

## **A note on the raw materials used to produce the Mareham-le-Fen ceramic building material.**

### ***Alan Vince***

Excavations at Mareham-le-Fen produced evidence for the production of ceramic building material in the late medieval period. Amongst the collection were bricks as well as flat roof tiles (with nibs) and floor tiles. Visually, these objects appeared to have several different fabrics and some of the brick and tile fragments were coated with mortar, and therefore had been used on site, not simply made there (although they could have been both made and used on the site). Furthermore, an unusual object, probably a piece of architectural ceramic decorated with ring stamps, incisions and high relief, was found on the site.

This study was therefore commissioned to determine whether or not the source of the raw materials used at Mareham-le-Fen could be determined using a visual examination under x20 magnification, what the potential of using other scientific techniques for characterising the fabric might be and whether or not the decorated object was likely to be a local product based on its fabric characteristics.

### **Fabric Analysis**

Four distinct fabrics were recognisable by eye. They are coded here CBM1 to CBM4.

#### **CBM1**

This fabric contains abundant subangular and rounded quartz sand, with grains up to 1.0mm across. It also contains moderate fragments of rounded quartz, sparse flint and sparse white sandstone up to 4.0mm across and sparse rounded pebbles of flint and quartzite up to 60mm across. The objects (mainly bricks) have a variegated texture with streaks of inclusionless clay and rounded laminated clay pellets.

#### **CBM2**

This fabric contains few inclusions larger than 0.1mm and has a groundmass of variegated calcareous clay. The single sample, a brick, has a fine subangular sand/silt on its base and sides.

#### **CBM3**

This fabric contains an abundant subangular and rounded quartz, sparse flint and sparse shell sand with grains up to 0.5mm across. Many of these grains are coated with haematite. The groundmass consists of calcareous clay. The sanding on these objects is similar in character to that found in the body.

## CBM4

This fabric contains abundant subangular and rounded quartz sand with grains up to 0.5mm across together with sparse subangular quartz, flint and iron ore up to 4.0mm across. The groundmass consists of yellow calcareous clay, sometimes with a dark or light grey reduced core.

## Discussion

**Table 1**

Fabric	SA/R Q >0.5mm	SA/R Q >1.0mm	Flint gravel	Iron	Large pebbles	Laminate d clay pellets	Calcareo us clay	Fine sand/silt sanding
CBM1	NO	YES	YES	YES	YES	YES	NO	NO
CBM2	YES	NO	NO	NO	NO	NO	YES	YES
CBM3	YES	NO	YES	YES	NO	YES	YES	NO
CBM4	YES	NO	YES	YES	NO	YES	YES	NO

There are distinct differences between all four fabrics. These are best seen in Table 1. In a sample of tiles and bricks selected to cover all the visual variations in fabric it was possible to assign each object to one of these four fabrics with only one example having intermediate characteristics - a flat tile with similar sanding to that in CBM1 (excluding the larger pebbles) but with a groundmass similar to that in CBM3 (Table 2). This suggests that these fabric groups represent different combinations of raw materials. There is also a strong correlation between the fabric groups and forms, as shown in Table 3.

**Table 2**

Cname:	1027	1028	103	1056	200	2034	2128	2134	2135	3032	Grand Total
CBM1			3		1		3			1	8
CBM1/3					1						1
CBM2			1								1
CBM3			1	1	2	1	5	1		1	12
CBM4		1			4		1		2		8
Grand Total	1	5	1	8	1	9	1	2	1	1	30

The majority of the brick samples are in fabric CBM1 and the majority of the flat roof tile samples are in fabric CBM3 and CBM4. The one brick in fabric CBM4 is thinner than those in CBM1 and CBM2 and has similar creasing lines to the tiles made in the same fabric. There is no doubt, therefore, that this one brick was produced alongside the flat roof tiles and the floor tile in CBM3 and CBM4 fabrics.

**Table 3**

Cname:	BRICK	FLAT	FLOOR	Grand Total
CBM1	7	1		8
CBM1/3		1		1
CBM2	1			1
CBM3		11	1	12
CBM4	1	7		8
Grand Total	9	20	1	30

CBM3 and CBM4 are clearly related. They appear to differ solely in the amount of carbonate in the clay matrix, which gives rise to a yellow colour in CBM4 and a redder colour in CBM3. It may be that the two fabrics represent extremes in a clay source which has variable carbonate content but there is no evidence for the mixture of clays of varying carbonate content in the same objects so it is more likely that they represent two distinct clays. However, the development of the yellow colour found in CBM4 depends not only of calcium carbonate content but also on the presence of salt (NaCl). It may be, therefore, that CBM4 tiles were producing using clays with a higher brine content than those in CBM3.

The relationship between CBM1 and these two calcareous clays is less clear. The former differs in several respects in its texture as well as in the character of the groundmass and it is quite clear that coarser grained material was selected for use as tempering in the bricks and tiles made in CBM1. However, streaks of inclusionless clay and laminated pellets are found in all three fabrics. Without a detailed survey of the local clay and sand sources it is not possible to evaluate the significance of these similarities whilst the differences are manifest.

The laminated clay pellets and the presence of dark grey or black cores in some of these samples suggest the use of Jurassic organic shaley clays, such as the Kimmeridge Clay, or of glacial clays composed of redeposited Jurassic material. The presence of flint in all of the fabrics is, however, an indication of the use of sands incorporating material of Cretaceous age. Sands from the western side of the Lincolnshire Wolds contain water-polished quartz grains which are present, but not common, in the Mareham samples whereas sands from the Lindsey Marshes and Humber Estuary (at Barton-upon-Humber) contain significant quantities of basic igneous erratics, sufficient to be noted in a study such as this.

Fabric CBM2, however, is quite different and is a typical example of a fabric produced from calcareous fen silts. Such clays probably occur close to Mareham-le-Fen.

### The Decorated Object

The decorated object was made in a sanded mould, as were the bricks and roof tiles, and is made in fabric CBM3. The upper surface of the object has been extensively decorated both by cutting out recesses with a knife and the fingers and by stamping the top surface with a ring stamp with a diameter

of 5.5mm. Linear grooves cut into the objects surface appear to have been produced with a rounded tool about 2mm in diameter.

It is difficult to determine the overall decorative scheme of the object but it has similarities with a number of ceramic objects (such as ceramic mortars) which are covered with decoration and are often found on production sites. This may be partly because the quantity of ceramics found on such sites is so great that the more unusual artefact types have a better chance of being recovered than on consumer sites. However, it is also possible that they are a class of artefact produced by potters and tilers as a test of their skills (apprentice pieces) and were never intended for domestic use.

## Conclusions

It is likely that most of the flat roof tiles found on the Mareham-le-Fen site were produced there and that the distinction in body colour which distinguishes CBM3 from CBM4 reflects either a difference in clay source or firing conditions, or both. The decorated object was made in a fabric which was used on the site to produce nibbed flat roof tiles, bricks and floor tile and it is likely that it was produced as an apprentice piece as a test of a tiler's skills rather than for a practical purpose.

It is less certain that the larger bricks, in fabrics CBM1 and CBM2, were produced on the site. The latter was certainly produced from fen silt, quite distinct from the definite Mareham-le-Fen products. The former was probably produced from boulder clay derived from Jurassic and Cretaceous strata. It might be that this clay was chosen for brickmaking but was unsuitable for tile manufacture without the effort of cleaning out the large pebbles or it might be that these bricks were brought onto the site and were made elsewhere.

Further information about the source of raw materials used could be obtained from thin-section analysis and chemical analysis, especially if this was combined with a survey of potential clay and temper sources in the immediate area of Mareham-le-Fen.

### Appendix: Sub-sample of ceramic building material examined under x20 magnification

Context:	Cname:	Form:	SUBFABRIC:	Description:
1027	CBM4	FLAT		
1028	CBM1	BRICK	NO LARGER PEBBLES VISIBLE;OVERFIRED	SOOTED ALONG ONE STRETCHER FACE
1028	CBM1	BRICK	ONE STRAW IMPRESSION	MORTARED
1028	CBM1	BRICK		MORTARED
1028	CBM2	BRICK		
1028	CBM3	FLAT	SANDY	
103	CBM3	FLAT		NIBBED
1056	CBM1	BRICK		MORTARED
1056	CBM1/3	FLAT	SANDY;MAY FORM LINK BETWEEN CBM1 AND CBM3	
1056	CBM3	FLAT	SANDY	
1056	CBM3	FLAT	REDUCED CORE (THEREFORE ORGANIC CLAY?)	
1056	CBM4	FLAT		
1056	CBM4	FLAT		
1056	CBM4	FLAT	INCLUSIONLESS LENSES;HAEMATITE-STAINED SANDING	MORTARED (MORTAR CONTAINS TILE CHIPS)
1056	CBM4	BRICK	INCLUSIONLESS LENSES;REDUCED CORE;HAEMATITE-STAINED	
200	CBM3	FLAT	REDUCED CORE (THEREFORE ORGANIC CLAY?)	
2034	CBM3	FLAT		
2034	CBM1	BRICK	OVERFIRED	FINGER-WIDE GROOVE ALONG LONG EDGE(S)
2034	CBM1	BRICK		
2034	CBM1	FLAT		
2034	CBM3	FLAT		
2034	CBM3	FLAT		
2034	CBM3	FLOOR	REDUCED CORE	BEVELLED EDGE
2034	CBM3	FLAT	REDUCED CORE (THEREFORE ORGANIC CLAY?)	

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2034	CBM4	FLAT		NIBBED
2128	CBM3	FLAT	REDUCED CORE (THEREFORE ORGANIC CLAY?)	MORTARED
2134	CBM4	FLAT		
2134	CBM4	FLAT	INCLUSIONLESS LENSES;REDUCED CORE	
2135	CBM1	BRICK	OVERFIRED	OVERFIRED
3032	CBM3	FLAT	REDUCED CORE (THEREFORE ORGANIC CLAY?)	

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