

Building Material Assessment

Site code: ONE94

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Number 1 Poultry (ONE94)
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Original Research Objectives

There are a number of original research objectives where the information from the building material can provide crucial information. These are discussed below:

6.2 Early Roman

6.2.10 Study of the ceramic and stone building material, as well as the daub and painter wall plaster, should help to define the date and function of buildings. This will involve identification of the production sites supplying early Roman London with ceramic tile and stone, and a detailed study of the types of tile present, which should provide information on the physical appearance of these buildings. Study of the impression in daub will allow the construction techniques of early clay and timber buildings to be examined

6.2 All Periods

6.2.27 The study of building material will be crucial in any understanding of the function and status of buildings across the site. This will include discussion of which buildings had tiled roofs, or in the later Roman period possibly stone roofs, and which buildings had tiles associated with hypocaust heating systems and decorated mosaic and plain red tessellated floors. The well dated sequence at Poultry may well allow a more precise dating of building material forms and the dates when kiln sites supplying London were in operation. The differences in the types of ceramic tile used at Poultry should allow the technological changes in building design and construction to be examined in much greater detail than previously.

6.3 Mid–Late Roman

6.3.1 As with the early Roman period, the stone and tile, as well as the daub and wall plaster, should help to define the nature of late-Roman occupation and building function. The presence, or absence of various late-Roman ceramic tile and imports and the amount of reuse of material from earlier structures can give an indication of late-Roman economic activity.

6.6 Medieval

6.6.1 The material will assist in understanding the establishment and development of the Pancras Lane area, specifically with regard to reuse of Roman materials, use of later materials, and perhaps status of buildings.

6.6.2 The material will assist in elucidating the history and development of the church of St Benet Sherehog and the associated cemetery down to the Great Fire (in which the church was destroyed, never to be rebuilt) – in particular, the medieval floor tiles indicate work on the church in the 13th century and at least some continued work down to the mid-16th century, perhaps largely running repairs rather than major undertakings; the continued use of the churchyard after abandonment of the church itself (and the amalgamation of the parish with that of the nearby St Stephen Walbrook) is confirmed by the brick-built tomb of Mayor John Maurois (d.1673).

6.6.4 The use of materials may contribute something to the understanding of the development of major properties. Even rather scanty evidence such as the paucity (though not complete absence) of bricks may be significant in judging the development of this part of the City. In this connection even negative evidence – such as the total absence of pantiles from the site – may be significant.

Additional Research Objectives

ROMAN

1. A number of Roman tiles in medieval contexts are overfired and some have glaze splashes. This would suggest their use in some industrial process, and should therefore be investigated more closely.

2. A total of 38 roller-stamped box flue tile, one possible voussoir and one curved brick have been recovered, keyed with at least seven different designs, two of which may be unpublished. More work is needed to confirm whether the latter are indeed new dies. The context of all the roller stamped tiles should be examined to establish whether any provide more detailed dating evidence than that recently published (Betts *et al.* 1994).

The extremely rare roller-stamped curved brick is of particular interest. These bricks are believed to have been used for special architectural features, such as half-columns attached to the outside of masonry buildings. It will be important to consider the purpose of the Poultry example and to discuss from which building it may have originated.

3. A number of fragments of daub are keyed with roller stamps. These should provide information on the keying pattern in use at various dates and the relationship with the plaster which may, or may not, have covered this keying.

4. Although most of the tile found at Poultry was probably made within 12 miles of London, as is the case on most sites in London, there are a number of more unusual tile imports from further afield. This should be examined to see if they can be used to date any of the structural feature, or alternatively to examine where Poultry itself may refine the dating of these imports.

5. On most sites in London there is evidence of a dramatic change in the distribution pattern of ceramic tiles in southern Britain between the early and

late 2nd century. The ceramic tile will be examined to see if a similar change can be detected in the ceramic brick and tile used at Poultry.

6. The building material from Poultry can be compared with sites east of the Walbrook and in Southwark, where detailed examination of ceramic brick and tile has already been undertaken. West of the Walbrook the tile assemblage can be compared with that from the nearby amphitheatre which lies to the north-west.

7. The presence of both civilian and procuratorial stamped tile raises the question as to ownership of the tile kilns supplying the tile used in the construction of the buildings at Poultry.

8. A particularly important research question is the date of the change from ceramic roofing to stone roofing in the late Roman period. This is believed to have occurred in the mid-4th century, indicating the demise of ceramic tilemaking in south-east Britain. The stone roofing and what may be paving of Roman date from Poultry may provide more dating evidence on the introduction of this material, and give an indication of what type of building had stone roofs.

9. Roman building material rarely survives intact, especially roofing tile. At Poultry there is the best collection of complete and partly complete bricks, roofing tile and box-flues ever found on an archaeological site in London. These need to be examined to determine the various size groups present and their relation to the various sources of the material. Of particular importance are the roofing tiles and box-flues, which very rarely survive with any complete measurements. These measurements will provide valuable information which can be compared with information derived not just from London but from other sites in Roman Britain (the latter are published in Brodribb 1987).

10. The presence of stone and ceramic tessera, of which there is a large amount from Poultry, can be used to indicate the presence of either mosaic pavements or tessellated floors when the floors themselves have totally disappeared.

11. A number of bricks have either accidental marks which are of interest, or deliberate marks which relate to the manufacturing process. In the former category are shoe and boot impressions, hand and finger marks, possible textile impressions (on daub) and even leaf imprints. The latter category include graffiti, signature marks and tally marks and the tile stamps. There are also roofing tile with nail holes added after firing. Nail holes were needed if the roof pitch was too steep to secure the tile in place by gravity and mortar alone. The presence of such holes suggests buildings with steeper pitched roofs, and the need to reuse older roofing tile which was not made with such holes from the start.

MEDIEVAL AND POST-MEDIEVAL

1. Some of the Roman building material was reused in the medieval period. Questions concerning this include: (i) The *manner* in which it was reused – whether as rubble within walls, as ‘strong’ structural elements – eg. quoins and jambs to openings – and whether this was exposed or rendered or (improbably) used as a major material in its own right; (ii) The period during which such materials *were* reused: when did they stop being used – and *why*? Did they simply become unavailable as stocks were used up or was there a change in fashion and/or building technique which made them no longer desirable?
2. Early roofing tiles – shouldered peg tiles, flanged tiles, and curved tiles (the latter used in tandem rather in the manner of Roman tegulae and imbrices) – were found in significant quantities in a restricted number of contexts. These materials are in very distinctive fabric types. Their presumed date-range is currently based on evidence from the Cheapside area. (i) It may be possible to contribute further to the chronology of these materials by extending/refining/confirming the date-range; (ii) Many of them appear to be associated with the church of St Benet Sherehog, suggesting that they may have been expensive and therefore confined to buildings of some status, such as churches; (iii) Following from this, it may be possible to assess the status of any secular buildings with which these materials were associated.
3. Potentially, the peg tiles from this site could contribute to our understanding of their chronology, in particular to the appearance of nail-/peg-holes of other than circular shape, which on current evidence seems to have occurred in the later 15th century. It might be worth attempting to group the peg tiles by sizes and correlating these to the known medieval and post-medieval phases at the site. This may enable changes through time to be ascertained. It should be noted, however, that few full dimensions were preserved.
4. Some peg tiles are of very thin type and some of these have splash-glaze very sparsely applied; this material may contribute to our further understanding of late 13th-century legislation regarding both these matters and to an assessment of how effective (or otherwise) such legislation was.
5. Study of the nail-/peg-holes of the peg tiles may contribute something to our understanding of how the tiles were used: a particular perplexity concerns those tiles in which either one of the holes was not pushed right through or the two holes were placed at different levels – that is, at different distances from the top edge – since clearly these could not both be used for fixing to laths – although they could have been used for nailing the tiles to boards.
6. It may be possible to group the peg tiles by size, although most were fragmentary and only a few complete tiles were recovered.
7. A number of the peg tile fragments had mortar on broken edges. This may sometimes indicate subsequent reuse, although it is known from documentary

sources, from excavation, and from standing buildings that peg tiles were used for a number of purposes other than roofing, especially, though not exclusively, those broken in transit or on site. The material from this site may contribute to our further understanding of such 'non-standard' uses.

8. A few fragments of ridge tiles were found, some with brown glaze. Perhaps their chief significance at this site is their very paucity: this may be relevant to a consideration of the status of buildings.

9. Many of the floor tiles recovered – mostly associated with the church of St Benet Sherehog – are clearly assignable on the basis of fabric and/or designs to well established groups – 'Westminster', Eltham Palace, Lesnes Abbey, and so forth. There were also a number of floor tiles of undoubted Flemish origin. (Some fabrics of plain tiles have not so far been identified.) These different types indicate a fluctuating trade, with different tiles being used sometimes at least at different times. This will contribute to our picture of both domestic and international trade in the Middle Ages.

10. It is *prima facie* plausible to suppose that Flemish plain tiles were not imported much before c.1300, since until that time plain-glazed 'Westminster' tiles were easily available. The material from this site may serve to confirm (or otherwise) this supposition.

11. Although manufacturing techniques of floor tiles are well understood, the material may contribute *something* to our understanding. In particular, there is an unusual Flemish tile with *two* squarish (or distorted?) nail-holes in each of two opposite corners.

12. Although not found in great numbers, some tin-glazed ('Delftware') wall tiles were found, some illustrating biblical scenes. They appear to be of English manufacture, but further study would perhaps confirm this and add to our understanding of trade in this material. Some individual designs – such as the biblical story of the Burning of the Fiery furnace – have already been identified, and it may be possible to identify others, even where remains are fragmentary, by comparison with published complete examples.

13. The bricks recovered from the site were all in red-firing fabrics of familiar London types; study of their contexts, where independently dated, is likely to confirm our current understanding of the chronology, in particular the change from softer, more orange-red bricks (fabric 3033 and variants) to harder and darker-hued bricks (fabric 3032 and variant) after the Great Fire of 1666.

14. Dimensions have been recorded for all the bricks recovered. It would be interesting to compare those from independently dated contexts with legislation – some of it affecting only the London area, some applied nationally – regarding brick sizes – eg. in 1571, 1625, 1725, 1729, 1769, and 1796. This might well underline the difficulties of enforcing such legislation in view of difficulties of control in traditionally made bricks and lack of adequate policing forces. It would also be worth correlating brick sizes with phases in

order to see whether any pattern emerges, particularly with respect to the thicknesses – generally the most variable dimensions in bricks.

15. Certain features of some of the bricks help to build up a picture of manufacturing methods. The formation of sunken margins, for example, has now been convincingly explained by I. M. Betts after a long period of supposition on the matter (Betts 191996, 6–10). Their disappearance from London bricks in the period after the Great Fire is well established and it may be possible to link this with adoption of new manufacturing methods – in particular to the use of pallet-moulding – in the period of rebuilding after the Fire; at this time demand was great and new methods probably speeded up the process of manufacture. Material from a site affected by the Fire itself is obviously relevant here. The presence of straw/grass marks on the lower bedfaces of some bricks also reflects methods of manufacture.

16. Similar considerations may apply to the adoption of new sources or compositions of raw materials in post-Fire bricks.

17. Of very great interest are the bricks from the tomb of John Maurois (died 1673) in the churchyard of St Benet Sherehog. (The churchyard itself continued in use after the Fire although the church itself was not rebuilt and the parish was amalgamated with that of St Stephen Walbrook.) Both plain and shaped bricks were used in the tomb and all were in the familiar London fabric 3032. But they show several interesting and extremely unusual characteristics.

(a) The sampled plain bricks had been cut in size prior to firing in order to give precise dimensions, a very regular rectangular form, and sharp arrises. The bricks are thus an equivalent to more common rubbed bricks used for gauged work at the same period (and later). The 3032 fabric bricks, however, could not be cut and rubbed after firing in the way of the softer, finer ‘rubbers’. Cutting before firing was therefore the only way of achieving such precision.

(b) By thus cutting the bricks, they were reduced below the minima laid down by legislation in 1625. It is not at present clear how such legislation was adapted for such specialised products – or whether, indeed, their makers simply ignored it. The tomb bricks raise this question, which seems not even to have been addressed before.

(c) The sampled plain bricks are also interesting in showing shallow scoopings from one bedface – and thus an early form of frog (indent). Frogs, following an all too uncritically accepted suggestion by L. S. Harley, are usually dated to the period after c.1690, though on no firm evidential basis. The tomb bricks obviously call this into question and raise the whole issue of the history of the frog in bricks. By providing precisely dated early examples they also contribute to a much-needed historical account of the frog.

(d) No less interesting are the shaped bricks, which were clearly cut to shape before firing. Moulding was a relatively simple process but it did require specialist moulds, and the brickmaker in this case may have felt that it was

not worth the expense of obtaining such moulds for a 'one off' project such as the tomb; moreover, the use of such moulds was most suited to producing a long run of similarly shaped units: the tomb comprised a number of different patterns, each required in only small numbers. It was probably for this and other reasons that, from the later Middle Ages down to the end of the Stuart period (perhaps beyond), cutting bricks to shape *after firing* was even more common than moulding; the tomb bricks, however, are unusual in having been cut *before* firing: this presumably reflects the intractability of the 3032 fabric, which is not suited to post-firing cutting. The matter, however, requires further investigation.

(e) In its turn, this raises the question of how far London brickmakers manufactured shaped bricks in any fashion; at present it seems that this was not a typical part of their stock-in-trade.

(f) Drag-marks along the lengths of the mouldings probably indicate that they were cut by 'sledding' – that is, by pushing a shaped template through the soft clay – rather than by trimming with a knife. The 'comet tails' to some of the drag marks enable the direction of the sledding to be ascertained. In a few cases the sledding procedure was even continued around a re-entrant angle. The sledding technique is normally associated with the manufacture of architectural terracottas rather than with that of coarse bricks, and it is of interest to find it (almost certainly) used here.

(g) Further, some of the bricks show distinct scribe-marks on (what would have been unexposed) faces. This is an unusual practice in brickmaking. The *precise* way in which these lines were used as a guide to cutting the bricks needs further investigation, although it can hardly be doubted that that was their purpose.

(h) One of the shaped bricks has an inscribed mark in the form of a *digamma* or double-tick in its (unexposed) stretcher face; this was cut before firing and was presumably some sort of batch or tally mark.

(i) Despite the effort that went into shaping the bricks – and the degree of forward planning that this suggests – it was found necessary for the bricklayers to chop or cut some of the bricks on their unexposed faces to make them fit into place in the tomb. This perhaps reinforces the impression of a brickmaker manufacturing products with which he was not wholly familiar.

BUILDING MATERIAL ASSESSMENT

ROMAN CERAMIC BUILDING MATERIAL

1) Roman ceramic building material can normally be split into a number of groups based on fabric type and possible origin. The majority of the tiles from ONE94 are in local red fabric types (group 2815), although this is a small percentage of other fabrics which are believed to have been brought into London from tileries further away from the city. The main fabric types are listed below, followed by a brief list of the rarer types whose origin is unknown.

i) Fabric group 2815 (AD 50 – early ? 3rd century)

Individual fabric types: 2452, 2459A, 3004 and 3006 dated 1st to mid 2nd century, and smaller quantities of 2459B dated 120/160 to early ? 3rd century.

Source: The earlier tiles are believed to come from north of London, mainly from kilns straddling Watling Street between London and St Albans. Others may come from kilns sites to the south-west of London. The later tiles are probably from north-east London or Essex.

Types of tile: brick, roofing (tegula, imbrex), wall tile?, tegula mammata, box flue (combed and roller stamped keying), tessera, half-box flue?

ii) Fabric group: 2454, 2455, 3022 (AD 50 to 75/80)

Source: Eccles area, north-west Kent

Types of tile: brick, roofing (tegula and imbrex), tegula mammata, tessera

iii) Fabric Group: 2453, 2457, 3001 (140/180 to 3rd century)

Source: unknown, but not from London area

Types of tile: roofing (tegula, imbrex), tessera, brick?!

iv) Fabric Group 3009, 3019 (AD 100 to 120+)

Source: Hampshire

Types of tile: brick, roofing? (tegula?, imbrex?)

v) Fabric Group: 3023, 3060 AD 50/70 to 120)

Source: Radlett, Hertfordshire

Types of tile: brick, roofing (tegula, imbrex), flue, tessera

vi) Fabric group: 3050, 3061 (AD 140/180 to early 3rd century)

Source, Reigate, Surrey

Types of tile: brick, roofing (imbrex), tessera

vii) Fabric group 3054, 3059?

Source: south-west Surrey?

Types of tile: flue (roller stamped, scored?), roofing?! (tegula), brick?!

Listed below are a number of rarer fabric types most of which come from kiln sources which at present are unknown. The range of unusual fabric types is unusually large for a City of London site, however further analysis may well reveal that many of these represent variations in clay used to make tiles from a much smaller number of kiln sources. Hopefully, the unusual fabric types still to examine in more detail will help to identify more precisely the number of tileries supplying ceramic tiles for building work at Poultry.

Rarer Fabric Types:

(t = tegula, i = imbrex, b = brick, w = wall tile, f = flue tile)

2451 – t

2456 – i, f

3005 – t

3007 – f

3008 – i,

3011 – t, i, b, tess

3013 – t, i

3016 – b

3020 – b

3021 – i

3028 – b, w, f

rarer fabric types (continued)

3051 – b

3053 – i, t

3058 – i

3077 – f, t

3222 – t, b

3227 – f

3236 – t?

3238 – t

Roofing Tile and Brick

Of particular interest is what appears to be either a roofing tile or brick which has been cut at an angle. The purpose of this tile (context 18113) is uncertain at present. Another unusual tile is a curved roller-stamped brick keyed with a diamond and lattice pattern. These are believed to have been used upright against a wall and plastered over to form decorative half columns.

Tessera

There are a large number of tessera which were used in mosaics and tessellated pavements. Most ceramic tessera is red in colour and is made from local red tile. There is also a considerable number of grey tessera made from amphora vessels, mainly Dressell 20.

Box-flue tile

Very few tiles from ONE94 have knife scored keying, which is generally a 1st century feature. Most tiles are combed with a wide variety of different comb

types. Combing seems to have only been used on London tiles towards the end of the 1st century, superseding scored keying. There are also 37 flue tiles, from at least two separate kiln sources, with roller stamped keying, along with one curved brick (discussed earlier), which are listed below:

Fabric	Die Number	Comments
2452	2 (x 1 tile)	
2459A, 3006	3 (x 16 tiles)	
3006	5 (x 1 tile)	
3006	12 (x 9 tiles)	includes one probable die 12
3006	13 (x 1 tile)	
3054	19 (x 1 tile)	adjacent side combed with vent, voussoir?
2452	28? (x 1 tile)	reused as a tessera
3054	70 (x1 tile)	
2452	100 (x1 tile)	same uneven cut surface as published tile
2452	Group 5 (x 1 tile)	diamond and lattice design, curved brick tile)
2452	Group 5 (x 1 tile)	diamond and lattice design, new? die tile)
2452	Group 5 (x 1 tile)	diamond and lattice design, new? die tile)
2452,3006	Still To Check (x 3 tiles)	

Note: 2452, 2459A and 3006 are all part of fabric group 2815

These roller stamped tiles are all probably late 1st to mid 2nd century in date. The most interesting are those keyed with roller-die types 19 and 70 which are believed to have come in to London from a tiliary situated somewhere near the Sussex coast, possibly in the Chichester area. The tile with die 19 has wide combed keying with part of a vent, this is a more unusual type of tile known as a double box-flue. The example keyed with die 70 is of particular interest as it shows more of the pattern than the existing published drawings. For this reason the Poultry example will need to be drawn and published. The same will apply to the tiles keyed with the designs which appear to have never been previously recognised in Roman Britain. It is very important that these tiles are studied in more detail to confirm their identification.

Of particular importance are the complete, and near complete flue tiles (listed below) from ONE94. Such tiles rarely survive with measurable size measurements on London sites.

Manufacturing Marks

i) Signature Marks

A large number of predominantly brick and tegula have signature marks on their top surface. These are believed to represent the signature of the tile-

maker who made the tiles. They are normally shallow marks made with the tips of the fingers.

Further work is required to catalogue the different mark types present and to determine if any can be securely dated.

ii) Tally Marks

These are knife cut marks, mainly found on edges of tegula and brick. They are much rarer than signature marks, but they are found on ONE94 tiles. These are believed to represent numerals cut into the tiles delineate different batches of tile made on a particular day, or represent a particular kiln loan. A brick (context 1421) with three holes in the sanded edge may be a type of tally mark as well. Bricks with similar marks have been found on London sites but have still to be fully examined. The Poultry project would be an ideal opportunity to establish once and for all the true purpose of these unusual marks.

As for the other definite tally marks, again further work is required to identify and date the different mark types that are present.

iii) Stamps

There are both procuratorial (official local government) and civilian tile stamps from ONE. The procuratorial stamp is from on brick (context 2318) and was presumably made from some official public building or structure. The stamp, which is incomplete, is of PPBRILON type.

The civilian stamp, which is lettered 'A(I?)' is even more interesting as such stamps are very rare in London. What is even more interesting is that it is of a type never before found in London or anywhere else in Britain.

iv) Graffiti

Two bricks (contexts 3252, 11304) have what appears to be writing on their top surface. It is crucial that these are sent to an expert, such as Mark Hassell, to see if the lettering (if that is what it is) can be deciphered.

v) Cream 'wash'

One imbrex tile (context 2405) is very unusual in having what may be a cream 'wash' over its upper surface. This needs to be examined in more detail to confirm that it really is wash and not some product of the kiln firing process.

Other Marks

Included in this category are shoe and boot prints, finger and hand prints, textile impressions, what appears to be a worm hole impression and various paw and hoof prints. The latter can be examined to give some impression of

the sort of animals that were wandering round the tilemaking site. Similarly, the impression of leaves in the clay says something about the local vegetation

A number of bricks have sunken margins, made when the mould was pushed down on the brick sides during manufacture. A small item of interest, but still important, is the brick from context 1897. This has a sunken margin which clearly illustrated the width of the mould being used. Another tile (context 3608) has what could be a wooden plank impression. Perhaps the plank was used to carry the newly made tile to the drying area.

Other Tile Features

It is category are two roughly circular tile fragments which may be gaming counters. Both came from context 2844. A number of tegulae have small circular nail holes added near the top of the tile sometime after firing. This may have been done many years after the tile was made, and could well indicate reuse from another structure. The question of reuse will form an important research question on the ONE94 tile, particularly in relation to the later Roman stone buildings on site.

Roman Tile Size

Another important aspect of the ceramic building material from ONE94 is the unusually large number of complete, or partially complete bricks and tiles, particularly roofing tiles and box-flue tiles. The latter rarely surviving intact on London sites. This information on size can be extremely useful as an aid to dating especially when examined with size evidence from tile found on other sites in London.

Listed below is a summary of brick and roofing tile size (in mm) from Poultry. All the roofing tiles with complete, or partially complete, measurements are listed as are a representative selection of roughly half the near complete and complete bricks.

Tile Type	Fabric	Length	Breadth	Thickness
Brick	2815	533	–	45
		–	308–316	35–39
		415	286	38
		365–385	270–305	33–45
		350–353	290–309	35–43
		283	262	37
		230	–	46
		205–213	203–207	29–35
Brick?		–	81	17
Brick	2454	–	289	36
		215	205–206	30–33
		2455	58	21
		3023	368	20
		3060?	–	204–205

	3050/ 3061	457–470	300–311	34–41
Tegula mammata	2815	–	264	37
Tegula roofing	2815	425–445 411–425 399–416 – – – –	360–370 330–360 306–318 330–347 302 285 264–282	17–32 20 22–25 16–25 22 20 20–37
	2453 3060 ? to check	– – 365	280 318 c.322	22 20 22–24
Imbrex roofing	2815	c.435 381–412 –	114–125 – 128–185	11–15 16–22 13–30
	2457	–	135	19–20

Summary of box-flue tile size (in mm) from Poultry

From the information already collected, two sizes of combed box-flue tile were apparently used at ONE94, although only the height of the wider examples is known. Again, these sizes can be compared with other box-flue tiles found in London.

fabric	height	width – keyed side	depth – usually plain side	thickness
2815	370	188–195	140	20–25
	–	160–168	93–104, 115– 120	14, most to add

Brickearth Building Material

(i) Daub and keyed daub walling

There are a number of groups of daub from clay and timber buildings with clear wooden wattle and lath impressions. These should be studied with a view to exploring construction techniques and surface finish. The latter includes the examination of roller stamped daub used as keying for wall plaster. Which walls were not keyed, and which buildings were keyed, with or without plaster attached, can give an indication of the social status of the building. The design of the keying can be discussed in relation to that found on other clay and timber buildings in London.

(ii) Mudbrick

Mudbrick rarely survives intact in London buildings, but there are a number of well preserved mudbricks from at least one building. The Poultry mudbricks are of various thickness measuring ? x 114–115 x 56; ? x ? x 70–76 mm, ? x ? x 80–82 mm and ? x ? x 92–99 mm. These figure can be compared to other measured examples found in other areas of the city.

Opus Signinum

The presence of opus signinum can be used to indicate the type of flooring material that was used in buildings, even where the floor no longer exists. There are a number of opus signinum fragments from Poultry.

ROMAN STONE BUILDING MATERIAL

All the building material was either found with Roman ceramic tile, or is of a type which suggests a Roman date. It is just possible that some of the undiagnostic stone types could be post-Roman, although this should can only be confirmed by more detailed stratigraphic analysis.

a) Rubble

The following stone types were recovered, most, or all of which, are believed to be of Roman date. These are Kentish Rag and Hassock 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. The latter stone type requires more detailed examination to establish the source.

b) Roofing and / or Paving

Fine grained sandstone was used as both roofing and as paving during the late Roman period. Often it is not apparent what purpose individual fragments were used for, although generally thicker stone is probably paving whilst thinner pieces are almost certainly roofing. Both types were found at ONE94, including part of what may be a triangular shaped roofing slate from context 2750. One thin stone (context 18085), of uncertain type (to be identified) is definitely roofing as a oval nail hole is present

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 Rag (context 7064) and Wealden Shale. There is also a solitary example from context 1967 which still requires further petrological identification.

Two small fragment of slate were recovered from Poultry (contexts 7050, 18094). These may be Roman roofing slate, which is extremely rare in London, but both are far too small to be certain. In addition there is a thick fragment of slate (thickness 43 mm) from context 12086 of unknown purpose.

c) Worked Block

A number roughly square ashlar blocks of Kentish Rag, from stone buildings were recovered, these being around 80 mm square on their cut face. A flint with two or three knapped faces may also be a rough ashlar block

d) Wall Veneer?

A thin fragment of what may be wall veneer from an important Roman building was recovered from context 6131. This is of Dorset Purbeck 'Marble' and measures 17–18 mm in thickness.

e) Marble Slab and Wall Veneer

Part of a imported marble slab, possibly part of a plaque or inscription, was recovered from context 3464. It has a dowel hole added so it could have been clamped into place. A wall veneer was recovered from context 8176. Both marble fragments will need their quarry source to be examined.

From context 12037 there is a slab of decorative Purbeck Marble

f) Stone Tessera

The stone tessera used in building at ONE94 were mainly made from white hard chalk or dark coloured Wealden Shale from the Weald area (these have been recorded as black limestone but this is almost certainly a mistake). There are also solitary oolitic tessera of oolitic limestone and Kentish Rag, which may represent later patching or repair. More remarkable is tessera made from normal soft chalk (context 12391), which presumably represents poor quality patching of an existing mosaic.

The distribution of stone tessera is of particular importance, as these were normally used in mosaic pavements rather than plain tessellated floors. It should be possible to relate these isolated fragments to the *in situ* mosaic floor fragments found at Poultry.

g) Moulding

A Kentish Rag moulding, of uncertain purpose, was recovered from context 1776.

MEDIEVAL AND POST-MEDIEVAL

(1) Shouldered Peg Tile, Flanged Tile and Curved Tile (mid 12th to late 12th / early 13th century)

Fabric type: 2273 and shelly variant 2272

These roofing tile types would appear to be of local manufacture as shouldered peg tile 'wasters' were found together with the very truncated remains of a kiln at Niblett Hall near Fleet Street. They were recovered in significant quantities from a number of contexts at this site, though none was complete. A number showed the usual glaze associated with such tiles; this was sometimes well applied and quite glassy; in other cases it was rather less well applied.

Some of the tiles had mortar on their broken edges; this does not necessarily indicate reuse – see further under Peg Tile.

(2) Peg Tile

Fabric types: 2271, 2276, 2586, 2587; some not certainly identifiable.

In London peg tiles first appeared in the late 12th century and continued to be the principal form of ceramic roof covering until the widespread introduction of pantiles after the Great Fire of 1666. The use of peg tiles continued after the Great Fire until the later 18th century when the use of slate roofing gradually took over.

Almost certainly, the vast majority of peg tiles 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).

It is extremely difficult to date peg tiles with any precision. Earlier tiles, those made before the late 15th century, tend to be thinner and are frequently characterised by the presence of splash glaze. The vast majority of these tiles have two round nail holes. A fair number of the tiles from this site showed glaze, either brown, green, or a greenish-brown. Its application was very variable – quite well applied in some cases, in others consisting of no more than a few splashes. This poor glazing is in accordance with concerns expressed in late 13th-century London, specifically about the thickness ('scantling') and glazing ('leading').

Peg tiles made from the late 15th century onwards tend to be both thicker and of more uniform thickness; glaze is no longer present. The types of nail holes found in these peg tiles is more diverse, not only are they round, but they can be square, diamond or even hexagonal in shape. Again, however, almost all are of two nail hole type. Most of the holes preserved in peg tiles from this site were round, although some of other shapes were found. In connection with the holes it is 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 carelessness during manufacture. The often sparse splashing of glaze, already mentioned, is another instance of the same thing.

Peg tiles in fabric type 2276 are of interest as tiles of this type are not normally found in London before the late 15th century. A number were found from this site.

A small number of tiles (considering the quantity found) preserved a width; only in one context (1562) were the full dimensions of a tile preserved: 318 x 218–22 x 19–20 mm (fabric 2586).

One 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 type 4).

One tile in fabric 2586 from context 16069 had an animal paw print in its upper surface, showing that it had been laid flat for initial drying; such prints, it may be remarked, are far less common on medieval and post-medieval than on Roman ceramic building materials.

Several of the peg tiles showed mortar on broken edges. As with the earlier roofing tiles mentioned above, this does not necessarily indicate reuse. In the Middle Ages and later tiles, whether whole or broken, were used for several other purposes than roofing.

NOTE: it is not always possible to separate early and late types of peg tiles.

(3) Curved Ridge Tile

Fabric types: 2271, 2586

The curved ridge tile fragments are in the same fabric types as certain peg tiles. They were almost certainly made at the same tileries as these peg tiles, and are presumable of similar date. That in fabric 2271 (context 2657) has glaze and a nail(?) hole; it was possibly used on a hip, unless the hole was not for fixing but for inserting a finial such as a finial; one of the two in fabric 2586 (context 1645) had a fairly glassy brown glaze and was associated with brown-glazed peg tiles; the other example from the same context was damaged.

(4) Red Brick

Only a limited quantity of red brick was recovered from this site, although it included the specially made bricks for the tomb of John Maurois (died 1673).

Fabric types: 3033, 3032

Almost certainly, the majority of red bricks found in the London area were almost certainly made using local brickearths. Bricks were being produced at Deptford, for use in London, as early as 1404 (Schofield 1984, 129), although it was not until the second half of the 15th century that brick buildings appeared in any number. By the 17th century there were a number of centres involved in brick manufacture such as Islington, Spitalfields, Moorfields and in the parish of St Giles in the Fields. Other brickmaking centres included Whitechapel, Shoreditch, Hoxton and Clerkenwell (Ray 1965).

The majority of red brick found in the London area falls into the following groups, one before and the others after the Great Fire, though with an apparent period of overlap in the later 17th century:

(a) *Mid / Late 15th century to 1666 and perhaps a little later, say down to c.1700*

Fabric type: 3033 (and variants 3039, 3046, 3065, not present at this site)

Red bricks made during this period vary little in size, although many mid 16th and later examples are very slightly thicker. These red bricks are frequently characterised by sunken margins (indented borders). They were probably produced as 'place bricks', laid flat on the 'place' or drying-ground for initial drying and only turned on edge later; this would be consistent with their soft fabric, which might slump under its own weight if placed on edge whilst still too wet.

(b) *1666 to the late 18th century*

Fabric type: 3032 (and silty variant 3034, not present at this site)

These bricks are generally 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 against which some complained in post-Fire London, 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 brick surface quite often shows a slight yellowish tinge, resulting from the moulding sand used during manufacture. Sunken margins are occasionally present, probably on the earlier (late 17th-century) products, but are far from usual. These bricks were almost certainly placed on edge even for initial drying, taking up less space at the brickyard; they probably, as a result of the ash, dried more quickly, thus speeding up manufacture – an important consideration in the decades after the Great Fire, when brick (or stone) was required by legislation for *all* new buildings and when construction had to proceed on an enormous scale.

The red bricks in fabric 3032 included those from the tomb of John Maurois, Lord Mayor of London, who died in 1673 and was buried in the churchyard of St Benet Sherehog. (The church had been destroyed in the Great Fire and not rebuilt; the parish was amalgamated with that of St Stephen Walbrook; but the churchyard continued for burials.) The general fabric bricks have been cut to very precise rectangular blocks with sharp arrises, capable of being laid with thin joints. This cutting, it is clear, was done *before* firing, undoubtedly because of the intractable nature of the 3032 fabric, which does not cut easily and, when it is cut, reveals voids and burned specks from the ash included within it. The brickwork of the tomb also included a number of brick architectural mouldings. Both in the Middle Ages and later, it was more usual in Britain to *cut* ('hew')shaped bricks to the required form rather than mould them, although the latter was certainly done; 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. 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 intractable nature of the 3032 fabric. The bricks appear to have been formed by 'sledding' – running a shaped template along the brick to cut the correct profile, a method more often associated with terracotta manufacture. Interestingly, some of the bricks

(though by no means all) show scribe-lines akin to those found on worked stone. It is not at present clear precisely *how* these guide-lines were used to aid cutting of the bricks.

(5) Floor Tile

A number of floor tiles, both decorated and plain, were recovered from the church of St Benet Sherehog, which was destroyed in the Great Fire of 1666 and not rebuilt. (On the tiles from the church see Betts 1994, 136.)

(a) 'Westminster' (c.1225–1250+)

Tiles of 'Westminster' type are so-called because they were first recognised in the Muniment Room at Westminster Abbey. Their place of manufacture is not certain, but they may have been made at the decorated floor tile kiln found at Farringdon last century. Certainly their distribution strongly suggests production somewhere in the London area. Tiles of 'Westminster' type are still in situ at Lambeth Palace chapel where they are dated 1225–1250 (Degnan & Seeley 1988, 18). Other tiles in these series may, however, be slightly later in date. The designs are Eames 1368, 1821, 2055, 2288, and 2276 (Eames 1980, catalogue); Degnan & Seeley types 2, 5, 6, 9, 13, and 18 (Degnan & Seeley 1988, 11–18). There are also six different unpublished designs. Plain tiles of Westminster type were found with black, brown, dark green, and yellow glaze.

(b) Lesnes Abbey series (late 13th to early 14th century)

Examples of these two-colour tiles, possibly manufactured in Kent, were recovered, showing Eames designs 1991 and 2634 (Eames 1980, catalogue).

(c) Penn (c.1350–c.1390)

Penn in Buckinghamshire was the location of one of the most successful commercial medieval floor tileries known in Britain. The main period of Penn floor tile production occurred after the Black Death when large quantities of predominantly decorated tiles arrived in London from the 1350s until c.1390. Tiles from this site include Eames designs 1398/P123, 1827/P73, 1846/P153(?), 2037, 2230/P52, 2262/P130, 2336/P75(?), 2337, and 2773/P136 (Eames 1980, catalogue).

c) Flemish Floor Tile

Flemish tiles can be identified by nail holes in their top surface and their distinctive fabric types. Plain glazed Flemish floor tiles from this site are probably of late 15th- to mid 16th-century date. They have mottled brown and yellow, green, and yellow glaze.

NOTE: A number of the floor tiles from the site still require to have their fabric types identified.

(6) Tin-Glazed Wall Tile (dating: see below)

The earliest tin-glazed wall tiles used in England were of Dutch origin. Production of such tiles began in the Netherlands as early as 1580, although some of the earliest London tin-glazed wall tiles seem to have been those used at a building in Billingsgate just before the Great Fire of 1666. The earliest documentary reference to English-made tin-glazed wall tiles dates to

1676 when a potter from Delft began production at Cophthall, Lambeth (Horne 1989, 17).

Very few English tiles can be dated to the period 1676–1700, it was only during the 18th century the English made tin-glazed tiles became common. This was also the main period during which Dutch wall tiles were imported into Britain.

Fairly few examples were recovered from this site, some unstratified and some from contexts 73 and 446. Most were of blue on white though some also incorporated purple in the designs. Some illustrate biblical themes. It is not always clear, because of their fragmentary nature, whether the tiles are of Dutch or English manufacture; nor, for the same reason, can all the designs be identified.

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