THE SLAGS by C. Salter

The collection of material examined consisted of samples from twenty-three different locations on the site. Table 2. correlates the Lab reference numbers with the site provenance, and also gives an indication of the type of material found at that location. It was possible to classify the material into five general groups, which were:-

A. Ironworking slags.
B. Reaction products due to the interaction of heat charcoal and iron working slag on the furnace lining material.
C. Various copper based alloys.
D. Natural materials.
E. Other items, such as corroded iron objects, and some glassy material.

Table 3. correlates the samples belonging to each of the groups, A-E, as listed above, and gives the approximate total weight for each group.

Group A
The ironworking slags

It is difficult to distinguish definitely between the various different types of slags produced at each stage of the iron making process, either by chemical means or on the basis of the visual appearance of the slags. However, there were a number of features in this case which would indicate that the slags were blacksmithing slags. The largest single piece of slag weighed only some 305 g., which must have represented at least 80% of the original mass of the slag. The plano-convex shape seen on some of the samples also indicates that these slags probably cooled where they formed, at the base of a bowl-shaped furnace. There were no signs of any of the slag having been tapped from the furnace. Chemically the slags were often heterogeneous, containing globules of metallic iron. Similar structures have been produced by the author during experimental welding operations, when the metal became overheated. Thus all the evidence points to these slags being the results of a small amount of blacksmithing.

Group B
The furnace lining material

The samples assigned to this group varied considerably, ranging from clays baked to a brick red colour to highly fired high silica sands and clays. The compositions and firing states of these materials show that the temperatures used ranged from as low as 500'C to at least 1450'C. In a number of samples virtually pure silica had been fused.

Other samples contained partially dissolved flints, and other material which had either fallen into the hearth or had been pulled away from the lining of the hearth. One sample (SL 20) consisted of globules of iron oxide held together by thin films of material rich in silicon and calcium. This would also support the idea that these slags were the result of blacksmithing operations.

It is interesting to note that some of the lining materials are ideally suited to resist prolonged exposure to high temperatures, but this could have been accidental or deliberate depending on the nature of the local supplies of sands and clays.

Group C
The copper base alloys

This group of materials appeared as a green-stained sandstone from the exterior, where the corrosion products had cemented the surrounding and to the surface of the object. Internally they were badly corroded, and although some still retained some metallic copper it was usually badly penetrated by corrosion. Thus although chemical analysis was carried out on the samples, it is unlikely that the results bear much relationship to the original composition. The analyses that were obtained showed a very mixed set of alloys containing copper, lead, antimony and sometimes tin, zinc and traces of iron. The shape of the samples did not suggest any object; rather, they appeared to be the results of drips from casting or melting operations. However, the very corroded state of the objects makes any interpretation of them impossible.

Group D
The natural objects

These consist of cemented quartz sands which could either belong to the local geology, or have been formed since the burial of the site. The sample SL13 was an iron oxide cemented sandstone, which could have formed by the leaching of iron from corroding iron objects or from iron naturally present in the ground waters. The other natural object was SL19, which was iron-sulphide cemented sandstone.

Group E
Other objects

Samples in SL5 were completely corroded iron objects, probably nails. Amongst the material in SL9, there was what looks like a fragment of a crucible. On one edge of this was a clear transparent blue glassy substance. A small sample was analysed and the results are given below:-

Table 1. Analysis of glassy substance in weight percent of oxide.

| | |
|---|---|
| Na-O | 0.4 |
| MgO | 0.6 |
| Al-O- | 3.4 |
| SiO- | 71.4 |
| P-O- | 0.4 |
| K-O | 16.2 |
| CaO | 6.9 |
| FeO | 1.0 |

Summary

We have at this site good evidence of a blacksmith working in the vicinity. However, the amount of slag recovered would not represent a long period of working, perhaps a few weeks of continuous working, or a longer period of non-continuous work. Moreover, the slag was found in fairly scattered pockets, making it difficult to estimate accurately the amount of working. Thus the percentage recovery is likely to

have been low, especially as such slag is likely to have been mixed up with domestic rubbish that was removed off the excavated site.

The copper working was probably confined to the melting-down of scrap metal, as the copper alloys were of a rather odd and heterogeneous composition, although all of them had fairly high lead contents. There was also evidence for possible glass working, in the form of a crucible which was probably used to melt glass.

Table 2.

| Ref No. | Context No. | Phase | Group | Comment |
|---|---|---|---|---|
| SL1 | 700/1 | 4/2 | 21 | Ironworking slag. |
| SL2 | 546/1 | 5 | 23 | Ironworking slag. |
| SL3 | 119 | 5 | 23 | Ironworking slag/iron mixture. |
| SL4 | 911/1 | U/S | - | Ironworking slag/iron mixture. |
| SL5 | 23 & 6 | 4/2 | 19 | Corroded iron artefacts. |
| SL6 | 49 | 2 | 3 | Ironworking slag. |
| SL7 | 8 | 5 | 23 | Copper based alloy. |
| SL8 | 23 | 4/2 | 19 | Mixed iron and copper corrosion products. |
| SL9 | 23 | 4/2 | 19 | Copper based alloy, and glass. |
| SL10 | 23 | 4/2 | 19 | Mixed iron and copper corrosion products and burnt clay. |
| SL11 | 186/1 | 5 | 23 | Ironworking slags. |
| SL12 | 534 | 2 | 3 | Ironworking slags. |
| SL13 | 500/1 | 5 | 23 | Natural iron cemented sand. |
| SL14 | 19 | 5 | 23 | Furnace lining material. |
| SL15 | - | U/S | - | Ironworking slag. |
| SL16 | 1088 | 3/2 | ?5 | Ironworking slag. |
| SL17 | - | U/S | - | Slag driplet. |
| SL18 | 756/2 | 2 | 25 | Ironworking slag. |
| SL19 | 504/1 | 5 | 23 | Natural. |
| SL20 | 186/1 | 5 | 23 | Furnace lining. |
| SL21 | 600/1 | 3/1-5 | 12 | Furnace lining material. |
| SL22 | 547/1 | 5 | 23 | Furnace lining material. |
| SL23 | - | U/S | - | Ironworking slag. |

Table 3.

| Group | Find Number (Lab number) | Weight |
|---|---|---|
| A | SL 1,2,3,4,6,11,12,15,16,17,18,23 | 1480g. |
| B | SL 10 (part of),14,20,21,22 | 50g. |
| C | SL 8,10 (part),7,9 | 390g. |
| D | SL 13,19 | 40g. |
| E | SL 5,9 (part) | |

Where Group A = Ironworking slags
B = Slagged furnace lining material
C = Copper based alloys of lead, antimony, tin

and zinc

D = Natural material, Sandstones

E = Glassy materials and corroded iron objects