

Ancient Monuments Laboratory
Report 63/86

INTERIM REPORT ON SLAG RECOVERED
DURING EXCAVATIONS AT YORK MINSTER

J. G. McDonnell B.Tech. M.I.F.A.

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Summary

The excavations revealed evidence of two smithy areas in trenches XB and XK. The quantities of smithying debris recovered from the other trenches can be considered to background levels. There was no evidence for iron smelting on the sites. A total of nearly 80kg was examined which included a few kg of non-ferrous material.

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H.B.M.C.E FUNDED ARCHAEOMETALLURGY CONTRACT
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING
ASTON UNIVERSITY, ASTON TRIANGLE
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York Minster Interim Slag Report

J.G.McDonnell M.I.F.A.

1 Archaeological Summary

Metal working debris was recovered from the excavations that took place outside and within the Minster during its renovation (Fig 1). The excavations were undertaken over a long period of time, and each area was an individual excavation.

2 The Metal Working Evidence

The material classed as metal working residues and slags was sorted into three broad groups (by J.Bayley (A.M.Lab) and G.McDonnell): firstly non-ferrous residues, which comprise all the copper alloy, lead working, other non-ferrous working debris and glass making residues. Secondly the ironworking residues, which comprise smelting and smithing debris. Thirdly, the non-diagnostic residues, her~~h~~ath lining and fuel ash slag, which may have derived from any pyrotechnological process. This report discusses the ironworking evidence and gives a listing of all the residues except those re-classed as either iron or copper alloy objects, tile or stone. The listing is given in Appendix 1, and is in Site and Context order.

3 The ironworking Evidence

The ironworking slags were ascribed to five classes in accordance with methods used elsewhere¹. They were:

Tap Slag - a form of smelting slag that has a characteristic ropey morphology.

Smelting Slag - slag that is believed to have derived from the smelting process, but lacks the characteristic tap slag morphology, and normally occurs in massive form.

Smelting/Smithing Slag- slag that might have derived from either the smelting or the smithing process.

Smithing Slag - randomly shaped pieces of slag deriving from the smithing process.

Hearth Bottom - characteristic plano-convex accumulation of smithing slag that developed in the base of the smithing hearth.

The total ascribed to each group is shown in Table 1, and clearly shows that there was smithing carried out, but no smelting of the ore occurred.

TABLE 1 TOTALS OF IRONWORKING SLAGS

	Weight (kg)
Smelting Slags	
Tap Slag	0.69
Smelting Slag	0.09
Smelting/Smithing Slag	0.05
Smithing Slags	
Smithing Slag	70.94
Hearth Bottoms	3.47

The small quantities of smelting slags are the background levels that might be expected on any urban site, this slag being intrusive to the site.

4 The Distribution of The Smithing Slag

The slag listing in Appendix 1 shows that major deposits of smithing slag occurred on Sites XB and XK (Figure 1). The low quantities of smithing slag recovered from the other sites are considered to be background levels, i.e. the quantity of residual smithing slag that might be expected on many sites.

The large quantities of slag on both sites indicate that smithing was practised on or close to these sites. The absence of significant amounts of slag in any of the adjacent sites, XL and XV next to Site XK, and XC and XD next to Site XB, suggest that the smithing activity was very localised.

5 Summary

The Minster excavations have revealed evidence of two smithy areas outside the main building. Further discussions with the archaeologists should provide data concerning phasing etc. The quantities of smithing debris recovered from the other sites can be considered to be background levels. There was no evidence for iron smelting on the sites.

Reference

- 1 McDonnell J.G. Amersham Mantles Green Slag Report
H.B.M.C.E. Laboratory Report.

APPENDIX 1

YORK MINSTER SLAG LISTING

CATEGORY HEADINGS

M:NO	M-Number, individual finds number
Context	Context Number, (not all finds had context Numbers)
Smith	Smithing Slag
HB	Hearth Bottoms
TAP	Tap Slag
SMELT	Smelting slag
SMELT?	Smelting or smithing slag
HL	Hearth Lining (non-diagnostic)
FAS	Fuel Ash Slag (non-diagnostic)
NONFER	Non-ferrous debris, copper alloy debris etc..

YORK MINSTER SLAG LISTING (WEIGHT IN gms)

M:NO	CONTEXT	SMITH	HB	TAP	SMELT	SMELT?	HL	FAS	NONFER
* TOTAL ON SITE 2CC									
2041	4	454	0	0	0	0	0	0	0
** Subtotal **		454	0	0	0	0	0	0	0
* TOTAL ON SITE A									
2138	4	7	0	0	0	0	0	0	0
** Subtotal **		7	0	0	0	0	0	0	0
* TOTAL ON SITE AA									
306	0	0	0	0	0	0	0	0	14
313	0	0	0	0	0	0	0	0	28
2113	7	0	0	0	0	0	0	0	7
** Subtotal **		0	0	0	0	0	0	0	49
* TOTAL ON SITE AF									
2240	2	0	0	0	0	0	0	0	42
** Subtotal **		0	0	0	0	0	0	0	42
* TOTAL ON SITE AG									
290	55	14	0	0	0	0	0	0	0
291	63	78	0	0	0	0	0	0	0
338	72	0	0	0	0	7	0	0	0
2032	73	0	0	0	0	0	0	71	0
412	94	21	0	0	0	0	0	0	0
707	97	42	0	0	0	0	0	0	0
2259	99999	7	0	0	0	0	0	0	0
** Subtotal **		162	0	0	0	7	0	71	0
* TOTAL ON SITE AH									
423	2	0	0	0	0	0	0	0	7
402	21	0	0	0	0	0	0	0	7
409	301	0	0	0	0	0	0	0	7
419	303	283	0	0	0	0	0	0	0
424	305	0	0	0	0	0	0	14	0
507	330	0	0	0	0	0	0	57	0
511	330	0	0	0	0	0	0	0	35
** Subtotal **		283	0	0	0	0	0	71	56
* TOTAL ON SITE AJ									
319	41	0	0	0	0	0	0	0	35
293	42	14	0	0	0	0	0	0	0
2168	42	0	0	0	0	0	0	7	0
287	50	57	0	0	0	0	0	0	0
2082	52	0	0	0	0	0	0	14	0
298	53	0	0	0	0	0	0	28	0
307	60	0	0	0	0	0	0	0	7
** Subtotal **		71	0	0	0	0	0	49	42

YORK MINSTER SLAG LISTING (WEIGHT IN gms)

M:NO	CONTEXT	SMITH	HB	TAP	SMELT	SMELT?	HL	FAS	NONFER
* TOTAL ON SITE BC									
2081		0 85	0	0	0	0	0	0	0
2156		0 212	0	0	0	0	0	0	0
** Subtotal **		297	0	0	0	0	0	0	0
* TOTAL ON SITE CC									
828	110	525	0	0	0	0	0	0	0
869	154	106	0	0	0	0	0	0	0
** Subtotal **		631	0	0	0	0	0	0	0
* TOTAL ON SITE F									
161	0	0	0	0	0	0	0	0	2906
168	0	0	0	0	0	0	0	0	511
147	6	0	0	0	0	0	0	0	7
** Subtotal **		0	0	0	0	0	0	0	3424
* TOTAL ON SITE GF									
345	29	71	0	0	0	0	0	0	0
** Subtotal **		71	0	0	0	0	0	0	0
* TOTAL ON SITE GL									
133	0	0	0	0	0	0	0	0	7
** Subtotal **		0	0	0	0	0	0	0	7
* TOTAL ON SITE GN									
2094	0	1063	0	0	0	0	0	0	0
2244	0	28	0	0	0	0	0	0	0
185	6	0	0	170	0	0	0	0	0
** Subtotal **		1091	0	170	0	0	0	0	0
* TOTAL ON SITE GS									
89	0	0	0	0	0	0	0	14	0
195	0	0	0	0	0	0	0	0	28
2239	0	0	0	0	0	0	0	14	0
** Subtotal **		0	0	0	0	0	0	28	28
* TOTAL ON SITE GY									
2087	0	0	0	0	0	0	0	0	35
893	504	0	0	0	0	0	0	0	113
899	504	149	0	0	0	0	0	0	0
** Subtotal **		149	0	0	0	0	0	0	148

YORK MINSTER SLAG LISTING (WEIGHT IN gms)

M:NO	CONTEXT	SMITH	HB	TAP	SMELT	SMELT?	HL	FAS	NONFER
* TOTAL ON SITE PG									
692	195	0	340	0	0	0	0	0	0
** Subtotal **									
		170	340	0	0	0	7	42	7
* TOTAL ON SITE PH									
749	700	0	0	0	0	0	0	14	0
703	701	0	0	0	0	0	0	0	7
724	701	35	0	0	0	0	0	0	0
2225	701	0	0	0	0	0	14	0	0
750	702	0	0	0	0	0	0	0	7
** Subtotal **									
		35	0	0	0	0	14	14	14
* TOTAL ON SITE PK									
867	67	7	0	0	0	0	0	0	0
886	257	92	0	0	0	0	0	0	0
** Subtotal **									
		99	0	0	0	0	0	0	0
* TOTAL ON SITE ST									
2170	0	219	0	0	0	0	0	0	0
** Subtotal **									
		219	0	0	0	0	0	0	0
* TOTAL ON SITE W									
2303	2	0	0	0	0	0	0	7	0
2135	4	0	0	0	0	0	0	0	57
** Subtotal **									
		0	0	0	0	0	0	7	57
* TOTAL ON SITE WC									
239	1	7	0	0	0	0	0	0	0
2037	8	156	0	0	0	0	0	0	0
** Subtotal **									
		163	0	0	0	0	0	0	0
* TOTAL ON SITE X									
1673	243	425	0	0	0	0	0	0	0
** Subtotal **									
		425	0	0	0	0	0	0	0
* TOTAL ON SITE XA									
1033	4	28	0	0	0	0	0	0	0
1043	4	255	0	0	0	0	0	0	0
1086	18	7	0	0	0	0	0	0	0
** Subtotal **									
		290	0	0	0	0	0	0	0

YORK MINSTER SLAG LISTING (WEIGHT IN gms)

M:NO	CONTEXT	SMITH	HB	TAP	SMELT	SMELT?	HL	FAS	NONFER
* TOTAL ON SITE XB									
2302	0	42	0	0	0	0	0	0	0
1016	1	156	0	0	0	0	0	0	0
1045	1	113	0	0	0	0	0	0	0
1046	1	695	0	0	0	0	0	0	0
2280	3	71	0	0	0	0	0	0	0
1219	7	0	0	7	0	0	0	0	0
1241	7	156	0	0	0	0	0	0	0
2196	12	0	0	28	0	0	0	0	0
1085	15	28	0	0	0	0	0	0	0
1246	19	177	0	0	0	0	0	0	0
1240	24	42	0	0	0	0	0	0	0
1758	24	0	0	0	0	0	0	14	0
2283	27	0	0	7	0	0	0	0	0
1226	28	0	0	0	0	0	0	7	0
1213	30	808	0	0	0	0	0	0	0
1263	30	0	0	0	0	0	28	0	0
1266	30	596	0	0	0	0	0	0	0
1269	30	14	0	0	0	0	0	0	0
1274	30	0	374	0	0	0	0	0	0
2089	30	489	0	0	0	0	0	0	0
2199	30	0	0	0	0	0	113	0	0
2209	30	0	0	7	0	0	0	0	0
2230	30	0	0	7	0	0	0	0	0
2248	30	0	0	7	0	0	0	0	0
1201	48	14	0	0	0	0	0	0	0
2216	58	0	0	0	0	0	14	0	0
1208	59	382	0	0	0	0	0	0	0
1249	59	35	0	0	0	0	0	0	0
1264	59	780	0	0	0	0	0	0	0
1272	59	170	0	0	0	0	0	0	0
1288	59	0	0	21	0	0	0	0	0
1292	59	28	0	0	0	0	0	0	0
1396	59	42	0	0	0	0	0	0	0
1415	59	28	0	0	0	0	0	0	0
1421	59	14	0	0	0	0	0	0	0
2227	59	0	0	0	0	7	0	0	0
2235	59	0	0	14	0	0	0	0	0
2249	59	0	0	7	0	0	0	0	0
2288	59	0	0	78	0	0	0	0	0
1279	63	0	0	0	0	0	0	28	0
1275	64	71	0	0	0	0	0	0	0
1207	65	78	0	0	0	0	0	0	0
1255	67	0	0	28	0	0	0	0	0
1280	67	149	0	0	0	0	0	0	0
2192	67	0	0	57	0	0	0	0	0
1291	71	99	0	0	0	0	0	0	0
2231	71	0	0	0	0	7	0	0	0
1395	72	0	0	0	0	0	0	7	0
1285	84	113	0	0	0	0	0	0	0
1394	84	42	0	0	0	0	0	0	0
1394	84	14	0	0	0	0	0	0	0
1400	84	92	0	0	0	0	0	0	0
1401	84	716	0	0	0	0	0	0	0
1402	84	0	0	127	0	0	0	0	0
1404	84	241	0	0	0	0	0	0	0
1412	84	2608	0	0	0	0	0	0	0
1413	84	170	0	0	0	0	0	0	0
1423	84	212	0	0	0	0	0	0	0
1428	84	1474	0	0	0	0	0	0	0

YORK MINSTER SLAG LISTING (WEIGHT IN gms)

M:NO	CONTEXT	SMITH	HB	TAP	SMELT	SMELT?	HL	FAS	NONFER
* TOTAL ON SITE XB									
1281	85	198	0	0	0	0	0	0	0
2215	86	0	0	14	0	0	0	0	0
1282	88	14	0	0	0	0	0	0	0
2237	95	0	0	14	0	0	0	0	0
1427	99	2041	0	0	0	0	0	0	0
1429	99	0	1559	0	0	0	0	0	0
2198	99	0	0	7	0	0	0	0	0
1411	106	71	0	0	0	0	0	0	0
2205	106	0	0	35	0	0	0	0	0
1410	110	113	0	0	0	0	0	0	0
1420	122	113	0	0	0	0	0	0	0
1464	126	2707	0	0	0	0	0	0	0
1447	168	475	0	0	0	0	0	0	0
1449	168	170	0	0	0	0	0	0	0
1454	168	1020	0	0	0	0	0	0	0
1757	182	42	0	0	0	0	0	0	0
2016	224	596	0	0	0	0	0	0	0
2015	237	0	0	0	0	0	0	14	0
2026	255	340	0	0	0	0	0	0	0
** Subtotal **									
		18859	1933	465	0	14	155	70	0
* TOTAL ON SITE XJ									
1327	93	0	0	0	0	0	0	7	0
1322	95	0	0	0	0	0	0	0	85
** Subtotal **									
		0	0	0	0	0	0	7	85
* TOTAL ON SITE XK									
1025	4	0	0	0	0	0	0	7	0
1103	51	0	0	0	0	0	0	0	142
1104	59	0	0	0	0	0	0	0	99
1300	101	113	0	0	0	0	0	0	0
1524	131	177	0	0	0	0	0	0	0
1388	143	0	0	0	0	0	71	0	0
1600	143	283	0	0	0	0	0	0	0
1637	145	0	96	0	0	0	0	0	0
1636	155	113	0	0	0	0	0	0	0
1640	159	525	0	0	0	0	0	0	0
1610	160	85	0	0	0	0	0	0	0
1612	161	191	0	0	0	0	0	0	0
1629	161	283	0	0	0	0	0	0	0
1616	162	35	0	0	0	0	0	0	0
2314	162	0	0	21	0	0	0	0	0
1632	174	177	0	0	0	0	0	0	0
1634	181	42	0	0	0	0	0	0	0
1611	183	0	0	0	0	28	0	0	0
1633	185	361	0	0	0	0	0	0	0
1631	186	241	0	0	0	0	0	0	0
1630	187	49	0	0	0	0	0	0	0
2187	187	113	0	0	0	0	0	0	0
2258	195	14	0	0	0	0	0	0	0
1624	196	1814	0	0	0	0	0	0	0
1622	197	319	0	0	0	0	0	0	0
1625	199	35	0	0	0	0	0	0	0
1639	200	0	290	0	0	0	0	0	0
2251	208	97	0	0	0	0	0	0	0

YORK MINSTER SLAG LISTING (WEIGHT IN gms)

M:NO	CONTEXT	SMITH	HB	TAP	SMELT	SMELT?	HL	FAS	NONFER
* TOTAL ON SITE XK									
1647	210	49	0	0	0	0	0	0	0
1674	242	511	0	0	0	0	0	0	0
1684	242	2892	0	0	0	0	0	0	0
1686	242	851	0	0	0	0	0	0	0
1691	242	3402	0	0	0	0	0	0	0
1784	242	1304	0	0	0	0	0	0	0
1692	246	652	0	0	0	0	0	0	0
1708	246	42	0	0	0	0	0	0	0
2197	246	0	0	0	0	0	7	0	0
2259	246	85	0	0	0	0	0	0	0
1687	250	113	0	0	0	0	0	0	0
1690	262	24834	0	0	0	0	0	0	0
1710	262	3402	0	0	0	0	0	0	0
1693	268	1460	0	0	0	0	0	0	0
1699	269	35	0	0	0	0	0	0	0
1711	281	617	0	0	0	0	0	0	0
1713	283	255	0	0	0	0	0	0	0
1712	284	496	0	0	0	0	0	0	0
1726	332	0	0	0	0	0	0	0	85
1725	336	0	0	0	0	0	0	0	134
1730	336	0	0	0	0	0	0	0	35
1732	343	0	0	0	0	0	14	0	0
** Subtotal **		46067	386	21	0	28	92	7	495
* TOTAL ON SITE XL									
1007	1	28	0	0	0	0	0	0	0
1054	2	0	0	0	0	0	0	0	21
1325	40	71	0	0	0	0	0	0	0
1353	40	0	0	0	0	0	28	0	0
1387	73	0	0	0	0	0	0	28	0
1605	83	0	0	0	0	0	0	454	0
1867	83	0	0	0	0	0	0	14	0
1627	104	0	0	0	0	0	0	57	0
1656	104	0	0	0	0	0	0	49	0
** Subtotal **		99	0	0	0	0	28	602	21
* TOTAL ON SITE YM									
2218	71	0	0	0	0	0	0	14	0
** Subtotal **		0	0	0	0	0	0	14	0
** Total **		70945	3467	691	92	49	1118	1088	4566

