Building Materials

Site code: ONE94

Undated

Author: Terence Paul Smith

Museum of London Archaeology

Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED
tel 0207 410 2200 fax 0207 410 2201 email mola@mola.org.uk

Building Materials

Terence Paul Smith

Method

The building material from the site was recorded by Ian M Betts, Susan Pringle, and the writer, using standard Museum of London recording sheets and fabric codes. I am grateful to my two colleagues for their continued help during the preparation of this report. The data have been computerised to allow correlation with the periods identified by study of the site. Certain information has been integrated with the main text above. Particular aspects of the building material are considered in this appendix. *A list of ceramic building material fabric codes used in this appendix is given at the end.*

Roman Ceramic Building Materials

Fabric Types and Sources

Roman London made use of vast quantities of ceramic building materials of a variety of forms, some commonplace, some rarer and indicating a degree of status. Even within the Roman period itself, early materials were sometimes reused at a later date. The site well illustrates the general situation, in which materials were brought into the capital from a number of different sources, but with the overwhelming majority being fairly local products in a limited number of related fabrics. It is convenient to consider the fabrics types within three categories: *(i)* those which are most abundant (that is, those of the 2815 fabric group); *(ii)* those which are present in medium-sized quantities; and *(iii)* those which are represented at the site by only a tiny number of pieces.

(i) The 2815 Fabric Group. In the period from AD50 to the mid 2nd century the vast majority of ceramic building materials used in London came from various kiln sites located on either side of Watling Street between London and *Verulamium* (St Albans); some too may have come from kilns to the south-west of London. They belong to the *fabric group 2815* which comprises individual *fabrics 2452, 2459A, 3004, and 3006*. In a later period, from the early or mid 2nd century down to some time in the 3rd century, later versions of *fabric2459 (fabrics 2459B and 2459C*) were brought in, though in much smaller quantities, from kilns probably located in north-east London and Essex. Bricks, *tegulae*, *imbrices*, *tegulae mammatae*, box flue tiles, and *tesserae* cut from other building materials were all used at the site. Because of their abundant initial use, they were readily available in later times for reuse, both within the Roman period itself and later. Materials belonging to this group account for no less than 90% (by count) and 87% (by weight) of all Roman ceramic building materials recovered from the site.

(ii) Fabrics Present in Medium-Sized Quantities. Roman London, including this site, also drew on a number of other manufacturing centres, although their locations are not all known at present. These yards provided the capital, and this site, with medium-sized quantities of material. Materials in the three

related *fabrics 2454, 2455, and 3022*, were much used in the very early period, 50 to 75/80; they were manufactured in the Eccles area of north-west Kent, possibly as estate products in connection with the large and important Roman villa there, although products were also sold elsewhere; bricks, *tegulae*, *imbrices*, *tegulae mammatae*, one possible half-box flue tile, and *tesserae* are all present. Materials in the three related *fabrics 2453, 2457, and 3001* were in use in London between 140 or 180 down to some time in the 3rd century, although their source is not at present known; *tegulae*, *imbrices*, and *tesserae*, are present, together with possible examples of bricks. Distribution of materials in the two related *fabrics 3009 and 3019* suggests manufacture somewhere in Hampshire, between 100 and 120 or later; bricks are certainly present at the site, together with possible *tegulae* and *imbrices*. Materials in the two related *fabrics 3023 and 3060* were produced in the Radlett area of Hertfordshire, some 20 miles north-west of London, in the period 50 or 70 to 120; bricks, *tegulae*, *imbrices*, flue tiles, and *tesserae* are present. Materials in the two related *fabrics 3050 and 3061* were made in the Reigate area of Surrey from 140 or 180 down to some time in the early 3rd century; bricks, *imbrices*, and *tesserae* are present. Distribution of materials in the two related *fabrics 3054 and 3059* suggests production in south-west Sussex; they date from between 70 and 140; the yard provided the site with box-flue tiles and possibly with *tegulae* and bricks. Together these various fabrics account for just over 9% (by count) and just over 12% (by weight) of all Roman ceramic building materials recovered from the site.

(iii) Fabrics Present in Very Small Quantities. The site also made some use of materials from yet other sources, although the relevant materials are present only in very meagre quantities: fabric 3028 is represented by 24 pieces, fabric 3011 by 15 pieces, and all the other fabrics in this category by between 1 and 10 pieces. Places of manufacture are mostly unknown and in some cases the date range too is not clear. The fabrics represented at the site are: *fabric 2451* (1 *tegula*), late 2nd to 3rd century; *fabric 2456* (6 pieces, *tegulae* and box-flue tiles), late 3rd and 4th centuries; *fabric 3005* (1 *tegula*), early or mid 2nd and early 3rd centuries; *fabric 3008* (1 *imbrex*), of uncertain date; *fabric 3011* (15 pieces, bricks, *tegulae*, *imbrices*, and *tesserae*), 70 or 100 to 140 or 200 or even later; *fabric 3013* (6 pieces, *tegulae* and *imbrices*), of uncertain date; *fabric 3016* (2 bricks), late 3rd and 4th centuries; *fabric 3020* (2 bricks), of uncertain date; *fabric 3021* (4 *imbrices*), of uncertain date; *fabric 3028* (24 pieces, bricks, wall tiles, and box-flue tiles), 70 to 100 or 120; *fabric 3051* (3 bricks), 50 or 70 to 80 or 120; *fabric 3053* (5 pieces, *tegulae* and *imbrices*), of uncertain date, but probably late, perhaps 350-400; *fabric 3058* (2 *imbrices*), 50 to 70; *fabric 3077* (1 *tegula* and 1 box-flue tile), of uncertain date; *fabric 3222* (8 pieces, bricks and *tegulae*), of uncertain date; *fabric 3227* (4 box-flue tiles), 50 to 70 or 80; *fabric 3236* (2 fragments, possibly from *tegulae*), of uncertain date; and *fabric 3238* (10 *tegulae*), 70 to 100 or later.

Of these, *fabric 2456* resembles that used for various products, including *imbrices* and box-flue tiles as found at this site, manufactured at Harrold, Bedfordshire in the late 3rd and the 4th centuries (Brown 1994, 79–86). The distribution pattern of materials in *fabric 3013* and related fabrics indicates coastal and riparian dissemination of products from Devon to Essex and including London *via* the Thames; place of production is unknown but

was probably somewhere on or near the south coast, perhaps in the Solent area (Betts & Foot 1994, 32–3; Kent and Essex examples now need to be added to the distribution: I M Betts, pers comm). Together these various materials account for less than 1% (both by count and by weight) of all Roman ceramic building materials recovered from the site.

It is clear that the site was able to obtain ceramic building materials from a variety of sources in southern and south midland England. It remained largely dependent, at least down to the mid 2nd century, on supplies from the area between London and *Verulamium*, although those supplies were augmented with others from Surrey, Kent, Sussex, Hampshire, and perhaps elsewhere. Most known manufacturing sites, including those of the 2815 fabric group, were able to make use of river or of coastwise and river transport to move their goods to London, an obvious advantage with what were, for the most part, high bulk/low value commodities. The materials used included a certain number of specialist products, such as the roller-stamped box-flue tiles probably manufactured somewhere near the Sussex coast. In the later Roman period, from the 3rd century, there was more reliance on more distant products, including those brought in from north Bedfordshire and, probably, the Solent area of Hampshire. The more local industries may have been in decline by this time, and 'many of the London/Hertfordshire kilns [supplying the fabric 2815 materials] had apparently fallen out of production' (Betts 1987, 28), forcing builders, when they did not simply reuse salvaged products of earlier date, to look further afield for suitable materials. The less extensive industry of these later times may well have resulted in more expensive products, and transport costs from more distant manufacturing sites would probably, therefore, have been a smaller percentage of the cost at the yard than was the case in the earlier period. Reuse of materials, either broken as rubble or as 'proper' building materials, was, it may be noted, extensive.

Much of the material supplied by the various yards, known and unknown, is commonplace enough. Amongst the material however, are products of more particular interest, and these are worthy of separate consideration. Some too show features of especial interest. Moreover, the site produced an unusual (for London) number of bricks which preserve their full dimensions.

Shaped Brick or Roofing Tile

From context [18113], a P10 dump in Open area 75, came a fragment of thin brick or roofing tile, 30–31 mm thick, which has been cut at an angle of some 105º before firing, its top edges trimmed with a knife or spatula. It may have been used to form the inner (obtuse) angle of a splayed window, of the sort long known from a cellar of 2nd-century date at *Verulamium* (Wheeler & Wheeler 1936, 79–81, fig 6, pl.xcvii a and *b*), or for creating some other architectural feature. Alternatively, it may be part of an heptagonal roofing tile of the sort recovered from two sites in south-east England (Brodribb 1987, 18). They were used for decorative roofing, the overall appearance in the roof being of a series of diagonally-set squares, an arrangement called *pavonacea* by Pliny on account of its resemblance to the overlapping feathers in the tail of a peacock (*pavo*). That the brick or tile was prepared before firing shows

that it was a deliberate product, not the *ad hoc* production of a bricklayer wielding his trowel, and this perhaps makes its use as a roofing tile more likely.

Segmental Facing Brick

From context [7533], a P18 dump associated with Road 1, came a segmental brick in fabric 2452 with roller-stamped keying on its outer (convex) side in the form of a lozenge and lattice pattern in group 5 of die-types (Betts *et al.*. 1994, 7 and *passim*). Bricks of this sort were probably used, on edge, against a wallface to form attached half-columns. They would have been rendered with plaster, the keying aiding in this, and then perhaps painted to simulate stone half-columns. Essentially *ersatz* features, cheaper than the real thing, they nevertheless testify to a degree of architectural sophistication and status.

Tegulae Mammatae

Tegulae mammatae are of two types, apparently with different purposes. Those from the site seem all to belong to Brodribb's Type A, which have shallow circular *mammae*, the purpose of which 'seems to be to assist bonding when the brick was used in [bonding] courses or for flooring' (Brodribb 1987, 62). Examples from the site include those within the floors of B34 Room B (P6) and B44 Room C (P7). One example, not in its primary context but in P20 dump [8119] in Open Area 67, has both combed keying and a single *mamma* on the keyed face. This is of some importance since it would seem to confirm the purpose of the *mammae* as an aid to bonding in tiles of Type A. (*Tegulae mammatae* of Type B, used in constructing cavity walling in connection with hypocaust systems, seem not to be represented at the site.)

Box-Flue Tiles

Also a mark of status are the several box-flue tiles (*tubuli*) from the site. Used for the construction of hot-air conduits within the thickness of walls in connection with a hypocaust system, they are rectangular in shape. The two wide sides are usually keyed for mortar or plaster, the two narrow sides left plain; these latter sides normally contain vents of various shapes. Some examples from the site preserve parts of their vents, most being rectangular or square in form, a few circular.

The earliest box-flue tiles have keying formed by scoring, in various patterns, with the point of a knife or other sharp implement. They seem mostly to belong to the 1st century. Only one example was recovered from the site, from context [11304]. Towards the end of the 1st century, it seems, combing, using a variety of combs with differently sized teeth and with different numbers of teeth, came into use to make patterns involving straight or wavy lines. A more sophisticated technique was the use of roller stamps to form the keying patterns. In one case, reused in levelling make-up in B35 (context [12419]), a box-flue tile with roller-stamped keying has its side also keyed using a comb; part of the vent is also preserved. Such keying of adjacent faces usually occurs on double box-flue tiles, that is flue tiles which are wider

than normal and have a dividing wall down their centre. The roller-stamped flue tiles from the site are probably all of late 1st- to mid 2nd-century date. Most belong to the common 2815 fabric group, although two, including the probable double box-flue tile, come from a yard which was probably on or near the Sussex coast. Combed and roller-stamped examples are well represented from a number of contexts, with the roller-stamped examples accounting for over half the number present at the site. The percentages by count of pieces are: *scored:* 2%; *combed:* 41%; *roller-stamped:* 57% (total = 100%). Two of the combed fragments were perhaps later cut to form gaming pieces (see below). The roller-stamped examples show various dies corresponding to those in the published corpus (Betts *et al.* 1994); in some cases it is possible only to establish the *group* of die-types to which a particular example belongs. The dies present at the site are shown in Table 401.

Table 401 Roller-stamped box flue tiles: die types

Die Type/Group	Fabric	No. of examples	Comments
2	2452	1	–
3	2459A, 3006	16	–
5	3006	1	–
12	3006	9	1 probable example
13	3006	1	–
19	3054	1	?double box-flue tile
28(?)	2452	1	reused as *tessera*
70	3054	1	–
100	2452	1	–
Group 5	2452	2	lozenge/lattice design

Half-Box Flue Tile(?)

Half-box flue tiles, essentially flanged tiles which could also be used to create hot-air ducts within a wall thickness in association with a hypocaust heating system (Brodribb 1987, 65–7), are also a mark of status. A possible example in fabric 2454 was recovered from context [12865], not associated with a particular structure, in P22. As usual on such items, the keying for wall plaster is scored.

Wall Tiles (Parietales)

These formed yet another method of constructing hot-air ducts in walls. They are brick-like tiles but provided with keying on one face. They were affixed vertically to a wall by means of metal pins at the corners and were separated from the load-bearing wall itself by bobbin-shaped spacers through which the pins passed (Brodribb 1987, 67–70). Again they imply a hypocaust heating system and are therefore an indication of status. One example, in fabric 3006, was recovered from within Floor [8786] of B21 in P6; others, including one probable example, came from open areas or from the construction debris of the church of St Benet Sherehog, B174 in P36, where they must be residual. All examples are scored to provide keying for wall plaster.

Manufacturing and Other Features

(i) Signature Marks. A large number of items, predominantly brick and *tegulae*, have signature marks on their top surface. Such marks are plausibly interpreted as identification marks of individual makers (Brodribb 1987, 99–105). They are normally shallow marks made with the tips of the fingers. They vary between a simple semi-circular sweep with one finger, through several such concentric marks, to more elaborate devices including intersecting straight lines and/or curves. The site produced a great variety of such marks. They were probably made whilst the brick or tile was still in the mould and certainly at an early stage of manufacture, for *tegulae* from contexts [3500] and [11518] at this site show such marks partly overlain by the paw prints of animals that wandered over them during drying and whilst they were still soft enough to take such prints.

(ii) Tally Marks. These are knife-cut marks, mainly on the edges of *tegulae* and bricks, normally interpreted as Roman numerals (Brodribb 1987, 131–5). It seems reasonable to suppose that they represent some form of batch mark, although their precise signification is unknown. A brick from P37 dump [1421] has a row of three holes of 9, 12, and 9 mm diameter in one edge; they may be an alternative type of tally mark, although equally they may represent no more than the passing of an idle moment at the yard.

(iii) Stamps. A brick from P41 road make-up [2318] (accession <6407>) bears a faint stamp [...]ON, the N being incomplete. It is part of a procuratorial stamp reading PPBRILON or one of its shorter variants, and standing for *procuratores* [or *procurator*] *provinciae Britanniae Londini(o)*: 'The procurators [*or* procurator] of the province of Britannia at London' (Collingwood & Wright 1993, 30–40; Betts 1995, 207–29). The brick was not in its primary context, but would presumably have come originally from some official building, perhaps, though not necessarily, in the immediate vicinity of the site.

A *tegula* of late 1st- or early 2nd-century date, reused within P34 destruction debris [3443] (accession <1008>), bears a stamp with the letter A within a square (fig T1). It is probably a civilian stamp, marking the product as one from a private yard, the letter presumably being the initial of the tilemaker. Such stamps are rare in London and this particular example has not previously been recorded in Britain (Collingwood & Wright 1993, 56–85).

(iv) Graffiti. Two bricks, from P32 destruction debris [3252] and [11304], have graffiti in their top faces, neither complete. The former (accession <2417>) includes the letters [...]R(?)I[...] and, in a lower line, the letters [...]DV[...]. The latter (accession <6046>) appears to read: [...]TIAV[...].

(v) Cream 'wash'. An imbrex from P40 make-up [2405] is unusual in having what may be a cream 'wash' over its upper surface, presumably added to alter the colour of the tile.

(vi) Sunken margins. A number of the bricks show sunken margins along one or more sides of the upper bedface. Because of their large but flat nature, Roman bricks, whether or not they were moulded at a bench, would have been demoulded direct onto the drying area itself. The procedure sometimes

pulled up small ‘lips’ along the edges of the bricks and these were immediately pushed down by using the bottom of the mould itself (Betts 1996, 6–10). An example from context [1895] has a margin with its full width of 20 mm showing; allowing for shrinkage of the brick during drying and firing, the mould wall must have been some 25 mm or more in thickness.

(vii) Accidental impressions. As commonly with Roman ceramic building materials, there are several accidental impressions, especially in the flat bedfaces of bricks and *tegulae*, which were laid flat at least for initial drying. A few pieces preserve the imprints of leaves, which were presumably lying on the ground when the bricks or tiles were put down. Others preserve finger impressions in the edges, from where the tile was handled whilst still soft; in one case, the finger impressions appear to be those of a child. More frequently, animals or people walked over the drying bricks or *tegulae*, leaving paw, hoof, sandal, or hobnailed boot impressions. Less common is the example from this site of an *imbrex* with hobnail impressions.

(viii) Nail holes in tegulae. Roman ceramic roofing materials were heavy enough to stay on a typically shallow-pitched roof under their own weight, helped by their interlocking nature, and without nailing. Nail holes are therefore rare, although they are sometimes encountered, and two *tegulae* from the site show them, one from make-up [12795] in B12 in P3 and one from destruction debris [12700] in open area 2 in P5; the former has a hole 15 mm in diameter, the latter a hole only 6 mm in diameter. In both cases they have been made after firing, which is not the normal practice, in which roof tilers seem to have ordered in advance the correct number of such tiles with the nail holes already formed (Brodribb 1987, 10–11). It may therefore be that the examples from this site represent secondary use. It seems likely that only the bottommost tiles, overhanging the eaves, would have required nailing.

Discs Made from Flue Tiles

From the occupational debris [2844] of B107 in P35 came two roughly circular fragments of combed box-flue tile which may have been deliberately cut to form gaming pieces (accessions <2841> and <2482>). Possibly the combed surfaces made them more attractive than plain pieces.

Dimensions of Materials

(i) Bricks. Over one hundred of the Roman bricks recovered (some as samples) preserve all three of their dimensions. This is an unusually large quantity for a London site and the material is therefore of some importance. When plotted onto a scatter diagram, lengths and breadths define four discrete groups, corresponding to familiar brick types. These had their specific functions within Roman building practices although all were capable too of being used as general walling materials.

Group I. This comprises *bessalis* bricks with a range of 195–229 mm in length and 193–220 mm in breadth, but with the vast majority (79%) falling within the range 203–215 mm in length and 200–210 mm in breadth; in thickness they range from 27 mm to 45 mm with a median of 32 mm. The primary use of the more or less square *bessales* was in the construction of

hypocaust *pilae*, and at this site the majority come from the *pilae* of the hypocaust heating system of Room A in B64. A few were used in general walling, an example in wall [11804] of the vaulted culvert B72 in P18 being fairly unusual in having knife-trimmed edges; another from the same building, wall [11780], is overfired, partly vitrified, and warped: clearly it would have been unsatisfactory within a hypocaust *pila* and seems therefore to have been used as rubble. Some of the largest bricks within the group would have served as bases or caps to the hypocaust *pilae*.

Group II. This is both the largest and the 'tightest' group and comprises *pedalis* bricks with a range of 277–291 mm in length and 262–294 in breadth, but with the great majority (75%) falling within the range 283–290 mm in length and 280–290 mm in breadth; in thickness they range from 37 mm to 45 mm with a median of 44·5 mm. Their primary purpose in Roman building practice was to serve as bases and caps to hypocaust *pilae*, but at this site they were not so used, occurring within various walls in B64 and in the vaulted culvert B72, in which they were laid using *opus signinum* type mortar – presumably, in such a context, to provide a more water-resistant construction than would be possible with ordinary lime mortar. A few examples show edges which have been knife-trimmed or trimmed with a fine-toothed comb.

Groups III & IV. These comprise a number of large rectangular *lydion* bricks and may be considered together, although they fall into two clear groups. Group III bricks have a range of 333–385 mm in length and 270–309 mm in breadth, with exactly 50% lying within the much more restricted range of 350–370 mm in length and 302–309 mm in breadth; in thickness they range from 33 mm to 45 mm with a median of 39·5 mm. Group IV bricks have a range of 412–470 mm in length and 270–311 mm in breadth, with the majority (59%) falling within the much more restricted range of 427–445 mm in length and 298–310 mm in breadth; in thickness they range from 35 mm to 50 mm with a median of 41·5 mm. The principal use of *lydion* bricks was in general walling, particularly for the formation of bonding courses in stone walls (*opus quasi vittatum*), and the majority from the site come from walls in the culvert B72.

It is perhaps worth noting that it is not the bricks which are largest in area but the *pedales* in Group II which have the greatest thickness.

(ii) Opus Spicatum Bricks. Surprisingly few *opus spicatum* bricks were found and none was complete. An example from context [1113] is 59 mm broad and 23 mm thick; one from [11028] is 20 mm thick. A larger example from [8180] is 90 mm broad and 58 mm thick. They are in fabric 2455 or in fabrics of the common 2815 group. They would have been used for flooring or paving, for which they were laid on edge, usually in a herringbone arrangement (Brodribb 1987, 50–54).

(iii) Tegula Mammata. Only one *tegula mammata* (fabric group 2815), from the dump [3765], preserves more than its thickness: it is 264 mm broad and 37 mm thick.

(iv) Roof Tiles. Complete *tegulae* were present only in small numbers, and it is not possible to place them into meaningful size-groups. In length they

range from 365 mm to 445 mm with a median of 416 mm; in breadth they range from 277 mm to 370 mm with a median of 318 mm. *Imbrices* ranged in length from 381 mm to 435 mm with a median of 401 mm. Four narrow (top) breadths were preserved: 125 mm, 128 mm, 135 mm, and 140 mm.

(v) Box-Flue Tiles. The box-flue tiles show a quite wide variation in size, although numbers with all or two of their three dimensions preserved are too small for meaningful classification into groups. Only two lengths are preserved, of 246 mm and 370 mm. The breadths of the wider (usually the keyed) sides range from 160 mm to 219 mm with a median of 189 mm. The breadths of the narrower sides range from 104 mm to 140 mm with a median of 117 mm.

Ceramic and Stone *Tesserae*

As well as mosaic floors found *in situ* at the site, numerous loose *tesserae* were recovered. They are in various materials giving different colours. Most of the ceramic examples are in varying shades of red and are cut from ceramic building materials of the common 2815 fabric group. A few are cut from building materials in other red fabrics and a few from materials in the cream or buff fabric 2454. There are also several greyish *tesserae* cut from amphorae, mainly Dressel 20. Stone *tesserae* used to augment the commoner ceramic examples are mostly of white hard chalk (clunch) or dark grey (almost black) Wealden shale, although there are a few examples in cream-coloured oolitic limestone and grey sandstone. All are well attested materials for the construction of tessellated or mosaic floors in Britain (Rule 1974, 8; Neal 1981, 20–21), and would have enabled parti-coloured floors to be created, either as more or less simple geometric designs or as more elaborate pictorial schemes.

The clunch *tesserae* are mostly small – in the region of 10 mm square; those in other materials tend to be larger. One of the clunch examples, found in the destruction debris [3542], appears to have been deliberately stained brown with wax or varnish, perhaps after it was laid. A *tessera* of grey Kentish ragstone, an intractable material for cutting, may represent later patching. More remarkable are a few *tesserae* made from ordinary soft chalk: this is hardly a suitable material for flooring and presumably represents poor quality repair work done ‘on the cheap’. A possible *tessera* of imported white marble was recovered from [8023]; it has a layer of green paint over a layer of grey paint.

Of some interest is the apparent change in materials between P21 and P22 in B64. In the earlier of these periods most of the *tesserae* are cut from red ceramic building materials and some from the cream or buff-yellow building materials in fabric 2454; a large number of white *tesserae*, mostly of small size, are cut from clunch, although one is of cream-coloured limestone and an orange quartzite pebble may also have been used as a *tessera*. In the later of the two periods, on the other hand, although small white *tesserae* of clunch are still present in large numbers, red examples cut from building materials are much more poorly represented whilst cream and buff examples cut from building materials are not present at all. There are, on the other hand, several made of dark grey, almost black, Wealden shale and one in a greyish colour cut from a Dressel 20 amphora. The use of these later, P22, materials must have given a far more sombre appearance to the floors than was the case in P21.

Tesserae, especially the typical clunch examples, are small objects, easily lost or scattered. They must too have proved irresistible as playthings

for children (or adults!). It is wise, therefore, to use them to suggest the presence of former tessellated floors only when they occur in significant numbers and within buildings independently dated to the Roman period. Table 402 shows Roman buildings which contained twenty or more *tesserae*.

Table 402 Roman contexts producing twenty or more tesserae

Context	Interpretation	Number	Comments
[3491]	Destruction debris	175	Redeposited destruction debris
[3500]	Floor	36	–
[3607]	Floor	316	Includes quartzite pebble – used as *tessera*?
[3619]	Floor	>189	Sample
[3620]	Floor	412	–
[3621]	Floor	62	–
[3633]	Floor	128	–
[3655]	Pit	128	–
[4533]	Floor	193	–
[4542]	Floor	203	–
[4583]	Posthole	34	–

Medieval and Post-Medieval Ceramic Building Materials

Shouldered Peg Tiles, Flanged Tile and Curved Tiles

These roofing tile types, in distinctive fabric 2273 and its variant 2272, appear to be of local manufacture since shouldered peg tile wasters have been found together with the very truncated remains of a kiln at Niblett Hall near Fleet Street, where the wasters have been dated archaeomagnetically to the range 1220–1280 (GeoQuest 1993, 3; Betts 1997b, 122). The tile types seem to have been adopted in London immediately after a serious fire of 1135/6, when the houses of a number of citizens were *spissis tegulis coopertam* – 'covered with thick tiles' (Riley 1859, 329); they lasted down to the late 12th or early 13th century. Shouldered tiles are thick and heavy, basically rectangular but with a narrow neck at the top. The flanged and curved tiles somewhat resemble Roman *tegulae* and *imbrices* and were used in similar fashion, although the curved tiles could also serve as ridge tiles. These tile types were recovered in significant quantities from the site, though none is complete. A near-complete shouldered tile measures 333 $\times 217 \times 20$ mm and another example is 212 mm wide and 20 mm thick. A number of the tiles show the usual glaze over the lower part of their surfaces; this is sometimes well applied and quite glassy, but in other cases rather less well applied. Some of the tiles have mortar on their broken edges. Such early tiles are normally associated with buildings of some status, notably, though not exclusively, ecclesiastical, and they probably indicate the presence of such buildings at or close by the site. None, however, appears to be in a primary context. In a number of cases they have been reused in flooring or in make-up, notably in B173 and B174 (the church of St Benet Sherehog), where early peg tiles were also found (below). They first appear at the site in P36 and also occur in P37 and P39–P40.

Peg Tiles

In London, peg tiles first appeared in the later 12th century and continued to be the principal form of ceramic roof covering until recent times. Almost certainly, the vast majority were made at tile kilns close to the City. Most of these seem to have been east of London; tilemaking is recorded in Stepney from 1366 (McDonnell 1978, 114) and in the later 14th and 15th centuries Woolwich was a principal centre for the manufacture of roof tile supplying both the City and Westminster (Cherry 1991, 194), although they were also brought in from as far away as Rayleigh, Essex, 30 miles distant (Jones 1953, 63). By their nature, peg tiles remained similar throughout their long period of use, although there are sometimes clues to a more refined dating.

The earliest, in fabric 2273, were thick and sometimes in the shape of an isosceles trapezium with the lower angles just less than 90º. They were probably in use from the late 12th to the mid 13th century and show a good cover glaze. They were found at the site in P39–P41, though none was in a primary context. They were reused in flooring in B173 and as make-up in B174 (the church of St Benet Sherehog), significantly in association with early tiles of other types (above); they were also found in other secondary contexts associated with these two buildings, suggesting that its predecessor, or a building nearby, used such tiles.

Peg tiles in fabrics 2271 and 2586 were made from the late 12th century onwards and those in fabric 2587 between the mid 13th and the mid 15th century; the first two first appear in P36 at the site, the last in P40. In the Middle Ages they are frequently characterised by the presence of splash glaze and, less often, of cover-glaze. A fair number of the tiles from this site show glaze, either brown, green, or a greenish-brown. Its application is very variable – quite well applied in some cases, in others consisting of no more than a few splashes. This poor glazing is accordant with concerns expressed in late 13th-century London about the 'leading' (lead glazing) and also about the 'scantling' of roofing tiles (Riley 1859, 288, 729); 'scantling' probably referred to the thickness alone rather than to the overall size, and peg tiles of the time are often remarkably thin. The vast majority of these tiles have two round nail holes.

Peg tiles in fabrics 2271 and 2586 continue beyond the late 15th century down to recent times; but they tend to be both thicker and of more uniform thickness in this later period, whilst glaze is no longer present. Peg tiles in fabric type 2276 are distinguished by their fine moulding sand; they were made and used within the London area from the late 15th century onwards. A few were recovered from the site, exclusively within P40. The types of nail holes found in the later peg tiles are more diverse: they may be square, diamond-shaped, or polygonal, although round holes still predominate. Almost all are of two nail-hole type. Most of the holes preserved in peg tiles from this site are round, although some of other shapes were found. In connection with the holes, it is perhaps worth noting that *(i)* in a number of cases one of the two holes was not pushed through the full thickness of the tile and *(ii)* in some cases the two holes were at radically different distances from the top edge. Both these characteristics – by no means unknown from other London area sites – suggest that it was common practice to use only *one* of the holes for fixing to the laths; alternatively, in some cases the tiles may have been fixed above continuous boarding, in which case two nail-holes at different heights would not be a hindrance to

fixing; tiling over boards, however, does not seem to have been a common practice at any period. What these two characteristics also bespeak is a certain casualness during manufacture.

A tile from context [11032], in fabric 2271, has a batch mark made with the finger in the still-wet clay, passing diagonally towards the top right-hand corner of the upper surface (MoLAS/MoLSS type 4). Another, from context [16069], in fabric 2586 has an animal paw print in its upper surface, showing that it had been laid flat for initial drying; such prints are far less common on medieval and post-medieval than on Roman ceramic building materials, though they are occasionally encountered (see, e.g., Bond *et al.* 1980, 3, fig 3).

In only one case are the full dimensions preserved: a tile from context [1562] in B174 (P39) measures 318 × 218–22 × 19–20 mm. Other widths range from 140 mm to 187 mm with a median of 156 mm.

Ridge Tiles

Only three ridge tile fragments were recovered, two from within the wall [1645] and one from a non-structural cut [1604], both associated with B174, the church of St Benet Sherehog. They are in fabric 2586 and were almost certainly made at the same yard or yards as the peg tiles. All have brown cover glaze. They are probably, therefore, of medieval date, but were reused as rubble at the site in P40.

Hip Tile(?)

A fragment of curved tile in fabric 2271 has a hole 9 mm in diameter some 44 mm from one end and has brown cover-glaze. It is probably part of a hip tile, used down an angle of a hipped roof, unless, just possibly, it is part of a ridge tile with the hole serving as a support for a finial. It is probably of medieval date, though found in a P40 cesspit [2657] associated with B130 in P40. Hip tiles were used in England from the 13th century at latest (Cherry 1991, 194).

Bricks

A limited number of bricks was recovered from the site, including those specially made for the tomb of John Maurois (died 1673). Suitable raw materials for brickmaking are virtually ubiquitous in the London area (Clout 1997, 133), and almost certainly the majority of red bricks used in London before Victorian times were made using such local resources. Brickmaking developed by the late 15th century to the east of London and developed during the Tudor period; by early Stuart times there were permanent commercial yards at various locations around London: in or near the Haymarket, along Tottenham Court Road, at Hackney, and at St Pancras (Brett-James 1935, 111–12, Clarke 1992, 99–100). The progress of the material within the City, however, was slow down to the Great Fire of 1666, with bricks being restricted largely to chimneys and ovens within timber-framed buildings and to wells and boundary walls, with very few buildings being completely of the material. Legislation concerned with the rebuilding after the Fire ensured that the material made rapid progress, which was

accompanied by changes in the nature of the bricks themselves.

(i) Mid/Late 15th century to c1700. Bricks made and used in London during this period are orange or orange/red in colour and quite soft and friable. Those from the site are in the common fabric 3033 or its more sandy variant fabric 3046. Some of the bricks, including that from wall [739] in the church of St Benet Sherehog, B174, in P39, show sunken margins, resulting from their method of manufacture (Betts 1996, 6–10; and see discussion of Roman materials above). They would have been made as 'place bricks', demoulded at the drying ground or 'place' and left in a flat position at least for initial drying, perhaps being turned on edge and stacked in an open honeycomb arrangement later (Neve 1726, 42–3); when the mould was removed it sometimes pulled up small 'lips' along one or more edges, and these were simply pressed down with the bottom of the mould, thus incidentally forming the sunken margins. Another brick, from Mayor Maurois' tomb [83], shows straw marks in its lower bedface, straw being one of the materials strewn on the drying ground to prevent the bricks from sticking to it. One brick sampled from context [5] has a worn upper bedface, suggesting use as a paving brick. The lengths of the bricks recovered or sampled range from 216 mm to 231 mm with a median of 222·5 mm, breadths from 104 mm to 114 mm with a median of 107·5 mm, and thicknesses from 50 mm to 65 mm with a median of 53 mm. There is a tendency (though no more than that) for these bricks to increase somewhat in thickness over time, and it is significant, therefore, that the thickest bricks (63 and 65 mm) come from the firmly dated tomb of 1673 – that is, at the end of the period when such bricks were being produced.

(ii) 1666 and later. During the three decades following the Great Fire the earlier bricks were gradually superseded by those in fabric 3032 and its silty variant fabric 3034. These bricks are darker red in colour, sometimes even purplish, and are characterised by occasional flint, pebble and ash inclusions. The last is the 'Spanish' or coal ash and other domestic rubbish added to the raw material and against which some complained, insisting that it weakened the bricks. Legislation on the matter was vacillating and in the end it was accepted that the ash *could* be added to the bricks. So long as they are well made in other respects it does not seem to have had a deleterious effect on the millions that are still extant in London. The outer surfaces often show a yellowish tinge, resulting from the moulding sand used during manufacture. Sunken margins are occasionally present on late-17th-century transitional products, but are far from usual; there are none on the bricks from this site. They were nearly all made, in fact, as 'pallet bricks' – Neve's 'stock bricks' (Neve 1726, 42–3) – being demoulded at the maker's bench onto small wooden boards (pallets) and taken in batches to the drying ground. The pallets pushed down the 'lips' sometimes pulled up during demoulding, so that there was no need to use the mould itself for this and sunken margins were not formed. The bricks were set on edge even for initial drying, taking up less space at the brickyard and drying more quickly because of the greater surface area thus exposed to the air. Manufacture was therefore speeded up – an important consideration in the post-Fire decades, when bricks were required on a vast and unprecedented scale. Excluding the bricks from John Maurois' tomb, which were modified before firing (below), the bricks range in length

from 212 mm to 235 mm with a median of 226 mm, in breadth from 94 mm to 114 mm with a median of 106 mm, and in thickness from 52 mm to 68 mm with a median of 59 mm.

Of particular interest are the fabric 3032 bricks used in the tomb [83] of John Maurois, Lord Mayor of London. Some of the bricks are in a variant of the fabric, more orange in colour and with slightly fewer inclusions; the tomb also incorporated a few of the earlier type bricks. Maurois died on 18 January 1673 and was buried beneath a brick-built table tomb topped by a flat stone slab with inscription in the churchyard of St Benet Sherehog, so that the bricks are unusually firmly dated. Their fabrics are entirely appropriate to this transitional period in London brickmaking. The tomb was damaged and thus not all its bricks were present, although at least one of each of the eight types needed to complete the design was recovered: Tables 403 and 404 and fig T2. The standard bricks have been knife-trimmed before firing with the intention of forming rectangular blocks with sharp arrises, presumably so that they might be laid with fine joints. Rough shallow depressions have been scooped from the upper bedfaces, probably with an eye to providing sufficient keying using such thin joints. The front of the tomb was decorated with recessed quarter-round mouldings running up each corner and finished at the bottom with simple square stops, whilst the central area was formed into a rectangular sunk panel bounded by similar mouldings. The shaped bricks too have been cut before firing. A few of them also have shallow depressions scooped from one bedface to serve, probably, as mortar keys. One brick (accession <410>) has an inscribed mark on the rear stretcher face in the form of a Greek digamma or double tick; this may have been some form of tally mark used at the yard or a setting mark used to guide the bricklayers.

Table 403 Shaped brick types from the tomb of John Maurois (1673)

Type no.	Description
1	Recessed quarter-round moulding along one stretcher face
2	Recessed quarter-round moulding along one header face
3	Recessed quarter-round moulding down one angle
4	Recessed quarter-round moulding down each angle of one stretcher face with additional rectangular return at one end
5	As 4 but with one moulding stopped square and other returned
6	Mirror-image of 5
7	As 1 but with moulding returned vertically towards one end
8	Mirror-image of 7

Table 404 Shaped bricks from the tomb of John Maurois (1673)

Type	ACC	Dimensions in mm	Comments
1	<367>	137 × 100 × 55	Rather crudely cut from longer brick
1	<368>	216 × 114 × 52	–
1	<370>	214 × 105 × 54	–
1	<371>	220 × 102 × 56	–
1	<372>	100 × 105 × 56	Rather crudely cut from longer brick
1	<375>	103 × 105 × 53	Rather crudely cut from longer brick
1	<376>	100 × 104 × 55	1 end cut or sawn after firing; 1 unshaped corner crudely chopped off
1	<377>	213 × 104 × 55	–
1	<379>	100 × 105 × 55	Rather crudely cut from longer brick
1	<381>	220 × 104 × 56	–
1	<384>	? × 107 × 55	1 end damaged
1	<385>	111 × 110 × 53	Damaged type 1? or type 2?
1	<386>	99 × 105 × 55	1 end hacked off after firing
1	<387>	? × 100 × 55	1 end damaged
1	<388>	215 × 104 × 58	1 front corner damaged
1	<400>	218 × 107 × 53	Shallow scoopings from upper bedface; lower bedface sawn before firing?
1	<404>	157 × 106 × 57	1 end cut or sawn after firing
1	<405>	214 × 103 × 54	1 corner damaged revealing reduced core
1	<408>	? × 105 × 59	1 end damaged
1	<410>	131 × 105 × 56	1 end cut or sawn after firing; possible tally or setting mark in form of digamma
2	<374>	140 × 112 × 52	Bottom edge of rear face chopped off
2	<401>	138 × 103 × 56	–
3	<391>	222 × 92 × 55	Rear face cut after firing
3	<407>	220 × 97 × 54	Rear face cut after firing
4	<369>	218 × 110 × 55	Rebate cut from rear before firing; scribe-line on upper bedface
4	<373>	? × 92 × 55	1 end damaged
4	<382>	? × 102 × 54	1 end damaged
4	<389>	? × 92 × 55	1 rear corner chopped off
4	<390>	? × 91 × 53	1 end damaged; scribe-lines on both bedfaces
4	<392>	? × 106 × 51	1 end damaged; rebate cut from rear before firing
4	<393>	193 × ? × 54	Rear face chopped off
4	<403>	? × 115 × 56	1 end damaged; rebate cut from rear before firing
4	<409>	? × 105 × 55	1 end damaged; moulding damaged
5	<406>	215 × 105 × 55	1 rear corner chopped off after firing
6	<378>	221 × 104 × 55	Slight scoopings from upper bedface
7	<380>	177 × 109 × 50	1 rear corner chopped off
8	<383>	? × 102 × 55	–
8	<402>	164 × 107 ×55	Slight frog-like scooping from upper bedface

Bricks of a precise rectangular form for use in walling having fine joints were almost invariably formed at this period by cutting and rubbing (on a suitable abrasive) special bricks, known as ‘rubbers’, with a soft and very homogeneous texture. The best of those used in London, wrote Joseph Moxon in 1700, came from Kent (Moxon 1700, 2–3). The fabric 3032 bricks were not suitable for such work because of their hard, intractable nature and because any such cutting would expose the grey or black ‘Spanish’ inclusions or even voids where these had entirely burned out during firing. It must be for this reason that the tomb bricks were shaped *before* firing, probably after

initial drying when the bricks were leather-hard.

The same holds of the shaped bricks used in the tomb. Both in the Middle Ages and later, it was more usual in Britain to *cut* ('hew') shaped bricks to the required form rather than to mould them, although the latter was certainly done on occasion; the cutting, however, was normally done *after* firing, usually at the building site and sometimes even when the bricks were *in situ* in the building (Smith 1999, 3–8; Lloyd 1925, 75–9), as in some of Wren's City churches (Smith forthcoming). The shaped bricks from the tomb, on the other hand, like the standard bricks, were cut in their green state, *before* firing. Once again this must be due to the nature of the 3032 fabric. Some at least of the bricks appear to have been formed by 'sledding' – running a shaped template along the brick to form the correct profile. This involved careful manipulation of the template when forming the re-entrant right angles which occur on a few of the bricks. Interestingly, a few of the bricks show scribe-lines akin to those found on worked stone. One type 4 brick (accession <390>) has scribe lines on both bedfaces, suggesting that it was cut whilst on edge, perhaps using a tin saw, as mentioned by Joseph Moxon for use in cutting *fired* bricks (Moxon 1700, 9). Possibly this single brick was used as a 'template' for cutting others which show no scribe-lines. Another brick (accession <369>) preserves a single scribe-line on just one bedface. Some bricks have had a square or rectangular rebate cut from their backs before firing, presumably in order to facilitate positioning; in other cases portions, usually angles, have been roughly chopped away after firing, again presumably to aid their positioning, and doubtless carried out by the bricklayers building the tomb.

As a substitute for the more common method of creating fine brickwork, including mouldings, by using special bricks, this experiment at the tomb cannot be regarded as successful. Inevitably, the bricks have shrunk during secondary drying (that is, after cutting to shape) and during firing. This has resulted in a certain amount of distortion, including the loss of strict right-angles and of precisely straight edges, whilst, even more important, differential shrinkage has resulted in quite widely varying dimensions (see Table 404). The most critical dimension, for work like that at the tomb, is the thickness; the full range is from 50 mm to 59 mm thick, and although sixteen (= 42%) of the thirty-eight bricks all have a maximum thickness equal to the mode (which is also the median) of 55 mm, many show variations in thickness along their length. The fine joints which could be achieved with properly cut and rubbed bricks (only 1 mm thick at St Benet Paul's Wharf, for example: Smith forthcoming) were thus unobtainable with these *ersatz* products, and indeed mortar still adhering to one brick (accession <410>) indicates that the horizontal joints were in the region of 13 mm (½ inch) thick. It is interesting that the experiment should have been made with what were, at the time of Maurois's death, entirely new types of bricks; at the same time, it is not surprising that, so far as is known, the experiment was not repeated.

A fragment of a yellow/brown London Stock brick, of 18th- or 19th-century date, was recovered from cesspit [7008] in P36.

Floor Tiles

A number of decorated and plain floor tiles were recovered, many from the

church of St Benet Sherehog, B174, which was destroyed in the Great Fire of 1666 and not rebuilt; others were recovered from surrounding open areas, several of them within grave fills in the church or churchyard. Many from the site have been reused, sometimes being incorporated within masonry walls. Floor tiles were of common occurrence as a flooring material in medieval London churches (Betts 1994, 133–40). The earliest in use at the site were almost certainly made locally at one or more extramural yards. Later, with the demise of the local industry, tiles had to be brought in from further afield – from England and from the Greater Netherlands.

(i) 'Westminster' Tiles (fabrics 2195, 2199)

Tiles of 'Westminster' type are so-called because they were first recognised in the Muniment Room and in St Faith's Chapel at Westminster Abbey (Degnan & Seeley 1988, 11–18). One place of manufacture was near Farringdon Road in Clerkenwell, discovered in the 19th century (Price 1870, 31–6) and from which came a distinctive double-headed eagle design recently recognised by Ian M Betts amongst tiles at Westminster Abbey itself (Betts, in prep.); this confirms the impression of London manufacture given by the distribution of examples (Eames 1980, vol.1, 207–8). Both plain and decorated tiles were made, though they are rather poor quality products, their surfaces bumpy and the designs of the decorated examples often ill-defined. Those still *in situ* at Lambeth Palace Chapel date from 1225–1250; other 'Westminster' tiles, however, may be slightly later in date, perhaps down to the late 13th century. They show distinctive fabrics, although all but two from this site are in fabric 2199; plain tiles from [946] and [1503] are in fabric 2195. Details of the decorated tiles are given in Table 405; previously unpublished designs are shown in fig T3. Plain tiles were found with variously coloured glazes; examples from [321], [1588], and [1640] have been snapped along diagonal score-lines to form triangular tiles. Details are given in Table 406. 'Westminster' tiles, whether decorated or plain, account for 69% of the floor tiles found at the site.

Table 405 Decorated 'Westminster' floor tiles (D&S = Degnan and Seeley 1988; E = Eames 1980); all fabric 2199

Context	ACC	Dimensions in mm	Design no.	Comments
[0]	<566>	? × 107 × 24	E 2776	Large pebble in matrix
[0]	<567>	? × ? × 29	D&S 4	–
[0]	<568>	107 × 104 × 24	Unpublished 1	–
[0]	<569>	? × ? × 24	D&S 2	Slightly worn
[70]	<316>	104 × 104 × 26	D&S 13	–
[70]	<317>	108 × 107 × 23	E 1821	Worn
[543]	<275>	? × ? × 23	D&S 2	Slightly worn
[543]	<276>	? × 105 × 24	E 1821	Slightly worn
[690]	<280>	? × ? × 28	Unpublished 3	Worn
[690]	<281>	? × ? × 26	E 2288	Worn
[725]	<335>	? × ? × 24	Unpublished 5	Slightly worn
[736]	<277>	106 × 105 × 20	E 2776	Worn
[738]	<334>	106 × 102 × 24	Unpublished 6	Worn
[752]	<307>	107 × 106 × 23	E 2055	Worn
[759]	<279>	? × ? × 28	D&S 2	Slightly worn
[785]	<309>	? × 103 × 26	D&S 6	Slightly worn
[855]	<418>	? × ? × 27	D&S 9	Slightly worn
[855]	<419>	? × ? × 26	E 2776	Worn
[855]	<420>	? × ? × 21	D&S 9	–
[855]	<513>	? × ? × ?	?	Fragment, slightly worn
[1510]	<308>	? × 102 × 26	D&S 18	Slightly worn
[1514]	<310>	100 × 99 × 25	Unpublished 2	Slightly worn; reused
[1514]	<311>	106 × 105 × 23	Unpublished 4	Slightly worn
[1514]	<312>	105 × 105 × 23	Unpublished 4	Slightly worn
[1514]	<313>	105 × 104 × 21	Unpublished 4	–
[1514]	<322>	? × 102 × 25	Unpublished 3	Slightly worn; reused
[1514]	<323>	105 × 105 × 26	Unpublished 2	Worn
[1514]	<324>	107 × 103 × 24	E 1368	Slightly worn
[1514]	<325>	106 × 105 × 24	D&S 5	Slightly worn
[1514]	<326>	108 × 103 × 28	D&S 9	–
[1554]	<505>	108 × 105 × 25	Unpublished 6	Worn
[1558]	<398>	104 × 103 × 23	Unpublished 1	Slightly worn
[1562]	<417>	108 × 104 × 22	Unpublished 1	–
[1595]	<345>	? × ? × 22	D&S 18(?)	Worn
[11032]	<4247>	? × ? × 25	Unpublished 3	Reused

Table406 Plain-glazed 'Westminster' floor tiles with dimensions; all fabric 2199 except where indicated

Context	Description	Dimensions in mm	Comments
[1640]	Triangular yellow	? × ? × 24	–
[1595]	Square brown	? × ? × 26	–
[1595]	Square brown	? × ? × 26	Reused
[1588]	Triangular dark green	? × ? × 25	Slightly worn
[1562]	Square dark green	103 × 101 × 25	Worn
[1562]	Square brown	103 × 102 × 25	Very worn
[1562]	Square yellow	104 × 104 × 24	Very worn
[1562]	Square yellow	106 × 103 × 23	Worn
[1558]	Square dark green	? × ? × 24	Worn; reused
[1538]	Square green/brown	100 × 99 × 22	Very worn
[1518]	Square dark green	? × ? × 27	–
[1518]	Square dark green	104 × 101 × 26	Very worn; reused
[1514]	Square green	101 × 98 × 23	Worn
[1514]	Square black	102 × 99 × 27	Slightly worn
[1514]	Square green	103 × 100 × 24	Very worn
[1514]	Square brown	103 × 101 × 25	Worn
[1514]	Square green	104 × 102 × 25	Slightly worn; reused
[1514]	Square green	106 × 103 × 27	Very worn
[1514]	Square green	107 × 102 × 27	Worn
[1514]	Square yellow	107 × 103 × 31	Slightly worn; reused
[1503]	Square dark green	107 × 104 × 25	Reused; *fabric 2195*
[981]	Square brown	? × ? × 28	Worn
[946]	Square brown	104 × 102 × 29	Worn; *fabric 2195*
[880]	Square brown	? × ? × 27	Slightly worn
[876]	Square brown/green	101 × 101 × 23	–
[876]	Square yellow	104 × 104 × 30	–
[821]	Square dark green	103 × 101 × 22	Very worn
[781]	Square green/brown	103 × 99 × 24	Slightly worn
[781]	Square brown	103 × 101 × 25	Worn
[752]	Square green/brown	? × 100 × 24	Worn; reused
[752]	Square black	99 × 99 × 26	Worn
[752]	Square black	101 × 100 × 26	Worn
[752]	Square green/brown	103 × 101 × 25	Very worn
[752]	Square green/brown	103 × 103 × 23	Very worn
[690]	Square brown	? × ? × 21	Possibly fragment of decorated tile
[543]	Square black	103 × 98 × 27	–
[321]	Triangular yellow	? × ? × 26	–
[70]	Square green/yellow	? × 103 × 25	–
[70]	Square yellow	106 × 101 × 26	–
[70]	Square dark green	106 × 102 × 25	–
[70]	Square dark green	106 × 103 × 24	–
[70]	Square yellow	106 × 103 × 27	–
[70]	Square dark green	106 × 105 × 26	–
[70]	Square brown	106 × 105 × 27	Reused
[70]	Square yellow	110 × 105 × 24	Worn

(ii) Lesnes Abbey Tiles (fabric 2324)

Tiles of this group, which occur at Lesnes Abbey, Kent, also occur in a number of sites, often monastic, around London, for example Bermondsey Priory, Merton Priory, and Stratford Langthorne Abbey. They are related to

tiles at Eltham Palace, also in Kent, where they are *in situ* in a pavement probably laid down *c*1305 in the hall built for Bishop Anthony Bek (Eames 1982, 238–44). They probably date from the 14th century and were perhaps made somewhere in north-west Kent. Accession <327> from [725] shows Eames design 1991 and measures ? × 126 × 20 mm; it is better made than most examples and may perhaps be from a different source. Accession <278> from [759] shows Eames design 2634 and measures ? × 129 × 19 mm (Eames 1980, as design numbers). At time of writing, these are the only examples known from within the City of London and they account for only 2·5% of the floor tiles from the site.

(iii) Penn Tiles (fabrics 1810, 1811, 2894)

After the demise of the 'Westminster' tile industry, floor tiles for use in London had to be obtained from alternative sources. One of these was at Penn in Buckinghamshire, some 30 miles north-west of London. This was one of the most successful of medieval commercial tileries, its main period of production occurring after the Black Death of 1348–9: large quantities of predominantly decorated tiles and some plain tiles were traded to London from the 1350s down to *c*1390, although from this site decorated examples only were recovered. The tiles are in distinctive fabrics and the decorated examples are of far better quality than those of the 'Westminster' group. Details are given in Table 407. Penn tiles account for 12% of the floor tiles from the site.

Table 407 Decorated Penn floor tiles (E = Eames 1980); all fabric 2894 except where indicated

Context	ACC	Dimensions in mm	Design no.	Comments
[693]	<318>	? × ? × 26	E 2773	Slightly worn
[693]	<319>	? × 106 × 22	E 2337(?)	Worn
[693]	<320>	? × ? × 18	E 2230	Worn
[693]	<321>	? × 111 × 20	E 1846	Fabric 1810
[721]	<333>	107 × 107 × 20	E 2262	–
[725]	<328>	? × 105 × 24	E 2337	–
[725]	<329>	? × ? × 20	E 2337	Worn
[725]	<330>	? × 105 × 22	E 2037	–
[725]	<331>	? × ? × ?	E 2337	–
[725]	<332>	? × ? × 19	E 2337(?)	–
[924]	<306>	? × ? × ?	E 1398	Fabric 1811
[966]	<314>	? × 112 × 22	E 2336	Worn
[966]	<315>	? × ? × ?	E 1827	Fabric 1811
[16037]	<5988>	110 × 108 × 26	E 2223(?)	Slightly worn

(iv) Plain-Glazed Tiles of English Manufacture (fabrics 1813)

Two tiles with plain green glaze over white slip were recovered from contexts [543] (in a coarser than usual version of the fabric) and [799], measuring 27 mm and 18 mm thick respectively; other dimensions are not preserved. Although their place of manufacture is not at present known, they are almost certainly English products, probably of 14th- or 15th-century date. They account for only 2·5% of the floor tiles from the site.

(v) 'Flemish' Floor Tiles (fabrics 1678, 2318, 2324, 2850, 3063, 3082)

Imported plain-glazed tiles from the Greater Netherlands show particular fabric types (containing calcium carbonate and/or silty inclusions) and evidence for distinctive methods of manufacture: they were fired before the application of glaze (and its underlying slip where used); after glazing, the tiles were fired for a second time. The result is a particularly glassy finish, although there is a tendency for the slip and/or glaze to flake off. After demoulding and before glazing, the tiles were knife-trimmed along their edges using a square wooden template as a guide. To prevent this from slipping, small nails were knocked into it and these pressed into the clay; no attempt was made to plug the tiny holes thus formed and they are a distinguishing mark of the 'Flemish' tiles, although where slip has been applied this may obscure them. The holes appear in one or more corners, occasionally with a central hole too; they are usually circular but may be oval or square. One tile from this site, from context [5], has four round nail holes but is in a fabric not normally associated with 'Flemish' tiles; it also shows an unusual thickness of 39 mm. It is possible that the tile is an English copy (*cf* Drury 1978, 235). Details of the tiles are shown in Table 408. The definite 'Flemish' tiles account for 13% of the floor tiles from the site.

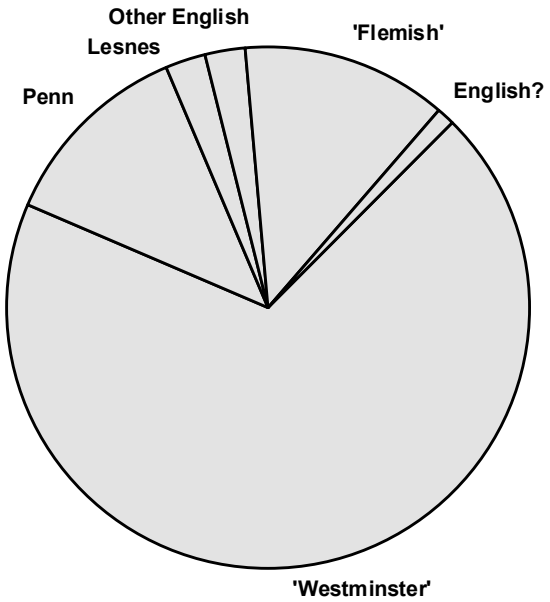
Table 408 Details of plain-glazed 'Flemish' floor tiles

Context	Fabric	Glaze	Dimensions in mm	Comments
[5]	2850	yellow	218 × 213 × 28	Square nail hole 2 × 2 mm
[5]	2324	green	184 × 183 × 39	Unworn but glaze does not completely cover top surface; round nails holes 1·5 mm diam. in centre and 3 corners; fabric 2324: not usually 'Flemish', so perhaps an English copy
[208]	2850	yellow	? × ? × 29	Round nail hole 2 mm diam
[208]	2318	green	? × ? × ?	–
[432]	2318	yellow	? × ? × 27	–
[543]	3082	brown	? × ? × 22	Unworn but glaze does not completely cover top surface
[647]	2850	green on white slip	? × ? × ?	Reused
[759]	2318	green on white slip	? × ? ×25	–
[759]	2318	yellow	? × ? × 26	–
[760]	3063	mottled brown and yellow	216 × 216 × 32	2 squarish nail holes, 2 × 2 mm, in each of 2 opposite corners; worn
[775]	3082	mottled brown and yellow	? × ? × 24	–
[880]	1678	yellow	? × ? × 29	Reused
[1510]	3082	mottled brown and yellow	? × ? × 24	–

There is firm documentary evidence for the import of 'Flemish' tiles (usefully brought together in Keen 1971, 148). Although trade with Flanders, and with Antwerp in particular, was vigorous in the later Middle Ages

(Nicholas 1992, 285–305), and many of the tiles must have come from that area, they also came from elsewhere in the Greater Netherlands, where floor tiles were certainly manufactured (Hollestelle 1976, 70–75). Both the documentary and the archaeological evidence (e.g. from St Bride's Church, Fleet Street: Betts 1997a, 65–6) indicate that the tiles were imported into the London area from the early 14th down to the 16th century. This was probably a result of an extended *Verkehrsgebiet* consequent upon the great expansion of the Netherlands (including Flemish) brick and tile industry in the 14th century (van de Walle 1959, 52), although it doubtless owes something also to the disappearance of the 'Westminster' tile industry by the end of the previous century. In London at least, these imported tiles were able to compete effectively with those from the Penn yard and from elsewhere in England. It is likely that, despite the sea voyage involved, the large scale of the Netherlands industry made its products cheaper, in London, than the English products. Individually, floor tiles have low bulk; though hardly *luxury* items, plain-glazed floor tiles were not 'gross' products either. These factors probably ensured that marine transport charges were only a small percentage of f.o.b. costs; those percentages, moreover, seem to have decreased during the 14th century, at least along well established sea lanes (Postan 1973, 123).

Proportions of tiles from different sources ('Westminster' 69%, 'Flemish' 13%, Penn 12%, Lesnes 12%, other English 2·5%, possible English 1%; total = 100%) are shown in the following pie chart: clearly the 'Westminster' tiles are dominant in the assemblage, suggesting that the main work of tiling the floor of the church was carried out after *c*1225 but before the end of the 13th century, and that thereafter tiling within the church was of a minor nature, perhaps in some cases no more than patching the existing pavements.



Pie Chart: incidence of floor tile types from St Benet Sherehog

Lead-Glazed Wall Tile?

A unusual tile was recovered from the make-up [1851] of B174, accession <506> (fig T4). It is in fabric 2324 and has concave sides with the 'arms' cut off straight. Inscribed upon its upper surface are two concentric squares. The whole is covered with brown lead glaze, pitted in places. There is mortar on the back face. The tile is damaged but has a thickness of 22–25 mm and must have had a maximum width of approximately 104 mm. It may have been used as a wall tile. The usual date range for the fabric covers the 14th and 15th centuries.

Tin-Glazed Wall Tiles

A quite large number of tin-glazed wall tiles was recovered from the site, a few unstratified but with a very high proportion (90% of the total) coming from a dump in the basement [16004] of B144 in P41. No complete examples were recovered and only two preserve a full length or breadth: accession <6457> has a length (that is, a height when *in situ*) of 125 mm; accession <6373> has a breadth of 126 mm. Thicknesses range from 6 mm to 11 mm but with the overwhelming majority belonging to the modal range of 8–9 mm. About half the fragments have been accessioned individually (see Table 409), but 78 (all from context [16004], B144) have been accessioned collectively as accession <6565>.

The earliest tin-glazed wall tiles used in England were imported from the Netherlands, where production began *c*1580 (van Dam 1991, 19–24), although some of the earliest occurring in London appear to be those in a building at Billingsgate dating from just before the Great Fire of 1666. The earliest documentary reference to English-made tin-glazed wall tiles is in 1676, when Jan Ariens van Hamme, a potter of the Guild of St Luke in Delft, obtained a patent on moving to England: he began production of 'Tiles ... after the way practised in Holland', as well as other wares, at Copthall, Lambeth (Britton 1987, 59). But very few English tiles date from the late 17th century, and it was only during the next century that they became at all common. Despite the development of the English industry, Dutch tin-glazed wall tiles continued to be imported into London in this same period. The tiles recovered from the site are of 17th- or early 18th-century date.

It is not easy to distinguish tiles of Dutch manufacture from those of English manufacture, especially when they are fragmentary. Many from the site, however, including all those from the basement [16004] of B144, are in fabric 3064, which appears to be Dutch, although an English variant is sometimes encountered (I M Betts, pers comm). Designs can sometimes be matched with known Netherlands examples, although caution is required here since many English tiles simply copied their Dutch prototypes. The quite numerous corner motifs present are without exception of the so-called spider's head type, which is far more common on Dutch than on English tiles. It is likely, therefore, that the tiles from the basement are imported products. Some of the tiles from other contexts are also in this same fabric and are perhaps imports. A few are in fabric 3067 and may be English or Dutch products. Apart from a few fragments with no decoration preserved, all examples are painted in positive in blue on white, although a number also

incorporate a purple (manganese) powdered octagonal border, applied using a spatter technique, in one case with a leaf motif also in purple. Purple was introduced in the Netherlands *c*1670 (Bolwerk *et al.* 1987, 2).

Table 409 Details of tin-glazed wall tiles (all fabric 3064 except where indicated)

Context	ACC	Description	Comments
[0]	<295>	Blue on white; windmill; octagonal purple border	Fabric near 3079
[0]	<297>	Blue on white; square tower	Fabric 3067, near 3064
[0]	<394>	Blue on white; tree with part of paling fence, male figure	Perhaps biblical scene
[0]	<395>	Blue on white; Zechariah and the angel of the Lord in the Temple	*Luke 1.8–13*; fabric near 3067
[0]	<558>	Blue on white; design uncertain; spider's head corner	Fabric 3067, near 3064; tile discoloured – burned?
[0]	<559>	Blue on white; animals entering Noah's Ark?	*Genesis 7.13–16(?)*; discoloured – burned?
[0]	<6409>	Blue on white; octagonal purple border	–
[0]	<6410>	Blue on white; Moses and the brazen serpent	*Numbers 21.4–9*; discoloured – burned?
[0]	<6411>	Blue on white; design uncertain	Discoloured – burned?
[73]	<560>	Blue on white; design uncertain	Discoloured – burned?
[345]	<6379>	Blue on white; rectilinear geometrical pattern	–
[432]	<423>	Blue on white; stylised tulip arranged diagonally across tile	Fabric 3067; 2 fragments
[432]	<424>	White	Part of decorated tile?
[446]	<289>	Blue on white; floral design	Fabric 3067
[16004]	<6373>	Blue on white; design uncertain	Several fragments; slightly blackened
[16004]	<6457>	Blue on white; Jonah and the great fish ('whale')	*Jonah 1.17*; damaged and darkened during firing
[16004]	<6458>	Blue on white; figure within double circle; purple border and leaf motifs	Biblical scene? Slightly darkened
[16004]	<6459>*a*	Blue on white; the burning fiery furnace	*Daniel 3.19–30*
[16004]	<6459>*b*	Blue on white; the burning fiery furnace	*Daniel 3.19–30*
[16004]	<6459>*c*	Blue on white; the burning fiery furnace	*Daniel 3.19–30*
[16004]	<6460>	Blue on white; sailing ships; octagonal purple border	–
[16004]	<6461>	Blue on white; gable-roofed buildings; octagonal purple border	Blackened base and broken edge
[16004]	<6462>	Blue on white; tall gabled building – disused and sail-less windmill? and ancillary buildings; octagonal purple border	–
[16004]	<6463>	Blue on white; sailing boats; octagonal purple border	–
[16004]	<6464>	Blue on white; round tower with banner or inn-sign and adjoining gabled house; octagonal purple border	–
[16004]	<6465>	Blue on white; buildings, including tower-like building; octagonal purple border	–
[16004]	<6466>	Tower and sailing ship; octagonal purple border	Slightly darkened
[16004]	<6467>	Blue on white; buildings; octagonal purple border	–
[16004]	<6468>	Blue on white; sailing ships; octagonal purple border	Slightly darkened
[16004]	<6469>	Blue on white; design uncertain;	Moulding sand on upper

		octagonal purple border	surface
Context	**ACC**	**Description**	**Comments**
[16004]	<6470>	Blue on white; male figure	Biblical scene? Major damage and blackening during firing
[16004]	<6471>	Blue on white; the adoration of the shepherds	*Luke 2.15–20*; blackened surface
[16004]	<6472>	Blue on white; Jesus, with two disciples, healing the man with the withered hand	*Matthew 12.9–14*; slight surface damage during firing
[16004]	<6473>	Female figure in tight-fitting Dutch bonnet, seated, church spire in background	–
[16004]	<6474>	Blue on white; design uncertain	Top surface partly blackened
[16004]	<6475>	Blue on white; part of sleeve and left hand of figure	–
[16004]	<6476>	Blue on white; lower parts of figures with gabled buildings in background	Surface slightly darkened
[16004]	<6477>	Blue on white; the return of the prodigal son	*Luke 15.20–24*; surface darkened
[16004]	<6478>	Elijah taken up into heaven	*II Kings 2.11–12*; moulding sand on upper surface
[16004]	<6479>	Blue on white; design uncertain	Major surface damage during firing; reused?
[16004]	<6480>	Blue on white; Jacob's dream of angels ascending and descending a ladder to heaven	*Genesis 28.10–17*; minor surface damage during firing
[16004]	<6481>	Blue on white; buildings	Major surface damage during firing
[16004]	<6482>	Blue on white; Jesus in the house of Martha and Mary at Bethany; spider's head corners	*Luke 10.38–42*
[16004]	<6483>	Blue on white; the judgement of Solomon	*I Kings 3.16–28*
[16004]	<6484>	Blue on white; tiled floor	–
[16004]	<6485>	Blue on white; angel – probably part of Zechariah and the angel of the Lord	*Luke 1.8–13(?)*
[16004]	<6486>	Blue on white; tiled floor with lowest part of figure	Biblical scene? Major surface damage during firing
[16004]	<6487>	Blue on white; tiled floor	Slight surface damage during firing
[16004]	<6488>	Blue on white; tiled floor with lowest part of figure	Biblical scene?
[16004]	<6489>	Blue on white; mitred bishop, seated next to lectern, dictating(?) to monk seated at table, covered with cloth, writing in book	–
[16004]	<6490>	Blue on white; turbaned figure, seated, reading(?)	Moulding sand on upper surface
[16004]	<6491>	Blue on white; turbaned figure and gabled building	Biblical scene?
[16004]	<6492>	Figure(?) with sailing boat in background; spider's head corner	–
[16004]	<6293>	Blue on white; soldier in elaborate costume with cloak and plumed hat, seen from rear	Slight surface damage during firing
[16004]	<6494>	Blue on white; Moses, the Israelites, and manna from heaven	*Exodus 16.4–8*
[16004]	<6495>	Blue on white; figure; spider's head corner	–
[16004]	<6596>	Blue on white; building – church?	Moulding sand on upper

			surface
[16004]	<6497>	Blue on white; two small (background?) figures	–

Context	ACC	Description	Comments
[16004]	<6498>	Blue on white; the expulsion of Adam and Eve from Eden, with serpent in foreground	*Genesis 3.22–24*
[16004]	<6499>	Blue on white; Jesus with two men, one in hat, probably Jesus and the Pharisees	*Matthew 22.15–22(?)*
[16004]	<6500>	Blue on white; Elijah and the chariot of fire	*II Kings 2.11–12*
[16004]	<6501>	Blue on white; landscape with small buildings and trees	–
[16004]	<6502>	Blue on white; design uncertain	–
[16004]	<6503>	Blue on white; landscape with paling fence	–
[16004]	<6504>	Blue on white; design uncertain	Partly blackened upper surface
[16004]	<6505>	Blue on white; Moses and the brazen serpent	*Numbers 21.4–9*
[16004]	<6506>	Blue on white; design uncertain	Damage to surface during firing
[16004]	<6507>	Blue on white; male figure and hand of another figure – possibly the raising of Lazarus	*John 11.38–44(?)*
[16004]	<6508>	Blue on white; part of figure with uncertain background	Slight blackening on top edge
[16004]	<6509>	Blue on white; lowest part of figure	–
[16004]	<6510>	Blue on white; design uncertain	Surface damaged during firing
[16004]	<6511>	Blue on white; design uncertain	Surface damaged during firing
[16004]	<6512>	Blue on white; design uncertain; spider's head corner	–
[16004]	<6513>	Blue on white; Nebuchadnezzar and attendant in background from burning fiery furnace scene	*Daniel 3.9–30*; surface damaged during firing
[16004]	<6564>	Blue on white; possibly Rachel with her father Laban's sheep; octagonal purple border with leaf design	*Genesis 29.9–10(?)*
[16005]	<5951>	Blue on white; pale blue stripes of uncertain design; dark blue oxhead corner	–
[16013]	<6080>	Blue on white; design uncertain	(Not locatable)

The fragmentary nature of the material makes it impossible to identify all the designs, although a number are certainly recognisable by comparison with published examples (van Dam 1991; Horne 1989; Huijg 1978; Pluis 1997). Details of the individually accessioned fragments are given in Table 409. As usual, the painting is generally vigorous if artistically indifferent. The one exception in the assemblage is accession <6293>, showing a well painted back view of a soldier dressed in an elaborate costume with cloak and plumed hat. Such subjects were popular in the Netherlands during the second quarter of the 17th century and are usually well delineated, being derived from paintings and engravings, which 'supplied many of the designs which the tile-makers had not the originality to create themselves.' (Lane

1939, 51). A number of the tiles show parts of landscapes or water scenes with sailing boats or ships; the landscapes incorporate a windmill and various buildings including towers and churches; one appears to show a disused and sail-less windmill; human figures are sometimes present.

Most of the human figures, however, occur in biblical scenes, which became popular in the Netherlands from about the middle of the 17th century. Scenes in the assemblage are taken from both the Old and New Testaments, the latter exclusively from the Gospels. Some scenes are represented more than once. Three pieces show Shadrach, Meshach, and Abednego with one 'like the Son of God' in the burning fiery furnace, which is depicted as a large oven with a semi-circular arched head – something like a large version of a 'Dutch oven' but with a fire burning beneath it – whilst another shows King Nebuchadnezzar and an attendant from the same scene (Daniel 3.9–30). Two pieces show Moses and the brazen serpent (Numbers 21.4–9), the serpent arranged, as normally, around a tau-cross. Elijah's ascent to heaven (II Kings 2.11–12) is shown in two different forms, one depicting the chariot of fire. The angel announcing the birth of John the Baptist to Zechariah in the Temple (Luke 1.8–13) is certainly depicted on accession <395> and probably on the much less complete accession <6485>.

Other scenes certainly present are the expulsion of Adam and Eve from Eden, with the serpent shown in the foreground (Genesis 3.22–24), Jacob's dream of the ladder with angels ascending and descending (Genesis 28.10–17), Moses, the Israelites, and manna from heaven (Exodus 16.4–8), the Judgement of Solomon (I Kings 3.16–28), Jonah and the great fish ('whale': Jonah 1.17), the adoration of the shepherds at Bethlehem (Luke 2.15–20), Jesus, with two disciples, healing the man with a withered hand (Matthew 12.9–14), Jesus in the house of Martha and Mary at Bethany (Luke 10.38–42), and the return of the prodigal son (Luke 15.20–24). Scenes probably represented are the animals entering Noah's Ark (Genesis 7.13–16), Jesus with the Pharisees (Matthew 22.15–22), and the raising of Lazarus (John 11.38–44). Amongst the collectively accessioned fragments (<6565>) one very probably shows Lot and his two daughters, the destruction of Sodom and Gomorrah, and Lot's wife turned to a pillar of salt (Genesis 19.15–26) and another probably shows Noah's Ark afloat (Genesis 7.17–21); another has several birds in flight and is probably from a scene of the animals leaving the Ark (Genesis 8.15–19). One fragment shows part of an angel, most probably in this case from the scene of Hezekiah in the Temple (II Kings 19.15–34). Other scenes possibly represented are the worship of the golden calf (Exodus 32.3–6) and the boy David cutting off the head of Goliath (I Samuel 17.51). As is usual, interior biblical scenes (except the adoration of the shepherds) show a tiled floor. Some of the unidentifiable fragments may also be from biblical tiles.

All the biblical scenes identified are from the Protestant bible; deutero-canonical or apocryphal scenes (such as the various Tobias or Susanna scenes) are not present. This contrasts with a series of Dutch tiles of later date (1740–1850) recently recovered, unstratified, at Spitalfields Ramp (site code: SRP98), in which some apocryphal scenes are present, including Judith with the head of Holofernes (Judith 13.2, 6–10) and the even more obscure scene of Daniel ordering servants to scatter ash on the floor of the Temple (Bel and the Dragon, verse 15). Interestingly too, the canonical scenes from

Spitalfields show scarcely any overlap with those from Poultry, the only episode probably present at both sites being Jesus with the Pharisees (Matthew 22.15–22), although a different episode from the David and Goliath story, possibly present at Poultry, is certainly depicted on one of the Spitalfields tiles. Perhaps – unless the difference results from the different dates of the two assemblages – individual households purchased scenes which were regarded as of particular significance for them, since such tiles had a didactic as well as a decorative function: in the Netherlands 'they created an air of piety and morality, qualities [that] Dutch families were eager to display' (van Dam & Tichelaar 1984, 116); doubtless the same was true of England.

Of related interest is accession <6489> from context [16004] in B144, a rare design showing a bishop or mitred abbot seated by a lectern and apparently dictating to a monk seated at a table covered with a table-cloth and with a book on it (fig T5). It is not an obviously satirical depiction of its subject matter and the tile therefore seems properly to belong with the biblical tiles with which it was found. Such clearly pre-Reformation ecclesiastical themes are not common on Dutch tiles although they are certainly present on some 17th-century examples (Pluis 1997, 360–61): Roman Catholicism was, after all, tolerated, if restricted, in the United Provinces (Israel 1995, 377–85, 637–9). The scene is perhaps somewhat more unexpected in late Stuart London.

Accession <6489> from context [16004] depicts a stylised tulip arranged diagonally across the tile and accompanied by leaf motifs. The design is paralleled exactly by Dutch examples, for instance some from Friesland dated 1725–50 (van Dam 1991, 117, fig145). They were used in groups to make a continuous design over several tiles. Accession <289> from context [446] is also a floral design. Accession <6379> from context [345] is a rectilinear geometrical design.

A number of the tiles have suffered some form of damage during manufacture, either by having moulding sand accidentally dropped onto their upper surfaces or by having become slightly blackened through overfiring. Other tiles have suffered subsequent burning or other damage, either during their period of use or during demolition, and, as mentioned, all are fragmentary. Some, particularly amongst the collectively accessioned fragments, have mortar on their faces, presumably indicating later reuse, perhaps as rubble.

The tile fragments in the basement of B144 (accounting for 90% of the total recovered) were presumably dumped there during demolition and probably came from that building or from another nearby. Although not perhaps quite a luxury material, wall tiles could be afforded only by the well-to-do and they thus testify to a degree of status and economic means – though bourgeois rather than aristocratic. Whatever the case with some of the other tiles, those showing biblical scenes are unlikely to have been used in utilitarian contexts such as a kitchen. They were perhaps used as fireplace surrounds in living rooms or bedrooms.

Non-Ceramic Building Materials

As well as the stone *tesserae* noted above, various non-ceramic building

materials were recovered, mostly of Roman date even when occurring in later contexts.

Opus Signinum

Fragments of *opus signinum* – a hard compound of mortar and broken ceramic building material, capable of taking a polish, and much used for flooring in Roman times – were recovered from the site. Most were from Roman levels but not in primary contexts; a few were from post-Roman levels where the material must be regarded as residual. A quantity of 460 gm, however, was associated with the floor of Room C and a quantity of 650 gm with the floor of Room E in B64; other fragments were also recovered from within Room A in the same building, though not directly associated with the flooring. Ceramic building materials, mostly *pedalis* and *lydion* bricks, were laid in *opus signinum* mortar in the walls of the vaulted culvert B72, presumably to provide a more water-resistant construction than would be possible with ordinary lime mortar. The *opus signinum* from the various contexts at the site varied between coarse and medium coarse, whilst in some cases a fine surface skim had been applied to the basic coarser material.

Mud Bricks (Lateres)

A total of twenty-six mud bricks (*lateres* in Vitruvius) and one possible mud brick were recovered. The last comes from destruction debris associated with B40. Another example comes from a pit within B63. Most are from Roman contexts, although one each was found in contexts [7751] and [11243], belonging to P35 and P36 respectively; the latter were, however, associated with ceramic building materials and with pottery of Roman date and are therefore probably residual and of Roman date. They are of grass-tempered brickearth (*adobe*) and some examples also show grass or straw marks on their surfaces from where they were laid out on such materials to dry. No complete examples were recovered and only one preserves its full breadth of 115 mm; thicknesses range from 56 mm to 99 mm with a median of 71 mm. It is not clear how far mud bricks in Roman Britain adhered to the standard sizes mentioned both by Vitruvius and by Pliny (Adam 1994, 61–2).

Mud bricks were used by the Romans as filling to timber-framed construction and also, structurally, as a building material in their own right (Perring 1991, 77–8). In the latter use they were sometimes bonded with sand rather than mortar and in both cases a protective covering of mortar or plaster render would have been required in the damp climate of London (Davey 1961, 24–5). Possible mortar on the example from context [3435] may represent such covering. The example from context [18264] has been burned at some stage.

Daub

Quantities of daub were recovered from Roman and later contexts. Much of it is fragmentary and abraded, although some larger pieces are also present. These sometimes show the impressions of flat laths or, more frequently, round wattles, against which the daub would have been placed. One piece from [3043] shows finger impressions, presumably from where the daub was pressed into position against the laths or wattles. It is mostly brown in colour, although a fragment from [7037] is in an unusual pink shelly fabric, whilst pieces from [12263] are very calcareous and one from [11678] contains flint. Organic material was used to bind the material, and pieces from [3399] show distinct straw or hay impressions resulting from this practice. The material was usually given a smooth finish, and a piece from [1907] preserves a good, though burned, flat face. Sometimes, however, a face was given a keying in order to aid the adhesion of internal plaster or external render. Four pieces were recovered, though all from open areas, not from specific structures. On pieces from [11962] and [18141] the keying has been formed by using a comb; on pieces from [3822] and [8346] it has been formed using a wooden stamp carved with a chevron pattern. Although different methods have been suggested for forming such stamped patterns, it is most likely that a roller stamp similar to that for forming roller-stamped ceramic flue tiles was used (Russell 1994, 47–50).

Building Stone

Most of the building stone recovered from the site was found with Roman ceramic tile or is of a type which suggests a Roman date. The building stone was used in various ways.

(i) Rubble stone. The following stone types were recovered, most, perhaps all, of which are believed to be of Roman date: Kentish ragstone and the associated Hassock sandstone from quarries in the Maidstone area of Kent; chalk; tufa; flint; calcareous clay (septera?); fine grained sandstone and ferruginous sandstone from elsewhere in south-east England; and oolitic limestone.

(ii) Ashlar. A few roughly squared ashlar blocks of Kentish ragstone were recovered. One is from a wall of B72, and is 200 mm square with a thickness of 65 mm. Others, from secondary contexts, are smaller: $80 \times 72 \times 50$ mm and $85 \times 80 \times$? mm.

(iii) Roofing and/or Paving. Fine grained sandstone was used both for roofing and for paving during the later Roman period. It is not always clear how individual pieces were employed, although in general, thicker stones probably represent paving whilst thinner pieces are almost certainly roofing. Both types were found at the site. One roof slab, from [18085], preserves an oval nail hole. A large thick (32 mm) fragment of fine grained limestone from context [3608] is probably paving, as is a large fragment from context [7537] measuring over 210 mm in length. Other probable paving stones are made from Kentish ragstone and Wealden shale. Two small fragments of slate were

recovered (contexts [7050] and [18094]). These may be Roman roofing slate, which is extremely rare in London, but both are far too small to make this certain.

(iv) Marble Slab and Wall Veneer. Part of an imported marble slab, possibly part of a plaque, was recovered from context [3464]. It has a dowel hole to aid fixing to a wallface. A fragment of marble wall veneer was recovered from context [8176]. From context [12037] came a slab of Purbeck marble with one preserved moulded edge, whilst a thin fragment of possible wall veneer, 17–18 mm thick, also in Purbeck marble, was recovered from context [6131]. Though not a true marble, this Dorset stone was valued for the high polish which it can take. None of these pieces was in its primary context, but they must originally have been placed in a building or in buildings of some status.

Museum of London Fabric Types

The numbers refer to the ceramic building materials fabric collection held by the Museum of London Specialist Services.

Roman

2451 Orange-red; sandy with frequent quartz and scatter of iron oxide and calcium carbonate; occasional rock fragments
2452 Red, orange, brown; fairly fine but with varying amounts of quartz and usually a scatter of calcium carbonate, siltstone, and iron oxide
2453 Pink, yellowish brown; Numerous yellowish white clay inclusions in often mottled clay matrix and scatter of iron oxide; frequent quartz in some examples
2454 Yellow, yellowish grey, pink, yellowish white; usually hard and well fired with varying amounts of red quartz plus scatter of iron oxide; some have red moulding sand
2455 As 2454 but smooth and much less sandy
2456 Light brown margins and grey core; frequent shell inclusions
2457 Light grey, greyish brown; abundant calcium carbonate with scatter of quartz giving mottled appearance against clay matrix; occasional shell fragments; some have brown or red moulding sand
2459A Red, brown, orange; sandy fabric with few quartz grains and occasional scatter of calcium carbonate and iron oxide; normal moulding sand
2459B As 2459A but with fine moulding sand
2459C As 2459A but with straw/grass moulding
3001 Grey, red, light brown, yellow; numerous grey inclusions with occasional calcium carbonate and silty bands and streaks; usually reddish brown moulding sand
3004 Orange, orange-red, brown; sandy with common quartz and occasional iron oxide and calcium carbonate
3005 Yellow, pinkish orange; scatter of large red and yellowish white inclusions with bands and lenses of clay in often mottled clay matrix
3006 Red, brown, orange; more sandy version of 2459A
3008 Greenish grey with yellow core; well fired with frequent quartz inclusions and occasional calcium carbonate and iron oxide

3009 Light brownish orange with grey upper margin; sandy with abundant quartz and large clay, siltstone, and iron oxide inclusions

3011 Pink, orange, brownish green; frequent red clay or iron oxide inclusions with varying amounts of quartz and silty inclusions

3013 Brown with greenish grey margins; numerous grey silty inclusions in clay matrix with frequent quartz, calcium carbonate, and iron oxide and occasional shell fragments

3016 Pink, brownish pink; well fired with distinct yellow speckling, scatter of iron oxide, and little or no quartz

3019 Light brownish orange; abundant siltstone inclusions and iron oxide with scatter of quartz and occasional calcium carbonate

3020 Light brown; abundant small quartz with prominent yellowish white silty streaks and bands and occasional iron oxide

3022 As 2454 but more sandy

3023 Red, orange, brown; sandy with abundant quartz and frequent black iron oxide specks and with silty and red iron oxide inclusions

3028 Red, orange, brown; sandy with frequent quartz and siltstone inclusions and/or silty bands and with scatter of red iron oxide

3050 Orange, reddish pink; frequent dark red and varying amounts of colourless quartz with occasional iron oxide and calcium carbonate in matrix sometimes with cream mottling and sometimes with silty streaks and bands

3053 Pink, light brown; similar to 3106 but with scatter of quartz and common pinkish red iron oxides and/or clay inclusions

3054 Light brown; abundant quartz with frequent red iron oxide and common grog inclusions of red and cream tile fragments

3059 Orange, red; common quartz with scatter of red iron oxide inclusions and varying amounts of chaff tempering

3060 As 3023 but without silty inclusions

3061 Orange, dark red; smooth clay matrix with common quartz and fairly common cream silty lenses and bans and with scatter of red iron oxide

3077 Orange; abundant iron oxide and clay inclusions with numerous thin cream silty lenses in fine matrix with no quartz

3222 Cream, red; poorly mixed cream- and red-firing clays, red clay with common quartz

3227 Orange, brown, cream; Very small black iron oxides scattered through clay matrix with scatter of quartz and iron oxide or clay inclusions and occasional silty bands

3236 Orange, red; Similar to 3452 but with frequent rounded mottled pinkish white calcareous inclusions and occasional dark red quartz

3238 Light orange; occasional or frequent silty bands and rounded silty inclusions with scatter of red iron oxide; often with fine moulding sand

Medieval and Post-Medieval

1678 Orange; common quartz and calcium carbonate and occasional iron oxide

1810 Light brown, orange, red; common quartz and red iron oxide; some examples have cream silty bands.

1811 Brown; fine sandy with common quartz, quite common red iron oxide, and occasional black iron oxide, calcium carbonate, and rock fragments

1813 Light brown; sandy with frequent quartz

2195 Brown, orange, grey; as 2199 but with occasional quartz

2199 Orange-brown, grey; little quartz, scatter of muscovite mica and black iron oxide, red iron oxide

2271 Red or orange-red, sometimes with grey core; fine texture with little quartz, scatter of muscovite mica in certain tiles, with red iron oxide and calcium carbonate

2272 As 2273 but with much crushed shell

2273 Orange-red, light brown, commonly with grey core; sandy with common quartz and calcium carbonate

2276 As 2271 but characterised by very fine moulding sand

2318 Orange, light brown; sandy with abundant quartz and frequent red iron oxide and/or clay inclusions and cream silty bands and lenses

2324 Orange, grey; fine sandy with common quartz and red iron oxide and occasional silty bands and inclusions

2587 Orange, light brown; fine sandy matrix with common quartz and iron oxide, usually with scatter of fine black iron oxide, red iron oxide, and silty inclusions

2850 Orange; common quartz and red iron oxide and/or clay inclusions and silty bands and lenses

2894 Light brown, orange, red; moderate quartz with red iron oxide, some with occasional cream inclusions

3032 Red, purplish red, often with yellow speckling to surfaces; hard texture with yellow or white carbonate specks and often with dark organic inclusions or voids where these have burned out during firing

3033 Orange, red; soft, sandy with moderate quartz and black iron oxide

3034 As 3032 but with white or yellowish streaky inclusions

3046 As 3033 but much more sandy

3063 Light brown; abundant cream silty inclusions and red iron oxide with occasional quartz

3064 White, cream; sandy with common quartz and scatter of light red iron oxide with occasional clay lenses

3067 Cream; fairly sandy with common small quartz and red and black iron oxides

3079 Cream; common quartz with scatter of brown iron oxides and occasional large maroon clay lenses

3082 Orange, brown; quite common orange and cream clay inclusions and red iron oxide with moderate amount of small quartz

Bibliography

Adam, J-P, 1994 *Roman building: materials and techniques*, ET of *La construction Romaine: matériaux et techniques*

Betts, I M, 1987 'Ceramic building material: recent work in London', *Archaeol Today* 8, 9, 26–8

Betts, I M, 1994 'Appendix: medieval floor tiles in London churches', in J Schofield, 'Saxon and medieval parish churches in the City of London: a review', *Trans London Middlesex Archaeol Soc* 45, 133–40

Betts, I M, 1995 'Procuratorial tile stamps from London', *Britannia* 26, 207–29

Betts, I M, 1996 'New thoughts on bricks with sunken margins', *British Brick Soc Information* 68, 6–10

Betts, I M, 1997a 'Ceramic building material', in G Milne, *St Bride's church, London: archaeological research 1952–60 and 1992–5*, English Heritage Archaeological Report 11, 60–68

Betts, I M, 1997b 'Building materials,, in J Schofield, 'Excavations on the site of St Nicholas Shambles, Newgate Street, City of London, 1975–9', *Trans LAMAS*, 48, 122–30

Betts, I M, in prep 'Thirteenth-century "Westminster" floor tiles' (provisional title)

Betts, I M & Foot, R, 1994 'A newly identified late Roman tile group from southern England', *Britannia* 25, 21–34

Betts, I M, Black, E W & Gower, J, 1994 'A corpus of relief-patterned tiles in Roman Britain', *J Roman Pottery Studies* whole number 7

Bolwerk, P B M, Hanekuijk, D, de Nas, L M C, Pluis, J & de Ree, G J M, 1987 *Kijkwijzer: het Nederlands Tegelmuseum Otterlo*

Bond, J, Gosling, S and Rhodes, J, 1980 *Oxfordshire brickmakers*

Brett-James, N G, 1935 *The growth of Stuart London*

Britton, F, 1987 *London Delftware*

Brodribb, G, 1987 *Roman brick and tile*

Brown, A E, 1994 'A Romano-British shell-gritted pottery and tile manufacturing site at Harrold, Bedfordshire', *Beds Archaeol* 21, 19–107

Cherry, J, 1991 'Pottery and tile' in *English medieval industries: craftsmen, techniques, products* (eds J Blair and N Ramsay), 189–209

Clarke, L, 1992 *Building capitalism: historical change and the labour process in the production of the built environment*

Clout, H (ed), 1997 *The Times London history atlas*, new edn

Collingwood, R G & Wright, R P, 1993 *The Roman inscriptions of Britain*, vol. 2, fascicule **5**, ed. S S Frere & R S O Tomlin

van Dam, J D, 1991 *Nederlandse tegels*, 2nd impression

van Dam, J D & Tichelaar, P J, 1984 *Dutch tiles in the Philadelphia Museum of Art*

Davey, N, 1961 *A History of building materials*

Degnan, S & Seeley, D, 1988 'Medieval and later floor tiles in Lambeth Palace chapel', *London Archaeol* 6, 11–18

Drury, P J, 1978 'A Saxon loomweight and medieval tile-kiln at Blackmore', *Essex Archaeol and Hist* 10, 234–6

Eames, E S 1980 *Catalogue of medieval lead-glazed earthenware tiles in the Department of Medieval and Later Antiquities*

Eames, E S, 1982 'The tile pavement' in H Wood, 'Excavations at Eltham Palace, 1975–9', *Trans London Middlesex Archaeol Soc* 33, 238–44

GeoQuest 1993 *Archaeomagnetic study of a tile kiln at Niblett Hall, City of London: a programme of research carried out on behalf of the Museum of London by GeoQuest Associates*, unpublished archive report, Museum of London

Hollestelle, J, 1976 *De steenbakkerij in de Nederlanden tot omstreeks 1560*, 2nd edn

Horne, J, 1989 *English tin-glazed tiles*

Huijg, A, OSB, 1978 *De Bijbel op tegels*

Israel, J, 1995 *The Dutch Republic: its rise, greatness, and fall, 1477–1806*

Jones, P E, 1953 'Some Bridge House properties', *JBAA* 3rd series 16, 59–73

Keen, L, 1971 'Medieval floor-tiles from Campsea Ash Priory', *Proc Suffolk Inst Archaeol* 32 (2), 140–51

Lane, A, 1939 *Victoria & Albert Museum: Guide to the Collection of Tiles*

Lloyd, N, 1925 *A history of English brickwork*..., re-issued in facsimile 1983

McDonnell, K, 1978 *Medieval London suburbs*

Moxon, J, 1700 *Mechanick Exercises: or the Doctrine of Handy-Works*...

Neal, D S, 1981 *Roman mosaics in Britain*

Neve, R, 1726 *The City and County Purchaser, and Builder's Dictionary*..., 2nd edn, re-issued in facsimile 1969

Nicholas, D, 1992 *Medieval Flanders*

Perring, D, 1991 'The buildings', in D Perring & S Roskams with P Allen, *The archaeology of Roman London*, vol. 2, *Early development of Roman London west of the Walbrook* CBA Res Rep 70, 67–107

Pluis, J, 1997 *De Nederlandse tegel: decors en benamingen / The Dutch tile: designs and names*

Postan, M M, 1973 *Medieval trade and finance*

Price, J E, 1870 'Medieval kiln for burning encaustic tiles discovered near Farringdon Road, Clerkenwell', *Trans London Middlesex Archaeol Soc* 3, 31–6

Riley, H T (ed), 1859 *Munimenta Gildhallae Londiniensis: Liber Albus, Liber Custumorum, et Liber Horn*, vol.1, *Liber Albus*

Rule, M, 1974 *Floor mosaics in Roman Britain*

Russell, M, 1994 'Relief-patterned daub', in Betts *et al.*, 1994, 47–50

Smith, T P, 1999 'The early Tudor chimney brick from Bridewell Palace, London, and its significance', *British Brick Soc Information* 76, 3–8

Smith, T P, 2000 'The church of Saint Benet Paul's Wharf, City of London, and its brickwork', *British Brick Soc Information* 79, 9–18.

van de Walle, A J, 1959 *Het bouwbedrijf in de Lange Landen tijdens de Middeleeuwen*

Wheeler, R E M & Wheeler, T V *Verulamium*, Soc Antiquaries Res Rep 11