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ROOF TILES: SOME OBSERVATIONS AND QUESTIONS

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Summary

This paper compares briefly the rival merits of the principal roofing materials available in the Middle Ages. It then discusses the different forms of ceramic tile from a functional viewpoint, and goes on to consider the organisation of their manufacture, drawing particularly on the records of the tilery of the Vicars Choral at York.

The Group has done me an undeserved honour in inviting me to give this sixth Gerald Dunning Lecture, but it is one that I felt I could not refuse. To the majority of you Gerald Dunning is probably already little more than a name, and as time passes these occasions will inevitably lose the personal link they have had up to now. Thirty years ago I knew him as a most congenial and helpful colleague, quite unselfish of his time and knowledge, but my first meeting with him had been even earlier, practically coinciding with my first acquaintance with archaeology. This was in 1949, on a training excavation being run at Verulamium by the great Sir Mortimer Wheeler, not then knighted but no less formidable for that. In the afternoons we were released in rotation to be instructed in appropriate skills - photography by Mr Cookson, surveying by Mr Stewart, and pottery drawing by Mr Dunning, which took place in the pleasant attic storey of the Museum. It was not that long after the war, when casual dress still tended towards the military. Perhaps in deference to this fashion Gerald wore an ample pair of khaki drill shorts supported by serviceable braces, the military effect being further compromised by a cigarette and a trilby hat - a comfortable figure, patently in his element, methodical and relaxed, emitting those little self-communing exclamations and affectionate addresses to the object being drawn which were so characteristic, exuding the comforting impression that it was all perfectly simple and within our powers. I had no idea what he did for the rest of the year; I naturally assumed that he was a Romanist, so when soon after I noticed a paper of his on medieval pottery in the Archaeological Newsletter I took it to be a temporary aberration, an incursion into a topic that clearly carried no archaeological clout whatsoever. How much more mistaken could one have been?

In considering a subject for this lecture I noticed that so far none of the series had touched on roof furniture, which was one of Gerald's main interests. Our debt to him for opening up this subject is considerable. He produced no less than thirty-seven papers on the subject, the first exactly forty years ago, and in the 1960s and 70s was publishing two or three papers or substantial notes annually on the subject (Evison et al. 1974, 17-32; Hurst 1982, 16-18).

Naturally he was drawn to the *potted* elements of the roof covering - the louvres, finials and other decorative elements, often identifying them for the first time from unpromising fragments. For the capping of the ridge such moulded ceramic forms, relatively light, impermeable, and versatile in shape, offered the best solution whatever the rest of the roof was made of; hence their wide distribution and the consequent attention they have received. In contrast the common roofing tile has been relatively neglected, so I thought it might be of interest to review one or two topics relating to these, and to consider what kind of questions we might be asking of the material.

Roofing materials: a comparison

First we must try to place ceramic tiles in the hierarchy of roof coverings by looking at the relative merits of the range of materials available. For choice was certainly exercised on occasion, with a variety of materials being used even within a single building (e.g. Streeten 1985, 94). Lead roofs, representing a different technology and a quality of a higher order, which removed them from direct competition with other materials, I have considered as falling outside this exercise.

The easy availability of long straw after harvest, not to mention other suitable vegetal material such as reeds or heather in many places, made *thatch* the most common roof covering, reflected in the fact that it retains the general Old English term for roof covering of any kind (*thack*). It had two obvious disadvantages, a comparatively short life and a tendency to catch fire, the latter witnessed by several recorded town fires in the 11th and 12th century, which in places led to the restriction of its use. Nevertheless, its availability and cheapness were enough to guarantee its wide use. To compare prices without knowing the sizes of the relevant buildings may be misleading, but examples of roofing prices from the 14th-15th century churchwardens' accounts of St Michael's, Bath, indicate for thatch prices ranging from 5s.11d. to 18s.7d., but for stone tiles prices from 17s.5d. to £1.18.11d. (Pearson 1878), which seems to indicate that in this case the price of thatch could be as low as a third of the price of its local competitor.

The material that would appear to have had the least advantages was *shingles* - sawn tiles of oak. Nevertheless, their use is well documented in England and Wales from at least the 1150s into the 15th century. Throughout the 13th century they seem to have been the favoured material for roofing royal buildings, probably because of the availability of timber from the royal forests (Salzman 1967). Their main disadvantages were probably their comparatively short life (which seems to have been no more than 20-30 years) and a continuous need for repair (see e.g. Colvin 1963, 506, 735, 916). They were also slow and laborious to produce, and this, coupled with an increasing shortage of timber, made them increasingly expensive as time went on: 2s. per 1000 at Marlborough in 1238, 3s.6d. at Clarendon in 1316, but a marked rise in the 1360s to 10s. at Dover and 13s.4d at Westminster.¹ The point is explicitly made in 1314 when Queen Margaret was allowed to re-roof various of her manors with stone slates and earthen tiles, these being cheaper than shingles (Salzman 1967). They also called for a substructure of boards to which the shingles could be nailed (Fig.1), which were not essential in other forms of roofing. But they continued to be used where available, especially where lightness was required, as in church steeples.

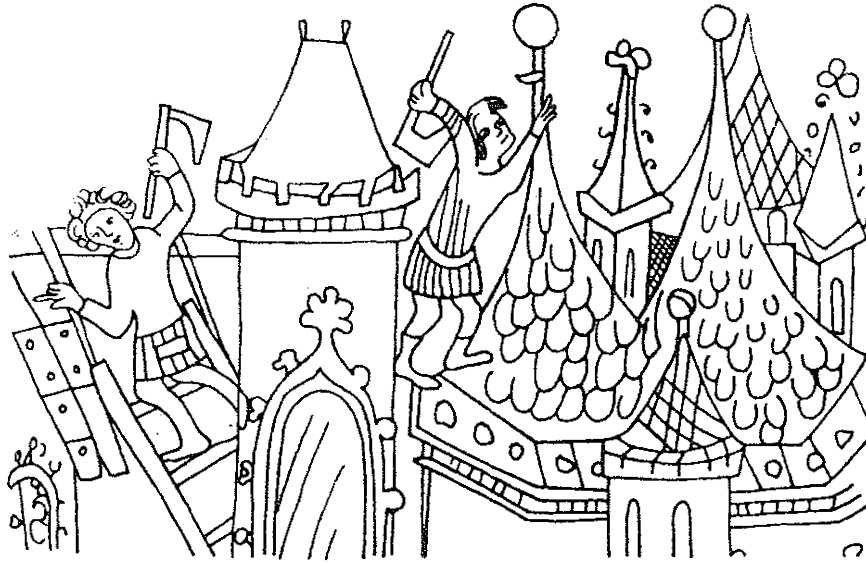


Fig.1. Nailing shingles to a roof. 15th century.
 (From a MSS at Prague: see Binding & Nussbaum 1978)

Slate had obvious advantages over all its competitors. First it is surprisingly light in weight: e.g. a comparison between samples of North Pembrokeshire slates from medieval sites, and ceramic tiles recovered from a medieval kiln site at Denbigh showed that size for size the tiles were more than 40 per cent heavier than the slates.² Their disadvantage was their limited availability, though it was pointed long ago that there was an extensive medieval trade in Cornish slate by sea along the southern English coast and round to London (Dunning & Jope 1954); there was a corresponding trade up the Bristol Channel in which North Pembrokeshire played a part (Knight 1976-8, 51-52), while there is evidence for the exploitation of Caernarvonshire slate along the North Wales seaboard in the Middle Ages, and perhaps for its exportation in large quantities from an early date (Jones 1978). Outside its immediate locality, however, slate tended to be expensive: 11d. per 1000 at the quarry for Restormel Castle in the 14th century, but 10s. in the New Forest at about the same time. There was another disadvantage in that although slates were supplied cut to shape, they were untrimmed and unpierced, which entailed extra cost and trouble in battering (i.e. thinning their ends) and piercing them to take pegs. These extras could add quite appreciably to the cost: 6d. to 1s.3d. per 1000 in the 14th century, rising into the 16th century.

The same limitations applied to the various, rather heavier, roofing *stones*, where these were available. They tended to be exploited locally, but their advantages did not warrant such extensive long distance trade as slates. In their localities they must have been excellent value: local stone slates 2s. per 1000 at Woodstock in 1265; Colyweston slates 8s. per 1000 ready battered and bored for Rockingham Castle in 1375 (each lot bought with 2000 wooden nails, suggesting that each slate had two perforations).

In the face of all this competition fired clay offered an alternative that was never less than effective: impermeable when glazed, not too heavy, and widely available. Ceramic tiles could be produced in large numbers to an acceptable uniformity, nibbed or perforated, and ready for the roof. As an added convenience, ridge tiles, hip tiles and gutters could also be ordered from the same source. Their prices always seem to have been competitive: in southern England 1s. to 3s. per 1000 in the 13th century, increasing to between 2.6d. and 7s.6d. in the next century, and to 9s. to 11s. at York in the 15th century.

Forms of ceramic tiles (Fig.2)

Both Drury (1981) and Streeten (1985) have sketched the broad lines of what is a complicated chronological and regional development in which several separate elements, notably form, size and method of hanging, are all involved. Here I merely wish to consider them functionally, and look at the ways they were intended to be hung on the roof.

Initially they can be divided into two broadly distinct traditions of roof covering.

A. The first is derived from the Roman system in which a semi-cylindrical cover tile (*imbrex*) fits over the flanged edges of two adjacent flat tiles (*tegulae*), covering the gap between them; each *tegula* also overlapped slightly the one beneath it. In the Roman system the *tegulae* are not perforated, being laid on boards on roofs of low pitch. The medieval examples are perforated, implying that they were pegged to laths (Fig.2.1). The cover tiles are also perforated, though the evidence points to their being fixed with mortar. Both forms are glazed, sometimes to produce a polychrome effect, with the flat tiles clear-glazed and the cover tiles green. This form of roofing appears to be relatively early in medieval England: at Battle Abbey fragments were found in the foundation trench of the Chapter House, which might mean a date as early as c.1100 (Streeten 1985, 95). They have also been identified in London, at Southampton and Reading Abbey, and in the north at Scarborough and York. The evidence seems to indicate a decline in their use after the early 13th century.

This system represents a southern European tradition, intended to cope with brief, violent storms of rain, where its deep channelling would be a decided advantage; but it has distinct disadvantages in damp climates of persistent rain, when moisture and detritus tend to collect and encourage the growth of vegetation. There were also structural difficulties when it came to managing hipped roofs, because of the depth of the cover-tiles (Viollet-le-Duc 1875). Certainly the system was superseded in northern Europe by others offering a flatter surface to the weather, and these make up the second broad category.

B. Within this second group classes are differentiated by the methods employed for hanging. The main division is between tiles with built-in projections (or nibs) on their undersides, and tiles with perforations through which wooden pegs or nails could be driven. Between these is a large hybrid class in which both methods are used together.

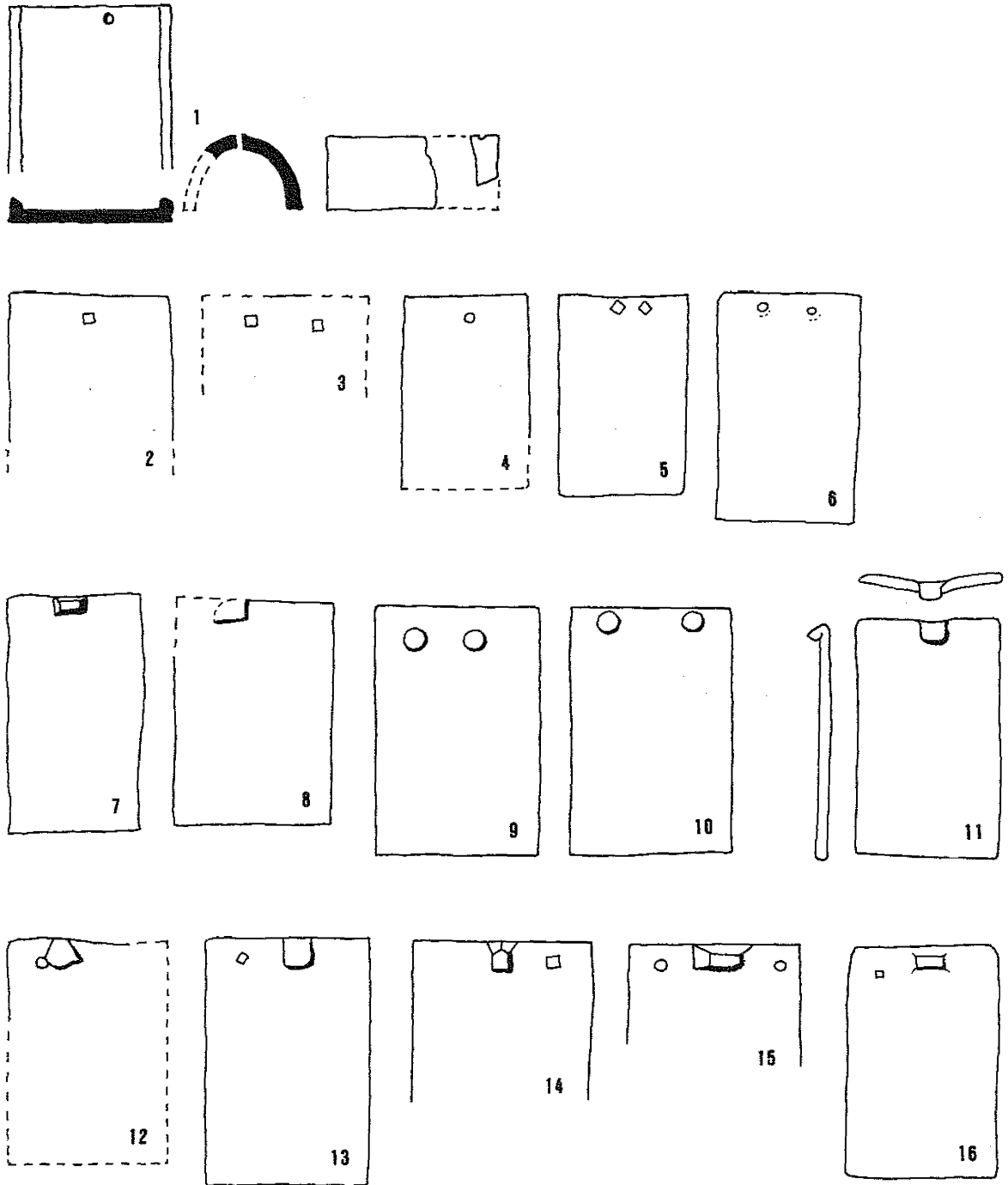


Fig. 2. Examples of roof-tile forms. Scale 1:8.

Pegged tiles (Fig. 2.2-6)

These are the simplest, and what might seem to be the least complicated form of flat tiles, with one or two holes pierced near their upper edges. Nevertheless they developed later than the nibbed forms, and do not seem to have become established until the middle of the 13th century, though they then continued into the 17th century and beyond. Single and double holes

can appear on the same site at an early period, e.g. at Sandal Castle in the mid 13th century (Moorhouse 1983), but it seems to have been the two-holes form that became more generally acceptable and firmer established. Whether both holes were intended to be utilised together is open to question; they may merely have been intended to give the tiler greater flexibility by ensuring that it would always be possible to avoid hitting a rafter, i.e. one of the vertical members of the timber frame. But this would not seem to be the intention in the case of tiles where the two holes are close together, as they tend to be in some of the supposedly earlier examples.

Nibbed tiles (Fig.2.7-11)

Given that they would have been more difficult and time-consuming to make, while not seeming to offer many advantages over the pegged types, the various nibbed forms constitute a remarkably persistent tradition. They begin early, at Wharram and Bordesley Abbey belonging to the second half of the 12th century (Hurst 1979; Rahtz & Hirst 1976). The advantage they offered was a built-in method of support not subject to decay, though perhaps liable occasionally to break off. Viollet-le-Duc illustrates a form with a flange along the whole of the upper edge, but I am not aware of this having been identified in Britain. Such a form might have given greater stability than the familiar nibbed varieties, which more often than not seem to have required (or were thought to require) the addition of a peg to fix them adequately. A significant distinction can be made in the way the nibs are produced: they could either be applied to the underside, which appears to be the method employed in the earliest identified examples, as at Wharram or Bordesley Abbey (Fig.2.7-8). Alternatively, the mould could allow for a projection in the tile's upper edge, which was then bent over, as at Battle Abbey, Austin Friars, Leicester (Fig.2-11), Chester, Denbigh and other sites. This latter method appears to have been practised from the 13th century, and may have become general from the 14th century: one can see that it would have been the method best adapted to large-scale production.

The oddest forms to understand are those with off-centre nibs, which are not uncommon. These unbalanced tiles could only have been prevented from slewing sideways by the tiles on each side of them. It may be that they had an advantage in ease of hanging for the tiler working his way along a row, but no completely convincing explanation offers itself.

Nibbed-and-pegged tiles (Fig.2.12-16)

More often than not nibbed tiles seem to have a peg-hole as well, sometimes set close to the nib, and thus intended to reinforce the nib rather than spread the weight, which might have been expected. In the case of central nibs, the peg often comes at the mid-point of one or other half; sometimes there are two pegs, one on each side. To judge by published examples, in perhaps the majority of cases the hole is level with the lower part of the nib, so that it must be intended to take a peg for suspension. At Battle Abbey, however, and in a recently published group from s'Hertogenbosch, the holes are below the level of the nib, implying that they are intended to take a nail to be driven into the lath; in fact, at s'Hertogenbosch some tiles were found with iron nails still attached (Janssen 1986). The same positioning of the hole can be seen in some unpublished tiles from Carrickfergus Friary, and no doubt there are others to be found.

This seems to point to one of three circumstances: either to quite substantial laths, of a width to stand nails being driven into them; or rafters placed close enough together for the nail holes - or a high proportion of them - to coincide (this is what Viollet-le-Duc seems to indicate); or, lastly, that the roofs were boarded over the rafters, as Roman roofs were, with laths fixed to the boards, which is what some contemporary illustrations may be indicating. Boards are implied in the cases of lead and shingle roofs, and there are certainly not infrequent references in building accounts to 'thackboards', but is it known how general they were? A great deal of distinguished work has been done on the substructure of timber roofs and their classification, but information on the details of their covering is harder to come by. Of course, the tiles themselves are part of the evidence for this, so that the remedy is in our own hands: we should be looking beyond the ceramic evidence to what it implies about the construction of the roof. The tile-maker made what the tiler wanted, that is axiomatic, and his requirements would in turn be governed by the builder, and we should remember this. It is easy to slip into the habit of regarding ceramics as somehow an autonomous activity, obeying its own rules of development. That is hardly likely. What is probably the case is that the chronology and distribution of ceramic forms were governed by underlying (in the literal sense) local traditions of building construction, unrelated to the ceramics industry and depending on different factors altogether.

Manufacture

Anyone reviewing this subject is heavily indebted to recent work by Drury and Smith (Drury 1981; Smith 185), a debt gratefully acknowledged here. There is ample evidence that the furniture of the ridge was made by potters: as well as producing a range of pottery, Laverstock, Nash Hill, and Woodhouse Farm, for instance, were all producing a range of ridge tiles, finials and louvres (Musty 1969; McCarthy 1974; Bellamy & Le Patourel 1970). This is not remarkable, for these items are produced for the most part by potting techniques, and none of the items involved would have been needed in large enough quantities to disrupt normal pottery production (always assuming that this was intensive enough for a switch to these forms to be regarded in such terms). For ordinary roofing tiles the situation would be different. On grounds of quantity alone it would have been impracticable to treat these as sidelines; furthermore their manufacture did not call for potting techniques, but for a rapid repetitive process involving flat moulds. Tiles, therefore, of all kinds demanded a different organisation of manufacture, as well as traditionally a rectangular kiln, in which the maximum number of small rectangular units could be accommodated.

Beginning in the 13th century, when paving-tiles became highly fashionable in England under the royal patronage of Henry III, there is evidence for the establishment of such specialist enterprises, sometimes producing more than one variety of tile - floor-tiles and ridge-tiles, floor-tiles and roof-tiles, roof-tiles and bricks. It is legitimate, therefore, in considering models for tile production to draw on examples from the whole range of architectural ceramics. It is customary to draw a distinction between temporary establishments, set up ad hoc to service the construction of particular buildings, and other more permanent establishments. The kilns at Norton Priory, Meaux and Sandal Castle are examples of the former (Green & Johnson 1978; Eames 1961; Moorhouse 1983). Set against these are works that owe their origin typically to the enterprise of a municipality or corporation: the brickworks at Hull, Beverley, Sandwich and the two tileries at York are cases in point (Smith 1985).

The distinction seems to have meaning only in terms of origin and organisation, not scale: it is not that the 'permanent' works necessarily had a larger production, e.g. the Hull brickyard's annual production was about 94,000 bricks, but the 'temporary' yard set up at Slough to service the building of Eton College was turning out 308,000 a year (Smith 1985). Also, works set up for a specific building project sometimes survived to become sources of local supply, as did Eastington Moor, set up to supply the building of Tattersall Castle. Conversely, it would be perhaps mistaken to assume that once an industry had been established on permanent premises, the phases of ad hoc production were over for good. For instance, it seems clear that in the middle of the 15th century paving tiles of the Severn Valley/Malvern tradition were being made in Gwent (formerly Monmouthshire) or local clays, perhaps by teams from the main works, local demand having been stimulated by the prestigious use of a factory-made pavement at Raglan Castle (Lewis 1987).

Large-scale, settled production, however, was certainly characteristic of the 15th century, and a remarkably interesting and detailed impression of the working of a large tiler over a few years in the 1420s can be obtained from the accounts of the Vicars Choral at York Minster. These tile-house accounts, with a partial transcription, are available in the Minster Library;³ they deserve to be better known.

The Vicars Choral, the community of priests charged with the day-to-day running of the Minster (Harrison 1952), owned one of the two tileries at York. (The other, which was adjacent, was run by the Corporation.) It produced roof-tiles and bricks, fortunately always meticulously differentiated in the accounts. The roof-tiles included flat tiles of two kinds ('thakchaps' and 'thakbastards'), but also ridge-tiles and hip-tiles ('riggs' and 'corners'), though these special shapes never numbered more than 1.5 per cent of the total production in any year. The operation was run by a work force employed by the Vicars Choral under a manager. The Vicars Choral covered expenses such as fuel, equipment and the building of kilns; the manager, although also receiving perquisites in money and in kind, seems to have been a contractor inasmuch as he was paid for the tiles and bricks he produced, which were then sold by the Vicars Choral. If one looks at these purchases and sales in isolation the profit margin appears to be very generous: roof tiles were bought from the manager for 3s.4d. per 1000 and sold for from 9s. to 11s.; the 'thakbastards' were bought for 2s.2d. per 1000 and sold for 6s.8d.; ridge-tiles and corner-tiles were bought for 10d. per 100 and sold for 3s.2d. But the margin was not, of course, pure profit, having to cover the costs of production - the fuel (cartloads of turves are constant items), maintenance and labour costs. In one of the years covered by the accounts (probably 1427), when the tilerly was operating a kiln short, it seems actually to have made a loss. There were eight kilns making tiles and three making bricks, the annual output of each being listed. The annual totals varied from 70,000 to 122,000 for tiles and 67,000 to 73,000 for bricks. That implies an average of 9,000 - 15,000 and 22,000 - 24,000 per kiln respectively. The higher number for bricks than for tiles might mean more firings or bigger kilns. Leaving aside the overhead expenses, the profit margin was greater for bricks than for tiles: was this because brick at this period was still regarded as a luxury product? Taking all expenses into account the yard seems to have made a profit of about 13 per cent a year.

The annual production does not strike one as high, though this can be no more than an impression given the absence of figures relating to kiln capacity. It must be remembered that the work was seasonal. This can be detected in the accounts: November to March is the time when repairs and refurbishment occurs. This is entirely in accord with the terms of the later regulatory statute of 1477, which stated that clay must be dug after 1 November and not worked until after 1 March (17 Edw.IV, c.iv). There is a noticeable absence of references to the clay, which was presumably obtained from within the site. The obtaining of clay is, however, mentioned in connection with the building of a kiln, which must have been clay-bonded. There are also regular references to the buying of sand, perhaps for tempering, but also for use in manufacture to prevent the clay sticking to the moulds, a practice to which the sanded upper surfaces of most surviving tiles bear witness.

The purchase and making of moulds or forms, both for tiles and bricks, and also their strengthening with iron; the purchase of 'strakes' (probably the wooden implements for striking or scraping off excess clay), of sieves and wire, of pots for water, and of gloves - all these bring the manufacturing process very much alive. Quantities of ashes are also bought, perhaps for the temporary sealing of the tops of open kilns. There are also references to maintenance operations: the repair and capping of the kiln and the tiling of the tile-house. Such works seem to be done by outsiders, men whose names do not otherwise occur: this indicates that the manufacture was in the hands of 'tile-makers', and not 'tilers' in a general sense.

The accounts for the rebuilding of one of the kilns are included, the sequence of operations and the cost of each being clearly set out. The whole operation seems to have taken at least ten weeks, beginning with the removal of the old kiln, followed by the taking of advice on the construction of the foundations, the laying of the stone foundation, the construction for the centring of the vault, the building of the vault, and finally the first firing to dry out the kiln. The total cost was 43s.8d. That represented the market value of about 4000 tiles, or something like 50 per cent of the kiln's annual output.

Accounts such as these - and they are not unique - are interesting for us at several levels. At a basic artefactual level it may be interesting to know that tile-makers of the 1420s wore gloves and reinforced their moulds with iron, though this kind of information is of strictly limited interest, being no more than confirmation of what we might have guessed. What is more important, they offer us a view of the industrial and commercial realities behind the hand forming the tile, which seems sometimes to be regarded as the limit beyond which we, as archaeologists (let alone ceramicists), have no business to stray. Data of this kind, illustrative of historical contexts, makes possible a richer, truer interpretation of the scraps we deal in. It is the knowledge of the context that brings the scraps to life. The converse - inferring the context, whether broadly or narrowly interpreted, from the

scraps - is, as we all know only too well, a far more difficult task. If any general point emerges from these somewhat random observations, it is the old, trite one: the constant need to look to our neighbouring disciplines - in this case to the practicalities of building as well as towards architectural and economic history - if our sherds, like the dry bones Ezekiel had no doubts about, are really to live.

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Notes:

1. Data on prices here and elsewhere extracted from Salzman 1952 and Colvin 1963. All prices are reduced to per 1000 for easy comparison.

2. Material in Department of Archaeology & Numismatics, National Museum of Wales, Accession Nos. 36.202/20 and 40.219/7 (slates) and 39.24 (tiles). Average weights per 100 sq.cm irrespective of thickness, were calculated, the results being 194.1g. for the slates and 278.9g.. for the tiles.

3. York Minster Library, Tile-works Accounts VC6/7/1-4. The transcription was made by Charles Kightly. They have been used by Ian M. Betts in his Ph.D thesis, 'A Scientific investigation of the brick and tile industry of York to the mid-18th century' (University of Bradford, 1985).