GeoArch

Report 2013/03

Metalwork and archaeometallurgical residues, Vulcan House, Merthyr Tydfil

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30th January 2013

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Abstract

This report covers approximately 106 items of metalwork (ferrous and non-ferrous), together with a small number of pieces and samples of industrial residues from Vulcan House, Merthyr Tydfil.

The metalwork includes a large number (constituting approximately half the assemblage) of wrought iron bars, mainly in short lengths, some with a forged loop at one end and some with one or more right-angle bends. The abundance of these various bars suggests that they had a structural role in the former buildings. There was a striking lack of fasteners (nails, bolts etc.) compared with assemblages from comparable sites.

The assemblage included a small collection of blacksmith's tools – including cold chisels, a handled punch, a file and part of a smith's tongs.

The non-ferrous artefacts were dominated by items of domestic character, including a gas tap (from a gas light or similar), a copper alloy decorated iron tube that was probably part of bedstead, two gilded mounts, perhaps from furniture and a furniture drawer handle.

The metalwork collection also included a small number of pieces of metal as process waste, including a small flow of cast iron, some corroded copper alloy waste or dross, a fragment of lead and fragments of a problematic mineralised bronze bowl that might be a metallic skin from the inside of the base of a crucible rather than being a corroded artefact.

The industrial waste assemblage was very small, but included several pieces of a black glassy slag typical of slag tapped from a foundry cupola iron melting furnace. One glassy slag fragment was in a penannular form, and had probably solidified around a tool. Other residues were various forms of clinker from the use of a coal fuel, but which were of indeterminate origin. The micro-residue assemblages were not of hammerscale, but of fine fuel ash (clinker) spheroids in ash.

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Methods

All materials were examined visually with a low-powered binocular microscope where required. A selection of the non-ferrous metalwork was analysed on a purely qualitative basis using a Bruker Tracer III-SD portable X-ray fluorescence spectrometer belonging to Cardiff University and the National Museum Wales. The instrument was operated at 40Kv and 7.9µA with the Bruker 'yellow' filter (300 µm Al; 25 µm Ti).

The summary catalogue of examined material from the metalwork collection is given in Table 1 by stratigraphic context and that of the residue collection in Table 2. The metalwork assemblage is also listed in Table 3, sorted by artefact type; this table provides the basis for the assigned catalogue numbers. All items in the catalogue are of wrought iron unless otherwise stated. This project was undertaken for Charley James of the Glamorgan-Gwent Archaeological Trust.

Metalwork

Results

The assemblage is small and is mainly derived from broad and poorly dated contexts. The metalwork includes a wide variety of materials, ranging from items that may have been structural (bars, spikes, loops) to tools (tongs, file, chisels, punch) and furnishings (decorative mounts, a gas tap).

Wrought iron bars and wire (Cat. Nos 1 - 59)

Fifty nine items were formed of wrought iron bar or wire. Some of these items were plain – and these were dominantly short lengths of either round- or rectangular-sectioned bar. A large proportion (thirteen examples) of the bar fragments had been forged to include either one or two right-angled folds. Most of the examples of these 'bent bars' from (111) were formed of 8-10mm bar (round or square), whereas only one of those from (119) was so slight, the other three were 12 or 14mm bars.

Seven bars (or bar fragments) had been forged to end in a loop. In most cases these loops were asymmetrical, lying mainly to one side of the rest of the bar. The majority (five) of these looped bars were from context (109). These examples had internal diameters for the loop of 30-45mm. One example from (119) has internal diameter of just 18mm and unstratified example from building 'E' had an internal diameter of 60mm.

One square-sectioned bar (Cat. No. 59) had been forged down at one end to a perforated flat section on the diagonal of the bar (the other end was probably missing). This is most likely to be a bracing strut or a window bar.

Fastenings (Cat. Nos 60 - 83)

The collection includes only a very small number of bolts, spikes, nails, washers and rivets. Most of these are not particularly noteworthy, but two short lengths of 7mm square-sectioned wooden batten from (109) had been attached with 20mm copper-alloy tacks (Cat. Nos 71, 72). These items were probably from a window.

Context (111) produced a single example of a small, but stout, copper alloy rivet with a washer (Cat. No. 83). The rivet was overall 10mm long, with a 12mm diameter head, a slightly oblique shaft c.4mm diameter with widened struck tip. The attached washer was 16mm outside diameter and 6mm internal diameter and 1mm thick.

Tools (Cat. Nos 84-88)

The collection included five examples of metalworking tools, all compatible with use a blacksmith.

Context (111) produced two cold chisels (Cat. Nos 84,85). Both had octagonal-sectioned shafts. One had a section of 30mm x 26mm (Cat. No. 84), the other 26mm x 20mm (Cat. No. 85). The larger chisel narrowed to a blade 30mm wide, the smaller to a blade 28mm wide. Both examples showed burred heads.

The same context also yielded part of one arm of a pair of metalworking tongs (Cat. No. 87). The arm was straight and parallel to the face of the jaw. The jaw face was 30mm long. The surviving part of the handle was 130mm long and formed of 12mm round bar.

Context (111) also yielded a 95mm long stout punch (Cat. No. 88), with a diameter of 35mm (burred to 40mm on the head) and tapering to a stout point. The short length of this punch indicates it would have been a handled tool – probably mounted on iron rod.

A stout flat file (Cat. No. 86), 360mm long including a 60mm tang, with a 36mm x 9mm section near tang and 26mm x 7mm distally, came from context (119). The teeth were moderately fine, at c.1mm spacing.

Footwear (Cat. Nos 89)

Clothing was represented by a single heel iron from an adult shoe or boot (Cat. No. 89).

Miscellaneous non-ferrous artefacts (Cat. Nos 90-98)

A leaded brass 'T'-shaped tap barrel (Cat. No. 90) is from an early gas tap.

A copper-alloy clip, comprising a nail-like shaft extending into a perpendicular clip with a semi-circular cross section (Cat. No. 91), is of unknown purpose.

Two pressed metal mounts (Cat. Nos. 92 and 93) both showed evidence of gilding. XRF analysis also revealed trace levels of mercury, suggesting that these items were produced by fire gilding, rather than the electroplating that became very popular in the Victorian period. The larger, dagger shaped piece (Cat. No. 92) is of copper. The front is heavily contaminated by lead, as well as being gilded, but the significance of this is uncertain. The smaller mount has a central hole, probably to accept a mounting screw. This mount is made of a slightly leaded brass.

A slightly deformed composite object (Cat. Nos. 94) comprises a thin copper-alloy moulding, formed in two pieces and applied onto a central iron tube. The moulding is symmetrical. The tube is substantial and is interpreted as probably being part of a bed frame.

A slightly deformed copper-alloy handle (Cat. Nos. 95) would be from a furniture drawer.

Three more indeterminate copper-alloy objects (Cat. Nos. 96-98) might also be associated with furniture fittings. Item 98 is deformed and irregular, so is possibly an unfinished piece.

Pipes (Cat. Nos 99-100)

Piping was represented by a short length of wrought iron pipe (Cat. No. 99) and a small fragment of cast iron pipe or gutter (Cat. No. 100).

Miscellaneous ferrous artefacts (Cat. Nos 101-102)

Cat. No. 101 is a triangular prismatic iron block with a central hole, of unknown purpose. Cat. No. 102 is a small fractured block of cast iron.

Waste metal and associated materials (Cat. Nos 103-106)

The collection included small pieces of waste lead (Cat. No. 103), some spilt copper-alloy (analysed as being gunmetal; Cat. No. 104) and a small spill of cast iron (Cat. No. 105). These probably all attest to foundry activity.

Rather less certain is the fragmented bowl-shaped object (Cat. No. 106) formed of highly corroded leaded

bronze. This could simply be a highly corroded, and deformed, small bowl-shaped object, or it could be a metallic or dross crust that has spalled from the interior of a crucible.

Discussion

Half of the metalwork assemblage comprises various forms of iron bar, divided equally between round and square/flat sections. Many of the bars either have a forged loop on one end, or have one or more right-angled forged bends. None of these bars is particularly diagnostic of purpose. It is possible that some of the bar fragments are offcuts from metalworking, but it likely that the fashioned examples had a structural purpose, perhaps, in the case of the bent bars, as structural ties or, in the case of the looped bars, to act as supports for piping.

The group of smith's tools is interesting, but it is unclear whether these relate to smithing for finishing or fabricating during use of the site as a foundry, or are of rather later date, when the site had more general engineering uses.

The domestic items formed of various copper alloys form an interesting group. The pressed metal mounts with gilded finishes are unusual finds. The Victorian appetite for gilded items was fed by the development of electroplating, but these two items both show trace levels of mercury, so were probably fire gilded, not electroplated. The two items have different base metal compositions. On balance it would seem likely that these are not products of the foundry. They may both have been used as applied details on furniture.

Other furniture-associated items include a fragment of an iron bedstead with copper alloy decorative details and a copper alloy drawer handle. It is unclear why these apparently domestic items are present in an industrial context.

Direct evidence for the iron foundry phase (apart from the slag described below) is present only as a small flow of cast iron from c136 (a drain-fill, which also yielded a slag fragment broken from a tool, see below). The casting of non-ferrous metals is demonstrated by just one small fragment of corroded spill of gunmetal (a quaternary alloy of copper, zinc, lead and tin), together with a fragmentary 'bowl' of highly mineralised bronze (copper-tin alloy) that may just be waste from inside a crucible rather than a corroded artefact.

The ferrous items were almost all formed of wrought iron, with just a few items probably of steel. The relative lack of bulk steel items would favour an earlier date for much of the assemblage (19th – early 20th century, rather than mid-late 20th century).

Industrial/archaeometallurgical residues

Archaeometallurgical process residues included small quantities of cupola slag, prills of cast iron and lead, together with copper alloy casting waste.

Description

Dark, almost black, glassy slags were recovered from contexts (102), (111) and (130). The piece from (130) shows discrete cooling lobes within a thin sheet, which has a prilly base with fuel impressions. These characteristics are strongly suggestive of these slags being tapped cupola slags from a foundry. One large piece from (111) probably contains a substantial inclusion of cast iron.
Drain fill (136) produced (besides the cast iron spill described above) a fragment of glassy slag that had chilled around a circular cross-sectioned tool. Slag commonly attaches to a tool used for 'rodding' the tap-holes of the cupola furnace.

Other macroscopic residues from (111) and unstratified from Building 'E' are low density clinkers from the burning of coal. They are not diagnostic of process and are not necessarily metallurgical.

The fine-grained bulk residues from (117) and (120) were not hammerscale, but were dominated by pale spherules generated by coal-burning. These too are not diagnostic of process.

Discussion

The residue assemblage is very small, but provides some limited evidence for some of the processes being undertaken on the site.

The glassy slags are typical of those from a cupola furnace for iron melting in a foundry. Cupola slags have not been described fully in the archaeometallurgical literature, but comparison with material from the Govan and Scotland Street foundries in Glasgow (Young 2011) would suggest that the Vulcan House slags are from a cupola that was fluxed with limestone.

Small quantities of probable waste materials suggest that the foundry was also working in non-ferrous materials. The fragment of copper alloy waste (Cat. No. 104) was analysed as being gunmetal. This is a general purpose casting metal for typical small artefacts. The bowl shaped object was of a leaded tin bronze. The working of copper alloys is not evidenced by any of the slaggy residues.

The various clinkers, both micro- and macro-scopic, document the use of coal as fuel in high temperature processes, but need not be of metallurgical origin. There was no certain evidence from any of the residues for the smithing activity suggested by the smith's tools from the site.

References

YOUNG, T.P . 2011. Archaeometallurgical residues and associated materials from the M74 Completion, Glasgow. *GeoArch Report 2010/22*, 274 pp.

Table 1: Summary catalogue of items in metalwork collection by context. Items are of wrought iron unless otherwise stated.

Item # (Table 3)	context	notes	Qualitative XRF analysis
53	109	330mm long, 20mm diameter round bar forged into loop 30mm i/d at one end and with trace of coarse thread at the other. Not clear if this is a broken bolt; the tapering of the threaded section suggests it might be the remains of a screw	
16	109	irregular bar, 190mm long, up to 14mmx7mm in centre but tapers off both ends	
17	109	33mm square bar, 109mm long	
60	109	85mm long bolt fragment, 20mmx20mmx10mm head, shaft too corroded to measure	
54	109	10mmx10mm bar, folded and welded back on its self to form rectangular loop with 45mmx10mm rectangular slot at right angles to bar	
55	109	overall 135mmx70mmx55mm, bar forged into asymmetric loop 35mm i/d, and right angle. Bar 15mmx15mm beyond right angle but narrower where drawn into loop. Thick end of bar forms a 70mm arm, which is probably broken	
18	109	10mmx10mm bar, narrowing down to chisel end - unclear if this is a worked bar remnant or a spike tip	
56	109	180mm long looped spike, 8mm round bar, possibly steel, formed into asymmetric loop, roughly 45x32mm internally	
19	109	180mm long, 12mm square bar fragment	
52	109	145mm long, 18mm round bar forged into loop end with 45mm i/d, 80mm long shaft section has broken end	
103	109	40mmx30mmx5mm irregular piece of lead	
104	109	27mmx17mmx6mm irregular lump of Cu-alloy or dross, probably casting waste	quaternary Cu-Zn-Sn-Pb alloy - loosely gunmetal
90	109	copper alloy tap, 'T'-shaped head 27mm wide and 2mm thick on tapering barrel 27mm long with lower ring on join. Barrel tappers from 12mm to 8mm diameter, foot has 6mm square fitting with 4.5 mm diameter central hole, shaft pierced by 4mm hole, 13mm above base. Gas tap.	leaded brass
71, 72	109	two pieces of 7mm square wood , one with one-, the other two- Cu-alloy tacks, 20mm long. Each piece 60-65mm long	
97	109	Cu-alloy rod, curved, tapers from 8-6mm across becoming slightly angular (square) as it does so	
98	109	folded Cu-alloy sheet, one side rounded and irregularly lobate , the other side is thickened and serrated. Has perforation through rounded end lobe. This piece appears imperfect and might be manufacturing waste	
61	111	long wrought iron bolt, 357mm long, 29mm square head , 12mm thick - appears to be added as welded component, 14mm diameter, approximately 75mmis threaded	
59	111	14mm square bar, forged down to 25mm wide flat on diagonal at one end - probably pieced, overall length, 22mm preserved, 235mm long overall. Strut or window bar	
1	111	100mm length of 25mm round bar, corroded and accreted	
20	111	2.5mmx2.5mm bar, 170mm long object, with bar folded back 50mm at 30mm away from main part, round fold	
63	111	21mm diameter bar, 295 mm long, sharp spike one end, probably burred the other	
84	111	chisel, 30x26mm just below burred head, probably octagonal, narrows to edge 30mm wide with rectangular section (but badly corroded)	
21	111	20mmx19mm bar, 280mm long, probably not original length, one end thickens to 22mmx20mm for 11mm	
37	111	5mmx5mm bar, 217mm long with two bends in opposite directions, 150mm centre section, ends 35mm and 60mm long	

Item # (Table 3)	context	notes	Qualitative XRF analysis
85	111	chisel, 26mm x 20mm below burred head, probably octagonal, narrows via rectangular section to edge 28mm wide	
22	111	wedge, 195x32x12 at widest, probably not a true head, but broken off on a righ- angled fold	
23	111	300mm x 50mm x 6mm iron bar	
24	111	206mm x 85mm x 3mm iron plate	
25	111	100mm x 15mmx 10mm highly accreted and broken bar fragment	
26	111	335mm long, flat bar, section 21x5.5mm, 250mm surviving length, corroded, then gently bent up and forged down to a 10mm diameter section 70mm long with slight expansion at tip to 15x13mm	
64	111	230mm long, 22x24mm sectioned bar, slightly burred at one end, other narrows, corroded so form uncertain, but probably narrowing to square spike rather than chisel, tip missing	
38	111	10mm round bar in right angle with 80mm and 130mm lengths either side	
27	111	70mmx2mm iron strip pierced by 80mm long stout chisel like nail with c. 10mm square head	
28	111	207mm x 14mm x 14mm bar	
29	111	30mm square bar, 115mm long, broken fragment	
81	111	23/8mm washer 2.5mm thick	
	111	small concretion probably cored on iron, rich in coal dust	
13	111	possible nail shaft/wire fragment with small concretion probably forming a continuation of the same piece	
	111	small prill of dark glassy slag	
87	111	part of one arm of a pair of metalworking tongs, arm straight and parallel to face of jaw, eye to tip of broken handle 130mm, eye to start of jaw 13mm, jaw 30mm long, handle 12mm diameter	
88	111	95mm long stout punch, 35mm diameter at top. burred to 40mm, comes to point. Probably would have been a wire-mounted top tool	
65	111	140mm long 10mm diameter, probably steel, spike,	
89	111	70mm long x 75mm wide heel iron	
39	111	c8mm square bar, forged through right angle, then to hook, 70mm straight, 120mm hook, which is 45 mm wide and returns 20mm	
73	111	170mm iron rod, corroded, but probably nail bent through 80 degrees	
69	111	55mm surviving of clout nail with 6mm square shaft and 20mm round head	
74	111	90mm long tapering square nail shank	
40	111	105mm length of 8mm bar with right-angled bend	
41	111	160mm length of c. 6mm square bar, bent in right angle, very corroded	
42	111	90mm of 8mm round bar, bent in right angles	
43	111	230mm of 10mm square bar bent through two right angles in 'dog leg'	
2	111	110mm length of iron with 10x20mm oval section and oblique head	
44	111	210mm length of 8mm square bar, forged through right angle in centre	
45	111	180mm of 8mm probably round bar, forged with two right angles, but unlike other examples these lie not in the same plane but at 120 degrees	

Item # (Table 3)	context	notes	Qualitative XRF analysis
30	111	190mm of 8mm square bar	
31	111	160mm of bar with parallelogram section, 14mm x 10mm	
3	111	210mm of 14mm round bar	
75	111	40mm length of 4mm square rod - nail shank?	
83	111	copper alloy rivet and washer, rivet 12mm head, now overall 10mm long, shaft slightly oblique with widened struck tip, shaft c.4mm diameter, washer 16/6mm x 1mm	
91	111	copper alloy clip, has nail-like spike 25mm long x 3.5mm diameter, coming to stubby point over 4mm, passing via just over right angle bend into curved (deformed?) section 35mm long of approximately 5mm semi-circular cross-section, rounded tip	
106	111	four fragments of bowl-like form, largely dense cuprite (?) layers with green corrosion products between the layers and in botryoidal growth on surface. Thickens slightly into 'rim'. Pieces could either be extremely highly corroded Cu-alloy vessel of perhaps 40mm radius, or, perhaps more likely, this is the dross layer formed on the inside of a crucible	leaded bronze
92	111	dagger-shaped gilt object, 160mm long, widens gently from 20mm to 56mm wide, then narrows back to 20mm, has raised central concavo-convex rib, probably a decorative strip or binding	copper, lead and gold on front, trace mercury; plain copper to rear
99	119	450mm length of bent iron pipe, ends clenched , 26mm o/d, 22mm i/d	
32	119	260mm x 40mm x 12mm bar, round ends, each with 22mm diameter hole with centre 30mm from end, one end badly decayed	
86	119	file, stout and flat, 360mm long including 60mm tang, 36mmx9mm near tang, 26x7mm distally, teeth c1mm spacing	
46	119	37mm x 12mm bar, folded into rectangular 'U', 190mm wide, 75mm tall	
66	119	605mm long spike, 30mm x 30mm section tapering to point, top burred into rounded shape	
33	119	600mm bar, 19mm x 19mm, one end slightly burred or enlarged	
34	119	72mm x 16mm bar, 605mm long	
47	119	14mm x 14mm bar, 380mm long, with right angle bend to give 310mm long side, short end possibly reduced at tip to about half the section	
35	119	390mm bar, 65mm x 18mm, 19mm hole, centre 142mm from one end	
36	119	215mm long bar, 32mm x 6mm, very corroded	
4	119	300mm long , 15mm diameter bar	
48	119	14mm square bar, 360mm long, right angle to give 100mm short side, long side corroded away at 275mm	
101	119	100mm square based prism, 50mm tall, 32mm diameter hole through centre	
49	119	20mm x 10mm bar, 390mm long, one end forged into asymmetrical hooked head, the other either broken at a fold, or narrowing to a chisel edge	
100	119	150mm long fragment from c.60mm diameter cast iron pipe or gutter	
57	119	8mm diameter rod forged into asymmetric loop 18mm i/d, overall length of loop and rod 230mm	
5	119	110mm of 12mm diameter rod, one end corroded away	
6	119	190mm of 12mm diameter rod, one end corroded away	
50	119	12mm rod bent into z shape, 110mm of rod	

Item # (Table 3)	context	notes	Qualitative XRF analysis
7	119	270mm of 12mm round, slightly bent, one end slight burred	
102	119	30mm x 19mm x 90mm block of cast iron	
8	119	70mm length of very corroded 12mm diameter rod	
9	119	155mm of 5mm round bar	
10	119	320mm length of 10mm round bar, locally reducing to 4mm - probably just the effect of corrosion, but might be real	
11	119	250mm of 6mm round rod	
51	119	280mm remaining of 8mm round bar forged through right angle and probably a second, 110mm preserved, 200mm central straight, 30mm after second fold/hook	
14	119	125mm iron wire	
93	119	Y-shaped small decorative stamped strip with scroll-like decoration and central mounting hole, shows good fresh metal	brass with low lead, some gold but only trace mercury
105	136	small 65mm x 45mm x 7mm irregular spill of cast iron	
	136	piece of slag? Spalled from c22mm diameter round tool	
76	136	nail fragment	
77	136	nail fragment	
78	136	nail fragment	
	136	concretion - very small	
16	136	concreted piece of thin iron wire, 35mm long x 3mm diameter - just possibly a small nail	
79	136	43mm corroded nail - possibly widening into slight thickening at end, suggesting wood nail	
70	136	43mm long corroded iron clout nail, thin shaft, circular head 12mm x 10mm	
12	no label	80mm length of 8mm round rod - possibly steel?	
94	u/s	ornate copper alloy casting with seam, on central iron pipe, 32mm o/d 17mm i/d, overall , has central ring with groove either side, then three rows of slightly scrolled moulding, 80mm x 62mm maximum section, widest in plane of seam, some scroll elements slightly squashed (or possibly misformed)	
67	u/s	disc headed spike, 20mmx4mm maximum spike section, 103mm long, head pointed oval overlapping spike, 22mm x 22mm protruding, with 6mm hole	
	u/s	concretion with 7mm square-sectioned object inside	
80	u/s	86mm long nail, maximum shank 7mm x 5mm, head 12mm x 17mm rounded	
58	u/s building E	213mm long, fragment of round bar formed into open loop, 90mm x 82mm outside loop, 57mm x 62mm internally, transverse, bar flattened just below loop then round again before break, shaft part 130mm long	
95	u/s building E	80mm x 45mm, originally 100mm x 45mm, copper alloy handle, spindles 5mm long x 4mm diameter, 11mm deep by 9mm thick maximum central profile, thinning to c.5mm diameter for lateral S bends	
68	u/s building E	24mm square by 10mm thick square head on shaft 100mm long, possibly showing narrowing at tip so possibly a spike rather than a bolt	

Item # (Table 3)	context	notes	Qualitative XRF analysis
96	u/s building E	160mm, 11mm wide Cu-alloy strip, has slightly off-centre raised ridge, one downturned edge, then narrow groove and upturned edge, bent and broken in two	
82	u/s tramroad	36/13mm x 2mm washer	
62	u/s tramroad	nut and bolt, 20mm square head, 6mm thick, c.10mm diameter shaft, 18mm a/f hex nut 8mm thick, 56mm long overall	

Table 2: Summary catalogue of items in industrial residues collection

context	*Sample*	*notes*
102	*019	concretionary material rich in coal dust. Also contains variety of slag types - including medium sized blebs and large angular fragments of dark glassy slag
111		three small angular fragments of slightly vesicular black glassy slag- probably cupola slag
111		c. 5 pieces of irregular concretion rich in coal dust, sand clinker, ironstone and wood, 4 pieces of black glassy cupola slag (largest piece very dense and exploding so probably contains significant iron lump), 3 large fragments of low density clinker.
117	*007	bag of fine dark residue, largely coal residue, with abundant small pale spherules
120	*006	dark spherule-rich residue with wood remains
130		dark glassy slag in moderately sized flow lobes, lobes show locally vesicular tops, base shows prilly ?fuel contact. Probably a tapped cupola slag
u/s building E		1 irregular concretion on iron bar with wood, ceramic coal residue etc., 2 pieces of bloated coal shale residues, 2 pieces of low density clinker

Table 3: Itemised metalwork catalogue, organised by artefact type. Items are of wrought iron unless otherwise stated.

Item #	*context*	*notes*	*Qualitative XRF analysis*
		round bar	
1	111	100mm length of 25mm round bar, corroded and accreted	
2	111	110mm length of iron with 10x20mm oval section and oblique head	
3	111	210mm of 14mm round bar	
4	119	300mm long , 15mm diameter bar	
5	119	110mm of 12mm diameter rod, one end corroded away	
6	119	190mm of 12mm diameter rod, one end corroded away	
7	119	270mm of 12mm round, slightly bent, one end slight burred	
8	119	70mm length of very corroded 12mm diameter rod	
9	119	155mm of 5mm round bar	
10	119	320mm length of 10mm round bar, locally reducing to 4mm - probably just the effect of corrosion, but might be real	
11	119	250mm of 6mm round rod	
12	no label	80mm length of 8mm round rod - possibly steel?	
		wire	
13	111	possible nail shaft/wire fragment with small concretion probably forming a continuation of the same piece	
14	119	125mm iron wire	
15	136	concreted piece of thin iron wire, 35mm long x 3mm diameter - just possibly a small nail	
		Flat/square bar	
16	109	irregular bar, 190mm long, up to 14mmx7mm in centre but tapers off both ends	
17	109	33mm square bar, 109mm long	
18	109	10mmx10mm bar, narrowing down to chisel end - unclear if this is a worked bar remnant or a spike tip	
19	109	180mm long, 12mm square bar fragment	
20	111	2.5mmx2.5mm bar, 170mm long object, with bar folded back 50mm at 30mm away from main part, round fold	
21	111	20mmx19mm bar, 280mm long, probably not original length, one end thickens to 22mmx20mm for 11mm	
22	111	wedge, 195x32x12 at widest, probably not a true head, but broken off on a right- angled fold	
23	111	300mm x 50mm x 6mm iron bar	
24	111	206mm x 85mm x 3mm iron plate	
25	111	100mm x 15mmx 10mm highly accreted and broken bar fragment	
26	111	335mm long, flat bar, section 21x5.5mm, 250mm surviving length, corroded, then gently bent up and forged down to a 10mm diameter section 70mm long with slight expansion at tip to 15x13mm	

Item #	*context*	*notes*	*Qualitative XRF analysis*
27	111	70mmx2mm iron strip pierced by 80mm long stout chisel like nail with c. 10mm square head	
28	111	207mm x 14mm x 14mm bar	
29	111	30mm square bar, 115mm long, broken fragment	
30	111	190mm of 8mm square bar	
31	111	160mm of bar with parallelogram section, 14mm x 10mm	
32	119	260mm x 40mm x 12mm bar, round ends, each with 22mm diameter hole with centre 30mm from end, one end badly decayed	
33	119	600mm bar, 19mm x 19mm, one end slightly burred or enlarged	
34	119	72mm x 16mm bar, 605mm long	
35	119	390mm bar, 65mm x 18mm, 19mm hole, centre 142mm from one end	
36	119	215mm long bar, 32mm x 6mm, very corroded	
		bent bars	
37	111	5mmx5mm bar, 217mm long with two bends in opposite directions, 150mm centre section, ends 35mm and 60mm long	
38	111	10mm round bar in right angle with 80mm and 130mm lengths either side	
39	111	c8mm square bar, forged through right angle, then to hook, 70mm straight, 120mm hook, which is 45 mm wide and returns 20mm	
40	111	105mm length of 8mm bar with right-angled bend	
41	111	160mm length of c. 6mm square bar, bent in right angle, very corroded	
42	111	90mm of 8mm round bar, bent in right angles	
43	111	230mm of 10mm square bar bent through two right angles in 'dog leg'	
44	111	210mm length of 8mm square bar, forged through right angle in centre	
45	111	180mm of 8mm probably round bar, forged with two right angles, but unlike other examples these lie not in the same plane but at 120 degrees	
46	119	37mm x 12mm bar, folded into rectangular 'U', 190mm wide, 75mm tall	
47	119	14mm x 14mm bar, 380mm long, with right angle bend to give 310mm long side, short end possibly reduced at tip to about half the section	
48	119	14mm square bar, 360mm long, right angle to give 100mm short side, long side corroded away at 275mm	
49	119	20mm x 10mm bar, 390mm long, one end forged into asymmetrical hooked head, the other either broken at a fold, or narrowing to a chisel edge	
50	119	12mm rod bent into z shape, 110mm of rod	
51	119	280mm remaining of 8mm round bar forged through right angle and probably a second, 110mm preserved, 200mm central straight, 30mm after second fold/hook	
		looped bars	
52	109	145mm long, 18mm round bar forged into loop end with 45mm i/d, 80mm long shaft section has broken end	
53	109	330mm long, 20mm diameter round bar forged into loop 30mm i/d at one end and with trace of coarse thread at the other. Not clear if this is a broken bolt; the tapering of the threaded section suggests it might be the remains of a screw	

Item #	*context*	*notes*	*Qualitative XRF analysis*
54	109	10mm x 10mm bar, folded and welded back on itself to form rectangular loop with a 45mmx10mm rectangular slot at right angles to the bar	
55	109	overall 135mmx70mmx55mm, bar forged into asymmetric loop, 35mm i/d, and right angle. Bar 15mmx15mm beyond right angle but narrower where drawn into loop. Thick end of bar forms a 70mm arm, which is probably broken	
56	109	180mm long looped spike, 8mm round bar, possibly steel, formed into asymmetric loop, roughly 45x32mm internally	
57	119	8mm diameter rod forged into asymmetric loop 18mm i/d, overall length of loop and rod 230mm	
58	u/s building E	213mm long, fragment of round bar formed into open loop, 90mm x 82mm outside loop, 57mm x 62mm internally, transverse, bar flattened just below loop then round again before break, shaft part 130mm long	
		window bar?	
59	111	14mm square bar, forged down to 25mm wide flat on diagonal at one end - probably pieced, overall length, 22mm preserved, 235mm long overall. Strut or window bar	
		bolts	
60	109	85mm long bolt fragment, 20mmx20mmx10mm head, shaft too corroded to measure	
61	111	long wrought iron bolt, 357mm long, 29mm square head , 12mm thick - appears to be added as welded component, 14mm diameter, approximately 75mmis threaded	
62	u/s tramroad	nut and bolt, 20mm square head, 6mm thick, c.10mm diameter shaft, 18mm a/f hex nut 8mm thick, 56mm long overall	
		spikes	
63	111	21mm diameter bar, 295 mm long, sharp spike one end, probably burred the other	
64	111	230mm long, 22x24mm sectioned bar, slightly burred at one end, other narrows, corroded so form uncertain, but probably narrowing to square spike rather than chisel, tip missing	
65	111	140mm long 10mm diameter, probably steel, spike,	
66	119	605mm long spike, 30mm x 30mm section tapering to point, top burred into rounded shape	
67	u/s	disc headed spike, 20mmx4mm maximum spike section, 103mm long, head pointed oval overlapping spike, 22mm x 22mm protruding, with 6mm hole	
68	u/s building E	24mm square by 10mm thick square head on shaft 100mm long, possibly showing narrowing at tip so possibly a spike rather than a bolt	
		nails	
69	111	55mm surviving of clout nail with 6mm square shaft and 20mm round head	
70	136	43mm long corroded iron clout nail, thin shaft, circular head 12mm x 10mm	
71, 72	109	two pieces of 7mm square wood , one with one-, the other two- Cu-alloy tacks, 20mm long. Each piece 60-65mm long	
73	111	170mm iron rod, corroded, but probably nail bent through 80 degrees	
74	111	90mm long tapering square nail shank	

Item #	*context*	*notes*	*Qualitative XRF analysis*
75	111	40mm length of 4mm square rod - nail shank?	
76	136	nail fragment	
77	136	nail fragment	
78	136	nail fragment	
79	136	43mm corroded nail - possibly widening into slight thickening at end, suggesting wood nail	
80	u/s	86mm long nail, maximum shank 7mm x 5mm, head 12mm x 17mm rounded	
		washers	
81	111	23/8mm washer 2.5mm thick	
82	u/s tramroad	36/13mm x 2mm washer	
		rivets	
83	111	copper alloy rivet and washer, rivet 12mm head, now overall 10mm long, shaft slightly oblique with widened struck tip, shaft c.4mm diameter, washer 16/6mm x 1mm	
		tools	
84	111	chisel, 30x26mm just below burred head, probably octagonal, narrows to edge 30mm wide with rectangular section (but badly corroded)	
85	111	chisel, 26mm x 20mm below burred head, probably octagonal, narrows via rectangular section to edge 28mm wide	
86	119	file, stout and flat, 360mm long including 60mm tang, 36mmx9mm near tang, 26x7mm distally, teeth c1mm spacing	
87	111	part of one arm of a pair of metalworking tongs, arm straight and parallel to face of jaw, eye to tip of broken handle 130mm, eye to start of jaw 13mm, jaw 30mm long, handle 12mm diameter	
88	111	95mm long stout punch, 35mm diameter at top. burred to 40mm, comes to point. Probably would have been a wire-mounted top tool	
		footwear	
89	111	70mm long x 75mm wide heel iron	
		miscellaneous non-ferrous artefacts	
90	109	copper alloy tap, 'T'-shaped head 27mm wide and 2mm thick on tapering barrel 27mm long with lower ring on join. Barrel tappers from 12mm to 8mm diameter, foot has 6mm square fitting with 4.5 mm diameter central hole, shaft pierced by 4mm hole, 13mm above base. Gas tap.	leaded brass
91	111	copper alloy clip, has nail-like spike 25mm long x 3.5mm diameter, coming to stubby point over 4mm, passing via just over right angle bend into curved (deformed?) section 35mm long of approximately 5mm semi-circular cross-section, rounded tip	
92	111	dagger-shaped gilt object, 160mm long, widens gently from 20mm to 56mm wide, then narrows back to 20mm, has raised central concavo-convex rib, probably a decorative strip or binding	copper, lead and gold on front, trace mercury; plain copper to rear

Item #	*context*	*notes*	*Qualitative XRF analysis*
93	119	Y-shaped small decorative stamped strip with scroll-like decoration and central mounting hole, shows good fresh metal	brass with low lead, some gold but only trace mercury
94	u/s	ornate copper alloy casting with seam, on central iron pipe, 32mm o/d 17mm i/d, overall , has central ring with groove either side, then three rows of slightly scrolled moulding, 80mm x 62mm maximum section, widest in plane of seam, some scroll elements slightly squashed (or possibly misformed)	
95	u/s building E	80mm x 45mm, originally 100mm x 45mm, copper alloy handle, spindles 5mm long x 4mm diameter, 11mm deep by 9mm thick maximum central profile, thinning to c.5mm diameter for lateral S bends	
96	u/s building E	160mm, 11mm wide Cu-alloy strip, has slightly off-centre raised ridge, one downturned edge, then narrow groove and upturned edge, bent and broken in two	
97	109	Cu-alloy rod, curved, tapers from 8-6mm across becoming slightly angular (square) as it does so	
98	109	folded Cu-alloy sheet, one side rounded and irregularly lobate , the other side is thickened and serrated. Has perforation through rounded end lobe. This piece appears imperfect and might be manufacturing waste	
		pipes	
99	119	450mm length of bent iron pipe, ends clenched , 26mm o/d, 22mm i/d	
100	119	150mm long fragment from c.60mm diameter cast iron pipe or gutter	
		miscellaneous ferrous artefacts	
101	119	100mm square based prism, 50mm tall, 32mm diameter hole through centre	
102	119	30mm x 19mm x 90mm block of cast iron	
		waste metal	
103	109	40mmx30mmx5mm irregular piece of lead	
104	109	27mmx17mmx6mm irregular lump of Cu-alloy or dross, probably casting waste	quaternary Cu-Zn-Sn-Pb alloy - gunmetal
105	136	small 65mm x 45mm x 7mm irregular spill of cast iron	
106	111	four fragments of bowl-like form, largely dense cuprite (?) layers with green corrosion products between the layers and in botryoidal growth on surface. Thickens slightly into 'rim'. Pieces could either be extremely highly corroded Cu-alloy vessel of perhaps 40mm radius, or, perhaps more likely, this is the dross layer formed on the inside of a crucible	leaded bronze

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