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Assessment of metalwork from the Merthyr Learning Quarter

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Abstract

The metalwork assemblage from the Merthyr Learning Quarter site is dominated by material that was unstratified. Some of this unstratified material relates to late 20th century structures and activity on the site and has no potential for advancing understanding of the archaeology. The larger part of the unstratified material relates to abandonment of the Ynysfach Ironworks, dereliction and eventual demolition of its structures. This material contains a wide variety of objects associated with the structure and use of the ironworks, but is a limited assemblage suggesting that the metalwork of the ironworks was mainly reclaimed. Although this part of the unstratified assemblage is important for the interpretation of the works, care must be taken in its interpretation because there are indications of material derived from elsewhere, possibly the main Cyfarthfa works. Fragments of furnace components and some tools may be associated with the Ynysfach works, but they might have been derived from Cyfarthfa.

The stratified material associated with the Ynysfach Ironworks includes items directly associated with the blowing engine (and its house), the refineries and the transport system. Of these, those items directly associated with the refineries are of the highest importance. Since there are no excavated examples of refineries and the origin of this technology lies in Merthyr Tydfil, this means the site and these artefacts are of international importance. The single most significant item of metalwork is the example of a refinery cistern (the other cisterns and all the overlying troughs having been removed during demolition). Other stratified metalwork in this area include spikes, pipes and numerous iron plate covers for the drains.

The items associated with the blowing engine, its house and boilers include a water inlet, fragments of blowing pipes, part of a boiler safety valve and structural ironwork. These are significant items and worthy of full recording, but add little to overall understanding of the site.

Stratified materials associated with the transport system are mainly restricted to in-situ *stone sleeper bocks (particularly those associated with a turnout system) and to tramway components (cast iron sills and plates) in the casting house. These are supplemented by the unstratified material including tram fragments, plateway plates (cast and wrought), plateway sills (dovetailed and horned varieties) and the cast iron sill components of a turnout. Although the unstratified material is diverse, the in-situ material dominantly comprises rather narrow dove-tailed sills and forms a useful addition to understanding of the later part of plateway development.*

Contents

Methods 1
Results: nature of the resource 1
Results: summary of materials 2
Results: distribution of residues 2
Assessment of potential & further work 4
Specific recommendations 4
References 5

Methods

All materials were examined visually with most drawn and photographed. Retention of all the items of metalwork was not practical because of the large size and weight of many items. An initial on-site assessment of the larger items was therefore undertaken as a triage. Out of the approximately 600 items recorded, 123 of the larger items were retained for further investigation and/or for ultimate deposition in the site archive; approximately 124 smaller items of metalwork did not pass through this triage and are currently retained.

This project was undertaken for the Glamorgan-Gwent Archaeological Trust.

Results: nature of the resource

Some 480 items were recorded in the field, almost all photographed and drawn. Of these 95 items have been retained by GGAT for further investigation as artefacts, a further 16 (mainly semi-products) have been retained for possible metallurgical analysis, 5 artefacts have been accessioned by the National Museum Wales and 7 artefacts have been retained at the MLQ site. The remainder has been disposed of, together with all the structural metalwork from the 20th century buildings.

In addition to the larger items recorded in the field, an additional approximately 120 items were recovered as finds and were retained by GGAT.

Results: summary of materials

Items associated with the blowing engine

The blowing engine itself had been thoroughly robbed apart from a large water intake preserved in a sump. Other related materials are scarce, reflecting the thoroughness of the reclamation process. A possible cylinder end may be a part of the same or a different engine.

A significant length of blowing pipe was located, of which a small fragment from close to the furnace was damaged and retained. At least five complete cast iron blast pipes were recovered, but not retained.

A weighted arm is probably from the safety valve from a steam boiler.

A broken very heavy duty cast iron frame with a central arch with lateral pintles may be from a boiler stoke hole, but no precise match has been found with any particular type of boiler.

Items associated with transport

The collections include a wide variety of 'railway'-related items, mostly unstratified. The most frequent items are associated with plateways, presumably mainly the internal plateways of the Cyfarthfa/Ynysfach works. There are at least four varieties of sill (wide and narrow dovetailed varieties; normal and lightweight horned varieties).

In-situ material is somewhat less diverse, but includes narrow dovetailed sills and turn-out components of a related pattern. The context of the in-situ material suggests it relates to the period post-1836, for which relatively little is known of the Merthyr tramroads.

In total, the collection contains 23 items from plateway plates, 2 rewheeling plates, 17 pieces from cast iron sills and 4 complex sills from turn-outs.

The fragments of trams themselves are rather limited, being largely fragments of bases formed of riveted bars with shackle-like couplings. There are 3 substantially complete bases, 4 isolated spices, 31 other pieces of tram strapping bars and one piece of coupling hook. Each base has 7 longitudinal bars, 15mm thick, with no intervening gaps. There are terminal transverse bars each end, then transverse bars to which is riveted each end of the spine (with the coupling shackle falling below the terminal bar) with 3 or 4 transverse bars between them. There is no evidence for sides – so these were probably flat-bed trams for the transport of pigs or bars, rather than for raw materials. There is no evidence either for the wheels or axles – making it likely these trams may have had a wooden frame and that the cast iron components were reclaimed in preference to the wrought iron ones.

Railways are represented by very few artefacts, including2 screws for mounting rail chairs and 4 pieces of wrought iron rail – including two examples of flat based rail (large enough to be from standard gauge track) and a section of very small bridge rail. Given the unstratified nature of these finds, it is unclear whether they were rails employed at the works, or merely waste products of the Cyfarthfa plant.

There were also 10 examples of fishplates, presumably associated with the replacement or removal of standard gauge track after the 1870s.

Two horseshoes are also placed in this category.

Items associated with the refineries

The main item associated with the refineries is the surviving cistern. This corresponds to the overall design as described by Truran (1865, 193-204) and Percy (1864, 622-626), but provides new evidence for construction and for the management of water flow that are not provided by contemporary documents.

The backfills of the robbed-out sites of the other troughs produced examples of the smaller components of the cisterns (large bolts, a fishplate-like connector and an 'H' shaped iron object)

Two cast iron troughs recovered in the engine house area may be associated with the refineries, but they might equally be derived from the smithy.

The superstructure of the refineries had been entirely removed. Two fragments of furnace might be derived from them, but other interpretations are possible (see below).

Items associated with other ironworking

The assemblage includes a few simple, long-handled hooked tools forged from iron rod. None of these can be linked to use of the refinery with any certainty.

Two large cast iron components appear to be related to furnaces. One is an elongate thick casting with one very irregular edge. This is likely to be a dam or similar component from a furnace – perhaps from a blast furnace, rather than a refinery. Further investigation and cleaning of this unstratified piece may help identify is original purpose. The second large component is a cast iron open, shallow, box. The interior of the box was at least partially originally filled with refractory bricks. This piece was recovered from the base of a refinery trough setting, but firebrick lining is not normally associated with refineries (normally water cooled), and the origin of this piece may more likely be sought in a puddling or reheating furnace.

Semi-products

Approximately 23 fragments of cast iron pigs were recovered, together with at least 11 other smaller

fragments of casting waste. The pigs are noticeably less-well preserved than many of the iron artefacts.

A single angular fragment from a thick sheet of cast iron apparently with some voids was found (unstratified) in the refinery area. This piece resembles descriptions of the metal produced in the refineries, but without analysis this identification is tentative and it may alternatively be a broken fragment from a cast iron structure.

These items can perhaps be more appropriately treated as process materials and will, therefore, be discussed more fully in the assessment of the archaeometallurgical residues.

Structural metalwork and fastenings

The largest category of objects was provided by the 71 cast iron plates, mainly covering the drains associated with the refineries. Some of the plates were simple rectangular slabs, but several showed various holes and/or marginal loops. Relatively few of the plates were intact, suggesting that the drain covers were sourced from 'seconds' or had been recycled from other uses. It is possible that some of the more complicated plates were intended for use as components in puddling furnaces or for similar purposes.

Two particularly large cast iron plates were discovered to form the base upon which one of the brick-built refinery furnaces was founded.

Various wrought iron items of structural ironwork were also recovered, including a number of structural tie bars of various forms. One of these was associated with a wall of the refinery building, but most were unstratified (but often spatially associated with the blowing house).

Several items of wrought ironwork appeared to be strapping for beams. One included the attachment of a small 'boss' to a beam and others included attachments for a pivoting iron bar. Whilst the precise nature of these items is not certain, it is not impossible that they are associated with the beam of the blast engine.

Two sets of bars providing strapping for a large object might also be associated with a beam - but might equivalently be strapping to support a small chimney.

Several pieces of complex ironwork (at least two possibly of mild steel rather than wrought iron) were strapping to support the woodwork of roof beams from an apex. These were unstratified and so it is unclear which building the roof was from.

Other structural ironwork includes a series of short lengths of small angle iron (approximately 9 items), of which several pieces are associated with pintles, suggesting these were framing for doors or other openings.

One of the largest categories of artefacts was bolts, of which 73 isolated examples of various types were recorded. Most of these were in wrought iron and are likely to have been from the structures of the ironworks. In contrast, only 23 nails were present in the assemblage – and many of these were modern steel nails probably associated with the mid-20th century buildings.

In addition the collection includes 2 eyed-bolts, 10 washers of various kinds, 2 small brackets, 3 probable staples and 45 wrought iron spikes. The spikes are an interesting aspect of the 19th century ironworks. They appear to have been used widely to pin aspects of the structure into the loose site formation makeup of unconsolidated blast furnace slag. Since floor levels were not preserved, it is not clear what these spikes held in place. The spikes range in length up to 750mm, although most are in the range of 200-400mm.

A group of 5 pipe fragments s with large terminal flanges may be interpreted as ends of columns. The end of one such pipe/column was found in-situ associated with the refinery structure, but its precise role was not ascertained. A photograph of a refinery in use at the Low Moor works Bradford suggests the use of cast iron columns as a framework to support the corners of the refinery hearth.

Domestic and personal items

As might be expected with such an industrial context there were relatively few items of a domestic or personal nature.

Those items which did occur were from late stratigraphic contexts or were unstratified. The dateable items in this category (a spoon and Rowntree's advertising plaque) were of early 20th century date.

Other materials included various fragments of cans (one containing a material that may be paint), fragments of ironwork that is probably from a bedstead, a probable curtain pole termination in copper alloy on an iron pole, part of a bicycle bell.

The backfill of a modern service trench produced a complete galvanised bucket and a large fragment of an enamelled teapot.

The only possibly (although not certainly) 'personal' item that might be associated with the nineteenth century ironworks is a curved iron sheet piece that may be a protector from a foundry boot.

Tools

All of the recovered tools were unstratifed. One pick head is probably from the late 20th century as is probably piece of hacksaw blade, but others, including a pick, two shovels and three prise bars, are probably associated with the demolition of the early- to mid-20th century. Three hooked tools of simple form and varying sizes may be from the ironworks, but hteir use is uncertain.

Undiagnostic materials

Various unmodified pieces of metalwork may indicate stock materials, although many are probably simply broken fragments from larger items. These include 40 pieces of square- or rectangular-sectioned iron bar, 11 lengths of round iron rod, 4 small pieces of thin iron strip and 43 pieces of thicker iron sheet. There were also two individual pieces of iron wire and 3 small fragments of wire rope. There were two large wrought iron rings of uncertain purpose.

There were two hooks attached to short lengths of chain and a few fragments of other hooks and chain links.

Miscellaneous materials

The collection includes 11 castings of uncertain purpose as well as various other miscellaneous items – including the surviving copper cores of a 3-strand electric cable, small fragments of lead and aluminium, a small inspection cover, a hexagonal steel rod, an iron block, two fragments of cast iron guttering and a cast iron perforated wedge.

Results: distribution of residues

The total number of metal items recorded in the field and subsequently was approximately 600. This included a total of approximately 70 cast iron plates (mainly used as drain covers) plus a further approximately 30 other artefacts that were reasonably securely stratified below the abandonment and demolition deposits. The vast majority of objects were, however, recovered from deposits associated with demolition or were unstratified (collected from disturbed or unsealed deposits, or collected from the scrap-heap assembled by the groundworks contractors.

It is clear from the archaeological stratigraphy and from the nature of the unstratified artefacts, that a substantial programme (or programmes) of reclamation of scrap metal must have been undertaken when (or possibly even before) many of the buildings of the Ynysfach Ironworks were demolished in the early- to mid-20th century.

Some finds from within unstratified deposits suggest that material may also have been dumped at Ynysfach (probably from Cyfarthfa) late in its history. Two classes of archaeometallurgical residues are particularly indicative:

1. Unstratified slag includes frequent examples of dense, well-flowed, iron silicate slags of variety usually interpreted as being derived from puddling. The puddling process was undertaken for the Crawshay business at Cyfarthfa, fed in part by the Ynysfach refineries. Puddling was not undertaken at Ynysfach. Puddling was undertaken at Cyfarthfa from the early 1790s to the 1870s.

2. The assemblage of archaeometallurgical residues includes three examples of fragments of tuyères from Bessemer convertors. This steel-making technology was introduced at Cyfarthfa in around 1882 and was employed (with some breaks) until 1919. During this period Ynysfach Ironworks was initially held in reserve (it did not operate again after the strike of 1873) and appears to have become progressively derelict.

The OS 1:1250 map 1st Edition (published 1875) shows the works close to its closure. Subsequent OS mapping shows the original tramways of the ironworks replaced by standard gauge lines running from down the valley from the eastern part of the main Cyfarthfa works. The construction and use of these railway lines provides a potential context for waste disposal from Cyfarthfa onto the former Ynysfach Ironworks site. Although similar deposition of metalwork cannot currently be demonstrated, the possibility of an outside origin for some of the unstratified artefactual material must also be considered.

Assessment of potential & further work

The thorough robbing-out of much of the ironwork on the site, together with the apparent dumping of debris from elsewhere provides a rather reduced potential for the assemblage.

There are several separate threads for which the investigation of the metalwork assemblage might be employed (in parallel with the study of the industrial residues):

1. the investigation of the industrial processes undertaken at Ynysfach – in particular the use of refineries which has been uniquely brought to light in this project.

2. the investigation of the transport infrastructure at Ynysfach, which formed part of a wider network encompassing Cyfarthfa Ironworks, the sources of materials and the locations of waste disposal.

3. the investigation of materials and technologies associated with the wider Cyfarthfa/Ynysfach enterprise.

In category (1) the surviving water cistern from the refinery trough requires full recording and publication, as do several items less certainly associated with the refineries including the small water troughs (boshes), some small cast iron pipes, columns and furnace plates. The publication of the surviving components, alongside the structural remnants and the residues, would form a contribution of national and probably international significance.

In category (2) the most important items are the *in-situ* plateway elements. Most of the published work on the South Wales plateways has focused on the earlier part of their story (e.g. Van Laun, but the present evidence carries that on through the mid-19th century. The *in-situ* evidence is accompanied by a substantial body of more varied elements either unstratified, or stratified but *ex-situ*. In particular the various examples of horned sills may help to document their late occurrence at Cyfarthfa compared with other ironworks.

The broader industrial context at Cyfarthfa/Ynysfach (Category 3) may be evidenced by examples of metalwork that may be products of the works. These may include items such as the wrought iron flat-based rails, wrought iron plateway plates and various castings.

Specific recommendations

A final reconciled catalogue bringing together all the elements recorded in the field and subsequently should be produced. This catalogue is likely to form part of an archive report and is unlikely to require publication, since it will be dominated by unstratified material of uncertain provenance.

For the final reporting and publication, the structural elements associated with the refineries, particularly the surviving cistern, should be illustrated and described in full.

The surviving fragment of the blast engine should be illustrated, described and related to the design drawings.

Some further investigation of the possible furnace components should be undertaken, including some cleaning and inspection of any adhering residues, in order to determine if these too are from the refineries. At present, this would appear unlikely to be the case.

Full description and illustration of the plateway components should be made (sills, plates and tram fragments), for there is little currently known about the details of these items in the Cyfarthfa/Ynysfach works. Emphasis should be placed on understanding those elements recovered *in situ*.

Metal materials that are semi-products are discussed in the assessment of the archaeometallurgical residues.

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