STUDIES OF ANCIENT EGYPTIAN FOOTWEAR. TECHNOLOGICAL ASPECTS. PART X. LEATHER COMPOSITE SANDALS

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ABSTRACT

The tenth part in the series on the manufacturing technology of ancient Egyptian footwear (phase I of the Ancient Egyptian Footwear Project) presents 15 so-called 'leather composite sandals'. These well made sandals, usually in bright colours and decorated, are known from New Kingdom contexts; they were not a common commodity. Although the focus is on the technological aspects, several other topics will be dealt with nonetheless, albeit in passing, among which the preliminary typology.

Introduction

Our knowledge of footwear in ancient Egypt is limited and largely based on iconographic studies[1] rather than the study of archaeologically attested specimens – which have been largely neglected. This is remarkable, because before being able to interpret footwear, one has to understand its construction: one has to know for example, how they look like, how they were made and what the materials are. Only with a thorough knowledge of the sandal or shoe itself is it possible to interpret its representations in reliefs and paintings. Therefore, the Ancient Egyptian Footwear Project (AEFP) is divided into three phases, the first phase of which focuses on the study of the archaeologically attested objects (for a detailed explanation of the objectives see Veldmeijer, 2009b). Consequently, the present work is one in a series on the manufacturing technology of ancient Egyptian footwear. The 'leather composite sandals' are well made sandals, which consists of various sole layers. In most cases the leather is coloured in bright hues and the dorsal surface of the sole is decorated. Usually, the insole is padded in the centre to en-

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hance comfort, but some sandals are without this. Despite the focus on manufacturing technology, other footwear related subjects will be dealt with, but only in passing, as they will be discussed in detail at a later stage of the project.

The terminology that is used in describing leather and footwear in this paper is adapted from Goubitz *et al.* (2001) and discussed elsewhere (Veldmeijer, 2009b). In contrast to other papers in this series, the sandals are described separately rather than focussing on the different components. The reason for doing so is the fact that the rather complicated sandals display many differences in detail (summarised in table 1; more specific information, however, is inserted in the text): they all differ from each other. Presenting the material this way enhances clarity.[2] Institutional abbreviations are explained with the table.

Typology

A complete typology on ancient Egyptian Footwear will be provided after all footwear in the database of the project has been described, and date and distribution can be inserted, as well as iconographic and philological information. This is also the main reason that Montembault's (2000) typology, which is based on the Louvre collection, is not used here as most of the objects are without provenance and date.

Many criteria can be used to make a typology and different types of footwear (for example leather versus fibre sandals), ask for different classification criteria. Goubitz *et al.* (2001: 132, 219-221) explains in the important work on European footwear, that there is much to say to use appearance ('recognisibility') as a criterion on a narrower level, especially if the footwear has no fastening (so-called 'slip-on shoes'). Here, the classification on Category- and Type-level is based on the shape of the sole, because the technological features, though different in detail, are based on the same principle: several layers are stitched together along the perimeter and includes decorative strips at the dorsal surface of the insole.

Type A has a rounded heel and the waist is constricted. Towards the front the sole increases in width at both sides, but the lateral side slightly more distinct. Due to the fact that it curves more gently towards the rounded toe, a swayed sole is the result. The orientation is, as usual, confirmed by the position, off centre, of the front strap. There is no padding.

The sole in Type B, Variant 1 has a rounded heel, constricted waist and a medial edge that runs nearly straight to the pointed toe. As usual, the lateral edge curves gently towards the toe, reaching the largest width at about halfway the total length of the sandal. Thus, a swayed sole is created, the orientation of which is confirmed by the off centre position of the front strap. Only one example of this variant has no padding. The shape of Variant 2 sandals is comparable although the lateral edge is less convex and the medial edge is slightly more curved. This variant, however, differs from Variant 1 in the fact that they have a large, extended, backwards curling toe. The sole is padded in all examples.

Type C is represented by only one example and differs distinctly from the Type A and B sandals in shape and technology. It has no padding and no separate decorative strips along the perimeter. On the other hand, the insole is highly decorative, as is the back strap.

Description

Type A

ÄMPB ÄM 20998 (table 1; figure 1-5, 35)

The two sandals ÄMPB ÄM 20998 (figure 1) are, according to the archival information from the museum, a pair but the left one is less well preserved. The sandals are recovered from Tomb 1150, E3 in Deir el-Medinah (Wolf, 1930: 137; Schwarz, 2000: Catalogue C, No. 19 [no page numbers]).

The description focus on the right one, with additional comments related to the left on occasion. The sandal consists of a thick rawhide insole – the dorsal surface of which is coloured bright red – and an equally thick, light brown/beige treadsole. The sole layers are secured by means of two rows of small but widely spaced running stitches of sinew, each of which secures a narrow strip of green leather, with an average width of about 5 mm (the outer strip is slightly wider than the inner one) (figure 2). The outer strip runs along the entire perimeter close at the edge, rather than a few mm inside the edge. The pre-strap interrupts the strip. Note, however, that at the left pre-strap, the end of the front element of this decorative strip is inserted in the cladding of the pre-strap (figure 3). The in-

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Figure 1. ÄMPB ÄM 20998. Left sandal in dorsal and ventral view and right sandal in ventral and dorsal view. Scale bar is 50 mm. Photography by E. Endenburg. Courtesy of the Ägyptisches Museum und Papyrussammlung, Berlin.

nermost strip extends less far backwards: it terminates less than halfway the sandal's length. The right element runs further towards the heel than the left one, but this seems due to the loss of the tip of the left one, judging the last stitch still *in situ* (arrow in figure 4). In the left sandal, this element terminates at the same level as the right element. However, posterior to the left side, there are two empty stitch holes. Since these do not have remnants of stitching, possibly these have not been used. Usually the width of this kind of strips is rather even, as is the case with the right one but the width of the strips of the left sandal is much more varied.

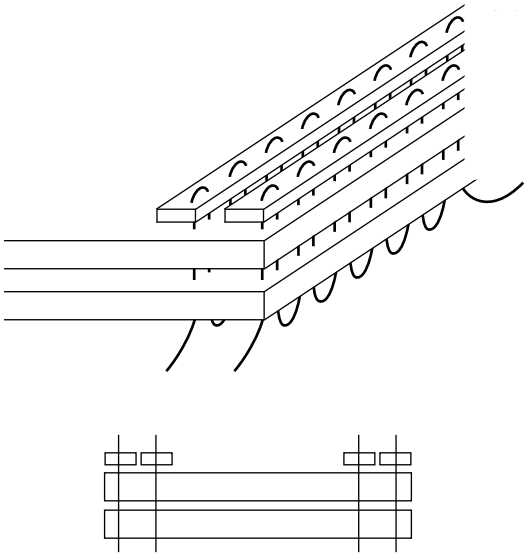


Figure 2. Sole construction of ÄMPB ÄM 20998. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

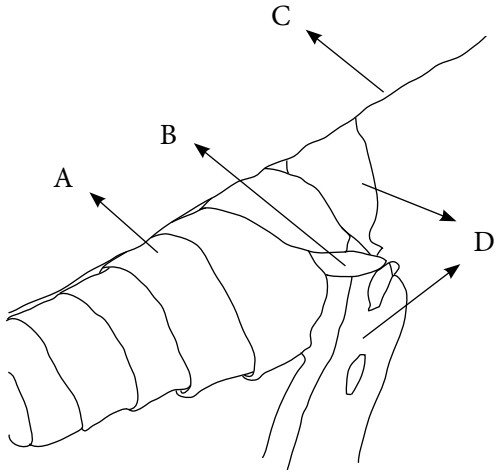


Figure 3. Detail of ÄMPB ÄM 20998. The medial outer strip in the right sandal is tucked in the pre-strap cladding. A) Clad pre-strap; B) Tucked in outer strip; C) Back strap; D) Green decorative strip at insole. *Cf.* figure 1. Scale bar is 10 mm. Drawing by E. Endenburg/A.J. Veldmeijer.

There is no padding. The centre of the dorsal surface of the insole shows two parallel impressed line decorations roughly following the outline of the sole, which cross each other at the level of the pre-strap.

The treadsole of the right sandal is made of rawhide, hence the light colour. The left sandal, however, has another, thin, dark brown/reddish layer. It is an addition to the midsole (which is the treadsole in the right one). The reason for this addition is unknown: there are no signs of extensive wear.

Figure 4. Detail of ÄMPB ÄM 20998. Dorsal view of the front part of the right sandal. The arrow points to the isolated stitch. Scale bar is 10 mm. Photography by E. Endenburg. Courtesy of the Ägyptisches Museum und Papyrussammlung, Berlin.

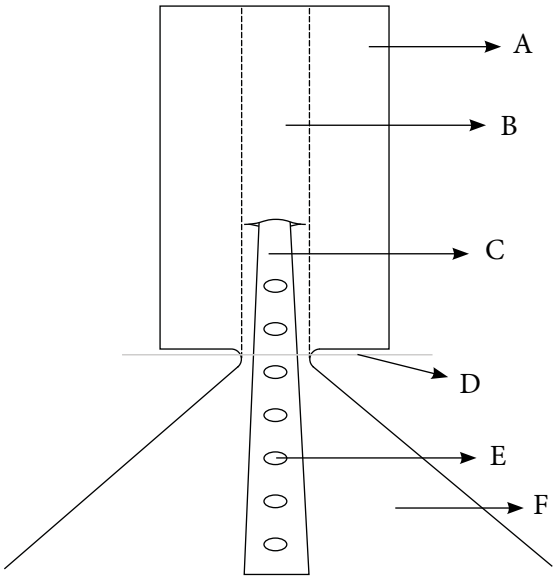


Figure 5. Strap complex of ÄMPB ÄM 20998. Likely, the front strap is cut of the same piece of leather as the rest of the strap complex. The green strip is decorative but also functional as it reinforces the narrow connection between the front strap and back strap. The numbers are explained in the text. Not to scale. Drawing by E. Endenburg/ A.J. Veldmeijer.

The pre-strap (figure 3) is cut out of the same leather as the treadsole. It is clad transversely with narrow strips of light brown/beige leather in a slightly overlapping, stair-step fashion. The slit cut lengthwise at the end of the pre-strap is covered with a strip of green leather, which is tucked in with the transverse cladding, to enhance the aesthetic effect. The red heel/back strap consists of one piece, pulled through the slit in the pre-strap and simply looped around one of the edges rather than hitched (figure 35). The heel strap increases in width slightly at the centre and its top edge is folded, which is done deliberately. The back strap widens rapidly from the pre-strap onwards, forming a roughly V-shaped part (F in figure 5) that lies on top of the foot with a maximal width of about 45 mm. A rectangular centre part is cut out of the same sheet of leather (figure 5), the longitudinal edges (A in figure 5) of which are folded towards the inside (*i.e.* the dorsal surface of the insole; B in figure 5), thus turned into the front strap. On top of this a green strip of leather (with an average width of about 12 mm, C in figure 5) is stitched, again of which the longitudinal edges are folded. The running stitches (short at the visible surface, but long at the other, invisible inner surface; E in figure 5) are made from the light brown/beige leather beneath the green strip, which has approximately the same width but protrudes from the green strip slightly at the top. Unfortunately certainty could not be obtained, as this would have seriously damaged the sandal. The lower end of the green strip is inserted in the front strap. Although this is the most likely construction, it cannot entirely be ruled out, however, that the red front strap is separate from the back strap and fastened by means of the green leather strip on top of it (grey line, D, in figure 5). The front strap is secured at the ventral surface of the treadsole by means of an expanded terminal end thus preventing it from slipping through the slit.

Although the layout is the same, the shape and size of the two sandals differs significantly (table 1). Interestingly, the left one seems to be made with less care, judging from the large variation in the distance between the green strips at the insole (which is much more distinct than in the right) and the asymmetry of the shape of the sole. Another difference between the two is the treadsole, as already mentioned. The differences are remarkable because usually differences in size of well made footwear (leather and fibre alike) are negligible. Several hypothetical explanations can be proposed. The left one,

though smaller, has a much coarser appearance, perhaps suggesting this one was made in a hurry: it could have been a quickly made substitute for the lost or broken original one. Another possible explanation could be that the two originally belonged to two separate pairs (comparable children's sandals have been recovered from Deir el-Medinah, see below), put together for a reason we can only guess at (including 'archaeological' practises). However, we cannot wholly ignore the possibility that the sandal-maker made them as we see them: different.

ÄMPB ÄM 14551 (table 1; figure 6, 7)

Children's sandal ÄMPB ÄM 14551 (figure 6), meant for the right foot, has a comparable shape as ÄMPB ÄM 20998 albeit more pointier. However, it consists of only two sole layers (figure 7). The insole is made of thin red leather, the edges of which are folded over the treadsole's edge. In contrast to the other sandals, the layer is not pulled tight and consequently the insole wrinkles but there is no indication of padding. The set of green decorative strips that adorn the dorsal surface compares well with ÄMPB ÄM 20998 (see above). A row of running stitches of sinew secures the two sole layers, including the folded edge of the insole at the ventral surface of the treadsole. The sinew running stitches of

Figure 6. Ventral and dorsal view of right children's sandal ÄMPB ÄM 14551. Scale bar is 50 mm. Photography by E. Endenburg. Courtesy of the Ägyptisches Museum und Papyrussammlung, Berlin.

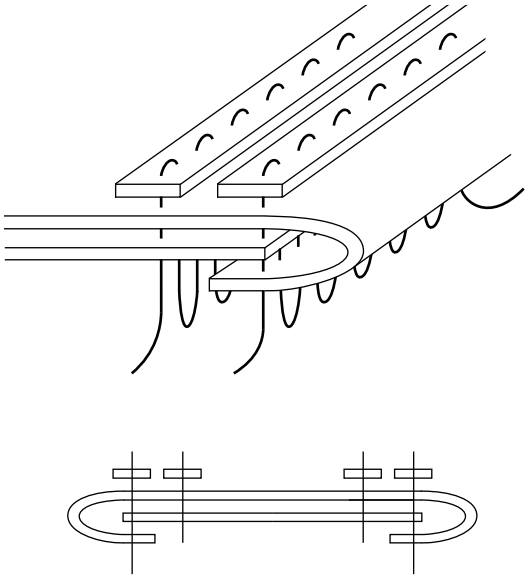


Figure 7. Sole construction of children's sandal ÄMPB ÄM 14551. Not to scale. Drawing by E. Endenburg/ A.J. Veldmeijer.

the decorative strip are stitched through both layers too, but do not include the insole's edge. The stitches are short at the dorsal surface of the insole but relatively large at the ventral surface of the treadsole.

The configuration of the strap complex is also comparable to ÄMPB ÄM 20998. However, the cladding of the pre-strap (the pre-strap is cut out of the treadsole's leather), is done with red leather that is comparable to the insole's leather. The main difference, however, is seen with the back strap (figure 8). At the widest part, openwork decoration consisting of two lotus figures (one above the other, see arrows), is stitched at a foundation. Together these two layers are secured with several stitches to the back strap (indicated in grey in figure 8). The front strap is broken off, but remnants suggest a same configuration as in ÄMPB AM 20998.

Amarna

Although numerous (fragments of) leather sandals are registered from Amarna (Veldmeijer, 2009a), only very few fall within the categories presented here (Veldmeijer, In press; see also Veldmeijer & Endenburg, 2007: 26). One, however, does. The children's sandal 22/119 (Peet & Woolley, 1923: pl. XX, 2) has not been studied first hand.[3] The sandal has a rounded heel, constricted waist and increases in width towards the front. The lateral edge shows a stronger con-

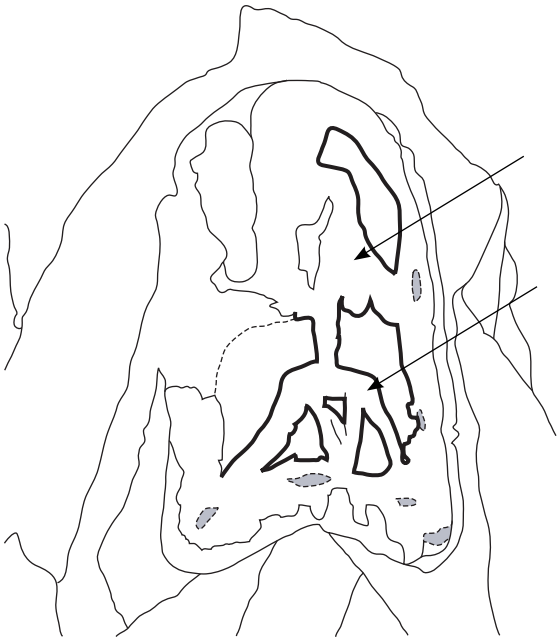


Figure 8. ÄMPB ÄM 14551. Several stitches secures the openwork decoration to the back strap. The arrows point to the top of the lotuses. Stitches are in grey. Drawing by A.J. Veldmeijer/E. Endenburg.

vex curvature, due to which the sole is swayed. It consists of at least two sole layers, which are secured along the perimeter with running stitches. The stitching, most likely of sinew, includes a decorative strip.

The sandal has an elaborate strap complex. The front strap is a strip of fairly thick leather, the dorsal terminal end of which has a slit lengthwise. The back strap is attached to it by pulling it through the slit, but the exact construction cannot be deduced from the photograph. It is equally unclear how the front strap is attached to the sole but most likely it goes through all sole layers and is secured at the ventral surface of the treadsole with an enlarged terminal end to prevent it from slipping through the slit. The pre-straps are cut from the same sheet of leather as the sole, but it is uncertain whether they were cut from one or more layers.

Most likely, the sandal consists of red and green leather. Several important characters for classification are obscure, because of the reason mentioned above, but the slightly raised area inside the perimeter stitching suggests the sandal was padded. If this is true, it differs from the other sandals of this type and can therefore be seen as a variant.

Type B, Variant 1

ÄMPB ÄM 21680 (table 1; figure 9-13)

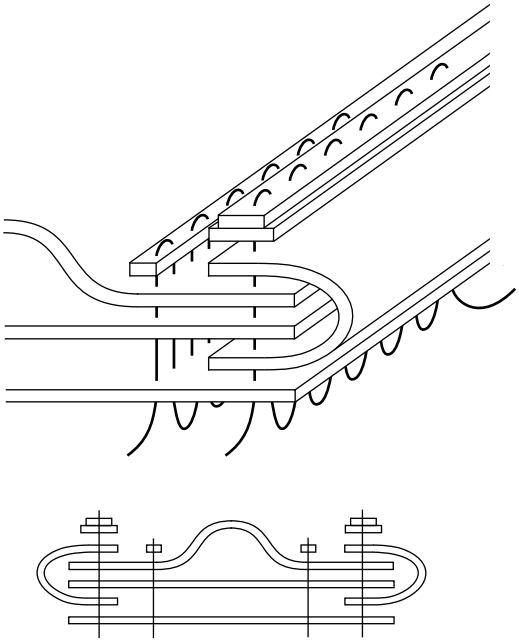
The sole of ÄMPB ÄM 21680 (figure 9) consists of a thick treadsole of rawhide and an equally thick midsole (figure 10). The insole is of much thinner leather and padded with hair, which might be goat. All sole layers are secured by means of two rows of running stitches of sZ_2 flax (figure 11). The outer row of stitches includes a strip of green leather, which is folded over the edge of the insole and midsole, but does not cover the edge of the treadsole. It is thus sandwiched between the midsole and treadsole. It cannot be established exactly how wide the strip is at the dorsal surface of the insole because it is partially obscured by a set of strips that follows the perimeter of the sandal several mm inwards from the edge. The lower of these two is slightly wider and red; the top one is green. Note that at the waist, which is also the attachment area for the pre-straps – which are broken off – the outermost set of strips as well as the leather strip that is folded around the in- and midsoles, are interrupted (figure 9). In the case of the folded strip the reason is due to the fact that the pre-strap, which is usually cut out of the same sheet of leather as one or several sole layers. Several mm inwards to this set is one strip of green leather, which is secured by the afore-mentioned second row of stitches. It also follows the perimeter of the sandal, but without interruption at the pre-strap attachment (see below). At the front, the two ends of this single strip meet, one of which runs over the other (figure 12). The end of the lower one was slightly too long and folded under the other strip (arrow in figure 12) and the junction is fastened with a stitch (note that the strips of the set have been cut off diagonally, but also stitched at the junction with a single stitch). At the front triangle of the sandal, inside the single green strip, decoration of green leather is applied, which is incompletely preserved (figure 13). It consists of a strip of leather, of which the outward facing edge is cut in triangles. At the front, a rectangular element points towards the heel.

BM EA 4389 (table 1; figure 14, 15)

The insole of the left sandal BM EA 4389 (figure 14) consists of a thin layer, which is rather

Figure 9. Left sandal ÄMPB ÄM 21680 in dorsal and ventral view respectively. Scale bar is 50 mm. Photography by E. Endenburg. Courtesy of the Ägyptisches Museum und Papyrussammlung, Berlin.

Figure 10. A damaged part in ÄMPB ÄM 21680 allows for the identification of the construction. *Cf.* figure 11. Scale bar is 5 mm. Photography by E. Endenburg. Courtesy of the Ägyptisches Museum und Papyrussammlung, Berlin.



> Figure 11. Sole construction of ÄMPB ÄM 21680. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

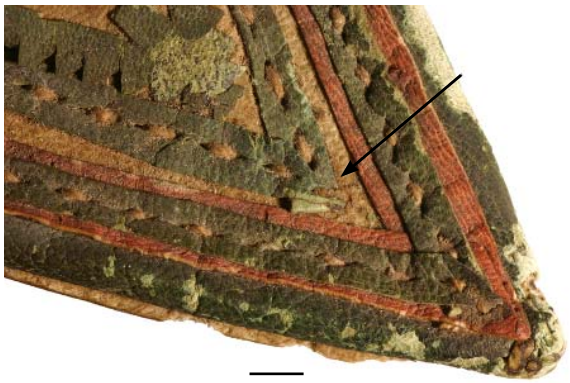


Figure 12. Detail of the toe part of ÄMPB ÄM 21680, showing the strip decoration. The arrow points to the folded end of the single green strip. Scale bar is 5 mm. Photography by E. Endenburg. Courtesy of the Ägyptisches Museum und Papyrussammlung, Berlin.

tightly pulled, leaving only little space for a shallow, vegetable padding, small remnants of which can still be seen. Two sets of strips run along the perimeter (total width of about 20 mm), both of which consist of three strips on top of each other (figure 15). The strips are, from bottom to top, narrower than the underlying one (7, 4 and 3 mm respectively). Because the sandal is turned entirely into a dark brown colour, nothing can be said about colours. Moreover, it is not possible to deduce the colours by

Figure 13. Inside the perimeter strip is an incompletely preserved applied decoration of green leather. Scale bar is 5 mm. Photography by E. Endenburg. Courtesy of the Ägyptisches Museum und Papyrussammlung, Berlin.

Figure 14. BM EA 4389 is incomplete, lacking the heel. Dorsal and ventral view respectively Scale bar is 50 mm. Photography by A. 't Hooft. Courtesy of the British Museum, London.

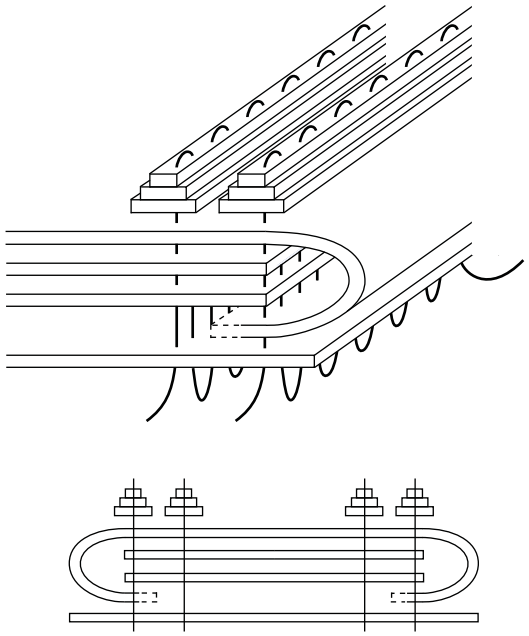


Figure 15. The sole construction of BM EA 4389. Note that, although it is likely, it is not certain that all stitching goes through the folded edge (hence the dashed line). Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

Figure 16. Left children's sandal BM EA 4390 in dorsal and ventral view. Scale bar is 50 mm. Photography by A. 't Hooft. Courtesy of the British Museum, London.

analogy with others, since different designs were used. The set of strips are secured with widely spaced running stitches, possibly of sinew, through all sole layers. The edge of the insole is folded around the two midsoles and sandwiched between the ventral midsole and the treadsole. Although it is likely that the outer row of stitches go through the folded edge, the incompleteness of the sandal prohibits clear vision (hence the dashed lines in figure 15). The midsoles are relatively thick; the treadsole is thinner but nevertheless still thicker than the insole.

Not much is left of the strap complex: the only remnant that has survived is the start of the right pre-strap, cut out of the treadsole's leather and clad. The cladding is attached in a comparable way as described for BM EA 4397/4398 (see below). A small remnant of the front strap shows that it was coiled lengthwise (several times?). Although vision at the ventral surface of the treadsole is somewhat blurred, a small stub protrudes, which is the fastening of the front strap.

BM EA 4390 (table 1; figure 16, 17)

The remarkable children's left sandal, BM EA 4390 (figure 16), has a rounded heel and a modestly constricted waist. Halfway down its length, towards the front, the width increases, after which the sandal quickly narrows and terminates in a pointed toe. Since the lateral edge curves more strongly than the almost straight medial edge, the sandal is clearly swayed. It consists of three sole layers, the midsole of which is the thickest. The treadsole slightly protrudes from the other layers on all sides. The insole is made of thin, white leather and shows a narrow, padded centre part (the only children's sandal to date showing this feature). The edge is folded around the midsole's edge (figure 17) and is sandwiched between it and the thinner, dark brown/reddish rawhide treadsole. It cannot be established how far it extends, hence the dashed line in the figure, but it can be safely assumed that at least the stitches of the outer set of strips (see below) goes through the fold in order to keep it firmly in place. The padded centre part is small, because large part of the edges (approximately 14 mm wide) is made of two parallel sets of leather strips, each made up of three strips on top of each other, each one narrower

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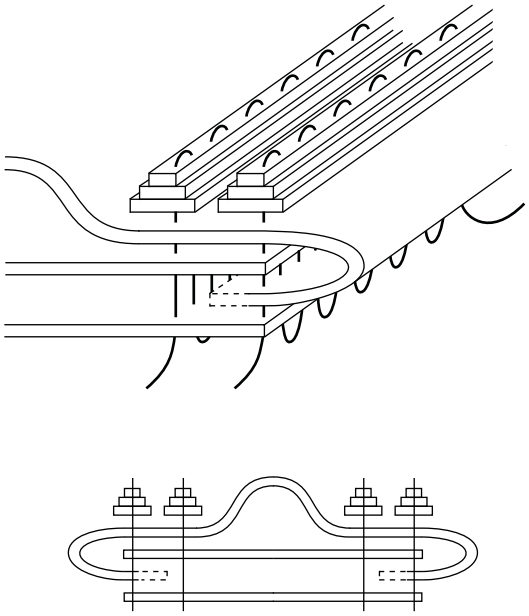


Figure 17. Sole construction of BM EA 4390. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

than the lower one (*cf.* BM EA 4389). The outer set is situated at the sandal's edge. The strips are rather coarsely secured to the surface, as there was little space for the elaborate decoration, and at several places, the two sets touch each other. Although the view is somewhat blurred, the sets are interrupted at pre-strap level, as is also seen in several other sandals (see above). The colours are almost gone, but at least the insole is red. The strips are secured with small, widely spaced running stitches of sinew, which go through all sole layers.

The strap complex lacks except for a remnant of the front strap, which is still *in situ* in the hole in the sole. Here, at the dorsal surface, a circular patch (20 mm in diameter) surrounds it onto which a 12(?) pointed star is visible. It is uncertain whether the star is cut from a separate layer or whether it is cut in relief. The star is painted green. The patch is not secured by any means but is kept in place because the front strap is pulled through it. At the ventral surface, the front strap is secured with an expansion of the terminal end in the shape of the leaf of a water lily. Decorative as the star may be, it would not have been visible when wearing the sandal.

BM EA 4397/4398 (table 1; figure 18-20)

BM EA 4397/4398 (figure 18) is a pair of sandals with rounded heel and modestly constricted waist. Halfway its length, the width increases, after which, towards the front, the sandal quickly narrows. The decrease in width is due to the lateral side, reaching the largest width approximately at the same level as the insertion of the front strap. From this point, the side runs diagonally and the medial edge runs nearly straight towards the short, curled toe. The result is a swayed sole, the orientation of which is confirmed by the off centre position of the front strap.

The sandals consist of a midsole and treadsole of about the same thickness but the thickness is far from continuous and thinner areas can be seen throughout. Anyway, they are thicker than the insole. Accept for the wear at the heel (see below), the holes and thinner spots are due to preservation. The treadsole is made of rawhide. Most likely the midsole is made of rawhide too, but certainty is impossible due to the completeness of the insole and treadsole, which thus obscures clear vision. An interesting detail is that the edges of both sole layers are rounded and not square. This means that they have been trimmed with an edge shaver, or beveller, after the sole was cut from the larger sheet. The insole is made of a much thinner sheet of white leather. It terminates under the green strip along the perimeter of the sandal (figure 19) rather than being folded around the midsole (or midsole and treadsole), as seen in others. This might be the reason for the relatively wide decoration strip at the insole. This single, narrow (10 mm wide), green strip of leather is secured lengthwise at both edges by means of short (1 to 2 mm) running stitches of sinew, which go through all sole layers. At the pre-straps, the strip is interrupted (but the stitching is not in both), and continues beyond the pre-strap (figure 20). At the inner side of this green strip, at about 4 mm distance, is another row of sinew running stitches, the function of which seems to be to tighten the leather over the padding. These stitches, however, also go through all sole layers. The padding, included to add more comfort, is hair (figure 20).

The only evidence of the front strap are the holes in which stubs of the strap proper survives, but too little is preserved to make useful comments. The hole, however, is situated almost in the centre: 34.5 mm from the left edge and 33.5 mm from the right edge of the sandal, the difference of which usually is larger.

Figure 18. BM EA 4397/4398. Left and right sandal in dorsal and ventral and ventral and dorsal view respectively. Scale bar is 50 mm. Photography by A. 't Hooft. Courtesy of the British Museum, London.

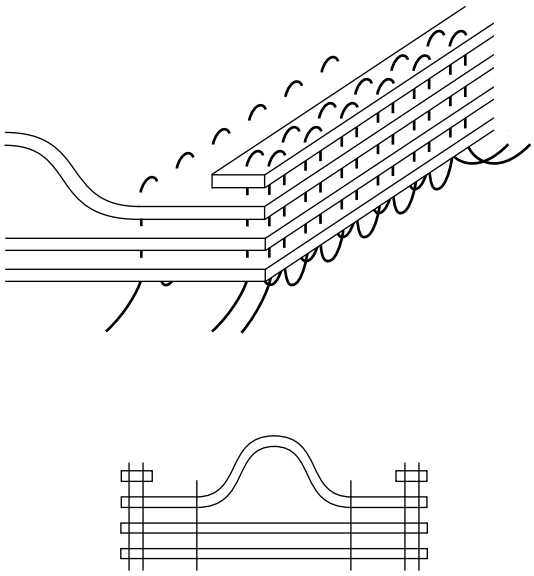


Figure 19. Sole construction of BM EA 4397/4398. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

Figure 20. The pre-strap of BM EA 4397/4398 is clad and secured by stitching the ends through the soles. It is tucked in with the cladding at the ventral surface of the treadsole. Note the interrupted strip at the pre-straps. Scale bar is 10 mm. Photography by E. Endenburg. Courtesy of the British Museum, London.

The pre-straps (figure 20) are cut from the same sheet of rawhide as the midsole and treadsole and thus consists of two layers. The transverse cladding is done with a leather strip. Each winding slightly overlaps the previous one in a stair-step fashion, thus holding the pre-straps firmly together. The cladding is, at the junction with the sole proper, stitched to the sole (arrow in figure 20) and the ends are tucked in with the cladding at the ventral surface of the treadsole. At the terminal ends there is a slit for the reception of the back (and heel?) strap, of which only a remnant survives at the lateral pre-strap of the right sandal (double arrow in figure 20).

BM EA 24708 (table 1; figure 21, 22)

BM EA 24708A and B, a pair of sandals from the Tomb of Any (figure 21),[4] has the same shape as BM EA 4397/4398 and BM EA 4396. The curled toe, however, is substantially shorter than in BM EA 4396 and much more comparable to BM EA 4397/4398. Schwarz (2000: Catalogue C, No. 16 [no page numbers]) mentions that the toes were broken off and glued back onto them, which must have been done in recent times. The heel of the right sandal is glued to the sole. According to Schwarz (*Ibidem*) this repair might be modern, but that is highly unlikely, considering the similarity of the heel and the rest of the sandal in terms of construction, colour, and fit.

The sandal consists of three sole layers (figure 22A). The insole is made of brownish leather and largely lacks the centre part. The edge of the insole is folded towards the dorsal midsole and sandwiched between the midsole and itself. The red, dorsal midsole is comparable in thickness as the insole and covers the treadsole. At

Figure 21. BM EA 24708, pair of sandals from the tomb of Any (18th Dynasty). Scale bar is 50 mm. Photography by A. 't Hooft. Courtesy of the British Museum, London.

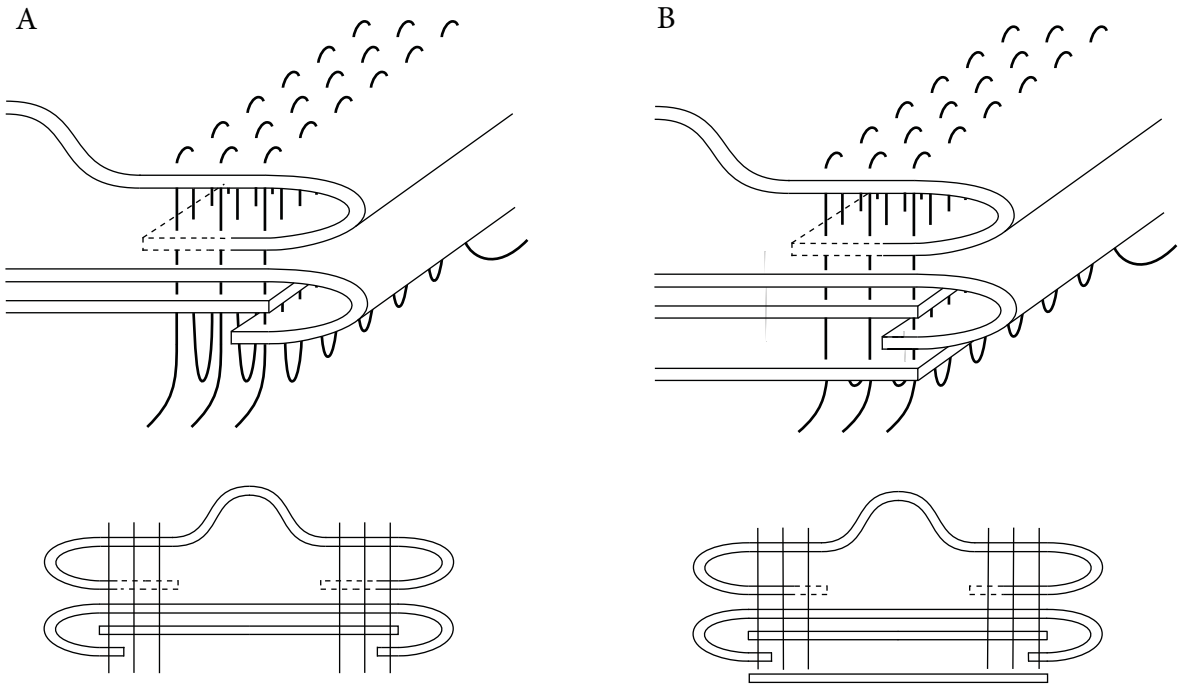


Figure 22. Sole construction in BM EA 24708. The width of the folds of the insole and midsole could not be determined due to the sandal's completeness, hence the dashed line. A) Construction of the sole; B) Construction of the toe part. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

the edge it is folded around the treadsole and secured with the outermost row of stitches only. The toe part, however, has an additional, triangular part that is placed against the ventral surface of the treadsole and thus obscures the folded edge of the midsole only at the front part (figure 22B). Along its perimeter, the sole layers are secured with short, but tightly spaced running stitches of seemingly sinew (three rows, 18, 10 and 7 mm from the sandal's edge). All of these go through all sole layers and emerge at the ventral surface of the treadsole (but not through the triangular front part). Only the middle row does not follow the entire perimeter as it terminates about halfway, securing the front half of the sandal only. The third, innermost row of stitches not only keeps the sole layers together, but also helps to keep the cover over the padding tight, as seen in the other sandals with padding. It is uncertain, however, whether it is stitched through the folded insole's edge or not hence the dashed line in the figures.

The originally red treadsole is faded to pink, but stains of bright red are still visible. According to Schwarz (2000: Catalogue C, No. 16 [no page numbers]) this is due to the use of the sandal (but see below with 'wear'). The treadsole is the thickest of the sole layers and slightly protrudes the others. The thin triangular patch at the curled toe, mentioned previously, is secured at the beginning, just anterior to the attachment of the front strap, by means of fine, but widely spaced flax(?) whip stitches. The lateral and medial edges, however, do not show stitches at all, which suggests that it has been glued. The edge of the sandal, which bears the stitching, is substantially thicker than the centre part: this is due to the fact that the edges of the sole layers are sandwiched between the soles.

Not much is left of the strap complex. The holes in the in- and treadsole for the reception of the front strap in the left sandal are not on top of each other, which suggest that in this case, the holes were made in the sole layers before they were put together. The position of the hole in the insole is rather far to the lateral edge, limiting a good fit between the first and second toe; the hole in the treadsole has a better position. This does not occur in the right sandal. The front strap is secured at the ventral surface of the treadsole by turning the end into a broad expansion in the shape of a leaf of a water lily.

The description as presented differs from Schwarz's catalogue entry (2000: Catalogue C, No. 16 [no page numbers]) on several points. She notes only two sole layers rather than three

or four, most likely because she regards the treadsole and its thin midsole as one. Moreover, and related to this, Schwarz identified an edge strip at the treadsole, but at especially the heel of the right sandal it can be seen that there is a thin midsole rather than only an edge strip.

Type B, Variant 2

ASH 1888.528 (table 1; figure 23, 24)

ASH 1888.528, a right sandal, has a rounded heel, constricted waist and a long, pointed toe. It compares well with other examples like for instance BM EA 24708. However, the lateral edge is less convex and the medial edge is slightly more curved. The ones-curled-toe is large and comparable in length to BM EA 4396 (see below), but is now flattened, showing large cracks at the bend.

The sandal consists of three sole layers (figure 24A). The insole is made of white leather and contained a shallow padding, which is now lost. Along the perimeter are three rows of small, tightly spaced running stitches of seemingly sZ flax, extending approximately 10, 7 and 4 mm from the edge of the sandal. It does not include a set of strips. Such a construction, however, is also seen in the remnant of another sandal, BM EA 4394 (not illustrated),[5] the padding of hair of which is substantially higher. Also Petrie UC 28350 shows rows of stitching without the decorative strips at the dorsal surface of the insole. The three rows of running stitches in ASH 1888.528 go through all sole layers. The outer and inner rows run parallel to the sandal's perimeter. The middle row, however, starts at about 83 mm from the frontmost tip of the toe and terminates at the waist (the attachment area of the pre-straps, the straps of which are not preserved).

The edge of the insole is folded around the thicker midsole and is sandwiched between the midsole and the brownish, rather thick treadsole (figure 24A). It seems obvious that the rows of stitches penetrate through the insole's folded edges, as is often seen, but certainty is impossibly to obtain due to the completeness of the sandal, hence the dashed line in the figure.

The curled toe is covered ventrally (but because it used to be curled, it would face dorsally originally), with a triangular, red, thin piece of leather (figure 24B). This must have been for

Figure 23. ASH 1888.528, right sandal in ventral and dorsal view respectively. Scale bar is 50 mm. Photography by E. Endenburg. Courtesy of the Ashmolean Museum, Oxford.

aesthetic reasons, as the ventral surface of the toe is very prominent and could not easily be missed if looking down on the sandals. The edge is folded around the edge of the treadsole but not included in the stitching, as it was too short: it protrudes from between the two layers at various spots. The triangular patch is attached by means of a row of whip stitches in flax along the posterior edge. It seems unlikely that the edges are glued, judging the fact that

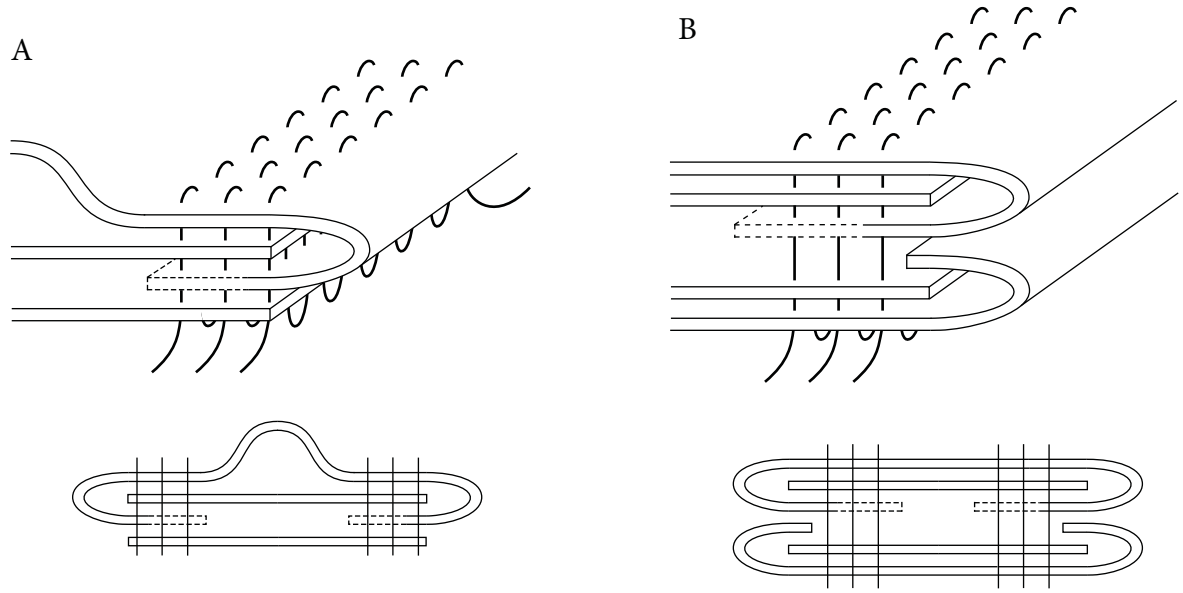


Figure 24. Sole construction of ASH 1888.528. A) Construction of the sole; B) Construction of the toe part. The width of the fold of the insole could not be determined due to the sandal's completeness, hence the dashed line. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

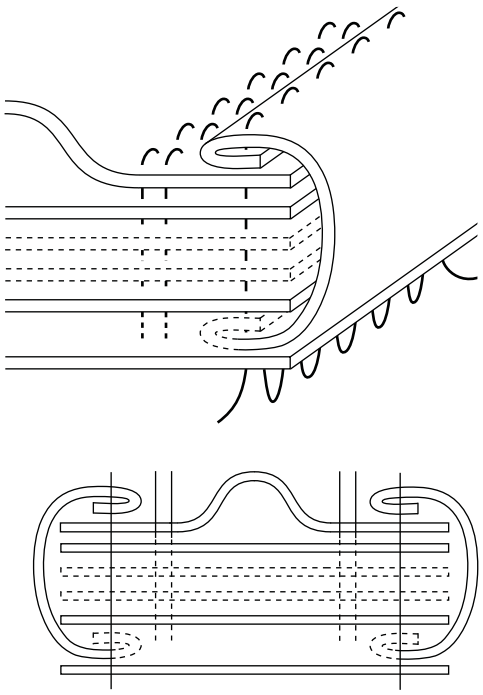
the edges are sandwiched between the mid- and treadsole, which contrasts to BM EA 24708 (see above). A small remnant of the front strap, *in situ* in the hole, suggests that it was secured with a knot (possibly an overhand knot).

BM EA 4396 (table 1; figure 25-28)

This well preserved left sandal (figure 25) has a rounded heel and a constricted waist. The medial edge runs almost straight to the curled toe, but the lateral edge is gently but distinctly curved. It thus indicates the sandal was meant for the left foot. The tapering toe is much elongated and extends backwards over half of the sandal's total length.

BM EA 4396 consists of possibly six sole layers (figure 26), but the undamaged condition of the soles prohibits exactness. The treadsole is of bright red rawhide. The thickness is less than the midsoles, but it is thicker than the insole and quite stiff. The insole is made of a thin sheet of white leather, which has turned into a brownish hue in the padded centre within the inner row of stitching. Likely, the padding caused the discoloration, as the remaining parts, which have not been in contact with it, still have their original white colour. The padding, now largely lost, must have been slight, as the leather sheet is rather tight, leaving little space for it. Two rows of small, tightly spaced running stitches of sinew (approximately 14 and 10 mm from the edge; the outermost row is discussed below) holds the insole in place. Both rows are situated inside the folded strip of leather that covers the edge of the sandal (figure 26; see below). The inner one of these two extends along the entire perimeter. The outer one, however, only runs until the waist, as is seen more often in composite sandals. Consequently, the heel only shows a continuation of the inner line of stitches. At the medial side, the outer row terminates without changing its course but at the lateral side, the row of stitches runs diagonally towards the inner row, where it terminates against it (dashed double arrow in figure 27). Certain is that these two inner rows of stitches do not penetrate all sole layers, as they are not visible at the ventral surface of the treadsole, but exactly through which they go could not be determined. Little can be said about the midsoles, which are either three or four in number, but in total the midsoles make up the larger part of the thickness of the sole. These midsoles, together with the insole, are covered with a red strip of thin leather that is folded over the edge of the sandal (figure 26). At the dorsal surface of the sandal, the strip is folded again towards the sole – the fold extends about 7 mm. The holes in the treadsole makes it possible to observe that it is only a strip tucked in between the ventralmost midsole and the treadsole. It is uncertain whether the edge is folded as in the dorsal part (dashed line in figure 26). At the medial edge, at

Figure 25. BM EA 4396, left sandal in lateral, dorsal and medial view. Scale bar is 50 mm. Photography by A. 't Hooft. Courtesy of the British Museum, London.



the front half, two pieces of the strip meet and slightly overlap each other. The strip is secured with a comparable row of running stitches but these penetrates all sole layers and are visible at the ventral surface of the treadsole. The pre-strap interrupts the strip, but the stitching continues.

Although the strap complex is more complete than in most other examples, it is still fragmentary. Fortunately, enough is preserved to identify the extraordinary construction (figure 27). The pre-strap is a long strip of leather, which is cut from the treadsole. It is folded towards the dorsal surface of the insole and secured to approximately the start of it (dashed arrow in figure 27). The folding of the pre-strap

< Figure 26. Sole construction of BM EA 4396. Uncertainty is indicated with dashed lines. Four midsole are drawn, two of which are uncertain. The inner two rows of stitches are assumed to go through all sole layers except the treadsole. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

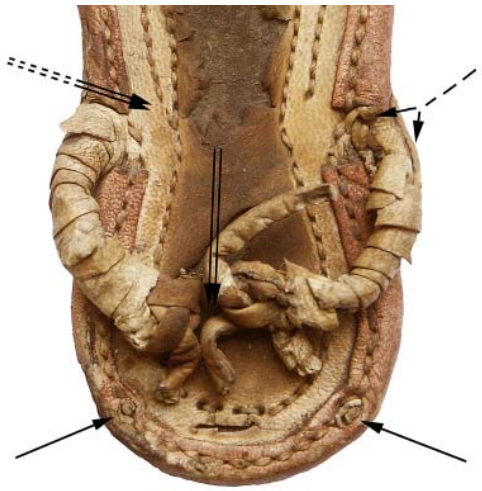
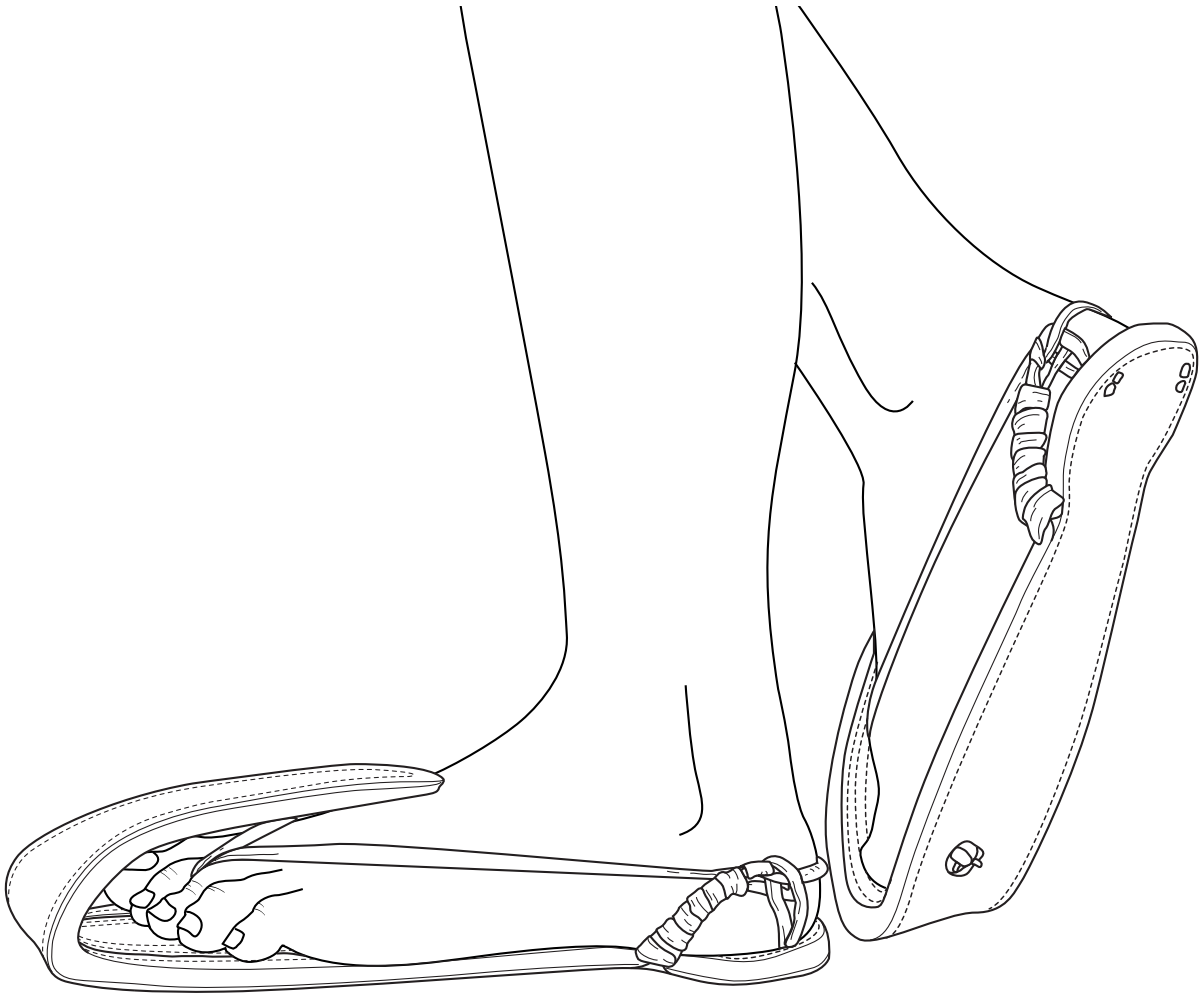


Figure 27. The strap complex of BM EA 4396 has a unique extra fastening at the heel (arrows), constructed with an extra element that is looped to the eye of the pre-strap (double arrow). Scale bar is 50 mm. Photography by E. Endenburg. Courtesy of the British Museum, London.

v Figure 28. Artist impression of BM EA 4396. Note the extraordinary strap complex. Drawing by M.H. Kriek.

results in a slit as long as the pre-strap itself, rather than that a smaller slit was cut at the end of it, as is usually seen and described in detail above. Although not clearly visible, there can be little doubt that the stitch that secures the strap goes through all layers and emerges at the ventral surface of the treadsole. The transverse cladding of the pre-strap, overlapping in stair-step fashion, is of the same leather as the insole. Due to the cladding, a small slit remains from the afore-described 'folded-strip-slit', through which two, lengthwise folded, leather straps are pulled (dashed arrow in figure 27). One must have formed a heel strap, continuing towards the front as Y-shaped back/front strap. Another remnant (figure 27, double arrow), looped to the eye of the pre-strap, suggests that it was attached, remarkably, at the heel's edge (figure 27, arrows), thus pulling the pre-strap backwards and downwards. This unique construction has not been seen in other sandals. Another remarkable feature of the strap complex are the two insertions for the front strap, probably one



for the left element of the Y-shaped front strap and one for the right (figure 28). The two elements are not connected at the ventral surface of the treadsole and emerge behind one and another. The element closest to the toe is attached to the sole with stitches, which emerge at the dorsal surface of the insole and surrounds the hole through which the strap was pulled. The other, however, is secured by bending the terminal end under the treadsole, a construction generally used. It is unlikely that one of these had to go between the first and second toe and the other between the third and fourth, as seen in Nubian sandals (see Veldmeijer, 2006/2007: 73 for a discussion on this feature), as they are too close together for such a way of wearing sandals.

Petrie UC 28350 (table 1; figure 29, 30; see also Van Driel-Murray, 2000: 313)

Sandal Petrie UC 28350 is rather badly preserved (figure 29). Two thicker sole layers are covered with a thinner treadsole and insole (figure 30). They all are secured with three rows of short flax stitches holding the insole padding as well. Note that the middle row runs only halfway the length, seen from the front. It is uncertain whether the insole is folded over the edge of one or more sole layers. The curled toe has, ventrally, a triangular piece of leather that is secured with leather thong stitches (arrow in figure 29). The use of leather thong is extraordinary as usually these sandals are stitched with sinew or, but less often, flax thread.

Figure 29. Petrie UC 28350 in dorsal view. Photography copyright of the Petrie Museum of Egyptian Archaeology UCL.

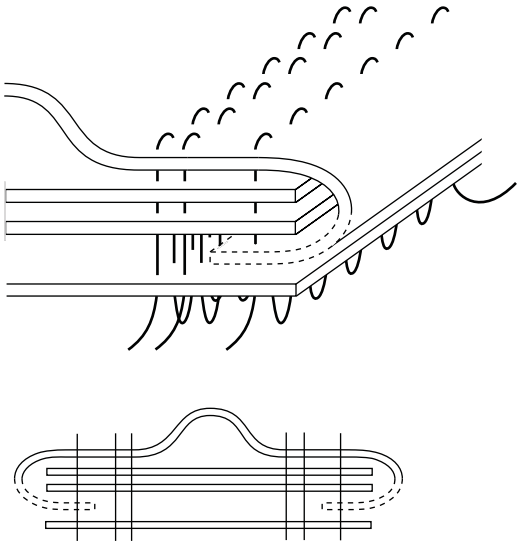


Figure 30. Sole construction of Petrie UC 29350. Uncertain elements are drawn in dashed line. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

Type C

BM EA 36200 (table 1; figure 31-34)

Van Driel-Murray (2000: 306) published a sandal (table 1, figure 31) "(BM EA 36200 [...]) – unfortunately undated and unprovenanced, but, judging from the shape, probably late Eighteenth- or Nineteenth Dynasty, [that] combines several techniques in a lurid display of colour. [...] Narrow strips of red leather (another dark colour may also be present) are woven through slits in the green-stained insole [...]" (figure 33).[6]

Compared to Type A and B sandals, the shape differs slightly: a rounded heel with a constricted waist and towards the front increasing in width. The lateral edge curves more distinctly towards the toe, resulting in a swayed sole for the left foot. The shape reminds one of the shape of sewn sandals Type C, which are made of vegetable fibre (Veldmeijer, 2009c; see also Veldmeijer, 2009b). However, imitations in other materials do occur (*Ibidem*). Van Driel-Murray's remark that the sole consists of a rawhide treadsole and insole only can be challenged, as the sole consists of three, but most likely four thin sole layers (figure 32) that are secured along the sandal's perimeter with flax running stitches. The stitching includes a red strip that is folded around the edges of the sole layers. The ventral surface of the treadsole seems to have been treated because a layer of brown material adheres to it.

Figure 31. BM EA 36200 in dorsal and ventral view respectively. Scale bar is 50 mm. Photography by A. 't Hooft. Courtesy of the British Museum, London.

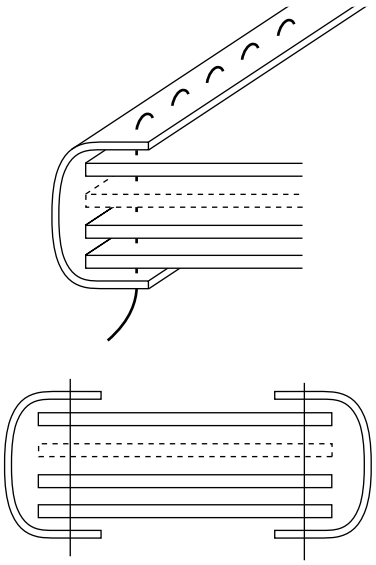


Figure 32. Sole construction of BM EA 36200. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

The front strap is pulled through the brown, rather enigmatic ventral sole layer. It consists of a strip of red leather that is folded lengthwise. It widens towards the back strap, where it is secured with short flax stitches (double arrow in figure 34). The back strap itself consists of two, likely three layers (indicated in shades of grey in figure 34); the lower one is beige but the dorsal openwork layer is green, showing a coarsely executed ureus. Note that the head of the uraeus is secured with a single, large stitch (arrow in figure 34). The back strap has a binding of a strip of red leather at its posteriodorsal edge, the edging of which is secured with flax whip stitches. The attachment of the straps at the waist is unclear because they broke off at the sole.

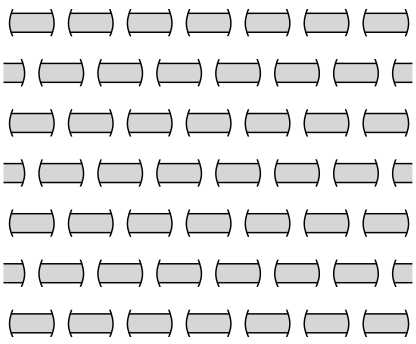


Figure 33. Weaving pattern of the sole in BM EA 36200. Not to scale. Drawing by E. Endenburg/A.J. Veldmeijer.

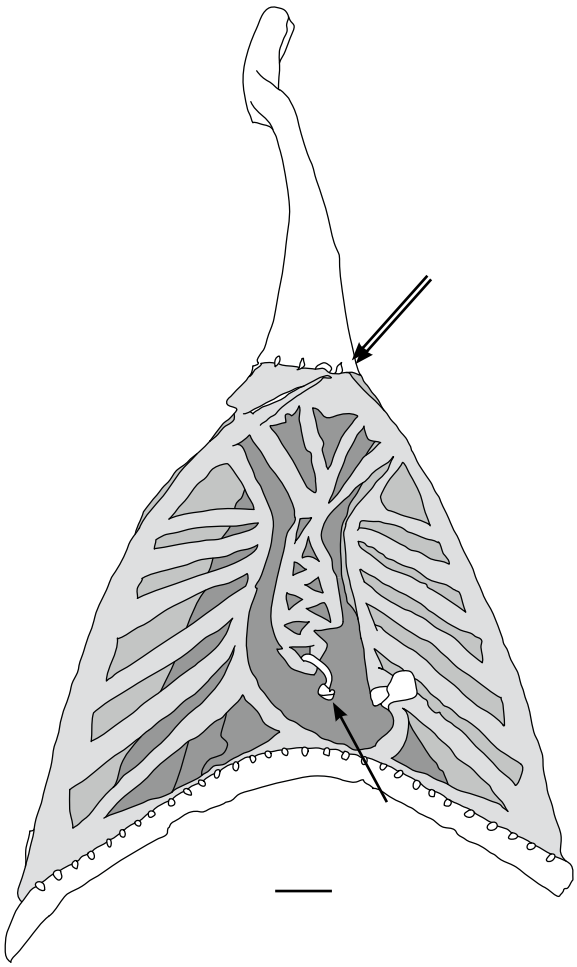


Figure 34. The strap complex of BM EA 36200, consisting of openwork leather that shows a uraeus. Scale bar is 10 mm. Drawing by A.J. Veldmeijer/E. Endenburg.

Note the cuts of a sharp knife at the beginning of the instep as well as through the sole layers. This curious feature is seen more often in footwear and cannot be explained as yet.

Material and Production

Identification of leather is difficult at best, even when the preservation of the leather is good. However, leather objects from Egypt often suffer bad preservation, which seriously limits the possibility of identification on the basis of the skin structure (*cf.* Haines, 2006). Trommer's (2005: 40-42) attempt to identify the leather by chemical analyses proved only partially successful.

Some indication on the origin of the leather is offered by the thickness: cow's leather is substantially thicker than leather from goat or gazelle and thus we can be fairly sure, even without microscopic research or chemical analyses, on the identification of the thick soles. Thus, BM EA 24708, although according to the British Museum Guide (1920: 266) made of gazelle skin,[7] is likely only partially made of this type of leather: only the thin insole whereas the treadsole and at least one midsole seems to be of cow's leather. Gazelle leather is thin and not well suited for those parts of footwear that are prone to wear (soles for example). Goatskin is attested in Petrie UC 28350 (Van Driel-Murray, 200: 313) and, by analogy, the thin insoles seen in the described sandals can be determined as goatskin too. Besides the use as insole in sandals, goatskin is used for uppers in New Kingdom curled-toe ankle shoes (Van Driel-Murray, 2000: 302; Veldmeijer, 2009d).[8]

It is beyond the scope of the present paper to fully discuss skin processing[9] and various projects attempt to include chemical analyses to identify them[10] as well as the means that were used to colour leather.[11] However, it is interesting to note the absence of aluminium in BM EA 4396 (Van Driel-Murray, 2000: 304) but its significance can only be judged after more systematic chemical analyses within an archaeological framework.

An interesting detail is that the edges of both soles of BM EA 4398 are rounded and not square. This means that they have been smoothed after the sole was cut from the larger sheet, a process identified by Schwarz (2000: 94-100) in several tomb scenes. There can be no doubt about this feature although edge shavers or bevellers, the knife with a 'forked beak' used for such a job and still part of the leatherworker's toolkit nowadays, has, to the best of my knowledge, not been identified from excavations. However, the tool compares well with a gouge and might be mistaken as such (Schwarz, 2000: 94-100; *cf.* Petrie, 1917: pl. XXI & XXII).

The fact that stitching is absent in the triangular patch at the ventral surface of the curled toe in for example BM EA 24708 suggests that glue must have been used to attach the patch to the treadsole before the sole layers were secured. Not surprising, however, is the choice of type of stitching: predominant are running stitches and, especially with the triangular patch, whip stitches. The choice of the whip stitch can be explained by the fact that these can be sewn easily through part of a layer when at right angle with the bending of the toe and when it only needs to go through part of the thickness (see Veldmeijer, 2009d: 14), and thus preventing them from showing at the insole.

Wear

The straps are missing either completely or partially in most cases. Usually, they are broken of at the start of the pre-strap or the pre-strap is intact but the rest of the strap complex lacks. Front straps are usually broken off at the point where it emerges at the dorsal surface of the insole. Anterior to remnants of the front strap in ASH 1888.528 are two relatively big stitches, which seems a repair of a small slit in the insole. It is not always clear whether the absence of the straps is due to wear and/or due to another reason, such as post-depositional events (including post-excavation procedures).[12]

All insoles of padded sandals show damage, although in some examples worse than in others. Several sandals still show some of the padding *in situ*. Often seen, and a good example is BM EA 4396, are holes in the treadsole. These, however, are not the result of wear, because they are much too isolated. Moreover, wear is absent for the rest of the surface, which is especially remarkable for the posteriormost part of the heel (caused by dragging). Thus the damage seems to be due to preservation. Schwarz (2000: Catalogue C, No. 16 [no page numbers]) mentions of BM EA 24708 that "*Die Brandsohle ist nur noch am Rand gut erhalten und von dunkler Farbe* [sic; cf. figure 21]*; in der Mitte z.T. hell abgerieben und glasig wirkend, was auf Gebrauch hinweist*". The fact that large areas of the sole are faded nearly equally, except for the spots that were predominantly in contact with the surface, contradicts this interpretation. Moreover, there are no signs of more obvious wear, such as the damage that occur due to dragging of the sandal over the floor. The fading, often seen in red leatherwork, seems due to chemical change of the colour. The exact reason, however, needs more research.

Sandal BM EA 4389 is black and has a glazed appearance, which is an indication of the deterioration of the leather. It occurs especially, but not exclusively with oil-cured leather (Van Driel-Murray, 2000: 303; see also Veldmeijer, 2009b). If not stopped, this process will continue; it is irreversible.

Child versus Adult

Ancient Egyptian children's footwear (figure 35) is generally the smaller equivalent of adult

Figure 35. Artist's impression of children's sandals ÄMPB ÄM 20998. The green strip covering the slit in the pre-strap (*cf.* figure 1) is not indicated as to show the attachment of the heel/back strap to the pre-strap. Drawing by M.H. Kriek.

footwear, sometimes to such an extent that the entire layout is copied even if this disturbed the appearance (BM EA 4390 is such an example). They often show the same degree of care of manufacturing, albeit in some cases the appearance is somewhat coarser, due to the fact that the same size material was used for manufacturing. Note that, besides the fragmentary material from Amarna, Type 1 mainly consists of children's sandals.[13]

Date and Distribution

Only several of the sandals have a possible date and even fewer are also provenanced. The dates clearly points to the later New Kingdom (18th-20th Dynasty). The pair from Any's tomb is dated to the 18th Dynasty. However, as already mentioned, there is no certainty that the box belonged to Any's wife. Wainwright (1920: 21-23, 52) published an example from 18th Dynasty Balabish and several fragments were recovered in TT 253, dated to the 18th Dynasty (Thusmosis IV-Amenhotep III; Strudwick, 1996: 124, 156, 183; see also Schwarz, 2000: Catalogue C, No. 15 [no page numbers]).

Van Driel-Murray (2000: 315) mentions another pair from the 21st Dynasty (Gall, 1961: 106) and suggests on the basis of depictions, that the sandals occurred at least into the 22nd Dynasty, but she adds that such sandals more commonly occur in fibre. Iconography will be dealt with

in a later phase of the AEFP, and is thus beyond the scope of the present paper, but it need to be remarked that often the identification of leather and fibre sandals in representations is difficult if not impossible. Veldmeijer (2009b) presents a more detailed survey of this problem, but this is mainly related to fibre, sewn sandals.

Discussion[14]

The sandal published by Montembault (2000: 64, 106) is comparable to the here presented Type A examples. However, the shape of the sole is slightly more elongated and less swayed. A curious feature – not seen in the sandals presented here – is the fact that the Louvre sandal has a separate heel part with pre-straps in addition to the three sole layers. Although Montembault does not mention it, it seems a repair, judging the coarse leather(?) stitches that fasten the additional heel. Unfortunately, the published photograph and drawing did not allow the identification of the possibly damaged attachment area of the 'original' pre-straps.

Van Driel-Murray (2000: 306) identifies the insole that is made of woven strips of leather of BM EA 36300 as imitation of fibre sandals. However, the visible result of the decoration technique (weaving strips of leather of different colour) is distinctly different from a sewn fibre fabric (*cf.* Veldmeijer, 2009c & d) and cannot be regarded as an imitation. The decoration technique of weaving strips through slits is not often seen but is fairly common in Tutankhamun's footwear (Veldmeijer, 2009b) the origin of which is obscure (*Ibidem*).

Leather composite sandals have several things in common with so-called 'eared sandals', the publication of which is forthcoming. Eared-sandals are known from several finds as well as leatherworking scenes and are often referred to as the 'classic Egyptian sandal'. The pre-straps in eared sandals are also cut from the same leather as the sole but although cladding does occur, often the pre-straps are without.[15] Moreover, the sole consists of one, sometimes two layers, but is without padding, appliqué decoration and stitching (there are some exceptions,[16] however; see the forthcoming publication for details). Van Driel-Murray (2000: 314) mentions that "numerous examples of such sandals can be cited from tombs [...and...] settlements [...] and funerary sandal-making scenes." However, she does not make a difference between the leather composite sandals discussed in the present work and leather sandals which does not show the characteristics of these sandals but are basically eared sandals (*cf.* Van Driel-Murray, 2000: 314, figure 12.11b, c, d). Moreover, these usually are without a curled toe, but with a pointed front.

In general, the construction of the various composite leather sandals is comparable, despite several differences in detail. The sandals are, without exception, made with much care, which suggests, together with the relatively low number of examples from the archaeological record, that they were not a cheap commodity. The fact that the studied examples show little wear prohibits the conclusion that the number is low because the sandals were used beyond repair or that the leather would have been re-used: there is no indication of substantial wear on the studied examples, which would have been strange. Moreover, there are no worn off fragments that supports such a conclusion (but see above on the Louvre sandal). Re-use of leather is common in post-Pharaonic era – and especially in Christian times – but examples of the re-use in Pharaonic time are not reported. However, Schwarz (2000: Catalogue C, No. 15 [no page numbers]) reports for the finds from TT 253"*Gebrauchsspuren zeigen, dass die Sandale bereits im Alltag verwendet wurde, bevor sie der Grabausstattung beigefügt wurde*", a suggestion that could not be verified by the present author. It thus seems that the leather composite sandals too were utilitarian and not specifically made for the burial.

Acknowledgements

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Endnotes

1 And even these are only few: especially Alfano (1987), Seibels (1997) and to certain extent Schwarz (2000).

2 The reader is also referred to the forthcoming catalogue and final analyses (Veldmeijer, Forthcoming).

3 Possibly, the sandal is now in a collection in Ostdorf, Germany. Attempts of establishing contact with this museum have thus far been unsuccessful.

4 Budge attributed the cosmetic box to Any's wife, Tutu. There is, however, no inscription on the box to confirm the association with Any (see http://www.britishmuseum.org/explore/highlights/article_index/a/any,_an_ancient_egyptian.aspx), visited 17 December 2009.

5 See Veldmeijer (Forthcoming).

6 Text between [ ] inserted by present author.

7 Schwarz (2000: 217) mentions, on the basis of the structure of the leather, that it is possibly antilope leather. In the catalogue (part C, no. 16 [no page numbers]), it is referred to as gazelle leather.

8 Objects made of (possibly) gazelle leather, such as loincloths, often show that the leather is still soft and supple (*e.g.* Veldmeijer, 2007: 24). Currently, it is not known whether this is due to the properties of the leather itself, or due to a different skin processing technique. Chemical analyses to obtain insight in this problem are in progress.

9 For overviews see especially Van Driel-Murray (2000: 302-306; In press) but also Veldmeijer (2008: 3) and Veldmeijer & Laidler (2008: 1216) and references therein.

10 Including investigations of the leatherwork various Nubian groups who entered Egypt from the Old Kingdom onwards.

11 Analyses on objects in the Ägyptisches Museum und Papyrussammlung, Berlin and experimental archaeological research.

12 For examples see Veldmeijer (2009b).

13 See also Veldmeijer (2009b) for additional information on other children's footwear.

14 More on the occurence of decoration in leatherwork in Veldmeijer (Accepted). Here, a more exhaustive discussion on the 'ear' pre-strap is presented as well.

15 The leather open shoes that are housed in the Egyptian Museum is also based on the same sole construction (Veldmeijer, Accepted).

16 For example ASH 1889.1068 (also discussed by Van Driel-Murray, 2000: 313-314) and BM EA 4386.

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Collection/ Identification	Provenance/ Date	Measurements	Type/ Variant	Sole					Strap Complex	Decoration	Remarks
				Insole	Midsole(s)	Treadsole	Padding	Toe patch			
ÄMPB ÄM 14551	?/?	W front: 41. W waist: 22.5. W heel: 28.5. L: 110. T: 3.4.	A	yes	no	yes	no	no	Pre-strap, heel strap, back strap & front strap(?)	Green strip along perimeter; one inner strip on front; red insole.	Cut out lotus front of back strap.
ÄMPB ÄM 20998	Deir el-Medinah/ 19th-20th Dynasty	(right sandal) W front: 65.5. W waist: 35.8. W heel: 47.5. L: 170. T: 6.4. (left sandal): W front: 55.2. W waist: 37.1. W heel: 46.9. L: 165. T: 7.8.	A	yes	no	yes	no	no	Pre-strap, heel strap, back strap & front strap.	Green strip along perimeter; one inner strip on front; red insole. Stamped lines.	-
ÄMPB ÄM 21680	?/?	W front: 85.5. W waist: 56.4. W heel: 62. L: 275. T: 9.8 (excl. padding).	B, 1	yes	no	yes	yes	no	Not preserved.	Two parallel green strips along perimeter; outer one on red strip.	-
ASH 1968.249	?/?	L total: 255 & 140. W: 90 & 90.	B, 1	yes	no	yes	no	no?	Not preserved.	Green strips on wider red one along perimeter. On beige/ brown (?) sole.	There are three concreted (parts of) sandals. The measurements are of the complete object. The technological details however are based on the top one which is best visible.
BM EA 4389	Thebes/ 19th Dynasty	W front: 88.6. W waist: 64.2. L: 215. T: 7.4 (at edge); innermost: 2.5.	B, 1	yes	yes (2)	yes	yes?	no	Remnant of front strap fastening.	Two parallel strips, each consisting of three on top of each other along perimeter. Colour not to discern.	Possibly, BM EA 36199 is the missing heel part.

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Collection/ Identification	Provenance/ Date	Measurements	Type/ Variant	Sole					Strap Complex	Decoration	Remarks
				Insole	Midsole(s)	Treadsole	Padding	Toe patch			
BM EA 4390	?/?	W front: 43.6; W heel: 37.7. L: 143. T total: 6.8. Diameter front strap patch: 20.4.	B, 1	yes	yes	yes	yes	no	Unique decorative patch for front strap.	Two parallel sets, each consisting of two on top of each other along perimeter. Red on green. Green on (?) red reinforcement patch front strap.	-
BM EA 4397/4398	?/ New Kingdom	W front: 78.4. W waist: 43.5. W heel: 59. L: 305. T: 18.5; T at edge: 6.2.	B, 1	yes	yes	yes	yes	no	Pre strap; rest is not preserved.	Green strip along perimeter on white.	-
BM EA 24708	Any/ 18th Dynasty	(left one) W front: 71.8. W waist: 47.3. W heel: 54 (just before pre-strap). L: 355. T: 6.8.	B, 1	yes	no	yes	yes	yes	Not preserved.	Red insole; pink treadsole.	-
BM EA 36199	?/?	W: 68.6. L: 67.9. T: 6.7.	B, 1?	yes	yes (2)	yes	yes?	no	Not preserved.	Two parallel strips, each consisting of three on top of each other along perimeter. Colour not to discern.	It is possible that this is the heel part of BM EA 4389.
MFA 72.4763	?/?	W front: 79.5. W back: 60.0. L: 230.0. T: 5.6.	B, 1	yes	yes	yes	yes	no	Not preserved.	Sets of parallel strips along perimeter.	-
BM EA 4394	?/?	W maximal: 75.7. W back: 48.5. T: 11.1 (incl. padding).	B, 2	yes	yes	yes	yes	no	Not preserved.	No decorative strips. Colour not preserved.	-
BM EA 4396	?/?	W front: 70; W heel: 48.9. L: 415. T: 9.6.	B, 2	yes	yes (3 or 4)	yes	yes	no	Pre-strap	No decorative strips. Beige insole; red strip folded around edges.	-

Collection/ Identification	Provenance/ Date	Measurements	Type/ Variant	Sole					Strap Complex	Decoration	Remarks
				Insole	Midsole(s)	Treadsole	Padding	Toe patch			
ASH 1888.528	Thebes/?	W front: 65. W waist: 38.3. W heel: 46.3. L: 380. T: 13 (includes the padding).	B, 2	yes	yes	yes	yes	yes	Not preserved.	No decorative strips. White insole; red toe patch.	-
Petrie UC 28350	Gurob/ 19th Dynasty	W front: 65; W heel: 46.1. L: 420. T: 8.1.	B, 2	yes	yes (2)	yes	yes	yes	Not preserved.	No decorative strips.	Provenance according to Van Driel-Murray (2000: 313).
BM EA 36200	?/?	W front: 79.2; W waist: 54.2; W heel: 58.4. L: 265. T: 4.9. W strips insole: 2.5.	C	yes	yes (possibly 2)	yes	no	no	Pre-strap(?), back strap & front strap.	Red and & strips insole pulled through slits; open work back strap.	-

Table 1. Summary of the most important features and measurements (in mm) of leather composite sandals, including the collection, provenance and date, type and variant, details of sole and strap complex and decoration. All measurements are 'as preserved'. Institutional abbreviations: ÄMPB = Ägyptisches Museum und Papyrussammlung, Berlin; ASH = Ashmolean Museum, Oxford; BM = British Museum, London; MFA = Museum of Fine Arts, Boston; Petrie = Petrie Museum of Egyptian Archaeology UCL. Other abbreviations: D = Diameter; L = Length; T = Thickness; W = Width.

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