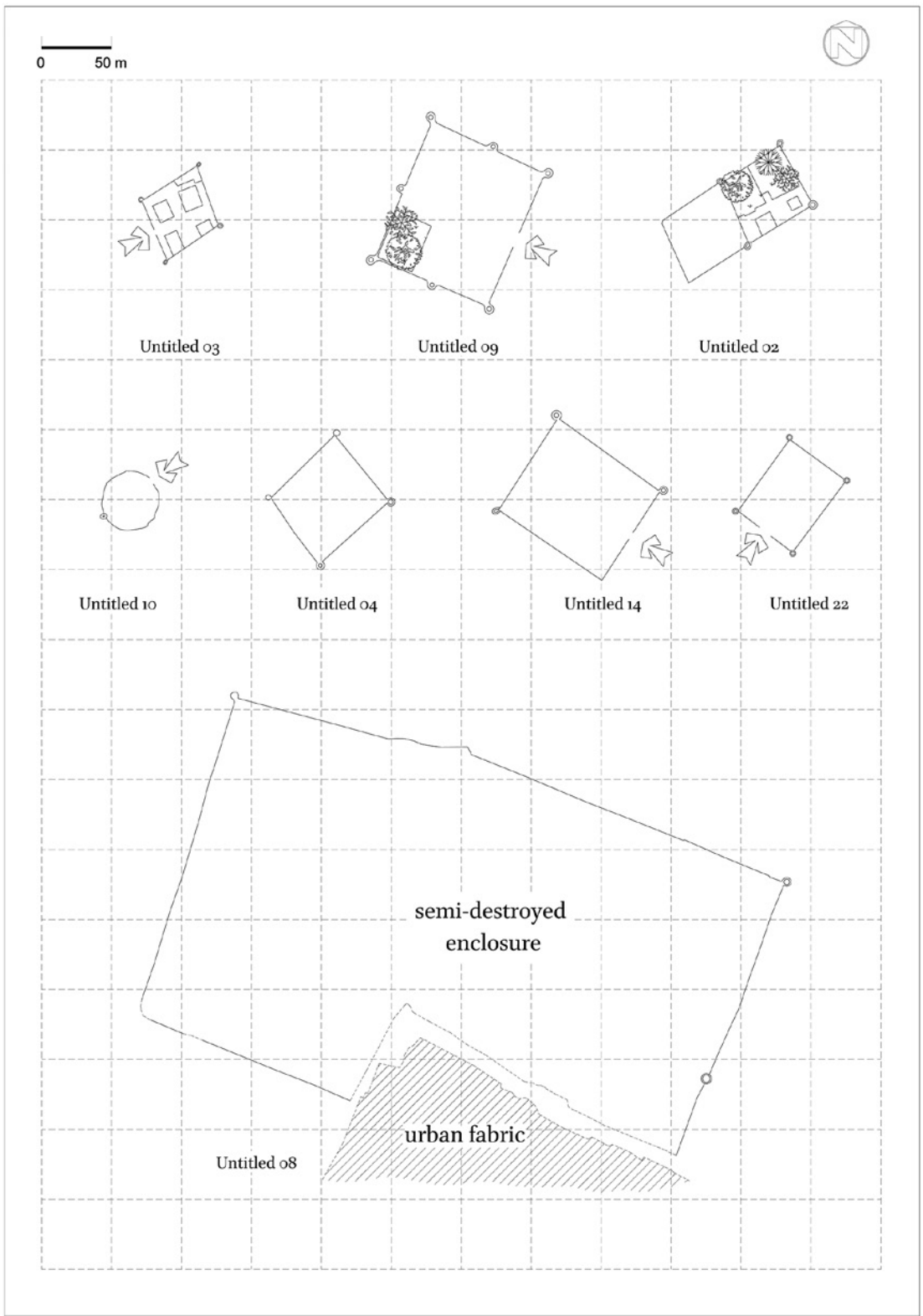


FIGURE 9.4a *The outline of ten untitled cases*
DRAWINGS: HATEF NAIEMI.

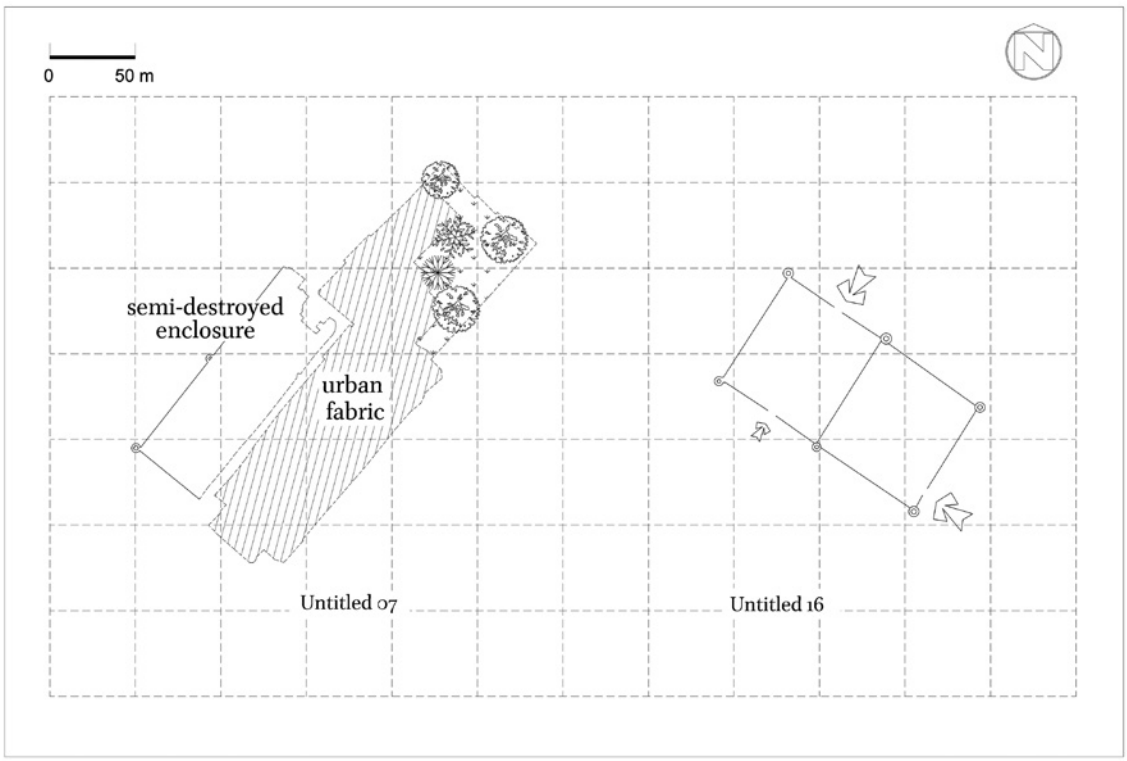


FIGURE 9.4b *The outline of ten untitled cases*
DRAWINGS: HATEF NAIEMI.

The internal organization of these complexes is composed of a large group of small units that are connected together within a network of narrow routes. Although most of the cases follow this pattern, there are also a few with one or more courtyards and rows of rooms that are organized around them. The open spaces presumably connect rooms or houses together (fig. 9.8). In some cases the combination of two compounds forms a larger walled settlement such as Fīrūzābād (fig. 9.9). This phenomenon happens when the older settlement does not have enough room for its residents as the number of people increases over time. Sometimes these two areas integrate into a larger compound so that the boundaries between them cannot be recognized. In some cases a smaller area surrounded by an internal towered wall can be identified within the compound. This area might be the original core of the settlement, or *kuhandizh* (old citadel). Shahrasb compound is a good example in this regard and will be examined in detail later in this essay. Although the majority of buildings within the walled settlements are residential units, some public spaces such as mosques, bathhouses and storehouses are also recognizable in the aerial photos (as their size and proportion are different from the houses). There are a few cases with spectacular elements, raising the possibility of an unconventional function for them. For instance, the central structure in Dihshīr is a cistern with two wind-catchers. Other components of the complex have been organized around it. They are presumed to enclose and conserve it as the main water source of the complex itself and

FIGURE 9.5 *Mihrpādīn* (*above*), *Saryazd* (*below*)
PHOTOS: STOCKPHOTO.IR.

FIGURE 9.6 *Machicolations over the gate and on the upper level of the walls, Bāgh Diyhūk*
PHOTO: HATEF NAIEMI.

FIGURE 9.7 *The main gate (entrance) of the complex is hidden within the tower, Mihrgird*
PHOTO: HATEF NAIEMI.

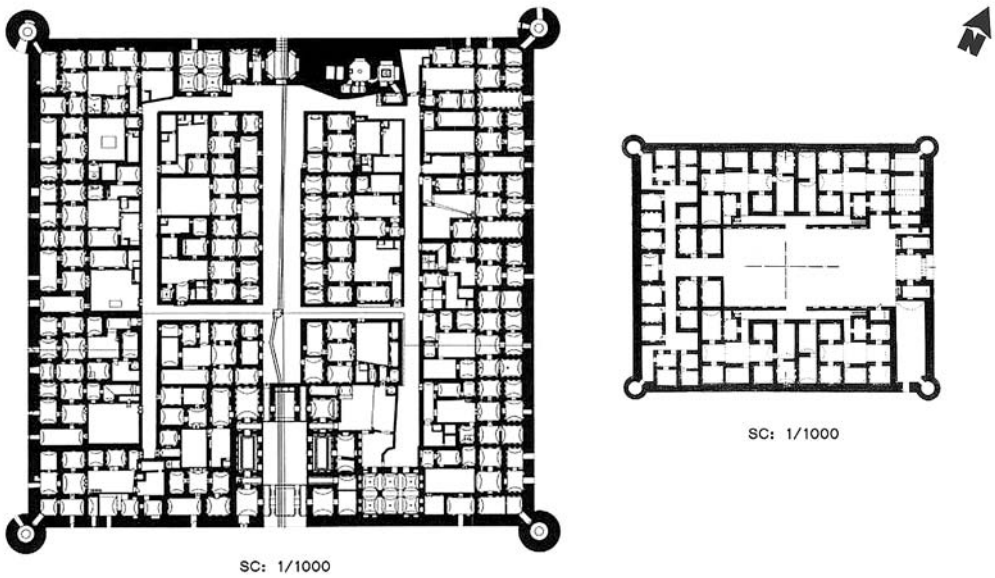


FIGURE 9.8 *Tīzuk (left) and Chāh Afḍal (right). Tīzuk is composed of a large group of small units that are connected together within a network of narrow routes, while Chāh Afḍal consists of one courtyard and rows of rooms that are organized around it.*
DRAWINGS: CULTURAL HERITAGE, HANDICRAFTS AND TOURISM ORGANIZATION OF IRAN, YAZD OFFICE.

FIGURE 9.9
The combination of two compounds forms a larger complex, Fīrūzābād
PHOTO: GOOGLE EARTH. IMAGE 2016 DIGITALGLOBE. IMAGERY DATE: 5/2/2011.

FIGURE 9.10 *The cistern is located in the center of the compound, Dihshīr*
PHOTO: GOOGLE EARTH. IMAGE 2016 DIGITALGLOBE. IMAGERY DATE: 3/28/2008.

the adjacent village (fig. 9.10). One can attribute a more protective role to this case rather than a purely residential compound.

Initial Typology of the Case Studies

The above-mentioned analysis reveals the physical characteristics of the internal structure of several complexes and suggests different functions for these cases, despite their similar external appearance. The relationship between the form of the enclosures and their precise function might be worth considering further. In other words, is typological variation simply a matter of pattern (model) or does it actually connote something about the function performed by the structural element or whole building? According to the architectural analysis of the 33 case studies, there are some key points that lead us to the initial typology of these cases.

There are compounds that are equipped with all the defensive devices, such as strong thick curtain walls, numerous towers, fortified gates, a moat, arrow slits, and machicolation. Their internal plan also emphasizes the high military or defensive quality of these enclosures: a well-ordered complex of small rooms that have probably been the temporary houses of people who sought refuge from attack. Saryazd is an outstanding example in this category, as it includes all the above-mentioned features. A second group of desert structures is formed by an enclosure with several houses surrounded by a towered wall. The residential units are arranged within a semi-organized system instead of the grid pattern of houses and paths. Shahrasb, with its rectangular plan significantly illustrates the main features of this group (fig. 9.11). The third group are multi-functional complexes that represent a combination of both defensive and residential qualities. Dihshīr, which functions as a water sanctuary in relation to the adjacent villages, is the best example of this kind of walled settlement.

The differences in formal qualities and functional characteristics of the 33 case studies lead us to speculate about whether they can be categorized into various types. A brief explanation regarding the suggested typology was presented above; however, in order to clarify the issue, we need to analyse a few specific case studies in great detail. Focusing on each case and examining the formal and functional features can shed light on the relationship between form and function for each site. For this purpose, three case studies have been selected: Shahrasb, with stronger residential qualities; Saryazd, with notable defensive features; and Dihshīr, a residential-defensive compound. Each of these three sites has its own unique qualities; therefore we cannot generalize about all the existing cases in one group just by examining one specific site. Nevertheless, focusing on the selected case studies can reveal some significant general characteristics of all the cases in that group and provide essential material for us in order to suggest a preliminary typology.

Analysis of the More Focused Case Studies

Shahrasb

Shahrasb is a fortified enclosure which lies about three kilometres to the east of Abarkūh. Although neither significant archival studies nor extensive archaeological excavations have been done

FIGURE 9.11 *Shahrasb*
PHOTO: STOCKPHOTO.IR.

on this compound, site survey and examination of the architectural remains raises the possibility that the complex was built during the Safavīd period (907–1149/1501–1736) and developed over the Qājār dynasty (1200–1344/1785–1925). The Shahrasb enclosure, in its original state, was a compound located at the heart of Abarkūh desert. The aerial photograph taken in 1956 indicates that there were agricultural lands organized on both sides of a route, which led to the enclosure and the long lines of pits on the ground. These pits were originally well shafts. The residents of Shahrasb complex worked on these fields, which were irrigated with *qanāt*s (fig. 9.12).

The Shahrasb complex is composed of two different parts: the inner enclosure surrounded by a towered wall, and the outer compound that encloses the inner one and has its own wall and towers (fig. 9.13). The circular towers are located on the main corners and the semi-circular ones

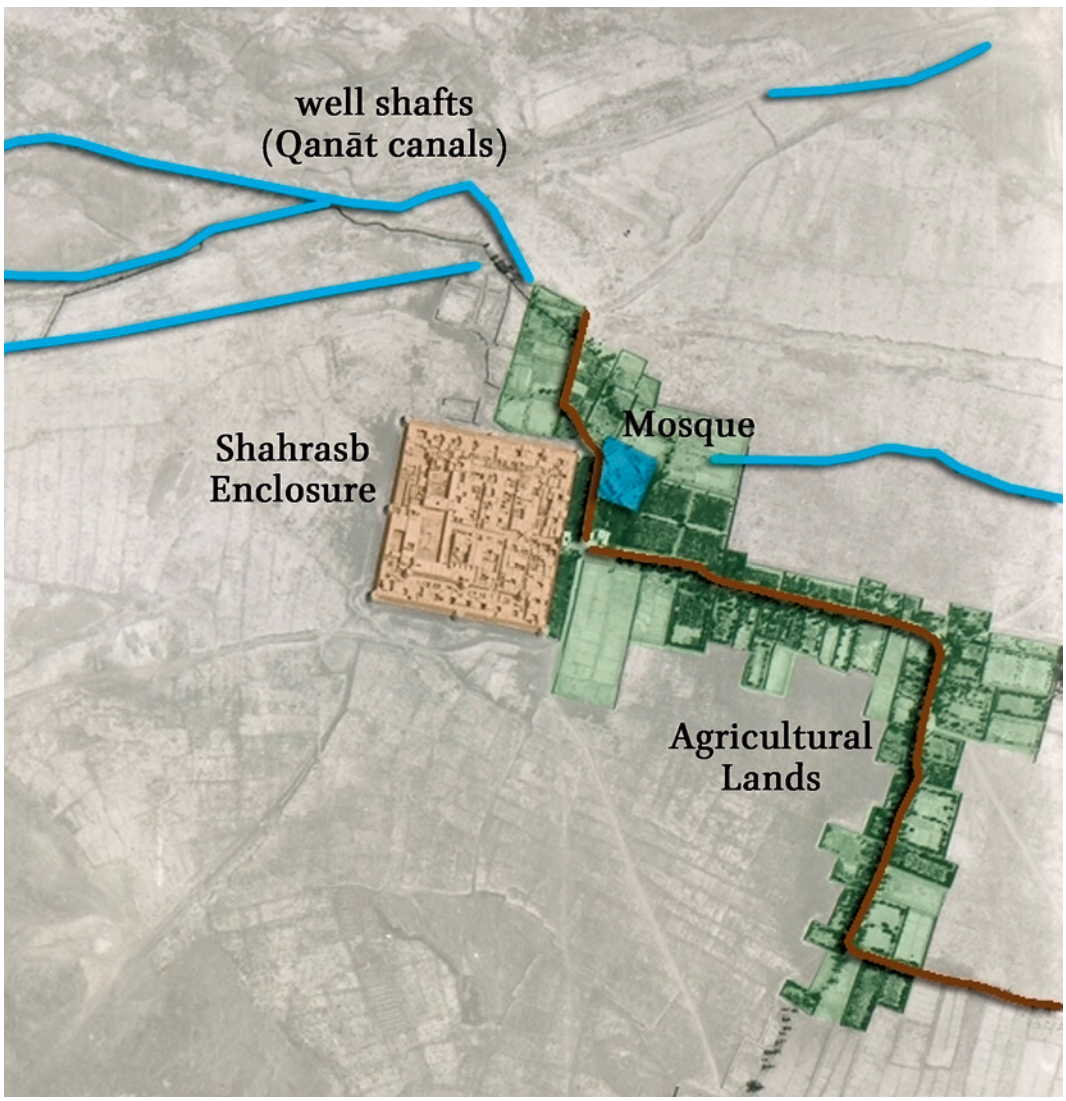


FIGURE 9.12 *Shahrasb in its environmental context. The aerial photograph was taken in 1956*
PHOTO: IRAN NATIONAL CARTOGRAPHY CENTER.

FIGURE 9.13 *Shahrasb plan*
DRAWIN: CULTURAL HERITAGE, HANDICRAFTS AND TOURISM ORGANIZATION OF IRAN, YAZD OFFICE.

are of the middle of the sides. The current structure of Shahrasb suggests that the complex grew in different phases. The inner enclosure, presumably formed in the first stage of the process of development, could be characterized as the Safavīd core of Shahrasb. The outer part, which is probably the Qājār addition to the compound, forms the second phase of the evolution process. The houses and gardens connected to the external wall of the outer complex probably represent a third phase

of growth, one that has occurred over recent decades and is still happening. A large group of small residential houses, situated within a network of narrow routes, forms the major internal part of the complex. The main access to the Shahrasb compound is through the gate on the eastern side. The gate of the outer enclosure is connected to the entrance of the inner complex with a *sābāṭ* (long covered passage), although the adobe vaults and arches have collapsed completely.

A comparison of the current satellite image (taken in 2011) with the historical aerial photograph reveals some significant points regarding the architectural characteristics of this enclosure (fig. 9.14). First, the 1956 photograph indicates two large gardens located on either side of the main entrance. The current image shows that part of these gardens has been converted into houses. Second, among all the small residential houses there are two larger buildings that look like mansions or edifices. The 1956 photograph shows these two houses with their central courtyards and a row of rooms organized around them, whereas the current photograph of the site depicts the extent to which their original arrangement changed over later interventions, so that several rooms and a road were built inside the courtyard. These two edifices are located at the farthest point from the main gate of the enclosure and are close to the stable and large storehouse, raising the possibility that they were the houses of the owner or ruler of the complex.

Shahrasb can hardly be characterized as a city. The arrangement of residential units within the enclosure attributes a more complicated character to it than that of a complex that is simply called a village. Although at first glance a dense fabric of houses is recognizable, a closer look reveals other structural elements such as a bathhouse, stables, a large storehouse, and edifices. The presence of public buildings indicates the semi-urban qualities of this compound, far from a mere temporary refuge. Consequently, despite the solid external appearance of the Shahrasb compound, the form and arrangement of houses and public buildings, along with the superficial fortified elements (such as the thin external walls, the towers with no machicolations and arrow slits on their top level, and the channel of a moat, which has been filled over time) support its residential function and diminish its defensive features.

Saryazd

The Saryazd compound is a defensive structure located about 36 kilometres south east of Yazd. The Saryazd village, in the vicinity of the Saryazd enclosure, consists of a large number of historical houses, cisterns, mosques, *ḥusaynīyya* (Shi'ite congregation hall), caravanserai, *chāpār-khānih* (pre-modern courier-house), and *ribāṭ* (fig. 9.15). The organized layout of the Saryazd compound suggests that the whole complex was arranged according to a predetermined pattern rather than having been the result of gradual evolution over a period of time (fig. 9.16). Three parallel walls surround the compound. The outermost layer is a semi-destroyed curtain wall whose height has

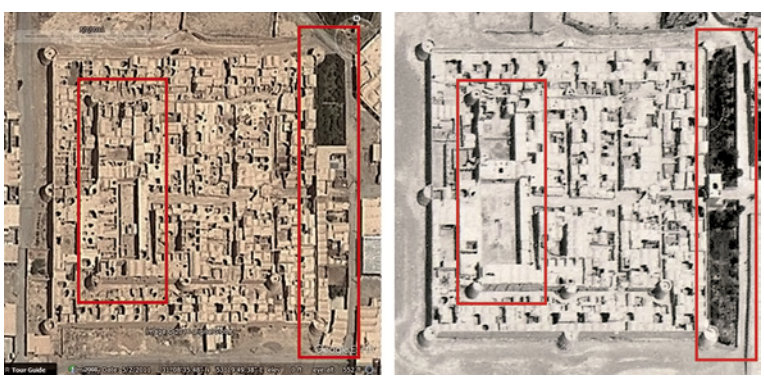


FIGURE 9.14
Shahrasb 2011 (*left*), *Shahrasb 1956* (*right*)
PHOTOS: GOOGLE EARTH. IMAGE 2016 DIGITALGLOBE. IMAGERY DATE: 5/2/2011 (LEFT), IRAN NATIONAL CARTOGRAPHY CENTER (RIGHT).

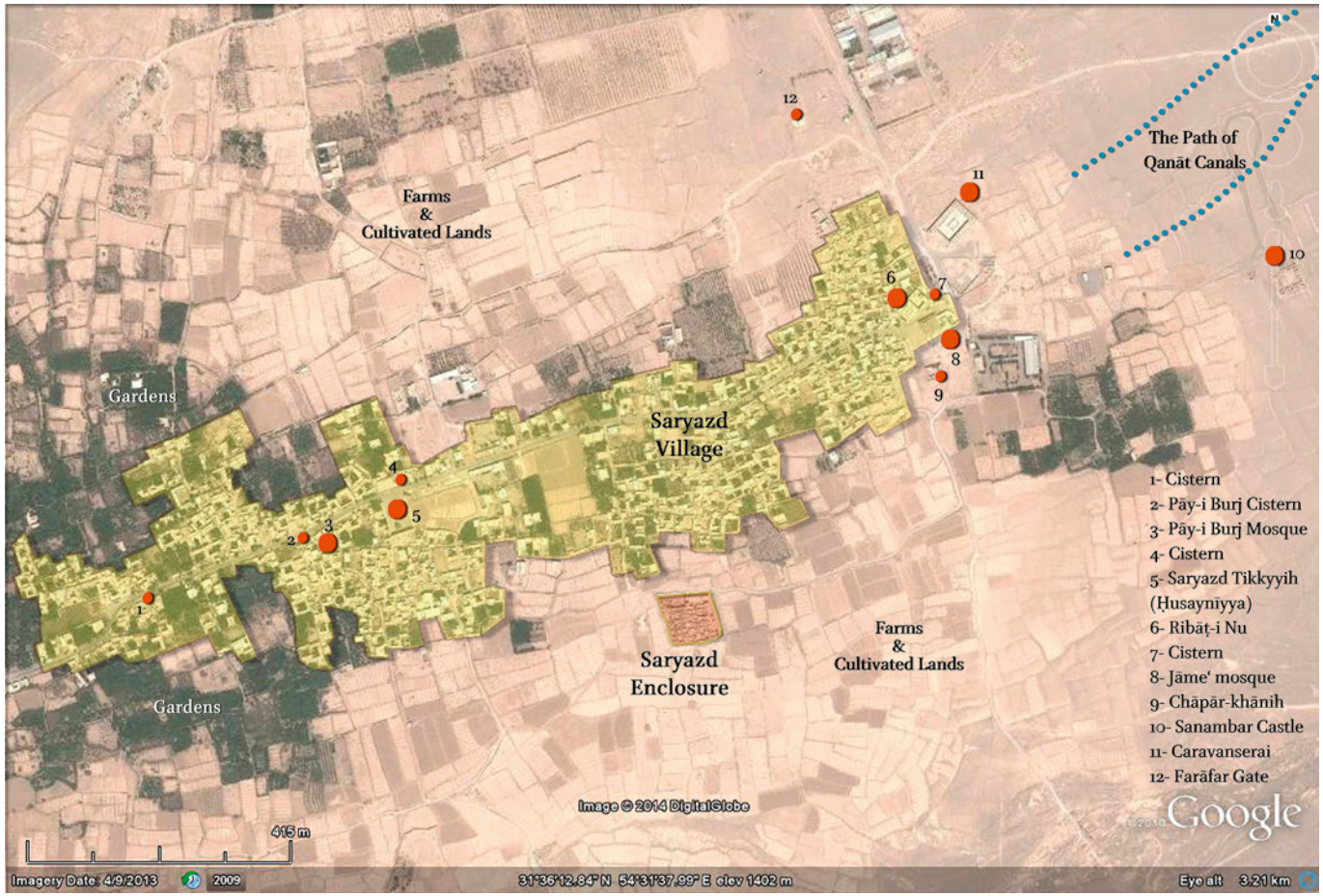


FIGURE 9.15 *Saryazd compound in its environmental context*
PHOTO: 2010 GOOGLE. IMAGE 2014 DIGITALGLOBE. IMAGERY DATE: 4/9/2013.

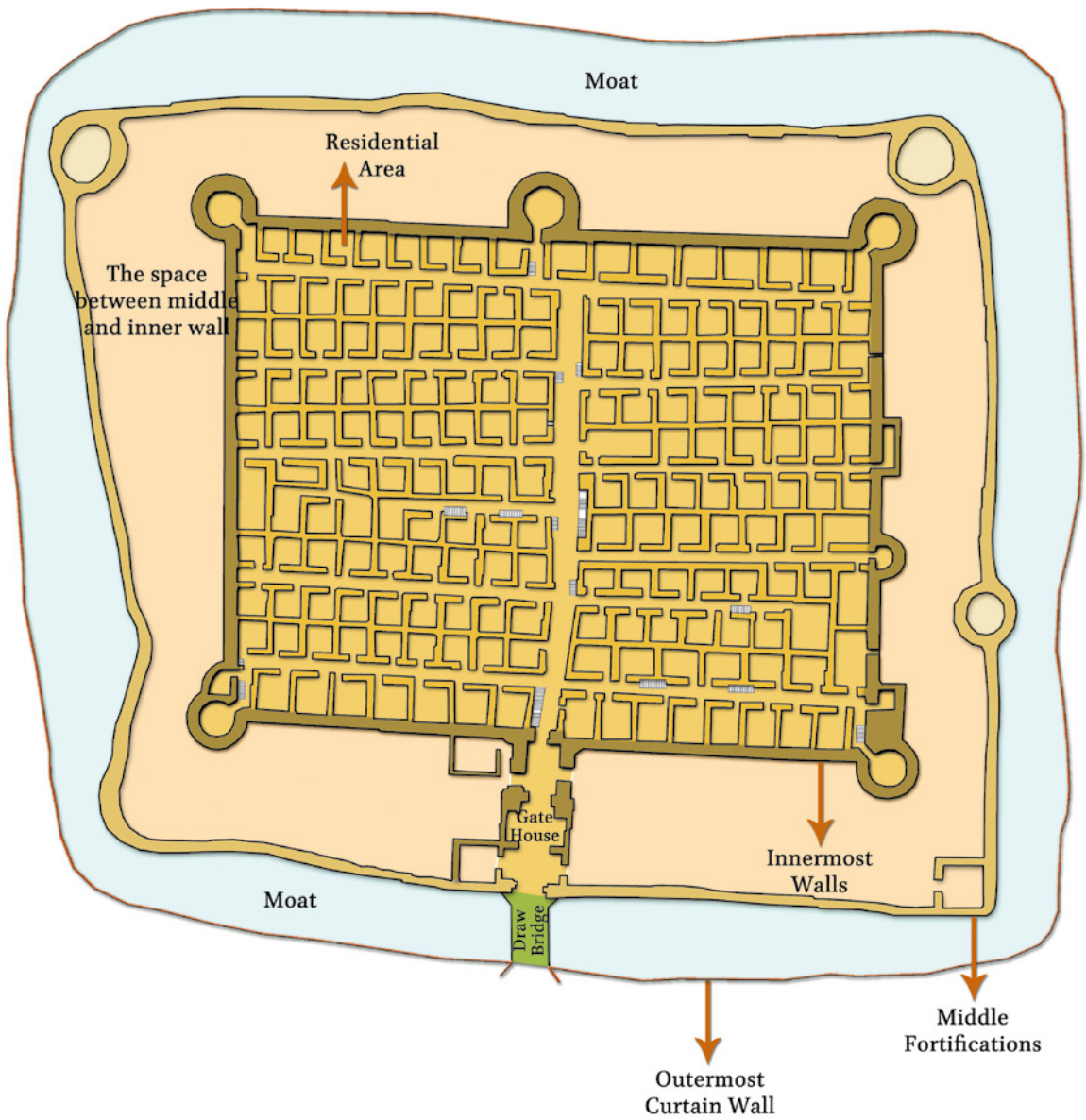


FIGURE 9.16 *Saryazd plan*
DRAWING: CULTURAL HERITAGE, HANDICRAFTS AND TOURISM ORGANIZATION OF IRAN, YAZD OFFICE.

been reduced to less than two meters. In the middle there are the fortifications of the enclosure, including a massive wall that is six to seven meters in height and has four towers on the corners and sides. The innermost wall encloses the residential units, public buildings, and grain barns. A four-meter deep moat is located between the outermost wall and the middle fortifications. The moat was probably filled with water to create a barrier against invaders. The architectural remains in the eight-meter wide space, between the middle and inner walls, probably contained cisterns, forage barns, and stables. The water of the cistern was provided in two ways: first, by channelling the water of the surrounding moat to the cistern's reservoir through earthen tubes, whose remains are

FIGURE 9.17 *The earthen tubes were probably used to lead the water of the surrounding moat to the cistern's reservoir, saryazd.*
PHOTO: HATEF NAIEMI.

still extant in the site (fig. 9.17); and second, by collecting rainfall. The latter method was mostly used during periods of war and siege, when there was the risk of pollution of the external water supply.[9] The main part of the enclosure is the central area, surrounded by three walls and containing houses, individual rooms, and storage spaces.

The connection between the interior and the exterior of the enclosure is provided by a drawbridge, consisting of a wooden platform with one hinged side fixed to the compound wall and the other side raised by rope or chains (fig. 9.18). The main entrance to the compound, located on the northern side, is through a gatehouse. The gatehouse is a fortified structure built over the gateway to the compound and in front of the drawbridge. The gatehouse has three doors. Two of them, on the left and right sides, open into the space between the middle and inner walls. The third door, which is located in front of the main gate, connects the entrance building to the residential area of the complex. The residential part is situated on a central north-south street running from the gateway. On both sides of this axis there are six narrower streets, each approximately 50 meters in length. A row of residential units is arranged along these streets. The units are usually three-story houses, with either two interconnected rooms or a single room on each floor and a maximum area of 30 square meters. There are niches and shelves on each side of the room, and bigger hollows in the walls, made to hold large earthenware crocks. These crocks were used for storing food. In addition to those in the walls, there are smaller hollows in the floor for hiding smaller containers (fig. 9.19). The size, form and interior space of the residential units strongly suggest that these structures were used as temporary shelters that could protect their residents over a long siege.

9 Pāzūkī Ṭarūdī, *Defensive Fortifications in Islamic Iran,* 248.

FIGURE 9.18 *The drawbridge, Saryazd*
PHOTO: HATEF NAIEMI.

FIGURE 9.19 *The hollows in the wall* (*left*) *and in the floor* (*right*), *Saryazd*
PHOTOS: CULTURAL HERITAGE, HANDICRAFTS AND TOURISM ORGANIZATION OF IRAN, YAZD OFFICE.

FIGURE 9.20 *Saryazd 2013* (*left*), *Saryazd 1998* (*right*)
PHOTOS: HATEF NAIEMI (LEFT), N. PĀZŪKĪ ṬARŪDĪ (RIGHT).

story structures with spiral staircases. The top level, which is 1.5 meters high, usually functioned as a battlement or parapet. Arrow slits and machicolations could be seen in their walls. These were intended for shooting arrows and pouring boiling water, hot sand and ash on the enemy. Similar defensive elements are also situated at the top of the three doors of the gatehouse.[10] Above the main gate there is a wooden beam. The photographs of Saryazd taken in 1998 show four small wheels (pulleys) on this beam; however, these objects were not seen during the 2013 site survey (fig. 9.20). The beam and pulleys, together with a rope or chain fixed to the drawbridge, were presumably used for moving it up and down. This system could prevent easy entry into the enclosure.

According to architectural analysis of the Saryazd compound as a whole and its main components in detail, this complex can be considered a defensive structure that could provide temporary refuge from attack for the residents of the nearby village. The layout of the complex and arrangement of the internal units decrease the likelihood of permanent residency over long periods of time.

10 Pāzūkī Ṭarūdī, *Defensive Fortifications in Islamic Iran*, 242.

Dihshīr

Dihshīr is a small town on the way between Yazd and Abarkūh. The oldest historical text that mentions Dihshīr as "*qarīeh-i Shīr*" is a 9th/15th-century local history of Yazd, *Tārīkh-i Jadīd-i Yazd,* written by Aḥmad ibn Ḥusayn Ali Kātib:

"... and Khājih Shams al-Dīn Muhammad-i Tāzīkū built *Chihil Miḥrāb* mosque and endowed four shares of *qarīeh-i Shīr*, in Quhistān-i Yazd, to it."[11]

Later textual sources also speak about Dihshīr and its well-known public buildings, like the mosque and *ribāṭ*. According to *Jāmeʿ-i Mufīdī*:

"In 754/1353 Amīr Mubāriz al-Dīn Muhammad Muẓaffar ... stayed in *Dihshīr-i Kuhnih* (old Dihshīr) for several days in order to equip his army ... he swore an oath to reclaim that arid village if God helped him to win the battle ... because of that admirable intent, he defeated Shaykh Abū Isḥāq, the ruler of Fārs ... and he commanded his men to construct a grand village ... with *khānqāh*, houses, gardens and mosques."[12]

However, there is no written evidence mentioning the exact construction date of either the Dihshīr village or the complex itself.

The Dihshīr compound is a small enclosure surrounded by a curtain wall and seven towers: four circular towers on the corners and three semicircular ones on the middle of sides. The main entrance to the compound is on the southern side, through a splendid building (fig. 9.21). This complex has been selected as a notable case study due to its particular architectural components and the way that the structural elements are arranged inside: the cistern sits at the centre of the complex and the residential units surround it protectively (fig. 9.22). In terms of environment context, Dihshīr is enclosed by a collection of prominent

FIGURE 9.21 *Dihshīr*
PHOTO: ṢAMĪMĪ.

buildings, including caravanserai, *jāmeʿ* mosque, *qadamgāh* (stepping place of a holy person), bathhouse, and *ḥusaynīyya*. The residential fabric of the town has greatly retained its historical structure; however, it has recently begun to grow up towards the southeast (fig. 9.23).

The residential units of the Dihshīr compound comprise six large independent houses with central courtyards surrounded by one row of rooms. A tall rammed-earth wall separates the central area and residential section. Small doors in this wall give the dwellers access to the cistern. In addition to the surrounding houses, there are large stables on the right side of the cistern which look like open spaces with no roof. A closer look at the six semi-destroyed houses reveals their cruciform plan via the central courtyard and the four *ẖwān* around it (fig. 9.24). The introverted plan of each house could be compared with the layout of the compound itself: a row of rooms encloses the courtyard, and a set of residential units surrounds a central cistern. Both of these plans convey a sense of protection and the potential for defence against attack and other external threats.

This set of materials describes Dihshīr as a multi-functional complex having stronger defensive qualities than merely residential compounds. The importance of the cistern as the main water

11 Kātib-i Yazdī, *Tārīkh-i Jadīd-i Yazd*, 133.

12 Mufīdī-i Mustufī-i Bāfqī, *Jāmeʿ-i Mufīdī*, iii: 699.

FIGURE 9.22 *The cistern, dihshīr*
PHOTO: HATEF NAIEMI.

FIGURE 9.23 *Dihshīr compound in its environmental context*
DRAWING: HATEF NAIEMI.

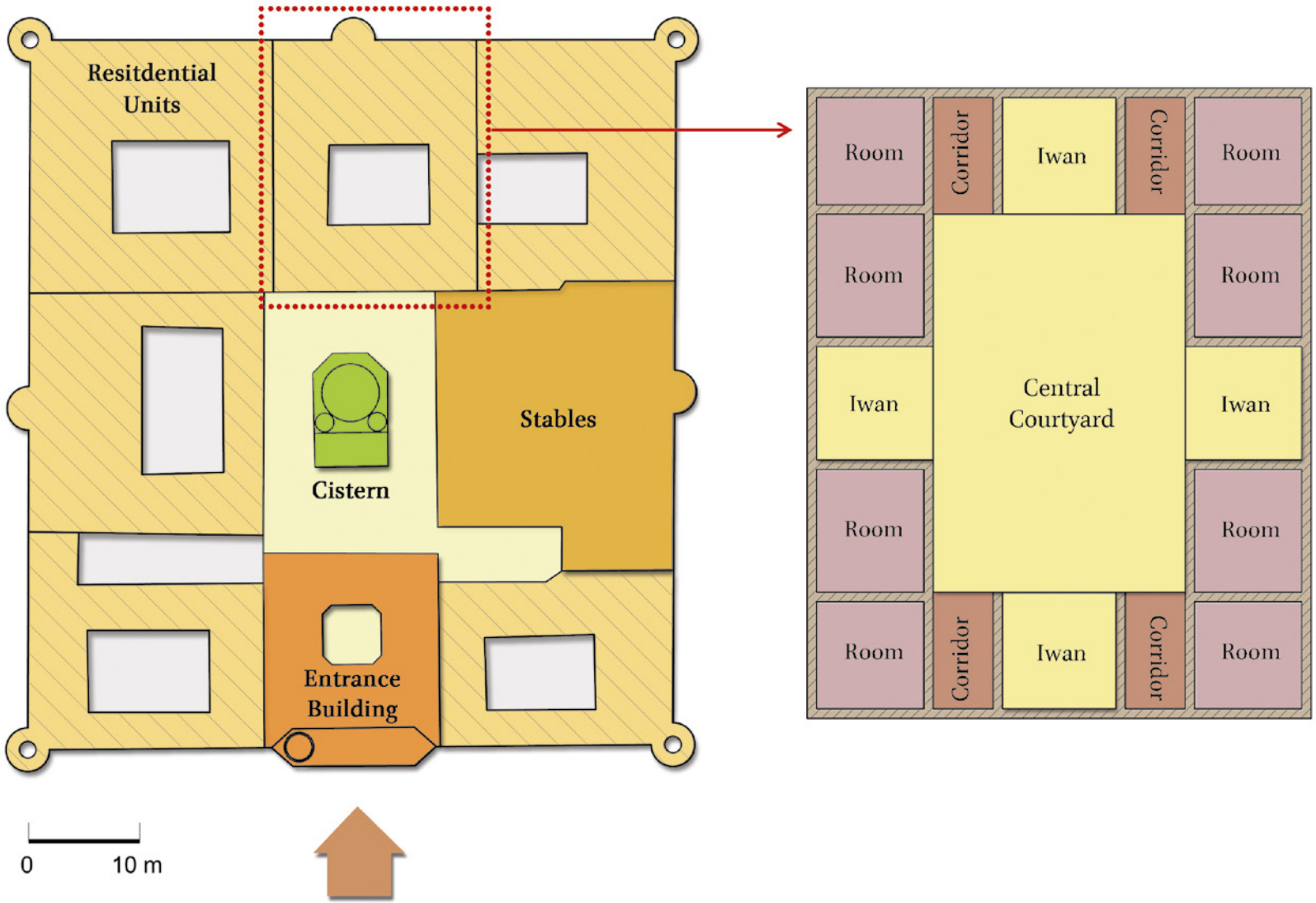


FIGURE 9.24 *The schematic outline of Dihshīr (left), the schematic outline of one of the residential units within the compound (right)*
DRAWINGS: HATEF NAIEMI.

source of the village persuaded the local rulers to establish a protective structure around it. The presence of residential units within the complex suggests that Dihshīr could function as a shelter to provide temporary housing for ordinary people during periods of war. However, the size and architectural features of the internal spaces of these houses decrease the likelihood of temporary residency by villagers and increase the feasibility of permanent living over the whole year.

Typology

The whole process of this research project, which intended to examine residential compounds on a large and a small scale, concludes with a substantial point: the identified walled settlements throughout the study area represent various functions, despite their similar external appearance. Studying a larger group of sites, then analysing a smaller number of more focused case studies offers a clear picture of the architectural features and functional characteristics of these structures. Although the pictures created for each individual site are unique, they share some common qualities that lead us to think about the possible typology of these structures. Examining 33 sites generally and three case studies in particular suggest that a typology of all identified cases can be achieved according to two main criteria: residential qualities and defensive features. In other words, each enclosure can be known as a residential compound or defensive complex according to the extent of its residential or defensive characteristics. But how can we recognize these qualities in each specific site? There are wide variations in the extent to which the cases manifest these two themes; however, some clarity is brought through attention to architectural features. Defensive devices like curtain walls, towers, gates, moats, arrow slits, and machicolations are the main elements forming the defensive qualities of each site. The internal fabric of these compounds, consisting of residential units and public buildings within the network of routes, makes up the residential features of each case. These physical characteristics, along with the functional peculiarities of the case studies, form a basis upon which the three following types are suggested.

Type One: There is a group of fortified compounds reinforced with real defensive elements that strengthen them against the external threats and ensure the safety and security of their residents over extended sieges. The well-ordered internal plan of the compounds is formed from a large number of small units, which look like shelters and perform the function of enabling the inhabitants to resist enemy attacks or long sieges. The type, size, and arrangement of residential units raise the possibility of temporary accommodation, as they are generally single-room houses with no openings except for small doors that open into the narrow paths. The internal road network usually consists of one central axis and several subsidiary alleys branching from and perpendicular to it. The absence of public buildings like mosques, bathhouses, and bazaars is the other fact that highlights the temporary nature of the residency within these complexes. The services provided by their public structure are more applicable to sites occupied for a longer period of time. Examining the Saryazd compound has clarified the details regarding this type of walled settlement.

Type Two: Further studies reveal another group of fortified enclosures, which represent a quite different character. They are made of a large number of residential units that provide real housing for their inhabitants, rather than only shelter. These houses consist of differentiated living spaces. What makes one distinguish these types of structures from defensive compounds is the presence of public buildings that convert a refuge into a real (but small) city, expected to supply the needs of the permanent life of the residents. The internal fabric of these settlements is also different from the first group. The components of the complex are arranged within a semi-organized plan, in comparison to the grid system of houses and paths in the more fortified cases (type one). Formal and functional analysis of Shahrasb elaborates on residential features of these types of

fortified sites. In this case different construction phases are recognizable, which suggests a gradual process of evolution, a characteristic not seen in the predetermined layout of the previous group. The superficial defensive elements of these sites were merely intended to have an impact on the viewer. They emphasize the residential qualities of these compounds and reduce their military functionality.

Type Three: The final group of walled settlements represents a multi-functional character. These enclosures are formed from a couple of residential units surrounded by towered walls. Arrow slits can be seen on the top level of the fortifications and look completely functional. What makes this third group different from other types is the presence of some special elements such as cisterns and large warehouses. The size of these buildings suggests that they met the needs of not only the compound's residents, but also the dwellers of the adjacent villages and protected their main water and food sources. The dimensions and proportion of the houses also illustrate that they are not just temporary shelters with a protective role during periods of external danger. The large houses of Dihshīr are entirely different from the one-room houses in defensive compounds like Saryazd. Therefore, on the one hand, the houses obviously define a residential character for these complexes; on the other hand, their solid external appearance emphasizes their defensive features. Consequently, determination of the exact character of these sites as defensive or residential complexes is challenging. They could best be described as special enclosures that represent a combination of both residential and defensive qualities.

This project of identifying walled settlements in the central desert of Iran concludes by suggesting the typology of these structures and categorising them into three types: residential complexes, defensive compounds, and special enclosures.[13] By highlighting the physical and functional differences, this classification enables one to differentiate among numerous identical residential compounds spread across the central desert of Iran. While the typology could pave the way for the study of these desert settlements, it should be dealt with cautiously. Many of the settlements gradually changed in appearance and function over time to meet the requirements of their inhabitants, and therefore while their present structure reveals one particular quality, scrutinising the architectural plan of the complex may suggest a different function for the original installation. Thus they seem to demonstrate a more nuanced range of qualities rather than being fixed in one certain category.

Conclusion

Since the early twentieth century, the residential compounds discussed in this essay have been subject to a gradual process of deterioration, as evolving social conditions determined that living within walled compounds was no longer necessary or economically practical. Accordingly, many compounds have been abandoned and some of them, which continued to exist, expanded, losing their original architectural integrity. Bringing an end to the centuries-old tradition of residency within the walled settlements, the inhabitants of the residential compounds left the complexes and founded new villages and towns in the immediate vicinity of the enclosures. Despite the outstanding historical and architectural values of the earthen installations, what we observe today are a great number of architectural remains that are going through their tragic process of destruction. While making the residential compounds habitable again sounds rather optimistic, the revitalisation of these complexes as outstanding examples of earthen architecture is of great significance.[14]

13 All the cases analysed in this research project are evaluated as a "settlement", regardless of its type, which can be residential, defensive or a combination of both—as distinct from fortified structures, with solely military functions.

14 Despite abandonment of residential compounds, many descendants of the former residents have a strong nostalgic attachment to these complexes. Some

They not only narrate different phases of the history of the region, but also document the traditional techniques of construction and thus are deserving of preservation. Moreover, the materials and techniques of earthen architectural heritage could be studied as a model for the restoration of existing earthen buildings as well as for the construction of new buildings in those regions where earth is still the best possible solution against environmental limitations.

Although the residential compounds are remarkable examples of earthen architecture, this essay discusses the main physical and functional features of these structures as a type of desert settlement rather than focusing on the technical issues affecting the construction of these enclosures as a form of "earthen" structure. It argues about how diverse and complex the purposes of these compounds could be across a specific geographical region. Moreover, the methods by which one might establish a definition for these structures and raise questions regarding their various types, despite their similar appearance, have been suggested in this essay. Undoubtedly the project will not end at this point. Each of the cases studied in this research, and several unidentified sites throughout central Iran, are certainly deserving of further archaeological and architectural studies. Nevertheless, it can be considered a starting point for the study of such earthen settlements and could expand in future to cover other parts of central Iran in addition to Yazd province, which was the main focus of this project.

of them still have the proof of ownership for their ancestors' residential units of the complexes. Conservators can apply this connection to abandoned homes to draw attention to architectural heritage. While revitalisation of the whole complex demands considerable financial resources, it could be started by addressing the compounds' public domain. Restoration of public buildings (such as mosques) provides context for at least the temporary presence of people within the complex, contributing to these settlements' rehabilitation.

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CHAPTER 10

Traditions of Monumental Decoration in the Earthen Architecture of Early Islamic Central Asia

Paul D. Wordsworth

The study of monumental historical buildings in Central Asia has been dominated by discussions of two types of architecture. On the one hand, the turquoise-tiled splendour of the Timurid and Shaybanid eras has been scrutinised through studies of the myriad surviving monuments, whose extensive restoration has given further cause to examine their artistic value.[1] The other, somewhat earlier, focus has been on monuments constructed from unglazed fired bricks, which, while rarer, have been celebrated for their ingenious use of brick forms, elaborately illustrated by the "Samanid mausoleum" in Bukhara.[2]

Owing to the preservation of these two types, individual buildings made from unfired earth materials have remained somewhat side-lined in discussions of Central Asian and indeed Islamic architecture (*Architecture of the Islamic World*, for example, describes only one unfired earth building in Iran and Central Asia).[3] The exception to this rule would be the particular focus on earth buildings of the Abbasid period, owing to the smaller total number of surviving monuments and the limited early use of fired brick in the eastern Islamic world.[4] Excavated examples, from the decorated rooms at Samarra[5] to the mosque of Dandanakan[6] and the so-called "Ruler's House" in Termez,[7] provide further comparisons for internal decorative aspects of early buildings, and the spotlight has duly rested on mosques and palatial structures. Awkwardly placed alongside these buildings, however, are earthen monuments that are not renowned for their ornamental interior design, but that are exceptional in their overall architectural composition. This chapter aims to reassess the architectural techniques used to create "monumentality" in these latter structures, examining the way in which Central Asian design principles utilise unfired earth. Of all the surviving buildings in this medium, most of the prominent monumental examples can be grouped under the rubric of "*köshks*".[8] Two of the unifying factors of this varied group of structures are their often-enigmatic function and problematic date. None has been subject to extensive systematic excavation,[9] and they do not typically feature any epigraphic evidence. Their relatively localised distribution meanwhile renders broad comparative stylistic analysis with more securely dated

1 Pugachenkova, *Mechet' Anau*; Tomaev, *Reznaia maĭolikovaia mosaika, v arkhitekture Sredneĭ Azii XIV–XV VV.*; Ratiia, *Mechet' Bibi-Khanym v Samarkande: issledovaniye i opyt restavratsii.*

2 Bulatov, *Mavzoleĭ Samanidov: zhemchuzhina arkhitektury sredney Azii.*

3 Michell, *Architecture of the Islamic World: Its History and Social Meaning,* 251–264.

4 For example the Hāji Piyādah Mosque in Northern Afghanistan. See Adle, "La mosquée Hāji-Piyādah/Nour Gonbādan à Balkh (Afghanistan); Un chef d'oeuvre de Fazl le Barmacide construit en 178–179/794–795".

5 Milwright, "Fixtures and Fittings; The Role of Decoration in Abbasid Palace Design".

6 Ershov, "Dandanakan".

7 Denike, "La décoration en stuc sculptée de Termez".

8 For a discussion on the origin of the term its relationship to Ottoman examples, or "kiosks" see Goodwin, "Köşk".

9 This situation is about to change as one of the largest examples, the Great Kyz Kala at Merv, is currently under excavation by archaeologists from the Turkmen State Historical and Cultural Park Ancient Merv.

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structures difficult. Several other secular buildings of unfired earth do survive, however, reflecting similar aspects of monumentality in their style. Caravanserais, for example, are traditionally set apart from *köshks* by virtue of their size and form based on a large open central courtyard (or courtyards). Several examples of rural caravanserais survive in Central Asia, although like many other buildings, analysis has focused on the better-preserved fired-brick examples. Examining the range of buildings made from unfired earth, the most notable monumental techniques are base platforms or glacis, large vertical engaged columns or "corrugations" on the exterior walls and monumental entrances or *pīshṭāks*. The discussion below explores each of these three features, considering their relationship to the use of earth material and their function in terms of creating monumentality.

The city of Merv, in modern Turkmenistan, forms an important case study for Central Asian earth architecture and the geographical focus of the material presented here. Located in the fertile Murgab delta, alluvial soils are well-suited for building in unfired brick and rammed earth, while the lack of substantial woodland fuel near the city renders this technique significantly more cost-effective than fired brick equivalents. Earthen structures also exist beyond the delta region into the surrounding desert: notwithstanding remote towns at the agricultural fringes and outpost settlements such as Dandanakan, archaeological survey has pinpointed remains of several monumental earth buildings along major desert pathways.[10]

Assessments of the value of earth as a building technology in Central Asia have highlighted several practical aspects of its use as a primary building material. Herrmann, for example, in her comprehensive volume on the *Monuments of Merv* highlights its environmental suitability above economy and speed factors, quoting another champion of the practical uses of mud, Elizabeth Beazley.[11] Full and detailed analysis of the functional qualities of earth structures is highly worthwhile and continues to advance our knowledge of historical construction techniques.[12] When confronted with the massive remains of these structures, however, there lingers the question of how these materials were chosen and adapted to fulfil specific iconographic and ideological purposes. My intention in this chapter is to address this lacuna, moving away from functional classification of earth techniques to explore their specific application for creating monumentality.

The Platform: A Starting Point

The most straightforward technique associated with monumentality in earth architecture is the creation of height. In areas where earth with high clay content is plentiful, this is effectively and quickly achieved by the construction of platforms beneath the construction of monuments themselves. The production of height is particularly pertinent when considering urban contexts in which the construction and abandonment of earth buildings forms an undulating and quickly changing cityscape. Adapted layouts of urban monuments that continue in use are often testament to this process,[13] which is far more rapid in cities made from unfired bricks than in those where the primary building materials are non-degradable. It is curious, then, to note that there are almost no examples in Central Asia of individual *urban*

10 Early work (summarised in Masson, *Srednevekovaia torgovye puti iz Merva v Khorezm i v Maverannakhr*) has recently been supplemented by a new comprehensive study of architectural and archaeological evidence for movement in the Karakum. See Wordsworth, *Pathways of Trade or Networks of Power?*.

11 Herrmann, *Monuments of Merv: Traditional Buildings of the Karakum*, 47–48.

12 Fodde, "Traditional Earthen Building Techniques in Central Asia".

13 For example the Magok-i Attor mosque in Bukhara, whose splendid 12th century portal is some 4.5 metres below the current surface of the ground.

structures that integrate a high purpose-built platform. Existing or natural height within urban topography can be seen in pre-Islamic urban foundations of Nisa,[14] and Afrasiab,[15] where the raised citadel is used to full effect. For surviving evidence of platforms beneath individual monumental buildings it is necessary to look at the edges of the urban *enceinte*.

Architectural evidence of purpose-built structural platforms is found in only three parts of Merv: in the outermost areas of the walled city, the suburban zones and in the Seljuk citadel. The juxtaposition of platforms on top of earlier building complexes is seen most clearly in the latter, also known as the Shahriyar Ark, where earlier road lines visibly disappear underneath rectangular mounds upon which are placed monumental buildings.[16] The largest extant ruin, the palace attributed to the Seljuk sultans,[17] is situated directly on one of these raised areas, whereas the steep glacis of its neighbour, the "Kepter Khana"[18] (fig. 10.1), is incorporated into the building in the style of the suburban *köshks*.

Unfortunately, almost none of the lower external sections of buildings have been excavated and described with sufficient detail to understand more about the characteristic features of platforms and their contribution to a monumental style, beyond the addition of height. For most the *köshks* in the Merv Oasis, a glacis is preserved above ground, up to around 4 m, but owing to the accumulation of eroded mud brick it is rarely clear if this represents its full extent. The platform of Nagim Kala, for example, was recorded by Pugachenkova as 4 m in height, constructed from both *pakhsa*[19] and mud bricks, sloping at an angle of 70°. She recorded a window in the platform, which suggests that at least in this instance the lower part of the structure is not completely a solid core but in fact contains rooms.

Like Nagim Kala, the Great Kyz Kala has windows in the glacis, which suggests rooms on the lower level, although again none has yet been excavated. The platform of Kyz Kala, however, is constructed entirely in mud brick, without the intermittent *pakhsa* layers present at Nagim Kala, or a uniform *pakhsa* base like at Kavat Kala in Khorezm. Recent excavation around the Great Kyz Kala at Merv has revealed the lower levels of the building's platform, which previously was assumed to be a plain steep-sided platform sloping to approximately 1.5 m beyond the upper corrugations. There is now evidence that the platform had a somewhat shallower gradient or it may have been tiered, as the area uncovered steps out from the plan of the upper wall at least 3 m (the base has not yet been fully revealed). Several large mud brick buttresses were also uncovered at the lowest level (fig. 10.2). These buttresses are placed in a seemingly irregular fashion, they do not extend the full length of the structure, and they are not keyed into the brickwork of the glacis, so it appears that they were added later on to provide support for the wall.

The lower courses of the platform of the aforementioned Kepter Khana in the Shahriyar Ark were previously concealed at ground level, but excavation of the erosion material around the base of the glacis revealed that this monument is placed on a foundation course of fired bricks.[20]

14 Invernizzi *et al.*, *Nisa Partica: Ricerche nel Complesso Monumentale Arsacide*, 1990–2006, fig. 2.

15 Muxammadzon, *et al.*, "Fouilles de la mission franco-ouzbèque à l'ancienne Samarkand (AFRASIAB) en 1990 et 1991", fig. 1. Note that in the case of Afrasiab, the citadel mound is also apparently the location of the rulers' palace, as well as of congregational mosques in the period after the coming of Islam.

16 Williams, "The Landscapes of Islamic Merv, Turkmenistan: Where to Draw the Line?" fig. 24.

17 Herrmann, *Monuments of Merv: Traditional Buildings of the Karakum*, 97–99.

18 While this structure is known commonly as "*kepter khana*" or "pigeon house", its function – along with several buildings of similar shape in the Merv region – remains enigmatic.

19 Rammed earth blocks.

20 Williams, "The Landscapes of Islamic Merv, Turkmenistan: Where to Draw the Line?" fig. 21.

FIGURE 10.1 *The Kepter Khana in the Seljuk citadel (Shahriyar Ark) at Merv*
PHOTO: WORDSWORTH.

Although clearly part of the overall design of the lower part of the monument, the incorporation of fired bricks acts as an important damp-course preventing capillary action of water eroding the base of the mostly unfired mud brick structure. It emphasises that although fired bricks were used, they were not employed to create the whole platform, but were restricted to architectural details. Additional fired bricks can be seen on the interior of the structure as a stringcourse marking the transition to the barrel vault.

The presence of lower rooms in *köshks*, the seamless incorporation of the steep glacis as part of the overall external appearance of the buildings and the deliberate juxtaposition with decorative brickwork above suggests that for these structures the term "platform" is something of a misnomer. This feature in isolated buildings is part of the external structural design, a plinth for the upper decoration, which in these cases is ubiquitously corrugated. It should, then, be considered as a part of the stylistic grammar of a corrugated building style, explored in greater detail below. Doubtless many also required a substantial make-up or levelling layer, but the sloping lower sections of the walls should not be considered in isolation from the rest of the building. Their stark appearance also portrays an impression of impenetrability, pierced only by a single door, or in exceptional cases tiny slot windows. They clearly relay that the function of these buildings is ostensibly a closed one. The platforms of the Shahriyar Ark represent a different phenomenon: the landscaping of a previously urban area on top of which are placed a series of well-spaced monumental buildings. In this instance the monumentality of the structures is created through space, while reinforcing the visible partitioning of the ruling elite from the urban landscape by the 11th century citadel wall.

FIGURE 10.2 *The lower glacis of the Great Kyz Kala at Merv, showing mudbrick bastions recently excavated by the State Historical Cultural Park Ancient Merv. Note the upper layers are new bricks after conservation*
PHOTO: WORDSWORTH, COURTESY OF REJEP JEPBAROW.

Corrugations

Most studies of corrugated decoration focus on its refinement in a Sasanian artistic space. The monumental architecture at Ctesiphon and Firozabad visibly demonstrates the use of engaged columns, the origin of which was traditionally attributed both to early Babylonian techniques and Hellenistic half columns,[21] although this technique appears to have been well established by the Parthian period.[22] The palace of Ardashir at Firozabad is one of the only preserved Sasanian monumental structures to display a similar technique, although again in this instance only a tentative line can be suggested between the series of engaged columns on the exterior wall[23] and the creation of a Khorasanian corrugated *façade*. The earliest monument with corrugation-type features in the Merv oasis (and seemingly in Central Asia) is the Sasanian citadel of Chilburj, where the walls of the fortified bastions are each divided into three semi-pillars (fig. 10.3). Pugachenkova noted that these are combined with a defensive feature: the presence of loopholes.[24] She suggested that maximising the surface area of the walls with arrow slots placed in a staggered design gives an exaggerated impression of the total number of portals to overwhelm and confuse attackers. This early use of corrugations may then have a military function.

As hinted above, the corrugated style is most distinctly represented in the *köshk* architecture of the Amu Darya basin, and more specifically in the region of Merv, in modern Turkmenistan. According to numerous studies of these monuments over the course of the 20th century, there are several periods represented. Pugachenkova asserts that the twin structures of the greater and lesser Nagim Kalas, located some 18 km west of Merv, are the earliest is this group. Based on "archaeological material in wall masonry, the type of bricks and the details of its construction",[25] she postulates that the original date of the large Nagim Kala structure must be the 7th–8th centuries CE. Grouped alongside these monuments are the Kyz Kalas in the Merv suburbs, similar in overall style and shape and again attributed (by Pugachenkova at least) as being constructed immediately after the coming of Islam. While Herrmann pushes the date of the latter back by a century or so (8th–9th), she can do so only tentatively. Both authors cite the evidence of contemporary material lodged in the mud brick walls,[26] which by taphonomic reasoning is most likely to be residual ground material incorporated into the brick matrix, and thus may well pre-date the building by a considerable period. Stylistically speaking, attribution of a definitive date is no less problematic; in particular the cone-shaped squinches form, which are in fact widespread and present in structures from the 4th to 11th centuries.[27] Thus the dating of the corrugation design on these buildings is somewhat ambiguous, along with the remaining corrugated *köshks*, although most are assigned approximate dates between the 8th–11th centuries.

The only monument with corrugated design that might possibly be dated directly is constructed in fired brick, and is located firmly in Transoxania, on the road between Bukhara and Samarkand. Apparently a portal inscription on the caravanserai of Robat-i Malik (Ribāṭ-e Malik[28]), which is now no longer visible, attributed its construction to the Karakhanid ruler Nasr Shams al-Mulk in the year

21 Reuther, "Sasanian Architecture: A History", 517.

22 For example, the engaged columns in the square hall of the Parthian palace at Nisa. See Pilipko, *Staraia Nisa: zdanie s kvadratnym zalom*, fig. 3.

23 Bier, "Sasanian Palaces in Perspective", 29.

24 Pugachenkova, *Puti razvitiia arkhitektury Yuzhnogo Turkmenistana pory rabovladeniia i feodalizma*, 52.

25 *Ibid.*, 134.

26 Herrmann, *Monuments of Merv: Traditional Buildings of the Karakum,* 116; Pugachenkova, *Puti razvitiya arkhitektury Yuzhnogo Turkmenistana pory rabovladeniya i feodalizma*, 134.

27 Wordsworth, *Pathways of Trade or Networks of Power?*, 150–151.

28 The standard spelling currently used in Uzbekistan has been adopted throughout this article.

FIGURE 10.3 *The pillared bastions of the city of Chilburj*
PHOTO: WORDSWORTH.

471 AH (1078–9 CE).[29] According to 20th century photographs,[30] the monumental *façade* of Robat-i Malik was fully covered by large smoothly rounded semi-circular corrugations, either side of the building's monumental entrance or *pīshṭāk* (see below) (fig. 10.4). Owing to their size and the material used, they appear distinctly different from those of the Merv *köshk*s, although the design principle is similar. Beyond its stylistic connections, this building demonstrates a number of important factors. Firstly, it is clear that elements of the corrugated design certainly continued into the late 11th century, becoming incorporated into local building traditions.[31] Secondly, these corrugations are not present as part of a *köshk* design, but are a *façade* for a caravanserai. The use of this design at Robat-i Malik indicates that aspects of monumentality epitomised by corrugations are applied in contexts of remote roadside architecture as well as suburban residences/fortresses.

Tying these monuments together, both geographically and stylistically, is another caravanserai in the Karakum desert, Turkmenistan, which has received comparatively little attention. The monumental structure, known in the present day as "Akcha Kala" (white castle), is a caravanserai larger in proportions than Robat-i Malik (150 m × 80 m), with a fully corrugated front *façade* in unfired bricks (fig. 10.5). Akcha Kala was first identified and studied by Masson's IuTAKE[32] team in 1952–3,[33] and Pugachenkova describes it in her subsequent overview of South Turkmen architecture. The front *façade* of the caravanserai is corrugated across its width, with semi-circular protrusions each bisected by a vertical rib. At the centre of the *façade* is a monumental *pīshṭāk* (see below). On the sides and possibly the rear of the monument, corrugations are limited to evenly spaced groups of three, alternating with panels of blank brickwork. The closest comparison in terms of architectural style is the Kepter Khana in the Shahriyar Ark, both in terms of the type of corrugation (with a central rib) and in terms of their size. The Kepter Khana has corrugated walls on all sides, however, and there is no glacis or platform visible at the Akcha Kala. The use of corrugations in the context of the caravanserai demonstrates their use outside the context of *köshk*s, mixed with particularly 11th–12th century features (for example the lobed arch decorations of the interior).[34] The monumentality is no less apparent than in the *köshk* examples however, but it clearly serves a different purpose.

For the majority of examples of corrugated buildings, the upper levels of corrugated earth buildings have completely disappeared, leaving the finishing of these features open to conjecture. The remarkable preservation of Robat-i Malik previously displayed rare evidence of finishing details between the corrugations in the form of pointed concentric arches strongly reminiscent of the aforementioned conical squinches. While the prospect of reconstructing the upper segments of corrugated walls might help elucidate their ambiguous purpose, the uniqueness of this monument means that it is treacherous to assume the finish was similar on the earth buildings described above. Much cited in discussions of the original complete forms of corrugations are one or two artistic representations, perhaps the most well known of which is the Hermitage plate.[35] While

29 Nemtseva, "Rabat-i Malik", 115.

30 The building deteriorated rapidly during the late 19th and early 20th centuries, and most of the *façade* had collapsed by the time the building was investigated by Soviet scholars in detail. It has subsequently been heavily restored, albeit at a fraction of its early 20th century height.

31 Compare decorative unglazed brickwork of the Karakhanid "Kolyan" minaret in nearby Bukhara, with the 12th century mausoleum in Uzgen, Kyrgyzstan.

32 South-Turkmenistan Archaeological Comprehensive Expedition.

33 Masson, *Srednevekovaia torgovye puti iz Merva v Khorezm i v Maverannakhr,* 114–117.

34 Wordsworth, *Pathways of Trade or Networks of Power*, 106.

35 Marschak, *Die Silberschätze des Orients; Metallkunst des 3.–13. Jahrhunderts und Ihre Kontinuität*, pl. 209–211.

FIGURE 10.4 *The caravanserai of Robat-i Malik, Uzbekistan*
PHOTO: WORDSWORTH.

FIGURE 10.5 *The entrance* (*south*) façade *of Akcha Kala caravanserai*
PHOTO: ALEXIS PANTOS, KARAKUM ROUTES SURVEY.

the form of the Robat-i Malik and the Hermitage plate building are strikingly similar, there is no indication of how far this was the widespread or the only variety of finishing. The fact that the corrugations themselves vary somewhat, and there is a range of dates, suggest that reconstructions of crenulations should be viewed critically.

In terms of the monumental effect desired in the creation of corrugations, we are left with something of an incomplete picture, in spite of the number and variety of buildings with this decoration. One of the major achievements of this technique, however, appears to be the use of shadows to create texture on the monuments in a medium that otherwise produces a relatively flat surface in colours similar to the background hues of the Merv suburbs. By creating a continuous wall of engaged pillars, shadows cast by the often-intense sunlight delineate vertical lines emphasising the height of the building, in addition to the pedestal platform. The repetitive pattern also creates something of an optical illusion in terms of disorienting the viewer in terms of scale when focussing on any given part of the wall, thus making the structure seem larger than the actual ground plan. The application of this technique ceases well before the Timurid period, and the few monumental unfired earth buildings of this period in the Merv oasis demonstrate a preference for arched panels (similar to earlier interior decoration) rather than pillars.[36] This may also reflect the much wider use of tiles in monumental structures and a preference for more open external fronts of urban buildings.

Pīshṭāks

One of the frequently cited principles of Central Asian (and indeed Iranian) architecture is the development of longitudinal axiality, which seemingly becomes more pronounced in buildings of the 11th century onwards.[37] The most notable result of this is the wider adoption of an adapted four-*īwān* structure, in spite of the fact that it is present in earlier secular buildings in the region. Beyond axiality, however, the development of the *pīshṭāk* represents an emphasis on monumental entrances, an aspect reflecting more than simply a preference for the longitudinal axis. Bier bemoaned in 1986 that there is no study devoted to the origins and development of the *pīshṭāk*, and the same statement remains true today.[38] It would be troublesome to pinpoint the development of monumental entrances as peculiar to the eastern Islamic or Iranian world, given that they can be found across the pre- and early Islamic world, from the Umayyad desert castles[39] to the fortified entrances of Khorezmian *kal'as*.[40] The specific defining characteristic of a *pīshṭāk* is a protruding portal, normally oversized in proportion to the size of the doorway and the height of the structure. In this sense, the *pīshṭāk* represents a fundamentally monumental aspect, creating grandeur and size beyond the functional needs of a doorway. In spite of the widespread nature of monumental portals, there is a distinct unity of style to be found in the Seljuk and Karakhanid *pīshṭāks*, which are thus seen to be archetypal in Central Asian architecture and inspiration for later Timurid designs.

"Seljuk-Karakhanid style" portals are preserved on two of the aforementioned monuments, at Robat-i Malik and at Akcha Kala, although the latter is a rare example of this form surviving in mud brick from this period. In the more complete example at Robat-i Malik, and indeed at the comparable structure of Ribāṭ-e Sharaf in North-eastern Iran, the square hood around the portal is formed

36 Herrmann, *Monuments of Merv: Traditional Buildings of the Karakum*, 66.

37 Grabar, "The Visual Arts, 1050–1350", 135.

38 Bier, *Sarvistan: A Study in Early Iranian Architecture,* 51; See Andrews, "Pīshṭak", for an overview of thoughts on the earliest examples.

39 Urice, *Qasr Kharana in the Transjordan,* 26; Hillenbrand, *Islamic Architecture: Form, Function, and Meaning,* 387.

40 Tolstov *et al.*, *Koĭ-Krylgan-Kala. Pamiatnik kultury drevnego Khorezma IV v, do n.e.–IV v.n.e.,* 305.

of a large border of angular Kufic inscription, around a decorative brickwork panel.[41] The equivalent portions of the mud brick portal are poorly preserved at Akcha Kala, although its relatively plain appearance suggests that it may not have been decorated to the same extent. Pugachenkova notes that *pīshṭāks* in unfired brick can also be observed on the palace of the Shahriyar Ark[42] and the mud brick caravanserai at al-Asker,[43] although in both instances, poor preservation renders these difficult to detect with certainty and no further details remain. The adoption of this device nevertheless monumentalises entrances in a way that does not seem to have been implemented before the 11th century. The uniform walls of the Samanid Mausoleum in Bukhara, or the Ghaznavid Gunbad-e Kābus in Iran, starkly contrast with the strong frontal aspect of the Karakhanid mausolea at Uzgen. Given the ostensibly Turkic origins of the Karakhanids and Seljuks, it is tempting to associate this portal device with pastoralist roots at the decorative tent entrances seen in ethnographic examples of Central Asian nomadic camps, but such an association is pure speculation and somewhat dangerously deterministic.

Hints at monumental entrances are found at several of the other caravanserais located in the desert east of Merv. Of the 17 structures recorded by the Karakum Routes Survey (2009–2013), seven are caravanserais built principally from unfired bricks or *pakhsa* with some form of protruding entrance, although none is preserved to the extent of Akcha Kala. For most of the other buildings, evidence for the type of entrance has largely disappeared while others are towers or cisterns and have entirely different forms. Chronology of occupation of these sites, based on associated ceramic material, suggests that none was constructed before the 10th century, confirming that protruding entrances were probably employed from this period onwards. In three examples (including Akcha Kala) a *pīshṭāk* was noted alongside corrugated walls, indicating that the two are also combined in creating monumental style.

It is striking that the only evidence for a *defined* entrance among the myriad examples of *köshk*s is from the poorly preserved Ovliali[44] and Nagim Kala[45] *köshks*. In this latter instance, the remains of a specific entry way have been reconstructed from the highly degraded remains as being relatively modest, and can hardly be called a *pīshṭāk*. Ovliali is the only example with a true protruding portal, and again, it is hard to be certain as to the original detail of its form and decoration, or whether it can be grouped with the other examples of *pīshṭāks*.

It is possible to reconcile the differences between the architecture of the *köshks* and those buildings with *pīshṭāks* on the basis of dividing them by date, and indeed Bier suggests that the evidence for portals of this type does not really flourish before the Ilkhanid period.[46] An alternative, however, is to distinguish the two on the type of monumentality being expressed. Almost all of the early *pīshṭāks* appear on buildings with an ostensibly public function, suggesting that in fact the inclusion of portals may be linked to the levels of access to the structure. By emphasising the entrance, the exaggerated scale is felt by those passing through into the interior. That some of the early portals (such as the example at Ribāṭ-e Sharaf) include dedications of the founder[47] suggests a further connection to patronage, emphasising the benefaction of the donor who erected the structure. It is difficult to imagine extensive

41 Kleiss, *Karawanenbauten in Iran: gebrauchte Buecher*, Tafel 20.2.

42 Pugachenkova, *Puti razvitiia arkhitektury Yuzhnogo Turkmenistana pory rabovladeniia i feodalizma,* 203–204.

43 *Ibid*., 223.

44 Herrmann, *Monuments of Merv: Traditional Buildings of the Karakum*, 209.

45 Pugachenkova, *Puti razvitiia arkhitektury Yuzhnogo Turkmenistana pory rabovladeniia i feodalizma*, 133.

46 Bier, *Sarvistan: A Study in Early Iranian Architecture*, 51.

47 In fact, at Ribāṭ-e Sharaf the inscription is to the refurbishment of the structure, supposedly undertaken by Sultan Sanjar's wife in the mid-12th century. See Godard, "Khorāsān", 13.

inscriptions on external mud brick *façades*, but the same monumentality is clearly articulated in the simple geometric form at Akcha Kala. The inevitable problem, as observed above, is that fewer buildings survive, and many later comparative structures were built entirely in fired brick.[48]

Another point noted by Herrmann is that *pīshṭāks* are only present at the ground level, following the assumption that the glacis of *köshk* buildings required the entrance at the first floor.[49] *Pīshṭāks* do not coincide with platforms or plinths, the two forming distinct groups of structures. Following the argument above, there appears to be a difference in layout, which matches the two distinct types of buildings.

This discussion has almost exclusively focussed on secular architecture, owing in part to the lack of preservation of early religious examples. The mosques and mausolea that survive in the Merv region are all from the 11th century onwards.[50] Pugachenkova characterises a range of mausolea from the 10th–12th centuries,[51] in the context of an early example in Dehistan, Shir-Kabir,[52] but none of these examples shows any form of monumental entrance. Likewise, none of the excavated mosques has produced evidence for a portal before the 13th century. The earliest example of a *pīshṭāk* in this context is at the site of Abiverd, where the only remaining part of the mosque is this portal, and has subsequently been used as the name for the area around the monument (Peshtak).[53] Although mosques and mausolea are ostensibly public buildings like caravanserais, the idea of ostentatious entranceways seems to have been developed much later. This could in part result from the majority of mosques being placed in relatively closed urban contexts, and thus lacking the space to present a projecting portal. More likely, however, is that the monumentalisation of Khorasanian earthen mosques developed in a different fashion to secular architecture, albeit frustratingly unclear owing to the lack of available data. It is clear that by the time of the grand Timurid building projects, there is a much higher degree of parity between the styles of portals in secular and religious monumental buildings, demonstrated in the elaborate urban fabric of Bukhara. In these circumstances it is possible again to highlight the importance of patronage in the formation of urban monumentality, although the lack of documentation for early endowments means that it is not possible to reconstruct with any certainty the financing of the earliest Central Asian public buildings.

Conclusion

The examples of earth architecture given above represent a wide range of dates, challenging the assumption that the use of mud brick and *pakhsa* for monumental structures might be restricted to the period prior to the widespread use of fired brick (i.e., before the 11th century). Further archaeological work may refine the chronology of these buildings, but even from the current data the three monumental techniques outlined reveal a startlingly long-lived tradition. That these techniques are used contemporaneously with very different fired brick construction demonstrates the

48 For abundant examples of later-period caravanserais with projecting portals in Northeastern Iran, see Kleiss, *Karawanenbauten in Iran: gebrauchte Buecher*.

49 Herrmann, *Monuments of Merv: Traditional Buildings of the Karakum,* 70. Again this is the prevailing assumption, although the mechanics of these entrances is poorly understood.

50 For example the mosque of Talkhatan Baba [*circa* 1080–1100 CE] and the mosque/mausoleum of Ibn Zayid at Merv [AH 506/1112–1113 CE].

51 Pugachenkova, *Puti razvitiia arkhitektury Yuzhnogo Turkmenistana pory rabovladeniia i feodalizma,* 169–179.

52 Sheila Blair, *The Monumental Inscriptions from Early Islamic Iran and Transoxiana,* 56–57, dates this monumental *mazar* to the last quarter of the 10th century based on the epigraphy.

53 Pugachenkova, *Puti razvitiia arkhitektury Yuzhnogo-Turkmenistana pory rabovladeniia i feodalizma*, 259–260.

important relationship between styles of monumental iconography and the building material—in this instance unfired earth. A direct comparison between buildings with a similar function, for instance caravanserais, reveals further aspects of the division between the two. The outposts of Daya Khatyn and Akcha Kala appear to be roughly contemporary (within a century perhaps) and show very different decisions as to their architectural style. Unlike the wide corrugated frontage of Akcha Kala, the decorative fired brick *façade* of Daya Khatyn draws the viewer's attention towards the detail of the individual panels where tessellating squares in Kufic purportedly spelt the names of the *rāshidūn.*[54] Both the large corrugations and the fired brick relief make use of strong shadows, but there is a critical difference in scale. The corrugations are deceptive in making the structure appear larger in a wide and sparse dune landscape, whereas the panelled designs of Daya Khatyn are compact and intricate, emphasising the intimacy of the space. The palatial component to the construction of Daya Khatyn conveys a different message to the very visible and open *façade* of Akcha Kala. Although the existence of an unfired mud brick wall around Daya Khatyn has been suggested as the remains of an earlier construction,[55] one possibility might be that this complex too was surrounded by an outer enclosure in unfired brick.

Reinforcing the idea of choice of materials, we also can discount the suggestion that fired bricks were less readily available in a desert context, as the presence of brick kilns adjacent to Akcha Kala[56] suggests that fired bricks were used in its foundation, albeit invisible at present. In the instance of Robat-i Malik, where corrugations were formed from fired bricks, the effect is altogether different, as the rounded columns do not form the same light-shadow effect, possibly owing to the reflectiveness of the bricks. It is possible that in this exceptional instance the emphasis is on a direct iconographic reference, rather than the creation of the same aesthetic.

Daya Khatyn, Akcha Kala and the other mud brick caravanserais in the region almost all have large portals, underlining the second dichotomy that can be made within the group of unfired earth monuments. Although the *façade* of Akcha Kala is clearly a bold statement linked to the tradition of *köshk* corrugations, its entrance and its plan suggest an open layout, with a focus on access rather than the closed spaces of the suburban buildings at Merv. Although there is some indication that there was a central courtyard or light well in some of the larger *köshk,*[57] the amount of open space is restricted by the layout of the buildings and the fact that most are two-storey. Only hypothetical plans exist for the majority of the internal arrangement of rooms inside *köshks*, in spite of several fragments of preserved internal divisions. The upper storey of the Lesser Kyz Kala, for example, seems to have comprised a number of small square rooms, connected with the lower floor by vaulted staircases. The presence of platforms or glacis incorporated into *köshks* also separates them stylistically from caravanserais, suggesting that the sloping blank walls with few if any windows convey the restriction of access in these buildings. While their purpose remains unclear, *köshks* represent the application of monumentality for individuals or closed groups, possibly elites given their mostly suburban placement.

Some of the most detailed and comprehensive data for these buildings comes from the exhaustive analyses of Galina Pugachenkova, who was the first to suggest in any direct way that the objective of this architectural grammar relates directly to power politics. Reading her descriptions of the structural forms, however, it is impossible to ignore the charged vocabulary she uses, which suggests from the outset the conclusions that will be drawn. For example, when describing the

54 Ibid., 234. These panels are now degraded and it is difficult to determine what was originally written.

55 Pribytkova, *Pamiatniki arkhitektury XI veka v Turkmenii,* 58.

56 Wordsworth, *Pathways of Trade or Networks of Power?*, 115–121.

57 For example, in the current excavations of the great Kyz Kala at Merv mentioned above.

relationship of *köshks* with the surrounding vernacular urban architecture (no longer extant), she states they "dominated" the skyline (*gospodstvovali v siluete goroda*),[58] and describes the platforms of the buildings as "powerful" (*moshchnyĭ*).[59] Although her aim may be to highlight similar aspects to those outlined here, her hyperbolic language leads the modern sceptical archaeologist to question the associated Marxist narrative. It is important, therefore, to try and qualify monumentality as far as possible and to identify ostensible aims of the building choices made. An awareness of our own charged language, meanwhile, highlights the inherent and paradoxical subjectivity of assessing monumentality. Notwithstanding semantic problems of qualitative analysis, it is evident that the builders of these unique structures in Khurasan specifically designed the exteriors to portray monumentality. Their respective effect on the landscape cannot be underestimated, whether or not they can be seen to "dominate". For the caravanserais in the desert, the use of monumental decoration reveals the overtly political action of creating these outposts, while the style echoes the well-established form of suburban monuments from within the fertile agricultural zone. Design aspects reflecting a defensive and military role are rare in these buildings, but their impact in terms of creating a landscape of power is clear.

58 Pugachenkova, *Puti razvitiia arkhitektury Yuzhnogo Turkmenistana pory rabovladeniia i feodalizma*, 160.

59 *Ibid.*, 166.

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CHAPTER 11

Ottoman Earth Architecture in Buda (1541–1686)

Adrienn Papp

Buda, part of Budapest, the capital of Hungary, was situated in the borderlands of the Muslim and Christian regions, to say the Ottoman and the Habsburg Empires in the 16–17th centuries (fig. 11.1). King Béla IV founded Buda in the middle of the 13th century, and a royal court was there from its beginning. The city functioned as capital for the Hungarian Kingdom from the 15th century.[1] In 1541, the city was occupied by the Ottoman Empire and became part of it until 1686. The old royal centre became centre for a new province, the vilayet of Buda. The city itself and the whole vilayet were situated along the borders, far from Istanbul, the capital of the Ottoman Empire. During the Ottoman period of Hungary, the Ottomans were not able to occupy the entire kingdom, only the central region of it. A new line of fortresses came into existence in the central region of the ex-Hungarian Kingdom, and Buda was the most important component of it. The city is situated on the right embankment of the Danube River, while the fortified castle lies on top of Castle Hill surrounded by suburban zones. The entire city was inhabited in the Middle Ages; the king, the aristocrats, and rich burghers lived in the city.[2] It was the administrative and commercial centre of the kingdom. The population of the city in the 16th century was about 8,000 that remained unchanged after the Ottoman occupation, but the content of the inhabitants completely changed.[3] Soldiers made up half of the population of Buda in the beginning of the Ottoman period. Later, this ratio modified, but at least 1,000 soldiers were still stationed permanently in the city.

During the Ottoman period, two significant sieges hit the city: the first took place during the so called "long war" at the end of the 16th century and in the beginning of the 17th century. The second one occurred during the liberation wars in 1684–1686. Dating to these periods, we have knowledge of many prints that Western artists created to portray the city.[4] A lot of travellers, mostly ambassadors and their crew visited Buda and wrote books about their experiences. In these books, we can identify shorter and longer descriptions of the city. By reading these reports, we can follow the changes in Buda to trace how the renaissance Christian royal capital was converted into a Muslim Ottoman vilayet centre (fig. 11.2). In the 1550s, Hans Dernschwam reported[5] on a neglected city, where nobody took care of the medieval palaces, the windows were boarded up, and hovels made of mud were attached to the old palaces. Dernschwam had visited the Renaissance royal capital before, so he had a genuine basis to compare the changes that he disliked.

What happened indeed? When the Hungarians were defeated in the battle of Mohács in 1526, King Louis died; consequently the queen, the royal court, the aristocrats and the German burghers of the city had to abandon Buda. After 1541, when the new king János Szapolyai died and Suleyman the Great occupied the city, the nobility was forced to leave Buda, most of the inhabitants left the site, and only 3,000 to 4,000 of them stayed in

1 Végh, *Buda város középkori helyrajza*, 163.

2 About the topography of Buda, see Végh, *Buda város középkori helyrajza.*

3 Dávid, *Pasák és bégek uralma alatt: demográfiai és közigazgatás-történeti tanulmányok*, 83.

4 Feuer-Tóth, *Medieval Royal Palace in Buda Castle.*

5 Dernschwam, *Eine Reise Nach Amasia Im Jahre 1555*, 497–498.

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FIGURE 11.1 *The territory of Ottoman Buda and its suburbs in the city plan of Budapest. 1. Buda, 2. Víziváros suburb, 3. Tabán Suburb*
PLAN: A. PAPP.

FIGURE 11.2 *Ottoman Buda, Veduta of Fontana Budapest History Museum, Collection of Prints, Photo: B. Tihanyi*

the city.[6] At that time, Ottoman soldiers, officers and craftsmen arrived to the city. They found the Hungarian aristocrats' abandoned medieval and renaissance palaces, the German and Hungarian burghers' large and vacant houses, and also churches, monasteries, hospitals, markets, etc., in the city. All of these were constructed of stone in the Christian European fashion style.

The Ottomans used these building and converted them and the city into their "Ottoman" style. Designed in Ottoman fashion, new *djami*s, baths, caravanserais were built of stone in a very high quality.[7] For example, four baths have still been in use since the 16th century. The sophisticated front *façades* of the Christian palaces failed to match the Muslim houses that rather faced inward. Thus, the windows on the *façades* were boarded up.

6 Káldy-Nagy, *A budai szandzsák 1559; évi összeírása*, 150–152.

7 Papp, "Architecture in Turkish-Occupied Hungary".

Muslim architecture prefers little rooms, open air, the alternation of wall faces, and porticos.[8] With these elements as well as new material, the mud brick appeared in Buda.

Everything changed in the new houses. In the book of Salomon Schweigger, more specifically in the description of Pest that stands opposite to Buda on the left embankment of the Danube River, we can find the picture of a house,[9] whose structure was made of wood and its infill made of mud bricks. The under structure of these buildings were made of stone, sometimes the entire first storey, too. It was a well-known technology in other parts of the Ottoman Empire but was totally unknown in the Hungarian Kingdom. Houses of this new design appeared in Buda: we can identify this type of building design ranging from new workshops to the palace of the beylerbeys. These Ottoman houses had more courtyards; edifices with porticos so these houses turned into the inner courtyards and the front *façades* were very simple.

I would now like to present a few examples of these buildings in Buda. These were totally destroyed and only a few features of them have remained in their original design. During the liberation wars in 1684–1686 Buda was blazed, so these wood and brick buildings burned and collapsed. After the Ottoman period, they were not rebuilt; rather a new construction style and design was implemented, and so their remains were buried. This kind of building style was so different from the technique having been used before and after the Ottoman period of the city, so we have been able to determine them very well. We have identified elements in the suburban zones and on the castle hill as well (fig. 11.3).

First, let us look around in the suburban zones. The Tannery suburb (varoş-ı Tabahâne) was situated in the south of the fortified castle hill; in the medieval ages we know that stone houses, palaces, hospital, churches were standing there. After the Ottoman occupation of Buda the inhabitants of this quarter were totally changed. Christians left this part of the city before the wars, and after the Ottoman occupation we can find only Muslims there.[10] New buildings, like mosques, baths, caravanserais were erected, but the old houses were still used. A stream reaches the Danube River in this suburb while tannery workshops were situated on the bank of it.

During the Ottoman period, this quarter expanded, and a newly inhabited area developed out of the medieval part of this suburban zone.[11] A thermal bath was built there in the 1560s, and we excavated the remains of a tannery[12] next to it. This bath called *Rác* bath is still used, but it was called Little or Tannery's Bath during the Ottoman period.[13] During the centuries, the bath expanded larger and larger, so that it was possible to unearth the vestiges of an Ottoman workshop amongst the walls of the following Baroque style extension. From the above-mentioned Ottoman houses nowadays we can find only some special pieces: the under structures with the remains of the beams, the stones belonging to the porticos, and the remains of the covered courtyards.

Next to the Ottoman *Rác* bath we found the details of four buildings (fig. 11.4), one of which was a house, while the rest were the buildings of the workshop. A quarry stone covered yard was discovered underneath the destruction layer of the wars of 1684–86. Buildings with portico stood on

8 Kuban, *Türk Hayatlı Evi*, 164.

9 Schweigger, *Ein newe Reiss Beschreibung auss Teutschland nach Constantinopel und Jerusalem*, 24.

10 In Buda, non Muslim inhabitants were written into sanjak censuses; in this particular quarter, there were no non-Muslim inhabitants (Káldy-Nagy, *A budai szandzsák 1559; évi összeírása*, 35–41).

11 Papp, Urbs.

12 From written sources we know that this district was the *Debbaglar mahallesi* ("quarter of the the tannery"): vakifname of Sokollu Mustafa pasha (Topkapı Saray Müzesi Arşıvı, D7000); Evliyâ, *Evlíyâ Çelebi Seyahatnâmesi*. About the archaeolgical remains of their workshop, see Papp, Craft.

13 Lászay, *et al.*, "A budai török fürdők kutatása az évezred elején", 298.

FIGURE 11.3 *Explained sites. 1. Tannery workshop next to the Rác Bath, 2. Ottoman house excavated in the Szarvas Square, 3. Pasha's palace on the Castle Hill*
PLAN: A. PAPP.

the sides of it. We found stones with mortises on the ground level next to the stone covered area (fig. 11.5–11.6). These stones were built as the footing of posts that supported the ceiling. We did not find walls in parallel with the side of the covered yard, so these buildings were open from that direction. We found walls stretching perpendicularly to the yard that could have been the sidewalls of the workshop. The wall was demolished to the floor layer, so we have not been able to decide whether it was a stone wall or a strip foundation on which stood a wooden structure. We did not find a lot of stone in the debris that covered the area, but it could be characterised as an area fully covered with charcoal and burnt reddish particles. Therefore, I believe that this was a wall with a wooden

FIGURE 11.4 *Excavated buildings of the tannery workshop next to the Rác Bath*
PLAN: ZS. VIEMANN.

structure filled with mud bricks. The covered yard formed a road leading to the stream that was only a few meters far from there. Used for the tanning process, pits were situated next to this road and the walls.

Lying southward, we found the vestiges of a house with timber boarding (fig. 11.7–11.8). Its wall collapsed onto the floor. We found a lot of stove tiles in the debris, where there were pieces with prints of a board, and on some pieces there were remains of painting or whitening. However, we did not find a complete piece of mud brick. In the ground, on the burnt floor, a stone with a mortise was discovered, the post of which could hold the wooden ceiling. Based on these fragments, we can extrapolate the former existence of a *pisé* (rammed-earth) wall. Unfortunately, the wall line lay out of the excavated area, so we could not do any relevant research there.

Northwards from the site presented above but still in this suburban zone, we made excavations connected to the works of the main sewer pipe in 2008. At that time we were working on small areas, where the launch and target shafts were made. We

FIGURE 11.5
Covered yard of the tannery workshop
PHOTO: A. PAPP.

FIGURE 11.6
Covered yard and a stone with mortise next to the Rác Bath
PHOTO: A. PAPP.

had no opportunity to increase the excavation outside these shafts.

In the Szarvas square, we found part of an Ottoman road leading to a *djami* (fig. 11.9).[14] The well-built road connecting the bridge of the stream and the riverside of the Danube River was one of the main streets of this suburban area.

Beside the road, the remains of an Ottoman house were excavated (fig. 11.10). Only its floor level survived, while its superstructure was completely destroyed. Its remains lay underneath the basement of a house built during the 19th century. A small part of this Ottoman house was in the excavated area only so we do not know its measurements or internal arrangements.

14 We can identify this building in the map of De la Vigne (Budapest History Museum Collection of Prints 2014.9.1).

FIGURE 11.7 *Ottoman house with timber boarding, next to the Rác Bath*
PHOTO: A. PAPP.

FIGURE 11.8 *Debris of an Ottoman house, next to the Rác Bath*
PHOTO: A. PAPP.

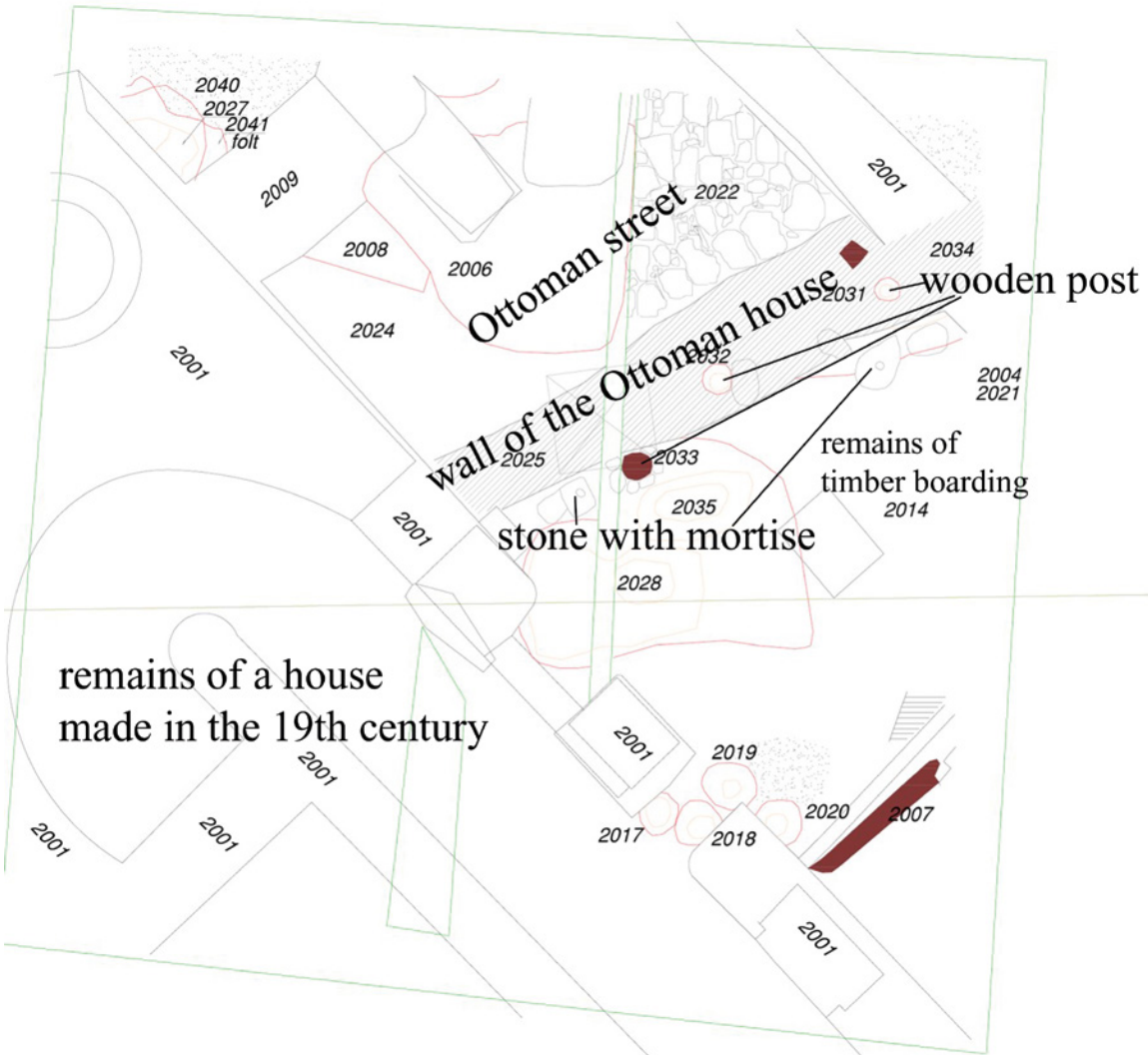

FIGURE 11.9 *Plan of the excavated Ottoman house, Szarvas Square*
PLAN: ZS. VIEMANN.

We found a quarry stone wall parallel with the road. Placed vertically, two wooden posts were identified in this wall. It can be explained as a strip foundation, on which a wooden structure could stand. Mud bricks were filled in between these posts. A few burnt pieces were found in the corner of the excavated area. Two stones with mortise were uncovered next to the wall. We found a damaged stove in the ruins that allowed us to extrapolate that this house was erected along the street, and its facade was built of a wooden structure lying on a stone foundation. The two stones with mortise were inside the building, which had timber boarding.

Based on these examples, I shall not presume that this sort of architecture was applied only by poor people or in consequence of pressure imposed by necessity. Buda is situated amongst hills meaning that stone to be used as building material for the purpose of construction could be found

FIGURE 11.10 *Photo of the remains of the Ottoman house and the road, Szarvas Square*
PHOTO: A. PAPP.

nearby. Ottomans who came to Buda knew how to apply stone for construction, because numerous new stone buildings, such as *djamis*, baths, caravanserais, etc., could and still can be found in the city. This sort of wooden-earth architecture used in the centre of the Ottoman Empire must have been their own.

The best example to prove this is the palace of the beylerbeys in Buda dating to the 17th century.[15] The palace itself was situated on top of the castle hill. The Renaissance royal palace became the property of the Sultans, so that the beylerbeys had to choose or built their own palace. The heads of the province first lived on the riverside of the Danube River, but unfortunately we do not know of the exact location. Later, because of the sieges of the Long War (1593–1606), the pashas moved up to the well-protected Castle Hill. We have knowledge of this palace based on a lot of different sources and archaeological excavations. Nowadays, the building of the Carmelite Monastery, which was made in the 18th century, stands there and its office premises are inside. After the Second World War, there was an opportunity to conduct excavations during the reconstruction works of the monastery. Archaeologist Győző Gerő could dig inside the building and along its eastern side. Fortunately, we could start archaeological excavations again in 2014, because the prime minister of Hungary desires to move there, and so new reconstruction and building works have begun.

The first interesting fact is the location of the Ottoman palace. It was located next to the

15 Papp, *Adrienn*: "Succinct Report on the Pasha's Palace in Buda".

Renaissance royal palace. The territory of the palace of the pashas was owned by the Palatine, the second official after the prevailing king of Hungary, whose large palace had stood exactly on the same site before the Ottoman period.[16] The ruins of it were unearthed which proves that it was a large, well-built aristocratic palace. What we can see now is that this building was totally rebuilt, and the majority of the medieval palace was unused by the Ottomans. Evliyâ Çelebi visited the palace of the pashas during the 1660s and wrote that there were 200 rooms and a *hamam*, while the *dívanhane* was on the castle wall with a view onto the Danube River and the plain of Pest.[17]

What did the Palace of the Ottoman Pashas look like? Here are some prints on which we can see the palace in Buda.[18] These are a little bit conflicting, but all of them show a building with three floors next to the castle wall, and we can identify the alternation of the wall faces. The plan of the excavations makes the picture more accurate. More or less separated buildings, big and small courts made up the palace that looked homogenous from the outside (fig. 11.11).

We can identify the wing on the castle wall where the dívánháne was placed. A big building was erected beside the castle wall. The pictures of the prints show a facade with three parts; the prints are contradictory with respect to the central part that either jutted out or retracted. The eastern wall of the palace functioned as a castle wall; originally it was the first city wall dating back to the 13th century. Stone constructions were discovered there. The medieval cellars were filled up, and new walls, i.e. new rooms were created. We can see the points of the vertical posts on these walls. We can presume that the floors on top of the castle wall were made of wooden structures and mud bricks. During the siege in 1686, the palace burnt down and its debris fell outside the walls. It contains burnt mud brick, debris of mud bricks (fig. 11.12), hexagonal floor bricks (fig. 11.13), and some stone footing with mortise for wooden posts.

The hamam of the palace was also discovered. It was made of stone and bricks. Courts can be identified around the buildings. There is a good map made by Haüy[19] dating from 1686 that shows drawn lots and sectors. If we match this map and the plan of the archaeological excavations, we can easily identify the great court of the palace, where the ambassadors arrived. A little court, the hamam of the ruling pasha and a gate were located north of the great court.

We can also identify a stone with mortise in the stone pavement of the great court (fig. 11.14–11.15). It can be said to be one of the holding posts of the portico on the first floor, if the data of the prints, the maps and the archaeological excavations are compared. The ambassadors walked there; this portico must have led to the dívanhane.

Evliyâ Çelebi wrote that there was a garden in the palace,[20] and on *veduta*[21] drawn after the Ottoman period in 1686 we can see a little garden on the eastern side of the city wall. During the archaeological excavation in 2014 and 2015, we were able to research that area. Here the city wall has a double line, parallel to the old wall (of the 13th century) made in the late medieval ages. The line of this newer wall shapes a bastion and we find embrasures on it.

A passage lead through the first city wall, from the eastern wing of the palace, out to a bastion-shape part of the fortification. Here we found big stones with mortises right next to the old and newer city walls and earth floor came to light (fig. 11.16). There was no other building or wall here besides the city walls. The above-mentioned big stones and beams held a wooden structure that could belong to the garden of the palace. We have no information of the southern side. The complete palace is situated in an area sized about 4,500 m^2.

16 Végh, *Buda város középkori helyrajza*, 142–143.

17 Evliyâ, *Evliyâ Çelebi Seyahatnâmesi*, 140.

18 Prints of De la Vigne, Fontana, Haüy.

19 Joseph de Haüy, Wien—Österreichisches Staatsarchiv, Haus-, Hof- und Staatsarchiv, Hung. Fasc. 73/II. No. 25.

20 Evliyâ, *Evliyâ Çelebi Seyahatnâmesi*, 140.

21 Made by Fontana (Rózsa: *Budapest* kat. 27).

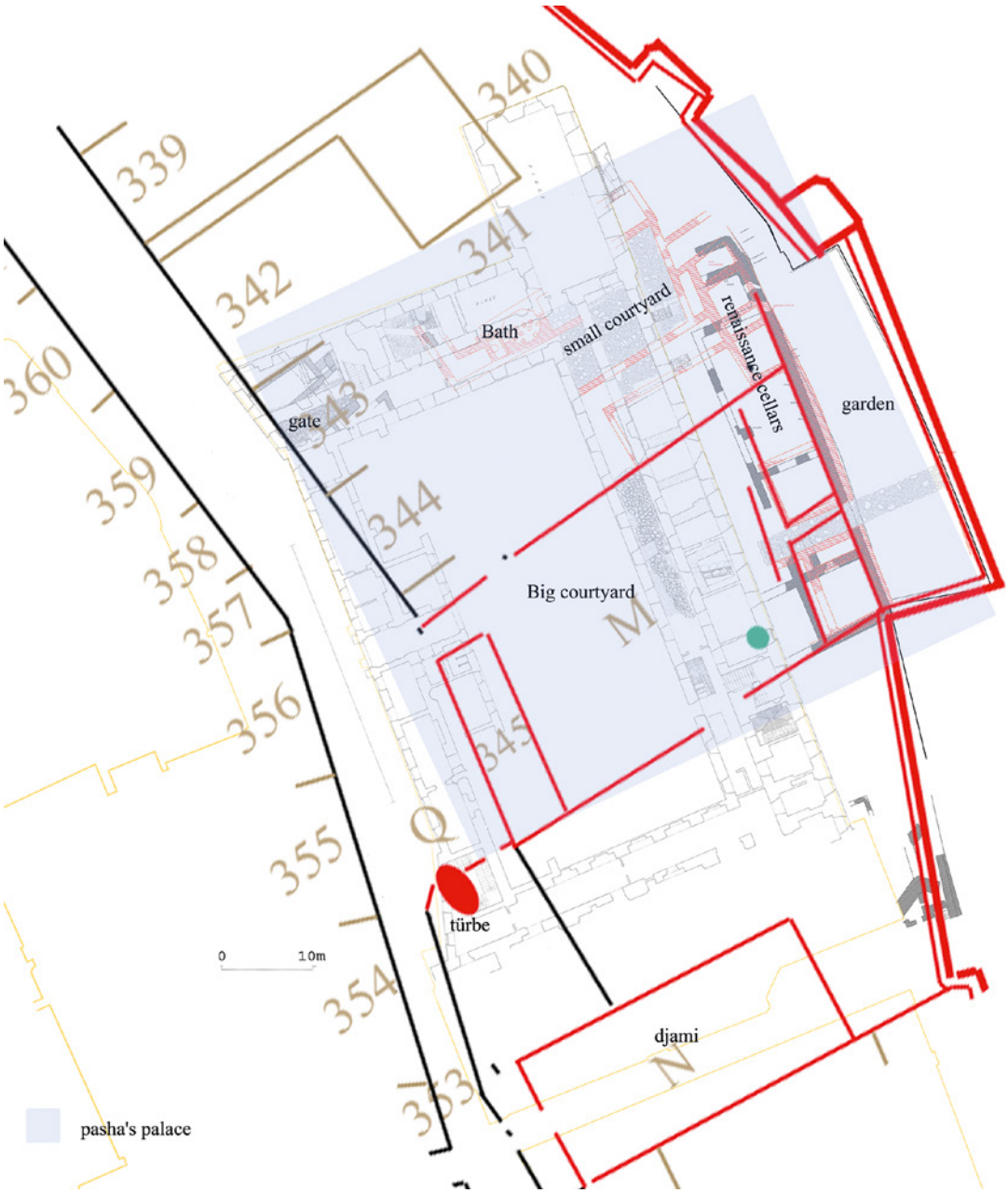

FIGURE 11.11 *Plan of the Pasha's Palace. Archaeological remains and the map of Haüy*
PLAN: A. PAPP, ZS. VIEMANN.

The Gothic church situated next to the palace was used as a *djami* by the pashas.[22] A monastery stood south of the *djami* during the Middle Ages. After the Ottoman occupation, monks abandoned the monastery, but the building was used in the Ottoman period (fig. 11.17). The rooms of the medieval building were divided into little rooms and workshops that archaeological excavations (lead by Júlia Altmann) can prove. Stone covered yards

22 Sudár, *Dzsámik és mecsetek a hódolt Magyarországon*, 189.

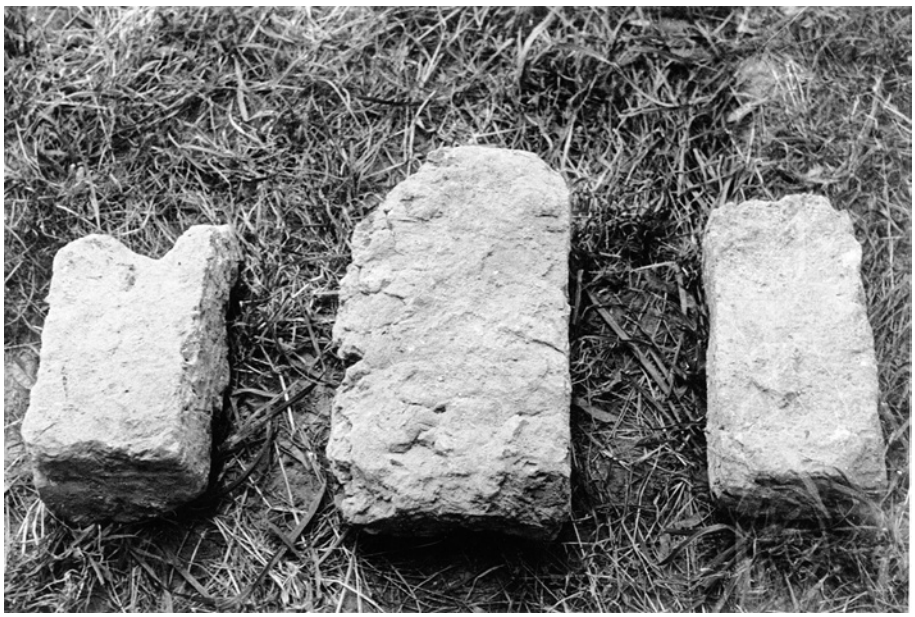

FIGURE 11.12 *Mud bricks excavated in the Pasha's Palace Budapest History Museum.* COLLECTION OF ARCHAEOLOGICAL DOCUMENTATIONS. INV.NO. 230–77.

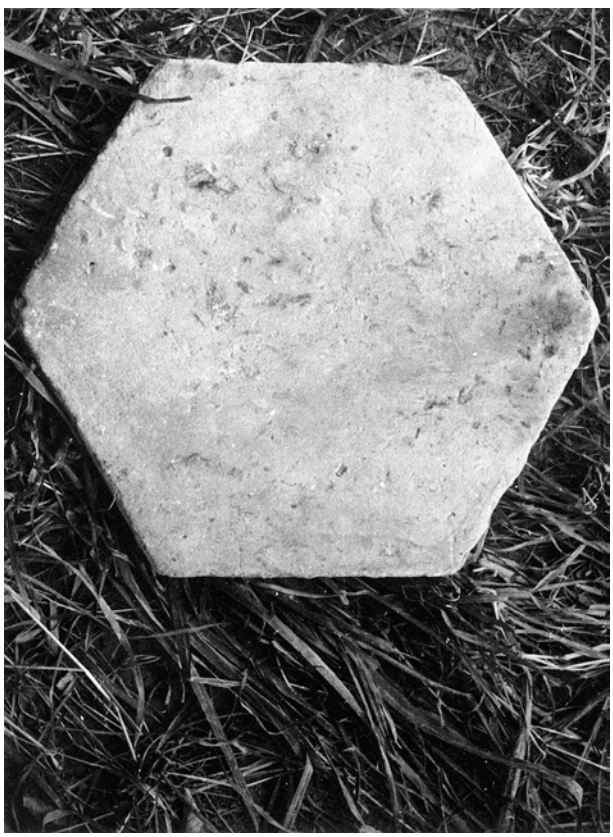

FIGURE 11.13
Hexagonal floor bricks excavated in the Pasha's Palace Budapest History Museum
COLLECTION OF ARCHAEOLOGICAL DOCUMENTATIONS. INV.NO. 230–77.

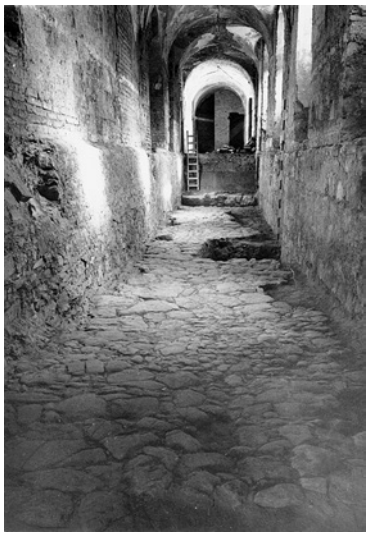

FIGURE 11.14 *Great yard of the Pasha's Palace Budapest History Museum* COLLECTION OF ARCHAEOLOGICAL DOCUMENTATIONS. INV.NO.230–77.

were excavated. Stones with mortise refer to wooden structures.[23] This could be the area separated for the pasha's servants and for workshops.

There is another type of structure where the Ottomans used earth in many cases: the fortresses. In the territory of the former Hungarian Kingdom new fort lines came alive after the Ottoman occupation. Sometimes medieval castles were used but new forts were also built. Among the new fortress earth architecture was the most common type.

In the neighbourhood of Buda, at the top of the Gellért hill (during the Ottoman period, *Gürz Elyas dağı*) a palisade (in Turkish, *palanka*) was built around 1593 and it was used till the 1686 recapture of Buda (fig. 11.18). It is known from written sources that 146 people served there,[24] and Evliyâ Çelebi gave a short description of the fortress.[25] He wrote that the inner part of the fortress was made of stone, but the outer was a *palanka*, an earthen one. Unfortunately the remains of this fort were destroyed in the 19th century during the construction works of the so-called Citdella, a modern fortress at the top of the hill.

We have some idea about these fortifications after the excavated examples in the countryside. Among the 46 palisades that were built in the territory of modern-day Hungary, Ottoman palankas of Barcs[26] and Szerdahely (Yenipalank)[27] were excavated to a great extent and probes were made in more sites (Babócsa,[28] Békés,[29] Érd,[30] Szarvas,[31] Vál[32]). In each fortress it was observed that two or three rows of thick (d = 20–25 cm) vertical posts were driven deeply into the soil. The posts were spaced at a distance of 40–45 cm from one another. Between these two rows of post-and-wattle stockade earth was filled in and the outer side was covered with loam. So the width of the palisade wall was cc. 2 m.[33] In Yenipalank it can be observed that the earth from the ditch was used to fill the space between the rows of posts.

The forms and measurements of these palisades were different. The fortress of Yenipalank was square shaped with a round bastillon on each corner, the castle of Barcs was pentangular with a diamond-shaped bastillon on each corner. There are some drawings on the palisade at the Gellért hill made at the time of Buda's Ottoman period.[34] Different plans and views can be seen: the most

23 Kovács, "*Budai ferences kolostor a török korban*", 247.

24 Hegyi, "The Ottoman Network of Fortresses in Hungary", 481.

25 Evliyâ, *Seyahatnâmesi.* 155.

26 Gerelyes, *et al.*, Archaeology of the Ottoman Period in Hungary: Papers of the Conference Held at the Hungarian National Museum, Budapest, 24–26 May 2000.

27 Gaál, "Török palánkvárak a Buda-eszéki út Tolna megyei szakazán".

28 Magyar, *Ottoman Hungary.*

29 Gerelyes, *Archaeológiai Értesítő.*

30 Dinnyés, Dinnyés I., Kővári K., Lovag Zs., Tettemanti S., Topál J. and Torma I., *MRT* XIII/1 *Pest megye régészeti topográfiája; A budai és szentendrei járás.*

31 Jankovich B.D., Makkay J. and Szőke B.M., *MRT* IV/2 *et al.*, *Magyarország Régészeti Topográfiája: a Szarvasi járás.*

32 Hatházi, "New Findings in the Research of Turkish Palisades in Fejér County", 125–127.

33 Gerelyes, *et al.*, Archaeology, 623.

34 E.g. Dillich, Hallart-Wenning, Fontana, De la Vigne.

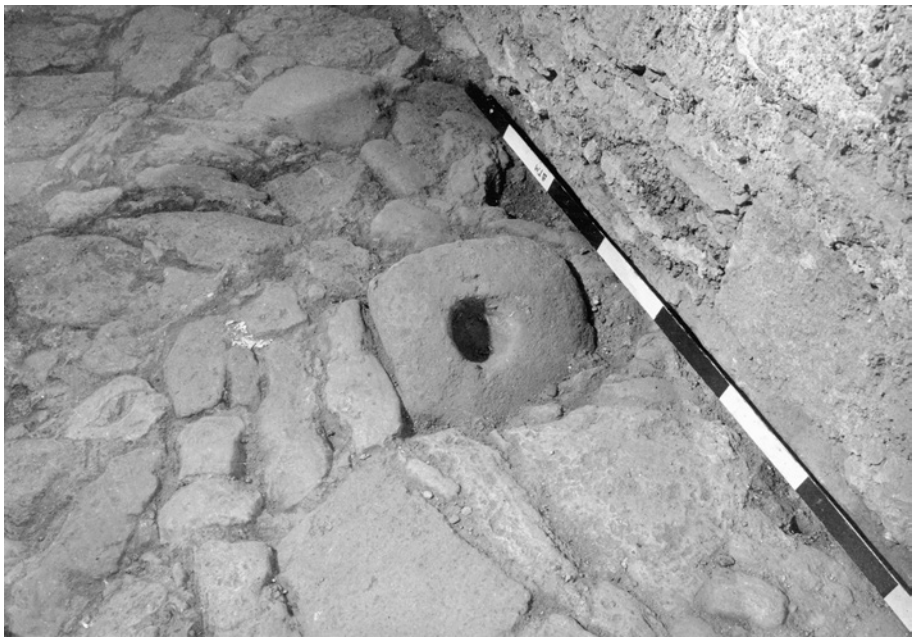

FIGURE 11.15 *Stone with mortise excavated in the great yard of the Pasha's Palace Budapest History Museum* COLLECTION OF ARCHAEOLOGICAL DOCUMENTATIONS. INV. NO. 230–77.

FIGURE 11.16 *Stones with mortise excavated in the garden of the Pasha's Palace* PHOTO: A. PAPP.

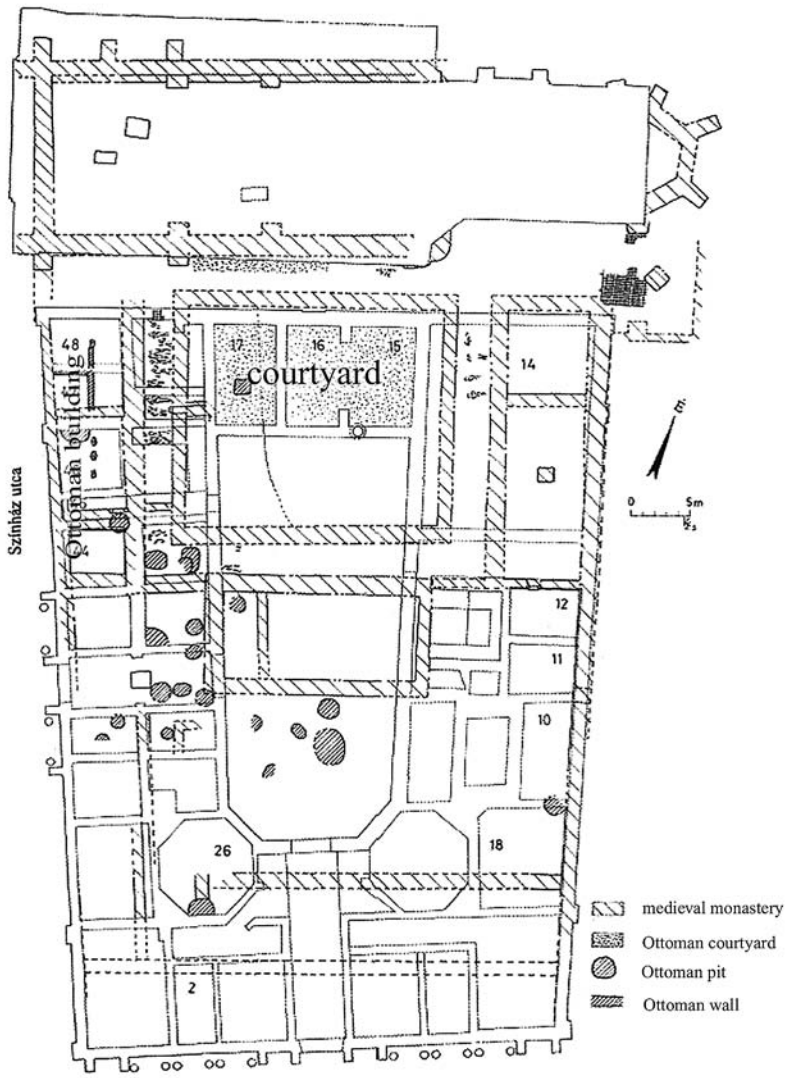

FIGURE 11.17 *Remains of the Ottoman houses in the medieval monastery*
PLAN: ZS. VIEMANN.

accurate ones were made at the time of the city's recapture. At that time, engineers were working on the maps and drawing of the battles and the city itself. The 1686 plan of the fort in the maps of Nicolas Marcelo de la Vigne[35] shows an irregular form (fig. 11.19–11.20). The shape of the fort was fit to the oval of the hilltop. The hill extends west to east where the eastern part is right next to the River Danube. The hillside is steep and rocky here, the gate of the fortress was at the western side. There is no information on the walls on his drawings, but the *veduta* of Wenning made after the drawing of Hallart (1684)[36] shows stockade, like the description of Evliyâ Çelebi.

35 Buda Castle, Budapest History Museum, the prints collection, inv. no. 2014.9.1.

36 Rózsa, *Budapest* kat. 77, Table XXX.

FIGURE 11.18 *Plan of Buda, 1686, made by De la Vigne, at the left side with C: Palisade at the Top of the Gellért Hill Budapest History Museum, Collection of Prints. Inv.no. 2014.9.1*
PHOTO: B. TIHANYI.

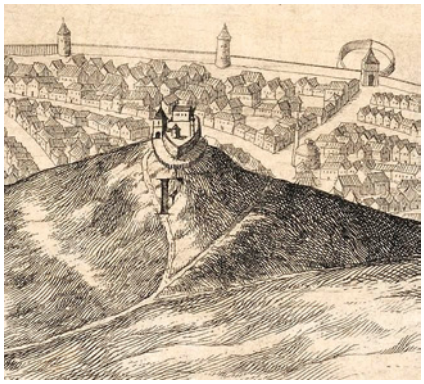

FIGURE 11.19 *Drawing of the palisade at the top of the Gellért Hill from the West (F), Veduta de la Vigne, 1686 Budapest History Museum, Collection of Prints. Inv.no. 2014.9.1.* PHOTO: B. TIHANYI

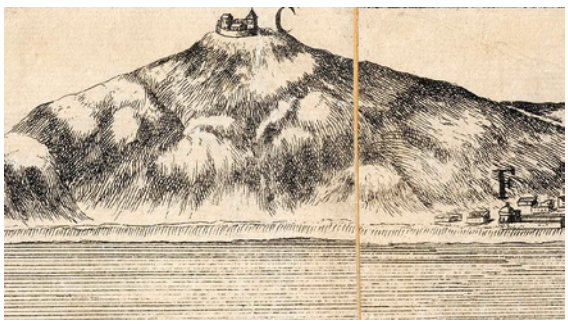

FIGURE 11.20 *Drawing of the palisade at the Top of the Gellért Hill from the East (C), veduta de la Vigne, 1686 Budapest History Museum, Collection of Prints. Inv.no. 2014.9.1* PHOTO: B. TIHANYI.

The fortification of Buda itself was made of stone and has medieval origins. On the vedutas[37] of the city made at the recapture wars we can see stockades in some places. These were rare examples and connected to the correction works during the siege.

To sum up, after the Ottoman occupation a new architectural style appeared in the city of Buda. This implies houses of a new type with wooden structures filled in with mud bricks. In these buildings, porticos and the alternation of wall faces were built. We can identify this type in the category of simple workshops, but the palace of beylerbeyi was constructed the same way as well. It was totally different from the medieval architecture of Buda that was the main reason behind the dislike of Hans Dernschwam. On the other hand, it was very familiar to Evliyâ Çelebi, an Ottoman traveller, to whom Buda was undoubtedly marvellous. Unfortunately, we have only little information concerning this really archetypical architecture.

37 Fontana, De la Vigne.

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CHAPTER 12

Between Tradition and Modernity: Building with Earth in the Contemporary City

Elizabeth Golden

In response to the theme, "Earthen Architecture in Muslim Cultures", this essay explores how building with earth within a contemporary urban environment, situated in a region with a long and rich tradition of working with the material, could become an increasingly valuable strategy for sustainable growth. Highlighting the historic significance of earthen architecture within Muslim cultures is essential, but equally important are the ways in which the craft traditions responsible for these buildings have changed—and must change—in order to remain relevant now and in the future. Although mud might still be considered by some to be "the most important African building material", perceptions and expectations of this resource will require revaluation, particularly in cities, where contemporary needs and desires have had the greatest impact on the built environment.[1]

Over the past fifty years numerous architects and historians have regularly warned of the "loss of tradition" and its negative impact on architecture. In the 1960s, Egyptian architect Hassan Fathy laid out his concerns in *Architecture for the Poor*, asserting that, "as a direct result of this lack of tradition, our cities and villages are becoming more and more ugly".[2] Likewise, while documenting traditional building practices in Niger during the 1980s, the Hungarian-French architect Laszlo Mester de Parajd described the difficult transition to postcolonial modernity: "There are instances, much more common than one might think, where a serious disruption is created over a period of only a few generations—a time when traditions are lost. …Of course young states of the Third World do not want to hear about going back, only the words 'progress' and 'modernism'".[3]

Today, the discourse surrounding tradition's demise has intensified in response to accelerated development and it is becoming increasingly difficult to envision the wholesale return to the "traditional" ways of living, working, and building, that many architects have advocated for in the past, especially in Africa. Some see tradition as a nostalgic, irretrievable and perhaps even objectionable past, while others view it as a foundation for future inquiry. Antoni Folkers observes that "conservative vernacularism was exhausted by the end of the twentieth century"; consequently, "… it is no longer possible to retreat into the past, to return to traditional African building cultures".[4] But Nezar Alsayyad describes a more nuanced understanding of tradition as a mediating agent between past and future.[5] Exploiting the liminality of tradition offers an alternative way forward: time-honored building practices can be reshaped and transformed to adapt to new economic and social forces. To this end, Folkers proposes a hybrid model for development, one based on a "… combination of formal and informal elements, of modern and traditional materials and technology, and the mixture of traditional and international formal aspects…"[6] It is through this lens that we

1 Folkers, *Modern Architecture in Africa*, 223.

2 Fathy, *Architecture for the Poor*, 20.

3 Mester de Parajd, *Regards sur l'habitat traditionnel au Niger*, 17.

4 Folkers, *Modern Architecture in Africa*, 212.

5 Alsayyad, *Traditions*, 58.

6 *Ibid*, 233.

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consider earth construction in a rapidly growing city located in West Africa.

Between Tradition and Modernity

Niamey is the capital of Niger and home to over one million inhabitants. The pressures of globalisation influencing the city's growth parallel those affecting other urban centers in West Africa, but Niamey is only now witnessing the same degree of development that has proliferated across the continent. Niger is a landlocked country with a limited amount of capital for building on the scale that its growing population demands. Most industrially produced building materials are imported into the country, inevitability driving up the cost of construction. Nevertheless, several sizable projects have now reached the planning phase and Niamey is at a crossroads; the traditional ways of living and working are transforming along with the built environment.

Against the backdrop of globalized development, native resources that were typically used for building in Niger—earth and straw—are now gradually being superseded by cement block and corrugated metal. The average person no longer wishes to live in a house made of mud brick or thatch but strives instead to obtain a home constructed of clean, modern materials. The desire for higher social status plays a role in this shift, as traditional materials carry with them the stigma of poverty. The rejection of traditional materials can be at least partially attributed to their poor performance over the last three decades. Repeated drought in the region has led to the scarcity of wood and plants often used for building. Older methods of construction have been forgotten or modified, and the annual custom of repair and replastering has fallen out of favor, leaving many

FIGURE 12.1 *Yaama mosque*
CREDITS: AGA KHAN AWARD OF ARCHITECTURE/PHOTO CREDIT KAMRAN ADLE.

earthen buildings vulnerable to the elements. Lifestyles have changed, and often there is little time to invest in the labor-intensive construction methods upon which previous generations relied. All of these issues have altered Nigérien building practices and even minimal modifications have substantially affected the durability and performance of natural materials for the long term.

The fragility of this architectural heritage can be observed in Niger's most well known example of mud brick or banco architecture, the Yaama mosque, which was completed under the guidance of the Nigérien mason Falké Barmou (Fig. 12.1).

The mosque's construction began between 1962 and 1963, with expansion and embellishment between 1978 and 1983. This expansion transformed an ordinary village mosque into a significant work of architecture that won an Aga Khan prize in 1986. The building is a display of Barmou's mastery of mud masonry and showcases building techniques typically only seen in centuries-old Hausa structures of Northern Nigeria. Ismaill Serageldin underscores the importance of Barmou's translation of traditional methods:

"There is a manifest will to use traditional techniques in a creative manner, to experiment with them and to achieve results that induce a new awareness of their possibilities. Within the local context this is a very striking element: almost everywhere traditional architecture is losing its momentum, but in this case, it is very much alive and exploring its possibilities."[7]

Earthen architecture of the Sahel has been described as deceptively solid—its appearance does not always reveal its hidden capacity for transformation.[8] Mud's malleable qualities allow for creative modifications, as generations of masons have shown. However, its impermanence also necessitates annual repairs and the periodic reapplication of plaster render. Shortly after its completion, the Aga Kahn award team documented visible signs of deterioration of the outside walls and other areas of the Yaama mosque, acknowledging the need for constant maintenance.[9] While the necessity to re-plaster never diminished, a lack of trained masons contributed to the mosque's degradation. Fortunately, thanks to its prominence, the mosque has recently undergone renovation, but this is not usually the fate of contemporary *banco* structures.

Earth is Urban

Despite its recent decline, earth has long been essential to several parallel and overlapping building traditions, especially in the Sahel region where Niger is located. A number of different ethnic groups across the region have influenced and developed a variety of styles and techniques for working with the material. This legacy informs our consideration of the cultural as well as the environmental dimensions of earth as a building material and its usefulness in forming contemporary urban settlements.

Building with earth in an urban setting is not new to the region. Hausa cities, for example, reveal to the contemporary observer that the material was once crucial in establishing dense settlements on the vast agricultural landscape of northern Nigeria.[10] If earth were to once again be deemed a viable resource for constructing housing within cities, then the material would stand a greater chance of acknowledgment in other, less cosmopolitan locales. Cities can act as hubs, disseminating information and knowledge about a particular building technology to the countryside, other regional settlements, and beyond. Cities are the most affected by population growth in

7 Serageldin, *Space for Freedom*, 133.

8 The Sahel is a semi-arid region located between the Sahara (to the north) and the Sudanian Savanna (to the south) and extends from the Atlantic Ocean to the Red Sea. This area is defined by its tropical, hot climate (Köppen climate classification BSh), and its mostly flat topography.

9 Aga Khan Award for Architecture, *Yaama Mosque*, 21.

10 Moughtin, *The Traditional Settlements of the Hausa People*, 22.

sub-Saharan Africa, so it stands to reason that they might also provide the best place for industry professionals and artisans to evaluate and promote large-scale projects using earth as a primary building material.

Does earth have the capacity to meet the demands of large-scale urban growth and development in a city such as Niamey? Probably the single most important determinant of earth's future as a building material will be its continuing cultural acceptance. In order to reflect the desires of contemporary society, new ways of engaging the material must be developed. On one hand, the material should capture the public's imagination by retaining some essential characteristics, such as weight, coolness, and tactility. These are the same attributes that many manufactured products lack. On the other hand, issues of durability and quality must be addressed through the adoption of contemporary building codes and construction practices. In addition to cultural acceptance, earth construction technologies must also be as affordable as other materials currently on the market.

Traditional handmade mud brick construction is inexpensive, but requires many modifications in order to withstand moisture and to meet contemporary codes and standards. One modern adaptation of mud brick is the compressed earth block (CEB), which was developed in the 1950s to address the issues of unpredictability and durability of mud brick construction. CEBs are made by combining earth with cement (typically 4%–8%) and compressing the mixture with either a manual or mechanical press (Fig. 12.2). The press's pressure creates a durable unit that can withstand moisture better than a typical mud brick without render.

CEBs were frequently used in the 1970s and 1980s for development projects in Africa and South America, but rarely saw large-scale use in, or outside of, developing countries due to the

FIGURE 12.2 *Compressed earth block production*
PHOTO CREDIT: MARIAM KAMARA.

high cost (of the press and cement) and time investment (despite mechanization, the blocks take much longer to produce compared traditional methods because the earth requires sifting before use).[11] Nevertheless, this technology has recently reappeared in several locations globally and the renewed demand stemming from a focus on sustainable growth could finally lead to the production of CEBs on an industrial scale. Even though this method could precipitate the loss of traditional production methods, it could offer a way to utilize earth for contemporary development.

Niamey, 2000

Historically, Niamey has never been considered an "earthen city" like its urban counterparts, Agadez or Zinder. Its existence is brief in comparison, and the traditional dwellings of its earliest settlements were typically made of lighter materials, such as wood and thatch. More permanent structures such as mosques, as well as the houses of significant community members, however, were commonly constructed from plastered mud brick, locally known as *banco*. The use of banco was even mandated by the city government in 1926 after a major fire destroyed the thatched dwellings of area inhabitants.[12] Since Niger declared its independence from France in 1960, reinforced concrete and cement masonry block have steadily replaced banco and thatch construction. Nevertheless, interest in compressed earth blocks (CEB) has increased in Niamey in recent years.

At the same time, the demand for housing has increased in the city, spurred on by population growth and migration. The proliferation of the compound—a single, one-story dwelling surrounded by a perimeter wall—has influenced much of the city's growth and character. While the compound is one of a few housing typologies found in Niger (as well as many other countries) it does not provide the density required to sustain the current level of urban growth. Niamey has yet to see its first large-scale housing project, but it is only a matter of time until investors capitalize on the city's growing need for living space.

The deficit of housing alternatives in Niamey attracted the attention of united4design, an architecture firm with partners hailing from Niger, Iran, Germany, and the United States. The team elected to engage the issue at the local level by developing an alternative model for multi-family housing that would increase density while at the same time respect the existing scale of the city and the privacy afforded by the compound wall. The architects proposed to house six families in the same area as a conventional, single-family compound lot (roughly 1,500 square meters) (Figs. 12.3 & 12.4).

The dwellings were designed to extend over two floors, producing residences unlike most in the city. Lower and middle-income accommodations are not typically two-story structures, but in a growing urban center such as Niamey, this strategy becomes increasingly relevant as the city expands and commuting distances increase. The living units were closely clustered around courtyards; this tight organization follows older housing configurations found in pre-colonial cities of the region, such as Timbuktu in Mali, Kano in Nigeria, or Zinder in Niger, which were all dense urban centers in their day. The arrangement is not without its challenges; privacy is important in a city located in a predominantly Muslim country, and the layout of the living spaces was carefully considered to accommodate this cultural necessity (Figs. 12.5 & 12.6).

Niamey 2000 is named after the neighborhood where it is located and is currently the only densely planned housing estate in the city. Local investors privately funded the project with the goal of selling the units on the open market to middle class families. Local materials and production methods were used to construct the building and—with the exception of three members of the design team—expertise for the project originated from within the country or neighboring Togo.

11 Minke, *Building with Earth*, 63.

12 Youngstedt, *Surviving with Dignity*, 36.

FIGURE 12.3 *Niamey 2000 aerial view*
CREDITS: UNITED4DESIGN/PHOTO CREDIT TORSTEN SEIDEL.

FIGURE 12.4 *View of Niamey 2000 from street*
CREDITS: UNITED4DESIGN/PHOTO CREDIT TORSTEN SEIDEL.

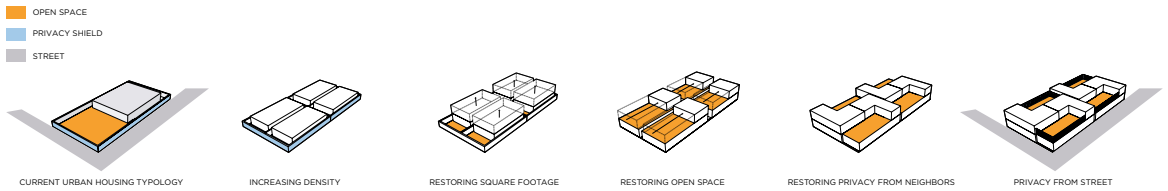

FIGURE 12.5 *Density and privacy*
CREDITS: UNITED4DESIGN.

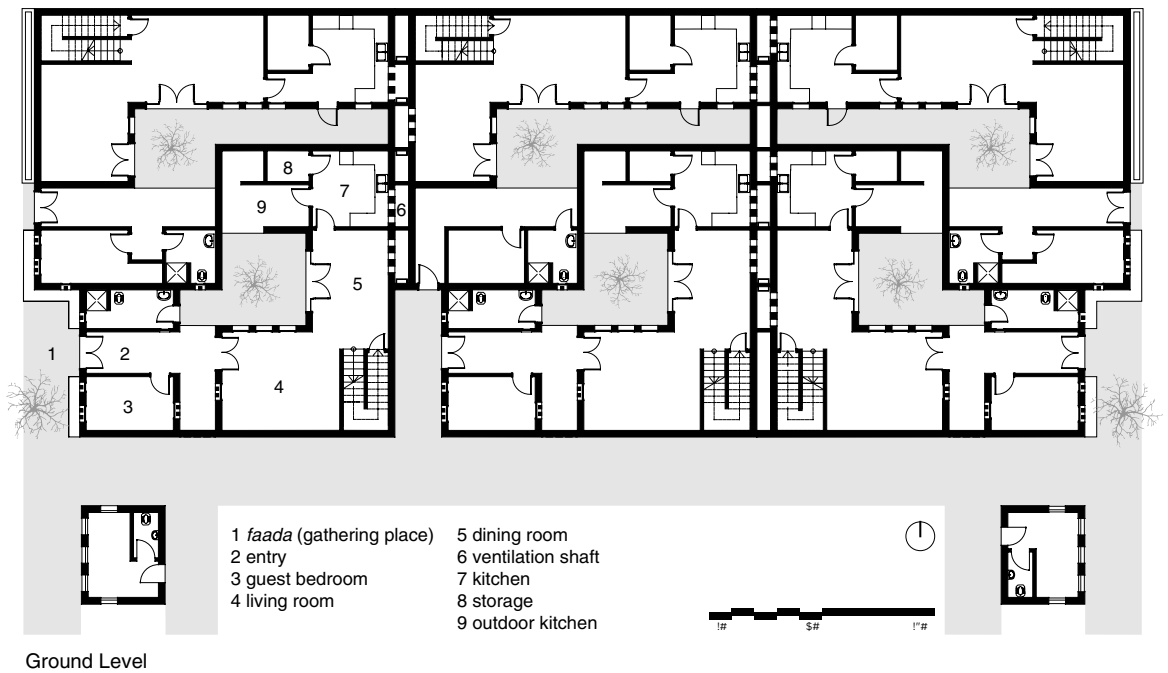

FIGURE 12.6 *Ground level plan*
CREDITS: UNITED4DESIGN.

At the outset, the team made the strategic decision to use earth as the primary material for Niamey 2000. A key goal for the project was to establish a model for urban development that could leverage earth-based construction, not only for its sustainable attributes and its cultural associations, but also for its potential to be transformed into an attractive and desirable commodity. Compressed earth block seemed to offer the best method for integrating earth-based construction with the contemporary demands of urban housing. However, despite modest interest in CEB, the system is still far from achieving mainstream acceptance.

The architects understood that for CEB technology to succeed beyond Niamey 2000, the material must be proven reliable and profitable, as well as desirable. As a result, the project became a pilot for promoting CEB technology. CEB does have a higher standing than mud brick, while offering many of the same benefits. It can be produced from local soil and performs well thermally in arid environments. In addition, it offers an environmentally friendly alternative to cement block. Even though CEBs are almost always processed in small batches, using manual labor and simple machinery, the blocks have the appearance of an industrial product, with smooth surfaces and consistent dimensions. In terms of cost, once the initial investment for the brick press is made, CEB can be produced as cheaply as cement block, another material that

FIGURE 12.7 *Construction*
CREDITS: UNITED4DESIGN/PHOTO CREDIT: MARIAM KAMARA.

is often made in small batches using rudimentary methods.[13]

CEB construction is not well known in Niger; most engineers are only familiar with conventional structural systems based on steel or reinforced concrete. Due to the complexity of the two-story construction, URBATEC, the most respected engineering firm in Niamey, was enlisted to perform the structural calculations for the project. The engineers were sceptical of the loadbearing capacity of the bricks and opted to add minimal insertions of reinforced concrete to the masonry bearing walls. The addition of concrete was not ideal; however, the architects anticipated that by working with the material and gaining a familiarity with the capacity of CEB masonry, the engineers might be more willing to work with an all-CEB system in the future.

13 Cost has been one of the predominant impediments to the large-scale adoption of CEB, making it important to explore the economics of the technology in Niamey and to test the limits of local production. If the cost and rate of brick production could compete with concrete blocks, then a greater number of projects might feasibly be planned using CEB in the future. Increased demand will help to lower the unit cost over time.

FIGURE 12.8 *East entry*
CREDITS: UNITED4DESIGN/PHOTO CREDIT TORSTEN SEIDEL.

FIGURE 12.9 *Dining room*
CREDITS: UNITED4DESIGN/PHOTO CREDIT TORSTEN SEIDEL.

FIGURE 12.10 *Upper terrace*
CREDITS: UNITED4DESIGN/PHOTO CREDIT TORSTEN SEIDEL.

The architects selected a contractor with previous experience in producing and building with CEB. Once pressed, the blocks were cured for a month before they were used for construction (Fig. 12.7). The project required double-width masonry walls in most areas, which totalled 30 centimetres in width. The resultant coursing was not overly complex, nor did it require exceptional skill, however, the workers spent more time and effort than they would have laying concrete masonry. Because of this, several teams left the job for other projects requiring less effort. To avoid this complication on future projects, the architects examined a few alternatives. Wider blocks would simplify construction by reducing the number of units, however the weight of a block would need to be considered along with its size. A certification process could also be instituted, which would give CEB masons special status, perhaps giving them an edge over unskilled labour.

Niamey 2000 was used not only to introduce CEB construction to the building sector, but also to present the benefits of the material to the general public. Following local preferences, the masonry walls are covered with plaster render. The bricks were left unfinished in select areas, but even when unseen, the material makes its presence known as the masonry's thickness lends a sense of protection and comfort to the living spaces and slows the transmission of sub-Saharan heat (Figs. 12.8 & 12.9). The depth of the enclosure is perceived through openings in the walls, especially at the thresholds between the interior and the exterior spaces. Masonry screens on the main *façades* and the staircases hint at the system responsible for supporting the building (Fig. 12.10). It is through small clues that the occupants gain an appreciation for earthen construction. These qualities, along with the project's contemporary aesthetic, are intended to appeal to the local market (Fig. 12.11).

Traditional Future

Historically, earth has not had a strong lobby of trade organizations and manufacturers to support the sort of testing and promotion enjoyed by its industrially produced counterparts, steel and concrete. Its only promoter has largely been nongovernmental aid organizations active in developing countries, and with the exception of a few projects, much of this work has resulted in one-off construction projects that have made little impact on local building practices, especially in urban areas. Most of these efforts emphasize technology transfer and training, focused toward self-built housing in rural areas.

Niamey 2000 is very different in this regard. It is not the product of an outside aid organization, but rather a locally funded, private venture, designed with the aspiring Niaméen middle-class in mind. The use of earth for the project has been promoted as a selling point and integrated into a structure that appeals to the desire to own a contemporary looking home.

The project represents a hybrid model combining traditional as well as contemporary materials and technology. In this way, earth has the potential to be appreciated and valued once again for its diverse cultural and functional properties.

If left to run its own course, the practice of building with earth in Niger may continue to survive for a few more decades, and for the very poorest individuals living in rural areas, the custom may never fully become extinct. As the country continues to grow and more foreign investors pledge funds for building public as well as private infrastructure, large-scale housing projects seem a likely addition to the urban landscape. A few well-conceived projects in the capital, using local

FIGURE 12.11 *Prospective homeowners*
CREDITS: UNITED4DESIGN/PHOTO CREDIT TORSTEN SEIDEL.

expertise and production methods, could set a valuable precedent for building with earth in the future.[14]

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14 During 2014, Comitato Internazionale Per Lo Sviluppo Dei Popoli (CISP), funded by a branch of the European Commission, led an educational initiative to increase the understanding and appreciation of earthen architecture within Niger. In addition to a conference, documentation, and educational seminars, two demonstration houses (low-income) were built using mud brick and CEB construction respectively. While these efforts are laudable and were sanctioned by the local government, the housing was designed exclusively by foreign architects and funded by outside agencies.

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