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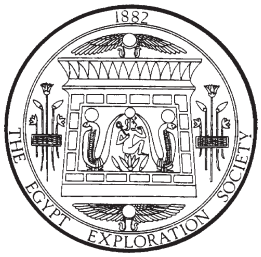


# Delta Survey Workshop

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# Skylines, Bridges and Mud in the Delta and elsewhere. A comparison of Egyptian and Yemeni Tower Houses

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# Skylines, Bridges and Mud in the Delta and elsewhere. A comparison of Egyptian and Yemeni Tower Houses [1]

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### Introduction

Throughout Egyptian history, from the earliest times, domestic houses were built of sun-dried mud bricks. The thickness of the walls usually varied between one and two bricks in length but occasionally also half a brick occurred.[2] At the end of the Third Intermediate Period and the beginning of the Late Period, possibly *c*.700 BC, a massive change in settlement architecture started to take place and a new type of building evolved using mud bricks on a completely new scale. This change can be observed, for example, in the settlement of Ashmunein in squares J10 and K10 (Fig. 1).[3]

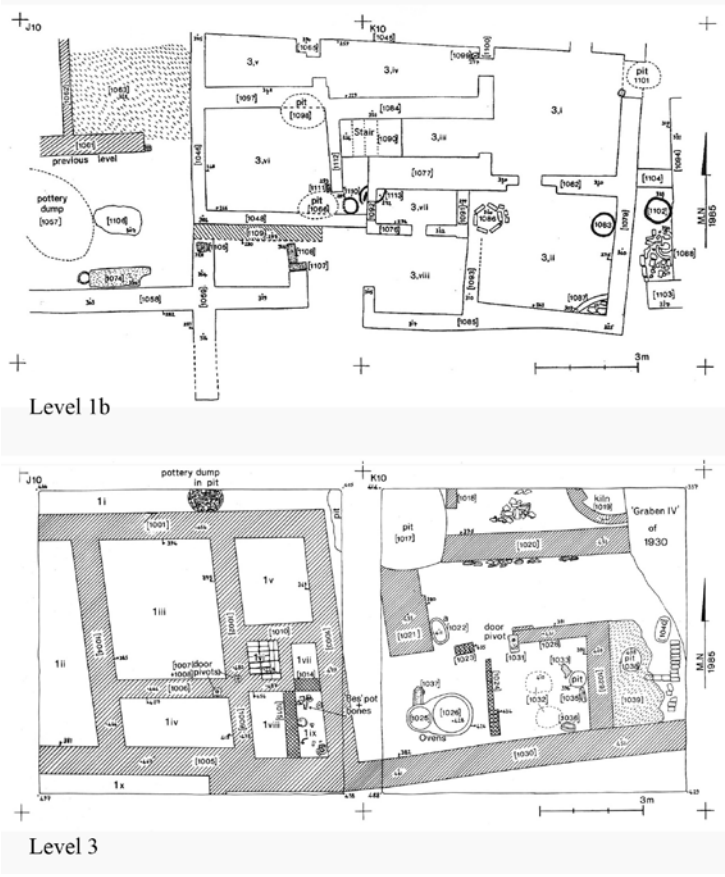



*Fig.1. Domestic houses of Level 1b and Level 3 at Ashmunein. Spencer 1993, Pl. 1 and Pl. 3.*

[1] This article is based on a chapter of my PhD thesis concerning the material culture of the Late and Ptolemaic Periods in Tell el-Dab'a, Egypt, including the architecture and within this the tower houses. Therefore the comparison is mainly focused on tower houses in the Delta during Late and Ptolemaic times, if not stated otherwise. Later examples from the Fayum and other parts of Egypt are also referenced.

[2] For example the houses in Amarna, see Kemp and Stevens 2010, 299-303.

[3] Spencer 1993, Pl. 1 and 3.

The walls of the earlier houses (Level 1b) were about 30cm thick (one brick length), while in Level 3 [4] most of the wall thicknesses had doubled, or even tripled, so that some were up to 1.29m (four brick lengths) thick. The massive foundations and solid walls indicate that these houses were constructed to bear the weight of several storeys, and as such they are known as 'tower houses'. In 1880 Edouard Naville was able to take a photograph of the ruins of such houses at Bubastis (Fig. 2). This image gives a good idea as to the quantities of mud bricks which were being used in domestic construction from this time onwards.

*Fig. 2. Tower houses at Bubastis. Naville 1891, Pl. II. Photograph © Egypt Exploration Society.*

Tower houses are found at widespread locations in Egypt from the Delta to the Fayum and south to Aswan. They were first attested at the beginning of the Saite Period and continued to be built in Ptolemaic and Roman times (especially in the Fayum) and even continued to be in use in Medieval times (Fustat, 9th - 11th centuries).

Unfortunately many *tell*s have been removed to a large extent due either to the *sebakhin*, who used the soil as a fertilizer in the fields or to private companies who sold the nitrate-rich soil that was used for the production of gunpowder.[5] As a consequence the upper layers of the *tell*s (those of the Late, Ptolemaic, Roman and Arabic Periods) in particular are often not preserved, and it is mostly only the foundations of the tower houses that remain, if at all. It is for this reason, that the better preserved buildings of slightly later times (Ptolemaic and Roman Periods) in the Fayum are important parallels for reconstruction of the earlier Late Period buildings of the same type.

Apart from the archaeological data, other sources can be used to gain information about the tower houses. Many house models made of stone or terracotta give a detailed impression of the buildings, showing attributes that are confirmed by the results of the excavations; the use of wood in the mud brick masonry and the pan-bedded brickwork, for example, as well as the layout of windows and doors:[6] see one house model from the British Museum (Fig. 3). Similarly some papyri describe such tower houses, especially those dating to Ptolemaic or Roman times. One often cited example is Pap. Oxyrhynchus 2719 of the 3rd century AD (Fig. 4), which gives directions to a certain Rufus as to how find a house in the city of Oxyrhynchus. In the description a house with seven storeys is mentioned (οἰκία ἑπτὰ στεγὸς). Also dating to the Roman Period are some images of tower houses known from wall paintings or mosaics,[7] of which the best known example is in Palestrina, Italy [8] (Fig. 5). On this mosaic there are many tower houses, and the way in which they are represented fits well with the archaeological results.

[4] Level 2 was removed by the construction of Level 3.

[5] Bailey 1999.

[6] In the course of my PhD I collected all available models of tower houses made of stone and of terracotta. Independently the same had been done by Gregory Marouard who will publish his results of his PhD 'Archéologie, Architecture et Images de la Maison Urbaine d'Époque Hellènistique et Romaine dans la Chora Égyptienne' soon.

[7] Versluys 2002.

[8] Meyboom 1995, Versluys 2002, No. 6.

*Fig. 3. Tower house model EA 2462, British Museum.* http://www.britishmuseum.org/research/collection_online/collection_object_details.aspx?objectId=119429&partId=1&searchText=house+model&page=2.

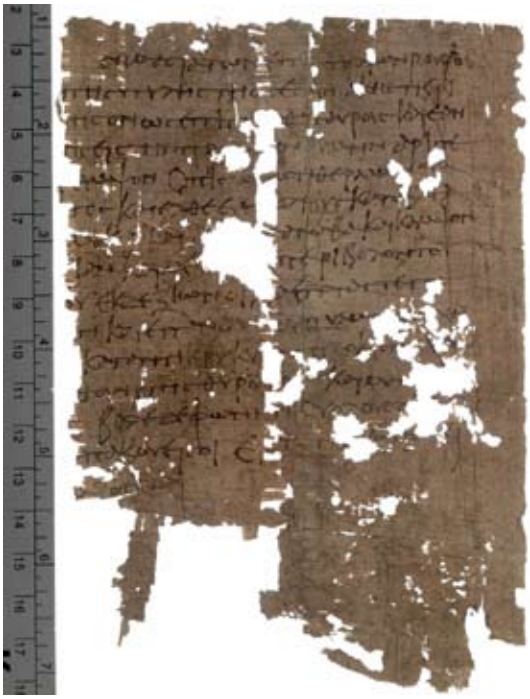


*Fig. 4 Papyrus Oxyrhynchus 2719. http://163.1.169.40/gsdl/collect/POxy/index/assoc/HASH0133/1e445bc7.dir/POxy.v0034.n2719.a.01.hires.jpg.*

*Fig. 5. Nile mosaic in Palestrina.* https://commons.wikimedia.org/wiki/File:Nile_Mosaic.jpg.

All in all these different sources provide a good general idea about the houses, but still we are missing a lot of details, especially concerning the upper storeys and the detailed layout. Even better suited for a comparison are the modern tower houses of the Yemen. Here in many places, especially in the region of the Wadi Hadramaut, for example in Shibam, Shabwah, Say'un or Tarim, and also in other areas in the west of the Yemen, as for example in San'a, tower houses are still today built of mud bricks and resemble the ancient tower houses of Egypt to a remarkable extent (Fig. 6). They give us a better insight into the architecture of the upper storeys which have not been preserved in the Nile Delta. They can also answer a lot of questions not only about the use and living arrangements within the houses, but also about constructional techniques and other details of the building process, that we cannot answer for the houses of ancient Egypt. Of course it is important to keep in mind that the modern Islamic society of the Yemen is a quite different culture to the society of the Late and Ptolemaic Period Egypt and therefore not all characteristics can be transferred, nonetheless it allows for possible interpretations that give an idea as to many aspects of the houses.


*Fig. 6. Map of the Yemen.* http://www.ezilon.com/maps/asia/yemen-physical-maps.html.

## Shibam (Yemen)

The city of Shibam is situated quite centrally in modern Yemen (Fig. 6), lying in the region of Hadramaut. The historic centre of Shibam is enclosed by a city wall with a height of between five and nine metres, surrounding a ground area of about 250m x 350m. Inside the city wall about 500 tower houses [9] can be found (Fig. 7), although today only about 300 people still live in the historic centre - many have moved outside. Fig. 8 shows the ground plan of the inner city, the different shades of grey indicating the number of storeys: the darker the houses the higher the buildings. It becomes clear that seven to nine storey houses are mainly situated in the south, forming the entrance façade of the city and, therefore, the side of the settlement that every visitor has to pass. These buildings are about 30m high. Houses with a height of six storeys are the most common in Shibam and those of four to five floors can still be found quite frequently inside the enclosure. One to three storey houses, however, are quite rare and only found in the north, forming part of the city wall.

[9] Damluji 1992, 132-136.

*Fig. 7. Overview of the Old city centre of Shibam.* http://www.boston.com/bigpicture/2008/10/stormbattered_yemen.html.


*Fig. 8. Groundplan of Shibam. Leiermann 2009, 52, fig. 63.*

Due to lack of space the houses inside the enclosure are not free standing but are abutted onto each other, as can be found, for example, in Ptolemaic times on the island of Elephantine[10] or at Buto.[11] Free-standing buildings are attested in Shibam only in the newer districts of the city outside the enclosure wall of the old city centre, or in other cities in the Yemen, for example in Tarim, where more space was available. The Yemeni tower houses are often 100 - 200 years old, sometimes even as old as 400 years. The dating of the buildings is often quite difficult, however, as houses are frequently torn down and re-erected in the same place with the same height as before. This happens because of the social network of the inhabitants: when the buildings are re-erected lower than before, the roof is visible to the neighbours, and if they are erected at a higher level than before the owner would look over the roofs of the neighbours and disturb their privacy. The height of the buildings therefore depends on the status of the owners. In addition, the ground space cannot be altered due to the already existing neighbouring buildings and streets, and that is the reason why the appearance of the town has not changed much over the centuries, as can be seen when comparing Fig. 7 with a drawing from the 18th century (Fig. 9).

The old city was erected on elevated land that originally probably was a *tell* itself. [12] While excavations suggest that the old city existed already around 400 BC,[13] it is not clear whether the settlement has been populated since then without a hiatus.

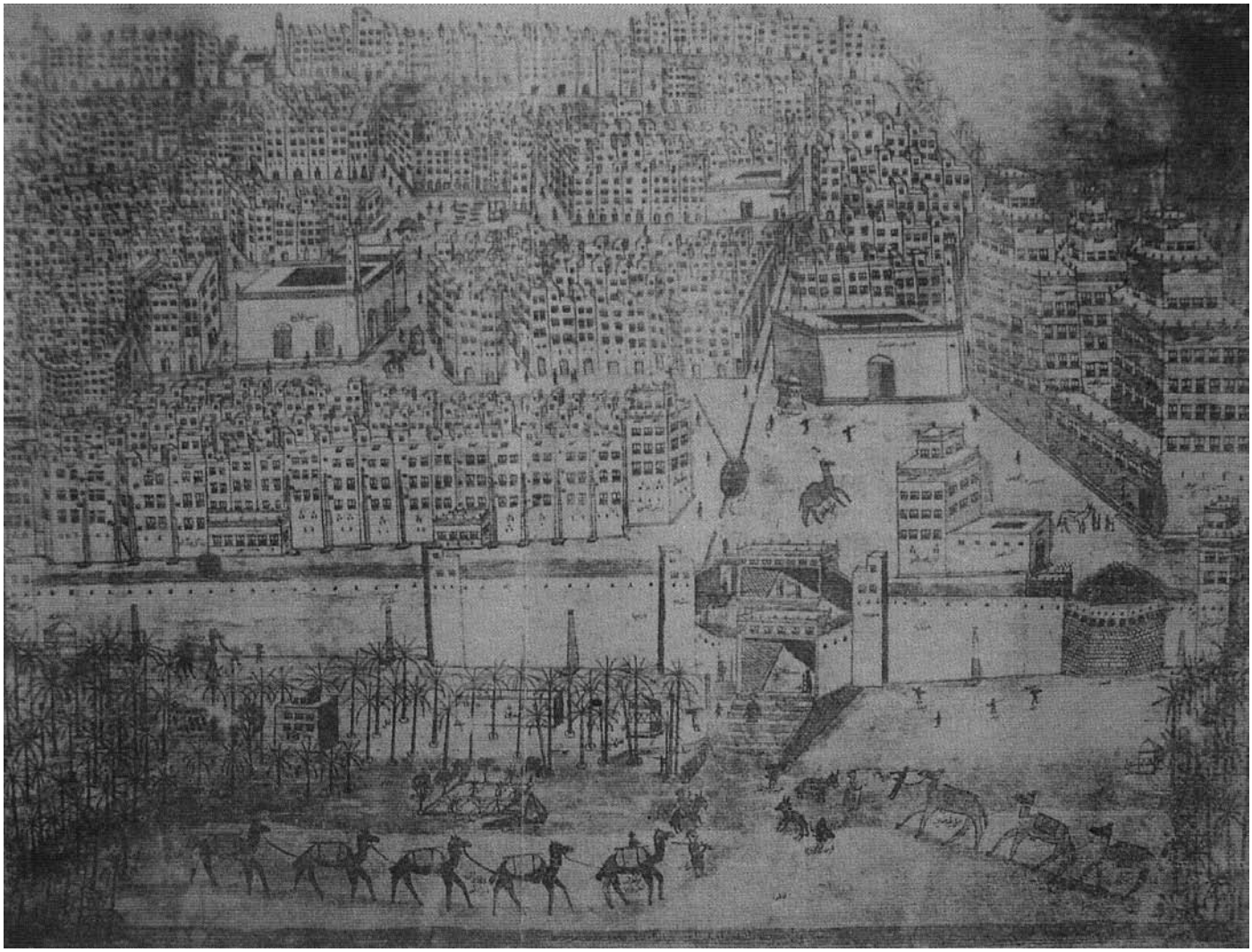


*Fig. 9. Drawing of the city. Leiermann 2009, 36, fig. 48.*

[10] Arnold 2003, 30, fig. 4
[11] Ballet et al. 2011, 95, fig. 2.
[12] Leiermann 2009, 58.
[13] Damluji 1992, 74 and Leiermann 2009, 24-26.

**Architectural similarities between the tower houses of Egypt and Shibam**

The tower houses of Shibam show many similarities to the ancient Egyptian ones. As in Egypt, the buildings in the Yemen are based on the measurement of the cubit (there called *dhirā'*) that has a length of about 50cm.[14] In the tower houses of Shibam a single staircase also connects the different storeys and the buildings have a flat roof that takes on the function of the courtyard from the other typical Arabic courtyard houses.[15] In addition the ground plan of the buildings are very similar to those in Egypt - very often square or rectangular floor plans, but also L-shaped or irregular forms adapted to the surrounding features of the city can be found (see Fig. 10).[16]

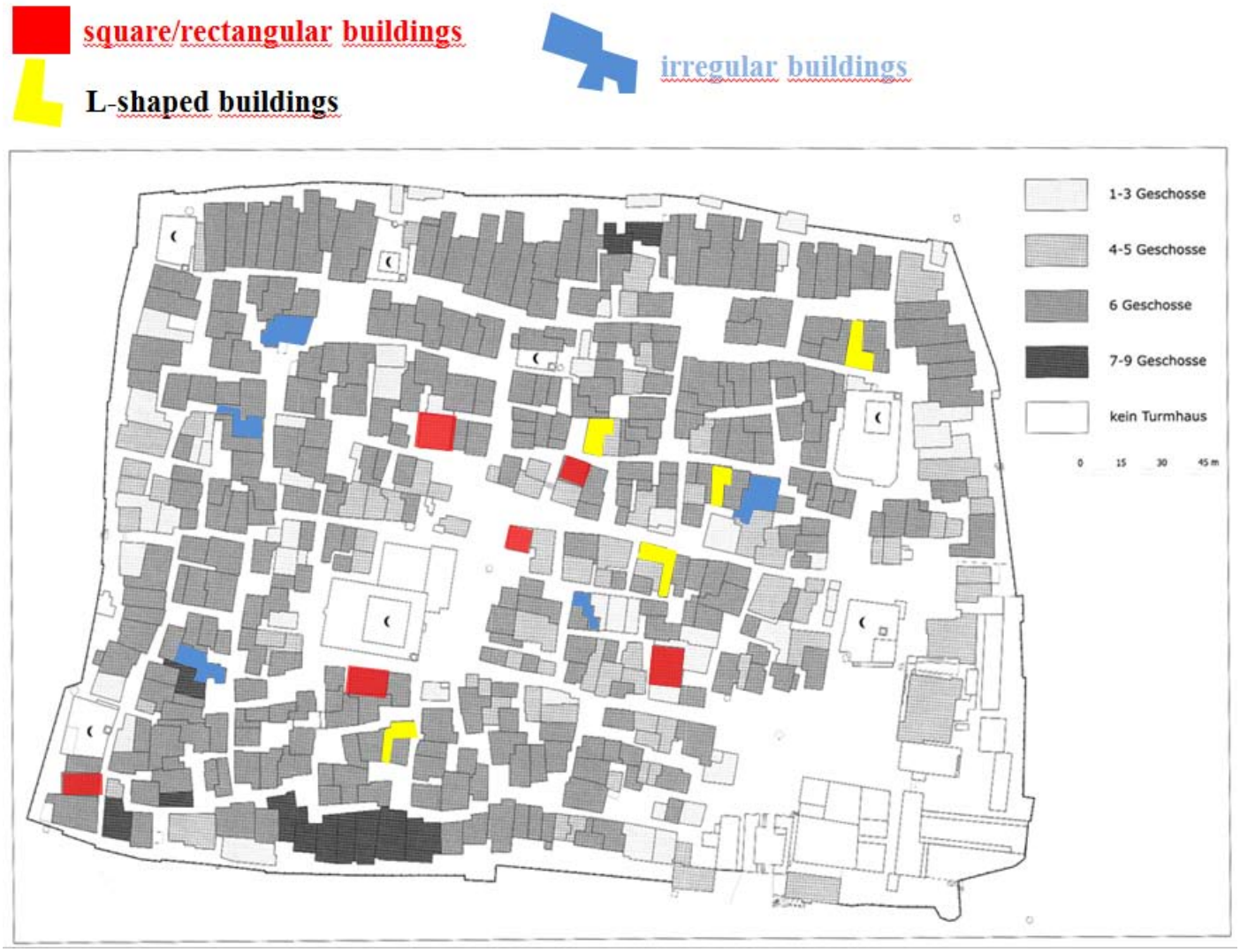



*Fig. 10. Shapes of the building ground plans with some examples highlighted. After Leiermann 2009.*

The walls of the houses in both Egypt and the Yemen slope downwards, and the walls get thinner the higher they rise. The exterior slope of the walls lets water run off the building more easily (see Fig. 11). Consequently the houses often stand next to each other at ground level, but have a gap between them as they become taller (Fig. 12); the same can be demonstrated for a tower house from Elephantine (Fig. 13). In Shibam the thickness of the walls is about 1.0m in the foundations, becoming thinner towards the roof to about 30.0cm. In Egypt in antiquity we find much broader walls, especially in the Delta due to the lack of stone in the foundations. For example, one house in Tell el-Dab'a has a wall width of 1.70m in the foundation, thinning down to 1.30m on the ground floor. In larger buildings at Tell el-Dab'a walls up to 3m and in Buto even up to 3.70m wide are found in the foundations.[17]

[14] Damluji 1992, 128.
[15] Damluji 1992, 606.
[16] For different ground plans of tower houses in Egypt see for example Valbelle 2007 for Tell el-Herr or for Tell el-Dab'a Lehmann 2012 and Lehmann 2013.
[17] Hartung et al. 2003, 212 and fig. 5.

*Fig. 11. Sloping outside wall of a tower house in Shibam.* http://www.ilovecob.com/ashan/castles/castle24.htm.

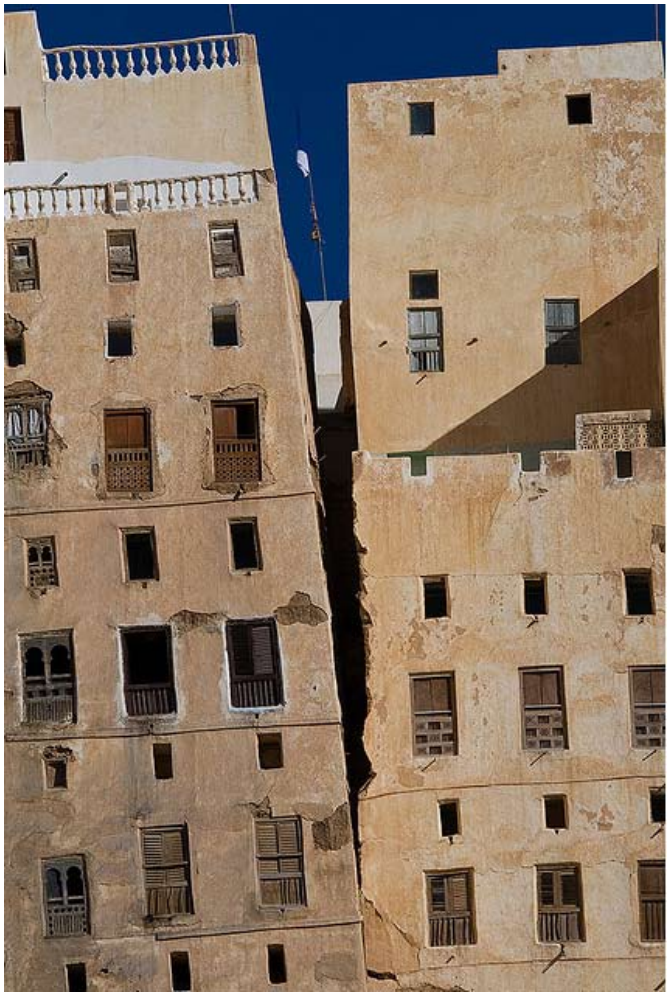


*Fig. 12. The gap between the upper parts of two buildings in Shibam.* https://secure.flickr.com/photos/phil_marion/4069822322/in/set-72157605482941019.

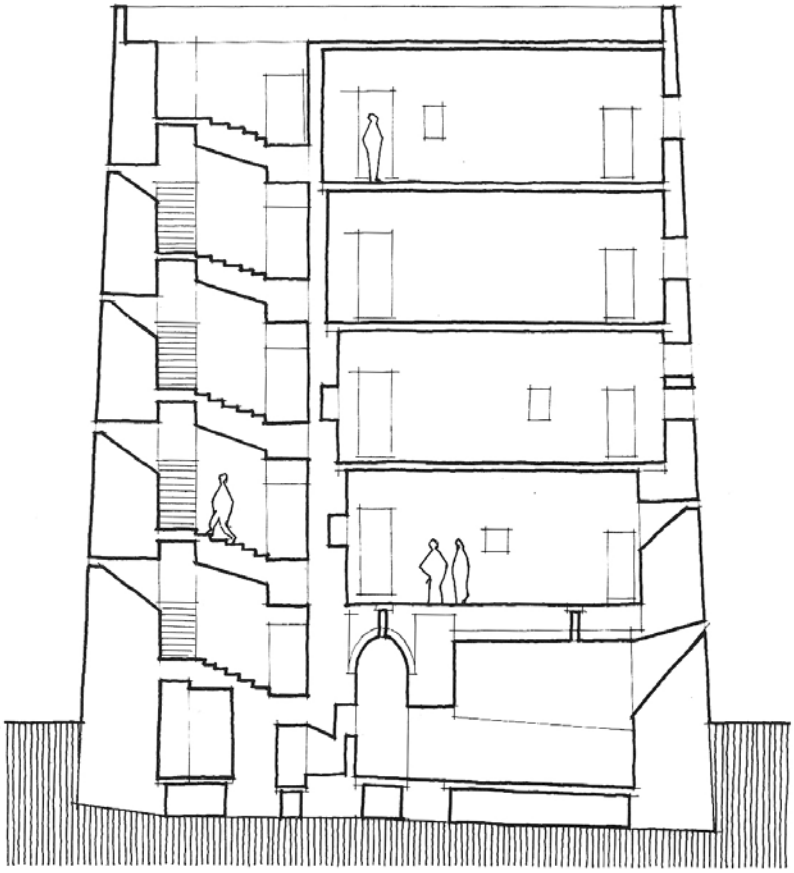


*Fig. 13. Reconstruction of a tower house from Elephantine. Arnold 2003, 168, fig. 109.*

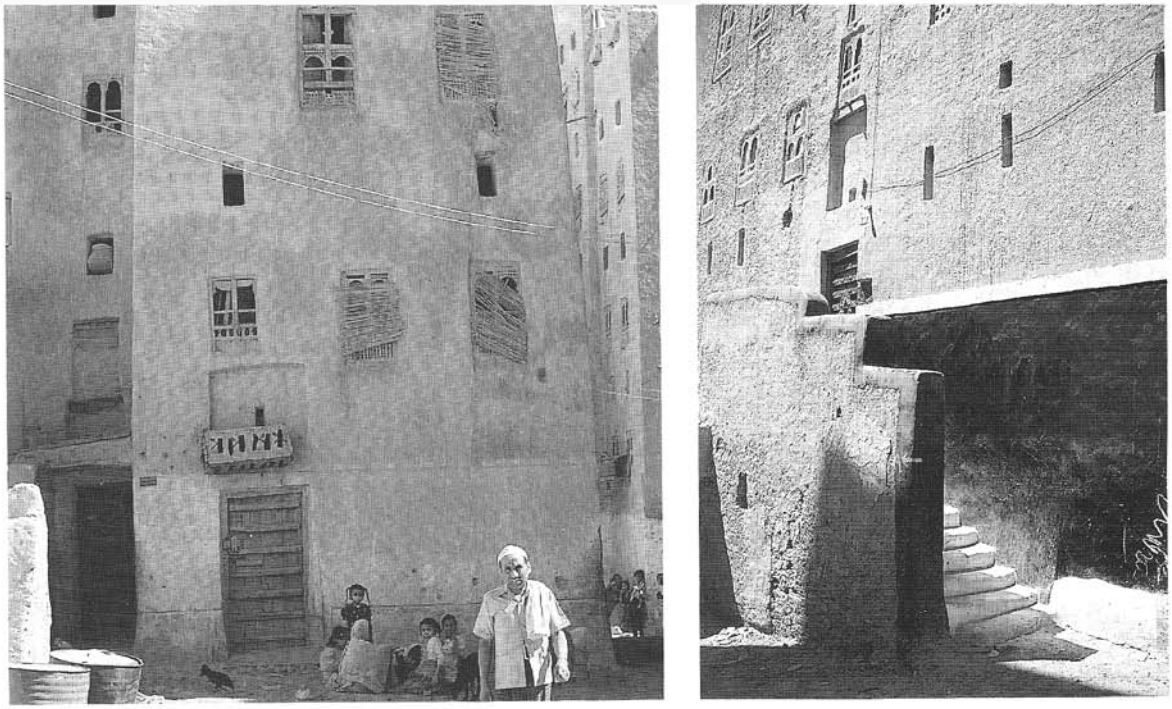


*Fig. 14 Different entrances to tower houses in Shibam, at ground level (left) and elevated (right). Damluji 1992, 105, lower two pictures.*

In the following section some architectural details of the houses shall be discussed.

*Doors*

Starting with the entrance, the buildings in Shibam mainly have one door, and only seldom are two doors found in one house. The entrance can be either at ground level or elevated, accessible via stairs [18] (Fig. 14). The same was true for the buildings in ancient Egypt as confirmed by the archaeology [19] and also by house models [20] in and from Egypt.

*Windows*

The ground floor of buildings in Shibam often has no windows, only small openings under the ceiling in the wall, installed to let in some light and air (see, for example, Fig. 12).[21] The ground floor is mainly used for storage, workshops or shops and can also be used for keeping animals such as goats.[22] The tower houses in Egypt often had no windows on the ground floor, as can be seen in the house models [23] and, for example, in the houses of Karanis.[24]

*Roofs*

The roofs of the Shibam tower houses are flat and some of the buildings show crenellations on the wall surrounding any roof constructions. A kiosk is frequently found on the roof of the Yemeni tower houses (Fig. 15), a feature that is also known from some house models of the Late Period in Egypt.[25] This construction type is even more common in other cities of the Yemen including Tārim [26], Horeida and Shabwa [27] for example. One building in Shabwa shows a close resemblance to a model of an Egyptian tower house, now in Hannover [28] (compare Figs. 15 and 16).

[18] Damluji 1992, 70, fig. p. 105.
[19] See, for example, in Karanis, Husselman 1979, Pl. 8 and Pl. 16 or in Tebtynis, Gallazi and Hadji-Minaglou 2000, 135, Pl. 12 and following. In Tell el-Dab'a some houses also had an entrance from the street level, see Lehmann 2011, 62.
[20] The house model EA 2462 from the British Museum shows, for example, two doors at ground level. See Fig. 3. Another house model with stairs can be seen at Arnold 2003, 173, fig. 110.
[21] Leiermann 2009, 93.
[22] Leiermann 2009, 64, 93.
[23] Most house models show no windows in the ground floor at all. See for example fig. 3 or Arnold 2003, 173, fig. 110.
[24] Husselman 1979, for example Pl. 35 and Plan 39.
[25] For example the two models from Cairo, JdE 30340 and JdE 28784, see Busch-Sperveslage 1999, fig. 10 + 11.
[26] Damluji 1992, 206-361.
[27] Leiermann 2009, 70.
[28] Ricke 1966.

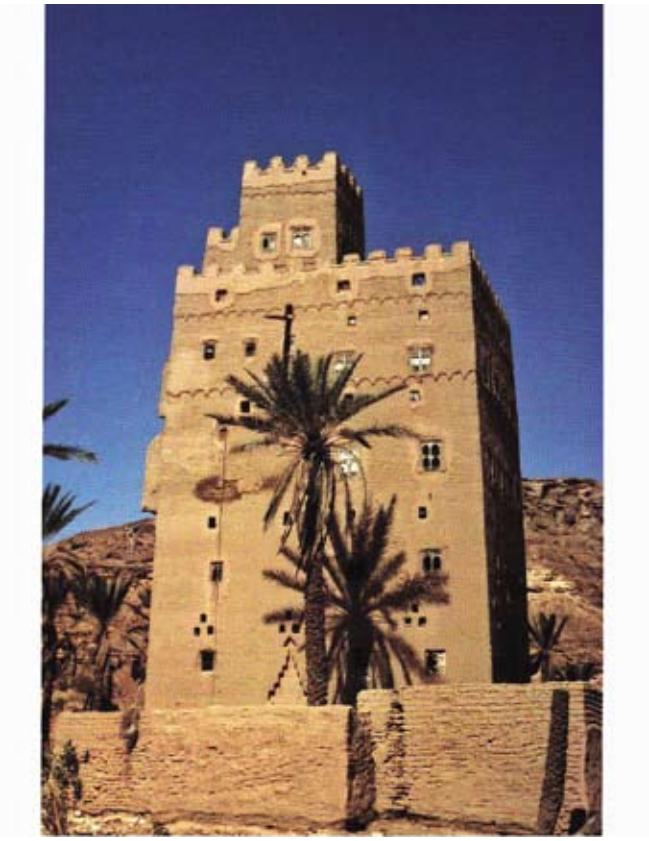


*Fig. 15. Tower house in Shabwa with crenelated roof and a kiosk. Leiermann 2009, 92, fig. 113.*

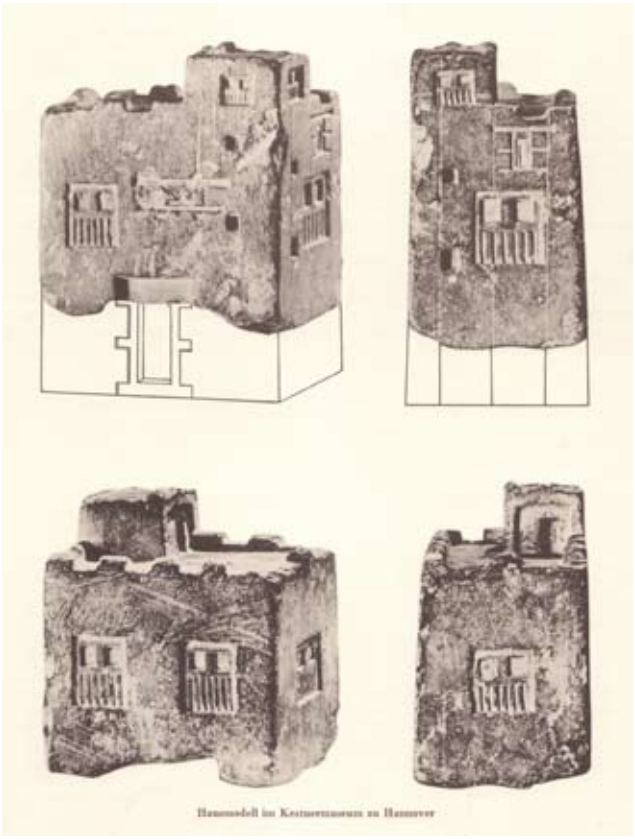


*Fig. 16. Egyptian tower house model, now in Hannover. Ricke 1966, Taf. VII.*

*Plaster*

Due to the rare, but very heavy, rainfalls the buildings in the Yemen have to be plastered in order to protect the mud bricks, otherwise the bricks can easily be washed away. A thunderstorm in Shibam in 2008 had devastating results for some of the buildings (see Fig. 17). In Shibam two types of plaster can be found. Firstly a normal mud plaster that is called *ramad*. This plaster is used on the outside of the buildings from the middle part of the house downwards to the ground. It is made from mud and ash, mixed together by beating the mud for several hours until it reaches the

*Fig. 17. Houses in Shibam after a thunderstorm in 2008.*
http://www.boston.com/bigpicture/2008/10/stormbattered_yemen.html.


*Fig. 18. Houses in Shibam showing the different types of plaster, the mud plaster* ramad *and the lime plaster* nurāh*. after Leiermann 2009, 59, fig. 69.*

right consistency.[29] In contrast the roofs, the sloped bases, the stairs and *mastaba*s, as well as the bathrooms in the interior, are plastered with a white lime plaster that is called *nurāh* (see Fig. 18) which is somewhat water resistant and therefore protects the parts of the buildings that are more exposed to water. This lime plaster is produced in a very exhausting way. First limestone is heated in an oven (see Fig. 19) and then extinguished with water so that it falls apart into a powder-like substance. This powder is then beaten with a large stick constantly for 8-10 hours (see Fig. 20) until

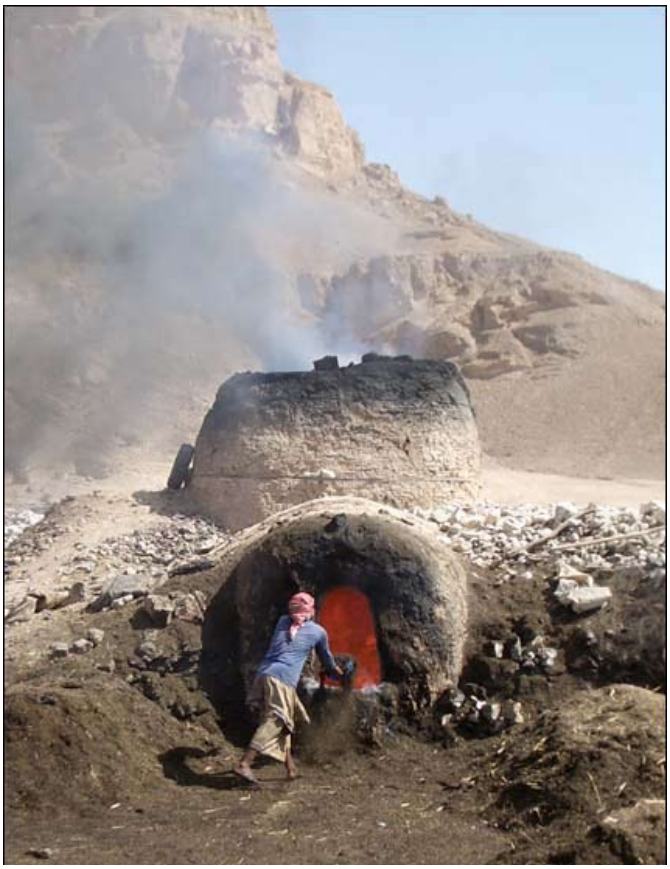


*Fig. 19. Oven for burning limestone in the process of creating* nurāh *plaster.* http://ilovecob.com/ashan/mudmasters/mm25.htm.

*Fig. 20. The beating of the lime powder until it becomes* nurāh *plaster.* http://ilovecob.com/ashan/mudmasters/mm18.htm.

[29] Leiermann 2009, 77 and 75, fig. 92.

*Fig. 21.* Nurāh *plaster being applied on a roof in Shibam.* http://ilovecob.com/ashan/mudmasters/mm30.htm.

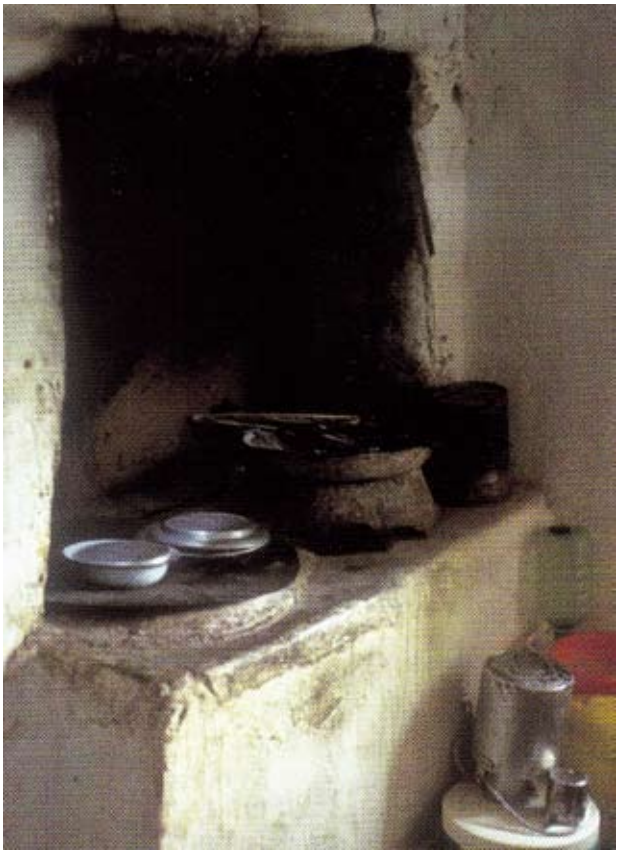


*Fig. 22. Storage facility in a tower house of Shibam. Leiermann 2009, 108, fig. 139.*

it reaches a creamy consistency. Only then it can be used to plaster the houses (see fig. 21). [30] In the Delta plaster on the walls of tower houses is only preserved in small fragments which at least proves that the buildings were also plastered. At Tell el-Dab'a we find a beige plaster on the exterior of some walls, and inside some rooms a white plaster, containing lime, was also documented.[31] Unfortunately in Dab'a a differentiation between varied utility areas could not be made. In better preserved Roman houses, as for example in Karanis, plaster is found quite often.[32]

### *Mastabas*

In addition to the outside, the interiors of the Shibam houses also show many parallels to the ancient Egyptian ones. For example *mastaba*-like features that were used as a storage facility for household articles or vessels are frequently used in Shibam (see Fig.22). They are also known from Egypt.[33]

### *Mašrabiyya*

As is typical for the orient the windows in Shibam are built with wooden grills called *mašrabiyya* instead of using glass to cover the windows (see Fig.23).[34] For the ancient houses in the Delta no wooden objects were preserved, but the house models often show hatched lines in the windows which are interpreted as *mašrabiyya.*[35] A wooden window found in Tebtynis (see Fig.25) shows a kind of *mašrabiyya* [36] as well.

[30] Leiermann 2009, 76.
[31] Lehmann 2012, fig. 7 and Lehmann 2013.
[32] Husselman 1979, Pl. 22.
[33] For example in Ashmunein (see building in Level 1b, in k/10, No. 1021, Spencer 1996, Plan 1 and Spencer 1993, Pl. 3 and Pl. 5d) or Tell el-Dab'a (see Lehmann 2012, fig. 9 and Lehmann 2013). In both places pottery was found *in situ*.
[34] Damluji 1991, 254; Damluji 1992, 114; Leiermann 2009, 125-129.
[35] Busch-Sperveslage 1999, 16.
[36] Hadji-Minaglou 2007, 236, Photo 122-129.

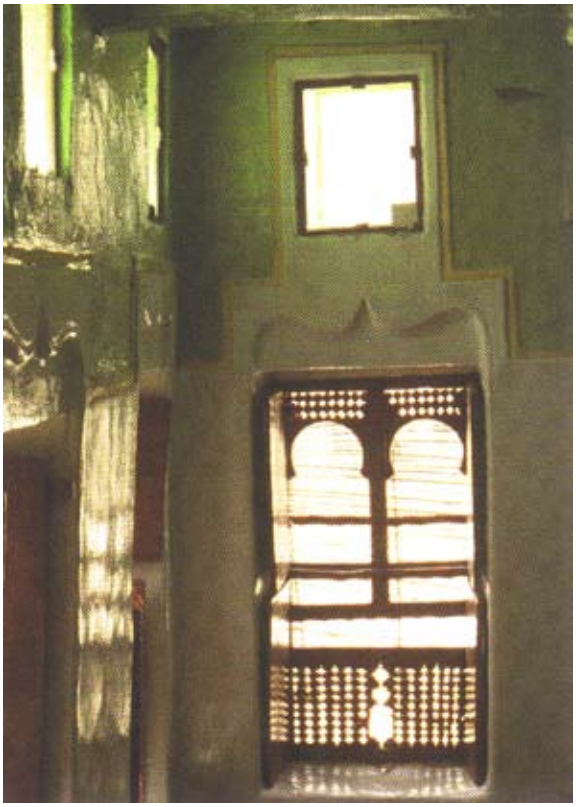


*Fig. 23. A* mašrabiyya *in a house in Shibam. Leiermann 2009, 99, fig. 125.*

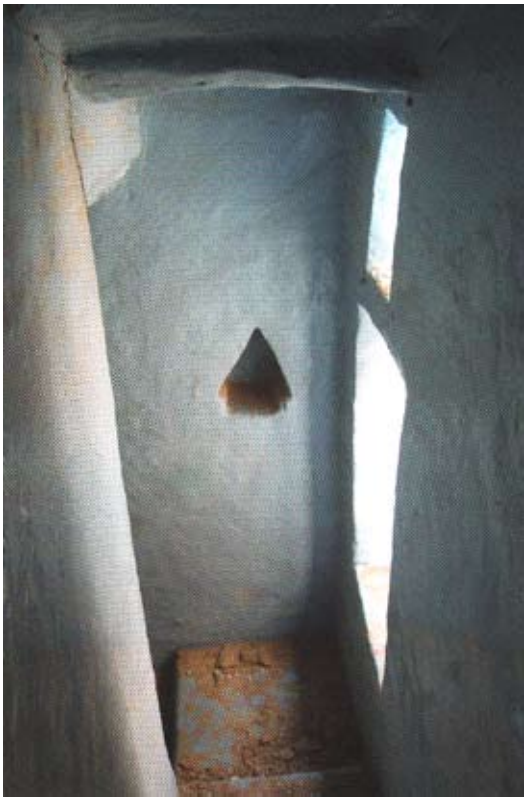


*Fig. 24. A niche in a staircase in Shibam. Leiermann 2009, 99, fig. 123.*

*Niches*

Niches in the walls used as shelves are common in Shibam and Egypt alike. See, for example, Fig.24 that shows a niche for an oil lamp on a staircase. Niches are found frequently in Egyptian mud brick houses, as for example in Karanis,[37] where wooden boards used as shelves within the niches are still preserved. These could also be painted.

*Fig. 25. A wooden window from Tebtynis.* http://www.ifao.egnet.net/archeologie/tebtynis/.

[37] Husselman 1979, 47-48, Pl. 69-70.

*Fig. 26. Reconstructed part of a building in Medinet Maadi. Photograph by the author.*

*Fig. 27. Bridges between Yemeni tower houses.* http://secure.flickr.com/photos/nbrown/462742431/.

### *Wooden elements*

Wood in general was used in large quantities for building the houses in Shibam. In addition to the usual wooden beams in the masonry stairs, doors, windows, niches and the ceilings are also built with wood.[38] Pillars inside the rooms are used to support the ceilings and the decoration is designed to show the status of the inhabitants.[39]

In many Roman houses in the Fayum, including for example Karanis, Tebtynis or Medinet Maadi, the wooden elements can still be seen (see Fig.26).

### *Bridges*

Wood is also used for small bridges that connect different buildings with each other (Fig. 27). Tower houses belonging to related families or close friends can be connected by such bridges. In modern Islamic Yemen the women can then move from one house to the other without moving into the public space of the street and without having to descend several storeys and later climb up again.[40] The bridges in the Yemen are situated mainly in the upper storeys of the buildings and if the same was true in ancient Egypt, this might be the reason why they have not been found at archaeological sites although several Roman Period wall paintings depict Nilotic landscapes with tower houses that are sometimes connected with a bridge. One example is found in the Casa dei Pigmei in Pompeii (see Fig. 28).[41] Bridges connecting two houses can still be found occasionally in modern Egypt as for example in Aswan.

[38] Leiermann 2009, 123-135.
[39] Leiermann 2009, 104-105.
[40] Damluji 1992, 110.
[41] Versluys 2002, No. 62, Fig. 87.

*Fig. 28. Roman wall paintings with a nilotic landscape from the Casa dei Pigmei in Pompeii. Versluys 2002, No. 62, 147, Fig. 87.*

## Architectural differences between the tower houses of Egypt and Shibam

In addition to the similarities there are naturally also some differences between the tower houses of modern Shibam and those of the Late, Ptolemaic and Roman Periods in Egypt. From an architectural point of view, probably the most fundamental difference is in the construction of the foundations. The tower houses of Egypt, especially in the Delta, always consist of a casemate foundation made of mud bricks, while in Shibam about six layers of local limestone are laid out,[42] resulting in a quite different depth of the foundation. Shibam is, however, very similar to Roman Karanis where local stone was also used for the foundations.[43]

Another difference is in the size and shape of the mud bricks. In general the bricks from Shibam are much larger and flatter than ancient Egyptian bricks. Interestingly for every storey in Shibam a different size of bricks is used, getting smaller with every level; and every type of brick has a different name as well.[44] In general the bricks of the ground floor (*madar*) have a size of 62.0cm x 40.0cm x 5.0cm, while the bricks of the roof (*shibr*) measure about 25.0cm x 16.0cm x 5.0cm. In the Delta no upper storeys of ancient houses are preserved and therefore nothing can be said about them, but buildings in the Fayum, as for example in Karanis, do not have different brick sizes for each storey. The typical Late Period Egyptian mud brick measures about 45.0cm x 20.0cm x 10.0cm.

[42] Damluji 1992, 137.
[43] Husselman 1979.
[44] Damluji 1992, 128-130.

*Fig. 29. Horizontal ash layer in a Ptolemaic tower house from Tell el-Dab'a. Copyright ÖAI, Cairo.*

The ceiling height of the rooms of Shibam is about 3.0m to 3.5m.[45] For ancient Egypt the height of the rooms is only known from Roman buildings where it was between 2.5m and 3.0m, sometimes up to 3.5m.[46]

The numerous windows and openings for air and light are much more distinct in Shibam than in the Egyptian tower houses. In Shibam, each storey has a row of large windows with *mašrabiyya* and just below the ceiling another row of smaller square openings (see for example Figs. 12, 14 or 18).[47] In Egypt the buildings often possessed three square windows in a row on one side of the building as seen in many examples of the house models.[48] In Karanis, however,, buildings with two or four windows in one row can also be found.[49] Furthermore, the position of the staircase within the building varies as well. In some larger buildings in the Yemen a second staircase is attested, and in the smaller houses the staircase is found in the middle of the structure.[50] In Egyptian tower houses the staircases are mainly positioned in a corner of the house.[51]

## Information from the Yemen that is unknown from ancient Egypt

As the inhabitants of the tower houses of Late Period and Ptolemaic Egypt can no longer be asked about their lives, the construction of the houses or the deposition of the living space inside these buildings, a lot of information is unobtainable. In these respects the houses of the Yemen provide a chance to gain an idea about these 'elements' as the buildings are still in use and are still being constructed. In particular information about the building process of the houses and the different stages of work, in addition to details of the lives of the workmen themselves, can be sought. Even though these aspects may not necessarily have been the same in ancient Egypt, one of the possibilities is shown through the analogy of Shibam, and this provides an idea as to how it might have been for Egypt.

In the Yemeni tower houses there are between six and 20 people living.[52] Usually only one family occupies a single house while it seems that in ancient Egypt – at least in Roman Oxyrhynchus – one storey could be sublet to completely different people.[53] Larger houses in Shibam often accommodate the children of the owner together with their own family living in the upper storeys, as is frequently the case in modern Egypt too.[54] In modern Islamic Yemen, some storeys are reserved only for women, but in general most rooms are multifunctional [55] as is also known from ancient

[45] Damluji 1992, 142.
[46] See Husselman 1979, a ceiling height of 2.3m-2.5m can be found frequently as for example in House C51, Pl. 32 and 37. A height of 3.0m-3.5m is attested mainly for the basement, the upper storeys then usually are less high, see for example house C51 or C56 Pl. 36 and 39.
[47] Leiermann 2009, 93 and fig. 115 + 116.
[48] As for example in the two house models cited already, see fig. 3 or Arnold 2003, 173, fig. 110.
[49] Husselman 1979, Pl. 12, 13 and 64.
[50] Leiermann 2009, see for example 95, 103 or fig. 128, fig. 132.
[51] This can be seen in the housemodels (for example model Hannover 1935.200.168, see Busch-Sperveslage 1999, fig. 9) as well as in houses of Tell el-Herr, see Valbelle 2007 (e.g. bâtiment 4, 6 or 7, p. 135-136) or in Karanis, see Husselman 1979 (Pl. 31, 33, 35 etc.).
[52] Damluji 1992, 78-80.
[53] Müfid 1932, 9.
[54] Damluji 1992, 78-80.
[55] Damluji 1992, 110.

Egypt.[56] Interestingly in modern Yemen the use of the rooms changes with the seasons: in the cold winter the smaller rooms are preferred while in the hot summer the larger rooms are used more frequently.[57]

Another observation that was made during the excavation of Ptolemaic tower houses at Tell el-Dab'a, and which at first was not understood, was explained by studying the Yemeni buildings. In four Ptolemaic houses a horizontal ash layer could be traced within the walls (Fig. 29).[58] The ash was only found alongside the walls, not in the rooms and no traces of burning could be found. In Shibam, the footings of the walls are set into foundation trenches up to 1.5m deep and in these trenches wooden branches are laid, on which salt is added to extract the water from the wood. Then a layer of *nurāh*-lime is added and on top follows a layer of ash.[59] This is done to prevent insects from getting up into the masonry from the ground. Ash used as an insecticide is also known from Old to New Kingdom Egypt [60] but so far no evidence has been found for it being used as horizontal layers within walls.

Social hierarchy is also reflected in several characteristics of the houses. Apart from the general size of the building area, the height of the building is another indicator of the status of the owner as it is quite expensive to run a mud brick house because they have to be repaired quite often.

Besides the size of the building, the status of the owner is also reflected in the amount of the *nurāh*, the water repellent lime plaster on the walls. Wealthy people can afford to plaster the whole house with *nurāh* but poorer people can only afford to plaster the roof and the first floor or nothing at all.[61] Also the decor of the windows, doors and rooms are important for representing the status of the owners.

## Construction of the houses at Shibam

For the construction of the houses at Shibam between seven and 20 people work on one house depending on the size of the building. The work is very specialised; one single person is responsible for the mortar, another for the transportation of the mud bricks, others for the actual building of certain parts of the walls, and others for the construction of the wooden parts for ceilings, pillars, stairs etc.[62] The first step consists of the production of the bricks. A lot of space is necessary for the drying of the bricks which often can be seen in the streets of Shibam or outside the city (see Fig. 30).[63]

*Fig. 30. Drying bricks in the streets of Shibam.*
*Damluji 1992, 87, 3rd picture from top.*

[56] This is found in all Egyptian settlements through time. See for example Elephantine (von Pilgrim 1996, 263-264), Lisht (Arnold 1996, 20) or Amarna (Kemp and Stevens 2010, 478-496).
[57] Damluji 1992, 110.
[58] Lehmann 2012, fig. 6 and Lehmann 2013, fig. 5.
[59] Damluji 1992, 136.
[60] For example, already in the Old Kingdom in Edfu (personal communication N. Möller) and in the New Kingdom in Amarna (Miller 1987). For Tell el-Dab'a see Lehmann 2013.
[61] Damluji 1992, 70, 118.
[62] Leiermann 2009, 75.
[63] Leiermann 2009, 71. For photos of brick production see also the slideshow on http://www.ilovecob.com/ashan/mudmasters/.

*Fig. 31 Renewing of the façade of a tower house in Shibam. Leiermann 2009, 79, fig. 97.*

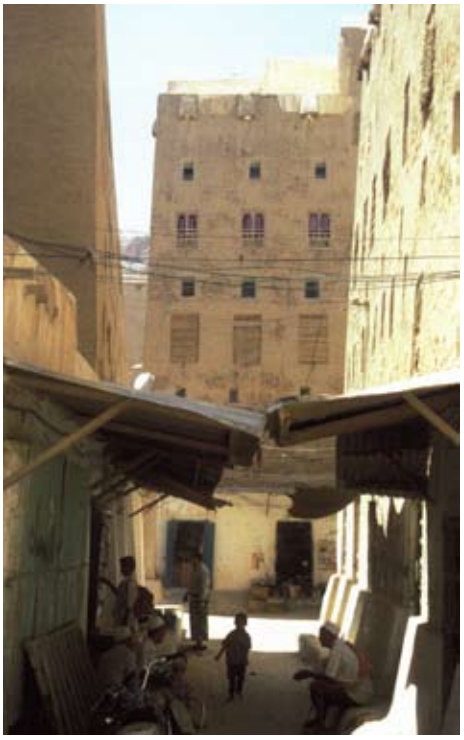


*Fig. 32.* Suq *with* mastabas *and wooden roofs in Shibam. Leiermann 2009, 55, fig. 66.*

On average eight workmen produce about 3,000 bricks a day.[64] For a building of five storeys approximately 115,000 bricks are necessary, therefore eight men have to work for 38 days or more just in the production of the bricks for one house. After the manufacture of the bricks it takes about three weeks until the bricks are dry and can be used. The walls of the buildings are erected in six to 11 phases. In each phase five to six courses of bricks are laid. Between every course of bricks, mortar about 5cm thick is used, so that the whole segment of five-six courses is about 50cm high (one cubit).[65] The phases of the walls then have to dry again during the building process. If the bricks are not given enough time to dry thoroughly they cannot carry the weight and ultimately the wall collapses. Therefore, it takes between two and three months, depending on the size, until a complete tower house is ready. The average life expectancy of such a building is about 200-300 years,[66] but every 30 years the buildings have to be partly renewed and the plaster both inside and outside is removed and new plaster applied (see Fig. 31).[67] The owner and his family have to move out of the house temporarily as the work produces so much dirt that even the neighbouring houses are completely covered in dust.

For Late Period Egypt no sources about this kind of information are available. However, one example from a papyrus from Karanis shows that the bricks were also produced by special brick-producing people (πηλοποιός).[68] The papyrus records that it took three masons and six slaves to tear down and rebuild parts of a building.[69]

Sales contracts from Roman Egypt show that frequently parts of buildings were owned by different people due to the division of property by heritage.[70] The smallest part mentioned in the contracts is 1/42 of a building. This might not be a fair representation of reality, however, since the houses are often very small in size and contain only a single entrance and staircase, therefore a physical division would have been very impractical.[71] Modern parallels from Iraq clarify the difference between theory and reality as for example a tailors shop in Erbil with a ground size of 1.0m by 1.0m is owned by almost 100 different people and yet this does not have any effect on the renting of the shop to one tailor.[72]

[64] Damluji 1992, 136.
[65] Damluji 1992, 142-144.
[66] Leiermann 2009, 72.
[67] Leiermann 2009, 80.
[68] Maehler 1983, 121.
[69] Maehler 1983, 121.
[70] Muhs 2008.
[71] Muhs 2008, 191.
[72] Lecture of Dr. D. Kurapkat, Dr. A. Mollenhauer and Dr. M. Müller-Wiener, `Vom traditionellen Handelszentrum zur "Boomtown" Erbilim Nordirak', Auswärtiges Amt Berlin, 27.06.2012.

Returning to Shibam, another characteristic of the city is that instead of a market place the city has a *suq*. In the street between the houses the *mastaba*s in front of the buildings are used as storage place for the goods. To produce some shade the *mastaba*s can be roofed with simple wooden constructions (see Fig. 32).

The buildings in Shibam are just one of many local styles of architecture in the Yemen, and the outer decoration of the houses can vary tremendously in form, styles and colours. The same is true in Saudi Arabia and other regions; for example in Morocco, where tower houses are still made of mud brick. For the Yemen the Book *A Yemen Reality. Architecture sculptured in mud and stone* by Salma Damluji (1991) gives a very good overview about different local styles and the decoration of tower houses. Many pictures can be found online and some examples to illustrate the differences are collected in Table 1 below.

## Conclusion

As this article hopefully has shown, a comparison between the tower houses of Late Period and Ptolemaic to Roman Egypt and the modern tower houses of the Yemen, mainly Shibam, is very fruitful. Many basic features as well as numerous elements are the same or very similar. Certainly, however, other elements are different or unknown for Egypt. Nevertheless, much information can be gained from the houses of the modern Yemen, which will probably never be available from ancient Egypt. This is especially so with regard to the construction methods for the buildings and information relating to the number of people being engaged in the building process, which gives a lively picture concerning the effort and the time that it takes to erect such buildings. The space required to dry the bricks as well as the enormous amount of bricks and wood in general that are needed for the constructions give a good insight into the necessary organisation on site, as well as for the transport of all the materials needed to the construction site. These observations enable similar considerations for the Egyptian examples.

Although houses of the more ancient type with one or two storeys still occurred in ancient settlements in Egypt, many houses from the beginning of the Late Period onwards were built as tower houses. With this, an extreme change from the typical Egyptian house with its tripartition to a multi-storey building with a roof terrace instead of a courtyard takes place. A change in the horizontal arrangement and use takes place, from the earlier model where the rooms closer to the entrance are more official and the private rooms are further away in the back of the building, to a new plan where there is a vertical rather than a horizontal spatial distribution, with the private rooms being in the upper storeys.

In summary the new building types in Late Period Egypt create a quite different settlement pattern in Egypt. If we imagine how the settlements might have looked like in the Late Period landscape of the Delta, one might think about a habitation that can still be found in areas such as Lake Manzala. Herodotus (2.97) writes: *'When the Nile invades the country, only the cities can be seen projecting above, most resembling the islands in the Aegean, for the rest of Egypt becomes a sea while the cities alone project'*. When we think about the ancient landscape and environment, this conjures a vision of the Delta in the Late and Ptolemaic Periods with the elevated *tell*s surmounted by four or five storey free-standing tower houses and surrounded by Nile branches and canals - perhaps similar to Fig. 33.

*Fig. 33. A view of San Francisco slightly changed from https://gartenzaun.wordpress.com/tag/san-francisco/.*

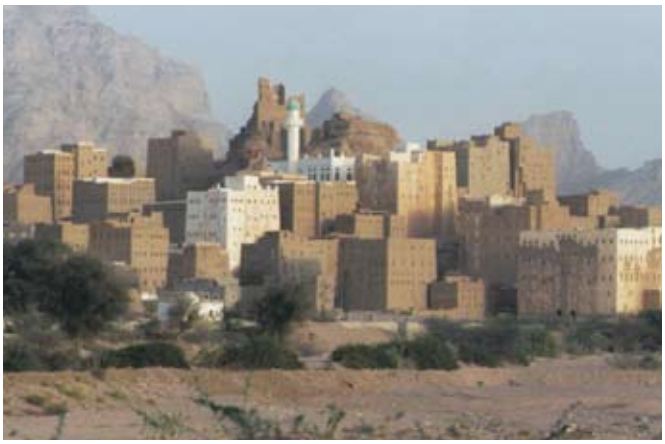
| | |
|---|---|
| Azzan:<br>  <br>http://www.panoramio.com/photo/6191243 | Azzan:<br>  <br>http://members.virtualtourist.com/m/p/m/1a4a5d/ |
| Habban:<br>  <br>http://www.trekearth.com/gallery/Middle_East/Yemen/East/Hadramawt/Habban/photo384315.htm | Habban:<br>  <br>http://www.yemenut.org/DisplaySectionDetail.aspx?id=194 |
| Dar el-hajar im Wadi Dhar<br>  <br>http://www.fotocommunity.de/pc/pc/display/23748804 | Dar el-hajar im Wadi Dhar<br>  <br>http://thewondrous.com/dar-al-hajar-a-palace-on-the-rock/ |

**Table 1**

| | |
|---|---|
| Qureia al-Ginan<br>  <br>http://www.panoramio.com/photo/10760644 | Wadi Daw'an:<br>  <br>http://www.theglobaldispatches.com/wp-content/uploads/2010/02/original_Howard5.jpg |
| Wadi Daw'an<br>  <br>http://www.allposters.de/-sp/Typical-Hadramawt-Village-with-Date-Plantation-in-Foreground-Wadi-Daw-an-Yemen-Poster_i3863188_.htm | Al Hajjarain<br>  <br>http://members.virtualtourist.com/m/p/m/112739/#2 |
| Al Hajjarain<br>  <br>http://members.virtualtourist.com/m/7a8e1/1c6c87/ | Al Hajjarain<br>  <br>http://members.virtualtourist.com/m/e3981/1c6c87/ |

**Table 2**

| | |
|---|---|
| Shibam<br>  <br><br>https://secure.flickr.com/photos/pskeggs/120897913/lightbox/ | Shibam<br>  <br><br>https://secure.flickr.com/photos/ronnyreportage/6244017954/ |
| Yafʿ:<br>  <br>http://www.panoramio.com/photo/49872012 | Khurayba, Wadi Dawʿan<br>  <br>https://secure.flickr.com/photos/29868194@N08/2982255204/ |

**Table 3**

| | |
|---|---|
| Kataira:<br>  <br>http://www.ilovecob.com/ashan/casltes/castle37.htm | Wadi Daw‘an<br>  <br>https://secure.flickr.com/groups/reportagemena/pool/ronnyreportage/?view=lg |
| San’a<br>  <br>https://commons.wikimedia.org/wiki/File:San%27a01_flickr.jpg | San‘a<br>  <br>http://www.world66.com/asia/middleeast/yemen/lib/gallery/showimage?pic=asia/middleeast/yemen/old_sanaa_city |

**Table 4**

| | |
|---|---|
| San‘a<br>  <br>https://secure.flickr.com/photos/phil_marion/2557513397/ | San‘a<br>  <br>http://www.flickriver.com/photos/phil_marion/sets/72157605472073676/ |
| Yemen without specific location mentioned:<br>  <br>http://www.ilovecob.com/ashan/casltes/castle17.htm | Azzan:<br>  <br>http://www.altairblog.com/files/images/Hipo%20en%20Yemen%20370%20bis%20Azzan.jpg |
| Marib, Yemen<br>  <br>https://secure.flickr.com/photos/justinsharp/2611903433/ | Morocco, Ait Ben Haddou<br>  <br>http://www.airport-nuernberg.de/152128/marokko_kasbah_ait-ben-haddou.jpg |

**Table 5**