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The Roman building materials from excavations at Chester's Roman amphitheatre

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The Roman building materials from excavations at Chester's Roman amphitheatre

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Front cover: *Tegula*; middle fragment with partial Twentieth Legion ?Holt type 5 stamp: LEGX[overlain by hobnail impressions (Catalogue No 28).

SUMMARY
This report presents the full analysis of the Roman building materials recovered from excavations at Chester amphitheatre between 2004—6. Although most of the material does not relate to the structure of the amphitheatre itself, it formed a major component of the occupation deposits around the building, and of the dumped material reused in the construction of the seating banks of the first amphitheatre. The assemblage demonstrates the quantity, quality and variety of building materials in use in Chester during the first three decades of the existence of the Roman fort and *canabae*.

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This report is dedicated to my mother, Barbara May Jones (2 May 1936 to 8 October 2004).

ARCHIVE LOCATION
The Project archive, including the objects reported upon will be located with the Grosvenor Museum, 27 Grosvenor St, Chester CH1 2DD.

DATE OF RESEARCH
The excavations producing this material took place from 2004-6. Work on the material was completed in 2016.

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INTRODUCTION

The site

The excavations at Chester's Roman Amphitheatre took place in 2004——6. The work was jointly resourced by English Heritage and Chester City Council (now Cheshire West and Chester Council – CWAC). These were by no means the first excavations on the site, which was discovered in 1929. The whole northern half of the building was excavated during the 1950s—70s by F H Thompson (1976), and a large number of evaluative excavations have taken place since then (Fig 1).

The recent excavations were carried out in three separate areas, designated A, B, and C (Fig 1).

The three open areas were excavated with different aims and objectives (Wilmott and Garner 2018, 23). Area A was completely excavated, examining all periods from prehistory to the 20th century, with particular emphasis on the phasing of the two successive amphitheatres. Area B was excavated to the top of Roman levels and no further, in order to examine the relationship between the medieval church of St John and the amphitheatre, and Area C was also completely excavated in order to examine the stratification of the arena fills from the Roman period to the present.

During the analysis phase of the work, the archaeology of the site was divided into 21 Phases, which were rationalised into 8 Periods. These, together with their dates and descriptions, are summarised in Table 1.

The final publication of the excavation will appear in two volumes, one for the Prehistoric and Roman periods, the second for the post-Roman archaeology. Volume 1 (Wilmott and Garner 2018) includes all Roman stratification, and all Roman finds, including that found residually. In some cases the full analyses are summarised in Volume 1 and fully published in the Historic England Research Report Series (*see also Gardner 2009*).

This report presents the full analysis of the Roman building materials recovered from the excavation, covering ceramic building material, plaster, cement mix (mortars) and earth mix (daub). Most of this material does not relate to the structure of the amphitheatre itself, but as a major component of occupation deposits around the building(s) in Phases 5 and 7, and of the dumped material reused in the construction of the seating banks of the first amphitheatre, the assemblage demonstrates the quantity, quality and variety of building materials in use in Chester during the first three decades of the existence of the Roman fort and *canabae*.

Fig 1 *Plan of all archaeological interventions on the amphitheatre site since 1972. 1–40, LUAU (Kath Buxton) (1993); 41–46, Chester Archaeology (R Cleary) 1994; 47—-49, Gifford (Dan Garner) 2004; 50—-54, L-P Archaeology (Dan Garner) 2015; I–XII, Chester Archaeology (Keith Matthews) 2000—03; A B and C, Chester Amphitheatre Project 2004—-6.*

PERIOD	Phase	Description	Dating
0	0	Natural geology, and soils	
1		Prehistoric activity	*c* 6,000 BC – *c* AD 70
	1a	Mesolithic to early Bronze Age	*c* 6,000 BC — ?
	1b	Middle Iron Age settlement	400—-200 CAL BC
	1c	Middle Iron Age cultivation	*c* 200BC – *c* AD 70
	2	Late Iron Age cultivation	
2	3	Roman occupation before the construction of the amphitheatre	*c* AD 70 — c AD 200
3		The first Roman amphitheatre	*TPQ* AD 71
	4	Construction of Amphitheatre 1a	*TPQ* AD 71
	5	Use of Amphitheatre 1a	*c* AD 71—-92/4
	6	Construction of Amphitheatre 1b	*TPQ* AD 92/4
	7	Use of Amphitheatre 1b	*c* AD 92/4 — *c* AD 200
4		The second Roman amphitheatre	c AD 200—- 280
	8	Construction of Amphitheatre 2	*c* AD 200
	9	Use of Amphitheatre 2	*c* AD 200—- 280
5	10	Change of use	750—-950 Cal AD
6		Disuse and robbing	11th century
	11a	Internal robbing	11th century
	11b	Robbing of outer wall	11th century
7		Medieval domestic occupation	11th — 17th century
	12	Structures and pits	11th —-13th century
	13	Stone founded buildings, pits and cultivation	14th — 15th century
	14	(post dissolution of St John's) demolition and cultivation	16th century
8		Post medieval domestic occupation	17th – 20th century
	15	Civil War siege: military finds	September 1645 – February 1646
	16 - 18	Construction and occupation of mansions Dee House and St John's House, including garden activity	1660s – *c* 1850
	19	Dee House chapel and convent gardens (Areas B and C)	*c* 1850—- 1976
	20	Housing and service runs	*c* 1850— 1950s
	21	Archaeological interventions	1929—- 2003

Table 1 Summary table of periodisation and phasing of the 2004—6 excavations.

Chronological distribution

Ceramic building material was recovered from pre-Roman Phase 2, Roman Phases 3—9, post-Roman Phases 10—11b (Periods 5—6: Amphitheatre 2 change of use and wall robbing) and 12—21. A small amount of unphased and unstratified material was also recovered. Roman phases produced just 18.4 % of the assemblage with 80.7 % from later phases, of which most was retrieved from Phases 12-21 (49.5 % by weight of the total), followed by 10 (12.9 %) and 11b (11.4 %), with 6.8 % from Phase 11a (*see Table 2*). The greatest quantity of ceramic building material from Roman phases came from Phase 6 (7.3 %), followed by Phases 7 (4.8 %), 5 (3.5 %), 8 (1.3 %) and 9 (1.0 %). Smaller amounts were retrieved from Phases 3 and 4 (0.3 % and 0.2 % respectively).

Phase	CBM % wt*	Plaster % wt	Cement mix % wt	Daub % wt
2	0.002	0	0	0
3	0.3	0.3	0.4	2
4	0.2	0	0.1	0
5	3.5	12.9	6	37.1
6	7.3	9.3	5.2	31.4
7	4.8	28.4	16.8	0.2
8	1.3	0.02	0.6	0
9	1	0	0.4	0
Total 3—9	18.4	50.92	29.5	70.7
10	12.9	0.4	3.7	11.1
11	0.1	0	0	0
11a	6.8	3.9	26.3	2.5
11b	11.4	14	21.2	2
Total 10—11b	31.2	18.3	51.2	15.6
12–21	49.5	30.8	19.1	13.5
Total PR	80.7	49.1	70.3	29.1
u/s	0.04	0	0.1	0.2
Unphased	1.1	0	0.1	0
Total	100.242	100.02	100	100

* % of total assemblage per material category

Table 2: Roman building materials by type, phase and % weight

Plaster was retrieved from Roman Phases 3 and 5—8, post-Roman Phases 10—11b and 12—21. None came from pre-Roman Phase 2 or was recorded as unphased or unstratified. Unlike the ceramic building material, a similar amount of plaster was retrieved from Roman (50.92 % by weight of the total) and later (49.1 %) phases. Most of the plaster came from post-Roman Phases 12—21 (30.8 %), with 14.0 % from Phase 11a, 3.9 % from 11 b, and just 0.4 % from Phase 10. The greatest quantity of plaster from Roman phases was retrieved from Phase 7 (28.4 %), followed by Phases 5 (12.9 %) and 6 (9.3 %). Smaller amounts came from Phases 3 (0.3 %) and 8 (0.02 %).

As with the ceramic building material, cement mix was recovered from Roman Phases 3—9, post-Roman Phases 10—11b and 12—21. A small amount of unphased and unstratified material was also recovered. None was retrieved from pre-Roman Phase 2. As with the ceramic building material, most of the assemblage came from post-Roman phases (70.3 % by weight of the total) with 29.5 % from Roman phases. Unlike the ceramic building material and plaster, most of the cement mix assemblage was recovered from post-Roman Phases 11a (26.3 % by weight) and 11b (21.2 %), followed by Phases 12—21 (19.1 %). Post-Roman Phase 10 produced 3.7 % by weight of the total. The greatest amount of cement mix recovered from Roman phases came from Phase 7 (16.8 %), followed by Phases 5 (6.0 %) and 6 (5.2 %), with 0.6 % from Phase 8 and 0.4 % each from Phases 3 and 9. Phase 4 yielded just 0.1 % of the total.

Daub was recovered from Roman Phases 3 and 5–7, post-Roman Phases 10—11b and 12—21. A small amount (0.2 %) of unstratified material was also retrieved. The chronological distribution of the daub differs quite markedly from the other building materials, as the majority (70.7 % by weight) of the assemblage was retrieved from Roman phases, with 29.1 % from later phases, almost the exact reverse of the chronological distribution of the cement mix assemblage. Most daub was recovered from Roman Phases 5 (37.1 % by weight of the total) and 6 (31.4 %). Smaller amounts were retrieved from Phases 3 (2.0 %) and 7 (just 0.2 %). The post-Roman Phases 12–21 yielded 13.5 % by weight of the total, followed by Phases 10 (11.1 %), 11a (2.5 %) and 11b (2.0 %).

The ceramic building material and cement mix assemblages had the most widespread chronological distribution, as they were recovered from all seven Roman phases, as well as from Phases 10—11b (Periods 5—6: Amphitheatre 2 change of use and wall robbing) and later Phases 12—21. The daub had the most limited distribution, as it was retrieved from just four Roman phases: 3 and 5—7. There was a similar distribution pattern for the plaster, as it was also retrieved from Phases 3 and 5—7, with just a single fragment/1 g from Phase 8. However, the plaster had the most even distribution between the Roman and later phases, with a roughly 50:50 split. In comparison, just over 80 % of the ceramic building material was retrieved from post-Roman phases, as was approximately 70 % of the cement mix assemblage. The majority of the daub (almost 71 %), however, was recovered from Roman phases.

Spatial distribution

The greatest quantity of building material was recovered from Area A (*see Table 3*) but there is a difference in the proportions of the different categories of material. More cement mix was retrieved from Area A (72.8 % by weight of the total), followed by plaster (61.4 %), daub (55.6 %) and ceramic building material (49.7 %). There is also a marked difference in the amounts recovered from Area C, with 18.0 % by weight of the ceramic building material assemblage, but just 1.9 % by weight of the cement mix assemblage and 0.2 % of the daub assemblage. None of the plaster was retrieved from Area C. Area B yielded a greater proportion of daub (44.2 % by weight of the total), compared to 38.6 % of the plaster assemblage, 32.0 % of

the ceramic building material assemblage and 25.2 % of the cement mix assemblage.

Material	Area A % wt*	Area B % wt	Area C % wt	u/s % wt	Total
CBM	49.7	32	18	0.3	100
Plaster	61.4	38.6	0	0	100
Cement mix	72.8	25.2	1.9	0.1	100
Daub	55.6	44.2	0.2	0	100

* % of total assemblage per material category

Table 3: Roman building materials by type, Area and % weight

A slightly different pattern emerges when one considers spatial distribution by period (*see Table 4*). A greater proportion of the ceramic building material assemblage (60.5 % by weight) from Roman phases was recovered from Area A, with 39.5 % from Area B and none from Area C. An even greater proportion (81.8 % by weight) of the plaster assemblage was retrieved from Area A (where it was mainly recovered from contexts associated with the Phase 7 shrine), with just 18.2 % from Area B. None was recovered from Area C. 86.0 % by weight of the cement mix assemblage came from Area A, with 14.0 % from Area B and none from Area C. The daub assemblage has a similar distribution pattern to the ceramic building material assemblage, in that a much greater proportion of material (43.6 % by weight) was recovered from Area B than either the plaster or cement mix, with 56.4 % from Area A and none from Area C.

Material	Area A % wt*	Area B % wt	Area C % wt	Total
CBM	60.5	39.5	0	100
Plaster	81.8	18.2	0	100
Cement mix	86	14	0	100
Daub	56.4	43.6	0	100

* % of Roman phased assemblage per material category

Table 4: Roman building materials from Phases 3—9 by type, Area and % weight

When considering both the chronological and spatial distributions from the Roman phases, the majority, by weight, of the ceramic building material assemblage (40.0 %) was retrieved from Phase 6 (comprising 39.5 % from seating bank deposits in Area B with just 0.5 % from Area A). 26.2 % came from Phase 7 and 19.2 % from Phase 5. Smaller amounts were retrieved from Phases 8 (6.9 %) and 9 (5.4 %) with the least ceramic building material from Phases 3 (1.5 %) and 4 (1.0 %).

In contrast, the bulk of the plaster from Roman phases was retrieved from Phase 7 (55.7 % by weight of the total) with 25.4 % from Phase 5 and 18.3 % from Phase 6.

The majority of the latter was also recovered from seating bank deposits in Area B (18.2 %), compared with just 0.1 % from Area A. Much smaller amounts were retrieved from Phases 3 (0.5 %) and 8 (0.04 %). The latter comprises a single fragment weighing just 1 g.

As with the ceramic building material, cement mix was recovered from all Roman phases, although the pattern of distribution is more akin to the plaster assemblage, with the greater proportion by weight of cement mix (56.8 %) retrieved from Phase 7, followed by 20.3 % from Phase 5 and 17.6 % from Phase 6. The majority of the latter (14.0 %) was also recovered from seating bank deposits in Area B, with just 3.6 % from Area A. Much of the Phase 7 assemblage comprises *arriccio* fragments from the collapse deposits of the shrine. As with the ceramic building material, less cement mix was retrieved from Phase 8 (2.2 %), with similar small quantities from Phases 3 (1.4 %) and 9 (1.3 %). Phase 4 also produced the least amount of cement mix (0.5 %).

The distribution pattern of the daub assemblage differs from the other building materials in that the bulk of the assemblage (52.5 % by weight of the total) was retrieved from Phase 5, with 44.4 % from Phase 6. The majority of the latter (43.6 %) came from seating bank deposits in Area B, with just 0.8 % retrieved from Area A. 2.9 % by weight of the assemblage came from Phase 3 with just 0.2 % from Phase 7. Daub was retrieved from just four Roman phases: 3 and 5—7.

Primary and secondary uses

It is probable that the ceramic building material assemblage derived mainly from the *canabae* and fortress and was brought to the site in the Roman period for use as hardcore, eg to add bulk and stability to the seating bank, for road make-up layers and surfaces, for floor and occupation surfaces, for bedding and packing, sealing, levelling and backfilling. The Phase 7 shrine may have had a tiled roof and it is possible that some of the roofing tile from this phase derived from the stone phase of this structure and may represent the only example of primary use of ceramic building material at the site. It is probable that a proportion of the ceramic building material assemblage came from the fortress baths, eg the fragments of vaulting tube and herringbone-floor brick, the hypocaust tiles, *cuneati* and unusual lugged brick. The finial/chimney fragments may also have originated there, as well as some of the painted plaster and hydraulic cement mix. It is also possible that some of the portable oven fragments came from the baths. The pieces of rare circular, domed window glass from the site are also likely to have derived from an *oculus* at the fortress *thermae* (Dunn 2018, 343).

In contrast, it is likely that a proportion of the plaster assemblage originated on the site. Painted plaster was used to decorate the arena wall, the Nemeseum and the Phase 7 shrine. It also may have been used to decorate the entranceway walls, as at Caerleon and possibly also London. The fragments of plaster which indicate high-quality work (eg those with a polished surface and/or crystalline calcite in the *intonaco* layer) are more likely to have come from expensively decorated public or private buildings in the fortress or *canabae*. During the Roman occupation of the site, fragments of plaster were deposited in layers and dumps of sand, seating-bank

deposits, pit fills, floor and occupation surfaces, road surfaces and make-up layers. It was found still adhering to the inner face of the sandstone wall of the stone phase of the shrine and was also recovered from collapse deposits within the structure.

A range of cement mixes was recovered from the site and was also used in the construction of the amphitheatre, specifically for wall bonding. Much of this material was recovered from the wall-robbing Phases 11a and 11b, and it was possible to identify two main types of cement mix used in the construction of the outer wall of Amphitheatre 1b (type 5) and the outer wall of Amphitheatre 2 (type 6). The assemblage includes many fragments of *arriccio*, which had become separated from the fine plaster surface to which they were originally attached, and most of these were recovered from collapse deposits associated with the Phase 7 shrine. The remainder of the Roman phased assemblage was retrieved from layers and dumps of sand, seating-bank deposits, pit, post-hole and foundation-trench fills, floor and occupation surfaces, road surfaces (including burnt and vitrified fragments) and make-up layers. It was presumably transported to the site along with other building debris, old broken pottery and other rubbish from the fortress and surrounding *canabae*.

Most of the daub is likely to derive from ovens, either fixed or portable, which may have been used for cooking and baking bread, probably on a relatively small-scale. The majority of the assemblage was recovered from Roman Phases 5 and 6, the latter mainly from seating-bank deposits. It is possible that the daub from Phase 5, most of which was recovered from the fills of a large ?latrine, located outside the outer wall of Amphitheatre 1a, derived from temporary fixed or portable structures, which may have been used to supply bread and other hot food for visitors to the amphitheatre. Indeed, it is possible that the material recovered from Phase 6 also may have resulted from such activity. During the Roman occupation of the site, daub was also deposited in layers, pit fills, levelling deposits and a gravel surface. This material probably comprises discarded rubbish and demolition debris from buildings elsewhere in the fortress or nearby *canabae*, although some of it may have originated at the site.

ANALYSIS OF ROMAN CERAMIC BUILDING MATERIAL

Introduction

Methodology

The ceramic building material was analysed in terms of quantity, range and variety, condition, provenance and date-range. It was recorded to the level set out in 2.6 of the Archaeological Ceramic Building Materials Group (ACBMG) minimum standards draft document for the recovery, curation, analysis and publication of ceramic building material (Hunter-Mann 2001), with the addition of 'part' (eg middle, edge, end, corner, etc) as a sub-term of 'form'. Fragments were identified macroscopically, except for unusual fabrics and surface features, which were examined microscopically at x 20 magnification. The assemblage was quantified by fragment count and weight (in grammes) and measurements (in mm) were taken of any complete dimensions. Rubbings were made of all stamps, signatures and other markings. Small find numbers were assigned to stamps, signatures, specific markings and atypical or unusual features and forms. Where possible, *tegulae* lower cutaways were identified and assigned to dated groups after Warry (2006*a*), although see also *Provenance and date range* below. Stamps were identified and numbered according to the Chester tile-stamp series; RIB numbers were also allocated where applicable (RIB II (4)). The figures for portable ovens are included here for the sake of completeness, as these devices were made from the usual Holt 'tile' fabric. They are described and discussed in detail elsewhere (Heke 2018a).

The report comprises a description of the assemblage, organised by phase, followed by a discussion of the nature and character of the assemblage. The catalogues are ordered by phase and are numbered consecutively.

Quantity

The site produced a total assemblage of 24,184 fragments of Roman ceramic building material weighing 491,004 g, with an average fragment weight of 20.3 g. 94 % by weight of the assemblage was hand-collected, 6 % came from sample residues. Area A produced the largest assemblage by weight, with 49.7 % of the total, followed by Area B (32 %) and Area C (18 %) of the total. 0.3 % by weight was unstratified.

Roman phases produced 9,677 fragments of ceramic building material with a weight of 89,843 g (40 % by fragment count and 18.3 % by weight of the total), with an average fragment weight of 9.3 g. Post-Roman phases produced 58.8 % by fragment count (14, 221 fragments) and 80.6 % by weight (395,630 g) of the total, with an average fragment weight of 27.8 g. Just 1.1 % of the assemblage by both fragment count (274 fragments) and weight (5,319 g) was unstratified, with an average fragment weight of 19.4 g. Pre-Roman and unphased contexts accounted for the remaining 0.05 % by fragment count and 0.04 % by weight of the total.

In terms of both fragment count and weight, most of the Roman phased assemblage (56.6 % by count and 60.5 % by weight) was retrieved from Area A, with 43.4 % by count and 39.5 % by weight from Area B. None of the Roman ceramic building material from Area C was recovered from Roman contexts. The ceramic building material from Area A (with an average fragment weight of 9.9 g) is slightly less broken than that from Area B (which has an average fragment weight of 8.4 g). In Area A, 87.8 % of the assemblage by weight from Roman phases was hand-collected; just 12.2 % came from sample residues. In Area B, 66.1 % by weight was hand-collected; 34.0 % by weight was recovered from samples.

In terms of weight, most of the assemblage from post-Roman phases came from Area A (47.5 % by weight of the total assemblage), with 30.3 % by weight from Area B and 22.2 % by weight from Area C. The material from Area A is the least broken, with an average fragment weight of 51.0 g. The material from Area B is more broken (with an average fragment weight of 32.8 g), with the most broken material from Area C (with an average fragment weight of 12.8 g). This is probably because proportionately more of the Area C post-Roman assemblage was recovered from sample residues. In Area A, 98.5 % by weight of the post-Roman assemblage was hand-collected; just 1.5 % by weight was recovered from samples. In Area B, 97.9 % by weight was hand-collected and just 2.1 % by weight came from sample residues. In Area C, 95 % by weight of the post-Roman assemblage was hand-collected; 5.8 % was recovered from samples.

Range and variety

A wide range of forms was recovered, although roof tiles and indeterminate fragments predominate (Table 5). As well as *tegulae* and *imbrices*, identifiable forms comprise antefixes, vaulting tubes, *cuneati*, flue tiles, bricks, herringbone-floor bricks, finial/chimney fragments, discs/stoppers and portable oven fragments.

Tegulae form the largest component by weight (32.5 %) of the assemblage, followed by indeterminate forms (26.4 %), bricks (22.6 %) and *imbrices* (14.9 %). The remaining forms together comprise just 3.6 % by weight of the total. They consist of small, but significant amounts of: flue tile [ie box tile, facing-tile and half-box tile] (2.0 % by weight); portable oven fragments (0.7 %); herringbone-floor bricks (0.4 %); and antefixes (0.1 %). In addition, small, but significant amounts were recovered of finial/chimney fragments (0.1 %) and vaulting tubes (0.03 %). Three discs/stoppers were also recovered (0.02 % by weight). The percentage of indeterminate forms is skewed by the number of small fragments recovered from sample residues. This is illustrated by the large number of indeterminate fragments (90 % by count) which form far less by weight (26.4 %) of the total assemblage.

Tegulae form the largest component of the hand-collected assemblage at 33.7 % by weight; brick at 23.7 %; indeterminate forms at 23.6 % and *imbrices* at 15.3 %. Flue tiles form 2.0 % by weight of the hand-collected assemblage, portable oven fragments 0.7 %, and herringbone-floor bricks 0.4 %. Much smaller amounts were recovered of antefix fragments (0.1 %); finial/chimney fragments (0.07 %); discs/stoppers (0.7 %) and vaulting tubes (0.03 %).

	Area A		*Area B*		*Area C*		*u/s*		*Total*			
Form	**No**	**Wt (g)**	**No**	**Wt (g)**	**No**	**Wt (g)**	**No**	**Wt (g)**	**No**	**% no**	**Wt (g)**	**% wt**
Antefix	4	254	2	73	0	0	0	0	**6**	0.02	**327**	0.1
Imbrex	384	35,144	305	22,835	191	15,211	0	0	**880**	3.6	**73,190**	14.9
Tegula	489	74,230	404	55,581	186	28,875	2	851	**1,081**	4.5	**159,537**	32.5
Vaulting tube (*tubi fittili*)	3	36	4	82	3	36	0	0	**10**	0.04	**154**	0.03
Solid voussoir *(cuneatus)*	3	1,718	0	0	1	113	0	0	**4**	0.02	**1,831**	0.4
Box tile *(tubulus)*	39	4,146	20	1,181	19	1,834	0	0	**78**	0.3	**7,161**	1.5
Half-box tile (*tegula hamata*)	2	186	2	567	0	0	0	0	**4**	0.02	**753**	0.2
Facing tile *(parietalis)*	0	0	3	1,361	0	0	0	0	**3**	0.01	**1,361**	0.3
Brick	138	73,809	112	25,115	43	12,200	0	0	**293**	1.2	**111,124**	22.6
Herringbone-floor (*opus spicatum*) brick	5	1,102	5	876	2	155	0	0	**12**	0.05	**2,133**	0.4
Finial/Chimney	1	30	3	173	1	122	0	0	**5**	0.02	**325**	0.1
Disc/Stopper	1	33	2	41	0	0	0	0	**3**	0.01	**74**	0.02
Portable oven	12	1,543	9	552	9	1,119	0	0	**30**	0.1	**3,214**	0.7
Indeterminate	8,266	51,792	7,009	48,585	6,461	28,877	39	566	**21,775**	90	**129,820**	26.4
Total	**9,347**	**244,023**	**7,880**	**157,022**	**6,916**	**88,542**	**41**	**1,417**	**24,184**	99.89	**491,004**	100.15
%	38.6	49.7	32.6	32.0	28.6	18.0	0.2	0.3	**100**		**100**	

Table 5: Total assemblage: range of forms by Area

Not surprisingly, indeterminate forms, at 71.2 % by weight, comprise the largest component of the material recovered from sample residues. Smaller amounts were recovered of *tegulae* (13.3 % by weight); *imbrices* (8.4 %) and brick (6 %). At less than 1 % by weight are small, but significant, amounts of herringbone-floor bricks (0.7 %), portable oven fragments (0.4 %) and flue tiles (0.02 %). No other forms were recognised.

The presence of bricks [293/111,124 g] in a range of thicknesses implies a range of forms. The range of thicknesses indicates that most are probably fragments of either *bessales, pedales* or *tegulae bipedales*, the three forms most commonly used in hypocaust construction. The small square *bessalis* was used to form brick-stack *pilae*, the larger square *pedalis* was generally used as a capping brick for such *pilae*, and the *tegula bipedalis*, the largest of the square bricks, was used to bridge the gaps between *pilae*. Some fragments may have come from the *sesquipedalis*, a large square brick which was also used for flooring, or from the *lydion*, a large rectangular brick, similar in size to the *tegula*, which was commonly used for levelling or binding courses in walls (Brodribb 1987, 34—43). The bricks also include a handful [4/1,831 g] of *cuneati* (solid voussoirs), wedge-shaped bricks which were used in the construction of arches. There is no evidence that bricks were used in the construction of the amphitheatre at Chester, as they were at Caerleon (Wheeler and Wheeler 1928). At London, *lydion* bricks were used in horizontal tile courses in the masonry walls of the amphitheatre (Betts 2008, 165).

Although small in number, the presence of *opus spicatum* bricks [12/2,133 g] is of note, as these small bricks were commonly used, set on edge in a herringbone pattern, for the construction of hard-wearing floors or external paving. They are known to have been used extensively in both the fortress baths and the western extra-mural bath house in Chester. Herringbone floors are not particularly common in Britain, eg York has produced a single example, found on the site of a major public baths in the *colonia* (McComish 2012, 183); plain brick floors paved with large square or rectangular bricks are more usual (Brodribb 1987, 52).

The small number of vaulting tubes (*tubi fittili*) [10/154 g] from the assemblage is also of note as these are the only items which can be stated with confidence to have come from the fortress bath house. They are thought to date to the reconstruction of the vaulting over the bathing halls during a major refurbishment of the baths in the second quarter of the 3rd century, although it is also possible that they belong to the original construction of AD 79 (Mason *et al* 2005, 38—9). Stray examples were also recovered in 1969 from the medieval robbing debris which covered the baths suite immediately south of the so-called Elliptical Building (Mason *et al* 2005, 150—1). A single fragment was also recovered from robbing debris at the western extramural baths in Watergate Street in 1989 (Dunn 2012, 238). A large number of vaulting tube fragments were retrieved from the legionary fortress baths at York, where they appear in demolition deposits of probable Antonine date (*c* AD 160+), although the ceramic evidence for this demolition is poor (McComish 2012, 263; Monaghan 1997, 1059—64).The baths at York, however, are thought to have gone out of use by the early 3rd century (*ibid*, 1064). The *tubi fittili* from the legionary fortress baths at Caerleon were found in demolition debris of late 3rd century date, where

they can be no later in date than the final, probable early 3rd century, construction phase, although they could also be much earlier (Zienkiewicz 1986, 334—6).

It is possible that some of the other forms also originated in the fortress bath house. For example, herringbone flooring, composed of *opus spicatum* bricks, was used in the original Flavian swimming baths, pools and *labrum* alcove. Box tiles (*tubuli*) were used for the wall jacketing (*tubulatio*) of the heated rooms and also for the original Flavian vaulting of the bathing halls. The Flavian period brick-stack *pilae* of the baths were composed of *pedalis* bricks, which were largely replaced by *bessales* during the Severan reconstruction and finally, by sandstone *pilae*, in the early 4th century alterations. They may have been deposited at the site as a result of these various phases of building and refurbishment (*see below*). The finial/chimney fragments from the amphitheatre may also have come from the fortress baths. A single fragment was recovered from a Phase 2 context during rescue excavations at the site in 1963/4 (Dunn, Jones and Mason 2005, 88). A 'chimney pot or ventilator' was also recovered from contexts east of the bath house at Prestatyn (Blockley 1989, 166 and 169 fig 92.120). Although finial/chimney sherds are rare at York, McComish has noted their association with hypocausts, in that they are always found on sites which also yielded flue tiles (2012, 148—-9). Fragments of two 'lamp chimneys' were also recovered from the London amphitheatre, one came from a road surface layer at the eastern entrance, the other was unstratified (Betts 2008, 164).

It is possible that some of the roof tiles (including the antefixes) may also derive from the fortress bath house. On the other hand, at least one ancillary building associated with the amphitheatre — the Phase 7 stone-built shrine in Area A — may well have had a tiled roof.

Area A produced seventeen possible rubbers/grinders/smoothers. Ten are formed from *tegulae*, three from *imbrices*, one from a brick and the other three from indeterminate fragments. Four were recovered from Roman contexts in Phases 7 and 8. Nine were recovered from wall robbing phases, 11a and 11b; the remaining four came from post-Roman phases 12—-21. Area B produced ten examples, comprising four *tegulae*, two *imbrices*, two bricks and two indeterminate fragments. Four came from Roman contexts in Phase 6. One was recovered from Phase 11b; the remaining five were retrieved from post-Roman phases 12—21. Area C produced just four rubbers/grinders/smoothers, comprising two *imbrices*, a *tegula* and a brick. None came from Roman contexts. All these fragments have one obviously very worn and rounded edge/surface. Their function is uncertain but the abrasion appears to be the result of use wear rather than from any other cause, such as weathering or trample.

Condition

The assemblage is of mixed condition, ranging from fresh to very abraded, battered and weathered. This mix occurs not only across the site but also within contexts. It suggests an assemblage formed from fragments buried soon after disposal alongside material exposed to surface movement and weathering prior to burial.

There are differences in condition between the trenches and these are most extreme between Areas A and C. Area A produced proportionally more abraded and re-used material and Area C the least abraded, burnt and re-used material. Area B produced proportionally less re-used material than Area A but more re-used material than Area C. The assemblage from Area A is fresher than that from Area B and much fresher than that from Area C. The assemblage from Roman phases in Area B is slightly less abraded than that from Area A. From non-Roman phases, the Area C assemblage has the freshest and least abraded material; that from Area A has the most abraded and least fresh material. There is little difference in the proportions of burnt material between Areas A and B, from either the Roman or non-Roman phases. Area C produced less burnt material than the other two trenches. Area A produced the greatest proportion of re-used material (ie fragments with mortar attached to broken edges) from both the Roman and non-Roman phases. The difference is quite marked both spatially and chronologically, indicating that a much higher proportion of re-used material was deposited in Area A during the Roman period than elsewhere on the site.

Provenance and date range

A small number (x 54) of *tegulae* with datable lower cutaways (x 52) or datable legionary stamps (x 2) were recovered from the site. The earliest, Group A, are thought to have been produced between *c* AD 40—120 (with production at Holt from *c* AD 90/100—120). Group B *tegulae* have a broad period of production from *c* AD 100—180 but are thought to date at Chester to between *c* AD 120—140. Chester was supplied at this period from kiln sites at Tarbock, Merseyside, which had a short period of production in the mid AD 120s, and at Holt, towards the end of the Group B production period, between *c* AD 130—40 (Warry 2006*a*, 156 and 158). Group C *tegulae* date from *c* AD 160—260 and group D *tegulae* to between *c* AD 240—380 (*ibid*, 63).

The *tegulae* with datable lower cutaways from the site comprise mainly group A's (40.7 %) followed by group D's (27.8 %). Group B's comprise 13.0 % and group C's 1.9 % of the total. Three are either group A or B (5.6 %). The remaining forms are either group C or D (3.7 %) or group B, C or D (3.7 %). The three datable legionary stamps (3.7 %) are only associated with group A/B *tegulae*. This suggests that there were two main periods of deposition of roof tile at the site — the first following the demise of group A; the second following the demise of group D.

All three trenches produced a similar spatial and chronological pattern, with a higher number of group A and B *tegulae* than groups C or D. Area A produced more group A's (22.2 % of the total number of datable *tegulae* recovered) than group D's (14.8 % of the total) and more group B's (3.7 %) than group C's (1.9 %). Area B also produced more group A's (13.0 %) than group D's (7.4 %) and more group B's (3.7 %) than group C's (none of the latter group were recovered). Area C produced an equal number of group A's and B's (5.6 % each) and 3.7 % of group D's. There were no group C's from this trench. One group D *tegula* (1.9 % of the total) was found unstratified. Two datable stamps, attributable to *tegulae* groups A/B, and therefore datable to between *c* AD 90/100—140, were recovered from Areas B and C and comprise 3.7 % of the total. The remaining forms belong to either groups C or D

(3.7 % of the total) — from Areas A and B, or can only be assigned to a broader group (B, C or D), comprising two fragments (3.7 % of the total) from Area A. There are noticeably fewer group C *tegulae* than any other type. In fact, only one definite group C form was recovered, from Area A. The dating of this type, between *c* AD 160—260, in part coincides with a period of abandonment and dereliction at Chester, when a large part of the legion was absent for long periods during the construction of the Antonine Wall and the campaigns of Severus in the North of Britain (the latter came to a close in AD 212). Could the presence of group D *tegulae* at Chester relate to the extensive programme of rebuilding that began at this time and which continued to occupy the first quarter of the 3rd century? If so, group D *tegulae* may have begun to appear a couple of decades earlier in Chester than they did elsewhere, ie from the AD 220s, rather than from *c* AD 240 onwards. If so, they would represent the earliest examples of this type in Britain (P Warry *pers comm*.).

Other datable forms comprise flue tiles and vaulting tubes. The vaulting tubes (*tubi fittili*) are of note as, apart from the stray examples previously mentioned, these forms are known only from the fortress baths in Chester, where they are thought to date to the reconstruction of the vaulting over the bathing halls during a major refurbishment in the second quarter of the 3rd century, although they could be earlier in date (*see above*). Unfortunately, none of the *tubi fittili* fragments were recovered from Roman phases (*see Tables 6—-8*), which perhaps supports the early 3rd century date for their use at the fortress baths. If this is indeed the case, they presumably represent building debris from a post-Severan phase of activity at the amphitheatre. It is probable that some of the other ceramic building material from the site comprises debris from various phases of refurbishment of the fortress baths (*see above*).

The flue tiles include rare examples of half-box tiles (*tegulae hamatae*) and facing tiles (*parietales*). Both these forms were in decline by the late 1st century and had been largely replaced by box tiles (*tubuli*) in the early 2nd century (Black 1996, 62; McComish 2012, 152). Both knife-scored and combed box tiles are present. The former are thought to have been generally replaced by the latter by the early 2nd century AD (Black 1996, 64; Betts 2000, 3; Ward 1999, 48). Combing was more efficient than scoring, as it provided a much better grip for keying (Brodribb, 1987, 109).

53.8 % by fragment count of the box tiles (*tubuli*) from Area A are scored; 23.1 % are combed. It is not known how the remaining 23.1 % were keyed. Roman phases in Area A produced a higher proportion of earlier scored forms (10.3 %) than later, combed ones (2.6 %), although the majority of both scored (43.6 %) and combed (20.5 %) forms came from post-Roman phases. In Area B, 20.0 % of the box tiles are scored, 23.1 % are combed and a large number of fragments (56.9 %) are unkeyed. Only three box tiles were recovered from Roman phases; two of these (10.0 %) are scored, the other (5.0 %) is combed. Four box tiles were recovered from post-Roman phases; two (10 %) are scored and two (10 %) are combed. There are also two very thin-walled (ie with wall thicknesses of 9 mm) box tiles, from post-Roman contexts (2028) and (2541). These thin-walled forms are thought to be early in date (*see below*). In Area C (all from post-Roman contexts), only 5.3 % of the box tiles are scored; 36.8 % are combed and 57.9 % of fragments are unkeyed, ie

there is a higher proportion of later combed forms from Area C than were recovered from Areas A and B. There is also one very thin-walled form (wall thickness: 8 mm) from context (3068).

A possible *tegula hamata* was recovered from unphased context (1057) in Area A. Area B produced one probable and one possible *tegula hamata* (from Phase 11 b context (2540) and Phase 10 context (2611) respectively. The fragment from (2540), SF 9852, has criss-cross knife-scoring on the sanded face. The same trench also produced a *parietalis* fragment from Phase 6 context (2461) and two possible *parietales* (both knife-scored on their sanded faces) from post-Roman contexts (2359) [Phase 15] and (2474) [Phase 11 b]. No examples of either form were recovered from Area C or were found unstratified.

Although small in number, the presence of box tiles, facing tiles and half-box tiles is notable, as these forms must have originated from hypocausts or bath houses. Three of the box tiles are thin-walled forms. In London and south-east England, these thin-walled, knife-scored, box tiles pre-date the early 2nd century AD (Black 1996, 60; Pringle 2006, 128). The thin-walled forms from the amphitheatre were all recovered from post-Roman contexts. Thin-walled box tiles are often found in association with facing tiles and half-box tiles. Black also notes that hypocausts used to heat domestic rooms are extremely rare before *c* AD 150 and therefore that the vast majority of box tiles made before the mid-2nd century are more likely to have come from bath buildings (1996, 64). It is therefore possible that this small group of early flue tiles are either from the original Flavian phase of the fortress *thermae* or from an early extra-mural baths somewhere in the vicinity of the amphitheatre, possibly even associated with it, as at Caerleon (Wheeler and Wheeler 1928, 144 and plate XX; Evans 2000, 495). Excavations at the Groves in 1989 revealed a possible small bath house to the south of the amphitheatre, just above the river (Carrington 2012*c*, 309).

Roman phases produced eight datable *tegulae* (14.8 % of the total number recovered), with five from Area A. These comprise two group A's, one group C and two group D's. The group A's were recovered from Phases 5 and 8, the C from Phase 9 and the D's from Phase 7. Area B produced just three datable *tegulae*; comprising one group D and two group A's. The group C *tegula* from Phase 9 provides a *terminus post quem* of *c* AD 160—260 for the use of the second amphitheatre. It could represent a fragment of old building material discarded at the site during the enlargement of the amphitheatre, which may well have taken place during the reconstruction and refurbishment of the fortress under Caracalla in the early 3rd century (Mason 2012, 175). It should be noted that Warry's dated groups have been questioned by Betts on the basis of material excavated from London and south-east England (McComish 2012, 216). The presence of three group D *tegulae* in Phases 6 and 7 could be taken to support the view that all of Warry's cutaway types were present from the outset of Roman occupation in Britain (*ibid*, 216). The two examples from Phase 7, however, were found alongside other intrusive material and can therefore be discounted. The example from Phase 6, with a *terminus post quem* of early to mid-2nd century, is less easy to dismiss. The presence of a handful of group D *tegulae* in 2nd-century contexts at Gorse Stacks should also be noted, particularly as this site produced very little material which post-dates AD 140

(Cuttler, Hepburn, Hewitson and Krawiec, 2012). Although well-dated group C's of 1st-century date from London suggest that Warry's start date for this type may be wrong, it does not seem to have had a widespread distribution outside London before the mid-2nd century (Mills 2013, 459). For example, group C *tegulae* at York have been found in association with buildings of mid-late 2nd and early 3rd century date, which fits with the date span suggested by Warry (McComish 2012, 234). An analysis of Warry's data carried out by Mills suggests that the greatest demand for group D *tegulae* was at high-status rural sites, with hardly any military connection (Mills 2013, 460). If so, the presence of group D *tegulae* at the amphitheatre and other sites at Chester, from both the fortress and *canabae*, would appear to be an unusual occurrence. The presence of group D *tegulae* at Chester certainly contrasts with York, where the only forms recovered comprise groups A—C, with type B the most common form (McComish 2012, 82). There seems to have been an overall decline in the use of tile at York from the 3rd century onwards, with a lack of evidence for its manufacture after *c* AD 250 and, although earlier forms were sometimes recycled in later building work, tile had been largely replaced with stone by the early 4th century (McComish 2012, 89—90). A switch from the use of ceramic to stone *pilae* at York may also have occurred around the mid-3rd century (*ibid*, 256). At Chester, in contrast, the use of stone *pilae* as a replacement for the earlier brick-stack variety was particularly diagnostic of fourth-century hypocaust construction (Mason *et al* 2005, 78), with the earliest evidence for their use in the Elliptical Building baths no earlier than the late 3rd century (Mason 2000, 144). Warry has stated that he would expect to see group D *tegulae* at Chester and confirmed the presence of an example of this type from the site of the legionary fortress bath house (Newgate/Pepper Street 1963/4), during his original survey of the stamped material from Chester. He also noted other possible examples of this type, which were made in part with the use of a rectangular insert to form the lower cutaway. Group C's are usually made by putting a rectangular insert into the mould and taking the lower diagonal slice for the cutaway with a knife, which is not how group D's are normally made. (*See Warry 2006b, 249—51 for a discussion of the lower cutaway forms*). For this reason he was unsure whether they were type C or D. He suggests that the examples he saw may represent a local variation of the 3rd/4th century form at Chester (P Warry *pers comm*.). The presence of a definite example of a group D *tegula* at the legionary baths is of note as it is possible that the group D tiles recovered from the amphitheatre may also represent building debris from the *thermae* (*see below*).

Phases 10—11b produced fourteen datable *tegulae* (25.9 % of the total), with eleven from Area A, two from Area B and a single example from Area C. Forms comprise nine group A's, one group A or B and two group D's. Three datable *tegulae* (55.6 % of the total) were retrieved from post-Roman phases 12—21. Two (3.7 % of the total) were also found unstratified, comprising a group C or D from Area B and a group D, which was found generally unstratified.

There are two probable sources for the ceramic building material assemblage from the amphitheatre. The legionary tile and pottery kilns at Holt, situated 12 km south of the fortress, were established by *legio* XX shortly after its arrival in Chester from Scotland and are thought to have been in production from *c* AD 90 (Carrington 2012d, 378). A tilery at Ochre Brook near Tarbock, Merseyside, 20 km due north of

Chester, which also supplied the fortress, is thought to have been established by a contractor, A[ulus?] Viduc[(i)us?], and was in operation for a short period in the 2nd century. Swan and Philpott date production at Ochre Brook to *c* AD 167, although Warry places it *c* AD 126 (Swan and Philpott 2000, 56; Warry 2010, 137). Recent detailed study of the samian and coins from Holt show that occupation continued until *c* AD 135 and then carried on at a lower level through the rest of the 2nd century. A detachment of the *Cohors I Sunicorum* is also attested at Holt, perhaps towards the end of the 2nd century, when the unit was based at Caernarfon (Carrington 2012d, 378). Although it is not certain when production ended at Holt, it is clear that the Twentieth Legion or its contractors continued to produce ceramic building material into the early 3rd century, as attested by the presence of *Antoniniana* tiles, none of which have been recovered from Holt (Warry 2006a, 80; 2010, 138). Warry has suggested that no further tiles were supplied to the fortress at Chester after this period (2010, 139). However, this does not account for the presence of later group D *tegulae* at the amphitheatre. A significant number (15.4 %) of group D *tegulae* was also retrieved from Gorse Stacks, the only other site in Chester where all the Roman ceramic building material recovered was retained for study (Heke 2012a). Mills has also suggested that the introduction of group D *tegulae* may have been due to the military reforms of Septimus Severus and may mirror the introduction of North African vaulting tubes in buildings at Chester, Caerleon, York and Carlisle (2013, 459). A small number of vaulting tubes have also been recovered from the amphitheatre and the only known source for these is the legionary baths, which underwent extensive reconstruction at this period. Vaulting tubes have not been found at Holt and so may have been produced elsewhere. Could they have been in production at the same time as the group D *tegulae*, perhaps at the same unknown production site? Perhaps the group D *tegulae* found at the amphitheatre also represent building debris from the legionary *thermae*, along with the fragments of vaulting tube, flue tiles and herringbone-floor bricks that also appear in the assemblage. Fabric analysis and the recovery of further well-dated groups may help to resolve these questions in the future.

Description

Period 1: The prehistoric phases

Phase 2: The later Iron Age

Upper cultivation soils and cord rig

(1222), an upper cultivation soil between the outer walls of the later amphitheatres, produced seven indeterminate fragments of Roman ceramic building material, weighing 12 g, with an average fragment weight of 1.7 g. This material is presumably intrusive to the phase.

Period 2: Roman occupation before the amphitheatre

Phase 3

This phase produced 108 fragments/1,324 g of Roman ceramic building material, comprising 1.1 % by fragment count and 1.5 % by weight of the Roman phased assemblage, with an average fragment weight of 12.3 g.

Cultivation soils

Soil layer (1123) produced three indeterminate fragments weighing just 4 g.

Pre-amphitheatre Roman occupation deposits

(1126) [= (1255)], a layer of 'trample' containing Roman domestic material, produced 27 fragments/813 g. The only identifiable forms comprise a *tegula* fragment, a tiny piece of *imbrex* and three pieces of brick. (1255) produced a single indeterminate fragment/4 g. (1273), a thin layer of mottled grey clay, produced three indeterminate fragments/26 g. (1102), the fill of a shallow linear beam slot, produced a tiny indeterminate piece weighing just 1 g. Sixteen indeterminate fragments/184 g came from ?occupation layer, (1091). (1086), a widespread deposit of red sand above (1091), produced 57 fragments with a weight of 292 g, including a fragment of *tegula*.

Period 3: The first Roman amphitheatre

Phase 4: Construction of Amphitheatre 1a

This phase produced 43 fragments/906 g of Roman ceramic building material, comprising just 0.4 % by fragment count and 1.0 % by weight of the Roman phased assemblage, with an average fragment weight of 21.1 g.

(637), a deposit of silty sand in an area of erosion and disturbance, produced a single fragment of *imbrex* weighing 78 g.

The primary seating bank

Roman ceramic building material came from seating bank deposits (1252) and (1262). (1252), one of the uppermost deposits in the seating bank sequence, produced four indeterminate fragments/11 g. (1262) yielded 36 fragments/667 g, all indeterminate, apart from a single piece of *tegula*. This material was presumably imported to the site as rubble to help build up the *cavea*.

Phase 5: Deposits outside Amphitheatre 1a associated with its use

Phase 5 produced 2,607 fragments/17,207 g of Roman ceramic building material, comprising 27.9 % by fragment count and 19.2 % by weight of the Roman phased assemblage, with an average fragment weight of 6.6 g.

(1064), a dark organic-rich deposit of silty sand, underlying Roman road (1028), produced 64 fragments/147 g, including fragments of roof tile

(1160), a compact layer of sand and clay above (1180), produced four indeterminate fragments weighing 10 g.

South west area

Roman ceramic building material was recovered from rubbish fills (1202) and (1216) of a large ?cess pit (1256). (1202) produced 299 fragments/968 g. Most are indeterminate but identifiable forms comprise *tegulae* and *imbrices*. (1216) produced 319 fragments/3,163 g. Most are indeterminate, but identifiable forms comprise fragments of roof tile and a single piece of brick. (1133), the deliberate backfill of a shallow depression (1134), yielded five fragments/91 g, including two *tegulae* fragments. (1152), a layer of red sand covering the back-filled pit (1256), produced 170 fragments/629 g, including two *tegulae* fragments. (1073), a possible floor surface for a small stall, yielded 67 fragments/63 g, including a tiny fragment of *imbrex* weighing just 1 g. (1075), a dark deposit immediately outside the outer wall of Amphitheatre 1a, the earliest Phase 5 deposit, produced 377 fragments/2,416 g. Most are indeterminate but a range of identifiable forms was also recovered. These comprise roof tile, bricks and a piece of box tile. (625), the final layer associated with the use of Amphitheatre 1a, produced a large group of Roman ceramic building material, comprising 1,226 fragments/8,273 g. Most are indeterminate but a range of identifiable forms was also recovered. Forms comprise roof tile, including a group A *tegula* dating between *c* AD 100—120; bricks, including a fragment of *tegula bipedalis*; and a fragment of box tile. The roof tile includes a ?*tegula* with an unusual lugged corner (Cat no 1).

North east area

(1076), a dump of sand which represents the earliest artificial deposit of Roman date in this area, produced 27 fragments/979 g. Most are indeterminate, although a range of identifiable forms was also recovered, comprising roof tile, brick and box tile. The primary fill, (1114), of ?cess pit (1078), produced a single indeterminate fragment/55 g. Secondary fill, (1100), yielded 17 indeterminate fragments/110 g. The upper fill, (1077), which also sealed the pit, produced 15 fragments/177 g. The majority of these are indeterminate. (1061), a deposit of red clay-silt which sealed post-hole (1051), produced just two fragments/61 g, including a fragment of *tegula*. (1036), a rough metalled surface of sand and sandstone above (1061), yielded 14 fragments/65 g, including two fragments of roof tile.

Ceramic building material from this phase was recovered from a variety of features and deposits and was used for levelling, for road and floor surfacing, as well as being incorporated with other rubbish in dumps of material, in pit fills and sealing deposits.

1 ?*Tegula*; flange fragment with unusual 'lugged corner', all edges of which are sanded and intended at manufacture, rather than a secondary modification; smooth/sanded underside and side of flange; finger-groove at base of (missing) flange; re-used — traces of Roman mortar

attached to broken edges; Fl W: 26 mm, Th: 28 mm. A (625): Phase 5 layer of silty clay; SF 9580.

Phase 6: Amphitheatre 1b: structural alterations

Phase 6 produced a total of 4,301 fragments/35,903 g of Roman ceramic building material, comprising 44.4 % by fragment count and 40.0 % by weight of the Roman phased assemblage. 99 fragments/443 g came from Area A; 4,202 fragments/35,480 g from Area B. Phase 6 is the only Roman phase represented in Area B. The average fragment weight from Area A is 4.3 g; that from Area B is 8.4 g.

Area A

Ground preparation: the terrace

(1214), a sterile layer of sandstone brash over the base of the terracing cut, representing upcast from the centre of the arena, produced two indeterminate fragments/5 g.

The timber-framed seating structure

The outer ring-beams

(516), the radial beam in Timber Slot 15, produced three indeterminate fragments/8 g.

The radial frames

Radial timber frame 7:
(484), a clay bedding deposit for packing material for the beam, produced a single indeterminate fragment/1 g. (472), a loose sand bedding deposit for the radial beam, yielded four indeterminate fragments/3 g.

Radial timber frame 8:
(1204), the basal fill of the beam, produced two indeterminate fragments/6 g.

Radial timber frame 11:
(923), a sandy silt representing the mineral-replaced base-plate, produced two indeterminate fragments/4 g. (924), a timber upright preserved as a cast, produced four indeterminate fragments/4 g. (922), a diagonal brace preserved as a cast, yielded two indeterminate fragments/26 g. (926), a cast of a second timber upright, produced an indeterminate fragment/2 g.

Radial timber frame 12:
(932), the cast of an upright timber of sandy-silt, produced three indeterminate fragments/2 g. (930), the cast of a diagonal brace outside the

upright (932), produced a single indeterminate fragment/3 g. (934), the cast of a second upright inside the outer one (932), yielded two indeterminate fragments/2 g. (976), the fill of a cut to withdraw a third timber upright (936), produced two indeterminate fragments/6 g.

Radial timber frame 13:
(789), a dump deposit probably deriving from the excavation of the timber slots (1024) and (1025), produced a single indeterminate fragment/1 g. (942), the cast of an upright beam, yielded two indeterminate fragments/1 g. (939), a supporting diagonal brace to (942), produced two indeterminate fragments/1 g.

Radial timber frame 15:
(1127), the packing of the base-plate, produced two fragments/7 g, including a piece of *imbrex*. (1121) a sandy silt which replaced the beam, generated 21 indeterminate fragments/34 g. (1155), a cast of the base-plate, produced four indeterminate fragments/23 g. (1022), the cast of an upright timber, yielded eight fragments/15 g, including a piece of *tegula*.

Deposits placed around the timber framework

(319), a fill of sand/decayed sandstone derived from the excavation of the arena, which was laid around the base-plates and uprights, produced just two indeterminate fragments/1 g. (886), a layer of re-deposited turf, yielded seven indeterminate fragments/25 g. (585), a layer of clean, re-deposited material from the arena, produced a single indeterminate fragment/14 g. A similar layer, (624), yielded four fragments/66 g, including part of a wheel-thrown finial/chimney with oval knife-cut window (Cat no 2).

In the area outside the outer wall of Amphitheatre 1b, (647), the fill of pit (?post-hole) (648), produced 14 indeterminate fragments/18 g. (736), the fill of a rectangular cut (737), yielded five fragments/152 g, including pieces of roof tile.

Area B

Seating bank deposits

These were excavated in two blocks. The first block of deposits which yielded Roman ceramic building material, produced the following sequence:

The earliest deposit, (2513), generated a relatively large group of 472 fragments/4,730 g. The majority is indeterminate but a range of identifiable forms was also recovered. These comprise fragments of roof tile and box tile (the latter both combed and knife-scored). Combed box tiles had generally replaced scored forms by the early 2nd century (Black 1996, 64). (2507) produced four indeterminate fragments/42 g. (2500) yielded 55

fragments/3,983 g. Identifiable forms comprise fragments of roofing tile, brick and a herringbone-floor brick. The roof tile includes a probable group D1 *tegula*, which is dated by Warry to between *c* AD 240—380 and so must be intrusive to this phase. (2499) produced 56 indeterminate fragments/212 g. (2498) yielded a large group of 1,471 fragments/7,235 g. Most are indeterminate but identifiable forms comprise roof tile, including a Warry group A *tegula*, dating from *c* AD 90/100—120, and brick.

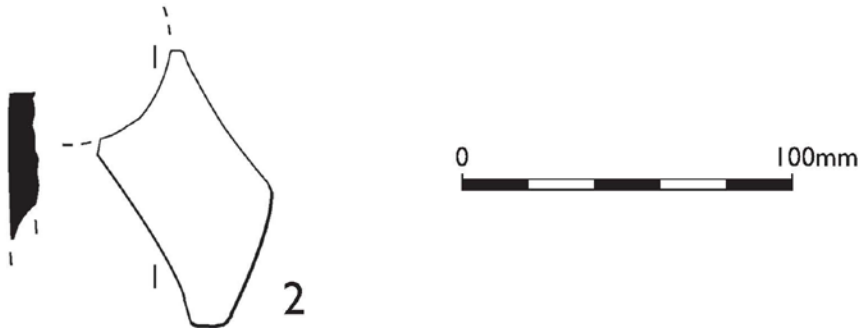
The second block of deposits produced the following sequence:

(2542) produced 23 fragments/639 g. Identifiable forms comprise just three fragments of *tegula*. (2552) produced 29 fragments/404 g, most of which are indeterminate. Identifiable forms comprise fragments of *tegula* and brick. (2543) generated a large group of 1,119 fragments/6,290 g. Most are indeterminate but a range of forms was also recovered. These comprise fragments of roof tile and brick, including a Warry group A *tegula*. (2461) yielded a relatively large group of 229 fragments/3,000 g. Most are indeterminate but a range of identifiable forms comprises fragments of roof tile, and a single fragment of facing tile (*parietalis*) g. Facing tiles are known to have been in use in London and south-east England (alongside thin-walled, knife-scored box tiles and half-box tiles) in the late 1st century and to have been generally replaced by combed and relief-patterned box tiles in the early 2nd century (Black 1996, 62). (2431) produced eight fragments/227 g. The only identifiable form comprises a single fragment of knife-scored box tile. (2450) yielded 84 fragments/605 g. Most are indeterminate but a range of identifiable forms comprise roof tile and brick.

Finds were also recovered from (2612), a group number assigned to the seating bank deposits. These comprise a relatively large group of 650 fragments/8,110 g. Most are indeterminate but roof tile and brick, including an *opus spicatum* brick, were also recovered.

A lot of this material would have been imported to the site as rubble, to be used, along with other demolition debris, old broken pottery and other rubbish, as hardcore for building up the *cavea*. As a result, much of the material recovered from these deposits is probably unlikely to be contemporary with the structural alterations that were taking place at this time, although Thompson believed that the pockets of occupation material within the seating bank represented contemporary rubbish dropped by the original builders (1976, 163). Peter Carrington has suggested that the building work may have been initiated by Hadrian (117—138), citing the slight upsurge in Hadrianic coinage at the amphitheatre and in the eastern *canabae* generally, as well as the presence of an early-mid 2nd century AD black-burnished ware sherd from Phase 6 context (923), which provides a *terminus post quem* for the construction of the timber framework (P Carrington *pers comm*.), although this date has since been disputed (Wilmott and Garner 2018, 157—8).

2 Finial/chimney; wall fragment with part of knife-cut, oval window, cut from exterior to interior, probably while leather-hard. Oxidised fabric, wheel-thrown; Th: 7—10 mm, external Diam: 150 mm. A (624): Phase 6 layer of red sand; SF 9854. Lowther group A (1972, 146; 1976, 48).



Phase 7: Deposits outside Amphitheatre 1b associated with its use

Phase 7 produced 1,860 fragments of Roman ceramic building material with a weight of 23,521 g, comprising 19.2 % by fragment count and 26.2 % by weight of the Roman phased assemblage, with an average fragment weight of 12.6 g.

In the area outside the outer wall of Amphitheatre 1b, (762), fill of pit (763), produced a single indeterminate fragment/1 g. (952), a deposit of sand outside the outer wall of the amphitheatre, yielded eight indeterminate fragments/38 g.

Road surface (1012) produced 92 fragments/2,653 g. The majority are indeterminate but a range of identifiable forms comprise fragments of roof tile and a knife-scored box tile. Road surface (1088) yielded just five fragments/4,732 g, including two fragments of brick. Fine road surface (1028) produced 19 fragments/741 g, including three fragments of roof tile.

South and west of the *vomitorium*

(1056), a deposit of sand pre-dating the creation of the road (557), produced 33 fragments/1,283 g. Indeterminate fragments account for the majority by count, but not by weight. A range of identifiable forms was recovered, comprising roof tile and single fragments of antefix (Cat no 3) and brick. Road surface (557)* yielded 11 fragments/91 g, including pieces of *imbrex*. [*marked as (557) but bagged as (554)]. (899), a dump of sandy silt which sealed the edge of the road, generated a relatively large group of 194 fragments/1,061 g. Most are indeterminate but identifiable forms comprise pieces of *tegula* and a fragment of brick.

(969), fill of post-hole (968), produced a single indeterminate fragment/1 g. (888), fill of post-hole (887), also produced a single indeterminate fragment/1 g. (894), a probable floor surface associated with the timber structure represented by these post-holes, yielded seven indeterminate fragments/64 g. (838), a spread of sand which sealed these features, generated 56 fragments/408 g. Identifiable forms comprise three pieces of roof tile. (855), a small dump of sand, produced 10 indeterminate fragments/5 g.

(827), a complex deposit of laminated sands and clays around the outer wall of the amphitheatre, yielded three indeterminate fragments/2 g. (556), a widespread deposit of fine laminated sands above (827), produced 72 fragments/648 g, including two pieces of roof tile. (847) = (848), a ridge of sandy clay along the edge of the outer wall of the amphitheatre, generated 17 indeterminate fragments/286 g with the majority (14/227 g) from (847). (798), a widespread dump of sand against the outer wall of the amphitheatre, produced 29 fragments/28 g, including two pieces of roof tile. (841), a deposit of clay forming a ledge against the outer wall of the amphitheatre, yielded three fragments/11 g, including a single piece of *imbrex*.

(796), a possible occupation surface, produced a single indeterminate fragment/1 g. (791), a layer of sand overlying (796), yielded three indeterminate fragments/1 g. (771), a further layer of sand overlying (791), produced two indeterminate fragments/3 g. (707), a small fragment of cobbled surface north of the external stair, produced eight fragments/453 g, including pieces of roof tile. (697), a rough stone surface possibly associated with a posthole set against the outer face of the amphitheatre outer wall, yielded two fragments/137 g, including a piece of brick.

(555), a deposit of sand sealing all these deposits outside the wall of Amphitheatre 1b, produced a relatively large group of 185 fragments/1,257 g. Most are indeterminate but identifiable forms comprise fragments of *tegula* and a piece of brick.

(745), a possible floor surface to the south of the external stair, generated 58 fragments/2,381 g. Most are indeterminate but a range of forms was also recovered. These comprise fragments of roof tile, a piece of brick and a fragment of *cuneatus* (solid voussoir). These wedge-shaped bricks were used in the construction of arches.

(717), a small patch of sand to the north of this surface, yielded eight indeterminate fragments/50 g. (716), a gravel surface overlying (717), produced 79 fragments/949 g. Most are indeterminate but identifiable forms comprise fragments of *imbrex* and brick. (715), a deposit of sand sealing (716), produced six indeterminate fragments/14 g.

North and east of the *vomitorium*

Primary road surface and temporary structures

(830), a narrow deposit of clay against the south side of the kerb of road (1066), yielded 31 fragments/390 g, including two pieces of brick. (814), a deposit outside the line of the kerb and sealing the wheel ruts, produced seven indeterminate fragments/6 g.

(1042), fill of post-hole (1041), which was probably related to a short-lived temporary structure against the face of the amphitheatre wall, produced a single fragment of *tegula*/14 g. (851), fill of post-hole (850), possibly part of a tilt hard by the amphitheatre wall, yielded a single indeterminate fragment/5 g.

Dump deposits and temporary structures

(722), a deposit of sandstone rubble, possibly either derived from a collapsed structure or laid as the basis for a surfaced area, produced eight fragments/570 g, including two pieces of *tegula*. Both are Warry group D types, with a date range of *c* AD 240—380, and so presumably derive from later intrusions [(722) also produced intrusive sherds of medieval pottery and post-medieval glass]. (804), a deposit of orange sand above (722), produced nine fragments/276 g, including three *tegulae* fragments. (832), the uppermost deposit in a sequence of sandy dumps, yielded two indeterminate fragments/12 g. Coarse sand deposit (806) = (951) produced five indeterminate fragments/12 g.

(695), fill of shallow pit (803 and 696), yielded four indeterminate fragments/23 g.

Sand deposit (673) generated a relatively large group of 80 fragments/1,075 g. Identifiable forms comprise fragments of roof tile, a single piece of knife-scored box tile and fragments of brick, including a *tegula bipedalis*. Sand deposit (672) produced 12 fragments/190 g, including a piece of *tegula* and a fragment of antefix (Cat no 4).

Pebble surface (669) produced two indeterminate fragments/4 g.

Sand deposits (126) and (128)—(135) together yielded 505 fragments/1,721 g. Most (by weight) came from (126), the earliest of these deposits, with 21 fragments/1,384 g. A range of forms was recovered, comprising roof tile, a fragment of combed box tile and two pieces of *tegula bipedalis*. Upper layer (128) produced 22 fragments/63 g, including a single fragment of *imbrex*. Upper layer (130) yielded 83 indeterminate fragments/84 g. Layer (131) produced 54 indeterminate fragments/24 g. Middle layer (132) produced 11 fragments/71 g, including a piece of *imbrex*. (133), a thin dark lens of material, yielded 23 indeterminate fragments/19 g. Layer (134) produced seven indeterminate fragments/58 g. Layer (135) generated a large number (279/66 g) of very small indeterminate fragments.

The shrine

Fill (741) of the western beam slot of the first (timber) phase of this structure, produced a single indeterminate fragment/8 g.

(811) = (819), the stone core at the back of the eastern wall of the second (stone) phase of this structure, yielded five fragments/62 g, including a piece of *tegula* from (819) and an *imbrex* fragment from (811). (995), the primary floor surface of the stone structure, produced three indeterminate fragments/21 g. (795), a thin deposit of hard, compacted sand within the stone structure, generated 39 indeterminate fragments/81 g. (790), a similar deposit to (795), produced five indeterminate fragments/5 g. This material may represent hard core used for both wall infill and floor surfacing within the structure.

Outside the structure, a deposit of mixed material with charcoal, (805), produced 13 indeterminate fragments/8 g.

(755), a thick deposit of compact sand within the structure, which raised the internal surface by 0.2 m, yielded 12 fragments/185 g. Most (nine fragments/106 g) are indeterminate. Identifiable forms comprise two *tegula* fragments and a piece of *imbrex*.

Following its disuse, collapse deposit within the alcove (753), produced 39 fragments/349 g. Most are indeterminate but identifiable forms comprise fragments of *tegula* and *imbrex*. Further collapse deposit (752) = (738) generated 71 fragments/604 g. Most (64 fragments/541 g) came from (752). Identifiable forms comprise two *tegulae* fragments and two pieces of *imbrex*. (738) yielded a small fragment of *tegula*/7 g. This material presumably represents part of the collapsed roof of the stone structure.

(809), a sand deposit which sealed the structure, produced five indeterminate fragments/14 g. (810), a further sand deposit which sealed the structure, yielded two indeterminate fragments/3 g.

Dumping during and after the use of the shrine

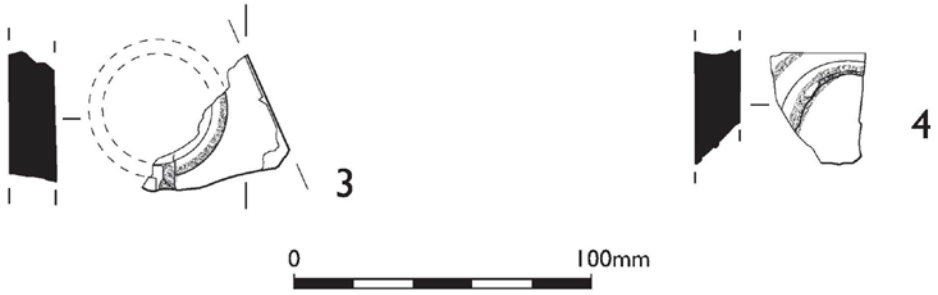
During the use of the shrine, (801), fill of cut feature (803), produced eight indeterminate fragments/109 g. Above this, a dump of clay-sand (797), yielded a single indeterminate fragment/3 g. Fine sand (788), above (797), produced seven fragments/63 g, including a piece of *tegula*. Sand deposit (784) yielded a single indeterminate fragment/1 g. Sandstone surface (743) produced six indeterminate fragments/7 g.

Following the disuse of the shrine, a dump of laminated sands (698), generated 41 indeterminate fragments/253 g. Sand layer (725) produced 11 indeterminate fragments/11 g. Fill (734) of pit (735), which cut (725), yielded seven fragments/157 g, including single fragments of *tegula* and *imbrex*. Fill (713) of ?rubbish pit (714), which cut (698), produced six fragments/29 g,

including a fragment of *imbrex*. It is possible that this material also includes roof tile from the collapsed stone structure.

Much of the material from this phase was used in road construction and in the floor surfaces of temporary structures. It was incorporated with other rubbish in sealing deposits and probably also includes material from the collapsed roof of the stone phase of the shrine.

3 Antefix; edge fragment of Twentieth Legion inscribed antefix with part of *phalera* and spear on plain-edged form. Partly sanded edge; Th: 17 mm. A (1056): Phase 7 layer of red sand; SF 9582. Grimes 1930, 210 fig 58.1, 5 or 6; RIB **II** (4), 2458.3, 2458.6 or 2458.7.



4 Antefix; middle fragment of Twentieth Legion inscribed antefix with partial moulded inscription:]EG[. Smooth underside. Traces of white slip on upper surface; Th: 15 mm. A (672): Phase 7 dump deposit of red/grey sand; SF 9562. Probably Grimes 1930, 210 fig 58.2; RIB **II** (4) 2458.2.

Period 4: The second Roman amphitheatre

Phase 8: Amphitheatre 2 construction

Phase 8 produced 488 fragments of Roman ceramic building material with a weight of 6,160 g, comprising 5.0 % by fragment count and 6.9 % by weight of the Roman phased assemblage, with an average fragment weight of 12.6 g.

The outer wall

(651), the backfill of a construction trench for the outer wall of Amphitheatre 2, produced six indeterminate fragments/16 g.

(554), an uppermost sandy deposit around the outside of Amphitheatre 1, cut by the construction trenches for the wall of Amphitheatre 2, yielded 29 fragments/1,378 g. Identifiable forms comprise pieces of roof tile, including a Warry group A *tegula*, dating between *c* AD 90/100—120.

Bonding layers for the foundation courses, (726) = (757) = (1220), generated 33 fragments/7,679 g of Roman ceramic building material. (726) produced three fragments/164 g, including two pieces of *imbrex*. (757) yielded six

fragments/1,102 g, including a piece of *imbrex* and a fragment of brick. (1220) produced 24 indeterminate fragments/374 g.

The following fills of the foundation trench for the outer wall of Amphitheatre 2, all derived from building activity, also produced Roman ceramic building material:

(653) produced 26 fragments/1,007 g, including single pieces of *tegula* and brick. (658) yielded five fragments/92 g, including a fragment of *imbrex*. Two indeterminate fragments/26 g came from (659). (684) produced 51 fragments/186 g, including two pieces of *tegula*. (686) yielded 16 fragments/608 g, including two pieces of box tile, one of which is knife-scored, and a *tegula* fragment. (687) generated 62 indeterminate fragments/70 g. 44 fragments/421 g came from (679), including single fragments of *tegula* and *imbrex*. (680) yielded 12 indeterminate fragments/61 g and (688) produced six indeterminate fragments/44 g.

Deposits of red sandstone chippings: (724), (685) and (692), between this wall and the outer wall of the first amphitheatre, also produced Roman ceramic building material. (724) yielded 15 fragments/134 g, including single pieces of *tegula* and *imbrex*. 166 fragments/451 g, including a single piece of *imbrex*, came from (685). (692) produced five indeterminate fragments/10 g.

Fills (678) and (601) of the linear construction trenches for the eastern side wall of the *vomitorium*, Entrance 11, also produced Roman ceramic building material. Six indeterminate fragments/6 g came from (678) and (601) yielded four indeterminate fragments/10 g.

The ceramic building material from this phase appears to have been used in the construction of Amphitheatre 2, both as part of the bonding layers for the foundation courses of the outer wall, and as packing for the construction trenches of Entrance 11, as well as for the outer wall of Amphitheatre 2. The fragment of knife-scored box tile from (686) indicates the re-use of old building material, as this method of keying is thought to have gone out of use *c* AD 100.

Phase 9: Amphitheatre 2, use

Phase 9 produced 270 fragments of Roman ceramic building material weighing 4,822 g, comprising 2.8 % by fragment count and 5.4 % by weight of the Roman phased assemblage, with an average fragment weight of 17.9 g.

The exterior

Cess pit (949) was back-filled in preparation for the laying of road surfaces. Fill (895) produced three fragments/46 g, including a fragment of *imbrex*. (897), cess pit fill below (895), yielded six fragments/201 g, including three pieces of roof tile.

A series of road surfaces and makeup layers outside the outer wall of Amphitheatre 2 produced Roman ceramic building material. The best-preserved sequence lay between entrances 11 and 12:

Levelling deposits (1011) = (1013) produced 31 fragments/1,293 g. (1013), probably a make-up layer for overlying surface (1004), produced 14 fragments/288 g. The only identifiable form comprises a single fragment of *tegula*. (1011) yielded 17 fragments/1,005 g. Identifiable forms comprise a *cuneatus* (solid *voussoir*) and three roof tile fragments. The latter includes a Warry group C *tegula*, dated between *c* AD 160—260, which provides a *terminus post quem* for the make-up layer of the first road surface outside the outer wall of Amphitheatre 2. Pebble surface (1004) produced 10 fragments/260 g, including an *imbrex* fragment. Levelling/surface deposit (998) yielded a single indeterminate fragment/2 g.

Resurfacing of the road produced Roman ceramic building material from levelling deposit (972), comprising 24 fragments/896 g, including five pieces of roof tile (mainly *imbrices*). Fine surface (967) produced 56 fragments/194 g, including a fragment of *imbrex*.

A third re-laying generated Roman ceramic building material from make-up layers (980) and (984) = (993): (980) yielded six indeterminate fragments/53 g. (984) = (993) together produced five fragments/142 g, including two brick fragments from (984); (993) produced a fragment of *imbrex*. Surface (983) yielded 47 fragments/604 g, including a piece of brick. Levelling/surface deposit (994) produced 11 indeterminate fragments/31 g.

Repair patch (996) yielded a single indeterminate fragment/4 g.

A fourth and final resurfacing produced Roman ceramic building material from make-up layer (970) = (874). Together, these contexts generated 66 fragments/936 g, with six indeterminate fragments/12 g from (874) and 60 fragments/924 g from (970). These include three fragments of *imbrex* and a piece of brick. The surface (873) yielded a single indeterminate fragment/158 g.

The ceramic building material from this phase was mainly used as rubble for levelling open areas and for road construction.

Periods 5—6: Amphitheatre 2 change of use and robbing

Phase 10: Amphitheatre 2 change of use

Phase 10 generated 5,379 fragments of Roman ceramic building material with a weight of 63,108 g, comprising 22.2 % by count and 12.9 % by weight of the total (site) assemblage. Ceramic building material was recovered from all three Areas. 291 fragments/40,694 g came from Area A, with an average fragment weight of 139.8 g. Area B produced 420 fragments/9,776 g, with an average fragment weight of 23.3 g. The most fragmented group came from Area C,

with 4,668 fragments weighing 12,638 g, giving an average fragment weight of just 2.7 g. This wide difference in average fragment weights, especially between Areas A and C, reflects the different methods of retrieval used. In Area A, 94.5 5 of fragments by count and 99.9 % by weight were hand-collected. In Area C, just 15 % of fragments by count (69.3 % by weight) were hand-collected.

Area A

The bottom fill (892) of the late Roman trench, cut around the outer wall of the amphitheatre, yielded 44 fragments/2,721 g of Roman ceramic building material. Most (by count) are indeterminate. Identifiable forms comprise small amounts of roof tile and brick. Single examples each of box tile and herringbone-floor brick were also recovered. The main fill of this trench, which was also spread thinly over the uppermost road surfaces, produced a total of 227 fragments/37,943 g of Roman ceramic building material from (802 = 852 = 799 = 878 = 891 = 909), with most (127/4,461 g) coming from (852), but with the greatest weight of material (65 fragments/31, 802 g) coming from (891). Identifiable forms comprise roof tile and brick with smaller amounts of box tile and antefix (Cat no 5); the latter was retrieved from (852). An unusual moulded fragment of indeterminate form was recovered from (891) (Cat no 6). A Warry group D16 *tegula*, *c* AD 240—380, came from (852). It provides a *terminus post quem* for the main fill of this trench.

Fill (858) of cut (860), made through the build-up of road surfaces in front of the gate at the *vomitorium*, Entrance 11, produced 19 indeterminate fragments/20 g. (862), the backfill of post-hole (863), below (858) yielded a single indeterminate fragment/10 g.

Area B

The fill (2528) of post-hole (2530) produced just two fragments/143, including a fragment of *imbrex*.

Make-up deposits (2611) = (2609) together yielded 85 fragments/5,911 g, with 75 fragments/5,437 g coming from (2611) and 10 fragments/474 g from (2609). A range of identifiable forms was recovered, though in small amounts only. These comprise roof tile and single examples of box tile and half-box tile, both from (2611), as well as a piece of finial/chimney, also from (2611) (Cat no 7). A Warry group A *tegula* (*c* AD 100 - 120) was also retrieved from (2611).

Layers (2610) = (2457), which covered post-pad structures (2607) and (2608), together produced 333 fragments/3,722 g, with most (317 fragments/2,980 g) coming from (2457). Indeterminate fragments predominate but diagnostic forms comprise roof tile and brick.

Area C

The Arena

Sub-phase 10a

Fill (3148) of large post-hole (3147), probably part of a timber building, produced 97 fragments/407 g, including single pieces of *imbrex* and box tile. Fill (3156) of post-hole (3155), which formed part of the same structure, yielded 41 fragments/1,261 g. A single piece of *imbrex* and two fragments of *tegula* comprise the only diagnostic forms.

Sub-phase 10b

Fill (3160) of E—W timber slot (3159) yielded just six indeterminate fragments/22 g. Fill (3151) of N—S timber slot (3150) produced 251 tiny indeterminate fragments/208 g, including a chip with part of a legionary stamp with a fishtail 'E' (Cat no 8).

Sub-phase 10c

(3166), fill of pit (3167), produced 113 tiny indeterminate fragments/38 g. Fill (3145) of pit (3161) yielded 355 fragments/821 g, comprising tiny indeterminate fragments and two pieces of *imbrex*.

Sub-phase 10d

Fill (3144) of pit (3143) yielded 853 tiny indeterminate fragments/338 g. Middle fill (3164) of pit (3122/3171) produced 122 fragments/1,081 g. Most are small indeterminate pieces but a range of identifiable forms was also recovered. These comprise roof tile, a piece of brick and a fragment of *cuneatus*. Fill (3152) of pit (3153) generated 204 fragments/1,990 g. Single fragments of *tegula* and *imbrex* comprise the only identifiable forms. Fill (3157) of pit (3153) produced 175 tiny indeterminate fragments weighing just 86 g.

Sub-phase 10e

Layer (3096), which sealed features of the first four sub-phases, produced a relatively large group of 778 fragments/1,466 g. Most are indeterminate but a few fragments of roof tile and brick were also recovered. Fill (3142) of linear gully (3121), which cut into layer (3096), produced 26 tiny indeterminate fragments/25 g.

Sub-phase 10f

Eastern alignment of N—S post-holes:

Fill (3099) of post-hole (3100) produced 28 tiny indeterminate fragments/18 g. Fill (3127) of post-hole (3117) produced 167 tiny indeterminate

fragments/43 g. Fill (3131) of post-hole (3130) yielded 25 tiny indeterminate fragments/16 g. Fill (3126) of post-hole (3116) produced 61 tiny indeterminate fragments/41 g.

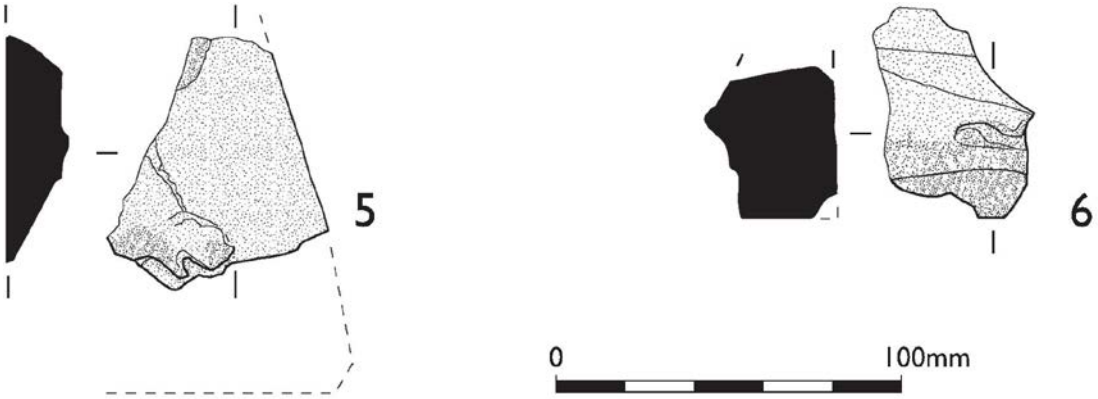
Western alignment of N—S post-holes:

Fill (3141) of post-hole (3140) produced 15 tiny indeterminate fragments weighing just 9 g. Fill (3102) of post-hole (3101) produced just four indeterminate fragments/4 g. Fill (3133) of post-hole (3132) yielded 289 tiny indeterminate fragments/89 g. (3128), fill of post-hole (3118), produced 430 tiny indeterminate fragments/136 g. Fill (3129) of the same post-hole produced 56 fragments/103 g. Fill (3088) of post-hole (3087) yielded nine indeterminate fragments/30 g. Fill (3090) of post-hole (3089) produced 28 tiny indeterminate fragments/26 g.

Sub-phase 10g

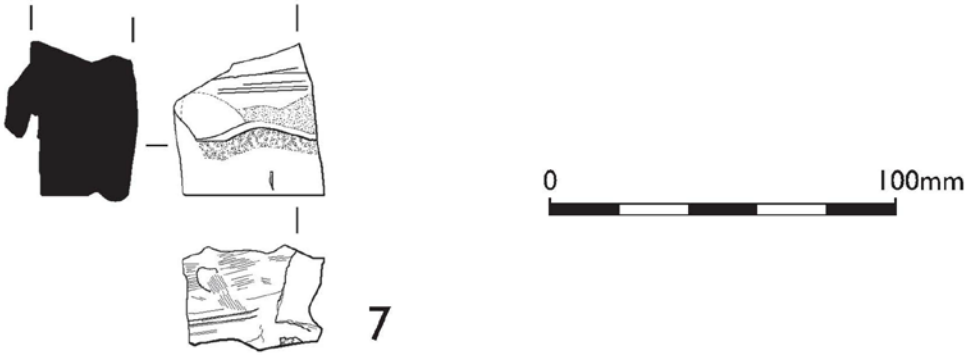
Fill (3115) of pit (3112) generated 269 fragments/482 g, including pieces of roof tile and an indeterminate fragment with a partial Holt 17 legionary stamp (Cat no 9). Fill (3111) of tree-bole (3110) produced just three indeterminate fragments/11 g. Fill (3092) of pit (3091) yielded 86 fragments/1,172 g, including three fragments of roof tile. Fill (3105) of post-hole (3094) produced 28 indeterminate fragments/38 g. Fill (3093) of pit (3104) yielded 22 indeterminate fragments/49 g. Fill (3125) of pit (3124) produced 70 fragments/847 g, including four pieces of roof tile. (3114), fill of possible root-bole (3113), yielded just five indeterminate fragments/6 g. Sandstone rubble spread (3085) produced 13 fragments/1,417 g. Identifiable forms comprise the corner of a lugged brick (Cat no 10) and two pieces of *tegula*, one of which belongs to Warry group A or B (the lower cutaway is incomplete). It is therefore broadly dated between *c* AD 90/100—140. Sandstone rubble patch (3095) yielded just three fragments/4 g, including a single piece of box tile. Similar sandstone rubble patch (3107) produced a tiny indeterminate fragment weighing just 1 g.

5 Antefix; edge fragment of Twentieth Legion inscribed antefix with part of boar's head and inner stem of final letter 'X'. Trimmed/wiped edge, battered upper surface; Th: 19 mm. Holt type 1 (RIB: 2458.3) or 2 (RIB: 2458.2). A (852): Phase 10 fill of robber trench; SF 9787. Grimes 1930, 210 fig 58.1 or 2; RIB II (4), 2458.3 or 2458.2.



6 ?Antefix; edge fragment with indeterminate moulded design; sanded underside and part of upper surface; Th: 30 mm. A (891): Phase 10 fill of robber trench; SF 9789.

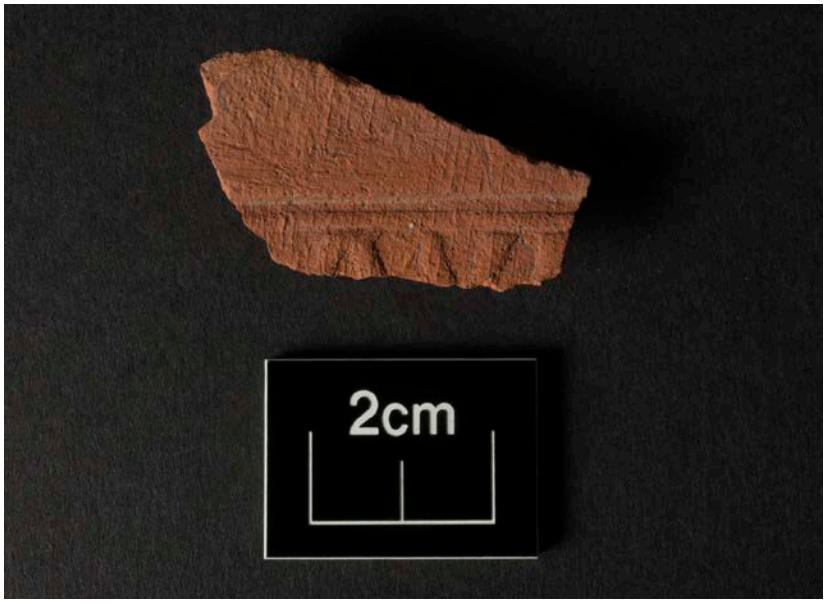
7 Finial/chimney; wall fragment with applied frill and top edge of horizontal knife-cut window below frill. Oxidised fabric. Wheel-thrown. Lightly burnt interior; Th: 28 mm, External Diam: 98 mm. B (2611): Phase 10 seating bank deposit; SF 9586. Lowther group B (1972, 147; 1976, 41—7).



8 Indeterminate; middle fragment (chip) with Twentieth Legion stamp: partial fishtail 'E'. C (3151): Phase 10*b* fill of beam slot; SF 9750. Grimes 1930, 211 *cf* fig 59.11—14, 17 and 24; RIB **II** (4), 2463.14, RIB 2463.21, 2463.44, 2463.54, 2463.55 and 2463.58.

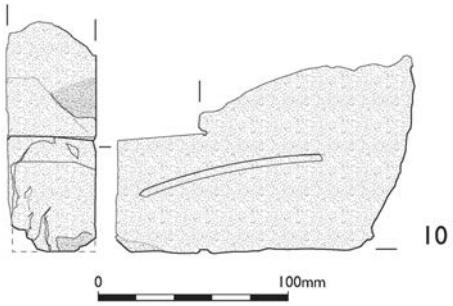
8

9 Indeterminate; middle fragment (chip) with partial Twentieth Legion stamp:]XVV. C (3115): Phase 10*g* fill of pit; SF 9147; Grimes 1930, 211 fig 59.17; RIB **II** (4) 2463.21.



9

10 Brick: lugged corner of a tapered brick with smooth/sanded edge and 'underside'. Knife-trimmed lug and end/edge; smooth 'upper' surface (orientation uncertain). Single faint signature mark; Th: 45—50 mm. C (3085); Phase 10*g* demolition layer; SF 9625. *cf* lugged, tapered brick from Caerleon fortress baths (Zienkiewicz 1986, 325 and 326, fig 1).



Phase 11

Four fragments/380 g, with an average fragment weight of 95 g, came from robber trench fill (2475) in Area B, a context assigned to Phase 11 but to neither of its sub-phases. Identifiable forms comprise single fragments of *tegula* and brick. Two indeterminate fragments were also recovered.

Phase 11a: Robbing of internal walls

Sub-phase 11a produced 610 fragments/33,176 g of Roman ceramic building material, comprising 2.5 % by count and 6.8 % by weight of the total (site) assemblage. Ceramic building material was recovered from Areas A and B. 464 fragments/26,077 g, with an average fragment weight of 56.2 g, came from Area A. Area B produced 145 fragments/7,099 g, with an average fragment weight of 49.0 g.

Area A

Fill (596) of robber trench (597), for the north wall of the *vomitorium*, (Entrance 11), yielded nine fragments/411 g. A fragment of *tegula* comprises the only diagnostic form. Fill (485) of robber trench (195), for the north wall of the *vomitorium*, (Entrance 11), produced 33 fragments/3,872 g. Most are indeterminate but recognisable forms comprise roof tile and brick. The latter includes a fragment of *tegula bipedalis*. The roof tile includes a probable Warry group A *tegula*, dated *c* AD 90/100—120. Fill (487) of robber trench (195) produced 28 fragments/2,280 g. Roof tile fragments comprise the only identifiable forms; they also include a Warry group A *tegula*. Fill (488) of the same robber trench yielded eight fragments/256 g, including a piece of *tegula*. Fill (708) of robber trench (195) produced 37 fragments/855 g, including a few pieces of roof tile.

(287), fill of robber trench (288) of the *vomitorium* wall, generated 11 fragments/1,204 g. Identifiable forms comprise roof tile and brick.

Fills of the robber trench of the inner end of the *vomitorium* wall (196) produced fragments of Roman ceramic building material: Fill (307) yielded just three fragments/287 g, including a piece of *tegula*. Fill (308) produced 42 fragments/1,041 g, including seven *tegula* fragments. Fill (309) yielded six

fragments/164 g, including a *tegula* fragment and a piece of *imbrex*. Fill (310) produced 31 fragments/496 g, including a handful of roof tile fragments.

The earliest fills, (491) and (492), in the arm of the cruciform robber trench (245), generated fragments of Roman ceramic building material. (491) produced 12 fragments/394 g; (492) yielded seven fragments/396 g. Most are indeterminate but identifiable forms comprise fragments of roof tile and a piece of box tile. Subsequent dumps (459), (458) and (457) also yielded fragments of Roman ceramic building material. (459) produced 27 fragments/672 g. Most are indeterminate but a range of forms was also recovered, comprising roof tile and brick. (458) yielded 27 fragments/2,193 g. Again, the majority is indeterminate but identifiable forms comprise *tegulae*, box tile and brick. The latter includes fragments of *tegula bipedalis*. Fourteen fragments/113 g came from (457), including two pieces of roof tile.

Roman ceramic building material also came from fills of the inner arm of the cross: (441), (306) and (442). An indeterminate fragment/7 g came from (441). (306) yielded just six fragments/181 g, including a piece of *tegula*. Just four fragments/51 g came from (442), including a piece of *tegula*.

Roman ceramic building material was also recovered from fills of the arm of the trench robbing the *vomitorium* wall up to the face of the outer wall. Deposits (320), (321) and (322), which filled the crossing point of the two robber trenches, together produced 75 fragments/4,256 g, with the majority (54 fragments/2,692 g) coming from (322). Indeterminate fragments and pieces of roof tile came from (320) and (321) but (322) yielded a wide range of forms, although most are indeterminate. Forms recovered comprise roof tile, box tile, brick and a roughly shaped disc or roundel (Cat no 11). Two probable Warry group B *tegulae* (*c* AD 120—140) came from (322). Above these fills, the centre of the cruciform robber trench was then levelled up with a mixed loose silty material. Deposits (244), (517) and (1047) all produced Roman ceramic building material. (244) yielded 56 fragments/6,127 g. As well as indeterminate fragments, a range of forms was also recovered, comprising roof tile and brick and single pieces each of box tile and herringbone-floor brick. Datable forms from (244) comprise a Warry group D *tegula* (*c* AD 240—380) and two Warry group A *tegulae*. In contrast, just two fragments/91 g came from (517), including a fragment of *tegula*/69 g. (1047) produced two indeterminate fragments/7 g.

(440), fill of the robber trench of the outer wall of Amphitheatre 1b, (417), yielded 12 fragments/36 g, including a piece of *imbrex*. (489), fill of the robber trench of the outer wall of Amphitheatre 1b, (519), produced just four fragments/648 g, including two pieces of *tegula*.

A dump of sandstone rubble (643) produced three indeterminate fragments/13 g. (660), a layer of red sandstone fragments, yielded a single indeterminate fragment/1 g.

(644), fill of post-hole (645), produced three indeterminate fragments/25 g.

As well as the datable forms already mentioned, fragments of scored box tile, which are generally thought to have been replaced by combed forms by *c* AD 100, were also recovered, from (244), (322), (458) and (492).

Area B

Earliest fill (2471) of the robber trench of the outer wall of Amphitheatre 1b (2454/2516) produced 21 fragments/558 g. Indeterminate fragments predominate but diagnostic forms comprise pieces of roof tile. Above this, silt-sand deposit (2470) yielded just two indeterminate fragments/10 g. Comparable deposit (2468) produced seven fragments/291 g, with diagnostic forms comprising roof tile and brick. Further fills of this robber trench, (2483) and (2486), also produced Roman ceramic building material. Three indeterminate fragments/22 g came from (2483); (2486) produced a single piece of *tegula*/85 g. The deposit which sealed these fills, (2466), produced 13 fragments/1,800 g, mainly comprising indeterminate fragments with small amounts of roof tile. Above this, (2484) produced seven indeterminate fragments/28 g. Upper fills (2465), (2458) and (2463) also yielded fragments of Roman ceramic building material. A single indeterminate fragment/6 g came from (2465). In contrast, (2458) produced 50 fragments/2,118 g. Most are indeterminate but diagnostic forms comprise roof tile as well as a single fragment of brick. 14 fragments/633 g came from (2463). The only identifiable forms comprise a handful of roof tile fragments.

Vomitorium wall robber trench (2443)

The earliest fill (2495) of the robber trench (2443) of the *vomitorium* wall, Entrance 10, produced a single indeterminate fragment/53 g. (2494), which sealed (2495), yielded 14 fragments/650 g. Identifiable forms comprise roof tile and box tile but most are indeterminate. Upper fill (2444) produced eight fragments/633 g, including pieces of *tegula*.

11 Disc/stopper; roughly shaped roundel formed from an indeterminate fragment. Almost complete; Th: *c* 10 mm, Diam: *c* 54 mm. A (322): Phase 11a fill of robber trench; SF 9761.

Phase 11b: Robbing of external walls

Sub-phase 11b produced 1,147 fragments/55,781 g of Roman ceramic building material comprising 4.7 % by count and 11.4 % by weight of the total (site) assemblage. Ceramic building material was recovered from Areas A and

B. 601 fragments/40, 687 g, with an average fragment weight of 67.7 g, came from Area A. Area B produced 546 fragments/15,094 g, with an average fragment weight of 27.6 g.

Area A

Roman ceramic building material was recovered from (764) and (769), layers of demolition debris from robbing the upper parts of the outer wall of Amphitheatre 2. 15 fragments/872 g, including pieces of *tegula*, came from (764). (769) produced 49 fragments/2,962 g. Identifiable forms comprise roof tile, brick and a fragment of combed box tile. All the datable fragments of box tile from Area A sub-phase 11b are combed and belong to either Chester types 1 or 3 (Jones 2008, 142—3).

Backfill deposits of robber trenches for the outer wall of Amphitheatre 2: (252), (369), (506), (575), (619), (391), (393), (394), (410), (446), (451) and (604), generated fragments of Roman ceramic building material amongst the general detritus of crushed and broken stone and mortar. (252) produced just two fragments/142 g, including a piece of *imbrex*. (369) yielded 1089 fragments/9,000 g, including a wide range of diagnostic forms. These comprise roof tile, brick and box tile. (306) produced 37 fragments/3,593 g, including a wide range of identifiable forms. These mainly comprise roof tile and brick. The latter includes two fragments of *tegula bipedalis*. Single pieces of box tile and *cuneatus* were also retrieved. 57 fragments/2,208 g came from (508). Identifiable forms comprise roof tile fragments, which mainly consist of pieces of *imbrex* but which also include a Warry group A *tegula* (SF 9788) that may have been reused as a rubber/smoother. A single piece of herringbone-floor tile was also recovered. (575) produced 10 fragments/1,178 g, including a few pieces of roof tile. Two further pieces of roof tile/89 g came from (584). (619) produced a single indeterminate fragment weighing <1 g. (391) yielded 17 fragments/2,175 g. Identifiable forms comprise roof tile and brick. (393) produced just three indeterminate fragments/44 g. Five fragments/496 g came from (394), including single pieces of *tegula* and brick. Just four fragments/579 g came from (410), including a relatively large piece of *imbrex*. (446) also yielded four fragments/184 g, including a piece of *tegula*. Four fragments/182 g came from (451). Diagnostic forms comprise single fragments of *imbrex* and brick. Six fragments/544 g came from (604), including two pieces of *tegula bipedalis*. Fill (765) of robber trench (417) produced 11 fragments/478 g, including pieces of roof tile.

(276), fill of robber trench (289), yielded just two pieces of roof tile/368 g. Fill (299) of robber trench (300) produced a single piece of box tile/91 g. (363), fill of robber trench (245), yielded six fragments/570 g, including a large piece of *tegula*. Other fills of (245) also yielded Roman ceramic building material: lower fill (411) produced 136 fragments/11,832 g. As well as indeterminate fragments, diagnostic forms comprise roof tile and brick, including a Warry group A *tegula* (*c* AD 100—120). Twenty fragments/739 g came from (525). Identifiable forms comprise fragments of roof tile. (532) produced 23 fragments/328 g of roof tile and indeterminate pieces. Fill (623) generated 77

fragments/2,033 g. Diagnostic forms comprise roof tile, including a Warry group A *tegula*, and brick. The latter includes a single piece of *tegula bipedalis*/255 g.

Area B

(2460), the robber trench following the outer wall of Amphitheatre 2, produced 16 fragments/498 g from its earliest fill (2503). Fragments of *tegula* and indeterminate pieces were recovered from this deposit. Overlying this, fill (2493) produced 20 fragments/361 g of roof tile and indeterminate forms. Above this, a deposit of red sandstone brash, (2492), yielded just eight fragments/236 g, including a piece of *tegula*. Silt fill (2459) produced 10 indeterminate fragments/147 g.

Primary fill (2491) of robber trench (2591), which followed the line of the Roman road running parallel with the outer wall of Amphitheatre 2, produced 14 fragments/417 g, including three pieces of *tegula*. Roman ceramic building material was also recovered from upper fills (2473) and (2497) of this trench. (2473) produced 22 fragments/223 g, all indeterminate apart from a single piece of *tegula*. (2497) yielded a single indeterminate fragment weighing just 3 g.

Fragments of Roman ceramic building material were retrieved from fills of robber trench (2545)/(2567)/(2464), which followed a substantial east-west aligned wall at the southern side of the east entrance. Primary fills (2569), (2546) and (2579) together produced 22 fragments/805 g, with the majority (15 fragments/742 g) from (2569). A limited range of diagnostic forms was recovered from these deposits, comprising roof tile and brick.

Sandy fills (2566), (2565), (2563), (2561) and (2559) on the southern side of the robber trench may have derived from the adjacent *in situ* Roman seating bank material and may represent trench collapse in antiquity. (2566) produced five fragments/194 g, including a single piece of *tegula*. (2565) yielded 182 fragments/951 g, the majority comprising tiny indeterminate fragments. A few pieces of roof tile were also recovered. 10 fragments/562 g came from (2563). Again, the few identifiable forms comprise fragments of roof tile. These include a Warry group A *tegula*, probably either form A27 or A28. (2561) produced five fragments/128 g, including a piece of antefix (Cat no 12). Finally, (2559) yielded just three indeterminate fragments/31 g.

Deposit (2562), which sealed these collapse deposits, produced 10 fragments/184 g, including a single piece of *imbrex*. Above (2562), a series of deposits rich in small fragments of red sandstone and lime mortar, also produced Roman ceramic building material: single indeterminate fragments came from (2581), (2583), (2578) and (2582). (2558) produced seven indeterminate fragments/84 g. Nineteen fragments/397 g came from (2557), including three pieces of *tegula*.

Dumps of material which then filled the robber trench also produced fragments of Roman ceramic building material. Context (2520), at the eastern end of the trench, yielded seven fragments/279 g, including two pieces of *imbrex*. Above this, (2541) produced 16 fragments/434 g, including small amounts of *tegula* and box tile.

Another probable trench collapse resulted in another series of sandy 'seating-bank like' deposits, which also produced Roman ceramic building material: (2519) yielded a single indeterminate fragment/14 g; (2540) produced a rare piece of half-box tile (*tegula hamata*)/364 g (Cat no 13). Grimes described an example from Holt as a flanged tile 'not of ordinary tegula form ... the flanges are cut away in the middle on each side...' (1930, 135)

A further dump deposit, (2536), yielded 16 fragments/764 g. Most are indeterminate but two fragments of roof tile were also retrieved. Above this, (2532), a deposit rich in sandstone fragments, produced 15 fragments/1,296 g. Diagnostic forms comprise roof tile and brick.

Later fills, representing a systematic backfilling of the trench from east to west, also produced Roman ceramic building material: (2518) yielded 30 fragments/936 g with identifiable forms comprising roof tile and brick. (2482/2549) together produced 14 fragments/193 g, with just one fragment/3 g from (2549). Three *tegulae* fragments/94 g were the only recognisable forms recovered. (2570) produced just three indeterminate fragments/55 g. (2480/2474) together yielded 12 fragments/252 g with just three indeterminate fragments/20 g from (2480). (2474) produced single pieces of facing tile and *tegula*, as well as indeterminate fragments.

Upper fills (2479) and (2476/2456), also produced fragments of Roman ceramic building material. Two indeterminate fragments/6 g came from (2479). (2476/2456) together yielded 20 fragments/964 g with the majority (19/960 g) from (2456). Recognisable forms comprise single pieces of *tegula* and brick.

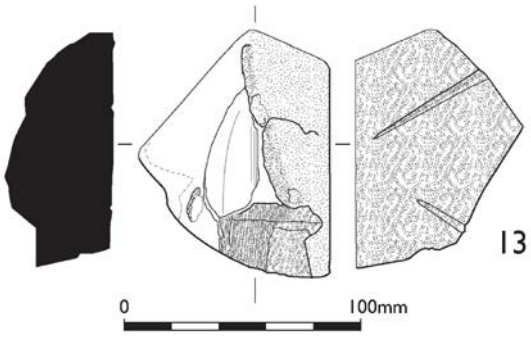
The mortar-rich deposit (2548), which filled cut (2547), produced seven fragments/729 g. The only diagnostic forms comprise single pieces of *tegula*, *imbrex* and brick.

Catalogue

12 Antefix; Middle fragment of Twentieth Legion inscribed antefix with partial moulded inscription:]GX[. Faded cream slip on upper surface. Smooth reverse; Th: 21 mm. B (2561): fill of robber trench; SF 8671. Grimes 1930, 210 fig 58.1 or 2; RIB **II** (4), 2458.3 or 2458.2.

13 Half-box tile (*tegula hamata*); flange fragment. Sanded face with criss-cross knife-scoring; sanded side of flange, trimmed along bottom. Edge of knife-cut vent with angled back; back and top surface of vent are lightly sanded. Unusual form; Th: 40 mm, Fl W: 30 mm. B (2540):

dump of rubbish associated with Amphitheatre 1b seating bank deposit; SF 9852. Grimes 1930, 135.



Periods 7--8: Post Roman Phases 12—21

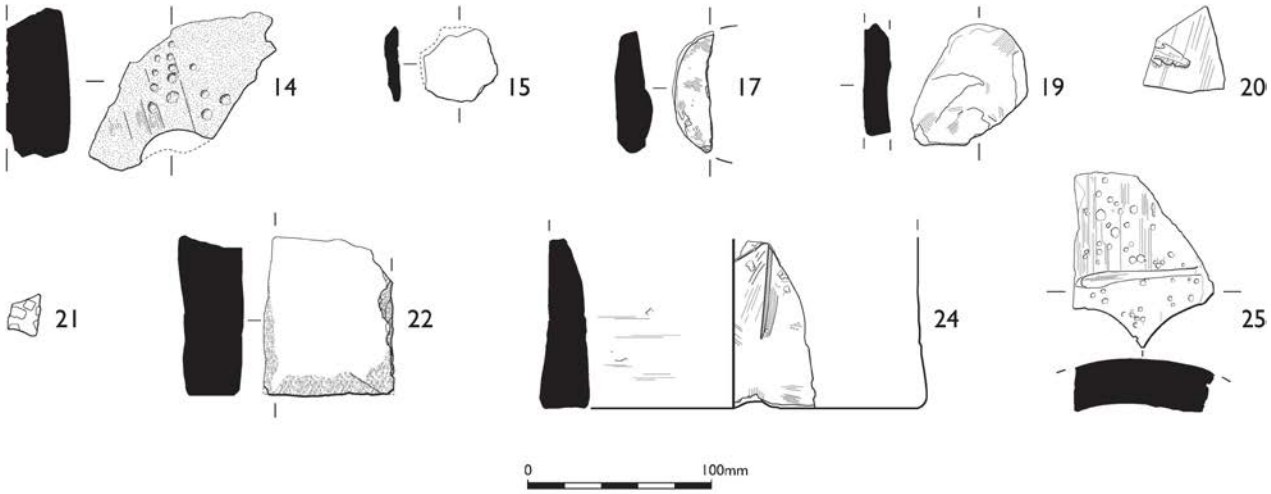
Post-Roman phases 12—21 produced a total of 7,081 fragments weighing 243,125 g (29.3 % by fragment count and 49.5 % by weight of the total assemblage), with an average fragment weight of 34.3 g. A wide range of forms was recovered from all three trenches (*see Table 8*). Roof tiles (*tegulae* and *imbrices*) predominate, together comprising 51.9 % by weight of the total. There is a large proportion of indeterminate fragments (27.2 % by weight of the total) and also of bricks, in a range of forms (17.3 % by weight of the total). All other forms occur in much smaller quantities and together account for just 3.7 % by weight of the total. Although small in number, the presence of these forms is significant, especially in terms of their range and variety.

The range of forms from post-Roman Phases 12—21 complements that recovered from Roman Phases 3—9 and post-Roman Phases 10—11b, and perhaps suggests a common origin for the assemblage. The vaulting tube fragments presumably originated from the fortress baths (*thermae*) and it is likely that the herringbone-floor bricks did too. The flue tiles and bricks may also derive from the *thermae* but they could equally have come from other hypocausted buildings within the fortress or surrounding *canabae*.

The only forms missing from Phases 12—21, which are present in Phases 3—9 and 10—11b, comprise fragments of *cuneatus* and half-box tile (*tegula hamata*). As only a handful of these forms were found in total, this is perhaps not surprising. The only form present in Phase 12—21 which is absent from the Roman phases, but which does occur in sub-phase 11a, is the disc/stopper. Again, only three examples were found in total, so its absence from phases 12—21 is not particularly significant. Apart from the disc/stopper, Phases 10—11b produced exactly the same range of forms as Phases 3 - 9.

A number of datable forms were recovered from Phases 12—21, comprising nine Warry group A *tegulae* (*c* AD 90/100—120); five group B (*c* AD 120—140); four group A or B (*c* AD 100—140); one group C or D (*c* AD 160—380); and nine group D (*c* AD 240—380). Ten vaulting tube fragments, which are

thought to date to the second quarter of the 3rd century, were also recovered. Their absence from Roman Phases 3—9 and robbing Phases 10—11b perhaps adds weight to the view that they do indeed date to this period, rather than to the initial Flavian phase of construction at the fortress baths (*see above*). Equal numbers (x 10 each) of both scored (pre-*c* AD 100) and combed (post-*c* AD 100) box tiles were also retrieved.



14 Brick; middle fragment with hobnail impressions, probably made by the officer in charge of the tilery testing the hardness of the tiles (Warry 2006*a*, 16); Th: >32 mm. A (1): post-Roman; SF 9543.

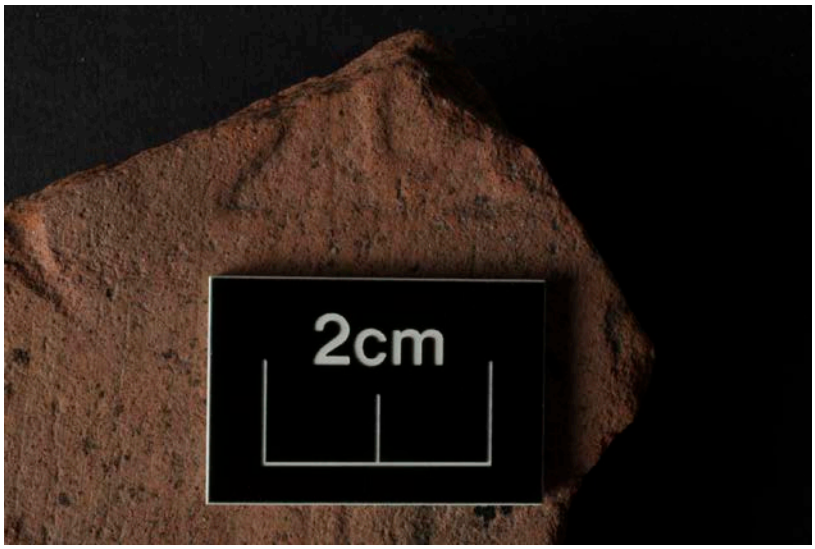
15 Disc/stopper; indeterminate fragment roughly shaped to form a disc (?counter); edges partially smoothed; Th: *c* 8 mm, Diam: *c* 42—45 mm. B (2094); post-Roman; SF 9794.

16 Box tile or facing tile; middle fragment with possible textile impression on the plain unsanded face. B (2114); post-Roman; SF 9796.

16

17 Disc/stopper; approximately one-third of a rough disc formed from a middle fragment of *imbrex*; trimmed shape; Th: *c* 20 mm, Diam (incomplete): >65 mm. B (2247); post-Roman; SF 9573.

18 ?*Tegula*; middle fragment with worn partial Chester type 83, Twentieth Legion stamp: LE[. This stamp only occurs on Warry group A/B *tegulae*. It is in contemporary use with Holt 18 (RIB **II** (4), 2463.39); Th: 28 mm. B (2294): post-Roman; SF 8039. RIB **II** (4) 2463.38. *c* AD 90/100—140.



18

19 ?Finial/chimney; wall fragment. Oxidised fabric. Wheel-thrown; Th: *c* 15 mm. B (2346): post-Roman; SF 9815. Lowther group B (1972, 147; 1976, 41—7).

20 ?Antefix; middle fragment with moulded design of ?part of snout of wild boar (facing right), Holt type uncertain; Th (incomplete): >9 mm. B (2388): post-Roman; SF 9588.

21 Indeterminate; middle fragment (chip) with hobnail imprints in upper surface. These were probably made by the officer in charge of the tile-works testing the hardness of the tiles (Warry 2006*a*, 16); Th: > 5 mm. B (2388): post-Roman; SF 9833.

22 Herringbone-floor (*opus spicatum*) brick with sanded edges and underside. Clay pushed up into upstanding ridge by fingers on one edge, when lifted while still soft; L: >90 mm, W: 73 mm, Th: 30 mm. B (2425): post-Roman; SF (9837).

23 *Tegula*; middle fragment with very faint (lightly impressed) partial Holt type 7 Twentieth Legion stamp:]EGXXV, overlain by looped signature. This stamp only occurs on Warry group A/B *tegulae*; Th: 30

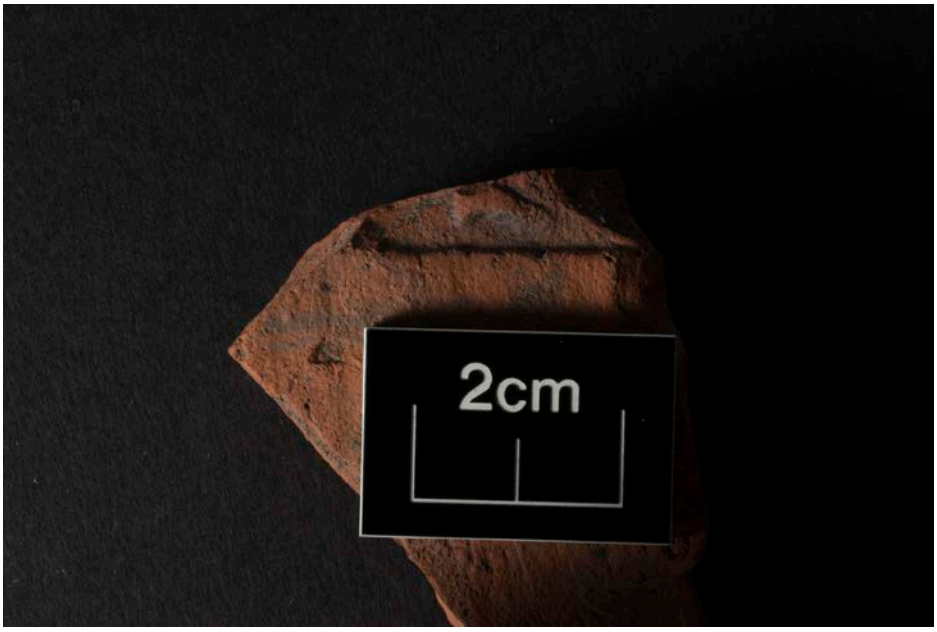
mm. C (3019): post-Roman; SF 9823. Grimes 1930, 211 fig 59.7; RIB II (4) 2463.36. AD 90/100—140.

23

24 Finial/chimney; base fragment with ?signature mark. Oxidised fabric. Wheel-thrown; Diam: 210 mm; Th: *c* 20 mm (*c* 26 mm at base). C (3024); post-Roman; SF 9904. Lowther group B (1972, 147; 1976, 41—7).

25 *Imbrex*; middle fragment with faint (lightly impressed) hobnail impressions and signature across top of gable. On *tegulae*, these were probably made by the officer in charge of the tile-works testing the hardness of the tiles (Warry 2006*a*, 16); Th: 24 mm. C (3047): post-Roman; SF 9603.

26 *Tegula*; middle fragment with partial Twentieth Legion,0 ?Holt type 4 stamp]L[; Th: 24 mm. C (3067); post-Roman; SF 9615; Grimes 1930, 211 fig 59.4; RIB II (4) 2463.11.



26

27 Indeterminate; middle fragment with possible textile impression. C (3068); post-Roman; SF 9618.

28 *Tegula*; middle fragment with partial Twentieth Legion ?Holt type 5 stamp: LEGX[overlain by hobnail impressions. These were probably made by the officer in charge of the tile-works testing the hardness of the tiles (Warry 2006*a*, 16); Th: 35 mm. C (3079): post-Roman; SF 8481. Grimes 1930, 211 fig 59.5; RIB II (4) 2463.30.

28

Unphased

Unphased contexts in Area A, (297) and (1057), produced a total of three fragments weighing 194 g. Forms comprise two pieces of half-box tile/93 g and a single indeterminate fragment/8 g. A single indeterminate fragment weighing 4 g came from unphased context (2138) in Area B.

Unstratified

274 fragments/5,319 g were found unstratified. A range of identifiable forms was retrieved, comprising roof tile, box tile and brick (*see Table 5*). A Warry group C or D *tegula* (*c* AD 160—380) was recovered from Area B and a probable group D1 form (*c* AD 240—380) was found generally unstratified. A fragmentary stamp was also retrieved from Area B

Catalogue

29 Indeterminate; middle fragment with partial ?Webster type 46 Twentieth Legion stamp:]V; Th: *c* 33 mm. B: Unstratified; SF 8036. RIB II (4) 2463.9).

29

Discussion

As a whole, the assemblage is fairly fragmented, with a high proportion of indeterminate material (26.4 % by weight of the total) and a low average fragment weight of just of 20.3 g. Of the identifiable forms, roof tiles form the largest component by weight (47.4 %) of the assemblage, followed by brick (22.6 %) in a range of thicknesses. Much smaller amounts of a wide range of other forms were also recovered (*see Table 5*).

Spatial and chronological distribution

The assemblage is distributed fairly evenly across the site in terms of the range and variety of forms recovered. The assemblage from Roman phases, however, was recovered from Areas A and B only. In Area B, Phase 6 is the only Roman phase to have produced Roman ceramic building material. In Area A, however, it was recovered from every Roman phase (3 to 9). Apart from the tethering stone, no other Roman contexts were identified in Area C. In terms of the range and variety of forms recovered from Roman phases, the assemblages from Areas A and B are closely similar (*see Table 6*).

Antefix, finial/chimney and *cuneatus* fragments were recovered only from Area A, whereas facing tile and herringbone-floor brick were retrieved only from Area B. In terms of quantity (% weight by Area), proportionally more brick was recovered from Roman phases in Area A but more roof tile was retrieved from Area B. There was little difference between the two Areas in the amount of indeterminate material recovered. Proportionally more box tile was found in Area A but more portable oven fragments came from Area B. Unsurprisingly, perhaps, there is a direct correlation between the amount of material recovered and the range of forms present in any particular phase. For example, Phase 6, which yielded the greatest quantity of material, also produced the widest range of forms. In contrast, the only identifiable

forms from Phases 3 and 4, which produced significantly less material, comprise fragments of roof tile.

In contrast, the Roman ceramic building material assemblage from Phases 10—11b was distributed fairly evenly across the site (*Table 7*). All three trenches produced roof tile, box tile, brick, portable oven and indeterminate fragments. Antefix fragments were recovered from Areas A and C only. Fragments of half-box tile, facing-tile and finial/chimney were recovered only from Area B. Fragments of herringbone-floor brick and disc/stopper were retrieved only from Area A. In terms of quantity (% weight by Area), similar proportions of roof tile were recovered from Areas B and C, with proportionally much less retrieved from Area A. A much larger quantity of brick was recovered from Area A, but a much smaller proportion of indeterminate fragments, compared with Areas B and C. Proportionally more box tile was recovered from Area C but Area A yielded more portable oven fragments.

In Phases 3—9, Roman ceramic building material was recovered from layers, cultivation soils, dump deposits, seating-bank deposits, pit fills, cess-pit fills, post-hole fills, construction trench fills, bedding and packing deposits, floor surfaces, road surfaces and make-up layers. In Phases 10—11b, it was retrieved from make-up deposits, layers and dumps of material, post-hole fills, pit fills, timber-slot fills and robber-trench fills.

A wide range of forms was also recovered from Phases 12—21, from all three trenches (*see Table 8*). Antefixes and facing tile were present in Area B only. Disc/stoppers and portable ovens were present in Areas B and C but not in Area A. In terms of quantity (% weight by Area), there were similar amounts of roof tile from all three trenches with proportionally fewer *tegulae* from Area C and fewer *imbrices* from Area B. Similar proportions of vaulting tube and herringbone-floor brick were recovered from all three trenches. More portable oven fragments were recovered from Area C. Areas A and C produced the same proportion of box tile, with a smaller amount coming from Area C. Proportionally similar amounts of brick were recovered from Areas A and B, with a slightly smaller proportion from Area C. Finally, proportionally more indeterminate fragments were retrieved from Areas B and C than from Area A.

Key to Roman phases

3: Roman occupation before the amphitheatre
4: Construction of Amphitheatre 1a
5: Deposits outside Amphitheatre 1a associated with its use
6: Amphitheatre 1b: structural alterations
7: Deposits outside Amphitheatre 1b associated with its use
8: Amphitheatre 2 construction
9: Amphitheatre 2 use

		Area A			*Area B*			Total		
7	Antefix	2	54	0.1	0	0	0	2	54	0.06
3, 4, 5, 6, 7, 8, 9	*Imbrex*	91	4,159	7.7	69	5,122	14.4	160	9,281	10.3
3, 4, 5, 6, 7, 8, 9	*Tegula*	126	12,464	22.9	78	9,411	26.5	204	21,875	24.3
7, 9	Solid voussoir (*cuneatus*)	2	1,275	2.3	0	0	0	2	1,275	1.4
5, 6, 7, 8	Box tile (*tubulus*)	8	659	1.2	3	31	0.09	11	690	0.8
6	Facing tile (*parietalis)*	0	0	0	1	158	0.4	1	158	0.2
3, 5, 6, 7, 8, 9	Brick	35	13,130	24.2	29	6,707	18.9	64	19,837	22.1
6	Herringbone-floor brick	0	0	0	2	523	1.5	2	523	0.6
6	Finial/chimney	1	30	0.06	0	0	0	1	30	0.03
5, 6	Portable oven	1	12	0.02	4	233	0.7	5	245	0.3
3, 4, 5, 6, 7, 8, 9	Indeterminate	5,209	22,580	41.5	4016	13,295	37.5	9,225	35,875	39.9
Total		**5,475**	**54,363**	**99.98**	**4202**	**35,480**	**99.99**	**9,677**	**89,843**	**99.99**

Table 6: CBM from Roman phases: spatial and chronological distribution by form

Phases present	Form	No frags	Wt (g)	% wt Area A	No frags	Wt (g)	% wt Area B	No frags	Wt (g)	% wt All

Key to Phases 10—-11b

10: Amphitheatre 2 change of use
11: Robbing of internal/external walls
11a: Robbing of internal walls
11b: Robbing of external walls

		Area A			*Area B*			*Area C*			*Total*		
10, 11b	Antefix	2	200	0.2	1	53	0.2	0	0	0	3	253	0.2
10, 11a, 11b	Imbrex	135	15,407	14.3	53	5203	16.1	17	1,620	12.8	205	22,230	14.6
10, 11—11b	Tegula	189	30,470	28.4	93	14,560	45	15	4,938	39.1	297	49,968	32.8
10, 11b	Solid voussoir (*cuneatus*)	1	443	0.4	0	0	0	1	113	0.9	2	556	0.4
10, 11a, 11b	Box tile (*tubulus*)	17	1,774	1.7	4	150	0.5	2	251	2	23	2,175	1.4
10, 11b	Half-box tile (*tegula hamata*)	0	0	0	2	567	1.8	0	0	0	2	567	0.4
11b	Facing tile (*parietalis*)	0	0	0	1	72	0.2	0	0	0	1	72	0.05
10, 11—11b	Brick	57	46,107	42.9	14	1,636	5.1	3	1,390	11	74	49,133	32.2
10, 11a, 11b	Herringbone-floor brick	3	696	0.6	0	0	0	0	0	0	3	696	0.5
10	Finial/Chimney	0	0	0	2	101	0.3	0	0	0	2	101	0.07
11a	Disc/Stopper	1	33	0.03	0	0	0	0	0	0	1	33	0.02
10, 11a, 11b	Portable oven	5	735	0.7	1	75	0.2	1	42	0.3	7	852	0.6
10, 11—11b	Indeterminate	946	11,593	10.8	944	9,932	30.7	4,629	4,284	33.9	6,519	25,809	16.9
	Total	1,356	107,458	100.03	1115	32,349	100.1	4,668	12,638	100	7,139	152,445	100.14

Table 7: Phases 10—11b: spatial and chronological distribution by form

Phases present	Form	No	Wt (g)	% wt A	No	Wt (g)	% wt B	No	Wt (g)	% wt C	No	Wt (g)	% wt

	Area A			*Area B*			*Area C*			*Total*		
Antefix	0	0	0	1	20	0.02	0	0	0	1	20	0.01
Imbrex	156	15,474	19.3	182	12,384	14.1	171	13,274	17.7	509	41,132	16.9
Tegula	166	30,757	38.3	230	30,518	34.8	167	23,852	31.7	563	85,127	35
Vaulting tube (*tubi fittili)*	3	36	0.04	4	82	0.09	3	36	0.05	10	154	0.1
Box tile (*tubulus*)	14	1,713	2.1	12	985	1.1	17	1,583	2.1	43	4,281	1.8
Facing tile (*parietalis*)	0	0	0	1	1,131	1.3	0	0	0	1	1,131	0.5
Brick	46	14,572	18.1	69	16,772	19.1	39	10,703	14.2	154	42,047	17.3
Herringbone-floor brick	2	406	0.5	3	353	0.4	2	155	0.2	7	914	0.4
Finial/Chimney	6	796	1	1	72	0.08	1	122	0.2	8	990	0.4
Disc/Stopper	0	0	0	2	41	0.05	0	0	0	2	41	0.02
Portable oven	0	0	0	3	184	0.2	8	1,077	1.4	11	1,261	0.5
Indeterminate	1,936	16,546	20.6	2036	25,117	28.7	1,800	24,364	32.4	5772	66,027	27.2
Total	**2,329**	**80,300**	**99.94**	**2544**	**87,659**	**99.94**	**2,208**	**75,166**	**99.95**	**7081**	**243,125**	**100.13**

Table 8: Phases 12—21: spatial distribution by form

Form	No frags	Wt (g)	% wt A	No frags	Wt (g)	% wt B	No frags	Wt (g)	% wt C	No frags	Wt (g)	% wt All

Decoration

A small number of tiles (0.5 % by fragment count of the total assemblage) bear traces of coloured slip, generally on their upper surfaces, sometimes including the top and inner edges of *tegula* flanges and, more rarely, on their undersides. Most (41.7 %) are from Area A, with 30.7 % from Area C and 27.6 % from Area B. This is sometimes red (15 %) but is usually cream (85 %) in colour. Forms comprise roof tiles — *tegulae*, *imbrice*s and antefixes — as well as bricks and indeterminate forms (probably roof tile fragments). More *imbrices* (53.5 %) are decorated in this way than any other form, followed by *tegulae* (26 %), indeterminate forms (14.2 %), bricks (4.7 %) and antefixes (1.6 %). Swan has noted that the contrasting colours thus produced would have been most effective on structures with extensive roof spans and so may have been reserved for large, probably public, buildings such as *thermae* (2008, 68). Warry has also noted that tiles coloured in this way seem to be mainly associated with later sites (2006*a*, 17). It is notable that the Roman phases produced tiles decorated exclusively with cream slip. 34.6 % of the decorated tiles recovered from Phases 10—11b were painted with red slip. Just 13.3 % of the decorated tiles from post-Roman Phases 12—21 were coated with red slip. A single piece of *imbrex* may have been deliberately reduced to produce a grey-coloured tile.

Stepdowns

A small number of *tegulae* (1.1 % by fragment count and 2.4 % by weight of the *tegulae* assemblage) have a sanded stepdown band, a feature of military production, which occurs on approximately 57 % of Chester/Holt/Tarbock *tegulae*, but which is not part of the process for forming the upper cutaway, as has sometimes been suggested (Warry 2006*a*, 14). Examples occur in all three Areas and all are from post-Roman contexts, including two from Phase 10: A (852) and C (3092). The stepdown lengths are complete on just two examples: L: 40 mm from B (2136) and L: 65 mm from B (2353). Unfortunately, none can be related to any of the Warry *tegulae* groups.

Markings

A small proportion (0.7 % by fragment count of the site total) of the assemblage is marked. This comprises 153 signatures, nine legionary stamps, five impressions and four inscriptions.

Using probability theory, Warry has estimated that for every 1,000 fragments of roof tile recovered, there is a 40 % chance of finding one or more stamps and a 60 % chance of finding none. For example, at Prestatyn, ten stamped *tegulae* were recovered from 2,531 fragments of roof tile (39.5 %) (2010, 144). The amphitheatre assemblage largely conforms to this theory, although legionary stamps were found on brick and indeterminate fragments as well as on *tegulae*. Nine were recovered from 2,254 fragments of roof tile and brick (39.9 %). If identifiable roof tile alone is considered (1,961 fragments), the figure rises to 45.9 %, although it should be noted that this figure excludes a number of indeterminate fragments which are also likely to be roof tile.

Of the nine stamps, only two are datable. Both are known to occur only on group A/B *tegulae* and are therefore *c* AD 90/100—-140 in date. They comprise a partial Holt 7 (RIB 2463.36) stamp, SF 9823, from (3019), a post-Roman [Phase 16] context in Area C (Cat no 23), and a partial Chester 83 (RIB 2463.38) stamp, SF 8039, from (2294), a post-Roman [also Phase 16] context in Area B (Cat no 18).

A possible textile impression on an indeterminate fragment, SF 9618, was recovered from post-Roman context (3068) [Phase 13] in Area C (Cat no 27). This piece — possibly an *imbrex* — also bears a single curved signature. Another possible textile impression, SF 9796, on the plain unsanded surface of a scored box tile or facing tile, came from post-Roman [Phase 18] context (2114) in Area B (Cat no 16). These are perhaps the impressions of the tile-makers' clothing or of cloths used during production, and were presumably left accidentally. The corner of a *tegula* with the impression of a round-sectioned object (Diam: 5 mm) in the top rear of the flange, SF 9774, was recovered from post-Roman [Phase 12] context (505) in Area A. There are also two tiles with hobnail impressions, comprising an indeterminate fragment from Area B (SF 9833, post-Roman context (2388) [Phase 15]) (Cat no 21) and an *imbrex* from Area C (SF 9603), post-Roman context (3047) [also Phase 15]) (Cat no 25). The latter piece also bears a signature across the top of the gable. Warry has noted that approximately 10% of military *tegulae* have boot marks (they are rare on civilian tiles), which were probably made by the officer in charge of the kilns testing the hardness of the tiles prior to firing (2006*a*, 16).

Four antefixes with partial moulded inscriptions were recovered, three from Area A and one from Area B. Two were recovered from Phase 7 contexts in Area A, comprising SF 9562 from (672), a probable Holt type 2 form (RIB 2458.2) with partial surviving letters 'E' and 'G' and traces of white slip on the upper surface (Cat no 4); and a probable Holt type 1 form (RIB: 2458.3), SF 9582, from (1056) (Cat no 3). It bears part of a *phalera* and spear. The example from Area A, Phase 10 context, (852), SF 9787, is from either a Holt type 1 (RIB: 2458.3) or 2 (RIB: 2458.2) (Cat no 5). The surviving fragment bears the partial inscription 'GX'. The example from Phase 11b Area B (2561), SF 8671, is also either a Holt type 1 or 2. It bears the surviving battered fragment of a boar's head and the partial inscription of the inner lower stem of the final letter 'X' (Cat no 12).

Of the 153 signatures recorded, the majority are on *tegulae* (x 63) with 33 on *imbrices*, nine on bricks and 48 on indeterminate forms. Most of the latter are likely to be fragments of *tegulae*. These figures correspond with the frequency of occurrences noted by Brodribb (1987, 99—105), in that signatures were found to be most common on *tegulae*, relatively common on *imbrices* and less frequent on bricks. The majority of signatures on *tegulae*, bricks and indeterminate forms are curved marks made with one (x 29) or more fingers, generally two (x 23) but sometimes three (x 4) or more rarely four (x 1) fingers. Semi-circular signatures account for approximately 60 % of all signatures found on *tegulae*, with a slightly wider range of signature types on roof tiles produced by the military (Warry 2006*a*, 15). Straight signatures are also fairly common: 15 were made with a single finger and three with two fingers. There are fewer examples of looped signatures (x 4 single looped; x 1 triple looped) and only one S-shaped mark, made with two fingers. There are 12 examples of more unusual multiple, over-lapping signatures, generally made with a combination of curved and straight finger marks. There is also a group of signatures (x 27) that are so fragmentary it is

unclear what form they take. The signatures on *imbrices* comprise 18 parallel to an edge with 14 across the top of the gable. One unusual signature, SF 9605, on an *imbrex* from Area C, context, (3059) [Phase 15], may have been made with a stick or three-toothed comb.

Summary

It is difficult to draw comparisons with other amphitheatres in Britain, as ceramic building material assemblages from these sites have rarely been published in detail. Those summaries that do exist give little or no hint of the quantities involved or the range and variety of forms recovered. In his summary of the assemblage from London, Betts merely states that a 'large quantity of ceramic and stone building material was recovered', although he does list the forms retrieved and notes that the assemblage was principally composed of brick and roofing tile, with a much smaller quantity of facing tile, hollow voussoirs (including 'armchair' voussoirs), box tiles and other forms. The latter included *tesserae,* a fragment of water pipe and an odd-shaped tile. *Lydion* bricks were used in horizontal bonding-courses in the masonry walls of the amphitheatre but most of the other forms probably came from buildings that surrounded the monument (Betts 2008, 164—9). Large amounts of roofing tile and brick were incorporated into the arena make-up dumps and entranceway surface deposits, along with smaller amounts of other building material, including mortar, gravel and stone. The inclusion of these various materials may have been deliberate, in order to provide a firm bedding for the surfaces (Bateman, Cowan and Wroe-Brown 2008, 60 and 104). Inverted *imbrices* were also used to create a feeder drain for the arena perimeter drain (*ibid*, 66 fig 64). The published account of the excavations at Caerleon amphitheatre contains only a catalogue of the legionary stamps, although the forms on which the stamps occur are generally not described, apart from a few *in situ* examples, which are said to be on bricks (Miller 1928, 159—61 and plate XXXI). At Silchester, 287.8 kg of ceramic building material was recovered from Roman contexts, with the largest quantity retrieved from the early 3rd century stone phase of the monument. Here, ceramic building material was imported with other material to raise the height of the arena surface and to form and line drains through the arena wall and at the south entrance. Some may also have been laid deliberately to provide a hard surface during the building of the arena wall. The use of brick as a bonding course in masonry walls at Silchester seems to have fallen out of favour by the 3rd century, when it was replaced by decorative string-courses of brown ironstone, as seen in both the arena wall and the late 3rd century town wall (Fulford 1989, 37 and 48—9). Forms from Roman phases are recorded by the number of fragments recovered and comprise *tegulae* (x 20), *imbrices* (x 8), *tegulae mammatae* (x 3) 'flat tiles' (x 340) and a single *tessera* (Fulford and Timby 1989, 143 Table V). The 'flat tiles', which form the majority of the assemblage, range in thickness from 38-60 mm and so clearly include a range of brick types. Other forms noted comprise box tiles (including combed forms) and a fragment of tile 'shaped into a rough disc'. These were presumably all recovered from post-Roman contexts. Their quantities are not stated, neither is the amount of indeterminate material that must have been retrieved (Fulford and Timby 1989, 142—6 and plates XXIIIB, XXIVA and B).

Unlike London, Caerleon and Silchester, there is no direct evidence that ceramic building material was used in the construction of the amphitheatre at Chester. The potential of the material to supply information about the structure of the building itself is therefore limited.

However, it was used ___ alongside dumps of other material — as make-up for the seating bank and also as levelling for various road surfaces. Some was deposited in pits along with other rubbish. It may also have been used as flooring in some of the temporary structures built outside the amphitheatre and some of the ancillary buildings may also have had tiled roofs, eg the stone phase of the shrine with its painted plaster walls. Some of the forms, especially the portable oven fragments, may have derived from activities associated with the amphitheatre.

The Twentieth Legion inscribed antefixes presumably adorned the more important or prestigious military buildings and so are perhaps more likely to have originated in the fortress rather than the *canabae*. The roof tiles probably came from a combination of the two.

The fragments of finial/chimney are of interest, as their exact function is unknown. There is no clear evidence that they were used on roofs, although they may have functioned as ventilators or finials. They may also have served as covers for lamps or for burning aromatics. They are found all over Britain, mainly on civilian sites, although some have come from temple sites. They represent objects of more than one type and so cannot be given a single interpretation (Ward 1999, 26—7 and 30). Lowther identified two main groups. His group A are thin-walled, wheel-made vessels in a 'pottery' fabric, which were probably not intended for external use. The examples from temple sites may have served a 'ritual' function. His group B, which may have functioned as ventilators or ornamental roof finials, were generally made in a 'tile' fabric and were probably intended for external use (Lowther 1976). They are associated with hypocausts at York and it is interesting that examples from Chester were recovered from the site of the fortress *thermae* in 1963/4 (*see above*) and also from the site of the Elliptical Building, which had an associated bath house, although this was not excavated at the time (Newstead and Droop 1939, 26—7 and fig 4.7). There is no direct evidence that any of the finial/chimney fragments were associated with the shrine, which was situated just to the west of the north entrance, outside the outer wall of Amphitheatre 1b, although this remains a possibility.

It has been possible to assign dates to some of the forms recovered and this has provided additional chronological evidence for the various phases of construction and rebuilding. Much of the assemblage presumably derived from demolished buildings surrounding the amphitheatre in both the fortress and the nearby *canabae*. Building debris from the fortress probably includes the fragments of *tubi fittili* used in the construction of the high-vaulted rooms of the legionary baths. These are thought to date to the reconstruction of the fortress and its buildings in the second quarter of the 3rd century AD, although they may belong to the original Flavian construction (Mason *et al* 2005, 38—9). Similarly, small floor bricks laid in a herringbone pattern are known to have been used as internal paving in the original Flavian construction of the fortress *thermae* (*ibid*, 15). The corner fragment of a lugged and tapered brick, recovered from a Phase 10 context, (3085), in Area C (Cat no 10), is comparable to the lugged bricks from the Caerleon fortress baths (Zienkiewicz 1986, 325 and 326, fig 1). Similar examples were also recovered during excavations in 2001 at 25 Bridge Street, Chester (Jones 2008, 136 and Ill 4.1.5). The handful of *cuneati* from the site (which include two from Roman phases 7 and 9, as well as examples from Phases 10d and 11b) may well have been used in earlier periods of vaulting at the baths. On the other hand,

it is possible that arched or vaulted brickwork may have been used in some of the construction phases of the amphitheatre, although there is no evidence that this was the case.

ANALYSIS OF ROMAN PLASTER

Introduction

Methodology

The plaster was analysed in terms of quantity, range and variety, condition, provenance and date-range. All fragments were examined microscopically at x 20 magnification (many 'white' plaster fragments actually bore small surviving patches of painted decoration or faint washes/traces of colour, which were not clear when examined macroscopically). Despite this, it is still possible that many of the fragments described as 'white' originally bore painted decoration, which has subsequently worn off.

The assemblage was quantified by fragment count and weight (in grammes) and measurements (in mm) were taken of any complete dimensions. Due to the fragmentary nature of the assemblage, it was decided not to measure the area covered (Ling 1989, 88). The thickness of the fine plaster layer (or *intonaco*), and the mortar backing (or *arriccio*) were recorded, as were part, colour/decoration and condition. Small find numbers were assigned to fragments exhibiting clear decorative schemes/motifs, and atypical or unusual features and forms.

Terminology for the thickness of painted lines and areas is derived from Davey & Ling (1982, 81), in which a 'stripe' is 5—20 mm wide, a 'line' is narrower than a 'stripe', a band is 20—200 mm wide and a 'zone' is wider than a 'band'.

In describing the plaster, the following definitions have been used

Arriccio: a thick undercoat or levelling coat of lime mortar; contains filler (usually sand) – to prevent cracking of thickly applied material, and often an aggregate (e.g. river gravel); the thicker the mortar, the coarser the filler (eg pebbles); sand was used for layers of less than a few centimetres; fibrous organic material (eg hay, grass, straw) was sometimes added as a filler to provide strength and binding properties (Davey & Ling 1982, 54; Ling 1989, 88).

Intonaco: the finishing plaster; a surface layer of fine, usually white, lime plaster, to which any painted decoration was applied (Davey & Ling 1982, 55).

The report comprises a description of the assemblage, organised by phase, followed by a discussion of the nature and character of the assemblage. The catalogues are ordered by phase and are numbered consecutively.

Quantity

The site produced a total assemblage of 540 fragments of Roman plaster weighing 4,752 g, with an average fragment weight of 8.8 g (*see Table 9*). 83.1 % by weight of the assemblage was hand-collected, 16.9 % came from sample residues. Area A produced the largest assemblage by both fragment count (75.2 %) and weight (61.4 %) of the total. The remaining 24.8 % by count and 38.6 % by weight came from Area B. None was recovered from Area C and none was found unstratified.

Area	No frags	% no	Wt (g)	% wt	Av frag wt (g)
A	406	75.2	2,919	61.4	7.2
B	134	24.8	1,833	38.6	13.7
C	0	0	0	0	0
Total	540	100	4,752	100	8.8

Table 9: Roman plaster by quantity and Area

Roman phases produced 441 fragments of plaster with a weight of 2,420 g (81.7 % by fragment count and 50.9 % by weight of the total assemblage), with an average fragment weight of 5.5 g. Post-Roman phases produced 18.3 % by fragment count (99 fragments) and 49.1 % by weight (2,332 g) of the total, with an average fragment weight of 23.6 g, ie the plaster recovered from Roman phases is more broken than that from post-Roman contexts. A comparison of the average fragment weights of the hand-collected plaster from Roman (7.0 g) and post-Roman (40.4 g) contexts reinforces this observation. Perhaps unsurprisingly, the average fragment weight of plaster recovered from sample residues is closely similar (Roman contexts: 3.4 g; post-Roman contexts: 3.3 g).

In terms of weight, a much higher proportion of the assemblage (61.4 %) was retrieved from Area A. The plaster from Area A (with an average fragment weight of 7.2 g) is clearly more broken than that from Area B (which has an average fragment weight of 13.7 g). When a comparison is made of the average fragment weights of hand-collected plaster (Area A: 10.8 g; Area B: 18.7 g) with that retrieved from samples (Area A: 2.9 g; Area B: 5.3 g), it is still clear that the plaster from Area A is more broken than that from Area B.

81.6 % by weight of the Area A assemblage was hand-collected, 18.4 % by weight came from sample residues. In Area B, 85.5 % of the assemblage was hand-collected, 14.5 % was recovered from samples.

In terms of both count and weight, most of the Roman phased assemblage (84.4 % by fragment count and 81.8 % by weight) came from Area A, with 15.6 % by count and 18.2 % by weight from Area B. The plaster from Area A (average fragment weight: 5.3 g) is slightly more broken than that from Area B (average fragment weight: 6.4 g). In Area A, 75.1 % by weight of the assemblage from Roman phases was hand-collected, 24.9 % by weight came from sample residues. In Area B, 63.3 % by weight was hand-collected, 36.7 % by weight was recovered from samples.

In terms of both count and weight, most of the Roman plaster which occurred residually came from Area B (65.7 % by fragment count and 59.7 % by weight of the post-Roman assemblage), with 34.3 % by count and 40.3 % by weight from Area A. The material from Area B (average fragment weight: 21.4 g) is slightly more broken than that from Area A (average fragment weight: 27.6 g). In Area A, 95.1 % by weight of the residual assemblage was hand-collected, just 4.9 % by weight was recovered from sample residues. In Area B, 92.6 % by weight was hand-collected and just 7.4 % by weight came from samples.

Range and variety

Few diagnostic features were recovered; the plaster comprises mainly middle fragments (413/4,085 g) with just 10/252 g possible edge or corner pieces. The remaining 117/415 g comprises indeterminate fragments of mortar, most of which are probably *arriccio* fragments from wall or ceiling plaster.

Most of the fragments have clear brush marks in the plaster surface, sometimes also in the paint surface. Most are roughly parallel and are probably vertical strokes, generally seen in fragments of wall plaster. There are a few pieces (51 fragments/459 g) with multi-directional brush marks, which are more commonly seen in ceiling plaster. All (9.4 % by count and 9.7 % by weight of the total assemblage) were recovered from Area A. Most (47 fragments/345 g) were retrieved from (753), demolition deposit of the Phase 7 shrine. A single piece/75 g came from Phase 5 cess-pit fill (1202). Two fragments/3 g were recovered from Phase 11b robber-trench backfill (618), and a final piece/36 g, was recovered from post-Roman [Phase 12] context (436).

A small number of fragments (5.6 % by count and 23.7 % by weight of the total assemblage), provide evidence of re-decoration, although none bears more than two layers of painted plaster. Some fragments have an intervening layer of mortar (*arriccio*) between the two coats of fine plaster (*intonaco*); in others, a second *intonaco* layer has been laid directly over the first. Twenty-two fragments/116 g were recovered from Area A, Phase 7; a single piece/14 g from Area B Phase 10; two fragments/58 g from Area A Phase 11b; and five fragments/9855 g from Area B, post-Roman Phase 12.

There are very few fragments with hydraulic, *opus signinum*-type, mortar (*arriccio*); most have a lime-mortar backing with sand, pieces of lime, voids, coal, impressions of hay/straw and rare inclusions of other materials (eg a tiny fragment of painted wall plaster, a tiny sherd/chip of samian ware and pieces of crystalline calcite). A small proportion of fragments still retain surviving pieces of hay/straw.

Most fragments of plaster have an *intonaco* layer with very few inclusions (eg rare sand grains). However, 43 fragments/1,028 g (8.0 % by count/21.8 % by weight of the total assemblage) contain moderate to abundant inclusions of crystalline calcite. Crystalline calcite added to the *intonaco* layer has previously been noted in painted wall plaster recovered from buildings in the western *canabae* (Heke 2012b, 106; Carrington & Heke with Roberts 2012, 167). There are also rare examples (5.0 % by count and 21.1 % by

weight of the total assemblage) with a polished surface. These forms of decoration sometimes appear in combination.

Colour range

A range of colours was used to decorate the plaster, although many appear patchy and abraded. Together with the small size of the fragments, this has made it difficult to distinguish any definite patterns or designs. Most colours occur on their own, appearing in combination with other colours on just 23 fragments/250 g (4.3 % by count and 5.3 % by weight of the total assemblage) (*Table 10*).

In terms of weight, shades of yellow (23.0 % by weight) are the most common colour, followed by shades of grey to black (6.8 % by weight) and shades of red (4.3 % by weight). Plain white fragments make up 8.6 % by weight of the assemblage. Indeterminate fragments (*arriccio* only) comprise 28.2 % by weight of the total.

The most popular colours in combination are shades of yellow and grey/black (3.7 % by weight of the total assemblage). Three adjoining fragments/45 g, combining red, pink and blue-green comprise 0.9 % by weight of the total, with yellow and red in combination just 0.02 %. Blue-green on its own also comprises just 0.02 % by weight of the total assemblage.

Condition

The assemblage is of mixed condition, ranging from fresh to very abraded, although most fragments (54.5 % by weight of the total are abraded. As with the Roman ceramic building material, this mix occurs both across the site and within contexts, suggesting an assemblage formed in a similar way, from fragments buried soon after disposal, alongside material exposed to surface movement and weathering prior to burial.

There are differences in condition between the trenches. Area B produced proportionally more abraded material (a difference of 10 %) than Area A. The assemblage from Area A is much fresher (a difference of 17 %), than that from Area B. The assemblage from Roman phases in Area A is more abraded than that from Area B and Area B produced a higher proportion of fresh material (a difference of 10 %). In contrast, Roman plaster from post-Roman contexts is much more abraded from Area B. A small proportion of plaster from post-Roman contexts in Area A is fresh in condition, compared to none from Area B.

There is no definite evidence of re-use on any of the plaster fragments (eg as aggregate for cement mix), although a middle fragment from (625) [Phase 5], has a patch of sandy mortar attached to the fine plaster surface, which may indicate re-use rather than re-decoration.

Provenance

The main pigments available in Roman Britain (eg red and yellow ochre, green earth, chalk-based white, black from soot or charcoal and blue from blue frit) could all have been obtained from local sources and so were relatively inexpensive (Ling 1985, 54-5). Energy Dispersive X-ray Fluorescence (ED XRF) analysis, carried out by David Dungworth, on

three fragments of painted plaster from (738) and (753), collapse deposits associated with the Phase 7 shrine, revealed that the red and yellow were probably formed using iron compounds (red and yellow ochre). The grey was uncertain; although soot was probably used, this cannot be detected using ED XRF.

Apart from the pigments used for the paints, the sources of the raw materials used in the production of the painted plaster would have been identical to those employed in the production of the various concretes and mortars used for building work at the site. Water was readily available, as were the aggregates and fillers used in the *arriccio* layers. River gravels, sand and crushed ceramic building material were easily obtainable in the local area. The presence of local red sand in the mortar backing is attested by the fact that the sandier the mortar, the pinker it appears to be.

There is no evidence for limestone-burning in Chester in the Roman period, suggesting that it probably took place close to the source of the stone. It would also have been easier and cheaper to transport the resultant quicklime or lime than the heavy, bulky raw stone. However, a reasonable quantity of limestone has been recovered from the site, suggesting that some of it may indeed have been transported in its raw state. The nearest, easily-exploitable sources of limestone in the region in the Roman period were Halkyn Mountain and the Llanfynydd/Ffrith area, 15—20 km distant from Chester respectively (Mason *et al* 2005, 51). It is possible that the quicklime or lime may have been transported to the fortress by sea, along with the lead ingots which were produced in Flintshire from *c* AD 74 onwards (Mason 2002, 93).

Date range

Most of the plaster probably derives from simple, two-dimensional, panel schemes, the most common form of decoration in Roman Britain, which occurs at all periods. It is also the only type of wall painting so far known in Britain before the mid-second century (Ling 1985, 21—2).

Some fragments indicate periods of re-design, but it is not possible to tell when, or how soon after the initial decoration, this occurred. Of these, 19 fragments/71 g were recovered from Roman phases, all from Phase 7 in Area A. All but 1 fragment/2 g, which came from (717), were recovered from (753), a thin layer of collapsed wall plaster associated with the shrine (754). These fragments indicate that the shrine was in position long enough to have undergone at least one phase of re-decoration.

	A (Roman)		B (Roman)		A (PR)		B (PR)		Total	
Description	*No*	*wt (g)*	*No*	*Wt(g)*	*No*	*Wt(g)*	*No*	*Wt(g)*	*No*	*Wt(g)*
Yellow	42	315	13	191	10	145	3	11	68	662
Pale yellow	18	61	5	18	5	65	5	102	33	246
Cream-yellow	20	136	8	36	1	10	1	3	30	185
Red	53	143	0	0	2	60	0	0	55	203
Grey	44	170	3	11	0	0	4	42	51	223
Pale grey	0	0	21	71	1	2	3	25	25	98
Black	0	0	3	4	0	0	0	0	3	4
Blue-green	1	1	0	0	0	0	0	0	1	1
Plain white	45	214	4	9	10	187	1	1	60	411
Yellow + grey	9	83	5	79	0	0	2	14	16	176
Yellow + red	1	1	0	0	0	0	0	0	1	1
Red + pink + blue-green	3	45	0	0	0	0	0	0	3	45
Black + yellow	0	0	2	6	0	0	1	22	3	28
Indet (*arriccio* only)	118	744	5	16	2	408	39	173	164	1,341
Total	**354**	**1,913**	**69**	**441**	**31**	**877**	**59**	**393**	**513**	**3,624**
*Redecorated frags**	*19*	*71*	*0*	*0*	*2*	*58*	*6*	*999*	***27***	***1,128***
Total									**540**	**4,752**

* Table excludes fragments with two or more layers of plaster/decoration (27/1,128 g).

Table 10: Colour range of Roman plaster by quantity and Area

Description

50.9 % by weight of the assemblage was recovered from five Roman phases, with most (28.4 % by weight of the total assemblage) coming from Phase 7. The remaining 49.1 % by weight occurred residually. None was found unstratified (*see Table 11*).

Period 2: Roman occupation before the amphitheatre

Phase 3

This phase produced just six fragments/13 g of plaster (0.5 % by weight of the Roman phased assemblage), with an average fragment weight of 2.2 g. All were recovered from Area A (1086), a widespread deposit of red sand. The fragments do not adjoin but are probably from the same scheme. They are painted in red, fading to pink, patchy in parts but otherwise fairly fresh in condition. The gradual colour change appears to be deliberate (ie by the addition of white to lighten the colour), rather then the result of weathering and bleaching. There is a thick *intonaco* layer with occasional inclusions of crystalline calcite. This was added to produce a hard, shiny surface and is indicative of high quality work.

Period 3: The first Roman amphitheatre

Phase 5: Deposits outside Amphitheatre 1a associated with its use

Phase 5 produced the second largest group of plaster from the Roman phased assemblage, comprising 52 fragments/614 g of plaster (25.4 % by weight of the Roman phased assemblage), with an average fragment weight of 11.8 g. All were retrieved from the south-west area in Area A.

South west area

Roman plaster was recovered from rubbish fills (1202) and (1216) of ?cess pit (1256). (1202) yielded six fragments/87 g. One is painted blue/green (the green is dominant), two have patchy yellow painted surfaces and the remainder are plain white. One fragment/75 g has multi-directional brush marks in the plaster surface (sometimes indicative of ceiling plaster) and traces of polishing. Another has abundant inclusions of crystalline calcite in a thick *intonaco* layer. Both of these features are regularly seen in high-quality work. (1216) produced three fragments/333 g. Two have patchy yellow painted surfaces, one of which has inclusions of crystalline calcite in the *intonaco* layer, as does another fragment with a missing painted surface. (1152), a layer of red sand formed over the back-filled pit (1256), produced two fragments/2 g, one of plain white plaster; the other with patchy cream/yellow paint. The latter has added inclusions of crystalline calcite in the *intonaco* layer. (1073), a possible floor surface for a small stall, yielded two tiny pieces/2 g of painted plaster, comprising one with a fine, hard, red painted surface and abundant crystalline calcite in the *intonaco* layer; the other with a patchy yellow painted surface. (625), the final layer associated with the use of Amphitheatre 1a, produced 39 fragments/190 g, including three small,

red-painted fragments/3 g, of *intonaco* only, with added inclusions of crystalline calcite, as well as six yellow painted fragments/61 g and one fragment/32 g with missing upper surface. The latter also has added inclusions of crystalline calcite in the *intonaco* layer. Five of these pieces (one red and two yellow) also have polished surfaces. The red painted fragment appears to have been painted in true fresco style, as the paint is bonded to the *intonaco* layer. This is also a feature of high quality work. Nine fragments/4 g are of mortar (*arriccio*?) only, including a single piece of hydraulic (*opus signinum*-type) mortar. Fifteen fragments/17 g of plain white plaster were also recovered and all have two layers of mortar, the upper layer being finer in texture (less sandy) than the lower layer. Four additional pieces/141 g of painted plaster also have two layers of mortar, of which two fragments have sandy mortar layers of similar texture and two others have a lower layer of *opus signinum*-type mortar with an upper layer of sandy mortar.

Roman plaster from this phase was recovered from a limited range of features and deposits in one specific area, including pit fills, layers and a possible floor surface.

Phase 6: Amphitheatre 1b: Structural alterations

Phase 6 produced 71 fragments/443 g of plaster (18.3 % by weight of the Roman phased assemblage). Two small fragments/2 g were recovered from Area A; the remainder (69 fragments/441 g) came from Area B. The average fragment weight from Area A is just 1 g; that from Area B is 6.4 g. Phase 6 is the only Roman phase represented in Area B.

Area A

Deposits placed around the timber framework

(319), fill of sand and decayed sandstone derived from the arena and laid around the base-plates and uprights, produced a single fragment/1 g decorated with patchy yellow paint. (886), a layer of re-deposited turf which separated elements of the red sand (319), produced a single fragment/1 g of *arriccio*, composed of hydraulic (*opus signinum*-type) mortar.

Key to Phases

3: Roman occupation before the amphitheatre
4: Construction of Amphitheatre 1a
5: Deposits outside Amphitheatre 1a associated with its use
6: Amphitheatre 1b: structural alterations
7: Deposits outside Amphitheatre 1b associated with its use
8: Amphitheatre 2 construction
9: Amphitheatre 2 use
10: Amphitheatre 2 change of use
11a: Robbing of internal walls
11b: Robbing of external walls
12–21: Other post-Roman phases

	Area A				*Area B*				*Total*			
Phase	No	% A	Wt (g)	% A	No	% B	Wt (g)	% B	No	% Total	Wt (g)	% Total
3	6	1.5	13	0.4	0	0	0	0	6	1.1*	13	0.3*
5	52	12.8	614	21	0	0	0	0	52	9.6*	614	12.9*
6	2	0.5	2	0.1	69	51.5	441	24.1	71	13.1*	443	9.3*
7	311	76.6	1,349	46.2	0	0	0	0	311	57.6*	1,349	28.4*
8	1	0.2	1	0.03	0	0	0	0	1	0.2*	1	0.02*
Total	**372**	**91.6**	**1,979**	**67.8**	**69**	**51.5**	**441**	**24.1**	**441**	**81.7***	**2,420**	**50.9***
10	1	0.2	5	0.2	2	1.5	16	0.9	3	0.6*	21	0.4*
11a	15	3.4	183	6.3	0	0	0	0	15	2.8*	183	3.9*
11b	11	2.7	630	21.6	2	1.5	34	1.9	13	2.2*	664	14.0*
Total	**27**	**6.7**	**818**	**28**	**4**	**3**	**50**	**2.7**	**31**	**5.7***	**868**	**18.3***
12 - 21	7	1.7	122	4.2	61	45.5	1,342	73.2	68	12.6*	1,464	30.8*
Total	**406**	**75.2***	**2,919**	**61.4***	**134**	**24.8***	**1,833**	**38.6***	**540**	**100***	**4,752**	**100***

* % of total assemblage

Table 11: Roman plaster by quantity, Area and Phase

Area B

Seating bank deposits

Apart from two fragments/10 g, assigned to group number (2612), the remaining plaster came from the lower/earlier seating bank deposits in Area B: (2450), (2461), (2513) and (2543). They comprise a sequence of sterile, coarse sands and artefact-rich dumps, the latter including (2461) and (2543), which were excavated in two blocks.

The earliest deposit in the first group, (2513) produced just four fragments/16 g, all from samples, one of plain white plaster, the other three decorated with patchy yellow paint.

The second block of deposits produced the following sequence:

(2543), another artefact-rich dump of material, produced the largest group from these deposits (32 fragments/180 g), also all from samples. Colours in combination comprise pale yellow and grey (three fragments/39 g) with patchy, indistinct coverage and scheme of decoration, and one fragment/3 g with a black edge on a white ground. Colours on their own comprise yellow, pale yellow, cream-yellow, pale grey and plain white. Seven fragments/71 g, all in shades of yellow, contain crystalline calcite in the *intonaco* layer. Two fragments/43 g also have polished surfaces. A single fragment/3 g, pale grey in colour, has two layers of mortar, the lower being sandier and coarser than the upper layer. A single fragment/14 g decorated with cream/yellow paint with a darker yellow patch, also has traces of fine plaster attached to the underside of the *arriccio* layer, indicating at least two phases of decoration.

(2461), a dump rich in artefacts, produced 14 fragments/88 g, all from samples. They include an edge fragment of fine plaster only, decorated with an indistinct design in yellow and grey/black paint. Another fragment/2 g has the same colours in combination in a similar indistinct scheme. Other colours appearing on their own comprise cream/yellow (two fragments/13 g, with two layers of mortar, both very sandy), grey, pale grey (three adjoining fragments with two layers of mortar, both very coarse and sandy), black and plain white plaster. The latter (one fragment/1 g) has a polished surface, indicating high-quality work. There is also a fragment of ?*arriccio* with no surviving *intonaco* layer.

(2450) produced 17 fragments/47 g, all hand-collected. Two fragments/6 g are decorated with a black or dark grey stripe/band/zone adjacent to a patchy, pale yellow, stripe/band/zone. These two fragments also have two layers of mortar, the lower layer being coarser and sandier then the upper one. The remaining fragments provide evidence of two phases of decoration, with two layers of fine plaster separated by a layer of mortar. Decoration, in the form of a band/zone of pale grey paint, is only visible on the upper layer of *intonaco*. There are two layers of *arriccio* below the first layer of fine plaster and the lower layer is coarser and sandier than the upper layer.

Both the fragments assigned to group number (2612) have a thick *intonaco* layer containing crystalline calcite. The larger fragment (106 g) also has a polished surface decorated with patchy yellow paint. The presence of crystalline calcite in the *intonaco* layer indicates fine quality work.

Much of the plaster from Area B probably would have arrived at the site, along with other demolition debris, old broken pottery and other rubbish, to be used as hardcore for building up the *cavea*.

Phase 7: Deposits outside Amphitheatre 1b associated with its use

Phase 7 produced the largest assemblage of plaster from the Roman phases, comprising 311 fragments/1,349 g (70.5 % by fragment count and 55.7 % by weight of the Roman phased assemblage), with an average fragment weight of 4.3 g.

Road surface (1012) produced three fragments/6 g, all hand-collected. Two fragments of *intonaco* only, one with a patchy, pale yellow, painted surface, contains abundant inclusions of crystalline calcite (indicative of high-quality work). The painted surface is missing from the second fragment. The third fragment has a plain white plaster surface.

South and west of the *vomitorium*

(838), a spread of sand which sealed features associated with a timber structure, produced just three fragments/3 g, two of plain white plaster, the other an *arriccio* fragment only.

(556), a widespread deposit of fine laminated sands, yielded a single tiny fragment/1 g with a patchy yellow painted surface. (798), a widespread dump of sand against the outer wall of the amphitheatre, produced 22 fragments/34 g, mainly comprising *arriccio* fragments, but also including five fragments/8 g of plain white plaster.

A possible occupation surface, (796), produced a single fragment/1 g, which lacks a surface but has inclusions of crystalline calcite in the *intonaco* layer. The *arriccio* layer is of *opus signinum*-type mortar. (707), a small fragment of cobbled surface north of the external stair, yielded five fragments/5 g, all painted in shades of yellow and one with a ?polished surface.

(555), a layer of sand which sealed all the deposits outside the wall of Amphitheatre 1b, produced four fragments/47 g with yellow painted surfaces.

(717), a small patch of yellow sand, produced three fragments/11 g. One fragment has two layers of fine plaster, the second placed straight on top of the first, with no intervening layer of mortar. The thin upper layer is plain white; the thick lower layer has a polished, yellow-painted surface and contains abundant inclusions of crystalline calcite. The earlier phase of decoration is clearly of much higher quality than the later phase. The remaining fragments, of *arriccio* only, are very abraded and sandy.

North and east of the *vomitorium*

Dump deposits and temporary structures

Sand deposit (673) yielded eight fragments/50 g. Three are decorated with patchy yellow paint and two of these have inclusions of crystalline calcite in the *intonaco* layer, as do two other pieces with abraded (missing) surfaces. One fragment has two *arriccio* layers, both of *opus signinum*-type mortar.

Sand deposit (129) produced a single fragment/5 g with patchy yellow paint and inclusions of crystalline calcite in the *intonaco* layer. Sand deposit (135) produced 11 tiny fragments weighing just 2 g, comprising two pieces with hard, shiny, polished, red-painted surfaces, which appear to have been painted in true fresco style. Another fragment bears patchy traces of red paint. The remainder comprise tiny fragments of sandy mortar only.

The shrine

The majority of the plaster from Phase 7 came from deposits associated with the shrine.

(790), a thin band of hard, compacted sand within the alcove, produced a single fragment/1 g with a slightly abraded and patchy yellow-painted surface and sandy pink mortar.

(755), a thick deposit of compact sand representing the internal surface of the shrine, produced 14 fragments/42 g. They comprise nine fragments of plain white plaster with weathered, powdery, patchy surfaces and a sandy pink *arriccio*, and five fragments/23 g of weathered, powdery and abraded mortar (*arriccio*) only.

Following its disuse, the collapse deposits within the shrine, (753) and (738), together produced 230 fragments/1,129 g, with the greatest quantity (178 fragments/715 g) coming from (753):

(738) produced 52 fragments weighing 414 g. Of these, the predominant colour, by both fragment count and weight, is yellow, in a plain band/zone of colour, in shades ranging from cream/pale yellow (nine fragments/90 g), through pale yellow (two fragments/4 g) to yellow (two fragments/16 g). They include a possible corner fragment with a curved surface and a corner or edge fragment. A much abraded cream/pale yellow fragment (weight 49 g) has two layers of mortar, the lower layer being much coarser, sandier and pinker than the upper one. The next most common colour is grey (17 fragments/70 g), which occurs as a band/zone of colour, occasionally adjacent to yellow (two fragments/28 g). One yellow and grey fragment has two layers of mortar, the lower layer being much coarser, sandier and pinker than the upper one. (738) also produced five fragments/13 g painted with plain red. Two of these contain rare crushed ceramic building material in the *arriccio* layer. 14

fragments/173 g of *arriccio* only were also recovered from (738) and four of these have two layers of mortar. In each case, the lower layer is much sandier and coarser than the upper layer. None of the fragments from (738) contain crystalline calcite in the *intonaco* layer or have polished surfaces.

(753) yielded 178 fragments/715 g. Twenty-one fragments/114 g provide evidence that the shrine underwent at least one phase of re-decoration, as all bear two layers of fine plaster. On only three fragments/11 g are the two layers of *intonaco* separated by a layer of mortar (they do not adjoin but are probably from the same scheme). On these three fragments, the lower layer is painted in a band/zone of blue-green; the second layer is painted yellow. This patchy upper layer may also have been polished. If so, this provides the only evidence for fine-quality work amongst the plaster assemblage from the shrine. The intervening *arriccio* layer also contains rare fragments of crushed ceramic building material, unlike the lower layer of mortar. Three adjoining fragments/45 g (SF 9976), provide evidence of a simple linear scheme. This comprises a red band/zone on a white ground divided by a pink stripe, a red stripe and a pink line. Originally this was adjacent to a blue-green band/zone which was later over-plastered in plain white, leaving just the red/pink part of the scheme exposed (Cat no 30). The remaining 15 fragments/58 g have two layers of *intonaco*, each painted with the following colours: 12 fragments/44 g have a lower layer of blue-green paint and half of these have a second layer of *intonaco* painted pale yellow; the other six fragments are of plain white plaster. This suggests an initial scheme with a plain blue-green band/zone, over-plastered in pale yellow adjacent to plain white. Four fragments/14 g have two layers painted plain yellow. One fragment/8 g has a lower layer painted grey adjacent to plain white and an upper layer of plain white plaster. The final fragment has a lower layer of grey which was then re-plastered and painted yellow.

The predominant colour amongst the remaining fragments from (753) is yellow, in shades ranging from cream/pale yellow (8/39 g), through pale yellow (8/13 g), to yellow (20/141 g). Yellow-painted fragments include one (weight 42 g) with a slight ridge on the reverse of the *arriccio* layer, probably the negative impression of the sandstone wall to which the plaster once adhered. Another fragment/29 g has two layers of mortar, the upper of which contains occasional crushed ceramic building material. There is also a possible edge fragment (weight 27 g) with a yellow stripe/band/zone adjacent to plain white. Shades of red are also common amongst this group (26 fragments/110 g). Some (five fragments/45 g) fade from red to pink in colour, although this may be due to bleaching rather than deliberate shading by the addition of white paint. SF 9977, however, has a clearly deliberate colour change with a red stripe/band/zone adjacent to a pink stripe/band/zone (Cat no 31). One fragment (weight 4 g) also has ridges on the reverse of the *arriccio*, probably the negative impression of the sandstone wall to which the plaster originally adhered. Several fragments have occasional mica in the painted surface, possibly added to the red paint to achieve a brighter finish. Shades of grey appear in band/zones of colour (31 fragments/104 g), including seven fragments/28 g painted dark grey or black and one fragment/2 g in pale grey. The remaining colours from (753) comprise yellow adjacent to grey (three fragments/3 g) and yellow adjacent to red (one fragment/1 g).

Fifty-three fragments/135 g of *arriccio* only were also recovered from (753).

The fragments recovered from the collapse deposits (738) and (753) indicate that yellow is the predominant colour (26.4 % by weight of the total number of painted fragments from these two contexts), followed by grey (16.9 %), plain white (11.1 %) and red (10.9 %). Grey and yellow in combination account for 1.2 % of the total and yellow and red in combination, just 0.09 %. Re-decorated fragments account for 6.1 % by weight of the total number of fragments from the collapse deposits. The double layers of painted plaster indicate that the original design included areas of plain blue-green and yellow as well as grey and white in combination. These particular colours were then replaced by a scheme comprising bands/zones of yellow and plain white plaster.

Plaster was also found still adhering to the inner face of the sandstone wall (739) of the stone phase of the shrine. The plaster on the bottom two courses (751) is described as coloured 'red/white/black/orange/blue' with one fragment bearing evidence of 'red and white patterning'. 'White creamy plaster' was also found attached to one of 'three sandstone blocks'. The plaster on the bottom two courses survived to a height of 0.25 m and is described as having 'no real thickness'. It is not clear from this description what form the decoration took and, unfortunately, there are no detailed drawings or close-up photographic images showing the plaster in position in the alcove. Walls of building were usually divided into three superimposed zones, the lower dado, the central main zone and the upper zone or frieze (Ling 1985, 16). It is unclear how closely the decoration of this small structure would follow this convention. If so, the plaster adhering to the bottom two courses would be from the dado, which was generally 30 - 90 cm in height (Ling 1985, 22). It is probable that the fragment described as bearing 'red and white patterning' equates to SF 9976 (Cat no 30).

The surviving plaster assemblage suggests that the shrine was probably painted using a simple panel scheme and that the structure was re-decorated at least once during its lifetime. It is notable that none of the fragments from the shrine contain crystalline calcite in the *intonaco* layer.

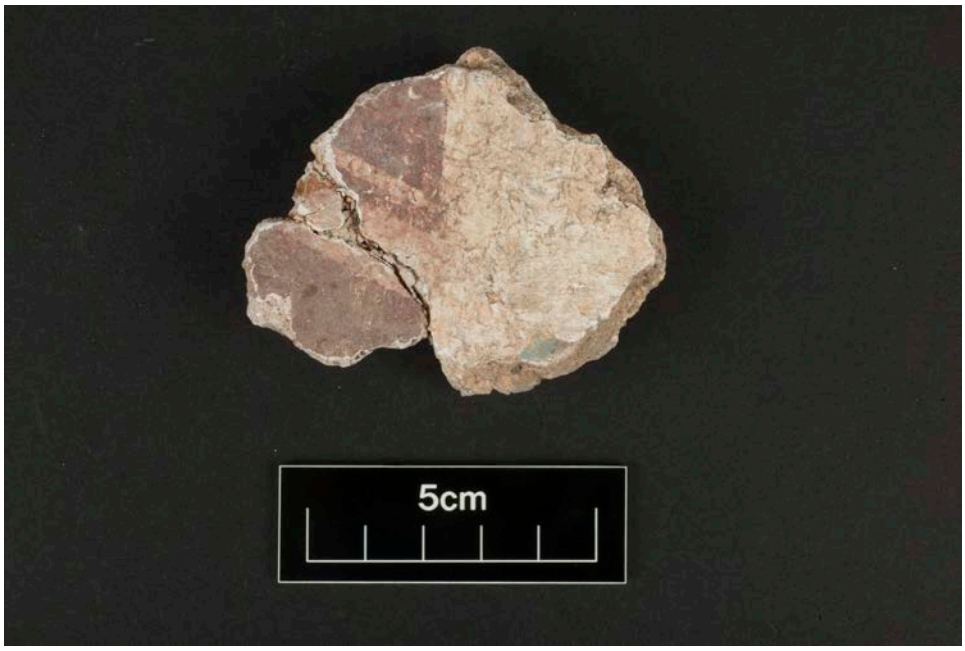
(809), a deposit of sand which sealed the shrine, produced just four fragments/12 g of plaster. The surfaces are battered and damaged and it is unclear if they were originally painted.

Most of the plaster from this phase was recovered from deposits associated with the shrine, from both its internal structure and from collapse deposits, following its disuse. Small amounts were also retrieved from deposits of sand, a possible occupation surface and an external road surface.

Catalogue

30 Painted wall plaster; three adjoining fragments with multi-directional brush marks in plaster surface; partially re-decorated: white ground with red

band/zone divided by pink stripe, red stripe and pink line; blue/green band/zone later over-plastered in white, leaving just the pink/red area exposed; sandy mortar with moderate lime and voids, occasional mica and rare coal; Th *arriccio*: 21 mm; Th *intonaco*: 0.5 mm. A (753): Phase 7 collapse deposit; SF 9976.



30

31 Painted wall plaster; vertical brush marks in paint surface; red stripe/band/zone adjacent to pink stripe/band/zone; sandy mortar with occasional lime and gravel. Th *arriccio*: >8 mm; Th intonaco: 0.5 mm. A (753): Phase 7 collapse deposit; SF 9977.

Period 4: The Second Roman Amphitheatre

Phase 8: Amphitheatre 2 construction

The outer wall

The primary fill (678) of the linear construction trenches for the eastern side wall of the *vomitorium*, Entrance 11, yielded a single fragment/1 g of abraded plaster with a tiny surviving patch of red paint, possibly polished, and an *arricio* layer of *opus signinum*-type mortar. This comprises just 0.04 % by weight of the Roman phased assemblage.

Periods 5—6: Amphitheatre 2 change of use and robbing

Phase 10: Amphitheatre 2 change of use

Phase 10 produced just three fragments/21 g of Roman plaster, comprising 0.6 % by fragment count and 0.4 % by weight of the total assemblage (*see Table 1*). A single fragment/5 g came from Area A. Area B produced two fragments/16 g, with an average fragment weight of 8 g.

Area A

(892), the bottom fill of a late Roman trench, produced a single ?*arriccio* fragment/5 g.

Area B

Layer (2457), which covered post-pad structures (2607) and (2608), produced two fragments/16 g. One is decorated with patchy yellow paint; the other bears two layers of fine plaster. The lower layer is only visible in section; the upper layer is decorated with patchy grey and yellow paint. Both the coverage and the scheme of decoration are indistinct.

Phase 11a: Robbing of internal walls

Sub-phase 11a produced 15 fragments/183 g of Roman plaster, comprising 2.8 % by fragment count and 3.9 % by weight of the total assemblage (*see Table 11*), all from Area A and with an average fragment weight of 12.2 g.

Fill (595) of robber trench (597) for the north wall of the *vomitorium*, Entrance 11, yielded just two fragments/2 g, both decorated with patchy yellow paint, one of which has inclusions of crystalline calcite in the *intonaco* layer. Fill (596) of the same robber trench produced three fragments/11 g, also decorated with patchy yellow paint.

Fill (308) of the robber trench of the inner end of the *vomitorium* wall, (196), produced four fragments/10 g; three decorated with patchy yellow paint; the other with ?cream/pale grey paint.

Later fill (457) of the arm of the cruciform robber trench (245) yielded two fragments/23 g decorated with patchy yellow paint.

Roman plaster was also recovered from fills of the arm of the trench robbing the *vomitorium* wall up to the face of the outer wall. Deposit (320), which filled the crossing point of the two robber trenches, produced a single fragment/13 g of plain white plaster. Similar deposit (322) also produced a single fragment/3 g of plain white plaster.

(244), a deposit of mixed, loose, silty material above these fills, yielded two fragments/121 g, one decorated with patchy yellow paint; the other of plain white plaster.

Phase 11b: Robbing of external walls

Sub-phase 11b produced 13 fragments/664 g of Roman plaster, comprising 2.2 % by fragment count and 14.0 by weight of the total assemblage. Plaster was recovered from Areas A and B. Eleven fragments/630 g, with an average fragment weight of 57.2 g, came from Area A; Area B produced just two fragments/34 g, with an average fragment weight of 17 g.

Area A

Lower fill (411) of robber trench (245) yielded seven fragments/216 g. Three are of plain white plaster, and one of these has an impression of lattice knife-scoring from the keyed face of a flue-tile on the reverse, indicating the type of walling to which it was previously attached. Two other fragments show evidence of redecoration: one has two layers of *intonaco*, with no intervening *arriccio* layer. The upper layer is decorated with pale grey paint, the lower layer with ?black paint. The other fragment has two layers of *intonaco* separated by a thick *arriccio* layer. The lower layer is only visible in section but the upper layer is decorated with pale yellow paint.

Backfill deposits of the robber trench for the outer wall of Amphitheatre 2, (506) and (618), produced a few fragments of Roman plaster. (506) yielded a single fragment/405 g with much crystalline calcite in the *intonaco* layer and two layers of *opus signinum*-type mortar. (618) produced two fragments/3 g, both decorated in yellow paint and with multi-directional brush marks in the plaster surface.

Area B

Two fragments/34 g of Roman plaster were recovered from sandy fill (2563) on the south side of the robber trench, which may have derived from the adjacent *in situ* Roman seating bank material and which may represent trench collapse in antiquity. One is painted pale grey and has two *arriccio* layers of sandy mortar. The other is completely vitrified into a crazed blue/green glass attached to an *arriccio* layer of sandy mortar. The original colour of the plaster is unclear.

Periods 7-–8: Post Roman Phases 12—21

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Post-Roman phases 12–21 produced a total of 68 fragments/1,464 g (12.6 % by count/30.8 % by weight of the total assemblage) of Roman plaster. Of this total, just seven fragments/122 g (10.3 % by count/8.3 % by weight of the total recovered from post-Roman contexts) came from Area A. 61 fragments/1,342 g (89.7 % by count/91.7 % by weight) were recovered from Area B.

Area A

The plaster assemblage from Area A includes a corner fragment from (3). There are just three fragments with painted decoration: two fragments/60 g from (162) have patchy traces of red paint on a white ground. Another fragment/10 g from (416) is painted cream/pale yellow. The fragments range in condition from fresh (13.1 % by weight) to slightly abraded (31.9 %), although most are fairly fresh (54.9 %).

Area B

The residual Roman plaster assemblage from Area B includes four corner/edge pieces and five fragments/985 g with evidence of re-decoration. Unlike the plaster from the shrine, all have two layers of fine plaster with an intervening layer of *arriccio* between the two layers of *intonaco*. Both of the *intonaco* layers on all the pieces are painted plain grey in colour. Thirty-eight fragments/156 g are of mortar (*arriccio*) only. Of the remaining fragments (23/1,186 g), yellow is the most popular colour, ranging in shades from cream/pale yellow (1/3 g), through pale yellow (5/102 g) to yellow (1/3 g). The only other colour present is grey (3/41 g) or pale grey (2/8 g). A single fragment/1 g of plain white plaster was also recovered. Colours appearing in combination comprise yellow and grey (2/21 g) and yellow and black (1/22 g). The condition of the Area B assemblage ranges from fairly fresh (3.5 % by weight), through slightly abraded (16.0 %) to abraded (80.3 %).

Discussion

When considering the spatial and chronological distribution of the plaster assemblage, it is clear that it was largely restricted to one Area, with most derived from a single structure in one particular phase. Plaster was recovered from Areas A and B only, with none from Area C. In Area B, Phase 6 is the only Roman phase to have produced Roman plaster. In Area A, it was recovered from Roman phases 3, 5, 6, 7 and 8, with none from phases 4 or 9. Most of the plaster from the Roman phases (55.7 % by weight) came from Phase 7 and the majority of this (88.6 % by weight of the Phase 7 assemblage) was recovered from contexts associated with the shrine which abutted the outer wall of Amphitheatre 1b. The rest of the plaster from Roman phases came from layers, dump deposits, seating-bank deposits, pit fills, a construction-trench fill, a possible floor surface, and a road surface. In Phases 10—11b, it was recovered from layers and robber-trench fills. It is probable that the fragments which hint at the presence of high-quality work (those with crystalline calcite added to the *intonaco* layer and those with polished surfaces) would have arrived at the site along with other demolition debris and general rubbish from buildings in the fortress and surrounding *canabae*, as none of the fragments recovered from the shrine, apart from a single small fragment with a possible polished surface, were decorated in this way.

Colours

The colours used to decorate the walls of the arena, the *Nemeseum*, and the shrine which abutted the outer wall of Amphitheatre 1b, are consistent with those used elsewhere in Chester, in both the fortress (Newstead & Droop 1931, 139; Newstead & Droop 1939, 37;

Davey & Ling 1982, 96—7; Liversidge 1983, 141—4) and *canabae* (Carrington 2012a; Heke 2012b; Carrington & Heke 2012; Carrington 2012b; Carrington & Heke with Roberts 2012; Dunn 2012, 241—2). Analyses of wall painting fragments from provincial domestic architecture has shown that the pigments in common use were red and yellow ochres, Egyptian blue (a calcium copper silicate), soot and carbon-based blacks, green earths, chalk-based white and mixtures of these colours (Siddall 2006, 28). The use of colour reflected a hierarchy of status, with white the least valued, shades of red and yellow of medium status and blue and black restricted to the very best rooms. There was also an increasing dominance of lower status white ground decoration from the end of the 2nd century onwards (Perring 2002, 124).

Summary

Evidence from other British amphitheatres indicates that painted wall plaster was commonly used to decorate the arena walls. There is also evidence that entranceway walls and even exterior walls were sometimes decorated in this way. At London, for example, although there was no *in situ* evidence of painted plaster on the arena wall, fragments lying face down on the arena surface adjacent to it are likely to have come from it. These reveal a decorative scheme of red and green, which was later over-painted with a design in dark red and white (Bateman, Cowan & Wroe-Brown 2008, 104). A coping stone, originally from the arena wall, also bore traces of paint, comprising a primary layer of plain white with a later surface of red paint on white (*ibid*, 77 and 166). A few small fragments of plain white, red and grey painted wall plaster, from contexts associated with the eastern entrance, hint at the presence of decoration on the entranceway walls (*ibid*, 62 and 68). The majority of the painted plaster from the site (298 fragments) was recovered from building debris associated with contemporary activity to the east of the amphitheatre, especially from Building 3, a two-roomed structure close to the eastern entrance, which may have functioned as a shop or tavern (*ibid*, 72 and 166). At Chichester, plaster from the robbed arena wall was found collapsed forward onto the arena floor. Fragments were painted in shades of red, purple, pink, orange, yellow, green and grey, streaked and mottled with white. Two types of *arriccio* were noted: one described as 'dirty cream in colour'; the other 'pink with many coarse fragments of broken brick'(White 1936, 152 and 156). This may suggest at least two phases of decoration, and could also help explain the range of colours found, if one scheme of decoration was replaced by another. A few ?arena wall stones were also found on which paint was applied directly to the surface (*ibid*, 153). At Silchester, the arena wall was built of flint with a decorative string course of brown ironstone and does not seem to have been plastered (Fulford 1989, 185). At Caerleon, the arena wall was given a thick rendering of waterproof mortar, while the exterior walls and entranceways had white mortar pointing with false joints struck in it and painted dark red. Sometimes the false joints were indicated in the paint alone, without grooving (Wheeler & Wheeler 1928, 118; Boon 1972, 93). The surface make-up layers in two of the entrances, A and G, contained fragments of wall plaster painted in a range of colours, comprising red and green; borders or splashes of red, white and grey; red, black, blue and yellow stripes; green, brown and blue splashes; and fragments of dark red-lined pointing (Wheeler & Wheeler 1928, 124 and 126). It is possible that some of these fragments originated elsewhere. At Cirencester, the later rebuild of the arena wall appeared to have been painted to imitate marble (Bateman, Cowan & Wroe-Brown 2008, 104).

At Chester, there is direct evidence that the shrine associated with Amphitheatre 1b had painted plaster walls and, from previous investigations at the site, it is known that both the *Nemeseum* and the arena wall were originally plastered and painted. It is possible that some of the entrances and other ancillary structures may also have been decorated in this way.

ANALYSIS OF ROMAN CEMENT MIX

Introduction

Methodology

The cement mix was analysed in terms of quantity, range and variety, condition and provenance. All fragments were examined microscopically at x 20 magnification in order to determine the aggregates and fillers used in their composition. The assemblage was quantified by fragment count and weight (in grammes) and measurements (in mm) were taken of any complete dimensions. Small-find numbers were assigned to fragments exhibiting atypical or unusual features.

In describing the cement mix, the following definitions have been used:

Concrete: composed of a cement (binding material) plus a coarse aggregate (where the majority of the aggregate is >5mm) and water (Siddall 2000, 2). Most Roman concrete used a lime-cement.

Mortar: composed of a cement (generally slaked lime) plus a fine aggregate (where the majority of the aggregate is <5mm) and water (Siddall 2000, 2).

Cement: a fine material used to bind the aggregates together, eg hydrated (or slaked) lime also known as 'lime'.

Aggregate: (i) Inorganic: eg river gravels, crushed/weathered rock, crushed fired clay (generally ceramic building material but also pottery), sand, etc. (ii) Organic: eg charcoal, hay/straw, etc. Organic aggregates improved tensile strength, especially in plasters (internal wall finishing) and renders (external wall finishing) (Elsen 2006, 1418—9).

Opus signinum ('*cocciopesto*'): a concrete or mortar composed of an hydraulic cement mix of hydrated lime, ceramic powder and finely-crushed fired clay, the addition of which acted as an artificial *pozzolana* and caused discolouration from white through pale pink to orange (Karatasios *et al* 2014, 271; Siddall 2000, 2). It is water-resistant and was used in water-bearing constructions and to protect the inside of walls from moisture, eg foundations, floors that lay below the water-table, baths, aqueducts and water cisterns, etc (O'Hare 1995, 5; Elsen 2006, 1419).

Pozzolana: a natural or artificial alumina-silicate material that forms an hydraulic compound when mixed with hydrated lime, eg volcanic ash deposits from Pozzuoli, Italy and the Greek islands of Santorini and Milos; or different types of finely-ground ceramic powder. The addition of *pozzolanas* to lime mixtures promotes a chemical reaction, which allows them to harden and develop strength in humid or extremely wet conditions (Karatasios *et al* 2014, 271 and 277).

Hydrated lime: produced by burning limestone (calcium carbonate); this produces quicklime (unslaked lime). The quicklime is then slaked, by the addition of water, to produce hydrated lime. The process of slaking generates a lot of heat, as quicklime reacts very violently with water. Hydrated lime hardens by carbonation (absorbs carbon dioxide), which re-converts the lime back to calcium carbonate. This whole process is known as the lime cycle. To make a water-resistant cement mix, the Romans mixed hydrated lime with a reactive silica material (in Britain this was usually finely-crushed fired clay) and water (*See 'Opus signinum', above*).

Quantity

The site produced a total assemblage of 2,854 fragments of Roman cement mix weighing 40,256 g, with an average fragment weight of 14.1 g (*Table 12*). 75.3 % by weight of the assemblage was hand-collected, 24.7 % came from sample residues. Area A produced the largest assemblage by both fragment count, with 78.2 % of the total, and weight (72.8 %). Area B produced 20.9 % by fragment count and 25.2 % by weight of the total and Area C just 0.8 % by fragment count and 1.9 % by weight. 0.1 % by both fragment count and weight was found unstratified.

Area	No frags	% no	Wt (g)	% wt	Av frag wt (g)
A	2,233	78.2	29,308	72.8	13.1
B	597	20.9	10,125	25.2	17.0
C	22	0.8	771	1.9	3.2
u/s	2	0.1	52	0.1	26.0
Total	2,854	100	40,256	100	14.1

Table 12: Roman cement mix by quantity and Area

Roman phases produced 1,283 fragments of cement mix with a weight of 11,900 g (45.0 % by fragment count and 29.6 % by weight of the total assemblage); with an average fragment weight of 9.3 g. Post-Roman phases produced 54.9 % by fragment count (1,567 fragments) and 70.2 % by weight (28,270 g) of the total, with an average fragment weight of 18.0 g. Two fragments/34 g (0.1 % by count and 0.08 % by weight) were recovered from unphased contexts in Area A and two others weighing 52 g (0.1 % by count and weight) were unstratified.

The cement mix recovered from Roman phases is more broken than that from post-Roman contexts. A comparison of the average fragment weights of the hand-collected cement mix from Roman (20.4 g) and post-Roman (58.7 g) contexts reinforces this observation. Perhaps unsurprisingly, the average fragment weight of cement mix recovered from sample residues is similar (Roman contexts: 4.3 g; post-Roman contexts: 5.1 g).

In terms of weight, a much higher proportion of the assemblage (72.8 %) was retrieved from Area A. The cement mix from Area A (with an average fragment weight of 13.1 g) is slightly more broken than that from Area B (with an average fragment weight of 17.0 g). The cement mix from Area C (with an average fragment weight of 35.0 g) is the least fragmented group. When a comparison is made of the average fragment weights of hand-collected cement mix only (Area A: 35.7 g; Area B: 53.8 g; Area C: 33.0 g), the cement mix from Area B is the least broken.

73.8 % by weight of the Area A assemblage was hand-collected, 26.2 % by weight came from sample residues. In Area B, 78.7 % of the assemblage was hand-collected, 21.3 % was recovered from samples. In Area C, 85.6 % of the assemblage was hand-collected, just 14.4 % came from sample residues.

In terms of both count and weight, most of the Roman phased assemblage (85.0 % by fragment count and 86.0 % by weight) came from Area A, with 15.0 % by count and 14.0 % by weight from Area B. The cement mix from Area B (average fragment weight: 8.6 g) is slightly more broken than that from Area A (average fragment weight: 9.4 g). This is borne out by a comparison of the average fragment weights of the hand-collected material from the Roman phased assemblages in Areas A (20.5 g) and B (18.0 g). In Area A, 76.6 % by weight of the assemblage from Roman phases was hand-collected, 23.4 % by weight came from sample residues. In contrast, in Area B, just 14.0 % by weight was hand-collected, 86.0 % by weight was recovered from samples.

In terms of both count and weight, most of the Roman cement mix from post-Roman phases also came from Area A (72.8 % by fragment count and 67.3 % by weight of the residual assemblage), with 25.8 % by count and 29.9 % by weight from Area B and 1.4 % by count/2.7 % by weight from Area C. The material from Area A (average fragment weight: 16.7 g) is slightly more broken than that from Area B (average fragment weight: 20.9 g). The cement mix from Area C (average fragment weight: 35.0 g) is the least broken. In Area A, 72.3 % by weight of the residual assemblage was hand-collected, 27.7 % by weight was recovered from sample residues. In Area B, 91.4 % by weight was hand-collected and just 8.6 % by weight came from samples. In Area C, 81.4 % by weight was hand-collected, with 18.6 % by weight from sample residues.

Range and variety

Few diagnostic features were recovered; the cement mix comprises mainly featureless, indeterminate fragments (2,611/225,771 g), comprising 64.0 % by weight of the total assemblage. Fragments with at least one surface, where the cement mix had been flattened, probably by walling blocks, comprise 14.2 % by weight of the assemblage. Floor fragments comprise 10.1 % by weight of the total. Edge, edge/surface, edge/corner and corner

fragments together comprise 6.5 % by weight of the forms recovered. Two fragments/2,098 g — formed by the negative impressions of walling blocks which have created irregularly-shaped surfaces — comprise the remaining 5.2 % by weight of the total (*Table 13*).

A relatively wide range of cement mixes was recovered from the site, indicating a range of sources and/or uses. All are composed of an hydrated lime cement with the addition of a varying range of aggregates and fillers. Aggregates comprise sand grains (which vary in both colour and type), rounded river gravels, rare large pebbles and crushed fired clay (especially ceramic building material). Fillers comprise hay/straw, the presence of which is attested by the negative impressions of plant stems/stalks and elongated voids, as well as rare instances of original plant material surviving in situ. Lumps of hydrated lime are common in many of the mixes and fragments of charcoal, ranging in size from small black flecks to large pieces, also appear regularly. 'Lime lumps' are binder derived but appear to act as a form of aggregate. Charcoal is probably present as a remnant of the limestone burning process (Elsen 2006, 1419—20).

Form	No frags	% no	Wt (g)	% wt
Corner	2	0.1	270	0.7
Edge	7	0.2	609	1.5
Edge/corner	3	0.1	746	1.9
Edge/surface	3	0.1	953	2.4
Floor surface	19	0.7	4,083	10.1
Surface	207	7.2	5,726	14.2
Shaped frag	2	0.1	2,098	5.2
Indet	2,611	91.5	25,771	64
Total	2,854	100	40,256	100

Table 13: Roman cement mix by quantity and form

Cement mixes were differentiated by variations in both colour and composition and six main types have been identified (*see Table 14)*. These comprise three groups (numbered 1—3) of *opus signinum*-type mortar/concrete* (*defined by aggregate size) and three types of sandy mortar (numbered 4—6). The *opus signinum*- types vary in the amount of crushed fired clay present and also in the colour, type and amount of sand. The sandy mortars vary in the amount of river gravel present, as well as in the colour, type and amount of sand. Type 7 comprises fragments of ceramic building material coated in lime mortar, which probably once formed the aggregate component of *opus signinum*. Type 8 relates to a specific group of burnt and vitrified fragments, fused together with the other component materials of two Roman road surfaces. Fragments which contain more than one layer of cement mix, often of quite different composition, form Type 9. Type 10 comprises fragments which were too small to ascertain the type of cement mix with any degree of certainty and are largely derived from sample residues.

Condition

The assemblage is of mixed condition, ranging from fresh (27.4 % by weight of the total assemblage) to abraded (18.2 % by weight of the total), although most fragments are either fairly fresh (26.6 % by weight) or slightly abraded (22.3 % by weight). The remaining 5.5 % by weight comprise tiny fragments of mixed condition. Ninety-five fragments (3.3 % by fragment count of the total) were also burnt.

When compared spatially, the cement mix from Area A is more abraded than that from Area B, with 16.2 % by weight of the total assemblage recorded as abraded compared with just 1.9 % from Area B. Cement mix which is slightly abraded from Area A comprises 20.7 % by weight of the total, that from Area B just 1.4 %. Cement mix which is fairly fresh in condition comprises 17.7 % of the total from Area A, 8.2 % from Area B and just 0.7 % from Area C. Cement mix in a fresh condition comprises 14.8 % by weight of the total from Area A, 11.9 % from Area B and just 1.1 % from Area C.

When compared both chronologically and spatially, by proportion of each Area's total assemblage, the cement mix from Roman contexts in Area A is more abraded than that from Area B: 13.5 % by weight of the Area A Roman phased assemblage is abraded, compared to just 3.2 % from Area B. 41.1 % by weight of the cement mix from Roman contexts is either slightly abraded or fairly fresh, compared to 38.0 % from Area A, 53.8 % by weight of cement mix from Area B and 100 % from Area C. 36.2 % of the cement mix from Roman contexts in Area B is fresh, compared to 33.3 % from Area A.

Roman cement mix from post-Roman contexts is also more abraded from Area A: 27.0 % is abraded, compared to just 8.6 % from Area B. Cement mix which is either fairly fresh or slightly abraded comprises 60.6 % from post-Roman contexts in Area A compared with 35.4 % from Area B and 24.0 % in Area C. 12.3 % by weight of cement mix from Area A is fresh in condition compared to 49.7 % from Area B and 75.2 % from Area C.

Provenance

The sources of the raw materials used in the production of the various cements, mortars and concretes used for building work at the site would have been identical to those employed in the production of the painted plaster used in the shrine and on the arena wall. Water was readily available, as were the aggregates and fillers used in the *arriccio* layers. River gravels, sand and crushed ceramic building materials were easily obtainable in the local area. The presence of local red sand in the various mixes is attested by the fact that the sandier the mortar, the pinker it appears to be. Clear to yellow local sand was also used, creating a different colour range in the mixes, depending on how much was added to the hydrated lime cement.

There is no evidence for limestone-burning in Chester in the Roman period, suggesting that it probably took place close to the source of the stone. It would also have been easier and cheaper to transport the resultant quicklime or lime than the heavy, bulky raw stone. However, a reasonable quantity of limestone has been recovered from the site, suggesting that it may indeed have been transported in its raw state. The nearest, easily-exploitable sources of limestone in the region in the Roman period were Halkyn Mountain and the Llanfynydd/Ffrith area, 15—20 km distant from Chester respectively (Mason *et al* 2005,

51). It is possible that the quicklime or lime may have been transported to the fortress by sea, along with the lead ingots which were produced in Flintshire from *c* AD 74 onwards (Mason 2002, 93).

Description

29.6 % by weight of the assemblage was recovered from Roman phases 3 to 9, with most (16.8 % by weight of the total) coming from Phase 7. Amphitheatre 2 change of use and wall robbing phases, 10—11b, yielded 51.2 %; post-Roman phases, 12—21, produced 19.1 %; unphased contexts in Area A produced 0.1 % and another 0.1 % was unstratified (*Table 14*).

Period 2: Roman occupation before the amphitheatre

Phase 3

This phase yielded eleven fragments/166 g of Roman cement mix (1.4 % by weight of the Roman phased assemblage), all from Area A, with an average fragment weight of 15.1 g.

Pre-amphitheatre Roman occupation deposits

A layer of 'trample' (1126) produced four indeterminate fragments/10 g of Roman cement mix, comprising a single fragment/1 g of *opus signinum*-type mortar/concrete (type 1) and three fragments/9 g of sandy mortar (type 6). A layer of fine orange sand (1107) produced a single *opus signinum* aggregate (type 7) fragment /11 g. Fill (1102) of beam slot (1103) also produced a single large fragment/98 g *of opus signinum* aggregate. A deposit of red sand (1086) produced two fragments/35 g of type 1 concrete. A patch of black sandy silt (1082) produced three fragments/12 g, comprising two curved edge/corner pieces/8 g of type 3 mortar/concrete and an indeterminate fragment/4 g of type 5 sandy mortar.

Period 3: The First Roman Amphitheatre

Phase 4: Construction of Amphitheatre 1a

This phase produced just three fragments/54 g of cement mix (0.5 % by weight of the Roman phased assemblage), all from Area A, seating bank deposit (1262), with an average fragment weight of 18.0 g. They comprise type 1 concrete fragments, one of which has attached iron corrosion.

Phase 5: Deposits outside Amphitheatre 1a associated with its use

Phase 5 produced 353 fragments/2,410 g of cement mix, comprising 20.3 % by weight of the Roman phased assemblage, with an average fragment weight of 6.8 g.

South west area

(1202), fill of ?cess pit (1256), produced 77 fragments/550 g, including a surface fragment of type 6 mortar (Th: 5 mm), which was probably used for cementing walling blocks together. Another surface fragment, of type 3 cement mix, may represent a thin surface skim (Th: 7 mm) of *opus signinum*. A possible surface fragment of type 2 cement mix (Th: >25 mm) was also recovered. A surface fragment of two layers, the upper of type 5 cement mix and the lower of type 2 cement mix, was also recovered. The upper layer has a thickness of 21 mm, the lower layer is more than 15 mm thick. The piece indicates two phases of construction and/or decoration. The remainder comprise indeterminate fragments of cement mix types 1, 2, 5 and 6.

(1216), fill of pit (1256), produced 44 fragments/429 g of cement mix. They include a surface fragment of type 6 mortar (Th: >15 mm) and a surface fragment of two layers. The upper layer is of type 3 mortar/concrete and has a thickness of 17 mm; the lower layer (Th: >3 mm) is of type 6 sandy mortar. This piece also indicates two phases of construction and/or decoration, but the cement mixes are of different types, and in the reverse order to the piece from (1202). The remainder comprise indeterminate fragments of cement mix types 1, 4 and 6. (1064), a dark layer of organic-rich silty sand, which sealed cess pit (1256), produced eight indeterminate fragments/50 g of cement mix, comprising four fragments/6 g of type 2 mortar/concrete; a single piece of type 6 sandy mortar and three fragments/29 g of *opus signinum* aggregate (type 7). (1152), a layer of red sand formed over the back-filled pit (1256), produced 18 fragments/95 g. All are featureless, indeterminate fragments, apart from a single surface piece/54 g of type 6 mortar. The remaining fragments are also of type 6, apart from five fragments/5 g of type 4.

(1073), a rectangular area of fine grey sand, a possible floor surface for a small stall, produced 11 indeterminate fragments of cement mix/6 g, of types 2, 3 and 5. The latter may comprise tiny fragments of *arriccio*.

(1075), a dark deposit immediately outside the outer wall of Amphitheatre 1a, the earliest deposit in this phase, produced 59 fragments/212 g of cement mix. Twenty-six fragments/58 g comprise *opus signinum*-type cement mixes 1—3; the remainder comprise sandy mortar cement mix types 4—6. All are indeterminate, featureless fragments apart from three surface fragments/4 g of type 2 mortar/concrete.

(625), the final layer associated with the use of Amphitheatre 1a, produced 107 fragments/802 g. Ninety-three fragments/362 g were recovered from samples; 14 fragments/440 g were hand-collected. Eleven diagnostic fragments were recovered; the remaining pieces are all featureless, indeterminate fragments of types 1—5 and 7. In terms of fragment count, cement mix types 5, 1 and 2 are the most common; types 7, 4 and 3 the least common. Nine surface pieces were retrieved: a single fragment of type 3 cement mix; another of type 5 with attached iron corrosion; two fragments of type 5, probably from the same piece although they do not adjoin, and three pieces,

two of which adjoin, of type 9 cement mix. The latter comprises three separate layers, indicating three phases of construction and/or decoration.

Key to cement-mix types

1 Cream/white *opus signinum*-type
2 Pale pink/orange *opus signinum*-type
3 Pink/orange *opus signinum*-type
4 Cream/white sandy
5 Pale grey/brown sandy
6 Pale pink/brown sandy
7 *Opus signinum* aggregate
8 Road surface fragments (burnt)
9 Two or three layers of cement mix
10 Unknown cement mix type

	Roman phases				*Phases 10—11b*				*Phases 12—21*				*Unphased*				*Unstratified*				*Total*			
Type	No	% no	Wt (g)	% wt	No	% no	Wt (g)	% wt	No	% no	Wt (g)	% wt	No	% no	Wt (g)	% wt	No	% no	Wt (g)	% wt	No	% no	Wt (g)	% wt
(1)	107	8.3	711	5.9	27	2	1035	5	26	11.9	669	8.7	1	50	23	67.6	0	0	0	0	161	5.6	2438	6.1
(2)	140	10.9	1006	8.3	16	1.2	116	0.6	8	3.7	269	3.5	0	0	0	0	0	0	0	0	164	5.7	1391	3.5
(3)	93	7.2	646	5.3	24	1.8	914	4.4	25	11.4	2727	35.6	0	0	0	0	0	0	0	0	142	5	4287	10.6
(4)	78	6.1	103	0.9	67	5	1340	6.5	29	13.2	51	0.7	0	0	0	0	0	0	0	0	174	6.1	1494	3.7
(5)	414	32.2	3547	29.4	859	63.7	9826	47.7	58	26.5	2144	28	0	0	0	0	0	0	0	0	1331	46.6	15517	38.5
(6)	196	15.5	1331	12.5	319	23.7	6713	32.6	14	6.4	401	5.2	0	0	0	0	0	0	0	0	529	18.5	8445	21
(7)	147	11.4	2017	16.7	33	2.4	646	3.1	50	22.8	1206	15.7	1	50	11	32.4	2	100	52	100	233	8.2	3932	9.8
(8)	76	5.9	1075	8.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76	2.7	1075	2.7
(9)	17	1.3	1301	10.8	0	0	0	0	8	3.7	201	2.6	0	0	0	0	0	0	0	0	25	0.9	1502	3.7
(10)	15	1.2	163	1.3	3	0.2	11	0.1	1	0.5	1	0.01	0	0	0	0	0	0	0	0	19	0.7	175	0.4
Total	**1,283**	**100**	**11900**	**100**	**1348**	**100**	**20601**	**100**	**219**	**100**	**7669**	**100**	**2**	**100**	**34**	**100**	**2**	**100**	**52**	**100**	**2854**	**100**	**40256**	**100**

Table 14: Roman cement mix quantified by period and type

	Area A				*Area B*				*Area C*				Total			
Phase	No	% Area A	Wt (g)	% Area A	No	% Area B	Wt (g)	% Area B	No	% Area C	Wt (g)	% Area C	No	% total	Wt(g)	% total
3	11	0.5	166	0.6	0	0	0	0	0	0	0	0	11	0.4	166	0.4
4	3	0.1	54	0.2	0	0	0	0	0	0	0	0	3	0.1	54	0.1
5	353	15.8	2,410	8.2	0	0	0	0	0	0	0	0	353	12.4	2,410	6
6	47	2.1	426	1.5	193	100	1,664	100	0	0	0	0	240	8.4	2,090	5.2
7	642	28.8	6,762	23.1	0	0	0	0	0	0	0	0	642	22.5	6,762	16.8
8	16	0.7	261	0.9	0	0	0	0	0	0	0	0	16	0.6	261	0.6
9	18	0.8	157	0.5	0	0	0	0	0	0	0	0	18	0.6	157	0.4
Total	1,090	48.8	10,236	34.9	193	32.3	1,664	16.4	0	0	0	0	1,283	45	11,900	29.6
10	31	1.4	1,247	4.3	8	1.3	252	2.3	2	9.1	2	0.3	41	1.4	1,501	3.7
11a	708	31.7	9,611	32.8	10	1.7	961	9.5	0	0	0	0	718	25.2	10,572	26.3
11b	249	11.2	2,666	9.1	340	57	5,862	57.9	0	0	0	0	589	20.6	8,528	21.2
Total	988	44.2	13,524	46.2	358	60	7,075	69.9	2	9.1	2	0.3	1,348	47.2	20,601	51.2
Other PR 12—21	153	6.9	5,514	18.8	46	7.7	1,386	13.7	20	90.9	769	99.7	219	7.7	7,669	19.1
Unphased	2	0.1	34	0.1	0	0	0	0	0	0	0	0	2	0.1	34	0.08
Unstratified	0	0	0	0	0	0	0	0	0	0	0	0	2	0.1	52	0.1
Total	2,233	100	29,308	100	597	100	10,125	100	22	100	771	100	2,854	100.1	40,256	100.08

Table 15: Roman cement mix quantified by Area and Phase

The upper layer (incomplete) is of type 3 cement mix, the middle layer (Th: 11 mm) of type 1 and the lower layer (Th: > 24 mm) of type 5. A possible surface fragment of type 2 cement mix (Th: 21 mm), is in fresh condition; another, smaller fragment of the same type, 2, is slightly abraded and crumbly. A surface/edge fragment of type 5 cement mix has probably been compressed and shaped by a walling block, to which it once adhered. A curved edge piece of type 2 cement mix was also recovered.

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North east area

(1076), a dump of red-brown sand, produced 16 indeterminate fragments/172 g. They comprise three fragments/78 g of type 7 *opus signinum* aggregate, including one burnt and partly vitrified fragment of ceramic building material, and 13 fragments/94 g of type 3 mortar/concrete. The latter fragments are all burnt and include three which are heavily burnt and fused together with fragments of ceramic building material, gravel and sand. They were originally interpreted as fragments of road surface, fused together by burning, and are comparable to the fragments of road surface (type 8 cement mix) from (1036) and Phase 7 (1012) (*see below*).

(1100), a greenish-grey, artefact-rich silt, the middle fill of cess pit (1078), produced nine indeterminate fragments/22 g. They comprise five fragments/17 g of type 6 mortar and four fragments/35 g of type 4 mortar. The latter is attached/fused to a core of lead waste and is vitrified and glassy in appearance. The red sand fill, (1077), which sealed cess pit (1078), produced two indeterminate fragments/5 g of type 4 mortar.

(1061), a deposit of red clay-silt, produced a single indeterminate fragment/ 8 g of *opus signinum* aggregate.

(1036), a rough metalled sand and sandstone surface, produced an abraded fragment/29 g of road surface (type 8 cement mix), composed of a partly vitrified and glassy fused mass of *opus signinum*-type mortar, indeterminate ceramic building material, sand, lime and gravel (*see also Phase 7 below*).

Fragments belonging to all the identified cement-mix types (1—10) were recovered from this phase. Type 6, at 32.9 % by weight of the Phase 5 assemblage, is the most common type, followed by types 2 (16.8 %) and 5 (14.6 %). Fragments with two or three layers (type 9), indicating at least two phases of construction and/or decoration, comprise 12.4 % of the assemblage. Smaller amounts of *opus signinum*-type cement mixes were recovered, with type 7 at 7.3 %, type 1 at 7.1 % and type 3 at 5.0 %. Type 4 produced just 2.4 % by weight of the assemblage; road surface fragments (type 8) 1.2 % and indeterminate cement mix types (type 10) just 0.3 %.

Cement mix from this phase was recovered from a limited range of features and deposits, comprising pit fills, layers, a road surface and a possible floor surface.

Phase 6: Amphitheatre 1b: Structural alterations

Phase 6 produced 240 fragments/2,090 g of cement mix (17.6 % by weight of the Roman phased assemblage) from Areas A and B, with the majority, by fragment count and weight coming from Area B, and with an average fragment weight of 8.7 g. All the cement mix recovered from Roman phases in Area B came from Phase 6. Forty-seven fragments/426 g were recovered from Area A and 193 fragments/1,664 g from Area B.

Area A

The outer wall and external stair

Fill (647) of pit (?post-hole) (648), near the external stairway built against the face of the outer wall, produced four indeterminate fragments/288 g. They comprise a single piece/1 g of type 2 cement mix and three fragments/287 g of type 5. One fragment bears the impression of walling blocks on opposing sides.

The timber-framed seating structure

The radial frames

Radial timber frame 7:
(471), the original fill that replaced the base-plate, produced four indeterminate fragments/38 g of type 5 cement mix; none of the fragments adjoin.

Radial timber frame 12:
(976), fill of cut (936), produced three fragments/11 g, comprising two indeterminate fragments/10 g of type 5 cement mix and a ?surface fragment/1 g of type 4.

Radial timber frame 13:
The cast of an upright beam, (942), produced 12 fragments/3 g of cement mix types 1 and 4.

Radial timber frame 14:
(1022), the cast of an upright timber, produced 16 adjoining fragments/43 g of type 4 cement mix.

Radial timber frame 15:
(1121), a sandy silt which replaced the beam, produced four fragments/13 g, comprising two fragments/8 g of type 2, one piece/1 g of type 3 and a single fragment/4g of type 6 cement mix.

Deposits placed around the timber framework

(886), a layer of re-deposited turf, produced four indeterminate fragments/30 g, comprising three fragments/9 g of type 2 cement mix and a single piece/21 g of type 1.

Area B

Seating bank deposits

Thirty-one fragments/282 g of cement mix were recovered from (2612), a group number assigned to the seating bank deposits. Apart from four fragments/127 g of type 7 (*opus signinum* concrete aggregate), the remainder are from samples and all are indeterminate. They comprise a single fragment/1 g of type 1; 15 pieces/115 g of type 6; six fragments/21 g of type 2 and three fragments/18 g of type 3 cement mix.

The remaining cement mix came from the lower/earlier seating bank deposits in Area B, which comprise a sequence of sterile, coarse sands and artefact-rich dumps, the latter including (2461) and (2543). These were excavated in two blocks. The first block of deposits which yielded Roman cement mix produced the following sequence:

(2513) produced 49 fragments/366 g. All are indeterminate, apart from a surface fragment of type 9, which comprises two layers, one (Th: 12 mm) of type 2, the other (Th: >9 mm) of type 3 cement mix; and an edge fragment/20 g of type 2 cement mix. The latter is triangular in shape, presumably the result of compression by walling blocks. All the cement mix from (2513) came from samples. They comprise two fragments/50 g of type 5; eight fragments/19 g of type 3; 12 fragments/114 g of type 6 and 25 fragments/156 g of type 1 cement mix. (2499) produced six fragments/60 g, all but one piece/15 g of type 7 *opus signinum* concrete aggregate. They include a surface fragment/43 g of type 3 cement mix, three indeterminate fragments/1 g of type 1 and a single indeterminate fragment/1 g of type 4 cement mix. (2498) produced 28 fragments/379 g, all from samples, comprising five fragments/47 g of type 1; four fragments/8 g of type 2; 11 fragments/8 g of type 3; seven tiny pieces/2 g of type 6; and a single fragment/314 g of type 9. The latter has two layers, one of type 3, the other of type 6 cement mix. The second layer (type 6) forms an L-shape between broken straight-edged fragments of red sandstone — the scars of walling blocks which were once mortared together and then covered over with type 3 hydraulic concrete.

The second block of deposits produced the following sequence:

(2552), a seating bank layer of sand with lenses of silt, produced a single indeterminate fragment/15 g of type 7 *opus signinum* concrete aggregate. (2543), another artefact-rich dump of material, produced the largest group by weight from these deposits, comprising 41 fragments/401 g. Apart from three indeterminate fragments/11 g (two pieces/8 g of type 7 and a single piece/3 g of type 3 cement mix), which were hand-collected, the remainder was recovered from samples. They comprise two fragments/6 g of type 1; four pieces/5 g of type 2; three fragments/7 g of type 3; seven fragments/125 g of type 4; five pieces/7 g of type 5; 14 fragments/120 g of type 6, including one piece with a slightly dished surface, possibly caused by the impression of a walling block; a surface fragment (8 g) which is partly burnt/vitrified; two fragments/84 g of type 7; and a single piece/36 g of unknown cement mix type. (2461), a dump rich in artefacts, produced 18 fragments/99 g, comprising 16

fragments/52 g of type 2 cement mix, of which two adjoin; a single piece/30 g of type 6; and a single fragment/17 g of type 7 (*opus signinum* aggregate). (2450) produced 19 indeterminate fragments/62 g, all from samples, comprising 14 fragments/51 g of type 6, one of which is partly burnt; a single piece of type 2; and four fragments/3 g of type 4 cement mix.

Fragments belonging to cement mix types 1—7 and 9—10 were recovered from Phase 6. Type 5, at 26.4 % by weight of the Phase 6 assemblage, is the most common type, followed by type 6 (24.8 %). Fragments with two or three layers (type 9) comprise 15.6 % of the assemblage and *opus signinum* aggregate (type 7), 12.7 %. Smaller amounts of *opus signinum*-type cement mixes were recovered, with type 1 at 6.9 %, type 2 at 6.7 % and type 3 at 4.7 %. Type 4 produced just 0.3 % by weight of the assemblage and indeterminate cement mixes (type 10) just 1.8 %.

Cement mixes from this phase were recovered from contexts associated with the external stair and the timber-framed seating structure in Area A, but mainly from seating bank deposits in Area B. Here they were found in association with other building debris, old broken pottery and other rubbish, which was used for building up the *cavea*.

Phase 7: Deposits outside Amphitheatre 1b associated with its use

Phase 7 produced by far the largest assemblage of cement mix from the Roman phases with 642 fragments/6,762 g (50.0 % by fragment count and 56.8 % by weight of the Roman phased assemblage), with an average fragment weight of 10.5 g.

Road surface (1012) produced the largest group from this phase, comprising 160 fragments/2,750 g. Forms comprise 14 surface fragments, 75 fragments of road surface and 71 indeterminate pieces. One ?surface fragment/156 g is formed from a double layer of hydraulic cement mix. The upper layer (Th: 20 mm), is of type 2 cement mix, the lower layer (thickness incomplete) is of type 3. Another surface fragment/89 g also has a double layer of hydraulic cement mix. The upper layer (Th: 5 mm) is of type 3, the lower layer (Th: 23 mm) is of type 2 cement mix. Other surface fragments comprise a single fragment/100 g of type 2 cement mix; three adjoining fragments/46 g also of type 2 (including a burnt/sooted piece); and a group of eight surface and seven indeterminate fragments/89 g also of type 2 cement mix, eight of which are burnt/sooted. The latter group may have formed part of the Roman road surface, as they are very similar to the 75 fragments/1,046 g of type 3 cement mix which did form part of the metalled surface. All 75 fragments are burnt and partly vitrified, causing them to have become fused to other components of the surface metalling, which includes pieces of red sandstone, small-medium rounded pebbles, small-medium fragments of indeterminate ceramic building material and rare fragments of plaster. Nineteen indeterminate fragments/196 g of type 3 *opus signinum* concrete include eleven partly burnt/sooted pieces. The remaining 45 fragments/848 g, comprise fragments of *opus signinum* aggregate (type 7 cement mix). Could this area of burning possibly indicate where a portable oven may have been placed?

Road surface (1088) produced four surface fragments/227 g of type 5 cement mix. Only two of the fragments adjoin but all were probably originally from the same piece. Road surface (1028) produced two indeterminate fragments/5 g of type 1 cement mix.

South and west of the *vomitorium*

(1056), a deposit of sand pre-dating the creation of the road (557), produced three fragments/48 g, comprising a surface fragment/22 g of type 3 cement mix, with impressions of rough walling blocks on each surface; and two indeterminate fragments/26 g of *opus signinum* aggregate. Road surface (557) produced a ?surface fragment/2 g of type 3 cement mix. A widespread dump of sandy silt, (899), which sealed the edge of the road, produced 18 indeterminate fragments/99 g. They comprise 13 fragments/90 g of type 7 *opus signinum* aggregate, a single fragment/3 g of type 5 and four fragments/6 g of type 3 cement mix.

Fill (969) of post-hole (968) produced two surface fragments/29 g. The fragments do not adjoin but are probably from the same piece. A small dump of sand (855) produced a single indeterminate fragment/3 g of type 4 cement mix.

(556), a widespread deposit of fine laminated sands around the outer wall of the amphitheatre, produced four indeterminate fragments/23 g, one of type 1 and three fragments/9 g of type 3 cement mix. Above this, (798), a widespread dump of sand against the outer wall of the amphitheatre, produced a single fragment/40 g of type 3 cement mix. It has a thickness of 16 mm and two surfaces, from the impressions of two walling blocks which had been cemented together. Sand layer (786), spread between the two outer amphitheatre walls, produced eight indeterminate fragments/4 g of type 4 cement mix. Sand layer (770) produced 24 tiny indeterminate fragments/3 g of type 5 cement mix. (839), a deposit of clay against the outer wall of the amphitheatre, produced three indeterminate fragments/15 g, comprising two adjoining fragments/8 g of type 6 cement mix and one fragment/7 g of type 5. (841), another deposit of clay against the outer wall of the amphitheatre, produced 26 indeterminate fragments/92 g of type 5 cement mix, including two adjoining fragments. A possible occupation surface (796) produced two fragments/16 g. They comprise a single indeterminate fragment/3 g of type 5 cement mix and a possible floor surface fragment/13 g comprising two layers of hydraulic concrete. The upper layer (Th: 8 mm) is of type 3, the lower layer (Th: >7 mm) is of type 2 cement mix.

The cobbled surface (707) produced 39 indeterminate fragments/12 g, the majority (37 fragments/10 g) of type 5 cement mix; a single piece/1 g of type 1 and another fragment/1 g of unknown cement-mix type. Surface (697) produced three indeterminate fragments/82 g of *opus signinum* aggregate (type 7 cement mix). South of the external stair, possible surface (745) produced three indeterminate fragments/45 g of *opus signinum* aggregate. (555), a substantial deposit of sand which sealed all the deposits outside the wall of Amphitheatre 1b, produced >92 fragments/308 g; >70 fragments/57 g came from samples, the remaining >22/251 g were hand-collected. Identifiable pieces comprise an hydraulic concrete ?floor surface

fragment/147 g, of type 2 cement mix (Th: 28 mm); and a ?surface fragment of type 3 cement mix/4 g. Indeterminate fragments comprise three/1 g of type 1; four adjoining pieces/12 g of type 2; a single piece/1 g of type 4; 66 fragments/45 g of type 5; 16 pieces/88 g of *opus signinum* aggregate; and an unknown quantity/8 g of tiny fragments of unknown cement mix type. A small patch of sand, (717), produced two indeterminate fragments/9 g of *opus signinum* aggregate. Gravel surface (716) yielded 17 indeterminate fragments/29 g, comprising a single fragment/1 g of type 2 cement mix; four pieces/2 g of type 4; six pieces/6 g of type 5; four fragments/5 g of *opus signinum* aggregate (type 7); one piece/4 g of type 3 hydraulic cement mix; and one fragment/1 g of unknown type.

North and east of the *vomitorium*

Metalled surface (1036) produced a single indeterminate fragment/2 g of type 3 cement mix. A deposit of clay, (830), against the south side of the roadside kerb, produced a possible corner/edge fragment/106 g of type 3 cement mix, with impressions of ?walling blocks forming two opposing surfaces.

Dump deposits and temporary structures

Sand deposit (832) produced 25 indeterminate fragments/10 g of type 5 cement mix, as well as three fragments/2 g of type 1 and three pieces/1 g of type 3. Coarse orange sand (951) produced three indeterminate fragments/27 g of type 5 cement mix. Below (951), a thick deposit of mortar (963), probably a floor surface, in the base of a four-sided structure (884) — possibly a stall/booth or other temporary structure, which butted the outer wall of Amphitheatre 1b, produced seven indeterminate fragments/2,006 g of type 5 cement mix. Although the fragments do not obviously adjoin, they are probably from the same piece. Part of a red sandstone ?walling block adheres to one surface. The mortar floor appears to have been set within a wattle framework, as evidenced by the presence of linear impressions within the surface, which had also been pierced by upright rods.

Sand deposit (673) produced 35 indeterminate fragments/162 g. They comprise 11 fragments/69 g of type 1 cement mix; nine fragments/21 g of type 2; one piece/2 g of type 4; 13 fragments/52 g of type 5 cement mix; and a single piece/18 g of *opus signinum* aggregate. Sand deposit (672) produced an indeterminate fragment/3 g of *opus signinum* aggregate. Sand deposit (669) produced a surface fragment/37 g (Th: 15 mm) of type 2 cement mix. Sand deposit (126) produced two adjoining fragments/412 g of an hydraulic concrete floor, laid down in three layers. The lower layer (incomplete thickness) is of type 3 cement mix, the upper and middle layers (both 20 mm thick) are of type 1. Sand deposit (130) produced three indeterminate fragments/2 g of type 1 cement mix. Sand deposit (131) produced two indeterminate fragments/4 g; one piece/3 g of type 4, the other/1 g of type 1 cement mix. Sand deposit (135) produced 16 indeterminate fragments/8 g, including 10 possible *arriccio* fragments/5 g of of type 4 cement mix.

The shrine

A thin band of hard compacted sand, (795), within the stone structure, produced 68 possible plaster *arriccio* fragments/50 g, of type 5 cement mix. (790), a similar deposit to (795), produced a possible *arriccio* fragment/11 g also of type 5 cement mix.

(755), a thick deposit of compact sand which raised the internal surface by 0.2 m, produced two indeterminate fragments/5 g: one piece/2 g of type 5 cement mix, the other/3 g of type 7.

Following its disuse, the collapse deposits within the shrine, (753) and (738), together produced 49 fragments/242 g, with the greatest quantity (45 fragments/225 g) coming from (753). Demolition deposit (753) produced 45 fragments/225 g. They include 37 probable *arriccio* fragments/49 g of type 5 cement mix, which are likely to be associated with the collapsed plaster from the shrine found with this deposit (53 fragments/135 g of *arriccio* only were also recovered from (753) (*see Roman plaster, 78*). A surface fragment with a slightly dished (concave) surface/109 g of type 3 cement mix was also recovered from (753), as well as five indeterminate fragments/54 g of type 7 and two indeterminate fragments/13 g of type 1 cement mix. Demolition deposit (738) produced four indeterminate fragments/17 g of *opus signinum* aggregate.

Dumping during and after the use of the shrine

Sand deposit (744) produced a single fragment/1 g of unknown cement-mix type. Fill (713) of refuse pit (714) produced nine indeterminate fragments/8 g, comprising eight fragments/6 g of type 4 and a single piece/2 g of type 5 cement mix.

Cement mix from this phase was recovered from a wide range of contexts, comprising layers, dumps and deposits, post-hole and pit fills, floor surfaces and road surfaces, the latter including areas of burning/vitrification. The cement mix from deposits associated with the shrine includes mainly *arriccio* fragments, which are presumably derived from the painted plaster which originally decorated the interior.

Period 4: The Second Roman Amphitheatre

Phase 8: Amphitheatre 2 construction

Phase 8 produced just 16 fragments/261 g of Roman cement mix (1.2 % by fragment count and 2.2 % by weight of the Roman phased assemblage), with an average fragment weight of 16.3 g.

The outer wall

Clay bonding to the foundations of the outer wall of Amphitheatre 2, (1220), produced three fragments/215 g of type 1 hydraulic concrete. Although the fragments do not adjoin, they are probably from the same piece.

The following fills of the foundation trench for the outer wall of Amphitheatre 2 produced fragments of Roman cement mix: (653) yielded a single fragment/4 g of *opus signinum* aggregate; (686) produced a single fragment/12 g of type 3 hydraulic concrete and (651) yielded a single fragment/2 g of *opus signinum* aggregate.

A deposit of red sandstone chippings, (685), yielded a further three fragments/10 g of *opus signinum* aggregate (type 7). A similar deposit, (692), also produced two fragments/7 g of type 7 cement mix.

(678), the primary fill of the linear construction trench for the eastern side wall of the *vomitorium*, Entrance 11, produced four fragments/3 g: two pieces/2 g of type 1 and 23 tiny fragments/1 g of type 5 cement mix. (601), the upper fill of this trench, produced a single fragment/8 g of *opus signinum* aggregate.

The cement mix from this phase was recovered from the bonding layers for the foundation courses of the outer wall of Amphitheatre 2, as well as from the packing for the construction trenches of both the outer wall of the amphitheatre and the *vomitorium*, Entrance 11.

Phase 9: Amphitheatre 2, use

Phase 9 produced just 18 fragments/157 g of Roman cement mix (1.4 % by fragment count/1.3 % by weight of the Roman phased assemblage), with an average fragment weight of 8.7 g.

The exterior

A series of road surfaces and makeup layers outside the outer wall of Amphitheatre 2 produced fragments of Roman cement mix. The best-preserved sequence lay between entrances 11 and 12:

Levelling deposit for the first road surface, (998) produced a single indeterminate fragment/14 g of *opus signinum* aggregate.

Levelling deposit for a resurfacing of the original road, (972), produced three fragments/30 g of *opus signinum* aggregate.

A third relaying produced five fragments/55 g of *opus signinum* aggregate from surface (983).

A fourth and final resurfacing produced cement mix from makeup layer (874) = (970): (874) yielded five fragments/27 g, comprising a single piece/2 g of type 3 cement mix and four fragments/25 g of *opus signinum* aggregate. (970) produced two fragments/13 g of *opus signinum* aggregate.

A layer of sandy silt, (896), produced a single fragment/15 g of type 5 cement mix.

The cement mix from this phase was used almost exclusively as rubble for road construction.

Periods 5—6: Amphitheatre 2 change of use and robbing

Phase 10: Amphitheatre 2 change of use

Phase 10 produced 41 fragments/1,501 g of Roman cement mix, comprising 1.4 % by count and 3.7 % by weight of the total assemblage. Cement mix was recovered from all three Areas. Thirty-one fragments/1,247 g, with an average fragment weight of 40.2 g, came from Area A; eight fragments/252 g, with an average fragment weight of 31.5 g, were recovered from Area B; and just two fragments/2 g, with an average fragment weight of 1 g, were retrieved from Area C. The majority was hand-collected, with just seven fragments/14 g recovered from samples in Area A, and a single fragment/1 g from samples in Area C.

Area A

(892), the bottom fill of the late Roman trench cut around the outer wall of the amphitheatre, yielded four fragments/4 g of Roman cement mix, comprising two indeterminate fragments of type 4 and two surface fragments/3 g of type 1, possibly from an hydraulic concrete floor. The main fill of this trench produced a total of 20 fragments/1,229 g from (802) = (852) = (891), with most (16 fragments/1,215 g) from (852). Sixteen surface fragments were recovered: (852) produced ten adjoining pieces of a pink/orange *opus signinum* floor surface in type 3 cement mix (Th: 58 mm) and four adjoining pieces of a white *opus signinum* ?floor surface in type 1 cement mix (Th: >80 mm). (891) produced a single surface fragment/1 g of type 1 cement mix and (802) a single ?surface piece/2 g of type 5 cement mix. Four indeterminate fragments/56 g were also recovered, comprising two pieces of *opus signinum* aggregate/45 g from (852) and two pieces/11 g of type 4 cement mix from (891).

Fill (858) of cut (860), made through the build-up of road surfaces in front of the gate at the *vomitorium*, Entrance 11, produced seven indeterminate fragments/14 g of type 5 cement mix.

Area B

Makeup deposit (2611) yielded seven fragments/236 g of *opus signinum* aggregate. Layer (2457) produced just one piece/16 g, also of type 7 cement mix.

Area C

Sub-phase 10 a

Fill (3148) of large post-hole (3147) produced a single fragment/1 g of type 6 cement mix.

Sub-phase 10d

Middle fill (3164) of pit (3122/3171) also yielded a single fragment/1 g of type 3 hydraulic cement mix.

The cement mix from this phase was recovered from a limited range of contexts, comprising trench fills, post-hole and pit fills and a makeup deposit.

Phase 11a: Robbing of internal walls

Sub-phase 11a produced 718 fragments/10,572 g of Roman cement mix from Areas A and B, comprising the largest group in terms of both count (25.2 %) and weight (26.3 %) of the total site assemblage (*see Table 15*). The majority, comprising 708 fragments/9,611 g, with an average fragment weight of 13.6 g, was recovered from Area A; Area B produced just 10 fragments/961 g with an average fragment weight of 96.1 g. The assemblage from Area B was entirely hand-collected, whereas 63.5 % by weight of the assemblage from Area A was recovered from samples, resulting in a divergence of average fragment weights between the two trenches.

Area A

Fill (440) of the robber trench of the outer wall of Amphitheatre 1b, (417), produced 142 fragments/1,657 g of type 5 cement mix. Fill (315) of the east-west robber trench (316), which cuts through (417) at its western end, produced two fragments/6 g of *opus signinum* aggregate.

Fill (595) of robber trench (597) for the northern wall of the *vomitorium*, Entrance 11, yielded 239 fragments/1,080 g of Roman cement mix, comprising 14 fragments/9g of type 4, eight fragments/23 g of type 2, a single piece/5 g of unknown type and 216 fragments/1,043 g of type 5 cement mix. Some fragments of the latter are attached to pieces of red sandstone, presumably fragments of detached walling blocks originally cemented together using a grey/brown sandy mortar containing common sand, regular gravel, occasional-regular lime and voids and rare impressions of hay/straw. One piece has a large cobble (L: 86 mm) as aggregate. Fill (596) of robber trench (597) produced 69 fragments/392 g of type 5 cement mix. Fill (708) of robber trench (195) yielded just three fragments/50 g of cement mix, comprising two pieces/44 g of type 5 cement mix and a single fragment/6 g of *opus signinum* aggregate.

Fill (307) of the robber trench of the inner end of the *vomitorium* wall (196), produced a single floor surface fragment/5 g of type 2 *opus signinum* concrete (Th: 12 mm). Fill (308) yielded 52 fragments/1,339 g, comprising two pieces/36 g of *opus signinum* aggregate and 50 fragments/1,303 g of type 5 cement mix. There are 21 surface fragments/215 g, including three with slight ridging on opposing surfaces and a maximum thickness of 20 mm. The ridging is presumably the impression of stone walling blocks, which were originally cemented into position. A large piece of floor surface/832 g (Th: 35 mm) was also recovered from (308), along with a smaller

piece/125 g (Th; 23 mm). Fill (309) produced just two fragments/85 g, one of type 5 cement mix; the other a piece of *opus signinum* aggregate/9 g.

One of the earliest fills, (492), in the arm of the cruciform robber trench (245), yielded two adjoining surface fragments/496 g of type 5 cement mix, which bear the flat angled impression of a ?walling block. Subsequent fill (457) produced 26 fragments/213 g, comprising a ?floor surface fragment/39 g (Th: 25 mm), together with an indeterminate piece/3 g, both of type 1 cement mix, and 24 fragments/171 g of type 5 cement mix. Forms include two surface fragments: one (weighing 55 g) bears the impressions of the ?walling to which the mortar originally adhered, the other has four parallel ridges (?wattle impressions) along the length of one surface, and is possibly comparable to the mortar ?floor (963) from Phase 7. The fill of the inner arm of the cross (442) produced 28 fragments/217 g of type 5 cement mix.

Roman cement mix was also recovered from fills of the arm of the trench which robbed the *vomitorium* wall up to the face of the outer wall. Deposit (322), which filled the crossing point of the two robber trenches, yielded just two floor surface fragments/223 g of type 5 cement mix. One piece has a thickness of 28 mm, the other of 31 mm. Above this, deposits (244), (517) and (1047), in the centre of the cruciform robber trench, also produced Roman cement mix. (244) yielded 16 fragments/3,546 g. Diagnostic pieces comprise a floor surface fragment/59 g of type 1 cement mix (Th: >44 mm) and two shaped pieces of type 5 cement mix: one piece has two curved surfaces; the other has one flat and one angled surface. Most of the indeterminate fragments are of type 5 cement mix, apart from one piece/31 g of type 2 *opus signinum* concrete and another/62 g of type 4 sandy mortar. Tiny fragments of indeterminate cement mix type weighing just 4 g were recovered from (517). (1047) produced three fragments/155 g, comprising one piece/30 g of type 3, one/110 g of type 6 and another/15 g of type 2 cement mix.

Area B

(2466), the deposit which sealed the fills of the robber trench for the outer wall of Amphitheatre 1b, produced two *opus signinum* aggregate fragments/94 g.

Middle fill (2494) of the robber trench (2443) of the *vomitorium* wall, Entrance 10, produced eight fragments/867 g of Roman cement mix, comprising two pieces/624 g of type 6 and eight fragments/337 g of type 4. Diagnostic pieces comprise a surface fragment/10 g and three edge fragments/227 g of type 4 cement mix. Each piece has two flattish surfaces and a smooth angled edge with a thickness varying from 15—25 mm.

The cement mix from this phase was recovered from robber trench fills. Cement mix types 1—7 and 10 were retrieved from Areas A and B in sub-phase 11a, with type 5 the most common of the mixes at 77.4 % by weight of the Phase 11a assemblage. Type 4 is the next most common cement mix at 12.2 %, followed by type 6 at 7.6 %. *Opus signinum*-type cement mixes (types 1, 2 and 3) are the least common, at 1.4%, 0.7 %

and 0.3 % respectively. The frequency of type 5, a pale grey/brown sandy mortar, fragments of which sometimes bear the impressions of walling blocks and occasional red sandstone breakage scars, strongly suggest that this particular mix derives from the construction of the outer wall of Amphitheatre 1b, and presumably was used to cement together the red sandstone walling blocks.

Phase 11b: Robbing of external walls

Sub-phase 11 b produced 589 fragments/8,528 g of Roman cement mix from Areas A and B, The majority, by both fragment count and weight, comprising 340 fragments/5,862 g, was recovered from Area B, with an average fragment weight of 17.2 g. Area A produced 249 fragments/2,666 g, with an average fragment weight of 10.7 g. In Area A, 54.5 % by weight of the sub-phase total was hand-collected, 45.5 % was recovered from samples. In Area B, 87.7 % by weight was hand-collected, with just 12.3 % from samples. Despite this, however, there is little difference in average fragment weights between the two areas.

Area A

(411), lower fill of robber trench (245), yielded three fragments/280 g of Roman cement mix. Diagnostic pieces comprise a surface fragment/217 g of type 5 cement mix with a long ?stalk impression on the surface; a possible floor surface fragment/22 g of hydraulic concrete (type 3 cement mix) with a thickness of 18 mm; and a shaped edge or corner piece of type 5 cement mix. Fill, (525), of robber trench (245), produced just two fragments/5 g of *opus signinum* aggregate. Two other fragments/203 g came from fill (623), comprising a surface/edge fragment/32 g (Th: 20 mm) of type 2 cement mix and a large piece of *opus signinum* aggregate (23 g).

Roman cement mix was recovered from (764) and (769), layers of demolition debris from robbing the upper parts of the outer wall of Amphitheatre 2. A surface or edge fragment/171 g of type 5 cement mix was recovered from (764). (769) produced five pieces/25 g, comprising a floor edge/surface fragment/8 g and three indeterminate adjoining pieces/3 g of type 2 hydraulic cement mix.

Fragments of Roman cement mix were retrieved from the general detritus of crushed and broken stone and mortar in the backfill deposits of the robber trenches for the outer wall of Amphitheatre 2: (369), (506), (508), (575), (618), (619), (391), (446) and (765). (369) produced 95 indeterminate fragments/493 g comprising 16 pieces/17 g of type 4 cement mix, 77 fragments/467 g of type 5, and two pieces/9 g of *opus signinum* aggregate. (506) yielded four fragments/60 g of hydraulic concrete of type 1 cement mix, one piece of which is burnt/blackened. (508) produced a ?surface fragment/43 g of type 2 cement mix, with a loose, light texture. Four pieces/746 g of type 6 cement mix came from (575), including a large corner/edge piece/698 g, which bears the impressions of masonry walling blocks to which the mortar originally adhered, including several attached red sandstone fragments with breakage scars. (618) yielded 19 fragments/112 g, all of type 5 cement mix apart from a single piece/4 g of type 2 hydraulic mortar. (619) produced a single fragment/13 g of *opus signinum*

aggregate. Ten indeterminate fragments/623 g of type 5 cement mix were recovered from (391). (446) yielded a single indeterminate piece/2 g of type 5 cement mix and (765) produced four fragments/38 g of *opus signinum* aggregate.

Area B

The robber trench, (2460), which followed the outer wall of Amphitheatre 2, yielded fragments of Roman cement mix. Primary fill, (2503), produced a single piece/118 g of type 6 cement mix. This deposit contained fragments of red sandstone and lime mortar, which may indicate cleaning of freshly robbed stone blocks close to the trench edge. Three fragments/994 g, all of type 6 cement mix, came from lower fill (2493). They include an edge/surface fragment/750 g in a thick truncated 'L' shape, with impressions of stone walling blocks and attached fragments of red sandstone with breakage scars.

(2491), the primary fill of robber trench (2591), which followed the line of the Roman road running parallel to the outer wall of Amphitheatre 2, produced 19 fragments/447 g of Roman cement mix. These comprise a single piece/11 g of *opus signinum* aggregate and 18 fragments/436 g of type 6 cement mix. Two edge pieces were recovered: one in the form of a truncated 'L' shape, the other in the form of an irregular 'T' shape, both caused by the impressions of walling blocks. Nine fragments/211 g were also recovered from the upper fill (2473) of this trench, all of type 6 cement mix. They include a surface fragment/77 g, which bears the impressions of walling blocks.

Roman cement mix was also retrieved from fills of robber trench (2545)/(2567)/(2464), which followed a substantial east-west aligned wall at the southern side of the east entrance. Primary fills (2569), (2546) and (2579) together yielded 165 fragments/539 g, with the majority (160 fragments/402 g) from (2579). The latter are of type 6 cement mix. A tiny surface fragment/1 g of type 3 mix came from (2569); (2546) produced four fragments/136 g of *opus signinum* concrete in type 1 cement mix. On the south side of the robber trench, sandy fills (2565) and (2563), which may have derived from the adjacent *in situ* Roman seating bank material and which may represent trench collapse in antiquity, also produced fragments of Roman cement mix. (2565) yielded 23 fragments/29 g, all but one piece/1 g (which is of type 3) of type 6 cement mix. A single piece/59 g of type 3 mix was recovered from (2563). Layer (2562), which sealed these collapse deposits, produced 85 fragments/217 g, comprising two pieces/4 g of type 3 cement mix and 83 fragments/213 g of type 6. Some of the latter pieces have attached red sandstone fragments with breakage scars. Above this, (2558), a layer rich in small fragments of red sandstone and lime mortar, yielded eight fragments/1,557 g of Roman cement mix. These comprise six adjoining fragments of type 1 concrete/197 g and two pieces/1,380 g of type 6 cement mix. As with (2503), the fill included some fragments of red sandstone with lime mortar adhering to them, possibly indicating the cleaning of freshly robbed stone blocks close to the trench edge.

The cement mix from this phase was recovered from robber trench fills and layers of demolition debris. Cement mix types 1—7 were recovered from Areas A and B in

Phase 11b, with type 6 by far the most common of the mixes, comprising 70.1 % by weight of the Phase 11b assemblage. Area B produced a much greater quantity of type 6 cement mix than Area A, with 98.7 % by fragment count and 87.6 % by weight of the type 6 total. Type 5 accounts for the second largest group, at 19.1 % by weight, although all of it was recovered from Area A. *Opus signinum*-type mixes are far less common, with types 1—3 in combination comprising just 5.5 % by weight of the total from this phase. The abundance of type 6, a pale pink/brown sandy mortar, fragments of which sometimes bear the impressions of walling blocks and occasional red sandstone breakage scars, strongly suggest that this particular mix derives from the construction of the outer wall of Amphitheatre 2.

The cement mix assemblages from Phases 11a and 11b indicate that whereas type 5, a pale grey/brown sandy mortar, appears to have been the main cement mix used in the construction of the outer wall of Amphitheatre 1b, type 6, a pale pink/brown sandy mortar, seems to have been the main type of cement mix used in the construction of the outer wall of Amphitheatre 2.

Periods 7—8: Post Roman Phases 12—21—

Post-Roman phases 12—21 produced a total of 219 fragments/7,669 g (7.7 % by count/19.1 % by weight of the total assemblage) of Roman and probable Roman cement mix, with an average fragment weight of 35.0 g. Of this total, the majority of fragments by both count (69.9 %) and weight (71.9 %) of the total recovered from these phases came from Area A. 21.0 % by count and 18.1 % by weight occurred residually in Area B with 9.1 % by fragment count and 10.0 % by weight from Area C. Most of the assemblage from Phases 12—21 comprises indeterminate fragments: 203/4,751 g. Diagnostic fragments comprise corner, surface and floor surface pieces

Area A

The cement mix assemblage from Area A includes eight floor surface fragments/2,216 g from six contexts. They include two fragments/1,143 g from (46) and two pieces/779 g from (95), of type 3 hydraulic cement mix. All four fragments have a thin patchy deposit of white lime on the upper surface, which is thicker in some places (max Th: 15 mm). This may indicate that the floor surface from which they originate was used for the mixing/manufacture of quicklime or fine plaster. One fragment, from (431), is composed of three layers. The upper and lower layers are of type 1 hydraulic concrete, the middle layer is of type 3 hydraulic concrete. *Opus signinum* concrete floor fragments were also recovered from (218) (type 3 cement mix).

Four surface fragments/308 g were recovered from Area A. One fragment of type 3 hydraulic cement mix, from (460), has slight ridging on the surface — presumably the impression of the flooring/walling to which the cement mix originally adhered.

Area B

Diagnostic fragments of Roman cement mix from Area B (46 fragments/1,386 g) comprise two corner pieces/270 g from (2449) of type 3 hydraulic cement mix. The fragments do not adjoin but are probably from the same piece.

The only other diagnostic piece comprises a surface fragment/24 g from (2136) of type 2 cement mix, which bears the impression of walling blocks on the opposite side to the smooth, slightly concave surface.

Area C

Two surface fragments/100 g of type 4 cement mix were recovered from (3024). The fragments do not adjoin but are probably from the same piece.

Cement mix types 1—7 and 9—10 were recovered from Areas A, B and C in post-Roman phases 12—21, with type 3 the most common by weight (35.6 %), followed by type 5 (28.0 %) and type 7 (15.7 %). Type 1 comprises 8.7 % by weight of the total; type 6: 5.2 %; type 2: 3.5 %; type 9: 2.6 %; type 4: 0.7 %; and type 10 just 0.01 %. The major difference with the assemblages from both the Roman phases, 3—9, and the change of use and wall-robbing phases, 10—11b, is the predominance of *opus signinum*-type mortars and concretes, particularly type 3. *Opus signinum* aggregate fragments (type 7) are also relatively common from Phases 12—21. Of the sandy cement mixes, although type 5, which appears to be associated with the construction of Amphitheatre 1b, is well represented, type 6, which particularly dominates the Phase 11b assemblage and which appears to be associated with the construction of Amphitheatre 2, is relatively rare in Phases 12—21.

Unphased

Unphased contexts in Area A: (297) and (412) produced a total of two fragments/34 g, one of type 7 *opus signinum* aggregate, the other of type 1 concrete (hydraulic cement mix).

Unstratified

Two fragments of *opus signinum* aggregate/52 g were found unstratified.

Discussion

Cement mix was recovered from Areas A, B and C and was also found unstratified. The assemblage from Roman phases was recovered from Areas A and B only, with Phase 6 the only Roman phase to have produced cement mix in Area B. In Area A, it was recovered from all seven Roman phases (3—9), with most (16.8 % by weight of the total assemblage) from Phase 7. The assemblage from Phases 10—11b was retrieved from Areas A, B and C but in Area C it was recovered only from Phase 10. Post-Roman phases 12—21 yielded Roman cement mix from all three trenches.

As a whole, the assemblage is fairly fragmented, with a high proportion of indeterminate fragments (64.0 % by weight of the total assemblage) and a low average fragment weight of 14.1 g. Of the diagnostic pieces, surface fragments form the largest component by weight (14.2 % of the assemblage), followed by floor surface fragments (10.1 %) and shaped pieces (5.2 %). Small amounts of edge and corner pieces were also recovered (*see Table 13*).

A wide range of concretes and mortars was recovered from the site. Different cement mixes were used for different building purposes, e.g. concrete with a coarse aggregate was generally used for floors; mortar with a fine aggregate was commonly used for rendering or plastering walls. The variations may also indicate different building phases. Slight variations in cement mixes also occurred because various batches would have been prepared and used during the building process (O 'Hare 1995, 6).

Cement mix was recovered from a range of contexts. In Roman phases (3—9), it came from occupation deposits and surfaces, layers, dumps of material, seating-bank deposits, fills of pits, post-holes, foundation trenches and other features, levelling deposits, road surfaces and make-up layers. In Phases 10—11b, cement mix was retrieved from layers of demolition debris, post-hole, pit and trench fills, robber-trench fills and deposits.

Summary

There is little evidence from other British amphitheatres for the types of cement mixes used in their construction, often because it did not survive *in situ*. At Silchester, for example, crushed tile may have been mixed with the mortar used to build the arena wall, but the mortar did not survive, except for small patches in both recesses (Fulford 1989, 37). Although no mortar was found in the matrix of the amphitheatre wall, it is unlikely that no lime was used as a binder. It is possible that the mortar was defective and may have been mixed with clay to bulk it out; the lime may then have leached out, leaving no trace behind (*ibid* 171—2). At Chichester, the arena wall had been robbed of its stone, leaving the remaining 'yellowish-grey mortar' to collapse and fall forward onto the arena floor (White 1936, 152). In London, *opus signinum* and *opus signinum*-like mortars were used as arena floor surfaces, in both the timber and masonry amphitheatres, as rendering on the arena wall, and as flooring in side chamber B of the eastern entrance. The walls of the Period 6 eastern entrance were also rebuilt on a foundation of mortar and reused tiles (Bateman, Cowan & Wroe-Brown 2008, 33—4, 37, 59—60, 62, 73 and 104). At Caerleon, the Period I external wall had a core of roughly coursed rubble, heavily mortared with a dark, sandy, white-speckled mortar, and the arena wall was covered in a thick rendering of hard, smooth, waterproof 'brick-mortar' (Wheeler & Wheeler 1928, 115 and 118; Boon 1972, 93). The extensive reconstruction work of Period III at Caerleon was characterised by the use of a hard white mortar, which was quite distinct from the brown sandy mortars used in the earlier phases (Wheeler & Wheeler 1928, 121). A 'hard pink cement' was also used to render the risers of the steps in Entrance C at this time (*ibid*, 130). A mason's iron trowel, which may have been used during the construction of the amphitheatre, was found in 'layer 7', a deposit which partially overlay the Period III steps, built against the outside of the outer wall (*ibid*, 130, 131, fig 7 and 171, fig 16.53). It is comparable to the example recovered from Chester in 1960 (*see below*).

From previous excavations at Chester amphitheatre, it is known that different cement mixes were used in the construction of the amphitheatre and that a 'mason's mixing-floor' and 'unmistakeable traces of the builders' working platforms' were also uncovered (Newstead & Droop 1932, 12, 18—19). The excavators identified three distinct kinds of mortar in the construction of the arena wall and microscopic examination of samples retrieved from the wall reveal that type 6 cement mix was used in the lower courses and type 4 in the upper courses (*see Appendix 3, 143*). The cement mix assemblages from Phases 11a and 11b also suggest that type 5 cement mix was the main mortar used in the construction of the outer wall of Amphitheatre 1b, with type 6 the main cement mix used in the construction of the outer wall of Amphitheatre 2. Excavations to the south of Dee House in 2001 revealed part of the outer wall of Amphitheatre 2, comprising dressed sandstone blocks bonded in a pink-white lime mortar, with a sandstone rubble core bonded in an identical mortar (Garner 2001, 9). This presumably equates to the pale pink-brown sandy mortar (type 6) which appears to have been used elsewhere in the construction of the outer wall of Amphitheatre 2 (*see Appendix 3, 144-5*). It is likely that the fragments of *opus signinum* and other hydraulic mortars would have originated from structures that required water-resistant walls and flooring, such as the legionary *thermae*, and would therefore have arrived at the site along with other demolition debris and general rubbish from buildings elsewhere in the fortress and/or surrounding *canabae*.

ANALYSIS OF ROMAN EARTH MIX (DAUB)

Introduction

Methodology

The earth mix (hereafter referred to as 'daub') was analysed in terms of quantity, fabric, range and variety, condition and provenance. All fragments were examined microscopically at x 20 magnification in order to determine the binders, aggregates and reinforcements used in their composition.

The assemblage was quantified by fragment count and weight (in grammes) and measurements (in mm) were taken of any complete dimensions. Small find numbers were assigned to fragments exhibiting unusual markings and atypical or unusual features.

Quantity

The site produced a total assemblage of 2,069 fragments of Roman daub weighing 9,233 g, with an average fragment weight of 4.5 g (*Table 16*). Just 13.9 % by weight of the assemblage was hand-collected, 86.1 % came from sample residues. The average fragment weight of the hand-collected assemblage is 21.5 g; that from sample residues is just 4.0 g.

Area A produced the largest assemblage by weight (55.6 %) of the total. Area B produced 44.2 % by weight of the total and Area C just 0.2 % by both fragment count and weight.

Area	No frags	% no	Wt (g)	% wt	Av frag wt (g)
A	867	41.9	5,131	55.6	5.9
B	1,198	57.9	4,083	44.2	3.4
C	4	0.2	19	0.2	4.75
Total	2,069	100	9,233	100	4.5

Table 16: Roman daub quantified by Area

Roman phases produced 1,333 fragments of daub with a weight of 6,530 g (64.4 % by fragment count and 70.7 % by weight of the total assemblage); with an average fragment weight of 4.9 g. Post-Roman phases produced 35.5 % by fragment count (735 fragments) and 29.1 % by weight (2,685 g) of the total, with an average fragment weight of 3.7 g. A single fragment/18 g (0.1 % by count and 0.2 % by weight) was unstratified.

The daub recovered from Roman phases is only slightly less broken than that from post-Roman contexts. A comparison of the average fragment weights of the hand-collected daub from Roman (22.2 g) and post-Roman (20.9 g) contexts reinforces this observation. The average fragment weight of daub recovered from sample residues shows a similar slight difference (Roman contexts: 4.6 g; post-Roman contexts: 2.8 g).

In terms of weight, a higher proportion of the assemblage (55.6 %) was retrieved from Area A, with 44.2 % from Area B and just 0.2 % from Area C. The daub from Area C (with an average fragment weight of 4.75 g) is slightly more broken than that from Area A (which has an average fragment weight of 5.9 g). The cement mix from Area B (with an average fragment weight of just 3.4 g) is the most fragmented group.

When a comparison is made of the average fragment weights of hand-collected daub only (Area A: 20.3 g; Area B: 25.6 g; Area C: 4.0 g), it is clear that the daub from Area A is slightly more broken than that from Area B but that the daub from Area C is much more fragmented than either.

17.0 % by weight of the Area A assemblage was hand-collected, 83.0 % by weight came from sample residues. In Area B, just 1.3 % of the assemblage was hand-collected, 98.7 % was recovered from samples. In Area C, 25.0 % of the assemblage was hand-collected, 75.0 % came from sample residues.

In terms of weight, most of the Roman phased assemblage (65.3 % by weight) came from Area B, with 56.4 % by weight from Area A. None was recovered from Area C. The daub from Area B (average fragment weight: 4.4 g) is slightly more broken than that from Area A (average fragment weight: 5.4 g). In Area A, just 9.9 % by weight of the assemblage from Roman phases was hand-collected, 90.1% came from sample residues. In Area B, just 6.7 % by weight was hand-collected, 93.3 % was recovered from samples.

In terms of weight, most of the Roman daub from post-Roman phases came from Area A (53.5 % by weight of the post-Roman assemblage), with 45.8 % from Area B and just 0.7 % from Area C. The daub from Area C (average fragment weight: 4.75 g) is less broken than that from Area B (average fragment weight: 2.3 g). The daub from Area A (average fragment

weight: 7.9 g) is the least broken. In Area A, 35.3 % by weight of the residual assemblage was hand-collected, 64.7 % was recovered from sample residues. In Area B, just 17.5 % by weight was hand-collected and 82.5 % came from samples. In Area C, 21.1 % by weight was hand-collected, 78.9 % came from sample residues.

Form	No frags	% no	Wt (g)	% wt
Corner	4	0.2	157	1.7
Corner/edge	4	0.2	62	0.7
Edge	14	0.7	203	2.2
Edge/rim	4	0.2	83	0.9
Edge/wall	5	0.2	59	0.6
Wall	65	3.1	1,005	10.9
Surface	233	11.3	1,818	19.7
Indeterminate	1,740	84.1	5,846	63.3
Total	2,069	100	9,233	100

Table 17: Roman daub quantified by form

Range and variety

Few diagnostic fragments were recovered and indeterminate featureless fragments (1,740 weighing 5,846 g), comprising 63.3 % by weight of the total assemblage, predominate. The forms identified are summarised in Table 17.

Thirteen fabrics were identified, based on the coarse components, vegetal inclusions and/or organic voids present (*Table 18*). The colour is varied, depending on whether the daub is fired or unfired and on how lightly or heavily it has been burnt, and colours may range within a single fragment from grey-brown to bright orange-red. All the fabrics are composed of sandy clay with varying amounts of other inclusions. It is likely that the daub was made from locally available clay and the sand may be either naturally-occurring within the clay or deliberately added as a fine inclusion. It is also possible that some of the differences observed may be due to natural variations in the local boulder clay. Daub fabrics can also vary greatly throughout a single structure and the relatively small fragment size (average fragment weight: 4.5 g) makes it unlikely that the full extent of variation within each fabric has been identified (Poole 2005, 1; Poole 2010, 141). As well as the inclusions listed below, other rare examples comprise crushed ceramic building material, small pieces of red sandstone, tiny fragments of cement mix and small angular fragments of ?slate.

Fabric 1
Fabric 1 comprises a clay matrix with inclusions of sand, ranging from rare to medium-high density of quartz sand. In the coarser examples, the sand was probably deliberately added to the clay to give the mix bulk and stability, rather than being naturally present. 2.3 % (by weight) of fragments occur in this fabric.

Fabric 2

Fabric 2 comprises a clay matrix with inclusions of sand and vegetable matter, ranging from rare to medium-high density of quartz sand, and elongate voids. Vegetable matter was frequently added as a reinforcement to help hold the mix together and to control shrinkage. In examples where the voids are rare, this indicates that they occur naturally in the clay and may represent small pieces of root material (Williams 2010, 121). This fabric is the second most common, comprising 14.7 % of fragments.

Fabric 3
Fabric 3 is similar to Fabric 2 but with the addition of rare to occasional lime or chalk, which ranges in size from tiny flecks to small rounded or sub-rounded fragments. 11.7 % of fragments occur in this fabric.

Fabric 4
Fabric 4 is similar to Fabric 2 but with the addition of rare to occasional rounded to sub-angular gravels and rare pebbles. This fabric is the most common, comprising 25.2 % of fragments.

Fabric 5
Fabric 5 is similar to Fabric 2 but with the addition of rare to occasional fragments of charcoal, ranging in size from small flecks to large pieces. 7.1 % of fragments occur in this fabric.

Fabric 6
Fabric 6 is similar to Fabric 1 but with the addition of rare to occasional fragments of charcoal, ranging in size from small flecks to large pieces. 4.0 % of fragments occur in this fabric.

Fabric7
Fabric 7 is similar to Fabric 6 but with the addition of rare to occasional rounded to sub-angular gravels and rare pebbles. Only 0.5 % of fragments occur in this fabric.

Fabric 8
Fabric 8 is similar to Fabric 1 but with the addition of rare to occasional rounded to sub-angular gravels and rare pebbles. 11.6 % of fragments occur in this fabric.

Fabric 9
Fabric 9 is similar to Fabric 1 but with the addition of rare to occasional lime or chalk, which ranges in size from tiny flecks to small rounded or sub-rounded fragments. 3.8 % of fragments occur in this fabric.

Fabric 10
Fabric 10 is similar to Fabric 9 but with the addition of rare to occasional fragments of charcoal, ranging in size from small flecks to large pieces, as well as rare to occasional rounded to sub-angular gravels and rare pebbles. 1.3 % of fragments occur in this fabric.

Fabric 11
Fabric 11 is similar to Fabric 9 but with the addition of rare to occasional fragments of charcoal, ranging in size from small flecks to large pieces, as well as rare to occasional vegetable matter in the form of elongate voids. 9.9 % of fragments occur in this fabric.

Fabric 12
Fabric 12 is similar to Fabric 9 but with the addition of rare to occasional rounded to sub-angular gravels and rare pebbles, as well as rare to occasional vegetable matter in the form of elongate voids. 6.5 % of fragments occur in this fabric.

Fabric 13
Fabric 13 is similar to Fabric 8 but with the addition of rare to occasional lime or chalk, which ranges in size from tiny flecks to small rounded or sub-rounded fragments. Just 0.3 % of fragments occur in this fabric.

In terms of weight, Fabric 4 is the most commonly occurring daub fabric from the Roman phases, comprising 23.5 % by weight of the Roman phased assemblage. Fabric 2 is the second most common fabric (18.2 %), followed by Fabric 8 (16.0 %) and Fabric 3 (14.6 %). Fabric 5 comprises 7.8 % by weight of the total, followed by Fabric 9 (5.4 %), Fabric 11 (4.0 %), Fabric 1 (3.8 %) and Fabric 12 (3.4 %). Much smaller quantities of Fabrics 10 (1.9 %), 6 (1.2 %) and 7 (0.3 %) were also recovered. There were no examples of Fabric 13 from the Roman phases.

At 41.6 % by weight of the total, Fabric 11 is the most common daub fabric from post-Roman phases 10—11b, followed by Fabric 6 (23.2 %), Fabric 12 (10.8 %), Fabric 2 (10.1 %), Fabric 4 (5.5 %) and Fabric 5 (5.1 %). Smaller quantities of Fabrics 13 (2.4 %), 1 (1.0 %) and 7 (0.3 %) were also recovered. There were no examples of Fabrics 3, 8, 9 or 10 from Phases 10—11b.

Fabric 4 is by far the most common daub fabric, at 50.6 % by weight of the total, from post-Roman phases 12 - 21. At 16.7 % by weight of the total, Fabric 12 is the second most common daub fabric from these phases, followed by Fabrics 3 and 11 (both at 8.8 %), Fabric 5 (5.8 %) and Fabric 1 (4.4 %). Smaller amounts of Fabrics 8 (2.1 %), 7 (1.6 %) and 2 (1.2 %) were also recovered. There were no examples of Fabrics 6, 9, 10 or 13 from post-Roman phases 12—21.

Eighty fragments/995 g bore markings, in the form of wattle impressions (all partial), ridging or finger-wiping of the surface. The types of markings identified are summarised in Table 19.

	Roman				*Ph: 10—11b*				*Ph 12—21*				*Unst rat*				*Total*			
Fabric	No	% no	Wt (g)	% wt	No	% no	Wt (g)	% wt	No	% no	Wt (g)	% wt	No	% no	Wt (g)	% wt	No	% no	Wt (g)	% wt
1	247	18.5	247	3.8	7	1.2	13	1	16	10.7	50	4.4	0	0	0	0	**270**	13	**310**	2.3
2	255	19.1	1,191	18.2	26	4.4	128	10.1	5	3.4	17	1.2	1	100	18	100	**287**	13.9	**1,354**	14.7
3	164	12.3	952	14.6	0	0	0	0	5	3.4	125	8.8	0	0	0	0	**169**	8.2	**1,077**	11.7
4	298	22.4	1,532	23.5	6	1	70	5.5	24	16.1	721	50.6	0	0	0	0	**328**	15.9	**2,323**	25.2
5	103	7.7	509	7.8	2	0.3	65	5.1	11	7.4	83	5.8	0	0	0	0	**116**	5.6	**657**	7.1
6	53	4	76	1.2	78	13.3	295	23.2	0	0	0	0	0	0	0	0	**131**	6.3	**371**	4
7	11	0.8	17	0.3	4	0.7	4	0.3	7	4.7	23	1.6	0	0	0	0	**22**	1.1	**44**	0.5
8	116	8.7	1,042	16	0	0	0	0	10	6.7	30	2.1	0	0	0	0	**126**	6.1	**1,072**	11.6
9	22	1.7	355	5.4	0	0	0	0	0	0	0	0	0	0	0	0	**22**	1.1	**355**	3.8
10	24	1.8	123	1.9	0	0	0	0	0	0	0	0	0	0	0	0	**24**	1.2	**123**	1.3
11	14	1.1	263	4	423	72.2	530	41.6	31	20.8	125	8.8	0	0	0	0	**468**	22.6	**918**	9.9
12	26	2	223	3.4	10	1.7	138	10.8	40	26.8	238	16.7	0	0	0	0	**76**	3.7	**599**	6.5
13	0	0	0	0	30	5.1	30	2.4	0	0	0	0	0	0	0	0	**30**	1.4	**30**	0.3
Total	**1,333**	**100**	**6,530**	**100**	**586**	**99.9**	**1,273**	**100**	**149**	**100**	**1,412**	**100**	**1**	**100**	**18**	**100**	**2,069**	**100**	**9,233**	**98.9**

Table 18: Roman daub quantified by period and fabric

Seventy-four fragments/722 g bore traces of white limewash on the surface and a single fragment/3 g had small pieces of shell pressed into the surface. It is unclear whether this was deliberate or accidental. White-washing was often applied to provide a water-resistant surface. The types of decoration used are summarised in Table 20.

Condition

The assemblage is of mixed condition, ranging from fresh (34.7 % by weight of the total assemblage) to very abraded (10.5 % by weight of the total) or abraded (20.0 %), although many fragments are either fairly fresh (15.2 % by weight) or slightly abraded (14.1 % by weight). 5.1 % by weight comprise tiny fragments of mixed condition and just 0.3 % are 'burnt' through. 213 fragments/1,551 g (16.8 % by weight of the total) were also partially burnt/sooted and/or heat-cracked.

When compared spatially, the daub from Area B is slightly more abraded than that from Area A, with 33.0 % by weight of the total assemblage recorded as abraded or very abraded compared with 28.4 % from Area A. Daub which is slightly abraded from Area B comprises 16.8 % by weight of the total, that from Area A 11.8 %. Daub which is fairly fresh in condition comprises 17.0 % of the total from Area A and 13.0 % from Area B. Daub in a fresh condition comprises 33.7 % by weight of the total from Area A and 36.2 % from Area B. Fragments in a mixed condition comprise 8.4 % from Area A and just 1.0 % from Area B. Of the small group of four fragments/19 g from Area C, 73.7 % were abraded and 26.3 % were slightly abraded.

When compared chronologically, the daub which occurs residually in post-Roman contexts is more abraded than that from Roman phases. 14.6 % by weight of the total assemblage from post-Roman contexts is abraded compared to just 3.6 % from Roman contexts. However, daub recorded as fresh is also slightly more common from post-Roman contexts (14.6 % by weight of the total assemblage) than Roman contexts (10.0 % by weight of the total assemblage).

When compared both chronologically and spatially, by proportion of each Area's total assemblage, the daub from Roman contexts in Area A is more abraded than that from Area B: 34.8 % by weight of the Area A Roman phased assemblage is abraded, compared to just 13.0 % from Area B. 36.0 % by weight of the daub from Roman contexts in Area A is either slightly abraded or fairly fresh, compared to 29.8 % from Area B. 49.6 % of the daub from Roman contexts in Area B is fresh, compared to 24.0 % from Area A.

In contrast, Roman daub from post-Roman contexts is more abraded from Area B: 79.0 % is abraded, compared to just 12.9 % from Area A. Daub which is either fairly fresh or slightly abraded comprises 26.5 % from post-Roman contexts in Area A compared with 15.7 % from Area B. 58.3 % by weight of daub from Area A is fresh in condition compared to just 5.3 % from Area B.

Provenance

Local boulder clays, river gravels and sand were readily obtainable in the local area and the fragments of chalk or lime in some of the fabrics may well derive from Halkyn Mountain and the Llanfynydd/Ffrith area, the nearest, easily-exploitable sources of limestone in the region in the Roman period (Mason *et al* 2005, 51).

Description

70.7 % by weight of the assemblage was recovered from four Roman phases (3, 5, 6 and 7), with most (37.1 % by weight of the site total) coming from Phase 5. 29.3 % by weight occurred residually or was unstratified, with 12.7 % by weight from Phases 10—11b and 16.3 % from Phases 12—21. Just 0.2 % was unstratified (*Table 21*).

Period 2: Roman occupation before the amphitheatre

Phase 3

This phase produced 47 fragments/187 g of Roman daub (2.9 % by weight of the Roman phased assemblage), with an average fragment weight of 4.0 g. All were recovered from samples, apart from a single piece/22 g, which was hand-collected.

Pre-amphitheatre Roman occupation deposits

A deposit of red sand (1086) produced six fragments/28 g, including a triangular-shaped fragment in fabric 3. Two probable wall fragments, one in fabric 2 (Th: 8 mm), the other (Th: 10 mm) in fabric 4, were also recovered. The latter retains traces of white limewash on the surface. The remaining pieces, in fabric 3, are featureless, indeterminate fragments.

A patch of black sandy silt (1082) produced 41 fragments/139 g. Forms comprise seven surface fragments and a single ?wall fragment (Th: 9 mm). The latter is in fabric group 9. The remainder, in fabric groups 2, 3, 6 and 10, are indeterminate, featureless pieces. The surface fragments include one slightly domed piece in fabric 3 with traces of white limewash on the surface. Three other surface fragments, in fabric 11, are marked with finger-ridging/wiping.

Period 3: The First Roman Amphitheatre

Phase 5: Deposits outside Amphitheatre 1a associated with its use

Phase 5 produced 629 fragments/3,427g of daub (52.5 % by weight of the Roman phased assemblage), from Area A, with an average fragment weight of 7.6 g.

	Roman						*Ph:10—11b*		*Ph:12—21*					
	Area A		Area B		*Total*		Area B		Area A		*Total*		Site total	
Marking	No	Wt (g)	No	Wt (g)	*No*	*Wt (g)*	No	Wt (g)	No	Wt (g)	*No*	*Wt (g)*	No	Wt (g)
Wattle impressions	10	218	5	69	*15*	*287*	0	0	13	137	*13*	*137*	28	424
Finger-wiped surface	3	22	4	65	*7*	*87*	0	0	0	0	*0*	*0*	7	87
Fine parallel ridges in surface	15	162	27	246	*42*	*408*	1	10	0	10	*1*	*10*	43	418
Combed/ridged surface	0	0	2	66	*2*	*66*	0	0	0	0	*0*	*0*	2	66
Total	28	402	38	446	*66*	*848*	1	10	13	137	*14*	*147*	80	995

Table 19: Roman daub quantified by period, Area and markings

	Roman						*Ph: 10—11b*		*Ph: 12—21*					
	Area A		Area B		*Total*		Area B		Area A		*Total*		Site total	
Decoration	No	Wt (g)	No	Wt (g)	*No*	*Wt (g)*	No	Wt (g)	No	Wt (g)	*No*	*Wt (g)*	No	Wt (g)
White lime-wash on surface	30	388	36	231	*66*	*619*	5	52	3	51	*8*	*103*	74	722
Shell frags pressed into surface	0	0	1	3	*1*	*3*	0	0	0	0	*0*	*0*	1	3
Total	30	388	37	234	*67*	*622*	5	52	3	51	*8*	*103*	75	725

Table 20: Roman daub quantified by period, Area and decoration

South west area

(1075), the earliest deposit of this phase, immediately outside the outer wall of amphitheatre 1a, a shallow deposit of silty sand with a high frequency of charcoal and iron slag, produced 200 fragments/189 g of daub, all from samples. Fabric groups 1 to 7 are represented. The majority (x 190) are featureless, indeterminate fragments. Identifiable forms comprise nine surface fragments and a probable wall fragment (Th: 10 mm). The latter has traces of white limewash and fine parallel lines of ridging on the surface. Another surface fragment also bears traces of white limewash and another has two partial wattle impressions (Diam: > 13 mm) on the reverse. The surface of this piece is also slightly domed.

(1246), a charcoal-rich fill of pit (1256), produced just four fragments/28 g of daub. They comprise an indeterminate fragment in fabric 2 and three surface fragments, two in fabric 2, the other in fabric 3. The latter has a partial ?wattle impression. One of the surface fragments in fabric 2 is burnt and has traces of white limewash on the surface, which is also partly vitrified. Fill (1202) of pit (1256) produced 18 fragments/132 g, all from samples. Identifiable forms comprise a heat-cracked edge (x two adjoining pieces) in fabric 3 and six surface fragments, four in fabric 3, one in fabric 11 and the other in fabric 9. The latter has traces of white limewash on a domed surface, which also bears fine parallel lines of ridging (?brush marks). The remaining ten featureless fragments occur in fabrics 4, 9 and 12. (1216), fill of pit (1256), produced 208 fragments/1,602 g of daub. Just five pieces/169 g were hand-collected; the remaining 203 fragments/1,433 g came from samples. Identifiable forms comprise a ?corner piece in fabric 9 and six edge fragments. One of these, in fabric 5, has a partial wattle impression on the reverse (wattle Diam: 4 mm) and is slightly burnt/sooted. Three edge fragments, two in fabric 9, the other in fabric 4, have traces of white limewash on the surface and edge. One ?edge fragment in fabric 2 has a domed surface and is heat-cracked. Three edge/rim fragments have a rounded ?rim and one, in fabric 11, has a wall thickness of 35 mm. Thirty-six surface fragments were recovered; they occur in fabrics 1—3, 5 and 7—9. Seven pieces bear traces of white limewash on the surface and one, in fabric 2, also has fine parallel lines of ridging (?brush marks) in a slightly dished surface. Three other fragments have similar markings in flat surfaces. A domed surface fragment in fabric 2 has a partial ?wattle impression on the reverse (wattle Diam: c 6 mm). Twenty-two wall fragments/422 g were also recovered from (1216). Four fragments/161 g were hand-collected, the remaining 18 fragments/261 g were recovered from samples. They occur in fabrics 1—4 and 9—12. SF 10031, in fabric 11, has three wattle impressions on the reverse, including one complete diameter of 15 mm (Cat no 32). SF 10032, in fabric 3, has a partial ?wattle impression (wattle Diam: c 10 mm) on the reverse and a domed surface (Cat no 33). One other fragment (wall Th: 20 mm), I fabric 10, has a partial ?wattle impression on the reverse and a slightly domed surface. Four fragments have fine parallel lines of ridging (?brush marks) on the surface and occur in fabrics 1, 3 and 11.

Key to Phases

3: Roman occupation before the amphitheatre
4: Construction of Amphitheatre 1a
5: Deposits outside Amphitheatre 1a associated with its use
6: Amphitheatre 1b: structural alterations
7: Deposits outside Amphitheatre 1b associated with its use
8: Amphitheatre 2 construction
9: Amphitheatre 2 use
10: Amphitheatre 2 change of use
11a: Robbing of internal walls
11b: Robbing of external walls
12—21: Other post-Roman phases

Phase	No frags	% no	Wt (g)	% wt	Av frag wt (g)	% wt total
3	47	3.5	187	2.9	4	2
5	629	47.2	3,427	52.5	5.4	37.1
6	651	48.8	2,900	44.4	4.5	31.4
7	6	0.5	16	0.2	2.7	0.2
Total Roman phases	*1,333*	*100*	*6,530*	*100*	*4.9*	*70.7*
10	536	72.9	1,025	38.2	1.9	11.1
11a	44	6.0	233	8.7	5.3	2.5
11b	15	1.2	184	5.7	12.3	2.0
Other PR: 12—21	140	25.9	1243	56.2	8.9	13.5
Total post-Roman phases	*735*	*100*	*2,685*	*100.1*	*3.7*	*29.1*
Unstratified	1	0.1	18	0.7	18	0.2
Total	2,069	100	9,233	100	4.5	100

Table 21: Roman daub quantified by phase

Three of the latter also bear traces of white limewash on the surface. Traces of white limewash also occur on four other fragments: one, in fabric 12, has an irregular, finger-ridged surface (wall Th: 14 mm); another, in fabric 9, has a domed surface and a thickness of 11 mm; another, in fabric 2, also has a slightly domed surface and a wall thickness of 7 mm. Wall thicknesses range from 7 mm (x 1), through 8 mm (x 1), 10 mm (x 2), 11 mm (x 3), 12 mm (x 1), 14 mm (x 1), 18 mm (x 1), 20 mm (x 3), 23 mm (x 1), 25 mm (x 1) to 26 mm (x 1). Two fragments taper in thickness: one from 3—12 mm, the other from 12—22 mm. One piece, in fabric 2, has a burnt, vitrified, glassy exterior and a brittle, heat-cracked interior. The remaining 140 fragments/696 g are all featureless. Only fragment/8 g, in fabric 10, was hand-collected; the remainder, in fabrics 2—5, 10 and 12, were recovered from samples.

(1064), a dark layer of organic-rich silty sand, which sealed cess pit (1256), produced seven fragments/18 g of daub. They comprise two surface fragments/6 g in fabrics 3 and 4, one of which has traces of white limewash on the exterior. The remaining five featureless fragments/12 g occur in fabric 1.

(1152), a layer of red sand formed over the back-filled pit (1256), yielded just two indeterminate fragments/6 g in fabric 11, both hand-collected.

(625), the final layer associated with the use of Amphitheatre 1a, generated 39 fragments/178 g. Just one indeterminate fragment/51 g, in fabric 4, was hand-collected; 38 fragments/127g were recovered from samples. Identifiable forms comprise five surface fragments, an edge fragment in fabric 2 and a ?wall fragment (Th: 6 mm) with a domed surface in fabric 4. The remaining pieces are all featureless, indeterminate fragments. A surface fragment in fabric 12 has a partial ?wattle impression and patchy traces of white limewash on a burnt surface. Two surface fragments in fabric 2 also bear traces of white limewash.

North east area

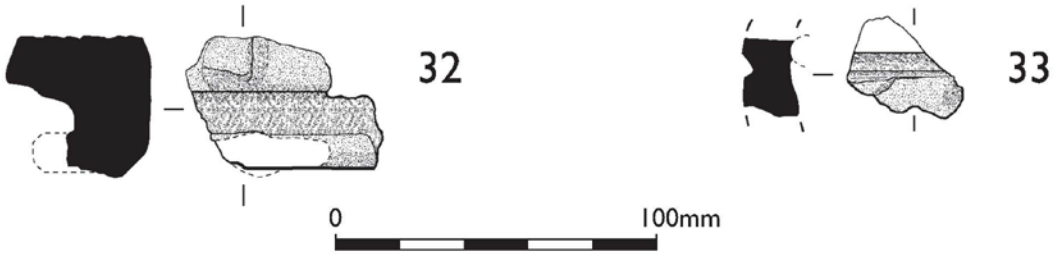
(1100), a greenish-grey, artefact-rich silt, the middle fill of cess pit (1078), produced 42 fragments/306 g of daub. Identifiable forms comprise four wall fragments/30 g, all in fabric 2. One piece (Th: 6 mm) has lines of ridging on one surface; another (Th: 16 mm) has a slightly dished surface. The remaining two fragments (Th: 9 mm and 11 mm) have slightly domed surfaces. Eleven surface fragments/165 g, in fabrics 2—4 and 9, were also recovered. Six fragments were recovered from samples, four were hand-collected. One piece, in fabric 2, has traces of white limewash on a flat surface; another, in fabric 4, has a partial ?wattle impression on the reverse (wattle Diam: 8 mm) and a slightly domed surface. Three fragments bear fine parallel lines of ridging (?brush/wipe marks) on the surface. The remaining 27 fragments/111 g are indeterminate featureless fragments and they occur in fabrics 1—3, 6 and 9—11. The red sand fill, (1077), which sealed cess pit (1078), produced just three surface fragments/16 g in fabrics 1, 5 and 12.

(1074), a levelling deposit of crushed sandstone near the north entrance, produced 106 very abraded indeterminate fragments/972 g in fabric 8.

Roman daub from this phase was retrieved from layers and pit fills.

Catalogue

32 Surface fragment of daub in fabric 11; three wattle impressions on the reverse, including one with a complete diameter (Diam: 15 mm). A (1216): Phase 5 fill of pit; SF 10031.



33 Domed surface fragment of daub in fabric 3; partial ?wattle impression on the reverse (Diam: *c* 10 mm). A (1216): Phase 5 fill of pit; SF 10032.

Phase 6: Amphitheatre 1b: Structural alterations

Phase 6 produced 651 fragments/2,900 g of daub (44.4 % by weight of the Roman phased assemblage) from Areas A and B, with the majority, by fragment count and weight (649 fragments/2,845g) coming from Area B. Just two fragments/55 g were retrieved from Area A.

Area A

The timber-framed seating structure

The radial frames

Radial frame 11
The cast of a timber base-plate, (923), produced a single surface fragment/50 g, in fabric 9.It has traces of white limewash on a domed surface and is slightly heat-cracked.

Radial frame 12
The cast of a timber upright, (934), produced a surface fragment/5 g of daub in fabric 2. It also has a slightly domed surface which bears traces of white limewash on the exterior.

Area B

Seating bank deposits

62 fragments/506 g, were assigned to group number (2612). Apart from a single ?wall fragment/135 g (Th: 32 mm), which was hand-collected, the remainder were recovered from samples. Identifiable forms comprise an edge (?rim) fragment in fabric 2; four wall fragments in fabrics 2—4 and 12; and eleven surface fragments in fabrics 1,2, 4—6 and 8. The remaining 46 indeterminate fragments occur in fabrics 2—4, 8 and 12. Two of the wall fragments (Th: 7 mm and 32 mm), in fabrics 3 and 4, bear fine parallel lines of ridging in the surface. Two of the surface fragments, both in fabric 2, bear similar markings. Two others, in fabrics 1 and 5, bear traces of white limewash on the surface. The surface fragments range from slightly dished, through level, to slightly domed.

The remaining daub came from the lower/earlier seating bank deposits in Area B. They comprise a sequence of sterile, coarse sands and artefact-rich dumps, the latter including (2461) and (2543), which were excavated in two blocks.

The first block of deposits from which Roman daub was recovered produced the following sequence:

(2513) produced 267 fragments/1,088 g of daub in fabrics 2—6, 11 and 12, including SF 10033, an edge/rim, comprising two adjoining fragments, in fabric 2. It has partial wattle impressions on the reverse, one with a surviving diameter of 26 mm, and a wall thickness of 27 mm (Cat no 34). Nine wall fragments were recovered: two bear traces of white limewash on the surface. One, in fabric 2, also has fine parallel lines of ridging in the surface. Another piece bears similar markings. Wall thicknesses range from 6 mm, through 9 mm, 10 mm (x 2), 11 mm, 13 mm, 14 mm, 17 mm to 25 mm. Fifty-eight surface fragments, in fabrics 1—4 and 11, were also recovered. Twelve pieces bear traces of white limewash on the surface and one fragment, in fabric 3, has an iron ?hobnail attached to the underside. Another piece, in fabric 11, has fragments of shell pressed (?deliberately) into a slightly domed surface. Four fragments (including two which also have traces of white limewash on the surface) bear fine parallel lines of ridging in the surface. Two edge fragments, in fabric 2, include one with a finger-wiped, domed surface, which is burnt/sooted and heat-cracked. An edge/wall fragment (Th: 6 mm), with traces of white limewash on the surface, is burnt grey and has a partially vitrified surface. Two triangular-shaped ?corner/edge fragments, one in fabric 2, the other in fabric 12, were also recovered. The remaining 194 featureless fragments occur in fabrics 1—6.

(2499) produced just three fragments/24 g of daub. They comprise two slightly domed surface fragments in fabrics 3 and 6 and an indeterminate piece in fabric 2.

(2498) produced 228 fragments/590 g, of daub, all from samples. Diagnostic pieces comprise two roughly triangular-shaped edge/corner fragments, both in fabric 4. Four wall fragments were also recovered, two in fabric 3, the others in fabrics 2 and 5. Thicknesses range from 9 mm, through 10 mm to 18 mm. One burnt fragment tapers slightly from 10—12 mm. Twenty-two surface fragments were recovered, in fabrics 1—4 and 9. Four bear traces of white limewash on the surface. One also has fine parallel lines of ridging (brush marks?) on the surface. Similar markings appear on two other fragments: one also has a ?fingerprint on the underside. The remaining two hundred featureless fragments occur in fabrics 1, 2, 4, 5 and 8.

The second block of deposits produced the following sequence:

(2543), another artefact-rich dump of material, produced 81 fragments/532 g of daub, all from samples. Diagnostic pieces comprise two corner/edge fragments and an ?edge fragment, all in fabric 2. Thirty-two surface fragments, in fabrics 1—3, 5, 6, 9 and 11, were also recovered. Nine fragments bear traces of white limewash on the surface; two pieces have marks of ridging/combing on the surface; another has an irregular, finger-impressed surface. Surfaces range from slightly dished, through level, to slightly domed. Eleven wall fragments, in fabrics 2—5, were also recovered. Three bear traces of white limewash on the surface and one has fine parallel lines of ridging in the surface. The remaining thirty-six featureless fragments occur in fabrics 1—5, 8 and 12. They include one fragment with a partial wattle impression (wattle Diam: >17 mm).

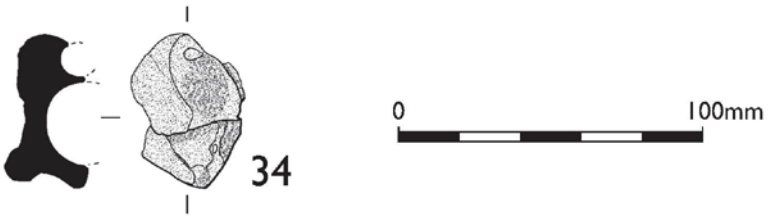
(2461), a dump rich in artefacts, also produced just four fragments/22 g. They comprise a slightly domed wall fragment (Th: 20 mm) in fabric 2, with traces of cement mix attached to the broken edges, and three tiny indeterminate fragments in fabric 1.

(2450) produced just four fragments/83 g. They comprise a wall fragment in fabric 9 (Th: 25 mm), with traces of white limewash on the surface. Two surface pieces in fabric 4 also bear traces of white limewash. A single indeterminate fragment/10 g, in fabric 1, was also recovered.

Roman daub from Phase 6 was recovered from contexts associated with the timber-framed seating structure in Area A and from seating-bank deposits in Area B.

Catalogue

34 Edge/rim fragment of daub (two adjoining pieces) in fabric 2; partial wattle impressions on the reverse, one with a surviving diameter of 26 mm. Wall Th: 27 mm. B (2513): Phase 6 seating-bank deposit; SF 10033.



Phase 7: Deposits outside Amphitheatre 1b associated with its use

Phase 7 produced just six fragments/16 g (0.5 % by fragment count and 0.2 % by weight of the Roman phased assemblage), with an average fragment weight of 2.7 g. Daub was recovered from a single context in Area A.

West end Amphitheatre 1b use

Gravel surface (716) produced six indeterminate fragments/16 g of daub, all in fabric 2.

Periods 5—6: Amphitheatre 2: Change of use and robbing

Phase 10: Amphitheatre 2 change of use

Phase 10 produced 536 fragments/1,025 g of daub, comprising 11.1 % by weight of the total assemblage (*see Table 21*). Daub was recovered from Areas B and C and all was from samples. Area B yielded 533 fragments/1,010 g, with an average fragment weight of 1.9 g; just three fragments/15 g, with an average fragment weight of 5 g, came from Area C.

Area B

All the daub recovered from this phase came from layer (2457). It occurs in a range of fabrics, with the majority (421 fragments/399 g) in fabric 11. In terms of weight, fabric 6 was the next most common group (78 fragments/295 g), followed by fabrics 2 (20 fragments/118 g), 12 (seven fragments/111 g), 5 (a single piece/54 g), 4 (three fragments/26 g) and 1 (three pieces/7 g).

Diagnostic pieces comprise a wall/edge fragment/13 g from (2457) (Th: 13 mm) in fabric 2; four wall fragments/112 g , two in fabric 2 and one each in fabrics 5 and 6.Two of the latter have a wall thickness of 18 mm, one of 14 mm, the other of 25 mm. One has traces of white limewash on the surface; another has fine parallel lines of ridging in a slightly dished surface. Eleven surface fragments/44 g were also recovered, in fabrics 1, 2, 4 and 6. Three have traces of white limewash on the surface; two are partially vitrified; two are partly burnt; and two others are burnt and vitrified (one of these is also heat-cracked). Of the 517 indeterminate fragments, only three are partly burnt/sooted and one of these is also heat-cracked.

Area C

No diagnostic fragments were recovered from Area C, which produced just three featureless indeterminate pieces/15 g.

Sub-phase 10b

Fill (3151), of N—S timber slot (3150), yielded a single piece/1 g in fabric 1.

Sub-phase 10c

(3166), fill of pit (3167), produced a single fragment/11g in fabric 4.

Sub-phase 10e

Fill (3139), of gully (3138), produced a single piece/3 g in fabric 4.

Roman daub from Phase 10 came from a layer and fills of a beam slot, pit and gully.

Phase 11a: Robbing of internal walls

Sub-phase 11a produced 44 fragments/233 g of daub, all from Area A, comprising 2.5 % by weight of the total assemblage, with an average fragment weight of 5.3 g.

Area A

Later fill (459) of the arm of the cruciform robber trench (245), yielded three indeterminate fragments/131 g of daub in fabric 4. Fill (306) of the inner arm of the cross, produced five fragments/162 g, also in fabric 4, comprising three indeterminate pieces/20 g and two non-adjoining surface fragments/42 g. Thirty-six indeterminate fragments/40 g were recovered from a single sample from (517), a deposit in the centre of the cruciform robber trench. Nine pieces/17 g are in fabric 8, the remainder are in fabric 13.

Phase 11 b: Robbing of external walls

Sub-phase 11b produced just 15 fragments/184 g of daub, comprising just 2.0 % by weight of the total assemblage. Daub was recovered from Areas A and B. Six fragments/32 g, with an average fragment weight of 5.3 g, came from Area A; nine fragments/152 g, with an average fragment weight of 16.9 g, came from Area B. All the daub was hand-collected.

Area A

Fragments of daub were retrieved from the general detritus of crushed and broken stone and mortar in the backfill deposits of the robber trenches for the outer wall of Amphitheatre 2: (506) and (765). Three indeterminate

fragments/27 g in fabric 12 came from (506); (765) yielded three indeterminate pieces/5 g in fabric 1.

Area B

Upper fill (2473) of the robber trench (2591), which followed the line of the Roman road running parallel to the outer wall of Amphitheatre 2, produced a single indeterminate fragment/11 g in fabric 5.

Daub was also recovered from fills of robber trench (2545)/(2567)/(2464), which followed a substantial east-west aligned wall at the southern side of the east entrance. Primary fill (2569) yielded a single probable surface fragment/7 g in fabric 2. On the south side of the robber trench, sandy fill (2565), which may have derived from the adjacent *in situ* Roman seating bank material, produced five indeterminate fragments/3 g, also in fabric 2. Above this, (2558), a layer rich in small pieces of red sandstone and lime mortar, yielded two fragments/131 g in fabric 11.

Periods 7—8: Post Roman Phases 12—21

Post-Roman phases 12—-21 produced a total of 140 fragments/1,243 g of Roman or probable Roman daub, comprising 6.8 % by fragment count and 13.5 % by weight of the total assemblage, with an average fragment weight of 8.9 g. The majority of fragments, by both count (94.3 %) and weight (93.6 %) of the total recovered from these phases, came from area A. Area B produced 5.0 % by fragment count and 6.1 % by weight of the total with just 0.7 % by count and 0.1 % by weight from Area C. Most of the assemblage comprises indeterminate featureless pieces: 130 fragments (92.9 % of the total from these phases)/1,025 g (82.5 % of the total). Diagnostic fragments comprise surface, edge, wall and corner pieces.

Area A

The daub assemblage from Area A includes a corner fragment/32 g, in fabric 3, with traces of white limewash on the surface, from (505). Eight surface fragments/171 g were recovered: two from (218) in fabrics 4 and 12, two from (221), both fabric 5, and one each from (421) (fabric 2) and (431) (fabric 12). The piece from (421) has traces of white limewash on the surface. A single wall fragment/13 g (Th: 12 mm), in fabric 5, also with traces of white limewash on the surface, came from (208). The indeterminate fragments include three examples with wattle impressions, one in fabric 5 and three adjoining pieces (diam of ?wattle: 16 mm) in fabric 7, from (221); and one from (426) in fabric 3 (diam of ?wattle: 20 mm). The majority of the Area A assemblage (110 fragments/1,125 g) was recovered from Phase 12, comprising 83.3 % by fragment count and 96.7 % by weight of the total recovered.

Area B

Diagnostic fragments of Roman daub from Area B comprise an edge fragment/43 g from (2146) in fabric 3 and surface fragment/1 g in fabric 2, from (2593). None of the fragments from Area B are marked or decorated.

Area C

A single indeterminate featureless fragment/4 g in fabric 2 was recovered from a Phase 12 context, (3081).

Unstratified

A single indeterminate fragment/18 g in fabric 2 was found unstratified in Area A.

Discussion

Daub was recovered from Areas A, B and C and was also found unstratified. Most of the assemblage was recovered from Roman phases, comprising 64.4 % by fragment count and 70.7 % by weight of the total, with an average fragment weight of 5.9 g; Phases 10—11b yielded 28.3 % by count/13.8 % by weight of the total, with an average fragment weight of just 2.2 g; Phases 12—21 produced just 7.2 % by count/15.3 % by weight of the total, with the highest average fragment weight of 9.5 g. The assemblage from Roman phases was recovered from Areas A and B only, with Phase 6 the only Roman phase in Area B to have produced daub. In Area A, it was recovered from Roman phases 3 and 5—7, with most (37.1 % by weight of the total assemblage) from Phase 5, closely followed by Phase 6, which produced 31.4 % by weight of the total. The assemblage from Phases 10—11b was retrieved from Areas A, B and C but, in Area A, it was recovered only from Phases 11a and 11b; in Area B only from Phases 10 and 11b; and in Area C only from Phase 10. All three trenches yielded Roman daub from post-Roman phases 12—21.

Most of the daub from Phase 5 was recovered from fills of the large pit (1256), which is thought to have functioned as a latrine for spectators, located outside the outer wall of Amphitheatre 1a. The assemblage from (1256) includes one partially vitrified fragment and another with a heavily vitrified surface, both of which may derive from a hearth or furnace. The fills of this pit also produced a quantity of corner, edge, edge/rim, surface and wall fragments, including pieces with wattle impressions. Some of the wall fragments are also domed (convex) and several pieces have marks of shaping, in the form of finger ridging and wiping, on the surface. Most of this material is likely to derive from ovens, the discarded fragments of which were then deposited in the pit. It is possible that some of these structures also may have been used to provide hot food for visitors to the arena, alongside the portable clay ovens, several fragments of which were also recovered from the site (Heke 2018a).

As a whole, the assemblage is fairly fragmented, with a high proportion of indeterminate fragments (63.3 % by weight of the total assemblage) and a low

average fragment weight of just 4.5 g. Of the diagnostic pieces, surface fragments form the largest component by weight (19.7 % of the assemblage), followed by wall fragments (10.9 %) and edge pieces (2.2 %). Small amounts of corner (1.7 %), edge/rim (0.9 %), corner/edge (0.7 %) and edge/wall pieces (0.6 %) were also recovered (*see Table 17*).

A wide range of fabrics was recovered from the site. Although different fabrics may have been used for different structures or structural phases, the variations may simply indicate variants of a heterogeneous clay source. Slight variations in fabrics probably also occurred because various batches would have been prepared and used during construction.

Daub was recovered from a range of contexts. In Roman phases (3—9), it came from layers, a gravel surface, a range of pit fills, beam-slot and gully fills, contexts associated with the timber-framed seating structure and seating-bank deposits. In Phases 10—11b, daub was retrieved from a layer and robber-trench fills.

Summary

Roman daub has been recorded so far from only one other British amphitheatre: in London, fragments of daub were found in association with Buildings 3 and 4, to the east of the amphitheatre's east entrance. Building 3, a small two-roomed earth and timber structure with painted plaster walls, dating to Period 5 (late 2nd to late 3rd century), may have been a shop, tavern or similar, providing facilities for visitors to the amphitheatre. Building 4, a single-roomed structure dating to Period 6 (late 3rd to mid-4th century), was constructed over the remains of the eastern room of Building 3, although its function is unknown (Bateman, Cowan & Wroe-Brown 2008, 12, 69, 72, 83—4 and 87). A quantity of daub was also recovered from Open Area 5, to the east of the amphitheatre, much of it from a dump of glass cullet, deposited in Period 4 (*c* AD 125—late 2nd century). It presumably derived from the remains of a demolished clay and timber building elsewhere in the settlement and may have been deposited in this area in order to level up the ground surface, east of the new masonry amphitheatre (Betts 2008, 166; Bateman, Cowan & Wroe-Brown 2008, 39).

The assemblage from Chester amphitheatre is of mixed condition, ranging from fresh to very abraded and weathered, and the majority of fragments are featureless. There is a similar range in condition from both Roman and post-Roman contexts. Fragments of wall daub and general structural daub were also recovered. They came from a variety of contexts, including discrete features such as pits, as well as from a surface, layers and dump deposits. House daub generally has a high organic content, comprising straw, dung and/or animal hair, and is rarely encountered archaeologically. House daub only tends to survive if the building burnt down with sufficient intensity to at least bake the daub. In such circumstances, one would expect a considerable quantity of daub to survive in the archaeological record, rather than the small number of fragments that are usually recovered (Poole, 2010, 142). It is more likely that the fragments of wall daub derive from ovens and once formed part of the upper walls of the oven dome. An interwoven wattle framework was sometimes used as a support for the upper walls or dome of both portable and

permanent superstructures. The size of the wattles commonly used for such frameworks is <20 mm diameter (Poole 2007, 270 and 276). The edge and corner fragments may derive from the outer margins of oven plates or covers or from openings in the oven wall (Poole 2010, 143). It is highly likely that the surface fragments, including those with convex surfaces and those with evidence of moulding and shaping of the clay in the form of finger-ridging and -wiping, also derive from ovens, which may well have been used for domestic or other small-scale cooking and baking.

There may be some association with ephemeral structures and activities related to the function of the amphitheatre, but the majority of the assemblage probably comprises discarded rubbish and demolition debris from buildings elsewhere in the fortress or nearby *canabae*.

Appendix 1

A summary of the Roman ceramic building material recovered from previous investigations at Chester Amphitheatre

It is highly likely that the material summarised below represents a very limited sample of the full range of forms and quantity of material originally recovered, eg, the low numbers and relatively high average fragment weights from 1965, 1966, 1968 and 1969 indicate that a selective retention policy was in operation at this time. Despite this, however, it is clear that a wide range of forms was present. Taken collectively, the assemblage retrieved from previous interventions at the site is closely similar in terms of both the range of material recovered and the relative proportions of different forms to that reported on in this volume. Additional information on the material recovered from excavations carried out between 1929 and 1969 is from an unpublished assessment of the records and finds held by the Grosvenor Museum, undertaken by Gillian Dunn and Rebecca Wegiel in 2003—04, and also by macroscopic examination by the author of the fragments retained.

1929—31: First discovery of the amphitheatre (1929), followed by extensive excavations on the northern half of the site (1930—1)

Ceramic building material forms retained from excavations at the amphitheatre between 1929 and 1931 comprise a fragment of *tegula* roughly shaped into a large disc (context unknown); a fragment of brick with a partial Holt 11 (RIB 2463.44) stamp from a 'mixed deposit outside the amphitheatre' (Newstead and Droop 1932, 32—3 and fig 9); the upper portion of a Holt type 1 (RIB 2458.3) antefix 'from the metalling of the road, outside the amphitheatre' (*ibid*, 33 and fig 10); and fragments of roof tile from the upper fill of a rubbish pit at the back of the arena wall (*ibid*, 17).

1934: Trial excavations to determine the northern limit of the amphitheatre

Fragments of Roman roof-tiles were found in the packing against the face of the outer wall of the amphitheatre during building work at 19 St John Street in May 1934 (Newstead 1948, 103—4).

1957—-9: Trial holes on the line of the northern perimeter of the amphitheatre

Indeterminate fragments of Roman ceramic building material were found unstratified during excavations at the site in 1957.

1960: Excavations (i) beneath the cellar of St John's House; (ii) of a trench for a new retaining wall between the site and Dee House; (iii) along the line of the northern entrance

Seventy-three fragments/3,282 g of Roman ceramic building material, with an average fragment weight of 45 g, were retained from excavations at the site in 1960. Roof tiles and indeterminate fragments predominate but box tiles were also represented. Single pieces of vaulting tube and ?half-box tile were

also recovered. The box tile fragments are all combed; the half-box tile has a knife-scored exterior. A *tegula*, found unstratified, which bears the partial stamp LE[is published in Thompson (1976, 187, fig 23.2). It is identified both here and in RIB (Frere and Tomlin 1992, 179) as a Holt type 30 (RIB 2463.15) stamp but is more likely to be a Holt type 26 (RIB 2463.17).

1961: Exploratory trenches to locate the top of the arena wall

Fourteen fragments/798 g of Roman ceramic building material were retained from excavations at the site in 1961, giving an average fragment weight of 57 g. Forms comprise roof tiles (particularly *imbrices*) and indeterminate fragments.

1965—9: Excavation of the northern half of the amphitheatre

1965

Just two fragments/181 g of Roman ceramic building material were retained from excavations at the site in 1965, giving an average fragment weight of 90.5 g. They comprise a fragment of reused *imbrex* and a combed box tile.

1966

Seventeen fragments/1,469 g of Roman ceramic building material, with an average fragment weight of 86.4 g, were retained from excavations at the site in 1966. A range of forms was recovered, comprising roof tiles (especially *imbrices*), a complete herringbone-floor brick and a fragment of vaulting tube. Indeterminate fragments were also retrieved.

1967

Seventy-five fragments/2,667 g of Roman ceramic building material, with an average fragment weight of 35.6 g, were retained from excavations at the site in 1967. Identifiable forms comprise roof tiles (especially *tegulae*) and two fragments of box tile; one is combed, the other knife-scored. A *tegula* fragment with an almost complete Holt type 1 stamp (RIB 2463.29) was found unstratified (*ibid*, 187, fig 23.3).

1968

Just six fragments/1,273 g of Roman ceramic building material, with an average fragment weight of 212.2 g, were retained from excavations at the site in 1968. Diagnostic forms comprise a complete herringbone-floor brick and the bottom portion, including back projection, of a Holt type 1 (RIB 2458.3) antefix. The latter was recovered from the fill of a circular feature, F 14 (*ibid*, 187, fig 23.1). The back projection is scored for luting/attachment to the reverse of the antefix. Another example of a Holt type 1 antefix was found in 1929, from the metalling of a Roman road on the west side of the amphitheatre (Grimes 1930, 137) (*see above*). A handful of indeterminate fragments were also recovered.

1969

Just four fragments/608 g of Roman ceramic building material were retained from excavations at the site in 1969. This gives an average fragment weight of 152 g. Identifiable forms comprise a probable Warry group B6 *tegula* (*c* AD 120—140), a combed box tile fragment and approximately half of a small paving brick. The latter equates to the 'small bricks' produced at Holt, which are recorded as having a width of *c* 75—-88 mm (*ibid*, 135 no 1). They were probably laid flat (ie wide face down), rather than on edge, as were the narrower (average width *c* 62 mm) herringbone-floor bricks.

1993: Evaluation trenches covering the Dee House site

Fragments of ceramic building material were retrieved during an evaluation at Dee House in 1993. A range of forms is noted in the evaluation report but the quantities recovered are not recorded. Forms comprise roof tiles, a probable box-tile fragment and a possible antefix fragment. None of the forms are further described. Apart from indeterminate fragments from Trench 8, which revealed the truncated remains of the outer wall of Amphitheatre 2, the rest of the material was recovered from an upper terrace to the south of the amphitheatre, from deposits which probably related to structures and activity either directly outside the amphitheatre or associated with its construction; or from (333), demolition deposits from a building located on a lower terrace to the south of the amphitheatre (Buxton, K 1993).

1994: Evaluation trenches in the car park south-east of Dee House

Thirty-three fragments/1,643 g of residual Roman ceramic building material, with an average fragment weight of 49.8 g, were recovered during an evaluation at Dee House in 1994 (Cleary, Edwards, Matthews *et al* 1994). Fragments are not identified to form and no further information is provided.

2000: Excavation of nine trenches (I—-IX) at the amphitheatre. Ceramic building material was recovered from Roman contexts in Trenches II and IX: II in the arena and IX in Thompson's [*vomitorium*] Entrance 4 (Thompson 1976, Fig 3)

Two hundred and sixty-six fragments/6,789 g of Roman ceramic building material, with an average fragment weight of 25.5 g, were recovered from Trenches II—IX during excavations at the amphitheatre in 2000. Most are indeterminate but diagnostic forms comprise roof tiles, bricks and box tiles. The quantities by form are not recorded. One fragment (form unknown), SF 57 from (21), bears a partial signature. Most of the assemblage is residual. Roman contexts which produced ceramic building material (the range and quantity is not indicated) comprise II (80), IX (64) and IX (101) (Dunn 2001). Trench II was located in the arena, half way between the concrete dividing wall and the North entrance. Trench IX was located around the north-eastern end of *vomitorium* 'Entrance 4'.

2001: (i) Evaluation trenches and watching brief relating to the construction of Trident House County Court to the south of Dee House; (ii) excavation of three trenches at the amphitheatre: X in the eastern entrance, XI to the north of the eastern entrance and XII to the east of the northern entrance

Fragments of ceramic building material were retrieved during an evaluation and watching brief at Dee House in 2001. The range of forms and the quantities recovered are not recorded in the evaluation report. Fragments were retrieved from Roman phases 1, 2a and 2b and from a possible Saxon structure in Phase 3. An indeterminate fragment from Phase 2b (119), a sand/clay deposit with a high proportion of ceramic building material, sandstone and mortar fragments, bears a partial dog's paw print on its surface (Garner 2001, fig 25). The lower portion of a probable Holt type 7 antefix (RIB 2458.8) [identified from the scale drawing] was recovered from (161), phase unknown (*ibid*, fig 25).

Three hundred and forty-eight fragments/10,585 g of Roman ceramic building material, with an average fragment weight of 30.4 g, were recovered during excavations at the amphitheatre in 2001. 347 fragments/10,435 g came from Trenches X—XII; a single fragment/150 g was unstratified. The proportions of forms recovered comprise 9.6 % *tegulae*, 3.0 % *imbrices*, 0.6 % bricks and 86.8 % indeterminate fragments (Dunn 2002). Their spatial distribution by form is not indicated in the report. A partial Holt type 7 (RIB 2463.36) legionary stamp, SF 100, was recovered from XII (100) (form unknown). Holt 7 stamps are found exclusively on Warry group A/B *tegulae*, giving a date range of *c* AD 100—140. A signature mark on a *tegula* fragment, SF 110, was recovered from XI (161). Trench X was located in the East entrance, Trench XI to the north of the East entrance and Trench XII to the east of the North entrance.

2002: Excavation of an additional trench (XIII) in the centre of the arena; continued excavation of trenches X—XII

Two hundred and sixteen fragments/6,263 g of Roman ceramic building material, with an average fragment weight of 29 g, were recovered from Trenches X—XIII during excavations at the amphitheatre in 2002. Most are indeterminate. Identifiable forms comprise *tegulae*, *imbrices* and bricks. Some fragments have mortar adhering to broken edges, indicating re-use. A very weathered tile from XII (350) (form unknown) has a possible signature mark (Dunn 2003). Trenches X—XII were located as in 2001 (*see above*). Trench XIII was located in the centre of the arena, in the garden of Dee House. The proportions of forms recovered and their spatial distribution is not indicated in the report.

Appendix 2

A summary of the Roman plaster recovered from previous investigations at Chester Amphitheatre

It is obvious that the material summarised below represents an extremely limited sample of the quantity of material originally recovered, particularly from the earlier excavations at the site. Additional information on the material recovered from excavations carried out between 1929 and 1969 is from an unpublished assessment of the records and finds held by the Grosvenor Museum, undertaken by Gillian Dunn and Rebecca Wegiel in 2003—04, and also from microscopic examination by the author of the fragments retained.

1929—31: First discovery of the amphitheatre (1929), followed by extensive excavations on the northern half of the site (1930—-1)

Excavations revealed that the wall plaster from the arena had largely fallen away but in one area (Section 3), two patches were found *in situ*, forming a thin coat over the joints of the masonry. Some detached fragments of keyed plaster were also found below these areas. The plaster comprised 'a single rendering of mortar' with 'definite traces of colour wash' which was 'best preserved on those blocks of stone which ... were lying face downwards on the floor of the arena ...' (Newstead & Droop 1932, 18). Three main colours were identified: a dark 'Venetian' red, shading to light red and orange-red; yellow shading to orange-yellow; and plain white. In places, these colours had been blended together to produce a marbled effect. A small patch of dark green was preserved on the face of one block, but was not found elsewhere. In other areas (Sections 4—7), superimposed layers of paint could be seen on some sections of plaster, but much of the colour was applied after the plaster had fallen away as, in many places, it completely covered the faces and edges of the bedding surface of the stones (*ibid*). At site 4 [the *Nemeseum*], the doorway was blocked with small blocks of stone from the face of the arena wall, one example of which still bore traces of paint (*ibid*, 14). Three small 'tufa-like' masses of pure lime were also found on the arena floor, close to the footings of the wall, one on site 2 [by the eastern entrance], two others on site 5 [by the *vomitorium* entrance], and may have been intended for use as a colour wash on the arena wall (*ibid*, 20).

Seven fragments of painted wall plaster, presumably from the arena wall, were retained from excavations at the amphitheatre in 1930. They comprise a single edge fragment and six middle fragments. Microscopic examination of one piece revealed an *arriccio* layer of sandy lime mortar (Th: *c* 18 mm) and a thin *intonaco* layer (Th: *c* 1 mm) decorated with a band/zone of well-preserved dark red paint. Three other fragments bear patchy traces of red to orange/red paint. All have an *arriccio* layer of sandy lime mortar, with abundant sand, common lime and occasional voids, which ranges in thickness from >15—23 mm. The *intonaco* layer ranges in thickness from 0.5—2 mm.

Two adjoining fragments, with an *arriccio* layer of sandy lime mortar (Th: >30 mm), also of abundant sand, common lime and occasional voids, are decorated with a band/zone of grey/green paint against a stripe/band/zone of orange/red paint. The *intonaco* layer has a thickness of just 0.5 mm. The final piece is decorated with an indistinct design of patchy orange/red, yellow and grey-green paint. It has a thin *intonaco* layer (Th: 0.5 mm) and an *arriccio* layer (Th: *c* 12 mm) of sandy lime mortar, which is similar in composition to the other pieces, but with the addition of rare impressions of hay/straw.

1957—-9: Trial holes on the line of the northern perimeter of the amphitheatre

A single fragment of painted wall plaster was found in Trench ?I—-IV (516) during excavations at the site in 1957. Microscopic examination revealed two *arriccio* layers: the lower of white sandy mortar (Th: >6 mm), the upper of pink/orange sandy mortar (Th: *c* 6 mm), the colour difference being due to the amount of sand added as a filler. The *intonaco* layer (Th: *c* 2.5 mm) is decorated with a band/zone of patchy yellow paint and parallel brush marks are visible in the plaster surface. It is perhaps unlikely to have originated from the amphitheatre and is more likely to represent material derived from buildings surrounding the site.

1965—9: Excavation of the northern half of the amphitheatre

Thompson noted two distinct types of plaster rendering on the face of the arena wall, traces of which were discovered at many points, although he did not find the range of colours noted by Newstead: (1) a primary coat of hard white lime plaster, less than 1.5 mm in thickness, the surface of which was painted a dark reddish brown. There were at least two coats, both painted the same shade of reddish brown. The coats were too thin to level up the irregular surface of the masonry but provided a hard, consistent base for the application of the paint; (2) a much thicker rendering of 'lime and sand', approximately 25.4 mm in thickness and quite coarse in texture, was applied over the earlier coats, giving a plain, smooth surface. The surface was worn away, leaving no evidence either of its finish or its possible colouring (Thompson 1976, 144 and 146). In its first period of use, the internal eastern angle of the *Nemeseum* was rounded in plan and bore a thick plaster rendering. It is probable that the walls, apart from the panelled dado at the rear of the chamber, were plastered and painted, as fragments of orange-painted plaster were recovered from the clay make-up against the north-east wall, which belonged to the shrine's second period of use (*ibid* 1976, 167).

1966

Twenty-three fragments of painted wall plaster plus three fragments of *arriccio* were recovered from excavations at the site in 1966, all from A66/3 (5), a black-brown loam which filled the chamber of the *Nemeseum*. They comprise a range of colours and designs, the latter including probable floral motifs, represented by curved lines (possibly leaves and other foliage) in green, grey/brown and red. Bands/zones of colours comprise shades of red,

yellow, green, grey/black and plain white. It is possible that these fragments represent part of the original decorative scheme within the *Nemeseum*.

1967

A single fragment of painted wall plaster was recovered from robber trench fill A 67/3 (7) during excavations at the site in 1967. It comprises a fragment of white sandy *arriccio* only (Th: >12 mm), which has a smooth upper surface with tiny dots, possibly accidental splashes, of orange/red paint. Its origin is uncertain.

1993: Evaluation trenches covering the Dee House site

Fragments of Roman plaster were found during an evaluation at Dee House in 1993, although neither the quantity recovered, nor a description of the material, is recorded in the evaluation report. Fragments were recovered from Trench 35, demolition deposit (352), which contained a considerable depth of rubble, including sandstone, cobbles, ceramic building material and mortar, as well as plaster. The trench was located on a lower terrace to the south of the amphitheatre and contained the demolished remains of a Roman building (Buxton 1993, 149, 170 and 172).

2000: Excavation of nine trenches (I—-IX) at the amphitheatre. Ceramic building material was recovered from Roman contexts in Trenches II and IX: II in the arena and IX in Thompson's [*vomitorium*] Entrance 4 (Thompson 1976, Fig 3)

Five small pieces of painted wall plaster were recovered from Trench IX during excavations at the amphitheatre in 2000. Two pieces are painted white and two others blue/green. The other pieces had lost its painted surface (Dunn 2001). Trench IX was located around the north-eastern end of *vomitorium* 'Entrance 4'.

2002: Continued excavation of trenches X—-XII, begun in 2001: X in the eastern entrance, XI to the north of the eastern entrance and XII to the east of the northern entrance. Excavation of an additional trench (XIII) in the centre of the arena

Three pieces of Roman plaster were recovered from wet-sieving during excavations at the amphitheatre in 2002. Two are plain white, the other is painted yellow. The context of these finds is not stated in the evaluation report. (Dunn 2003). Trenches X—-XII were located as in 2001 (*see above*). Trench XIII was located in the centre of the arena, in the garden of Dee House.

Appendix 3

A summary of the Roman cement mix recovered from previous investigations at Chester Amphitheatre

It is obvious that the material summarised below represents an extremely limited sample of the quantity of material originally recovered, particularly from the earlier excavations at the site. Additional information on the material recovered from excavations carried out between 1929 and 1969 is from an unpublished assessment of the records and finds held by the Grosvenor Museum, undertaken by Gillian Dunn and Rebecca Wegiel in 2003—04, and also from microscopic examination by the author of the fragments retained.

1929—31: First discovery of the amphitheatre (1929), followed by extensive excavations on the northern half of the site (1930—-1)

Newstead & Droop describe the use of three distinct kinds of mortar in the construction of the arena wall: (a) a sandy mortar 'heavily charged with nodules of pure lime', as well as local sand and gravel; (b) a sandy mortar similar to (a) 'but with relatively few nodules of lime'; and (c) a fine sandy mortar, greyish in colour which contained much colourless sand and which was 'further characterised by the admixture of odd bits of charcoal' (1932, 18—19). They also describe a 'mason's mixing-floor' and 'unmistakeable traces of the builders' working platforms', as 'indicated by very thin and widely-separated horizontal lines of waste mortar' thought to have resulted from the construction of the arena wall (*ibid*, 12). Three areas of pure lime were also found massed on the arena floor, 'close up to the footings of the wall'. These were interpreted as possibly having been 'placed in readiness for use as a colour wash' for the arena wall (*ibid*, 20). A section of the outer wall of Amphitheatre 2, revealed at Site 1, which lay to the south of Dee House, uncovered footings of five courses of roughly hewn sandstone blocks, set in puddled clay, on which rested a single course of huge ashlar blocks bedded in a 'poor sandy mortar' (*ibid*, 10 and plate xvi).

Microscopic examination of thirteen sample fragments, retrieved during excavations on the northern half of the site in 1930, revealed an indeterminate fragment of type 6 cement mix from the 'mason's mixing-floor'; a lump of hydrated lime (light in texture and full of voids), from one of the areas of 'pure lime' found at the foot of the outer face of the arena wall; and an indeterminate piece of type 4 cement mix from the 'builder's working platform'. The latter is a cream/white sandy mortar with regular sand, gravel and lime and occasional fragments of red sandstone. A further fragment of type 4 cement mix was recovered from the 'upper courses' of the arena wall and a fragment of type 6 cement mix came from the 'lower courses' of the arena wall. The latter piece is a pink/brown sandy mortar with common sand and regular gravel (including a large pebble max L: 30 mm) and occasional lime. The type 4 fragment is a cream/white sandy mortar with regular sand, occasional lime and gravel and rare charcoal. It is in the form of a rough 'T'-shape and has a piece of red sandstone walling attached to one surface. A further sample of

type 4 cement mix was recovered from the arena wall and comprises a surface fragment with attached broken pieces of red sandstone walling. A surface fragment of type 6 cement mix (Th: 45 mm) was retrieved from Site 2 (*ibid*, 11 and pl xvi). Other pieces of uncertain provenance comprise a large surface fragment of type 9 cement mix. The upper layer (Th: 28 mm) is of type 6 cement mix, the lower layer (Th: 17 mm) is of type 2 *opus signinum*-type cement mix. There are patchy traces of white limewash on the upper surface. A surface fragment of type 3 *opus signinum*-type mortar (Th: 18 mm) was also recovered, along with a corner/edge piece and three indeterminate fragments, all of type 5 cement mix.

1960: Excavations of a trench for a new retaining wall between the site and Dee House

A mason's iron trowel, possibly used in the construction of the amphitheatre, was recovered in 1960 from the sandstone cobbling and stiff clay laid between the end of the south side-wall of the east entrance and the arena wall Thompson (1976, 198 and 200, fig 31). It is comparable to the example from Caerleon (*see above, 111*).

1965—9: Excavation of the northern half of the amphitheatre

Thompson describes the outer wall of Amphitheatre 2, the walls of the *Nemeseum*, the passage walls of the northern main entrance, the passage walls of the east entrance and the side-walls of the *vomitorium* entrance 4 as built of 'the normal coursed and mortared stone blockwork' (1976, 157, 166, 170, 174 and 180). The entrances had a 'grouted sandstone rubble' fill (*ibid*, 181).

1993: Evaluation trenches covering the Dee House site

Fragments of cement mix were retrieved during an evaluation at Dee House in 1993 but the quantity recovered is not recorded. Trench 8 revealed the truncated remains of the outer wall of Amphitheatre 2 and the outer edge of the foundation trench appeared to have been covered by a thin mortared surface of compacted, pinkish-grey *opus-signinum*-type mortar (Buxton 1993, 55). Trench 15, just inside the outer wall of Amphitheatre 1b near the eastern wall of a minor entrance (*vomitorium*) revealed seating-bank material of yellow-red sand above a burnt rubbish deposit containing 'stones, mortar, carbon, Roman pottery and degraded mussel shells' (*ibid*, 86). In Trench 18, to the south of Dee House), the east face of the outer wall of Amphitheatre 1b comprised 'six courses of dressed sandstone blocks, bonded with compacted mortar and clay' (*ibid*, 95). A deposit of rubble, (352), comprising 'sandstone fragments, cobbles, tile, plaster and mortar' was noted in Trench 35, a demolition deposit from a building located on a lower terrace to the south of the amphitheatre (*ibid*, 149 and 172).

2000: Excavation of nine trenches (I—-IX) at the amphitheatre. Cement mix was recovered from Trench IX in Thompson's [*vomitorium*] Entrance 4 (Thompson 1976, Fig 3)

Roman mortar was recovered from contexts (14), 64) and (101) in Trench IX during excavations at the amphitheatre in 2000. The types and quantities are not recorded, apart from three pieces of *opus signinum*. (Dunn 2001). Trench IX was located around the north-eastern end of *vomitorium* 'Entrance 4'.

2001: (i) Evaluation trenches and watching brief relating to the construction of Trident House County Court to the south of Dee House

Fragments of cement mix were retrieved during an evaluation and watching brief at Dee House in 2001. The range of types and the quantities recovered are not recorded in the evaluation report. The upstanding masonry (297) of the outer wall of Amphitheatre 2 (297/299) comprised dressed sandstone facing courses bonded in a pink-white lime mortar, with a sandstone rubble core bonded in an identical lime mortar (Garner 2001, 9). Petrological analysis of this mortar indicated a local origin for the sandstone with original mix proportions of the sample of 18.8 % hydrated lime and 81.2 % sand (*ibid*, 25). It presumably equates to the pink-brown sandy mortar (type 6) which appears to have been used elsewhere in the construction of the outer wall of Amphitheatre 2 (*see above, 111*).

2002: Continued excavation of trenches X—-XII, begun in 2001: X in the eastern entrance, XI to the north of the eastern entrance and XII to the east of the northern entrance. Excavation of an additional trench (XIII) in the centre of the arena. Cement mix was recovered from Trench XI

A single piece of *opus signinum* concrete/5 g was recovered from (141) in Trench XI, during excavations at the amphitheatre in 2002 (Dunn 2003, 5). Trench XI was located to the north of the eastern entrance.

Bibliography

Abbreviations

RIB **II** (4) Frere and Tomlin 1992

Modern sources

NB 'Grey literature' reports and internal documents appear in square brackets [ ]

Bateman, N, Cowan, C and Wroe-Brown, R *2008 London's Roman amphitheatre: Guildhall Yard, City of London*, Museum of London Archaeology Service Monogr, **35** (London: MOLAS)

Betts, I 2000 'The ceramic building material: Roman tile types', in Poole, C. Bath Spa redevelopment project: results of the 1998—1999 excavation, 1—6. http:/homepages.tesco.net/~cynbyn/index.htm (Accessed February 2006)

Betts, I M 2008 'The building materials', in Bateman *et al*, 164—8

Black, E W 1996 'Box-flue tiles in Britannia: the spread of Roman bathing in the first and second centuries', *Archaeol J*, **153**, 60—78

Blockley, K 1989 *Prestatyn 1984—5: An Iron Age and Romano-British industrial settlement in North Wales,* BAR Brit Ser, **210** (Oxford: Brit Archaeol Reps)

Boon, G C 1972 *Isca: the Roman legionary fortress at Caerleon, Monmouthshire*, 3rd edn (Cardiff: National Museum of Wales)

Brodribb, G 1987 *Roman brick and tile* (Gloucester: Alan Sutton)

[Buxton, K 1993 Dee House, Chester, Cheshire: archaeological evaluation. Lancaster University Archaeological Unit]

Carrington, P, 2012a 'Greyfriars Court 1976—8 and 81/Building materials/Plaster', in Ward *et al*, 2012, —50—3

Carrington, P 2012b 'Black Friars' House 1986/Building materials', in Ward, *et al* 2012, 156

Carrington, P 2012c 'The extramural settlements: an overview', in Ward, *et al*, 2012, 301—37

Carrington, P 2012d 'Fortress, *canabae* and hinterland', in Ward, *et al*, 2012, 338—415
Carrington, P & Heke, A 2012 'Grey Friars' House 1983/Building materials/Plaster', in Ward, *et al*, 2012, 150
Carrington, P & Heke, A with Roberts, S 2012, 30—42 Nicholas Street 1974/Building materials/Plaster', in Ward, *et al*, 2012, 166—7

Cleary, R, Edwards, J, Matthews, K *et al* 1994 *Dee House, Chester: evaluation, March 1994*. Chester Archaeol Serv Eval Rep **30** (Chester: Chester City Council)

Cuttler, R, Hepburn, S, Hewitson, C & Krawiec, K 2012 *Gorse Stacks —- 2000 years of quarrying and waste disposal in Chester*, BAR Brit Ser, 563 (Oxford: Archaeopress and Birmingham Archaeology)

Davey, N and Ling, R 1982 *Wall painting in Roman Britain* (Gloucester: Alan Sutton)

[Dunn, G 2001 'Roman building materials', in Matthews, K J *et al. Chester amphitheatre: investigations, Summer 2000*. Chester Archaeol Serv Eval Rep 58 (Chester: Chester City Council), 70—1]

Dunn, G 2002 'Roman building materials', in Matthews, K J *et al. Chester amphitheatre: excavations, May—July 2001 and May—July 2002*. Chester Archaeol Serv Eval Rep 60,(Chester: Chester City Council), 5]

Dunn, G 2003 'Roman building materials'. In Matthews, K J *et al. Chester amphitheatre: investigations, Summer 2002*. Chester Archaeol Serv Eval Rep 61 (Chester: Chester City Council]

Dunn, G 2012 'Sedan House 1989/Building materials', in Ward, *et al* 2012, 235—42

Dunn, G 2018 'Window glass', in Wilmott and Garner, 2018, 341—3

Dunn, G, Jones, A and Mason, D J P 2005 'Building materials', in Mason, *et al* 2005, 87—9

Elsen, J 2006 'Microscopy of historic mortars —- a review', *Cement and Concrete Research*, 36 (8), 1416—24.
http://romanportland.net/files/doc/seminar2008/jan_elsen_seminar2008s.pdf (Accessed 10 September 2015)

—Frere, S S and Tomlin, R S O (eds) 1992 *The Roman Inscriptions of Britain*, II: *Instrumentum domesticum* (4) (Stroud:Sutton)

Fulford, M 1989 *The Silchester Amphitheatre: excavations of 1979—85*, Britannia Monogr Ser 10 (London: Roman Society)

Fulford, M and Timby, J 1989 'Tile and brick', in Fulford, 1989, 142—6

[Gardner, C 2009, *Assessment of Evidence for Metal Working from Chester Amphitheatre*, Historic England Research Department Report Series 26—-2009]

[Garner, D 2001 *Report on an archaeological excavation and watching brief at Dee House, Chester*, Gifford and Partners (Rep B2159C/D.01)]

Grimes, WF 1930 Holt, Denbighshire: the works depôt of the Twentieth Legion at Castle Lyons. *Y Cymmrodor* 41 (London: Hon Soc Cymmrodorion)

Heke, A 2012a 'The Roman ceramic building materials', in Cuttler, *et al* 2012, 71—86

Heke, A 2012b 'Nicholas Street Mews 1988/Building materials/Plaster', in Ward, *et al* 2012, 101—7

Heke, A 2018a 'Portable ovens', in Wilmott and Garner 2018, 343—53

Heke, A 2018b ' Roman building materials' in Wilmott and Garner 2018, 356—376

Hunter-Mann, K 2001 *Ceramic building materials. Minimum standards for recovery, curation, analysis and publication*, Archaeological Ceramic Building Materials Group draft document

Jones, A 2008 'Roman building materials', in Garner, D, *Excavations at Chester, 25 Bridge Street 2001: two thousand years of urban life in microcosm*, Archaeol Serv Excav Surv Rep, **14** (Chester: Chester City Council), 127—-44

Karatasios, I, Alexiou, K, Müller, N S, Day, P and Kilikoglou, V 2014 'The second life of ceramics: a new home in a lime environment', in M Martinón-Torres (ed),*Craft and science: International perspectives on archaeological ceramics* (Bloomsbury:Qatar Foundation), 271—9

Ling, R 1985 *Romano-British Wall Painting* (London: Shire)

Ling, R 1989 'The wall plaster', in O'Leary, T J, Blockley, K and Musson, C, *Pentre Farm, Flint 1976—81: an official building in the Roman lead-mining district*, BAR Brit Ser **207** (Oxford: Brit Archaeol Reps), 88—90

Liversidge, J 1983 'Wall painting from military sites in Roman Britain,' in Barbet, A 9ed). *La peinture murale romaine dans les provinces de l'Empire. Journées d'étude de Paris 23—25 septembre 1982*, BAR Int Ser **165** (Oxford: Brit Archaeol Reps), 141—56

Lowther, A W G 1972 'Appendix G: The ventilator', in Johnson, D E, 'A Roman building at Chalk, near Gravesend', *Britannia*, **3**, 146—7

Lowther, A W G 1976 'Romano-British chimney pots and finials', *Antiq J*, **56**, 35—-48

McComish, J M 2012 *An analysis of Roman ceramic building material from York and its immediate environs,* MA Thesis, University of York

Mason, D J P, 2000 *Excavations at Chester: the Elliptical Building: an image of the Roman world?*, Chester Archaeol Excav Surv Rep, **12**, (Chester: Chester City Council)

Mason, D J P 2002 'The construction and operation of a legionary fortress' in Carrington, P (ed) *Deva Victrix: Roman Chester re-assessed* (Chester: Chester Archaeol Soc)

Mason, D J P 2012 *Roman Chester: fortress at the edge of the world* (Stroud: The History Press)

Mason, D J P *et al*, 2005 *Excavations at Chester: the Roman fortress baths – excavation and recording 1732—1998*, Chester Archaeol Excav Survey Rep, **13**, (Chester: Chester City Council)

Miller, S N 1928 'The stamped tile', in Wheeler and Wheeler (1928) 159—60

Mills, P 2013 'The supply and distribution of ceramic building material in Roman Britain', in Lavan, L (ed), *Local economies? Production and exchange of inland regions in late antiquity*, Late Antique Archaeol, **10**, 451—69

Monaghan, J 1997 *Roman pottery from York*, The Archaeology of York **16**: The pottery, fasc 8. York Archaeological Trust (York: CBA)
Newstead, R 1948 'The Roman amphitheatre', *J Chester Archaeol Soc* new ser **36** (ii), 49—172

Newstead, R and Droop, J P 1931 'Excavations in the Deanery Field, Chester, 1928 part ii: the finds'. *Annals Archaeol Anthropol* **18** (3—4), 113—56. Univ Liverpool

Newstead, R and Droop, J P 1932 'The Roman amphitheatre at Chester', *J Chester Archaeol Soc* new ser **29**, 5—40

Newstead, R and Droop, J P 1939 'Excavations at Chester, 1939: the Princess Street clearance area', *J Chester Archaeol Soc* new ser **34** (i), 5—45

O'Hare, G B 1995 'Mortar analysis in archaeology', *Inst Field Archaeol Buildings Spec Interest Group Newsl*, **7**, 5-6

Perring, D 2002 *The Roman house in Britain* (Oxford: Routledge)

Philpott, R & Adams, M H 2010 *Irby, Wirral: excavations on a late prehistoric, Roman-British and medieval site, 1987—96*. Nat Mus Liverpool

Poole, C 2005 'The daub and fired clay and briquetage.' http://www.arch.ox.ac.uk/files/Research%20Projects/Hillforts/Segsbury/daubreport.pdf (Accessed 30 September 2015)

Poole, C 2007 'Structural clay and ceramic building material',in Timby, J, Brown, R, Hardy, A, Leech, S, Poole, C & Webley, L. *Settlement on the Bedfordshire Claylands: archaeology along the A421 Great Barford Bypass*. Bedfordshire Archaeology Monogr. Oxford Archaeological Unit, 265—78

Poole, C 2010 'Structural daub and fired clay', in Philpott & Adams, 2010, 141—8

Pringle, S 2006 'Early box flue tiles in London', *London Archaeol*, **11** (5), 124—9

Sidall, R 2000 *Lime cements, plasters, mortars and concretes*, http://www.ucl.ac.uk/~ucfbrxs/limes/G123notes.htm. Accessed (10 September 2015)

Sidall, R 2006 'Not a day without a line drawn': Pigments and painting techniques of Roman atrtists. *In focus* **2**, 18—31

Swan, V G 2008 'Builders, suppliers and supplies in the Tyne-Solway region and beyond', in Bidwell, P (ed). *Understanding Hadrian's Wall: papers from a conference held at South Shields, 3—5 November 2006, to mark the publication of the fourteenth edition of the Handbook of the Roman Wall* (South Shields: Arbeia Society), 49—82

Swan, V G and Philpott, R A 2000 'Legio XX VV and tile production at Tarbock, Merseyside', *Britannia*, **31**, 55—67

Thompson, F H, 1976 'The excavation of the Roman Amphitheatre at Chester', *Archaeologia*, **105**, 127—-239

Ward, C 1999 Iron Age and Roman Piddington: the Roman ceramic and stone building materials 1979—1998, fasc **4**. Upper Nene Archaeological Society

Ward, S W, *et al* 2012 *Excavations at Chester: the western and southern Roman extramural settlements: a Roman community on the edge of the world, excavations 1964—1989 and other investigations*, Chester Archaeol Excav Surv Rep, **15**, BAR Brit Ser, **533** (Oxford: Archaeopress), 235—-42

Warry, P 2006a *Tegulae: Manufacture, typology and use in Roman Britain*, BAR Brit Ser, **417**, (Oxford: Archaeopress)

Warry, P 2006b 'A dated typology for Roman roof tiles (*tegulae*)', J Roman Archaeol, **19**, fasc 1, 246—65

Warry, P 2010 'Legionary tile production in Britain', *Britannia*, **41**, 127—47

Wheeler, R E M and Wheeler, T V 1928 'The Roman amphitheatre at Caerleon, Monmouthshire', *Archaeologia*, **78**, 111—-218

White, G M 1936 The Chichester amphitheatre: preliminary excavations. *Antiq J* **16** (2), 149—59

Williams, D F 2010 'Thin-section petrology of late prehistoric pottery and fired clay', in Philpott & Adams, 2010, 120—2

Wilmott, T and Garner, D 2018 *The Roman Amphitheatre of Chester: Volume 1, the prehistoric and Roman archaeology* (Oxford: Oxbow)

Zienkiewicz, J D 1986 *The legionary fortress baths at Caerleon. **1**: The buildings* (Cardiff: National Museum of Wales/Cadw)

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