Architectural terracottas from Akragas : investigating monumental roofs from the Archaic and Classical period

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ARCHITECTURAL TERRACOTTAS FROM AKRAGAS

INVESTIGATING MONUMENTAL ROOFS FROM THE ARCHAIC AND CLASSICAL PERIOD

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TABLE OF CONTENTS

Summary...iii

Glossary of terms...iv

1 Introduction... 2

1.1 A short history of Greek colonization in Sicily ... 3

1.2 Akragas and its monumental architecture... 6

2 Architectural terracottas from Akragas ... 12

2.1 History of research ... 12

2.2 State of research... 20

2.2.1 Established areas of investigation... 21

2.2.2 New areas and methods of investigation... 24

2.3 Research aims and questions ... 26

2.4 Material used in this study ... 28

3 Theory and Methodology... 31

3.1 Typologies... 31

3.2 Stylistic typology... 33

3.3 Fabric typology ... 35

3.4 Compositional analysis ... 38

3.5 Reconstructing roof systems... 44

4 Results ... 47

4.1 Stylistic typology... 47

4.2 Fabric typology ... 124

4.2.1 Defining and evaluating attributes ... 125

4.2.2 a Fabric typology... 141

4.3 Compositional analysis ... 145

4.3.1 Petrographic analysis ... 146

4.3.2 Chemical composition... 147

4.3.3 HH-XRF ... 159

4.3.4 Provenance ... 166

4.4 Architectural context ... 170

4.4.1 From the workshop to the building site... 170

4.4.2 The connections between terracotta roof elements... 172

5 The terracotta roofs from Akragas... 183

5.1 Synthesis of stylistic, fabric, and material compositional results... 183

5.1.1 Combining results from the stylistic and fabric investigations... 184

5.1.2 Combining results from the stylistic and compositional analysis... 184

5.1.3 Additional fabric attributes according to the new typology... 189

5.2 A Revised typology: The roofs from Akragas ... 191

5.2.1 Canonical Sicilian sima roofs... 193

5.2.2 Anthemion sima roofs 204
5.2.3 Antefix roofs and types 211
5.2.4 Roof acroteria types 214
5.3 The roofs from Akragas in architectural context 217
5.3.1 Fastenings 217
5.3.2 Architectural remains 220
5.3.3 Reconstructing roof 1 223
5.3.4 Waterproofing 226
6 Discussion 230
6.1 Stylistic analysis 230
6.1.1 The canonical Sicilian roofs 230
6.1.2 Anthemion roofs 231
6.1.3 Corinthian roofs 232
6.1.4 Antefix roofs 233
6.1.5 Stylistic influences and local adaptations 234
6.2 Fabric and production techniques 234
6.3 Material analysis 238
6.4 Architectural context 241
6.5 Chronology 243
6.6 Production of terracotta roofs at Akragas 243
Bibliography 247
Curriculum Vitae 260
Acknowledgments 261
Appendix A 263
Appendix B 323

SUMMARY

Terracotta roofs of the late Archaic and Classical period were an integral part of the architecture of monumental buildings. These objects provide unique insights into the built environment of Greek colonies in terms of their appearance and construction, as well as their associated stylistic and technical influences. The architectural terracottas from Akragas have not been investigated comprehensively since the 1965 article written by Ernesto De Miro, which was based on a limited number of objects. Furthermore, the ways in which architectural terracottas are viewed and the research approaches have changed significantly in the decades since that publication. These objects are no longer seen as merely decorative roof edges but are now recognized as complex architectural components: their final form is shaped by such factors as the production method used, the properties of its raw materials, and the functional aspects of the roof. By focusing on these new areas of investigation, it is possible to gain valuable new insights into the built environment as well as into the nature of local production at the Greek colony of Akragas in Sicily.

The work presented in this study is based on first hand observation, analysis, and documentation of over two hundred and fifty objects housed in the regional archaeological museums of Agrigento and Palermo as well as newly excavated objects from the extra-urban sanctuary of S. Anna, and the architectural remains of structures within the urban sanctuaries. Based on the analysis of profile, decoration, fabric, *chaîne opératoire*, material composition, and architectural context this study formulates a revised typology of the canonical Sicilian sima, anthemion sima, antefix, and Corinthian roofs. This process required a multi-disciplinary approach that draws on the theories and methods associated with the art-historical analysis of style, ceramic studies, archaeometry and architecture.

The results of this study provide a holistic view of architectural terracottas from Akragas. Changes in stylistic influences, production techniques, and material sources allowed this study to identify different generations of roofs and a technical style associated with local production. While the architectural terracottas from Akragas draw from an established regional oeuvre for their style, production techniques, and architectural solutions, there is evidence that these were adapted to local conditions. By taking into account this adaptation and the means by which the technical knowledge of pre-existing regional solutions was transferred to Akragas, it is possible to identify traces of the operation of local workshops. While the sanctuaries of Akragas are known for their impressive monumental structures from the Classical period, the architectural terracottas indicate that the built environment during the Archaic period extend beyond what is already known, and that the buildings themselves were of modest size compared to contemporaries in other cities.

GLOSSARY OF TERMS

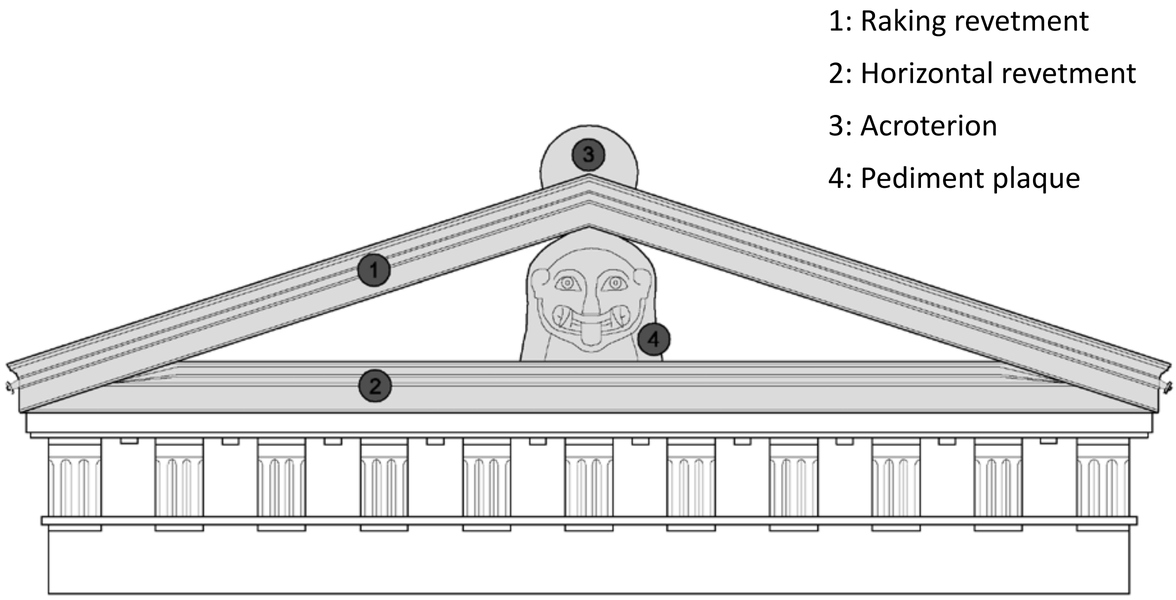

Figure 1: The location of architectural terracotta on the front of an archetypal archaic doric temple in Sicily based on temple C at Selinus (after Mertens 2006, fig. 204), temple H at Naxos (after Lentini & Pakkanen 2011, fig. 23-24) and temple B at Gela (after Brea 1952, fig. 9). Architectural terracotta objects are indicated in grey.[1]

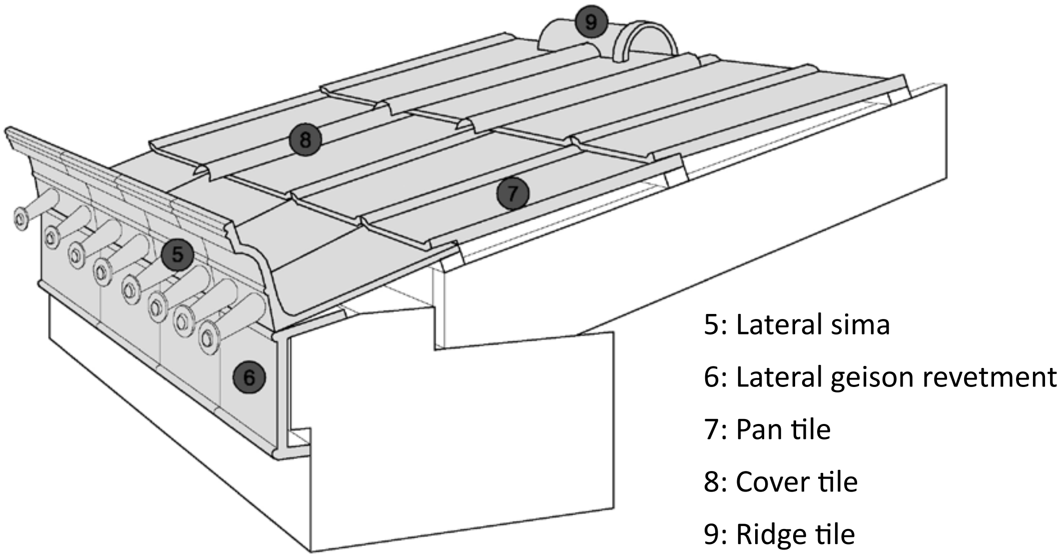

Figure 2: The various components of the canonical Sicilian roof based on frieze A and C from Gela (after Brea 1952, fig. 14, 36-7, plate 2-3), roof 8 from Selinus (after Conti 2012, fig 77) and the Apollo temple from Syracuse (after Wikander 1986, fig. 1; Mertens 2006, fig. 165-66, 169). The architectural terracottas are indicated in grey. The support structures in white are hypothetical.

1 Unless stated otherwise, the drawings in this thesis were created by the author based on observation of the archaeological material. Additional sources of information are credited within the caption for each figure.

The study of architectural terracottas have developed a number of specialized terms for the various elements of the roof. The exact definition of various elements varies considerably between different languages as well as the diverse styles of architectural terracotta. The most important terms associated with Sicilian roofs will be described below using the definitions as used by Winter and Wikander.[2] Reference is also made to the terminology used by Ciurcina, Lentini, Danner and Lang.[3]

Acroterion	A decorative element placed at the corners of a roof or along the ridge. An acroterion can be a statue, palmette or disk shaped element (figure 1:3).
Antefix	The cover tile at the lower edge of the roof which consists of a cover tile and a vertical plaque. The vertical plaque closes the gap between the cover tile and the pan tiles which would otherwise be exposed at the eaves.
Anthemion	A continuous pattern chain consisting of alternating palmette and lotus motives.
Anthemion Sima	A lateral sima consisting of an anthemion pattern in relief. Perforations within the pattern allow for the discharge of water from the roof. Wikander uses the term 'Selinus system', Winter uses 'Selinus type' while Lang uses 'Anthemiensima'. Simas of this type are not restricted to Selinus and it is therefore more appropriate to use the term 'anthemion sima'.
Canonical Sicilian Sima	The canonical Sicilian sima is characterized by a high cavetto which sits on a low fascia. On the lateral sides this lower fascia is interspersed with tubular waterspouts (figure 1). This roof is considered to be a truly Sicilian type and as such is called either the 'Sicilian System' by Wikander or the 'Geloan sima' by Winter since the roof of the geloan treasury in Olympia is seen as one of the best examples of this type. Lang terms this type the 'Kanonisches siziliches Dach' which is perhaps the most appropriate term to use.
Cavetto	A concave moulding. Both Wikander and Winter uses the Italian term, cavetto. In German it is referred to as the Kehle.
Cover tile	Long, narrow tile with a curved or polygonal profile placed over the slight gap between two adjacent pan tiles (figure 2:8).
Eaves	The bottom edge of a sloping roof.
Eaves tile	The pan tile at the bottom edge of a sloping roof which forms the visible edge of the roof (Italian: tegola "de rive").
Fascia	The flat, vertical part of a moulded profile which forms a horizontal band on the roof edge. In the description of canonical sima profiles Wikander distinguishes between the top fascia (Italian: listello superiore. German: Stirn) and the lower fascia (Italian: listello di base, zoccolo. German: Plattenborte, Sockel). For the geison profile Wikander only uses the term plain vertical (Italian: Piastra frontale, faccia). For this study the term fascia will also be used to refer to the plain vertical section of the geison profile.

2 Wikander 1986, p. 31; Winter 1993, pp. 5-6.

3 Ciurcina 2006; Conti 2012; Danner 1996; Lang 2010; Lentini & Pakkanen 2011.

Geison revetment	A cladding element consisting of an oblique plaque, a vertical profile and sometimes a smaller horizontal soffit plaque at the bottom. The revetment is located directly below the roof eaves or sima tile and provides protection to underlying wooden or stone structural elements (Italian: cassetta, German: GeisonVerkleidung)
Grog	Ground pieces of fired clay used as a temper in the production of terracotta and ceramic objects. Also referred to as chamotte.
Guilloche	A cable pattern formed by braided or interlocking bands.
Hawksbeak	A concave profile reminiscent of the beak of a hawk, also referred to as a Doric Kyma.
Horizontal revetment	The revetment of the horizontal geison on the short sides of a rectilinear building, below the pediment. In the canonical Sicilian system this consists of both a horizontal sima (Italian: sima frontonale orizzontale. German: Horizontalsima) and horizontal geison revetment (Italian: cassetta orizzontale) (figure 1:2).
Horizontal plaque	The section of a profile that is roughly perpendicular to the main profile (sima or geison). On the sima this section functions as a pan tile (It: Tegola di appoggio, piano/staffa di sostegno, piano di posa; German: Auflagerplatte). On the geison there can be both an upper plaque (Italian: Tegola, piano superior) and in some cases a lower plaque (Italian: Taglio inferiore, risvolto inferior; German: Bodenplatte).
Lateral revetment	The revetment pieces placed at the eaves. In the canonical Sicilian system this can consists of both a lateral sima (Italian: sima laterale; German: Traufsima) and lateral geison revetment.
Levigated clay	Fine grained, purified clay created by suspending clay in water and then removing coarse and organic material.
Pan tile	The main roof cladding element. The canonical Sicilian pan tile consists of a flat rectangular plate with raised borders on the long sides (figure 2:7).
Plaque	A vertical tablet attached to a wall or other structural element. The term is also used to refer to the vertical profile attached to a cover tile to form an antefix.
Raking revetment	The revetment of the raking geison, located on the sloping edges of a roof, above the pediment. In the canonical Sicilian roof this consists of the raking sima (Italian: Sima rampante; German: Giebelsima) and the raking geison (Italian: Cassetta rampante) (figure 1:1).
Revetment	In classical architecture the term usually refers to external cladding panels. In terms of architectural terracotta Winter uses the term only in regards to the geison, but both Wikander and Lentini uses the term to refer to the decorated edge of terracotta roofs formed by both the sima and geison.
Ridge palmette	An upright plaque decorated with a palmette, attached to the ridge tile.

Ridge tile	A larger cover tile placed along the ridge line in order to cover the gap created where two roof slopes meet (Italian: coppo di colmo, kalypter) (figure 2:9).
Ridge tile antefix	The ridge tile at the pediment which consists of a ridge tile and a vertical plaque. The vertical plaque closes the gap between the ridge tile and underlying roof tiles which would otherwise be exposed. In some instances the vertical plaque is in the form of a large disk, in which case Winter refers to this element as a disk acroterion. In German the term Firstantefix, as seen in the publication by Danner, is perhaps more appropriate to the objects described in this thesis.
Roll	A convex moulding that forms a semi-circle. Winter also uses the term torus to describe this type of moulding. This study will follow the precedent set by Wikander (Italian: tondino; German: Rundstab)
Sima	The last row of pan tiles at the roof edges terminate in a vertical element which prevents the uncontrolled discharge of water from the roof. The same term is used in Italian, German and English literature.
Slip	A thin layer of purified clay applied to the surface of objects in a very liquid form before firing.
Soffit	The under-side of an architectural element.
Taenia	The front edge of a pan tile placed on the eaves of a roof.
Waterspout	An opening in the lateral sima through which water is funnelled away from the building (Italian: tubo, canale di gronda; German: Wasserspeier).

1 INTRODUCTION

The architectural remains found at Syracuse, Selinus, and Akragas, are some of the most visible reminders of a period when Sicily formed an important part of the Greek world. Both Akragas and Syracuse are recognized as Unesco world heritage sites due to the significance of these locations during antiquity as well as the importance of the preserved architectural remains.[1] Akragas is thought to have been founded in the first quarter of the 6th century BC, which places it at the end of a long period of Greek colonization on Sicily (figure 1-1). While the colony appears to have started as a small outpost, it grew into a prominent and prosperous regional player, as demonstrated by the victory of Akragas and Syracuse over the Carthaginians at the battle of Himera in 480 BC.[2]

Elaborate terracotta roofs of the late Archaic and Classical period were an integral part of the architecture of monumental buildings, and included sculptural embellishments (e.g. acroteria), and decorated. Architectural terracottas therefore form an important component of monumental architecture during this period. As archaeological remains, these objects provide unique insights into the built environment of Greek colonies in terms of their appearance, construction, and stylistic and technical influences. The architectural terracottas of Akragas comprise a large collection of objects, including examples of a diverse range of roof types that span the archaic and classical period. In recent years architectural terracottas, including material from Sicily, have received renewed academic interest, as exemplified by the Deliciae Fictiles conference held since 1990.[3] Yet, despite the importance of these objects (as well as the colony itself), the architectural terracottas of Akragas have not been comprehensively investigated for almost 60 years. The 1965 article written by Ernesto De Miro remains the most comprehensive investigation of the material from Akragas, and thus forms the basis for subsequent scholarly investigations on Greek architectural terracottas from Sicily.[4]

In the past, architectural terracottas have fallen within the art historical tradition, in which decorative style and chronological development are the main areas of investigation. But as architectural elements, style is only one aspect that the original craftsmen had to consider. By definition, architectural elements are required to address a number of concerns which often can be difficult to define and identify, especially in an historic context. For example, a sima is limited by the structural limitations of the material from which it is formed; it also must address functional concerns (to waterproof and protect underlying structures) and aesthetic standards of that particular period. The final form of an architectural element is the solution that emerges from a range of often competing factors. Therefore, investigations based on one factor, such as style, only provide a one dimensional view of these complex objects. Within the study of architectural terracottas, the need for a wider and more comprehensive research focus is slowly gaining recognition. Areas of investigation which have been proposed, and in some cases explored through pilot studies, include the manufacturing of architectural terracotta, the material properties of the raw materials used, and the architectural function of the roof as a whole.[5] New avenues of investigation requires new methods and theoretical frameworks, the majority of which are derived from established research fields including ceramic studies, archeometry and architecture.

1 World Heritage List 2017.

2 Holloway 1991, pp. 97-98, 112; Mertens 2006, p. 315.

3 Rystedt et al. 1993; Lulof & Moormann 1997; Edlund-Berry et al. 2006; Lulof & Rescigno 2011.

4 De Miro 1965; Lang, 2010, pp. 87-90; Wikander 1986, pp. 31-32.

5 Edlund-Berry, 1997, p. 75; Glendinning 1996, pp. 102-103; Wikander & Wikander 2006, pp. 42-43.

First, the investigation of the architectural terracottas of Akragas will be placed within the wider regional context. The establishment of Greek colonies in Sicily is a unique period, and the interaction between contemporary political, cultural, and religious forces form the backdrop against which the terracottas can be examined. Chapter 1 briefly considers this wider context, including an introduction to the Greek period in Sicily and an overview of the development of Akragas as a city.

The study of the architectural terracottas in Sicily have a long history of investigation that begins in the late 19th century. Chapter 2 reviews this history of research as well as the established investigative focus and research conventions. This includes an overview of the accepted developmental phases for architectural terracottas. The chapter presents the main aims and research question of this study, and introduces the material upon which this study is based. In recent years new areas of investigation have been identified and in some cases explored through pilot studies. These studies are hugely influential in developing the approach taken in this study, and will be introduced in section 2.2.2. However, each of these new areas of investigation requires a particular research methodology and theoretical framework. Chapter 3 lays out these novel approaches in detail. Chapter 4 presents the results from the different analytical components, namely the stylistic analysis, raw materials and production techniques, compositional analysis and architectural analysis. Chapter 5 consists of a synthesis of the results from chapter 4. An important component of this synthesis is a revised typology for the terracotta roofs from Akragas. This typology is based on the results obtained in the preceding chapter 4 and consists of canonical Sicilian sima, anthemion sima, antefix, and Corinthian roofs. The architectural analysis of the revised roof systems is also within this chapter. Chapter 6 contains a discussion of the results and proposes the conclusions of this thesis. The general information for each object used in this study is provided in appendix A. This incorporates the museum inventory number, current state of preservation and find information. Appendix B contains data related to fabric and production techniques.

1.1 A SHORT HISTORY OF GREEK COLONIZATION IN SICILY

The first Greek colonies were established towards the end of the 8th century BC,[6] but the new settlers were neither the first nor the last to settle on the island.[7] The position of Sicily in relation to the wider Mediterranean region and the fertility of its soil are likely factors influencing its desirability. Even before the establishment of the first Archaic Greek colonies there is evidence for trade between Sicily and the Aegean,[8] and it has been proposed that some of the first colonies (e.g. Naxos and Syracuse) were founded for the purpose of protecting these trade routes.[9]

Hence, when the first Greek colonists arrived in Sicily they came into contact with a number of permanent ethnic groups which had an established presence on the island with large territories and cities. While some of these groups are only named in the often contradictory Greek sources, a large number of settlements can be connected with various local cultures: Morgantina and Leontini are large settlements connected to the Sikels, Segesta and Monte Iato with the Elymians.[10] A number of other settlements are difficult to associate with a specific local culture and some scholars

6 De Polignac 1995, pp. 89-90; Holloway 1991, p. 43; Mertens 2006, p. 14.

7 Brea 1964-1965, pp.1-33; Finley 1968, p. 3; Holloway 1991, p. 41.

8 Boardman 1973, p. 172; De Angelis 2000, p. 112; Finley, 1968, p. 3; Mertens, 2006, p. 15.

9 De Polignac 1995, p. 6; Dominquez 2006, pp. 257-258.

10 Bell & Holloway 1988, p. 314; Finley 1968, pp. 9-10; Holloway 1991, pp. 9, 87, 119, 148; Leighton 1993, p. 275; Mertens 2006, p. 407.

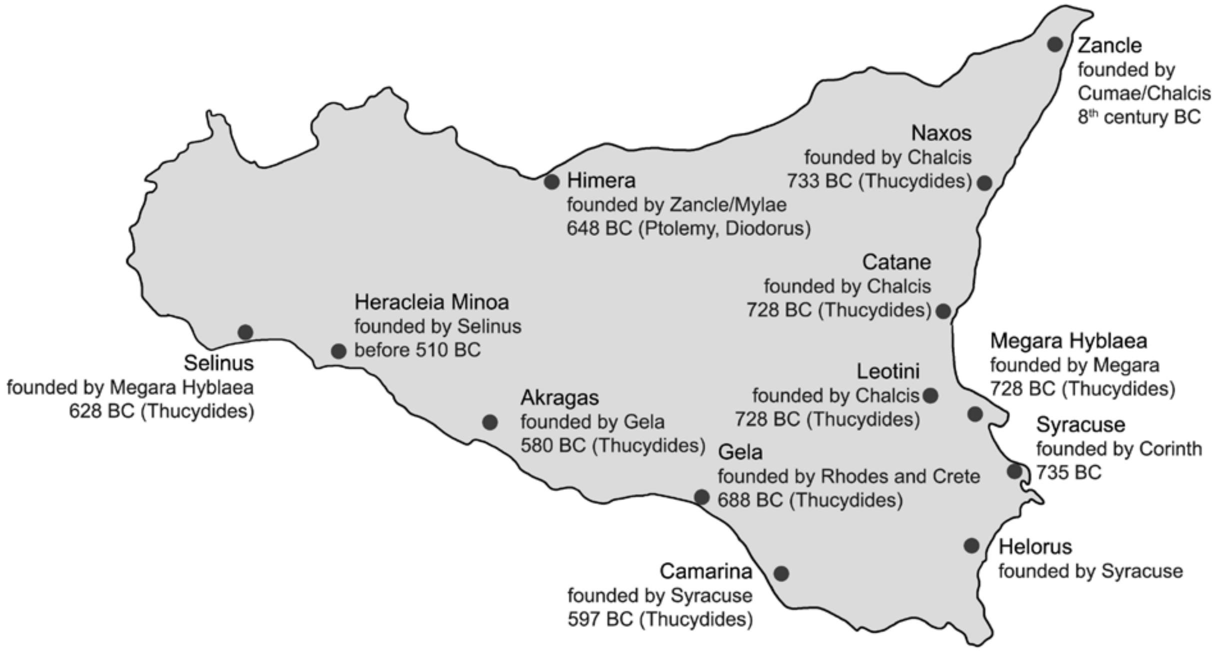

Figure 1-1: The Greek colonies of Sicily with founding information (after Tsetskhladze 2006, tab. 6; Dominguez 2006, p. 255).

prefer to refer to all local settlements collectively as 'local'.[11] In addition to these local settlements, the Phoenicians also had a strong presence on the island. The most important site was at Motya, a large settlement on the western coast of the island which was already flourishing in the 8th century BC. A number of other Phoenician settlements including Panormus and Soloeis are also known.[12]

One of the most important Greek textual sources on Greek colonization is the late 5th century BC work by Thucydides. In books 6 and 7 of his *History of the Peloponnesian War* he provides his readers with background information on the inhabitants of Sicily in order to contextualize the events of 415 BC, when the Athenians besieged Syracuse.[13] Generally speaking, the chronological information provided by Thucydides agrees with the archaeological data.[14] The conventional founding dates of the cities are mostly based on Thucydides, as is the identity of the mother city that founded each city (figure 1-1). The Greek colonization of Sicily began in the 8th century with the founding of Syracuse and other colonies (e.g. Naxos) on the island's eastern coast followed by a gradual westward expansion. Most of the colonies founded during the 7th and early 6th century (except Gela), were part of the second phase of colonization, in which established Greek settlements themselves founded new colonies.[15] Akragas was founded by Gela and new Rhodian colonists around 580 BC, as indicated by both Thucydides and archaeological finds.[16]

Terminology plays an important role in the study of Greek colonization. The terms 'colony' and 'colonization' were first used during the colonization of large parts of the globe by European powers starting in the 15th century AD. As such, these terms are loaded with inherent concepts that have had a significant impact on how scholars viewed ancient Greek colonization. Even into the second half of the 20th century some scholars still viewed colonization as the political, cultural,

11 Dominquez 2006, p. 255.

12 Di Mauro, Alfonsi, Sapia, & Urbini 2014, p. 114; Dominquez 2006, p. 255; Holloway 1991, p. 43; Niemeyer 2006, pp. 155-156.

13 Rutter 1986, p. 142.

14 Dominquez 2006, pp. 253, 256; Nijboer 2006, p. 272; Tsetskhladze 2006, p. xxxi.

15 De Angelis 1994, p. 90; De Polignac 1995, pp. 80-90; Mertens 2006, pp. 14, 40.

16 De Miro 1992, p. 152; Mertens 2006, p. 45; Tsetskhladze 2006, p. lxxii, tab. 6.

and religious control of the motherland over a subjugated territory. This view is being challenged in current academic debates, with many scholars no longer supporting the uncritical application of the more modern colonization model to Archaic Greek colonization.[17] One significant aspect in which the Greek phenomenon differs from modern definitions of colonization is in the relationship between the colony (apoikie) and the mother city (metropolis). Unlike European colonies, such as those in India or South Africa, Greek colonies were largely independent from its founding city. Although the founding of a colony benefitted the mother city, the general scholarly consensus is that the colony was not under the mother city's direct control as it became a city state of its own.[18] The results is that while aspects of the new colony, such as architecture, might be influenced by that of the mother city, it is rarely a facsimile.

According to Thucydides, Akragas was founded by the nearby city of Gela around 580 BC and he names two *oikistes*; Aristonous and Pystilos. Thucydides also mentions that the new colony was given the same institutions as the mother city.[19] Polybius, writing in the 2nd century BC, also mentions the involvement of Rhodian settlers.[20] According to De Miro, the main motivation for the foundation of the colony so close to Gela itself was to halt the territorial expansion of neighbouring colonies and to strengthen trading routes.[21] An analysis of the textual sources led Morakis to define this founding as a state sponsored activity, which implies some level of oversight by authorities in the mother city.[22] But the study by Graham on the relationship between colonies and mother cities shows that this relationship changed over time: the situation at the founding of the colony is generally not the same throughout its history.[23] This appears to be the case for Akragas as well, for fairly soon after the foundation, textual sources already indicated autonomous rule under the direction of tyrants such as Phalaris, who is thought to have ruled from 571/0 – 555/4 BC.[24] By the end of the Archaic period Akragas appears to have surpassed its mother city in terms of political power and wealth. The political landscape of Sicily between 480 and 460 BC was dominated by tyrants from Syracuse (Gelon and Hieron), and by Theron from Akragas.[25]

Greek colonization during the Archaic period is a reflection of the wider social and cultural environment of the time. During this period there was not a unified Greek identity. Instead, a person would identify themselves according to their city or territory of residence. The theory, as formulated by Jonathan Hall, is that Greeks only started viewing themselves as a unified people in face of the outside threat posed by the invading Persians in the 5th century BC. [26] This sentiment is expressed by Herodotus, who is thought to be the first to refer to a common Greek identity based on a shared language, religion, customs and material culture during this period.[27] But while a common Greek identity was only formalized in the early 5th century, the foundation on which this identity was based was formed during the Archaic period. According to scholars including Tsetskhladze, Malkin and De Polignac, Greek colonization was more than just the vehicle of distribution for Greek culture, but was integral to the formation of Greek

17 Boardman 1973, p. 33; Gosden 2004, pp. 1-3; Malkin 2011, pp. 7-8; Ridgway 1994, p. 28; Van Dommelen 1997, p. 306.

18 Malkin 2011, p. 3; Mertens 2006, p. 14; Snodgrass 1994, p. 9.

19 Thuc. 6.4.4; Morakis 2011, p. 481.

20 Polyb. 9.27.

21 De Miro 1992, pp. 151-152.

22 Morakis 2011, pp. 481-482, 492.

23 Graham 1964, p. 4.

24 Adornato 2012, p. 483.

25 Holloway 1991, pp. 97-98.

26 Gosden 2004, p. 65; Hall 2007, pp. 52-53; Malkin 2011, 5; Tsetskhlandze 2006, p. lx.

27 Herodotus 8. 144.

culture and identity during the archaic period. [28]

An important example of this process is the development of monumental architecture during the Archaic period and which is considered to be one of the most prominent features of 'Classical' Greek culture.[29] The archaeological evidence suggests that monumental stone architecture was established during a period of experimentation from the late 7th to the middle of the 6th century.[30] This activity was not restricted to the mainland alone but spanned a wider geographic area. Generally speaking, Greek architectural orders are somewhat bound by broad geographic regions, with the Doric most used in the Peloponnese and the Ionic in the Cyclades and Asia Minor. The architecture of Sicily is mainly Doric with a smaller number of Ionic examples. Naxos was influential in the development of the Ionic order, and Syracuse of the Doric. The involvement of Athens during this period has been overstated in the past, to date, fully developed peristyle temples in the Doric order in Athens are only known from the 6th century.[31] In this regard the development of Greek architecture demonstrates that the Greek colonies were not merely the recipients of Greek culture, but were themselves active participants in its development. Architectural terracottas were widely used in Sicily during this period, and as such form an important part of this period of architectural development (Chapter 2).

1.2 AKRAGAS AND ITS MONUMENTAL ARCHITECTURE

According to the traditional chronology, Akragas was founded around 580 BC by colonists from Gela (section 1.1). In general, the archaeological data supports the presence of a Greek settlement in this location in the first quarter of the 6th century. But the material evidence is rather scarce, mostly consisting of Proto-Corinthian pottery found in the rock sanctuary outside of the later city walls (figure 1-2.21) and graves from the Pezzino necropolis (figure 1-2.27).[32] De Miro has found evidence of a port settlement located on the coast and linked it to Rhodian trading interest along the Mediterranean coast. He dates this settlement to around 582-575 BC based on material from the Pezzino necropolis, which places it at roughly the same period as the founding of the main settlement.[33]

The main settlement is located further away from the coast. The city gate closest to the ocean, gate V (figure 1-2.5) lies roughly 2 km from the modern coast line and has an elevation of around 100 m above sea level (a.s.l.). The natural topography of the area forms an area of around 450 ha that is bordered by limestone cliffs on almost all sides, especially the North and East. This area slopes down from around 300 m a.s.l. on the North side to 100 m a.s.l. on the South side, and is nestled between the Hypsas (figure 1-2.28) and Akragas (figure 1-2.29) rivers.[34] The Hypsas river eroded a canyon to the South-West of the city.

The natural features rendering this location attractive to the early colonists are the results of geological processes in the Caltanissetta basin during the Middle-Upper Pliocene and the Lower Pleistocene periods. The limestone cliffs found on

28 De Polignac 1995, p. 91; Malkin 2011, p. 5; Tsetskhladze 2006, pp. xxii.

29 De Polignac 1995, pp. 3-4.

30 Barletta 2001, pp. 79, 123.

31 Barletta 2001, pp. 153-155; Lawrence 1957, p. 58; Wilson Jones 2014, pp. 45, 212.

32 De Miro 1992, p. 152; Holloway 1991, p. 63; Mertens 2006, p. 45; Tsetskhladze 2006, pp. lxxii, tab. 6.

33 De Miro 1992, p. 152.

34 de Waele, 1971, p. 3; Mertens 2006, pp. 194-195.

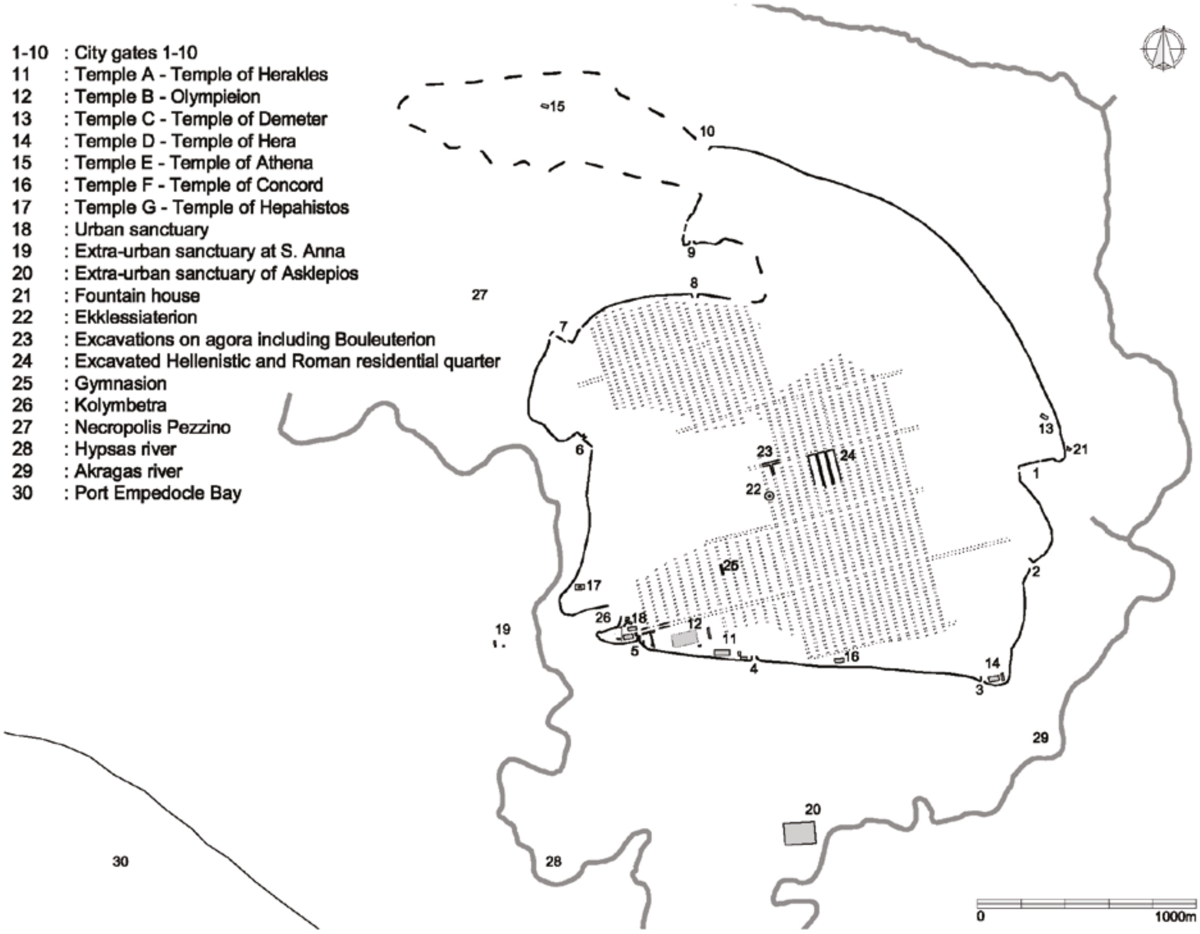

Figure 1-2: Overview of Akragas indicating structures dating from the Archaic period until the Roman occupation (after De Miro 2000, fig. 1-2; Fiorentini 2009, tbl. I, XIV; Fiorentini 1969, tbl. XXVIII; and the 1957 map by Schmiedt and Griffo).

the North and East parts of the city are part of the Agrigento formation from the Lower Pleistocene. This formation consists of three facies: yellow-grey clayey-sandy silt, marly sand with macrofossils, and biocalcirudite and biocalcarenite. Biocalcarenite is a type of limestone that consists of transported sand, carbonate grains, and an abundance of fossils and/or fossil fragments. The Agrigento formation sits on top of the Mt. Narbone formation, which dates to the Middle-Upper Pliocene and consists of blue-grey silty-marly clays. This layer is between 175-400 m thick and is exposed in the river valleys.[35] To the South is found quaternary conglomerates, and in the Akragas river valley there is fluvial clay. Closer to the coast there are marine sand layers.[36]

Textual sources, especially the accounts of the tyrant Phalaris, create the impression that the city already had taken shape in the first half of the 6th century during an early time of prosperity. Polyaenus, the 2nd century AD author of the *Stratagems in War*, mentions Phalaris in relation to the building of the temple of Zeus Polieus, the celebration of the Thesmophoria, and the construction of fortifications.[37] Based on these literary sources, some scholars date the construction of the earliest urban sanctuaries and even the fortification walls of Akragas to the first half of the 6th century.[38] However, the archaeological record does not support this view. Recent excavations have found that the city fortifications were only defined

35 Ciampalini et al. 2012, pp. 137-138; de Waele 1971, pp. 3-4.

36 de Waele 1971, p. 4.

37 Polyaenus Strat. 5.1.1.

38 Marconi 1929, p. 32; Marconi 1933, pp. 12-72; Murray 1992, p. 48.

towards the end of the 6th century.[39] According to Dieter Mertens, during the period directly after foundation the early settlers likely relied on the natural protection provided by the rocky cliffs surrounding the city.[40] Furthermore, there are only minimal traces of religious activity in the urban areas datable to the first half of the 6th century, such as an early archaic head of a deity with a high polos found in the urban sanctuary of the chthonic deities (figure 1-2.18). De Miro postulates that the Thesmophoria festival mentioned by Polyaenus was actually celebrated outside the city limits. A large pithos filled with bronze fragments was found at the extra-urban sanctuary of S. Anna (figure 1-2.19); De Miro views this deposition as evidence of activity at the sanctuary before the creation of its late 6th century structures. The same scholar attributed the lack of evidence for building activity within the city (figure 1-2.19) to the use of perishable materials; he suggested that mudbrick walls were first constructed on top of stone foundations, and were subsequently destroyed by later building activity. This type of construction is also seen in the Bitalemi sanctuary in Gela.[41] Unfortunately, the scarce archaeological evidence described above is rather ambiguous in regards to dating cultic activity in Akragas. Hoards consisting of metal objects, such as the bronze fragments found inside the pithos mentioned above, are known to accumulate and be stored for long periods before deposition.[42] Instead of De Miro's hypothesis, the lack of extensive building activity during this period can be seen as a reflection of contemporary economic conditions. Compared with established Greek colonies such as Megara Hyblaea (figure 1-1), early tombs at Akragas demonstrate a lack of wealth, and there is an absence of monumental construction activity. Together, this indicates that the first half of the 6th century was a period of consolidation and lower economic prospects for Akragas.[43]

The first sacred buildings in stone at Akragas can be dated to the middle of the 6th century. One of the earliest sanctuaries is the urban sanctuary traditionally attributed to the chthonic deities (figure 1-2.18; figure 1-3.2). Situated at the Western end of the hill and to the West of gate V, the preserved remains are the result of intense and varied building activity. While some of the identified ceramic and votive objects can be dated to the end of the second quarter of the 6th century, which may indicate cultic activity occurring soon after the founding of the colony.[44] The earliest architectural features can only be dated to the middle of the 6th century and consist of large, open air altars. Additional structures were added soon after, such as the small rectangular tempietto 1 that dates to the end of the 6th century.[45]

In the South-Western part of the urban area is temple G (figure 1-2.17),[46] which is located North-West of the urban sanctuary. Inside the foundations of temple G, Pirro Marconi found the remains of an Archaic naiskos (figure 1-3.1), as well as a large quantity of roof terracotta fragments dating to the middle of the 6th century. The naiskos is constructed out of large calcarenite ashlars and

39 Fiorentini 2009, pp. 26-27.

40 Mertens 2006, p. 195.

41 De Miro 1992, pp. 153-154.

42 Baitinger 2017.

43 Adornato 2012, pp. 485-486; De Miro 1992, p. 154; Mertens 2006, p. 194.

44 Zoppi 2001, p. 81.

45 Adornato 2012, p. 487; Mertens 2006, pp. 197-198; Zoppi 2001, pp. 82-84.

46 This structure is also known as the temple of Hepahistos. As with most of the temples at Akragas, the attributions are based on historic convention (Holloway 1991, p. 61). The exception is temple B, the Olympieion, for which textual evidence supports the identification. The temple names, however, have now become academic convention and are used by scholars including Mertens, De Miro and Adornato. The numbering of the temples that appear on the 1957 map by Schmiedt and Griffo is perhaps not as widely used, but the abbreviated form is less cumbersome, especially since this work will mostly focus on unnamed structures which are identified only in relation to these temple buildings.

consists of a naos and a pronaos. The terracotta fragments form part of a roof in the canonical Sicilian style and are now known as frieze A (section 4.1.1), according to De Miro.[47] The front of the building is not preserved and no traces of columns have been found.[48]

To the South-East of temple B (figure 1-3.10) is a second naiskos of roughly the same size and form measuring 14 x 7 m (figure 1-3.6). Excavators have dated this naiskos to the same period as the naiskos inside temple G.[49] A large quantity of architectural terracottas dating to different periods was found in and around the naiskos near temple B.[50] One group of fragments is from a roof with similar features as that of the frieze A. This roof is known as frieze D (section 4.1.9) according to De Miro, and is also dated to the middle of the 6th century.[51]

To the East of gate V (figure 1-2.5; figure 1-3.3) is a third naiskos (figure 1-3.4) dated either to the middle of the 6th century or slightly later (i.e. in the second half of the century). This structure is larger than the two mid-6th century naiskoi already described, and in addition to having a length greater than 15 m, it consists of three parts: a naos, pronaos, and adyton with no columns.[52] It should be noted that all the sacred structures described above date around the mid-6th century , and are concentrated in the South-West corner of the city. In general, these structures are simple in terms of their plan and decoration, and are of a modest size. When compared to later structures, the difference in orientation and the distance between these buildings indicate that the urban form at their time of construction was considerably different from what is visible today.[53]

Continuing into the second half of the 6th century, building activity in the sacred areas of Akragas remained largely concentrated in the South-West of the city. The buildings of this period appear to be larger in size than the naiskoi of the mid-6th century discussed above. A long, rectangular building (figure 1-3.8) was identified in the current gardens of the Villa Aurea, and was located to the West of gate IV. This structure is over 30 m long, constructed from local stone ashlars, and is dated to 530 BC, or slightly earlier.[54] A structure of comparable size and date was identified at the extra-urban sanctuary of S. Anna (figure 1-2.19).[55] But while the structure at the Villa Aurea is orientated East-West, this one is orientated roughly North-South.

The urban layout of Akragas underwent significant changes in the period between the late 6th and early 5th centuries BC. The earliest indications of a new street grid were found in the South-West of the city. Temple L in the urban sanctuary and a large rectangular building to the east of gate V (figure 1-3.4) are both orientated according to the newly established streets (plateia I-L; figure 1-3.11). The 5th century layout completely covered the earlier residential areas and the street network. The city grid that is visible today in areas such as the Hellenistic and Roman residential quarter (figure 1-2.24), is the result of Roman period building activity. According to current evidence, the Roman plan appears to be based on the 5th century Greek layout.[56] The agora was located on the S. Nicola hill, which is the geographic centre of the city and is reached by plateia E-F. The most identifiable

47 Adornato 2012, p. 488; De Miro 1965, p. 49; Mertens 2006, p. 197.

48 Marconi 1933, pp. 113-126.

49 De Cesare & Portale 2016.

50 Gàbrici 1925, p. 440.

51 De Miro 1965, pp. 58-60; Lang 2010, p. 88.

52 De Miro 2000, p. 44. De Miro excavated extensively in this area and dated this building to the second half of the 6th century BC. Other authors date the building slightly earlier, to the middle of the 6th (e.g. Adornato 2012, p. 487; Mertens 2006, p. 198; Zoppi, 2001, p. 82).

53 Adornato 2012, p. 486; Mertens 2006, p. 198.

54 Adornato 2012, p. 488; Mertens 2006, p. 197.

55 Adornato 2012, p. 488; De Miro 1992, p. 153; Fiorentini 1969, p. 63.

56 De Miro 2000, p. 44; Mertens 2006, pp. 198, 317; Zoppi 2001, p. 120.

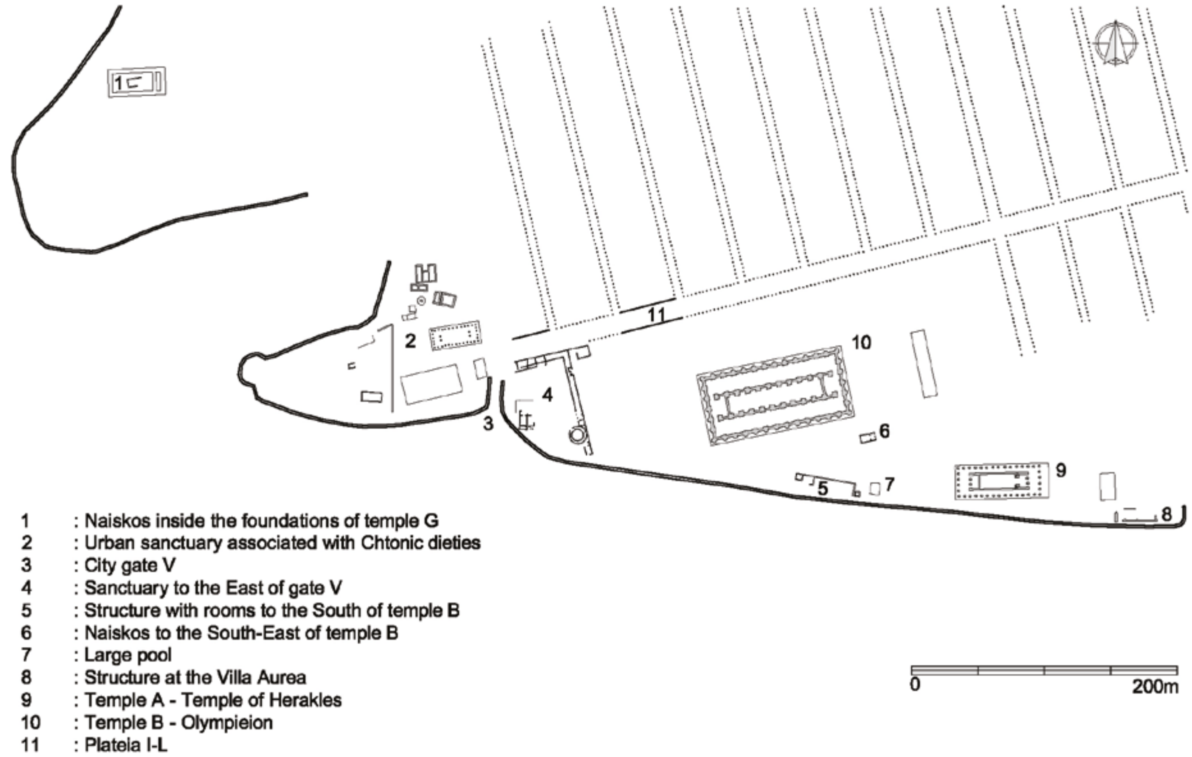

Figure 1-3: The urban sanctuary and neighbouring monumental structures associated with architectural terracottas (after De Miro 2000, fig. 1-2; Fiorentini 2009, tbl. I, XIV; Fiorentini 1969, tbl. XXVIII; and the 1957 map by Schmiedt and Griffo).

public buildings, the Ekklesiasterion and the Bouleuterion (figure 1-2.22, 23), are dated later but it is reasonable to presume that the functions they served were already present in this location in the 5th century. Based on literary descriptions of the city, a second agora has been proposed in the area below the Ekklesiasterion and behind the Southern temple hill. However, the archaeological evidence from this area does not substantiate the presence of such a large area and would deviate considerably from urban formats known from other Sicilian colonies.[57]

The reordering of the urban layout appears to be contemporary with the construction of the city's fortifications. Recent excavations indicate that work on the city walls began around 530 BC, with modifications and additional changes taking place in the early 5th century.[58] The establishment of the city walls and the urban grid during this period was accompanied by an increase in monumental construction. The first peristyle temples were constructed at this point, starting with temple A in the early 5th century (figure 1-2.11; figure 1-3.9). This was soon followed by temple C (figure 1-2.13) and which was later incorporated into the church of S. Biagio. Both of these temples had limestone simas with lion-head waterspouts.[59]

The battle of Himera is seen as a turning point in the history of Sicily, marking the transition from the Archaic to the Classical period. Fought in 480 BC by Syracuse and Akragas against Carthaginian forces, the Sicilian victory brought an influx of wealth to the two colonies, resulting in a number of monumental construction projects, such as the temple of Athena in Syracuse. There is considerable debate whether temple B (figure 1-2.12; figure 1-3.10) should be seen as part of this construction activity. Literary sources indicate that construction on this substantial building started before the war

57 Mertens 2006, p. 318.

58 Adornato 2012, p. 485; Fiorentini 2009, pp. 27-27, 59-65; Mertens 2006, p. 195.

59 Holloway 1991, p. 119; Mertens 2006, pp. 236, 239.

and that it was only later completed with funds obtained through the war effort.[60] Barbara Barletta finds a correspondence between the building's atypical plan and architectural features and other developments in the late Archaic period, which supports the theory that the building was started before the battle of Himera. Mertens points out that the dynasty of Theron (founded in 488 BC) must have possessed the financial and political means before the battle of Himera in order to launch the war effort in the first place. This point would thus support the theory that large-scale monumental construction began before the battle of Himera. The rule of Theron is seen as a period of large-scale public construction works, and a substantial project of aqueducts was created. This water system has not been fully explored yet but around 14,5 km of tunnels are known and they fed into a large artificial lake in the Kolymbetra gorge (figure 1-2.26).[61]

Around the middle of the 5th century, the temple hill was expanded towards the East with the addition of temples D and F (figure 1-2.14, 16).[62] The urban sanctuary also witnessed construction activity in this period with the addition of at least two buildings, one of which is temple L which was added shortly before the middle of the 5th century.[63] A second, larger structure might also have been added to the sanctuary to the east of gate V, although the building's shape can now only be traced in the foundation trenches dug into the bedrock. However, the presence of an altar and two triglyphs of a scale proportionate to the building's plan suggest that this building might have been completed.[64]

During the same period, temple E (figure 1-2.15), was constructed in the upper parts of the city. It is thought that temple E was located in the area of the city's acropolis, as it is situated in the highest part of the city. Unfortunately, this area was covered by the Medieval and modern city, which have severely affected the preservation of archaeological remains from the Archaic period. The 5th century temple E survived because it was incorporated into the later church of S. Maria dei Greci.[65]

The end of the 5th century saw substantial military activity at Akragas. Soon after the Athenian war effort against Syracuse in 415-413 BC, the Carthaginians started a military campaign in 409 BC. Akragas was eventually invaded in 406 BC.[66] While the Carthaginian invasion seems to signal the end of large-scale temple construction projects, building activity continues at least until the Roman period in areas such as the urban sanctuary; two smaller structures, buildings 2 and 3, were added here in the 4th century BC.[67] During the Hellenistic period, structures were also added to the sanctuary to the East of gate V, and a Gymnasium was constructed between temple A and the agora (figure 1-2.25).[68] The conflict between the Romans and Carthaginians during the first and second Punic wars in the middle and second half of the 3rd century was a period of great turmoil in Sicily. In Akragas, this period coincides with the erection of additional fortification walls across the steps of the naiskos to the South-East of temple B (figure 1-3.6).[69]

60 Diod. Sic. 13.82.

61 Barletta 1997, p. 370; Holloway 1991, pp. 43, 112, 117; Mertens 2006, pp. 315-320.

62 Holloway 1991, p. 116; Mertens 2006, pp. 386-397.

63 Voigts 2018, p. 51; Zoppi 2001, p. 120.

64 De Miro 2000, pp. 46-47.

65 Mertens 2006, pp. 196-197.

66 Holloway 1991, p. 141; Mertens 2006, p. 320.

67 Zoppi 2001, p. 121.

68 De Miro 2000, pp. 43-63, fig 3; Mertens 2006, p. 319.

69 De Cesare & Portale 2016, p. 258.

2 ARCHITECTURAL TERRACOTTAS FROM AKRAGAS

2.1 HISTORY OF RESEARCH

The architectural remains from the Archaic and Classical Greek period had a visible presence in the city of Agrigento throughout the Medieval period and into the present day. In the main part of the city, temple E was incorporated into the church of S. Maria dei Greci.[1] On the temple hill, temple F was similarly turned into a Christian basilica in the 6th century AD before being restored to the Greek phase in the 18th century.[2] Literary sources from the period testify to the visual presence of the site's archaeological material. One example is the account by Johann Wolfgang von Goethe. In his book, *Italienische Reise,* he describes the visual impact of the well-preserved buildings on the temple hill when he visited the city in 1787. Goethe also writes on viewing isolated finds of artistic merit, such as a carved Roman sarcophagus and a red-figure *krater* which were on display within the cathedral.[3]

The visibility of these remains drew the attention of those interested in Greek art and architecture during the 18th and 19th centuries, leading to a number of private explorations and excavations of the necropolis and temple areas. A notable example is the exploration of the urban sanctuary during 1835-36, during which the North-East corner of the temple of the Dioscuri was restored.[4] A summary of the excavation history of areas pertinent to this thesis is provided in table 2-1. Unfortunately, these endeavours were mainly concerned with the discovery of valuables.[5] Excavations in the necropolis in the 19th century provided objects for local private collections, such as that of the abbot Ciantro Giuseppe Panitteri. Through the actions of foreign collectors like Leo von Klenze, collections outside of Italy gained Agrigentine objects. A number of these later ended up in international museum collections; for instance, the pieces purchased by Leo von Klenze first went too the collection of the Bavarian king Ludwig I., and are now part of the state collections of antiquities in Munich.[6] And a terracotta fragment of the eye and forehead of a gorgonieion is now housed in the Copenhagen national museum.[7] This period of private exploration and collection mostly ended after the unification of Italy in the 19th century. Objects found during sporadic activity were then housed locally in the civic museum in the city of Agrigento, instituted in 1864, or in the custodian building near the temple hill. Unfortunately, the provenance of these finds was rarely recorded.[8]

These early explorations of Akragas yielded only a handful of architectural terracottas with no provenance. This might explain why one of the first publications focused on Western Greek architectural terracottas did not mention Akragas: the 1881 publication by Richard Borrmann and Wilhelm Dörpfeld can be considered as the earliest dedicated academic work on Sicilian architectural terracottas.[9] In an attempt to define Western Greek architectural terracottas and to establish a chronology for their stylistic developments, Dörpfeld considered terracotta roofs from Selinus and Syracuse in Sicily, Metaponto in the South of Italy, and the Geloan treasury in Olympia, Greece. While the main focus was on architectural terracottas, the authors also considered plain roof tiles and the supporting stone structures. This approach allowed them to provide reconstructions

1 Mertens 2006, pp. 196-197.

2 Holloway 1991, pp. 116-117; Paul 2002, p. 43.

3 Goethe 1816-17, pp. 219-220; Paul 2002, pp. 39-40.

4 Zoppi 2001, p. 9.

5 Marconi 1933, p. 115.

6 Fiorentini 1992, p. 18.

7 Danner 2000, pp. 23, abb. 2.

8 Fiorentini 1992, pp. 18-19; Mangione 2018, p. 3; Marconi 1929, p. 153.

9 Darsow 1938, p. 9; Dörpfeld et all. 1881; Lang 2010, p. 1.

of the terracotta friezes as well as the wider roof context, including connections with the plain roof tiles, timber structures and walls. Dörpfeld is credited with setting the standard for documenting architectural terracottas by recording not only the decoration, but also the profile and fabric of objects.[10] However, his published drawings rarely differentiate between what is preserved and what is reconstructed.

By the early 20th century, the number of known examples from Sicily had increased significantly. This led to the publication of important and large-scale catalogues on architectural terracottas, such as the 1923 publication by Elizabeth Douglas van Buren.[11] Her work consisted of a description of the various sites in Sicily and Western Greece, including their major buildings and a catalogue of the various types of decorated architectural terracotta. Van Buren's publication included two fragments from Akragas: a satyr antefix from a collection in The Hague, and a ridge tile palmette, then housed in the civic museum of Agrigento. The provenance of these objects is not known, but based on the date of publication these objects can be attributed to the period of 19th century explorations described above. Van Buren's typology is based on the decoration and principle profile characteristics. As can be seen from the publication's figures, the main focus is on the decorative aspects of the elements and not their architectural function.

The first scientific excavations in Agrigento started between the second and third decade of the 20th century. These campaigns were a mixture of state and private endeavours, exemplified by the work of Ettore Gàbrici, who received assistance from the Technical Department of Finance of Agrigento.[12] Between 1922 and 1923, Gàbrici excavated the area to the South-East of temple B (figure 1-2; figure 1-3). He considered the building remains in this part of the ancient city to be poorly preserved except for the naiskos; which contained a large quantity of finds. Gàbrici was also the first to publish the results from his excavations in 1925, presenting the preliminary findings from his excavations at temple A, the city fortifications, and the naiskos to the South-East of temple B. Despite finding more than a hundred fragments of architectural terracottas of various types in this area, Gàbrici only published reconstructed drawings for one sima and geison revetment. These drawings and his descriptions are very limited and raise a number of questions regarding the profile and painted decoration of the objects. Gàbrici also only makes mention of the decorated architectural terracottas, the plain roof tiles are not presented.[13] During this period it was the practise to send excavated finds to the National Museums already established in Palermo and Syracuse, which explains why a number of architectural terracottas from Gàbrici's excavations ended up in Palermo.[14]

The retired British naval commander Alexander Hardcastle made significant contributions to the archaeology of Akragas by financing a number of campaigns directed by Pirro Marconi. These began with excavations in the area of S. Nicola and S. Biagio in 1925.[15] In 1927 there was an excavation in the urban sanctuary, followed by excavations in temple G in 1928 and 1929.[16] Before this investigation, the site of temple G was used as agricultural land, and Marconi remarks that the farmers would regularly find objects while working there.[17] Marconi published his findings in two publications in 1929 and 1933. While brief, his descriptions are slightly more detailed than those by Gàbrici, and include a wider range of objects and a few images. These contain reconstructed drawings for the sima and geison revetment from

10 Winter 2016, p. 94.

11 van Buren 1923.

12 Gàbrici 1925, pp. 437-420.

13 Gàbrici 1925, pp. 440-441.

14 De Miro 1965 note 2.

15 Marconi 1926, p.93.

16 Marconi 1933, pp. 11, 113; Zoppi 2001, p. 10.

17 Marconi 1933, pp. 113-115.

the naiskos inside the foundations of temple G, and photographs of the anthemion sima fragments associated with the naiskos at the Villa Aurea. Like Gàbrici, Marconi makes no mention of the undecorated roof elements.[18]

Marconi excavated extensively in Agrigento until 1932, when he left for a different position.[19] In 1939 the *Soprintendenza alle Antichit*à *per le province di Agrigento e Caltanissetta* was formed, and supported further scientific exploration at Agrigento under the leadership of Pietro Griffo.[20] During his tenure, Griffo led a number of excavations, including some in the urban sanctuary.[21] In 1953 he also directed the excavation of the area between gate V and the temple of Zeus (figure 1-2; figure 1-3).

The 1938 publication by Wolfgang Darsow and the slightly later one by Hans K. Süsserott of 1944 were instrumental for cataloguing Sicilian architectural terracottas as they established typologies (e.g. 'Blattstabsimen' and 'Anthemiensimen') and their chronological development. Unfortunately, neither of these two publications included images.[22] Charlotte Wikander finds that the overall typological framework proposed by Süsserott is still fairly reliable, except for his 'alt-sizilisches Dach' and his use of material from Corfu to date the beginning of terracotta roofs in Sicily.[23] Of the two publications, only Darsow incorporates material from Akragas, and of that, only the anthemion sima published in 1929 by Marconi.[24]

The work of Lucy Shoe is a rare exception to the academic trend of the first half of the 19th century as exemplified by Darsow and Süsserott. Instead of basing her studies on published excavation records she studied the objects in person; by using new methods she produced highly accurate profile drawings of a wide range of architectural objects. Shoe first published her methodology in 1936, regarding Etruscan mouldings. Her methodology separates form and function from decoration, and allows for the comparison of material from different scholars. In 1952, Shoe published a study that applied the same methods to Western Greek objects, including material from Akragas.[25] In a reappraisal of her work in 1997, Ingrid Edlund-Berry found that Shoe's methods and findings are still relevant.[26]

Significant events occurred in the 1960's that promoted the protection and scientific investigation of the archaeological remains of Akragas. In 1966 the so-called Valley of the Temples was declared a zone of National Interest, which provided legal protection for the archaeological remains. Subsequent laws were passed in the following years for the additional protection and definition of the area.[27] The National Archaeological Museum of Agrigento was inaugurated in 1967. The new museum brought together the collections from the civic museum as well as objects from Akragas that had been sent to museums in Palermo and Syracuse during earlier periods. During this time, Ernesto De Miro was the director of Archaeology for the *Soprintendenza*, and together with the superintendent, Pietro Griffo, he had a significant role in the establishment of the new museum. New finds excavated under the direction of De Miro were also incorporated into the new museum's collection.[28]

De Miro conducted a number of excavations starting in the 1950's that continued for another five decades. In 1958 he revisited the area to the South-East of temple B, which had previously

18 Marconi 1929, 1933.

19 Marconi 1933, p. 7.

20 Fiorentini 1992, p. 19.

21 Zoppi 2001, p. 11.

22 Darsow 1938, pp. 12-13, 35, 42; Süsserott 1944.

23 Wikander 1986, p. 10.

24 Darsow 1938, p. 32.

25 Shoe 1952.

26 Edlund-Berry 1997, p. 77.

27 Unesco World Heritage Centre.

28 De Miro 1965, pp. 39-40, 55, 58; Fiorentini 1992, pp. 20-21; Mangione 2018, p. 3; Wikander 1986, p. 31.

been excavated by Gàbrici. Although Gàbrici had focused on the naiskos, De Miro concentrated his attention on the structures between this building and the Southern edge of the hill. The findings from the 1958 excavation season were published in 1963 and comprised a detailed description of the architectural remains and a catalogue of finds that included a handful of architectural terracottas.[29] De Miro also conducted a number of excavations in the area between gate V and temple B in 1966-1967, 1970-1973, and 1995-1996. His results were published in 2000 in two large excavation reports that also included material from Griffo's previous excavations in the same area (table 2-1). The extensive catalogue also contains a small number of isolated architectural terracotta fragments but not any undecorated roof tiles.[30]

In 1965, De Miro also published a comprehensive overview of the architectural terracottas from Akragas with detailed descriptions and a large number of images. In addition to objects from De Miro's own excavations, the work includes previously unpublished material from Gàbrici's excavations to the South-East of temple B, and stray finds previously housed in the civic museum. De Miro created a stylistic typology in which each type is called a 'frieze'. The typology is based on the terracotta's profile, painted decoration, find location and fabric. He established date ranges based on stylistic comparisons with known objects from Western Greece. Based on 84 fragments, De Miro identified 15 different friezes. A number of objects which cannot be placed within his frieze categories are organized into stylistic groups (e.g. four different groups of acroteria palmettes). De Miro also proposed partial reconstructions for two friezes, A and G, and one acroteria palmette. His reconstruction of the architectural structures that support the terracotta roof is heavily based on a stone geison revetment block found by Marconi in the area of temple G. Yet, it remains unclear on what evidence other aspects of this reconstruction are based. All 84 fragments are photographed, but only a handful of the objects are accompanied by profile drawings, none of which are reconstructions of the entire profile. As already mentioned, De Miro considered the ceramic fabric of fragments when grouping objects into friezes. The colour and consistency of the clay and occasionally the colour of the inclusions are briefly mentioned using verbal descriptions. However, his fabric analysis lacks a clear and systematic methodology. De Miro also proposed some observations regarding the production of these objects, but this was not a major line of investigation.[31]

The 1965 publication by De Miro does exclude a number of objects, such as a gorgoneion antefix published by Marconi.[32] Also omitted was a second gorgoneion antefix fragment found by Graziella Fiorentini during excavations at S. Anna. The S. Anna site lies on private land and was discovered accidentally through agricultural activities. Two structures came to light during the rescue excavation, and Fiorentini identified them as an extra-urban sanctuary.[33] The reason for De Miro's omission might be that Fiorentini conducted the rescue excavation in 1965, the same year as the publication of De Miro's work. Thus, while he was able to include the only other architectural terracotta fragment found by Fiorentini (a sima with a partially preserved waterspout), the antefix might not have been available for publication yet. Fiorentini published both fragments in her excavation report in 1969, but even this was limited to a brief mention and a single photograph.[34] Despite these criticisms, De Miro has made a significant contribution to the study of Sicilian architectural terracottas by publishing descriptions and photographs of the

29 De Miro 1963.

30 De Miro 2000.

31 De Miro 1965, p. 41.

32 Marconi 1933, pp. 40, fig. 17.

33 Fiorentini 1969, p. 63.

34 De Miro 1965, pp. 56, tab. XXIV-1g; Fiorentini 1969, pp. 67-68, fig. XXXII-2.

fragments known at that time, and by placing these into a new chronological typology. To date, his work remains the most important reference for scholars in regards to architectural terracottas from Akragas.

Due to the relative absence of published antefixes, investigations of these objects from Magna Graecia conducted in the 1970's and 1980's were limited to the fragments published earlier by Marconi and Darsow for material from Akragas. With his 1982 publication, Volker Kästner developed a typology for gorgoneion antefixes based on a stylistic analysis of attributes, form and artistic execution. Two other studies from the same period by Janer D. Belson and Josef Floren are similar in approach and content.[35] In his 2000 publication on the urban sanctuary, De Miro uses Kästner's typology to date two antefixes found to the east of gate V.[36]

Apart from the publications on antefixes already mentioned, the works by Darsow (1938) and Süsserott (1944) were the only large-scale studies on Sicilian architectural terracottas until 1986, when Charlotte Wikander published a small volume focused solely on the simas.[37] Wikander provided an overview of the stylistic development of Sicilian architectural terracottas. While her chronological development is based in part on the work by Süsserott, she also incorporated newly discovered finds, such as the material from Akragas that was published by De Miro. Based on revised dates for the Geloan roof in Olympia, Wikander also adjusted the dating of the canonical Sicilian roof. The publication also provided systemized descriptions and drawings of known Sicilian fragments, making it an important reference for the study of architectural terracottas from Sicily.

In 1988, Madeleine Mertens-Horn published a detailed investigation of lion-headed waterspouts, which included a previously unpublished terracotta fragment from Akragas.[38] Mertens-Horn considered the chronological development of this type of element based chiefly on stylistic characteristics.

The 1993 publication by Nancy A. Winter revisited the development of Greek architectural terracottas.[39] Unlike previous studies, Winter incorporated undecorated roof tiles in order to reconstruct the development of regional roof systems (e.g. Corinthian, Laconian, and Attic systems). In comparison to these systems, Winter's section on Sicilian roofs is not as comprehensive and does not include a reconstruction of a canonical roof. However, Winter did expand on the existing stylistic development typology by, for example, diving Wikander's Geloan phase into three separate phases based on the increasing elaboration of the painted decoration. While the focus of Winter's work was on the development of regional roof systems, she did include a very brief section relating to the production of architectural terracottas.

Peter Danner produced a number of works focused on various types of Western Greek architectural terracottas. Of interest to this investigation is his publication on ridge antefixes and horse rider acroteria in 1996 which incorporates a number of fragments from Akragas, some of which had not been published before.[40] A small number of these objects were presented again in a volume dedicated to pedimental decoration in 2000.[41] Danner's work included a catalogue and a discussion on the architectural context of these objects.

The 2007 publication by Patricia Lulof provided a detailed catalogue (with stylistic and fabric descriptions) for antefixes from the Allard Pierson Museum in Amsterdam.[42] It also included

35 Kästner 1982; Belson 1981; Floren 1977.

36 De Miro 2000, p. 122.

37 Wikander 1986, pp. 7-8.

38 Mertens-Horn 1988, p. 184.

39 Winter 1993, pp. 274-278.

40 Danner 1996.

41 Danner 2000.

42 Lulof 2007.

photographs and drawings of the front, sides, and in some cases, the back of objects. Lulof provides an overview of the stylistic development of antefixes from the Archaic, Classical and Hellenistic periods in Italy, and includes material from Sicily. One of the objects described in this publication was an antefix depicting the head of a silen or satyr that is thought to be from Akragas. This object was previously housed in The Hague and was published by van Buren in 1923.

From 1986 to 2005 the *Soprintendenza ai Beni Culturali e Ambientali di Agrigento* and the *Parco Archeologico e Paesaggistico della Valle dei Templi di Agrigento* have conducted excavations on the fortifications of Akragas. The results were published by Gisella Fiorentini in 2009 and the catalogue includes isolated examples of gorgoneion antefixes. Fiorentini provides a brief description of the objects, including their fabric, estimated dates, and a photograph.[43]

The 2010 Ph.D. dissertation by Matthias Lang is the latest in this line of research; the Akragas objects contained in the catalogue rely on the preceding publications by De Miro, Marconi, Winter, and Wikander.[44] Based on a review of published objects from the Western Greek world, Lang offers a number of refinements to the established developmental phases. This refined typology forms the basis for the revised dates proposed by Lang for the Akragas objects. His work also contains the material analysis of objects associated with the Geloan roof in Olympia in order to prove its provenance. In general, Lang does not pay particular attention to the fabric or the architectural contexts of these objects. His chronological typology is based mainly on stylistic considerations.

This overview of the research and publication history of Greek architectural terracottas demonstrates that the typology established by De Miro in 1965 has been largely retained by modern scholars. In her 1986 publication Wikander discussed five of De Miro's friezes (A, D, E, F, and G) and retained his dating of these objects.[45] Lang's 2010 Ph.D. dissertation slightly modified the 15 friezes defined by De Miro. Lang identified 19 separate roof systems by dividing De Miro's frieze H1 into two individual roofs, and by reorganizing some of De Miro's stylistic groups into new roofs, such as AKRA 14 which consists of a single eaves tile. Lang also published a group of objects which came from De Miro's 1963 publication on the excavations to the South-East of Temple B (AKRA 15).[46] Both Wikander and Lang have only used material based on De Miro's publications. This means that currently, most studies of Sicilian architectural terracottas are based solely on material excavated before 1965. Additionally, the work by Lang demonstrates that the stylistic typology created by De Miro requires revision.

Since 2012 the University of Palermo has been excavating at Akragas in the area to the South-East of temple B. The investigations are directed by Monica de Cesare and Elisa Chiara Portale. Their research revisited the naiskos and proposed an updated interpretation and chronology.[47] They also re-examined the structures located between the naiskos and the edge of the hill. While to date the excavations have not unearthed any additional architectural terracottas, the researchers have revisited the archives of the regional archaeology museum Antonio Salinas in Palermo as part of the on-going investigation. A number of boxes with material from Gàbrici's initial excavations which had been thought lost were subsequently discovered, and these form an important part of the present study.

Since 2013, Natascha Sojc has reinvestigated the area to the North of S. Anna, which was previously

43 Fiorentini 2009.

44 Lang 2010, pp. 87-90.

45 Wikander 1986, pp. 31-32.

46 Lang 2010, pp. 87-90.

47 Danile et al. 2013, p. 133; de Cesare & Portale 2016; de Cesare & Portale 2018.

Table 2.1: The excavation history of areas pertinent to this study in terms of excavation directors and years.

	Gàbrici	**Marconi**	**Griffo**	**De Miro**	**Fiorentini**	**de Cesare and Portale**	**Sojc**
Urban sanctuary		1927	1953-1955				
Sanctuary to the East of gate V			1953	1966-1969, 1970-1973, 1995-1996			
Naiskos inside the foundations of temple G		1928-1929					
Naiskos to the South-East of temple B	1922-1923			1958, 1962		2012-present	
Extra-urban sanctuary of S. Anna					1965		2014-present

excavated by Fiorentini in the late 1960's.[48] To date, the excavations have identified numerous votive deposits, some fragmentary architectural remains, and a handful of architectural terracottas and roof tiles. This material had not yet been published.

The description of the history of research in table 2.1 focuses on material from Akragas, but there are a number of studies dealing with architectural terracottas from a wider Mediterranean context that are important to this investigation. Some of these were discussed above, as they incorporate material from Akragas (Süsserott, Winter, Wikander, Danner, and Lang). However, there are also a number of studies that do not deal directly with material from Akragas. These still merit consideration as they provide important references for this project's methodology and objects for comparison. Of particular interest is the material from Gela, Naxos, Selinus and Syracuse due to the amount of available information, the similarities with objects from Akragas, and the impact of particular scholars on the wider field. A brief overview of the history of research for relevant material is provided below.

The scholarship of the early to middle 20th century at the mentioned Greek colonies can be characterized as slightly broader in focus than previous research, and demonstrated an overall interest in architectural reconstructions. One of the earliest works is that of Paolo Orsi on the Athenaion from Syracuse, published in 1918.[49] In essence this publication is an excavation report, but the architectural remains and terracottas received particular attention. He provided a number of reconstructions for different roof revetments, and for different roof sections; the latter included the underlying wall, roof timbers, and in some cases, the undecorated roof tiles. The 1949 publication by Luigi Bernabò Brea on the Athenaion from Gela reflected a similar methodology as the work by Orsi, except that it focused solely on the architectural remains and architectural terracottas,[50] as is the 1956 publication by Gàbrici on material from Selinus.[51] Paola Pelagatti excavated the area around

48 Sojc 2016; Sojc 2018.

49 Orsi 1918.

50 Bernabò Brea 1949.

51 Gàbrici 1956.

temple B at Naxos and published a report in 1964, which included a smaller number of architectural terracottas, these are described in less detail and offer only one revetment reconstruction.[52]

The *Deliciae Fictiles* conferences and the subsequent publications have revitalized the study of architectural terracottas in Sicily. The first conference was held in 1990 and focused on the architectural terracottas from central Italy but included a number of papers on Sicilian material, for instance, the contribution by Concetta Ciurcina on material from Syracuse and Naxos.[53] The second conference took place in 1996 and focused on material from Archaic Italy, including papers by Ciurcina on material from Syracuse, and Maria Lentini on Naxos.[54] The third conference in 2002 also presented a section on material from Sicily. The publication includes papers by Ciurcina on eaves tiles from Syracuse, by Lentini on acroteria from Naxos, and by Pelagatti on gorgoneion antefixes from Sicily and Magna Graecia.[55] The 2009 conference contained the following contributions on Sicilian objects: Ciurcina on material from the regional archaeology museum Paolo Orsi in Syracuse, Pelagatti and Lentini on anthemion revetments and gorgoneion fragments from Naxos, Lentini and Jari Pakkanen on material from Naxos, Giovanna Greco on material from Gela, and lastly Maria Conti on new material from Selinus.[56] The *Deliciae Fictiles* conferences have contributed to the study of architectural terracottas by providing a platform for the publication of new finds and the revision of existing scholarship. Of note is the paper by Charlotte and Örjan Wikander from the 2002 conference which provides a valuable reflection on current scholarship and future directions.[57] The focus of most of these conference contributions is predominantly on the stylistic aspects of decorated and figurative elements. One exception is the paper presented by John Kenfield on the technical aspects of production as seen in the material from Morgantina.[58] Another is the paper by Lentini and Pakkanen, which includes a reconstruction of the terracotta roof associated with the tempietto H at Naxos.[59] While this publication is an important reference on current practises in regards to 3D reconstruction and architectural remains, it unfortunately does not include the undecorated parts of the roof.

The *Deliciae Fictiles* conference proceedings are focused on the architectural terracottas from Italy. Thus, while objects from Greek contexts are included, a large portion of the material comes from Etruria and other Italian sites. Beyond the conferences' publications, impressive collections from sites such as Satricum and Murlo have received significant scholarly attention. Of note is the work by Lulof, who applied a systematic methodology to the documentation and analysis of objects and their fabric, as well as to the subsequent reconstruction of acroteria statues from Satricum. Lulof also worked on objects from Murlo, paying particular attention to the manufacturing techniques used and the identification of a 'technical style'.[60] Winter also produced a number of publications on Italian material, which explored the regional nature of production techniques.[61] A number of scholars have referred to the connection between the architectural terracottas from Sicily, Etruria, and South Italian sites.[62] But the exact nature of this connection and the lines of influence have not yet been studied in greater detail. From a methodological point of view, the research on material from Etruria and South Italy is an

52 Pelagatti 1964.

53 Rystedt et al. 1993; Ciurcina 1993.

54 Lulof & Moormann 1997.

55 Edlund-Berry et al. 2006.

56 Lulof & Rescigno 2011.

57 Wikander & Wikander 2006.

58 Kenfield 1997.

59 Lentini & Pakkanen 2011.

60 Lulof 1991, 1994.

61 Winter 2002, 2009; Winter et al. 2009.

62 Wikander 1986, pp. 26, 29, 30; Winter 1993, p. 27.

important reference point for the present study.

The work by Conti on material from Selinus provided a comprehensive and detailed resource on the decorated architectural terracottas from the Greek colony. Her 2012 publication included a revised typology for the terracotta roofs, a catalogue of fragments, and a systematic description of their fabric, style, provenance, and chronology.[63] As such, this work is an important reference point for current standards of documentation and graphic reconstructions. Although her focus was on material from Selinus, the study does not include objects from the collections of the regional archaeological museum Antonio Salinas in Palermo.

Undecorated roof tiles are largely absent in this overview of research on architectural terracottas from Sicily. Traditionally, these objects were not documented, studied, or even collected, but this is changing. Starting in 1988, Örjan Wikander published a number of investigations on undecorated roof tiles in Greece.[64] And in 1998, Conti published a typological study of undecorated roof tiles from Selinus.[65] This work considered the fabric, structure, and methods of production for pan and cover tiles. Conti's chronological typology of pan tile profiles has been used by other scholars to date Sicilian material, including a collection of tiles from the acropolis at Selinus,[66] and eaves tiles from Syracuse.[67]

2.2 STATE OF RESEARCH

Based on the historical overview of research in the preceding section (section 2.1), it is now possible to summarize the state of scholarship on the architectural terracottas from Akragas. A number of excavations have produced material of significance to this thesis. These are: the excavations by Gàbrici in the area to the South-East of temple B, Marconi at temple G, De Miro in the area to the East of gate V, and Sojc at S. Anna. Other excavations produced only a small number of isolated finds, such as the excavations by Fiorentini at S. Anna and the city fortifications. There are also a number of objects which were collected before the start of scientific research in Agrigento in the 1920's. The provenance of these objects is largely unknown.

The material from Akragas is predominantly published in two ways. The first is in excavation reports, which at best offer a brief description in the catalogue of finds and a photograph. The second type of publication is specialist studies focused on specific types of architectural terracottas (e.g. gorgoneion antefixes, lion-headed waterspouts, or roof revetments). These publications focus primarily on decorated roof elements. In the isolated cases where undecorated elements are considered, such as by Dörpfeld and Wikander, these do not include material from Akragas. Within these publications the analysis of the material is centred on questions relating to style, in order to identify regional and chronological typologies based on profile and decoration. While some publications do consider aspects relating to fabric, production, or the architectural context of architectural terracottas, these are by no means exhaustive lines of investigation and large gaps still remain. There are a number of objects from Akragas which have also not been published before, including material from Gàbrici's excavations recently rediscovered in the regional archaeological museum in Palermo, and objects from the recent excavations at S. Anna.

The most important published work in regards to the architectural terracottas from Akragas is the 1965 publication by De Miro. As mentioned above, his work is the key source of published information currently available to scholars. However, there are a number of concerns regarding his work, the first being that it is a reflection of the state of the art in 1965. Furthermore, while it documents over 80 objects, the majority of which had not

63 Conti 2012.

64 Wikander 1988, 1990.

65 Conti 1998.

66 Jonasch 2009.

67 Ciurcina 2006.

been published before, it is not complete. As shown above (section 2.1), it omits gorgoneion antefixes and undecorated roof elements. Lang demonstrated that the 15 friezes identified by De Miro may also require revision. Lastly, De Miro does not record the profile or the fabric of objects in a consistent and systematic manner.

A large corpus of research from other Sicilian sites is of importance to this study. These include newly published materials from Naxos, Syracuse, and Gela in the *Deliciae Fictiles* conference proceedings as well as the work by Conti on Selinus. The wider context of scholarship contains a number of trends in regards to the field's research aims and methodology, which will be outlined below.

2.2.1 ESTABLISHED AREAS OF INVESTIGATION

Historically, one of the main aims of research on architectural terracottas is the establishment of a chronological typology by considering aspects related to style, including painted decoration, profile, and relief. For Sicilian revetments this process started with the work by Dörpfeld and Borrmann and was continued by van Buren, Süsserott, Darsow, Shoe, Wikander, Winter and most recently Lang (see section 2.1 in detail). Roof types such as a canonical Sicilian sima or the anthemion sima have been classified according to these categories and assigned a chronological time span. Scholars such as Mertens-Horn, Danner, Kästner and Belson also have defined stylistic typologies for other types of architectural terracottas (e.g. gorgoneion antefixes, lion-headed waterspouts, horse rider acroteria, and ridge tile antefixes). One of the main reasons for this focus on style likely comes from the art historical origin of the specialization. In addition to style, a chronological typology is also important for dating objects. Stratigraphic data are not available for a large percentage of architectural terracottas as they come from earlier excavations. Where archaeological data are available they are not always conducive to the establishment of precise dates, for example, the stratigraphic context may date only the final collapse of the roof elements and not when the roof was first erected. For these reasons, both Winter and Wikander consider stylistic chronology to be the most widely used method for dating architectural terracottas.[68]

The chronological typology of Sicilian roof terracottas, especially revetments, have been established by a long and relatively intensive history of research with the latest contributions by Wikander, Winter and Lang (section 2.1). These more recent studies do not depart dramatically from previously established typologies, instead they offer further refinements for the chronology, and in some cases, the more detailed definition of existing typologies. The main developmental stages as described by these researchers are accepted in the wider field, and have been used in the works by Mertens-Horn and the Italian reference entry by Maria José Strazzulla.[69] Therefore, based on existing knowledge and methodology, there is no reason at this point to reconsider the established typology. Instead, the existence of a reliable stylistic typology provides the opportunity to expand research into areas that have received less attention to date, which will be described below (section 2.2.2). But this does not mean that stylistic chronology is not of relevance to this investigation since it is integral to dating objects. For this reason, a brief overview of the established stylistic chronology for Sicilian terracotta roofs is provided below.

2.2.1.1 MAIN DEVELOPMENTAL STAGES OF SICILIAN TERRACOTTA ROOFS

Terracotta roofs from Sicily during the Archaic period mainly consist of two types. The main distinction is seen on the eaves: one type has a

68 De Miro 1965, p. 40; Wikander 1986, p. 10; Winter 1993, p. 4.

69 Mertens-Horn 1988, p. 79; Strazzulla 1997, pp. 705-707.

lateral sima, the other has antefixes and eaves tiles. The lateral sima roof type is mainly confined to the Archaic period and appears to be the preferred type for monumental buildings. The antefix roof type is used into the Classical and Hellenistic periods but is confined to monumental buildings of lesser status.[70]

The lateral sima roof type is generally divided into three main developmental stages; the early period, the canonical Sicilian sima and the anthemion sima. Lang also identified an intermediate stage consisting of composite revetments, in which the sima and geison revetment is connected as a single element. The majority of roofs of this composite type is from Lokri, on mainland Italy, and Naxos and are dated to the beginning of the 6th century BC. Thus, this type predates the first terracotta roofs at Akragas, which appear only in the middle of the 6th century (section 1.2). As this period falls outside the chronological limits of the present study, it is not represented in the material under investigation.[71] The three main development phases for the lateral sima are described below.

The first architectural terracottas appear in Sicily in the last quarter of the 7th century BC. This early phase extends into the first quarter of the 6th century. Sima fragments from Syracuse, Grammichele, Naxos, and Himera are associated with this first phase. Winter puts the objects from Naxos and Himera into a second, transitional phase, but Lang does not agree with subdividing the early stage since it has so few examples. Lang also identified a sima from Megara Hyblaea as being part of this early stage.[72] The early system of the lateral sima roof type is thought to form the basis of the later canonical phase. However, given the small amount of available material, this phase and its stylistic influences are not well understood at this time. As with the composite revetments described above, the early stage predates the first terracotta roofs from Akragas.

The second development phase is considered to be particular to Sicily and dates from the first quarter of the 6th until the first quarter of the 5th century BC. While the sima profile is based on the earlier Sicilian roofs it developed features quite distinct from roofs on mainland Greece. The canonical Sicilian sima consists of three main profile components, each separated and bordered by single or double rolls. The top component is a narrow band or fascia, the middle component is a high cavetto and at the bottom there is a base with tubular waterspouts inserted on the eaves (figure 2 in the glossary). While there is consensus among scholars that this roof system is a truly Sicilian development, they refer to it by different names. Wikander calls it the 'Sicilian system', while Winter terms it the 'Geloan sima' since the roof of the Geloan treasury in Olympia is seen as one of the best examples of this type. Lang terms this type the 'canonical Sicilian roof', which is perhaps the most appropriate term as it does not link the type to a single colony.[73] The city where this sima type was first developed is not known at this point. What is certain is that by end of the first quarter of the 6th century this canonical system is found at a number of locations in Sicily, and that these roofs show a high level of consistency in terms of their profile and decoration. The canonical system was in use until the end of the 6th century, and during this time the main profile components remained the same.[74] The decoration, however, shows a development that Winter and Lang formalized into three different phases which are summarized below.

Decoration phase 1: the first phase is from the first

70 Belson 1981, p. 99; Lulof 2007, p. 11; Strazzulla 1997, pp. 705-707; Winter 1993, p. 271.

71 Lang 2010, pp. 11-60; Wikander 1986, p. 9; Winter 1993, pp. 274-277.

72 Lang 2010, pp. 11-14; Wikander 1986, p. 12; Winter 1993, p. 275.

73 Lang 2010, p. 31; Wikander 1986, p. 12; Winter 1993, p. 275.

74 Shoe 1952, p. 23; Strazzulla 1997, p. 707; Wikander 1986, pp. 12-17.

quarter of the 6th century. The main characteristic is the painted decoration on the cavetto that consists of only thin Doric leaves. The top fascia is decorated with a hooked meander, chequer-board, or tooth pattern. The bottom fascia is decorated either with a chequer-board or lozenge pattern.[75]

Decoration phase 2: the leaf pattern on the cavetto becomes more elaborate during this phase. The leaves now have tapered ends with smaller leaves inserted between the standing leaves. Some examples also have a wavy band or lyre-shaped leaves. The decoration for the top fascia remains relatively the same, but rosettes and lozenges are more often used on the bottom fascia to facilitate the insertion of waterspouts in the pattern without disruption. This phase starts around 570 BC and lasts until the third quarter of the 6th century.[76]

Decoration phase 3: Further elaboration of the established canonical features is evident, as is the addition of ionizing elements. Some of the rolls are now bead-and-reel mouldings, and palmettes are inserted into the lyre-shaped leaf pattern or a wavy band on the cavetto. Elements from this phase date between 550 and 480 BC.[77]

The third and final developmental stage for the lateral sima is the anthemion sima present from the third quarter of the 6th century BC onwards. The profile of the lateral sima now changes dramatically from that of the previous stage. The sima is decorated with an anthemion pattern. On the canonical sima the decoration is normally only a painted motif, but decoration in relief is also used on the anthemion sima. Water from the roof is discharged not through tubular waterspouts, but through perforations made within the pattern. The horizontal and raking simas (e.g at Selinus) appear to retain some of the features of the canonical form in that the profile is still separated into different bands. Yet, the cavetto is no longer present. There are two main anthemion patterns used for the lateral sima. The pattern from Selinus has an interwoven volute running through the middle, with a palmette growing on one side and a lotus flower on the reverse. The anthemion pattern on objects from Naxos has a volute at the bottom, with alternating palmette and lotus flowers on top. Although examples of both types are found at Akragas, this type is only found at a few other sites in Sicily. Lion-headed waterspouts are considered to form part of the anthemion sima roof system.[78] The dating of this development has fluctuated, as it is based on differing dates ascribed to the examples from Selinus. For the earliest examples, Conti suggested that this phase began in the third quarter of the 6th century; these dates will be followed by the present study.[79]

Both the canonical and the later anthemion sima type of Sicilian roofs are characterized by the use of a separate geison revetment element that is almost the same size as the sima. In general, the geison revetment experiences a much simpler development over time than the sima. The main elements of the geison are a fascia decorated by a guilloche, and a border with single or double rolls. On earlier examples associated with the canonical Sicilian sima, the bottom edge of the fascia is decorated but later a horizontal soffit plaque is added (figure 2 in the glossary), probably in the second quarter of the 6th century BC. The geison revetment found with the final decorative phase of the canonical sima, described above, is characterized by the use of bead-and-reel mouldings in place of (one or more of) the rolls from the previous stage. There does not appear to be a chronological difference in the use of a single or double guilloche; while the single guilloche

75 Lang 2010, pp. 35-36; Wikander 1986, p. 13; Winter 1993, pp. 275-276.

76 Lang 2010, pp. 37-38; Wikander 1986, p. 17; Winter 1993, p. 276.

77 Lang 2010, pp. 39-40; Wikander 1986, pp. 18-20; Winter 1993, p. 276.

78 Mertens-Horn 1988, pp. 79-80.

79 Conti 2012, pp. 163, 321; Mertens-Horn 1988, pp. 79-80; Strazzulla 1997, p. 707; Wikander 1986, pp. 21-26; Winter 1993, p. 277.

occurs less frequently it is present in both early and late stages. The geison revetment associated with the anthemion sima involved the addition of a hawksbeak moulding above the main fascia.[80]

Although the sima and geison revetment roof system seems to be favoured in Sicily, numerous examples exist on the island of roofs with antefixes on the eaves. The earliest examples of this type of roof are known from the first quarter of the 6th century BC from Syracuse and Megara Hyblaea. The first figurative representations appear at Morgantina in the middle of the 6th century. There is a variety of types, including those with painted and moulded decoration. Gorgons and silens are popular figurative motifs and they are frequently used in combination. It appears that lateral antefixes were used for smaller buildings, and the canonical sima systems were favoured for larger and more important structures.[81] The study of Sicilian antefix roofs is not as well developed as the canonical Sicilian and anthemion sima roofs. For example, the appearance of the gable of this type of roof is not very well known. One of the few examples where the antefix, geison revetment, and raking sima of a roof have been identified is from the ship sheds at Naxos.[82]

2.2.2 NEW AREAS AND METHODS OF INVESTIGATION

In a review of current scholarship of architectural terracottas, Charlotte and Örjan Wikander raised concerns regarding the predominance of stylistic studies applied only to selected roof elements. The authors advocated for the study of architectural terracottas within their wider archaeological and architectural context, which required the inclusion of all undecorated roof terracottas. They also viewed the study of production methods and regional traditions as important new areas to investigate.[83] While these suggestions were important, the Wikanders were not the first to advocate for this line of inquiry. The 1993 publication by Winter had already departed from the traditional stylistic analysis. This work considered architectural terracottas as an element within a larger combination of roof elements, and included a brief discussion on methods of manufacture.[84] Slightly later, Edlund-Berry also argued for the importance of investigating the roof as a whole and to investigate the methods of its production.[85] While studies exploring these new areas are still a minority compared to the traditional stylistic approach, they are crucial to the research direction of this work and will therefore be discussed in greater detail below.

2.2.2.1 ARCHITECTURAL TERRACOTTA AS PART OF A BUILDING

Some publications on architectural terracottas from the first half of the 20th century did include partial roof reconstructions, most often in the form of a section. This was done to demonstrate the connection between different roof elements, the supporting wooden structure, the stone geison block, and the wall. But as already mentioned, these reconstructions provide only a single view of a portion of the roof, and it is not always clear what evidence informed a particular hypothesis. The reconstruction by De Miro, for example, shows the horizontal tile portion of the lateral sima as well as pan tiles, but these elements are not described elsewhere in his publication.[86] In essence, these reconstructions provide little more than a suggestion of the architectural context for the decorated roof elements, or more accurately, the decorated parts of the decorated revetments. As

80 Wikander 1986, pp. 26-29; Winter 1993, pp. 277-278.

81 De Miro 1965, p. 73; Lulof 2007, p. 41; Mertens-Horn 1997, pp. 244-245; Strazzulla 1997, p. 707; Winter 1993, p. 279.

82 Lentini et al. 2008.

83 Wikander & Wikander 2006, pp. 42-43.

84 Winter 1993.

85 Edlund-Berry 1997, p. 75.

86 De Miro 1965 fig. 1.

described in section 2.2.1, the main research focus has traditionally been on the decorative elements of the roof. Some studies did briefly mention undecorated roof tiles, but this was only in the context of a particular building or excavation site.[87] However, it was not until the work of Wikander on undecorated roof tiles in the 1990's that these objects experienced greater scholarly attention.[88]

Both Winter and Strazzulla credit a greater interest in the study of the whole roof beyond the decorated edge to the larger corpus of available material . As already mentioned, this approach was taken by Winter, when she reconstructed the various roof systems as complete roofs, including ridge tiles and plain tiles.[89] This approach is also seen in later publications such as the 1996 publication by Matthew R. Glendinning on the Archaic period roof at Gordion in Turkey.[90] As the growing number of recent publications indicate, plain roof tiles are now included in the investigation of architectural roofs with greater frequency than in the past.[91] These studies represent an important shift in how researchers interpret and investigate architectural terracottas. While previous research viewed these objects as decoration, recent studies show a greater appreciation for these objects as architectural elements which functioned within a larger architectural context.

2.2.2.2 PRODUCTION TECHNIQUES

To some extent an awareness of the importance of the material characteristics of terracottas has been present in the discipline from an early period. Previous large-scale studies included at least a basic description of the fabric colour in the catalogue.[92] The colour, the texture of the fabric, and the type and size of inclusions are utilized to identify architectural terracottas that share a common point of origin. This is based on the theory that objects manufactured from the same clay source or within the same workshop would likely have a similar fabric. While such considerations of the terracotta's material properties do form part of current research approaches this does not mean that its results are highly influential. In the majority of instances, material characteristics form only an ancillary set of criteria for evaluating assemblages, and the primary focus still rests on stylistic characteristics such as form and decoration.[93]

The fabric, or internal composition of objects, reveals a great amount of information regarding the raw materials used and the methods of the object's production. This area of investigation offers a valuable source of information on modes of production and craft activities, which is why many scholars advocate for more of this kind of research.[94] To date, only an isolated number of such investigations exist for Sicilian and Greek architectural terracottas. One example is the study on architectural terracottas from Morgantina carried out by Kenfield, in which different manufacturing techniques were a central point of analysis. Kenfield connected the presence of different production techniques to craftsmen from different production traditions.[95] A larger sample of studies relating to the production of architectural terracotta exists for Etruria and other Italian sites. The work by Lulof is of particular note here, as it includes the identification of a 'technical style' for the acroteria of Murlo, as well

87 Broneer 1971; Darsow 1938, pp. 61-63; Gàbrici 1956.

88 Wikander 1988, 1990.

89 Strazzulla 1997, p. 701; Winter 1993, pp. 202-203.

90 Glendinning 1996.

91 Hostetter 1994; Kenfield 1990; Lentini et al. 2008; Roebuck 1990.

92 Darsow 1938; Van Buren 1923.

93 De Miro 1965; Hemans 1989; Simantoni-Bournias 1990; Winter 1990.

94 Edlund-Berry 1997, p. 75; Glendinning 1996, pp. 102-103; Lulof 1994, pp. 221-222; Wikander & Wikander 2006, pp. 42-43.

95 Kenfield 1997.

as a detailed reconstruction of the manufacturing process for acroteria from Satricum.[96] Winter's publications also contain a detailed reconstruction of manufacturing techniques, based on visual observation of objects in Etruria.[97]

In comparison to decorated roof elements, the production of undecorated roof elements is better understood. This is due to a small number of experimental and ethnographic studies on the manufacture of undecorated roof tiles.[98] These studies provided a number of important insights into the methods of terracotta production, and the traces which these methods leave on the finished objects. These studies also produced reference points in regards to the time, facilities, and necessary skills required for production.

2.2.2.3 MATERIAL ANALYSES

There is an isolated number of examples of archeometric analysis on Greek architectural terracottas, such as the analysis of objects associated with the Geloan treasury in Olympia using Neutron Activation Analysis (NAA).[99] However, the majority of these studies have been carried out on non-Greek terracotta roofs, such as the petrographic and chemical analysis of Roman roof terracottas done by Giménez et al., and petrographic analysis of terracotta objects from Satricum by Lulof and Remier Knoop.[100] Robert C. Henrickson and M. James Blackman investigated the Hellenistic roof tiles from Gordion using NAA.[101] There are a number of studies from Sicily which included undecorated roof tiles as part of wider ceramic studies. This includes two studies on the provenance of coarse ware objects, one study on material from the Alcantara River valley,[102] and another on selected Greek colonies (e.g. Akragas, Gela, Messina).[103] These studies are of great value to the present investigation as the published data provide benchmarks for the chemical and mineralogical composition of terracotta objects from various locations in Sicily.

In comparison to other types of terracotta objects from the Greek period in Sicily, such as amphorae, the use of archeometric methods on architectural terracottas is comparatively rare.[104] While there might be a number of factors contributing to this situation, one point is the fact that the majority of archeometric methods are destructive. Therefore, it is more difficult to obtain permission to study decorated architectural terracottas compared to undecorated amphora sherds.

2.3 RESEARCH AIMS AND QUESTIONS

As demonstrated above, the perception of architectural terracottas has gradually shifted; from viewing these objects as little more than a decorative roof edge to recognizing that the objects are complex architectural elements which exist within a wider architectural context. The final form of each object is governed not only by aesthetic considerations, but also by functional, structural, and material requirements, to name but a few variables. These variables have been classified and investigated in different ways by different scholars, for example: Dwight W. Read separates these factors into the material and ideological.[105] Material requirements include the choice of raw materials, methods of production, and the object's intended function. Ideological requirements incorporate the social and cultural influences which impact the choices made by

96 Lulof 1991, 1994.

97 Winter 2009.

98 Henrickson 1999; Rostoker & Gebhard 1981; Sapirstein 2009.

99 Lang 2006.

100 Giménez et al. 2005; Lulof 1996; Knoop 1997.

101 Henrickson & Blackman 1999.

102 Belfiore et al. 2010.

103 Barone et al. 2003.

104 There are a number of archeometric studies on amphorae from Sicily, for example, from: Gela and Akragas (Barone et al. 2003), Messina (Barone et al. 2011), and Naxos and Taormina (Belfiore et al. 2010).

105 Read 2007.

craftsmen. While a craftsman might have access to a number of different responses to these material and ideological requirements, it is apparent that only specific solutions were considered appropriate in a specific period or at a given location. When there was a wider consensus among craftsmen in terms of which specific production technique or decorative scheme was the most appropriate, it is possible to identify a 'style'. Style therefore not only applies to architectural aesthetics, but also production techniques.[106] One of the main aims of this thesis is to develop a research approach which investigates these complex objects in light of both the material and ideological conditions which gave them form.

The first step in research involves placing objects within their spatial and temporal context. Generally this entails organizing objects according to various categories including date, find location and form. This classification system or typology then forms the basis for subsequent analysis.[107] As discussed in the above sections, the current typology for architectural terracottas from Akragas was created in 1965 by De Miro. This typology does not reflect the advances made in the research field in the subsequent decades, nor does it cover the entire corpus of material that is presently available from Akragas. His typology is also mainly based on profile and decorative styles, and only provides a cursory mention of material aspects. For this reason, one of the primary aims of the present investigation is to revise the current typology based not only on the decorative style, but also on other material factors (chapter 5). The revised typology is a synthesis of results obtained through an analysis of the style, production techniques, material composition, and the architectural function of these objects (chapter 4). While a revised typology is a key research result, it is also important to the successful investigation of the main research question posed by this thesis.

The main research questions are as follows:

Through over a century of research on the architectural terracottas from Sicily, the stylistic development of the objects and their major stylistic influences have been well established on a regional level. What is not yet understood is how the regional stylistic development is reflected on a local level in Akragas. It is not yet clear if there is a pattern behind the adoption and adaptation of regional stylistic innovations in different time periods by local craftsmen. **Is it possible to identify stylistic characteristics particular to Akragas and can such a local character be placed in the larger context of colonies and their influence?**

In recent studies on Etruscan architectural terracottas a theory emerged regarding the identification of a 'technical style' based on the characteristic use of specific techniques and materials. This technical style can then be related to particular workshops or regions.[108] The second research question asks: **are different technical styles identifiable in the material from Akragas and how do these styles relate to wider regional trends?**

Traditional art-historical methods have identified a number of stylistic links between the objects from Akragas and other colonies, including Naxos and Selinus.[109] But the exact nature of these connections have not yet been determined as this involves establishing provenance. While provenance testing normally requires destructive analysis, the recent use of portable X-ray fluorescence (XRF) technology has opened up the possibility of performing non-destructive analysis on archaeological material. However, the use of this method on terracotta objects is not well-established. The third question **will explore the use of portable XRF on architectural terracottas to identify possible imports.**

106 Van Eck et al. 1995, pp. 4-5; Van Eck, C. A., Versluys, M. J., ter Keurs, P., 2015, pp. 5-6.

107

108 Arnold 2000, p. 113; Lulof 1994, pp. 221-222.

109 De Miro 2000, p. 67.

The functional aspects of terracotta roofs have not received extensive consideration in current scholarship. For example; the connection between the canonical sima and the rest of the roof is not well understood, nor are the measures used to protect this area against water seepage. The fourth and final research question addresses questions related to **the architectural function of terracotta roofs by considering its architectural context and the details of its construction.**

Consideration of the research questions requires the investigation of different aspects of roof terracottas including style, fabric, production techniques, material composition and architectural context. It is important to examine the different aspects independently, since each is influenced by different factors. For example, the profile of objects can change due changing regional styles, but the method of production might stay the same. The independent investigation are detailed in chapter 4. The relationship between different aspects are then investigated in chapter 5, which is a synthesis of the results obtained in chapter 4. This synthesis includes the revised typology. In order to answer the research question it is therefore necessary to draw on results from both chapter 4 and 5 and thus will only be considered in the discussion chapter 6.

2.4 MATERIAL USED IN THIS STUDY

The preceding section 2.2 has demonstrated that the published information currently available does not include all the known architectural fragments from Akragas. Neither does the published record provide all the information which is required for the investigation of the proposed research questions. For this reason, a number of research campaigns were conducted in Sicily between 2012 and 2016 to study and document the available material. The drawings, photographs, and observations on the decoration, fabric, and production techniques will form the basis of this investigation. Due to the number of objects and the volume of data a custom database was created to aid in the qualitative and quantitative analysis of the data.

The new database includes objects currently housed in a number of different locations and which are under the control of different authorities (table 2-2). In total 265 objects are used in this study. As the inventory numbers of objects in the various collections can be conflicting, confusing, or unavailable, it was necessary to devise a new numbering system for the fragments in this study. The resulting Visual Inventory Number (VIN) for each fragment will be used throughout this investigation, but the object's original museum inventory number and current location are provided in appendix A.

The majority of the material, especially that published by De Miro in 1965, is part of the collections of the regional archaeological museum of Agrigento. In total 188 known architectural terracotta fragments were studied and documented. The remaining material comes from different locations. As mentioned above in section 2.1, during the early 20th century some objects excavated in Agrigento were sent to the museums of Palermo and Syracuse. At the establishment of the museum in Agrigento in 1967, the majority of these objects were returned to Agrigento but unfortunately some objects were misplaced during the move. This included material from Gàbrici's excavations at the naiskos to the South-East of temple B.[110] Fortunately 49 of these fragments were recently rediscovered. The incorporation of these previously unpublished objects is an important component of the present investigation. Material from more recent and current excavations are housed in the *Parco Archeologico e Paesaggistico della Valle dei Templi di Agrigento.* This includes 27 fragments from the recent excavations by Sojc at the extra-urban sanctuary of S. Anna. This group is important for the proposed compositional

110 De Miro 1965, pp. 39, 58; Wikander 1986, p. 31.

Table 2.2: The number of objects used in this study according to their current location.

Location of object	Number of fragments
Allard Pierson museum, Amsterdam	1
Regional archaeological museum Pietro Griffo, Agrigento	188
Regional archaeological museum Antonio Salinas, Palermo	49
Archaeological parks of Agrigento	27
Total	**265**

analyses: unlike the objects from museum collections, permission for the collection of samples for destructive analysis was granted.

As detailed in section 2.1, a small number of objects found before the start of scientific exploration in Agrigento were sold on the international market and currently form part of museum collections outside Italy. One of these fragments, an antefix, is currently housed in the Allard Pierson Museum in Amsterdam, and was recently documented by Lulof. The antefix was included in this investigation based on the published data and not on direct observation.[111]

The provenance of the material is of importance for a number of reasons. The find location of objects can impact the identification of types, and the period in which the object was excavated can influence the level of documentation and the type of material collected. As shown in section 2.1, in the period before 1920, a small number of sporadic finds was collected without provenance information. During the early excavations it was not the practise to document or keep undecorated roof elements. In terms of this study, the provenance of the various fragments was based on published data and the museum documentation and is provided in appendix A. Figure 2-1 summarizes the number of fragments according to the period when they were excavated, and demonstrates that the vast majority of material was excavated before 1970. It is only in recent excavations that undecorated roof elements have been documented and kept for investigation. However, isolated finds from the recent excavations of the city's fortifications by Fiorentini were not included in this study.[112]

The majority of the material used in this study are objects that are clearly identifiable as architectural terracotta fragments. There are a number of figurative terracotta elements (e.g. heads, hands, and feet) from a number of different excavations in the collection of the regional archaeological museum of Agrigento. The fragmentary nature of these elements makes it very difficult to distinguish between sculpture and acroteria statues. For this reason, only clearly identifiable acroteria fragments are included in this investigation.

The use of architectural terracotta in Sicily, with the exception of antefixes, decreased rapidly after 480 BC with the rise in popularity of monumental stone simas. Academic attention has focused on the Archaic material, as seen with the work of Wikander and Lang. Yet, there are a number of from the Classical period that have been published, including palmettes published by De Miro in 1965.[113] Some of these objects bridge the transition between the Archaic and Classical periods and they also provide a more comprehensive view of production at Akragas and how it developed over time. For this reason, the chronological scope of the material under investigation includes both the Archaic as well as the Classical periods.

This work is based on data collected through first

111 Lulof 2007.

112 Fiorentini 2009.

113 De Miro 1965, p. 76, tab. XXIX-1a, b.

hand observation of 264 objects from Akragas (Table 2-2, the object in the Allard Pierson museum is only known through publication). Due to time and resource constraints architectural terracottas from other cities within Sicily or mainland Italy were not studied in person. Any comparison between the material from Akragas and the wider region is therefore restricted to information available in existing publications. As described in section 2.1 and 2.2 there are considerable variations in the type of information which is recorded and certain aspects including production techniques, undecorated roof tiles and the architectural context is under represented. The exploration of the main research topics of this thesis within the broader scope of Sicilian architectural terracottas beyond Akragas is therefore constrained by the limitations within the published documentation.

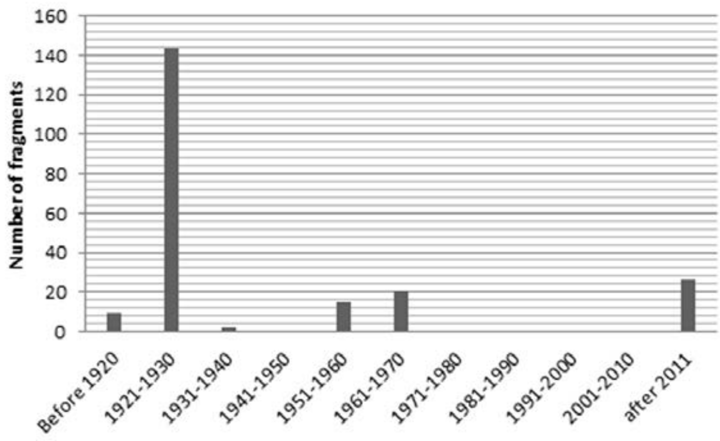

Figure 2-1: The number of architectural terracotta fragments according to period in which they were excavated.

3 THEORY AND METHODOLOGY

The investigation of architectural terracottas as the product of diverse material and ideological conditions requires a research approach that incorporates a number of different areas including decorative style, production techniques, material composition and architectural function (section 2.3). Each of these topics is governed by different theoretical and methodological frameworks, which are thus considered separately in sections 3.2 to 3.5. It should be noted that the theory and methodology, which is applicable to each individual area of research, will be treated together. According to William Y. Adams and Ernest W. Adams; "theory and practice must be interrelated and inter-relevant."[1] In essence theory is grounded in the practical reality while any proposed methods should in turn be born from a thorough theoretical understanding. Due to the interrelated nature of theory and methodology, the two will thus be discussed together for each research area investigated in the following sections.

A number of scholars agree that the first step in the study of archaeological assemblages is organizing the material according to the various categories relevant to the particular research.[2] These categories can include the find location of objects as well as the functional form, to name but a few. The ordering of data creates a classification system, or typology. A typology can address both material and ideological material conditions. For example, the choice of material for a specific type of object can be governed by functional requirements, practical considerations and even ideological concepts regarding what is appropriate for a specific type of object.[3] The investigation of style, production and material composition is therefore also concerned with identifying objects which are similar in these terms. In this manner, the study of the different material and ideological conditions identified in section 2.3 includes the production of different typologies. These contain a stylistic typology (section 4.1) and a fabric typology, which is the combination of characteristics related to raw materials and production techniques (section 4.2). As described above (section 2.3), the production of a revised typology for the terracotta roofs from Akragas is one of the major goals of this thesis. This revised typology (section 5) aims to reflect the diverse conditions which affect architectural elements and as such is a synthesis of the various analytical typologies created in section 4. The creation of typologies is therefore both an important analytical tool as well as a research aim in this thesis. The theory and methodology which underlie the establishment of such classification systems will be considered in section 3.1.

3.1 TYPOLOGIES

In the introduction of this chapter the terms 'classification' and 'typology' were used together, but some scholars argue that these are separate concepts.[4] In essence a system of classification organizes objects into different groups based on specific characteristics, be it style or material or a wide range of other characteristics. A typology is a form of classification system which organized objects into types based on an underlying conceptual system related to the producers and users of the objects.[5] Adams and Adams define typology as follows: "A typology is a conceptual system made by partitioning a specified field of entities into a comprehensive set of mutually exclusive types, according to a set of common criteria dictated by the purpose of the typologist."[6] This definition introduces an important aspect of typologies, project specificity. Due to the large amount of criteria and the substantial differences between assemblages it is recognized that one

1 Adams & Adams 1991, p. 1.

2 Adams & Adams 1991, p. 9; Abramov et al. 2006, p. 256; Orton & Hughes 2013, p. 3; Winther-Jacobsen 2010, p. 49.

3 Read 2007.

4 Horejs et al. 2010, p. 10.

5 Read 2007.

6 Adams & Adams 1991, p. 91.

single typology will not necessarily be appropriate for all assemblages. Furthermore, as indicated by Read, the purpose of a typology is to identify the social and cultural context in which an object was produced.[7] The choice of characteristics used for organizing the data is therefore specifically chosen in order to investigate a specific research question, which introduces a level of subjectivity.[8]

Due to the nature of the objects in an assemblage, a typology is also required to account for a certain level of variability. For example, one of the attributes used for identifying fabric types is clay colour. Because of the manual production process and the variance of natural resources, even objects manufactured on the same day by the same person using the same material can be expected to vary slightly. It is therefore recognized that a typology must be able to account for a certain level of variability.[9] When considering this, it is important that the variation between objects within the same type must be smaller than the variation between objects from different types. In other words, the homogeneity inside a group is higher than the homogeneity between groups.[10] For example, while the dimensions of a particular profile element might vary with one or two millimetres between objects from the same sima, they may vary from objects from a different group of sima by centimetres. Due to this variability, the boundaries between different groups or types are rarely sharply defined. An object therefore occasionally falls within a fuzzy boundary and then the allocation of that object to a specific group becomes a judgement call. It is therefore of great importance that this process be as transparent as possible and that these boundary cases be clearly identified.[11]

7 Read 2007.

8 Adams & Adams 1991, pp. 2, 8; Horejs et al. 2010, p. 9; Read 2007; Winther-Jacobsen 2010, pp. 49-50.

9 Adams & Adams 1991; Read 2007; Winther-Jacobsen 2010, pp. 50-51.

10 Winther-Jacobsen 2010, p. 49.

11 Adams & Adams 1991, p. 46; Winther-Jacobsen 2010, pp. 49-50.

The references used in the above description of typologies are all related to pottery studies and not architectural terracottas. Within archaeology the theory and methodology regarding the classification of objects is more defined and established in some disciplines compared to others. As was demonstrated in chapter 2, investigation of architectural terracottas only recently moved beyond classifying objects only according to style and chronology in order to include new areas of investigation such as methods of manufacture and material characteristics. In this regard pottery studies have the advantage. Clive Orton and Michael Hughes describe the research history of archaeological pottery as consisting of three phases. The first phase is primarily concerned with art-historical questions, the second with the creation of stylistic and chronological typologies and the last phase is characterized by a more complex contextual approach.[12] This contextual approach started in the 1960's and is characterized by a more systematic procedure in order to investigate the material based on raw materials, methods of production as well as well as wear and destruction. This allowed for the investigation of larger contextual concerns such as trade and exchange, use and abandonment.[13] Not only do pottery studies have a longer history of studying objects within a contextual approach, they also have a much more established theoretical and methodological research base. For example, there are a number of handbooks focused on methodology,[14] and the state of research is periodically reviewed and new methods explored.[15] For this reason, the theory and methods regarding typologies draw extensively on those developed within pottery studies.

The methodology for the creation of a typology can be divided into two steps; the first is the

12 Orton & Hughes 2013, p. 4.

13 López Verala et al. 2002; Moody et al. 2003, pp. 38-39; Orton & Hughes 2013, p. 150; Rice 1996, p. 196.

14 Orton & Hughes 2013; Rye 1981.

15 Arnold 2000; Rice 1996; Gnesin, 2012.

identification and evaluation of attributes, the second step is combining different attributes into relevant groups or types.16 The first step is particularly important due to the potential for correlation between attributes. If one attribute has a direct influence on another, a typology based on these attributes will be distorted by the hidden dynamics between the two. In statistical terms, one attribute should be independent to another.17 The method by which attributes are combined into groups can be intuitive or rational, inductive or deductive, through attribute clustering or object clustering, or a combination of a number of methods.18 Read distinguishes between intuitive, objective and quantitative clustering, for example.19 Since the present investigation requires the formation of different typologies based on different types of attributes, the specific methods used will vary. The statistical analysis used for investigating the material composition of objects in section 4.3 is one example of quantitative clustering.

3.2 STYLISTIC TYPOLOGY

For both architectural terracottas as well as pottery the traditional attributes used for the formation of typologies were style and shape.[20] For this reason, the majority of published works on Western Greek architectural terracottas are in essence stylistic typologies.[21] While the discussion in section 2.2.2 demonstrates that the research focus applied to architectural terracottas is justifiable expanding beyond stylistic concerns, there is a number of valid reasons why such stylistic typologies are still an essential component to any investigation.

Earlier definitions saw style as a methodological approach by which art historians can classify and study objects.[22] But it is now recognized that style is a complex concept that carries meaning beyond its material form.[23] The influential work by Martin Wobst on the definition of style in archaeology emphasizes the role of style in exchanging information, and by extension in the integration or differentiation of social groups or individuals.[24] This view is reflected in the summary by Debra Schafter of the various ways in which style is being identified by previous researchers; style can function as an emblem, symbol, signifier and sign. All of these functions are connected to ideological concepts related to form, relationships, meaning and beauty that were held by the original makers and users of the objects.[25] For this reason, style is a valuable subject for investigation as it can reveal a vast amount of information regarding the production and usage circumstances of the objects. For example, style is used by various authors in order to identify patterns of influence or trade between the wider Mediterranean world.[26] The complex nature of style might be partly responsible for the variety of definitions of style itself proposed by the numerous scholars who have considered the subject.[27]

Since the majority of published architectural terracottas from Sicily and the wider Greek world is focused on style, any comparisons between the objects from Akragas and published material is thus often limited to stylistic elements. By finding attributes which are stable or those that are flexible over time or location, patterns of use appear which can be used for the identification of relationships between makers and users from different time

16 Adams & Adams 1991, pp. 182-183.

17 Adams & Adams 1991, p. 91; Winther-Jacobsen 2010, p. 59.

18 Adams & Adams 1991, p. 182.

19 Read 2007.

20 Abramov et al. 2006, p. 256; Alpers 1987, p. 138; De Miro 1965, p. 40; Wikander 1986, p. 10; Winter 1993, p. 4.

21 Danner 1996; Mertens-Horn 1988; Wikander 1986.

22 Alpers 1987, p. 138.

23 Van Eck et al. 1995, pp. 8-9.

24 Wobst 1977, pp. 8, 17; Wobst 1999, p 125.

25 Schafter 2003, p. 3.

26 Lulof 2007; Winter 1993.

27 Abramov et al. 2006, p. 256; Wobst 1977, 1-2; Wobst 1999, 122.

periods or locations.[28] In the published works mentioned above, regional and temporal aspects connected with style are key focus areas. As these two aspects are also of importance to this investigation they require a more detailed discussion.

Some of the earliest investigations regarding roof tiles already distinguished between different styles according to region. For instance, the Laconian and Corinthian roof systems are widely used in early publications.[29] In recent years, especially through the work of Winter and other scholars these categories have been expanded, but the new stylistic categories are still geographically bound to a large extend.[30] And while the regional character of sima and geison revetment objects are well documented,[31] additional elements have also been proven to be region bound; including the profiles of architectural elements[32] and antefixes.[33] Regional characteristics are used by scholars to identify the movement of objects, craftsmen or knowledge as well as relationships between various settlements or cultures. For example, Lucy T. Shoe uses the presence of specific profile elements to postulate that Selinus had the strongest influence on early architectural terracottas from Akragas,[34] while De Miro finds that Gela had the largest stylistic influence on the early objects based on decoration and profile.[35] The identification of stylistic elements that are indicators of regions are thus of key importance to this investigation.

Furthermore, a stylistic typology is instrumental to the study of architectural terracottas due to the challenges in dating these objects. One form of archaeological data with the potential to date a roof is the building itself, yet there are a number of complicating factors. Dating the collapse of a building only provides a terminus ante quem for the roof. The life span of terracotta roofs is not well understood but it is possible that the collapse of a roof took place a generation or two from when the roof was erected. Dating the foundation of a building can provide information on when the building was constructed, but it is difficult to determine if the roof associated with a building was part of the original building or a later refurbishment. An additional complication is the difficulty of dating Archaic building structures, the dates suggested by various scholars can vary by decades. For this reason, scholars still rely on dating objects based on stylistic comparisons with other objects. Attempts have been made to compare the decoration on roof and pottery examples, but this has been less successful. Therefore, most scholars agree that only comparisons with terracotta, and in later periods, stone roof elements are reliable.[36] Wikander found the stylistic development schema, as first suggested by Süsserott, a valid basis for dating Sicilian architectural terracottas.[37] This chronological development of the profile and decoration of Sicilian architectural terracottas has subsequently been expanded by Wikander, Winter and Lang and is summarized in chapter 2. To date there has not been any new developments which contradict this schema and as such it will form an important reference point in the dating of objects from Akragas.

As described in section 2.1, the stylistic typology for the Archaic architectural terracottas from Akragas was defined by De Miro in 1965. His typology consists of 15 friezes, and a small number of additional elements which he did not designate as being part of a defined frieze. These objects were grouped according to architectural type, such as

28 Ackerman 1962, p. 227.

29 Van Buren 1923, pp. xvii-xx.

30 Winter 1990, p. 13; Wikander 1990.

31 Wikander 1986.

32 Shoe 1952, p. 3.

33 Belson 1981, p. 89.

34 Shoe 1952, p. 25.

35 De Miro 1965, pp. 51, 59.

36 Conti 2012, pp. 23-24; Wikander 1986, pp. 11-12; Winter 1993, pp. 4-5.

37 Wikander 1986, p. 12.

ridge palmette group 3, for example.[38] To a large extent these groupings are retained by later scholars even if they use their own labelling system in their catalogues, and in the case of Lang, make some small revisions as well.[39] It is therefore evident that the friezes identified by De Miro are the established norm for the objects from Akragas. But the existing typology might not reflect the expanding terracotta assemblage from the colony or current knowledge based on newer finds and studies. It is therefore necessary to revisit De Miro's original typology to determine which of the original types are still valid in their entirety or if some amendments and additions are required. The first step in this process will be to revisit the original typology by analysing the original types according to their decoration and form. The identification of similar objects in the wider region is also an important step. Not only will this allow for the further identification of regional similarities and possible precedents it will also aid in the establishment of a chronology based on stylistic comparisons. This will be shown in section 4.1.

The stylistic typology is largely based on the profile and decoration of objects. A detailed description of these aspects is thus key, not only for finding similarities and discrepancies between objects, but also for comparison to other examples from Sicily for dating purposes. Previous scholars have used various methods for the systematic description of architectural terracottas. As already mentioned in chapter 2, the canonical sima consists of a number of different horizontal profile elements which can be complicated to describe. Van Buren wrote on each horizontal band in terms of its form, painted decoration and dimensions in a single sentence.[40] The work by Shoe demonstrates the benefit in a systematic approach to revetment profiles.[41] For this reason, subsequent works have included a more systematic description of the profile itself as well as an accurate drawing of the object in profile.[42] The publication by Wikander is such an example in which she describes the profile separately from the painted decoration.[43] Conti adopts this method but adds an additional layer of description for the profile dimensions as well. The placement of these different layers of description for the profile shape, dimension and decoration in a table is very clear and functional and allows for easy access to the data for reference and comparisons.[44] This method will therefore be used for the description of complex profiles. Some objects, including antefixes and ridge palmettes, are not composed of different decorative bands and as such a description in table form is redundant. For these elements the profile, painted decoration and dimensions will be provided in a general description.

3.3 FABRIC TYPOLOGY

While the investigation of raw materials and production techniques are gaining prominence within the field of architectural terracotta studies (section 2.2), the theory and methodology of such an investigation is not yet well developed. As with typologies in general (section 3.1) pottery studies have a long history of investigating these topics. The scientific methods and theoretical frameworks developed as part of such studies are often applied to the field of architectural terracottas. For example, the terminology and methods used for describing colour and inclusions, in most cases, are related to those in pottery studies.[45] This is not surprising, as terracotta objects and pottery are both made using natural clay and are then fired. Therefore, established methods from pottery investigations, such as the reliance on standardized charts for describing inclusion size, sorting, and percentages, for example, are relevant to this study as well.

38 De Miro 1965, p. 76.

39 Lang 2010 pp. 87-90; Wikander 1986, pp. 31-32.

40 Van Buren 1923.

41 Shoe 1952.

42 Edlund-Berry 1997, p. 73.

43 Wikander 1986.

44 Conti 2012, p. 90.

45 Conti 2012; Lulof 2007; Winter 2009.

Since the influential publication by Anna O. Shepard on the study of ceramics in archaeology, both the characteristics related to raw materials as well as the manufacturing process are used together in the classification of pottery.[46] While there is some variation, following scholars refer to the system of classification based on raw material and methods of production as a fabric typology.[47] From a methodological point of view it is appropriate to consider raw materials and methods of manufacture together. Both are directly related to decisions made by the producers of the original objects and some elements can potentially directly influence another. For example, the type of temper chosen can influence the firing of objects and the surface finish that is applied. For this reason, it can be problematic to consider the two as separate areas of investigation as important underlying connections could potentially be missed. Within pottery studies it is also practise to consider style and fabric as separate typologies.[48] In 1956 Shepard already noticed that methods of manufacture change slower than style, but this is a theory supported by more recent scholars as well.[49] For this reason, groups of objects identified as separate types in a stylistic analysis could be produced using the same raw materials and methods of manufacture. It is also possible that replacement pieces for a roof produced at a later period would be in the same style as the original roof, but manufactured using a different fabric. It is therefore a strong possibility that the assemblage will be organized differently in a fabric typology than in a stylistic one.

As discussed in section 3.1, typologies provide a conceptual system for the investigation of producers and users of objects. The use of a fabric typology for such a purpose has been one of the main aims of pottery studies since the 1960's when it has been used for the identification of imported objects and the study of cultural change.[50] At the root of this line of investigation is the practice of using non-decorative attributes in order to retrace the identity of the original producer.[51] At first, the focus was on identifying objects that were manufactured in a specific region in order to distinguish imports and to study how objects themselves travelled. But recently this line of investigation has been extended by a number of influential scholars who have postulated that the specific methods employed by a craftsman, workshop or region can form a 'technical style'.[52] A technical style is the culmination of all the various methods and decisions made by the producer during the entire manufacturing process. The concept was first formulated by Heather Lechtman in 1977, and from the beginning technical style was intrinsically linked to a social and cultural context.[53] While Lechtman is interested in the link between technical style and ideology, Pierre Lemonnier studies the various ways in which it reflects social groupings. For example, the social organization of a group during the application of a specific technical style.[54] Ethnographic and archaeological studies have demonstrated that craftsmen had a much wider range of available material and techniques and that the constraining influence of local resources are often over emphasized. The use of a particular method and material can therefore be seen as a choice which is governed by social, economic and ideological

46 Moody et al. 2003, p. 39; Orton & Hughes 2013, pp. 12,14; Rye 1981, p. 2; Shepard 1956, p. 306.

47 Moody et al. 2003, pp. 49, tab. 4; Winther-Jacobsen 2010, p. 51.

48 Horejs, et al. 2010, p. 10; Jung 2010, p. 148.

49 Rye 1981, p. 5; Shepard 1956, p. 314.

50 Moody et al. 2003, p. 39; Orton & Hughes 2013 p. 14; Shepard 1956, pp. 310-311, 314, 335-341.

51 Arnold 2000, p. 113.

52 Arnold 2000, p. 113; Lulof, 1994, p. 220; Rye, 1981, p. 5; Wikander, 1986, p. 26.

53 Hegmon 1998, 266; Lechtmann 1977.

54 Lemonnier 1986, p. 147; Hegmon 1998, p. 268.

factors.[55] In theory, a different producer would make different decisions, and thus the work of two producers would be identifiable due to different technical styles used. Technical style is therefore a way in which to identify different producers, but also a can provide insight into social groupings, boundaries and organization.

One manner in which these choices can be investigated is by considering each step which was taken in order to produce an object. The term, *chaîne opératoire* is used by some scholars in order to describe the series of operations by which raw material is transformed into a finished product.[56] The knowledge of materials, methods, and designs plays an integral part in this process. While new knowledge can be created through innovation, most knowledge is not. The term 'technological transfer' is used by some scholars to specify the process by which new production techniques are learned. This can be done through direct or indirect contact between the person learning and the one already in possession of the knowledge. The transfer of knowledge often involves adaptation or even reinterpretation by new users as it might be necessary to account for local conditions.[57]

The method of describing fabric attributes used in this work is based on the established methodology from pottery studies. A key component of ceramic descriptions is the use of standardized charts and descriptive terms that facilitate reuse and cross referencing.[58] The standardization of descriptions allows for a greater consistency to the data collected over a wider period of time and by different individuals. For example, the great variance in the perception and verbal description of colour by individuals has been well documented in relation to archaeological material.[59] Such inconsistencies are significantly reduced by using a standardized method of measuring and recording colour. The Munsell colour charts are the most common and widely accepted reference used for sorting archaeological material.[60] There are also charts developed by such institutions such as the Department of Urban Archaeology of the Museum of London which are recommended for use in pottery studies for the description of the shape of temper grains, the fabric break as well as the concentration of inclusions, to name but a few.[61]

Long-term exposure to the elements can change the surface appearance of terracotta objects. Burial conditions also affect the surface of objects by leaching or depositing salts and minerals. Since weathering and deposition causes discoloration and obscures details on exposed surfaces, the documentation of attributes requires a fresh break that allows a visual inspection of the original fabric of an object from the surface to the core.[62] The majority of material used in this thesis form part of museum collections which restricts the breaking of objects. Observations are therefore limited to the freshest visible breaks, generally caused during excavation and handling of objects in the past. For a number of fragments the available breaks were too small or degraded to allow for the recording of attributes. The suboptimal observation conditions might result in a higher margin of error, which leads to a higher degree of variance in the dataset. Analysis of attributes such as colour therefore requires the inclusion of broader categories which allows for a higher level of variance.

The first step in creating a fabric typology, which is specific to the research question and material of this thesis, is the identification and evaluation

55 Ingold 1988, 1990; Lemonnier 1986, 1992; van der Leeuw 1993; Nielsen 1995; Schiffer & Skibo 1987, 1997; Sillar & Tite 2000.

56 Cresswell 1976, p. 6; van der Leeuw 1993, p. 240.

57 Knappett & Kiriatzi, 2016, p. 8; Ownby, Giomi & Williams 2017, pp. 617, 623.

58 Orton & Hughes 2013, p. 155.

59 Goodwin 2000, pp. 29-33.

60 Abramov et al. 2006, p. 261; Goodwin 2000, p. 19; Orton & Hughes 2013, p. 73.

61 Overviews in Orton & Hughes 2013; Rye 1981.

62 Moody et al. 2003, p. 54; Orton & Hughes 2013, pp. 75-76, 155.

of different attributes. The majority of attributes evaluated during this process are the ones utilized for pottery studies, such as the size and sorting of inclusions.[63] A small number of attributes specific to of architectural terracottas have also been identified based on the existing research presented in section 2.1; such attributes include the finishing layers (e.g. slip or epidermis layer).[64]

There are different methods for identifying groups of objects with the same fabric attributes. Multivariate statistical methods are recommended by Read as being the most objective and accurate.[65] A number of precedents are available for such an analysis, including studies within the publication by Barbara Horejs.[66] Most of the handbooks on pottery and pottery classification still suggest a more manual process by which the researcher recognizes groups which correspond to the wider context of the dataset.[67] Multivariate analysis was explored but in the end it was found that compared to the traditional manual process, the statistical method is less effective. For the size of the assemblage, the type of data collected and the high degree of variability in the dataset, the traditional manual process of identifying fabric types is more appropriate.

3.4 COMPOSITIONAL ANALYSIS

The use of scientific methods for the study of the material composition of archaeological material is a relatively recent development which started in the middle of the 20th century. Studies undertaken in the 1950's such as the work by Shepard, are seen as instrumental to the establishment of archaeometric techniques for the study of archaeological ceramics.[68] Scientific standards for archaeometric study ideally require a combination of methods, especially for provenance testing. Every method has a limited range in terms of accuracy and the data it can produce. Comprehensive results therefore consist of a combined methodology; such as petrographic and chemical analysis, to produce data that can distinguish between occasionally overlapping material.[69] The approach taken in this research will make use of three methods; thin section petrography, wave-length dispersive X-ray fluorescence (WD-XRF) and handheld X-ray fluorescence (HH-XRF).

Thin section petrography is a widely used and established method for the study of ceramic material from Sicily and the wider Mediterranean world.[70] Thin sections were employed by William Nicol for the first time in the late 18th century but the method was only applied for the identification of minerals in rocks in the middle of the 19th century. While archaeological materials were already being investigated by the end of the 19th century, the method only came into widespread use for the study of archaeological ceramics around the middle of the 20th century. It is considered to be quick, relatively inexpensive, and a reliable means of investigating production techniques and comparing material with objects of known origin. The principle focus of petrography is the identification and classification of the mineral composition of ceramic and terracotta fabrics. Petrography rely on the use of thin sections which are investigated using a number of different methods including scanning electron microscopy (SEM), electron microprobe analysis (EMPA) and

63 Orton & Hughes 2013; Rye 1981.

64 Kenfield 1997; Lulof 1991.

65 Read 2007.

66 Horejs et al. 2010.

67 Adams & Adams 1991; Moody et al. 2003; Orton & Hughes 2013.

68 Degryse & Braekmans 2014, p. 191; Shepard 1956.

69 Degryse & Braekmans 2014, p. 193; Montana et al. 2011, p. 476.

70 Aquilia, Barone, Mazzoleni & Ingoglia 2012; Degryse & Braekmanss 2014, p. 193; Kamili & Ramage 1978, p. 12.

cathodoluminescence spectroscopy.[71] For this thesis, the petrographic analysis of thin sections made use of optical microscopy and was performed at the Laboratory for Ceramic Studies at the University of Leiden's Archaeology Faculty (NL) under the direction of Dennis Braekmans. Samples were prepared by grinding a material sample down to between 25 and 30 micrometres and then placing the thin section on a glass slide. The thickness of the sample means that it gains a translucent quality and thus, when viewed under a microscope with a polarized light source, the characteristic optical properties of minerals become visible. These characteristics include the distribution and shape of non-plastic inclusions, the colour of the clay matrix, and the shape and percentage of voids.[72] For this analysis photomicrographs were taken under crossed polarizers (XP).

There are a number of different methods that can be used to determine the chemical composition of ceramic and terracotta material. Neutron activation analysis (NAA) is a high-resolution method and therefore used quite frequently, as seen in the analysis of architectural terracottas from Gordion[73] and Olympia.[74] X-ray fluorescence (XRF) is a more accessible method which can be performed using a number of different instruments,[75] of which wave-length dispersive X-ray fluorescence (WD-XRF) is well established in the analysis of ceramic and terracotta objects from Sicily.[76] The extensive use of WD-XRF for Sicilian material makes this method attractive as it allows for the comparison between objects from Akragas and other colonies in Sicily. The WD-XRF analysis was performed at the Materials Science and Engineering Laboratory at Delft University of Technology (NL) using a Panalytical Axios Max WD-XRF spectrometer. The samples were prepared by grinding the material down to a fine, homogenous powder. 2 g of powder were mixed with 0.5 g of binding agent and then compressed into a pellet. The sum total of the elemental composition is normalized to 100 percent in order to calculate the weight percentage (wt%).

Both thin section petrography and WD-XRF are destructive methods. For each method samples require preparation before they can be analyzed in a laboratory environment. The majority of material under investigation form part of museum collections, and thus the collection of relatively large material samples are not desirable. For this reason, it was decided to experiment with the use of handheld X-ray fluorescence technology (HH-SRF). It was first developed for industrial application but has been adopted for the study of archaeological material. In theory HH-XRF allows for the quick, in-situ analysis of archaeological material, which makes it a non-destructive method that can also be used on objects on display in museums.[77] But this is a new method of analysis and as such has generated a lot of debate regarding appropriate application in the field of archaeology. One misconception among new users of archeometric technology is that non-destructive analysis can replace established laboratory based techniques.[78] A number of archeometric specialists instead only view HH-XRF technology as a first step process that helps to define the research hypothesis and sampling strategy for subsequent destructive analysis.[79] An example of this approach is the work by Erica Aquilia and Germana Barone on terracotta objects from Gela.[80] Ellery Frahm

71 Adams et al. 1984, p. i; Aquilia et al. 2012; Degryse & Braekmans 2014, p. 193; Kamili & Ramage 1978, p. 12; Peterson 2009, pp. 2-6.

72 Adams et al. 1984; Peterson 2009, pp. 1-2.

73 Henrickson & Blackman 1999, p. 318.

74 Lang 2010, pp. 68-69.

75 Bezur & Casadio 2012, p. 100.

76 Aguilia et al. 2011; Barone et al. 2005; Barone et al. 2011; Belfiore et al. 2010.

77 Frahm 2013, p. 1080; Hunt & Speakman 2015, p. 626; Shugar & Mass 2012, p. 17.

78 Frahm & Doonan, 2013, p. 1426.

79 Frahm & Doonan, 2013, p. 1428; Shackley 2010, p. 17.

80 Aguilia et al. 2011, p. 977.

believes that this approach might be too cautious. In his recent study of obsidian from the Near East he found that HH-XRF can be used for more analytical applications which extend beyond the first step phase.[81] Unfortunately, while HH-XRF might be particularly suited to the study of obsidian, there are a number of concerns regarding its use on ceramic and terracotta objects. It is therefore necessary to consider the use of HH-XRF technology for the study of terracotta objects in greater detail.

Truly portable, or handheld, XRF machines are a relatively new technology. While laboratory based XRF technology has been used in archaeological research for many decades with a standard methodology in place since the 1950's and in widespread use in archaeology since the 1960's,[82] handheld technology is only now being explored as an archeometric technology. The first handbook on the use of HH-XRF was only published in 2012.[83] It is therefore not surprising that the appearance of HH-XRF technology in archaeology is generating so much scholarly debate as a standard methodology and accepted application parameters have not been established yet. Recent publications by Frahm,[84] Robert J. Speakman,[85] and Michael S. Shackley[86] are representative of the controversy. A number of points have been raised which are of direct concern for this study and therefore require consideration.

The first point of contention centres around the perceived use of HH-XRF technology as a black box process. The relative low cost of handheld XRF instruments and the ease with which it can be used means this technology is accessible to a much wider range of users including museums and academic institutions which did not previously have archaeometric capabilities. The justifiable fear of established researchers with years of experience in XRF technology is that new researchers will treat the handheld technology as a black box process, with little scientific understanding of the processes taking place as well as the instrument functions. Some, including ambitious vendors, create the impression that the technology can be used with little training to produce quantifiable data. The truth is that without appropriate knowledge regarding basic chemistry, specifically X-ray spectrometry, as well as statistical data analysis and established XRF methodology, the user will not be able to avoid even the most basic of scientific errors nor would they be able to produce reliable and usable data.[87]

A second point of concern is the perceived lack of an established methodology. The absence of a comprehensive, widely accepted methodological framework limits researchers in how the technology is applied but also in the ability to produce scientifically reliable results. In recent publications scholars have proposed a number of methods which improve accuracy; these include polishing surfaces before testing, minimizing background interference, establishing sample error and periodic instrument stability tests.[88] But to date, without an established methodology, it is hardly surprising that researchers are relying strongly on the established methods for laboratory based XRF applications as a reference in regards to guidelines for the selection of material, calibration and data analysis.

A third point of concern centres around the reproduction of results. Established laboratory XRF methods require grinding down samples to a homogeneous powder. Since archaeological

81 Frahm 2013.

82 Frahm & Doonan 2013, p. 1426; Hein et al. 2002, p. 542; Kempe & Templeman 1983, p. 43; Shugar & Mass 2012, p. 31.

83 Shugar & Mass 2012

84 Frahm & Doonan 2013.

85 Speakman & Shackley 2013.

86 Shackley 2010.

87 Shackley 2010, p. 18; Shugar & Mass 2012, pp. 17-18; Speakman & Shackley 2013, p. 1435.

88 Shugar & Mass 2012, p. 19; Speakman & Shackley 2013, p. 1436.

objects are rarely homogeneous and XRF only measures a very small area this is the best practice for producing reliable data. Unfortunately, the same method cannot be used with the HH-XRF when testing objects in-situ. For this reason, reproducible measurements are might not be achievable.[89] To put it simply; a single measurement is dependent on the particular components in a specific 5 mm spot on an object. Measurements from different spots on the same object composed of a mixture of material would potentially produce different results based on the specific composition of each spot and thus reproducing data becomes problematic. This is a serious concern since established scientific practice relies on the use of data that can be compared to previous tests or verified by subsequent tests. Some authors, including manufacturers, try to downplay this point by stating that internally consistent results are enough in regional scale studies and targeted research.[90] But this view is not supported by all researchers. In a review on the Frahm article,[91] Speakman and Shackley express concern over the acceptance of 'internally consistent' results; the authors fear this will create a 'silo science' in which each individual researcher's data is self-contained and independent with no independent external verification possible. [92] "If the results of any experiment cannot be compared and evaluated by a subsequent experiment outside the original experiment, then it is unreliable even though it is internally consistent."[93]

Within the current debate on the use of HH-XRF in archaeology, calibration is seen by many scholars as one of the most important concerns regarding the technology's application. Since each instrument model and analytical method has a specific instrument error, the established method uses international geological reference materials (CRM) to calibrate results in order to compare data from different laboratories, instrument models and analytical methods.[94] When it comes to the HH-XRF one point of current debate is that the instruments and most specifically, the calibration files, were developed for use in metal recycling industry and archaeologist are thus treated as minor or novel users. Manufacture calibration files for specific materials are therefore often unsuitable to historic artefacts.[95] One exception is the 'green filter' calibration developed by Shackley for the Bruker HH-XRF instrument for the analysis of obsidian objects.[96] Most off the shelf settings are rarely sufficient and are typically only instructional. Many researchers see the need for empirical, user specific, calibrations as the single most important concern when it comes to the use of HH-XRF in archaeological research.[97] The recent study performed by Alice M. W. Hunt and Robert J. Speakman in 2015 tested the accuracy of HH-XRF data calibrated according to the recommended manufactures mudrock calibration files against the data obtained through laboratory based ED-XRF analysis. The authors found the mudrock calibration to be rather unreliable for ceramic investigations but that custom calibration using matrix matched certified reference materials produces systematically better results.[98]

The study by Hunt and Speakman is an important reference regarding the use of HH-XRF for ceramic objects as it identifies limitations not previously known. This includes the overlapping of spectrum peaks for elements which means that HH-XRF cannot accurately measure sodium (Na), phosphorus (P), vanadium (V), chromium (Cr), cobalt (Co), nickel (Ni), and the L-lines of barium

89 Shugar & Mass 2012, p. 28.

90 Frahm 2013, p. 1087.

91 Frahm 2013.

92 Speakman & Shackley, 2013, p. 1435.

93 Speakman & Shackley 2013, p. 1436.

94 Hein et al. 2002, pp. 543-545.

95 Shugar & Mass 2012, pp. 24-25.

96 Speakman & Shackley 2013, p. 1437.

97 Shugar & Mass 2012, pp. 19-28; Speakman & Shackley 2013, p. 1437.

98 Hunt & Speakman 2015.

(Ba). Within their study they also prepared samples by grinding material down to a fine homogenous powder and using a Helium vacuum for the measurement of low-Z elements, or elements with a low atomic number. The authors conclude that under these conditions HH-XRF can match the performance of conventional laboratory based XRF methods, for a limited range of elements.[99] These results support that of Speakman and Shackley. According to their recently published article, HH-XRF machine capabilities are on par with laboratory based instruments of 5-10 years ago which are still in use in many laboratories today, and therefore make the handheld capabilities comparable to those of many laboratories.[100] Tests performed using international standard obsidian samples and the Bruker calibration for obsidian produced results with a relative standard deviation (RSD) of less than 2 percent, which is comparable to laboratory results. Instrument drift was also proved to be negligible which leads Speakman and Shackley to conclude that the challenge in producing scientific relevant data using HH-XRF technology depends on the expertise and the experience of the user in order to produce reliable quantifiable data that is reproducible.[101]

The conclusion drawn from the current debate on the application of HH-XRF technology in archaeology is that the concerns of the research community are not based on instrument performance but on the calibration of data and the establishment of a scientific methodology appropriate to the material under investigation. The methodology used for the HH-XRF analysis applied in this thesis therefore attempts to address the most pressing of these concerns.

The HH-XRF analysis was performed using a Bruker Tracer HH-XRF instrument. Measurements were taken with the Ti-Al (or yellow) filter for 300 seconds per reading at 40 kV. For all measurements spots were chosen on the most suitable fracture of an object that is as flat and as clean as possible in order to avoid contaminating the sample with surface encrustation.[102] As pointed out above, terracotta fabric is non-homogenous, with large inclusions and uneven distributions. Hence, taking a measurement on non-homogenous material is problematic, as only a small area is sampled, close to 5 mm in size and 1 mm deep. Large inclusions can therefore easily skew the final result.[103] For this reason, three measurements were taken per object in different positions on a clean break and large visible inclusions were avoided. In order to measure low-Z elements a vacuum is required and essential. Due to the uneven surface of the terracotta objects a sufficient vacuum could not be established. Therefore, only the heavy (or mid- to high-Z) elements were measured since these do not require a vacuum. The spectrum data obtained using this method was calibrated using six sediment and clay CRM that are as close as possible to terracotta material in terms of the fabric matrix. The six CRMs used for the calibration are BCR-667(estuarine sediment), BIR-1a (Icelandic basalt), GSP-2 (granodiorite, silver plume, Colorado), NIST-98b (plastic clay sediment), NIST-2710a (Montana soil) and SGR-1b (oil shale, Wyoming). The calibration is based on calculating the relationship between measured HH-XRF values (in counts per second) and the known quantified values (in weight percentage). This relationship is expressed as a regression equation that can then be used to calculate the quantified values for HH-XRF values measured in the field. This is the method that was also used by Hunt and Speakman for creating custom calibrations for HH-XRF data.[104]

As discussed in the beginning of this section, the accuracy of quantified HH-XRF data has been questioned. The calibrated data obtained through

99 Hunt & Speakman 2015.

100 Speakman & Shackley 2013, p. 1436.

101 Speakman & Shackley 2013, pp. 1438-1439.

102 Shugar & Mass 2012, p. 29.

103 Shugar & Mass 2012, p. 28

104 Hunt & Speakman 2015.

the custom calibration detailed above is therefore first evaluated using a control group. 15 roof tile samples were obtained from the extra-urban sanctuary at S. Anna. These objects were analysed using petrography, WD-XRF, and HH-XRF. The WD-XRF data for this group of objects forms a benchmark by which the calibrated HH-XRF data that can be evaluated. The control group is also used for identifying elements susceptible to local weathering conditions by considering the degree of variance for known groups of objects. It is clear that weathering and centuries of burial have an impact on the chemical composition of objects. For example, zirconium (Zr) tends to accumulate in weathered profiles, but the exact nature of the transportation and accumulation of the element is yet unknown.[105] Local weathering conditions produce site specific weathering. One method, which is also applied by Speakman and Shackley, is the use of standard deviation, as high variance can be an indication of weathering.[106]

Archaeometric studies are closely tied to the question of provenance.[107] The large number of studies using WD-XRF to investigate ceramic and terracotta material from Sicily is in essence concerned with the identification of imported and locally produced material.[108] Provenance is a key characteristic in the investigation of a wide range of research topics including economies, trade, cultural interactions as well as Greek colonization. Contemporary provenance studies are based on the 'provenance postulate' as formulated by Wiegand et al.l in 1977. The postulate assumes that the chemical variance within a natural source is less than in the object being tested.[109] This assumption leads to a further assumption that the variance inside a population group is smaller than the variance between two population groups.[110] Furthermore, discreet population groups are thought to relate to geographically restricted sources or 'source zones'. As a result, provenance testing often revolves on matching population groups with raw sources.[111] However, caution is required since specific raw source material and finished objects rarely match up completely. Manufacture can significantly alter the composition of the finished object with the addition of temper, the removal of coarse grained objects through levigation and the mixing of different clays.[112] Hence, the use of 'source zones' which aims to establish the compositional characteristics for the raw material from discreet geographical zones. The study by Giuseppe Montana et al. on clayey sources in Sicily is such an example where numerous samples from within a specific zone are analysed in order to establish the characteristics of the overall zone.[113]

Thus, use of HH-XRF data to establish provenance has not yet been established. Frahm proposes that even in suboptimum conditions the results do not contradict the 'provenance postulate', and he supports the possibility of using HH-XRF technology in provenance testing for obsidian objects.[114] Hunt and Speakman consider the identification of provenance in ceramic material to be much more complicated than for obsidian. They point out the limited range of elements which can be reliable calibrated for HH-XRF data as a prohibitive factor.[115] Aaron N. Shugar and Jennifer L. Mass identify provenance testing as the most problematic aspect of HH-XRF application which can only be successfully achieved by making use of samples from raw sources and custom

105 Degryse & Braekmans 2014, p. 194.

106 Speakman & Shackley 2013, pp. 1438-1439.

107 Degryse & Braekmans 2014, p. 191.

108 Barone et al. 2003; Belfiore et al. 2010; Montana et al. 2009.

109 Weigand et al. 1977.

110 Degryse & Braekmans 2014, p. 191; Hein et al. 2002, p. 542.

111 Degryse & Braekmans 2014, p. 195.

112 Bezur & Casadio 2012, pp. 262-263; Degryse & Braekmans 2014, p. 195.

113 Montana et al. 2011.

114 Frahm 2013, p. 1091.

115 Hunt & Speakman 2015, p. 638.

calibration.[116] The HH-XRF data will therefore not be used for establishing provenance in this thesis.

Provenance testing relies on the formation of compositional groups. Based on a number of major and minor focus elements such as SiO_2, CaO, Na_2O, Ti, Zr, Sr, and Rb, the compositional characteristics of specific groups can be determined and subgroups can be identified or the coherence of a particular group can be evaluated. The statistical method used to establish and evaluate compositional groups is the principal component analysis and has been in use in archaeology for a number of decades.[117] For example, based on studies by Richard Jones and Marie Farnsworth in the 1970's and 1980's, scholars investigating Sicilian ware can reliably distinguish between local manufacture and Greek imports based on the higher levels of Co, Cr, and Ni in Greek objects.[118] The choice of which focus elements to use is related to the instruments used since each instrument provides reliable readings for only a specific range of elements. For this analysis the elements are determined by the precedent set by a number of provenance studies on Sicilian material which used the same instrument.

Before the principle component analysis can be performed the data is first transformed in order to avoid the constant sum problem of compositional data. This transformation is done by means of a log normalization.[119] For this study the central log-ratio (clr) was used as it has a developed theoretical background and has been used for pottery studies by a number of scholars.[120] Statistical analysis was performed using the program R. The clr normalization used can be found in the hotelling package and all diagrams were created using ggplot packages for biplots and dendrograms.

3.5 RECONSTRUCTING ROOF SYSTEMS

As discussed in chapter 2, architectural terracottas are increasingly studied as complete roof systems which include both decorated and undecorated terracotta elements.[121] Unfortunately, the archaeological remains are very fragmentary and it is exceedingly rare to find the various elements that constituted a roof in a single, undisturbed context. For instance, in the objects from Akragas it is clear that fragments that belonged to the lateral sima of a single roof were found distributed in various mixed contexts in an area with an estimated 90 m radius (section 4.1, frieze F). It is therefore necessary to consider the collection of objects as a whole in order to identify objects that belonged to the same roof. The criteria used for organizing fragments is governed by two main theoretical principles

The first principle centres on the manner in which the roof is manufactured. The general theory states that the entire roof was made by a single workshop during the same period of time. This would result in objects that are manufactured using the same techniques and raw materials and, therefore, there will be consistency in the fabric, decoration, form and technical execution between the various elements. An example of this principle being used for identifying roofs is the work by Conti on the architectural terracottas from Selinus. Both Conti and Winter do identify a number of limitations to the application of this principle.[122] For instance, it is thought that especially in later periods a workshop could have produced a number of different roofs which would result in fragments with similar fabric and technical characteristics. Conti notes that in these cases the dimensions of the elements and the form of the objects can be

116 Shugar & Mass 2012, p. 27.

117 Braekmans et al. 2017, p. 478; Degryse & Braekmans 2014, p. 195; Hein et al. 2002, p. 542; Kempe & Templeman 1983, p. 48.

118 Farnsworth et al., 1977; Jones, 1986.

119 Braekmans et al., 2017, p. 483; Baronne et al., 2011, p. 3064.

120 Aitchison 1986; Aitchison & Greenacre 2002; Aquila et al., 2015, p. 5; Baronne et al., 2011, p. 3064.

121 Lulof 2007, p. 41; Strazzulla 1997, p. 701; Winter 1993, pp. 202-203.

122 Conti 2012, p. 22; Winter 1993, p. 3.

used for separating the fragments into respective roofs. Another limitation to the application of this principle concerns the maintenance of a terracotta roof. Over time an individual piece might be damaged or fail completely. It is acknowledged that replacement pieces can be manufactured using different raw materials and techniques but retaining roughly the same decorative scheme, dimensions and form of the original elements. In his work on the Archaic architectural terracottas from Morgantina, Kenfield notices that objects associated with the same roof are manufactured using different techniques. While the reasons for this are unclear, Kenfield suggests that the depth of relief of objects or workshops employing craftsmen of different cultural traditions might play a role.[123] Since methods of manufacture are not traditionally considered in the study of Sicilian architectural terracottas it is not certain if the situation at Morgantina is an isolated case or if it is a more widespread occurrence. For the roofs of Selinus, at least, the methods of manufacture do not appear to be mixed on individual roofs.[124]

A second theoretical principle used by scholars for identifying elements from the same roof is that of modular design. In order for all elements including pan and cover tiles as well as sima and ridge tiles to fit together on the roof without excessive overlap or large gaps the objects need to be sized according to a number of key dimensions.[125] For example, the sima, geison revetment, and pan tiles should all have the same width. Examples of such modular systems are known from Sicily and mainland Greece. These include roof 3 from Selinus,[126] and the temple of Apollo at Halieis.[127] The two roof phases associated with a building from Naxos erected during the 5th century use the same module.[128] But not only should the roof elements be sized according to each other, they should also be sized according to the building. Therefore, roof elements from the Archaic period are thought to be sized according to a module specific to each building.[129] Starting at the end of the 6th century BC, however, greater standardization can be seen in the dimensions of building elements.[130] Thus, a single workshop could produce such objects that could be used for a number of different roofs; as was the case with some Laconian workshops which had a stock pile of tiles of standardized size.[131] According to Conti the greater standardization seen in the 5th century BC means that in some cases it is no longer possible to identify a single roof but rather a roof type.[132]

In the discussion above it becomes apparent that there is not a single characteristic which by itself reliably identify fragments from the same roof in all circumstances. Instead, a combination of characteristics including the raw materials, the production techniques, decoration, and profile dimensions should be taking into account. The method employed by Conti for the objects from Selinus focuses on fabric, structural elements, profile dimensions, technical execution and decoration.[133] Style, fabric, chemical composition and architectural context are already separate areas of research in this thesis. The identification of roofs will therefore rely on a synthesis of the

123 Kenfield 1997, pp. 110-111.

124 Conti 2012.

125 Sapirstein 2009, p. 223.

126 Conti 2012, p. 58. Roof 3 has the same width for the sima, geison, and roof tiles with 1 or 2 cm variations.

127 Cooper 1990, p. 72. According to Nancy K. Cooper the temple and the roof tiles all use the same basic dimension as a module, this dimension is known as the Halieis foot

128 Lentini et al. 2008, pp. 323, 337, 347, 360. The ship sheds at Naxos had two different roofs, one from the start of the 5th and one from the second half of the 5th century BC. Both have roughly the same module as can be seen in the geison fragment having roughly the same width as the pan tiles. The cover and pan tiles of the two roofs also follow the same modules.

129 Sapirstein 2009, p. 223; Winter 1993, pp. 3-4.

130 Wikander 1986, p. 30.

131 Winter 1993, p. 3.

132 Conti 2012, p. 23.

133 Conti 2012, p. 22.

results from each of these different analyses. The methodology applied to this thesis is based on the work by Conti. One important element of the proposed methodology is the emphasis on direct observation. As Conti notes, published records use different methods of observation and recording, the level of information regarding the fabric, manufacture, profile and decoration is also not consistently documented.[134] For this reason, only objects that were observed and documented in person (either the author or students working under direct supervision by the author) are included in the analysis.

While known profile dimensions are provided in section 4.1, additional dimensions can be proposed by graphically reconstructing the roofs. The availability of dimensions for the various elements that constitute the roof allows for a more comprehensive comparison with known roofs from Sicily as well as forming an integral part in the discussion of the roofs within an architectural context (chapter 6). Apart from frieze A, D and G from De Miro's typology, none of the revetments from Akragas have been reconstructed either physically or graphically. Graphically reconstructing the fragments identified by fabric, methods of manufacture and decoration as being part of a single roof serves a dual purpose. As already mentioned this provides information crucial to the subsequent study of the architectural context. But Conti also mentions that by graphically combining fragments it is possible to determine if fragments can realistically be considered to be part of the same roof. She found that for a number of fragments there were a number of discrepancies in the observed profile of objects which raised questions regarding the attribution of individual fragments.[135] As such the graphical reconstruction process provides additional answers. For this reason, a large number of object drawings were produced that document both the front, back, and profile of individual fragments. These drawings are then employed for reconstructing roofs graphically by using the AutoCAD program, which was found to allow for the highest level of accuracy and technical capability as opposed to purely graphical platforms. As a scientific method, graphic reconstructions in archaeology and heritage studies have been criticized for a lack of scientific rigour.[136] When only the complete reconstruction is presented the decision making process becomes opaque and it makes the determination of reliability problematic. For this reason, the reconstruction drawings make a distinction between known fragments and the hypothetical reconstruction of connecting space.

Roofs that had already been identified and reconstructed by previous scholars play an important role in the reconstruction process. Conti uses established roofs as a means of verifying known fragments and to attribute unknown fragments to existing groups.[137] Not only are those roofs used for comparison, they also provide a benchmark for the amount of variation that can be found in the dimensions and decoration of objects belonging to the same roof. As will be discussed in greater detail in section 4.2 and chapter 5, the production process utilized for Archaic terracotta objects in the Greek period is a manual process. In principle small variations can therefore be expected for objects from the same roof, but when the variations in size are too large these elements can no longer constitute a functional roof. The allowable tolerance is difficult to determine and can vary depending on the type of object and the time period in which it was manufactured. Established roofs therefore offer a valuable indication of the level of variation that can be expected for various objects.

134 Conti 2012, p. 23.

135 Conti 2012, p. 23.

136 Vico & Vassallo 2013, p. 63.

137 Conti 2012, p. 23.

4 RESULTS

4.1 STYLISTIC TYPOLOGY

This section is comprised of the stylistic description and analysis of the architectural terracottas from Akragas. The format is based on conventions as seen in the publications by Wikander, Conti, and Lang.[1] This includes a description of the decoration, profile and size of elements as well as the provenance, publication history, and dating for each stylistic group (section 3.2).

The stylistic groups used in this discussion are based on the friezes identified by De Miro (frieze A-I).[2] As discussed in section 3.2, these established groups will be retained for the descriptive and analytical portions of this work. A small number of fragments published by De Miro were not assigned to a frieze, but were instead categorized according to the function such as antefixes and acroteria palmettes. These categories are sometimes numbered, as with the palmettes, but in other cases the fragments are described as single objects without a named typological group. In the interest of consistency, the functional groups identified by De Miro are relabelled in this chapter, for example: palmette A, antefix B, etc. The friezes and functional categories named by De Miro are clearly marked in the title of the stylistic groups in the following. As discussed in section 2.1, he only published around 84 fragments, while the number of fragments used in this study is 265. Thus, using De Miro's established framework, additional fragments are either added to existing friezes or functional groups, or when necessary, new functional groups are created. Furthermore, the information for each individual fragment, including functional type, provenance and museum information, is provided in appendix A.

The analytical component of this chapter is given in the following discussion section for each stylistic group. This analysis centres on evaluating the placement of the relevant fragments into a single stylistic group and the position of this group in relation to the wider regional context. The frieze categories established by De Miro are based on known terracotta fragments at the time of publication in 1965. The relevance of these attributions therefore requires a re-evaluation based on what is known about Sicilian material today. To this aim the discussion will include references to stylistic precedents seen in the terracotta roofs of Sicily. Such precedents are important indicators for today's dating of objects based on style and will be a key factor in the discussion on stylistic influences in chapter 7.

4.1.1 FRIEZE A (DE MIRO)

Provenance: A large number of fragments were found by Marconi during excavation of temple G. According to Marconi some of the finds were uncovered by farmers who had a vegetable garden in the cella before the time of the first investigation, but he does not specify which ones. The majority of fragments are presumed to come from the excavation itself.[3]

Fragments: 43 fragments in total. 24 sima fragments: VIN 253-257, 260, 261, 265, 267, 277, 278, 280-286, 294, 296-299, 355. 10 geison revetment fragments: VIN 258-259, 262-264, 266, 276, 295, 331, 354. 9 waterspout fragments: VIN 287-293, 621, 622 (figure 4.1-1-2).

1 Conti 2012; Lang 2010; Wikander 1986.

2 De Miro 1965.

3 Marconi 1933, pp. 115, 124.

Description:

Sima:

Profile	Size	Painted decoration
Top roll 1	Average: 20 mm (range: 18-23 mm)	Horizontal black and white blocks with three black lines
Top roll 2	21 (13-22)	Horizontal red and white blocks with three black lines
Top fascia	43 (41-44)	Interlocking black and red hooked meanders separated by vertical black line
Cavetto	179 (based on the reconstructed sima VIN 355)	Alternating red and black standing thin tipped leaves outlined in black. Small thin tipped leaves hanging. Small red leaves are to the right of the large leaves. At the top of the cavetto between the large standing leaves are small three leaved palmettes. Leaves are separated by a thin black line
Intermediate roll	23 (20-26)	Diagonal black lines on a white background
Lower fascia	85 (84-86) Waterspout disk 189 mm in diameter	Lateral sima: One rosette on a black background between waterspout and sima edge. Two rosettes on a red background between two waterspouts. Rosettes have between 9-10 petals. Rosette is 38 mm in radius. Gable sima: Large meander pattern in black. Waterspouts are unpainted, tapering down in diameter to a large disk. The disks are painted in a number of different patterns, including a number of rosette variations
Bottom roll	21 (19-23)	Horizontal white and black blocks with three black lines

Angle of incline on lateral sima: 14 degrees average. Range 12-15 degrees.

Geison revetment:

Top roll	Average: 21 mm (range: 20-22 mm)	Red and white rectangular blocks with three black vertical lines
Main plaque	Estimated: 220 Radius of guilloche is 58 mm	Double guilloche consisting of three strands of almost equal thickness in black, white, and red. Central decoration is a black disk. Between patterns are palmettes, likely with 5 leaves each
Bottom roll 1	19 (18-19)	Red and white rectangular blocks with three black vertical lines
Bottom roll 2	15 (14-16)	Black and white rectangular blocks with three black vertical lines
Horizontal plaque	78 (74-80)	Alternating red and black single meanders in separated by black line

Figure 4.1-1: Lateral Sima and geison revetment from frieze A (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Discussion: The development of the canonical Sicilian sima is described in section 2.2.1.1. With the thin tipped leaves on the cavetto, meander on the top fascia and the rosettes between the waterspouts, frieze A is representative of the second phase of stylistic development dated to between 570 and 530 BC.[4] The combination of the specific decorative schemes and profile elements does not have an exact precedent among the roofs from Sicily. However, there are close parallels where individual decorative elements are used in a similar fashion. For example, the use of a meander on the top fascia, the cavetto decoration and the horizontal bands on the rolls is similar to objects from Syracuse including a geison revetment from the via Minerva[5] area and two from the temenos around the Apollonion.[6] Based on style Lang dates these

4 Lang 2010, pp. 37-38; Wikander 1986, p. 17; Winter 1993, p. 276.

5 Lang 2010, p. 138, no. Syra 9, fig. 32.2; Wikander 1986, p. 46, no. 57, fig. 9.

6 Lang 2010, pp. 138-139, no. Syra 14-15, fig. 34.1-5; Wikander 1986, pp. 47-48, no. 66, 70, fig. 11, 13.

roofs to the period 570-530 BC as well. From Selinus comes another example of unknown attribution with some similarities to frieze A. These include the use of a meander on the top fascia and diagonal lines on the intermediate roll, but as a whole there are substantial differences. The object is dated to the 2nd quarter of the 6th century BC by later scholars including Lang and Conti.[7] A number of fragments from Gela have strong parallels to various decorative elements of frieze A from Akragas. Frieze B from Gela is similar in that rosettes are found between the waterspouts, the intermediate roll has diagonal bands and the sima cavetto design shows strong similarities.[8] Frieze C from Gela is comparable as well, as seen in the decoration of the double rolls with horizontal bands and three thin stripes. The sima decoration has strong parallels except that the rosettes are on the gable pieces, and not the lateral sima. Brea dates the roof to just after the middle of the 6th century, while Lang places it in the first quarter of the same century.[9]

These Sicilian examples differ from frieze A from Akragas in that none of the simas have a bottom roll. The meander patterns on the top fascia are also running meanders, not single interlocking hooked meanders. These features are found on a roof from Selinus, on which a meander pattern is also visible on the raking sima. Both Conti and Lang date the roof to the last quarter of the 6th century due to features such as the bead-and-reel decoration on the lateral sima, which is absent from frieze A.[10]

The painted decoration and profile of the geison revetment is consistent with other examples from the canonical Sicilian sima phase (section 2.2.1.1). In general, there are less variation compared to the sima objects. The painted decoration, therefore, has strong similarities with a large number of Sicilian roofs including especially frieze A, B, and C from Gela. In terms of profile, the closest parallel is frieze C with the soffit plaque and double roll at the bottom. The painted decoration also comprises a guilloche pattern which consists of a black disk in the centre and the palmette is made of three leaves. There are also close parallels in the painted decoration to roofs from Selinus, except that these have a six leaved palmette inserted in between the double guilloche.[11]

In conclusion, based on parallels with other Sicilian roofs, frieze A is representative of canonical Sicilians roofs from the second development phase. The profile and painted decoration are comparable to roofs from Gela, Syracuse, and Selinus, to name a few. Nevertheless, as seen in the discussion above, the exact configuration of profile elements and painted decoration in frieze A is not found on any of the known examples from Sicily.

The majority of the fragments identified with this frieze belong to the lateral geison revetment and sima. Two of the reconstructed pieces are also from the eaves (VIN 354, 355, figure 4.1-1), while a third is a horizontal geison revetment (VIN 276).[12] In addition, De Miro identified one fragment from the raking sima (VIN 296, figure 4.1-2)[13] and another fragment with a decreasing guilloche pattern that he attributes to the raking geison revetment (VIN 331, figure 4.1-2). This fragment is rather small, but based

7 Conti 2012, pp. 43-67, roof 3, fig. 41; Lang 2010, p. 132, no. Seli 5, fig. 29.1-5; Wikander 1986, pp. 40-41, no. 45, fig. 11.

8 Brea 1949, pp. 39-42, fig. 28; Wikander 1986, pp. 33-34, no. 7, fig. 8.

9 Brea 1949, pp. 47-56, fig. 36-39; Lang 2010, pp. 94-95, no. Gela 3, fig. 4.5-6, 5.1; Wikander 1986, p. 34, no. 8.

10 Conti 2012, pp. 113-127, roof 14, fig. 108; Lang 2010, pp. 131-132, no. Seli 3, fig. 28.6-8.

11 Conti 2012, roof 5, 10, 12, 13.

12 Some of the reconstructed pieces are currently stored in the magazine, but the complete set is visible in the museum catalogue by Carratelli & Fiorentini 1992, fig. 80.

13 De Miro 1963, pp. 43-44.

Figure 4.1-2: Fragments associated with frieze A (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo) on the profile as well as the position and dimensions of the guilloche pattern De Miro places it as part of a corner decrease on the raking geison revetment. From the absence of painted decoration it is clear that the preserved edge is not from a visible soffit, as would be expected if it were part of the horizontal sima.[14] This is a rather unconventional reconstruction as the majority of roofs from Gela,[15] Naxos,[16] and Syracuse[17] show the decrease on the horizontal geison revetment. The only comparable example is frieze C from Gela, but the evidence for this reconstruction is also limited.[18] Overall, the painted decoration on this fragment is not very precise and the fragment is rather small. An unconventional reconstruction of the gable based on it alone is thus problematic.

The raking sima fragment (VIN 296) has the same painted decoration on the cavetto as the lateral sima, except that the relationship between standing and hanging leaves of the same colour on the cavetto is inversed. This situation is also found on four other sima fragments, including one fragment with the remains of a waterspout (VIN 277, 282, 285, 297). In addition, there are also three fragments with slight variation in the meander pattern; namely the dividing line between the interlocking hooked meanders is omitted (VIN 280, 286, 299). At least three of these fragments are published by De Miro as being part of frieze A (VIN 277, 282, 286) and their museum numbers all fall within the range of other known fragments from this group. The variations in the painted decoration might be due to later replacement pieces or due to inconsistent execution by the craftsmen during production.

Dating: While Marconi placed the roof in the beginning of the 6th century,[19] both De Miro and Lang date the roof convincingly to the middle of the 6th century.[20]

Publications: Carratelli & Fiorentini 1992, p. 82, fig. 80; Darsow 1938, p. 12; De Miro 1965, pp. 40-55; Lang 2010, p. 86, AKRA 1; Marconi 1933, pp. 120-126; Marconi 1929, pp. 155-157; Wikander 1986, p. 31, fig. 7, no 1.

4.1.2 FRIEZE B1 (DE MIRO)

Provenance: According to De Miro the provenance is not known.[21] The museum number starts with an 'S', which indicates that it comes from the civic museum collection of Agrigento (section 2.1).

Fragments: 1 geison revetment fragment: VIN 351 (figure 4.1-3)

14 De Miro 1965, p. 49.

15 Frieze A and D from Gela, cf. Brea 1952.

16 The roof associated with tempietto H from the sanctuary to the West of Santa Venera (Lentini & Pakkanen 2011, p. 423, fig. 22).

17 The roof found in the area of the Athenaion, cf. Ciurcina 1993, p. 36, fig. 23.

18 Brea 1949, fig. 99.

19 Marconi 1933, p. 126.

20 De Miro 1965, p. 49; Lang 2010, p. 87.

21 De Miro 1965, p. 55.

Description:

Profile	Size	Painted decoration
Top roll	21 mm high	Red and white rectangular blocks with black vertical lines
Fascia	Guilloche radius 49 mm	Double guilloche consisting of three strands in black, white, and red/black. Central decoration is a black disk. Between patterns is three leaved palmette

Discussion: The geison revetment fragment has strong similarities with the geisa from frieze A and C. The painted decorations on the top roll and main plaque are similar; the main fascia is decorated with a double guilloche built from three strands around a central disk and there is a three leaved palmette in the centre.

Dating: Lang dates this object to 570-530 BC.[22]

Publications: De Miro 1965, p. 55, tab. XXIV-1c; Lang 2010, p. 90, AKRA 18.

Figure 4.1-3: Frieze B1 geison revetment fragment (VIN 351, Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.3 FRIEZE B2 (DE MIRO)

Figure 4.1-4: Frieze B2 raking or horizontal sima fragment (VIN 349, Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

22 Lang 2010, p. 90.

Provenance: unknown,[23] museum number indicates object comes from the civic museum collection of Agrigento.

Fragments: 1 horizontal sima fragment: VIN 349 (figure 4.1-4)

Description:

Profile	Size	Painted decoration
Cavetto	-	Traces of tear shaped leaves
Top roll	26 mm	Diagonal bands in red and black
Lower fascia	67 mm high Angle between fascia and horizontal tile is 81 degrees	Three rosettes on a black background. The rosettes consist of eight or nine petals with a central black disk

Discussion: There is no evidence of waterspouts on the lower fascia. The space required for the three rosettes visible, and the fact that the connection with the horizontal plaque covers more than half of the lower fascia, indicates that there were no waterspouts present. Thus, this fragment is from either the raking or the horizontal sima.

The painted decoration has strong similarities with frieze A as well as three roofs from Gela and one from Syracuse. The strongest similarities are with frieze F from Gela which Lang dates to 570-530 BC.[24] Two other roofs with similar painted decoration are dated to the same period by Lang, frieze A[25] and frieze B from Gela.[26] There are also similarities with a lateral sima from Syracuse which is placed in the same period.[27]

In terms of the profile, VIN 349 is set apart from other simas from Akragas dated to the this period. Unlike the ones from frieze A, B3, and D this fragment does not have a bottom roll. According to Shoe the bottom roll is a characteristic of Selinuntine simas.[28] The situation seems to be slightly more complicated for while it appears the bottom roll is restricted to simas from Selinus and Akragas the recent publication by Conti demonstrates that there are a number of early simas from Selinus where the bottom roll is also absent, including roof 1[29] and roof 3.[30]

Dating: Lang dates the object to 570-530 BC.[31]

Publications: De Miro 1965, p. 55, tab. XXIV-1d; Lang 2010, p. 87, AKRA 4.

4.1.4 FRIEZE B3 (DE MIRO)

Provenance: A single sima fragment was found during the excavation at S. Anna by Fiorentini next to the large rectangular structure dated to the end of the 6th century BC (VIN 358, figure 4.1-5).[32] During recent

23 De Miro 1965, p. 55.

24 Brea 1949, pp. 62-63, fig. 51-53; Lang 2010, p. 96; Wikander 1986, p. 35, fig. 7.

25 Brea 1949, pp. 22-38, fig. 14-26; Lang 2010, pp. 93-94, fig. 4; Wikander 1986, pp. 32-33, fig. 1,7.

26 Brea 1949, pp. 39-47, fig. 27-35; Lang 2010, p. 94, fig. 4; Wikander 1986, pp. 33-34, fig. 8.

27 Lang 2010, pp. 137-138, fig. 33.1; Wikander 1986, pp. 44-46, fig. 5,12.

28 Shoe 1952, p. 10.

29 Conti 2012, pp. 32-33, fig. 15.

30 Conti 2012, pp. 53-56, fig. 40-41.

31 Lang 2010, p. 87.

32 De Miro 1965, p. 56; Fiorentini 1969, p. 67.

excavations by Sojc three additional fragments were discovered in secondary use to the North-East of Fiorentini's excavation. These fragments have not yet been published.

Fragments: 3 sima fragments: VIN 358, 569, 562. 1 geison revetment fragment: VIN 570 (figure 4.1-5)

Description:

Sima:

Profile	Size	Painted decoration
The top section is not represented by any of the known fragments		
Intermediate roll	Average: 23 mm (range: 22-23 mm)	Unclear
Lower fascia	85 (82-88)	Rosette on a black background between waterspout and sima edge
Bottom roll	21 (20-22)	Unclear

Angle of incline on lateral sima: 13 degrees average. Range 11-14 degrees.

Geison revetment:

Top roll	21 mm in diameter	Unclear
Main plaque	Unclear	Unclear

Figure 4.1-5: Frieze B3 lateral sima fragments (Copyright VIN 358 : Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo. Copyright VIN 562,569 and 570: Parco Archeologico e Paesaggistico Valle dei Templi di Agrigento).

Discussion: The three new fragments (VIN 562, 569, 570) are placed together with the one known fragment from Fiorentini's excavation (VIN 358) since all fragments are from a canonical Sicilian roof and similar in size, and they were found in the area of the extra-urban sanctuary of S. Anna. Two fragments are associated with the lateral entablature, one from the sima (VIN 358) and the other from the lateral geison revetment (VIN 570, figure 4.1-5). A third, larger fragment, appears to be from the raking sima, since the fragment is big enough that traces of waterspouts would have been visible in the lower fascia if it came from the lateral sima (VIN 562). The last sima fragment is rather small and might belong to either the raking or the lateral sima (VIN 569). The painted decoration on the three new fragments is eroded and the geison revetment fragment shows evidence of secondary burning. The fragment from Fiorentini's excavation retains some of the painted decoration though. It shows a strong similarity with frieze A both in terms of the painted decoration and the profile. The size of the rosette as well as its position within the lower fascia are identical. The angle of the fascia and the stepped join are also the same.

Dating: Lang dates the fragment from Fiorentini's excavation to 570-530 BC.[33]

Publications: De Miro 1965, p. 56, tab. XXIV-1g; Fiorentini 1969, p. 67, fig. XXXII.2.2; Lang 2010, pp. 87-88, AKRA 5.

4.1.5 FRIEZE B4 (DE MIRO)

Figure 4.1-6: Sima fragment from frieze B4 (VIN 352, Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: De Miro does not provide any information on the provenance.[34] The museum number starts with 'S', an indication that it originally comes from the civic museum of Agrigento. Other objects that fall within the same range of museum numbers include fragments from frieze A (VIN 277, 278, 280, 284, 285, 297), frieze B1 (VIN 351) and frieze B2 (VIN 349) (see appendix A).

On the back of the fragment is a small white sticker with a blue border and the text: S. 24 P.D. R.B N.5. The sticker and text are similar to ones found on objects from frieze A. For example, on VIN 278 is a sticker with the text: S. 24 P.B R.B N. 6. Although there are some discrepancies since the text associated with fragments from frieze A includes P.B, while on this fragment it is P.D. To date no other corresponding documentation on objects has been found. It therefore appears that it is linked to the excavations of

33 Lang 2010, p. 88.

34 De Miro 1965, p. 55.

Marconi, but it is important to note that Marconi investigated the urban sanctuary the year before he excavated at temple G when he uncovered fragments associated with frieze A (section 2.1). One other fragment from his urban sanctuary excavation (VIN 279) is within the same group of fragments from the civic museum. Similarities in the excavation documentation between objects from these excavations would therefore not be surprising.

Fragments: 1 sima fragment: VIN 352 (figure 4.1-6)

Description:

Profile	Size	Painted decoration
Top fascia	55 mm high	Hooked meander
Cavetto	-	Standing thin tipped leaves with possible small thin tipped leaves hanging. Between leaves is a solid black wavy band

Discussion: While the fragment has a similar documentation system as objects from frieze A (see provenance above) the painted decoration and profile size are different. The top fascia is almost 1 cm higher and decorated with a hooked meander, while frieze A has an interlocking hooked meander. The standing leaves within the wavy band are also much wider than the ones seen on frieze A. The painted decoration is similar to the drawings published by Gábrici of the terracotta revetment found at the naiskos to the South-East of temple B (frieze D).[35]

Dating: Lang dates the fragment to 570-530 BC.[36]

Publications: De Miro 1965, p. 56, tab. XXIV-1b, fig. 2; Lang 2010, p. 88, AKRA 6.

4.1.6 FRIEZE B5 (DE MIRO)

Figure 4.1-7: Sima fragment from frieze B5 (VIN 353, Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: The provenance of this fragment is not published by De Miro.[37]

Fragments: 1 sima fragment: VIN 353 (figure 4.1-7)

35 Gábrici 1925, fig. 10-11.

36 Lang 2010, p. 88.

37 De Miro 1965, p. 57.

Description:

Profile	Size	Painted decoration
Top roll 1	-	Unclear
Top roll 2	21 mm high	Red horizontal block with black vertical lines
Top fascia	25 mm high	Alternating black and red dog-tooth
Cavetto	-	Alternating red and white thin tipped standing leaves on a white background with a black outline. Small hanging leaves in between. Appears to have black Doric/tear shaped leaves on back

Discussion: The use of a dog-tooth pattern on the top fascia is relatively rare with only two examples, one from Leontini[38] and the other from Megara Hyblaea.[39] The cavetto decoration is very similar to frieze A. While there is only one incomplete fragment of frieze B5, the size of the top fascia as well as the decoration and curve of the cavetto indicate a smaller sima than frieze A. A stepped join is preserved on the lateral edge.

Dating: Lang dates this fragment to 570-530 BC.[40]

Publications: De Miro 1965, p. 57, tab. XXIV-1a, fig. 2c; Lang 2010, p. 88, AKRA 7.

4.1.7 FRIEZE B6 (DE MIRO)

Figure 4.1-8: Sima fragment from frieze B6 (VIN 333, Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: The provenance of this fragment is not published by De Miro.[41]

Fragments: 1 sima fragment: VIN 333 (figure 4.1-8)

38 Wikander 1986, p. 38, fig. 7.

39 Lang 2010, p. 112, fig. 13.3.

40 Lang 2010, p. 88.

41 De Miro 1965, p. 57.

Description:

Profile	Size	Painted decoration
Top roll	21 mm high	Black and white horizontal blocks
Top fascia	40 mm high	Four rows of black and white checkerboard
Cavetto	-	Unclear

Discussion: The sima fragment is one of the few examples from Akragas of black and white painted decoration. While the decoration is well preserved on only the top roll and fascia, there is no indication of other painted colours. A number of examples from elsewhere in Sicily exist with similar decoration and profile. These include an earlier raking sima from Selinus,[42] frieze B from Gela dated by Lang to the middle of the 6th century,[43] and smaller fragments from Syracuse.[44]

Dating: Lang dates this fragment to 570-530 BC.[45]

Publications: De Miro 1965, p. 57, tab. XXVII-3a; Lang 2010, p. 88, AKRA 8. Frieze C (de Miro)

4.1.8 FRIEZE C (DE MIRO)

Provenance: De Miro identifies VIN 200 and 201 as being from a fill layer around the naiskos to the South-East of temple B found during his excavation in 1962.[46] According to the museum inventory documentation the other two fragments are from the same area.

Fragments: 4 geison revetment fragments: VIN 198-201 (figure 4.1-9)

Description:

Profile	Size	Painted decoration
Top roll	22 mm	Red and white rectangular blocks with three black vertical lines
Main plaque	Guilloche radius 51 mm	Double guilloche consisting of three strands in black, white and red/black. The middle strand is slightly thinner. Central decoration is a black disk. Between patterns are three leaved palmettes.
Bottom roll 1	Average: 20 (range: 18-21)	Red and white rectangular blocks with three vertical lines
Bottom roll 2	15	Rectangular blocks with three vertical lines

Discussion: De Miro appears to populate this frieze with geison revetment fragments that were found in a disturbed context in the area around the naiskos to the South-East of temple B. While he only placed two fragments (VIN 200 and 201) in this group, there are two other fragments in the storerooms of the archaeology museum of Agrigento which are recorded as being from the same excavation and find context.

This geison revetment frieze has very strong similarities to frieze B1 in terms of the size of the elements

42 Conti 2012, pp. 32-33, fig. 15; Lang 2010, p. 131, fig. 27.3-4, 28.1-3; Wikander 1986, p. 42, fig. 10.

43 Brea 1949, pp. 39-47, fig. 27-35; Lang 2010, p. 94, fig. 4; Wikander 1986, pp. 33-34, fig. 8.

44 Lang 2010, p. 138, fig. 32.3; Wikander 1986, pp. 46-47.

45 Lang 2010, p. 88.

46 De Miro 1965, p. 57.

and the painted decoration. VIN 201 has a flat lateral edge preserved.

Dating: Lang dates these fragments to the 6th century BC.[47]

Publications: De Miro 1965, p. 57; Lang 2010, p. 89, AKRA 15.

Figure 4.1-9: Sima fragments from frieze C (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.9 FRIEZE D (DE MIRO)

Provenance: When Gábrici excavated the naiskos to the South-East of temple B, he discovered over a hundred fragments of a terracotta roof similar to that of the Geloan treasury in Olympia. These fragments were found in the upper floor layers and are thought to come from the collapse of the building.[48] While the majority of these fragments are now lost, 17 were recently rediscovered in the archaeological museum in Palermo (VIN 500-516). According to the find tags stored with these objects they are from inside the naiskos. In 1962 De Miro excavated in the same area and uncovered a handful of additional fragments. One of them (VIN 196) he attributes to the sima found by Gábrici.[49] Three additional fragments were never published. According to the text written on the objects themselves they were also found in 1962, close to the Hellenistic fortification to the South of temple B (VIN 574, 612, 614).

Fragments: 21 fragments in total. 7 sima fragments: VIN 196, 503, 504, 506-508, 612). 14 geison revetment fragments: VIN 195, 500-502, 505, 509-515, 574, 614 (figure 4.1-10)

47 Lang 2010, p. 89.

48 Gábrici 1925, p. 440.

49 De Miro 1965, p. 58.

Figure 4.1-10: Fragments associated with frieze D (Copyright VIN 196 and 614: Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo. Remaining objects copyright Regione Siciliana – Assessorato Reg.le dei BB. CC. e I. S. – Su concessione del Polo Regionale di Palermo per i Parchi e i Musei Archeologici– Museo Archeologico Regionale "Antonino Salinas" – divieto di duplicazione con qualsiasi mezzo)

Description:

Sima

Profile	Size	Painted decoration
Top roll 1	19 mm	Horizontal black and white blocks with three black lines
Top roll 2	21	Horizontal red and white blocks with three black lines
Top fascia	-	Single hooked meanders alternating in red and black
Cavetto	-	Black wavy band with white outlines. Alternating red and black infill
Intermediate roll	24	Diagonal black lines on a white background
Lower fascia	Angle between fascia and horizontal base: between 82 and 78 degrees.	On the lateral sima there are alternating red and black lozenges between the waterspouts. On the raking sima there is a 9-10 petal rosette on a white background. The rosette has a radius of 61 mm
Bottom roll	Average: 23 (range: 20-25)	Horizontal white and black blocks with black vertical lines

Angle of incline on lateral sima: 13 degrees average. Range 12-14 degrees.

Geison revetment:

Top roll	22 mm	Red and white rectangular blocks with three black vertical lines
Main plaque	186 based on the guidelines on VIN 505. Guilloche radius 42 mm	Double guilloche consisting of three strands in black, white and red/black. Central decoration is a black disk. Between patterns are three leaved palmettes
Bottom roll 1	Average: 19 (range: 18-24)	Red and white rectangular blocks with three black vertical lines
Bottom roll 2	17 (15-18)	Black and white rectangular blocks with three black vertical lines
Horizontal plaque	74 (70-78)	Single hooked meanders alternating in red and black

Discussion: During his excavation to the South-East of temple B Gábrici found numerous fragments associated with a number of different roofs. According to him the remains of the roof of the naiskos were found inside the building, while fragments from different roofs, including some associated with frieze C and G, were located in the disturbed context around the building and towards the later fortification walls. Unfortunately, none of the fragments excavated by Gábrici and interpreted with the roof of the naiskos has been published and the documentation from this investigation is minimal. The identification of objects from the roof of the naiskos, associated with frieze D, is thus dependent on the drawings published by Gábrici. Based on them De Miro assigned the sima fragment (VIN 196), excavated in 1962, to this frieze (figure 4.1-10). The fragments recently rediscovered in the archaeological museum in Palermo are assigned to frieze D, too, due to similarities with the published drawings as well as their find location inside the naiskos (VIN 500-516, figure 4.1-10). For example, VIN 505 is a lateral sima fragment with alternating red and black diamonds (figure 4.1-10). While three unpublished fragments appear to come from the disturbed context near the fortification walls (VIN 574, 612, 614) they are also assigned to frieze D due to their similarities with the published material. For example, VIN 614 is a geison revetment fragment with preserved painted decoration on the soffit plaque consisting of alternating red and black hooked meanders (figure 4.1-10).

There are a number of concerns, however, because the majority of objects are not in a very good state of preservation, as can be seen in figure 4.1-10 and as documented in appendix A. The most important published source of information, Gábrici's drawings, raises some questions. The top fascia sits at an odd angle to the cavetto and the guilloche pattern shows a triple strand next to the palmettes, but a double strand at the outer edges. Both details are inconsistent with material from Sicily. On closer inspection of especially the geison revetment fragments such as VIN 513 it appears that the guilloche in fact consists of three strands and that the central disk is smaller than previously indicated by Gábrici.

In 1925 Gábrici estimates the sima to be 370 mm high and 520 mm long, while the geison revetment's height, based on the fragments, is 245 mm.[50] This results in the sima being slightly smaller than frieze A, while the geison revetment has the same size. As with frieze A the sima also consists of a bottom roll. Unfortunately, fragments associated with the top fascia and cavetto of the sima are rare and badly eroded; therefore, Gábrici's reconstructed drawing cannot be confirmed based on this group of objects alone.

While the decorative elements on frieze A and D show minor variations, they are all typical motifs used during the second phase of the canonical Sicilian roof as discussed in section 2.2.1.1. These decorative elements show strong similarities to various fragments found in Gela within the sanctuary of Athena, dated to the first quarter of the 6th century or the period 570-530 BC.[51] There are also strong stylistic parallels to the roofs from the area of the Athenaion and Monte Casale, Syracuse, which are placed in the middle of the 6th century.[52]

Dating: De Miro dates frieze D to the middle of the 6th century based on stylistic similarities with the Geloan treasury in Olympia.[53] Lang dates it to 570-530 BC.[54]

Publications: Darsow 1938, p. 12; De Miro 1965, pp. 58-60, tab. XXIV-1h; Gábrici 1925, pp. 440-441, fig. 10,11; Lang 2010, p. 88, AKRA 8; Marconi 1929, p. 155, fig. 87a-b; Wikander 1986, pp. 31-32, fig. 7, no. 2.

4.1.10 FRIEZE E (DE MIRO)

Provenance: The museum number is in the middle of a range of inventory numbers that point to Gábrici's excavation to the South-East of temple B (appendix A). Some of the fragments in this range, such as VIN 180, are published by De Miro as coming from the fill layer around the naiskos (e.g. ridge tile antefix A).

Fragments: 1 geison revetment fragment: VIN 224 (figure 4.1-11)

50 Gábrici 1925, p. 141.

51 Lang 2010, pp. 94-95.

52 Ciurcina 1993, pp. 30-31, fig. 4,5.

53 De Miro 1965, p. 59.

54 Lang 2010, p. 88.

Description:

Profile	Size	Painted decoration
Doric cyma	72 mm	Alternating black and white Doric leaves with outline in white and central white stripe
Top roll	18	Unknown
Main plaque	-	Guilloche with thin outline in white and red band visible

Discussion: The profile has a rather unique feature not found on geison revetment fragments from earlier periods. The interior join between the top horizontal plaque and the main vertical plaque is fortified, creating a large, sloping join. This indicates that VIN 224 did not sit flush with the stone geison but instead cantilevered at least 40 mm beyond the stone geison revetment. Examples of painted Doric cyma are found in a number of fragments from Selinus including roof 19, which is associated with temple C.[55] The strongest similarity show fragments from roof 20, which was formerly connected with temple Y. They are similar not only in the painted decoration but also in the profile which includes a large chamfered inner join between the top horizontal and vertical plaques.[56] Conti dates roof 19 and 20 to be roughly similar, around 530 BC.[57] There appears to be consensus among scholars that the addition of a hawksbeak moulding, or in this case a painted Doric cyma, on top of the main geison revetment plaque is associated with the anthemion sima phase of Sicilian architectural terracottas.[58]

Dating: De Miro dates this object to the last decade of the 6th century based on similarities with temple C from Selinus.[59] Lang dates it to the last third of 6th century BC.[60]

Publications: De Miro 1965, pp. 60-61, tab. XXIV-2; Lang 2010, pp. 89-90, AKRA 16; Wikander 1986, p. 32, no. 3.

Figure 4.1-11: Sima fragment from frieze E (VIN 224, Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

55 Conti 2012, pp. 184-185, fig. 166-167.

56 Conti 2012, pp. 191-193, fig. 170-173.

57 Conti 2012, p. 204.

58 Lang 2010, p. 89; Wikander 1986, pp. 26-29; Winter 1993, pp. 277-278.

59 De Miro 1965, p. 59.

60 Lang 2010, p. 90.

4.1.11 FRIEZE F (DE MIRO)

Provenance: VIN 145, 146 and 148 were found in a cistern North of temple A,[61] while VIN 147, 177 and 178 came from the base of the hill.[62] VIN 521 was recently rediscovered in the archaeological museum in Palermo among fragments of the 1922 excavation by Gábrici to the South-East of temple B.

Fragments: 7 sima fragments: VIN 145-148, 177, 178, 521 (figure 4.1-12)

Description: The anthemion sima consists of a repetition of the same design motifs in relief. Every other repetition is inverted. The different repetitions are separated vertically by perforations but tied in the middle by interwoven volutes. The two volutes are held together with a red band and have a black disk in the centre. From the red band there grows a five leaved palmette with alternating red and black leaves. On the opposing side is a lotus flower with three internal leaves. Every other repetition consist of a standing palmette with a hanging lotus. At the base of the lotus flower next to the volutes is a dog-tooth pattern in white and red. The perforated sima sits on a horizontal tile which is decorated with a single guilloche on the front. The soffit of the tile is painted with a simple meander in white with alternating red and black blocks, followed by a large solid red band until the edge of the fracture which indicates an overhang of at least 96 mm.

Discussion: VIN 521 is placed in this group based on similarities in profile and painted decoration with the other six fragments already published by De Miro. All of the seven fragments are associated with the perforated lateral sima. VIN 145, 147 and 148 are similar to VIN 178 (figure 4.1-12.a) based on their standing palmette with five leaves. The other three fragments (figure 4.1-12.b,c,d) are associated with different parts of the sima design, which accounts for their differences in profile and decoration. VIN 146, for example, is an inverted palmette, with the profile thickening towards the tips of the palmette at the bottom. VIN 177 contains an inverted lotus and a part of the horizontal tile, whereas the inverse of VIN 177 is VIN 521 which contains a standing lotus.

In general, the combination of palmette, lotus flower and volute is a common design motif on Archaic Greek objects from pottery to jewellery. The anthemion design is also a characteristic part of the Corinthian system, of which the mid-6th century temple of Apollo at Corinth is a good example.[63] There are only a small number of examples where the anthemion pattern is used for a perforated lateral sima. In Sicily, examples can be divided into two groups based on details in the decoration. The first group includes the frieze F from Akragas, and objects of frieze G from Akragas represent the second. The first group is sometimes referred to as the 'Selinuntine sima' due to three well known simas from Selinus associated with temple E1, C and Y.[64] Other examples include three simas from Metapontium dated between 540-400 BC,[65] one fragment from Leontini,[66] and an isolated fragment in secondary use found in Akrai.[67] In terms of style, size, and profile, the sima of frieze F most closely resembles roof 20 from Selinus, formerly associated with temple Y. Conti dates it to around 530 BC.[68]

61 De Miro 1965, p. 63.

62 De Miro 1965, p. 62; Marconi 1929, p. 154.

63 Winter 1993, pp. 32-33, fig. 3.

64 Lang 2010, pp. 45-46; Winter 1993, p. 21.

65 Lang 2010, p. 112, tab. 14.

66 Monterosso 2009, p. 434, fig. 14.

67 Ciurcina 1997, p. 42, fig. 7-8.

68 Conti 2012, pp. 186-204, fig. 181, 184.

Figure 4.1-12: Sima fragment from frieze F. (Copyright VIN 521 : Regione Siciliana – Assessorato Reg.le dei BB. CC. e I. S. – Su concessione del Polo Regionale di Palermo per i Parchi e i Musei Archeologici– Museo Archeologico Regionale "Antonino Salinas" – divieto di duplicazione con qualsiasi mezzo. Remaining objects copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo)

Dating: Last third of 6th century BC.[69]

Publications: Darsow 1938, p. 32; De Miro 1965, pp. 62-64, tab. XXV-1; Lang 2010, p. 88, tab. 1.4, AKRA 11; Marconi 1929, pp. 153, 156, fig. 86; Wikander 1986, p. 32, no. 4.

4.1.12 FRIEZE G (DE MIRO)

Provenance: The fragments are likely from the extensive fill layer in the area to the South-East of temple B, excavated by Gábrici in 1922. The layer contained a mix of different terracotta roof elements dating to the 6th century BC.[70]

Fragments: 10 sima fragments: VIN 136-139, 166-169, 179, 181. 3 geison revetment fragments: VIN 144, 183, 184 (figure 4.1-13)

Description:

Sima:

The anthemion sima is decorated in relief showing a seven leaved palmette alternating with lotus flowers growing from a series of u-shaped volutes. The volutes have a large central disk with a painted star. Where the two curls of the volutes meet there is a small three leaved hanging palmette, at the junction between two volutes is a single hanging bud. The horizontal tile is not preserved.

Geison revetment:

Profile	Size	Painted decoration
Hawksbeak	Average: 89 mm (range: 88-90)	Alternating thick and thin Doric leaves in relief with painted centres in red and black
Top roll	22 (20-23)	Diagonal bands in red
Main plaque	Guilloche radius 48 mm	Double guilloche with five strands in black and white. The central strand is substantially wider and in white. The centre of the guilloche is a four petal rosette and at the junction between two guilloche bands is a three leaved palmette

Discussion: VIN 136-138, 166-169 and 179 are from a perforated lateral sima (figure 4.1-13). VIN 139 is associated with a sima from the gable as there is no evidence of perforations (figure 4.1-13.e). Of the three geison revetment fragments De Miro interprets the angle of 97 degrees between the top horizontal and main vertical plaques on VIN 183 as evidence that this fragment belongs to a lateral geison revetment, while VIN 144 and 184 (figure 4.1-13.j) have a 90 degree angle and are thus from the horizontal geison revetment.[71] It should be noted that none of the geison revetment fragments have the horizontal plaque preserved and the angle measured on the top of the vertical plaque might not represent the whole.

In terms of style and size, there is considerable variety within this frieze G. The palmette of VIN 138 is smaller and has a rounded silhouette compared to VIN 179, which has a more traingular silhouette. The relief on VIN 179 and 167 is considerably shallower and the profile is straight compared to VIN 136-138, 166 and 168 which show a deeper, more rounded relief and a curved profile. There are also differences between the two lotus bud fragments from the perforated sima (VIN 136 and 169) in terms of the depth

69 Lang 2010, p. 88.

70 De Miro 1965, p. 64; Gábrici 1925, p. 440.

71 De Miro 1965, p. 65.

Figure 4.1-13: Frieze G. (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo) of relief, the position of the leaves at the base of the flower and the size of the bud. Such variations within sima fragments, especially the ones associated with the lateral sima, are considerable especially when compared to the perforated lateral sima of frieze F, where all fragments related to the same position in the frieze are of the same size, profile and decoration. Differences in size and design might be attributed to renovations made to an existing roof, as suggested by De Miro.[72] Another possible explanation is that the fragments were grouped together by De Miro based on their overall stylistic similarities and provenance, but that at least some objects of frieze G might come from a separate roof. Since these fragments were discovered in a disturbed context the provenance would arguably support such a scenario. In the fill layer in which these objects were found there were a number of fragments from other roofs, too, including VIN 521 from frieze F and VIN 143 from frieze H.

Many of the fragments from the lateral sima (VIN 136-138, 166, 168) and the geison revetment (VIN 183, 184) have strong similarities to numerous fragments from Naxos. They are divided into three groups, series A to C, which are believed to belong to three successive roofs associated with building B which was in use until the 5th century.[73] The form and size of the relief as well as the details of the anthemion pattern of at least some of the fragments associated with frieze G seem identical with series B (VIN 136-138, 166); for this reason De Miro suggests that the objects of frieze G from Akragas are made with the same mould as the ones from series B and might in fact be produced in Naxos.[74]

Dating: Last third of the 6th century BC.[75]

Publications: Carratelli & Fiorentini 1992, pp. 82, 86, fig. 81, 86; De Miro 1965, pp. 64-70, tab. XXV-3, XXVI-1; Lang 2010, p. 89, tab. 1.5-6, AKRA 12; Wikander 1986, p. 32, fig. 7, no. 5.

4.1.13 FRIEZE H (DE MIRO)

Provenance: The fragment is likely from the extensive fill layer in the area to the South-East of temple B, excavated by Gábrici in 1922.[76]

Fragments: 1 geison revetment fragment: VIN 143 (figure 4.1-14)

Description:

Profile	Size	Painted decoration
Main plaque	-	Unknown
Bottom roll 1	30 mm	Plain roll, painted decoration unknown
Bottom roll 2	36	Bead-and-reel in relief
Bottom roll 3 (soffit)	18	Plain roll, painted decoration unknown
Horizontal plaque	-	Unknown

Discussion: As discussed in section 2.2.1, the addition of the bead-and-reel decoration to the geison revetment is associated with the last developmental phase for Sicilian geison revetments. Lang also dates the fragment to this period which is at the end of the 6th century.[77] Nevertheless, there are some variations,

72 De Miro 1965, p. 69.

73 Pelegatti & Lentini 2011, p. 392, fig. 2-6.

74 De Miro 1965, p. 67.

75 Lang 2010, p. 89.

76 De Miro 1965, p. 71; Gábrici 1925, p. 440.

77 Lang 2010, p. 90.

the first example of a bead-and-reel moulding on a geison revetment at Selinus is found on roof 22 and dated by Conti to the first quarter of the 6th century.[78] The closest parallel can be seen in a geison revetment from Naxos which is forms part of the anthemion roof associated with temple B.[79] Other fragments of this geison revetment and sima type are well represented in Akragas as well, namely by frieze G that shows strong similarities with the example from Naxos as well, which raises the possibility that VIN 143 belongs to the same roof as frieze G instead of being from a separate one.

Dating: Last third of 6th century BC.[80]

Publications: De Miro 1965, pp. 71-72, tab. XXVII-3b; Lang 2010, p. 90, AKRA 17.

Figure 4.1-14: Fragment associated with frieze H (VIN 143, Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.14 FRIEZE H1 (DE MIRO)

Figure 4.1-15: Sima fragments from frieze H1 (VIN 140, VIN 141. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: The fragments are likely from the extensive fill layer in the area to the South-East of temple B, excavated by Gábrici in 1922.[81]

78 Conti 2012, pp. 205-222, fig. 200, 202, 203.

79 Ciurcina 1993, pp. 34-35, fig. 14.

80 Lang 2010, p. 90.

81 De Miro 1965, p. 72; Gábrici 1925, p. 440.

Fragments: 2 sima fragments: VIN 140, 141 (figure 4.1-15)

Description:

Profile	Size	Painted decoration
Top roll	28 mm	Black horizontal blocks, possibly with vertical lines
Top fascia	32/50	Crossed meander in black with red blocks in between
Cyma	42/38	Ionic cymation in relief
Cavetto	-	Fragmentary remains of small red and black leaves

Discussion: The two fragments are very similar to each other, especially in regards to the presence of the Ionic cymation below the top fascia. This might be the reason De Miro published the objects as part of to the same frieze. However, there is also a size variation of the top fascia, which leads Lang in contrast to separating the two fragments into two different roofs.[82] On closer inspection the profile of VIN 141 (figure 4.1-15.b) shows the presence of a horizontal scar on the back, close to the top of the fragment, which indicates that this fragment might be from a corner decrease at the gable. The presence of a red block set between the interlocking meanders on the top fascia of VIN 140 (figure 4.1-15) cannot be determined anymore, as this fragment is too small that the space is not preserved where this decorative element would have been placed. It is therefore possible to account for the differences mentioned and, in the absence of additional fragments, there is no reason why the two fragments should not be considered as belonging to the same roof.

The presence of an Ionic cymation on the sima is rare, but not unknown for Sicilian architectural terracottas. An equivalent is recognized in the raking sima fragments associated with building B at Naxos. These fragments have a single roll, small fascia decorated with a crossed meander and an Ionic cyma followed by a cavetto.[83] Three successive lateral anthemion simas are associated with the same structure and are dated from the end of the 6th until the 5th century but it is not certain which of the simas, series A-C, is actually associated with the raking sima fragments. The strong stylistic connections between both frieze G and frieze H1 with the anthemion roof of building B at Naxos are therefore pointing towards the possibility that some of the fragments from frieze G and frieze H1 might belong to the same roof.

More parallels also exist with the raking sima from temple B at Himera. There, the top fascia is completely replaced by the moulded Ionic cymation, and it is dated to 550-530 BC by Wikander[84] and the last third of the 6th century by Lang.[85] Both Lang and Wikander see the addition of Ionic elements to the canonical sima as part of the last phase of this roof type dating to between 550 and 480 BC.[86] The Himera example shows a more substantial departure from the canonical sima since the top roll is a moulded bead-and-reel and the top fascia has disappeared. In comparison frieze H1 retains many of the canonical elements, such as the double roll and fascia at the top. The less elaborate VIN 140 and 141 might therefore be considered slightly older than the example from Himera.

Dating: Last third of 6th century BC[87]

82 Lang 2010, p. 87.

83 Pelegatti & Lentini 2011, pp. 392-394, fig. 7.

84 Wikander 1986, p. 37, fig. 9.

85 Lang 2010, p. 100.

86 Lang 2010, pp. 39-40; Wikander 1986, pp. 18-20; Winter 1993, p. 276.

87 Lang 2010, p. 87.

Publications: De Miro 1965, p. 72, tab. XXVII-3c,d; Lang 2010, p. 87, tab. 1.1-2, AKRA 2-3.

4.1.15 FRIEZE I (DE MIRO)

Figure 4.1-16: Sima fragments from frieze I. (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo)

Provenance: VIN 182 was found to the North of temple A. The museum number of the second fragment indicates this object is originally from the civic museum of Agrigento, more information about the find context is not available (VIN 616).

Fragments: 2 sima fragments: VIN 182, 616 (figure 4.1-16)

Description:

Profile	Size	Painted decoration
Top fascia	26 mm high	Plain fascia with slightly rounded top edge. Remains of black paint on front and top surfaces
Moulding 1	37 mm high	Inverted egg-and-dart cyma
Moulding 2	31 mm high	Squarish bead-and-reel
Fascia	-	Plain fascia

Discussion: VIN 616 has not been published before and has no information on provenance, but in terms of style and profile this fragment matches VIN 182 exactly, and the two objects are therefore placed in the same stylistic group.

The profile of the two fragments is not readily identifiable as architectural terracotta. De Miro considers VIN 182 to be a geison revetment fragment with stylistic comparisons to mainland Greece and Metapontium based on the large moulded cyma.[88] While Barletta follows this identification, she

88 De Miro 1965, p. 73.

finds closer stylistic parallels with simas from Sardis based on stylistic similarities of the egg-and-dart in combination with the bead-and-reel.[89] Lang considers the fragments as architectural terracottas but does not identify the specific type.[90]

When the profile of frieze I is examined the identification as a geison revetment fragment is cast in doubt. The top fascia is about 3 cm high and set at the back from the projecting cyma, in line with the bottom fascia. This fascia would therefore prevent the placement of a sima fragment on top. The top fascia can also not be interpreted as the start of a connected sima fascia similar to the combined sima and geison revetment fragments from Metapontium. The presence of paint at the top of this ridge indicates that the top edge is not a broken fracture.

In discussing the fragments' profile in 2012, Clemens Voigts suggested that this fragment might better be interpreted as part of a terracotta sarcophagus. Known terracotta sarcophagi from Akragas provide a number of stylistic comparisons, including the use of a squarish bead-and-reel,[91] and a top ledge profile that includes a bead-and-reel as well as and egg-and-dart moulding.[92] Furthermore, there are similarities with profiles from published terracotta sarcophagi from other Sicilian colonies, such as from the necropolis near Leopardi, Gela.[93] While the main body of the sarcophagus consists of a uniformly thick slab less than 4 cm thick, there is a moulded ledge at the top which supports the separately made lid. The back edge of this top ledge corresponds in size, shape and placement to the top fascia of the fragments of frieze I. Based on these close similarities in profile and decoration between frieze I and Sicilian terracotta sarcophagi, the identification of this fragment as architectural terracotta is thus in doubt.

The majority of previous researchers did not have access to the original fragment, relying instead on published information. The previous images are only of the front view from which the profile of the object is not readily discernible. The problematic identification of this fragment demonstrates the importance of profile images or drawings (figure 4.1-16).

Dating: Last third of 6th century BC[94]

Publications: Barletta 1983, pp. 267-269, fig. 45; De Miro 1965, p. 73, tab. XXVIII-1; Lang 2010, p. 90, tab. 1.3, AKRA 19.

4.1.16 SIMA A

Provenance: From the excavations to the South of temple B by De Miro in 1958[95]

Fragments: 1 sima fragment: VIN 225 (figure 4.1-17)

89 Barletta 1983, pp. 268-269.

90 Lang 2010, p. 90.

91 Agrigento Archaeological Museum Inv. no. C 1889 (Bonanno 1998, tab. 82).

92 Agrigento Archaeological Museum Inv. no. AG 8887 (Bonanno 1998, tab. 88).

93 Bonanno 1998, pp. 191-195, tab. 10.

94 Lang 2010, p. 90.

95 De Miro 1963, pp. 160-165.

Description:

Profile	Size	Painted decoration
Cavetto	-	Fragmentary remains consistent with standing leaves
Roll	25 mm	Alternating red and white blocks with one thin vertical line
Fascia	-	Possibly a meander

Discussion: While a photograph of this fragment is published by De Miro in the 1965 publication, it is not named or discussed. Instead, the information comes from one of his earlier publications, in 1963. Stylistically this object does not fit with any of the known groups based on the type and colour of the decoration. It is therefore placed in a functional category of its own. While this fragment is rather small the profile and decoration is consistent with a sima. As seen in frieze A and D the meander pattern is quite common for the architectural terracottas of Akragas and Sicily as a whole, but its placement on the lower fascia is normally only found on raking or horizontal simas. Examples of raking simas with a meander pattern include one from the temenos of the Athenaion at Gela[96] and revetment C from Selinus.[97]

Dating: 570-530 BC[98]

Publications: De Miro 1965, tab. XXIV-1e,f; De Miro 1963, p. 165, fig. 84c; Lang 2010, p. 88, AKRA 10.

Figure 4.1-17: Sima A (VIN 225. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.17 SIMA B

Provenance: The museum number is in the middle of a range of numbers that are from Gábrici's excavation to the South-East of temple B and are most likely from the fill layer which contained numerous fragments of different architectural terracottas from the 6th century.[99]

Fragments: 1 sima fragment: VIN 142 (figure 4.1-18)

96 Lang 2010, p. 94, GELA2, tab. 4.3-4.

97 Conti 2012, pp. 113-127, fig. 105, 108, 111.

98 Lang 2010, p. 88.

99 Gábrici 1925, p. 440.

Description:

Profile	Size	Painted decoration
Top roll 1	21 mm diameter	Unknown
Top roll 2	22	Unknown
Top fascia	-	Unknown

Discussion: While the painted decoration is barely visible on the top fascia, there appears to be at least one curved white line. Even though this is a deviation from the more conventional rectilinear patterns including a checkerboard or meander, it is not entirely unknown for the architectural terracottas of Sicily. A sima found by Orsi during his excavations in the via Minerva in Syracuse has a pattern consisting of alternating rosettes and blocks on the top fascia, for instance.[100]

Dating: Unknown

Publications: Not published

Figure 4.1-18: Sima B (VIN 142. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.18 SIMA C

Figure 4.1-19: Sima C (VIN 279. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: From Marconi's excavation in the urban sanctuary in 1927.[101]

Fragments: 1 sima fragment: VIN 279 (figure 4.1-18)

100 Lang 2010, pp. 337-338, taf. 33,1.

101 Marconi 1933, p. 39.

Description:

Profile	Size	Painted decoration
Top roll 1	20 mm diameter	Horizontal black and white blocks with three black lines
Top roll 2	21	Horizontal red and white blocks with three black lines
Top fascia	-	Unknown

Discussion: This fragment shows strong similarities in terms of its profile and decoration with frieze A and D.

Dating: Unknown, middle of the 6th century based on stylistic similarities with Frieze A and D

Publications: Marconi 1933, p. 39, fig. 15-2.

4.1.19 GEISON REVETMENT A

Figure 4.1-20: Fragments from geison revetment A (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: The museum number indicates the three fragments originally came from the civic museum collection. VIN 350 and 611 both have a small white sticker similar to those found on VIN 352 (frieze B4, section 4.1.5) with the first three lines of text being an exact match. If these stickers can be associated with Marconi's excavations the objects might come from either the excavations at temple G or the urban sanctuary.

Fragments: 3 geison revetment fragments: VIN 350, 610, 611 (figure 4.1-20)

Description:

Profile	Size	Painted decoration
Main plaque	-	Double guilloche consisting of three strands in black, white and red/black. Central decoration is a black disk
Bottom roll 1	19 mm	Unknown
Bottom roll 2	15	Unknown
Horizontal plaque	78	Unknown

Discussion: The fragments have strong similarities in terms of the profile and painted decoration with frieze A and D. Unfortunately, the decorative elements are not preserved on VIN 350. In the museum of Agrigento the three fragments are stored in the same drawer with objects from frieze B1, B2, and B4.

Dating: middle of the 6th century based on stylistic similarities with Frieze A and D.

Publications: Unpublished

4.1.20 LION HEADED WATERSPOUT

Provenance: On the back of the fragment is a note indicating it is was found in 1959 in a cistern near temple A.

Fragments: 1 waterspout fragment: VIN 334 (figure 4.1-21)

Description: The fragment preserves the left-hand side of a lion's mane and ear. The mane is rendered as two rows of triangular, teeth like locks. The sculpted ear has a rounded point and sits at the beginning of the pate. A small portion of red painted relief remains on the main fascia to the left of the lion. While there is very little remaining decoration, this appears to be a leaf from a hanging palmette.

Figure 4.1-21: Lion headed waterspout fragment (VIN 334. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Discussion: Only a handful of terracotta lion headed waterspouts are documented from Sicily from the Archaic period. Including this single fragment from Akragas there are only six in total. The other known examples are a fragment from temple A or B from Megara Hyblaea, three from Selinus,[102] and one from Leontini.[103] The scarcity of lion headed waterspouts in Sicily as compared to the presence in mainland Greece is attributed to the preference for tubular waterspouts in the canonical Sicilian roof. The use of

102 Mertens-Horn 1988, pp. 183-184, taf. 18b.c, 19.a.b.c.

103 Monterosso 2009, p. 433, fig. 13.

lion headed waterspouts is instead associated with the later anthemion sima in Sicily.[104] Mertens-Horn has some doubts regarding the complete form of VIN 334. She does not connect it to an anthemion sima, but instead proposes that the remains of the anthemion pattern in relief, seen on the side of the head, indicate it was in fact part of a continuous lion headed waterspout sima.[105]

Due to the fragmentary condition, only the lion's mane and ear as well as the decoration of the main fascia can be used for stylistic comparisons. Three fragments of lion headed waterspouts from Selinus have three rows of long and straight, rectangular shaped locks with a rounded edge. They are all associated with the Selinuntine anthemion roofs of temple C, temple E1 and the roof formerly associated with temple Y respectively.[106] In terms of style, the closest parallel are the lion headed waterspouts from temple A at Akragas. These stone elements have similarly shaped hair and ears and are dated to the last quarter of the 6th century.

Dating: 520-500 BC[107]

Publications: Mertens-Horn 1988, p. 184, tab. 19d.

4.1.21 TUBULAR WATERSPOUT

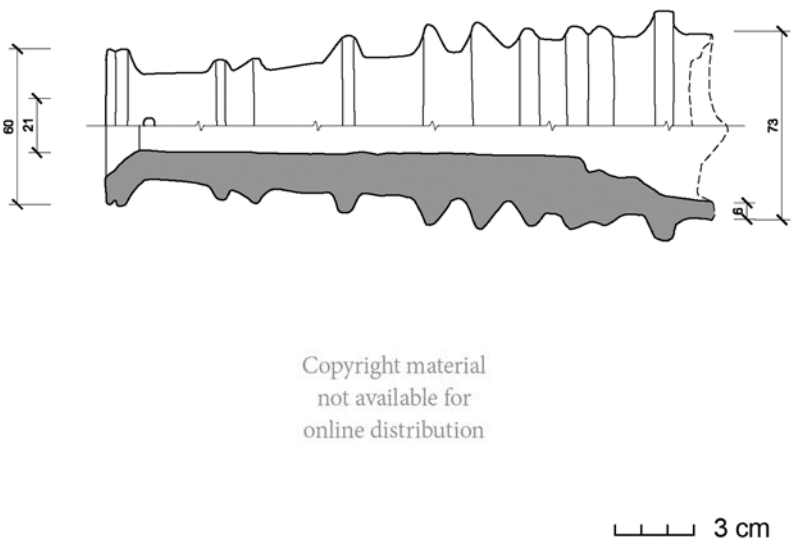

Figure 4.1-22: Waterspout (VIN 361. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: From Marconi's excavation in the urban sanctuary in 1927[108]

Fragments: 1 waterspout fragment: VIN 361 (figure 4.1.-22)

Description: This 240 mm long waterspout consists of a simple rimmed opening and a long conical spout decorated with nine rings. Near the rim there are two small holes which were punched into the

104 Mertens-Horn 1988, pp. 79-80.

105 Mertens-Horn 1988, p. 84.

106 Mertens-Horn 1988, p. 183, taf. 18.b-c, 19.a-b.

107 Mertens-Horn 1988, p. 84.

108 Marconi 1933, p. 39.

clay while wet.

Discussion: Unlike most canonical Sicilian sima waterspouts, which have a disk shaped decoration located close to the mouth of the spout, this fragment has a plain opening. However, there are some examples of waterspouts without a disk, including ones from Selinus.[109] The length and the ring decoration on this waterspout are not very typical although an example of a long waterspout with a couple of rings is associated with a canonical roof, frieze B from Naxos, dated from 580-570 BC.[110] It is possible, however, that this waterspout was not part of a terracotta roof.

Dating: Unknown

Publications: Marconi 1933, p. 40, fig. 16.

4.1.22 ANTEFIX A

Figure 4.1-23: Antefix A (VIN 391. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: From the archaic layer at the Roman and Hellenistic quarter close to S. Nicola, excavated in 1964[111]

Fragments: 1 antefix fragment: VIN 391 (figure 4.1-23)

Description: An extended semi-circular plaque with painted decoration. The curved cover tile was connected at the top edge of the plaque and terminates 30 mm from the bottom edge of the plaque. The painted decoration consists of a standing palmette with nine leaves growing from a double volute that encircles the entire palmette, forming a border. The outer border consists of small petals with a red outline, white line and alternating red and possibly black centre. Remains of black decoration on the right side of palmette.

Plaque height: 157 mm, width: 209 mm

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109 Conti 2012, pp. 248-249.

110 Lentini 1997, p. 131, fig. 8.

111 De Miro 1965, p. 74.

Discussion: The fragment was published by De Miro in 1965, but not specifically identified as a type. Rounded cover tiles with a flat semi-circular antefix plaque are associated with the Laconian roof system of which examples dating to as early as the third quarter of the 7^{th} century BC are known. While the profile of the Laconian antefix is similar, the use of palmette and volute in the painted decoration is rare.[112] Compared to moulded antefixes, this type of antefixes with painted decoration on a flat plaque is less common in Sicily. While similar objects are missing in the well-published collections for Selinus,[113] a few examples from Sicily do exist. These include a number of fragments found by Orsi during his excavations at the Athenaion of Syracuse. The antefixes are slightly smaller (18 x 13,5 cm) and have a seven leaved palmette on a simple s-shaped double volute.[114] Recent excavations at the ship sheds of Naxos uncovered a 11 x 15,9 cm antefix with a curved cover tile. The painted decoration is not visible and it is not clear if this antefix belongs to the ship shed buildings dated to the 5^{th} century.[115] An antefix found in the acropolis area of Gela is similar to the Syracuse example mentioned and dates to the second half of the 6^{th} century.[116] According to Winter this antefix type known from Gela, Megara Hyblaea, Syracuse, and Camerina can be dated to the second half of the 6^{th} century.[117]

Dating: Second half of the 6^{th} century until the beginning of the 5^{th} century BC.

Publications: De Miro 1965, p. 74, tab. XXVIII-2a, fig. 3.

4.1.23 ANTEFIX B

Figure 4.1-24: Antefix B. (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo)

112 Winter 1993, pp. 95, 96, 106-107, fig. 11.

113 Conti 2012.

114 Orsi 1918, p. 673, fig. 247.

115 Lentini et al. 2008, pp. 347, 351, fig. 44.

116 Panvini 1998, p. 31, Inv. 35940.

117 Winter 1993, p. 279.

Provenance: From excavations at the sanctuary on the hill of S. Nicola[118]

Fragments: 2 antefix fragments: VIN 384, 385 (figure 4.1-24)

Description: Two fragments of semi-circular antefixes with a flat plaque and rounded cover tile placed at the top of the plaque. The left corner of VIN 385 appears to be the bottom edge of the cover tile. For both fragments the cover tile sits perpendicular to the plaque but the painted decoration differs. VIN 384 has a palmette encircled by a single undecorated band, possibly part of a volute in red on a black background. VIN 385 has a border of rounded petals with a white outline and a centre alternating in red and black which sits on top of a white band, possibly part of the volute which encircles the palmette. Only the tip of a palmette leaf is preserved.

Radius of outside edge: 85 mm

Discussion: The fragments were published by De Miro in 1965, but not specifically identified as a type. While VIN 384 and 385 only preserve a portion of the respective antefix, it appears that there are slight differences in the size of the plaques, as well as differences in the painted decoration. While it is not unknown for a single roof to have different antefixes,[119] it is not possible at this stage to determine if these two antefixes belong to the same roof or not.

There are strong similarities with the painted decoration of antefix A and VIN 385 but the differences in the size and profile as well as the find locations indicate that these two fragments are not from the same roof.

Dating: Second half of the 6th century until the beginning of the 5th century BC.

Publications: De Miro 1965, p. 75, tab. XXVIII-2c,d.

4.1.24 ANTEFIX C

Figure 4.1-25: Antefix C (VIN 356. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

118 De Miro 1965, p. 75.

119 Lentini et al. 2008, p. 337, fig. 56.

Provenance: From Fiorentini's 1965 excavation at the extra-urban sanctuary at S. Anna. This object was found next to the eastern wall of the main structure.[120]

Fragments: 1 antefix fragment: VIN 356 (figure 4.1-25)

Description: Most of the left side of the face of the gorgoneion except for the nose and forehead is preserved. While the top of the head is eroded, there is no indication of a diadem or border. The hair hangs down straight in rows of bead like locks. The large eyes are pronounced with exaggerated upper and lower lids. The ears are considerably smaller than the eyes and almost disappear in the hair.

Fragment height: 154 mm, width: 110 mm

Discussion: The overall rendering of the face appears exaggerated, the eyes are disproportionately large and folds in the face are overstated. These stylistic characteristics can be seen in two other groups of antefixes. One group comes from the area around S. Francesco Bisconti at Morgantina and is dated to the end of the 6th century.[121] The second is from Gela and dated to the second half of 6th century.[122]

Dating: Second half of 6th century BC

Publications: Fiorentini 1969, pp. 67-68, fig. XXXII-2c.

4.1.25 ANTEFIX D

Figure 4.1-26: Antefix D (VIN 332. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: The museum number is in the middle of a range of numbers for known architectural terracottas from Marconi's 1929 excavation around temple A.

Fragments: 1 antefix fragment: VIN 332 (figure 4.1-26)

Description: A large part of the gorgoneion's face is preserved. The face is square with large ears. The hair is not well defined and is styled into a single row of spiral curls. The small eyes have pronounced upper

120 Fiorentini 1969, p. 68.

121 These objects are on display at the local museum at Morgantina, a published reference has not yet been found.

122 Panvini 1998, p. 33; Castoldi 2006, p. 390.

and lower lids and are slanted upwards. The eyebrows follow the shape of the eyes. The relief is shallow. The protruding tongue covers the entire chin and the teeth are quite equal in size with no protruding canine teeth.

Plaque height: 159 mm, width: 178 mm

Discussion: There are no direct parallels found elsewhere in Sicily. The closest example is antefix type B from Selinus which is dated to the second quarter of the 5th century.[123] The shape of the eyes and nose as well as the shallow relief are similar, and pronounced canine teeth are also absent. The rendering of the hair on the Selinus antefix, however, is in well-defined waves with a diadem, while the Akragas example has ill-defined spiral curls. There are also comparisons between this object and antefix H from Akragas (4.1-29), which is dated slightly earlier, to the end of the 6th century. The dating for VIN 332 can thus cover a wider period.

Dating: End of the 6th until first half of the 5th century

Publications: Unpublished

4.1.26 ANTEFIX E

Figure 4.1-27: Antefix E (VIN 348. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: Unknown, according to the museum information this is a sporadic find originally from the civic museum of Agrigento.

Fragments: 1 antefix fragment: VIN 348 (figure 4.1-27)

Description: Only the top half of the face is preserved. While the top of the head is partly damaged, there is no evidence of a diadem or a border. The face is moulded with the nose and eyes in prominent relief. Sharp incised lines are used to define the heavy eyelids and the grooves around the nose. The eyes are almond-shaped and turned up at the ends. The prominent eyebrow follows the shape of the eye. The hair is less defined and in shallow relief.

Fragment height: 112 mm, width: 137 mm

Discussion: There are similarities in the shape of the eyes and brow, the definition of the hair and the

123 Conti 2012, pp. 287-291, 295.

depth of the relief with antefixes from Syracuse that are dated to the second half of the 6th century.[124]

Dating: Second half of 6th century BC

Publications: Unpublished

4.1.27 ANTEFIX F

Provenance: From De Miro's 1958 excavation in the area to the South of temple B. The fragment was found between the main building and the large pool.[125]

Fragments: 1 antefix fragment: VIN 162 (figure 4.1-28)

Description: Only three rows of tight spiral curls are preserved.

Fragment height: 93 mm

Discussion: The depiction of hair as spiral curls is known from gorgoneion antefixes from Syracuse and Megara Hyblaea from the middle through to the end of the 6th century.[126] At Morgantina, there are also examples of similar hair depictions on antefixes from the early 5th century.[127] De Miro dates VIN 162 to the 6th century BC.[128] But as the comparisons with objects from Morgantina show the date might extend into the 5th century.

Dating: Second half of 6th century until beginning of the 5th century BC

Publications: De Miro 1963, p. 185, fig. 99.

Figure 4.1-28: Antefix F (VIN 162. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.28 ANTEFIX G

Provenance: From Marconi's 1927 excavation in the urban sanctuary[129]

Fragments: 1 antefix fragment: VIN 362 (figure 4.1-29)

124 Pelagatti 2006, p. 444, fig. 43.21a-b.
125 De Miro 1963, p. 185.
126 Pelagatti 2006, p. 446, fig. 43.24-28.
127 Kenfield 1990, p. 270, fig. 44.d-e.
128 De Miro 1963, p. 185.
129 Marconi 1933, p. 40.

Description: Only the bottom right quarter of the gorgoneion's face is preserved. It shows a prominent nose and protruding canine teeth that overlap, the tongue is partly preserved. The cheeks are round and the moulded relief is quite deep.

Fragment height: 92 mm, width: 102 mm

Discussion: The grotesque features present on this fragment are thought to be characteristic of earlier gorgoneion depictions. A grotesque snaggletooth example is considered one of the earliest gorgoneion antefixes from Megara Hyblaea, but there are also similar ones from later in the century including an example from Syracuse which is dated to the end of 6th century.[130] Belson dates antefix G from Akragas to the second quarter of the 6th century.[131] Based on the objects from Megara Hyblaea and Syracuse VIN 362 should rather be dated to the second half of the 6th century. While the first stone structures in the urban sanctuary are dated to middle of the 6th century it might be that this antefix was used on an earlier structure with a different construction, but the presence of early buildings is disputed (section 1.2) and the stylistic comparisons point towards a later date.

Dating: Second half of the 6th century BC

Publications: Belson 1981, p. 104; Darsow 1938, p. 13; Marconi 1933, p. 40, fig. 17.

Figure 4.1-29: Antefix G (VIN 362. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.29 ANTEFIX H

Provenance: VIN 245 was found in 1953 during Griffo's excavation in the small sanctuary to the West of gate V,[132] while VIN 246 is from the civic museum collection of Agrigento and, therefore, the provenance is not known.

Fragments: 2 antefix fragments: VIN 245, 246 (figure 4.1-30)

Description: The well-preserved antefixes depict a gorgoneion within a circular antefix plaque. The eyes are slanted upwards and the painted brows are lifted. The face is rounded with chubby cheeks and chin. The hair consists of a single row of spiral curls. This gorgoneion is bearded, which is depicted by a single row of spirals, smaller than the hair above. The mouth and tongue are relatively small and the teeth do not feature prominently.

130 Pelagatti 2006, pp. 434-444.

131 Belson 1981, p. 104.

132 Carratelli & Fiorentini 1992, p. 72; De Miro 2000, pp. 122, 253.

Complete height: 140 mm, complete width: 150 mm

Discussion: While VIN 246 is from an unknown context, it appears to come from the same mould as VIN 245 (figure 4.1-30). It seems that De Miro considers the two objects to be from the same context.[133] This type has a friendlier aspect as earlier examples from Akragas including antefix C and G. There are strong similarities with antefix D in terms of the rounded cheeks, the shape and size of the eyes, the depiction of the hair and the lack of prominent canine teeth. Antefix D does not have a beard, however, and the relief is shallower.

The facial features are close to a gorgoneion antefix from Gela, currently housed in the British Museum, London. The round cheeks, nose, and mouth and the absence of prominent canine teeth as well as the shape of the ears are all similar. The Gela antefix wears a *stephané* and circular earrings, it also has wings or hair protrusions at the bottom, which are absent from the Akragas antefix. Van Buren and Higgins date this Geloan example to the 5^{th} century.[134] Other antefixes from Gela with a similar rounded face structure and friendlier countenance are dated to the end of the 6^{th} century.[135] Antefixes from Syracuse with similar characteristics are also placed to the end of the 6^{th} century.[136]

Dating: Last quarter of 6^{th} century BC[137]

Publications: Carratelli & Fiorentini 1992, p. 72, fig. 58; De Miro 2000, pp. 122-123, 253, tab. CLVI-1.

Figure 4.1-30: Antefix H (VIN 245. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

133 De Miro published an antefix in his catalogue which he states is similar to VIN 245 and has the same provenance. This antefix, no. 1560, has the museum number AG 349. VIN 246 has the museum number C 349. The 'C' denotes that the object comes from the civic museum, for which no provenance information is available. Based on the similarities in the numbers it is likely that De Miro is actually referring to VIN 246 (De Miro 2000, pp. 122, 253).

134 Higgins 1954, pp. 309-310, no. 1137; Van Buren 1923, p. 144, no. 36.

135 Panvini 1998, p. 44.

136 Pelagatti 2006, p. 444.

137 De Miro 2000, p. 253.

4.1.30 ANTEFIX I

Figure 4.1-31: Antefix I (VIN 576. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: The unpublished fragment is located in the same drawer in the museum storage as VIN 574 and other objects from De Miro's 1958 and 1962 excavations in the area to the South of temple B and the urban sanctuary. While this fragment has no museum inventory number, on the back it is written that the object comes from the Western section, next to a South-Western wall.

Fragments: 1 antefix fragment: VIN 576 (figure 4.1-31)

Description: The small fragment is the top right edge of a gorgoneion antefix plaque. Three of the spiral curls and part of the brow are preserved.

Fragment height: 63 mm

Discussion: The radius of the outside edge indicates that the fragment belongs to an antefix with a curved cover tile. As with most of the known antefixes from Akragas already discussed, for example antefix D and H (4.1.25, 29) this object also have hair depicted as a single row of spiral curls.

Dating: Unknown

Publications: Unpublished

4.1.31 ANTEFIX J

Provenance: Found in a deposit to the North of temple A[138]

Fragments: 1 antefix fragment: VIN 176 (figure 4.1-32)

Description: The object shows a high level of plasticity. The bearded face is turned slightly to the left, the heavy brows are furrowed and protrude slightly over the heavy eyelids. The nose is squashed with flaring nostrils. The mouth is partly covered by a full moustache that blends in with the slightly wavy beard. There is no separation between the hair and beard, instead appearing as a continuous element like a lion's mane. The bovine ears are placed at the edge of the plate, but only the right ear is visible due to the slight movement of the head. In the centre of the forehead there are traces of two horns. The base of the horns is surrounded by hair and indicates that they grew from a single, central spot on the forehead. The horns appear to be thin, curving up and away from the head, but are not preserved beyond the base. The curved cover tile was connected to the top curve of the face plaque.

Complete height: 230 mm, complete width: 184 mm

138 Pugliese Carratelli 1996, p. 705.

Discussion: Stylistically this antefix has many similarities to silen antefixes from Gela and Naxos. The ones from Naxos are dated to the early 5th century and have upright bovine ears, wavy hair and beard, and a furrowed forehead, but the execution of the relief is less detailed and has a higher degree of rigidity.[139] Silen antefixes from Gela show similarities in terms of the bulging eyes, the prominent frown and bulbous nose. The moulding presents a high level of plasticity and realism. These objects are dated to 470-460 BC.[140] The silen antefixes from Gela and Naxos all face straight ahead. According to Lulof the side view and increase in plasticity are associated with antefixes from the 4th and 3rd century BC.[141] The dating of this object based on style is therefore likely to be later than the examples from Gela and Naxos. According to the museum information this object is dated to the end of the 5th century,[142] which places it after Gela and Naxos. However, based on the high level of plasticity and the turn of the head it might be even later.

The position of horns at the centre of the forehead is not present on the other silen antefixes from Sicily. Scholars have suggested that the male figure on VIN 176 is a local river god,[143] who is depicted as a human headed bull figure with a beard and horns on local coins from the beginning of the 5th century.[144]

Dating: End of 5th century BC[145] or later

Publications: Carratelli & Fiorentini 1992, pp. 86-87, fig. 87; Pugliese Carratelli 1996, p. 705.

Figure 4.1-32: Antefix J with bearded face with horns (VIN 176. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

139 Lentini et al. 2008, p. 329, fig. 39.

140 Panvini 1998, p. 50.

141 Higgins 1954, p. 370, no. 1363; Lulof 2007, pp. 43, 53-55, no. 51-54.

142 Pugliese Carratelli 1996, p. 705.

143 Carratelli & Fiorentini 1992, pp. 86-87.

144 Inv. 2758, Archaeological Museum of Agrigento.

145 Pugliese Carratelli 1996, p. 705.

4.1.32 ANTEFIX K

Figure 4.1-33: Antefix K, fragment associated with unknown palmette group A (VIN 607. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: The unpublished fragment is part of a group of various ridge palmette fragments that might come from Marconi's excavation in the urban sanctuary. In his report Marconi mentions finding a large number of such fragments[146] and the museum number, which starts with an 'S' is associated with other known finds by Marconi from the urban sanctuary (VIN 363 and 365, sections 4.1.45, 46).

Fragments: 1 antefix fragment: VIN 607 (figure 4.1-33)

Description: Part of a volute consisting of a double strand, one larger than the other. The centre of the volute is a raised semi-sphere. A small portion of the horizontal tile is preserved where it connects to the top of the antefix plaque.

Discussion: VIN 607 is the only fragment of this type found at Akragas. The decoration appears to be on only one side and there is a pronounced top flange, which points to this fragment being part of an antefix, and not a ridge tile palmette. Similar examples are not known in Sicily and therefore interpreting this fragment based on the small preserved portion is problematic.

Dating: Unknown

Publications: Unpublished

4.1.33 ANTEFIX L

Provenance: Collected during the period of unscientific exploration before the 1920's. The antefix was bought by Lunsingh Scheurleer for his private collection in The Hague in 1921 from Arndt from Munich. In 1934 it moved to the Allard Pierson museum in Amsterdam.[147] In the museum documentation and early publications the provenance of this piece is given as Akragas, but the exact find location is not known.

Fragments: 1 antefix fragment: VIN 623 (figure 4.1-34)

Description: Almost fully preserved head of silen antefix except for chipping around the beard. The cover tile is not preserved. Overall, the decoration in relief is fairly shallow except for the protruding,

146 Marconi 1933, p. 88.

147 Lulof 2007, pp. vii, 19.

bulbous nose. Vertical lines indicate the hair and beard. The large almond-shaped eyes have shallow eyelids and are framed by large eyebrows which follow the shape of the eyes until they meet just above the bridge of the nose.

Complete plaque height: 215 mm, complete plaque width: 94 mm

Discussion: As exemplified by the roofs of the ship sheds from Naxos[148], Sicilian antefix roofs frequently combined silen and gorgoneion antefixes on the same roof (section 2.2.1.1). Unfortunately, this object comes from an unknown provenance and it is therefore not possible to determine which of the known gorgoneion antefixes might have accompanied VIN 623 on the same roof. The execution is similar to silen masks found in the large pool to the South of temple B.[149]

Dating: Lulof dates this object to the first quarter of 5th century BC[150]

Publications: Lulof 2007, p. 19, fig. 5c-d, pl. 5b-c; Van Buren 1923, p. 145, no. 41, fig. 6.3.

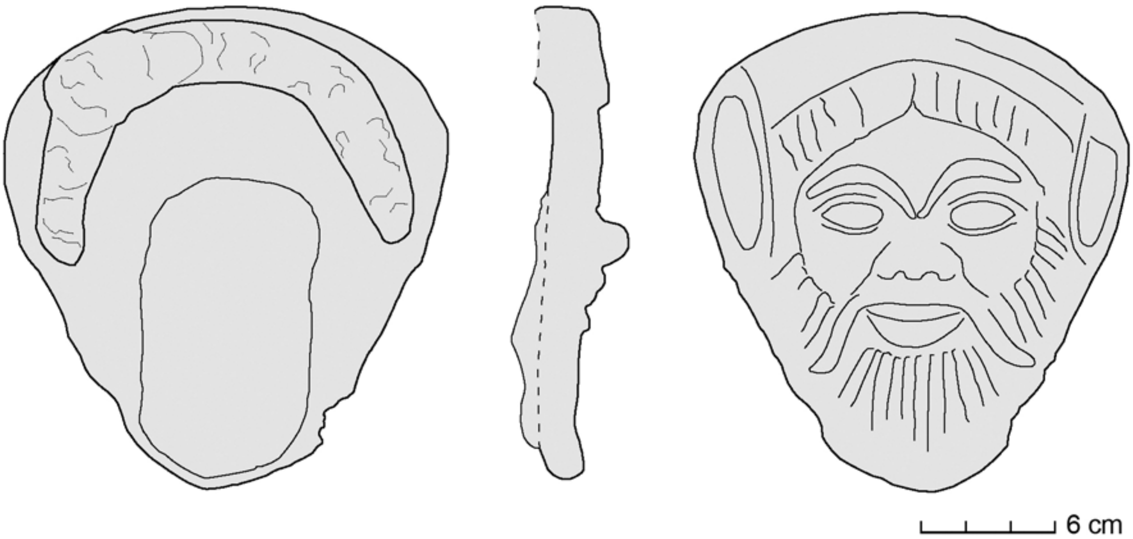

Figure 4.1-34: Antefix L (drawing after Lulof 2007, fig. 5c-d, pl. 5b-c) (VIN 623).

4.1.34 PLAQUE

Provenance: Found in 1953 during De Miro's excavation in the small sanctuary to the East of gate V[151]

Fragments: 1 plaque fragment: VIN 244 (figure 4.1-35)

Description: Only the top right quarter of the gorgoneion is preserved. The hair is depicted as a single row of spiral curls. The rounded eye has a pronounced upper lid and slants downwards. The pronounced eyebrow is slightly s-shaped.

Fragment height: 115 mm

Discussion: De Miro recorded the fragment as a gorgoneion antefix. Nevertheless, there is no evidence of a horizontal tile on the back of the object, which casts doubt on classifying it as an antefix.

148 Lentini et al. 2008.

149 De Miro 1963, p. 115, fig. 30.

150 Lulof 2007, p. 19.

151 De Miro 2000, pp. 122, 253.

Dating: Last quarter of 6th century BC[152]

Publications: De Miro 2000, p. 253.

Figure 4.1-35: Plaque (VIN 244. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.35 EAVES TILE A

Figure 4.1-36: Eaves tile A (VIN 383. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: De Miro attributes this piece to an Archaic sanctuary in the area of S. Nicola[153]

Fragments: 1 eaves tile fragment: VIN 383 (figure 4.1-36)

Description: The tile has painted decoration on the exposed front edge and along the main fascia. The decoration consists of multiple meanders and solid blocks of colour. On the main fascia, a running meander with two additional lines following the shape is visible. Two outlines at the top and bottom form

152 De Miro 2000, p. 253.
153 De Miro 1965, p. 70.

a decorative band. On the reverse side, part of a painted figure and the Greek letter Alpha are preserved.

Fragment height: 140 mm, width: 175 mm, thickness: 36 mm

Discussion: De Miro described two different eaves tiles (VIN 383 and 197), but did not identify different types as well. In his text De Miro writes about evidence of deep chipping which he attributes to the fixing of additional elements after firing with the use of metal pins. Lang proposes that this indicates that the eaves tile was part of an anthemion roof which is why he dates VIN 383 to the last third of the 6th century.[154] The painted decoration is similar to that of painted eaves tiles from Syracuse found in excavations in the main square which are thought to date to the 6th century.[155] It should be noted that no anthemion sima fragments are known from the S. Nicola area and that the other anthemion simas from Akragas are formed as a single element. The pitting visible on the object today appears to be due to later damage, but there is modern restoration which might obscure additional evidence. The evidence would suggest that this element is part of an eaves tile instead of an anthemion sima.

Dating: Second half of the 6th century

Publications: De Miro 1965, pp. 70-71, tab. XXVII-2b; Lang 2010, p. 89, AKRA 13.

4.1.36 EAVES TILE B

Figure 4.1-37: Eaves tile B (VIN 197. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: De Miro attributes this piece to an Archaic sanctuary in the area of S. Nicola[156]

Fragments: 1 eaves tile fragment: VIN 197 (figure 4.1-37)

Description: The tile is decorated on one side with a block pattern consisting of black and white lines. The central block contains a rosette. The black paint is very faded. The outlines seen in figure 4.1-37 are lead pencil lines added in modern times. At the bottom edge is a bead-and-reel in relief. The front face is

154 De Miro 1965, p. 71; Lang 2010, p. 89.

155 Ciurcina 2006, pp. 393-394.

156 De Miro 1965, p. 70.

at an angle, decorated with a meander and staggered rectangular blocks of colour.

Fragment height: 108 mm, width: 167 mm, thickness: 36 mm

Discussion: De Miro described two different eaves tiles (VIN 383 and 197), but did not identify different types, see discussion in section 4.1.35. Decorated eaves tiles from Sicily are underrepresented in publications on architectural terracottas. Therefore, a close parallel to this object is currently not known. Nevertheless, it is also not certain that VIN 197 is actually an eaves tile; while De Miro published the object as such, Lang does not suggest a function.[157] There is one fragment (VIN 613, section 4.1.37) originally from the civic museum of Agrigento which has some similarities to this tile, predominantly the bead-and-reel, but it is much eroded.

Dating: Last third of 6th century BC[158]

Publications: De Miro 1965, pp. 70-71, tab. XXVII-2a; Lang 2010, p. 89, AKRA 14.

4.1.37 BEAD-AND-REEL MOULDING

Figure 4.1-38: Bead-and-reel fragments (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: VIN 359 and 360 were excavated by Marconi in the area of the urban sanctuary.[159] According to the text written on the back of VIN 613 it was excavated in 1962 to the South of temple B.

Fragments: 3 fragments: VIN 359, 360, 613 (figure 4.1-38)

Discussion: VIN 359 and 360 are both half-round bead-and-reel rolls of around 45 mm in diameter. A small section of the vertical fascia on VIN 360 is preserved. This small section indicates that the bottom edge of the vertical plaque had a sloping edge similar to that of VIN 613. The bead-and-reel on the last one, however, is only 30 mm in diameter. Based on the size difference VIN 613 might therefore belong

157 De Miro 1965, p. 71; Lang 2010, p. 89.

158 Lang 2010, p. 89.

159 Marconi 1933, p. 40, fig. 15-3.

Figure 4.1-39: Acroterion, horse and rider fragments. (Copyright Regione Siciliana – Assessorato Reg.le dei BB. CC. e I. S. – Su concessione del Polo Regionale di Palermo per i Parchi e i Musei Archeologici– Museo Archeologico Regionale "Antonino Salinas" – divieto di duplicazione con qualsiasi mezzo) to a different object. There are some parallels between these mouldings and eaves tile B in terms of the placement of the bead-and-reel at the bottom edge of a vertical plaque, but the three fragments are too small to allow for a clearer identification of the architectural type.

Bead-and-reel moulding diameter: 45 / 30 mm

Dating: Unknown

Publications: Marconi 1933, p. 40, fig. 15-3.

4.1.38 ACROTERION

Provenance: Most of the fragments were recently rediscovered in the storerooms of the archaeological museum in Palermo. The museum tags indicate that the objects are from Gábrici's 1922 excavation in the naiskos to the South-East of temple B. VIN 174 and 175 are stored in the archaeological museum in Agrigento; the information written on the fragments indicates they are from De Miro's 1962 excavation around temple B.

Fragments: 23 fragments: VIN 174, 175, 516-520, 522-536, 540 (figure 4.1-39)

Description: A large number of fragments is from the head of a horse. The mane falls to both sides of the head and is rendered as a series of beads roughly lined up in rows. Two smaller strands of beads fall between the horse's ears (VIN 174, figure 4.1-39.c). One fragment is from the horse's right leg and shows painted decoration with leave patterns (VIN 524, figure 4.1-39.f). The rider is wearing pointed shoes (VIN 516 and 517, figure 4.1-39.d,g). The rider's hair flows around his shoulders in a series of bead like locks.

The size of the feet indicates this horse rider acroterion figure was close to life size.

Discussion: According to published reports there are two groups of horse rider fragments found by early excavators. Marconi mentions horse rider fragments found in the foundations of temple G[160] and Gábrici recalls a large quantity of figurative elements found to the South-East of temple B.[161] Until the find in the archives of the museum of Palermo it was thought that both groups were lost.[162] According to the museum tags, the group of recently rediscovered objects are from Gábrici's excavation. The two fragments found by De Miro to the South of temple B are similar to this group in style and size. Based on these similarities in style as well as on the find location the 23 objects from Gábrici's and De Miro's excavations are considered to belong to the same horse rider figure.

Fragments of horse and rider figures are known from Gela[163], Kamarina, Naxos, Selinus, and Syracuse. The ones from Naxos are thought to be from a number of equestrian figures depicting the whole horse, including the hooves, and are dated to the 6th century.[164] Other figures are noted to have been horse rider acroteria which were placed at the apex of the gable roof, as seen on the famous building model from Sabucina.[165] Examples of this type only depict the upper part of the horse, as seen in the acroteria from

160 Marconi 1929, p. 158.

161 Gábrici 1925, p. 141.

162 Danner 1996, p. 89.

163 According to Lentini & Pakkanen 2011, p. 421, the horse rider fragments from Gela are thought to be from a votive sculpture and are thus no acroteria.

164 Lentini 2006, pp. 417-422.

165 Danner 1996, pp. 101-102.

Kamarina, which is dated to the second quarter of the 6th century.[166] VIN 516 and 517 contain parts of the rider's left and right foot respectively. Both fragments have a finished horizontal edge just below the feet, indicating that this figure is an acroterion similar to the one from Kamarina.

The rider's pointed shoes are also found on an acroterion from Gela dated to the first half of the 6th century.[167] There is a very wide range seen in the depicting of the horse's mane. For example, the acroteria from Kamarina make use of incised wavy lines. In this regard, the 6th century horse rider fragments from Selinus have strong similarities with the fragments from Akragas based on the large rounded bead like hair roughly placed in rows and parted at the back of the horse's neck.[168]

All the examples of similar objects from Sicily mentioned above date to the 6th century. Danner places the acroteria fragments from Akragas to the first half of the 6th century.[169] However, considering the beginning of monumental construction at Akragas (chapter 1) the dating is more likely to be towards the middle of the 6th century.

Dating: Middle of the 6th century BC

Publications: Danner 1996, pp. 89-90, fig. 18,1; Gábrici 1925, p. 441.

4.1.39 RIDGE TILE ANTEFIX A

Figure 4.1-40: Ridge tile antefix A (VIN 180. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: Found by Gábrici in a fill layer to the South-East of temple B[170]

Fragments: 1 ridge tile antefix fragment: VIN 180 (figure 4.1-40)

Description: Two petals with a raised outline in relief and a small bud in between. The top of the leaves forms the outside edge of the object. The scar left from the connection with the cover tile is set about 20 mm below the outside edge.

Fragment height: 106 mm, width: 140 mm

Discussion: The fragment is described by De Miro, but it is not identified as a type. The size as well as the

166 Ciurcina 2011, pp. 409-410, fig. 5; Danner 1996, pp. 86-87, fig. 22,1-3.

167 Danner 1996, pp. 80-85, fig. 20.1,5.

168 Danner 1996, p. 91, fig. 24.1,2.

169 Danner 1996, p. 89.

170 De Miro 1965, p. 75.

presence of a cover tile suggest that it is a ridge tile antefix. This fragment is similar to a ridge tile antefix from Naxos in terms of the size and decoration in relief. Danner dates the examples from Naxos to the first quarter of the 5^{th} century.[171]

Dating: First quarter of the 5^{th} century BC[172]

Publications: Danner 1996, p. 19, tab. 5.3; De Miro 1965, p. 75, tab. XXIX-1c.

4.1.40 RIDGE TILE ANTEFIX B

Figure 4.1-41: Ridge tile antefix B (VIN 226. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: Found in 1958 by De Miro in the top layers of the building to the South of temple B[173]

Fragments: 1 ridge tile antefix fragment: VIN 226 (figure 4.1-41)

Description: Less than half of the left side of the gorgoneion's face is preserved. The hair is rendered as two rows of tight spirals. The eye is almond-shaped with pronounced lids. There are fine laugh lines incised at the corner of the eye. The eyebrow is rendered as a straight line in relief. The ear and eye are both slightly oversized. A round disk-shaped earring is preserved. The cheeks and overall shape of the face are rounded.

Fragment height: 405 mm, width: 185 mm

Discussion: While ridge tile antefixes with a moulded gorgoneion are known from a number of sites in Sicily, including Gela, Himera, and Selinus,[174] the closest parallels in terms of style are the antefixes from

171 Danner 1996, pp. 19-20, tab. 5.1.

172 Danner 1996, p. 19.

173 De Miro 1963, p. 181.

174 Danner. 1996, pp. 23-26.

Akragas. There, the hair is also rendered as spirals and no diadems or snakes are present (antefix D and H, sections 4.1.25, 29).

Dating: First quarter of 5^{th} century BC[175]

Publications: Danner 1996, p. 21, tab. 9.2; De Miro 1963, p. 191, fig. 96.

4.1.41 RIDGE TILE ANTEFIX C

Figure 4.1-42: Ridge tile antefix C (VIN 392. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: According to the text on the back of the object it is a sporadic find from the Roman and Hellenistic quarter in 1964

Fragments: 1 ridge tile antefix fragment: VIN 392 (figure 4.1-42)

Description: The concave disk is painted with thin leaves alternating in red and black. The leaves have rounded edges and project beyond the ridge tile at the back. The back of the leaves are painted in a similar manner as the front.

Fragment height: 53 mm, width: 64 mm, outer edge radius: 185 mm

Discussion: The fragment is described by De Miro, but it is not identified as a type. According to Danner it is part of a disk-shaped ridge tile antefix with multiple zones of non-figurative decoration; he places the object to the 2^{nd} quarter of the 6^{th} century[176]. Nevertheless, his dating is a little early according to what is known about monumental construction in Akragas (chapter 1). The scar where the cover tile connected to the plaque is only around 13 mm thick. The object thus seems slightly small for a ridge tile antefix.

Dating: Middle of the 6^{th} century BC

Publications: Danner 1996, p. 13, tab. 2.2; De Miro 1965, p. 77. tab. XXVIII-2b.

4.1.42 GORGONEION A

Provenance: The object is from the collection of objects recently rediscovered in the archives of the museum of Palermo attributed to the 1922 excavation by Gábrici around the naiskos to the South-East of temple B.

Fragments: 1 fragment: VIN 542 (figure 4.1-43)

Description: Fragment of large gorgoneion plaque of which one serpentine curl, the back of the head, some internal supports and the flat back plate are preserved.

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175 Danner 1996, p. 21.

176 Danner 1996, p. 13, tab. 2.2

Fragment height: 200 mm

Discussion: The back of the object is flat with no visible scars associated with a ridge tile. This indicates that it might be a pediment decoration and not a ridge tile antefix. While this is only a small portion of the original object it shows strong similarities with the large gorgoneion fragments from the pediment found on the acropolis of Gela and which are dated to the 6th century by Danner.[177]

Dating: 6th century BC

Publications: Unpublished

Figure 4.1-43: Gorgoneion A (VIN 542. Copyright Regione Siciliana – Assessorato Reg.le dei BB. CC. e I. S. – Su concessione del Polo Regionale di Palermo per i Parchi e i Musei Archeologici– Museo Archeologico Regionale "Antonino Salinas" – divieto di duplicazione con qualsiasi mezzo).

4.1.43 GORGONEION B

Provenance: The object is from the collection of objects recently rediscovered in the archives of the museum of Palermo attributed to the 1922 excavation by Gábrici around the naiskos to the South-East of temple B.

Fragments: 2 fragments: VIN 538, 539 (figure 4.1-44)

Description: Two small fragments with bead like hair in shallow relief known for gorgoneia. The hair is painted black and the plaque is about 35 mm thick. The outside edge on VIN 538 and the flat bottom edge on VIN 539 are preserved.

Discussion: Both fragments show similarities with a gorgoneion pediment plaque from Gela found inside temple B, which is dated to the second quarter of the 6th century by Danner.[178] But VIN 538 and 539 represent only a small part of the original object. It is possible that these fragments belong to a ridge

177 Danner 2000, p. 30, fig. 9.

178 Brea 1949-1951, p. 72, fig. 69; Danner 2000, p. 26, fig. 5.

tile antefix, too, similar to the one found East of temple F at Naxos.[179]

Dating: Unknown

Publications: Unpublished

Figure 4.1-44: Gorgoneion B (Copyright Regione Siciliana – Assessorato Reg.le dei BB. CC. e I. S. – Su concessione del Polo Regionale di Palermo per i Parchi e i Musei Archeologici– Museo Archeologico Regionale "Antonino Salinas" – divieto di duplicazione con qualsiasi mezzo).

4.1.44 PALMETTE A (DE MIRO)

Figure 4.1-45: Palmette A (VIN 396. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: Unknown, museum number indicates object comes from the civic museum of Agrigento

Fragment: 1 fragment: VIN 396 (figure 4.1-45)

179 Danner 1996, p. 36, tab. 10-11.

Description: De Miro identified this object as palmette type 1.[180] The large fragment is mostly complete and consists of a nine leaved, rounded palmette growing from a double volute. The decoration is in very shallow relief except for the central eyes of the volute, which are raised. The palmette is decorated on both sides and has a hollow core. A small part of the connected ridge tile is preserved and the palmette sits parallel to it. Traces of red and black paint are still visible.

Complete height of palmette: 350 mm, complete width of palmette: 300 mm

Discussion: VIN 396 is distinct from other ridge tile palmettes from Akragas and Selinus in that the palmette has a round shape compared to the elongated shape of the other examples. In addition, the double volute consists of a single curl each, while others have of a s-shaped double curl. As De Miro noted there are similarities with palmettes from the Acropolis in Athens and one from Thermos[181], but the closest comparisons might be found in the anthemion simas from Akragas (frieze F) and Selinus.[182] The shape of the palmette is similar to ridge tile antefixes from the Geloan treasury in Olympia, except for the shallow relief.[183]

Dating: Middle of the 6th century BC due to similarities with Geloan treasury

Publications: De Miro 1965, p. 76, tab. XXX-2a.

4.1.45 PALMETTE B (DE MIRO)

Provenance: Marconi and De Miro found a large number of these palmettes during excavations in the urban sanctuary in 1927 and 1953.[184] Two fragments also come from the sanctuary to the East of gate V from various excavations by Griffo in the 1950's (VIN 572, 587).

Fragments: 8 fragments: VIN 363, 367-9, 372, 373, 572, 587 (figure 4.1-46)

Description: A nine leaved palmette consisting of rounded leaves with swollen tips divided by sharp thin tipped leaves. One fragment (VIN 572) is painted red.

Discussion: De Miro identified VIN 372 and 373 as palmette type 2.[185] There are a number of fragments on display or in the storerooms of the archaeological museum at Agrigento which were discovered in the same area. Based on the similarities in find location and profile these fragments can therefore be added to this stylistic group palmette B. Only one of the fragments (VIN 572) shows evidence of being painted. Another identified by De Miro (VIN 373) appears to be smaller.

During excavations in the urban sanctuary and the sanctuary to the East of gate V, both Marconi and De Miro found numerous ridge tile acroteria consisting of a palmette on top of an s-shaped double volute. Both authors organized the fragments into different types based on the shape and size of the leaves. Neither attempted a reconstruction of the complete objects. The exception is group palmette D (section

180 In order to distinguish clearly between the established types presented in this chapter and the revised typology in chapter 5, stylistic types are ordered here by alphabetic letters, while numbers are used in chapter 5. For this reason, De Miro's type 1 is here listed as type A, type 2 as type B, etc.

181 De Miro 1965, p. 76.

182 Conti 2012, pp. 160-170, 194-203.

183 Heiden 1990, p. 100, tab. 68.1.

184 De Miro 2000, pp. 182, 234; De Miro 1965, p. 76; Marconi 1933, pp. 88, 96.

185 De Miro 1965, pp. 76, tab. XXIX-1d.

4.1.47) which is a well-preserved example with both palmette and volutes.[186] The association between the different types of palmettes and the different types of volutes is not clearly defined. De Miro does not place any of the known volute fragments with ridge palmette B, instead he groups all of them with palmette D, even though there are numerous stylistic differences.[187]

Similar fragments were discovered by Marconi during his excavation of temple C at S. Biagio.[188] The current location of these fragments are not known, but they are likely housed in the regional archaeological museum in Syracuse, where a number of finds from the S. Biagio are are part of the permanent display.

The shape of the palmette B has strong parallels to palmette fragments found over a wide area of Selinus and dated by Conti to the first half of the 5th century.[189] A similar palmette has also been located in Gela in the excavations around Molino di Pietro, which is dated by Orlandini to the 6th century.[190]

Dating: 6th century until first half of 5th century BC[191]

Publications: De Miro 2000, pp. 182, 234, tab. CLVII-1b; De Miro 1965, p. 76, tab. XXIX-1d,e; Marconi 1933, pp. 40-41, fig. 19c.

Figure 4.1-46: Palmette B (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

186 De Miro 1965, pp. tab. XXX-1.

187 De Miro 1965, pp. 76-77, tab. XXX-1; Marconi 1933, pp. 40-41, fig. 19.

188 Marconi 1926, p. 135, figs. 28-29.

189 Conti 2012, pp. 273-279.

190 Panvini 1998, p. 47.

191 De Miro 2000, pp. 182, 234.

4.1.46 PALMETTE C (DE MIRO)

Provenance: Marconi and De Miro found a large number of these palmettes during excavations in the urban sanctuary in 1927, 1932, and 1953.[192] Some of the fragments are unpublished but according to museum documentation they come from excavations in the same locations (VIN 580, 581, 584, 588)

Fragments: 17 fragments: VIN 365, 370, 371, 378-81, 580, 581, 584, 588, 592, 596, 598, 600, 619, 620 (figure 4.1-47)

Figure 4.1-47: Palmette C (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Description: The nine petals of the palmette have a wavy form, except for the longest central leaf which is straight. The leaves have a concave shape with raised borders and the decoration in relief is on both

192 De Miro 2000, pp. 182, 234; Marconi 1933, pp. 88, 96.

sides of the object.

Discussion: De Miro identifies two fragments directly as belonging to palmette group 3 (VIN 370, 371, figure 4.1-47).[193] Both of them have only portions of the palmette preserved with no volutes visible. Based on similarities in terms of style and find location a number of additional fragments are added now to this group. Like VIN 620, which shows a portion of the volutes. These are similar to VIN 382 and 388 which were published by De Miro as being part of palmette D (section 4.1.47). So far no other stylistic parallels have been found from Sicily.

Dating: Unknown

Publications: De Miro 2000, pp. 182, 253, tab. CLVII; De Miro 1965, p. 76, tab. XXIX-1a,b; Marconi 1933, pp. 40-41, fig. 19b, 62a.

4.1.47 PALMETTE D (DE MIRO)

Figure 4.1-48: Palmette D (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

193 De Miro 1965, pp. 76, tab. XXIX-a,b.

Provenance: VIN 387 was found near temple A,[194] and VIN 375 is possibly from Marconi's excavations at the urban sanctuary based on the museum number. Other unpublished fragments from excavations in the 1950's by De Miro in the sanctuary to the East of gate V come from museum storage (VIN 575, 577-579, 583, 585, 586, 589, 590)

Fragments: 27 fragments: VIN 366, 375-377, 382, 387, 388, 575, 577-579, 583, 585, 586, 589, 590, 594, 595, 597, 599, 601-603, 605, 606, 608, 609 (figure 4.1-48)

Description: De Miro included a number of volute fragments of different designs in this type. The most complete fragment (VIN 387) consists of a nine leaved palmette with rounded leaves with swollen tips divided by sharp thin tipped leaves sitting on a s-shaped double volute. The volute has a round central eye and the base of the palmette is arrow shaped with a raised central line. Some of the fragments (e.g. VIN 376 and 377) are similar to VIN 387 in that a simple s-shaped spiral with a shallow relief and a raised central eye form the volute. However, there is some variation; VIN 382 and 388 consist of a s-shaped volute where the main strand is accompanied by a much smaller secondary vine, which terminates in a lotus flower and acanthus leaf. VIN 577 and 589 are also smaller than VIN 376.

Discussion: De Miro placed VIN 375, 382, 387, 388, 577, and 590 in palmette group 4. The remaining fragments are largely unpublished and are placed in this group based on similarities in style and find location with the six fragments already identified. As already mentioned, the fragments in this group palmette D appear to belong to at least three different types based on the variations in size and decoration. VIN 387 is the most complete, containing at least the base of the palmette and the top half of the volutes. The full extent of half of the palmette is preserved and it is therefore the most informative piece regarding the overall design of this type. De Miro places VIN 375 in this group based on the strong stylistic similarities with VIN 387 even though it is significantly larger. For example, the diameter of the top volute for VIN 387 is 55 mm and for VIN 375 it is 70 mm.

Palmette group B is similar in design to VIN 387, but larger, it is therefore a possibility that at least some of the fragments within palmette group D might belong to the same type as objects currently in palmette group B.

The shape of the palmette itself has strong parallels to objects found over a wide area of Selinus and dated by Conti to the first half of the 5th century.[195] A similar palmette has also been found in Gela in the excavations around Molino di Pietro which is dated by Orlandini to the 6th century.[196] There is a very strong similarity in the style of these palmette fragments and VIN 387 exept that this fragment is smaller in size.

The bottom edge of a number of fragments of various designs indicate a polygonal shaped ridge tile (VIN 376, 577, 609)

Dating: 5th century BC[197]

Publications: De Miro 1965, p. 77, tab. XXVIII-3e, XXX-1, XXX-2b.

194 De Miro 1965, p. 77.

195 Conti 2012, pp. 273-279.

196 Panvini 1998, p. 47.

197 De Miro 1965, p. 77.

4.1.48 PALMETTE E

Provenance: From Marconi's excavations in the urban sanctuary in 1927[198]

Fragment: 1 fragment: VIN 364 (figure 4.1-49)

Description: A single incomplete fragment of this type has been identified to date. It contains a partial palmette with isolated blade-shaped leaves with a raised central ridge. The overall palmette might have consisted of seven or nine leaves.

Discussion: While the palmette was published by Marconi, it was not included by De Miro in his 1965 publication. It can be identified as a ridge tile palmette or a lateral or central acroteria fragment based on similarities with known elements from Magna Graecia. The palmette shape is similar to central and lateral acroteria palmettes found at Caulonia. According to Barello they are typical for Magna Graecia during the second half of the 6th century.[199] Based on the small portion of the preserved tile it is not possible to determine conclusively if this fragment belongs to a ridge tile palmette or a central or lateral acroterion.

Dating: Second half of the 6th century BC

Publications: Marconi 1933, pp. 40-41, fig. 19d.

Figure 4.1-49: Palmette E (VIN 364. (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.49 PALMETTE F

Provenance: The unpublished fragment is part of a large group of ridge palmette fragments that might come from Marconi's excavation in the urban sanctuary. In his report Marconi mentions finding a large number of such fragments,[200] and the museum number, which starts with an 'S', is associated with other known finds by Marconi from the urban sanctuary (VIN 363, 365).

Fragment: 1 fragment: VIN 593 (figure 4.1-50).

Description: A volute with one preserved blade-shaped palmette leaf. The volute has raised edges.

Discussion: VIN 593 is the only fragment documented with a volute with raised edges. The blade-shaped

198 Marconi 1933, p. 40.

199 Barello 1995, pp. 77-78, tab. XLIII.

200 Marconi 1933, p. 88.

palmette leaf is also less common, the only other fragment with similarly shaped leaves is palmette E. It is not clear whether VIN 593 had moulded decoration on both sides.

Dating: Unknown

Publications: Unpublished

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Figure 4.1-50: Palmette F (VIN 593. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.50 PALMETTE G

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Figure 4.1-51: Palmette G (VIN 374. (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: From an excavation in the urban sanctuary in the 1950's or early 1960's[201]

Fragment: 1 fragment: VIN 374 (figure 4.1-51)

Description: A small five leaved palmette on top of a double volute. The palmette leaves are in shallow relief with a small rounded border and painted in alternating black and red. The volute is in a shallow concave relief, too, with a central disk with a painted rosette. There is a complete void created between the bottom junction of the two volutes and a deeply recessed gap between the volute spiral and stem. The decoration is only on one side. The back of the object is flat.

Discussion: A single fragment of this palmette type is preserved with only the top part of the piece. The function of it is therefore indeterminable although it has strong similarities with the Archaic anthemion

201 De Miro 1965, p. 77.

sima, frieze F (section 4.1.11). According to De Miro it shows further similarities to palmettes from Syracuse.[202]

Dating: Unknown

Publications: De Miro 1965, p. 77, tab. XXIX-1f.

4.1.51 RIDGE TILE A

Figure 4.1-52: Ridge tile A (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: VIN 401 was found by Marconi inside temple B.[203] VIN 397 is of unknown provenance, but the museum number starts with 'S', which is indicative for objects found by Marconi.

Fragments: 2 fragments: VIN 397, 401 (figure 4.1-52)

Description: The tile body is painted with crossed meanders in black and red. Where two meanders meet, there is a white square with two thin crossed lines. The bottom edge is decorated with alternating red and black dog-tooth pattern. The rim consists of a large flat band painted with a hooked meander in black and red. This band slopes upwards to the edge of the tile and is bordered on both sides with smaller rolls painted in red, white and black blocks. On one side of the tile is a semi-circular opening for a cover tile, this hole is 200 mm wide and 75 mm high.

202 De Miro 1965, p. 77.

203 Marconi 1929, p. 154.

Complete length: 495 mm, complete height: 255 mm, thickness of main tile: 32 mm

Discussion: While VIN 397 has no provenance its similarities in painted decoration and size to VIN 401 support placing the two fragments in the same stylistic group.

VIN 401 is associated with the roof of temple B at Akragas. Recent scholarship suggests that while this building was started before the war in 480 BC, it was only completed afterwards.[204] Dating the roof of temple B to the period directly after the war would correspond with the chronology suggested by Marconi for the ridge tile.

Dating: Second quarter of 5th century BC[205]

Publications: Marconi 1929, p. 154, fig. 85; Mertens 2006, p. 266.

4.1.52 RIDGE TILE B

Figure 4.1-53: Ridge tile B (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: VIN 398 was found in the area of the L-shaped portico in the sanctuary to the East of gate V during excavations by De Miro between 1960 and 1970[206]

Fragments: 2 fragments: VIN 398, 399 (figure 4.1-53)

Description: The main body of the ridge tile is painted with a large crossed meander in black. The bottom

204 Barletta. 1997, p. 370.

205 Marconi 1929, p. 154.

206 De Miro 2000, p. 293.

edge consists of alternating black and red Doric leaves with a white outline. The tile is 35 mm thick but tapers down at the bottom edge.

Discussion: The painted decoration bears similarities to a ridge tile on display in the archaeological museum of Gela which was discovered in excavations in the Castellano cistern and dates to the 6th century according to the display information. A second ridge tile with comparable painted decoration was found by Brea in the area around the Athenaion of Gela.[207] Ridge tile B also bear some resemblance to ridge tile A from Akragas, which is dated to the second quarter of the 5th century. Based on comparisons with objects from Gela and Akragas a date from the end of the 6th century until the first half of the 5th century is appropriate for ridge tile group B. This is slightly earlier than the date suggested by De Miro for VIN 398.[208]

Dating: End of 6th century until first half of 5th century BC

Publications: De Miro 2000, p. 293, tab. CLVII-4.

4.1.53 RIDGE TILE C

Provenance: VIN 389 was found in a cistern in the area to the South of temple B in 1958.[209] VIN 553-555 are part of the collection of fragments rediscovered in the archives of the museum of Palermo. According to the museum tags these objects are from Gábrici's 1922 excavation of the naiskos to the South-East of temple B. VIN 563 was found in secondary use during the 2016 excavations at S. Anna.

Fragments: 6 fragments: VIN 389, 553-555, 563, 617 (figure 4.1-54,55)

Description: Ridge tile with a simple semi-circular ridge. No painted decoration is visible except for VIN 389 which has evidence of uniform red paint on the rim and main tile, and VIN 617 with solid black paint. On the inside, the rim has a single step to accommodate the next tile and at the bottom edge the rim is hollowed on the inside in order to tapper to a point at the bottom edge.

Rim width: 110 mm, thickness of main tile: 30-38 mm

Discussion: Over ten fragments of this type were found with VIN 553-555 in the naiskos to the South-East of temple B. The profile matches that of the ridge tile VIN 563 found at S. Anna, which places all objects in the same stylistic group. The substantial distance between the two find locations, however, suggests that these fragments were not part of the same roof.

Undecorated roof tiles from Sicily are not well represented in archaeological studies and therefore comparable examples from outside Akragas are not known at this time.

VIN 617 is added to this group due to the similarities in profile, but unlike the other objects in the group, except VIN 389, it has painted decoration, consisting of a solid black across the preserved rim.

Dating: 6th or 5th century BC[210]

Publications: De Miro 1963, p. 180, fig. 84bis-c.

207 Brea 1949, p. 66, fig. 59.

208 De Miro 2000, p. 293.

209 De Miro 1963, p. 180.

210 De Miro 1963, p. 180.

Figure 4.1-54: Ridge tile C (VIN 389: Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo. VIN 553-554: Copyright Regione Siciliana – Assessorato Reg.le dei BB. CC. e I. S. – Su concessione del Polo Regionale di Palermo per i Parchi e i Musei Archeologici– Museo Archeologico Regionale "Antonino Salinas" – divieto di duplicazione con qualsiasi mezzo).

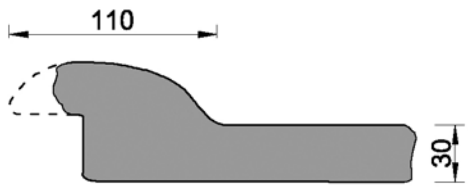

Figure 4.1-55: Side view and profile drawing for VIN 563 (measurements in mm) (Copyright Parco Archeologico e Paesaggistico Valle dei Templi di Agrigento).

4.1.54 RIDGE TILE D

Provenance: VIN 390 was found in a cistern to the South of temple B in 1958.[211] VIN 618 is unpublished and without provenance, but the museum number falls within a range of objects known to be from Marconi's excavations around temple G. VIN 395 is a sporadic find from the Roman and Hellenistic quarter area.

211 De Miro 1963, p. 180.

Fragments: 3 fragments: VIN 390, 395, 618 (figure 4.1-56)

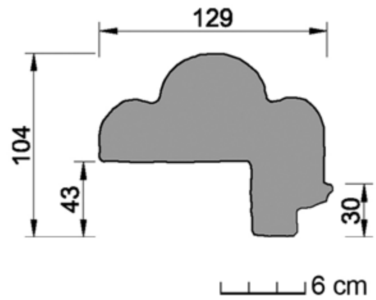

Figure 4.1-56: Side view and profile drawing for ridge tile D (Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Description: The rim consists of three semi-circular bands and varies in width between 120 and 130 mm. The central band is larger than the adjacent two. The painted decoration shows alternating black and red chevrons on a white background. On VIN 395 and 390 the chevron extends over all three bands; on VIN 618 it is only present on the central band, on the smaller bands the chevron is extended with a diagonal band of the same colour and thickness, but slanting in the opposite direction.

Rim width: 120-130 mm, thickness of main tile: ca. 30 mm (based on fracture on VIN 618)

Discussion: VIN 395 is fragmentary, but the presence of a large fracture on the right edge of the border suggests the presence of a third band, similar to the VIN 390 and 618. The profile and painted decoration of all three objects show strong similarities. The different find locations, however, indicate that they were part of different roofs.

The profile is similar to examples of type 1 from Selinus which Conti dates to the early 5th century, but these objects might be from the late 6th as well.[212] A comparable piece was also found by Brea in his

212 Conti 2012, pp. 264-268.

excavations around the Athenaion of Gela.[213]

Dating: 6th to 5th century BC[214]

Publications: Unpublished

4.1.55 RIDGE TILE E

Figure 4.1-57: Ridge tile E (VIN 222. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Provenance: The museum number falls within a range of objects from the 1962 excavations to the South of temple B.

Fragments: 1 fragment: VIN 222 (figure 4.1-57)

Description: The edge of the ridge tile has a raised rim consisting of two semi-spherical bands, the outer one being 96 mm wide, the inner band is 48 mm wide. The fracture of the main tile itself indicates a tile thickness of 24 mm. The painted decoration consists of alternating black, red, and white chevrons on the larger band, with slanged lines on the smaller bands that do not correspond directly to the placement of the adjacent chevrons.

Discussion: The profile is similar, if slightly larger, to examples of type 4 from Selinus which Conti dates to the 5th century based on the fabric type.[215]

Dating: 5th century BC

Publications: Unpublished

213 Brea 1949, p. 65, fig. 58-b.

214 De Miro 1963, p. 180.

215 Conti 2012, pp. 266-268.

4.1.56 RIDGE TILE F

Provenance: Found in the large pool to the South of temple B in 1958[216]

Fragments: 1 fragment: VIN 223 (figure 4.1-58)

Description: The edge of the tile consists of a raised rim of three rounded bands. The central band is 26 mm wide while the two bands on either side are 50 mm wide. There is no evidence of painted decoration.

Rim width: 126 mm, thickness of main tile: ca. 28 mm (based on fracture)

Discussion: Undecorated roof tiles from Sicily are not well represented in archaeological studies and therefore comparable examples from outside Akragas are not known at this time.

Dating: 6^{th} century BC[217]

Publications: De Miro 1963, p. 166, fig. 84bis-a; De Miro 2000, p. 151.

Figure 4.1-58: Ridge Tile F (VIN 223. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.57 RIDGE TILE G

Provenance: The museum number falls within a range of objects that is associated with a fill layer around the naiskos to the South-East of temple B excavated by Gábrici.

Fragment: 1 fragment: VIN 386 (figure 4.1-59)

Description: The rim consists of three rounded bands. The outer band is 21 mm wide and painted black. The central band is 56 mm wide and painted white. The third band is broken away, but there is evidence that it was also painted black.

Reconstructed rim width: ca. 100 mm

Discussion: The majority of ridge tile fragments already discussed has a rim that exceeds 100 mm in width. The reconstructed width of VIN 386 is slightly smaller. The shape of the profile is similar to ridge tile D, and by extension, to the same objects from Selinus and Gela which are dated to the late 6^{th} and early 5^{th} century.

Dating: Unknown

Publications: Unpublished

216 De Miro 2000, p. 151.

217 De Miro 1963, p. 166.

Figure 4.1-59: Ridge tile G (VIN 386. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

4.1.58 RIDGE TILE H

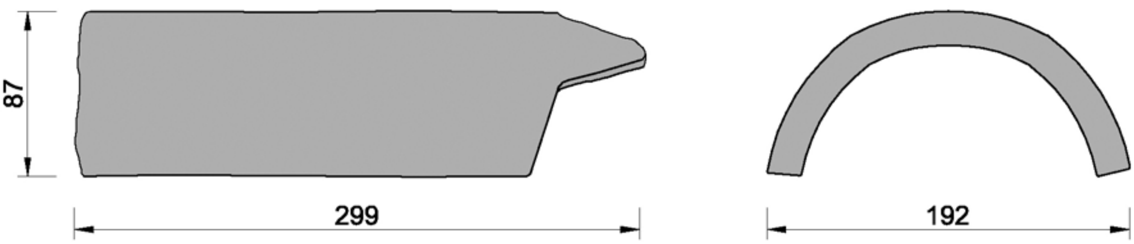

Figure 4.1-60: Drawings and photographs of ridge tile H (VIN 571, measurements in mm. Copyright Parco Archeologico e Paesaggistico Valle dei Templi di Agrigento).

Provenance: Found in secondary use, covering a votive deposit, during the 2016 excavations at S. Anna

Fragment: 1 fragment: VIN 571 (figure 4.1-60)

Description: The tile is 192 mm wide and has two openings for cover tiles on the opposing long sides. On one side is a pentagonal-shaped hole that fits Corinthian style cover tiles similar to cover tile A (section 4.1.59). On the opposing side is a semi-circular hole for a curved cover tile.

Fragment width: 192 mm, thickness of tile body: 18 mm

Discussion: The overall dimensions of the tile are consistent with cover tiles from Selinus dating to the 5th century.[218] In comparison to the ridge tiles A-G from Akragas described above VIN 571 is substantially smaller. But the presence of openings on the sides to allow placing of cover tiles indicates that this tile functioned as a ridge tile, not a cover tile. In addition, the two openings show that the roof incorporated cover tiles of both the Corinthian and Laconian types, as seen in a 5th century roof at Selinus.[219]

Dating: Unknown

Publications: Unpublished

4.1.59 COVER TILE A

Copyright material not available for online distribution

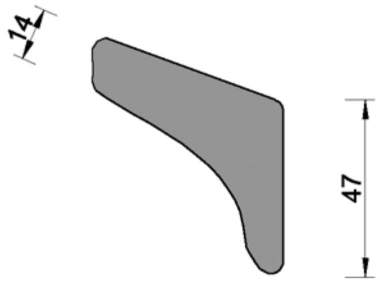

Figure 4.1-61: Photograph and drawing of profile of cover tile A (VIN 568, measurements in mm. Copyright Parco Archeologico e Paesaggistico Valle dei Templi di Agrigento).

Provenance: Found in secondary use during 2016 excavations at S. Anna

Fragment: 1 fragment: VIN 568 (figure 4.1-61)

Description: The bottom segment of the polygonal-shaped cover tile is 47 mm high. The main tile is 14 mm thick.

Discussion: Sicilian roof tiles are generally considered as a combination of flat pan tiles and curved, Laconian style, cover tiles.[220] However, recent excavations in Selinus have also uncovered the presence of polygonal-shaped cover tiles of the Corinthian type, which are dating from the classical period.[221]

Dating: Unknown

Publications: Unpublished

4.1.60 COVER TILE B

Provenance: Found in secondary use during 2016 excavations at S. Anna

Fragments: 3 fragments: VIN 427, 564, 565 (figure 4.1-62)

Description: 18 mm thick curved cover tile with a square bottom edge. The outside curved edge has a slight, irregularly shaped upstand.

Discussion: Only fragments of this cover tile type have been found in secondary use and as such it is not possible to provide the complete dimensions. The estimated reconstruction is based on the largest

218 Jonasch 2009, p. 4.

219 Jonasch 2009, pp. 3-4.

220 Winter 1993, p. 273.

221 Jonasch 2009, p. 4.

available fragment. Cover tiles of this type are known to have tapered down to one end in order to facilitate overlap, so the dimensions in figure 4.1-62 were not constant over the entire length of the tile.

Dating: Unknown

Publications: Unpublished

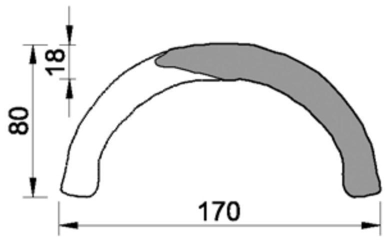

Figure 4.1-62: Cover tile B, top view of fragments and reconstruction of the profile (VIN 564, measurements in mm. Copyright Parco Archeologico e Paesaggistico Valle dei Templi di Agrigento).

4.1.61 COVER TILE C

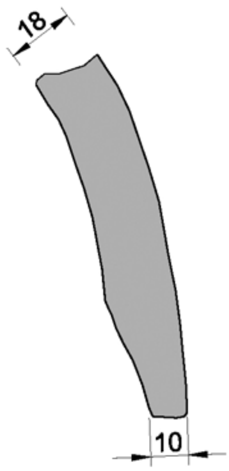

Figure 4.1-63: Side view and profile drawing of cover tile C (VIN 435, measurements in mm. Copyright Parco Archeologico e Paesaggistico Valle dei Templi di Agrigento).

Provenance: Found in secondary use during excavation at S. Anna in 2014

Fragments: 1 fragment: VIN 435 (figure 4.1-63)

Description: The curved cover tile is 18 mm thick, but at the bottom edge it tapers down to 10 mm.

Discussion: This isolated fragment is too small to allow for a full reconstruction. Based on the tapered bottom edge it is grouped separately from cover tile B.

Dating: Unknown

Publications: Unpublished

4.1.62 PAN TILE A

Provenance: Found in secondary use during excavation at S. Anna in 2014

Fragments: 6 fragments: VIN 421, 422, 425, 428, 436, 437 (figure 4.1-64)

Description: Pan tiles with a rounded side ridge that is around 50 mm high and 60 mm wide. The tile itself is around 30 mm thick.

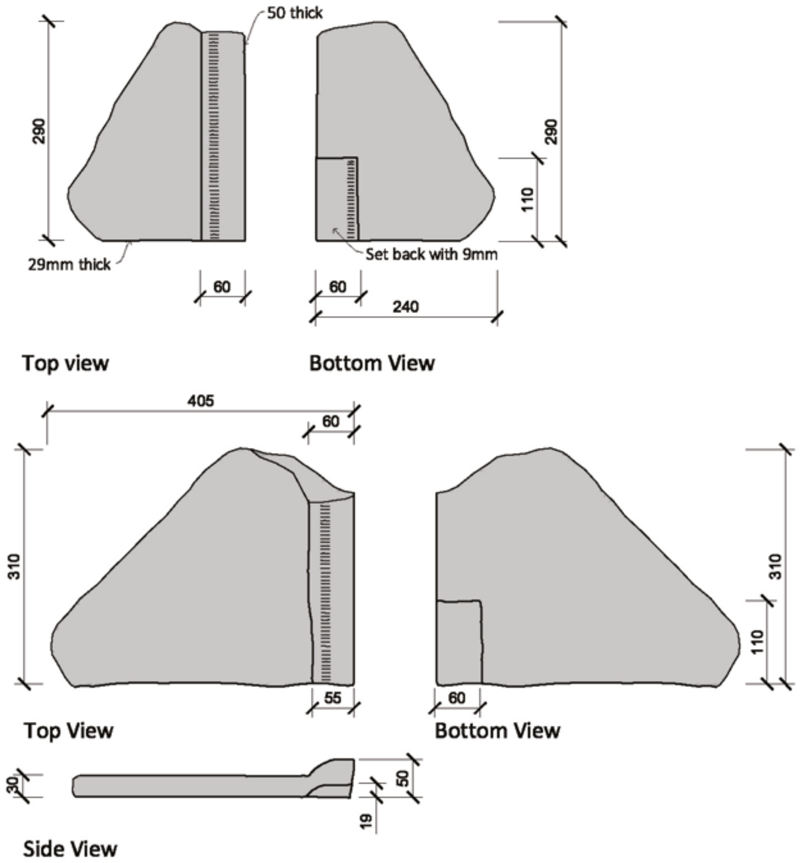

Figure 4.1-64: Pan tile A fragments (a: VIN 421, b: VIN 437, measurements in mm)

Discussion: The roof tiles found during the S. Anna excavations were all in secondary use. The fragments are therefore from a disturbed context and to date it has not yet been possible to reconstruct a complete pan tile. The identification of types has to rely on diagnostic characteristics of raised edges and notches. The key concern in organizing the fragments into groups is the size of the allowable variations in dimensions for each group. The notches formed at the bottom corners of the tiles correspond exactly to the size of the underlying tile's side ridge. Where the ridge is 60 mm wide, the notch made to fit on top of it is of an equal size. The only variation are VIN 425 and 437 where the side ridge tapers down to 55 mm at the ends. The depth of the bottom notch is also equal to the height by which the side ridge rises above the main tile, which is 20 mm. This indicates that there is a very small tolerance for dimensional variations in pan tiles.

Published studies on Greek roof tiles normally only provide the absolute overall dimensions and make no mention of size variations between individual tiles.[222] One exception is the work by Philip Sapirstein

222 Glendinning 1996; Jonasch 2009.

on the 7th century roof tiles from Corinth. He found that while the thicknesses of tiles vary considerably the top and bottom profiles, where adjacent tiles have to connect, are very consistent.[223] For this reason, VIN 428 is also added to group A, for while the height of the side ridge is 56 mm and the thickness of the pan tile is 36 mm; the width of the side ridge is the same as for the rest of the group. In her analysis of roof tile types from Selinus Conti combines objects primarily on the shape of the profile; as a result the particular dimensions of elements such as the side ridges can differ considerably within objects of the same category, i.e. tiles of the same type might vary by as much as 3 cm at the side ridges.[224]

The profile of pan tile A has similarities to Conti's type 11 and 12, but the side ridge is slightly narrower, at 60 mm instead of 65-70 mm as seen in the tiles from Selinus. Conti dates these types to the second half of the 5th century to the 4th century.[225] A similar profile is also found at Himera, but the excavators do not provide chronological information.[226]

Dating: 5th to 4th century BC

Publications: Unpublished

4.1.63 PAN TILE B

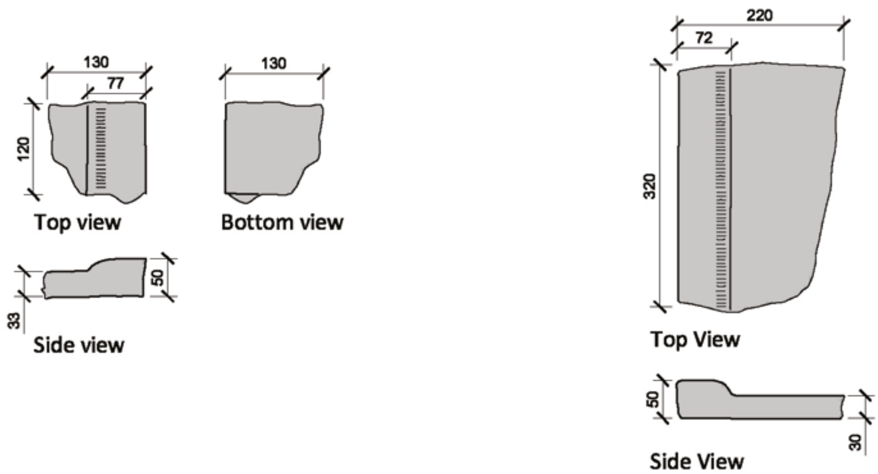

Figure 4.1-65: Pan tile B fragments (a: VIN 424, b: VIN 430, measurements in mm).

Provenance: Found in secondary use during excavation at S. Anna in 2014

Fragments: 3 fragments: VIN 423, 424, 430 (figure 4.1-65)

Description: Pan tile with slightly flattened side ridge. Ridge is around 50 mm high and more than 70 mm wide. The tile itself is more than 30 mm thick.

Discussion: The group B of pan tiles is distinguished from pan tile A by the side ridge being more than 10 mm wider. As discussed above (section 4.1.62), such a large variation in the dimension of interlocking elements would be highly problematic and thus indicates that these pan tiles were not part of the same roof as the ones of group A. As it is, VIN 424 has a side ridge of 77 mm wide, which is 7 mm wider than

223 Sapirstein 2009, p. 205.

224 Conti 1998, p. 221.

225 Conti 1998, p. 224, tab. II.14, III.15-17.

226 Tullio 1976, pp. 441-442, fig. 12.5.

VIN 423. This might indicate that the two tiles are from different roofs, too.

Similar profiles are known from Selinus where it was in widespread use from the 5th to the 4th century, and is classified by Conti as type 10.[227]

Dating: 5th to 4th century BC

Publications: Unpublished

4.1.64 PAN TILE C

Provenance: Found in secondary use during excavation at S. Anna in 2014

Fragments: 1 fragment: VIN 429 (figure 4.1-66)

Description: Side ridge is very wide, 100 mm, and rather shallow, less than 50 mm high. The tile itself is less than 25 mm thick.

Discussion: The pan tile profile is similar to type 7 from Selinus as identified by Conti. This tile is used throughout the 5th century.[228]

Dating: 5th century BC

Publications: Unpublished

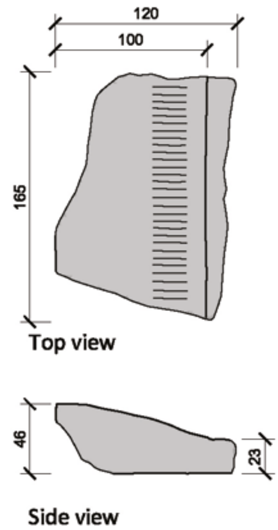

Figure 4.1-66: Pan tile C fragment (VIN 429, measurements in mm).

4.1.65 PAN TILE D

Provenance: According to the museum tags the fragment comes from Gábrici's 1922 excavation in the area around temple B

Fragments: 1 fragment: VIN 544 (figure 4.1-67)

Description: Raised edge of 60 mm wide and 50 mm high.

Discussion: In profile and size this fragment is similar to pan tile group A, but since it is from a different

227 Conti 1998, p. 223, tab. II.12.13; Jonasch 2009, p. 3.

228 Conti 1998, p. 221, tab. II.8.

location and the object is too fragmentary preserved, it is placed separately. VIN 544 is the bottom left corner of a pan tile with the notch on the underside in order to accommodate the tile when placed on the roof. On the inside of the notch there is a character in relief, most likely formed in the mould. The character appears to be the Greek Heta or Phoenician Heth.

Dating: 5^{th} to 4^{th} century BC

Publications: Unpublished

Figure 4.1-67: Pan tile D fragment, top view, underside and profile (VIN 544. Copyright Parco Archeologico e Paesaggistico Valle dei Templi di Agrigento).

4.1.66 UNKNOWN PAN TILE

Provenance: Found in secondary use during excavation at S. Anna in 2014

Fragment: 1 fragment: VIN 434 (figure 4.1-68)

Description: The 115 x 100 mm fragment has no preserved edges.

Discussion: This fragment is presumed to be a pan tile due to the flat profile and thickness. On one side there is a mark resembling a Greek Iota that was pressed into the clay while still wet.

Dating: Unknown

Publications: Unpublished

Figure 4.1-68: Pan tile fragment of unknown type (VIN 434. Copyright Parco Archeologico e Paesaggistico Valle dei Templi di Agrigento).

CONCLUSION

The stylistic typology of architectural terracottas from Akragas is based on the published one by De Miro from 1965. Since then the amount of material has increased from 85 fragments to 265 objects and, therefore, the original typology had to be expanded considerably, especially in regards to antefixes, ridge tiles, and undecorated roof tiles. During this process a number of concerns have been identified in regards to the original typology by De Miro. For instance, frieze I (section 4.1.15) is identified as an architectural terracotta in his typology. While it does show some similarities to material from Metapontium, the overall dimensions and the profile are closer to that of terracotta sarcophagi from Akragas. The first identification of the objects in frieze I as architectural terracottas is thus in doubt. Another example are palmette group B, C, and D (sections 4.1.45-47), which follow De Miro's palmette group 2, 3, and 4. The previously unpublished fragment VIN 620 shows portions of both the palmette and volutes preserved. The shape of this palmette is the same as in VIN 371, which is assigned to palmette group C, but the volutes of VIN 620 are similar to objects in palmette group D (VIN 382, 388). It therefore appears that fragments that belong to the same type are split among different groups by De Miro. Such concerns raised about the original 1965 typology are based on the stylistic analysis of section 4.1. Differences in fabric and material composition also need to be taken into consideration in the following (section 4.2 and 4.3). Chapter 5 provides a completely revised typology for the material from Akragas based on the results of the different analytical endeavours in sections 4.1-4.3.

In terms of style, the material from Akragas represents the major terracotta roof types known in Sicily from the 6th and 5th centuries BC (section 2.2.1.1). This includes the canonical Sicilian sima (e.g. frieze A, B3, and D), the anthemion sima type (e.g. frieze F and G) and the antefix roofs (e.g. antefix A, B, and H). There are more antefixes than previously indicated by the published record. Unfortunately, the majority of these antefix types are represented by a single object and, in some cases, only by a small fragment which cannot be assigned to specific type due to a lack of more information. Antefix roofs in Sicily are known to have consisted of antefixes of different types, with the combination of gorgoneion and silens being particularly popular (section 2.2.1.1). A number of gorgoneion antefix types have been identified (e.g. antefix C, D, E, F, G, H, and I) and two silen antefix types (antefix J and L). However, based on the find location information and stylistic aspects it is not possible to determine if any of the gorgoneion and silen types belonged to the same roof. When compared to other gorgoneion antefixes from Sicilian sites, the antefixes from Akragas appear to have some stylistic markers which appear to be particular to the city itself. None of the preserved fragments seems to wear any form of headdress or diadem.[229] There is also no evidence of snakes in the hair.[230]

The stylistic influence of other Sicilian cities on the canonical Sicilian simas from Akragas appears to be more diverse than previously thought. De Miro considered the architectural terracottas from Gela to have the main stylistic impact.[231] While frieze A, B3, and D show similarities with Geloan roofs including frieze B and C,[232] there are strong similarities with roofs from Selinus[233] and Syracuse as well.[234] The use of a bottom roll on the sima profile seems to be present with greater frequency on objects from Akragas than at other cities. While bottom rolls appear on a roof from Selinus already mentioned, these are dated slightly later to the last third of the 6th century BC. For the anthemion sima roofs there are strong stylistic parallels between frieze F from Akragas with anthemion roofs from Selinus, and between frieze G and H1 from Akragas with the ones from Naxos.

In conclusion, the use of a bottom roll on the canonical Sicilian sima profile and the lack of a diadem or snakes on gorgoneion antefixes represent characteristics of the terracotta roofs from Akragas. While the architectural terracottas of the city draw on stylistic precedents from a fairly wide Sicilian context, a number of features are particular to material from Akragas.

229 Examples of diadems include antefix type A and B from Selinus from the first half of the 5th century, an antefix from Megara Hyblaea from the 6th century, and a number of different antefixes from Gela from the 6th century BC, cf. Panvini 1998, pp. 33, 44.

230 Examples of antefixes with snakes include antefixes from the ship sheds at Naxos from the 5th century (Lentini et all. 2008, fig. 41) and some from Himera dated to the end of the 6th or the beginning of the 5th century BC (Epifanio Vanni 1993, p. 40, fig. 5).

231 De Miro 1965, p. 51.

232 Brea 1949, pp. 39-42, 47-56, fig. 28, 36-39; Lang 2010, pp. 94-95, no. Gela 3, fig. 4.5-6, 5.1; Wikander 1986, pp. 33-34, no. 7-8, fig. 8.

233 Conti 2012, pp. 113-127, roof 14, fig. 108; Lang 2010, pp. 131-132, Seli 3, fig. 28.6-8.

234 Ciurcina 1993, pp. 30-31, fig. 4,5.

4.2 FABRIC TYPOLOGY

The overview of the history and current state of research on architectural terracottas emphasizes production techniques as an important new area of investigation (chapter 2). In essence, the production of architectural terracottas is significantly influenced by two factors: the decisions made by the craftsmen and the availability of resources, which includes raw materials and skilled labour. The final appearance of an object is thus determined by the selection and preparation of raw materials, the forming and finishing of objects as well as the firing process, to name but a few.[1] Each of these steps leaves characteristic traces on the finished product which can be recognized and described using standardized methods. For example, the temper that was added to the raw clay can be described using standardized charts to specify its distribution, shape, and size.[2] A recognized and described characteristic is termed an attribute. As discussed in chapter 3, such attributes need to be mutually exclusive, in other words, one attribute cannot be directly correlated to another.[3] These attributes will be labelled independent attributes. The first section of this chapter will thus involve the identification and evaluation of various attributes for the architectural terracottas from Akragas (section 4.2.1). The second section (section 4.2.2) organizes the fragments into groups, or types, according to relevant attributes identified in the first section. The creation of a typology based on independent attributes associated with raw materials and production techniques is common in pottery studies and is frequently referred to as fabric or ware categories.[4] In this investigation we will use the term 'fabric typology', but it is important to note that this typology describes not only the materials used but also the production techniques. The fabric group for each individual fragment is provided in appendix A. The attributes data for each individual fragment is provided in appendix B.

While the methods and theories applied to this chapter are detailed in chapter 3, it is important to briefly emphasize two important points at this stage. The first note is in regards to the separation of fabric typology and stylistic categories.[5] In pottery studies there is the assumption that production techniques are in fact slower to change than style.[6] In theory it is feasible that a single workshop could create different styles of architectural terracottas over a wide span of time by using the same raw material sources and methods of manufacture. Style and fabric appear to be independent processes and are, therefore, investigated separately in the analytical portion of this thesis, with the discussion of the stylistic aspects in chapter 4.1. The second important note is in regards to the methodological limitations. The established method used for describing the fabric requires a fresh break. Over time the accumulation of dirt and the encrustation of mineral salts obscure the true colour and visual appearance of the clay fabric and its inclusions. In ceramic studies a fresh break is created breaking a small piece from the object.[7] In most circumstances, it was not possible to utilize a estructive analytical method for objects which form part of museum collections. The exception are the roof tiles from the S. Anna excavations. Observations were thus limited to areas of clean breaks already present due to modern damage. The available data for all 265 fragments studied, as well as the observation limitations, are noted in appendix A and B. The data in appendix B forms the basis for the analysis of aspects relating to materials and methods of

1 Orton & Hughes 2013, p. 151.

2 Orton & Hughes 2013; Rye 1981.

3 Adams & Adams 1991, p. 91; Winther-Jacobsen 2010, p. 59.

4 Adams & Adams 1991, p. 183; Moody et al. 2003, p. 49, tab. 4; Orton & Hughes 2013, p. 71; Shepard 1956, p. 306; Winther-Jacobsen 2010, p. 51.

5 Horejs et al. 2010, p. 10; Jung 2010, p. 148.

6 Rye 1981, p. 5; Shepard 1956, p. 314.

7 Moody et al. 2003, p. 54; Orton & Hughes 2013, pp. 75-76, 155.

production. In essence, within the following sections summaries of specific parameters of the dataset are presented.

4.2.1 DEFINING AND EVALUATING ATTRIBUTES

4.2.1.1 FABRIC COLOUR

Colour is one of the most widely used fabric attributes used in archaeology for categorizing ceramic and terracotta objects.[8] The colour of the natural clay within the fabric of the object depends on the amount of iron compounds and the carbon substances that come from organic materials.[9] As the quantity varies between clay sources, colour can therefore be used to distinguish between objects manufactured using different raw sources. Some colour variation is seen in complete objects due to differences in firing, weathering, and depositional conditions. However, it is thought that the fabric colour of wares produced by the same workshop is consistent enough in order to distinguish between wares produced by different workshops.[10] To minimize the impact of such factors as firing and depositional conditions, care was taken to measure colour on clean fractures and careful distinction was made between colour zones created by incomplete oxidation. For further analysis only the colour associated with completely oxidized fabric is used. Therefore, if the correct methods are used, the colour difference between objects of the same fabric group is smaller than the differences in colour between objects from different groups. In conclusion, while there are conditions that can cause variance in the colour, it is an important characteristic of the particular raw source used for production.

For describing colour in pottery studies the Munsell soil colour charts and classification system are the standardized method.[11] Each Munsell code contains key identifiers for the hue, chromaticity, and lightness of a specific colour. In addition, each code has an equivalent textual description. Different codes of a similar colour are frequently described using the same textual description, for example, 5YR 6/6, 5YR 6/8, 7.5YR 7/6, and 7.5YR 7/8 are all described as reddish yellow. It is frequently this textual description that is used when objects are categorized according to colour, which means in essence the analysis is based on groups of verbal Munsell descriptions.[12] Nevertheless, the description and number categories applied are a point of debate with some scholars proposing alternative systems.[13] The observation conditions in this study are less than ideal due to the restricted use of fresh breaks. A greater variance in the range of colour recorded for objects from the same group is therefore expected. To accommodate such variance, broader categories for colour were used for this analysis. They include a greater number of colour codes and as such reduce the impact of variability to the observation restrictions. Munsell codes from 10R to 2.5YR are described as reddish, from 5YR to 7.5YR as reddish yellowish, and from 10YR to 2.5Y as yellowish. These three categories are further defined according to hue and chromaticity into two groups, one being lighter than the other. For instance, 5YR 6/2 is specified as pale reddish yellowish. The specific recorded data and the colour for each fragment are listed in appendix B. A summary is provided below in table 4.2-1. The fragments appear to fall within four major colour groups: reddish, pale reddish yellowish, reddish yellowish and pale yellowish. For 22 out of 265 objects the colour could not be determined, the individual reasons are provided in appendix A..

8 Ciurcina 1997; Cooper 1990; De Miro 1965; Kenfield 1997; Kjellberg 1940; Lulof 2007; Vanni 1997.

9 Gnesin 2012, p. 497; Malacrino 2010, p. 42.

10 Orton & Hughes 2013; Rye 1981, p. 119.

11 Abramov et al. 2006, p. 261; Ferguson 2014, pp. 329-331; Goodwin 2000, p. 19; Moody et al. 2003, p. 47; Orton & Hughes 2013, pp. 73, 155-156.

12 Orton & Hughes 2013, p. 156.

13 Ferguson 2014; Moody et al. 2003, p. 47, tab. 3; Orton & Hughes 2013, p. 156.

Table 4.2-1: Number of fragments according to each analytical colour group

Colour group	Number of fragments
Greyish	11
Pale reddish	11
Pale reddish yellowish	66
Pale yellowish	37
Reddish	69
Reddish yellowish	43
Yellowish	6
Unknown	22
Total	**265**

4.2.1.2 TEMPER

Raw clay is likely to crack when drying due to differential shrinkage. Craftsmen add aggregates such as sand, natural rock, grog, and cut straw to it to prevent this from happening. Within pottery studies the use of the term 'temper' denotes deliberate additions to the clay. The type of temper is a very distinctive and relevant indicator of different fabric groups. Moody et al. relies on temper as one of the primary indicators of specific fabric groups.[14] While the identification of temper based on a visual inspection alone is rather limited, the following temper types could be distinguished within the material from Akragas:

Volcanic gravel: The rather distinctive temper group consists of dark grey, dark red, and dark brown particles with a rounded form that are likely volcanic or basaltic materials.

Non-volcanic gravel: Compared to volcanic material, the temper group is differentiated by angular shaped grains of a lighter colour likely derived from the local calcarenite or marine sands.

Grog: Grog is ground terracotta fragments left over after firing. It is therefore often similar in colour to the main clay fabric. Due to the colour and friability of the local stone it can be difficult to distinguish between grog and non-volcanic temper.

Organic material: During the firing process organic material is completely destroyed. Identifying the presence of organic temper is thus limited to a study of the voids left in the clay matrix. While the resultant voids are not always distinguishable from simple air cavities left within poorly processed clay, some types of material, such as cut straw, leave distinctive voids that are easily recognizable.

In table 4.2-2 the temper data as provided in appendix B is summarized. For example, only 29 fragments have volcanic temper, while the majority of the fragments contains a mixture of grog and non-volcanic temper. For 102 fragments it was not possible to determine the type of temper due to the state of preservation and/or absence of fresh breaks.Based on this analysis the following important observations can be made in regards to the material from Akragas. Firstly, volcanic material and non-volcanic material, including grog, are not used in combination. In comparison grog and non-volcanic material are often combined. Secondly, organic temper is never used as the primary temper and is always used in combination with non-volcanic material and grog. Furthermore, it is also apparent that volcanic temper fabrics are not a frequent occurrence for

Table 4.2-2: Temper types and combinations.

Temper type	Number of fragments
Grog	19
Non-volcanic	7
Non-volcanic and grog	100
Non-volcanic, grog and organic	8
Volcanic	29
Unknown	102
Total	**265**

14 Moody et al. 2003, p. 49.

Table 4.2-3: Summary of basic temper data for each major type of temper used.

Temper Type	Average minimum grain size	Average maximum grain size	Average percentage	Average sorting
Grog	0.6 mm	4.4 mm	5.8 %	Fair
Non-volcanic	0.6	3.8	3.9	Fair
Non-volcanic and grog	0.4	2.7	3.8	Fair
Volcanic	0.5	2.2	11.5	Good

Table 4.2-4: Types of temper according to types of architectural terracottas.

Type of architectural terracotta	Grog	Non-volcanic	Non-volcanic and grog	Unknown	Volcanic	Grand total
Antefix	1	5	6		2	14
Cover tile	2		4			6
Eaves tile	1					1
Geison revetment	5	6	19	1	3	34
Horizontal geison Revetment			2			2
Horizontal sima			1		2	3
Horse rider acroterion	6	17		1		24
Lateral geison revetment		2			1	3
Lateral sima	1		18	1	7	27
Lion headed waterspout			1			1
Other		5		1	2	8
Pan tile	7	1	7			15
Raking geison revetment			1			1
Raking sima	1	2				3
Ridge palmette	8	22	20	6		56
Ridge tile	6	6	7		3	22
Ridge tile antefix			1		1	2
Sima		3	18		5	26
Sima corner fragment		1				1
Unknown	1		2	1	2	6
Waterspout		2	8			10
Total	**39**	**72**	**115**	**11**	**28**	**265**

the objects from Akragas.

The use of organic temper requires some additional clarifications. It is important to distinguish between temper, which is organic material deliberately added by the workmen, and accessories, which are organic material that is part of the natural raw clay. The absence or presence of accessories is indicative of the specific methods used for refining the raw clay and will be discussed in detail in relation to fabric density (section 4.2.1.3). The only organic temper that can be clearly identified is cut straw, which leaves a distinctive void and imprint in the fired fabric. Of the eight fragments in which organic temper is identified, all were lateral sima fragments in which the organic temper was restricted to the slurry used for connecting the waterspouts, which are formed separately, within the sima (VIN 267, 355). Slurry is a clay mixture with a higher water ratio and is used predominantly for connecting differently formed elements before firing. The presence of organic temper is therefore restricted to only one type of architectural terracottas, namely lateral simas. It would therefore be misleading to use it as a general attribute to define objects of the same fabric type, since it will exclude all other types of architectural terracottas.

Additional characteristics of the temper groups are recorded based on systems devised for the Department of Urban Archaeology of the Museum of London as published by Orton and Hughes.[15] The type of data collected is restricted to what is observable to the naked eye on existing fractures only and the following criteria were therefore selected. The size of the temper is recorded as a range in mm using the chart published by Mathew, Wood, and Oliver as reference, the same chart is also used as a standard for identifying the percentage of temper or voids in relation to the overall fabric.[16] A chart by Barraclough is assigned as reference to describe the level of sorting of temper grains on one hand on a scale from 1 to 5, with 5 indicating an even distribution of uniformly sized temper grains. On the other hand, the sorting scale includes also descriptions as 'very good', 'good', 'fair', 'poor', and 'very poor'.[17] The summary in table 4.2-3 is derived from the data in appendix B. There is a concern regarding the independence of some attributes related to temper. As seen in table 4.2-3, objects with volcanic temper have a smaller average grain size and a higher density in comparison to fragments with grog or non-volcanic temper. At least some of the attributes related to temper is appears to be influenced by the type of temper, and are thus not independent variables.

As seen with the use of organic temper, it is possible that the type of architectural terracottas might influence the choice of the temper used. For this reason, table 4.2-4 compares the number of fragments in each temper type according to the type of architectural terracottas. In general, most architectural terracottas including antefix, sima and geison revetment pieces are produced using all the temper types. The exceptions are the undecorated roof tiles (pan and cover tiles) as well as the ridge tile palmettes, acroteria, and waterspouts which use only non-volcanic temper and grog. The factors at play here might be rather complex, involving changes in production techniques over time; the pan tiles, for example, are all dated to the 5th century and later (section 4.1). This matter will be explored in detail in chapter 7 as it depends on the results of more than just the fabric analysis. At this point is enough to note that while there are some exceptions, the majority of architectural terracotta types are produced using all the major temper groups and as such the type of temper is not restricted to specific roof elements.

4.2.1.3 DENSITY

Raw clay contains numerous undesired material including pebble and organic matter. Such

15 Orton & Hughes 2013, pp. 275-284.

16 Orton & Hughes 2013, p. 282, fig. A.4.

17 Orton & Hughes 2013, p. 284, fig. A.6.

Table 4.2-5: Number of fragments per temper type according to the percentage of air cavities.

Temper type	2 %	5 %	10 %	20 %	Unknown	Total
Grog	6	15	6		12	39
Non-volcanic	6	6	4		56	72
Non-volcanic and grog	30	65	10	1	9	115
Volcanic	24	2	1		1	28
Unknown					11	11
Total	**66**	**88**	**21**	**1**	**89**	**265**

accessories should not be confused with temper, which is added deliberately.[18] In general, clay is first refined at the start of the production process in order to remove unwanted material. This can be as simple as removing large accessories by hand after breaking open all the clumps. Other methods include sieving dry clay or levigation, which involves dissolving the clay in a bath of water and allowing heavier particles to settle at the bottom. Based on evidence observed within the archaeological record, through experimental archaeology, and ethnographic studies, it has been determined that all three refining methods are associated with terracotta production during the Archaic and Classical period.[19] After the initial refinement, the clay is wetted, temper is added and then blended.[20] The blending process is especially important since an even distribution of temper and moisture is desirable to prevent cracking while firing objects. During the experimental making of Corinthian roof tiles, workmen accomplished this by mixing the clay with a shovel and by physically stomping on the clay.[21] An additional advantage of blending and compressing the clay is the removal of air bubbles. Trapped air can cause cracking and warping during the firing process as gasses expand with heat.

The extend to which raw materials were refined varies within the objects from Akragas. There is evidence that the clay used for some objects went through an abbreviated refining process. This is seen in an uneven distribution of temper grain sizes and a higher percentage of small air cavities. These voids are indicative of both the number of organic accessories within the clay as well as incomplete blending. The amount of voids, or air cavities, is thus a sign of the degree to which the raw clay was refined and blended. The amount of visible air cavities that are not associated with organic temper is measured as a percentage of the overall fabric by using the same standardized charts to measure the average percentage of temper. The data is provided in appendix B. A summary of the percentage of voids recorded for each fragment, according to temper type, is provided in table 4.2-5. Of the 28 fragments with volcanic temper, 24 have a void density of 2 percent or less. This indicates that the workmen who used volcanic temper also used a more refined clay. While it appears that the percentage of voids varies according to the type of temper used, this is due to the production processes used and not directly related to the type of temper. For this reason, the density of the fabric is considered an independent attribute.

4.2.1.4 OXIDATION

The difference in colour between the raw clay and fired fabric is the result of the oxidation of iron particles in the natural clay. This occurs when the object is fired at a temperature of around 700° C or higher for longer than eight minutes.[22] It should be noted that this figure is based on pottery and the specific time required for thicker terracotta objects

18 Rye 1981, p. 16.

19 Malacrino 2010, p. 44; Rostoker & Gebhard 1981, p. 213; Rye 1981, pp. 17-18; Winter 1993, p. 305.

20 Henrickson & Blackman 1999, pp. 313-314.

21 Rostoker & Gebhard 1981, p. 215.

22 Orton & Hughes 2013, p. 73; Rye 1981, p. 25.

Table 4.2-6: Number of fragments per temper type according to the level of oxidation.

Temper type	Completely oxidized	Fairly complete	Incomplete oxidation	Misfired	Unknown	Total
Grog	12	18	1		8	39
Non-volcanic	10	9	3		50	72
Non-volcanic and grog	41	46	13	1	14	115
Volcanic	23	2	3			28
Unknown	1				10	11
Total	**87**	**75**	**20**	**1**	**82**	**265**

Table 4.2-7: Number of fragments per type of architectural terracotta according to the level of oxidation and temper.

Type of architectural terracotta	Complete oxidation	Fairly complete	Incomplete oxidation	Misfired	Unknown	Total
Antefix	5	4	2		3	14
Cover tile	3	3				6
Eaves tile		1				1
Geison revetment	7	17	3		7	34
Horizontal geison revetment		1			1	2
Horizontal sima	2		1			3
Horse rider acroterion		6			18	24
Lateral geison revetment	1				2	3
Lateral sima	14	8	1		4	27
Lion headed waterspout		1				1
Pan tile	9	4		1	1	15
Raking geison revetment		1				1
Raking sima		1	2			3
Ridge palmette	24	6	3		23	56
Ridge tile	2	10	4		6	22
Ridge tile antefix	2					2
Sima	7	11	1		7	26
Sima corner fragment					1	1
Waterspout	8				2	10
Other	1		2		5	8
Unknown	2	1	1		2	6
Total	**87**	**75**	**20**	**1**	**82**	**265**

is likely to be more. In an oxygen rich environment this process starts from the outside of the object to the inner core. A colour difference between the margin and the core of an object is therefore evidence of incomplete oxidation, which is normally the result of lower or not sustained firing temperatures.[23] The level of oxidation for each fragment is recorded in appendix B. If the fragment has a uniform colour throughout the visible fracture then the oxidation is considered complete. A slight colour difference between the margin and core indicates that the oxidation process is close to completion. A greyish core colour is then the evidence of incomplete oxidation. A summary of the oxidation levels according to each temper type is provided in table 4.2-6.

While it is not certain if the type of temper used has an impact on the level of oxidation, there does appear to be some correlation. As can been seen in table 4.2-6 none of the fragments with volcanic temper showed evidence of incomplete oxidation; in fact, 23 out of the 28 fragments with volcanic temper were completely oxidized. The fragments with grog and non-volcanic temper have a roughly equal distribution of completely oxidized and fairly complete oxidized fragments.

The thickness of an object can also influence the oxidation process since thicker objects require a longer firing time than thinner ones. In addition, some types of architectural terracottas, such as ridge tiles, are composed of elements of varying thickness. In order to gain an impression of the relationship between the type of architectural terracotta and the level of oxidation a summary of the data of appendix B is provided in table 4.2-7. As can be seen, of the 22 ridge tile fragments, only two are completely oxidized. However, of the 15 pan tile fragments, nine are completely oxidized. This might be because the thickest portion of the pan tile is smaller than the thickest portion of the ridge tile (sizes and profiles are provided in section 4.1). While the level of oxidization is thus an important indicator of firing conditions, it is not a very reliable independent aspect for identifying fabric groups, as the type of architectural terracotta object itself appears to influence the level of oxidation.

4.2.1.5 FORMING TECHNIQUES

The architectural terracottas from Akragas vary in terms of the complexity of the profile and decoration. While a cover tile consists of a fairly simple profile, an anthemion sima with perforations and decoration in relief is much more complex. The techniques for forming the different types of architectural terracottas is thus varied. Based on relevant studies as well as visual observation of fragments (appendix B) the following methods have been identified for the objects from Akragas.

MOULDS

Moulds are made of wood or terracotta and are used for forming complex shapes. As seen on the gorgoneion mould in terracotta from the urban sanctuary at Akragas (figure 4.2-1), elements in relief are in the negative. The clay is layered into the mould, compressed, and allowed to dry until firm, or leather-hard, before being removed.[24] The objects from Akragas were formed upside down, with the back exposed. In general, the back of objects is rougher and shows evidence of being scraped flat with a straight edged tool such as a wooden plank (e.g. VIN 145, 166, 184). When an object requires moulded relief on both the front and back, the two halves are formed separately and then joined before firing (e.g. VIN 364, 370, 619). The gorgoneion mould VIN 243 is of a size similar to the antefixes documented in section 4.1. The closest comparison in terms of decoration is antefix I (section 4.1.30) since it also has a single row of spiral curls consisting of two turns each. However, not enough of the antefix is preserved to determine if this object comes from exactly this

23 Abramov, et al. 2006, pp. 261-263; Rye 1981, p. 119.

24 Rostoker & Gebhard 1981, pp. 220-221; Winter 1993, p. 304.

mould. The gorgoneion plaque (section 4.1.34) is also very similar, but there are variations in the curls as well as the shape and position of the brow.

Figure 4.2-1: Mould for gorgoneion plaque (VIN 243. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

SLABS

Easier forms were created using clay slabs that had been roughly fashioned on the ground or a table by using a rectangular form and/or a roller. The slabs are then shaped over simple forms while the clay is still moist. This method appears to be in widespread use from early simas in Delphi[25] to Hellenistic cover tiles at Gordion.[26] According to #first name# Le Roy early simas from Delphi were too large to form in a mould. He suggests that the clay was first formed into a slab, and then shaped on a simple form with the front surface exposed. The front surface was finished by using a template to scrape along the surface.

POTTER'S WHEEL

A small number of rounded objects, primarily the waterspouts, were formed using a potter's wheel in a similar method as that used for pottery.[27]

HAND SCULPTING

While moulds are useful for the production of smaller scale objects, it was not appropriate for all types of architectural terracotta. Larger and complex shapes, such as fully rounded forms, could not be made in a mould if the moulded form would pinch the shape and prevent removal. For this reason, more intricate objects, such as acroteria sculptures, were sculpted by hand.

COMBINED TECHNIQUES: SLAB AND MOULD FORMING

Several objects were formed as separate pieces in separate moulds or forms and then connected while the clay was leather-hard. For example, moulded antefixes were made using a mould for the plaque while the cover tile was formed separately by shaping a slab of clay over a rounded form. On some antefixes it is quite apparent that the plaque and cover tile were formed separately. On VIN 332 the plaque has a very low percentage of inclusions, compared to the connected cover tile, which indicates that the two objects were formed separately using different fabric groups.

While Le Roy suggests that early simas from Delphi were constructed using slabs, as described above, it appears that this method was used for some of the geison revetments and not the simas at Akragas. Evidence for this forming method can be seen in visible marks left in the surface of objects and in the fractures of the connections. A reconstruction of this process of combined techniques is shown by the example of a geison revetment (section 4.1.1, 4.1.2, 4.1.19) which various elements and production marks are presented in three steps as illustrated in figure 4.2-2.

25 Le Roy 1967, pp. 202-203.

26 Henrickson & Blackman 1999, p. 311.

27 Winter 1993, p. 306.

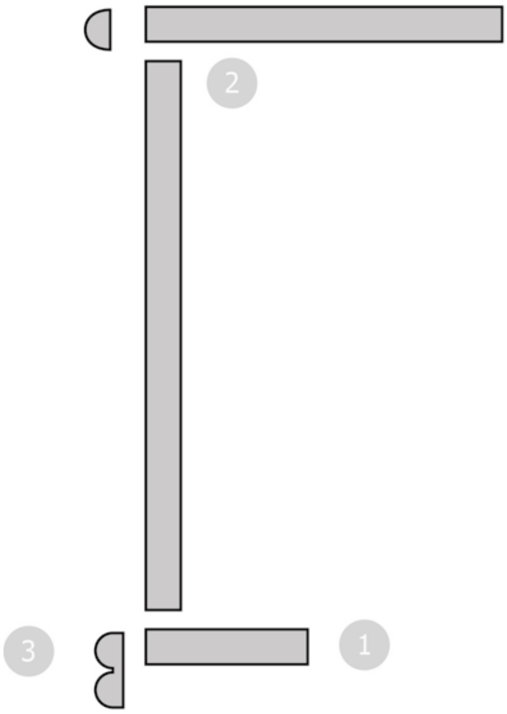

Figure 4.2-2: Reconstruction of the manufacturing process for geison revetment A with its five elements, which are separately formed and the joined. Visible marks on different fragments (VIN 263, 295, 351. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

1. On the back of the soffit flange, a number of fragments contain a vertical groove. The striations in this groove indicate the object was formed while the clay was still wet. Reproduction experiments performed on early Greek roof tiles have found that removing objects from the mould can be extremely challenging and that additional steps are required to achieve successfully this task.[28] The marks left in the clay appear to be from a flat tool which was inserted at the side of the object and then tilted slightly in order to lift the bottom of the object from the mould. This action would also account for the slightly curved profile of the bottom flange as seen in figure 4.2-2.1. The position of the mark on the back edge of the bottom flange is quite significant. It indicates that the mould or form for this element included an unmovable vertical panel for the back edge. The important thing to note here is that this vertical panel would prevent removing the geison revetment if it was formed as a whole. The vertical panels at the top and bottom would pinch in the clay object. Therefore, it is evident that a single mould or form for the entire revetment was not used. Rather it suggests that the main elements were made separately in simple forms and then pressed together while the body have not yet completely dried.

2. The fracture seen in figure 4.2-2.2 would support this theory. The slight vertical and horizontal marks in the fractured edge of a geison revetment fragment indicate that the top flange, vertical geison revetment fascia and top roll were all formed separately and then joined while the clay was still leather-

28 Rostoker & Gebhard 1981, p. 222.

hard. This join can be seen between the front edge of the top flange and roll as well as the top flange and the main vertical face of the geison revetment. It is not very pronounced though, there are no air cavities caught between two elements and rarely do breaks occur here. On the back, the corner join shows very little indication of extra clay or slurry. All this indicates that the separate pieces were joined using pressure and little or no slurry.

3. The regularity and dimensions of the top and bottom rolls would suggest the use of a form as opposed to rolling the elements by hand. The shape and position indicate that they were likely formed in separate forms, one for the top, one combined form for the two bottom rolls together. The use of a mould for the bottom rolls would create a sharp, almost 90-degree edge for the back of the hanging roll. It appears that this edge was smoothed and rounded by hand which accounts for the irregularity seen on the back of the hanging roll (figure 4.2-2.3).

After the various individual elements had been joined and before the fabric became bone-dry, a wooden or metal template was used to scrape along the outer surface to provide for a neater and more uniform shape. Slight vertical grooves formed in the soft clay of the surface of the vertical face as well as the rolls support this theory (VIN 281, 285, 294).

COMBINING OBJECTS

As described in the above section regarding the various methods of forming roof terracotta, some methods involve combining separately formed objects. Before firing they are connected before the clay becomes bone-dry. To accomplish this joining it is common to use a slurry.[29] The antefixes from Akragas all show a thickening of the cover tile where it meets the plaque which indicates the use of wet clay to facilitate the join. In the case of antefix B (VIN 384, 385) the thickening is on the outside edge while the rest of the objects show fortification on the inside join. Slurry or wet clay was also used with the canonical Sicilian sima. The waterspouts (VIN 293, 294) were formed on a potter's wheel and fixed in using a soft clay or slurry. The soft clay was shaped like a ring around the base of the spout against the main fascia. This served the dual purpose of concealing the join as well as providing additional stability to the waterspout, as can be seen on VIN 267 and 355 (figure 4.2-3) The gap between the waterspout and the hole in the sima is visible in the area where part of the ring is now missing. Since this ring is formed by hand its shape is less consistent. It often slightly overrun onto the top and bottom rolls of the fascia strip where the ring is located (figure 4.2-3).

Figure 4.2-3: Evidence of wheel made waterspout fixed in with soft clay which is shaped into a ring around the base of the spout to cover and reinforce the join (VIN 267 and 355. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Objects can also be combined by using pressure instead of slurry or soft clay. If enough pressure is

29 Winter 1993, p. 306.

applied to the join while the clay is not yet leather-hard, then the two objects will seal together. Thus, there will be no air gap between the previously separate pieces and, if the surface is smoothed over, the join becomes invisible.[30] The separately formed geison revetment fragments described above (figure 4.2-2) are an example of this.

When both sides of an object are decorated in relief the two sides are formed separately in moulds and then joined together while the clay is hard but still slightly moist. The ridge palmettes are good examples for this production method. Because the two separate halves are connected, while the clay is still slightly wet, it is not possible to exert a lot of pressure when joining the objects otherwise the relief pattern will be distorted. Therefore, large air gaps are visible within the join on some of the fragments (figure 4.2-4) and a number of objects broke later on along this join (VIN 588, 589, 592, 598, 600).

Figure 4.2-4: The join between two sides of a ridge palmette formed in separate moulds. The epidermis layer is clearly visible (VIN 365. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo)

30 Lulof 1991, p. 119; Rye 1981, p. 72.

SECONDARY FORMING

The majority of fragments in the dataset shows traces of secondary forming (appendix B). This occurs after the objects had been removed from the mould or form, but before the fabric had dried out completely and is therefore still soft enough to cut with a knife. The stepped join on sima fragments (VIN 257, 260, 265, 355) was formed by hand while the clay was still pliable. The perforations on perforated sima fragments (VIN 138, 146, 177) show also the marks left by a knife in wet clay. On the geison revetment plaques, holes were made for the nails which were needed to fix the objects later to the building. Decorations in relief such as hawksbeak, Doric leaves, or figurative motifs on antefixes were retouched or sharpened with a pointed implement. The curvature of the clay around the retouching indicates that the clay was still relatively malleable, even after the primary forming process. The level of malleability raises a concern over unwanted deformation, because even slightly deformed objects have an impact on how well they fit together as a roof. The methods used for addressing this situation will be described in detail in section 4.4.

FORMING TECHNIQUES USED IN AKRAGAS

The forming techniques used for each fragment can be identified by the characteristic traces left on the objects themselves and according to the production principles described above. The multiple evidence for forming techniques for each individual fragment is provided in appendix B. A summary of the number of fragments of each architectural terracotta type according to the forming technique used can be found in table 4.2-8.

The type of architectural object determines the method of forming. Of the 34 geison revetment fragments identified the majority was formed using a combination of moulds and slabs. Antefixes with decoration in relief are formed by using moulds

Table 4.2-8: Number of fragments according to architectural type and method of manufacture.

Type of architectural terracotta	Slab and hand formed	Mould	Mould and slab	Slab	Unknown	Wheel made	Total
Antefix			10	3	1		14
Cover tile			3	3			6
Eaves tile				1			1
Geison revetment		6	21		7		34
Horizontal geison revetment			2				2
Horizontal sima		3					3
Horse rider acroterion	19				5		24
Lateral geison revetment		1			2		3
Lateral sima		25			2		27
Lion headed waterspout	1						1
Pan tile			13	1	1		15
Raking geison revetment			1				1
Raking sima		3					3
Ridge palmette		44			12		56
Ridge tile		3	12	2	5		22
Ridge tile antefix			2				2
Sima		24			2		26
Sima corner fragment					1		1
Waterspout						10	10
Other	1	1	2		4		8
Unknown		5			1		6
Total	**21**	**115**	**66**	**10**	**43**	**10**	**265**

and slabs as well, ridge palmettes are all formed using only moulds. The method of manufacture is thus determined by the type of architectural terracotta and can therefore not be considered as an independent attribute.

4.2.1.6 SURFACE FINISH

The architectural terracottas of Akragas demonstrate a number of different finishing methods which were formed or applied to the surface of the main fabric body of an object before firing. The described methods of forming as well the specific temper produced finished surfaces of varying quality whereas the smoothness has an impact on the visual appearance of the object itself. Sicilian workshops employed various techniques in order to improve the final surface which are described in the following.

EPIDERMIS

This method of manufacture seen in Greek architectural terracottas makes use of two separate layers of fabric placed in a mould. The first layer, called the epidermis, can vary between a couple of millimetres up to a centimetre in thickness. It consists of very fine, highly levigated clay that is placed in the mould first. After this layer a heavier, tempered clay is added (figure 4.2-5). The fine clay of the epidermis layer thus forms an outside surface that is very smooth and with sharper definition in the moulded decoration.[31] According to Lulof this technique is very difficult to fire without cracking the thinner, less tempered epidermis and is, therefore, considered a technique that requires considerable skill and knowledge.[32] It appears on all types of architectural terracottas including geison revetment, sima, ridge tile, and antefix fragments from Akragas (table 4.2-9).

Figure 4.2-5: Epidermis layer on top of tempered clay (VIN 181. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

SLIP

Within Greek and Italian architectural terracottas the use of a slip is well documented. It involves the application of a thin layer of fine clay to an object after it is removed from the mould.[33] The slip layer can be distinguished from the epidermis technique because the latter is added during the moulding process and is only applied to the front surface. In contrast, the slip is added after the object has already been moulded and can cover the entire surface. The slip layer is generally thinner than the epidermis layer and of a relatively uniform thickness. Distinguishing between a slip layer and the paint layer is more complicated by the fact that the white paint used for decoration is most often finely levigated white clay which is similar in appearance to the slip layer. For the purpose of this study only a layer that clearly covers the entire original surface is categorized as slip. The slip layer is slightly thicker than painted layers and can still be seen in areas where the paint has flaked off. A number of examples exist of where the both an epidermis and a slip layer are applied to an object, including VIN 365 (figure 4.2-6). Here, the epidermis consists of fine red clay that is applied while forming the object with a mould. Slight air gaps are still visible between the epidermis layer and the main fabric body. After removing the object from the mould, a pale yellow slip is applied either by brush or by dipping the object. Traces of red pain are still visible on top of the bright slip layer.

Figure 4.2-6: Fragment of ridge tile palmette showing grog laded fabric core, a fine red epidermis layer and a light coloured slip layer with traces of red paint on top (VIN 365. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

PAINT ONLY

A number of fragments from Akragas have the painted decoration applied directly on the main

31 Kenfield 1997, p. 107.

32 Lulof 1991, p. 132.

33 Conti 2012, pp. 36, 60, 89; Kenfield 1997, p. 107; Lulof 1991, p. 132.

fabric body before firing. It appears that when the clay matrix is pounded into the mould or form the pressure and vibration forces moisture and finer particles to the outsides, creating a smoother surface layer. The effect is more successful for the grog laded fabrics. The ones containing volcanic material as temper have a more uneven surface finish with the temper particles visible even through the painted decoration (figure 4.2-7). In general, an uniform paint layer covering all the surfaces was added.

Figure 4.2-7: Dark grain temper visible through painted finish (VIN 137. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

FINISHING TECHNIQUES USED IN AKRAGAS

As discussed in the preceding sections, in essence, it is possible to distinguish between four different techniques used for finishing the surfaces of the architectural terracottas from Akragas: an epidermis layer, a slip layer, a slip and epidermis layer, and lastly a paint layer applied directly to the main fabric. These methods are recorded for each fragment in appendix B when a clean fracture and the level of preservation allow for visual identification of the finishing technique. A summary is provided in table 4.2-9. The fragments are again divided according to architectural type and then the number of fragments exhibiting each finishing technique is indicated. As can be seen, the most commonly used finish is the slip layer, with 82 fragments in total. 65 fragments are finished with the paint-only technique. The use of a slip and epidermis layer is not very widespread and is restricted to ridge tile palmettes except for a single ridge tile.

4.2.1.7 PAINTED DECORATION

Paint is usually applied after the object had been formed and allowed to dry, but before firing.[34] The majority of the painted decoration is added by hand except for the guilloche pattern on the geison revetments, which was drawn using a compass.[35] On a number of geison revetment fragments there are small circular depressions in the centre of each circular band that was left in the wet clay by the needle of the compass (figure 4.2-8.a) (VIN 276, 354).[36]

The level of execution of the painted decoration varies but there are major tendencies traceable. On some geison revetment fragments an abundance of mistakes and corrections is visible; outlines do not connect or overlap, lines and bands differ in width, and some bands veer away from the painted outline (figure 4.2-8.a). On the other end of the spectrum there are examples (figure 4.2-8.b), in which the painted lines are consistent in width with sharp edges and a uniformly applied thickness. The level of execution for each fragment is rated from

34 Kenfield 1997, p. 107; detailed Winter 1993, p. 306 for Greek architectural terracottas and Lulof 1991, p. 120 for Etruscan architectural terracottas.

35 Winter 1993, p. 306.

36 De Miro 1965, p. 42.

Table 4.2-9: Number of fragments per type of architectural terracotta according to the finishing technique used.

Type of architectural terracotta	Epidermis	None	Paint only	Slip	Slip and epidermis	Unknown	Total
Antefix	3			8		3	14
Cover tile		3		2		1	6
Eaves tile				1			1
Geison revetment	3		10	19		2	34
Horizontal geison revet-ment			1			1	2
Horizontal sima	1		1	1			3
Horse rider acroterion	1			18		5	24
Lateral geison revet-ment	1			2			3
Lateral sima	1		20	1		5	27
Lion headed waterspout				1			1
Pan tile		11		1		3	15
Raking geison revet-ment			1				1
Raking sima			1	1		1	3
Ridge palmette	2		1		34	19	56
Ridge tile		1	5	14	1	1	22
Ridge tile antefix				1		1	2
Sima	2		15	4		5	26
Sima corner fragment						1	1
Waterspout		1	9				10
Other			1	4		3	8
Unknown	1			4		1	6
Total	**15**	**16**	**65**	**82**	**35**	**52**	**265**

poor to excellent based on these considerations. A summary of the ratings is provided in table 4.2-10, according to each type of architectural terracotta. Most of the fragments do not preserve enough painted decoration and are, therefore, labelled as unknown. From the findings it appears that the level of execution on both sima and geison revetment fragments range from excellent to poor with the majority of fragments falling in the middle.

Guidelines for the painted decoration were incised on objects before the clay became bone-dry. Examples include centrelines for the guilloche pattern (figure 4.2-8), and outlines for hand painted patterns including the meander pattern (figure 4.2-9). The presence of guidelines is noted for each fragment in appendix B. In general, they appear to be limited to particular patterns such as the guilloche pattern or meander. On objects with moulded decoration, such as gorgoneion antefixes or anthemion simas, there are no incised guidelines for the painted decoration. The presence of such incisions is therefore not an independent attribute as it is linked to the type of object and the forming method.

In essence, the painted decoration comes in a combination of only three colours: red, black, and white. In addition, there is some variation in the specific colour, for example the red can be a purplish red, brick red or reddish orange. The

Table 4.2-10: Number of fragments according to architectural type and level of execution of painted decoration.

Type of architectural terracotta	Excellent	Fair	Poor	Unknown	Total
Antefix		2		12	14
Cover tile				6	6
Eaves tile		1			1
Geison revetment	3	13	2	16	34
Horizontal geison revetment			2		2
Horizontal sima	2	1			3
Horse rider acroterion				24	24
Lateral geison revetment	1			2	3
Lateral sima	4	9	1	13	27
Lion headed water-spout				1	1
Pan tile				15	15
Raking geison revetment			1		1
Raking sima		1		2	3
Ridge palmette				56	56
Ridge tile		9		13	22
Ridge tile antefix				2	2
Sima	2	11	1	12	26
Sima corner fragment				1	1
Waterspout		7		3	10
Other				8	8
Unknown		1		5	6
Total	**12**	**55**	**7**	**191**	**265**

white paint consists of light coloured levigated clay. It appears that on objects with a slip or epidermis layer the parts of the design which required a light colour were thus achieved by just leaving the slip or epidermis layer unpainted. For this reason, while recording the colour no further distinction is made between painted decoration with or without a finishing layer. In this analysis, the focus is on the applied colour and a summary of number of fragments in each painted category is provided in table 4.2-11. The painted decoration on a large number of fragments (106 out of 265) could not be determined, because the fragment is either too small or too damaged. White colour alone is not present, but only in combination. 28 fragments show no painted decoration at all, on closer inspection these are pan or cover tiles or palmettes (see appendix A and B). In the case of the palmettes it seems that the paint colours differentiate between two groups, those with no paint and those with red paint whereas this architectural type represents the majority within the group of fragments with only red paint. Most objects with traces of the painted decoration preserved make use of a decorative scheme in red, black, and white.

Figure 4.2-8: Painted decoration, a: irregularly applied (VIN 354), b*: regularly applied (VIN 184. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).*

Figure 4.2-9: Incised guidelines for the hand painted meander pattern (VIN 262. Copyright Regione Siciliana - Assessorato Reg.le dei BB. CC. e I. S. - Su concessione del Polo Regionnale di Agrigento - Museo Archeologico "Pietro Griffo" - divieto di duplicazione con qualsiasi mezzo).

Table 4.2-11: Number of fragments according to paint colours used.

Painted colours	Number of fragments
Black only	2
Black and white	8
Red, black, and white	101
Red only	20
None	28
Unknown	106
Total	**265**

4.2.2 A FABRIC TYPOLOGY

In the preceding sections the various attributes related to raw material and production techniques were described and evaluated. This constitutes the first step in the creation of a fabric typology for the present study. The second step involves the selection of appropriate attributes which can be used for identifying a fabric type. An appropriate attribute meets the following criteria: it is responsible for variation in the dataset and it is independent from other variables. Based on this framework the various attributes are subsequently evaluated.

With regard to the first requirement the colour of the painted decoration, as shown in table 4.2-11, is not a suitable attribute as the majority of objects are painted with red, black, and white paint. If the colour of painted decoration was to be used to organize the fragments into different groups then almost all the decorated objects would fall within one group. The painted decoration is therefore not responsible for variation in the dataset and cannot be used in the identification of fabric groups.

The second requirement for an appropriate attribute is independence. The size of temper grains, for example, was shown to be related to the type of temper used and is therefore considered to be a dependent variable. Another example are the forming techniques. Antefixes with moulded relief, for instance, are formed with the use of a mould while the cover tile is formed by shaping a slab of clay over a simple form before the two objects are joined and then fired. The forming technique is, therefore, determined by the type of object, irrespective of fabric groups. For this reason, forming technique is not an appropriate attribute to use in the creation of a fabric typology.

Based on the above mentioned selection criteria of variation and independence the following attributes were chosen for the identification of specific fabric groups in this study: fabric colour, temper type, fabric density, and surface finish. By using these attributes as variables it is possible to create a large number of groups statistically. However, the fact is that the majority of these groups might not be applicable to the architectural terracottas of Akragas. For example, in table 4.2-5 it is apparent that none of the fragments with grog temper has a void density higher than 10 %. Defining a fabric group with grog temper and void density of 20 % would thus be redundant. The specific characteristics used for defining the fabric types are therefore selected in order to describe the major groupings in the dataset, guided by established groups of objects already identified in section 4.1-4.2. Since the typological categories are created in order to fit a specific dataset, such types are inherently subjective. According to influential scholars in the field of ceramic typology, the purpose of a typology is to distinguish between different groups of objects in a manner that is meaningful to the researcher and the research question. A certain level of subjectivity is therefore unavoidable.[37] Eight fabric groups have thus been identified by running queries on the dataset provided in appendix B and taking the criteria identified in this chapter as basis. These groups are:

Fabric A: The group is characterized by a reddish clay (10R 6/6-5YR 6/8) with light coloured inclusions, some of which have a crystalline structure. A large percentage of the inclusions is identifiable as grog. The percentage of inclusions ranges from 3-5 %. The fabric is fairly dense, with small air cavities at around 5 %. The paint is applied directly on the surface.

Fabric B: The clay colour is reddish yellow (5YR 6/6-7.5YR 7/4). The inclusions are of a similar colour as the clay matrix, some of which can be identified as grog. The fabric has a rather porous appearance, with air cavities at a density of around 10 % and more. The surface finish is a slip layer of clay similar in colour to the main fabric (10YR 7/4).

Fabric C: The fabric matrix has a reddish colour (2.5YR 6/4-10R 6/8) and is rather dense with small air cavities at less than 2 %. The inclusions are of a similar colour as the clay matrix, some of which can be identified as grog, and are at a density of around 2 %. The surface finish is an epidermis of highly levigated clay with few visible inclusions and a similar colour as the main fabric. The epidermis varies in thickness according to the relief of the object. On top of the epidermis there is a 2-4 mm thick slip layer of fine pale yellow clay (10YR 8/2).

Fabric D: The fabric matrix has a pale reddish yellowish colour (5YR 7/3-2.5Y 7/3) and is not as dense as fabric C, with small air cavities at less than 5 %. The inclusions are of a similar colour as the clay matrix, some of which can be identified as grog, and are at a density of around 5 %. The surface finish is an epidermis of highly levigated reddish clay with few visible voids. The epidermis varies in thickness according to the relief of the object. On top of the epidermis there is a 2-4 mm thick slip layer of fine pale yellow clay (10YR 8/2).

Fabric E: The fabric is similar to fabric A except for smaller differences. The clay is a pale yellowish reddish (5YR 7/4-7.5YR 7/3) with a higher density as the small air cavities are at less than 2 %.

Fabric F: The fabric matrix has a reddish yellowish colour (5YR 6/6-7.5YR 6/3) with a high density

37 Adams & Adams 1991, p. 91; Shepard 1956, p. 308; Winther-Jacobsen 2010, p. 49.

and air cavities at less than 2 %. The inclusions are dark reddish, grey or brown grains with a rounded shape, most likely volcanic gravel. The percentage of inclusions range from 7-15 %. The paint is applied directly on the surface.

Fabric G: The fabric is similar to fabric F, except for the presence of a surface finish. The epidermis layer has the same colour as the main fabric.

Fabric H: The fabric matrix has a pale yellowish to yellowish colour and uses grog and non-volcanic temper. The fabric is not very dense, with air cavities of up to 10 %. No surface finish or painted decoration.

Table 4.2-12: Number of fragments according to fabric type.

Fabric groups	Number of fragments
Fabric A	39
Fabric B	33
Fabric C	10
Fabric D	8
Fabric E	6
Fabric F	8
Fabric G	9
Fabric H	6
Outliers	33
Unknown	113
Total	**265**

A brief summary of the total number of fragments within each fabric group is provided below in table 4.2-12. For 113 fragments out of 265 there is not enough information available on the fabric and surface finish. Of the remaining fragments, 119 could be assigned to the eight fabric groups, with the most fragments falling with fabric groups A and B. The attributes for 33 fragments fall outside the main fabric groups. This group contains fragments including VIN 182 and 616, which are part of frieze I and are suspected of being part of a sarcophagus (section 4.1.15), as well as VIN 197, which is the single fragment identified as eaves tile B (section 4.1.36). The majority of the 33 fragments therefore constitute outliers, isolated examples which do not fall within the major fabric groups and, furthermore, not in the stylistic groups (section 4.1). The fabric group for each fragment as well as reasons why it cannot be assigned to one fabric type is detailed in appendix A.

CONCLUSIONS

While the main aims of this chapter are interconnected, the final products are quite distinct. The achievement of the research aims relies on a systematic investigation of the production process based on the traces left within the finished product. Based on this information it was thus possible to define characteristics, or independent attributes, which define major groups of objects within the 265 fragments from Akragas. The fabric typology is especially important for the identification of objects which belong to the same roof (chapter 5). But this chapter also lays the groundwork for the detailed investigation of the actual manufacture and workshops by identifying preferred raw materials and production techniques. From the choice of raw materials, especially temper, as well as the preparation of such materials to the methods used for forming objects as well as the various techniques for finishing decorated surfaces, all provide important insights into the production of architectural terracottas at Akragas.

The methodological and theoretical framework applied to the creation of the fabric typology is described above in chapter 3. One of the main components centres on the evaluation of each attribute in terms of the impact it has on the dataset as well as the factors that influences it in turn. The importance of using independent variables from a statistical point of view is emphasized by scholars focussing on typologies and is demonstrated in this chapter. For example, the forming techniques used are strongly related to the type of objects being produced. Therefore, a specific forming technique cannot be applied to identify objects from the same roof, as it would exclude objects from the same roof which are made by a different forming technique only because they are of a different architectural type. Through this process the attributes with the most significant impact on the fabric typology have been identified as fabric colour, temper, fabric density, and surface finish.

Furthermore, it has become apparent that, in essence, there are two types of appropriate attributes for creating a fabric typology of the architectural terracottas from Akragas. One is the independent attribute, such as temper type, which is useful for identifying different fabric groups. The second group of attributes, such as oxidation, forming techniques, and the painting methods cannot be used for the same task as they are all influenced by other factors, including the architectural type of an object. That does not mean that these attributes are not also important to the discussion of production techniques and workshops. Nevertheless, they can only taking into account and discussed once the objects have already been grouped into roofs or types. In essence, they should not be used for identifying or establishing types, but rather for describing existing types. This part of the discussion is therefore located below, once the new roof typology has been defined in chapter 5.

4.3 COMPOSITIONAL ANALYSIS

The most widely used archeometric methods employed in the study of ceramic and terracotta objects from Sicily in the past and present includes thin section petrography and wavelength dispersive x-ray fluorescence (WD-XRF). As discussed in chapter 3, each particular method provides information on a specific aspect of the material under investigation, and it is therefore necessary to use a combination of methods in order to obtain the most comprehensive results. [1] These methods have a well-established methodology regarding the preparation of samples, measuring and analysing results, which will also be used for this investigation. Both petrographic and WD-XRF analysis requires rather large samples of material for destructive analysis. Experience in the field have shown that around $6cm^3$ of raw material is required in order to obtain a suitable sample for the creation of thin sections , 2g of powdered material and $2cm^3$ of reference material. It was possible to obtain the necessary samples from objects excavated at the S. Anna extra urban sanctuary, these objects include pan and cover tiles as well as ridge tiles and sima fragments.

The large samples required for analysis using petrography and WD-XRF makes these methods unsuitable for the study of museum objects. A recent development in archeometric studies is the use of a handheld XRF (HH-XRF) device on archaeological material. As discussed in chapter 3, the HH-XRF closely match the pure measuring capabilities of conventional laboratory based XRF technology, but as this is a new technology, a scientifically robust methodology or interpretative framework for these tools has not yet been established and a number of concerns are currently being investigated by specialists in the field.[2] The two main concerns of relevance to this study centres on the calibration of data[3] and the use of HH-XRF on non-homogenous material. [4] The HH-XRF measures elements as a spectrum range that indicates the relative presence of an element in the sample. The spectral data can be expressed as counts per second. This means that the results are qualitative, since it provides an indication of which material is the most or least counted. In order to calculate quantitative data it is necessary to calibrate the data. To date the recommended calibration file was one provided by the manufacturer and based on mudrock samples. A recent study by Hunt and Speakman, however, have demonstrated that the mudrock calibrations are less reliable for archaeological ceramics and that custom calibration based on certified reference material (CRM) of a similar matrix provides more accurate results.[5] This study will therefore calibrate the HH-XRF based on 6 CRM samples. The reliability of this custom calibration can be tested on the objects from S.Anna that were measured with both HH-XRF and WD-XRF as the WD-XRF data provide a benchmark for the calibrated HH-XRF data.

The concern regarding non-homogenous material is based on the fact that the HH-XRF only measures an area of about $5mm^2$ on an object. Non-homogenous fabrics with large inclusions thus provide a challenge as the inclusions might differ in chemical composition, which will influence the measurements. For the Hunt and Speakman study material was ground down to a homogenous powder, which is the same method used for WD-XRF samples. But this method is not possible for non-destructive analysis. In order to address this concern multiple measurements were taken for each object in order to obtain a more representative reading.

1 Degryse & Braekmans 2014, p. 191.

2 Frahm & Doonan 2013; Hunt & Speakman, 2015; Shackley 2010; Speakman & Shackley 2013.

3 Speakman & Shackley 2013, p. 1437; Shugar & Mass, 2012, pp. 19-28.

4 Shugar & Mass 2012, p. 28.

5 Hunt & Speakman 2015.

Archeometric methods are most often employed in archaeology in order to establish provenance.[6] Provenance testing is based on the "Provenance Postulate" as formulated by Wiegand eta all in 1977 and which is described in greater detail in chapter 3. In short, the postulate is based on the fact that the raw material from different geographic locations differs in terms of chemical composition. In theory it is therefore possible to both distinguish between objects made from different sources as well as to link these different groups to geographic locations by identifying characteristic chemical compositions. The aim of this investigation is thus the identification of different population groups in the objects from Akragas as well as the identification of possible imports by comparing these populations groups with the published chemical composition of objects associated with different locations in Sicily.

4.3.1 PETROGRAPHIC ANALYSIS

Petrology is a widely used and established method for the study of ceramic materials. The method relies on thin sections of material that are placed between glass plates and polished before observation under a polarized microscope. By viewing the material under different polarized light conditions it is possible to identify minerals such as commonly encountered Kaolinite and K-feldspar based on characteristic optical properties. This method provides the mineralogical composition of both the clay matrix as well as the inclusions. It is also possible to gain information regarding manufacturing processes, such as the temperature at which objects were fired. By establishing characteristic mineralogical components it is thus possible to identify groups of objects that are related in regards to the raw mineral sources used and the methods of manufacture.[7] Based on the mineralogical characteristics observed through this method it was possible to identify 3 population groups in a collection of 12 roof tile samples from the S. Anna excavation.

4.3.1.1 PETROGRAPHIC GROUP A

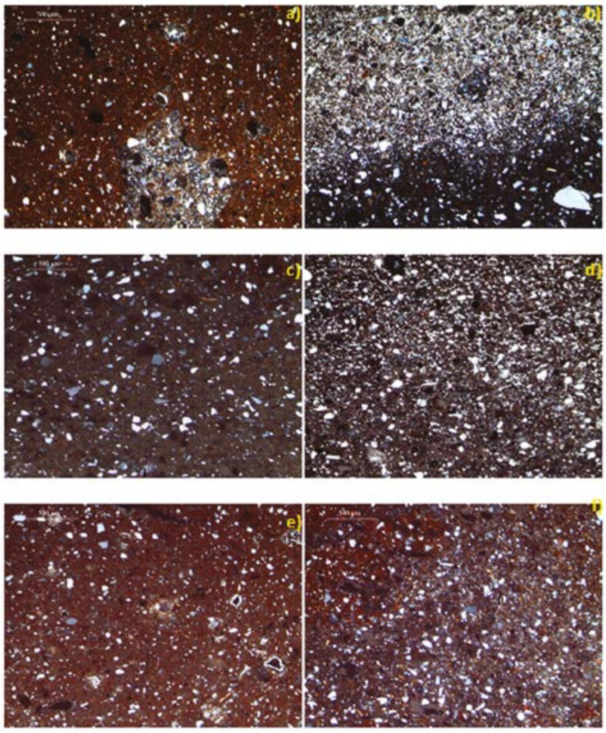

Figure 4.3-1: Photomicrographs of Petrographic group A (a: VIN 422, b: VIN 425, c: VIN 430, d: VIN 432, e: VIN 436, f: VIN 437). All photomicrographs are taken under crossed Nicols (XP)

This group is the largest of the three groups identified. It consists of six objects (VIN 422, 425, 430, 432, 436, and 437). The predominant mineral observed is monocrystalline subangular quartz which is accompanied by laths of mostly brown mica(biotite) although less white mica (muscovite) is also present (figure 4.3-1). In rare instances k-feldspars are visible, as is plagioclases as well as mica schist. Grog is visible in VIN 422 (figure 4.3-1.a). All the samples have inclusions which show a close- to single- spaced porphyric related distribution and have a coarse to fine (c:f) ratio of 40:55. The coarser fraction (<0.05 mm) is

6 Degryse & Braekmans 2014, p. 191.

7 Degryse & Braekmans 2014, p. 193; Orton & Hughes 2013, pp. 162-3; Peterson & Betancourt 2009, p. 2; Williams 1983, p. 301.

exclusively of siliceous composition. Planar and vugh voids are in most cases filled with micritic calcite of secondary origin and occupy around 5% of the visible field (figure 4.3-1.b, d, e and f). The groundmass is inhomogeneous and the micromass is optically active exhibiting a crystallitic and porostriated b-fabric and a green brown colour under crossed polars (XP) and light brown in plane polarized light (PPL).

4.3.1.2 PETROGRAPHIC GROUP A2

This group consists of three fragments, VIN 421,423 and 427. It is similar to group A except for the presence of microfossils, most likely green algae and foraminifers, in an extent area of the samples (Fig 2a-c).

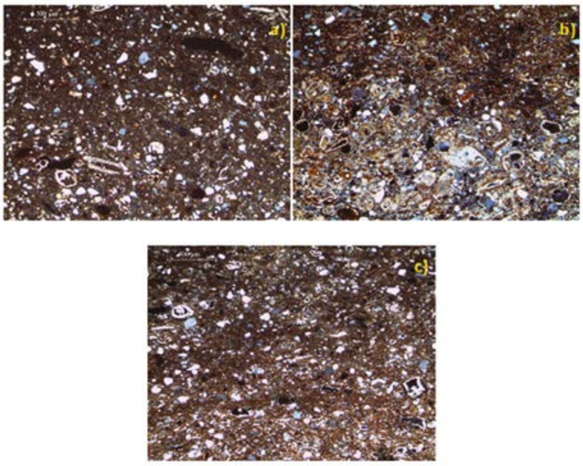

Figure 4.3-2: Photomicrographs of Petrographic group A2 (a: VIN 421, b: VIN 427, c: VIN 423) All photomicrographs are taken under crossed Nicols (XP)

4.3.1.3 PETROGRAPHIC GROUP B

This group consists of three samples (VIN 424, VIN 426, VIN 433). The predominant minerals present in the clay fabric is a subangular to subrounded monocrystalline quartz and the re-depositioned micritic calcite (figure 4.3-3.a-c). Plagioclase and k-feldspars are rare to few samples. This group differs from group A and A2 due to the absence of mica. The grain size of coarse fraction lies to the field of fine sand (<0.06 mm) and occupies about the 30 % of thin section. Porosity is about 5-10% and is represented mainly by vughs and planars. The micromass is characterized by crystallitic and porostriated b- fabric and is slightly activeand seems to be sporadically vitrified. Under crossed polars (XP) a dark green micromass is visible, under plane light (PPL) is appears light green brown.

The absence of mica, the green colour of the micromass, the high porosity and the slightly active micromass are characteristics of a higher firing temperature as compared to groups A and A2.

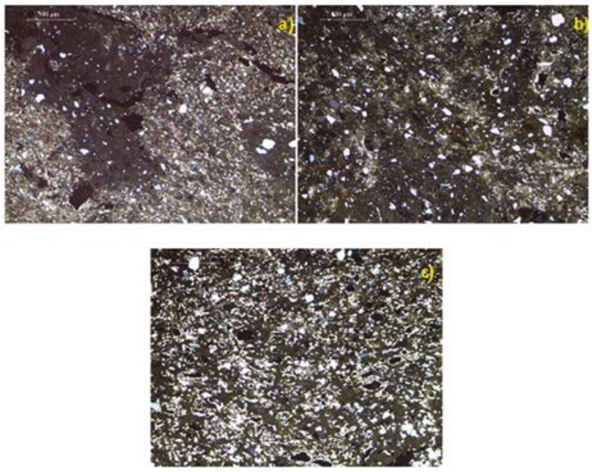

Figure 4.3-3: Photomicrographs of Petrographic group C (a: VIN 424, b: VIN 426, c: VIN 433). All photomicrographs are taken under crossed Nicols (XP)

4.3.2 CHEMICAL COMPOSITION

The current excavation at the extra-urban sanctuary of S. Anna, provided the opportunity for destructive laboratory analysis in order to determine the chemical composition of roof terracottas from Akragas. Samples from a wide range of roof terracotta objects including plain pan and cover tiles, ridge tiles and sima fragments in the canonical Sicilian phase were collected and analysed using WD-XRF. The method used for preparing and measuring the samples are well established in archeometric sciences and are

Table 4.3-1: Chemical composition of roof terracotta elements from the S. Anna excavation as measured by WD-XRF. Major elements only, measurements are given as the weight percentage (wt%)

VIN	Al_2O_3	CaO	Cl	F	Fe_2O_3	K_2O	MgO	MnO	Na_2O	P_2O_5	SiO_2	SO_3	TiO_2
569	16.744	16.72	0.39		7.48	1.19	3.05	0.07	0.58	0.31	51.65	0.31	1.05
568	17.02	15.20	0.05		8.12	1.30	2.74	0.09	0.61	0.32	52.91	0.17	1.04
564	15.67	14.87	0.06		7.53	1.64	3.28	0.08	0.85	0.38	53.92	0.17	1.04
562	17.76	11.59			8.10	1.38	2.71	0.08		0.30	56.57	0.20	0.98
571	18.00	11.75			7.78	1.32	2.76	0.07	0.01	0.32	56.59	0.13	0.99
567	16.31	15.40			6.77	1.50	2.58	0.08	0.01	0.34	55.68	0.23	0.86
563	17.31	16.80	0.03		7.68	0.55	2.82	0.09	1.13	0.40	51.71	0.08	1.01
421	15.78	15.66	0.07	0.26	6.48	1.24	2.52	0.06	0.45	0.33	55.68	0.12	0.91
422	16.70	10.98	0.06	0.27	6.46	1.59	3.21	0.06	0.73	0.34	58.22	0.13	0.94
423	15.30	16.96	0.09	0.28	6.62	1.50	2.84	0.07	0.68	0.33	53.84	0.23	0.93
424	16.29	15.73	0.02	0.21	6.14	0.47	3.15	0.05	1.47	0.31	54.86	0.12	0.91
425	15.24	16.80	0.03	0.43	6.27	0.95	3.06	0.06	0.73	0.37	54.63	0.21	0.87
426	13.57	18.07	0.01		5.68	1.25	3.10	0.06	1.03	0.27	55.77	0.11	0.80
427	15.60	14.85	0.06		6.92	1.50	2.90	0.06	0.76	0.32	55.49	0.18	0.93
428	16.21	11.53	0.09	0.25	6.75	1.62	3.40	0.07	0.86	0.27	57.60	0.11	0.93
429	14.12	14.80	0.01		5.81	1.11	3.34	0.06	0.90	0.25	58.35	0.16	0.80
430	16.83	10.85	0.03		6.28	1.65	2.89	0.07	0.50	0.28	59.38	0.03	0.93
431	13.25	14.83	0.02		5.95	1.37	2.48	0.05	0.86	0.23	59.85	0.06	0.83
432	16.03	10.51	0.10	0.50	5.94	1.09	2.88	0.07	0.53	0.31	60.73	0.10	0.89
433	14.31	17.98	0.02	0.23	6.48	1.02	3.21	0.07	0.80	0.26	54.39	0.08	0.88
434	16.17	15.49	0.01		6.56	0.81	3.63	0.07	0.92	0.28	54.88	0.03	0.89
436	16.58	10.04	0.07	0.63	6.46	1.61	3.39	0.06	0.92	0.28	58.69	0.10	0.96

described in Chapter 3. The chemical composition of these samples are provided below. Major elements in ceramic materials are characterized by a low atomic number (or Z number) which is a reflection of the number of protons in the nucleus of that element. These elements are given as elemental oxides in weight percentage values (wt%). Minor and trace elements have a higher atomic number and are given as elements as measured in parts per million (ppm).[8] The major and minor elemental composition of the objects from S.Anna are provided below in table 4.3-1 and table 4.3-2 .

The elements measured behave in complex and varied ways during soil formation processes, firing and post deposition conditions. Certain oxides, or groups of trace elements, are known to be indicative of characteristic soil features that can therefore be related back to the raw sources used for manufacturing. For example: lithophile elements, such as Rb, Sr, Ba and Th are linked to the silicate phases in soils.[9] In archeometric studies a lot of attention has been given to the identification of oxides and elements which are the most appropriate in evaluating ceramic material as measured by different methods.[10] Since WD-XRF has a long history of use on archaeological material the specific combination of major, minor and trace elements used in analysis is well established.

8 Hunt & Speakman 2015, p. 627.

9 Degryse & Braekmans 2014, p. 194.

10 Degryse & Braekmans 2014; Hunt & Speakman. 2015

Table 4.3-2: Chemical composition of roof terracotta elements from the S. Anna excavation as measured by WD-XRF. Minor and trace elements measurements are given as parts per million (ppm)

VIN	Ba	Ce	Cr	Cu	Nb	Ni	Pb	Rb	Sr	Y	Zn	Zr
569	2265.21		233.84	125.18			68.12	76.55	934.25		174.27	891.53
568	1942.89		233.84	112.66	57.22	165.43	87.58	87.49	1028.86		174.27	769.96
564	2498.00		219.23		42.92	190.88	48.66	120.30	1289.03		186.72	796.97
562	1128.13		379.99		57.22	127.25	38.92	109.36	827.82		211.62	851.00
571	1011.73		277.69			165.43	48.66	76.55	827.82		186.72	648.38
567	581.97		204.61	87.63			58.39	109.36	1123.47		149.38	729.43
563	1450.45		219.23			203.60	38.92	229.66	1218.08		136.93	864.51
421	2417.42		233.84	62.59	42.92	63.63	38.92	76.55	863.30	50.80	149.38	634.88
422	1459.40		219.23	75.11	28.61	127.25	29.19	76.55	603.13	25.40	112.03	540.32
423	1289.29		219.23	62.59	28.61	114.53	58.39	87.49	815.99	38.10	161.82	675.40
424	850.57		277.69	112.66	28.61	101.80		32.81	993.38	38.10	87.14	580.84
425	1325.10		263.07	75.11	42.92	127.25	29.19	54.68	910.60	38.10	112.03	688.91
426	537.20	491.36	233.84	75.11	42.92	76.35		65.62	934.25	38.10	136.93	580.84
427	1862.31		321.53		42.92	114.53		87.49	863.30	50.80	149.38	675.40
428	1360.92		277.69		57.22	127.25	38.92	98.42	638.60		199.17	553.83
429	447.67	515.93	248.46	87.63	28.61	114.53		54.68	721.39	38.10	112.03	580.84
430	922.20		263.07	100.14	128.75	76.35	29.19	54.68	685.91	38.10	112.03	594.35
431	635.69		190.00		42.92	101.80		87.49	733.21	25.40	149.38	769.96
432	1486.26		263.07	50.07	28.61	101.80	48.66	32.81	685.91	38.10	112.03	634.88
433	805.81		204.61		42.92	114.53		65.62	1040.69	38.10	136.93	783.46
434	805.81		292.30	62.59	42.92			32.81	886.95	25.40	161.82	634.88
436	752.09		131.54	62.59	42.92	89.08	29.19	76.55	532.17	38.10	149.38	499.80
437	1226.62		219.23	62.59	28.61	89.08	29.19	43.74	603.13	38.10	124.48	607.86

The standard elements used for analysis in these publications are Na_2O, MgO, Al_2O_3, SiO_2, P_2O_5, K_2O, CaO, TiO_2, MnO, Fe_2O_3, V, Cr, Co, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba, La and Ce.[11] As can be seen in table 4.3-2 V, Co and La were not detected in the WD-XRF analysis of the S. Anna objects, and will therefore not be included in this analysis.

The ratio between key elements is useful as a first step identifier of patterning in the dataset and is frequently used by scholars.[12] The relationship between major elements, given as oxides, are shown in as pairwise plots in figure 4.3-4 and the minor elements in figure 4.3-5. The petrographic groups are shown in these plots in order to evaluate the first groupings that have been identified in the data set. It appears that group A can be distinguished from group A1 and B due to lower levels of CaO and higher levels of Al_2O_3 and SiO_2. There is one fragment (VIN 425) from group A, however, which consistently plot with group A1 and B. Group A2 is distinguished by higher levels of Rb and lower levels of SiO_2. While there is considerable overlap between group A2 and B in especially in regards to CaO and SiO_2, group B can nevertheless be distinguished from group A2 by higher levels of Sr and lower levels of Al_2O_3. A number of the pairwaise plots show linear groupings (e.g MnO, Y, Nb and Ce). This is related to the detection limit of the instrument for these elements. For example,

11 Aguilia, et al. 2011; Aquilia, et al. 2012; Barone, et al. 2011; Barone, et al. 2005; Belfiore, et al. 2010.

12 Aquilia, et al. 2015, fig 4; Aquilia, et al. 2012, p. 446, fig 2; Barone, et al. 2005, p. 753, fig 3; Belfiore, et al. 2010, fig 7.

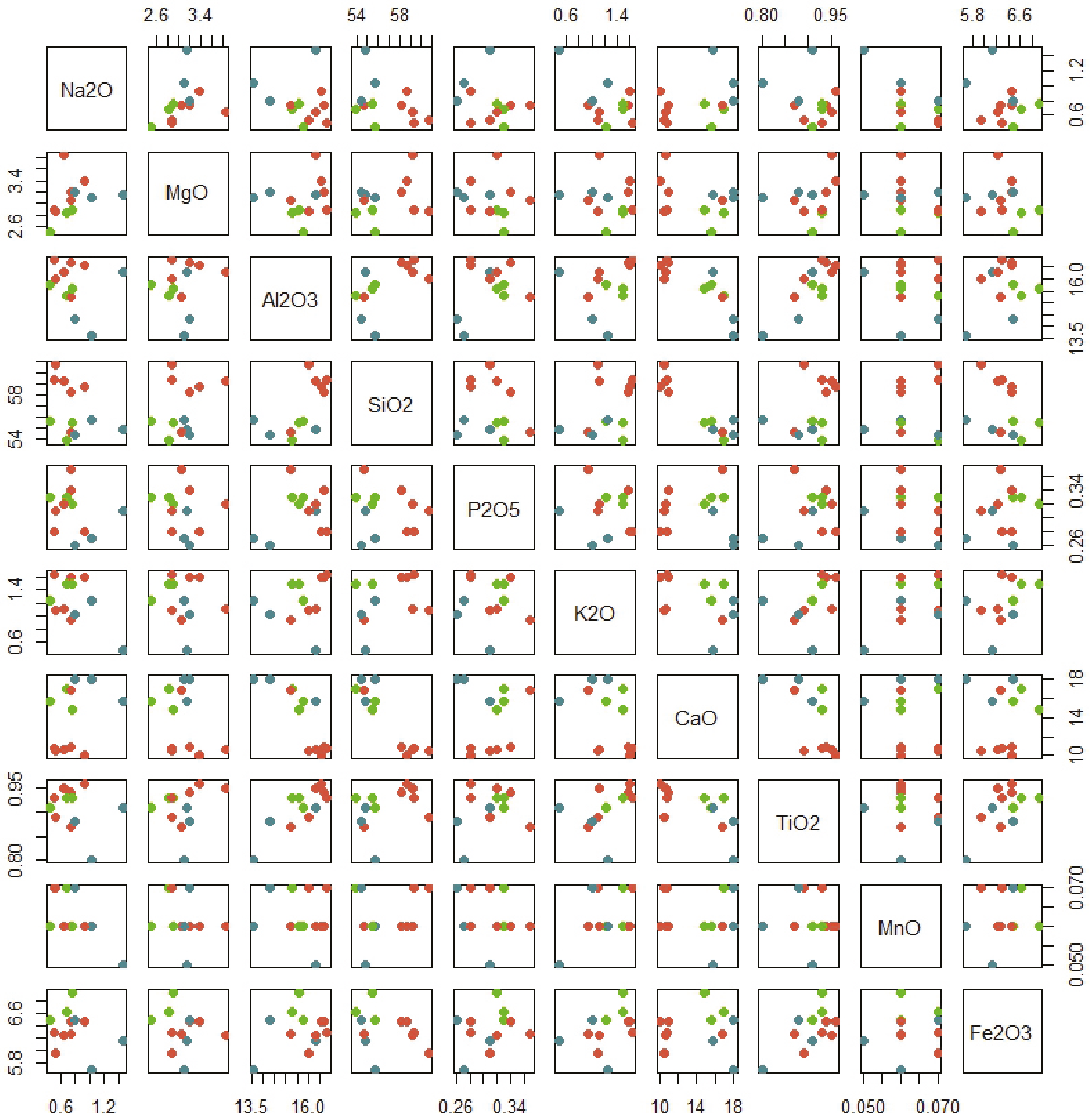

Figure 4.3-4: Pairwise plots of major elements according to groups identified in petrographic analysis (Red: group A, Green: group A2, Blue: Group B)

the objects from S.Anna have very low values of Y (table 4.3-2). The wt% of the oxide (Y2O3) as measured by the WD-XRF is between 0.002 and 0.004%, which explains why there are only three different values for Y in the data set when converted to ppm. The differentiation in the data for Y shown below is thus overinflated. While the same condition also applies to Niobium (Nb). There is a clear outlier in group A in regards to Nb, VIN 430 has almost 3 times the levels than other objects in the same group. A closer look at the relationship between key elements identified in the figures 4.3-4 and 4.3-5 is shown in figure 4.3-6.

Trace elements are often used as indicators of provenance. Th, Sc, Zr, Y, and Nb are considered to be some of the more useful trace elements since they are the least soluble and mobile, which means they are resistant to weathering and alteration. For this reason this group of elements are good indicators of raw clayey sources.[13] Th is not detected in the dataset. But the relationship between these remaining elements are provided in figure 4.3-5.

13 Degryse & Braekmans 2014, p. 195.

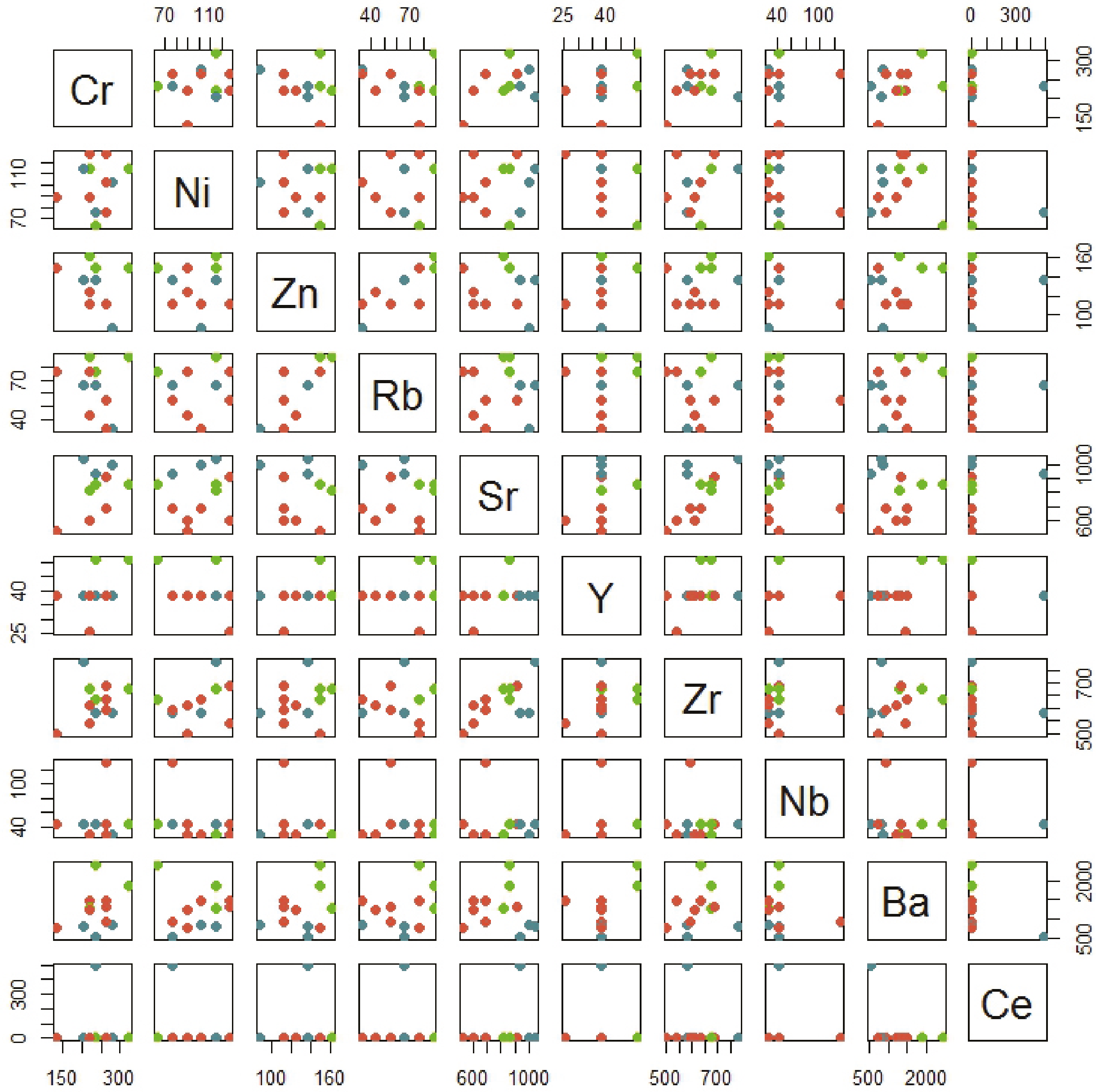

Figure 4.3-5: Pairwise plots of minor elements according to groups identified in petrographic analysis (Red: group A, Green: group A2, Blue: Group B)

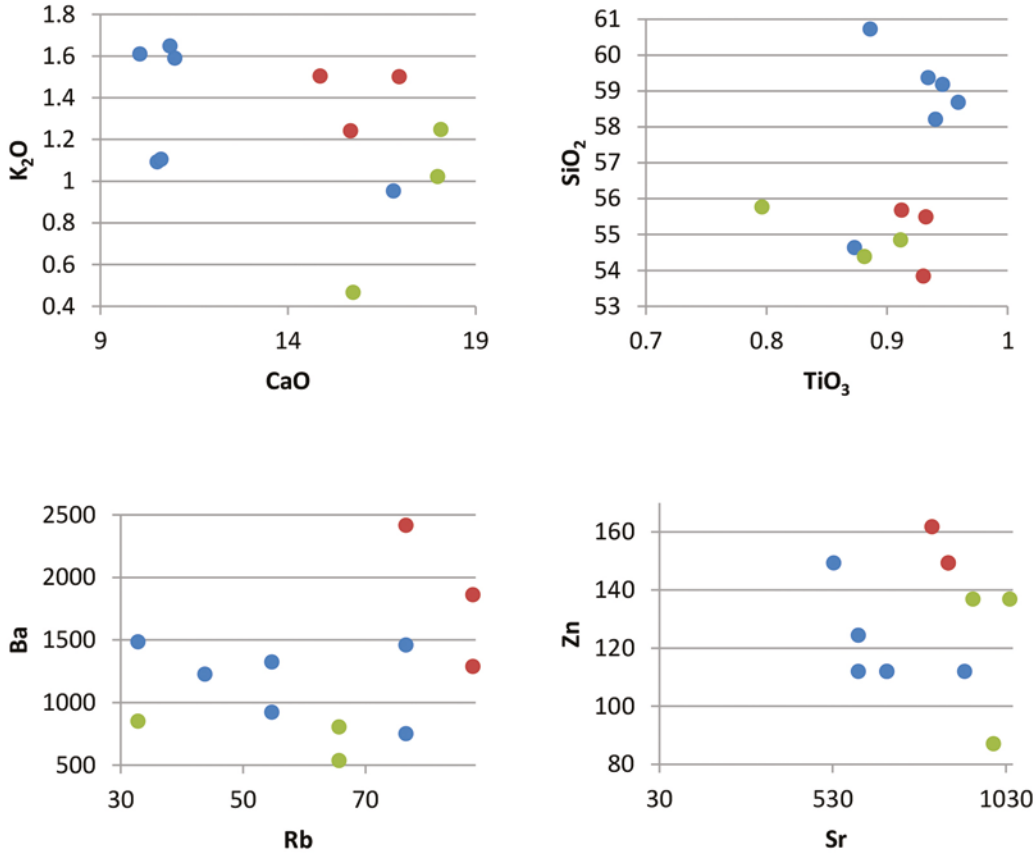

Figure 4.3-6: Individual pairwise plots of key major and minor elements, according to groups identified in petrographic analysis (Red: group A, Green: group A2, Blue: Group B)

Apart from Barium (Ba) there does not seems to be a clear differentiation in the different petrographic groups according to these trace elements.

4.3.2.1 PRINCIPLE COMPONENT ANALYSIS OF PETROGRAPHIC GROUPS

The pairwise plots in the preceding section are a valuable first step in evaluating the dataset, but there are a number of limitations. It is only possible to evaluate 2 values against each other on a graph and the difference between elements with high concentrations against elements with low concentrations can distort the dataset. A statistical method of analysis which is widely used in these circumstances is principle component analysis which is discussed in greater detail in Chapter 3. In essence it is a method by which a large number of variables are reduced to a much smaller set of variables, or principle components. These principle components still reflect the major patterns found in the original data. This is done by finding variables with a strong correlation that as a group seems to respond to the same condition and as such can be expressed as a single variable.[14] A summary of the principle component analysis performed on the same objects used for the petrographic analysis is provided below in table 4.3-3 , which indicates the level of influence that each component has on the data set, for example, component 1 accounts for 29% of the variance.

The composition of each component can be expressed by calculating the loading of each original variable according to each component. The loading is provided in table 4.3-4. For the first component Al_2O_3, SiO_2, TiO_2, and Fe_2O_3 have the highest negative loading (>- 0.35) while CaO and Sr have the highest positive loading (> 0.25). This means that there is a positive correlation

14 Drennan 2009, p. 300.

Table 4.3-3: Summary of Principle component analysis performed WD-XRF data for objects from S.Anna that were also used in the petrographic analysis. The first 8 components are shown, which collectively account for 97% of the variance in the data.

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
Standard deviation	2.36	2.08	1.56	1.46	1.27	1.19	0.77	0.64
Proportion of variance	0.29	0.23	0.13	0.11	0.09	0.07	0.03	0.02
Cumulative proportion	0.29	0.52	0.65	0.76	0.85	0.92	0.95	0.97

Table 4.3-4: The loading of each major and minor element within each principle component.

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
Na_2O	-0.09	0.26	-0.45	-0.11	-0.24	-0.11	0.08	-0.16
MgO	-0.32	0.10	-0.30	0.05	0.02	0.07	0.21	-0.23
Al_2O_3	-0.40	0.03	0.10	0.10	-0.13	-0.03	-0.06	0.20
SiO_2	-0.36	0.02	-0.03	0.26	0.01	0.05	0.37	0.04
K_2O	-0.01	-0.46	0.01	-0.02	0.16	-0.12	0.20	-0.14
CaO	0.29	0.27	-0.21	-0.06	-0.03	0.12	0.15	0.42
TiO_2	-0.41	0.00	-0.01	0.04	-0.11	0.13	-0.15	0.12
MnO	-0.11	-0.13	-0.04	0.34	0.55	0.20	0.09	0.16
Fe_2O_3	-0.36	0.01	-0.06	-0.12	-0.12	0.21	-0.50	0.08
Cr	0.07	0.31	0.35	0.13	0.03	-0.26	0.21	-0.36
Ni	-0.12	0.20	-0.10	-0.38	0.42	-0.13	-0.23	-0.34
Zn	0.11	-0.33	-0.18	-0.08	-0.04	0.48	0.22	-0.10
Rb	0.18	-0.34	-0.16	-0.32	-0.06	-0.06	-0.08	0.15
Sr	0.25	0.36	-0.11	0.10	-0.03	0.07	-0.03	0.26
Y	0.14	0.04	0.16	0.28	-0.44	0.43	-0.04	-0.36
Zr	0.13	0.26	0.03	0.15	0.42	0.38	-0.23	-0.03
Nb	0.07	-0.17	0.01	0.49	-0.07	-0.41	-0.30	0.17
Ba	0.00	-0.04	0.57	-0.25	-0.02	0.19	-0.12	0.02

between Al_2O_3, SiO_2, TiO_2 and Fe_2O_3, and between CaO and Sr, but Al_2O_3, SiO_2, TiO_2 and Fe_2O_3 have a negative correlation with CaO and Sr. But as already mentioned the first component only accounts for 29% of the variance seen in the data and the other components also need to be taken into consideration.

A way of expressing the relationship between two components graphically is by using a biplot. The biplot for principle components 1and 2 is provided in figure 4.3-7, and component 2 and 3 in figure 4.3-8. Group A, as identified in the petrographic analysis, is characterized by high levels of Al_2O_3, SiO_2, TiO_2 and Fe_2O_3, Group A2 by high levels of Rb and Zn. Group B is characterized by high levels of Sr and CaO.

On closer inspection of these two biplots it becomes that the objects in petrographic group A have one outlier which falls outside the 68% confidence level. This indicated that the object differs by more than one standard deviation from the mean. In order to evaluate the variation the relative standard deviation (also known as the coefficient of variance) for each element according to the petrographic groups were calculated and are visible in Table 4.3-5.

There are a number of possible reasons for the variance seen in a number of major and minor

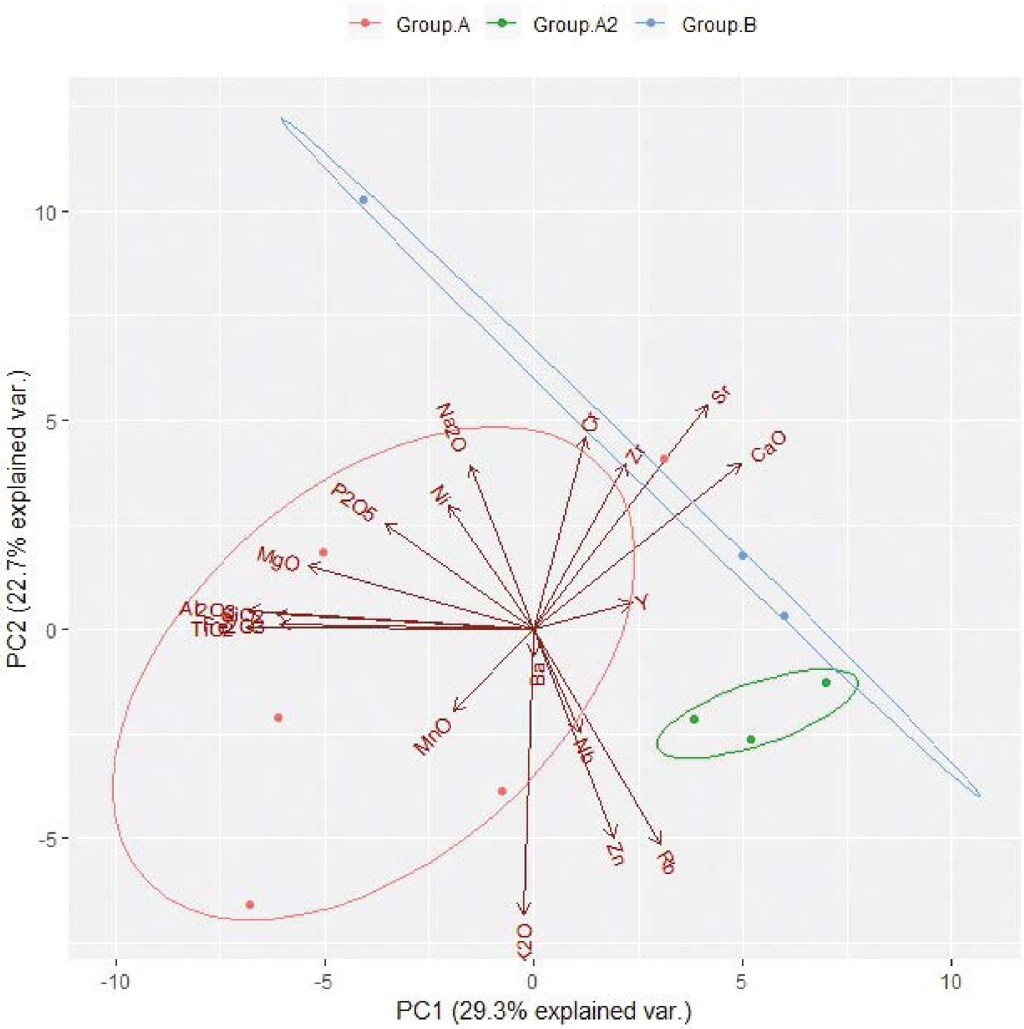

Figure 4.3-7: Biplot of principle component 1 and 2 calculated for chemical composition of the petrographic groups as measured by WD-XRF. The ellipse indicates a 68% fit for each group.

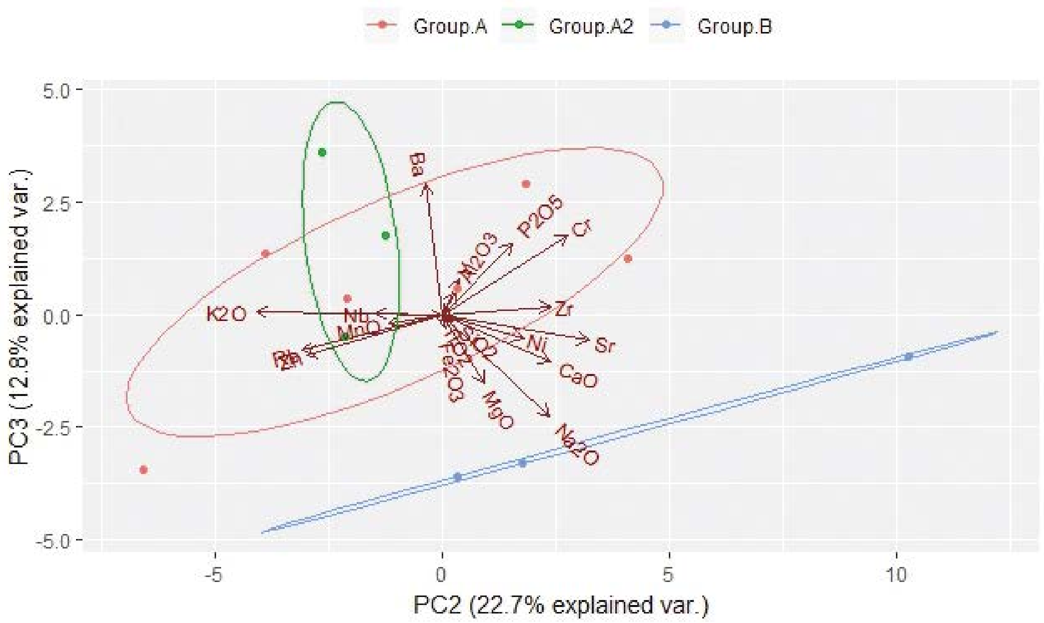

Figure 4.3-8: Biplot of principle component 2 and 3 calculated for chemical composition of the petrographic groups as measured by WD-XRF. The ellipse indicates a 68% fit for each group.

Table 4.3-5: The relative standard variation of each major and minor element according to petrographic group

	Group A RSD%	Group A2 RSD%	Group B RSD%	Average
	n=6	n=3	n=3	
Na2O	22.7	25.5	31.1	26.4
MgO	11.4	7.3	1.8	6.8
Al2O3	3.6	1.6	9.6	4.9
SiO3	3.5	1.8	1.3	2.2
K2O	23.6	10.6	44.1	26.1
CaO	22.0	6.7	7.7	12.1
TiO2	3.8	1.2	6.9	4.0
MnO	5.0	14.5	19.6	13.1
Fe2O3	3.0	3.4	6.6	4.4
Cr	22.6	21.4	15.4	19.8
Ni	20.9	30.1	19.9	23.7
Zn	12.5	4.7	23.9	13.7
Rb	31.0	7.5	34.6	24.4
Sr	19.6	3.2	5.4	9.4
Y	14.4	15.7		15.1
Zr	11.3	3.5	18.0	11.0
Nb	78.2	21.7	21.7	40.5
Ba	24.9	30.4	23.2	26.2
Average	**18.2**	**11.2**	**16.7**	

elements in table 4.3-5. It should be noted that the groups are based on petrographic groups and the sample sizes are fairly small. The presence of subgroups cannot be discounted. This matter will receive more attention in in the next section. The purpose of this analysis is to identify elements which might show a high degree of variance which can be attributed to weathering conditions. It has already been noted in the pairwise plots in figure 4.3-4 and figure 4.3-6 that there is one object in group A which consistently plot as an outlier. This is confirmed by the biplots of the principle components 1:2 and 2:3 in figure 4.3-7 and figure 4.3-8. This object can be identified as VIN 425 due to high levels of CaO and Sr. But it is also possible that the weathering conditions while deposited in the soil is affecting specific elements and is causing the variance. Both Na_2O and Ba both show high variance among all three groups. In a recent study on find grain pottery from Lentini, Messina and Syracuse the authors found that these two elements also exhibited high variance and they linked it to high mobility of these elements during burial.[15] K2O, Ni, Rb and Ce also show a high overall RSD, but on closer inspection it is apparent that this figure is strongly influenced by a high RSD in either Group A2 or B. A high variation in these two groups might be associated with subgroups, and not weathering. In contrast Nb has a very high RSD, which is seen predominantly in petrographic group A. This variance cannot be attributed to the influence of the outlier already identified as VIN 425 have the same Nb concentration as other objects in the group. Instead, the variance in Nb might instead be attributed to the low detection limit of the instrument, which has already been discussed by hand of figure 4.3-5. Three elements have thus been identified that show a higher than average variation. Na2O3 and Ba are known to be

15 Barone, et al. 2005, p. 754.

affected by local weathering conditions. And while the weathering conditions for Nb is not known it shows a very high variance that can potentially skew the data. For this reason Na2O3, Ba and Nb will be excluded from further analysis.

By using principle component analysis in order to evaluate the chemical composition of the petrographic groups already identified, elements which have the greatest influence on the patterning of the dataset were thus identified. The analysis also identified elements which are more susceptible to local weathering conditions and as such cause a higher level of variance in the dataset. This information is relevant to the subsequent analysis of a wider range of objects from S. Anna, as the same weathering conditions are applicable to these objects. The petrographic analysis and subsequent principle component analysis, as detailed above, is limited to samples taken from the S. Anna excavation in 2015. During 2016 a second group of objects were uncovered but due to time constraints were only analysed using WD-XRF and not petrography as well.

4.3.2.2 MULTIVARIATE ANALYSIS OF ALL WD-XRF DATA

In the preceding section the principle components have thus been identified in regards to the chemical composition of the 3 petrographic groups previously identified and checked for their consistency. During this analysis a group of elements (Na_2O, Ba, Nb) are identified as elements which might cause distortion of the statistical results since they appear to be more affected by local weathering conditions and/or instrument detection limitations. In addition, the analysis also suggests the potential for subgroups within the main petrographic groups. These subgroups are difficult to identify due to the small sample sizes involved. The larger collection of objects from the S. Anna that were analysed using the WD-XRF (table 4.3-1 and table 4.3-2) therefore requires consideration regarding to two aspects. The first is to identify objects which are related to the groups already identified in the dataset, and the second is to investigate the possible presence of subgroups.

In order to evaluate the similarity of different objects by using multiple variables of different magnitudes a multivariate statistical analysis is the most appropriate and widely used method. The first step of this analysis involves transforming the data using the central log-ration (section 3.4). The similarity between objects is then calculated as the Euclidian distance between each object. The results are shown below in table 4.3-6. The lowest value is between VIN 430 and VIN 422, which means these two are the most similar, while VIN 429 and VIN 563 is the least similar. The second step uses the Euclidian distance in order to group the data according to similarity by applying hierarchical cluster analysis. This method expresses potential groups by visually indicating the links between different objects as a dendrogram. Objects with the shortest linkage are thus the most similar. The dendrogram for the WD-XRF data is provided in figure 4.3-9.

The dendrogram in figure 4.3-9 shows 5 groups of objects. The grouping is formed at a linkage distance of 6. The objects from petrographic group A2 all fall within group 3 (VIN 421, 423, 427). The objects which make up petrographic group A all fall within group 4 except for VIN 425, which falls in group 5. This fragment had already been identified as an outlier in the preceding analysis. The objects of petrographic group B all fall within group 5 (VIN 424, 433) exept for VIN 426 which is in group 3. Therefore, with the exeption of VIN 425 and 426, the chemical composition of the three petrographic groups support the presence of three groups. The other objects from S. Anna which were not part of the petrographic analysis comprise two groups, 1 and 2, with VIN 563 as an outlier. A possible reason for the separation between group 1 and 2 with the rooftile objects in groups 3-5 is discussed in section 5.1.2.

Table 4.3-6: Euclidian distance between clr normalized WD-XRF results for objects from S. Anna

437	436	434	433	432	431	430	429	428	427	426	425	424	423	422	421	563	567	571	562	564	568	569	
6.7	7.4	5.9	5.9	6.9	8.0	6.7	8.2	6.2	5.4	7.7	5.6	7.7	4.4	6.7	4.7	6.7	5.4	5.8	6.0	4.9	4.1		**569**
7.2	7.4	7.2	6.4	6.8	8.6	6.6	8.6	5.9	5.9	8.4	5.9	8.4	4.2	6.5	5.5	5.4	5.8	4.4	5.2	3.6		4.1	**568**
7.1	7.3	7.2	5.8	7.3	8.0	7.0	8.1	5.5	5.2	7.7	5.9	8.2	4.6	6.4	5.7	5.5	6.6	5.7	6.3		3.6	4.9	**564**
7.3	8.0	7.0	7.3	6.6	8.2	6.0	8.3	5.4	5.3	8.7	6.7	9.0	5.9	6.8	6.3	7.5	6.1	3.3		6.3	5.2	6.0	**562**
5.6	5.8	6.3	6.3	5.1	7.2	4.5	7.0	4.2	4.7	7.5	5.5	7.6	4.5	4.8	5.0	7.3	5.2		3.3	5.7	4.4	5.8	**571**
6.6	6.5	5.9	5.2	5.7	6.2	5.0	6.5	6.1	5.7	5.9	5.1	7.8	4.0	6.0	4.6	7.5		5.2	6.1	6.6	5.8	5.4	**567**
8.8	9.1	8.2	6.6	8.7	9.1	8.7	9.1	7.9	7.2	8.7	6.7	8.1	6.4	8.2	7.5		7.5	7.3	7.5	5.5	5.4	6.7	**563**
5.4	5.7	5.4	4.8	4.2	5.1	4.4	5.5	4.8	3.3	5.1	3.5	5.9	3.2	4.3		7.5	4.6	5.0	6.3	5.7	5.5	4.7	**421**
2.8	2.7	5.5	5.5	3.1	5.5	2.3	4.4	3.3	4.0	5.5	4.3	5.8	4.3		4.3	8.2	6.0	4.8	6.8	6.4	6.5	6.7	**422**
5.2	5.1	5.1	3.8	4.8	5.3	4.4	5.2	4.0	3.7	4.7	3.2	6.3		4.3	3.2	6.4	4.0	4.5	5.9	4.6	4.2	4.4	**423**
5.6	6.8	4.6	4.8	5.7	6.3	6.1	4.4	6.8	5.3	4.6	3.9		6.3	5.8	5.9	8.1	7.8	7.6	9.0	8.2	8.4	7.7	**424**
4.5	5.8	4.0	2.6	4.0	4.9	4.4	3.5	5.0	3.4	3.5		3.9	3.2	4.3	3.5	6.7	5.1	5.5	6.7	5.9	5.9	5.6	**425**
5.7	6.0	4.5	3.2	5.6	3.8	5.6	2.5	5.8	4.7		3.5	4.6	4.7	5.5	5.1	8.7	5.9	7.5	8.7	7.7	8.4	7.7	**426**
5.1	5.8	4.7	4.3	4.7	5.1	4.2	4.8	3.9		4.7	3.4	5.3	3.7	4.0	3.3	7.2	5.7	4.7	5.3	5.2	5.9	5.4	**427**
3.9	3.9	5.0	5.7	4.5	6.1	3.9	5.2		3.9	5.8	5.0	6.8	4.0	3.3	4.8	7.9	6.1	4.2	5.4	5.5	5.9	6.2	**428**
4.2	5.1	4.5	3.9	4.3	3.9	4.6		5.2	4.8	2.5	3.5	4.4	5.2	4.4	5.5	9.1	6.5	7.0	8.3	8.1	8.6	8.2	**429**
3.5	3.8	5.2	5.6	2.5	5.5		4.6	3.9	4.2	5.6	4.4	6.1	4.4	2.3	4.4	8.7	5.0	4.5	6.0	7.0	6.6	6.7	**430**
6.2	5.8	6.5	4.5	5.3		5.5	3.9	6.1	5.1	3.8	4.9	6.3	5.3	5.5	5.1	9.1	6.2	7.2	8.2	8.0	8.6	8.0	**431**
3.3	4.7	5.4	5.6		5.3	2.5	4.3	4.5	4.7	5.6	4.0	5.7	4.8	3.1	4.2	8.7	5.7	5.1	6.6	7.3	6.8	6.9	**432**
5.4	6.1	4.1		5.6	4.5	5.6	3.9	5.7	4.3	3.2	2.6	4.8	3.8	5.5	4.8	6.6	5.2	6.3	7.3	5.8	6.4	5.9	**433**
4.4	6.0		4.1	5.4	6.5	5.2	4.5	5.0	4.7	4.5	4.0	4.6	5.1	5.5	5.4	8.2	5.9	6.3	7.0	7.2	7.2	5.9	**434**
3.3		6.0	6.1	4.7	5.8	3.8	5.1	3.9	5.8	6.0	5.8	6.8	5.1	2.7	5.7	9.1	6.5	5.8	8.0	7.3	7.4	7.4	**436**
	3.3	4.4	5.4	3.3	6.2	3.5	4.2	3.9	5.1	5.7	4.5	5.6	5.2	2.8	5.4	8.8	6.6	5.6	7.3	7.1	7.2	6.7	**437**

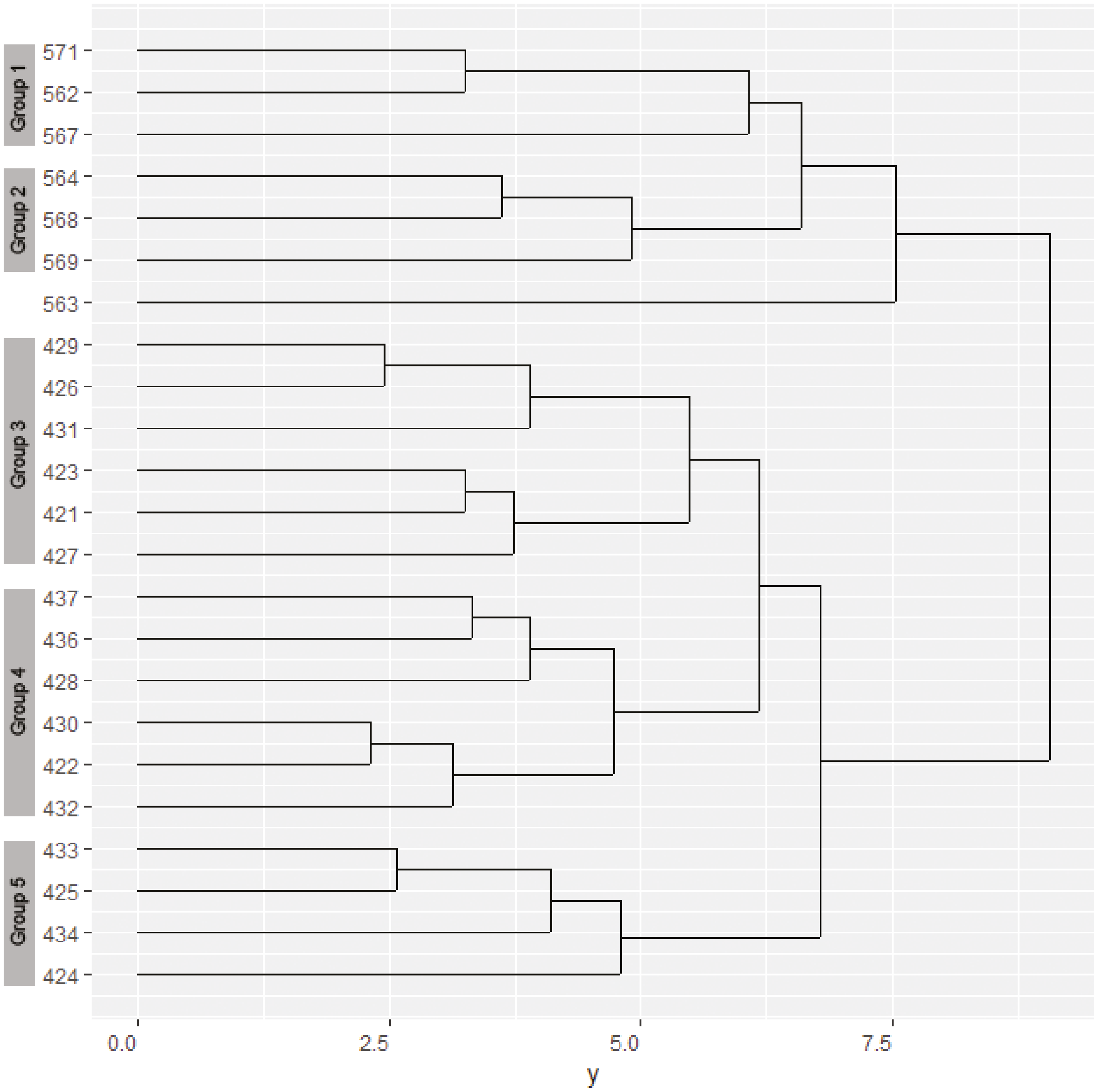

Figure 4.3-9: Dendrogram of WD-XRF data for objects from S. Anna. The standardized Euclidian distance is expressed through complete clustering, the groups were discriminated at a linkage distance of 6.

4.3.2.3 PRINCIPLE COMPONENT ANALYSIS OF COMPLETE ASSEMBLAGE WD-XRF DATA

The main factors which influence the grouping of objects in the multivariate analysis above (figure 4.3-9) can once again be determined through principle component analysis. This time the first two components collectively account for 80 % of the variance in the dataset (table 4.3-7). The first component is characterized by a negative loading for SiO2, TiO_2, Al_2O_3, Fe_2O_3, MnO, and CaO (< -0.28). Component 2 show a high loading for Na_2O (>0.30) and a low loading for Pb (< -0.30) (table 4.3-8).

The results from the principle component analysis is visualized with a biplot of the first two components (figure 4.3-10). The 5 groups identified in the multivariate analysis (figure 4.3-9) are indicated by colour and the 68% confidence margin is shown as an ellipse. Group 1 is distinguished by higher levels of Pb and Rb. Group 2 have slightly lower levels of Pb and Rb, and higher levels of Na_2O. Group 3-5

Table 4.3-7: Summary of Principle component analysis performed on all the WD-XRF data for objects from S.Anna. The first 8 components are shown, which collectively account for 99% of the variance in the data.

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
Standard deviation	3.43	1.32	1.09	0.87	0.76	0.69	0.37	0.30
Proportion of variance	0.69	0.10	0.07	0.04	0.03	0.03	0.01	0.01
Cumulative proportion	0.69	0.80	0.87	0.91	0.95	0.97	0.98	0.99

Table 4.3-8: The loading of each major and minor element within each principle component.

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
SiO_2	-0.28	0.11	0.10	0.20	-0.02	-0.03	0.03	-0.32
TiO_2	-0.29	0.03	-0.02	0.09	0.02	-0.06	0.17	-0.14
Al_2O_3	-0.28	0.01	0.02	0.17	0.07	-0.13	0.23	-0.28
Fe_2O_3	-0.29	-0.04	0.03	0.01	0.08	-0.04	0.16	0.00
MnO	-0.28	-0.11	0.01	0.06	-0.04	-0.23	0.01	0.42
MgO	-0.27	0.16	0.01	0.23	-0.08	-0.11	0.27	0.02
CaO	-0.28	0.13	-0.03	-0.18	-0.02	-0.12	-0.46	-0.02
Na_2O	-0.02	0.61	-0.40	-0.09	-0.52	-0.02	0.09	0.05
K_2O	-0.21	-0.12	0.24	0.33	-0.39	0.64	-0.37	-0.12
Sr	-0.27	0.02	-0.05	-0.27	0.13	-0.21	-0.49	0.07
Cr	-0.27	0.04	0.01	0.14	0.41	0.05	0.09	-0.14
Ni	0.18	0.39	0.39	-0.15	0.41	0.26	0.02	0.08
Zn	-0.27	-0.15	0.08	-0.03	-0.06	0.24	0.24	0.70
Rb	-0.17	-0.25	0.26	-0.72	-0.29	0.10	0.31	-0.28
Zr	-0.28	-0.03	-0.01	-0.14	0.09	-0.08	-0.22	0.00
Ba	-0.11	-0.15	-0.72	-0.16	0.30	0.49	0.06	-0.07
Pb	0.19	-0.53	-0.15	0.19	-0.13	-0.25	-0.04	-0.07

have higher levels of Na_2O and Ni, with groups 3 and 5 distinguished from group 4 by higher levels of SiO_2, TiO_2, Al_2O_3, Fe_2O_3, MgO and CaO.

4.3.3 HH-XRF

As discussed in chapter 3, the use of handheld XRF technology for the analysis of terracotta objects is challenging and its application frequently discussed. The major concerns relate to the calibration of spectral data and the heterogeneous nature of terracotta fabric. In the study by Hunt and Speakman it was demonstrated that the use of calibration functions derived from regression equations based of certified reference materials (CRM) provide results that correspond more closely with the certified values, especially compared to data based on the manufacturers supplied mudrock calibration for use with ceramic materials.[16] In this study the samples were ground down to a homogenous powder, which greatly addresses the concern regarding heterogeneous material. With this method, however, is not possible when analysing museum objects, as it requires the destructive analysis of a relatively large sample. The use of non-destructive analysis of objects using handheld XRF technology remains a problem that needs to be addressed. The following section will describe the steps taken in calibrating

16 Hunt & Speakman 2015.

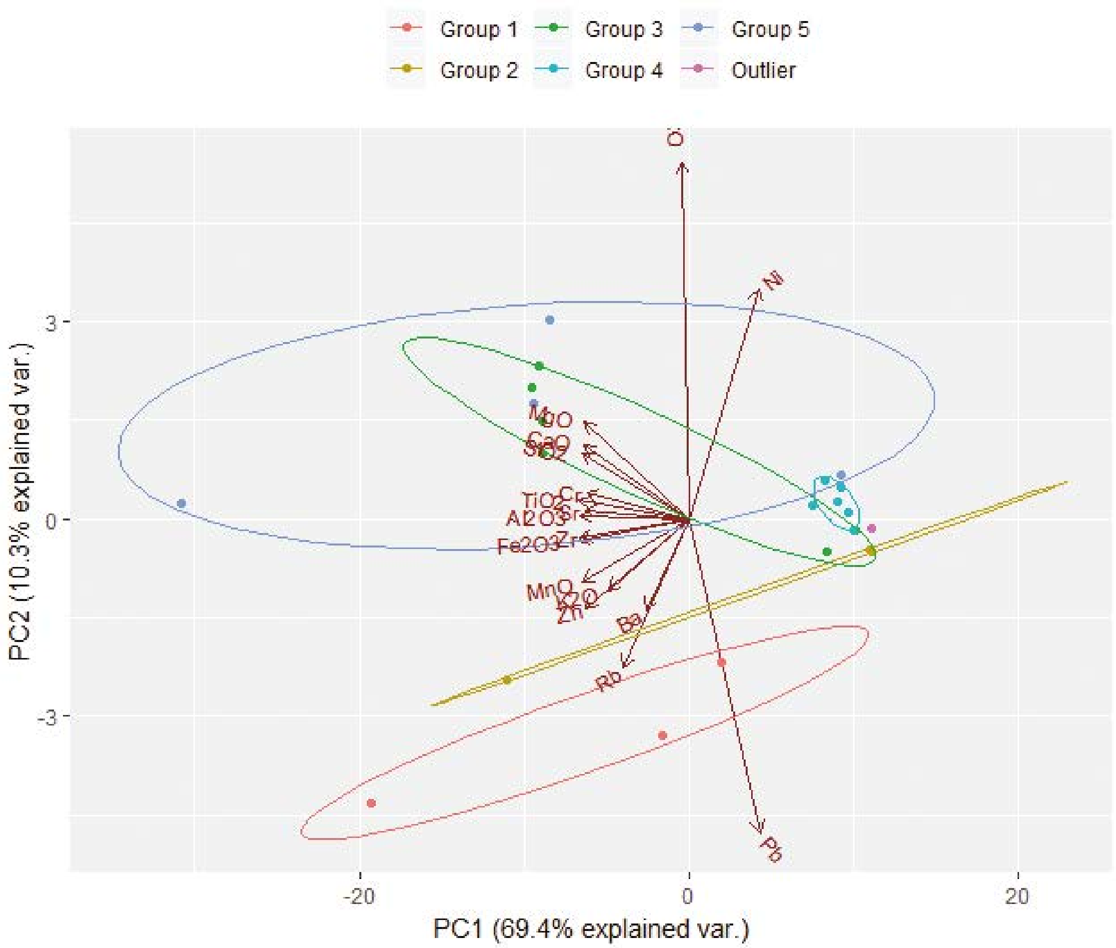

Figure 4.3-10: Biplot of principle component 1 and 2 calculated for main groups of objects as identified in the multivariate analysis of WD-XRF data for objects from S. Anna.. The ellipse indicates a 68% fit for each group.

the HH-XRF data and will evaluate the reliability of the data according to the statistical methods described in chapter 3.

4.3.3.1 CERTIFIED REFERENCE MATERIAL REGRESSION CALIBRATION

Six CRM samples were measured with the Brucker Tracer HH-XRF at the same settings as those used for measuring roof terracotta objects housed in the Archaeology museum of Agrigento and material from the S.Anna excavation. The Ti-Al (or yellow) filter was used for measuring the minor, or trace, elements at 300 seconds per reading at 40 kV. In order to measure major elements a vacuum is required. But in order to eliminate surface deposits readings are taken on clean fractures, which by nature are irregular surfaces that create a large airgap between the object and the instrument. This airgap prevents an effective vacuum and therefore the low-Z elements were not measured. The elements used for analysis are the based on the ones already identified for the analysis of the WD-XRF data, the exceptions are elements identified by Hunt and Speakman as problematic elements for HH-XRF analysis (Na, P, V, Cr, Co, Ni, Ba, Ce).[17] For the regression calibration it was not possible to calculate MgO, Al_2O_3 and La as the data for these elements were not available.

The six soil and ceramic CRMs used for the calibration are BCR-667, BIR-1a, GSP-2, NIST-98b, NIST-2710a and SGR-1b. The regression equation is calculated by comparing the certified values and the measured values for each element.

17 Hunt & Speakman 2015, p. 638.

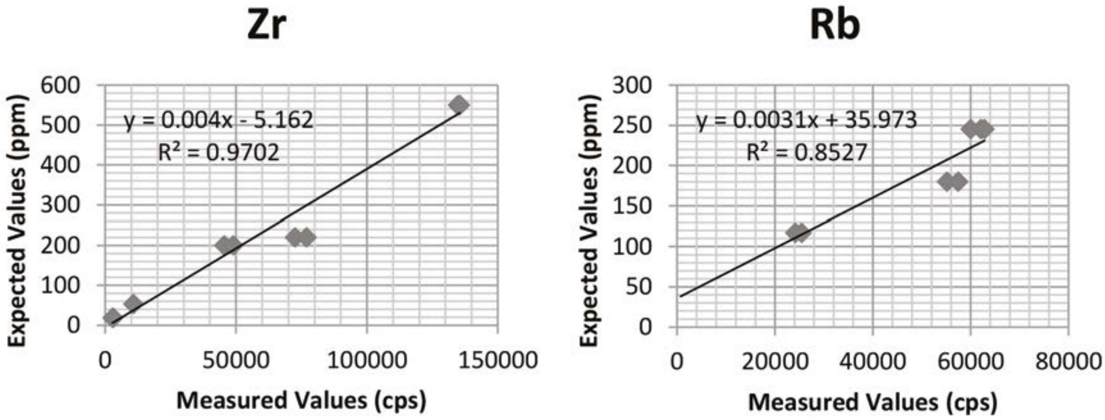

Figure 4.3-11: Biplots of the measured values in counts per second (cps) against the expected concentration in parts per million (ppm) for Zr and Rb.

A representative sample of these graphs are shown in figure 4.3-11 for the elements Zr and Rb. The regression equations and regression coefficients are provided below in table 4.3-9. The majority of elements have a regression coefficient of higher than 0.9 while Rb, and Y are above 0.8.

Based on these regression equations it is therefore possible to provide an initial empirical calibration for the HH-XRF data in order to obtain semi-quantitative values. It is possible to determine the accuracy of the quantitative values obtained through the regression calibrations by comparing the calibrated HH-XRF values of the control group with the WD-XRF results of the same. The control group is a collection of roof tile samples that were analysed using petrographic analysis, WD-XRF and HH-XRF. The HH-XRF data was calibrated using the regression equations in table 4.3-9, the same data was also calibrated using the GL2 mudrock calibration provided by Brucker. The GL2 calibration is the calibration supplied by the manufacturer for archaeological ceramics.[18] The quantitative values obtained through the regression equations and the GL2 calibration are compared to the quantitative values obtained through WD-XRF (table 4.3-1and table 4.3-2) these are shown below in table 4.3-10 . The average concentration of major and minor elements for each petrographic group is shown according to the method used for obtaining the data. The relative standard deviation is also provided in order to show the variance of each group.

Table 4.3-9: Regression Equations based on the expected and measured values for CRM samples

Element	Regression Equation	Regression Coefficient
Ca	$y = 1.2927x - 1553.7$	$R^2 = 0.9968$
Fe	$y = 0.0516x - 850.3$	$R^2 = 0.9694$
K	$y = 2.3137x - 406.97$	$R^2 = 0.9907$
Mn	$y = 0.0716x - 56.593$	$R^2 = 0.9963$
Nb	$y = 0.0041x - 1.6372$	$R^2 = 0.9869$
Rb	$y = 0.0031x + 35.973$	$R^2 = 0.8527$
Si	$y = 79.311x + 88198$	$R^2 = 0.9069$
Sr	$y = 0.0027x + 68.251$	$R^2 = 0.9645$
Th	$y = 0.0099x - 19.282$	$R^2 = 0.9919$
Ti	$y = 0.3034x + 572.33$	$R^2 = 0.9789$
Y	$y = 0.01x - 4.3155$	$R^2 = 0.8391$
Zn	$y = 0.0146x - 9.772$	$R^2 = 0.9994$
Zr	$y = 0.004x - 5.162$	$R^2 = 0.9702$

The elements which have been proven to characterize the material from S. Anna has been identified in the preceding sections, these are CaO, Fe_2O_3, MnO, SiO_2, TiO_2, Sr, Zr and Y. When the results of the calibration in table 4.3-10 is evaluated, especially regarding these elements it is found that for the majority of these elements the CRM calibrated files outperform the GL2 calibration by having less variance and being more accurate,

18 Hunt & Speakman 2015, pp. 634-5.

Table 4.3-10: Measuring the accuracy of calibrated HH-XRF data for the petrographic groups against the WD-XRF data. The average concentrations of major and minor elements are for each petrographic groups is show according to the method used for obtaining the data; WD-XRF results, GL2 calibrated HH-XRF and CRM calibrated HH-XRF results.

		Group A		Group A2		Group B	
		wt%	RSD%	wt%	RSD%	wt%	RSD%
SiO2	WD-XRF	58.47	3.53	55.01	1.84	55.00	1.28
	CRM	61.77	5.23	53.99	8.45	58.28	3.98
K2O	WD-XRF	1.33	23.61	1.42	10.62	0.91	44.05
	CRM	1.62	22.40	1.63	17.94	1.24	49.82
CaO	WD-XRF	11.63	21.96	15.83	6.72	17.26	7.67
	GL2	5.17	151.46	10.80	19.82	10.78	158.91
	CRM	14.57	16.32	17.08	8.01	21.94	12.78
TiO2	WD-XRF	0.92	3.79	0.92	1.19	0.86	6.91
	GL2	0.77	37.10	0.55	9.27	0.65	36.02
	CRM	0.69	5.16	0.57	6.72	0.58	6.66
MnO	WD-XRF	0.06	4.98	0.06	14.53	0.06	19.64
	GL2	0.77	83.86	0.05	15.41	0.56	83.16
	CRM	0.06	13.42	0.04	8.79	0.04	3.53
Fe2O3	WD-XRF	6.27	3.03	6.67	3.43	6.10	6.63
	GL2	1.95	65.63	4.39	12.17	1.75	69.44
	CRM	5.15	6.44	4.00	11.56	4.22	10.57
		Group A		**Group A2**		**Group B**	
		ppm	**RSD%**	**ppm**	**RSD%**	**ppm**	**RSD%**
Zn	WD-XRF	120.33	12.53	153.53	4.68	120.33	23.89
	GL2	84.70	10.65	77.24	3.32	80.01	1.75
	CRM	77.01	11.42	66.26	7.88	65.09	3.28
Rb	WD-XRF	56.50	31.01	83.84	7.53	54.68	34.64
	GL2	56.41	32.94	64.58	12.38	45.92	60.74
	CRM	81.51	15.51	86.56	9.12	73.60	25.20
Sr	WD-XRF	670.14	19.61	847.53	3.22	989.44	5.39
	GL2	530.67	18.26	537.86	7.89	791.21	14.70
	CRM	444.64	14.39	431.34	4.68	536.71	10.33
Y	WD-XRF	35.98	14.41	46.56	15.75	38.10	0.00
	GL2	25.17	7.51	22.76	12.51	25.10	8.47
	CRM	44.36	11.94	34.70	6.96	34.33	11.52
Zr	WD-XRF	594.35	11.32	661.89	3.53	648.38	18.04
	GL2	246.00	9.13	220.25	3.76	232.27	10.74
	CRM	242.16	12.67	202.19	5.38	203.82	13.64
Nb	WD-XRF	50.07	78.25	38.15	21.65	38.15	21.65
	GL2	6.55	21.46	7.27	8.69	6.12	33.55
	CRM	17.97	7.42	14.93	9.04	15.47	5.16

Table 4.3-11: Chemical composition of architectural terracotta from Akragas, as measured by HH-XRF and calibrated using regression equations based on certified reference material.

VIN	SiO2	K2O	CaO	TiO2	MnO	Fe2O3	Zn	Rb	Y
136	44.18	1.69	8.75	0.55	0.09	3.97	110.17	73.52	18.96
137	47.14	1.39	10.79	0.65	0.13	4.65	92.84	79.04	39.35
138	44.01	1.73	3.32	0.66	0.09	4.46	78.06	83.68	22.82
139	38.49	1.83	7.11	0.57	0.10	4.31	100.58	84.75	25.36
145	38.58	0.85	5.91	0.47	0.03	2.79	111.42	70.92	19.69
146	48.34	2.21	15.87	0.59	0.06	4.50	125.07	91.95	34.48
147	42.69	1.07	12.81	0.54	0.05	4.04	117.48	67.18	31.99
148	44.45	0.97	7.11	0.69	0.06	4.60	143.48	80.07	28.75
166	44.34	2.08	2.73	0.79	0.11	5.43	101.99	97.88	23.80
167	46.68	1.79	6.71	0.72	0.10	5.36	92.31	74.58	23.62
168	45.88	2.56	2.89	0.82	0.13	5.97	115.90	99.57	26.63
169	44.15	1.57	8.02	0.61	0.10	4.67	117.34	73.59	33.54
177	36.75	1.24	31.06	0.33	0.02	2.08	81.04	67.14	18.81
178	45.52	1.55	16.08	0.50	0.04	3.77	272.43	78.23	32.45
179	36.72	1.19	8.04	0.58	0.09	4.58	106.55	65.20	32.50
181	39.01	0.97	19.17	0.44	0.06	3.26	74.05	71.06	25.62
183	43.06	1.53	14.15	0.63	0.13	5.10	89.00	73.98	33.70
184	55.55	2.32	12.02	0.77	0.11	6.46	102.12	79.74	41.60
253	55.16	1.59	9.68	0.64	0.04	4.47	69.64	82.80	38.76
255	61.13	1.85	9.12	0.59	0.05	4.13	121.19	84.77	33.61
256	56.47	1.48	9.36	0.77	0.06	5.38	148.13	83.72	51.90
257	36.73	1.05	51.12	0.28	0.04	3.65	240.52	67.60	17.36
258	46.51	1.40	11.55	0.74	0.12	5.34	275.82	88.21	39.32
259	51.60	1.98	16.06	0.52	0.05	3.93	85.19	89.25	40.54
260	48.26	1.95	17.32	0.56	0.04	4.25	290.86	81.48	22.67
261	44.29	1.64	46.65	0.37	0.05	3.58	110.53	74.75	39.43
262	36.58	1.61	65.13	0.22	0.03	2.86	86.22	86.26	31.63
266	36.66	0.94	24.18	0.33	0.03	2.48	61.72	70.68	21.60
421	49.88	1.29	15.54	0.53	0.04	3.49	60.76	77.52	31.92
422	64.50	2.06	16.51	0.68	0.06	5.06	84.21	96.11	45.19
423	53.20	1.81	18.16	0.57	0.05	4.11	71.16	90.07	36.24
424	58.69	0.57	22.07	0.62	0.05	4.74	66.80	53.80	38.52
425	62.11	1.06	17.91	0.66	0.07	4.96	67.46	67.06	43.13
426	55.78	1.38	19.07	0.55	0.04	3.94	62.70	76.43	30.66
427	58.90	1.79	17.54	0.61	0.05	4.40	66.87	92.09	35.94
428	64.59	2.05	13.53	0.70	0.06	5.13	83.65	102.09	46.77
429	63.10	1.05	19.80	0.73	0.06	5.51	77.47	57.00	42.69
430	61.20	1.75	13.77	0.75	0.06	5.63	64.55	70.88	39.06
431	60.57	1.44	18.95	0.56	0.04	4.06	67.88	81.01	34.40
432	60.97	1.34	15.06	0.68	0.06	5.01	81.97	73.60	46.98
433	60.36	1.78	24.67	0.57	0.05	3.99	65.78	90.58	33.81
434	57.12	0.98	20.07	0.63	0.05	4.60	71.17	62.64	32.76
436	56.33	1.86	11.81	0.66	0.05	4.76	79.17	94.75	38.88
437	65.53	1.65	12.37	0.72	0.07	5.47	84.69	86.65	52.91

Table 4.3-12: Summary of Principle component analysis performed on all the HH-XRF data for objects from Akragas. The first 6 components are shown, which collectively account for 98% of the variance in the data.

	PC1	PC2	PC3	PC4	PC5	PC6
Standard deviation	1.777	1.586	1.303	0.825	0.665	0.560
Proportion of Variance	0.351	0.279	0.189	0.076	0.049	0.035
Cumulative Proportion	0.351	0.630	0.819	0.894	0.943	0.978

Table 4.3-13: The loading of each major and minor element within each principle component.

	PC1	PC2	PC3	PC4	PC5	PC6
SiO_2	-0.109	0.500	0.290	-0.429	0.298	-0.145
K_2O	-0.020	-0.318	0.570	0.306	-0.063	-0.637
CaO	0.486	0.253	-0.123	0.131	0.328	0.043
TiO_2	-0.521	0.082	0.081	-0.322	-0.026	0.029
MnO	-0.415	-0.273	-0.216	0.422	0.181	0.324
Fe_2O_3	-0.523	0.051	-0.118	-0.041	0.104	-0.158
Zn	0.153	-0.425	-0.327	-0.559	-0.395	-0.159
Rb	0.073	-0.235	0.633	-0.180	-0.094	0.640
Y	-0.072	0.515	0.035	0.278	-0.769	0.071

as measured against the WD-XRF values. The performance of the CRM calibrated files on the trace elements, however, does not perform as well in some cases. The calibrated values for Sr and Zr are significantly lower than the WD-XRF results. The reason for this difference for these elements is not known and is also not seen in the study by Hunt.[19] One possibility might be attributed to the course fabric of the terracotta objects. The WD-XRF samples as well as the samples measured by Hunt were ground down to a fine powder. The effect of larger grain sizes on the measurements obtained with XRF is well known and is referred to as the matrix effect.[20] The large discrepancies in the Sr and Zr measurements might therefore potentially be attributed to the matrix effect. The variance in the different groups, as indicated by the relative standard deviation (RSD%) is roughly the same for both the WD-XRF and CRM calibrated HH-XRF data.

The CRM calibrated files thus outperform the manufacturer calibration (GL2) both in terms of correspondence with known quantitative results obtained through WD-XRF analysis as well as showing less variance. For the elements of Sr, Zr and Nb the calibrations are not reliable however, and will therefore not be incorporated in further statistical analysis.

A number of objects from Akragas were measured with the HH-XRF using the same settings as those used for measuring the CRM samples for the regression analysis. The regression calibration developed above can therefore be applied to these objects. The calibrated HH-XRF data for architectural terracotta from Akragas is provided in table 4.3-11. As already mentioned, a collection of objects from S. Anna were analysed using petrographic analysis, WD-XRF as well as HH-XRF. The calibrated HH-XRF data for this group of objects is included in table 4.3-11 as a control.

19 Hunt & Speakman 2015

20 Hunt & Speakman 2015, p. 632.

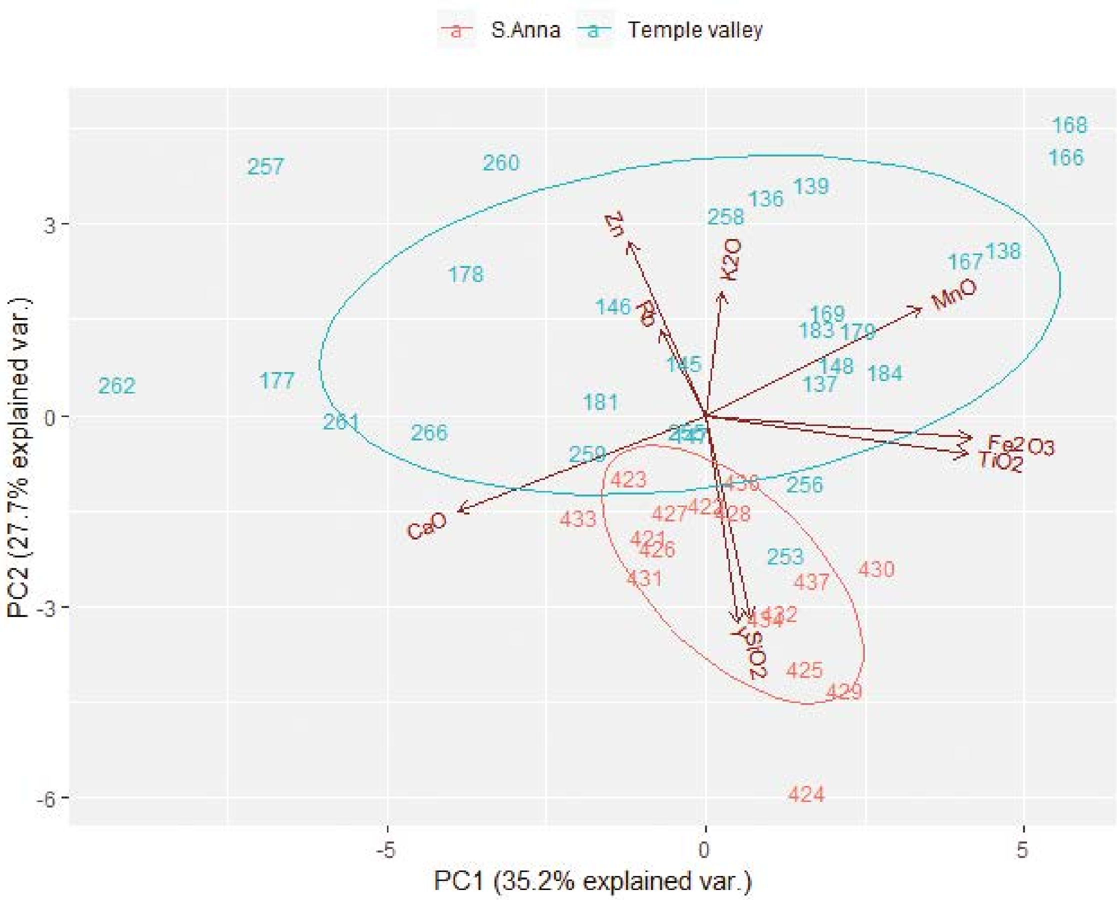

Figure 4.3-12: Biplot of the HH-XRF data for a collection of fragments from the urban area of Akragas (Valley of the temples) as well as a collection of roof tiles from S. Anna. The ellipse indicates the 68% confidence interval for each group.

4.3.3.2 PRINCIPLE COMPONENT ANALYSIS OF HH-XRF DATA

The calibrated HH-XRF data as shown in table 4.3-11 is analysed using the same statistical methods used in preceding sections. The summary data for the principle component analysis is provided below in table 4.3-12 and the loading on each element is shown in table 4.3-13. Principle component 1 and 2 collectively account for 63% per the variance in the dataset. The elements involved with these two components show a correlation between TiO_2 and Fe_2O_3, which are negatively correlated with CaO. SiO_2 shows a correlation with Y.

The first two principles are plotted on a biplot in figure 4.3-12. The objects measured with the HH-XRF can be divided into two groups. The first groups of objects are architectural terracotta fragments housed in the archaeological museum and which are associated with the sanctuaries inside the city of Akragas, or what is known as the valley of the temples. The control group consisting of roof tile samples from the extra urban sanctuary of S.Anna. The two groups plot as two distinct entities. The objects from the valley of the temple can be distinguished from the objects from S. Anna due to a higher concentration of Zn and a lower concentration of SiO_2 and Y. Two objects from the urban area (VIN 136, 138) overlap with the S. Anna group. The objects from S. Anna also has a lower concentration of CaO. While the objects from the urban area are grouped together, there are at least 4 objects (VIN 262, 177, 261, 266) which appears distinct from the main groups due to higher concentrations of CaO, while VIN 168 and 166 have lower levels of CaO but higher levels of MnO.

All the groups show higher variance, which objects with a standard deviation of more than 1

Table 4.3-14: Published data obtained through wavelength dispersive X-Ray Fluorescence (WD-XRF) used for comparison with the WD-XRF data from the S. Anna excavation in Agrigento

Location:	Period	Material	Instrument	Publication
Gela	Archaic and Hellenistic	Fine grain pottery	Philips PW2404/00	Aquilia et al 2012 table 1
Syracuse	Archaic and Hellenistic	Fine grain pottery	Philips PW 2400	Barone, et all, 2005, table 2
Lentini	Archaic and Hellenistic	Fine grain pottery	Philips PW 2400	Barone, et all, 2005, table 2
Messina	Archaic and Hellenistic	Fine grain pottery	Philips PW 2400	Barone, et all, 2005, table 2
Naxos, Francavilla and Toarmina (Alcantara Valley)	Archaic and Roman	Amphora, bricks and roof tiles	Philips PW2404/00	Belfiore, et all, 2010, table 5&6
Akragas (valley of the temples)	VI-Vth century	Amphora and roof tiles	Philips PW 2400	Barone, et al., 2003, table 4
S. Anna	Archaic and Classical	Roof terracottas	Panalytical Axios Max	New data

(the 68% confidence interval shown as an ellipse on the biplot). In the case of the S.Anna group, the petrographic and WD-XRF analysis have already shown the presence of at least 3 subgroups. Due to the high variance in the group of objects from the urban area in Akragas, subgroups are therefore a likely prospect. These subgroups are likely linked to stylistic groups and will be explored in chapter 5.

4.3.4 PROVENANCE

The large number of archeometric studies published on ceramic and terracotta objects from Sicily provides the opportunity to compare the S. Anna objects to objects from other sites in Sicily. While it is possible to compare quantitative data obtained through different methods, a recent study by Hein et all recommend the use of correction factors in order to compensate for discrepancies that arise due to different analytical set ups.[21] For this reason, only data obtained by using the same analytical method is used in order to avoid the necessity of correction factors. The published data used for comparison is detailed in table 4.3-14. Only objects for which the provenance has clearly been established by the relevant scholars are included in this analysis. The collection of published reference material consists of ceramics and terracotta objects from the Greek and Hellenistic periods.

The chemical composition of both the published reference groups as well as the objects from S. Anna can once again be analysed using principle component analysis in order determine the chemical characteristics of each group as well as potential overlap. The summary from this analysis is provided in table 4.3-15 and table 4.3-16. Principle component 1 and 2 are collectively responsible for 51% of the variance in the dataset. Component 1 is characterized by a high loading on K_2O and Ce (>0.20) and a high negative loading on Sr, Cr, Zr and Ba(< -0.30). Component 2 has a high loading on CaO and Ce (>0.20) and the highest negative loading is on Al_2O_3, Fe_2O_3, MnO and Ni (< -0.40).

The relationship between component 1 and 2 is visualized in figure 4.3-13. There is overlap between objects from Gela and those from Messina and the

21 Hein, et al. 2002.

Table 4.3-15: Summary of Principle component analysis performed on published WD-XRF data for objects from Sicily as well as objects from the S. Anna excavation. The first 12 components are shown, which collectively account for 97% of the variance in the data.

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12
Standard deviation	2.53	1.79	1.68	1.23	1.09	0.92	0.87	0.69	0.63	0.54	0.52	0.51
Proportion of variance	0.34	0.17	0.15	0.08	0.06	0.04	0.04	0.03	0.02	0.02	0.01	0.01
Cumulative proportion	0.34	0.51	0.65	0.74	0.80	0.84	0.88	0.91	0.93	0.94	0.96	0.97

Table 4.3-16: The loading of each major and minor element within each principle component.

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12
SiO_2	0.13	0.15	-0.44	0.02	-0.32	0.03	-0.21	0.38	-0.05	0.23	-0.01	0.01
TiO_2	-0.04	-0.15	-0.37	0.49	-0.15	-0.27	0.16	-0.27	0.04	0.07	0.00	0.16
Al_2O_3	-0.01	-0.36	0.32	0.20	0.16	0.13	-0.37	-0.18	0.04	0.19	0.02	0.14
Fe_2O_3	0.13	-0.41	-0.19	0.35	-0.04	-0.15	0.03	-0.15	0.10	-0.02	-0.03	-0.07
MnO	0.18	-0.33	0.05	-0.24	-0.30	0.17	0.31	-0.14	0.18	-0.56	0.01	-0.18
MgO	-0.07	-0.24	-0.02	-0.40	0.35	-0.54	0.29	0.16	0.34	0.24	-0.05	0.09
CaO	-0.24	0.33	0.15	0.01	0.30	0.01	0.11	-0.33	-0.19	-0.05	0.00	0.07
Na_2O	0.19	-0.09	0.19	-0.33	-0.46	-0.05	0.20	-0.31	-0.30	0.55	0.16	0.07
K_2O	0.28	-0.26	0.23	0.03	0.15	0.14	-0.18	0.05	-0.10	0.03	0.00	0.10
Sr	-0.35	0.08	-0.02	0.05	-0.10	0.08	0.26	-0.29	-0.03	0.02	0.10	-0.19
Cr	-0.37	-0.08	-0.09	0.00	0.03	-0.10	-0.09	-0.04	0.03	0.05	0.15	-0.09
Ni	-0.18	-0.36	-0.09	-0.02	0.12	-0.19	0.05	0.20	-0.80	-0.16	-0.06	-0.15
Zn	-0.29	-0.20	0.20	0.22	-0.08	0.16	0.02	0.09	0.18	0.18	0.27	-0.04
Rb	-0.04	0.02	0.42	0.34	-0.12	0.02	0.40	0.53	0.02	0.13	-0.01	-0.21
Y	-0.05	0.14	0.35	0.04	-0.32	-0.55	-0.39	-0.12	0.06	-0.10	-0.32	-0.37
Zr	-0.37	0.02	-0.10	-0.04	-0.13	0.15	0.01	0.03	0.07	0.09	0.03	-0.16
Nb	-0.29	-0.05	0.15	-0.10	-0.32	-0.21	-0.17	0.18	0.00	-0.33	0.37	0.59
Ba	-0.31	-0.15	0.02	-0.07	-0.17	0.25	0.07	0.02	0.03	0.07	-0.79	0.36
Ce	0.23	0.28	0.17	0.31	-0.01	-0.20	0.32	-0.03	-0.12	-0.11	-0.08	0.37

Alcantara Valey, which incorporates objects from Naxos, Taormina and Francavilla. The objects from S. Anna is clearly identifiable as a separate group due to much higher concentrations of CaO, Sr, Cr and Zr and low concentrations of SiO_2, Ce, and K_2O.

The published data for amphora and rooftiles from the valley of the temples at Akragas as indicated in table 4.3-14 only provide information for 11 elements. The large number of unavailable data can skew the statistical analysis, so this group of objects were omitted from the principle component analysis above. However, if the analysis is repeated, this time using only the 11 elements for all the available published date the following biplot for principle component 1 and 2 is created (figure 4.3-14). This plot still shows a separation between the objects from S.Anna and the published data. But there is an overlap between some of the objects from the valley of the temples. This group of objects consists of roof tiles and amphora. It is possible that the amphora came from a different raw clay source than the roof tiles, which would explain why some of the objects are not grouped together. Once again, the rooftiles from S.Anna is characterized by high concentrations of Cr and CaO.

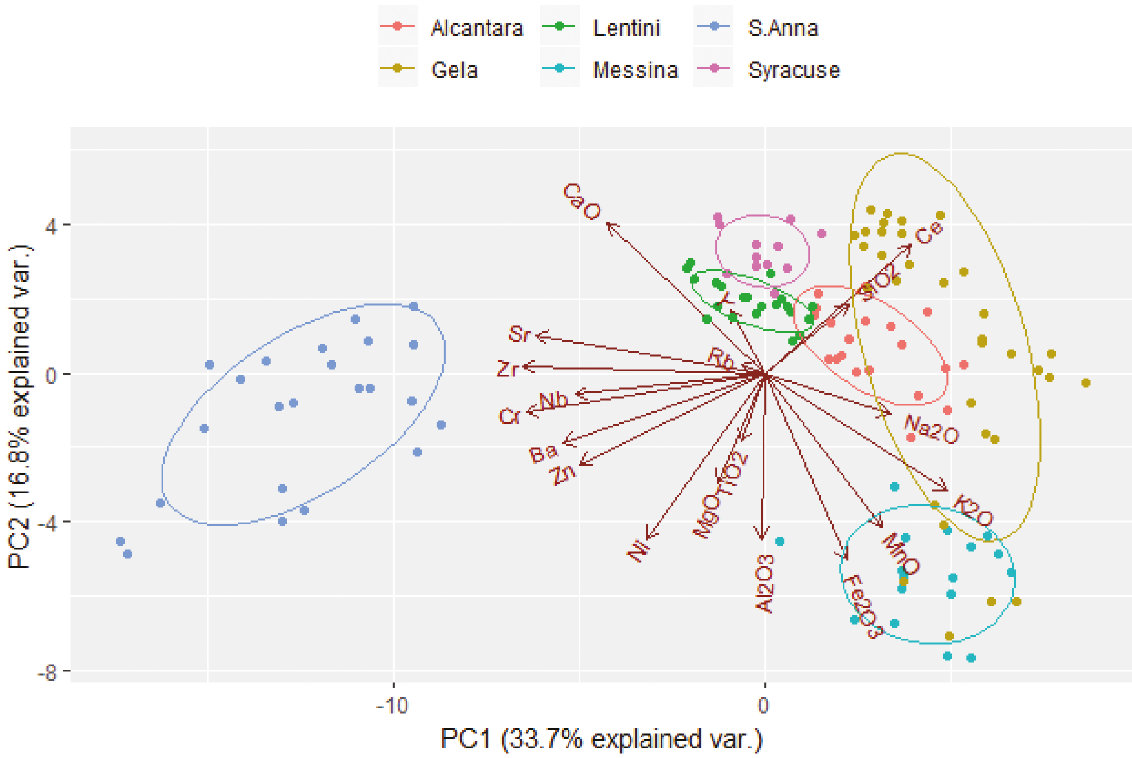

Figure 4.3-13: Biplot of the first two principle components based on the published WD-XRF data for locations in Sicily as well as the S. Anna objects. The ellipse indicates the 68% confidence interval for each group.

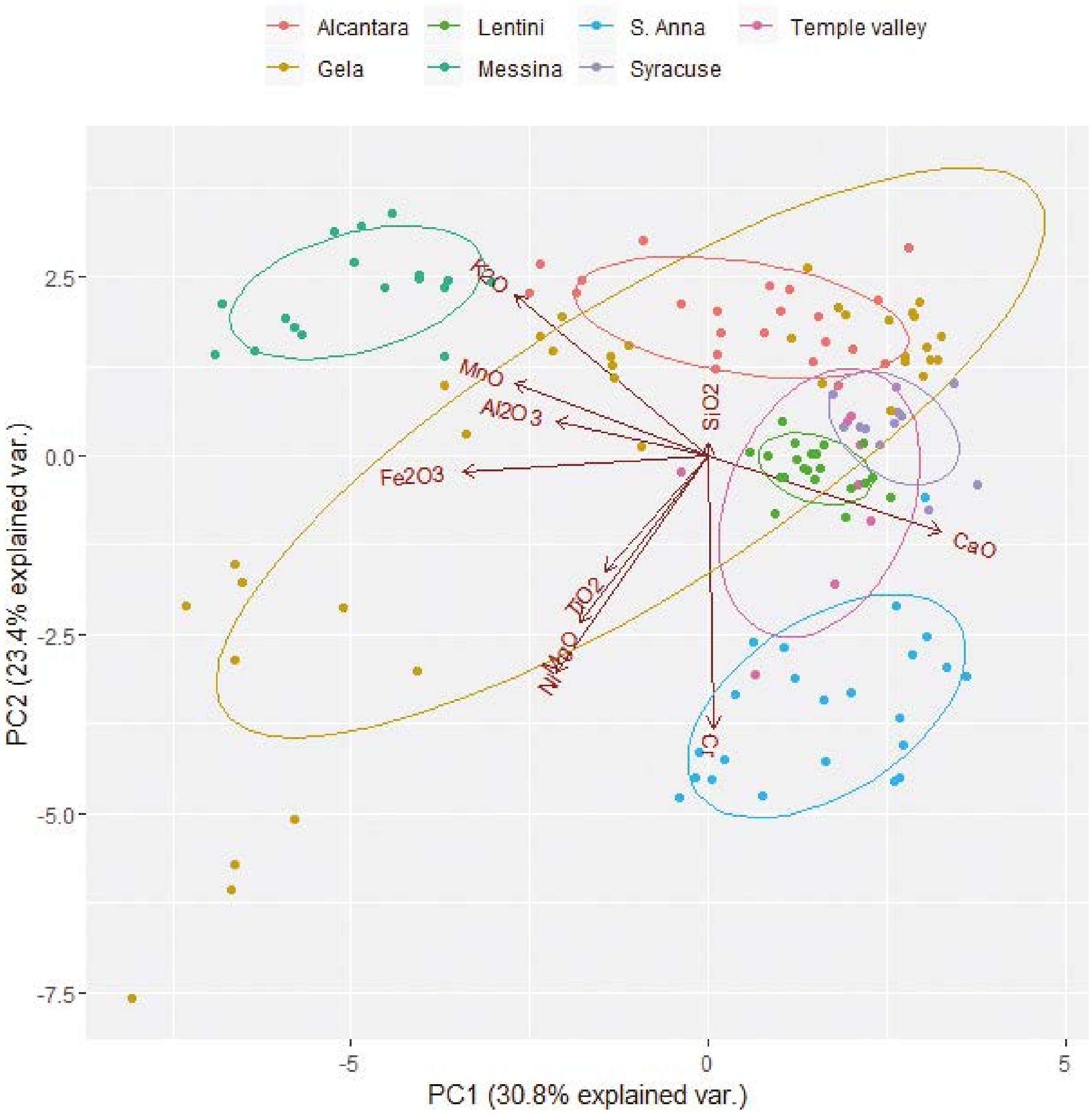

Figure 4.3-14: Biplot of the first two principle components based on the published WD-XRF data for locations in Sicily as well as the S. Anna objects. This dataset includes published data for Akragas, but only uses 11 elements for analysis. The ellipse indicates the 68% confidence interval for each group.

4.4 ARCHITECTURAL CONTEXT

Architectural terracottas are complex manufactured objects whose shape is influenced by various material and ideological factors. One of the main material factors identified in section 2.3 is architectural function by which the objects are intended to form part of a roof. In this regard objects are expected to address requirements such as structural stability, waterproofing and protection of underlying structures. Thus, it is one of the research aims of this investigation to explore in more detail the technical solutions employed by craftsmen to fulfil the functional demands. The history of research in section 2.1 demonstrates the scarcity of archaeological studies which address questions relating to actual architectural function. Where research examples exist, these mostly consists of older and partly outdated publications.[1] Therefore, the study of the architectural function of terracotta roof elements from Akragas must start with a systematic revaluation of the preparation of the objects themselves as well as the way in which the different roof elements connect in order to become a roof.

4.4.1 FROM THE WORKSHOP TO THE BUILDING SITE

A modern, industrialized, perception of objects produced from a mould presume identical and interchangeable objects. But this modern perception is not applicable to the past. As the objects from Akragas can attest, architectural terracottas produced by a manual process involving moulds and forms are not identical, nor consistent. And irregularities in the painted decoration have already been described in section 4.2.1.7. The production process affects then not only the painted decoration, but the shape of the profile as well. Examples of inconsistencies in the form include changes in dimensions and objects also being twisted out of the desired plane. This can be attributed to the mechanics of manual production including the handling of objects when not yet completely dry, changes in drying conditions and inconsistent firing. Various fragments from Akragas show these inconsistencies (e.g. frieze A, section 4.1.1). The curvature of the cavetto fragment (VIN 286) is different from the left to the right side of the object, resulting in a slightly twisted form. There is also considerable variation in the dimensions of specific profile elements: for example, the height of the uppermost fascia on the sima varies with a couple of millimetres from object to object; with 43 mm for VIN 286, 41 mm for VIN 355, and 46 mm for VIN 283.

In the absence of complete revetment pieces there is not enough evidence to determine overall dimension variations but based on the inconsistencies already discussed it seems probable that they could have varied to such a degree that it would be easily visible. The plain roof tiles from Gordion were found to vary up to 10 mm, while the ones from Selinus differ in 10-20 mm.[2] Whereas this might not be considered a major problem for plain roof tiles due to a more robust overlapping connection system, on the sima and geison revetment a step or gap of 10 mm between two elements would be visually jarring. To ensure the best fit and to correct any discrepancies, De Miro suggests that objects were placed in sequence after firing but before the application of painted decoration. During this process, objects could be reshaped as needed. He sees the chisel marks on the base of VIN 276 (figure 4.4 1) as evidence of this procedure. From the traces left in the clay it appears that the chisel was not applied to wet clay, and the painted decoration is applied on top of these marks.[3] But there are a couple of concerns regarding this theory. Firstly, according to conventional knowledge, the paint was added

1 Gabrici, 1956; Kunze & Schleif 1944, Orsi 1918.

2 Conti 1998, pp. 216-226; Henrickson & Blackman 1999, p. 310.

3 De Miro 1965, pp. 41-42.

before firing.[4] And, secondly, reshaping terracotta objects after firing is a difficult and risky task, as the terracotta is both hard and brittle, which makes it liable to crack under sharp impact. It seems therefore more probable that slight alterations were made with a chisel when the piece was bone-dry, but before firing. Confirming this procedure, additional chisel marks can be seen on VIN 353 and VIN 276. Their preparation indicates that the fit between individual elements was thus tested, and adjusted, before firing. However, the production process concerning the painted decoration is less clear. The meander pattern on the top fascia of frieze A (figure 4.1-1) is clearly interrupted by the edge of a tile. A more sensible interruption would be between two meanders, on a symmetry line. It is possible that while the objects were placed in sequence they were then also painted allowing, for example, the meander to be drawn across adjoining tiles. At the moment, however, there is not enough evidence to explore this hypothesis further.

After fitting and painting objects, the terracottas were placed in the kiln for firing and then eventually transported to the work site before being placed on the building. Due to the individual fit of the tiles, the order in which they are positioned is crucial. It is thought that this individual sequence was indicated by different marks on the back side of the objects.[5] There are a number of such marking systems known for canonical Sicilian simas including the roofs associated with the Athenaion and Olympieion at Syracuse and frieze B from Gela. On the Athenaion roof, this sequence consists of vertical lines and circles which do not correspond with known Greek numbering systems. On the Olympieion roof, there are painted figurative elements.[6] A similar system is found on the back of the anthemion sima formerly associated with temple Y at Selinus.[7] At Gela, a large amount of vertical lines and dots were painted on the back side of sima and geison revetment fragments from frieze B, and there are also evidence of more complex symbols, such as the vertical lines and crosses on the frieze C.[8]

Figure 4.4-1: Chisel marks visible on top corner of the horizontal flange of geison revetment associated with frieze A (VIN 276. Copyright Regione Siciliana – Assessorato Reg.le dei BB. CC. e I. S. – Su concessione del Polo Regionale di Agrigento – Museo Archeologico "Pietro Griffo" – divieto di duplicazione con qualsiasi mezzo).

A number of inscribed or painted traces on the reverse side of objects from Akragas can be interpreted as marks that are supposed to help builders place objects in the correct location or sequence: for example, the painted arrow at the top of VIN 276 from roof 1 (figure 4.4 1) or the three inscribed vertical lines on the back of VIN 355. On one side of an eaves tile (VIN 383, figure 4.1-36) there is part of a painted figurative element as well as the Alpha letter preserved. Nevertheless,

4 Winter, 1993 p. 306.

5 Brea 1949, p. 47; Ciurcina 1997, p. 36; Winter 1993, p. 307.

6 Ciurcina 1997, p. 36.

7 Conti 2012, pp. 197-198, fig 181-3.

8 Brea 1949, pp. 47, 56, fig 35, 43.

the exact interpretation of these marks remains difficult. As seen with the well-preserved example from Syracuse, the marks do not correspond with common Greek numbering systems. It is therefore likely that a workshop used its own numbering system. At this moment, the fragmentary nature of the remaining tiles and painted traces does not permit a detailed reconstruction of individual marking systems in Akragas.

4.4.2 THE CONNECTIONS BETWEEN TERRACOTTA ROOF ELEMENTS

An integral step in looking at roofs as an architectural and functional entity is the investigation of the way individual elements connect with each other. The manner in which a specific roof element is placed in relation to an adjacent component is a fundamental part of a roof's design as it has an impact on the stability, waterproofing and visual effect of the roof. While some connections are quite well documented and understood, others have not yet received comprehensive scholarly attention. The following overview presents thus the different types of interconnections of terracotta roof elements in greater detail.

4.4.2.1 PAN AND COVER TILES

The manner in which the plain roof tiles connect with each other is quite well understood. While Winter does not visually show the typical Sicilian roof, she does detail the way in which different roof elements connect for a number of different types of Greek roofs, including the Corinthian roof of the Megarian treasury at Olympia.[9] The roof tiles from Selinus and the manner in which they interconnect is well documented thanks to the work by Conti[10] and Jonasch.[11] In contrast, very little information is available regarding the plain roof tiles of the archaic period of Akragas, as described above in section 2.1. The roof tiles from the recent S. Anna excavation are dated to the 5th and 4th century based on the profile types as identified by Conti (section 4.1.59-64). And they all come from a secondary context. A single pan tile fragment from Gàbrici's excavations to the south of temple B at Akragas (section 4.1.65) has a similar profile to material from S. Anna. No example from the 6th century has been identified. Due to the fragmentary nature of the available information for this small collection of roof tiles it is not yet possible to determine which pan tiles and cover tiles were used on the same roof.

All the pan tiles detailed in chapter 4.1 have a rounded edge on the long sides of the flat rectangular tile. At the bottom, there are two notches on the underside or the corners to allow for the overlap between tiles (figures 4.1-64). This method of connecting pan tiles is also known from the roofs of Selinus,[12] where the examples are similar to the group of pan tile B from Akragas (section 4.1.63). To illustrate the specific connection between plain roof tiles this type of pan tile B is thus used as an example (figure 4.4 2). It is important to note that the overlap of pan tiles means that each individual pan tile is at a different angle than the main roof slope. For example, if the slope of the roof rafters are 18 degrees, then the slope of 700 mm long pan tiles is 15 degrees. The difference is caused by the raising of the bottom of the pan tile with 30 mm (the thickness of the pan tile) in order to overlap with the lower one.

The archaeological remains from Akragas do not provide enough information on the overall dimensions of the pan tiles nor the rounded cover tiles. Therefore, the roof from Selinus represents a significant reference for the reconstruction, especially due to strong stylistic similarities between the tile profiles of the two sites.[13] The top right pan tile in the digital reconstruction is tilted

9 Winter 1993, pp. 28-32, fig 4.

10 Conti 1998.

11 Jonasch 2009.

12 Part of a roof consisting of pan tiles that fall within Conti's type 7 is reconstructed physically by Jonasch (Jonasch 2009, p. 3, fig 3, 15-17).

13 Jonasch 2009.

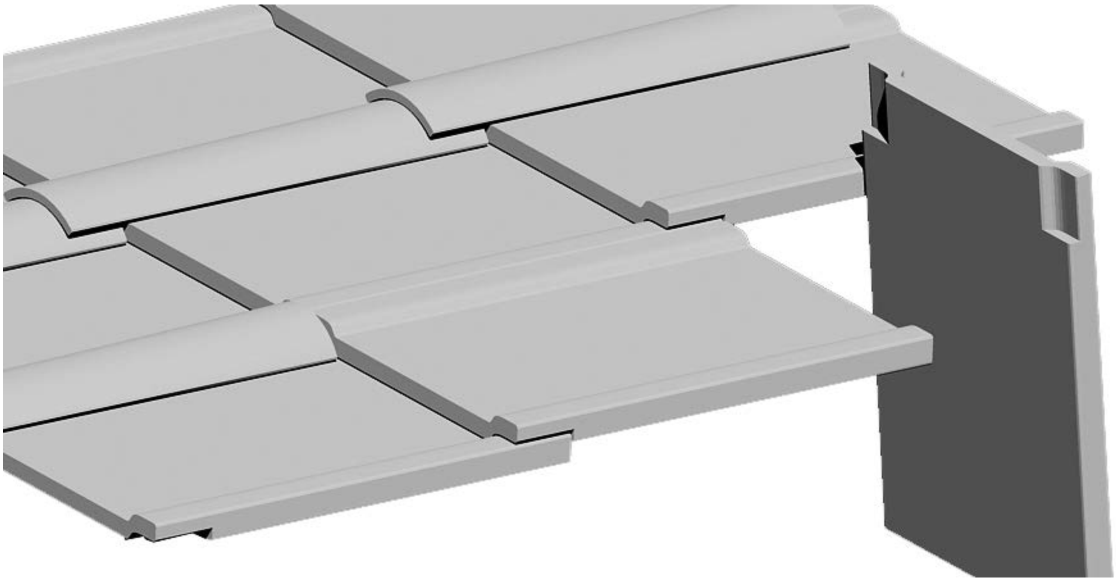

Figure 4.4-2: Digital reconstruction of system in which pan and cover tiles are connected. Pan tile profile is based on pan tile group B. The cover tiles are based on examples from Selinus.

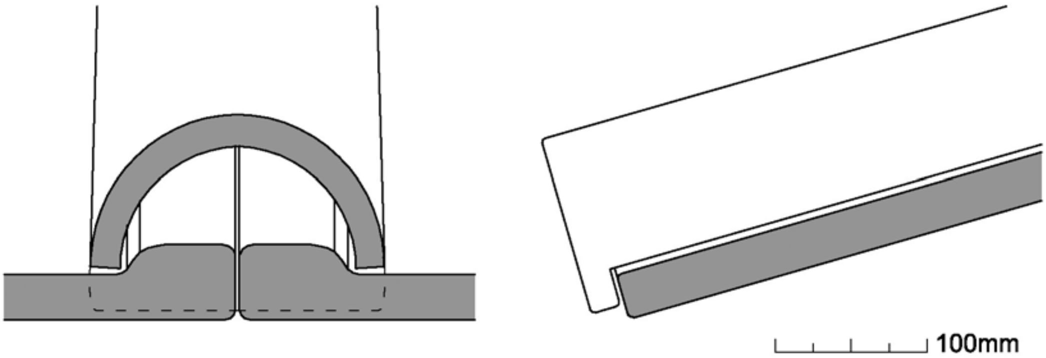

Figure 4.4-3: Antefix and pan tile connection. The front view is on the left, with the antefix plaque show in dashed lines. On the right is a side view, cutting through the pan tile. The curved cover tile of the antefix is based on antefix B and the pan tiles are based on pan tile group B

upwards in order to show the underside of the tile itself (figure 4.4 2). The first two cover tiles on the right are also digitally removed, thereby uncovering the connection between adjoining pan tiles. While the adjacent pan tiles are connected to each other at the bottom and top by an overlap of around 100 mm, the tiles placed in a horizontal row are not overlapping. The separate cover tile overarches instead the gap between such two adjoining pan tiles and also overlaps with the other cover tiles at the top and bottom.

4.4.2.2 ANTEFIX AND EAVES TILES

The placement and connection between eaves tiles and antefixes are also quite well documented. Winter provides detailed drawings and reconstructions for various types of antefix roof systems, including the Corinthian roof.[14] At Naxos, the 5th century ship sheds with the gorgon and silen antefix roof are another example.[15] In both cases, the antefix profile provides the information regarding the placement and size of the cover tile. The majority of antefix fragments from Akragas is combined with a curved cover tile that is connected to the plaque along it's top edge (antefix B, D, E

14 Winter 1993, fig, 4, 8-9.

15 Lentini, et al. 2008.

and H; section 4.1.23, 25, 26 and 29). On antefix C (section 4.1.24), however, the cover tile is set below the top edge by about 15 mm. The more common placement of the curved cover tile on antefix A, B, C, D, H and L also shows that it did not extend all the way to the bottom edge of the antefix plaque. This means that if the cover tile is placed on top of the eaves tile, the antefix plaque would cover part of the taenia (the visible front edge of an eaves tile). This connection between antefix and eaves tile is illustrated below using the early 5th century antefix B (section 4.1.23) and the 5th century pan tile B profile (figure 4.4-3). From the painted decoration on the underside of eaves tile A (section 4.1.35) it is clear that the eaves tile cantilever beyond the supporting roof structure.

4.4.2.3 RIDGE TILES

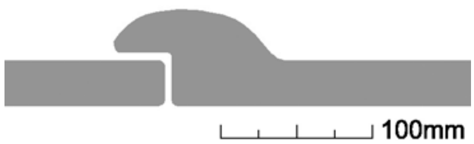

Figure 4.4-4: Connection between two ridge tiles (ridge tile type C)

Where the pan and cover tiles meet at the ridge of the roof, there is a gap which is protected by the central ridge tiles (figure 4.4 5). These curved tiles found at Akragas have a raised border on one edge which incorporates a notch on the inside to accommodate the end of the adjacent tile (figure 4.4-4). This type of overlap design is known for other ridge tile examples from Sicily from the archaic period including from Gela[16] and Selinus.[17] In contrast, the polygonal shaped ridge tiles of the early classical period from Selinus have a stepped edge, not a raised border.[18]

As shown in section 4.1.51-57, the overlap design of the raised border varies at Akragas. The simplest design is a single rounded border, as seen in ridge tile C (section 4.1.53). But more elaborate borders consisting of two or more rounded bands are also common. In terms of function, the different ridge tile types work on the same notching principle as illustrated in figure 4.4-4.

The connection between ridge tile and cover tiles are facilitated by a hole on each side of the ridge tile as seen on VIN 401 (figure 4.1.52) and VIN 571 (figure 4.1.60). This allows for part of the cover tile to extend below the overarching ridge tile, and thus providing a protected connection (figure 4.4-5). This connection method is also known for ridge tiles from other colonies including Gela[19] and Selinus.[20]

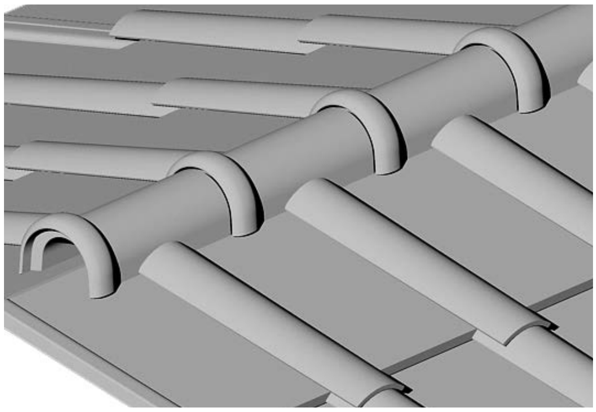

Figure 4.4-5: Graphic reconstruction of ridge tiles on a pitched roof.

4.4.2.4 SIMA AND GEISON REVETMENT

The connection between the sima and geison revetment elements must be different from the interconnections of pan, cover and ridge tiles as there is no overlap intended between two sima or two geison objects. Instead, the sima and geison revetment pieces are placed directly next to each other with the side edges abutting. For the objects from Akragas two types of side edges are present. On a number of fragments there are clear remains of a stepped edge (figure 4.4-6) while on others

16 Brea 1949, p. 59, fig, 58.

17 Conti 2012, pp. 264-268.

18 Conti 2012, pp. 268-271, fig. 269-70.

19 Brea 1949, p. 67, fig. 59.

20 Conti 2012, pp. 268-271, fig. 269-70.

there is just a straight edge (figure 4.1.13). It should be noted that the stepped edge is only applied to the upstand portion of the sima. The horizontal portion appears to have a straight edge according to the preserved fragments.

The two types of side edges on sima and geison revetment pieces are detailed in table 4.4-1. For a few stylistic groups, fragments with preserved side edge are not available, these are indicated as unknown. In essence the canonical Sicilian sima roofs (frieze A and D) have a stepped edge on the sima pieces and a straight edge on the geison revetment tiles. The anthemion roof (frieze G) presents a straight edge on both the sima and geison revetment.

Figure 4.4-6: Stepped edge on sima fragments from roof 1: showing the step on the right and left hand side of the sima (VIN 260, VIN 257. Copyright Regione Siciliana – Assessorato Reg.le dei BB. CC. e I. S. – Su concessione del Polo Regionale di Agrigento – Museo Archeologico "Pietro Griffo" – divieto di duplicazione con qualsiasi mezzo)

The use of a stepped edge is quite common for the architectural terracottas in Sicily. Examples of roofs with the stepped edge on the canonical sima and the straight edge on the geison revetment include frieze B from Naxos[21] and roof 8 from Selinus.[22] Both date to the same period as frieze A and D from Akragas. However, the anthemion sima and geison revetment fragments from Naxos show straight edges on both the sima and geison pieces.[23] Other examples that do not match the ones from Akragas in terms of the side edges include roof 12 from Selinus, which has a stepped edge on the geison revetment fragments instead.[24]

Table 4.4-1: The side edge used for sima and geison revetment for the different stylistic groups (section 4.1)

Stylistic group	Sima	Geison revetment
Frieze A	Stepped edge	Straight edge
Frieze B3	Stepped edge	Unknown
Frieze B5	Stepped edge	Unknown
Frieze D	Stepped edge	Straight edge
Frieze G	Straight edge	Straight edge

The stepped edge on the sima creates a more secure connection in that it has to potential to restrict differential movement between two tiles. This feature helps to prevent two adjacent tiles from moving out of line in both the horizontal, but especially the vertical plane (figure 4.4-7). In this regard the stepped edge facilitates more stability. It should also be noted that the adjoining pieces, especially the horizontal tile section, provides additional resistance to movement. By linking the tiles more securely in this manner, it ensures that the individual tiles stay in position thereby creating a clear overall profile along the roof edge. In contrast, the geison revetment profile is less complex than the canonical Sicilian sima and it's position in the roof might be more stable due to the weight of sima resting on top. This might explain the lack of a complicated stepped edge on geison revetment pieces from Akragas. An additional advantage of

21 Lentini & Pakkanen 2011, p. 419, fig 3.

22 Conti 2012, p. 95. fig 63, 72.

23 Fragments are on display in the archaeological museums of Syracuse and Naxos (Ciurcina 1993, pp. 34-35, fig 14-16).

24 Conti 2012, pp. 107-108, fig 89.

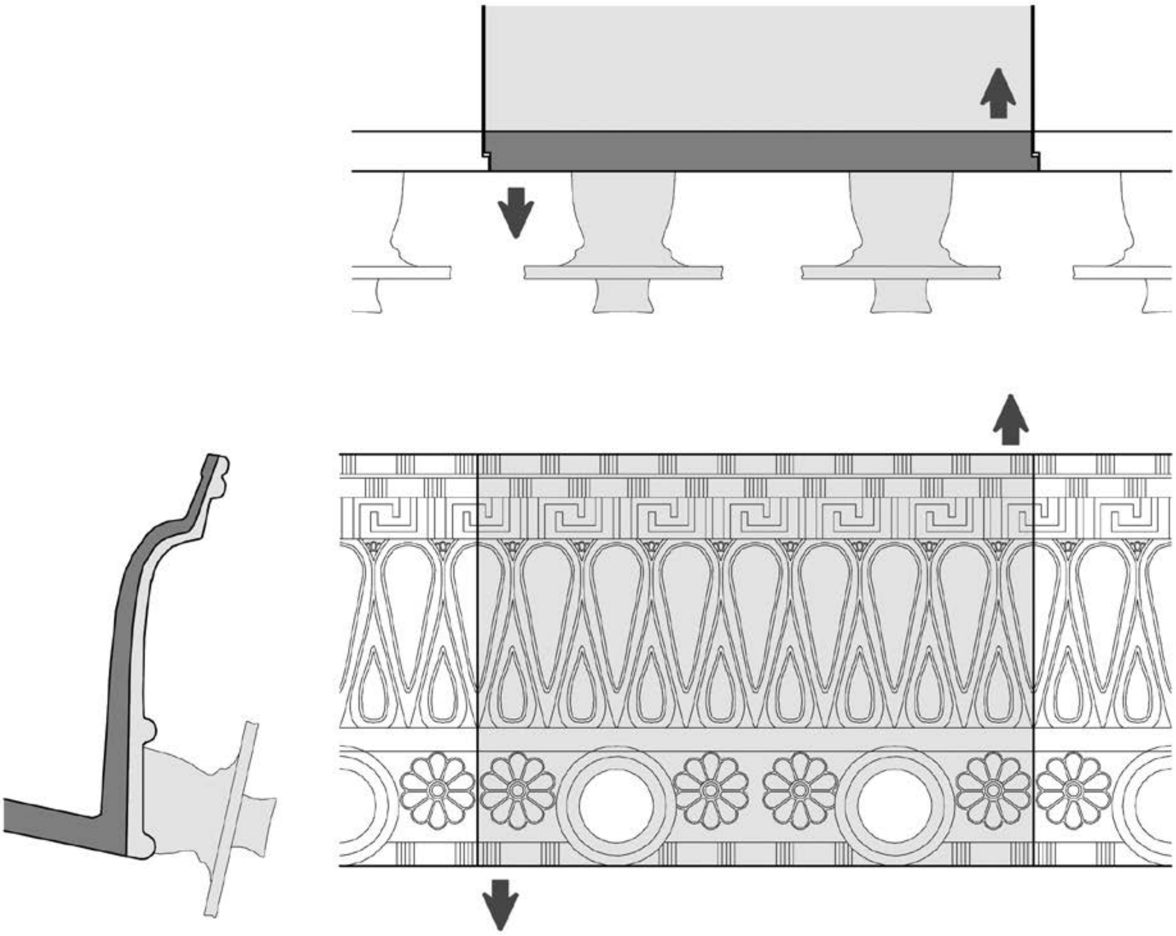

Figure 4.4-7: The stepped join partially prevents movement in the horizontal plane (top image) and vertical plane (bottom image). The restricted movement is indicated by arrows.

the stepped edge on the sima is the visual shading of the join due to overlapping elements. The sima upstand is backlit against the sky during parts of the day. A large vertical gap between two sima tiles will thus be highlighted if there is a clear line of sight between the tiles. The stepped edge prevents this from happening in addition to its stabilizing function. In contrast, the geison revetment pieces are placed directly against the wall, and thus there is no backlighting.

The full sima profile including the horizontal tile section is not very well documented. A view of the back side of sima fragments is sporadically published and the full extent of the sima piece is rarely reconstructed.[25] In the few instances, where the connection between lateral sima and pan tiles from the Western Greece are described, the sima tile shows the same profile dimensions as a regular pan tile. The side ridges of the horizontal tile profile terminate against the sima upstand, and the gap between two tiles is protected by a cover tile. The reconstruction of the Geloan treasury roof by Kunze and Schleif is a good example of such a reconstruction.[26] Other known sima tiles with a raised border include an earlier roof from Himera dated to 570 BC,[27] and the anthemion roof from Naxos dated to the end of the 6th century BC.[28] From Southern Italy, there is an example of a canonical sima from Caulonia.[29] Another sima fragment from Himera, dated to the first half of the 6th century, also has a raised border, but on the

25 Of the 28 sima profiles published by Wikander, only 4 include the full extent of the horizontal tile portion (Wikander, 1986).

26 Kunze & Schleif 1944, p. 89, fig 24.

27 Lang 2010, p. 98, tab. 6.2.

28 Ciurcina 1993, p. 34, fig 14.

29 Barello 1995, p. 62, fig. 32.

Figure 4.4-8: Back of corner fragments of lateral sima fragments associated with frieze A (VIN 260), frieze B3 (VIN 358) and frieze D (VIN 508)(Copyright for VIN 260 and 358: Regione Siciliana – Assessorato Reg.le dei BB. CC. e I. S. – Su concessione del Polo Regionale di Agrigento – Museo Archeologico "Pietro Griffo" – divieto di duplicazione con qualsiasi mezzo. Copyright for VIN 508: Regione Siciliana – Assessorato Reg.le dei BB. CC. e I. S. – Su concessione del Polo Regionale di Palermo per i Parchi e i Musei Archeologici– Museo Archeologico Regionale "Antonino Salinas" – divieto di duplicazione con qualsiasi mezzo)

published image it appears that it does not extend all the way to the sima upstand.[30]

Evidence for the profile of the tile portion of the sima pieces from Akragas is limited to fragmentary remains directly next to the sima upstand. The best indication comes from the bottom corners of lateral sima pieces. There are such corner fragments available for three of the stylistic groups, frieze A, B3 and D (figure 4.4-8). The preserved fracture on these objects indicates a tile with an overall thickness of 30 mm, or slightly less, which is consistent with known pan tiles from Akragas (section 4.1.62-65). The preserved fracture of the tile portion proves a uniform thickness for the entire extent of each fragment. While the presence of a raised border cannot be ruled out, the available evidence shows that there was no raised border which connected to the upstand sima.

One of the reasons might be due to the relatively small size of simas from Akragas. The distance from the edge of the sima to the inside of the waterspout is around 100 mm for all three frieze examples. Depending on the size of the pan tile profile in use, the cover tile might have partly obscured the waterspout hole if it extended all the way to the sima upstand. On the roofs at Selinus, the cover tile needed to overarch the connection between two pan tiles with a ridge of 70 mm width is 200 mm.[31] However, this example is dated later than the canonical roof systems from Akragas from the middle of the 6th century, of which the pan tile profiles are not known. Earlier pan tile profiles from Selinus from the 6th century have a raised ridge of 55 mm wide,[32] whereas the earliest identified pan tile from S. Anna shows a raised border of 100 mm (section 4.1.64). In the absence

30 Allegro, 1976, pp. 537, Tab. LXXXVI.1; Lang 2010, pp. 101, HIM 12;.

31 Jonasch 2009, p. 4.

32 Conti 1998, pp. 216-219.

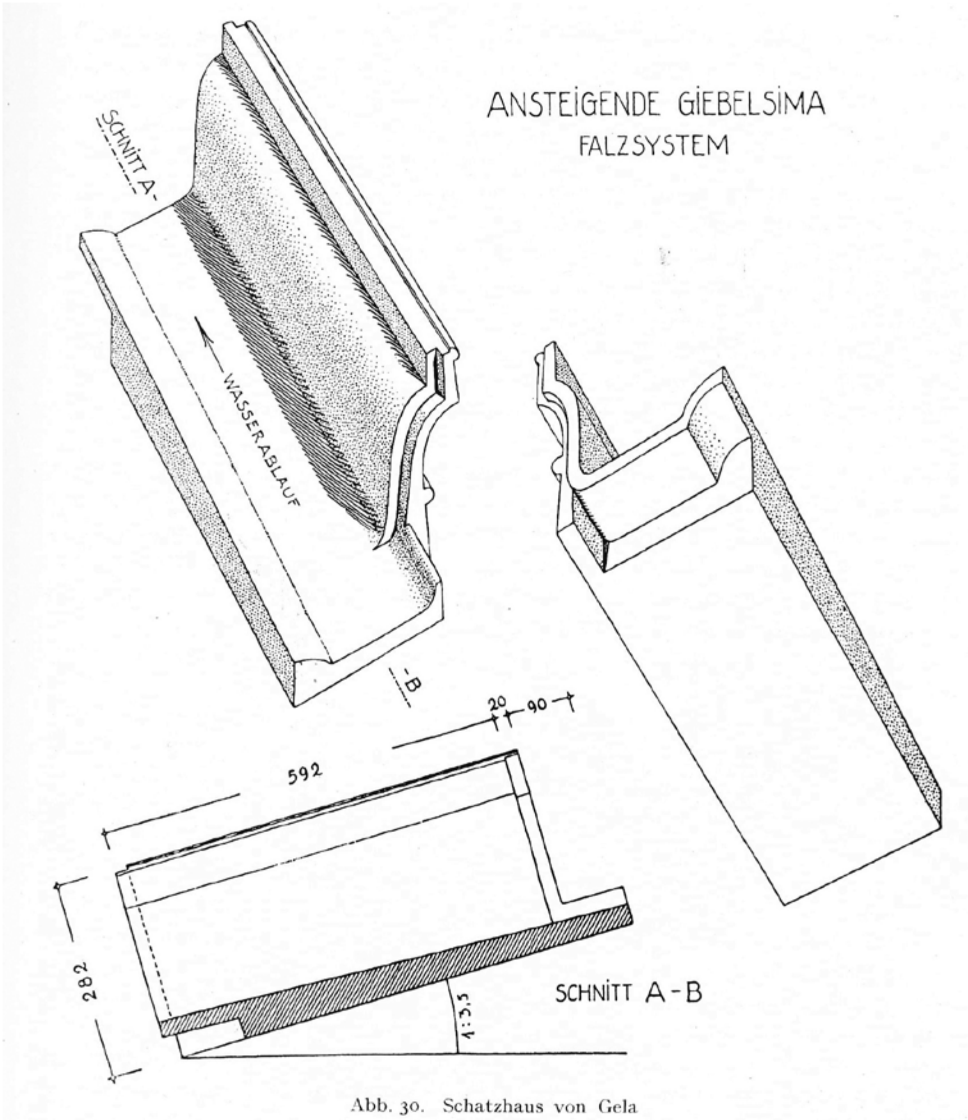

Figure 4.4-9: Detail of raking sima from the Geloan treasury, Olympia (Kunze & Schleif 1944, fig 30).

of clear evidence regarding the profile dimensions of the pan tiles associated with these roofs it is not possible to clarify if the lack of raised edges on the sima is due to insufficient space between the sima edge and waterspout.

The connection between the raking sima and pan tiles is still less known than the one for the lateral sima. The reconstruction of the Geloan treasury roof at Olympia represents one of the few examples. Here the lateral sima is reconstructed as having a raised border at the back edge in order to mirror the adjacent pan tile.[33] Another example comes from Selinus, identified as roof 3, and is dated to the end of the first quarter of the 6th century BC by Conti. This roof has a small raised border at the back edge of the horizontal tile.[34] From Caulonia in Southern Italy, another well published example presents a raised border with a profile similar to pan tiles. The roof offers similarities with the canonical Sicilian roof and is dated to the second half of the 6th century.[35] In summary, the connection of both elements is best explained in the reconstruction and detailed drawing of the raking sima of the Geloan treasury roof by Kunze and Schleif (figure

33 Kunze & Schleif 1944, pp. 89, fig 24.

34 Conti 2012, pp. 63, fig. 41; Wikander 1986, pp. 40, fig. 11.

35 Barello 1995, pp. 66-68, fig 35; Lang, 2010, pp. 102-103, tab. 7.5.

Table 4.4-2: The angle between the vertical face and the horizontal tile for stylistic groups (section 4.1).

		Canonical Sicilian sima					**Anthemion sima**	
	VIN	**Frieze A**	**Frieze B1**	**Frieze B2**	**Frieze B3**	**Frieze D**	**Frieze F**	**Frieze G**
Lateral sima	177						93	
	196					84		
	253	75						
	257	75						
	260	75						
	261	76						
	265	77						
	267	77						
	349			81				
	355	78						
	358				79			
	508					78		
	562				76			
	569				77			
	612					76		
	Average	**76**		**81**	**77**	**79**	**93**	
Lateral geison	183							93
	351		99					
	354	97						
	505					98		
	570				100			
	Average	**97**	**99**		**100**	**98**		**93**
	Total	**173**			**177**	**177**		

4.4-9). [36] The section of the bottom tile portion shows that it changes in thickness and has a notch at the bottom thereby facilitating the connection between the pan tiles of the main roof and the raking sima. As already discussed and illustrated in section 4.4.2.1, the overlap between pan tiles means that each of these objects is at a different angle than the overall roof slope (figure 4.4 2). As another result, this overlap also creates a step in the profile of the lower tile portion of the sima. In contrast, the known raking sima fragments from Sicily generally form a continuous straight line that follows the slope of the pediment.[37] The Geloan treasury at Olympia is the only published example of a fully detailed raking sima, where the difference in thickness of the raking sima tile thus accommodates the difference in slope between the pan tiles and the raking sima.

The connection between the sima and geison revetment varies according to the type of roof and the position of the objects. The established convention used by scholars on the canonical

36 Kunze & Schleif 1944, tab. 47.

37 The Geloan treasury at Olympia ((Kunze & Schleif 1944, tab. 47); Frieze A from Gela (Brea 1949, tab. 2); "Secondo Nucleo" from the Athenaion, Syracuse (Orsi 1918), fig 233; (Wikander 1986, pp. 44-46, fig 2,15).

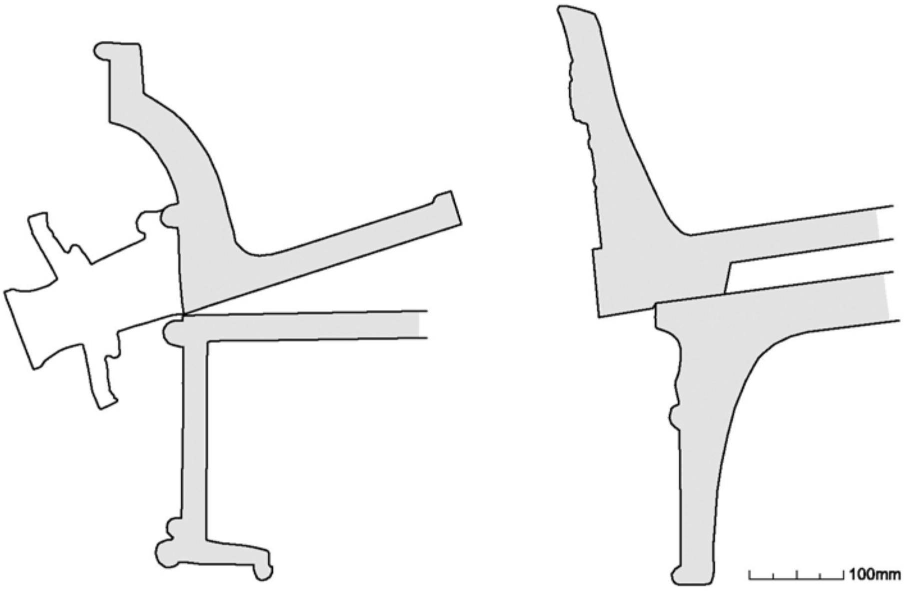

Figure 4.4-10: The placement of the lateral sima and geison revetment for a) the canonical Sicilian roof, represented by the Geloan treasury at Olympia (after Heiden 1995, fig 33-34), and for b) the anthemion roof, represented by roof 20 from Selinus (after Conti 2012, fig 186).

Sicilian roof is to depict the lateral sima with the lower fascia as vertical, seen in the profile drawing of the Geloan treasury roof at Olympia (figure 4.4-10a). In contrast, the raking sima is depicted with the bottom tile portion as horizontal, which places the bottom fascia at an angle. This is the convention also followed for the graphic reconstruction of the roofs from Akragas in chapter 5. The geison revetment from the lateral, raking and horizontal parts of the roofs are all depicted with the main fascia completely vertical. This way, the sima is placed directly in line with the geison revetment.[38] The angle between the vertical face and horizontal tile for the lateral sima and geison revetment is summarized in table 4.4-2. For the canonical Sicilian roofs (frieze A, B2, B3 and D), this angle on the sima fragments is considerably smaller than 90 degrees, while on the geison revetment fragment it is larger than 90 degrees. The sum total of the angles for the sima and geison revetment pieces are less than 180 degrees. This means that if the sima and geison revetment is placed according to the convention, there is a gap between the sima and geison revetment tile of a couple of degrees, as seen in the profile drawing for the Geloan treasury (figure 4.4-10a).

The connection and placement of the lateral sima and geison revetment for the anthemion roof (frieze F and G) differ slightly from the one of the canonical Sicilian roof. As seen in table 4.4-2, the angle between the vertical and horizontal parts of the sima is more than 90 degrees. This means that if the lateral geison revetment has an angle of more than 90 degrees, the sum angle of the sima and geison revetment is also slightly more than 180 degrees. This raises the question if there was a gap between the sima and geison revetment, as seen for the canonical Sicilian sima. The profile reconstruction for roof 20 from Selinus (figure 4.4-10) shows no such gap. While the fragments from Akragas are not preserved in full profile, the available evidence appears to correspond to the known profiles for anthemion roofs from Sicily in terms of the positioning of the lateral sima and geison revetment.[39] The angle of the lateral sima of frieze F is similar to roof 20 from Selinus and the painted soffit on VIN 177 is indicative of a

38 Conti 2012; Wikander 1986.

39 Roof 20 from Selinus (Conti 2012, fig 186) and series A from Naxos (Ciurcina 1993, fig 14).

cantilever beyond the lateral geison revetment.

The knowledge of the placement of sima and geison revetment pieces in relation to each other along the façade of the building is limited. The connection can only be conclusively determined in the rare instances where complete sima and geison revetment corner pieces are available. The Geloan treasury at Olympia is again one of the few examples. In the reconstruction of the front of the roof, the sima corner fragment is longer in relation to the length of geison revetment corner. This means that the join between two raking sima pieces does not line up with the join between two raking geison revetment fragments.[40] This variation is also found at another Olympian roof with tubular waterspouts.[41] It can be hypothesized that the staggering of sima and geison revetment joins, known from the two examples from Olympia, was also used for the roofs from Akragas. The painted black line on the top corner of the horizontal flange of geison revetment on VIN 276 (figure 4.4-1) might be associated with the placement according to the sima join: this black line is about 60 mm from the left edge of the geison revetment. If the sima is placed on top of it with the corner on this line it will stagger the sima and geison revetment joins by 60 mm. On the underside of two corner fragments from the lateral sima, similar black lines are visible around 30 mm from the right corner (VIN 260-261). These fragments are all associated with frieze A (section 4.1.1), and, therefore, indicate that at least for this frieze the sima and geison revetment joins were staggered. This has implications for the management of water seepage discussed in section 5.3.

40 Kunze & Schleif 1944, tab. 47-9.

41 The roof with rosettes as reconstructed by Winter (Winter 1993, fig. 26)..

CONCLUSIONS

The connections between individual terracotta roof elements are integral to the successful function of the roof in terms of structural stability and durability, waterproofing and protection of underlying structures as well as uniform painted decoration. A systematic evaluation of the interconnections is therefore a key step in analyzing the architectural context of terracotta roofs. The functional and technical understanding of the objects is a principle point for creating accurate graphic reconstructions in chapter 5. Unfortunately this aspect of architectural terracottas has not received wide spread academic interest (section 2.1), as attested by the lack of published photographs or drawings showing, for example, the back side of objects or the full profile or the horizontal tile sections. The objects from Akragas do not present all aspects of the terracotta roof elements discussed above and the evidence is therefore limited. For instance, the sima and geison revetment corner pieces as well as the lateral sima profile is not preserved. However, the revaluation of different evidence such as numbering and construction marks, the scars left by missing elements and the finishing of adjoining objects' sides provides additional information which contributes new details to the reconstruction of connections and to the wider discussion on architectural function.

Based on the detailed review in this chapter, it is apparent that the solutions used for addressing specific technical requirements change over time, especially between the canonical Sicilian roofs of the mid-6th century and the anthemion roofs of the late 6th century. The majority of connections between different terracotta roof elements rely on overlapping and notching elements in order to protect joins but also to provide additional stability to the roof. The overlap between pan tiles is one solution, as are the side edges of some sima pieces. These stepped joins between the sima pieces are only found on the earlier canonical Sicilian roof examples, not on the later anthemion sima. In relation to the supporting structures, the canonical Sicilian sima also differs from the other roof type in that there is a gap between horizontal elements of the sima and geison, which means that the sima only rests on its edge against the geison revetment. Furthermore, the discharge of water from the roof is achieved differently between the two roof systems as can be seen with the interconnections of sima, pan and cover tiles. On the canonical Sicilian sima the water is funneled away from the building surfaces by means of the tubular waterspouts. On the anthemion roof the perforated sima cantilevers beyond the supporting structures, which protects the building surfaces below from damage caused by water runoff. The full extent of the measures taken to protect against water seepage will be discussed in greater detail in chapter 5 in light of the new roof typologies.

As architectural components the shape of individual terracotta roof elements is designed to fit within a specific position on the building. Their different interconnections are carefully considered and incorporated into the final form. Even before firing the placement of individual elements is already tested and adjusted. The architectural function of these terracottas therefore constitutes an integral factor in the design and production of the objects.

5 THE TERRACOTTA ROOFS FROM AKRAGAS

One of the aims of this study is the formation of a revised typology for the architectural terracottas from Akragas. As discussed in chapter 2 and shown in section 4.1, the existing typology created in 1965 by De Miro1 no longer fully represents the complete corpus of archaeological material. The proposed revised typology in this chapter incorporates different parts of the terracotta roof: the decorated as well as the undecorated elements. This approach is similar to the work performed by Conti for the architectural terracottas from Selinus.2 The revised typology identifies roofs based on the style (section 4.1), fabric (section 4.2), and chemical composition (section 4.3). The analysis of each of these aspects is performed separately in chapter 4 as they are subject to different processes and, therefore, require a different methodological approach. Chapter 5 is the synthesis of all the results from the preceding one.

The methods and theories applicable not only to the analysis of style, fabric, and material composition but also to the creation of a typology are discussed in chapter 3. It is useful to the reading of this chapter to briefly summarize the most important factors. In regards to the use of style it should be noted that the history of research on Sicilian terracotta roofs has established a number of principles (chapter 2). For example, the profile and decoration of the lateral, raking, and horizontal sima of a canonical Sicilian roof are alike except for the lower fascia, which only has waterspouts on the lateral sima. A single fragment with enough of the profile and decoration preserved to distinguish it from other roofs can therefore be enough evidence to identify a roof, as seen with frieze B6 (De Miro) in section 4.1.7. The situation is more complicated for other architectural types. Antefix roofs could make use of a combination of different types on the same structure, such as the silen and gorgoneion antefixes seen on the ship sheds of Naxos.[3] And the gable decoration of these types of roofs is also not well known. Other architectural types such as undecorated roof tiles, ridge tiles and ridge tile acroteria are more difficult to assign to a specific roof as the same type could conceivable have been used on different buildings. In such cases it is not always possible to identify a roof, especially if there is only a single fragment available. In the revised typology these elements are therefore not identified as roofs, instead they are organized as architectural types.

The use of fabric for the identification of fragments belonging to the same roof is governed by established theories regarding the production process, since the fabric typology is in essence based on the raw materials and production techniques used by the craftsmen or workshop. It is thought that all the elements of a roof were created in one location during a short period of time. This would result in objects that are similar in not only the decoration but also the raw materials and production techniques used. Elements from the same roof are therefore expected to exhibit the same fabric.[4] Furthermore, it should also be noted that the inverse condition is not applicable. A single workshop could conceivably have produced more than one roof using the same raw materials and production techniques, therefore fragments of the same fabric type do not necessarily belong to the same roof.

5.1 SYNTHESIS OF STYLISTIC, FABRIC, AND MATERIAL COMPOSITIONAL RESULTS

The analysis of style, fabric, and material composition occurred independently from each other in chapter 4, the first step in creating a revised typology based on these results is a synthesis of the data. In doing so, stylistic and fabric types as

1 De Miro 1965.

2 Conti 2012.

3 Lentini et al. 2008.

4 Conti 2012, p. 22; Winter 1993, p. 3.

well as stylistic and material compositional groups are combined and evaluated based on a detailed statistical analysis.

5.1.1 COMBINING RESULTS FROM THE STYLISTIC AND FABRIC INVESTIGATIONS

A comparison between the stylistic and fabric groups identified in chapter 4.1 and 4.2 is provided in table 5.1-1. There is a larger number of fragments for which the fabric characteristics could not be determined in comparison to unidentified objects within the stylistic analysis (146 fragments compared to 13). The reason for this is that fabric observations were restricted to the visual inspection of existing fractures on fragments within museum collections (section 4.2). Yet it is possible to make a number of preliminary observations regarding the stylistic and fabric data based on table 5.1-1.

In some cases the fragments assigned to a single stylistic group also fall within the same fabric group, which is supports the identification of single roof (e.g. fragments from frieze D (De Miro)[5]). Other cases are slightly more complicated. Out of 43 fragments associated with frieze A, 33 falls within fabric group A while a single fragment falls within fabric group E. This fragment (VIN 291, appendix A and B) is assigned to fabric E due to a fabric colour that is slightly more yellow than fabric A. This is a very slight difference that can be attributed to variations in the firing process or even a measurement error. In terms of style, VIN 291 matches other waterspouts fragments from frieze A. The single fragment is therefore considered a statistical outlier, and not an object from a different roof.

Finally, there are a couple of cases where the stylistic group contain fragments which belong to different fabric groups. For example, four fragments from frieze G fall within fabric group F, another five within fabric group G. Fragments associated with palmette D are equally divided between fabric groups C and D. In both cases a difference in the profile and decoration has already been identified on objects within each of the two stylistic groups (sections 4.1.12 and 4.1.47). Thus, based on these differences in style and fabric, fragments from frieze G as well as palmette group D appear to belong to different roofs or architectural types.

The discussion above focuses on stylistic groups in relation to fabric groups. But it is also important to consider the inverse because some fabric groups contain fragments from different stylistic groups. Fabric E includes the single fragment from frieze E as well as the majority of objects from frieze F. This might be interpreted as an indication that the same workshop produced different roofs using the same fabric, i.e. raw materials and production techniques. Or it might indicate that frieze E and G belong to the same roof. This particular case is resolved based on the stylistic consideration, fabric and provenance in section 5.2.2.1.

5.1.2 COMBINING RESULTS FROM THE STYLISTIC AND COMPOSITIONAL ANALYSIS

While destructive analytical methods such as WD-XRF have a more established history of use in archeometric studies and, therefore, produce more reliable results, it was not possible to procure samples for destructive analysis from objects in museum collections. For this reason, it was decided to use a combination of analytical methods consisting of WD-XRF analysis of objects from the S. Anna excavations and HH-XRF analysis for objects from museum collections. A control group consisting of roof tile fragments from the location of S. Anna was analysed using both methods. Due to higher variance in the HH-XRF data and the fact that it was measured using a different method, HH-XRF and WD-XRF are not analysed and presented together (section 3.4). More information

5 In the following the names of stylistic groups will simply be mentioned and will not refer specifically to the identification by De Miro in order to reduce repetition, e.g. instead of frieze D (De Miro) only frieze D, cf. section 4.1.

Canonical Sicilian and anthemion revetments										
Stylistic groups	**Fabric A**	**Fabric B**	**Fabric C**	**Fabric D**	**Fabric E**	**Fabric F**	**Fabric G**	**Fabric H**	**Unknown**	**Total**
Frieze A	33				1				9	43
Frieze B1		1								1
Frieze B2									1	1
Frieze B3	2	1							2	5
Frieze B4									1	1
Frieze B5									1	1
Frieze B6						1				1
Frieze C		4								4
Frieze D		8							15	23
Frieze E					1					1
Frieze F	1				4				2	7
Frieze G						4	5		4	13
Frieze H							1			1
Frieze H1						2				2
Frieze I									2	2
Geison A	1									1
Sima A		1								1
Sima B							1			1
Sima C									1	1
Waterspout								1		1
Lion Headed Waterspout		1								1

Antefix revetments										
Stylistic groups	**Fabric A**	**Fabric B**	**Fabric C**	**Fabric D**	**Fabric E**	**Fabric F**	**Fabric G**	**Fabric H**	**Unknown**	**Total**
Antefix A									1	1
Antefix B									2	2
Antefix C									1	1
Antefix D									1	1
Antefix E							1			1
Antefix F		1								1
Antefix G									1	1
Antefix H		2								2
Antefix I									1	1
Antefix J		1								1
Antefix K									1	1
Antefix L									1	1
Eaves tile A		1								1
Eaves tile B									1	1

Additional roof elements

Stylistic groups	Fabric A	Fabric B	Fabric C	Fabric D	Fabric E	Fabric F	Fabric G	Fabric H	Unknown	Total
Acroteria									24	24
Bead-and-Reel		2							1	3
Cover tile A									1	1
Cover tile B		1							2	3
Cover tile C									1	1
Gorgoneion A									1	1
Gorgoneion B									2	2
Palmette A	1									1
Palmette B			7						1	8
Palmette C				5					12	17
Palmette D			3	3					21	27
Palmette E									1	1
Palmette F									1	1
Palmette G									1	1
Pan tile A		1							5	6
Pan tile B								1	2	3
Pan tile C								1		1
Pan tile D									1	1
Plague									1	1
Ridge tile antefix A						1			1	1
Ridge tile antefix B		1								1
Ridge tile antefix C									1	1
Ridge tile A									2	2
Ridge tile B		2								2
Ridge tile C		2							4	6
Ridge tile D									3	3
Ridge tile E		1								1
Ridge tile F		1								1
Ridge tile G						1				1
Ridge tile H									1	1
Unknown pan tile								1		1
Unknown	1	1					1	2	8	13
Total	**39**	**33**	**10**	**8**	**6**	**9**	**9**	**6**	**145**	**265**

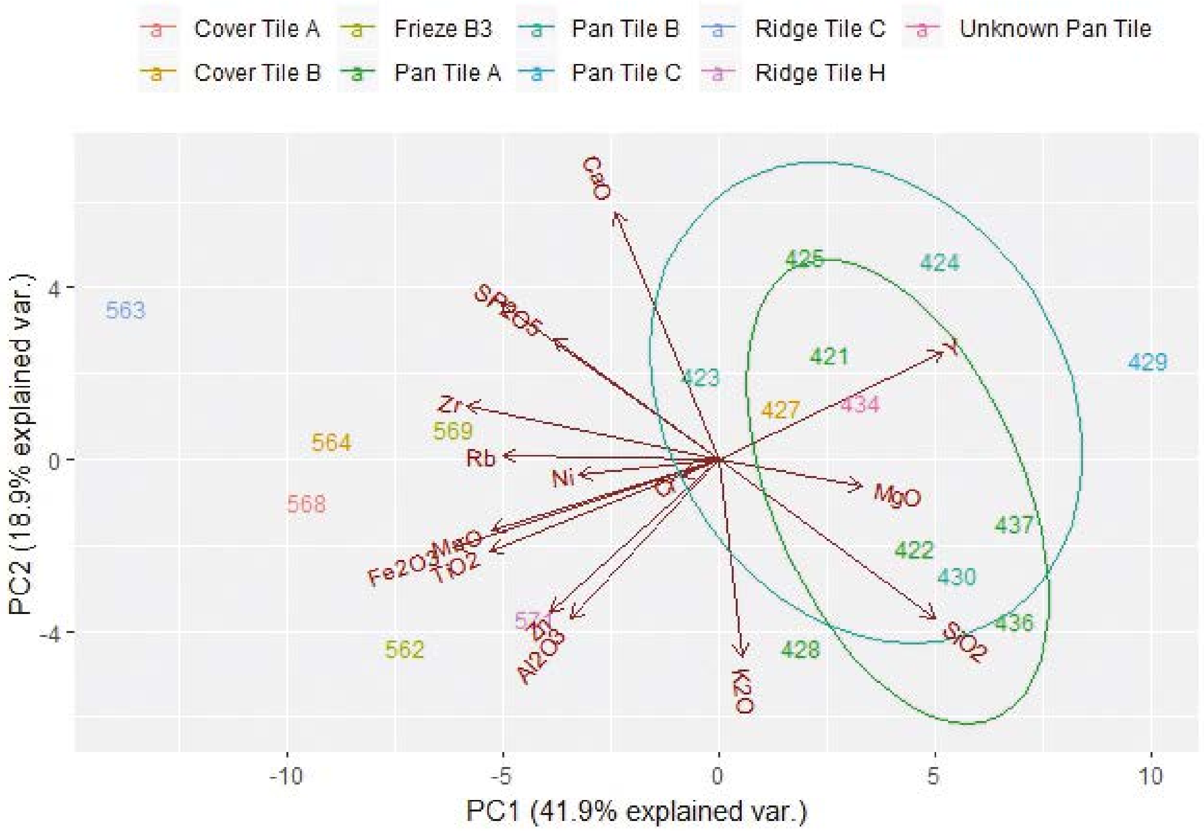

Figure 5.1-1: Biplot of principle component 1 and 2 for objects from the S. Anna excavations as measured using WD-XRF. Stylistic groups are indicated in colour. The ellipse indicates the 68% confidence interval for groups with a sample size of 3 or more.

regarding which archeometric analysis was applied to which fragment is listed in appendix A.

The principle component analysis of the WD-XRF data is detailed in section 4.3.2. A new biplot is created using the same results, but this time the stylistic groups as identified in section 4.1. are indicated in colour (figure 5.1-1). There is a high degree of overlap between pan tile group A and B, while the one fragment from pan tile group C (VIN 429) can be distinguished from other pan tiles by a higher concentration in yttrium (Y) and magnesium oxide (MgO). The sima fragments from frieze B3 (VIN 562, 569) appear to be fairly similar in terms of chemical composition and are distinguished from the pan tiles due to a higher concentrations of Fe_2O_3, TiO_2, Zr, and Rb. Cover tile A (VIN 568) and B (VIN 564) as well as ridge tile H (VIN 571) lie close to objects from frieze B3. Ridge tile C (VIN 563) is separated from the main body of analysed objects due to higher concentrations of P_2O_5, Zr and Sr. By demonstrating the relationship between individual objects within stylistic groups, this graph contributes to the establishment of the revised typology (section 5.2).

The first two components from the principle component analysis of the HH-XRF data as described in section 4.3.3 can be displayed graphically as a biplot, this time indicating the stylistic groups in colour (figure 5.1-2). The six stylistic groups from S. Anna which were also tested using WD-XRF (figure 5.1-1) are collectively labelled as S. Anna in figure 5.1-2 in the interest of legibility and as they represent a consistent material group. There is a high level of overlap between the objects from frieze A and F. These two groups can the distinguished from the S. Anna control group due to lower levels of SiO_2 and high levels of Zn and Rb. The distribution of objects from frieze G indicate the presence of subgroups. While a number of objects overlap with the objects

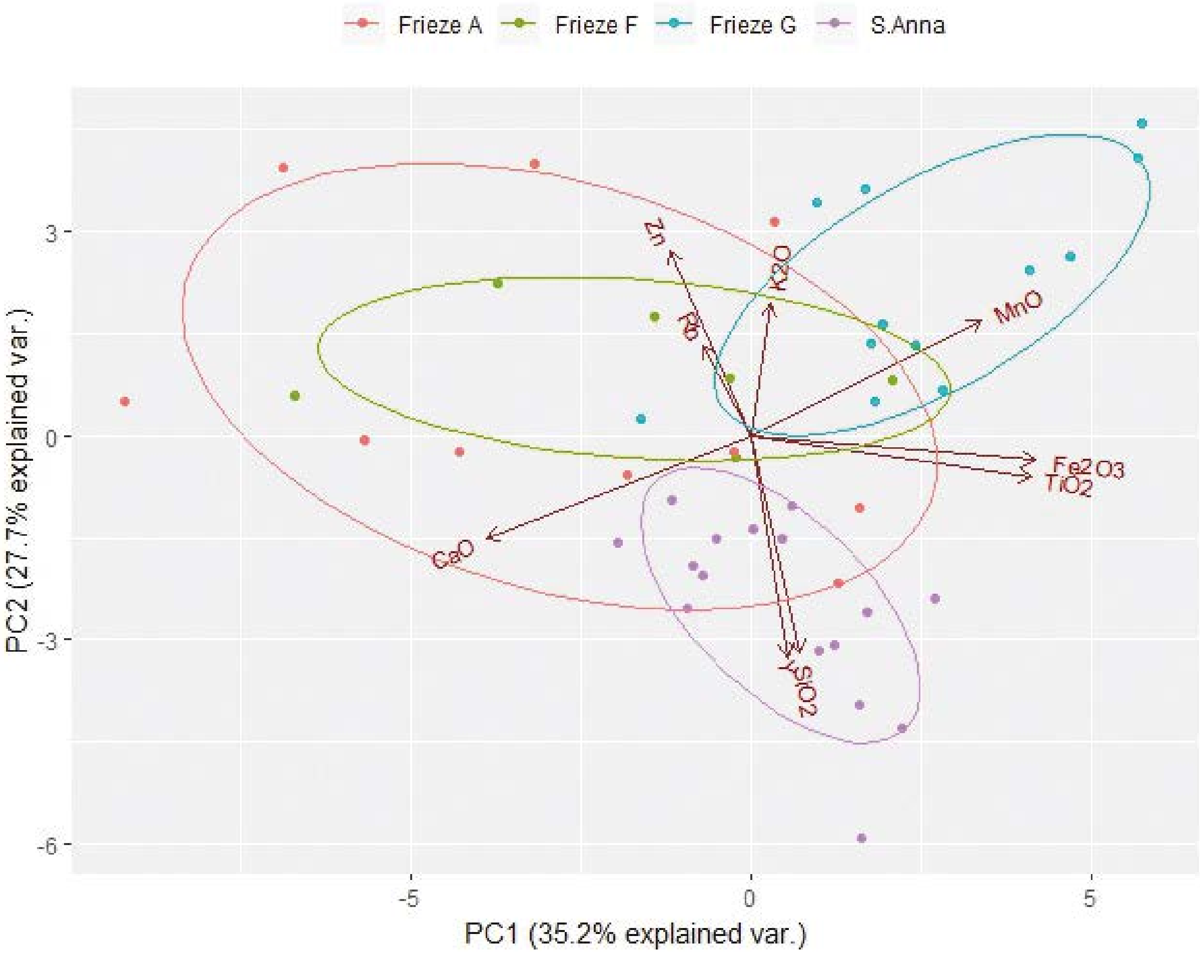

Figure 5.1-2: Biplot of the HH-XRF data for three groups of architectural terracotta fragments from Akragas (frieze A, F, and G) as well as a collection of material from S. Anna. Stylistic groups are indicated in colour. The ellipse indicates the 68% confidence interval for each group.

from frieze A and F and the group from S. Anna, there are at least four objects (VIN 139, 166, 167, 179) which appear distinct from the main groups due to higher concentrations of MnO.

The analysis of both the WD-XRF and HH-XRF both demonstrate a separation between the control group from S. Anna and other types of architectural terracottas. The control group consists of roof tiles dating from the start of the 5th century until the 4th century BC. The architectural terracotta groups (frieze A, F, G, and B3) are dated to the 6th century, and can be clearly distinguished from the control group due to higher concentrations of Zn and lower concentrations of SiO_2. The separation between the two different groups therefore indicates a change in the chemical composition of objects from the 6th to the 5th centuries BC.

The analysis above of the WD-XRF and HH-XRF data in terms of the stylistic groups identified in section 4.1 contributes to the establishment of a revised typology (section 5.2). The final step in analysing the chemical composition of the architectural terracottas from Akragas concerns the revised types. Since a significant number of these objects form part of museum collections they were analysed using HH-XRF and not WD-XRF. As described in section 3.4 and 4.3, the HH-XRF data shows a higher degree of variability due to nonhomogeneous fabric matrix. A method used within statistics for the reduction of variance is the removal of outliers. While this can be done manually, a more objective approach is to trim the dataset mathematically by removing a specified percentage of the highest and lowest values

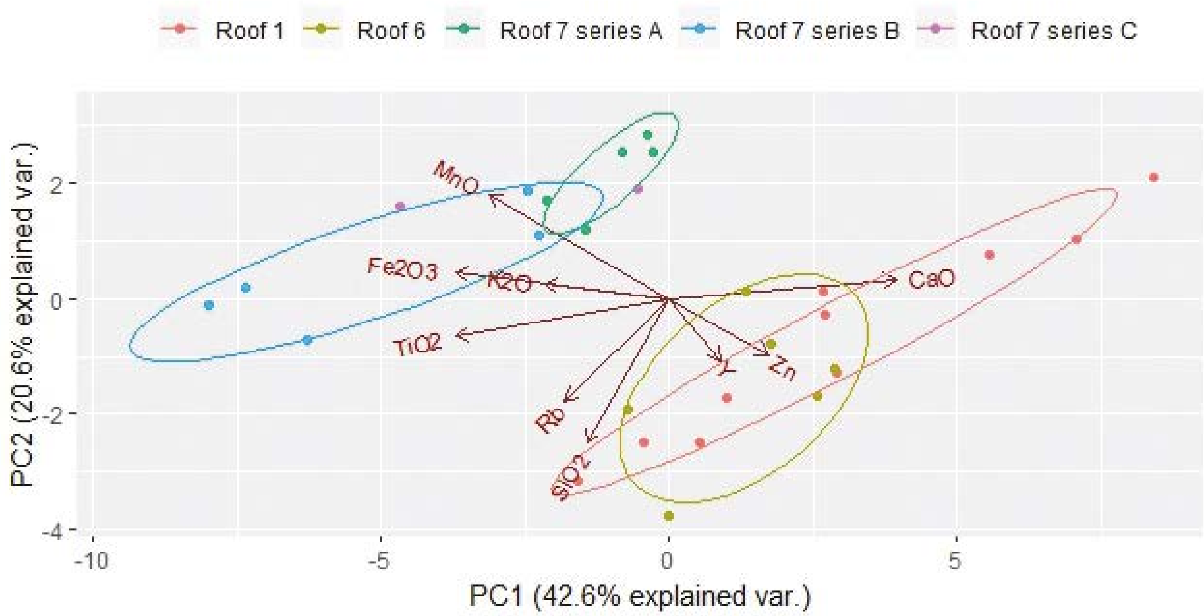

Figure 5.1-3: Biplot of the HH-XRF data according to the revised typology from section 5.2. Revised types are indicated in colour. The ellipse indicates the 68% confidence interval for each group.

for each group.[6] The dataset was trimmed by winsorizing. This means that instead of removing the highest value it is instead replaced with the second highest value, with the same principle applying to the lowest value.[7] The data was then transformed using the central log-ration and the principle components were calculated. The first two components are plotted in figure 5.1-3, the revised types identified in section 5.2 are indicated in colour. While roof 1 and roof 6 overlap, they can be distinguished from roof 7 by higher levels of Zn and Y and lower levels of Mno, Fe_2O_3 and TiO_2. Series A from roof 7 can be have lower levels or TiO_2, SiO_2 and Rb compared to series B.

5.1.3 ADDITIONAL FABRIC ATTRIBUTES ACCORDING TO THE NEW TYPOLOGY

In the conclusion of chapter 4.2 the existence of two different types of fabric attributes are discussed. In essence, there are the independent attributes such as fabric colour, temper type, fabric density, and surface finish which are important for identifying fabric groups within the overall dataset. A second group of attributes were found to be influenced by additional factors, such as the type of object. While these dependent attributes are therefore not appropriate for identifying fabric groups, they are still important for the description of groups of objects once these have been established. This section expands the previous fabric descriptions by providing a synthesis of additional fabric attributes for the revised typology in section 5.2.

Table 5.1-2 provides an overview of the number of fragments according to the level of oxidation. Roof 1, 2, and 3 are all classified as canonical Sicilian sima roofs (section 0). All three roofs show that the majority of the associated fragments are not fully oxidized. This is interesting when compared to the anthemion roofs (section 5.2.2). While roof 6 indicates that most of the fragments are fully oxidized, roof 7, series A -C appear to have a fully oxidized fabric.

The forming techniques are described in greater detail in section 4.2.1.5. In table 5.1-3 the information is summarized according to the number of fragments formed according to each method. The majority of antefix types (antefix type 1, 3-7) are made by the combination of moulds and

6 Barone et. al., 2005, p. 753.

7 Drennan 2009, pp. 20-21, 32-33.

Table 5.1-2: Oxidation level and number of fragments per roof types and architectural types, as identified in the revised typology.

Revised typology	Unknown	Complete oxidation	Fairly complete oxidation	Incomplete oxidation	Misfired	Total
Antefix type 1	1					1
Antefix type 2	1					1
Antefix type 3				1		1
Antefix type 4		1				1
Antefix type 5		1	1			2
Antefix type 6		1				1
Antefix type 7			1			1
Ridge tile antefix type 1		1				1
Ridge tile antefix type 2		1				1
Ridge palmette type 1			1			1
Ridge palmette type 2	3	11	1			15
Ridge palmette type 3	3	1	1			5
Ridge palmette type 4	17	11	2	2		32
Roof 1	5	15	22	2		44
Roof 2	35		14	1		50
Roof 3		1	5	2		8
Roof 4	2		1	2		5
Roof 5		1				1
Roof 6	4	3	2			9
Roof 7, series A		6				6
Roof 7, series B		5				5
Roof 7, series C		2				2
Roof 7, series D		3				3
Roof 8	1		2			3
Not Assigned	10	23	22	10	1	66
Total	**82**	**87**	**75**	**20**	**1**	**265**

slabs. Roof 8 and antefix type 3 consist of antefixes without any decoration in relief, these appear to be made using only slabs and simple forms. Four of the canonical Sicilian roofs (roof 1-4) show the use of the mould and slab technique as well. This method is used of the manufacturing of the geison revetments (figure 4.2-2). In comparison the anthemion roofs are only formed using moulds.

The last two attributes discussed in section 4.2 consider the painted decoration of architectural terracottas. As already detailed there are different levels of painting quality ranging from poor to excellent. And on a number of objects incised guidelines can be seen which were used to set out the painted decoration beforehand. A summary of the data is provided in table 5.1-4 by showing the number of fragments within each painting quality range as well as the traces of incised lines. The painted decoration of roof 1 appears to have the highest number of errors and inconsistencies. This roof, as well as two other canonical Sicilian roofs (roof 2 and 3), make the most use of incised guidelines.

Table 5.1-3: Forming methods and number of fragments according to the roof types and architectural types, as identified in the revised typology.

Revised typology	Hand and slab	Mould	Mould and slab	Slab	Wheel formed	Unknown	Total
Antefix type 1			1				1
Antefix type 2				1			1
Antefix type 3			1				1
Antefix type 4			1				1
Antefix type 5			2				2
Antefix type 6			1				1
Antefix type 7			1				1
Ridge tile antefix type 1			1				1
Ridge tile antefix type 2			1				1
Ridge palmette type 1		1					1
Ridge palmette type 2		13				2	15
Ridge palmette type 3		3				2	5
Ridge palmette type 4		24				8	32
Roof 1		24	11		9		44
Roof 2	19	6	12			13	50
Roof 3		2	4			1	8
Roof 4		3	1			2	5
Roof 5		1					1
Roof 6	1	7				1	9
Roof 7, series A		6					6
Roof 7, series B		5					5
Roof 7, series C		2					2
Roof 7, series D		3					3
Roof 8				3			3
Not Assigned	1	15	28	6	1	15	66
Total	**21**	**115**	**66**	**10**	**10**	**43**	**265**

5.2 A REVISED TYPOLOGY: THE ROOFS FROM AKRAGAS

The revised typology is based on the combined results from the stylistic, fabric, and compositional analysis. In the following, reference to the relevant data in chapter 4 and in the synthesis in section 5.1 is thus provided for each roof. The identification of fragments that fit together to form a roof is also influenced by a fourth process, namely the graphic reconstruction. In a recent study on the architectural terracottas from Selinus, Conti discusses the importance of such drawings in identifying objects from the same roof based on the size of various elements as well as the decorative patterns.[8] The graphic reconstruction also allows for the estimation of additional information, such as overall sizes. The available fragments are most often only a small portion of the total object and do not necessarily account for all parts of the roof. It should also be noted that the architectural terracottas are formed during a manual process which means that variation in sizes and decoration is to be expected. The already established roofs

8 Conti 2012, p. 23.

Table 5.1-4: Painting quality level and number of fragments according to roof types and architectural types of revised typology.

Revised typology	**Excellent**	**Fair**	**Poor**	**Incised painting guidelines**	**Unknown Painting quality**	**Total**
Antefix type 1					1	1
Antefix type 2					1	1
Antefix type 3					1	1
Antefix type 4					1	1
Antefix type 5		2				2
Antefix type 6					1	1
Antefix type 7					1	1
Ridge tile antefix type 1					1	1
Ridge tile antefix type 2					1	1
Ridge palmette type 1					1	1
Ridge palmette type 2					15	15
Ridge palmette type 3					5	5
Ridge palmette type 4					32	32
Roof 1		27	7	9	10	44
Roof 2		5		4	45	50
Roof 3	1	7		3		8
Roof 4					5	5
Roof 5		1				1
Roof 6	6			1	3	9
Roof 7, series A	3					6
Roof 7, series B		1			4	5
Roof 7, series C					2	2
Roof 7, series D	2			1	1	3
Roof 8		1			2	3
Not assigned		11			55	66
Total	**12**	**55**	**7**	**19**	**191**	**265**

from Akragas and Sicily provide an important resource in this regard: both by providing examples of complete objects of a similar style and for benchmarks for the amount of variation that can be found in the dimensions and decoration of objects belonging to the same roof. A discussion of the graphic reconstruction and the evidence on which it is based is thus also included for each roof in the revised typology. In total, 24 roof and architectural types were identified based on 199 out of the 265 documented fragments. The provenance of the various objects is discussed in detail in section 4.1. While the majority of fragments placed within the same stylistic group were found in the same location, there are exceptions. Objects from frieze F (section 4.1.11), for example, were discovered in secondary use distributed over a fairly large area. As will be shown below, in some cases different find locations do not necessarily result in different roofs. The find context of each roof as well as of single objects therefore requires careful consideration.

The revised typology is divided into different groups based on the general roof type, such as canonical Sicilian sima (section 5.2.1), anthemion sima (section 5.2.2) and antefix roofs (section 5.2.3). However, there are a number of new types which cannot be attributed to a specific roof. According to Conti the greater standardization seen in the 5th century BC means that in some cases it is no longer possible to identify a single roof but rather an architectural type, such as ridge tile palmettes (section 5.2.4).[9] In these cases objects will be identified according to functional type.

5.2.1 CANONICAL SICILIAN SIMA ROOFS

5.2.1.1 ROOF 1

Stylistic group: All the fragments are grouped in De Miro's frieze A (section 4.1.1) except for VIN 618 which is in ridge tile group D (section 4.1.54).

Fabric group: Out of 44 fragments there is enough information to determine the fabric group of 33 and all fall within fabric group A (table 5.1-1). In addition, the majority of objects are not fully oxidized and the painted decoration is applied with less accuracy and the aid of incised guidelines (table 5.1-2 and table 5.1-4).

Material testing: Nine fragments were measured using HH-XRF. The fragments show overlap with the anthemion roof fragments from frieze F and G, but not the control group from S. Anna. In general, the chemical composition is characterized by higher concentrations of Zinc (Zn) and low concentrations of Silicon dioxide (SiO_2) (figure 5.1-2).

Graphic reconstruction: The lateral sima (VIN 355), lateral geison revetment (VIN 354), horizontal/raking geison revetment (VIN 276), and waterspout disks are physically reconstructed by the museum (figure 4.1-1). The reconstruction of the sima and geison revetment is confirmed by the graphic reconstruction, since the placement of the fragments matches the reconstructed painted patterns except for some of the small geison revetment fragments used in the physical reconstruction, these are out of alignment with the overall pattern by more than 10 mm (figure 5.2-1). There is enough evidence to reconstruct the lateral and raking sima, because the top section of the raking sima can be copied from the lateral sima. Canonical Sicilian roofs from this period used the same profile and decoration for simas from the eaves and the gables except for the lower fascia. On the lateral sima this element is interrupted by the waterspouts and thus requires a different pattern. On the elements from the gable the lower fascia therefore has a different pattern, while the rest of the profile and decoration is the same.[10] The raking sima is reconstructed using VIN 296, which shows a meander pattern at the bottom fascia.

The ridge tile fragment has most of the bottom edge of the rim preserved. Based on the curvature it is possible to estimate the size of the original tile (figure 5.2-2). The length of the ridge tile is calculated according to the width of the sima and the overlap between tiles.

Reconstructed dimensions: Sima: 394 mm high, 532 mm wide. Geison revetment: 248 mm high. Ridge tile: 290 mm high, 630 mm long and 455 mm wide.

Associated building: The fragments are from Marconi's excavation at temple G. The stylistic dating of the roof indicates that it comes from the middle of the 6th century. The find location, date and size of the roof elements support Marconi's and De Miro's hypothesis that it is the roof of the mid-6th century naiskos that is preserved in the

9 Conti 2012, p. 23.

10 Conti 2012, pp. 78-91, fig. 75; Lentini & Pakkanen 2011, pp. 418-419, fig. 2-3.

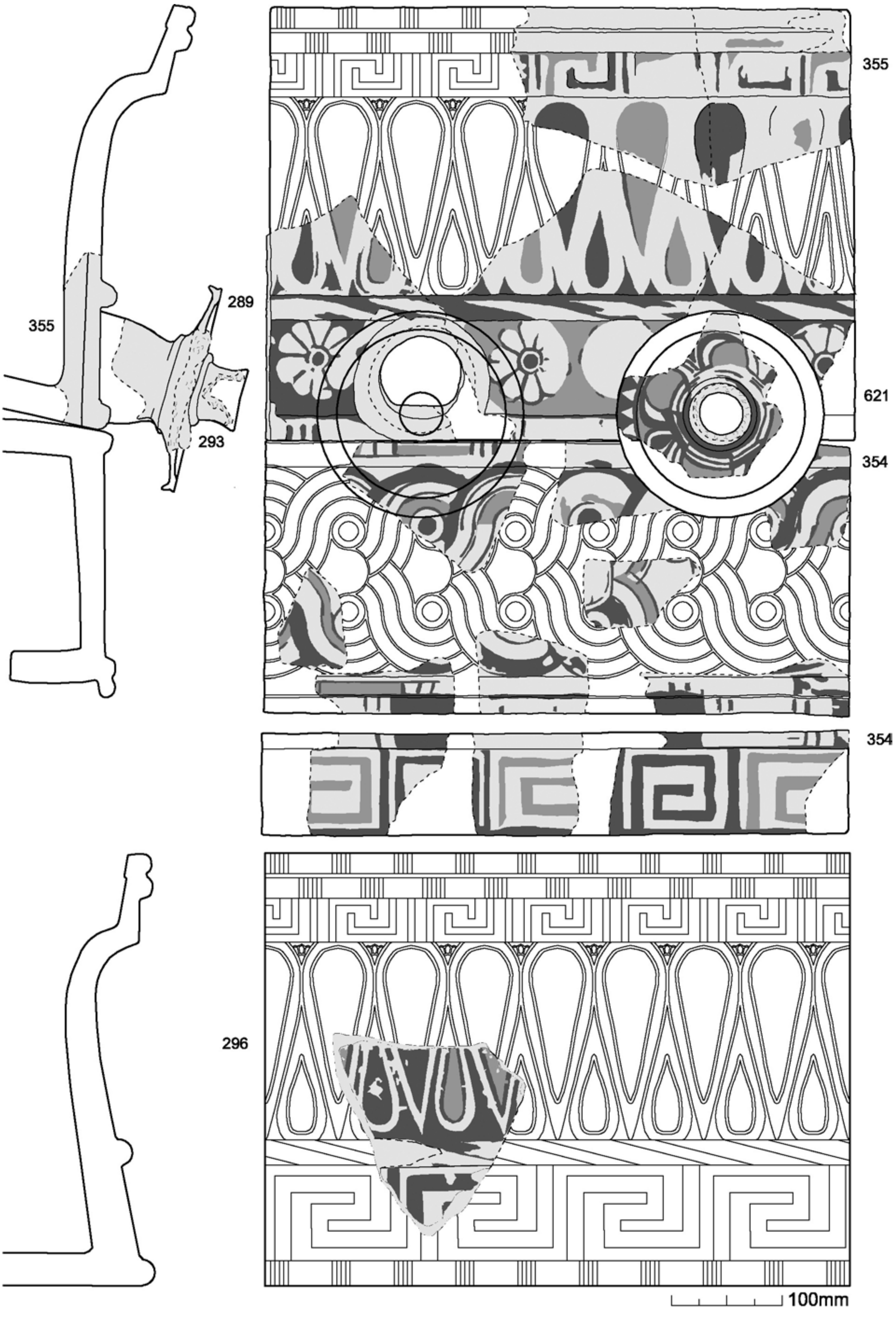

Figure 5.2-1: Reconstruction drawing for roof 1 showing lateral sima and geison revetment on top, with raking sima on the bottom.

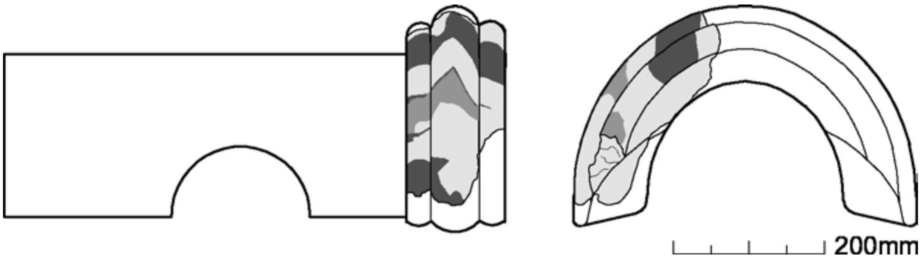

Figure 5.2-2: Reconstruction drawing for the ridge tile associated with roof 1. Reconstruction is based on VIN 618.

foundations of temple G.[11]

Discussion: As described above, the 43 fragments from the decorated roof edge (frieze A (De Miro) section 4.1.1) have been associated with the Archaic naiskos building since the time of excavation. But Marconi also described a number of additional objects found during his investigation which he associates with the Archaic building, including plain roof tiles, curved cover tiles, and acroteria.[12] Among these is a human arm as well as a leg which is still attached to a curved form and about a third of life size. Marconi considers the fragments to be part of a horse rider figure that was placed on the edge of the roof ridge, similar to the horse rider found at the Archaic naiskos to the South-East of temple B. The roof tiles and acroteria fragments are no longer available for study. But one ridge tile fragment (VIN 618, appendix A) corresponds to Marconi's description and the museum inventory number is also in the same range as the fragments from frieze A (De Miro). Based on a comparison with material from Selinus and Gela this fragment is dated to the 6th or early 5th century (section 4.1.54). The roof of the Geloan treasury at Olympia, which is has similarities with the sima and geison of this roof, also includes a ridge tile with a similar profile to VIN 618.[13] Temple G is dated to the end of the 5th century while the Archaic naiskos is from the middle of the 6th century.[14] Due to the find location, date and the precedent set by the Geloan treasury, VIN 618 can therefore be placed within this roof.

Dating: 570-530 BC

Fragments: 44 (VIN 253-267, 276-278, 280-299, 331, 354, 355, 618, 621, 622)

5.2.1.2 ROOF 2

Stylistic group: The roof incorporates all the fragments from De Miro's frieze D (section 4.1.9) and the single fragment from his frieze B4 (section 4.1.5). The roof also includes the horse rider acroterion (4.1.38) and a number of fragments from ridge tile group C (section 4.1.53).

Fabric group: Due to the bad state of conservation only eight sima and geison revetment fragments have a visible fracture which allows for observing fabric characteristics. They fall all within fabric group B (table 5.1-1).

There is not enough evidence to assign VIN 352 from frieze B4 to a fabric group but it has the same fabric colour, temper and surface finish as seen in fabric group B (appendix B). While it is currently not possible to determine the fabric group of the horse rider due to its state of preservation, two of the ridge tiles also fall within fabric group B. Based on the available information, the objects of roof 2 from the different stylistic groups are of the same fabric.

On closer inspection the objects from this group have a very thin slip layer which is very close in colour to the clay fabric (appendix B).

11 De Miro 1963, p. 41; Marconi 1933, pp. 115, 124.

12 Marconi 1933, pp. 125-126.

13 Heiden 1995, fig. 19-1, tab. 67-1,2.

14 Mertens 2006, p. 397.

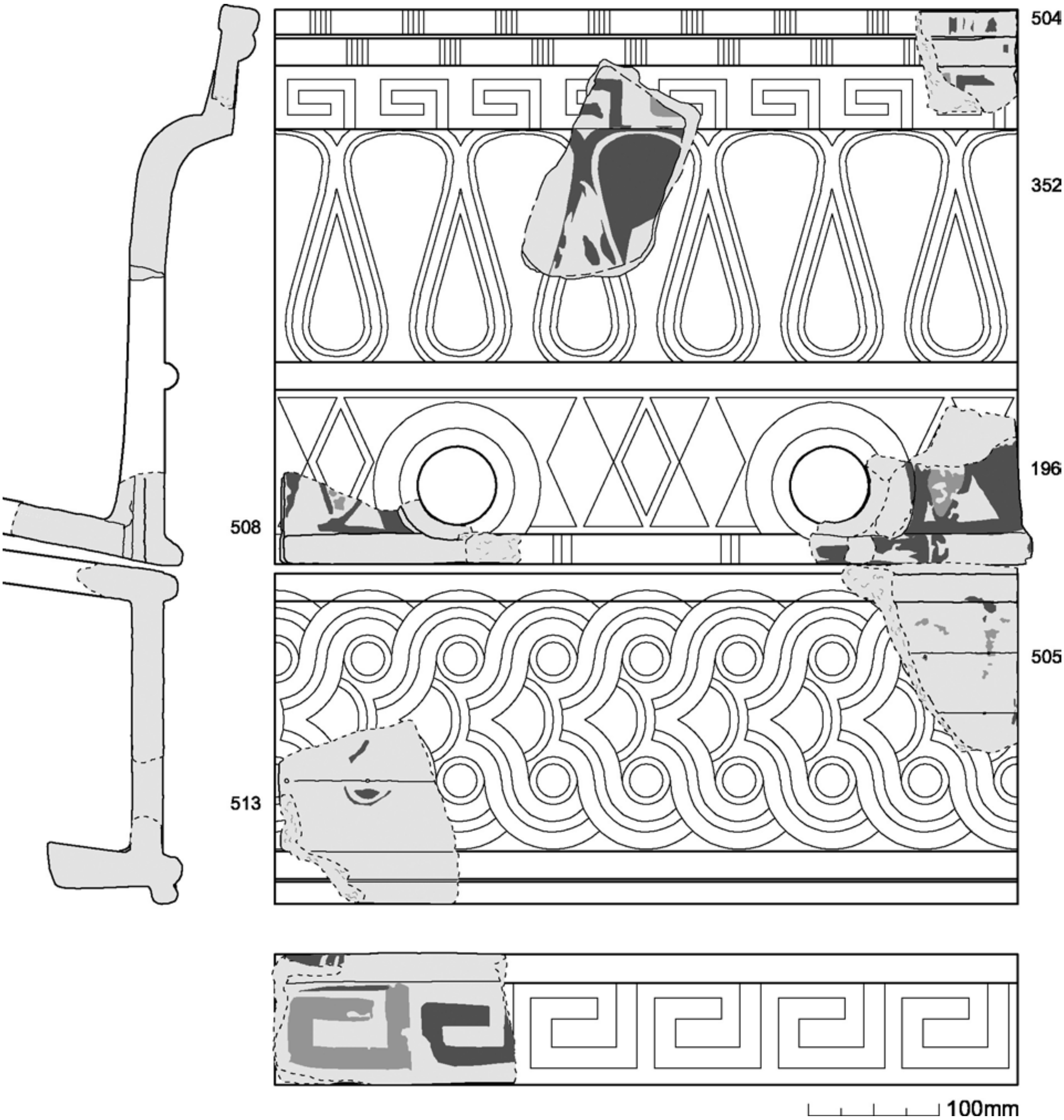

Figure 5.2-3: Reconstructed lateral sima and geison revetment from roof 2.

Graphic reconstruction:

The sima and geison revetment: VIN 196 is a corner fragment which provides information for the reconstruction of the lateral and raking sima (figure 5.2-3, 5.2-4). While this fragment is the only available information for the raking sima, the remaining profile and decoration can be reconstructed based on the same principle detailed for roof 1. Not all elements of the profile are represented within the preserved fragments. A number of key sizes therefore had to be extrapolated based on the available evidence. For example, the width of the sima is based on the spaces between the waterspouts preserved on VIN 196 and 508. As seen on roof 1 (section 5.2.1.1), the distance between the edge of the sima to the centre of the waterspout is roughly a quarter of the overall length. This means that when the sima pieces are placed on the roof edge the waterspouts are spaced at an equal distance apart, namely half the overall sima lenght. The height of the geison revetment fascia is based on the incised guidelines for the guilloche pattern on VIN 513 and 505, as this pattern is created through geometric symmetry. Beside a central horizontal symmetry line there are two additional guidelines which run through the centre points of the disks. Based on the equal distance between guidelines and centre line, as well as the distance between the two guidelines and the top and bottom roll, the size of the geison revetment can thus be reconstructed. It appears that there is not enough space between the top roll and the top guideline for the top of the guilloche pattern. For this reason, the outer band of the guilloche extends partly on top of the roll. This situation is also found on the preserved fragments from roof 1 (figure 5.2-1).

The horse rider: The horse rider acroteria from Sicily have a number of shared characteristics, as seen in the examples from Kamarina, Gela, and Syracuse discussed in section 4.1.37. The body of the horse is positioned on a large rounded ridge tile. The front of it is shaped into the horse's chest and the animal's head is fully formed. The horse's body ends just behind the rider and just below his feet in straight edges. The rider is also fully formed and wears a typical Archaic hairstyle. The reconstruction of the horse rider figure from Akragas refers to these examples when the relevant portions of the acroterion are not preserved. For example, the back end of the horse and the majority of the upper body of the rider are missing (figure 5.2-5).

There are two fragments which provide a strong indication of the placement and size of the rider's legs on the acroterion (VIN 518, 522). Two additional fragments each show the complete front part of the foot, including the toes and bridge (VIN 516, 517). The fragments are respectively 130 and 180 mm long, which when reconstructed graphically indicates a foot of between 240 and 290 mm long. Based on the reconstruction of the feet as well as the back of the horse's head (VIN 519, 520, 523, 529) it is estimated that the figure was around life size. Not all the fragments documented in the catalogue were used for the reconstruction. Some of the fragments do not provide enough information in order to determine a specific position. A smaller number of fragments have a shape and decoration which is difficult to reconcile with known examples of horse rider figures from Sicily. Fragment VIN 525, for example, can be interpreted as the back of the rider, where his *chitoniskos* sweeps back and flows over the flank of the horse. But this configuration is not seen on known examples of horse riders from Sicily, therefore its interpretation and position are less secure.

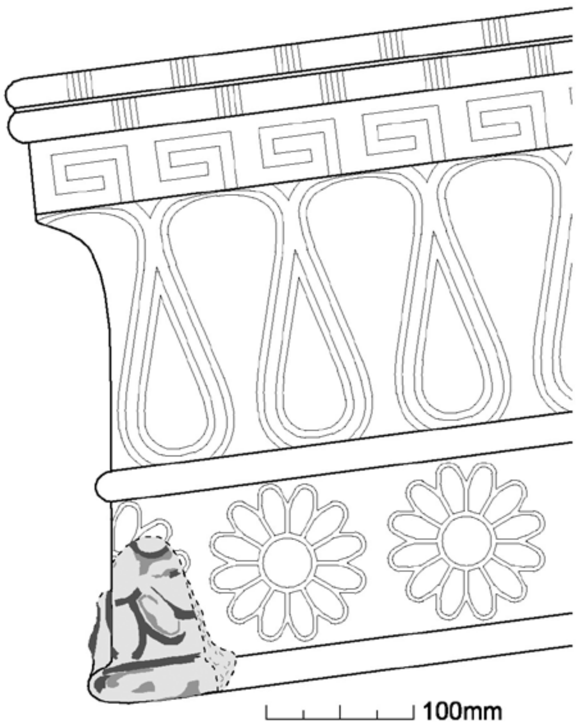

Figure 5.2-4: Reconstruction of raking sima of roof 2 (VIN 196).

The ridge tile: The ridge tile fragments have a similar profile. The semi-circular ridge varies between 105 and 110 mm in width and the ridge tile section between 29 and 38 mm in thickness. The best preserved tile section is VIN 554 which consists of two connected fragments (figure 5.2-6).

Reconstructed dimensions: The reconstructed sima is 424 mm high and 570 mm wide. Geison revetment: 252 mm high. The reconstructed ridge

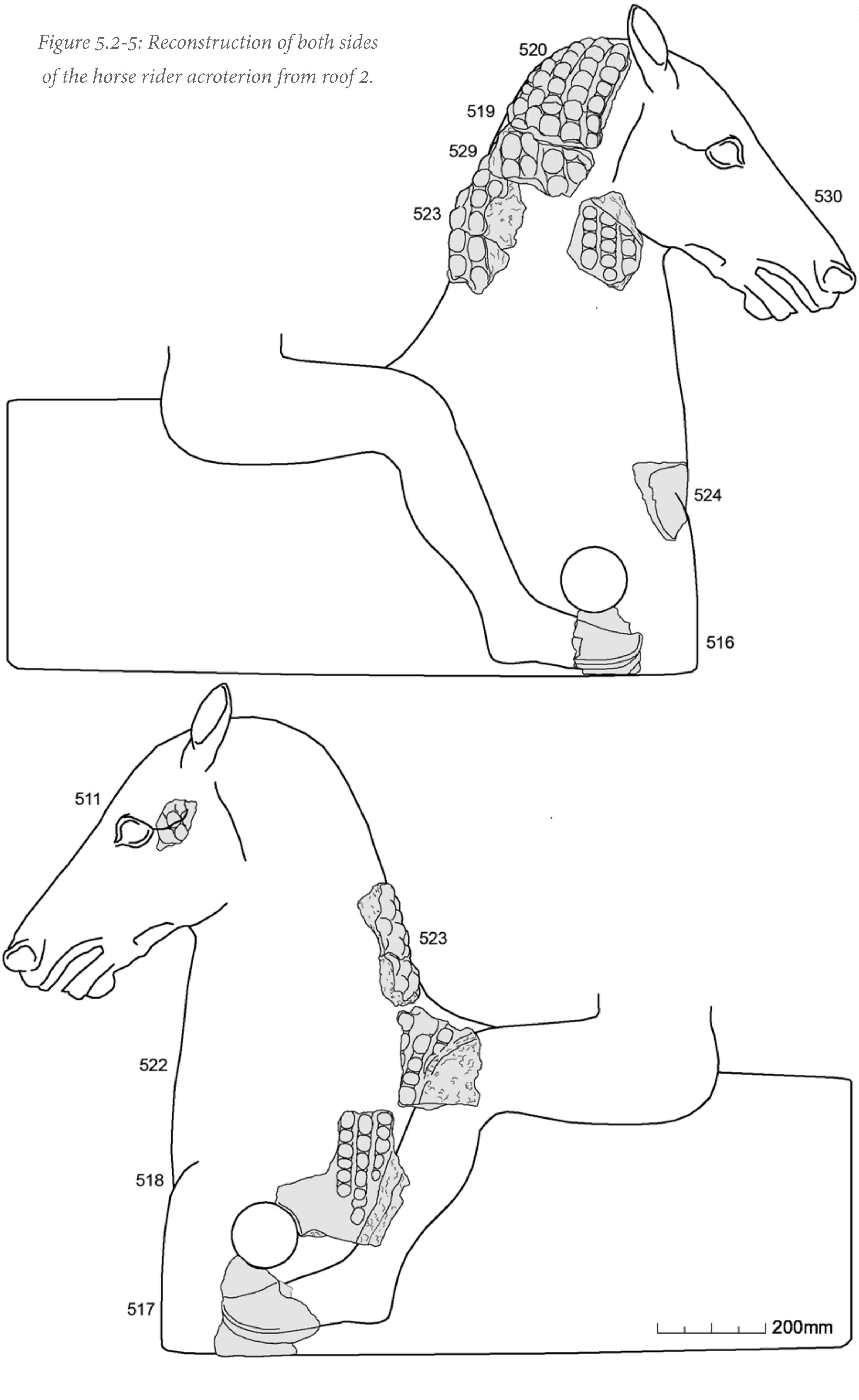

Figure 5.2-5: Reconstruction of both sides of the horse rider acroterion from roof 2.

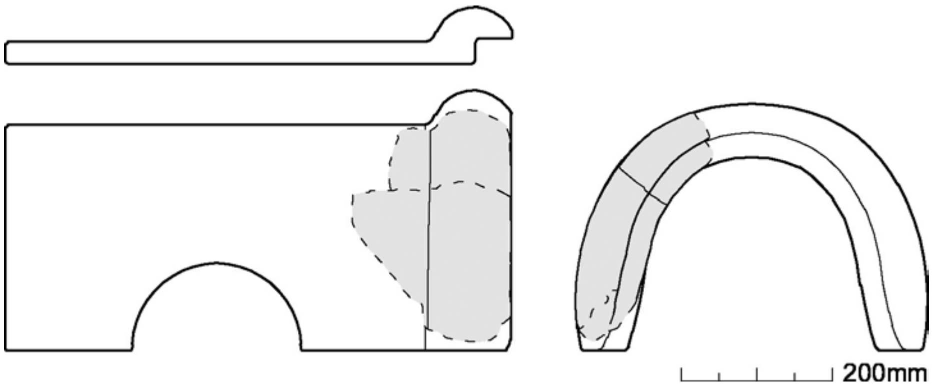

Figure 5.2-6: Reconstruction of ridge tile associated with roof 2, based on VIN 554.

tile is 295 mm high and 450 mm wide. The horse rider acroterion is close to life size.

Associated building: The majority of objects from frieze D, the horse rider acroterion, and ridge tile C were discovered by Gábrici in 1922 during his excavations to the South-East of temple B. The provenance for VIN 352 from frieze B4 is not known but there is a possibility that it comes from Marconi's excavations in the urban sanctuary which is less than 300 m away from where the other objects were found.

Both Marconi and De Miro attribute the fragments from frieze D to the roof of the naiskos to the South-East of temple B. The number of fragments and find location strongly support this attribution. The date of the building remains are also consistent with the date of the roof (section 1.2).

Discussion: The single fragment published by De Miro as frieze B4 (section 4.1.5) is placed in this group based on similarities in fabric and its correspondence with the painted decoration of the sima published by Gábrici.[15]

Overall, the reconstructed sima varies slightly from the previous reconstruction by Gábrici. His drawing places the top fascia at an angle, tilting downwards. This means the top fascia is at an oblique angle in relation to the bottom fascia. This reconstruction differs from known profiles of similar roofs from this period, including frieze A from Akragas,[16] the revetment found at the via Minerva in Syracuse,[17] roof 7, series B from Selinus,[18] and frieze A, B, and C from Gela.[19] In profile, the top and bottom fascia of these roofs have almost identical angles. The profile of the new reconstructed sima (figure 5.2-3) places the top fascia at an angle similar to the bottom fascia. Therefore, the reconstructed sima and geison revetment are slightly larger than originally proposed by Gábrici. He estimated the sima to be 370 mm high and 520 mm long, and the geison revetment 245 mm high.[20]

A number of scholars associate the horse rider acroteria with the canonical Sicilian sima roof type.[21] Based on the number of fragments, their find location and date it is therefore probable that the horse rider belongs to this roof. In general the terracotta figure is thought to have been placed on the end of the ridge, at the apex of the pediment, as seen in the small terracotta shrine from Sabucina which resembles a naiskos with a terracotta roof and two acroteria figures at the edges of the roof

15 Gábrici 1925, fig. 10-11.

16 De Miro 1965, pp. 40-55, tab. XXII; Wikander 1986, p. 31, fig. 7.1.

17 Lang 2010, p. 138, no. Syra 9, fig. 32.2; Wikander 1986, p. 46, no. 57, fig. 9.

18 Conti 2012, pp. 78-95, fig. 77.

19 Bernabò Brea 1949-1951, pp. 22-56, fig. 27, 36, 38, tab. III; Wikander 1986, pp. 33-34, fig. 8; Lang 2010, pp. 94-95, fig. 4.5, 4.6, 5.1.

20 Gàbrici 1925, p. 141.

21 Danner 1996, pp. 100-102; Darsow 1938, p. 67; Szeliga 1986, pp. 80-87.

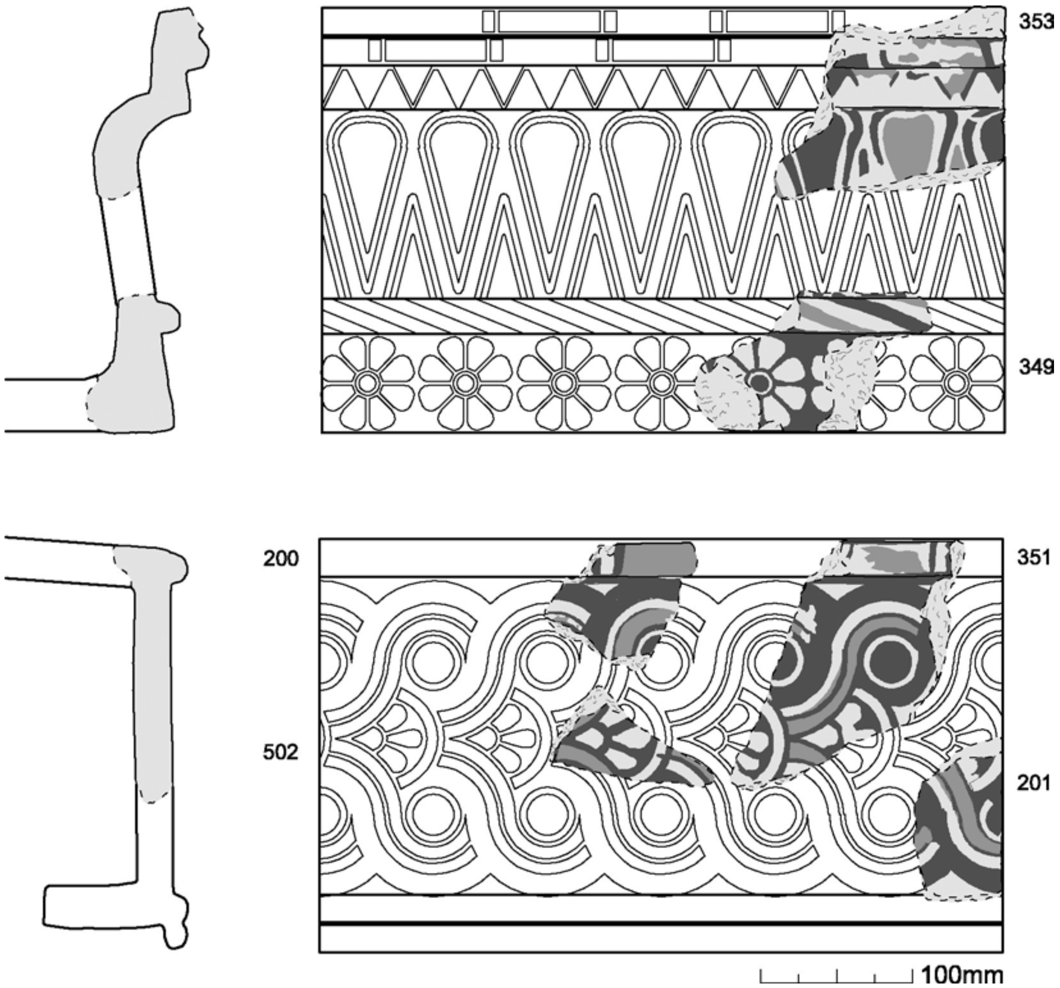

Figure 5.2-7: Reconstructed raking sima and lateral geison revetment for roof 3.

ridge.[22] But the exact nature of this placement and the connection between the horse rider and other roof elements are yet not well understood. One theory proposes that the horse rider acroteria came in groups of two, one on each pediment.[23] At this stage there is insufficient information to determine if the fragments of roof 2 belong to one figure or two. None of the known fragments, which can be attributed to a specific position, is a duplicate. The possible exception are the two feet fragments. VIN 516 is slightly smaller than VIN 517 and the distance between the circular opening and the bottom of the fragment is less in size. But these elements were hand sculpted, so some variation is to be expected. It is therefore not possible to determine if the difference in size is because the objects come from different acroteria figures, or because of the manufacturing process of one figure.

22 Danner 1996, p. 102; Marconi 2007, pp. 46-47; Szeliga 1986, pp. 80-82.

23 Danner 1996, p. 102; Marconi 2007, pp. 46-47; Szeliga 1986, pp. 166-167.

Dating: 570-530 BC

Fragments: 50 fragments (VIN 174, 175, 195, 196, 352, 500, 501, 503-520, 522-536, 540, 553-556, 559, 574, 611-614)

5.2.1.3 ROOF 3

Stylistic group: The majority of fragments are originally assigned to different friezes by De Miro: VIN 351 from frieze B1 (section 4.1.2), VIN 349 from frieze B2 (section 4.1.3), VIN 353 from frieze B5 (section 4.1.6), VIN 200 and 201 from frieze C (section 4.1.8), and VIN 502 from frieze D (section 4.1.9).

Fabric group: The two sima fragments (VIN 349 and 353) do not fall within the major fabric groups, in general they are similar to fabric B, but the fabric colour is slightly more red (appendix A and B). The four geison revetment fragments form part of fabric B (appendix A and B). In general, all the fragments have a very visible slip layer, especially when compared to objects from roof 2 which belong to the same fabric group. The objects of roof 3 have a pale yellow slip (10YR 8/2-2.5Y 8/2) of between 0,5 and 1,5 mm thickness (appendix B).

Graphic reconstruction: The two sima fragments provide information on the profile and painted decoration for all parts of the sima. The only incomplete profile element is the cavetto for which the size and decoration had to be extrapolated from the small preserved section on VIN 353.

The geison revetment is reconstructed based on the painted decoration and profile preserved (figure 5.2-7).

Reconstructed dimensions: The raking sima is reconstructed as 280 mm high and 452 mm wide. The geison revetment is 272 mm high.

Associated building: As detailed in section 4.1, the provenance of the various objects is not known.

Discussion: The two sima fragments are both from canonical Sicilian roofs and their profiles are smaller than that of roof 1, 2, or 4 from Akragas. If the proportion between the profile elements is the same for roof 3 as for the others, then for a bottom fascia with a height of 67 mm (VIN 349) the top fascia is expected to be 29 mm, which matches very well with VIN 353. The two fragments therefore appear to form a sima with the same proportional profile. Based on the size, profile, dating, and fabric it is thus possible that these two fragments belonged to the same roof. The geison fragments are also similar in size, painted decoration, and fabric, and are therefore also placed in this roof.

The reconstructed height of both the sima and geison revetment is fairly equal. In contrast, the sima and geison revetment of roof 1 and 2 have a considerably larger sima compared to the geison revetment. For roof 3 this might be an indication, on the one hand that the geison revetment actually belongs to a different roof, but it should be noted on the other hand that the relationship between the height of the sima and geison revetment for roof systems from Gela is close to 1:1.[24] As discussed in section 4.1.3, the sima profile has strong similarities with roofs from Gela especially in regards to the lack of a bottom roll. Therefore, the characteristics of roof 3 show a greater similarity to architectural examples from Gela than roof 1 and 2 from Akragas.

Dating: 570-530 BC

Fragments: 8 (VIN 198-201, 349, 351, 353, 502)

5.2.1.4 ROOF 4

Stylistic group: The roof incorporates all the fragments from stylistic group B3 (section 4.1.4) and one ridge tile from ridge tile C (VIN 563, section 4.1.53).

Fabric group: Two out of the three fragments for which enough information is available for fabric analysis are placed in fabric group A (table 5.1-1). The third fragment (VIN 562, appendix A) falls within fabric group B due to the presence of a slip layer and a lower fabric density.

Material testing: VIN 562 and 569 were tested using WD-XRF. Both objects fall within group 5 (figure 4.3-8). This group is characterized by a higher concentration of ferric oxide (Fe_2O_3) and titanium dioxide (TiO_2) as well as lower concentrations of cerium (Ce) and yttrium (Y). VIN 563, the ridge tile, falls within group 4, which is closely related to group 5. So it is plausible that all three objects belong to the same manufacture.

Graphic reconstruction: The amount of fragments are limited. Nevertheless, as already mentioned in section 4.1.4, there is a very strong stylistic similarity between the sima fragment VIN 358 and the lateral sima fragments from roof 1. The

24 Wikander 1986, pp. 32-32.

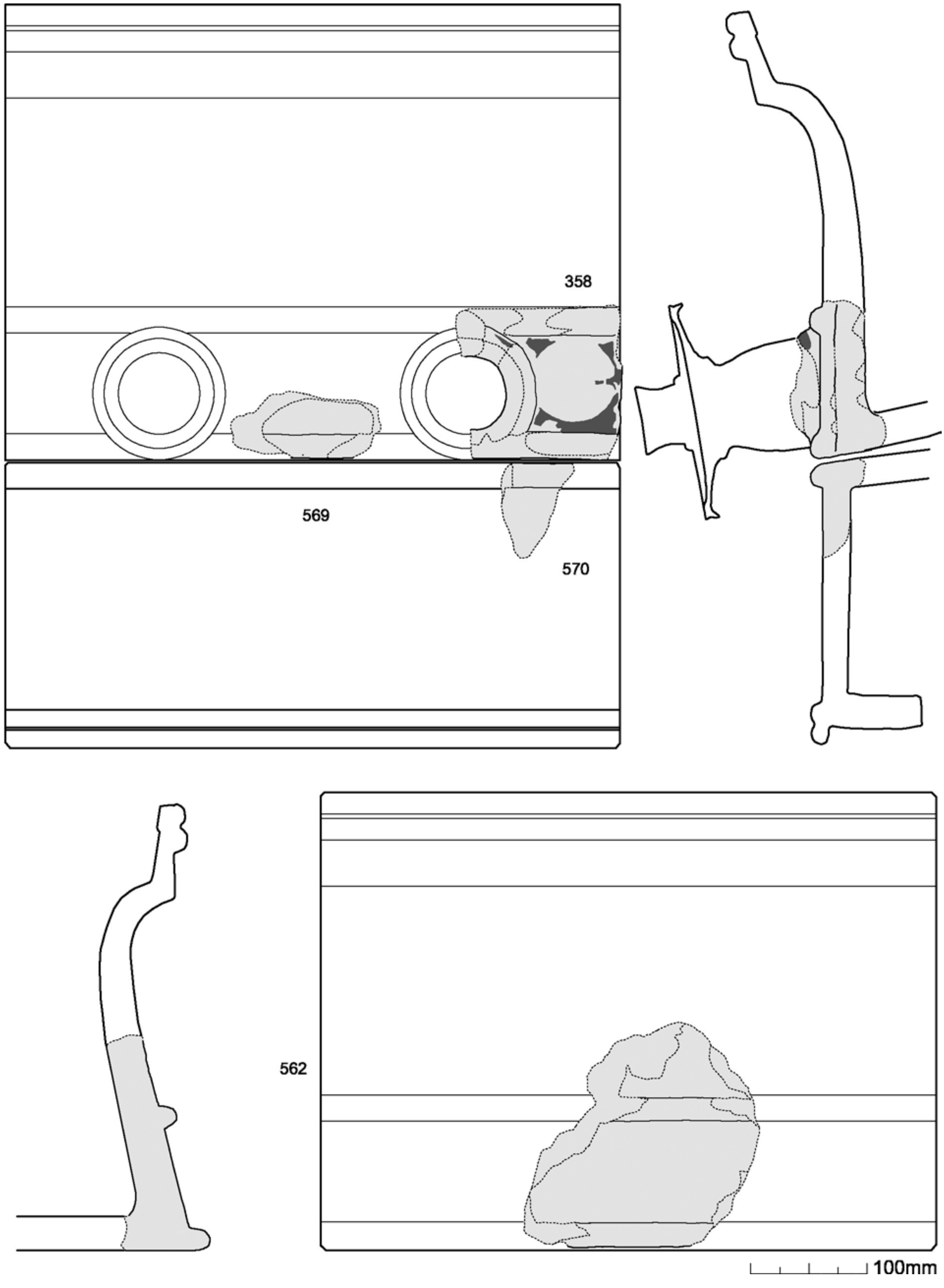

Figure 5.2-8: Reconstructed roof 4 with lateral sima and geison revetment on top and raking sima below.

size of the profile elements, the painted decoration and the angle are very alike. It is not unknown for roofs from the same colony to be so similar, as seen with the frieze A and C from Gela.[25] The profile dimensions and painted decoration from roof 1 are therefore used as an indication of the overall profile of the sima and geison revetment of roof 4.

Reconstructed dimensions: Estimated to be similar to roof 1.

Associated building: The excavations at S. Anna are still ongoing and therefore, while a number of architectural features have been revealed, the overall architectural layout of the extra-urban sanctuary is not yet fully known. There is one building which might be associated with roof 4. It was found by Fiorentini and is dated by her to the second half of the 6th century.[26] The long and narrow shape of this structure is different from the two naiskoi which are associated with roof 1 and 2, and it is also larger than the naiskoi (section 1.2). The roof elements are dated slightly earlier than the date provided by Fiorentini for this building. Based on these factors it is therefore not certain if roof 4 belongs to this building. It is possible that the associated building for this roof has not yet been identified in the area of S. Anna.

Discussion: Roof 4 is similar to roof 2 in terms of the dating, style, and profile. The majority of the fragments in ridge tile C are also associated with roof 2 (section 5.2.1.2). The exception is VIN 563, which is excluded due to its find location in the extra-urban sanctuary of S. Anna. Based on the similarities between both roofs and the fact that this fragment was found in S. Anna, it is plausible that this ridge tile was part of a separate roof 4.

But roof 4 is also similar to roof 1 in terms of the profile and decoration. The fabric groups are also the same. In light of these similarities and the close proximity between the find locations of the two roofs it is therefore worth considering if the objects of this group are not in fact originally from roof 1 and were then transported *extra muros* to S. Anna and deposited in secondary use. The direct line of sight distance between the naiskos inside the foundations of temple G and the area of S. Anna is a little over 400 m (figure 1-2). But the location of the city gates and the hilly terrain mean that the actual distance to travel would be more than 1 km.

There are, however, a number of indicators which support the existence of a canonical Sicilian roof at S. Anna during the middle of the 6th century BC. First, the archaeological evidence suggests that the extra-urban sanctuary was thriving from a very early date, possibly soon after the foundation of Akragas (section 1.2). The wealth of the finds there gives the impression that it was a very important location during the middle of the 6th century, and as such the construction of a monumental structure with a terracotta roof would not be surprising. In addition, the number of fragments found is relatively high and include pieces from different parts of the same roof. In conclusion, the number and representative nature of the finds thus suggest that these objects are from a building in S. Anna which was similar in terms of style and fabric to existing structures within the city.

Dating: 570-530 BC

Fragments: 6 (VIN 358, 562, 563, 567, 569, 570)

5.2.1.5 ROOF 5

Stylistic group: The single fragment is from frieze B6 (section 4.1.7).

Fabric group: It falls within fabric F (table 5.1-1).

Graphic reconstruction: Since it is the only fragment, no graphic reconstruction of this roof is possible.

Associated building: Unknown

25 Frieze A from Gela is dated to the middle of the 6th century BC by Lang, frieze C to the first quarter of the 6th century. The two have strong similarities in terms of the decoration and profile of the sima pieces. (Brea 1949-1951, pp. 22-38, 47-56; Lang 2010, pp. 93-95).

26 Adornato 2012, p. 488; De Miro 1992, p. 153; Fiorentini 1969, p. 63.

Discussion: Other fragments placed in the same fabric group F are all from frieze G and H1. Both are dated to the last third of the 6th century and are associated with anthemion sima roofs (section 4.1.12, 4.1.14). This makes the fragment from roof 5 the only example of a canonical Sicilian roof with a volcanic temper at Akragas.

Dating: 570-530 BC

Fragments: 1 (VIN 333)

5.2.1.6 RIDGE PALMETTE TYPE 1

Stylistic group: One fragment from palmette A (section 4.1.44).

Fabric group: The object falls within fabric A (table 5.1-1).

Dimensions: Plaque: Complete height: 350 mm, complete width: 300 mm

Associated building: Unknown

Discussion: The shape of the palmette is similar to ridge tile antefixes from the Geloan treasury, except that it is not in relief.[27] It is therefore possible that this object belonged to a canonical Sicilian sima roof. However, the find location is currently not known as well as no similar fragments. Therefore, it cannot be determined if this palmette belongs to any of the canonical Sicilian roofs already identified.

Dating: Middle of the 6th century BC

Fragments: 1 (VIN 396)

5.2.2 ANTHEMION SIMA ROOFS

5.2.2.1 ROOF 6

Stylistic group: The roof combines three stylistic groups: frieze E (section 4.1.10), frieze F (section 4.1.11) and the lion headed waterspout (section 4.1.20).

Fabric group: The single fragment from frieze E belongs to fabric group E like the majority of fragments from frieze F. The lion headed waterspout falls within fabric B due to the slip layer. Alternatively, if this layer is interpreted as a paint layer, the object will also fall in fabric group E (table 5.1-1).

Material testing: Six objects from frieze F were measured with HH-XRF (figure 5.1-2 and figure 5.1-3) and plot as a fairly coherent group that shows overlap with frieze A but is separated from the roof tiles from S. Anna due to higher concentrations in zinc (Zn) and lower concentrations of silica dioxide (SiO_2).

Graphic reconstruction: There are enough well preserved fragments to reconstruct the lateral sima with a fair degree of confidence. Based on a small fragment of the lion headed waterspout the size and shape of the head can be estimated based on the comparisons with temple A, which have strong stylistic similarities (section 4.1). There are traces of an upside down palmette to the side of the lion's head which indicates a continuation of the anthemion pattern from the lateral sima without the presence of the single guilloche at the bottom, as seen with the reconstruction by Gábrici for the anthemion roof of temple C at Selinus.[28]

There are no fragments from the vertical edge of the sima piece. The termination of the pattern is thus estimated based on examples from Selinus which show the pattern ending at the link between two anthemion palmettes, with no perforation at the edge (figure 5.2-9).

Reconstructed dimensions: Lateral sima: reconstructed height: 280 mm, width: 650 mm. Lateral geison revetment: height: 252 mm. Lion headed waterspout: height: 285 mm.

Associated building: The fragments from frieze F were found in a disturbed context around temple A and temple B. The closest known building dated to the same period as roof 6 is a structure between temple A and gate IV, currently located in

27 Heiden 1990, p. 100, tab. 68.1.

28 Gábrici 1933, fig. XXV.

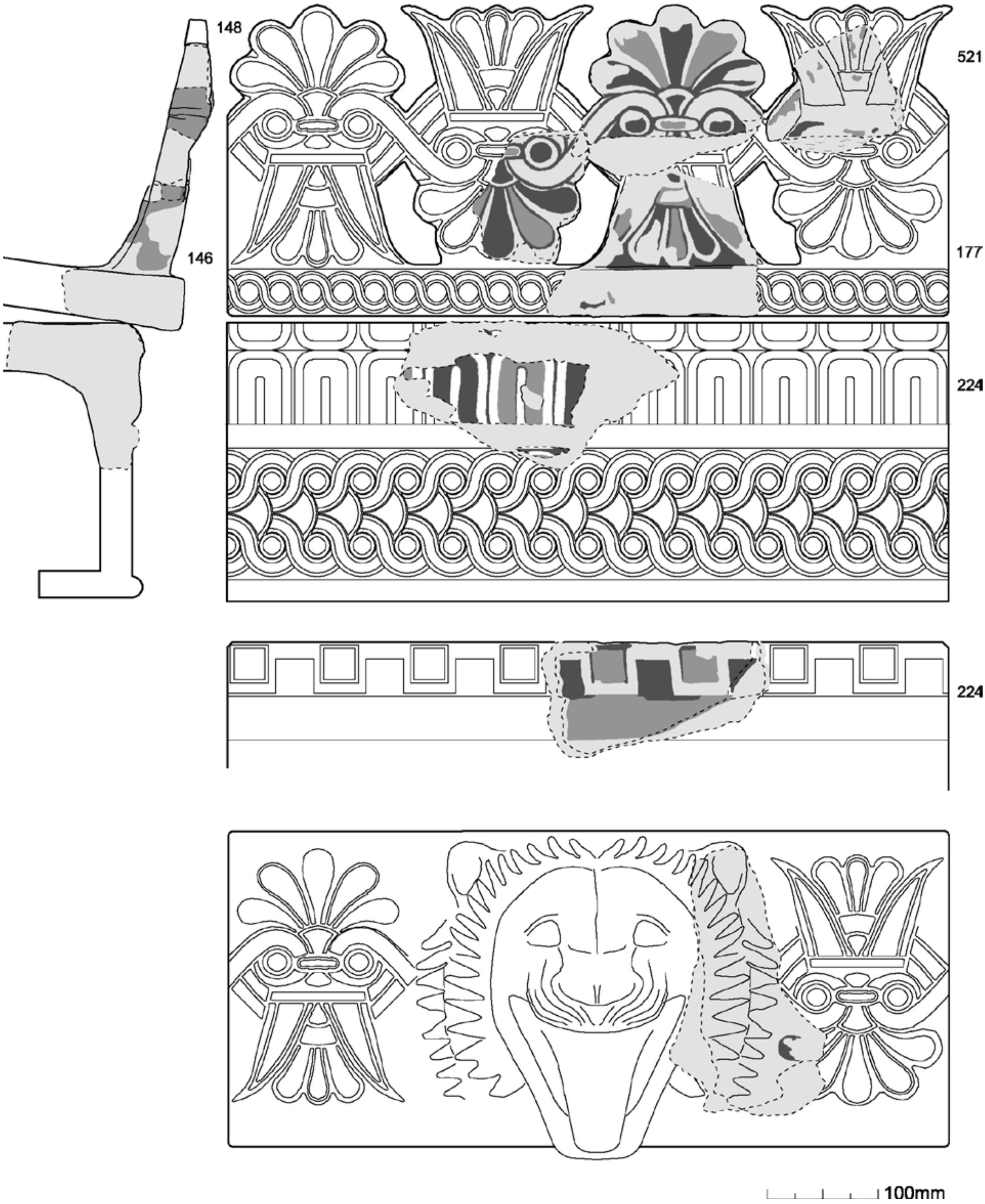

Figure 5.2-9: Reconstruction of roof 6. A: Lateral sima, b: lateral geison revetment, c: soffit of lateral sima, d: lion headed waterspout.

the gardens of the villa Aurea. Both De Miro and Marconi therefore attribute most of the fragments to this building.[29] There are, however, more than one unattributed roof from the same time period that were found in a similarly disturbed context to the South of temple B (roof 7, series A-D) and thus the previous attribution is less secure.

Discussion: Stylistically all three groups of fragments are associated with the anthemion sima developmental phase which is dated to the last quarter of the 6th century BC. Comparisons from Selinus, specifically roof 18 and 20, indicate that the lateral simas, geison revetments and lion headed waterspouts of a similar style formed part of a single roof.[30] It therefore appears that the objects from Akragas belong to a single roof based on examples from Selinus, fabric and size.

Dating: Last third of 6th century BC.

Fragments: 9 (VIN 145-148, 177, 178, 224, 334, 521)

5.2.2.2 ROOF 7, SERIES A

Stylistic group: Three sima (VIN 139, 169, 181) and two geison revetment fragments (VIN 183, 184) are originally from frieze G (section 4.1.12). A third geison revetment fragment (VIN 143) is from frieze H (section 4.1.13).

Fabric group: All objects fall within fabric G (table 5.1-1, appendix A). They are characterized by a volcanic temper and an epidermis layer consisting of fine levigated clay.

Material testing: All fragments, except VIN 143, were measured using HH-XRF and show a close grouping, except for VIN 139, which has a higher concentration of CaO (figure 5.1-2 and figure 5.1-3).

Graphic reconstruction: The available fragments come from the lateral and horizontal geison revetment and lateral sima. The reconstructed revetments are extrapolated from these (figure 5.2-10). Some reference is also made to the similar sima and geison revetment from Naxos especially in regards to the horizontal tile section of the sima.[31] The reconstructed dimensions for both the geison revetment and sima are close to that of the anthemion roof from Naxos, except for the sima from Akragas being slightly wider.[32] Based on comparison with the two examples from Naxos and other fragments of frieze G it is clear that the pattern terminates at the edge of the sima in the middle of the top lotus. There is one fragment, VIN 139, which does not appear to come from the lateral sima. It lacks perforations and there is a horizontal scar on the back, slightly below the top edge. The function of this piece is not certain.

Reconstruction dimensions: The lateral sima have a reconstructed height of 300 mm. The reconstructed width of the lateral sima is 610 mm. The lateral and horizontal geison revetment is reconstructed to be 360 mm high.

Associated building: As described in section 4.1.12 the objects are thought to come from a fill layer around the naiskos to the South-East of temple B. Due to the secondary context, the original location of this roof is not known.

Discussion: Already in section 4.1.12 the difference between the sima fragments that are originally grouped in frieze G has been discussed, in terms of the depth of the relief, the shape and thickness of the profile, and the shape of the lotus flowers. Based on the fabric, profile, and chemical composition the fragments in frieze G are separated into three different groups (roof 7 series A-C). Roof 7, series A consists of objects with a thick epidermis layer and the sima has a flat profile with the decoration in relatively shallow relief. The geison revetment and sima fragments have strong similarities to the anthemion roofs from Naxos which are associated

29 Marconi 1929, p. 154; De Miro 1965, p. 62.

30 Conti 2012, pp. 186-204, fig. 170-173, 181, 184; Mertens-Horn 1988, pp. 183-184, tab. 18b.c, 19.a.b.c.

31 Pelegati & Lentini 2011, p. 292, fig. 2-3.

32 Lang 2010, p. 121.

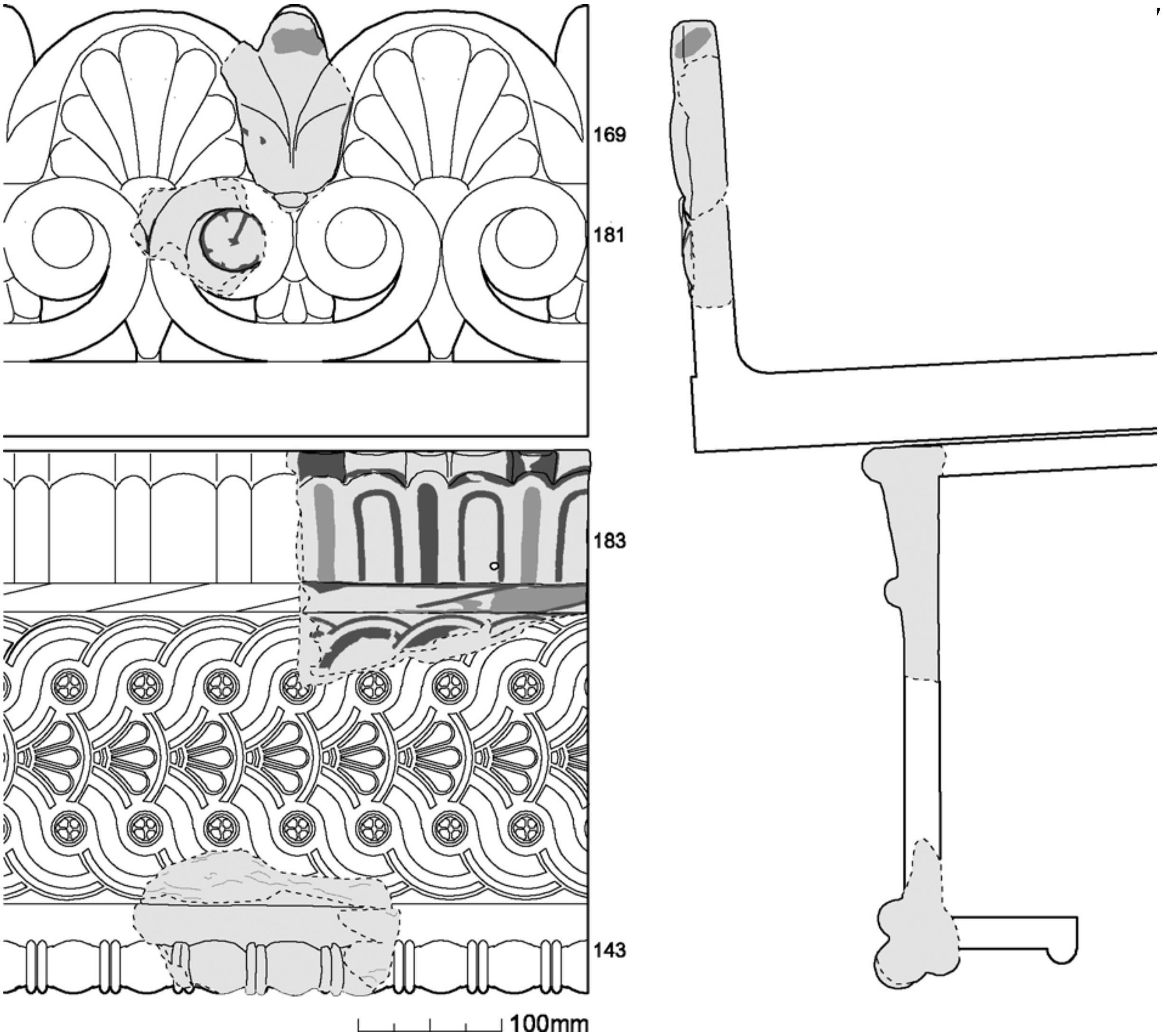

Figure 5.2-10: Reconstructed lateral sima and geison revetment for roof 7, series A (VIN 143, 169, 181, 183).

with temple B. The sima shows strong similarities with series A both in terms of the decoration, profile, and fabric.[33] The similarities in decoration and size between the different elements from roof 7 series A-C raises the possibility that these are different iterations of the same roof. Different roof sections might have been produced by different workshops, which would account for the variation in profile and fabric. Or the different elements might represent different generations of repairs. For this reason these different sections are identified as series of the same roof instead of different roofs.

Dating: Last third of 6th century BC

Fragments: 6 (VIN 139, 143, 169, 181, 183, 184)

33 Pelegati & Lentini 2011, p. 292, fig. 2-3.

5.2.2.3 ROOF 7, SERIES B

Stylistic group: The five sima fragments are all originally part of frieze G (section 4.1.12).

Fabric group: All fall within fabric F (table 5.1-1, appendix A) which is distinguished from fabric G by the fact that it has no epidermis layer as seen with the objects from roof 7, series A.

Material testing: According to the HH-XRF data, the objects of this group plot together with the possible exception of VIN 166 which have slightly higher CaO levels (figure 5.1-2, figure 5.1-3).

Graphic reconstruction: VIN 136 (figure 4.1-13) shows no perforations between the palmette and lotus flowers, as seen in the three fragments used for the reconstruction (figure 5.2-11). It is thus

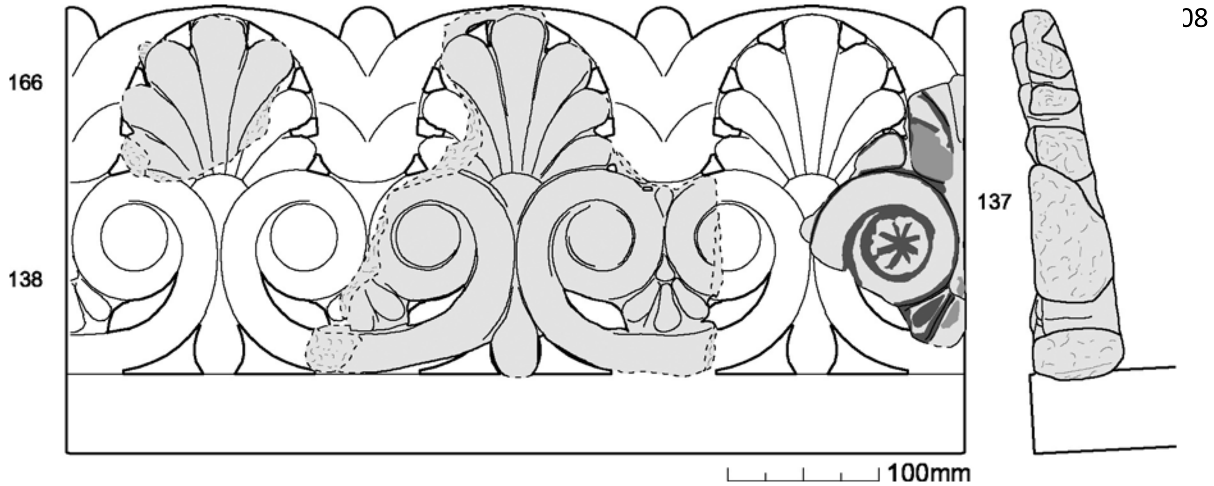

Figure 5.2-11: The reconstructed lateral sima from roof 7, series B.

likely from the horizontal sima. VIN 137 has the vertical termination of the pattern preserved. The tile has a straight edge that cuts down the middle of the lotus flower and between the two volute curls. All the fragments of roof 7, series B have strong stylistic similarities to the anthemion sima from Naxos associated with temple B, especially frieze C in regards to the thickness and shape of the profile.[34] This roof informed parts of the reconstruction that are not preserved within the available fragments of roof 7, series B (e.g. the thickness of the horizontal tile).

Reconstructed dimensions: Reconstructed lateral sima is 295 mm high and 595 mm wide.

Associated building: As described in section 4.1.12 the objects are thought to come from a fill layer around the naiskos to the South-East of temple B. Since all the fragments come from a secondary context, the original location of this roof is not known.

Discussion: The fragments are placed in the same roof type based on similarities in the decoration, the thickness of the profile, and the fabric. The profile of this sima shows a slight curve outwards (figure 5.2-11) which is at contrast to the straight profiles of roof 7, series A and C.

Dating: Last third of 6th century BC

Fragments: 5 (VIN 136-138, 166, 168)

34 Pelegati & Lentini 2011, p. 393, fig. 6.

5.2.2.4 ROOF 7, SERIES C

Stylistic group: The two sima fragments are originally placed in frieze G by De Miro (section 4.1.12).

Fabric group: Both fragments fall within fabric F (table 5.1-1, appendix A), as does roof 7, series B.

Material testing: The objects were analysed using HH-XRF. As seen in figure 5.1-2 and figure 5.1.3 the two objects show overlap with objects from series A and B.

Graphic reconstruction: The two fragments of roof 7, series C are very similar to each other except that VIN 167 has a finished vertical edge on the left. It indicates that the pattern ended in the middle of the lotus flowers.

Reconstructed dimensions: Similar to roof 7, series B, reconstructed lateral sima is ca. 295 mm high and ca. 595 mm wide.

Associated building: As described in section 4.1.12 the objects are thought to come from a fill layer around the naiskos to the South-East of temple B. Since all the fragments come from a secondary context, the original location of this roof is not known.

Discussion: The fragments from roof 7, series A and B were also originally part of frieze G, but stylistically there are some differences. The sima profile from roof 7, series B is much thicker and curved compared to roof 7, series C, and

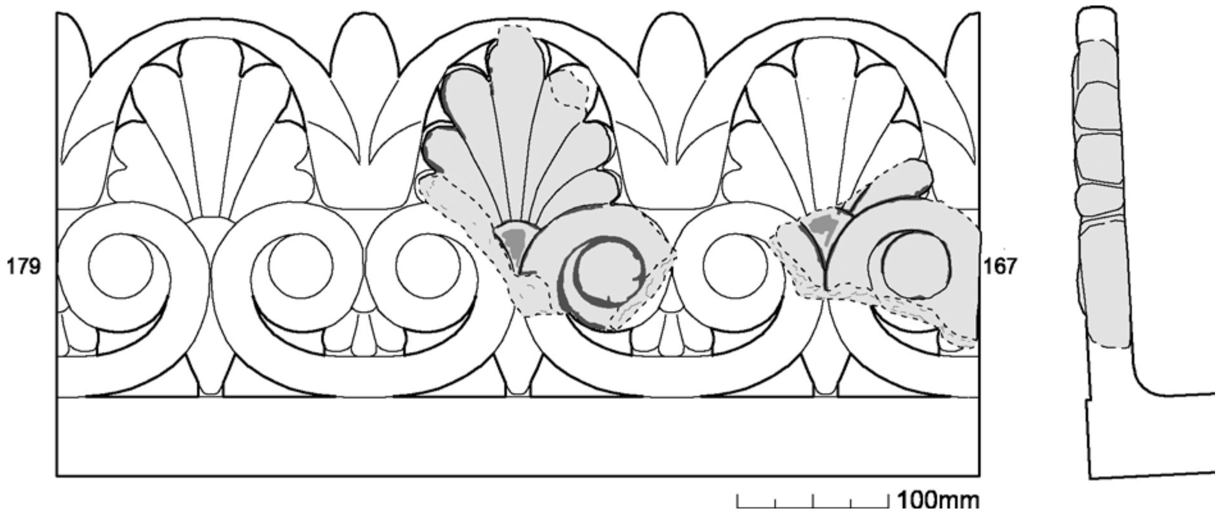

Figure 5.2-12: Lateral sima fragment of roof 7, series C.

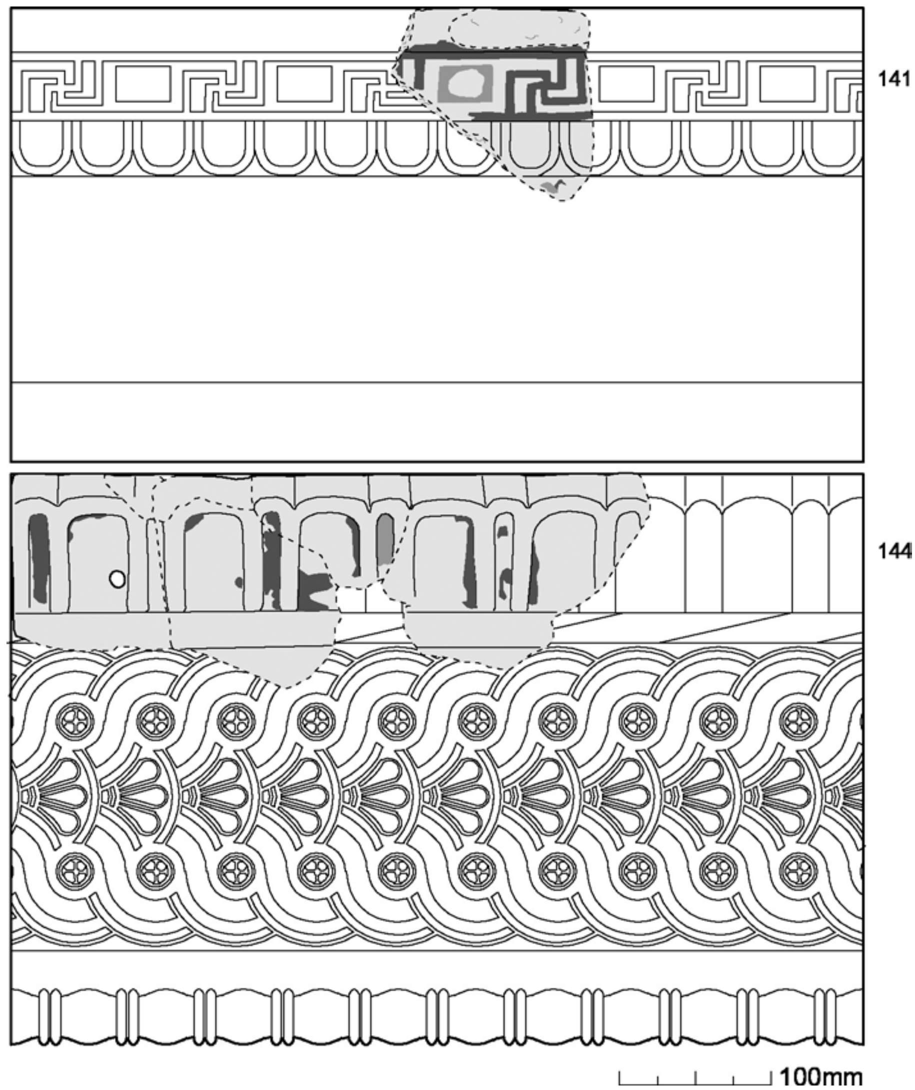

Figure 5.2-13: Lateral geison revetment and sima of roof 7, series D.

the palmettes are longer with a triangular shape compared to series A and B.

Dating: Last third of 6th century BC

Fragments: 2 (VIN 167, 179)

5.2.2.5 ROOF 7, SERIES D

Stylistic group: The sima fragments (VIN 140, 141) are from De Miro's frieze H1 (section 4.1.14), the geison revetment fragment (VIN 144) is grouped with frieze G (section 4.1.12).

Fabric group: The fragments fall within fabric F (table 5.1-1, appendix A). It is the same fabric group as for objects from roof 7, series B and C. As already mentioned this fabric group is differentiated from fabric group G, which characterizes roof 7, series A, by the absence of an epidermis layer.

Graphic reconstruction: One sima fragments (VIN 141) is from the raking sima and are only preserved for the top edge. There is thus not enough evidence from the fragments or from published precedents in order to reconstruct the full sima profile. While only the top section of the geison revetment is preserved, it is similar in style to the geison revetment from roof 7, series A and was originally placed in the same group by De Miro. These therefore provide an indication for the parts of the geison revetment not preserved. VIN 140 differs from VIN141 in the size of the profile and it has a horizontal scar on the back. The exact position of this fragment is not known but it is possible that it formed part of the corner decrease of the horizontal sima.

Reconstructed dimensions: The height of the sima and geison revetment elements are most likely similar to those of roof 7, series A-C.

Associated building: As described in chapter 4.1.14 the objects are thought to come from a fill layer around the naiskos to the South-East of temple B. Since all the fragments come from a secondary context, the original location of this revetment is not known.

Discussion: The sima fragments have a close parallel with fragments from Naxos which are thought to be from the gable of temple B. The anthemion roofs from Naxos, which in general show a strong stylistic parallel to roof 7, series A-C, are associated with the same building.[35] The geison revetment fragment is similar to the one from roof 7, series A, but the fabric is different. The fragments from this revetment are similar in terms of fabric and find location as objects associated with roof 7 series B and C. This revetment is therefore also associated with roof 7 based on these similarities as well as the precedent set by temple B at Naxos.

For both series A and B from roof 7 there is a fragment without perforations. This would indicate that these fragments are not part of the lateral sima, but the exact position is not known. The available evidence for the gable revetments associated with the differ iterations of roof 7 is thus fragmentary and not very clear. For this reason it is not possible to determine the exact relationship between this revetment and the different components of roof 7 already identifies and thus it is identified as a separate series.

Dating: Last third of 6th century BC

Fragments: 3 (VIN 140, 141, 144)

5.2.2.6 RIDGE TILE ANTEFIX TYPE 1

Stylistic group: A single fragment from ridge tile antefix A (section 4.1.39)

Fabric group: The fragment falls within fabric F (table 5.1-1)

Graphic reconstruction: Only a small fragment is preserved but in terms of decoration and profile it has strong similarities with a ridge tile antefix from Naxos.[36] This piece informs aspects of the graphic reconstruction not preserved on the fragment.

Reconstructed dimensions: Palmette height: 310

35 Pelegati & Lentini 2011, p. 39, fig. 7.

36 Danner 1996, pp. 19-20, tab. 5.1.

mm, width: 420 mm.

Associated building: As described in section 4.1.39 this object is thought to come from a fill layer around the naiskos to the South-East of temple B. Since it comes from a secondary context, the original location of this element is not known.

Discussion: The object has the same fabric as roof 7, series C and D. In terms of style, it is comparable to a ridge tile antefix from Naxos. But it is not known if the ridge tile antefix from Naxos belongs to temple B, which is associated with an anthemion roof similar to roof 7 from Akragas. VIN 180 does come from the same find context as the fragments from roof 7. But while the dating, find context, and fabric are therefore similar to roof 7, series A-D, it is not clear if this element should be associated with this roof. At this point there is no clear precedent for the placement of this type of ridge tile antefix with a raking sima.

Dating: First quarter of the 5th century BC

Fragments: 1 (VIN 180)

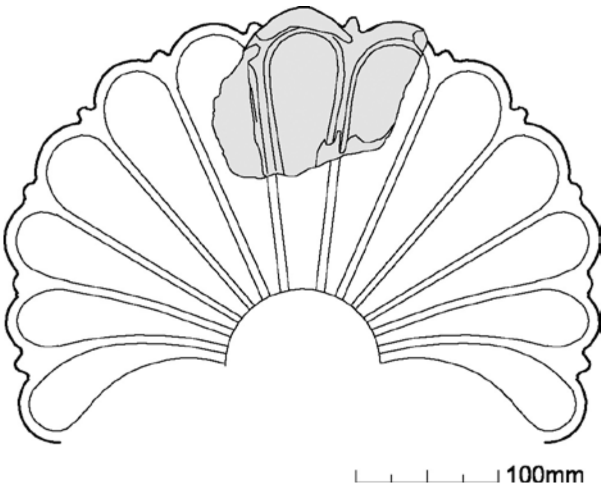

Figure 5.2-14: Reconstruction of ridge tile antefix type 1 (VIN 180).

5.2.3 ANTEFIX ROOFS AND TYPES

5.2.3.1 ROOF 8

Stylistic group: The two antefix fragments (VIN 384, 385) are from antefix B (section 4.1.23) and the eaves tile fragment (VIN 383) is from eaves tile A (section 4.1.35).

Fabric group: None of the three fragments fall within the main fabric groups due to the combination of grog and non-volcanic temper, slip, and fabric colour. But all three objects appear to have a similar fabric with a pink colour (2.5YR 7/3-7.5YR 7/3) and a pale yellow slip layer (2.5Y 8/2) of less than 1 mm thickness (appendix B). However, there is not enough of the fabric visible on VIN 384 and 385 to determine the level of oxidation, fabric density, and percentage of temper.

Graphic reconstruction: The cover tile is perpendicular to the antefix plaque and does not extend all the way to the bottom edge of the plaque. Based on the painted decoration on the underside of the eaves tile it is estimated that the roof had an overhang of at least 100 mm. The full profile of the eaves tile is not preserved. Based on similarities with eaves tiles from Syracuse, a flat pan tile profile with rounded raised borders can be expected (figure 5.2-15). According to the size of the antefixes this border is likely less than 70 mm wide.[37]

Reconstructed dimensions: The reconstructed antefix is 186 mm wide and 124 mm high. The cover tile is 20 mm thick.

Associated building: As described in sections 4.1.23 and 4.1.35, all three fragments are associated with a sanctuary in the area of S. Nicola close to the agora (figure 1-2).

Discussion: Very little information is available on the roofs and buildings from the area of S. Nicola where the objects had been found. Based on similarities with other Sicilian roofs it is likely

37 Ciurcina 2006, pp. 393-394.

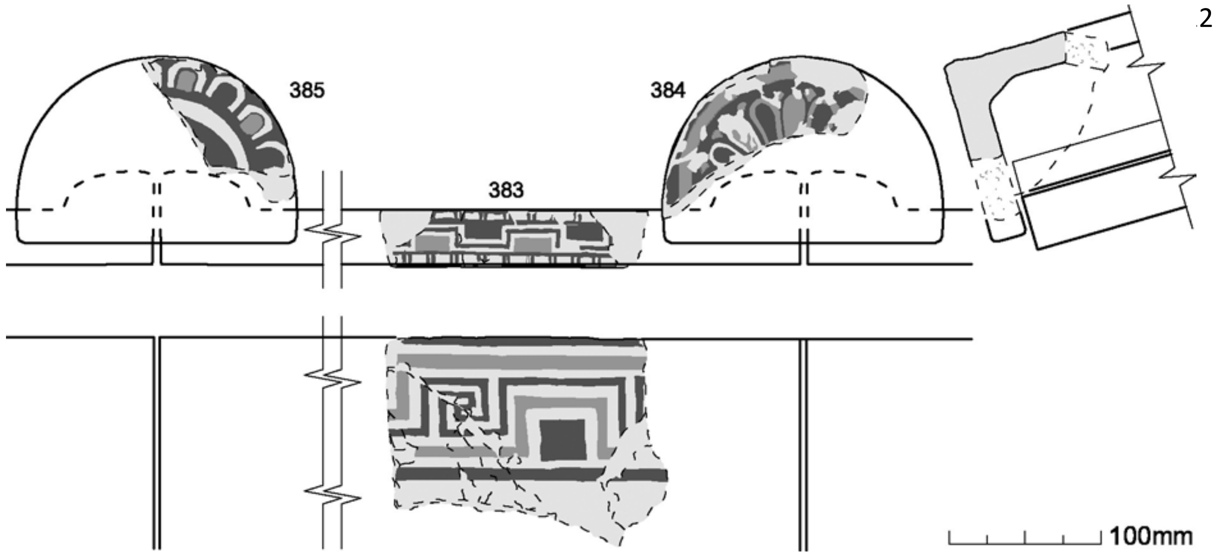

Figure 5.2-15: Reconstruction of roof 8 (VIN 383-385).

that they belonged to an antefix style roof but there is a possibility that they were not part of the same roof. Taking the similarities in the fabric, dating, and find location of these objects into account they are provisionally placed in the same roof.

Dating: Second half of the 6th century until the beginning of the 5th century BC.

Fragments: 3 (VIN 383-385)

5.2.3.2 ANTEFIX TYPE 1

Stylistic group: A single fragment from antefix C (section 4.1.24)

Fabric group: The object does not fall within the main fabric groups. In essence, it is similar to fabric group A, except for a redder clay colour and a very thin slip layer (appendix B).

Associated building: It was found next to the main structure at the extra-urban sanctuary at S. Anna excavated by Fiorentini which is dated to the second half of the 6th century.[38] Due to the location and date there is a possibility that this antefix belonged to this structure.

Discussion: To date this is the only gorgoneion antefix found at S. Anna. There is enough of the antefix preserved to establish that no comparable antefixes from Akragas are documented so far (figure 5.2-16). In general it is problematic to identify a roof based on a single antefix fragment due to the fact that different types could be used on the same roof (section 2.2.1.1.). Therefore, when a number of different antefix fragments are known from the same area it can be difficult to determine which belonged to the same roof. But to date, this is the only antefix found at S. Anna, and thus there is a possibility that this fragment represents an antefix roof at S. Anna.

Dating: Second half of 6th century BC

Fragments: 1 (VIN 356)

5.2.3.3 ANTEFIX TYPE 2

Stylistic group: A single fragment from antefix A (section 4.1.22). Stylistically this antefix is similar to the ones from roof 8, but it is smaller.

Fabric group: Not enough of the clay fabric is clearly visible in order to determine the fabric group

Reconstructed dimensions: Antefix plaque: 209 mm wide and 157 mm high

Associated building: As discussed in chapter 4.1.22 the antefix was discovered in the Archaic layers of the Roman and Hellenistic quarter close to the sanctuary at S. Nicola.

Discussion: The fragment was found in the general vicinity of the fragments from roof 8. While the object is smaller than the reconstructed antefixes

38 Fiorentini 1969, p. 68.

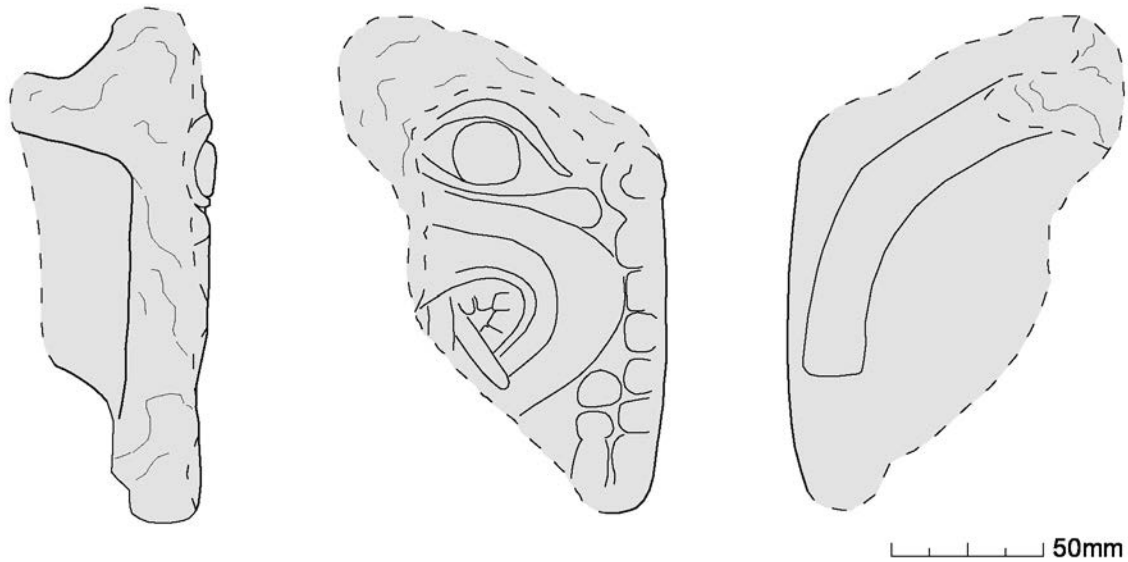

Figure 5.2-16: Fragment associated with antefix type 1 (VIN 356).

from roof 8, there is a possibility that they belonged to the same roof, or at least represent different phases.

Dating: End of 6th century, beginning of 5th century BC

Fragments: 1 (VIN 391)

5.2.3.4 ANTEFIX TYPE 3

Stylistic group: A single fragment from antefix D (section 4.1.25)

Fabric group: The fabric is different from the major fabric groups. The clay matrix is very fine. While the antefix plaque appears to have grog as a temper, there is evidence of large volcanic grains on the rounded cover tile (appendix A and B).

Reconstructed dimensions: Plaque height: 159 mm

Associated building: As discussed in section 4.1.25 the object was excavated around temple A. It is therefore possible that it formed part of an antefix roof located somewhere between temple A and the urban sanctuary.

Discussion: Currently there is not enough information available to assign this antefix to a specific building or a specific roof.

Dating: End of the 6th, first half of the 5th century BC

Fragment: 1 (VIN 332)

5.2.3.5 ANTEFIX TYPE 4

Stylistic group: A single fragment from antefix E (section 4.1.26)

Fabric group: Fabric G (table 5.1-1)

Associated building: The provenance of the object is unknown.

Discussion: Currently there is not enough information available to assign this antefix to a specific building or a specific roof.

Dating: Second half of 6th century BC

Fragments: 1 (VIN 348)

5.2.3.6 ANTEFIX TYPE 5

Stylistic group: Two fragments from antefix H (section 4.1.29)

Fabric group: Both fragments fall within fabric group B (table 5.1-1)

Dimensions: Complete height: 140 mm, complete width: 150 mm

Associated building: As discussed in section 4.1.29 VIN 245 was found near the sanctuary next to gate V while the provenance of VIN 246 is not known. It is therefore possible that it was part of an antefix roof located somewhere between temple B and the urban sanctuary.

Discussion: There is not enough information to assign this antefix type to a specific building or a specific roof.

Dating: Last quarter of 6th century BC

Fragments: 2 (VIN 245, 246)

5.2.3.7 ANTEFIX TYPE 6

Stylistic group: One fragment from antefix J (section 4.1.31)

Fabric group: Fabric B (table 5.1-1)

Dimensions: Plaque: Complete height: 230 mm, complete width: 184 mm

Associated building: As discussed in section 4.1.31, the fragment was discovered in a deposit to the north of temple A. It is therefore possible that it was part of an antefix roof located somewhere between temple A and the urban sanctuary.

Discussion: There is not enough information to assign this antefix to a specific building or a specific roof.

Dating: End of 5th century BC

Fragment: 1 (VIN 176)

5.2.3.8 ANTEFIX TYPE 7

Stylistic group: One fragment from antefix L (section 4.1.33)

Fabric group: The finishing layer is not preserved, the temper size and density are not known. A fabric group could thus not be determined (appendix A/B).

Dimensions: Complete height: 215 mm, complete width: 94 mm

Associated building: The provenance of the fragment is not known.

Discussion: There is not enough information to assign this antefix to a specific building or a specific roof.

Dating: First quarter of 5th century BC

Fragment: 1 (VIN 623)

5.2.4 ROOF ACROTERIA TYPES

5.2.4.1 RIDGE PALMETTE TYPE 2

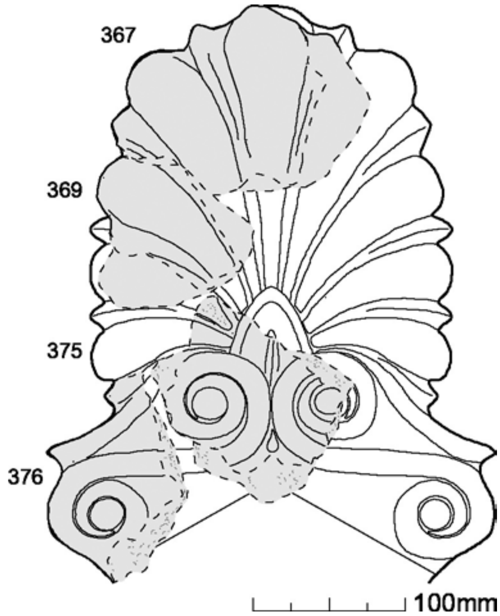

Figure 5.2-17: Reconstructed ridge palmette type 2.

Stylistic group: A combination of fragments from two groups identified by De Miro: VIN 363, 367-369, 372, 572 and 587 are from palmette B (section 4.1.45), VIN 375-377, 585, 590, 602, 605 and 608 are from palmette D (section 4.1.47).

Fabric group: Nine fragments with sufficient information are all placed in fabric group C (table 5.1-1, appendix A and B)

Graphic reconstruction: There are enough fragments from the different parts of the palmette to reliably reconstruct the overall form and size. Fragments from the ridge tile itself are missing. From the shape of the void at the base of the palmette it is clear that it was a pentagonal shaped tile, but the exact shape and dimensions are not known (figure 5.2-17).

Reconstructed dimensions: The palmette itself is 376 mm high and 296 mm wide

Associated building: As detailed in sections 4.1.45 and 4.1.47, VIN 585 and 587 were found at the sanctuary to the East of gate V, the rest of the objects is thought to be from Marconi's excavations in the same location or the urban sanctuary associated with the chthonic deities. VIN 572 was discovered in the area to the South-West of temple B. Nevertheless, the specific find context for the majority of the fragments is not clear. Therefore, a specific building, or buildings, cannot be associated with this roof acroteria type at the moment. The concentration of the objects to the Western end of the temple hill does suggest that the roof was located in the urban sanctuary or the adjacent sanctuary next to gate V. But since the objects are dated to the 5th century when greater standardization is common for architectural elements, it cannot be excluded that they were manufactured by the same workshop but placed on different buildings.

Discussion: While De Miro ordered the palmette fragments in different groups, it is certain that these objects belong to the same type. Not only do the various components; such as the volute design, the blade shaped centre node, and the rounded leaves interspersed with narrow blade shaped leaves, line up along the various fragments, but all objects fall within the same fabric group. They also have strong stylistic parallels to palmettes from Selinus[39] and Gela[40], which further supports the proposed graphic reconstruction. This palmette is also similar to that found at temple C, at S. Biagio by Marconi, although his reconstruction drawing shows a palmette with a more rounded profile.[41]

Dating: First half of 5th century BC

Fragments: 15 (VIN 363, 367-369, 372, 375-377, 572, 585, 587, 590, 602, 605, 608)

5.2.4.2 RIDGE PALMETTE TYPE 3

Stylistic group: VIN 373 is from palmette B (section 4.1.45), VIN 387, 575, 577 and 589 are from palmette D (section 4.1.47).

Fabric group: None of the fragments falls within the main fabric groups (appendix A). But they all appear to be from a similar fabric which is characterized by a pale yellow clay (10YR 8/3-2.5Y 7/3) with light coloured inclusions, at least some of which is grog. The main fabric is not very dense and has a void density of about 5 %. There is an epidermis of the same coloured clay as the main fabric body. None of the objects appears to have been painted (appendix B).

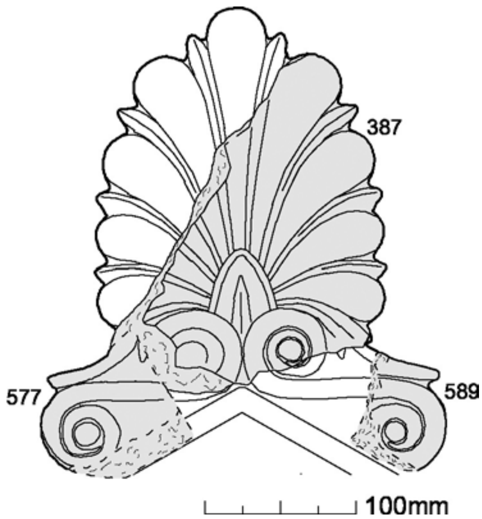

Figure 5.2-18: Reconstructed ridge palmette type 3.

Graphic reconstruction: There are enough fragments from the different parts of the palmette to reliably reconstruct the overall form and size. Fragments from the ridge tile itself are missing. From the shape of the void at the base of the palmette it is clear that it was a pentagonal shaped tile, but the exact shape and dimensions are not known (figure 5.2-18).

Reconstructed dimensions: The palmette itself has a reconstructed height of 310 mm and width of 268 mm

Associated building: The fragments were found dispersed over a wide area of the temple hill, mostly in disturbed contexts. VIN 387 was discovered around temple A, VIN 373 is from the urban sanctuary, VIN 575 and 577 are from the sanctuary at gate V, and VIN 589 is probably from Marconi's excavations. It is therefore not possible to identify a

39 Conti 2012, pp. 273-279.

40 Panvini 1998, p. 47.

41 Marconi 1926, p. 135, figs. 28-29.

specific location or building that can be associated with this roof (sections 4.1.45 and 4.1.47).

Discussion: The type shows strong stylistic similarities with ridge palmette type 2, except it is smaller in scale and has a different fabric group.

Dating: First half of 5th century BC

Fragments: 5 (VIN 373, 387, 575, 577, 589)

5.2.4.3 RIDGE PALMETTE TYPE 4

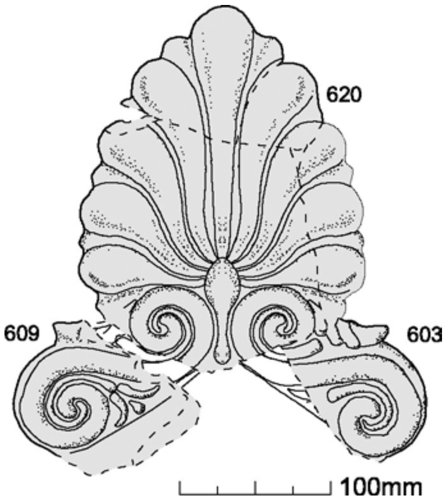

Figure 5.2-19: Reconstructed ridge palmette type 4.

Stylistic group: Fragments from palmette group C (section 4.1.46) and palmette D (section 4.1.47).

Fabric group: Seven fragments with enough information fall all within fabric group D.

Graphic reconstruction: There are enough fragments from the different parts of the palmette to reliably reconstruct the overall form and size. Fragments from the ridge tile itself are missing. From the shape of the void at the base of the palmette it is clear that it was a pentagonal shaped tile, but the exact shape and dimensions are not known.

Reconstructed dimensions: The palmette itself is 300 mm high and 271 mm wide.

Associated building: As detailed in sections 4.1.46-47 and appendix A, the fragments were found during various excavations in the urban sanctuary associated with the chthonic deities and the sanctuary next to gate V. The specific find context for a number of objects is unknown, possibly they are from disturbed contexts. A specific building, or buildings, cannot be associated with this roof acroteria type. The concentration of the objects to the Western end of the temple hill does suggest that the roof was located in the urban sanctuary or the adjacent sanctuary next to gate V.

Discussion: De Miro originally organized the volute and palmette fragments into two separate groups, the palmettes in one and the volutes in another. He seems unaware of a fragment (VIN 620) which contains both a portion of the volute and an almost complete palmette and, moreover, which has the same fabric as the other two groups.

According to Danner the ridge palmettes from Sicily were influenced by Corinthian examples. The concave profile and wavy shape of the leaves are characteristic of later examples.[42] The addition of embellishments within the volute, such as the small lotus flowers, is also seen in Corinthian examples from the Classical and Hellenistic period.[43] The pentagonal shaped cover tile is also associated with Corinthian terracotta roofs.

Dating: Second half of 5th century BC or later

Fragments: 32 (VIN 365, 366, 370, 371, 378-382, 388, 578-581, 583, 584, 586, 588, 592, 594-601, 603, 606, 609, 619, 620)

5.2.4.4 RIDGE TILE ANTEFIX TYPE 2

Stylistic group: One fragment from ridge tile antefix B (section 4.1.40)

Fabric group: Fabric B (table 5.1-1)

Graphic reconstruction: The available fragment preserves almost entire outer edge of the left side. Based on this information the remaining plaque could be extrapolated.

42 Danner 2000, p. 32.

43 Roebuck 1994.

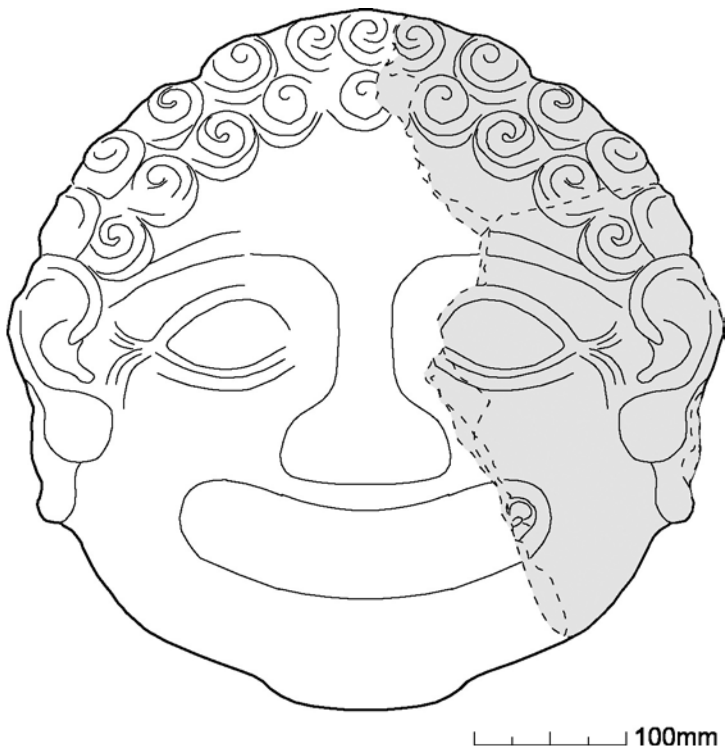

Figure 5.2-20: Reconstructed ridge antefix type 2 (VIN 226)

Reconstructed dimensions: The reconstructed plaque is 460 mm high and 470 mm wide.

Associated building: The fragment was found in the area to the South of temple B, where a number of structures are located (section 1.2). But based on the available information it is not possible to associate this ridge tile antefix to a specific building.

Discussion: Ridge tile antefixes with a moulded gorgoneion are known from a number of sites in Sicily, including Gela, Himera, and Selinus.[44] These objects are dated between the 6th and 5th centuries BC and are similar in size to the reconstructed ridge tile antefix type 2 from Akragas.

Dating: First quarter of 5th century BC

Fragment: 1 (VIN 226)

5.3 THE ROOFS FROM AKRAGAS IN ARCHITECTURAL CONTEXT

Starting from the revised typology for the architectural terracottas from Akragas in section 5.1 it is now possible to consider the architectural context of the terracotta roofs in greater detail. As explained in chapter 2, the terracotta roofs were also designed in order to satisfy requirements related to their architectural function. These factors include aspects of construction, waterproofing and structural stability. In order to discuss these aspects it is helpful to gain a better understanding of the completed roof. The available architectural remains of associated buildings are therefore important sources of information.

5.3.1 FASTENINGS

The use of nails to secure sima and geison revetments to underlying structures is known from elsewhere in Sicily. One example is the bronze nails from Selinus, which are associated with the terracotta roof from temple M and are dated to just after the middle of the 6th century.[45] For the most part, however, the evidence for the use of nails comes not from the nails themselves, but from the holes in the terracotta roof elements. Terracotta objects are susceptible to cracking when subjected to sharp force since fired terracotta is structurally brittle. The best practise is thus to create holes for the nails in the wet clay before

44 Danner. 1996, pp. 23-26.

45 Conti 2012, pp. 250, 254-257, fig. 249.

firing. Small circular holes are evidence not only for the use of nails, but also for the position of the nails in relation to the roof element. For the roof of temple M from Selinus there is a nail hole in the horizontal tile of a geison revetment from the gable and in the main fascia of a lateral geison revetment. Examples of nail holes in earlier roofs can also be found in Selinus, these include holes in the main fascia of the geison revetment associated with roof 3 dated to the first half of the 6th century.[46] All the examples mentioned above come from geison revetment pieces. The situation for Sicilian simas is not well documented due to the scarcity of preserved horizontal tile fragments but a small number of examples exist. Reconstructed drawings for roof 3 from Selinus show a nail hole in the back of the horizontal tile from the raking sima.[47] From Caulonia nail holes are known preserved on the horizontal tile of the lateral and raking simas.[48]

Based on the available evidence, the conventional view is that nails were used towards the back of the horizontal tile of both the sima and geison revetment, and nails were also applied to the vertical face of the geison revetment tile. This theory is visible in the reconstruction drawings of the Geloan treasury in Olympia[49] and the Athenaion from Syracuse.[50] The reconstructions of frieze A by De Miro[51] and temple D by Gábrici[52] do not show nails to the main fascia of the geison revetment. There is some evidence to support the omission of nails in this location for at least some early roofs, including roof 2 from Selinus dated to the first quarter of the 6th century BC by Conti.[53]

For the objects from Akragas there is evidence of nail holes in the main fascia of various geison revetment fragments associated with anthemion sima roofs (roof 7, series A and series D, namely VIN 144, 183, 184). The smooth raised ridge around the hole indicates that it was made before the clay dried out but after the object had been removed from the mould (figure 5.3-1). The nail holes in the geison revetment fragments from Akragas are located towards the side edges of the terracotta element (figures 4.1-13, 5.2-10). Based on these examples it seems that each revetment piece had at least two nail holes. The geison revetment fragments associated with the canonical Sicilian roofs 2 and 3 (sections 5.2.1.2-3) are too fragmentary for clear evidence of nail holes. For roof 1 there are a large number of fragments, but none has conclusive proof of a nail hole and it therefore is a possibility that they were not used for the main geison fascia of this roof.

Figure 5.3-1: Detail view of nail hole in VIN 184.

Compared to the geison revetment and sima, the fastening of pan, cover and ridge tiles is less well understood. The documented roof tiles from Selinus[54] and S. Anna (section 4.1.62-64) lack nail holes. One of the theories to explain the absence

46 Conti 2012, p. 63, fig. 20, 218, 224-6.

47 Conti 2012, p. 63, fig. 41; Wikander 1986, p. 40, fig. 11.

48 Barello 1995, tab. 35, 38.

49 Kunze & Schleif 1944, fig. 24.

50 Orsi 1918, fig. 215.

51 De Miro 1965, fig. 1.

52 Gábrici 1956, fig. 15.

53 Conti 2012, pp. 38-43, fig. 16.

54 Jonasch 2009.

of nails proposes that tiles were laid on a bed of unfired clay on top of wooden planks or reeds.[55] While there is evidence for such practices for Lydian roofs,[56] the theory is no longer supported by modern scholars in relation to Western Greek roofs.[57] The current view is that the weight of these objects, the friction between the tiles and the supporting timber structures as well as the relatively shallow slope of the roof were sufficient to keep these objects in place.[58] The interlocking connections between pan tiles detailed in section 4.4.2 is another important stabilizing factor.

But while self-weight might be enough to keep the heavy objects in place during normal conditions, events such as earth tremors, strong wind, or the movement of workmen on the roof for maintenance can cause slippage. Examples of maintenance include the removal of leaves and twigs from waterspouts, an activity familiar to modern homeowners, as well as the repair or replacement of damaged objects. Evidence for such repair can be found on the inside of the horse's head from roof 2 (VIN 520, appendix B). Due to the interlocking connections between the pan tiles, the upper tile courses are supported by the lower ones. This means that the last course at the eaves is the most important in terms of stabilizing the rest of the roof. There is evidence that tiles at the eaves were fixed using nails, at least in the Argive roof systems.[59] For canonical Sicilian sima and anthemion sima roofs the lateral sima is thought to have been fixed using nails, as seen in the examples from Selinus. In cases were the horizontal tile of the sima has the same profile as a pan tile, as seen with the Geloan treasury, the sima tile will thus provide additional stability to the remaining roof tiles due to the interlocking connections between the sima and pan tiles.

In the reconstructed drawings by Gábrici, Orsi, and Kunze and Schleif, the terracotta sima and geison revetment are nailed directly to the stone geison block. In a number of geison revetment blocks from Selinus the remains of nails can still be seen, which would support this theory, at least for the geison.[60] The current convention for the placement of the lateral sima on top of the geison revetment indicates that the horizontal tile of the sima is at a more acute angle than the top flange of the geison (section 4.4.2.4, figure 4.4-10). This indicates that while the horizontal flange of the geison revetment might be fixed directly to the geison block, the sima is fixed to the roof rafters. This is in line with the reconstruction of the Geloan treasury roof by Kunze and Schleif.

The reconstruction of the wooden structure which supported the architectural terracottas is a complex endeavour as there are different types of roof structures in Greek contexts. On smaller buildings a primary timber with a sufficiently large cross section would be adequate to support the secondary timbers and roof tiles. With larger buildings the span of the primary timber requires support, this roof system is known as a post and lintel roof.[61] The roof truss, which consists of a number of elements in a triangular configuration, is a more sophisticated and structurally sound roof system. Klein proposes that there is evidence that even smaller buildings from the 6th century in Sicily made use of a roof truss.[62] On top of the primary timbers there are smaller, secondary timbers known as battens, which support the roof tiles. [63] The exact nature of the roof system used as well as

55 Darsow 1938, p. 29; Hodge 1960, pp. 60, 62.

56 Evidence of clay with reed impressions has been found in recent excavations in Sardis. Tiles with unfired clay, some with evidence of straw, have also been discovered in Corinth. Such material use for fixing the roof can also still be seen in traditional buildings of the region (Hostetter 1994, pp. 33-34, fig. 60).

57 Winter 1993, p. 307.

58 Jonasch 2009, p. 6; Winter 1993, pp. 306-307.

59 Winter 1993, p. 307.

60 De Miro 1965, p. 53.

61 Klein 1998, p. 336; Hodge 1960, p. 26, fig. 9.

62 Klein 1998, pp. 338-339.

63 Hodge 1960, p. xvi, fig. 15.

Figure 5.3-2: Building remains of the naiskos inside the foundations of temple G. View of back wall of naiskos, looking East (Copyrigh Parco Archeologico e Paesaggistico Valle dei Templi di Agrigento).

the size and position of the roof elements can only be determined by considering the architectural remains. The size of the roof as well as supporting structures, such as columns or stylobate walls, are therefore important. Stone blocks such as the geison from the eaves or gable sometimes have cuts to hold primary or secondary timbers. These provide some indication of the size and spacing of these elements.[64] As discussed in the following, the architectural remains for buildings from Akragas associated with terracotta roofs are limited. Only a single geison block from Akragas can be linked to a terracotta roof type (section 5.3.2, figure 5.3-4). Therefore, it is not possible to determine the exact nature of the timber roof supporting the various terracotta roofs from Akragas.

The reconstruction of the horse rider acroterion (figure 5.2-5) provides additional information regarding the fastening of this type of object. There are two circular openings on both sides of the horse, above the rider's feet. These are similar to openings found on a horse rider from Gela dated to the second half of the 6th century.[65] According to Danner these openings were for anchoring the acroterion to the roof. This method of fastening does not appear to be very common in Sicily.

5.3.2 ARCHITECTURAL REMAINS

The attribution of an architectural terracotta roof to a specific building is only possible in two cases for the present study: roof 1 is associated with the naiskos inside the foundations of temple G (section 5.2.1.1) and roof 2 with the naiskos to the South-East of temple B (section 5.2.1.2).

5.3.2.1 NAISKOS INSIDE TEMPLE G

Inside the foundations of temple G the remains of an Archaic naiskos are visible. The majority of the foundation as well as a couple of ashlar blocks of the first course are still in situ (figure 5.3-2). The naiskos consists of a single room, or naos, and pronaos (figure 5.3-3). The pronaos is not well

64 Hodge 1960, p. 60; Klein 1998, pp. 338-339.

65 Danner 1996, pp. 85-86, tab. 18, 4-5.

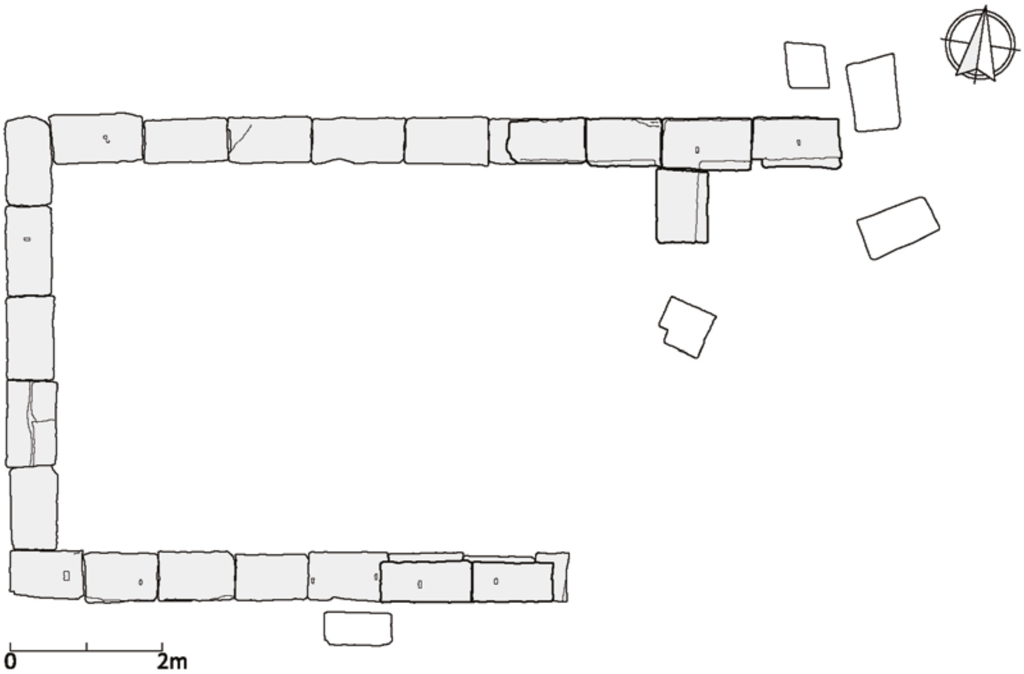

Figure 5.3-3: Plan of building remains of the naiskos inside foundations of temple G.

preserved and the presence of columns cannot be determined.[66] Based on the stylistic dating of the architectural terracottas, the building is placed in the middle of the 6th century BC.[67] The ashlars are from the local calcarenite stone, which is quite friable. It is not clear when the naiskos fell out of use, but by the end of the 5th century BC construction started on a peristyle temple which encloses the naiskos completely (figure 5.3-2). The majority of the roof tiles were found inside the foundations of this temple (temple G), presumably either in a collapse layer or in a debris layer associated with the demolishing of the naiskos. No evidence of a later terracotta roof has been found in this location. It is not known if the naiskos was abandoned and in a state of disrepair before the start of the construction of temple G, but the economic prosperity of the city during the end of the 6th century and during the 5th century, as evidenced by the substantial monumental building activity (section 1.2), does not support this scenario. Based on the lifespan of the building remains it is thus a possibility that the terracotta roof was in use from the middle of the 6th century until the start of construction for temple G towards the end of the 5th century.

For further analysis, the naiskos was measured using a differential GPS by a team from the University of Leiden during an campaign at S. Anna in 2013. The plan of the architectural remains was created based on this data (figure 5.3-3). The width of this building is 6,43 m. The length is uncertain as the front of the building is not preserved. Based on similarities in style and size, as with the naiskos to the South of temple B or the so-called tempietto at the sanctuary next to gate V (figure 1-3), it is probable that the pronaos walls extended by at least one more ashlar block, which would end in a length of 12 m in total. While the ashlars are fairly eroded, the foundation course appears to be 0,64 m thick and the first course of the wall seems to be slightly thinner, creating a small step on the interior face. The wall thickness is around 0,55 m.

A single stone geison block was identified and documented by Marconi.[68] The same block is later also described by De Miro, but there are differences

66 Marconi 1933, pp. 113-126.

67 Adornato 2012, p. 488; De Miro 1965, p. 49; Mertens 2006, p. 197.

68 Marconi 1933, p. 123, fig. 75-6.

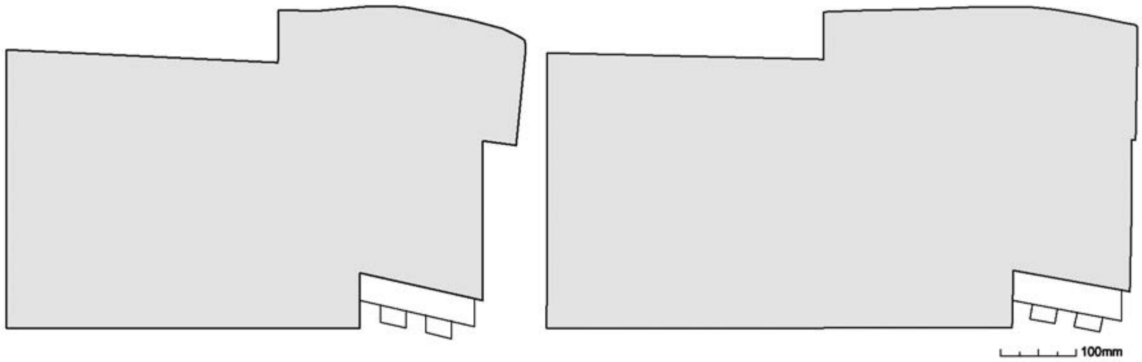

Figure 5.3-4: Stone geison block associated with the naiskos inside the foundations of temple G; a: after De Miro (De Miro 1965, fig. 1), b: after Marconi (Marconi 1933, p. 123, fig. 75-6).

in the dimensions provided by both authors (figure 5.3-4).[69] According to Marconi the block is 420 mm high, and 780 mm wide, with a small overhanging fascia of 150 mm high and 5 mm deep. In contrast, according to De Miro the block is 420 mm high and 670 mm wide; the top fascia is 42 mm deep and at an angle. The top fascia is essential to the placement of the terracotta geison revetment, and thus the discrepancy in the dimensions given by the two authors is problematic. The block can no longer be located, either on site or in the museum archives, therefore this matter cannot be resolved at this point for the present study. In general, the overall width of the profile as described by Marconi means that the block itself spans the entire width of the wall. But the small fascia indicates that the geison revetment with its 78 mm wide soffit plaque will cantilever beyond this geison block. The cantilever is reduced by the larger profile of the top fascia described by De Miro, but for both versions of this block the top fascia has a much shallower profile than the terracotta geison revetment. This would result in quite a substantial gap between the terracotta geison revetment and the stone geison fascia. This gap might be the reason why no nail holes are visible in the terracotta geison revetment fragments from roof 1. As the gap between the terracotta geison revetment and stone geison would require a substantially larger nail in order to achieve stability and it would be difficult to fix. The geison block is of further importance to the reconstruction of roof 1 in section 5.3.3.

5.3.2.2 NAISKOS TO THE SOUTH-EAST OF TEMPLE B

The building remains visible today represent two different phases of the naiskos (figure 5.3-5). The oldest phase consists of three exterior walls constructed from calcarenite ashlar blocks. The blocks form a rectangular building of 7 x 14 m in size with a single room. The front elevation is not very clear due to later renovations. The second phase of the building sees the addition of steps approaching the building and the front entrance. The single room is now divided into two, with the floor level of the front room being lowered to create a pronaos. This phase is dated to the end of the 6th century and the beginning of the 5th century BC.[70] The fortification wall constructed at an angle in front of the building and covering part of the front steps to the South are probably part of emergency fortifications related to the Roman-Phoenician conflicts. The extensive fill layers associated with this fortification contain many architectural terracotta fragments and the wall itself reuses architectural elements as well.[71]

A large number of 6th century roof terracottas were found in an upper layer inside the building. It was on top of a layer containing 4th-3rd century material.

69 De Miro 1965, p. 52, fig. 1.

70 de Cesare & Portale 2016, pp. 258-259, fig. 7.

71 de Cesare & Portale 2016, p. 258.

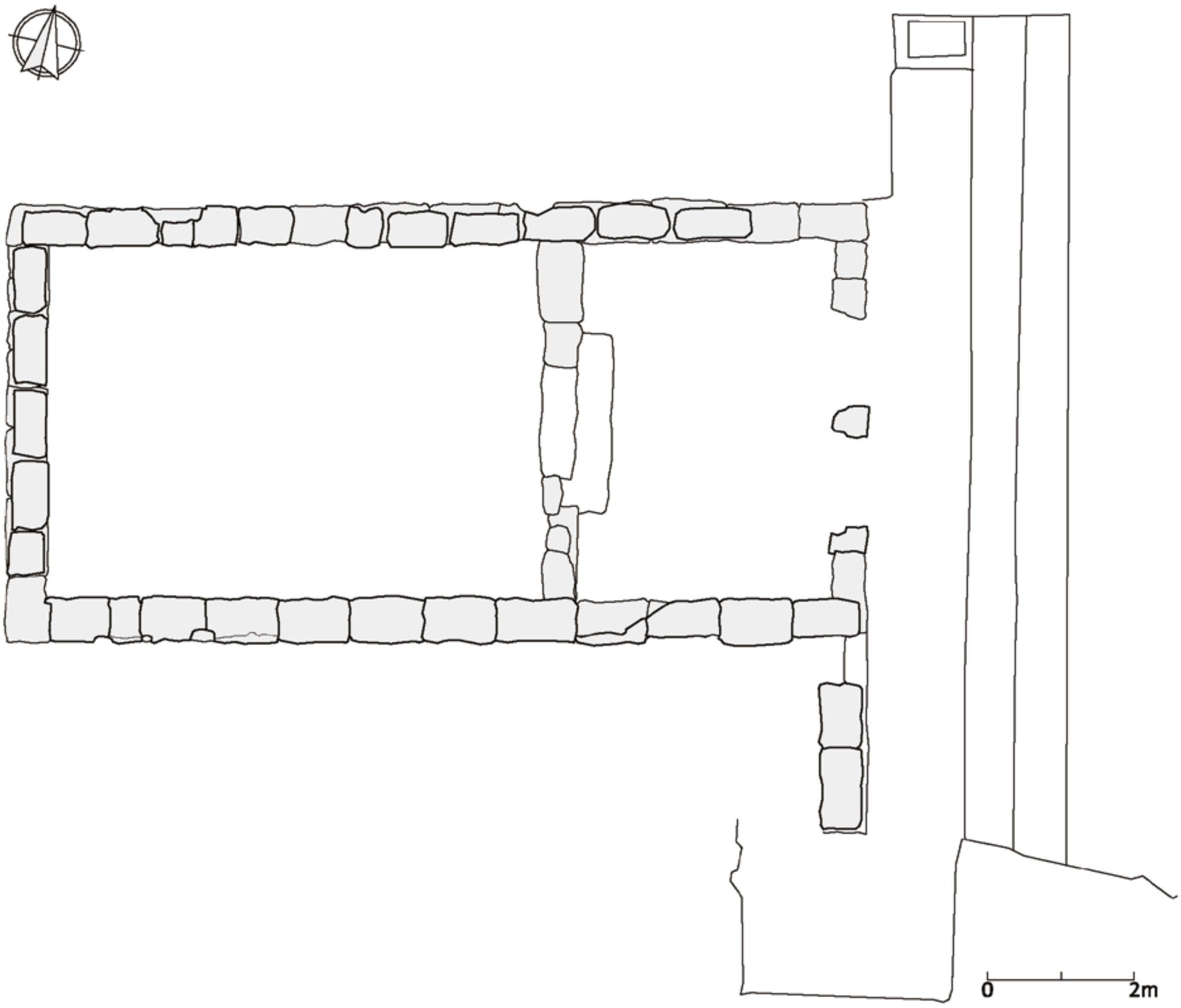

Figure 5.3-5: Plan of building remains of the naiskos to the South-East of temple B (after Marconi 1933, fig. 79 and de Cesare & Portale 2016, fig. 1,7).

The most current theory is that the original mid-6th century roof, associated with the first phase of the building, was in use for a long period of time before it eventually collapsed on top of the more recent layers.[72]

5.3.3 RECONSTRUCTING ROOF 1

The reconstruction of roof 1 draws on information discussed in a number of different chapters in this document: the connections between different roof elements (section 4.4), the creation of a new roof typology (section 5.2), the manner in which roof elements were fastened (section 5.3.1), and the architectural remains of the naiskos inside the foundations of temple G (section 5.3.2). The proposed reconstruction for roof 1 is a synthesis of these results and is shown in figure 5.3-6. The stone geison block used in this reconstruction is as documented by De Miro (section 5.3.2.1, figure 5.3-4), because his version fits in the general architectural context. The width of this block at its base is close to the width of the wall. The difference in the angle between the top of the stone geison and the horizontal flange of the terracotta geison revetment might be attributed to the erosion of the geison block which is made from the friable local stone. The timber structures are purely hypothetical as nothing of the wooden elements is preserved.

Due to the slope of the roof and the interlocking

72 de Cesare & Portale 2016, p. 258.

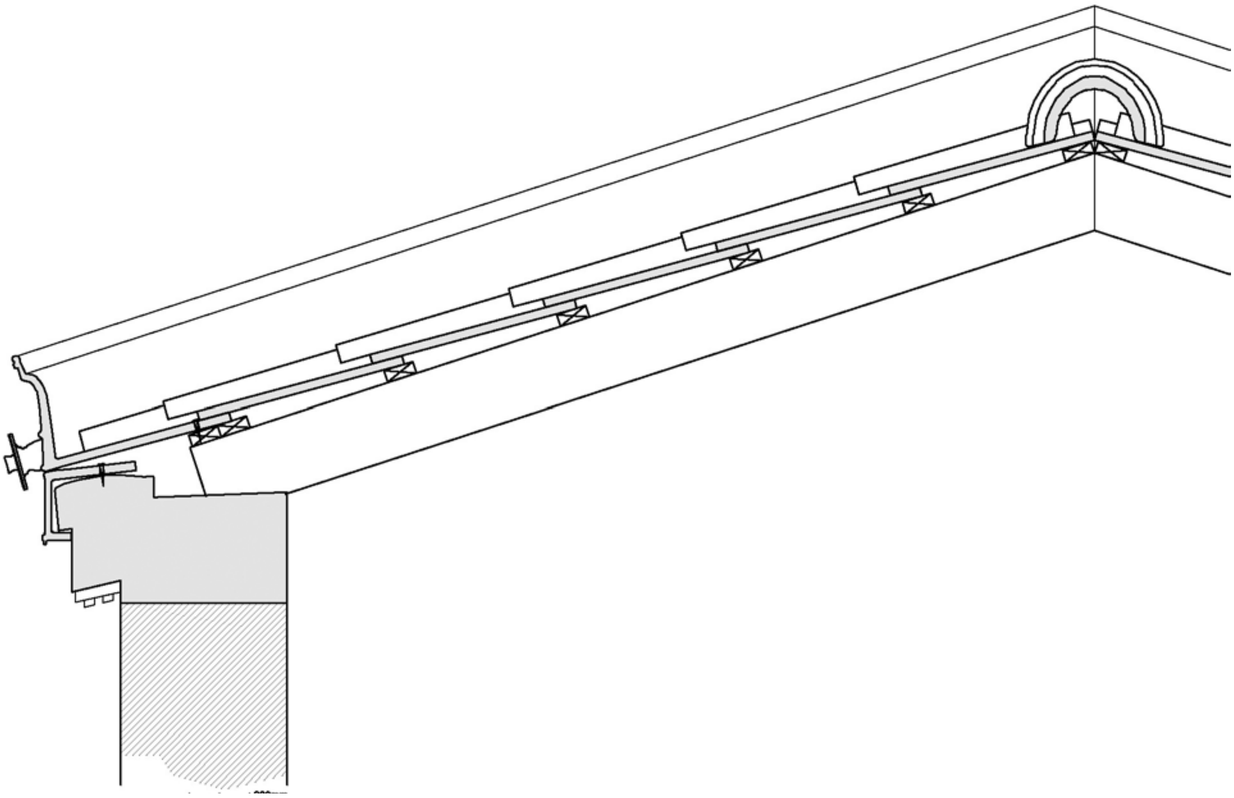

Figure 5.3-6: Proposed reconstruction of roof 1.

design of the tiles, the majority of the structural weight transfers to the supporting timber structures via the underlying roof element. In the case of the lateral sima, most of the structural load of this element is transferred to the top of the geison revetment tile below, where the horizontal tile and vertical fascia meet. According to the published profile of the stone geison the terracotta geison revetment is not supported at this point. It is possible that the additional structural load of the lateral sima on the lateral geison at this unsupported point caused a structural weak point.

It would appear that this weak point is addressed in the next generation of terracotta roofs from Akragas. VIN 244 from roof 6 shows a gentle curve to the interior join of the horizontal tile and vertical fascia of the geison revetment (fig 5.2-9). The curve means that the join between these two elements are considerably thicker and thereby more stable. This type of structural solution does not appear to be used widely in Sicilian roofs. In the publications by Winter and Conti only one example of such a join is documented, namely the geison associated with roof 20 from Selinus.[73] This is an anthemion roof very similar to roof 6 from Akragas in terms of its style and profile. Based on the profile and painted decoration the lateral sima of roof 20 is thought to cantilever slightly beyond the geison revetment. Based on the painted decoration on the sima soffit, roof 6 is thought to have a cantilever of 100 mm or more (figure 4.4-10). The structural implication of a cantilever means that the majority of the load associated with the sima upstand is located at a point beyond the geison revetment. The load applied at the point of connection between the sima and the geison revetment is thus greater since it incorporates the weight of the object as well as the bending moment created by the cantilever. In the canonical Sicilian sima roof the sima and geison revetment are in a vertical line. But based on the examples from Naxos, the lateral sima from roof 7, series A is also thought to have projected beyond the geison

73 Conti 2012, fig. 171, 173, 184.

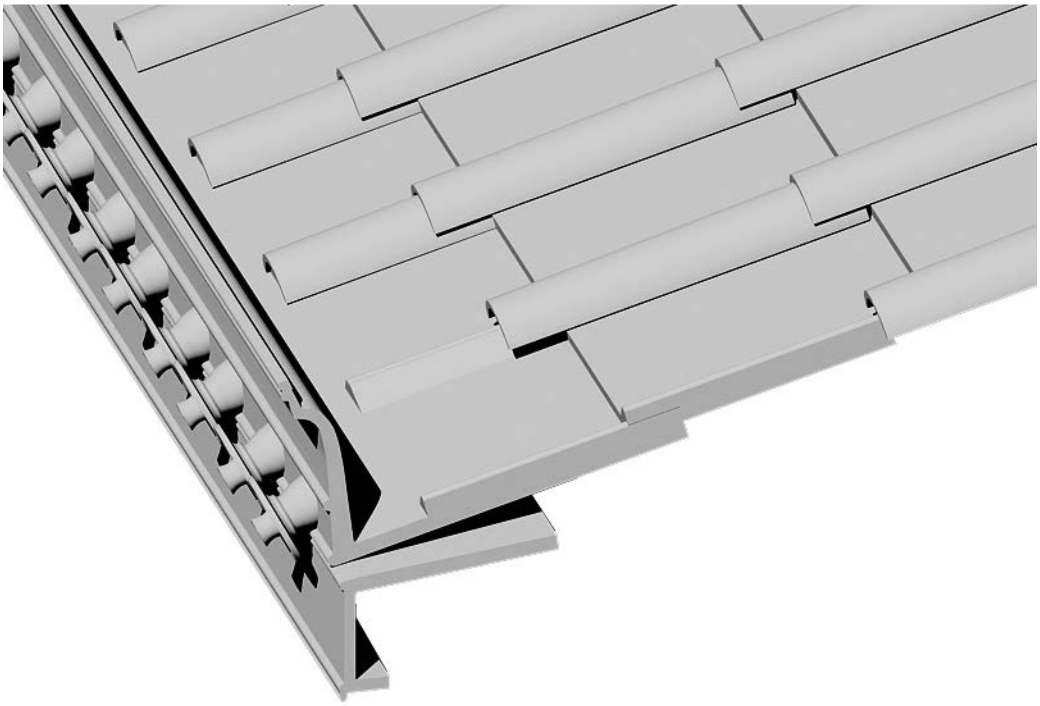

Figure 5.3-7: 3D reconstruction of roof 1.

revetment. The geison revetments associated with roof 7, series A (figure 5.2-10) do not appear to have the same internal reinforcement of the join. However, the underlying stone structure for this roof is not preserved and as such it is not known if this type of reinforced join was required.

The connection between the lateral sima and geison revetment associated with roof 1, the stone geison, as well as the hypothetical supporting timber structures are combined in figure 5.3-6. But the connection between the sima and plain roof tiles requires further consideration. This will be discussed using a 3D reconstruction of a section of the eaves (figure 5.3-7). It is based on evidence from a number of different sources: The size and profile of the sima and geison revetment are derived from the graphic reconstructions in section 5.2.1.1. The profile of the pan and cover tiles is based on 6th century roof tile profiles from Selinus.[74] As discussed in section 4.4.2.4 the conventional reconstruction of the horizontal tile portion of the lateral sima is one with a profile similar to the normal pan tile. This allows for better integration between the sima and the rest of the roof, the raised sides of the profile help to stabilize the next course of pan tiles, and it also applies the same strategy for protecting the raking joins from water penetration. The preserved sima fragments from Akragas, however, indicate that the pan tile profile does not extend all the way to the sima upstand (figure 4.4-8). There is an example from Himera which might provide an alternative reconstruction. Here the horizontal tile has a profile similar to that of a pan tile, but the raised borders terminate before reaching the sima upstand.[75] In the 3D reconstruction drawing the bottom three cover tiles are removed in order to show the pan tile profiles below. The extent of the overlap between the sima and geison revetment joins is based on the painted marks described in section 4.4.2.4 and seen in figure 4.4-1.

Marconi mentions finding horse rider acroteria fragments during excavation of the naiskos inside temple G, but very little is known about these objects and they are no longer available for study.[76]

74 Conti 1998, pp. 216-218, tab. 1.

75 Allegro 1976, p. 537, tab. LXXXVI.1; Lang 2010, p. 101, HIM 12.

76 Marconi 1933, pp. 125-126.

Another example of a horse rider acroterion from Akragas is associated with roof 2 and described in section 5.2.1.2. At this stage it is not yet clear how these objects were placed on the roof. In general, it is thought that they were located at the end of the ridge, at the apex of the pediment. This theory is supported by the small terracotta shrine from Sabucina which resembles a naiskos with a terracotta roof and two acroteria figures at the edges of the roof ridge.[77] But the exact nature of this placement and the connection between the horse rider and other roof elements is not well understood. Danner finds that some of the smaller horse rider acroteria appear to sit directly on the underlying roof tiles. But as Danner and Szeliga both point out, this raises questions regarding the connection with the raking sima. If the figure was placed behind the sima, a significant portion of the rider would not be visible. Alternatively, if the figure projected beyond the sima, the connection between the rider and the raking sima would be complicated due to the rider's legs on the sides of the horse. On some of the known examples of horse rider figures (e.g. from Kamarina), there is a lack of semi-circular holes in the sides which would be needed to accommodate cover tiles. This leads Szeliga and Danner to reconstruct that the horse rider was raised above the main roof tiles. While Szeliga suggests a raised ridge, Danner proposes the use of a pedestal. In essence, both solutions raise the horse rider, increasing its visibility behind the raking sima. However, only a small portion of the bottom edges of the horse rider figure from Akragas is preserved. At this point it is thus not possible to determine if this terracotta object was placed directly on the plain roof tiles or on a pedestal, and how it was positioned in relation to the raking sima and ridge tiles. In terms of the connection with the ridge tiles, the horse rider acroterion is thought to have connected directly with the adjacent ridge tile, forming a continuous line as shown on the model from Sabucina.[78] At Akragas, the size of the reconstructed ridge tiles (sections 5.2.1.1, 5.2.1.2) is smaller than the body of the horse. Therefore, if these two elements did form part of the same roof, it is more likely that the horse rider acroteria fitted over the ridge tiles. If roof 1 had one or two horse rider acroteria, corresponding with roof 2 and other examples, its placement on the roof as well as the connection between it and surrounding roof elements are not known.

5.3.4 WATERPROOFING

An integral function of any terracotta roof is to provide protection from nature. Preventing rainwater from penetrating into the interior of the building is essential in order to protect users, objects, building elements, and finishes. Sustained water seepage and pooling will erode paint and stucco finishes as well as stone blocks and cause timber elements to rot. The same requirement also applies to the exterior face of the building. Sustained water seepage will over time cause erosion, discolouration and, in severe cases, the growth of unsightly mould on the visible exterior surfaces. The design of the individual roof elements as well as the connection between them therefore has to provide a reasonable level of protection against water penetration and seepage.

The connections between the various roof elements as discussed in section 4.4.2 are summarized and analysed according to the direction of flow for rainwater in figure 5.3-8. The detailed view suggests that all joins are protected using a two-step strategy. The first part involves the overlapping of elements and the second makes use of the slope of the roof or profile. For example, the join between two adjacent pan tiles is protected by creating an overlap between the pan tile and the cover tile as well as by using the raised border of the pan tile profile. In order for water to reach the join it therefore has to penetrate between two

77 Danner 1996, p. 102; Marconi 2007, pp. 46-47; Szeliga 1986, pp. 80-82.

78 Danner 1996, p. 102.

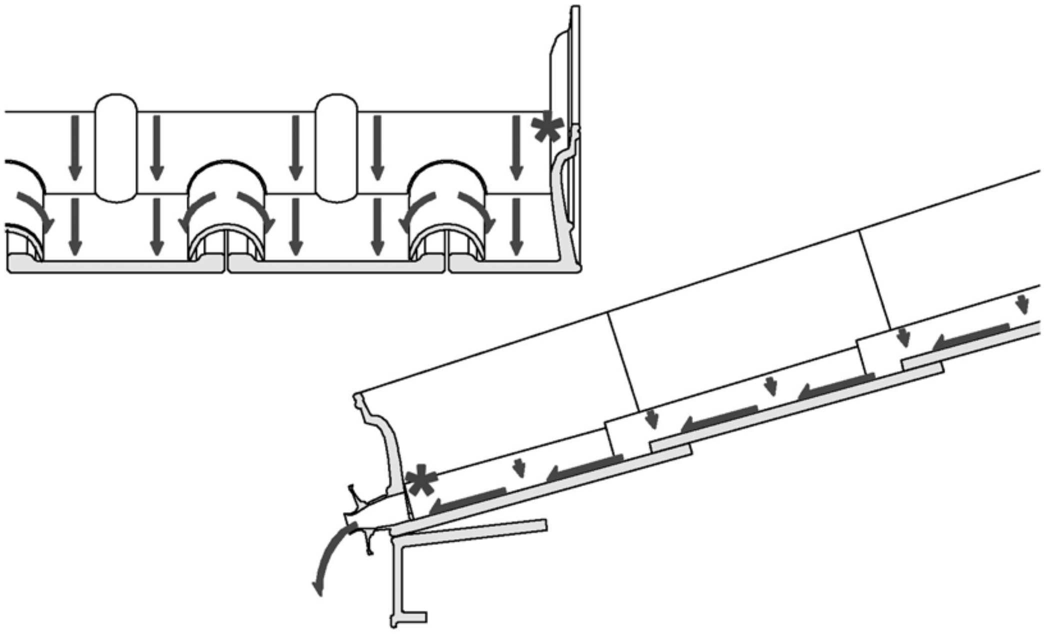

Figure 5.3-8: Diagrammatic representation of rainwater flow on typical canonical Sicilian sima roof showing a section parallel to the ridge (above) and gable (below). The red asterisk indicates the point of vulnerability to water penetration.

overlapping elements and then travel against the slope of the raised border. This two-step strategy is also seen at the ridge where the two different roof slopes meet, and between the pan and cover tiles of different rows.

The fact that pan and cover tiles are aligned means that the roof is divided into drainage strips, with each row of pan tiles forming an isolated unit. This might be one of the main reasons why each canonical Sicilian sima piece has two waterspouts. A single waterspout per drainage strip constitutes a risk. If the single waterspout were to become blocked by debris such as leaves, the water from that particular strip would not be able to drain. Pooling rainwater might push back upslope and reach the join between the pantiles, causing leakage. The addition of two waterspouts per sima piece therefore provides a backup.

The analysis of the drainage of a representative terracotta roof in figure 5.3-8 highlights a point of concern in regards to water seepage. This area is located at the point where two lateral sima tiles meet. The connection is already discussed in section 5.3.3. The evidence suggests that if the sima's horizontal tile had the same profile as a pan tile, then the raised borders did not extend to the sima upstand. The absence of a raised border in this location means that there is nothing to prevent water from moving horizontally directly to the open join between the sima tiles. This problematic area is unfortunately situated at the bottom of each drainage strip, at the point where water collects against the sima upstand before discharge through the waterspouts. The pooling of water in this location would further compound the problem. This situation is mitigated by the use of two waterspouts per drainage strip, i.e. for each row of pan tiles. While this is excessive compared to modern drainage designs it would allow for rapid discharge of water before pools can form. Another design measure which appears to mitigate water seepage in this area is the staggering of sima and geison revetment joins (figure 5.3-7). By staggering the joins, the small amount of water which seeps through from the sima is collected on top of the geison revetment tile. The slope of the geison revetment tile helps then to discharge this water to the outside of the building.

The long lifespan of roof 1 (section 5.3.2.1) indicates that the potential for water penetration at the eaves was not substantial enough to cause catastrophic structural damage. Less severe seepage, however, could still cause damage to interior decoration and the plaster wall finishes through discolouration and erosion. The extent of this damage, if it did occur, cannot be determined since none of the affected objects or elements have been preserved. While it might be unrelated, it is interesting that the next generation of terracotta roofs in Akragas, namely the anthemion sima roofs, eliminates the potential for seepage behind the sima upstand by pushing the lateral sima beyond the geison revetment (figure 5.2-9, 5.2-10). In this way any water that seeps through between two adjoining lateral sima pieces at the bottom of the roof slope will drain directly towards the exterior. The cantilever of the anthemion sima type also prevents the discharge from the roof of draining against the exterior building surface, causing damage and erosion there. On the canonical Sicilian sima this function is performed by the tubular waterspouts.

There is the possibility that the problematic areas discussed above were secured using an additional waterproofing agent such as plaster, unfired clay, or even bitumen. Unfortunately, no visible traces of any such materials are documented on the roof fragments from Akragas. The use of such agents have also not been recognized elsewhere in Sicily. The archaeological record therefore does not support the use of waterproofing agents for the objects of Akragas at this point.

CONCLUSION

This chapter brings together the results from various analytical endeavours in chapter 4 including style, fabric, and material compositional analysis. Through this process a number of important patterns have emerged. For example, there appears to be a change in production methods between two different generations of roof terracotta, namely the canonical Sicilian sima roofs from the middle of the 6th century to the anthemion sima roofs from the end of the 6th century. Compared to the earlier generation, the anthemion roofs show improved firing conditions resulting in fully oxidized clay fabric. The painted decoration on the anthemion pieces also improves, in comparison to the earlier roofs, in terms of consistency and accuracy.

One of the most important results obtained by combining the results from chapter 4 is the creation of a revised roof typology. Where the previous typology created by De Miro in 1965 relied on around 85 fragments, the revised typology is based on 199 fragments out of the 265 fragments used in this investigation. The 66 fragments not assigned are either small isolated fragments, such as a small gorgoneion antefix fragment (VIN 162), pieces of an unknown architectural type, such as a small bead-and-reel moulding (VIN 360), or fragments of a general roof type which cannot be assigned to a specific building, such as pan tile fragment (VIN 421). There are a number of proposed changes between the new and old typologies. De Miro's frieze E and F are now considered part of the same roof (roof 6) and De Miro's frieze G is now separated into three different types (roof 7, series A-C) based on the profile, decoration, fabric, and material composition. The revised typology also incorporates a wider range of architectural elements in an attempt to gain a better understanding of the roof as a whole and not just the decorated edge. Therefore, it is possible to identify not only the sima and geison revetments from roof 2, but also the ridge tiles and horse rider acroteria, as well as to contextualize all the objects and their characteristics. This is accomplished by considering the architectural context of the revised types. The various building elements such as geison blocks and building foundations as well as the way in which these elements are overall connected to each other, facilitate a more detailed impression of how the terracotta roof functioned within the building. The exploration has demonstrated a number of different design solutions employed by craftsmen from different periods in order to address functional concerns such as structural stability and waterproofing.

6 DISCUSSION

The revised typology proposed in chapter 5 incorporates both published and previously unpublished material. It also includes not only the decorated roof edges, but also the undecorated elements such as ridge tiles, which means previously excluded types of terracotta elements are now incorporated into the various roofs. The revised typology is formulated based on decoration, profile, fabric, methods of production, and the chemical composition of the various fragments; furthermore, it considers aspects related to the architectural context. As such, it now provides the opportunity to discuss the terracotta roofs from Akragas in a comprehensive manner. The relation between the city and its wider context no longer has to rely on stylistic comparisons alone, but takes also the *chaîne opératoire* as well as the technical architectural details into account, to name but a few examples. Therefore, while the revised typology is one of the major outcomes of this thesis, it is also an essential component in addressing the other research goals and questions raised in section 2.3.

6.1 STYLISTIC ANALYSIS

6.1.1 THE CANONICAL SICILIAN ROOFS

By the end of the first quarter of the 6th century BC the canonical Sicilian roof system is already well defined and in common use in colonies such as Selinus, Syracuse, Naxos, and Gela (section 2.2.1.1). Thus it is already established in Sicily by the time that the first such terracotta roofs appear in Akragas around the middle of the 6th century. Knowledge of the decoration and profile for roof elements in this system therefore had to be brought to Akragas in order for these roofs to be manufactured in this location. As already discussed, one of the traditional concerns in the investigation of the architectural terracottas from Akragas is the identification of other colonies or cities which had a significant stylistic impact on the material from Akragas. There are a number of different theories as to where the strongest influences originated from. De Miro views the architectural terracotta from Gela as the most important stylistic precedent for the canonical Sicilian roofs from Akragas.[1] It is true that in a number of aspects Gela is especially close to Akragas, it is the *metropolis* of Akragas, and in terms of distance it is also one of the nearest neighbours. But already in chapter 4.1 it was found that while the canonical Sicilian roofs from Gela and Akragas show many similarities, the roofs from Akragas also incorporate decorative aspects seen in other colonies, including Syracuse, Naxos, and Selinus.

In terms of the profile, Shoe concluded that Akragas looked further towards Selinus for inspiration. After a detailed study of the profiles of Western Greek architectural elements, she found the base astragal, or bottom roll, of the sima to be a Selinuntine invention.[2] A review of recent publications on architectural terracottas from Sicily concludes that the bottom roll on the canonical sima is a relatively rare element. For instance, the first known example is revetment A from Naxos, which is dated to the first quarter of the 6th century.[3] The first known example from Selinus is revetment C, which Conti calls roof 14, and which is dated to the last quarter of the 6th century.[4] While the earliest object appears first in Naxos, it is not found in subsequent roofs at this colony from the mid-6th century onwards. In comparison, a relatively large number of early roofs from Akragas have a bottom roll (roof 1, 2, and 4), and all date to the middle of the 6th century. This means the first example from Selinus occurs chronologically after the majority of examples from Akragas and thus does not support Shoe's hypothesis. It therefore appears that while this profile element might not have originated in

1 De Miro 1965, p. 51.

2 Shoe 1952, pp. 10, 25.

3 Lang 2010, pp. 119-120, fig. 18.8; Lentini & Pakkanen 2011, p. 419, fig. 8.

4 Conti 2012, pp. 113-127, roof 14, fig. 108; Lang 2010, pp. 131-132, Seli 3, fig. 28.6-8.

Akragas, during the middle of the 6th century it was one of the first and few cities in Sicily which incorporated this element into its sima profiles. In terms of the profile and the painted decoration the workshops of Akragas did not look towards a single stylistic template from a single colony for their own roofs but instead drew from a rich canon of decorative elements already established and in wider use in Sicily.

The horse rider acroteria, which are popular in Sicily until the beginning of the 5th century, are associated with the canonical Sicilian sima roof types.[5] Marconi described horse rider fragments in association with roof 1 (section 5.2.1.1)[6] and Gàbrici mentioned figurative elements found to the South-East of temple B.[7] Until recently both these groups of objects were thought lost and some scholars were no longer certain about the presence of such figures in Akragas.[8] But the new discovery of fragments from Gàbrici's excavation has made it possible to investigate the horse rider acroteria at least from roof 2 (section 5.2.1.2). Similar figures are known from Gela, Himera, Kamarina, Naxos, Selinus, Morgantina, and Syracuse.[9] There is considerable variation within these examples in terms of size and execution. While significant portions of the figure from Akragas are not preserved, it appears similar to the ones from Selinus based on the moulding of the horse's mane.

Another popular feature in combination with the canonical Sicilian sima roof is the gorgoneion pediment decoration in Sicily during the first three quarters of the 6th century.[10] There are three objects which appear to come from such large gorgoneion plaques (section 4.1.42-43). While these fragments represent only a small section of the original decoration they show stylistic similarities with gorgoneion pedimental plaques from Gela.[11] Unfortunately, the state of preservation does not allow for a reconstruction of these objects and at this point it is not possible to assign them to a specific roof or roofs.

6.1.2 ANTHEMION ROOFS

According to the work by Wikander, Winter, Lang, and Mertens-Horn, the last developmental stage of Sicilian terracotta roofs is characterized by a perforated anthemion sima on the eaves. In general, this development is dated to the second half of the 6th century. Within this roof type there are two different anthemion patterns in use: one associated with three roofs from Selinus, and another with three friezes from Naxos (section 2.2.1.1). For the Selinuntine anthemion roof there are six known examples in Sicily. Three are from Selinus itself, namely, the roofs traditionally associated with temple E1, C, and Y.[12] Then there are a fragment from Leontini,[13] and an isolated fragment in secondary use found in Akrai.[14] The last example of this anthemion roof type is roof 6 from Akragas. In terms of the profile and decoration in relief it resembles roof 20 from Selinus which was previously associated with temple Y. Furthermore, the lion-headed waterspout from Akragas is associated with roof 6. Apart from this example from Akragas, Mertens-Horn identifies another five examples of terracotta lion-headed waterspouts which are also associated with the anthemion roof system in Sicily; a fragment from temple A or B from Megara Hyblaea, three from

5 Danner 1996, pp. 100-102; Darsow 1938, p. 67; Marconi 2007, p. 45; Szeliga 1986, pp. 80-87.

6 Marconi 1929, p. 158.

7 Gàbrici 1925, p. 141.

8 Danner 1996, p. 89; De Miro 1965, p. 40; Szeliga 1986, p. 39.

9 Danner 1996, p. 103; Lentini 2006, pp. 417-422; Marconi 2007, p. 46.

10 Danner 2000, pp. 93-94.

11 Bernabò Brea 1949-1951, p. 72, fig. 69; Danner 2000, pp. 26, 30, fig. 5, 9.

12 Lang 2010, pp. 45-46; Winter 1993, p. 21.

13 Monterosso 2009, p. 434, fig. 14.

14 Ciurcina 1997, p. 42, fig. 7-8.

Selinus,[15] and one from Leontini.[16]

Moreover, Akragas is so far the only other location with terracotta roofs similar to the anthemion roofs from Naxos. These examples incorporate three friezes, series A-C, which are associated with building B and are thought to have been in use until the 5th century.[17] Roof 7, series A-C from Akragas have direct parallels with these three roofs from Naxos. Roof 7, series D and ridge tile antefix 1 (section 5.2.2.5-6) both resemble material from Naxos which is also interpreted as part of anthemion roofs.

In conclusion, taking into consideration not only the revetments, but also lion-headed waterspouts and ridge tile antefixes, the anthemion sima roof appears to be represented only in Akragas, Selinus, Naxos, and Leontini. While examples from Megara Hyblaea and Akrai also exist, the presence of anthemion roofs in these locations have not yet been conclusively confirmed. The distribution and occurrence of this roof type compared to the canonical Sicilian sima and the antefix roof are therefore considerably less. Akragas stands out in this regard because it presents a number of anthemion roofs of different designs.

6.1.3 CORINTHIAN ROOFS

The roof systems of Sicily have traditionally been thought to consist of flat pan tiles combined with curved, Laconian style, cover tiles.[18] Conti finds a strong Corinthian influence in numerous roofs from second half of the 6th century. This includes the anthemion roof E1 which is seen as the prototype for the later anthemion sima roofs from Selinus. Conti attributes the Corinthian influence on the decorated roofs, acroteria and sculpture to the strong economic and cultural ties between Selinus and Corinth at this time.[19] While undecorated roof tiles did not receive a lot of attention in earlier publications, a number of recent studies are expanding on these traditional views. Roofs found in current excavations in Selinus and Naxos have revealed cover and ridge tiles with a polygonal shape similar to Corinthian roofs. The examples from Selinus are generally dated to the classical period,[20] the one from Naxos to the second half of the 5th century.[21] Pentagonal cover tiles and a curved ridge tile with an opening on one sides to accommodate a pentagonal shaped cover tile have been found at the ongoing S. Anna excavation, indicating that the presence of Corinthian cover and ridge tiles also at Akragas (section 4.1.58-59).

A second group of objects is also related to the Corinthian roof system. Three types of ridge palmettes have been reconstructed from numerous fragments found predominantly around the urban sanctuary. While palmette type 4 (section 5.2.4.3) does not have any known Sicilian counterparts, palmette type 2 and 3 (section 5.2.4.1-2) show strong stylistic parallels to examples found over a wide area of Selinus and dated by Conti to the first half of the 5th century BC.[22] A similar palmette has also been found at Gela in the excavations around Molino di Pietro and is dated by Orlandini already to the 6th century.[23] From the fractures at the base of all three palmette types from Akragas it is clear that the palmette sat on a polygonal shaped ridge tile.

To date only ridge tile palmettes and cover tiles in the Corinthian system have been found in Akragas. Antefixes, such as the ones from Selinus,[24] have not yet been discovered, with the possible exception of VIN 607 (section 4.1.32). Conti dates

15 Mertens-Horn 1988, pp. 183-184, tab. 18b.c, 19.a.b.c.

16 Monterosso 2009, p. 433, fig. 13.

17 Pelagatti & Lentini 2011, p. 392, fig. 2-6.

18 Winter 1993, p. 273.

19 Conti 2012, pp. 316-317.

20 Jonasch 2009, p. 4.

21 Lentini et al. 2008, pp. 322-323.

22 Conti 2012, pp. 273-279.

23 Panvini 1998, p. 47.

24 Conti 2012, pp. 130-132.

the examples of Corinthian type roofs from Selinus to second half of the 6th century. But the material from Akragas appears to date only to the start of the 5th century. The initial indications are therefore that Corinthian style roofs reached Akragas slightly later than the city of Selinus. The volume of both decorated and undecorated objects indicate that Corinthian style objects where much more prevalent at Akragas than previously recognized.

6.1.4 ANTEFIX ROOFS

Based on overall decorative and profile characteristics it is possible to distinguish three main types of antefixes found in Akragas. The largest group of objects depict a smiling gorgon in relief. As already mentioned in chapter 2 and 4.1, the mythological creature is a very popular motive in Sicilian architecture from the beginning of the 6th century onwards.[25] Of the eight gorgoneion antefixes known from Akragas, only two are the same in terms of style and profile and thus likely belong to one type (antefix type 5, section 5.2.3.6). The other six fragments come from a variety of locations including the extra-urban sanctuary at S. Anna (antefix type 1, section 5.2.3.2), the urban sanctuary (antefix G) and the vicinity of temple A (antefix type 3, section 5.2.3.4); they are all different in terms of the stylistic execution, depth of relief, and shape. While there are some stylistic similarities between the various antefixes from Akragas and other examples from Sicily, there does not appear to be any direct stylistic connections. The majority of gorgoneion antefixes from Sicily dating to the second half of the 6th and early 5th century contains additional decorative elements. These include the snakes in the gorgon's hair, as seen in 5th century antefixes from Naxos.[26] Or a diadem that range from plain to elaborate, including antefix type A and B from Selinus dated to the first half of the 5th century, a 6th century example from Megara Hyblaea and a number of different antefixes from Gela placed to the end of 6th century.[27] There are also gorgoneia combining both a diadem and snakes, such as an antefix from Himera from the end of the 6th or beginning of the 5th century.[28] It is therefore striking that all the recorded gorgoneion antefixes from Akragas have neither a diadem nor snakes.

Selinus antefixes were often used in combination with gorgoneion antefixes on Sicilian roofs. To date only two silenus type antefixes are known from Akragas. The first is a piece now housed in the Allard Pierson Museum in Amsterdam for which no detailed find information is available (antefix type 7, section 5.2.3.8). It is dated to the beginning of the 5th century based on style. The second silenus type antefix is dated to the end of the 5th century and comes probably from the area between temple A and the urban sanctuary (antefix type 6, section 5.2.3.7). It has not been possible to associate either of these two with a specific gorgoneion antefix.

The third group of antefixes consists of a flat plaque and a curved cover tile, which is connected at the top of the plaque along a curved top edge, while the bottom edge is straight. The decoration is painted directly on the plaque and consists of different variations of palmettes and volutes (roof 8, section 5.2.3.1). While this type of antefix does not appear in great numbers at other Sicilian sites, some examples are known, including a number of fragments found by Orsi during his excavations at the Athenaion of Syracuse.[29] Another comparison comes from the ship sheds of Naxos.[30] An antefix discovered at the acropolis area of Gela is similar to the Syracuse example mentioned and is dated to the second half of the 6th century.[31] According to Winter these objects are Eastern Greek in influence

25 De Miro 1965, p. 73; Lulof 2007, p. 41; Mertens-Horn 1997, pp. 244-245; Strazzulla 1997, p. 707; Winter 1993, p. 279.

26 Lentini et al. 2008, fig. 41.

27 Panvini 1998, pp. 33, 44.

28 Epifanio Vanni 1993, p. 40, fig. 5.

29 Orsi 1918, p. 673, fig. 247.

30 Lentini et al. 2008, pp. 347, 351, fig. 44.

31 Panvini 1998, p. 31, Inv. 35940.

and dated primarily to the second half of the 6th century BC.[32]

6.1.5 STYLISTIC INFLUENCES AND LOCAL ADAPTATIONS

Coming back to the question of stylistic impact, De Miro considered the architectural terracotta from Akragas to be principally influenced by those of Gela based on the similarities between the sima and geison revetments. But as discussed above it is evident that there was a larger sphere of influence at play and that the situation also underwent changes over time. While the canonical Sicilian sima roofs were indeed influenced by those of Gela, it appears that the craftsmen drew from wider regional traditions because the decoration also shows similarities with roofs from Syracuse, Naxos, and Selinus. In terms of the acroteria figures the influence of Selinus and Gela seems particularly strong. By the end of the 6th century the impact by Gela diminishes though, as the anthemion sima roofs are now principally influenced by roofs from Selinus and Naxos.

For the most part the terracotta roofs from Akragas follow the wider regional traditions already in place but there are details relating to the profile and decoration which point to local preferences. The use of a bottom roll on most of the canonical Sicilian simas sets the roofs from Akragas apart from contemporary roofs in Selinus and Gela. The gorgoneion and ridge tile antefixes from Akragas can also be differentiated from similar objects from the wider region by to a lack of snake like hair and diadems. These localized variations become less prevalent over time. The later anthemion sima roofs as well as the 5th century ridge tile palmettes show instead very little deviation from similar objects from Selinus and Naxos. The degree of resemblance between the sima and geison fragments from Akragas and Naxos led De Miro to suggest that some of these objects might even come from the same workshop.[33] This question will be addressed again in section 6.4.

Style in archaeology has played an important role in the study of social groupings and identity (section 3.2). While the theories of Wobst were instrumental in framing style as a way of transmitting information regarding social integration or differentiation, he later stressed that style is equally important in defining individuality.[34] In this regard, the fact that the architectural terracottas from Akragas conform to the wider Sicilian convention is an expression of inclusion in a wider architectural tradition. Furthermore, variation from the regional norm decreases from the Archaic to the Classical period which might either indicate a level of fluidity in the regional style or greater freedom on the part of the craftsmen during the earlier period. This topic will be discussed in greater detail section 6.6.

6.2 FABRIC AND PRODUCTION TECHNIQUES

For this investigation, as per many comparable ceramic studies, the attributes associated with raw materials as well as production techniques together form the basis from which to identify major fabric groups.[35] Both categories are interrelated and a reflection of the decisions made by the workmen during manufacture. In chapter 4.2 the various attributes are investigated and evaluated based on their diagnostic capacity. Attributes such as the colour of the fully oxidized clay matrix, type of temper, fabric density, and surface finish are then used for identifying objects with the same characteristics, which are then organized into fabric groups. Not all attributes are appropriate for diagnostic purposes. For example, the level of oxidation and the level of skill used for the painted decoration are influenced by the type of object itself. Due to the dependent nature of such

32 Winter 1993, p. 279.

33 De Miro 1965, p. 67.

34 Wobst 1977, 8, 17; Wobst 1999, 125.

35 Moody et al., 2003, p. 39; Orton & Hughes 2013, pp. 12, 14; Rye 1981, p. 2; Shepard 1956, p. 306.

attributes they are thus not used for identifying, but for describing the fabric of established groups of objects (section 5.1.3). Based on the results from chapter 4.2 and their application in chapter 5, a number of observations can be made regarding the raw materials and production techniques used in the manufacture of roof terracotta especially for Akragas.

Scholars including Moody have identified temper as one of the most distinctive aspects of a fabric, and within this study temper is also one of the key attributes which distinguishes different fabric groups (table 4.2-2, 5.1.1).[36] At Akragas the predominant temper type is a combination of grog and non-volcanic temper which is used for canonical Sicilian sima roofs (roofs 1-4), anthemion sima roofs (roof 6), antefix roofs (roof 8) as well as elements such as ridge tile palmettes (ridge tile palmettes 2-4). In comparison, the use of dark grained volcanic sand is less prevalent, it appears on one canonical Sicilian sima (roof 5) and one antefix type (antefix type E). It also is the main temper type for roof 7, series A-D, and ridge tile antefix 1. Volcanic temper does not appear in widespread use during the 5th century at Akragas. Architectural terracotta elements from this period, including undecorated roof tiles (pan tiles A-D) and ridge tile palmettes (ridge tile palmettes 2-4) contain non-volcanic temper. For the most part volcanic and non-volcanic temper is not used in combination. The possible exception is antefix type 3: here the antefix plaque consists of a fine fabric with grog while the cover tile contains volcanic temper. The two temper categories are present in different components which were connected before firing.

Another independent attribute of architectural terracotta is the different surface finishes (table 4.2-9). The most prevalent type is slip, followed by the application of painted decoration directly on the fabric surface. There are different types of slip layers; on roof 2 it is a thin layer of clay which is similar in colour to the main fabric and less than 0,5 mm thick. Another type consists of a layer of highly purified light yellow clay, mostly around 1 mm in thickness (e.g. roof 3), but it can be even thinner (e.g. roof 8). A clearly identifiable slip layer could not be recognized on fragments associated with a number of roofs (e.g. roof 1 and 6). Instead, the paint layer appears to be applied directly to the fabric. Another surface finish comprises an epidermis layer of levigated clay. This finish is used in combination with volcanic temper (fabric G) and is mostly restricted to objects from roof 7, series A. As part of fabric groups C and D the epidermis layer is combined with a thick slip layer (ridge palmettes 2 and 4).

The methods of production demonstrate a chronological development. The canonical Sicilian sima roofs show the highest level of incomplete firing conditions (table 5.1-2). The fabric associated with these roofs (fabric A and B) also have a higher density of small air cavities which is indicative of not as much refinement of the raw clay. And the painted decoration represents a higher number inconsistencies (table 5.1-4). In contrast, the anthemion roofs from the end of the 6th century show an improvement in production techniques as well as in the application of more ambitious surface finishes. While roof 6 is similar to roof 1 and 4 in terms of the raw material and production techniques, its clay matrix is fully oxidized and has a higher density. Roofs from this period also incorporate surface finishes which require greater technical expertise, such as the epidermis layer on roof 7, series A. Subsequently, objects dated to the 5th century make use of even more challenging production methods. Ridge palmette 1 and 3 consist of both a slip and an epidermis layer, at the same time the clay fabric is fully oxidized and uses non-volcanic material and grog as temper.

In conclusion, the roof terracottas from Akragas follow the established theory of increasing sophistication and refinement in manufacture for

36 Moody et al. 2003, p. 49.

the Archaic and Classical period. It is commonly accepted that firing techniques improved over time with temperatures of up to 1.000 °C being reached during the late Archaic and Classical period for Greek architectural terracotta.[37] The roofs from the middle of the 6th century show evidence of firing conditions which did not achieve the sustained temperatures required for full oxidation, but later roofs do. The methods used for finishing the decorated surfaces also progress over time, from a paint only finish on the first roofs, to a combination of slip and epidermis method on the 5th century ridge tile palmette. The preference for non-volcanic material and grog as temper is consistent throughout the entire period of investigation.

But while the chronological overview demonstrates improvements in production techniques over time, it also indicates variation during each period. Some of the variation might be attributed to differences in the technical requirements for different types of objects. For instance, the pan tiles of the 5th century are undecorated and therefore did not require the combination of epidermis and slip layer which was more suitable for the moulded ridge palmettes from the same period. But when the raw materials and techniques used for a single class of objects, such as the sima revetments from a specific period, are compared to each other, there is also variation. Simas associated with the canonical Sicilian roofs make use of different types of temper and surface finishes. It is possible that this variation is not related to functional requirements, but rather to the decisions made by the workmen.

Links between producer, characteristic raw materials, and production techniques have already been investigated by some scholars.[38] In regards to potters, Rye postulates that forming techniques are more stable and less subject to change when compared to style and shape.[39] It is reasonable to apply the same theory to the craftsmen manufacturing architectural terracotta due to the very similar material choices and production techniques. In a complex process involving many practical steps and different resources craftsmen are less likely to experiment with the procedure once a reliable and proven method has been established. Unless new technical innovations prove considerably advantageous or new styles require changes to the manufacturing process, it is reasonable to presume that a craftsman will continue to employ the methods of manufacture in which he was trained, even when moving to a new location.

In a recent publication Kenfield attempts to link the use of specific production techniques to different ethnic identities. According to him the use of a slip is associated with Italic sites, while the use of an epidermis layer with Greek sites.[40] In general, the presence of a slip layer is well attested in Italic sites, such as Satricum and Murlo.[41] However, it is not exclusively used by Italic cultures as it is also seen on Greek architectural terracottas including roofs from Delphi and Corinth.[42] Such links between ethnic or cultural groups and production techniques can therefore not be substantiated at this point, and in the present study of Akragas no evidence allows for linking architectural terracottas to specific people. But it is worth considering a second theory regarding production techniques, namely the identification of wider regional characteristics. According to Lulof, a particular craftsman or workshop can be recognized by its particular technical characteristics, therefore, the movement of said craftsmen or artists would be reflected in the archaeological record of locations spread over a wider region.[43] Observation of technical characteristics thus has the potential

37 Winter 1993, pp. 304-305.

38 Arnold 2000, p. 113.

39 Rye 1981, p. 5.

40 Kenfield 1997, p. 107.

41 Lulof 1991, p. 132.

42 Roebuck 1990, pp. 47, 56, 61; Winter 1993, pp. 304-305.

43 Lulof 1994, pp. 221-222.

to provide important information on both the movement of craftsmen as well as the distribution of technical innovations. As discussed in section 3.3, the theory that a specific style of production, or technical style, can be used for investigating social boundaries and cultural context was introduced in 1977 by Lechtman.[44] Technical style, as the reflection of a social and cultural context has been further developed by a number of influential scholars including Lemonnier, Ingolt, Schiffer and Skibo and within the study of architectural terracotta has influenced the work of Lulof and Wikander.[45] It essence it is defined as the culmination of all the techniques used and the decisions made by the craftsman during the entire production process. There are two aspects of particular relevance to this study, technical style as a reflection of social boundaries and social organization. The regional dimension is also explored by Lulof and Wikander.

In order to discuss technical styles and boundaries, it is important to first gain an overview of the raw materials and production techniques used in the production of architectural terracottas from other sites in Sicily. Canonical Sicilian sima and geison fragments dated to the beginning and middle of the 6th century from Selinus show the exclusive use of dark grained volcanic temper and a purified slip layer of 2-5 mm thick.[46] The ones from Gela, such as frieze A, also make use of volcanic temper and a thick slip layer of fine, light coloured clay.[47] While a small number make use of grog as a temper, such as an early sima from Himera,[48] but these are in the minority. The anthemion roofs from Selinus (roof 18-20 as identified by Conti) also contain lithic temper, and on roof 20, which is the closest to roof 6 from Akragas in terms of style, is finished with a slip layer of fine yellowish clay between 1-2 mm thick.[49] The fabric of the anthemion roofs from Naxos appear to also make use of dark grained volcanic sand as temper and for the objects associated with series A there is a well-defined epidermis layer as well.[50] Furthermore, on objects from Naxos, which are similar to roof 7, series B-D from Akragas, the painted decoration is applied directly to the fabric surface. The ridge palmettes from Selinus have light and dark coloured lithic inclusions as well as an epidermis layer and show stylistic parallels with ridge palmette 2 from Akragas.[51] The undecorated pan and cover tiles from Selinus associated with the 6th and 5th centuries also contain volcanic inclusions.[52]

Concluding, it appears that the predominant temper used in the wider region is dark grained lithic sand. In terms of surface finish, even earlier canonical Sicilian sima roofs apply a thicker slip layer of purified clay. The majority of objects from Akragas, however, does not correspond to the regional production traditions. The widespread use of grog and non-volcanic temper appears to be a preference which distinguished local production at Akragas. Another characteristic is the absence of a thick slip layer of purified, light coloured clay on the majority of the canonical Sicilian roofs, roof 6 from the anthemion sima phase, and a number of the antefix roofs. Most roof types from Akragas were thus produced in technical style(s) that appears specific to Akragas. This technical style is associated with canonical Sicilian roofs (roof 1, 2, and 4), and anthemion sima roof (roof 6) as well as an antefix roof (roof 8) that date from the middle of the 6th to the beginning of the 5th century BC. One exception is roofs 7, series A-C, which

44 Hegmon 1998, 266; Lechtmann 1977.

45 Arnold 2000, p. 113; Ingold 1988, 1990; Lemonnier 1986, 1992; Lulof 1994, p. 220; van der Leeuw 1993; Nielsen 1995; Schiffer & Skibo 1987, 1997; Sillar & Tite 2000; Wikander 1986, p. 26.

46 Conti 2012, pp. 36, 60.

47 Bernabò Brea 1952, p. 25.

48 Allegro 1976, p. 537, tab. LXXXVI.1 ; Lang 2010, p. 101, HIM 12.

49 Conti 2012, pp. 170-177, 185, 198.

50 Ciurcina 1993, pp. 34-35, fig. 14-16; Pelagatti & Lentini 2011, p. 292, fig. 2-3.

51 Conti 2012, pp. 276-267.

52 Conti 1998, p. 210; Jonasch 2009, p. 4.

resemble the same technical style as stylistically related roofs from Naxos. De Miro hypothesized that the very strong similarities in style and fabric between these objects might indicate that the objects were produced in Naxos itself, which will be considered in detail in section 6.4.[53] While the ridge tile palmettes from 5th century onwards make use of more sophisticated surface finishes, the temper used seems to follow the precedent set by earlier roofs. Objects of a similar style from Selinus and Gela make use of a different temper. It should be noted that many of the decisions made by a producer are subconscious.[54] The existence of a technical style particular to Akragas might therefore not be a deliberate attempt to differentiate local material from the wider region. After all, while there are some minor variations, the decoration and profile of these objects are within the regional stylistic traditions (section 6.2.5). Instead, the existence of a local technical style which is used for both canonical Sicilian and anthemion sima roofs, indicate that there was a sufficient amount of local production taking place over at least two generations for a local style to develop.

As demonstrated in section 4.2 and 5.1.3, the terracotta roofs demonstrate a variety of technical styles which differs from the technical style described above. For example, roof 3 has a defined slip layer and roof 5 makes use of dark lithic temper. Both these roofs are dated to the same time period. The use of different techniques demonstrates that production at Akragas was not homogenous. Even among the different roofs produced in the local technical style there are some variation. The level of skill demonstrated in the painted decoration on objects from roof 1 and roof 6, or the improvements in firing conditions are just some of the examples (section 5.1.3). Lemonnier defines technique as the combination of material, the sequence of actions and knowledge.[55] While Ingolt finds that skill and knowledge are intrinsically linked.[56] The roof terracottas from Akragas is therefore evidence of different materials, production techniques, skill levels and knowledge at play. This is an indication of variation within the producers active in the city. The second aspect related to technical style relevant to this work, as stated above, is that it is a reflection of the organization among participants. This topic will be explored further in section 6.6.

6.3 MATERIAL ANALYSIS

Ridge, pan and cover tiles as well as a selection of other architectural terracotta objects were analysed using archeometric methods in order to determine the material characteristics of these objects. A combination of thin section petrographic analysis, wave-length dispersive X-ray fluorescence (WD-XRF) and handheld X-ray fluorescence (HH-XRF) was applied. The first two methods are destructive, and as such could only be used for objects from the recent S. Anna excavation. As already explained, HH-XRF is not always a successful method for the study of terracotta objects and a number of questions regarding the optimal procedure to obtain quantified data have not yet been resolved in current scholarship (section 3.4). For this reason, a control group was analysed using all three methods, which consists of 15 roof tile samples from S. Anna. Stylistically this control group contains fragments associated with pan tile A, B, and C (4.1.62-64) and cover tile B (4.1.60). Three of the fragments fall out of stylistic groups due to a lack of diagnostic profile elements (VIN 426, 433-434).

The use of a control group allows for the evaluation of methods and results as well as for a more comprehensive understanding of the material composition of objects in general. A single archeometric method is normally limited in the range of information it can provide, which is why most studies of this nature apply multiple

53 De Miro 1965, pp. 68-70.

54 Lemonnier 1986, p. 155.

55 Lemonnier 1986, p. 154.

56 Ingold 2000, p. 300.

methods.[57] In both the petrographic and WD-XRF analysis of the control group, three main material groups are identified. In figure 4.3-6 it is clear that these three groups are composed of the same objects for both the petrographic and WD-XRF analysis, except for VIN 425, which while being placed in petrographic group A, has a similar chemical composition to objects from group B. VIN 425 is from pan tile group A, while the other three objects in petrographic group B are unassigned ridge and cover tile fragments and one object from pan tile group B (VIN 424). Furthermore, by means of the control group it is also possible to determine elements susceptible to local weathering conditions. An evaluation of the variance for each material element, according to the petrographic groups, is given as the relative standard deviation in table 4.3-5. Three elements have a very high variance of which Na_2O_3 and Ba are known to be affected by local weathering conditions.[58] The role of Nb is less well understood and is a less mobile element, but it shows a very high variance, too, that can potentially skew the data. It is probably that the variance is due to the quantification of peak areas which are situated just above the background signal. For this reason, the three elements are excluded from the statistical analysis of the data as their presence and composition are not related to the raw material sources used, but to depositional conditions.

One of the major concerns in the present study questions the results obtained through HH-XRF and their evaluation. As described in section 3.4, the use of this technology is not yet a widely accepted method of analysis for archaeological material. Scholars have raised a number of concerns, the most relevant to this study involves the calibration of spectrum readings into quantified data and the impact of a non-homogenous fabric matrix. As the recent study by Hunt and Speakman clearly demonstrates, the calibration files provided by the manufacturers of HH-XRF instruments are not appropriate for the analysis of archaeological ceramics.[59] It was therefore necessary to create a custom calibration based on the regression line between expected and measured values. The expected values are the known concentrations of elements from certified reference materials (CRM), for this study six clay and ceramic CRM were used. The detected values are the counts per second for CRM as measured with the HH-XRF. The regression equation is an expression of the relationship between the measured and expected values and can thus calculate the quantified concentrations of elements from the HH-XRF data. The accuracy of the custom calibration is expressed by comparing the calibrated values and the WD-XRF values for which the mentioned control group is used and therefore represents an essential and especially important part of the study (table 4.3-10). The majority of elements relevant to the investigation of terracotta objects (CaO, Fe_2O_3, MnO, SiO_2, TiO_2, and Y) show an improvement in the CRM calibrated data compared to the data calibrated according to the manufacturers' mud rock calibration file (GL2). In summary, the custom calibration data are closer to the known concentrations, as well as the data measured by WD-XRF, and also show less variance than the GL2 calibration data. Nevertheless, there are some exceptions. For strontium (Sr) and zirconium (Zr) the calibrated values are significantly lower than the WD-XRF results. One possible explanation for this discrepancy might be material conditions, due to difference in the grain sizes of the ground down samples used for WD-XRF and the coarse grains in the terracotta fabric measured by the HH-XRF. Unfortunately, the exact impact of the matrix effect on the HH-XRF data for non-homogenous material is not yet well investigated. While the exact reason for the discrepancy is not known, the measurements for these two elements

57 Aquilia et al. 2015; Barone et al. 2005; Barone et al. 2011; Belfiore et al. 2010.

58 Barone et al. 2005, p. 754.

59 Hunt & Speakman 2015.

are problematic and therefore excluded from the statistical analysis of the HH-XRF data.

In conclusion, the concentrations of a selected group of elements as obtained by custom calibration of HH-XRF data show a correspondence to the concentration and variance of the WD-XRF measurements for the same group of objects. As it is expected, the discrepancy between the HH-XRF and WD-XRF data, even with custom calibration, is still fairly high. The use of HH-XRF for in-situ analysis of terracotta objects, while appropriate for a limited application, does not produce reliable quantified data sufficient for provenance testing. It is thus applied in isolation and not directly comparable to quantified data obtained through other methods. Any conclusions derived from the HH-XRF data are preliminary unless it can be corroborated through other means as well. For example, the analysis of HH-XRF data shows that the architectural terracottas from the city of Akragas, dated to the 6th century BC (frieze A, G, and F), are clearly separated from the control group of mostly 5th century material from S. Anna (figure 5-1.2). They have a higher value of zinc and a lower concentration of silicon dioxide (SiO_2) compared to the control group. This separation is confirmed by the WD-XRF data which show that the architectural terracottas from the 6th century (frieze B3) are clearly separated from the 5th century pan tiles (pan tile A, B, C in figure 5-2.1) by high concentration of Zn and a low one of SiO_2, which indicates a lower quartz, or sand, content. The difference in material used for the manufacture of 6th century architectural terracotta and 5th century roof tiles is therefore substantiated by both the WD-XRF and HH-XRF data.

The petrographic, WD-XRF and HH-XRF data demonstrate that the roof terracottas from Akragas vary in the mineralogical and chemical composition of the material. This raises the question of provenance and technology. A difference in chemical composition might indicate the use of different, but local, clay sources or mixtures. However, it can also signify the presence of objects manufactured in a different location and moved to the city. A large body of published data on the chemical composition of Greek ceramic and terracotta objects from Sicily is taken into account in order to explore the question of provenance (section 4.3.4) and the principle components for objects known to come from Greek sites in Sicily are analysed (figure 4.3-13,14). This principle component analysis shows that the chemical composition of the roof tiles of the control group show some similarity with published roof tiles thought to have been manufactured in Akragas (figure 4.3-14). These objects are distinguishable from material from other Sicilian cities like Gela, Leontini, Syracuse, Messina, and the Alcantara river valley, which incorporates objects from Naxos, Taormina, and Francavilla (figure 4.3-12). The Akragas examples contain much higher concentrations of CaO, and Cr and low concentrations of K_2O, and MnO. The published data for objects from Akragas provide some indication in support of local production for the S. Anna material. This includes the undecorated pan, cover and ridge tiles as well as the architectural terracottas associated with roof 4.

The selected object collection from the urban area of Akragas was measured with HH-XRF, and is therefore not directly comparable with the published provenance data. But there are some indications to support the local production of the majority of material. As the HH-XRF data show a high degree of overlap for the chemical composition of architectural terracottas associated with roof 1 and 6 (figure 5.2-3) and these objects are similar in chemical terms to the locally produced fragments from roof 4, it seems more than probable to see here in general products of local manufacture. As discussed in section 5.2.2, the anthemion roof 7 from Akragas is strongly related to Naxos in terms of style and technology. This connection is so evident that the suggestion arose the objects might have been produced in Naxos itself.[60] The HH-XRF data, however, demonstrates clearly that the fragments from roof 7, series A and C have a similar chemical composition to that of locally produced roof 1 and 6. The only exception is roof 7, series B, which is characterized by a higher level of CaO and lower concentrations of MnO, K_2O, TiO_2, Fe_2O_3, and Rb (figure 5-2). But still, this does not prove the attribution of roof 7, series B to a production area in the Alcantara river valley, which includes Naxos. As shown in figure 4.3-12, objects from this location are characterized by higher levels of SiO_2, K_2O, and MnO and lower levels of CaO, Sr, Zr, and Cr. In contrast, objects from roof 7, series B have higher level of CaO and lower concentrations of MnO and K_2O. Roof 7, series B compared to the objects of the area of Naxos. Based on the CaO, MnO and K_2O values in relation to the S. Anna as well as the Alcantara river valley objects, roof 7, series B differs and does definitely not have the same chemical composition as that of objects manufactured in Naxos. Despite stylistical and technical similarities the attribution of objects from the anthemion roofs from Akragas, and roof 7, series B in particular, to a production site at Naxos can be excluded; nevertheless, the question of their provenance remains partly unclear.

6.4 ARCHITECTURAL CONTEXT

The architectural terracotta roofs of the 6th and 5th century BC constitute an intricate system of interconnected parts. The various roof elements, such as the geison revetment, sima, ridge, and pan tiles, have complex profiles that are designed with overlapping joins that provide stability and protection against water seepage (section 5.3.4). The interlocking roof system also helps to keep individual elements in position with a minimum amount of nails (section 5.3.1). While the profile and position of most of the roof elements can be reconstructed based on the evidence from Akragas and from the wider region, some parts (e.g. the raking sima and horse rider acroteria) are more problematic. The archaeological and architectural remains suggest that roof 2, and possibly roof 1 as well, were in use for an extended period of time, maybe as much as a century or more (section 5.3.2). The long life span of at least some of the roofs is indicative of the quality of production and construction of these roofs.

By analysing the architectural context of the roof terracotta objects it becomes apparent that a fairly high level of specialized knowledge is required for the manufacture of the single parts of a complex structure. The various steps of production demand a clear understanding of how these objects will function later on as parts of a roof. The complex interlocking joins, the size of the elements, the painted construction marks, and the nail holes are all formed before the objects are fired and placed at the construction site. A number of the technical solutions employed at Akragas are already known elsewhere in Sicily. For example, stepped edges on the sides of canonical Sicilian sima pieces from Selinus which are dated to the beginning of the second quarter of the 6th century.[61] The method of fastening the terracotta roofs with nails fixed through pre-made holes also predates the first terracotta roofs from Akragas. It is seen in roof 3 from Selinus, dated to the middle of the first half of the 6th century.[62] And the use of painted construction marks on the back of canonical Sicilian sima pieces are documented for objects from Syracuse,[63] Gela,[64] and Selinus[65] (section 4.4.1). As a whole, the technical solutions described in section 4.4 and 5.3 are in widespread use in Sicily during the 6th and 5th century BC, and not particular to Akragas. It is important to note that, overall, these types of architectural techniques and

60 De Miro 1965, pp. 68-70.

61 Conti 2012, p. 63, fig.36.

62 Conti 2012, p. 63, fig. 20.

63 Ciurcina 1997, p. 36.

64 Bernabò Brea 1952, p. 56, fig. 43.

65 Conti 2012, pp. 197-198, fig. 181-3.

methods are not visible to the casual observer of a finished roof. Quite the contrary, knowledge of the architectural aspects of the roofs as well as the sequence of production and construction can only be gained through exposure to the entire manufacturing and construction process. The distribution of technical knowledge in Sicily will be further discussed in section 6.7.

Architectural terracottas are an integral part of the architecture of monumental buildings during the Archaic period. As such they provide additional information about the built environment of sanctuaries at Akragas. The largest of the terracotta simas studied is roof 2, measuring just above 400 mm high. Compared to canonical Sicilian simas from other locations in Sicily this is fairly modest. The early 6th century peristyle temple of Apollo at Syracuse measure 21.5 by 55.4 m and has a sima of 650 mm high.[66] Roof 3 from Selinus, dated to the middle of the first half of the 6th century BC, has a lateral sima which is 660 mm high.[67] From the second half of the 6th century, temple C from Selinus also has a peristyle and measures 23.9 by 63.8 m. An anthemion sima of between 460 and 490 mm high is associated with temple C.[68] The building remains associated with the canonical Sicilian roofs at Akragas are comparably smaller in their overall dimensions. These include the 6 x 12 m naiskos inside the foundations of temple G and the 7 x 14m naiskos to the South-East of temple B (section 5.3.2). Buildings dated to the second half of the 6th century are slightly larger, the naiskos to the East of gate V is over 15m long and the rectangular structure in the gardens of the Villa Aurea is around 30m in length (section 1.2). The first buildings which can compare to the temples at Selinus and Syracuse in size only appear at the beginning of the 5th century. While there is a debate about the start of construction on temple B, it seems likely to date before the battle of Himera, and the first peristyle temple (temple A) was also constructed at this time (section 1.2). Based on the size of both the terracotta roofs and building remains, it is therefore apparent that the monumental buildings at Akragas from the middle to the end of the 6th century were fairly modest in size compared to other cities in the region such as Syracuse and Selinus. The lack of monumental construction in the period of the founding of the city to the middle of the 6th century is attributed by De Miro and Mertens to lower economic prospects.[69] Based on the evidence discussed above, it appears that the period from the middle to the end of the 6th century saw economic improvements, but that the city was not yet the economic power it became at the beginning of the 5th century.

Revising the available information it is possible to reconstruct at least five roofs that can be placed in the first generation of decorated terracotta roofs (section 6.5). Isolated fragments point to the possible presence of more roofs dated to this period (e.g. antefix F and I), but these objects are too small to conclusively identify a specific roof. As seen in section 1.2 there are only three monumental buildings which are excavated and assigned to this period. These are the naiskos inside the foundations of temple G, the naiskos to the East of gate V, and the naiskos to the South-East of temple B. Subsequently, during the last quarter of the 6th century, between four and six roofs can be placed to the second generation. Again, the number of monumental buildings during this period is just three, the tempietto 1 in the urban sanctuary, the building at S. Anna, and the building in the gardens of the Villa Aurea. Therefore, during the second half of the 6th century the number of known roofs is almost double that of recorded monumental structures. It is possible that at least some of the

66 Mertens 2006, pp. 104-109; Wikander 1986, p. 47, fig. 13.

67 Conti 2012, p. 66; Wikander 1986, p. 40, fig. 11.

68 Mertens 2006, pp.118-125; Conti 2012, pp. 139-184.

69 Adornato 2012, pp. 485-486; De Miro 1992, p. 154; Mertens 2006, p. 194.

second generation roofs are replacements for earlier roofs, and it should also be mentioned that antefix roofs could have been used for buildings of a lesser stature.[70] But based on the number of identified terracotta roofs from both the first and second generation compared to the known building structures from the same period it is apparent that a number buildings dated to the period under investigation have not yet been discovered and identified. The architectural remains from the 6th century are not well preserved. Building activity during subsequent periods, starting with extensive activity during the Classical period had a significant impact. There are also areas within the urban sanctuaries that are inaccessible due to modern structures including the villa Aurea and a road. The architectural terracottas are therefore an important source of information regarding the sanctuary areas from this period.

6.5 CHRONOLOGY

As discussed in chapter 3, roof terracottas are dated primarily on stylistic considerations. In isolated cases it is possible to associate a roof with specific building remains, which can provide additional dating but in the case of the early naiskoi of Akragas, the building remains are actually dated according to the associated roof terracotta. Stylistically roofs 1-5 fall all within the same period, namely 570-530 BC. Their dating corresponds with the date of construction of the first sacred buildings in stone at Akragas (section 1.2) and, therefore, form chronologically the first generation of terracotta roofs from Akragas. This group might also include at least one antefix roof (antefix type 1), although it appears to be dated slightly later. The second generation of terracotta roofs is dated to the last third of the 6th century. These roofs include the anthemion style roofs 6-7 and some antefix roofs with gorgoneion antefixes (roof 8, antefix type 2, 3, and 5).

It is thought that the end of the Archaic period lead to the proliferation of monumental buildings with sima and geison elements in stone. This period is thus seen by some scholars as the end of decorated architectural terracotta roofs.[71] The evidence from Akragas, however, does not support the theory. While it is true that roofs with a decorated terracotta sima are no longer produced during the first half of the 5th century, there are still a number of roofs with ridge palmettes in terracotta (ridge palmette type 2 and 3). It is also possible that the antefix type 7 can be dated to this period. These examples represent the third generation of decorated terracotta roofs at Akragas. The very last generation of roofs includes ridge palmette type 4 and antefix type 6 dated to the second half of the 5th century, or even later. The large number of plain roof tiles from S. Anna dated to the 5th and 4th centuries BC (pan tile A and B) indicate that while decorated terracotta roofs might no longer have been a regular feature, undecorated roof tiles continue to be in widespread use.

6.6 PRODUCTION OF TERRACOTTA ROOFS AT AKRAGAS

Within the discussion on stylistic influences (section 6.1), production techniques (section 6.2) and architectural solutions (section 6.4) it has become apparent that the roof terracotta from Akragas follow well established regional traditions. The manner in which knowledge of these regional traditions were gained and then applied to production at Akragas warrants further consideration. Within the study of architectural terracottas the discussion has most often centred on the role of traveling workshops. The presence of itinerant workshops consisting of master craftsmen is attested in a number of locations including Latium and Campania as well as in

70 De Miro 1965, p. 73; Lulof 2007, p. 41; Mertens-Horn 1997, pp. 244-245; Strazzulla 1997, p. 707; Winter 1993, p. 279.

71 Strazzulla 1997, p. 708.

literary sources.[72] In Sicily, Kenfield hypothesizes the existence of a workshop which is active at Morgantina and Megara Hyblaia and possible even further afield at cities including Syracuse and Gela in the beginning of the 5th century.[73] However, Wikander argues that the quantity of architectural terracotta which is produced in Sicily during the archaic period is beyond the capacity of traveling workshops. She proposes that the quick and widespread distribution of a standard style is the results of interchange between the workshops of various locations.[74] In order to establish the presence of traveling workshops in Sicily it would be necessary to compare not only the decoration and profile of objects from different locations, but also the fabric, production techniques and architectural solutions. The exchange of objects between different locations, on the other hand, can only be confirmed through archaeomtric analysis. Such endeavours fall outside the scope of the present study. However, by redirecting the inquiry to the knowledge required to produce these objects at Akragas, it is possible to advance the debate on how new innovations in architectural terracottas were distributed.

The theoretical framework for the study of invention and the distribution of new innovations were significantly influenced by the work of Everett Rogers first published in 1962.[75] While this work is focussed on technology within a modern context, some of the theoretical principles have been applied within the archaeology of earlier periods.[76] According to these studies, the process of invention is divided into three stages; the initial discovery which is then followed by invention, or the application of the discovery, and lastly innovation, which is the diffusion of the invention. According to Rogers diffusion "is the process by which an innovation is communicated through certain channels over time among the members of a social system."[77] The diffusion of new innovations is dependent on persons, with those who play an active role in communicating with and persuading others called agents of change. Different persons also react with varying degrees of receptiveness or resistance during this process. A slightly different approach to the distribution on new innovation focusses on the process by which new production techniques are learned. Termed 'technological transfer', it makes a distinction between direct or indirect transfer and the possibility for reinterpretation or adaptation (section 3.3).[78]

The roof terracotta from Akragas demonstrate a thorough knowledge of the style and architectural solutions employed on a regional scale. The profiles of both decorated and undecorated objects follow regional precedents and demonstrate a clear understanding of how the various components of the roof are fitted together. Examples include the use of stepped joins and the presence of inscribed or painted construction marks on a number of roofs. A number of features necessary for construction, e.g. nail holes and construction marks, are made before the objects are fired. This indicates knowledge of not only the form of objects, but of the production and construction process (section 6.4). The person or persons who transferred the technical knowledge required for producing roof terracotta at Akragas therefore had direct contact with producers in other locations within Sicily and likely were directly involved in the production of roof terracotta at these locations. According to the diffusion of innovation theory, these persons would be described as agents of change. It should be noted that an agent of change can be a single

72 Knoop 1987; Knoop 1997, p. 51; Lulof 1991, p. 115, note 91; Lulof 1994, pp. 221-222; Lulof 1996, pp. 175-182.

73 Kenfield 1997, p. 109.

74 Wikander 1986, 29.

75 *Diffusion of Innovation* is now in its third edition (Rogers 1983); Shortland 2004, p. 5.

76 Shortland 2004.

77 Rogers 1983, p. 5.

78 Knappett & Kiriatzi, 2016, p. 8; Ownby, Giomi & Williams 2017, pp. 617, 623.

craftsmen and does not necessarily denote an entire traveling workshop. Agents of change are active not only during the first generation of roof terracottas at Akragas. The curved inner join on the geison of roof 6, and the epidermis layer on roof 7, series A demonstrate technical knowledge gained through involvement with production at both Selinus and Naxos.

By considering stylistic influences is possible to gain a better understanding of the locations where these agents of change gained the technical knowledge described above. The style and architectural solutions for roof 1, 2, and 4 from the canonical Sicilian sima roof type are not limited to a single colony for precedent, but instead make use of a combination of decorative schemas and technical features that are applied in many colonies including Selinus, Gela, Syracuse, and Naxos. It appears that this situation change over time. The second generation of roofs at Akragas, the anthemion sima roofs, shows stronger stylistic connections to only two specific locations, namely Selinus for roof 6 and Naxos for roof 7, series A-C. During the Classical period there is much greater standardization of forms and production techniques. The fact that the acroteria palmettes from Akragas have strong stylistic parallels with ones from both Selinus and Gela can therefore not be taken as an indication of knowledge transfer from these cities (section 6.1).

There is evidence for local adaptation within the decoration and profile of objects (section 6.1). From the middle of the 6th century to the Classical period there is a gradual decrease in the stylistic adaptation. This corresponds to a wider process of consolidation and standardization seen within Greek architecture. While the Archaic period was characterized by fluidity in the perception of identity and Greek culture, the beginning of the Classical period saw an increased awareness of a common Greek identity (section 1.1). The local adaptation of production processes and fabric, as exemplified by the local technical style identified in section 6.2, appears to correspond to different social influences than stylistic ones. It is possible that the absence of a separate finishing layer on roofs from the canonical Sicilian sima and the Anthemion sima types were influenced by economic considerations. By eliminating a finishing layer the production process is simplified which have time and cost benefits. As already discussed in section 6.4, the city did not have the same economic means as other Sicilian cities, as evidenced by the monumental architecture of the sanctuaries. The use of grog and non-volcanic temper is used for objects from both the Archaic and Classical periods. It is not clear if this is the due to availability, economic constraints or technical considerations. The use of dark grained lithic temper for objects from different time periods (e.g. roof 5 and roof 7) indicates that this temper type was available to producers at Akragas. The use of a different temper for the majority of roof terracotta from Akragas therefore appears to be based on local preference and the fact that it is used through different generations of roofs point to continuity in local production practises.

According to Lemonnier it is possible to study social organization through the investigation of technical style. He specifically considers the organization of specific groups while performing specific production processes.[79] Based on the evidence already discussed a number of observations in regards to the organization of roof terracotta producers at Akragas can now be made. In each generation of roofs at Akragas there is a mixture of different stylistic influences and technical styles. The differences in the profile, decoration and production techniques between roof 3, roof 5, and roof 1 and 2, during the middle of the 6th century, shows variation in the technical knowledge and choices made by producers. This is also seen during the last third of the 6th century with the differences in stylistic influence and

79 Lemonnier 1986, 147.

technical styles between roof 6 and roof 7. This indicates the presence of craftsmen who possess knowledge of different regional precedents and who have different preferences for material and production techniques. It is not clear if this translate to different workshops, or just different master craftsmen working in the same workshop. But it appears that some were more prolific than others. The distinctive technical style described in section 6.2 is present in a number of different roofs from different time periods, while the technical style which characterizes the production of roof 7 seems to be used only for this roof. There is also evidence for differences in skill levels (section 6.2). This indicates that not all the persons involved with the production of roof 1 had the extensive prior experience in the production of roof terracotta, especially during the first generation of production.

The discussion above reveal nuances within the production of terracotta roofs at Akragas which is not represented in previous debates on workshops. The evidence demonstrate a high level of mobility of craftsmen between different production centres in Sicily, while at the same time there is continuity in local production methods through different generations of roofs. The preliminary archaeometric results also suggest the presence of local production through different periods. The diffusion of technical knowledge is facilitated by craftsmen who gain experience in production at different locations within Sicily and then introducing this knowledge to craftsmen in Akragas. The inexperience demonstrated by the painted decoration of roof 1 is indicative of this learning process. There is evidence that this process is not one directional, but that local conditions and experience also influences the production process. Roof 6 is a good example. While the style of decoration and the profile indicate a direct transfer of technical knowledge from Selinus, the roof is produced in the local technical style.

In conclusion, the characteristics and complexities of architectural terracotta production at Akragas are revealed in the systematic analysis of various aspects including style, production techniques, and architectural solutions of the Archaic and Classical period. The transfer and adaptation of knowledge are illustrated by a number of examples drawn from the colonies of Gela, Selinus, Naxos, Syracuse, to name but a few. The influence of local production traditions is evident in terms of a 'technical style' particular to Akragas. The concluding discussion on all characteristics of architectural terracottas from Akragas is facilitated by the revised typology proposed by this thesis, and both will contribute to the architectural understanding of terracotta roof elements as well as to the overall study of Sicilian architectural terracottas.

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CURRICULUM VITAE

Annalize Rheeder was born on the 25th of March, 1981, in Mthatha, South Africa. The family soon relocated to Pretoria, South Africa, where she started her schooling at Pierneef primary school in 1988. She completed her primary school education at Villieria primary school in 1994. In 1995 Annalize started at Oos-Moot high school, but within a couple of months the family relocated to Kuala Lumpur in Malaysia. Here she attended the International School of Kuala Lumpur until the family's return to Pretoria in the end of 1997. Annalize matriculated in December 1999 from the Hendrik Verwoerd high school in Pretoria.

In 2003 Annalize obtained a BSc in Architecture from the University of Pretoria and in 2005 she received a Masters of Architecture (professional) from the same institution. Her master's thesis explored the use of architecture in the building and supporting of communities in a previously disadvantaged neighbourhood of Mamelodi, South Africa. Annalize began her professional career at the end of 2004 at DSA Architects International in Dubai, the United Arab Emirates, where she was employed until the start of 2010. During this period she was involved in the design of numerous hotel and multi-use developments as well as technical documentation and site inspection. The practical experience gained in architectural design and construction provided important insights and skills for her later study of classical archaeology. At this time, Annalize also pursued her interest in archaeology by starting a BA degree in ancient civilizations through the University of South Africa, which specializes in long distance learning. In 2010 she completed this degree and moved to Leiden in the Netherlands to begin a master's degree in archaeology at the University of Leiden. Annalize obtained her master's degree in 2011; her thesis investigated the architect of the Domus Augustana on the Palatine hill in Rome under the supervision of Prof. Sojc.

At the end of 2012, Annalize began her PhD research at Leiden University. During this period she was also involved in a number of archaeological projects. Between 2011 and 2014 she participated in a project led by Prof. Sojc on the chthonic sanctuaries of Akragas, which started by investigating votive objects in the collections of the Regional Archaeology Museum "Pietro Griffo" of Agrigento and then developed into an excavation at the extra urban sanctuary of S. Anna. Annalize has worked from 2012 until the present as the project architect for the excavation of a late Roman synagogue at Horvat Kur in Israel, as part of the Kinneret Regional Project that is directed by Prof. Zangenberg. From the end of 2014 until the present Annalize moved to the University of Augsburg as a guest researcher, where she has taught numerous courses on the architecture and archaeology of Greek and Roman cities as well as on the use of computer applications in archaeology. She also works on a project led by Prof. Sojc that aims to investigate the Roman city of Augsburg by building a geographic information system based on data obtained through rescue excavations by the city archaeology department of Augsburg. This project is ongoing and provides exciting prospects for future research.

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"*Carefully directed ignorance is the key to all knowledge.*"

Terry Pratchett

The words of Sir Terry Pratchett, which first appeared in the 2005 edition of the Times Higher Education Supplement, best describe the manner in which this work came into being. A depth of gratitude is owed to a number of persons for providing the knowledge, encouragement, and insight that supported this process. Chief among these is my supervisor, Natascha Sojc, whose project in Akragas gave this work a firm foundation on which to grow. Her discerning eye and astute insights saw direction and potential despite the befuddled disorder of this project's first steps. In addition, she has provided me with the opportunity and support for additional academic growth in areas including teaching, fieldwork, and digital archaeology. Thanks go also to Dennis Braekmans, my co-supervisor, for the motivation and guidance in the hitherto unexplored world of archaeometry. Clemens Voigts generously shared some of his expertise on Greek architecture in Sicily, and his support and advice is much appreciated.

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This work is based on the first hand observation and analysis of material housed in different institutions in Sicily. This was made possible by travel grants from the Leiden University Fund and the graduate school of Augsburg University respectively. I am also very grateful to Armida De Miro, Gabriella Costantino and Gioconda Lamagna, who served as directors of the Regional Archaeology Museum "Pietro Griffo" of Agrigento during my time of study, and Tommaso Guagliardo and Carla Guzzone from the operations unit 2. The advice and assistance provided by Donatella Mangione during numerous study seasons is deeply appreciated. I also wish to thank the director of the Regional Archaeology Museum "Antonio Salinas" of Palermo, Spatafora Francesca, and members of staff Costanza Polizzi, Alessandra Merra and Sandra Ravituso, who provided kind assistance during my study there. I am grateful to the director of the Archaeological Park of the valley of the temples at Agrigento, Giuseppe Parello, as well as Maria Concetta Parello for enabling and supporting research within the sanctuaries of Akragas. The following students from Leiden University provided assistance in documenting and photographing objects housed in the regional archaeological museum in Agrigento during research campaigns between 2012 and 2013; Diederik Bredero, Abel Bosman, Iris Kramer, Denis Janssen, Ischa Schepers, Erik Kroon and Charlotte Spiering. From the University of Augsburg, Thomas Dworschak and Antonia Hoffmann assisted during the study campaign of 2014.

Lastly, a heartfelt word of thanks to my friends and family. To my academic family, which includes colleagues from the University of Augsburg and the Kinneret regional project, I will be forever grateful for their support and inspiration. To the friends who have become my expatriate family in the Netherlands and Germany I offer my deep thanks for their company and care. I am grateful to Sarina Prinsloo and Marlize Odendaal for the decades of friendship. To my paranimfs, Lisa Götz and Marike van Aerde, I extend my thanks for accompanying me on this journey through times of tribulation and triumph. I thank my extended family for being an accepting and grounding presence in my life. My brother and sisters were always willing accomplices and called shenanigans when necessary. But above all I wish to thank my parents for their unwavering support, wisdom and encouragement. They continue to inspire me with their work ethic, thirst for knowledge, and sense of adventure.

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
136	AG 9594 / AG 8862	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of relief with a lotus flower and two leaves of a palmette. Finished top edge on palmette bud preserved		Frieze G	Fabric F	HH-XRF	Roof 7 series B		Gabrici	1922	Naiskos East of Temple B	
137	AG 9595 AG 8864	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of perforated relief with standing palmette and lotus flower on top of volute with central eye painted with a star. Finished side edge, clear vertical cut through symmetrical point in pattern. Small section of volute broken on side elevation, painted black.	painted surface sealed with clear varnish	Frieze G	Fabric F	HH-XRF	Roof 7 series B		Gabrici	1922	Naiskos East of Temple B	Fill to the SE of temple B (barletta)
138	AG 9589 AG 8858	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of perforated sima with 7 leaf standing palmette growing out of double volutes. 3 petal hanging palmette below missing lotus flower. Profile has slight curve	two fragments glued together	Frieze G	Fabric F	HH-XRF	Roof 7 series B		Gabrici	1922	Naiskos East of Temple B	
139	AG 9596 AG 8865	Arch. M. Agrigento	Roof Terracotta	Horizontal Sima	Fragment of shallow relief with lotus flower and portion of palmette. Straight edge on top preserved.	painted surface sealed with clear glaze	Frieze G	Fabric G	HH-XRF	Roof 7 series A		Gábrici	1922	Naiskos East of Temple B	
140	AG 9600 AG 8889	Arch. M. Agrigento	Roof Terracotta	Horizontal Sima	Fragment with roll, fascia and Ionian kymation in relief.	painted surface sealed with clear glaze	Frieze H1	Fabric F		Roof 7 series D		Gábrici	1922	Naiskos East of Temple B	
141	AG 9599 AG 8868	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment with Top edge, roll, fascia, Ionian kymation in relief and beginning of cavetto.	painted surface sealed with clear glaze	Frieze H1	Fabric F		Roof 7 series D		Gábrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
142	AG 9588 AG 8857	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment with double roll and fascia, portion of top edge preserved		Sima B	Fabric G			Fragment has no parallel to known fragments from Akragas. Not enough of the profile is preserved in order to determine if this object belongs to a specific roof	Gabrici	1922	Naiskos East of Temple B	
143	AG 9506	Arch. M. Agrigento	Roof Terracotta	Geison	Hanging bead and reel, with a roll on the fascia and soffit side. Not enough of fragment remaining for accurate reconstruction but mouldings probably from bottom corner of geison.		Frieze H	Fabric G		Roof 7 series A		Gabrici	1922	Naiskos East of Temple B	
144	AG 9587	Arch. M. Agrigento	Roof Terracotta	Geison	Doric leaves in relief forming a cavetto, roll and portion of fascia of a geison. Top edge preserved. Doric leave alternating between wide and thin leaves. Finished right edge preserved.	Five fragments glued together, clear glaze	Frieze G	Fabric F		Roof 7 series D		Gabrici	1922	Temple B	Fill to the SE of temple of Zeus
145	AG 6083	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of a perforated sima with 5 leaved standing palmette on top of double volute. Finished top edge of palmette and top of volutes preserved.	painted surface with only a part sealed with a glaze	Frieze F	Fabric E	HH-XRF	Roof 6		Marconi	1969	Temple A	In Cistern north of Temple A
146	AG 6084	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of perforated sima with 5 leaved hanging palmette growing from volutes. Finished side edges of palmette leaves preserved.	painted surface, unsure of glaze	Frieze F	Fabric A	HH-XRF	Roof 6		Marconi	1969	Temple A	In Cistern north of Temple A

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
147	S 25	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of a perforated sima with 5 leaved standing palmette on top of double volute. Finished top edge of palmette and top of volutes preserved.	Fragment fairly eroded. Evidence of previous museum mounting on back including drilled hole	Frieze F		HH-XRF	Roof 6	No clean fracture available for fabric analysis	Marconi		Temple A	
148	AG 6083 bis	Arch. M. Agrigento	Roof Teracotta	Lateral Sima	Fragment of a perforated sima with 5 leaved standing palmette on top of double volute. Finished top edge of palmette and top of volutes preserved.		Frieze F	Fabric E	HH-XRF	Roof 6		Marconi	1969	Temple A	In Cistern north of Temple A
162	AG 2605	Arch. M. Agrigento	Roof Teracotta	Antifix	Fragment of Gorgonaion antefix showing the hair in three rows of spiral curls		Antefix F	Fabric B			Not enough of original antefix is preserved in order to determine the overall characteristics and assign to a particular roof	De Miro	1958	Area South of Temple b	between building and grand pool
166	AG 9590 AG 8850	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of perforated sima with a 7 leave standing palmette Finished edges of perforations between palmette and missing lotus leaves preserved. Small portion of lotus leave on 3rd leave from left.	there is a stripe of varnish on the surface of the right leaf	Frieze G	Fabric F	HH-XRF	Roof 7 series B		Gábrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
167	AG 9592 AG 8861	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with volute and standing palmette with on the left side the preserved side edge. Portion of hanging flower preserved. At the bottom of the volute, you see trimming with a knife, in section.		Frieze G	Fabric F	HH-XRF	Roof 7 series C		Gábrici	1922	Naiskos East of Temple B	
168	AG 9591 AG 8860	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of a perforated sima. Palmette with half a lotus flower. Preserved side edge through middle of the lotus flower.		Frieze G	Fabric F	HH-XRF	Roof 7 series B		Gábrici	1922	Naiskos East of Temple B	
169	AG 9597 AG 8866	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	fragment of perforated relief of a lotus flower, the sides of the petals and the top of the bulb are finished edges, showing traces of paint.	a clear glaze applied to moulded surfaces	Frieze G	Fabric G	HH-XRF	Roof 7 series A		Gábrici	1922	Naiskos East of Temple B	
174	AG 8605	Arch. M. Agrigento	Acroteria	Horserider	Fragment with hair and the base of the ear		Acroterio n			Roof 2	Fabric group not assigned due to lack of fabric information		1962	Temple B	Between the wall and the reccia wall
175	AG 8604	Arch. M. Agrigento	Acroteria	Horserider	Fragment of hair, defined as shallow beads in a row		Acroterio n			Roof 2	Fabric group not assigned due to lack of fabric information		1962	Temple B	Between the wall and the reccia wall

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
176	AG 6079	Arch. M. Agrigento	Roof Terracotta	Antifix	Fragment of an antefix depicting a horned and bearded male figure looking slightly to the left. Face has a pronounced nose, bulging eyes, beard, and possibly horns. In back the lower half is finished. The top half has a broken edge, possibly from a cover tile.	broken fragments at base glued in. Gypsum fixing in the back for museum display	Antefix J			Antefix Type 6		Marconi	1969	Temple A	Trench near Temple
177	S 23	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Bottom half of anthemion pattern with lyre shaped leaves and hanging palmettes. Portion of horizontal tile preserved with painted decoration of the soffit. Perforations on both sides of lyre shaped leaves also painted.	painted surface sealed with clear glaze	Frieze F	Fabric E	HH-XRF	Roof 6		Marconi		Temple A	at base of south hill, opposite temple A
178	S 24	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of a palmette	painted surface sealed with clear glaze, glue residue from a stand. Hole in the back, looks relatively new, perhaps put in for restoration.	Frieze F	Fabric E	HH-XRF	Roof 6		Marconi		Temple A	at base of south hill opposite temple A
179	AG 9593	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of a palmette with a volute.		Frieze G	Fabric F	HH-XRF	Roof 7 series C		Gábrici	1922	Naiskos East of Temple B	
180	AG 9601 (AG 8870)	Arch. M. Agrigento	Roof Terracotta	Ridge Tile Antefix	possibly a fragment of a rosette antefix		Ridge Tile Antefix A			Ridge tile antefix type 1	Not enough information available for assigning fabric group	Gábrici	1922	Naiskos East of Temple B	in fill layer

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
181	AG 9598	Arch. M. Agrigento	Roof Terracotta	Sima	fragment of a volute, only a small part on the left side of the volute has a finished edge.		Frieze G	Fabric G	HH-XRF	Roof 7 series A		Gábrici	1922	Naiskos East of Temple B	
182	AG 6082	Arch. M. Agrigento	Unknown		Fragment with finished top roll and edge. Curving doric leaves and bead and reel with small portion of fascia preserved	painted surface sealed with clear glaze	Frieze I				Object likely from a sarcophagus. Therefore not included in subsequent analysis.	Marconi	1969	Temple A	Trench near Temple
183	AG 9585	Arch. M. Agrigento	Roof Terracotta	Lateral Geison	Fragment of geison, with top and left edge preserved. Standing doric leaves with portion of guilloche	two fragments glued together and painted surface sealed with a clear glaze	Frieze G	Fabric G	HH-XRF	Roof 7 series A		Gábrici	1922	Naiskos East of Temple B	
184	AG 9586	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of geison, with top and left edge preserved. Standing doric leaves with portion of guilloche	6 Fragments glued together with portion filled in. Painted surface sealed. Vertical grooves and glue remains from previous mounting	Frieze G	Fabric G	HH-XRF	Roof 7 series A		Gabrici	1922	Temple B	Fill to the SE of temple
195	AG 2184 bis	Arch. M. Agrigento	Roof Terracotta	Geison	Preserved double roll and soffit plaque.	The painted decoration is not well preserved	Frieze D	Fabric B		Roof 2					
196	AG 2184 ter	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of corner piece of sima with waterspout. Bottom edge preserved	Fragments glued together	Frieze D	Fabric B		Roof 2		De Miro	1962	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
197	AG 9508	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of horizontal plaque with bead-and-reel at bottom. Painted decoration on fascia and bottom edge have been defined by pencil.	Paint pattern outlined in pencil	Eaves Tile B				With an epidermis and non volcanic inclusions this object does not fit with any fabric groups. Not enough information to assign to a roof.			Sanctuary at S. Nicola	
198	AG 8588 a	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of a roll with a finished top edge		Frieze C	Fabric B		Roof 3		De Miro	1962	Naiskos East of Temple B	
199	AG 8588 b	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of a double roll and fascia. Top roll is the topmost finished edge with paint on 3 sides	Glaze on the double roll	Frieze C	Fabric B		Roof 3		De Miro	1962	Naiskos East of Temple B	
200	AG 8601	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of roll and fascia		Frieze C	Fabric B		Roof 3		De Miro	1962	Naiskos East of Temple B	Fill layer outside of naiskos
201	AG 8600	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of fascia, original edge on right side.		Frieze C	Fabric B		Roof 3		De Miro	1962	Naiskos East of Temple B	Fill layer around naiskos
222	AG 8599	Arch. M. Agrigento	Roof Terracotta	Ridge tile	Fragment of ridge tile band with flange. The bottom edge of the band is preserved, but not the flange edge, the flange seems to have continued past the large roll		Ridge Tile E	Fabric B						Naiskos East of Temple B	
223	AG 2185 ter	Arch. M. Agrigento	Roof Terracotta	Ridge tile	Fragment of ridge tile band. The flange and band is preserved. The main body of the tile is not.		Ridge Tile F	Fabric B			Not enough information to assign to a roof	De Miro	1958	Area South of Temple b	from grand pool

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
224	AG 9605	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of sima with fragment of fascia, roll and downwards curving cavetto with doric leave painted. Portion of horizontal base preserved. With sloping corner on back		Frieze E	Fabric E		Roof 6		Gábrici	1922	Naiskos East of Temple B	
225	AG 2184 a -b	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of fascia with roll	Two fragments glued	Sima A	Fabric B			Not enough information available to assign to a roof	De Miro	1958	Area South of Temple b	From the big pool
226	AG 2575	Arch. M. Agrigento	Roof Terracotta	Ridge Tile Antefix	Fragment of large Gorgonaion ridge tile antefix. Hair is in two rows of curls. Laugh lines around the eye. Large, forward facing ear. Bottom edge, from chin to ear is preserved. Portion of ridge tile preserved on the side. Finished edge of ridge tile preserved, ends against the antefix just below the ear.	Three fragments glued together	Ridge Tile Antefix B	Fabric B		Ridge tile antefix type 2	Not enough information available to assign to a roof	De Miro	1958	Area South of Temple b	inside and outside the dell'edifici o a camerone
243	AG 1228	Arch. M. Agrigento	Mould	Antifix	Fragment of a Gorgonaion mould with ear, part of the eye and hair visible. The edge of the mould around the hair is original	Clear glaze applied to all surfaces, hole drilled in bottom for museum mounting		Fabric G			Mould has strong similarities with VIN244. But there are some discrepancies including the shape of the eye and the position of the eyebrow				

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
244	AG 1265	Arch. M. Agrigento	Plaque		Fragment of gorgonian plaque with complete right ear, eye and three spiral hair locks. The eye is bulging, the eyebrow large and prominent and the ear rather small and facing forward.	Hole drilled in bottom for museum mounting	Plague				Identification as architectural terracotta not certain	De Miro	1953	Sanctuary at Gate V	Sanctuary area
245	AG 1264	Arch. M. Agrigento	Roof Terracotta	Antifix	Fragment of bearded gorgonaion antefix. The hair are in spiral curls around the face and extend towards the back along the cover tile. Bulging eyes with painted eyebrows. The ears are small and faces forward. Rounded cheeks and chin. Small red tongue. The frown lines painted on forehead. The entire antefix plaque is preserved	Clear glaze applied to all surfaces, hole drilled in the back and white gypsum residue from previous display.	Antefix H	Fabric B		Antefix Type 5		De Miro	1953	Sanctuary at Gate V	Sanctuary area
246	C 349	Arch. M. Agrigento	Roof Terracotta	Antifix	Fragment of bearded gorgonaion antefix. The hair are in spiral curls around the face and extend towards the back along the cover tile. Bulging eyes with painted eyebrows. The ears are small and faces forward. Rounded cheeks and chin. Small tongue. The frown lines painted on forehead. The bottom edge with the beard is not preserved	The surface is quite eroded with most of the hair gone.	Antefix H	Fabric B		Antefix Type 5		pre-1920's			

Appendix A: General Information

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253	S 2000	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with portions of two waterspout holes preserved. Bottom edge with small portion of horizontal section preserved. Paint on underside, extending slightly further than bottom roll.		Frieze A	Fabric A	HH-XRF	Roof 1		Marconi	1929	Naiskos inside Temple G	
254	S 2021	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of double roll with possible top edge		Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
255	S 1999	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with portion of waterspout.	possible clear glaze on painted surface, but not entire roll	Frieze A	Fabric A	HH-XRF	Roof 1		Marconi	1929	Naiskos inside Temple G	
256	S 2004	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with fascia, roll and evidence of waterspout		Frieze A	Fabric A	HH-XRF	Roof 1		Marconi	1929	Naiskos inside Temple G	
257	S 2001	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with spout and complete bottom edge and left edge with stepped joint		Frieze A	Fabric A	HH-XRF	Roof 1		Marconi	1929	Naiskos inside Temple G	
258	S 2055	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of geison with fascia and double roll. The last roll hangs. The geison soffit is painted and original back edge is preserved	encrustations on back and fragment edges	Frieze A	Fabric A	HH-XRF	Roof 1		Marconi	1929	Naiskos inside Temple G	
259	S 2057	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of geison with bottom edge of fascia and double roll. The last roll hangs. The geison soffit is painted and original back edge is preserved	encrustations on back	Frieze A	Fabric A	HH-XRF	Roof 1		Marconi	1929	Naiskos inside Temple G	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
260	S 1996	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with spout and portion of original bottom edge and right edge with stepped joint	encrustations on all surfaces with some breaks due to modern damage	Frieze A	Fabric A	HH-XRF	Roof 1		Marconi	1929	Naiskos inside Temple G	
261	S 1997	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with original left edge and portion of bottom edge. Small portion of waterspout hole preserved	encrustations on all surfaces with some breaks due to modern damage	Frieze A	Fabric A	HH-XRF	Roof 1		Marconi	1929	Naiskos inside Temple G	
262	S 2054	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of geison with fascia and double roll. The last roll hangs. The geison soffit is painted and original back edge is preserved	encrustations on all surfaces with some breaks due to modern damage	Frieze A	Fabric A	HH-XRF	Roof 1		Marconi	1929	Naiskos inside Temple G	
263	S 2056	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of geison with fascia and double roll. The last roll hangs. The geison soffit is painted and original back edge is preserved	encrustations on all surfaces with some breaks due to modern damage	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
264	S 2058	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of geison soffit with original back edge.		Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
265	S 1995	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with waterspout and original right edge complete with stepped joint	possible clear glaze on painted surface	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
266	S 2053	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of geison with bottom edge of fascia and double roll. The geison soffit is painted and original back edge is preserved	encrustations on all surfaces with some breaks due to modern damage	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
267	S 1994	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with waterspout and original right edge complete with stepped joint	encrustations on all surfaces with some breaks due to modern damage	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
276	S 2035-2043	Arch. M. Agrigento	Roof Terracotta	Horizontal Geison	Reconstructed Geison Piece with single roll on top, double guilloche pattern and double roll at bottom. The fragments used include pieces with finished edges for both sides as well as the soffit plague.	Plaster infill painted light beige. There are traces of dark glue on the back and some of the beige paint is smeared along the edges of the painted front pieces. There is a rough layer of cement smeared across the whole of the vertical plaque on the back. Thin layer of clear varnish on painted surfaces.	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
277	S 2011	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of sima cavetto		Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
278	S 2005	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of sima cavetto, portion of the righthandside step joint preserved	Colour difference due to handling on the edge of the pained surface	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
279	S 2020	Arch. M. Agrigento	Roof Terracotta	Sima	fragment of top edge of sima with double roll, top edge preserved, part of the fascia visible	The fragment is rather eroded with no clean fractures visible	Sima C				No clean breaks are visible for fabric observation. Due to find location and small size of object it is not possible to assign it to an existing roof.	Marconi	1927	Urban Sanctuary	
280	S 2014	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of top edge sima with double roll, fascia and beginning of cavetto.	Some encrustations, especially of fractured edges. Colour difference due to handling on the edge of the pained surface	Frieze A			Roof 1	Not able to observe fabric on a clean break	Marconi	1929	Naiskos inside Temple G	
281	S 2016	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of the fascia and cavetto	Colour difference due to handling on the edge of the pained surface	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
282	S 2012	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of cavetto and small piece of fascia, portion of the lefthandside step joint preserved		Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
283	S 2018	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of sima, double roll, fascia and small piece of cavetto. Top edge preserved. Portion of the lefthandside step joint preserved.	Painted surface fairly eroded with some encrustations. Some clean breaks due to modern damage	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
284	S 2006	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of cavetto		Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
285	S 2002	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima, cavetto and single roll. Portion of the righthandside step joint preserved. The top edge of the waterspout hole is visible, and you can see on the surface where the waterspout base used to have been fitted on. And a small piece of the waterspout hole.		Frieze A			Roof 1		Marconi	1929	Naiskos inside Temple G	
286	S 2013	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of sima, double roll, fascia, cavetto. Preserved part of top edge, righthandside part of step joint visible.	Two fragments glued together	Frieze A	Fabric A		Roof 1		Marconi	1929		
287	S 2032	Arch. M. Agrigento	Roof Terracotta	Waterspout	fragment of a waterspout disk with rosette decoration with a visible outer edge		Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
288	S 2033	Arch. M. Agrigento	Roof Terracotta	Waterspout	painted fragment of a waterspout disk with a visible outer edge. Decoration of flower with pointed petals	possible varnish on the painted surface	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
289	S 2031	Arch. M. Agrigento	Roof Terracotta	Waterspout	painted fragment of a waterspout disk with a visible outer edge. Decoration of flower petals.	possible gloss on the painted surface	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
290	S 2030	Arch. M. Agrigento	Roof Terracotta	Waterspout	painted fragment of a waterspout disk with a visible outer edge. Decoration of flower petals.		Frieze A			Roof 1	Fragment falls outside main fabric groups due to fabric colour. Closest to Fabric group A, but the colour is to pale. This can be due to different firing conditions or an observation error	Marconi	1929	Naiskos inside Temple G	
291	S 2034	Arch. M. Agrigento	Roof Terracotta	Waterspout	painted fragment of a waterspout disk with a visible outer edge. Decoration of flower with pointed petals.		Frieze A	Fabric E		Roof 1	Fragment does not fall in same fabric group as other objects from the same roof due to the fabric colour. This can be due to different firing conditions or an observation error	Marconi	1929	Naiskos inside Temple G	
292	S 2029	Arch. M. Agrigento	Roof Terracotta	Waterspout	waterspout with part of decorated disk	possible glaze on the painted surfaces	Frieze A			Roof 1	Fragment falls outside main fabric groups due to fabric colour. Closest to Fabric group A, but the colour is to pale. This can be due to different firing conditions or an observation error	Marconi	1929	Naiskos inside Temple G	
293	S 2028	Arch. M. Agrigento	Roof Terracotta	Waterspout	waterspout with part of disk, decorated with radial lines and blocks	possible glaze on painted surface	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
294	S 2003	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of sima with cavetto, roll and top edge of waterspout preserved	Clear varnish added to painted surface. Red paint on back at top edge much different in colour from painted decoration, fractures and unpainted surfaces mostly covered in encrustation	Frieze A			Roof 1	Not possible to observe fabric on a clean break	Marconi	1929	Naiskos inside Temple G	
295	S 2052	Arch. M. Agrigento	Roof Terracotta	Geison	Fragment of sima with preserved soffit, double roll and portion of facia	Clear varnish applied to painted surfaces, very thick and discoloured on underside of soffit	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
296	S 2025	Arch. M. Agrigento	Roof Terracotta	Raking Sima	Fragment of sima with bottom edge of cavetto, roll and facia. The decoration on the facia is different from the other sima fragments in this group	Clear varnish applied to painted surface. Faint traces of writing, possibly from excavation on back. Some surfaces very eroded	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
297	S 2022	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with cavetto, roll and facia with top edge of waterspout hole visible and right edge with fragment of stepped joint preserved		Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
298	S 1998	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with roll, fascia and top edge of waterspout hole. Right stepped joint preserved	Clear varnish added to painted surface. Some heavy encrustations	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
299	S 2017	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of sima with double roll, facia and cavetto. with top and left edge preserved	encrustations on most surfaces but some clean breaks due to modern damage	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
331	S 2059	Arch. M. Agrigento	Roof Terracotta	Raking Geison	Geison fragment with portion of top ledge, roll and facia. Possible from contracted horizontal geison since the guilloche pattern is decreasing in size and the position of the central eyes moves downward	Varnish added to painted surfaces discoloured	Frieze A	Fabric A		Roof 1		Marconi	1929	Naiskos inside Temple G	
332	AG 6081	Arch. M. Agrigento	Roof Terracotta	Antifix	Gogonaion antefix with complete edge from chin, around left ear to just above right ear.	White gypsum knob fixed to back for display stand	Antefix D			Antefix Type 3	Not possible to assign a fabric group because the original finish is not known	Marconi		Temple A	
333	AG 9601 bis	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of sima with roll, checkerboard pattern on facia and cavetto. Top edge is preserved	Clear varnish applied to painted surface is decolouring	Frieze B6	Fabric F		Roof 5					
334	NI 20536	Arch. M. Agrigento	Roof Terracotta	Lion Headed waterspout	Fragment of lion spout with mane and left ear and some painted decoration on front visible		Lion Head Waterspout	Fabric B		Roof 6				Temple A	Cistern

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
348	C 348	Arch. M. Agrigento	Roof Terracotta	Antifix	Fragment of gorgonaion antefix with two eyes, nose and portion of ear and hair on left visible. The left edge is complete.	Hole drilled in the back and bottom as well as rests of glue on back from previous mounting. Front surface has soft, sandy, appearance - likely due to weathering.	Antefix E	Fabric G		Antefix Type 4		pre-1920's			
349	S 2069	Arch. M. Agrigento	Roof Terracotta	Horizontal Sima	Fragment of sima with lower fascia, roll and portion of upper fascia. The bottom edge is preserved. Possibly from gable since there are not waterspouts, only string of flowers	Clear glaze added to painted surface. Portion of paper glued to bottom.	Frieze B2			Roof 3	Fabric does not fall within main fabric groups due to fabric colour, temper and use of a slip	pre-1920's			
350	S 2072	Arch. M. Agrigento	Roof Terracotta	Geison	Portion of geison with preserved double roll and soffit fascia with preserved back edge.	Plexiglas stand is fixed to the back of the soffit fascia with epoxy glue. Fragment is quite weathered with almost no traces of paint and heavy encrustations on surface	Geison A	Fabric A			The object comes from unclear provenance. The profile dimensions are similar to frieze A or frieze D. While it has the same fabric as frieze A, it is housed separately in the museum.	pre-1920's			
351	S 2068	Arch. M. Agrigento	Roof Terracotta	Lateral Geison	fragment of geison with top edge and roll preserved	Clear glaze to painted surfaces. Significant encrustations	Frieze B1	Fabric B		Roof 3		pre-1920's			
352	S 2023	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of sima with top fascia and cavetto	heavy encrustations on surface	Frieze B4			Roof 2	Not enough of fabric visible for observation	pre-1920's			

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
353	AG 9504	Arch. M. Agrigento	Roof Terracotta	Sima	Fragment of sima with stepped joint on left side and small section of top preserved. There is a painted pattern in black on the back side and black paint on top and joint	Two fragments glued together	Frieze B5			Roof 3	Object falls outside main fabric groups due to colour, temper and the use of a thin slip				
354	S 2044-2051	Arch. M. Agrigento	Roof Terracotta	Lateral Geison	8 fragments restored into a complete geison. The fragments might not all have come from the same original piece, some appear to be by a different hand when comparing the painting and size of central disks The geison consists of roll, fascia with double guilloche, double roll and soffit. The edge of the soffit is complete and one fragment in top left corner has finished edge.	The infill appears to be painted plaster. A clear glaze is added to the painted surfaces. The back is completely covered in plaster	Frieze A			Roof 1	Due to the restoration none of the fractures are available for fabric observation.	Marconi	1928	Naiskos inside Temple G	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
355	S 1992-1993	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Restored sima consisting of two fragments. The middle roll is basically complete with finished edges on both sides, and the left side waterspout hole is complete.	Two fragments, one in two and one in three pieces that are glued together with painted plaster infill. Traces of paint or plaster sometimes on fragment surface at joint. Clear glaze added to painted surfaces. The base is completely reconstructed. Some surfaces are badly damaged with gauges and encrustations	Frieze A			Roof 1	Due to the restoration none of the fractures are available for fabric observation.	Marconi	1928	Naiskos inside Temple G	
356	AG 8939	Arch. M. Agrigento	Roof Terracotta	Antifix	Gorgonaion Antefix with right eye, ear portion of mouth and two rows of bead like hair remaining. The right edge is complete	Encrustation on all surfaces	Antefix C			Antefix type 1	Due to fabric colour, temper and finish the object does not fall in the major fabric groups	Fiorentini	1965	St Anna	found next to eastern wall
357	AG SA 12394	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Fragment of ridge tile with thick black lines						Not enough of the profile is preserved in order to assign it to a stylistic group. Due to the yellow fabric colour this object does not fall within the main fabric groups	Fiorentini	1965	St Anna	
358	AG 9584	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Portion of sima with waterspout. Complete left edge with stepped joint	heavy encrustation on all surfaces as well as significant weathering	Frieze B3	Fabric A		Roof 4		Frorintini	1965	St Anna	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
359	S 44	Arch. M. Agrigento	Unknown	Unknown	Fragment of bead and reel with one and a half beads. The half bead has a finished side edge and bottom edge is smoothed in 10mm strip on back	some encrustations	Bead and Reel	Fabric B			Not possible to determine the type of architectural terracotta or the roof it belonged to based on the limited information	Marconi	1927	Urban Sanctuary	
360	S 45	Arch. M. Agrigento	Unknown	Unknown	Fragment of bead and reel. Bottom edge of relief finished	Surface is rather weathered with slight encrustations on fractured edges.	Bead and reel				Not possible to determine the type of architectural terracotta or the roof it belonged to based on the limited information Not enough of the fabric is visible for fabric observation	Marconi	1927	Urban Sanctuary	
361	S 46	Arch. M. Agrigento	Roof Terracotta	Waterspout	Almost complete waterspout with vertical rolls in varying sizes and spaced apart at different lengths. There are three holes near rim, two close together and one on the opposite side	Slight encrustations	Waterspo ut	Fabric H			This waterspout does not fit with any of the known stylistic and roof groups. It is possible that it is not part of a roof at all.	Marconi	1927	Urban Sanctuary	
362	S 47	Arch. M. Agrigento	Roof Terracotta	Antifix	Fragment of gorgon antefix with portion of nose and tongue visible. Most of right cheek with protruding canine teeth. Bottom edge of chin preserved	Most surfaces are rather weathered, some clean breaks visible	Antefix G				Since the object has grog and an epidermis it does not fall within the major fabric groups. There is not enough preserved to conclusively identify this fragment with a roof	Marconi	1927	Urban Sanctuary	

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
363	S 48	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of standing palmette with relief on front and back. Top edge preserved	Surface rather weathered. Two holes at bottom, possibly from previous mounting. Traces of what appears to be gypsum around holes.	Palmette B	Fabric C		Ridge tile palmette type 2		Marconi	1927	Urban Sanctuary	
364	S 49	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Remains of standing palmette with relief on back and front sides. Thin, pointed leaves with two leaves with complete edges remaining	Surfaces very weathered, not possible to determine presence of paint or slip layer. Hole at bottom edge from previous museum mounting.	Palmette E				Due to the weathered nature of the surface it is not possible to determine the surface finish and therefore it cannot be placed in a fabric group. There is not enough of the object preserved in order to determine what type of architectural terracotta it is, since it has parallels with acroteria as well. Therefore it cannot be assigned to a roof	Marconi	1927	Urban Sanctuary	
365	S 50	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of standing palmette with wavy leaves. Front and back in relief, portion of side edge preserved	Hole in bottom edge from previous mounting in museum	Palmette C	Fabric D		Ridge tile palmette type 4		Marconi	1932	Urban Sanctuary	Temple L

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
366	S 169	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of standing palmette with single volute visible. Possibly two petals from three leaved small hanging palmette visible at bottom. Back and front face in relief	One side is very damaged	Palmette D	Fabric D		Ridge tile palmette type 4		Marconi	1932	Urban Sanctuary	Temple L
367	S 2076	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of large standing palmette with both sides in relief. Large rounded leaves alternating with thin leaves with sharper points. Top finished edge mostly preserved	object not very clean	Palmette B	Fabric C		Ridge tile palmette type 2		Marconi	1927	Urban Sanctuary	
368	S 2077	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of large standing palmette with back and front in relief. Consists of large rounded leaves alternating with thin sharp pointed leaves with pronounced ridge. Top edge of large leave preserved	Object not very clean	Palmette B	Fabric C		Ridge tile palmette type 2		Marconi	1927	Urban Sanctuary	
369	S 2078	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of large standing palmette with back and front in relief. Consists of large rounded leaves alternating with thin sharp pointed leaves with pronounced ridge. Partial top edge of large leave preserved	Object very dirty and damaged	Palmette B	Fabric C		Ridge tile palmette type 2		Marconi	1927	Urban Sanctuary	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
370	AG 9512	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of standing palmette with wavy leaves. Both back and front is in relief. The leaves are convex shaped. Portion of top edge preserved.		Palmette C	Fabric D		Ridge tile palmette type 4		De Miro	1953	Sanctuary at Gate V	Sanctuary area
371	AG 8977	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of standing palmette with wavy leaves. Central bud visible. Portion of side edge remaining.	Possible traces of red pen writing on one side, possibly from excavation	Palmette C			Ridge tile palmette type 4	The finishing layer is not preserved. Since it is not possible to determine the presence of a slip or paint layer a fabric group cannot be assigned	De Miro	1953	Urban Sanctuary	Fortification walls
372	20394	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of large standing palmette with round leaves alternating with thin, sharp pointed leaves with pronounced ridge. Portion of side edge preserved.	Remains of writing with red ink from excavation	Palmette B	Fabric C		Ridge tile palmette type 2		De Miro	1953	Urban Sanctuary	area B
373	20395	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of standing palmette with round leaves alternating with thin, sharp pointed leaves with pronounced ridge. Portion of top edge preserved.	Very dirty with remains of writing in red letters from excavation	Palmette B			Ridge tile palmette type 3	Not enough of the fabric is visible for observation and therefore a fabric group cannot be determined	De Miro	1953	Urban Sanctuary	Fortification walls

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
374	AG 8978	Arch. M. Agrigento	Roof Terracotta	Unknown	Fragment of 5 leave palmette and volute with painted star in eye. Finished right edge and opening between two volutes	Fractured edges very dirty	Palmette G				Because the object has an epidermis and grog for temper it does not fit within the main fabric groups. Based on current knowledge it also cannot be attributed to any roof type	De Miro		Urban Sanctuary	
375	S 2079	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of volutes from a standing palmette with decoration in relief on both front and back side. Volutes with spherical central eye. Small hanging bud between. And portion of standing palmette with beginnings of leaves and centre point.	Object is dirty and there are traces of glue on the backside relief	Palmette D			Ridge tile palmette type 2	Not enough of fabric visible for observation.	Marconi	1927	Urban Sanctuary	
376	S 2083	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of volute with curved stems. Side and top edge of volute and stems preserved. Only one half, other side of relief missing	Dirty with traces of glue on back	Palmette D			Ridge tile palmette type 2	Not enough of fabric visible for observation.	Marconi	1927	Urban Sanctuary	
377	S 2084	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of volute with curved stems. Side and top edge of volute and stems preserved. Both front and back decoration are in relief	Very dirty with glue on back	Palmette D			Ridge tile palmette type 2	Not enough of fabric visible for observation.	Marconi	1927	Urban Sanctuary	
378	S 2088	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of standing palmette with wavy leaves and small buds in between the tips of the leaves. Only one half, second half in relief missing	Object not clean. Fixed to Plexiglas stand with glue	Palmette C			Ridge tile palmette type 4	Not enough of fabric visible for observation.	Marconi	1927	Urban Sanctuary	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
379	S 2089	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of standing palmette with wavy leaves and small buds in between the tips of the leaves. Only one half, second half in relief missing	Object very dirty and fixed to Plexiglas stand with glue	Palmette C			Ridge tile palmette type 4	Not enough of fabric visible for observation to assign to a fabric group	Marconi	1927	Urban Sanctuary	
380	S 2090	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of standing palmette with wavy leaves and small buds in between the tips of the leaves. Only one half, second half in relief missing	Object not clean. Fixed to Plexiglas stand with glue	Palmette C			Ridge tile palmette type 4	Not enough of fabric visible for observation.	Marconi	1927	Urban Sanctuary	
381	S 2093	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of standing palmette with wavy leaves. Decoration in relief on front and back	Object covered in encrustation and damaged. Fixed to Plexiglas stand with glue	Palmette C			Ridge tile palmette type 4	Not enough of fabric visible for observation.	Marconi	1927	Urban Sanctuary	
382		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of volute with both ends curled. Second, much thinner strand in volute ends with a lotus blossom. Small portion of finished edge on main volute stem. Decoration in relief on both front and back sides	The two halves have come apart, at some point they were glued together but the glue has failed. The entire joint is now covered in dark resin like glue. Entire object was covered in needle shaped crystal growth.	Palmette D			Ridge tile palmette type 4	Not enough of fabric visible for observation.	Marconi	1927	Urban Sanctuary	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
383	N. I. 44128	Arch. M. Agrigento	Roof Tile	Eaves Tile	Fragment of roof tile with painted decoration on top surface and painted letters on the bottom. Decoration consists of a running meander and solid rectangles. Front edge preserved with painted decoration consisting of staggered black and red rectangles	Fragments connected using infill of a similar colour and dark coloured glue. Visible on top and bottom faces as well as fractured edges. Bottom face with letter possible varnished	Eaves Tile A	Fabric B		Roof 8			1960	Sanctuary at S. Nicola	
384	AG 7478	Arch. M. Agrigento	Roof Terracotta	Antifix	Fragment of antefix with flat plaque with painted palmette and portion of cover tile remaining	Encrustations on fractures	Antefix B			Roof 8	Not enough of fabric visible for observation	De Miro		Sanctuary at S. Nicola	
385	AG 7479	Arch. M. Agrigento	Roof Terracotta	Antifix	Fragment of painted antefix, possibly with bottom corner of the cover tile preserved. Antefix has flat plague with painted decoration and portion of cover tile preserved	Encrustations on fractures	Antefix B			Roof 8	Not enough of fabric visible for observation	De Miro		Sanctuary at S. Nicola	
386	AG 9602	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Rim of ridge tile with small and large roll. Front edge preserved	Clear varnish added to painted surfaces, starting to discolour	Ridge Tile G	Fabric F			Cannot assign to specific roof due to a lack of find context and size of object				
387	AG 1317	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge palmette with more than half of standing palmette and portions of double volute visible. Decoration in relief on front and back. Palmette consists of 9 large rounded leaves with smaller, thin sharp tipped leaves in between	Large hole in bottom fracture from previous museum mounting. Object is very dirty with remains of what appears to be plaster still on the surface	Palmette D			Ridge tile palmette type 3	Not enough of fabric visible for observation			Temple A	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
388	AG 8606	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of volute with curls on both ends. In between main volute is smaller ones ending in a lotus bud or acanthus leave. Decoration in relief on both front and back. Side edge preserved		Palmette D	Fabric D		Ridge tile palmette type 4		De Miro	1962	Temple B	
389	AG 2507	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Fragment of large ridge tile rim with complete stepped joint front and bottom edge		Ridge Tile C	Fabric B			Cannot assign this object to a specific roof. The find location and traces of painted decoration sets it apart from roof 2	De Miro	1958	Area South of Temple b	Cistern with two openings
390	AG 2508	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Rim of Ridge tile with triple roll, central roll larger. Bottom and side edge preserved		Ridge Tile D				Not enough of the fabric is visible for observation. Also cannot assign object to a specific roof since it comes from a mixed context and can potentially fit a number of different buildings	De Miro	1958	Area South of Temple b	Cistern with two openings
391	AG 9500	Arch. M. Agrigento	Roof Terracotta	Antifix	Complete front of semi circular antefix with painted palmette and volutes	Clear varnish applied to painted areas	Antefix A			Antefix type 2	Not enough of fabric is visible for observation	De Miro		Hellenistic and Roman Quarter	archaic layer

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
392	AG 9502	Arch. M. Agrigento	Unknown	Unknown	Fragment of antefix with extended, curved edge shaped to follow the rosette petals. Top edge preserved	Clear varnish applied to painted areas	Ridge Tile Antefix C				The fabric falls outside the main fabric groups due to the temper and surface finish. The small size of the fragment makes it difficult to determine the architectural terracotta type	De Miro	1964	Hellenistic and Roman Quarter	sporadic find
393	I 13454	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Portion of a ridge tile with painted meander			Fabric A			Fragment is to small with no diagnostic elements preserved to allow for identifying the stylistic group.	De Miro		Hellenistic and Roman Quarter	Casa Afroditi
394	I 13455	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Top rim of a cover tile with most of rim, joint and inside face remaining except for small band along outer rim edge			Fabric B			Fragment is to small with incomplete diagnostic elements preserved to allow for identifying the stylistic group.		1951	Hellenistic and Roman Quarter	Casa Afroditi
395	I 13456	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Rim of ridge tile consisting of a double roll. Side and bottom edge preserved	Clear varnish added to painted surfaces, starting to discolour	Ridge Tile D				Fabric does not fit within major fabric groups. Sporadic find which cannot be assigned to a specific roof			Hellenistic and Roman Quarter	Sporadic find

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
396	C 350	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Complete standing palmette with portion of ridge tile preserved. 9 leaved palmette growing out of non defined volute with pronounced central eyes. Decoration in relief very shallow	A large amount of encrustations on finished surface. Painted surface preserved with clear varnish	Palmette A	Fabric F		Ridge tile palmette type 1	The ridge tile antefix could be attributed to a number of canonical sicilian roofs, but the find context is not known	pre-1920's			
397	S 2321	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Fragment of ridge tile with preserved side edge and portion of bottom edge and very small portion of cover tile hole remaining. Painted with a crossed meander in red and black with central connection point left as a gap and a band of red and black downward facing triangles at bottom.	Clear varnish added to painted surface	Ridge Tile A				Fabric falls outside major fabric groups due to use of grog and an epidermis. Strong similarities to ridge tile associated with temple B (VIN401)	pre-1920's			
398	S 2866?	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Fragment of large ridge tile with preserved bottom edge and painted decoration of ionic leaves and crossed meander. Side edge preserved with portion of semi-circular hole for cover tiles preserved	Clear varnish added to painted surface	Ridge Tile B	Fabric B			Ridge tile could belong to a number of different buildings in the vicinity of gate V. Not enough information to assign to a specific roof			Sanctuary at Gate V	L shaped portico
399	n.a.	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Fragment of large ridge tile with preserved bottom edge and painted decoration of ionic leaves and crossed meander. Bottom edge preserved	Clear varnish added to painted surface	Ridge Tile B	Fabric B			See VIN399				

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
401		Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Large fragment of ridge tile with complete front and back edges and complete bottom edge on right side with semi circular hole for cover tiles.	Painted surface covered with a varnish	Ridge Tile A				Not enough of fabric available for observation. Object associated with temple B			Temple B	Inside the temple
421	FB218	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Fragment of pan tile with preserved ridge and bottom notch	Not cleaned	Pan Tile A		WD-XRF, HH-XRF and petrographic		Similar fabric to fabric E except for the presence of a painted finish. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector West
422	FB221	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Fragment of Pantile with preserved side ridge and portion of bottom notch	Not cleaned	Pan Tile A		WD-XRF, HH-XRF and petrographic		Similar fabric to fabric A except for the presence of a painted finish. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector West
423	FB222	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Fragment of pantile with preserved side ridge	Not cleaned	Pan Tile B		WD-XRF, HH-XRF and petrographic		Similar fabric to fabric A except for the presence of a painted finish. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector West
424	FB030	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Fragment of pan tile with wide ridge. The fabric is very soft	Not cleaned	Pan Tile B	Fabric H	WD-XRF, HH-XRF and petrographic		Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector West

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
425	FB223	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Fragment of pan tile with preserved side ridge and notch preserved	Not cleaned	Pan Tile A		WD-XRF, HH-XRF and petrographic		Similar fabric to fabric E except for the presence of a painted Finnish. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector West
426	FB224	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Large fragment of pan tile with no diagnostic profile remaining	Not cleaned		Fabric H	WD-XRF, HH-XRF and petrographic		The diagnostic elements are not preserved so cannot assign to stylistic group. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector West
427	FB225	Arch. park magazine Agrigento	Roof Tile	Cover Tile	Fragment of cover tile with preserved side edge with slightly raised outside edge	Not cleaned	Cover Tile B		WD-XRF, HH-XRF and petrographic		Cannot be assigned to a specific roof due to secondary find context. Due to the fabric colour the object falls outside the majority of fabric groups	Sojc	2014	St Anna	Trench A - Sector West
428	FB210	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Fragment of pan tile with preserved side ridge. Possible slip layer on outside and inside	Not cleaned	Pan Tile A	Fabric B	HH-XRF		Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector West
429	FB029	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Portion of pantile ridge with very wide profile (about 10 cm)	Not cleaned	Pan Tile C	Fabric H	HH-XRF		Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector East

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
430	FB219	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Fragment of pan tile with preserved ridge with rather flat profile	Not cleaned	Pan Tile B		WD-XRF, HH-XRF and petrographic		Similar fabric to fabric E except for the presence of a painted finish. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector East
431	FB034	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Misfired pan tile with significant distortion and cracking in fabric The top surface almost looks like tufa with large amount of air bubbles	Not cleaned			HH-XRF		The misfired condition makes assigning a fabric and stylistic group difficult. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector East
432	FB033	Arch. park magazine Agrigento	Roof Tile	Cover Tile	Portion of cover tile	Not cleaned			WD-XRF, HH-XRF and petrographic		Not enough of profile visible to assign to specific stylistic group. Similar fabric to fabric E except for the presence of a painted finish. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector East
433	FB211	Arch. park magazine Agrigento	Roof Tile	Ridge Tile	Portion of ridge tile with preserved side edge	Not cleaned		Fabric H	WD-XRF, HH-XRF and petrographic		Due to small size and lack of diagnostic elements the stylistic type cannot be determined. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector East

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
434	FB032	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Small fragment of pan tile without preserved profile. Possible roof stamp present, possibly a zeta or iota (I)	Not cleaned	Unknown Pan Tile	Fabric H	HH-XRF		Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector East
435	FB031	Arch. park magazine Agrigento	Roof Tile	Cover Tile	Fragment of cover tile with tapered bottom edge on the inside	Not cleaned	Cover Tile C				Similar fabric to fabric A except for the presence of a painted finish. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector East
436	FB226	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Portion of pan tile with preserved side ridge	Not cleaned	Pan Tile A		WD-XRF, HH-XRF and petrograp hic		Similar fabric to fabric A except for the presence of a painted finish. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector East
437	FB217	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Pantile with preserved ridge and bottom notch	Not cleaned	Pan Tile A		WD-XRF, HH-XRF and petrograp hic		Similar fabric to fabric E except for the presence of a painted finish. Cannot be assigned to a specific roof due to secondary find context.	Sojc	2014	St Anna	Trench A - Sector East
500	NI.42104	Arch. M. Palermo	Roof Terracotta	Geison	Fragment of geison with bottom double roll and soffit plague with single hook meander in black	Not clean. Surfaces including fractures not very visible. Possible traces of burning visible on side of soffit surface	Frieze D	Fabric B		Roof 2		Gabrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
501	NI.42105	Arch. M. Palermo	Roof Terracotta	Geison	Fragment of geison with bottom double roll	Not clean. Surfaces including fractures not very visible. Possible traces of burning visible on side of soffit surface. Possible evidence of burning on external surfaces.	Frieze D			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
502	NI. 41817	Arch. M. Palermo	Roof Terracotta	Geison	Fragment of geison guilloche. With central three petal palmette	Painted surface well preserved. Fractured edges not clearly visible, heavy encrustations.	Frieze D	Fabric B		Roof 3		Gabrici	1922	Naiskos East of Temple B	
503		Arch. M. Palermo	Roof Terracotta	Sima	Top double roll of sima. No museum nr visible	Not clean. Surfaces including fractures not very visible. Possible traces of burning visible on fracture below encrustations	Frieze D			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
504	NI. 41816	Arch. M. Palermo	Roof Terracotta	Sima	Double roll and part of top fascia of sima. Preserved left edge with stepped join clearly visible	Not clean. Surfaces including fractures not very visible.	Frieze D			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
505	NI. 41801	Arch. M. Palermo	Roof Terracotta	Lateral Geison	Fragment of lateral geison (top plague and top roll quite well preserved) Top plaque at an angle. The painted decoration on the facia is not visible, but the incised horizontal guide lines are. The left edge is preserved. Painted slip layer clearly visible, especially on side edge.	Not clean. Surfaces including fractures not very visible.	Frieze D	Fabric B		Roof 2		Gabrici	1922	Naiskos East of Temple B	
506	NI. 41815	Arch. M. Palermo	Roof Terracotta	Sima Corner Fragment	Sima fragment consisting of bottom of cavetto, roll and bottom fascia. The inside edge of the right side fracture curves outward, possible part of corner piece	Heavy encrustations on all surfaces. Paint traces all but missing.	Frieze D			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
507	NI. 41816	Arch. M. Palermo	Roof Terracotta	Raking Sima	Fragment of Sima. There is a preserved stepped join on the left side that steps up towards the front. This suggest (based on VIN 508 with stepped joint on right that steps up towards the back) that the preserved fascia is the bottom fascia. The lack of evidence of waterspouts indicate this object was part of gable sima.	State of preservation rather poor. None of painted decoration visible, except for what appears to be construction marks painted on the back. Most of visible surfaces covered in heavy layer of encrustations.	Frieze D			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
508	NI. 41802	Arch. M. Palermo	Roof Terracotta	Lateral Sima	Fragment of bottom right corner of sima including portion of bottom roll, stepped joint and remains of waterspout. A good sized portion of the horizontal plaque is also preserved	Heavy encrustations on most visible surfaces. New fractures not available. Some painted decoration still preserved but not all.	Frieze D	Fabric B		Roof 2		Gabrici	1922	Naiskos East of Temple B	
509	NI. 41803	Arch. M. Palermo	Roof Terracotta	Geison	Fragment of geison with double roll and full soffit plague preserved.	Heavy encrustations on most visible surfaces. New fractures not available. Limited painted decoration still preserved.	Frieze D			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
510		Arch. M. Palermo	Roof Terracotta	Geison	Fragment of geison with double roll and full soffit plague preserved.	Heavy encrustations on most visible surfaces. New fractures not available. Almost no painted decoration still preserved.	Frieze D			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
511		Arch. M. Palermo	Roof Terracotta	Geison	Geison fragment with portion of vertical plaque and double roll at bottom. Left side edge preserved.	Heavy encrustations on most visible surfaces. New fractures not available. Limited painted decoration still preserved.	Frieze D	Fabric B		Roof 2		Gabrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
512		Arch. M. Palermo	Roof Terracotta	Geison	Small geison fragment with the bottom double roll.	Heavy encrustations on most visible surfaces. New fractures not available. Almost no painted decoration still preserved.	Frieze D			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
513	NI. 41813	Arch. M. Palermo	Roof Terracotta	Geison	Fragment of geison with bottom part of guilloche still visible. Right side edge preserved, as is double roll and small part of horizontal plague.	Fragment not very well preserved. Thick encrustation on most surfaces except front, from which they were presumably cleaned. The painted decoration is still visible, even if in some places it is only due to the void.	Frieze D	Fabric B		Roof 2		Gabrici	1922	Naiskos East of Temple B	
514	NI. 41813	Arch. M. Palermo	Roof Terracotta	Geison	Fragment of geison with double roll and portion of soffit plaque preserved	Fragment quite eroded and covered in encrustations	Frieze D			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
515	NI. 41813	Arch. M. Palermo	Roof Terracotta	Geison	Fragment of geison with preserved left side edge. Double roll and full extend of soffit plague preserved.	Painted decoration not preserved except for isolated spots. Heavy encrustations on factures.	Frieze D			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
516	NI.42103	Arch. M. Palermo	Acroteria	Horserider	Fragment of a horse riders right foot. The front half of the foot is preserved along with a portion of the horse's flank. The bottom edge of the piece is preserved as is the bottom part of a hole located above the foot in the side of the horse.	Object has not been cleaned. Heavy encrustations on almost all surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
517	NI.42103	Arch. M. Palermo	Acroteria	Horserider	Fragment of a horse riders left foot. The front half of the foot is preserved along with a portion of the horse's flank. The bottom edge of the piece is preserved as is the bottom part of a hole located above the foot in the side of the horse.	Object has not been cleaned. Heavy encrustations on almost all surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
518	NI.42083	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse rider akroteria. The bottom part of the horse mane is preserved. It is in three strands of beadlike hair. The fracture of where the rider's leg connected to the horse is visible. To the bottom left corner there is a hole in the horse's flank.	Object has not been cleaned. Heavy encrustations on almost all surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
519	NI. 42094	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse's head consisting of bead like rows of hair. Evidence of restoration including reddish 'glue'. Unlikely to be modern restoration. VIN 519 & 520 fit together.	Object has not been cleaned. Heavy encrustations on almost all surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
520	NI. 42094	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse's head consisting of bead like rows of hair. Fragment appears to be top right side of head. Evidence of restoration including reddish 'glue' and a nail. Unlikely to be modern restoration. VIN 519 & 520 fit together.	Object has not been cleaned. Heavy encrustations on almost all surfaces	Acroterio n			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
521	NI. 42102	Arch. M. Palermo	Roof Terracotta	Sima	Fragment of anthemion sima. Parts of lyre shaped leaves with three palmette leaves between preserved as is finished right edge and part of curved back edge. Appears to the upper part of the inversed pattern.	Object has not been cleaned. Heavy encrustations on almost all surfaces	Frieze F			Roof 6	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
522	NI. 42084	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse rider akroteria. Part of horse main and the fracture where the rider's left knee was connected visible	Object has not been cleaned. Heavy encrustations on almost all surfaces	Acroterio n			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
523	NI. 42095	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse's head consisting of bead like rows of hair. Fragment appears to be left side of neck. Fragment is in two parts that are joined together, the inside of the fragment has a reddish coating - probably the bonding agent used. Appears to be an ancient repair. There is also glue on the bottom edge. So restoration had involved more than three pieces. VIN 533 fits perfectly at bottom of this fragment	Object has not been cleaned. Heavy encrustations on almost all surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
524	NI. 42082	Arch. M. Palermo	Acroteria	Horserider	Fragment of acroteria with painted remains. Appears to be the right shoulder and part of the collar bone of horse.	Object has not been cleaned. Heavy encrustations on some surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
525	NI. 42081	Arch. M. Palermo	Acroteria	Horserider	Large moulded fragment with remains of painted decoration. Rather strange piece, best guess is that it is the top left edge of the horses back with a portion of the riders clothes sweeping down. This means there is no saddle visible.	Object has not been cleaned. Heavy encrustations on almost all surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
526	NI. 42090	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse and rider. Bead like hair preserved	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
527	NI. 42089	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse and rider. Bead like hair preserved	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
528	NI. 42091	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse and rider. Bead like hair preserved	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
529	NI. 42096	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse and rider. Bead like hair preserved	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
530	NI. 42086	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse and rider. Preserved ends of three strings of beadlike hear as well as curved fracture in left hand corner. Of element that connected at an angle. Possible part of the right shoulder and neck of the rider	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
531	NI. 42093	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse and rider. Bead like hair preserved. Appears to be the edge of the horse mane, probably on right side.	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
532	NI. 42100	Arch. M. Palermo	Acroteria	Horserider	Forehead of horse. Two locks of bead like hear falling down in centre of forehead. Moulded edge of forehead/bridge preserved on both sides	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
533	NI. 42087	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse rider with bead like hair. Evidence of repair in reddish brown coating on fracture, same as on VIN 520, 519 and 523. Fragment fits perfectly at bottom of VIN 523	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
534	NI. 42092	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse and rider. Bead like hair preserved	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
535	NI. 42088	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse and rider. Bead like hair preserved	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	
536	NI. 42097	Arch. M. Palermo	Acroteria	Horserider	Fragment of the head from a horse and rider acroteria. Possibly partial remains of beadlike hear lock falling across either the forehead ridge or the depression leading to the eye. Remains of second lock on top of first.	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group	Gabrici	1922	Naiskos East of Temple B	

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
537	NI. 42098	Arch. M. Palermo	Roof Terracotta		Acroteria fragment of either a horse or gorgon. Show beadlike hair in shallow relief and part of moulded face	Object has not been cleaned. Heavy encrustations on most surfaces					Not enough of fabric is visible to allow for determining a fabric group. The fragment is to small to conclusively determine if it is part of a gorgonian antefix or horse rider acroteria	Gabrici	1922	Naiskos East of Temple B	
538	NI. 42101	Arch. M. Palermo	Roof Terracotta		Fragment of large gorgonaion pediment plaque or ridge tile antefix. Two rows of bead like hair in shallow relief with bottom edge of plague preserved.	Object has not been cleaned. Heavy encrustations on most surfaces	Gorgon B				Not enough of fabric is visible to allow for determining a fabric group. The fragment is to small to conclusively determine if it is part of a gorgonian pediment plaque or ridge tile antefix	Gabrici	1922	Naiskos East of Temple B	
539	NI. 42099	Arch. M. Palermo	Acroteria		Fragment of outside edge of large gorgonaion with one row of bead like hair preserved. Not clear if it is right of left edge.	Object has not been cleaned. Heavy encrustations on most surfaces	Gorgon B				Not enough of fabric is visible to allow for determining a fabric group. The fragment is to small to conclusively determine if it is part of a gorgonian pediment plaque or ridge tile antefix	Gabrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
540	NI. 42085	Arch. M. Palermo	Acroteria	Horserider	Fragment of horse and rider with single strand of bead like hair and internal support preserved. Possibly part of the rider, the left side shoulder. The internal support sits at a right angle, possibly where the joint for the arm is	Object has not been cleaned. Heavy encrustations on most surfaces	Acroterion			Roof 2	Not enough of fabric is visible to allow for determining a fabric group.	Gabrici	1922	Naiskos East of Temple B	
542	NI. 41835	Arch. M. Palermo	Acroteria		Fragment of large Gorgonaion plague. One serpentine curl, the back of the head, some internal supports and the flat back plate preserved. There is some doubt whether it is part of a pediment plague since it differs from the flat gorgons from Gela and Syracuse	Object has not been cleaned. Heavy encrustations on most surfaces	Gorgon A				Not enough of fabric is visible to allow for determining a fabric group.	Gabrici	1922	Naiskos East of Temple B	
544	NI. 41831	Arch. M. Palermo	Roof Tile	Pan Tile	Fragment of bottom left corner of a pantile with preserved raised edge and bottom notch. On the inside there is a character in relief, probably created in the mould. It appears to be a Phoenician heta, or just a rectangular block divided into two by a central line.	Object has not been cleaned. Heavy encrustations on most surfaces	Pan Tile D				Not enough of fabric is visible to allow for determining a fabric group. Due to mixed context of find it is not possible to assign fragment to a specific roof	Gabrici	1922	Naiskos East of Temple B	
553	NI. 41830	Arch. M. Palermo	Roof Terracotta	Ridge Tile	Two fragments of the edge of a large ridge tile. Portion of chamfered bottom edge on rim visible.	Object has not been cleaned. Heavy encrustations on most surfaces	Ridge Tile C			Roof 2	Not enough of fabric is visible to allow for determining a fabric group.	Gabrici	1922	Naiskos East of Temple B	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
554	NI. 41829	Arch. M. Palermo	Roof Terracotta	Ridge Tile	Two fragments of the edge of a large ridge tile. Portion of chamfered bottom edge on rim visible.	Object has not been cleaned. Heavy encrustations on most surfaces	Ridge Tile C			Roof 2	Not enough of fabric is visible to allow for determining a fabric group.	Gabrici	1922	Naiskos East of Temple B	
555	NI. 41824	Arch. M. Palermo	Roof Terracotta	Ridge Tile	Fragment of ridge tile rim. 8 other similar small fragments in casette	Object has not been cleaned. Heavy encrustations on most surfaces	Ridge Tile C			Roof 2	Not enough of fabric is visible to allow for determining a fabric group.	Gabrici	1922	Naiskos East of Temple B	
556	NI. 41834	Arch. M. Palermo	Roof Terracotta	Ridge Tile	Fragment of large ridge tile. Portion of cover tile and inside edge of rim preserved	Object has not been cleaned. Heavy encrustations on most surfaces	Ridge Tile C			Roof 2	Not enough of fabric is visible to allow for determining a fabric group. Not enough of the diagnostic elements are preserved in order to determine the stylistic groups.	Gabrici	1922	Naiskos East of Temple B	
557	NI. 41812	Arch. M. Palermo	Unknown		Curved fragment with preserved back edge. Has smaller radius and is substantially thinner than ridge tiles 553-4.	Object has not been cleaned. Heavy encrustations on most surfaces						Gabrici	1922	Naiskos East of Temple B	
562	FB551	Arch. park magazine Agrigento	Roof Terracotta	Raking Sima	Fragment of sima, probably a raking sima due to the angle between the horizontal tile and the bottom fascia as well as the absence of waterspouts, which is to be expected on a tile this size	washed during excavation, but rather eroded	Frieze B3	Fabric B	WD-XRF	Roof 4		Sojc	2016	St Anna	trench A-erw 3, US 0

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
563	F305	Arch. park magazine Agrigento	Roof Terracotta	Ridge Tile	Fragment of ridge tile with rounded rim	washed during excavation, but rather eroded	Ridge Tile C		WD-XRF	Roof 4	Not enough of fabric is visible to allow for determining a fabric group.	Sojc	2016	St Anna	Schnitt A, Erweitening III, US*
564	FB510	Arch. park magazine Agrigento	Roof Tile	Cover Tile	Portion of a curved cover tile in 4 fragments, two of which fit	washed during excavation	Cover Tile B	Fabric B	WD-XRF		The disturbed context of the find makes it difficult to determine if it belongs to a particular roof	Sojc	2016	St Anna	Schnitt B, US3
565	FB510	Arch. park magazine Agrigento	Roof Terracotta	Cover Tile	Fragment of curved cover tile, found together with 564	washed during excavation	Cover Tile B				Surface to eroded to determine if a slip layer was present. The disturbed context of the find makes it difficult to determine if it belongs to a particular roof	Sojc	2016	St Anna	schnitt B US3
566	FB547	Arch. park magazine Agrigento	Roof Tile	Pan Tile	Small fragment of pan tile with bottom left corner preserved. Raised edge with notch in bottom to fit on top of next tile	Washed during excavation					The fragment is too small to determine stylistic group. The disturbed context of the find makes it difficult to determine if it belongs to a particular roof	Sojc	2016	St Anna	Schnitt B US O
567	F307	Arch. park magazine Agrigento	Roof Terracotta	Geison	Small fragment of flat slab with traces of paint.	washed during excavation, but rather eroded			WD-XRF		Not enough of the fabric or profile is available to conclusivly assign this object to a stylisti or fabric group	Sojc	2016	St Anna	trench A, US 34

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
568	FB562	Arch. park magazine Agrigento	Roof Tile	Cover Tile	Corinthian type pitched cover tile	Washed during excavation	Cover Tile A		WD-XRF		The disturbed context of the find makes it difficult to determine if it belongs to a particular roof. Object does not fall within the major fabric groups	Sojc	2016	St Anna	trench C, US O
569	FB575	Arch. park magazine Agrigento	Roof Terracotta	Lateral Sima	Fragment of sima with bottom roll and portion of lower fascia preserved. Small piece pf black paint remaining	washed during excavation, but rather eroded	Frieze B3	Fabric A	WD-XRF	Roof 4		Sojc	2014	St Anna	trench A, US0
570	F315	Arch. park magazine Agrigento	Roof Terracotta	Lateral Geison	Small fragment of lateral geison, portion of top flange visible with an angle. Fragment appears to have been damaged by fire	washed during excavation, but rather eroded	Frieze B3			Roof 4	Not enough of fabric is visible to determine fabric group				
571	F312	Arch. park magazine Agrigento	Roof Tile	Ridge Tile	Curved ridge tile in two fragments that together form a complete width. The two bottom edges are preserved, but front and back is missing. There are parts of the two holes to allow for the cover tiles remaining, one is for a pitched cover tile, the other for a curved tile. The circular hole in the top of the tile appears to have been made after the object had been fired, possible related to it's secondary use	washed during excavation, but rather eroded	Ridge Tile H		WD-XRF		Due to the fabric colour, grog and slip layer the fragment falls outside the major fabric groups. The disturbed context of the find makes it difficult to determine if it belongs to a particular roof	Sojc	2016	St Anna	Trench A US 34

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
572	AG 2186 bis	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	two fragments of a ridge tile palmette that fit together	heavy encrustations of fractures	Palmette B			Ridge tile palmette type 2	Not enough of the fabric is visible for observation and therefore a fabric group cannot be determined	De Miro	1958	Naiskos East of Temple B	
574	AG 62	Arch. M. Agrigento	Roof Terracotta	Geison	three geison fragments, none of which are directly connected. On fragment with double roll has preserved left edge, a second piece with double roll and part of painted soffit and one painted soffit flange	only some painted decoration visible, very small fresh fractures	Frieze D			Roof 2	The fabric colour is redder than fabric group B, but it has a slip so it does not fall within fabric group A	De Miro	1962	Naiskos East of Temple B	Mura Hellenistic he
575		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	fragment of ridge tile palmette with volute and base of palmette preserved on two sides. Volute has a semi circular eye, in relief. Similar to VIN 387	small fragment. Decoration in relief well preserved	Palmette D			Ridge tile palmette type 3	The fabric does not fall within the main fabric groups	griffo	1955	Sanctuary at Gate V	
576		Arch. M. Agrigento	Roof Terracotta	Antifix	Small fragment of gorgonaion antefix with one row of spiral curls painted in black and the start of an eyebrow visible, remains of curved cover tile fracture on back	object not perfectly clean, some paint on curls preserved	Antefix I				Object fairly eroded, cannot determine presence of an epidermis. Not possible to place within a fabric group. Fragment too small to allow placement within a roof group			Sanctuary at Gate V	

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
577		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge palmette volute with rounded central eye and secondary tendril preserved. Only one side of double sided piece preserved, broke away along main joint. Similar in size to VIN 387. fracture of Corinthian type tile visible with inside edge preserved		Palmette D			Ridge tile palmette type 3	The fabric does not fall within the main fabric groups	Griffo	1955	Sanctuary at Gate V	
578		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette volute with small lotus flower inside. Similar to VIN 388	Object is fairly eroded	Palmette D			Ridge tile palmette type 4	Not enough of the fabric is visible to determine the fabric colour in the core.	Griffo	1954	Sanctuary at Gate V	
579		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette volute with small lotus flower inside. Only one side of double sided relief remaining. Similar to VIN 388	object not very clean, surfaces eroded	Palmette D			Ridge tile palmette type 4	Not enough of the fabric is visible for observation and therefore a fabric group cannot be determined	Griffo	1954	Sanctuary at Gate V	
580		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of palmette with wavy leaves in concave relief. Left edge and three leaves are preserved. Only half of double sided palmette preserved.	object not very clean	Palmette C			Ridge tile palmette type 4	Not enough of the fabric is visible for observation and therefore a fabric group cannot be determined	Griffo	1954	Sanctuary at Gate V	
581		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of palmette with wavy leaves in concave relief. Parts of 6-7 leaves are preserved. Both sides of double sided palmette preserved.	object not very clean and fairly eroded	Palmette C	Fabric D		Ridge tile palmette type 4		Griffo	1953	Sanctuary at Gate V	

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
583		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette volute with small lotus flower inside. Only one side of double sided relief remaining. Similar to VIN 388	object not very clean and quite eroded	Palmette D			Ridge tile palmette type 4	Not enough of the fabric is visible for observation and therefore a fabric group cannot be determined	Griffo	1954	Sanctuary at Gate V	entrance to gate V
584		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge palmette with decoration in relief on both sides. Parts of 4-5 wavy palmette leaves preserved in concave relief,	object not very clean and fairly eroded	Palmette C			Ridge tile palmette type 4	Not enough of the fabric is visible for observation and therefore a fabric group cannot be determined	Griffo	1954	Sanctuary at Gate V	
585		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Ridge tile palmette fragment with base of palmette consisting of blade shaped node in relief preserved on both sides. Base of at least 8 leaves visible. Similar to VIN 375	object not very clean	Palmette D	Fabric C		Ridge tile palmette type 2		Griffo	1953	Sanctuary at Gate V	
586		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	two fragments of ridge palmette volutes visible that appear to fit, two parts of double sided decoration. Volute consists of two strands, one substantially smaller. Similar to Vin 388	Object not very well preserved. Crystals growing on one indicates objects stored while still wet.	Palmette D			Ridge tile palmette type 4	Not enough of the fabric is visible for observation and therefore a fabric group cannot be determined	Griffo	1953	Sanctuary at Gate V	
587		Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette with two rounded palmette leaves and blade shaped in leaf in between, outside edges of leaves preserved. Decoration in relief on both sides. Similar to VIN 372	object not very clean	Palmette B	Fabric C		Ridge tile palmette type 2		Griffo	1953	Sanctuary at Gate V	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
588	S 2094	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette with two wavy, concave leaves and right edge preserved. Only one side of double sided decoration in relief preserved	Object not very clean. Decorated area slightly damaged	Palmette C			Ridge tile palmette type 4	Not enough of fabric is visible in order to determine fabric group	Marconi	1927	Urban Sanctuary	
589	S 2086	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette volute with rounded central eye and a second tendril on top. Only one side of double sided decoration in relief preserved. Top and left edges complete. Similar in size to VIN 387	not very clean and decorated surfaces are eroded	Palmette D			Ridge tile palmette type 3	Not enough of fabric is visible in order to determine fabric group	Marconi	1927	Urban Sanctuary	
590	S 2081	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette volute with decoration in relief on two sides. Similar in size and design to Vin 357. All three top tendrils are preserved, as is small hanging bud between the two volutes	not very clean	Palmette D			Ridge tile palmette type 2	Not enough of fabric is visible in order to determine fabric group	Marconi	1927	Urban Sanctuary	
592	S 2096	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette with two wavy, concave leaves and left edge preserved. Only one side of double sided decoration in relief preserved	Object not clean. Decorated area fairly damaged	Palmette C			Ridge tile palmette type 4	Not enough of fabric is visible in order to determine fabric group	Marconi	1927	Urban Sanctuary	

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
593	S 2105	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Portion of ridge tile palmette with volute and one palmette leaf preserved. Decoration in relief only on one side, do not know if it was decorated on two sides. The volute has raised edges. The leaf is blade shaped.	object not very clean, and covered in encrustations	Palmette F				Not enough of fabric is visible in order to determine fabric group. The small size of the fragment and the fact that it does not match other object from Akragas means it cannot be assigned to a specific roof				
594	S 2103	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of volute with second, smaller strand inside. Same size than VIN 388. Only one side of double sided decoration preserved.	object not very clean,	Palmette D			Ridge tile palmette type 4		Marconi	1927		
595	S 2100	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette with portion of volute and second tendril on top preserved. Small secondary strand next to main volute. Top edge and decoration in relief on both sides preserved. Decoration on both sides is staggered wit 5mm	very eroded and dirty	Palmette D			Ridge tile palmette type 4	Not enough of fabric is visible in order to determine fabric group.	Marconi	1927		
596	S 2092	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	fragment of ridge tile palmette with wavy leaves in concave relief. Start of four leaves preserved. Decoration in relief from only one side.	very eroded and dirty	Palmette C			Ridge tile palmette type 4	Not enough of fabric is visible in order to determine fabric group.	Marconi	1927		

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
597	S 2104	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Very small fragment, volute with second, smaller strand inside, similar to VIN 388	badly preserved	Palmette D			Ridge tile palmette type 4	Not enough of fabric is visible in order to determine fabric group.	Marconi	1927	Urban Sanctuary	
598	S 2091	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette with wavy leaves in concave relief. Parts of three leaves preserved as well as right edge. Only one side of double sided decoration.	not clean	Palmette C	Fabric D		Ridge tile palmette type 4		Marconi	1927	Urban Sanctuary	
599	S 2102	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Very small fragment, volute with second, smaller strand inside, similar to VIN 388	not very clean	Palmette D			Ridge tile palmette type 4	Not enough of fabric is visible in order to determine fabric group.	Marconi	1927	Urban Sanctuary	
600	S 2095	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette with remains of two wavy leaves in concave relief and right edge preserved. Only one side of double sided relief	Object not very clean and surfaces are eroded	Palmette C			Ridge tile palmette type 4	Not enough of fabric is visible in order to determine fabric group.	Marconi	1927	Urban Sanctuary	
601	S 2101	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette with parts of volute on both sides preserved. Secondary strand inside volute preserved. Part of connection to corinthian tile preserved	not clean and very eroded	Palmette D			Ridge tile palmette type 4	Not enough of fabric is visible in order to determine fabric group.	Marconi	1927	Urban Sanctuary	
602	S 2080	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Ridge tile palmette with volute in relief on both sides. Volute has rounded centre and small hanging bud at centre line, part of small strand visible to side. Similar to vin 375	covered in encrustations	Palmette D	Fabric C		Ridge tile palmette type 2		Marconi	1927	Urban Sanctuary	

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
603	S 2098	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of a ridge tile palmette with volute in relief preserved on two sides. Similar to VIN 388. Top and side edge preserved	Object eroded and largely covered in encrustations	Palmette D	Fabric D		Ridge tile palmette type 4		Marconi	1927	Urban Sanctuary	
605	S 2085	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment of ridge tile palmette with portion of volute on both sides. Similar to VIN 375	Object very damages and not very clean	Palmette D	Fabric C		Ridge tile palmette type 2					
606	S 2097	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	fragment of ridge palmette. Bottom left volute with secondary strand ending in lotus flower preserved. Left and part of top edge preserved along with acanthus leave. Similar to VIN 388. Junction with corinthian style cover tile also visible. Traces of red paint left on surface	object not very clean	Palmette D			Ridge tile palmette type 4	Not enough of fabric is visible in order to determine fabric group.				
607	S 2087	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Fragment with a volute in relief. The volute consists of two strands, one smaller than the other, but at the same level. There is a raised central semi sphere. The top edge is preserved and rounded. The thickness of the object as well as the extended top edge might indicate that object was hollow.	object not very clean. Heavy encrustations on back and top edge	Antefix K				Not enough of fabric and finishing layer is visible in order to determine fabric group.				

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
608	S 2082	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	fragment of ridge tile palmette with bottom left hand volute preserved. Volute has round central eye, similar to VIN 375. Only one side of decoration in relief preserved	object not very clean	Palmette D			Ridge tile palmette type 2	Not enough of fabric is visible in order to determine fabric group.	Marconi	1927	Urban Sanctuary	
609	S 2099	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	fragment of ridge palmette. Bottom right volute with secondary strand ending in lotus flower preserved. Right and part of top edge preserved. Similar to VIN 388. Junction with corinthian style cover tile also visible. Traces of red paint left on surface	object not very clean	Palmette D			Ridge tile palmette type 4	Not enough of fabric is visible in order to determine fabric group.				
610	S 2060	Arch. M. Agrigento	Roof Terracotta	Geison	fragment of geison with painted guilloche		Geison A								
611	S 2061	Arch. M. Agrigento	Roof Terracotta	Geison	geison fragment with guilloche visible	object not very clean	Geison A			Roof 2	Not enough of fabric visible to allow for determining fabric group				
612	AG 62	Arch. M. Agrigento	Roof Terracotta	Lateral Sima	Sima fragment with bottom fascia with preserved right stepped joint and part of waterspout preserved	Object not very clean and surfaces are very eroded	Frieze D			Roof 2	Not enough of fabric visible to allow for determining fabric group		1962	Naiskos East of Temple B	The hellenistic walls

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
613	AG 62	Arch. M. Agrigento	Roof Terracotta	Unknown	small fragment of possibly a geison or eaves tile. Bottom edge at an angle (but very eroded) and a bead and reel roll.	not very clean	Bead and reel				Not possible to determine the type of architectural terracotta or the roof it belonged to based on the limited information Not enough of the fabric is visible for fabric observation		1962	Naiskos East of Temple B	
614	n.a.	Arch. M. Agrigento	Roof Terracotta	Geison	Geison soffit with double roll and right edge preserved	Red encrustations on many surfaces	Frieze D	Fabric B		Roof 2				Naiskos East of Temple B	
615	n.a.	Arch. M. Agrigento	Roof Terracotta	Unknown	Small fragment without a number. Might be part top right leaf of a lotus flower as part of an anthemion sima, similar to VIN 138	Fragment very eroded, none of the finished surfaces preserved					Fragment is to small and eroded to identify fabric or stylistic groups.				
616	C 346	Arch. M. Agrigento	Unknown		similar fragment to VIN 182, published as architectural terracotta, but more likely part of a sarcophagus		Frieze I				Object likely from a sarcophagus. Therefore not included in subsequent analysis.	pre-1920's			
617	n.a.	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Ridge tile rim fragment consisting of a single rounded border. The bottom edge is preserved showing a tapered edge on the inside	object not very clean	Ridge Tile C				Not enough of the fabric is available for observation. Despite being similar in type to other fragments in the group, this object was probably not part of roof 2 due to the differences in painted decoration				

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
618	S 2030	Arch. M. Agrigento	Roof Terracotta	Ridge Tile	Large ridge tile fragment with preserved border consisting of three rounded bands. The bottom edge is preserved and tapers to a point.	Object was stored while not quite dry, resulting in salt crystals forming on all surfaces. The painted decoration appears to be covered by a thin, clear varnish that has discoloured with age	Ridge Tile D			Roof 1	Not enough of fabric available for observation.				
619	S 1201	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Nearly complete palmette from ridge tile palmette. 9 wavy leaves in concave relief are fully preserved on two sides as sell as central node. Overall shape of palmette is slightly triangular	not very clean, heavy encrustations on one face	Palmette C			Ridge tile palmette type 4	Not enough of the fabric is available for observation				
620	n.a.	Arch. M. Agrigento	Roof Terracotta	Ridge Palmette	Almost complete ridge tile palmette with full palmette consisting of 9 wavy leaves in convex relief and the first half of mirror volutes preserved. Volutes consists of a double strand, one smaller than the other. The palmette grows out of central blade, pinched between the two volutes	Object reconstructed out of 4-5 fragments that fit securely together. The glue is dark brown. One side of object is covered with a thin, clear varnish that is becoming darker with age.	Palmette C			Ridge tile palmette type 4	Not enough of the fabric is available for observation				

Appendix A: General Information

VIN	Museum number	Housed	Object type	Object type detail	Object description	Current condition	Chapter 4-1	Chapter 4-2	Chapter 4-3	Chapter 5	Not assigned	Archaeologist	Excavation year	Find location	Findspot
621	S 2026	Arch. M. Agrigento	Roof Terracotta	Waterspout	Reconstructed waterspout disk. Painted decoration consists of an outer border consisting of black and white dogtooth. Main decoration consists of an 8 petal rosette with 4 large leaves with red centres alternating with smaller ones with a black centre. Parts of the outer edge as well as the complete waterspout mouth *without rim) is preserved	Two fragments that fit securely are glued together, the rest of the disk is reconstructed. The painted surface is covered by a clear varnish, slightly discoloured	Frieze A			Roof 1	Not enough of fabric visible for observation	Marconi	1929	Naiskos inside Temple G	
622	S 2027	Arch. M. Agrigento	Roof Terracotta	Waterspout	Reconstructed waterspout disk. Painted decoration consists of four white disks on a white background. Traces of black lines inside disks suggest outlines of a rosettes in black. Parts of the outer edge as well as the complete waterspout mouth (without rim) is preserved. No painted decoration on back	Single fragment with preserved centre and extending on one side to preserved rim. the rest of the disk is reconstructed. The surfaces are covered by a clear varnish.	Frieze A			Roof 1	Not enough of fabric visible for observation	Marconi	1929	Naiskos inside Temple G	
623	1822	Allard Pierson	Roof Terracotta	Antifix	Almost fully preserved silen's head antefix except for chipping around the beard. The cover tile is not preserved. Overall the decoration in relief is fairly shallow except for the protruding, bulbous nose.	The finishing layer has not been preserved	Antefix L			Antefix Type 7	The finishing layer is not preserved and the temper size and density not recorded. A fabric group could thus not be determined				

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
136	7.5 YR 7/4		10 YR 8/3	2	Complete	0.5	2	10	Volcanic	No					paint only			Unknown	mould		
137	7.5 YR 6/3		10 YR 8/2	2	Complete	0.5	1	7	Volcanic	No					paint only	Fair	Red, black & white	No	mould	Perforations shaped with knife	
138	7.5 YR 7/3		7.5 YR 7/3	2	Complete	0.5	2	15	Volcanic	No					paint only			Unknown	mould	Back finished with knife, perforations shaped with knife while clay still wet	
139	7.5 YR 7/3			2	Complete	0.5	2	10	Volcanic	No				23	epidermis	Excellent	Red, black & white	No	mould	Back smoothed with fingers, pattern in relief redefined with sharp point	
140	7.5 YR 7/4		10 YR 7/4	2	Complete	0.5	2	10	Volcanic	No					paint only	Excellent		No	mould		
141	7.5 YR 7/4		5 YR 7/4	2	Complete	0.5	2	15	Volcanic	No					paint only	Excellent	Red, black & white	Yes	mould	Pattern of Doric leave redefined with a tube like object where it meets the meander	
142	7.5 YR 7/4		10 YR 8/3	2	Complete	0.5	3	10	Volcanic	No				21	epidermis			Unknown	mould	top finished with an object with a flat surface.	
143	5 YR 6/6		7.5 YR 6/4	2	Complete	0.5	2	20	Volcanic	No				11	epidermis		Red, black & white	Unknown	mould	Pattern redefined with sharp point around beads at top	
144	10 YR 8/3		10 YR 8/3	2	Complete	0.5	3	15	Volcanic	No					paint only		Red, black & white	No	mould	Back scraped with an object with a flat surface, side and bottom smoothed with a more blunt tool with a straight surface. Doric leaves redefined with a sharp edge	
145	5 YR 7/4		10 YR 7/4	2	Complete	0.5	3	2	Not-Volcanic and Grog	No					paint only	Excellent	Red, black & white	No	mould	Side finished with knife and back scraped by an object with a straight edge	

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
146	7.5 YR 7/3	5 YR 6/6	10 YR 7/4	2	Complete	0.5	1	2	Not-Volcanic and Grog	No					paint only	Excellent	Red, black & white	No	mould	Sides finished with thin flat object. Back scraped with an object with a flat surface	
147									Not-Volcanic and Grog	No					paint only		Red, black & white	No		Sides finished with thin flat object	
148	5 YR 7/4			2	Complete	0.5	3	8	Not-Volcanic and Grog	No					paint only	Excellent	Red, black & white	No	mould	Sides finished with thin flat object	
162	7.5 YR 7/3	5 YR 6/6	10 YR 7/3	2	Fairly Complete				Not-Volcanic	No					slip			No	mould and slab	Some evidence of redefinition of hair around face with an edged object	
166	7.5 YR 7/3		7.5 YR 7/3	2	Complete	0.5	2	20	Volcanic	No								Unknown	mould	perforations defined with a sharped edged object. Back scraped with an object with a flat surface	
167	7.5 YR 6/4	5 YR 6/6	7.5 YR 6/4	2	Complete	0.5	2	15	Volcanic	No					paint only		Red, black & white	No	mould	Side finished with an object with a straight edge	
168	7.5 YR 7/4		7.5 YR 6/6	2	Complete	0.5	2	15	Volcanic	No								Unknown	mould	Back scraped with an object with a flat surface, perforations defined with a sharped edged object	
169	7.5 YR 6/6		10 YR 6.6	2	Complete	0.5	2	10	Volcanic	No			5YR 7/3	4	epidermis		Red, black & white	Unknown	mould	Back scraped with a knife, sides with an object with a straight edge, top is smoothed. Perforations defined with a sharped edged object	
174				5	Fairly Complete				Not-Volcanic	Unknown					epidermis			No	hand and slab		

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
175				5					Not-Volcanic	Unknown							Red	No	hand and slab		
176	5 YR 5/8		5 YR 6/6	2	Complete	0.5	10	5	Not-Volcanic	No	10 YR 8/1				slip			No	mould and slab	Some features, including the nose and mouth seems to have been redefined with a sharp object, including incising the pupil.	
177	10 YR 7/3	5 YR 7/4	10 YR 7/4	2		0.5	1	1	Not-Volcanic and Grog	No					paint only	Excellent	Red, black & white	No	mould	Sides finished with thin flat object	
178	7.5 YR 7/3		10 YR 7/3	2		0.5	2	1	Not-Volcanic and Grog	No	10 YR 7/4				paint only	Excellent	Red, black & white	No	mould	Back scraped smooth with straight edged object.. Sides finished with thin flat object	
179	10 YR 7/1	5 YR 6/6	7.5 YR 6/4	2	Complete	0.5	2	15	Volcanic	No					paint only		Red, black & white	No	mould	Sides finished with thin flat object	
180	5 YR 6/4		5 YR 6/4	2	Complete	0.5	2	10	Volcanic	No					paint only			Unknown	mould and slab	on the top there are marks left by a sharp tool during redefining of top edge. The back scraped with an object with a flat surface.	
181	7.5 YR 6/3	7.5 YR 7/4	7.5 YR 8/1	2	Complete	0.5	2	15	Volcanic	No					epidermis			No	mould		
182	7.5 YR 6/1	5 YR 7/3	7.5 YR 6/4	2	Incomplete	0.5	3	5	Volcanic	No	10 YR 7/2				slip		Red, black & white	No	mould and slab	Buds between the doric leaves, doric leaves and bead and reel show traces of being reshaped or redefined with a sharp object.	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
183	7.5 YR 6/3		7.5 YR 7/3	2	Complete	0.5	2	3	Volcanic	No				7	epidermis	Excellent	Red, black & white	No	mould	Top edges of the doric leaves reshaped. Top and side edge are cut, back scraped smooth with flat surface. Large air pockets at top edge indicating clay was layered into the mould. Possible nail hole made in the wet clay	
184	7.5 YR 7/3		10 YR 7/4	2	Complete	0.5	2	15	Volcanic	No				3	epidermis	Excellent	Red, black & white	No	mould	Top edges of the doric leaves reshaped. Nail hole made in while clay wet. Top and side edge are cut, back scraped smooth with flat surface.	
195	5 YR 6/3	5 YR 6/6	7.5 YR 7/4	5	Fairly Complete	0.5	1	1	Not-Volcanic	No					slip		Red, black & white	Unknown	mould and slab		
196	7.5 YR 8/3	5 YR 7/6	7.5 YR 8/3	5	Fairly Complete	0.5	1	1	Not-Volcanic and Grog	No					slip	Fair	Red, black & white	No	mould	The waterspout was formed separately and inserted possibly while the clay was still wet, finger-marks on the back indicates the smoothing by hand of the two different elements in wet clay. Underside smoothed roughly.	
197	10 YR 8/3	7.5 YR 8/4	10 YR 8/4	5	Fairly Complete	0.5	1	2	Not-Volcanic and Grog	No			5 YR 7/4	2	epidermis			Unknown	mould	Back scraped smooth with straight edged object.	
198	10 YR 7/4	5 YR 7/4	7.5 YR 6/6	5	Fairly Complete	0.5	2	3	Not-Volcanic and Grog	No					slip	Fair	Red, black & white	No	mould and slab		

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
199	7.5 YR 6/3		7.5 YR 7/3	10	Complete	0.5	1	2	Not-Volcanic and Grog	No					slip	Fair		Unknown	mould and slab	Bottom roll is slightly triangular in profile, possibly due to damage while clay was still wet	
200	10 YR 7/4	7.5 YR 7/4	10 YR 8/3	5	Fairly Complete	0.5	1	2	Not-Volcanic and Grog	No	2.5 Y 8/2	.5			slip	Fair	Red, black & white	Unknown	mould and slab		
201	10 YR 7/3	5 YR 6/4	10 YR 8/4	5	Incomplete	0.5	1	1	Not-Volcanic and Grog	No	10 YR 8/2	.5			slip	Fair	Red, black & white	Yes			
222	7.5 YR 7/3	5 YR 6/6	7.5 YR 7/4	5	Incomplete	0.5	4	2	Not-Volcanic and Grog	No					slip	Fair	Red, black & white	No	mould and slab	The back of the flange was shaped with a straight edged object. The finished edge of the band appear to have been formed a flat edged object. Large grooves running parallel to tile soffit	
223	10 YR 8/1	7.5 YR 7/4	10 YR 7/2	2	Incomplete	0.5	2	3	Not-Volcanic	No	2.5 YR 8/3				slip		None	No	mould and slab	The back of the flange was shaped with a straight edged object. The back of the flange was shaped with a straight edged object.	
224	10 YR 7/2	5 YR 7/4	7.5 YR 7/3	5	Fairly Complete	0.5	7	5	Not-Volcanic and Grog	No					paint only	Excellent	Red, black & white	Yes	mould		
225	2.5 Y 7/1	5 YR 8/3	10 YR 7/4	5	Fairly Complete	0.5	4	3	Not-Volcanic and Grog	No					slip	Fair	Red, black & white	Unknown	mould		

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
226	5 YR 7/4		5 YR 8/2	5	Complete	0.5	5	3	Not-Volcanic and Grog	No	2.5Y 8/2				slip			No	mould and slab	Traces of redefinition with a sharp object around curls and ear. Two finger-marks in the clay below the ear lobe. The wrinkles are incised. Back of plague smoothed, possibly by hand, sides of ridge tile is scraped smooth, inside and out.	
243	5 YR 5/4	2.5 YR 6/6	7.5 YR 7/4	2	Complete	0.5	7	15	Volcanic	No			2.5 YR 6/6		epidermis		None	No		The inside of the mould is from a fine red clay, the rest is of a similar colour but with lots of small stone inclusions. There are finger marks on the back of the mould, possibly from smoothing the clay.	
244	10 YR 7/4		10 YR 7/4	5	Complete	0.5	2	1	Not-Volcanic	No					paint only		Red	No	mould		
245	2.5 Y 7/3		2.5 Y 7/3	2	Complete	0.5	2	1	Not-Volcanic and Grog	No	2.5 Y 7.3				slip	Fair	Red, black & white	No	mould and slab	Some slight redefining on the ears and possibly hair. The back of the plaque roughly shaped with a blunt object and smoothed by hand, with finger grooves visible.	
246	5 YR 7/4		2.5 Y 8/2	2	Fairly Complete	0.5	4	1	Not-Volcanic and Grog	No	2.5 Y 8.3				slip	Fair	Red, black & white	No	mould and slab	Some evidence of redefining on left ear. The junction between the plaque and cover tile was scraped	
253	10 R 6/6		2.5 YR 7/6	5	Complete	0.5	5	5	Not-Volcanic and Grog	Yes					paint only	Fair	Red, black & white	No	mould	Evidence of reshaping around the top roll.	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
254	2.5 YR 6/4			5					Not-Volcanic and Grog	No					paint only		Red, black & white	No	mould		
255		5 YR 7/6	5 YR 7/4	5	Complete	0.5	3	3	Not-Volcanic and Grog	Yes					paint only			No	mould	The waterspout was formed separately from a similar clay as the rest of sima, but without grog. It was added with wet clay which was used to form a ridge on the sima around the spout on the front side. The wet clay ring has a lot of organic temper voids	
256	2.5 YR 7/3	2.5 YR 6/6	2.5 YR 7/6	5	Fairly Complete	0.5	3	3	Not-Volcanic and Grog	No					paint only			No	mould		
257	10 R 6/6		2.5 YR 6/6	10	Complete	0.5	3	2	Not-Volcanic and Grog	Yes					paint only	Fair		No	mould	The waterspout was formed separately from a similar clay as the rest of sima, but without grog. It was added with wet clay which was used to form a ridge on the sima around the spout on the front side on the fascia and roll	
258	10 R 5/1	10 R 5/6		5	Incomplete	0.5	2	2	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	No	mould and slab	Edge of soffit is very smooth, maybe part of mould	
259	2.5 YR 6/3	2.5 YR 6/6	10 YR 8/3	5	Complete	0.5	3	2	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	No	mould and slab		

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
260	10 R 6/1	2.5 YR 6/6	7.5 YR 7/4	2	Fairly Complete	0.5	2	2	Not-Volcanic and Grog	No					paint only			No	mould		Incised line on back of fascia lines up with black line painted on underside
261	5 YR 6/2	5 YR 6/6	5 YR 7/4	5	Fairly Complete	0.5	4	2	Not-Volcanic and Grog	Yes					paint only	Fair		No	mould	Bottom edge finished very roughly. Back of fascia smoothed. Pattern of voids indicate layering of clay into mould	Black line painted on bottom, perpendicular to fascia and away from the painted decoration on the roll
262	5 YR 6/6	2.5 YR 6/6	10 YR 7/4	5	Fairly Complete	0.5	2	2	Not-Volcanic and Grog	No					paint only	Poor	Red, black & white	Unknown	mould and slab		
263	2.5 YR 6/4	2.5 YR 6/6	10 YR 7/4	5	Fairly Complete	0.5	2	2	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	No	mould and slab	All backside surfaces are very smooth. Evidence of reshaping around the double roll. Pattern of voids suggest clay was layered into mould.	
264	5 YR 6/4	2.5 YR 6/6	10 YR 7/4	5	Fairly Complete	0.5	3	3	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	No	mould and slab		

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
265	5 YR 7/3	5 YR 6/6	10 YR 7/4	5	Fairly Complete	0.5	2	3	Not-Volcanic and Grog	Yes					paint only	Fair		No	mould	The hole for the waterspout in the sima itself seems to be rather rectangular, portion of clay used to fit spout in still preserved, including ridge on front face which extended onto the roll. There are vertical grooves in the joint between the horizontal and vertical parts, probably from shaping. The inside of the hole for the spout is very roughly shaped. The underside as well.	There is a black line painted on the underside, 37 from the front edge of the roll and paralleled to it
266	5 YR 6/6	2.5 YR 6/8	10 YR 7/6	5	Fairly Complete	0.5	2	2	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	Yes	mould and slab	Back side of soffit smoothed. Reshaping on double roll. Gauge in wet clay on backside of soffit. 12mm side shallow groove along width of back edge of soffit. Paint from soffit around the edge, indicating it was made before paint was applied	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
267	2.5 YR 6/4	2.5 YR 6/6	10 YR 7/4	5	Fairly Complete	0.5	2	3	Not-Volcanic and Grog	Yes					paint only	Fair	Red, black & white	No	mould	The underside is very roughly finished. Seems to be abraded with paralleled incised grooves, like from a file or wire brush. Waterspout formed separately and fixed in place with wet clay with lots of organic temper voids, finger-marks indicate done by hand. Underside very rough.	
276	2.5 YR 7/3	2.5 YR 5/6	5 YR 5/4	5	Fairly Complete	0.5	2	5	Not-Volcanic and Grog	No					paint only	Poor	Red, black & white	Yes	mould and slab	The meander pattern on the bottom, horizontal plaque is laid out with incised lines. The palmette is hand painted with the guilloche lines being made by compass. There are small circular depressions in the middle of the black, hand painted central disks (top and bottom). On the top right hand corner, on the top of the horizontal plague the clay has been roughly chiselled away. The painted decoration is applied on top of these chisel marks.	Two black lines, one at an angle forming an arrow painted 6cm from the edge on top of the top horizontal plaque on the right hand side.
277	7.5 YR 8/4	10 R 6/8	7.5 YR 8/4	5	Fairly Complete	0.5	3	5	Not-Volcanic and Grog	No					paint only		Red, black & white	No	mould		Possible traces of red paint on back

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
278	7.5 YR 8/2	10 R 6/8	7.5 YR 8/4	10	Fairly Complete	0.5	3	5	Not-Volcanic and Grog	No					paint only	Poor	Red, black & white	No	mould		
279	10 YR 8/3	10 R 8/2	10 R 8/2			0.5	3	5	Not-Volcanic and Grog	No							Red, black & white	Unknown			
280			10 YR 7/1		Fairly Complete	0.5	3		Not-Volcanic and Grog	No					paint only	Fair	Red, black & white		mould		On the back of the cavetto 6 vertical thick incisions are visible.
281	10 YR 8/3	10 R 6/6	10 YR 8/4	10	Fairly Complete	0.5	3	5	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	Yes	mould	Parallel marks left by a template on the front surface. Incised guidelines for the painted meander visible	
282	7.5 YR 8/4	10 R 7/6	7.5 YR 8/6	5	Fairly Complete	0.5	3	5	Not-Volcanic and Grog	No					paint only		Red, black & white	No	mould		
283	10 R 6/4	2.5 YR 7/6	7.5 YR 7/4	5	Incomplete	0.5	3	5	Not-Volcanic and Grog	No					paint only		Red, black & white	No	mould		
284	2.5 YR 7/2	10 R 6/6	10 YR 7/3	5	Fairly Complete	0.5	3	5	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	No	mould		
285	10 YR 8/2	10 R 6/3	10 YR 7/4	10	Fairly Complete	0.5	3	10	Not-Volcanic and Grog	No					paint only	Poor	Red, black & white	No	mould		
286	10 YR 8/4	2.5 YR 6/6	10 YR 7/6	5	Fairly Complete	0.5	3	5	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	Yes	mould		

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
287	2.5 YR 6/6		5 YR 7/4	5	Complete	0.5	1	2	Not-Volcanic and Grog	No					paint only		Red, black & white	No	wheel	concentric grooves from wheel-formation visible on the back and front	
288	2.5 YR 6/8		7.5 YR 7/5	2	Complete	0.5	1	3	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	No	wheel	concentric grooves visible on the back and front of the disk from wheel formation	
289	10 R 6/6		10 YR 8/4	2		0.5	1	2	Not-Volcanic and Grog	No					paint only		Red, black & white	No	wheel	concentric grooves visible on the front and back	
290	2.5 YR 7/4		10 YR 7/6	5	Complete	0.5	1	1	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	No	wheel	concentric grooves visible on the front and back	
291	5 YR 7/3		2.5 YR 7/4	2	Complete	0.5	1	3	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	No	wheel	concentric grooves visible on the front and back	
292	10 YR 6/4		10 YR 7/4	2	Complete	0.5	1	3	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	No	wheel	concentric grooves visible on the front and back	
293	5 YR 5/8		5 YR 6/4	2	Complete	0.5	1	3	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	No	wheel	concentric grooves visible on the front and back	
294				5	Complete	0.5	2	10	Not-Volcanic and Grog	No					paint only		Red, black & white	No	mould	Main form mould pressed and finished with a template, the waterspout is wheel made and fixed in with clay. Horizontal ridge on back from wiping. Damage on front face of cavetto appear to have been when clay was wet	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
295	5 YR 6/4		10 YR 8/2	5	Complete	0.5	3	3	Not-Volcanic and Grog	No					paint only	Poor	Red, black & white	No	mould and slab	Pressed into a mould and finished with a template afterwards. Horizontal grooves left by template around roll. Deep grooves in facia painted over. Vertical groove approximately 12 mm wide on back edge of soffit possibly left by thin knife used to lift object out of mould, can see more damage in clay at top edge. Faint incised lines on soffit to outline pattern.	
296	5 YR 6/3	5 YR 6/6		10	Fairly Complete	0.5	3	5	Not-Volcanic	No					paint only	Fair	Red, black & white	Yes	mould	faint horizontal grooves, possibly from finishing template, front face	
297	5 YR 6/6		7.5 YR 7/4	5	Fairly Complete	0.5	3	5	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	Yes	mould	front finished with template. Waterspout fixed in with wet clay (evidence of wet clay on roll and in back with fingerprints) before painting	
298	5 YR 6/4			10	Complete	0.5	3	3	Not-Volcanic and Grog	Yes					paint only	Fair		No	mould	front finished with template, sides and waterspout hole finished with straight edged tool	
299	5 YR 6/6		5 YR 7/4	5	Complete	0.2 5	2	3	Not-Volcanic and Grog	No					paint only	Fair	Red, black & white	Unknown	mould	Front surfaces finished with template.	

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
331	5 YR 6/4		5 YR 7/4	5	Fairly Complete	0.2 5	2	5	Not-Volcanic and Grog	No					paint only	Poor	Red, black & white	Yes	mould and slab	round edge finished with template. Faint inscribed outlines on facia for decoration	dark brownish red paint line on underside of top ledge, next to joint
332	5 YR 5/1	5 YR 6/4	5 YR 7/4	2	Incomplete	0.1	1.5	2	Not-Volcanic and Grog	No								No	mould and slab	Front plaque of a very fine clay with almost no inclusions (surface cracking visible), cover tile section with a lot of inclusions so two sections formed separately and joint while clay still damp. Back of plaque roughly finished by hand	
333	5 YR 7/3		7.5 YR 7/3	2	Complete	0.5	1.5	10	Volcanic	No					paint only	Fair	Black & white	No	mould	Front surface finished with a template - horizontal grooves at bottom of roll	
334	5 YR 7/1	5 YR 7/4	5 YR 7/3	5	Fairly Complete	1.5	3	7	Not-Volcanic and Grog	No	10 YR 8/3	0			slip		Red, black & white	No	hand and slab	mane section mould formed with some defining by hand, ex the inside of the lion's ear and the points of the mane. On left edge clearly visible that clay was layer in two slabs. Finished by hand at back with a lot of wet clay smoothed by hand	

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
348	2.5 YR 6/4		5 YR 7/4	2	Complete	0.5	2	3	Volcanic	No				4-25	epidermis			No	mould and slab	Details of face, such as nose and eyes defined after removal from mould with sharp tipped object. Back of plaque smoothed with cloth or by hand. Only the plaque has an epidermis. The tempered fabric of cover tile is smeared towards front where it meats the epidermis fabric that is slightly formed around hair on the top and sides.	
349	7.5 YR 7/2	2.5 YR 6/4	7.5 YR 7/4	5	Incomplete	0.25	4	7	Not-Volcanic and Grog	No	10 YR 8/2	1.5			slip	Fair	Red, black & white	No	mould	Surface smoothed after coming out of mould. Horizontal grooves at top and bottom of roll. Slight horizontal grooves on lower fascia. Point and circle outline inscribed in wet clay by compass for flower. Bottom roughly scraped	
350	5 YR 5/1	5 YR 6/6	5 YR 6/4	10	Incomplete	0.25	2	3	Not-Volcanic and Grog	No					paint only		Red, black & white	Unknown	mould and slab	Front surfaces smoothed - traces in-between two rolls and on top of fascia.	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
351	2.5 Y 7/4		2.5 Y 7/4	5	Fairly Complete	0.2 5	3	3	Not-Volcanic and Grog	No	10 YR 8/2	1			slip	Excellent	Red, black & white	Yes	mould and slab	surface smoothed and reformed after taken out of mould, especially around roll. Guides for the guilloche incised with thin tipped point in wet clay - centre lines through centre of disks and palmettes. Also faint trace of incised mark made with compass for outside curve of guilloche. Small point depressions from compass used to paint guilloche, slight overlap where two curves meet. Centre disk and palmette hand painted	
352	5 YR 6/4		5 YR 7/3			0.2 5	4		Not-Volcanic and Grog	No					slip	Fair	Red, black & white	Unknown	mould	Surfaced smoothed after taking out of mould.	
353		2.5 YR 6/4	2.5 YR 6/4	5	Fairly Complete	0.2 5	5	3	Not-Volcanic and Grog	No	2.5 Y 8/2	0.5			slip	Fair	Red, black & white	Yes	mould	Chipping of at corner in stepped joint appears to have been made after clay dried, maybe even fired. Appears that bottom roll was added later from looking at the left hand corner. Incised lines in clay to outline pattern on cavetto and possibly bottom roll.	

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
354									Not-Volcanic and Grog	No						Poor	Red, black & white	Yes	mould and slab	On the top right hand corner, on the top of the horizontal plague the clay has been roughly chiselled away. The painted decoration is applied on top of these chisel marks. Faint horizontal grooves visible on all finished surfaces - possibly from final finish with template. The meander pattern on the bottom, horizontal plaque is laid out with incised lines. The central disks are hand painted with the guilloche lines being made by compass. There are small circular depressions in the middle of the black, hand painted central disks.	
355	2.5 YR 6/6		7.5 YR 7/3						Not-Volcanic and Grog	Yes						Fair	Red, black & white	Yes	mould	Clearly visible that spouts where added afterwards and fixed with wet clay - portion on left side spout no wet clay in joint. Scratches on sima around this fixing clay formed into a ring around base of spout indicate spout fixed when clay still somewhat wet.	Three vertical incised lines visible on back towards left side, appears to have been incised when clay dry, but not fired

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
356	2.5 YR 6/6		7.5 YR 7/4	2		0.2 5	2	5	Not-Volcanic and Grog	No	10 YR 8/2				slip		Red, black & white	No	mould and slab	The cover tile added separately to plaque, wet clay around joint on top and bottom, smoothed by hand	
357	2.5 Y 7/4	2.5 Y 6/1	2.5 Y 8/3	5	Fairly Complete	0.2 5	3	5	Not-Volcanic and Grog	No					paint only	Fair			slab		
358	5 YR 5/1	2.5 YR 6/6	5 YR 7/4	2	Incomplete	0.2 5	4	5	Not-Volcanic and Grog	No					paint only			No	mould	The waterspout was added separately with wet clay, which forms a ring around the base of the spout on the front surface. Horizontal groove on bottom roll from forming, or reshaping with template	
359	5 YR 7/4	5 YR 7/6		2		0.0 5	2	3	Not-Volcanic and Grog	No	2.5 Y 8/2	0			slip			No	mould	Multiple marks from palette knife used to reshape reels visible.	
360	10 YR 7/4	5 YR 7/4	10 YR 8/2	5	Fairly Complete	0.0 5	6	10	Not-Volcanic and Grog	No					slip			No	mould		
361	10 YR 7/4		2.5 Y 8/2	2	Complete	0.2 5	0.7 5	7	Not-Volcanic and Grog	No					none		none	No	wheel	The holes were made while clay still wet, pushed from the outside in, clay ridges visible on the inside.	
362	7.5 YR 5/1	7.5 YR 7/4	7.5 YR 7/3	5	Complete	0.5	5	3	Not-Volcanic and Grog	No					epidermis		Red, black & white	No	mould and slab	Some evidence of reshaping round tongue and mouth	
363	2.5 YR 6/6			5	Complete	0.5	3	5	Not-Volcanic and Grog	Unknown			10 YR 8/3	2-6	slip and epidermis		none	Unknown	mould	Faint traces of retouching visible in grooves	

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
364	2.5 YR 6/8	2.5 YR 7/4	7.5 YR 8/4	2	Complete	0.5	3	1	Not-Volcanic and Grog	No								Unknown	mould	Large void along centre line of fracture indicates that two sides of relief were moulded separately and then joined while clay was wet	
365	2.5 Y 7/3			5	Complete	0.2 5	4	7	Not-Volcanic and Grog	No			2.5 YR 6/8	2-8	slip and epidermis		Red	No	mould	The two faces were moulded separately and then joined while clay was still wet. Joint can be seen in broken edges and in slight crack running along finished top edge	
366	5 YR 7/3			5	Complete	0.2 5	4	2	Not-Volcanic and Grog	No			2.5 YR 6/8	2-8	slip and epidermis		Red	Unknown	mould	Two faces moulded first and then joined while clay still moist. Joint with number of voids visible.	
367	2.5 YR 6/4			5	Complete			3	Grog	No	2.5 YR 8/2			3	slip and epidermis		none	Unknown	mould	Two faces moulded separately and pressed together while clay still moist. Joint with large void visible along centre line	
368	10 R 6/8			2	Complete	0.5	3	3	Not-Volcanic and Grog	No	2.5 YR 8/2				slip and epidermis		none	Unknown	mould	Two faces moulded separately and pressed together while clay still moist. Joint with small voids visible along centre line in fractured edges. Characteristic marks from applying wet slip visible.	

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
369	2.5 YR 6/8			2	Complete	0.25	4	3	Not-Volcanic and Grog	No				2	slip and epidermis			Unknown	mould	Two faces moulded separately and pressed together while clay still moist. Joint with small voids visible along centre line. Possible redefining with sharped edge tool indicated by clay ridge formed in groove between leaves	
370	5 YR 7/3			2	Incomplete	0.25	4	2	Not-Volcanic and Grog	No				2-4	slip and epidermis			Unknown	mould	Two faces moulded separately and pressed together while clay still moist. Joint with small voids visible along centre line, at some points the two halves are barely connected. Voids between fabric and epidermis also visible	
371	7.5 YR 7/3			2	Complete	0.5	4	5	Not-Volcanic and Grog	No				2-7	epidermis			Unknown	mould	Two faces moulded separately and pressed together while clay still moist. Joint with small voids visible along centre line in fractured edges. Top edges smoothed to remove visible joint. Voids between epidermis and fabric also visible	

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
372	2.5 YR 6/6			2	Complete	0.25	5	5	Not-Volcanic and Grog	No				3-6	slip and epidermis		none	Unknown	mould	Two faces moulded separately and pressed together while clay still moist. Joint with void visible along centre line in fractured edge. Marks left by fingers smoothing slip. Voids left between fabric and epidermis layers as well	
373	10 YR 8/3								Not-Volcanic and Grog	Unknown								Unknown		Two faces moulded separately and pressed together while clay still moist. Joint with void visible along centre line in fractured edge. Characteristic marks left from smoothing slip.	
374	2.5 YR 6/6			2	Complete	0.25	4	3	Grog	No			2.5 YR 7/4	11	epidermis		Red, black & white	No	mould		
375	2.5 YR 7/4			2	Complete				Grog	No				3-6	slip and epidermis			Unknown	mould	Two faces moulded separately and pressed together while clay still moist. Joint with void visible along centre line in fractured edge.	
376	2.5 YR 6/6								Not-Volcanic	Unknown								Unknown		Two faces moulded separately and pressed together while clay still moist. This joint not very secure - see VIN 382. Fingers marks left from applying slip visible on finished edges	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
377	2.5 YR 6/6								Not-Volcanic	Unknown								Unknown		Two faces moulded separately and pressed together while clay still moist. Joint with void visible along centre line in fractured edge. Fingers marks left from applying slip visible on finished edges and around volute	
378	10 YR 8/4								Not-Volcanic	Unknown								Unknown		Two faces moulded separately and pressed together while clay still moist. This joint not very secure - see VIN 382. The back of each halve roughly smoothed by hand.	
379	5 YR 7/3								Not-Volcanic	Unknown					slip and epidermis			Unknown		Two faces moulded separately and pressed together while clay still moist. This joint not very secure - see VIN 382. The back of each halve roughly smoothed by hand. Can see that the epidermis was pressed to both the front and sides of the mould, part of the fabric has broken away, leaving only the epidermis at the edge	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
380	10 YR 8/4								Not-Volcanic	Unknown								Unknown		Two faces moulded separately and pressed together while clay still moist. This joint not very secure - see VIN 382. The back of each halve roughly smoothed by hand.	
381	2.5 YR 6/6								Not-Volcanic	Unknown								Unknown		Two faces moulded separately and pressed together while clay still moist. This joint visible on one fractured edge	
382	10 YR 8/3					2	5	1	Not-Volcanic	Unknown			5 YR 7/4					Unknown		Two faces moulded separately and pressed together while clay still moist. The back of each halve roughly smoothed by hand.	
383	10 YR 7/1	7.5 YR 7/3	7.5 YR 7/4	5	Fairly Complete	0.25	5	5	Grog	No	2.5 Y 8/2				slip	Fair	Red, black & white	No	slab		
384	10 YR 8/3	2.5 YR 6/4	2.5 YR 7/6						Not-Volcanic	Unknown	2.5 Y 8/2	0.2			slip		Red, black & white	No	slab	Plaque and cover tile formed separately and joined with wet clay. Wet clay smoothed to form curved inside corner	
385	2.5 YR 6/6		2.5 Y 8/3		Fairly Complete				Not-Volcanic	Unknown	2.5 Y 8/1	0.2			slip		Red, black & white	No	slab		
386	7.5 YR 7/3		2.5 YR 8/2	2	Complete	2	2	10	Volcanic	No					paint only		Black & white	No			

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
387	2.5 Y 8/3	2.5 YR 7/4	2.5 Y 8/2						Not-Volcanic	Unknown					slip and epidermis		none	Unknown		Two faces moulded separately and pressed together while clay still moist. This joint visible on one fractured edge	
388	5 YR 7/2			5	Complete	0.2 5	4	5	Grog	No	2.5 Y 8/2		2.5 YR 6/6	2	slip and epidermis		none	Unknown	mould	Two faces moulded separately and pressed together while clay still moist. This joint visible on one fractured edge. The palmette was connected to the ridge tile while clay still wet, this connection formed by pressing down firm on joint, this smooth groove visible on both sides	
389	7.5 YR 7/3		2.5 Y 8/3	10	Fairly Complete	0.5	7	7	Grog	No		0.2			slip		Red	No		Inside edge roughly finished, scraped and smoothed in corners. Bottom edge is hollowed out while clay still wet	
390	2.5 YR 7/2					0.2	6		Not-Volcanic	Unknown					paint only		Red, black & white	No	mould	Inside and bottom roughly finished, probably scraped. Top is smoothed. Redefining in grooves between rolls	
391		10 YR 8/3	10 YR 7/4						Not-Volcanic	Unknown					slip		Red, black & white	No	slab	Antefix face and cover tile manufactured separately and then connect while clay still wet with slip. Slip layer on back still partly remaining with clear finger marks visible	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
392	5 YR 6/2	5 YR 6/4	7.5 YR 6/4	5	Incomplete	0.05	1	6	Volcanic	No					slip	Fair	Red, black & white	No			
393	5 YR 6/6		10 YR 7/3	5	Fairly Complete	0.5	2	4	Not-Volcanic and Grog	No					paint only	Fair		No		Fabric appears to have been formed in two layers, with some air voids running within this joint in the centre of some fractures	
394	10 YR 7/1	5 YR 7/4	10 YR 7/6	10	Incomplete	0.25	1.5	5	Not-Volcanic and Grog	No	10 YR 8/3	0.2			slip	Fair	Red, black & white	No	mould	The fabric consist of at least three visible layers, on for the outer layer of the rim, a second rim layer that does not extend far into cover tile and a third layer, probably connected to cover tile. The bottom of the tile is roughly scraped while the top is smoothed	
395	10 YR 6/6		10 YR 7/3	5	Fairly Complete	0.25	2	5	Grog	No	2.5 Y 8/2	0.2			slip		Red, black & white	No	mould		
396	2.5 YR 6/3	2.5 YR 6/6	7.5 YR 7/3	5	Fairly Complete	0.25	4	3	Grog	No					paint only		Red, black & white	Unknown	mould	The front and back formed separately, not known if decoration in relief was part of mould. Seems like relief pattern was formed by creating shallow grooves with a finger. The two separate parts roughly connected with wet clay, slightly wider at bottom. The inside is hollow and there is a small strut at the bottom	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
397	7.5 YR 7/3	2.5 YR 6/4	10 YR 7/3	5	Fairly Complete	0.25	2	7	Volcanic	No				3	slip	Fair	Red, black & white	No	mould and slab	Inside roughly shaped with straight edged tool, as is finished side edge.	
398	2.5 Y 8/2	7.5 YR 7/3	2.5 Y 8/2	5	Fairly Complete	0.25	5	3	Not-Volcanic and Grog	No					slip	Fair	Red, black & white	No		Underside roughly smoothed and edge tapered, possibly with a plank or other straight edge implement	
399	2.5 Y 7/4		2.5 Y7/3	5	Fairly Complete	0.5	5	8	Grog	No					slip	Fair	Red, black & white	Yes		Underside roughly smoothed and edge tapered, possibly with a plank or other straight edge implement	
401	7.5 YR 7/3				Fairly Complete	0.25	2	5	Volcanic	No				7	slip	Fair	Red, black & white	Unknown	mould and slab	Inside roughly shaped with straight edged tool, as is finished side edge. Top surface very smooth.	
421	5 YR 7/4			2	Complete	1	6	15	Grog	No					none		none	NA	mould and slab	The notch appears to have been formed by hand	
422	5 YR 6/4	2.5 YR 5/8		2	Fairly Complete	0.5	3	7	Not-Volcanic and Grog	No					none		none	NA	mould and slab	Top surface smooth, bottom surface rather rough	
423	2.5 YR 6/6			5	Complete	0.5	2	3	Grog	No					none		none	NA	mould and slab	Both top and bottom surfaces are smooth	
424	5 Y 7/3			5	Complete	0.5	2	3	Not-Volcanic and Grog	No					none		none	NA	mould and slab		
425	5 YR 7/3			5	Fairly Complete	0.5	1	3	Not-Volcanic and Grog	No					none		none	NA	mould and slab	Top surface is smooth, bottom surface is very pitted and the notch appears to have been made by hand	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
426	5 Y 7/4			5	Complete	0.5	5	5	Not-Volcanic and Grog	No					none		none	NA	mould and slab		
427	7.5 YR 7/1			5	Complete	0.2	1	5	Not-Volcanic and Grog	No					none		none	NA	slab		
428	5 YR 6/6			5	Complete	0.0 5	1	1	Not-Volcanic	No	2.5 Y 8/2	2			slip		none	NA	mould and slab		
429	5 Y 7/4			5	Complete	0.0 5	1	1	Not-Volcanic and Grog	No					none		none	NA	mould and slab		
430	7.5 YR 7/4			5	Complete	1	5	3	Grog	No					none		none	NA	mould and slab		
431	5 Y 7/6	5 Y 4/1		5	Misfired	0.0 5	1	2	Not-Volcanic and Grog	No								NA	mould and slab	Object is misshaped due to misfiring with large folds and numerous surface bubbles	
432	5 YR 7/4		10 YR 8/2	2	Complete	0.5	2	7	Not-Volcanic and Grog	No					none		none	NA	slab		
433	5 Y 7/6			5	Complete	0.5	3	3	Grog	No					none		none	NA	slab		
434	5 Y 8/4			5	Complete	1	4	5	Not-Volcanic and Grog	No					none		none	NA	slab		
435	5 YR 7/4	2.5 YR 6/6		5	Fairly Complete	1	3	3	Not-Volcanic and Grog	No					none			NA	slab		
436	5 YR 6/4	2.5 YR 6/6		5	Fairly Complete	1	5	15	Grog	No					none		none	NA	mould and slab	Smooth surface on top. Bottom and sides are rougher	

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
437	10 YR 8/2	5 YR 7/4		5	Complete	1	5	10	Grog	No					none		none	NA	mould and slab	Top surface is smooth, bottom surface is very pitted and the notch appears to have been made by hand	
500	7.5 YR 7/4		7.5 YR 8/3	10				7	Not-Volcanic and Grog	No					slip		Red, black & white	Yes	mould and slab	The roll surfaces are very messy. Slight imperfections and fingerprints indicating a slip or wet clay. There are multiple and deep grooves running in the same direction indicating the use of a template	
501		5 YR 8/3	10 YR 8/2					5	Not-Volcanic	Unknown								Unknown	mould and slab	Deep horizontal grooves on the double roll.	
502	2.5 Y 7/2	5 YR 7/4		10	Fairly Complete			3	Grog	Unknown	10 YR 7/3	1			slip	Fair	Red, black & white	Yes		Incised horizontal guideline through the centre of the palmette	
503		7.5 YR 7/4		10				7	Not-Volcanic	Unknown								Unknown			
504	7.5 YR 7/4			10				5	Not-Volcanic	No								Unknown	mould	Quite a lot of deforming of the rolls while clay still wet, possibly when it was removed from the mould	

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
505		5 YR 6/6	7.5 YR 7/4	10					Not-Volcanic	No	10 YR 7/4	.2			slip			Yes		Horizontal guide lines for painting double guilloche still visible. Side edge appear to have been both pressed against a hard surface and cut. The painting lines for the slip is clearly visibly, painted in an wide arch. Top surface of horizontal plaque is very rough except at edge next to roll where the template smoothed the surface, grooves left by the template are clearly visible	
506		7.5 YR 7/6							Not-Volcanic	Unknown							Red, black & white	Unknown			
507	5 YR 7/2	2.5 YR 6/6	7.5 YR 7/4	5	Incomplete			7	Grog	Unknown								Unknown	mould	Slight horizontal marks on front fascia surface There is a vertical ridge left in the wet clay towards the back of the stepped joint. This mark is perfectly aligned to the very regularly shaped stepped joint. On the other side of this mark the finish is much less regular. This suggest that it was left after a template was used to form the stepped joint.	There are marks in black paint on the back of the sima, but not enough is visible to have an indication of what they look like

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
508	7.5 YR 7/4			10	Fairly Complete			7	Grog	No	10 YR 8/3				slip	Fair	Red, black & white	Unknown	mould	The roll is rather irregular. The waterspout appease to be wheel made and has a finer fabric. There is a 3mm gap between the spout and the hole in the sima, partly filled with clay. The waterspout is flatten out and smoothed out into the horizontal plaque at the back. The stepped joint seems to have been formed by pressing a number of different edges into the clay.	
509		5 YR 6/6	7.5 YR 7/4						Not-Volcanic	Unknown	10 YR 7/3	0.1			slip			Unknown	mould and slab		
510	7.5 YR 6/2	7.5 YR 6/6			Fairly Complete				Grog	No	10 YR 7/3	0.1			slip			Unknown	mould and slab		
511	7.5 YR 7/4			10	Fairly Complete			7	Grog	No					slip			Unknown	mould		
512		5 YR 6/6							Not-Volcanic	Unknown								Unknown		vertical grooves in front surface of rolls, compression groove in back of bottom roll	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
513	10 YR 7/2	7.5 YR 7/4		10	Fairly Complete			3	Grog	No					slip		Red, black & white	Yes	mould and slab	Horizontal guide line runs through the two holes left by the point of the compass. Horizontal line is 51 mm from double roll. Horizontal scrapes and grooves visible on double roll The fracture very Cleary expose that the horizontal plaque and vertical plaque are constructed from two different slabs. There is a colour difference between the two and the shapes are clearly visible in the fracture.	
514		7.5 YR 7/4							Not-Volcanic	Unknown		0.1			slip			Unknown		voids between rolls and soffit plague indicate they were formed separately and joined	
515		5 YR 6/6							Not-Volcanic	Unknown	2.5 Y 8/2				slip			Unknown	mould and slab	Soffit plague has very slight convex curve	
516	2.5 Y 6/3	2.5 Y 7/2							Not-Volcanic			4			slip		Red, black & white	Unknown	hand and slab	The visible parts of objects is finely finished. The underside of the boot is rough. The boot is hollow and there is a 20mm dia hole to the inside for ventilation during firing	
517	5 Y 7/4				Fairly Complete				Not-Volcanic	No					slip			Unknown	hand and slab	The visible parts of objects is finely finished. The underside of the boot is rough. The boot is hollow	

Appendix B: Fabric and Production techniques

VIN	Fabric: Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Slip: Colour	Thickness	Epidermis: Colour	Thickness	Surface finnish: Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming: Forming techniques	Secondary forming	Construction marks
518		5 Y 8/3	5 Y 6/3						Not-Volcanic	No		2			slip			Unknown	hand and slab	The scar where the leg was joined to the horse is still visible	
519	5 Y 6/3								Not-Volcanic	Unknown							Red	Unknown		Evidence that the main shape was first formed and then the hair was added as a detail on top while clay was not yet bone-dry.	
520									Not-Volcanic	Unknown								Unknown		There are three holes (including one that is now partially obscured by nail). These are in a row at the curve of the horse's neck running vertically. The holes are 4x4mm big and were formed by pressing a square implement from the outside in while the clay was still slightly wet. Not clear if holes were intentionally filled after firing or if they are now filled with dirt	
521		5 YR 7/4							Not-Volcanic	Unknown							Red, black & white	No	mould	The side edges are shaped by a straight edged object	
522		5 Y 7/3							Not-Volcanic	Unknown	7.5 YR 8/3						Red	Unknown	hand and slab	Main structure formed first and then hair added. The leg was added with slip.	
523	2.5 Y 6/1	10 YR 8/3			Fairly Complete				Grog	No	7.5 YR 8/2				slip		Red	Unknown	hand and slab	Hair added to main structure while still not bone-dry	
524		5 YR 6/4							Grog	Unknown	5 YR 7/6				slip		Red, black & white	No	hand and slab	Thick second layer moulded on to base shape	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
525	5 Y 6/2	5 Y 6/4			Fairly Complete				Grog	Unknown					slip		Black & white	Unknown	hand and slab	there is a ventilation hole 8mm in diameter in the riders' bottom close to where it meets the horse	
526		7.5 YR 7/4							Not-Volcanic	Unknown	5 YR 7/6				slip		Red	Unknown	hand and slab	hair moulded on 25mm thick base while not yet bone-dry	
527									Not-Volcanic		5 YR 7/6				slip		Red	Unknown	hand and slab		
528		7.5 YR 7/4							Not-Volcanic	Unknown	5 YR 6/6				slip			Unknown	hand and slab	hair moulded on 25mm thick base while not yet bone-dry	
529		2.5 Y 7/3							Not-Volcanic	Unknown					slip		Red	Unknown	hand and slab		
530	7.5 YR 6/4 and 2.5 Y 6/3								Grog	Unknown	5 YR 7/4				slip			Unknown	hand and slab	hair moulded on base. Neck fracture in two thick layers	
531			10 YR 8/4						Not-Volcanic	Unknown					slip			Unknown		hair moulded on base while not yet bone-dry	
532		5 YR 7/4							Not-Volcanic	Unknown					slip		Red	Unknown	hand and slab	hair moulded on 25mm thick base while not yet bone-dry	
533	5 Y 6/2	7.5 YR 7/4			Fairly Complete				Grog	Unknown					slip			Unknown	hand and slab	hair moulded on 29mm thick base while not yet bone-dry	
534	7.5 YR 7/4								Not-Volcanic	Unknown	7.5 YR 6/6				slip			Unknown	hand and slab		
535		7.5 YR 7/4							Not-Volcanic	Unknown					slip		Red	Unknown			
536	5 Y 7/3	7.5 YR 7/4			Fairly Complete				Not-Volcanic	Unknown					slip			Unknown	hand and slab		

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
537									Not-Volcanic	Unknown					slip		Black & white	No			
538		7.5 YR 7/3							Not-Volcanic	Unknown							Black & white	Unknown			
539		7.5 YR 7/3							Not-Volcanic	Unknown							Black & white	Unknown			
540		5 Y 7/4							Grog	Unknown	5 YR 7/6				slip			Unknown	hand and slab	In the wet clay roughly wiped into the join between the main object and the internal support there is a small 2mm wide hole, as from wire or a thin stick that was used for support during production	
542		5 YR 6/6							Not-Volcanic	Unknown					slip			Unknown	hand and slab	The curl is partly hollow and partly solid. The internal surfaces are very rough with wet clay roughly smoothed. The internal support varies in thickness.	
544		2.5 Y 7/4							Grog	Unknown							none	NA			
553		7.5 YR 7/6							Not-Volcanic	Unknown	2.5 Y 8/2	0.5			slip			No	mould and slab		
554	5 Y 7/4								Not-Volcanic	Unknown		5 Y 8/2			slip			No	mould and slab		
555	5 Y 7/3			5				3	Grog	No					slip			No	mould and slab		
556		10 YR 7/4							Grog	Unknown					slip			No	mould and slab		

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
557		7.5 YR 8/4						15		No	2.5 Y 8/2	0.3						No			
562	5 YR 5/3	5 YR 6/6		5	Incomplete			10	Not-Volcanic		2.5 Y 7/3	0.7			slip			No	mould		
563		10 YR 8/3							Not-Volcanic								Black	No	mould and slab		
564	7.5 YR 7/2	5 YR 6/6		2	Fairly Complete			3	Grog		2.5 YR 8/4	0.3			slip		Black & white	No	mould and slab		
565		2.5 YR 6/8	2.5 Y 6/4	2	Fairly Complete				Grog								none	No	mould and slab		
566		2.5 Y 8/4		5	Fairly Complete				Grog								none	No	mould and slab		
567		2.5 YR 6/6			Complete						10 YR 8/3	0.4			slip			No			
568	2.5 YR 6/6			2	Complete			3	Not-Volcanic and Grog	No	2.5 Y 8/3	0.5			slip		none	No	mould and slab		
569		2.5 YR 6/6		5	Fairly Complete				Not-Volcanic and Grog	No					paint only			No	mould		
570		2.5 YR 6/6							Not-Volcanic						slip			Unknown			
571	10 R 5/1	10 R 5/8		2	Incomplete			2	Not-Volcanic and Grog	No					slip			No	mould and slab	The holes for the cover tiles were cut out while the clay was still wet	
572		2.5 YR 6/6		2	Fairly Complete			7	Not-Volcanic and Grog	No	10 YR 8/3	.5		6	slip and epidermis		Red	No	mould	Object formed in two halves and then connected.	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
574		2.5 YR 5/8		5	Fairly Complete			5	Not-Volcanic and Grog	No	2.5 Y 8/3	0.2			slip		Red, black & white	Unknown	mould and slab		
575	2.5 Y 7/4			5	Complete			7	Not-Volcanic and Grog	No					epidermis			No	mould	Object formed in two halves and then connected.	
576		2.5 YR 6/8		5	Incomplete			7	Not-Volcanic and Grog	No							Black & white	No	mould and slab		
577				5	Fairly Complete				Not-Volcanic and Grog	No	2.5 Y 8/3	0.6			slip and epidermis			No	mould	Object formed in two halves and then connected while clay still wet. Only one half is preserved, other half broke away along this join	
578				2				3	Not-Volcanic	No	10 YR 8/2	0.2	10 R 6/6		slip and epidermis		Red	No	mould		
579	5 YR 7/3				Complete				Not-Volcanic	No	10 YR 8/2	0.5			slip and epidermis			No		Object formed in two halves and then connected while clay still wet. Only one half is preserved, other half broke away along this join	
580		5 YR 7/3		5	Complete				Not-Volcanic and Grog	No								No		Object formed in two halves and then connected while clay still wet. Only one half is preserved, other half broke away along this join. Sides are redefined with sharp edged object.	
581	10 YR 8/2			5	Fairly Complete			3	Not-Volcanic and Grog	No		0.5			slip and epidermis		Red	No	mould	Object formed in two halves and then connected while clay still wet.	

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	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
583	2.5 Y 8/2									Unknown	2.5 Y 8/2	0,6			slip and epidermis			No	mould	Object formed in two halves and then connected while clay still wet. Only one half is preserved, other half broke away along this join.	
584	2.5 Y 8/2								Not-Volcanic	Unknown		0.5			slip and epidermis			No	mould		
585	2.5 YR 6/6			5	Complete			7	Grog	No	2.5 Y 8/2	1			slip and epidermis			No	mould	Object formed in two halves and then connected while clay still wet.	
586																			mould	Object formed in two halves and then connected while clay still wet. Two halves have seperatid along this join.	
587	2.5 YR 6/6			10	Complete			7	Grog	No	2.5 Y 8/2	1.2		5	slip and epidermis			No	mould	Object formed in two halves and then connected while clay still wet.	
588	2.5 YR 7/4				Complete				Not-Volcanic		2.5 Y 8/3	1			slip and epidermis			No	mould	Object formed in two halves and then connected while clay still wet. Only one half is preserved, other half broke away along this join.	
589	2.5 Y 7/3								Not-Volcanic		2.5 Y 8/3				slip and epidermis			No	mould	Object formed in two halves and then connected while clay still wet. Only one half is preserved, other half broke away along this join.	
590	2.5 YR 6/6				Complete				Not-Volcanic		2.5 Y 8/3	1			slip and epidermis			No	mould	Object formed in two halves and then connected while clay still wet.	

Appendix B: Fabric and Production techniques

	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
592	2.5 Y 7/2								Not-Volcanic		2.5 Y 8/2	0.5			slip and epidermis		Red	No	mould	Object formed in two halves and then connected while clay still wet. Only one half is preserved, other half broke away along this join.	
593	10 YR 7/2	2.5 YR 6/6		2	Fairly Complete				Not-Volcanic									No	mould		
594	2.5 Y 7/2								Not-Volcanic									No	mould	Object formed in two halves and then connected while clay still wet. Only one half is preserved, other half broke away along this join.	
595	2.5 Y 8/2				Complete				Not-Volcanic		2.5 Y 8/3				slip and epidermis			No	mould	Object formed in two halves and then connected while clay still wet. One half is slightly out of line with the other	
596	2.5 Y 7/3																		mould	Object formed in two halves and then connected while clay still wet. Only one half is preserved, other half broke away along this join.	
597																		No	mould		
598	2.5 Y 7/2			2	Complete				Not-Volcanic	Unknown	2.5 Y 8/3	0.5			slip and epidermis			No	mould	Object formed in two halves and then connected while clay still wet. Only one half is preserved, other half broke away along this join.	
599	2.5 Y 7/2				Complete				Not-Volcanic		2.5 Y 8/3							Unknown	mould		

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	Fabric										Slip		Epidermis		Surface finnish				Forming		
VIN	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
600	2.5 Y 8/3										2.5 Y 8/2						Red		mould	Object formed in two halves and then connected while clay still wet. Only one half is preserved, other half broke away along this join.	
601					Incomplete				Not-Volcanic						slip and epidermis				mould		
602	2.5 YR 7/6			5	Complete			5	Not-Volcanic and Grog	No	2.5 Y 8/3				slip and epidermis			No	mould		
603	10 YR 7/4			2	Complete			3	Not-Volcanic and Grog	No		0.5		5	slip and epidermis			No	mould		
605	10 R 6/6	10 R 6/8		2	Complete			5	Grog	No	2.5 Y 8/3	1			slip and epidermis			No	mould	Object formed in two halves and then connected while clay still wet.	
606	2.5 Y 8/3									Unknown		0.5								Object formed in two halves and then connected while clay still wet.	
607	2.5 YR 5/1	2.5 YR 6/6		10	Incomplete			7	Not-Volcanic and Grog	No								No	mould		
608									Not-Volcanic and Grog	Unknown	2.5 Y 8/2								mould	Object formed in two halves and then connected while clay still wet.	
609									Grog	Unknown					slip and epidermis		Red		mould	Object formed in two halves and then connected while clay still wet.	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
610		2.5 YR 7/4		20	Fairly Complete			5	Not-Volcanic and Grog	No	10 YR 8/2	0.2			slip	Fair	Red, black & white	No			
611	2.5 YR 6/6								Grog						slip	Fair	Red, black & white	No			
612	2.5 YR 7/6																	Unknown			
613		2.5 YR 7/4									2.5 Y 8/2				slip			Unknown	mould		
614		2.5 YR 7/4		5	Fairly Complete			3	Not-Volcanic and Grog	No	10 YR 8/3				slip	Fair	Red, black & white	No	mould and slab	Horizontal groves along front surface, possibly from scraping a template over the surface	
615	5 YR 7/4		5 YR 7/3	2	Complete			20	Volcanic	No									mould		
616	10 R 6/2	10 R 6/4		10	Incomplete			10	Volcanic	No	2.5 Y 8/2	0.1			slip		Red, black & white	No	mould and slab	the bead and reel decoration was clearly added separately. There are clear joins visible on both sides	
617		10 R 6/6			Fairly Complete				Not-Volcanic	No					paint only		Black	Unknown	mould and slab		
618		10 R 6/4			Fairly Complete				Not-Volcanic and Grog	No	2.5 8/2	0.2	10 R 6/6		slip and epidermis	Fair	Red, black & white	No	mould and slab		
619	10 YR 7/4			5	Fairly Complete				Not-Volcanic and Grog	No	2.5 Y 8/2	0.6	10 R 6/4		slip and epidermis		Red	No	mould	Object formed in two halves and then connected while clay still wet	
620									Not-Volcanic		2.5 Y 7/2		10 R 6/6		slip and epidermis				mould	Object formed in two halves and then connected while clay still wet	

Appendix B: Fabric and Production techniques

VIN	Fabric										Slip		Epidermis		Surface finnish				Forming		
	Core Colour	Margin Colour	Surface Colour	Percentage of Voids	Oxidation	Temper - min size	Temper - max size	Temper - Percentage	Main temper type	Organic temper	Colour	Thickness	Colour	Thickness	Finnish layer	Paint quality	Paint colour	Incised guidelines	Forming techniques	Secondary forming	Construction marks
621									Not-Volcanic	Unknown					paint only	Fair	Red, black & white	No	wheel		
622					Complete				Not-Volcanic	Unknown					paint only	Fair	Red, black & white	No	wheel		
623		7.5 YR 6/6			Fairly Complete				Grog										mould and slab	The back is rough. The cover tile added separately	