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THE USE OF GYPSUM-PLASTER AND LIME-ASH FOR FLOORING IN MEDIEVAL EAST MIDLANDS: EVIDENCE FROM BINGHAM, NOTTINGHAMSHIRE

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Figure 1 The upper layer of gypsum-plaster and lime-ash with fragments of charcoal, gypsum (white), burnt limestone (grey) and red shale clearly visible. Photo by Peter M. Allen.

Between 2012 and 2016 Bingham Heritage Trails Association dug 73 test pits, mostly in the historic core of Bingham, a small town in south Nottinghamshire. The project was funded by the Heritage Lottery Fund and overseen by Trent & Peak Archaeology.

Three of the test pits were on the site of a medieval manor house, known to be derelict in 1586. Two of them revealed a partly robbed-out stone layer, no more than 20cm thick, that may have been a foundation for a tiled floor. A layer of broken limestone roof tiles above it probably signifies a roof collapse. Pottery from below the stone layer indicates that the manor house was probably built in the second half of the thirteenth century. Midland Purple Ware sherds above the broken roof tiles show that it ceased to be used either in part or wholly in the fifteenth century.

The third test pit encountered a degraded gypsum-plaster and lime-ash floor under a pile of building rubble dumped on it in the late sixteenth to early seventeenth century. The floor extended to the outside wall of the manor house, which was 53cm thick, well made and built of local, medium-grained sandstone fixed with a sandy mortar.

There were five layers to the floor, fully described by Allen and Cooper (2016):

- The lowest is 45-50mm thick and made of sand laid directly on the soil.
- Above it is a layer of small flaggy sandstone pieces 10-30cm thick embedded in the sand.
- A layer of gypsum-plaster and lime-ash rests on the flags and penetrates between them. It is on average 25mm thick, grey and crumbly in places. The most visible fragments in it, rarely more than 4mm long, are gypsum, charcoal, coal, sandstone and red shale with sand grains. The upper surface is flat and it clearly was meant to be a floor, but the crumbly nature made it unsuitable for that purpose.
- The lower floor is overlain by a skim of white lime plaster no more than 2mm thick.
- This is overlain by an upper, hard-set gypsum-plaster and lime-ash floor about 45mm thick. It contains pieces of wood charcoal up to 20mm long

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and large fragments of gypsum, burnt limestone, sandstone, red shale, pieces of slag and burnt straw. The coarse aggregate makes up 40% of the material. Petrographic and gravimetric analyses show the fine matrix to be a mixture of gypsum-plaster and about 20% lime-ash.

Bingham's lord of the manor was in residence only between 1266 and 1458. Floors of the quality revealed here were costly. Financial difficulties experienced by the later occupants of the manor house suggest that the floor could only have been laid before 1429. This ties in well with the evidence of the pottery that dates the robbed stone floor found in the first two pits as being between the mid thirteenth and the fifteenth centuries.

Plaster floors in medieval and post-medieval buildings are typically present close to natural sources of lime and/or gypsum, both of which have been mined close to Bingham, but the terms used in contemporary literature to describe them rarely give any indication of whether both materials are present and in what ratio. Traditionally, after firing wood or coal-burning lime kilns the residue at the bottom of the kiln was mixed with some gypsum plaster and water to make flooring. In Bingham lime is the minor component and the coarse aggregate includes large gypsum clasts, some with reaction haloes. These tend to form by reaction when quick-lime is added. Voids in the material are probably indicative of gas bubbles that would have formed during this exothermic reaction. In medieval times plaster-of-Paris was made by burning gypsum in an open stack built on charcoal or coal. The coarse residue left after burning was also used for making floors, but generally the less heavily used first floor not the ground floor. The likelihood is that the floors in Bingham were made by mixing some quick-lime with the residue from an open-stack fire to lengthen the setting time. This may explain the crumbly nature of the lower of the two floors. Temperature control in the open-stack process was so poor that anhydrite, which has poor setting qualities, could be produced rather than plaster-of-Paris if the temperature of the fire was too high.

Bibliography

The full, published account of this work is in:

Allen, P.M. and Cooper, A.H. 2016. The use of gypsum-plaster and lime-ash for flooring in medieval East Midlands: evidence from Bingham, Nottinghamshire. *Transactions of the Thoroton Society of Nottinghamshire* **120**: 1–15.