

# GeoArch

Report 2008/29

Evaluation of Archaeometallurgical  
residues from the M7/M8 Contract 2:  
Shanboe 6 (A015-41, testing area 14)

Dr Tim Young  
12<sup>th</sup> December 2008

# Evaluation of Archaeometallurgical residues from the M7/M8 Contract 2: Shanboe 6 (A015-41, testing area 14)

Dr T.P. Young

## Abstract

*The site comprised a single slagpit containing a large block of slag. The pit dimensions resemble those of the basal pit of a slagpit shaft furnace for iron smelting. The slag block is unlike most smelting slags, and includes some unusual textures indicative of a strong reaction between the slag in the pit and the enclosing subsoil. The upper part of the slag block is raised on one side, with granular textures similar to those seen in slags of the zone between the bloom and blowing wall in many furnaces. The slag appears very manganese-rich. The lower part of the slag forms a well-formed puddle. The block therefore shows textures intermediate between typical smelting slags and bloom-smithing slags.*

*Despite Shanboe 6 being an undated and isolated occurrence, the problematic nature of the slag makes this worthy of further investigation.*

## Contents

Abstract .....	1
Methods .....	1
Results .....	1
Interpretation .....	2
Evaluation of potential.....	2
References .....	2
Catalogue .....	3

## Methods

All investigated materials were examined visually, using a low-powered binocular microscope where necessary. All significant materials were summarily described and recorded to a database (Table 1). As an evaluation, the materials were not subjected to any high-magnification optical inspection, nor to any other form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

## Results

### Material

The material is a single large slag cake weighing just over 8kg. The cake has a bowl of 330mm by 270mm up to 55mm thick in the centre. The slag cake shows a high degree of interaction with the substrate, and clearly molten slag lay directly on the pit base. The slag cake rises rapidly to 115mm above the its bowl top on one side, with coarsely crystalline textures and some void space, that is reminiscent of textures found below the blowhole of a smelting furnace. The upper surface of the bowl is smooth distally, but is covered with granular slag on the proximal side. The weathering products have a slightly purple-blue tinge suggesting a high manganese content.

### Distribution

The slag derived from the fill of a burnt pit (F032: 0.60m x 0.60m x 0.20m), identified as a "bowl furnace". The furnace is described as having a rim of oxidised fired clay around the pit, to a width of 0.10m. It is apparent from the feature plan however, that the fired clay lies within the measurements given, so the working volume of the pit measured approximately 0.40 x 0.35 x 0.20m. In most case the pit of the slagpit furnaces is not lined (though in rare cases it is) and the burnt clay recorded is probably natural, giving the inner margin of the fired zone as the probable true cut.

The revised measurements would be typical of an Iron Age to Early medieval slagpit furnace.

## Interpretation

This is a highly unusual slag cake. It does not have the morphology of typical smelting slags from the Irish slagpit furnaces, which generally have a rather friable main slag mass, formed of coalesced prills, with additional prills running down into the void of the pit below (e.g. Adamstown, Young 2006c; Tullyallen 6, Young 2003). However, much denser slag accumulations are known from slagpit furnaces in the UK and in continental Europe..

The general form of the cake is reminiscent of large cakes attributed to bloom-refining, sharing with them the general form of a slag puddle, resting directly on the pit substrate. The piece differs from most bloom-refining slags in possessing the coarsely crystalline raised region on the proximal side. This is very similar to textures that can be observed in smelting furnaces in slags forming in the narrow gap between the bloom and the furnace wall, just below the blowhole. Although very high manganese contents have been held to be indicative of smelting slags, it is now recognised that they may also occur in bloom-refining slags.

A weight of 8kg is high for bloom refining slags, with cakes of this weight known from Clonfad (Young 2006a), but equivalent cakes from other sites (e.g. Woodstown, Young 2006c; Clonmacnoise, Young 2005 and unpublished data; Ballykilmore, Young 2006b) rarely exceed 7kg.

There are broadly four possible interpretations of this piece.

- Firstly it might be an unusual smelting slag, either because of a deliberate process, or perhaps because the blowhole was positioned too low relative to the pit bottom, or even perhaps because some chemical property of the slag caused it to be more fluid than is usual.
- Secondly it might be bloom-refining slag and that high temperatures on the blowing side of the hearth have generated slag textures (perhaps through slow cooling from a very temperature) that mimic those seen in some iron smelting furnaces.
- Thirdly it is possible that the refining of a bloom has been undertaken by reheating it in the smelting furnace, creating a slag mass that has hybrid features.
- Finally, it is becoming clear that experienced iron workers can use slag baths in ways which currently remain poorly understood and are largely outside the traditional concepts of smelting and smithing. It is now known that puddles of molten slag (usually recycled smelting slag) can be used as a matrix within which to reattach broken bloom fragments to each other. It is also possible to melt wrought iron in a reducing environment to produce molten steel, which can be collected through dripping down into an underlying slag bath where the steel accumulates as a single block. Both of these two techniques are outside the normal range of activities undertaken by conventional blacksmiths, so the processes and their residues remain largely unknown.

The favoured interpretation at this stage is that this is a bloom-refining slag, but further work would be needed to try to demonstrate this more conclusively.

## Evaluation of potential

Despite Shanboe 6 being a currently undated and isolated occurrence, the problematic nature of the slag makes this worthy of further investigation. Although great progress has been made recently, the certain distinction of smelting and bloom-refining slags, particularly when in incomplete cakes, requires further refinement. Investigation of problematic pieces such as this is therefore highly beneficial to the broader understanding of early iron slag.

## References

- YOUNG, T.P. 2003. Evaluation of slag from Tullyallen 6, Co. Louth (00E00944). *Geoarch Report 2003/10*. 2pp. + 2 figs.
- YOUNG, T.P. 2005. Metallurgical Residues from Clonmacnoise, Part 1: Evaluation of material from the waste water treatment works (02E1407). *GeoArch Report 2005/08*. 29pp.
- YOUNG, T.P. 2006a. Evaluation of archaeometallurgical residues from Clonfad 3, Co. Westmeath (A001:036). *GeoArch Report 2005/14*. 7pp.
- YOUNG, T.P. 2006b. Evaluation of archaeometallurgical residues from Ballykilmore 6, Co. Westmeath (A001:032). *GeoArch Report 2005/15*. 17pp.
- YOUNG, T.P. 2006c. Evaluation of archaeometallurgical residues from sites on the N25, Co. Waterford (Woodstown 6, Adamstown 1,2,3). *GeoArch Report 2006/15*. 38pp.

---

F	find	sample	context wt	wt	no	notes
30	1		8061	7895	4	large dense bowl, 330x270mm, bowl c55mm thick in centre, one side rises rapidly with cavernous coarsely crystalline textures (cf wall-bloom gap) to total height of 170mm. This zone is arcuate and approximately 150mm wide. Several pieces of lower margin have spalled off (see below). Whole cake looks Mn-rich. Slightly vesicular. Strong interaction with coarse gravelly substrate. Top smooth distally(?) with granular material lying over this proximally (?) extending c170mm into bowl.
				166	7	small spalled pieces of base from the above cake.

Table 1. Summary catalogue

# GeoArch



*geoarchaeological, archaeometallurgical & geophysical investigations*

54 Heol y Cadno,  
Thornhill,  
Cardiff,  
CF14 9DY.

*Mobile:*  
*Fax:*  
*E-Mail:*  
*Web:*

07802 413704  
08700 547366  
Tim.Young@GeoArch.co.uk  
www.GeoArch.co.uk

