

Southampton French Quarter 1382

Specialist Report Download F9: Metalworking - the iron slag and related debris

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Methodology and quantification

A small to medium assemblage (almost 18kgs) of material described as slag was retrieved by hand and by soil sampling during excavation. The slag was examined by eye and categorised on the basis of morphology. Each slag or other material type in each context was weighed; smithing hearth bottoms were individually weighed and measured to obtain statistical information. Quantification data are given in Table 1 below in which weight (wt.) is shown in grams, and length (len.), breadth (br.) and depth (dep.) in millimetres; statistical data for the smithing hearth bottoms is given in Table 3.

Table 1: Quantification table of iron slag and related debris

Cxt	^	Identification	wt	len	br	dep	Comment
76		smithing hearth bottom	1894	170	170	60	in med. pot used as fuel container
106		smithing hearth bottom	304	100	65	40	incomplete
106		smithing hearth bottom	140	90	60	30	incomplete
106		smithing hearth bottom	98	65	60	25	
106		smithing hearth bottom	422	110	105	40	
106		undiagnostic	80				
175		undiagnostic	179				
175		vitified hearth lining	15				
185	24	vitified hearth lining	25				
208	6	smithing hearth bottom	1151			45	fragments
208		cinder	11				
208		smithing hearth bottom	439	95	85	35	
208		undiagnostic	69				
209	7	undiagnostic	30				
217		undiagnostic	7				
258	4	cinder	18				
265		cinder	89				
267		undiagnostic	96				large burnt-out charcoal inclusions
267		undiagnostic	30				
267		vitified hearth lining	9				
275		vitified hearth lining	29				
278		smithing hearth bottom	297	90	80	30	
278		smithing hearth bottom	465	90	80	70	
278		undiagnostic	21				with charcoal
278		undiagnostic	125				
288		undiagnostic	476				
288		undiagnostic	164		95	45	poss. part of smithing hearth bottom
288		vitified hearth lining	39				
301		undiagnostic	26				

Cxt	^	Identification	wt	len	br	dep	Comment
493	11	undiagnostic	58				
497	12	fuel ash slag	3				
502	14	undiagnostic	18				
625		vitriified hearth lining	7				
650		cinder	8				
650		smithing hearth bottom	91	70	45+	30	
650		undiagnostic	72				
720		smithing hearth bottom	602	130	65	55	incomplete
776		undiagnostic	96	65	40	25	like small smithing hearth bottom
846		undiagnostic	91				with Cu inclusions
858		vitriified hearth lining	9				
896		iron	46				
939		vitriified hearth lining	263				
940		vitriified hearth lining	44				
1037		cinder	19				
1037		ferruginous concretion	8				
1077		undiagnostic	77				
1105	40	undiagnostic	20				
1112		undiagnostic	47				
1180		burnt coal	16				
1284		smithing hearth bottom	254	85	60	40	
1326		iron	54				
1362		iron	41				
1362		undiagnostic	21				with burnt charcoal
3185	51	microslag splash	1				
3189	107	cinder	29				
3189		coal	3				
3189		ferruginous concretion	14				
3189		smithing hearth bottom	476	100	90	40	
3189		smithing hearth bottom	555	140	140	55	
3189		smithing hearth bottom	771	165	80	60	slightly elongated
3189		undiagnostic	63				
3284		iron	20				
3284		smithing hearth bottom	157	90	0	40	half
3456	122	ferruginous concretion	16				
3640	108	undiagnostic	22				
3641	109	undiagnostic	4				
3641		burnt coal	2				
3647		burnt coal	3				
3829		ferruginous concretion	4				
4093		undiagnostic	171				
4123		undiagnostic	402				with run slag on top
4128		undiagnostic	63				
4305		undiagnostic	173				probably smithing slag
4499		vitriified hearth lining	28				
4504		cinder	50				
4504		smithing hearth bottom	295	95	70	35	
4504		vitriified hearth lining	39				
4574	145	ferruginous concretion	49				
4710		undiagnostic	47				

Cxt	^	Identification	wt	len	br	dep	Comment
4813		iron-rich undiagnostic	45				charcoal inclusions
4813		smithing hearth bottom	542	120	95	50	
4817	150	sample	4				tiny iron pieces and cinder
5092	69	fuel ash slag	17				
5105		undiagnostic	1				
5148	61	cinder	0				a large sphere
5165		smithing hearth bottom	556	130	80	55	
5233	83	undiagnostic	7				
5238	98	vitified hearth lining	8				
5252	92	smithing hearth bottom	81		70	20	fragment
5254		fuel ash slag	10				
6042		burnt coal	6				
6054		undiagnostic	122				
6173		iron	41				
6390		ferruginous concretion	27				and fired clay
6438		nail	22				
6438		undiagnostic	49				
6504		cinder	17				
6844		iron	70				slagged with nail inclusion
6872		smithing hearth bottom	196	75	75	35	
6872		undiagnostic	82				
7022		vitified hearth lining	35				
7116		cess	19				
7188		undiagnostic	86				
7207		smithing hearth bottom	352			40	incomplete
7207		vitified hearth lining	39				
7220	164	cinder	3				
7220		undiagnostic	164				
7221	163	undiagnostic	3				
7255		undiagnostic	213				
7257		cinder	29				
7257		smithing hearth bottom	748	140	110	55	
7257		undiagnostic	307				pieces of smithing hearth bottoms?
7336	167	cinder	49				
7337	168	undiagnostic	15				
7337		fuel ash slag	1				
7388	169	cinder	5				
7388	169	undiagnostic	14				
7396		burnt coal	64				
7396		slagged coal	39				
7396		vitified hearth lining	6				
7424		smithing hearth bottom	125	75	65	35	
7424		undiagnostic	74				
7434		cinder	13				
7434		iron-rich undiagnostic	15				
7434		smithing hearth bottom	295	100	70	40	
7434		undiagnostic	81	81			
7579	179	undiagnostic	23				
7689		vitified hearth lining	4				
8042	183	smithing hearth bottom	100	70	60	20	

Cxt	^	Identification	wt	len	br	dep	Comment
8042	183	undiagnostic	208				
8083	186	cinder	10				
8091		undiagnostic	34				
8113		undiagnostic	16				
8131	187	cinder	7				
8131	187	iron	9				
8135	188	undiagnostic	12				
8176		cinder	4				
8176		undiagnostic	78				
8229	81	vitrified hearth lining	41				
8248	198	undiagnostic	8				
8279		fired clay	408				and coal; very light

Explanation of terminology and discussion of the slag

Although some of the assemblage was described as smelting slag at assessment, the entire slag assemblage, based on the diagnostic slag types present, was produced by smithing: hot working, using a hammer, of one or more pieces of iron to create or repair an object. As well as bulk slags, including the smithing hearth bottom, this activity generates micro-slags: hammerscale flakes from ordinary hot working of a piece of iron (making or repairing an object) or tiny spheres from high temperature welding to join or fuse two pieces of iron. No diagnostic smelting slags were present in the assemblage but neither were any hammerscale flakes or spheres.

Much of the slag assemblage was, however, undiagnostic, i.e. could not be assigned to either smelting or smithing either because of its morphology or because it had been broken up during deposition, re-deposition or excavation. Other types of debris in the assemblage may be the result of a variety of high temperature activities - including domestic fires - and cannot be taken on their own to indicate iron-working was taking place. These include fuel ash slag, fired clay, vitrified hearth lining and cinder (the inner portion of vitrified hearth lining closest to the fire).

Table 2: Slag types /(total wt. in g.)

smithing hearth bottom	10635
iron-rich undiagnostic	60
undiagnostic	5116
ferruginous concretion	118
fuel ash slag	31
vitrified hearth lining	640
cinder	361

The slag type described as 'smithing hearth bottom' is a plano-convex shaped slag formed as a result of high temperature reactions between the iron, iron-scale and silica from either a clay furnace lining or the silica flux used by the smith. The iron silicate material from this reaction dripped down into the hearth base forming slag which, if not cleared out, developed into the smithing hearth bottom. Before it could grow large enough to block the tuyere hole (where the air from a bellows entered the hearth) the smithing hearth bottom was removed and dumped in the nearest pit, ditch or unused area. The tenements with most smithing hearth bottoms were 173 (six examples), 172 (five examples), 237 and 239 (three examples each).

The tiny hammerscale produced by smithing would remain in greatest quantity around the anvil and between it and the hearth. Despite smithing hearth bottoms being found some pits and cut features, no

hammerscale was present in the assemblage. Its absence may indicate smithing did not take place on the site, which is probably the case; or it could be that floor or occupation layers where it might have remained were not sampled. It seems highly likely that most of the smithing hearth bottoms are re-deposited from elsewhere but if any smithing, such as repair of horseshoes or some other small-scale activity, did take place on site it was a one-off or very occasional activity which left very little trace. An example of the kind of small-scale activity that could have taken place is evidenced by one of the best preserved and largest smithing hearth bottoms, recovered from context (76). A STS/STCW (AD1250-1350) cooking pot had been used to hold fuel and the fire for a smithing operation: i.e. the pot was used as a smithing hearth. The slag produced during the operation had dripped down into, and been left in, the vessel which later suffered re-deposition, causing the parts not adhering to the slag to be broken off and scattered.

Table 3: Statistical data for smithing hearth bottoms (25 examples):

	range (g/mm)	aver.	std. dev.
weight	81 - 1894	425	393
length	65 - 170	101	27
breadth	45 - 170	82	29
depth	20 - 60	41	12

Discussion of the assemblage by phase and tenement

Late Saxon and Anglo-Norman

During the Late Saxon period there was already a very small quantity of residual slag in the area but in the Anglo-Norman period slag begins to appear in pits of some tenements. Pit 210 (fills 208, 209 and 258) in Tenement 173 contained two smithing hearth bottoms and a small quantity of undiagnostic slag. Pits in Tenements 237 and 239 also contained slag: a small amount in pit 4614 (one smithing hearth bottom) and a larger quantity in pits 7256, 7423 and 7425 (a total of three smithing hearth bottoms, undiagnostic slag and some cinder).

Early Medieval

Pit 105 in Tenement 172 contained four smithing hearth bottoms, some undiagnostic slag and vitrified hearth lining. Pit 287 contained a quantity of slag, which may be part of a smithing hearth bottom.

High Medieval

Pit 7242 contained small quantities of undiagnostic slag, cinder and fuel ash slag. Tenement 173 had one smithing hearth bottom (in pit 104), three in linear feature 279, one in pit 651 and small amounts of undiagnostic iron slag in these and other features.

Post-Medieval

Small quantities of slag may well be re-deposited earlier material. Pit 3188 in Tenement 237 contains two normal-shaped smithing hearth bottoms, a rather elongated example and a small amount of undiagnostic slag which may have been in the area during that period; in the same property, tank 3549 also contained undiagnostic slag.