How do you solve a problem like nails? A new, multi-period methodology and typology for recording iron nails

KATIE J B MANBY

HOW DO YOU SOLVE A PROBLEM LIKE NAILS? A NEW, MULTI-PERIOD METHODOLOGY AND TYPOLOGY FOR RECORDING IRON NAILS

Summary. *This paper sets out new recommendations for recording structural iron nails. Despite their ubiquity, iron nails have received limited analytical and interpretative attention and recording practices are highly variable. Too often current recording is time-consuming and costly without providing meaningful information. This paper proposes a new recording methodology, developed through analysis of the Roman structural nail assemblage from the MHI A14 Cambridge-Huntingdon excavations alongside experiments in nail shaping, with wider context provided by medieval and post-medieval assemblages from the City of London. This approach includes a new nail typology, recommendations for bulk recording of basic details for whole assemblages (using counts and typologies), alongside detailed recording (shank morphology and further metric data) for certain nail groups. Shank morphology is a particularly important aspect proposed here, being indicative of how nails were used in antiquity.*

INTRODUCTION

Nails are the most common iron finds recovered from archaeological sites from the Romano-British period onwards (Goodall 1980, 106; Manning 1985a, 134). Despite their ubiquity, they are often disregarded as having limited analytical potential within academic and developer-funded contexts. Currently no standardized recording practices exist for nail assemblages. Presently most are recorded as bulk objects with few attempts to link them to past usage. This problem applies particularly to developer-funded projects, where large volumes of material strain resources. Practical decisions need to be made on processing time and retention of material based on analytical value.

This paper will suggest that targeted recording of structural iron nails can maximize analytical potential. This is based on results from a series of investigations into nails: a review of previous studies, survey of current recording practices, practical experiments, and the application of different recording and analytical methodologies to the assemblage from the MOLA-Headland Infrastructure (MHI) A14 Cambridge-Huntingdon excavations. This paper concludes by

recommending how structural iron nails from the Iron Age to the post-medieval period should be recorded. These have been developed considering British material but should be broadly applicable to multi period/place assemblages. A refined nail typology is presented, alongside a methodology detailing which aspects of structural nails should be prioritized for recording to provide information about usage. The methodologies proposed will increase the analytical potential of structural nails while reducing time and cost of recording and curation.

PREVIOUS STUDIES ON STRUCTURAL NAILS

Archaeological iron nails can be split into broad categories depending on usage. 'Structural nails' are here defined as those used within some form of construction, be it house, coffin, or furniture. Other nail categories have more specific functions, including 'horseshoe nails' from the medieval and post-medieval periods (Sparkes 1976; Clark 1995), 'hobnails' used in Roman and post-medieval footwear (Burandt 2016; Volken 2017; Bernardini *et al*. 2023), or ship-building nails (Bill 1994; McGrail 2004; Zori 2007). Copper-alloy nails are a separate artefact type, appearing particularly as inscribed 'ritual' examples (How 2019) and within post-medieval ship building (Cohen *et al*. 2015; Bram *et al*. 2020). This paper focuses on structural iron nails which make up the largest group on most sites but have received proportionally the least attention.

Previous interest in structural nails concentrated on two depositional contexts: hoards and burials. The Inchtuthil hoard contained the largest recovered volume of Roman iron nails, with 875,428 (minimum) discovered in 1960 from a pit dug into the legionary fortress (Pitts and St Joseph 1985, 112). Interpretations include deposition of unused nails during the fort's abandonment to secure the material (Angus *et al*. 1962; Pitts and St Joseph 1985, 109); unused and used nails collected during the demolition (Manning 1985b, 289); and ritual deposition to remove unsettling volumes of ironwork (Dungworth 1998, 157). This hoard was particularly spectacular in size and preservation: the corroded outer layer formed a protective crust. This is normally not the case with iron finds, and indeed corrosion frequently makes object identification highly challenging. Cleaning and preservation costs mean artefacts are often left to degrade in storage, contributing to relative lack of interest in iron finds as a category (Humphreys 2021b, 174). Another notable hoard was recovered at Bucklersbury House, London (2456 nails), interpreted as a blacksmith's collection stored for recycling (Rhodes 1991, 132).

Nails used within burials have also received attention. For inhumations, Powell (2010) determined types of Romano-British coffins using nail location. Within cremations, nails have been suggested as indicators for burial furniture, and a particularly late Roman tradition of ritually burning this furniture (Mould 2004, 271–2; Marshall 2019). They have been identified as a form of grave goods, with single or non-functional nails (through twisting) suggested to have acted to 'fix' the dead in place, and as apotropaic protection (Villa 2009, 432).

Outside these contexts, the use and interpretation of structural nails has received limited attention. Typological recording and basic quantification has become the aim, with no link to wider usage or deposition interpretations. A notable exception to this is American historic archaeology where machine-made nails have been employed for dating buildings, and determining site-usage and layout (Fontana 1962; Barnes 2018).

Nail typologies

Cleere (1958) developed the first typology of Roman iron nails, identifying six classes (differentiating by size and head-shape) from Brading villa, Isle of Wight. His type III, 'smaller general-purpose nail' (1958, 57) with square shank and round head was the most common. Later typologies based on Roman assemblages also used divisions by head size and nail length (Angus *et al*. 1962; Rhodes 1977). In every assemblage, a variant on Cleere's Type III predominated. Manning's (1985a, 134, fig. 32) system of 11 types was developed for his catalogue of the Roman ironwork of the British Museum and was also based on head shape and shank length. Type 1b (equivalent to Cleere's Type III) was the most common with a rounded or rectangular head and a square shank, below 150 mm. Most (if not all) subsequent discussions of Roman nail assemblages using a typology follow Manning (for example, Rhodes 1991; Marshall 2019).

Additional nail typologies exist for later periods. Goodall's 1980 typology of medieval nails was written for his PhD, but published posthumously in 2011. As Manning's student there are similarities, although Goodall included additional head shapes not found in earlier periods. Further medieval types have been subsequently identified (How *et al*. 2016; Humphreys 2020).

Outside Britain, other typologies have been developed and a Manning Type 1b equivalent dominates, for example, within Roman and early-Byzantine Sardis (the type 2, Waldbaum 1983, 68–9) and post-Medieval Amsterdam (Gawronski *et al*. 2018, 76–80, type 1.10.1–1.10.9). Typo-chronologies of American nineteenth and twentieth century machine-made nails also exist (Mercer 1923; Nelson 1968; Wells 1998; Adams 2002; Green 2014), although these are uncommon in Britain.

These British typologies have several problems. Despite some overlap, they are not fully compatible: one nail can have multiple names depending on period, introducing unnecessary complexity when analysing multi-period sites and comparing assemblages. Whilst some forms are specific to certain periods, such as the medieval figure-of-eight lath nail (Goodall 1980, Type 5; How *et al*. 2016), the primary form of a wrought-iron nail (tapering square-sectioned bar ending in a point, with an expanded head) has never significantly changed. Thus, nails should be described consistently across periods.

The exceptional assemblages used to develop these typologies are also not representative of most excavated examples. Inchtuthil is certainly not representative, given the number, condition, and explicitly military link of the material. Rhodes (1977) and Manning (1985a) used well-preserved material largely from waterlogged contexts within London. To differentiate between intentionally headless nails and broken shanks is very challenging in practice. Furthermore, the distinguishing feature of many types is the head shape. During hammering the soft wrought iron head may deform making distinguishing a type more difficult (Humphreys 2020, 2). Previous typologies were also inherently descriptive in nature with limited attempt made to link types to usage. This results in sorting nails into typologies with little further analysis, reinforcing the impression analysing nail assemblages is not useful. Finally, all these assemblages identified one predominant type, (equivalent to Manning's Type 1b). Once apparent that one type makes up most structural nail assemblages, is it useful to continue to record this fact?

To compliment a head-based typology, further avenues must be sought to describe nails in such a way that usage patterns can also be determined, namely considering how nail shank form may provide usage evidence. Rhodes (1991, 138) attempted a 'classification of bends' on the Bucklersbury hoard, considering whether shanks and heads showed evidence for extraction, identifying three types of associated damage. These were: a sideways kink in the shank immediately below the head formed by hammering in a nail claw, head sides raised from claw pulling, and an ‘extraction curve’ in the nail shank. He was unable to develop this methodology fully, but the potential for this approach is clear. This has been partially explored by Humphreys (2020) who developed descriptive categories for shank morphologies while recording a medieval nail assemblage from Three Quays and Sugar Quay, London (currently unpublished). My paper gives a developed, tested, and quantifiable methodology for this approach building on Rhodes’ (1991) and Humphrey’s (2020) work. It will also explore other recording possibilities, including utility of recording length profiles for the most common nail type to differentiate between assemblages and how far function can be assigned to certain types.

CURRENT RECORDING PRACTICES

To understand how iron nails are at present being approached in professional and academic archaeology, a survey was distributed, garnering responses from 12 individuals working as finds specialists or overseeing archaeological excavations. Three were within academic/university-led excavations, four from developer-funded companies, three within museums and two ‘other’ workers. The questions focused on collection and initial treatment of nails, recording, storage and retention, and perceived analytical potential.

The results showed a variety of approaches, particularly between different sectors. Developer-funded organizations had set policies but were inconsistent between companies. Most respondents treated nails as bulk finds by context, with some specific nails registered as individual finds (from burials, *in situ* within structures, hobnails). Time for processing was the key factor behind the decision to treat nails as bulk. For developer-funded responses, the individual count was normally recorded as a minimum, alongside complete (whole) nail count. There were some instances of more detailed recording, such as shank width and head thickness within the academic responses. Existing typologies were not used by all respondents. Manning’s (1985a) typology was used by eight of the twelve. Notably three did not use typologies at all (two academic, one museum). Six responses mentioned recording elements of use-wear, shank morphology or shaping, most often whether a nail was clenched. Terminology used for shank morphology was not consistent amongst responses. The only details given on nail storage were from developer-funded institutions: storage within plastic bags with silica gel in plastic containers. This, to a certain extent, stops the iron degrading. The lack of responses here makes it unclear whether this is routine practice outside developer-funded assemblages, or even taking place consistently within developer-funded companies. Generally, analytical potential for nails was held to be low: minimal time was invested into recording nails producing limited results.

Although small, this survey gives a baseline. The recording of structural nails clearly needs to improve, and the lack of standardization between and among sectors is obvious (for full results see Manby 2022).

EXPERIMENTAL TESTING

Having established the limitations of current head-shape focused typologies, new indications of use-wear need to be identified based on robust theories around shank shaping. ‘Shank morphology’ refers to how the shank has been impacted upon through usage. A series of experimental investigations were carried out to determine how different morphologies may have occurred. Shank morphology categories were adapted from work by Humphreys (2020, discussed above). Fig. 1 illustrates these, alongside archaeological examples.

To determine how these morphologies may have been created, 26 wrought iron nails, sourced from a blacksmith specializing in historic ironwork, were hammered into oak planks and extracted. This was a provisional experimentation intended to generate ideas rather than provide exhaustive explanation of shank morphology. All nails used fitted Manning's (1985a) Type 1b with two length groups tested (52.1–59.1 mm; 99.5–107.1 mm). Oak was selected as the most common timber in Roman Britain (Hanson 1978, 298), and recovered from the A14 excavations (Goodburn 2019, 262–87). Plank dimensions were based on examples preserved from Roman London (Goodburn 1991, 201; 2011, fig. 351; Goodburn *et al*. 2011). The main shank shaping forces tested were: a) hammering the nail straight into wood; b) extracting a straight nail; c) turning a straight nail; d) extracting a turned nail. The main extraction tools were a pincer, claw hammer and crowbar (all attested from the Roman period onwards). Partial pilot holes were made in the wood using a tapering square-sectioned bradawl or electric drill (for the larger nails). Some nails were X-rayed *in situ* to understand shank form without extraction. The online supplement contains full results and descriptions.

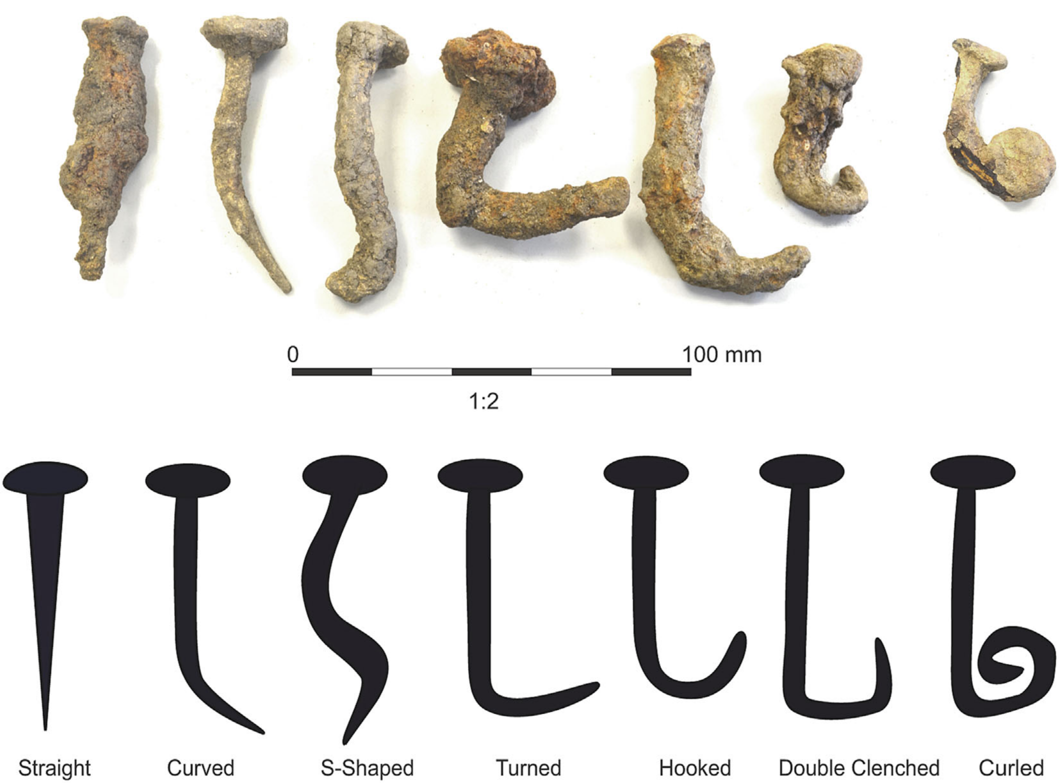

FIGURE 1
Nail shank morphologies with archaeological examples (from River Great Ouse Settlement 2, MHI A14 Cambridge-Huntingdon excavations). After Humphreys (2020, fig. 2) with additions.

Observations from experimental testing

The first observation was that pilot holes would have been necessary for all Manning Type 1a and b nails, particularly those with longer shanks. Cracking of the planks occurred immediately with all nails over 100 mm in length, with minor cracking for smaller nails. This implies a primary step of hole-making was involved in construction with nails.

Concerning detecting use-wear, nails with straight shanks have sometimes been taken as unused (Angus *et al*. 1962, 957). However, the smaller category (under 60 mm) could be extracted with a claw hammer and appear straight with no signs of use. Some extracted nails had only very slightly curved shanks that would not be archaeologically detectable due to corrosion. The longer nails were impossible to extract as heads bent or shattered. It is suspected that if the heads had withstood extraction, their shanks would have shown a similar pattern of straight or only minor curves as observed with the smaller nails.

Rhodes (1991, 137) suggested the Bucklersbury nails showed distinct evidence of extraction using a nail claw, identified through three forms of damage (detailed above). The experimental results only partly supported these conclusions; most significantly his ‘extraction curve’ was not conclusively demonstrated. Any curve visible was usually a kink part way down the shank, with the shank straight before and after this point. This morphology is more in line with Rhodes’ (1991, 137) identification of a sideways kink almost immediately below the nail head. However, *contra* Rhodes’ suggestion that this occurred because of the hammering in of a clawbar, multiple different processes could have caused this. As historical nails are tapered down the shank, the thickest point is immediately below the head. For extraction, most force was required initially to dislodge this point, but once done, the remaining shank came free. This kink could occur from the release of pressure and change of angle. Additionally, some un-extracted nails X-rayed *in situ* also showed a slight bend immediately below the head. This possibly resulted from the initial hammering not being straight. In particular, larger nails tended to have a slight kink under the head *before* usage, resulting from removal of the nail heading tool while the metal was still malleable. Given the number of factors that could have caused the shank to curve, this aspect is not helpful as evidence for usage or extraction.

Rhodes (1991, fig. 96) also gives an s-shaped nail as extraction evidence. However, experimentation suggests this shape results from insertion methods, occurring when the nail is not hammered in straight and then corrected by hammering from another direction.

Any attempts to remove turned, hooked or double clenched nails resulted in shank snapping, supporting previous suggestions that turned nails would have been impossible to remove without changing their morphology (Rhodes 1991, 138; Marshall 2019). Turned nails must have been deposited when still in the wood which then rotted away, separated prior to deposition by burning or, (less likely) cut out of the wood. This means these shank morphology categories have the most analytical potential. Taking measurements of the internal clenched length (from head to bend) will give evidence for the dimensions of the piece of wood they were clenched around.

Extraction was overall much harder than anticipated with many failures, indicating retrieval was likely not always worth the effort, particularly for longer and heftier nails. All smaller examples extracted with pincers snapped off immediately below the head. For larger nails, heads tended to crack around the edges during hammering or extraction, making removal impossible. This tendency to lose elements of the head raises further questions about type identification based on head shape. Caution should be applied when assigning types, particularly to nails in poor condition.

The experiments had several limitations which could be overcome through further testing. Some scenarios could only be tested the once. Although made as closely as possible to archaeological examples, there were indications that the nail specification differed. This applied particularly to head thickness of the larger nails, given the cracking issue. The tools were also not exact replicas. Additionally, only one wood type was tested. Furthermore wooden-framed timber buildings may have lasted 15 years (Goodburn 1991, 192), and nails extracted from rotten wood may behave differently.

Despite limitations, experimentation did provide useful conclusions to build upon. The analytical potential for detecting use-wear is highest in deliberately bent nails (turned, double clenched, or hooked). These retain most closely the form used *in-situ* within ancient structures and can indicate depositional processes. By taking metric data from nails with these shank morphologies we also gain the dimensions of the wood they were used in.

THE MHI A14 CAMBRIDGE-HUNTINGDON EXCAVATIONS

Archaeological investigations were conducted by MHI between Cambridge and Huntingdon, England to mitigate the planned A14 road improvement scheme, encompassing 228 ha. There were 27 targeted excavation areas (TEAs), grouped into eight landscape blocks. 15 Roman settlements were identified, from rural farmsteads to villas and a potential roadside settlement. A possible blacksmith's workshop (TEA20) and industrial area with metalworking debris (TEA32/33) provide evidence for rural iron industry. Initial assessment results have been released (MHI 2019), with full publication forthcoming.

The A14 assemblage, comprising 5775 nail fragments, was studied for the author's MA dissertation (Manby 2022). The nails were investigated at two scales. The full assemblage was treated as bulk material and analysed by landscape block. The nails were recorded using a methodology designed by Michael Marshall for MOLA (detailed in Humphreys 2021a). Recording was carried out predominantly by the MHI finds team (Michael Marshall, Owen Humphreys, Julie Franklin and Rachel Cubitt, 2018–2021) with the author recording the remainder (August 2021). Recording was based on number of head and shank fragments, typology (based on Manning), condition and weight. Nails were not treated as individual objects, but grouped by context. Results of this bulk analysis (not given here due to space constraints) are detailed in Manby 2022 and within individual A14 landscape block reports (Manby 2024a–g).

The second scale of investigation considered a sample of the nails from a single settlement, Settlement 2 (River Great Ouse). Detailed recording of each nail as an individual find was carried out (August 2022) with further recording categories added to the bulk recording. The intention was to ascertain whether it was beneficial to collect more information about nails as individual artefacts and determine if recording shank morphology would show usage and deposition patterning. Settlement 2 had the largest nail assemblage from any A14 settlement (1634 fragments, 717 heads) covering the middle Iron Age to the early Saxon period; a large enough sample to see discrete patterning. The site grew organically in the Iron Age and early-mid Roman period, developing into a more linear settlement in the late Roman period covering *c*.400–250 m. This late Roman phase consisted of a large enclosure with densely packed features, including post-hole structures, trackways and a timber gateway (Atkins and Douthwaite 2024). The settlement likely fronted a villa complex directly to the south-west of the excavated area. Table 1 details the elements recorded for individual settlement 2 nails and the condition scale used in Table 2 (Tables 1 and 2; Fig. 2).

TABLE 1
Elements recorded for individual nails from River Great Ouse Settlement 2, MHI A14 Cambridge-Huntingdon excavations

Recording Element	Description
Typology	Following Manning 1985a, 134, fig. 32
Condition	Following criteria described in Table 3
Completeness	Complete/Incomplete
Length	Of complete nails only
Internal clenched length	From underneath the head to the first bend
Length after first clench	From the bottom of the bend to the nail tip. For complete nails only.
Weight	
Head shape	
Head section	
Head size	At widest point
Shank width	Taken directly underneath the nail head at widest point
Shank morphology	According to Fig. 1
Tip morphology	According to Fig. 2

TABLE 2
Condition descriptions used for MHI A14 Cambridge-Huntingdon excavations nail recording

Condition	Condition Description
Very Good (VG)	No corrosion. Form recognisable and generally complete. As if new.
Good (G)	Only superficial corrosion. Details visible and measurements largely accurate.
Moderate Good (MG)	Some corrosion, but largely superficial. Most measurements and details visible and recordable.
Moderate (M)	Corroded but length and basic form clear.
Moderate Poor (MP)	Very corroded, uncertain form. Measurements likely to be inaccurate.
Poor (P)	Very corroded, uncertain form.
Very Poor (VP)	Very corroded, form uncertain. Likely to be very fragmentary.

Nails below moderate-poor condition, headless shank fragments, and head fragments with under 10 mm of the shank retained were excluded, as preservation was too poor to give usable individual information. Alongside recording, each nail was also plotted across the settlement using ArcGIS to visualize nail distribution to known structures, particularly by morphology.

Typology, morphology and metrics of the River Great Ouse Settlement 2 nails

459 nails were sampled from 178 contexts, mainly from the late Roman period (*n*=390), according with the main A14 assemblage, and were mostly of moderate condition (*n*=181). Manning's 1b was the most common type (88%, *n*=405), confirming the picture from other sites. The main use of Manning's typology was to identify objects which were *not* Type 1b's, as this implies commissioning for specific purposes. Of the sampled nails, 53 were not Type 1b, and most were Manning's Types 2 (*n*=14) or 3 (*n*=24).

For complete nails, weight and length measurements were non-normally distributed and positively skewed with values clustering towards the lower end (Table 3). Manning's Type 1b lengths showed very similar patterning. Lengths suggest the majority were not being used as heavy-duty structural nails (for example to secure timbers), except for Manning's Type 1a (*n*=2)

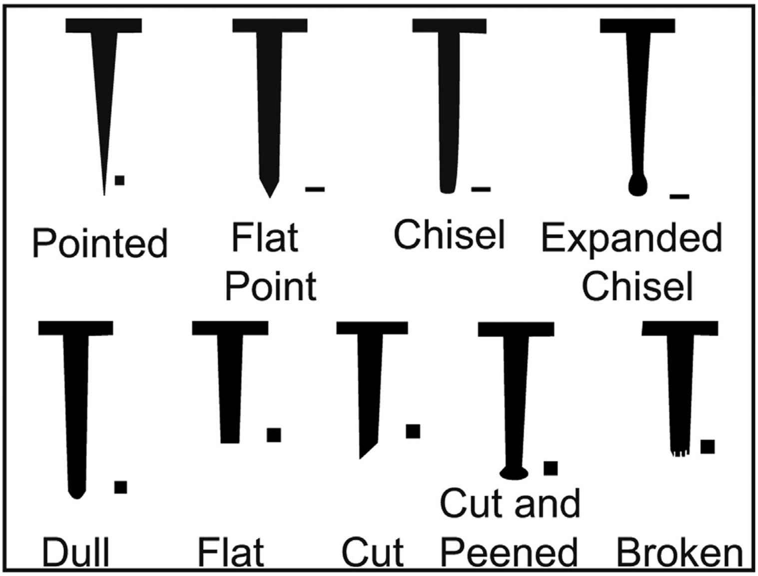

FIGURE 2
Nail tip morphologies. Illustration by Humphreys (2020, fig. 2).

TABLE 3
Count, length and weight measurements for River Great Ouse Settlement 2 nails, MHI A14 Cambridge-Huntingdon excavations

Category	Result
Complete nail count	229
Incomplete nail count	230
Complete nail length range	18.2-170.0 mm
Complete nail length interquartile range	46-70.0 mm
Complete nail weight range	2.5-80.1 g
Complete nail weight interquartile range	9.4-20.4 g
Count of complete Manning Type 1b nails	199
Count of incomplete Manning Type 1b nails	206
Complete Manning Type 1b length range	27-140 mm
Complete Manning Type 1b length interquartile range	44.5-69.8 mm
Complete Manning Type 1b weight range	2.5-80.1 g
Complete Manning Type 1b weight interquartile range	9.4-18.1 g

and some longer (over 100 mm) Type 2 nails. It is thus likely that the majority, particularly the Manning Type 1b nails, had different functions within buildings, like attaching cladding, or furniture construction. For the Bucklersbury hoard, Rhodes (1991, 133) suggests the lack of longer nails was due to removal for re-forging. However, the Settlement 2 pattern implies that may not have been the case, but instead the shorter Manning Type 1b nails are just more representative of actual usage. This length profile contrasts with the Franklands Drive third century cremation assemblage. Here, Manning Type 1b nails were also the most common type, but these were much shorter, with

TABLE 4
Shank morphology results for River Great Ouse Settlement 2, MHI A14 Cambridge-Huntingdon excavations

Shank Morphologies	Complete	Incomplete	Total
Straight	130	168	298
Curved	49	38	87
S-Shaped	9	2	11
Turned	31	20	51
Hooked	3	0	3
Double-Clenched	1	0	1
Other	6	2	8
Total	229	230	459

lengths mainly between 16–35 mm long (Marshall 2019, S103). All this demonstrates that by recording length measurements, particularly for a sample of complete Manning Type 1b nails, we gain a more nuanced picture of how nail usage varied across site types. Settlement 2 also gives a more typical baseline than burial nails which are one of the few types of nail assemblages for which length is more routinely recorded.

Head shape and shank section did not provide particularly useful information. Most followed the default of a square (*n*=445) or rectangular-sectioned (*n*=10) shank and a round or sub-round head. Most Manning Type 1b nails had either square, round, or sub-round heads. The variation in Manning Type 1b head shape appears to be caused by inconsistent manufacturing technologies, and so is not meaningful. Recording head shape is more useful for the small proportion of non-Manning Type 1b nails, but this information is often tied into typology. Recording the head size and the shank width were also only of limited value: head size, shank width, and shank length plotted together, suggesting head size and shank widths are not useful to be routinely recorded separately from overall length.

Shank morphology and the internal clenched lengths gave information of a more analytical value. It should be noted that recording shank morphology can be a somewhat subjective process and morphologies should be seen as a spectrum with some groups (such as curved and hooked) closely related. However, these broad categories have been recognized anecdotally both within the literature and through survey work (see Fig. 1 for archaeological examples). For Settlement 2, complete and incomplete nails revealed similar shank morphology patterning, although the straight morphology was over-represented for incomplete nails due to broken ends (Table 4).

Valuable information was gained from nails with shank morphologies which could not have been extracted without losing their shape (turned, double clenched, and hooked). Five of the eight 'other' morphology nails were clenched in some way but did not fit specific morphology categories.[1] This was normally because the clench occurred within a different plane, for example instead of a double clenched nail with the final clench turning upwards towards the head, the clench turned towards the side of the shank. The internal clenched length range (10.2–91.8 mm) implies use with a variety of wood thicknesses. The positive skew of the lengths (IQR: 16.2–33.7 mm) suggests primary usage in smaller constructions. It particularly suggests that, if nails were being used to attach two wooden items together, these items must have been thin. Cladding from buildings

1 The curled shank morphology was not recorded for the Settlement 2 nails as it was not identified prior to sampling, instead being classed as an 'Other morphology' type.

recovered from Roman London have thicknesses of around 20–30 mm (Goodburn 1991, 201; 2011, fig. 351), suggesting these turned nails were likely not used to clench wooden planking together. This raises questions of why the clenching was occurring in the first place if it was not, as with ship building, employed to clench multiple wooden pieces together (McGrail 2004). The turning could have been intended to attach wooden and metal objects together, as with Anglo-Saxon turned nails found *in situ* within hinges from Coppergate, York (Ottoway 1989, 196), and Roman drop hinges from Lakenheath, Suffolk (Manning 1985a, 126, R8; British Museum BEP 1882,0206.14). Further investigation of internal clenched lengths within surviving wooden assemblages and functional iron objects would confirm this.

Recording tip morphology provided few insights, although this information has provided results for other assemblage types, particularly ship building nails (Bill 1994). Medieval and post-medieval nails have greater tip morphology variety (Humphreys 2020). The lack of variety in this sample may suggest Roman nails were less specialized in function.

Spatial distribution of the Settlement 2 nails

Nail distribution correlated strongly with other registered finds, and areas in which occupation was concentrated in the late Roman phase. Fig. 3 shows the distribution of shank morphologies across the site. There was no noticeable difference in the distribution of straight, curved or turned nails within the distribution of the whole sample. Turned nails occurred in small numbers, with only a few areas displaying higher concentrations (discussed below). Counts for the other morphologies were too small to detect individual patterning.

Nails clearly concentrated in three areas of the site. The fact nails were recovered from the heart of the settlement suggests deposition near usage location, rather than removal for extramural dumping. Nails were scattered across multiple contexts rather than recovered in large volumes from single contexts, contrasting with large hoards from military (Inchtuthil) and urban (Bucklersbury) sites. This may be taken as an indication that nail extraction and collection was not a common practice for this rural site. Certain features of nail distribution, particularly their relationship to excavated structures, deserves further comment. The places in which nails are most concentrated broadly relate to excavated structures, although few nails were actually found in specifically structural contexts like postholes or beamslots.

Structure 20.500: The blacksmith's forge

The first cluster was around structure 20.500 and the surface in front of it. Due to the quantity of metalworking debris found, the area has been identified as a potential forge (Atkins and Douthwaite 2024). The surface in front ([202529]) contained a large nail assemblage, including 22 straight, three turned and one curved nail. The number of nails associated with the structure, particularly compared to near-by structures, likely relates to its use as a forge. However, the presence of turned nails on the surface in front implies that these were used within the area rather than as unused products of the forge. The forge would allow for greater access to iron for use in the structure's construction, and potentially less interest in collecting nails (against the traditional interpretation of blacksmiths being more likely to recycle iron). Hammer (2003, 155) suggests Roman forges would have been less substantial than other buildings, requiring multiple rebuilds, and the nails may be evidence of this.

FIGURE 3
Distribution of shank morphology groups across River Great Ouse Settlement 2, MHI A14 Cambridge-Huntingdon excavations.

Structure 20.231–3: A multi-phase structure and midden

The second concentration was found within a multiphase wooden structure built in two late Roman sub-phases. Only straight (*n*=7) and curved (*n*=1) nails were excavated directly from the structure. In comparison, one area of the surface (20.229) in front of the building (organic deposit [208334]) provided a huge number of nails (*n*=88) including 10 turned, 57 straight, 18 curved, 2 s-shaped and one 'other' shaped. This area was originally a metaled surface constructed during late Roman sub-phase 1, but by sub-phase 2 had been cut into by enclosure ditches. By phase 2 a dense occupation layer formed in one corner which, given the presence of large amounts of animal bones, CBM, and pottery, has been identified as a midden (Atkins and Douthwaite 2024). As turned nails were contained within this layer, nails were likely deposited still attached to the wood (or potentially after burning). There is some patterning with the internal clenched lengths for these nails, with one group between 10.4–20 mm (*n*=7) and another 31.7–38.4 mm (*n*=3). Although a small sample, it may suggest the two groups were originally used in different constructions, or different parts of the same construction. This deposit comprised dumped household waste alongside used nails from one or more structures, representing discarding of nails as rubbish rather than collecting for re-use.

Structure 20.221: The timber gateway and trackway

The gateway was a multiphase structure, with one phase cutting into the nearby metaled trackway. Towards its northern end, 36 nails were excavated from a deposit ([207543]). There were 21 straight, 11 curved, and four turned nails. Six were not Manning Type 1b – a high proportion of non-Manning Type 1b's compared to the rest of the settlement. The complete nail lengths also had distinct patterning. Of the 22 complete nails, 12 measured between 39.0 and 50.0 mm, with two groups exactly the same length (46.8 mm, *n*=2; 48.4 mm, *n*=3). These extremely close dimensions suggest the nails may have been manufactured for specific usage within the gateway. One of each nail from these grouped lengths was a Manning Type 3, further indicating specific commissioning. One turned nail was a very distinctive 'other' Type, with a very large round head (45.7 mm diameter). The internal clenched length (51.2 mm) was also relatively short suggesting it was not driven through a very thick timber. This nail was clearly made for a particular purpose within the gateway itself, potentially a large decorative stud for the entry door.

The trackways used to reach the gate had 30 nails associated with them (16 straight, six curved, four turned and two s-shaped nails). Two 'other' shank morphology nails also had morphologies suggestive of specific function. Both had the bottom shank portion curled back up and into the shank. At Bucklersbury, Rhodes (1991, 138) identified nails that 'curl back or around in a spiral' as evidence of hitting an obstruction in the wood during insertion. Although no diagram is given, this resembles the two 'other' shank morphology nails from the external trackway. However, their specific spatial location argues against accidental formation. It is not clear what these could have been used for, but this shank morphology was found nowhere else on the settlement. Further recording of this morphology from other assemblages will assist in assessing its significance.

A group outside enclosure 9 also showed the potential of recording shank morphology. Six turned nails excavated from ditches and deposits in this area had two groups of internal clenched lengths: 14–18 mm (*n*=3), 28.4–33 mm (n=3). No clear structures were excavated here, but the volume of material recovered has been taken as potential evidence for domestic occupation. The turned nail groups were not all from one spot (nor were nails of each length located together). This makes it more likely the common lengths did not result from them being dumped together, but from having been used within two distinct wood thicknesses. Notably, a group of woodworking tools (froe, chisels and drill bits) were recovered here, tentatively indicating the area could have been used for woodworking (Humphreys 2024). The shank morphology pattern may be helpful in giving further information as to the types of activity occurring here, with initial indications for small scale furniture construction.

Settlement 2 conclusions

This detailed recording has shown there are clearly areas with greater analytical value. Using a typology was most useful in highlighting nails different from the norm (Manning's Type 1b). For Manning Type 1b's, length can be a helpful measurement for an assemblage sample, to give detail about what the nails may practically have been used for. The indication from length analysis is that most Settlement 2 nails were for general structural situations (cladding, roofing or shelving) rather than heavy-duty or load bearing use. For other types, more likely to have been commissioned for specific purposes, it was valuable to record detailed information (length, head shape and size). Shank morphology, and recording internal dimensions from turned, double clenched, and hooked nails revealed patterns in construction in specific locations. Four nail clusters were identified, and the detailed recording allowed for greater analysis of activities undertaken than otherwise possible. These were: a blacksmith's forge with more nails than surrounding buildings, a structure and midden indicating dumping nails and timbers, a gatehouse with specially commissioned nails, and a timberyard with turned nails relating to activities there.

RECOMMENDATIONS FOR FUTURE NAIL RECORDING

A number of recommendations can be made for future recording of nail assemblages. These recommendations apply only to structural nails and aim to extract the maximum amount of useable data from assemblages quickly and efficiently. These recommendations have been developed primarily considering British material, but should be applicable to multiple period/place assemblages. Consideration should be taken of the regional contexts of assemblages outside Britain and in the longer-term further research should be undertaken to determine the significance of nails outside of Romano/British contexts which may particularly impact retention/discard policies.

Nails are often recovered in a highly corroded state and are unlikely to be cleaned prior to analysis. X-radiographs should be taken of all nails recovered to: aid in type identification, ensure a full permanent record, and allow identification of fragmentary iron objects (especially tools).

Most structural nails should continue to be recorded as bulk material by context. Nails should be separated into bags containing only one type, with headless shanks bagged separately.

The following represents the minimum data recording for each bag:

- Fragment Count
- Head Count
- Complete Nail Count
- Bag typology
- Condition
- Number of nails clenched, curled or otherwise modified in some way
  - This could be done grouped, or by individual morphology categories (turned, hooked, double clenched, curled, etc). Straight, curved or s-shaped shanks should not be quantified.

This research has revealed several gaps and inconsistencies in existing typologies and suggests a revised structural nail typology is required, one adapted from Manning's types, but expanded to be useable for wrought iron nails of any period (including Goodall's types) and adding new types discovered since (Fig. 4; Table 5). As with all typologies, it may require expansion in light of new discoveries or specific regional/temporal variations (especially if applied outside of Britain). The new typology also aims to link types with likely functions.

This paper also presents a new nail condition scale developed by Owen Humphreys. Condition recording for the A14 nails was based on the imagined/perceived condition of the iron within the nail rather than its identifiability in its current state. However, as most nails are unlikely to be cleaned, a condition scale based on identifiability is more suitable. The encrustation scale has five stages and considers both encrustation and any fragmentation that may have occurred (Fig. 5). As all nails are from the same context, this is likely to be consistent within the bag. Where variation is present, recording the condition of the best-preserved nails is the most useful.

Weight was not a helpful factor to record for either the A14 or Settlement 2 assemblages. Whilst nails were historically sold by weight rather than quantity, true nail weight is often obscured

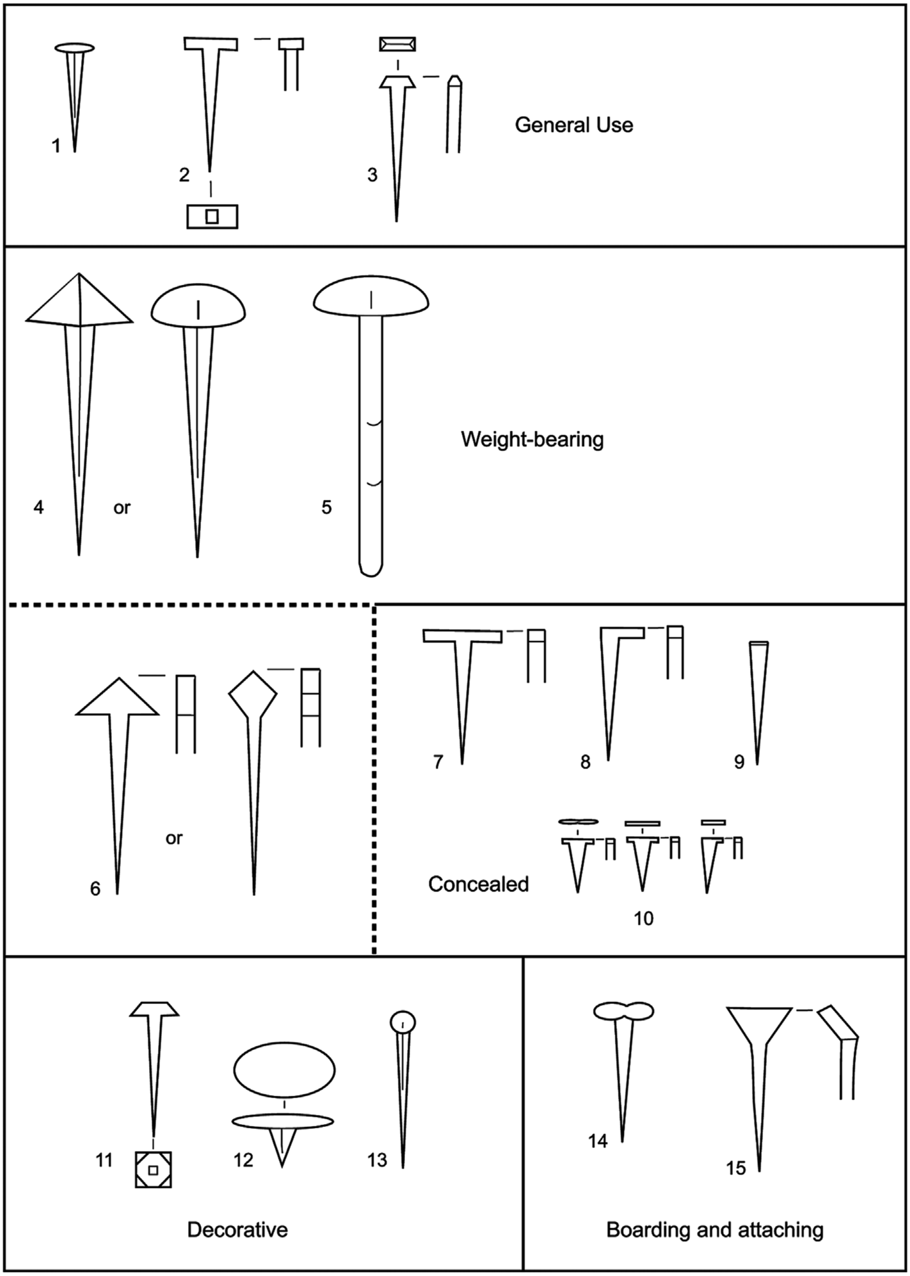

FIGURE 4
A new typology of wrought structural iron nails. By the author with additions from Humphreys. (Note: this is to relative scale rather than absolute).

TABLE 5

A new typology of wrought structural iron nails: descriptions, periods, suggested usage and equivalences. By the author with additions from Humphreys

Number	Name	Description	Suggested Usage/Function	Manning (1985a) and Goodall (1980) equivalences	Period
1	General type	Round, square or sub-round flat head. Square tapering shank ending in a point. Varied length, but likely to cluster around lengths under 150 mm.	Very varied general usage, mainly non-weight bearing. Cladding, fixing, hanging, furniture, coffins, etc. Within cremations, examples likely to be under *c*.20 mm and used for furniture.	Manning 1b (but without length restriction), Goodall 1	Any
2	Expanded T-Shaped	T-shaped head, with head wider than shank. Shank can either be in line with head or rotated.	Varied usage. Functional type allowing for head to be flat against the board. Head not concealed.	NA	Any
3	Rectangular Faceted	Faceted rectangular head. Shank and head equal width. Square shank tapering to a point.	Varied usage, general purpose type with a sturdy head.	Goodall 4	All
4	Structural	Neatly made robust head (usually either pyramidal or conical). Square tapering shank ending in a point. Usually, above *c*.100 mm in length.	For weight-bearing usage, for attaching heavy timbers. Head to withstand extreme hammering.	Manning 1a	Any
5	Masonry	Round or sub-round head, slightly domed. Thick, round tapering stem.	For use within masonry	Manning 6	Roman
6	Concealing structural	Diamond/lozenge or triangular head (when viewed from the side). Head is the same width as the shank. Square tapering shank ending in a point.	Can be weight-bearing, depending on length. Head can withstand force of hammering needed for longer structural elements. May be concealing due to common head and shank width.	Manning 2	Any
7	T-shaped	T-shaped head, head same width as the shank. Square tapering shank.	Concealing, non-weight bearing. Could have been used to clamp things down together.	Manning 3, Goodall 3, Goodall 9	Any
8	L-shaped	L-shaped head with protrusion only on one side. Square tapering shank ending in a point.	Concealing, non-weight bearing.	Manning 4, Goodall 7	Any
9	Headless	Square tapering shank with no head. Head is smooth		Manning 5, Goodall 6, Goodall 8	Any

(Continues)

TABLE 5
(Continued)

Number	Name	Description	Suggested Usage/Function	Manning (1985a) and Goodall (1980) equivalences	Period
		and not resulting from a broken shank. Some have a slight lip where the head would otherwise be. Identification difficult depending on encrustation.	Concealing type, non-weight bearing		
10	Small T-shaped	Rectangular, figure-of-eight or sub-rectangular heads. Thin rectangular sectioned shank almost as if cut from a sheet.	For fine detailed work, small concealing heads that can easily be driven into wood.	NA	Medieval and post-medieval
11	Square Faceted	Square heads with deliberately faceted corners. Square shank tapering to a point.	Decorative or general construction. Faceted head may have withstood greater hammering force.	NA	Medieval and post-medieval
12	Decorative	Round head with square tapering shank. Head and length are proportionate to each other. Differentiated from general type by short length and wide head.	Decorative, likely for use within furniture and upholstery	Manning 7, Goodall 10, Goodall 12	All
13	Globular	Small globular head with extended shank, resembling a pin. Square tapering shank ending in a point.	For furniture, upholstery, decorative purposes	Manning 9	All
14	Bipedal	Figure of eight head with two lobes and shank in the middle. Square tapering shank ending in a point.	Used for holding two edges of boarding together	Goodall 5	Medieval and post-medieval
15	Chisel headed	Flaring chisel head. Widest part of the head away from the shank. Square tapering shank ending in a point.	Clamping down on one edge, for example with boarding	NA	All

by iron condition. Weight fails as a representative quantitative measurement, with nail length a better factor. Weight may occasionally be required for storage/assemblage management.

Once all nails have received basic bulk recording, further detailed recording should be undertaken on specific contexts or groups. This is also the scale at which it is helpful to conduct detailed spatial analysis. Considering nails as individual registered finds makes it easier to conduct this type of analysis, as measurements will relate to individual objects. Nails not of the 'General' type should receive additional recording. Scarcity of these types implies commissioning for specific purposes. Other types are also easier to link to specific usage, particularly with further metric information. Detailed recording is also appropriate for nail groups from assemblages of interest, with decisions taken on a site-basis. On the A14, significant groups included those from burials (particularly cremations), multi-phase structures, functional structures (like the forge), prehistoric and early medieval structures (which use fewer nails), formation deposits (such as dark earth or demolition layers).

Additional recording elements for these groups are:

- Nail length
- Head shape
- Head size (at widest point)
- Shank section (if not square)
- Shank morphology
- Internal clenched length (from underneath head to clench point)
- Tip morphology

A sample of length measurements should also be taken from complete 'General' type examples. Whilst it is not always practical to take measurements for all 'General' type nails, particularly when recording nails as bulk material, a spatially and temporally representative sample indicates how this general-purpose type may have been used across the site. This will facilitate inter-site comparison and allow the broad characterization of the assemblage.

The supplementary material contains blank basic and detailed recording sheets, suggested recording categories, and key terminology for consistent description of each category and for describing new types or shank morphologies, alongside a glossary of key terms.

Assemblages recorded with this methodology may be considered appropriate for discard, with x-rays and tabulated data serving as a permanent record. Nevertheless, it is recommended that, as a minimum, nails from the following categories be stored in dry conditions and retained for future study:

- A sample of complete nails of each type identified.
- All nails from:
  - Iron Age or early medieval contexts.
  - Burials
  - Other significant contexts identified during analysis.

CONCLUSION

This paper has reviewed current nail recording practices and former academic study. It has established that there has previously been no consistent way to record structural iron nails to maximize their potential and allow for comparing assemblages. Existing typologies are inconsistent and crucially lack the full range of information required to understand how nails might have been used in the past. The principles of shank morphology have been tested through experimental nail shaping which revealed that nails which were clenched in some way (turned, hooked, double clenched) retained most information about past usage. By taking metric data from these morphology types, we can gain an indication of the dimensions of the wood they were used in, and the circumstances under which they were deposited. The most common morphology types, straight and curved shanks, are too ambiguous to provide definitive evidence for archaeological use, *contra* previous suggestions of them evidencing extraction (Rhodes 1991, 136). The form of s-shaped nails seems to result from insertion rather than extraction. This experimental testing also cast doubts on

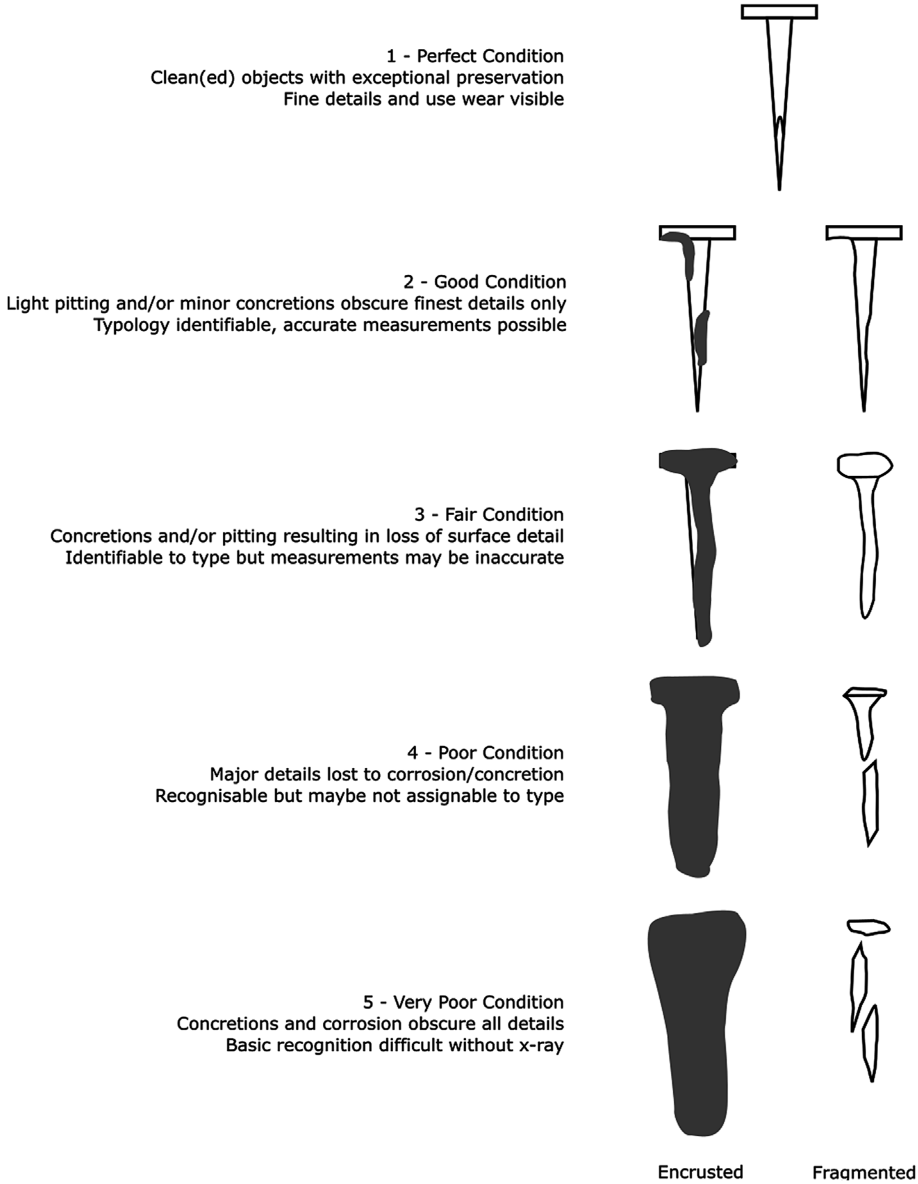

FIGURE 5
Nail encrustation scale. Illustration by Humphreys.

the likelihood of large-scale nail extraction in antiquity, given the difficulty of physically removing nails, although it would have been easier to extract nails from partially rotten wood. More comparable experimental work should be carried out to confirm the conclusions developed here. Additional investigation of internal clenched lengths within surviving wooden assemblages and functional iron objects would also be helpful.

For future archaeological practice, head-based typology recording should be combined with other types of information (shank morphology, tip morphology, select metric information) to maximize the analytical potential of nails. For time/cost reasons, such detailed data gathering should be directed at targeted nail groups. Analysing the Settlement 2 assemblage from the A14 revealed the benefits of recording shank morphology and metrics for understanding particular locations and structures. Finally, improved recording practices for structural nail assemblages are suggested, including a revised nail typology.

Acknowledgements

This work comprised a Masters thesis at the University of Reading, funded by National Highways as part of the archaeological mitigation of the impact of the A14 Cambridge-Huntingdon road improvement scheme prior to development, in conjunction with MHI. The Roman Finds Group provided a grant, allowing me to carry out experimental work with a historic blacksmith (Hector Cole). Sarah Lambert-Gates and Swagata Sarkar assisted with illustrations. My particular thanks to Dr Owen Humphreys for his support on nail recording and refining the typology, alongside use of several figures, and Professor Hella Eckardt for her continued support of this work, alongside those who kindly completed the survey.

(KJBM) Department of Archaeology
University of Reading
Reading RG6 6AH
UK
E-mail: k.j.b.manby@pgr.reading.ac.uk
ORCID: https://orcid.org/0000-0001-5447-3557

doi: 10.1111/ojoa.12291

REFERENCES

ADAMS, W.H. 2002: Machine cut nails and wire nails: American production and use for dating 19thcentury and early-20thcentury sites. *Historical Archaeology* 36(4), 66–88.

ANGUS, N.S., BROWN, G.T. and CLEERE, H.F. 1962: The iron nails from the Roman legionary fortress at Inchtuthil, Perthshire. *Journal of the Iron and Steel Institute* 200, 956–68.

ATKINS, R. and DOUTHWAITE, A. 2024: A14 Cambridge to Huntingdon, *Cambridgeshire: River Great Ouse Landscape Block Analysis Report* (*MHI Infrastructure*).

BARNES, J.A. 2018: Nails, tacks, and hinges: the archaeology of Camp Monticello, a World War II prisoner of war camp. *Southeastern Archaeology* 37, 169–89.

BERNARDINI, F., HORVAT, J. and VINCI, G. 2023: San Rocco/Koromačnik military camps (2nd–1st centuries BC). In HORVAT, J., BERNADINI, F. and BELAK, M. (eds.), *The Roman Conquest beyond Aquileia (II-I Centuries BC)* (Ljubljana, *Opera Instituti Archaeologici Sloveniae* 45), 21–48.

BILL, J. 1994: Iron nails in Iron Age and Medieval shipbuilding. In WESTERDAHL, C. (ed.), *Crossroads in Ancient Shipbuilding: Proceedings of the Sixth International Symposium on Boat and Ship Archaeology, Roskilde 1991* (Oxford), 53–63.

BRAM, M., IDDAN, N., ASHKENAZI, D. and CVIKEL, D. 2020: The nineteenth-century Molyneux boat: archaeometallurgical perspective of its metal fastenings. *Metallography, Microstructure and Analysis* 9, 721–43.

BURANDT, B. 2016: Iron footed – hobnail patterns under Roman shoes and their functional meaning. In HOSS, S. and WHITMORE, A. (eds.), *Small Finds and Ancient Social Practices in the Northwest Provinces of the Roman Empire* (Oxford), 9–15.

CLARK, J. 1995: *The Medieval Horse and its Equipment c.1150–1450* (London).

CLEERE, H.F. 1958: Roman domestic ironwork, as illustrated by the Brading, Isle of Wight, villa. *Bulletin of the Institute of Archaeology* 1, 55–76.

COHEN, M., ASHKENAZI, D., KAHANOV, Y., STERN, A., KLEIN, S. and CVIKEL, D. 2015: The nails of the Akko Tower wreck (Israel): archaeometallurgical analyses. *Metallography, Microstructure and Analysis* 4, 188–206.

DUNGWORTH, D. 1998: Mystifying Roman nails: *clavus annalis*, *defixiones* and *minkisi*. In FORCEY, C., HAWTHORNE, J. and WITCHER, R. (eds.), *TRAC 97: Proceedings of the Seventh Annual Theoretical Roman Archaeology Conference* (Oxford), 149–58.

FONTANA, B.L. 1962: Square cut nails. In FONTANA, B.L. and GREENLEAF, J.C. (eds.), *Jonny Ward's ranch: a study in historic archaeology.* Kiva 28, 44–66.

GAWRONSKI, J., KRANEDONK, P., STRAK, H and, GAMESTER, K. 2018: *Catalogue of Archaeological Finds from Amsterdam's North-South Metro Line* (Amsterdam).

GOODALL, I.H. 1980: Ironwork in Medieval Britain: An Archaeological Study (PhD thesis, University College Cardiff).

GOODALL, I.H. 2011: *Ironwork in Medieval Britain: An Archaeological Study* (London).

GOODBURN, D. 1991: A Roman timber framed building tradition. *Archaeological Journal* 141, 182–204.

GOODBURN, D. 2011: Woodworking. In HILL, J. and ROWSOME, P. (eds.), *Roman London and the Walbrook Stream Crossing: Excavations at 1 Poultry and Vicinity, City of London* (London, *Museum of London Archaeology Monograph* 37), 393–6.

GOODBURN, D. 2019: Worked wood. In *Mola-Headland Infrastructure 2019: A14 Cambridge to Huntingdon, Cambridgeshire: Vol. 3.1 Finds Assessment (Non-pottery)* (London, *MHI report*), 262–87.

GOODBURN, D., GOFFIN, R. and HILL, J. (with ROWSOME, P.) 2011: Domestic buildings and other structures of timber. In HILL, J. and ROWESOME, P. (eds.), *Roman London and the Walbrook Stream Crossing: Excavations at 1 Poultry and Vicinity, City of London* (London, *Museum of London Archaeology Monograph* 37), 414–37.

GREEN, J. 2014: Dating modern wire nails. *Newsletter of the Louisiana Archaeological Society* 42, 20–1.

HAMMER, F. 2003. *Industry in North-western Roman Southwark: Excavations 1984–8* (London, *MoLAS Monograph* 17).

HANSON, W.S. 1978: The organisation of Roman Military timber supply. *Britannia* 9, 293–305.

HOW, C. 2019: Historic 'magic' nails: their typologies and their ritual uses. In CAMBELL, J.W.P., BAKER, N., DRIVER, M., HEATON, M., KUBAN, S., TUTTON, M., WALL, C. and YEOMANS, D. (eds.), *Water, Doors and Buildings, Studies in the Histories of Construction. The Proceedings of the Sixth Annual Conference of the Construction History Society* (Oxford), 213–27.

HOW, C., BOLLE, C., LÉOTARD, J.-M., and LAPIN, A. 2016: The Medieval bi-peal head nail. In CAMBELL, J.W.P., BAKER, N., BILL, N., DRIVER, M., HEATON, M., PAN, Y., TUTTON, M., WALL, C. and YEOMANS, D. (eds.), *Further Studies in the History of Construction: The Proceedings of the Third Annual Conference of the Construction History Society* (Cambridge), 119–28.

HUMPHREYS, O. 2020: The Bulk Iron Nails from Sugar Quay (SGA12) and the Three Quays (TEQ10) (London, *MOLA Unpublished Report*).

HUMPHREYS, O. 2021a: The A14 Nails (London, *MOLA Unpublished Report*).

HUMPHREYS, O. 2021b: *London's Roman Tools* (Oxford).

HUMPHREYS, O. 2024: A14 Cambridge to Huntingdon, Cambridgeshire: River Great Ouse Registered Finds: Iron Age and Roman (MHI report).

MANBY, K. 2022: For want of a Nail: How Should We Approach Structural Iron Nail Assemblages, and What Can They Reveal about Society, Settlement Patterns, and the Economy within the A14 Landscape (MA Thesis, University of Reading).

MANBY, K. 2024a: A14 Cambridge to Huntingdon, Cambridgeshire: Alconbury Iron Nails (MHI report).

MANBY, K. 2024b: A14 Cambridge to Huntingdon, Cambridgeshire: Brampton West Iron Nails (MHI report).

MANBY, K. 2024c: A14 Cambridge to Huntingdon, Cambridgeshire: West of Ouse Iron Nails (MHI report).

MANBY, K. 2024d: A14 Cambridge to Huntingdon, Cambridgeshire: River Great Ouse Iron Nails (MHI report).

MANBY, K. 2024e: A14 Cambridge to Huntingdon, Cambridgeshire: Fenstanton Gravels Iron Nails (MHI report).

MANBY, K. 2024f: A14 Cambridge to Huntingdon, *Cambridgeshire: Conington Iron Nails (MHI report)*.

MANBY, K. 2024g: A14 Cambridge to Huntingdon, *Cambridgeshire: Bar Hill Iron Nails (MHI report)*.
MANNING, W.H. 1985a: *Catalogue of the Romano-British Tools, Fittings and Weapons in the British Museum* (London).
MANNING, W.H. 1985b: The iron objects. In PITTS, L.F. and ST JOSEPH, J.K. (eds.), *Inchtuthil the Roman Legionary Ffortress* (London, *Britannia monograph series* 6), 289–99.
MARSHALL, M. 2019: The iron nails from Franklands Drive, Addlestone. In HENDERSON, M. and HOWELL, I.J. (eds.), *A 3rd Century AD Cremation Cemetery at Franklands Drive, near Addlestone* (Guilford, *Surrey Archaeological Collections* 102) S101–6.
MCGRAIL, S. 2004: To clench or to rivet: that is the question? *The International Journal of Nautical Archaeology* 33, 149–53.
MERCER, H. 1923: *The Dating of Old houses* (Pennsylvania).
Mola-Headland Infrastructure 2019: *A14 Cambridge to Huntingdon, Cambridgeshire* Vols. 1–3 (London, *MHI report*).
MOULD, Q. 2004: The iron nails. In COOL, H.E.M. (ed.), *The Roman Cemetery at Broughton Cumbria, Excavations 1966–67* (London), 271–2.
NELSON, L.H. 1968: Nail chronology: as an aid to dating old buildings. *History News* 23(11), 203–14.
OTTOWAY, P. 1989: Anglo-Scandinavian Ironwork from 16–22 Coppergate, York. c.850–1100AD (PhD thesis, University of York).
PITTS, L.F. and ST JOSEPH, J.K. 1985: *Inchtuthil the Roman Legionary Fortress* (London, *Britannia monograph series* 6).
POWELL, K. 2010: Structural nails and coffin fittings. In BOOTH, P., SIMMONDS, A., BOYLE, A., CLOUGH, S., COOL, H.E. M. and POORE, D. (eds.), *The Late Roman Cemetery at Lankhills, Winchester Excavations 2000–2005* (Oxford), 320–33.
RHODES, M. 1977: Iron nails. In BLURTON, T.R. (ed.), *Excavations at Angel Court, Walbrook, 1974*. Transactions of the London and Middlesex Archaeological Society 2.28, 63–4.
RHODES, M. 1991: The hoard of ion nails. In WILMOTT, T. (ed.) *Excavations in the Middle Walbrook Valley* (London), 132–8.
SPARKES, I.G. 1976: *Old Horseshoes* (Aylesbury).
VILLA, S.A. 2009: Nails for the dead: a polysemic account of ancient funerary practice. In SIMÓN, F.M., and GORDON, R.L. (eds.), *Papers from the International Conference Held at the University of Zaragoza, 30th September – 1st October 2005* (Leiden), 427–56.
VOLKEN, M. 2017: The Roman hobnail, finds from the Valais, Switzerland and first steps towards a typology and chronology. *Journal of Roman Military Equipment Studies* 18, 5–26.
WELLS, T. 1998: Nail chronology: the use of technologically derived features. *Historical Archaeology* 32(2), 78–99.
WALDBAUM, J.C. 1983: *Metalwork from Sardis* (Massachusetts).
ZORI, D. 2007: Nails, rivets and clench bolts: a case for typological clarity. *Archaeologia Islandica* 6, 32–47.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Data S1. Supporting Information.

Data S2. Supporting Information.

Data S3. Supporting Information.