

Characterisation Studies of Late Medieval Bricks from Llanthony Priory, Gloucester

Alan Vince

Four samples of brick (A to D) from Llanthony Priory, Gloucester, were submitted to the author by John Rhodes for analysis using thin sectioning and inductively coupled plasma spectroscopy (ICP-AES). These studies confirm the visual impression that the bricks are of south Worcestershire origin, probably being made in Worcester itself.

The samples consist of pieces of brick from two structures, the precinct wall and a barn. Both are of 15th-century date and thus predate the common use of brick in the Gloucester area.

Fabric

The two structures have bricks whose fabrics are distinguishable by eye and in thin section.

Fabric 1 (Samples A and B, V3007 and V3008)

The following inclusions are present:

- Rounded quartz. Moderate grains, up to 0.5mm across. A small number of the grains have a high sphericity and these ultimately derive from Permo-Triassic sands and sandstones (Millet seed quartz).
- Rounded chert. Sparse rounded grains up to 0.5mm across.
- Rounded opaque grains. Sparse rounded opaque grains up to 2.0mm long containing rare angular quartz and muscovite, less than 0.05mm across.
- Black-stained clay pellets. Concretionary pellets up to 3.0mm across with a similar texture to the groundmass but with black mottling. Some have shrinkage cracks.
- Subangular quartz. Moderate ill-sorted grains up to 0.2mm across.
- Muscovite. Sparse laths up to 0.1mm long.
- Marl. Sparse angular fragments of marl with fine-grained sparry dolomite, up to 1.0mm across.

The groundmass is optically isotropic and variegated in texture, with lenses and streaks of lighter-firing clay.

Fabric 2 (Samples C and D, V3005 and V3006)

The following inclusions are present:

The Alan Vince Archaeology Consultancy, 25 West Parade, Lincoln, LN1 1NW

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- Marl pellets. Sparse rounded pellets consisting of well-sorted quartz and non-ferroan calcite grains c.0.1mm across in a light brown clay/carbonate groundmass. The largest pellet is 10mm long but most are less than 3.0mm across.
- Rounded quartz. Sparse rounded grains, similar to those in Fabric 1.
- Microcline feldspar. A single rounded grain, 0.3mm across.
- Subangular quartz. Moderate ill-sorted grains up to 0.2mm across.
- Granite. A single rounded fragment of fresh feldspar enclosing quartz and opaque grains, 0.5mm across.
- Mudstone. Moderate rounded grains of unbedded, inclusionless brown mudstone, up to 1.0mm across.
- Muscovite. Sparse laths up to 0.1mm long.

The groundmass consists of optically isotropic clay minerals and is variegated in texture. It contains numerous light-coloured specks, resulting from the former presence of calcareous specks.

Discussion

Source

Both fabrics have characteristics which can be paralleled locally in samples of weathered Mercian Mudstone: similar fabrics to Fabric 1 occur in the area between Great Malvern and Hanley Castle, for example, and the calcareous groundmass of Fabric 2 is paralleled at Worcester, whilst the rounded quartzose sand found in both fabrics is typical of non-calcareous terrace sands in the Severn Valley. Neither fabric, however, is similar to samples of lower Jurassic clays or alluvium from the Gloucester area. Geologically speaking, the nearest source of suitable raw materials is probably to the west of the Severn. However, Fabric 2 is closely matched by Canynge-types floor tiles, for which a source in Worcester is argued (1984).

A study of the ceramic building material from Tewkesbury Abbey Meadow has shown that several different groups of bricks and flat roof tiles of probable Worcester origin were present. A comparison with the Llanthony fabrics is given in Table 1. From this, it can be seen that Fabric 2 at Llanthony Priory is the equivalent of Fabric 3 at Tewkesbury. The bricks from the latter site include one complete example (235mm by 118mm by 50mm); eighteen with complete widths (ranging from 104mm to 127mm) and forty-two with measureable thicknesses, ranging from 44mm to 73mm. One of these bricks has the scar where it was in contact with a glazed floor tile during firing and this floor tile is of Canynge-type fabric.

There is no precise match for Fabric 1 in the Tewkesbury fabrics although Fabric 15 is close.

Table 1

Fabric	Calcareous groundmass	Black-stained clay pellets	Rounded quartzose sand	Subangular Quartz sand, c.0.2-0.4mm	Marl Pellets	Mudstone Pellets
LLANTHONY 1	No	Yes	Moderate	No	No	No
LLANTHONY 2	Yes	No	Sparse	No	Yes	Yes
TAM 3	Yes	No	Sparse	No	Yes	Yes
TAM 13	Overfired	No	Sparse	No	Yes	No
TAM 14	Yes	No	Moderate	No	Yes	Yes
TAM 15	Yes?	Yes	Abundant	No	Yes	No
TAM 16	Yes	No	Abundant	No	Yes	No
TAM 18	Yes	Yes	Sparse	Abundant	No	No
TAM 19	Yes	Yes	Sparse	Abundant	No	No

Chemical analysis

The four samples were analysed at Royal Holloway College, London, and a range of major and minor elements were measured (App 1a and 1b).

These results indicate differences between the two fabrics in the frequencies of Aluminium, Iron, Magnesium, Potassium, Titanium, Chromium, Lithium, Nickel, Scandium, Strontium, Vanadium, Lanthanum, Neodymium, Lead and Cobalt. Without a larger sample it is difficult to be certain that this is not simply due to sampling error, but taken together, these differences strongly suggest that the two fabrics were made from different raw materials. The sum of the measured major elements is similar for both fabrics, suggesting that these differences were not due to the dilution effect of quartz.

The data were then transformed, by normalisation to aluminium, and compared with samples of the various Tewkesbury "Worcester-area" fabrics. The result of this was to show that Fabric 2 is very similar in chemical composition to Tewkesbury Fabric 3, which was also shown at Tewkesbury to be similar to a sample of Canynges-type floor tile from the site. However, Fabric 1 was dissimilar to the Worcester-area fabrics and to Fabric 2.

Dating

Fabric 2 is clearly contemporary with the Canynges-type floor tile production, which seems to have operated from the 1480s or 1490s until the 1530s. The Canynges-type floor tiles at

Llanthony Priory appear to have been made for the last prior and are therefore of early 16th-century date. No closely-datable designs occur on the few Canynoges-type tiles which survive at Tewkesbury and the Fabric 3 bricks (and flat roof tiles, several of which are stamped with maker's marks) occur only in the latest phase of excavated monastic buildings. It is possible that the use of this fabric started before the production of the floor tiles but is unlikely to be earlier than the mid 15th century, since floor tiles which are probably produced in the Worcester area of that date have a non-calcareous body and abundant rounded quartz sand temper (Vince 1984, Droitwich-type tiles). The outside limits for the Fabric 2 bricks at Llanthony are therefore late 15th to early 16th century.

Fabric 1, however, cannot be closely dated by archaeological parallels and associations although it is likely to be of broadly similar date to Fabric 2.

Conclusions

The Llanthony Priory bricks come from two separate consignments, one of which (Fabric 2) can be linked to Worcester, and within Worcester, to the Canynoges-type floor tile industry, which operated only for a short period in the later 15th and early 16th centuries. The other, Fabric 1, is also made using weathered Mercian Mudstone, but was not similar to any of the Worcester-area ceramic building material fabrics analysed from Tewkesbury. Given the wide outcrop of this formation, it could have been produced closer to Gloucester or have been made at Worcester using a different, non-calcareous, clay source. Such non-calcareous clays were used in the Worcester area for pottery and ceramic building material production from the late 12th century into the 15th century.

Appendix 1

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
Fabric 1									
V3005	13.93	5.38	5.84	3.43	0.50	4.22	0.60	0.26	0.115
V3006	12.35	5.36	2.30	1.27	0.46	3.58	0.56	0.12	0.104
Mean	13.14	5.37	4.07	2.35	0.48	3.90	0.58	0.19	0.110
SD	1.12	0.01	2.50	1.53	0.03	0.45	0.03	0.10	0.008
Fabric 2									
V3007	19.06	8.87	1.31	1.50	0.52	2.56	0.84	0.14	0.130
V3008	17.49	8.96	1.22	1.41	0.51	2.33	0.79	0.17	0.162
Mean	18.28	8.92	1.27	1.46	0.52	2.45	0.82	0.16	0.146
SD	1.11	0.06	0.06	0.06	0.01	0.16	0.04	0.02	0.023

Appendix 2

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
Fabric1																				
V3005	452	74	20	78	43	12	96	72	20	55	43	83	44	8	1	4	2	32	87	14
V3006	403	66	29	54	36	11	76	67	17	40	42	97	43	8	1	4	2	50	165	16
Fabric2																				
V3007	443	116	31	113	60	17	114	133	22	61	48	99	50	8	1	5	3	62	112	20

V3008 422 109 29 106 61 17 107 129 22 53 50 110 52 9 1 5 3 68 119 24

Bibliography

Vince, A. G. (1984) *The Medieval Ceramic Industry of the Severn Valley*, Unpublished PhD thesis, University of Southampton.