Ceramics Re-Functionalized: The reassessment of typo-chronological studies on ceramics from the Bronze and Iron Ages in the southern Netherlands (2000 BC - 12 BC)

Brandsma, Rex

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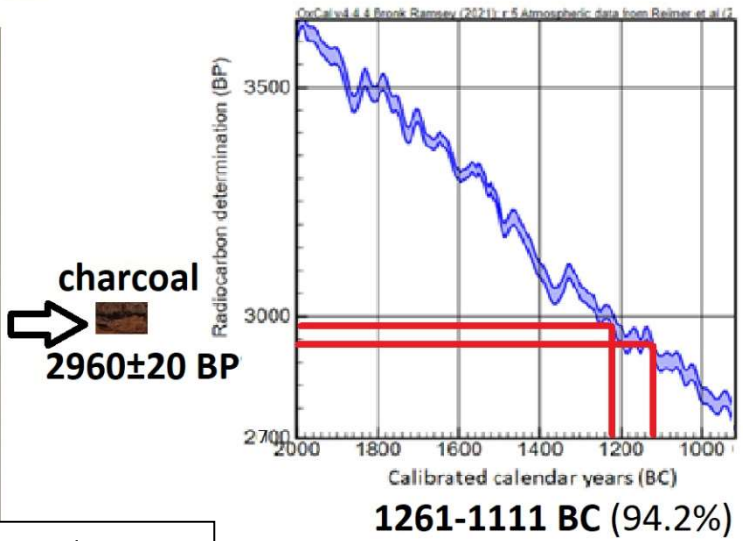

Rex Victor Brandsma

Image frontpage: Image assembled by author: top images (by author), bottom left image (after Glasbergen 1954b, 105) and the bottom right image (after c14.arch.ox.ac.uk). The (BP) dating result of this image could be expected on the basis of typo-chronology, but is nevertheless improvised (!).

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Part I: The reassessment of typo-chronological studies on ceramics from the Bronze and Iron Ages in the southern Netherlands (2000 BC - 12 BC)

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1. Introduction

Ceramics can be considered both durable and nondurable. They can easily break, cannot be reshaped like clay, and are therefore oftentimes discarded and replaced when fractured. Many ceramics have therefore been used for relatively short periods of time, but their (fractured) remains accumulated and continued to be preserved after deposition in nearly any soil type. Ceramics are therefore relatively nondurable for their original purpose and durable for archaeological research. They are among the most common types of materials found during excavations (Bloo *et al.* 2017, 5).

1.1. Relevance of ceramics to Late Prehistoric studies

Due to their ubiquity in the present landscape, ceramics are a major tool to study the distribution and developments of prehistoric societies. This requires knowledge on how ceramics and their functions changed over time. These changes include characteristics like their material components, fabrics and shapes. These characteristics can therefore be used to date archaeological sites and features, by means of the ceramics found in them. Archaeologists have created so-called typologies to enable this type of dating (=typo-chronology). For ceramics in the Low Countries, they exist for each period since the introduction of ceramics in the Early Neolithic (5300 BC-present; e.g. Van den Broeke 2012; Van Heeringen 1992) and have been applied in the analyses and dating of ceramics (e.g. Van Kerckhove 2007). The dating of ceramics may become more significant with the development of absolute dating methods for ceramics (Le Goff and Gallet 2014 and Casanova *et al.* 2020). These methods are nevertheless not yet suited for (large-scaled) utilization in archaeology, and typo-chronologies of ceramics may therefore retain their importance for future years of archaeological research.

Aside of dating purposes, information can be gained about the extraction of raw materials and production processes. The remains of these processes can be observed microscopically (e.g. diatom analysis) and macroscopically (e.g. shaping methods) (e.g. Van den Broeke and Jansma 2012; Roux 2010; Roux 2019; Rye 1988). The functions of a finished ceramic product can also be observed by analysing changed surfaces (e.g. soot from fire) or remaining contents on surfaces (e.g. food residue) (e.g. Demirci *et al.* 2021; Van Kerckhove 2009; Kleijne *et al.* 2021; Kubiak-Martens and Oudemans 2018; Theunissen et *al.* 2021, 22-23). At the same time, depositional contexts of these ceramics can help solve questions about the functions, treatment and potentially the

meaning of ceramics in past societies. All in all, ceramics are omnipresent in archaeological sites, have a wide variety of uses in archaeological research and exist in a wide variety of appearances and contexts.

1.2. Need for revision and improvement

Due to the ubiquity and variety of ceramics, it is useful to have an overview of characteristics, functions and uses of ceramics in archaeology, and how these change over time and depending on location. A variety of ways to research ceramics, and a set of guidelines on their documentation were written down in the Dutch KNA guidelines about handmade ceramics (Dutch: *leidraad*) (Bloo *et al.* 2017). Whereas this "*leidraad"* touches upon a variety of research possibilities and documentation, it does not include a general overview of physical (typological) characteristics and contextual information about handmade ceramics over time. In recent years, there has not been a publication that functions as reference work and discusses, describes and pictures Dutch prehistoric ceramics in physical characteristics over a wider timeframe (see sections 1.2.1 and 1.2.2). At the same time, the chronological framework of known characteristics may have to be put to the test (see section 1.2.3).

1.2.1. Narrow timeframe

Typological analyses often constrain themselves to relatively short periods of time (e.g. Arnoldussen and Ball 2007; Drenth 2018). This is problematic for dating and research. The need for research encompassing a wider timeframe with an overarching view is perfectly illustrated by the citation below;

"*(…) nearly all the decorative motifs of the Molenaarsgraaf BWB association (phase 2)* **[=Early Bronze Age]** *recur on Hilversum pots* **[=Middle Bronze Age].** *It is one of the reasons why we think the Hilversum culture cannot represent a pure immigration as Glasbergen suggests, but bears a strong autochthonous stamp*" (Louwe Kooijmans 1974, 269).

Glasbergen was a pioneer with regards to research on the Bronze Age, including Middle Bronze Age pottery types common to the southern/central Netherlands, known by the names of *Hilversum, Drakenstein* and *Laren* (=HVS, DKS and LRN). He ended up creating a typology of the abovementioned pottery types and compared them to similar pottery from southern England (*Wessex biconical urns*) (Glasbergen 1969, 18-19; 26). The known dating results of this similar English pottery put it earlier in time than pottery from the European mainland (Glasbergen 1969, 13-15). Together with other similarities in

material culture, he concluded that prehistoric peoples from southern England settled on the continent and therefore migrated to the Netherlands (Glasbergen 1969, 32).

However, the problem with this view is that Glasbergen compared Middle Bronze Age pottery spatially, but largely ignored comparison to preceding or succeeding periods, i.e. comparing them temporally. The shortly mentioned comparability of Middle Bronze Age *Hilversum* (=HVS) pottery to Early Bronze Age *Barbed Wire Beaker* (=BWB) pottery was simply interpreted as interaction of migrants with locals (Glasbergen 1969, 17). His conclusions were met with criticism during the following years (Theunissen 1999, 32).

All in all, the typology was later put in a wider chronological framework, as characterized by Louwe Kooijmans' above-cited statement. One could say that the narrow chronological framework of Glasbergen's research gave us the wrong perception of the Early to Middle Bronze Age for a number of years. This may still be relevant to the relation between other periods, like the transition from Middle to Late Bronze Age.

1.2.2. Lack of reference

Relating to the previous point, the narrow timeframes in typo-chronological publications make it difficult to study and date ceramics. For example: during my personal university education relating to Late Prehistoric ceramics, the students made use of one large book for Iron Age pottery (Van den Broeke 2012) and some short chapters or articles for Bronze Age pottery (e.g. Arnoldussen 2008, 177-178; articles in: Louwe Kooijmans 2005). The extensiveness of the first made it hard to get any sense of understanding, and the information of the latter was scarce and scattered. The publications had the exact same purpose for our studies, but were not available in a single illustrating document. Neither was there a good opportunity to "get a feel" for many characteristics of these ceramics, as many were not physically available during my studies. It is difficult to get a sense of surface and colour variability when publications only show drawings, and imagery only shows it in one type of lighting with limited resolution. There was no good place of reference, neither digitally nor physically.

1.2.3. Lack of revision

Besides the narrow timeframes they often encompass, existing typo-chronologies have often not been reviewed with absolute dating. Around the mid-20th century, absolute dating was a revolution in the archaeological field that, like all major changes, required

time to get adopted. Typo-chronologies had been carefully constructed and archaeologists had many years of practice applying them. Therefore, the existing, and well-established typo-chronologies remained in active use in archaeological practice for many decades to come. As a matter of fact, typo-chronologies that followed in the decades thereafter still did not use (e.g. Desittere 1968a, 9-10; 30) or marginally used (Glasbergen 1969, 20) absolute dating to support their chronologies, and those are still often used in archaeological practice today (e.g. Dyselinck 2013, 71-75). The main researchers who started comparing the typo-chronologies to absolute dating are Lanting and Mook (1977), and Lanting and Van der Plicht (e.g. 2003; 2006), but this was carried out unsystematically for a wide variety of characteristics aside of ceramics.

In archaeology, excavation projects virtually always have limited budgets, which is why absolute dating methods can only be applied to limited numbers of samples. Often, it is preferred to apply these methods to contexts that do not contain datable finds, whilst dating contexts with datable ceramics (or other finds) with typo-chronology. However, the disadvantage of this way of working is that existing typo-chronologies cannot be questioned by new data. In case of Boxmeer-Sterckwijck, there were 111 urns from the Late Bronze Age and Iron Age, none of which can be correlated to an absolute date, as they were able to date the urns typologically. Eight graves without pottery were dated with absolute dating instead (Vermue *et al.* 2015, 195; 205). Cuijk- De Nielt has more than a hundred pages of pottery analyses and plenty of pots belonging to the entire research period, but only dated one feature from this period with absolute dating because they "could not date the three sherds" in it (Habermehl and Van Renswoude 2017, 97-98; 169-280).

Some archaeologists have applied both relative typo-chronological dating and absolute radiocarbon (=^{14}C) dating. The results of some of these projects have so far shown disparity between the results of both methods. Some good examples of sites are known from Belgium and the southernmost part of the Netherlands.

One of these examples is the Bronze Age cemetery of Maastricht-Ambyerveld (Dyselinck 2013, 72-80; 163-165). A total of 27 graves with ceramics were dated with ^{14}C dating, 16 of which were also individually dated with typo-chronology. Most of the typo-chronological dating results involve pottery. The application of both methods produced individual dating results with time intervals of one to three centuries (Dyselinck 2013, 72-80; 136; 165). The results show a disparity between both dating methods, with

absolute dating results placing graves and sites in earlier periods (fig. 1). For the five graves with the biggest disparity, each dating method yielded an individual dating result of one to three centuries, but there was still no overlap between the results of both methods (Dyselinck 2013, 165).

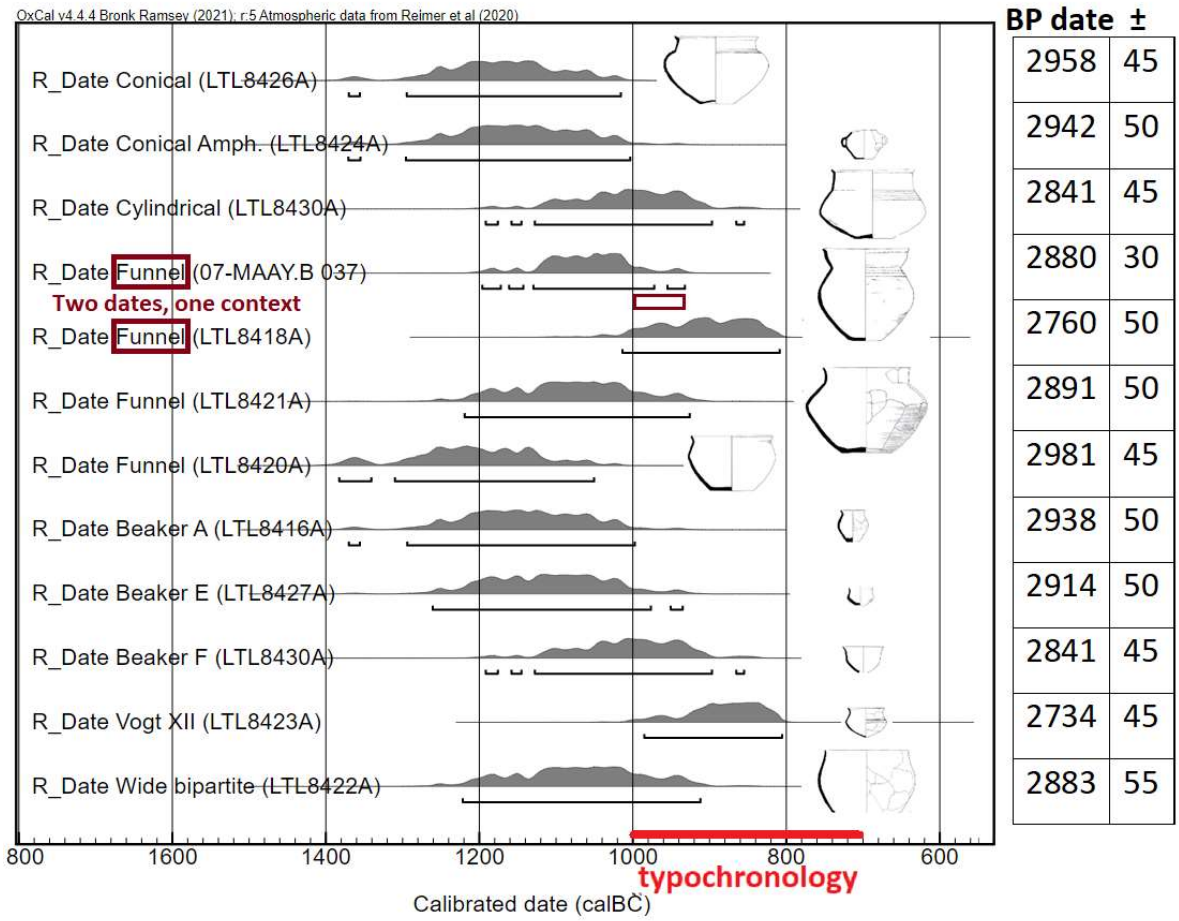


Figure 1: Recalibrated ^{14}C dates from burial contexts with complete vessels from Maastricht-Ambyerveld compared to a combined typo-chronological dating of the 11 vessels marked by a red line (by author; information and vessel drawings: Dyselinck 2013, 76-80; 136-137)

Dyselinck mentions more sites in eastern Belgium of the same period where similar disparities have been observed (Dyselinck 2013, 137). The sites of Velzeke and Blicquey offer similar issues for western Belgium (De Mulder *et al.* 2007, 506-507; De Mulder *et al.* 2008, 111). To elaborate on the issue, apart from a disparity between typology and ^{14}C dating, there may also be one between typological dating of different regions. The shape and decoration of the pots of figure 2 are quite similar. The typological dates do not have any chronological overlap with one another, nor with one of the ^{14}C dating results (De Mulder 2007, 509-510; Ruppel 1990, appendix 2). Typo-chronologies therefore contradict ^{14}C dating and other typo-chronologies.

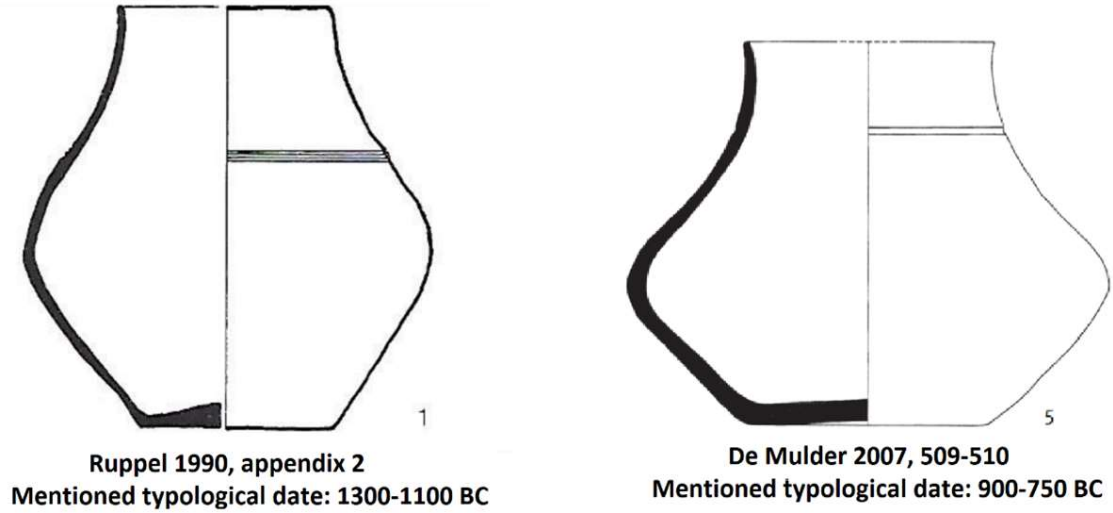


Figure 2: Comparison of two similar shapes with different typological dates and one calculated ^{14}C date (after De Mulder 2007, 509-510; Ruppel 1990, appendix 2)

Relative dating of typology is often based on absolute dating results of other sites, so absolute dating should be considered more reliable. The existing typo-chronology is nevertheless often applied as the only dating method of an archaeological context, because ^{14}C dating is either more expensive or not applicable, for example due to a lack of organic material or because the context has been disturbed. Dyselinck therefore argued that the existing typo-chronologies of ceramics, at least of the Late Bronze Age, are not reliable and in need of revision with new data and ^{14}C dates (Dyselinck 2013, 137). This may also be recommendable for other time periods as can be demonstrated by other examples (e.g. Tol 2009, 39). The findings of sites like Maastricht, Velzeke and Blicquey generally suggest that the disparity between absolute dating and typo-chronology may be reflective of a much wider area stretching several countries, including the research area, as these have a similar research history and often use the same sources as reference (e.g. Desittere 1968b). All in all, there is a need for revision and overview, which requires a sufficient amount of existing typo-chronological data from a particular area that has a lot of material similarity over a longer period of time. The Bronze and Iron Ages of the southern Netherlands fit these requirements, as outlined below.

1.3. Research area and period

The research has been constrained geographically to the southern Netherlands (fig. 3), and temporally to the Bronze and Iron Ages (2000 BC – 12 BC: see fig. 4). Specifically, the geographical area comprises the entire province of North Brabant, most of the province of Limburg, parts of Gelderland and small areas south of the river Lek (fig. 3). This scope is considered sufficiently challenging for a master's thesis. The period is subdivided into six subperiods abbreviated as EBA, MBA, LBA, EIA, MIA and LIA (see table 1 and section 2.2).

Figure 3: The research area in the southern Netherlands (after www.d-maps.com)

The south of the Netherlands, as opposed to the north, has been selected because it is adjacent to the region where some of the issues with typo-chronology have been observed (see section 1.2). Furthermore, it is fairly homogeneous from a geological perspective, mostly including areas covered by Late Pleistocene sand deposits. Nevertheless, it also includes some areas of the Dutch river delta covered by Holocene river deposits. The research area is bordered by the river Lek and landscapes with peat and marine deposits in the northwest, the river Nederrijn in the northeast and the national borders in the south and east. It excludes a region in south-eastern corner of

the Netherlands that is commonly covered by loess soils (Gerritsen 2003, 17-18).

Also, the material traditions are fairly homogeneous across the research area (fig. 4). During most subperiods of the Bronze and Iron Ages (see section 2.2), distinctions can be made between the archaeological remains of the north and the south of the Netherlands (Gerritsen 2003, 123 Hessing and Kooi 2005, 632-633; Theunissen 1999, 202). It is therefore sensible to set the boundary of the research area in the central provinces. Moreover, the area has been researched extensively with many excavations having taken place. Extensive research projects also included most of it as a single research area (e.g. Gerritsen 2001, 3; Theuws and Roymans 1999, back cover). The national borders have, on the other hand, been used to delimit the research area for more practical reasons, ensuring easier access to sources, considering that archeological firms typically operate on a national level.

The research period potentially has a slight issue with the Early Bronze Age, as it can be more easily connected to the Late Neolithic B rather than the Middle Bronze Age. This is mostly due to the similarities in material culture, including its pottery (Fokkens 2001; 256-258; Lanting and Van der Plicht 2003, 152).

The following can be stated about the ceramic traditions that existed in the research area during the subsequent stages of the research period. During the Early Bronze Age, most of the research area belonged to the ceramic tradition of *Barbed Wire Beakers* (BWB). Finds of this tradition are scarcer in the west (Theunissen 1999, 209). During the Middle Bronze Age, the ceramic traditions of the *Hilversum* group (HVS/DKS/LRN) can be found in the entire research area, but is uncommon east of the Meuse/Maas river (Theunissen 1999, 210). During the Late Bronze Age, ceramics of the research area do not (yet) belong to a regionally defined ceramic tradition (Arnoldussen and Ball 2007, 181). At last during the Iron Age, ceramics of the Netherlands are generally placed within three typological groups (Van Kerckhove 2007, 62); a southern, western and northern group (Van den Broeke 2012; Van Heeringen 1992; Taayke 1996). The research area falls entirely within the southern group, and the typo-chronology is mostly relevant to the northern half of the research area (Van den Broeke 2012, 146). In conclusion, the research area seems fairly uniform in terms of well-known ceramic traditions that existed during particular points in time.

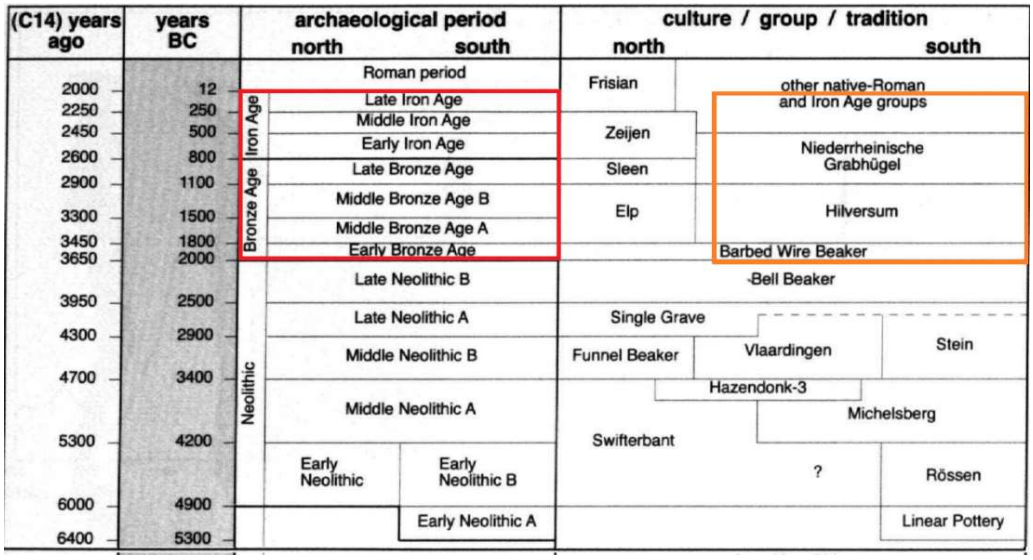


Figure 4: Dutch periodization during the Late Prehistory; red marks the research period and orange marks the groups of material culture/traditions that existed in the southern Netherlands during this period (after Van den Broeke et al. 2005, 28)

1.4. Research goals and questions

The first aim of this thesis/project is to create an overview and evaluation of typo-chronologies from a wide timeframe of the southern Netherlands; the Bronze and Iron Ages (2000 BC-12 BC) (fig. 3 and 4). Such a revision can lead to new knowledge that counters and/or builds upon existing typo-chronologies. It may help set directions for future research like recommendations to emphasize research into particular types of ceramics or, during archaeological practice, to emphasize or de-emphasize the dating of particular ceramic assemblages.

The second aim is to create a physical reference collection with a (digital/paper) manual which can both be used for educational purposes and future research. The manual of this collection combines information from a wide variety of sources in a single overview and the physical collection makes it more tangible. This collection can serve as a product for students and the archaeological working field to attain familiarity with ceramics from this area and period, and to aid in the interpretation and dating of these ceramics.

In order to do so, the following research questions have been formulated:

1. Which typo-chronologies are used and how are they applied?
2. To what extent are the common typo-chronologies for Bronze- and Iron Age ceramics in the southern Netherlands supported by absolute dating methods?
   -If applicable: how and why are they lacking a chronological basis?

3. What are the typological characteristics of ceramics per (sub)period (e.g. Early Bronze Age) and how do they develop over time?
4. How should the reference collection be structured in order to sketch a reliable picture of Bronze- and Iron Age ceramics in the southern Netherlands?

1.5. Methodology

In order to understand the characteristics of ceramics throughout the research period (research question 3), the methodology heavily relies on compiling overviews of typo-chronologies and absolute dating results of contexts with ceramic assemblages (which respectively relate to research questions 1 and 2).

The vast majority of Late Prehistoric ceramics and its typo-chronological research concerns pottery: (fragments of) vessels like plates, bowls and pots that usually held liquids, foods, objects etc. Pottery has a lot of characteristics that are distinguishable from one another. To realize a compilation of typo-chronologies, without becoming too extensive, the overview is limited to a selection of characteristics, known as variables. These are selected based on their perceived chronological value.

- Shape (build-up/height etc.)
- Rim decoration (type/positioning)
- Body decoration (type/positioning)
- Temper (usually grit/grog)
- Surface/finishing techniques

Different periods are characterized one after the other, by analyzing these five variables. An overview of the main sources with information on these variables is also compiled to identify the different sources relating to the local typo-chronologies.

Two complementary methods are used to test and fine-tune the typo-chronologies by comparing them to absolute dating results. Firstly, the creation of a compilation of research that already conducted such comparisons for narrower time periods using their own methodologies. Secondly, an analysis of characteristics of ceramic assemblages from site publications tied to absolute dating results regarding the five variables.

The analysis involving site publications concerns assemblages described in the source material. These assemblages are tied to an absolute dating result from (in nearly all cases) the same archaeological feature. This includes ^{14}C dating and (to a lesser extent)

dendrochronology. The assemblages are ordered in sequence of the absolute dating results for each of the five variables in a large dataset (appendix 3).

The combined data is used for discussion, conclusion and in order to create a reference collection that is in accordance with contemporary typo-chronological data generally supported (at least not contradicted) by absolute dating. Tables and figures related to typo-chronology are created from a variety of sources. A compilation of this material is used to create the manual of the reference collection. Ceramics in the reference collection are dated by using these tables and figures. These dates are complemented by remarks and referenced information from sources for precision and nuance regarding the given typo-chronological dates. This information is entered in catalogues.

1.6. Reader's guide

This research comprises two parts:

- **Part I:** the **current document**, also sometimes referred to as "thesis", which provides a complete description of the work conducted. It is the best starting point for reading. The underlying datasets can be found in the appendices. To maintain readability of the current document, many figures and tables appear in the reference collection (part II) instead. In the current document, those figures and tables are referred to using "ref. fig. xx" and "ref. table xx" respectively (with "xx" referring to the table/figure numbers).
- **Part II:** the **reference collection**, which in turn comprises a physical reference collection and a manual describing and complementing it:
    - The **physical reference collection** is a collection of (numbered) sherds relating to the research area and period, which can be found in a set of drawers located at the faculty of archaeology at the University of Leiden (room C1.11). This allows the reader the possibility to experience the characteristics of the material first hand (literally).
    - The **manual** contains a description in catalogues of pottery from the physical reference collection but also tables and figures providing an overview of the different variables per subperiod. This part is meant to be printed as a hardcopy and used alongside the physical reference collection, and can also be used digitally (e.g. for searching terminology). It can, to a large extent, be used in isolation without frequent referral to the current document (i.e., part I).

The structure of the current document (i.e, part I) is further elaborated below. The structure of part II can be found in the manual itself.

Chapter 2 provides an overview of the different typo-chronologies and characteristics of ceramics during the research period. This also includes definitions for some of the terminology repeatedly used throughout the research (section 2.1) and the periodization of the research period (section 2.2).

In chapter 3, research is discussed that relates to ceramics that have been dated with absolute dating methods (particularly ^{14}C dating). This includes an elaboration of the dataset that is included in appendix 3. Comparisons of typo-chronology with absolute dating has been carried out by other researchers in the past. That research is compiled in section 3.1. The data is complemented with data from site publications that are collected in the dataset of appendix 3. This dataset is briefly discussed in section 3.2.

Subsequently, chapter 4 makes a comparison between the typo-chronological analyses from chapter 2 and the comparison with absolute dating from chapter 3 as expressed in the dataset (appendix 3). This, in turn, raises a few interesting topics for discussion.

Appendices 1 and 2 respectively include overviews of typo-chronologies created by Desittere (1968a; 1968b) and Verwers (1972) that are complemented by imagery. These tables are extensive and are partially outdated. They include descriptions of traditional types that are still referred to in modern publications. Appendices 3 and 4 respectively include the extensive dataset of the analysis involving site publications in which the typo-chronological dates of ceramic assemblages are compared to absolute dates.

1.7. Glossary

Abbr.	Written in full	Additional remarks
>	"After" or "More than"	It refers to "after" when it is about years/dates. It refers to "more than" when it refers to other numbers: length/percentage. "->" is an arrow symbol
<	"Before" or "Less than"	It refers to "before" when it is about years/dates. It refers to "less than" when it refers to other numbers: length/percentage.
^{14}C	Carbon-14/Radiocarbon	-
BA	Bronze Age	2000-800 BC
BWB	Barbed Wire Beaker	Type of decorated vessel from the EBA
DKS	Drakenstein	Type of pottery from the MBA (referring to a place)
Cal.	Calculated	Used for ^{14}C dates
EBA	Early Bronze Age	2000-1800 BC
EIA	Early Iron Age	800-500 BC
Fig.	Figure	-
HVS	Hilversum	Type of pottery from the MBA (referring to a place)
IA	Iron Age	800-12 BC
LBA	Late Bronze Age	1100-800 BC
LRN	Laren	Type of pottery from the MBA (referring to a place)
LIA	Late Iron Age	250-12 BC
MBA	Middle Bronze Age	1800-1100 BC
MIA	Middle Iron Age	500-250 BC
Ref.	Reference	Used in combination with "fig.". Refers to figures in the reference collection (and not in this document)
TAQ	Terminus Ante Quem	dating predates context it is associated with
TPQ	Terminus Post Quem	dating post-dates context it is associated with

Table 1: Abbreviations (= abbr.) repeatedly used in this research (including two recurrent symbols)

2. Typo(chrono)logy

In this chapter, the typo-chronologies most commonly used for Bronze and Iron Age ceramics of the research area are discussed in chronological order. Ceramic, and more specifically pottery, typo-chronologies form the basis of this research. Ideally, they are specific to the research area, but these are occasionally lacking, which is why typo-chronologies from a wider or neighbouring area are occasionally used or mentioned. In order to figure out the accuracy of typo-chronologies, an overview of past typological research and characteristics is required. This overview is based on five macroscopically identifiable variables with chronological value mentioned in section 1.5.

These variables are particularly based on the typo-chronology of Van den Broeke (2012), who tied particular chronological value to them. Additional variables are considered in this research when deemed important for a particular typo-chronology by its author.

In order to understand some of the terminology and phasing used throughout this chapter and (to an extent) the following chapters, additional terminology and (ceramic) periodization are provided in individual sections of this chapter. This is of importance to the scientific and chronological framework of the local typo-chronologies. Table 2 shows a combined table for all typo-chronologies (of all periods) discussed in this chapter.

Modderman 1955	Decoration + illustration of pots (mostly Central/Northern Netherlands!)	Entire EBA
Lanting 1973 (220-221)	Shape + decoration (mostly Central/Northern Netherlands!)	Entire EBA
Glasbergen 1954b, 89-137; (89-92; 128-132)	Shape + temper + surface treatment + decoration	Entire MBA
Glasbergen 1969 (13-19; 27)	Final typology: pot shape + decoration	Entire MBA
Ten Anscher 1990 (74-77)	Rim shape typology + new classification (HVS1-3)	Entire MBA
Drenth 2018	Decoration + shape (pot build-up types)	Entire MBA
Arnoldussen 2008, 177-178	Shape + decoration (fine-tuning Glasbergen's types)	MBA (<1400 BC)
Kersten 1948, 15-26	Elaboration on two types of decoration + Urnfield Period (shape) types	(Entire) LBA
Desittere 1968a, 30-50; b	Typology of shapes + decoration: elaboration + drawings	Entire LBA
Van den Broeke 1991	Characterization of some characteristics of settlement pottery	(Entire) LBA-early LIA
Van den Broeke 2012	This is an Iron Age typology, but the author makes analogies to/disclaimers about LBA pottery in the many paragraphs titled "datering regionaal"	"Hidden" information about the LBA
Kersten 1948, 29-77	Mostly: Shape + decoration	Entire IA
Verwers 1972, 123-140	Mostly: Shape + decoration types (+new periodization)	Entire IA
Van den Broeke 1987a; Van den Broeke 1987b; Van den Broeke 2012	Shape + (rim/body) decoration + temper + finishing techniques + much more: very elaborate typo-chronology (for weights and sling bullets: 1987a, 38)	Entire IA

Table 2: Publications of typo-chronology of Bronze and Iron Age ceramics (excluding some rim shape typology), the numbers within the brackets refer to page numbers most relevant to the typological characteristics (by author)

2.1. Terminology

Terminology can be discussed for the variables mentioned in section 1.5; shape, rim/body decoration, temper and surface/finishing techniques. Because most variables cannot simply be characterized by “A” or “B”, the terminology provides the context required for the understanding of general classifications.

It should also be mentioned that some characteristics, like *cordons*, *ears/handles* and *perforations* may be categorized as part of several variables or none. For this research, cordons are considered a type of decoration, because cordons are often decorated themselves. Ears are categorized as a shape characteristic because of the functional purpose they must have had. Perforations, lumps and perforated lumps (lump ears/knobbeloren) are categorized as decoration, for their particular function is often uncertain and they are usually not a defining part of the profile of a shape.

2.1.1. Shape

Shapes are differentiated with the aid of a variety of classifications based on vertical profiles of vessels. To distinguish different types, it is possible to count different sections based on profile angularity. Figure 5 shows recurring shape terminology based on sections between vessel angles. The terms for sections are counted from the bottom to top. Logically speaking, not all of these terms apply to each vessel, as many lack a neck and possibly a shoulder. Some vessels may have additional sections in their vertical profiles.

The rim (top) is always present and includes part of the section below it (neck, shoulder or belly). The rim additionally includes the transition from the outer to the inner surface of a vessel. The body is the entire vessel from rim to base until a vessel profile reaches its horizontal position (at rim/base).

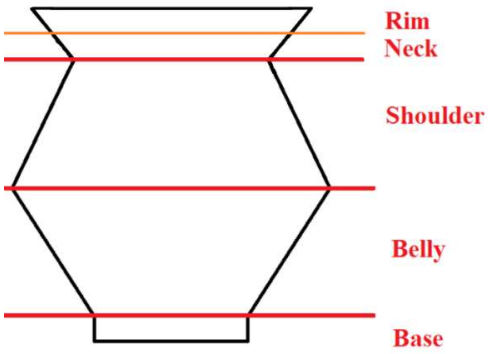


Figure 5: Common pot shape terminology (by author)

There is a method that distinguishes vessels by counting the amount of sections they have (fig. 6). Short protrusions of a rim or base can be neglected for this count. Thickened rims that protrude outwards on the outer surface of a body (and not the inner surface) do not count as sections either. The determination of what is long and angular enough to be considered a section (belly/shoulder/neck) is often arbitrary. Van den Broeke has a more precisely defined definition for necks (read down below) applied to this terminology. The terminology for pots with respectively one, two or three of these sections is shown on figure 6. An additional (rare) term for vessels with four sections is *quadripartite*.

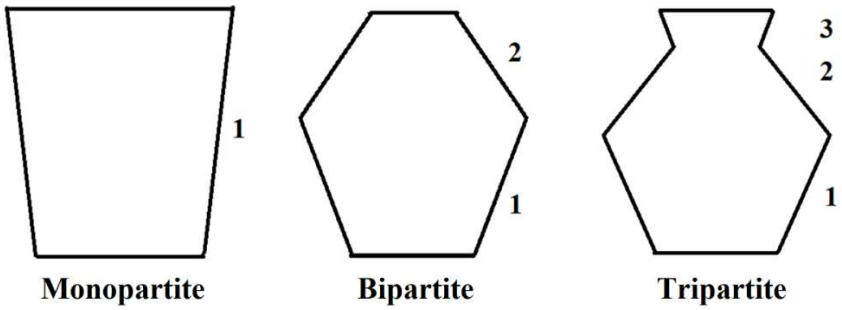


Figure 6: Three common profile build-ups. Most bipartite and tripartite profiles have gradual transitions between the sections which makes it slightly difficult to specify exactly where one ends and the other stops (by author)

The terminology does cause issues for shapes with gradual profile transitions, for it is not always clear where one section starts or whether it should even be considered a section. An example of this is a barrel shape that gradually bends from base to rim without any change in profile angularity. The upper section of this shape is often called a shoulder and the vessel is considered bipartite despite the lack of angularity (fig. 7). The

transition between the sections is defined by the position where the profile bends inwards and closes the shape.

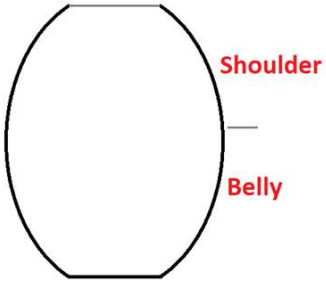


Figure 7: When the profile bends inwards, it is still considered a shoulder (and bipartite) despite the lack of angularity (by author)

Van den Broeke (2012) decided to use a different classification for shapes, by which he fixed issues of some of the definitions above (fig. 8). The first type (I) of this classification generally includes vessels that only have a belly. They may have angles in their profiles with shoulders and necks, but it counts as type I as long as the largest width is at the rim (=open shape). The second type (II) includes pots with conical-shaped necks because these necks, akin to the shoulders, protrude inwards (Van den Broeke 2012, 40-41). The neck of a pot of the third type (III) can only be considered a neck if it is longer than the thickness of the uppermost section of the body (rim) (Van den Broeke 2012, 39).

Pot-buildup type I	Open shapes
Pot-buildup type II	Closed shapes with belly and shoulder
Pot-buildup type III	Closed shapes with belly, shoulder and neck

Figure 8: Pot build-up types as defined by Van den Broeke (2012, 41)

This classification has so far (for the research period/area) mostly been used in Van den Broeke's typo-chronological publications that predominantly revolve around Iron Age pottery (Van den Broeke 1987a, 32; Van den Broeke 2012, 41) and at least one Middle Bronze Age pottery typology (Drenth 2018, 165). These have since also been used for analyses of ceramics of particular sites (e.g. Van Kerckhove 2007, 71).

Another classification that is of particular importance to Van den Broeke's typology is the height to width ratio (fig. 9; Van den Broeke 2012, 39). There is no particular

distinction between pots and tall pots in this classification. All pots are called *tall pots* in the classification of Van den Broeke, but pots with a height-width ratio of 1: 0.85 are generally be considered *tall pots* in this research.

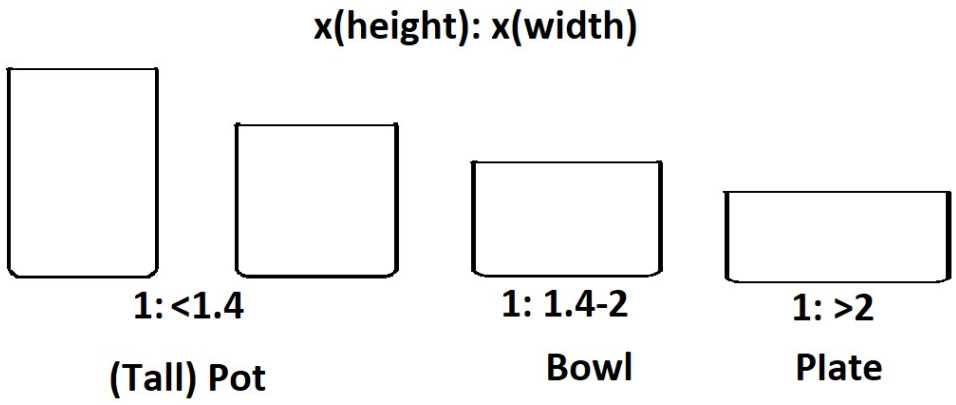


Figure 9: Height to width ratio and the applied terminology for each of these vessel types defined by Van den Broeke (2012, 39; by author)

2.1.2. Decoration

A recurring definition is the positioning of the rim decoration *in front of*, *on top of* and *inside (of) the* rim. The first two are distinguished by Van den Broeke on the basis of the standing position of a vessel and the horizontal line of a vertical profile. The latter positioning of decoration (*on the inside of the rim*) is practically grouped with the second (*on top of the rim)* in his research (Van den Broeke 2012, 111). Van den Broeke's definition is applied in this research, but the definition of decoration *inside of the rim* is individually considered for its particular use during the Bronze Age (fig. 10).

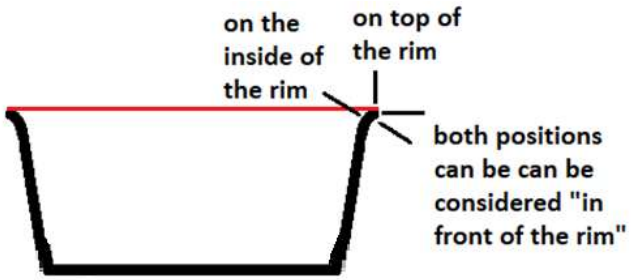


Figure 10: Different positions of rim decoration according to Van den Broeke (2012) (by author)

Body decoration is different per time period, and is therefore distinguished in other sections of this chapter.

2.1.3. Temper

Temper refers to the material added to the clay before firing. This mostly includes grit, grog and/or sand. Grit usually refers to smashed quartz (quartz grit). It can also refer to other smashed stone materials (like granite) or tiny pebbles from fluvial deposits (fluvial grit). Grog refers to smashed ceramic material.

2.1.4. Surface

Surface, which includes finishing techniques, is by far the most questionable variable of this research and is predominantly chosen to include the Iron Age surface technique known as besmirching (Dutch = *besmijting*). In the reference collection (ref. fig. 46), several types of surfaces and their definition are shown. The physical reference collection can also be used to get accustomed to different surface types. The main issue of this variable is that different researchers have different perspectives on what should be considered “polished”, “smoothened” or as some other finishing technique. This research partially relies on the descriptions of other researchers.

2.2. Periodization

For the thesis and reference collection, a broad periodization is used, which divides the research period into six subperiods (Early Bronze Age to Late Iron Age; see fig. 11), which were broadly defined in the 1960s and 1970s (Van Es *et al.* 1967, 10; Verwers 1972, 123-124). These subperiods have had different definitions in years throughout the following research history (Bourgeois 2013, 24; compare e.g. with: Roymans 1991, 20; Roymans and Fokkens 1991, 2). Ceramics defined as Late Bronze Age may for example not fit within the Late Bronze Age anymore (e.g. Van den Broeke 1991, 204). The subperiods are usually abbreviated in three letters: EBA, MBA, EBA, EIA, MIA and LIA. IA and BA are also used to define the Iron Age and the Bronze Age respectively.

The years used to define the subperiods were presented by Van den Broeke in 2005 (see fig. 4 in section 1). With new research, the chosen periodization can be put into question (e.g. Dyselinck 2013, 137-138), but this is mostly beyond the scope of this research.

Aside of this subdivision into six (sub)periods, there is the settlement-based subdivision of the Middle Bronze Age into phases A (1800-1500 BC) and B (1500-1100 BC) (Arnoldussen 2008, 18; Bourgeois 2013, 24-25). For the LBA and EIA, the Hallstatt phases HaA (1100-1000 BC), HaB (100-800 BC), HaC (800-650 BC) and HaD (650-475 BC) are to be mentioned. These are used in this chapter, for these are used by major typo-chronologies of the Late Bronze Age (section 2.6). HaA can be stretched to 1200 BC in German typo-chronology (HaA1). For the entire Iron Age, there is also an elaborate phasing based on the pottery research of Van den Broeke: phases A to L (fig. 11; Van den Broeke 1987a, 32; Van den Broeke 2012, 36).

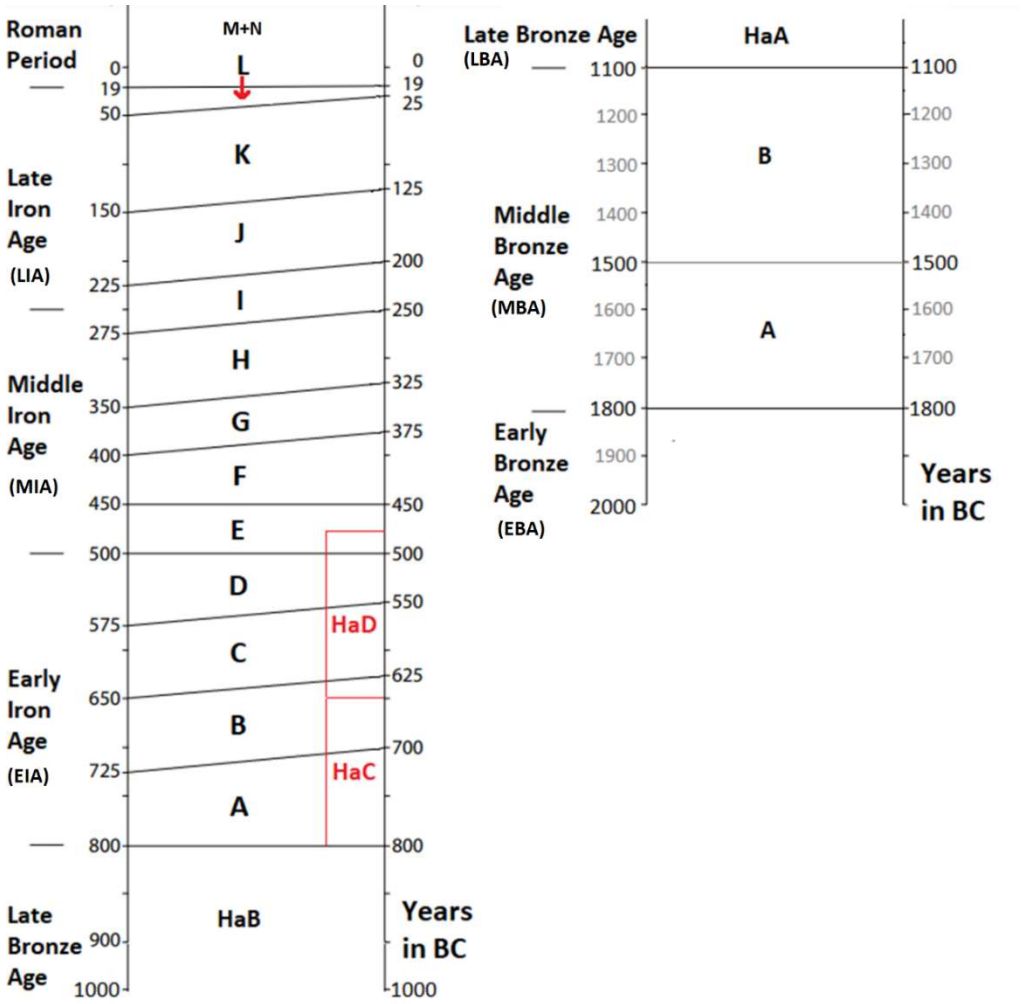


Figure 11: Phases of the Iron Age defined by Van den Broeke (A-M), complemented with the subdivision of the remainder of the research period (after Van den Broeke 2012, 36)

2.3. Early Bronze Age

There is relatively little research history relating to EBA pottery within the research area. It is traditionally mostly known from “settlement” contexts (Fokkens 2019a, 92) and even rarer burial contexts outside of the research area (Bourgeois 2013, 164; Butler and Fokkens 2005, 377; Fokkens *et al.* 2016, 38; Lanting 1973, 223-226; Theunissen 1999, 209). Aside of Molenaarsgraaf (Louwe Kooijmans 1974) and Meerlo (Verlinde 1971), settlements contexts in the research area have only been discovered in the recent decades (Fokkens *et al.* 2016, 38; Theunissen 1999, 209).

The EBA is commonly associated with the earliest occurrence of *Barbed Wire Beakers* (=BWB), referring to barbed wire decoration (fig. 12; ref. fig. 6). Modderman characterized the pottery and put it in a wider framework (Modderman 1955, 32; 35). The decoration differentiates it from previous periods and the shapes differentiate it from the following periods (Fokkens 2001, 256-258). It is nevertheless also possible to find pots with an S-shaped profile and a typical BWB ridge/cordon below the rim with older existing decoration types (Lanting 1973, 259-260). At the same time, it is possible to find a shape that typologically belongs to the Late Neolithic (Veluvial Bell Beaker), but is decorated with barbed wire decoration (Lanting 1973, 249).

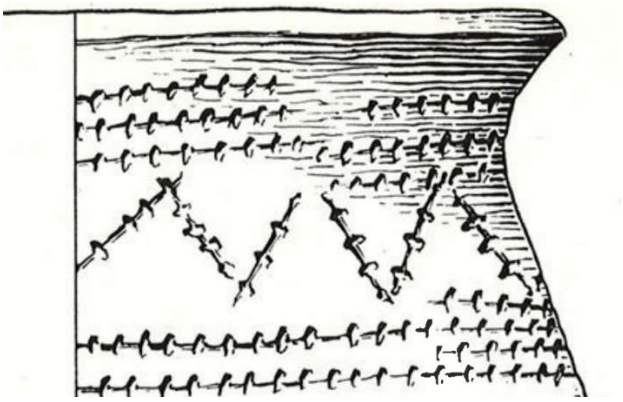


Figure 12: Rim of a BWB from Gasteren (not research area) with barbed wire decoration (Lanting 1973, 224)

On the basis of northern Dutch sites, a typo-chronology was introduced to characterize the pottery (ref. table 3; Lanting 1973, 220-221). Its development out of Neolithic pottery was later characterized by Lanting, but it adds little to the EBA typology itself (Lanting 2008, 92-97). A (non-chronological?) distinction was also made between beakers that are completely decorated and those that have a partially undecorated belly (Drenth and Hogestijn 2006, 54-55). This was much later followed by a publication about characteristics addressing several ^{14}C-dated sites from the research area (see section

3.1.1; Fokkens *et al.* 2016, 286-288). This later publication and Lanting's typology are used as chronological tools for this period (e.g. Fokkens 2019b, 186; Ufkes 2004, 28; Ufkes and Bloo 2002, 344).

The reference collection includes a table of characteristics of shape, decoration and temper (ref. table 3) together with some imagery (ref. fig. 6, 7 and 8). Overall, it can be stated that most pots have tripartite profiles and can be assigned to pot build-up type III (Drenth 2018, 169). As for temper and surface, grit (e.g. quartz) was predominantly used as temper (ref. table 3) and surfaces gradually became rougher towards the MBA (Butler and Fokkens 2005, 374; Louwe Kooijmans 1974, 216; Modderman 1955, 32).

2.4. Middle Bronze Age

The first relatively well-defined MBA typo-chronology was created by Glasbergen, which he more clearly categorized at a later date (Glasbergen 1954b; Glasbergen 1969). Glasbergen's typo-chronology divides the pottery from this period into three main types: *Hilversum, Drakenstein* and *Laren* (HVS/DKS/LRN; table 3; ref. fig. 20). It was originally argued that each of these had chronological value, but this has mostly been disproven (Lanting and Mook 1977, 119; Theunissen 1999, 205). The typo-chronology has been redefined by several authors (table 3).

Ten Anscher (1990) and Arnoldussen (2008) proposed changes to the existing typo-chronology, but Ten Anscher did not provide an explicit definition of the different pottery types (Arnoldussen 2008, 178). Arnoldussen's typo-chronology has been used in recent years to classify pots (e.g. Bloo *et al.* 2015). Aside of Arnoldussen, Lanting and Van der Plicht made a suggestion to redefine Glasbergen's types by disregarding shapes, as to avoid typological overlap (see table 3; Lanting and Van der Plicht 2003, 155). This suggestion was adopted by Drenth for his own typological classification (Drenth 2018, 163-164; 166-167). Drenth created a new typology on the basis of Van den Broeke's pot build-up types and the types of decoration (fig. 8; see ref. fig. 25).

Several authors have fine-tuned and questioned the existing typo-chronology by relating it to ^{14}C dates from multiple sites (section 3.1.2; Ten Anscher 1990, 72-73; Fokkens *et al.* 2016, 286-288; Lanting and Mook 1977, 117-119; Lanting and Van der Plicht 2003, 247; 249; Theunissen 1999, 202-206). The most recent typologies nevertheless still do not have well-defined chronologies. The types have huge chronological overlap of centuries (Arnoldussen 2008, 178) or have not yet chronologically been defined (Drenth 2018).

Rim shape typologies (e.g. ref. fig. 21; Ten Anscher 1990, 74-75; Bloo 2013, 55; Ufkes and Bloo 2002, 322) do not have major chronological value either.

Pot Type + Age Range (Arnoldussen)	**Glasbergen 1954b; 1969**		**Lanting and v. d. Plicht 2003**	**Arnoldussen 2008**	
	Shape	**Decoration**	**Decoration**	**Shape**	**Decoration**
Hilversum (HVS)	• Biconical profiles	• Location: **upper half of pots** (shoulder) (lower half undecorated) • Commonly decorated in **patterns**, especially in case of cord impressions (e.g. wavy/parabolic lines, vertical/horizontal lines, meshes, zigzag) <u>Common types of decoration</u> • Cordon below the neck • Cord impressions • (paired) Nail impressions • Small circular (reed/bone) impressions • (horseshoe-shaped) Handles	• **Wide variety** in decoration (any type of decoration from this period not mentioned in DKS below)	• No diagnostic pot shape <u>Possibly more common</u> • convex-concave in profiles • biconical profiles • wide and outward-protruding rims (rim **type A**)	<u>Body decoration</u> • Horizontal cordons common • Horseshoe-shaped handles occur • Decoration between the rim/cordon ->Cord impressions ->Nail impressions ->in vertical, diagonal, triangular, cross-hatched and looped patterns <u>Rim decoration</u> • Cord impressions on the (inner) rim • Vertical nail impressions inside of rim
Drakenstein (DKS) **DKS1**	• Bucket-shaped profiles *OR* • Truncated pear-shaped profiles	<u>Most of the decoration has disappeared, but</u> • **Cordon** still very common • At most **row of finger impressions** below the rim	• **Cordon** • **Row of decoration**; finger impressions/ groove below the rim • No other decoration	• No diagnostic pot shape	• Horizontal **cordon** applied or pressed out • **fingertip/nail impressions** on cordons (type DKS1a) or cordons without decoration (type DKS1b)
DKS2				• No diagnostic pot shape <u>Possibly more common</u> • Barrel-shaped profiles	• No cordon • Horizontal **fingertip/nail impressions** on the shoulder (where a cordon would be) (type DKS2)
Laren (LRN/LR)	• Bucket-shaped profiles *OR* • Barrel-shaped profiles	• **Commonly undecorated** (no cordon either) • At most row of finger impressions below the ring	• **No decoration**	• Bucket-shaped profiles *OR* • Barrel-shaped profiles	• **No decoration**

Table 3: The three types of MBA pottery as described by Glasbergen and how they were later defined by others (Arnoldussen 2008, 178; Glasbergen 1954b, 89-90; Glasbergen 1969, 14; 16-18; 27; Lanting and Van der Plicht 2003, 155)

A general characteristic of the MBA is that the vast majority of pot profiles lack angularity and belong to the category of "tall pots", i.e. their height is (much) bigger than their maximum width (e.g. ref. fig. 20 or 25; Drenth 2018, 165-166). Small pots or bowls with wider proportions may also appear (e.g. OHV type B: ref. fig. 25; Glasbergen 1954a, 101). The pots generally evolved out of the pots with S-shaped profiles from the

EBA (possible transitional shape: ref. fig. 20). Short necks, rim type A (ref. fig. 21) and/or lips are typologically more common to the early MBA-A and less common during proceeding periods of the MBA. The opposite development may be expected for the end of the MBA-B. Whereas it is barely covered in existing local typo-chronologies, Ruppel's typo-chronology of neighbouring Germany shows wider angular tripartite shapes with short necks defined for (German) phases late BzD and HaA: ~1250-1050 BC (Ruppel 1990, appendices 2 and 4).

Rim decoration is common inside of the rim, in front of the rim and on top of the rim (e.g. ref. table 6; e.g. ref. fig. 13, 14 and 23), but not elaborately covered by typology. Typical body decoration types and cordons (fig. 13) can be seen in the reference collection (ref. fig. 22; also ref. fig. 12 to 14). Cord impressions and most patterns (aside of single horizontal rows) are typical for the early MBA-A (fig. 13; ref. fig. 12, 13, 22 and 23).

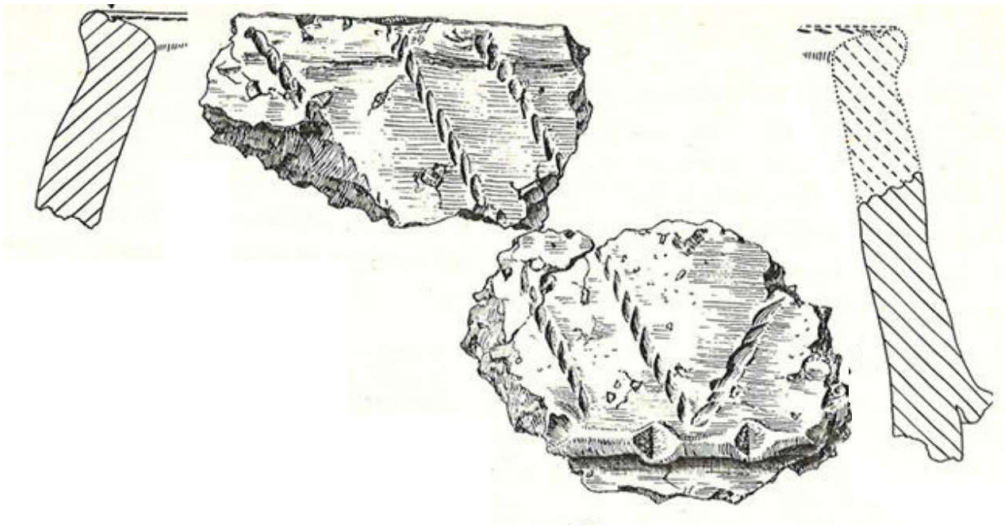


Figure 13: Cord impressions and a finger-impressed cordon on two fragments of MBA pottery from Wijchen, note that only the cordon is representative of most or the entire MBA, whereas the cord impressions are an early decoration type (Glasbergen 1954b, 125)

Quartz grit is most commonly used as temper material (ref. table 5). The surfaces of pots are often rough and uneven. The grit may easily be visible through the surface (ref. fig. 14 on the right), slip is usually used and the surfaces often show shrinkage cracks around the big pieces of quartz (Glasbergen 1954b, 89).

2.5. Late Bronze Age

The pottery typo-chronology of the LBA was primarily initiated and developed in the early 20th century in neighbouring Germany (e.g. Kiekebusch 1908, 36-42). Reinecke's

publication (1911/1965) may be considered as the basis of typo-chronology of the LBA (Louwen 2021, 54). Rademacher, Stampfuss and Kersten subsequently all made important contributions to typology (directly) east of the research area (Kersten 1948; Rademacher 1912; Stampfuss 1925-1961 in Desittere 1968a, 150-151). Kersten was the first to cover particular pottery types within the research area (Kersten 1948, 15-26). Desittere later published an extensive typo-chronology for the research area for HaA and HaB (see appendix 1; Desittere 1968a, 30-50; Desittere 1968b). Desittere created the typo-chronology by adopting and adjusting existing German typo-chronologies, but did not test the chronology with absolute dating results from his research area (Desittere 1968a, 10; Louwen 2021, 54).

In the period following Desittere's publication, no major typo-chronology was created for the research area. This is why it is still commonly applied in more recent publications (e.g. Dyselinck 2013, 71-75; De Jong and Beumer 2013, 129; 132; 134; 136). A number of publications covering pottery from a variety of sites was created for neighbouring regions (Kooi 1979; Verlinde 1987; Ruppel 1990; Schoenfelder 1992; Verlinde and Hulst 2010). There are several foreign typologies that include types that can be found in the research area as well (e.g. Brun and Mordant 1988, 628-633; Ruppel 1990, appendices 2 and 4). Individual site publications in the research area also include unique pottery characteristics that can be used for comparison (e.g. see listings of sites in: Van den Broeke 1991, 194; Lanting and Van der Plicht 2003, 169). The Iron Age typo-chronology of Van den Broeke (2012) often describes which types also appear in the LBA (as mentioned in table 2). There are also two publications that discuss characteristics of settlement ceramics from this period on the basis of ^{14}C dating results (see sections 3.1.3 and 3.1.4; Arnoldussen and Ball 2007; Van den Broeke 1991). These are also used for reference in more recent site publications (e.g. De Jong and Beumer 2013, 114; 176).

The LBA is characterized by an increase in complexity of shapes (e.g. appendix 1; ref. fig. 29 and 30; Desittere 1968a, 31). Compared to the previous period, many (if not most) vessels have tripartite build-ups, long necks (length: >5 cm), low shoulders, large widths and sharp angles (e.g. fig. 14; ref. fig. 29 and 30). Unlike other parts of the Bronze and Iron Ages, many vessels also have ears (Arnoldussen and Ball 2007, 192; 194-196; Van den Broeke 2005, 607; 2012, 128; Desittere 1968b; Ruppel 1985, 12; Ruppel 1990, 106; Taayke 2004, 167). Appendix 1 presents an overview of Desittere's typo-chronology (Dessitere 1968a, 30-50; Dessitere 1968b). A general development towards the end of the LBA is a decrease in neck length and a decrease in profile angularity with more

rounded shapes and S-shaped profiles (e.g. Desittere 1968a, 39; 41; 43; Verwers 1972; 125; appendix 1).

There is also a diversification of decoration types. Nail, finger or spatula impressions occur on top and in front of the rim (Van den Broeke 1991, 207; Van den Broeke 2012, 111). Thick engraved lines or triangles, known as *Kerbschnitt* decoration, start appearing (fig. 14). Regular grooves (not as deep) and spatula impressions also appear during this period. There are also cordons and patterns of finger and nail impressions, which were partially also typical for the MBA. It should nevertheless be mentioned that stereotypical types like *Kerbschnitt* decoration (fig. 14; ref. fig. 29, 31 and 32) may not appear at all in assemblages (Desittere 1968a, 80; Kersten 1948, 19; Taayke 2004, 167-168).

Figure 14: Cylindrical-necked pot from Baarlo with a long neck and Kerbschnitt decoration on its shoulder and neck (Stet 2020, 22; picture taken by P.J.R. Modderman)

There are different decorative patterns uncommon during other periods, like herringbone, hatched triangle, meander and pendant arch patterns (ref. fig. 29 and 30). Most are deemed typical for HaB (table 4), but this may be questionable (section 3.1.4), which is why these typo-chronological dates are not included in the reference collection. Most decoration seems to be positioned on the shoulders and necks of pots (fig. 14), which distinguishes it from EIA and MIA ceramics. Finger/nail impressions in two or more horizontal rows are mostly confined to the LBA. A single row is typical, but also appears in the IA, albeit in combination with specific characteristics (Van den Broeke 2012, 104). Decorated ears may be confined to the LBA (ref. fig. 29; Van den Broeke 2012, 207).

Most ceramics from this period have more fine-grained temper, thinner bodies and smoother surfaces compared to the MBA (Van den Broeke 2005, 607; 2012, 128; Taayke 2004, 167-168). The period can be considered a transitional phase from grit to grog temper (ref. table 8). The surfaces are frequently smoothened (occasionally polished) and shrinkage cracks are absent (Arnoldussen and Ball 2007, 194-196; Van den Broeke 2005, 607-608; Van den Broeke 2012, 128).

Type of decoration	**Typo-chronological dating**
Kerbschnitt decoration (regardless of pattern)	HaB
Kerbschnitt pattern: vertical row of triangles + lines on neck	Early HaB
Hatched triangle pattern	HaB (possibly also later)
Pendant arch/parabolic pattern	HaB (possibly also later)
Herringbone pattern	Early HaB
Meander pattern	Early HaB
Parallel horizontal grooves with a lot of undecorated space in between each groove	Early HaB
Cannelures	Early HaB?

Table 4: Decoration types/patterns and their dating according to Desittere; the typo-chronological dating is questionable (Desittere 1968a, 13; 30-50)

2.6. Iron Age

2.6.1. Research History

For the entire EIA, a lot of the early research history is similar to that of the LBA (see section 2.5). A number of well-known German pottery names were adopted from German (Lower Rhine) research (e.g. Kersten 1948, 33; 43; 46; Willems 1935, 87). Kersten (1948) was also the first to deliver a basic typology for the (Early) Iron Age types from burial contexts in the research area. Desittere occasionally mentioned “devolved” EIA types as well (e.g. Desittere 1968a, 39; 41; 43; 47; 48).

Verwers built upon the publications of Kersten and Desittere, and described shape and decoration types for the Iron Age (Verwers 1972, 123-140). Most of the characteristics of pottery from the MIA and LIA are nevertheless not well-described by either Kersten nor Verwers, as they are mostly known from fragmented settlement contexts (Kersten 1948, 62; Verwers 1972, 137).

Van den Broeke can be considered the pioneer of the typo-chronology of settlement ceramics for the entire Iron Age within the research area (Van den Broeke 1987a; Van den Broeke 1987b; Van den Broeke 2005, 612; 624; Van den Broeke 2012). The latest of these publications (2012) is the *go-to* typo-chronology to determine Iron Age pottery (e.g. in: Van As and Fokkens 2019b; Van As and Fokkens 2019c; Bloo 2021; Meurkens

2015; Meurkens 2017; Meurkens 2018). Van den Broeke's shorter two chapters of an older publication (1987) were the main source of typo-chronology before that time (e.g. in: Van Kerckhove 2007; Van der Linde 2009), albeit used in combination with other sources (e.g. in: Drenth and Geerts 2012). There are other major typo-chronologies, which cover areas adjacent to the research area (Van Heeringen 1992; Taayke 1996). Radiocarbon dating from the site of Oss-Ussen is at the basis of the typo-chronology of Van den Broeke (2012) (see section 3.1.5).

2.6.2. Shape

There is a LBA development of angular pot profiles and long necks gradually disappearing, which is mostly finalized in the EIA with the exception of a few types (see section 2.5 and appendices 1 and 2). The Iron Age can be characterized by the following developments in shape (separate numbers in the text refer to shape types, which are from: Van den Broeke 2012, 41-88; e.g. see: ref. tables 11, 13, 14 and 16).

The EIA (800-500 BC) starts out with some angular LBA shapes (e.g. 45; 58) and rounded or tall pots with S-shaped profiles (e.g. 55). If any profile transition is angular, it is usually the shoulder-neck transition (ref. fig. 50). Unlike during the LBA, necks are commonly 1 to 4 cm long (<5 cm; ref. fig. 36). Ears still appear (ref. fig. 49). By the final century of the EIA (~600-500 BC), barrel-shaped profiles have replaced a lot of the S-shaped profiles (e.g. from 23b to 23a). This is part of a more general increase of pot build-up type II in favour of type III (ref. fig. 37). However, the necks that do appear also increase in length (>5 cm, e.g. 73a) (ref. fig. 36).

The early MIA (500-400 BC) is mostly known for angular profile transitions, very long low (diagonal) bellies, very short shoulders and very long necks: Marne shapes (73b, 74, 75). However, most shapes lack these characteristics, especially the necks (31-34). Angular bipartite bowls/plates and barrel-shaped pots are dominant in assemblages, and so is pot build-up type II. This is more typical than the Marne shapes. The latter serves as a guide artefact (left on ref. fig. 52 and centre of ref. fig. 54).

By the **later MIA (400-250 BC)**, traditional Marne shapes (see above) do not appear anymore and necks are generally short (length: <3 cm; ref. fig. 36). The other shapes of the early MIA still appear, including dominant barrel-shaped pots. Rounded equivalents of wide shapes (wide bowls/plates) are very common. S-shaped profiles start to

reappear (e.g. 42a and 52), which is why pot-build-up type III is increasingly common (ref. fig. 37).

The **LIA (>250 BC)** is characterized by very short necks protruding outwards (ref. fig. 36 and 55) and thus pot build-up type III (ref. fig. 37) with angular shoulder-neck transitions. The first half of the period (<125 BC) is mixture of these shapes and those discussed for the later MIA. The second half (>125 BC) lacks most of the MIA shapes.

The reader is referred to appendix 2 for traditional IA types described by Verwers (1972) and Perizonius (1976). Whereas the chronology is partially outdated, the terminology is still applied in more recent publications (Louwen 2021, 110-111). These shapes are mostly from burial contexts (Van den Broeke 2012, 47; 68; 77; 103; Verwers 1972, 131).

2.6.3. Rim decoration

Rim decoration is most characteristic for the EIA and LIA and appears less in assemblages of other periods (ref. fig. 38). During the LIA, decoration in front of the rim becomes increasingly common (ref. fig. 38). In the Bronze Age, the front of the rim was also more commonly decorated (Van den Broeke 2012, 111). Rim decoration diversifies during the LIA (ref. fig. 39).

2.6.4. Body decoration

Body decoration is relatively scarce throughout the EIA and MIA but becomes more common during the LIA (ref. fig. 40; increasingly in north-western direction from Oss).

Finger/nail impressions, comb decoration and grooves are common during the EIA. Comb decoration is dominant during the MIA. In phase H of the MIA, body decoration starts to re-diversify with grooves, nail/finger impressions and spatula impressions. These latter decoration types appear throughout the LIA (ref. fig. 40).

There are also rare types of decoration like *dellen* (bulbous impressions; EIA), circular impressions (MIA-LIA), studded decoration (LIA and later) and (finger-impressed) cordons (BA-EIA) with some chronological value (ref. fig. 42).

Most patterns of finger and/or nail impressions on the body are exclusive to the EIA and/or LIA, or at least very uncommon for the MIA (ref. fig. 41). Patterns of grooves and comb decoration can also have chronological value. Parallel non-horizontal grooves and vertical comb decoration appear in the MIA and/or LIA in Oss (ref. fig. 43), but may

appear earlier outside of Oss. Other patterns have lesser chronological value, but the chronology applies to the entire research period (Van den Broeke 2012, 115-119; 278).

The positioning of body decoration in relation to the shape is also important for typo-chronology (ref. fig. 44). Decoration on the belly is common throughout the Iron Age, in contrast to the LBA. Decoration on the shoulder is mainly common for the LIA (and the LBA). Decoration on (short) necks is common for the LIA, but it may appear on (long) necks during phases F-G (and the LBA).

2.6.5. Temper

Regarding the entire Iron Age, the dominant temper material is grog, but grit may appear very early in the Iron Age and rarer materials very late in the Iron Age. Grit is especially common along the northern fringes of the research area (ref. table 10).

2.6.6. Surface and finishing techniques

With regards to finishing techniques, the Iron Age can be characterized by besmirching (Dutch: *besmijting*), which causes a rough surface of trails or clods (ref. fig. 46). The Iron Age generally has thicker body sherds than the LBA due to this technique (Arnoldussen and Ball 2007, 198; Van den Broeke 2012, 208-211). The MIA has the highest percentage of besmirching (ref. fig. 45). Shapes besmirched up to the rim are rare before phase C and after phase J (Van den Broeke 2012, 106).

For periods with little besmirching, the EIA has many smoothened (and polished) (inner+ outer) surfaces, especially on shoulder and neck, whereas the LIA often has rough surfaces. LIA pottery is the thickest and plumpest since the MBA (ref. table 16). The reader is referred to figure 46 in the reference collection for an overview of typical surface treatments.

2.6.7. Briquetage and other ceramic objects

A separate category of pottery not further discussed in this thesis is imported coastal *briquetage* (Van den Broeke 2012, 155-180). It can be distinguished from locally produced pottery by a combination of characteristics like uncommon shapes, organic temper and a chalky surfaces (ref. fig. 47). It first appears in the research area during the EIA. Ceramic objects like sling bullets and weights should also be mentioned, as these are recurrent during the Iron Age. Whereas these have little known typo-chronological

value, sling bullets and a triangular shapes of weights first appear around the start of the MIA. The other types may already appear in the Bronze Age (section 9 in reference collection; Van den Broeke 1987, 38; Kodde and Van der Velde 2015, 335-339).

2.7. Conclusion

A variety of typo-chronologies have been discussed for each of the subperiods. When these are combined, general evolutionary "trends" can be perceived (see fig. 15). From all typo-chronological research of the entire research period, the following general conclusions can be drawn.

A lot of (especially older) typo-chronologies rely on entire pot shapes (usually urns) and their decoration (Arnoldussen 2008, 177-178; Desittere 1968a, 30-50; Drenth 2018; Glasbergen 1954b; Glasbergen 1969; Kersten 1948; Verwers 1972, 123-150). This makes them less applicable to fragmented assemblages.

The typo-chronology of the EBA (Lanting 1973) is not only relatively old, but mainly relies on data from outside of the research area. The typo-chronologies of the MBA (Arnoldussen 2008, 177-178; Glasbergen 1954b; 1969) are imprecise as they fail to differentiate the centuries of the long period they represent. Moreover, most of the typo-chronologies seem to refer to the MBA-A, whereas the MBA-B does not have any defining characteristics. The transition to the LBA is also not properly covered by typo-chronologies. Desittere's LBA typo-chronology has very little information about HaA (1100-1000 BC) and is mostly about HaB (1000-800 BC) (Desittere 1968a, 30-31). The typo-chronology of a neighbouring region in Germany, on the other hand, covers a wide variety of types dating to the late MBA and the early LBA (Ruppel 1990, appendices 2 and 4). In contrast to the lack of knowledge about the Bronze Age, the typo-chronology of the Iron Age (Van den Broeke 2012) is very detailed and precise and even includes information about the LBA.

Most of the authors of (older) typo-chronologies had limited access to local ceramics connected to absolute dating results, which is why they made correlations between local ceramics of certain periods and non-local or non-contemporaneous ceramics (e.g. Desittere 1968a, 30-50). In order to address this shortcoming, the next chapter investigates correlations between pottery characteristics and absolute dating from the research area.

Figure 15: Overview of some characteristics from the variables based on this chapter (by author; drawings from; Van den Broeke 2012, 56; 110-111; 397; 401; 405; 407; 409; 412; 414; 416; 420; 423; 427; Desittere 1968b, 55; 62; 68; 70; 74; 76; Fokkens and Smits 1989, 14; Glasbergen 1954b, 121; 125; Lanting 1976, 58; De Laet and Glasbergen 1959, 139; Louwe Kooijmans 1974, 222; 248; Modderman 1955, 33; Modderman 1960, 289; Perizonius 1976, 91-92; Verwers 1972, 135)

3. Absolute dating

In chapter 2, the existing typo-chronologies have been discussed. In this chapter, absolute dating methods, specifically ^{14}C dating and dendrochronology, are used to evaluate the chronological placement of characteristics of ceramics. Two types of sources have been used to collect the data for this comparison:

1. Inventories of sites in the research area with ceramics and ^{14}C dating
2. Site publications with ceramics and ^{14}C dating.

These are discussed in sections 3.1 and 3.2, respectively. The inventories are discussed because a lot of data is already available, but it is spread across many different publications. The combined discussion of earlier research helps to create an overview of the state of research in this area that is not entirely encompassed by the typo-chronologies. The reason for the separation between inventories and site publications is the difference in methodology applied. The inventories include information collected by other researchers, each of whom analysed and presented their information differently. Site publications generally offer detailed information that can be used for systematic comparison. The data collected from site publications is collected in appendix 3, which includes the references to the bibliography of dates mentioned in section 3.2.

Absolute dating involves mostly ^{14}C dating, because it is readily available for single assemblages and vessels. The ^{14}C dating process involves analysis of a sample of (organic) material that was found in the same context as the ceramics. The result is a so-called ^{14}C date (BP = Before Present), which is subsequently converted – i.e., calibrated – into a calendar date (BC) by means of an atmospheric curve. For this research the most recent atmospheric curve available online was used (fig. 16; c14.arch.ox.ac.uk; OxCal v4.4.4; IntCal20). The steeper the curve, the more precise the ^{14}C dating results are, because there are more ^{14}C dates (BP) for fewer calendar years (BC). The flatter the curve is, the more imprecise the results are.

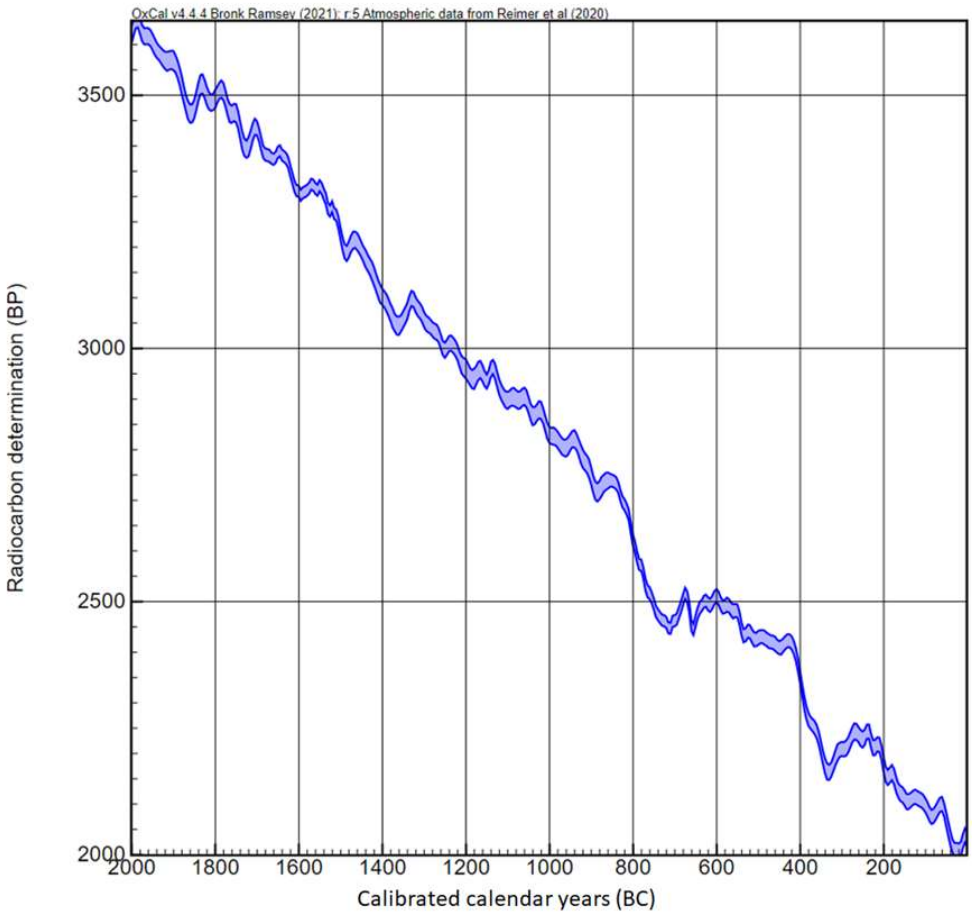


Figure 16: Recent curve used to calibrate ^{14}C dates into calendar years in this thesis (c14.arch.ox.ac.uk)

In this research, ^{14}C dating of charcoal is most commonly used. A limitation of dating on the basis of charcoal is that it may exhibit a disparity with the actual dating of a context due to the so-called *old-wood effect*. This effect occurs when the ^{14}C date represents the age of an older piece of wood (Lanting and Van der Plicht 2003, 120). Charcoal is also more likely to be intrusive in a feature and yield a different date than the more reliable carbonate from bones/cremations (Louwen 2021, 56; De Mulder *et al.* 2007, 504-505). That being said, even cremations may have an *old-wood effect* due to the pyre (Snoeck *et al.* 2016, 41), and the exclusion of ^{14}C dating of charcoal would have excluded most settlement contexts and several periods. Dendrochronology is more precise, but is harder to find in the desired contexts and may also have an issue with the *old-wood effect*. Another limitation of ^{14}C dating is its lack of precision, especially when the curve is flattened within periods like the so-called *Hallstatt plateau* (~800-400 BC on fig. 16).

3.1. Inventories from literature: older comparisons

An overview of research involving inventories of ^{14}C dates associated with ceramics is given in table 5. Some of this data has been reincorporated into the dataset (appendix 3). This section also includes some of the discussions and conclusions about typo-chronology by these researchers. Each subperiod of the research period is individually discussed, with an additional section about the transition from the MBA to the LBA, as this period is barely known from typo-chronology discussed in chapter 2.

Source	**Period**	**~Period (in BC)** (rounded up/down)
Lanting and Mook 1977 *(dating results/assemblages reincorporated in Lanting and Van der Plicht 2003/2006)*	**Research period**	2000-12
Lanting and Van der Plicht 2003	**EBA-EIA**	2000-500
Fokkens *et al.* 2016, 287	**EBA-MBA-A**(+part of B)	2000-1400
Ten Anscher 1990, 73 *(dating results/assemblages largely reincorporated in Theunissen 1999)*	EBA-**MBA**	2000-1200
Theunissen 1999, 205	**MBA**	1800-1100
Drenth 2015, 183-189	**MBA**	1800-1100
Arnoldussen and Ball 2007, 182	Late MBA-**LBA**	1200-800
Van den Broeke 1991, 204 *(dating results/ assemblages largely reincorporated in typo-chronology of 2012)*	Late LBA-**EIA**	900-500
Van den Broeke 1987a *(dating results/assemblages reincorporated in typo-chronology of 2012)*	**Entire IA**	800-500
Van den Broeke 2012, 30	**Entire IA**	800-500
Lanting and Van der Plicht 2006	**MIA-LIA**	500-12

Table 5: Sources in which multiple assemblages and ^{14}C dates are jointly listed or discussed to gain a better understanding of the dating of pottery types/characteristics, the page numbers (if mentioned) refer to the pages where the ^{14}C dating results are compiled

3.1.1. Early Bronze Age

For the EBA, Lanting differentiated an early and a late phase for this typo-chronology (see section 2.3; Lanting 1973, 220-221). He created a relative chronology, but also based his data on ^{14}C dates (of charcoal) of six northern Dutch sites and one south(west)ern Dutch site (Molenaarsgraaf). Figure 10 in the reference collection shows a recalibration of these dates. These dates played a role in the division between early and late characteristics, as well as a general dating of *barbed wire beakers* (=BWB) between 2000 and 1800 BC (section 2.3) and shortly to the century thereafter.

Since this typo-chronology, more dating results (^{14}C dating of charcoal) were compiled by Lanting and Van der Plicht (2003), but these do not include sites within the research area with ^{14}C-dated closed contexts of BWB ceramics (ref. fig. 10). The example from Tilburg mentioned in section 3.2.1 (fig. 19) characterizes how problematic it may be

when the ^{14}C date and its associated material are not from the same closed context. The numerous closed contexts with BWB of Lanting and Van der Plicht's compilation were from sites north of the research area. All in all, the dates do represent an overall chronology of BWB. The contexts with BWB may partially predate 2000 BC, still appear between 1800 and 1700 BC, and potentially appear thereafter. It should be mentioned that this was mostly a comparison of barbed wire decoration with ^{14}C dating. It generally excludes other characteristics belonging to pottery from this period.

Fokkens *et al.* incorporated more ^{14}C-dated sites from (or directly adjacent to) the research area in his comparison (Fokkens *et al.* 2016, 287: Culemborg, Barendrecht and Houten). However, the comparison includes sites without ^{14}C dating and still seems to have a northern Dutch bias. The list of features is nearly identical to that of Lanting's (1973) typo-chronology (ref. table 3).

The only Late Neolithic Bell Beaker type that, based on ^{14}C dating, seems to continue into the EBA is the Veluvian Bell Beaker. Although sixteen out of twenty ^{14}C dates from Veluvian Bell Beaker assemblages most likely date to the Late Neolithic, the other four might date to the EBA and/or MBA. Three of these assemblages also have barbed wire decoration (Beckerman 2012, 63-64).

3.1.2. Middle Bronze Age

For the MBA, the evaluation of typo-chronology with absolute dating was predominantly carried out by Lanting and Mook (1977), Theunissen (1999), Lanting and Van der Plicht (2003), Drenth (2015) and Fokkens *et al.* (2016). For the transition from the EBA, Lanting and Van der Plicht presented pits with barbed wire decoration and HVS characteristics (fig. 17). These dating results indicate that BWB and HVS pottery likely had a contemporaneous period of use during the late EBA and/or early MBA-A. It is unclear which particular characteristics the pottery has (Fokkens 1992, 159-160).

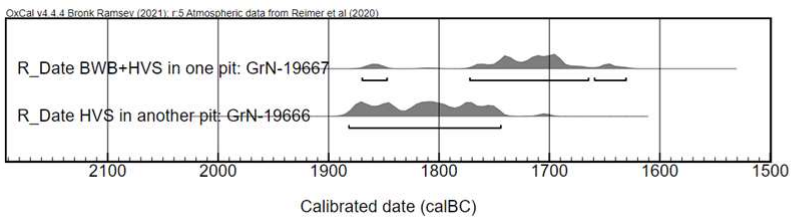


Figure 17: Pits from Oss-Ussen containing BWB (typical for the EBA) and HVS (typical for the MBA) pottery, including one pit containing both, which may indicate a contemporaneous period of use (by author; Lanting and Van der Plicht 2003, 176)

The chronology of Glasbergen's traditional typology of the MBA (section 2.4; Glasbergen 1954b; Glasbergen 1969) was rejected in later research with the aid of ^{14}C dating (Arnoldussen 2008, 177-178; Lanting and Mook 1977, 119; Lanting and Van der Plicht 2003, 155; Theunissen 1999, 203-205). The reclassified definition of Arnoldussen (2008, 178) yielded the following age ranges[1]:

- HVS: (1960)1880-1660(1600) cal. BC
- DKS1: (1890)1750-1390(1120) cal. BC
- DKS2: (1880)1780-1490(1210) cal. BC
- LRN: (1890)1670-1430(1120) cal. BC

As can be seen, the types have centuries of overlap. The ^{14}C dating results of graves and settlement sites compiled by Lanting and Van der Plicht (using his similar definitions) seem to affirm this contemporaneity (Lanting and Van der Plicht 2003, 161; 184-185; 188-189). Noteworthy is that none of the types were considered to belong to a later phase of the MBA (1400-1100 BC) with any certainty (Arnoldussen 2008, 178). Lanting and Van der Plicht (2003) nevertheless already established the presence of some of these types in the later MBA (ref. fig. 18; Lanting and Van der Plicht 2003, 161; 184-189).

Similar to the EBA, the abovementioned comparisons are not accompanied by pottery analyses and rather limited to the variable of decoration (HVS/DKS/LRN in ref. fig. 25). Drenth used the same data and some additional data to classify ^{14}C-dated pottery shapes according to his personal typology (Drenth 2015, 183-188; Drenth 2018, 166-167). The reader is referred to the reference collection for an overview of this comparison (ref. fig. 26 and 27).

This comparison was used to create a relative chronology (Drenth 2015, 189; incorporated in ref. table 6). The subtypes of his typology (based on shape) did not yield a much more detailed chronology, but it does clearly show a reduction of decoration over time. Therefore, the distinction made by Lanting and Van der Plicht into HVS, DKS and LRN (see table 3 in section 2.4) has chronological value.

[1] Arnoldussen referenced several sources with ^{14}C dates without providing a combined ^{14}C date, individual ^{14}C dates and/or a calculation on how these ranges were obtained (Arnoldussen 2008, 178). These ranges are therefore listed like they occurred in Arnoldussen's publication. Although a clear explanation is missing, it is assumed that the narrower and wider ranges correspond to the 1 sigma (~65% certainty) and 2 sigma (~95% certainty) results respectively.

Fokkens *et al.* have analyzed MBA-A pottery for shape (albeit barely), rim decoration, body decoration and temper (albeit barely). The period has been divided into three phases (Fokkens *et al.* 2016, 287; incorporated in ref. table 6). This comparison does not question typo-chronology, but categorizes MBA-A characteristics into specific centuries with the aid of ^{14}C dating (incorporated in ref. table 6).

However, not all data is supported by ^{14}C dating. Several of the assemblages are dated typo-chronologically and (partially) used to characterize the pottery of specific centuries (e.g. Wijchen-Bijsterhuizen: Fokkens et. al. 2016, 240; 287). It is occasionally difficult to know which characteristics and/or images are tied to absolute dating results (e.g. Tilburg-Tradepark Noord or Heteren-Uilenburg: Fokkens *et al.* 2016, 225-227; 267). This can partially be attributed to the lack of closed assemblages with diagnostic pottery and ^{14}C dating. The comparison does also not include the (later) MBA-B.

In the comparison of Theunissen, the entire MBA-A and -B were analysed by relating ^{14}C-dated assemblages to characteristics (ref. fig. 24; Theunissen 1999, 204-205). This comparison features decoration (as well as rim type A: ref. fig. 21), but does not test other variables like shape. Typical Bronze Age decoration methods like cord impressions and paired nail impressions seem to predate 1530 BC according to this comparison.

Undecorated pottery appears throughout the MBA, but the MBA-B (1500-1100 BC) generally seems to have an absence of decorated pottery with the exceptions of (finger-impressed) cordons and finger/nail impressions on top of the rim (ref. table 6; ref. fig. 24, 26 and 27).

3.1.3. Middle to Late Bronze Age

As mentioned in the conclusion of chapter 2, the transition from the MBA to LBA practically does not exist in local typo-chronology and German typo-chronology was used to define it (section 2.5). Some comparisons south of the research area seem to suggest that well-known types of the LBA appear earlier than the traditional typology would suggest, possibly in the 14th to 13th century (section 1.2.3). This includes characteristics like shape, temper, surface, decoration and body thickness (Dyselinck 2013, 67-69; 72-80; 137; 163-165; De Mulder 2007, 508-510; De Mulder 2009, 112).

Theunissen (1999) and Lanting and Van der Plicht (2003) used ^{14}C dates to discuss pottery from this period. Theunissen distinguishes MBA-B pottery from LBA pottery by stating that the pottery becomes more elaborately decorated from 1050 BC onwards

(Theunissen 1999, 205-206). Shapes nevertheless already seem to have diversified before that time (fig. ref. 18). It is highly likely that the (more typical LBA) tripartite shapes with short necks developed before 1100 BC (in the MBA) and possibly already before 1200 BC. Some pottery also seems to become thinner (Lanting and van der Plicht 2003, 221; 247).

Multiple LRN pots seem to date to the end of the MBA-B and (partially) the LBA. Therefore, the age range provided by Arnoldussen (section 3.1.2) should be applied with caution. Aside of LRN pots, the late MBA-B also has some characteristics previously attributed to the LBA, including necks, lips and angularity.

3.1.4. Late Bronze Age

The comparisons of pottery characteristics to ^{14}C dating were created in view of the lack of accurate general knowledge about characteristics from the LBA (Arnoldussen and Ball 2007, 181; Van den Broeke 1991, 194-195).

Lanting and Van der Plicht (2003) dated a number of complete vessels with ^{14}C dating stretching the entire LBA. Figure 34 of the reference collection shows drawings, types and a typo-chronological dates (by author) of these pots/vessels based on Desittere's typology (Desittere 1968a; 1968b). It shows a lot of overlap between typo-chronology and absolute chronology, but there is a discrepancy; the ^{14}C dating includes early dating results (1200-1000 BC) that are not predicted by the typo-chronology. Traditional decoration types such as Kerbschnitt and grooves in particular patterns (fig. 14; ref. fig. 29, 31 and 32) presumably predate 1000 BC unlike Desittere suggests (table 4 in section 2.5). This contradicts the typo-chronological distinction between HaA and HaB as presented by Desittere, who generally overemphasizes HaB (appendix 1; Desittere 1968a, 30-50).

Arnoldussen and Ball analysed seven settlement assemblages dated with ^{14}C dating, two of which can be analysed as one, due to the similar dating and sherds of a single pot (fitting) in both assemblages (ref. fig. 33). These are within or adjacent (Rhenen) to the research area. They also re-analysed some existing data from other researchers.

Arnoldussen and Ball divide the period into two phases (ref. table 8). They state that Ruppel's typo-chronology (Ruppel 1990) works reasonably well for the research area, but many of its characteristic shape and decoration types are rare or absent (Arnoldussen and Ball 2007, 199). Similarly, Arnoldussen and Ball's assemblages can

practically be dated with Desittere's typo-chronology (ref. fig. 33; Desittere 1968a; Desittere 1968b), but typical decoration types (table 4) are rare or absent in these assemblages, and shapes are difficult to classify. The typo-chronology is therefore not entirely representative.

3.1.5. Iron Age

As mentioned in section 2.6, Van den Broeke based his typo-chronology on absolute dating results, in particular 37 dates from Oss-Ussen, which span the entire research period (Van den Broeke 2012, 30). Some of these were re-used from his older research (Van den Broeke 1987a; Van den Broeke 1987b; Van den Broeke 1991, 204; Van den Broeke 2012, 30). Nevertheless, these absolute dates played a relatively minor role in defining the individual phases, because these phases have narrower ranges than the individual ^{14}C dates (phases: fig. 11 in section 2.2). This is especially true for phases A2 to F/G (Hallstatt plateau: see introduction of this chapter). In Oss-Ussen itself, stratigraphy played a minor role and dendrochronology was only applied to a single assemblage (Van den Broeke 2012, 28; 31-32).

In order to define phases, the pottery is often correlated to many other sites with absolute dating results. The very precise division between many of the different phases is often based on correlation to other sites, typological arguments and estimation (Van den Broeke 2012, 28-35; including the notes that are referred to). These other sites had two examples of wiggle matching and one of dendrochronology (Van den Broeke 2012, 29; 34). All in all, one should be aware that Van den Broeke's Iron Age typo-chronology is supported by absolute dating, but not fully based on it. The precision in phasing (e.g. phase A versus C) is often typological. His use of absolute dating and typo-chronology resulted into what is summarized in section 2.6. The overviews of Van den Broeke's typo-chronology as presented in the reference collection combine several phases and can therefore more easily be supported by ^{14}C dating (ref. table 11, 13, 14 and 16).

A comparison of ^{14}C dates of two traditional urnfield shapes (descriptions in appendix 2; Verwers 1972, 123-142) was carried out by Louwen (fig. 18). These shapes generally fit within the *Hallstatt plateau* of the EIA. This is in line with typo-chronology.

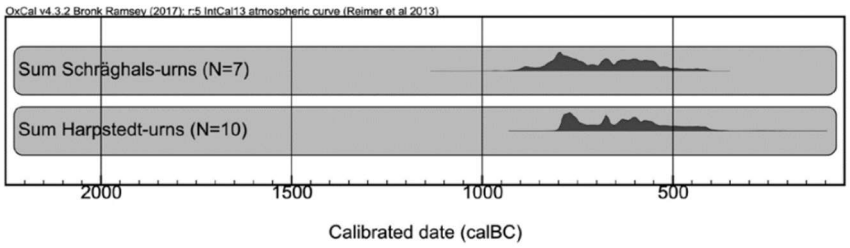


Figure 18: Schräghals and Harpstedt urns recalibrated on the basis of 17 Dutch samples (after Louwen 2021, 112)

3.1.6. Conclusion

Some general conclusions can be drawn from the inventories discussed. The ^{14}C dates of the EBA overwhelmingly concern sites north of the research area with a general focus on the presence of barbed wire decoration as a guide artefact. The dates generally still support the older typo-chronology of the EBA (ref. table 3; Lanting 1973, 220-221), but certain Late Neolithic and MBA characteristics respectively seem to disappear and appear during the EBA.

In contrast to the EBA, the MBA has a lot of ^{14}C dates associated with ceramics from the research area. The older typo-chronology (Glasbergen 1954b; Glasbergen 1969) has mostly been rejected with ^{14}C dating, as the pottery types have a lot of chronological overlap. The ^{14}C dates nonetheless show a clear reduction of decoration during the MBA-A and a lack of decoration during most of the MBA-B. A redefinition of Glasbergen's HVS, DKS and LRN types is based on the amount of decoration and has some chronological value (see table 3 in section 2.3). The dating of ceramics with typo-chronology is nevertheless still very imprecise compared to the other periods.

The transition of the MBA to the LBA is not covered by local typo-chronology. The ^{14}C dates show a diversification of shapes that can presumably be dated to the last century of the MBA-B. This is accompanied by a diversification of decoration during the first century of the LBA. The main LBA typo-chronology (Desittere 1968a; Desittere 1968b) has a distinction between two phases (HaA/HaB) that does not correspond with some of the ^{14}C dates. The typo-chronology also does not seem to be representative of general characteristics featured in several ^{14}C-dated assemblages. It e.g. overemphasizes decoration types that are not recurrent (table 4 in section 2.5).

The Iron Age typo-chronology of Van den Broeke (2012) is representative and highly detailed, but the precision in its phasing is not supported by absolute dating.

3.2. Site publications: comparison of this research

3.2.1. Dataset

The ceramics from site publications are either associated with ^{14}C dates or (in a few cases) with dendrochronological dates. The dataset discussing these ceramics and their dating results (appendix 3) was created by entering data into a variety of different tables containing the following information;

1. Radiocarbon (^{14}C) dating results + references
2. Dendrochronological dating results + references
3. Feature type (context) + amounts (of pottery)
4. Shape (characteristics + types: including those partially tied to decoration)
5. Decoration (Rim + Body: types + percentage of occurrence)
6. Temper materials + surfaces (finishing techniques)
7. (Recalibrated) ^{14}C date (BC) + typological dates (both of the source and of personal judgement)

The requirements for the selection of the sites used for the dataset depend on the subperiod (see section 2.2). Some subperiods, particularly parts of the Bronze Age, have little data to rely on. More older data is therefore collected and re-analysed. The MBA(-B) and early LBA are mainly covered by the site of Son-Ekkersrijt-IKEA, which has a lot of data available (De Jong and Beumer 2011; De Jong and Beumer 2013). The Iron Age has plenty of known and compiled (older) ^{14}C dates associated with ceramics (e.g. Lanting and Van der Plicht 2006, 272-273). The typo-chronology is also much more recent and the author makes references to many recently dated Iron Age assemblages throughout the publication (Van den Broeke 2012). Most site data collected with regards to the Iron Age is therefore from sources published after 2012.

One requirement for the comparison based on site publications is that the absolute dating results and the ceramics with typo-chronological value have to be from the same closed context. A comparison of absolute dating with typo-chronology from Tilburg illustrates the importance of this requirement (fig. 19). The comparison was carried out between ^{14}C dating of features from a house plan, ^{14}C dating of features adjacent to this house plan and the typo-chronological dating of the pottery collectively found in/around this context. There is a clear discrepancy between ^{14}C dating from the house plan compared to the ^{14}C dating from the surrounding features. The typo-chronological dating is wide and encompasses multiple centuries. If in this case, the ^{14}C dating of the

house plan been would have been used to date some of the pottery in the surrounding pits, then wrong conclusions would have been drawn.

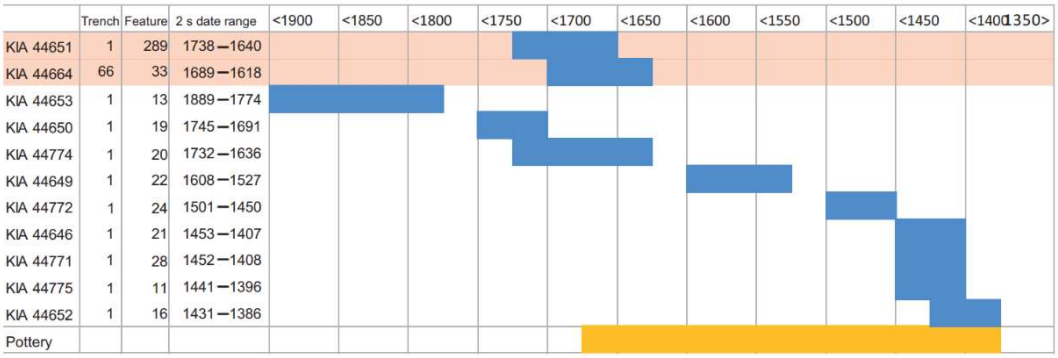


Figure 19: Comparison between ^{14}C dating of features from a house plan from the site Tilburg-Tradepark Noord (upper two rows highlighted in red/orange), ^{14}C dating of pit features in/around the same house plan (other blue dating results) and the dating of all pottery found in/around this context (yellow) (Tol et al. 2015, 125)

3.2.2. Results

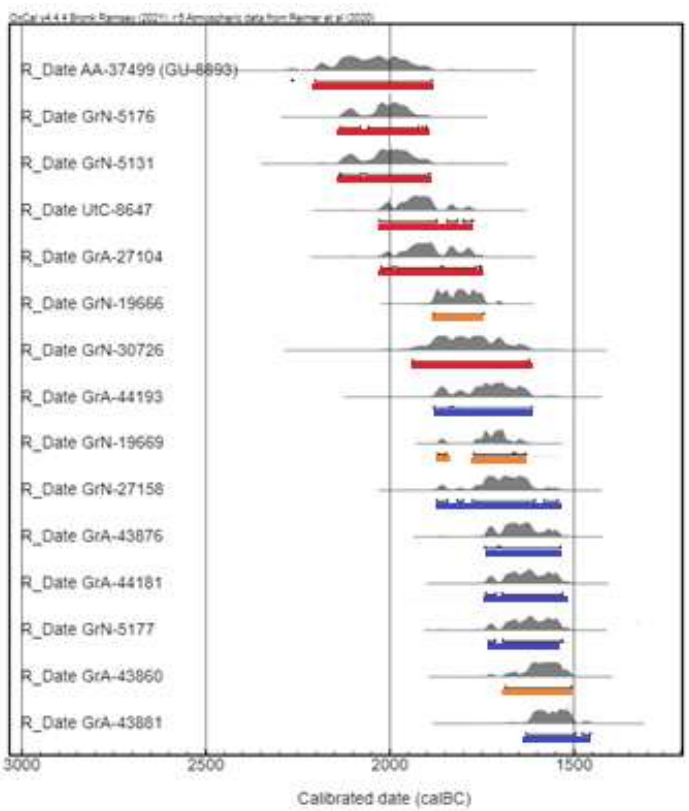
As stated in section 3.1.1, the EBA is mainly associated with material north of the research area. On the basis of three ^{14}C-dated assemblages from three sites within the research area (appendix 3: 3574±35; 3555±40; 3485±20 BP[2]; ref. fig. 9), a few decoration types can generally be attributed to the local EBA: barbed wire decoration, circular impressions (hollow and non-hollow), multiple cordons below the rim (on the neck) and pointy impressions below the rim. On the basis of other associated material from one of the three sites (e.g. ref. fig. 7 and 8; Ufkes and Bloo 2002, 341-343), an older assemblage with a TPQ date (appendix 3: 3640±30 BP[3]) and ^{14}C-dated assemblages from sites (Houten/Barendrecht) not far away from the research area (e.g. Fokkens *et al.* 2016, 209; 213; Moree *et al.* 2011, 61; 81-82), it can generally be stated that paired nail impressions are also a common decoration type. Aside of the tripartite profiles of pot build-up type III, bipartite shapes of pot build-up type II also seem to appear, despite not having any ^{14}C dates associated with them. It was difficult to find any assemblages associated with this tradition in the south of the research area (section 4.1). The

[2] Meteren-de Bogen 28-1 [V3834-4/V3159/6]: Labcode UtC-8647: 3574±35 BP: 2029-1873 cal. BC (84.2%); Culemborg-Lanxmeer [S12/13]: Labcode GrA-27104: 3555±40 BP: 1984-1862 cal. BC (59.7%)/1856-1766 cal. BC (28.9%); Oss-Schalkskamp [S1029.5]: Labcode GrN-19666: 3485±20 BP: 1882-1745 cal. BC (95.4%).

[3] Molenaarsgraaf [Break-through gully]: Labcode GrN-5176: 3640±30 BP: 2070-1897 cal. BC (74.6%)/2136-2076 cal. BC (20.9%): TPQ date: the material post-dates this dating.

surfaces of EBA ceramics seem to be both rough and smooth (including polished), and the temper mostly consists of (fine) grit and occasionally granite.

The MBA-A seems to show an increase of shapes without necks and a decrease in decoration. Some pots still have decoration covering the upper sections of pot surfaces. This at least includes patterns of paired nail impressions and cord impressions (appendix 3: 3470±60 BP[4]; ref. fig. 13). During the MBA-A, similar shapes without any decoration appear relatively early. Assemblages that only have decoration consisting of finger or nail impressions on the rim, on horizontal rows or on cordons can already be expected before 1600 BC (fig. 20; ref. table 6). Some of the assemblages of the MBA-A also have perforations. Rough surfaces with shrinkage cracks and grit are generally common. Assemblages with these characteristics seem to persist until 1400 BC. It should also be mentioned that necks do not seem to disappear and are either short and/or have a weak shoulder-neck transition (e.g. ref. fig. 15).



BP date	±	
3665	60	
3640	30	
3635	40	
3574	35	EBA
3555	40	
3485	20	
3470	60	
3425	45	
3425	20	
3400	40	MBA -A
3365	35	
3350	35	
3345	35	
3320	35	
3290	35	

Figure 20: Examples from the dataset of the thesis: red = a lot of decoration (25%+ of a pot or assemblage), orange = small amount of decoration other than those mentioned for blue, blue = no decoration or decoration is limited to rim decoration, cordons, perforations and/or horizontal rows of impressions (after appendix 3 and 4; by author)

[4] Boekel-Parkweg [S.1036]: Labcode GrN-30726: 3470±60 BP: 1940-1622 cal. BC (95.4%).

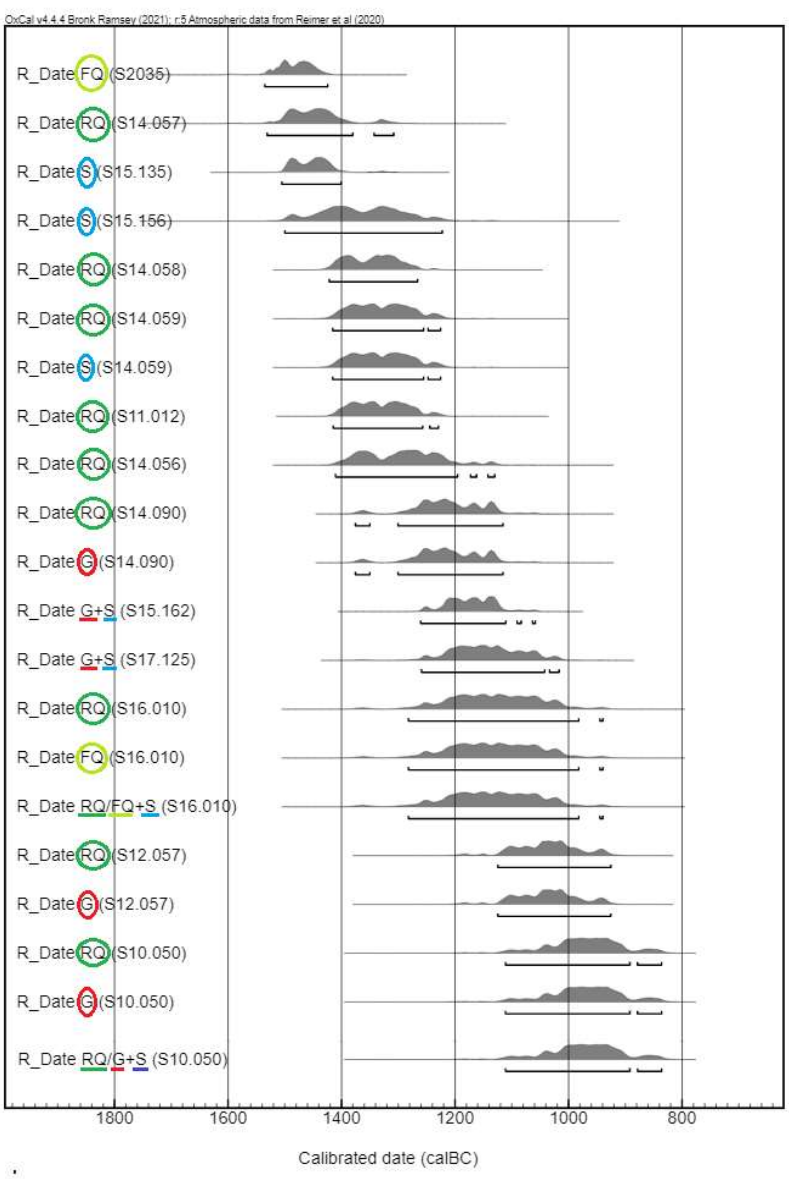
Rough surfaces with shrinkage cracks and grit temper seem to be continuously present in assemblages post-dating 1400 BC. However, one of the major sources of the dataset (De Jong and Beumer 2013, 179) did not include information about temper and surface of individual assemblages. Nevertheless, it does make a mention that grit temper of this period is generally finer and grog more significant in comparison to the MBA-A (De Jong and Beumer 2013, 179).

An earlier publication (De Jong and Beumer 2011) does include this type of information, see figure 21. This information was not added to the dataset to avoid a large number of entries containing information about only grit/temper (as none of the other variables are mentioned). Note, that the conclusions of the later publication (De Jong and Beumer 2013) only partially be inferred on the basis of this information.

Most defining until 1200 BC is the sheer lack of diversity in shapes and decoration (as mentioned in section 3.1.2; see ref. table 6). All but one of the (few) assemblages of the dataset seem to correspond with this, as they have bucket- and/or barrel-shaped profiles without decoration. Many small assemblages (e.g. see: dates in fig. 21) not included in the dataset seemingly have no decoration either. Note that both sources (De Jong and Beumer 2011; De Jong and Beumer 2013) contain many small assemblages for which no description of decoration is described, which leads to believe that also no decoration was present (otherwise one would expect it to have been described).

One very large assemblage not corresponding with this has angular profile transitions and rows of deep finger impressions (appendix 3: 3120±35 BP[5]). Some of the assemblages have nail/finger impressions on top of the rim (appendix 3: 3190±30; 3120±35; 3025±35; 3000±30 BP[6]). Noteworthy is also a protrusion on the rim of a bucket-shaped pot (appendix 3: 3060±40 BP[7]).

[5] Son-Ekkersrijt-IKEA [S34.018]: Labcode GrA-43748: 3120±35 BP: 1455-1283 cal. BC (92.6%).
[6] Oss-Mettegeupel [S51.48]: Labcode GrN-21512: 3190±30: 1507-1415 cal. BC (95.4%); Son-Ekkersrijt-IKEA [S34.018]: Labcode GrA-43748: 3120±35 BP: 1455-1283 cal. BC (92.6%); Oss-Mikkeldonk [S902.1]: Labcode GrN-16732: 3025±35 BP: 1399-1194 cal. BC (91.3%); [same site+feature]: Labcode GrN-16733: 3000±30 BP: 1306-1124 cal. BC (86.1%).
[7] Son-Ekkersrijt-IKEA [S19.125]: Labcode GrN-31958: 3060±40 BP: 1405-1053 cal. BC (95.4%).



BP date ±	
3225	30
3175	45
3175	30
3110	60
3085	30
3065	35
3065	35
3065	30
3035	40
2985	30
2985	30
2960	20
2940	35
2930	50
2930	50
2930	50
2865	30
2865	30
2815	45
2815	45
2815	45

Figure 21: Temper material (abbreviated) and feature number of assemblages of Ekkersrijt's first publication, FQ (light green) = fine quartz, RQ (dark green) = rough/big quartz, S (blue) = (rough) sand, G (red) = grog, letter(s)+S = other temper material and sand in one vessel, SM = sand mixed with other temper (by author; De Jong and Beumer 2011, 57; 71; 108; 110)

By the end of the MBA-B (1200-1100 BC), short necks and decoration reappear *(or never disappeared)*. A typical decoration type of the earlier MBA that "reappears" are (finger-impressed) cordons (fig. 22). Van den Broeke took note of this supposed reappearance (Van den Broeke 2012, 280). Aside of cordons, a similar decoration type is a horizontal row of impressions. Aside of one assemblage previously mentioned (appendix 3: 3120±35 BP[5]), they are mostly lacking among assemblages dated between 1400 and 1200 BC, but are quite numerous during the period that followed (fig. 23).

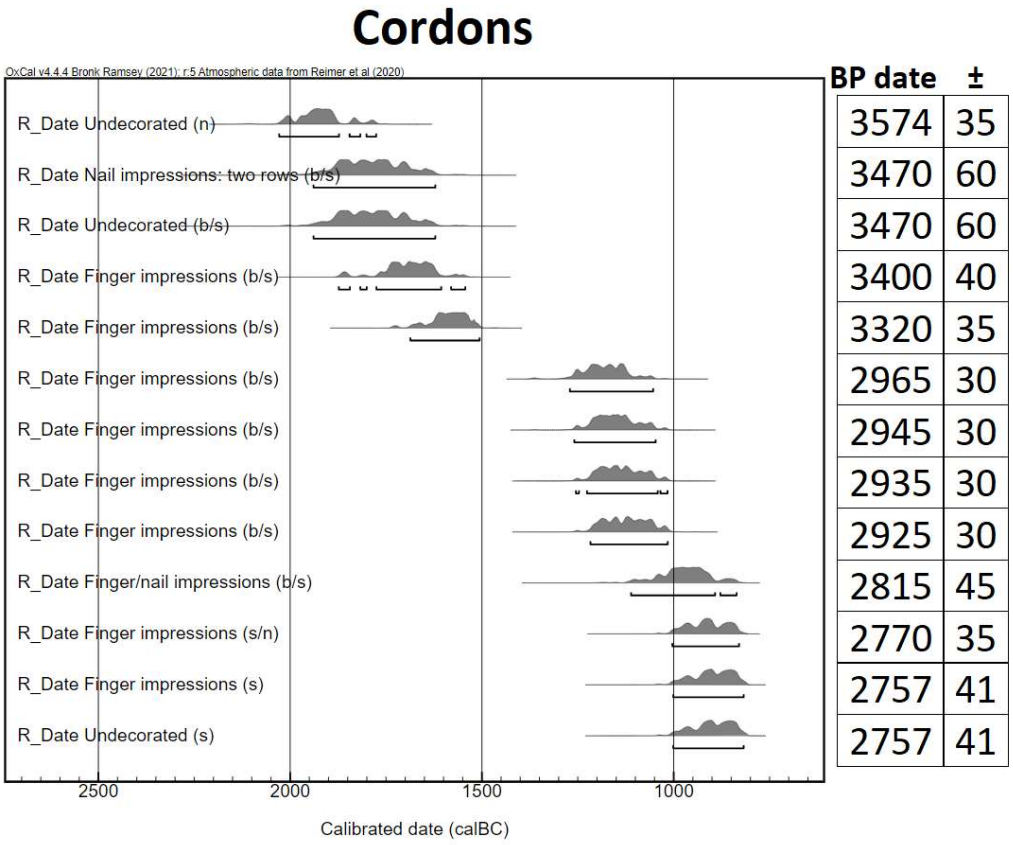


Figure 22: Cordons from the dataset (appendix 3), their decoration types, their positioning and their ^{14}C dating, n = neck, b/s = belly-shoulder transition, s/n = shoulder neck transition and s = shoulder (after appendix 3; by author)

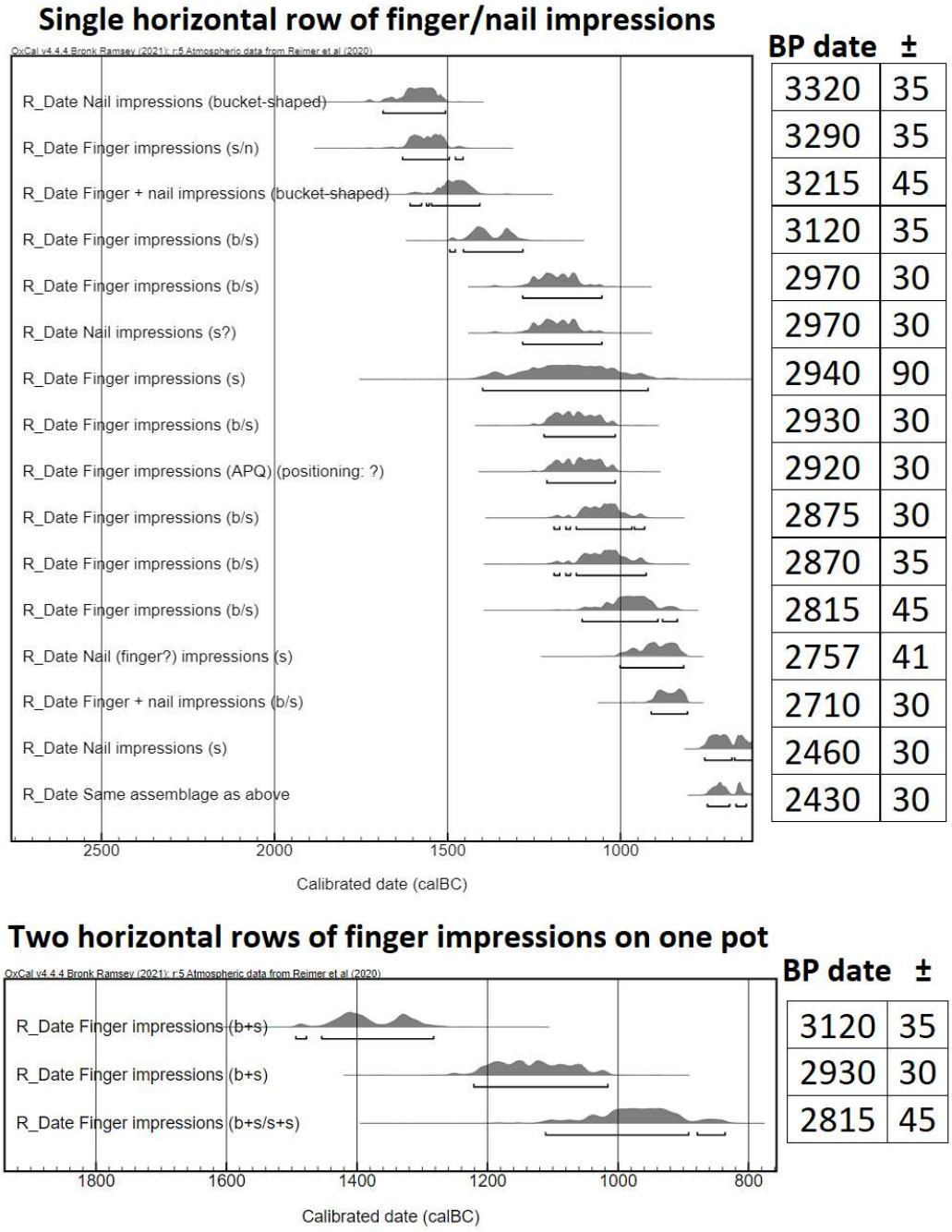


Figure 23: Horizontal rows of finger/nail impressions on pots from the dataset (appendix 3) and their ^{14}C dating, n = neck, s/n = shoulder-neck transition, s = shoulder and, b/s = belly-shoulder transition, "+" differentiates the two individual rows and their respective positionings, bucket-shaped pots barely have a shoulder (after appendix 3; by author)

The end of the MBA-B (1200-1100 BC) and its transition into the LBA is also very different from the earlier MBA. There are vessels with angular profile transitions, wider vessel shapes, shapes with (short) necks, lips (thickened rims), rim decoration on different sides of the rim, smoother surfaces and more vessels tempered with grog (appendix 3; ref. table 6). Whereas some of the shapes, including biconical shapes,

already appeared during the earlier MBA, many vessel shapes of this period are nothing like typical MBA shapes (e.g. fig. 28; appendix 3: variety of dates[8]). Some of the shapes have contemporary equivalents in a wider area (ref. fig. 19). Other decoration methods like grooves also start to appear (appendix 3: 2930±50[9]), but there are not enough examples to state that these predate 1100 BC. The assemblages in the dataset of the late MBA-B and early LBA (<1000 BC) generally show a sheer dominance of horizontal rows of finger/nail impressions and rim decoration. The rows of decoration are generally positioned around the belly-shoulder transition (fig. 23).

Around the start of the LBA, ears and very long necks (length: >5 cm) appear. Ears are a recurring characteristic of the LBA (appendix 3: variety of dates[10]). Throughout the LBA, there are many diverse shapes and a variety of decoration types. Many of these shapes, as with those of the end of the MBA, do not seem to correspond with types mentioned in the typologies, or may otherwise be classified as Iron Age types (section 4.2). In general contrast to the Iron Age, the decoration is often present on the shoulders in combination with undecorated (lower) bellies. The most characterizing decoration type still consists of horizontal rows of finger and nail impressions (fig. 23). Classical decoration types and decoration patterns from urnfields (most in ref. fig. 31 and 32) do not seem to appear a lot in the dataset, but can generally still be dated to the LBA based on the analysis of other data created by Lanting and Van der Plicht (2003; ref. fig. 34). The transition from grit to grog is finalized during this period, but this presumably varies from region to region. Several late MBA and early LBA assemblages from the dataset are typo-chronologically classified as dating to a later time period (see sections 4.2 and 4.3).

[8] Son-Ekkersrijt-IKEA [S33.028]: Labcode GrA-43742: 2945±30 BP: 1260-1048 cal. BC (95.4%); Son-Ekkersrijt-IKEA [S16.010]: Labcode GrN-31448: 2930±50 BP: 1283-983 cal. BC (95.2%); Rhenen-Remmerden [S11.18]: Labcode Poz-14567: 2930±30 BP: 1222-1016 cal. BC (95.4%); Son-Ekkersrijt-IKEA [S18.327]: Labcode GrA-43858: 2925±35 BP: 1225-1011 cal. BC (95.2%); Son-Ekkersrijt-IKEA [S22.047]: Labcode GrA-43505: 2925±30 BP: 1218-1016 cal. BC (95.4%); Son-Ekkersrijt-IKEA [S31.056]: Labcode GrN-31984: 2910±40 BP: 1225-983 cal. BC (95.1%); Son-Ekkersrijt-IKEA [S29.085]: Labcode GrA-43885: 2910±35 BP: 1220-1003 cal. BC (95.4%).
[9] Son-Ekkersrijt-IKEA [S16.010]: Labcode GrN-31448: 2930±50 BP: 1283-983 cal. BC (95.2%).
[10] Sint-Oedenrode [Grave 63]: Labcode GrA-19649: 2910±60 BP: 1271-924 cal. BC (95.4%); Son-Ekkersrijt-IKEA [S27.005]: Labcode GrA-43515: 2875±30 BP: 1129-968 cal. BC (86.5%); Son-Ekkersrijt-IKEA [27.004]: Labcode GrA-43874: 2870±35 BP: 1126-929 cal. BC (94%); Cuijk-Heeswijkse Kampen [Greppel 1]: Labcode Ua-35743: 2840±40 BP: 1125-899 cal. BC (95.4%); Son-Ekkersrijt-IKEA [S10.050]: Labcode GrN-31437: 2815±45: BP: 1112-893 cal. BC (88.6%); Tiel-Medel 8 [S36.12]: Labcode Poz-16714: 2815±35: BP 1056-895 cal. BC (90.4%); Tiel-Medel 8 [S51.12]: Labcode Poz-16711: S2770±35 BP: 1004-830 cal. BC (95.4%); Cuijk-Groot-Heiligenberg [S34.225]: Labcode Poz-13257: 2730±45 BP: 983-805 cal. BC (95.4%).

The Iron Age assemblages of the dataset generally follow the developments mentioned in section 2.6. In general, temper nearly always consists of grog, besmirching is common and the decoration is usually positioned on the bellies of vessels. Remarkable is one assemblage from Well that has a few deviating decoration types on the shoulder (appendix 3: 2290±30[11]). There are also minor exceptions like the use of organic temper during the EIA (appendix 3: 2470±30[12]). Several shape types with strong chronological value, like Van den Broeke's type 73, generally appear in assemblages that were ^{14}C-dated to the periods they are associated with (e.g. appendix 3: 2410±30[13]). Some types may also be associated with contexts that date them slightly later in time (e.g. type 32 in appendix 3: >299 BC[14]). Some characteristics, like coastal *briquetage* shape type k-7a, seem to appear relatively often in the assemblages in the dataset. LIA assemblages are underrepresented, by which typical shape and decoration types are also lacking. This includes the wide variety of rim decoration types and positioning that are commonly associated with the LIA. The dataset generally also lacks interconnected nail and finger impressions considered typical for the EIA and LIA.

Whereas the focus of this research has so far mainly been on pottery, other ceramic objects have been largely disregarded. Spindle whorls may have very unique individual characteristics like a row of nail impressions (e.g. appendix 3: >724 BC[15]). These are not covered by typo-chronology (so also not in chapter 2).

[11] Well-Aijen [S18104]: Labcode Poz-87161: 2290±30 BP: 405-352 cal. BC (60.4%)/291-209 cal. BC (35%).
[12] Culemborg-Hoge Prijs [S2422/kuil 23]: Labcode Poz-66584: 2470±30 BP: 766-465 cal. BC (93.4%).
[13] Culemborg-Hoge Prijs [S413/kuil 3]: Labcode Poz-66487: 2410±30 BP: 550-399 (81.1%)/743-692 cal. BC (10%).
[14] Best-Aarle [S7163]: Measurements 13.102.004 and 13.102.005: Estimation of most recent cut based on the second measurement is (late) 299 or 298 BC.
[15] Culemborg-Hoge Prijs [Spieker 67]: Measurements 12.017.001, 12.017.002 and 12.017.003: Estimation of cut based on the measurements is in between 724 and 700 BC.

3.3. Conclusion

All things considered, the ^{14}C dating has shown that the EBA does not really have a typo-chronology that is clearly supported by local examples from the research area, but the examples from the dataset (and research area) generally support it. Apart from the start of the MBA-A, the MBA is still a period with few defining characteristics that can easily differentiate the different centuries. Some subtle differences like the protrusion on the rim of a bucket-shaped pot may prove chronologically valuable if more examples are encountered within dated MBA-B contexts. Neither Theunissen (1999) nor Drenth (2015) have nevertheless mentioned such characteristics (section 3.1.2).

The diversification of shapes by the end of the MBA-B and the continued diversification during the LBA has a lot of typo-chronological potential (1200-800 BC). There are characterizing shapes among the assemblages that are generally not mentioned in the typo-chronologies or that can be defined as Iron Age types (appendix 3; section 4.2; e.g. ref. fig. 30). Figure 19 in the reference collection already shows a few similar ^{14}C-dated pots that could be classified as a single type of this period. A more detailed research and categorization of these types could prove useful for typo-chronological purposes.

For the Iron Age, there is little to be remarked as a lot of the data generally (see section 4.4.2) corresponds with the data known from Van den Broeke (2012). Section 3.1.5 also made clear that the typo-chronology is based on a lot of local ^{14}C-dated assemblages, as well as comparisons to assemblages in the wider surroundings. It is advisable to use section 2.6, the overview of appendix 3 and the reference collection to get a general perspective on characteristics of each Iron Age subperiod. It is also important to take the chronological basis of Iron Age typo-chronology (section 3.1.5) and the so-called *Iron Age tunnel vision* (section 4.2) into account when dating assemblages.

See figure 24 for an updated overview of characteristics per period. In order to put the data into a broader perspective combined with the typo-chronologies of chapter 2, next chapter discusses some of the discrepancies and mistakes of typo-chronologies.

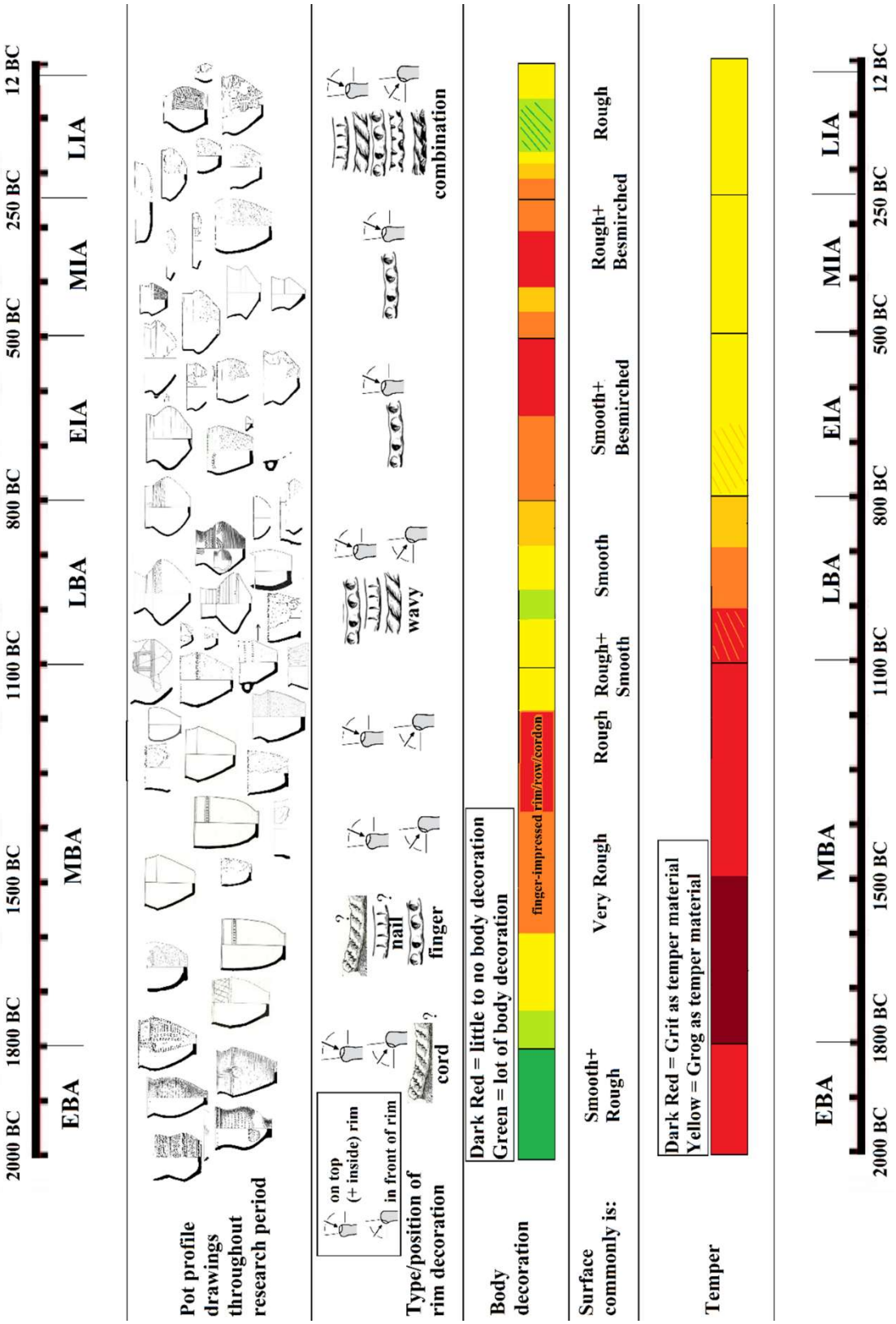


Figure 24: Same overview from the conclusion of chapter 2, with some changes and additions based on the absolute dates compiled in this chapter (by author; drawings from appendix 3 and from: Van den Broeke 2012, 56; 110-111; 397; 401; 405; 407; 409; 412; 414; 416; 420; 423; 427; Desittere 1968b, 55; 62; 68; 70; 74; 76; Fokkens and Smits 1989, 14; Glasbergen 1954b, 121; 125; Lanting 1976, 58; De Laet and Glasbergen 1959, 139; Louwe Kooijmans 1974, 222; 248; Modderman 1955, 33; Modderman 1960, 289; Perizonius 1976, 91-92; Verwers 1972, 135)

4. Discussion

This chapter discusses the particular characteristics that displayed discrepancies between typo-chronology and absolute dating. This includes discrepancies caused by the application of a typo-chronological publication rather than the information available within it. Aside from the discrepancies, particular attention is given to the EBA and the general lack of finds from this period in parts of the research area.

Most entries of the comparison based on site publications (appendix 4; section 3.2) match the typo-chronology, which is partially due to the use of ^{14}C dating in the creation of some of these typo-chronologies, especially in case of the Iron Age (section 3.1.5). At the same time, there are entries in which the typo-chronological dating encompasses a very wide time period. See appendix 4 for a comparison of the ^{14}C dating of assemblages from appendix 3 with typo-chronological interpretations by respectively the authors of the source material (site publications) and the author of this thesis.

Throughout this research, several main discussion points came to attention. For one, most information about EBA ceramics is based on an older typo-chronology and non-local ^{14}C dating (see sections 2.3, 3.1.1 and 3.2.2). What could explain this EBA hiatus (section 4.1)? In sections 1.2.3 and 3.2.2, it was mentioned that several late MBA or LBA assemblages have a typo-chronological dating in the later LBA or the Iron Age. How and why does this occur (see sections 4.2 and 4.3)? Aside of these discussion points, there are also several (minor) discrepancies between ^{14}C dates and typo-chronological dates that can more easily explained (see section 4.4).

4.1. Early Bronze Age hiatus

Section 2.3 mostly describes a relatively old typo-chronology for the EBA (ref. table 3; Lanting 1973, 220-221). A more modern ^{14}C dating comparison to typo-chronology (Fokkens *et al.* 2016, 287) appears to confirm and strengthen the chronological value of the typology provided by Lanting (section 3.1.2). It could be argued that modern ^{14}C dating has further confirmed and strengthened the chronological value of typo-chronology provided by Lanting. In this regard, there are two points to be addressed: the EBA is underexposed as a field of research and there is a lack of pottery and sites within the research area.

4.1.1. Early Bronze Age is underexposed

The EBA has had the minor dilemma of being shoved in between two fields of research: Late Neolithic and Bronze Age research. Fokkens claimed the entire EBA is merely a continuation of Late Neolithic material culture with different decoration types (Fokkens 2001, 256-258). At that point in time, it had nevertheless already been excluded from both early Late Neolithic and MBA typology (Van der Waals and Glasbergen 1955, 7; Glasbergen 1954b; Glasbergen 1969). In current research, like publications of Late Neolithic pottery (Beckerman 2012; Beckerman 2015), or research on MBA pottery (see section 2.4 and 3.1.2), mentions of EBA (BWB) pottery are scarce. In Neolithic research, Veluvian Bell Beaker pottery was shown to have a probable continuation into the EBA (see section 3.1.1; e.g. appendix 3: 3635±40[16]). Aside of that, EBA exclusion may continue into future research, like the exclusion of a single grave from a dataset, because the ^{14}C date has a timespan covering part of the EBA (Wentink 2020, 198).

It therefore took several decades for the EBA to get renewed attention, whilst still being excluded from one research project to the other. In this regard, it could be argued that the characteristics of Fokkens *et al.* (2016, 287) are so similar to Lanting's typo-chronology, because that was still the most important data available to them. It seems as if the newly discovered sites correspond with the typo-chronology, but only nine sites are discussed, only five of which have ^{14}C dating, and only one of which is in the research area (see section 3.1.2).

4.1.2. Lack of Early Bronze Age pottery and sites in the research area

Most of the ceramics, including those with absolute dating, are from areas north of the research area (see sections 2.3, 3.1.1 and 3.2.2). More recently published sites in Barendrecht and Schokland have plenty of ^{14}C dates and show Bell Beaker assemblages transitioning into EBA (BWB) and MBA assemblages (Fokkens *et al.* 2016, 102-118; 199-210; and/or see Ten Anscher 2012 and Moree *et al.* 2011). However, neither are within the research area, nor are most other ^{14}C-dated sites with EBA pottery. Most sites are in the north-eastern regions of the Netherlands. The one site geographically closest to (but not within) the research area (Houten: see fig. 39: phase 2) has a ^{14}C date (2140-1910 BC) that was slightly disregarded with the assemblage being placed later in time (1900-

[16] Molenaarsgraaf [Break-through gully]: Labcode GrN-5176: 3640±30 BP: 2070-1897 cal. BC (74.6%)/2136-2076 cal. BC (20.9%): TPQ date: the material post-dates this dating.

1800 BC) because of the speculation that fish residue had resulted in an earlier date (Fokkens *et al.* 2016, 212). It could nevertheless be argued that the phasing was only changed because the assemblage typologically matched the late phase of EBA pottery (ref. table 3).

That being said, ^{14}C-dated EBA assemblages from the northern side of the research area in our dataset are largely in correspondence with typo-chronology (appendix 3: 3574±35; 3555±40; 3485±20[17]). This includes several potsherds with decorative elements that have also been found on more complete examples, like those from the break-through gully of Molenaarsgraaf with a TPQ date (appendix 3: 3640±30[18]).

Sites in the south(west)ern side of the research area are even harder to find. This area does not have a lot of known EBA sites, despite the extensive excavations that have been carried out (Fokkens *et al.* 2016, 38; 48). Could this be an EBA hiatus?

There are Late Neolithic and EBA flint finds from the areas where sites are lacking (Fokkens *et al.* 2016, 52). Research in Breda also showed that people of the EBA had an extensive influence on the vegetation of the local landscape, despite the lack of features and associated pottery (Berkvens *et al.* 2004, 55).

It is possible that a lot of pottery has been recognized as pottery from other/wider time periods (Koster *et al.* 2004, 80-81). The pottery may also have characteristics unknown to research. Some of the EBA/MBA-A pottery from Barendrecht for example has remarkable thin biconical shapes with very low belly-shoulder transitions (e.g. Moree *et al.* 2011, 61; 82-83). In Tilburg, a grave that is ^{14}C-dated to the EBA is associated with fragments of pottery that look like “Iron Age pottery” without any further elaboration (Verbeek and Mostert 2012, 39). There is perhaps too much emphasis on barbed wire decoration distracting researchers from other characteristics common to this period, when analysing random assemblages. The features and pottery may therefore have been found but not dated to the EBA.

Another possibility is the place of deposition. Veldhoven-Habraken yielded a site with a lot of MBA-A (possibly also one EBA) and Late Neolithic ^{14}C dates (Van den Brink and Van

[17] Meteren-de Bogen 28-1 [V3834-4/V3159/6]: Labcode UtC-8647: 3574±35 BP: 2029-1873 cal. BC (84.2%); Culemborg-Lanxmeer [S12/13]: Labcode GrA-27104: 3555±40 BP: 1984-1862 cal. BC (59.7%)/1856-1766 cal. BC (28.9%); Oss-Schalkskamp [S1029.5]: Labcode GrN-19666: 3485±20 BP: 1882-1745 cal. BC (95.4%).
[18] Molenaarsgraaf [Break-through gully]: Labcode GrN-5176: 3640±30 BP: 2070-1897 cal. BC (74.6%)/2136-2076 cal. BC (20.9%): TPQ date: the material post-dates this dating.

Kampen 2013, 30). Despite the presence of plenty of features, the Bronze Age section of the site yielded a very low amount and concentration of pottery compared to the Late Neolithic section of the site (Van Kampen *et al.* 2013, 95; 103). The pottery may for example have been deposited in different off-site contexts not commonly excavated. That being said, pottery is still found in regular features like those in Oss and Culemborg (appendix 3; but also e.g. in Meteren: Ufkes and Bloo 2002, 356-360). Fokkens made the suggestion that the lack of assemblages and settlements may be attributed to their lesser known locations within (lower parts of) the landscape (Fokkens 2019b, 187).

More ^{14}C dating of Late Neolithic and Bronze Age contexts in future research may be the key to make EBA pottery from the research area better known and understood.

4.2. Iron Age tunnel vision

Whereas the Iron Age typo-chronology of Van den Broeke (2012) is a useful tool for dating pottery of the Iron Age, considering that it shows little discrepancy with the ^{14}C dates, an issue may appear when an assemblage from another period is dated with the aid of this typo-chronology. As a matter of fact, LBA assemblages have been identified as Iron Age assemblages (table 6; fig. 25). This can be referred to as the "Iron Age tunnel vision". How and why does this occur?

Site Name: Feature identification no. : *^{14}C date Labcode*	**^{14}C/BP date**	**^{14}C-BC date (recalibrated with 2 sigma)**	**Typological date (BC) (source)**	**Typological date (BC) (author)**	**Source**
Best-Aarle: S800: *Poz-61427*	2970±30	**1284-1055** (95.4%)	**250-0** (LIA)	**1780-800; 250-0**	Tol 2017, 82; Meurkens 2017, 1357-1358
Culemborg-Hoge Prijs: S2428: *Poz-66501*	2965±30	**1271-1054** (95.4%)	**1100-650**	**1800-1100**	Verhelst *et al.* 2015, 38; Meurkens 2015, 146
Cuijk-Heeswijkse Kampen: Greppel 1: *Ua-35743*	2840±40	**1125-899** (95.4%)	**800-12**	**1100-450**	Beckerman and Bloo 2009, 87; 92; Roessingh 2009, 70
Best-Aarle: S982: *Poz-61428*	2740±30	**933-813** (92.8%) 971-956 (2.6%)	**375-12**	**900-800; >500**	Tol 2017, 82; Meurkens 2017, 1357-1358
Well-Aijen A: S12070: *SUERC-38059*	2670±35	**901-793** (95.4%)	**800-500** (temper) **500-250** (shape)	**1000-650**	Ter Wal and Tebbens 2012, 167; 224

Table 6: List of BA assemblages typo-chronologically classified as IA assemblages by the source (edited extract from appendix 3)

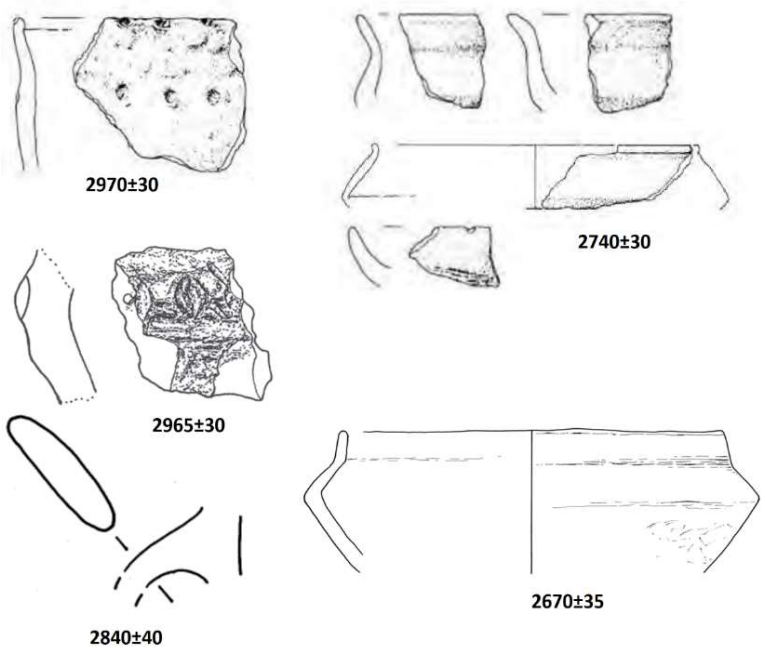


Figure 25: Drawings of Bronze Age ceramics dated to the Iron Age by the authors of the sources: see table 6 for data and sources (after appendix 3; compiled by author)

The most obvious answer to this question would have been that these periods are not addressed by Van den Broeke's typo-chronology, because it is not part of his research period (=Iron Age). However, in fact, they are addressed yet most likely lost in the detail of this typo-chronology. This typo-chronology is by far the most elaborate for the research period and perhaps for the entire local Prehistory. Nevertheless, the sheer amount of detail makes it difficult to apply.

Van den Broeke created figures with percentages throughout the typo-chronology (2012) to create overviews, but the figures do not cover the periods before the research period, for which there was not a sufficient amount of local assemblages.

The typo-chronology shows that there is awareness that certain shape types, decoration types and other characteristics are typical for the LBA. These are nevertheless always hidden in the text, usually in sections headed with "datering regionaal" or in the notes. Figure 26 shows how reading one paragraph and not reading another affects the perceived dating of a characteristic (in this instance: finger-impressed cordons). There are three different possible dating ranges depending on what is read. This particular example may even be more extreme, because horizontal cordons with decoration also appeared during the Corded Ware Period of the Late Neolithic (see section 3.4; Beckerman 2015, 41; 115; 126; 137). One researcher dated a finger-impressed cordon to the LBA or EIA by (presumably) not checking the notes (table 6; fig. 25 and 26).

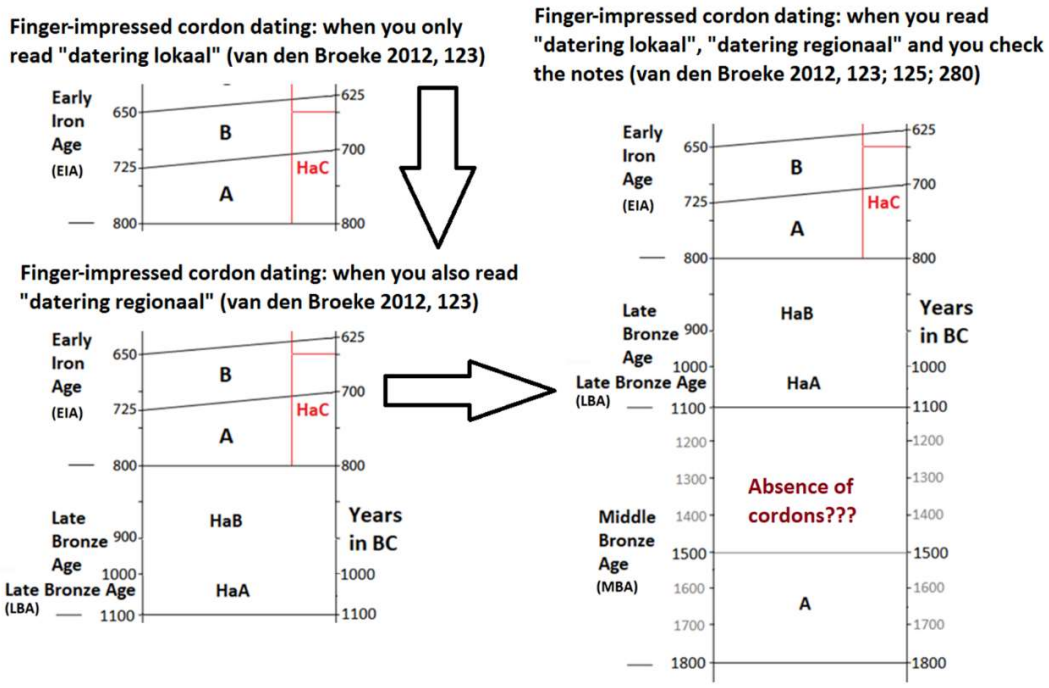


Figure 26: How the typo-chronology of Van den Broeke (2012) may be confusing to the researcher using it (after Van den Broeke 2012, 36)

Different examples of this phenomenon by the same researcher relate to the positioning of the decoration and to shape types (fig. 27). The characteristics in question are also mentioned to appear in the (L)BA in the text headed by "datering regionaal", but this is not mentioned in text headed by "datering lokaal" or reflected in the figures (fig. 26). This is why LBA assemblages eventually appeared in a compilation of MIA-LIA pottery without a single mention of the LBA (Meurkens 2017, 1358). There are other examples that may have caused a discrepancy. Such an example is comb decoration typical for the MIA and Roman Period. It nevertheless also appeared during the LBA (e.g. appendix 3: 2730±45[19]; Van den Broeke 2012, 118 -> "datering regionaal").

Before the typo-chronology of Van den Broeke (2012) was created, there were already (minor) examples of an Iron Age tunnel vision dating LBA assemblages to the Iron Age, like a publication bluntly dating a small assemblage of a ditch to the "Iron Age" (800-12 BC), whereas the one diagnostic sherd (plugged ear) is especially typical for the LBA (appendix 1; ref. table 8; Bloo and Beckerman 2009, 92). Another example is a pot/bowl from Well with a shape typo-chronologically dated to the early MIA (Marne tradition)

[19] Cuijk-Groot-Heiligenberg [S34.225]: Labcode Poz-13257: 2730±45 BP: 983-805 cal. BC (95.4%).

because of profile angularity and elaborate smoothening (see section 3.1.2; Wall and Tebbens 2012, 67). These features are nevertheless also typical for the LBA.

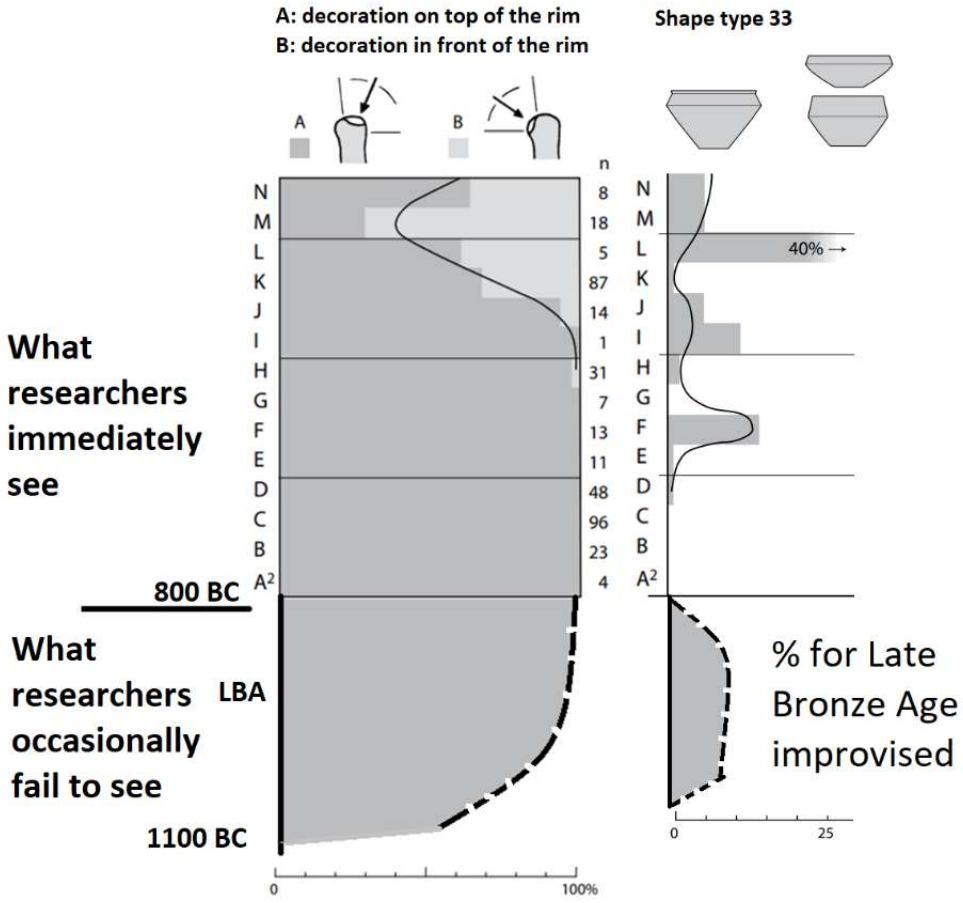


Figure 27: Two examples of Middle/Late Iron Age characteristics atypical for the EIA but typical for (or at least occurring in) the LBA (after Van den Broeke 61; 86; 111)

Characteristics appear, disappear and reappear, which is what may cause the biggest discrepancies between typo-chronology and ^{14}C dating, especially when the data is misinterpreted. It is advisable to read headings of "datering regionaal" and the notes in the typo-chronology of Van den Broeke (2012) when dating (small) assemblages.

4.3. Late Bronze Age tunnel vision

The tunnel vision of the above can also apply to other periods. Desittere's LBA typo-chronology dates a lot of shape and decoration types to the last two centuries of the LBA (HaB: 1000-800 BC), with HaA (1100-1000 BC) remaining largely undefined (Desittere 1968a, 30-31). The ^{14}C dates mentioned throughout this research generally suggest earlier dates for several shape types that were previously defined as dating to HaB (fig. 28). These types seem to date to period of shape diversification of 1200-1000

BC (shortly discussed in section 3.2.2). The Urnfield examples from section 1.2.3 from Maastricht and Belgium can fit this tunnel vision principle, and to a lesser extent, the examples from Lanting and Van der Plicht (2003) from the research area (ref. fig. 34).

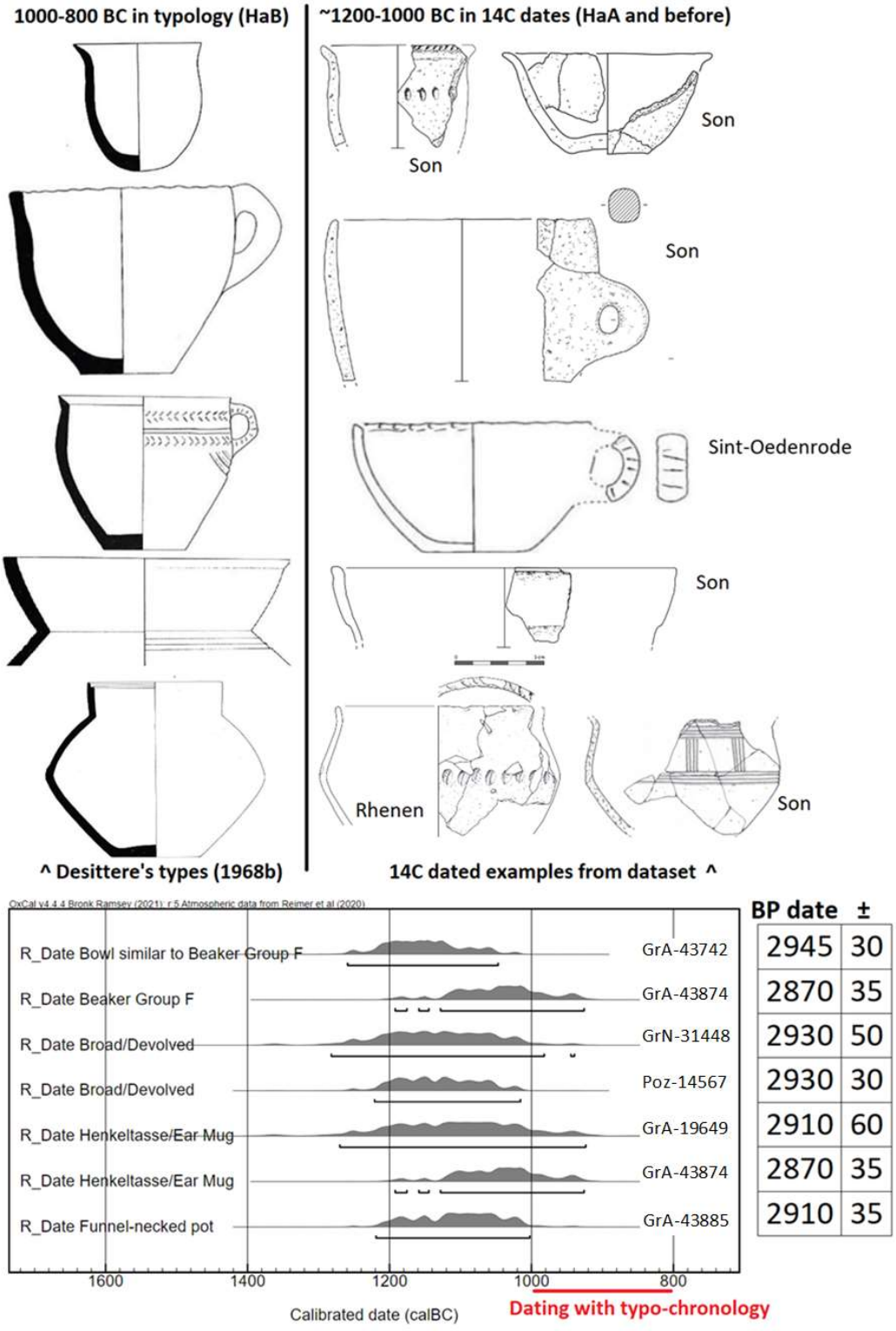


Figure 28: Examples from the dataset (appendix 3) that can typo-chronologically be dated to HaB (1000-800 BC) that are absolutely dated to the transition of the MBA to the LBA (1200-1000 BC). The imagery and data of pottery from appendices 1 and 3 was used to create this figure (after appendix 1 and 3; by author)

Good examples of this tunnel vision are wider shapes with short necks ^{14}C-dated to the transition of the MBA to the LBA (e.g. bottom right vessels in fig. 28). Typo-chronologically, they are akin to examples from the latest phase of the LBA, and Desittere would thus refer to these shapes as “devolved” subtypes with definitions like “broad type” (appendix 1). Dyselinck typo-chronologically dated similar shapes to the late LBA (e.g. ref. fig. 19; Dyselinck 2013, 73; 136). The typo-chronological dating of a different Belgian shape follows a similar reasoning of belonging to the late LBA for being “devolved” (fig. 2 in section 1.2.3; De Mulder 2007, 509-510). Some other shapes in figure 28 could also be defined as late LBA shape types with the typo-chronology of Desittere, whilst having ^{14}C dates leaning to an earlier period.

If the examples from the dataset (fig. 28) had been dated typo-chronologically instead, they could have mistakenly been interpreted as late LBA shapes, as occurred with the ^{14}C-dated examples of Maastricht and Belgium mentioned above. Desittere’s typo-chronology makes it seem as if this pottery dates to the late LBA. In contrast to Desittere’s typo-chronology, a German typo-chronology does cover the late MBA and the early LBA (HaA) as a phase (Ruppel 1990, appendices 2 and 4). Some of the shapes of this typo-chronology from this phase seem to correspond with some of the shapes from the research area that were ^{14}C-dated to this period.

In conclusion, based on both ^{14}C dating as well as a typo-chronology from a neighbouring region, one can state that general knowledge and a proper typo-chronology is lacking for this early period of the LBA with regards to the research area.

4.4. Other discrepancies

There are a variety of other discrepancies that can quite easily be explained by discussing the typo-chronologies that dated them to the wrong periods.

4.4.1. Bronze Age discrepancies

In case of the Bronze Age, it should be mentioned that a number of the repetitive discrepancies is also discussed in sections 4.2 and 4.3, covering the so-called tunnel visions. Aside of these discrepancies, a lot of Bronze Age assemblages could not be

dated to narrow time periods, due to a lack of defining characteristics. Some discrepancies are caused by a gap of knowledge about the Bronze Age.

One of these discrepancies is partially caused by perforations. Perforations are a well-known characteristic in EBA pottery (ref. table 3). Several examples of perforations can nevertheless be dated to the MBA (fig. 29). A MBA site outside of the research area in The Hague also has a perforation (Bloo 2013, 57). It should be noted that the perforations are diverse. Whereas it is not entirely certain how those from Son and Molenaarsgraaf were created, the one of Heteren was created before the pot had been fired (in wet clay) and the one from the The Hague after it had been fired (Bloo 2013, 58; Van der Linden *et al.* 2010, 71). The ones from Son and Molenaarsgraaf also have very different shapes and positioning. A perforation/hole should nevertheless not be a reason to date it to the EBA as was done in Heteren (Van der Linden *et al.* 2010, 71).

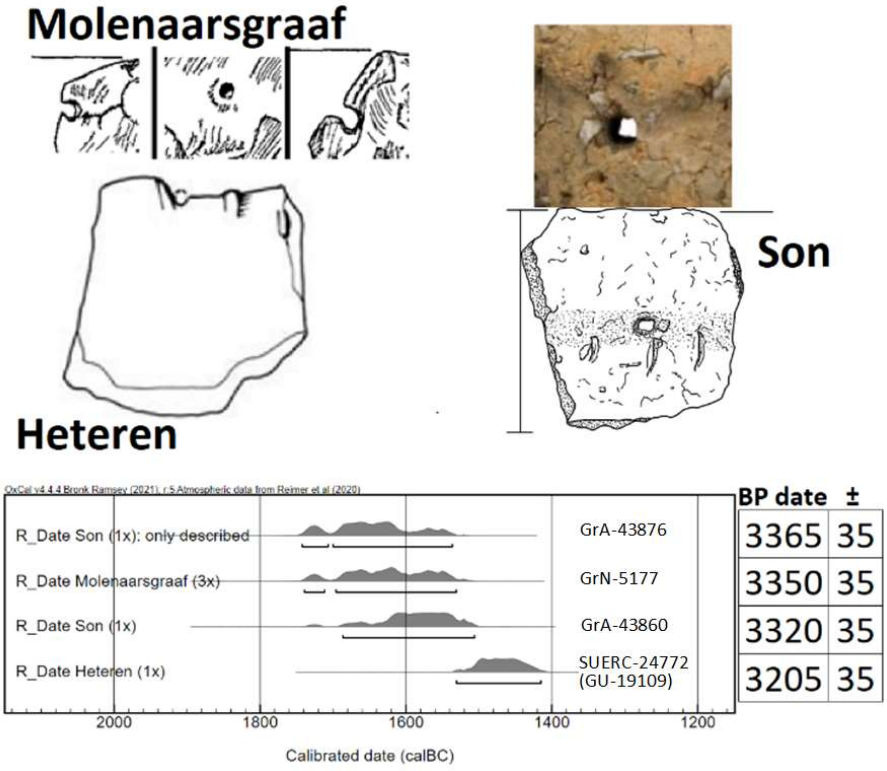


Figure 29: Holes/perforations in the bodies of sherds during the Middle Bronze Age (after appendix 3; by author)

Other discrepancies of Son, Heteren and Oss were caused by the general presence of necks, sometimes in combination with other characteristics (ref. fig. 15; also in appendix

3: 3290±35; 3205±35; 3190±30[20]). With typo-chronology, the authors generally placed the sherds in the EBA or LBA. ^{14}C dates of three sites placed them within the MBA, roughly in between 1600 and 1400 BC (ref. fig. 15). Because of a repeated appearance of similar tripartite shapes, and a lack of attention given to them in the different MBA typo-chronologies, it could be argued that the discrepancy is caused by a lack of knowledge about these shapes during this period, despite their general (scarce) presence among the drawings of typological publications (Drenth 2018, 166; Glasbergen 1954b, 101).

Two individual MBA assemblages also had remarkable discrepancies, like a rim sherd with an unusual type of decoration and granite temper (Heteren: appendix 3: 3205±35[21]) and a large assemblage with angular shapes and rows of decoration (Son: appendix 3: 3120±35[22]). These are typo-chronologically respectively dated to the EBA and LBA. In these particular instances, it could be argued that the first is an intrusion, as the other sherds of the assemblage are mineralogically different, and the latter is a result of an old-wood-effect dating the assemblage to an earlier period. Future research could prove otherwise.

The final assemblage from Budel is the opposite of the assemblages discussed in section 4.3. The assemblage has several pots and vessels that lack classical LBA shapes and decoration. It shares characteristics with MBA typology (DKS/LRN/OHV types), but it also has a smoothened bowl and plate atypical for the MBA. Typo-chronology may place it in the earlier LBA, but the ^{14}C date places it in the late LBA (appendix 3: 2757±41[23]).

4.4.2. Iron Age discrepancies

The Iron Age typo-chronology of Van den Broeke (2012) is very elaborate and precise. This is also what caused some LBA assemblages to be dated to the Iron Age (section 4.2). This precision may also cause discrepancies based on a combination of questionable characteristics or very narrow typological dating ranges.

One of such discrepancies was caused by a few rim shapes, surface techniques and temper material of an assemblage from Culemborg. It is dated to the LIA, whereas the

[20] Son-Ekkersrijt-IKEA [S29.057]: Labcode GrA-43881: 3290±35 BP: 1631-1496 cal. BC (93%); Heteren-Uilenburg [KL04]: Labcode SUERC-24772 (GU-19109): 3205±35 BP: 1531-1416 cal. BC (95.4%); Oss-Mettegeupel [S51.48]: Labcode GrN-21512: 3190±30 BP: 1507-1415 cal. BC (95.4%)
[21] Heteren-Uilenburg [KL04]: Labcode SUERC-24772 (GU-19109): 3205±35 BP: 1531-1416 cal. BC (95.4%).
[22] Son-Ekkersrijt-IKEA [S34.018]: Labcode GrA-43748: 3120±35 BP: 1455-1283 cal. BC (92.6%).
[23] Budel-Meemortel [S1.189]: Labcode KIA-35904: 2757±41 BP: 1009-811 cal. BC (95.4%).

^{14}C date points at the EIA (fig. 30; appendix 3: 2470±30[24]). The assemblage included four rim shapes with short necks not tied to types, which are generally typical for the LIA, but far from being exclusive to this period (ref. fig. 36). The low percentage of besmirching is typical for the LIA (when it decreased), but also for the EIA (when it increased) (ref. fig. 45). The presence of organic temper in local pottery points at the LIA or Roman Period (ref. table 10), but the assemblage only includes a few fragments with this material. In summary, the use of three questionable typo-chronological markers lead to the wrong conclusion. One rare decoration method of big *dellen* of the assemblage actually does point at the EIA (ref. fig. 42; Van den Broeke 2012, 119-120), but it was disregarded in favour of the combination of the other characteristics and perhaps by not reading the paragraph headed by "datering regionaal" (fig. 26; Van den Broeke 2012, 120).

Another discrepancy is caused by two pots of shape type 23b encountered in Best. This is a type commonly associated with the EIA yet these examples are ^{14}C-dated to the later MIA (fig. 30; appendix 3: 2265±30[25]). This type has chronological value despite its simplicity. Its simplicity is nevertheless also a reason why it keeps appearing throughout the Iron Age (Van den Broeke 2012, 57). A later dating is therefore not surprising.

A third discrepancy is relatively small and relates to shape type 32 encountered in Best. This is a type considered a guide artefact of the earlier MIA, yet is dendrochronologically dated to the end of the MIA (fig. 30; appendix 3: >299 BC[26]). Interestingly, it is mentioned that this type commonly appears during later phases south of Oss (northern Limburg), which may generally apply to Best (Van den Broeke 2012, 61; note 145). It could also be argued that single-century dates from typo-chronology are highly questionable.

A fourth discrepancy is also relatively small and based on shape type 71 encountered in Best. This type generally does not appear after phase J in the wider region (Van den Broeke 2012, 83), yet is dated to this particular phase (fig. 30; appendix 3: >213 BC[27]). The neck length is also uncommonly long for this period (ref. fig. 36). Later LIA examples

[24] Culemborg-Hoge Prijs [S2422/kuil 23]: Labcode Poz-66584: 2470±30 BP: 766-465 cal. BC (93.4%).
[25] Best-Aarle [S8394]: Labcode Poz-61445: 2265±30 BP: 311-207 cal. BC (55.9%)/396-349 cal. BC (39.5%)
[26] Best-Aarle [S7163]: Measurements 13.102.004 and 13.102.005: Estimation of most recent cut based on the second measurement is (late) 299 or 298 BC.
[27] Best-Aarle [S7687]: Measurements 15.094.002, 15.094.003, 15.094.006, 15.094.007, 15.094.008, 15.094.011, 15.094.012, 15.094.021, 15.094.023: Estimation of most recent cut based on the third measurement is in between 217 and 200 BC (estimate: 213 BC)

are mentioned for an area far southwest of Oss (Kontich: Van den Broeke 2012, 83; note 273). This discrepancy can generally also be blamed on the use of single shape types to include and exclude entire periods. This example and the last example generally also show how dendrochronology can question detailed typo-chronologies.

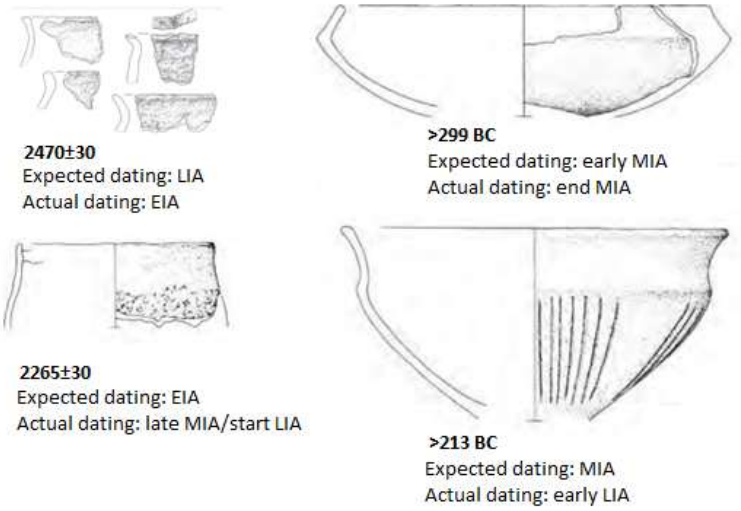


Figure 30: Some Iron Age pottery that has a (slightly) different absolute dating than expected (after appendix 3; compiled by author)

4.5. Conclusion

What the EBA hiatus of 4.1 and the tunnel visions of sections 4.2 and 4.3 represent is a reflection of part of the problem statement (section 1.2.1). Time periods (i.e. Iron Age: 800-12 BC) or areas with an extensive typo-chronology overshadow periods and areas that do not have a well-developed typo-chronology (especially 1200-1000 BC and the southern Dutch EBA). Similar research with ^{14}C dating can help fill this void.

The vast amount of detail in Iron Age typo-chronology of Van den Broeke (2012) leads some researchers to draw the wrong chronological conclusions from characteristics in assemblages, i.e. it is a complex tool to manage.

The repetitive appearance of discrepancies between typo-chronology and ^{14}C dating with regards to perforations and tripartite shapes may indicate that knowledge about MBA pottery is quite limited (section 4.4.1). Similar to the Iron Age tunnel vision, the Iron Age discrepancies are partially the result of extensive typo-chronology dating small assemblages and single pots quite precisely. This precision can be put into question, especially with the aid of dendrochronology.

5. Conclusions

This thesis concerns the typo-chronology of ceramics throughout the Bronze and Iron Ages in the southern Netherlands. The goal was to create an overview of how ceramics developed throughout this era and to refine the existing typo-chronologies by using ^{14}C dating and dendrochronology. Sections 5.1 to 5.4 briefly restate the research questions stated in the introduction and answer them to the extent that is possible, and section 5.5 discusses the limitations of this research and give recommendations for future work.

5.1. Typo-chronologies in their application

Which typo-chronologies are used and how are they applied?

The typo-chronologies used are discussed by time period in chapter 2 (also see table 2). Some research also links characteristics to certain periods by using ^{14}C dating without creating or changing typo-chronology (see section 3.1. and table 5). These too are often employed by researchers in the field.

Different typo-chronologies are used depending on the context of the site. In case of the sites analysed by Dyselinck (2013) and De Jong and Beumer (2011; 2013), the researchers were well-aware that the pottery of their sites dates to the Bronze Age, so they compared the pottery to Bronze Age typo-chronologies (e.g. Desittere 1968a; Desittere 1968b) and other data available to them (e.g. Arnoldussen and Ball 2007). However, when researchers (mistakenly) assume they are only dealing with the Iron Age, the Iron Age typo-chronology of Van den Broeke (2012) is applied (section 4.2; Meurkens 2015; Meurkens 2018). The use of typo-chronology therefore depends on the knowledge and observations of archaeologists.

The typo-chronology of the EBA dates back to the 1970s and its application mostly relies on the presence of barbed wire decoration and some shape and decoration characteristics described by Lanting (1973; ref. table 3; sections 2.3 and 3.1.1). It is applied by confirming the presence of these main characteristics.

The typo-chronology of the MBA has been overtly simplified for decades, so its application is relatively simple (table 3 in section 2.4). Initial determination is mostly based on the appearance of sherds that are thick, rough and have large quantities of grit temper shining through the surface. Other than that, it is mostly based on characterizing decoration and shape. The dating is always wide (section 3.1.2). The typo-chronology of

Arnoldussen (2008, 178: see table 3) is applied by analysing shape and decoration. This is similar to the Drenth's more extensive (non-chronological) typology (Drenth 2018; 166-167; ref. fig. 25).

For typo-chronology of the LBA, the application mostly consists of analogies to complete shapes and decoration types of typo-chronologies (Desittere 1968a; Desittere 1968b) and (more recent) site publications.

For the Iron Age, Van den Broeke's typo-chronology is applied. When dating an assemblage, a whole list of characteristics, with amounts and percentages are recorded and compared to the analyses of Van den Broeke. This yields a very precise date when the assemblage has enough characterizing features (Van den Broeke 2012). The application is complicated, and researchers may miss chronological details when using it (section 4.2 and 4.4.2).

5.2. Chronological basis of typo-chronology

To what extent are the common typo-chronologies for Bronze- and Iron Age ceramics in the southern Netherlands supported by absolute dating methods?
-If applicable: how and why are they lacking a chronological basis?

The support of typo-chronology by absolute dating varies widely depending on the time period concerned (EBA, MBA, LBA, IA). Therefore, this question are addressed per period below.

For the EBA, the chronological basis of typology is undeniably linked to sites with ^{14}C dating in the northern parts of the Netherlands (sections 3.1.1 and 4.1; ref. fig. 10). The typo-chronology is locally only supported by a handful of ^{14}C-dated sites (see section 3.2.2; appendix 3). Ceramics are rarely found or recognized (see section 4.1).

For the MBA, the chronological basis of current typology is established with a reasonable amount of ^{14}C dating (sections 3.1.2, 3.1.3 and 3.2.2; ref. fig. 25, 26 and 27). The pottery is nevertheless lacking an elaborate typo-chronology that distinguishes different types with chronological value. There are seemingly too few defining characteristics for a precise typo-chronology.

For the LBA, the chronological basis of typo-chronology is based on a limited amount of ^{14}C dating. The classical typo-chronology of Desittere (1968) is purely typological and not based on any ^{14}C dates, but types have been dated to the corresponding calendar years

and earlier (sections 3.1.4 and 4.3; ref. fig. 19 and 34). Whereas most described types seem to fit in the LBA, some of the "devolved" types may actually be "prototypes" based on ^{14}C dating. The typological differentiation between HaA and HaB does not seem to be very accurate, because HaB is overemphasized (section 4.3).

For the Iron Age, the typo-chronology is supported by a wide range of ^{14}C dating, but it is so detailed that the precision goes beyond the capabilities of ^{14}C dating. Particular phases are differentiated based on typological reasoning (section 3.1.5). Discrepancies between ^{14}C dating and typo-chronology are usually small (section 4.4.2). Unlike pottery, the typo-chronology of other ceramic objects like weights is generally scarce and not included in large-scaled analyses that involve absolute dating (section 2.6.7 and the end of section 3.2.2).

5.3. Characteristics per period

What are the typological characteristics of ceramics per (sub)period (e.g. Early Bronze Age) and how do they develop over time?

The characteristics per period are more easily shown than explained (see fig. 24; e.g. compare to fig. 15). They can also be viewed in the reference collection (part II).

That being said, regarding the EBA and MBA, rough grit temper is common, and pottery generally transitions from relatively tall pots with S-shaped profiles and lots of decoration (~2000 BC) to tall (rougher) biconical pots and pots with little to no angularity and fewer decoration on the shoulders (~1800-1600 BC). For a long period of time thereafter (>1600 BC), decoration is limited to the rim or horizontal rows around the body. During a later phase of the MBA (1400-1250 BC), decoration may be entirely absent, but a few assemblages still have (rim) decoration.

During the subsequent period (1200-1100 BC), (finger/nail) decoration becomes increasingly common in one or more horizontal rows around pots (and on every side of the rim). Shapes gradually become shorter, wider and angular. Surfaces become smoother, temper becomes finer (fine grog = more common) and bodies become thinner. Lips, short necks and bowls are increasingly common (late MBA-B/early LBA). Around or after 1100 BC, decoration gradually starts to diversify with e.g. grooves, but

the former decoration types (and shapes!) still seem to appear in following centuries (e.g. appendix 3: 2757±41[28]).

Very long necks (length: >5 cm) and very angular shapes appear sometime before the year 1000 BC, but probably not (long) before 1100 BC (no direct evidence). These gradually disappear towards the start of the Iron Age (900-800 BC) with shapes generally also becoming rounder and less angular. Many of these later shapes may look similar to those of the start of the LBA. LBA shapes may also look similar to those from Iron Age phases D to F (575-375 BC: ref. fig. 36; section 2.6.2: angular shape + appearance of long necks). LBA rim decoration types and positioning (=diverse) may be confused with rim decoration types form the LIA (>250 BC: ref. fig. 39) (section 4.2).

Throughout the Iron Age, there are many developments explained in sections 2.6.2 to 2.6.7 (also see appendix 3). There is generally little discrepancy between the ^{14}C dating and the typo-chronology and it is generally accurate (especially when distinguishing the basic subperiods of EIA to LIA).

5.4. Reference collection

How should the reference collection be structured in order to sketch a reliable picture of Bronze- and Iron Age ceramics in the southern Netherlands?

In order to structure the reference collection, it is useful to subdivide the research period into several subperiods. The existing periodization into six subperiods is a viable option (section 2.2). It is not (yet!) useful to divide the reference collection into very specific phases like Iron Age phases A to L (fig. 11), as these can (individually) not yet to be tied to absolute chronology (section 2.6), require a lot more pottery and would (as of now) obscure the overview. In other words, that would be too fine-grained.

Within the manual of the reference collection, each of the subperiods should have its own chapter with tables, figures and a catalogue describing the ceramics in the physical reference collection associated with that subperiod. The Iron Age should also have its own chapter, as a lot of the figures lose their illustrative value when they are divided into the Iron Age subperiods. The imagery in the figures should complement smaller potsherds of the physical reference collection. The tables should reflect the five

[28] Budel-Meemortel [S1.189]: Labcode KIA-35904: 2757±41 BP: 1009-811 cal. BC (95.4%).

variables discussed in this research and describe their general characteristics. These tables can also entail more information about specific phases.

When grouping ceramics of the physical reference collection into specific subperiods, the catalogue should mention if it is exclusive to a period (guide artefacts) or not exclusive to (but defining/typical for) a period. This classifies ceramics in a typical and an expected range. The ceramics should generally exhibit more clearly recognizable variables than just temper or surface. Otherwise, in general, the ceramics would entail too little information for a period. Exceptions are to be made for rarer temper materials (e.g. fluvial grit). The ceramics themselves should be marked with a colour referring to the subperiod and a unique code, so they can easily be identified and will not get mixed up. There is little information about the dating of ceramic objects, so it is more useful if these objects are shortly discussed in an individual section.

The introduction of the manual of the reference collection should comprise a concise quick start guide. The guide should aid someone with limited knowledge about pottery from this region and period to find their way in the reference collection and particularly enable them to quickly perform a first rough dating of a sherd or assemblage. The quick start guide should discuss basic characteristics of the five variables and be applied as guidance. The user should be referred to the chapters of the respective (sub)period(s) for more thorough dating.

5.5. Limitations and recommendations

A limitation of this research is that it constrains itself to handmade pottery from 2000 years, whereas handmade pottery has existed since the 6th millennium BC and continued to be made until the Middle Ages (e.g. Amkreutz *et al.* 2010, 15-16; Bloo 2017, 1; Verhoeven 1998, 3). Some defining features may for example be typical for the Late Neolithic.

If possible, for future research, it is recommended to apply dendrochronology to features with datable ceramics, because it can achieve better accuracy than ^{14}C dating, especially close to the Hallstatt plateau. This could be helpful to test the detail in the typo-chronology of Van den Broeke (2012). The few Iron Age dendrochronological dates, mentioned in this thesis, have shown a (minor) discrepancy with the typo-chronology (section 4.4.2). Another option to obtain precise dating results is a complex method like *wiggle matching* requiring several ^{14}C dates from a particular (layered) context like wood

containing tree rings (e.g. Calvo Trias *et al.* 2020). It is generally recommended to continue applying ^{14}C dating on contexts with typo-chronologically datable Iron Age assemblages in order to test the existing typo-chronology. This may also be done with the general aim of encountering regional variation (e.g. Bloo 2019, 48).

Another recommendation is to date more Bronze Age assemblages with ^{14}C dating. Any absolute dating of pottery from the EBA would be valuable to improve the understanding of the local typo-chronology (see section 4.1). Characterizing the subtle differences between MBA shapes and decoration of different centuries would be useful (see section 4.4.1). The biggest opportunity relates to the transition of the Middle to the Late Bronze Age (1200-1000 BC). Several sites, particularly Son-Ekkersrijt, clearly show a diversification of decoration and shapes during this period (section 3.2.2; appendix 3), but a useful typo-chronology addressing it (hardly) exists (section 4.3). Such a typo-chronology could be based on ^{14}C-dated examples (e.g. see: comparison in ref. fig. 19).

Yet another recommendation is to compile an overview of all data relating to the LBA from Van den Broeke's Iron Age typo-chronology (Van den Broeke 2012), as this useful piece of LBA typo-chronology is now hidden in de details (typically as disclaimers).

In addition to the recommendations mainly concerned with pottery, it generally became apparent that typo-chronologies of other ceramic objects have not been created in recent years, at least to the extent that the author of this thesis could find. A typo-chronology discussing weights and sling bullets is simplified and relatively old (Van den Broeke 1987, 38). A typo-chronology of spindle whorls does not seem to exist at all, whereas plenty of spindle whorls have very different appearances. One of the spindle whorls in the dataset is decorated and has a reliable dendrochronological date (appendix 3: >724 BC[29]).

With regards to the reference collection, a better visualisation of thickness, colour and surface throughout time, obtained by analysing ^{14}C-dated assemblages, could be very helpful. This could make it a lot easier to understand and see any differences between ceramics of the Bronze and Iron Ages over time. A digital reference collection containing 3D scans might also be very helpful for future research in this regard.

[29] Culemborg-Hoge Prijs [Spieker 67]: Measurements 12.017.001, 12.017.002 and 12.017.003: Estimation of cut based on the measurements is in between 724 and 700 BC.

5.6. Afterthought

Researching characteristics on ceramics is like laying out a giant jigsaw puzzle. Bronze and Iron Age ceramics in the Southern Netherlands constitute such a puzzle. Quite a few researchers have already put many pieces together. Peter van den Broeke nearly perfectly pieced together the Iron Age, but the Bronze Age was still fragmented with a few mislaid pieces as well. The Iron Age even overshadows the Late Bronze Age. Therefore, it was difficult to see the whole picture. This thesis has made a connection between the fragmented pieces and fixed a few of the mislaid pieces, hopefully showing more of the full picture -- which comes to life with the reference collection -- even though many pieces remain to be found.

Abstract

This MA thesis focuses on ceramics from the Bronze and Iron Ages in the southern Netherlands (2000-12 BC) and their use for dating purposes. Researchers used to define and subsequently date types on the basis of characteristics, which is known as a typo-chronology. Around the mid-20th century, absolute dating, and ^{14}C dating in particular, was developed. The legacy of typo-chronology was kept alive, however, and only sporadically questioned by researchers that reverted to absolute dating. In many cases, this questioning was also carried out for narrower time periods. This thesis brings typo-chronologies and absolute dating together within the context of a wider time period, in order to discover the current status of research for this wider time period and to find out how/where research is currently lacking. This endeavour was started by initially compiling an overview of the applicable typo-chronologies considering a handful of variables relating to shape, decoration and material. Subsequently, a compilation of research was made that compares ceramics to absolute dating. Aside of this, a dataset of ceramic assemblages tied to absolute dating was created and discussed. The combined data was used for discussions and conclusions. Finally, the combined results were used to create a physical reference collection with a manual containing a lot of tables and imagery. The main conclusions are that some periods (e.g. Late Bronze Age) are typologically overshadowed by other periods (Iron Age). The vast amount of detail of the leading Iron Age typo-chronology generally causes researchers to make mistakes. Recommendations include paying more attention to some periods and types of ceramics in order to fill voids of knowledge created by focus and disregard. Better compilations and visualisations (e.g. 3D scans) of absolutely dated examples are also recommended.

Internet Pages

This list of internet pages also includes sources used in Part II (the reference collection)

https://www.d-maps.com/carte.php?num_car=2463&lang=en, accessed on 25-9-2021

https://exploratorium.gallaromeinsmuseum.be/default.aspx#/query/054dfa59-52f2-4650-be19-30811d23cc2c, accessed on 3-11-2021

https://c14.arch.ox.ac.uk, accessed repeatedly: April to August 2022 *(used for the creation of figures related to ^{14}C dating)*

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**The chapter/article does not have a known author, so the names of the editors of the edited book/volume are named instead*

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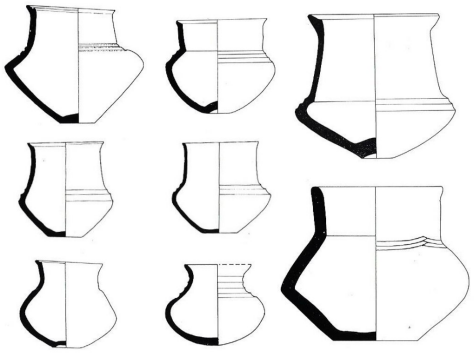
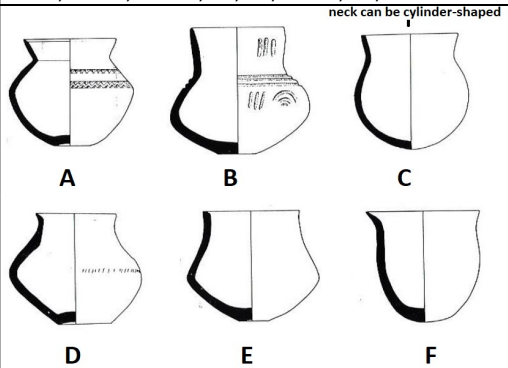
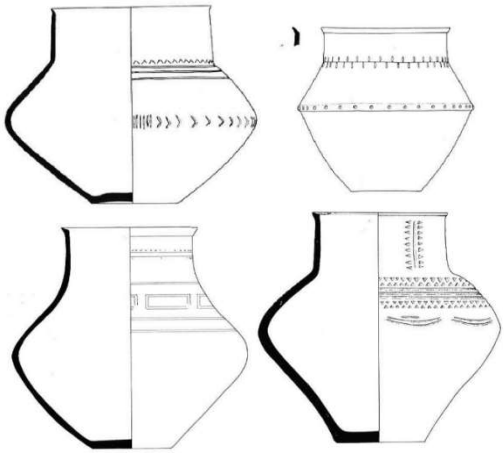
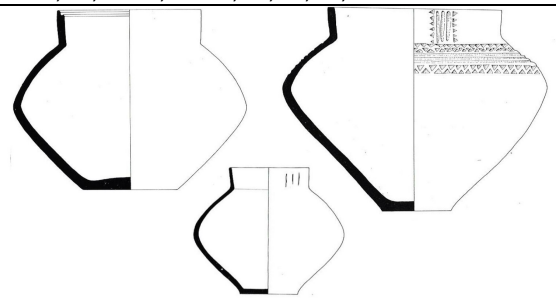
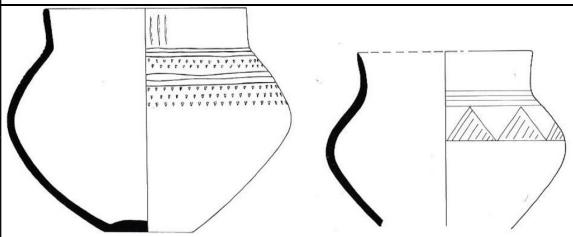
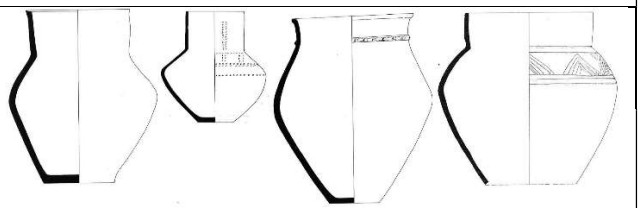
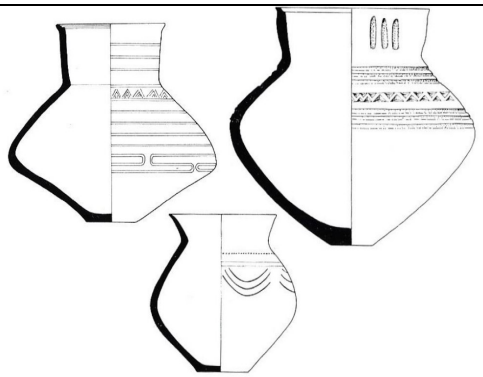
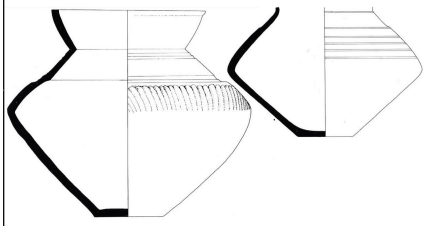
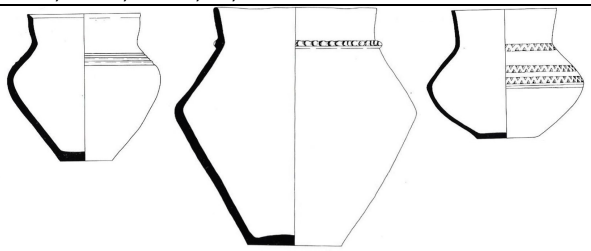
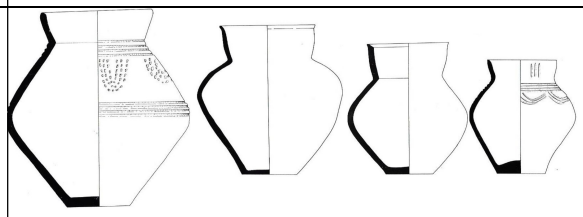
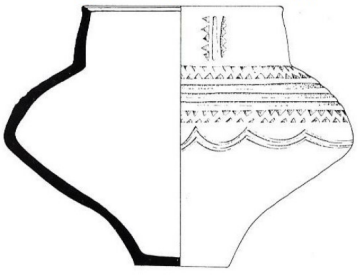
Appendices

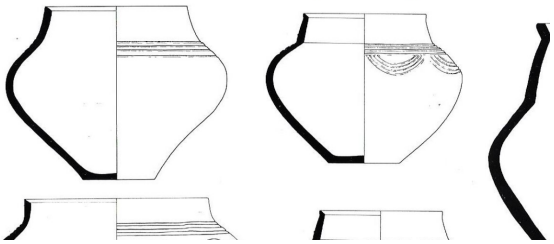
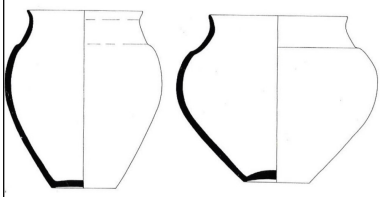
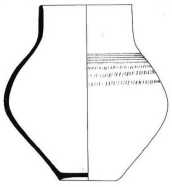
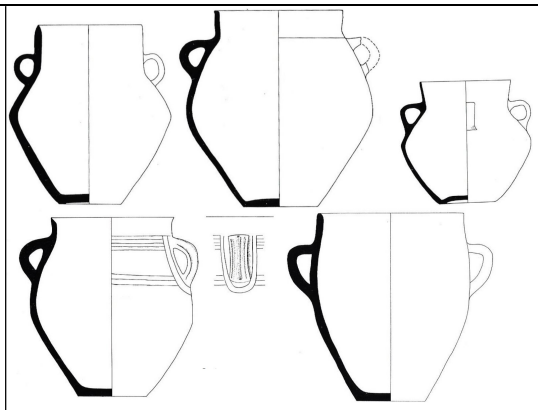
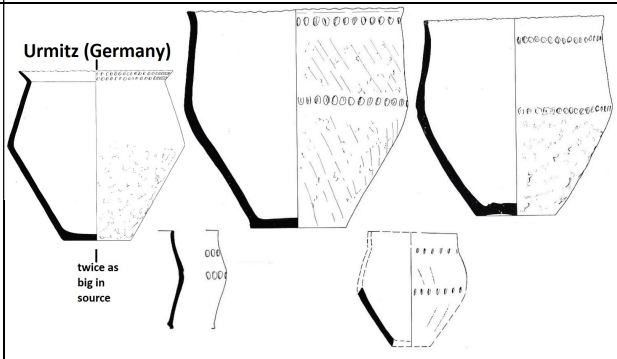
Appendix 1: Overview of LBA pottery types as formulated by Desittere (1968)

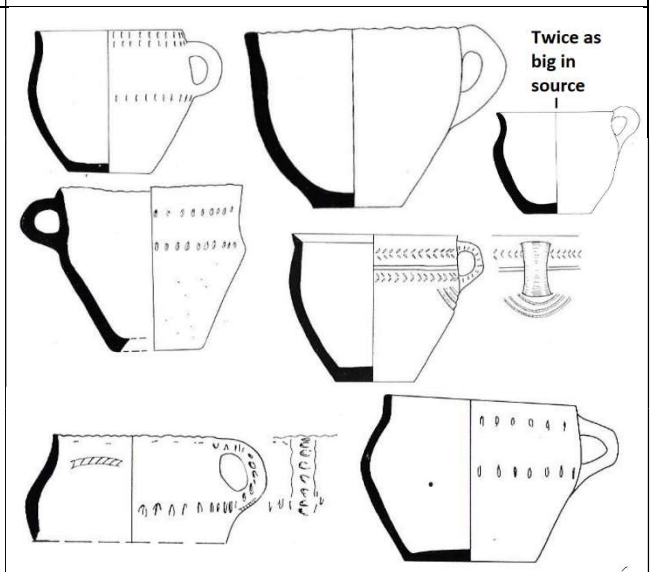
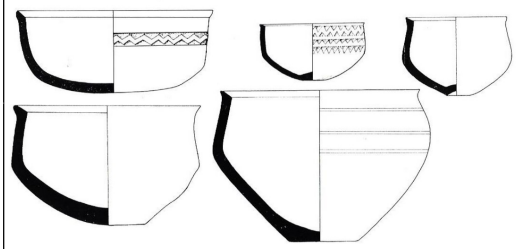
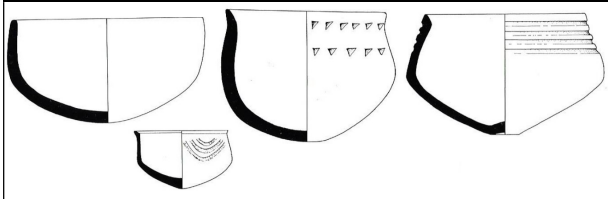
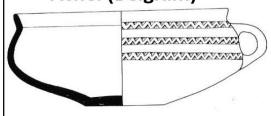
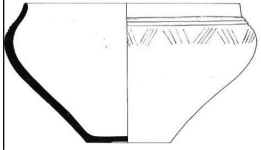
Remarks: All drawings are of vessels from the research area unless stated otherwise. A bold font used for a dating phase (HaA/HaB) means it is most common during this period according to Desittere. Cursive font means it is an observation from the imagery (by author). Most Dutch (in brackets) and English names for types were translated from similar established German names (by Desittere and by myself). The references to (Desittere 1968b) occasionally also refer to pages with drawings of the same (sub)type from the research area that are not included in the table. The table was inspired by Valentijn (2011, 40-43) (Desittere 1968a; Desittere 1968b).

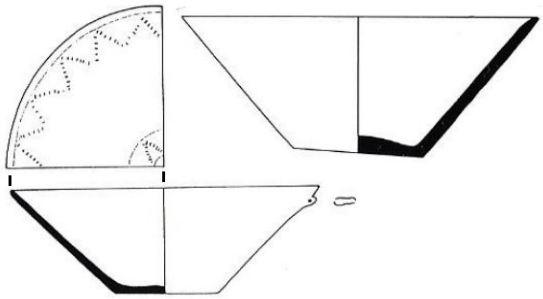
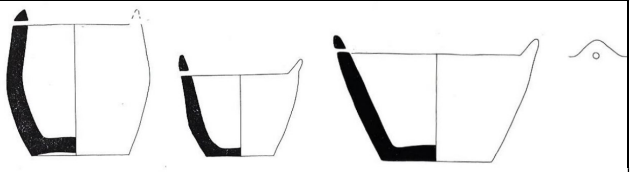
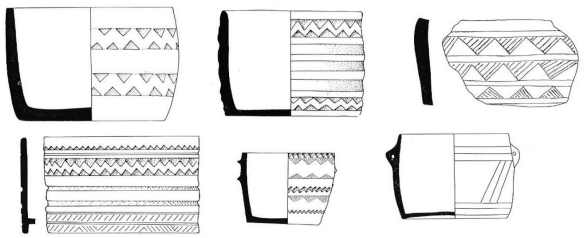
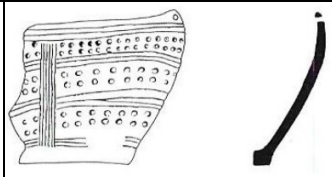
Type	**Shape (first row)** **Decoration (second row)** **Other comments and subtypes (rows below)**	**Phase**	**Drawings + source (publication + page numbers of Desittere)**
Beakers / beaker-shaped pots (bekers / beker-vormige potten)	• Related to German **shoulder beakers** BUT shoulders are generally shorter than the German equivalents • *Small in size (as the name suggests)* • *Greatest width around belly-shoulder transition* • *Often undecorated* • (one example of) horizontal-wavy **wide shallow groove** on the shoulder-neck transition	**HaA** HaB	 1968a, 30-31; 1968b, 58; 62; 68-70; 79; 123
	• Desittere differentiates **six beaker groups (A-F)** for **HaB** (see compilation of drawings) • There are more beaker shapes than this beaker typology suggests. They are often identical to other shapes of Desittere's typology, but much smaller in size • Decoration is diverse*, but does correspond with the decoration of other types*	Group A to C: **HaB** Group D to F: **HaB** HaC/D	 1968a, 34-36; 1968b, 56-57; 60-63; 68-71; 75-76; 80; 82-83, 86-87
Cylindrical-necked urns (cylinderhals-urnen) + "devolved types"	**Early shapes of this type** • **Biconical shape** *(below the neck)* • Relatively **sharp angles: angularity** • Relatively **long vertical neck** • **Lip** (thickened rim) • *Relatively wide* • Early HaB: rim may protrude inwards	**HaA Early HaB**	

Type	Shape (first row) Decoration (second row) Other comments and subtypes (rows below)	Phase	Drawings + source (publication + page numbers of Desittere)
	• *Horizontal lines/grooves* • *Cuts/grooves in herringbone pattern (early HaB)* • *Impressed cordon* • *Nail impressions* • Also see the decoration in "broad subtype"		 1968a, 31; 40-41; 1968b, 57; 62; 69; 77
	Broad subtype • Shorter vertical neck • *Angular shoulder-neck transition* • Sometimes: very rounded belly-shoulder transition	**Early HaB**	 1968a, 31; 41-42; 1968b, 56; 83-84
	• **Kerbschnitt**: typically on the neck: -vertical row of triangles -vertical lines *-horizontal triangles/lines on the shoulder* • (Symmetrical) **meander** decoration (on neck and/or shoulder)		
	Even **Broader subtype** • *Loss of angularity: lost its biconical shape: usually a globular shape below the neck* • **No lip** (no thickened rim)	**Late HaB** – HaC	 1968a, 41; 1968b, 60;68
	• Kerbschnitt is less common but appears: -on the neck: vertical lines; *-on the shoulder: triangles* • *Horizontal grooves: on shoulders* • *Grooves in a hatched triangle pattern*		
	Tall subtype • *Narrower* • More pear-shaped towards HaC	**HaB**	 1968a, 42; 1968b, 56; 60; 66-67; 73-74
	• *Kerbschnitt (triangles) on the neck and shoulder* • *Grooves* *-horizontal* *-hatched triangle pattern* • *Cordon (once) on shoulder-neck transition*		
Funnel-necked urns (trecherhals-urnen)	**Early shapes of this type** • **Biconical shape** *(below the neck)* • Relatively **long diagonal neck** protruding outwards • (often a) **Lip** (thickened rim)	**Early HaB**	

Type	Shape (first row) Decoration (second row) Other comments and subtypes (rows below)	Phase	Drawings + source (publication + page numbers of Desittere)
	• Grooves/line decoration: (Symmetrical) **Meander** decoration (on the neck and/or shoulder) • **Kerbschnitt** -vertical row of triangles on the neck -vertical lines/grooves on the neck *-horizontal triangles/lines on the shoulder*		 1968a, 42-43; 1968b, 58; 74; 84
	Subtype with **conical section** between the neck and the shoulder: *part of the shoulder that was pressed into a narrower position and can clearly be distinguished from the rest of the shoulder*	**Early HaB**	 1968a, 42-43; 1968b, 57; 76
	• Vertical **wide shallow grooves** in a horizontal row on the shoulder (one example) • Groove/line decoration		
	Broad subtype • *Shorter neck compared to the early shapes (usually)* • Very broad shapes (e.g. drawing on the right) may date to the late HaB and develop into Laufeld/Schräghals urns of HaC (Iron Age)	**HaB**	 1968a, 43; 1968b, 71; 75; 84
	• *Cordon* • *Kerbschnitt* *-horizontal lines/grooves* *-horizontal rows of triangles in zigzag pattern*		
	Tall subtype • *Narrower* • More pear-shaped towards HaC	**HaB**	 1968a, 43; 1968b, 68-69; 75; 82
	• *Kerbschnitt* *-horizontal lines/grooves on the shoulder* *-lines/dots on the shoulder: parabolic patterns* *-vertical lines/grooves on the neck*		
Conical-necked urns (kegelhals-urnen) + "devolved types"	**Early type with lip** (rim protruding outwards) • Conical neck: neck tilted (slightly) inwards • Sharp angles in the profile • Example on the drawing to the right has a rounded shoulder unlike HaA versions	**Early HaB**	**Birgelen (Germany)**  1968a, 43-44; 1968b, 44
	• **Kerbschnitt** -vertical row of triangles on the neck -vertical lines/grooves on the neck *-horizontal triangles/lines on the shoulder* *-parabolic pattern on the shoulder*		
	More rounded subtype with lip • More rounded shapes	**HaB**	

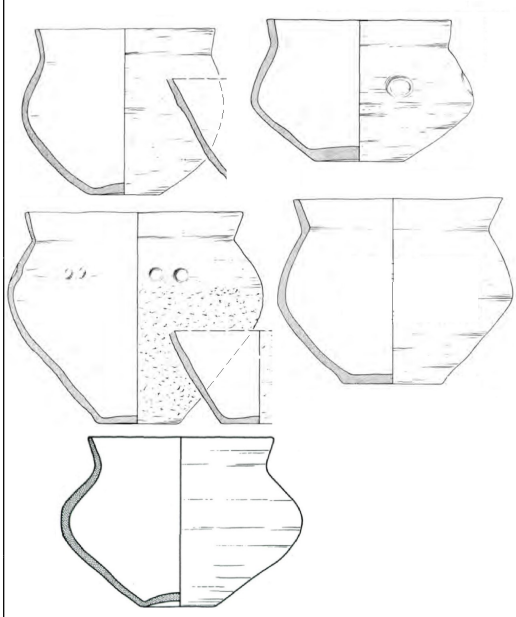
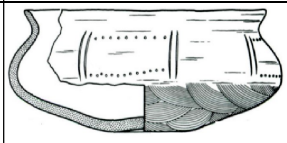
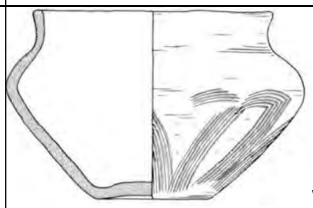
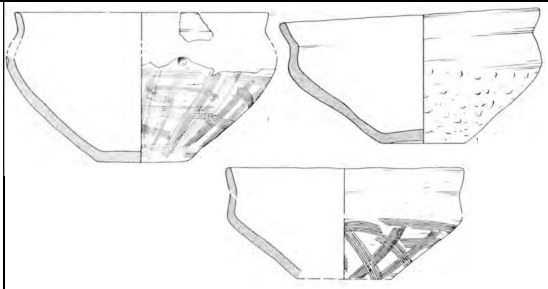
Type	Shape (first row) Decoration (second row) Other comments and subtypes (rows below)	Phase	Drawings + source (publication + page numbers of Desittere)
	Kerbschnitt *on the shoulder* -vertical lines/grooves on neck (no triangles) *-wavy lines* *-parabolic pattern* *-horizontal lines*		**Birgelen and Gladbeck (Germany)** **Rie**  1968a, 44; 1968b, 44; 49; 74
	Even more rounded subtype • High (arching) shoulder • Shoulder that is initially conical, but has a short neck that protrudes outwards: *biconcave shape of a shoulder and neck* • Reminiscent of German Koberstadt urns	Late HaB? **HaC?**	 1968a, 44; 1968b, 85
	Type without lip • In HaA: sharper-angled profile than all imagery of conical-necked urns provided in this table • More rounded in HaB and even more rounded towards HaC	**HaA** **HaB** HaC	**Haffen-Mehr (Germany)**  1968a, 31; 43-45; 1968b, 50
	Similar decoration as previously provided for the lipless versions: example to the right has horizontal rows of small diagonal lines/cuts and horizontal lines		
	• Desittere provides few drawings from the research area: many from the Dutch-German border area • There is only one image for versions without lip. Other examples are from references to other sources		
Amphorae	• These pots can typologically fit within the category of the abovementioned **cylindrical/funnel/conical-necked urns**: -usually have similar shapes, developments and *decoration* • There are some **uncommon shapes**, like the two bottom drawings on the image to the right; *biconical or barrel-shaped* pots without a neck • They are characterized by **two** (sometimes four) **ears/handles** on the upper section of a pot	HaA **HaB** HaC (not clear)	 1968a, 45; 1968b, 56; 59; 64; 72; 75; 67; 81; 87
Coarse Ware/pots (grofwandige potten)	• More traditional shape in Germany: Short neck protruding outwards (see example from Urmitz) • **Biconical:** *some types do have a very weak belly-shoulder transition* • Varying sizes: small pots are common in some local areas	**HaA** **HaB** HaC	**Urmitz (Germany)**  1968a, 38-39; 1968b, 33; 59; 66; 72; 80
	• **Cartel rim**: finger/nail impressions on top AND occasionally in front of rim: *rim look wavy* • **Vertical finger/nail impression: horizontal row** **-on belly-shoulder transition** **-below and/or in the front of the rim** • Some local forms often compared to/confused with Early Iron Age Harpstedt pots		

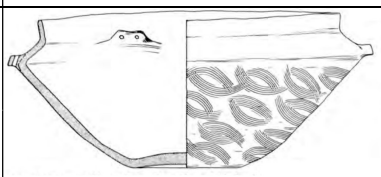
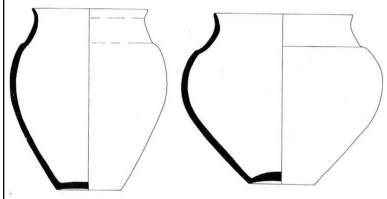
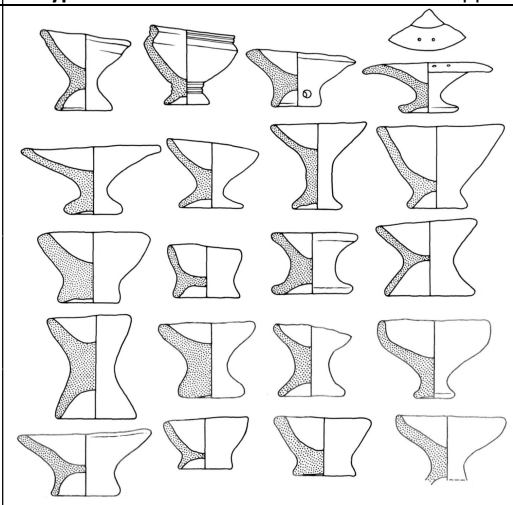
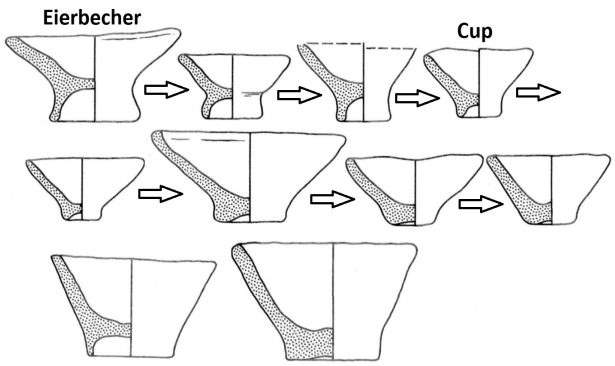
Type	Shape (first row) Decoration (second row) Other comments and subtypes (rows below)	Phase	Drawings + source (publication + page numbers of Desittere)
	• Rough surface; particularly below the belly-shoulder transition (can also be besmirched) • Thick body • Red brown in colour		
Ear mugs / beakers (German: Henkeltasse /töpfe)	• *Width-height ratio of around 1:1 (usually taller)* • **Ear***: attached below the rim: usually on the neck, shoulder and/or around the belly-shoulder transition*	**HaB –** HaC/D	 1968a; 37-38; 1968b, 56; 59; 63-64; 72; 78; 82; 83
	• **Vertical finger/nail impression: horizontal row -on belly-shoulder transition -below and/or in the front of the rim** • **Cartel rim** (see explanation coarse ware) • **Horizontal lines (cuts) on the ear** • Cuts/grooves in herringbone patterns (->possible indication of early HaB) • Can be undecorated		
	• Moderately smoothened or not smoothened at all: i.e. relatively rough surface (similar to coarse ware) • Ochre or brown read in colour		
Vogt XII bowls	• *Small and wide* bowls • **Biconical profile** (*bipartite*) • **Rim protruding outwards**	**HaB**	
	• (Thin) **groove/line** decoration • **Kerbschnitt** decoration *-patterns of triangles, including zigzag pattern*		 1968a, 33-34, 1968b, 60; 63; 77-78
	Similar shapes lacking • a rim protruding outwards OR • (bottom drawing) a flat base		 1968a, 34, 1968b, 56; 61; 81
Saucer-shaped pots (schotel-vormige potten)	• Largest width on upper half of vessels • (Much) broader/wider than tall • Biconical *(often with a neck)* • Rim either flares outwards or is (nearly) vertical • **Ear** on the shoulder	**HaB** HaC/D	**Achel (Belgium)**  1968a, 36-37; 1968b, 88
	• For decoration, see subtype		
	Deeper subtype • Largest width much closer to the rim • Broader/wider than tall • *Long (higher) belly* • **No ear** on the shoulder		**Donsbrüggen (Germany)**  1968a, 36-37; 1968b, 46
	• **Kerbschnitt** decoration (directly below rim) *-horizontal rows of triangles in zigzag pattern* • **Lines/grooves** of decoration		

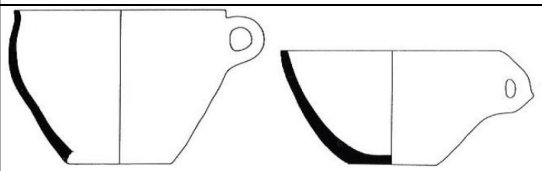
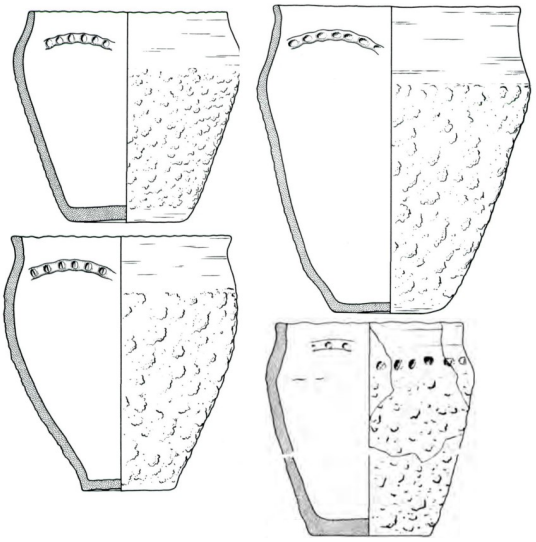
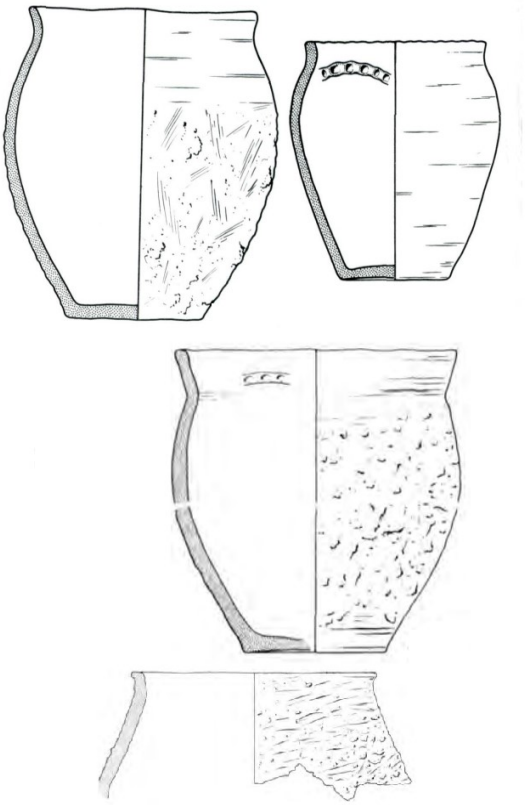
Type	Shape (first row) Decoration (second row) Other comments and subtypes (rows below)	Phase	Drawings + source (publication + page numbers of Desittere)
Conical bowls (konische schalen)	**Conical shape with flat base** HaC (so not EBA) • Small bilobed ear/*small lump ear/knobbeloor*	**HaA** **HaB** **HaC**	 1968a, 39-40; 1968b, 55; 72
	• **Often undecorated** (Early) HaB: • Horizontal grooves on inside of rim HaC (so not EBA): • **Decoration (deep) on the inside of bowl** -Impressions -Kerbschnitt		
Lid boxes (deksel-dozen)	**Classical shape** • **Truncated conical** shape in profile • BUT often rounded towards the rim • **Protrusion with perforation** on top of rim (for attachment to lid)	HaA **HaB** HaC	 1968a, 31-33; 1968, 70; 84
	• Kerbschnitt decoration appears *Decoration less common than on local/box shape*		
	Local/box shape • Usually **Square**-shaped profile -"barrel"- or "cylinder"-shaped • **Lacks protrusion with perforation** of the classical shape (one exception)	**~HaB**	 1968a, 31-33; 1968b, 55; 62; 68-70; 79; 82
	• *Horizontal rows of decoration* • **Kerbschnitt decoration** *-lines; rows of triangles, incl. zigzag pattern* • **Grooves** -horizontal lines; hatched triangle pattern; diagonal cuts Can be undecorated		
	• Decoration type occurring on both classical and local shapes consisting of parallel grooves and/or small round impressions -Wavy patterns across the body -Parallel set of lines/impressions is abruptly stopped when it crosses paths with another set of lines/impressions (reminiscent of Iron Age Kalenderberg decoration)	**End of HaB**	 1968a, 31-33; 1968b, 83

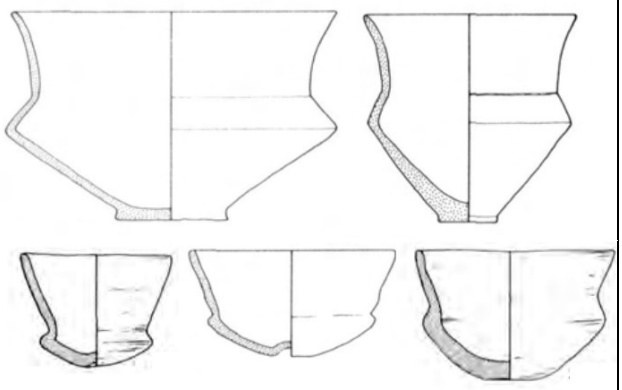
Appendix 2: Overview of IA pottery types as formulated by Verwers (1972)

Remarks: The names of these types were not adopted by Peter van den Broeke (2012), but are still used in more recent publications (e.g. Louwen 2021, 112). Information about Eierbecher was added by making use of another source (Perizonius 1976). The dating of many of these types and developments is not based on absolute dating. Cursive font means it is an observation from the imagery (by author).

Type	**Shape (first row)** **Decoration (sometimes: second row)** **Other comments and subtypes (rows below)**	**Period** Based on Verwers	**Drawings + sources**
Schräghals/ Schrägrand urns (slanted neck/rim urns) + "devolved/ deviating types"	• **Developed out of** taller LBA **funnel**-(and also cylindrical-) **necked pots** (Desittere 1968a, 41; appendix 1) • **Lip does not appear** at all (unlike LBA cylindrical/conical/funnel-necked urns) • **Wide and round**: often globular • **Slanted neck**: protrudes outwards: angular shoulder-neck transition	**EIA**	 Verwers 1972, 125-127; Drawings: Perizonius 1976, 91; Verwers 1972, 43; 45; 47
	• **Dellen**: round/oval impressions impressed with bulbous object: on the shoulder • Horizontal **grooves** and **"cannelures"**: wide shallow grooves: on the shoulder • Scratched/engraved patterns: on the belly? • **Comb impressions**: on the belly • Kerbschnitt occasionally still appears on similar shapes: not in zigzag pattern: perhaps these do have a LBA dating		
	• **Polished** surfaces are common • Besmirched surfaces below the largest width appear: more common on other shape types		
	• Much **wider** than earlier shapes	Later EIA? – MIA?	 Perizonius 1976, 90-91
	• **Belly-shoulder transition is higher** compared to the more traditional type above: shorter + higher shoulder	**Later EIA** MIA?	 Verwers 1972; 45; 126
Development out of Schräghals urns	"Bowl-shaped urns" • **Shorter + higher shoulder** (and neck) • **More open** • **Fewer angular profile transitions** • Some: nearly biconical	**MIA**	 Verwers 1972, 41; 45; 47; 126-127; 136
	• Besmirching is rare		

Type	Shape (first row) Decoration (sometimes: second row) Other comments and subtypes (rows below)	Period Based on Verwers	Drawings + sources
	"Bowls" • **Shorter + higher shoulder and neck** • **Angular profile transitions** • Besmirching is rare	**MIA**	 Verwers 1972, 45; 126-127; 136
Conical-necked vessels (Kegelhals-gefässe/kegel-hals-vaatwerk)	• Slanted shoulder-neck transition • **Pronounced high shoulder** • Reminiscent of Koberstadt urns	**EIA**	 Verwers 1972, 127-128; Drawings: from "**even more rounded subtype**" of conical-necked urns described in appendix 1
Eierbecher (eggcups/egg beakers)	• Combination of a **bowl and a small (squeezed out) foot** (4-8 cm high; 5.5-11 cm wide) • **Narrowest width is above the foot** • Foot can be extremely hollow or flat • Variety of profile shapes • Similar shapes: in the Middle Neolithic • Decoration is rare but can consist of horizontal grooves • Perforations in foot and rim occasionally appear • Usually rough, but can be smoothened or polished	**EIA** Start of **MIA**	 Verwers 1972, 128-129: Verwers barely elaborated upon the shape and diversity. Perizonius (1976, 85-89) illustrated and explained some diverse characteristics. Drawings: Perizonius 1976, 86; 88
Cups	• Similar to Eierbecher, but **narrowest at the base** • Cups do not fit Perizonius' definition of Eierbecher, but have a similar dating, size and appearance	**EIA Start of MIA**	 Perizonius 1976, 85-89; Drawings: Perizonius 1976, 87

Type	Shape (first row) Decoration (sometimes: second row) Other comments and subtypes (rows below)	Period Based on Verwers	Drawings + sources
Ear mugs/ beakers (Henkeltasse)	• *Characterized by an ear on/below the rim* • Whereas these are most typical for the LBA (see appendix 1), undecorated versions of this are considered typical for the EIA as well	(Start of?) LIA	 Verwers 1972, 129; Drawings: Desittere 1968, 53
Coarse Pots/ Ware (Rauh-wandiges Keramik) **Harpstedt urns** + "devolved/ deviating types"	• **A large percentage** (sometimes majority) of **EIA** pots **can be categorized as coarse ware** **Classical Harpstedt urns** • Often bucket-shaped • *Usually at least bipartite (not monopartite)* • *Tall pots with little angularity: high shoulders*	**EIA** Start of MIA	 Verwers 1972, 129-133; Drawings: Perizonius 1976, 92; Verwers 1972, 39
	• **Finger**(tip) **impressions on top of the rim** • *Usually no other decoration*		
	• **Besmirched** (besmeten/geschlickt); **below the largest width** • **Smooth**ened or even polished **above the largest width** • Light yellow to dark brown and/or reddish in colour • Some similarities to Late Bronze Age coarse pots (see appendix 1)		
	Deviating subtypes These often have Harpstedt characteristics, but lack one or two of the typical characteristics; • The shapes are **more rounded** • The pots **lack finger-impressions** on the rim • The lower half of the pots are **not (elaborately) besmirched** or the pots are **besmirched all the way up to the rim**	**EIA** **Start of MIA** **Later?**	 Verwers 1972, 131; 136-137; Drawings: Perizonius 1976, 92; Verwers 1972, 97
	• These examples may also date to the **MIA-LIA** • A besmirched lower part and smoothened upper part seems to be typical for the **EIA** regardless of finger impressions		
	Middle and Late Iron Age coarse ware • Few to no remarks about the shape	**MIA-LIA**	
	• **Wavy/cartel** rim: double finger impressions (in front/on top) on the rim in **MIA** • At least in the western Netherlands(and more western research area) in **LIA** on the body (instead of besmirching); -Comb decoration -Grooves/lines -Finger impressions		
	• **Entire** outer surface **besmirched** (esp. **MIA**) • Towards the west: **less often besmirched**, but decorated instead (esp. **LIA**)		

Type	Shape (first row) Decoration (sometimes: second row) Other comments and subtypes (rows below)	Period Based on Verwers	Drawings + sources
Marne Ceramics	• **Strong angularity** in pot profiles: especially belly-shoulder transition • Fairly **flat diagonal belly** • **Very short shoulder** (or more of a protrusion) • **Funnel-shaped neck** (often slightly rounded) • Often a **small base** • Alternatively a **lens base** (rounded hollow base)	**MIA**	 Drawings: Verwers 1972, 45; 47; 134-136
	• *No particular decoration mentioned: often undecorated*		

Appendix 3: Dataset of ^{14}C-dated assemblages from site publications

Remarks: The dataset functions as a single appendix consisting of 7 tables. Additional information (about abbreviations) is above each table. The first three tables are about radiocarbon/^{14}C dates (including labcodes), dendrochronological dates and feature types/amounts. These include all assemblages of the dataset. The subsequent three tables about typological characteristics do not include all assemblages as some assemblages do not have (information about) shapes, decoration types and/or surfaces/temper. The final table, which includes all assemblages, includes calibrated ^{14}C dates (including percentage of certainty: 2 sigma) and typological dates. The references to the source material can be found in the right column of the first two tables.

Radiocarbon (^{14}C) dating results + references

-Sorted chronologically.

-Few examples: from the same site with similar date are combined in a single entry.

-Abbreviations for dated material: S = feature (*Dutch: spoor*); CH = charcoal; CG = charred grains; CP = charred pea(s); CR = charred residue; CW = charred wood; G = grain(s); GS = grass; BL = blackthorn; FB = field bean; WF = wild flax; HCR = (Human) cremation; W = wood; B = bone; S = seeds; no. = number; TPQ = terminus post quem.

Site name	**Feature no. or other ID**	**Labcode**	**^{14}C date** (in BP)	**±** (standard deviation)	**Dated material**	**References to source**: see bibliography (in red: source is not a site publication)
Meteren-de Bogen 45 – grafheuvel	Grave 4	AA-37499 (GU-8893)	3665	60	CH	Hielkema *et al.* 2002, 210; Meijlink 2002, 47
Molenaarsgraaf	**TPQ** Break-through gully	GrN-5176	3640	30	CH	Louwe Kooijmans 1973, 220-223; 227; 259
Molenaarsgraaf	Grave 1	GrN-5131	3635	40	B	Louwe Kooijmans 1973, 248-249
Meteren-de Bogen 28-1	V3834-4/ V3159/6	UtC-8647	3574	35	CR	Hielkema *et al.* 2002, 237; Ufkes and Bloo 2002, 344-345
Culemborg-Lanxmeer	S12/13	GrA-27104	3555	40	CH	Ufkes 2004, 25-29
Oss-Schalkskamp	S1029.5	GrN-19666	3485	20	CW	Van As and Fokkens 2019b, 334-336; 354
Boekel-Parkweg	S1.036	GrN-30726	3470	60	CH	De Jong 2008, 39-43
Son-Ekkersrijt-IKEA	S29.020	GrA-44193	3425	45	CH	De Jong and Beumer 2013, 127-128; 166
Oss-Schalkskamp	S1029.12	GrN-19669	3425	20	W	Van As and Fokkens 2019b, 333-335; 354
Oss-de Geer	S35.07	GrN-27158	3400	40	W	Jansen and Van Hoof 2003, 44-45; 97-98
Son-Ekkersrijt-IKEA	S29.001	GrA-43876	3365	35	CH	De Jong and Beumer 2013, 126; 166
Molenaarsgraaf	S29	GrN-5177	3350	35	CH	Louwe Kooijmans 1973, 193-194
Son-Ekkersrijt-IKEA	S38.128	GrA-44181	3345	35	CH	De Jong and Beumer 2013, 126; 147
Son-Ekkersrijt-IKEA	S19.010	GrA-43860	3320	35	CH	De Jong and Beumer 2013, 71; 114
Son-Ekkersrijt-IKEA	S29.057	GrA-43881	3290	35	CH	De Jong and Beumer 2013, 129; 166
Son-Ekkersrijt-IKEA	S18.126	GrA-43846	3280	35	CH	De Jong and Beumer 2013, 71; 112-113
Son-Ekkersrijt-IKEA	S18.125	GrN-31952	3215	45	CH	De Jong and Beumer 2013, 71; 112
Heteren-Uilenburg	KL04	SUERC-24772 (GU-19109)	3205	35	CH	Hazen and Roessingh 2010, 37; Van der Linden *et al.* 2010, 71-72
Son-Ekkersrijt-IKEA	S29.002	GrN-31972	3200	45	CH	De Jong and Beumer 2013, 127; 166
Oss-Mettegeupel	S51.48	GrN-21512	3190	30	CH	Van As and Fokkens 2019c, 387-388; 403
Son-Ekkersrijt-IKEA	S34.018	GrA-43748	3120	35	CH	De Jong and Beumer 2013, 127; 142-143
Son-Ekkersrijt-IKEA	S14.059	GrA-45334	3065	35	CH	De Jong and Beumer 2011, 38; 92; 99; 108; 110; 115
Son-Ekkersrijt-IKEA	S19.125	GrN-31958	3060	40	CH	De Jong and Beumer 2013, 115; 166

Son-Ekkersrijt-IKEA	S33.065 (lower fill)	GrA-44171	3035	35	CH	De Jong and Beumer 2013, 140; 166-167
	" " (upper fill)	GrA-43746	2920	30	CH	
Son-Ekkersrijt-IKEA	S27.029	GrN-31969	3020	25	CH	De Jong and Beumer 2013, 125; 166
Oss-Mikkeldonk	S890.3	GrN-16658	3025	35	W	Van As and Fokkens 2019a, 268-270; 298
Oss-Mikkeldonk	S902.1	GrN-16732	3025	35	CH	Van As and Fokkens 2019a, 264-266; 298
		GrN-16733	3000	30	CH	
Haps-Kamps Veld	Urn 218	GrN-5689	3010	45	CH	Verwers 1972, 16; 30; errata
	Urn 440	GrA-19123	2920	50	HCR	Verwers 1972, 17; 30; Lanting and Van der Plicht 2003, 164
	Urn 443	GrN-5955	2970	35	CH	Verwers 1972, 20; 30
Oss-de Geer	S28.64/65	GrN-19971	3000	60	HCR	Jansen and Van Hoof 2003, 47; 98
Lent-Smitjesland	Grave 1	GrA-16979	2985	50	HCR	Arnoldussen and Ball 2007, 203; Van den Broeke 2001, 135-136; 149; Lanting and Van der Plicht 2003, 164; 247
	Grave 2	GrA-16977	2920	50	HCR	
	Grave 3	GrA-16980	2915	45	HCR	
Best-Aarle	S800	Poz-61427	2970	30	S	Tol 2017, 82; Meurkens 2017, 1357-1358
Son-Ekkersrijt-IKEA	S33.061	GrN-31990	2970	30	CH	De Jong and Beumer 2013, 138-139; 166
Culemborg-Hoge Prijs	S2428; greppel 2	Poz-66501	2965	30	CH	Verhelst *et al.* 2015, 38; Meurkens 2015, 146
Son-Ekkersrijt-IKEA	S15.162	GrN-31446	2960	20	CH	De Jong and Beumer 2011, 38; 95; 110
Son-Ekkersrijt-IKEA	S33.028	GrA-43742	2945	30	CH	De Jong and Beumer 2013, 134-135; 167
Son-Ekkersrijt-IKEA	S33.055	GrN-31989	2945	30	CH	De Jong and Beumer 2013, 136-137; 167
Nijmegen-Laauwikstraat-Noord	Graansilo	GrN-23823	2940	90	CH	Van den Broeke 1999, 27; 29
Groot-Linden	Urn De Wit	GrN-14676	2935	30	CH	Fokkens and Smits 1989, 13-14
Son-Ekkersrijt-IKEA	S16.010	GrN-31448	2930	50	CH	De Jong and Beumer 2011, 38; 65; 95-96; 108; 110; 112; 115
Rhenen-Remmerden	S11.18	Poz-14567	2930	30	CH	Arnoldussen and Ball 2007, 183; 195-196; 203; appendix III: *Remark: site is not part of the research area! Directly adjacent of it.*
Son-Ekkersrijt-IKEA	S18.327	GrA-43858	2925	35	CH	De Jong and Beumer 2013, 114; 167; 186
Son-Ekkersrijt-IKEA	S22.047	GrA-43505	2925	30	CH	De Jong and Beumer 2013, 120-121; 167
Sint-Oedenrode-Haagakkers	Grave 63	GrA-19649	2910	60	HCR	Lanting and Van der Plicht 2003, 164; 247; Van der Sanden 1981, 315; 318
Son-Ekkersrijt-IKEA	S31.056	GrN-31984	2910	40	CH	De Jong and Beumer 2013, 132; 167; 186
Son-Ekkersrijt-IKEA	S29.085	GrA-43885	2910	35	CH	De Jong and Beumer 2013, 129-130; 167
Son-Ekkersrijt-IKEA	S19.177	GrA-43863	2885	35	CH	De Jong and Beumer 2013, 116; 167
Son-Ekkersrijt-IKEA	S33.032	GrA-44169	2885	35	CH	De Jong and Beumer 2013, 135; 167; 287
Son-Ekkersrijt-IKEA	S27.005	GrA-43515	2875	30	CH	De Jong and Beumer 2013, 124; 167
Son-Ekkersrijt-IKEA	S27.004	GrA-43874	2870	35	CH	De Jong and Beumer 2013, 122-123; 167
Son-Ekkersrijt-IKEA	S33.068	GrA-44175	2860	35	CH	De Jong and Beumer 2013, 141; 167
Cuijk-Heeswijkse Kampen	Greppel 1	Ua-35743	2840	40	CH	Beckerman and Bloo 2009, 87; 92; Roessingh 2009, 70
Son-Ekkersrijt-IKEA	S10.050	GrN-31437	2815	45	CH	De Jong and Beumer 2011, 38; 53; 80; 86-87; 108; 110-111; 115; 119
Tiel-Medel 8	S36.12	Poz-16714	2815	35	CG	Arnoldussen and Ball 2007, 182; 185-186; 196-198; 203; appendix III
Cuijk- Groot-Heiligenberg	S34.249	Poz-13259	2800	30	CG	Arnoldussen and Ball 2007, 182; 186-188; 203; appendix III
Tiel-Medel 8	S51.12	Poz-16711	2770	35	CG	Arnoldussen and Ball 2007, 182; 185-186; 196-198; 203; appendix III
Budel-Meemortel	S1.189	KIA-35904	2757	41	CH (nut)	Van Kerckhove 2012, 39-42; Van den Brink and Tops 2012, appendix 20; 23
Son-Ekkersrijt-IKEA	S34.012	GrN-31996	2745	40	CH	De Jong and Beumer 2013, 142; 167
Best-Aarle	S982	Poz-61428	2740	30	CH	Tol 2017, 82; Meurkens 2017, 1357-1358
Cuijk- Groot-Heiligenberg	S34.225	Poz-13257	2730	45	CG	Arnoldussen and Ball 2007, 182; 186-189; 203; appendix III: Remark: pottery from the same vessel in both features: discussed as a single feature.
Cuijk- Groot-Heiligenberg	S34.10	Poz-13256	2710	30	CG	

Well-Aijen A	S12070	SUERC-38059	2670	35	CP	Ter Wal and Tebbens 2012, 167; 224
Culemborg-Hoge Prijs	S453; kuil 4	Poz-66488	2515	30	G/GS	Verhelst *et al.* 2015, 38; Meurkens 2015, 154-155
Udenhout-den Bogerd	S1385; Waterput 46	Poz-92168	2510	30	W	Meurkens 2018, 72; 74-79; Zon 2018, appendix 3
		Poz-92169	2450	30	W	
Culemborg-Hoge Prijs	S1870; kuil 17	Poz-66493	2505	30	CH?	Verhelst *et al.* 2015, 38; Meurkens 2015, 164
Culemborg-Hoge Prijs	S2211; kuil 22	Poz-66498	2475	30	BL	Verhelst *et al.* 2015, 38; Meurkens 2015, 178
Culemborg-Hoge Prijs	S2132; kuil 19	Poz-66497	2470	30	G	Verhelst *et al.* 2015, 38; Meurkens 2015, 164-165
Culemborg-Hoge Prijs	S1131; kuil 9	Poz-66582	2470	30	G	Verhelst *et al.* 2015, 38; Meurkens 2015, 158
Culemborg-Hoge Prijs	S2422; kuil 23	Poz-66584	2470	30	G	Verhelst *et al.* 2015, 38; Meurkens 2015, 131; 166
Best-Aarle	S7784	Poz-61446	2465	30	CH	Tol 2017, 82; Meurkens 2017, 1355-1357
Oss-Mettegeupel	S35.70	GrN-21510	2460	30	W	Van As and Fokkens 2019c, 394-396; 403
		GrN-21509	2430	30	W	
Groesbeek-Hüsenhoff	Crematie-graf 28	SUERC-34624 (GU-24167	2455	30	CH	Drenth and Geerts 2012, 64; 67
Groesbeek-Hüsenhoff	Crematie-graf 14	SUERC-34623 (GU-24166)	2435	35	CH	Drenth and Geerts 2012, 62-63; 65
Culemborg-Hoge Prijs	S844; kuil 5	Poz-66491	2430	30	G	Verhelst *et al.* 2015, 38; Meurkens 2015, 128-129; 131; 155-156
Someren-Sluis 11	S2.7; Waterkuil 100	Ua-61842	2427	39	W	Sinke 2019, 30-32; Wesdorp 2019, 17-18; 46-47
Culemborg-Hoge Prijs	S24; kuil 1	Poz-66496	2425	30	FB	Verhelst *et al.* 2015, 38; Meurkens 2015, 131; 149-152
Culemborg-Hoge Prijs	S413; kuil 3	Poz-66487	2410	30	G	Verhelst *et al.* 2015, 38; Meurkens 2015, 131; 153-155
Well-Aijen	S18104	Poz-87161	2290	30	CG	Bloo 2019, 50-51: Bloo 2021 is a more elaborate excavation report of this site, but not consulted for this entry.
Culemborg-Hoge Prijs	S1270; graf 1	Poz-66585	2285	30	CH	Verhelst *et al.* 2015, 38; Meurkens 2015, 145
Best-Aarle	S8394	Poz-61445	2265	30	CH	Tol 2017, 82; Meurkens 2017, 1355-1356
Son-Ekkersrijt-IKEA	S10.051	GrA-39999	2265	30	HCR	De Jong and Beumer 2011, 78-79; 86; 115-117
Oss-Mettegeupel	S15.347	GrN-21507	2260	40	W	Van As and Fokkens 2019c, 391-393; 403
Culemborg-Hoge Prijs	S2667; kuil 24	Poz-66502	2260	30	CH	Verhelst *et al.* 2015, 38; Meurkens 2015, 131; 178-181
Culemborg-Hoge Prijs	S3163	Poz-66503	2260	30	CH?	Verhelst *et al.* 2015, 38; Meurkens 2015, 178-181
Culemborg-Hoge Prijs	S1366; kuil 12	Poz-66495	2235	30	CH?/G/WF	Verhelst *et al.* 2015, 38; Meurkens 2015, 131; 158-160
Cuijk-Heeswijkse Kampen	S13-55; Kuil 8	Ua-36063	2180	35	CR	Beckerman and Bloo 2009, 100; Bos *et al.* 2009, 181; Vanneste 2009, 43

Dendrochronological dating results + references

A = presence of latest tree ring established (e.g. due to the presence of bast): the year (and occasionally the season) of when the tree was cut down could be established.

B = (most of the) sapwood is present: reliable estimation (~95%) of when the tree was cut down.

C = only part (or boundary) of the sapwood is present: less reliable estimation (<95%) of when the tree was cut down.

D = absence of sapwood, only heartwood is present: dating is mostly TPQ

> = the year of cut succeeds the given BC date.

Site name	**Feature no. or other ID**	**Measurement**	**Dating of latest tree ring (in BC)**	**Estimation of the year the tree was cut (in BC)**	**Type**	**Source**
Culemborg-Hoge Prijs	Spieker 67 (S1892; S1890; S1926)	12.017.001	730	>724 (724-700)	C	Verhelst *et al.* 2015, 38; Meurkens 2015, 158-160; 185; Lange 2015, 247-248
		12.017.002	733	>724 (724-700)	C	
		12.017.003	731	>724 (724-700)	C	
Best-Aarle	S11895	15.094.013	442	431 (summer)	B	Tol 2017, 85; Meurkens 2017, 1360-1361
		13.028.026	431	431 (summer)	A	
Best-Aarle	S7163	13.102.004	334	~329 (335-315)	B	Tol 2017, 85; Meurkens 2017, 1357-1358
		13.102.005	299	(late) 299/298	A	
Best-Aarle	S7687	15.094.002	330	>324	D	Tol 2017, 85; Meurkens 2017, 1357-1358
		15.094.011	280	>274	D	
		15.094.023	280	>272	D	
		15.094.008	249	>243	D	
		15.094.007	247	>241	D	
		13.028.021	240	220 (229-205)	B	
		15.094.012	235	~226 (236-213)	B	
		15.094.003	221	~218 (222-205)	B	
		15.094.006	216	~213 (217-200)	B	

Feature type and amounts

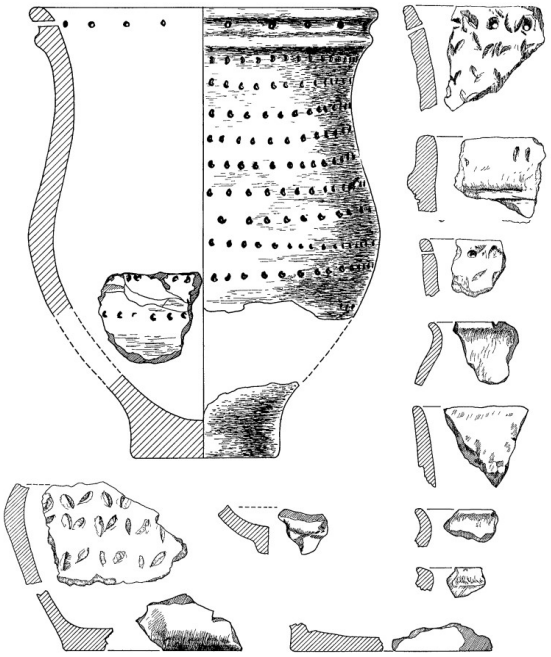
Toponym	**BP date or BC year of cut** (see first two tables of appendix)	**Type of feature**	**Contents in dated feature** (assemblages measured in amounts of potsherds, in weight and/or in amounts of vessels) + additional remarks about context
Meteren	3665±60	Grave	19 sherds
Molenaarsgraaf	**Tpq** 3640±30	Bottom of layer	729 grams (no amount provided) of pottery (dating from layer at the base of this context)
Molenaarsgraaf	3635±40	Grave	One complete pot
Meteren	3574±35	(finds in) Layer	Residue of one (diagnostic) rim sherd was ^{14}C-dated. Many periods are represented in the find layer, so those are not to be discussed (Ukfes and Bloo 2002, 370)
Culemborg	3555±40	Hearth	25 sherds (7 other sherds from nearby context) belonging to (at least) 5 pots
Oss	3485±20	Pit (possibly well)	53 sherds
Boekel	3470±60	Pit	Two complete pots
Son	3425±45	Pit	111 sherds (of at least 9 vessels)
Oss	3425±20	Well	17 sherds
Oss	3400±40	Well	Part of one pot
Son	3365±35	Pit	68 sherds (fragmented)
Molenaarsgraaf	3350±35	Hearth	"Few sherds" (no amount given: at least 6x rims)
Son	3345±35	Pit	60 sherds (of at least 19 vessels)
Son	3320±35	Pit	82 sherds (of at least 6 vessels)
Son	3290±35	Pit	6 sherds (the one discussed seemed remarkably thin compared to the other 5)
Son	3280±35	Pit	6 sherds (1 that seemed to belong the EIA)
Son	3215±45	Pit	80 sherds (of at least 22 vessels; one nearly complete pot)
Heteren	3205±35	Pit	114 sherds/ 350 grams (81 sherds are tiny)
Son	3200±45	Pit	54 sherds (of at least 9 vessels)
Oss	3190±30	Pit	754 sherds
Son	3120±35	Pit	35 sherds (of 3 large pots)
Son	3065±35	Pit	31 sherds
Son	3060±40	Pit	16 sherds (of at least 5 vessels)
Son	*3035±35* **2920±30**	Pit	51 sherds (of at least 4 vessels; each dating result represents one fill and most pottery is tied to the second dating result: 43 of the 51 sherds: therefore, the second dating is prioritized)
Oss	3025±35	Well	67 sherds
Oss	3025±35 3000±30	Well	626 sherds
Son	3020±25	Pit	11 sherds (3 of the rim of a single pot)
Haps	3010±45	Grave	Probably one pot (not reconstructed)
Oss	3000±60	Grave	Amount NM: few sherds from the burial pit
Lent	2985±50	Grave	One complete pot (one burial context)
Haps	2970±35	Grave	One complete pot
Best	2970±30	Well	Amount NM: small assemblage
Son	2970±30	Pit	62 sherds (of at least 10 vessels)
Culemborg	2965±30	Circular ditch	One sherd (circular ditch would have belonged to a burial mound)
Son	2960±20	Pit	3 sherds
Son (S33.028)	2945±30	Pit	15 sherds (including an archaeologically complete bowl)
Son (S33.055)	2945±30	Pit	One archaeologically complete pot
Nijmegen	2940±90	Pit/grain silo	52 sherds
Groot-Linden	2935±30	Grave	One complete pot
Son	2930±50	Pit	75 sherds (of at least 34 vessels)
Rhenen	2930±30	Pit	149 sherds

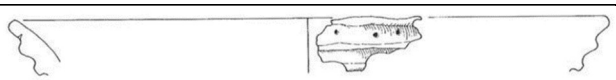
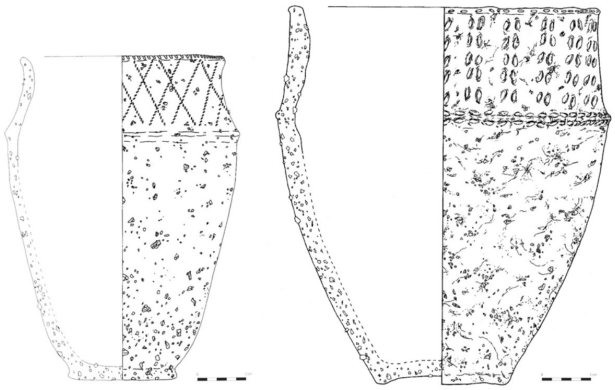
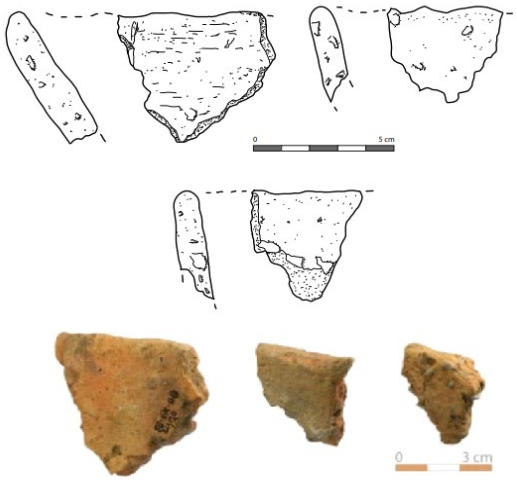
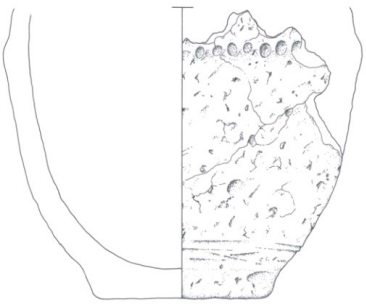
Son	2925±35	Pit	One sherd (of one shape)
Son	2925±30	Pit	26 sherds (of 9 vessels)
Lent	2920±50	Grave	One complete pot
Haps	2920±50	Grave	One complete pot
Lent	2915±45	Grave	One complete pot
Sint-Oedenrode	2910±60	Grave	Two complete vessels
Son	2910±40	Pit	25 sherds
Son	2910±35	Pit	21 sherds
Son (S19.177)	2885±35	Pit	5 sherds
Son (S33.032)	2885±35	Pit	One sherd (rim)
Son	2875±30	Pit	25 sherds (of at least 7 vessels)
Son	2870±35	Pit	81 sherds (of at least 20 vessels)
Son	2860±35	Pit	11 sherds
Cuijk	2840±40	Ditch	35 sherds: highly fragmented
Son	2815±45	Pit	234 sherds (from at least 18 vessels)
Tiel	*2815±35*	Pit	355 sherds: *after the creation of this entry, it turned out that the ^{14}C date is not from the exact same feature (closed context) as the pottery assemblage (Arnoldussen and Ball 2007, 185; 203)*
Cuijk	2800±30	Pit	36 sherds
Tiel	2770±35	Well	35 sherds
Budel	2757±41	Pit	88 sherds / 2047 grams
Son	2745±40	Pit	12 sherds
Best	2740±30	Well	Amount NM: small assemblage
Cuijk	2730±45 2710±30	Two pits	364 sherds (two contemporaneous contexts: sherds from the features belonging to the same pot). Respectively 262 and 102 sherds for each feature
Well	2670±35	Posthole	43 sherds/ 1269 grams (at least four vessels)
Culemborg	2515±30	Pit	36 sherds (most belonging to two vessels)
Udenhout	2510±30 2450±30	Well	67 sherds (excl. 4 ceramic object fragments)
Culemborg	2505±30	Pit	23 sherds (15 sherds are tiny)
Culemborg	2475±30	Well	50 sherds (18 sherds are tiny)
Culemborg (kuil 9)	2470±30	Pit	47 sherds (22 sherds are tiny; excluding 1 Roman/medieval considered intrusion!)
Culemborg (kuil 19)	2470±30	Pit	60 sherds (35 sherds are tiny; 2 sherds are briquetage; 1 sherd presumably of a loom weight)
Culemborg (kuil 23)	2470±30	Pit	169 sherds (44 sherds are tiny; 1 “sherd” is a complete sling bullet)
Best	2465±30	Posthole (of house)	One (diagnostic) sherd
Culemborg (spieker 67)	>724 BC	Structure of postholes	26 sherds (10 sherds are tiny; 1 sherd is from a spindle whorl; the posts of the structure belonged to the same tree; all have a similar dendrochronological result)
Oss	2460±30 2430±30	Well	509 sherds
Groesbeek	2455±30	Grave	One vessel
Groesbeek	2435±35	Grave	One vessel (secondary burnt)
Culemborg	2430±30	Pit	167 sherds (83 sherds are tiny; 5 sherds are briquetage; 1 spindle whorl; excluding some MBA sherds considered intrusion!)
Someren	2427±30	Well	153 sherds/ 3795 grams
Culemborg	2425±30	Pit	211 sherds (91 sherds are tiny)
Culemborg	2410±30	Pit	212 sherds (109 sherds are tiny)
Best (S11895)	>431 BC	Well	Amount NM: one pot (probably more)
Well	2290±30	Pit	Amount NM: few diagnostic sherds: more information may be available in another publication of the site (Bloo 2021)
Culemborg	2285±30	Grave	One vessel (reconstructed from sherds)
Best	2265±30	Pit (in house)	673 sherds (436 sherds are tiny)/ 12400 grams (likely from four big pots) (secondary burnt)
Son	2265±30	Grave	One (lower half of a) pot

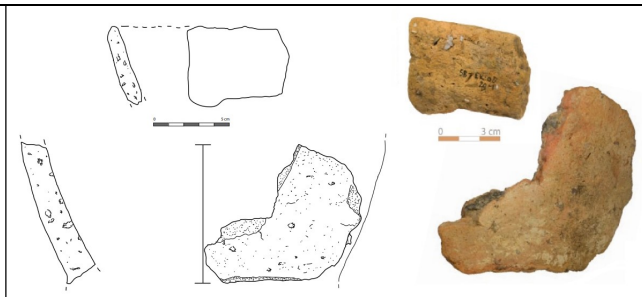
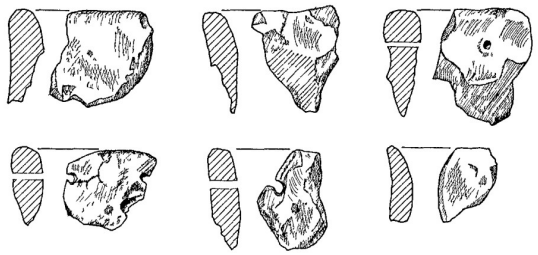
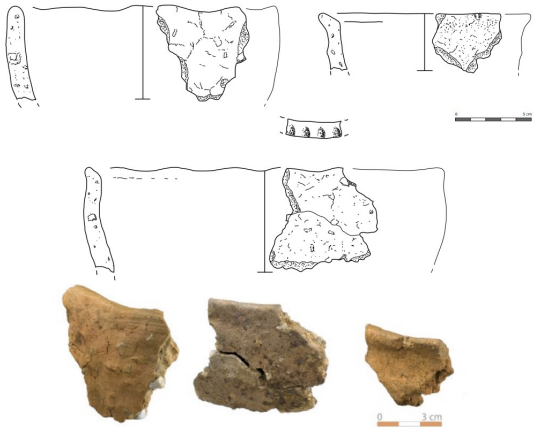
Oss	2260±40	Well	1345 sherds
Culemborg (kuil 24)	2260±30	Pit (ceramic deposit)	191 sherds (62 sherds are tiny) (likely from four to six pots)
Culemborg (S3163)	2260±30	Posthole	One sherd
Culemborg	2235±30	Pit	166 sherds (68 sherds are tiny; one sherd of a loom weight)
Cuijk	2180±35	Pit	233 sherds/ 8500 grams (likely from at least seven vessels; dating result is from the charred residue of a base sherd)
Best (S7163)	>299 BC	Well	Amount NM: at least two vessels
Best (S7687)	>213 BC	Well	Amount NM: at least two vessels

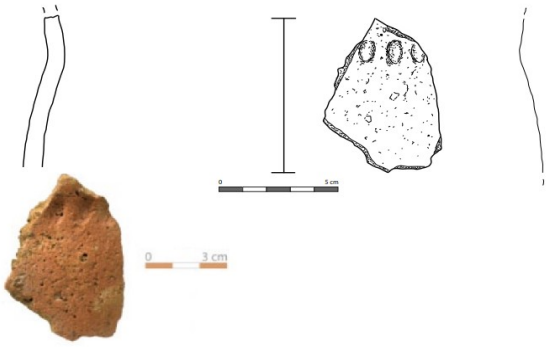
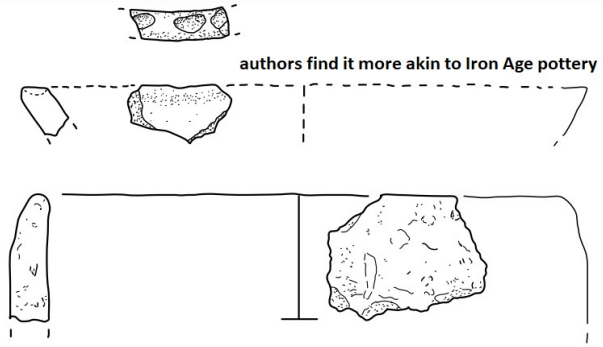
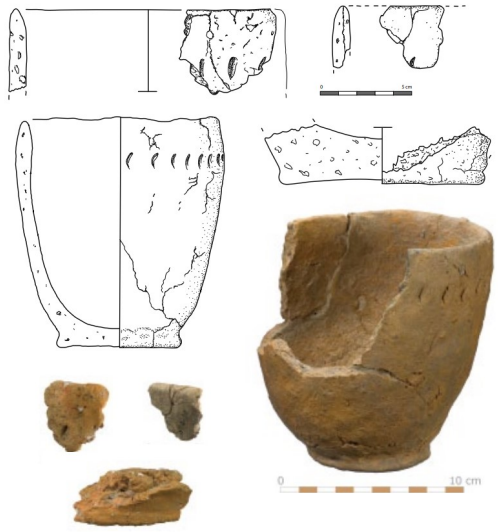
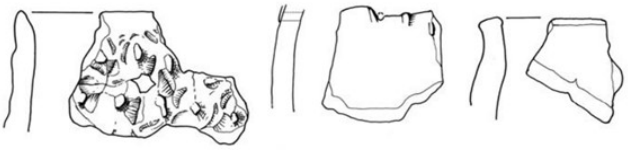
Shape

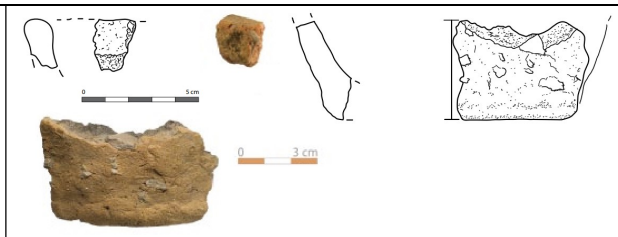
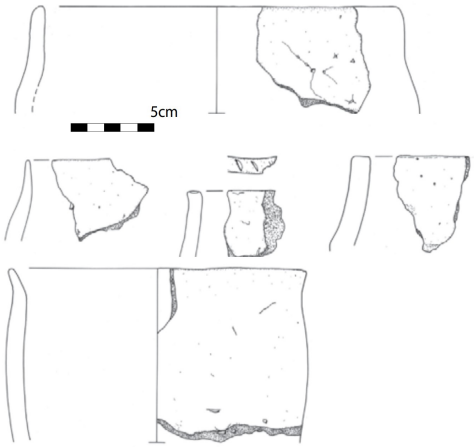
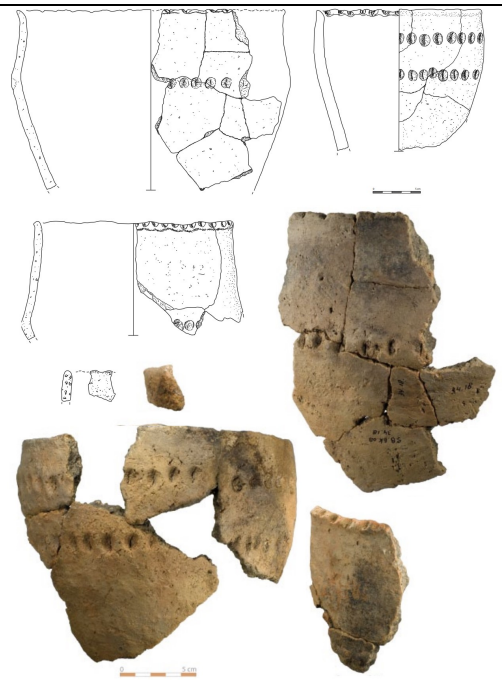
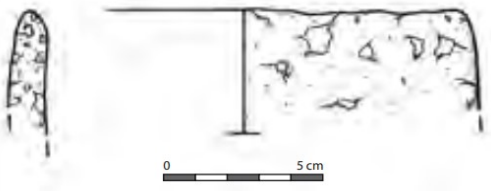
Remarks: For types, in which case different authors have deviating definitions (e.g. HVS), the type is prefixed with the author whose definition applies. Van den Broeke (2012) is abbreviated to “Broeke”. Others include Arnoldussen (2008), Desittere (1968a; b), Drenth (2018) and Ruppel (1990).

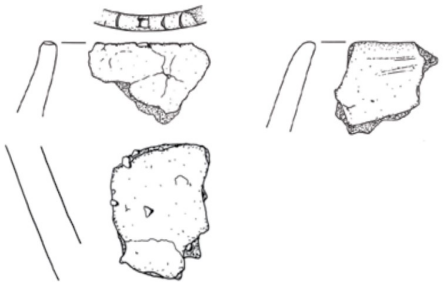
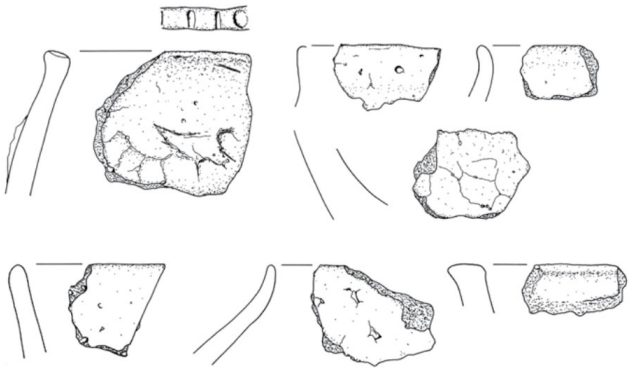
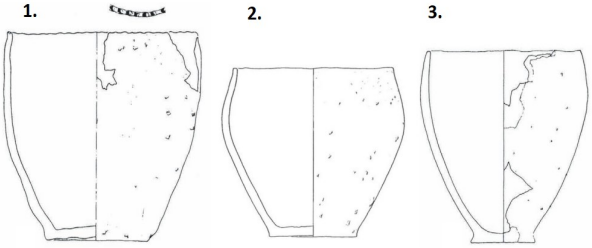
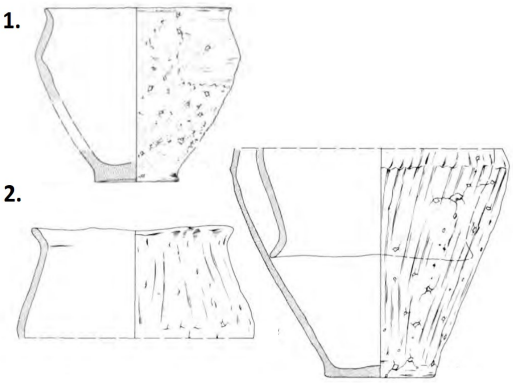
Toponym	**BP date or BC year of cut** (see first two tables of appendix)	**Information/results**	**Examples from the assemblage**
Meteren	3665±60	• **Bell Beaker shaped sherds** (no imagery or further explanation provided)	NA
Molenaars-graaf	**Tpq** 3640±30	• S-shaped profiles with both high (and sharp) and low (and weak) shoulder-neck transitions • Weak angularity: rounded profile transitions • Very long (often straight) and very short necks • Rims protruding outwards (but no lip!) • Protruding foot/base (2x) and regular flat base (2x) • Cordoned rim: thickened rim (1x) • EBA/Lanting’s **type BWB** • Tripartite • Pot build-up type III	
Molenaars-graaf	3635±40	• Angular profile transitions • Slightly rounded funnel-shaped neck • **(Veluvian) Bell Beaker** • Tripartite • Pot build-up type III	

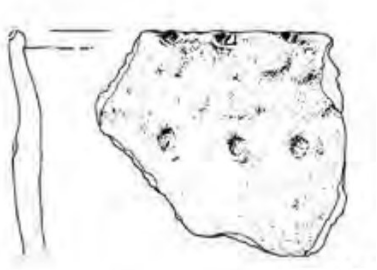
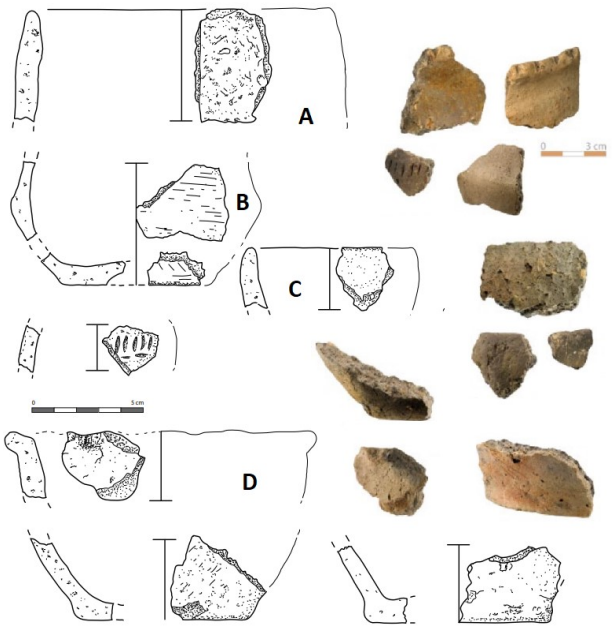
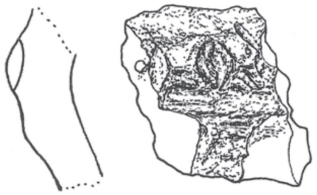
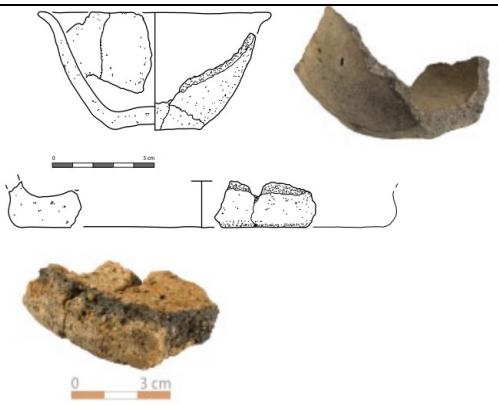
Meteren	3574±35	• Very incomplete but; • Neck protruding outwards • Seemingly a thickened rim (but the profile drawing suggests otherwise) • Likely the start of an S- or egg-shaped profile -May very well be an EBA/Lanting's **type BWB** • Pot build-up type III?	
Boekel	3470±60	• (Very+relatively) tall pots • Weak S-shaped and nearly biconical (slightly curved) profiles • Arnoldussen's **type HVS** • Drenth's **HVS types 2 + 5** • Tripartite (barely) and bipartite • Pot build-up types II and III	
Son	3425±45	• Fragmented; • Three straight rims • MBA (different typologies) **types DKS/LRN?**: lack of decoration below the rim (so probably not HVS) • Weak mono/bipartite profile shapes	
Oss	3400±40	• Barrel-shaped pot • Arnoldussen's **type DKS1a** • Drenth's **DKS type 5** (unless the rim deviates) • Closed shape • Monopartite • Pot build-up type II (or less likely: III)	

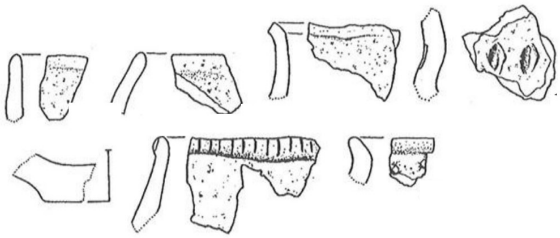
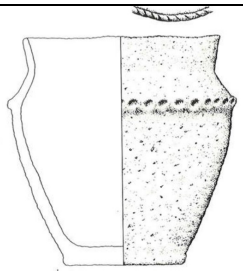
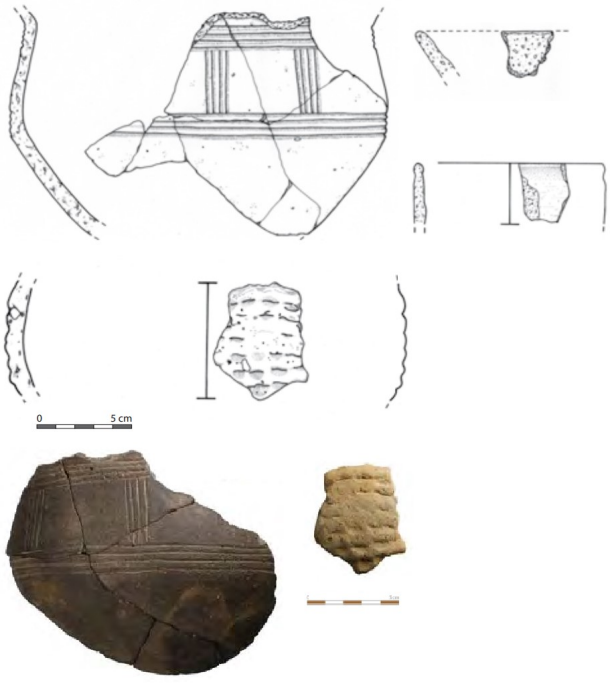
Son	3365±35	• Fragmented; • One straight rim • MBA **types DKS/LRN?**: lack of decoration below the rim (so probably not HVS) • Weak mono/bipartite profile shapes • Pot build-up I or II	
Molenaars-graaf	3350±35	• Fragmented; • Many straight or slightly curved rims • Only weak profile transitions • MBA **types DKS/LRN?**: lack of decoration below the rim (so probably not HVS) • Weak mono/bi/tripartite profile shapes	
Son	3345±35	• Three relatively long rim sherds • Pot with (presumably) a bucket-shaped profile with lip (nearly a neck) -Drenth's *LRN type 4* if it hadn't been for rim decoration; Arnoldussen does not cover it -***does not fit the typology*** • Pot with (presumably) a barrel-shaped profile - Drenth's **LRN type 2** • Pot with biconical profile -Drenth's *LRN type 1* if it hadn't been for rim decoration; Arnoldussen does not cover it -***does not fit the typology*** • Weak mono/bipartite profile shapes • Pot build-up types I and II	
Son	3320±35	• Two relatively long rim sherds • Pot with (presumably) a bucket-shaped profile with row of impressions -Drenth's **DKS type 11** • Pot with (presumably) a bucket-shaped profile without decoration -Drenth's ***LRN type 4*** *(drawing probably shows the body more slanted than it is supposed to be; rim is uneven)* • Curved body sherd (barrel-shaped) with cordon: possibly *DKS type 5* • Weak mono/bipartite • Pot build-up types I and II	

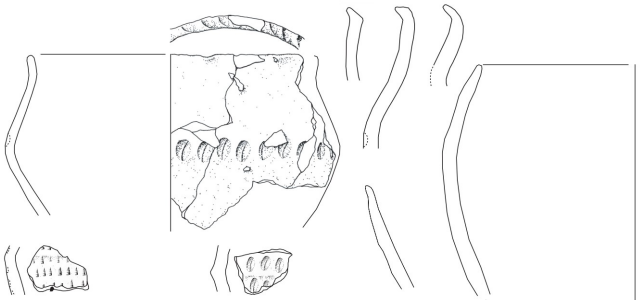
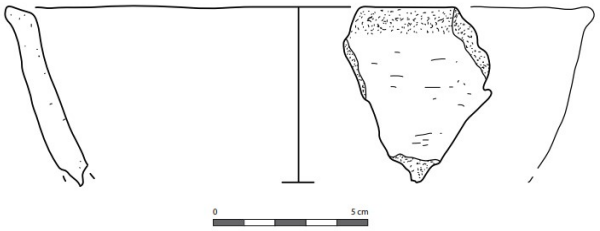
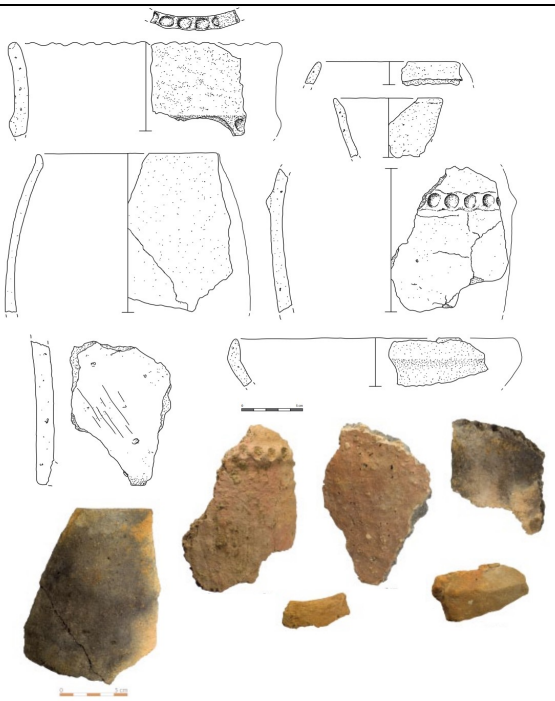
Son	3290±35	• One shape constructed from a single sherd: • Pot shape with a neck protruding outwards and a row of decoration -Drenth ***DKS type 14*** (which is less angular and more S-shaped in profile!); *Arnoldussen does not cover this type* • Tripartite • Pot build-up type III	
Son	3280±35	• Two fragmented rim sherds • *Sherd (authors: "looks like it is from an Iron Age pot)* • Pot with a barrel-shaped profile and presumably no decoration -Drenth's ***LRN type 2*** • Mono/bipartite • Pot build-up type II	
Son	3215±45	• Three (partial) shapes reconstructed; pots with barrel-shaped profile (1x) and barrel/bucket-shaped profile (2x) with row of decoration: -Drenth's **DKS type 6** and probably **DKS type 11** -Arnoldussen's **type DKS2** • Mono/bipartite • Pot build-up type II (and probably I)	
Heteren	3205±35	• Fragmented; • Vertical rim of a long neck or shoulder -possibly Drenth's ***HVS type 2*** but pretty messy uncommon pattern for this period • Short neck curving to a shoulder -possibly Drenth's **LRN type 5** • Only weak profile transitions • Pot build-up types II and II?	

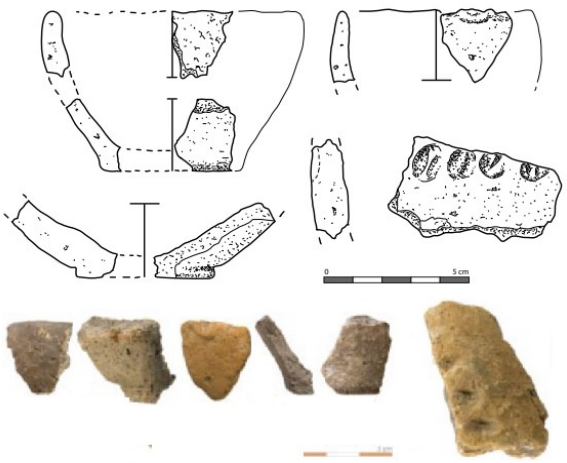
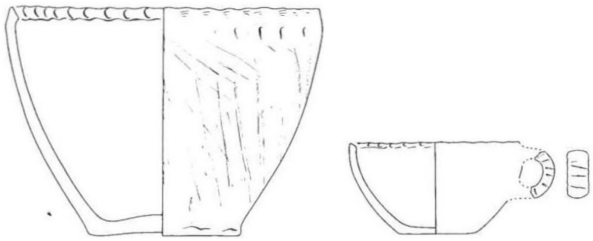
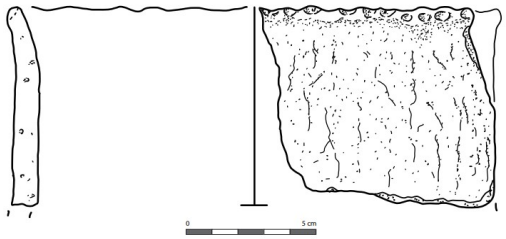
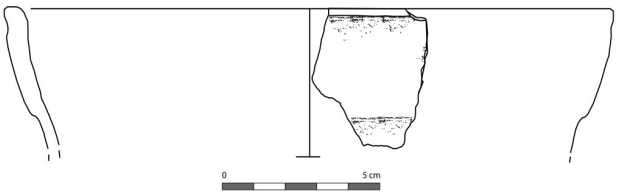
Son	3200±45	• Fragmented; • Two sherds that may possibly be from pots with barrel-shaped profiles of MBA types **DKS/LRN**	
Oss	3190±30	• Several partial pot reconstructions; • One barrel-shaped pot with short neck protruding outwards (bottom) -could be deemed Drenth's ***LRN type 5***, but not really S-shaped • One pot with weak shoulder-neck transition and relatively long vertical neck (top) -"devolved" **conical-necked pot;** could even be **Harpstedt** • Other shapes: possibly **LRN types 1 and 2** (+OHV type A) • Bipartite and tripartite • Pot build-up types II and III -nearly I on the bottom right	
Son	3120±35	• Three partial pot reconstructions and one rim; • Biconical pot with relatively low shoulder (for this period) and a row of decoration -Drenth's ***DKS type 3*** *(belly-shoulder transition is low for this type)* -Desittere's **Coarse Ware** • Biconical pot with high shoulders, a lip protruding outwards and a row of decoration -Drenth's **DKS type 3** *(but the lip and curving shoulder seems uncommon)* -Desittere's **Coarse Ware** • Barrel-shaped pot with two rows of decoration -Desittere's *Coarse Ware (can only be called coarse ware based on the distinctive decoration: shape is wholly uncommon)* -***Does not fit MBA typology*** due to the decoration • Rim; possibly of a barrel-or bucket-shaped profile (LRN/DKS)	
Son	3065±35	• One partial pot profile reconstruction; • Barrel-shaped (source: "bucket-shaped") profile of a pot with (presumably) no decoration -Drenth's ***LRN type 2*** • Bipartite • Pot build-up type II	

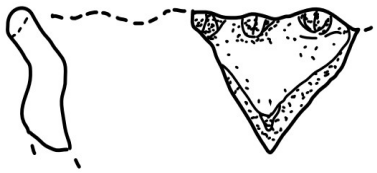
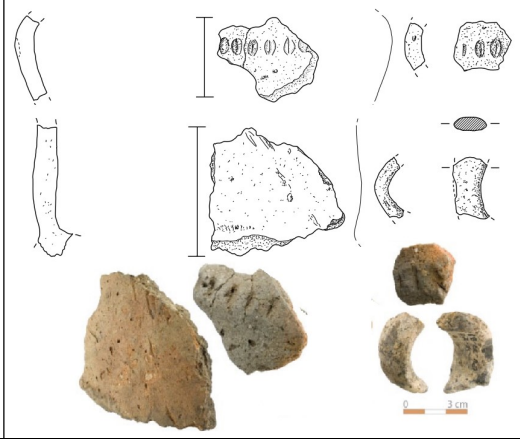
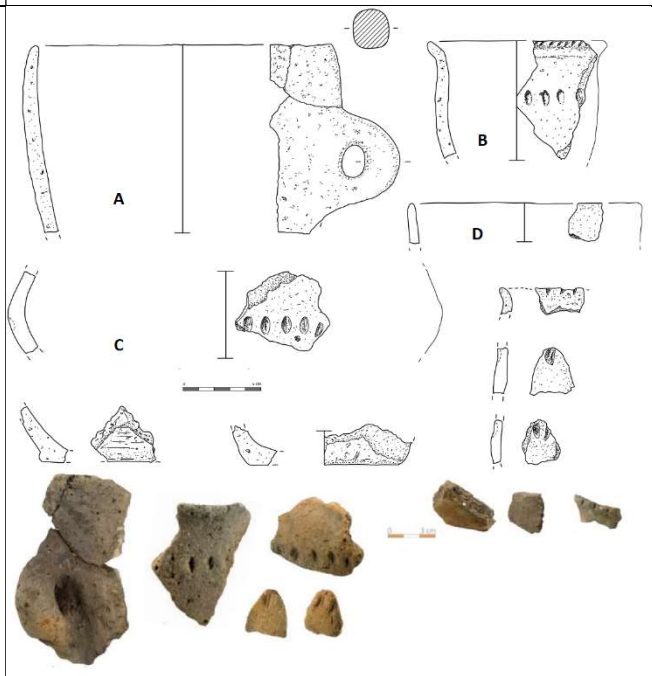
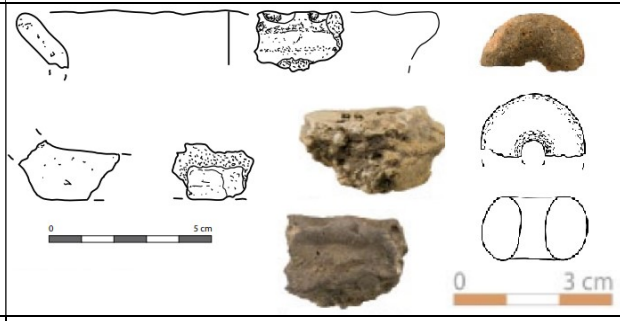
Son	3060±40	• One complete pot profile reconstruction; • Bucket-shaped profile with a lip and without decoration -**LRN type 4** *(but the lip seems a bit uncommon!)* • Relatively wide pot (not tall) • Monopartite • Pot build-up type I	
Oss	3025±35	• Fragmented; • Closed shapes that are probably bipartite: barrel-shaped or biconical in shape? -likely Drenth's ***LRN types 1 and/or 2*** • Bipartite? • Pot build-up type II?	
Oss	3025±35 3000±30	• Several fragmented rim sherds, but; • (presumably) pots with barrel-shaped and possibly bucket-shaped profiles that are seemingly undecorated -likely Drenth's ***LRN type 4*** • Closed shapes that are probably bipartite: barrel-shaped or biconical in shape? -likely Drenth's ***LRN types 1 and/or 2*** • Two closed shapes with a slanted rim (nearly a short neck) -Very **rounded or angular pot; or more slanted than it is supposed to be**? • Mono/bi/tripartite • Pot build-up types I and II	
Lent	1: 2985±50 2: 2920±50 3: 2915±45	• Barrel-shaped pots • Biconical shape (2) • Drenth's **LRN type 1** (2) and **LRN type 2** (3) and **OHV type A** (1) • Broeke's **type 23a** • Relatively wide pots (not tall) • Monopartite (1+3) and bipartite (2) • Pot build-up type II	
Haps	1: 2970±35 2: 2920±50	• Relatively tall pots • Angular profile transitions • Very short necks • Drenth's typology: practically **LRN type 1**, but with necks (so does not fit local typology of this period) • 1: Broeke's **type 34** • 2 (left pot): Ruppel has a similar example (1990, appendix 4.5; but may be much taller; like the example on the right probably is) • Closed shapes • Tripartite • Pot build-up-up type III	

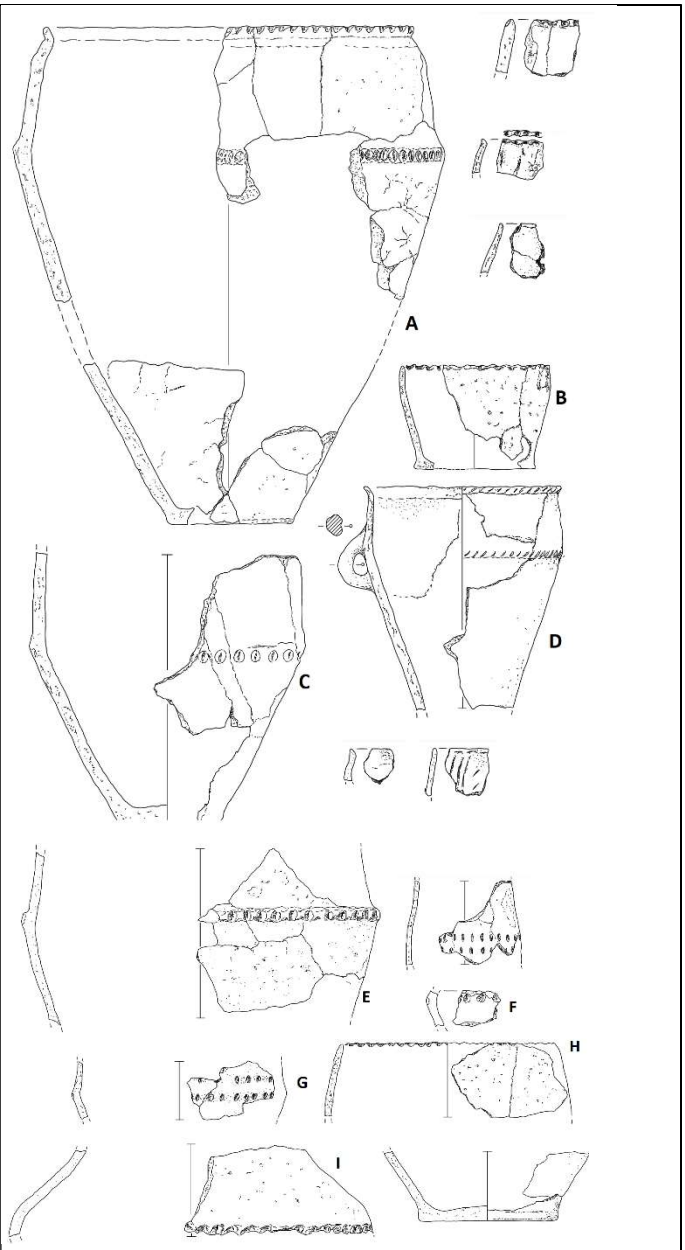
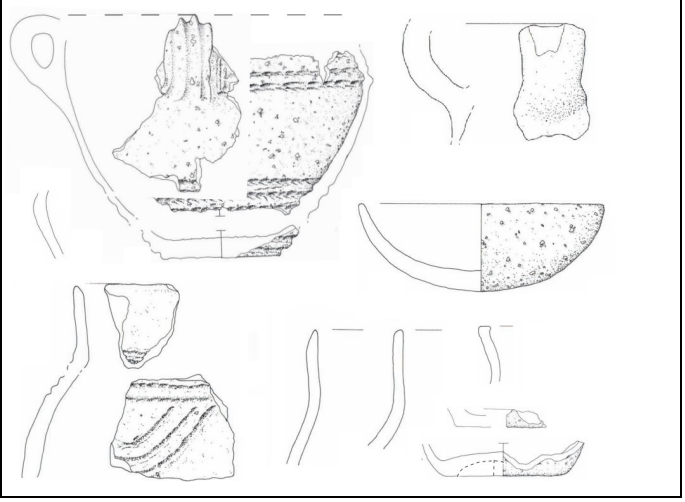
Best	2970±30	• Only one shape slightly reconstructed • Very weak angularity • Could be Desittere's ***Coarse Ware*** *(mostly based on decoration)* • Drenth's **DKS type 14** • Arnoldussen's **type DKS2** • Extremely weak tripartite shape • Pot build-up type I or III	
Son	2970±30	• Fragmented assemblage with some recognizable shapes; • Pot with barrel/bucket-shaped profile with (presumably) no decoration (drawing A) -Drenth's ***LRN type 2/LRN type 4*** • Angular biconical bowl or pot with a low angular belly-shoulder transition if I take the reconstruction for granted (drawing B) *-difficult to classify (uncommon for MBA)* • Rim sherd with a lip (drawing D) • Shape with a sudden inner angle from belly to shoulder (drawing C) -Similar example in Ruppel's typology (1990, tafel 38.8; 111) • Several bases and body sherds either belonging to small bowls and/or barrel/bucket-shaped pots *-difficult to classify* • Bipartite (and probably monopartite) • Pot build-up type I and II	
Culemborg	2965±30	• One small fragment; • Angularity in the profile and the decoration on this angular position -(presumably) Drenth's ***DKS type 2, HVS type 1 or HVS type 2***	
Son (S33.028)	2945±30	• One partial plate (nearly a bowl) reconstruction and a base • Monopartite bowl with a rim flaring out and a curved base -Broeke's ***type 5a***, but none of the examples have a similar rim/base shape -The rim is similar to Desittere's *beaker group F (HaB), whereas the base fits other beaker types of both HaA and HaB in Desittere's typology* -***does not seem to fit MBA/LBA typology***	

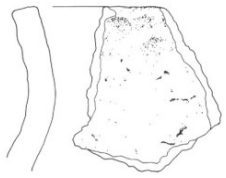
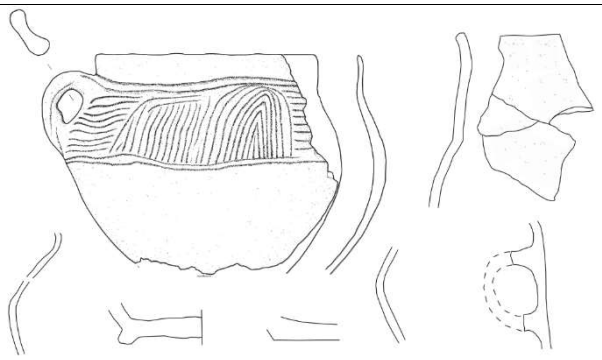
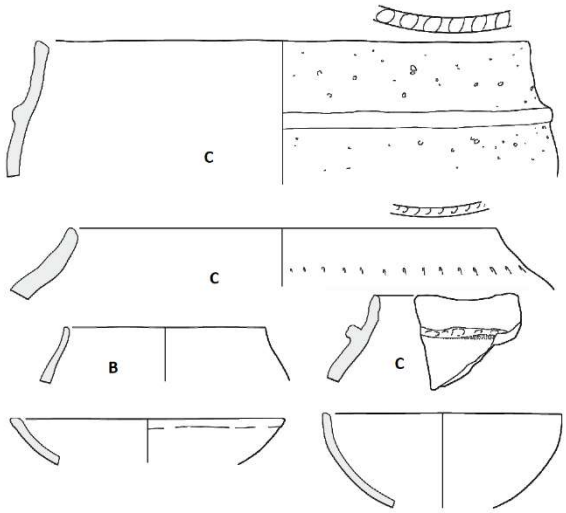
Son (S33.055)	2945±30	• One complete pot profile reconstruction • Relatively angular pot with biconical profile and a lip *(but the lip seems a bit uncommon!)* -Drenth's **DKS type 2** -Arnoldussen type **DKS1a** • Bipartite • Pot build-up type II	
Nijmegen	2940±90	• Fragmented; • Many rims protruding outwards • Bipartite and tripartite shapes • Pot build-up types II (majority) and III	
Groot- Linden	2935±30	• Relatively tall pot • Angular profile transitions • Short neck and shoulder • Drenth's typology: **practically DKS type 12**, but too angular + neck (so does not fit local typology of this period) • Closed shape • Tripartite • Pot build-up type III	
Son	2930±50	• Several partial bowl/pot reconstructions • Biconical profile shape with a neck protruding outwards (top left drawing) -possibly Broeke's ***type 43*** (depends on the neck and belly size) -may be considered a "devolved" type of ***funnel-necked pots*** -Ruppel (1990) shows similar shapes in appendix 2 (top) and appendix 4 (top) that match the ^{14}C dating • Rim sherd of an open shape (top right drawing) -possibly Broeke's ***type 3a*** *-not clearly covered by LBA/MBA typology* • Very rounded body shape (bottom left drawing) • Rim shape of a pot with bucket-shaped profile and a narrowed section below rim (bottom right drawing) -possibly Drenth's ***LRN type 4***	

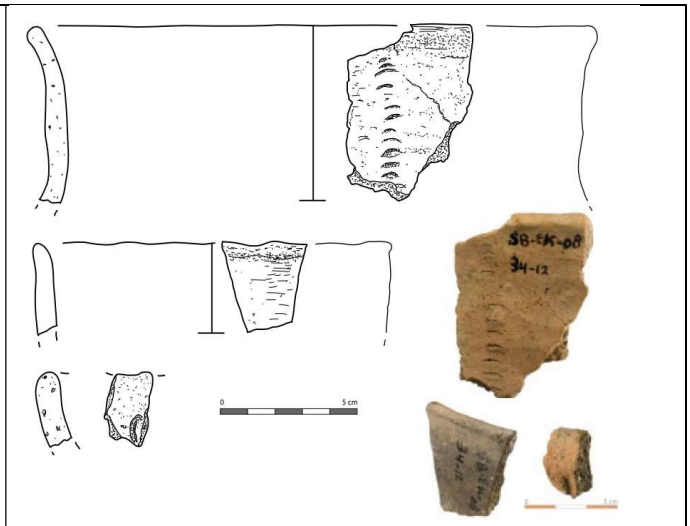
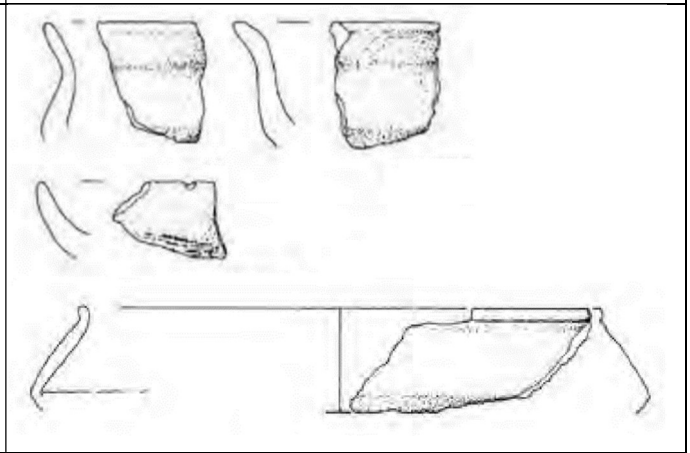
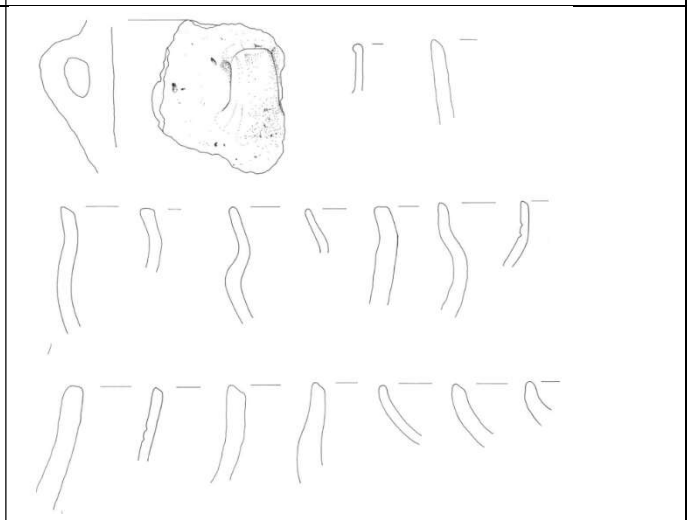
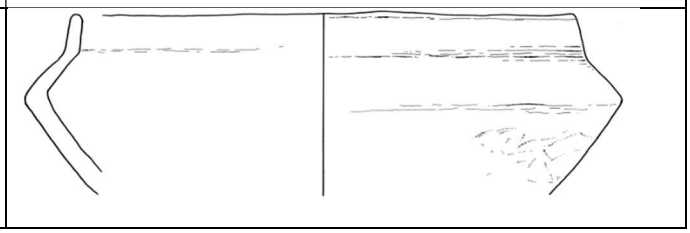
Rhenen	2930±30	• Pots/bowls with angular profile transitions • Also: barrel- and egg-shaped pots - Drenth's **LRN type 2** (can also be considered Broeke's **type 23a**) • Short necks, no necks or; • Rims with lips protruding outwards -Broeke's **type 35** or possibly 34 (left drawing: neck is a bit too long) • Open shape with a slightly slanted shape -might belong to Broeke's ***type 3b*** • *Many not clearly covered by LBA/MBA typology* • Open shapes (3x) and closed shapes with (11x) and without neck (1x) • Mono/bi/tripartite • Pot build-up types I, II and III	
Son	2925±35	• One vessel partially reconstructed • A bowl (or pot) shape with a lip on the rim -***does not fit the typology*** *(looks a bit like a rim of the assemblage of Rhenen: 2930±30)*	
Son	2925±30	• Several partial vessel reconstructions • (presumably) pot with a barrel-shaped profile that is seemingly undecorated -Drenth's ***LRN type 1*** • Pot with a barrel-shaped profile that is undecorated from rim to base -Drenth's **LRN type 1** • Pot with a curved neck (>5 cm); -could have been Drenth's *DKS type 12* had it not been for the rim decoration and neck -might have been Desittere's ***funnel-necked pot***, but it is difficult to define without belly • Bowl or (less likely) a pot with an angular belly-shoulder transition ***-does not fit LBA typology*** -Broeke's **type 33 (possibly 32)** • Small pot (without visible base) with straight body ***-does not fit LBA typology*** -Broeke's **type 5a** • Mono/bipartite (possibly also tripartite) • Pot build-up types I and II	

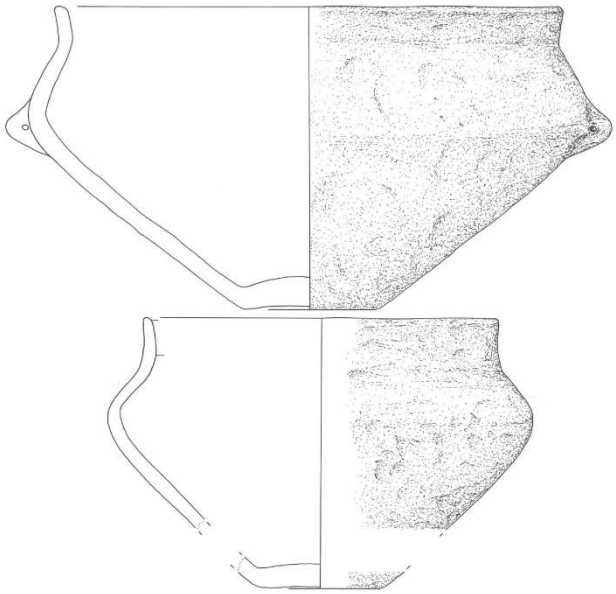
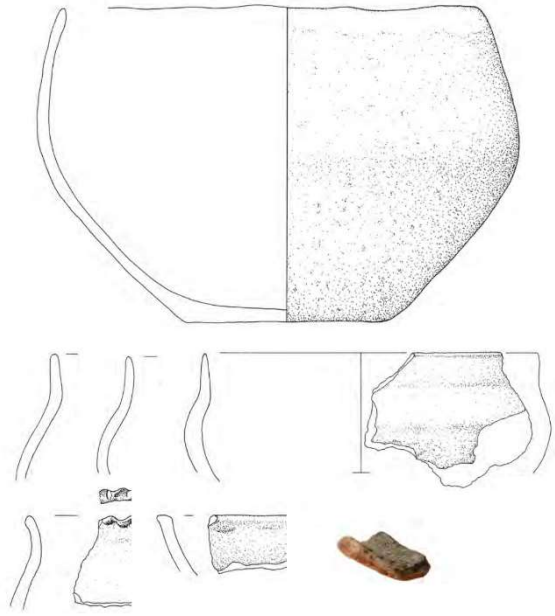
Son	*3035±35* **2920±30**	• Very small cup/bowl based on two sherds that do not fit: *shape may e.g. be taller: shape is speculative!* -In Ruppel 1990, appendix 4.49, there is a similar shape with ear (>1000 BC) -In Desittere 1968b (53), there is a similar shape, not tied to a type -Drenth's **OHV type B** -Broeke's ***type 5b*** *(can also be considered 22, but seems way too closed in shape)* • Base shape with a low diagonal belly -possibly Drenth's *OHV type B*, but this is very speculative • Rim sherd of a barrel-shaped pot or a small mono/bipartite bowl *-difficult to classify*	
Sint-Oedenrode	2910±60	• Small bowl with an **ear** (right) -Drenth's **OHV type B** -Desittere's **Ear mug/Henkeltasse** -Broeke's **type 51** -in Ruppel 1990 e.g. appendix 4.49 • **Lower bucket-shaped pot** (left) -Broeke's ***type 22*** *(deviating! should be closed)* -Desittere's ***Local box shape*** *(deviating!)* -most examples in Ruppel 1990 are wider • Open shapes (2x) • Monopartite • Pot build-up type I (2x)	
Son	2910±40	• One long rim sherd • It could either be a very long slanted neck (~8 cm long), or a slanted upper body of a mono/bipartite pot. *The source seems to indicate the first possibility, which would make it the following type;* *-Desittere's* ***conical-necked pot*** *-Also possible: Broeke's types 73a or 76*	
Son	2910±35	• One neck sherd • Probably Desittere's **funnel-necked pot** • The authors of the source make an analogy to two funnel-necked pots in Desittere's typology (1968b, 53; 90; De Jong and Beumer 2013, 129). These do not have narrowed section on the lower neck though • This is perhaps similar to a ***funnel-necked pot subtype*** with a narrowed ***conical section*** on the higher shoulder • Likely tripartite • Likely pot build-up type III	

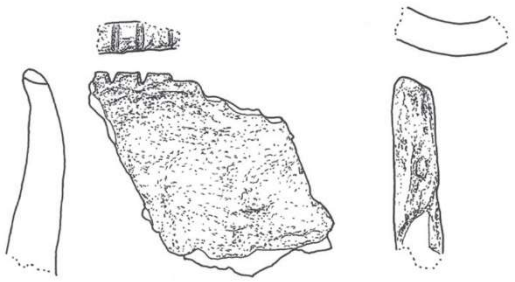
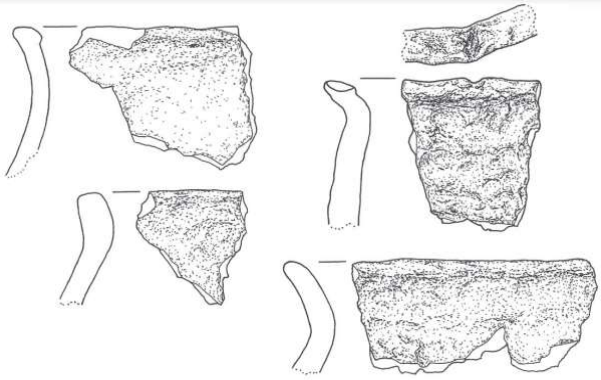
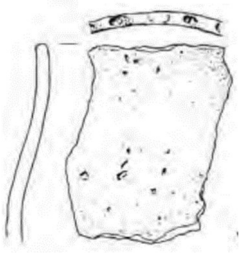
Son (S33.032)	2885±35	• One rim sherd • Rim sherd with a short shoulder and a short neck protruding outwards *-difficult to classify* • Tripartite • Pot build-up type I or III	
Son	2875±30	• Several incomplete shapes that are difficult to classify • (2x) very angular belly-shoulder transitions • (1x) **ear** • At least bipartite and/or tripartite • At least Pot build-up type II and/or III	
Son	2870±35	• Bowl or pot with an **ear** (drawing A) Possible (ear is pretty low): -Drenth's ***OHV type B*** -Desittere's ***Ear mug/Henkeltasse*** -Broeke's ***type 51*** Alternatively (perhaps more likely): -Desittere's ***Amphora*** (other ear missing, because it is incomplete) • Small pot/beaker with a neck protruding outwards (drawing B) -Possibly Desittere's **Beaker group F** • Other sherds cannot be classified; • Body sherd with angularity (drawing C) • Possibly a bucket-shaped profile or a long neck (drawing C) • Neck protruding outwards • Pot build-up types, I (1x?), II (1x) and III (2x)	
Son	2860±35	• Neck protruding outwards -Could be Desittere's ***funnel-necked pot*** • Ceramic bead (too small to be a spindle whorl) • Tripartite (most likely) • Pot build-up type III (most likely)	
Cuijk	2840±40	• Fragmented, but; • A fragment of an **ear** (plugged onto (a seemingly relatively small) pot)	

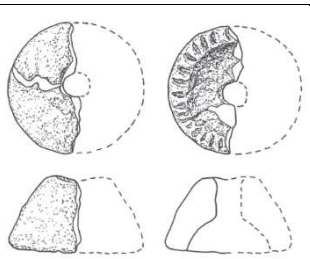
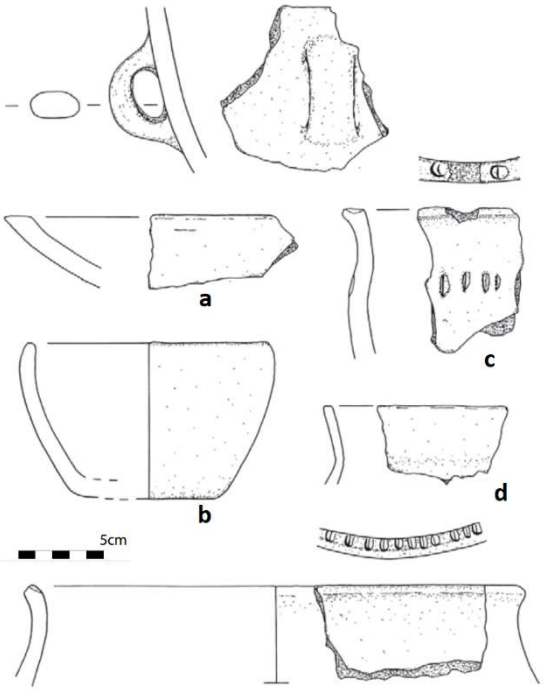
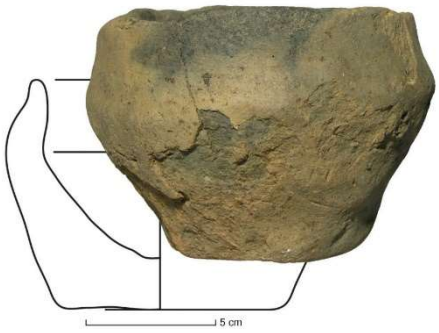
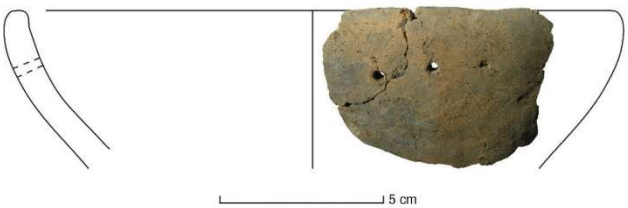
Son	2815±45	• Large amount of pot/bowl reconstructions • Biconical pot with high shoulders and cordon (drawing A; drawing E may have been similar) -***does not really fit the typology*** -might have been Drenth's ***DKS type 12*** had it not been for the rim decoration -might have been Desittere's ***Coarse Ware*** had it not been for the cordon • An open bowl with diagonal sides profile that reach a vertical position below the rim (drawing B) -***does not really fit the MBA/LBA typology*** -Similar to Desittere's *lid box*, but deviates slightly below rim and has a different base -Broeke's **type 5b** • Biconical pot with a row of impressions on the shoulder (drawing C; drawing G may have been similar) -Desittere's **Coarse Ware** -possibly Drenth's ***DKS type 3*** or -Arnoldussen's type ***DKS2***, but it has a very low shoulder • Biconical pot with high shoulders, a neck protruding outwards and at least one ear (drawing D) -possibly Desittere's ***Amphora****, but only one ear and uncommon shape* -similar to Desittere's ***Coarse Ware****, but ear and decoration are uncommon* • Seemingly a barrel-shaped pot (drawing H) -possibly Drenth's ***OHV type A*** • Shapes with angular belly-shoulder transition (drawings F and I) • Bipartite and tripartite shapes • Pot build-up type I (2x), II (7x or more) and III (1x, likely at least 2x)	
Tiel	*2815±35 (see remark in the third table of this appendix)*	• Pots with slightly angular profile transitions • Relatively long necks • Possibly incomplete amphora(e) (top left and top right on image): pots with **ears** • Wide small monopartite bowl • Desittere's classical **Cylindrical**- (and seemingly also **funnel**)-**necked pots** (incomplete): several examples • (Bowl=) Broeke's **type 3b** • Open (6x) and closed (7x) shapes with necks • Monopartite and tripartite • Pot build-up types I (1x) and III (4x)	

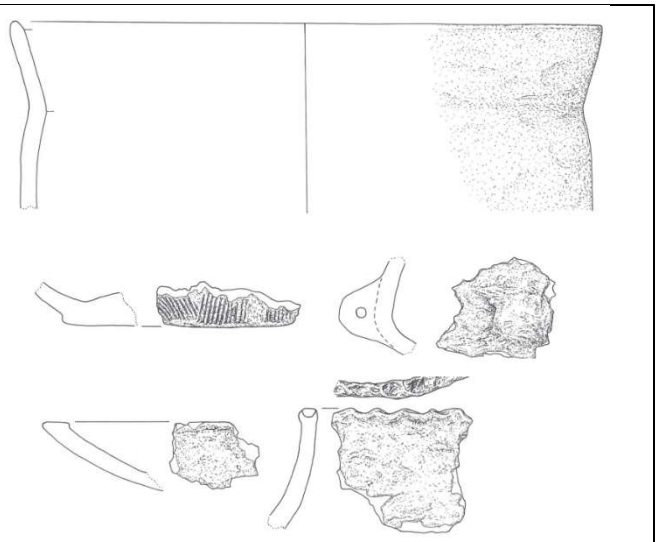
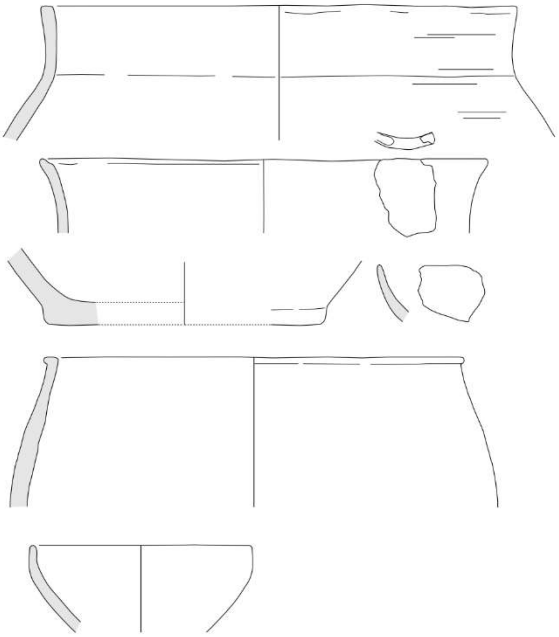
Cuijk	2800±30	• Fragmented; • **Ear** (1x; no drawing) • Relatively long neck (1x): Desittere's **funnel-necked pot?** • Closed shape with neck • (seemingly) Tripartite • Pot build-up type III	
Tiel	2770±35	• Both angular and more rounded profile transitions • Possibly incomplete amphora(e): pots with **ears** • "Devolved" **cylindrical-necked pot** (very rounded wide subtype) with at least one **ear**; possibly amphora • (seemingly a) **conical-necked pot** (top right) -practically quadripartite because the conical-shaped neck protrudes outwards -lacks angularity -Broeke's type 25 (but more rounded) • Possibly a funnel-necked pot (bottom left) • Very long and relatively short necks • Closed shapes (4x) • Tripartite (possibly also bipartite) • Pot build-up types II and III (3x)	
Budel	2757±41	• No angularity at all • No necks at all (only shoulders and bellies) • Desittere's **Coarse Ware** (Grobkeramik) (drawings with C). However: -(two are) much more closed than usual -most of typological examples do not have cordons: top example looks more like DKS; • Seemingly a barrel-shaped profile (but may be different) with an undecoratedcordon (top drawing) -Drenth's *DKS type 4* -Arnoldussen's *type DKS1b* *-but **does not fit typology** due to the rim decoration* • (smooth) Barrel-shaped pot (drawing B) -presumably Drenth's **LRN type 2** • (smooth) Monopartite bowls (bottom drawings) -Broeke's **type 3b** (bottom left) • Open and closed shapes without necks • Monopartite and bipartite • Pot build-up types I and II	

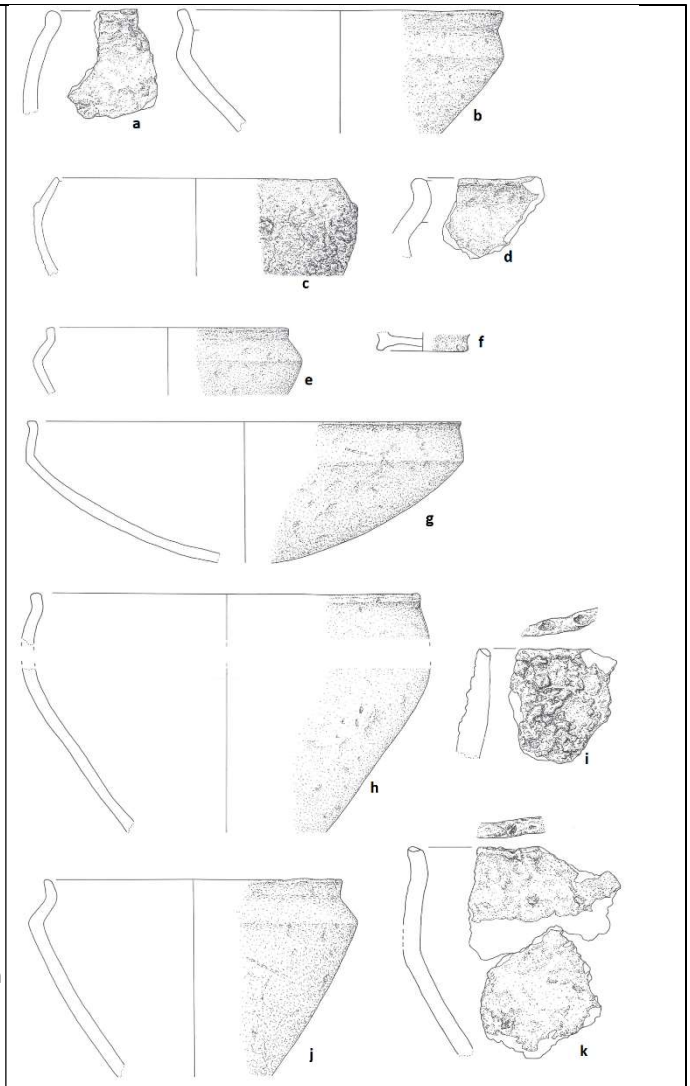
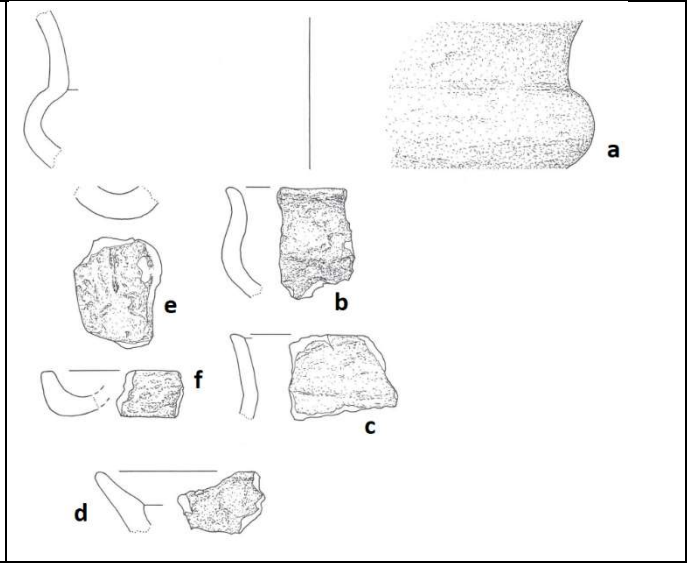
Son	2745±40	• Several partial pot reconstructions • Pot with a very long (>6 cm) curved neck that likely protruded outwards; -Desittere's **funnel-necked pot** • Rim sherd that seems to have belonged to a bowl, but may also have belonged to a barrel-shaped pot or another shape -*difficult to classify* • Rim sherd that is possibly of a bucket-shaped pot with a lip -could be *LRN type 4* • Pot build-up types I (2x?) and III (1x)	
Best	2740±30	• Four diagnostic rim sherds • Rim of a potential barrel-shaped pot (no drawing): -Broeke's **type 23**(a or b) • Tripartite shapes (2x) -Broeke's **type 71** according to source • Bipartite bowl/pot -Broeke's **type 32 or 33** according to source • Bipartite and tripartite • Pot build-up types I (2x), II (1x) and III (1x)	
Cuijk	2730±45 2710±30	• Not a lot of angularity • weak S-shaped profiles • Possibly incomplete amphora(e) (e.g. top left on image): pots with **ears** (3x) • One angular shape with a short shoulder • One shape with a curved neck: might be considered quadripartite • **Possibly** Desittere's "devolved" **cylindrical + funnel-necked pots**, but hard to conclude • Many shapes could be deemed Broeke's types: e.g. **3b, 55a and 71** • Open (4x), closed shapes with (21x) and without (6x) necks • Mono/bi/tripartite (mostly tripartite) • Pot build-up types I, II and III (mostly III)	
Well	2670±35	• Only one vessel (bowl?) reconstructed: • Strong angularity • Short conical-shaped neck • Desittere's **conical-necked pot** (but very short neck is atypical in combination with angularity!)	

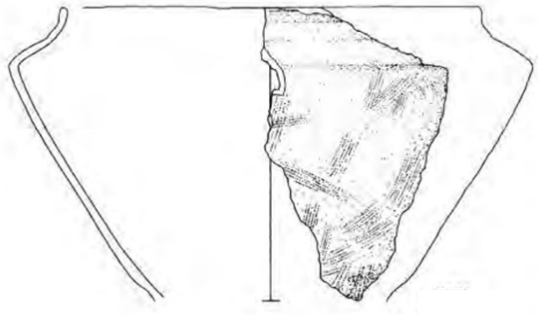
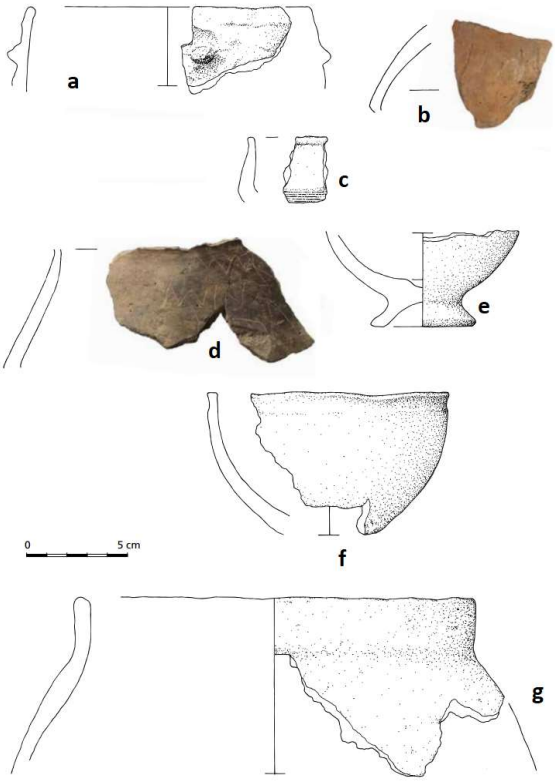
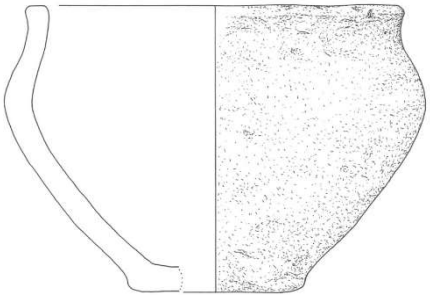
		• Neck usually protrudes outwards: *Broeke's **type 41 or 42a*** (e.g. Van den Broeke 2012, fig. 3.14: 4) • *Author calls it a Marne shape, but I disagree (deviates too much from the different MIA types in typology)* • Tripartite • Pot build-up type II	
Culemborg	2515±30	• Two bowls completely reconstructed; • **Lump ears** plugged horizontally (on belly-shoulder transition) (1x) • Closed wide shape (bowl/plate, practically the first) with short neck (top drawing) -Broeke's **type 41** • Closed bowl with relatively high shoulder and straight neck -Source claims Broeke's pot type 45b or 52; disagree with 45b (neck is too long); also disagree with 52 (profile is too rounded/weak) -Author: Broeke's **type 53** -Could be a later subtype of Desittere's cylindrical-necked urn, but looks more like; -Verwers's **Schräghals** "devolved" subtype • Closed shapes • Tripartite • Pot build-up type III	
Udenhout	2510±30 2450±30	• One vessel completely and several partially reconstructed • Bipartite wide bowl (top drawing) -Broeke's **type 22** • Open shape (bottom middle drawing) -Broeke's **type 3b** (could possibly be *type 4*) • Several rim types of tripartite vessels (bottom left drawing) -Presumably Broeke's **types *42a*** and/or ***55a*** • Tripartite shape with angular shoulder-neck transition -Presumably Broeke's **type 55b** • "Zoutgootje": Broeke's **type k-7** • Closed shapes (6x) and open shape (1x) • Mono/bi/tripartite (mostly tripartite) • Pot build-up types I (1x), II (1x) and III (4x)	

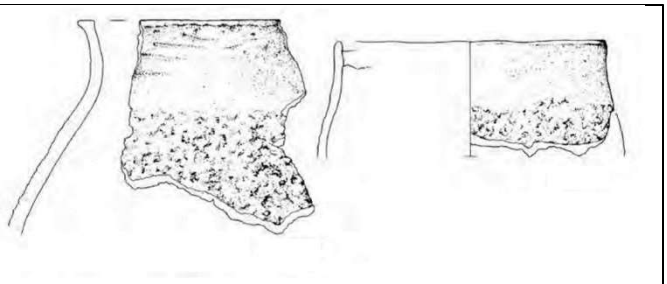
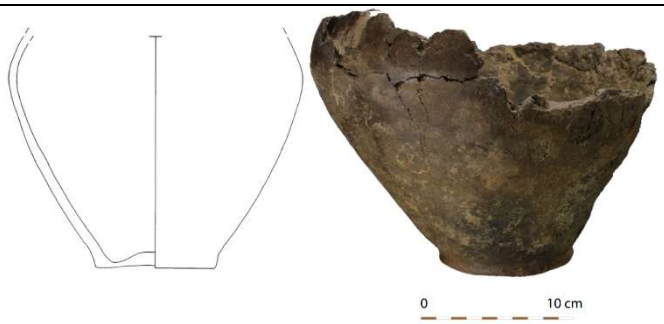
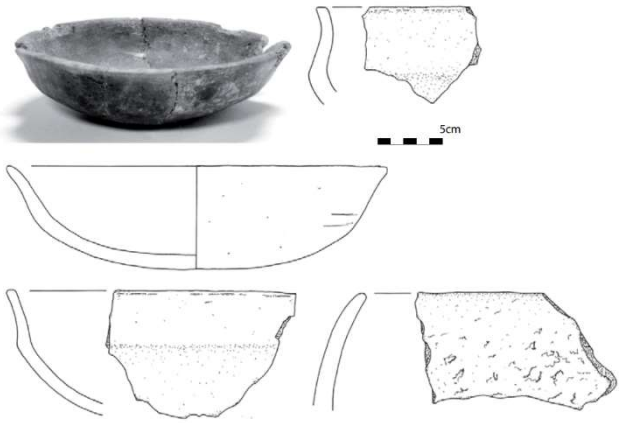
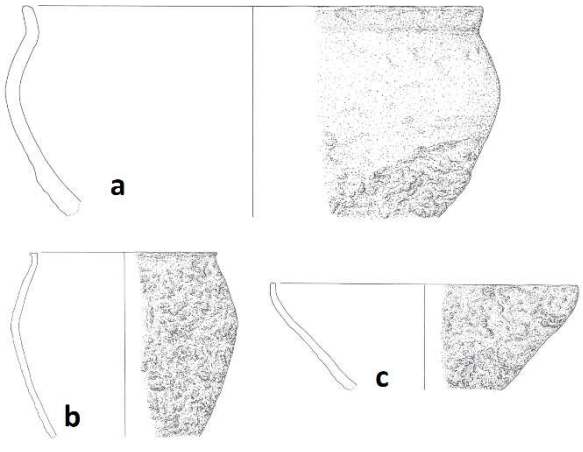
Culemborg	2475±30	• One vessel reconstructed (presumably a bowl) • Wide vessel with a long belly and a funnel-shaped neck that is of similar size to a diagonal (relatively short) shoulder -Broeke's **type 43** • Tripartite • Pot build-up type III	
Culemborg (kuil 9)	2470±30	• Closed shapes without necks: presumably barrel-shaped pots of Broeke's **type 23a** (no drawings/imagery provided) • Bipartite • Pot build-up type II	NA
Culemborg (kuil 19)	2470±30	• One slightly closed vessel with a rim slightly curving outwards (left drawing) -*difficult to classify* • Wide bowl with a relatively straight body and a "bump" on the inner side of the body ("haakrand"; no drawing provided) -Broeke's **type 4** • Presumably a fragment of a "Zoutgootje" (right drawing) -Broeke's **type k-7** • Mono/bipartite • Pot build-up types I (1x) and II (1x)	
Culemborg (kuil 23)	2470±30	• Sherd with a very short neck strongly protruding outwards (top right drawing) -Possibly Broeke's ***type 54*** • Rim sherds with angular shoulder-neck transitions (bottom drawings) -*difficult to classify* • Rim sherd with a rounded shoulder-neck transition (top left drawing) -*difficult to classify* • *Complete sling bullet* • Pot build-up types I (1x) and III (3x)	
Best	2465±30	• Weak angularity • Weak S-shaped profile -**Harpstedt:** Broeke's **type 55a** according to source • Tripartite (but barely) • Pot build-up type II (nearly III)	

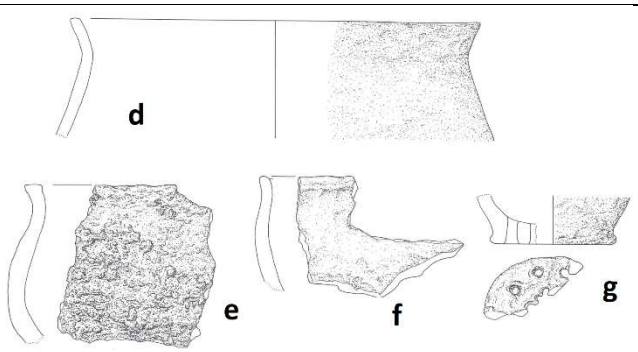
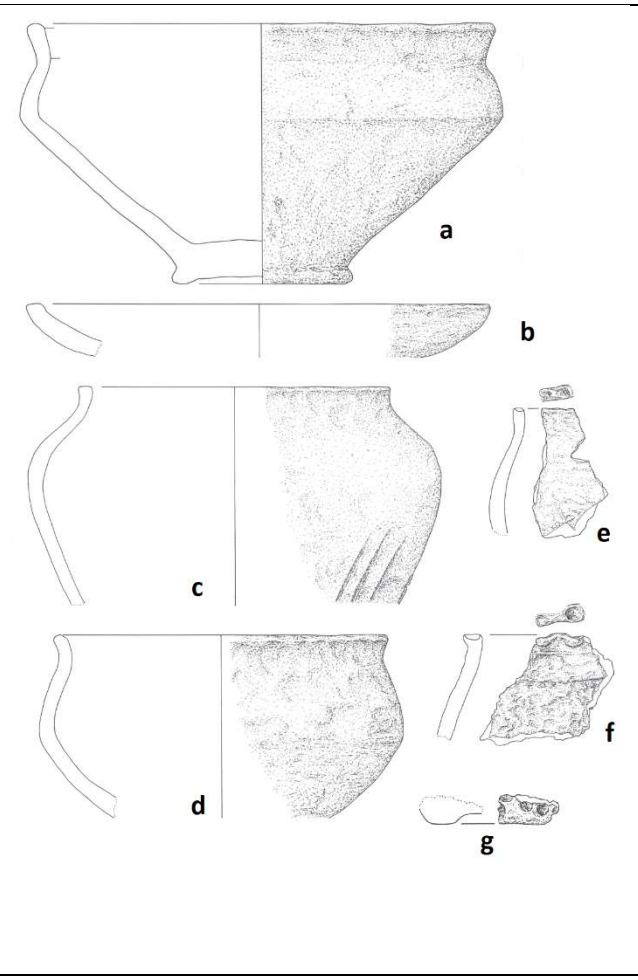
Culemborg (spieker 67)	>724	• No reconstructed pot shapes, but one fractured **conical-shaped spindle whorl**	
Oss	2460±30 2430±30	• Pot with **ear** (on the body without known profile transitions) • Rim sherd of a wide open bowl/plate shape (drawing a) -Broeke's **type 3b** • Slightly closed open bowl (drawing b) -Broeke's **type 22** • S-shaped profile with rounded profile transitions and a short shoulder and neck (drawing c) -Broeke's **type 52** or **55a** • Relatively long straight neck protruding outwards from a sharp shoulder-neck transition (drawing d) -Desittere's **funnel-necked pot** -*Wide variety of Broeke's pot types* • Pot with a very short neck and long shoulder (bottom drawing) -*Several different pot types* • Mono/bi/tripartite • Pot build-up types I (1x), II (1x) and III (3x)	
Groesbeek	2455±30	• One complete vessel within grave; • Very small biconical bowl with a short neck -I could agree defining it as ***type 52***, as the belly-shoulder transition is not so abrupt: it is smaller than most examples presented • Tripartite (though barely) • Pot build-up type II	
Groesbeek	2435±35	• Sherds of one vessel within grave; • One wide open bowl with a nearly closed shape (due to the roundness of the rim) -could be Broeke's **type 5b**, but the shape might be too wide for it • Monopartite (nearly bipartite) • Pot build-up type I	

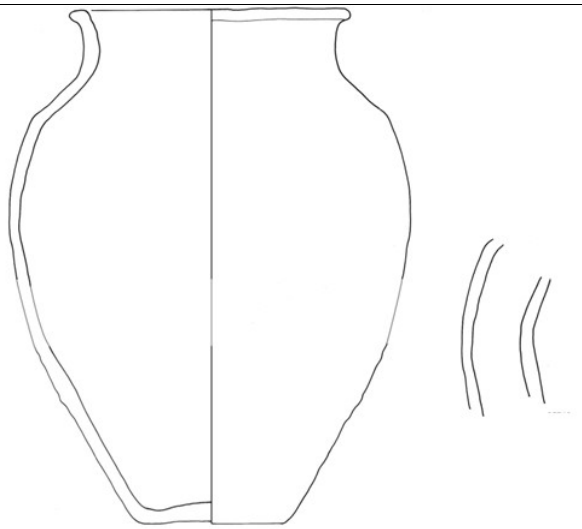
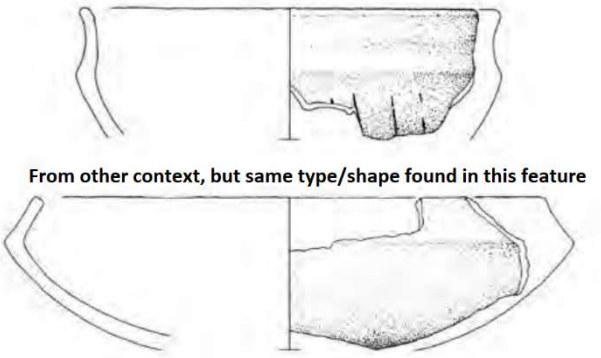
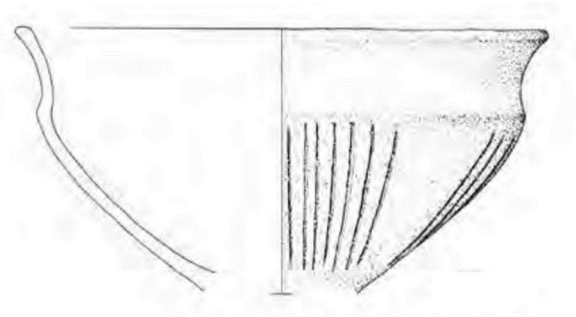
Culemborg	2430±30	• Relatively sharp profile transition with lump **ear** (knobbeloor) • Rim sherd of a wide open bowl/plate shape (bottom left drawing) -Broeke's **type 3b** • Pot sherd with neck curving from diagonal to vertical position: likely a barrel-shaped pot with a neck (bottom right drawing) -likely Broeke's ***type 23b*** • Barely closed shape with long neck protruding beyond the largest width (top drawing) -Desittere's "devolved" **funnel-necked pot** -might be Broeke's ***type 43*** *(according to author)*; ***type 55b*** *or (unlikely) type 53* depending on belly-shoulder transition • Possible: "Zoutgootje": Broeke's ***type k-7*** (no drawing, and uncertain) • Mono/bi/tripartite shapes • Pot build-up types I (2x), II (2x) and III (1x)	
Someren	2427±30	• Several reconstructed shapes: • Big pot with long slightly tilted neck (top drawing) -possibly Broeke's ***type 58*** (lacks belly for certainty) -possibly Desittere's **cylindrical/funnel-necked pot** • Small bipartite bowl with high shoulder (bottom drawing): could be Broeke's ***type 21*** • Tall pot: possibly-barrel-shaped • Small monopartite bowl (middle drawing) -Broeke's ***type 5a*** according to source, but could e.g. also be ***type 3b*** depending on proportion • "Zoutgootje" (6x) -Broeke's **type k-7** (no drawing/imagery) • Closed and open shapes • Mono/bi/tripartite • Pot build-up types I (2x), II (1x) and III (2x)	

Culemborg	2425±30	• ~10 reconstructions of incomplete vessels; • Slightly closed (wide) bowl with angular profile transitions and a short neck protruding outwards (drawing b) -Broeke's **types 41 *or 42a*** (neck-shoulder transition might be a bit too angular for type 42a) • Barrel-shaped pots (drawings c and k, possibly/probably also drawings a and i) -Broeke's **type 23a** (2x to 4x) -One besmirched up to the rim (drawing i) • *Source: sherd k = type 23a; I would say it is probably **type 33 or 34*** • Pots (1x: or bowl) with a high short shoulder, relatively angular profile transitions and a very short neck (2x: drawings e and j) -source: Broeke's **type 33** or *42a;* *-Neck is too angular for 42a; it is also not akin to the examples of 42b, as the provided examples have curvy/rounded necks* -Broeke's **type(s) 33 or 34** • Slightly closed bowl/pot with a very short (nearly vertical) neck (drawing h) -Broeke's ***type 22*** (it is a bit too tall for the description, but otherwise perfectly fits the shape type) • Slightly closed wide bipartite bowl with angular belly-shoulder transition and a rim protruding outwards (drawing g) -Broeke's **type 32** • Other rim shapes with short necks that are *hard to classify* (e.g. drawing d) • Base type B2 (2x; once drawn: drawing f) • Mono/bi/tripartite • Pot build-up types I (1x), II (6x) and III (4x)	
Culemborg	2410±30	• Part of vessel with a relatively short shoulder, long slanted neck and (likely) a relatively flat diagonal belly -Verwers' classical **Marne shape** -Broeke's **type 73(a or b)** • One rim of open shape (no drawing); two sherds of tripartite vessels with either a short or fairly long neck (drawings b and c); *-difficult to classify* • Wide bowl/plate with a relatively straight body and a "bump" on the inner side of the body ("haakrand"; drawing d) -Broeke's **type 4** • "Zoutgootje" (drawings e and f) -Broeke's **type k-7** (2x)	

		• Mono/tripartite • Pot build-up types I (2x), II (1x) and III (3x)	
Best	>431	• One vessel reconstructed: • Angular belly-shoulder transition • Broeke's **type 45a according to source** • Broeke's **type 42a according to author** • Closed shape • Tripartite • Pot build-up type II	
Well	2290±30	• Slightly closed shape without neck (or unlikely; a very long neck) (drawing a): -seemingly Broeke's ***type 23a*** • Closed shape with a very short neck and a very angular belly-shoulder transition with presumably a relatively flat belly (drawing c) -Broeke's **type 32 or 33** *(unlikely but possible; type 31)* • Base type B3 (drawing e) • Rounded bowl that seems open; the outer body seems to narrow a bit down below the rim (drawing f) -Broeke's ***type 5a*** (***nearly 5b***) (it is not supposed to narrow down; bowl has the diameter that distinguishes 5a and 5b) • Pot with a relatively straight long shoulder and a relatively long vertical neck (drawing g) -Likely Broeke's **type 44b or 58** • Body sherds with angular profile transitions and seemingly long shoulders (drawings b and d) • Mono/bi/tripartite • Pot build-up types I (1x) II (1x) and III (3x) (possibly more)	
Culemborg	2285±30	• Vessel from grave reconstructed • Slightly closed small pot/bowl with rounded profile transitions and an S-shaped profile -Broeke's **type 52** • Closed shape • Tripartite • Pot build-up type III	

Best	2265±30	• Two shapes partially reconstructed • **Barrel-shaped pots:** 2x Broeke's **type 23b** possibly also 23a) according to source • Author calls other pot (left on drawing) Harpstedt (type 55a/b): I disagree (it has a low shoulder at large width): difficult to classify (also incomplete): likely **S-shaped** • *Sherd crafted into a disc (no drawing)* • Closed shapes • Bipartite and tripartite • Pot build-up types II (2x) and III (1x)	
Son	2265±30	• One shape partially reconstructed • Could be several shapes due to the lack of neck and unknown shoulder length; -Broeke's ***types 57-59****; unlikely but possible: 54-55* -Broeke's base type A4	
Oss	2260±40	• Wide open bowl with a very weak S/Z-shaped profile (bottom left drawing) -Broeke's **type 13** • Another bowl that is similar, but the angles have mostly disappeared (top+middle left drawing) -Broeke's **type 13** (similar examples counted as type 13 by Van den Broeke 2012, 51) • Barrel-shaped pot (bottom right drawing) -Broeke's **type 23a (or e.g. 22)** • Tripartite shape with a very short neck (top right drawing) *-difficult to classify* • Mono/bi/tripartite • Pot build-up types I (2x), II (1x) and III (1x)	
Culemborg (kuil 24)	2260±30	• Part of a closed pot (or bowl) with a short neck protruding outwards and a relatively high belly-shoulder transition (drawings a and e) -Broeke's ***type 52*** or ***type 55a*** (2x) (source only mentions latter) -Besmirched up to the rim (1x) • Part of a closed barrel-shaped pot without neck but with the rim slightly protruding outwards (drawing b) -Broeke's ***type 34*** *(though barely; belly-shoulder transition is a bit too rounded)* • Sherd of an open bowl with a very short shoulder and without neck (drawing c) -Broeke's **type 5b**	

		• Pot with a neck protruding outwards (drawing d) *-difficult to classify* • Base sherd with perforations (drawing g) • Closed barrel-shaped pot (no drawing) -Broeke's **type 23a** • Unclassified sherds of a rim with vertical neck and one closed shape without neck (no drawings) • Mono/bi/tripartite • Pot build-up types I (1x), II (3x) and III (6x)	
Culemborg	2235±30	• Slightly closed bowl with angular profile transitions, a long diagonal belly, a short shoulder and a shorter neck (drawing a) -Entire shape is polished -Broeke's **type 41** • Sherd of a plate with a rounded profile (drawing b) -Broeke's **type 3b** *(no type in source)* • Closed pot/bowl with a relatively flat shoulder and a very short neck (drawing c) -Broeke's **type 54** • Closed bowl (possibly pot) with an S-shaped profile and a short neck (drawing d) -likely Broeke's **type 52** *(not entirely certain; belly-shoulder transition has to be on upper half of the pot; no type in source)* • Closed shape with weak rounded profile transitions and a short neck (drawing e) *-difficult to classify* • Closed, probably bipartite shape without neck (drawing f) -possibly Broeke's ***type 23a*** • Base type B2 (drawings a and g) • Mono/bi/tripartite • Pot build-up types I (1x), II (1x) and III (3x)	

Cuijk	2180±35	• Fragmented shapes within the assemblage are not described/shown: one complete pot shape: • Tall pot with a fairly very closed profile, an S-shaped profile, a high and relatively flat shoulder and a thickened rim -Broeke's **type 58** • Tripartite • Pot-build-up type III	
Best	>299 BC	• Two vessels reconstructed: • Bowl/plate (top) and plate (bottom) with angular belly-shoulder transitions; -Broeke's **types 42a** (top) **and 32** (bottom) • Closed shapes • Bipartite and tripartite • Pot build-up types II and III	
Best (S7687)	>213 BC	• Two vessels mentioned: • Bowl (drawing): with angular belly-shoulder transition and short shoulder -Broeke's **type 71** • S-shaped profile (no drawing) • Tripartite (2x) • Pot build-up type I (and III?)	

Decoration

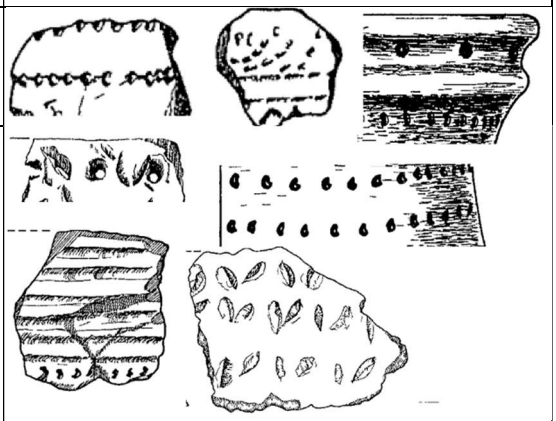
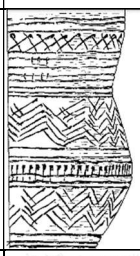
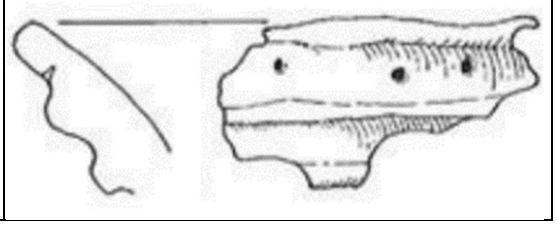
-NA = not applicable: it only includes one or a few complete pots, or there are no decorated rims/body sherds.

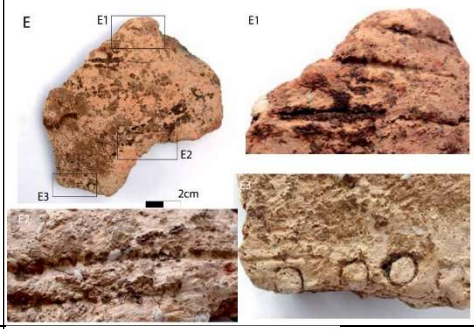
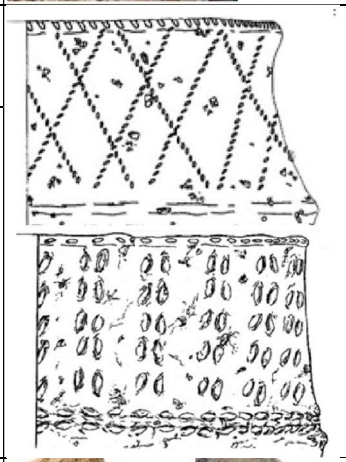
-NM = not mentioned.

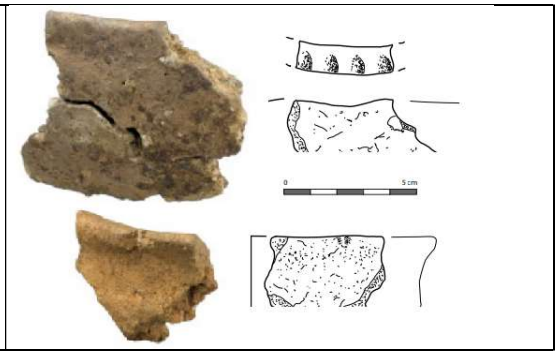
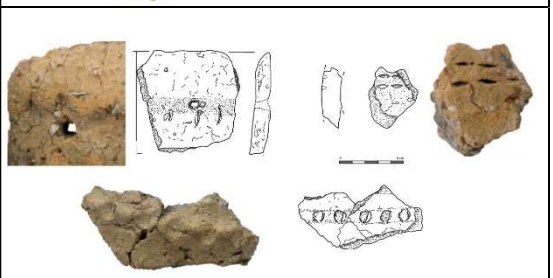
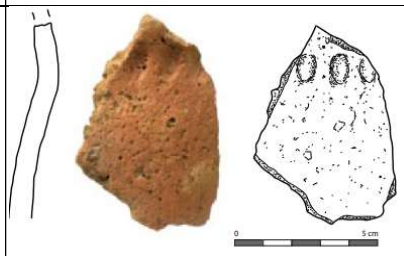
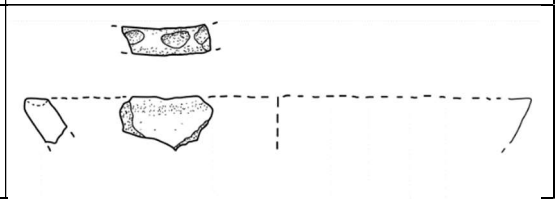
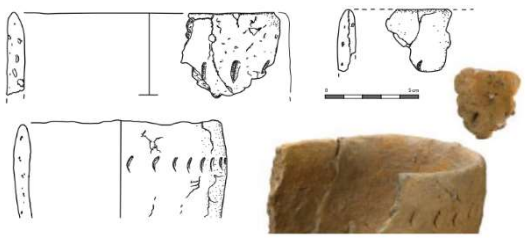
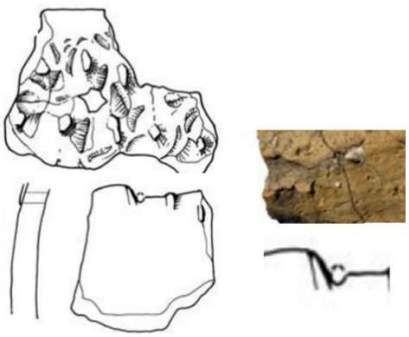
-X with a number (e.g. x5) means that there are 5 rims with body decoration (so not 5 rims in total).

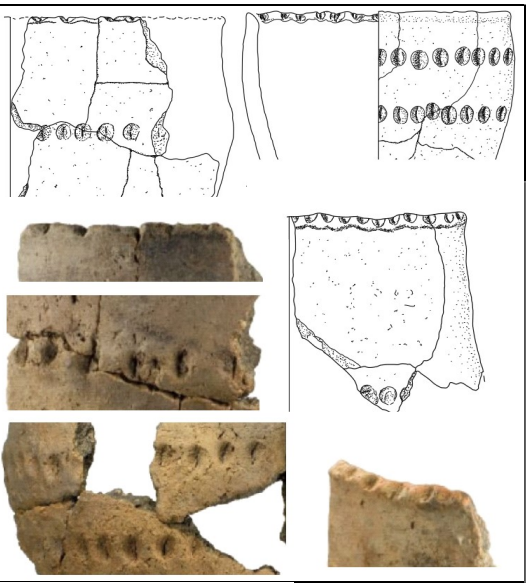
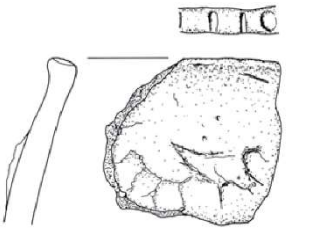
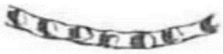
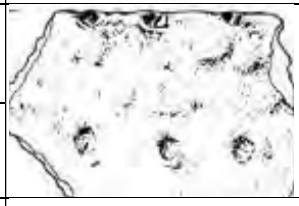
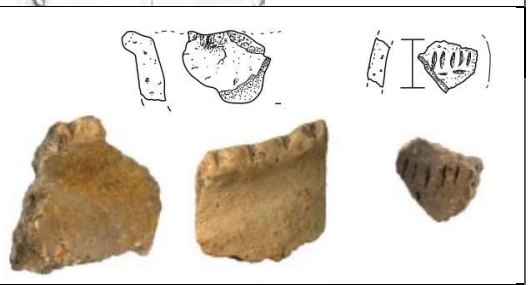
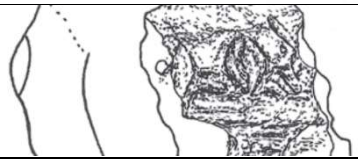
-The total amount of rims has to be at least 5, and the total amount of body sherds at least 20, for a percentage to be calculated/presented.

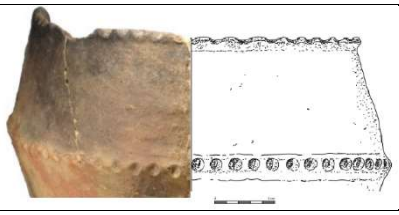
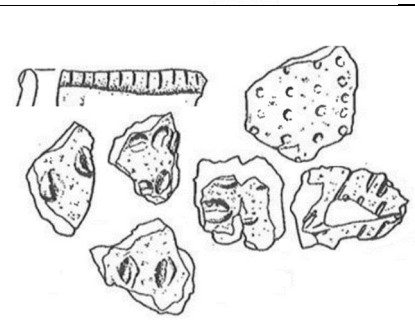
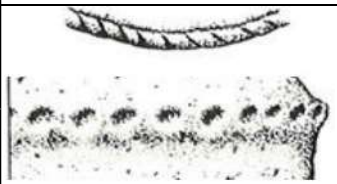
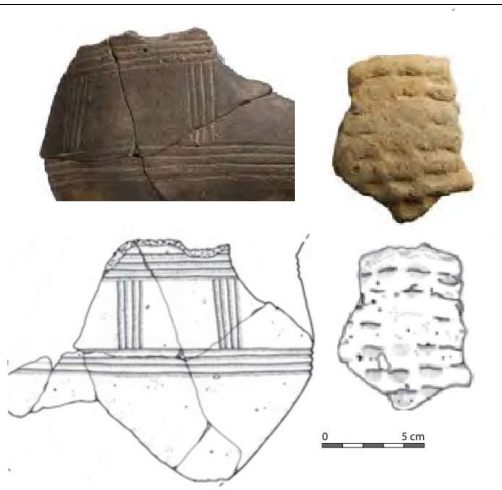
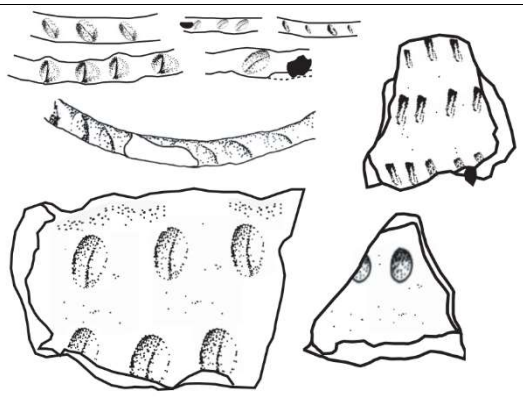
-To describe positioning on the belly-shoulder transition or the shoulder-neck transition, the word "transition" is left out.

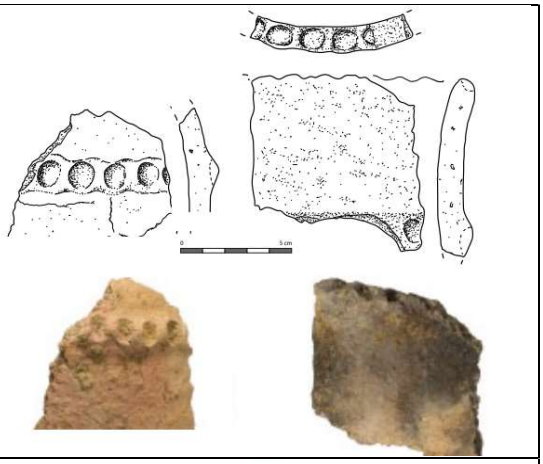
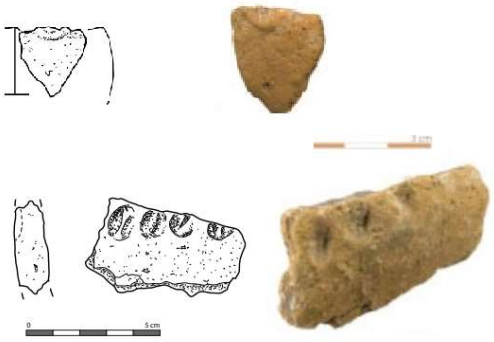
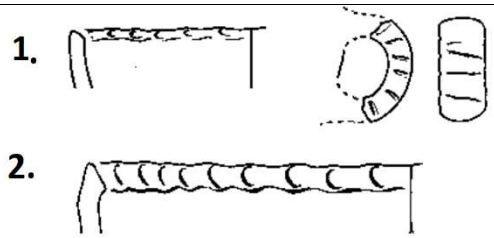
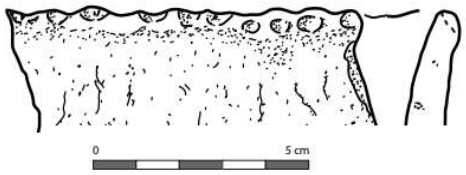
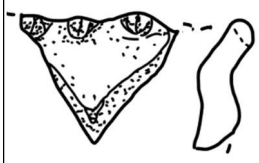
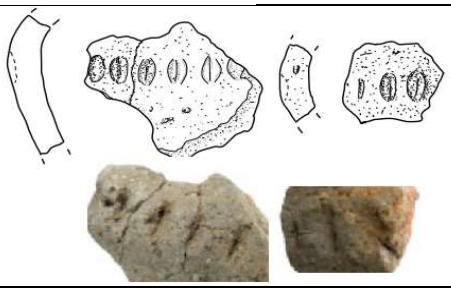
Toponym	**BP date or BC year of cut** (see first two tables of appendix)	First row: **type(s) of rim decoration** Second row: **type(s) of body decoration**	**% of rim/body decoration (if it is a fragmented assemblage) + positioning**	**Drawings/imagery**
Meteren	3665±60	• **Bell Beaker decoration** (no imagery or further explanation provided)	%NM	*No imagery*
Molenaars-graaf	**Tpq** 3640±30	*Decoration appears directly below the rim as part of patterns on the neck (paired finger/nail impressions)*	%NM	
		• (Paired) **Finger** impressions (absolute majority of decoration: 22x) • (Paired) **Nail** impressions • **Barbed wire** decoration • **Cannelures** (wide shallow grooves) • **Reed impressions** (circles/ ovals) on entire body • Irregular impressions (1x) • **Perforations** below the rim (3x) • **Cordons** on the neck (2x)	%Body (weight): **~92%** (10.5% in top of layer!) On entire body	
Molenaars-graaf	3635±40	**Grooves** (made with **spatula**) in a variety of patterns: -horizontal -vertical -crosses crossing each other -zigzag	%NA On entire body	
Meteren	3574±35	• **Perforations** below the rim (but not entirely through; round impressions, but narrower and deeper) **Two cordons** resulting into (at least) **two deep grooves**	%NA Neck(+more?)	

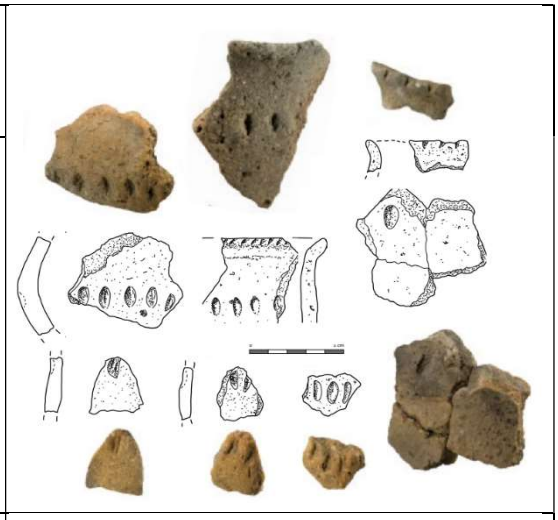
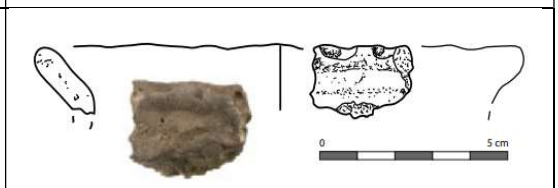
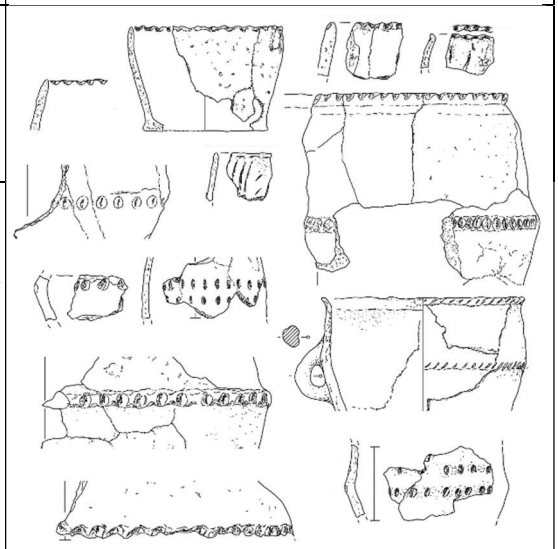
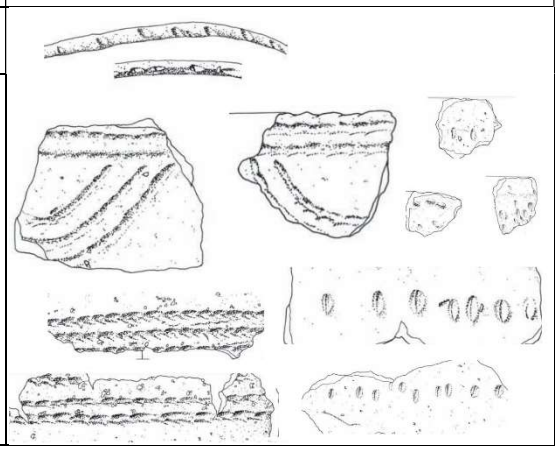
Culemborg	3555±40	• **Barbed wire** decoration in horizontal patterns • (non-hollow) **Reed/bird bone** impressions (circles/ovals) Horizontal decoration in break of one sherd: possibly cord or groove decoration	%Body (no known amount): **~25%** Positioning unclear	
Oss	3485±20	One sherd with; • **Barbed wire impressions** • (hollow) **Reed/bird bone** impressions (circles)	%NM, but calculated body (1x); **~2%** Positioning unclear	
Boekel	3470±60	• "**Twig**" impressions (similar to spatula?) (perpendicular) • **Nail** impressions (in the length)	%NA In front of rim	
		• **Cord** impressions in cross-hatched pattern above the belly/cordon • **Paired finger** impressions in vertical rows above the belly/cordon • **Cordon**: undecorated • **Cordon**: impressed by two rows of finger impressions (horizontal)	%NA Neck and shoulder	
Oss	3425±20	• **Cord** impressions (at least 1x; on the basis of pictures 2x)	%NM, but calculated body (2x); **~11%** Positioning unclear	
Oss	3400±40	• **Cordon: finger-impressed**	%NA Belly-shoulder	
Son	3365±35	• "Hole" (**perforation**) in the body of a sherd (only in description)	%NA Positioning NM	*No imagery*
Molenaars-graaf	3350±35	• **Perforation** (3x) • Very shallow grooves (not clear on image)	%NM Below the rim (neck/shoulder)	

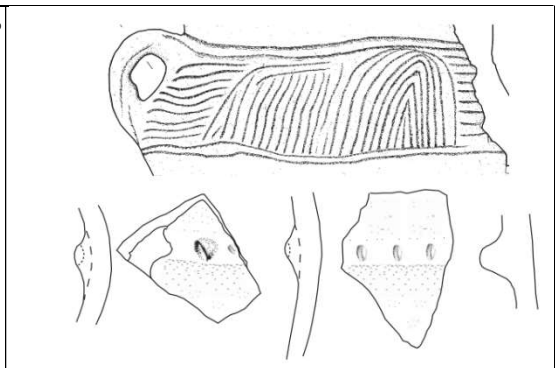
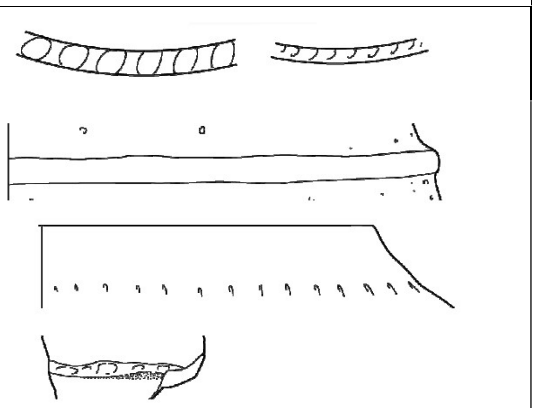
Son	3345±35	• **Finger** impressions (perpendicular) • **Nail** impressions (perpendicular)	%NA In front of rim	
Son	3320±35	• **Cordon: finger-impressed** (vertical) • **Nail** impressions -horizontal row of vertical impressions -two horizontal rows of horizontal impressions • **Perforation**	%NM, but calculated body (4x): **~5%** High on belly/shoulder *(upper half of body?)*	
Son	3290±35	• **Finger** impressions (vertical)	%NA Shoulder-neck	
Son	3280±35	• **Finger** impressions (in the length)	%NA On top of rim	
Son	3215±45	• **Finger** impressions -horizontal row of vertical impressions (3x)	%NM, but calculated body (5x): **~6%** Belly-shoulder (and/or high on belly; *upper quarter of body*)	
Heteren	3205±35	• **Nail/finger** impressions (1x: covering large part of the surface in a variety of directions) • **Perforation** (on the shoulder?) • **"Wart" decoration** (source); studded decoration as I call it for the IA (no image) **Ridge** pressed out of the body	%NM (very low) On the shoulder /neck	
Oss	3190±30	• **Nail** impressions (diagonal)	%NM On top of rim	

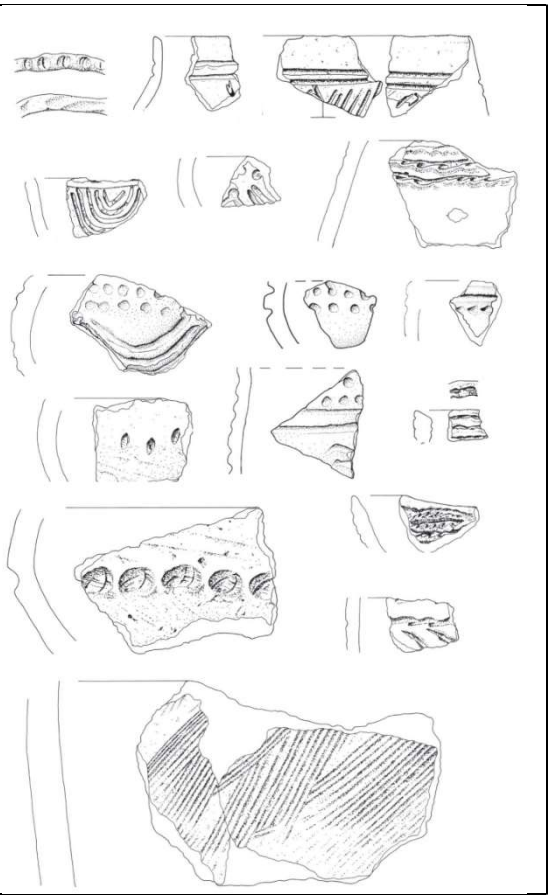
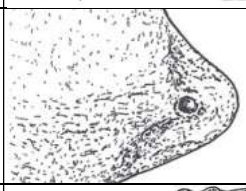
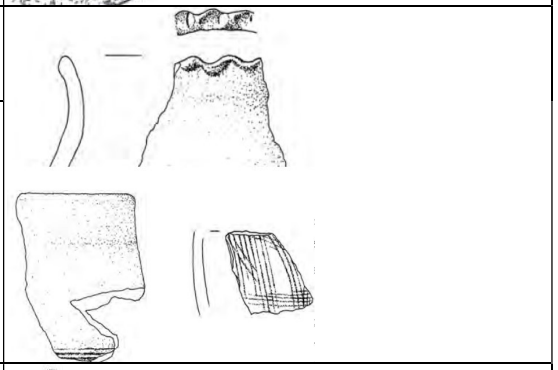
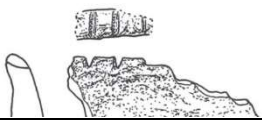
Son	3120±35	• **Finger** impressions (perpendicular) (3x different pots; 7x different sherds)	%NM, but calculated rim (7x): **86%** In front (1x), on top (1x) and inside (1x) of rim	
		• **Finger** impressions (vertical) -horizontal row of (deep) impressions (2x) -two horizontal rows of (deep) impressions (1x)	%NM, but calculated body (9x): **26%** Shoulder, belly-shoulder and/or high on the belly *(upper half of body)*	
Oss	3025±35 3000±30	• **Nail** impressions (perpendicular)	%NM On top of rim	
Son	3020±25	• **Round impression**/ *perforation not pressed entirely through the inner body*	%NA Below the rim	*No imagery*
Lent	2985±50	• **Finger** impressions (perpendicular)	%NA On top of rim	
Best	2970±30	• **Finger** impressions (perpendicular?)	%NA In front of rim	
		• **Finger** impressions (vertical?)	%NA Belly-shoulder	
Son	2970±30	• **Finger** impressions (perpendicular) (2x)	%NA In front of rim	
		• **Nail** impressions (vertical) -horizontal row	%NM, but calculated: **~2%** Positioning unclear	
Culemborg	2965±30	• **Cordon: finger-impressed** (vertical)	%NA (presumably) Belly-shoulder	
Son	2960±20	• **Cordon**: not further defined: undecorated?	%NA Positioning NM	*No imagery*
Son (S33.055)	2945±30	• **Finger** impressions (perpendicular) (2x)	%NA	

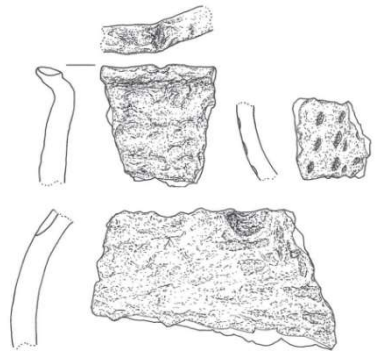
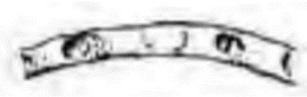
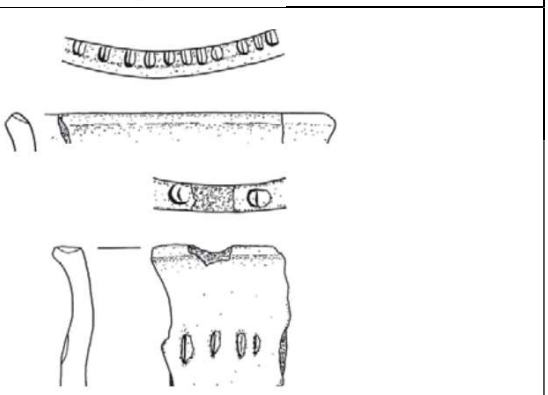
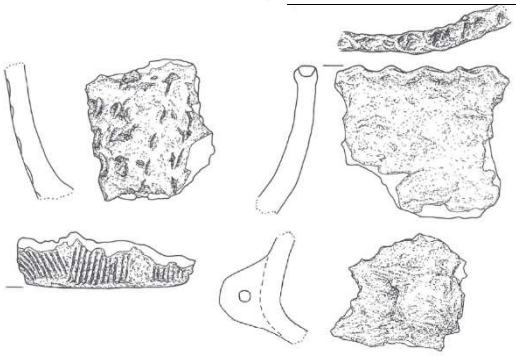
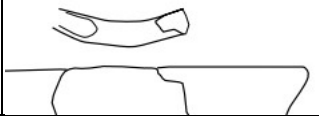
		• **Cordon: finger-impressed** (vertical)	%NA	
Nijmegen	2940±90	• **Nail (or spatula?)** impressions (perpendicular)	%Rim (1x): **20%** In front of rim	
		• **Finger** impressions • **Grooves** • **Circular** impressions	%Body (6x): **~12%** Belly-shoulder	
Groot-Linden	2935±30	• **Nail** (mentioned as finger) impressions (diagonal)	%NA On top of rim	
		• **Cordon: finger-impressed**	%NA Belly-shoulder	
Son	2930±50	• **Nail** impressions -separated horizontal impressions in horizontal rows • **Grooves** -horizontal and vertical parallel lines in groups of four with space in between	%NM, but calculated body: **~8%** Belly-shoulder and shoulder	
Rhenen	2930+30	• **Finger** impressions (perpendicular+diagonal) (5x) • **Nail** impressions (diagonal) (1x)	%Rim (6x): **~26%** On top (5x) and in front (1x) of rim	
		• **Finger** impressions (vertical) • **Spatula** impressions -thin and long -bulbous (practically **dellen**) • Only pattern: one or several **horizontal rows** • Same site: horizontal grooves with space in between	%Body (14x): **~11%** Mostly on/around belly-shoulder	
Son	2925±30	• **Finger** impressions (in the length)	%Rim (1x): **20%** On top of rim	

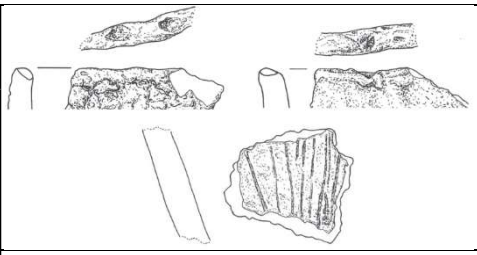
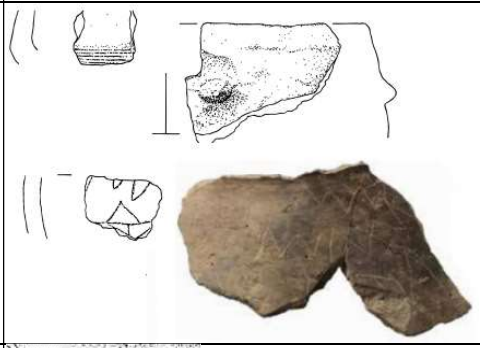
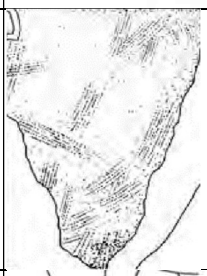
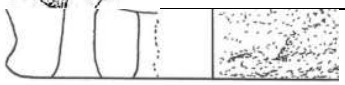
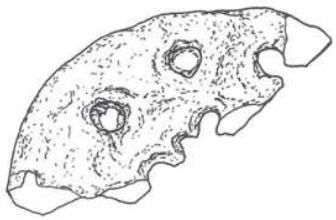
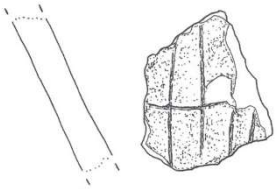
		• **Finger** impressions (vertical)	%Body (2x): **13%**	
Son	*3035±35* **2920±30**	• **Finger** impression(s)	%NA On top of rim	
		• **Finger** impressions (diagonal/vertical)	%NM, but calculated body (1x): **~2%** Positioning unclear (belly or shoulder)	
Sint-Oedenrode	2910+60	• **Nail** (1) and **finger** (2) impressions	%NA On inside of rim	
		• **Nail** impressions (horizontally placed)	%NA On ear	
Son	2910±40	• **Finger** impressions (in the length?)	%NA In front of rim	
Son (S19.177)	2885±35	• **Cordon: finger-impressed**	%NA	*No imagery*
Son (S33.032)	2885±35	• **Finger** impressions (perpendicular)	%NA In front of rim	
Son	2875±30	• **Finger** impressions (2x) (vertical)	%NM, but calculated body (3x): **12%** Belly-shoulder	

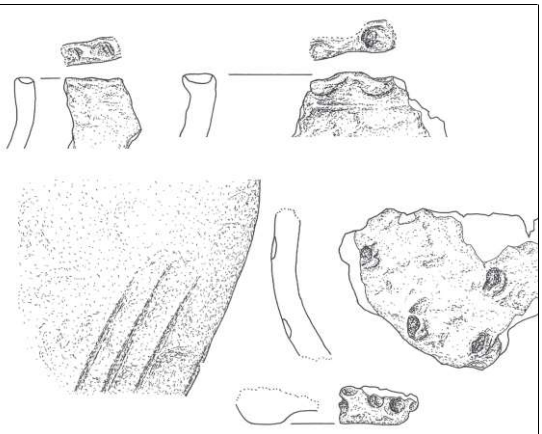
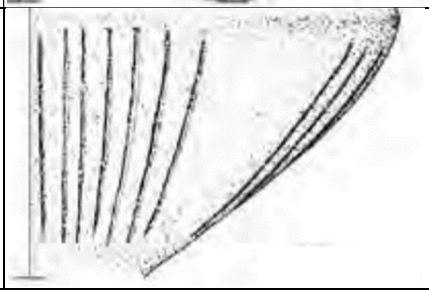
Son	2870±35	• **Nail** impressions (diagonal) • **Finger** impressions (perpendicular)	%Rim (2x): **40%** In front of rim	
		• **Finger** impressions (vertical) (5x) -horizontal row (4x)	%NM, but calculated body (6x): **~7%** Shoulder and Belly-shoulder	
Son	2860±35	• **Finger** impressions (in the length)	%NA On top of rim	
Son	2815±45	• **Nail** impressions (perpendicular; possibly also in length or diagonal) • **Finger** impressions (diagonal)	%NM, but calculated rim: **~33%** In front (4x?) and on top of rim (2x?)	
		• **Nail** impressions (vertical) -two horizontal rows • **Finger impressions** (vertical; sometimes diagonal) -one horizontal row (3x) -two horizontal rows • **Cordon: nail-impressed** (diagonal) • **Cordon: finger-impressed** (vertical) (2x)	NM, but calculated body: **~8%** Belly-shoulder (or belly-shoulder + shoulder)	
Tiel	*2815±35 (see remark in the third table of this appendix)*	• **Nail** impressions (diagonal and in the length)	Rim (2x): **~11%** On top of rim	
		• **Finger** impressions (in horizontal rows) • (Paired) **Nail** impressions (in horizontal rows) • **Interconnected finger/nail** impressions in horizontal and **pendant arch** (3x) patterns • Probably contemporaneous: horizontal grooves with space in between	Body (16x): **~5%** Variety of positions (lower neck to lower belly)	

Tiel	2770+35	• **Grooves** in vertical, horizontal and parabolic pattern (on one pot) • **Cordon: undecorated** • **Cordon: finger-impressed** (2x)	%Body (4x): **~12%** Shoulder-neck and shoulder	
Budel	2757±41	• **Finger** impressions (perpendicular + diagonal)	%Rim (8x): **~53%** On top of rim	
		• **Cordon** (6x; at least 3 vessels) -partially: with finger-nail impressions • **Nail(/finger)** impressions -horizontal row • **Comb decoration** (1x)	%Body (7x?): **~8%** Shoulder	
Son	2745±40	• **Nail impressions** -horizontal row of horizontal impressions	%NA Neck *(*and high on belly *slightly below rim)*	
Cuijk	2730±45 2710±30	• **Finger** impressions (2x) • **Nail** impressions (2x) • **Spatula** impressions (1x) • **Wavy/Cartel rim** (1x)	%Rim (6x): **~12%** On top of rim	

		• **Comb decoration** (3x) -random distribution • **Grooves** (5x): some seem to be *Kerbschnitt* on imagery: Broeke's subtype Ca -**pendant arch** pattern (3x) • **Finger impressions** -in one/multiple horizontal rows • **Nail impressions** -in zones/horizontal row(: if one row: Broeke's subtype A1c) -interconnected • **Spatula impressions** -in one/multiple horizontal rows • **Bulbous spatula** impressions *(dellen?)* (also combined with grooves/kerbschnitt)	%Body (19x): **~6%** Variety of positions: lower neck to upper belly	
Culemborg	2515±30	• **Lump ear** (knobbeloor) (perforated horizontally)	%NA Belly-shoulder	
Udenhout	2510±30 2450±30	• **Finger** impressions (perpendicular): *wavy appearance but not cartel rim*	%Rim (2x): **29%** On top of rim	
		• **Comb decoration** (2x) -Random distribution: Broeke's subtype Ca (1x)	%Body (4x): **2%** Belly	
Culemborg	2505±30	• **Big "Dellen"** -Group of four in a diamond-shape	%NM Positioning unknown (shoulder?)	
Culemborg (kuil 19)	2470±30	• **Spatula** (or nail) impressions (perpendicular)	%NM On top of rim	
Culemborg (kuil 23)	2470±30	• **Finger** impression(s) (perpendicular) (2x)	%Rim (2x): **25%** On top of rim	

		• **Nail** impressions (1x) -in several vertical rows • **Big "del(len)"** (2x)	%Body (3x): **3%** Positioning unknown (belly or shoulder)	
Best	2465±30	• **Finger** impressions (in the length)	%NA On top of rim	
Culemborg (spieker 67)	>724 BC	**Nail** impressions	%NA On the wider side of the conical-shaped whorl	
Oss	2460±30 2430±30	• **Finger** impressions (perpendicular)	%NM On top (1x) and inside (1x) rim	
		• **Nail** impressions -horizontal row: Broeke's subtype A1c	%NM Shoulder	
Groesbeek	2435±30	• Two **Perforations** (horizontal to one another)	%NA High on belly *not far below rim*	
Culemborg	2430±30	• **Finger** impressions (in the length): *wavy appearance but not cartel rim*	%Rim (2x): **33%** On top of rim and inside rim	
		• **Finger** and **nail** impressions (4x) - nail: in several vertical rows (1x) -finger: horizontal row (2x): Broeke's subtype A1c • **Comb impressions** (2x) • **Lump ear** (knobbeloor) (perforated horizontally)	%Body (6x) **9%** Belly-shoulder and belly *(directly above base)*	
Someren	2427±30	• **Finger** impressions (in the length)	%NM On top of rim	

Culemborg	2425±30	• **Finger** impressions (in the length + perpendicular)	Rim (2x): **12%** On top of rim (2x)	
		• **Grooves** -pattern of (mostly) parallel horizontal grooves with space in between: Broeke's subtype Bc	Body (1x): **~1%** Positioning unknown (belly?)	
Culemborg	2410±30	• **Likely finger/nail** impressions (no drawing/imagery of sherds)	Rim (2x): ~**22%**	*No Imagery*
Well	2290±30	• **Comb decoration** • **Grooves** (2x) -"messy" **zigzag pattern** (applied when the clay was hard, e.g. dried or partially baked • Type of **studded decoration** (applied lump of clay)	%NM On belly (regular decoration) and shoulder (uncommon decoration)	
Best	>431 BC	**Comb** decoration (1x) -random distribution: Broeke's subtype Ca	%NA Belly	
Culemborg (kuil 24)	2260±30	• *"Golfachtige versiering"*: likely **cartel rim (golfrand)**	%Rim (1x): ~**8%** At least on top of rim	
		• ***Grooves*** *(apparently not entirely certain)* • **Perforations** (likely highly functional; not really decoration)	%Body (1/2x): ~**1-2%** Positioning uncertain (grooves) and base	
Culemborg (S3163)	2260±30	• **Grooves** -rectangular pattern of vertical and horizontal lines: not mentioned in typology	%NA Positioning unknown (belly?)	
Culemborg	2235±30	• **Finger** impressions (perpendicular; 2x)	%Rim (2x): ~**33%** On top of rim	

		• **Finger** impressions (2x) -random (?) distribution on the body (with space in between) • **Small "Dellen"** (~6 cm) -covering most of the surface • **Grooves** -pattern of parallel diagonal grooves with space in between: Broeke's subtype Bc	%Body (3x): ~**6**% Belly	
Best	>299 BC	• **Grooves** (on the belly) -pattern of parallel vertical grooves with space in between: Broeke's subtype Bc	%NM Belly	
Best	>213 BC	**Grooves** (on the belly) -pattern of parallel vertical grooves with space in between: Broeke's subtype Bc	%NM Belly	

Temper and surface

Percentages below 5% not included (counted as exceptions), NM= not mentioned (neither shown on imagery), BP = Before Present, x with a number (e.g. x10) means there are 10 sherds that are decorated.

Toponym	**BP date or BC year of cut** (see first two tables of appendix)	**Type of temper** Grog/Grit/Organic	**Surface** Rough/Smooth/Polished/Besmirched
Molenaars graaf	**Tpq** 3640±30	• **Grog** (seemingly vast majority) • Quartz Grit (minority) • Granite Grit (minority)	NM
Molenaars graaf	3635±40	• **Grog + Fluvial Grit** (in one vessel)	• Source: **"**not particularly smooth": slightly smoothened?
Culemborg	3555±40	• Quartz **Grit** (majority) • Fluvial Grit (minority) • Muscovite granite grit (1x)	NM but relatively smooth (on images)
Oss	3485±20	• **Grit** (quartz; fine in size; low quantities)	NM but relatively rough (on images)
Boekel	3470±60	• **Grit** (quartz)	NM but relatively rough (on images)
Son	3425±45	NM, but pictures+drawings suggest: • **Grit** (quartz)	NM
Oss	3425±20	• **Grit** (quartz, but also other stone materials: based on picture; both vast and lower quantities)	NM but relatively rough (on images)
Oss	3400±40	• **Grit** (quartz; in vast quantities)	• **Rough** (one vessel)
Son	3365±35	NM, but pictures+drawings suggest: • **Grit** (quartz and some other material)	NM
Molenaars graaf	3350±35	• **No visible temper** (majority) • Grit (in small quantities) • Grog (in small quantities)	NM
Son	3345±35	NM, but pictures+drawings suggest: • **Grit** (quartz)	NM, but relatively smooth and seemingly a few shrinkage cracks (on images)
Son	3320±35	• **Grog** (rough) • **Grit** (big/rough quartz visible through the surface)	• **Rough** • Shrinkage cracks
Son	3290±35	NM, but pictures+drawings suggest: • **Sand or finer grit**	NM, but relatively rough (on images)
Son	3280±35	NM, but description suggests: • Grit (5x) • Grog (1x)	NM, but description suggests: Rough (5x) and Smooth (1x)
Son	3215±45	NM, but pictures+drawings suggest: • **Grit** (quartz)	NM, but relatively rough (on images)
Heteren	3205±35	• **Grit** (quartz) (~70%) • **Grit** (pink granite) (~13%) • **Grit** (quartz) and **sand** (in one vessel) (~17%)	NM
Son	3200±45	NM, but pictures+drawings suggest: • **Grit** (rough pieces visible through the surface)	NM, but relatively rough/uneven (on images)
Oss	3190±30	NM, but drawing suggests: • **Grit** in lower quantities	NM
Son	3120±35	NM, but pictures+drawings suggest:	NM, but relatively rough (on images)

		No rough grit visible through the surface: temper is finer or only visible in the fracture	
Son	3065±35	• **Grit** (big/rough quartz visible through the surface) • **Sand**	NM
Son	3060±40	NM, but pictures+drawings suggest: No rough grit visible through the surface: temper is finer or only visible in the fracture	NM, but relatively rough (on images)
Oss	3025±35	NM, but drawing suggests: • Grit in lower quantities	NM, but one vessel seems to have shrinkage cracks on the image
Oss	3025±35 3000±30	NM, but drawing suggests: • Grit in lower quantities	NM, but one vessel seems to have shrinkage cracks on the image
Haps	3010±45	• **Grit** (quartz; in vast quantities)	NM
Oss	3000±60	• **Grit** (equal amount to grog) • **Grog** (equal amount go grit)	• "Surface is better finished than MBA-B pottery": **Smoothened?**
Lent	2985±50	• **Grit** (quartz)	• **Smoothened** (belly)
Haps	2970±35	• **Grit** (quartz)	NM
Best	2970±30	NM (possibly in appendices of source; classified as Iron Age pottery by source: probably grog)	• **Rough** (one vessel) • Other: NM
Son	2970±30	NM, but pictures+drawings suggest: No rough grit visible on the imagery: temper is finer	NM, but both rough and smooth (on images)
Culemborg	2965±30	• **Grit** (in large quantities)	NM but Rough (on image)
Son	2960±20	• **Grog + Sand** in one vessel	NM
Son (S33.028)	2945±30	NM, but pictures+drawings suggest: No rough grit visible on the imagery: temper is finer	NM
Son (S33.055)	2945±30	NM, but pictures+drawings suggest: No rough grit visible on the imagery: temper is finer	NM, but relatively smooth (on images)
Nijmegen	2940±90	• **Grit** (coarse to fine quartz) (~50%) • **Sand** (reasonable amount) (~50%)	• **Rough** ("rarely smooth")
Groot-Linden	2935±30	• **Grit**	NM but Rough (on image)
Son	2930±50	• **Grit** (both big/rough and fine) • **Sand** (in combination with grit)	NM, but Smooth (on image)
Rhenen	2930±30	• **Grit** (46%) • **Grit + Sand** in one vessel (50%)	• **Smoothened** (if not: undetermined)
Son	2925±30	NM, but pictures+drawings suggest: No rough grit visible on the imagery: temper is finer	NM, but both smooth and very rough surfaces (on images) • Absence of shrinkage cracks
Haps	2920±50	• **Grog + Grit** (quartz) in one vessel	NM but rough (on image) • Straight vertical strokes on belly
Son	3035±35 **2920±30**	NM, but pictures+drawings suggest: No rough grit visible on the imagery: temper is finer	NM, but relatively rough (on images)
Sint-Oedenrode	2910±60	NM	NM but seemingly some straight and diagonal strokes on one vessel (on drawing)
Son	2875±30	NM, but pictures+drawings suggest: Barely any rough grit visible on the imagery: temper is finer	NM, but relatively rough (on images)
Son	2870±35	NM, but pictures+drawings suggest: • Grit (fine quartz; lower quantities)	NM, but relatively rough (on images)
Son	2860±35	NM, but picture suggests: • Grit (for at least one sherd)	NM

		• Not visible on another sherd (possibly grog)	
Cuijk	2840±40	• **Grog** (most) • **Grog** + **Sand** (in one vessel)	• **Rough**
Son	2815±45	• **Grit** (big/rough quartz visible through the surface) • **Sand** (big/rough) • **Grog**	NM
Tiel	*2815±35 (see remark in the third table of this appendix)*	• Grit + Sand in one vessel (17%) • **Grit + Grog + Sand** (in one vessel) (62%) • Grog + Sand in one vessel (16%)	• **Smoothened**
Cuijk	2800±30	• **Grog** (~64%) • *Not visible (~28%)* • *Few exceptions (grit/organic)*	• **Rough** (~62%) • **Smoothened/polished** (~39%)
Tiel	2770±35	• **Grit + Grog** in one vessel • **Grog** • **Grog + Sand** in one vessel (in equal amounts)	• **Smoothened** • Once polished
Budel	2757±41	• **Grit/Sand** (73%) • **Grog + Grit/Sand** (in one vessel) (22%) • **Grog** (5%)	• **Rough** (78%) • **Smoothened** (22%)
Son	2745±40	NM: probably fine temper of grit or grog	NM, but smooth(ened) (on images)
Best	2740±30	NM (possibly in appendices of source)	• **Polished** (one vessel) • Other: NM
Cuijk	2730±45 2710±30	• **Grog** (~68%) • *Not visible (~22%)* • *Variety of exceptions (grit/organic; often combined with grog)*	• **Rough** (~54%) • **Smoothened/polished** (~46%)
Well	2670±35	• **Grog** (usually in one vessel + Sand OR fine Quartz Grit) (~50%) • Fine **Grit** (quartz) + **Sand** in one vessel (~50%)	• **Besmirched** (17x-> ~40%) • **Smoothened** (3x-> ~7%): on shoulder/neck • Everything else = unclear: **rough** and/or undetermined
Culemborg	2515±30	• **Grog** (NM, but assumed from formulation; majority) • Grit (quartz; minority)	• **Polished** (both of the reconstructed vessels)
Udenhout	2510±30 2450±30	• **Grog** (all unless unidentifiable or in combination with sand)	• **Besmirched** (25x-> 39%) • **Smoothened** (+polished) (17x-> 27%) • **Rough** (16x -> 25%)
Culemborg	2505±30	• **Grog** (majority) • Grit (quartz; minority: 3x)	• **Besmirched** (1x) • **Smoothened** (1x) • Rest: NM
Culemborg	2475±30	• **Grog** (majority) • Grit (quartz; minority: 3x)	• **Besmirched** (majority of sherds with a proper surface: 23x); mostly from belly of a single pot • Rest: NM
Culemborg (kuil 9)	2470±30	• **Grog** • Grog and grit (quartz; 5x)	• **Besmirched** (small assemblage: 5x) • Rest: NM
Culemborg (kuil 19)	2470±30	• **Grog** (majority) • Grog and grit (in one vessel; quartz; minority: 4x) • Grit (quartz; minority: 2x)	• **Besmirched** (small assemblage: 4x) • **Smoothened** (at least one sherd) • Rest: NM

Culemborg (kuil 23)	2470±30	• **Grog** (79%) • Grog and sand (9%) • Sand (5%) • *Organic (1%)*	• **Rough** (65%) • **Smoothened/polished** (16%) • **Besmirched** (16%)
Best	2465±30	NM (possibly in appendices of source)	• **Besmirched** (belly) • **Smoothened** (neck)
Culemborg (spieker 67)	>724	• **Grit** (quartz; 3x) Rest NM: presumably **grog**	• **Besmirched** (2x)
Groesbeek	2455±30	• **Grog** (presumably with sand)	• NM, but visibly **smoothened**
Groesbeek	2435±35	• **Grit** (quartz)	• NM, but visibly **smoothened**
Culemborg	2430±30	• **Grog** (58%) • **Grit** (quartz) (18%) • Grit and grog (in one vessel) (8%) • Sand (5%)	• **Besmirched** (38x -> 49%) • **Rough** (28x -> 38%) • Smoothened/polished (7x -> 9%)
Someren	2427±30	• **Grog** (one with very big pieces) • Grit (fine in size: seemingly minority)	NM
Culemborg	2425±30	• **Grog** (82%) • Sand and grog (in one vessel) (6%) • Undetermined/invisible (12%)	• **Rough** (60x -> 50%) • **Besmirched** (36x -> 30%) • **Smoothened**/**polished** (16x -> 13%) • 1x polished rim sherd • 1x besmirched up to the rim
Culemborg	2410±30	• **Grog** (84%) • Grit/sand (some: + grog) (6%) • Undetermined/invisible (10%)	• **Besmirched** (59x -> 57%) • **Rough** (29x ->28%) • **Smoothened**/**polished** (15x -> 15%)
Culemborg	2285±30	• **Sand** (one vast quantities)	• **Rough** (mainly caused by the sand temper)
Best	2265±30	NM (possibly in appendices of source)	• **Besmirched** (~67%): below neck • Everything else = **rough** (incl. necks)
Son	2265±30	NM (grog?)	• **Polished**
Oss	2260±40	NM	• **Besmirched** (type 23a high up the shoulder)
Culemborg (kuil 24)	2260±30	• **Grog** (94%) • Rest: sand or not visible	• **Besmirched** (85x -> 66%) • **Rough** (35x ->27%) • **Smoothened**/**polished** (9x -> 7%) • 1x besmirched up to the rim (2x nearly)
Culemborg	2235±30	• **Grog** (79%) • Sand (8%) • Undetermined/invisible (11%)	• **Rough** (29x ->47%) • **Besmirched** (20x -> 32%) • **Smoothened**/**polished** (13x -> 21%)
Cuijk	2180±35	• **Grog** (in smaller quantities, but with big pieces)	Deemed unreliable by source: secondary burnt (so NM)
Best	>299	• NM (possibly in appendices of source)	• **Polished** (one vessel) Other: smoothened? (NM)
Best	>213	NM (possibly in appendices of source)	• Smoothened (mentioned for one pot) • Otherwise: NM (small assemblage)

Radiocarbon (^{14}C) dates and typological dates

Dendro = dendrochronological dating.

NA = not applicable.

NM = not mentioned.

Some notes are at the bottom of this table (Notes I to III).

Place	**BP date** (^{14}C dating: (see first table of appendix)	**BC date** (cal. BC from BP date or dendrochronological date: see first two tables of appendix) + % of certainty (2 sigma)	**Typological date** (according to source, in BC)	**Typological date** (by author: based on typology presented in chapter 2, in BC)	**Remarks** (Van den Broeke 2012, [page]; abbreviated to Broeke, [page])
Meteren	3665±60	**2204-1887** (95.2%) 2267-2264 (0.2%)	**<2000 BC**	NA	Bell Beaker assemblage with a dating that could be from the EBA.
Molenaars-graaf	**TPQ** 3640±30	**2070-1897** (74.6%) 2136-2076 (20.9%)	NA (outdated)	**2000-1800** (EBA)	It is one of the only old southern Dutch examples of the EBA traditionally used by typology.
Molenaars-graaf	3635±40	**2068-1892** (77.2%) 2136-2077 (18.2%)	NA (outdated)	**<2000**	Veluvian Bell Beaker that could be from the EBA.
Meteren	3574±35	**2029-1873** (84.2%) 1846-1818 (6.7%) 1802-1776 (4.5%)	EBA	**2000-1800** (EBA)	The rim, the additional cordon(s) and decoration can be associated with the complete vessel of Molenaarsgraaf (see this appendix: TPQ 3640±30).
Culemborg	3555±40	**1984-1862** (59.7%) 1856-1766 (28.9%) 2025-1992 (6.4%) 1757-1752 (0.5%)	NM	**2000-1800** (EBA)	Barbed wire impressions and the circular impressions are typical for this period.
Oss	3485±20	**1882-1745** (95.4%)	**2000-1800** (EBA)	**1900-1800** (late EBA)	Barbed wire impressions and the circular impressions are typical for this period. Due to the low amount of decoration (1 out of 53 sherds), it likely dates to a later phase of this period.
Boekel	3470±60	**1940-1622** (95.4%)	NM	**1880-1660** (most of MBA-B)	Arnoldussen would classify these as HVS types for which he provides the chronology on the left.
Son	3425±45	**1831-1615** (82.5%) 1881-1836 (13%)	**1800-1110** (MBA)	**1800-1100** (MBA)	Temper, rim shapes and lack of decoration would generally exclude the EBA and the LBA.
Oss	3425±20	**1882-1745** (95.4%)	**1800-1500** (MBA-A)	**1880-1660** (most of MBA-B)	Cord impressions are a stereotypical decoration type for HVS pottery of the earlier MBA-A.
Oss	3400±40	**1776-1607** (85.3%) 1874-1845 (5%) 1818-1801 (1.5%) 1581-1544 (3.7%)	NM	**1750-1390** (most of the MBA)	Arnoldussen would classify this as a DKS1a type for which he provides the chronology on the left.
Son	3365±35	**1701-1537** (81.4%) 1743-1707 (14%)	NM	**1800-1100** (MBA)	The fragmented sherds have temper and also e.g. thickness of MBA pottery. The base and rim sherds suggest barrel/ bucket-shaped profiles. The EBA (and to a lesser extent LBA) can generally be excluded for the lack of decoration.
Molenaars-graaf	3350±35	**1696-1532** (87.1%) 1740-1712 (8.3%)	NA (outdated)	**<2000-1800** (Neolithic; EBA; possibly also MBA-A)	Perforations are typical for the EBA. Rim shapes seem typical for EBA-MBA. Little quartz temper makes MBA-B unlikely. Neolithic is possible (perforations are also typical for this period).
Son	3345±35	**1694-1532** (89%) 1738-1715 (6.5%)	**1800-1100** (MBA)	**1660-1100** (MBA; excluding early MBA-A)	Three rim sherds lack any decoration on the body. With 19 vessels identified in the assemblage without any body decoration, the early MBA (with HVS characteristics) can likely be excluded.
Son	3320±35	**1687-1507** (95.4%)	**1800-1500** (MBA-A)	**1800-1500** (MBA-A)	Source states large (?) pieces of grog are a reason to date it to the MBA-A. With a presence of grog and typical MBA characteristics (shrinkage cracks/quartz), and lack of any defining LBA characteristics, this seems plausible.
Son	3290±35	**1631-1496** (93%) 1478-1456 (2.4%)	**1100-800** (LBA)	**1250-1000** (transition MBA-LBA)	The thin body, finer temper and sudden (relatively angular) shoulder-neck transition point to the LBA.

					Decoration and overall shape (e.g. diameter+barrel shape) are still typical for the MBA. Transition MBA-LBA may be considered. *Possibility: sherd might be an intrusion as it is very different from the other sherds in the assemblage.*
Son	3280±35	**1623-1495** (90.9%) 1478-1455 (4.5%)	NM	***1100-1000*** (LBA; but uncertain)	One rim has an MBA shape and a BA surface. Another rim is smooth with fine temper that seems to be from a very open shape or e.g. funnel-neck. The early LBA might be a possibility. *Possibility: smooth rim might be an intrusion.*
Son	3215±45	**1547-1407** (90.3%) 1609-1576 (4.3%) 1562-1554 (0.8%)	**1500-1100** (MBA-B)	**1660-1100** (MBA; excluding early MBA-A)	With several clear examples of barrel-(and bucket-)shaped DKS types and lack of decoration for 22 identified vessels, the early MBA (with HVS characteristics) can likely be excluded.
Son	3200±45	**1544-1390** (93%) 1601-1584 (1.3%) 1336-1322 (1.2%)	**1800-1100** (MBA)	**1800-1100** (MBA)	The fragmented sherds have temper and also e.g. thickness of MBA pottery. The base and rim sherds suggest barrel/ bucket-shaped profiles. The EBA (and to a lesser extent LBA) can generally be excluded for the lack of decoration.
Heteren	3205±35	**1531-1416** (95.4%)	**2000-1800** (EBA)	**2000-1800** (EBA)	Wart-like decoration appears on potbeakers and other Late Neolithic pottery (e.g. Fokkens *et al.* 2016, 239-240). This continued into the EBA. I rely on the source about it not dating to the Late Neolithic. Perforations with nail impressions are typical for the EBA and before the EBA according to source (this low on body?). *Possibility: rim with wart-like decoration might be an intrusion.*
Oss	3190±30	**1507-1415** (95.4%)	**~1300-800** (late MBA-B and LBA)	**1250-1000** (transition MBA-LBA)	*Source* (I agree): *some rims (also short necks): LBA or late MBA dating*. Finer/fewer temper: excludes most of the MBA. Lack of body decoration: excludes most of the LBA. One of the shapes looks more like late LBA or early EIA due to the long neck.
Son	3120±35	**1455-1283** (92.6%) 1494-1478 (2.9%)	**1100-800** (LBA)	**1100-800** (LBA)	There is a strong affinity to Desittere's Coarse Ware. The decoration of two horizontal rows excludes the Iron Age and is typical for the LBA (Broeke, 114). This decoration pattern and lack of rough quartz temper makes the MBA unlikely.
Son	3065±35	**1416-1256** (90.6%) 1248-1226 (4.8%)	**1800-1100** (MBA)	**1800-1100** (MBA)	Temper, quantity of temper and shape are stereotypical for the MBA in general.
Son	3060±40	**1421-1216** (95.4%)	**1200-1100** (end MBA-B)	**1250-1100** (end MBA-B)	Source *("after correspondence with ceramic specialists"*): typical for "1200-1100 BC". This might be because it has a shorter shape, a lip and a lack of rough grit temper. This seems in accordance with typology (section 2.5). I apply Ruppel's phasing definition (1250-1100) (also see Louwen 2021, 55).
Oss	3025±35	**1399-1194** (91.3%) 1144-1161 (2.2%) 1175-1161 (2.0%)	**1800-1100** (MBA)	**1800-1100** (MBA, more likely second half)	The rim shapes, temper and (supposedly!) shrinkage cracks suggest a MBA dating. MBA-B more likely due to the lack of decoration.
Oss	1. 3025±35 2. 3000±30	1. **1399-1194** (91.3%) 1144-1161 (2.2%) 1175-1161 (2.0%) 2. **1306-1124** (86.1%) 1381-1344 (9.4%)	**1800-1100** (MBA)	**1670-1100** (MBA-B, perhaps late MBA-B)	The shapes, temper and (supposedly!) shrinkage cracks suggest a MBA dating. Lack of decoration (on such a large amount of sherds) suggests MBA-B (or later MBA-A). One highly closed shape: close towards LBA?
Son	3020±25	**1318-1198** (73.2%) 1388-1338 (20.7%) 1171-1165 (0.7%) 1141-1133 (1.0%)	**1800-1100** (MBA)	*Not verifiable*	The type of decoration does not necessarily reveal a typological date. The source dating is probably based on temper/surface, but these are not shown/described in the source.

Haps	3010±45	**1402-1119** (95.4%)	NM	*1800-1100 (MBA)*	Temper makes this likely, but this alone is highly unreliable.
Oss	3000±60	**1405-1053** (95.4%)	NM	*1100-800 (LBA; but uncertain)*	Based on temper: LBA is the "transitional phase of grit to grog". The context makes this period more likely than e.g. EBA.
Lent	2985±50	**1321-1049** (85.6%) 1390-1337 (9.8%)	NM	**1250-800** (part of MBA-B and LBA)	The relatively tall barrel-shaped LRN/OHV shape type with grit temper is typical for most of the MBA. However, it is also a type that appears in the Iron Age. The belly being smoothened makes a dating to most of the MBA-B and IA unlikely.
Haps	2970±35	**1292-1052** (94.2%) 1369-1357 (1.3%)	NM	**1100-800; *575>*** (LBA, phase D>; latter is less likely)	The shape exists during the LBA, and after phase D in the Iron Age, but often with different types of surfaces, temper and decoration (Broeke, 61-62).
Best	2970±30	**1284-1055** (95.4%)	**250-0** (LIA)	**1780-800; 250-0** (part of MBA-LBA; LIA but less likely)	Source forgot details in the typological text about rim decoration and positioning of body decoration (Broeke, 111; 114; 126). Type also exists in typologies of the MBA. Temper could exclude the LIA.
Son	2970±30	**1284-1055** (95.4%)	**1100-800** (LBA)	**1250-1000** (MBA-LBA transition)	Decoration in front of the rim generally excludes the EIA and MIA (Broeke, 111). Barrel-shaped profiles and angular profiles are typical for the MIA (already excluded) and respectively for the MBA and LBA. MBA-LBA transition? The lack of long necks but presence of lips may support such a date.
Culemborg	2965±30	**1271-1054** (95.4%)	**1100-625** (LBA-phase B)	**1800-1100** (MBA; LBA/EIA unlikely)	Decoration and the position of decoration are typical for the MBA; see Note I.
Son	2960±20	**1261-1111** (94.2%) 1091-1084 (0.7%) 1064-1059 (0.5%)	NM	**1100-800;** *1250-1100 800-625* (LBA; early EIA and end MBA less likely)	A cordon with grog instead of grit as temper makes the LBA more likely than the MBA itself. The early EIA also has cordons (albeit very rare).
Son (S33.028)	2945±30	**1260-1048** (95.4%)	**1100-12** (LBA-IA)	***1100-800** (LBA?)*	Whereas no clear analogy of shape could be found, the rim shape is akin to a LBA beaker. The base is common among other beaker types. It is also atypical among shapes presented in extensive Iron Age typology. Therefore: LBA?
Son (S33.055)	2945±30	**1260-1048** (95.4%)	**1200-1000** (LBA-MBA transition)	**1250-1100** (end of MBA-B)	Author of the source makes analogies to LBA shapes in Desittere (1968b, 38) and Taayke (2004, 83), but both have a longer/lower shoulders, the first has a neck, and the latter is wider. The shape of this pot is very typical for the MBA. Because of finer temper and a lip, a general late MBA-B dating still seems plausible.
Nijmegen	2940±90	**1399-921** (95.4%)	NM	**1100-800** (LBA)	Rim decoration in front of the rim are known from the LBA and LIA (Broeke, 111). Also from the MBA. The shapes and round impressions may generally date to the LBA, MIA or LIA (Broeke, 120). Temper would generally exclude the LIA (Broeke, 128-129).
Groot-Linden	2935±30	**1227-1042** (91.7%) 1035-1017 (2.8%) 1256-1248 (1%)	**1800-1100** (MBA)	**1250-1000** (transition MBA-B-LBA)	The high shoulders, the cordon, the temper and the surface seem very akin to general MBA-B pots, but the angularity and the long neck make it seem like a transitional form to the LBA.
Son	2930±50	**1283-983** (95.2%) 945-940 (0.3%)	NM	**1000-800** (HaB: later LBA)	The two broader rounded shapes, the use of grit and the horizontal and vertical groove decoration on the shoulder make a (later) HaB dating very likely.
Rhenen	2930±30	**1222-1016** (95.4%)	NM	**1000-800** (HaB: later LBA)	Mainly based on temper (Broeke, 128-129). Shape and decoration often result into certain confusion, but e.g. two rows of impressions are known from LBA typology. The presence of broader open shapes with shorter necks points at (later) HaB.
Son	2925±35	**1225-1011** (95.2%) 1253-1250 (0.3%)	**900-800** (latest phase LBA)	**1100-800; 500>** (LBA or MIA>; LIA and	The author of the source dates it to the end of the LBA based on two analogies, perhaps unaware that

				Roman Period less likely)	one of these is ^{14}C-dated to ~1200-1000 BC. A lip is generally typical for the LBA, but this is not reliable, as similar rim shapes exist during from the early MIA onwards (Broeke, 90-91)
Son	2925±30	**1218-1016** (95.4%)	**1300-1100** (late MBA-B)	**1100-1000** (early LBA)	The presence of cordons makes the Iron Age (esp. >B) unlikely. A very long neck (>5cm), shape type 33 and shape type 23a are generally absent during the EIA, but present during the LBA (Broeke, 57; 61; 92-93). The first two do not appear during the MBA. It must therefore typologically date to the LBA. Presence of MBA features and lack of LBA decoration could indicate the early LBA. See Note II.
Haps	2920±50	**1266-977** (94.3%) 951-935 (1.2%)	NM	**1250-1150** (German phase in MBA-B)	The temper, the surface and the high shoulders are typical for the MBA. The neck is not (LBA). Ruppel (1990, appendix 4) shows rims that correspond with the shape and have similar dating. See (Louwen 2021, 55) for his phasing.
Lent	2920±50	**1266-977** (94.3%) 951-935 (1.2%)	NM	**1670-800**; *possibly >800* (part of MBA-B and LBA)	The relatively tall undecorated biconical/barrel-shaped LRN shape type with high shoulders and grit temper generally excludes the IA. It does show some affinity to LBA coarse ware. Moreover, the shape type does exist in the IA (Broeke, 55-61)
Son	*1: 3035±35* 2: **2920±30**	*1: 1409-1199 (94.8%)* *1140-1134 (0.7%)* 2: **1214-1016** (95.4%)	NM	**1250>** (later MBA, possibly thereafter)	The shapes and decoration reveal little of typo-chronological value. The complete shape is rather speculative. Decoration is common during a wide timespan (Broeke, 114). Lack of decoration and presence of fine temper generally exclude the EBA and most of the MBA.
Lent	2915±45	**1235-983** (93.1%) 1260-1241 (1.9%) 946-940 (0.5%)	NM	**1670>** (part of MBA-B and after; IA unlikely)	The relatively tall undecorated barrel-shaped LRN shape type with grit temper is typical for most of the MBA. However, it is also a type that appears throughout the LBA and IA, albeit less common with grit and the lack of besmirching or decoration.
Sint-Oedenrode	2910±60	**1271-924** (95.4%)	NM	**1000-800** (HaB: later LBA)	Typical LBA Ear Mug/Henkeltasse. Ear decoration is considered a LBA trait (Broeke, 207). Shape of an Ear Mug/Henkeltasse: dating to HaB.
Son	2910±40	**1225-983** (95.1%) 1254-1249 (0.3%)	**1100-800** (LBA)	**1100-800** (LBA)	The author of the source suggests the shoulder starts where it is fractured. If true, the neck length would generally exclude anything but the LBA and IA phases D-F (Broeke, 92-93). The decoration would exclude the MIA; and phase D (Broeke, 111). It should therefore date to the LBA.
Son	2910±35	**1220-1003** (95.4%)	**1050-800** (LBA: uses different definition in years here)	**1000-800** (HaB: later LBA)	My analogy to a specific subtype of funnel-necked pots/urns would indicate an early HaB as dating for the shape type. For it is not precisely the same, a general HaB dating for funnel-necked urns/pots is typologically more fitting (see appendix 1).
Son (S19.177)	2885±35	**1134-975** (80.2%) 1203-1441 (12.2%) 954-934 (3%)	**1100-800** (LBA)	**1800-625** (LBA- phase B)	Finger-impressed cordons have a long period of use (Broeke, 123; 125; 280). The source does not discuss the temper and position of decoration of these sherds.
Son (S33.032)	2885±35	**1134-975** (80.2%) 1203-1441 (12.2%) 954-934 (3%)	**1100-800** (LBA)	**1100-800; 250>** (LBA; LIA>)	Angularity in the pot profile and position of decoration would (for the research period), generally point at LBA, LIA or Roman Period (Broeke, 111).
Son	2875±30	**1129-968** (86.5%) 1193-1176 (2.2%) 1159-1146 (1.7%) 961-931 (5.1%)	**1800-1100** (MBA)	**1100-800** (LBA)	The author of the source describes the decoration and the ear as typical MBA characteristics. The ear is nevertheless typical for the LBA (see amphora/ear mugs in appendix 1; Broeke, 99-100). One shape also has a fairly angular belly-shoulder transition typical for the LBA.

Son	2870±35	**1126-929** (94%) 1187-1180 (0.9%) 1154-1149 (0.6%)	**1200-1000** (LBA-MBA transition)	**1000-800** (HaB: later LBA)	Despite the lack of characterizing LBA decoration, two shapes are featured by Desittere's typology, one of them (Beaker group F) having a typological date in HaB. Characterizing MBA features are lacking.
Son	2860±35	**1126-919** (94.1%) 1187-1180 (0.7%) 1155-1149 (0.6%)	**1100-500** (LBA-EIA)	**1250-500** (late MBA-EIA)	The rim sherd includes a short neck with angular shoulder-neck transition. Another sherd has rough grit temper and is relatively thick. This generally excludes most of the MBA, MIA and LIA.
Cuijk	2840±40	**1125-899** (95.4%)	**800-12** (IA)	**1100-450** (LBA-phases A-E)	Source did not consider the existing chronological value of ears for the LBA. There is also specific chronological value of "plugged ears" for the Iron Age (Broeke, 99-100).
Son	2815±45	**1112-893** (88.6%) 879-837 (6.8%)	NM	**1100-1000** (HaA/early LBA)	All LBA types may appear during HaA according to the typology. The overrepresentation of bipartite shapes with high shoulders and lack of diverse decoration types makes this likely.
Tiel	*2815±35 (see remark in the third table of this appendix)*	**1056-895** (90.4%) 875-841 (3.3%) 1080-1069 (0.9%) 1107-1097 (0.8%)	NM	**1000-900** (first half of HaB)	The rows of nail impressions, shoulder decoration, pendant arch pattern, presence of ears, presence of long necks, and angularity are typical for the (earlier) HaB of the LBA.
Cuijk	2800±30	**1018-895** (88.2%) 876-851 (5.7%) 1044-1033 (1.6%)	NM	**1100>** (LBA and IA: MIA/LIA less likely)	Assemblage is small and the neck (despite its length) is not long enough to exclude the LIA. The shape and lack if besmirching make MIA and LIA unlikely though).
Tiel	2770±35	**1004-830** (95.4%)	NM	**900-800** (second half of HaB)	The presence of long necks, shoulder decoration and two cordons makes the LBA likely. The very round short shape with a short neck is akin to shapes from the later HaB and HaC. The ear below the neck on a regular-sized pot should further exclude the IA (Broeke, 100; 271).
Budel	2757±41	**1009-811** (95.4%)	NM	**1100-1000** (early LBA)	Rather atypical compared to absolutely dated assemblages discussed in 3.1 by other researchers; also see Note III.
Son	2745±40	**984-811** (95.4%)	**1100-800** (LBA)	**1100-800** (LBA)	The neck length of one sherd (6+ cm) excludes most periods apart from the LBA and Iron Age phases D-F (Broeke, 92-93). Neck decoration may occur during both periods (appendix 1; ref. fig. 44), but finger/nail impressions are especially uncommon for the later period (ref. fig. 40 and 41).
Best	2740±30	**933-813** (92.8%) 971-956 (2.6%)	**375-12** (late MIA or LIA)	**900-800; 500>** (late LBA; MIA>)	One shape (type 32; 33) may date to the LBA and otherwise at least post-date phase C (Broeke, 59-61). Another one has (type 71; uncertain) a dating in the late LBA or post-date phase D (Broeke, 81-83).
Cuijk	1. 2730±45 2. 2710±30	1. **983-805** (95.4%) 2. **912-807** (95.4%)	NM	**900-800** (second half of HaB)	The shape types (e.g. 71) do have chronological value in the IA, but also in the LBA (e.g. Broeke, 80-81; 86-87). Decoration types (Kerbschnitt), patterns (e.g. pendant arch) and positioning (shoulder) are typical for the LBA. The lack of "traditional" early HaB shapes suggests the second half of HaB.
Well	2670±35	**901-793** (95.4%)	**800-500** (temper) **500-250** (shape)	**1000-650**	The mentioned shape type commonly appeared in the LBA, was rare in the later EIA and common in the later IA (Broeke, 67; 86-87). The temper suggests LBA, and possibly the EIA. Besmirching appeared 1000 BC> (Broeke, 105-106; 128-129).
Culemborg	2515±30	**653-543** (52.4%) **786-720** (24.4%) **708-662** (18.7%)	**800-500** (EIA)	**900-500** (late LBA; early EIA)	The combination of the two shape types (41; 53) and lump ears exclude the earlier LBA and MIA. The end of LBA should be included (Broeke, 67; 71; 100).

Udenhout	1: 2510±30 2: 2450±30	1: **786-541** (95.4%) 2: **594-412** (54.1%) 754-682 (26%) 670-609 (15.3%)	**650-500** (second half EIA)	**650-500** (second half EIA)	Especially imported type k-7 can be tied to this period (Broeke, 166-167): without it, "800-500 BC" would probably be the dating based on local pottery.
Culemborg	2505±30	**780-540** (95.4%)	**725-550** (phase B-C)	**725-550** (phase B-C)	The (rarer type of) decoration is considered very typical for phase B and C of the EIA (Broeke, 119-120).
Culemborg	2475±30	**770-471** (94.2%) 434-423 (1.3%)	**800-500** (EIA)	**800-450** (EIA- E)	Shapes of this type (with these proportions) seemingly only appear in the EIA and phase E (Broeke, 66-68).
Culemborg (kuil 9)	2470±30	**766-465** (93.4%) 436-422 (2.1%)	**1100-500** (LBA-EIA)	**1100-500** (LBA-EIA)	The typological date of this assemblage is mainly based on the (small minority) of grit temper, and comparison of body sherds (colour/surface).
Culemborg (kuil 19)	2470±30	**766-465** (93.4%) 436-422 (2.1%)	**650-500** (phase C-D)	**650-500** (phase C-D; but see remarks)	The two shape types are both placed in phases C-D (Broeke, 49-50; 166-167). The spatula/nail impressions would more likely suggest LBA/LIA (Broeke, 108)!
Culemborg (kuil 23)	2470±30	**766-465** (93.4%) 436-422 (2.1%)	**250-12** (LIA)	**250-12?** (LIA? Alternatively: "big dellen": 650-500)	LIA based on shape fragments (e.g. short necks), dellen decoration, presence of organic temper and % of besmirching. Dellen are most commonly known from phases C-D (Broeke, 119-120). This is disregarded by the author of the source (I think he only read "datering lokaal"). I nevertheless agree with the dating.
Best	2465±30	**761-458** (91.6%) 442-418 (3.8%)	**800-500** (EIA)	**800-500** (EIA)	Shape type 55a + neck smoothened (Broeke, 71) + belly besmirched: EIA.
Culemborg (spieker 67)	NA (dendro)	**>724**	**1100-500** (LBA-EIA)	**1000-500** (later LBA-EIA: EIA more likely)	Besmirching indicates a dating after 1000 BC (but increases during the EIA). Grit temper likely does not appear here in the MIA (Broeke, 105; 128-129; 273).
Oss	1: 2460±30 2: 2430±30	1: **671-453** (60.5%) 758-679 (29.3%) 446-416 (5.7%) 2: **571-404** (68.7%) 750-686 (18.2%) 667-638 (7.8%) 588-579 (0.9%)	**650-500** (phase C-D)	**800-450** (EIA-E)	Shapes generally point at the EIA (Broeke, 47-49; 54-55; 69-74). The (type of) ear excludes everything after phase E (Broeke, 100-101). The specific date by the source may e.g. be true if other data (e.g. %) had been included in the publication.
Groesbeek	2455±30	**596-414** (50.6%) 755-680 (27.7%) 670-607 (17.1%)	NM	**1100>** (entire LBA/EIA)	The common occurrence of both of the shape types make a precise dating impossible (Broeke, 61; 69).
Groesbeek	2435±35	**591-406** (64.3%) 751-684 (20.7%) 668-634 (9.3%) 622-613 (1.2%)	**~800-400** (EIA or start MIA)	**~800-400** (EIA or start MIA)	Dating based on perforations (Broeke, 103). Quartz grit temper is common in the MIA for Groesbeek (exception!) and areas further north (Broeke, 129).
Culemborg	2430±30	**571-404** (68.7%) 750-686 (18.2%) 667-638 (7.8%) 588-579 (0.9%)	**650-500** (phase C-D)	**650-500** (phase C-D)	Several shape types and lump ears point at EIA or phase E (Broeke, 47-49; 57; 67-68; 73; 100). Decoration types, high % of besmirching (in this area) and high % of grit temper make phases C-D highly likely (Broeke, 105; 123; 128-129).
Someren	2427±30	**592-402** (66.8%) 752-683 (18.8%) 669-633 (8.6%) 623-612 (1.2%)	**650-500** (second half EIA)	**650-500** (second half EIA)	Especially imported type k-7 can be tied to this period (Broeke, 166-167): without it, "1100-500 BC" would probably be the dating based on local pottery.
Culemborg	2425±30	**570-403** (72.3%) 749-686 (16.1%) 666-640 (6.8%) 587-583 (0.3%)	**450-325** (phases F-G)	**450-325** (phases F-G)	Positioning (23a) and % of besmirching suggest phases C-J (Broeke, 105-106). Shape types (e.g. 32) narrow it to phases E-G (Broeke, 59-63; 67). The groove pattern's dating for Oss (G>) does not apply to the wider region (Broeke, 117).
Culemborg	2410±30	**550-399** (81.1%) 743-692 (10%)	**575-500** (phase D)	**575-500** (phase D)	Shape type 4, shape type k-7 and % of besmirching help narrow it down to phase C-D (Broeke, 49-50;

		665-646 (4.4%)			105-106; 166-167). Shape type 73 only appears from phase C onwards (Broeke, 83).
Best	NA (dendro)	**>431**	**500-250** (MIA)	**1000-0>** (MIA=likely)	Source dating based on shape + decoration: other periods might be possible (Broeke, 64-69; 87; 118-119).
Well	2290±30	**405-352** (60.4%) 291-209 (35%)	NM	***<800;* 575-325; *12>*** (phase D-G; possibility of LBA and Roman Period)	One incomplete shape (type 31, 32 or 33) excludes a dating before phase D (LBA = possible) (Broeke, 59-61). Another shape (type 44b or 58) does not appear after MIA phase G, but the Roman Period is possible (Broeke, 68; 77-79). See Note IV.
Culemborg	2285±30	**403-351** (56.1%) 292-209 (39.3%)	**650-500; 400>** (phases C-D; G>)	**1100-500; 400>** (LBA, phases C-D; G>)	The dating, based on the shape, should also be extended to the LBA (Broeke, 69; 71; 87).
Best	2265±30	**311-207** (55.9%) **396-349** (39.5%)	**800-450** (EIA to early MIA)	**800-0>** (likely EIA; early MIA; possibly also LBA)	Shape + pot context (Broeke, 55-57) are typical for the EIA (but not exclusive!). It should be noted that the main shape type (23b) can generally also be associated with the LBA. This includes besmirched examples!
Son	2265±30	**311-207** (55.9%) **396-349** (39.5%)	**500-250** (MIA)	**1100>** (LBA>)	It being polished on the outside may be a reason to date it to the MIA for the authors of the source, but it is highly questionable without rim/neck.
Oss	2260±40	**312-206** (95.2%) 395-349 (36.3%)	**350-250** (phase H)	**350-250** (phase H)	All shape types: typical for type H. All types phase H "predominantly exists of" appear in this assemblage (Broeke, 139).
Culemborg (kuil 24)	2260±30	**312-206** (95.2%) 395-349 (36.3%)	**575-200** (phase D-start LIA)	**575-250** (phase D-H)	Shape types and the type of perforations indicate it must post-date phase D or date to the LBA (Broeke, 48; 50; 61; 97-98). Positioning and % of besmirching indicates phases C-J, most likely MIA (Broeke, 105-106). Lack of decoration excludes the LIA (Broeke, 107; 112).
Culemborg (S3163)	2260±30	**312-206** (95.2%) 395-349 (36.3%)	*Source: cannot be dated*	***400>*** (phase G>; *to be taken with a grain of salt*)	The groove pattern has vertical lines, which are of chronological importance to Oss. It is different for sites further away from Oss, but it may still apply to Culemborg (116-117; 277; 329).
Culemborg	2235±30	**321-201** (71.2%) 389-342 (24.2%)	**250-12** (LIA)	**250-12** (LIA; possibly a bit earlier)	Three types exclude the EIA and early MIA. One type is typical for the LIA (Broeke, 47-49; 67; 69-71; 86; 95-96). % of besmirching excludes the LBA and Roman Period. It is also low for the MIA (Broeke, 104-105). The dellen decoration pattern (and also grooves) is typical for late MIA and LIA (Broeke, 117; 119).
Cuijk	2180±35	**368-147** (91.8%) 139-110 (3.7%)	**800-12** (IA)	**800-250** (MIA-EIA; LBA and LIA possible)	The shape type would place it in the EIA or MIA (Broeke, 77-79). It seems atypical for the LBA (unlike other examples of the same type).
Best	NA (dendro)	>**299**	**450-350**	**475-350**	Type 32 is regionally tied to this period (Broeke, 59-61).
Best	NA (dendro)	>**213**	**375-250**	**800-150** (most IA: likely late in period)	Shape typical for EIA, but appears until phase J and it looks more akin to the examples from the later MIA. Decoration typical late MIA-LIA (but appears in EIA) (Broeke, 80-83; 117).

Note I: The combination of vast quantities of quartz grit temper (typical for the MBA) and an impressed cordon at that angle are typical for the MBA (e.g. see: Drenth 2018, 166). LBA-EIA examples are possible, but the ones of the EIA are relatively rare (Van den Broeke 2012, 123). LBA examples are often on the shoulder or shoulder-neck transition (Van den Broeke 2012, 123; Desittere 1968b, 73; 77; 84; 94; 111; 118), unlike the examples from this assemblage (inversed; so most likely belly-shoulder transition). It has therefore been given a general MBA dating and excluded the LBA/EIA.

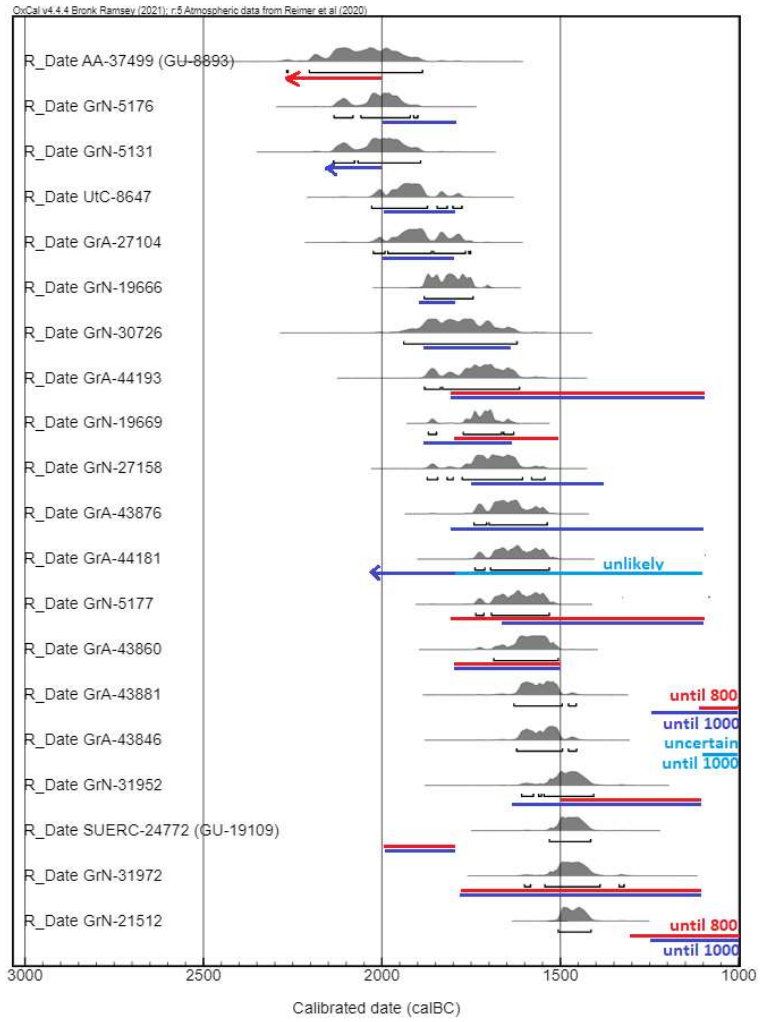
Note II: The author of the source typologically dates it to 1300-1100 BC based on the absence of shrinkage cracks and shape diversification. The author refers to conversations with ceramic specialists. This is nevertheless knowledge not mentioned by major typo-chronologies on this topic. Aside of this, this assemblage (combined with some others) can be used to argue that ^{14}C dating generally shows shape diversification occurred before 1100 BC (section 3.1.3).

Note III: Similar shapes of DKS-like coarse ware (with cordons) are known from late LBA contexts (>1000 BC) that lack absolute dating (Arnoldussen and Ball 2007, 190-191). Bowls of type 3b that lack absolute dating are sporadically also known from later LBA contexts (~1000-900 BC) (Van den Broeke 1991, 196; 2012, 49). However, given the lack of necks in the assemblage, the presence of a (rather typical) DKS type, the occurrence of coarse ware in HaA according to Desittere's typology and the dominance of grit temper in the assemblage (with small presence of grog), an earlier dating seems more likely (1100-1000 BC). It should be noted that the closure of some of the shapes is not something known from the typologies of this period or the previous period, but some MBA-B shapes of this dataset seem to be similar (3025±35 BP and 3000±30 BP).

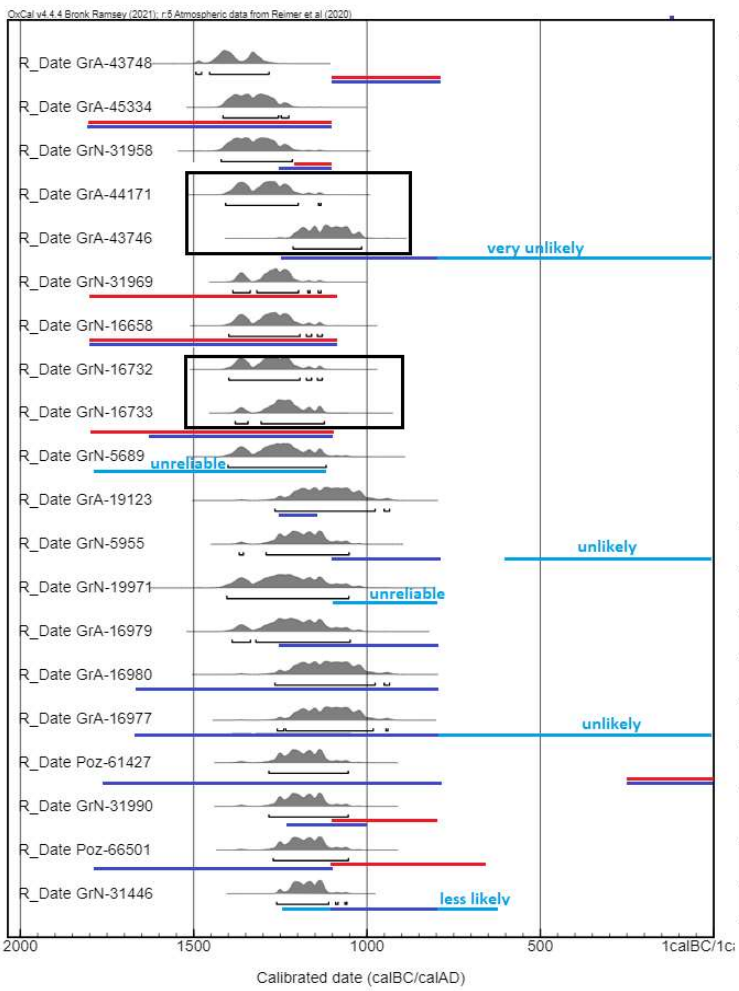
Note IV: Besides comb decoration, the decoration types of this assemblage are not covered by typology. The author of the source suggests inspiration of the potters by Neolithic pottery sherds they are said to have come across (Bloo 2019, 55). The entry of this assemblage in the dataset was created with limited information from a short article predating the official publication. More elaborate (and chronologically helpful) information may be available in the excavation report (e.g. %/absence of besmirching; Bloo 2021).

Appendix 4: Comparison of ^{14}C dating with typo-chronology

Remarks: Visual representation of absolute dates of assemblages from the dataset. This includes ^{14}C dates (BP dates on the right), recalibrated ^{14}C dates (black/grey charts), dendrochronological dates (BC dates on the right + thick black stripes), typo-chronological dates according to the source of the publication (red stripes) and typological dates according to the author of this research (blue stripes). The labcodes of the ^{14}C dates are shown on the left. The black boxes around two individual dates indicate that both dating results are from a single context. The sources and data used to create this appendix can be found in appendix 3.

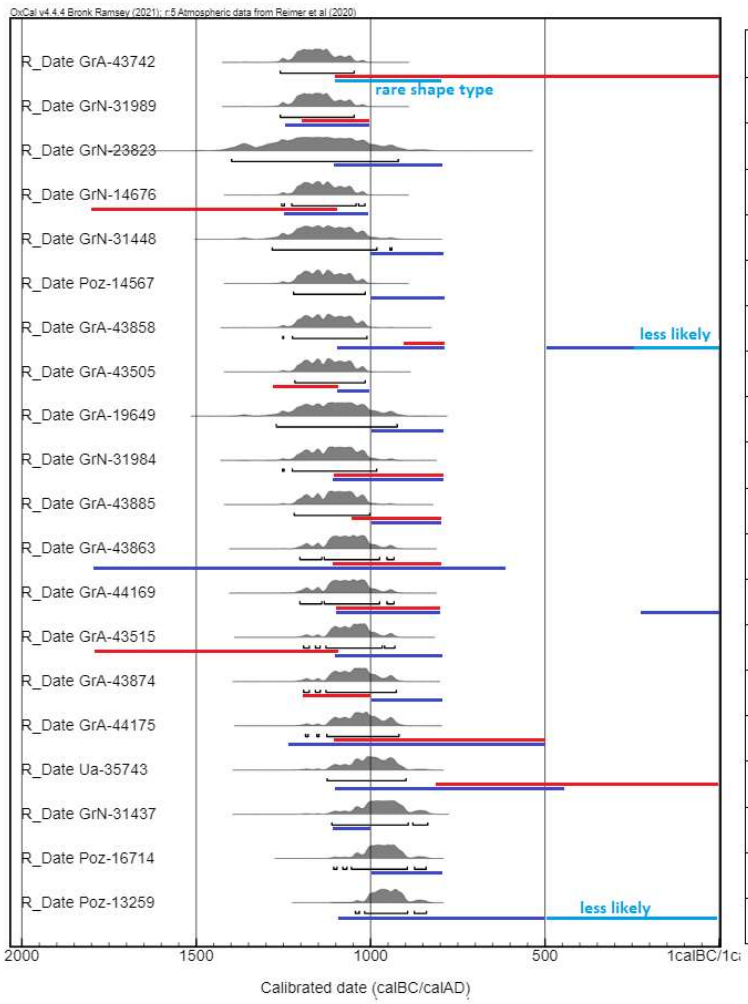


BP date	±	
3665	60	
3640	30	
3635	40	
3574	35	EBA
3555	40	
3485	20	
3470	60	
3425	45	
3425	20	
3400	40	MBA-A
3365	35	
3350	35	
3345	35	
3320	35	
3290	35	
3280	35	
3215	45	
3205	35	MBA-B
3200	45	
3190	30	

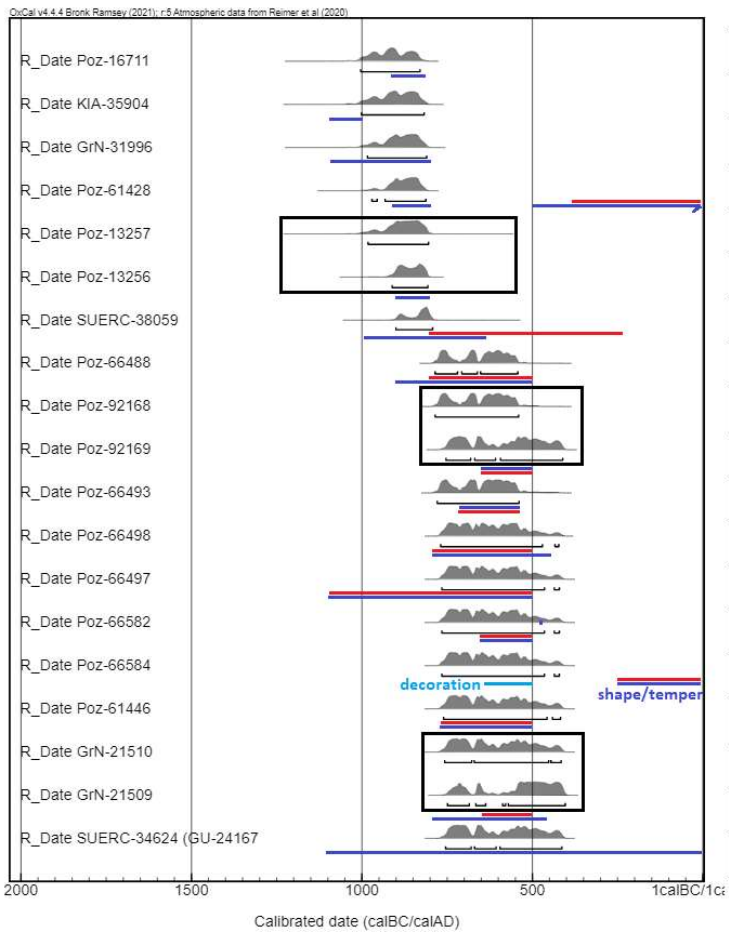


BP date	±
3120	35
3065	35
3060	40
3035	35
2920	30
3020	25
3025	35
3025	35
3000	30
3010	45
2920	50
2970	35
3000	60
2985	50
2920	50
2915	45
2970	30
2970	30
2965	30
2960	20

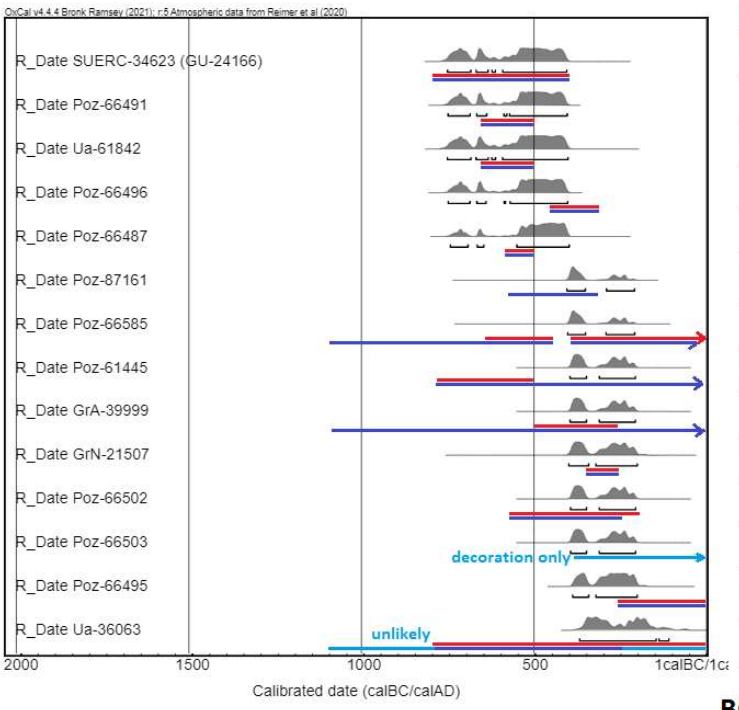
MBA -B



BP date	±	
2945	30	
2945	30	
2940	90	
2935	30	
2930	50	
2930	30	MBA-
2925	35	LBA
2925	30	
2910	60	
2910	40	
2910	35	
2885	35	
2885	35	
2875	30	
2870	35	
2860	35	
2840	40	
2815	45	LBA
2815	35	
2800	30	



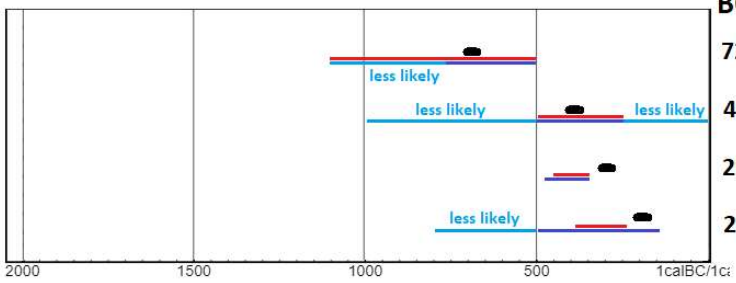
BP date	±	
2770	35	
2757	41	
2745	40	
2740	30	**LBA**
2730	45	
2710	30	
2670	35	
2515	30	
2510	30	
2450	30	**EIA**
2505	30	
2475	30	
2470	30	
2470	30	
2470	30	**EIA-start MIA**
2465	30	
2460	30	
2430	30	
2455	30	



BP date ±	
2435	35
2430	30
2427	39
2425	30
2410	30
2290	30
2285	30
2265	30
2265	30
2260	40
2260	30
2260	30
2235	30
2180	35

EIA-start MIA

MIA-Start LIA



BC date (year tree was cut)

724

431

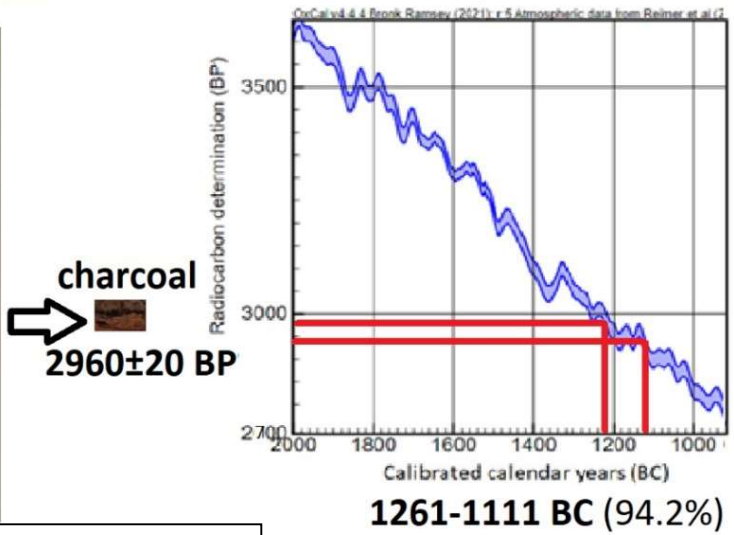
299

213

IA dendro-chronological dates in BC

Ceramics Re-Functionalized

Part II: Reference Collection



Rex Victor Brandsma

Image frontpage: Image assembled by author: top images (by author), bottom left image (after Glasbergen 1954, 105) and the bottom right image (after c14.arch.ox.ac.uk). The (BP) dating result of this image could be expected on the basis of typo-chronology, but is nevertheless improvised (!).

Table of Contents

Title:

Manual to the reference collection for Bronze and Iron Age ceramics in southern Netherlands

Product to the thesis Ceramics Re-Functionalized

1. Introduction

This is a manual to a reference collection for Bronze and Iron Age ceramics in the southern Netherlands. Both are part of the Graduation Project "Ceramics Re-Functionalized" in which an overview of ceramics in the Bronze and Iron Ages from the south of the Netherlands is made. The overview was created based on a scientific research of the different earlier developed typo-chronologies for this period and later research that applies absolute dating (Brandsma 2022).

The reference collection is thus part of a MA Graduation Project. As a product, it is provided on its own together with this manual (part II). It is related to the academic paper (part I) that is provided as a separate document (Brandsma 2022). The paper forms the scientific substantiation for the reference collection. References are made between the academic paper and the current document. The academic paper is commonly referred to as "(the) thesis".

This manual is linked to a physical reference collection that is kept at the faculty of archaeology. The purpose of the manual is to serve as a catalogue of the reference collection and complement it with additional figures and tables providing an overview of pottery characteristics for the six distinguished periods: Early, Middle- and Late Bronze Age, and Early, Middle- and Late Iron Age. This is especially for the periods that are less represented in the physical reference collection. The main goal of the project was the creation of a physical reference collection usable for educational purposes. The collection is hopefully also beneficial for the elaboration of the many Bronze and Iron Age excavations carried out by companies.

It is advised to use the quick start guide of section 1.1 to get accommodated with the characteristics that are important to observe when trying to date a sherd, a vessel or an assemblage. This guide introduces common characteristics from the start of the Bronze Age till the Roman Period.

For more information on terminology, research history and typological developments, the reader is referred to chapter 2 of the thesis. For more information on absolute dating, the reader is referred to chapter 3 of the thesis (Brandsma 2022). Table 1 is an inventory of codes used for the physical reference collection. The codes are accompanied by colours shown in each of the subperiod's catalogues. The term dataset in the catalogues refers to appendix 3 of the thesis (Brandsma 2022).

Code (# refers to a number)	**Town/ Village/ Area**	**Additional toponym**	**Type of project + year of project**	**What do the numbers refer to?**
RC# (RC =Reference collection)	Unknown	Unknown	Unknown: sherds were already present in drawers (RC = reference collection)	The numbers are created for this reference collection in particular. The RC code is only used for sherds without code and without known context. (they were "laying around").
R#(-#) (R= Reference?)	Unknown	Unknown	Unknown: from bags labelled with "Ref.": were possibly used as reference before	The first number refers to the number on the bag (e.g. 16), the second number is used to differentiate the sherds whenever several from the same bag are used for the collection.
MP#-# (= Materiaal-practicum)	Usually unknown	Unknown	From a former practical assignment	The first number refers to the bag number (1, 3, 7 or 9) of the former assignment, the second number (or code!) is used to differentiate the different sherds from one bag.
AW#-# (AW= Aardewerk?)	Unknown	Unknown	Probably from a former practical assignment	It is uncertain what the numbers refer to, but probably not to a specific context.
EDE #-#-# #	Ede	Bunschoten	Excavation: 1992	Created by other students in an assignment of the 1990s: the first number refers to the ditch, the second to the excavation level and the third to the find number. The fourth (in black) to the sherd number within that context.
H	???	Hamperoord	Uncertain about the type of project: 1997	*Not applicable: only one sherd used, so only the letter H.*
HBB	Hei-en Boeicop	Den Beiten	Survey: 1963	*Not applicable: only one sherd used, so only letters.*
LS	Dieden?	Langestraat	Survey: 1997	*Not applicable: only one sherd used, so only letters.*
LTS#(-#)	Lith	Tussen de Stegen	Survey: 1997	The first number refers to the row number of the survey; the second number distinguishes different sherds from the same row and is only present if multiple sherds from this row are included.
MHM#-#	Macharen	Hoge Morgen	Survey: 1997	The first number refers to the row number of the survey; the second number distinguishes different sherds from the same row.
MT#(-#)	Maaskant (area)	Hoge Tussenrijten	Survey: 2008	The (first) number refers to the find number. The second number distinguishes different sherds from the same find number and is only present if multiple sherds from the same find number are included. *Remark: Official code of this project is "MK-HT '08"*
NK#(-#)	Neerloon	Kalfsheuvel	Survey: 2009	The (first) number refers to the find number. The second number distinguishes different sherds from the same find number and is only present if multiple sherds from the same find number are included. Remark: *Official code of this project is "NEKH '09"*
OLM#(-#) *(often also with stripe between OLM and #)*	Oss	Lange Maaijen	Survey: year unknown	The (first) number refers to the find number. The second number distinguishes different sherds from the same find number and is only present if multiple sherds from the same find number are included.
OM	Oss	Meerdijk	Survey: 1997	*Not applicable: only one sherd used, so only letters.*
DISTINCT CODES with no relation to the catalogue codes	Some sherds have distinct codes not tied to particular contexts, bags or assignments (they were "laying around"). These are listed here; 7090 (tied to RC4); MK89509 (tied to AW1-48); 920 (tied to AW1-3); 1300/521 (tied to R14-3); 1300/522 (tied to R14-2); 1300/523 (tied to R14-1); 3141/669 (vague; tied to R14-5); 3141/686 (vague; tied to R14-6); ES-E (vague; tied to R16-2).			

Table 1: Different codes used for ceramics of the reference collection and their known provenance (or lack thereof)

For the reference collection, periods are often abbreviated (fig. 1). Some terminology often used in the thesis is also mentioned in this manual (Brandsma 2022, section 2.2). Some of the recurrent main shape terminology is shown in figure 2. The recurrent abbreviations are summed up in table 2.

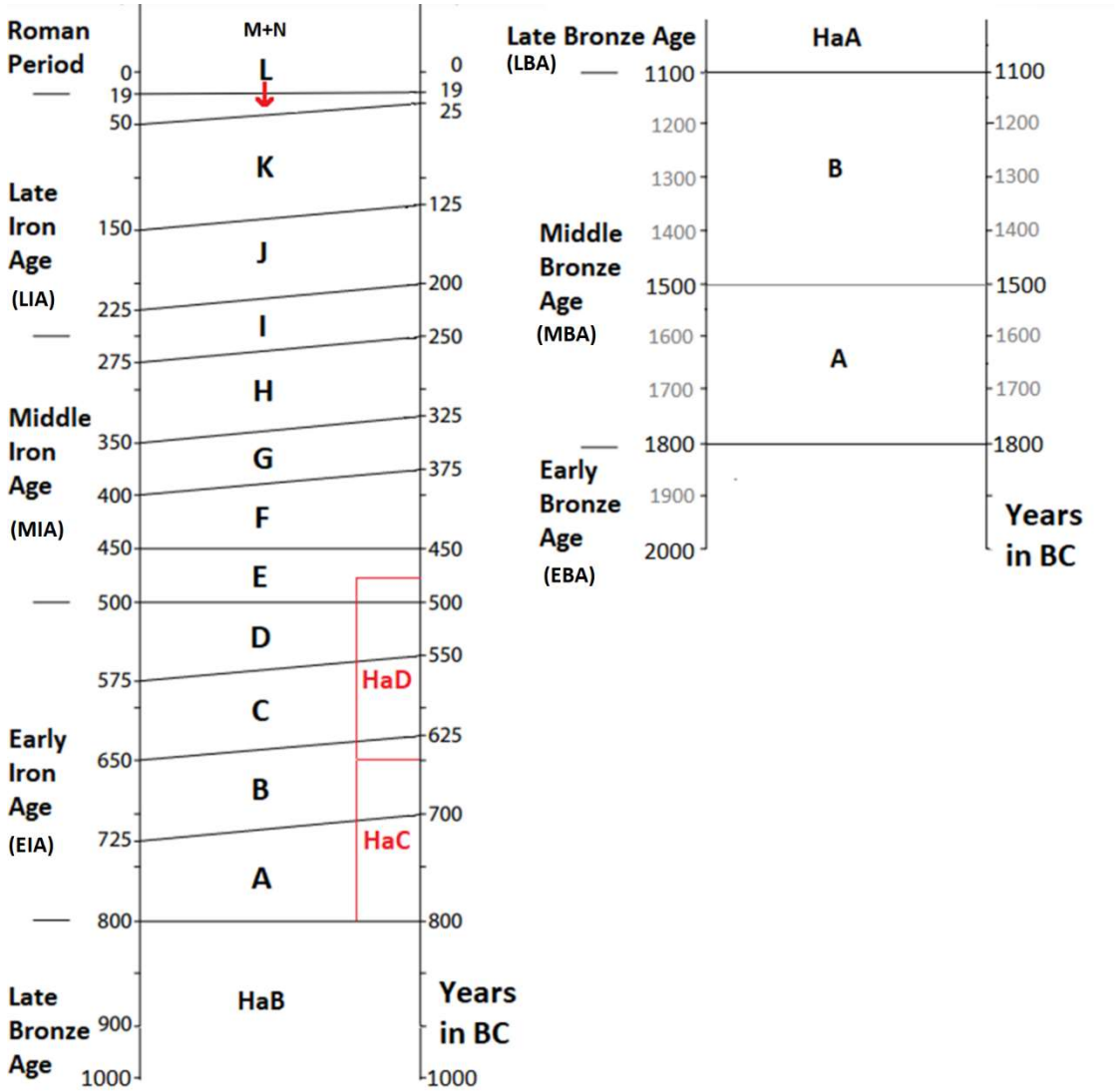
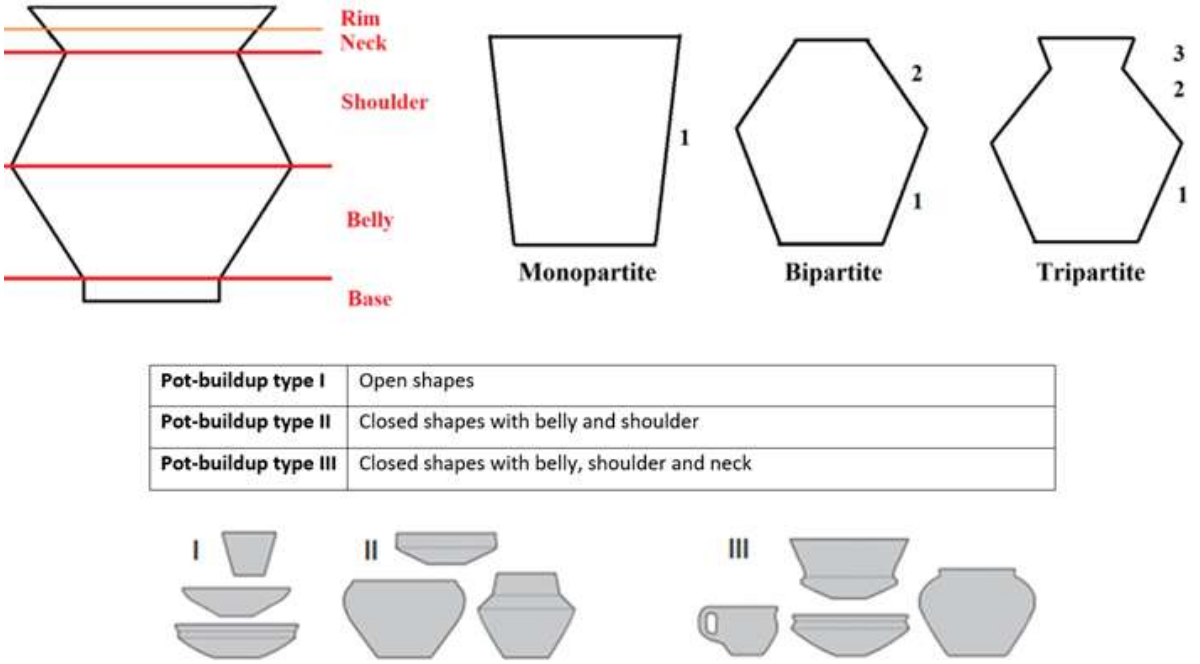


Figure 1: Phases of the Iron Age defined by Van den Broeke (A-M), complemented with the subdivision of the remainder of the research period (after Van den Broeke 2012, 36)



Pot-buildup type I	Open shapes
Pot-buildup type II	Closed shapes with belly and shoulder
Pot-buildup type III	Closed shapes with belly, shoulder and neck

Figure 2: Some of the figures with shape terminology from the thesis (Brandsma 2022, section 2.2). The pot build-up types mostly correspond with mono/bi/tripartite (by author; after Van den Broeke 2012)

Abbr.	**Written in full**	**Additional remarks**
>	"After" or "More than"	It refers to "after" when it is about years/dates. It refers to "more than" when it refers to other numbers: length/percentage. "->" is an arrow symbol
<	"Before" or "Less than"	It refers to "before" when it is about years/dates. It refers to "less than" when it refers to other numbers: length/percentage.
^{14}C	Carbon-14/Radiocarbon	-
BA	Bronze Age	2000-800 BC
BWB	Barbed Wire Beaker	Type of decorated vessel from the EBA
Cal.	Calculated	Used for ^{14}C dates
DKS	Drakenstein	Type of pottery from the MBA (referring to a place)
EBA	Early Bronze Age	2000-1800 BC
EIA	Early Iron Age	800-500 BC
Fig.	Figure	-
HVS	Hilversum	Type of pottery from the MBA (referring to a place)
IA	Iron Age	800-12 BC
LBA	Late Bronze Age	1100-800 BC
LRN	Laren	Type of pottery from the MBA (referring to a place)
LIA	Late Iron Age	250-12 BC
MBA	Middle Bronze Age	1800-1100 BC
MIA	Middle Iron Age	500-250 BC
RP	Roman Period	After 12 BC (ending date not specifically defined)
TAQ	Terminus Ante Quem	dating predates context it is associated with
TPQ	Terminus Post Quem	dating post-dates context it is associated with

Table 2: Abbreviations (= abbr.) repeatedly used in this research (including two recurrent symbols)

1.1. Quick start guide for the dating of Bronze and Iron Age ceramics

The reference collection functions as a tool to date individual sherds, assemblages, vessels and (to a much lesser extent) ceramic objects (the latter in section 9). Prior to the descriptions of the different periods distinguished in the reference collection (following sections), a general overview is given.

In general, the dating of a sherd, vessel or assemblage is obtained by considering a combination of the five following variables (see figure 1 and/or table 2 for the abbreviations of periods):

1 Temper

- **Grit temper** generally points at a dating in the **BA** (see sections 2, 3 and 4). This is usually quartz and often shines through the surface.
- **Grog temper**, usually fine-grained and often not macroscopically visible, points at a dating in the **IA** (see section 5). It was also common during the RP and quite common during the LBA.
- **Organic temper** is very uncommon in the research area and period (example in the LIA drawer: *code MT134*), but is quite common for imported **IA** coastal briquetage pottery (examples in the IA drawers: *codes R14-1 + R14-2 + R14-3 + R14-4 + R14-5 + R14-6*)

2 Surface/finishing techniques

Please make use of the physical reference collection to get slightly more accustomed to surface variability. Figure 46 (in section 5) is also illustrative for Iron Age surface variability.

- **Very rough** surfaces are mostly typical for the **MBA** (see section 3).
- **Very smooth (polished**/shiny**)** surfaces are more common during the **LBA**, **EIA** and start of the **MIA** (see sections 4, 5, 6 and 7).
- **Besmirched** (purposefully roughened) surfaces are common throughout the **IA** (fig. 46; examples in the IA drawers: *codes R16-5 + MP7-8 + RC5 + R16-1 + AW1-14 + H1 + OLM-9 + OLM-19-1*).

3 Rim decoration

- **Finger impressions** on the rim generally appear **throughout the BA and IA**.
- **Nail and/or spatula impressions** are typical for the **LBA**, **LIA** and **RP** (sections 4, 5 and 8), and may appear in the **MBA** (section 3).
- **Other rim decoration** (cord/barbed wire) may point at the **EBA** or **MBA-A**: often appearing **on the inside of the rim** (see sections 2 and 3).

- **Decoration in front of the rim** generally points at a dating in the **MBA**, **LBA**, **LIA** or **RP** (sections 3, 4, 5 and 8).

4 Body decoration

There is a large amount of diversity, which makes it difficult to summarize the types of body decoration. Absence of decoration is only slightly indicative of its dating (see fig. 4).

- **Finger and nail impressions** generally appear **throughout the BA and IA**. Single (or two) horizontal rows are very typical for the **MBA** and **LBA** (yet not exclusive to this period). Most patterns, especially when the impressions are interconnected and/or cover much of the surface, are typical for the (end of the) **LBA**, **EIA** and **LIA**.
- **Barbed wire decoration** is typical for the **EBA** and shortly thereafter (fig. 6; see section 2; examples in the EBA drawer: most codes).
- **Cord impressions** are typical for the **MBA-A** (fig. 12; see section 3).
- **Cordons** are typical for the **BA**, raised/pressed out cordons (see MBA drawer: *code RC1*) for the **MBA-A** and applique cordons (same drawer: *code AW1-48*) for this period and the **succeeding part of the BA** (see sections 3 and 4; fig. 8, 9, 12, 13, 14, 17, 31 and 32)
- **Comb decoration** is typical for the **IA** and **RP** (see section 5), but it already appeared before (section 4) and after. In the MIA and RP, it was dominant (fig. 40; 42; examples in the IA drawers: *codes R17-10 + R17-11 + R17-12 + R17-13 + MP7-3 + LTS3 + MP1-4*).
- **Grooves** are typical for the **LBA** and the **IA** in general (see sections 4 and 5; examples in the LBA and LIA drawers: *codes R17-9 + MT190 + LTS1*).

The positioning of body decoration on a shape (fig. 1) can be indicative of its dating.

- **Positioning close to the rim** (usually neck/shoulder): typical for the **BA** and **LIA**.
- **Positioning close to the base** (usually belly): typical for the entire **IA**.

5 Shape

The reader is referred to figure 2 for a visualisation of the following shape terminology.

- **Build-up type I**: never the majority of shape types, but relatively typical for the **MBA** (bucket-shaped pots) and relatively common **until the end of the MIA** (bowls/plates)
- **Build-up type II:** dominant build-up type for the **MBA**, second half of the **EIA**, **MIA** and **RP**.
- **Build-up type III**: dominant build-up type for the **EBA**, **LBA**, first half of the **EIA** and **LIA**.

Other shape characteristics:

- **Long necks** (>5 cm) appear during the **LBA**, the end of the **EIA** and the start of the **MIA**. They may also appear around the start of the **EBA**. They are mostly absent during other periods.
- Strong **Angularity** refers to sudden/sharp angles in pot profiles. These are most common to the **LBA** and the **MIA**.
- **Ears/handles** are most typical for the **LBA**.

Figure 4 visualizes and/or illustrates the abovementioned characteristics of all variables through time (Brandsma 2022, fig. 24).

Figure 3 can be used to help dating ceramics. For this example, the reader is asked to find the sherds of a fragmented pot in the Late Iron Age drawer of the reference collection with codes that start with *R12*. This little pot has several defining characteristics concerning the variables of temper, (rim) decoration and shape. In figure 3, these characteristics are summed up and combined with a heat map showing when they were common. In this instance, this yielded an indicative dating of the pot to the Roman Period. Based on this dating, the reader is referred to the corresponding section (in this instance 5 and 8). Going to this section can yield a more reliable or precise dating, e.g. when characteristics like shape type are taken into consideration.

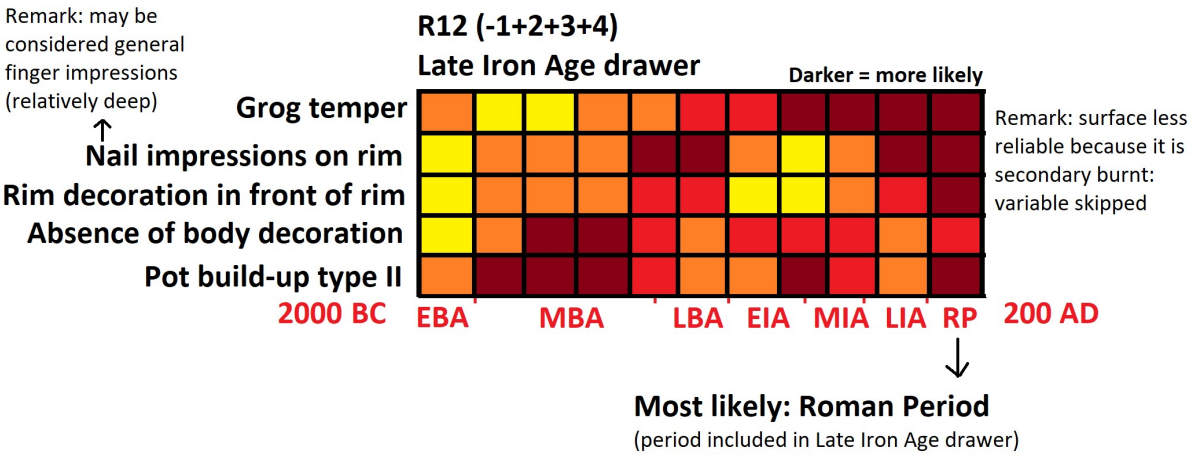


Figure 3: Example of a method to estimate the dating of a fragmented pot in the reference collection (with code R12) using basic variables described in this introduction; note that single characteristics like the absence of body decoration are very unreliable for dating (the reader is referred to the LIA sherds of the physical reference collection and section 8.1)

Figure 4: Overview of characteristics of pottery from the research period (by author; drawings from the thesis and more sources: Van den Broeke 2012, 56; 110-111; 397; 401; 405; 407; 409; 412; 414; 416; 420; 423; 427; Brandsma 2022, appendix 3; Desittere 1968b, 55; 62; 68; 70; 74; 76; Fokkens and Smits 1989, 14; Glasbergen 1954, 121; 125; Lanting 1976, 58; De Laet and Glasbergen 1959, 139; Louwe Kooijmans 1974, 222; 248; Modderman 1955, 33; Modderman 1960, 289; Perizonius 1976, 91-92; Verwers 1972, 135)

When dating a context by looking at the characteristics of an individual vessel or sherd, the dating should always be considered indicative. One sherd does not make a reliable dating, but when multiple sherds in a closed context exhibit characteristics pointing at a similar dating, the dating of a context becomes more reliable. There have always been craftsmen doing things differently. For example, the little Iron Age vessel in figure 5 has grooves that seem to represent symbols of an inscription. There are no equivalents of similar “inscriptions”, but the shape and size of the vessel are generally known from the research area (Van den Broeke 2019, 71).

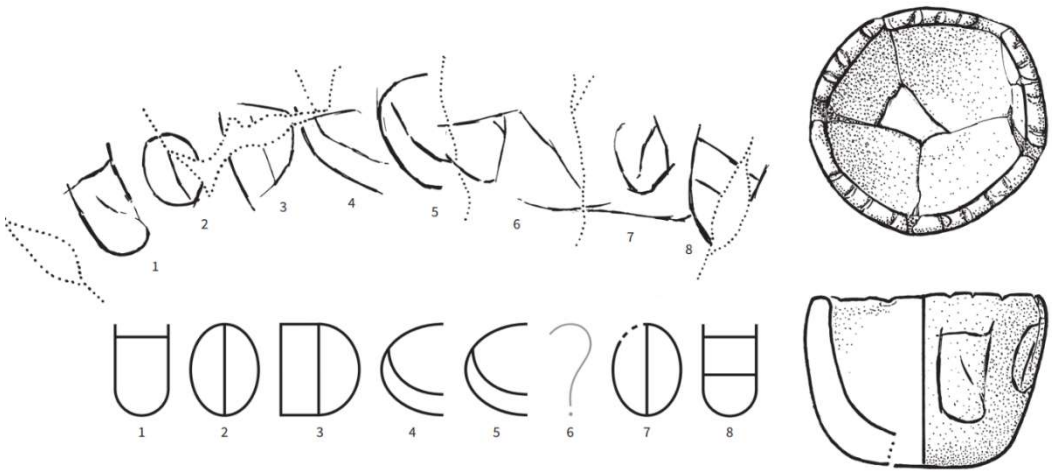


Figure 5: Small locally produced vessel that is not part of the dataset of the thesis, which was dated to the Early Iron Age on the basis of two ^{14}C dates and additional analyses/discussion (Hendriks 2019, 46-47; Van den Broeke 2019, 67-77)

2. Early Bronze Age (2000-1800 BC)

The EBA is generally associated with S-shaped profiles of pot build-up type III and particular decoration types (incl. barbed wire decoration) covering most of the surfaces of pots. For more information on the EBA, the reader is referred to sections 2.3, 3.1.1 and 3.2.2 in the thesis (Brandsma 2022). An important disclaimer is that ceramics from this period are mainly known from the north(east)ern half of the research area and further north (Brandsma 2022, section 4.1). This is therefore also what the typo-chronology is based on. The reader is referred to table 3 for basic shape, decoration and temper characteristics of an early and late phase, figure 6 for stereotypical barbed wire decoration, figure 7 for an early shape, figure 8 for other (more typical) shapes, figure 9 for ^{14}C-dated pottery shapes and figure 10 for (mostly northern/central Dutch) ^{14}C dates of barbed wire pottery. The main sources provide little information about finishing techniques, but smooth surfaces are dominant in some of the assemblages (e.g. Ufkes 2004, 27; Ufkes and Bloo 2002, 355). Pottery therefore seems to have more smoother and polished surfaces compared to the MBA.

	Shape	Rim decoration	Body decoration	Temper
Early Phase (2000-1900 BC)	• weak **S-shaped profile** (sometimes: angular belly-shoulder transition) • Sometimes: chamfered/filleted inner rim • protruding foot (*standvoet*) • Indication: presence of bipartite shapes	• Sporadically inside rim	• **Barbed** wire impressions • Pseudo barbed wire impressions (likely made with spatula) • **Round perforations** beneath rim (more common during late phase) • **(Paired) Nail/finger** impressions • **Oval-shaped or round** reed/bird bone impressions and/or triangular impressions • **Cordon below rim:** ridge in neck between cordon and rim: indication: two (or more) cordons may appear • Horizontal (**well-aligned**) patterns and zigzag patterns • Bell Beaker "component": e.g. decoration patterns	• **Grit**: sharp **quartz** (most common) • **Grit**: sharp **granite** (less common/ incidentally) • **Grit**: round from **fluvial** deposits (less common/ incidentally) • **Grog** (incidentally or in combination with other temper materials)
Late Phase (1900-1800 BC)	• **Egg-shaped profile** with (a generally shorter) neck protruding outwards (higher shoulder) • Sometimes: angular belly-shoulder transition • Spout-shaped foot • Indication: presence of bipartite shapes	• **Cord** or **barbed wire** impressions (rarely: vertical grooves) on the inside of the rim -horizontal pattern -vertical/zigzag pattern (only for barbed wire impressions)	• **Barbed** wire impressions • Pseudo barbed wire impressions (likely made with spatula) • **Round perforations** beneath rim (more common during late phase) • **(Paired) Nail/finger** impressions • **Oval-shaped or round** reed/bird bone impressions and/or triangular impressions • **Cordon below rim:** ridge in neck between cordon and rim: indication: two (or more) cordons may appear • Horizontal, diagonal or "sloping" patterns (mostly horizontal)	

Table 3: EBA characteristics according to an early typo-chronology of Lanting (1973, 220-221; 261), as well as some additions by Fokkens et al. (2016, 286-288) in red and additions by the author of this document in blue. The information about temper is based on a few sources mentioning this variable (Butler and Fokkens 2005, 374; Louwe Kooijmans 1974, 216-218; Modderman 1955, 32)

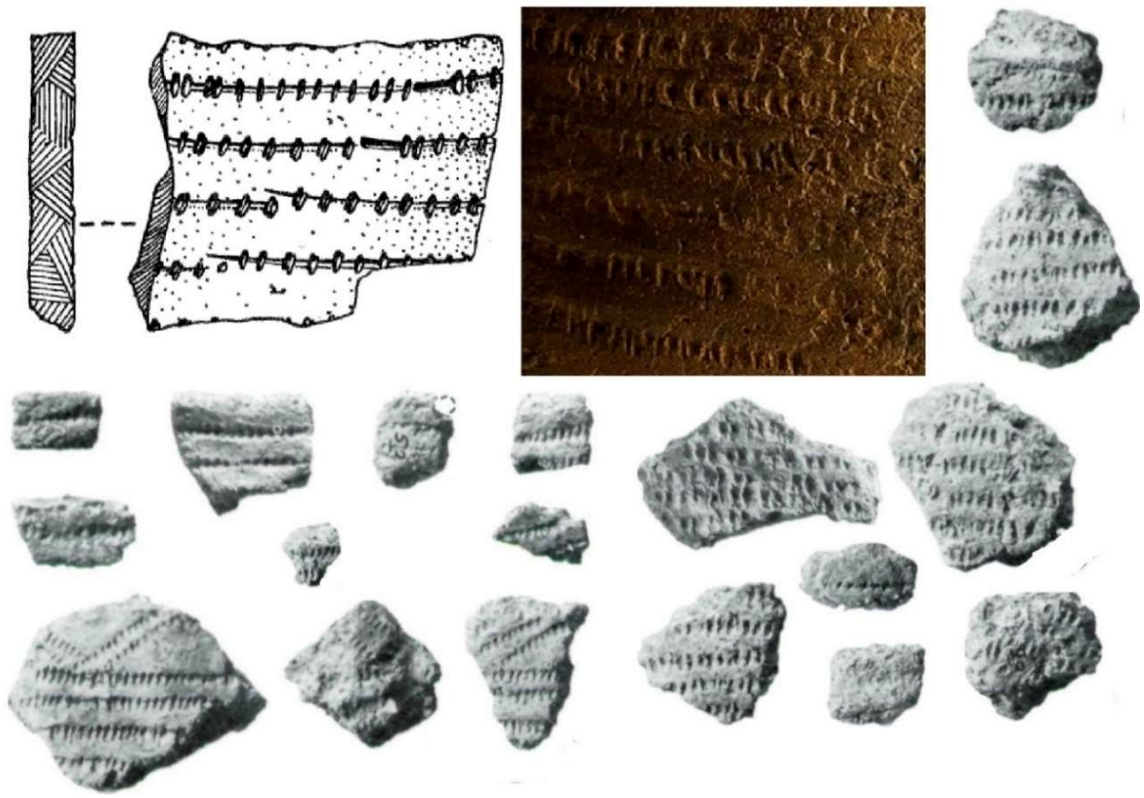


Figure 6: Barbed wire (and pseudo barbed wire) impressions from the research area or close to the research area (after Modderman 1955, 35; Verlinde 1971, 29; 15xploratorium.gallaromeinsmuseum.be)

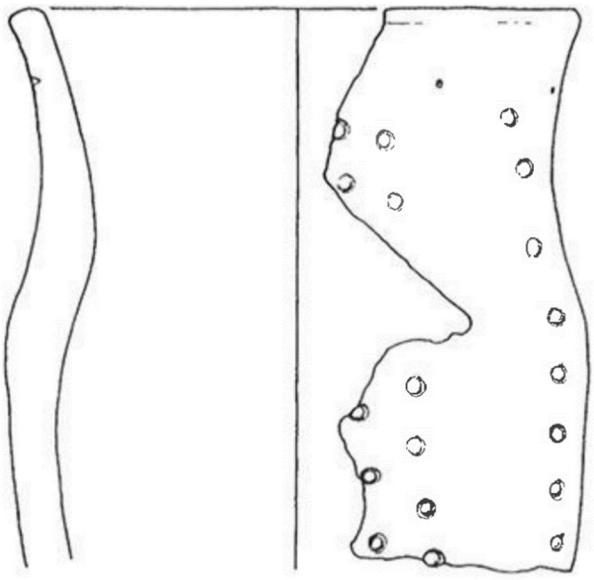


Figure 7: Beaker shape that is typologically early in dating phase with round hollow impressions from Meteren (Ufkes and Bloo 2002, 343)

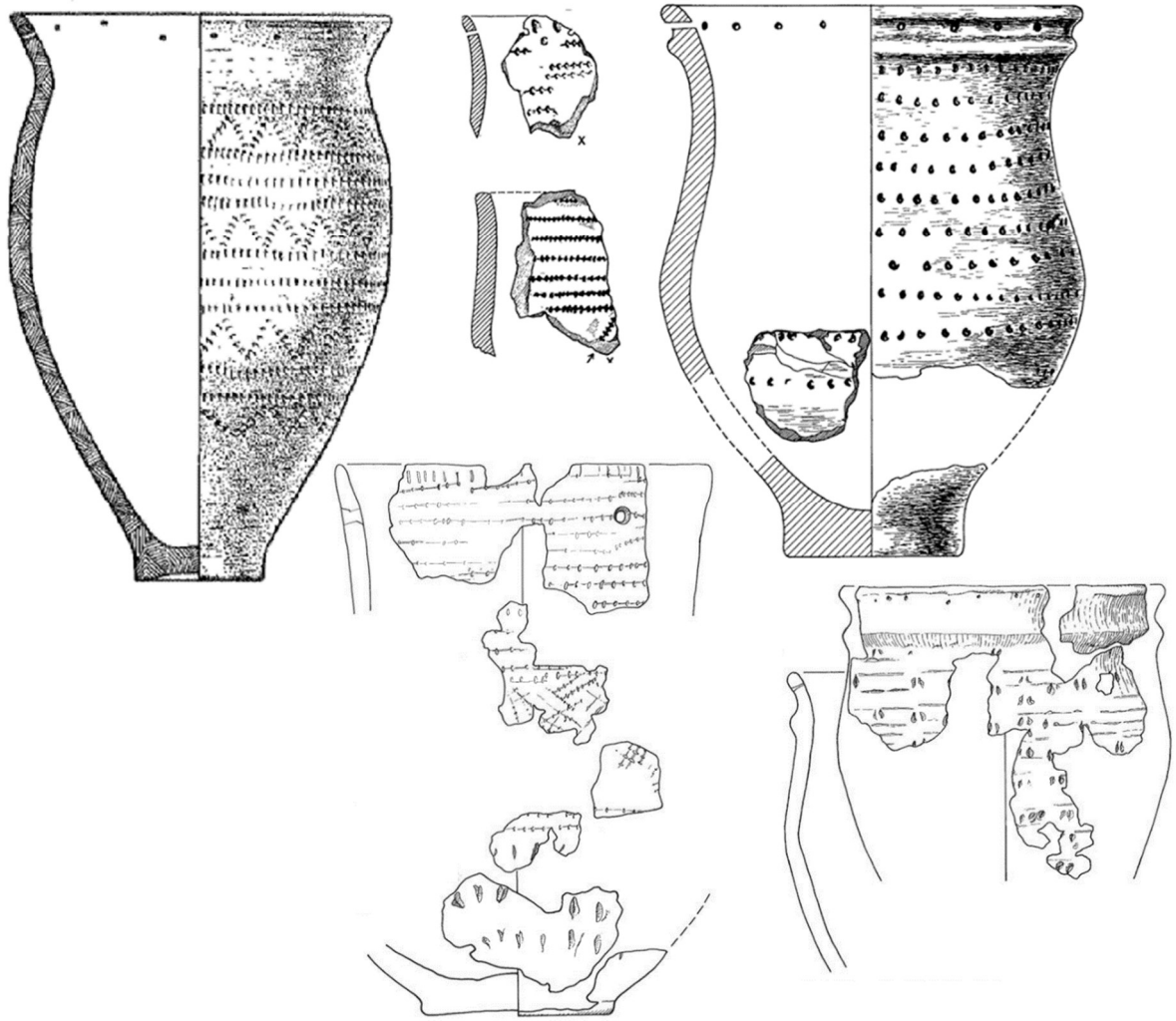


Figure 8: EBA beakers, including late phase beakers (top beakers): BWB from Wijchen (top left), reconstructed EBA beaker from Molenaarsgraaf (top right), barbed wire rim sherds from Molenaarsgraaf (top middle) and two incomplete barbed wire beakers from Meteren (bottom) (Louwe Kooijmans 1974, 211; 222; Modderman 1955, 33; Ufkes and Bloo 2002, 341)

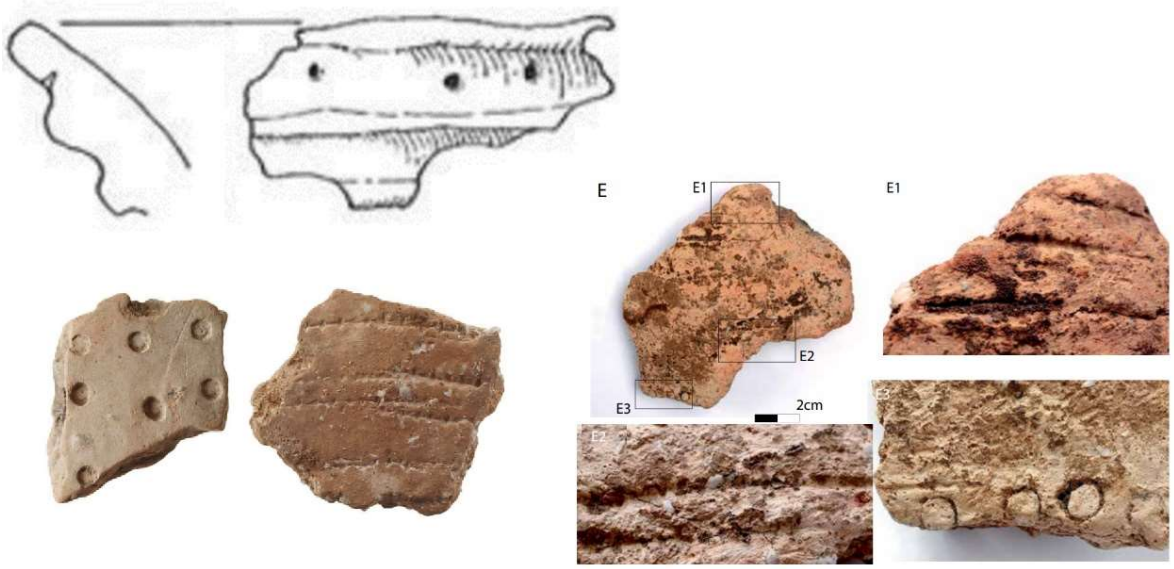
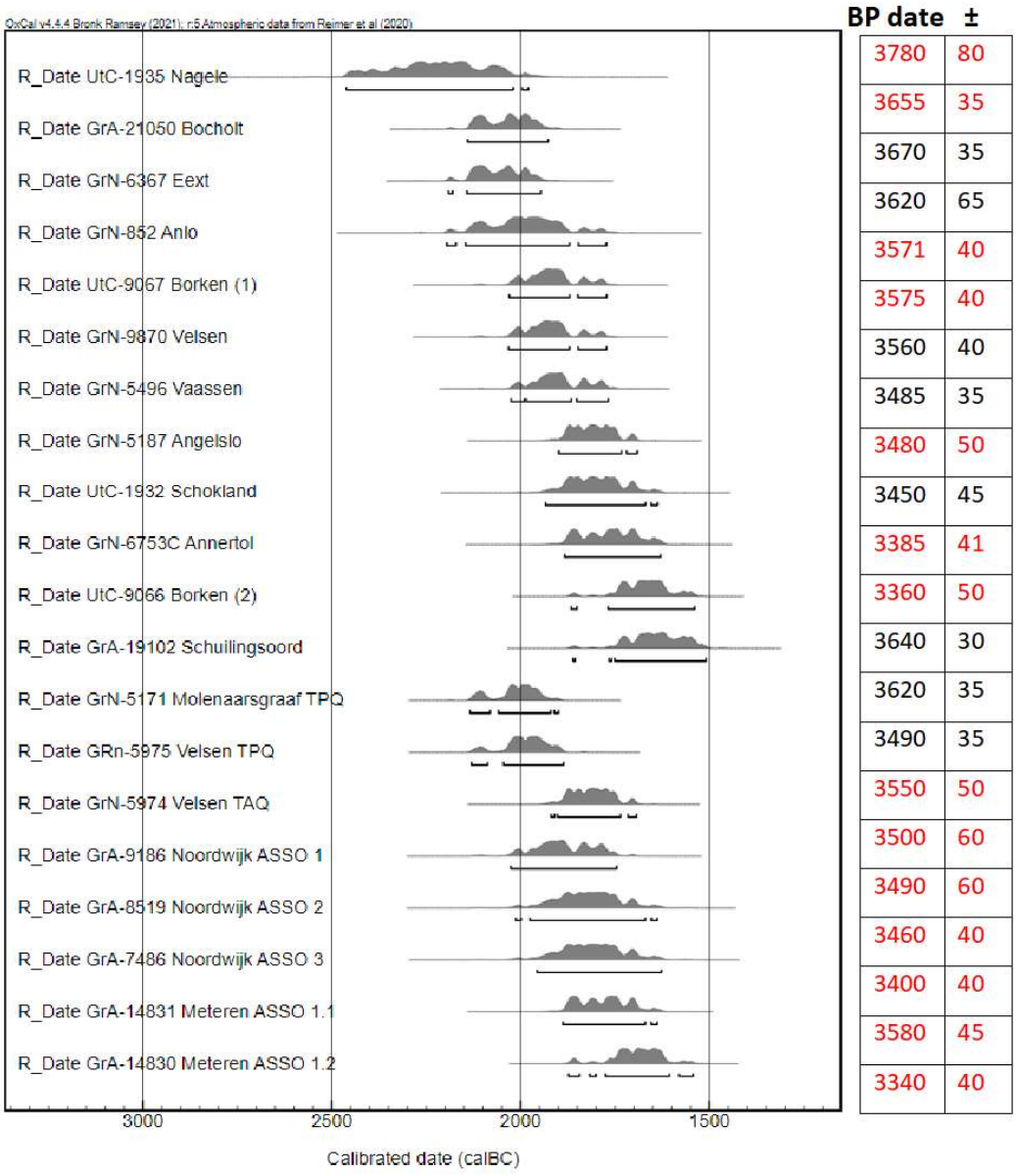


Figure 9: Examples of pottery sherds from the research area ^{14}C-dated to the EBA (~2000-1800 BC) with charcoal from their closed contexts or burnt residue from their surface (Van As and Fokkens 2019a, 334; Brandsma 2022, appendix 3; Ufkes 2004, 27; Ufkes and Bloo 2002, 344)



BP date	±
3780	80
3655	35
3670	35
3620	65
3571	40
3575	40
3560	40
3485	35
3480	50
3450	45
3385	41
3360	50
3640	30
3620	35
3490	35
3550	50
3500	60
3490	60
3460	40
3400	40
3580	45
3340	40

Figure 10: Recalibrated ^{14}C dates compiled by Lanting and Van der Plicht: the black dating results (as opposed to red) were also included in Lanting's typology of 1973, ASSO = associated, meaning the pottery is not necessarily from the same context as the ^{14}C dating, note that the vast majority of these dates is not from the research area, but from the northern Netherlands (Lanting 1973, 221; 223 and Lanting and Van der Plicht 2003, 156; 174-177)

2.1. Catalogue

Code (in combination with dark green colour)	**Defining features for chronology**	**Dating**	**^{14}C dates from assemblages from dataset sharing features (in BP)**
RC3 + MP3-P3 + MP3-2 + MP3-3 + MP3-6 + MP3-P3 + AW1-8	-Barbed wire decoration (all) -Zigzag pattern (RC3) -Horizontal pattern (AW1-8; RC3 in combination with zigzag)	Typical: **EBA**: 2000-1800 BC (fig. 6; table 3). Occurrence: entire EBA + **early phase MBA**: 2000-1700 BC; possibly also slightly earlier or later (fig. 10).	TPQ 3640±30 3555±40 3485±20 (barbed wire)
	-Grit: coarse quartz temper (shining through the surface) -Grit in combination with grog (very small in small quantities; MP3-3; AW1-8; RC3)		
	-Polished, also on the inside (except for RC3)		
MP3-88(-75)	-Closed shape (build-up type III) -Slanted neck seemingly transitioning into a shoulder: S-shaped profile?	Typical: **EBA**: 2000-1800 BC (fig. 8; table 3). Occurrence: entire EBA **+ early phase MBA**: 2000-1700 BC; possibly also slightly earlier or later (fig. 10).	TPQ 3640±30 (decoration)
	-Two perforations below the rim -Horizontal (+practically vertical) rows of paired nail impressions covering the entire surface		
	-Grog		
	-Polished		
MP9-4	-Presumably: closed shape (build-up type III) -Slanted neck seemingly transitioning into a shoulder: S-shaped profile?	Typical: **EBA**: 2000-1800 BC (fig. 6-9; table 3). Occurrence: entire EBA + **early phase MBA**: 2000-1700 BC; possibly also slightly earlier or later (fig. 10).	TPQ 3640±30 3555±40 3485±20 (barbed wire) TPQ 3640±30 3574±35 3350±35 (perforation below rim)
	-Two perforations below the rim -Barbed wire decoration		
	-Grit: coarse quartz temper (shining through the surface)		
	-Polished (but still rough)		

Table 4: Catalogue of sherds of the Early Bronze Age in the physical reference collection

Figure 11: Late Bronze Age sherds in the reference collection (by author)

3. Middle Bronze Age (1800-1100 BC)

The MBA is mostly associated with tall pots of pot build-up II, little to no decoration and cordons. Typical decoration methods like cord impressions are usually limited to the start of the MBA on the higher sections of the pots. More typical for the MBA are coarse surfaces with quartz grit. For more information on the MBA, the reader is referred to sections 2.4, 3.1.2, 3.1.3 and 3.2.2 in the thesis (Brandsma 2022). The MBA is a long time period with relatively little diversity in shapes and decoration. The reader is referred to table 5 for surface characteristics and temper materials, and table 6 for basic shape and decoration characteristics. The former table is separated from the latter in order to make the latter fit on a single page. The reader is referred to figures 12 to 17 for a general evolution of shape, figure 18 for shape developments towards to the Late Bronze Age, figure 19 for a few comparable shapes that may date to the end of the MBA, figures 20 and 21 for older shape and rim typology, figures 22 to 24 for decoration and figures 25 to 27 for a more recently defined typology and its comparisons to ^{14}C dating.

The phases MBA-A (1800-1500 BC) and MBA-B (1500-1100 BC) in table 5 are completely unrelated to Middle Phase A (1700-1600 BC) and Middle Phase B (1600-1400 BC) in table 6. The first phasing is established by other researchers and not based on pottery characteristics (Arnoldussen 2008, 18; Bourgeois 2013, 24-25). The second phasing is entirely created for this document, is based on chronological changes of pottery and is based on research of the thesis (Brandsma 2022) and of other authors (Drenth 2015, 189; Fokkens *et al.* 2016. 287). The first table makes use of different phases, because the data about temper and surface is not sufficient enough for narrower phases.

	Temper material	**Surface**
Entire MBA (1800-1100 BC)	• **Grit:** sharp **quartz**: **most common**: perhaps especially common around 1600-1400 BC (Fokkens *et al.* 2016, 287) • **Grit:** round from **fluvial** deposits: less common/ occasionally	• **Rough**: **most common** • **Shrinkage cracks**: might be less common on pottery surfaces from the late MBA: 1300-1100 BC (based on: De Jong and Beumer 2013, 120)
MBA-A (1800-1500 BC) *(aside of the characteristics stated for the Entire MBA)*	• **Grog**: incidentally, typically as **big pieces**	• **Smoothened**: at least common for some sites (e.g. Drenth 2015, 149) • Incidentally polished (e.g. Ten Anscher 1990, 54: not in the research area!)
MBA-B (1500-1100 BC) *(aside of the characteristics stated for the Entire MBA)*	• **Grog**: likely more common than it was during the MBA-A, usually in combination **with sand** and/or **grit**	• **Smoothened**: common by the end of this period (e.g. De Jong and Beumer 2013, 177) • (At least incidentally) Polished by the end of this period (Brandsma 2022, appendix 3)

Table 5: Temper materials and surface characteristics in the MBA, quartz grit was the typical temper material (by author; Van den Broeke 2012, 128; Butler and Fokkens 2005, 375; Glasbergen 1954, 89; De Jong and Beumer 2013, 114; 177-179)

	Shape (tall pots)	**Rim Decoration**	**Body decoration**	**Types** *Drenth's classification*
Early phase (1800-1700 BC)	• **Biconical**-shaped • Sometimes: **bucket**-shaped • Rarely (early): Beaker shapes (generally S-shaped) • Indication from typology: tripartite shapes with short necks and/or longer necks with weak profile angularity • Rim type A1	• Nail *(+ possibly finger)* + **cord** impressions on top (and in front) of the rim • Decoration on the inside of the rim	• **Cordons** • **Cord** impressions • **(Paired) Nail** impressions • Finger impressions • (Regular and pseudo-) **barbed wire** impressions: mostly horizontal patterns • Maggot decoration (examples in: Moree *et al.* 2011, 84; 137) • Round (hollow) impressions • Horseshoe-shaped handles (fig. 12) + probably applications of other shapes (e.g. fig. 23) • **Decoration above and below a cordon**	HVS + DKS (and less commonly: LRN)
Middle phase A (1700-1600 BC)	• **Barrel**-shaped • Sometimes: **biconical**-shaped • Sometimes: **bucket**-shaped • Rim type A1 is scarce • *Likely: tripartite shapes with short necks and/or longer necks with weak profile angularity*	• Nail *(+ possibly finger)* impressions on top (and in front) of the rim • *Little to no decoration on the inside of the rim*	• **Decorated (raised/pressed out) cordons**: finger/nail impressions • Decorated horizontal rows: finger/cord impressions • Horseshoe-shaped handles *+ possibly also applications of other shapes* • Cord impressions: often zigzag patterns • Paired nail impressions: often vertical patterns • **Decoration solely above a cordon**: presumably often already often few to no decoration	HVS (excl. types 1, 3, 5 and 6), DKS and LRN
Middle Phase B (1600-1400 BC)	• **Barrel**-shaped • Sometimes: **bucket**-shaped • *Likely sometimes: biconical-shaped (fig. 27)* • Indication: tripartite shapes with short necks and/or longer necks with weak profile angularity (see fig. 15; e.g. Drenth 2015, 151)	• Nail *(+ possibly finger)* impressions on top (and in front) of the rim	• **Decorated (applique) cordons**: finger/nail impressions • **Decorated horizontal rows**: finger/nail impressions • Rare: vertical lines/grooves on the shoulder (Nijnsel/Lienden) • Indication: perforation in the upper half of the body • **Fewer (to no) decoration**	LRN + DKS (very unlikely: HVS)
Late Phase (1400-1200 BC)	• **Barrel**-shaped • Sometimes: **bucket**-shaped • *Possibly sometimes: biconical-shaped (fig. 27)* • *Possibly: early reappearance of lips (fig. 16)*	• Indication/ sometimes: nail *(+ possibly finger)* impressions on top of the rim	• *Possibly due to old-wood-effect: one assemblage in dataset (in the thesis: Brandsma 2022, appendix 3) with one or multiple horizontal rows on the body* • Some indications of cordons, but they are at least rarer (fig. 24) • **(Body) Decoration absent**: 99% undecorated	LRN
Transition to LBA (1200-1100 BC)	• **Gradual shape diversification**: -**angular** profile transitions -wider shapes: **low pots + bowls** -shapes with **lips/short necks** • **Bucket/barrel**-shaped • **Biconical**-shaped • *Weak S-shaped profiles* • *Possibly: ears (otherwise likely shortly after 1100 BC)*	• Finger + nail + spatula impressions on top, in front and inside of the rim	• **Decorated (applique) cordons**: finger/nail impressions • **Decorated horizontal rows**: finger/nail impressions • *Likely (less common than the above): multiple horizontal rows on one vessel* • *Diversification of decoration methods around 1100 BC* • **Decoration on upper halves of vessels**	LRN + DKS + New types

Table 6: Reshaped version of the table of Drenth's relative chronology of the MBA (2015, 189), combined with data from Fokkens et al. in red (2016, 286-288) and from the author of this document in blue (based on Brandsma 2022; usually an indication because of the low sample size); cursive means there is a strong degree of uncertainty (by author)

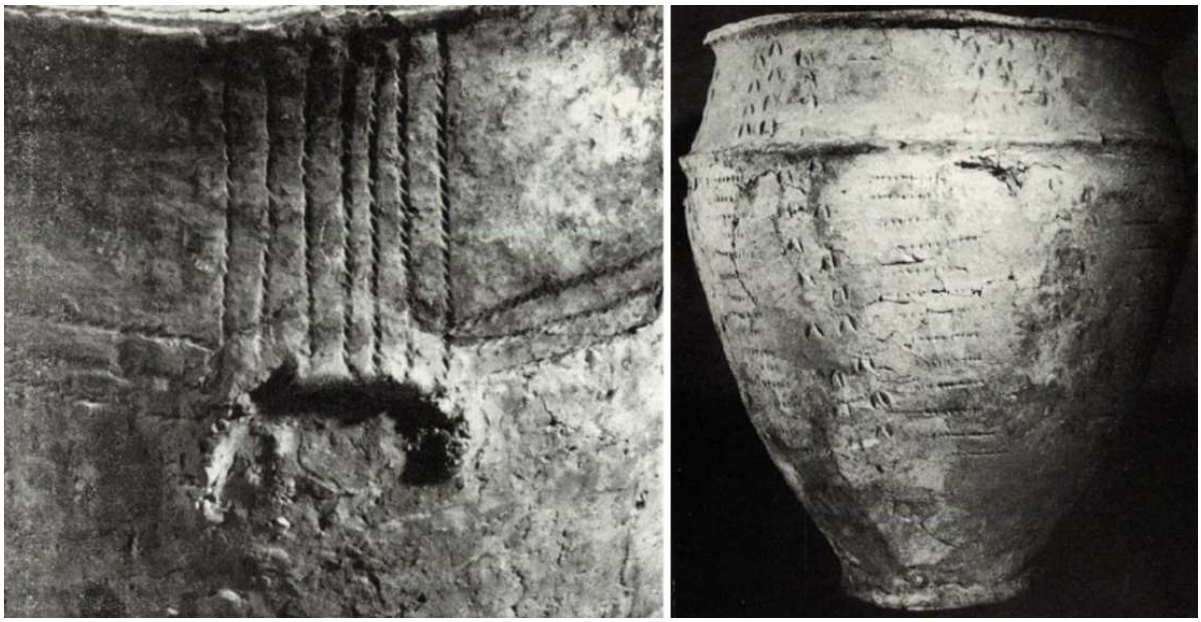


Figure 12: A close-up of a typologically early HVS pot from Budel-Weert with cord impressions and a horseshoe-handle (left) and an early HVS urn from Vorstenbosch with a raised cordon, paired nail impressions and barbed wire decoration: these are typologically transitional forms from the EBA to the MBA (Glasbergen 1962, 262, Modderman 1960, 288)

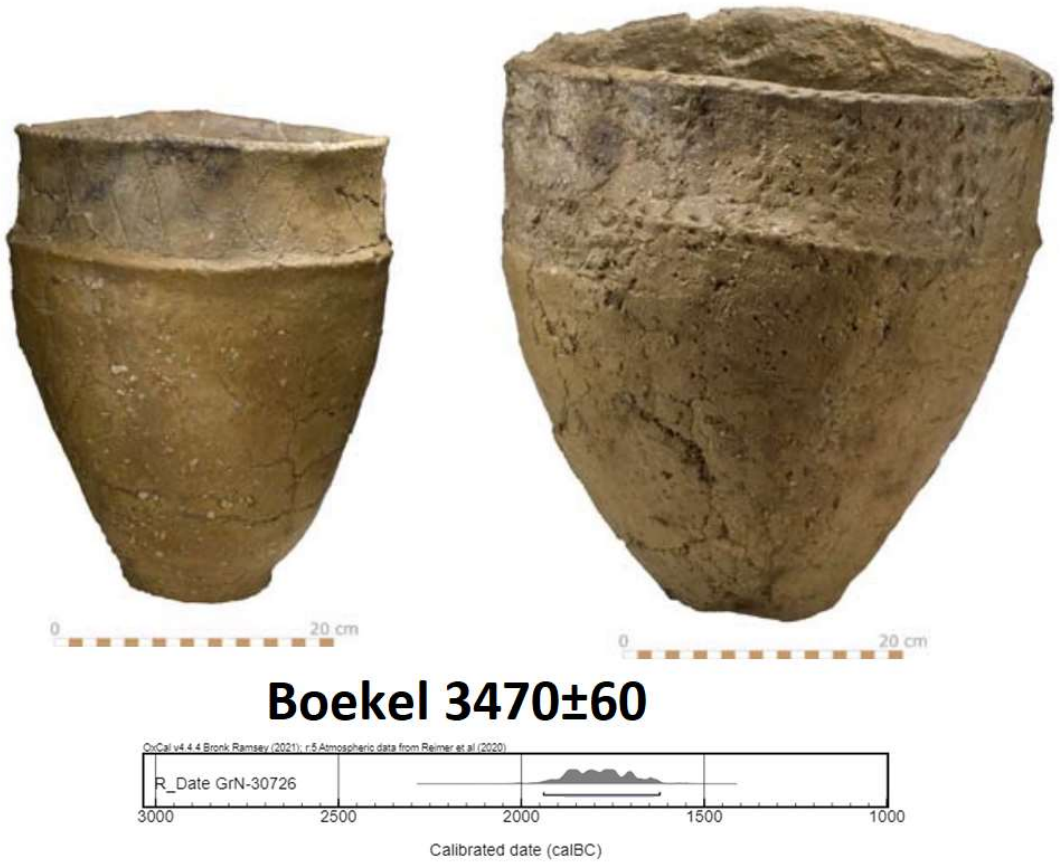


Figure 13: Typical HVS pots from the Middle Bronze Age-A from Boekel with decoration above the raised/pressed out cordons consisting of cord impressions (left) and finger/nail impressions (right) (after Brandsma 2022, appendix 3; De Jong 2008, 41-42)

Figure 14: Bucket-shaped DKS pot (from Tilburg-Stappegoor) with two applique cordons with finger impressions (left); applique cordon with finger impressions from Tilburg-Stappegoor (bottom); Barrel-shaped LRN pot from Knegsel with a rough surface with quartz grit (right); both are typical for the MBA (Bloo et al. 2015, 41; Glasbergen 1969, 21)

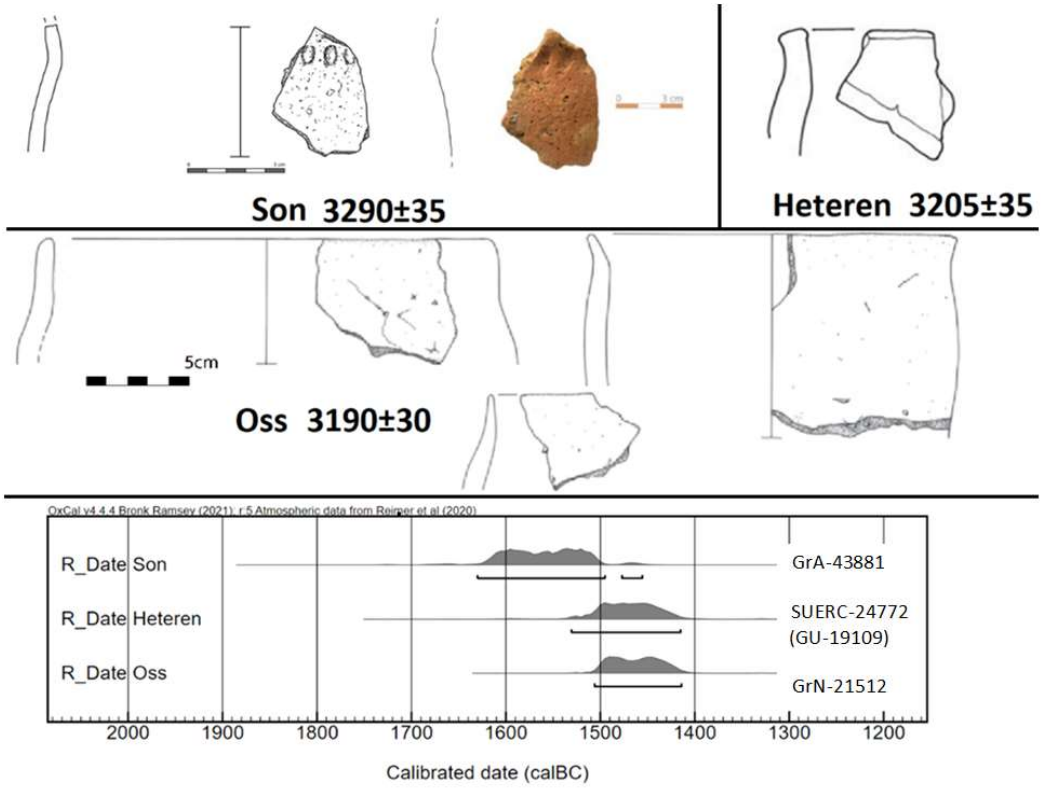


Figure 15: Some shapes with necks and weak angularity with ^{14}C dates in the middle of the MBA; typologically relatively atypical for this period, the temper material is also very small/fine for this period (after Van As and Fokkens 2019b, 387-388; 403; Brandsma 2022, appendix 3; Hazen and Roessingh 2010, 37; De Jong and Beumer 2013, 129; Van der Linden et al. 2010, 72)

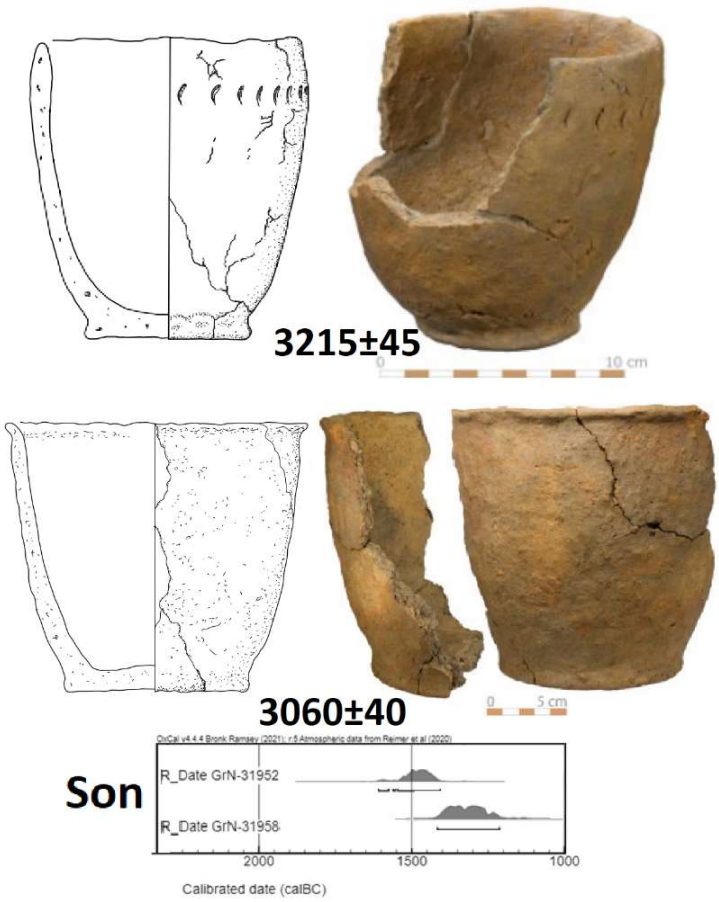


Figure 16: ^{14}C-dated MBA barrel-shaped DKS pot (top) and bucket-shaped LRN pot with lip (bottom) from Son, typologically (and in ^{14}C dating) typical for the MBA-B (after Brandsma 2022, appendix 3; De Jong and Beumer 2013, 182-183)

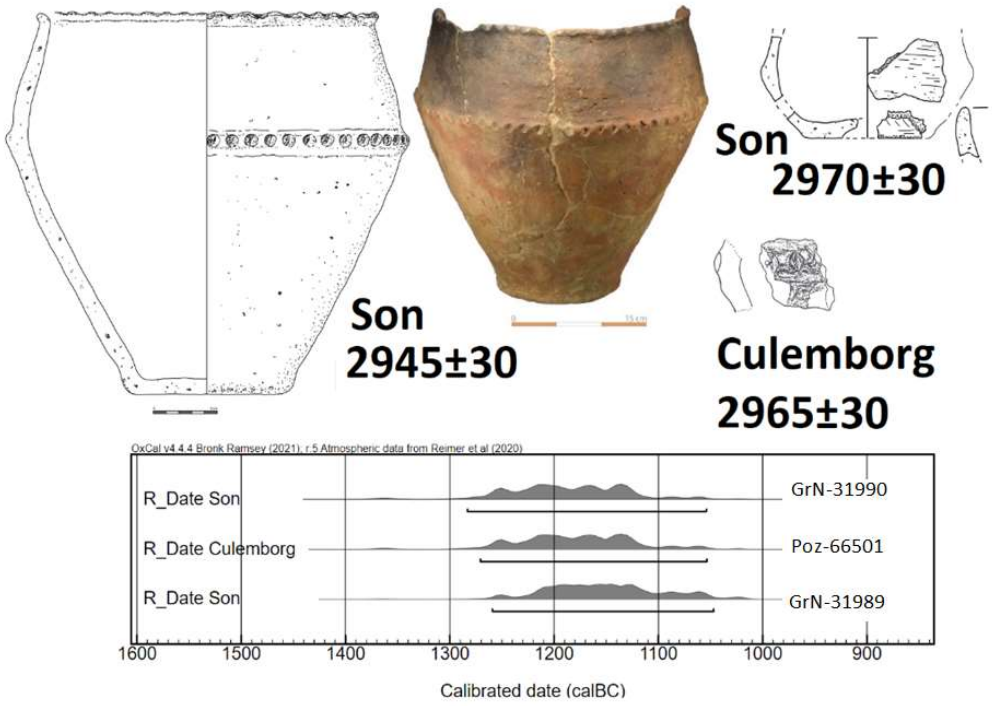


Figure 17: Biconical shape of the end of the MBA-B and two fragmented examples with similar angularity; there are more examples in next figure (after Brandsma 2022, appendix 3; De Jong and Beumer 2013, 136-139; Meurkens 2015, 146; Verhelst et al. 2015, 38)

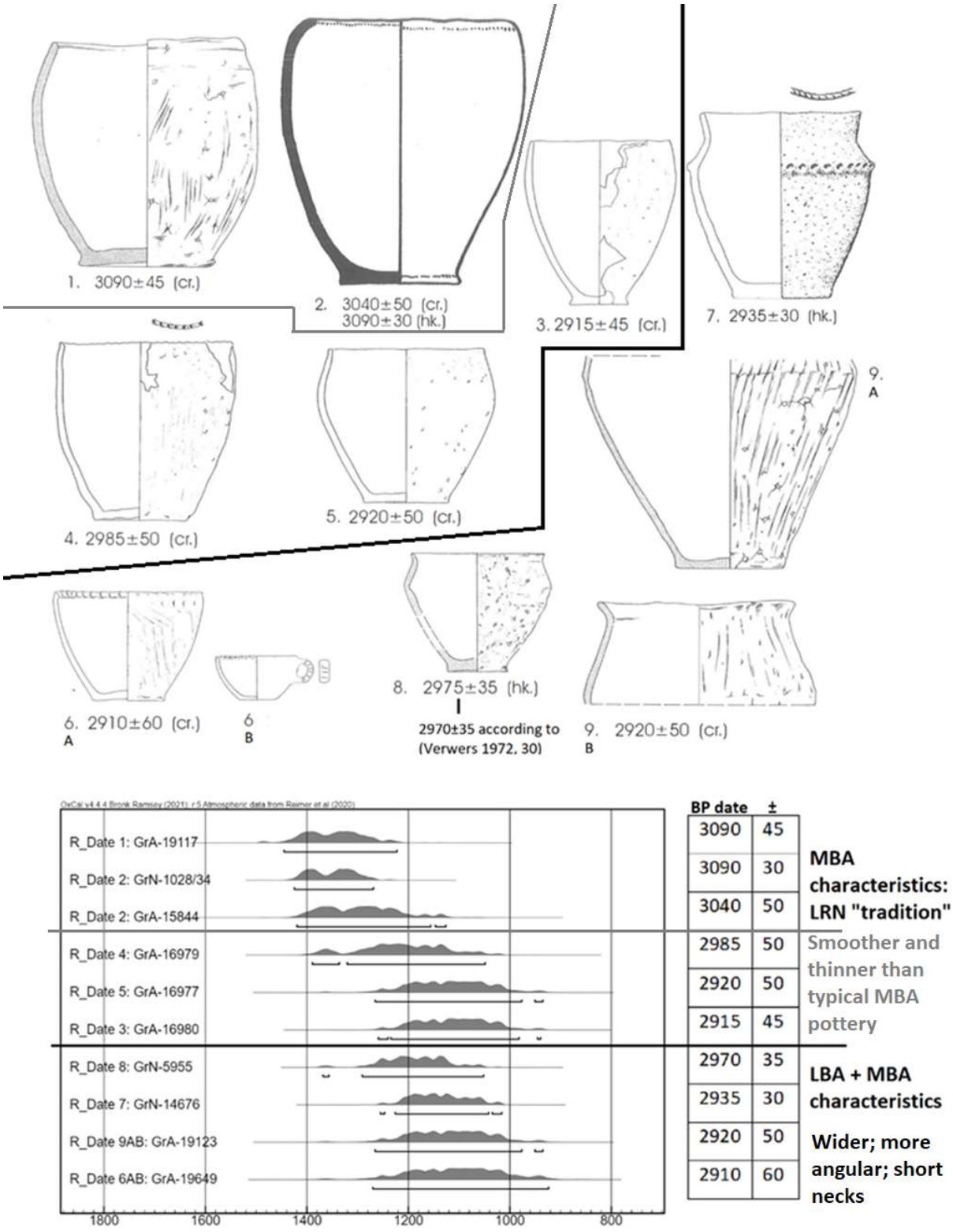


Figure 18: Pots mentioned and showed by Lanting and Van der Plicht of the transition of the MBA to LBA, recalibrated dating results; the four bottom dating results (vessels 8, 7, 9A, 9B, 6A and 6B) strongly deviate from MBA typology due to width, angularity and the presence of necks, no. 4 can practically not be considered LRN due to the finger-impressed rim (after Lanting and Van der Plicht 2003, 164; 196; 224; 247; 249)

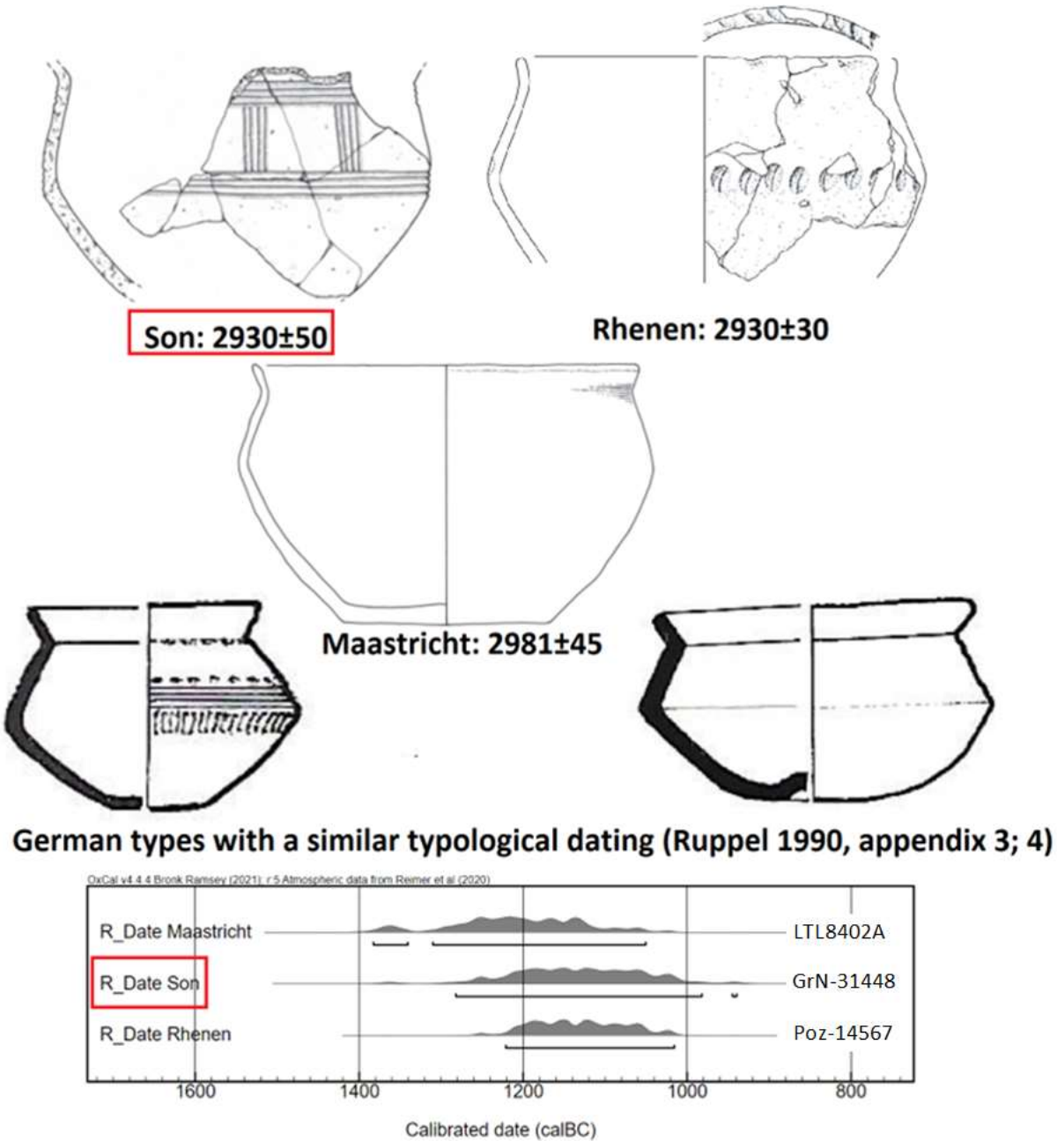


Figure 19: Wider shapes (bowls/wide pots) that are not typical for the MBA according to typo-chronology that may date to the end of the MBA based on ^{14}C dating, the example from Son is directly within the research area, whereas the other examples are from sites (directly) adjacent to the research area, the typological dating of the types shown by Ruppel correspond with the ^{14}C dating (after Arnoldussen and Ball 2007, 183; 204; Brandsma 2022, appendix 3; Dyselinck 2013, 79; 136; De Jong and Beumer 2011, 95-96; Ruppel 1990, appendix 3-4)

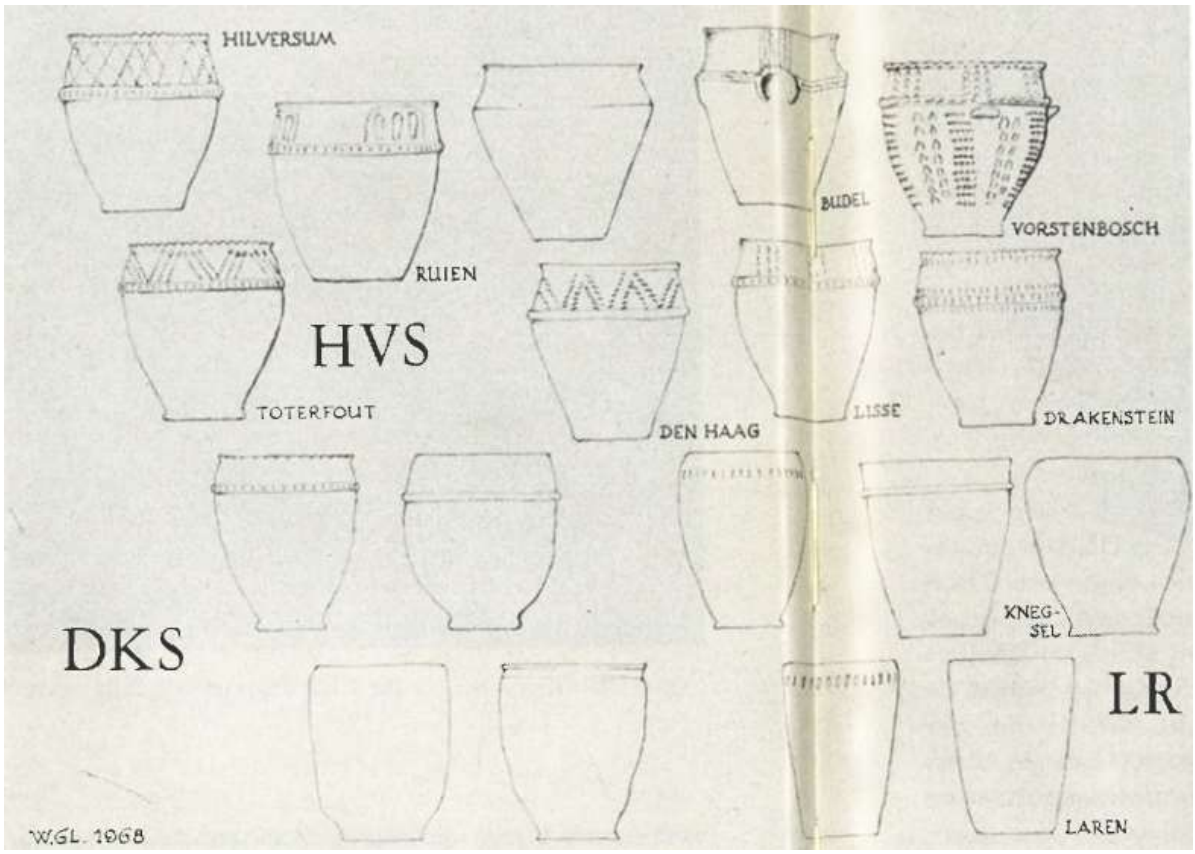


Figure 20: Illustration of MBA shapes and decoration for each of Glasbergen's types: the definitions of types (HVS/DKS/LRN) differ from the more recent definitions illustrated in figure 25 (Glasbergen 1969, 17-18)

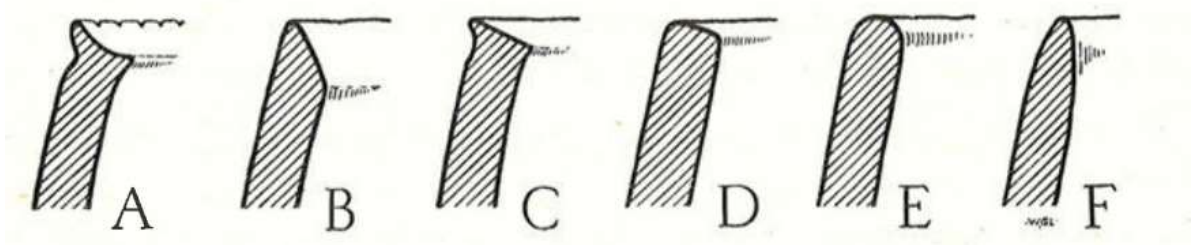


Figure 21: Rim types defined by Glasbergen, including rim type A(1) with chronological value (Glasbergen 1954, 90)

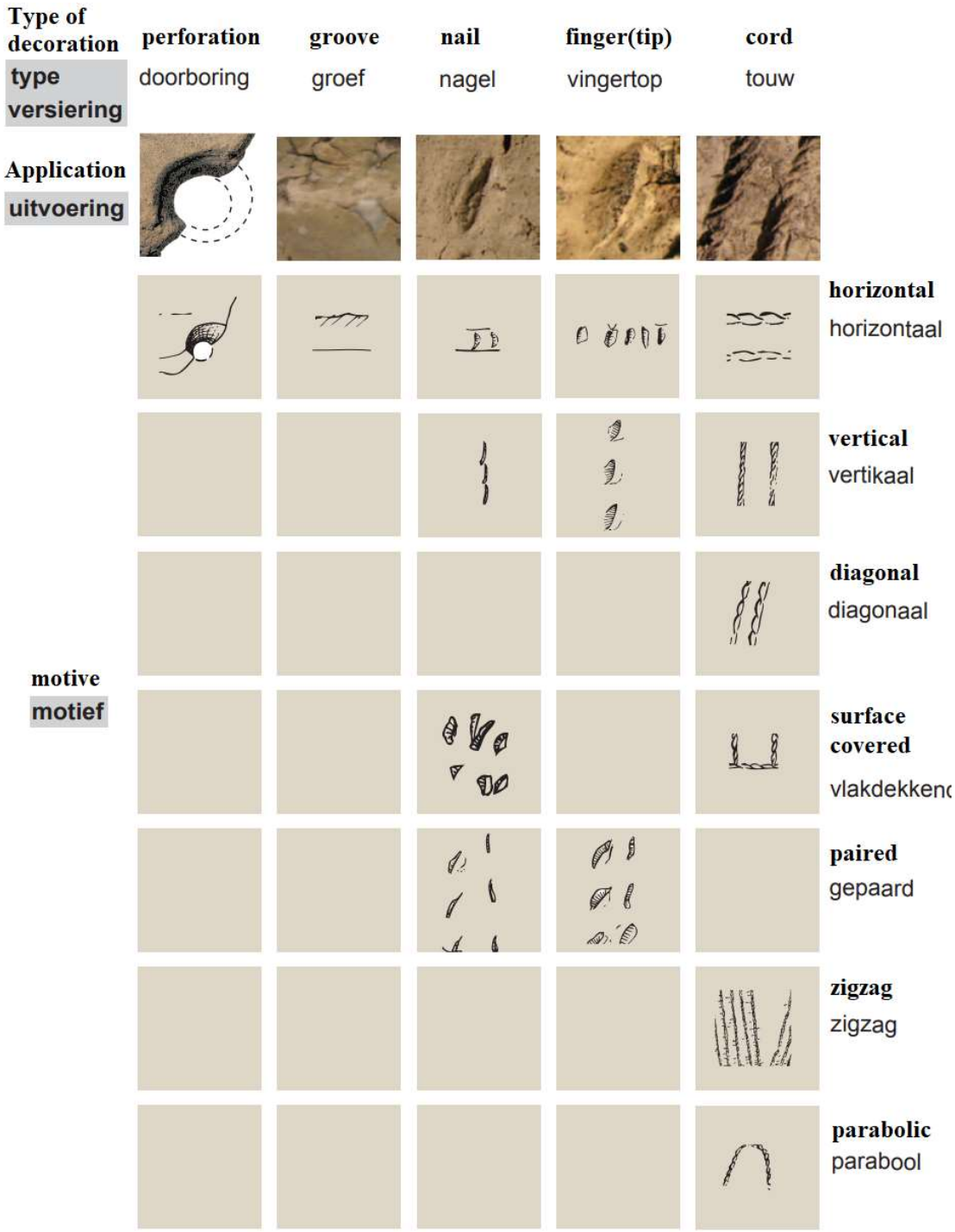


Figure 22: Different decorations and patterns on pottery from Den Haag Bronovo , they are typical for the MBA-A in the research area according to the typologies with the exception of the perforation (after Bloo 2013, 57)

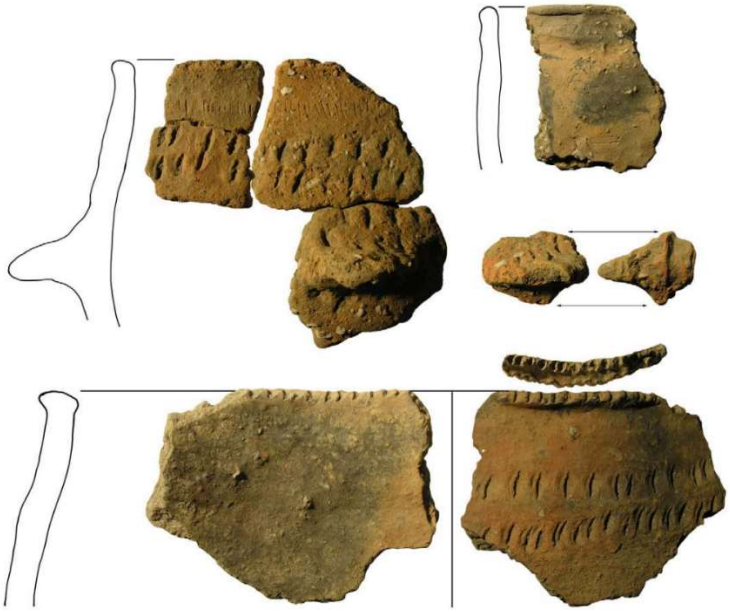


Figure 23: Some typologically dated MBA-A pottery with decoration on the upper sections of pots from Boxmeer, including two rare lumps/applications (Opbroek et al. 2015, 114)

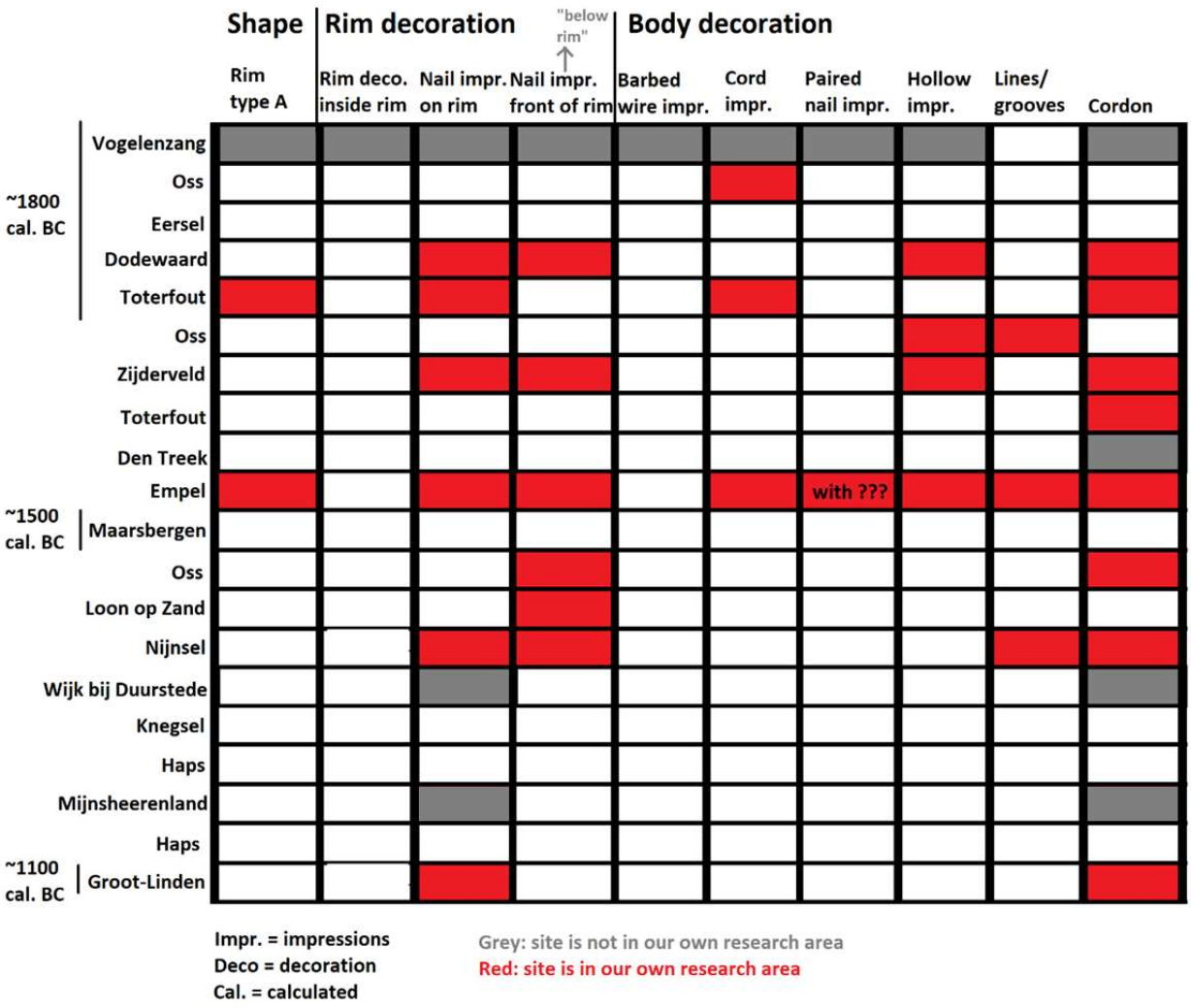


Figure 24: Re-organized overview of Theunissen's research on MBA characteristics of decoration from 1800 to 1100 BC, nail impressions might include finger impressions (by author; Theunissen 1999, 204)

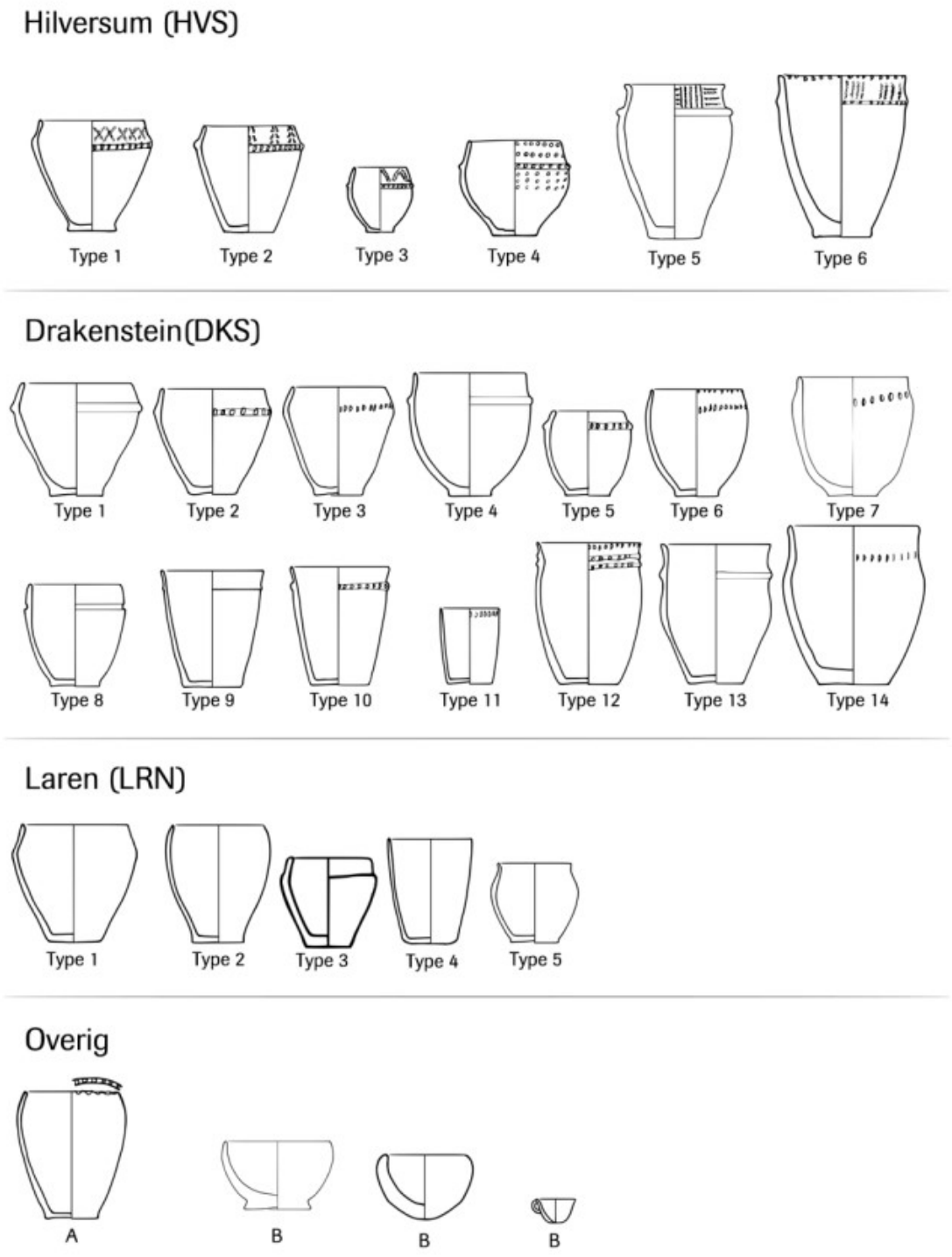
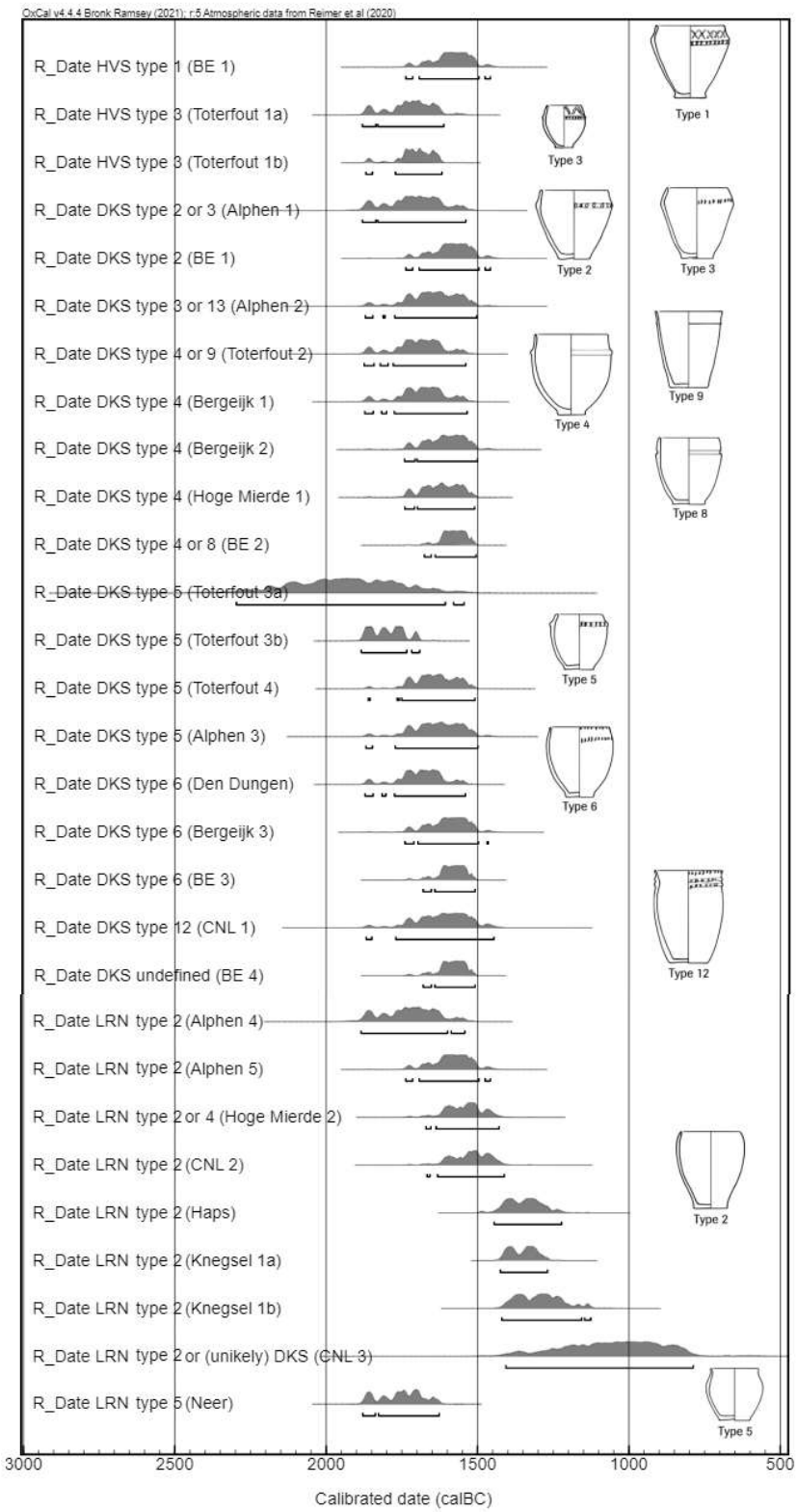


Figure 25: MBA pottery classifications of Drenth based on how much body decoration covers the surface (HVS/DKS/LRN) as suggested by Lanting and Van der Plicht (2003, 155; Brandsma 2022, table 3) with a subdivision into numbered types by Drenth on the basis of shape and types of decoration, Overig = OHV = other types (Drenth 2018, 166)



BP date	±
3310	50
3420	45
3410	30
3410	60
3310	50
3360	60
3400	50
3390	50
3330	50
3345	45
3315	30
3580	130
3470	30
3360	50
3350	60
3395	45
3320	50
3320	30
3330	70
3320	30
3420	60
3310	50
3270	50
3250	55
3090	45
3090	30
3040	50
2840	140
3440	40

Figure 26: MBA pots from burial contexts classified with Drenth's typology of 2018 (including examples of these types), sites outside of the research area are mentioned with BE (Belgium) and CNL (Central Netherlands), numbers following these abbreviations or toponyms represent individual burials, with letters representing different dating results of one burial (by author; after Drenth 2015, 134, 183-184; Drenth 2018, 166-167; Lanting and Van der Plicht 2003, 161)

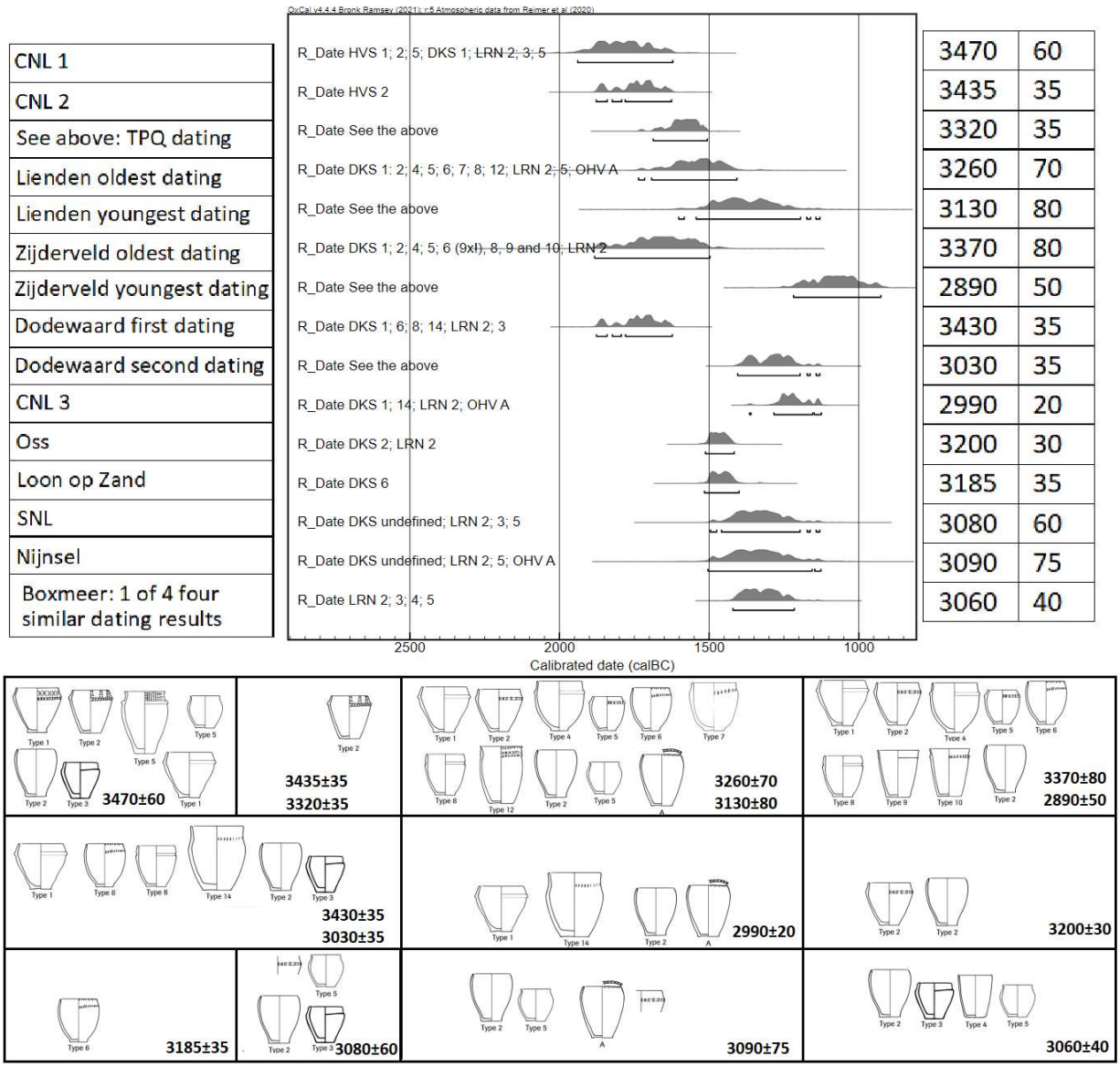


Figure 27: MBA pottery from settlement contexts classified with Drenth's typology of 2018 (including examples of these types), sites outside of the research area are mentioned with CNL (Central Netherlands) or SNL (Southern Netherlands), the drawings at the bottom of this figure represent types associated with the BP dating results, but they are not necessarily all from closed contexts (by author; after Drenth 2015, 134, 188; Drenth 2018, 166-167; Lanting and Van der Plicht 2003, 184-185; 188-189)

3.1. Catalogue

Code (in combination with light green colour)	**Defining features for chronology**	**Dating**	**^{14}C dates from assemblages from appendix 3 of the thesis sharing features (in BP)**
RC1	-Raised/pressed out cordon: nail-impressed by paired nail impressions -Pair of nail impressions above this cordon (may have been a typical vertical pattern)	Typical/Occurrence: **MBA-A: Early phase-Middle phase A:** 1800-1600 BC (fig. 13; table 6).	3470±60
	-Grit: coarse quartz temper (shining through the surface)	Remarks: the type of cordon and the decoration are typical for the MBA-A. Future research may possibly extend the dating.	
RC2 + EDE-5-1-2-7 + EDE-5-1-2-9; 10; 11; 12	-Closed shapes (build-up type II) -Likely (or almost certainly in case of EDE-5-1-2-9; 10; 11; 12): Barrel-shaped without decoration: LRN type 2 (fig. 25)	Typical: **most of MBA: Middle Phase B and phases thereafter**: 1600-1100 BC (fig. 14; 18; table 6).	3345±35 3280±35? 3065±35 2970±30? 2930±30 2915±45 2757±41? (shape type with grit temper)
	-Grit: coarse quartz temper (shining through the surface) -Grog: few large pieces (only EDE-5-1-2-9; 10; 11-12)	Occurrence: **Entire MBA** and **LBA**.	
	-Rough but slightly smoothened in diagonal/horizontal striations (fingers?) -Shrinkage cracks		
MP9-Oss 51	-Base: very thick	Typical/Occurrence: **EBA?-Entire MBA** (table 5).	3555±40 (possibly other examples in the dataset with no mention of the temper material)
	-Fluvial grit: rounded temper (shining through the surface in large quantities) -Grog: few large pieces	Remarks: Example of a rarer temper material with typical pottery thickness and surface of the MBA.	
AW1-48	-Open shape (build-up type I) -Likely bucket-shaped: DKS type 10 (fig. 25; see e.g. fig. 14) -Possibly a very long neck	Typical: **MBA transition to LBA?**: 1200-1100 BC (table 6): to be taken with a grain of salt.	3470±60 (raised cordons) 3400±40 (raised cordon?)
	-Applique cordon with finger impressions	Occurrence: **most of MBA: Middle Phase B-LBA:** 1600-800 BC, less likely during the late phase B of the MBA (1400-1200 BC).	3320±35 (pseudo-cordon?) 2965±30 2960±20?
	-Grit: coarse quartz temper (shining through the surface) -Grog: large/coarse pieces (shining through the surface)	Remarks: the absence of shrinkage cracks, the presence of a lot of grog and the presence of an applique cordon could generally indicate a dating to the MBA-B, in particular the latest phase (cordons and grog were more common). Applique cordons are also typical for the LBA.	2945±30 (pseudo-cordon?) 2935±30? 2815±45 2770+35 2757±41 (single cordons)
	-Rough but slightly smoothened in diagonal/horizontal striations (fingers?)		
EDE-5-1-2-5	-Closed shape (build-up type II) -Slanted shoulder (that does not bend outwards or it would have been a neck): possibly a biconical shape: DKS type 3 or 7 (fig. 25); also similar to Desittere's Coarse Ware (appendix 1 of thesis)	Typical: **most of MBA: Middle Phase B and phases thereafter**: 1600-1100 BC (fig. 16; table 6).	3120±35 (very similar impressions and shapes)
	-Row of very deep finger impressions (belly-shoulder transition)	Occurrence: **Entire MBA** and **LBA**, 1800-800 BC; less likely during the late phase B of the MBA (1400-1200 BC).	
	-Grit: coarse quartz temper (shining through the surface)	Remarks: the surface with shrinkage cracks is typical for the MBA, but similar shapes known as coarse ware (Brandsma 2022, appendix 1) do appear in the LBA. The one similar assemblage of the dataset actually points at the late phase of the MBA.	
	-Rough but slightly smoothened in diagonal/horizontal striations (fingers?) -Shrinkage cracks		
	-Closed shape (build-up type II): neck does not protrude outwards so not build-up type	Typical: **MBA-A: Early phase?**: 1800-1700 BC (table 6): to be taken with a grain of salt	*Nothing that is very comparable*

Code (in combination with light green colour)	Defining features for chronology	Dating	^{14}C dates from assemblages from appendix 3 of the thesis sharing features (in BP)
EDE-5-1-2-13; 14; 15; 16	III -Very gradual/weak shoulder-neck transition	Occurrence: wider dating in **MBA?** Remarks: The lump is akin to horseshoe-shaped handles and other lumps (fig. 12; 21). Drenth remarked that such a characteristic may appear during the early MBA-A (table 6). Polished surfaces incidentally appear during this period (table 5). The temper and shrinkage cracks are typical for the MBA in general. That being said, pottery from the same feature (EDE-5-1-2) generally does not match this dating (no typical decoration types).	
	-Lump/application		
	-Grit: coarse quartz temper (shining through the surface) -Grog (in much smaller quantities)		
	-Polished -Shrinkage cracks		
EDE-5-1-2-17	-Closed shape (build-up type II) -Not clear: possibly a biconical pot without decoration: e.g. LRN type 1 (fig. 25)	Typical: **most of MBA: Middle Phase B and phases thereafter**: 1600-1100 BC (table 6). Occurrence: **Entire MBA**.	*Different dating results in the dataset generally have comparable features*
	-Grit: coarse quartz temper (shining through the surface)		
	-Rough but slightly smoothened in horizontal/diagonal striations (fingers?) -Shrinkage cracks		
HBB	-Row of (at least two) nail/finger impressions	Typical: **Entire MBA** (table 6). Occurrence: Most other periods with quartz grit as temper material: e.g. **LBA**. Remarks: the sherd has little chronological value of its own, but is often the only type of decoration found in late MBA-A, MBA-B and early LBA assemblages.	*Many different dating results in the dataset throughout the MBA and early LBA*
	-Grit: coarse quartz temper (shining through the surface)		

Table 7: Catalogue of sherds of the Middle Bronze Age in the physical reference collection

Figure 28: Middle Bronze Age sherds in the reference collection (by author)

4. Late Bronze Age (1100-800 BC)

The LBA is associated with shape and decoration diversification (started ~1200 BC), pots with angular profile transitions and pots with long necks. One of the most common decoration methods consists of horizontal rows of finger impressions (which was also common during the MBA) and decoration is usually positioned on the shoulders. There is also a relatively common appearance of decoration on the neck and on every side of the rim. Temper material consists of grit or grog and many pots are smoothened and/or polished. For more information on the LBA, the reader is referred to sections 2.5, 3.1.3, 3.1.4 and 3.2.2 in the thesis (Brandsma 2022). The reader is referred to appendix 1 of the thesis for an overview of traditional typological (shape) types from the LBA based on the typology of Desittere (Brandsma 2022, appendix 1; Desittere 1968a; Desittere 1968b).

The reader is referred to table 8 for the characteristics of temper, surface, (basic) shapes and decoration (and individual phases), figures 29 and 30 for a selection of characterizing (mostly angular) shapes, figures 31 and 32 for some decoration types and figures 33 and 34 for some vessels and assemblages that were ^{14}C-dated to this period.

	Shape	Rim decoration	Body decoration	Surface and temper
Period as a whole (especially compared to MBA)	• Increase of **shape diversity** • Increase of **angularity** -occurrence of some shapes easily confused with the Middle Iron Age! • **Tripartite** shapes (in contrast to barrel/bucket shaped pots) • Bodies visibly **thinner** (also in relation to the shape) • Inner angular shoulder-neck transition (also on EIA Schräghals)	Period as a whole: • **Finger** impressions • **Nail** impressions • **Cartel rim** (diagonal finger impressions/ sweeps; wavy rim) • Impressions in front, on top and inside of the rim • Also see (Van den Broeke 2012, 107-112) for some additional elaboration	• **Increase in percentage** of body decoration compared to MBA-B • **Diversification** of decoration (MBA-B: finger/nail impressions + cordons) • ***Ear decoration*** *might be typical: only one dated example in the thesis (Brandsma 2022, appendix 3)* • *Classical decoration types in e.g. Desittere 1968: not sure when they appear+disappear* • **Decoration on the shoulder and neck** (much like the LIA)	• **No shrinkage cracks** anymore • **Smoothening: 15% to 44%** of assemblages analysed by Arnoldussen and Ball (2007) • Examples of **polishing** • Entire body **smoothened/ polished,** which includes the **belly:** unlike Iron Age
Early phase (1200/ 1100 -1000 BC)	• **Short necks** (protruding outwards) appear quite commonly • **Long necks** (>5 cm) seem to appear (probably after 1100 BC; likely before 1000 BC) • **Lips** (thickened rims) • Both **pots** and **smaller wider shapes** appear more often: bowls • **Biconical shapes** appear • **Barrel-shaped** pots are still common		• **(Applique) Cordons** -Typical: finger-impressed • **Finger/nail** impressions -Typical: horizontal row of impressions on belly-shoulder transition -Typical: one/two horizontal rows (vertical nail impressions) below the rim • **Spatula** impressions -different shapes (round/striped) • **Lines/grooves** -Typical: horizontal parallel lines • **Kerbschnitt**: likely before 1000 BC	• **Quartz grit** temper is dominant • May be used in combination with other materials: mostly **sand** • General increase in use of **grog** temper • Usually oxidized: often **red** (/orange?)-coloured pottery
Late Phase 1000-800 BC	• **Long necks** (more common): includes traditional shapes: **-Cylindrical-shaped** **-Conical-shaped** -Funnel-shaped (>4 cm long) less common • **Arched** (rounded) **shoulders** • **Pots, smaller beakers** and **wider shapes** appear: often with e**ars** and/or **handles**		• **(Applique) Cordons** -Typical: finger-impressed; and on the shoulders of big pots (grog-tempered) • **Finger/nail** impressions -Typical: horizontal rows -Both separate and interconnected • **Spatula** impressions -Typical: horizontal rows • **Grooves** and/or **Kerbschnitt** -Typical: geometrical patterns • Parabolic/pendant arch pattern may be typical	• **Grog** temper is generally dominant • Temper may be used in combination with other materials: mostly **sand** • (Quartz) grit can (locally) still be dominant • Usually not entirely oxidized: often **brown**-coloured pottery • Sporadically besmirching after 1000 BC (on belly) (Van den Broeke 2012, 128-129)
End 900-800 BC (and into Iron Age)	• **Weaker angularity** in pot profiles (in general!) • Wide bellies (belly-shoulder transition) and/or; • Weak S-shaped profiles • Classical EIA shapes	• Possibly fewer rim decoration than before (<10% of rims)	• See the above (1000-800 BC) *Speculation by Arnoldussen and Ball (2007):* • *Paired **nail/finger** impressions in different directions* • **Comb decoration**	• See the above (1000-800 BC)

Table 8: The characterization of pottery from the LBA according to research of Arnoldussen and Ball (2007, 182; 189; 192; 194-198; appendix 3) combined with some data added by the author (partially from Brandsma 2022, appendix 3) in blue: some additional sources were accessed to look for additional characteristics, in particular temper (Berkvens et al. 2004, 83; Van den Broeke 1991, 205-206; Van den Broeke 2012, 128-130; 282; Schoenfelder 1992, 242; Taayke 2004, 167)

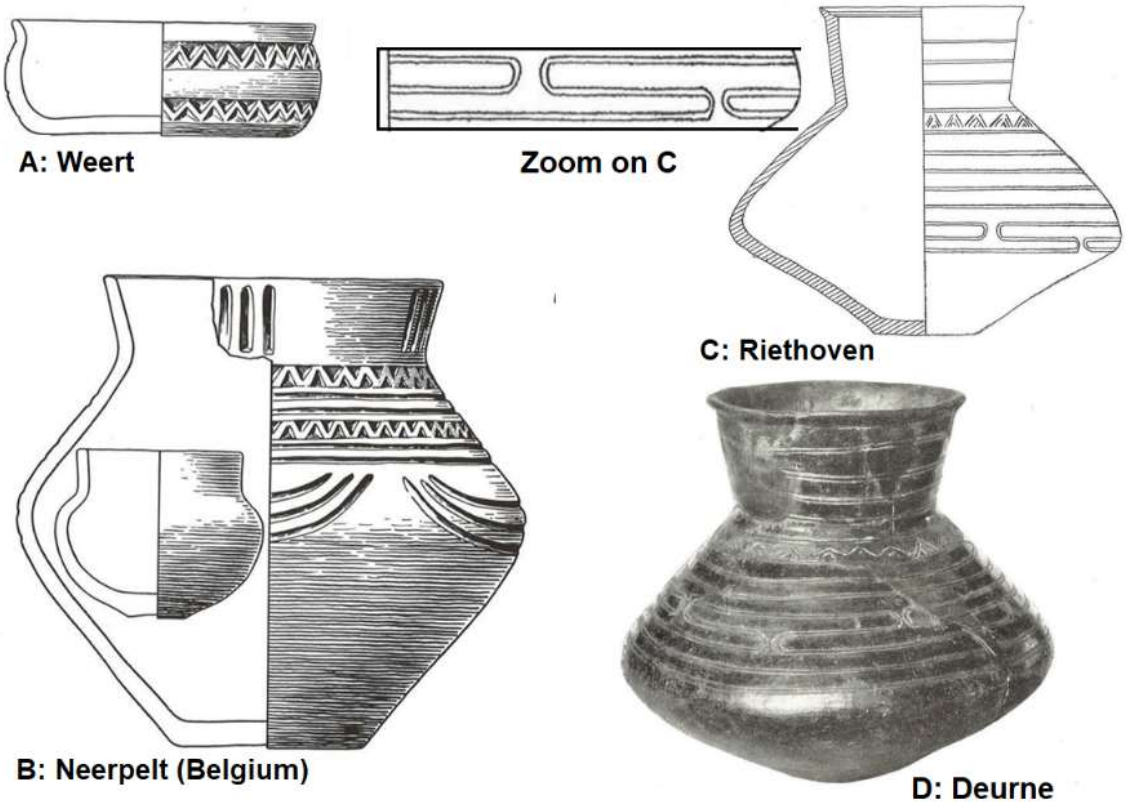


Figure 29: Typical angular tripartite vessels from the LBA with typical decoration types/patterns: Kerbschnitt decoration of lines and triangles in zigzag pattern (A+B), and lines/grooves in a horizontal pattern with space in between, a meander pattern and hatched triangle decoration (C+D) (after Desittere 1964, 49; after Lanting 1976, 58)

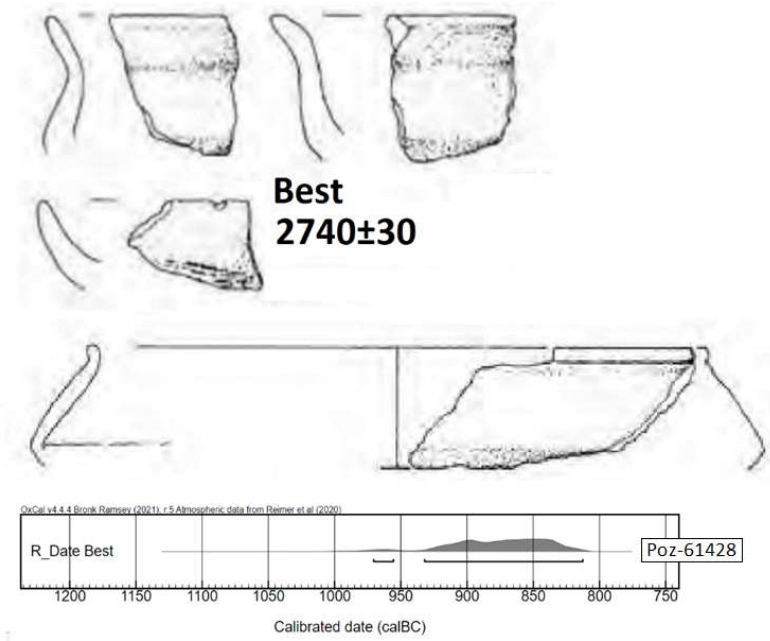


Figure 30: Angular shapes ^{14}C-dated to the Late Bronze Age that are typologically also typical for the Middle Iron Age (after Brandsma 2022, appendix 3; Meurkens 2017, 1357-1358; Tol 2017, 82)

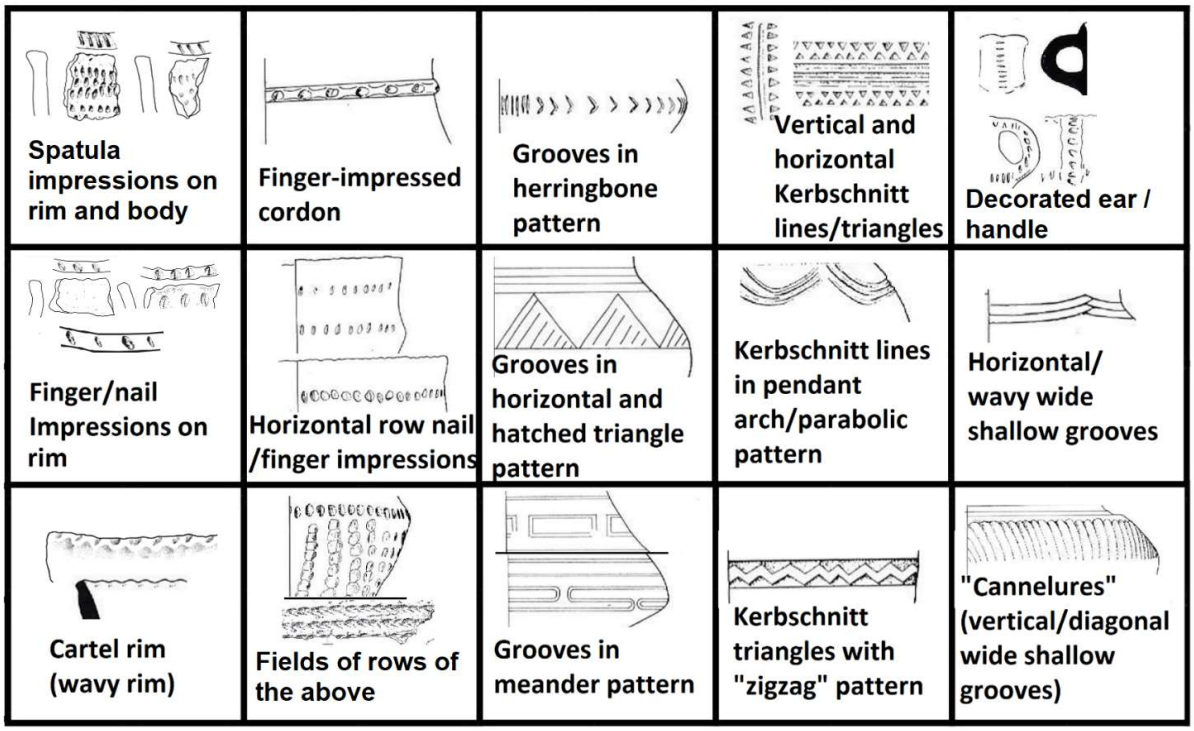


Figure 31: Some typical decoration types that have been observed on LBA pottery (many of which are rare), some patterns may occur with other tools: e.g. a parabolic pattern with interconnected finger impressions (by author; information from: Van den Broeke 1991, 207; Desittere 1968a, 30-50; imagery from: Arnoldussen and Ball 2007, 183-184; 186; Desittere 1968b, 57; 60; 62-64; 66; 69; 73-74; 89; Taayke 2004, 167)

Figure 32: Fragmented sherds from Wijchen with decoration types typical for the LBA (Verhelst 2011, 100)

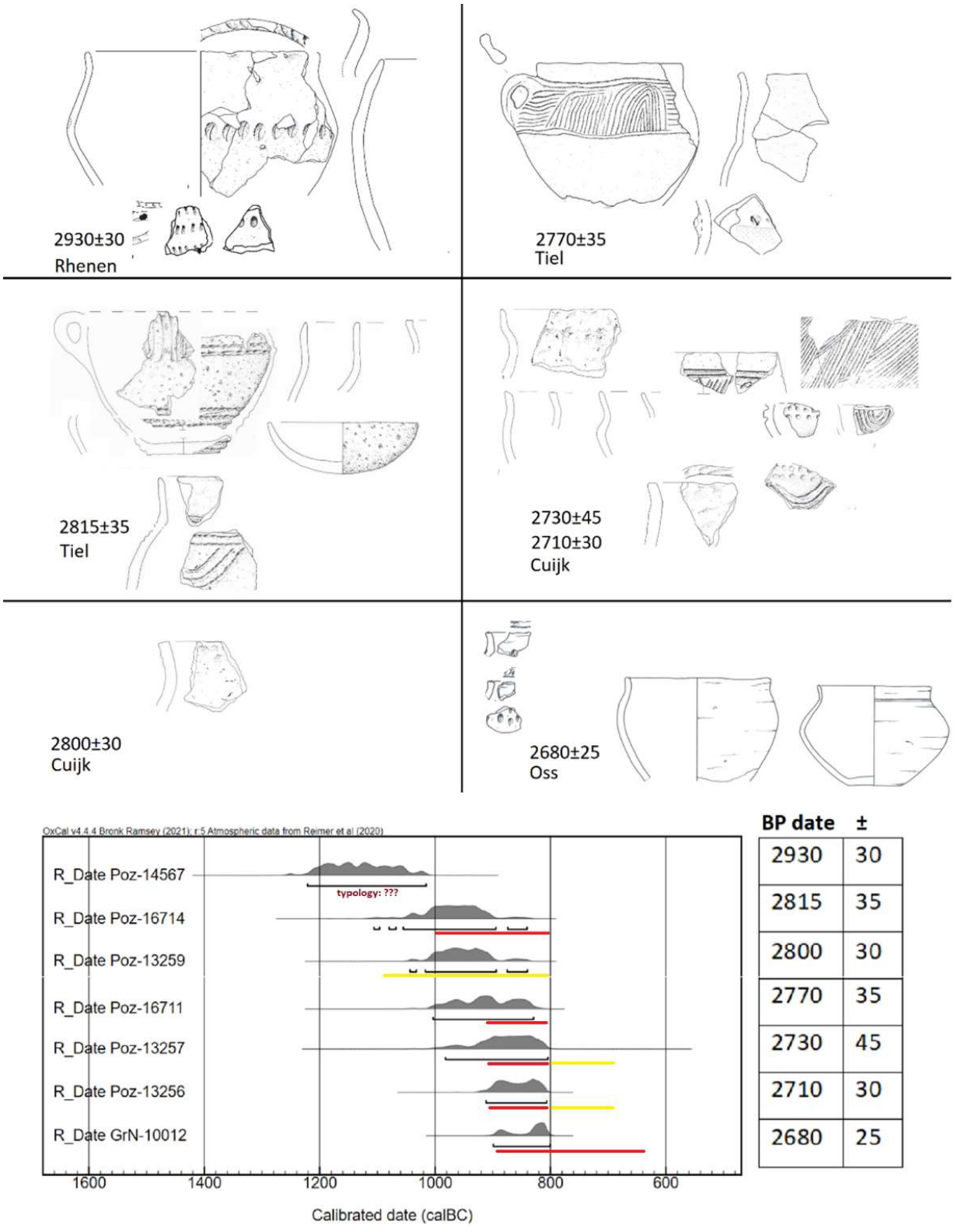
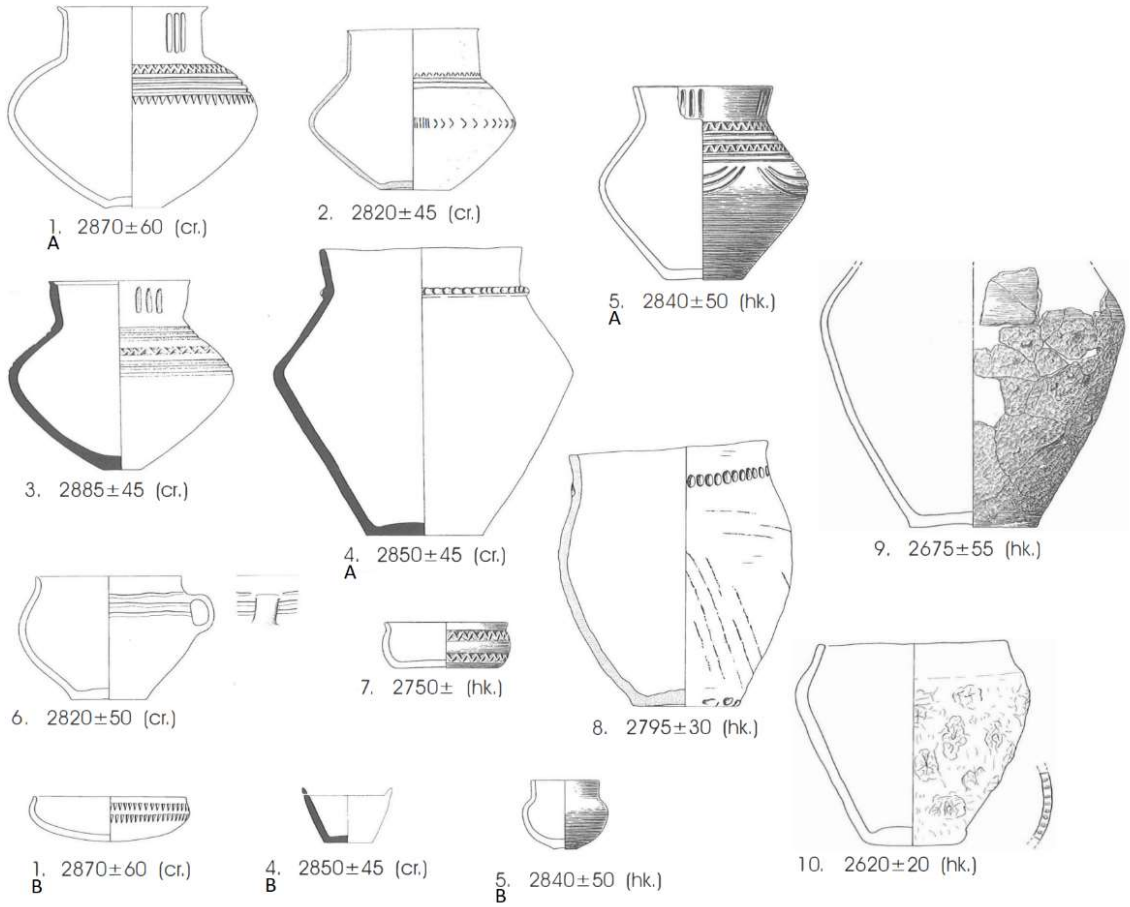
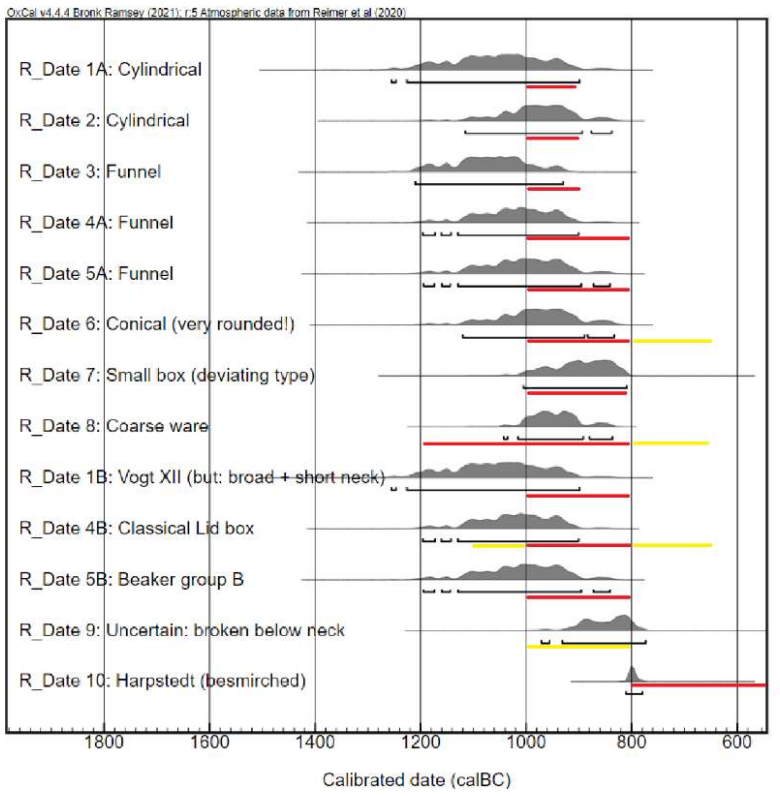


Figure 33: Recalibrated ^{14}C dates of seven assemblages used by Arnoldussen and Ball to characterize LBA pottery, as well as examples of drawings from these different assemblages, it also includes typological dates (red stripes below the ^{14}C dates, yellow lines mean typological dating to this phase is less likely/uncertain) (by author; after Arnoldussen and Ball 2007, 182-183; 186-189; 192)





BP date	±
2870	60
2820	45
2885	45
2850	45
2840	50
2820	50
2750	50
2795	30
2870	60
2850	45
2840	50
2675	55
2620	20

Figure 34: Pots/vessels mentioned and showed by Lanting and Van der Plicht, accompanied by ^{14}C dates and typological dates (red stripes below the ^{14}C dates, yellow lines point that the typological dating to this phase is less likely and/or uncertain) (by author; after Lanting and Van der Plicht 2003, 222; 224-225; 248-249; 251)

4.1. Catalogue

Code in combination with yellow colour	**Defining features for chronology**	**Dating**	**^{14}C dates from assemblages from dataset sharing features (in BP)**
RC7 + **RC8** + *R17-8*	-Lines of parallel interconnected nail impressions -Grog -(relatively) smooth (inner + outer surface) (RC8 + R17-8) -relatively rough (RC7)	Typical: (late) **LBA, start of EIA** (phase A) and **part of the LIA** (phase J-K) (fig. 41). Occurrence: Potentially a wider dating in the **LIA** and **EIA** (e.g. phases H and N). Remarks: RC8 looks similar to a late LBA example (Van den Broeke 2012, 45). R17-8 is messy in comparison. RC7 is rather similar to Kalenderberg decoration for the depth of impressions. The surface and thickness are more akin to those of the LIA. RC7 and R17-8 are used in the LIA catalogue.	*2815+35* 2730±45 2710±30 (interconnected nail impressions)
R17-9	-Parallel grooves with space in between -Rows of nail/finger impressions *-It cannot be certain whether these lines/rows are horizontal or vertical* -Grog -Rough (outer surface) -Smoothened (inner surface)	Typical: **LBA** and **LIA** (fig. 31; 41; 43). Occurrence: Aside of the LBA and LIA, they are also known from the **EIA**. Remarks: Individually, they are quite typical for the LBA (fig. 31) and LIA (fig. 41; 43). The combination is known from the LIA and more incidentally from the LBA/EIA. The examples of LIA patterns generally seem to be different. Those from the LBA/EIA might be (Van den Broeke 2012, 123; 421; 426).	*The dataset only has non-combined examples of these decoration types (both horizontal and vertical)*
R17-1 + R17-2 + R17-3 + R17-4 + R17-5 + R17-6 +	-Two horizontal (might be vertical) rows of finger impressions *(similar to Henkeltasse/Desittere's Coarse Ware)* -Grit: rough quartz grit + fluvial grit -Sand -Grog (smaller quantities)	Typical: **LBA** (fig. 31). Occurrence: **LBA** and **possibly during the MBA-B** (table 8). Remarks: Van den Broeke (2012, 114) specifically mentions two (horizontal) rows as LBA characteristic. ^{14}C dates indicate the possibility of an earlier appearance. If the impressions are actually vertical, the LBA is still most likely because of the temper.	3120±35 (different nature of impression) 2930±30 2815±45
MP1-6	-Closed shape (type III) -Very short neck -Nail impressions in front of the rim -Polished	Typical: **LBA** (fig. 38; 39; table 8; 16). Occurrence: **LBA** and **LIA**. Remarks: Polished surfaces are relatively rare during the LIA but common during the LBA. Rim decoration is typical for both.	3345±35 2940±90 2870±35 2815±45 (nail impressions in front of rim)
LTS5 (LTS-5)	-Ear -Grog	Typical: **LBA** (fig. 49; table 8). Occurrence: Aside of the EIA, it may have first appeared in the **late MBA-B** and it appeared during **periods of the Iron Age A-E; K-M**.	2910±60 2870±35 2840±40 2815±45 2460±30 2430±30 (regular ears)
LTS6-3	-Closed (build-up type III; very short neck: nearly II) -Van den Broeke's shape type 33; may also be considered the angular version of type 41 -Grog -Smoothened/polished (outer surface) -Rough (inner surface)	Typical/Occurrence: **LBA**, **MIA, LIA** and **Roman Period** (fig. 30; table 8; 13; 14; 16). Remark: This sherd was purposefully added to the LBA catalogue, despite it also being typical for the MIA and periods afterwards. Angular profile transitions are a typical LBA feature and the shape types also existed during the LBA according to typo-chronology (Van den Broeke 2012, 61-67). The ^{14}C-dated assemblage in figure 30 has a similar shape.	2925±30 (thicker) 2740±30 2670±35 (longer neck) 2425±30 2290±30 2235±30 (much longer neck) (shape types: similar)

Table 9: Catalogue of sherds of the Late Bronze Age in the physical reference collection

Figure 35: Late Bronze Age sherds in the reference collection (by author)

5. Iron Age (800-12 BC)

The Iron Age in general is characterized by a dominance of grog temper, belly decoration and a finishing technique known as besmirching. For more information on the Iron Age, the reader is referred to sections 2.5, 3.1.5 and 3.2.2 in the thesis (Brandsma 2022). The subperiods have additional basic information about shape and decoration. The Iron Age overview is structured differently compared to the Bronze Age overviews, as it is predominantly based on the single elaborate work provided by Peter van den Broeke (2012). It is still divided into subperiods (sections 6 to 8), but many of the figures have more illustrative value when they show the developments throughout the entire Iron Age, which is why these are shown in this section. The reader is referred to table 10 for some temper materials throughout the research area, tables 11, 13, 14 and 16 for basic characteristics of respectively four subsequent periods within the Iron Age (EIA, MIA-first half, MIA-second half, LIA), figures 36 and 37 for shape characteristics throughout the Iron Age (neck length; pot build-up types), figures 38 and 39 for rim decoration, figures 40 to 44 for body decoration, figures 45 and 46 for surface types and figure 47 for an overview of characteristics of coastal briquetage. Figures 48, 49, 50, 52, 53 and 55 include some imagery of shapes (or shape elements) characterizing for the respective subperiods of the Iron Age.

	Temper
Entire IA (800-12 BC)	• **Grog**: vast majority in all assemblages: often macroscopically invisible • **Sand**: relatively uncommon, used in combination with other temper materials, and possibly naturally in the clay that was used to create the pottery • Grit: sporadically throughout the Iron Age, or very local traditions • Other materials: crushed shell or bone splinters, both of which are more common during the Roman Period and may only appear incidentally
(Early) **EIA** (800-500 BC)	• **Grit:** sharp **quartz**: up to 20% of an assemblage (often <1%): more common (with higher percentages) along the northern fringes of the research area: one extreme exception in Groesbeek with a high percentage of grit during MIA phase E (Van den Broeke 2012, 129)
Late EIA-Roman Period (650-12 BC>)	• **Organic**: in imported coastal briquetage (fig. 47): usually pottery with a yellow/orange colour and a chalky surface
LIA-Roman Period (250-12 BC>)	• **Organic**: excluding imported coastal briquetage (local pottery): incidentally during the LIA, and much more common during the Roman Period • Incidentally also earlier in the Iron Age (e.g. Verhelst *et al.* 2015, 38; Meurkens 2015, 166)

Table 10: Temper materials in the Early, Middle and Late Iron Age (=EIA, MIA and LIA) (Van den Broeke 2012, 128-131)

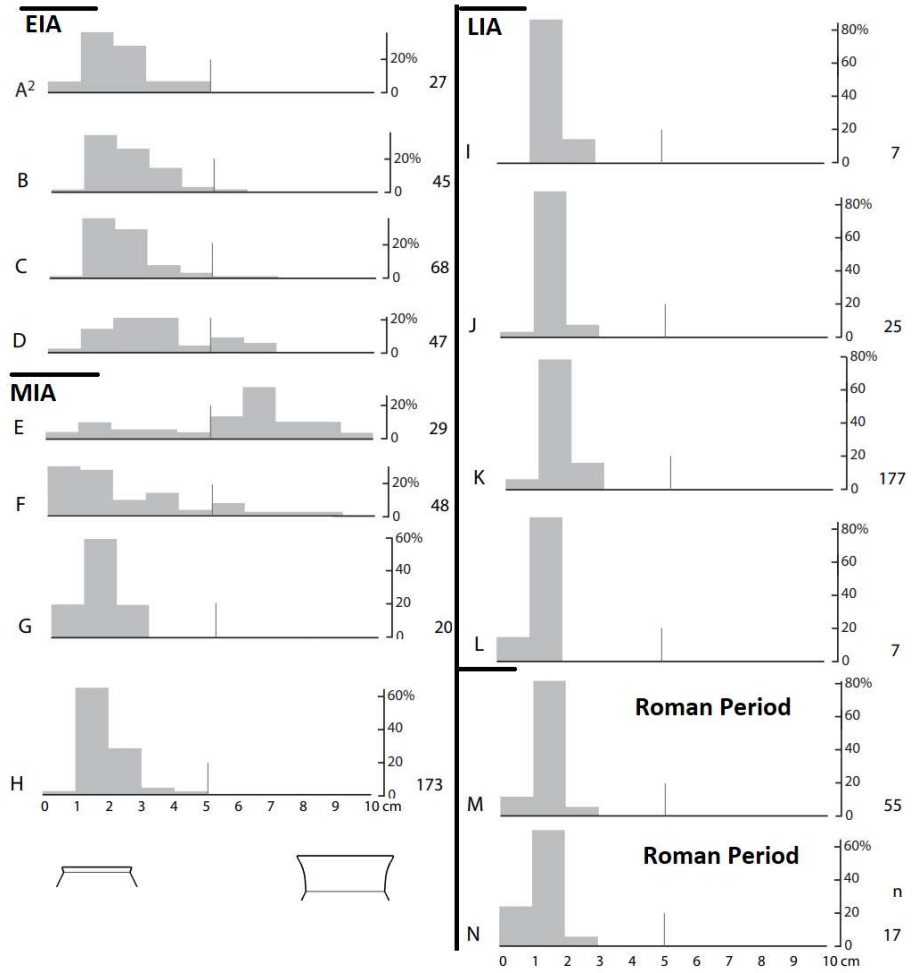


Figure 36: Percentage of vessels with a certain neck length (1-10 cm) throughout the Iron Age in Oss-Ussen, largely applicable for the entire research area (after Van den Broeke 2012, 92-93)

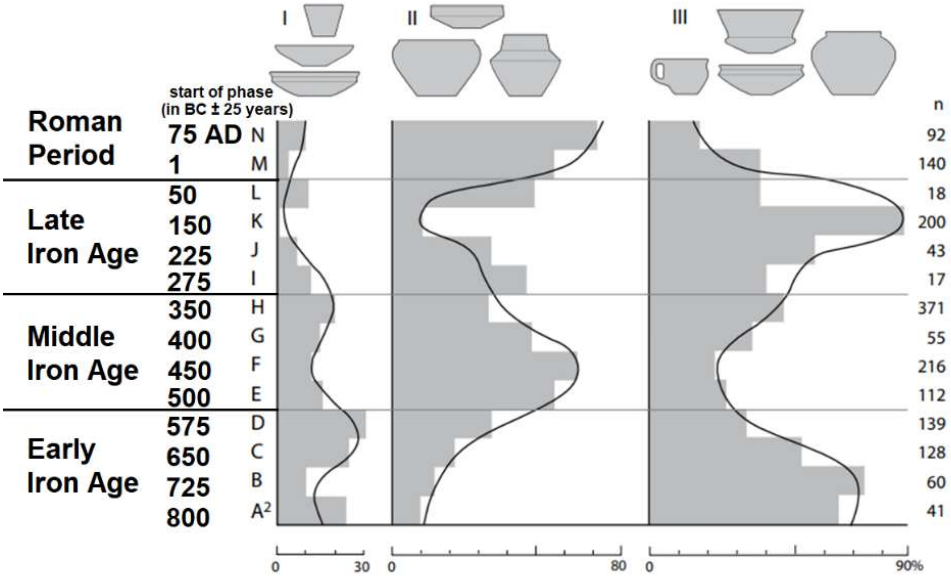


Figure 37: Van den Broeke's pot build-up types and their common occurrence during the Iron Age in Oss-Ussen (after Van den Broeke 2012, 41)

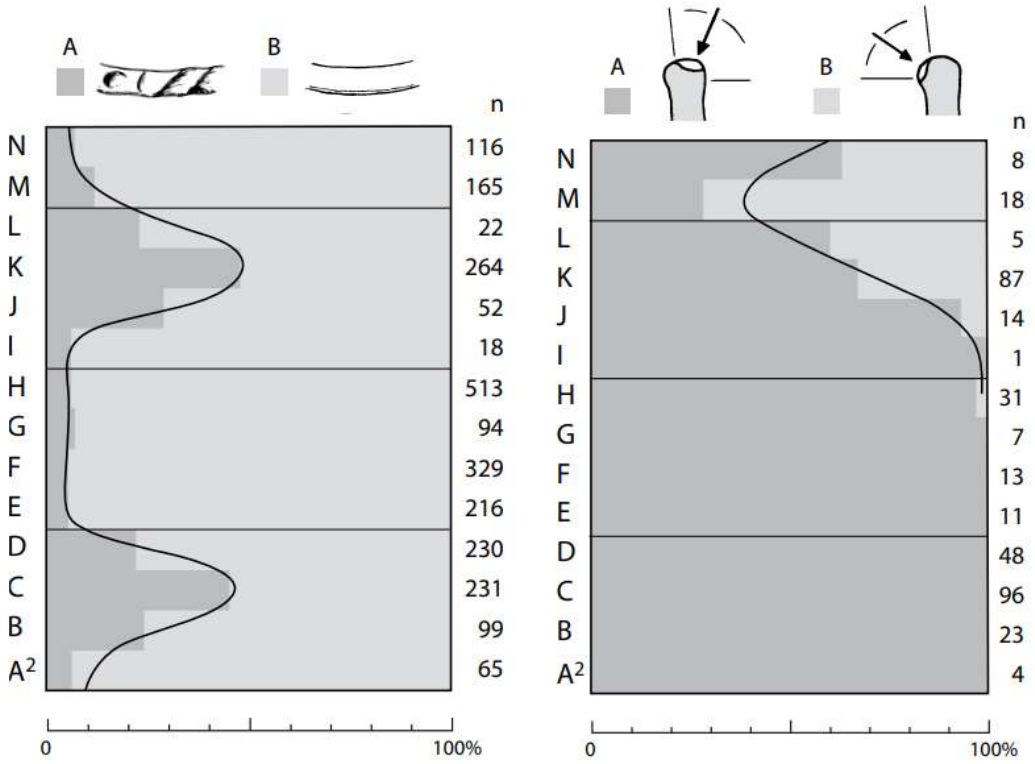


Figure 38: Amount of decorated rims (A) compared to undecorated rims (B) (left) and location of the impressions on top/behind (A) or in front (B) of the rim (right), data from Oss-Ussen mostly representative for the wider research area (Van den Broeke 2012, 107; 111)

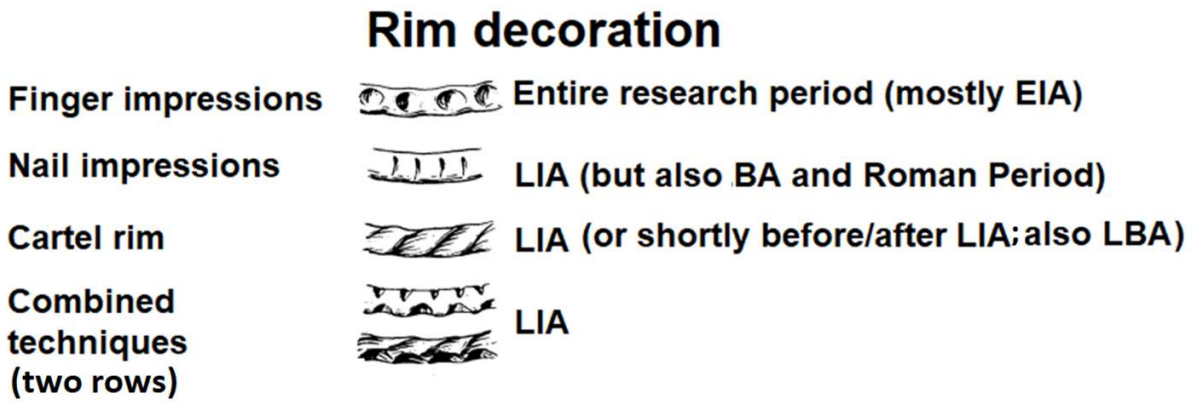


Figure 39: Types of rim decoration common to the Iron Age, besides finger impressions, most are typical for the LIA and may also appear in the LBA (after Van den Broeke 2012, 110)

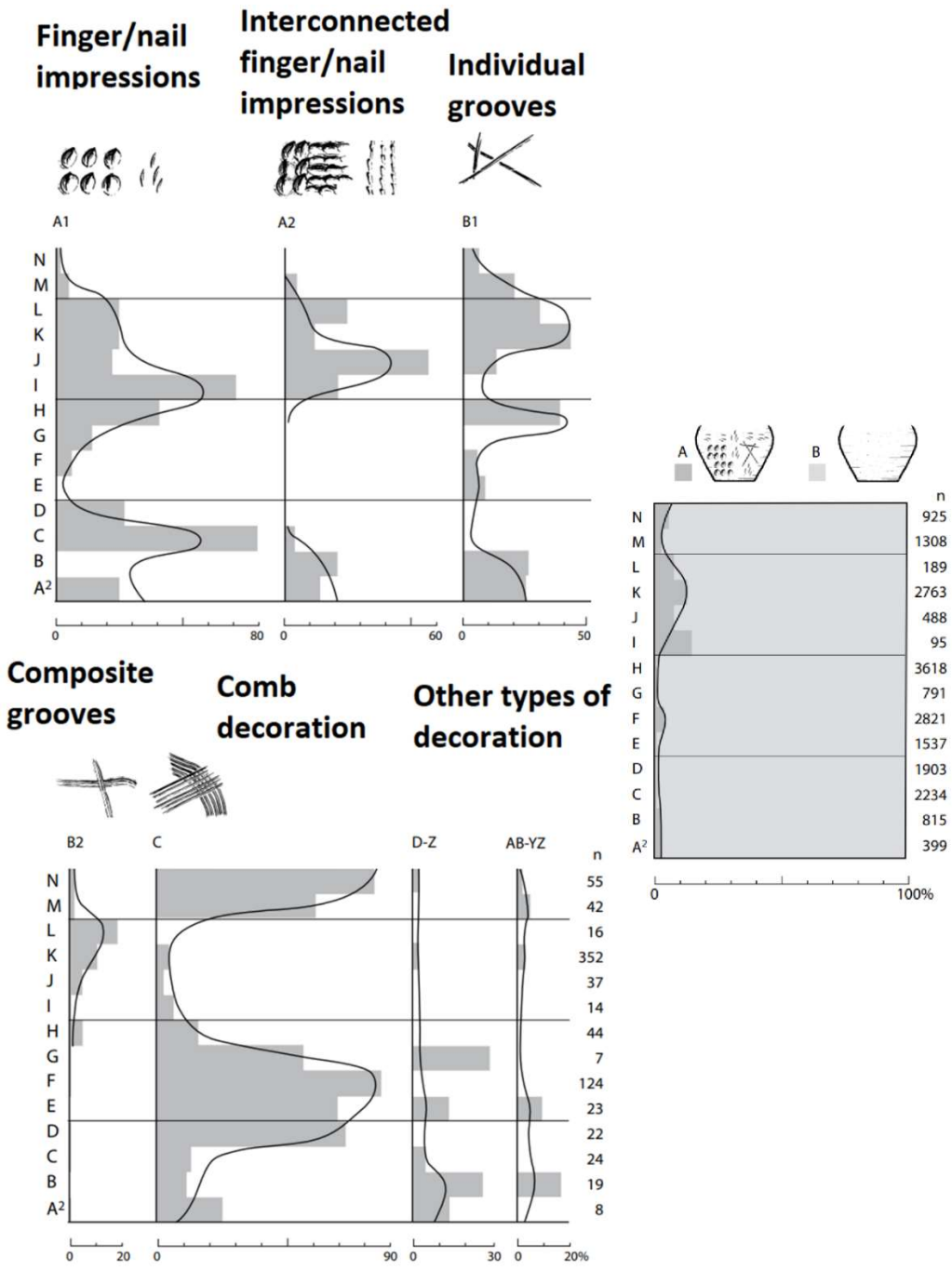


Figure 40: Percentual prevalence of the main body decoration types throughout the Iron Age in Oss-Ussen (upper+lower left), as well as the prevalence of body decoration (A) in Oss-Ussen (right) (after Van den Broeke 2012, 112; 124)

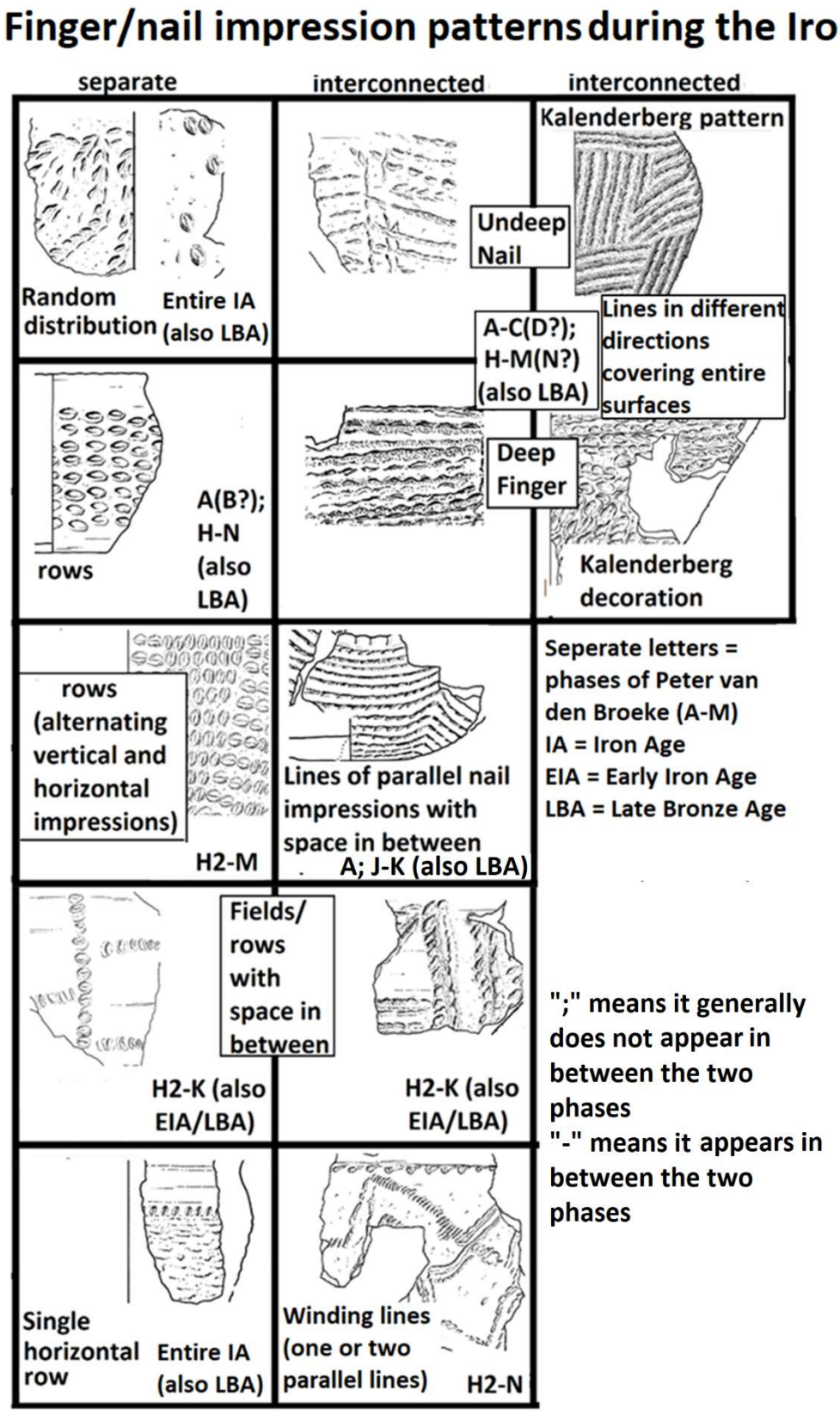


Figure 41: Typical patterns of nail and finger impressions during the Iron Age, a text in a box between two boxes refers to the decoration on both sides of this box (by author; after Van den Broeke 2012, 60; 64-65; 74; 76; 113-116; 395; 418; 420)

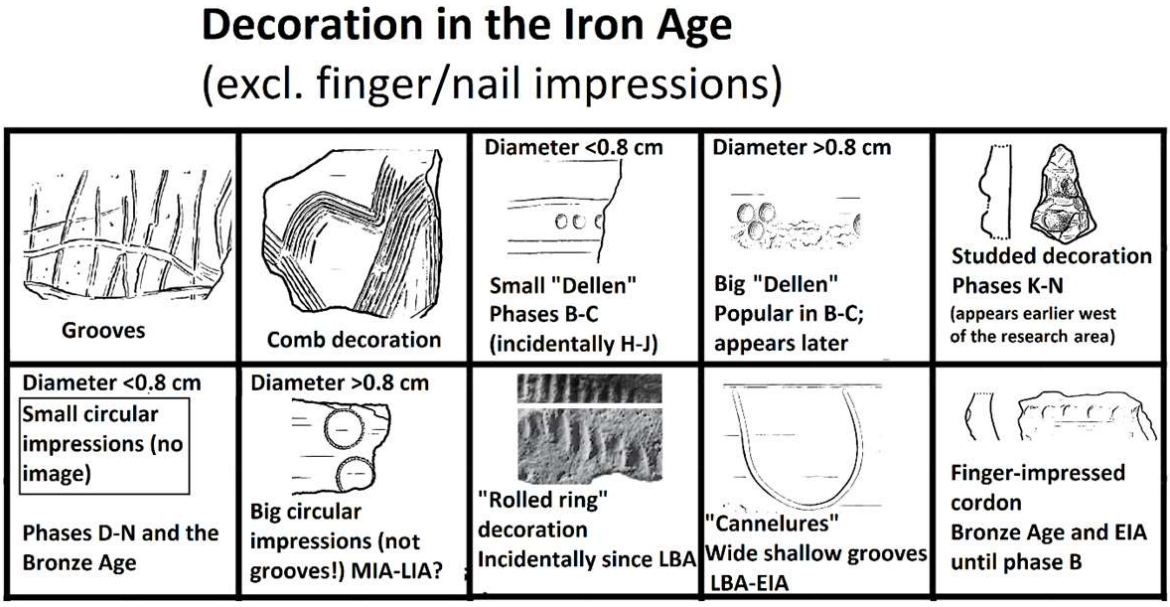


Figure 42: Most decoration types of the Iron Age excluding finger and nail impressions: grooves and comb decoration are common and the other types are uncommon but have some chronological value (by author; after Van den Broeke 2012, 48; 58; 70; 116-125; 396; 398; 411; 426)

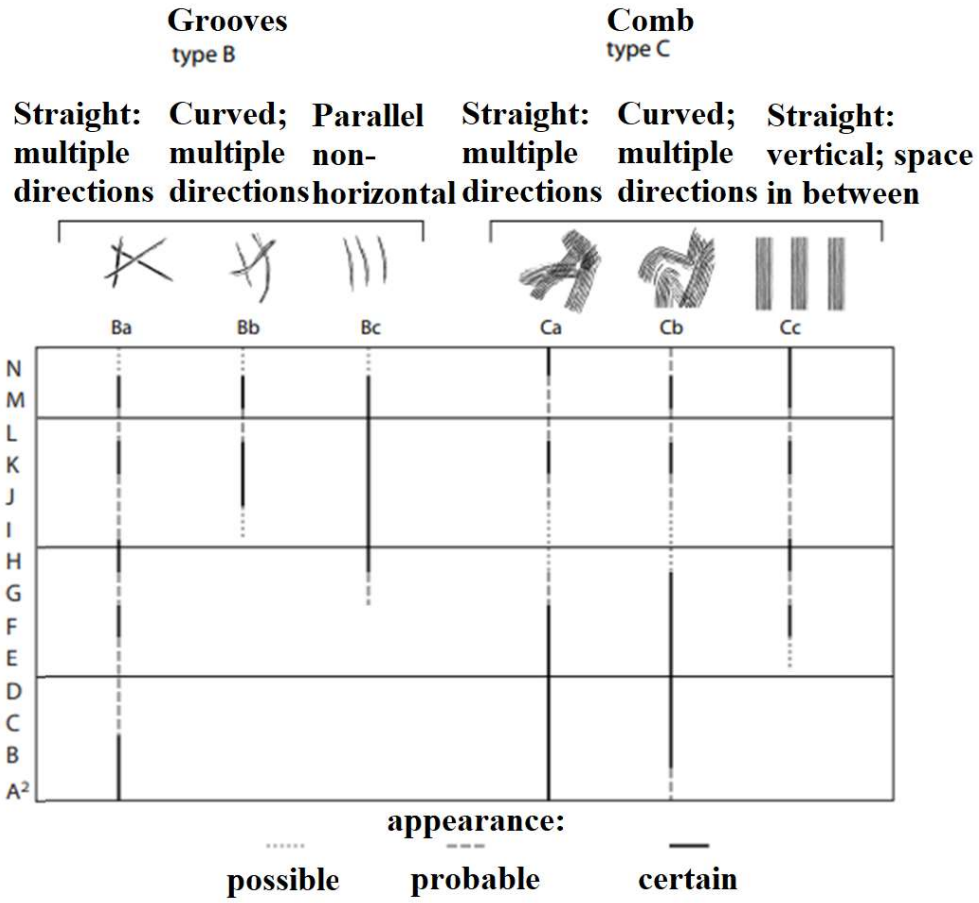


Figure 43: Occurrence of body decoration patterns of grooves (B) and comb decoration (C) in Oss-Ussen, types Bc and Cc may have a lesser chronological value for the wider research area (Van den Broeke 2012, 124)

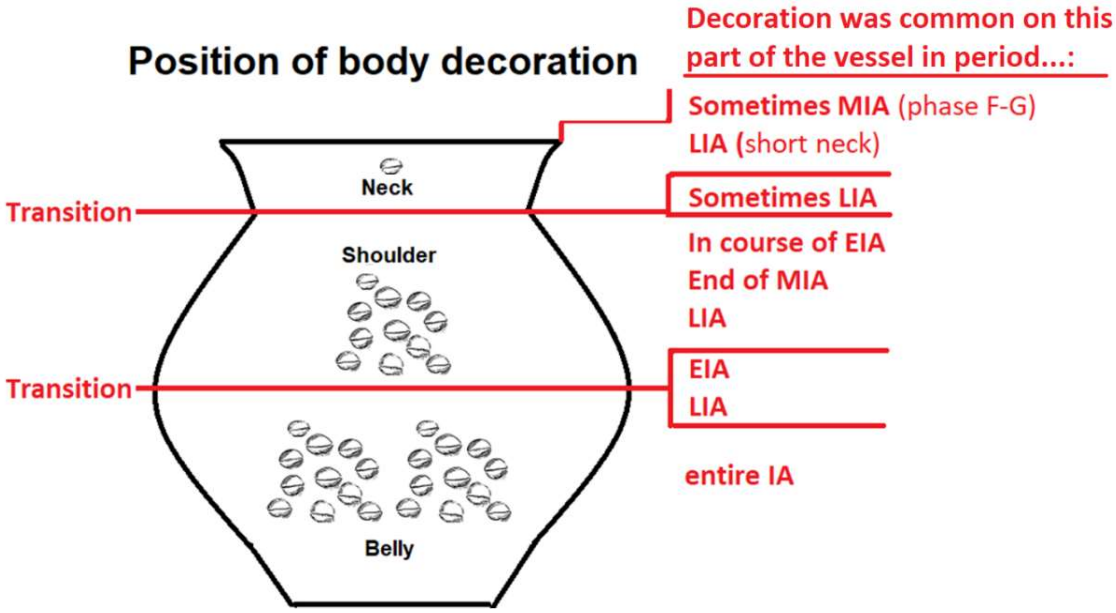


Figure 44: Position of body decoration on pots according to Van den Broeke, the period abbreviations reflect the period in which respectively the neck, shoulder-neck transition, shoulder, belly-shoulder transition and belly were decorated (by author; Van den Broeke 2012, 124-126)

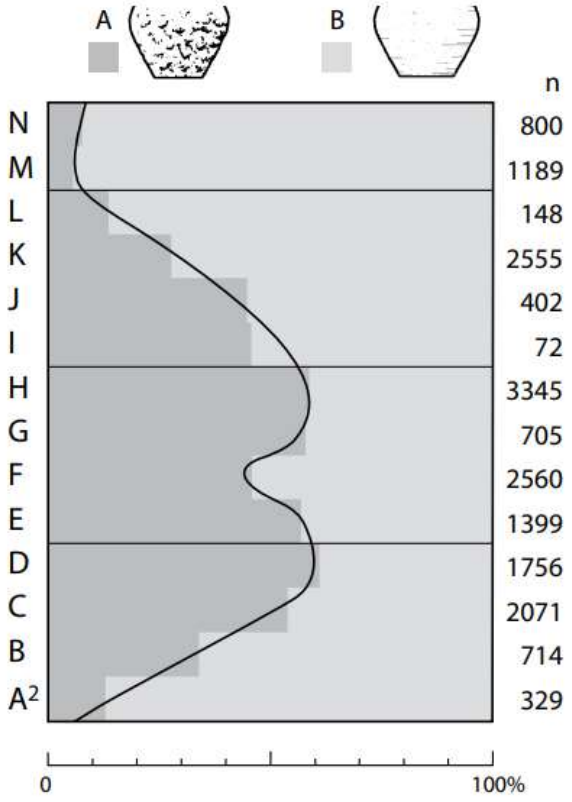


Figure 45: percentage of pottery that is besmirched (A) and that is not besmirched (B) for every pottery phase defined by Peter van den Broeke (2012, 105)

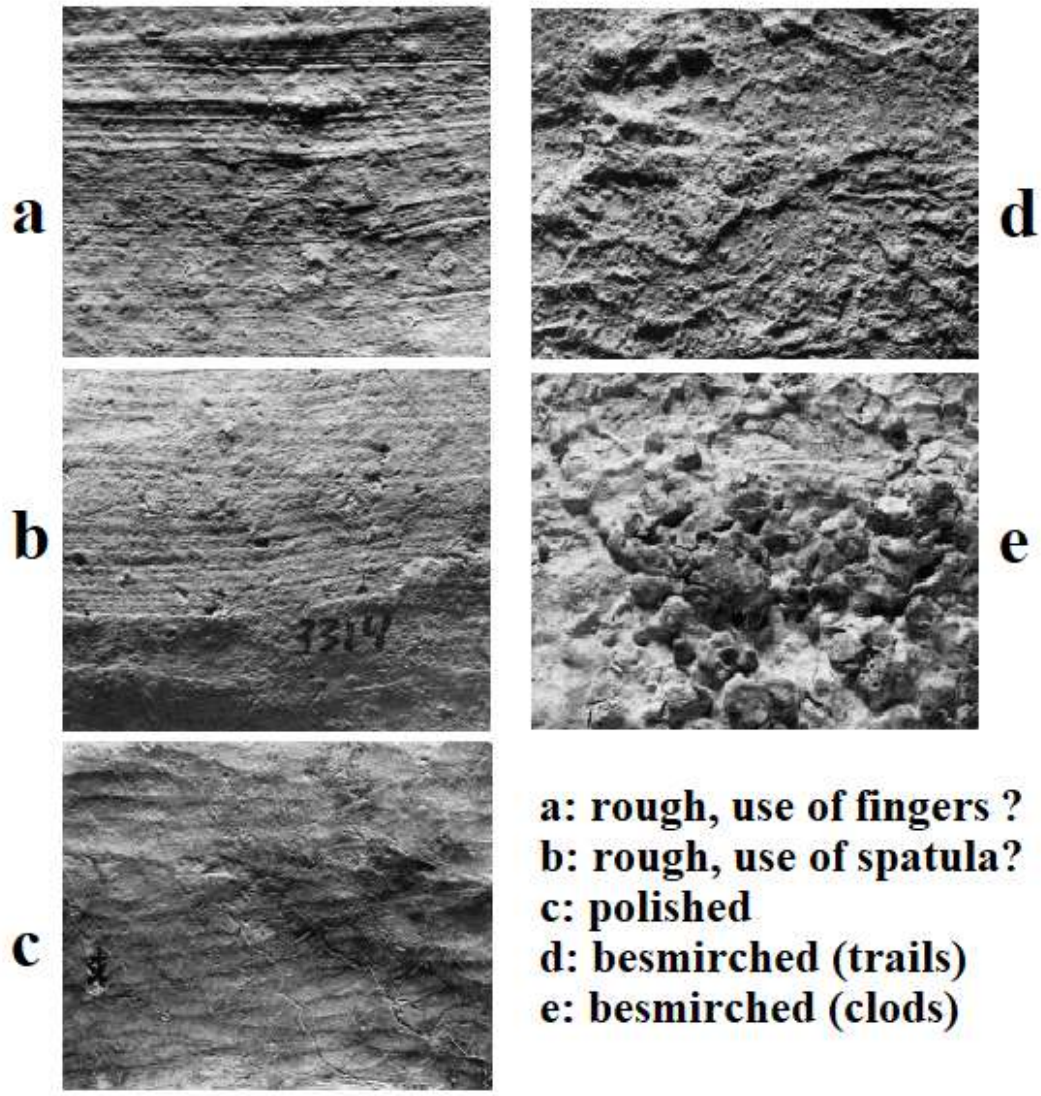


Figure 46: Typical types of surface treatment during the Iron Age, polished surfaces may be polished even more elaborately, by which they lose their traces of polishing (unevenness) shown on this figure (after Van den Broeke 2012, 210)

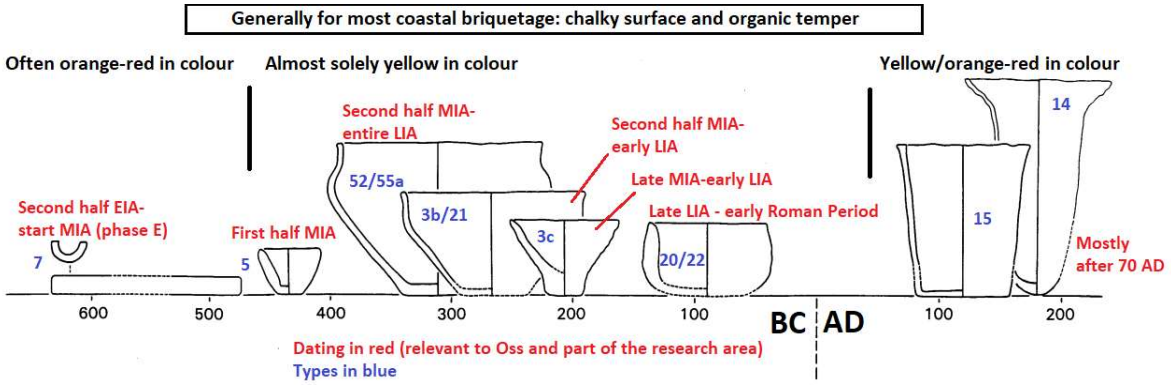
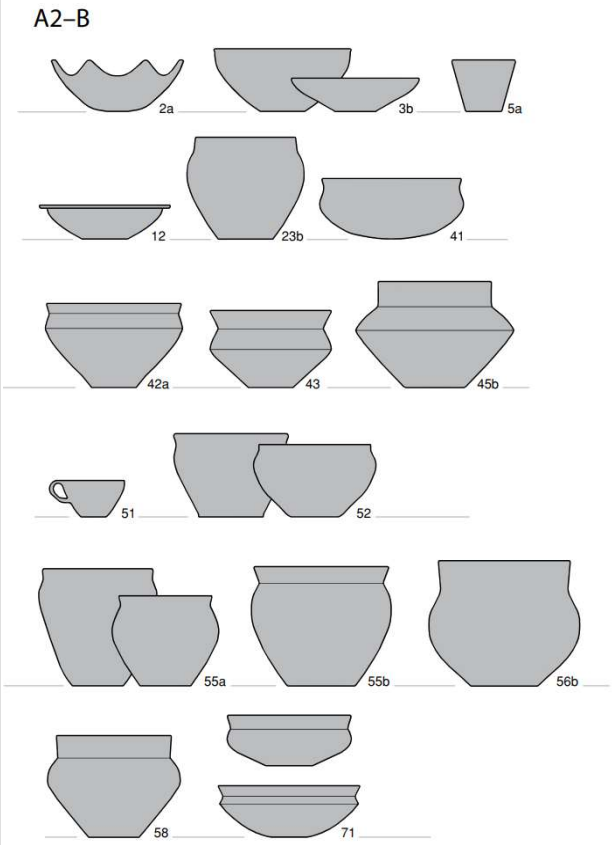


Figure 47: Overview of coatal briquetage pottery profile shapes, their colour and their approximate dating (after Van den Broeke 2012, 172; 177-180; 220)

6. Early Iron Age (800-500 BC)

The EIA is generally characterized by S-shaped profiles and pots with an angular neck-shoulder transitions of pot build-up type III. Decoration is usually positioned on the belly and rim decoration on top of the rim. Many pots are smoothened/polished.

Variable	Information	Drawings of types (by Van den Broeke 2012)
A-D: Early Iron Age (800-500 BC): pottery is fairly similar throughout this long period (or differences have not been recognized)		
Shape	• **Weak angles** in profile are common: often **rounded** • Belly-shoulder transition may **sometimes** be **angular** (e.g. type 71 with a sharp angle) • **Cylindrical and funnel-shaped necks** are common; -angular shoulder-neck transition • Shapes of imported situlae are copied in pottery • **Ears** and lump ears ("knobbeloren") are well-represented -Ears are generally on the rims of small cups (type 51; Henkeltasse/ear mug) or on very large pots (Van den Broeke 2012, 100) Gradual developments towards end of phase D (finalized in E) • Weak S-shaped profiles (23b/55a/55b) develop into more barrel-shaped profiles (higher shoulder, e.g. 23a) • (lump + regular) ears gradually disappear • Length of the neck increases: e.g. twice the size of shoulder -latter is: very rare in phase A, common in phase D • Typical for phase C-D: "haakrand" (type 4): thickening on the inner body of an open shape. Also typical: coastal briquetage cylinder shape (type k-7a: "zoutgootje")	
Rim Deco-ration	• Relatively **scarce in phase A** (<10% in Oss-Ussen) • **Increase** in use is **common in phase C** (45% in Oss-Ussen) (slight decrease in phase D) • When applied: **Finger**(tip) **impressions on top of the rim** • Nail impressions are scarce (unlike the Late Bronze Age) (Van den Broeke 2012, 107; Van den Broeke 2012, 108)	
Body Deco-ration	• **Body decoration is scarce** (<2%), but if used**;** • **Comb** impressions (dominant in phase D) • **Grooves** • **Finger/nail** impressions (dominant in phase C) -Single horizontal row -Interconnected series of impressions (incl. Kalenderberg): it disappears after phase C and reappears in phase H2 • **Lump ears** ("knobbeloren"): see shape	

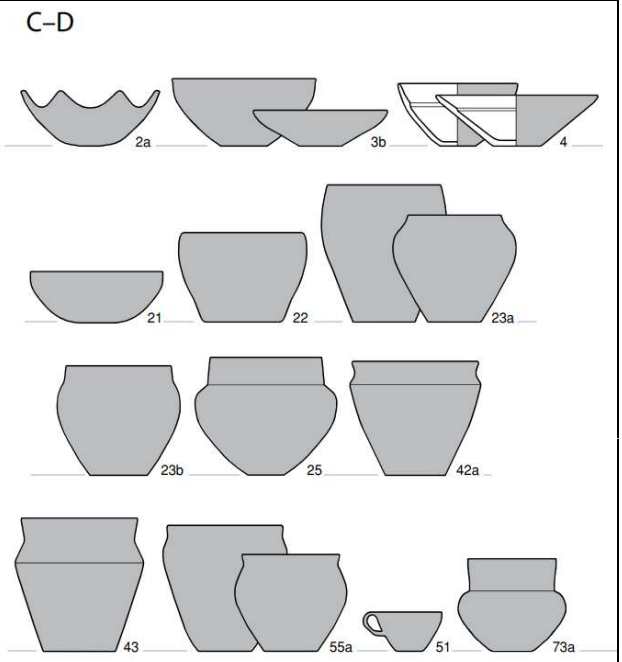
Variable	Information	Drawings of types (by Van den Broeke 2012)
Surface /thick-ness	• Elaborate surface finishing techniques (smoothening) • **Polishing** is common: especially on the neck and shoulders: inner surfaces are also more commonly polished (Van den Broeke 2012, 105-106; 383) • Use of **Besmirching increases** -in Oss-Ussen, **12.8% to 61.7% increase of besmirched pots** from phases **A to D** -phase A: only tripartite closed shapes of pot build-up type III are besmirched (classical Harpstedt pots) -phase B>: closed shapes without neck are also besmirched -phase C>: shapes can be besmirched up to the rim • **Thin** bodies -towards phase D; gradual increase in thickness	
Temper	• **Dominance of grog temper** • Use of a **grit** (coarse material) temper in a relatively high percentage of pottery **(~10%)** in **phase C** in the **north(east)**ern part of the research area (at most 20% per site) (Van den Broeke 2012, 128-129)	

Table 11: Typo-chronological characteristics of phases A-D as formulated by Van den Broeke (2012, 133-136)

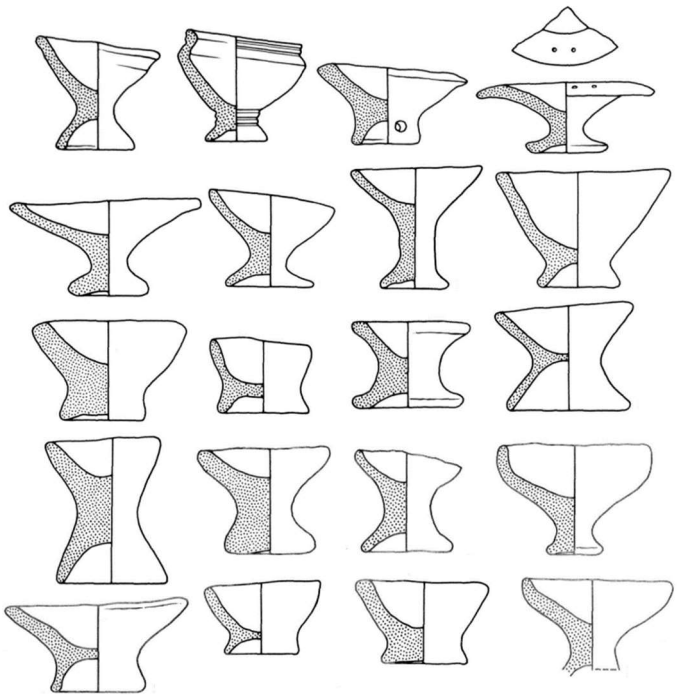


Figure 48: Compilation of Eierbecher (Egg cups: Van den Broeke's type 3a) typical for the Early Iron Age (and start of the Middle Iron Age): mostly known from burial contexts: the narrow hollow foot (base type B3) is typical for this period because of this shape, note that they are usually significantly bigger than contemporary egg cups (after Perizonius 1976, 86; 88)

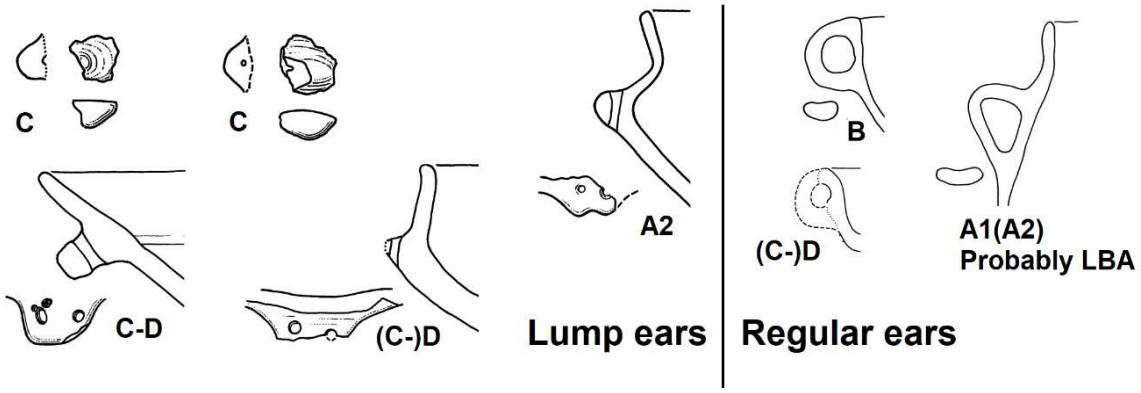


Figure 49: Lump ears (=knobbeloren) and ears/handles are typical for the LBA and EIA and not for the later Iron Age (occasionally in phase E and regular ears sporadically appear in/around phases K-L), the individual letters refer to the Iron Age phases, lump ears appear sometime around the later LBA (after Van den Broeke 2012, 46; 60; 66; 70; 81; 99-100; 403)

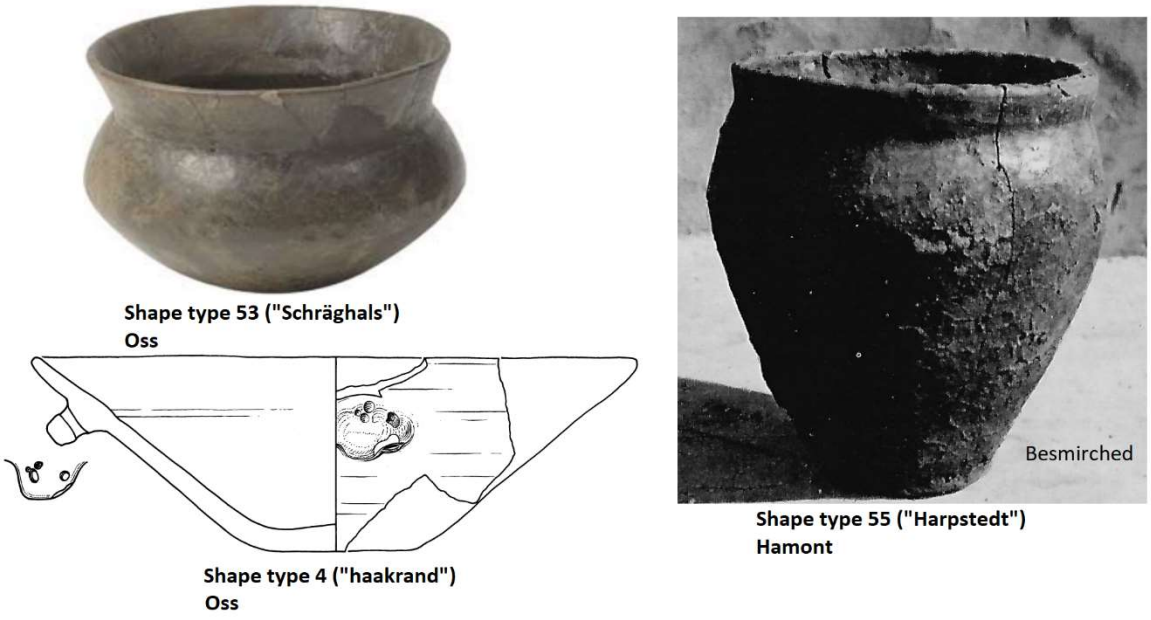


Figure 50: Several typical complete EIA shape types (after Van den Broeke 2012, 46; Fontijn et al. 2013, 145; Roosens and Beex 1965, 11)

6.1. Catalogue

Code in combination with light blue colour	Defining features for chronology	Dating	^{14}C dates from assemblages from dataset sharing features (in BP)
RC9 + R16-10 + MP 1-1	-Interconnected finger impressions that caused wide grooves and ridges (R16-10 + MP1-1) -Interconnected nail impressions (on belly) (RC9) -Grog	Typical: **EIA** and **LIA** (fig. 41). Occurrence: Slightly before and/or after the LIA/EIA; also during the Late Neolithic (Van den Broeke 2012, 114). Remarks: also see AW1-3 and MT-130 in this catalogue, and MT134, MT163 and MT164 in the LIA catalogue.	*Nothing that is very comparable*
R14-1 + R14-2 + R14-3	-Not a closed nor open shape (only "open" in a literal sense) -Van den Broeke's shape type k-7a: zoutgootje: coastal briquetage -Organic temper -Combined with grog + (fine) sand -Chalky surface -Orange colour	Typical: **second half of EIA**: phases C-D (fig. 47; table 11). Occurrence: its dating can (at most) be stretched to phases B and E (Van den Broeke 2012, 167).	2510±30 2470±30 2450±30 2430±30? 2427±30 2410±30 (shape type)
R16-5	-Closed shape (build-up type II) -Van den Broeke's shape type 23b Finger impressions on top of the rim -Rough, but slightly smoothened in horizontal striations (neck) -Besmirched (belly+shoulder)	Typical: **EIA** (table 11). Occurrence: EIA, possibly the late **LBA** (Van den Broeke 2012, 57) and (incidentally) the **MIA** (and possibly later).	2430±30? 2265±30 (shape type)
R16-6	-Slightly/barely open shape (build-up type I) -Van den Broeke's shape type 21 -Polished (inner + outer surface)	Typical: **second half of EIA:** phase C-D (table 11). Occurrence: The **entire EIA**, the **LBA** and early **MIA** (Van den Broeke 2012, 52-54), more incidentally during the LIA and Roman Period.	*Nothing that is very comparable*
R16-11	-Closed shape (build-up type III) -Van den Broeke's shape type 41: "subtype": see remark -Grog -Polished (inner + outer surface)	Typical: **early EIA**: phase A-B (table 11). Occurrence: **late LBA**; shape type also a has wider dating spanning most of the MIA and LIA, but these generally look different. Remark: Specifically similar to a "subtype" considered typical for the first half of the EIA (Van den Broeke 2012, 63). It also reminds of the well-known EIA Schräghals urn shape (appendix 2 in the thesis), due to it having an angular shoulder-neck transition and rounded belly-shoulder transition (fig. 50).	2515±30 2425±30 (somewhat similar shape of the shape type; necks not as angular)
MP1-4	-Open shape (build-up type I) -Van den Broeke's rim type B1 (thickened on inside) -Van den Broeke's shape type 3b leaning towards type 4 due to the rim *(similar example: Van den Broeke 2012, 398; plaat 4.1)* -Comb decoration -Grog -Polished (inner + outer surface)	Typical: **EIA-first half of MIA**: phases A-G (table 11 + see remark). Occurrence: (late) **LBA-Roman Period** (LIA + Roman Period highly unlikely). Remarks: Shape appears since the end of the MBA. The combination of the shape type, rim type (making it akin to shape type 4: fig. 50; table 11), polished surface (table 11) and comb decoration make the EIA or early MIA likely (Van den Broeke 2012, 47; 49; 90).	2430±30 (shape type with thickened rim) 2930±30 2925±35 2510±30 2450±30 2460±30 2430±30 2235±30 (shape type)

Code in combination with light blue colour	Defining features for chronology	Dating	^{14}C dates from assemblages from dataset sharing features (in BP)
MP1-7	-Closed shape (build-up type II) -likely Van den Broeke's shape type 23a (a very large version of it) -Grog -Smoothened (inner + outer surface)	Typical: In and before/after the **MIA**, more typical for the **second half of the EIA** than the first (fig. 53; table 11). Occurrence: **The entire IA**, but it is most representative for the MIA (table 13; 14). Remarks: The sherd has little chronological value of its own. It grew in popularity together with the gradual decrease of similar type 23b (see R16-5 in this catalogue). The shape was also common in the Bronze Age and Roman Period (Van den Broeke 2012, 55; 57), usually smaller and with ears/grit temper.	2470±30? 2425±30 2290±30 2260±40 2260±30 2235±30 (shape type)
MP7-3	*See remark*	Remark: R17-10, R17-11, R17-12 and R17-13 are used in the MIA catalogue, which includes the description of MP-7-3 (and LTS3). The sherd is more typical for the Roman Period.	---
MP7-8	-Closed shape (build-up type III) -Van den Broeke's shape type 71 -Grog -Polished (neck + shoulder + inner surface) -Besmirched (belly)	Typical: **first half of EIA** (table 11). Occurrence: late **LBA**, **entire EIA** and **MIA**; incidentally thereafter (Van den Broeke 2012, 81-83). Remarks: MIA examples from Oss generally have more rounded/ gradual shoulder-neck transitions (Van den Broeke 2012, 81). The surface treatment is typical for the EIA.	2740±30 213 BC (dendro-chronology) (shape type; only the first example looks similar)
Aw1-3	-Seemingly Van den Broeke's base type B1/standschijfje (disc base), but not entirely certain (fragmented) -Interconnected finger impressions: Kalenderberg decoration (on belly) -Polished base -Smoothened/polished (inner surface)	Typical: **EIA** (fig. 40; 41). Occurrence: EIA and also the **late LBA, LIA** and **Roman Period**. Remark: Base type B1 is disregarded for the dating. Base type B1 is considered a guide artefact for phase F (table 13), and should not appear with the decoration type (fig. 40; 41). Polishing generally makes the sherd (with this decoration) more typical for the EIA than the LIA.	*Nothing that is very comparable*
LTS6-1	-Knobbeloor/"Lump Ear": perforated horizontally	Typical: **EIA** (fig. 49). Occurrence: Aside of EIA: **the end of LBA** and **start of MIA** (phase E). Generally also during the Late Neolithic.	2515±30 2430±30
MT130	-Seemingly: closed shape (build-up type III): very small piece of rim present to judge the positioning -Very short neck with a (relatively weak) protrusion outwards -Gradual belly-shoulder transition (looks angular on one side) -Van den Broeke's shape type 52 -Interconnected nail and finger impressions on belly: Kalenderberg pattern Grog	Typical: **first half of EIA**: phases A-B (fig. 40; fig. 41; table 11). Occurrence: The **LIA** is also very likely, and solely excluded on the basis of the polished surface. Also possible: late EIA + phase H. Remarks: belly decoration is common for the IA, Kalenderberg pattern is common for parts of the EIA and LIA, shape type is common for the early EIA, IA and Roman	2285±30 2235±30 (undecorated examples of the shape type)

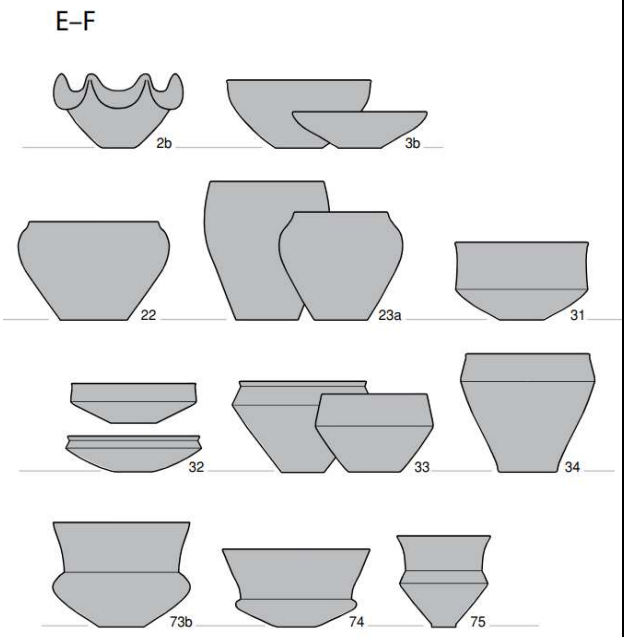
Code in combination with light blue colour	Defining features for chronology	Dating	^{14}C dates from assemblages from dataset sharing features (in BP)
	-Polished neck and shoulder	Period, polished surfaces are more common in the EIA than the LIA.	
OLM-7-2	-Hollow narrow foot -Van den Broeke's base type B3 -Likely: Van den Broeke's shape type 3a (Eierbecher: see fig. 48)	Typical: **EIA-start MIA:** phases A-E (fig. 48) Occurrence: also in the later **MIA** to early **LIA** in southern direction (Van den Broeke 2012, 47; 96). E.g. see example in the dataset and fig. 53. In these cases, the shape type is different (not type 3a).	2290±30
	-Grog		
	-Smoothened/polished but not shiny		

Table 12: Catalogue of sherds of the Early Iron Age in the physical reference collection

Figure 51: Early Iron Age sherds in the reference collection (by author)

7. Middle Iron Age (500-250 BC)

The MIA is characterized by vessels without necks of pot build-up type II. There are many vessels with very angular profile transitions akin to the LBA. Together with the LBA, it is also the only subperiod that has very long necks (>5 cm long). Decoration is a lot rarer during this period, but may mostly appear as comb decoration and finger impressions on top of the rim. Besmirching is most common during this period, but smoothened and polished surfaces are also relatively common.

Variable	Information	Drawings of types (by Van den Broeke 2012)
E-F: First half of the Middle Iron Age (500-400 BC): pottery is reminiscent of Marne area in northern France		
Shape	Typical characteristics phase E and F • **Traditional Marne shapes** with tripartite profile, often with very low diagonal belly (more horizontal than vertical), angular belly-shoulder transition, very short (nearly absent) shoulder and (slightly rounded) funnel-shaped neck (types 73b; 74; 75) -developed out of type 73a -types 31-34 may be considered Marne as well (without neck and with a longer shoulder): also typical, but some may appear later • **Bipartite/biconical pots** without neck or with a very short <1cm) neck -low diagonal belly; long (cylindrical) shoulder (type 31) -tall; high diagonal belly; short shoulder (type 34) • **Thickened rims**: thickened on the outside (types B2 and B3): However, the chronological value of this element for the wider research area is generally unknown (Van den Broeke 2012, 90-91) • **Bases** (the chronological value of this element for the wider research area is generally unknown): -"**standring**": circular foot around base: hollow within the foot (base type B2) -**impressed** with a bulbous object creating a small "**del**" of <3 cm in diameter (type of "lensbodem": base type B4) • Aside of the "lappenschaal" (type 2a), a subtype (2b) appears with a thickened rim/rim strongly protruding outwards ("parasolschaal") • The rougher **barrel-shaped pots** (of type 23a) from phase D remain dominant in assemblages • **Adaptation of existing** (phase D) **shapes** by making them more angular, elongating the neck or shortening the shoulder Developments in phase F • Increase of wide low angular pots (e.g. type 32; 33); decrease of tripartite shapes with a long neck (e.g. type 73; 74) • Larger quantities of thickened rims: see comment above • First and last appearance (for the research area) of "base type B1 **standschijfje**": disc base (diameter: <7cm): not hollow (Van den Broeke 2012, 95) • Often sharp "ribs" on belly-shoulder transition	

Variable	Information	Drawings of types (by Van den Broeke 2012)
Rim Deco-ration	• **Rim decoration** is **scarce** (<10% in this period), if used: • **Finger impressions on top of the rim** (Van den Broeke 2012, 107-111)	
Body Deco-ration	• **Body decoration** is **still scarce** (<2%) -particular to phase F: more body decoration compared to the rest of the MIA and EIA (~4%) • **Comb decoration** is absolutely dominant (since phase D)	
Surface /thick-ness	Little changes in phase E, but important changes in **phase F**: • Often **polished** really well: without any unevenness on the surface • Even when the pottery is besmirched: thin body • **Besmirched surfaces** are temporarily less common (e.g. disappear from shape type 3b): still around 40% • Vast majority is reduced: dark grey to black in colour	
Temper	• **Dominance of grog temper** • **Coarse temper** (mostly **quartz grit**) still used in some sites in the southern part of the research area (Van den Broeke 2012, 128-129).	

Table 13: Typo-chronological characteristics of phases E-F as formulated by Van den Broeke (2012, 134; 136-138)

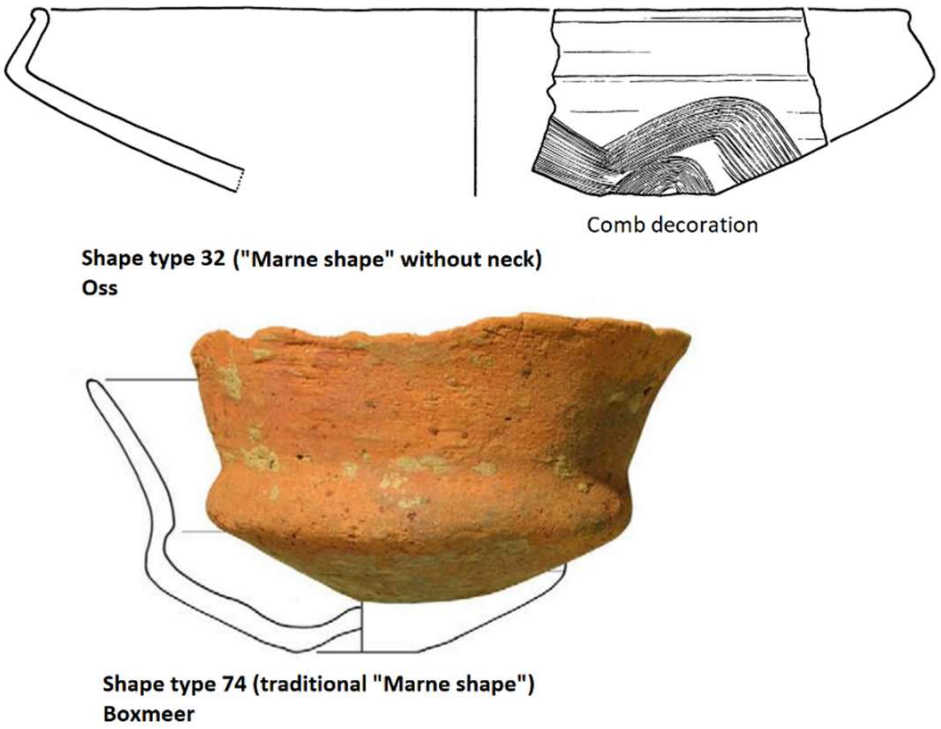


Figure 52: Two Marne shapes with angular profile transitions typical for the earlier MIA (after Van den Broeke 2012, 60; Vermue et al. 2015, 225)

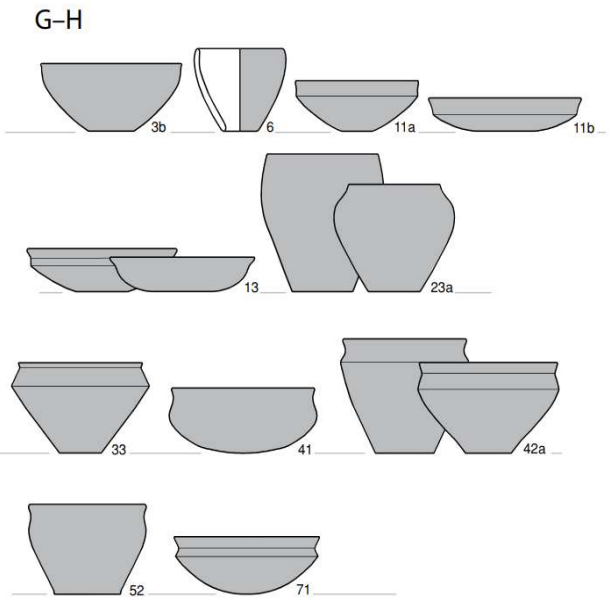
Variable	Information	Drawings of types (by Van den Broeke 2012)
G-H: Second half of the Middle Iron Age (400-275 BC): Marne tradition disappears: similar to phase D		
Shape	• Period is relatively unknown (especially phase H) • Traditional **Marne shapes usually do not appear anymore** • Rare examples of Marne shapes (e.g. type 75) are still present in phase G (imported/inherited?) • **Wide shapes** with **angular belly-shoulder** transition and occasionally a short neck are still **reminiscent of Marne tradition** (e.g. types 11a; 11b; 13; 33 42a) • **Thickened rims** thickened on the outside (types B2 and B3): however, the chronological value of this element for the wider research area is generally unknown (Van den Broeke 2012, 90-91) • **Weakening of** the **angularity** of profile transitions • Many **wide and low shapes** • **Tall barrel-shaped pots** still **appear very commonly** (type 23a) Phase H predominantly exists of • Wide shapes (bowls) with or without neck and shoulder (types 3b; 13; front version) • Barrel-shaped pots (type 23a: present since EIA; practically already in most of the BA) • Tripartite pots of pot-build-up type III with a very short neck (necks above 5 cm in length do not appear at all in phase H!) • No angular shoulder-neck transition in phase H (only rarely)	
Rim Deco-ration	• **Rim decoration** is **scarce** (<10%) • For **phase G and H** -**Finger impressions on top of the rim** • Incidentally for **phase H** -wavy/cartel rim: finger impressions (or sweeps) diagonally placed on top of the rim, causing a wavy appearance -impressions in front of the rim -two rows of impressions (e.g. in front + on top of rim)	
Body Deco-ration	• **Body decoration** is **still scarce** (<2%) • **Comb decoration** is still dominant in **phase G** (60%) strongly decreased in popularity in **phase H** (<20%) • **Nail/finger impressions + Grooves:** shared dominance in **phase H** -Mostly on belly -Grooves and comb decoration in first half of phase H (**H1**) -Nail/finger/spatula impressions in second half (**H2**) (Van den Broeke 2012, 27; 118-119; 124) • **Patterns of nail/finger impressions: in phase H2** -stretches of (concentrated) impressions alternated with undecorated stretches -(rare!) interconnected impressions (incl. Kalenderberg)	
Surface /thick-ness	• **Besmirching** and body thickness are back at the same level as phase E (60% besmirched in Oss-Ussen (Van den Broeke 2012, 105)	
Temper	See explanation for phase E-F	

Table 14: Typo-chronological characteristics of phases G-H as formulated by Van den Broeke (2012, 135; 139)

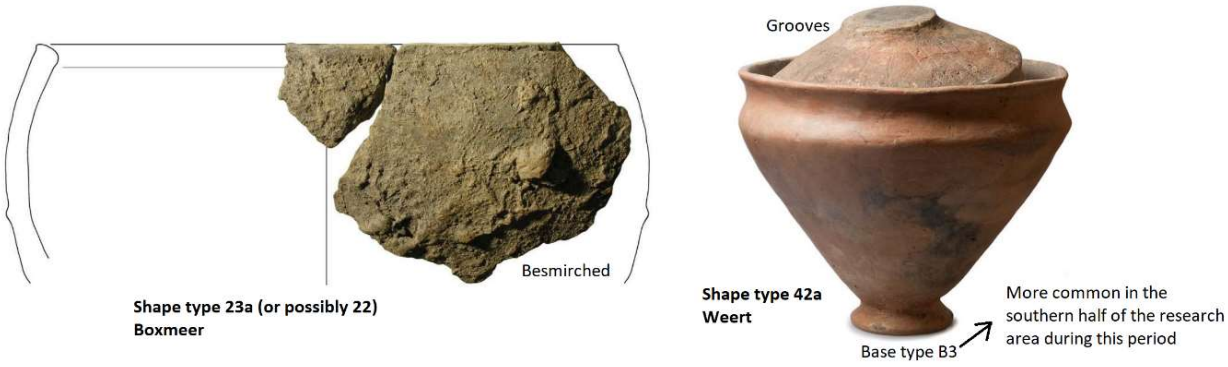


Figure 53: Barrel-shaped pot generally dominant during the MIA, but also during the periods before and after (left); pot with lid typical for the second half of the MIA and the LIA that is ^{14}C-dated to the late MIA or the start of the LIA (right) (after Kodde and Van der Velde 2015, 300; Van der Linde 2009, 72)

7.1. Catalogue

Code in combination with dark blue colour	**Defining features for chronology**	**Dating**	**^{14}C dates from assemblages from dataset sharing features (in BP)**
RC4	-Closed shape (build-up type III) -Van den Broeke's shape type 73b	Typical: **early MIA:** phase E-F (fig. 36; table 13; similar to type 74 in fig. 52). Occurrence: Rare guide artefact: only known from **phase E** in the typology of Oss-Ussen (Van de Broeke 2012, 83). The dark colour is also typical.	2410±30 (shape type)
	-Grog		
	-Polished elaborately: entire surface -Very dark in colour		
RC5	-Closed shape (build-up type II) -Van den Broeke's shape type 23a	Typical: In and before/after the **MIA**, especially typical for **late MIA** and **early LIA** (see remark; fig. 45; 53; table 13; 14; Van den Broeke 2012, 86; 106).. Occurrence: **The entire IA**, but it is most representative for the MIA. Remark: The late MIA and early LIA can be mentioned as potentially more typical because of the besmirched clods (fig. 46; Van den Broeke 2012, 104).	2425±30 2260±40 2260±30 (deviating) 2235±30? (shape type + besmirched up to the shoulder)
	-Grog		
	-Besmirched: clods (entire outer surface)		
R14-4 + R14-5 + *R14-6*	-Open shapes (build-up type I) -Van den Broeke's shape type k-3c: coastal briquetage	Typical: **late MIA** and **early LIA** (fig. 47; table 10). Occurrence: typical for phase **H**, presumably common in phases **I-J**. Remark: R14-6 is used in the LIA catalogue.	*No coastal briquetage of this type in the dataset*
	-Organic temper		
	-Rough and uneven -Yellow in colour		
R16-1	-Closed shape (build-up type III) -Likely Van den Broeke's shape type 52 or 55a	Typical: **second half MIA**: phases G-H (see remarks). Occurrence: **entire IA**, in particular also the **EIA**.	2260±30 (shape type + besmirched belly)
	-Sand (fine) -Grog		

Code in combination with dark blue colour	Defining features for chronology	Dating	^{14}C dates from assemblages from dataset sharing features (in BP)
	-Smoothened/polished (in+outside except outer belly) -Besmirched (belly)	Remarks: Shape type 52 and besmirching are typical for phases G-H (table 14). Polishing and besmirching are less common for the LIA (fig. 45; table 16). EIA has matching features (table 11), but besmirched EIA examples of shape types 52/55a generally have lower belly-shoulder transitions and have rim decoration (Van den Broeke 2012, 70; 74).	
R16-8	-Closed shape (build-up type III) -Van den Broeke's shape type 32 -Grog -Polished: entire surface	Typical: **early MIA:** phases E-F (fig. 52; table 13). Occurrence: Generally speaking a guide artefact for the MIA. It peaks in phase F and may still be present in **phases G-H**. It may incidentally appear during later phases (Van de Broeke 2012, 59; 61).	2425±30 >299 BC (dendro-chronology)
R17-10 + R17-11 + R17-12 + R17-13 + *MP7-3* + *LTS3*	-Comb decoration: no clear indication of a pattern with strong chronological value: LTS-3 may have had a vertical pattern, but this is speculative (fig. 43; Cc; e.g. Van den Broeke 2012, 429) -Grog (all) -Fine sand (R17-12) -Mostly rough, but some smoothened surfaces -Polished (inner + outer surface) (MP7-3)	Typical: **end of EIA** and **most of MIA**: phases D-H1; also **Roman Period** (fig. 40; table 13; 14). Occurrence: **Late LBA** (table 8), **entire IA** and **Roman Period** (fig. 40). Remark: The sherds have little chronological value of their own, but can easily function as typo-chronological markers in assemblages. MP7-3 and LTS3 have respectively been added to the EIA and LIA catalogues.	2757±41 2730±45 2510±30 2450±30 >431 BC (dendro-chronology) 2430±30 2290±30 (comb decoration)
AW1-14	-Likely closed shape (build-up type II); rim is uneven -Likely Van den Broeke's shape type 23a (otherwise likely 5b) -Grog -Polished yet very uneven (high on shoulder) -Besmirched (low on shoulder; with visible finger sweeps) -Very thick, plump and uneven	Typical: In and before/after the **MIA** (fig. 37; 53; table 13; 14; Van den Broeke 2012, 86; 106). Occurrence: **The entire IA**, but it is most representative for the MIA. Remarks: Polishing is relatively uncommon in the LIA, but the thickness, plumpness and unevenness makes it perhaps more likely (table 16).	2425±30 2260±40 2260±30 (deviating) 2235±30? (shape type 23a + besmirched up to the shoulder)
H1 + OLM-9	-Open shapes (build-up type I) -Part of a monopartite plate/bowl -Van den Broeke's shape type 3b or 5b -Deep finger impressions on top of the rim -Grog -Besmirched up to the rim	Typical: In and before/after the **MIA** (fig. 37). Occurrence: **The entire IA**, but it is most representative for the MIA. Remark: The sherds have little chronological value of their own.	2260±30 (shape + besmirched)
MHM6-1	-Open shape (build-up type I) -Van den Broeke's rim type B3 -Van den Broeke's shape type 11a -Grog -Smoothened/polished but not very shiny (shoulder + neck)	Typical: part of the **MIA**: phase G (table 14). Occurrence: its typological dating can be stretched to phase F of the MIA. May incidentally appear in the **LIA** in the southeast of the research area (Van den Broeke 2012, 51).	*Nothing that is very comparable*
MP1-Oss2 (used to be Oss-11795)	-Closed shape (build-up type II/III) -Shape with at least one very angular profile transition (may e.g. have been -	Typical: **early MIA:** phase E-F (table 13). Occurrence: **LBA?**	*Nothing that is very comparable*

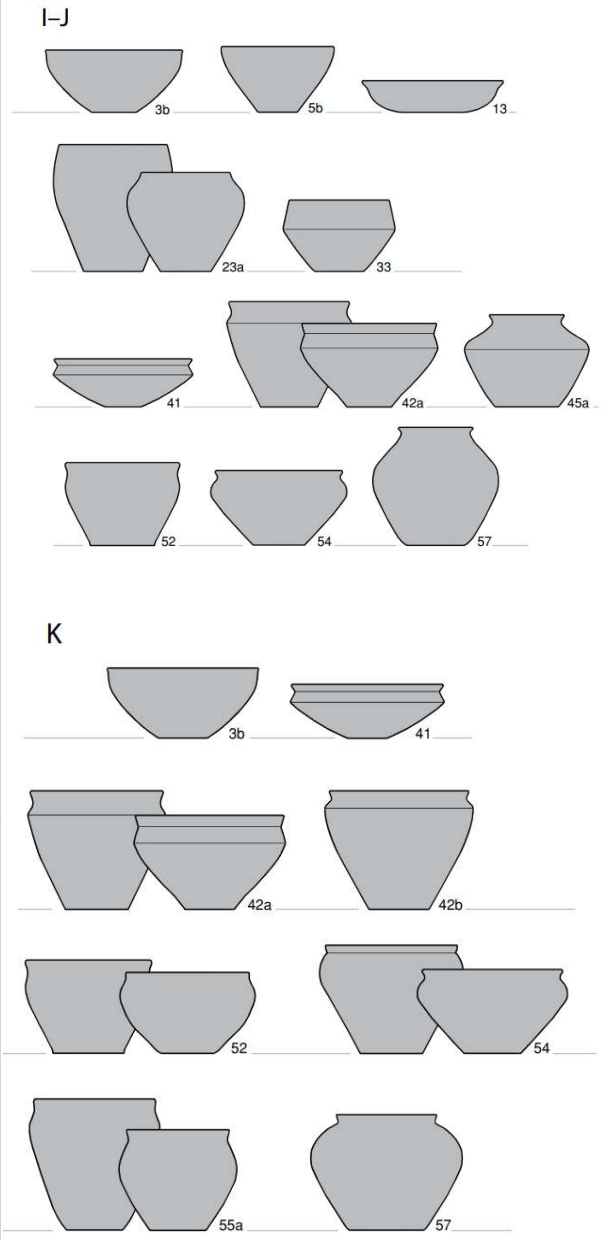
Code in combination with dark blue colour	Defining features for chronology	Dating	^{14}C dates from assemblages from dataset sharing features (in BP)
	Van den Broeke's shape types 32, 74, 75 or 99)	Remarks: The profile transition is so angular that most shape types can be excluded. This shape characteristic, the elaborate polishing and the colour make it typical for the Marne tradition of the MIA (table 13). The LBA has some common angular shapes and polishing as well (which should be kept in mind). Compare to RC4 in this catalogue.	
	-Grog		
	-Polished elaborately: entire surface -Very dark in colour		
LS	-Open shape (build-up type I) -Inner belly-shoulder transition (more rounded/gradual on inside) -Likely Van den Broeke's shape type 11b *(see Van den Broeke 2012, 52 -> similar example):* otherwise type 21	Typical: **part of MIA**: phases F-G (table 13; Van den Broeke 2012, 51). Occurrence. MIA and sporadically in **Roman Period**. Remark: the shape is relatively simple, which generally makes a typological dating less reliable.	*Nothing that is very comparable*
	-Grog		
	-Smoothened (outer surface) -Besmirched? (outer surface)		
OLM-19-1	-Closed shape (build-up type III) -Short neck and shoulder -Van den Broeke's rim type B3 -Van den Broeke's shape type 41 (presumably); nearly type 71, had the neck been slightly longer; possibly type 42a (fig. 53)	Typical: middle of **MIA: F-G** (table 14; see remarks). Occurrence: Entire IA after phase F, the shape also exists in the LBA + phase A+B (but without besmirching!). Remark: the combination of a besmirched belly, rim type B3 and shape type 41 (or even 71) makes the middle of the MIA most likely (Van den Broeke 2012, 63; 67; 80; 81; 90).	2670±35 2515±30 2235±30 (same shape type with different characteristics)
	-Smoothened/polished but not very shiny (shoulder + neck) -Besmirched (belly)		
LTS6-2 + OLM-1 + OLM-20	-Open shape (build-up type I) -Van den Broeke's shape type 13 (all)	Typical: **Second half MIA**: **phases G-H** (table 14). Occurrence: possibly during the LBA, incidentally or decreasingly after phase F in the IA (Van den Broeke 2012, 52-53).	2260±40 (shape type)
	-Grog (all)		
	-Polished/smoothened (in+outside) (OLM-1 + OLM-20) -Presumably secondary burnt and rough (LTS6-2)		

Table 15: Catalogue of sherds of the Middle Iron Age in the physical reference collection

Figure 54: Middle Iron Age sherds in the reference collection (by author)

8. Late Iron Age (and Roman Period: >250 BC)

The LIA is characterized by a recurrence of necks, rounded profile transitions and of pot build-up type III. The necks are generally very short (<3 cm). It is also characterized by more body decoration and a dominance of finger/nail impressions in front of the rim. Decoration is positioned on every part of the body and rim, which makes it similar to the LBA. Surfaces are usually rough rather than smoothened or besmirched.

Variable	Information	Drawings of types (by Van den Broeke 2012)
Late Iron Age: I-K (275-50 BC): Less applicable to the south and west of the research area (Van den Broeke 2012, 149)		
Shape	• **Tripartite pots** with build-up **type III** with a very short neck are (increasingly) common • **Necks** are always very **short** (like phase H: >5 cm is rare) • **Angular shoulder-neck transition** • **S-shaped profiles** are most common (but types with angularity in belly-shoulder transition not uncommon) • **Thickened rims** (type B2: not the pointed version of B3): however, the chronological value of this element for the wider research area is generally unknown (Van den Broeke 2012, 90-91) Phases I-J • **Wide** (monopartite) **shapes** still **appear: but rare!** • **Barrel-shaped pots** (type 23a) still **appear very commonly** • **Angular** (and rough) **base-belly transition** (markings of base-body attachment are visible) (Van den Broeke 2012, 94-95) Development toward phase K • **The types** described for **phases I-J** largely disappear • Tripartite pots of type III with short necks dominate: **shape uniformity** • **Ears** sporadically appear	
Rim Deco-ration	• **Rim decoration** is **very characteristic** • Still relatively **scarce in phase I**, increase in phase J • **Common in phase K** (48% in Oss-Ussen) • Greater increase in western direction (75% can be common) • Barely any increase in southern direction (5% in Sittard) What was **incidental for phase H**, is still **incidental in phase I** (perhaps common on some sites) and **common in phases J-L** (as well as in the Roman Period). These characteristics are: • **Wavy/cartel rim** -finger impressions (or sweeps) diagonally placed on top of the rim, causing a wavy appearance -majority of decorated rims in phase K: decrease afterwards (uncommon in Roman Period) • **Impressions in front of the rim**: more common in Roman Period • **Two rows of impressions** (e.g. in front + on top of rim) -most common in/around phase K • **Nail and spatula impressions** (aside of **finger impressions**) -unlike the other points, this one is relatively rare until **phase L** (~20% of rims in Oss-Ussen): characteristic for Roman Period (Van den Broeke 2012, 107-108; 110; 273)	No image for phase L
Body Deco-ration	• **Body decoration becomes common** and is a good way to differentiate phase I from phase H -In Oss-Ussen, small increase in **phase I** (~5-10%) -Bigger increase **towards phase K** (~13%) -Slight decrease in phase L	

	-West of the research area: decoration drift in **LIA** (50-70%): percentage may therefore be higher in western research area (Van den Broeke 2012, 112). Opposite may be true in eastern and southern direction. • Decoration not only on **belly**: also on **shoulder and neck** -intensively decorated pots of type 42a;b in phase J • **Nail and finger impressions** are very common -Elaborate patterns covering large surfaces -Kalenderberg decoration or patterns • **Grooves** -singular -parallel (often uneven) (probably made with a ragged twig, stem or bone splinter): most common in phase L -pattern of vertical grooves	
Surface /thick-ness	• **Besmirching** gradually decreases, from around 50% to 10% from phase I to phase L (Van den Broeke 2012, 105) • Smoothened and polished surfaces are rarer: often **rough** (increasingly when besmirching decreases) • Especially in phase I: **thickest** and plumpest of the Iron Age	
Temper	• **Dominance of grog temper** • **Organic temper** is used: more common for some sites -usually an exception in an assemblage (<1%) -higher percentages directly south of the research area	

- **Iron Age to Roman Period: phase L**
  Transitional period to the Roman Period: partially incorporated in the text above. Short period that is not well-known, but should already be much more akin to phases M-N.
- **Roman Period: phases M-N**
  Not part of the research period. Please use the source of the typo-chronology (Van den Broeke 2012) for more elaborate information about handmade pottery from the Roman Period. Some defining characteristics:
  -Necks often absent and bipartite shapes very common
  -Thickened rims (sometimes with several facets) even more common
  -Rim decoration is rare: usually spatula/nail impressions (often in front of the rim, but also on top of the rim)
  -Comb decoration as body decoration is extremely common (but generally not as much in the wider research area as it is in/around Oss; Van den Broeke 2012, 118)
  -Organic temper is more common: may e.g. be 30% of assemblage (Van den Broeke 2012, 130)

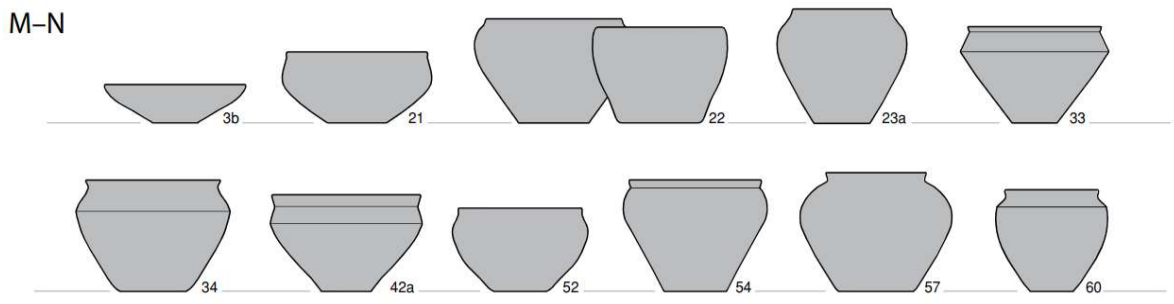


Table 16: Typo-chronological characteristics of phases I-M as formulated by Van den Broeke (2012, 135; 139-143)

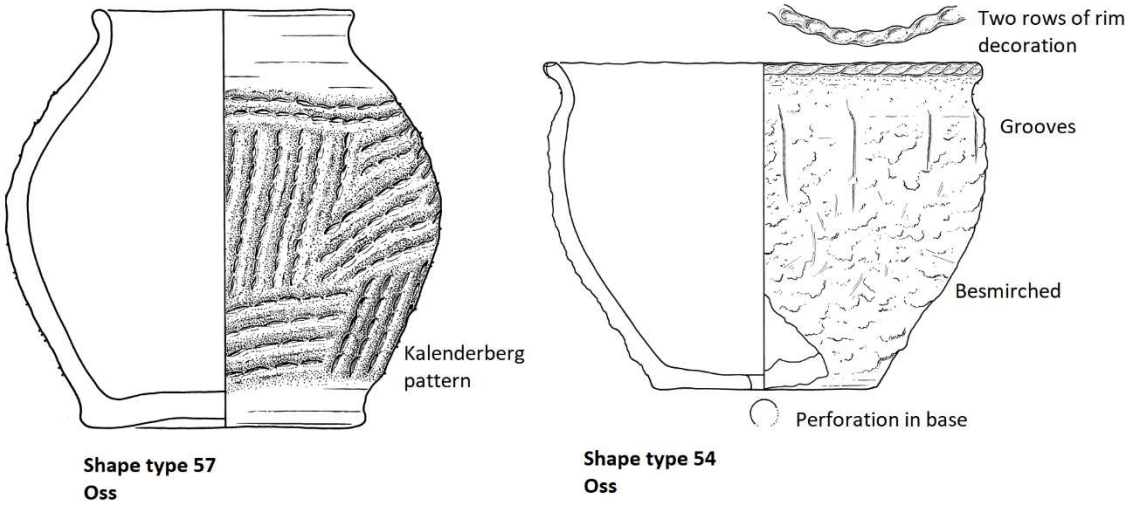


Figure 55: Shape types typical for the LIA combined with decoration types typical for the LIA (after Van den Broeke 2012, 72; 78)

8.1. Catalogue

Code in combination with a dark red colour covering a blue colour	**Defining features for chronology**	**Dating**	**^{14}C dates from assemblages from dataset sharing features (in BP)**
RC6 + R12 (-1 +2+3+4)	-Closed shapes (build-up type II (both) -Van den Broeke's rim type B2 (both) -Van den Broeke's shape type 21 or (more likely) 22 (RC6) -Van den Broeke's shape type 22 (R12)	Typical: **Roman Period**. Occurrence: Most likely also typical for the **end of the LIA**: phase L. Occurs **throughout the entire IA**, possibly incidentally in the LBA (Van den Broeke 2012, 53-55). Remarks: The dataset lacks assemblages from the late LIA/Roman Period, which is why the dates to the right may be misleading. The combination of characteristics of R12 is especially common to the Roman Period (Van den Broeke 2012, 55).	2510±30 2460±30 2450±30 2430±30 2425±30 (too tall) (shape type)
	-Finger impressions on top of the rim (RC6) -Nail impressions in front of the rim (R12)		
	-Grog (at least R12)		
	-Secondary burnt (both); lot of soot (RC6) -Smoothened (on shoulder) (RC6) -Rough + one lump of clay (on belly) (RC6) -Smooth (entire body)(R12)		
RC7 + R17-8	*See remark*	Remark: RC8 is used in the EIA catalogue, which includes the descriptions of RC7 and R17-8.	---
R14-6	*See remark*	Remark: R14-4 and R14-5 are used in the MIA catalogue, which includes the description of R14-6.	---
R16-2 + R16-3 + R16-4 + OLM-11	-Open (R16-2?) and closed shapes (R16-3+4) (build-up types I + III) -Possibly Van den Broeke's shape types: -3b/5b (R16-2) -52/55a (R16-3) -56a (R16-4)	Typical: **LIA** (fig. 39; table 8; 16). Occurrence: **LBA** and **LIA**. Remarks: -Dating is based on rim decoration alone! The shapes match (even peak in) the period, but are not exclusive to it (Van den Broeke 2012, 86-87). -Compare R16-3 to R16-1 (MIA): typology may classify very different shapes as single shape types.	2730±45 2260±30? (cartel rims)
	-Cartel rim (fig. 39)		
	-Grog		
	-Rough (mostly) or smoothened in horizontal striations (R16-2+3)		

R16-12	-Closed shape (build-up type III) -Mostly judging from the flat positioning of the rim: Van den Broeke's shape type 57 (also relatively similar to 58; may also be type 45a for the sherd lacks its belly-shoulder transition) -Grog -Polishing (neck + higher shoulder; also inner surface less elaborately) -Rough(er) (lower shoulder)	Typical: **LIA** and **Roman Period** (fig. 55; table 16). Occurrence: From the end of the MIA (phase G) to the start of the Roman Period (phase N), incidentally during other periods. Remarks: shape type 58 is rare and the only example of type 45a with a similar shoulder-neck transition dates to the end of the LIA (Van den Broeke 2012, 68).	*Nothing that is very comparable*
R16-14	-Closed shape (build-up type II) -either Van den Broeke's shape type 22 or 23a -Grog -Rough	Typical: Depending on the shape type: **MIA** and the phases shortly before/after (**late EIA/early LIA**), as well as the **Roman Period**. Occurrence: **The entire IA** and **Roman Period**, but it is most representative for the MIA and Roman Period (fig. 53; table 13; 14; 16). Remarks: Both shape types gained large popularity in the Roman Period. The sherd has little chronological value of its own. The shape was also common in the Bronze Age (e.g. fig. 25) with different characteristics (Van den Broeke 2012, 57).	2470±30? 2425±30 2290±30 2260±40 2260±30 2235±30 (shape type)
R16-7	-Closed shape (build-up type III; nearly II) -presumably either an angular version of Van den Broeke's shape type 41 or type 42a -Van den Broeke's rim type B3 -Nail/finger impressions in a horizontal row (on the shoulder directly above the belly-shoulder transition) -Grog -Smoothened (outer surface) -Rough (inner surface)	Typical: **LIA** (and **LBA?**). Occurrence: **late LBA, early EIA, end of MIA** (phase H) and LIA. Remarks: Whereas the decoration appears throughout the LBA and IA (fig. 31; 33), the positioning of the decoration is unlikely for the MIA (fig. 36). The late LBA and EIA have similar shapes, but they are not as common (Van den Broeke 2012, 67; 86-87). The thickened rim and rough inner surface are slight indications that it likely dates to the LIA (table 16). That being said, thickened rims are also known from the LBA (table 8).	*Many examples of rows of nail/finger impressions on the shoulder; especially in the LBA; shape type is mostly present during different parts of the IA*
LTS1	-Parallel (non-horizontal) grooves, and (at least one) groove perpendicular to these parallel grooves -Grog	Typical/occurrence: possibly slightly before/after **LIA: phases H-M** (fig. 43); also in late **MBA-LBA** (2930±50 BP in dataset); possibly during other periods as well. *Remark: See description of MT190 for more elaboration.*	2930±50 2260±30 (parallel grooves perpendicular to one another)
LTS3	*See remark*	Remark: R17-10, R17-11, R17-12 and R17-13 are used in the MIA catalogue, which includes the description of LTS3 (and MP7-3). The sherd is more typical for the Roman Period.	---
MHM6-2	-Interconnected nail impressions (that look like grooves), seemingly in a winding line pattern -Grog	Typical/Occurrence: **LIA and slightly before/after**: phases H2-N (fig. 40; 41). Remark: the fragment is a bit small and the pattern relatively rare (Van den Broeke 2012, 116).	*Nothing that is very comparable*
MT134 + MT163 + MT164	-Small base (MT163) -Interconnected finger impressions in a variety of directions that caused wide grooves and ridges: Kalenderberg	Typical: **EIA** and **LIA** (fig. 40; 41); perhaps the Early Roman Period for MT134 due to temper (table 10; 16).	*Nothing that is very comparable*

	decoration (MT134 + MT 163) -Interconnected nail impressions (MT163) -Grog (all) -Organic temper (MT134)	Occurrence: Slightly before and/or after the LIA/EIA; also during the Late Neolithic (Van den Broeke 2012, 114). Remarks: also see RC9, R16-10, MP 1-1, AW1-3 and MT-130 in the EIA catalogue.	
MT190	-Grooves: non-horizontal slightly curved parallel grooves -Grog	Typical: slightly before/after **LIA: phases H-M** (fig. 43). Occurrence: Possibly **incidentally during the late MBA+LBA** (e.g. dataset examples: 2930±50 BP; 2770±35), **possibly earlier in the Iron Age** (other dataset example: 2425±30). Remark: the dating particularly applies to the region close to Oss. It appeared earlier in the Iron Age in other regions, that may include the dating from the dataset of 2425±30 (Van den Broeke 2012, 117).	2930±50 2770±35 2425±30 2260±30 2235±30 >299 BC (dendro-chronology) >213 BC (dendro-chronology) (parallel non-horizontal grooves)
MT176-1	-Seemingly: closed shape (build-up type III): very uneven -Very short neck with a strong protrusion outwards -presumably Van den Broeke's shape type 54 -Very rough surface	Typical: **LIA** (table 16). Occurrence: shape type may appear in the LBA (Van den Broeke 2012, 73). Remark: The surface is extremely rough, which makes the LIA more likely.	*Nothing that is very comparable*
NK143-2	-Closed shape (build-up type III) -Van den Broeke's shape type 52 or 55a (or possibly 41) -Van den Broeke's rim type B2 -Grog -Smoothened	Typical: **second half of MIA** and **LIA** (table 14; 16) Occurrence: in the **Roman Period**, the shape types are less common. These types are only also common in the early **EIA**, but (at least in Oss) without thickened rims (Van den Broeke 2012, 63-73; 86-87; 90-91).	2730±45 2510±30 2450±30 2465±30 2460±30 2430±30 2285±30 2235±30 (shape type)
OLM-7-1	-Barely closed shape (build-up type III) -Very short neck with a strong protrusion outwards -Van den Broeke's shape type 54 (possibly 42b) -Finger impressions in front of the rim -Rough outer surface	Typical: **LIA: phases I-N** (fig. 38; table 16). Occurrence: **LBA?** Remarks: shape type incidentally appears since the LBA (Van den Broeke 2012, 67; 71). The rim decoration is also typical for the LBA (table 8). Besmirching is nevertheless rare during the LBA.	*Dataset lacks a comparable combination of shape + decoration*

Table 17: Catalogue of sherds of the Late Iron Age (including Roman Period) in the physical reference collection

Figure 56: Late Iron Age (and Roman Period) sherds in the reference collection (by author)

9. Ceramic objects

There are three common ceramic objects from the research period: weights, sling bullets and spindle whorls. They are also the only complete handmade ceramic objects among the find material of the reference collection. That naturally does not mean other objects cannot be found, like a figurine, a bead (dated to 2860±35 BP[1]), a spoon and a bobbin (fig. 57; 58). Weights and sling bullets have known chronological value (fig. 59). Weights existed throughout the Bronze and Iron Ages, but changed in shape (fig. 59; Kodde and Van der Velde 2015, 336). Spindle whorls do not have a known chronological value (as of yet). See a compilation of drawn shapes in figure 60.

Figure 57: Several rare ceramic objects most likely dating to the Bronze Age: a figurine (left/centre), a spoon (top right) and a bead (bottom right) (De Jong and Beumer 2013, 141; 192; Verhelst 2011, 101)

[1] Son-Ekkersrijt-IKEA [S33.068]: Labcode GrA-44175: 2860±35 BP: 1126-919 cal. BC (94.1%) (De Jong and Beumer 2013, 141; 167; also included in Brandsma 2022, appendix 3)

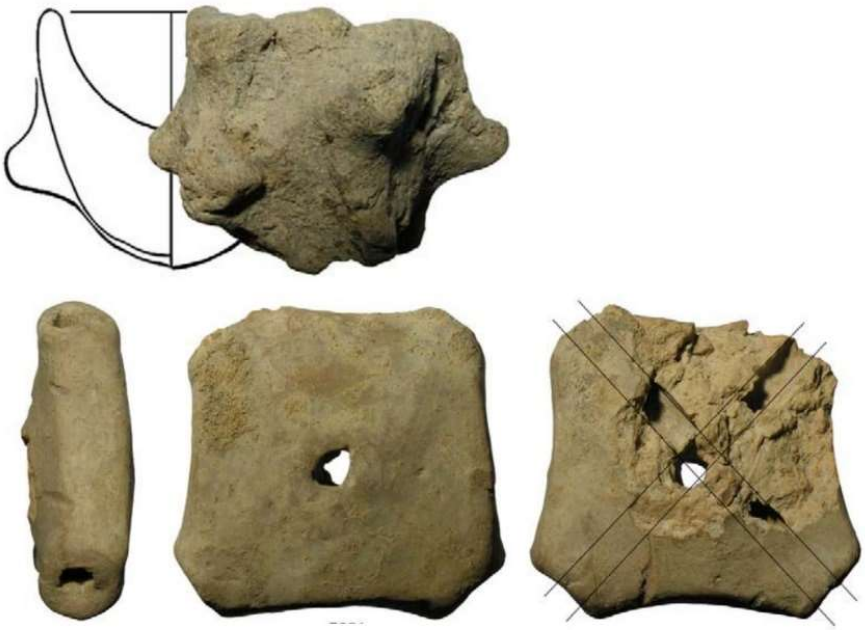


Figure 58: Two rare ceramic objects most likely dating to the Iron Age: a so-called knotskop with an unknown function (top) and an object interpreted as bobbin (bottom) (Kodde and Van der Velde 2015, 338-339)

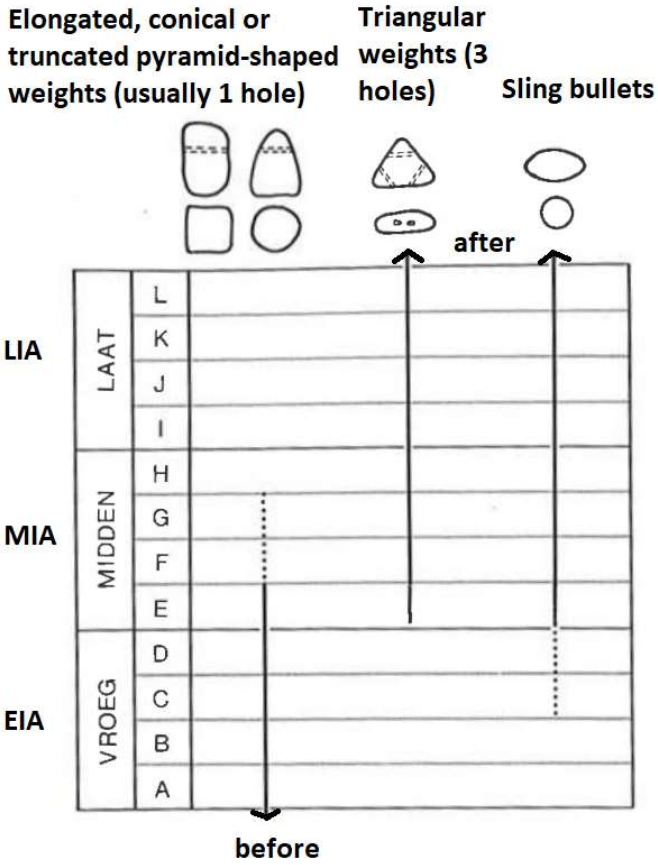


Figure 59: Chronology of sling bullets and weights for the southern Netherlands during the Iron Age (after Van den Broeke 1987a, 38)

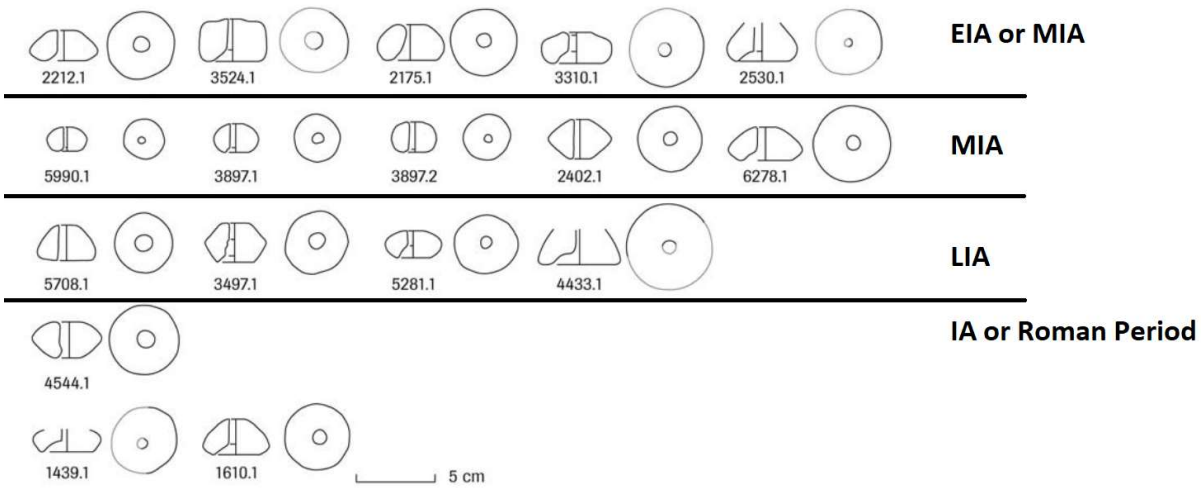


Figure 60: Spindle Whorls from Boxmeer-Sterckwijck ordered chronologically based on the context they are deposited in (not on absolute dating) (after Kodde and Van der Velde 2015, 336)

9.1. Catalogue

Code (no additional colour)	**Type of object**	**Dating**	**^{14}C dates from assemblages from similar objects (in BP)**
R71 + MT176-2 + OLM7-4 + OLM-15 + OLM-21 +OM	-Sling bullets -Fragmented: R71 + OLM-7-4 + OM	**Most of IA**: phases C-L (also **Roman Period**) (fig. 57).	2470±30
MT13 + MT192	-Weight fragments, probably belonging to the older type (left on fig. 59)	*Uncertain: likely similar dating to NK14*	2470±30 2235±30 (weight fragments)
NK14	-Truncated pyramid-shaped weight fragment	**EIA-MIA**: late MIA unlikely (also **before IA**) (fig. 57)	*None of this type (or only fragments)*
OLM-1-2	-Triangular weight (with three holes): fragmented on one side	**MIA-LIA** (also **Roman Period**) (fig. 57)	*None of this type (or only fragments)*
NK143 + OLM-7-3 + OLM13-1 + OLM13-2 + OLM19-2	-Spindle whorls -All fragmented -Nearly complete: NK143 + OLM 19-2	Typological dating unknown	724 BC (dendrochronology) 2430±30 (spindle whorls)

Table 18: Catalogue of ceramic objects (or fragments thereof) in the physical reference collection

Figure 61 Ceramic objects in the reference collection (by author)

Internet Pages

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