8.1 Introduction

This lengthy chapter concerns the questions about the function and use of the vessels from Uitgeest and Schagen. The most important aspects of pottery functions and use, and the relationship of both with the production and discard practices were outlined in chapters 1 and 2. These aspects are repeated summarily below and specified into research variables and methods for the pottery concerned.

The emphasis lies on the investigations of the possible functions of the pottery. Function is defined as the intended or formal use of ceramic containers, which is to be distinguished from the actual use of a vessel, since the latter may have diverged from the former in actual practice. The distinction between intended and actual use is commonly made in (ethno)archaeological studies of ceramics.

The main route to establish the original classification of pottery functions and the degree of functional differentiation is through the analysis of morphological characteristics. It was argued that there will be specific relations between the visible characteristics of vessels, created in the manufacturing process, and their functions (chapter 2.2-5). The first purpose is therefore to analyze the formal variations, as defined through the analysis of a. metrical properties of size and shape and b. non-metrical properties, mainly surface treatments and rim types, of the pottery. These data are the basis for distinguishing specific form-groups and, through those, for inferring the most likely categories of use of the pottery (paragraphs 3-11, 13).

Secondly, the actual use of the pottery is studied through the alterations visible on or in the surfaces of the vessels. The use indicators consist mainly of residues, the remains left by the use and/or content of a vessel (paragraph 12). For Uitgeest, data are available from both samples. The analysis of their chemical composition, carried out by ms. T. Oudemans, provides independent data on actual use. Together, the data are also used as additional information on the correspondence between function and actual use. A very limited analysis of the composition of the two samples of Uitgeest, the relative frequencies of the pottery groups, is a first attempt to reconstruct household inventories (paragraph 15).

Thirdly, the context and structures of deposition for complete vessels in the settlement of Schagen are analyzed (paragraph 14). A large percentage of the sample is associated with ritual depositions. These practices can greatly increase the understanding of the meaning of pottery and through this also provides feedback to their functional classification.

8.1.1 Form and function; ideas and methodology

The type and number of functions defined for the pottery in a community, the functional differentiation, will be the result of many factors, such as cultural traditions, types of food-stuffs, methods of food preparation and storage, technological knowledge and skills, etc. (chapter 1.5). It was argued in chapter 2, on the basis of ethnographic evidence, that there will be a connection between the degree of functional differentiation and the actual use of the pottery:

the more functional categories are differentiated, the more specific the definitions of such functions will be and the stricter the rules for the use of specific vessels; consequently it will be less likely that the actual use is different from the intended use.

Vice versa, if only very general and vague categories of function are distinguished, it can be expected that the rules for use are not very strict and that the same type of vessel may have been used for several purposes. An example is the designation as ‘cooking pot’ without any further specification for which type of cooking. It is even possible that some types of vessels had more than one formal purpose. An example is the combined function of storage and cooking among many groups (see appendix 2.2). Alterations of or residues on the pottery, caused by the actual use, can therefore also be an important indicator for functional differentiation. Secondly,

the more specific and/or stricter the definitions of functions are, the more likely it is that the function is also expressed in specific morphological characteristics, as well as in technological properties.

As an example, the differentiation in glass-ware for beverages in our society was mentioned. Many ethnographic
examples show the same combination of a specific vessel reserved for specific uses. Moreover, some types of use require specific shapes from the practical point of view, like pouring fluids (Juhl 1992). However, the relationships between functions and morphological properties of ceramics are by no means self-evident; many factors, including cultural norms and technological traditions, will have influenced the way a function was ‘given shape’ as well as the way of differentiation between functional categories. Some assumptions about these relations were derived from several sources, both of a theoretical and an empirical nature. Ethnographic research suggested that the following categories of functions are almost universally assigned to ceramic vessels (chapter 2.1-3): the cooking and boiling of potables and non-potables, the storage of dry goods and liquids, eating, drinking and serving vessels, vessels for transport and special purpose ceramics. The universal presence of these general categories is hardly surprising as they are basic aspects of all societies and require some kind of container. Especially the cooking of foodstuffs is one of the major functions of pottery all over the world, because it has considerable advantages over other materials for any use involving heat. For the other categories more alternatives are usually available.

There also is an important link between form and function and the production process. The three are being connected, literally given shape in the manufacturing itself. A potter will have an image in her head of all relevant details of the vessel she wants to make. This image or mental template will include the size and shape and the purpose of use of a vessel. The template itself refers to the existing distinctions of functional categories, made by both the makers and the users of the pottery in a society; there is in other words a duality of production, function and use. The composition of archaeological ceramic assemblages can theoretically be used to infer the most frequently broken category of vessels. The more often a category of vessels is used and the more stressful this use is, the higher the break-frequency for this type of vessel will be. The effects are that (a) this category needs to be replaced (reproduced) more often and (b) over time it will constitute a much higher percentage of sherd than categories with a long life span in the excavated assemblages. For the first, several studies have shown that pottery with the highest reproduction rate has a significant influence on the basic or standard recipes. The second effect will be stronger, the longer the period of use that is represented by a pottery assemblage, everything else being equal. For example, if every household inventory contained four cooking pots with an average life-span of six months and one storage vessel with an average life span of three years, twenty-four cooking pots will have been used up before the storage vessel needed to be replaced. After nine years, the relative amounts of ‘pottery waste’ from this household would be 72:3 from both types.

The positive side of this effect is that the assemblage composition can give some idea about the break frequencies and through this the use frequencies of specific forms. The conditions for such an exercise are a sample which is representative for the complete assemblage and a reliable estimate of the period over which the waste was formed. One of the questions that is attempted to be answered is to what extent such functions were specified and how this can be deduced from the morphological characteristics of the pottery. The central idea is that some differentiation in the functions of ceramic vessels did exist and that these distinctions will be expressed in metric properties, variations in size and proportions, as well as in non-metric characteristics of pottery such as the type of rim, the treatment of the surfaces, the presence of decoration, handles etc. Ideally, the approach leads to definitions of ‘original’ and meaningful categories in a pottery assemblage, to a categorization of pottery as made by the original makers and users. Methodically, this approach requires that pottery groups are defined by as many interrelated variables as possible. The analyses should result in a selection of specific defining combinations for pottery groups. Such groups show a maximum internal homogeneity and a maximum external heterogeneity, at least initially. At the same time, it should be taken into account that the degree of functional differentiation may have been low and that definitions of functions may have been rather vague or general. Therefore, the criteria for classification should be as ‘open’ as possible, allowing for some fuzziness or overlap if that is clearly present in the sample. Under these conditions it is theoretically possible to link such categories of pottery to specific functions.

8.1.2 POTTERY REQUIREMENTS OF HOUSEHOLDS IN THE SETTLEMENTS OF UITGEEST AND SCHAGEN

The above hypotheses can be specified for the societies concerned in light of the assumptions made in chapter 1.5. The available information suggests that food- and other production was still largely a household affair in the Roman period, as was the production of pottery. It is expected that the processing and storing of food was one of the more important categories of use of pottery studied here. It is known that the crops consisted of several cereals, beans and vegetables. The growing of seeds containing oil is also well documented for this period. Meat formed an important part of the diet as well, as can be argued from the bone remains and stalling capacity, but also from remarks made by Tacitus in Germania. How the products were processed and how food was prepared or stored is less well known yet. Such methods are not only an important factor in determining the
need for—cERamic—containers per se, but also in the composition of a household inventory in a society. For the Roman period settlements we may assume that each household had similar ceramic inventories. It is argued here on the basis of previous studies that the degree of functional differentiation expressed in vessel forms probably was quite low. Most of the pottery has the same three-partite S-shaped profile and differs in size only. This may represent a low degree of functional differentiation, but it is also possible that minor variations in metric, but especially in non-metric features were used to express different functions. For example, a specific type of use may well be associated with a specific treatment of the surface, intended to make a vessel more suitable for that use. The roughening of the exterior surface by application of extra clay (‘besmeten’ surface) is possibly an example of use-related treatment. Moreover, minor differences in size or shape or other details may have been recognized as an indication for, and culturally associated with, different purposes. The methods of analyses should make it possible to search for and find such meaningful details. It is also expected that the cooking of foodstuffs was one of the most important functions of pottery and that ‘cooking pots’ are the most frequently used, broken and reproduced category. In the settlement of Uitgeest, this effect should be noticeable in the sherd assemblages. The study of actual use alterations can also point in the same direction.

The study of alterations caused by use is an important part of this chapter. The availability of this type of information in archaeological assemblages depends on many secondary factors, such as the type of soils, the postdepositional processes and the way the pottery has been treated during and after excavation. The pottery studied here was handled with care and provides good opportunities for the analysis of residues. Most of the residues consist of carbon or carbonized remains. These data provide independent evidence on actual use, which will be tested against the functional groups, based on form. Moreover, I am in the fortunate position that the macro-analysis of use residues has been supplemented by chemical analysis by means of pyro-analysis and gaschromatography techniques (Oudemans & Boon 1992; 1993).

The methods for the analysis of form and function of the pottery are presented in the next paragraph, while both types of analyses for use alterations are presented in paragraph 12. Because of the approach used in this study, the presentation of the methods is necessarily also a description of the analytical process itself and the choices made during that process.

8.2 **Methods, variables, and sample composition**

The following groups of variables were used to analyze the forms, possible functions and the actual use of the pottery, for both sites:

- **Metric variables**: the measurements of size and proportions
- **Non-metric variables**: the types of rims, the modes of surface treatment, the presence of handles, decoration etc.

Both categories of data were recorded on a specially designed form. The most important variables and their abbreviations are listed in fig. 8.1 and table 8.2, and the basic data can be found in the appendix to this chapter. The data were entered into dBase and the analyses were carried out in SPSS for Windows. Each group of data, metric and non-metric, was first analyzed in its own right, than for their interrelations. Since all the pottery from Uitgeest and nearly all from Schagen has basically the same, S-shaped, three-partite profiles, the same documentation system and variables were used for both sites.

8.2.1 **Sample composition**

The sample for the analysis of form, function and use is largely the same as for the technological analysis. Shards were excluded if they were too small to take accurate measurements; others were added if they formed part of the original selection but were not used in the technological analysis. For the site of Uitgeest, a second sample of 628 sherds, sample 2, was used as a control for size measurements and for additional data on use alterations.

**Classification of preserved profiles**

Fig. 8.1 shows the way in which a vessel profile has been divided, the terms for these parts, and the measurements which were taken. These definitions will be used throughout this chapter, mostly in abbreviated form (table 8.2). The same variables were used for both sites. The samples are composed of sherds of varying size and varying length of the vessel profiles (table 8.1):

- Incomplete profiles, which consist of a rim and upper wall extending to at least the maximum diameter or including a part of the lower wall (category 2).
- Complete profiles, extending from the rim to the base (category 3).
- A few rim sherds without a maximum diameter present were included (category 1) as well as some base sherds with a lower wall, sometimes reaching up to the maximum diameter (category 4). These sherds were included when they were part of a specific pottery complex, such as wells or pits.

**Composition of sample 1 and 2, Uitgeest**

**Sample 1** consists of 146 cases (table 8.1). The majority (n=134) are partial vessels in categories 2 and 3, *i.e.* pots for which both the rim and the maximum diameters could be measured. With a few exceptions, the size of the sherds in sample 1 covers at least 1/4 or more of the original diameters. The number of nearly complete vessels is very low.
FIG. 8.1a: Definitions of profiles of three-partite vessels

Legend:

<table>
<thead>
<tr>
<th>Profile parts</th>
<th>Measurement in mm (at exterior surface)</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6: Rim (from Sd to top)</td>
<td>diameter at top of rim</td>
<td>Rd</td>
</tr>
<tr>
<td>5: Minimum circumference</td>
<td>minimum diameter</td>
<td>Sd</td>
</tr>
<tr>
<td>4: ‘Shoulder’: minimum to maximum circumference</td>
<td>height 3-5</td>
<td>(not used)</td>
</tr>
<tr>
<td>3: Maximum circumference</td>
<td>maximum diameter</td>
<td>Gd</td>
</tr>
<tr>
<td>2: Lower wall, from base to maximum circumference</td>
<td>height 1-3</td>
<td>H2</td>
</tr>
<tr>
<td>1: Base</td>
<td>base diameter</td>
<td>Bd</td>
</tr>
</tbody>
</table>

Parts 1-6: Total Height | Height | Htot |
Parts 1-3: Lower wall | Height lower wall | H2 |
Parts 3-6: Upper wall | Height upper wall | H1 |
Fig. 8.1b: Definitions of proportions in 3-partite profiles.

**Complete profiles:**
- $H_1: H_{tot}$ Proportion of height of upper wall ($H_1$) and total height
  - This index represents the relative height from the base at which the maximum diameter is constructed
- $R_d: H_{tot}$ Proportion of rim diameter and total height
  - This index represents the relative width of the opening in relation to height.
- $G_d: H_{tot}$ Proportion of maximum diameter and total height
  - This index represents the relative tallness of a vessel in relation to width.

**Incomplete profiles, with at least part 3-6 present:**
- $G_d: R_d$ Proportion of rim and maximum diameter
  - This index represents the relative width of the opening in relation to the maximum width
- $H_1: R_d$ Proportion of upper wall and rim diameter
  - This index represents the shape of the upper wall, in combination with other indices, especially the $G_d: R_d$ index
- $H_1: G_d$ Proportion of the upper wall and maximum diameter
  - This index represents the relative length of the upper wall in relation to the maximum width.

Combinations of indices describe specific shapes; extremes are shown in the examples

**EXAMPLE**

**SHAPE DEFINED BY**

![Diagram](image)

$R_d = G_d = H_{tot}$

![Diagram](image)

$R_d << G_d$

$Rd < Gd$

$Rd < H_{tot}$

$Gd < H_{tot}$

$H_1: R_d > 0.5$

![Diagram](image)

$Rd >> H_{tot}$

$Rd >> H_{tot}$

$H2 << Rd$

$Rd = Gd$
Most of the pottery in category 3 (n=52) are complete profiles, not complete vessels. The complete profiles play an important role in the analysis.

**Sample 2** consists of 625 sherds selected from the sample of sherds for which a drawing was available. The selection is based on the size and context of the sherds and is used as an addition to the analysis of the main sample 1. Sample 2 contains sherds from nearly all excavated areas, but the majority was recovered from the densely occupied area (chapter 2, fig. 2.2) and from the fill of the Dunkirk I creek around the settlement. The 625 sherds have at least one measurable diameter: the rim or the base. For 437 cases the rim diameter was measured, but of these only 193 cases include the maximum diameter. The remainder of the sample consists of bases with a lower wall only. The measurements for this sample are less accurate than for sample 1, as most sherds are much smaller fragments of vessels, often less than 1/4 of the original diameter.

**Composition of sample from Schagen**

The sample size is rather small, 108 pots, but 47 of these cases are complete profiles, including three one-partite vessels (table 8.1). The number of vessels in category 2 is 45. The remainders are three rim sherds and 12 base sherds. The measurements for the Schagen pottery are much more accurate than for Uitgeest, as the surviving parts of the vessels are generally much larger. Unfortunately, two complete and three nearly complete vessels were lost during transfer, before they were drawn or measured. For some of these vessels the overall shape and size could be inferred from photographs, field drawings and notes. Those vessels were added to the final groupings of the pottery, but were excluded in the figures and tables.

Altogether, the sample used for shape and size analyses consists of 90 measured rim fragments, of which three are one-partite and two do not reach the greatest circumference: thus there are 85 cases for which both the rim-diameters and the maximum diameters are present. Of the 12 base sherds, four include the maximum diameters, bringing the number of measured maximum diameters to 89. The total of measurements of base sherds is 53 (three measurements are missing).

8.2.2 MEASUREMENTS OF SIZE AND PROPORTION

The size of a vessel is expressed by its diameters, rim, minimum and maximum diameter, and base diameter, and by height measurements, the height of the lower wall, the upper wall and the total height (fig. 8.1a,b; table 8.2)\(^2\). The measurement of the total height is available for the complete profiles only. Most measurements for the lower wall and the base diameters, except for Uitgeest sample 2, also stem from these profiles.

The proportions or shapes of a vessel profile are described by the relationships between size variables. In 2- or 3-partite vessels three different types of proportions can be distinguished, the relations between two diameters, between two height measurements, or between a combination of a diameter and height measurement. In this study, after exploring all possibilities, the following indexes of two size variables were chosen to describe the proportions of the pottery.

1. **Proportions for the upper wall** (from rim to maximum diameter; fig. 8.1a,b)

   For all sherds in category 2 and 3 (consisting of rim sherds including the maximum diameter or part of the lower wall), the following indices are used:

   \[ \text{Gd:Rd} = \text{Maximum diameter} / \text{Rim diameter} \]

   \[ \text{H1:Gd} = \text{Height of upper wall} / \text{Maximum diameter} \]

   \[ \text{H1:RD} = \text{Height of upper wall} / \text{Rim diameter} \]

   Together, these indices describe the shape of the upper part of a vessel, i.e. above the maximum diameter. The Gd:Rd index defines the relative width of the opening, while the other two define the relation of the rim and maximum diameter with the length of the upper wall.

2. **Proportions for complete profiles**

   For these cases the following indices are also available (fig. 8.1b):

   \[ \text{Gd:Htot} = \text{Maximum diameter} / \text{Height} \]

   \[ \text{Rd:Htot} = \text{Rim diameter} / \text{Height} \]

   \[ \text{H1:Htot} = \text{Height of upper wall} / \text{Height} \]

   \[ \text{H2:Htot} = \text{Height lower wall} / \text{Height} \]

   These indices together define the shape of a complete profile. The first two indices describe the overall proportion of maximum width, width of the opening and height for a complete vessel. The shapes defined by these proportions can vary from a very wide and low shape, like a plate, to a very tall and narrow shape, such as a jar. Three examples are given in fig. 8.1b. The proportions of heights concern the relative lengths of the upper and lower walls, defining the relative height of the maximum diameter from the base or rim. For these proportions the H1:Htot index is mainly used here in the definition of shapes and the classification of the pottery following from these definitions.

   There are three vessels with a one-partite form in the sample of Schagen. For these forms, indices including the maximum diameter could not be constructed. For the Gd:Htot index the Gd was substituted by the Rd.

8.2.3 ANALYSIS OF METRIC VARIABLES

The first step was to analyze the frequency distributions of individual size and proportion measurements and the
interrelations between these variables for each vessel in charts combining two or more variables. These data were the basis for distinguishing size and shape clusters. Not surprisingly, the complete profiles were the most informative and these vessels were used to delineate major size and shape variations. The analyses of the metric variables resulted in two different classifications of the pottery, one for the complete profiles (A) and one for all pottery with a profile extending from the rim to the maximum diameter (B). The criteria for both classification are shown on page 173.

Complete profiles:
From the analyses of the complete profiles, four variables were selected to describe shape and size variations:
– the size of maximum diameter (Gd) itself
– the size of the opening (Rd) as a proportion of the maximum diameter (Gd): Gd:Rd
– the proportion of the total height and maximum diameter: Gd:Htot
– the proportion of the length of the upper wall and the total height: H1:Htot

The classifications of the variables can be found in table 8.3 and 8.6 for Uitgeest and table 8.10 for Schagen. The maximum diameter proved to be a very good indicator of overall size, showing a uniform relation with the size of the height and rim diameter for most vessels. This diameter is classified into three size classes in Uitgeest and four in Schagen. The class limits are based on the relationships between all variables, visible in the distribution charts. They differ slightly for the samples of both sites, as the relations of the maximum diameter with other variables are slightly different (compare table 8.3 and 8.10). The second and third variable clearly define a specific shape, shape 3, for a small number of vessels by the index values >1.5 and <1.0 respectively. The vessels have a narrow opening and a relatively small maximum diameter. This pottery is added as a separate class to the size classification, based on the maximum diameter. The fourth variable is the basis for the definition of two other specific shapes present within the subsample of the complete profiles. The two distinct value clusters of the H1:Htot index define these two shape variations, shape (A)1 and (A)2.

Incomplete profiles:
Most of the incomplete profiles in the samples of both sites consisted of the upper part of vessels, for which the size of the maximum diameter and the Gd:Rd index value could be measured. The next step was to examine if there was a consistent relationship between the shape of the complete profiles and the shape of the upper wall in each vessel; in other words, to find an alternative for the H1:Htot index. If there was, this would considerably extend the number of cases to be classified.

The H1:Rd index, the proportions of the upper wall and rim diameter, turned out to be the best indication for this relationship. The index was classified in such a way that the ‘best fit’ was obtained with the distribution of the H1:Htot index values, also resulting in three classes for the shape of the upper wall. The H1:Rd index is used for the second classification of the pottery, classification B. Shape B1 and B2 for the pottery classified by size, while shape (B)3 is the same as shape A3, defined by the Gd:Rd index (>1.5). As for the maximum diameter, the class limits for the H1:Rd index are slightly different for the samples of both sites, again based on the interrelations between several variables. Classification B thus contains all cases for which the size of the maximum diameter and H1:Rd index values were known, including the complete profiles. The great advantage is that nearly all cases in the samples of both sites could be included. For that reason classification B is used more often in the analyses of non-metric variables and data relating to actual use.

To repeat, the basis of both classification A and B is the same, the size classes defined by the maximum diameter and the specific shape defined by the Gd:Rd index, but the subdivisions of each size class are based on class 1 and 2 of the H1:Htot index for intact profiles and on the H1:Rd index for incomplete profiles. The similarities and differences between A and B are discussed in paragraphs 8.3-6 for the samples of Uitgeest and in paragraphs 8.8-9 for that of Schagen. The comparison of the two classifications also improved the interpretation of the relations between overall shape and shape of the upper part of vessels.

8.2.4 NON-METRIC FEATURES
In this study four non-metric variables are used:
– The finishing treatment of the rim: smoothed (mostly tooled) or ‘decorated’ (finger-impressed)
– The presence or absence of handles
– The finishing treatment of the exterior surfaces
– The presence or absence of ‘besmeten’ surfaces

The term ‘besmeten’ refers to a specific type of finishing treatment of the exterior surface, for which no proper English term exists. ‘Besmeten’ refers to a thick layer of clay ‘thrown’ on to the exterior lower wall creating a rough surface. Within such surfaces, several variations can be distinguished, see fig. 8.12,13 for examples. In the analyses only the presence or absence of such a surface is used.
For all sherds the treatment of both the interior and exterior surfaces and the rim was documented for each part of the profiles. The types of treatment distinguished here were derived from experience gained within the Assendelver Polder project by ms.T. Spruyt and the author. Here only the treatments of the exterior surfaces are presented. These were classified into specific combinations for the upper and lower wall, resulting in six modes of surface treatment. The surface treatment, especially the application of an extra clay layer will have had functional and technological reasons. The type of rim finishing and the ‘besmeten’ surfaces represent very clear ‘either/or’ choices by the potter.

The data on size and shape groups were combined with those on the other non-metric variables for each site, to test the relation between forms and surface treatments. Unfortunately the size of the samples from Uitgeest and Schagen was often too small to establish statistically significant associations, especially for data that were available for complete profiles only. The following step was to analyze the relations between all morphological properties and the evidence of the use residues (paragraph 12). All information was in turn used to assign general categories of functions to the morphological groups (paragraph 13).

8.3 Analysis of size and shape, Uitgeest-Gr.D. sample 1

The analyses of the data for size and proportions and the resulting classifications into pottery groups is presented here. As this analysis is illustrated and summarized by a large number of charts (fig. 8.2 through to fig. 8.11), the reader is advised to use fig. 8.1a, b and table 8.2 as a reference for the abbreviations of profile parts and for the schematic representation of shape variations. Most of the figures are not discussed individually in the main text. Instead a brief description and interpretation is given with each figure or group of figures. Fig. 8.2 and 8.3 contain the frequency distributions of size measurements for single variables and those for proportions between two variables (indices). The charts in fig. 8.4 illustrate the associations between diameters and height measurements. The metric properties of the subsample of complete profiles are presented in more detail in fig. 8.5.1 and 8.5.2. Figures 8.5.2a-d show the relationships between different indices of size variables in complete profiles (subsample A), while fig. 8.6 contains the distributions of variables for incomplete profiles. The analysis results in two different classifications, one for the subsample of complete profiles and one for all pottery with a complete profile of the upper wall. The most important properties of the resulting pottery groups are illustrated in fig. 8.7 and 8.8.

8.3.1 DIMENSIONS OF SIZE VARIABLES

For sample 1, 137 rim diameters (Rd), 135 maximum diameters (Gd), 64 diameters of bases (Bd) and 53 heights (Htot) were measured; the latter represent the sub-sample of complete profiles (table 8.1). The histograms in fig. 8.2 show the frequency distributions of these variables for all data and/or for the subsample of 53 complete profiles.

The rim diameter varies from 94 to 298 mm with 50% measuring between 150 and 280. The distribution of the smallest diameters (Sd) is virtually identical to that of rim diameter (fig. 8.4a). The maximum diameter (Gd) for all cases varies from 110 to 420 mm. In about half of the pottery the Gd measures between 200 and 310 mm. The measurements are continuous for all variables except the base diameter, i.e. there are no clear breaks in size classes within the pottery. The distributions of the rim and maximum diameters do suggest the presence of at least two main size groups or two overlapping normal distributions. This indication is stronger in the histograms for the subsample of complete profiles. The height measurements show two main size distributions as well, vessels with a height of 90-150 mm and of 190-330 mm. In the sizes of the base diameter three or four clusters can be distinguished: bases with a diameter of 40-60 mm, 70-100 mm, 100-130 mm and more than 140 mm (also fig. 8.4c). The size distributions for complete profiles are not significantly different from those for the total sample, except for a slight over-representation of smaller vessels. This is due to the fact that such vessels have a much better chance to be recovered as complete vessels and are also easier to restore to complete profiles.

The scatters of measurements in fig. 8.4a-d show the overall relationships between the size variables in each vessel. Those available for the upper part of vessels, the rim diameters, the minimum and the maximum diameters show a perfect correlation. Almost all cases show the same proportions between these variables. A small cluster is formed by cases with a very narrow opening and a large upper wall (fig 8.4b). In all other vessels the size of the rim diameter equals or is slightly lower than that of the maximum diameter. The length of the upper wall shows two main size clusters, one of 20-60 mm and one of circa 60-90 mm, which correspond with two different sizes of the maximum diameter (smaller and larger than 190 mm respectively). Thus these two variables divide the pottery into two basic size groups.

The measurements for complete profiles show that the size of the rim diameter, maximum diameter and total height of vessels as well as the length of the lower wall are highly correlated, indicating a proportional increase in all of these variables with increasing vessel size. Thee correlations are, however, less strong in the largest vessels (fig. 8.4c,d). The base diameters show two size clusters as well, also related to the maximum diameter value of 190 mm, but there is more overlap than for the two size clusters of the upper wall.
8.3.2 Dimensions of Proportions

Fig. 8.3(a-e) shows the frequency distribution of values for the most important indices, the fractions of two size variables.

The \( Gd:Rd \) index (the maximum diameter divided by the rim diameter) defines the relative width of the opening of a vessel. The \( Gd:Rd \) index shows two distinct clusters with values lower and higher than 1.4 (fig. 8.3a). The index was classified into three classes and is used as the first criterion to divide the pottery accordingly (table 8.3). The cases with an index value >1.5 form the small cluster of vessels with a narrow opening and long upper wall, mentioned above. For nearly 90% of the cases the index is lower than 1.4. The values show a normal distribution, although fig. 8.3b suggests that it may be bimodal, with values lower or higher than 1.15. Only a few cases have values between 1.4 and 1.5. The \( H1:Rd \) index (the height of the upper wall divided by the rim diameter) defines the proportions between the length and width for the upper parts of vessels. The values are also clearly divided into two classes (values below and above .6). For the majority of vessels the index value varies between .2 and .5. Those with values >.6 also have a \( Gd:Rd \) value >1.5 (fig. 8.4a).

The frequency distribution for the \( H1:Gd \) index values (the height of the upper wall divided by the maximum diameter) is similar to that for the \( H1:Rd \) index.

Complete profiles

The \( Gd:Htot \) index defines the relation between the maximum width and maximum height. The index value is >1.0 for most cases and the frequencies show a normal distribution. In a small number of cases the value is <1.0, mostly those with a \( Gd:Rd \) >1.5 (also fig. 8.4d). The relationship between the rim diameter and the height, \( Rd:Htot \) index, shows that in most cases the value of both variables is more or less the same (index values around 1). The cases with index values <.7 also have high values for the \( Gd:Rd \) index.

The \( H1:Htot \) index (the height of the upper wall divided by the total height) defines the proportions in the heights of vessels by the relative height of the maximum diameter. The values for this index vary from .20 to .50, which means that the size of the upper wall varies from 1/5 to 1/2 of the total height. The distribution shows a clear dichotomy by the value of .33 or 1/3 of the total height. In 28 cases the maximum diameter is constructed at a point higher than 2/3 of the total height from the base and in 25 cases this diameter is positioned below that point. Of the latter, six vessels also have a relatively narrow opening (cluster 3 in fig. 8.4d). The \( H1:Htot \) index values were classified into class 1 (<.33) and class 2 (≥.33), which define two different shapes present in the complete profiles, shape A1 and A2.

8.3.3 Size and Shape Relations

Three clusters of pottery can be distinguished in the subset of complete profiles on the basis of a few size and proportion variables. The narrow opening and the large total height, relative to the maximum diameter define a small group of cases. These proportions are expressed by the value of the \( Gd:Rd \) index, the \( Gd:Htot \) index and the \( H1:Htot \) index (fig. 8.4). The other vessels, the majority of cases, differ mainly in size, while the proportions of the rim and maximum diameter, the total height and that of the lower wall are very similar for the size of the upper wall and to a lesser extent the base diameter divides this pottery into two clusters, with a maximum diameter smaller and larger than 190 mm (fig. 8.4d,e).

The next step was to analyze and delineate distinct combinations of size and shape in the pottery in more detail. For this purpose most variables were classified, the most important being the maximum diameter and two indices, the \( Gd:Rd \) and \( H1:Htot \) for complete profiles (table 8.3). The subsample of complete profiles was analyzed first to explore the interrelations between all variables. It included the search for variables that could be used as criteria for the classification of incomplete profiles.

To repeat, the \( Gd:Rd \) index, in combination with the \( Gd:Htot \) index defines a small cluster of pottery with a narrow opening (\( Gd:Rd >1.5 \)) and a height that exceeds the size of the maximum diameter (\( Gd:Htot <1.0 \)). This group is also distinct by several other variables. The vessels have a long upper wall (\( H1:Rd >.60 \)), the \( H1:Htot \) is always >.33 (and mostly >.40). These values were used to define one of the classes for each variable (table 8.3). Their combination is a specific shape, defined as shape 3. Such vessels are usually described as jars. All other vessels which form the majority of sample 1, can be divided into two main size clusters, those with a \( Gd \) smaller and larger than 190 mm (fig. 8.4a-d). This division, with corresponding sizes, is also visible in the distributions of most other variables. Because of its constant linear distribution and the high correlation with all other size variables, especially the lower wall and height, the maximum diameter can be regarded as an indicator for overall size. This variable was therefore used as a primary criterion for the classification of size groups. Three size classes are distinguished: \( Gd <190 \) mm, 190-295 mm, and >295 mm. These size classes are referred to in the figures as size class 1-3. The complete profiles also show two different shapes, defined by the \( H1:Htot \) index value of .33, shape A1 and A2. The pottery with shape 3 was added as a separate class, class 4. These size and shape classifications are used in fig. 8.5 to determine the criteria for the classifications A and B in detail.

Size and shape relations in complete profiles

The charts of fig. 8.5 show the relationships between two or more size variables or their proportions for the complete
profiles only. The classification of the maximum diameter into three size classes was based on the following characteristics of these distributions. The two shapes defined by the H1:Htot index are clearly related to the overall size of the pottery (Rd, Gd and Htot, fig. 8.5.1b,c). All of the 19 cases with shape 2 are vessels with a Gd <295 mm. For this reason, size class 2 was defined as pottery with a Gd of 190-295 mm and size class 3 with a Gd >295 mm. Pottery with a Gd <190 mm) is clearly a separate size class, in which both shape 1 and 2 are present as well. In the pottery of class 3, shape 1 is present in all complete profiles but one, despite the large variations in the size of the upper wall. The lower wall is always relatively large in relation to the total height, and this size is more or less independent from that of the upper wall (fig. 8.5.1d,e). The H1:Rd and the H1:Gd values for these vessels, representing proportions of variables for the upper wall, vary but are also quite low in most cases (fig. 8.5.2a,d). The only vessel with shape 2 has an exceptionally large upper wall (vesselnr 35-7). There is a high correlation between the length of the lower wall with both the maximum width (Gd) and maximum height (Htot) in all size classes, indicating that an increase in the overall size of a vessel is primarily the result of an increase in the size of the lower wall (fig. 8.5.1d-f). In size class 1, there is some variation in the length of the upper wall, but the absolute size range is quite similar for shape 1 and 2, while the lower wall shows two different size ranges. Shape 1 and 2 are therefore defined by the lower wall size (fig. 8.5.1d,e,g). In most cases in Gd class 2 and 3, the proportion of the lower wall and the maximum diameter are quite similar. In other words, the size of both variables is increased by the same fraction. The absolute size of the upper wall (H1), on the other hand, hardly varies and shows a restricted range for most vessels (fig. 8.5.1d, fig. 8.6a,b). Therefore the relative size of the upper wall as a proportion of the rim, the maximum diameter or the height varies considerably between cases. The result is a change from shape 2 in the smaller vessels to shape 1 in the larger ones (fig. 8.5.1e). Thus the main factor determining the differences in shapes in class 2 and 3 is the more or less standard size range of the upper wall. In contrast, the shape variations within size class 1 are determined much more by the size of the lower wall. Vessels with shape 3 (class 4) are again clearly marked by the large size of the upper wall (8.5.1d).

For vessels in size class 3, the correlation between the size of the Rd, Gd, Htot and H2 is not as strong as for those in class 1 and 2. When the maximum diameter is larger than circa 290 mm more variations occur in the interrelations between these size variables; the proportions are more variable (fig. 8.4, fig. 8.5.1). The distributions in fig. 8.5.1b,c suggest the presence of two and possibly three clusters for the size of the rim diameter, lower wall and height for vessels in class 3. In some cases the height is lower and the rim diameter larger than in other vessels with the same size of the maximum diameter, in others the height exceeds the rim and maximum diameter (fig. 8.5.2c,d). These cases may represent a different shape, but this variation is not expressed by the values of the H1:Htot index. These characteristics are an additional reason for the distinction between size class 2 and 3.

Size and shape relations in incomplete profiles
Sample 1 contains 80 partial profiles for which no data on the lower wall, height and base diameters are available. An important question was therefore which of the available measurements could be used as an indication or even substitute for overall shape as defined by the H1:Htot index. Such a variable is especially relevant for the cases in size class 3, with very low numbers of complete profiles. As the shapes of the complete profiles in class 3 are determined mainly by the size of the upper wall, the distributions of all indices containing this variable are compared in fig. 8.5.2a-d. These figures show that there is a near perfect match between the H1:Htot and H1:Rd index in the complete profiles. In only five cases, mostly in size class 1, the two classifications do not match. The proportions of the upper wall size with the rim and maximum diameter provide an even better distinction of class 4, the jars, than the H1:Htot index. Both indices are therefore classified in such a way that there is an optimal correspondence with the classifications of the H1:Htot and Gd:Rd indices (fig. 8.5.2a,b). The result is three classes for the H1:Rd index values: class 1 with values <.33, class 2 with values between .33-.6 and class 3 with values >.6. The value of .33 was chosen as a direct copy of the H1:Htot classification, and because the size of the rim diameters is very close to that of the height in most cases in size class 2 and 3. The first two classes thus correspond to a large degree with shape 1 and 2 as defined by the H1:Htot index. As mentioned before, the pottery with shape 3 (class 4) is defined by correspondent values for all indices. The shapes based on the classification of the H1:Rd index are referred to as shape B1, B2 and B3 of the upper wall.

Fig. 8.6 shows the distribution of size and shape variables in relation to the shape of the upper wall for all cases. Pottery with shape 3 (the jars) is often omitted, as this group was already clearly defined. Compared to the subsample of complete profiles, there are some differences in the classification for the shape of the upper wall, when incomplete profiles are added. A higher percentage of vessels are now classified as shape B2 (figs.8.6a-d). In size class 1 (Gd <190 mm) the number of cases with shape B1 is now slightly higher than those with shape B2 (the reverse for classification A). In the
size class 3, vessels with shape B2 are much more frequent than in grouping A (11:1 to 1). The possible causes for these differences between the complete and incomplete profiles will be discussed in more detail below.

The H1:Gd was also classified into 3 classes with a limit between class 1 and 2 at .30, as the maximum diameter is usually slightly larger than the height and rim diameter. The match between these two classifications is nearly 100%.

8.3.4 CLASSIFICATION OF THE POTTERY

As a result of the analyses described so far, two different sets of criteria are used to classify the pottery of sample 1. One for the subsample of complete profiles and one by criteria available for incomplete profiles, consisting of rims to lower wall. Both classifications have the same basis, the three size classes defined by the size of the maximum diameter and one shape class, defined by the Gd:Rd index. Together they define the major pottery groups 1-4. They differ only in the subdivisions in size class 1-3.

In classification A, for complete profiles only, the H1:Htot index values define the subgroups within each size class (table 8.4a).

In classification B, for all cases with profiles from rim to lower wall, the shape of the upper wall define the subgroups (table 8.4b).

The slight differences between classification A and B in the percentage of shape 1 and 2 in each pottery group (table 8.4a,b) are partly caused by the slight variations in rim diameters and heights relative to the size of the maximum diameter (to be discussed below).

The term pottery group is preferred instead of pottery class for two reasons. Firstly because, despite the strong correlation between most metric variables within each group, there is some overlap in size for most variables, except the maximum diameter. Secondly, because the main purpose of the classification is to build up progressively more meaningful units of pottery, which can lead up to meaningful interpretations about function and use of vessels. This is also the reason to present both classifications, although I am aware that it complicates the reading of the text. However, at this stage of research and with such small numbers of complete profiles, it is necessary to explore different types of information and to keep the classifications as open as possible. Since archaeological assemblages usually consist of partial profiles with rims, it is important to find a way to infer and reconstruct the overall size and shape from them. It can also increase the available data for Uitgeest enormously. Sample 2 from this site contains only partial profiles and/or small fragments.

Exceptions and additions:

There are four incomplete profiles in sample 1 with a Gd:Rd index value between 1.4 and 1.5 (vessel nr. 7-7, 14-12, 19-10, 31-9; appendix 8); these cases were not included in group 4 because they do not meet the other criteria for this group. Despite the narrow openings they have the same values as other vessels in group 2 and 3 for most variables. They all have large maximum diameters and no extreme upper wall sizes, while the H1:Rd index values are always <.6.

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### Uitgeest. Criteria for classification A

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<td>+ Gd: Rd &lt; 1.5</td>
<td>Group A 2.1 + 2.2</td>
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<tr>
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<td>H1: Htot &gt; .33</td>
<td>Group A 3.1 + 3.2</td>
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<td></td>
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<td>Group 4</td>
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### Uitgeest. Criteria for classification B

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<tr>
<td></td>
<td>+ Gd: Rd &gt; 1.5</td>
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These cases were added to group 2 or 3 on the basis of the maximum diameter. Another exceptional case (pot 31-15) with the extreme value of 2.2 for the Gd:Rd index and .8 for the H1:Rd index was also added to group 3.1. This is a ‘Frisian earpot’ with a large maximum diameter, but an extremely small opening. This case is omitted from most of the distributions in fig. 8.7. Several other sherds in the sample from category 1 and 4 (rim sherds and bases) were added to the appropriate groups, when enough information was available. Two bases with a lower wall nearly reaching the Gd were added to group 3 (by the minimum value of the maximum diameter) and two others to group 1. Two rim fragments were added to group 3 and two to group 4. Altogether eight sherds were added to the pottery groups, bringing the total of sample 1 assigned to pottery groups to N = 138. Note that this number will be lower in individual figures when combinations of measurements are unknown for these sherds.

8.3.5 Characteristics of the pottery groups

The characteristics of the four main pottery groups are described and summarized, first the general shape and metric properties of the complete profiles, followed by those for all upper parts. Fig. 8.7 and fig. 8.8 show the most important associations between variables for classification A and B. Examples of all pottery groups are illustrated in fig. 8.12–8.14.

Characteristics of group 1

All vessels are wide-mouthed, three-partite forms with a maximum circumference equal to or slightly larger than the rim diameter and height (see fig. 8.1b). Group 1 is clearly demarcated from group 2-4 by all size variables, except the base diameters (fig. 8.7.1). The maximum size of the rim diameter is 160 mm, that of the height is 180 mm. The (average) base diameters and the size of the upper walls are also clearly lower than for the other groups, although there is some overlap with group 2. Both shapes are present. Six vessels in this group are so-called ‘pedestal bowls’, with a small foot. It is a very distinct type of pottery found in indigenous sites in the Roman period in the northwestern part of the Netherlands (fig. 8.12; 8.14).

Complete profiles: group A1.1 and A1.2

Shape A1 and A2 are represented by 7 and 12 vessels respectively and are clearly related to height and rim diameter (fig. 8.7.1a.b; fig. 8.8). The average size of the Rd and Htot differ very little from that of the maximum diameter in vessels with shape 1, but are somewhat smaller in shape 2 (table 8.4; fig. 8.8a). The size of the upper wall is not very different for both shapes but the lower wall is clearly shorter in group 1.2. Shape 1 and 2 are therefore mainly defined by the length of the lower wall. Six of the seven pots in group 1.1 are pedestal bowls. The large difference in base diameters between shape 1 and 2 is explained by the small foot of pedestal bowls in group 1.1.

Group B1.1 and B1.2

For most complete profiles there is a good match between the H1:Rd and H1:Htot index, both defining the same subgroups 1.1 and 1.2 (fig. 8.7.1d,e). In the incomplete profiles shape B1 occurs more frequently than shape B2 (table 8.4b; fig. 8.7.1c; fig. 8.2a,b). For most of these vessels, however, the H1:Rd values are close to the class limit of .33. If this limit would be set at .32, all incomplete profiles but one would be defined as shape 2. The differences between classification A and B are caused by the fact that the size (range) for the upper walls is quite similar for all vessels, while in most of the vessels (other than the pedestal bowls) the lower wall is rather short. The H1:Rd index therefore adds more cases to shape 1, than the H1:Htot index. Also, the fractions are much more influenced by minor changes in sizes in small vessels than in larger ones.

Characteristics of group 2 and 3

Group 2 and 3 together form a large cluster of similarly shaped pots. They are wide-mouthed, 3-partite forms with a maximum circumference equal to or slightly larger than the total height and opening. The distributions show a continuous size range between 190 and 360 mm, with only a few larger cases (fig. 8.7.1). The proportions between the size variables are also quite similar for all sizes (fig. 8.7.2). But the vessels in group 3 show more variation in the relative dimensions of diameters and heights than those in group 1 and 2, especially when the maximum diameter is >330 mm. Group 3 was therefore divided by the size of the maximum diameter into subgroups 3A and 3B, with a Gd of 295-330 mm and >330 mm respectively. It was hoped that this division might shed more light on the variability in size relations visible in this pottery, but because of the low number of complete profiles (n=3), little added information was gained; the subgroups are used only in table 8.4 and fig. 8.8. That size relations vary more in larger vessels may be due to the measurements being less accurate, simply because the remaining fragments of these vessels are often a smaller part of the total vessel. And, as most archaeologists will recognize, it is much more difficult to find and fit pieces of larger vessels together. Variations in proportions occur mainly in relation to the size of the upper wall and its indices and these were used as the main criteria for the division of class 2 and 3. There is a quite a large variation in the base diameters relative to other size variables and independent of shapes (fig. 8.7.1c). Despite the considerable overlap, the
base diameters seem to be slightly larger for the larger vessels in group 3B.

Group 2
Complete profiles: group A2.1 and A2.2
Most of the vessels show similar proportions between the major size variables (Rd, Gd, H2, Htot), while the base diameter and the upper wall vary more or less independently from the other size variables (fig. 8.7.1a-c). Shape 1 occurs slightly more frequent than shape 2 (n=9 and 6 respectively). Four of the latter are vessels with rim and maximum diameters smaller than 240 and 260 mm. For group 2.1 these measurements are mostly larger. The other two complete profiles with shape 2 are larger and clearly have a very long upper wall (fig. 8.7.1c). Also, the average rim diameter is larger than the height in vessels with shape 1 and vice versa for shape 2 (fig. 8.8a,b).

Apparently one size range was used for the upper wall in most of the vessels in group 2 and continuing in group 3, more or less independent from the maximum diameter and height. As a result, the upper wall is proportionally larger in the smaller vessels in relation to total height, the rim and maximum diameter. At the same time the size of the lower walls and the total height are increasing proportionally with the maximum diameter in this group. Together these variations result in increasingly lower values of the H1:Htot index and thus in a change from shape 2 to shape 1 with increasing vessel size (fig. 8.7.1b,c; fig. 8.8). The base diameters show no relation with other variables at all.

Group B2.1 and B2.2
As was the case in group 1, classification B results in a change in frequencies for subgroups 1 and 2 (table 8.4b; fig.8.8). In the complete profiles, the relative frequencies of shape 1 and 2 are 1.9:1, while in group B2, they are 1.3:1 (14 cases are added to group B2.1 and 13 to group B2.2). The differences are caused by more pottery with long upper walls within this group (compare fig. 8.6b,c and fig. 8.7.2ab). In group B2.2, the average size of the upper wall is clearly larger as in group A2.2. The variation in upper wall size is to a large extent independent of the size of the openings and the total heights. Most vessels have Gd:Rd index values between 1.0 and 1.2 in both subgroups, although the rim diameters of the larger vessels in group B2.2 seem to be slightly smaller (fig. 8.7.1c,2c). This trend is more pronounced in group 3.

Group 3
Complete profiles
Within group 3 a distinction is made in two size classes of the maximum diameter (smaller and larger than 330 mm; table 8.4a). All but one of the complete profiles in group 3 are pots with shape 1, despite the large size range of the upper wall (fig. 8.7; fig. 8.8). This is the result of the relatively large size of the lower wall in most vessels, expressed by the higher (average) values of the H2:Gd (and H1:Htot) index compared to group 2; the Gd:Htot index values are lower (table 8.5). Together they indicate a reduction in total height by a relative decrease in the length of the upper wall with increasing size of the maximum diameter. The rim diameter is usually slightly larger than the height (Rd:Htot >1.05). In group 3, the lower wall is always more than 2/3 of the total height, independent of the actual size of the upper wall. The one exception, pot 31-15, is a vessel with an extremely narrow orifice, a ‘Frisian earpot’ (appendix nr 8).

In the few large vessels (Gd >330 mm), the average height nearly equals that of the maximum diameter (Gd:Htot index =1.06 on average) and is larger than the rim diameter. Those vessels with a longer upper wall also have slightly smaller openings as well as slightly larger base diameters. Admittedly this is a very small sample, from which no definite conclusions can be drawn.

Group B3.1 and B3.2
For the complete profiles, classification A and B largely correspond; the H1:Htot index values are clearly associated with the H1:Rd index values. (compare fig. 8.8a1 with fig. 8.8.1c,d). The classification by the shape of the upper wall is especially important for group 3, as the number of complete profiles is so low (table 8.4b).

As in group B2.1, in group B3.1 the size and shape of the upper part of a pot is independent from that of the maximum diameter and lower wall (fig. 8.7.1c,d). Unfortunately there is a large discrepancy for incomplete profiles: instead of 1 case with a H1:Htot >.33, there are 12 cases with a H1:Rd index value >.33-.60 (table 8.4b). The distributions in fig. 8.6b,c and fig. 8.7.a,c suggest that the subsample of complete profiles is not representative for this group as a whole. However, the H1:Rd index values correspond with the two size clusters defined for the upper wall (fig. 8.4; fig. 8.5.1d; fig. 8.7.2a,b). In vessels in group B3.2 the length of the upper wall is mostly >100 mm and seems to be proportional to that of the maximum diameter; in other words, the length of the upper wall is increasing with increasing Gd in this subgroup. Most of the cases in group B3.2 not only have quite long upper walls, but they have a smaller opening as well (Gd:Rd values >1.15, fig. 8.7.2b).

Trends within group 2 and 3
The pottery in group 2 and 3 shows two interesting trends. In the first place for the majority of vessels the length of the upper wall varies within a standard size range between 60 and 90 mm, independent of overall size. Secondly, in the vessels with shape 2 (subgroups B2.2 and B3.2, together 23%), the
upper wall is clearly larger than in those with shape 1, especially when the maximum diameter is larger than 250 mm (fig. 8.7.2a). From that point there seems to be a more or less proportional increase in the size of the upper wall with that of the maximum diameter, together with a limited size range for shape 2. For the smaller vessels in group 2, those with a maximum diameter between 190 and 250 mm, the ‘standard’ size of the upper wall results in higher values for the H1:Rd index and so most of these vessels are defined as shape 2 (fig. 8.7.2b). With increasing overall size, these vessels with the same size of the upper wall change from shape 2 to shape 1, firstly because the H1:Rd index value will decrease and secondly because the lower walls are quite large and increasing proportional to the maximum diameter. As a result, the H1:Htot index remains low in all complete profiles in group 2 and 3, while the H1:Rd index value is much more variable and can be quite high. However, the relations between the shape of the upper wall and the rim diameter and height differ for the two size groups. In group B2.2, the average size of the openings is quite similar to that in group B2.1 for vessels with a GD smaller than 250 mm, while the size is clearly smaller relative to the maximum diameter in the larger vessels with shape B2. In most of these, the Gd:Rd index value is >1.2, the Rd:Htot is then mostly <1.0 (fig. 8.7.2b,c; fig. 8.8a). Moreover, in the complete profiles there is a very slight shift in the proportions of the maximum diameter and total height when the maximum diameter is >250 mm. The height is slightly lower (Gd:Htot is higher) than in smaller vessels (fig. 8.5.1b,c). This shift is related to the size of the lower wall, but is more or less independent from the shape of the upper wall (fig. 8.5.1d; 8.7.1d,e). Admittedly these are minor variations but nevertheless seem to be consistently present in all the relevant figures (fig. 7.7.2); the distributions and variable relations tend to show a ‘break’ around the maximum diameter of 250 mm. The trends suggest that the group of pottery with a Gd between 190-250 may be a separate group with specific proportions or alternatively, this value is a better criterion to define group 2 and 3 (see classification of sample 2, par. 8.5). As the same indications for change around 250 mm are present in sample 2, the pottery was subsequently reclassified for further analysis (see paragraph 12).

**Group 4:**
All vessels in this group show a consistent relationship between size and shape variables. They all have a long upper wall and a very narrow opening; the Gd:Rd index is always >1.4. The values of the H1:Rd en H1:Gd indices are clearly higher than for pottery groups 1-3, in most cases >.6. For the complete profiles the H1:Htot index >.33-.60, and mostly >.6. The maximum diameters are small in relation to the height (the Gd:Htot index is <1.0). The absolute size is similar for most of these vessels, the height varying between 240 and 300 mm and the maximum diameter between 200 and 260 mm. There is one exceptionally large vessel in this group (pot nr 7-7) with a Gd >300 mm and a Rd >200 mm.
Fig. 8.2 Ulitgeest-Gr. D. *sample 1*. Frequency distribution (N) of size variables: diameters and heights (see fig. 8.1a).

Fig. 8.2a All rim diameters (Rd).

Fig. 8.2b Rd of complete profiles.

Fig. 8.2c All maximum diameters (Gd).

Fig. 8.2d Gd of complete profiles.

Fig. 8.2e All base diameters (Bd).

Fig. 8.2f Total height (Htot) of complete profiles.
Fig. 8.3 Uitgeest-Gr. D. sample 1. Frequency distribution (N) of variables for proportions (indices of two size variables; see fig. 8.1b).

Fig. 8.3a The size of the maximum diameter (Gd) divided by the size of the rim diameter (Rd), all cases.

Fig. 8.3b Gd:Rd ≤ 1.4, complete profiles.

Fig. 8.3c The length of the upper wall divided by the maximum height.

Fig. 8.3d The maximum diameter divided by the total height (Htot).

Fig. 8.3e The rim diameter divided by the total height (Htot).

Fig. 8.3f The length of the upper wall divided by the rim diameter.
Description fig. 8.3:

a,b In the majority of the pottery the index value is 1-1.2: the rim diameter is equal to or slightly smaller than the maximum diameter. A small but distinct group of vessels has a high Gd:Rd index value (>1.4); the thirteen vessels with a value >1.5 form a separate class of pottery (fig. 8.4a). In only 2 cases the rim diameter, which is measured at the outside, exceeds the maximum diameter.

c The pottery with complete profiles (n=53) is divided by the value of .33 of the H1:Htot index (or .67 of the H2:Htot index, not shown here). This value represents the position of the maximum diameter at 2/3 of the height above the vessel base. The length of the upper wall, H1, is then less than 1/3 of the total height in 28 cases and more than 1/3 of the total height in 25 cases. The index was classified accordingly (see fig. 8.5.1):

class 1: H1:Htot ≤ .33; H2:Htot > .67
class 2: H1:Htot > .33; H2:Htot ≤ .67

d The size of the maximum diameter is mostly larger than that of the total height (index value >1.0). The index value is lower than 1.0 in those cases which also have a high value for the Gd:Rd and H1:Htot index, i.e. a small opening and long upper wall.

e The relative size of the height and the rim diameter shows two clusters: one in which the rim diameter is larger and one in which the height is larger, although both are minor variations around the value 1. In most vessels, the height and rim diameter are more or less the same size. Again there is a small cluster with very low values (<.7).

f There is a slightly skewed normal distribution of this index for values <.50. In most cases, the length of the upper wall is ca 1/3 of the rim diameter. In 14 cases (with a value >.60), the upper wall is quite large and/or the rim diameter quite small.
Fig. 8.4 Uitgeest-Gr. D., sample 1: Relations between size variables for individual cases: diameters and heights.

Fig. 8.4a. Scatter of all combinations of the size or the rim diameter (Rd), smallest diameter (Sd), the maximum diameter (Gd) and the upper wall (H1).

**Fig. 4a, d, e:** Read the values of the variable in each row on the Y-axis and those of the other variables on the X-axis. Vice versa. In each column, the values of the variable are read on the X-axis and those of the other variables on the Y-axis. The triangle on the right side is the mirror image of the triangle on the left side.

**Description fig. 8.4:**
The figures a-e present the interrelations between size variables, combined with classifications of size variables and of their proportions. They are, together with those shown in figs. 8.2, 8.3 and 8.5, the basis for the classification of the maximum diameter into 3 size classes and for one specific shape, defined by the Gd:Rd values. The classifications of variables are listed in table 8.3. For definitions and abbreviations of variables see fig. 8.1.

**Description fig. 8.4a-c**
The pottery shows a clear linear relation between the size of the three diameters (fig. 4a,b). For larger sizes the relations vary more than in smaller vessels. There is no significant correlation between the length of the upper wall (H1) and other size variables, but the H1 size shows three clearly distinct clusters (fig. 4c). Two of these are related to the size of the maximum diameter (Gd). When the Gd is <190 mm, the upper wall size is <60 mm. When the Gd is >190 mm, the size range of the upper wall is the same (60-90 mm) for most cases, i.e. the length of the upper wall hardly varies with changing size of the maximum diameter. When the Gd is >290 mm, however, the H1 size range is very large indeed (40-130 mm, with one extreme value of 280 mm). The third cluster is formed by a combination of small rim diameters and long upper walls (fig. 4b). The size of the opening as a proportion of the maximum diameter clearly defines this cluster as a specific group of cases, with an index value > 1.4 (or >1.5 in the complete profiles). These were labelled as class 4 (see fig. 8.4e).

All other vessels were classified by the size of the maximum diameter into 3 classes (fig.4c; table 8.3): Gd class 1-3 (n=119). Gd class 1 (Gd <190 mm) is clearly distinct from 2 and 3 by almost all size variables. The variation in the size of the rim and upper wall is one of the reasons to distinguish between class 2 and 3, with the class limit at 295 mm. Class 3 is subdivided into 3A and 3B (330 mm and >330 mm), also because of the difference in the size of the upper wall. The charts in figs. 8.4d-e and 8.5 show the differences between the two classes in more detail.
Fig. 8.4b Relations between the size of the rim diameter (Rd) and the maximum diameter (Gd), with the Gd:Rd index classes.

Fig. 8.4c Relations between the size of the upper wall and maximum diameter, with the maximum diameter classification.
Fig. 8.4d Scatter of all combinations of the size of the maximum diameter (Gd), the height of the upper wall (H1), that of the lower wall (H2) and total height (Htot) for complete profiles. The cases are classified by the Gd:Rd index.

Fig. 8.4e Scatter of all combinations of the size of the rim diameter (Rd), the total height (Htot) and the base diameter (Bd) for complete profiles.
In the subsample of complete profiles, significant correlations are present between the size of the maximum diameter (Gd), maximum height (Htot) and the height of the lower wall (H2). Class 1 and 4 (legend in fig. 4e) are clearly defined by size and proportion measurements. All cases in class 2 and 3 (Gd >190 mm) show more or less the same proportions between size measurements in each vessel; the size distributions are continuous. The three size clusters for the upper wall are clearly visible (fig. 4d; X1-Y3). There is less variation in the complete profiles than in the total sample (fig. 4b). Especially in class 3 (Gd ≥295 mm) the complete profiles are apparently a select subsample as far as the length of the upper wall is concerned. As the size range for the upper wall hardly varies in Gd class 2 and 3, the proportions between the upper and lower wall change with increasing size of the maximum diameter between these classes. For vessels in class 1-3, the total height is mainly determined by the size of the lower wall (fig. 4d). Two standard lengths are present for the lower wall relative to the maximum diameter and upper wall in class 1 (X1-Y2; Y1-X3). In class 2 and 3 the lower wall and maximum diameter increase proportionally in size. In those cases with a long upper wall and narrow opening the total height exceeds that of the maximum diameter (class 4).

There is a considerable overlap in the base diameters between Gd class 1 and 2 and between Gd class 2 and 3, due to a large variation in size in class 2 (Gd 190-295) (fig. 4e). Cases with a maximum diameter smaller than 190 mm have smaller base diameters (40-80 mm) than the larger ones (>100 mm). The base diameter shows a slightly better correlation with the maximum diameter than with the lower wall or total height.

The proportions of the three height measurements are clearly related to the overall size of vessels (fig. 5.1d-f). Size class 1 and 2 (Gd <295 mm) are more or less equally divided by the H1:Htot index value of .33 (fig. 5.1b,c). The pottery in size class 3 is, with one exception, shape 1. In Gd class 1, the size range of the upper wall is the same for both shapes, while that of the lower wall is clearly different (smaller or larger than 85 mm). In Gd class 2 and 3, the latter is proportional with the maximum diameter and total height (fig. 8.5.1d,e; also fig. 8.4d). The two size ranges for the upper wall in Gd class 2 and 3 are not correlated with that of the lower wall. Thus, the change from shape 2 to shape 1 with increasing size of the maximum diameter is due to the unchanging size-range- of the upper wall together with an increase in the lower wall size, proportional to the maximum diameter (fig. 8.5.1d especially). Because of these distributions, the limit between size class 2 and 3 was set at Gd=295 mm. It provides an optimal distinction between shape variations, occurring mainly in class 2, while in the larger vessels the two sizes for the upper wall are distinct. The limit is to some extent arbitrary. For maximum diameters between ca 270 and 300 mm, the size of the rim diameters, lower walls and heights (as well as their proportions) always show some overlap between vessels.

The pottery in class 4 forms a distinct group in all figures. It is defined by a Gd:Rd index >1.5, the H1:Htot index is always >.33 and mostly >.4 and the height always exceeds the size of the maximum diameter (Gd:Htot index <1.0), while the H1:Rd index is always >1.6. Together these four indices provide the criteria for the definition of shape 3 (fig. 5.1e).
Fig. 8.5.1a Relations between the size of the rim and the maximum diameter. Cases are classified by the Gd:Htot index (class 1 and 2) expressing the relation between maximum width and maximum height. The classification of the Gd:Htot index is based on fig. 8.5.2c.

Fig. 8.5.1b Relations between the height and maximum diameter; cases are classified by the Rd:Htot index (class 1-3) expressing the relation between the rim diameter and maximum height. The classification of the Rd:Htot index is based on the distribution in fig. 8.5.2c.
Fig. 8.5.1c Relations between the height and rim diameter, classified by Gd class 1-4.

Fig. 8.5.1d Relations between the size of the upper and lower wall (H1 en H2); cases are classified by Gd class 1-4.
Fig. 8.5.1e Combinations of the height of the lower wall (H2) (circles) and the upper wall (H1) (squares) with the size of the maximum diameter (Gd).

Fig. 8.5.1f Relations between the size of the maximum diameter and the H2:Htot index value; the reference line at value .67 divides class 1 and 2.
Fig. 8.5.2 Ultegeest-Gr. D., sample 1. Relations between proportions: indices of two size variables for complete profiles which include the maximum height and indices for the upper wall of vessels.

The distributions in the charts are used to define criteria for the classification of incomplete profiles, by comparing the shape of the upper wall with that of the complete profile.

Figures 5.2a,b form the basis for the classification of the H1:Rd index. The class limits were chosen on a 'best fit' basis with the distribution of the H1:Htot and Gd:Rd index. Together, the H1:Rd and H1:Htot indices express the shape of the upper wall and that of the complete profile.

The relationship between the two shape indices is important, because it provides a criterion to define the shape of an incomplete profile, by substituting the height by the rim diameter (see description fig. 8.5.1c). However in 5 cases (of which 4 in size class 1) of the 53 complete profiles the two classifications do not correspond.
Description fig. 8.5.2c, d:
The relation between the Rd:Htot and Gd:Htot values divides the pottery into three clusters, encircled in the chart (fig. 5.2c; pottery with shape 3 is not included). One cluster consists of vessels with high values and one with low values for both indices, while in the third the values of the Gd:Htot index are high, but those of the H1:Rd index vary. The clusters are not correlated with the overall size of the vessels (the case markers).

The H1:Rd index values largely correspond with those for the Rd:Htot index. In most cases, when the Rd:Htot index value $\geq 1.0$, the H1:Rd index value is $\leq 0.33$ (and vice versa). The vessels have a large rim diameter and a short upper wall, relative to the total height.

The Rd:Htot index was classified into:
- class 1: $<0.7$ (occurring in pottery with shape 3 only)
- class 2: $0.7-1.05$
- class 3: $\geq 1.05$

The limit of 1.05 is chosen as it best corresponds with the Gd:Htot index value of 1.15, dividing most cases into exclusive classes on both variables.

Fig. 5.2d combines the distribution of vessels for the four indices describing the shape of the complete profile and that of the upper wall. Four separate clusters are formed by the combinations of index values. The two classes for the H1:Rd index and the H1:Htot index (the case markers) are closely correlated, but seem to be subdivided by the H1:Gd as well as the Rd:Htot.

In the vessels with shape 1 for the complete profile (H1:Htot index), indicated by the number at each case, the H1:Rd index value is also $<0.33$ and the H1:Gd index value $<0.30$. Within this cluster, higher H1:Gd index values are associated with lower Rd:Htot index values (indicated by the value H1:Gd $=0.25$). The same slight ‘shift’ in proportions is seen in the vessels with shape 2 (defined both by the H1:Htot and the H1:Rd index).

In conclusion, minor differences in the length of the upper wall also include slight differences in the size of the rim diameter, although the shapes of the complete profile and that of the upper part stay the same.

The six cases with low values for the Rd:Htot and high ones for the other variables are those with shape 3.

Fig. 8.5.2b As a, for size class 1-3 of the maximum diameter.
Fig. 8.5.2c Relations between the Rd:Htot and Gd:Htot index values in combination with the H1:Rd index class 1 and 2. The number at each case refers to the classification of the maximum diameter.

Fig. 8.5.2d Relations between Rd:Htot and H1:Gd with class 1-3 of the H1:Rd index. The number at each case refers to the H1:Htot index class 1 and 2.
Fig. 8.6 Ultgeest-Gr. D. sample 1: Relations between two size variables and classified size or shape variables, for complete and incomplete profiles. The incomplete profiles consist of all cases with a complete profile for the upper wall (H1) (fig. 8.1). In these charts, the H1:Rd index is used as a substitute for the H1:Htot index to define shape variations.

Description fig. 8.6a-c:
Figures a,b with all valid cases support the interpretations made for complete profiles (fig. 8.5.1). The majority of vessels in size class 2 and 3 show not only a standard size-range for the length of the upper wall (60-90 mm), but also for the Gd:Rd values (between 1.0 and 1.1). Most vessels therefore are characterized by a short upper wall, while the rim diameter is the same size as the maximum diameter.

The much lower number of vessels with a larger sized upper wall show two clusters for the relative width of the opening, which are related to the size of the maximum diameter. Those with a small opening (Gd:Rd >1.2) are mainly part of size class 2, those with a large opening are all part of class 3 (fig. 6.2a, compare with fig. 8.5.2d).

In the complete profiles (8.6c), the size (range) of the upper wall corresponds quite well with the H1:Rd index classification. In the pottery with the more or less standard H1 size of 60-90 mm, there is a change from class 2 to class 1 of the H1:Rd index around Gd =250mm. The H1:Rd index thus shows the same change in shape as does the H1:Htot index in the complete profiles.

In the few larger vessels in class 2 of the H1:RD index the upper wall is clearly larger. The same trend is visible in fig. 8.6b containing all upper wall profiles. However, there is an important difference as well. The percentage of cases with a H1:Rd index value >.33 is clearly higher than for the complete profiles. The classification of the H1:Rd index seems to be more arbitrary for other than the complete profiles, especially for the smaller vessels (see par. 8.3 for further discussion).
Fig. 8.6b Relations between the size of the upper wall and maximum diameters, classified by class 1 and 2 of the H1:Htot index, for complete profiles only.

Fig. 8.6c Relations between the size of the upper wall (H1) and maximum diameters, classified by 3 classes of the H1:Rd index (1 extreme value of H1 = 290 mm is excluded).
Fig. 8.7 Uitgeest-Gr.D. sample 1. Classification A and B of the pottery into pottery groups A1-4 and B1-4.  
**In classification A** for complete profiles, the shape is defined by $H1: H_{tot}$ index classes (table 8.4a).  
**In classification B** for all profiles including the rim and maximum diameter, the shape is defined by $H1: Rd$ index classes, in all cases (table 8.4b)

Fig. 8.7.1 Uitgeest-Gr.D. sample 1. Relations between size variables for shape 1, 2 and 3 in the pottery groups, complete profiles only.

![Figure 8.7.1](image)

**Description fig. 8.7.1a-e:**
There is a linear relation between the size of the lower wall, the maximum diameter and total height for all sizes in group 1, 2 and 3. The vessels differ mostly in the proportioning of the upper and lower wall, but not in absolute size (maximum width and height).

For **group A1-4** (7.1a,b), the size range for the upper wall is similar for subgroups 1.1 and 1.2, but the lower walls are shorter in group 1.2. In group 2.2 the vessels have a shorter lower wall as well as a longer upper wall than those in group 2.1. Group 2.1 and 3.1 show highly similar values for and relations between most of the size and proportion variables. The vessels form one cluster within the size range of Gd 240-350 mm, for which the size -range- of the upper wall hardly changes. **Classification B** largely corresponds with classification A (compare fig. 7.1a,b with 7.1c,d), but the match between the two classifications is clearly less good in incomplete profiles (fig. 7.2a). Within group 3, there also is a slight increase in the size of the H1 for vessels with a Gd >330 mm; see paragraph 8.5 for further discussion.

The base diameters vary considerably relative to other size variables and independent of shapes, especially in group 2 (fig. 7.1c). The base diameter in group 1 is smaller than in group 2 and 3, where there is little difference in size range.
Classification A:
Pottery group A

Classification B:
Pottery group B

Fig. 8.7.1b Relations between the size of the rim diameters, upper and lower walls and heights for pottery group A1-3.

Fig. 8.7.1c Relations between the size of the rim diameter, upper wall, height and base diameters for pottery group B1-3.
Fig. 8.7.1d Relations between the rim diameter and height for pottery group B1-4.

Fig. 8.7.1e Relations between three indices, Rd:Htot, H1:Gd, H1:Htot in pottery group B1-3.
Fig 8.7.2a Relations between the size of the upper wall and maximum diameter for all cases of group B1-3, showing the difference in size of the upper wall on which this grouping is based.

Fig 8.7.2b Relations between the Gd:Rd index values and the size of the upper wall for all cases in group B1-3.

Fig 8.7.2 Outeest-Gr. D. sample 1. Relations between size or index variables for the upper part of profiles in pottery group B1-3, all cases.
Fig. 8.8 Ultegeest-Gr. D. *sample 1*. Value distribution of the rim diameters (a), heights (b), the upper wall size (c) and the lower wall size (d) in each pottery group A1-4, in combination with shape 1-3 for the upper wall.

**Explanation of boxplots**
The plots represent the distribution of a dependent variable. The upper and lower boundaries are the upper and lower quartiles of the measurements. The box length is the interquartile distance, containing the middle 50% of the values in each group. The lines emanating from the box extend to the smallest and largest observations that are less than one interquartile range from the end of the box, while larger values (outliers) are indicated by *.

Fig. 8.8a Quartiles and average size of the rim diameters for shape 1, 2 and 3, all cases. The groups without a sub-number contain the incomplete profiles.

Fig. 8.8b Quartiles and average height for shape 1, 2 and 3, complete profiles only.

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Description fig. 8.8:
Four cases of nearly complete profiles were added to the subsample of complete profiles, including one lower wall. In figs. a-c, group 3 was subdivided by the size of the maximum diameter: group 3A (Gd ≤ 330 mm) and B (Gd > 330 mm).

The plots show the similarities and differences between the shape of the complete profile (classification A) and that of the upper wall (classification B). The three classes of the H1:Rd index divide each subgroup for group A1-4 on the X-axis.

For group 2 and 4, there is a good match between the two classifications, but less so for group 1 and 3. In group 1, the differences are the result of the minor variations in the upper wall size, while the average rim diameters are more or less the same. In group 3, the H1:Htot is always < .33 (shape A1), but shape B2 is present as well, especially in the larger vessels (group 3B; Gd > 330 mm). The rim diameters of vessels with shape B2 also are clearly smaller than those subgroup B3.1.

These differences are the main reason for the distinction within group 3 by the size of the maximum diameter (see paragraph 8.3.5 and 8.5). Outlier 31-15 is the ‘Frisian earpot’, with an extremely small rim diameter (Gd:Rd index value >2), while outlier 75-* has an exceptionally wide opening (fig. 8a). It is an unique vessel in the sample and one of very few in the assemblage.
8.4 Analysis of size and shape, Uitgeest-Gr.D.

Sample 2

Sample 2 contains 629 sherds (table 8.1). For 437 cases the rim diameter is known, but only 193 of these included the maximum diameter. Base diameters were measured for a subsample of 173 cases. For the remaining sherds no measurements are available and these sherds are omitted from this analysis. The sample contains no complete profiles. Sample 2 is used as a check on the data for sample 1 in two ways, (a) for the distributions and relations of the rim and maximum diameters and the shape of the upper wall and (b) for the size distribution of the bases (subsample of 173 cases). The classifications of the available variables is the same as for sample 1 (table 8.6). The criteria for the classification of the pottery are mostly the same as well (classification B only), but the sherds with a maximum diameter between 190-295 mm were subdivided into two size classes by Gd= 250 mm. The division is based on the frequency distribution of this variable and on the trends observed for sample 1. The bases were classified into three classes based on the sizes of the complete profiles in sample 1.

8.4.1 DIMENSIONS OF SIZE AND SHAPE

Size

Although the measurements must be considered far less accurate than for sample 1, there is no significant difference in the frequency distributions of the Rd, Gd, Bd and Gd:Rd index for both samples (fig. 8.9a-d). The maximum diameter varies from 110 to 450 mm. These values correspond closely to those of sample 1. In 50% of the cases the Gd measures between 200 and 310 mm, an even smaller variation than in sample 1. The distribution suggests the presence of two to three size groups: smaller than 230 mm; 230-290 mm and larger than 290 mm.

The rim diameters vary between 65 and 400 mm, with 50% of the values between 200 and 280 mm. Their distribution (n=437) indicates the presence of three size groups: smaller than 190 mm; 190-270 mm and larger than 270 mm. These ranges match the classifications of sample 1. The main difference between the two samples is that in sample 2, size class 2 includes a substantially higher number of cases with a Gd between 190-295 mm (45%, and 30% in sample 1). The most likely reason for this difference is the fact that the remains of smaller vessels are over-represented in the measurements to an even larger degree than in sample 1. In view of the results for sample 1, group 2 was divided into two subgroups, by the value of Gd=250 mm; this limit was chosen because the data for sample 1 are more accurate and the classifications were based on more variables than those for sample 2.

The base diameters vary from 40-300 mm, the latter being one exceptional case. This diameter was classified into three classes, based on the distribution in pottery groups in sample 1: ≤90 mm, 90-120 mm, and >120 mm.

Proportions

The frequency distributions of the indices are shown in fig. 8.9(e-f). The Gd:Rd index values vary from 0.9 to 1.98, similar to those of sample 1. In only 5 of the 193 cases the value is larger than 1.4, an even smaller part of the total than in sample 1. These cases are omitted from most figures and tables, as they do not add any information.

For the H1:Rd index the number of cases with an index value <.33 (shape 1) is 99 and for 53 cases >.33-.60 (shape 2) for the sample of 193 sherds, in which there are 41 missing values for H1.

8.4.2 CLASSIFICATION OF THE POTTERY

For the classification of the pottery in sample 2 the same criteria were used as for sample 1. The pottery groups contain 152 cases for which the H1:Rd index was known.

Group 2 provides the opportunity to check the indication in sample 1 that the smaller vessels in group 2, with a Gd <250 mm, may have a slightly different shape of the upper wall (mainly shape B2) than the larger ones (mainly shape B1). Group 2 was therefore divided into two subgroups by the value of Gd= 250 mm (table 8.7).

Group 2a: Gd 195-250 (with subgroups B2.1 and B2.2)
Group 2b: Gd 250-295 (with subgroups B2.3 and B2.4)

Because of the high numbers of cases, separate figures were made for each pottery group, showing the size distributions of the available variables Rd, Gd, and H1 (figs 8-10a-e). There is a high correlation between the rim and maximum diameters for all sherds in sample 2. As in sample 1 an increased variation in their relationship can be observed when the maximum diameter is larger than 250-280 mm. The size range for the upper wall is quite large, but shows two distinct clusters, related to the size of the maximum diameter: H1 is between 30-70 mm and 60-100 mm at a maximum diameter smaller and larger than 200 mm respectively. There is more overlap between these two clusters than in sample 1, especially for sherds with shape 2, but the overall picture is very similar indeed; a higher value of the H1:Rd index is caused by a greater length of the upper wall, much more so than by the size of the rim diameter (fig. 8.9f).

In group 1, shape 2 occurs more frequently than shape 1 (21 to 13 cases), but the values of the H1:Rd index are mostly very near the class limit of .32 for these cases. In contrast to sample 1, the differences in the size of the upper wall between vessels with shape 1 and 2 is larger.

In group 2, shape 1 and 2 are present in 40 and 25 cases respectively. The more or less standard size of the upper wall and its standard variation results in a decrease of value of the H1:Rd index with increasing size of the maximum diameter.
in these groups. Groups 2a, 2b, and their subgroups by shape 1 and 2 indeed support the idea that the smaller vessels have slightly different proportions than the larger ones (fig. 8.10b). For nearly all vessels with shape 2, the size of the upper wall, relative to the maximum diameter, is clearly larger than for shape 1. In group 2a the rim diameters are more or less the same size for both shapes (subgroups 2.1 and 2.2, fig. 8.10b,d). In group 2b these are clearly smaller in vessels with shape 2 in relation to the maximum diameter (group 2.4).

In group 3, only 6 of 50 cases are shape 2, all with narrow openings. When the maximum diameter is >350 mm, all pottery has shape 1 (fig. 8.12c,d).

Altogether, the percentage of cases with shape 2 is gradually diminishing from the smallest vessels in group 2 to the largest sizes in group 3 (fig. 8.12f). The data and distributions from sample 2 thus match the interpretations made for sample 1. These results also indicate a highly similar composition of sample 1 and 2, allowing the following conclusions to be drawn:

– Even though the accuracy of measurements is much lower, the pottery in sample 2 has the same formal properties as those in sample 1.
– Sample 1 can be regarded as representative for the formal variation in the total population of pottery from the Roman period for Uitgeest. The relative frequencies for each pottery group also match to a large extent. The higher frequency of cases in group 2, sample 2 is probably due to an over-representation of smaller vessels; smaller fragments of these can still be measured with some accuracy. The larger number of cases in group 4 in sample 1 is an intentional over-representation of jars by the author.
– There is a difference in proportions between pottery with a Gd smaller than 250 mm and larger than 250; in the first group, sherds with shape 2 have larger sized upper walls, but the size of the openings is similar to the vessels with shape 1. In pottery of the second group, the rim diameters are also smaller. Sherds with shape 1 and a maximum diameter >250 mm are all very similar in both samples. The range of the upper wall size is quite large, but does not vary very much in relation to the size of the maximum diameter and is, in other words, more or less independent of overall size. The H1:Rd index values are mostly between .2 and .3.

8.5 Size and shape, Uitgeest-Gr.D. sample 1 and 2

The pottery in both samples is highly similar in its morphological characteristics. Three major size classes, group 1, 2 and 3 are defined by the size of the maximum diameter. In each size class, two types of shape variations are defined, one for the complete vessel profile and one for the upper wall. A separate group of vessels, group 4, is defined by its specific shape only, the jar. This pottery has a very small opening and small maximum diameters in relation to a large height. The schematic representation of all forms is given in fig. 8.25 and are illustrated in fig. 8.12 and 8.14 with examples of vessels. This summary deals mainly with the majority of the pottery, group 1-3. The small group of jars has been discussed sufficiently before.

The maximum diameter proved to be an optimal indicator for overall size and was used as the main criterion for the classification of the pottery. One clearly defined size class is that of the small vessels in group 1 with a Gd <190 mm. For the rest of the material, the distributions of size variables are more or less continuous, without any variable clearly demarcating size classes. The pottery has more or less the same shape, a three-partite, S-shaped profile with the size of the openings and the height varying slightly around the size of the maximum circumference. Within the general form, there are only slight yet meaningful variation in proportions, meaningful because they are linked to size differences. The potters used more or less the same proportions for the size of the lower part of the vessels, the rim and maximum diameter, but varied the length of the upper wall, partly independent of these variables. These variations in shape were used to delineate size class 2 and 3, with a maximum diameter of 190-295 and >295 mm respectively, based on the properties of the vessels in sample 1.

For the variations in shape, two separate definitions were established, one for the proportions in the complete profiles and a second one for the form of the upper part of the vessels. The reason to use two classifications was to establish an alternative shape description for incomplete vessels, based on the properties shown by the complete profiles. The first shape is defined by the proportions of the upper or lower wall with the total height, the H1:Htot index or H2:Htot index. These indices define shape A1 and A2, representing a short and long upper wall in relation to total height respectively. The second shape variation, shape B1 and B2, is defined by the proportions of the upper wall and rim diameter, the H1:Rd index. There is a high correlation between the two shape definitions in sample 1.

Size and shape were combined in the classifications A and B, to define subgroups for each pottery group. The first can be used for the complete profiles only. Shape A2, a relatively long upper wall, is present mainly in the smaller vessels (group 1 and part of group 2). With increasing size, the shape is determined more and more by the size of the lower wall in relation to the maximum diameter. Because the size range of the upper wall does not increase significantly with that of the lower wall and maximum diameter, shape A2 hardly occurs when the maximum diameter is larger than 250 mm. The second definition of shape, by the H1:Rd index, proved to be a very good substitute for the H1:Htot index in complete profiles. This index is the basis for
classification B. Again, the number of cases with shape 2 (a relatively long upper wall) is high in the smaller pottery and low in the larger vessels. The five complete profiles that did not score the same on both variables, are all small vessels (group 1).

The pottery shows the following general characteristics. In group 1 the shape of the complete profile is mainly determined by variations in the size of the lower wall. These are shorter in group 1.2, while the size range for the upper wall is similar for most vessels, independent of shape. In group 2, the smaller vessels (Gd < 250 mm) with shape 2 also have a shorter lower wall, but a longer upper wall as well in comparison to those with shape 1. In these vessels, shape 2 is apparently defined both by the shape of the complete profile and that of the upper wall. In the larger vessels of group 2 the shapes seem to be defined by the length of the upper wall only and this is also the case in group 3. The complete profiles in group A2.1 and A3.1 are all quite similar in shape, with a high linear correlation between most of the size and proportion variables (fig. 8.7.1a,b). These vessels seem to form one cluster with a size range of Gd 250-350 mm, in which a more or less standard size range was used for the upper wall, independent of other sizes. In this cluster, the increase in height and size of the maximum diameter is obtained by increasing the size of the lower wall. The complete profiles with shape 2 also show quite similar relations in size and proportions, when the maximum diameter is larger than 250 mm. These vessels have relatively large upper and lower walls in relation to the size of the maximum diameter as well as smaller openings. The size of the upper wall seems to be more in proportion with the other size variables than in shape 1. This results in an increase in height for the largest vessels in this group (for example pot nr 7-6 with a total height of 425 mm).

The sample of complete profiles is not wholly representative for group 2 and 3, especially for both ends of the range. The incomplete profiles show a much more ‘diffuse’ distribution in upper wall sizes. There is no clear demarcation between shape 1 and 2 for the upper wall, defined by the H1:Rd index, but rather a fluid change from one shape to the other (fig. 7.2a,b). Some possible reasons for the slight discrepancy between complete and incomplete profiles are discussed in paragraph 8.13. On the other hand, the general trends in the differences between the two shapes remain present and are more pronounced in vessels with a maximum diameter > 250 mm. In the cases with larger upper walls, shape B2, the rim diameters tend to be narrower than in the complete profiles (the Gd:Rd index is > 1.2; fig.8.7.2b). Moreover, in sample 2 the slight change in proportions between the size of the upper wall, the rim diameter and maximum diameter from smaller to larger vessels around a maximum diameter of 250 mm is even more pronounced than in sample 1 (fig. 8.10b,d,e). For these reasons, group 2 was subdivided by the maximum diameter of 250 mm in this sample.

The main conclusion drawn from the analysis of both samples is that pottery with a maximum diameter between 190 and 250 mm should probably be treated as a separate group. The morphology of this pottery seems to be more similar to vessels in group 1.2 than to the larger vessels. The finer classification proved to be useful in exploring the relationships with other variable groups, the non-metric properties and the use alterations. This is the reason that in subsequent analyses, a slightly different classification is used for the pottery of sample 1 in the figures and tables, see paragraphs 6 and 11.

Altogether the forms, present in sample 1 and 2, can be summarized as follows:
1. Vessels with a maximum diameter < 190 mm and shape 1 or 2
2. Vessels with a maximum diameter > 190 mm and shape 1 or 2

For vessels with shape 2, a further distinction by size is visible:

a If the maximum diameter is 190-250 mm, the proportions are similar to the smaller vessels
b If the diameter is > 250 mm, the vessels also have a long lower wall as well as a slightly narrower opening: the overall shape of the complete profiles is shape 1, but the upper part of these vessels is shape 2*.

3 Narrow-mouthed, tall vessels with a small maximum diameter: jars (shape 3)

*Shape B1: a relatively short upper wall and wide opening; the opening and height are just slightly smaller than the maximum diameter.
*Shape B2: a relatively long upper wall, sometimes combined with a slightly smaller opening
fig. 8.9a Rim diameters (Rd)
Fig. 8.9b Maximum diameters (Gd)
Fig. 8.9c Base diameters (Bd)
Fig. 8.9d Maximum diameters divided by the rim diameters: Gd:Rd index
Fig. 8.9e Heights of the upper walls divided by the rim diameters: H1:Rd index

Description fig. 8.9a-e:
The frequency distribution of the available size variables are very similar to those of sample 1, especially considering the high number of rim diameters measured for sample 2. The peak values are mostly 10 mm lower than for sample 1, which reflects the lower accuracy of measurements. In the size of the rim and maximum diameter, three clusters are present: <180 mm, 180-280 mm and >280 mm for the RD; >220 mm, 220-300 mm and >300 mm for the Gd. The size clusters in the base diameters are much more pronounced in sample 2 (>100 mm, 100-130 mm and >130 mm), due to higher frequencies. The distribution of the values of the Gd:Rd and H1:Rd index match with those for sample 1. The latter is possibly a two-topped distribution.
Fig. 8.10 Ulgeest-Gr. D. *sample 2*: Scatters of size and shape variables for pottery groups B1-3, with shape defined by the H1:RD index classification (table 8.7). Group B2 has been subdivided into two size classes of the maximum diameter:
Gd 190-250 mm: subgroups 2.1 and 2.2 (shape B1 and B2)
Gd 250-295 mm: subgroups 2.3 and 2.4 (shape B1 and B2)

**Description fig. 8.10a-d:**
As in sample 1, the rim diameter (Rd) increases proportionally to the size of the maximum diameter (Gd), while the size (range) of the upper wall (H1) is more or less independent of both variables. The sherds in group B1.2 have larger upper walls and slightly smaller rim diameters than those in group B1.1. The number of cases with shape 2 drops with increasing size of the maximum diameter (fig. 10.2b,c).
Because of the greater number of cases, group 2 was subdivided to test the interpretation made for sample 1 that the smaller vessels form a separate group with different proportions (fig. 10b). The distribution suggests that there may be a slight change in proportions around Gd = 250 mm. As the size range for the upper wall is the same for all subgroups in group 2, the result is that shape 2 is more frequently present in the smaller vessels and shape 1 in the larger ones. This is also due to a slight change in the rim diameters in relation to the maximum diameter. In group 2.1 and 2.2 there is a linear relation between the two, independent of the upper wall size, while in group 2.4 the rim diameter of the vessels are slightly smaller than in group 2.3. In the latter two groups, the differences between shape 1 and 2 are more clearly defined in than in sample 1.
Group 3 contains only a few cases with shape B2 (fig. 10c). The relation between the rim and maximum diameter is less ‘linear’ and restricted than in sample 1, which is probably caused by increasing inaccuracies in measurements.
The slight changes in proportions are shown in more detail for the pottery groups in fig. 10d.

![Fig. 8.10a Combinations of the rim diameter (Rd), maximum diameter (Gd) and upper wall (H1) for group B1.](image-url)

*Fig. 8.10a Combinations of the rim diameter (Rd), maximum diameter (Gd) and upper wall (H1) for group B1.*
Fig. 8.10b Combinations of the rim diameter (Rd), maximum diameter (Gd) and upper wall (H1) for group B2.

Fig. 8.10c Combination of the rim diameter (Rd), maximum diameter (Gd) and upper wall (H1) for group B3.
Fig. 8.10d Combination of H1 and Rd for group B1-3.

8.6 Non-metric variables, Uitgeest-Gr.D. sample 1
The next step in the analysis was to establish the possible links between the shape and size groups and variables concerning the appearance and construction of the pottery: the type or rim, the presence of handles and the finishing treatment of the surfaces. The analysis concerns sample 1 only. The much smaller fragments in sample 2 make the information on surface treatment too unreliable. References to pottery groups are those of classification B (page **), unless stated otherwise. The complete profiles are often discussed separately, as more information about the non-metric variables is available.

8.6.1 Rim types: the construction of the rims
In virtually all pottery from Uitgeest the rim is constructed in the same fashion, by folding the last roll either towards the inside or towards the outside of the vessel and pressing the two parts together, thus creating a thickened rim. The folded roll was then smoothed and often scraped roughly, while for the finishing touch two major techniques were used (fig. 8.12). The first technique was to further smooth or scrape away the irregularities of the last roll, using the fingers and/or a tool, into a rounded or faceted rim shape. In this chapter these two techniques and forms are treated together and are defined as rim type 1, smoothed or tooled rims. The other technique is finishing the rim by pressing the clay with the fingertip. The resulting fingertip ‘decoration’ is present only on the outside of the rim; sometimes nail impressions are still visible. Usually the inside is smoothed, scraped or slightly polished afterwards. The finger-impressed rims are defined as rim type 2. A third method, although used only sporadically, is to finish the rim by making impressions with a tool. The one vessel in sample 1 with such a rim was added to rim type 2. Finger- or tool-impressed rims are traditionally called ‘decorated’ and this term will occasionally also be used here, although I prefer the more technological definitions. From this point of view, ‘decoration’ by fingertips is an easier and quicker way of finishing a rim than is tooling, especially facetting or polishing. At the same time rims with impressions may have had special meaning in the cultural context as well.

The pottery in group 1 mainly and in group 4 always has smoothed and often facetted rims, while in group 2.1 and 3 circa 50% has decorated rims (table 8.8.1a,b). In vessels with shape 2 for the upper wall on the other hand, the rims are mostly smoothed (70%), specifically those in group 1.2 and 2.2 (table 8.8.1c). These trends are more pronounced in the complete profiles, especially in group A2. This points to the problems with the classification of the H1:Rd index as a substitute for the H1:Htot index in smaller vessels (see
above). The correlation between rim type and pottery groups appears to be significant, but the number of cases is too small for reliable statistical testing.

8.6.2 HANDLES
Only 20 vessels in the sample have handles. There are two types of handles, handles ‘proper’, applied from the rim to the shoulder and handles in the form of horizontal extensions of the rim, mostly three or four (fig. 8.12). Such extended rims were present in group 1 and 2 only. Proper handles, usually two per vessel, are present in all pottery groups but mostly in group 2 and 4. In group 2.2 they occur with a relatively high frequency. Again this group seems to represent a specific cluster. Only six of the thirteen jars have handles. Five of these also had roughened surfaces, suggesting a relationship between the two variables. One of the two vessels with two handles in group 3 is the exceptional ‘Frisian earpot’ with an extremely narrow opening (pot 31-15); the other (pot 33-9) is not an exceptional vessel.

8.6.3 TREATMENT OF THE EXTERIOR SURFACE
Treatment of the interior and exterior surface is a variable much discussed in relation to pottery function and technology. In general, finishing the walls of a hand-made vessel has two reasons, (a) to remove superfluous clay and reduce the thickness of the wall and (b) to create a specific type of surface. In relation to the function of the pottery, one major concern is how to make a vessel waterproof, for example cooking pots or containers to hold liquids. There are several ways to do so, for example by using fine clay and temper, high firing temperatures, applying a fine slip layer, etc. Burnishing or polishing the surfaces may also reduce the permeability of a vessel wall. The potters will have to find a balance between the fabrics, the surface treatments and the type of stress to which a vessel is exposed (chapter 2; appendix 1).

In the pottery studied here, three main types of surface treatment left specific marks on the vessel walls, being manual smoothing, scraping, and ‘polishing’. Examples of these marks are shown in the photographs of fig. 8.14.2 Polishing is defined here as all treatments in which a flat tool was used to smooth the surface, as opposed to scraping. The degree of smoothing varies from only a rough smoothing of only a part of the surfaces to a very fine and intense polishing of the complete surface. In the analyses presented below, fine polish is treated as one category while all other forms of polishing together form another, labelled ‘rough polishing’.

A fourth and very specific feature is the intentional roughening of the exterior surface by smearing an extra layer of clay on the lower wall (fig. 8.13; 8.14). The presence or absence of such besmeten surfaces is analyzed as a separate feature as this treatment has often been linked specifically to pottery function. Two different explanations are offered for this type of surface treatment (see Franken & Kalsbeek 1975). The first explanation is that a roughened surface improves the grip or hold on the pot. In that case, one would expect the clay applice on very large vessels or on vessels which are handled frequently. The second explanation is that an enlarged surface area improves the thermal stress or shock resistance. In that case cooking pots can be expected to have a besmeten surface and this is the more likely because these vessels will also be handled frequently.

In the pottery studied here, the extra clay was applied on the lower wall only, as is normally the case for any other site of the Roman period in the province of North-Holland (as the Assendelfer Polder sites) and South-Holland (Rijswijk). Taayke (1995) mentions the same phenomenon for the pottery from the terps in the coastal regions of the north-eastern Netherlands. The problem this presents for the analyses is that for some pots in sample 1 and for most in sample 2 very little of the lower wall was present. The information from the remaining surfaces is unreliable in the cases with no remains of a clay applice, because it could still have been present further down the lower wall. In table 8.8, the pottery with no information on the lower wall was excluded (n=11), but the value 0 (not roughened) still includes cases where only small parts of the lower wall were present. The tables 8.8.1 and figures 8.11 therefore give the minimum number of roughened surfaces or the maximum number of cases without such treatment.

The finishing of both the interior and exterior surfaces were analyzed in detail for each part of the profile. For the purpose of the present analysis, only the final or most important treatment of the exterior surfaces was used to define several modes of finishing treatments. Two classifications are used, one for the subsample of complete and nearly complete profiles, combining information of upper and lower wall surfaces, and one for the upper walls only. The classifications for the complete and nearly complete profiles is based on the distinction between pots with and without besmeten surfaces in combination with the treatment for the upper wall (see legend table 8.8.2 for the description of each mode).

Intentionally roughened surfaces
Of the pottery of group 1 only five of the twenty-four cases have roughened surfaces (25%). There is very little difference between shape 1 and 2 in this respect (table 8.8.1b; fig. 8.11.1). The observation is quite accurate as a large part of the lower wall is present in all small vessels. This is also true for the pottery in group 2, where in twenty of the forty-six cases the lower wall has a clay applice. In the complete profiles, the roughened surface is present slightly more often
in pottery with shape 1 than that with shape 2 in this group (80% and 67% respectively; table 8.8.1b). The larger vessels in group 3 are usually ‘besmeten’. Of the complete profiles of group 3, 89-100% had such surfaces. The percentages are 77 and 50 when all cases are considered. Obviously, the difference is due to the inaccurate or missing information for the lower wall of incomplete profiles (table 8.8.1b). Three of the six jars with complete profiles are roughened and four altogether. In four jars the lower wall was missing. Table 8.8.1c shows the general relation between shapes and roughened surfaces for all nearly complete profiles. Of the vessels with shape A1, 70% is roughened, but only 42% of those with shape A2. In classification B for the upper wall proportions, the frequencies for such surfaces are lower due to missing data, but the trends are the same (table 8.8.1b). Of the vessels with shape B1, at least 58% has a roughened lower wall.

Modes of surface treatment

Table 8.8.2 contains the data for the finishing treatment of the total exterior surfaces. Of the 58 complete or nearly complete vessels 51% has a roughened lower wall (mode 1-3; table 8.8.2a). The upper walls are then mostly roughly polished or scraped. The latter combination (mode 2) occurs more frequently (in 29% of all complete profiles) than the combination with fine polish or manual smoothing. In contrast, vessels with a finely polished upper wall usually also have a polished lower wall surface (mode 4.1) and this type of treatment occurs much more frequently in group 1. Altogether this treatment is seen in 22% of the vessels. Part of this group are the so-called pedestalled bowls with a shiny, highly polished exterior and finely polished interior surface. They are moreover always fired in a reduced atmosphere Table 8.8.2a also shows that in pottery without a roughened lower wall the same techniques, mode 4.1, 4.2 and 5, are often used for both parts of the wall. In only 7% of the cases a combinations of different techniques is observed for finishing the upper and lower wall, for example smoothing of the upper wall and scraping of the lower wall (mode 6). When all cases are considered (with classification B to define the shape), the same trends as in the complete profiles are present in all vessels with a roughened lower wall (table 8.8.2b). The other treatments, modes 4-6 show a clear difference with the complete profiles: the percentage of the finely polished ware (mode 4.1) is lower, but the percentage of pottery with scraped walls is much higher, especially in group B2. This difference is probably due to the small number and/or specific selection of complete profiles in this size group (see par. 8.3.5).

The treatment of the upper wall was analyzed separately because data are available for a larger number of cases (table 8.8.2c). This part of the surface was scraped and/or roughly polished in respectively 43% and 24% of the 127 cases. Missing cases are those with badly preserved surfaces or burnt pottery. Fine polishing occurs slightly more frequent in vessels in group 2.2 and 3.2, the larger vessels with shape 2 (25%, 26%), than in those with shape 1 (13%). The majority in group 2.1 and 3.1 have scraped or roughly polished surfaces (48%, 31%). These two groups were joined in table 8.8.2c because they show so much similarity for all metric and non-metric variables. The distribution of upper wall treatments seems to correspond well with the treatments of the complete profiles. Most cases in group 2.1 and 3.1 also have roughened surfaces.

8.6.4 RELATIONS BETWEEN NON-METRIC VARIABLES AND POTTERY GROUPS

Although the number of cases is small, there is quite a good correlation between pottery groups, rim types and specific modes of surface treatment. The smaller vessels, group 1 and partly group 2, usually have smooth rims. The surfaces are often finely polished in group B1.1, but roughly scraped in group B1.2. Handles of both forms are also found especially in vessels with shape 2. ‘Decorated’ rims occur more frequently in vessels with roughened surfaces and vice versa (non-decorated and non-roughened) and this correlation is linked to specific pottery groups: vessels in group 2.1 and 3.1 (both in classification A or B) more often have decorated rims together with roughened surfaces. Moreover, the cases in these groups show similar treatment of the upper parts of the exterior surfaces: most of the upper walls were scraped or else were roughly polished (48%, 31%). In most of the vessels with shape 2 in group 2 and 3, on the other hand, the rims are smoothed, but the surface treatment is more or less the same; roughened surfaces occur frequently, together with a scraped upper wall. Most of the handles are also associated with group 2 and especially with shape 2 for the upper wall (group B2.2). The main difference with group 2.1 and 3.1 is the slightly higher number of cases with a finely polished upper wall associated with shape 2 (table 8.8.2c).

The data support the conclusion, that the pottery of group (A and B) 2.1 and 3.1 is essentially one group of very similar vessels, varying in size of the maximum diameter between c. 250 and 350 mm. In classification B, group 3.2 is also quite similar to both groups for most non-metric variables, although the rim is more often smoothed instead of decorated and the upper wall more often polished. In group 2.2 (A and B) the number of cases with roughened surfaces and decorated rims is clearly lower, but there is a much higher percentage of cases with handles. These conclusions suggest that group 2 should be divided by size as was done for sample 2.
For the jars in group 4 the treatment of the exterior surfaces varies, but of the 5 vessels with handles, three also have roughened surfaces. The rims are always smooth and often faceted. The few other cases with extended rims or handles all occur in shape 2 and mostly in group 2.2. Also, in all but one of the vessels with handles, the rims are smoothed (19 out of 20).

Altogether, the non-metric features of the pottery strengthen the size and shape correlations. Smaller vessels (Gd < 190 mm) more frequently are shape 2, the surfaces are not roughened, the rims are usually smoothed, not decorated, and handles occur regularly. In larger vessels (Gd > 290 mm) the surfaces are roughened (70-80%) and the rims are decorated (60-55%); handles occur on only 2 vessels. The vessels in group 2, as defined here, show an intermediate position. Roughened surfaces and decorated rims are more frequently associated with shape 1, mostly the larger sizes in this group and vice versa, supporting the conclusion that group 2.1 and 3.1 form a continuum in size and shape and that group 2.2 consists of a different type of vessels. A larger sample should be studied to see if these trends are statistically significant. The comparison of these results with those from Schagen (and other settlements of the same period) can be found in the paragraphs 12 and 15.

8.7  Context of the pottery from Uitgeest-Gr.D.

In chapter 3, the features from which pottery was selected were discussed briefly. The pottery in sample 1 was recovered from different categories of features, including ditches associated with houses, field ditches, wells, etc. (fig. 3.5). Sample 2 consist of sherds from all areas within the excavation, the majority being found in the creek fills and dwelling areas (fig. 3.7), but their context is not studied in detail here. It is very likely that the entire period of occupation, at least the first three centuries AD, is represented in both samples. In such a long period technological, stylistic and functional changes could have occurred. As chronological changes cannot be accurately analyzed for the samples from Uitgeest, they are disregarded here out of necessity. Even the few closed contexts, the wells, show considerable overlap in calibrated dates. Here, only the spatial relationships of the pottery groups with the context are examined, as far as the data allow. Is there any indication that the groups are not randomly distributed?

The distribution of pottery groups of sample 1 in the feature categories is apparently random (table 8.9a), although the highest percentage is found in ditches around houses, in the wells, and in the creek fill. Most of the complete profiles were also recovered from the wells, and from features in trench 35. The random distribution supports the assumption that sample 1 can be treated as random sample of all pottery. The wells with Roman period pottery cover at least two centuries (table 3.1). All pottery groups were represented in the wells. Most individual wells contained vessels of pottery groups 1-3, depending on the total number of vessels (between one and five and 5, not including missing cases). In the two wells with more pottery, 31-1 with eight and 18-1 with 13 vessels, more pottery groups are represented. The contents of all wells together show the same composition as the pottery in other feature categories, in so far as conclusions can be drawn from such small samples (table 8.9b). Together with the radiocarbon dates, the data indicate that there is indeed no chronological influence in the different form groups.

Fig 8.11  Uitgeest-Gr. D. sample 1. Non-metric features: (8.11.1) rim types and ‘besmeten’ surfaces and (8.11.2) finishing treatments of the exterior surfaces (overleaf)

1 The term ‘besmeten’ refers to a lumpy clay layer smeared on to the surface of the lower wall (see paragr. 8.6.3). The term ‘roughened’ is used as a synonym.

The number of cases with score ’0’ are maximum numbers, as the the lower wall is incomplete or absent for 83 cases. Of the total sample, n=147, 24 cases were omitted because of missing information. The base sherds in the sample are included only if they were assigned to a pottery size class (n=4).

Description fig. 8.11.1a,b:

Fig 11.1a,b show the relationships of pottery group B1-3 with the type of rim and the surface finishing of the lower wall (‘besmeten’ or not). The two features are also related to size. In group 1 and 4 most of the vessels have smoothed rims. ‘Besmeten’ lower walls do occur, but in a minority of vessels. Vice versa in group 3 most of the vessels with shape 1 have decorated rims and roughened lower walls. Group 2 shows an intermediate position between 1 and 3, but the majority of vessels with roughened surfaces and decorated rims occur in group 2.1. The frequencies of smoothed rims is clearly higher in group 2.2. Although there are no exclusive relations between or within pottery groups with rim types and ‘besmeten’ surfaces, they do indicate a strong (and significant) trend (see also table 8.11.1).
Fig. 8.11.1a Percentage and number of cases with rim type 1 (smoothed or tooled) and 2 ('decorated' by fingertip impressions) for pottery in group B1-4 (subgroups only).

Fig. 8.11.1b Percentage and number of cases with ‘besmeten’ surfaces in group B1-4.

Fig. 8.11.2 Finishing treatments of the exterior surfaces in the pottery groups (classification B only).

For the complete profiles six different modes of surface treatment are distinguished. Mode 1-3 are vessels with ‘besmeten’ lower walls, mode 4-6 with non-’besmeten’ lower walls. For the upper wall, four different modes of surface finishing are distinguished. The modes represent the last action only, the finishing treatment: if a surface was scraped and then roughly polished, the latter is used in the classification.

“Besmeten” refers to

Complete profiles:

1.1: ‘besmeten’ lower wall + finely polished upper wall
1.2: ‘besmeten’ lower wall + coarsely polished upper wall
2: ‘besmeten’ lower wall + scraped upper wall
3: ‘besmeten’ lower wall + other treatment (mostly smoothing with fingers; untooled)
4.1: finely polished upper and lower wall
4.2: coarsely polished upper and lower wall
5: scraped upper and lower wall
6: combinations of treatment, mostly untooled

Upper wall:

1.1: finely polished
1.2: coarsely polished*
2 : scraped
3 : other (mostly smoothed and untooled)

* coarse polishing is usually a last treatment, which is preceded by or combined with treatment 2 or 3

Description fig. 8.11.2a,b:
For the complete profiles in group B1-3, there is a clear difference in surface treatment between shape 1 and 2. In the vessels with shape 1, polished surfaces, either of the complete exterior surface or in combination with ‘besmeten’ lower walls, occur much more frequently than in shape 2 (fig. 11.2a). This difference is however to a large degree caused by the vessels in group 1.1 (all of them polished) and 1.2 (mostly scraped) (fig. 11.2b). All cases in group 1.2 with a coarsely polished upper wall surface also show signs of scraping before the final smoothing-over.

For group 2 and 3, the surface treatment is virtually the same for both shapes, except for a difference in ‘besmeten’ surfaces. The overriding mode for shape 1 in these groups are ‘besmeten’ lower walls and scraped upper walls. Together, these two modes represent 79% of the cases. The combination of size, shape and surface treatment is the main reason for a reclassification of the pottery in sample 1, see paragraph 8.11.
Fig. 8.11.2a Six modes of finishing treatment of the exterior surface of the upper and lower wall in pottery group B1-4:

Fig. 8.11.2b Three modes of finishing treatment of the exterior surface of the upper wall in pottery group B1-4.
Fig. 8.12 Uitgeest-Gr.D. sample 1. Examples of pottery groups 1-5.

Note that the vessels are arranged according to the reclassification into 5 groups, see table 8.14, but with reference to the original classification (table 8.4a,b). The numbers represent the vessel number.

Explanation of the drawing system

- The block of columns on each side of the vessel drawing represent the type of surface treatment:
  - on the left, for the interior surface
  - on the right, for the exterior surface

- Within each block, three types of surface treatment are represented by the symbols
  - The extent of the symbol in each column indicates the part of the surface with that treatment.
  - The direction of the symbols represent the direction of the treatment.

- The symbols represent the following treatment, from left to right:

<table>
<thead>
<tr>
<th>MANUAL SMOOTHING</th>
<th>SCRAPING</th>
<th>POLISHING</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Rough:</td>
<td>-Fine:</td>
<td></td>
</tr>
<tr>
<td>arrows</td>
<td>dots</td>
<td></td>
</tr>
</tbody>
</table>

All drawings by Joop Hulst (ROB)
Fig. 8.12.1 Pottery group 1 (Gd < 190 mm), SHAPE 1
Fig. 8.12.2 Pottery group 1, SHAPE 2

Fig. 8.12.2 Pottery group 2, with a maximum diameter 190-250 mm, SHAPE 2
Pottery group 2, SHAPE 1, with a maximum diameter of 190-250 mm
Fig. 8.12.3 Pottery group 3, with a maximum diameter of 250-330 mm.

Fig. 8.12.3a Pottery group 3, SHAPE 1, with a maximum diameter of 250-295 mm. This group was first classified as group 2.
Fig. 8.12.3b Pottery group 3, SHAPE 1, with a maximum diameter of 295-330 mm. This group was first classified as group 3A.
Fig. 8.12.3b, cont.
Fig. 8.12.3b, cont.
Fig. 8.12.3b, cont.
Fig. 8.12.3b, cont.
Fig. 8.12.3c Pottery group 3, SHAPE 2 (Gd 250-330 mm)
Fig. 8.12.3c, cont.
Fig. 8.12.3c, cont.
Fig. 8.12.4 Pottery group 4, SHAPE 1 (Gd > 330 mm). This group was first classified as group 3B.
Fig. 8.12.4, cont.
Fig. 8.12.4 Pottery group 4.2, SHAPE 2
Fig. 8.12.5 Pottery group 5, the jars: SHAPE 3
Fig. 8.13 Pottery from two wells, 18.1 and 31.1.

Fig. 8.13 Pottery from well 18.1.

Group 1.1

Group 2

Group 5
Well 18.1, cont.
Fig. 8.13.2 Pottery from well 31.1
Fig. 8.14  Vessels from Uitgeest-Gr.D., sample 1.

Group 1:
Vessel number 31-1 and 8-4 are examples of the polished and reduced pedestalled bowls.
Number 31-4 and 35-24 are examples of small vessels with a rather thick wall and a virtually unfinished in- and exterior surface.

Group 2 and 3:
Vessel nr 18-5, with a well-polished upper wall surface, was originally fired in a reducing atmosphere, but was oxidized secondarily. It is part of the partially burnt content of well 18-1 (fig. 8.13). The surface of vessel nr 20-2 is finished in the more usual way, by scraping. Both examples show the roughened lower wall surfaces (‘besmeten’).
Group 3 and 4:

Vessel nr 35-21 and 7-6 are ‘standard’ examples: the opening is large and the upper wall is very short. The rim is finger-impressed, the upper wall is scraped and the lower wall is roughened by extra clay. Vessel nr 7-6 also shows the pigment staining on the surface; on the lower wall it is applied over, on top of, the extra clay layer.
Group 5:
Both jars have handles and a roughened lower wall. They also are rather ‘badly’ constructed and finished. The coils are still clearly visible in the lower wall. See fig. 8.24 for the same group of vessels from Schagen-M1.

35-20

35-22
8.8 Analysis of size and shape, Schagen-M1

The morphological analysis of the Schagen pottery was carried out in the same manner as for Uitgeest. The absolute measurements of diameters, heights and their proportions were used to explore the data, and the interrelationships were used to define the pottery groups (for legend of variables and abbreviations, see fig. 8.1). Figures 8.15 and 8.16 contain histograms of the frequency distribution of the size variables and those for proportions. The charts in fig. 8.17 illustrate the associations between diameters and height measurements for each individual vessel. The metric properties of the complete profiles are shown in more detail in fig. 8.18.1-2, including the classifications of several variables. As in Uitgeest, the maximum diameter, the Gd:Rd index and the H1:Htot index, expressing the shape of the complete profile, were the basic variables used to group the pottery, while the H1:Rd index (expressing the shape of the upper wall) was used for incomplete profiles (fig. 8.18.2; 8.19). The classifications of the variables in table 8.10 differ slightly from those for Uitgeest, for reasons discussed below, except for the H1:Htot index. For the Schagen pottery the Rd:Htot index was also used for defining shape. The main features concerning shape and size and their interpretation are summarized at each of the figures or group of figures. As the method of analysis and the criteria for grouping the pottery are the same as for Uitgeest, these will not be explained in detail any more for the Schagen pottery.

The sample from Schagen consists of 108 vessels, of which 46 are complete profiles (chapter 3.5 and 3.6). A substantial number, at least 21 of this group are more or less complete three-partite vessels. Three other complete vessels have a one-partite profile. Note that this affects the number of cases for all measurements including the maximum diameter (Gd) or the size of the upper/lower wall (H1 and H2). For the Gd:Htot index of these cases the rim diameter was used instead of the maximum diameter. Also affecting total of complete profiles are the two missing vessels from feature 27. In general, the measurements for Schagen are more precise and reliable than for Uitgeest.

8.8.1 Dimensions of size variables

The maximum diameter varies between 86 and 500 mm, the rim diameter between 65 and 410 mm, the height between 50 and 465 mm (complete profiles only) (fig. 8.15b). The diameters of the bases vary between 45 and 170 mm, with a peak around 100 mm. The median value of the maximum diameter is 230 mm, with 50% of the vessels having values between 193 and 310 mm. The median of the rim diameter lies at 217 mm, with 50% of the values between 140 and 280 mm. The distribution of the smallest diameter (Sd) is identical to that of the rim diameter (fig. 8.17a). For the base diameter the median value is 92.5 mm, with 50% between 74 and 106 mm. The distribution of the maximum diameter (fig. 8.15c,d) suggests the presence of at least three main size clusters or overlapping normal distributions: vessels with Gd <170 mm, 170-290 mm, and 290-370 mm and larger. There is no clear indication for a ‘break’ in the distributions around Gd=250 mm, as is seen for the rim diameters (fig. 8.15a,b). The height measurements (n=45) indicate three possible clusters (Htot ≤170 mm; 170-370 mm and larger).

8.8.2 Dimensions of proportions

In the majority of the pottery (74%) the Gd:Rd index value is lower than 1.4 and higher than 1.0, while for most cases the value is between 1.0 and 1.2 (fig. 8.16a,b). There are eight mainly small vessels for which this index is lower than 1.0, the rim diameter being larger than the ‘maximum’ diameter at point 3. In fourteen cases, the index value is greater than 1.4, of which in ten cases the value is more than 1.5. The Gd:Rd index was classified accordingly into four classes (table 8.10). The Gd:Rd value ≥1.4 defines shape 3, the narrow-mouthed vessels, as in the pottery from Uitgeest. The distributions of the H1:Gd index and H1:Rd index in fig. 8.16d,e show that most values are lower than 0.5 and 0.4 (71%, table 8.10) with averages of .32 and .30 respectively. These distributions are similar to those for Uitgeest pottery. The H1:Rd index was classified into 3 classes, with values ≤.34 , .34-.65 and >.65, on the basis of fig. 8.18.2. The class limits are slightly higher than for the pottery of Uitgeest.

Complete profiles:

The distribution of the Gd:Htot index is similar to that of the Gd:Rd index, although in about 30% of the cases this index value is lower than 1.0, i.e. the height exceeds the size of the maximum diameter (fig. 8.16f). These cases include some of the larger sized vessels and all vessels with a Gd:Rd >1.5. The latter usually have a Gd:Htot value lower than .92 and this value is used in the classification of this variable (fig. 8.18.1b). The Rd:Htot index value is very high in six cases indicating wide and low shapes, while the majority has values between 0.7 and 1.3 (fig. 8.16h). Lower values represent vessels with high values for the Gd:Rd index. The Rd:Htot index was classified into 3 classes (≤.65, 0.65-1.1, >1.1) and proved to be a good criterion for shape together with the H1:Htot index (fig. 8.16g), which shows a division in the distribution at .33. In 48% of the pottery the greatest diameter is constructed at or above 2/3 of the total height and in 52% below this point. The index value of .33 was used to define two classes: H1:Htot class 1 (≤.33) and 2 (>-.33), referred to as shape 1 and 2, for vessels with a Gd:Rd index value <1.5 (table 8.10).

8.8.3 Size and shape relationships

The relationships between the size and shape variables are shown in the distribution of two or more variables in
fig. 8.17 and in more detail in fig. 8.18 and 8.19. The classification of the more important variables and the definitions of specific size and shape clusters are based on these charts, especially those for complete profiles (table 8.10). The most important variable for the classification of size is the maximum diameter, and for the definition of shapes the Gd:Rd index. For the complete profiles the H1:Htot index (shape 1 and 2) together with the Rd:Htot index are important criteria, while the H1:Rd index is most important for the incomplete vessels (see especially fig. 8.18.2). Figures 8.17a,b show a close correspondence between the size of the maximum diameter, the smallest diameter and rim diameter, for all cases with a Gd:Rd index <1.4 and up to a maximum diameter of 340 mm. Above this value the rim diameter tends to be more variable relative to the maximum diameter. Vessels with Gd:Rd index values >1.5 form a distinct group with large sized upper walls (fig. 8.17c), the vessels with shape 3. Four cases with values between 1.4 and 1.5 literally lie in between shape 3 and the majority of vessels in the distributions. Two of these are very much like vessels with shape 3 and were classified as such. Another cluster is formed by vessels with a rim diameter larger than the Gd (Gd:Rd <1.0; fig. 8.17a). These are mostly smaller vessels, all are lower than 230 mm, with Gd and Rd <160 mm. To make sure that the index values were not unduly influenced by longer rims bending outwards, the proportions of the maximum diameter and the smallest diameter were also analyzed, but this index did not reveal new information or provide a better classification criterium. There is no significant correlation between the size of the upper wall and the rim or maximum diameter, although in general this size tends to increase with increasing size of the maximum diameter (fig. 8.17c).

Size and shape relations in complete profiles
Vessels with shape A3, the group of pottery defined by Gd:Rd index value >1.5 have, with one exception, also a H1:Htot index value >.33 (class 2 of this index), the Gd:Htot index value is <.92, again with one exception (fig. 8.18.1b; 8 complete profiles). An even better criterium for shape 3 in the Schagen sample is the value of the Rd:Htot index, which is always <.65; for all other pottery this value is larger. The absolute size varies little, except for one very large vessel (nr 223-6; fig. 8.23). Two other cases with Gd:Rd values >1.4 but <1.5 also have a H1:Htot index >.33 and a Rd:Htot index <.65 (pot numbers 240-1 and 143-4; fig. 8.23) and were therefore included in the cases with shape 3.

All other vessels, the majority of cases, differ mainly in size and in the proportions of the upper and lower wall defined by the H1:Htot index. The measurements of the total height and that of the lower wall are highly correlated with those for the rim and maximum diameter (fig. 8.18.1a-d). In these distributions a cluster of small vessels, with a maximum diameter <170 mm can be distinguished from the rest, with corresponding low values for the Htot, H2 and Rd (fig. 8.18.1c). A second, small cluster is formed by five complete profiles with a Gd >340 mm, for which the total height and rim diameters tend to be more variable. The remainder of cases, with a Gd between 170 and 340 mm show a more or less continuous and linear distribution for all major size variables, although in the smaller vessels there is quite a large variation in the size of the upper wall and in the H1:Htot index values.

The proportions of the upper and lower wall divide the pottery with Gd:Rd index <1.5 into two sets, those with an index value smaller and larger than .33, shape A1 and A2 respectively (fig. 8.18.1c,d). The values are defined mainly by variations in the size of the upper wall and much less by variations in that of the lower wall. The latter size shows a linear relationship with the size of the maximum diameter and rim diameter in most vessels (fig. 8.18.1e,f). Shape A2 is present in pottery with a maximum diameter <250 mm (fig. 8.18.1c). Most of the smaller vessels (8 out of 11) with a Gd <170 mm have shape 2, while those with a Gd between 170 and 250 mm are more or less equally divided between shape 1 and 2 (fig. 8.18.1e; table 8.11a). The only vessel with shape A2 among the larger pottery is vessel nr. 223-3, with a rather narrow opening. The correlation between the sizes of the upper wall and the shapes is one of the reasons to choose the maximum diameter value of 250 mm as a limit in the classification of this variable. A second reason is the presence of the two clusters in height relative to the maximum diameter in the range of Gd 170-280 mm (fig. 8.18.1). Both clusters, also visible in the size of the lower wall, show a linear relationship with the maximum diameter. Pottery with a maximum diameter between 170-250 mm is slightly taller than that with a Gd between 250-280 mm. In this range the height is the same, which means that there is a relative decrease in the total height of the vessels. In a few cases, there even seems to be an inverse relation between the maximum diameter and the shape of the upper wall (fig. 8.18.1f). There relationship between the maximum diameter, height and the lower wall, is on the other hand clearly a linear one, the sizes increasing proportionally for Gd 250-340 mm. The increment in height also seems to be larger in this group than in group 2, resulting in a height equal to or larger than the maximum diameter in vessels with a Gd ≥340 mm (fig. 8.17c, 8.18.1c,e). In those vessels, the Rd:Htot index changes from class 1 to class 2, i.e. towards a narrower opening. In virtually all vessels with a maximum diameter between 200 and 350 mm a larger height is due mainly to an increase in the size of the lower
The distribution of the base diameters indicates the presence of two specific size ranges, smaller and larger than 90 mm, more or less corresponding with maximum diameters smaller and larger than 250 mm and with the height measurements, although there is some overlap (fig. 8.17d). The analysis of size and shape distributions led to the classification of the maximum diameter into four size classes with class limits at 170, 250 and 340 mm (table 8.10). As in the samples of Uitgeest, the class limit in the range of Gd 250-280 mm was rather difficult to define. For some variables, mainly the upper wall size, the 280 limit is a better criterium, for others the 250 mm limit. Weighing all information, the Gd of 250 mm as the upper limit for size class 2 was considered the best basis for classifying the pottery. The classification of the maximum diameters together with shape 1-3 are the basis for classification A.

### Size and shape relations in the upper part

The length of the upper wall for all profiles with a rim and a maximum diameter tends to cluster into four size classes (fig. 8.17c). The size of the upper and lower wall correspond more or less with those of the maximum diameter, although with a large overlap. In complete profiles, the H1:Rd index corresponds well with the H1:Htot index values and Gd:Rd classes (fig. 18.2a,b). In the pottery with shape A3, the value of the H1:Htot index is >.65. In most cases with shape A1 the values are between .10 and .34 and between .34 and .65 in those with shape A2. The values match those for the variations in the Rd:Htot index and were used to define the class limits for the H1:Rd values (fig. 8.18.2b,c). The H1:Gd index values show the same relationships as the latter with the H1:Htot (fig. 8.18.2c). Both classifications define shape B1-3 for the upper wall and are the basis for classification B (table 8.11b). In most of the pottery the upper wall size is less than 1/3 of the rim diameter: shape B1 (H1:Rd <.34). Shape B2 (H1:Rd index .34-.65) occurs mainly in smaller vessels (Gd class 1 and 2) and in the larger vessels in Gd class 4, while shape 3 is present in all vessels in class 5 (fig. 8.19a,b). There are only three cases for which the classification of the upper wall differs from that of the complete profile. In two vessels the H1:Rd value is slightly lower than expected (pot nr. 21-1, 143-6), and in one the value is higher (pot nr 223-6). The latter is a large vessel with a small rim diameter. In incomplete profile the H1:Rd index value is very high (.78), in combination with a Gd:Rd index value <1.4. This vessel, nr. 143-5, was therefore classified as shape B2. There are three other cases with a rather high value for the H1:Rd index, between .5 and .65 and high values for the Gd:Rd and/or Rd:Htot index as well, but not high enough to be classified as shape B3: pots nr. 143-3, 259-1, 223-3. This

### Schagen. Criteria for classification A.

<table>
<thead>
<tr>
<th>Size (Gd)</th>
<th>+ Shape</th>
<th>=Pottery Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>size 1: ≤170mm</td>
<td>shape A1:</td>
<td>Group A 1.1 + 1.2</td>
</tr>
<tr>
<td>size 2: 170 – 250mm</td>
<td>H1: Htot &lt; .33 + Gd: Rd &lt; 1.5</td>
<td>Group A 2.1 + 2.2</td>
</tr>
<tr>
<td>size 3: 250 – 340mm</td>
<td>Shape A2:</td>
<td>Group A 3.1 + 3.2</td>
</tr>
<tr>
<td>size 4: ≥340mm</td>
<td>H1: Htot &gt; .33 + Gd: Rd &lt; 1.5</td>
<td>Group A 4.1 + 4.2</td>
</tr>
</tbody>
</table>

### Schagen. Criteria for classification B.

<table>
<thead>
<tr>
<th>Size (Gd)</th>
<th>+ Shape</th>
<th>=Pottery Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>size 1: ≤170mm</td>
<td>shape B1:</td>
<td>Group B 1.1 + 1.2</td>
</tr>
<tr>
<td>size 2: 170 – 250mm</td>
<td>H1: Rd &lt; .34 + Gd: Rd &lt; 1.5</td>
<td>Group B 2.1 + 2.2</td>
</tr>
<tr>
<td>size 3: 250 – 340mm</td>
<td>Shape B2:</td>
<td>Group B 3.1 + 3.2</td>
</tr>
<tr>
<td>size 4: ≥340mm</td>
<td>H1: Rd &gt; .65 + Gd: Rd &gt; 1.5</td>
<td>Group B 4.1 + 4.2</td>
</tr>
</tbody>
</table>

wall as the H1:Htot index is always <.33 (fig. 8.18.1b).
rather exceptional pottery will be discussed in more detail below and in part 8.14.

8.8.4 CLASSIFICATION OF THE POTTERY
As for Uitgeest, two different groupings were constructed for the Schagen pottery: one for the subsample of complete profiles, classification A, and one for incomplete profiles, rims extending to the lower walls, classification B. Both classifications have the same basis, the size of the maximum diameter (size class 1-4) and the shape defined by the Gd:Rd index, class 5. In classification A the size groups 1-4 are subdivided by the H1:Htot index classification into shape 1 and 2. In classification B, the subdivisions of the size groups 1-4 are based on the shape of the upper wall only, measured by the H1:Rd index, and divided into shape 1 and 2.

Exceptions
The following vessels do not match all criteria for one group:
- Vessels 159-2 and 258-1 are small, ‘miniature’ vessels, added to group 1, despite the Gd:Rd value (of 1.40 and 1.48) and the high values for H1:Rd index.
- The vessels 143-4, 154-2 and 240-1 are added to group 5, although the Gd:Rd index is rather low, as these pots are similar to all other jars in this group and fit all other criteria. For vessel nr. 154-2, the H1:Htot index is exceptional (<.33; fig. 8.18.2d,e).
- Vessel 143-5 was added to group 2, despite the exceptional value for the H1:Rd index (.78), because the Gd:Rd is lower than 1.4. Vessel 143-3 has a rather high value of the Gd:Rd index (1.4), as do the vessels 223-3 and 6 (group 4), also with high values of H1:Rd index. Although these four vessels do not match the criteria for group 5, their shape is rather similar and is best described as intermediate between shape 2 and 3.

8.8.5 CHARACTERISTICS OF THE POTTERY GROUPS
The morphological characteristics of the five pottery groups are described and summarized below, firstly for the complete profiles and secondly for the upper parts of all available cases (table 8.11; fig. 8.23 and 8.24). The majority of vessels in group 2-4 are similarly shaped, basically having an S-shaped profile, while the size for the rim diameter and height are more or less the same as that of the maximum diameter in each vessel (see fig. 8.1b, example 1). Especially in size group 2, these measurements also show quite a lot of variation in relation to the maximum diameter. Variations also occur in the length of lower and upper wall in relation to the overall sizes, again especially in group 2. Group 2 contains the largest number of cases, followed by group 3. Most vessels in group 1 show the same basic characteristics of group 2-4. Group 1 and 2 include a few miniature pots and two one-partite vessels as well as some vessels with a low and wide form (fig. 8.23). Group 5 consists of tall vessels with a narrow opening and small maximum diameter, the jars. The individual vessels within this group show considerable variation in size, while some vessels in group 2 and even in group 4 have rather similar shapes. These cases are rather difficult to classify. Possible explanations for the ‘fluidity’ in shape 3 are mentioned below and in paragraph 11.

Characteristics of group 1
Group A1.1 and A1.2
Group 1 is defined by most size measurements. The maximum diameter is smaller than 170 mm, the height of these vessels is lower than 150 mm and the rim diameter is more or less equal to or slightly larger than the maximum diameter. Most complete profiles are shape 2 (8 of 11 cases), determined by the larger sized upper wall and by the slightly lower average rim diameter, as compared to shape 1 (fig. 8.21a,b). The base diameters vary from 45 to 80 mm. Three of the five vessels with a rim diameter just over the size of the maximum diameter also have a limited height (Rd:Htot index >1.1). The form of these vessels is similar to that of the example in fig. 8.1B, a rather wide and low ‘bowl’ shape.

Group B1.1 and B1.2
All but one of the complete profiles have the same shape in both classifications. The upper wall in group B1.2 is slightly larger than for group B1.1 (fig. 8.20.1f).

Characteristics of group 2 and 3
Group 2 is defined by Gd values between 170-250 mm in classification A and B. There is quite a large variation in relations between size variables, especially for the upper wall. Group 3, defined by the maximum diameters between 250 and 340 mm, forms a continuum with group 2, especially 2.1, in many respects. The relations between size variables do not vary much with size of the maximum diameter. The overall form is an S-shaped profile with a short upper wall and large lower wall as well as a large orifice.

Group A2.1 and A2.2
The number of complete profiles is 12. Shape A1 and A2 are represented by four and six cases respectively*. The vessels with shape A2 tend to be slightly taller for the same diameters, due to larger upper walls; these vessels also have slightly shorter lower walls and larger base diameters (fig. 8.20a). The upper and lower wall sizes tend to form two clusters with a linear relation between them (fig. 8.20a,b). There is a negligible difference in the rim diameters of these
vessels in relation to the Gd and Htot. Although the number of cases is small, the distributions suggest a change taking place with increasing size of the Gd from shape A2 to shape A1 in group 2 and 3 (as was also the case in the Uitgeest pottery). Moreover, the size of the lower walls in group 2.1 form a continuous, linear cluster with those of group 3.1 in relation to the maximum diameter and height, fig. 8.20a-d. The base diameters seem to be slightly larger in group 2.2. These relationships indicate that shape A1 and A2 in this group are defined by both the size of the upper and lower wall. The upper wall size is more important in the smaller vessels, while the lower wall size is more important in the larger ones, especially in group 3. Note that there also seems to be a continuum in size relations between group 2.2 and some of the vessels in group 5; as mentioned above (see exceptional cases), the differences between these two groups is rather arbitrary in some cases, such as vessel 143-5.

**Group B2.1 and B2.2**

There is a good match between the shape of the upper wall and that of the complete profiles, i.e. between the H1:Rd and H1:Htot index values in each vessel. The only exception is case nr 143-6. Both shape B1 and B2 are represented by five cases in the complete profiles. Most of the incomplete profiles however are classified as shape B1 (12, against three with shape B2). This difference is not easy to explain (the same difference was seen in the Uitgeest pottery). It is probably due to the large variation in the upper wall size, varying from 30-90 mm. There is an overlap with the sizes for group 1 and 3, with a few exceptionally high values for shape 2 and low values for shape 1. Within the clusters of shape 1 and 2 the range of the H1 is more or less independent of the maximum diameter (fig. 8.20c, also e,f).

Altogether there are three different size/shape combinations in group 2: (a) most vessels are similar to either those in group 3 (i.e. vessels with shape B1) or group 1 (i.e. the vessels with shape 2); (b) there are a few vessels with a wide and low shape, e.g., 31-1 and 2, 157-3 and (c) another few with a shape similar to those in group 5. The latter could be labelled as ‘pseudo’ jars as the overall shape is rather similar to that of the pottery in group 5, although the orifices are usually larger. It is suggested below (paragraph 14) that the reason for this variation may be the fact that many pots were made specifically for ritual deposition and were—therefore?—not constructed by the same formal standards as ‘normal’ utilitarian ware.

**Group 3**

**Group A.3.1**

The complete profiles (n=8) are all shape A1, while the length of the upper wall is mostly >70 mm. The three vessels with a shorter H1 form one cluster with three exceptional vessels in group 2: fig. 8.20a,c show the ‘inverse’ relation between upper wall and rim size for these cases, which have maximum diameters around 250 mm. There is a good correlation between all sizes and indices in all other cases in this group, but the number of cases is small. Most vessels show more or less standard size/shape relations between the lower wall, height, and maximum diameter, even for the upper wall. These relations are slightly different from those in group 2.1. The lower wall and height are larger relative to the diameters (especially fig. 8.18.1b; 8.20c).

**Group B3.1 and B3.2**

Using the shape of the upper wall as a criterium, 19 cases are defined as shape B1, with only 3 as shape B2. In this group the two classifications match quite well. In fig. 8.20e it can be observed that the upper wall size varies between 60 and 100 mm. for most cases (with Rd >250 mm), partly overlapping with the range for group B4.1. The three vessels with shape B2, vessels 157-11, 194-2, and 259-1 have higher values. Only in the last one the upper wall is very large and the value of H1:Rd very high (.5). In the other two cases the H1:Rd index values are just above the limit of class 1. The Gd:Rd values are <1.3 for all three cases.

**Characteristics of group 4**

**Group 4.1 and 4.2, both classifications**

When the maximum diameter is larger than 340 mm, the relations between size variables is more variable. Although the group is too small to establish significant correlations, there are basically two clusters, each with its own proportions. One cluster, mostly group 4.1, forms a continuum with group 3.1; the rim diameter is more or less the same size as the Gd. The second cluster consists of cases with smaller orifices, mostly group 4.2 (and B3.2, see fig. 8.20e). In both clusters, the H2 and Htot show a large increase compared to that in group 3, both in absolute value (the H2 size jumps from 220 to 260 mm) and relative to the maximum diameter. The result is an increase in height relative to the maximum diameter (fig. 8.19c, 20b). The average values of Htot even exceed those of the maximum diameter. In the two exceptional cases, 223-3 and 223-6, the rim diameter is substantially smaller than the maximum diameter or height.

**Similarities in group 2-4**

The distinction between group 3 and 4 is made for the same reasons as in Uitgeest, being the increasing variation in the relationships between the size of the maximum diameter, rim diameter and height for maximum diameters larger than 340 mm. The vessels with shape A1 in both groups share most of the characteristics, also with those in group 2, that is the more or less constant proportions between height, lower
wall size and maximum diameter, but the size of the upper wall is variable. In general, with increasing size of the maximum diameter the height of these vessels is increasing while the rim diameter tends to decrease (fig. 8.20a–c). Classification B highlights the two different but standard proportions for the upper and lower wall between shape 1 and 2 (fig. 8.20d,e). The cases in group B3.2 and B4.2 share the large upper wall and smaller orifice relative to the maximum diameter. So despite the variability in specific measurements, vessels with a maximum diameter between 170 and 340 mm form a more or less continuous range of sizes with similar shapes.

**Characteristics of group 5**

Group 5 is defined by a narrow opening; the Gd:Rd index is in two cases >1.4 and mostly >1.5. The H1:Htot of the complete profiles is always >3.3, the Gd:Htot index is lower than 1.0, except for pot 194-1, with a value of 1.0. As mentioned, ‘jar-like’ shapes are also present in other pottery groups, especially group 2.

**8.9 Non-metric variables, Schagen-M1**

8.9.1 **Rim types**

Finger-impressed or ‘decorated’ rims were present in twenty-five vessels (for definitions, see paragraph 6). In seventy cases the rims are smoothed, often tooled and faceted (fig. 8.23). The rims of jars, group 5, are always smoothed, and in group 1 only one vessel has a decorated rim. In group 2 the majority of rims is smoothed as well. Decorated rims occur most frequently in pottery groups 3 and 4, and there is a weak correlation with the shape of the upper wall (table 8.12.1b,c). The percentage of smoothed rims is slightly higher in the subsamples of complete profiles. In group B2 and B3, decorated rims are mostly associated with shape 1. There is no connection with shape in group 4. In general then, finishing the rim by fingertip impressions is more commonly applied in larger sized vessels.

8.9.2 **Handles**

Handles occur relatively frequently in the selected Schagen pottery. Of the 13 vessels with handles (15%; 20% of the complete profiles), twelve had proper handles, extending from the rim to the upper wall. One vessel had extended rims. It was expected that handles would be present more frequently on jars, but this is not the case. Only 5 of the jars had handles, while just as many were present on vessels in group 2 and on 3 vessels in group 3 (table 8.12.1a,b). The shape of two of these vessels (nr 143-3 and nr. 155-2) is similar to that of the jars, while the other three are similar to the rest of the pottery in group 2 and 3. Handles were also present on the sacrificial vessel in the dwelling (212-1; fig. 8.23.1).

8.9.3 **TREATMENT OF THE EXTERIOR SURFACE**

As in Schagen more complete vessels and profiles were present, it was hoped that the analyses of surface treatment would be more rewarding than for the pottery of Uitgeest, but the opposite is the case. Many surfaces were badly damaged, probably by the acidity of the peat, although remnants of surface treatments are usually still visible. They are considered to represent the major last treatment. The modes of treatment are the same as defined for the pottery of Uitgeest, but no distinction is made between fine and rough polishing (table 8.12.2). A second method of analysis was applied in relation to the ritual context of the pottery, based on the degree of ‘care’ with which the vessels were built and finished. This classification was made especially to compare pottery from pits with ritual depositions and from other features.

*Intentionally roughened or ‘besmeten’ surfaces*

‘Besmeten’ surfaces are discussed separately for the same reasons mentioned for Uitgeest and are also referred to as ‘roughened’. As part of the lower wall was present in most pottery in the sample, the evidence for ‘besmeten’ surfaces is more reliable than for Uitgeest. The number of cases with such surfaces is too low for most statistical significance tests, but the following trends can be observed in tables 8.12.1a,b. The percentage of roughened surfaces is slightly lower among the complete profiles than in the total sample. They tend to be present more often in pottery groups 2 and 3. Within group 2, mainly the larger sizes are roughened below the maximum diameter. In group 1 only one vessel had such a surface, together with a decorated rim. In group 4, five of the thirteen vessels had roughened surfaces, including one from the cremation pit. In group 5, nearly half of the jars have such surfaces. There is no clear relation between ‘besmeten’ surfaces and shape variations, although in the complete profiles the number of cases is slightly higher for vessels with shape 1.

*Finishing treatment of the exterior surface*

It was not easy to classify the vessels by modes of surface treatment, not only because of the badly preserved surfaces, but also because it was often difficult to make the distinction between fine and rough polishing. Polishing and scraping were often carried out on only part of a surface or only to a minor extent, leaving large areas of a surface more or less untreated. To enable comparison with the surface treatments for the pottery from Uitgeest, the same classification was used, but without a distinction between fine and rough polishing. This results in a rather inflated percentage for ‘polishing’. Bearing this in mind, the second most important treatment is polishing of the upper wall (31% in the total sample, 32% in the subgroups B1-5; table 8.12.2a,b). If the
lower wall is not ‘besmeten’, polishing occurs more frequently in all groups and especially in vessels of group 1 and 5 (table 8.12.2a). Polishing the upper wall also is done slightly more often in pottery with shape 1, especially in group 2 and 3 (table 8.12.2b). Scraping of the upper wall of the exterior surface is the most frequently used finishing technique in the Schagen pottery (40% for the total sample). Scraping occurs especially in combination with the roughened lower wall in pottery group 2-4 and also in combination with shape 1 (table 8.12.2c). Finishing the exterior surface by manual smoothing occurs in all groups, except group 5, but in low percentages (class 3 and 6 in tables 8.12.2a,b). However, as mentioned, in many cases parts of the surfaces were only treated roughly by hand. A number of complete vessels were built rather carelessly, the coils being clearly visible, the walls irregular and rather thick and— because of this?— the vessels had sagged (see fig. 8.23 and 8.24). Often the walls were finished only minimally by rough scraping or smoothing with the fingers, leaving a rather irregular shaped vessel with all construction details visible. In contrast, other vessels were made and finished with much care. Because of this variation in construction, a different classification was also used in the analyses. The following three categories were distinguished for the overall mode of construction and finishing treatment of the vessels (table 8.12.3):

1. Very roughly made and finished: abbreviated to ‘rough’ ware
2. Carefully made and finished: abbreviated to ‘fine’ ware
3. More or less standardly made and finished: abbreviated to ‘normal’ ware

In the second category, the coils are usually well-joined and the walls have been treated to remove irregularities and/or superfluous clay. The surface finishing is also carried out with care and on the complete exterior surfaces10. If polished, the polish is usually fine, often combined with reduced firing. In vessels in the third category the construction and finish was ‘standard’, compared to pottery from other sites in the Western Netherlands, including Uitgeest. The finishing treatments usually cover the entire exterior (and interior) surface.

Group 1 and 2, especially group B2.2 and group 5 contain more roughly made vessels than group 3 and 4, where most vessels are more standard or well-made (table 8.12.3a,b). There is no, or at best a weak, correlation with other features of the pottery such as rim types or surfaces with clay applice. A higher percentage of the ‘normally’ made vessels has roughened lower walls and decorated rims, but this is linked to the fact that most of these are cases in group 3 and 4. Both the rough and fine ware has mainly smoothed rims, while roughened surfaces occur less frequently. There is a relationship between the mode of construction and the context of the pottery. The roughly made pots are found relatively more frequent in the northern area, the fine in the southern area. The percentages for ‘normal’ ware are the same, but this is greatly influenced by the pottery used to cover the cremations (group 3 and 4 in the northern area). If these vessels are omitted, the opposition between mode 1 in the northern and mode 2 and 3 in the southern area becomes much more pronounced. The relations with the context are further explored in paragraph 14.

8.9.4 RELATIONSHIPS BETWEEN NON-METRIC VARIABLES AND POTTERY GROUPS

In pottery group 1-4 there is a weak association between shape 1 and the presence of roughened lower walls and finger-impressed rims, while vessels with shape 2 more often have smoothed rims and no clay applice. In group 5 all vessels have smoothed rims, independent of surface treatment. For both combinations the upper wall is mostly scraped, in the first group associated more frequently with shape 1 and in the second group more often with shape 2 (table 8.12.2c). In the latter the vessels with shape 1 are more frequently polished. The general construction modes shows a similar picture. The roughly made pots form a high percentage of the vessels in group 1 and 2, especially B2.2 (also in group B3.2 and B4.2, but the number of cases is very low). Apparently this type of construction is often associated with shape 2, and with ‘besmeten’ lower walls (table 8.12.3b). The rims of the well-made pottery are never decorated and the lower walls are usually not ‘besmeten’. Most of the normally made vessels are found in group 3 and 4. About two-third of these are also ‘besmeten’, while nearly half of the cases have decorated rims. There is no clear relation with the presence of handles. The pottery in group 5 is different in several respects. Rims are always smoothed, but there is a negative correlation between the presence of ‘besmeten’ surfaces and handles. With one exception (223-2), the jars are either ‘besmeten’ or have handles. This is not correlated with the general construction and finishing. Altogether the data indicate that vessels in group 3 and 4 are mostly ‘normally’ made, regular three-partite S-shaped profiles, often with clay applice on the lower wall and a decorated rim, while the upper wall is either polished or scraped. Vessels in group 1, 2 and 5 are more variable in form as well as in construction and surface treatment. These groups consist of combinations of badly made and well-made vessels, about half of them with roughened surfaces and two-thirds with smoothed rims. In other words, they show the opposite of the characteristics of group 3 and 4. It will be clear that these interpretations are based on trends only; most correlations were not statistically significant due to low number of cases.
8.10 Vessel forms in Schagen-M1

The majority of the pottery from Schagen consists of similar shaped vessels, varying mainly in size. The pottery in group 2-4 has more or less standard proportions. The vessels have S-shaped profiles with a relatively short upper wall and more or less equal size of the rim diameter, the maximum diameter, and height, while the size of the lower wall is directly proportional to that of the maximum diameter. There also is a high correlation between the upper and lower wall size and consequently of both with the total height for all complete profiles in group 1-3. There are two well-defined standards for this proportion, shape A1 and A2 as expressed by the H1:Htot index, and these shapes are matched by those defined for the upper wall only (H1:Rd index). The smaller vessels (group 1 and 2) more often have a relatively short lower wall and long upper wall, while these trends are reversed with increasing size. Especially in group 4, the lower wall of a vessel is proportionally much larger than in the smaller pottery.

Group 5, the jars with a narrow opening and a small-sized maximum diameter form a separate cluster, but there are considerable variations in specific proportions as well as size within this group. The overall shape of some of the vessels in group 2 is rather similar, these vessels also have a rather narrow orifice, a rather large upper wall, and handles in some cases, but the proportions of the maximum diameter and height are standard (Gd:Htot higher than 0.9). Handles however are not restricted to these forms. It is not clear what the similarities between group 2 and 5 or the differences within group 5 mean. There are two possible explanations. The most obvious one is that the function of the two types of jars, possibly including some of the ‘jar-like’ vessels of group 2, is different. A more likely explanation is the relation with differences in construction modes. The size and shape variations are partly due to the irregularities that resulted from a very ‘careless’ construction (for example, the vessels from feature 143, fig. 8.23, cluster 5). These in turn can be associated with the use of such vessels in ritual depo-
sitions. Another specific group of vessels, present in group 1 and 2 only, are those with a relatively wide opening and low height (fig. 8.1b, example 3; fig. 8.23.1). The shape is approximating the bowl-, or even dish-, shape. A few mini-
tature vessels were recovered as well. They are found regu-
larly in Roman period settlements in the Netherlands. There are indications that certain surface and rim finishing techniques were preferred for specific pottery groups.

Larger-sized vessels (group 3 and 4) more often have a combination of a scraped exterior upper wall, a finger-
impressed rim, and ‘besmeten’ surfaces. In smaller vessels, group 1 and 2, the exterior surface is more frequently polished or scraped all over, and the rim is mostly smoothed. In groups 2, a rather high percentage of cases has a roughened lower wall. Both groups, as well as group 5 also contain more vessels which have been made either badly or very well than those in group 3 and 4. Most of the above conclusions point in the direction of the ritual contexts in which the pottery was used as an explanation for its specific characteristics. Below, the main aspects of the context in relation to the pottery groups are discussed. The site also provides an unique opportunity for an in-depth contextual analysis of ritual depositions, which is presented in paragraph 14.

8.10.1 Feature contexts of the pottery

Most of the selected pottery was found in pits (68%), a much smaller number in hearths, ditches, or other features (table 8.13). Each of the pottery groups is represented in all types of features, except group 4, which in the southern area was found in pits only\(^\text{11}\). Contrary to data available from other sites vessels of group 3 are present in rather low percentages, while those of groups 1, 2, and 5 are rather high, especially in the pits, in comparison with Uitgeest (table 8.14, 8.20). Of the complete profiles, 75% was recovered from the fills of pits; the highest percentage of any pottery group found in pits is group 5 (78%). The clusters of pits involved in seasonal depositions (table 8.13b, 8.18a) contained 63 of the 108 vessels in the sample. Table 8.13b contains a list of pottery from each individual feature, classified by the type of context; pits and ditches, hearths and the cremation pit.

**Pottery from pits and ditches**

More pottery was found in pits and ditches in the northern than in the southern area (n=44 and n=23), but the number of features is also much larger (n=14 and n=7; table 8.18a). The average number of vessels per pit is thus very similar in both areas. In the pits in the northern area, the percentage of smaller vessels (group 1 and 2) is much higher than that of group 3 and 4. The largest number of vessels in the sample (9, 8, and 10 respectively.)\(^\text{12}\) was found in the pits 79, 143 and 223, each containing five or more complete profiles and including two to three jars. Features 31, 147, 154-5 and 240 contained three to five pots each, all with one indigenous jar, except feature 147. This feature however contained an unbroken Roman jar. The jars (group 5) occur mostly in combination with vessels of group 2 with the exception of feature 155. The rest of the pits and ditches had less than three larger fragments or complete profiles (in the sample) and no jars. The contents consisted mostly of vessels from group 1 and 3 and of a few from group 2 and 4. Pottery from group 3 and 4 is however never found in combination in any of the pits. The ditch surrounding the dwelling contained large amounts of sherds. In this case, the entrance to the house was not
Fig. 8.15 Schagen-M1. Frequency distribution (N) of size variables: diameters and heights (see fig. 8.1a).
marked by complete vessels—as for example in the Assendelver Polders—but by other materials. Leaving out the pottery recovered from ditches, the pattern emerging from Table 13b is that if the number of complete profiles is three or more, three to four pottery groups are represented, while in features with one or two complete profiles group 1 and 3 occur most frequently.

**Pottery from hearths**

Most hearths contained sherds from at least one more or less complete profile in its construction. From the seven open air hearths in the northern area, 16 large fragments and six complete profiles, including three complete vessels, were recovered. The complete vessels are miniature pots (Fig. 8.23). It is questionable whether such miniatures were a standard component of household inventories. From the hearth in the dwelling (feature 194) four vessels, one of which being the complete profile of a jar, are included in the sample. The combined hearths of features 157/177 contained many sherds which could be restored to large fragments of vessels (n=10), followed by features 194, 153, and 159 with four, including 1 jar, and three cases respectively (Table 8.13c). All other hearths contributed very few larger fragments and only one complete profile. All pottery groups are represented in the hearths, but vessels from group 3 forms the highest number.

**Vessels from the cremation pit**

The pottery covering the cremation remains is discussed briefly here as this feature is so very unusual (see Hessingh 1993). These ‘urns’ are classified as groups 3 (n=5) and 4 (n=3). All vessels are quite large, with a maximum diameter >300 mm, and one >500 mm, being the largest vessel on site. All are highly similar in general appearance, shape, fabric and surface treatment (Fig. 8.18). The construction is more or less standard, five pots have ‘besmeten’ lower walls, scraped upper walls and decorated rims, while the surfaces of the other three, with smoothed rims, is not preserved. In fact, the surfaces of all of these vessels are damaged, looking worn and pitted. It is not possible to say whether the surface erosion took place before or after deposition. All but vessel 344-1 show signs of secondary oxidation and some—secondary?—burning, but none of the vessels is really damaged by fire. Of three pots, the bases were missing. Since it is unlikely that this happened during excavation, the bases may have been removed before deposition. It is possible, however, that bad preservation lead to their loss after excavation. The details of construction and fabrics suggest that the same ‘hand’ made this pottery, perhaps even from one batch of clay. A further analysis of the context is conducted in paragraph 14.

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Fig. 8.16 Schagen-M1. Frequency distribution (N) of variables for proportions (indices of two size variables; see Fig. 8.1b), opposite page.

**Description fig. 8.16a-h:**

16a,b The Gd:Rd index value has a wide range but in only a few cases the values are lower than .9 or higher than 1.4 (16a). Between these values the distribution is virtually a normal curve (16b). The index was classified into three or four classes (Fig. 8.17a). Those with Gd:Rd values >1.5 are defined as shape 3.

16c,d The H1:Rd index shows a very wide range of values. In the majority of the pottery the values range from .2 to .4. In the cases with a value >.65, the upper wall is quite large and/or the rim diameters quite small. All but two of these also have high Gd:Rd values (>1.5): pottery with shape 3 (Fig. 8.17a-c). In the few cases with index values >1.0, the upper wall is larger than the rim diameter.

16e The distribution of H1:Gd index values is comparable to that of the H1:Rd index, but without the extremes. In most cases the index values are between .1 to .5, with a top between .2 and .4; in a small number of vessels, the value is >.55.

16f-h The pottery with complete profiles (n=42) is divided into two groups by the value of .33 or 1/3 of the total height of a vessel. The index was classified accordingly into class 1 (H1:Htot < .33; n=20) and 2 (> .33; n=22).

The Gd:Htot index distribution also is divided into two clusters. In the majority of cases the maximum diameter is equal to or slightly larger than that of the total height (index values mainly between 1.0 and 1.4), but there are 10 cases with an index value lower than 1.0. Part of these also have a high value for the Gd:Rd index (shape 3) and H1:Htot index. i.e. cases with a small opening and long upper wall. The exceptionally large values are due to small values of the height (also Fig. 8.17d,e).

The distribution of the Rd:Htot index shows that in more cases than for the Gd:Htot index, the rim diameter is slightly smaller than the height (n=20). There is a small cluster with very high values (>1.4), which include the three one-partite vessels. The index classification is based on Fig. 18.1d, 2e.
Fig. 8.17 Schagen-M1. Relations between size variables for individual cases: diameters and heights.

The figures present the relations between size variables, combined with the classifications of size variables and their proportions. Together with those shown in figs. 8.18, they are the basis for the classification of the maximum diameter into four size classes, defined by the maximum diameter and one specific shape, defined by Gd:Rd index values (see table 8.10). The classification is referred to as Gd class 1-5.

For an explanation of how to read fig. 8.17a,d,e, see fig. 8.4.

Fig. 8.17a Scatter of all combinations of the size of the rim diameter (Rd), smallest diameter (Sd), the maximum diameter (Gd) and the upper wall (H1), with Gd:Rd index classes.

Description fig. 8.17a-c:
The pottery shows a clear linear relation between the size of the three diameters. They vary more in the larger sized vessels than in the smaller ones. The size of the opening as a proportion of the maximum diameter (Gd:Rd) defines a specific group of cases, with an index value ≥1.5. These were labelled as class 5 and shape 3. In a few cases the index value is 1.4-1.5, but they are extremes in the distribution of the majority of cases and are not part of the group with shape 3.

Although there is no clear linear relation between the size of the upper wall and the diameters (fig. 17a,c). In general the H1 size is larger with increasing size of the maximum diameter. In the largest vessels the H1 is highly variable (more than 70 mm), as is the rim diameter. On the other hand, the distribution in fig. 17c suggests that its range is more or less standard for specific size ranges of the maximum diameter. Within each cluster (the encircled areas**), there even is a tendency for the upper wall size to decrease in larger vessels (see also fig. 8.18.1e,f, showing a decrease in upper wall size with increasing Gd between ca 200-270 mm and again between 330 and 370 mm).
Fig. 8.17b Relations between the size of the rim diameter (Rd) and the maximum diameter (Gd), with Gd:Rd index classes.

Fig. 8.17c Relations between the size of the upper wall (H1) and the maximum diameter (Gd), with Gd:Rd index classes.
Fig. 8.17d Scatter of all combinations of the size of the maximum diameter (Gd), height (Htot), height of lower wall (H2) and base diameters (Bd), with the classification of the H1:Htot index. Cases with a Gd:Rd index >1.5 are excluded. Complete profiles only.

Fig. 8.17e Scatter of all combinations of the size of the rim diameter (Rd), height of upper and lower wall (H2) and height (Htot), with the classification of the maximum diameter. Complete profiles only.
Description fig. 8.17d,e:
The subsample of complete profiles shows significant correlations between the size of the maximum diameter (Gd), maximum height (Htot) and the height of the lower wall (H2), with two distinct size relations for the upper and lower wall and the total height.
In the vessels with a maximum diameter <250 mm, the H1:Htot index is often >.33, while the reverse is true for the larger vessels. With increasing overall size, the vessel profile changes from shape 2 to shape 1, as a result of variations in the size of the upper wall as well as different size ranges for the lower wall.
Vessels with a maximum diameter <170 mm all have more or less the same upper wall size (H1). In cases with a maximum diameter between 170-250 mm, there are two distinct size ranges in the upper wall (notably fig. 8.17e, also 18.1a-c), while that of the lower wall is proportional with the maximum and rim diameter.
Vessels with a maximum diameter >250 mm tend to have smaller sized upper walls and larger sized lower walls, relative to the diameters (see fig 8.18.1b,c for more details). The base diameters show little variation between Gd 170 and 350 mm and measure c. 75-110 mm.

Fig. 8.18.1-2 Schagen-M1. Relations between size and shape variables for the subsample of complete profiles.

Fig. 8.18.1 consists of combinations of size measurements with (classified) size or shape variables. Fig. 8.18.2 consists of combinations of variables for proportions (indices of two size variables).

On the basis of the distributions in fig. 8.17 and fig. 8.18.1-2, specific size and shape clusters and their combinations were defined, which in turn were used to classify the pottery.
The most important variables for the definition of the shape are the Gd:Rd index and the H1:Htot index. The latter divides the pottery into two classes with a different shape: class 1 =<.33 and 2 = >=.33 (see fig. 8.17), representing different proportions between the upper and lower wall. They are labelled shape 1 and 2, for cases with a Gd:Rd index value <1.5. Shape 3 is a combination of high values for both Gd:Rd and H1:Htot index (>1.5 and >.33).
Size clusters are defined by four size classes of the maximum diameter (legend fig. 17e). The combination of four sizes and one shape is referred to as the Gd classification (class 1-5).

Description fig. 8.18.1a-f:
There is a clear distinction into two shapes defined by the proportions of the upper and lower wall, expressed by the H1:Htot index (18.1a,b,d). The maximum diameter of all but one vessels with shape 2 is less than 250 mm, and/or the Gd:Rd values are >1.4. The latter form a distinct group defined by the three variables for height and the Rd:Htot index (18.1d,b).
The Gd of 250 mm is the most suitable size to separate the smaller vessels, with considerable variation in proportions, and the larger ones with relatively uniform proportions, especially those between the rim diameter and height measurements (fig. 18.1c,d).
In the pottery with a Gd <250 mm, two distinct groups are present.
A group of small vessels (Gd<170), mostly shape 2, for which the height is lower than 150 mm and the rim diameter is equal to or slightly larger than the maximum diameter. The lower wall size is relatively small, while the size -range- for the upper wall varies between 35 and 60 mm. Size class 1 is therefore defined by Gd <170 mm (Gd:Rd <1.5). Size class 2 (Gd is 170-250 mm) is more or less equally divided by class 1 and 2 of the H1:Htot index, as a result of differences in the upper wall size (fig. 18.1e,f). For shape 1, the range of the upper wall size is overlapping with that for vessels in class 1 and is 30-70 mm. For shape 2, the upper wall is clearly larger: 70-140 mm (fig. 18.1c,e). In both size classes the Gd:Htot index is >.92, while the Rd:Htot index is >.65. In vessels with shape 3 (Gd:Rd index >1.5), the values of the same indices are <.92 and <.65 respectively (also fig. 8.18.2).
In most pottery with Gd >250 mm the lower walls are large and the upper walls short. The total height is slightly lower than the size of the rim and maximum diameter, when the maximum diameter is <340 mm, while the upper wall size is mostly 60-90 mm. The five largest complete profiles show extreme variation in the length of the upper wall (with a minimum of 60 mm and a maximum of 160 mm; fig. 18.1c). The total height in relation to the maximum diameters is much less variable, as a result of the relatively large increase in the lower wall size in this cluster. Some of the vessels also show rather restricted openings and higher values for the Rd:Htot index; in one case the H1:Htot index is also larger than .33 (pot nr 223-3). Pottery with a Gd >250 mm was therefore divided into Gd class 3 and 4 with the class limit at 340 mm.
Fig. 8.18.1 Schagen-M1. Relations between size and shape variables for each complete profile: combinations of height measurements and diameters, with (classified) size or shape variables.

In fig. 18.1b,d and e the number at each case refers to class 1 and 2 of the H1:Htot index.

Fig. 8.18.1a Relations between the size of the rim and maximum diameter. Cases are classified by the H1:Htot index.

Fig. 8.18.1b Relations between height and maximum diameter. Cases are classified by the Rd:Htot index.
Fig. 8.18.1c  Relations between the size of the upper and lower walls (H1 en H2). The cases are classified by the H1:Htot index; the number at each case refers to Gd class 1-5 (see fig. 8.17e).

Fig. 8.18.1d  Relations between the height and rim diameters, classified by Gd:Htot.
Fig. 8.18.1e Combinations of the height of the lower wall (H2) (circles) and the upper wall (H1) (squares) with the size of the maximum diameters (Gd).

Fig. 8.18.1f Combinations of the height of vessels (Htot) (circles) and the upper wall (H1) (squares) with the size of the maximum diameters (Gd) and the rim diameters (Rd); the number at each case refers to Gd class 1-4 (class 5 excluded).
Fig. 8.18.2 Schagen-M1. Relations between proportions: indices for complete profiles which include the maximum height (Htot) and indices for the upper or lower part of vessels, which include the height of the upper or lower wall (H1 or H2).
The distributions in the charts are used to define criteria for the classification of incomplete profiles, by comparing the shape of the upper wall with that of the complete profile (see also 8.5.2 for Uitgeest, sample 1).

Description fig. 8.18.2a-c:
In fig. 18.2a,b the shape of the complete profile is compared with that of the upper wall as expressed by the H1:Rd index, to find a substitute for the classification of the shape of incomplete profiles. There is a good match between the distributions of the three indices in these figures. In the pottery with a Gd:Rd index >1.5, the values of the H1:Rd index are also high (>0.65). For the other pottery, the division into class 1 and 2 of the H1:Htot index is matched by the value of the H1:Rd index being larger and smaller than 0.34 respectively.
The associations are the basis for the classification of the H1:Rd index values:
- H1:Rd 1= ≤0.34: shape 1 of the upper wall
- H1:Rd 2= 0.34-0.65: shape 2 of the upper wall
- H1:Rd 3= >0.65: shape 3 of the upper wall
There are four exceptions (fig. 18.2b). One is a jar with a low H1:Htot value, but high values for all other indices. Two other vessels with shape 2 have values for the H1:Rd index which are only just lower than the limit for shape 2. The fourth case is a very large vessel with a H1:Htot index value of exactly 0.33, but with large upper wall and small opening (also fig. 18.2d,e). In three cases, values for the H1:Rd index are rather extreme (between 0.55 and 0.65), compared to the Gd:Rd index; two are miniature vessels, the third has all the characteristics of group 5, but with the lowest values for the defining indices (pot nr. 143-4). The distribution of the H1:Gd index values are very similar to those for the H1:Rd, indicating that these values are mainly determined by the variations in upper wall size, and much less by those in the rim diameters (fig. 18.2c). The three exceptions are 2 miniature vessels and one small one with a straight, virtually one-partite form.
Fig. 8.18.2a As 18.2a, for vessels with a Gd:Rd index value <1.5 only.

Fig. 8.18.2c Relations between the H1:Gd and H1:Htot index values for the four size classes of the maximum diameter and the vessels with shape 3 (class 5). The number at each case refers to the H1:Rd index classes (legend fig. 18.2d).
Fig. 8.18.2d Relations between \( \text{Rd: Htot} \) and \( \text{H1: Gd} \) with class 1-3 of the \( \text{H1:Rd} \) index; the numbers refer to class Gd 1-5 (legend fig. 18.2c).

Fig. 8.18.2e Relations between \( \text{Rd:Htot} \) and the maximum diameter (Gd) with class 1-3 of the \( \text{H1:Rd} \) index; the numbers refer to class 1 and 2 of the \( \text{H1:Htot} \) index.
Description fig. 8.18.2d,e (page 255)

Fig. 2d,e combine the distribution of the four indices for complete profiles and express the relations between the overall shape and that of the upper wall. The combination of the Rd:Htot and Gd:Htot values lower than .65 and .92 resp. clearly defines the group of pottery with shape 3 (Gd:Rd =>1.5): Gd class 5. In the other cases, the Rd:Htot is mostly >.7 and the Gd:Htot mostly >.92. Vessels with a Gd:Htot index >1.2 usually also have high values for Rd:Htot index (>1.1) and low values for H1:Rd index (<.34).

On the basis of the distributions the Rd:Htot and Gd:Htot indices were classified into 3 classes (table 8.10). The index values are also related to size (the number at each case in fig. 18.2d refers Gd class 1-5). The vessels in group 4 have lower values for the Rd:Htot and Gd:Htot, while most of the vessels with shape 2 for the upper wall also have lower values for both indices. Fig. 18.2e shows that the Rd:Htot index is decreasing with increasing size, meaning that the rim diameters become smaller and the heights larger (also fig. 8.18.1d). There is also a very high correlation between the Rd:Htot index classes and those of the H1:Htot index (the case markers).

Altogether fig. 8.18.2a-e show that variations in the proportions (shape) of vessels are most extreme in size class 2 and to a lesser extent in class 4 and 5.

Fig. 8.19 Schagen-M1. Relations between the size of the upper wall and size and shape variables, for complete and incomplete profiles.

Description fig. 8.19a,b:

Fig. 19a,b shows the relationships between the size and proportion of the upper wall, for the complete profiles and all other cases. The distinction between shape 1, 2 and 3 in relation to the length of the upper wall is quite clear for all cases. Vessels with shape 1 tend to have a standard upper wall size (range) for specific size classes of the maximum diameter, while for shape 2 and 3 there is a more equal increment for the two variables. In most of the complete vessels with shape A2, the rim diameter is relatively small (Gd:Rd >1.3). A second cluster, with both shape A1 and A2 present, is formed by vessels with Gd:Rd values around 1.0 and a restricted range for the upper wall size, but there also are a few cases with shape 1, in which the upper wall size is quite large (fig. 19a). Those are vessels with a large maximum diameter as well (19b). The difference in size of H1 between shape 1 and shape 2 is increasing with size. There is no significant difference between the complete profiles (marked 3) and incomplete ones (marked 2) in fig. 19b.
Fig. 8.19a Relations between the size of the upper wall (H1) and the Gd:Rd index, classified by class 1 and 2 of the H1:Htot index; complete profiles only.

Fig. 8.19b Relations between the size of the upper wall and maximum diameters, classified by the H1:Rd index. The numbers at each case refer to the surviving size of the profile (see fig. 8.1a; ‘3’ = a complete profile).
Fig. 8.20 Schagen-M1. Classification A and B of the pottery into group A1-5 and B1-5.

In classification A for complete profiles, the shape is defined by $H_1:H_{tot}$ index classes (table 8.11a).

In classification B for all profiles including the rim and maximum diameter, the shape is defined by $H_1:R_d$ index classes (table 8.11b).

Description fig. 8.20a-e:
The figures summarize the size and shape distributions for pottery classification A and B. Fig. 20a,b clearly shows the two size ranges for the upper and lower wall for vessels in group A1 and A2. The total height is clearly correlated with the size of the maximum diameter for all groups (fig. 20b). In group 1.1 and 2.1 the base diameters tend to be slightly smaller than in group 1.2 and 2.2, while the base diameters of vessels in group 3 and 4 tend to be larger than in group 2. In the complete vessels in group 3 (all shape 1), the lower walls and rim diameters are larger than in group 2 (fig. 20c). Group 4 is defined by large sized lower walls as well as total height. The (incomplete) profiles in group B4.2 have smaller rim diameters and/or larger upper walls than those in group B4.1, as do some of the cases in group B2.2 (fig. 20c,d)
The differences between group B3.1/4.1 and B3.2/4.2 are more pronounced than in the complete profiles. Viewed in more detail (fig. 20e,f), most vessels of group B2.1, B3.1 and possibly group B4.1 seem to form one group with constant more or less the same proportions between the upper wall, rim diameter and maximum diameter.
Fig. 8.20b Relations between the size of the rim diameters, maximum diameters and heights for pottery groups A1-4.

Fig. 8.20c Relations between the size of the rim diameter, upper wall and lower wall for pottery groups B1-4.
Fig. 8.20d Relations between the rim diameter, the size of the upper wall and the maximum diameter for pottery groups B1-4.

Fig. 8.20e Relations between H1 and Rd with pottery groups B1-4.
Fig. 8.21 Schagen-M1. Average values of the rim diameters (a), heights (b) and the upper wall sizes (c) in each pottery (sub)group A1-5, for shape 1, 2 and 3.

For an explanation of the plot values, see fig. 8.8
The plots show the similarities and differences between the shape of the complete profile and that of the upper wall (between classifications A and B). The 3 classes of the H1:Rd index divide each subgroup for group A1-5 on the X-axis. The groups without a sub-number contain the incomplete profiles.

Fig. 8.21a Average size of the rim diameters for shape 1, 2 and 3 for pottery groups A1-5, in relation to the H1:Rd index classification.

Description fig. 8.21:
The plots largely confirm the high correspondence between the two classifications A and B, except for group 2. Vessels in this group show a large difference between the two; while 6 of 10 complete profiles are defined as shape A2, 12 of 14 incomplete profiles are classified as shape B1. The average rim diameters and heights differ only slightly within each of the subgroups, while the size of the upper wall is clearly different (21c). Shape 2 for the upper wall is present in group 2 and 4 only.
The one exceptional vessel in group 5, with a rather short upper wall, is vessel 143-7
Fig. 8.21b Average height for shape 1, 2 and 3 for pottery groups A1-5, complete profiles, in relation to the H1:Rd index classification.

Fig. 8.21c Average size of the upper wall for shape 1, 2 and 3 for pottery groups A1-5, in relation to the H1:Rd index classification.
Fig. 8.22 Schagen-M1. (a) Rim types and (b) 'besmeten' surfaces in pottery groups B1-5
Fig. 8.23 Drawings of Schagen pottery. The vessels are arranged by *cluster*, *feature* and *pottery group*.

Nb Due to circumstances, not all vessels in the Schagen sample were drawn at the completion of this study, while the information on the surface treatment could not be added to the available ones.
cluster 4, group 1 and 2
223-7 is virtually identical to 223-6

cluster 4, group 4
cluster 4, group 5
cluster 5, group 1, 2 and 5
cluster 7, group 1, 2, 3 and 4
cluster 7, group 3 and 5
Pottery from cremation pit group 3 and 4
Pottery from cremation pit, cont.
group 4
Pottery from hearths.
Pottery from hearths, cont.
Pottery from house-ditch, group 1, 2, 3 and 5
Fig. 8.24 Schagen-M1. Examples of construction and finishing techniques and of a potter’s tool.

Vessel number 143-4, 154-1,2 and 115-2 are examples of the very irregular and ‘rough’ construction with virtually unfinished surfaces. In vessel 115-2, the impressions left by the potter’s fingers to finish the rim are clearly visible.

Number 22-4, 79-8, 79-3 and 223-10 (opposite page) are examples of the category of well-made, finely polished and reduced vessels. The long rim of number 223-10 is uncharacteristic, as is the sharp shape of the smallest circumference in vessel 22-4.
Fig. 8.24b Examples of finely polished and reduced vessels.
Fig. 8.24c Worked rib bone from Schagen-M1, interpreted as a potter’s tool for scraping and polishing, together with its modern parallel (left). The details of this tool are exactly the same as those of the modern implement used by potters for scraping. The marks left by it are consistent with those found on pottery surfaces.
Drawing by Jan de Wit, IPP, UvA
*Printed with permission of Therkorn (FRW, University of Amsterdam)
8.11 Vessel-forms in the samples from Uitgeest-Gr.D. and Schagen-M1

The main similarities and differences in the formal properties of the pottery from both sites are summarized here. It is a first step towards answering the research questions formulated in chapter 1, 2 and in the introduction of this chapter. The size and shape combinations present in the pottery were discussed in detail for the two samples of Uitgeest (paragraph 5). The same formal variation is also present in the Schagen pottery. There is only a slight difference in the size distributions of the pottery for group 2. In sample 1 of Uitgeest, group 2 was defined by maximum diameter values between 195 and 295 mm (table 8.4) and in sample 2 this group was subdivided at Gd=250 mm (table 8.7). In the sample from Schagen the best classification was obtained by Gd=170-250 mm as the boundaries of group 2 (table 8.10). However, the combined information from samples 1 and 2 of Uitgeest indicates that there is a similar change in formal properties around the maximum diameter size of 250 mm (see paragraphs 5 and 6). For these reasons, and to make all samples more comparable, the pottery in the samples of Uitgeest is reclassified, see table 8.14. The class boundaries of group 2 were set to 195 and 250 mm, group 3 is divided into group 3 and 4, resulting in the class boundaries being virtually the same as for group 3 and 4 for Schagen (250-330 mm and > 330 mm). In this classification, 26 cases of group 2 are added to group 3, mainly with shape 1. The main size and shape combinations are summarized in fig. 8.25.

In the comparison of both sites, the occupational time-span at both settlements should be taken into account. The samples of Uitgeest cover at least the first three centuries AD, while the pottery from Schagen represents one settlement period at the beginning of the third century AD. The three samples should overlap in time, but it is as yet not possible to make chronological distinctions within the pottery of Uitgeest. All evidence gained so far in this and other studies suggests that there is very little change during the first three centuries AD in the western Netherlands (see Bloemers 1978; Taayke, 1990, 1995). Therefore, partly out of necessity but also because of the available evidence, the two samples from Uitgeest will be treated as if there are no major chronological differences.

8.11.1 Similarities

The most important morphological distinction in both sites is the one between jar-shaped vessels and the other pottery. The group of jars, tall vessels with a narrow orifice, form a specific class of pottery with a limited size range (pottery group 5; fig. 8.25a, shape 3). The rims of these vessels are always smoothed. Some of the lower walls are roughened and some vessels have handles, occasionally the two are present together. There is no difference in surface treatment from other pottery groups. It is not clear what the variations mean, but they may indicate different functions associated with the jar-shape.

Most other pottery, the majority at both sites, consists of vessels with the same basic shape, a smoothly curved profile with more or less standard proportions. The rim diameters and the total height are about equal or slightly smaller in size than the maximum diameter (fig. 8.25a, shape 1 and 2). The pottery is characterized mainly by variations in overall size, expressed by the size of the maximum diameter or height, as well as by variations in surface treatment. A clear break in the size distributions of the maximum diameter occurs at 170 mm (Schagen) and 190 mm (Uitgeest) in all three samples, defining the small vessels, group 1. The larger pottery, divided into three size classes (group 2-4), shows a more or less continuous size distribution of the main size variables (the maximum diameter, rim diameter and height) without clear-cut interruptions between these groups. Especially the pottery in groups 2 and 3 shows regular and even uniform proportions of the diameters and height. Within groups 1-4, two shapes were distinguished through slight variations in the shape of the complete profile—classification A, based on the proportions of the upper and lower wall—and by that of the upper part—classification B, based on the proportions of the upper wall and the size of the orifice. Shape A1 and A2 represent the position of the maximum diameter above and below 2/3 of the total height, respectively, in complete profiles (fig. 8.25b). With increasing overall size there is a shift from mostly shape A2 to predominantly shape A1 in the vessels, caused by the change from a relatively long upper wall to an increasingly large lower wall as a proportion of the total height (fig. 8.25a). Moreover, the shape distinction for the complete profiles is matched to a large extent by proportion of the upper wall size and the rim diameter (shape B1 and B2, fig. 8.6 and 8.19). The match between the two classifications is an important result, because in this way the sample size for formal analysis can be considerably increased for most archaeological assemblages. The shape variations are, however, to some extent the result of the method by which they are defined. The smaller the overall size, the more the indices for shape are influenced by even slight variations in the size of the upper and lower parts or in the rim diameters. In the smaller vessels, group 1 and 2, the size of the upper wall varies within a more or less standard size range for both shapes. The distinction in shape A1 and A2 is not so much the result of a real difference in shape, but rather of the lack of a strict standard for the size of the upper and lower wall. This can largely be explained by technological factors (see below). The change in proportions observed in the larger vessels (group 3 and 4), on the contrary, is a significant one.
With increasing overall size, the height of both the upper and lower wall is increased, while in some of the vessels in group 4 the rim diameter is decreased as well. A few of these vessels, especially in the Schagen sample, have very long upper walls and small openings and the shape approaches that of the jars (group 5).

The analysis of the surface and rim treatment also resulted in a meaningful distinction between vessels, corresponding with the morphological variations. Again, these variables divide the pottery of both sites into two major groups, vessels with a maximum diameter smaller than 250 mm (group 1 and 2), and vessels with a maximum diameter larger than 250 mm (group 3 and 4). Nearly all vessels in group 1 have smoothed and tooled rims, while roughened surfaces are rare. In group 2, a ‘besmeten’ lower wall and finger-impressed rims also occur less frequently than in the larger vessels. Polished surfaces are seen in a substantial part of the smaller pottery (fig. 8.12 and fig. 8.24). Moreover, most of the vessels with handles are found in this size group and in all cases the rims are tooled. The handled vessels may represent a specific subgroup in both sites.

Other vessels of group 2, specifically those with a short upper wall and wide opening (shape 1) are very similar to those in group 3. In the latter group and even more often in group 4, ‘besmeten’ surfaces and finger-impressed rims occur frequently and in combination. For both groups the exterior surface of the upper wall is usually finished by scraping or rough polishing.

8.11.2 DIFFERENCES

The main difference between the two sites is the type and number of vessels that were constructed and finished in a manner, that differed from the standard way. Another difference is to be found in the relative frequencies of the pottery groups. The special construction techniques are to a large extent related to special, mainly ceremonial, use of the pottery. In Schagen, two such techniques are recognized, in Uitgeest just one.

Firstly, the Schagen sample contains a substantial number of vessels with a very irregular shape, due to a rather ‘careless’ construction and the lack of a finishing treatment of the surfaces (fig. 8.23 and 8.24). Such vessels are referred to as ‘roughly made’ ware in distinction of the regularly made pottery. As a result of the construction technique, the relationships between size variables is also less ‘regular’ than in the pottery of Uitgeest, especially in group 2 and 5. The ‘pseudo-jars’, vessels with a jar-like shape, are probably defined as part of group 2 instead of 5 because of their very irregular shapes. On the other hand, and contrary to Uitgeest, the upper wall size shows a much better correlation with that of the lower wall. Two quite clear and more or less standard proportions in the heights are present in the complete profiles (fig. 8.17e). The most likely explanation is that the sample represents only a few potters (see below).

Secondly, the vessels in group 1 and in part of group 2 show variations in form and construction details between the two sites. In Uitgeest, the small vessels consist mainly of two clearly defined types of pottery. The first type is the rather roughly made vessel with scraped surfaces in group 1, but the construction is not the same as that of the rough ware in the Schagen sample. The second type is a group of well-made and finely polished ware, often fired in a reduced atmosphere (in group 1 and 2). The latter includes the ‘pedestalled’ bowls with their special form, of which several, virtually complete examples were found in Uitgeest (fig. 8.12, 8.13). In Schagen, on the other hand, only parts, mostly the ‘feet’ of these vessels were recovered, while every pottery group included a few very carefully made, polished and reduced pots. Here, the well-made ware in pottery group 1 and 2 includes of low and wide forms (fig. 8.1B). Such forms are not present in Uitgeest and are rare in other settlements in the region as well. The difference in shape of the well-made ware could point to a diminishing use of the pedestalled cups in the third century AD.

The fine ware of Schagen being found mainly in features with ritual depositions, the contextual difference between the two sites is, however, probably more important than chronological factors.

Thirdly, there are some interesting differences in sample composition between Schagen and Uitgeest. In both sites, group 2 and 3 form the majority of the vessels in more or less equal percentages (56% and 61% for Uitgeest sample 1 and 2; 54% for Schagen), but their relative frequencies are quite different. In Schagen group 2 has the highest percentage. In Uitgeest the percentage of cases in group 3 is by far the largest in sample 1 and 2, which also explains the higher percentage of decorated rims in Uitgeest. The frequencies for group 1 and 4 do not differ significantly in the three samples. The number of vessels in groups 4 and 5 (jars) is low in both sites, but constitute a higher percentage of the sample for Schagen. Possibly, but unlikely, the different composition is due to the sampling criteria. For Uitgeest, the composition of the samples as compared to the total assemblage is basically unknown, while for Schagen the sample is influenced by the specific use in ritual contexts. In Uitgeest only a few special depositions of complete vessels are known, although the recognition of such deposits was certainly negatively influenced by the excavation methods. Even so, most of the pottery seemed to have been actually used, broken and discarded, especially in the ditches and in the creek. The tentative conclusion is that the Uitgeest assemblage to a large extent consists of the broken remains of household inventories, while that of Schagen represents a special selection out of these inventories as well as pottery.
that was specially made for ritual use. The latter are marked by the use of special construction and finishing techniques, but do not differ from the ‘utilitarian’ pottery otherwise, as is clear from the overall morphological similarities between pottery groups in both sites and within the Schagen sample. Both aspects, that of discard and deposition of household inventories and the use of special construction techniques will be further analyzed below (paragraphs 14 and 15).

8.11.3 THE RELATION BETWEEN FORMAL GROUPS AND CONSTRUCTION TECHNOLOGY

All pottery in both sites is made by the coiling technique, built up from the base to the rim (see Van der Leeuw et al. 1987). The majority of the ceramics at both sites was constructed according to a few simple basic rules, related to the size, notably the total height, and the shape of a vessel. The first rule governs the relationship between the height of the lower wall and the maximum diameter, the second one is the relationship between the height of the upper and lower wall, and the third one is the width of the opening.

Firstly, the best way to make a larger vessel, one with a larger maximum diameter and height, is to increase the size of the lower wall and the maximum diameter in a proportional manner and adapt the angle with the base to this height. As a rule of thumb, this angle should be less than 60 degrees and more than 30 degrees from the vertical axis. In this way a relatively wide and tall construction can be made without risking the collapse of the wall during construction. Secondly, the different proportions for the upper and lower wall in small and large pottery can also be related to construction. In a three-partite vessel, the size and weight of the upper and lower wall have to be in proportion to prevent sagging or collapse, everything else being equal (chapter 2.4). The smaller a vessel, the easier it is to make the lower wall relatively short or the upper wall relatively long, because the absolute sizes (and the total weight) are so small. The larger the vessels, the longer the lower wall has to be and the upper wall can be. If the lower part, including the base diameter, is wide enough, the size of the upper part can be varied without much risk and can even be used to add to the overall size.

Thirdly, the factor influencing the length of the upper wall is the width of the opening. If the potter wanted to construct a relatively narrow orifice, the length of the upper wall above the maximum diameter will have to increase and more so with increasing overall size of the vessel for exactly the same reasons mentioned above: the angle at which this part is constructed cannot be too steep or it will collapse. Alternatively, a small orifice can be obtained by reducing the maximum width. The jars represent a combination of conditions. A tall, narrow-mouthed vessel can be constructed by building the lower wall at a steep angle with the base. This limits the size of the lower wall and that of the maximum diameter. By increasing the length of the upper wall it is possible to create a narrow opening as well as sufficient height.

The constructional conditions and possibilities largely explain the basic relationships between size and shape observed in the pottery studied here. The potters started the construction of a vessel with an image of its overall shape, size. In their template, the maximum diameter was the major determinant for shape as well as for content capacity. The maximum diameter also determined the necessary length of the lower wall. The absolute size of the upper wall is less restricted for larger sizes. The potters of Uitgeest seem to have used a standard size range for most of the pottery. Within this range the exact size was varied at will in both samples, although in Schagen the upper wall size is more proportional to other size variables. Only for vessels that required a narrower opening the potters used a different size. The very large vessels of Schagen are good examples, being narrower and taller than usual.

It will be clear that the distinction in two shapes for the upper parts of vessels is to some extent arbitrary, especially for smaller sized vessels. Small differences in the length of the upper or lower wall obviously have a larger influence on the indices for shape in smaller pots. All of the above interpretations, moreover, are based on very small numbers of complete profiles. Yet the ‘techno-logic’ of potters is clearly present in the pottery. It is equally clear that within the basic conditions much variation was possible. The specially made vessels from Schagen are interesting in this respect. They demonstrate on the one hand the technological skills and know-how needed to make high quality pottery. On the other hand the—same?—potters also made vessels in such a roughshod way, that it must have been a conscious decision. It can even be argued that one needs to be a highly skilled potter to ‘carelessly’ make such vessels, knowing exactly within which limits a vessel could successfully be made and fired.

8.11.4 CONCLUSIONS

In view of the research questions, the following conclusions can be drawn from the analyses of pottery morphology. Firstly, the formal differentiation is low and consequently the degree of functional differentiation is rather low, at least as far as function was expressed in formal properties. The potters made only two or three clearly different shapes. The bulk of the pottery consists of a continuous range of sizes with only minor variations in proportions. Part of these variations in size and shape combinations can be explained by conditions in the constructional phase. More distinct variations are present in non-metric properties, such as rim types, handles and surface treatment, especially in
Three basic shapes are present within the three-partite form in the pottery from Uitgeest and Schagen are schematically represented in figure (a). The major form, shape I, is defined by more or less equal size of the rim diameter, maximum diameter and height (fig. b). The position of the maximum diameter relative to the total height define shape I and II, which are related to vessel size. Shape 2 occurs most frequently in smaller sized vessels, due to variations in the size of the lower wall. Shape I is almost exclusively present in vessels with a maximum diameter between 250-330 mm (group 3). In this pottery, the size-range of the upper wall is standard between 60 and 90 mm, independent of overall size. In group 4, shape I and II are present, but now related to variation in the size of the upper wall and rim diameter (group 4.2).

Shape III represents pottery group 5, the jars: the height of the vessels exceeds the size of the maximum diameter, while the opening is small.
the application of intentionally roughening the lower wall (‘besmeten’ surfaces) and in the degree of polishing. Obviously, both metric and non-metric properties of the vessels constituted the mental templates of the potters and users. All of these variables appear to have been meaningful in their specific combinations. The question is whether these specific combinations were linked to the function or expected use of the pottery, or merely express an accepted and ‘normal’ variability. If the former was indeed the case, then the degree of functional differentiation recognized by the community may have been much larger than the classifications made here. Another possibility is that the finer distinctions were related to other aspects, such as the preferences of an individual potter, social, and household distinctions. Chronological differences are highly unlikely in view of the evidence from Schagen, with its short production period, and that from the pottery found in the wells in Uitgeest. The closed contexts show essentially the same combinations of characteristics and the same variations within and between the pottery groups.

Secondly, the lack of standardization in measurements and the fact that every vessel is a unique combination of metric and non-metric properties point to pottery production as a small scale affair, taking place within each settlement, possibly at the household level. In this respect the differences between the two sites are meaningful. In the Schagen pottery, the proportions between size variables, especially between the size of the upper and lower wall, are much more regular than in that of Uitgeest. In both sites, moreover, some groups of vessels are very much alike in details of construction and finishing treatment. Such specific details represent individual potters.

Thirdly, the overall similarities in various aspects of the pottery within and between the two sites point to a shared set of rules on how to make pottery (the technological know-how) as well as on how to express meaningful distinctions between vessels. The better defined, broad distinctions in morphological categories can indeed be interpreted as the basic ‘mental templates’ of the potter, referring to major functional distinctions. Both sets of rules were apparently not very strict as far as details of formal properties were concerned. Specific combinations of shape, rim types and surface treatments are never used exclusively for any (size) group. On the other hand, three categories of finishing treatment carry a specific meaning (one in combination with firing technique), the black polished ware and the ‘besmeten’ surfaces and rim types. The first mode has a highly symbolic meaning, while that of the second is probably more utilitarian and/or technological. Before drawing all information together to establish possible functional categories for the pottery of Uitgeest and Schagen, the data on actual use of vessels is presented.

8.12 Use alterations
The study of alterations of ceramic surfaces caused by actual use is far from straightforward. Many factors influence the presence or absence of use residues. The completeness of a vessel, the preservation of its surfaces, the type of use alterations and the extent of their presence on or in the surfaces may all influence the possibility to identify such alterations. On the other hand, actual use analysis is an important way to support any conclusion about the type and number of functions of pottery. The data form an independent source of information that can be compared with the formal classification. Ideally this type of analysis is based on a sample of complete profiles or vessels with well-preserved surfaces. The sample from Uitgeest meets the second requirement, but not the first, and the pottery from Schagen meets the first requirement, but not the second.

The definitions of the types of use alterations are developed within this study and that of Oudemans & Boon (1991). Most important are the use residues: any type of deposit on the interior or exterior surfaces which is a result of use. Skibo (1992, see fig. 2.5) made a classification of use-related residues as well as surface changes (abrasions and discolorations) caused by cooking, cleaning, storage, and transport. The use residues in the pottery studied here are quite similar. The surface alterations (abrasion and scratching), although present and documented, are not included here, as the data are too scant.

8.12.1 Types of residue; methods of analysis

Macro-observations
For each vessel, the presence and type of residues on, meaning adhered to, the interior and/or exterior surface was documented. Five types were defined for the pottery of both sites, four of which are actual use residues. The fifth is a staining, applied to the surfaces, but not caused by use. The types of residues and application are illustrated in fig. 8.26.1-3.

1. A black, dull to shiny, solid residue: soot (S)
2. Solid residues with a dark-brown to black colour: chars (C)
   These residues can appear in different forms: as a cracked surface, as a very hard, rather shiny black ‘pitted’ surface or as a dull brown-black surface without a clear structure. These residues consist of charred material.
3. A creamy to light brown coloured layer on the interior surface: B1
4. Red to dark brown residue, ‘painted’ on the exterior or interior surface in the form of drops or linear stains: Pigment or painting (P)
5. Brown to black residues without a clear texture. These residues vary from a vague staining to residues resembling a peaty substance, mostly on the interior surfaces: B2-4
Fig. 8.26.1-4 Examples of use residues in the pottery from Uitgeest and Schagen and in vessels used in cooking experiments.

Fig. 8.26.1 Soot. Scale 1:4
Fig. 8.26.2 Examples of chars, enlarged to 400%, showing different degrees of charring.
Fig. 8.26.2 Examples of several types of chars; scale 1:1
Fig. 8.26.3. Liquid residue B1 (left) and Pigment stains (above)
Fig. 8.26.4. ‘Iron Age’ replica’s, used in cooking experiments.

Fig. 8.26.4a. Top: Vessel used for cooking milk and porridge. Scale 1:2
Middle + bottom: Details of residue of burnt milk on the exterior and interior surface.
Fig. 8.26.4b. Top: Vessel used for cooking a vegetable/meat stew, with soot on the exterior surface. Scale 1:2
Bottom: Detail of the burnt content, compare fig. 26.2. Scale 150%
The analyses mainly deal with the residues type 1 and 2 as these are present most frequently. The definitions ‘soot’ and ‘chars’ are based on the descriptions and examples given by Hally (1983) and Skibo (1992), and on observations of the remains on the pottery itself. As both types of residues are formed in contact with fire and smoke, it is likely that the use of pottery with such residues was indeed fire-related. Cooking experiments in replicas of Iron Age pottery led to residues quite similar to those studied here (Olthof 1996) (fig. 8.26.4). Soot is used here exclusively for the black deposits (both the dull and the shiny type, see Hally 1983), consisting of organic compounds from the smoke of a fire on the exterior surfaces. It is occasionally present on the interior surfaces as well. Skibo (1992, chapter 7) also distinguishes ‘oxidized patches’ when the soot has partly burned off or ‘oxidized’ in direct contact with the fire. This type of change is difficult to distinguish in the pottery analyzed here, but possibly part of the vague residues B2-4 represent the same phenomenon.

Chars are present mainly on the interior surfaces and only those cases are represented in the tables. Smoke and fire-related residues were present in low numbers and because of this, the distinction between several types had to be dropped in the analysis. The positive identifications indicate the minimum number of cases with residues, because the latter may have been removed before or after deposition, or are present on the missing parts of incomplete vessels. Chars, for instance, occurred often in small patches on the lower interior wall only. Soot, on the other hand, was frequently found over large parts of the surface and especially around the maximum diameters. The location indicates a position of the vessel in rather close contact with the fire (Skibo 1992, 157-163). As soot is also very resistant against decay and handling, this type of residue will have a high chance of being present in the pottery sample.

The two other residues discussed here, type B1 and P, were present in only a small number of vessels from both sites. They are included because they add important information on the use of specific types of vessels. Residues type B2-4 are not further discussed, because their origin is not always clear. They may partly have been formed by post-depositional processes.

### Chemical analysis of use residues

A selection of sherds from Uitgeest was studied by means of Curie-point Pyrolysis Mass Spectrometry and Gaschromatography by Oudemans (Oudemans & Boon, 1991, 1993; Oudemans & Ehrhardt 1996; Oudemans in prep.). These techniques are used to determine the chemical composition of complex organic materials. The selection of the samples was based primarily on the macroscopic definitions of the different types of residues and the quality of their preservation, and secondly by their presence on specific pottery groups. Because of the first criterion several sherds were included for which the size or shape of the original vessel is unknown. As a control on the post-depositional influence of, or contamination by, the context of the residues, a few samples were taken from the vessel walls and from the surrounding soils.

The analyses conducted by Oudemans were directed at four major research aims. Firstly, to show that the residues from archaeological materials did contain organic components, secondly to identify the composition of these components, ‘chemo-typing’ and thirdly to determine what the origin of these components may have been, the ‘chemo-taxonomy’. The fourth question was whether specific types of residues could be linked with specific pottery groups. On a more general level the studies were aimed at the further development and evaluation of these analytical techniques in their application to complex organic materials in archaeological research. The residues were first chemically described at the molecular level. These ‘fingerprints’ of the organic components in the residues were then further analyzed by multivariate analytical techniques. Cluster analysis and differential analysis were used to compare large numbers of such ‘fingerprints’ or chemo-types (see fig. 8.27 by Oudemans & Ehrhardt 1996). This resulted in several clusters with specific organic components, discussed in paragraph 12.4. This type of research can be an important step forwards in establishing the uses of pottery on the one hand, and the preparation methods of foodstuffs on the other (Oudemans & Boon 1993).

Although the field is rather new, several promising studies have been published so far (see Evershed et al. 1992) for a review of methods and results in this field.

#### 8.12.2 SOOT AND CHARS, UITGEEST

**Note that sample 1 and 2 are used in the reclassified form with pottery groups B1-5, see table 8.14.** Sample 1 is the primary sample. Sample 2 is the additional sample of rim and base sherds.

**Uitgeest sample 1**

Soot is present on the exterior surface in 65 cases (47 %) in all pottery groups. Charred residues are also present in all pottery groups, but in only 33 certain and an additional 11 possible cases (together 32%) (table 8.15.1a). The highest percentages of sooted surfaces are found in group 1.2 and 2 and slightly less often in group 3, both in complete and incomplete profiles. Sooted surfaces also occur, rather surprisingly, on at least four of the fifteen jars, once together with charred residues in a vessel with a ‘besmeten’ surface and handles. The highest occurrence of charred residues is found in vessels of group 1.2 and 2.1, while in group 3.1 the percentage of chars is also high. For the complete profiles, both sooted surfaces and chars clearly occur more frequently...
than in the sample as a whole (table 8.15.1b). This proves the point made above that the information on use residues is more reliable when larger parts of a vessel and especially the lower wall are present.

There is a significant correlation between the presence of the two types of residues. Vessels with charred remains on the interior surface have sooted exterior surfaces in virtually all cases (see the right hand column of table 8.15.1a). Although the number of cases is too small for statistical testing, the evidence suggests a difference in the association of soot and chars between subgroups, related to shape and size. Charred residues are more often associated with shape 1 in group 2, 3 and 4 and with shape 2 in group 1. The high percentage of chars in subgroup 1.2, 2.1 and 3.1 is associated with a high percentage of soot. In subgroups 2.2 and 3.2 on the other hand, a high percentage of soot (64%, 47%) is combined with a low percentage of chars (18 and 27%; 13 and 26%). The percentage of chars in group 4 is only slightly lower than for group 3.1, but the association with soot is seen mainly in vessels with shape 1 (group 4.1). The large vessels in group 4 with shape 2 are characterized by the presence of soot. The differences in combinations of chars and soot suggest that there may have been a difference in the use of vessels with shape 1 and 2, especially for those with a maximum diameter <250 mm. These variations are to some extent associated with other features. Vessels in group 1.2 and 2.2 usually are not ‘besmeten’ and most have smoothed rims (table 8.8.1). In group 3.1 and 4 on the contrary, most vessels have ‘besmeten’ lower walls and decorated rims. The differences cannot be due to the size of the sherds or to conservation of the surfaces. The vessels in group 1.2 represent a special group. In nearly all of these the surfaces have been roughened and most rims are untooled smoothed rims. In about 50% some extra clay was put onto the exterior surface, often limited to a few spots, unlike the all-over roughened lower wall of the larger vessels. The exterior surface can be covered with a crust of soot, while the interior surfaces show charred residues and in some cases soot as well (see fig. 8.14 and 8.26). Macroscopically, the residues on the interior are similar to those in group 2 and 3, but chemical analyses revealed a different composition from the chars in group 2 and 3, see below. The significance of the differences in shape and use residues observed within group 2 and 3 is less clear. First of all the shape variations of the upper wall are slight in most cases and hardly relevant. Especially in group 2 these may be caused mainly by the overall size of the vessel. The small number of cases however prohibits firm conclusions, based on this sample alone.

**Uitgeest sample 2. Soot and chars in 3 subsamples**

Sample 2 consists of measurable fragments of pottery and is used to increase the sample size for the analysis of use residues. The information for these smaller fragments is evidently even more sensitive to missing data than sample 1. The first selection out of the 629 is that of the pottery groups B1-5 (n=193; table 8.15.2a). Group 5 is omitted from most figures and tables, because of the low number of cases. The second and third selection are all sherds with measurable rim and base diameters (n=432 and 173 respectively; table 8.15.2b,c). The rim diameters were classified in such a way that the classes correspond as closely as possible with the pottery groups (Rd class 1 = pottery group 1 etc.). The classification of the bases into three classes was derived from the size distribution for complete profiles in sample 1 (fig. 8.4).

In the sample of pottery group B1-4, soot is present on the exterior surface in 72 cases, while there are 47 cases with charred residues on the interior surface (table 8.15.2a). Sooted surfaces are observed in all groups, in 53% and 48% of the cases in group 3 and 4, and 38% in group 1 and 2. In group 2, soot occurs mostly in vessels with shape 2 (56%), while in group 3 and 4 it occurs mostly in combination with shape 1. The correlations between chars and soot is also high for this subsample. The combined data, all fire-related residues, add only nine cases to the individual totals. The highest percentage of chars is found in vessels with shape 1 in group 3 and 4, as well as in those in group 1.2. In group 2.1, the percentage of both soot and chars is quite low. The evidence for the subsample of rim diameters corresponds to a large extent with that for the pottery groups B1-4 (table 8.15.2b). Again the percentage of cases with soot is high in all classes, but especially in class 3. For chars the percentage of cases is more or less the same for class 1, 3, and 4 and rather low for class 2. As the number of cases is substantially higher, and taking into account that use residues have a higher chance of being present on rim sherds from smaller vessels, it can be concluded that these trends are not caused by the size of the vessels or by the sample size.

The subsample of base sherds shows higher percentages of chars than soot and the highest percentage for both is found in bases with a diameter between 90 and 130 mm (table 8.15.2c). This size roughly corresponds with the base diameters of the complete profiles in group 2 and 3 of sample 1. The frequent presence of chars indicates that they are indeed present more often on the lower wall near the bases than higher up on the interior surface. They also support the idea that soot is formed higher up a vessel’s exterior wall. The reason is that soot will burn off the lower wall by the heat and the flames (see Hally 1983; Skibo 1992). The same observation was made in a recent cooking experiment (Othof 1996). The photographs in fig. 8.26.4 show the results of cooking a porridge and a vegetable stew over a hearth.
Altogether, the evidence of the two samples of Uitgeest is quite similar. In the smaller pottery, sooted surfaces are present in many vessels, but the percentage of charred residues is low, especially in pottery group 2. The main difference between the two samples is the higher occurrence of soot and chars in group 4 in sample 2. Most likely this is due to the low number of cases in sample 1. Another factor may be the burial context. Sample 2 includes many sherds from the creek fill in which organic material was generally better preserved.

The following preliminary conclusions can be drawn from the data on fire-related residues from both samples.

– Soot on the exterior surfaces occurs frequently in vessels of all sizes and shapes in both samples. Its presence and location on the maximum diameter and upper wall indicates that vessels from all pottery groups were sometimes placed on or in a fire. Soot and chars in combination are observed more often in pottery with shape 1 in group 2-4 in sample 1 and in group 1, 2, 3 and 4 in sample 2. The smaller vessels (1.2) mostly have smoothed rims and roughened surfaces.

– Of special significance are the residues in the sample of bases, demonstrating that chars are formed more often near the bottom in the larger vessels. As this part is often missing in these pottery groups (3 and 4), the percentage of chars observed is probably a very low estimate of their actual presence. The location of the chars also indicates a rather direct contact with the fire.

8.12.3 CREAM-COLOURED RESIDUE B1 AND PIGMENT (P), UITGEEST

Despite their rare occurrence, two specific types of residues are worth discussing (table 8.15.1,2), firstly the cream-coloured layer on the interior surface, defined as residue B1, and secondly the addition to the interior or exterior surfaces in de form of splashes and linear marks, labelled as pigment or ‘painting’. Some examples are shown in fig. 8.26.3.

Residue type B1, the cream-coloured layer
Residue B1 is a very thin ‘film’ on the interior surface, which looks very much like the boiler-scale found in kettles. As the chemical analysis proved, it actually contains organic compounds. The pattern of the staining, over most of the interior surface and sometimes demarcated by a clear horizontal line, suggests that the residue was formed by a fluid. In sample 1, residue B1 was observed in four, possibly eight cases in pottery of group 1.2, 3.4 and 5 (table 8.15.1c). This residue is found on vessels with and without roughened lower walls and both types of rims. It is also present in four of the vessels with handles (20%), once in group 1.2 and 3.2 and twice in group 5 (the jars). In four cases it is combined with soot or chars. In sample 2, this residue was present in ten, possibly twelve cases in pottery groups 1, 2 and 3, including five base sherds (of which four with diameters less than 90 mm, table 8.15.2c). In the base sherds, it is always combined with soot and/or chars, suggesting that this type of residue was formed when heating the original substance.

Pigment
The second type, the pigment or paint has a reddish brown colour. The texture always has the same appearance, suggesting a resinous material and/or iron-oxide as its origin, applied in a liquid form. The application of resinous material, for instance produced by boiling tree-bark, on pottery is known from very different parts of the world; historical sources suggest it is associated with making (cooking) vessels waterproof. If the paint had this functional value only, it should be present all over the interior surface, which is never the case in Uitgeest and was observed in only one vessel from Schagen (fig. 8.26.3). It was initially thought that the pigment was applied before the firing of the vessel, but the chemical analysis of two samples shows that no heating had occurred. This is an important point that I will return to in section 8.14.

In sample 1, pigment occurs sporadically but exclusively in vessels of group 3 and 4 (n=11, table 8.15.1d). The lower walls of these vessels are mostly ‘besmeten’ and the rims are of the ‘decorated’ type. The largest vessel in the sample is an example (pot nr 7-6; fig. 8.14). Pigment is found in combination with soot or chars in four cases. In sample 2, 30 rim sherds and ten base sherds show this staining, the majority being part of pottery group 3 or class 2 for the base diameters (which most likely represents the same size group). On 21 of the rim sherds and six of the base sherds with paint, soot or charred residues were also present (63% and 27% respectively). Despite the low numbers, it seems justified to connect ‘painting’ with specific size groups of pottery and the presence of charred use residues (table 8.15.2d,e). The rare occurrence in itself points to a possible symbolic value of this application.

8.12.4 ALL RESIDUES, SCHAGEN

Macroscopically, the residues in the Schagen pottery are the same as observed in that of Uitgeest. Both quantity and quality of residues was low, which is at least partly due to the bad preservation of the pottery surfaces (table 8.16). Also, there may be a relation with the ritual context of most vessels. An interesting question is whether the use and the content of the pottery was different from that of ‘daily use’, but residues from Schagen have not been analyzed chemically yet.

Soot and chars
Soot was found on thirty-three vessels, chars on twenty-six (table 8.16a,b). Both types of residue were present on
vessels from all pottery groups, with the highest percentage of soot in group 1 (47% in complete profiles) and that of chars in group 4 (57%). The relatively high percentages of fire-related residues is clearly the result of the higher number of nearly complete profiles in the Schagen sample. As in Uitgeest, there seems to be a relation between size and shape and residues, although the number of cases is too low for statistical testing. In group 1.2 and to a lesser extent in group 2.1, the percentage of sooted surfaces is high and that of chars is low. In group 3 and 4 soot and chars are more often found in combination, while the percentage of pottery with chars even exceeds that with a sooted surface. The two types of residues also show significant relations with the surface treatments (table 8.16c). The chars were found more often on vessels with a decorated rim, which is directly related to size, while soot was more often present on vessels with a roughened lower wall surface. What the latter correlation means, if anything, is not very clear, since decorated rims and roughened surfaces both occur more often in larger pottery. It is possible that soot is better preserved on roughened surfaces than on others.

In the Schagen sample, 19 polished and reduced vessels are present, in group 1-3 and 5. In only two of them, the large jars from feature 223, charred residues were observed on the exterior surface and once on the interior surface. The trends seen in the Schagen pottery are thus similar to those in the pottery from Uitgeest, especially to that in sample 2. In both sites, charred residues are most found frequently in group 3-4.

Residue type B1 and pigment (P)
The cream-coloured residue and the pigment staining are present in 11 (plus two unclassified base sherds) and nine vessels (plus one base sherd) respectively (table 8.16c,d,e*). The first, type B1, is limited to groups 1 (n=1), 2 (n=3), and 5 (n=5), in other words most of these residues were found in jars. In four cases (three jars), the lower wall was ‘besmeten’ , while most of the rims were smoothed. In two cases, both jars, handles were present. There is no relation with the presence or absence of soot and chars, as in Uitgeest. The difference between the sites may be related to the special use of the vessels for this particular fluid in Schagen. The context may indicate how likely a specific use may have been (section 8.14). The application of pigment occurred, contrary to Uitgeest, in all pottery groups and slightly more often in the vessels of group 2. In one case, one of the ‘pseudo’ jars, almost the complete interior surface was stained, suggesting that the vessel was used as a container for this substance (fig. 8.26.3). Pigment is present in nine vessels with ‘besmeten’ surfaces and four others. In eight cases it is combined with a decorated rim and twice with a smoothed rim.

Context of vessels with residue B1 and pigment
Both types of remains occur in a higher percentage of the pottery than was the case in Uitgeest and there may be a relation with the ritual contexts (paragraphs 11 and 14). Ten out of the eleven cases with painting were found in features associated with the seasonal rituals, six of them in association with winter rituals, three with spring rituals and one with those taking place in the fall (see table 8.18e). Only one jar shows this type of treatment. The specific contexts strengthen the idea that the painting is a symbolic reference, although in Schagen this symbol is not associated with specific pottery groups. The distribution of the liquid residue B1 shows no clear connection with seasonal rites other than through the overall preference for jars in these depositions.

Context of vessels with soot and chars
Vessels with soot or chars occur in all types of features (see table 8.18e). In the northern area, in 40% of the pottery from the hearths charred residues were present, in the southern area in only 10%. For the pottery recovered from the pits, the frequency of fire-related residues is much higher in the southern than in the northern area, 70% and 32%, respectively. Despite the low absolute numbers, the evidence indicates that the pots, especially those of group 4, were used on a fire before deposition. The meaning of the variation between the two areas is not clear and the following possibilities seem equally feasible.

– the pottery in the southern ritual contexts were selected from the normal household inventories.
– the rituals involving the southern pits were associated with cooking of special meals.

For both options, there are supporting arguments. For the first it is the fact that most of the ritual pits are located in or directly near the dwelling. Moreover, a higher percentage of the vessels in them is ‘normally’ constructed compared to the pits in the northern area, and most are classified as group 3 and 4. On the other hand, the lack of correlation between the presence of chars and the mode of construction of these vessels (paragraph 9), could be an argument in favour of the second explanation. Pointing to the same direction is the fact that the two larger than usual jars in feature 223, both polished and reduced, had charred remains. It seems highly unlikely that these vessels were used for cooking in daily life. In any case, there are clear indications that the inhabitants used different types of vessels for ceremonies in the northern and southern area and perhaps in a different way.

8.12.5 MASS SPECTROMETRY (CUPY/MS) ANALYSIS OF USE RESIDUES
The summary results of the CuPy/MS, chemical analyses are based on Oudemans & Boon (1991, 1993), shown in table 8.17. I will spare the reader the highly
technical details by which the residues are transformed into ‘fingerprints’ of its substances and refer to the article of Oudemans & Erhardt (1996) and Evershed et al. (1992). Fig. 8.27 shows the most important ‘chemo-types’ and their possible origins as found in the samples from Uitgeest. ‘Fingerprints’ or chemo-types were obtained for thirty-three samples, taken from twelve vessels (sample 1) and fourteen additional sherds. Elementary analysis for the organic elements C, H and N resulted in 30-70% (weight percentage) of organic materials in the charred residues on the interior surfaces and in under 10% for the cream-coloured residues of Uitgeest. Although these figures may be different for other sites, they indicate a high organic content for the chars. Comparison with samples from the surrounding soils and from the vessel walls fortunately eliminated any confusion between soil and use residues and also showed that no extensive contamination had taken place within the selected sample, except in one case. The ‘fingerprints’ were further analyzed statistically by discriminant analysis and complete linkage cluster analysis, which classified the compositions of each sample according to their similarities and differences (fig. 4 and 5, Oudemans & Boon, 1993). The analysis resulted in the distinction of five different clusters of residues, each with a typical composition, clusters A-E (based on Oudemans & Boon 1993, table 2 and 3).

Cluster A is formed by charred residues which consists mainly of charred polysaccharides (starch), combined with fatty acids and proteins. Such residues can be formed during cooking of a rather thick liquid, such as grains or porridge or other starch-rich stews, to which in some of the residues protein-rich material like meat, fish or beans, was added. They are found on vessels of group 3.

Cluster B/D are residues, characterized by phenols or aliphatic compounds (PACs) and/or CO₂, which were derived from different types of residues. Fatty acids or polysaccharides are (virtually) absent. Three of the samples were defined as soot and this identification is confirmed. The composition points to wood-fires as the source (Oudemans 1993, 229). Several chars in this cluster consisted of aliphatic compounds, which could have been formed by heating oil, although in that case fatty acids should have been present as well. As these were not found in significant quantities, the source material is as yet not clear. These chars were found on the roughly finished vessels of group 1.2.

The same aliphatic compounds were found in a sample of the liquid residue (B1) from the interior surface of a jar (vessel 35-20), in this case together with proteins. Again the source material could not be identified with any certainty. It is suggested that the proteins may represent the content of the vessel, while the aliphatic compounds may have been present in the vessel wall rather than being part of the composition of the layer itself. Since this vessel did show soot on the exterior surface this may represent an earlier use before the vessel contained the cream-coloured liquid B1. The other two samples of this residue showed a different composition (see cluster C). As remarked above, the combination of this residue with soot or chars is quite common in Uitgeest.

Cluster C contains three samples, one of pigment and two of the cream-coloured liquid residue B1. All three consisted mainly of protein-rich substances, without significant quantities of fatty acids or charred polysaccharides. The well-preserved protein pattern suggests that the residues are unheated (ibid. 230-31). It is not clear whether the original substance of the three residues is the same. The two samples of the liquid layer (B1) were present in a vessel of group 1 and in one sherd, the pigment sample was taken from a vessel of group 3. The protein-rich material was probably mixed with an anorganic substance, such as an iron-compound.

Cluster C presents an interesting problem in view of the relation between formal and actual use. If the proteins were indeed not heated, then it must be concluded that the pigment was applied after firing and that the vessel was no longer used for cooking or heating afterwards. Both conclusions apparently contradict those made in the previous and next paragraph, that this pigment is associated with a cooking function. The question may be solved by the analysis of more samples. Taking the pyrolysis results as the starting point, a new hypothesis could be that vessels from group 3 and 4 were selected from the existing inventory and were painted for special occasions, marking the end of their previous use at the same time. Although the source material could not be defined chemically, blood seems to be a likely candidate as blood(plasm) consists mainly of proteins.

The next question concerns the composition of the liquid residue B1. Before the analyses took place I was fairly convinced that the remains were those of dairy products, like milk. The presence of proteins fit the idea. However, the very low percentage of organic material in the samples (less than 20 %) and the very low quantity of fatty acids apparently excludes dairy products as a source (Oudemans, pers. comm.). The alternative explanation, that the residues are indeed ‘boiler-scales’ from water, is equally untenable, as in that case organic compounds should not be present at all.

Cluster E, consisting of two residues only, is of a quite different nature than the others. One residue is that of pigment (P) on the interior surface of a vessel from group 3, the other a char on the exterior surface. The latter was included to see whether the macroscopically defined difference between soot and chars also shows up in the chemical composition. Char on the exterior can be formed when the
content of the vessel is boiling over. Both residues are defined, however, by the presence of elementary sulphur. It is possible that these samples represent soil and/or clay contaminations. In the case of the pigment, the sulphur may be part of the anorganic substance that constitutes the basis for the paint.

8.12.6 RELATIONSHIPS BETWEEN USE RESIDUES AND FORMAL GROUPS

Although the data on use related residues are meagre and should be used with caution, there are certain consistencies in their relationship with the morphological properties of the pottery groups. The results so far support most of the broad distinctions that were made on the basis of size, shape and surface treatments between small and large vessels. All evidence taken together, it is likely that specific types of residues signify real differences in use of the pottery. Moreover, the clusters defined by the CuPyMS analyses are indeed related to specific pottery groups in the samples of Uitgeest. They also indicate that the distinctions made for the types of remains are meaningful. Altogether, the evidence can provide supporting arguments for the definitions of the vessel functions. The results of the chemical analyses of residues can be summarized and interpreted as follows:
Virtually all charred residues consist of a combination of carbohydrates, fat and/or proteins and are associated with pottery from group 2 and 3 (vessels with a maximum diameter >190 mm). These vessels are without doubt used as cooking pots. Only one sherd, estimated to be size group 1, showed the same type of residue. The soot on the exterior surfaces was caused by wood-fire.

The chars on the special category of vessels in group 1 (<190 mm, mainly shape 2) have a different composition than those on the larger pottery. The composition points to a heated oily substance as its source. In Uitgeest, this pottery consists of ‘dirty’ cups, often covered in soot and is clearly defined by size, shape and surface treatment. It is likely that the contents consisted of other than food-stuffs. Experiments, ethnographic data, and archaeological data provide fitting types of contents, such as oils, tallow, resins, etc.

The pigment applied to some vessels, mainly group 3 and 4 in Uitgeest, consists of a fluid with an anorganic basis to which an organic protein-rich substance was added. It is suggested, that the latter may have been blood. If the liquid material was unheated, it marks the end of a vessel’s regular use. In the Schagen pottery, pigment was applied to vessels from all pottery groups in association with ritual deposition.

The cream-coloured liquid residue is also formed by a protein-rich material. Contrary to expectations, a dairy product as the source material could not be proven and there is no exclusive relation with jars or vessels with handles. In Uitgeest, the residue is associated with soot and chars and mainly with group 3 and 4. In Schagen it is associated mainly with group 1, 2 and 5, but not with soot or chars.

The high correspondence between the morphologically determined vessel groups, the macro-definitions of residues, and their chemical composition is an important support for the methods used in this study and enabled the definitions of broad categories of functions for the pottery studied here. The results should encourage much more research on use residues on pottery from different periods and regions, so that more information on the foodstuffs as well as food-processing is obtained.

For the present study the evidence that cooking of vegetable food, perhaps together with meat, took place in pottery from group 3 is most important. This category of vessels forms the majority within the assemblages. Very likely cooking also took place in vessels of group 2.1 and 4.1. The evidence for group 4.1 is especially strong in sample 2, Uitgeest and in the Schagen sample. The virtual absence of pots with soot or chars in the polished vessels in group 1, Uitgeest sample 1 is also significant. Most of these are pedestalled bowls (highly polished and reduced), which never show any type of use residue. The only indication that they were used at all is the abraded interior surface; this may point to cleaning or scrubbing with a hard object. The same lack of residue was also observed for the black polished ware in the Schagen sample, present in all pottery groups except group 4. The data from both sites therefore point to the symbolic connotation of this type of vessel treatment. The actual use of the jars, group 5, is as yet not evident. Residues of all types except the painting are present in a few cases in both sites.

Secondary use?
Soot is observed in all pottery groups except the black polished vessels, indicating that at one time any vessel might have been used on or near a fire. Most likely an exchange of use between ‘cooking’ pots and other vessels took place to some degree in both directions. Further research is needed to provide more evidence for this hypothesis.

Despite the low numbers a closer look at the vessels with the liquid residue, the cream-coloured layer B1 is warranted, as it points to one specific source material but is found in a variety of vessel classes. Although the following is no more than a hypothetical interpretation of the present data, it may further the understanding of the relation between functional differentiation and the variation in actual use of specific pottery groups. The residue is found in vessels of group 1, 3, 4 and 5 in Uitgeest sample 1 (table 8.15.1c,d). Four of the seven cases are vessels with handles. In sample 2 it is present in vessels of pottery group 1-4 but not in the group of jars (with only 5 sherds of limited sizes). Most vessels in both samples show a combination of residue B1 and soot or charred residues, suggesting that the contents were heated. In the experiments carried out by Olthof (1996), the cooking of milk and porridge resulted in a similar combination of residues (fig. 8.26.4). The chemical analysis, however, indicates that the liquid substance was not heated. In that case, the carbonized residues were formed before the cream-coloured residue and are the results of different contents. A secondary use for cooking would have obliterated or changed the composition of the liquid residue. The data from Schagen, where the occurrence of residue B1 is restricted to the jars (n= 5) and to small vessels (<250 mm) (n=4), may be of help here. In the latter the residue was present in one handled vessel, in one ‘pseudo-jar’ (143-5), in one base-sherd (155-5), and in a miniature vessel (159-1). No charred residues were found, but soot was observed in two cases. None of the jars showed any sign of fire-related use. The evidence suggest that the liquids were kept in clean(ed) vessels in Schagen and it is possible that the vessels represent a much more restricted use in their primary functions only. If so, then the function of container for specific fluids was associated with specific types of vessels.
For the apparent contradiction in data from the two sites, two explanations can be offered. Firstly, the sample used in the chemical analysis may not be representative, as that particular vessel from Uitgeest shows no signs of soot or char. Secondly, the residue may represent the secondary use of vessels for storing this specific type of liquid. The latter explanation fits the idea that any type of vessel, but especially smaller ones, was used when containers were needed for seasonal and/or short term storage. At the same time the Schagen data indicate that vessels with handles or jar-like shapes were preferred over others for use as containers of liquids, at least in the context of rituals.

8.13 Interpretation: function of the pottery groups
For Uitgeest, pottery groups refer to the reclassified groups B1-5, see table 8.14. The subsample of complete profiles is not discussed separately.

Pottery functions in general were discussed in chapter 2 and in the introduction to this chapter. In the previous paragraph, several types of actual use were established which were connected with the formal pottery groups in varying degrees. Here it is attempted to define categories of functions for the formal pottery groups and their associated variations in surface treatment, based on both types of information. At this stage of research only general categories of functions will be distinguished for the samples of both sites. The arguments for the definitions are based on the morphological data from both sites, but the evidence for the pottery of Uitgeest is the main basis. The pottery in the two samples of this site represents the more ‘mundane’ use, and there is a good correlation between morphological aspects and the use residues. Although, strictly speaking, the relation between the formal and actual use of vessels must be analyzed independently, at this stage of research the latter is used as supporting arguments for the former. As a large part of the sample from Schagen consists of pottery selected or even made for ritual deposition, the selection criteria may affect the representativity of pottery groups as well as the source and type of use alterations. Even though the type of residues and their distributions are not essentially different from those in Uitgeest, in the Schagen pottery they are likely to represent a type of use linked first of all to the ceremonial contexts. Whether, and how much the content or use of the vessels may have differed from the ‘daily’ use and context is the subject of a separate analysis of depositional patterns in the Schagen settlement (see paragraph 14).

It was concluded in paragraph 11 that the degree of functional differentiation expressed in the morphological variation in the pottery itself is low. The correlations between morphological variables and between these and the use residues are at best strong and significant trends. With the exception of the jars and the small vessels of group 1, none of the defined pottery groups has exclusive combinations of properties except, by default, for the size of the maximum diameter. The few basic distinctions in size, shape, and surface treatments can be used, however, to infer a few primary functions for the pottery groups. The following functions are assigned with some confidence to specific pottery groups:

<table>
<thead>
<tr>
<th>1. Cooking function</th>
<th>GROUP 3 + 2.1 + 4.1</th>
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</thead>
<tbody>
<tr>
<td>2. Storage/ stock function</td>
<td>GROUP 4.2, also 4.1?</td>
</tr>
<tr>
<td>a – mainly for dry goods</td>
<td>GROUP 5</td>
</tr>
<tr>
<td>b – mainly for fluids</td>
<td>(+ vessels with handles?)</td>
</tr>
<tr>
<td>3. Special or multiple functions</td>
<td>a GROUP 1.2, also 2.2?</td>
</tr>
<tr>
<td>a – for keeping and heating special, non-edible substances, used on a regular basis</td>
<td>b GROUP 1 (.1 .2)</td>
</tr>
<tr>
<td>b – for keeping special food or fluids, used on special occasions.</td>
<td></td>
</tr>
</tbody>
</table>

This preliminary classification refers to only those primary functions that can be associated with specific characteristics of pottery groups. This of course does not exclude the possibility that more purposes were recognized by the users. For each of the categories the arguments, as well as the correspondence between function and use, will be presented.

8.13.1 COOKING
Ethnographic research indicates that cooking pots are the most easily defined group of vessels in any assemblage (chapter 2). The most important features of such vessels are the easy access to the content, the content capacity, a fabric which ensures a good heat conductivity as well as heat containment and an efficient heat transfer (Juhl 1995). The efficiency of heat transfer depends on the volume of the area below the maximum diameter (Juhl, 1993, 91) and on the treatment of the interior surface (Schiffer 1986). Altogether these requirements put contradicting demands on the size of the orifice: a restricted orifice reduces evaporation, but also the volume in proportion to heating surface and the accessibility to the content. Even so, all conditions together still allow for a large variation in form and fabrics. The vessels in group 3 in the three samples can be interpreted as cooking pots with some certainty, especially those with a short upper wall and large opening (shape 1). The difference in shape within group 3 is considered to be of little importance, given the more or less continuous distribution of the relevant size variables in all vessels. Because of the overall similarity with group 3, the slightly smaller vessels in group 2.1 are interpreted as cooking vessels as...
well and so are the larger vessels in group 4.1. Both groups also share the frequent presence of charred residues with group 3. The low number of vessels in group 4.1 may however indicate a different function (see storage). The function of vessels in group 2.2\(^2\) is less easy to determine, because of the larger variation in morphology and use residues; these vessels may have had a different function and are discussed separately below. The strength of the evidence for the cooking function of vessels in group 2.1, 3 and 4.1 lies in the following combination of arguments (indicated by the ‘plus’ signs):

The overall size and proportions
The vessels have a large opening and the rims are always bent outwards, giving easy access to the content. The capacity of these containers also makes them suitable for such purposes (Juhl 1995, 32-34). They can be filled up to the maximum diameter and because of the short upper wall, the content capacity is maximized. The large orifice could have been closed off during the cooking to reduce the loss of heat. The proportions of these vessels approach that of a ‘square’ (Bruyn 1979): the height and maximum width are approximately the same size while the angle and shape of the lower wall are smoothly adapted to these sizes. The overall proportions make these vessels quite stable.

+ Surface treatment
Non-metric properties, such as the surface also seem consistent with the function of cooking. The lower wall is often ‘besmeten’, especially of vessels in group 3.1 and 4.1. To repeat, such surfaces improve the heat conductivity and are therefore very suitable for any use associated with fire (chapter 2). It is argued here, that this type of surface is probably more relevant for larger vessels than for smaller ones in relation to cooking. The strain caused by differences in temperature between different parts of the vessel wall will be greater in larger vessels. The smaller a vessel, the more directly the complete wall will be heated by the fire. In most vessels the exterior surface of the upper wall is scraped and/or roughly polished. Several authors suggest that such an ‘open’ texture leads to inefficient heating because of increased heat transfer (see review in Juhl 1995). It is equally feasible, however, that an open texture may have been favourable for transferring the heat above the content through the upper wall, thereby preventing too large a difference in temperature with the lower wall. Moreover, heat loss through an open texture applies especially to the interior surface\(^2\)\(^4\). In the pottery studied here, most interior surfaces were smoothed by hand from the base up to the shoulder or minimum diameter, often followed by a rough polishing of the parts above it. This treatment of the interior surface is, however, not exclusive for cooking vessels.

The significance of the distinction in tooled and finger-impressed rims is less obvious. The latter occur more frequently. The technological explanation given above is that this treatment is a quick way of ending the construction of a vessel. Clearly, this argument is not directly linked to a cooking function. It can be argued though that a finger-impressed rim is more suitable for a use that does not involve pouring the contents out of a vessel. In that case a smoothed rim, together with a smooth surface, would be more practical, because both would be easier to clean. There is indeed some connection between the surface treatment and the rim. Impressed rims are mostly combined with rough polishing and/or scraping of the upper wall (88%), while in vessels with tooled rims in this group, 33% of the exterior surfaces are finely polished (table 8.8.1-3). The distinction in rim type and surface treatment therefore possibly refers to specific types of cooking or contents, in relation to the way the contents are ‘dished up’ (see below for further remarks on the subject).

+Sample composition
A third and strong argument for a cooking function is that the vessels of group 3 constitute the largest group in the two samples of Uitgeest (39% and 41%). Although the representativity of the samples cannot be proven, this is most likely also true for the total assemblages (see section 8.15). In most ethnographic contexts, cooking pots have the shortest lifespan\(^2\)\(^5\). In some societies eating bowls are broken even more frequently (appendix 2.2). In Uitgeest, the vessels in group 2-4 constitute 82% and 78% of the cases in sample 1 and 2 respectively. The majority are vessels with shape B1 (a short upper wall and wide opening), being 68% and 75% in group 2 and 3 and 80% and 90 % in group 4. In the Schagen sample, 67% consists of vessel from group 2-4, while 70% in group 2 and 3 and 60% in group 4 are vessels with shape 1.

(+Relations with use residues
A relatively high percentage of the pottery in group 2.1, 3 and 4.1 shows soot and charred residues. Although all groups contain vessels with sooted surfaces, the percentage of vessels with charred residues on the interior surface is clearly higher in the cooking vessels, especially in the Uitgeest sample 1. Moreover, in the sample of base sherds (sample 2) the percentage of chars is very high for bases with a diameter between 90-130 mm. As the size range corresponds with that of the complete profiles in group 2 to 4 of sample 1, the residues form strong evidence for their use as cooking vessel, in correspondence to the function. Another argument in favour of the cooking function is provided by the results of the chemical analyses of the chars, consisting of carbohydrates, lipids and proteins. Although it is not yet possible to define the exact parent material, the
composition of the residues points to foodstuffs that were cooked as stews or porridges (table 8.17). Of course, the few residues examined this way cannot be generalized for all others, nor can chars be used as ‘proof’ for a cooking function, but the evidence on use does not conflict in any way with the formal and functional classification.

**Two types of cooking (vessels)?**

Within the group, defined as cooking pots (group 2.1+3+4.1) a first division into two types seems possible, based on the variation in surface and rim treatments. As mentioned above, the distinction in surface and rim treatments may refer to different types of content and to different ways of using them. In Uitgeest sample 1, the upper wall is scraped or roughly polished in the majority of the cooking pots (n=63), often associated with finger-impressed rims (n=41; for Chi square p=0.05) and roughened lower walls. There is also a small group (n=14) with a finely polished upper wall. In twelve of these vessels the rim is tooled, five of them have handles and one an extended rim. Of the other cooking pots only one vessel may have had handles. Moreover, within this subgroup the percentage of soot and especially of charred residues is lower than in the majority. In none of the vessels with a finely polished upper wall charred residues are present and only 21% had a sooted surface. In vessels with a scraped or roughly polished upper wall the percentages are 40% and 52% respectively. The differences in use residues are in a minor way related to the distinction between shape 1 and 2 in group 3. In group 3.2 the percentage of soot is high, but that of chars is lower than in the vessels of group 3.1, as is the percentage of ‘besmeten’ surfaces (table 8.15.1b). Whether the slight difference has any significance for such few cases is questionable (but see table 8.19). Hypothetically, the polished rims and surfaces may be more suitable for pouring the contents instead of spooning them out of the vessel. In the same vein it can be argued that in the first case the contents are fluids, and in the second case a much thicker substance, the distinction between ‘soup’ and ‘stew’ in the modern sense. The presence of handles can be seen as a supporting argument. Altogether, it can be concluded that the majority of vessels in group 2 and 3 can be classified as cooking pots and that they were also used as such in actual practice. There are also indications for a further functional differentiation within the vessels with a cooking function, by means of rim and surface treatment and the presence of handles. The distinctions may represent different types of cooking, but an entirely different meaning cannot be excluded at present and needs further research. Especially further study of the treatment of the finishing treatment of the interior surfaces may be helpful in this respect.

**Cooking function and the association with pigment**

The pigment may have been made partly of a resinous material mixed with blood. In the two samples from Uitgeest, pigment was most often associated with pottery of group 3(.1) and 4.1 and less frequently with that of group 5. The relationship may point to the special use of some larger cooking pots. If the residue analysis is correct and the substance was indeed unheated, the painting took place after the use of the vessel for cooking and is marking the end of use for this purpose. In light of the evidence of Schagen, a final use in ceremonies seems likely. In the Schagen sample, moreover, vessels from all groups were ‘painted’, favouring the explanation that the paint was applied only on vessels marked for ritual use.

8.13.2 **STORAGE**

No exclusive or even well-defined criteria are available to link a storage function with specific vessel form and size. Both will depend on many factors, the most important being the type of goods being stored, their quantity and the duration of storage: long and short-term; fluids and dry goods, large and small amounts. Here I will limit the discussion to the two extremes of this range of possibilities:

1. the long-term storage of a substantial quantity of dry goods
2. the short-term storage of small quantities of a variety of goods including liquids

1. **Long-term storage vessels**

Theoretically, the long-term storage of a sizeable quantity of goods in ceramic containers is the type of storage which should be recognizable in archaeological assemblages. The main characteristics of storage containers in ethnographic and historical examples are the large size, and a relatively narrow opening which can be closed off but still allows easy access to the content. This type of storage vessel is not handled very frequently and can be placed in a safe environment, such as pits or corners of a dwelling. The lifespan is therefore comparatively long, resulting in a low frequency of the remains in an assemblage (chapter 2; appendix 2.2). However, a low frequency of large vessels in archaeological assemblages is enhanced by the fact that they are much more difficult to reconstruct into complete profiles.

For the settlements of Uitgeest and Schagen, the most obvious type of goods to be stored is agricultural produce like cereals and pulses. Although pottery is suitable for this purpose, several alternatives could have been used such as granaries and lofts or other than ceramic materials, such as baskets, wooden containers etc.26 Storage in pits is highly unlikely in both sites, because of the natural conditions. None of the pits or vessels in pits in Schagen contained foodstuff remains nor any other specific content. In Uitgeest no granaries were found that could be securely placed within the Roman period settlement.27 In view of the large settlement
area and period, it therefore seems likely that storage of agricultural produce took place in containers or lofts. If a storage function was assigned to pottery, the most likely candidates are the large vessels of group 4 (Gd >330 mm), but especially those with a relatively small opening, a long upper wall and large height (shape 2; table 8.14). An extreme example is pot 31-1, reconstructed from two parts on the basis of their similarity (fig. 8.12). The small number of vessels in group 4.2 in all three samples is taken as a supporting argument for a storage function. In Uitgeest, group 4.2 is 4% of sample 1 and only 1% of sample 2, in Schagen it is 6% (all vessels in group 4.1 and 4.2 together represent 14%, 15% and 14% respectively). The actual number of storage vessels in the assemblages is probably higher because of restoration problems. The higher percentage for group 4.2 in Schagen, due to the deposition of complete vessels of this type in a few pits, proves this. Whether vessels in group 4.1 that were used for cooking were also meant to be used for storage is difficult to determine. There is no clear-cut difference in surface or rim treatment between the two shapes in group 4. In most vessels in both sites, the lower wall is ‘besmeten’, the upper wall is scraped and the rim finger-impressed.

(+) Relation with use residues
In Uitgeest sample 1, charred residues and sooted surfaces were present in varying percentages in group 4.1 and 4.2. The number of cases is too low to attach much significance to their presence (table 8.15.2c). In Uitgeest sample 2, a much higher percentage of vessels in group 4 showed fire-related residues (55%), all of them with shape 1, but group 4.2 consists of 2 cases only. The presence of chars in group 4 indicates that at least part of the vessels were used for cooking, which seems to contradict the storage function. It is possible, however, that larger vessels had a double use and perhaps also a double function for storage and cooking. Such a function of the largest size cooking vessel is mentioned regularly in ethnographic studies and this category has a slightly lower life span than vessels which were used exclusively for storage (appendix 2.2). Alternatively, storage containers may occasionally have been cleaned above a fire to burn out micro-organisms. This would certainly be necessary when a pot was used to store grain produce. Both explanations are consistent with the presence of charred residues in the pottery studied here. Especially for the vessels in group 4.1, the combination of the two functions seems a likely explanation. The more or less continuous distribution in size and shape measurements of group 3 and 4.1 and the presence of pigment almost exclusively in pottery groups 3.1 and 4.1 (table 8.15.1d,2e) also point in that direction.

The evidence is admittedly not very strong, due to small numbers, but based on it the vessels of group 4.1 are classified as having both a cooking and storage function, while those with shape 2 are classified as storage vessels proper.

2. Short-term storage / multipurpose function
On the other extreme of the ‘storage’ spectrum, one can expect the need for containers for temporary, short-term storage of a wide variety of goods in small quantities (water, milk, blood, vegetables, stocks of meat, herbs, etc.). The function of the pottery is primarily that of ‘container’ sec; the type of vessel may not even be very important, only its availability. Again, many alternatives to ceramics were available for this purpose, like wooden bowls, leather bags, baskets etc. Especially for short term storage, the degree of functional differentiation recognized in pottery and other materials will be a factor of importance. If short-term storage of specific goods is not associated with its own specific ceramic form, it will be impossible to detect such a function in archaeological assemblages. In the samples studied here there are no special forms that point to the function of short-term storage of specific materials. Yet it can be argued that special features of pottery, like handles, mostly occurring in size group 2 and 3, or specific treatments of the surfaces (highly polished and reduced) indicate such a special function (see also section 13.2). One example is vessel nr. 18-5, in fig. 8.14. Furthermore, the size and low frequency of pottery in group 2.2, together with the variety in forms and use residues, could also indicate a special or multi-purpose function of this group, see the next section.

8.13.3 CONTAINERS FOR FLUIDS
At least one type, the jar, and possibly a second one, the vessel with handles, can be interpreted with some certainty as containers for liquids.

1. The jar
There can be little doubt that the function of the vessels in group 5, with their specific shape, is that of containers of fluids. The overall appearance and form is clearly defined as a separate category within all archaeological assemblages of this period. It also is so similar to ethnographic examples, that it seems justified to assume they had this specific function then as well as now. Supporting evidence is that these vessels always have smoothed rims, making it easier to pour and easier to clean them, while about half of them had handles.

Within the societies concerned, several possibilities for the liquid contents come to mind. First of all, milk from cattle and goats formed an important product (van Wijngaarden-Bakker, 1988). Milking was probably a seasonal activity; how it was processed is largely unknown. Cheese-making, as argued by the van Wijngaarden Bakker, seems a good
possibility. The link with the specific ceramic objects for this purpose is an interpretation I do not agree with, however. Secondly, the many wells found in the settlement of Uitgeest, point to the need for containers to haul water. In that case they should have handles and show abrasion around the neck from the rope. Because water containers would have been used and handled frequently, even on a daily basis, they are also subject to mechanical stress. Vessels with such a function are expected to have a short use-life and consequently to form a relatively high percentage in the ceramic assemblages. Clearly this is not the case in the samples studied here, not even in that of Schagen. The low frequencies of jars instead suggest that their use-life was relatively long or, alternatively, that the frequency of use and handling was low, while there are no signs of abrasion on any of them. In addition, the group of jars shows quite a lot of variation in non-metric properties in both sites. Jars with and without handles, with and without roughened surfaces, scraped surfaces, and polished surfaces are present in both sites. The variation in non-metric properties is so lacking in consistency that it seems to exclude any distinction in specific functions within this group. Even if there is, obviously none of the specific functions involved a high break frequency in actual use. Altogether the evidence makes it quite unlikely that the function of the jars was that of water carrier or container, and whatever its content, the jar was not used on a ‘daily’ basis. The remaining options are that jars were containers (a) for specific purposes, linked to periodical or seasonal activities, (b) for long term-storage involving very little handling, (c) for ceremonial activities only, and (d) for alcoholic beverages, beer and/or mead. The latter two options are the most fitting for the data from Schagen and probably in combination. Beer and mead are known to be part of the indigenous culture. If the historical sources are to be believed, the ‘Germans’ loved beer, which was used ‘in large quantities’ (Tacitus, Germania, chapter 22, 23). The love of alcohol is of course not typical for the Germans. The overwhelming evidence for the importance of drinking as a socio-cultural phenomenon is well-documented for the (Roman) Iron Age in Europe (Diepeveen-Jansen 1999; Dietler 1994; Pare 1989). Turning once again to the ethnographic evidence, in most present day communities in different parts of the world, the vessels used for beer-brewing as well as storage are jar-shaped. The studies also show a relatively long use-life for jars used for storing liquids, especially for beer storage and beer mixing, although there is a considerable variation in the exact lifespan between different communities (Varien & Mills 1997; appendix 2.2). Why this is so remains uncertain as virtually no additional information on the specific type of use is available.

Altogether, the conclusion can be drawn that in the western Netherlands jars probably had primarily a ceremonial function, associated with drinking and/or a function associated with dairy products (see paragraphs 14 and 15).

**Relation with use residues**

At present there is only one indication for what type of fluids were stored in ceramic containers, although it is not exclusively associated with jars. The residue, the cream coloured layer, is caused by a liquid substance and is found slightly more often in jars than in other pottery groups. The chemical analysis of two samples showed that the residue mainly consists of unheated proteins, which could point either to skimmed milk or to water with an unknown addition as a possible origin. The function of milk-container would fit in well with a limited, perhaps seasonal use frequency and a low stress level. However, according to Oudemans (1993,229), milk as the origin is quite unlikely, because the specific fatty acids are lacking. As the liquid residue B1 is also found in other vessel types in all pottery groups in Uitgeest and in group 1 and 2 in Schagen, other vessels than jars obviously were used for the same type of fluids (see paragraph 14.3).

2 **Vessels with handles or extremely narrow openings**

Several arguments were given above to consider the vessels with handles in group 2 and 3 as a separate class. The one vessel with an extremely restricted opening (‘Friese oorpot’: Frisian handled vessel; nr 31-15) clearly is not designed for ‘normal’ cooking activities. Examples of this type are found much more frequently in the northern provinces (Taayke 1990, fig. 17). The very globular shape shares only the restricted opening with the jars. A function as a container for fluids is most likely, because of the extremely narrow opening and the presence of handles. The same function may apply to other vessels with handles. Those in group 2 and 3 were discussed above, as part of cooking vessels. Surely the handles are applied for a reason and, as they are part of the construction process, must refer to a specific function within the rather undifferentiated morphology. The association with a function of liquids containers seems most likely; the question remains why a different shape than that of the jars was chosen, or vice versa why not all of the jars had handles. The only property this group of vessels shares with the jars is that the rims are always tooled. Handles occur on vessels with a short and long upper wall and both ‘roughened’ and other surfaces. Yet they are always associated with a finely polished upper wall. It is therefore possible that such vessels were used for cooking or heating liquids.

To summarize, the function of the jars, the handled vessels in group 2 and 3, as well as some exceptional forms is probably that of a container of liquids. It is quite likely that different types of liquids, or of treatment of liquids are associated with sub-types of these vessels, but the present
data allow no further inference on that matter. The use residues suggest that the handled vessels in form group 2 and 3 were also used on a fire, but whether this is an indication of their primary function or of secondary use is not clear either. It also is not possible at present to link specific fluids to variations in the morphological properties of these vessels. Beer, water, milk and perhaps blood are likely candidates in the societies concerned. Further analysis of the use residues is needed to establish the specific functions of these vessels and of the substance that formed the creamy layer.

8.13.4 SPECIAL AND MULTI-PURPOSE VESSELS

For several reasons, I consider most of the pottery in group 1 as either special or multi-purpose vessels. Group 2.2 is also included in the latter category. The pottery in group 1 and 2 consists of a variety of forms, with different shapes as well as surface treatments (paragraph 12). Group 1 contains at least two clearly defined subgroups with different functions, which is also borne out by chemical analyses.

Pottery for special occasions and with a special meaning: group 1

As mentioned, pedestalled bowls (fig. 8.12) form a specific type of pottery in indigenous sites in the Roman period in the western and northern Netherlands. Van Es (1965) called them *situlae*, suggesting a Roman influence or specific production centres for this type. Lately, Taayke (1990, 178,184) repeats that this ‘luxury ware’ may have developed from external, *i.e.* eastern influences and that it was probably produced in a few ‘centres’ only. I disagree with both authors. The technological analyses clearly show that these vessels are indigenous in every respect, from fabrics to construction and finishing techniques to firing methods. All aspects of these vessels are part of the standard range of techniques used by the potters. The only difference with the other pottery is that the techniques were applied with much greater care than usual and partly also to a specific form. The reduction as the final step in the firing process is not a foreign element, but is known throughout the Iron Age and Roman period in the Netherlands. The distribution of the bowls over all of the inhabited areas suggests that they are part of the standard household inventory, at least in the settlement of Uitgeest. But for what purpose?

Their shape and appearance leave no doubt that they were ‘special’, not in a foreign sense, but *special within the regional tradition*. The bowls never have any type of use related residue, but the inside surface often is damaged in a way that points to abrasion; the one sherd examined chemically had no organic residues on or in the wall. The pitted abrasion of the interior surfaces is most consistent with a content of dry goods, which were rubbed with a rather hard object. These data, together with the infrequent presence, do not fit the use as a drinking cup although such a function would be most fitting with the ideas about the drinking habits. For the same reason, the function as eating bowl, at least a regular basis, must be excluded.

The black polished ware also forms a special category among the pottery from Schagen, where it is equally lacking in fire-related or other residues (except in two specific cases, see paragraph 11). Here, the range of forms treated this way is much greater and the vessels were placed in specific ritual contexts. This pottery clearly had a highly symbolic value and was made for and used on special occasions only, even though the contents are yet unknown.

A second group of small vessels with polished surfaces is present in even smaller quantities than the reduced ware, also mainly in Uitgeest (see fig. 8.12.1). A few of these have one handle or some rim extensions. Their overall form is compatible with a function as drinking cups. However, the low number seems to contradict such a use on a regular basis.

Pottery for heating special substances: group 1.2

Also part of group 1 is a specific type of vessel with crusts of soot all over the exterior, and sometimes interior surface, often in combination with chars on the inside. They were obviously frequently used on or near a fire. Based on size alone, the most probable function seems to be that of serving or eating bowls. However, this type of use is inconsistent with the thick layers of soot and chars. More importantly, if eating/serving of the cooked food was their main function, their use-life would have been short. As small vessels have a higher chance of being recovered in large fragments and of being restored to full profiles, the number of vessels in this category should be significantly higher. The conclusion is therefore that serving or consuming was neither their function nor their use. The latter is firmly supported by the results of the residue analysis. If these vessels were used to consume food, the chemical composition of the residues should be the same as those in the cooking vessels. Instead, the composition of the residues is clearly different and is probably caused by heating *oily substances*. A quite likely use is suggested by the Iron Age life experiment carried out at the prehistoric open air museum in Eindhoven (Boonstra 1997). The group used several small bowls for tallow, oil and animal fats, which were re-heated when needed. These materials were used for example to repair cracked pottery, for lighting (*ibid.*, 63, 84), etc. Small bowls were also used for keeping coals and ashes and left-overs from meals. Such uses would all be consistent with the appearances and sizes of the vessels in this study, as well as with the information on the cultivation of linseed and camelina (both plants with oil-bearing seeds) in later prehistory.
8.13.5 ‘Besmeten’ Surfaces and the Function of the Pottery

As mentioned, ‘besmeten’ surfaces are commonly interpreted as a technological measure related to the function of the pottery. Two explanations are usually offered. The first one is that such a surface improves the grip or hold of the pot, while the second states that it improves thermal stress resistance and heat conductivity through the enlarged contact surface (appendix 2.2). In the first case, one would expect ‘besmeten’ surfaces on large vessels and/or vessels which are handled frequently. In the second case they would be associated with cooking vessels. Their restricted occurrence in the assemblages from both sites certainly points to a conscious decision of the potters. Although ‘besmeten’ lower walls are present occasionally in all pottery groups, the larger the size of the vessel the more frequently this treatment occurs. Within the interpretations made above, that group 3 and 4 comprise both cooking and storage vessels, both explanations are therefore equally feasible. Another argument in favour of both functions is the fact that this type of treatment was limited to the lower wall. This part of the vessel contains most if not all of the content (Juhl 1995) and is also most directly in contact with the fire. However, because cooking pots are also handled frequently, they are subjected to mechanical stress as well. Therefore it can be expected that all of the cooking vessels have ‘besmeten’ surfaces. For the majority of vessels in group 4 en perhaps group 3 this is indeed the case, but not for all and certainly not for the smaller cooking pots in group 2.1. The relation with size seems to favour the ‘handling’ argument. A counter argument is that a large percentage of these pots may have had a double function for cooking and storage. My own conclusion is that a roughened surface was first of all a protection for vessels that were used most frequently for cooking, but at the same time provided a better grip for larger vessels. The smaller the cooking vessel, the less important the containment and conductivity of heat is and the special treatment is then probably less important. These explanations are purely technical. Yet the possibility of a functional or cultural value should not be excluded. A ‘besmeten’ surface is a very distinctive marker, especially in comparison with the smoothness of a well-polished surface. It certainly refers to a cooking or heating function, as is also witnessed by the small vessels for heating non-edible substances. Moreover, the clay applice was sometimes used on larger vessels as the basis for decoration, consisting of groups of vertical and parallel lines. The lines are created by running 2-4 fingertips through the wet clay-applice and are practically the only form of decoration present in the Roman period pottery (see fig. 8.12 and 8.23 for examples).

8.14 Pottery groups and ritual deposition in Schagen-M1

Schagen-M1 provides an unique opportunity to carry out a contextual analysis of material culture involved in utilitarian and ceremonial practices. The interpretation of the features and their contents by Therkorn (forthcoming) was presented in chapter 3.5 (table 3.3). Around the dwelling extensive craft production and ritual activities took place. The most important ceremonies were carried out at the three seasonal changes, late spring, fall and midwinter, and involved the deposition of special categories of materials in distinct clusters of pits (fig. 3.8)31. These categories are associated with food and material production activities and the depositions were possibly made on a yearly basis. The distribution of the pottery sample in and across the main types of features was discussed in the summary of the formal analysis (paragraph 10). A further investigation into the depositional context of the pottery is aimed at a better understanding of the meaning of pottery in ritual as compared to utilitarian practices. The first question is which types of pottery were selected for ritual depositions and how this selection was related to their normal household functions. The second question is whether the type of vessel itself was important and carried a meaning of its own or whether its content was of more value during the ceremonies. Both suppositions are feasible. Although samples taken from the soil in the vessels gave no clues as to their contents, on many of them use residues are present. There also is strong evidence that quite a few vessels were specially made for use in ceremonies and ritual deposition. Thirty of the pits excavated on the site were assigned to a specific season32. Spatially, the pits were arranged in clusters of three, one for each season of deposition. Within a cluster, the shape of the pits is either rectangular or round, with the exception of cluster 6. The layered fill in most pits suggests that depositions within each pit also took place in temporal
sequences. In the following analysis, the structural relationship between the pottery groups, their possible functions and the ritual context is explored, according to the analytical categories outlined in chapter 1 (fig.1.1):

– the selection of vessel forms (the pottery groups defined above).
– specific characteristics of these vessels: the mode of construction, finishing treatments and firing technique,
– the association or avoidance of vessel types in each feature and cluster(s) of features.
– the combined spatial distribution of pits and pottery.

For several variables and associations abbreviating terms will be used to reduce textual complexity. For example the combination of pit and season is abbreviated as winter pit, spring pit, and fall pit or seasonal pit. The modes of construction, described in paragraph 9.3, will be abbreviated to ‘rough’, ‘fine’ and ‘normal’. Table 8.18a,b shows the distribution of the pottery groups for each season, while in table 8.18c the pottery is arranged according to the clusters of pits, from winter to fall. Pottery is present in 18 pits and 11 clusters. In table 8.18d, also arranged by cluster number, the relationship between the clusters and the mode of construction of the pottery groups in the northern and southern area is presented.

8.14.1 THE DISTRIBUTION OF POTTERY IN PITS, ASSOCIATED WITH WINTER, SPRING AND FALL RITUALS

The data in table 8.18a,b represent the final state of all depositions in seasonal pits. All pottery groups are represented. Despite the low numbers, the difference with other features in the relative frequencies of the pottery groups indicate a specific selection of complete vessels and complete profiles for deposition. The number of vessels of group 2 and 5 is higher and that of complete vessels of group 3 is lower than expected, in comparison to the pottery from other features and to the sample compositions from other sites. Vessels of groups 2 constitute the highest percentage of complete profiles in the seasonal pits and by far the largest absolute number of vessels (table 8.18b).

The distribution over the seasons also seems to be specific. Although the number of cases is too small for statistical testing, the data indicate a deliberate selection and association of pottery by size and shape for each season. One or more vessels from group 2 are present in each season and in many pits, in combination with jars (group 5), although only three winter pits, two spring pits and one fall pit contain jars (table 8.13b; 8.18c). The relationship between the two groups is accentuated by the presence of jar-like shapes and vessels with handles in group 2. The two types are accompanied by vessels of another and different size group in each season, from large vessels in the winter to slightly smaller cooking vessels in the late spring and the small special ware of group 1 in the fall rituals.

In the winter pits vessels from group 2 and 5 dominate, including most of the complete profiles or vessels. It is the only season with at least two complete vessels of group 4, interpreted as cooking/storage vessels (but probably four, see note table 8.18b). In the spring pits, group 2 is associated with the highest number of complete profiles of group 3, the cooking vessels. It is striking that vessels of group 3 and 4 never occur together in one pit. In the fall pits all pottery groups are represented again, but vessels from group 1 are now the most frequent. All of these are complete profiles and so is the one jar, while the rest of the pottery consists of partial profiles only.

At the same time, the total number of vessels deposited is dropping from winter to fall, while the number of pits for each season is nearly the same (6, 5, and 5 respectively). Therefore nearly twice as many vessels were used in the midwinter rituals than in the fall and the importance of pottery in ritual depositions seems to diminish through these seasons. In the two pits interpreted by Therkorn as representing all seasons, only two complete profiles were found. The distribution of the pottery is moreover linked with the spatial distribution of the individual clusters.

**Relations between the northern and southern area**

In table 8.18c the clusters are arranged according to pits with pottery for one or more seasons from winter to fall, *i.e.* from high to low numbers of vessels, ending with the two pits representing ‘all seasons’. Four of the six winter pits with pottery are associated with those for another season, one with spring, two with fall rituals and only one with both (cluster 7)\(^3\). One combination is formed by pottery in a spring and fall pit (cluster 6). In the remaining clusters, only one of the features contained pottery, three in the northern and one in the southern area. Between the northern and southern area the same number of clusters and the same feature-season combinations are present in both areas. At the same time there is a clear difference between the two areas in the number of vessels deposited in the late spring and fall rituals, due mainly to the lack of depositions in these seasons in the southern area. Moreover, in the arrangement of clusters in table 8.18c, there is a distinction in pottery groups in relation to their location. Group 1 and 5 are represented in all seasons in the northern area. Pottery of group 2 is used most frequently in the southern area, while groups 1, 4, and 5 are used in the fall and spring only. Obviously, the more vessels that are deposited within a cluster, the more pottery groups are represented. Yet there are no pits which contain vessels from all groups and only in cluster 7 all groups are represented. Cluster 7 is also the only one with vessels in each of the three pits. This distribution pattern suggests that
vessels from different groups were indeed *added over time* to specific features and clusters and perhaps in a specific sequence.

As at least some of the pottery was made in a special manner, perhaps for ritual deposition, the relationships between the mode of construction, surface treatment and firing method are analyzed in relation to the spatial location of the clusters (table 8.18d). The first group consists of ‘fine’ ware, the highly polished and usually reduced vessels; the second is the ‘rough’ ware, fired in an oxidizing atmosphere (see paragraph 11). The distribution of these two types of vessels and their relation with the ‘normally’ made ware, possibly sheds more light on the meaning of the pottery groups in rituals and/or on the relation between the northern and southern area within the cycles of deposition. With exception of cluster 2 all clusters contain at least one well-made vessel and, except cluster 2 and 8, all contain at least one reduced vessel. Cluster 2 is the only one with a combination of ‘rough’ and ‘normal’ ware, while cluster 8 contains only one well-made but not reduced vessel. In three clusters (4, 5, and 7) all pottery groups and all modes of construction are represented, although not in each individual feature. The clusters include the three features with the highest number of vessels (discussed in more detail below). In clusters 6 and 11, all three modes of construction are present, but the pits contain a selection of pottery groups only. It seems therefore likely, that not only the type of vessel but also the construction modes are associated with the frequency or the sequence of deposition. In both areas ‘rough’ and ‘fine’ vessels are present in equal amounts:

<table>
<thead>
<tr>
<th>Construction</th>
<th>‘rough’</th>
<th>‘fine’</th>
<th>‘normal’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern area</td>
<td>N 18</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>% 43%</td>
<td>48%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>Southern area</td>
<td>N 6</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>% 30%</td>
<td>30%</td>
<td>40%</td>
<td></td>
</tr>
</tbody>
</table>

With one exception, the reduced vessels belong to the category of fine ware; they are present in both areas and in all pottery groups except group 4 (see below). In the dwelling area a much higher percentage of the fine ware is also reduced (83%, and 55% in the northern area), while the group of ‘rough’ ware consists of smaller vessels or jars (group 1, 2 and 5; table 8.18d). The percentage of normally made pottery is also much higher in the northern area and this pottery consists of vessels of group 2, 3 and 4 only. In the northern area on the other hand, the normally constructed vessels are part of group 1, 2 and 5. All groups are represented in the specially made pottery. These data suggest that there is a dichotomy or even an opposition between the northern and southern area in the choice of ‘rough’ or ‘normal’ vessels of group 1 and 5. The opposition is especially clear when leaving out group 2, which is present in all seasons and all clusters.

<table>
<thead>
<tr>
<th></th>
<th>‘rough’</th>
<th>‘fine’</th>
<th>‘normal’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern area</td>
<td>all</td>
<td>all</td>
<td>1 + 5</td>
</tr>
<tr>
<td>Southern area</td>
<td>1 + 5</td>
<td>all</td>
<td>3 + 4</td>
</tr>
</tbody>
</table>

A second dichotomy can be seen between the northern and southern area in the ‘normal’ ware, between cooking/storage vessels on the one hand and jars and vessels with special functions on the other.

To sum up, the ritual context analysis indicates, firstly, that size and shape together with the mode of construction and firing method are important elements in the choice of pottery. These elements are used in alternating ways in the clusters in the northern and southern area of the settlement. The fine, reduced ware is clearly the most symbolically important category of ceramics in the depositions, while the other two modes seem to be used as additions or as oppositions. Secondly, the jars and jar-like shapes, the fluid containers, have a significant meaning of their own and are used in a few special features. These distinctions were spatially expressed as well34. In the following part, the feature context of both categories is analyzed in more detail.

8.14.2 THE CONTEXT OF JARS, OTHER VESSELS WITH HANDLES, AND REDUCED WARE

Jars and other vessels with handles

Group 2 and 5 are not only the most important vessels in connection with ritual deposits; they also share the presence of handles on the vessels (36% of all jars and 63% of jars with complete profiles; 43% in group 2) and the ‘jar-like’ shape. All three types are interpreted as containers for storing liquids. Their distribution is more restricted than that of other pottery groups. Jars were present in ten features (6 pits involved in the seasonal rituals, 2 hearths, 1 ditch and 1 layer; table 8.13a,b). The only part of a jar in what seems to be an occupation layer (feature 30) is associated with the ‘industrial’ hearths in the northern area35. The five jars with handles are found in five features (4 pits and 1 hearth). Specially made ‘pseudo-jars’ are present in two features only (see below). Other pottery with handles (group 2 and 3; n=8) is present in eight features, six of which are again pits associated with seasonal deposition. The two other incomplete vessels with handles in the sample are reconstructed from a hearth (feature 135) in the northern area and from the fill of the house ditch (feature 240). In five of the eight cases this pottery was found in combination with jars. Complete profiles or complete vessels with handles and jars were all recovered from the ritual pits, except one complete profile.
restored from the sherds of the hearth in the dwelling. Dwelling hearths have a highly symbolic value in the Roman period in the western Netherlands (Therkorn 1987a), while ritual depositions in ditches around houses are a common phenomenon in settlements (e.g., Hessingh 1993). The fact that nearly all liquid storage containers are recovered from ritual features further strengthens the symbolic value of this pottery. Most of the features with jars are located in the northern area, where also the highest number of ‘rough’ jars and jar-like pottery is found.

Reduced ware
It is hardly surprising that the polished and reduced ware (abbreviated below to reduced ware) is used to create differences within the pottery. Such vessels are markedly different in appearance from all others. So-called pedestalled or protruded foot vessels were found in many of the features, but only the foot itself (the ‘pedestal’), never a complete vessel. Their distribution shows no relation with a specific context.

The presence of these ‘feet’ may be part of the foot symbolism expressed by the animal bones (Therkorn 1991/2). Instead of complete pedestalled bowls, other reduced vessels are present in all pottery groups in small numbers, except in group 4, and in all clusters except cluster 2 (n=16; table 8.18d). Some of these are truly bowl-shaped (for example pot nr. 31-1, fig. 8.22). Complete vessels were deposited in features 21, 31, and 212. Eight of the reduced vessels are jars (n=6) and vessels with handles. The reduced jars were found especially in features 79, 143, and 223 (see below). These data indicate that the two symbols, the jar-shape and reduced firing, are combined in the context of the seasonal ritual depositions and thereby gain extra symbolic value. This interpretation is supported by the presence of one ‘black’ Roman import jar in feature 147. In feature 148, cluster 7, another incomplete and ‘black’ import vessel was present, which probably had a narrow opening as well. Of the other reduced vessels in the sample, seven cases are part of group 2 and 3 (one unknown).

To further explore these tentative trends in links between feature context, construction and firing techniques and pottery functions, the three features with the highest number of vessels are analyzed in more detail.

8.14.3 POTTERY IN FEATURES 143 (WINTER), 223 (WINTER) AND 79 (SPRING)
Features 79, 143, and 223 contain the largest numbers of vessels (fig. 3.8, 8.23 and 8.24). In each, specific and defining associations of material objects and categories were found (table 3.3). The spatial division between the seasons and the areas and its relations with the mode of construction of the selected pottery groups is clearly present in these examples. The pits are also the only ones with more than one jar amongst the deposited pottery (table 8.18c).

Feature 143 (northern area, cluster 5; winter ritual) is a large rectangular pit with two layers in its fill and is interesting in more than one respect. The lower fill contained diverse bones of cattle, sheep, pig, and horse, as well as a bone die. The upper fill contained bones of sheep and cattle, a bone bridle disc and two playing discs, together with ceramic slag, daub, and 11.5 kg of pottery (Therkorn forthcoming). The eight vessels that could be restored from the sherds represent group 1, 2 and 5 only. The five complete profiles were probably deposited as complete vessels. Vessels nr. 1-6 (group 2 and 5) are very similar in all respects; they share the characteristics of raw materials, firing methods, construction and finishing techniques as well as form. These vessels are all very ‘roughly’ made; the coils are badly joined, the walls are irregular and thick and most vessels are lopsided (fig. 8.23). The fabrics are also quite similar and all were well-oxidized (with a yellow to orange colour). It is not likely that this pottery was suitable for actual use. The pit contains one small jar (pot nr. 4) and two other pots with a jar-like shape (nr. 3 and 5). The jar with handles (nr. 5) was placed on its side with the opening pointing to the north-east (see chapter 3, fig. 3.9). Pot nr. 6 is a small ‘rough’ cooking vessel.

In two cases (pot nr. 1 and 2, both with finger-impressed rims), sherds from other features fit those from pit 143. Pot 143-1 is reconstructed from sherds from features 143, 30, and 148. Vessel nr. 143-2 contains a few sherds from feature 156. Both are recovered from the topfill of feature 143 and it is not clear whether they represent the last deposition or are part of the covering layer. The overall similarity between the vessels suggests, however, that (sherds of) pot 1 and 2 were deposited in the highest layer of the pit fill itself. Vessel 143-2 is ‘marked’ by pigment residues on the interior and exterior surfaces (fig. 8.26b) and the vessel probably served as a container for the fluid that left the residue. Pot nr. 7 and 8 on the contrary are well-made and reduced. The first has a very globular shape, but is classified as a jar because of the very narrow opening. The lower wall sherd (nr. 8) is included in the sample because it is part of a pedestal bowl, polished and reduced. In sum, most complete profiles or vessels in this pit are small, badly made and fully oxidized containers and most are associated with storing liquids.

Feature 223 (southern area, cluster 4, winter ritual) is a small, rather shallow rectangular feature in the southern area. The fill consisted of tightly packed material: a spindle whorl, a variety of bones from cattle, sheep, horse and pig, a polished boar’s tusk, wood (including construction beams), a...
The pottery of groups 2 and 5 are the basic categories for deposits in both areas. The vessels of the first group are either badly or normally made, those of the second are either badly made or well-made and reduced. For the other groups either ‘rough’ or ‘fine’ vessels are present in the northern area, but ‘rough’ pottery predominates. There also is a clear difference in the size selection between North and South, small and large respectively. The well-made jars in feature 223 are exceptionally large. Moreover, the clusters to which these pits belong are the only ones with cooking/storage vessels (group 4) and this pottery is associated with the winter and fall rituals only (see also chapter 9.1.2). It is not clear why the large storage vessels are never reduced. The distinction in the types of pottery within feature 223 is therefore also present between the contents of this pit and the other two, especially feature 143. In other words, the dichotomies
small/large, oxidized/reduced and rough/fine seem to be spatially expressed as well, as an opposition between the northern and southern area. Moreover, these categorical distinctions are combined in different ways in different pottery groups. The normally made vessels, especially the smaller cooking pots, were probably taken out of the existing household inventory and are found more often in and around the dwelling itself. Perhaps the same can be concluded about some of the storage vessels. On the contrary, all of the containers for liquids are specially made. In this group the categories seems to be connected in a direct manner and related to specific features:

\[ \text{Rough} + \text{small} + \text{oxidized} : \text{Fine} + \text{large} + \text{reduced} \]

Within the northern area the two categories are found in different pits, while the first category is hardly found in the southern area.

8.14.4 SUMMARY

Although the contextual interpretations are obviously still tentative and highly hypothetical, the following aspects seem to have played a major role in the choices of pottery for ceremonial depositions.

Firstly, the vessels deposited in the ‘seasonal’ pits represent a conscious selection of specific sizes and shapes. This selection refers to the general functions of the vessels. There is a preference for complete smaller-sized vessels (group 1 and 2) and for containers for keeping fluids (group 2 and 5). Group 2 and 5 are the essential elements for the midwinter and late spring rituals and are associated mainly with one other pottery group in each season. Storage—or cooking and storage—vessels were deposited in the winter and cooking vessels in the spring. In the fall rituals, the special pottery of group 1 is predominant. Thus the size of the selected vessels is decreasing from winter to fall depositions, as is the total number of vessels. There also is a change in the place of deposition. The winter depositions seem equally important in both areas, but those of the spring and autumn are concentrated in the northern area.

Secondly, many of the deposited vessels were ‘specially made’. There are two distinct ways of construction and finishing treatment, combined with a distinction in firing methods: the ‘finely’ and ‘roughly’ made pottery. The two modes are represented in all pottery groups. As the potters in this settlement obviously knew their craft, witnessed by both the normal and fine ware, it must have been a conscious decision to make ‘bad’ pottery. Together, the two special modes of construction clearly form a dichotomy or even an opposition in the visual aspects of the pottery.

The symbolic meaning of reductive firing in the western Netherlands in general during the Roman period has been discussed before. The evidence from the depositions indicate that the ‘jar’ also had a symbolic value. This is strengthened by the facts that reduced jars are found in the most important ritual features 79, 143, and 223, and that some of these vessels are exceptionally large. While in Uitgeest the black polished ware consisted mainly of (nearly) complete bowls, in Schagen a variety of forms and sizes of such ware is present. Obviously, the symbolic value of the special appearance remains throughout the Roman period. The reduced vessels never show any use residues as far as could be determined. It is therefore unlikely that such vessels were selected from the household inventory-in-use, although the forms are clearly based on it.

Thirdly, there are indications that the pottery selection is connected with the spatial layout of the clusters. The pits in the northern area contain more pottery than those in the southern area, especially pits associated with late spring and fall rituals, and a much larger percentage of these vessels were specially made. In the pits in the southern area more ‘normal’ vessels were deposited, which are mostly cooking vessels. The very few cooking vessels recovered from pits in the northern area are all specially made. This evidence strongly suggests that the ‘normal’ use ware, was taken from the household inventory-in-use. As this area contained the house, there seems to be a positive relationship between the two. In the same vein it can be argued that there is an avoidance of vessels from the existing household inventory in depositions in the northern area. There also is a dichotomy in the use of the jars and jar-like shapes in relation to the location of the pits. Those in the northern area are either small and oxidized or large and reduced. In the dwelling area, the number of jars and vessels with handles is lower, but most of these are large, well-made and reduced. This distinction is not related with the seasons of deposition. The reference to fluids would fit in well with the general pre-occupation with ‘wet’ contexts for ritual use in many areas in Europe, including features that were cut into the soil (see Cunliffe 1993). In other words, are the jars a representation of water? The few ‘oversized’ jars in pit 223 as well as jars being deposited on their side may be seen in this light. The other vessels selected for deposition seem to be referring partly to daily activities, such as cooking and storage, and partly to just being a container. Perhaps, the spatial structure itself and the differences in the pottery selection between the northern and southern area can be connected to gender differences. In the north all features point to outside activities, especially crafts, while the southern area contains the dwelling with its inside activities. Therkorn (pers. comm.) suggested that the northern deposits refer to the livestock-component of the economic cycles, while the southern deposits refer to the home and possibly to agriculture. She suggested previously that this dichotomy can be
linked to a distinction in male and female domains (Therkorn 1987). Assuming that pottery making was predominantly a female activity it can be suggested that the differences in construction modes and types of vessels refer to or symbolize different ‘domains’ of activities for men and women and/or to a difference in their involvement in specific rituals. A second suggestion is that there may be a connection between the containers for fluids and milk, referring to the livestock, or to the drinking of beer on special occasions. Possibly, both required specially made and unused pottery as opposed to used pottery for cooking and storing of harvest produce.

In conclusion it is suggested that several categories of pottery were used to express distinctions made in ritual activities, which themselves may have been associated with specific food-production activities and with the time of year in the productive cycles. The most clearly defined elements that formed part of the cultural-ritual logic of the inhabitants in Schagen-M1 are listed schematically above. Clearly, the links between the categories within the pottery and the spatial-temporal contexts of deposition are as yet only partly understood\(^4\). Further research including data from other settlements is needed to explore the structural relations in material-spatial contexts. A first continuation of this analysis has to focus on the relation between pottery and all other material categories, in the settlement at Schagen-M1 as well as other sites in North-Holland with similar features (e.g. Schagen-M3; Assendelver polders, Velserbroek polders etc).

### 8.15 Summary: form, function and use of pottery

In the following summary, the results of the previous analyses of form, function and use (paragraphs 11 to 13) are combined into a more generalized view on the functional taxonomy and the use of pottery. It includes a comparison with two other studies of pottery from the same period and an exploration of the data of Uitgeest for the reconstruction of household inventories.

The most important conclusion to be drawn is that the pot-

<table>
<thead>
<tr>
<th>Elements</th>
<th>Categories</th>
<th>Possible association</th>
</tr>
</thead>
<tbody>
<tr>
<td>POTTERY:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLAY:</td>
<td>(Fe-) inclusions</td>
<td>firing method</td>
</tr>
<tr>
<td>CONSTRUCTION:</td>
<td>rough : fine</td>
<td>special = new (unused)</td>
</tr>
<tr>
<td></td>
<td>: normal</td>
<td>utilitarian = old (used)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>out of household inventory</td>
</tr>
<tr>
<td>FirING METHOD:</td>
<td>oxidized : reduced</td>
<td>yellow-red : black</td>
</tr>
<tr>
<td>SHAPE:</td>
<td>jar(shape)</td>
<td>fluids</td>
</tr>
<tr>
<td>SIZE:</td>
<td>large : small</td>
<td>colour</td>
</tr>
<tr>
<td>RIM AND BASE:</td>
<td>head : foot</td>
<td>size</td>
</tr>
<tr>
<td></td>
<td></td>
<td>construction season?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>animal bones ?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACTIVITY (area)</th>
<th>Categories</th>
<th>Possible use</th>
<th>user</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husbandry</td>
<td>milk + cheese (storage)</td>
<td>Jars</td>
<td>male?</td>
</tr>
<tr>
<td>Craft production</td>
<td>metal</td>
<td>Water jars?</td>
<td>male?</td>
</tr>
<tr>
<td>Agriculture</td>
<td>seed and consumption</td>
<td>Storage vessels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>herbs, legumes etc.</td>
<td>Cooking vessels</td>
<td>female?</td>
</tr>
<tr>
<td>Ceremonies</td>
<td>(beer) brewing</td>
<td>Smaller vessels:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>drinking</td>
<td>cleaning, storage, cooking</td>
<td></td>
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<td></td>
<td></td>
<td>Largest vessels?</td>
<td>male?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jars passed around?</td>
<td></td>
</tr>
<tr>
<td>North/south</td>
<td>outside : inside</td>
<td></td>
<td>male - female?</td>
</tr>
</tbody>
</table>
8.15.1 FUNCTION AND USE

Daily, practical use

The most important and well-defined vessel is the cooking pot, usually with a width and height between 25 and 34 cm. Smaller and larger sizes with the same function exist as well; the overall range is circa 20-40 cm. The cooking vessel is defined by a wide opening and a short upper wall, while the maximum diameter and the height are more or less the same. The larger the vessel, the more frequently the rim is finger-impressed and the lower wall intentionally roughened (fig. 8.29a,b,d, 8.30; table 8.19a,b, 8.20b,c). This treatment can be associated with the protection against both thermal and mechanical stress. The cooking vessel has the highest frequency, not only in the samples studied here, but in general in Roman period settlements in the western Netherlands (see below). The frequency is consistent with the available evidence on use-life and break-frequency for cooking pots. The presence of soot in combination with charred remains of foodstuffs shows, that the vessels were actually used for cooking as well (table 8.19c,d; 8.20d).

A functional distinction was possibly made within the general category of cooking pots. While most of the vessels in Uitgeest, especially those larger than 29 cm, show the above characteristics, a second category of vessels is present in which the lower wall is not roughened and the rims are mostly tooled, while the exterior surface is more often polished and in a few cases two or three handles are added (compare fig. 8.29a,b). The vessels are mostly smaller-sized (group 2) or tend to have a slightly narrower opening (group 3.2)42. They may have had a function as cooking vessel for fluids or other special contents. If they represent a specific category than their use frequency is much lower than that of the main cooking vessels. In the pottery of Schagen, the number of vessels and the variety of shape and surface treatment in group 2 is higher, but many of these vessels are associated with ritual depositions (see below). The ‘normally’ constructed cooking vessels show basically the same characteristics as those of Uitgeest.

An interesting result in this context is the lack of any vessel category that can be associated with serving or eating (cooked) food in Uitgeest and probably also in Schagen. Although in the latter site some bowl- and dish-shaped forms are found, the vessels show no sign of actual use and most were found as ceremonial depositions. Certainly their number in the assemblages of both sites is far too small to have been used in daily life. The conclusion is, that either an alternative material, like a wooden bowl, was used or that the food was eaten straight from the cooking pot. In either case, the food was probably spooned out of the vessel, not poured. This habit may be one of the reasons for the finger-impressed rims. The evidence for wooden bowls is scarce, although this obviously does not mean that such equipment was not used. In most circumstances, wooden artefacts will have decayed after deposition, while another possible fate is their use as firewood43.

The second clearly defined category of vessels is the jar and its function as a container for fluids, like water and milk. In view of the many wells in Uitgeest, the low frequency of the jars makes the former less likely44. Clearly other materials were used to haul and store water from the wells. An association with periodically available materials, such as milk, seems more likely. In addition, the data from Schagen show clearly that the shape as such played an important role in ritual depositions and probably carried an intrinsic, symbolic meaning beyond that of practical use45. The symbolic connotation can also explain the low numbers in both samples. The purpose of the variations in surface treatments in this group is as yet not clear. The presence of soot and chars on some of the jars indicates that the contents were sometimes heated.

The third specific category are vessels smaller than 19 cm, present mainly in Uitgeest, with an unfinished or scraped surface and roughly tooled rims. Part of the lower wall is usually roughened, although less extensively than the cooking vessels (fig. 8.29c), while the surface is often covered with crusts of soot and chars. The chemical composition of the chars differs from those on cooking pots. Most likely, the vessels were used to heat special substances, but not
foodstuffs, such as animal fats, vegetable oils, and tallows, used for a variety of purposes. Without this group the differences between the presence of chars in cooking vessels as compared to all other vessel types would be more pronounced (see table 8.19,c,d). There are very few parallels for this type of vessel; they are not present in the Schagen sample, although vessels like nr 79-10 and 115-2 may have had a similar function (fig. 8.24). A few examples are also known from the Assendelver Polder sites.

Fourthly, the function of storage is ascribed to the largest vessels with a narrow opening and a long upper wall (group 4.2), most likely made for storage of larger quantities of (dry?) goods. Within group 4, the shape variations in the upper wall are well-defined and meaningful. The vessels with shape 1 (group 4.1, a short upper wall and wide opening) may have had a double function for cooking and storage. Soot and chars were present regularly. However, soot was also found on the large storage vessels of group 4.2, with a narrow opening. Further research should be carried out to determine what kind of activity is linked to the fire-related use of these vessels. Two possibilities are the cooking of larger quantities of food or the heating of storage vessels to burn out micro-organisms; another activity coming to mind is the brewing of alcoholic liquids such as beer and mead. Beer-brewing is not only mentioned in historical sources, but the role of drinking alcohol is well-documented archaeologically for central and north-western Europe in the Roman Iron Age. Drink and special drinking sets are now recognized as an important part of cultural life and social (exchange) relations. The population in North-Holland did not have imported or home-made ‘luxury’ drinking sets. In view of the evidence it seems unlikely that they consumed their beverages from ceramic containers.

Ceremonial use
The black and polished pottery is a distinctive group of vessels in both sites. It is evident that the two features together gave a vessel a special and highly symbolic meaning. In Uitgeest, the forms associated with the special treatment are mostly the, often complete, ‘pedestalled bowls’ and a few other vessels, mainly in group 2 and 3. Compared to Schagen their total number is quite low. As far as can be determined, the black polished ware was not deposited in specific contexts in Uitgeest. In Schagen pedestalled bowls were found only as fragments in low numbers. The presence of the ‘feet’ in some of the ritual contexts, together with other black polished vessels, may be referring to the head-and-foot-symbolism, observed in several other material categories as well (chapter 3 and paragraph 14). Here quite a few other, often complete vessels with a variety of shapes received the same special treatment; wide and low bowl shapes, handled vessels as well as jars and jar-like shapes, some of an exaggerated size. In combination, the data emphasize the symbolic importance of ‘jar’ and ‘black-polished’. None of these vessels in Uitgeest and only two in Schagen show any use residues. The pedestalled bowls sometimes show an abraded interior surface. Altogether, it can be concluded that the function and use of the black polished ware was reserved for ceremonial or ritual occasions (see note 34). What these vessels contained during the ceremonies or at the time of deposition (in Schagen) is unknown at present.

A connection with the drinking ceremonies is a possibility for the pedestalled bowls of Uitgeest, although it is difficult to connect the use as drinking cup with the abrasion of the interior. For Schagen, such a use is most unlikely. Here, the symbolic connotation of both special treatments (black and polished) is dissociated from specific vessel forms and functions and constitutes specific categories of pottery specially made for and used in ritual deposition. Moreover, the category ‘black-polished’ was used in opposition with the category of the well-oxidized and ‘badly’ constructed vessels. Part of the latter was also constructed for ritual deposition. What the two modes of construction are symbolizing is not clear, however.

A second characteristic of pottery associated with the use in rituals is the presence of pigment stains on the surfaces. The pigment may have been made of blood mixed with an aeorganic substance. Although the evidence is weak, it suggests that painting a vessel took place at the moment it was withdrawn from daily use for ritual deposition. Again the difference between the two sites may be meaningful. In Uitgeest, pigment is found mainly on cooking vessels, while in Schagen vessels from all groups were occasionally treated this way.

Exchange of functions in daily use, c.q. with use in rituals
The analysis of use residues for the samples of Uitgeest suggests that the same form or the same individual vessel was sometimes used for different purposes or activities in daily life. Soot and to a lesser extent chars are present on vessels of all categories (table 8.19) and the same is true for Schagen (table 8.16). The presence of soot alone does not necessarily indicate a fire-related use. It can be formed during cleaning, for example, or because a vessel stood near a fire. The presence of chars on the other hand betrays the ‘burning’ of a content. The overall relation with cooking and heating vessels is quite clear in the samples of Uitgeest, but not at all in that of Schagen. If the functional classification made here is basically correct, then the conclusion is that the actual use of pottery was not restricted to its formal function, and more so in Schagen than in Uitgeest.

However, most residues probably represent the last and final use of a vessel. When different types of residue are present,
Fig. 8.29 Utgeest-Gr.D sample 1. Treatment of the upper wall surface in (a,b) cooking vessels and (c) all others.
it is usually impossible to establish whether they were formed simultaneously or represent different activities. For part of the pottery from Schagen the last activity was a transfer from a daily use context to a ceremonial one, followed by deposition. If the vessel was used as a container for some specific content during the ceremonies, many of the residues may represent the ritual activity and not the daily use, unless the two are the same. Clearly, this is a matter for further research. The specific cream-coloured liquid residue, for instance, is present in vessels from all pottery groups, also in combination with soot and chars. If it was unheated (see paragraph 13), it marks a different use of cooking vessels. The same conclusion was drawn for the ‘painted’ vessels in both sites, also marking the exchange from a daily to a depositional context. In table 8.21, the construction and finishing details of the main functions are compared to the context of deposition once again. The data show that in general, the well-made vessels with a polished upper wall seems to have been selected for deposition in the seasonal clusters (table 8.21b), especially in the category of cooking vessels. Most of the roughly and normally constructed ones are found in other features. There also is a clear difference in the presence of residues, soot and chars, between the well-made pottery on the one hand and the rough or normally made ones on the other. Only a small percentage of the former show soot or chars, while in the latter they occur more frequently, especially pottery in group 1 and the cooking pots (table 8.21d). The difference is, however, not connected with the feature contexts for the normally constructed vessels. If anything, the percentage of use residues is higher for pottery from the ‘seasonal’ pits than from other features. For the roughly made ones, there seems to be no difference in use residues between different contexts. These distributions can be interpreted in two ways. They can indicate that vessels used for deposition in pits (including the cremation pit) were mostly taken from the actual household inventory, or that most of the ‘normal’ and ‘rough’ ware was actually used in the ceremonies for cooking or heating of specific contents (see also chapter 9). The black-polished ware was apparently never used in any other way than its inherent ritual purpose. Altogether the exchange of vessels with different functions in actual use is very difficult to establish, because of the many possible causes of both the presence and absence of use residues. The transfer from this context to that of ceremonies and rituals further complicates such an attempt.

8.15.2 LOCAL PRODUCTION AND LOCAL-REGIONAL DISTINCTIONS
Virtually every vessel in the three samples is unique, not
Fig. 8.30 Schagen-M1. Treatment of the upper wall surface in (a) cooking vessels and (b) all others.
only in size and proportions, but also in other aspects and despite the fact that they can be very similar or even near-identical. The ‘individuality’ of the vessels demonstrates the low degree of standardisation in pottery making and/or the high individual freedom of the potters. Pottery making most likely was a small-scale affair, taking place at the household level by an individual within that household. The slight differences between the samples of Uitgeest and Schagen, discussed in paragraph 11, support this conclusion. In the Schagen sample, covering a very short period, the relationship between size and shape is clearly less variable than in the vessels from Uitgeest\textsuperscript{47}. The similarities in details between the vessels found together in one pit also betray the hand of one potter. The samples of Uitgeest represent the production of several if not many generations of potters and the time factor may obscure a much stricter adherence to

<table>
<thead>
<tr>
<th>Function</th>
<th>Pottery Group</th>
<th>Standard size in cm (Gd)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fire-related Use</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking / heating of food</td>
<td>Group 2.1 + 3 + 4.1: small to medium to large</td>
<td>24-34</td>
</tr>
<tr>
<td></td>
<td>standard shape</td>
<td></td>
</tr>
<tr>
<td>Combined cooking and storage</td>
<td>Group 4.1: Standard shape</td>
<td>35-40</td>
</tr>
<tr>
<td>Special cooking / heating</td>
<td>Group 2 + 3: vessels with handles polished vessels</td>
<td>20-30</td>
</tr>
<tr>
<td>(including liquids)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquids (potable)</td>
<td>Group 5: jars</td>
<td>(Height 25-30)</td>
</tr>
<tr>
<td></td>
<td>Group 2 + 3: polished vessels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>vessels with handles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>rather narrow opening</td>
<td></td>
</tr>
<tr>
<td>Dry goods (foodstuffs, agricultural produce)</td>
<td>Group 4.2:</td>
<td>&gt;34</td>
</tr>
<tr>
<td></td>
<td>Narrow opening, long upper wall</td>
<td></td>
</tr>
<tr>
<td>Multi-purpose / incidental / short term</td>
<td>all vessels available</td>
<td></td>
</tr>
<tr>
<td>(divers substances)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Specific substances</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating and storage of non-foods</td>
<td>Group 1.2:</td>
<td>&lt;19</td>
</tr>
<tr>
<td>Beverages?</td>
<td>rough surfaces</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Group 1, polished (+ one handle)</td>
<td></td>
</tr>
<tr>
<td>Specially made for ceremonial use</td>
<td>Group 1-3.5:</td>
<td>&lt;19</td>
</tr>
<tr>
<td></td>
<td>Polished / reduced</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Group 1.1: pedestalled bowl</td>
<td></td>
</tr>
</tbody>
</table>

Highest to lowest difference of norms in actual use:

High  group 2 and 4
Medium group 3 (and 5?), vessels with handles
Low    group 1.1, 1.2, and 5

Fig. 8.31 An ‘ideal’ representation of functions in the pottery samples of Uitgeest and Schagen.
size for any individual potter\textsuperscript{48}. Furthermore, the percentages of finger-pressed rims and roughened lower walls are higher in Uitgeest, while the form variation is larger in the Schagen sample.

Although further study is necessary, the evidence from the few trustworthy contexts in Uitgeest indicates that most of the variations are \textit{not} chronological. This is confirmed by the evidence from other sites from the same period (see below). Yet some chronological changes are to be expected for Uitgeest, if only through the many generations of potters. The variation in surface treatment for the group of jars, the two rim types in the cooking vessels, or the shape variations within a size class, may for instance be due to such factors\textsuperscript{39}. Altogether, the slight variations between the sites point to local habits or preferences within the general cultural norms for the morphological characteristics of the ceramic inventories that were shared at the regional level. The two other pottery samples, discussed in the next paragraph, also share the same (inter-)regional tradition.

8.15.3 \hspace{1em} \textbf{Comparison with two other pottery samples}

Circumstantial support for the interpretations made above is provided not only by the evidence from ethnographic and historical sources, but also by archaeological data from the same period. Pottery from the so-called ‘Frisian’ regions in the northern Netherlands (in casu Westergo) is in many respects similar to that of the ‘West-Frisian’ region in North-Holland (Taayke 1990). It is now generally agreed that the ceramics from this region and from most of the western Netherlands that are dated to the Roman period, are stylistically one and the same. The pottery from the Assendelver Polders sites (Helderman 1971; Meffert 1998; Van der Leeuw \textit{et al.} 1987) and Rijswijk (Bloemers 1978) is virtually identical\textsuperscript{50}. Comparing the morphological composition of the samples from settlements in the western and northern Netherlands may also show that the pottery had the same general functions. Unfortunately, different methods were and are used in almost every study of ceramics, including different sampling criteria, presenting a severe obstacle for any quantitative comparison of assemblages. Despite the limitations, enough information was provided for the settlement at Rijswijk (Bloemers 1978) and the sites in the Westergo region in Friesland (Taayke 1990) to allow a reclassification of the pottery into size and shape groups that are more or less similar to my own (table 8.22)\textsuperscript{51}. Both authors also mention the ‘natural’ break in size between small and large vessels at circa 20 cm for the size of the maximum diameter, which is practically identical to the results in this study.

\textit{Reclassification of pottery types from Rijswijk}

The typology is a combination of stylistic variables with only a rough classification by size and shape (Bloemers 1978: table 8.22). The pottery dates from about the first to the third century AD. The regrouping is based on Bloemers (1978), chapter XLIV, especially fig. 184, p. 391. Types I (without IF) and VII, mostly with smoothed rims, roughly correspond to the size and shapes of group 1 of this study. A differentiation between shape 1 and 2 is not possible. Type IV is basically the same as group 2 and 3 (cooking vessels). Both decorated and smoothed rims, ‘besmeten’ and not ‘besmeten’ surfaces occur. Types II and IIIA correspond with group 4.1 and 4.2 respectively, while type IIIB corresponds with group 5, the jars. Both jars with and without handles are present, but the rim is always smoothed. Type V, smaller vessels with handles but a wide aperture, are comparable to group 2 in this study.

\textit{Reclassification of pottery types from the Westergo region}

Taayke (1990) studied pottery available from a large number of sites in the Westergo region (Friesland) with the purpose of improving the stylistic typochronology for the Northern Netherlands for the Iron age and Roman period. The reclassification of this pottery is more accurate as the author published a classification of the rim- and maximum diameter sizes per type (\textit{ibid.}, table 2,3). These measurements are presented only for the total sample, \textit{i.e.}, for all of the sites together (n=135, but there are only 14 sites with more than 100 sherds). This will probably have an effect on the relative percentages of types. The types themselves are not based on size and only to a limited extent on shape, causing an extreme variation in sizes for each type. The cases are reclassified here by the size classes of the maximum diameters, restricted to the types dating to period IV (late 1st-3d c. AD) and with some uniformity in size and shape variables:

- Type G(w)5,6,7 (vessels with a smoothed rim)
- Type V4 (vessels with a decorated rim)
- Type K3b and K4 (small vessels)
- Types G(e)5,6,7 (vessels with a narrow aperture)

The limit between ‘K’ and ‘G+V’ types (small and large vessels) is 200 mm. Type G+V5-6, and to a lesser extent type G7, with the addition ‘w’ (a wide aperture) correspond to group 2, 3 and 4 in this study. The limit between group 3 and 4, at 330 mm in this study, is not completely matching (see group 3+4 in table 8.22). Vessels with a maximum diameter >36 cm are to a large extent similar in size and shape to group 4 in this study. The pottery in type G5-7 with the addition ‘e’ (narrow-mouthed) have been reclassified by size. All those with a maximum diameter smaller than 32 cm are grouped as group 5, the jars, while larger ones were added to group 4; these vessels are comparable to group 4.2 in this study (the storage vessels). As none of the other ‘G/V’ types could be divided by shape, they are excluded here. The group of small vessels, K4, consisted mainly of the
pedestalled bowls, while at least part of those in group K 3a are clearly similar to the ‘dirty’ vessels of group 1.2 in Uitgeest. Other polished and reduced ware is apparently most often found in group G7 (ibid, 177-9). Altogether, the reclassified Westergo sample corresponds quite well with the grouping for Uitgeest, although there will be some overlap between the groups (especially for type G7 and between group 1 and 2)\textsuperscript{52}.

The comparison of the samples of Uitgeest, Rijswijk and Westergo in table 8.10 shows that cooking vessels form the majority in all samples, followed by smaller vessels (group 1 and 2), while the percentage of large vessels and jars varies considerably. The relative frequencies of the pottery groups of Rijswijk correspond quite well with those of Uitgeest, especially in view of the totals for each sample. As expected, the number of cooking vessels (group 2 and 3) seems to increase with increasing sample size, relative to other groups. Pottery of group 1 and 2 also seems to be used and broken much more frequently than the storage vessels and jars, conform the impressions for the total sample of sherds from Uitgeest. The relative frequencies of pottery groups of the Westergo sites are also similar to those of Uitgeest, but with two exceptions. The first one is the extremely high frequency for group 5, the jars. The percentage is also higher than in the Schagen sample. The second difference is the higher percentage of storage and/or cooking vessels (group 4) in Westergo as well as North-Drenthe (Taayke 1991, table 2). The reason for the differences is not clear, but could be the result of different sampling methods or to lumping pottery from many sites (135 in Westergo and 100 in Northern Drenthe). In view of the foregoing, the Westergo data suggest that jars were used much more frequently in the Northern Netherlands. However, nothing is known about their context and therefore no conclusions can be drawn as yet. Other assemblages in North-Holland show more or less the same composition as the three mentioned here. There clearly is a great need for more studies on the morphological properties of pottery from individual settlement that use comparable methods.

8.15.4 HOUSEHOLD INVENTORIES: AN ATTEMPT AT RECONSTRUCTION

The process of use, failure and discard of pottery and the resulting composition of an archaeological assemblage were discussed in chapter 2. To repeat, the underlying idea is that the vessels most frequently used will also be broken most frequently, especially when the use involves more (thermal) stress. Such vessels will eventually form a higher percentage of the ‘death’ assemblages recovered from an archaeological site. Under certain conditions, the total composition of an archaeological assemblage can be used to estimate the average composition of a household pottery inventory and/or the relative ‘use-life’ of specific categories of ceramics. In this study, the relative frequencies of specific pottery groups in the samples were used as one argument in linking pottery groups to functional categories. Here an attempt is made to interpret the data in terms of inventory composition for the settlement of Uitgeest through the relative frequencies of the functional categories, despite the fact that the samples are clearly far from ideal for this purpose. Those of Uitgeest form only a fraction of the total amount of pottery recovered. Closed context finds are virtually lacking. The accuracy of the relative frequencies of pottery groups is probably low and can only be regarded as a rough indication\textsuperscript{53}. Information about many important factors, such as total composition, duration of settlement, and context of pottery, is not available for Uitgeest. In view of the comparison with other sites, it seems acceptable, however, to treat the combined samples as representative of the total assemblage of Uitgeest in this exercise. For the Schagen pottery, the context information is excellent, but most if not all pottery was intentionally deposited in contexts of a ritual nature. The composition of the sample indicates that it is not a random selection and this pottery is therefore not used.

The following exercise is no more than a first exploration of the possibilities that ceramic assemblages may offer. The combined data of sample 1 and 2 and data from one well, 18-1, will be used. The content of the well is used because it is one of the few closed contexts and because it contained a large number of complete profiles. Many of these were partially or completely burned. Hypothetically, this complex could represent the burnt and dumped pottery inventory of one household, similar to the examples mentioned in chapter 2 (note\textsuperscript{*}). The samples are compared in terms of relative frequencies of the pottery groups, to infer information about use-frequencies and inventory compositions\textsuperscript{54}.

Assumptions and methods

The composition of an archaeological assemblage can be the result of very different practices with regard to the use and reproduction of household inventories. Here I will start with the following assumptions:

– in every household the same standard ceramic inventory was present; in other words, if the content of well 18-1 represents such an inventory, it can be used as a standard.
– the pottery types with the highest use-frequency will form the highest number of vessels in an inventory and vice versa.
– vessels with the highest use-frequency will also have the shortest ‘use-live’.

In table 8.23, the pottery is classified according to the most likely functional categories in two different ways. In the first one, all the vessels in group 4 are set apart, as one cluster of combined storage+cooking vessels, in the second those of
group 4.2 (shape 2) are considered to be storage vessels ‘proper’, while group 4.1 is added to the class of cooking vessels, together with group 2.1 and 3. Group 1 (all cases) and 2.2 are assumed to be special and multi-purpose vessels. Cases in group 2.0 and 4.0 were omitted in the tables, because the specific shape of the upper wall is unknown. The actual number of vessels in each class is also expressed in relative proportions, with the category of cooking pots set at a factor 10. If the pottery from well 18-1 does represent the inventory of one household and if only the more or less complete profiles are taken into consideration, this family would have had at least:

6 small and medium sized cooking vessels
4 small vessels: 3 for special use near the fire and 1 pedestal bowl for ceremonial use.
1 large vessel: possibly a storage vessel or else a ceremonial vessel *
1 jar
* The one vessel present from group 4.1 is an exceptional case. The exterior surface was finely polished all over and the vessel was reduced.

Cooking pots form the highest percentage, followed by the group of small (special and multi-purpose) containers. Both types would be used more frequent than storage containers, which seem to be lacking in the well content. In the total sample, the cooking vessels also constitute the largest group and the small vessels of group 1 are quite numerous too. The relative frequency of the jars is clearly much lower than in the well. Those of group 4 (all vessels) are much higher, but the percentage of storage vessels as a separate category (group 4.2 in table 8.21b) is quite low in the total sample. The data possibly indicate that group 4.1 was indeed used mainly as cooking vessel. The low proportion of group 2.2 on the other hand is the same in the total sample and the well. When the possible underrepresentation of the (medium to) larger cooking pots and storage vessels is taken into account, the trends may be slightly stronger, in favour of the cooking pots. Altogether the differences in relative frequencies for the well and the total sample are not very large. They seem to refute the expectation of a progressive increase in the percentage of vessels with the highest break frequencies. Several rather obvious explanations can be given. The first is the low total of cases in the total sample, only 25 times the number of pots in the well, which may not be enough to show a clear change in proportions. The slight increase in the percentage of cooking vessels and the decrease in other categories would probably become stronger with increasing sample size. The second is that the well is a secondary context of the pottery and the content may not be complete. As many of the vessels were very badly burned (especially the smaller ones), it is quite possible that some vessels are missing. Thirdly, the data can be interpreted in a different way. If the assumptions made above are correct, the similarity between the content of the well and the total sample may indicate that both cooking and small (multi-purpose) containers were kept in stock in higher numbers in an inventory, ‘compensating’ for the higher break frequency.

notes

1 These data have not been published yet.
3 Both internal and external measurements were recorded, but only external measurements are used in the tables and charts of this chapter for simplicity’s sake. The actual content capacity of the vessels is not used in this study, because it does not provide information on size and shape. For pottery with a rim diameter larger than that of point 3, the term ‘maximum diameter’ is strictly speaking not correct; this term will be used, however, consequently for the size of the diameter at point 3 in the profile (fig.8.1a).
4 As is explained below, the pottery groups in fig. 13 and 14 are slightly different from the classification present so far.
5 The distinction between ‘rough’ and ‘fine’ polishing is to some extent artificial as it is a matter of degree rather than kind of surface treatment. The fine polishing was very easy to define and recognize. Definition at the other end of the scale was more difficult, as sometimes only a small part of the surface showed some irregular smoothing marks. The marks may have been formed only because the surface was damaged by for example scraping.
6 There is no exact translation for the Dutch term. Here, the terms ‘clay applice’ and ‘roughened’ surface are used as English synonyms. Officially French postillage.
7 Sherds that could not be assigned to a pottery group are omitted in table 8.8.
8 The measurement of one complete profile is missing, another is a one-partite form: case 31-3.
9 The total height of this vessel was reconstructed to a minimum value, which may be too low).
10 as well as on the interior surfaces; The data for the interior surfaces are not presented here, nor are those on wall thickness.
11 A possible reason is that broken vessels of that size are more difficult to restore.
12 During excavation of the pit it was evident that at least ten complete vessels were deposited. Not all of these could be restored to a complete vessel or even a complete profile, due to the bad state
of preservation of the sherds.

13 Such miniatures occur in small numbers in many of the Roman period settlements in North- and South Holland. They sometimes look like ‘children’s’ pottery, made for and perhaps even by children. But I find this an unsatisfactory explanation. It is likely that the pottery had another specific use or meaning.

14 For the northern regions the end date for this type of vessel is considered to be around 250 AD, although it is followed by type Wijster 1B (Taayke, 1990, 185).

15 In comparison with Uitgeest, sample 1, the percentage of cases in group 1 and 2 is slightly higher in sample 2, but this is mainly the result of the sampling criterion, which was the size of the sherd.

16 The inference is based on the evidence of old and recent fractures, in combination with the context and the amount of pottery recovered, see chapter 3.

17 Although individual traits of potters are not analyzed in detail, they are clearly present in the Schagen assemblage. The pottery from features 143, 223, and the vessels used to cover the cremations, was made by one potter each, while the difference between the vessels from features 223 and 143 suggest that at least two potters were at work within the ‘lifetime’ of this site (see paragraph 15).

18 Both terms are used as synonyms in the text and the tables.

19 There are also no clear indications for changes in colour caused by re-oxidation of the surface.

20 Vessels made of clay from a Dunkirk 0 deposit in site 11.07 in Midden-Delfland (South-Holland) were used for the cooking experiments. The paste, temper, construction techniques, and forms were based on the late Middle Iron Age pottery from this region. One of the vessels was made waterproof by filling it with milk with a high fat content; in just over 2 hours, the leaking had stopped completely. This method is known from historical sources in the Netherlands (Harsema 19*).

21 An example is pottery from rural India where resin was applied mainly to cooking pots, as a remnant of an old method of making vessels waterproof, and on vessels involved in rituals (Saraswati and Behura 1964, p. 131,168). The same remnant application on cooking pots is mentioned by Thompson 1952, 145, while among the Kalinga the use of resin was still the main method of making cooking pots and water vessels waterproof (Longacre 1981, 60). See also Schiffer (1990) for an experimental use of resin.

22 The term ‘ceremonial’ is used here as an alternative and synonym for ‘ritual’. Both refer to activities or contexts with a special value and meaning, which can take place at diverse levels of social time, space, and cultural importance within a community.

23 Vessels with a maximum diameter between 190-250 mm and shape 2 (slightly restricted orifice).

24 Schiffer (1986) argues that a less permeable surface, like a polished one, is favourable for a shorter cooking time by reducing the heat loss; this applies mainly to the interior surfaces, however, whereas he remarks that polishing of the exterior surface would probably lead to spalling. The question then is why spalling does not occur on a polished interior surface. The reduction of permeability is also used as an argument by Juhl (1995). Yet the evidence on these relationships is rather contradictory so far (see appendix 2.1).

25 This was also the case in a recent experiment in Eindhoven: the highest breaking rates occurred among vessels used for cooking (cooking pots proper and open dishes): 14 out of the 25 were badly cracked or broken after 2 months of use (Boonstra 1996, 166).

26 Granaries are known from almost all settlements of the Roman period, although they occur less frequently in the western Netherlands than elsewhere.

27 One very large ‘platform’ construction in the southern limits of the excavation is possibly a granary. The construction is as yet undated. Two pits from the Roman period contain special deposits, but no remains of agricultural produce. At present no data are available for macrobotanical remains from the settlement of Uitgeest.

28 The so-called cheese-making objects are found only sporadically and not even in every settlement of the Roman period (see Brandt 1983, fig. 7 for an example). In my opinion their scarcity is inconsistent with the importance of livestock and milk in this period. Moreover, the varying forms of the objects do not suggest a connection with cheese-making techniques.

29 Again, several alternative materials could have been used for liquid containers such as leather bags and wooden vats.

30 with the exception of David & David-Hennig 1971.

31 The terms ‘ritual’ and ‘ceremony’ are used here as virtually synonyms, but a distinction is made between those involving depositions and others. The former, the structured deposition, is the main focus of this section.

32 According to Therkorn (pers. comm.), all of the pits within the site were involved in these rituals, but not all could be assigned to a specific season.

33 Although feature 147 was defined as part of a separate cluster, with other pits being destroyed by the Medieval ditch, see fig. 3.8, it is possible that this feature was part of cluster 5. In that case, pottery was present in three pits and all seasons as well (Therkorn, pers. comm.).

34 Therkorn (1991/2) has suggested that the seasonal rituals took place in cycles of 1, 3 and 9 years. It is quite possible that such cycles are represented by these complicated choices of vessel form and construction. One could suggest that in this cyclical process a specific order was used to add certain types of pottery to old pits and/or start a new sequence in new pits.

35 A review of the notes made by Spruyt about sherds not included in the sample supports this; only occasionally sherds from jars or sherds with handles were present.

36 Only three of such bases are included in the sample, but several more were found.
37 The sideways deposition could be deduced from the differential infiltration of iron in the vessel wall, as well as from the difference in the preservation within the surfaces, see also note *(40?).

38 The wall of the vessels tends to split vertically, i.e. through the core (except in nr. 10 and 11, both polished and reduced). As the clay seems to be homogeneous and well-kneaded, the cause of this fissuring is not clear, but it may be due to postdepositional conditions in the waterlogged pit in combination with the large amount of pottery. The latter prevented the backfill from forming a ‘cushion’ against the groundwater and against pressures. According to Therkorn (pers. comm.), the larger the volume of vessels and other materials, and the less soil there is in a pit, the worse the conservation will be.

39 It is likely, that the smaller bowl-shaped, polished and reduced vessels found in Schagen are a continuation of the pedestalled bowls in the later Roman period (see Taayke 1990 for similar changes in the northern provinces).

40 The presence or absence of cooking residues cannot be used as supportive evidence, because the vessel may have been used to cook a special meal or on the contrary cleaned before deposition. The number of normally made cooking vessels is, however, substantially higher in other features, see chapter 9.1.2.

41 Of the few associations mentioned in fig. *, the material-spatial structure and the symbolic and gender-connotations are already analyzed in much more detail and depth by Therkorn (forthcoming) and will be published shortly.

42 Vessel nr 18-5 (fig. 8.13; originally reduced) is one example, as is vessel nr 19-20 (fig. 8.12.2).

43 The number of wooden artefacts found in wetland sites in the western Netherlands is strikingly low, even in sites where hundreds of posts have been preserved, as in the Assendelver Polders, Midden-Delfland, and Voorne-Putten.

44 The jars in sample 1 are recovered from all types of features, see table 8.9.

45 One other specific vessel form should be mentioned here, the ‘Frisian’ handled vessel with an extremely restricted aperture. The one example in the pottery from Uitgeest is similar to those occurring more frequently in the northern Netherlands (vessel nr 31-15, appendix 8.3). The form is only suitable for materials that can be poured in and out, such as fluids or very fine dry material.

46 A possible exception is the set of imported products from the ‘Sommeltjesberg’, Texel (Woltering 1983b).

47 See for instance fig. 8.7.2 and 8.19.

48 In Uitgeest, there also are indications for the ‘hand’ of one potter in the pottery of some features, for example that of well 18-1 and of some features in trench 19. A possible course for future research would be to examine the dactylographic evidence for this purpose, as quite a lot of good fingerprints are available.

49 Although not yet confirmed, the impression of the author is that the pottery from later features more often has tooled rims and is more often fired in an oxidizing atmosphere.

50 See Bloemers (1978), Helderman (1971), Bosman (1997), Van der Leeuw et al. (1987). Other examples are Texel-den Burg (personal knowledge of the material) and other sites in North-Holland (excavated by Therkorn, pers. comm.). For the previous period, the Iron Age in the western Netherlands, van Heeringen (1992) made a distinction in several pottery regions based on differences in sample composition for stylistic and technological variables. The similarities between the pottery regions are, however, just as large as the differences, especially for the later Iron Age.

51 The analysis of size and shape used here are very like those used by Meffert (1998) for pottery of the Assendelver Polders. Unfortunately I was unable to include his data in this section.

52 Several other similarities exist between the pottery from Westergo and North-Holland (Taayke 1990):
– decorated rims occur only on vessels in group 2-4, never on small pottery or jars.
– soot or chars were present in varying percentages in group 2-4, but the percentages are clearly lower for type K4 (group 1.1) and for the jars (ibid, table 12).
– Type K3 (= group 1.2) shows a relatively high percentage of soot and/or chars.

53 It is likely that the smaller pottery is overrepresented and the larger pottery underrepresented in both samples, see paragraph 2).

54 I am well aware that this exercise is close to a circular argument, as I am using the functional terms for the pottery groups, which were partly defined by their relative frequencies in the samples, and it is therefore of limited value. But it is still useful to
analyze the *proportions* of specific morphological categories as a method to establish use- and break frequencies, whatever the specific functions of these categories may have been.

55 Although no storage vessel was found in the well, I assume one was present in any inventory.