

Mud Brick Architecture in Ḥaḍramawt-Yemen under the Qu‘aiti and Kathiri Sultanates

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Ḥaḍramawt is a vast, semi-arid region in the South of the Arabian Peninsula, situated between the immense Rub al-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 a thousand meters.

The Yemenite power of Sana‘a set up these last decades a massive immigration of north-Yemenite za‘idite populations to try an assimilation of a historically Sunni territory. Al-Qaeda found a place in the Arabian Peninsula where it could develop between refusal of the 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 Qu‘aiti Sultanate and the Kathiri Sultanate, of this Protectorate will disappear in 1967, as the other sometimes tiny entities: they possessed their flag and issued numerous emissions of postage stamps. Ḥaḍramawt tried for a short while to be independent with the support of Saudi Arabia that would have liked having 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. In 1990, the general reunification of Yemen was made to the detriment of the South and especially of Ḥaḍramawt.

Politically autonomous and separate from the 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 the production of aromatic resins, also guaranteed the commercial traffic of precious items that were highly appreciated by the Mediterranean world and 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, as described by ancient authors such as Strabo. Located at the entrance to the wādī Ḥaḍramawt, the old *Sarīrān*, the city controlled all the routes that led towards Gaza, Petra and Palmyra. The wādī flows from the high plateaus of western Yemen that rise more than 3500 meters, crossing the desert of Ramlat al-Sab‘atayn underground, followed by 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, inhospitable, in the North, is on the fringe of the desert; the other, in the South, between the wādī and the ocean, descends steeply towards a narrow coastal plain. The 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,

¹ We do not know exactly the origin of this name. During antiquity, we can find *hḍmt* or *hḍrmwt* 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), “*Hāṣarmāweth*”. We find also the name of these people in Greek (Strabo) and *Atramitae* in Latin (Plinius).

which is the most important oasis with major tributaries such as wādīs Dū'ān, 'Amd and 'Idīm coming from the south.

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

The tribal structure of the population quickly gave rise to several state entities, often in conflicts, such as, in the beginning of the 19th century, with the Qu'aiti Sultanate, including the city of Shibām, ruled from al-Mukalla and the Kathiri Sultanate, including the town of Tarīm, ruled from from Say'ūn (fig. 7.1). Great travellers, the Ḥaḍramīs, colonized numerous coastal regions just 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 and also fashions and architectural models that transformed the large houses of Tarīm and Say'ūn into “Maharajah's palaces” (fig. 7.2), as illustrated by the palaces of the al-Kāf family (fig. 7.3)³

2 “Of all parts of the Arabian Peninsula, Ḥaḍramawt is pre-eminently the land of emigration. In Dutch East Indies 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 Qu'aiti territory is a quarter of an hour's walk from Shibām. Here is a custom-house, a white Kathiri military

A city cannot be separated from its rural context and territories. Likewise, agriculture cannot be separated from the wādīs' flood management nor architecture from building construction techniques. ■ Please provide in-text citation for Figure 7.4.

“Each irrigation network is associated with a house,” wrote Pierre Gentelle about the agricultural soils of the lowlands around Ramlat al-Sab'atayn.⁴ Conversely, it can be added that there is no construction without the existence of an irrigation system. The clay of raw bricks, or rather sunbaked bricks, comes from the muddy deposits which constitute fields. 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 its processing into a construction material easy to do. Two inconveniences are the duration of the manufacturing and the number of bricks needing to be produced.⁵ A great advantage is the close proximity to raw material and the manufacturing workshops that are usually associated with construction sites.

The construct buildings the Ḥaḍrami mastered the techniques necessary for using this easy available “at hand” material that, nevertheless, had a limited time span and, therefore, required periodic renewal.⁶ They developed an exceptional architectural type—the tower-house, which is

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 Dū'ān: “...to the right in the far distance the lies the village of Ḥōra with a great castle and a watch tower on a hill. It is a small Qu'aiti 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 de'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 them fall in to ruin. Then they reconstruct a house of the same type in the same location.

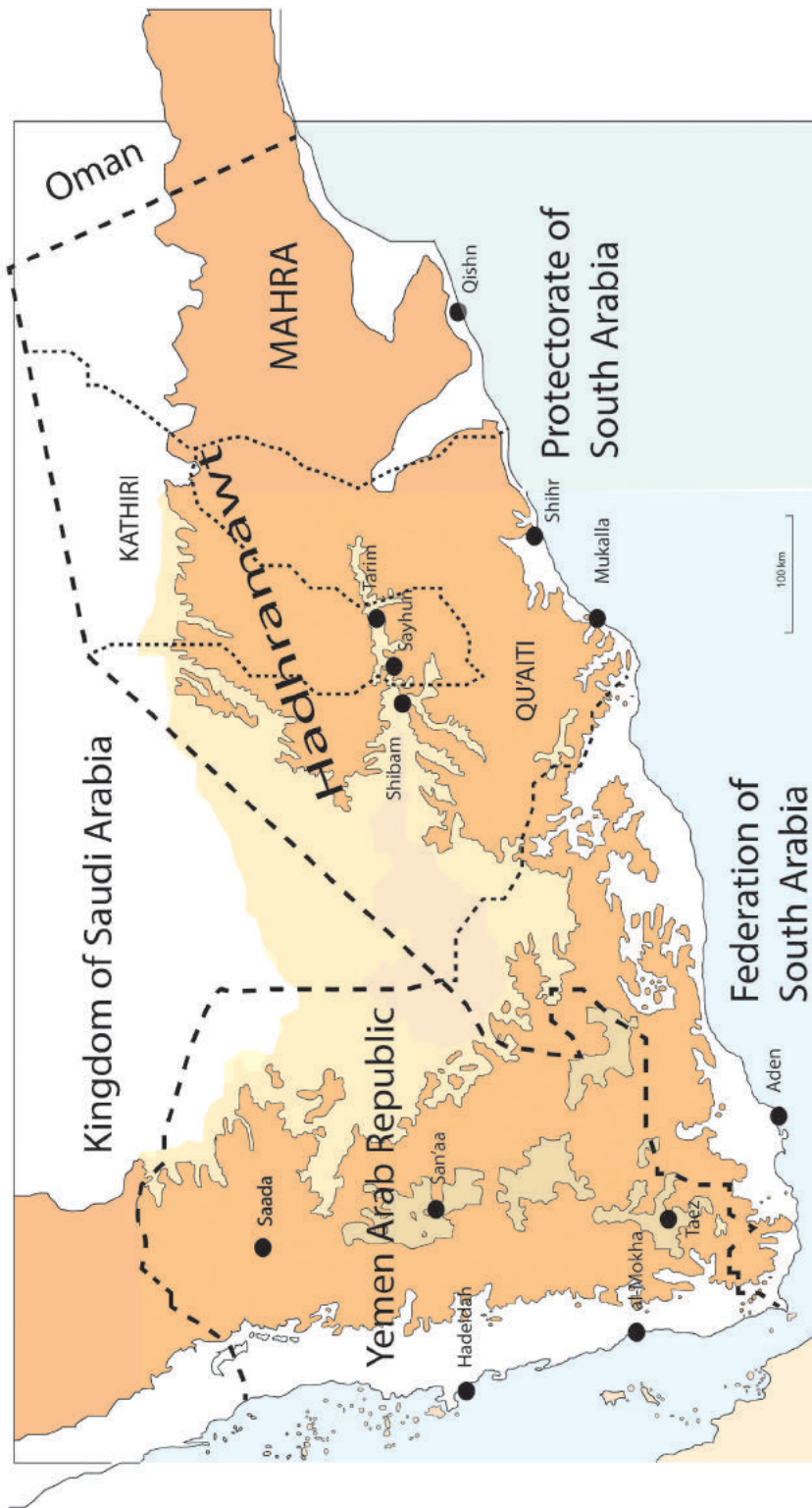


FIGURE 7.1 Map of Southern Arabia during the two Sultanates.
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FIGURE 7.2 *Palace of the al-Kāf Family.*
CREDITS: CHRISTIAN DARLES.

found 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 the techniques used in mud-brick construction. One also finds this material used not only for the building above but also for the construction of floors. The sites are Jujah, where the Institute of Fine Arts of New York University excavated in the valley of wādī Ḥaḍramawt for two brief seasons during 1994 and 1995 (Shabwa-Mission Archéologique Française au Sud-Yémen, 1974–2002), and Raybūn, where the Russian Archeological Mission in Ḥaḍramawt was active between 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 dates from the 16th century BC to the 5th century AD. The earliest periods are characterized by domestic buildings

constructed primarily of mud-brick. In this period irregular clumps of not entirely mud were absent, excluded especially for enclosure walls and floors. The fortification dating from the latter half of the first millennium BC comprise a large mud-brick structure faced with finely worked limestone. It was at Shabwa where, 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 the mud-brick was only used above a basement or foundation. At Tamna further to the west, French and Italian archaeologists found the same style of architecture built on a foundation of granite.

The Ḥaḍrami towerhouse is connected with the model of the fortified farmhouse (fig. 7.7). It shelters stored produces and animals in the lower levels, which are less exposed to the outside. The

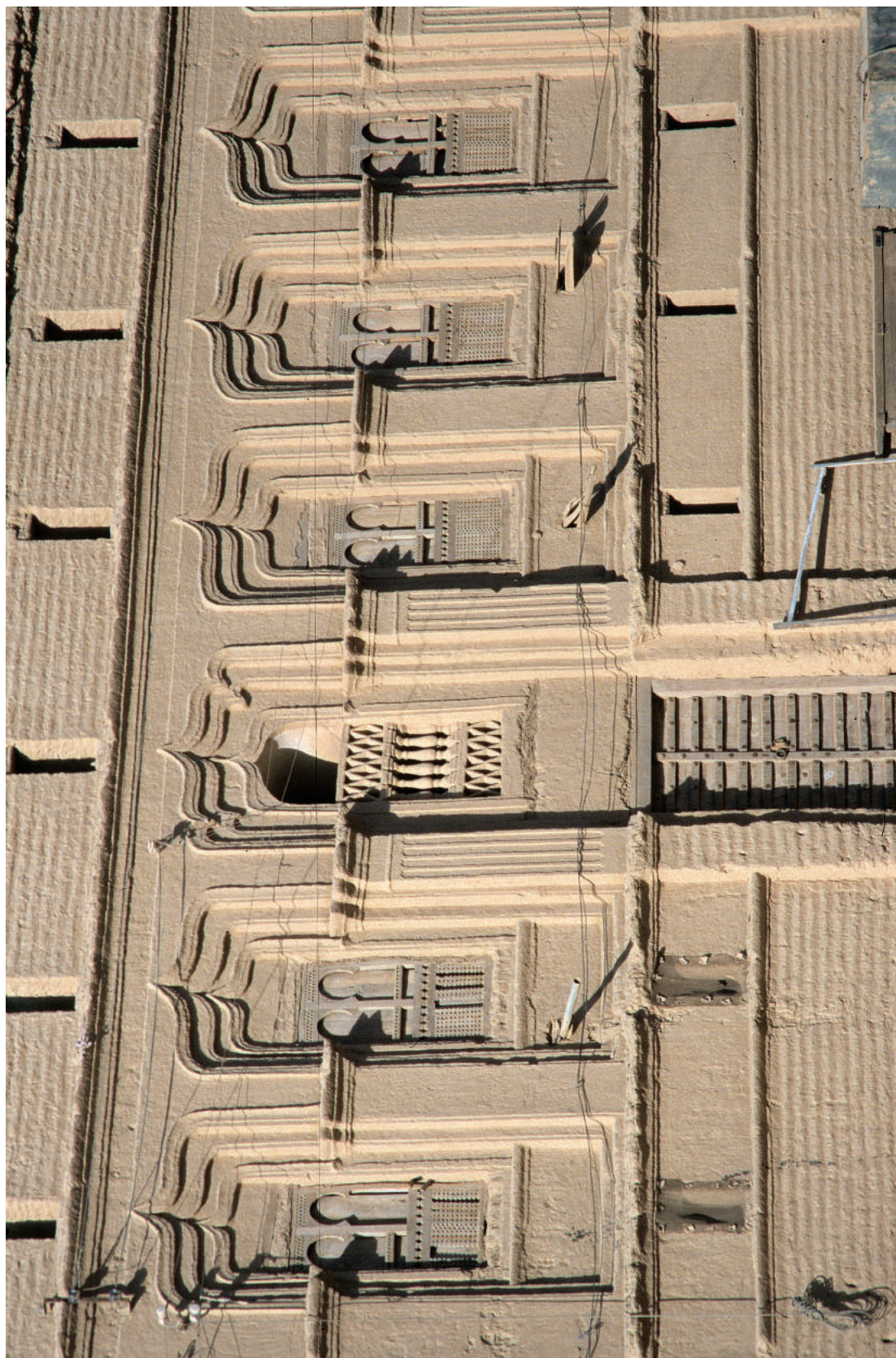


FIGURE 7.3 Detail of one of the Palaces of the al-Kāf Family in Tarim.
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FIGURE 7.4 *Custom House Built by the Kathiri.*
CREDITS: CHRISTIAN DARLES.

intermediate floors are reserved for residential areas while the upper level, with its 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 building. There are no adjacent walls and when an owner buys a contiguous house, it is necessary to open up walls and establish interconnected floors.⁷

This vertical construction, sometimes massive, but most of the time high-rise and slender, 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 the mud from local silts and takes climatic constraints into account, particularly those associated with monsoon rains that are often violent and damage the moulded or modelled elements that it is necessary to protect. Heaps of abandoned surplus bricks melted in the rains, and after a few seasons transformed again into building material.

The inhabitants of South Arabia, during their history, 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 Sa’dah or in Mā’rib

⁷ Breton *et al.*, “Les maisons-tours dans l’Antiquité”.



FIGURE 7.5 *Tower House of a rich People in Shibam.*
CREDITS: CHRISTIAN DARLES.

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

The fertile silt from irrigated agricultural land supplies the earth for making mud. The flood waters were always mastered by sedentary inhabitants. They transport a large quantity of alluviums that feed fields while contributing to their raising. The surplus of earth from fields constitutes homogeneous and finely sorted construction material. Since Antiquity, man built houses using the fertile earth from fields without any conflict between his farming and building activities. The only thing necessary is the transport to construction sites,



FIGURE 7.6 *Façade of Shibam above the Wādī Hadramawt.*
CREDITS: CHRISTIAN DARLES.

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 continued without notable changes in the manufacturing processes and implementation.⁸

The earth was always collected near the place where it will be transformed into building material. The construction site changes location and the brickyard moves according to needs. An open area is cleared of unwanted debris and the brickyard is organized. Earth is heaped on a first location, straw is stacked nearby and some old cans are filled with water. If the water well is distant, donkeys are used to carry goatskin containers. The place where the mixture is made will remain 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 inclusions such as grass straw, the construction earth is placed on a small stretcher by two workers and brought to the place indicated by the worker who moulds it and is responsible for the construction site (fig. 7.9). They immediately

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.

put it down by his 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 well 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

9 Aurenche, *Dictionnaire Illustré Multilingue de l'Architecture du Proche-Orient Ancien*; 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.

As a rule, the 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). The drying of the moulded bricks does not last more than three weeks. Bricks dry flat at first (from six hours to three days), then set on edge (from five to 15 days), arranged vertically, in fishbone array and moved repeatedly to dry uniformly. They can be used immediately afterwards or stored depending on progress at the construction site. In Ḥaḍramawt they can be stored for several months nowadays (fig. 7.12 and 7.13).

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

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



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

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

The generally plano-convex bricks, in Ḥaḍramawt, are more than 40 cm in length by 25–28 cm in width and 5 cms in thickness while at

Sana'a the dimensions are 25 cms by 18 cms and 10 cms in thickness. On each horizontal foundation the builders put a layer of earth mixed with grass straw intended to receive the following row. The bonding mortar generally comprises diluted clay.



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



FIGURE 7.10 *Mud Bricks Molds.*
CREDITS: CHRISTIAN DARLES.

Used in plastering, it fills the gaps between bricks as they are laid.¹¹

The mud brick construction in the city of Shibâm 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 wellbeing. The building techniques are (still today) maintained by skilled masters. For example at Shibâm, the tower-house often replaces 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, council agreed to limit the 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. The terraces bordering reception rooms constitute important open spaces with no ceiling other than the sky above. They possess large windows and small openings allowing to view the activity of the street and the opening of the main door. These terraces are the archetypal places of family life, women and young children. The outer ring of buildings that lead to the peripheral rampart wall of the city of Shibâm form



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.

a second defensive fortification. The 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 and vary between 0,90 m and 1,10 m wide, made 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 and 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. The use of this kind of bricks, in the past as well as today, requires protection against humidity, against rare run off waters, spray from roof spouts which splash on the ground, and against 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 guarantees the waterproofing of 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). Lintels are rehabilitated and the inscriptions engraved on their faces allow the dating of the most recent reconstructions of the house. Reused wooden fittings carefully taken to pieces, are installed later, their

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

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

¹⁴ *Ibid.*

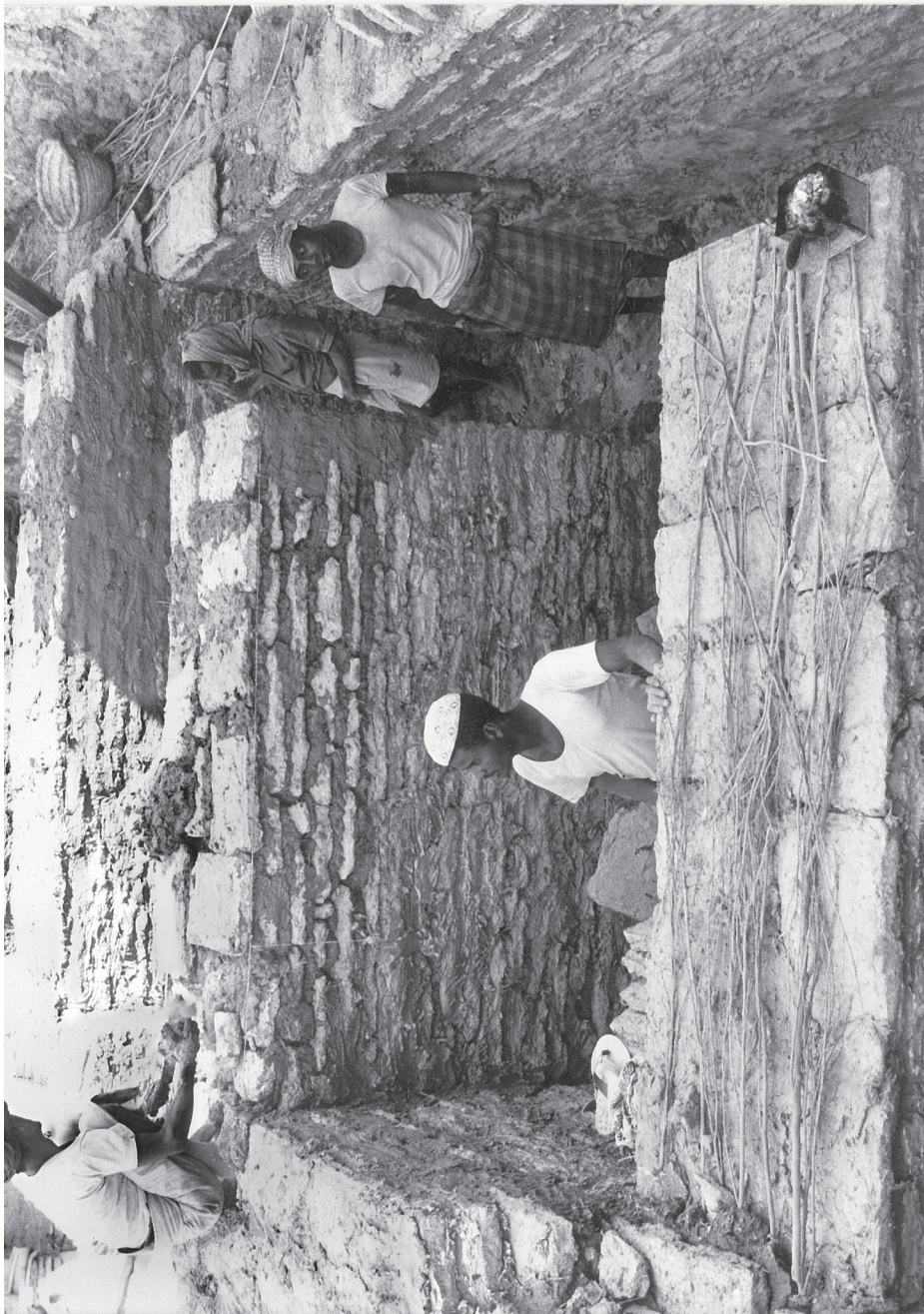


FIGURE 7.15 Between every five Courses of Mud Brick Construction, the Muallim insert cut Branches as a Chaining.
CREDITS: CHRISTIAN DARLES.



FIGURE 7.16 *Plastering Work of the Façade of the Tower Houses.*
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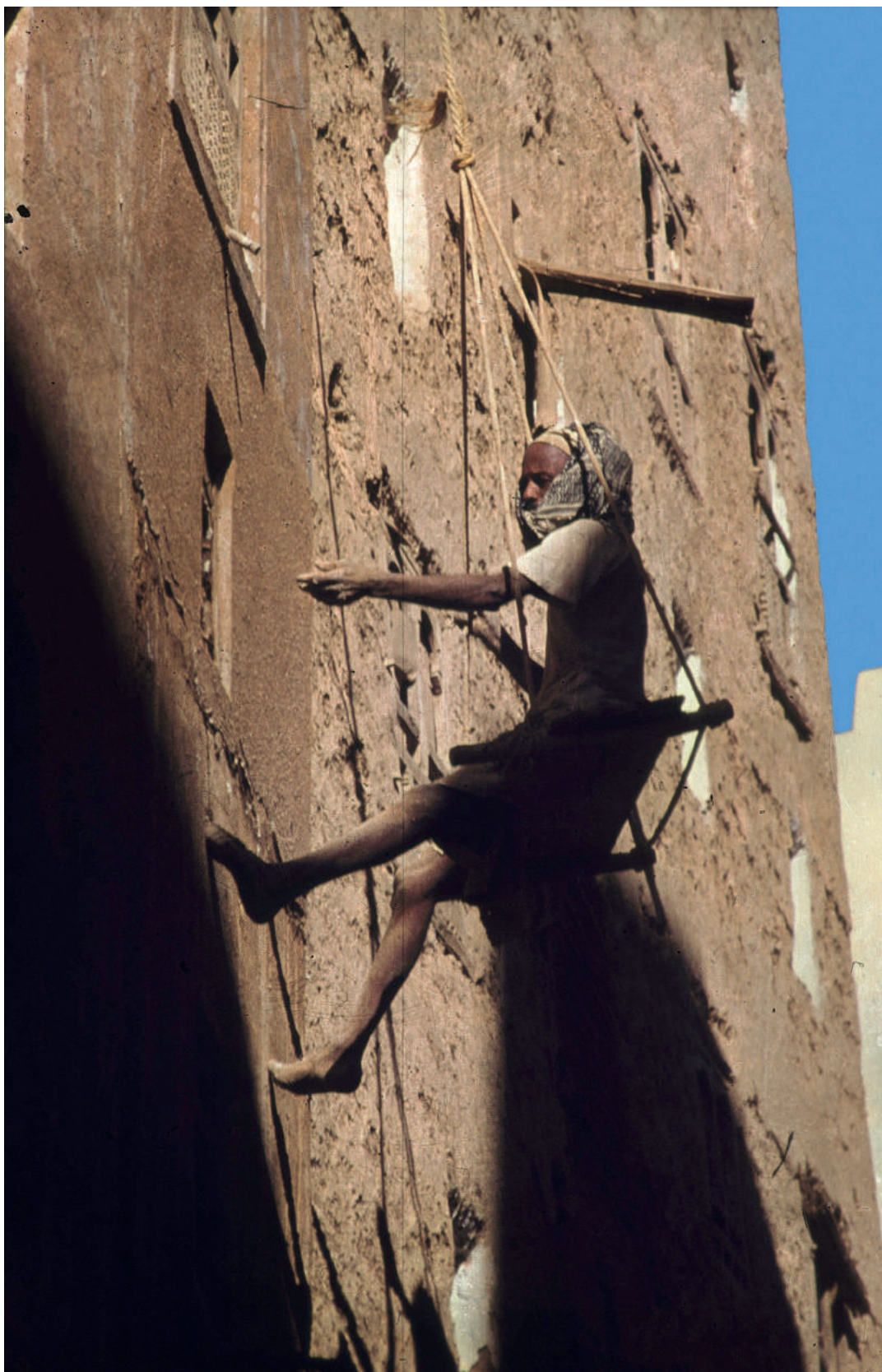


FIGURE 7.17 *Often suspended the Worker is Alone.*
CREDITS: CHRISTIAN DARLES.



FIGURE 7.18 *Lime-based Ramad for Waterproofing the upper Parts and Basements of the Houses.*
CREDITS: CHRISTIAN DARLES.

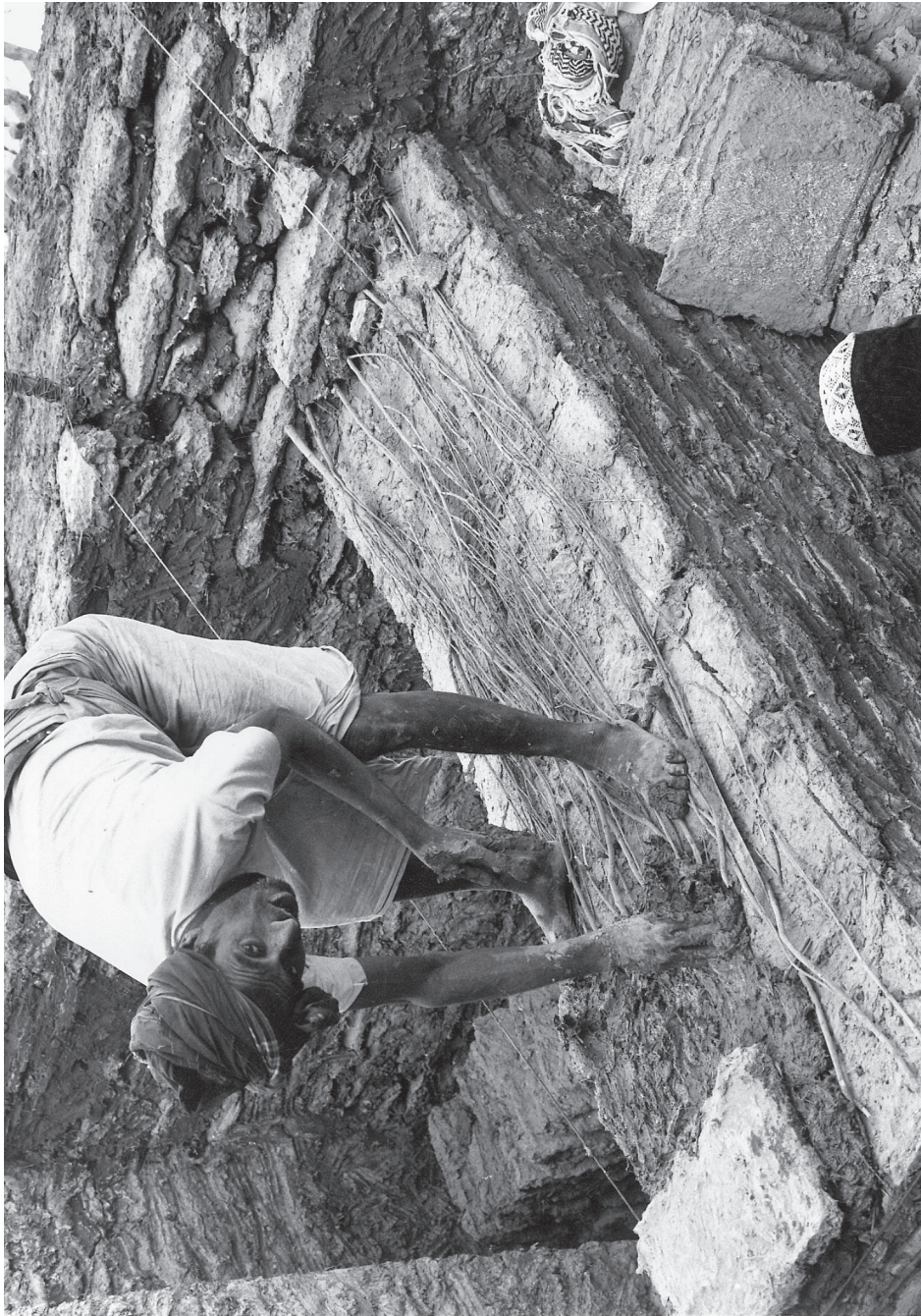


FIGURE 7.19 *Branches and Timbles enable the Clamping of the Walls.*
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FIGURE 7.20 *Indonesian Palace of Tarim built by a rich Yemeni Merchant in southeast Asia.*
CREDITS: CHRISTIAN DARLES.

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. The internal walls, and the 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.

The lower levels have thick and close walls and very narrow rooms are not rare. In the upper floors, the use of wooden posts allows to increase the surface area of living rooms without increasing the bearing of horizontal timbers. This composite architecture combining wooden linear vertical carrier elements to raw brick-built walls 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 an animal was sacrificed by the workers (most often a goat) walls are coated for the last

time and the wooden fittings installed. Then only, after payment of craftsmen, the owner can enter his house.

And so they built at Shibâm in the Qu'aiti Sultanate and also at Say'un in the Kathiri sultanate. At Say'un however buildings are lower. At Tarim, east of Say'un, the great number of large, square palaces is noticeable (fig. 7.20). They are not ochre and white as in Say'un and Shibâm, 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 round but square in shape, and also plastered in a shade of blue, is a thing by itself. Tarim is a town of many rich men: one can see that even from a distance".¹⁵ The most beautiful house in all Tarim was the one of Sayyid 'Umar bin Shaikh al-Kâf, 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 found also 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 few extensions on the roof and some decorative designs on the top of the walls or on the parapets.

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

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

16 *Ibid.*, 135.

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