

EXAMINATION OF GRITS ON MORTAR SAMPLES FROM ROMAN POTTERY SITE, HARTSHILL

Purpose of Examination: To ascertain the precise nature, and if possible the sources of the grits.

Preliminary Examination:

The grit particles vary in size from 8mm down, the average being approximately 4mm.

The samples were divided into three preliminary groups:-

- a) Those in which the grit clearly consists of fragmented, pre-fired material, being angular, and brick red in colour.
- b) Those in which the grit is angular to sub-angular, with some rounded forms, dark red to black in colour, suggesting a derivation from washed gravel, e.g. quartzite or fine grained sandstone pebbles.
- c) Those in which the form is well rounded - almost hemi-spherical, and the colour very dark. Most of these have their surfaces perforated by small holes indicating slagging and evolution of a gaseous phase during firing.

Examination After Grinding:

To study the effect of the firing samples from 'a', 'b' and 'c' were ground over a part of their bearing surface, removing only sufficient material to reveal the inner portion of each grit particle where it is embedded in the matrix of the mortar.

This revealed very clearly that:-

- 1) All the grit was angular form, the rounding of the exposed outer surfaces being due to partial fusion during firing.
- 2) In each case the grit particles showed:
 - (i) Complete absence of crystalline form.
 - (ii) Absence of stratification.
 - (iii) A very homogeneous, fine grained structure.
 - (iv) A vesicular, slaggy development on exposed surfaces.

From these facts it is safe to say that the grits were not derived from naturally occurring rocks, e.g. quartzite, flint etc., but were prepared by firing clay which was subsequently broken up and graded for size.

Experimental Firing:

To verify the conclusion that the rounding of the exposed surfaces was due to firing, two samples were taken from category 'b' and placed in an experimental gas heated furnace, allowing a flame to impinge upon them, and bringing them up to temperature gradually.

On reaching approximately 1150 degrees C, the grit particles on the outer fringe (the hotter portion), of the flame began to fuse, to darken in colour, and to assume a spherical form. Heating was continued up to an

estimated temperature of 1200 degrees C for this outer fringe, the inner portion not exceeding 1100 degrees C.

When examined cold the fusion areas were seen to resemble closely, except for weathering, the very rounded forms of category 'c'.

Conclusions:

1) The grits are entirely artificial in that they consist of fragmented and graded ceramic material, derived from a clay having a rather high iron content, >4%. Where quartzite or other naturally occurring rock particles do occur, these could well have been impurities contained in the original clay.

2) The well-rounded form of some of the exposed, working surfaces of the grits is due to partial fusion (slagging and formation of gas vesicles) during the firing of the mortars. Temperatures of 1150 degrees C to 1200 degrees C were probably reached, whereas 1100 degrees C is suggested as sufficing for the firing of the clay from which the mortars themselves were made.

3) The clays used for firing the grit body material could have been taken from the locally occurring Productive Coal Measures, though this is by no means certain.