Mudbricks and Modular Architecture at Tell es-Sultan from the Neolithic to the Bronze Age

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Abstract: The introduction of mudbricks at Tell es-Sultan (ancient Jericho) in the Epipaleolithic period led to the birth of architecture at the site. In the Pre-Pottery Neolithic A, loaf-shaped mudbricks allowed the construction of curvilinear buildings, while in Pre-Pottery Neolithic B the appearance of cigar-shaped mudbricks, which had modular dimensions, made the alternation of headers and stretchers possible and consequently led to the construction of solid and rectilinear architecture. This technical development led to the realization of large-scale projects in the following periods, such as construction of city walls. This was the earliest communal enterprise, carried out at an extra-familiar level of social aggregation.

Mudbrick architecture at Jericho evolved during the Bronze Age, with the chemical composition of mudbricks gradually improving, and their strength and durability increasing. The use of this architectural technique became increasingly specialized, and wall textures became more regular, while brick dimensions were standardised. Larger scale constructions testify to the presence of skilled teams of workers, some of whom would have been in charge of mudbrick production, others in directing building construction, pointing to the presence of a central organizing authority for controlling construction methods, and managing labour costs and organization.

Keywords: Neolithic, Early Bronze Age, Middle Bronze Age, Jericho, Tell es-Sultan, mudbrick, modular architecture.

Introduction

The Jericho Oasis provided an extraordinarily favourable environment for human settlement, and life there was deeply influenced by the orography and geomorphology of the region. This was characterised by two main wadis flowing into the Jordan river from the west — the Wadi Nueima to the north, and the Wadi Qelt to the south — as well as by the springs of ‘Ain es-Sultan, ‘Ain el-Auja and ‘Ain ed-Deuk, and then Jebel Qarantal and the limestone plateau and cliffs west and north of it. All these natural resources made it possible for the communities inhabiting the oasis to achieve an extraordinary series of successes (Nigro 2013, 1–6). The first of these was the transformation from a nomadic society, based on hunting and gathering, to the first settled society, based on the domestication of plants and animals.

This new subsistence economy allowed the invention of mudbrick (Love 2013a, 746), which may be considered one of the highlights of the site, and which was facilitated by the presence of a natural spring (Nigro 2014a, 27–28). Mudbrick was invented in the context of the development of agriculture, especially the cultivation of grain, which required a high degree of cooperation within the group, particularly at harvest time, and led to a need to develop structures for storage. The cultivation cycle also involved a time lag, encouraging the development of a sedentary lifestyle, another factor that created a need for more permanent structures (Frangipane 1996, 33–34; Wright 2005a, 96). The Neolithic period, therefore, saw a remarkable development in architecture, along with a strong codification of housing units across the Near East. As pointed out by Love (2013a, 746–747), there is also a social aspect behind the invention of bricks, because the choice of building materials and their use in architecture can be considered codes of social practice and even ideology. For understanding the parallel emergence of mudbrick architecture and social life at this time, we must therefore consider the wider shift towards artificial environments, supported by other changes in social behaviour.

Tell es-Sultan represents an interesting case study both for the birth of architecture and for the development of mudbrick construction technique. A study of mudbricks from the site — their dimension, colour and their mise en œuvre — allows us to also observe the socio-economic and organizational changes within this Levantine community over the millennia. This paper offers an overview of mudbricks and modular architecture at Tell es-Sultan through three main periods: the Neolithic, the Early Bronze and the Middle Bronze Age. The first part considers how the invention of mudbrick during the Neolithic Period attests to sedentarisation. The next section examines at how the introduction of standardised wooden moulds in the Early Bronze Age made possible the erection of public works, such as city fortifications, granaries, palaces and temples. Finally, we will explore how the higher
degree of standardization of mudbricks in the Middle Bronze Age, including their clay components, testifies to a new concept of urbanization as whole, with the development of a more complex organization of labour and wider exploitation of resources.

**The Neolithic Period**

K. M. Kenyon noted the existence of a great number of beaten earth floors, bounded by slight humps constructed of clay, and very primitive bricks consisting of balls of clay in the Proto-Neolithic layers (Stages I–VI) of her Square MI (1981, 18, 220, 224–225). The earliest mudbrick wall was built during Pre-Pottery Neolithic A. We may consider this the birth of architecture, a step thus described by W. G. Childe (1948): ‘The brick is essentially just a lump of mud mixed with straw, that has been shaped by pressing into a wooden mould and then dried in the sun, but this invention made free construction and monumental architecture possible’. The process that led to the construction of monumental mudbricks works was probably long and gradual. In Pre-Pottery Neolithic A, round houses appear built of ‘hog-back’ mudbricks — that is, oval bricks with flat bases and convex upper surfaces (Kenyon 1957, 70); these houses were placed on stone foundations and surrounded by walls.

During Pre-Pottery Neolithic B there was a fundamental change, and we see the passage from curvilinear to rectangular architecture (Cauvin 1989, 14; Bar-Yosef 1998, 198; Liverani 2005, 69; Nigro 2014a, 28; Nigro 2016, 6–7). Houses were now made of a succession of sizeable rooms linked by wide openings, usually on the central axis, with further openings between the end of the cross-wall and the side-wall. Rooms were rectangular in plan, with slightly rounded angles; adjoining the main rooms were a complex of smaller rooms, some of which lacked doorways and may have been storage bins. Rooms were grouped around courtyards that were used for cooking. The main house walls were solidly built, averaging 45 cm in width, with mudbrick walls on stone foundations.

The mudbricks used were very characteristic: sun-dried, unbaked clay, hand-made into bricks without the use of moulds. They had an elongated shape with rounded ends, rather like a flattened cigar, which is the name Kenyon gave to the form (Figure 1). The upper surface had a herringbone pattern created by impressing the brick-maker’s thumb, which provided a keying for the mud-mortar in which they were set. Bricks measured 45 cm long and 15 cm wide, with the length of each brick being a multiple of its width, enabling them to be used in a modular fashion, and thus introducing modular architecture to the site — that is, the use of standardised elements that could be combined in different ways during construction. Their size and shape meant the bricks could be used as headers and stretchers in a wall, alternating in each course. The majority of mudbricks were laid as stretchers on three parallel courses, but

![Figure 1. The ‘flattened cigar’ mudbrick of the PPNB period (Kenyon 1981, pl. 138c). Copyright UCL, Institute of Archaeology (Kenyon Archive: Jericho 1954.272).](https://about.jstor.org/terms)
Occasionally headers were placed to run through the full width of the wall.

House B in Kenyon Trench III is one of the best examples of a PPNB house (Figure 2) and shows very clearly the mudbrick setting of the wall (Kenyon 1981, 184–187). Observing the plan of the house, it can be noted that in walls NAA, NAB and NAC, mudbricks were laid as stretchers and, because of their modular dimensions, helped to strengthen the wall junctions. They therefore combine to form a structure which becomes difficult to destroy. This design may have been developed as a technical solution to one of the major problems that affects the Southern Levant: earthquakes (Garfunkel et al. 1981; Hamiel et al. 2009; Alfonsi et al. 2012; Nigro 2014b, 55–56). These houses give the impression of having a solid, well-planned layout, with even a considerable degree of comfort.

Most of the houses of Pre-Pottery Neolithic B Period were discovered by Kenyon; all of them show the same architectural features and were built using the same type of mudbricks. Examples are attested in different parts of the site, including Building 60–67 in Trench I (Kenyon 1981, 73–74, pl. 221), Walls MDE, MDN and MDO in Square MI (Kenyon 1981, 251–252, pls 287b, 288a) and House E101–E212 in Squares EI, II, V (Kenyon 1981, 307, pl. 308c). This suggests that Tell es-Sultan was already inhabited by an organised community, an impression reinforced by contemporary structures such as the public building, the round tower and the defensive wall (Kenyon 1957, 65–68). It can be supposed that the people who built their houses were following the same rules of construction within their community. However, it does not seem likely that specialised workers, who might have been employed in constructing public works, were also engaged in the production of domestic
bricks. A recent study on Neolithic mudbrick houses from Çatalhöyük demonstrates that each family group made mudbricks for their own house, even when sharing sources of raw materials (Love 2013b, 89–90).

The Early Bronze Age

The defensive walls are one of the main features of the Early Bronze Age city (Nigro 2006, 350–351; 2017, 153, fig. 8.7). At the very beginning of the 3rd millennium BC Tell es-Sultan grew from a rural village to achieve an economy and complexity of social organization sufficient to allow it to successfully face the challenge of transforming a town into a major fortified city (Nigro 2016, 9). Fortifications were necessary for security, in order to protect the economic surplus gathered into the town, and for the self-representation of the newly developed urban power (Kempinski 1992, 68; de Miroshchidji 2014, 314). This period marks the emergence of the first urban society in Southern Levant, Schaub’s so-called ‘Walled Towns Culture’ (1982). He argued that the construction of the first defence systems in Early Bronze II, which took place simultaneously in several sites in the region (e.g. Beth Yerah, Tell es-Sa‘idiyeh, Pella, Tell Abu Kharaz, Tell Shalem, Megiddo and Tell Sakan), is a clear indicator of the emergence of complex societies (Schaub 2007, 251–252).

The architecture of the Early Bronze II city wall exhibits a marked social and economic transformation (Nigro 2010, 461–463). It was built of large light yellowish mudbricks, laid upon a foundation consisting of a single course of limestone boulders with a width varying between 4.5–5.6 m and a total perimeter of around 1 km. Semi-circular towers were added at some strategic defensive locations (Nigro 2006, 356–361; 2010, 461–463). The Early Bronze II city wall was identified in different parts of the site by all the archaeological expeditions of the last century, who also noted the light yellowish colour of the mudbricks (Sellin and Watzinger 1913, 17; Garstang 1930, 129–130; 1931, 186, 192, fig. 5; Kenyon 1981, 97, 258). From the analysis of their data, it would appear that the mudbricks employed were quite uniform in colour and dimensions: the most common type measuring $56 \times 28 \times 10$ cm. These dimensions were reported by K. M. Kenyon for the Town Wall II in Square MI (Kenyon 1981, 259, pls 142a, 289b) and were also deduced from a study of Garstang’s sections and photographs of his Wall A (1932, fig. 3; Garstang et al. 1935, pl. Lc). Bricks of a different size, $70 \times 40 \times 15$ cm, were used in the structure excavated by Sellin and Watzinger as the ‘Massiv’ (1913, 17, fig. 10, pl. 3a, plan I). It must be emphasised that this wall is part of an angular defensive tower, which may explain the greater thickness of the wall and the larger size of the bricks. Other segments of the Early Bronze II city wall were Walls A and B, identified by K. M. Kenyon in Trench I and built with mudbricks measuring $40–43 \times 28–29 \times 7–8$ cm (Kenyon 1981, 97–98, pls 79a, 229b, 240d, 241b), and Town Wall 1 in Area A, for which the dimensions of the bricks are not given (Kenyon 1981, 372–373, pls 200a, 343a).

The two most frequent types of mudbricks used in Early Bronze Jericho show a dimensional ratio of 2:1, which is basic to modular architecture and allows alternating headers and stretchers, since each header laid corresponds to two mudbrick stretchers (Figure 3). Masonry can be constructed in various ways, but the correct combination of header and stretcher bricks
Figure 4. Reconstruction of the bonding technique used in the EB II fortification walls. Illustration by Gaia Ripepi.
was the same as the Early Bronze II fortification system (Figure 6), but with some innovation. Mudbricks are now smaller than those used in Early Bronze II, measuring either $40 \times 30 \times 10$ cm or $42 \times 36 \times 12$ cm; they have a quadrangular shape and the layer of mortar between the rows is thinner. The Early Bronze IIIA fortifications were identified by all the archaeological expeditions on the north, west and south sides of the tell, with a short section also identified by Garstang on the east side (Wall B).

A study of Garstang’s excavation records provided further detail on the composition of Wall B. The mudbricks in the section in Square F5 measured 36–40 cm in length and 12 cm in thickness (Garstang 1931, fig. 5); in Square H4 they measured $36 \times 31 \times 16$ cm (Garstang 1932, 13); in Square I4 they were 44 cm long and 13 cm thick (Garstang 1931, fig. 3), while in Square L3–4 (Trench d-d) they were 35–44 cm long and 13–18 cm thick (Garstang 1931, fig. 2). Kenyon also gave information on the mudbrick used in segments of the Early Bronze III city wall excavated by her in Trench I, Square A and Trench III. In Trench I she distinguished between Inner Wall E+F+G and Outer Wall K+L. The mudbricks used in the Inner Wall had a variable length of 30–40 cm and a thickness of 8 cm (Kenyon 1981, 98–99, 101, pls 83b, 230, 236, 240d). The measurements of the mudbricks used in Town Wall 2 in Area A, were $36 \times 26 \times 9$ cm (Kenyon 1981, 373, pls 200a, 201, 343a). Finally, in Trench III, mudbricks of Wall NFB were also 30–40 cm in length, and 10 cm in thickness (Kenyon 1981, 209, pls 343a, 200a, 201).

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**Figure 5.** Exposed segment of EB III brickwork from the fortification wall on the southern side of the tell. Photograph by Gaia Ripepi.

**Figure 6.** Reconstruction of the bonding technique used in the EB III fortifications. Illustration by Gaia Ripepi.
The walls of Jericho exhibited some specific technical features. The thickness of the mortar changed from 5 cm in Early Bronze II (Garstang 1930, 129–130) to 2–3 cm in Early Bronze III (Garstang 1931, fig. 3; Kenyon 1981, pl. 240d; Nigro 1998a, fig. 1.11), making the structure more resistant, because mortar represents a weak point (Aurenche 1981, 121; Latina 1994, 87). Modern studies about the performance of brick walls during earthquakes have shown that the strength of a wall is affected by the quality and thickness of its mortar, as well as by its degree of cohesion with the bricks. When a wall is built only of headers, breakage will only occur in the mortar joints (Borri and De Maria 2012, 10, fig. 8, 12). As various studies have shown, in addition to the thickness, another important aspect is the mortar composition; if it is stronger than the bricks, it will tend to break, but if it is weaker, the joints are subject to breakage (Homsher 2013, 63; Wright 1985, 409). Smaller mudbrick dimensions made them more convenient to use and simplified the construction of the double city wall.

Another aspect of brick dimension worth noting is that their size, varying between 40 and 45 cm, is very close to the ‘cubit’ of a man (Spencer 1979, 147–150; Wright 1985, 118; de Miroshedji 2001, 467), suggesting the possibility that slight variations in size came from the actual workers who made the mudbricks (Homsher 2013, 66). The use of the cubit, documented also in Mesopotamia and Egypt, reveals an early standardization of measurement, linked with urban development (Wright 1985, 88).

The Early Bronze IIIA city came to a sudden end, being destroyed around 2500 BC. It is not clear if another earthquake was the cause of this destruction, or whether it was due to a military attack, since fierce fire is documented in some areas (Nigro 2014b, 75). However, this destruction did not interfere in the continuing cultural and economic development of Jericho. The city wall and related structures were immediately rebuilt and further reinforced with the addition of towers and bastions. The EB IIIB walls followed the line of the previous double city wall and remained the same size.

Stretches of these new walls have been exposed along the northern, western and southern sides of the tell. Sellin and Watzinger followed sections on the northern and western sides (1913, 20–33, figs 8–9, 12–14, pl. 19; their Hauptmauer and Vormauer), as did Garstang (1930, 128–130, pls I, VI, IX; 1931, 192, fig. 4; his Wall D). Kenyon mainly exposed the city wall on the western side of the tell — her inner Wall H and outer Wall M in Trench I (Kenyon 1981, 100, 102, pls 80b, 81a–b, 84a–b, 236, 240d), inner Town Wall IV in Square MI (Kenyon 1981, 265, pls 142b, 143b, 296b) and inner Town Wall 3 in Site A (Kenyon 1981, 373–374, pls 201, 343a). She also exposed the inner and outer walls in Trench III at the southern foot of the tell (Kenyon 1981, 211–212, pls 124b, 213, 269c, 270a, 273; her walls NFG and NIF). The Italian-Palestinian Expedition opened Areas B and B West in the same region (Figure 7), providing good evidence for understanding the stratigraphic sequence of the two phases of EB III (Marchetti et al. 1998, 122–125, 129; Nigro 1998a, 36–38, 90–91).

The double defensive line of EB IIIB was formed by inner wall W.1 and outer wall W.51. W.1, built directly on earlier wall W.2, was narrower that of W.2 (c. 3.50 m), while W.51 was built slightly set back on its inside face, and with a greater thickness, suggesting a shift of function between the two defensive lines (Figure 8). The inner wall seems to have been gradually added to the internal quarters, as the presence of Building B1 demonstrates. The excavations in Area B West demonstrated that there were blind rooms filled in with marl between the inner and outer walls. The mudbricks used in these walls measured 36 × 32 × 12 cm, were pale brown in colour, and were laid alternately as headers and stretchers. The Area B excavations provided further evidence for the architectural design of the walls, with wooden beams and reeds being employed inside the walls as chains and draining devices (Figure 9). This method is attested at other Levantine sites such as Megiddo and Beth Shan (Wright 1985, 413), while the use of straw mats between the brick courses was more characteristic in Egypt (Clarke and Engelbach 1930, 210).

Jericho epitomizes the earliest urban phenomenon in the Southern Jordan Valley, marked by the construction of a large-scale fortification system. The urbanization process is attested across the Levant, and is characterized by the abandonment of numerous Early Bronze I villages and the consequent transfer of population to particular settlements, which rapidly transform into fortified urban sites (Getzov et al. 2001). Even though this phenomenon shows regional variation in the density and nature of settlements (de Miroshedji 2009, 106; 2014, 314), one of the common elements in the process is the construction of city walls. The study of the mudbricks used in different sites, and the logistics behind their use, can therefore help us better understand the characteristics of this urban phenomenon.

An examination of three Early Bronze Age sites helps illustrate how mudbricks were used elsewhere in the Southern Levant. To the north is the site of Khirbet
Figure 7. Jericho: map of the excavation areas. Illustration by Gaia Ripepi.
Figure 8. Schematic plan of Area B, showing the double defensive line of EB IIIB (originally published as Nigro 2000, fig. 2.2). Copyright University of Rome 'La Sapienza' ROSEPAJ.

Figure 9. A wooden beam from the EB III fortification wall in Area B. Copyright University of Rome 'La Sapienza' ROSEPAJ.
Kerak, located on the south-western bank of the Sea of Galilee. In Early Bronze II, this site was protected by a mudbrick wall that was up to 8 m thick (Paz and Greenberg 2006, 236–237, Wall A). The bricks used had varying dimensions of 55 × 50 cm, 50 × 40 cm and 40 × 25 cm, and they were separated by a layer of thick, dark mortar (Paz and Greenberg 2006, 236–237, fig. 6.2). The city wall of the Early Bronze IIIB period, however, had an average thickness of 3–7 m, and was constructed from two types of bricks: quadrangular (40 × 40 × 10 cm) and rectangular (50 × 35 × 10 cm; Paz and Greenberg 2006, 249–267, plans 6.6–6.10, Wall C).

In the centre of the region, the site of Tell el-Farʿah North was encircled in Early Bronze II by a mudbrick fortification wall built on stone foundations. This was made of bricks 45 × 25 × 11 cm in size, in two main colours, some whitish, others darker (de Vaux 1951, 421–422; 1962, 212–215, pl. XXIIa). Finally, similar features were seen in the Ghôr region, east of the Dead Sea, at the city of Bâb edh-Dhrâ’. In Early Bronze II the site was encircled by the earliest city wall (Wall B): this was 2.5 m wide and was built of mudbricks without stone foundations (Rast and Schaub 2003, 120–122, 166–170). A stretch of this wall in Field I was preserved to a height of 19 rows of bricks, with each brick measuring 50 × 25 × 10 cm, with a dimensional ratio of 2:1. A later wall was built around the site in Early Bronze III (Wall A), and identified along the western, eastern and southern sides of the tell (Rast and Schaub 2003, 172). This wall was 7 m wide and built of mudbrick on a stone foundation; the bricks measured 30 × 30 × 9 cm or 40 × 30 × 9 cm; some were impressed with characteristic signs.

This brief survey leads to the following observations:

- Fortification walls using modular mudbricks first appear in Early Bronze II, and were often built on stone foundations.
- Cities strengthened their fortifications in Early Bronze III, with the thickness of the wall increasing, and sometimes doubled.
- Mudbricks have a rectangular shape in Early Bronze II, then become smaller and usually quadrangular in Early Bronze III.

In the face of the need for defence and to protect common goods, each community was endowed with a fortification wall. As urbanization grows in Early Bronze III, these defensive systems not only become more massive, but also improve in the technical way they are realised. Mudbrick size may be reduced, because smaller mudbricks can be produced more quickly and handled more easily. Despite some debate about the political organization of these communities (e.g. Philip 2001, 217), the presence of town walls and the effort required to produce them serves as proof of the emergence of a degree of centralization and a hierarchical level of resource management (de Miroschedji 2014, 319).

The Middle Bronze Age

After the peak of urban life prosperity in the EB III (around 2500–2400 BC), there was a rather sudden collapse during 24th century. This period, which Kenyon called the ‘Intermediate Early Bronze – Middle Bronze Period’, corresponds to the EB IV in current terminology (Stern 1993; Maier 2010) and was a process of structural collapse. The following Middle Bronze Age period represents the second period of urban life in the Levant, and was marked by radical change (de Miroschedji 2009, 112). This paper follows Stern’s terminology for the Middle Bronze Age (1993) with further subdivisions as established by the Italian-Palestinian excavations at Tell es-Sultan (Marchetti 2003, table 1; Nigro et al. 2011, table 1). Correlations between current archaeological periodization, the stratigraphic phases of the Italian-Palestinian Expedition, and Kenyon’s terminology are presented in Table 1.

In the Middle Bronze I period (corresponding to Sultan IVa), Jericho was again a fortified city: fortifications consist of a free-standing mudbrick wall incorporating rectangular towers, which was found on the eastern

### Table 1. Correlations between current archaeological periodization, stratigraphic phases of the Italian-Palestinian Expedition, and Kenyon’s terminology.

<table>
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<tr>
<th>Period</th>
<th>Kenyon terminology</th>
<th>Dating</th>
<th>Tell es-Sultan phase</th>
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<tbody>
<tr>
<td>Middle Bronze Age IA</td>
<td>Middle Bronze I</td>
<td>2000/1950–1900 BC</td>
<td>Sultan IVa1</td>
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<tr>
<td>Middle Bronze Age IB</td>
<td></td>
<td>1900–1800 BC</td>
<td>Sultan IVa2</td>
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<td>Middle Bronze Age IIA</td>
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<td>1800–1700 BC</td>
<td>Sultan IVb1</td>
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<td>Middle Bronze Age IIB</td>
<td>Middle Bronze II</td>
<td>1700–1650 BC</td>
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<td>Middle Bronze Age III</td>
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<td>1650–1550 BC</td>
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slopes of the tell. These included Garstang’s fortification wall B (1932, 13, pl. XI) and tower (1931, pl. VI; 1932, 13, 15–17, pls IX, XI), and Kenyon’s walls HCJ and HCP (1981, 357, pls 339–340).

However the best data for understanding the fortifications of the Middle Bronze IB–II period comes from Tower A1, discovered in the southern part of the tell by the Italian-Palestinian Expedition (Marchetti 1998, 124–135; Marchetti 2000, 199–207; Nigro et al. 2011, 573–577; Figure 7). This tower is a rectangular building (6.50 × 5.40 m), constructed of regular reddish-brown mudbricks on a stone foundation (Figure 10).

The westernmost wall of the tower had a monumental stone foundation, which consisted of large orthostats (90 × 80 cm) placed at different elevations, following the slope of the tell. Mudbricks used in the tower measured 52 × 36 × 15 cm. On the northern, western and southern walls, these were laid as headers, while on the eastern wall they were laid as stretchers, staggered in each row (Figure 11). Since the western wall (W.19) was the main wall of the tower, that carried on to the north and south, and to which the other three walls were attached, it can be assumed that W.19 was built as a structural unit first, and then the other three walls added, all as part of a single operation.

Comparisons may be drawn with the tower discovered by J. Garstang on the eastern slope of the tell. Even though this tower no longer exists, and archaeological field documentation is lacking, the eastern front view published by Garstang (1932, fig. 6) suggests that a similar architectural technique was used in its construction. Mudbricks were laid as headers. These measured 36 cm in the eastern front view; angular mudbricks, measuring 52 cm, were laid as stretchers, in order to allow the same technique, with mudbricks laid as headers, on the other walls. The walls of Tower A1, which were 1.5 m wide, were made up of three lines of mudbrick, while the Eastern Tower walls, which were 2 m wide, made use of four.

The study of the building technique of Tower A1 suggests that during the Middle Bronze Age architecture became more specialized, showing technical and structural superiority over its Early Bronze predecessors. In addition to greater standardization of brick measurements, we can also note a more orderly bonding of the walls. The ‘standardization hypothesis’ proposes that greater uniformity is due to a higher rate of specialized production, that is linked in turn to some degree of centralised control (Homsher 2013, 238–243). Standardization between buildings may indicate urban planning within the site.

These issues are common to other sites of southern Levant, where an increasing similarity between the bricks used in fortification walls and structures may be noted. The first Middle Bronze Age fortification wall at Jericho, W.7 in Area D on the eastern slope of the tell, was built with reddish yellow mudbricks, measuring 42 × 36 × 15 cm (Marchetti et al. 1998, 130; Nigro 1998b, 95–96, figs 2.1–3; Nigro 2000, 165–170, figs 3.2–7). In the triple-arched gateway of Dan, the mudbricks employed...
measured 40 × 40 × 13 cm (Biran 1984, figs 2–4; Biran et al. 1996, plan 10; Homsher 2012, 8–10; Homsher 2013 appendix, 116). Mudbricks used in the fortification walls and gate of Megiddo measured 35 × 35 × 11 cm (Homsher 2012, 8,10; 2013 appendix, 117). At Pella mudbricks used in the defence walls (W.9, W.41) were extremely uniform in dimensions, measuring 38 × 38 × 10.5 cm (Bourke et al. 1994, 93–96, fig. 9; Homsher 2012, 5–6, 10, fig. 3; 2013 appendix, 118). In the north-western gate at Shechem, mudbricks measured 38 × 38 × 10–12 cm (Campbell 2002, 105–118), while the bricks used in the South Gate at Gezer were 40 × 30 × 10 cm (Macalister 1912, 238–243, figs 125–126). Finally, the mudbricks employed in Ashkelon Gate 1 measured 40 × 35 × 10 cm (Stager et al. 2008, 221, fig. 14.6).

**Final Remarks**

Jericho is characterized by an almost continuous history of occupation, with an impressive stratigraphic sequence, making it the perfect site for studying the development of mudbrick construction techniques over time. The Neolithic Period marked the transition from shapeless mudbricks to moulded ones with modular dimensions, which enabled the construction of more complex structures. This was a fully sedentary
community, with a certain degree of stability in the supply of food and raw materials. This allowed builders to search for and experiment with technical solutions for improving the quality and stability of houses. The invention of wooden moulds in Early Bronze II led to the creation of large-scale works, such as the fortification walls of the city. Tell es-Sultan formed part of the urbanization process that experienced a sudden acceleration in Early Bronze II, becoming a small fortified settlement of about 3 ha in size (de Miroshchij 2014, 314, fig. 22.1). During the Early Bronze Age the brick-making technique was refined, and construction methods improved, reducing the risk of structural damage. The expansion and strengthening of defensive walls then bear witness to the growth of the site during Early Bronze III, when Tell es-Sultan became an urban centre and was integrated into the interregional and foreign networks of contact that are typical of this period (de Miroshchij 2014, 320–321; for links between Tell es-Sultan and Egypt, see Sala 2012).

Finally, in the Middle Bronze Age not only did the quality of mudbricks improve, but there was also an increase in size uniformity, with an increasing similarity between the bricks being used in fortifications across the Levant. Bricks at this time had a quadrangular shape, and were staggered both in horizontal and vertical levels, making structures more resilient. This aspect forms part of a series of innovations that jointly characterize the sites of the southern Levant, including architectural innovations in fortifications, such as earthen ramparts and multi-entry gates, as well as new strategies for urban planning and settlement expansion. This is the picture of a society growing in population (Ilan 1995, 305), intensifying agricultural and craft production, and participating in far-flung exchange systems; and as Maeir has argued, it may even have formed some kind of Central Hills polity (2010, 139–155).

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Bibliography


