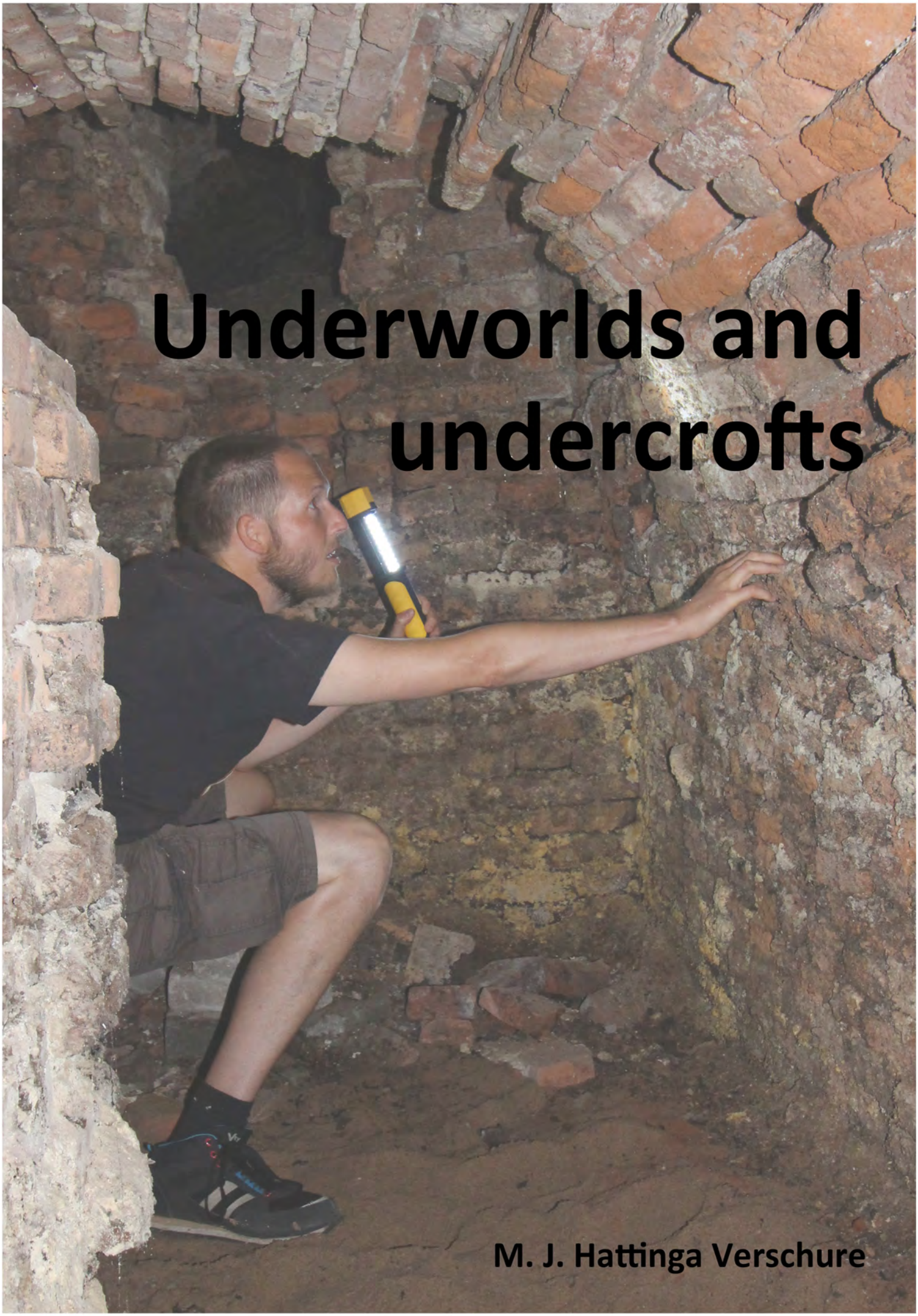

Underworlds and undercrofts

M. J. Hattinga Verschure

Cover: author investigating brickwork during a cellar visit in Zwolle, Melkmarkt 41 (photo by: prof. dr. ing. D.J. de Vries).

Underworlds and undercrofts

The development of medieval house cellars in urban context

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Master Thesis

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Archaeology of the Roman Provinces, Middle Ages and Modern Period

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1 Introduction

1.1 Context

Previous studies on the subject of medieval cellars (sometimes called undercrofts) in Ghent (Laleman and Raveschot, 1991) and Stralsund (Brüggemann, 2006), show the importance of cellar research. The lowest floors are the most numerous and best conserved remains of the oldest urban structures. Therefore, studying these parts grants valuable insights into the growth and urban development of medieval towns.

Although there are hundreds of medieval cellars present in Dutch historic towns, only in Arnhem have parts of the inner city been subject to extensive cellar explorations and is cellar research currently taking place in the city of Zwolle (Wassink, 2018). The buildings in the city of ‘s-Hertogenbosch and Utrecht are thoroughly studied; however no structural cellar research has taken place. In general, a systematic and analytical approach is lacking.

The subject is in the middle of the disciplines of archaeology and building history, a distinction that exists solely in the Netherlands and of which only archaeological research is required by law. The approach for this study was initially from an archaeological point of view; however for a better understanding of the cellar it was essential to combine both disciplines. Major flaws of urban archaeology are the limitations with regard to the usually relatively small research areas and that the results are always one-dimensional (Drunen 2006, 24). In order to realize reliable three-dimensional reconstructions and insights into spatial cohesions of historical buildings, it is of the utmost importance to combine these complementary disciplines.

1.2 Research questions

In this thesis, about 200 cellars are investigated which are located in three towns, namely 's-Hertogenbosch, Arnhem and Deventer. The aim is to investigate what the chronological developments are in the various cities and what this relates to,

as well as finding out their function and explaining the external characteristics. In order to do so the following five research questions are formulated:

- Which characteristics can be distinguished? Both on the outside (such as location, orientation, accesses) and on the inside (such as dimensions, vaulting type, amount of aisles, masonry and other facilities).
- Is there a visible chronology regarding the development of cellars? And is there an appropriate era for cellars demonstrable and with which development does this relate?
- Which trends in dimensions (L x W x H x m^2) can be seen and explained?
- Is there a characteristic type of cellar for a city, as is suggested for Zutphen and Deventer?
- Which functions did cellars have and to what extent are these ascertainable?
- To what extent were cellars used as fire-safe spaces that were lockable from the outside world?
- To what extent can cellars contribute to determining the general functions of medieval districts?

1.3 Methodology

To answer the above questions, three methods have been applied to the subject of this study, namely literature research, archival research and field research.

The literature research is mainly used to place this study in a broader European context to give a brief insight in interregional cellar studies. By presenting the results of cellar research in England and Germany, the similarities and problems in regard to the cellar research in this study became clearer. Especially a publication by Stefanie Brüggemann proved to be an invaluable asset. Yet, the literature research did have some shortcomings, particularly in terms of translation. Due to the nature of the subject, one has to deal with specific terminology which is difficult to translate, especially the translation of the

German literature proved to be a problem. To avoid wrong translations as much as possible, there is decided to leave most terms in the original language, for clarification these words are printed in italics and explained in the text. In addition, a glossary has been included.

The cellar data presented in the chapters on 's-Hertogenbosch and Arnhem is mainly derived from archival research, but also partly literary sources. The archival documents in Arnhem were readily available and consisted of two ring binders containing all cellar reports. The archives in 's-Hertogenbosch, however, were more difficult to access. All investigations have been archived per address, but it was often unclear beforehand whether the cellars had been examined at all and to what extent. The biggest drawbacks were the lack of uniformity in the data and the unavailability of digital archives. The first made it more difficult to make reliable comparisons between the cellars themselves or with cellars in other cities and the latter is particularly evident in the lack of a general overview and the documentation that is only available on location. Luckily, due to the long and extensive research in this city, there are many publications with additional information available.

In the city of Deventer, field research was carried out in order to study the cellars, because the town has never been the subject of cellar research whatsoever. A research method has been developed by the author, based on the findings and approaches of the cellar research in ´s-Hertogenbosch and Arnhem. The investigated cellars have been chosen according to own insights and opportunities that occurred. The advantages of this method are that the data can be obtained in the way that is desirable. The disadvantages, especially in this situation, are the lack of expertise and experience of the author, which may have led to misinterpretations and the overlooking of certain elements within the cellars. To minimize these disadvantages and to keep the data as accessible as possible, a catalogue containing all self-investigated cellars is included in the appendix according to the FAIR data principles (i.e. to make the data Findable, Accessible, Interoperable and Re-usable).

1.4 Reading Guide

The structure of this thesis consists of an introduction in which the context of the topic is discussed briefly, after which several research questions are formulated. The second chapter explains the terminology, gives a brief general history about cellars and discusses the issues regarding the dating of cellars. The subsequent chapter presents previous cellar research in respectively the United Kingdom and Germany, in order to place this study in a broader context. Thereafter, the core of this thesis is presented, which consists of three chapters about investigated cellars in the Dutch towns of Arnhem, ´s-Hertogenbosch and Deventer.

Each chapter presents successively the economic and political history, as well as the building history of the city. This is followed by sections about the methods used, the compiled dataset and the presented results. Each chapter ends with a partial conclusion that deals with some research questions. The thesis concludes with a final chapter in which the main research questions are discussed on the basis of the previous chapters and is followed by recommendations on future research. The appendix includes the three corresponding datasets of the cities, an example of a systematic cellar investigation in Arnhem, a copy of a blank field form that was used to investigate the Deventer cellars and the catalogue of self-investigated cellars in Deventer.

2 Defining the concept "cellar"

The cellar is an interesting research object, because it is often the oldest remaining construction of bygone times. For a better understanding of this study, this chapter will discuss some matters regarding cellar research. The first section will clarify the title of this study and explain the terminology used, this is followed by a brief general history of cellars, after which the most common types of cellars are discussed and the typology is presented that was used in this study. Finally, the difficulties regarding the proper dating of cellars will be briefly discussed.

2.1 Terminology

As the subtitle suggests, this study focuses on the development of medieval house cellars in urban context within the Netherlands. Because several terms in the subtitle can be interpreted in various ways, the following is a short description of the definitions used for this study.

Here, *medieval* means in principal the period from 500-1500 AD. However, as will be seen, the first evidence for cellars is dated to the 10th century and a large number of cellars are dated to the 16th century, or even later. Nevertheless, the culmination of the construction of cellars appears to be during the Middle Ages, hence the choice of words in the title.

Regarding the term *house* is chosen to follow the definition formulated by Laleman and Raveschot (1991, 9), which is a structure where certain people lived and/or performed activities, a building used as residence, storehouse or workplace. Furthermore, cellars related to abbeys, monasteries, churches, manor houses and community buildings are disregarded, because it was necessary to demarcate the subject and their development often proceeded in different ways (Laleman and Raveschot 1991, 39).

In regard to the word *cellar*, it is of importance to mention that in the English language several words are used for this subject. Besides *cellar*, the words *undercroft* and *basement* are commonly used translations, although every word has its own specific meaning. However, in Dutch and German there is only one collective word for all types of cellars, respectively *kelder* and *Keller*. To avoid translation difficulties, it is decided to only use the word *cellar* in this study, even when in the originally English publications different terms were used.

As far as the definition of the word *cellar* is concerned, this is also taken over from Laleman and Raveschot (1991, 8). It means, grammatically spoken, the part of the house that is located below ground level or between the ground floor and the foundations, and mainly serves as a storage place. However, as already noted by them, it appears not always easy to determine which spaces should be interpreted as cellar. For example, do we approach these constructions from a contemporary point of view or from an historical perspective? And what about the floors that are partially underground, can they be treated as cellars as well? Therefore, to approach the concept as broadly as possible, is decided to interpret the bottom floor within a construction as the cellar.

Finally, *urban context* means all areas within the city walls.

2.2 A general history in regard to cellars

The word cellar originates from the Latin word *cellarium*, which means storage room or storage space. Different translations like *cellier* (French), *kelder* (Dutch) and *Keller* (German) are all derived from the Latin origin (Haans and Frank 2003, 37). The Greek word *apotheka*, meaning storage room or wine storage, was in the Middle Ages sometimes used when mentioning wine cellars (Haans and Frank 2003, 38). The first known cellar-like structures were built by the Egyptians, who often buried their rulers in these large underground complexes. Also the Romans used underground spaces as catacombs, but they also built subterranean complexes for other purposes, such as a cool storage space under palaces and

houses of notables or as a foundation for large buildings like thermal baths and palaces. They developed complex constructions like stone vaults and domes to span these spaces (Haans and Frank 2003, 25). Although much of the Roman architecture was adopted and copied in the early medieval architecture in southern Europe, this was not the case in the more northern parts. In these regions most constructions were of a temporary nature and build with perishable materials (Haans and Frank 2003, 26). Evidence for the presence of early cellars can only be found by archaeological research and scarce literary and graphical records, because the remains of the earliest constructions are extremely rare.

The first mentions of medieval cellar-like constructions are known as *Grubenhauser*. These sunken featured buildings (SFBs) or pit-houses were common in large parts of northern Europe between the 5th and 12th centuries AD. They originated from Germanic settlements, hence the German name, and it was Tacitus (ca. 56-120 AD) who already mentioned in Germania the habit of the Germans to hollowing out the underground to create cellars as storage for goods (Quiney 2003, 134). Although their sizes varied, most had the dimensions of single rooms and it is assumed that they were used as such, as well. The bottom floor was located between 0.25 and 1m underground and the walls were lined with wickerwork or timber planks. In many cases was the sunken area provided with an overlying floor at ground level (Quiney 2003, 134). Their functions varied and they were used as dwellings, workshops, cowsheds, barns, granaries and storehouses (Rahtz 1976 in Quiney 2003, 134). Although there is the possibility that SFBs are the predecessors for later cellars it is important to mention that this hypothesis is still subject to debate. According to Voskuil (1979, 16), these structures were more likely used as workshop or temporary residence for shepherds or skippers. Besides, some SFBs are older than the Anglo-Saxon conquerors and in the vicinity of several SFBs were rectangular houseplans present (Trier 1969 in Voskuil 1979, 16).

The upcoming development of the building styles of houses and cellars differs greatly per country and region, because of differences in politics, economics and

their geographical location. In general, most early medieval towns had spacious layouts and still many rural features. The development of the first buildings was closely linked to the (natural) supply of building materials, in Britain for example, was stone available as a natural resource and also the Roman remains proved useful stockpiles for building materials, like stone and brick (Schofied and Stell 2000, 389). In The Netherlands, however, there were only marl, bog iron and glacial erratics available and because of the limited availability of these resources were most early buildings built with more temporary materials, like timber, cob and thatch (Orsel 2007, 5). From the 10th century, tufa stone was introduced, which proved to be an important building material when wood was not available (Voskuil 1979, 17). Prominent buildings were also constructed with tufa stone, which was imported from the German Eifel (Orsel 2007, 5). The house constructions in that century usually consisted of timber framed houses with cob floors and sometimes wooden cellars (Mittendorff 2007, 19). Instead of posts, supportive frameworks were introduced, making it possible to build multiple storeys and thus increasing space (Gläser 2001, 282; Mittendorff 2007, 257). Around 1200 AD, the use of brick became widespread in The Netherlands (Hoeve 2005 in Orsel 2007, 6). Brick is one of the oldest building materials made by man and was already produced by the Romans (Stenvert et al. 2007, 90). However, after the Romans left these regions, the brick industries disappeared as well (Orsel 2007, 6) and the reintroduction of this material was probably related to a new form of status (Holst 2005 in Orsel 2007, 6). Brick was a locally produced product and an excellent replacement for the expensive imported stone. In addition, the material was fireproof and therefore the use of the material was stimulated by the city councils, due to many large city fires (Orsel 2007, 21). The new building material was used in many churches, city walls and large residences and displaces tufa during the 13th century entirely. From the 14th century, the brick sizes are shrinking, however with large regional differences (Stenvert et al. 2007, 92). The advantages of smaller bricks were numerous, such as an easier and faster production process, a better quality of the baked stones and a cheaper production line. The decrease in size also contributed to a handier

and less heavy building material, which was easier to transport, to process and proved suitable for constructions with thinner walls and on unstable undergrounds (Hollestelle 1961 in Orsel 2007, 9). Besides, it was more lucrative to produce smaller sized bricks, because fewer raw materials were necessary for the production, while more bricks were needed in the construction (Hollestelle 1961 and Bitter 2002 in Orsel 2007, 10). The introduction of brick and the stimulation of the *versteningsproces* by city regulations led to many stone houses being built. Shared intermediate walls, so-called shared walls (*gemene muren*), became commonplace and the cities grew compacter. Under the houses, cellars emerged on various locations on the plot and with different orientations. Initially, all early cellars were constructed with beamed ceilings, but most of them were gradually replaced by brick vaults. The cellars were used for a wide variety of functions, ranging from workshop to store. Especially in the 17th and 18th century, when many cities were overcrowded, cellar residences were created, although the conditions in cellars were anything but healthy. Newly built cellars became smaller and their functions were limited to private use. Until a century ago, the cellar was a familiar part of the house and it was still used as storage for food, alcohol and fuel, such as coal and peat. However, after the installation of electricity and the introduction of central heating and appliances, such as the refrigerator and freezer, the cellar became increasingly redundant. In the first half of the 20th century the cellar was already subordinate in housing and the size decreased. After the Second World War, hardly any more new cellars were built under houses. The extant cellars were used for the storage of junk. In historic city centres, like Arnhem, many shops were established and cellars were often closed off, because there was no need for anymore. The exceptions were cellars under restaurants and bars, which often remained in use, for storage of barrels or location for cooling systems (Haans and Frank 2003, 8).

2.3 Cellar types

For a better understanding of the findings described in the following chapters, it is necessary to briefly address the most common features of the cellars, in which they distinguish themselves from each other. These are the orientation of the building, and corresponding cellar, in relation to the street, the degree to which the cellar is situated underground, the location on the plot and the variety in ceiling constructions. Because the aim of this study is to compare the cellars in the various cities with each other, an attempt has been made to establish a typology. This typology is specifically focused on the different types of vaultings and comprises five elements, which are subdivided into specific forms and variations. The main forms are indicated by a number; the subtypes by a lower case letter (see Table 2.1).

Table 2.1 Subdivision of the various vault types with their assigned numbering.

Vaulting types and their corresponding numbering		
Beamed ceiling	1	
Barrel vault	2	
	various types	a
	with a half barrel vault at street side	b
Cross vault	3	
	cross ribbed	a
	cross groined	b
Through vault	4	
	on diaphragm arches	a
	Deventer type	b
	with wooden/steel girders	c
Concrete ceiling	5	

The first distinction to be made is the orientation of the building, in which the building is either situated with its façade or its eaves towards the street, respectively called front-gabled or side-gabled. Because cellars can have different

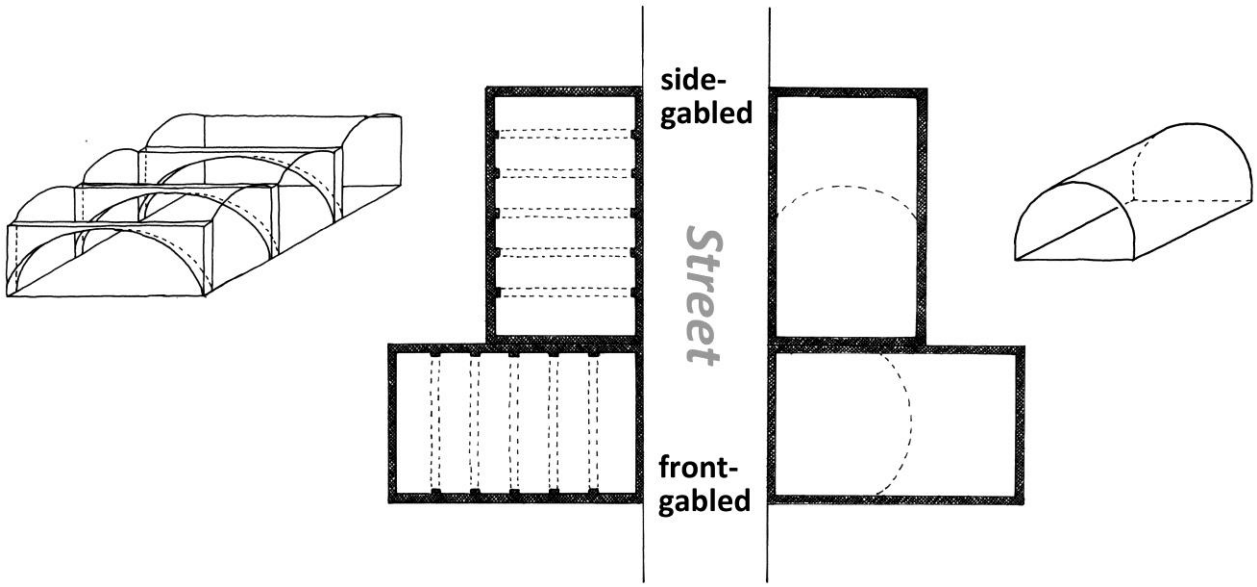


Figure 2.1 Overview of the possible orientations of cellars relative to the street. Cellars with the vaulting types 2a (*right*) and 4a (*left*) are shown, to illustrate in which way the direction of the crown is leading (sources: hand-drawn and edited by author; based on: Haans and Frank 2003, 27 (type 2a) and Koolstra and Willems 2008, 52 (type 4a)).

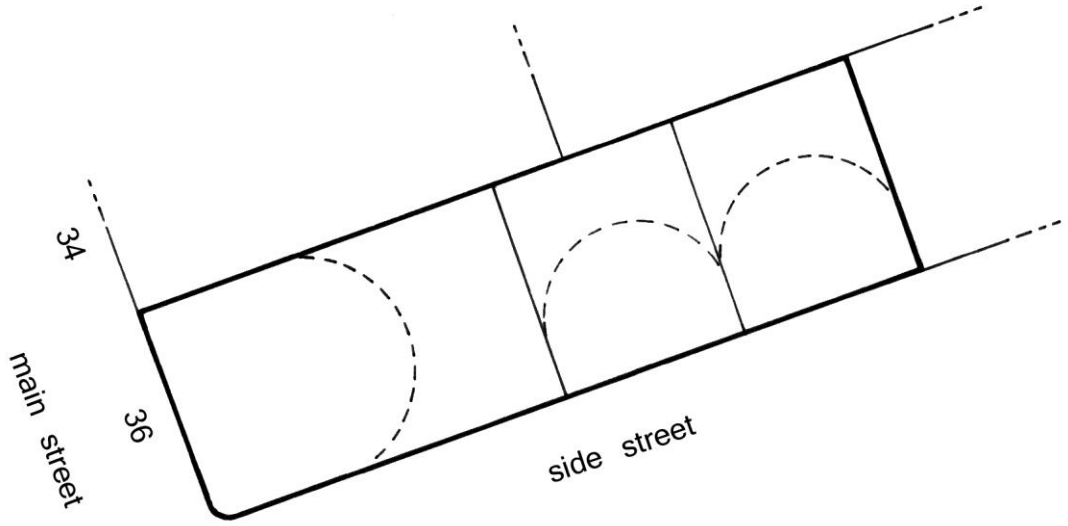


Figure 2.2 Schematic overview of a possible situation in which the orientation of the cellars in the back of a current building may be the indicator to point out that they originally belonged to adjacent buildings that have disappeared over time (source: hand-drawn and edited by author).

dimensions in comparison to the superstructure, it is not always easy to determine if a cellar has a front-gabled or side-gabled orientation. In order to categorize the cellar nonetheless, the axis of the ceiling crown is leading in this study (see Figure 2.1). The orientation of the cellar in relation to the superstructure is important, because this can be an indicator to determine whether or not they descend from the same building phase, in which case both orientations are usually the same. When the orientations are divergent, there is the possibility that the sub- and the superstructure originates from different phases. For example, it occurs that there are several cellars present under the current buildings, while these originally belonged to neighbouring buildings. Here, the orientation of the crown of the barrel vaults can be leading, to indicate the existence of the original buildings (see Figure 2.2). Such a situation can be found in Arnhem (A7), on the corner of Bakkertstraat and Pastoorstraat. Such situations occur in principle only at (former) corner buildings.

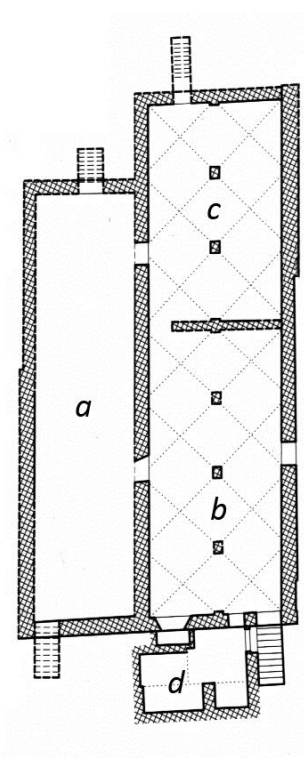


Figure 2.3 Possible locations for cellars on the plot (source: van Drunen 2006, 207; edited by author).

Another subdivision is between completely (full cellars) and partially (semi-cellars/semi-basements) subterranean floors. The first is, as the name suggests, fully underground, while the latter only to a certain degree below ground is. How much the semi-cellar protrudes above ground can vary, in 's-Hertogenbosch are examples known from 0.5 m up to almost the complete cellar (Enderman 2016, 95). The floor above the semi-cellar is known as *bel étage* and usually contained the prominent rooms of the house. In this study, only the semi-cellars are mentioned explicitly, in all other cases it concerns full cellars.

As for the location on the property, four types of cellars are distinguished as is shown in Figure 2.3: the ones that stretch under the entire house (*a*),

Figure 2.4 Photo of remaining corbels in cellar D8a (Brink 48) just below the current vaulting (source: photographed by author).

under the front house (*b*), under the back house (*c*) and cellars located under the street (*c*). The four types exist individually, as well as in combination with one another. The variety in appearance can differ per region, city or even district. Cellars under the entire house were often provided with two entrances, one to the street and the other to the backyard. The cellars under the front house had usually only an entrance towards the street, while the cellars under the back of the house were accessed through the backyard and/or through an internal access to the house above. A special feature is the street cellar, which is the only one outside the plot: in front of the house and under the street. These cellars were mostly accessed via the front cellar and had sometimes a direct access to the street. The street cellar will be discussed in more detail in Chapter 4.

Finally, the various cellar ceilings are discussed, which have a wide variety. The most common ceiling in historical cellars today is a stone vaulting, however it is assumed that all early cellars originally had beamed ceilings. Evidence for this can sometimes still be found in the presence of remaining building elements, such as the presence of stone corbels in the sidewalls (see Figure 2.4) which formerly supported the joists and also the presence of light niches in the original walls that are now (partially) covered by the newer vaulting (see Figure 2.5). The beamed ceiling (type 1) is the oldest type of cellar ceiling and consists of joists on

which the planks of the ground floor are located (see Figure 2.6; I). When covering wide spans, these ceilings were provided with an extra supporting beam resting on brick columns (see Figure 2.6; II). In later times, most beamed ceilings were replaced by stone vaulting.

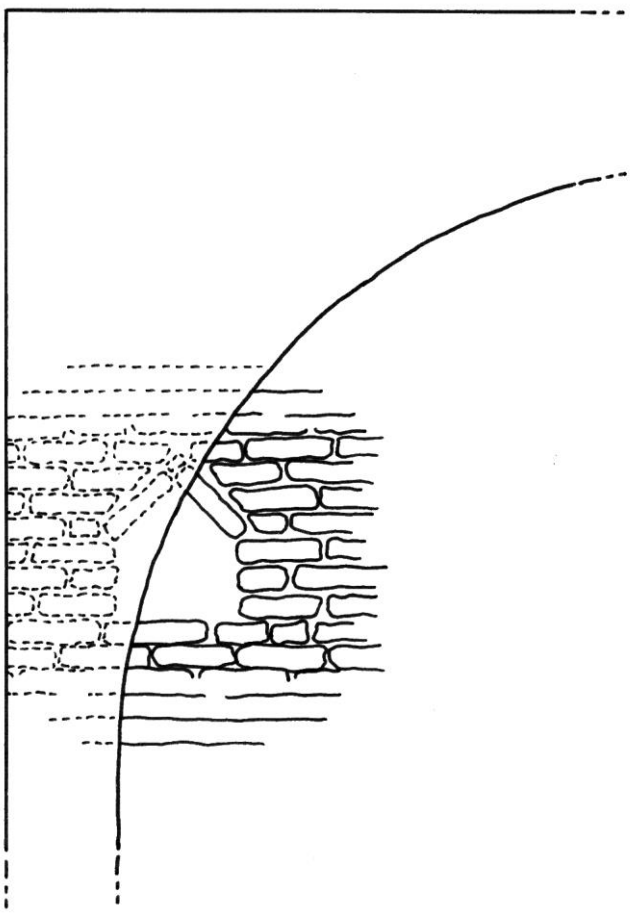


Figure 2.5 Schematic representation of a light niche from an earlier building phase, covered by a younger vaulting (source: hand-drawn by author; partly based on a drawing of Markt 77-79, heritage department of the municipality of 's-Hertogenbosch).

The second type of vaulting is the oldest and most common type: the barrel vault (type 2), which has a semi-circular cross-section and a rectangular floor plan (see Figure 2.6; III). The barrel vault is both the most simple vault type and the longest type used, until in the 18th century. Due to its round vaulting, barrel vaulted cellars are the least space-efficient, (see Figure 2.7). In some cellars, however, this lack of space is overcome by adding lunette (*steekkappen/steekgewelven)* (Joffroy 1994, 9) in the vaulting (see Figure 2.6; VI); these are smaller vaults transverse to the direction of the barrel vault (Enderman 2016, 95). The barrel vault has many appearances, among which its profile can be steeper or flatter, e.g. semi-circular, segmental or ogival, as well as variations with a lower or higher position of the springer (type 2a) (see Figure 2.6; III-VI). Due to the relative small dataset of this study, all barrel vault types are addressed as plain barrel vault. Moreover, it was often impossible to determine the exact type of barrel vault due to the lack of available data or

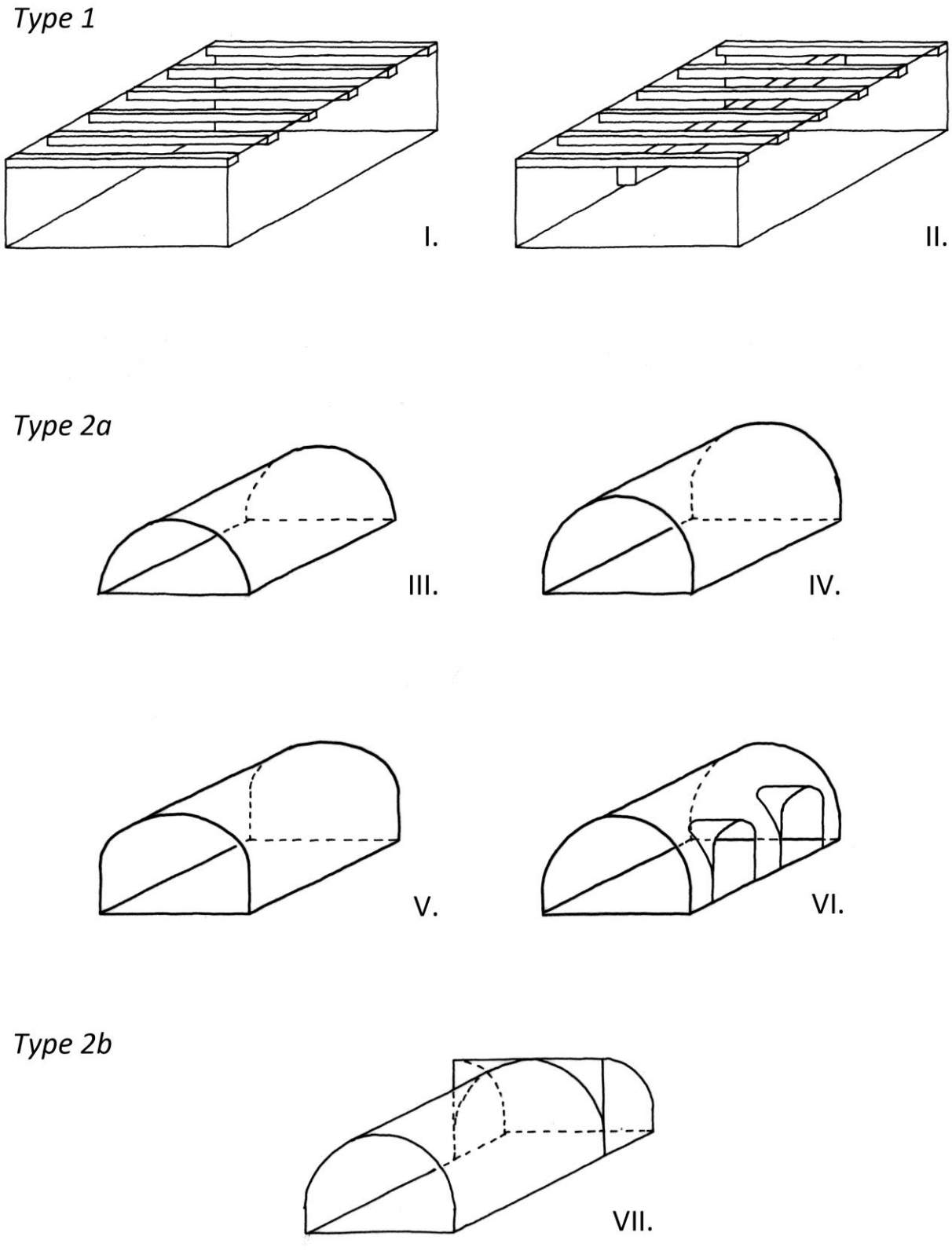


Figure 2.6 Overview of the vaulting types 1 and 2. Type 1: beamed ceiling without supporting beam (I), beamed ceiling with a supporting beam (II); type 2a: barrel vault with a pure round arch and the springer on the ground (III), barrel vault with a pure round arch and the springer above the ground (IV), barrel vault with a pressed vault (or basket-handle arch) and the springer above the ground (V), barrel vault with lunette (*steekkappen*) (VI); type 2b: barrel vault with on the street side a half barrel vault (VII) (sources: hand-drawn and edited by author; based on: Haans and Frank 2003, 27 (IV and VI), Haslinghuis and Janse 2005, 191 (III), Koolstra and Willems 2008, 52 (VII)).

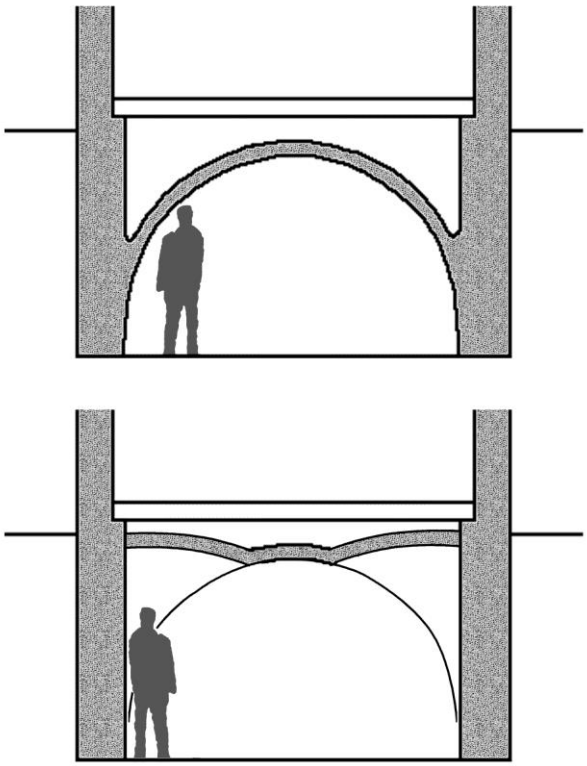
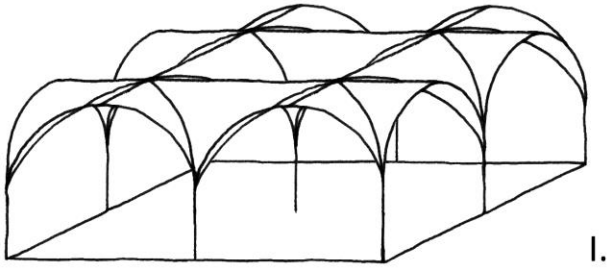


Figure 2.7 Schematic representation of the space in a cellar with a barrel vault (type 2) (*above*) and cross vault (type 3) (*below*) (source: Haans and Frank 2003, 28).

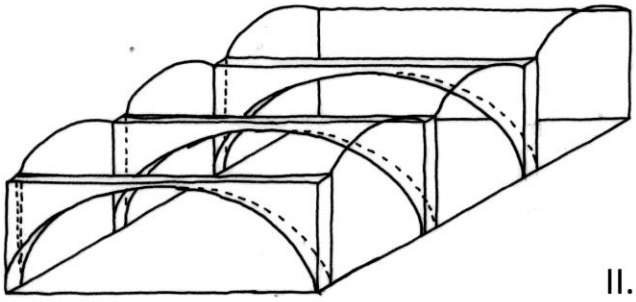
expertise and any further subdivisions could possibly give a false picture when comparing the different cities with each other. The only subdivision made, is when the barrel vault has the addition of a half barrel vault on the front side (type 2b) (see Figure 2.6; VII). This variant was built in order to facilitate an easier access into the cellar, when the entrance was positioned on one of the sides of the façade. Although this particular type is not that common in the results of this study, they are a very common phenomenon in the town of Zutphen, leading to the introduction of the term '*Zutphens type*' (oral communication drs. M. Groothedde). However, according to several building historians, this specific cellar type is also common in 's-Hertogenbosch, as well as in several towns in Limburg and Belgium (oral communication with M.W. Enderman and dr. R. Glaudemans). For this reason, this vault type is included as a variation on the barrel vault and not as 'Zutphens type'.

A third vaulting type is the cross or groined vault (type 3b) (see Figure 2.8; I), which occurs when multiple vault fields intersect. It is created by the intersection at right angles of two barrel vaults with the same profile. The word 'groin' refers to the edge between the intersecting vaults and is sometimes covered by a rib to conceal erratic intersections of the courses. When these ribs are supported separately it is called a ribbed vault (type 3a). The simplest form consists of two

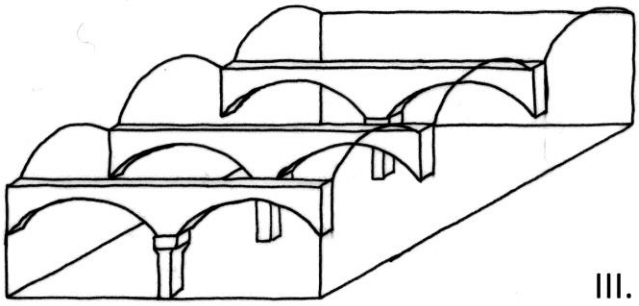
Type 3



Type 4a



Type 4b



Type 4c

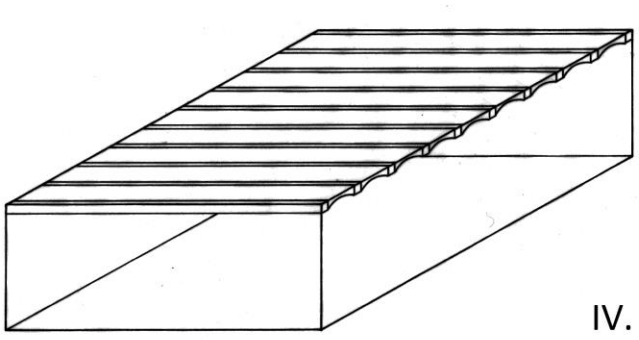


Figure 2.8 Overview of the vaulting types 3 and 4. Type 3: cross vaulting (I); type 4a: trough vault on diaphragm arches (II); type 4b: *Deventer type* (III); type 4c: trough vault with wooden or steel girders (IV) (sources: hand-drawn and edited by author; based on: Haans and Frank 2003, 27 (I), Koolstra and Willems 2008, 52 (II)).

crossing courses on a square or rectangular floor plan and occurs both with semi-circular arches and with pointed or ogival ones.

The final vaulting type is the trough vault which consists of small segmental arches next to each other but separated by diaphragm arches, creating a large space with sufficient standing space in the entire cellar (type 4a) (see Figure 2.8; II). A variation on this type consists of diaphragm arches which are supported by (stone) columns in the middle creating two aisles (type 4b) (see Figure 2.8; III). This type of vaulting proves to be typical for the town of Deventer (Bloemink 2009, 7), hence the name '*Deventer type*'. In the 18th and 19th century, a variation on the trough vault was introduced with respectively wooden and steel girders separating the small segmental arches (type 4c) (see Figure 2.8; IV). Since the 20th century many historical types of vaulting were replaced and provided with the most practical and space efficient ceilings: flat ceilings of concrete (type 5).

2.4 Difficulties regarding the dating of cellars

One of the difficulties regarding cellar research is to date them probably, because many elements that are suitable for absolute dating are often absent in cellars, such as primarily used building materials, timber constructions or (parts of) inventories (Stenvert et al. 2007, 56). However, there is often the possibility to obtain a dating by combining multiple relative dating methods. Most of these methods can be individually unreliable, but present good results in combination with each other. This section will briefly describe the dating methods of the following materials in regard to cellars: brick sizes and bonds, wooden elements, stylistic features and historical sources.

Many cellars are built in brick, which is a building material with a great variety, making it an important material for determination. Distinctive features of brick are its size, composition, appearance, tint and used production method. It should be taken into account that there are significant regional differences and therefore the determinations and datings must be treated very carefully. As regards the

size, not the length of bricks is the correct indicator for a proper dating, but the thickness of the brick seems far more reliable; so to say the thicker, the older (Frank and Haans 2003, 15; Groothedde 2002b, 16). However, the timeframe in which sizes can be related to dating is relative small (14th and 15th century), brick chronologies only apply to certain cities, many bricks were imported and recycled on a large scale and separate brick industries were often set up for the construction of large structures, independent of regional standards (Stenvert et al. 2007, 92). The city of Leiden, for example, produced large amounts of brick and this was a well-known export product during the 15th and 16th century for cities including Haarlem, Amsterdam, Enkhuizen, Amersfoort en Harderwijk (Berends 1990 in Orsel 2007, 8). Additionally, recent building historical researches in Leiden proved that simultaneously multiple brick sizes were used, as is also the case in Amsterdam and Alkmaar. Therefore, it is important to look beyond the size of the bricks and also examine other matters, such as the context, corner solutions, masonry mortar, eventual reuse and the brick bond (Orsel 2007, 12). As for the latter, this is the way in which bricks are arranged on the outside of a wall to provide solidity and a good appearance to the brickwork. In several regions and centuries were different brick bonds fashionable (Haslinghuis and Janse 2005, 325) which makes them suitable for typological dating (Groothedde 2002b, 17). Unfortunately, many cellars are often plastered, so that the masonry is out of sight. It often seems that it was the intention from the beginning to plaster the walls, because the brickwork often consists of bonds without a clear structure, so-called wild bond, which had no representative function. This is also substantiated by the frequent use of recycled building materials. The variety in brick sizes and brick bonds could possibly be explained by the evidence of relations with foreign regions and consequently their traditions and craftsmen. For example, it is known that in north-eastern Germany brick was introduced by craftsmen from Lombardy (Holst 2005 in Orsel 2007, 7).

As far as wood is concerned, few wooden constructions remained and are usually from recent times (19th century and later) (Frank and Haans 2003, 21). Only if there is no vault, the ceiling consists of wooden beams and joists, which

are usually not original, but built later. Still, dating the wood dendrochronological can prove useful to provide a terminus ante quem regarding the construction of the cellar. However, it should be taken into account that (part of) constructions can consist of recycled materials, making the samples unusable. Therefore, it is important to choose the sample locations carefully, by sampling several beams and wooden parts, to narrow down the dating (Stenvert et al. 2007, 58). If the samples do not match the date curve or if there is no suitable wood available, thorough building historical investigation can determine whether the cellar originally belonged to the house. When this turns out to be the case, a good dendrochronological dating of the building is sufficient to date the cellar as well. This approach has been used extensively in 's-Hertogenbosch.

Examining architectural or style characteristics can also contribute to a more accurate dating of the cellar. These elements are very suitable for a typological dating, but are often region-specific and are rare in cellars, so that the research of the superstructure often yields more. In addition, extensive experience is needed to use stylistic research as a dating method (Frank and Haans 2003, 15).

A last useful dating method is the investigation of historical sources, such as historic city- and construction accounts, building specifications and blueprints. Such sources contribute to more knowledge and sometimes even an estimated dating. The research is at best conducted by persons with the right knowhow and skills, such as (building) historians (Stenvert et al. 2007, 58). Also the use of historical imagery like maps, drawings and paintings can provide additional information. However, one should keep in mind that there were hardly any maps before Jacob van Deventer (ca. 1505-1575 AD) and therefore this is not an option for 14th / 15th century cellars. Besides, many maps are copies of older versions and most maps were originally intended for military purposes, and therefore lack the proper details regarding non-military buildings (Stenvert et al. 2007, 61).

3 Cellar research in a broader context

The importance of intensive archaeological and architectural historical research emerged during the last decades throughout Europe. Consequently, many cellars and their remains were investigated and multiple international studies show comparable difficulties and similarities in cellar research. This chapter will focus on the research conducted in the United Kingdom and Germany. The discussed cities are chosen on the basis of extensive cellar research by archaeologists and building historians. No distinction has been made between the research carried out by both disciplines, because the separation between archaeological and building historical research only exists in The Netherlands. The matters discussed in this chapter can be formulated in the following questions: to what extent contributes cellar research in a better understanding of medieval urban development? Are their similarities between the locations of cellars in different towns? Which problems are recurring in cellar research?

3.1 Britain

The first cellar-like constructions in Britain date from the 5th century up to the 10th century. These constructions are so-called *sunken featured buildings* (or SFBs) which were introduced and built by the first Anglo-Saxons and are seen as the earliest evidence of renewed occupation after the Romans left (Quiney 2003, 135). Especially on the eastern part of England, around the Thames estuary (see Figure 3.1), many of these constructions were recovered, both in rural context as well as in towns. Their sizes varied from 60 m^2 to 5 m^2, although the majority was quite small and functioned probably as individual rooms (Quiney 2003, 134). After the 7th century, more permanent and solid houses made their appearance and the construction of SFBs declined (Quiney 2003, 135). In Ipswich (Figure 3.1; 5), the SFBs were superseded by larger structures with cellars and probably one or two storeys. The cellars were located 2 m underground and the complete house plan covered circa twice as much space compared to SFBs, making it suitable as family house (Quiney 2003, 141).

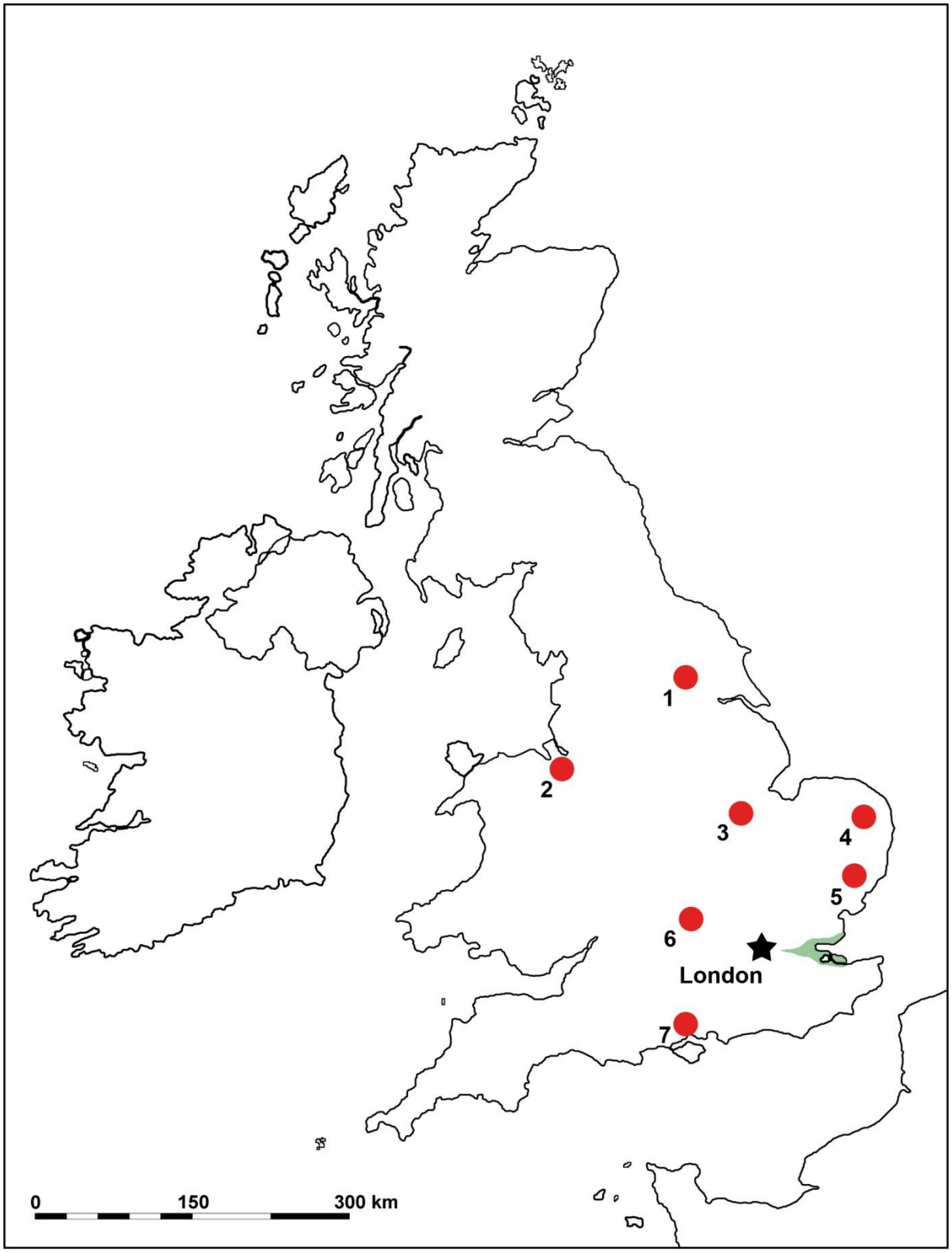


Figure 3.1 Overview map of the United Kingdom. The red dots represent the cities mentioned in this chapter: 1. York; 2. Chester; 3. Stamford; 4. Norwich; 5. Ipswich; 6. Oxford; 7. Southampton. In green the area of the Thames estuary (source: made by author).

The 10th century was an important period for urban development, which is reflected in the emergence of urban specific constructions in larger and medium-sized towns. At the end of the 10th century, new trading opportunities occurred due to new silver supplies and coinage reform. An important feature of some late 10th century towns is the emergence of a distinctively cellar type, which is only found within urban context and never on rural or aristocratic sites (Hinton 2000, 230). These early cellars were rectangular and often timber-lined, it is assumed that they had a ceiling as well, allowing a timber superstructure to serve as a living space (Hinton 2000, 230). Examples of this type were found in York (Figure 3.1; 1) during excavations between 1976 and 1981 and could be dated in the 970s. Parts of the timber was even preserved up to their originally height (ca. 1.8m) (Hall 1978 in Hinton 2000, 230). Because there were no traces found of light inlets except for the entrance, it is assumed that the cellars were not used as regular living space or workshop. In cases where the earthen floor was identified as a work surface, it is believed that the cellars had a roof, instead of a ceiling. Or that they partly protruded above ground, forming semi-cellars, with a superstructure above ground level, which made it possible to add light inlets (Hinton 2000, 230). The cellar constructions developed further, in Oxford (Figure 3.1; 6) is a stone-vaulted semi-cellar located, which is considered as the transition to vaulted cellars. This still existing cellar was located close to the building line and is dated to the first half of the 12th century (Hinton 2000, 235). This new type generally succeeded the timber-lined types (Hinton 2000, 236).

From the 13th and early 14th century it seems that the need for an easy access towards the street became important in English towns south of the highland zone, which is reflected by the position of the cellar within the property. The cellars were vaulted and presumably colourful decorated probably to encourage business in or off the street. One type of cellar consisted of a single aisle along the street frontage and was probably situated under small shops, hence its entrance to the street. Larger cellars with two aisles and columns down the middle were seen on more prestigious properties and under stone buildings (Schofield and Stell 2000, 387). The vaulted cellars are often associated with and connected to the

street. Due to their easy street access, these cellars were often let separately to third parties (Schofield and Stell 2000, 388). Examples are a stone house in London (Figure 3.1) that had its cellar sublet before 1200 (Schofield and Vince 2003, 110) and the famous Rows in Chester (Figure 3.1; 2), dated to the late 13th and 14th century. The latter consists of multiple cellars next to each other forming whole streets, many of whom were probably rented separately (Schofield and Stell 2000, 388). Nevertheless, vaulted cellars can also be found further away from the facade. These cellars were usually less ornate and both cellar types were present in towns (Schofield and Vince 2003, 111). Besides its use as storage or shop, they were in the early 14th century also used as taverns, such as in London and Oxford. Such wine houses were major capital investments (Schofied and Stell 2000, 389) and a possible result of the already existing relation between cellars and the storage of wine (Quiney 2003, 150). In the 15th century, the drinking area extended to the ground floor as well, and from the 16th century most cellars were abandoned (Schofied and Stell 2000, 389).

Constructions in medieval Britain were built in timber, stone, brick and earth. The building materials have influenced the variety, decoration and life-span of the buildings. At first, all materials were locally available and the former Roman towns proved to be an excellent source for obtaining them. When the supplies ran out, brick was imported during the late 13th century. From the 14th century, the local brick industries, initially introduced by the Romans, were revived (Schofied and Stell 2000, 389). Initially, brick was particularly used in the civic works of eastern towns, for example as finishing for the city walls of Norwich, raised between 1294 and 1343 (Quiney 2003, 100). After brick proved its use, it came into wider use in the early 15th century (Schofied and Stell 2000, 389), like in the well-researched cellars in Norwich (Figure 3.1; 4) (Quiney 2003, 100). This town was in the middle of the 14th century, the second largest city of the country, with a population of circa 30,000 inhabitants (Rutledge 1988 in Ayers 2001, 35). Although many major monuments are still intact, as well as the layout of the cities centre, unfortunately fewer than twenty houses dating from before the 16th century remain (Ayers 2001, 35). Luckily, significant amounts of brick vaulted

cellars were discovered during large excavations, allowing the research of medieval domestic buildings (Ayers 2001, 36). Most of the cellars can be dated to the 15th century and some even in the 14th century. Compared to other English towns like Stamford or Southampton (Figure 3.1; 3 and 7), the occurrence of brick vaulting is a relative late phenomenon in Norwich. Usually they are located on topographically distinct locations; which is often on the downward slopes of hills and close to the building line. Besides facilitating a fire-proof and damp-proof storage, it is also suggested that the cellars formed a platform on which timber framed houses could be built (Smith/Carter 1983 in Ayers 2001, 43). These vaulted spaces had most likely domestic functions, instead of being used as shop or tavern. Evidence for this is the absence of connections to the street and only rarely an entrance to a private courtyard. Furthermore, it seems that they were closely linked to the superstructure and used for storage. Generally there were no windows, instead there was a light niche in the wall; many had side rooms and the vaulting was achieved by various techniques, such as barrel vaults and unribbed or ribbed groined vaults (Ayers 2001, 43).

During the 15th century an alteration in use is noticeable, cellars were no longer used as places that were regularly visited from the street. This change is possibly explained by the many economic problems in towns. For example Southampton, here, the 13th and 14th century cellars were used both as shop and storage, while the 15th century cellars functioned exclusively as storage. The cellar interiors reflected this change in use as well, their appearance was simplified and decorations disappeared (Schofield and Stell 2000, 388). It is unclear why exactly these changes occur and the shops were moved to the ground floor instead, perhaps people were less hoarding goods in urban houses (Schofield and Vince 2003, 112). It is argued that this change may have been affected by the increased trade in draperies. Cellars would not be suitable for the storage for cloth, because they would suffer under the damp conditions, in contrast to wine which benefits from cool temperatures. Therefore, it seems plausible that the size of storages and shops increased on ground level (Schofied and Stell 2000, 388). Besides the size, also the importance and possibly the function of the cellar changed, as well as

other areas like shops and storages. This is probably a result of market forces demanding various forms of wholesale and retail trading (Schofield and Vince 2003, 113). It is mentioned by Dodgshon (1987 in Schofield and Vince 2003, 113) that the changes in size of trade-related buildings can be used as an indication for changes in the organisation of local and long-distance trade.

3.2 Germany

3.2.1 Lübeck

Another country with a rich history and many old cities is Germany. Despite the destructions in World War II, many historical buildings and cellars are still present. One of these cities is the Hanseatic city of Lübeck (Figure 3.2; 2), the first German settlement at the Baltic Coast, founded in 1143 (Bosau 1973 in Schalies 2006, 79). The city was part of the Hanseatic League and functioned as an important trade hub, since all trading goods for the Scandinavian, Baltic and Slavic regions went through here (Gläser 2001, 277). Since the 12th century many large residential and commercial buildings were located and built on small plots with a front-gabled orientation (Schalies 2006, 79). Around 1200 Lübeck consisted mainly of wooden structures, except for the city walls and churches. At the end of the 13th century the whole city was already built in stone, due to a rapid *versteningsproces* (Gläser 2001, 277).

At the beginning, the settlement consisted of plots with loose buildings. The timber-built main houses were single storey and post-constructed with a front-gabled orientation bordering the street. On the rear of the plot were outbuildings located, as well as water wells, storage pits and waste pits. In addition to the post-constructed house types, there were also log-built outbuildings with cellars (Legant-Karau 1994 in Schalies 2006, 79). From the last quarter of the 12th century, multi-storeyed frame buildings with cellars emerged, known as *Ständerbau auf Schwellen*. This typical Lübeck timber house of the late medieval (Gläser 2001, 282), was a type of half-timber work of which the posts in the walls were going

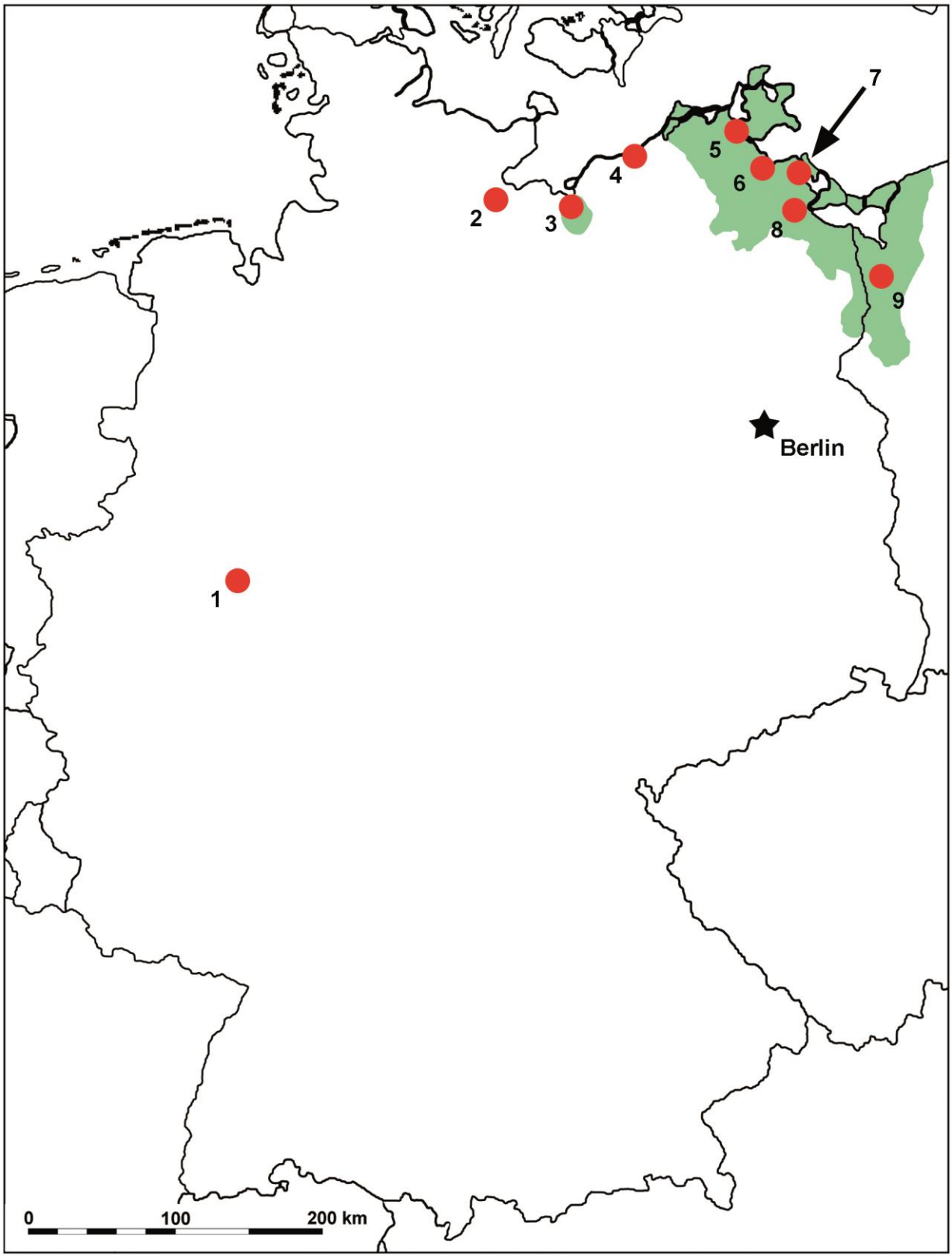


Figure 3.2 Overview map of Germany. The red dots represent the cities mentioned in this chapter: 1. Soest; 2. Lübeck; 3. Wismar; 4. Rostock; 5. Stralsund; 6. Greifswald; 7. Wolgast; 8. Anklam; 9. Stettin (Poland). In green the area of former West Pomerania (source: made by author).

continuously from the threshold up to the roof. These posts formed the supporting system of the building and constituted at the same time the side walls (Grütze 2007 in de.wikipedia.org). This building type was not the first deepened type of frame building known in Lübeck, however it was, during major excavations between 1985-1990 (Dumitrache et al. 1990 in Schalies 2006, 79), the first time this house type was found on six adjacent plots and systematically was examined in context with the rest of the building (Schalies 2006, 79). In two of the four excavated buildings, the original floor level and the underlying cellar were still intact, consisting of strong ceiling joists and the remains of the ground floor. These buildings were usually not located adjacent to the street, but rather in the rear half of the plot or directly behind the main building. Their surface areas varied considerably, with dimensions between 15 to 59 m2. The cellars were dugout in a more than 3 m deep pit into the hillside. In only two large cellars there were internal columns present and only one had columns with bevelled edges (Schalies 2006, 80). Another remarkable characteristic of the latter was the presence of four wooden shafts in the south wall just below the ceiling. These wooden shafts, with an approximate size of 110 cm (L) x 40-50 cm (W) x 20 cm (H), are mainly interpreted as ventilation shafts, although they could have provided the cellar with a bit of light as well. In most cases, the cellar floor was level with the bottom edge of the thresholds and did it consist of a sandy-humic occupation level. Only occasionally did cellars in the merchant district have wooden floors (Schalies 2006, 81). Noteworthy is the presence of multiple barrels found in the floors of several cellar. Presumably, they were dug into the ground to achieve a draining effect (Gläser 2001, 287). The cellars were accessed by an external ramp or staircase and evidence for internal accesses have not been found. Unfortunately, the preservation of such remains was generally poor, due to subsequent younger constructions. (Schalies 2006, 81). Cellars that were excavated on the east side of the city, between the Alfstraße and the Fischstraße, could be narrowly dated to the 1180s. They were all burned to the ground and never rebuild. It is assumed that the cellars were used as storage for goods that needed a cool and humid climate, although specific finds are lacking. In the fill of

one of the cellars were stove tiles, stove clay and heated stones found, these finds are interpreted as an indication that any of the storeys was heated and thus serving residential purposes (Legant-Karau 1994 in Schalies 2006, 82).

There are 19 frame-buildings known that are deepened or constructed with a cellar and dated in the 80s and 90s of the 12th century. Depending on their location and, most probably, their purpose, these buildings had either full or semi-cellar. This type of building can particularly be found at the outskirts of the town. The buildings are relatively small, with surface areas of mostly 4 x 4m, and the used timber is generally more weakly, that is why it seems unlikely that there were multiple storeys (Schalies 2006, 82). The occurrence of wooden cellars seems to be concentrated at locations with a natural high altitude in the central area of the city island. Beyond this area no wooden cellars were detected, despite extensive excavations in recent years. However, the absence of them in the archaeological record seems to be related with a change in building construction within the urban plots. It could be determined that after 1230 the wooden front houses in the merchants district were alternately replaced by brick, side-gabled oriented, buildings with cellars (Schmaedecke 1996 in Schalies 2006, 85), which in all probability will have taken over the storage function of their wooden predecessor (Schalies 2006, 85).

In the course of the 13th century the Lübeck economy developed rapidly and thus the demand for living and storage space. The building density became so high that a city fire would have devastating consequences. Therefore the city council decided, while already promoting the use of bricks after the last great fire in 1276, to regulate the construction of brick firewalls by law (Radis unpublished in Schalies 2006, 85). Due to this regulation, the *Dielenhaus* (or hall house) made its appearance; a building with a large high hall (up to 6 m), which occupies a considerable part of the building, similar to hall houses in the United Kingdom. It served as the main living- and working space and seems to have been perfectly suitable for small-scale production as well as for storage and sale of bulk goods. The houses had a front-gabled orientation, often two-storeys and in most cases

cellars (Gläser 2001, 298). Since the sides of the houses consisted of shared walls, they were owned by both homeowners and therefore were not often demolished. As a result, the houses lasted for centuries and they define the streetscape of Lübeck since the late 13th century (Radis unpublished in Schalies 2006, 85).

3.2.2 Soest

Another Hanseatic city, with a completely different architectural development, is the city of Soest (Figure 3.2; 1) in North Rhine-Westphalia. The town developed between circa 800 – 1200 AD and had been an important Westphalian centre since the Carolingian period. Soest experienced a huge boom in the high Middle Ages. A highlight in its development was achieved in the 15th century, when the city renounced the Cologne archbishop and therefore needed to defend their emancipation during the Soester Feud (1444-1449). The won freedom in the feud brought a political isolation with it and at the same time the decline of the Hanseatic League began, which resulted in a loss of medieval legitimate economical trade power. Soon the city started to decline and consequently its population reduced. Due to the migration of wealthy merchants, many of the major civil buildings fell in disrepair (Jakob/Köhn 1984 in Thiemann 2001, 455). As a result, many medieval structures were preserved both underground and above ground (Thiemann 2001, 455).

A typical feature of Soest is the earth cellar, a structure deriving from early medieval sunken featured buildings (SFBs) or *Grubenhäuser* (pit-houses) (Thiemann 2001, 471). These structures were dug directly into the ground, because the subsoil of Soest consists of loess. The stability of this soil was in dry state high enough to do without liner, therefore most of the earth cellars were constructed without a boarding. In some cases it was difficult to distinguish if these earthworks were part of a separate outbuilding in the form of a pit-house, or belonged to a larger building as a cellar (Thiemann 2001, 456). The pit-houses of the Carolingian-Ottonian period differ in size of the 35 so far excavated pit-houses in the urban area; however their design features are very similar. The shape of the pit is usually oblong, with a surface of 2 m x 3 m generally, up to 4

m x 4 m as a maximum and a variable depth between 1 m and 3-4 decimetres. However, the lesser deep variants may also be caused by erosion of the original surface, an event that occurs quite often in the hilly terrain of Soest. Most of the pit-houses were constructed with posts sunk into the pit bottom. Although the occurrence of fully walled pit houses has been very rare, there is at least one recovered. Its walls consisted of piled elongated natural stones with loam used as a binder and the construction was accessed by a ramp. It is likely that the nearby archiepiscopal palatine (about 100 metres) related is to this early stone building. The link with stately structures generally seems to apply to pit-houses with stone walls (Grothe 1997 in Thiemann 2001, 457). However, these stone walls did not have a bearing function, they were basically set against the flanks of the pit; therefore it seems unlikely that upwards stone walls were used in pit-houses. The stone building materials consist exclusively of the regional green sandstone and brick was barely used in Soest until the 19th century (Thiemann 2001, 468). From the late 11th century the appearance of the pit-houses changed. The shape and size remained similar, however the construction method changed; the posts were no longer placed inside the pit, but on the outside. This type occurs until the 13th century. In one case, a pit-house was found dated to the 12th/13th century with posts unusually deep sunken into the ground, indicating the possible presence of a massive superstructure and thus a use as cellar (Thiemann 2001, 457). Besides the pit-houses, there are also vaulted cellars present in Soest, which arose mainly from the 12th century onwards, after the increased use of brick in constructions. Characteristically for medieval stone constructions is the combination with wooden components, therefore most buildings consists of both materials, although cellars were often fully built in stone (Thiemann 2001, 461). One of the features of these large cellars was a division in two unequally sized rooms, both of which were accessible by its own access; an example of such cellar has been dated to the middle of the 12th century (Thiemann 2001, 463).

3.2.3 Stralsund

The final German city which will be discussed is the Hanseatic city of Stralsund (Figure 3.2; 5). This city has been the subject of extensive cellar research,

involving the mapping of all cellars. In total, 1,030 cellars were systematically charted in order to contribute to an extensive cellar cadastre (Brüggemann 2006, 11).

The city of Stralsund, in Mecklenburg-Vorpommern, is located at the Strelasund, a strait of the Baltic Sea. The city has city rights since 1234 and was one of the founding members of the Hanseatic League; therefore the free trade played a major role in its urban development. The most important sources concerning the appearance and function of the houses and cellars in Stralsund are two historical drawings, dating to respectively 1647 and 1706/7 (Brüggemann 2002 in Brüggemann 2006, 13), and the *Swedish Matrikel*[1]. The description of cellars in this record made clear that most cellars in Stralsund are from medieval origin. The *versteningsproces* first began in the second half of the 13th century, particularly in the northern part of the old city. From the 14th century, there was a real construction boom in the northern and southern parts of the city, mainly of houses with a front-gabled orientation, so-called *Giebelhäuser* (Brüggemann 2006, 28). Typical features for these houses were firewalls and *Vorkeller*; represented in 460 medieval firewalls and 184 *Vorkeller* comprehensively distributed in the city. The *Vorkeller* is a small vaulted cellar to the street and built into public space below the stoop (Brüggemann 2006, 20). The front-gabled *Giebelhäuser* of the late 13th-16th century are mostly very well preserved below ground and almost all of these houses have a barrel vaulted streetcellar. The purpose of these *Vorkeller* is assessed through an analysis of its construction. The ones situated at the market for example, are interpreted as (part of) a market stall. Other examples are with both ends connected to the street and also accessible via the side adjacent to the street. There are also *Vorkeller* that were only accessible from one side, in these cases is the side entrance to the barrel vaulted room in the middle missing (Brüggemann 2006, 20). Furthermore, some *Vorkeller* were extraordinary

[1] The *Swedish Matrikel*, or Swedish Land Survey of Western Pomerania, is a mapping of Swedish Pomerania and the rule of Wismar in Mecklenburg between 1692 and 1709. It is known as the oldest cadastre work in Germany and consists of 1737 surviving maps and 77 descriptive volumes (www.deacademic.com, entry Schwedische Landesaufnahme von Vorpommern).

decorated, indicating the probability of trade purposes (Brüggemann 2006, 21). The remains of door hinges at the side and middle passages indicate the possibilities to lock these *Vorkeller*, as well as the street entrance. This seems necessary according to some 15th century Stralsunder charters, which mention that theft from cellars occurred regularly (Brüggemann 2006, 20). In the first half of the 14th century, stone *Giebelhäuser* were built alongside the main roads of the old town according to Lübecks construction law. Cellar registrations and excavations showed that these houses covered all free space along the main traffic axis. Good examples are the merchant houses (or *Kemläden*) with cellars at Badenstraße 40-45. This entire row of houses consists of mainly medieval structures. In the 16th and 17th century major renovations took place, like the merging of two plots, redesigning the gable, retraction of cross vaults in merchant houses and the use of architectural decoration. During these renovations spiral stairs were often added to the merchant house cellars (Brüggemann 2006, 25) and original beamed ceilings under combined plots often replaced by vaultings (Brüggemann 2006, 28). Evidence of combining two or more plots in the 14th – 16th/17th century are found in the presence of niches converted into historical passages in firewalls and existing *Vorkeller* (Brüggemann 2006, 29).

After the Scanian War in 1678 and a devastating city fire in 1680, around 60% of the buildings in the old city were rebuild (Grabinsky 2005 in Brüggemann 2006, 14). Due to bombardments were on many plots only the cellars still habitable, because they were not affected substantially. After the events, the new baroque buildings were founded on the old cellar walls, although the original cellar ceilings were often replaced or repaired (Brüggemann 2006, 14). Many of the medieval cellars changed in size, because many destroyed merchant houses were not rebuild. Front-gabled houses were often replaced by side-gabled ones and the original house depths of 17-20 m shortened by about 5-10 m. The lack of building materials for the reconstruction was resolved by the reuse of medieval bricks of destroyed parts of buildings. This shortening is still visible in many rear walls of cellars, which consist of (split) field stone, mixed masonry of reused brick and

fieldstone, or just out of recycled monastery sized bricks, while the house above was often built with timber framed walls (Brüggemann 2006, 15).

The various cellar ceilings in Stralsund were distinguished and surveyed according to material, shape and age. Originally, most cellars were covered with wood-beamed ceilings and around 1700 there were still 971 left. Nowadays, however, there is only one third still intact (Brüggemann 2006, 17). Besides these beamed ceilings, there were also vaulted cellars; the inventory of vaulting distinguishes 88 barrel vaults of the 14th-18th century, 24 groin vaults of the 16th/17th century and three cross rib vaults of the 14th-17th century (Brüggemann 2006, 19). It is clear that many of the historical cellars give evidence of constructional modifications, because of social- and economical changes (Brüggemann 2006, 28).

In the vicinity of Stralsund, there are many other towns investigated regarding the occurrence of cellars. A typical feature for cellars in this region was the function of cellar residence. Evidence for this type of use was found in many cities in former Western Pomerania (see Figure 3.2), a region that was a Dominion under the Swedish Crown from 1630 to 1815 and called Swedish Pomerania. Between 1706 and 1709 surveyors commissioned by the Swedish Crown made accurate measurements of land and detailed descriptions of buildings, including the presence of cellar residences. This type of cellar was found in Stettin (324 cellar residences), Stralsund (76), Greifswald (11), Wolgast (1) and Anklam (14) (Figure 3.2; 5-9). The investigations showed that in these descriptions, there was often evidence for the presence of (un)inhabited residential cellars, which concerned no independent dwellings, but belonged to the houses above (Kroll 2006, 157). The residential cellars were often used for the quartering of infantrymen, but were also inhabited by people from lower social classes, such as servants, carriers, day labourers and craftsmen, as well as people described as poor or 'simple' (Kroll 2006, 158).

Especially the city of Stettin, now called Szczecin and located in Poland, forms an exception regarding the presence of cellar residences. The study shows that in the

early 18th century, at least 324 cellar residences were recorded, ranging from one up to six cellar residences per property. If only the three well-preserved city districts are taken into account, it can be determined that there were cellar residences present on 237 of the 858 properties (27.6 %). In other words, the occurrence of cellar residences played still an important role on the house market of Stettin in the early 18th century. Although comparative sources are lacking for earlier periods, it can be assumed that the amount of cellar residences in the 18th century had declined compared to the 17th century, due to a declining population and new building regulations (Kroll 2006, 160). Travelogues from the 16th century mentioned already cellar residences as a typical feature for the city of Stettin (Schröder 1929 in Kroll 2006, 160). It seems that only in larger cities, like Stralsund and Stettin, significant numbers of cellar residences present were in the early 18th century (Kroll 2006, 162). A few other cities with cellar residences are Wismar and Rostock (Figure 3.2; 3 and 4) (Münch 2006, 146). Although most of the cellar residences are dated to later periods, the fact remains that it seems plausible that cellars in earlier periods could have been used as cellar residences as well.

This confined overview of cellar research in Britain and Germany, gives a better understanding of the necessity for this study. It is clear that thorough research of cellars can give valuable information about the knowledge of the history of urban development and city planning. By comparing the constructions above the ground with the remains underground it appears to be possible to reconstruct the subdivisions of structures, the size and width of houses and the course of old streets (Frank and Haans 1996, 18). Even when the original building has disappeared completely, it is sometimes possible to find out its general appearance, due to the shape and size of the cellar (Frank and Haans 1996, 14). In addition, a broader framework offers the opportunity to compare the subject in different cities in an international context. In this way it could appear that

formerly local cellar types suddenly turn out to be widespread phenomena in other cities.

4 Methods

The following chapters will discuss the variety of cellars in three different Dutch cities, according to the composed dataset presented in the appendix (see 15.1, 15.2 and 15.3). The investigated cities are ´s-Hertogenbosch, Arnhem and Deventer and they are presented in this order, which is based on the degree of research. ‘s-Hertogenbosch is the first, which has been studied the most extensively and its data has formed the initial basis for the layout of the dataset. Next is the city of Arnhem which has been examined less thoroughly, although cellars have been systematically investigated. Moreover, Arnhem’s reports were used to further refine the layout of the database and were used as a basis in order to design field forms for Deventer cellar research. Finally, the city of Deventer, which has not been investigated at all; which made it necessary to develop its own method for this.

For every city in this study, a dataset has been compiled which is presented in the appendix. The design and presentation format of the tables of the dataset are derived from the tables in the appendix of the NAR59 (Cleijne 2017, 406-441). The table in which the data is presented is subdivided into different characteristics that are present in the cellars. These subdivisions have been made by looking closely to reoccurring characteristics in the various documents and by choosing those that seemed most typical. The structure of the table is largely based on the obtained Bossche data, because 's-Hertogenbosch was the first city from which data was obtained. Complementary data from the Arnhem reports led to further adjustments of the table. Because of the different building phases and the many later adjustments, there could be many exceptions and subdivisions made, however to keep the data and results workable, the choice has been made to limit the variety of characteristics presented in the table. As a result, all charts shown in this study are extracted from the data presented in the appendix. All deviations and exceptions are discussed in the section “Dataset” in the corresponding chapters. The data in the dataset are divided into the following categories:

- *Building number* – Each address in this study is provided with a unique combination of a letter and a number. The used letter is the first letter of the city where the cellar is located ('s-**H**ertogenbosch, **A**rnhem and **D**eventer). When there is more than one cellar on a property; every cellar gets its own record, distinguished by an additional letter in lower case (i.e. *a*, *b*, *c* etc.). The issued numbers are subject to the alphabetical order based on the addresses.
- *Location* – Contains the address, and in the case of 's-Hertogenbosch the corresponding building block number. The building block numbers correspond to the systematic building-historical research of 's-Hertogenbosch, in which the individual housing blocks are provided with a unique numbering. In some cases it may be that the addresses are not up to date anymore; which is due to the disappearance of buildings over time and subsequently the renumbering of the remaining buildings.
- *Monumental status* – This subdivision has been added to give the most complete picture possible of the current situation.
- *Still present* – See above.
- *Accessible* – See above.
- *Dating* – Consists of a specified and a normalised dating. The specified dating is based on archives, literary sources and limited available dendrochronological datings of the properties and can be year or period specific. The so-called normalised datings are derived from the specified datings so that they are more useful to analyse. In every case, the oldest possible dating is used. The dating in this study is limited to one general dating for the entire cellar. It should be noted, however, that the various elements such as walls and ceilings are not necessarily dated to the same building phase.
- *Situated* – This covers the location of the cellar on the plot: under the front or back part of the house, under the street or under the entire house. Any cellars under annexes are not included. In the case of multiple cellars on

the plot, they are given their own record, as explained under *Building number*.

- *Dimensions* – Concerns the dimensions of the cellar and since most cellars are measured from the inside, the dimensions do not include the walls. However, this data was often lacking in the available sources. In the case of 's-Hertogenbosch, this has been partially overcome by making use of the measurements of other floors, if available. If done so, the measurements have the addition of the 'smaller than'-symbol (<), which means that the cellars are, most probably, at least smaller than the superstructure.
- *Orientation to street* – This indicates whether the crown of the cellar is parallel or perpendicular to the street, as far as barrel vaults are concerned. However, this is different with regards to trough vaults on diaphragm arches. The crown of the trough vaults appears subordinate to the diaphragm arches, therefore is decided that the line of sight with respect to the diaphragm arch is used as guidance (see Figure 2.1). In addition, the subdivision between a front-gabled and side-gabled orientation is always related to the **current** address of the property. In some cases are the properties located on corners and are the current cellars in the rear originally part of houses which have disappeared over time (e.g. A7, see Figure 2.2). Even in such cases is the façade of the current address leading in regards to the orientation and are such cellars listed as *cellars situated in the back*.
- *Ceiling/vaulting type* – Describes the type of ceiling of the cellar, according to the types of vaulting presented in section 2.3. Many vaulting types were often used in combination with one another and therefore it was sometimes necessary to attribute more than one vaulting type per cellar. If more than one type is used, this is shown in the table. Furthermore, vaultings on columns such as cross and trough vaults are not specifically mentioned, instead they are represented by the amount of aisles present (see also *Aisles*).

- *Above ground* – This includes the extent to which the cellar is subterranean. When a cellar is partly above ground, the number of centimetres it protrudes is mentioned.
- *Aisles* – The amount of aisles indicates whether columns are present in the cellar. Because columns also occur in cellars with a beamed ceiling, the mentioned cellars do not necessarily have a vault. Furthermore, because barrel vaults are in principle always single aisled, the subcategory ("single aisled") is left out.
- *Entrances* – Covers the location of the entrance to the cellar: by street, backyard or internal. It happens that one cellar is accessible through multiple entrances.
- *Other facilities (open & closed off)* – This concerns the various facilities that are or have been present in the cellars, namely passage ways, *trapportaal*, light niches, cellar light/dumping chute, hearth, water well and cess pit. No distinction has been made between cellar lights and dumping chutes, because it is nowadays often difficult to distinguish their exact function. The available facilities are indicated per quantity, although the totals presented are merely an approximation of the possible number and in all probability incomplete, because the documentation available was often unverifiable. The original facilities may also have disappeared as a result of major renovations and adjustments to the cellars.
- *Wall finishing* – This is about the presence or absence of a wall finishing, like plaster. This is added, because it was explicitly mentioned in some Arnhem investigations. There is also a possible relation between wall finishing and brick bonds, with regard to the visibility and representativeness of the masonry.
- *Brick bond* – This category has been added for the same reasons as *wall finishing*. If necessary an 'L' or 'R' was added, to specify which sidewall is meant.
- *Brick sizes* – These are added; because brick sizes can sometimes contribute to dating, provided local brick chronologies are available. It

was also the intention to bundle as much information as possible regarding available cellar research in this dataset. The height of 10 layers of bricks is an important measurement among building historians, therefore this is added when available. If there were only a 5 layers of bricks available, '5L=' is added for clarification.

All data in the dataset is based on the available sources, with an exception of several cellars in Deventer, which are investigated by the author. If no data was available whatsoever, the cells in the dataset have been left empty.

Each chapter has the same layout, which consists of an introduction, followed by a brief history of the economy and politics, as well as the building history, during the Middle Ages. Hereafter a section in which is explained how the relevant data was obtained and a section that explains the structure of the dataset. Subsequently, the results of the research are presented, which is subdivided in the following subsections: the dating of the cellar, its situation on the building plot, the dimensions and size, to what extent there are semi-cellars present, the orientation relative to the street, the ceiling- or vaulting type, the location of the entrances, the presence of other facilities and finally the applied brick bond and various brick sizes. The order in which the results are presented is similar to the table of the datasets (see appendix 15.1, 15.2 and 15.3). Finally, the results are discussed in the analysis and a general conclusion will be formulated.

As regards the presence of other facilities, these have been present in many cellars, such as passages, doorways, light niches, cellar lights, dumping chutes, hearths, water wells and cess pits. These elements have been taken into account because of the design of the registration forms, which are based on the descriptions in the report about Rijnstraat cellars in Arnhem. In this report, attention is paid to such facilities per address and it has therefore been decided to adopt this approach in this study. However, the results are often not unambiguous and should therefore be handled with care. In some cellars, for example, several passages are present, but it is often unclear to which

construction phase they belong, moreover many facilities have been closed, reopened or completely removed at a different time. Showing all the differences and exceptions in the dataset caused difficulties, because it was necessary that it would remain well-organized. Moreover, the descriptions of the non-visited cellars (121 of 137) often lack exact details with regard to such special elements, making it impossible to make valid comparisons. So it has to be taken into account that the lack of data from other cellars is not proof of the lack of these facilities, but only that no data were available. This applies to all three chapters. That is why this section is meant to take a brief look at special elements that can be found in cellars, without drawing any firm conclusions.

5 ‘s-Hertogenbosch

5.1 Introduction

This chapter is about the city of ‘s-Hertogenbosch, which is located in the south of the Netherlands and the capital of the province of North Brabant. The city is ideally situated on a natural levee both on the edge of a higher sand ridge and on the transition area to the river valley. At the place of the historic city, the rivers Dommel and Aa merged and formed the Dieze, which ended 6 km to the north in the Meuse. The landscape was characterized by relative high sand ridges and lower areas with wet conditions and several streams and rivers (Cleijne 2017, 170). In order to answer the research questions, the cellars on 50 addresses (see Figure 5.1) were examined and the results are discussed in the sections below.

5.2 History

5.2.1 Economy and politics

The town of ‘s-Hertogenbosch was founded by Henry I, Duke of Brabant (1190-1235) at the end of the 12th century, on the ducal domain at Orthen, close to the northern border of his duchy (van Drunen 2006, 32). During the same period, many small settlements in rural areas in the region were abandoned and transformed into fertile arable land by covering the abandoned ground with large layers of manure and *plaggen* (Theuws 1989 in Janssen 2009, 33). The inhabitants were driven away in search for new places to settle, which resulted in unstable situations and, most likely, power vacuums (Janssen 2009, 33). The duke took advantage of the situation to enhance his power in the region and to do so he founded several new towns on virgin soil in those regions that lent themselves to the extensions of his sovereignty. Many of these new towns were founded in the vicinity of smaller settlements, however ‘s-Hertogenbosch was created ‘out of nothing’ (Janssen 2009, 28). The new town was founded in the vicinity of a crossing of an important north-south connection over land and a road to the east (see Figure 5.2). The nearby confluence of a number of smaller rivers into one

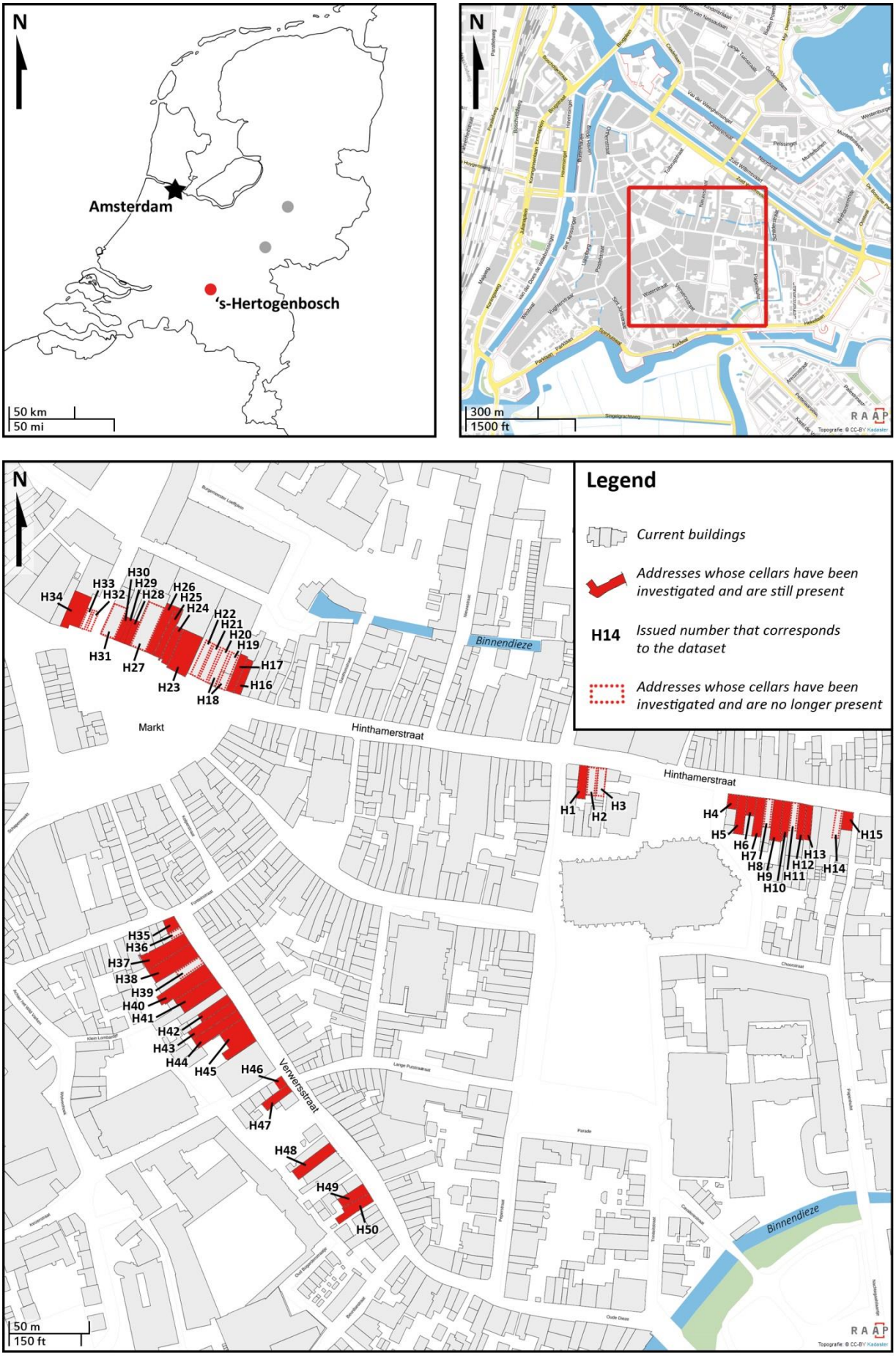


Figure 5.1 Overview map of the city of ´s-Hertogenbosch. *Above left*: **the location of 's-Hertogenbosch in the Netherlands relative to both other cities;** *above right*: **location of the research area within the city;** *middle below*: **detailed view of the research area (source: made by author; underlying city maps: geo.raap.nl/raap-geo-info).**

larger river, which was connected with the Meuse, gave access to the international trade (Janssen 2009, 34). The choice of this location was possibly influenced by the duke himself regarding the increase of trade by river and land routes, although the exact motive of the foundation remains unknown. (Janssen 2009, 33). To enhance the position of the town even further, the duke negotiated exemption from all river-tolls on the rivers Rhine and IJssel (Camps ed. 1979 in Janssen 2009, 34).

Due to its location, the city had a 'gateway function' in the medieval international trade (Janssen 2009, 34), connecting the seafaring and the river trade. Moreover, the town was probably also involved in the regional trade (Janssen 2009, 37). The trade contacts were mainly with the Baltic region, Flanders and the Rhine and Meuse areas (Janssen 2009, 44). As a result of the trading activities in the city, related industries arose. In addition to industries producing end products, such as cloth, leather products, iron and metal tools, industries were developed that specialised in half-products such as fur bonnets whose raw materials were imported from the Baltic region (Janssen 2009, 44). Important industries for the town were especially the cloth and iron industry, the latter of which was already present with certainty in the early 13th century, as evidenced by the large quantities of iron slag in archaeological contexts, indicating smelting and smithy processes (Janssen 2009, 34). Although the first mention of a cloth hall dates from 1287 (Camps 1979 in Janssen 2009, 36), it appears from archaeological evidence that the presence of the industry was not earlier than in the 14th and 15th century (Janssen 2009, 34). From the 14th century, trade with the hinterland increased, as did the Rhineland and Baltic region (van Drunen 2006, 33). Cloth was one of the most important export products to the Baltic. The trade with this region was of such importance that the city established an official trading post in Skåne (Sweden) in 1362 (Pirenne and Formsma 1962 in Janssen 2009, 33), where mainly cloth, fur, wine and fish were traded (van Drunen 2006, 33).

Due to the increasing conflicts between Guelders and Brabant and declining trade with the Baltic region, the growth of the city stagnated at the end of the 14th

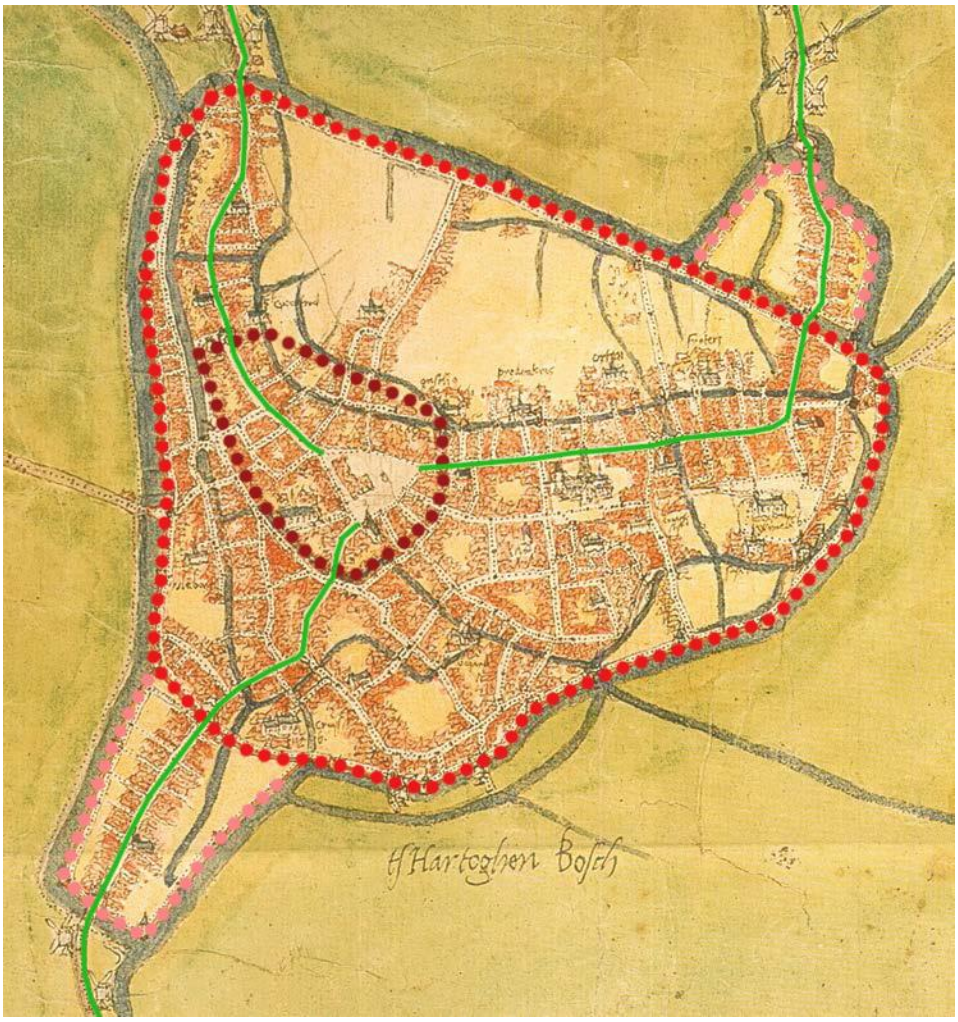


Figure 5.2 A section of the map of Jacob van Deventer, ca. 1545, showing 's-Hertogenbosch. The first city walls are marked in dark red, the second city walls in bright red and the later expansions in light red. In green the main roads that meet at the Markt (source: Cleijne 2017, 169; edited by author).

century. During the 15th century there was more misfortune, including various famines, city fires in 1419 and 1463 and the decline of the cloth trade and industry (van Drunen 2006, 34). Nevertheless, the population grew from 10,507 in 1464 to 15,500 around 1500 (Hanus 2010 in van Oosten 2015, 311) making 's-Hertogenbosch, together with Utrecht, the largest city in the Netherlands. Due to the rise and bloom of Antwerp, new trade opportunities arose and prosperity increased. The cloth industry was eventually replaced by the linen industry, which took an increasingly prominent place (van Drunen 2006, 35). After 1500, the importance of Utrecht and Amsterdam increased, as a result of which 's-Hertogenbosch lost this leading position (Cleijne 2017, 170). However, the

population still increased and reached its largest size around 1550 with circa 19,000 inhabitants (Hanus 2010 in van Oosten 2015, 311) in an area of more than 128 ha, making it the third largest city in the duchy, after Brussels and Antwerp (van Drunen 2006, 35). This prosperity came to an end in the second half of the 16th century, when the city lost its political and economic importance (Cleijne 2017, 170).

5.2.2 Building history

Due to the extensive building historical and archaeological research in the past 40 years, there is a good understanding of the urban development. From the beginning, 's-Hertogenbosch was an important town in the region, regarding its economic activity, wealth, political- and administrative power (Janssen 2009, 43). Its building history begins at the end of the 12th and first half of the 13th century. At that time, the first buildings were located in the centre of the town, close to the current Markt, and consisted of sill-beam constructions with dug-in heavy timber posts (Janssen 2009, 39). The defence of the settlement consisted of a simple defensive work, like probably an earthen wall with a moat and perhaps a palisade (van Drunen 2006, 32). After an attack by the count of Holland in 1202, city walls were built that enclosed a rather small area (9 ha) around the Markt (van Drunen 2006, 32) (Figure 5.2). The defences consisted of a brick- and tufa-built wall with multiple wall towers. Gatehouses with two towers with horseshoe-shaped plans were erected at three locations to guard the main roads and two water gates with double round towers were built at the locations where the river crossed the wall (Janssen 2009, 35).

Although the town had still a rather pre-urban character, there were already several large brick-built houses on spacious and wide plots. They were constructed with a certain space in between them. These plots were specifically located within the first city walls. Smaller houses were built in later times to fill out the spaces in between them (van Drunen 2006, 94). The oldest known cellars are all located under these large houses (van Drunen 2006, 87) and are generally stretched out below the entire house. Because many buildings were located on

the edge of the sand ridge, there is often a difference in ground level between the front and the back of the house. The cellars were constructed in such way, that the floor level of the cellar was ground level with the backyard. This was also advantageous for the supply of goods that often took place via the Binnendieze, which was located at the end of many elongated parcels at the Markt (see Figure 5.3). Due to this situation, the cellars were only partially underground on the street side, thus forming a semi-cellar. The walls of the cellar functioned simultaneously as foundation walls for the building (van Drunen 2006, 88). This The earliest cellars were not yet constructed with vaults, but covered with beams instead (type 1), supported by protruding edge beams and one supporting beam in the middle, that was supported by a stone column or timber beam (van Drunen 2006, 89).

Already around 1230 economic prosperity led to a boom in town growth that led to the construction of a new city wall to enclose a much larger area, namely 104 ha instead of 9 ha. The work started from the second half of the 13th century and lasted less than a century. The newly created space was mainly used for private houses and industries, as well as the port, which was relocated from within the first city walls, to the river Dommel (Janssen 2009, 38). Simultaneously with the construction of the new town walls, the raising of the ground level of the city was started (Janssen 2009, 38). These raisings took place on a very large scale throughout the entire city and ranged from 1.7 m up to 3.25 m. Initially, clean sand was used, but later also sand mixed with urban waste. The work lasted for at least three centuries (Cleijne 2017, 186). From the middle of the 13th century, a rapid urban development began in the construction of houses (Janssen 2009, 40). In the second half of the 13th century the foundation of the sill-beam constructed houses changed. Instead of dug-in posts, square or rectangular brick-built blocks were placed in the ground, to support the timber-framed posts. The blocks were interconnected by narrow brick walls, which served as support for the timber ground sills on which the wattle and daub walls were erected. By using a stone foundation to support the posts and sills they were less susceptible to rotting, than if they were placed directly in and on the ground. Between 1275 and 1325

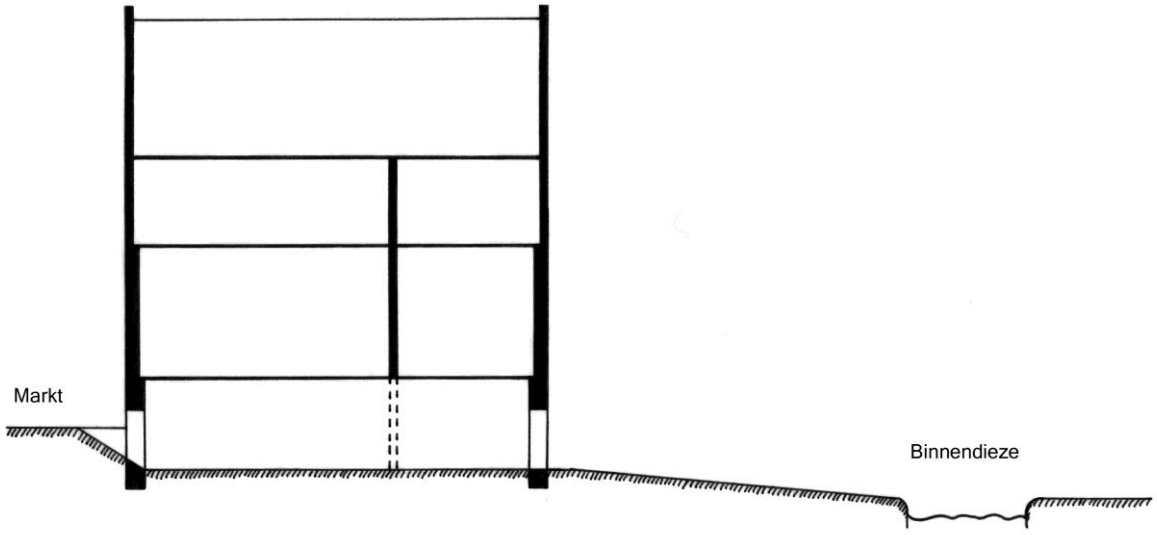


Figure 5.3 Schematic cross-section of a Bosch house located on the Markt (source: hand-drawn and edited by author; based on: Boekwijt 1990, 175).

was almost every newly built house in 's-Hertogenbosch constructed with such foundations (Janssen 2009, 41).

In the 14th century began the *versteningsproces* and the preceding timber houses were systematically replaced by brick-built houses. The introduction of hard roof coverings, such as roof tiles or slates, made eavesdrops unnecessary. In their place, shared walls or adjoining walls were built (van Drunen 2006, 110). During the process a new type of house emerged, which occurred especially on the smaller plots. Because of the limited building space on these plots, there was not much variation in house types possible, except for the distinction between deep and not so deep houses (van Drunen 2006, 111). The deep houses were divided in a front and a rear part, separated by a brick wall in the middle to support the long sidewalls. This wall functioned simultaneously as a fire-proof wall, against which the hearth was placed. This construction was a common phenomenon, particularly in 's-Hertogenbosch (van Drunen 2006, 112). The not so deep houses, on the other hand, were mainly located in the side streets, at the back of the plots of corner houses on the main streets. Due to the limited length, a supportive brick wall in the middle was unnecessary. However, more than half of these houses within the first city wall were still subdivided into a front and rear part, but by means of a floor elevation and a wooden wall (van Drunen 2006, 119).

Figure 5.4 Detail of a painting by A. van Beerstraten, showing houses on the Markt around 1664 with canopies, *pothuizen* and cellar entrances (source: van Drunen 2006, 53).

Almost all of these small houses within the first city walls were provided with a cellar. The oldest cellars were usually completely below ground level, unlike the cellars under the large houses. The younger cellars were, however, only on the street side completely underground and were sometimes partly above ground at the rear, due to the lower level of the backyard (van Drunen 2006, 89). The cellars under the houses that were not so deep, often stretched underneath the entire house, although it also occurred that they were only present under the front or rear part of the house. The entrance was mostly indoors, due to the limited space in the narrow side streets, which may also be the explanation for the absence of street cellars under these streets (van Drunen 2006, 119). Instead, street cellars were frequently found in the main streets and on the market square (van Drunen 2006, 55). These cellars were located below the street and constructed with a barrel vault. They functioned as additional storage space and were provided with small ventilation openings to the street. The street cellars were not ideal because of rainwater leakage; nevertheless at least 100 have been built since 1400 (van Drunen 2006, 90). They varied greatly in size and were not tied to the piece of land right in front of the house, because they were sometimes partly in front of the neighbouring house. They were accessed through the cellar under the front house or via *pothuizen*, small buildings in front

of the main building (see Figure 5.4) (van Drunen 2006, 129). A new type of cellar was introduced during the *versteningsproces* and can be found mostly outside the first city walls. This cellar was located under the rear part of the house and was usually constructed with a barrel vault. As a result of the vault, a difference in level arose on the ground floor between the front and back of the house. The cellar was smaller than the width of the house, making it possible to realize a hallway next to it at the same level as the front house (van Drunen 2006, 89). The cellars were accessible through this corridor and possibly the backyard, which makes them less suitable for renting to third parties (van Drunen 2006, 90).

Although the extent of the impact of the city fires in 1419 and 1463 appears to have been similar, the *versteningsproces* started only after the latter. The reason for this was the immediate introduction of regulations to promote reconstruction, by the town's authorities (Enderman 2017, 33). Homeowners had to replace their flammable thatched roofs with hard roofing materials such as roof tiles or slates within 10 years (Vink 2013 in Enderman 2017, 33). In order to stimulate this process, subsidies were granted on these roof coverings (Enderman 2017, 33). In the middle of the 16th century the *verstening* was almost completed, with the exception of many timber-built facades (van Drunen 2006, 37).

5.3 Current state of affairs regarding cellar research

The city has been extensively investigated since Ad van Drunen was appointed as a municipal building historian in 1975. Van Drunen, together with Frans Kipp in Utrecht, was the first building historian in its kind in the whole Netherlands and conducted extensive building historical investigations in cooperation with the municipal heritage preservation (van Drunen 2006, 8). Since then, the building historical research has been carried out systematically with a focus on monumental buildings, which were examined during renovations, restorations and sometimes demolition work (van Drunen 2006, 26). In the decades that followed, van Drunen developed a new approach in order to get a grip on the coherence between buildings called *bouwblokonderzoek*. This method approaches

buildings not individually, but systematically and within the context of the building block, making it possible, for example, to reconstruct adjacent buildings that are long gone (van Drunen 2006, 28). Within the boundaries of the former first city wall, no less than 450 addresses could be reconstructed using this method (van Drunen 2006, 28).

Van Drunen's observations and findings are summarized in several maps of the city within the first city walls and, according to German example, also include a cellar chart (Figure 5.5). The cellar chart may give the impression that all cellars have been visited systematically; however this is, unfortunately, not the case. Despite the extensive building historical research, systematic cellar investigations never took place. The reconstructions are only partially based on actual building historical explorations and more often by the use of historical sources and old building plans. The addresses that were actually visited were often only partially examined, i.e. only the cellar or ground floor (oral communication with M.W. Enderman). Furthermore, it is worth noting that Van Drunen's focus was mainly on the plots within the first wall, while this study also focuses on the cellars outside the oldest city centre.

Despite the lack of systematic cellar research, van Drunen's research has yielded various insights into the subject of medieval cellars. It turned out that the majority of the houses had cellars and that most of them were located under the back house. Historical research also provided insights into the functions and owners of the cellars in question (van Drunen 2006, 54). Furthermore, he distinguishes two types of cellars, namely those under wide houses and those under narrow ones. The first were the oldest cellars, which are located underneath the entire house and usually partly protrude above the ground level (van Drunen 2006, 88). The latter were usually only partly under the house and were completely underground (van Drunen 2006, 89).

Unfortunately there are some difficulties regarding the data. Although many addresses are included in the archives, their files regularly only consist of a few building plans. Manpower to find out what is and what has not been examined is

Figure 5.5 Cellar chart of the Bossche cellars within the first city walls, including the course of the old city walls and the Binnendieze (source: van Drunen 2006, 25; edited by author).

lacking, a circumstance that applies to the entire city, making it hard to tell, how many buildings have been actually investigated throughout 's-Hertogenbosch. Moreover, large quantities of the analogue documentation material have not yet been digitized and consist of partly hand-written documentation and many architectural drawings, making the results rather difficult to obtain. Nevertheless, there is a lot of knowledge about the urban development of 's-Hertogenbosch and therefore the building-historical approach of 's-Hertogenbosch can serve as an example for other historic cities that have not yet been investigated.

5.4 Methods

In order to get the results regarding cellars in 's-Hertogenbosch, the department of heritage was contacted. In consultation with the building historians M.W. Enderman and dr. R. Glaudemans, fifty addresses with cellars were chosen, spread over six building blocks. The choice of these addresses is mainly based on the large variety of cellars on the properties and the degree of research done. Their location within the city played a role as well, with 18 addresses within the first city walls and the rest outside.

Three decades of building historical investigations, observations and research have resulted in an extensive archive with documentation about buildings and the urban structure of 's-Hertogenbosch (van Drunen 2006, 29), however large parts of this archive are not yet digitized and also lacks uniform descriptions per address. Some files contained solely construction drawings, while others consisted of extensive and detailed descriptions per floor. Therefore, the amount of available data was variable and relative hard to obtain. By combining both archives (analogue and digital) during a two-day visit, the author managed to compile the dataset used in this chapter.

5.5 Dataset

As far as the dataset of ‘s-Hertogenbosch is concerned, the dataset consists of 50 addresses with a total of 73 cellars. The issued numbers are H1 to H50 and can be found in appendix 15.1; the various locations are shown in Figure 5.1 The numbering of houses on the Markt is rather complex, because several buildings have been demolished and are replaced by modern structures over time, as well as their cellars. Because the archives in 's-Hertogenbosch are classified according to the address, and because addresses change over time, it was not always possible to pinpoint the exact location of the former cellars. Please note that the approximate location of these cellars (H19 to H24) is indicated with a red dotted line in the figure. As regards the building block numbering, this is related to the systematic working method of the heritage service in 's-Hertogenbosch and has been taken over exclusively to clarify the situation and location of the cellars. This numbering is separate from this research. All addresses are located within the second city walls, however only the addresses in the building blocks 1.3 and 1.4 are located within the first city walls.

5.6 Findings

5.6.1 Dating

The datings of the cellars in ‘s-Hertogenbosch are based on three different sources, namely A. van Drunen’s House Atlas (‘*s-Hertogenbosch van straet tot stroom*), the reports at the department of heritage and dendrochronological datings obtained through M.W. Enderman. Unfortunately it was not always clear when the cellars were constructed exactly. In three cases (H16b, H17c, H22b) was only mentioned that the designated cellars were younger than other cellars at the same address, in those cases is this description literally included in the dataset and these cellars are excluded from the column ‘*normalised dating*’. Furthermore, especially in the Verwersstraat, several cellars were built after the large city fire in 1463, though it is not known when exactly. In those cases, the

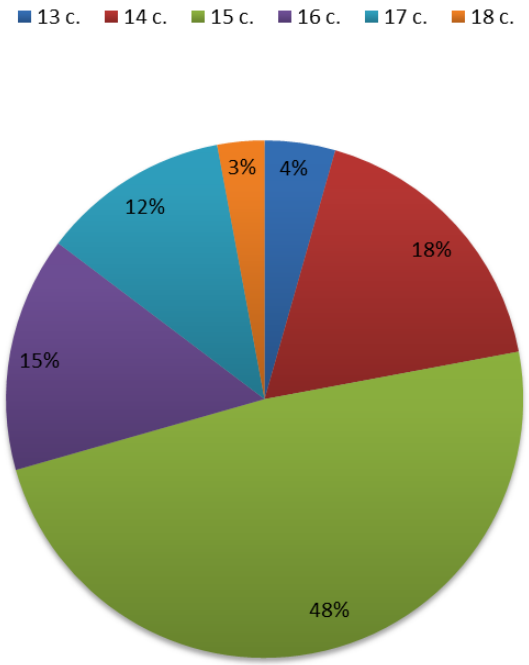


Figure 5.6 Dating of the investigated cellars in centuries in 's-Hertogenbosch (in %), n=68.

Table 5.1 Absolute number of cellars in 's-Hertogenbosch categorized according to their dating in centuries.

Dating in centuries	Investigated cellars
13 c.	3
14 c.	12
15 c.	33
16 c.	10
17 c.	8
18 c.	2
Total	**68**

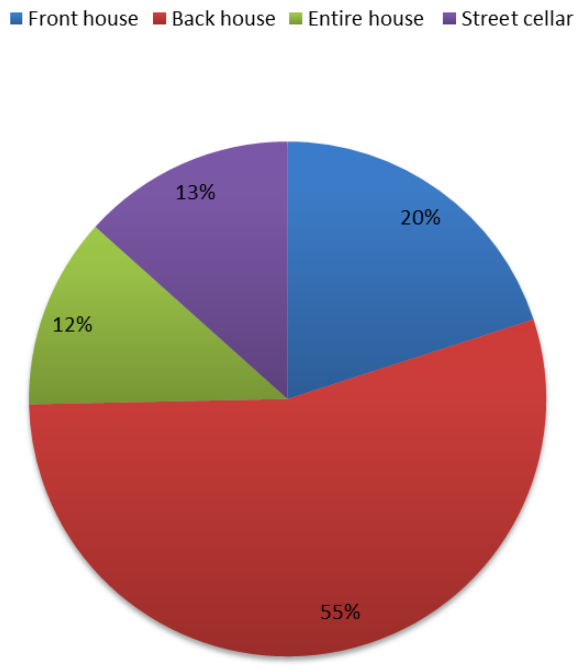


Figure 5.7 Location of the cellars on the building plot in 's-Hertogenbosch (in %), n=75.

Table 5.2 Absolute number of cellars in 's-Hertogenbosch categorized according to their location on the building plot.

Situated on the plot	Amount
Under front house	15
Under back house	41
Under street	10
Under entire house	9
Total	**75**

description suffices '1463>', indicating that the cellars are at least younger than 1463.

The data shows (Figure 5.6 and Table 5.1) that the earliest cellars have been in existence since the 13th century (4%), but that they are more prevalent since the 14th century (18%). Nevertheless, the vast majority of cellars (48%) were built in the 15th century, which corresponds well with the flowering periods of the city.

5.6.2 Location on the building plot

It is striking that the majority of the cellars (55%) are located under the back of the house (Figure 5.7 and Table 5.2). This phenomenon is typical for 's-Hertogenbosch and this has been noted previously by van Drunen (2006, 54) and Enderman (2016, 91). When the cellar is located under the front of the house then this is usually in combination with a cellar under the back of the house. It only happens sporadically that a house only has a cellar under the front house.

Figure 5.8 Map of 's-Hertogenbosch in the year 1500 AD. In red the streets with houses with a cellar under the front house, the yellow dots represent the most important city gates (source: Enderman 2016, 91).

Table 5.3 The average dimensions of the Bossche cellars of which the measurements are certain.

	Under front house	Under back house	Under entire house	Under the street	**All investigated cellars**
Average of length (in m)	11.58 (n=4)	6.38 (n=13)	-	6.9 (n=1)	**7.56 (n=18)**
Average of width (in m)	4.25 (n=4)	3.99 (n=14)	-	2.3 (n=1)	**3.96 (n=19)**
Average of height (in m)	-	1.89 (n=5)	3.9 (n=1)	-	**2.23 (n=6)**
Average surface (in m²)	49.22	25.46	-	15.87	**29.94**

Houses with a cellar under the front are almost always located on the Markt and at the main streets towards the city gates (Figure 5.8) (Enderman 2016, 91). Only the oldest cellars were located under the entire house (van Drunen 2006, 54). A special phenomenon in this city is the occurrence of street cellars (13%), which are cellars located in front of the house and under the street. They differed in size, but were generally relatively small (approximately 3 x 5m) (van Drunen 2006, 482, note 111). In both other cities, street cellars do not occur on such a large scale as in 's-Hertogenbosch.

5.6.3 Dimensions

In order to be as complete as possible, the available dimensions of the cellars are included. Unfortunately, it was not possible to find out the dimensions of all cellars, because these measurements were often lacking. If the cellar dimensions were not available, the dimensions of the superstructure were used instead, provided that they were available, as already explained in Chapter 4. Table 5.3 contains the average dimensions of the cellars of which the measurements are certain. The other data is omitted in this table, but can be found in the dataset. In the end, it proved difficult to find coherence in the various dimensions, because many cellars were adjusted over time and may or may not be enlarged and expanded.

5.6.4 Occurrence of semi-cellars

Especially in 's-Hertogenbosch many semi-cellars are present. At least 19 cellars (26.4%) are with certainty a semi-cellar, in contrast to only 8 full cellars. In all probability, there are even more semi-cellars in the dataset, however it was often unclear whether cellars were partly above ground or not, therefore they are only mentioned if this was certain. The average height of which the semi-cellars protrude is 72.2 cm, however this differs greatly. A striking phenomenon is the presence of two aboveground cellars in houses that were built shortly after the city fire in 1463. Both cellar floors are only half a meter lower than the floor in the front house, while the crown of the vault protrudes circa 1.50 m above the ground (Enderman 2016, 94). The reason for calling these floors cellars is due to the fact that their appearance is similar to other cellars, such as the presence of vaultings (Enderman 2016, 95).

5.6.5 Orientation

Of the 40 cellars of which the orientation is known, there is only one with a side-gabled orientation (3%), which makes the front-gabled orientation (97%) pre-eminently the most common orientation (Figure 5.9 and Table 5.4).

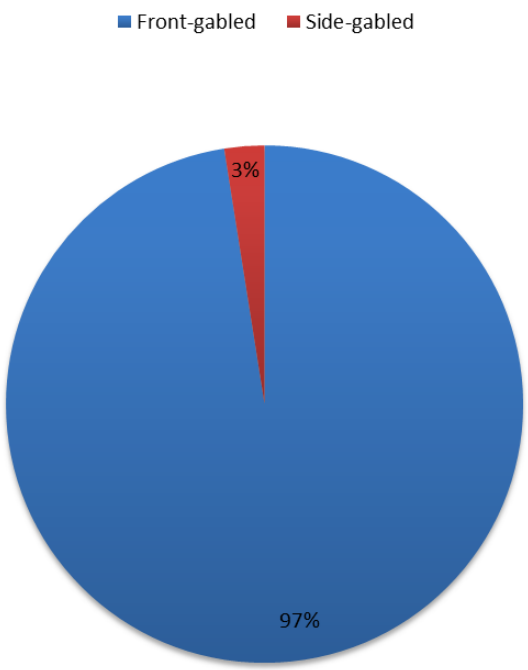


Figure 5.9 Orientation of the cellar relative to the street in 's-Hertogenbosch (in %), n=40.

Table 5.4 Absolute number of cellars in 's-Hertogenbosch categorized according to their orientation to the street.

Orientaton to the street	Amount
Front-gabled	39
Side-gabled	1
Total	**40**

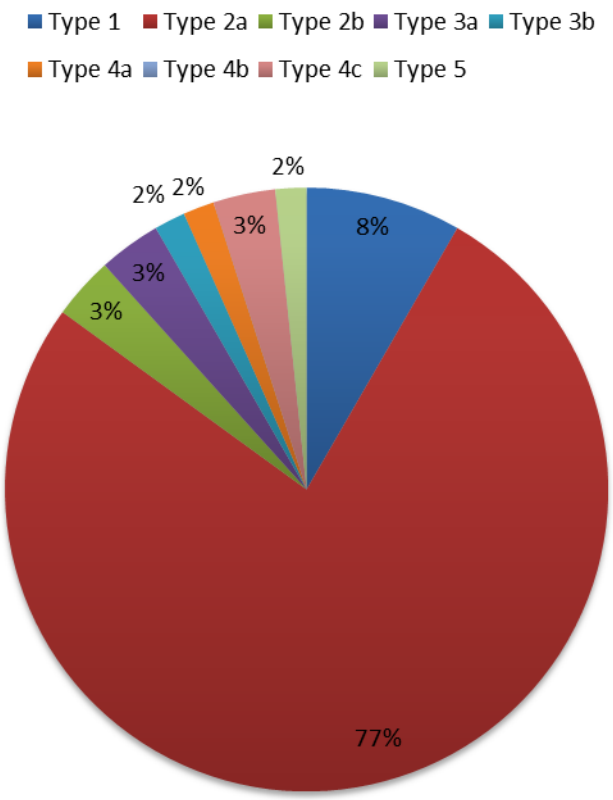


Figure 5.10 Vault types in 's-Hertogenbosch (in %), n=60.

Table 5.5 Absolute number of cellars in 's-Hertogenbosch categorized according to their vaulting types.

Type of vaulting		Amount
Type 1	(beamed ceiling)	5
Type 2a	(barrel vault, various types)	46
Type 2b	(barrel vault with half barrel at street side)	2
Type 3a	(cross ribbed vault)	2
Type 3b	(cross groined vault)	1
Type 4a	(through vault on diaphragm arches)	1
Type 4b	(*Deventer type*)	-
Type 4c	(through vault with wooden/steel girders)	2
Type 5	(concrete ceiling; modern)	1
Total		**60**

5.6.6 Vault type

The data from this study (Figure 5.10 and Table 5.5) is in line with the findings from Enderman (2016, 95), who presents that the most common vault type in 's-Hertogenbosch is the barrel vault. He mentions that some barrel vaults are combined with lunette, to create more space along the sidewalls. Unfortunately, barrel vaults with lunette have not been found within the research area of this study. As has already been indicated in section 2.3, there is no further subdivision made than plain barrel vaults with or without half a barrel vault at the street side. Therefore, this variant on the barrel vault is not included separately in the dataset. Furthermore, the presence of cross ribbed and cross groined vaults is exceptional in the city and possibly related in particular to buildings with public functions, such as the cellars under the town hall and the inn in Markt 43 (H21). Even more rarely are cellars with trough vaults on diaphragm arches and beamed ceilings are in general only applied in the oldest cellars of the city (Enderman 2016, 95).

5.6.7 Entrance type

Given the fact that most medieval house cellars were usually only accessible via external entrances to the street or backyard, it is remarkable that many Bossche cellars had an internal access. Particularly, cellars located under the back of the house had an internal access and often a second entrance to the backyard as well. Such cellars are typical for the Bossche houses and were introduced during the *versteningsproces* (see 5.2.2). Furthermore, the cellars under the front of the house had usually only an entrance to the street and the large cellars under the entire house had entrances to both the street and the backyard. As far as the cellars under the street are concerned, not much information was available, but most were probably accessible through the cellar under the front of the house, or via a possibly present *pothuis*. The presented data in Table 5.6 is in line with the previous findings of van Drunen (2006, 90).

Table 5.6 Absolute number of cellars in 's-Hertogenbosch categorized according to their entrance type relative to the location of the cellar.

	Cellars under front house (n=15)	Cellars under back house (n=41)	Cellars under entire house (n=9)	Street cellars (n=10)
Street access (n=22)	11	-	9	2
Backyard access (n=27)	2	18	7	-
Internal access (n=26)	2	24	-	-
No data (n=15)	1	6	-	8

Table 5.7 Absolute number of facilities present in Bossche cellars, of which n is the number of cellars where these facilities are present.

Other facilities (open & closed off) (n=36)	Amount
Passageways (n=20)	26
Trapportaal	-
Light niches (n=11)	24
Cellar light/dumping chute (n=12)	17
Hearth (n=10)	10
Water well (n=1)	1
Cess pit	-

5.6.8 Presence of other facilities

Other facilities are mentioned in 36 of the 73 cellars, however, it must be noted that the cellar descriptions often lacked exact details with regard to such special elements. The most common facilities in general are passageways, light niches, cellar lights and dumping chutes. These facilities are divided as follow (see Table 5.7): in 20 cellars are passageways found of which there is more than one present in four cellars, with a maximum of three passages in H21 and H23. In 11 cellars are light niches found of which there is more than one present in five cellars, with a maximum of five light niches in H31 and H34. In 12 cellars are cellar lights found of which there is more than one present in four cellars, with a maximum of three cellar lights in H50.

Especially the number of hearths in cellars is striking in 's-Hertogenbosch. In total, hearths were found in 10 of the 73 cellars (14%). Unfortunately, due to the lack of consistent descriptions, it is unclear whether this percentage is representative for the entire city. Furthermore, it seems in line with Drunen's findings that 12% of the cellars had a hearth, however his research area is limited to only the cellars within the first wall (van Drunen 2006, 55). The presence of this facility is an indication for residential functions and working activities, and will be discussed in more detail in section 5.7.3.

5.6.9 Brick sizes, brick bonds and wall finishing

As explained in section 2.4, the size of the brick, as well as the pattern of the brick bond, can sometimes prove useful in order to complement the dating of a structure. Therefore, in order to be as thoroughly as possible, also the dimensions of the bricks and eventual brick bonds are included, provided that this information was available. The differences in detail of the building reports, which often lacked the extensive descriptions of the brickwork in the cellar, resulted in incomplete results. A general problem is that the walls of many cellars are often finished with materials such as plaster, making it impossible to document them properly. To clarify the presence or absence of data regarding the brick bond or brick size, the column 'wall finishing' was added to the dataset.

Table 5.8 Dimensions of the bricks and their corresponding walls including the normalised dating of the cellars in 's-Hertogenbosch.

Cellar nr.	Wall	Normalised dating (in c.)	Length of the bricks (in cm)	Width of the bricks (in cm)	Height of the bricks (in cm)	10 layers of bricks (in cm)	5 layers of bricks (in cm)
H2a	vault	17	21.5	10.5	4.5	-	-
H9	front	15	20-22	9.5-11	4.5-5	52	-
H16a	front	15	-	-	-	-	37
H17a	front	15	12.5-13	6-7.5	-	-	37-39
H26a	side	14	27-28	13-14	7-7.5	82	-
H26b	vault	-	25	6	-	-	-
H34a	side	14	29	14	8	-	44
H40	rear	15	26	12	5-5.5	64	-
H41	front	18	27-28	13.5	7-8	-	42
H43	front	15	22-22.5	5.5-6	-	-	-
H50	side	16	24	12	5.5	62	-

However, it is necessary to mention that also the presence or absence of plaster not always was mentioned in the reports. If there is no wall finish, it is referred to as 'N' (none), in all other cases, even if it is only partially plastered (i.e. one wall, only the vault) is chosen for 'Y' (yes). To make no false assumptions, the columns are left empty if there is no specific mention regarding the wall finish. With regard to the walls of which brick sizes are mentioned, it is preferable to use the side, front or rear walls, instead of the vault, because the latter can be added in later times. However, the other walls can also be adjusted, renovated or (re)built at a different time than the cellar. Moreover, the sidewalls are sometimes shared walls of adjacent buildings that have been built before. Also is often unclear which mentioned sidewall is measured. Therefore, it is preferable to use the brick sizes of the front or rear wall, because these belong to the original building to which the cellar belongs and therefore gives the greatest chance of reliable data. Yet it is still possible that the cellar has been added after the construction of the

superstructure. In Table 5.8 only one size is mentioned, the complete overview of brick sizes can be found in the dataset in the appendix. Because the dimensions of the front or rear walls are not always available, the designated wall is also mentioned in the table. In conclusion, the presented data is intended for the most complete record of the cellar and for possible further research in the future, rather than being an active element for comparisons.

The only documented brick bonds are two left walls in the cellars H26a and H30a. Both walls are built in Flemish bond, a bond that is common used until the beginning of the 14th century especially in the south of the Netherlands (Janse 2005, 325).

5.7 Results

Summarizing the findings, the vast majority of the cellars (48%) is dated to the 15th century and located under the back of the house (55%). The average dimensions of these cellars are 6.38m (L) x 3.99m (W), which is a lot smaller in comparison with cellars under the front of the house that measure 11.58m (L) x 4.25m (W) on average. At least 26.4% of all cellars are semi-cellars, which protrude to a greater or lesser extent above the ground level. The predominant type of vaulting is the barrel vault (77%) and all cellars, except for one, have a front-gabled orientation (97%). In regards to the entrance, it is striking that more than half of all the cellars under the back of the house (59%) had an internal access.

5.7.1 The cellar era in 's-Hertogenbosch

The data shows that nearly half of all cellars date from the 15th century, which means that this was clearly the cellar era of 's-Hertogenbosch. However, the heyday of 's-Hertogenbosch took place especially during the first half of the 16th century. This discrepancy may be explained by the city fire in 1463, after which regulations were ordained to stimulate the *versteningsproces*. Furthermore, the occurrence of mostly large cellars within the first city walls dated to the 13th

century is notable. The origin of these cellars is more difficult to explain and may not be related to an economic flowering period, but rather to the early period of the city. Most of these cellars were located under the large brick houses on spacious plots. This might suggest that these large cellars are possibly related to owners of noble origin and perhaps the Duke himself.

5.7.2 A city specific cellar type

In general there is one type of cellar that can be identified as city specific cellar type in 's-Hertogenbosch, namely the barrel vaulted cellars which were located under the back of the house. These cellars were accessed by both an internal and a rear entrance leading, respectively, to a hallway on the side of the house and to the backyard. Such cellars are one of the characteristics for the '*Bossche Burgerhuis*' (Figure 5.11), which was typical for the 16th century. However, recent research refuted the uniformity of these houses. Instead, the houses were less uniform than expected and their variations in size were mainly related to the location of the house and the social status of the owner. As far as the interior and the layout of the house (e.g. cellars) were concerned, there was a lot of variation, which led to houses with a more individual character (Enderman 2016, 82). Other elements that are specific to 's-Hertogenbosch are the large numbers of hearths present in cellars, as well as the appearance of street cellars. In both other cities, these phenomena are the exception rather than the rule.

5.7.3 The functions and usage of the cellars

Due to the extensive research much is known about the use of the cellars. It seems that cellars under the front of the house were not internally accessible and were accessed from the street. They were rented separately and were used as storage, as well as workshop and cellar residences (van Drunen 2006, 54), which is indicated by the presence of hearths, iron hooks and rings (Enderman 2016, 94). It is striking that these cellars are all located around the Markt and on the main roads (see Figure 5.8). There may be links between the function and the exact location within the city, but these have not been demonstrated within this study. The tax registers show that the cellars were let to various craftsmen,

including cutters, coopers, cobblers, a basket maker and a hatter. However, it cannot be determined with certainty that they rented the cellar as a workshop (van Drunen 2006, 54). Because of the important role that 's-Hertogenbosch played as a production centre for cloth, cellars were also used by hand loom weavers. It turned out that cellars were a suitable place to weave linen because of their humid environment, and due to the limited size of the products it was easy to produce at home. The larger cellars under inns were not sublet, but served probably as storage for beer and wine instead (van Sasse van Yselt 1908 in van Drunen 2006, 54). There are also indications that some of these cellars served as accommodation for infantrymen, while their captains stayed in aboveground departures (van Sasse van Yselt 1910-1914 in van Drunen 2006, 54). Much

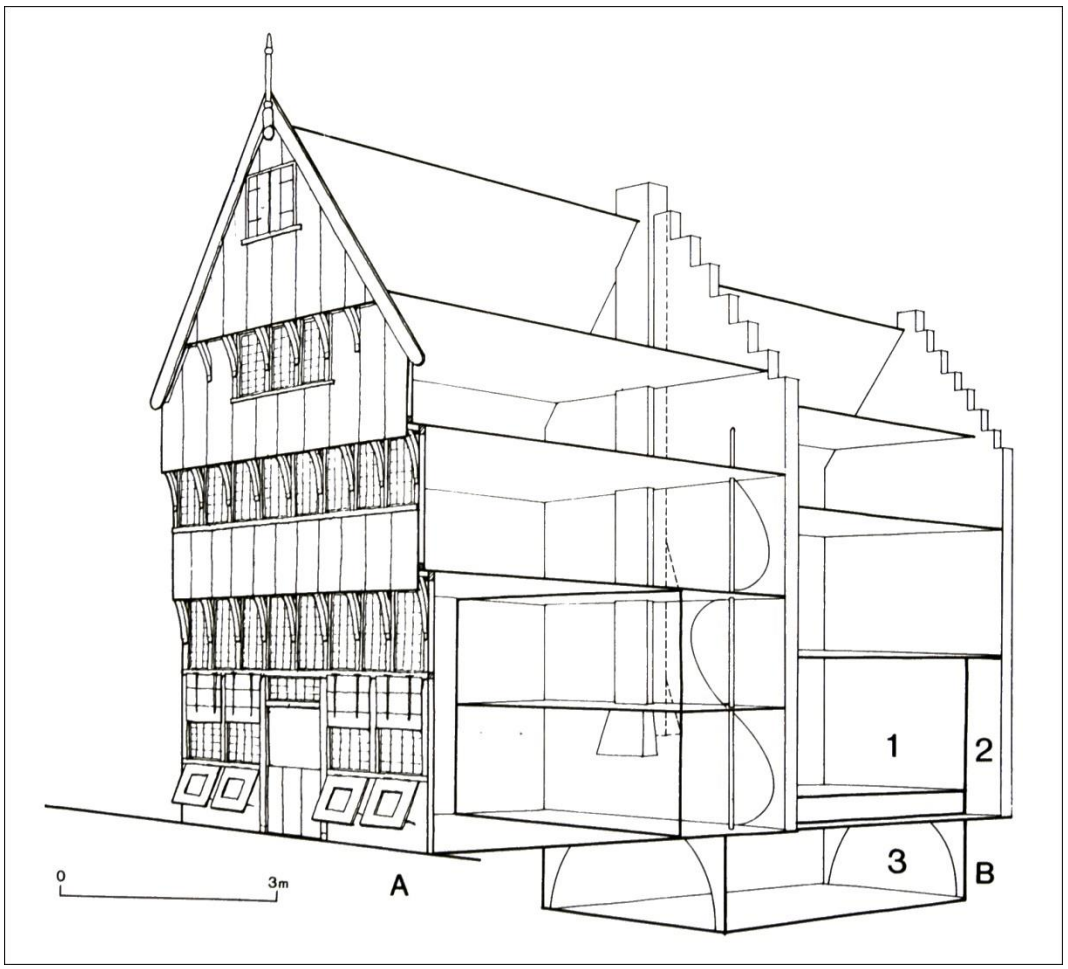


Figure 5.11 The characteristic *Bossche Burgerhuis*, which is divided by a stone fire wall into a front (A) and a back house (B). Next to the *bel étage* (1) of the back house is the hallway at ground level (2) located, through which the cellar (3) was accessed (source: van Drunen 1983, 129; edited by author).

evidence indicates the presence of cellar residences, which were mainly occupied by those who belonged to the lower social class, such as porters, servants, masons and also paupers. The living conditions were poor due to the limited height, high humidity, lack of daylight, little ventilation and limited heating possibilities (van Drunen 2006, 54). The presence of hearths in cellar residences was registered officially in the so called 'hearth register'. This tax document from 1553 mentions the number and type of hearths per house. The exact location of the hearths is not mentioned, with the exception of the ones in the cellar (van Drunen 2016, 52). According to this historical source, at least 43 cellars within the first city walls had a hearth, which is equal to 12% of all cellars (van Drunen 2006, 55).

Cellars under the back house seem to have had a private function, hence the internal access with the above house and backyard. In addition, these cellars were usually narrower than the above building, which made them less suitable for habitation or labour. Due to the presence of the nearby river, these types of cellars may be used mainly for the storage of goods such as salt, coal, peat, lime, pitch, wine, beer and perishable goods (van Drunen 2006, 55). As regards to the street cellars, they probably served as extra storage space although they were limited in terms of their function due to their high humidity as a result of seeping rainwater (van Drunen 2006, 55). With regard to the occurrence of aboveground cellars, this could be an indication for special activities or a specific storage function (Enderman 2016, 95).

5.7.4 The cellar as a fire-safe place

The dendrochronological datings of recent research on supporting structures in the houses in 's-Hertogenbosch show that large parts of the city had been rebuilt shortly after the city fire (Enderman 2017, 2). These results are in line with the research of visible foundations in Bossche cellars, which also showed that considerably more cellars had been built after the city fire (Enderman 2016, 95). This issue seems to be of a more general nature when we look at it in a broader

Figure 5.12 A rare top view of a vaulted cellar belonging to Noordenbergstraat 9 (1621) in Deventer. The photo clearly shows how the cellar forms a closed brick space in the ground. The hole in the vault will be of recent date, possibly to realize an internal passage. (source: www.rijksmonumenten.nl; photographed by: Berends, G., April 1971 | License: CC-BY-SA-3.0-NL (wiki)).

context. The introduction of vaults in medieval cellars created lockable underground spaces of brick that could only be accessed from outside (Figure 5.12). These spaces seem to have been extremely suitable for matters that were fire-hazardous, evidenced by the urban statutes (*stadskeuren*) of several cities. These statutes mention the implementation of various industrial activities, which were only allowed to take place in cellars. The Leiden statutes of 1438, for example, stated that it was only allowed to melt smear in vaulted cellars provided with a chimney and without air outlets to the street. Another statute of the same city, dated to 1450, ordained that the storage and crafting of leather could only take place in cellars (Hamaker 1873 in Meischke 1988, 220). A statute from Haarlem, dated to 1493, obligate to flay flax exclusively in cellars (Huizinga 1911 in Meischke 1988, 220), and in Gouda was it in 1563 only allowed to store pitch and tar in vaulted cellars (Cuquerque and Meerkamp van Embden 1917 in Meischke 1988, 220). Such regulations might also be the explanation for the existence of the aboveground cellars mentioned in section 5.6.4. At the same time, this fireproof room was an excellent opportunity to protect valuable goods against fire or theft. This is also supported by Dr. A. Quiney, a building historian that authored several books on the building history of England. He mentions that the fireproof qualities of subterranean stone buildings and their general security made them especially suitable for the "*storage of those goods where security from fire and theft was paramount*". Examples can be found in Canterbury, where several 12th century cellars were owned by merchants, goldsmiths, moneyers and financiers (Quiney 2003, 150). In addition, it is remarkable that in several cities the number of cellars increased substantially after devastating city fires. Besides 's-Hertogenbosch, is this also the case in the city of Chester that was rebuilt after a devastating city fire in 1278, after which many cellars were constructed (Quiney 2003, 151).

6 Arnhem

6.1 Introduction

The following chapter discusses the cellars in Arnhem, a Hanseatic city and the capital of the province of Gelderland, located on the northern bank of the river Rhine. Arnhem is located on a transition between two landscapes, of which the northern and largest part of the city is situated on the foothills of the Veluwe and the southern part on the floodplain of Rhine and Waal, called Betuwe (Verhagen and Wientjes 2008, 19). By examining the cellars of 50 addresses (see Figure 6.1) an attempt is made to answer the research questions. The layout of this chapter will be the same as the previous chapter.

6.2 History

6.2.1 Economy and politics

Arnhem is mentioned for the first time in 893 (Schwab 1983 in Verhagen and Wientjes 2008, 32), at that time it was still a small agricultural settlement that extended on both banks of the Sint-Jansbeek, a small brook that flowed from the northwest to the southeast (Verhagen and Wientjes 2008, 32) (Figure 6.2). The settlement was originally part of a larger royal domain, or so-called *fiscus*, which was becoming increasingly fragmented and eventually split up between the abbey of Prüm and the counts of Hamaland. The latter, in their turn, assigned the land later to the abbey of Elten and the counts of Guelders (Verkerk 1983 in Verhagen and Wientjes 2008, 32). The exact size of the settlement is uncertain; however the abbey of Prüm owned about 7 farms closest to the centre of the settlement, which is equal to approximately 95 hectares of land (Verhagen and Wientjes 2008, 33). In the following centuries the settlement slowly developed into a place of importance. From the beginning of the 11th century it is mentioned as a stopping place on a pilgrim route that runs from Bremen, via Rome, to Jerusalem (Verkerk 1983 in Verhagen and Wientjes, 2008, 35) and around the

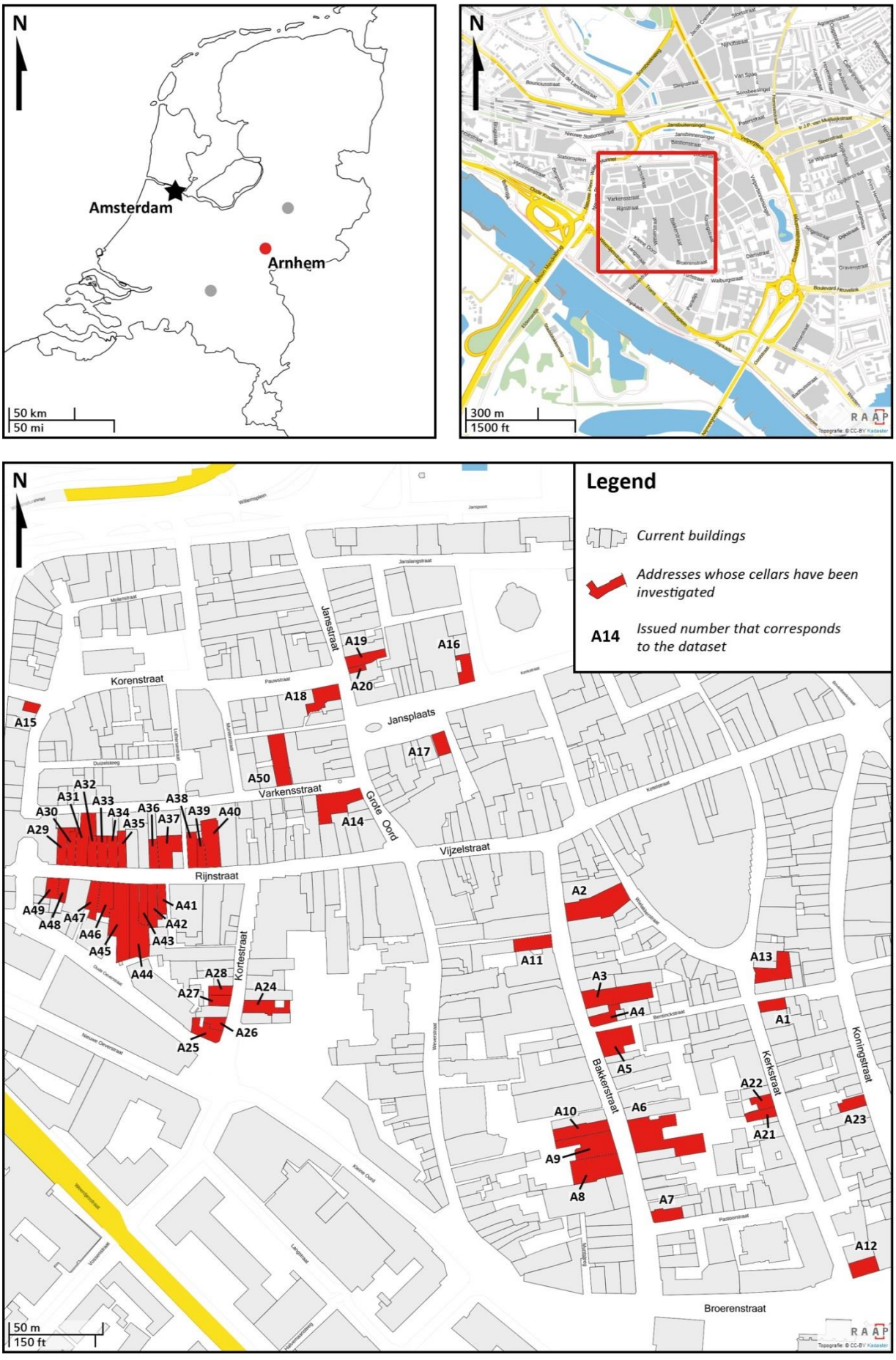


Figure 6.1 Overview map of the city of Arnhem. ***Above left*****: the location of Arnhem in the Netherlands relative to both other cities;** ***above right*****: location of the research area within the city;** ***middle below*****: detailed view of the research area (source: made by author; underlying city maps: geo.raap.nl/raap-geo-info).**

middle of the 12th century, the settlement served as a transit place for goods coming from the Werden abbey in Putten, located on the Veluwe. The actual city arose on the domain of the counts of Guelders, situated in the northwest of the current city centre, not far off the domain of the abbey of Prüm. It is plausible that the counts already had a residence at this location in the 12th century, where they resided when they visited Arnhem. The first indications for urban development date from the 13th century and the Rhine would play an increasingly important role. From 1195 the town is mentioned as a toll, presumably a transit toll of count Otto I (1182-1207), and in 1233 city rights were granted by Otto II (1229-1271), count of Guelders and Zutphen. At that time Arnhem was already a fortified place with an urban appearance and market rights (Verhagen and Wientjes 2008, 35), that was ideally located at the crossroads of waterways and trade routes. Already before obtaining its city rights in 1233, Arnhem had a weekly market and probably three annual markets. Before 1240 even two more annual markets were added (Verhagen and Wientjes 2008, 36). The counts of Guelders stimulated the economic position of Arnhem as a market place even further, which led to the town being the most important annual market town of the county of Guelders at the end of the 13th century. However, the markets had a limited regional scope due to the proximity of other, larger, annual market towns, such as Deventer and Cologne (Benders and Bosch 2008, 171). Especially the textile trade played an important role during these markets and this was related to the Veluwe sheep farming, as is evident from the many cloth halls in the city (Verhagen and Wientjes 2008, 36). Other important commodities included beer, salt, cattle and wine. Already from the first half of the 13th century wine was exported to Arnhem via the Rhine and Arnhem was an important buyer of this so-called Rhine wine, which is reflected by the various wineries and inns. Also, the excise duty on wine sales was the biggest source of income for the city after the beer tax (Verheijen 2002, 17). In order to be independent of German wines, attempts were made in the 14th century to cultivate wine on the flanks of the Veluwe, initially with more or less good results (Verheijen 2002, 10). The quantities were stored in the many cellars of the

city and some still existing house names are a remembrance of this. Beer was produced in modest sized city breweries and stored in cellars as well. As far as known, the brewing process never took place in the cellars and they were only used for the storage of the product (Frank and Haans 2003, 22).

The city itself was meant as a centre of power to control the Veluwe quarter in the county. This was all part of the politics of the counts of Guelders, in which they stimulated and secured the growth and development of their county by dividing it in several quarters and developing a city in every quarter. Besides Arnhem, also Zutphen, Nijmegen en Roermond functioned as such power centres. The four cities served as a residence for the counts and had to develop strongly economically (Haans and Frank 2003, 16). During the 13th century, the abbey's economic position was gradually curtailed and as a result its dominance within the area declined, while at the same time the city of Arnhem grew steadily (Verhagen and Wientjes 2008, 40). After the purchase of the vicarage and associated homestead of the domain of the abbey of Prüm, the counts of Guelders had access to a wide strip of land located on the eastern bank of the Sint-Jansbeek

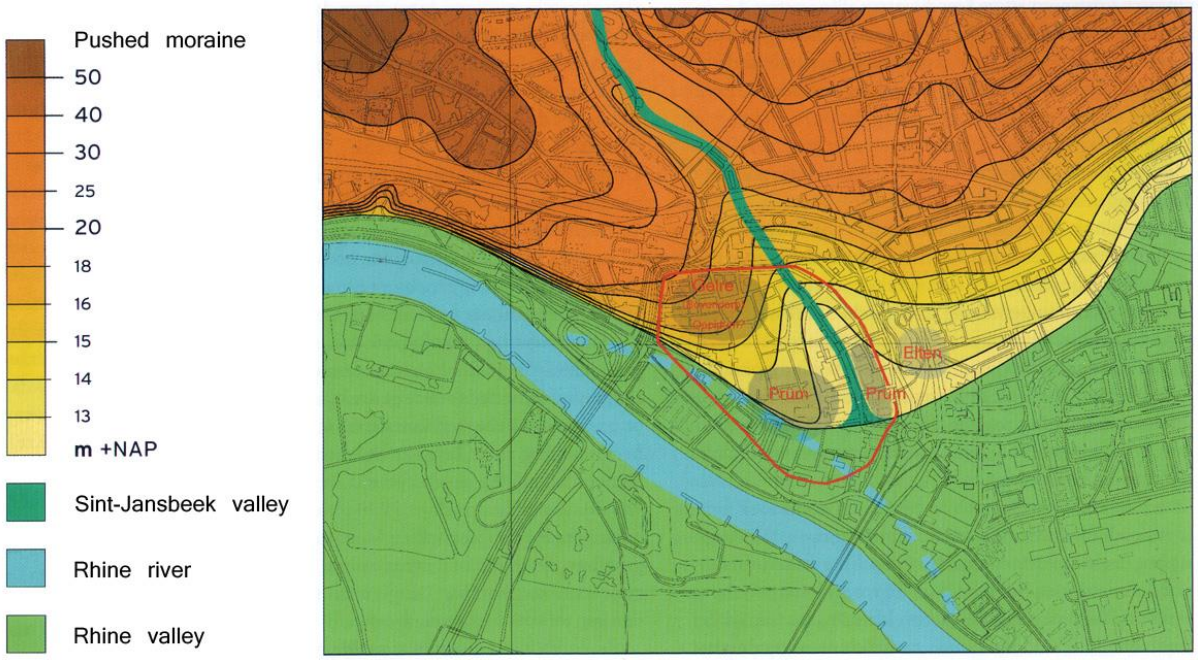


Figure 6.2 Overview of the pre-urban situation of the current city of Arnhem. Shown are the domains of the most important landowners, namely the abbey of Elten, the abbey of Prüm and the Counts of Guelders. The red line represents the course of the medieval city wall (source: Verhagen and Wientjes 2008, 34; edited by author).

and also the administrative centre of the Prüm domain. Already in the second half of the 13th century this area was added to the city and located within its ramparts, resulting in the systematic relocation of the abbey domain to just outside the city walls (Verhagen and Wientjes 2008, 41). In line with the politics of the counts, they had a vision for (inter)national trade in and through Arnhem, and therefore a harbour in combination with market squares and storage capacities were realised in the 13th century. Through the course of the river, the harbour was realized on the west side of the city, making the western part of the city the most suitable for the merchant quarter. From the second half of the 13th century the Nije Merckt (the current Korenmarkt) was put into use, especially for long-distance trade (Haans and Frank 2003, 16). Indications for the river trade are mainly found in toll accounts mentioning payments for specific goods. From the beginning of the 13th century, Arnhem traders were exempted from the Lobith toll. Around 1300, their goods consisted of fish, salt and barley in the direction of Cologne and wine, pottery, construction wood, stone, millstones, limestone and rye in the direction of Holland and the IJssel region (Benders and Bosch 2008, 176). The 14th century was characterized by growth and economic prosperity and the population is estimated at over 2,200 in 1364 (Benders and Bosch 2008, 159). Nevertheless, Arnhem seems to be lagging behind in size compared to the population numbers of the cities 's-Hertogenbosch (in 1374: approx. 14,526 (Blockmans 1981 in van Oosten 2015, 311)) and Deventer (in 14c (1450-1475): approx. 3,200 (Benders 2004 in van Oosten 2015, 312)). Despite the growth and prosperity, the trade in the annual markets was increasingly damaged by the growing competition of Holland and, in addition, there were increasing conflicts concerning the staple rights in Venlo and Dordrecht. The combination of these factors led in all likelihood to the collapse of the Arnhem cloth trade after 1439 (Benders and Bosch 2008, 175). After a conflict in 1441, due to the introduction of a new tax on trade goods in Dordrecht, a river blockade arose. Suddenly the Rhine formed an important passage for Cologne to Holland, Flanders and England, and vice versa (Benders and Bosch 2008, 174). This may have resulted in the economic prosperity that followed, during which Arnhem invested in mainly

trade-related activities. However, this bloom was only short-lived and after the blockade was lifted the river trade over the Rhine dried up again (Benders and Bosch 2008, 174). In the same period Arnhem was officially received in the Hanseatic League, however their membership has never been of great importance and Arnhem played only a minor part within the League (Benders and Bosch 2008, 178).

In conclusion, it seems that there was no clearly defined flowering period and that periods of greater or lesser prosperity probably varied. Arnhem never played an important role as a transfer point between the Rhine and the hinterland, mainly due to its regional character. Although active in the trade, it could not compare itself with towns such as Cologne and Deventer.

6.2.2 Building history

It is unknown whether there were houses with cellars present, prior the obtaining of city rights in 1233. The majority of the houses at that time consisted of timber constructions and probably only the parish church was built in stone. There may also have been some large courts that belonged to the nobility, which were built of stone and usually still freestanding in the middle of spacious plots (Haans and Frank 2003, 29). However, few details are known concerning these houses, dated from 1250-1350, which is due to the fact that the city accounts dated before 1353 are very fragmentary preserved and also that archaeological and building historical research yielded little for this period. It is unknown whether and how numerous the numbers of cellars were in the 13th century. It is likely that the cellars present consisted mainly of wood (Frank and Haans 2003, 12), because stone buildings, dated to the period 1200-1350, were only scattered sparsely through Arnhem. The first signs of the *versteningsproces* are dated to the late 13th century and took place in the western part of town, although the majority of the houses were still timber-built. In the 14th century the town flourished and from the middle of this century, especially in the western part of the town, the timber constructions were extensively replaced by brick versions and immediately constructed with large vaulted cellars under at least the front

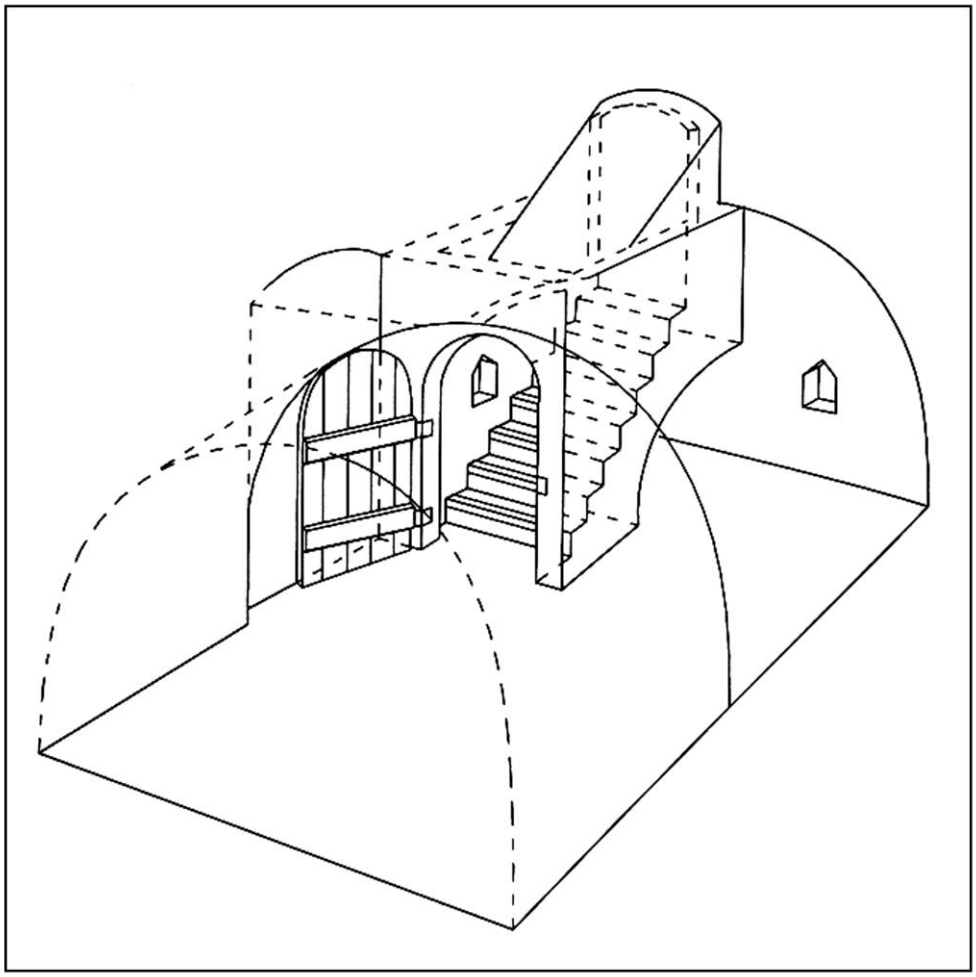


Figure 6.3 Schematic representation of a cellar with a barrel vault and *trapportaal* (source: Haans and Frank 2003, 34).

house (Frank and Haans 2003, 13). Several large merchant- and wine houses were built, with an approximate size of 6-7 meters wide and 10-15 meters long (Haans and Frank 2003, 31). Because of the limited space, many eavesdrops in this district disappeared and shared walls made their appearance (Frank and Haans 2003, 13). Characteristic for these large 14th century houses were cellars that consisted of large, single-nave, rectangular spaces finished with one major barrel vault with a pure round arch and a height of at least 3 meters (Haans and Frank 2003, 32 There were no spatial constructions, such as columns or diaphragm arches, except for a remarkable feature called *trapportaal* (Figure 6.3). This element consisted of some sort of brick portal with a lockable door on cellar level which enclosed the entire staircase leading to a *pothuis* at street level. The

staircase was enclosed by a wall and underneath it was a half barrel vault constructed for extra support (Haans and Frank 2003, 32). A precise explanation for the use of this construction is unknown (Haans and Frank 2003, 36); however it had probably a practical function associated with the storage of luxuries and expensive goods (Haans and Frank 2003, 33) or with renting the cellar out to third parties (Haans and Frank 2003, 34). In the front and rear walls were often lightniches with chevron arches situated and sometimes even in the side walls just below the barrel vault as well. Since the latter place is unusual, this might be related to the ownership of the common wall, in which case the light niches were located on the cellar side of the owner (Frank and Haans 2003, 14).

In the late 14th century, the economic growth stagnated and at the beginning of the 15th century the broadcloth industry collapsed (Haans and Frank 2003, 20). This downturn was reflected in the city- and streetscape; the city grew barely and the construction of large brick merchant houses came to an end (Haans and Frank 2003, 40). Haans and Frank note that the houses and cellars in the 15th – and 16th centuries were in generally built smaller in comparison with their predecessors from the 14th century, which might be related to this economic setback. Nevertheless, the number of brick houses increased over the same period, probably as a result of two large city fires in 1419 and the subsequent stimulation of the *versteningsproces* with grants in kind by the city council (Haans and Frank 2003, 41). These regulations will have led to a further promotion of the *versteningsproces*, especially in the artisan quarter.

The single-nave cellars with a barrel vault and *trapportaal* that were typical in the 14th century still occurred in the first half of the 15th century, although with minor adjustments. The arches of the barrel vaults were less round and more depressed (*gedrukt tongewelf*), sometimes even tending towards a basket-handle arch (*korfboog*) (see Figure 2.6; V), and also the brick size decreased (Frank and Haans 2003, 16). The masonry had changed as well, the 15th century barrel vaults were in general half a brick thick and had a stretcher bond, instead of one stone thick barrel vaults often built in header bond during the 14th century (Frank and Haans

2003, 16). From the middle of the 15th century, a new type of vaulting is introduced consisting of multiple aisled cellars with groined vaults, sometimes with diaphragm arches and wall pillars. By then, the *trapportaal* has completely disappeared, although there are still stairs in place, leading to the *pothuis* (Frank and Haans 2003, 17). The 14th-15th century cellar types were continuously used in the 16th century and the barrel vault even until far into the 19th century (Frank and Haans 2003, 18). Groined vaults were being used until the 16th-17th century (Frank and Haans 2003, 18). The newly build large houses in the 17th, and in particular the 18th century, had no longer cellars below the whole house, only under parts of it. This trend continued during the 19th and 20th century and is in all probability related to the changes in cellar usage, in which cellars transformed into stock cellars for wine and perishables, for own use solely (Frank and Haans 2003, 18).

6.3 Current state of affairs regarding cellar research

Since 1991, the external Monumenten Advies Bureau has carried out building-historical explorations on behalf of the municipality of Arnhem. Since then, almost all buildings and plots in the historic inner city have been examined in terms of building history. Between 1995 and 2002, more intensive research followed specifically into cellars in a small part of the city. The aim was to investigate whether the contiguous cellars on the Rijnstraat could be connected and made accessible to the general public, to an example of re-used historical cellars in the former German Democratic Republic (GDR) (Frank and Haans 2003, 3). Thanks to the research, much is known about the development of medieval structures in Arnhem and a part of these cellars is nowadays accessible to the public (Haans and Frank 2003, 7).

6.4 Methods

The publication in the *Arnhemse Monumentenreeks* (Haans and Frank, 2003) formed the basis for this chapter. This little book is a publication for the general public following an extensive and systematic cellar research performed by the Monumenten Advies Bureau between 2000 and 2002 and commissioned by the municipality of Arnhem. Any references to the original reporting of this research were lacking in the literature and therefore the city archaeologist of Arnhem (mr. drs. M. Defilet) was contacted. It turned out to be an internal report, which fortunately was readily available, yet is only present at the heritage and archaeology department at the city office of Arnhem. The report is the result of an extensive survey in order to make the Rijnstraat cellars presentable and accessible to the general public and suitable for public functions (Frank and Haans 2003, 3). The report consists of three parts, in which the project is explained and the cellars of the following addresses are described: Rijnstraat 5-20, 67-79a/b and Oude Oeverstraat 3-4. Each address is described according to a systematic listing of the various elements subdivided into six sections (general information, spatial aspects, special elements, masonry works, datings, further comments and conclusions), followed by drawings comprising of respectively the floor plan of the cellar and a cross-section in length and width, and finally several pictures of the situation on the spot. All drawings are to scale and colours represent the different building phases. An example of such a description is included in the appendix (see 15.4). Unfortunately, there are a few pages missing (approx. nine), although the exact number remains unclear, because the report does not have a table of contents and is only partially page numbered.

In addition to the above-mentioned report, also the documentation concerning exploratory building historical research of the historical cellars in the city centre of Arnhem between 1991 and 2000 was used. During this period, the Monumenten Advies Bureau carried out extensive explorations in old buildings in the inner city, including their cellars, in the context of possible extension of the list of municipal monuments. Unfortunately, this documentation is, compared to the 'Rijnstraat report', less extensive, lacks the systematic approach and

consistent description of the cellars and it seems that large parts are missing[2]. On the basis of the table of contents it can be concluded that the data of 76 addresses are completely missing and that the data of 26 other addresses is incomplete to a greater or lesser extent.

Due to these shortcomings was the acquisition of the data difficult and is the data presented in the dataset sometimes probably incomplete. It is possible that complete documentations are available at other locations, but at the time (spring 2017) the choices were made based on the available reports in Arnhem. The choice of addresses, which are presented in the dataset, is based on the degree of conducted research and the variety of available cellar types. The aim was to choose addresses on the basis of the variety of cellars on the properties, as was the case in 's-Hertogensbosch, however Arnhem is not as thoroughly investigated and mapped. Therefore, the choice is solely based on my own insights in response to the conclusions of the reports.

6.5 Dataset

The collection method has led to a dataset consisting of 50 addresses with a total of 78 cellars. The numbering can be found in appendix 15.2 and the addresses are shown in Figure 6.1. The 50 addresses are compiled through the merge of the reporting in the context of the Rijnstraat cellar project (A29-49) and the documentation of the investigations done between 1991 and 2000 (A1-28, A50). Except for the cellars at Rijnstraat 74-76 and 79a/b, as well as Oude Oeverstraat 3 and 4, are all investigations of the Rijnstraat cellar project processed in this dataset. The reason for excluding these 4 addresses is that Rijnstraat 79 a/b concerns a cellar dated to the late 19th century and the others, although of medieval origin, do not seem of particular interest and do not contribute to a greater variety of the complete dataset. The other 29 addresses originate from the documentations regarding the investigations between 1991 and 2000. Apart from

[2] This includes the pages 4, 9, 14, 16, 20, 22, 26, 27, 29, 33, 35, 36, 39, 41-44, 46-50, 52, 54, 57-60, 62-64, 66, 69, 70, 72-74, 78, 79.

the missing and incomplete descriptions in the documentation, 154 addresses remain which are complete, whereof 20 addresses were picked[3]. In addition, 9 addresses which might be incomplete to a certain extent were added to this[4].

6.6 Findings

The findings from the cellar investigations are presented in the same way as in the previous chapter; this layout is already described in Chapter 4. Unfortunately, the available data is not evenly distributed throughout the city and thus lacks a good reflection of the state of affairs. It should be taken into account that 33 cellars (42% of the total) in the dataset of 78 cellars are situated in a small section of the Rijnstraat and that their data is derived from an extensive detailed report. This deficiency is reflected in all documented features presented in this section; however it still seems possible to make some general statements.

6.6.1 Dating

All datings in the Arnhem dataset are derived from the before mentioned reports. However, as stated above, the reports are not equivalent with regard to the description of the cellars. The Rijnstraat cellars are investigated in such detail that every building phase has been dated, as well as every wall. In order to keep the data uncluttered and useful for analysis, a sacrifice has been made: only the earliest datings of each cellar have been included in an attempt to date its earliest appearance. Furthermore, the dating of some cellars (A1ab, A3a, A7ab, A12, A22) was limited to the mere description of '(late) medieval' or, in the case of composed cellars, being 'younger'/'older' than the other one. As with 's-Hertogenbosch are such descriptions literally included.

[3] Extracted from complete documentations: A1-4, A7-10, A12, A13, A15-18, A21-23, A27, A28, A50.
[4] Extracted from partially complete documentations: A5, A6, A11, A14, A19, A20, A24-26.

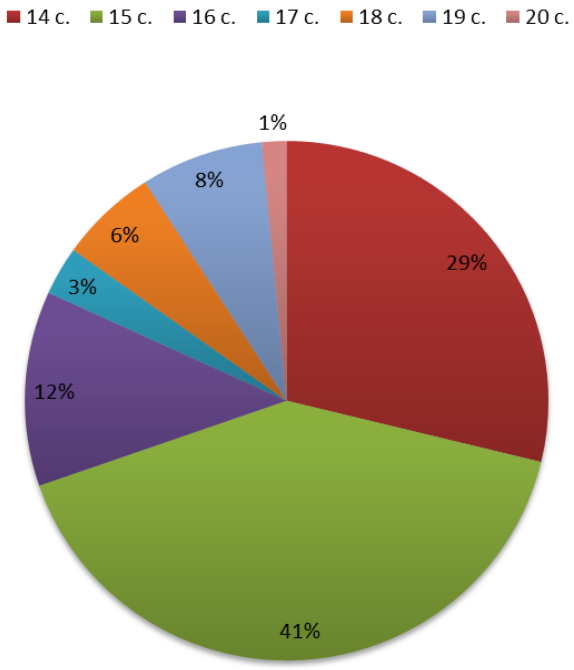


Figure 6.4 Dating of the investigated cellars in Arnhem in centuries (in %), n=68.

Table 6.1 Absolute number of cellars in Arnhem categorized according to their dating in centuries.

Dating in centuries	Investigated cellars
14 c.	19
15 c.	27
16 c.	8
17 c.	2
18 c.	4
19 c.	5
20 c.	1
Total	**66**

Despite the difficulties related to the dating of cellars, Frank and Haans managed to date 14th century cellars in Arnhem on the basis of the type of brick used, the shape of the vault (barrel vault with a pure round arch), archival data and research concerning the houses to which the cellar belongs (Frank and Haans 2003, 15). The realisation of the cellar project in the Rijnstraat formed an excellent opportunity for them, to examine the exterior of the cellars. By examining the construction of the masonry, they managed to date a number of cellars relatively. A good example is Rijnstraat 71 (A45), which must have been constructed before the adjacent houses were present, because the investigation showed that the construction site of this building must have been so large that the presence of adjacent buildings was simply impossible. The cellar walls were also provided with mortar joints on both sides, a feature that is only possible when workers can build on both sides of the wall. In other cellars, it became clear that the walls had to be built from the inside, which meant that it was not possible to reach the wall from the outside, most probably due the presence of adjacent buildings (Frank

and Haans 2003, 14). From 1350, the brick sizes reduced, but the research of the 14th century houses has shown that the length of the bricks is not a good indicator for a correct dating. According to Frank and Haans, the thickness of the brick rather than the length seems to be related to the age; thus the older, the thicker. And although Arnhem already had its own brick industry quite early, the possibility of imported bricks must be taken into account, which was very common at this time, as shown in other cities (Frank and Haans 2003, 15).

Figure 6.4 and Table 2.1 make clear that many cellars date to the 14th century (29%), but that the majority (41%) was constructed during the 15th century. The remaining 30% covers all cellars dated to the 16th century and later. There are considerably fewer examples available from younger cellars, which may be explained by the preservation of older cellars during renovations and renovations. Frank and Haans mention several examples that show that even parts of the medieval framing above ground level were maintained and only provided with modern facades. This was applied until the late 19th century (Frank and Haans 2003, 18).

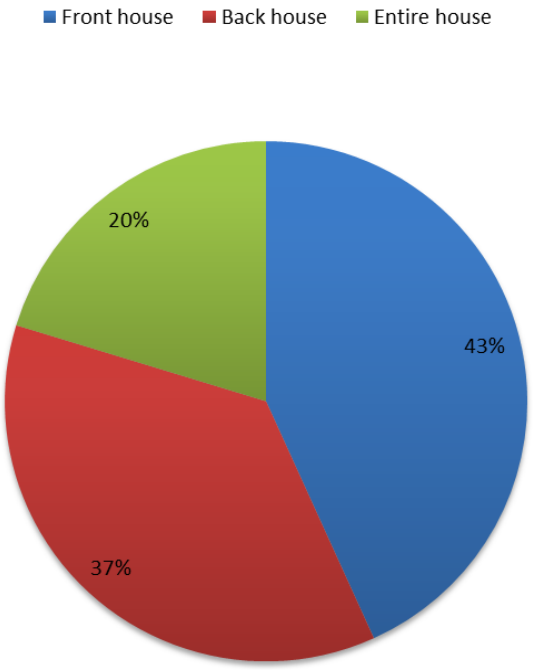


Figure 6.5 Location of the cellars on the building plot in Arnhem (in %), n=75.

Table 6.2 Absolute number of cellars in Arnhem categorized according to their location on the building plot.

Situated on the plot	Amount
Under front house	32
Under back house	27
Under street	-
Under entire house	15
Total	**74**

Table 6.3 The average dimensions of the Arnhem cellars.

	Under front house	Under back house	Under entire house	Under the street	All investigated cellars
Average of length (in m)	7.74 (n=16)	6.15 (n=13)	9.09 (n=12)	-	**7.36 (n=45)**
Average of width (in m)	4.75 (n=17)	4.28 (n=13)	4.65 (n=12)	-	**4.48 (n=46)**
Average of height (in m)	2.47 (n=18)	2.88 (n=12)	2.67 (n=11)	-	**2.63 (n=43)**
Average surface (in m²)	36.77	26.32	42.27	-	**32.97**

6.6.2 Location on the building plot

The discussed cellars are mainly localized under the front house (43%) or the back house (37%) (Figure 6.5 and Table 6.2). Only 20% of all the discussed cellars are stretched out under the entire house. Furthermore, in contrast to 's-Hertogenbosch, there are no street cellars present within this dataset. The large amount of cellars under the front and back house might be related to the *versteningsproces*, in which during the 14th century many wooden constructions were replaced by brick ones with cellars under at least the front house (section 6.2.2). Due to the economic setback in the 15th and 16th century, the necessity for an expansion of space was perhaps unnecessary and the cellars were not replaced on a large scale, as in Deventer.

Regarding cellar A42, it is unsure if this cellar was located under the entire house, because parts of the documentation are lacking. However, due to its address (Rijnstraat 68), the appearance of the adjacent cellars and the mention of a rectangular plan shape, this cellar is added to the group of cellars under the entire house.

6.6.3 Dimensions

The dimensions of as many as 46 cellars could be determined to a greater or lesser extent (Table 6.3). As explained in section 5.6.3, it proved difficult to find

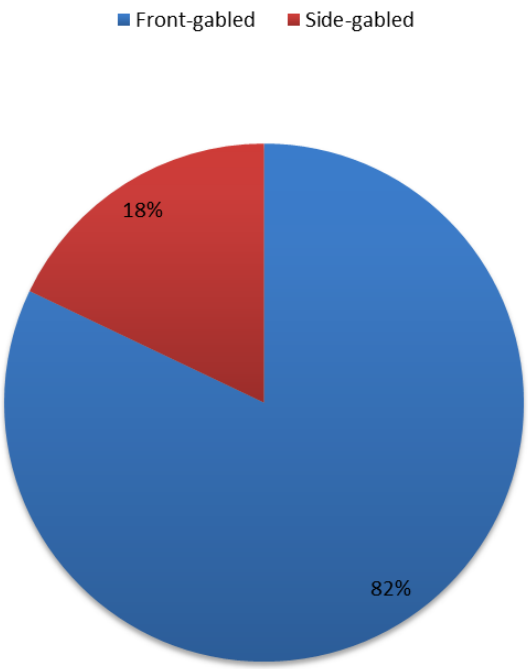


Figure 6.6 Orientation of the cellars relative to the street in Arnhem (in %), n=40.

Table 6.4 Absolute number of cellars in Arnhem categorized according to their orientation to the street.

Orientaton to the street	Amount
Front-gabled	55
Side-gabled	12
Total	**67**

coherence in the various dimensions, however it is striking that, in particular, the height of the Arnhem cellars is on average larger than that of the cellars in Deventer (on average 0.5 m higher). It is uncertain how this relates to Bossche cellars due to the limited amount of data about the cellar heights in this city. As far as Arnhem is concerned, some of the cellars were not determinable whether it was a front or back cellar, therefore the grand total differs from the sum of the three categories.

6.6.4 Occurrence of semi-cellars

In contrast to 's-Hertogenbosch, no semi-cellars are present in the data. Apparently, there are semi-cellars present in Arnhem, but only in some smaller streets and nowhere along the main roads of the town. Because no semi-cellars are included in the Arnhem dataset, all cellars are mentioned as 'full cellars'.

6.6.5 Orientation

The vast majority of the cellars in Arnhem have a front-gabled orientation (82%) (Figure 6.6 and Table 6.4). When looked upon the city map in detail, it is apparent that most of the addresses in the city centre of Arnhem still have a similar orientation. Only few addresses seem to have their eaves directed towards the street and these are mostly located in the eastern part of town, which might be related to the former presence of nobility in these districts. Unfortunately, 11 cellars were not classifiable due to the lack of required data.

As explained before, many cellars were maintained during rebuilding or renovations and therefore apply as a valuable indication for the original orientation of former structures on the address. This is well illustrated by the cellars under A7 (Bakkerstraat 25-26), a building on the corner of the Bakkerstraat and the Pastoorstraat. Originally, there was one corner house with behind it two individual houses facing the Pastoorstraat. However, after a renovation in the 18th century, the corner house was merged with both buildings, forming a new building. Yet, the original situation is still visible in the cellars, because the cellars under the easternmost part of the building (A7cd) consist of two separate barrel vaults which are oriented towards the Pastoorstraat. The existence of such a situation has already been explained in section 2.3.

6.6.6 Vault type

In Arnhem several types of vaulting are represented in the data, however it is striking that the vast majority (87%) consists of cellars constructed with a barrel vault (Figure 6.7 and Table 6.5). It is noteworthy to mention that there are several cellars in Arnhem explicitly mentioned to have a so-called basket handle arched barrel vault (*korfboog*). This is, according to the Merriam Webster Dictionary, a low-crowned elliptical arch drawn from three or more centres (www.merriam-webster.com, entry basket-handle arch). Yet, this feature is not included individually in this dataset, as is explained in section 2.3. Therefore, the presence/absence of this feature in this dataset is not representative and it is considered sufficient to explicitly mention the several cellars with this type of

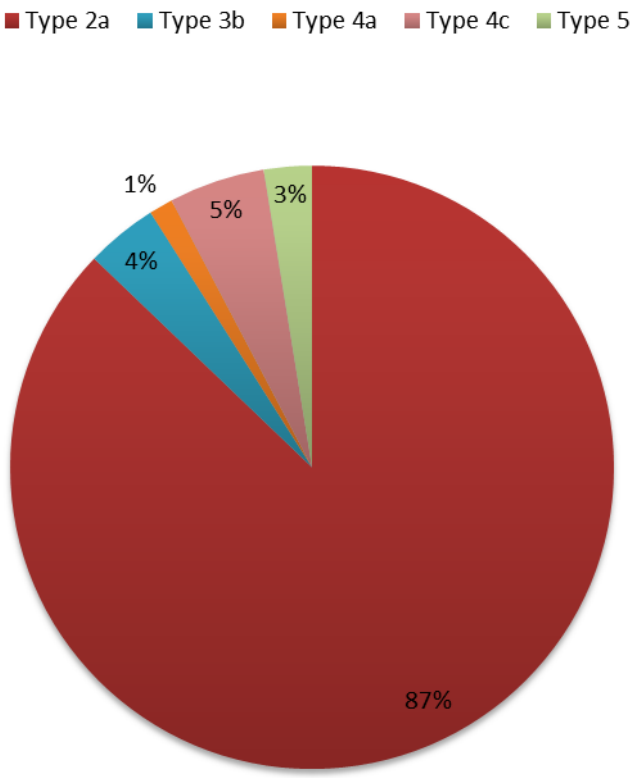


Figure 6.7 Vault types in Arnhem (in %), n=60.

Table 6.5 Absolute number of cellars in Arnhem categorized according to their vaulting types.

Types of vaulting		Amount
Type 1	(beamed ceiling)	-
Type 2a	(barrel vault, various types)	68
Type 2b	(barrel vault with half barrel at street side)	-
Type 3a	(cross ribbed vault)	-
Type 3b	(cross groined vault)	3
Type 4a	(through vault on diaphragm arches)	1
Type 4b	(*Deventer type*)	-
Type 4c	(through vault with wooden/steel girders)	4
Type 5	(concrete ceiling; modern)	2
Total		**78**

vaulting here. At least seven cellars are constructed with this deviant barrel vault[5] and they represent 10.3% of all barrel vaulted cellars in Arnhem and all are located outside the Rijnstraat. Furthermore, only one cellar (A15) is constructed with trough vaults on diaphragm arches. This vault type is already mentioned as a rare type in the report of the cellar investigations, and this is also substantiated by the results of this study. Another cellar worth mentioning is A28, which is constructed with a barrel vault with lunette ascending from brick piers placed against the sidewalls. In contrast to 's-Hertogenbosch (see section 5.6.6), this vault type is fairly rare in Arnhem (Monumenten Advies Bureau 1995, 56).

6.6.7 Entrance type

Particularly in Arnhem, many cellars have an entrance to the street (Table 6.6). Logically, these cellars were located under the front or the entire house. It is striking, however, that only two cellars under the entire house had an entrance to the backyard. The lack of entrances to the backyard seems to indicate that most (business) activities probably took place on the street rather than through the backyard. Several cellars are provided with more than one entrance; therefore the grand total is greater than the total of the investigated cellars.

6.6.8 Presence of other facilities

As already discussed in the previous chapter, this section only serves to give a brief insight in the presence of possible facilities in cellars. Facilities have been reported in 53 of the 78 cellars in total (Table 6.7). As far as the present facilities in Arnhem cellars are concerned, three things are striking. First of all, the common facilities (i.e. passageways, light niches, cellar lights and dumping chutes) are much more frequently occurring in Arnhem, than in both other cities. In 34 cellars are passageways present and in 13 cellars there is even more than one passageway, with a maximum of four in A45a and A45c. In 27 cellars are light niches present and in 16 cellars there is even more than one light niche, with a maximum of eight in A49. In 36 cellars are cellar lights present and in 24 cellars

[5] Cellars with a basket handle arched barrel vault are A4, A7d, A8a, A10, A23, A27 and A50.

Table 6.6 Absolute number of cellars in Arnhem categorized according to their entrance type relative to the location of the cellar.

	Cellars under front house (n=32)	Cellars under back house (n=27)	Cellars under entire house (n=15)	Street cellars (n=0)
Street access	23	1	14	-
Backyard access	-	12	2	-
Internal access	5	5	4	-
No data	7	12	-	-

Table 6.7 Absolute number of facilities present in Arnhem cellars, of which n is the number of cellars where these facilities are present.

Other facilities (open & closed off) (n=53)	Amount
Passageways (n=34)	53
Trapportaal (n=19)	19
Light niches (n=27)	61
Cellar light/dumping chute (n=36)	72
Hearth (n=0)	-
Water well (n=2)	2
Cess pit (n=1)	1

there is even more than one cellar light, with a maximum of seven in A38. Secondly, there are (or were) *trapportalen* present in 19 cellars (24.4% of 78 cellars) and this seems a specific facility for Arnhem cellars in particular (see 6.2.2). The *trapportaal* is present in all 14th century cellars and is, as far as known, in no other city so often and consistently used as in Arnhem (Haans and Frank 2003, 32). Unfortunately, many have disappeared, because they were often replaced or simply demolished in later times. However, all cellars which have or had one present are included in this count. Although the *trapportaal* is related to the entrance, the feature is included in this section because the section about entrances focuses mainly on the direction of the entrance, rather than the spatial constructions. Lastly, there are no hearths present, which might be an indication for the absence of cellar residences.

6.6.9 Brick sizes, brick bonds and wall finishing

The available data about brick sizes in Arnhem cellars is overrepresented compared with the other two cities, this is mainly due to the comprehensive investigations in the Rijnstraat, in which the brick sizes and brick bonds were described in detail. The descriptions consist of extensive information, such as the kind of brick, brick bonds, brick sizes and the possible presence of stone. The sizes of the used bricks of every single cellar were documented per surface, i.e. the rear, side and front wall, as well as the vault, stairs, fillings, floors and possible dividing walls. These descriptions are followed by the various datings per surface, partly based on the brick sizes (for an example, see appendix 15.4). In an effort to provide the most complete dataset, the choice was made to process at least the brick sizes of the vault, rear, side and front wall. In some cellars are multiple brick sizes per surface available, due to variations in building phase and later adjustments. In these cases[6], the largest sizes are included in the dataset, because the larger bricks are usually dated earlier (excluding recycled materials). In the other report (Monumenten Advies Bureau, 1995), different sizes were available without specifying the specific surface to which they belonged and in

[6] Cellars with multiple brick sizes per surface are A35, A45a (vault); A19a, A29a, A39, A40a, A42 (sidewalls); A45c (front wall).

all these cases[7] the brick sizes are classified in the column 'front wall'. These choices were taken from a practical point of view to prevent that the dataset would be too large and confusing, and would contain data that does not contribute to the aim of this study. Due to the extensiveness of the available brick sizes and because the emphasis of this research is not on brick sizes, the overview is presented in the dataset in the appendix, rather than in a separate table in this section.

Because all cellars in the framework of the Rijnstraat cellar project have been stripped of their plasterwork, Frank and Haans managed to determine and record their brick bonds. Table 6.8 shows the brick bonds of the walls and the

Table 6.8 Brick bonds of the vaults and walls of the Arnhem cellars including the normalised dating of the cellar.

Cellar nr.	Normalised dating (in c.)	Brick bond vaults	Brick bond walls
A29a	14	header	wild
A29b	15	header	wild
A30	14	wild	wild
A31a	16	wild	wild
A31b	19	wild	wild
A32	14	wild	wild
A33a	15	wild	wild
A34	15	-	wild
A35	15	stretcher	wild
A36	15	header	wild
A37a	15	header	wild
A37b	19	stretcher	cross
A38	14	wild	wild
A39	15	wild	wild
A40a	15	wild	wild
A40b	16	wild	wild
A41	15	wild	wild
A42	15	wild	wild
A44a	14	header	wild
A44b	14	header	wild
A45a	14	stretcher	wild
A45b	14	stretcher	wild
A45c	19	stretcher	cross
A45d	19	stretcher	cross
A46a	14	stretcher	wild
A46b	15	stretcher	wild
A47	14	head/stretch	wild
A48	15	stretcher	wild
A49	14	header	wild

[7] Cellars of which it is unknown to which wall the brick sizes belong are A1a, A2a, A2c, A6a, A7d, A9, A10, A12, A14b, A16, A21, A22.

vault in comparison with the normalised datings in centuries. The occurrence of wild bond in walls and vaults may indicate the use of mainly secondary material or, at least, that the wall in question did not have a representative function and was probably plastered (Stenvert and van Tussenbroek 2007, 139). As shown, the wild bond is a very common brick bond (90%) for cellar walls. The cross bond was introduced in the beginning of the 16th century and is only used in three cellar walls, all dating from the 19th century. Regarding the vault, three types of brick bond can be distinguished, of which header bond is typical for 14th century one brick thick barrel vaults and ideal for constructing curved walls, such as vaults. The use of stretcher bond is introduced in the 15th century and generally used in half a brick thick barrel vaults (Frank and Haans 2003, 16).

6.7 Results

When summarizing the previous section, the following can be concluded: the majority of the cellars are only partially located under the house, most of which are under the front house (43%) and a substantial amount under the back house (37%). The average size of the cellars under the front house is 7.7m (L) x 4.8m (W) x 2.5m (H), while the cellars below the back house are on average slightly smaller, namely 6.2m (L) x 4.3m (W) x 2.9m (H), but higher. Their surface areas are respectively 36.8m² and 26.3m². Furthermore, it is striking that almost all cellars have a type of barrel vault (87%) and a front-gabled orientation (82%). Finally, it is noteworthy that most cellars have an entrance to the street (58%), but that almost all cellars under the entire house lack an entrance to the backyard. Also, a reasonable number of cellars are provided with an internal access (23%).

6.7.1 The cellar era in Arnhem

By far, most of the cellars are dated to the 14th and 15th century, respectively 29% and 41%. However, this does not seem to relate to a specific period of economic prosperity or an event, such as a large city fire. Yet there is indeed a clear cellar era, so there will be other possible causes underlying the emergence of cellars in Arnhem. It might even be that due to the decline in prosperity few new large

cellars were built, which led to the original cellars being used longer and thus preserved.

6.7.2 A city specific cellar type

According to this study and the presented data, there is no such thing as a typical Arnhem cellar. However, there are a number of elements that occur very often throughout the city. First of all, it is striking that almost every cellar is constructed with some type of barrel vault. Unfortunately, the barrel vault is the most widely used type of vault in general, as is it the longest-used type, and therefore it is risky to designate this as a city-specific type. Secondly, many cellars, particularly in the Rijnstraat, have on average a higher crown in relation to the other two cities. Because there are no semi-cellars mentioned in the available data, it seems that the cellar floors are located at a deeper level in the ground. This leads to impressive cellars with large spans, which, despite the barrel vault, offer plenty of space for many goods. Unfortunately, it has remained unclear why the rear cellars are on average higher than the cellars located under the front of the house, but perhaps this was to facilitate light inlets. Finally, the presence of a *trapportaal* seems a typical phenomenon in the Arnhem cellars. This feature consisted of a brick portal with a lockable door on cellar level, enclosing the entire staircase. In the cities discussed in this study, inside and outside the Netherlands, the existence or occurrence of such a structure has not been described anywhere else. However, more systematic and inter-city research is necessary before any firm conclusions can be drawn.

6.7.3 Determining the general functions of districts by cellar research

Frank and Haans succeeded to distinguish various city districts including their general functions (see Figure 6.8), by combining the cellar research with thorough building historical research. The findings from their research are as follows:

The western part of the town was laid out systematically and consisted mostly of connected buildings with front-gabled orientations. In this area were most of the large, single-nave, rectangular cellars with one major barrel vault located and the

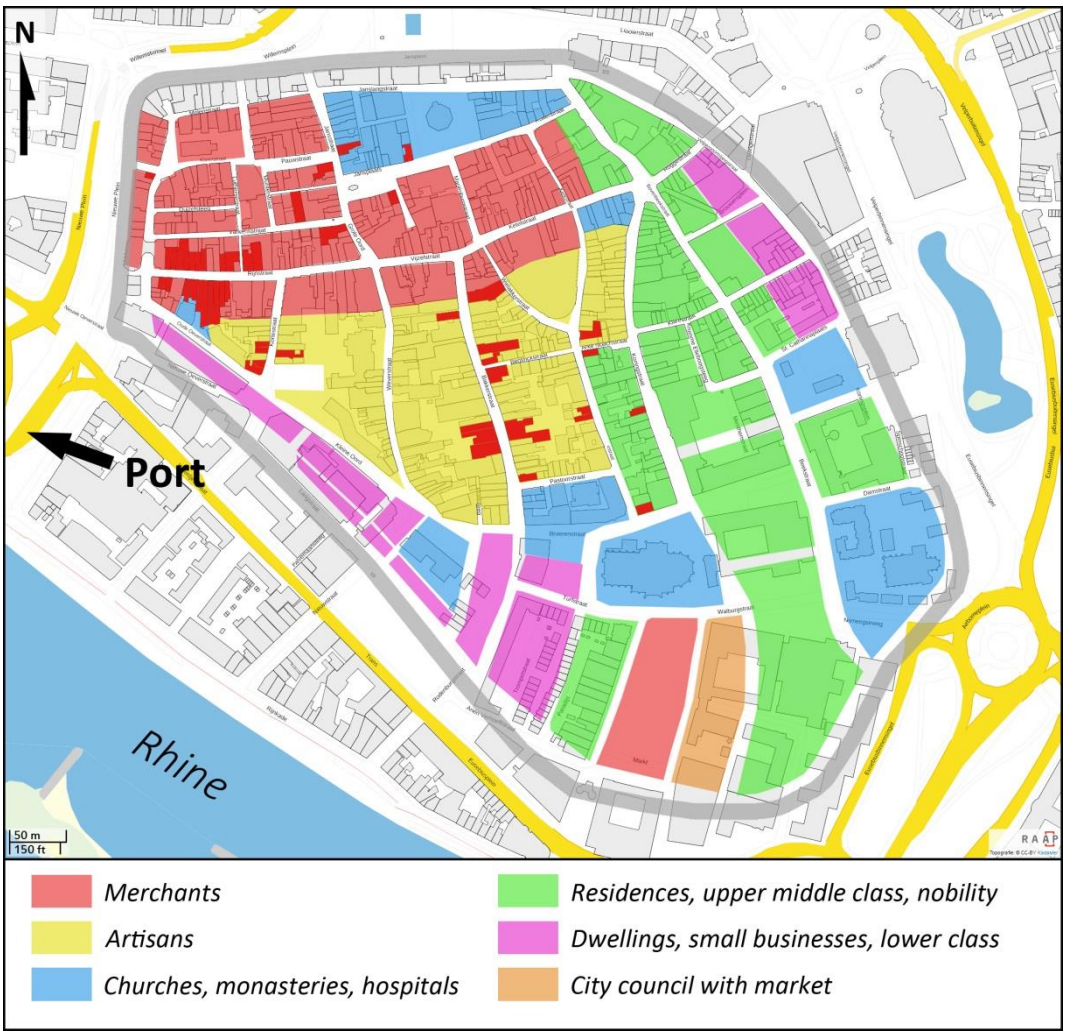


Figure 6.8 Functions of the various districts of Arnhem, according to the insights of Frank and Haans. The districts, the course of the old city wall (grey) and the discussed addresses (red) are projected on a contemporary map. The boundaries between the areas will in reality probably have been less abrupt (sources: made by author; based on a projection on the late 16th-century map of Guicciardini by Frank and Haans (2003); contemporary map: geo.raap.nl/raap-geo-info).

oldest can be dated to the first half of the 14th century. The presence of the warehouses of the counts of Guelders nearby, as well as the port, makes it plausible that this district was the merchant quarter of the town (Frank and Haans 2003, 9). Many cellars in Arnhem were used in the international and local trade as commercial storage and the cellars below taverns and inns functioned as storage for their stock (Frank and Haans 2003, 10). The eastern part consisted mainly of residential areas for prestigious families and the upper middle class, but also the centre of clergy and the city council were located here. The houses in this area had more often side-gabled orientations and usually modest sized cellars often located under the back house or only partially below the front house (Frank and Haans 2003, 10). The cellars were particularly meant for personal use

and are in general younger than the cellars in the western part of town. They are mostly dated in the 15th and 16th century (Frank and Haans 2003, 10). As a result of the side-gabled orientation of the superstructure, many cellars had a similar orientation, i.e. with the crown of the barrel vault parallel to the street (Frank and Haans 2003, 17). The artisan quarter was in particular located in the south-western part of town; this is substantiated by archaeological finds and the remaining names of the streets (e.g. *Weverstraat*, *Bakkerstraat*). The presence of eavesdrops between parcels indicates prolonged existence of timber constructions. In this area were also cellars present, sometimes even with decent sizes, however not in uninterrupted series like in the merchant quarter (Haans and Frank 2003, 42). They were presumably not rented to third parties, but rather used as workspace, storage for work equipment and provision (Frank and Haans 2003, 11).

6.7.4 The functions and usage of the cellars

Although the general function of the districts can be reconstructed, it remains difficult to determine the exact functions of the individual cellars and by whom they were used (Frank and Haans 2003, 20). As in most cellars, there are barely any indications left of medieval facilities concerning the possible functions of the cellar. Also the city archives, such as city accounts, are very sparse in terms of information. Still, there are some functions of cellars known; they were used for the storage of *gruyt* (the main ingredient of beer before the introduction of hops), (temporary) prison and arsenal (Frank and Haans 2003, 22). One of the few visible elements present are light niches that are more abundant in some cellars than in others (section 6.6.8; Table 6.7). This difference is possibly explained by the need of light in this dark environment or to indicate to whom the common wall belonged to (see 6.2.2). Other elements like wine racks, ovens and brine containers can be dated, without exception, in the 18th and 19th century. In order to gain more insights on the subject, Frank and Haans broadened their view and compared the situation in Arnhem with other cities (Frank and Haans 2003, 21). The situation in Arnhem can be compared to the situation in other trading towns, like Deventer, Groningen, Kampen and even Lübeck. Still, in Groningen and

Kampen were many cellars partially situated above ground level and in that perspective is Arnhem more similar to Lübeck and Cologne, which also had large barrel vaulted cellars with stairs to the streets (Frank and Haans 2003, 23). As seen in's-Hertogenbosch, the place and type of access was often related to the function of the cellar. Remarkable is the lack of direct internal accesses from the house above in cellars from the 14th and 15th century. These cellars were, without exception, separated from the house and only accessible through a *pothuis* in the street, from which a staircase led to a lockable *trapportaal* that gave access to the cellar (Figure 6.3). If the cellar entrance was also lockable at street level with a hatch remains uncertain (Frank and Haans 2003, 20). Because the 14th and 15th century cellars were separated from the superstructure, it is plausible that the owner of the building was not necessarily the user of the underlying cellar. Some archives confirm the hiring to third parties, mostly foreign merchants who used these cellars as storage prior to markets or as shop space (Frank and Haans 2003, 21). A storage function is also endorsed by the lack of traces of hearths in the cellars (Frank and Haans 2003, 23), although it should be mentioned that a hearth was not required for various activities. The most common uses of these cellars were probably letting the cellars out to merchants during annual markets, the practicing of crafts and as storage for beer and wine (Frank and Haans 2003, 22). The reasons for storing raw materials in cellars differed, but it will certainly have played a role that some materials were simply too heavy to hoist upwards via the hoisting wheels (Frank and Haans 2003, 23). Unlike Kampen, Groningen and Deventer, for example, it seems that no cellars were inhabited in Arnhem (Frank and Haans 2003, 21).

Between 1500 and 1900, and especially in the 19th century, many renovations were made inside the cellars and many of the modifications can be related to the change of cellar usage. Some medieval cellars were already in the 16th century provided with internal stairs; this was often a spiral staircase that was built through the old vault (Frank and Haans 2003, 18). Particularly in the 18th and 19th century were cellars adjusted to be accessed from the superstructure, by simply putting straight stairs through the old vault. Sometimes were the original

entrances from the street no longer in use as passageway and exclusively used as chute for coal. Closing off these old entrances occurred generally no sooner than in the late 19th or even the early 20th century (Frank and Haans 2003, 19).

7 Deventer

7.1 Introduction

The last city of which the cellars are discussed is the city of Deventer, which is one of the oldest cities of the Netherlands without a Roman origin. The city is located in the province of Overijssel on the eastern bank of the river IJssel. The river formed probably around 600 AD (Makaske *et al.* 2008 in Cohen 2009, 102) and was originally a braided river with fordable areas and large river dunes on both sides, which remained dry during floods (Hogenstijn 2015, 10). In Deventer, the cellars of 37 addresses (see Figure 7.1) were examined in order to answer the research questions. The layout of this chapter is similar to the previous two.

7.2 History

7.2.1 Economy and politics

Nowadays, Deventer is best known as Hanseatic city, however its wealth and prosperity are mainly due to the function it had as a market town since the Middle Ages. The river IJssel has always played an important role for the city throughout its entire history and has always been a leitmotiv.

Around 765 AD a mission post was founded on the eastern bank at the crossroads of a land route and a waterway and it is likely that a small settlement already existed. The mission post was intended as a base to support conversion campaigns in Saxon territory to the east, where the river formed the eastern border of the diocese of Utrecht and the natural border between the Frankish empire in the west and the Saxons in the east. The small mission post soon developed in a fast-growing Frankish trading town with a port (Slechte 2010, 11) and was mentioned as *portus Dauentre* for the first time in 877 AD (Slechte 2010, 104). The town lay on top of three large river dunes (Figure 7.2), which remained dry during floods, although the locations between these dunes still flooded during high water in the IJssel. In the course of time, as a result of the raisings

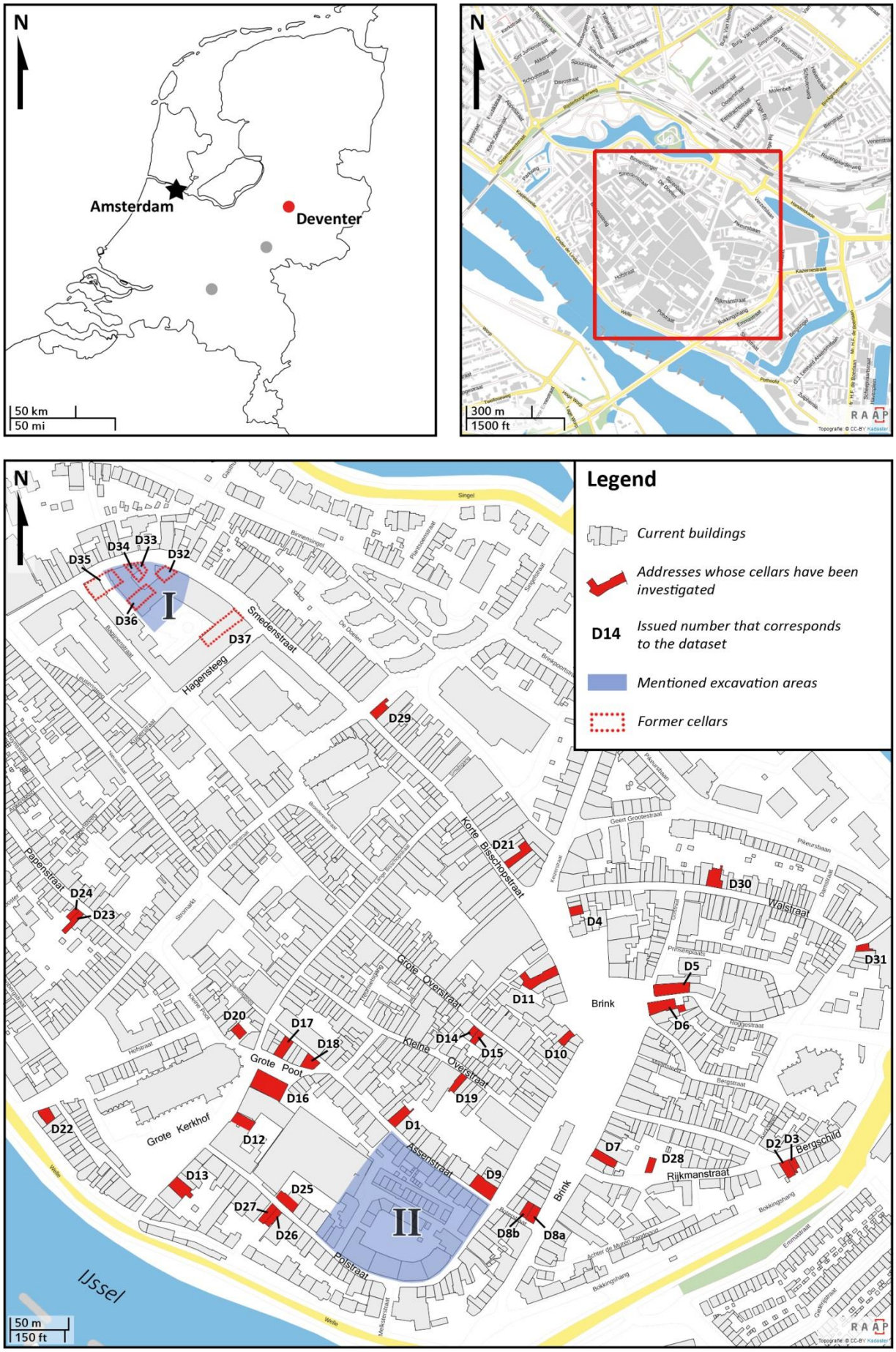


Figure 7.1 Overview map of the city of Deventer. *Above left*: **the location of Deventer in the Netherlands relative to both other cities;** *above right*: **location of the research area within the city;** *middle below*: **detailed view of the research area. The excavation sites mentioned in the text are Smedenstraat (I) and Polstraat-Assenstraat (II) (source: made by author; underlying city maps: geo.raap.nl/raap-geo-info).**

of the ground level, the differences in height largely disappeared from the cityscape (Vermeulen 2006, 53). During the 9th century, the river IJssel became a suitable route for bulk goods that were difficult to transport by land (Slechte 2010, 100), this caused the Veluwe to become connected with the Rhineland and Frisian ports, like Dorestad (Slechte 2010, 11). The thriving development of the portus was closely linked to the strategic location at the river, which was the only waterway connecting the Rhineland with Northern Europe (Slechte 2010, 12). Since the late 9th century the town was already an important trading centre for the trade between the German Rhineland in the south and the Baltic region and Scandinavia up north (Hogenstijn 2015, 16). Based on the findings from numerous excavations, it seems that from the second half of the 9th century almost the entire area of the current city centre was in use. The original distributions of plots as well as the main roads are still recognizable in the nowadays street plan (Figure 7.2) (Hogenstijn 2015, 11). After a Viking raid in 882 AD an earthwork was erected to protect the town against new raids (Hogenstijn 2015, 11) and until 1200 the development of the town would take place within this earthwork.

Due to its origin as mission post, Deventer played an important role as an ecclesial centre in the historical province Oversticht. In 1046 emperor Hendrik III transferred territory, royal jurisdiction, mint and tolls to the bishop of Utrecht, which became the region's prince. As a result the town, already the oldest and most prosperous of Oversticht, became a centre of administrative affairs and the seat of a chapter, and thus the capital of the region (Hogenstijn 2015, 14). After a conflict between the emperor and the bishop in 1123, in which Deventer choose side for the emperor, the town was exempt from many ecclesiastical financial obligations and obtained its city rights (Hogenstijn 2015, 15). The IJssel got a fixed riverbed in the early 12th century and became diked later on, making her navigable all year long and thus increasing its importance even more. From the 13th century the German Hanseatic League was formed and Deventer has been a member since the establishment. However, it would turn out that it has only to a limited extent determined Deventer's history (Slechte 2010, 252). From the mid-

14th century the Hanseatic League became of European importance, but by that time Deventer had already lost its leading role in the seafaring trade to Kampen. This town emerged shortly after 1200 at the river mouth of the IJssel, where the water via a wide river delta in the, by then well-navigable inner sea, Almeer, flowed (Slechte 2010, 100). The location of Kampen was more suitable than Deventer and thus developed Kampen rapidly into a trading city, largely taking over Deventer's role. Nonetheless, Deventer would continue to play a role in the hake trade with Bergen in Norway (Slechte 2010, 124). In 1230, Zwolle acquired its city rights and Kampen followed shortly after. At the time, Deventer was already aware of its position as oldest town in the region, considering the ranking during meetings between those three cities (Slechte 2010, 101). Deventer was the undisputed number one and was followed by Kampen and thereafter Zwolle. Although Zwolle obtained its city rights sooner, the city was overtaken by Kampen, due to its rapid success as trading and port city (Slechte 2010, 104). Despite the fact that Deventer had lost its active share in the seafaring trade, its convenient location at the crossing of north-south and east-west connections, led to the transition of a modest trading town into the most important market town of the Eastern Netherlands (Slechte 2010, 100). This economic development was further accelerated by the better navigability of the IJssel and the Zuiderzee (former Almeer) (Slechte 2010, 124). The annual markets of Deventer are mentioned for the first time in 1340, although they already existed previously. In total, there were five, of which the latter dates from 1386 (Slechte 2010, 224). Each annual market lasted 16 days and took place around the name day of the saint to which the markets were named. This meant that there was every year 2.5 month of annual markets in total (Slechte 2010, 120). The planning of other annual markets in the IJssel region was adjusted to those in Deventer, so that there was always an annual market somewhere (Slechte 2010, 224). To function as an interregional annual market, Deventer had to meet heavy requirements in the field of accessibility, safety and the access to an interregional network. Due to the strategic location of the city in relation to trading centres in Northern and Western Europe, Deventer proved ideal to maintain business relations (Slechte

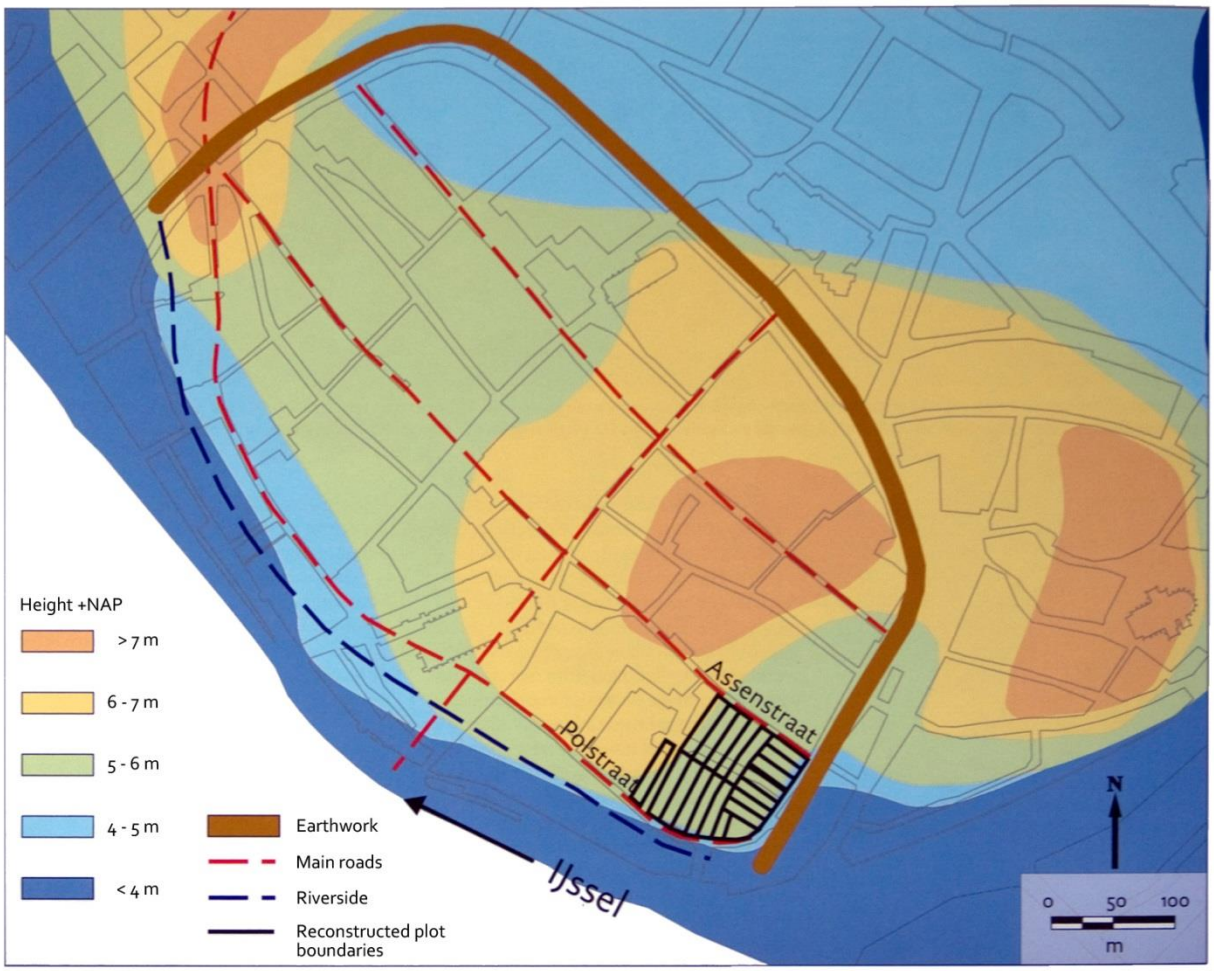


Figure 7.2 Overview of the Deventer settlement in the 9th century, plotted on a map showing the natural subsoil. The reconstructed plot boundaries still form the basis for the current lots (source: Hogenstijn 2015, 10; edited by author).

2010, 121). Deventer soon became the most important market town in the Netherlands, with large-scale markets and visitors from afar. The markets functioned as central distribution point for the export of Dutch dairy and as centre for the trade in grain and rye. Other trading goods included butter, cheese, fish and cloth from Holland and West Frisia and Rhinewine, linen, sandstone, millstones, iron and wood from Westphalia and the Rhineland (Slechte 2010, 226). The city of Deventer was a gateway city, like Dordrecht in that time, and functioned as distribution and transhipment point between the seafaring and river trade. The difference between the both was that the distribution in Dordrecht took place via the staple market and in Deventer via the annual market. (Slechte 2010, 124). In the 15th century, the markets reached their peak, which lead to the greatest bloom of Deventer (Slechte 2010, 250). By then, the markets had the protection of the German emperor (Slechte 2010, 224) and many

traders from Holland and West Frisia conducted their businesses here, as well as many merchants from all over Europe. Their goods varied from silk fabrics from the Far East and pelts from Eastern Europe to boxes of leather, household goods and weapons from France. The intensity and variety of the trade is reflected in the registers of various tolls around Deventer (Slechte 2010, 232). From the second half of the 15th century the leading position of Deventer gradually declines (Slechte 2010, 101), because the inland annual markets were gradually replaced by staple ports in the sea districts. At the same time, the Kampen trade with the Baltic region and the Deventer trade with the German hinterland were taken over by Amsterdam and Antwerpen (Slechte 2010, 250). After the outbreak of the Dutch War of Independence in the 16th century was Deventer's role as a market town definitely over. After the decline of its trading position, Deventer seemed suitable for a role in the defence of the Netherlands as a fortified city, due to its location at the IJssel. The river, which had always led to prosperity, now turned out to be a disadvantage.

7.2.2 Building history

The first known cellars in Deventer are from the 10th century and have been found during large excavations in the oldest part of town, between the Polstraat and Assenstraat (see Figure 7.1; II). These early cellars were constructed in timber and belonged to the housetype *Deventer 4A*, which occurred mainly between 950 – 1050 AD. This type of house was timber frame constructed, consisting of a frame of horizontal wooden beams that was placed directly on the loam floor on which the supporting structure was placed, a so-called sill-beam construction (Janssen 2009, 39). The houses were constructed with at least a deepened ground floor level and had possibly a cellar under the entire house or parts of it. Their dimensions were about 4-5 m wide and 11-12 m long (Mittendorff 2007, 19). This new construction method made it possible to build multiple storeys; therefore it is assumed that all these houses were constructed with at least two floors. Among the excavated structures, the most complete example of this type of house had a cellar of 1.8-2 m deep with an entrance on the rear side (Mittendorff 2007, 257). In the cellars of other equivalent houses, the remains of timber floors,

walls and posts were found. Among the burnt remains of one of these former houses were, in addition to timber walls and posts, also concentrations of charred grain and some weaving weights from the upper floors found on the cellar floor, indicating a residential or artisanal function (Mittendorff 2007, 259). The presence of these cellars suggests a storage function, besides residential functions. Therefore it seems plausible that these properties were owned by merchants and land owners from outside the city, who used the cellar and floor(s) for storage (Mittendorff 2007, 260). It seems that these houses were particularly located in a wide strip along the river. The parts of town further away from the river became depopulated in the 11th and 12th century and the empty spaces were used for agriculture instead. The first buildings constructed with tufa emerged from the second half of the 11th century, while the wooden buildings remained common (Hogenstijn 2015, 12). Around 1200 the town was extended with a new district, the *Bergkwartier;* and shortly after a new city wall was built which was fortified in the 14th century by adding a second rampart. Within the walls the transition to stone buildings continued and the earliest buildings in brick can be dated to the late 13th or 14th century (Hogenstijn 2015, 12).

In 1334, a major city fire took place which apparently destroyed two-thirds of the city. Although it was not the first city fire, it was the most devastating one and as a direct consequence, the city council decided to subsidize everyone who was willing to provide his house with hard roofing. In 1360 the subsidy was expanded with the purchase of bricks for the use of stone walls, which is seen as the beginning of the *versteningsproces* in Deventer. It took until 1425, provided that the last granted grant may be considered as the completion of this process (Slechte 2010, 102). Due to these regulations, the city's appearance changed radically within a century. Although such strict construction regulations occurred in many medieval cities, Deventer is possibly the only city that actively subsidized the use of bricks and roof tiles. The subsidy was also a sign of great prosperity, which was significant in the period 1334-1425, and also is reflected by the beautification of many buildings (Slechte 2010, 103).

7.3 Current state of affairs regarding cellar research

The city has undergone extensive archaeological research in recent decades, but lacks any systematic building historical research. The municipality has never recognized the importance of extensive building historical research. That is why a municipal building historian has never been appointed to systematically investigate the historic inner city. As a result, there is a gap in the building historical knowledge concerning the buildings of the inner city. Despite the extensive archaeological research, which proves a valuable addition to the knowledge of early cellars, the absence of a building historian and the associated research is a shortcoming for the city. This situation proved to give difficulties in obtaining information about cellars, but also created a challenge and an opportunity for this research. This is also the reason why data on excavated cellars have been used specifically in this chapter.

7.4 Methods

In search for records related to Deventer cellars, it seemed initially that no data was available whatsoever. Therefore, the author decided to start investigating a certain amount of cellars himself, in the context of a short internship. In order to document the Deventer cellars properly and systematically, a form was compiled on the basis of the documentation reports from the Monumenten Advies Bureau about the Rijnstraat cellars in Arnhem. Both an example of a documented cellar by the Monumenten Advies Bureau, and a blank field form for the description of Deventer cellars, are included in the appendix (respectively appendix 15.4 and 15.5). The investigations by the author served two purposes: firstly, it provided half of the Deventer data presented in this study; and secondly, it gave a better understanding of the subject with all its difficulties and exceptions. The investigated cellars were chosen by their accessibility, which was achieved by networking, in which the social skills of the author proved useful, as well as his

connection with the city in which he lived for many years. In the end, the number of cellars under investigation was unfortunately limited, due to lack of time and led to the amount of only 16 addresses. In an attempt to achieve a more representative amount of cellars Mr. J.W. Bloemink was contacted, who is a building historian that conducted many building historical investigations, among which in Deventer, and he provided all his relevant reports. In addition, a few reports were added from the building historical workgroup of Deventer, however their investigations are small and their reports limited, so that only three reports were useful for this study. To expand the dataset even further, several excavated cellars have been included as well, which are described in the excavation report of a large-scale excavation campaign at the Smedenstraat in 2003 and 2004 (Vermeulen 2006) (see Figure 7.1; I). In the end, the lack of systematic research and local knowhow led to an approach in which all available documentation was used and home and shop owners were approached at random. As a consequence, the investigated cellars are randomly scattered throughout the city.

7.5 Dataset

The dataset of Deventer consists of 37 addresses with a total of 54 cellars. The corresponding numbering is presented in appendix 15.3 and the locations are shown in Figure 7.1. The catalogue with self-investigated cellars from the internship report (Hattinga Verschure, 2017) has also been added to the appendix (see appendix 15.6). The 37 examined addresses are compiled on the basis of 16 cellar investigations carried out by the author[8], ten investigation reports by Bloemink[9], three reports of the Deventer building historical workgroup[10] and six cellars described in the excavation report of the Smedenstraat (Vermeulen, 2006)[11]. Regarding the latter, four cellars were excavated on the corner of the

[8] Investigated by author: D4, D6, D8-11, D14, D15, D18, D19, D21, D23, D24, D28-30
[9] Investigated by J.W. Bloemink: D1, D5, D7, D12, D13, D16, D17, D20, D26, D27, D31
[10] Investigated by Deventer building historical workgroup: D2, D3, D22, D25
[11] Excavated cellars: D32-37

Smedenstraat/Bagijnenstraat (D32-35). Unfortunately, the exact addresses are unknown; therefore the numbers are used that are indicated in the excavation report which refers to the *Straatboek*[12] and *Kadaster* of Deventer (Vermeulen 2006, 82). Within the building block there were also two other large cellar complexes that belonged to a hospital. One was located under the western part of the *Lange Huis* (D36), the other under the *Mr. Geertshuis* (D37) (Vermeulen 2006, 120, 176). The address data of these two cellar complexes is also missing, so it was decided to use the name of the buildings instead. The approximate location of these six cellars is shown with a red dotted line in the figure. Although chapter 3 explicitly states that cellars under community buildings are ignored, an exception has been made for cellars D36 and D37. The reason for this is the limited size of the Deventer dataset.

In order to provide as much transparency as possible, the self-investigated cellars are coloured grey in the dataset. This distinction has been made, because the findings from the author might be incomplete or misinterpreted. Additionally, the forms which were filled in during the visits are deposited at DANS EASY[13].

7.6 Findings

7.6.1 Dating

The dating of the cellars can be divided into two groups; the cellars that were self-investigated by the author and the cellars originating from the various publications.

A major problem regarding the self-investigated cellars is the inaccuracy of the datings. Due to the lack of resources and knowledge, it was impossible to properly date most of these cellars or buildings. In an attempt to give an estimated date, a variety of sources was used. Cellars belonging to buildings with

[12] Administrative document which was assembled from 1630 and covered a city district per book. Every property had its own number and page, on which the various owners of the building plot and buildings were recorded (Vermeulen 2006, 27).
[13] https://doi.org/10.17026/dans-292-2fk5

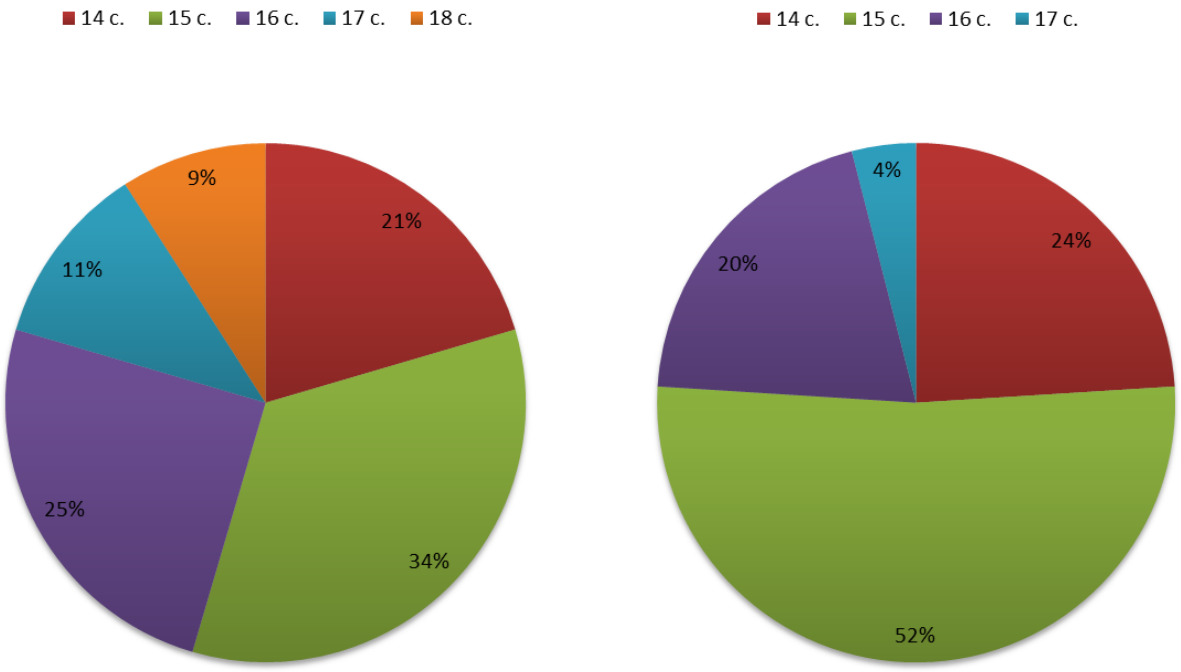


Figure 7.3 Left chart: Dating of all investigated cellars in centuries in Deventer (in %), n=44. Right chart: Dating of the other investigated cellars (i.e. this excludes the self-investigated cellars) in centuries in Deventer (in %), n=25.

Table 7.1 Absolute number of cellars in Deventer categorized according to their dating in centuries.

Dating in centuries	Total amount	Self-investigated cellars	Other cellars
14 c.	9	3	6
15 c.	15	2	13
16 c.	11	6	5
17 c.	5	4	1
18 c.	4	4	-
Total	**44**	**19**	**25**

a national monumental status[14] are dated based on the information given by the website of national monuments (www.rijksmonumenten.nl)[15]. However, the building descriptions on this website are generally very short and it remains mostly unclear to which parts of the building the available dating relates (i.e. does the dating also apply to the cellar?). Besides, most buildings are only provided with one general dating, which often cover larger periods or originate from the anchor plates on the gable (e.g. D28 and D29a). In addition, the *Restauratievademecum* (Berends 1989, 11-12) was consulted in an attempt to date the brick sizes in those cellars[16] where bricks were visible. The dating was determined by comparing the brick sizes found with the existing Deventer brick chronology. In this respect, it is important to mention that these datings are mere guidelines in order to provide in something, rather than nothing. An exception to the case are the cellars D23 and D24, which are located under two adjacent houses from the same building phase, and have been dendrochronically dated by order of the owner. The dating of the other (i.e. not self-investigated) cellars[17] is from the various sources in which they are described.

When summarizing the results, it is striking that the majority of the discussed cellars is dated to the 15th century. When the self-investigated cellars and their potentially incorrect datings are ignored, this trend becomes even clearer as is shown in the table and charts (Figure 7.3 and Table 7.1). Respectively, one third (34%) and more than half (52%) of all investigated cellars can be dated in the 15th century which seems in line with the city's flourishing period in the same century.

[14] Addresses with national monumental status: D8, D9, D10, D15, D19, D28, D29, D30
[15] Rijksmonumenten.nl has been consulted by address, i.e. every individual address has been looked up by using the interactive map, because the search function proved to give difficulties.
[16] Self-investigated cellars with visible brickwork: D4, D10b, D11, D14, D18a, D28, D29b
[17] Cellars derived from other research: D1-3, D5, D7, D12, D13, D16, D17, D20, D22, D25-27, D31-37

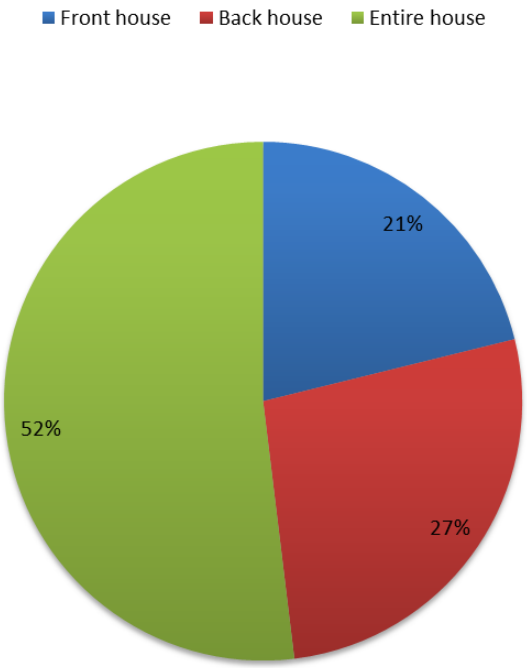


Figure 7.4 Location of the cellars on the building plot in Deventer (in %), n=52.

Table 7.2 Absolute number of cellars in Deventer categorized according to their location on the building plot.

Situated on the plot	Amount
Under front house	11
Under back house	14
Under street	-
Under entire house	27
Total	**52**

7.6.2 Location on the building plot

The majority of the investigated cellars in Deventer are situated under the entire house (52%) (see Figure 7.4 and Table 7.2). However, this may have not always been the case, because it seems that many early cellars were replaced by newer ones in later centuries, especially in the 15th and 16th century. Therefore, this is a plausible explanation for the occurrence of so many 15th century cellars, former cellars have simply been replaced by these ones. The often large cellars were mostly adjacent to the streets and destroyed older features up to a depth of 2.20 – 2.50 m, including smaller predecessors. Therefore, many medieval floors and residential levels have disappeared. However there are some exceptions, such as a small cellar under Kleine Overstraat 57, which was located nine meters behind the façade and preserved due to this location. During a small-scale excavation in the current cellar, a small cellar made of tufa was found dated to the 12th or 13th century and certainly used up to in the 14th century. Its dimensions were 3 x 3 m and several loam floor levels were present, as well as a start of a staircase in the

direction of the street (Spitzers 1988, 22). Cellars located under the front and back house do occur in Deventer, however in most cases only in combination with each other. Only the cellars D26 and D30 are solely located under the front house. In the dataset, there are no addresses with only a cellar under the back. Cellars under the street are not shown in the dataset, but as far as is known there is at least one address[18] with such a cellar in Deventer, belonging to a building located on the central square in the city.

7.6.3 Dimensions

The dimensions of all self-investigated cellars were measured during the visits, except for D8, because this visit was unexpected and there was no time for a proper examination. As far as the other cellars are concerned, it was unfortunately often not possible to determine their dimensions. Only in cases where the dimensions were explicitly mentioned, are they included in the dataset. Here too, it proved difficult to find coherence; nonetheless the available dimensions are presented in Table 7.3. As far as the height of the cellars is concerned, Deventer appears to be the most like 's-Hertogenbosch, which both have cellars that are on average about 0.5 m lower than the cellars in Arnhem. However, in terms of length, the Deventer cellars are on average about 1.5 m longer than the cellars in Arnhem. The considerable difference in surface area

Table 7.3 The average dimensions of the Deventer cellars.

	Under front house	Under back house	Under entire house	Under the street	**All investigated cellars**
Average of length (in m)	6.96 (n=5)	6.63 (n=7)	10.42 (n=21)	-	**8.95 (n=34)**
Average of width (in m)	4.34 (n=5)	4.01 (n=7)	5.6 (n=22)	-	**5 (n=35)**
Average of height (in m)	2.1 (n=4)	2.18 (n=4)	2.19 (n=18)	-	**2.17 (n=26)**
Average surface (in m²)	30.21	26.59	58.35	-	**44.75**

[18] Brink 55

(44.75 m2 in Deventer) compared to Arnhem (32.97 m2) and 's-Hertogenbosch (29.94 m2), will mainly have to do with the fact that most of the basements in Deventer extend below the entire building (22 out of 37).

7.6.4 Occurrence of semi-cellars

During the investigations no semi-cellars were found in Deventer. Also, the reports did not mention the presence or absence of semi- or full cellars, therefore these columns have been left blank.

7.6.5 Orientation

The majority of the Deventer cellars (77%) are front-gabled oriented (see Figure 7.5 and Table 7.4), which is most similar to the situation in Arnhem. Unfortunately, six cellars were not classifiable (D27, D32-36), because not enough data was available.

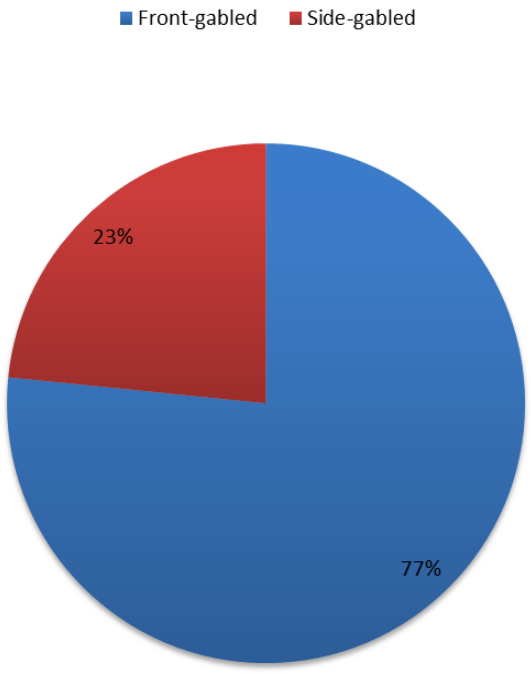


Figure 7.5 Orientation of the cellars relative to the street in Deventer (in %), n=47.

Table 7.4 Absolute number of cellars in Deventer categorized according to their orientation to the street.

Orientaton to the street	Amount
Front-gabled	36
Side-gabled	11
Total	**47**

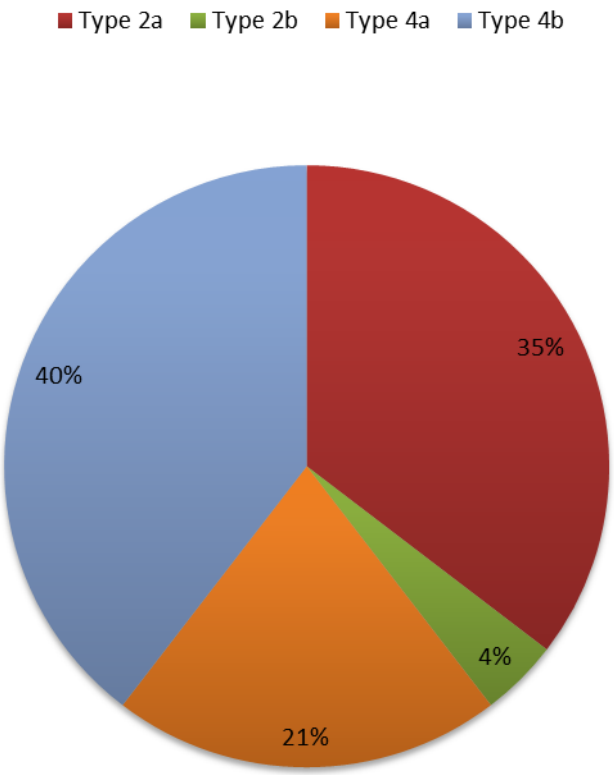


Figure 7.6 Vault types in Deventer (in %), n=54.

Table 7.5 Absolute number of cellars in Deventer categorized according to their vaulting types.

Types of vaulting		Amount
Type 1	(beamed ceiling)	-
Type 2a	(barrel vault, various types)	17
Type 2b	(barrel vault with half barrel at street side)	2
Type 3a	(cross ribbed vault)	-
Type 3b	(cross groined vault)	-
Type 4a	(through vault on diaphragm arches)	10
Type 4b	(*Deventer type*)	19
Type 4c	(through vault with wooden/steel girders)	-
Type 5	(concrete ceiling; modern)	-
No data		6
Total		**54**

7.6.6 Vault type

As mentioned earlier, the oldest cellars were usually constructed with beamed ceilings. Although such ceilings are absent in the presented data, evidence for these ceilings has been found in the cellars D6, D8 and D20 in the form of several basalt consoles in one or both of the sidewalls which were used to support the beam upon which the floor joists were placed (Bloemink 2009, 7). Cellars with beamed ceilings were also very common in Deventer in the 14th century, but few remained because most cellars were later vaulted (Bloemink 2006, 18).

When looking upon the various vaulting types used in Deventer, the first thing that strikes is the large share of cellars with the vaulting types 4a and 4b. Besides a fair share of barrel vaults (type 2a; 39%), the majority of the cellars were built with a trough vault on diaphragm arches (type 4a; 61%), of which more than half consists of a variation on this, namely the *Deventer type* (type 4b; 40%) (see Figure 7.6 and Table 7.5). The latter vaulting type seems characteristic for the city of Deventer so far. In the dataset, the construction material of possibly present columns is not mentioned; however in 12 out of 18 cases it has been determined that natural stone was used. As regards to the six cellars of which no data is present, this concerns the aforementioned excavated cellars. This is a general problem with excavated cellars, usually the floor is still present and also parts of the ascending wall, but the vaults are missing. Sometimes the beginning of the vault construction is still visible and this can give insight into the applied construction. However, in this case the literature did not give such details.

7.6.7 Entrance type

As far as the entrances are concerned, it strikes that there are many street accesses in Deventer. It seems that even the cellars under the entire house are more often connected to the street, than the backyard. However, this difference could be caused by not recognizing older entrances that were later closed and covered with plaster. The connection to the street seems logical, because many cellars are either located under the entire house or the front (and back) of the

Table 7.6 Absolute number of cellars in Deventer categorized according to their entrance type relative to the location of the cellar.

	Cellars under front house (n=11)	Cellars under back house (n=14)	Cellars under entire house (n=27)	Street cellars (n=0)
Street access	7	2	16	-
Backyard access	-	2	7	-
Internal access	4	2	5	-
No data	3	9	7	-

house (see Table 7.6). The majority of street entrances might be explained by the trade-related character of the city of Deventer.

7.6.8 Presence of other facilities

Other facilities are found, or mentioned, in 35 of the 54 cellars in Deventer (seeTable 7.7). As for the distribution of the common facilities, in 22 cellars are passageways found of which there is more than one present in six cellars, with a maximum of two passages. In 4 cellars are light niches found of which there is more than one present in three cellars, with a maximum of four light niches in D28. In 23 cellars are cellar lights found of which there is more than one present in 13 cellars, with a maximum of six cellar lights in D25. Unfortunately, the data give little surprising insights, although it is striking that the amount of light niches is exceptionally low compared to 's-Hertogenbosch and Arnhem. For a complete overview, it is highly recommended to combine the results shown in the table with the cellar registrations and drawings in the appendix.

7.6.9 Brick sizes, brick bonds and wall finishing

Unfortunately, details about the masonry were usually missing in the consulted reports. Only of four cellars (D2, D3, D13a and D25) were in a greater or lesser extent data available. This does not apply to the self-investigated cellars; here the plaster was often not completely intact, making it possible to measure at least portions of the brickwork. When measuring bricks, the aim was always to measure multiple bricks, although this was not always possible. Another

Table 7.7 Absolute number of facilities present in Deventer cellars, of which n is the number of cellars where these facilities are present.

Other facilities (open & closed off) (n=35)	Amount
Passageways (n=22)	28
Brick doorway	-
Light niches (n=4)	10
Cellar light/dumping chute (n=23)	41
Hearth (n=2)	2
Water well (n=2)	2
Cess pit	-

Table 7.8 Brick bonds and brick sizes of the sidewalls of the Deventer cellars, including the normalised dating of the cellar and the presence or absence of a wall finishing.

Cellar nr.	Normalised dating (in centuries)	Wall finishing (Y/N)	Brick bond	Length of the bricks (in cm)	Width of the bricks (in cm)	Height of the bricks (in cm)	10 layers of bricks (in cm)
D2	-	-	-	28-29	13.5-14	6-7	78-83
D4	-	Y	-	28-29	13-13.5	6.5-7	-
D6a	-	Y	-	-	-	7.5-8	-
D10b	16	Y	-	26-27	12-14	6-6.5	-
D11a	17	Y	Flemish	21.5-23.5	13.5-14.5	-	87
D11b	16	Y	-	26	12-13	6.5-7	76
D13a	14	Y	-	29	14	7.5-8	85-86
D14	16	Y	-	20	12-14	6-6.5	-
D18a	14	N	-	27-28	13-15.5	7.5-8	90
D23	16	Y	-	22-23	11-11.5	5-6	71-72
D24	16	Y	-	22-23	11-11.5	5-6	71-72
D25	15	-	-	29	12	7	80
D28	17	Y	-	27-29	12.5-14	6-6.5	75
D29b	16	Y	-	25	13-14	5-6	81

problem formed the frequent occurrence of plaster as wall finishing, which made it difficult to recognize brick bonds. In Table 7.8, only the brick sizes of the side walls are included, because there are too few available brick sizes of the vaults, front and rear walls.

7.7 Results

The above findings can be summarized as follows: the majority of the investigated cellars in Deventer are dated in the 15th century (34-52%), of which most are located under the entire house (52%). Their size is on average 10.42 m (L) x 5.60 m (W) x 2.19 m (H), with an average surface area of 58.35 m². As in both other cities, the front-gabled orientation (77%) prevails. Furthermore, the majority of the cellars had an entrance to the street (55%), which is due to the fact that so many cellars are located under the entire house. Of these cellars, 26% had an entrance to the backyard, which might be an indication for activities in the backyard. As regards to the vaulting types, it strikes that nearly one-third of all cellars contains trough vaults on diaphragm arches (59%), whether or not of the Deventer type (38%), while all other cellars have a barrel vault (41%), of which some (6%) with a half barrel vault on the street side.

7.7.1 The cellar era in Deventer

On the basis of the findings, the 15th century clearly stands out as cellar era. It is plausible that there exists a relation between the blooming of the Deventer economy in the 15th century and the occurrence of the many cellars in the same century. The absence of basements that date from before the 14th century can possibly be explained by the possibility that until the city fire of 1334 many cellars were built of perishable materials, like the earliest cellars found in the Deventer type 4A houses (see 7.3.3). Evidence for this, as well as the rise of stone cellars as a direct result of the subsidy following the 1334 city fire was not found in this study. However, the small number of cellars dating from the 14th century and the absence of earlier cellars could be explained by the fact that they were replaced by larger ones in the 15th century. The small number of cellars from the

16th century is possibly explained by the decline of the prosperity from the second half of the 15th century (see 7.2.1).

7.7.2 A city specific cellar type

As mentioned earlier, the vaulting types that occur in Deventer deviate from the other two cities, therefore it can be stated that there is clearly a city specific cellar type. Typical for Deventer are cellars that usually stretched under the entire house and had an entrance to the street and sometimes the backyard. The vaultings of these cellars mostly consist of trough vaults, placed one after the other, on one transversely placed (parallel to the façade) large diaphragm arch (type 4a) or on double diaphragm arches, which are supported in the middle by sandstone columns (type 4b) (Figure 7.7). This is also recognized by the building historians Bloemink and Hemmes (2003, 5). The latter (type 4b) is so city specific, that cellars with such vaulting are considered as *Deventer type* (see Figure 7.8). These cellars are typical for the late 15th and early 16th century, but they may have occurred much earlier in Deventer (Bloemink 2009, 7). Many of the stone columns are made out of Bentheimer sandstone, a material that was frequently used since 1450 (Vermeulen 2006, 120-121). Similar cellars can also be found in Utrecht and are usually dated in the 15th century, but some even in the 14th century (Bloemink 2009, 7).

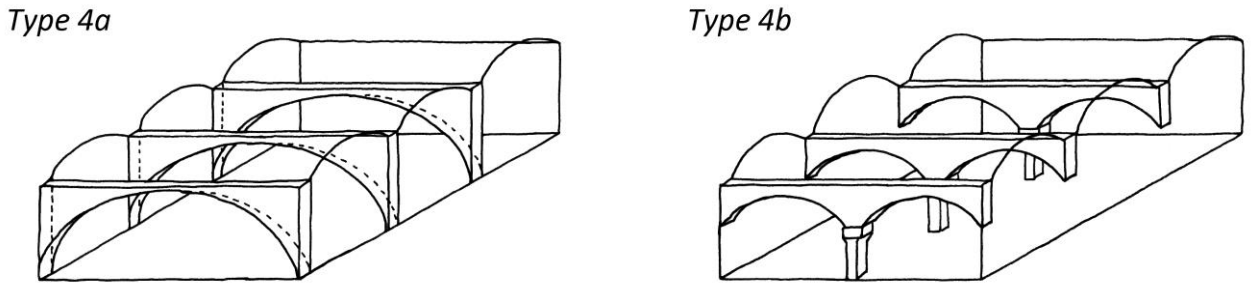


Figure 7.7 Overview of the vaulting types which are characteristic for the Deventer cellars (source: hand-drawn and edited by author; type 4a is based on Koolstra and Willems 2008, 52).

Figure 7.8 Example of a cellar of the *Deventer type* (under Brink 48), including columns of Bentheimer sandstone (source: photographed by author).

7.7.3 The functions and usage of the cellars

As has already been shown in the other chapters, finding out the precise functions of the cellar is a difficult task. However, the frequent occurrence of large cellars with entrances to the streets seems ideal for storage purposes and can therefore be trade-related. Given the fact that Deventer was an important town, regarding annual markets from the 14th until the 16th century, the need for as much storage possibilities as possible seems to be essential in order to function as an international trading hub. Other functions are much more difficult to trace, especially due to the lack of thorough building historical research. Therefore, based on the results, no clear distribution can be made of specific cellar types in certain districts, as is the case in Arnhem. Yet, it is striking that there is barely any local variation found within the city centre and certainly not to the extent as shown in the other two cities. This finding is also confirmed orally by Mr. Bloemink, who visited many cellars in Deventer in his life, whether or not work-related. The presence of the many cellars with trough vaults can be of a practical nature, in an attempt to use the space more efficiently. This type of vaulting created an equal amount of vertical space in every area in the entire cellar, which is ideal for storage purposes.

8 Conclusions

The aim of this study was to gain more insights in the occurrence and development of house cellars in the Netherlands. In order to do so, five research question were formulated that will be answered here on the basis of the findings in response to the investigations of the cities 's-Hertogenbosch, Arnhem and Deventer.

8.1 Results

8.1.1 Distinguishable characteristics

The external characteristics that can be distinguished are the same as the applied subdivision in the datasets.

The recorded features are:

- the location on the plot, i.e. the cellar is located under either the front of the house, the back of the house, the entire house or under the street;
- the dimensions of the cellar (L x W x H x m^2);
- the orientation in relation to the street, i.e. the cellar has either a front-gabled or a side-gabled orientation;
- the vaulting type, i.e. the cellar is constructed with a wooden beamed ceiling or a stone vaulting, such as a barrel vault, a cross vault, a trough vault or a variation on one of these;
- the presence of a semi-cellar or a full cellar, i.e. the cellar protrudes to a greater or lesser extent above the ground or not at all;
- the aisles of the cellar, i.e. the cellar is divided in one or more aisles by the presence of columns;
- the entrances to the cellar, i.e. the cellar is accessed via the street, the backyard or internal;

- the presence of other facilities, i.e. in the cellar are facilities present, such as passageway(s), a trapportaal, light niche(s), cellar light(s), dumping chute(s), a hearth, a water well or a cess pit;
- the presence or absence of a wall finishing;
- the brick bonds of the masonry;
- the sizes of the bricks used.

8.1.2 Chronological development / Cellar era

The types of vaulting show a chronological development. This is not so much visible in the location or the size of the cellars, because this varied strongly per city, but in the development of the vaulting types. The first cellars were built with beamed ceilings (type 1) on which the ground floor was located, such cellars can be found in 's-Hertogenbosch, of which the oldest (H31a) dates to the 13th century. After abandoning the beamed ceilings, the first stone cellars were built with barrel vaults (type 2). This vaulting type was introduced on a large scale in Arnhem and 's-Hertogenbosch in the 14th century. Apparently, this type of vault was relatively easy to construct because it was used in many cellars. The downside of this construction was, however, the amount of space it took in relation to the beamed ceilings. When looking at the development of vaulting types, it seems that a solution was sought to have as much space as possible without losing the stone vaulting. This development is clearly shown in Figure 2.6 and Figure 2.8. The first developments were limited to adaptations and expansion of barrel vaults (type 2a and 2b), such as the addition of lunette and possibly also the construction of pressed barrel vaults instead of pure round arches. This was followed by the introduction of new types such as the cross vault (type 3), a vaulting type that had no additional benefits and was more difficult and expensive to construct. This vaulting type is underrepresented in the data and is only found in ‘s-Hertogenbosch, the earliest cellars with this vaulting type are dated to the 13th century. Subsequently, the trough vault on diaphragm arches (type 4a) was introduced in the 15th century. This type occurs in all three cities, but especially in Deventer. The brick diaphragm arches eventually made way for steel or wooden girders between smaller trough vaults

(type 4c), which are generally dated from the 17th/18th century. In the end, the usable space was more or less the same as with the first cellars with beamed ceilings, although the cellar was now completely constructed in stone. However, it should also be noted that the application of a certain vaulting type might have been related to the status of the cellar or its owner, as was the case with various decorated cellars in England.

In Figure 8.1 all datings of the cellars are brought together, categorized according to their vault type. It can be deduced from this figure that the rise of stone cellars began in the 14th century and had its peak in the 15th century. As witnessed by the large number of cellars in the 15th century, there even seems to be a real cellar era. In regard to earlier cellars, the exact reason for their emergence remains unknown. The first cellars were mostly built with perishable building materials, such as wood. Due to this, these early structures can hardly be found, because they were only preserved when the soil condition was good, besides, many wooden specimens were later replaced by stone variants. Therefore, not much can be said about the earliest cellars.

The introduction of the cellar is usually explained as trade-related. This seems a plausible explanation, because there are often many cellars in former trade districts and because the 15th century in many cities was a Golden Age with high economic prosperity. However, there seems to be more to it. It is noticeable that Arnhem does not have a clear flowering period, at least not as sharply in history as a city like Deventer. In particular, the 14th century was a century of economic prosperity for Arnhem, but this changed at the beginning of the 15th century. In the case of ´s-Hertogenbosch, this city had a clear bloom; it reached its peak in the first half of the 16th century. Yet, most cellars of both Arnhem and 's-Hertogenbosch date from the 15th century. This raises the question of which other causes have stimulated the rise of the cellar.

A first possibility is that the cellars are related to the *versteningsproces* that took place in many cities in the 15th century, in response to devastating city fires.

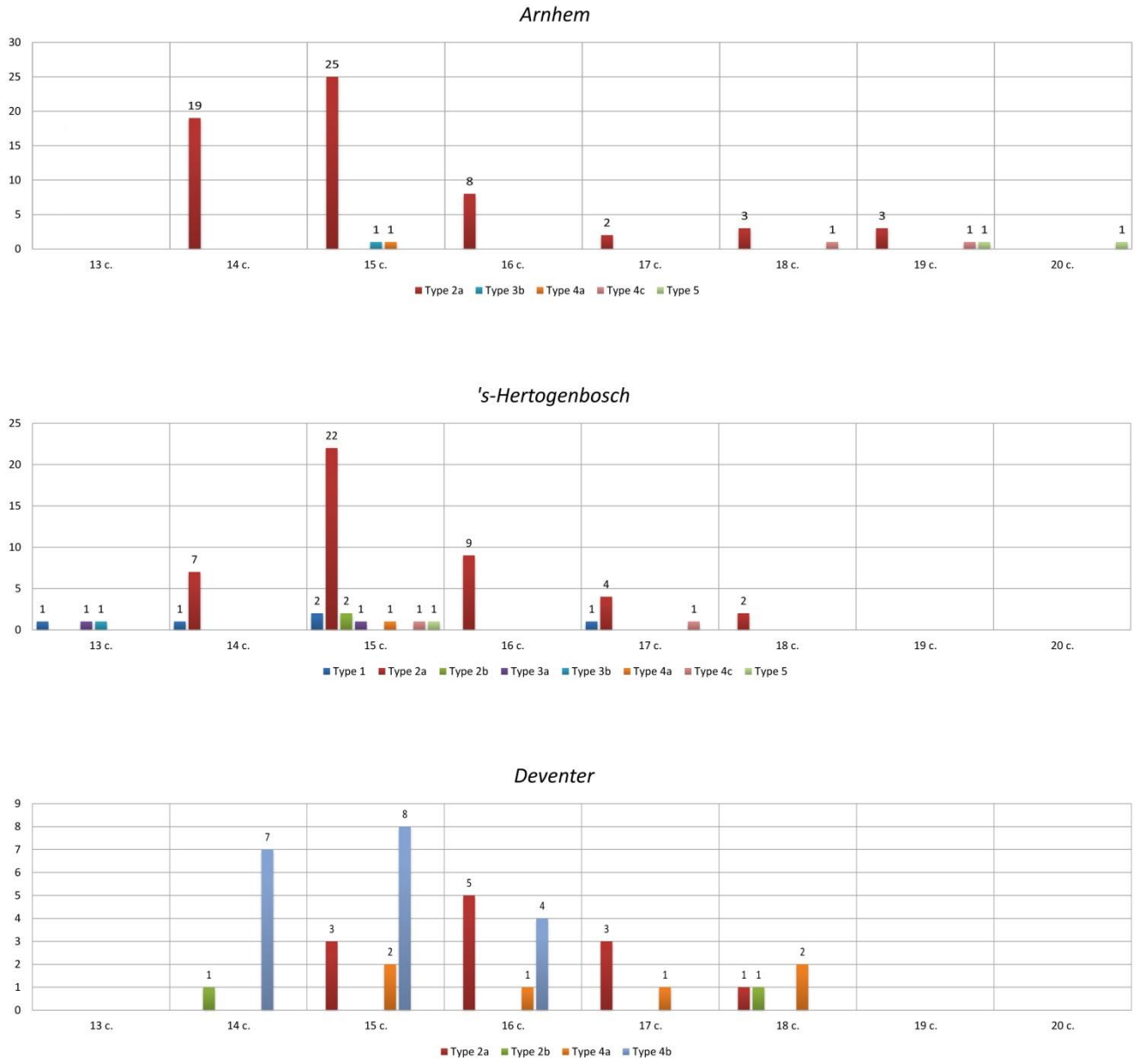


Figure 8.1 Overview of the datings of all cellars per century per city, categorized according to their vault type.

Because of the wooden character of most buildings, cities were very flammable. That is why timber-built houses were replaced on a large scale by constructions of stone and thatch roofs by solid roof coverings. A very preferred solution, however, seems to be the addition of a cellar below the building. Cellars turned out to be ideal fireproof spaces in the building: located underground, lockable from the outside and covered on all sides by a stone mantle. Another possibility is the possible problem of a growing lack of space. Many medieval cities had the same city surface for centuries and expanding proved difficult, due to often extensive defences around the city. The presence of cellars that were later added under already existing buildings, which was a difficult and very labour-intensive affair, and cellars located in wet contexts or underneath the streets, suggests that due to the steady increase in population growth, the need arose to realise more space within the city. This seems also supported by the emergence of cellar residences, especially in overpopulated cities. A final possibility is a relation between the vaulting types and the support of the superstructure that became heavier in the course of time due to the replacement of wooden houses by stone houses. Unfortunately, this study is too limited to answer this hypothesis and future research into houses and cellars may reveal to what extent this relationship exists. In all probability there is not one demonstrable reason, but several causes underlying the rise of cellars in the Middle Ages.

8.1.3 Trends in dimensions

In Table 8.1 - Table 8.5, the average dimensions of all cellars are brought together and categorized according to the location of the cellar within the plot. This shows that there are two dimensions that stand out; in the first place it seems that cellars under the back of the house (Table 8.2) are generally smaller, compared to cellars under the front of the house (Table 8.1). This may be related to the function of the cellar, where the cellar under the back of the house was often intended for private use. Secondly, the cellars in Arnhem are clearly higher than the cellars in Deventer and ´s-Hertogenbosch (Table 8.5). Because there are no semi- cellars present in the dataset, it seems that the Arnhem cellars lie deeper in the ground. An explanation for this is unknown.

Table 8.1 The average dimensions of the cellars under the front house per city.

Under front house	's-Hertogen bosch	Arnhem	Deventer
L	11.58 (n=4)	7.74 (n=16)	6.96 (n=5)
W	4.25 (n=4)	4.75 (n=17)	4.34 (n=5)
H	-	2.47 (n=18)	2.1 (n=4)
m^2	49.22	36.77	30.21

Table 8.2 The average dimensions of the cellars under the back house per city.

Under back house	's-Hertogen bosch	Arnhem	Deventer
L	6.38 (n=13)	6.15 (n=13)	6.63 (n=7)
W	3.99 (n=14)	4.28 (n=13)	4.01 (n=7)
H	1.89 (n=5)	2.88 (n=12)	2.18 (n=4)
m^2	25.46	26.32	26.59

Table 8.3 The average dimensions of the cellars under the entire house per city.

Under entire house	's-Hertogen bosch	Arnhem	Deventer
L	-	9.09 (n=12)	10.42 (n=21)
W	-	4.65 (n=12)	5.6 (n=22)
H	3.9 (n=1)	2.67 (n=11)	2.19 (n=18)
m^2	-	42.27	58.35

Table 8.4 The average dimensions of the cellars under the street per city.

Under the street	's-Hertogen bosch	Arnhem	Deventer
L	6.9 (n=1)	-	-
W	2.3 (n=1)	-	-
H	-	-	-
m^2	15.87	-	-

Table 8.5 The average dimensions of all investigated cellars per city.

All cellars	's-Hertogen bosch	Arnhem	Deventer
L	7.56 (n=18)	7.36 (n=45)	8.95 (n=34)
W	3.96 (n=19)	4.48 (n=46)	5 (n=35)
H	2.23 (n=6)	2.63 (n=43)	2.17 (n=26)
m^2	29.94	32.97	44.75

Unfortunately, the dataset is relatively small, especially with regard to the available dimensions, because the availability of this data varied considerably. For example, when looked at the average dimensions of all the cellars investigated per city (Table 8.5), the dimensions vary greatly in size. This can be explained by the type of cellars that dominate the city and the dataset. For example, the average surface area of the Deventer cellars is no less than 45 m^2. However, most of the cellars in Deventer are located under the entire house and it is therefore not surprising that the total surface area of the Deventer cellars is larger than that of the other two cities.

8.1.4 Characteristic cellar type per city

There is clearly a local variation between the different cities and it is striking that types of cellars or vaults that are abundant in one city can be completely absent in the other (see Figure 8.2). It is clear that the different cities had their own building traditions with regard to cellar constructions. However, it is difficult to explain how this local variation took place, due to the limited degree of cellar research in general and the limited scope of this study in particular.

The distinct city specific cellars can be described as follows: typical for 's-Hertogenbosch are cellars with barrel vaults located under the back of the house, which were accessible via an internal entrance and an entrance to the backyard, and small cellars outside the plot, located under the street. In Arnhem, a city specific cellar is less clearly recognizable, although the barrel vault is very common, the cellars crown is on average higher and, only in this city, the cellars from the 14th century are constructed with a *trapportaal*, a brick portal that encloses the entire staircase and that was lockable on cellar level. A clear cellar type is distinguished in Deventer, consisting of cellars located under the entire house with at least an entrance to the street and sometimes also one to the backyard. Most cellars were constructed with trough vaults on diaphragm arches (type 4a) of which many are from the Deventer type (type 4b) with supporting columns in the middle.

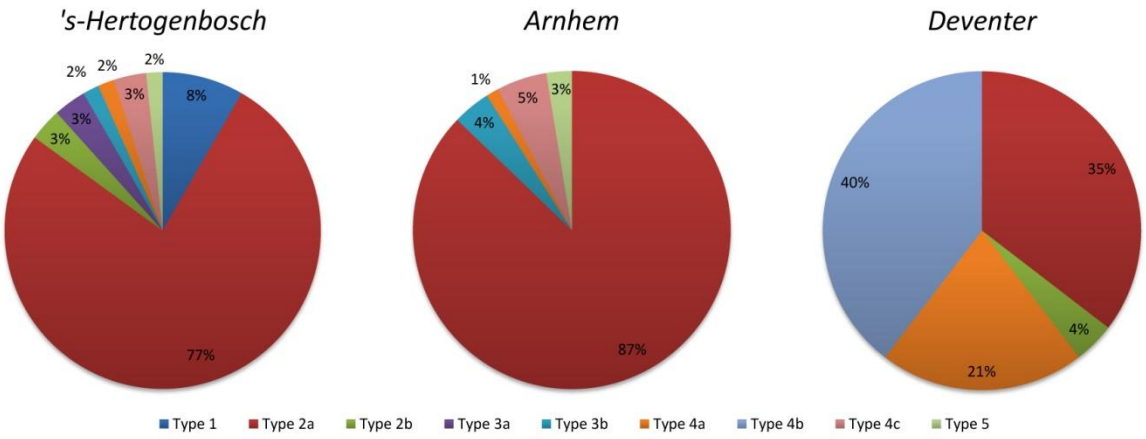


Figure 8.2 Overview of the relative distribution of vaulting types per city.

There was even local diversity between the various city districts within cities. Previous research has shown that this is the case in Arnhem, but unfortunately this is not represented in the data of this study. However, such a distinction is clearly visible in the data of 's-Hertogenbosch. As far as Deventer is concerned, it seems that such a variation within the city is lacking. Explanations for these local variations are difficult to establish, because the limited degree of research makes it difficult to compare the different cities. It is possible that traders and architects from other regions brought along ideas about how best to handle such things, based on their home situation. Another possibility is that the development was mainly stimulated by practical necessity.

8.1.5 Functions of the cellars

The functions that have been found in this study comprise storage space, workshop and cellar residence. The function of the cellars seems to be related to the location of the cellar on the plot. Cellars under the back of the house are associated with private use, while cellars adjacent to the street were often used for commercial activities, such as trade purposes, subletting and residence.

Determining the (original) functions of cellars is very difficult and is only possible to a certain extent. Account must be taken of the fact that it is in any case not possible to rely on the presence of possible inventories of building contents. There are many uncertainties regarding inventories, but it is certain that it is not possible to determine whether an inventory is primary. Even when houses are

being excavated, it is exceptional when the in situ objects and artefacts are located in their original places. Fortunately, only the superstructures were often rebuilt and renovated and that is why not much has changed in the cellars. However, the only features that remain are elements such as light niches, rings and hooks, passageways, stairs, chutes and entrances. The presence of such facilities might be an indication of the original function of the cellar, but one must be careful with this. Suggesting that a cellar had a storage function because a hearth is lacking, is invalid, because no hearth was needed for carrying out various activities.

To determine the functions more specifically it is necessary to extend the research to building historical research of the superstructure, if it still exists, and consulting the corresponding historical archives. By combining these disciplines, it is often possible to reconstruct at least parts of its former function. For example, it is known that, although the conditions in cellars were far from ideal for habitation, they proved ideal for some activities. The constantly cool temperature and dark environment was ideal for the storage of wine, the moist environment was very suitable for the production of cloth and the lack of natural light lent itself perfectly for the trade in silk and exquisite clothing, to prevent the colours from fading. In addition, the sober interior of the cellar was perfect for beautiful decorations for the sales function of the luxury goods. There are also indications that the limited accessibility of the cellar was used in favour of the owner. An example is the storage of the herb mixture *gruyt* (the main ingredient of beer before the introduction of hops), which was safely stored in cellars in Arnhem, because at that time this mixture was only distributed by the city and it was forbidden to harvest it yourself. Similar functions were cellars that were used as (temporary) prison or as an arsenal, when the cellar was located in the vicinity of the defences. Cellars also proved extremely suitable for fire-hazardous activities or valuable items that needed to be protected against the fire.

8.1.6 Cellars as fire-safe space

Building historical research on foundations in 's-Hertogenbosch has shown that after the great city fire of 1463, specifically many cellars were built. Something similar has been noticed in the city of Chester (UK), where many cellars were built after a city fire in 1278. Moreover, according to various historical sources, the execution of fire-hazardous activities was only allowed in vaulted stone rooms, such as cellars. In addition, we see in the development of the vault types that the wooden beamed ceilings were replaced by stone vaults, despite the fact that the wooden ceilings offered the most space. The subsequent search for the most space-efficient construction confirms that the use of wooden ceilings was no longer an option. Given these examples, it seems plausible that there is causality between fire hazard and the emergence of cellars. However, in order to support this hypothesis, more synthesising research is necessary.

8.1.7 Cellars and the general functions of medieval districts

In Arnhem, various city districts and their functions have been distinguished, by doing extensive research on the historical buildings and their cellars. One can wonder if it happens to be possible to distinguish the functions of districts by classifying the remaining cellars alone. On the basis of the orientation of individual cellars, it is possible to determine the orientation of the superstructure to a certain extent and this should in theory make it possible to map disappeared streets and alleys. However, determining the general functions of whole districts by just cellar research is a different story. It is important to mention that the cellar is not an individual element, but part of a house; therefore, as stated above, it is difficult to determine the function of individual houses solely based on the cellar. Perhaps, when more research has been conducted on the subject of cellars, it becomes possible to determine the general functions of medieval districts on the basis of cellar constructions. Until then it will be necessary to perform multidisciplinary research in order to get a complete picture.

8.2 Recommendations for future research

Although we are on the right track in various cities in terms of multidisciplinary collaboration and the research into cellars, there are various recommendations for future research.

Firstly, it is of importance to stimulate the synthesising research between the disciplines of archaeology and building history. Both disciplines can complement each other to a great extent, because they can reveal otherwise invisible sections and details for the other discipline. For example, archaeological excavations can reveal foundation- and masonry techniques, the construction of the floor surface and the presence of possible wooden predecessors. Building historical investigations on the other hand concentrates on the existing building and the superstructure, features that are usually absent in archaeological investigations. The success of such collaborations is represented in the well-researched cities which are discussed in this study. All cities with clear results regarding cellar research are examples of cities where multidisciplinary research took place.

Secondly, it is recommendable to let go of type descriptions involving the names of cities or regions. Subdivisions consisting of the names of regions or cities (e.g. *Deventer type*) may wrongly imply that this type originates from this city. Instead, it stems often from local research and the lack of interregional and synthesising research. An example is vaulting type 2b (barrel vault with a half barrel vault at the street side), which has been seen in Zutphen as *Zutphens type*, due to its frequent occurrence in this town. However, after discussing this case with several building historians it turned out that this vaulting type regularly occurs in southern Dutch provinces, as well as Belgian towns. Therefore, the naming of such divisions should consist solely of the description of the construction type. The cellars could be categorized on the basis of the main types presented in this study. Deviating cellars would then be seen as variations of the main types, instead of independent types. In the case of the *Deventer type* (type 4b), the type number is already related to the main shape, but the name should also be changed to, for example, *trough vault on diaphragm arches supported by columns*.

Especially within the Netherlands, not much cellar research has been conducted, therefore not much is known and a general typology is lacking. It is recommendable to intensify the research of cellars, because the value of thorough research has proved itself in other towns, such as Arnhem, leading to more insights regarding the urban development of the town in the Middle Ages. A good methodology can be that of the Monumenten Advies Bureau, as already discussed in this study. Furthermore, a systematic approach is recommendable, so that the results of different cities can easily be compared with each other. It should also be mentioned, that much documentation, regarding cellar investigations, is already available in archives that have not yet been sorted out (e.g. Arnhem and 's-Hertogenbosch).

Moreover, the work of historical work groups should not be underestimated. Such groups are present in several cities and carry out building-historical inventories of historical buildings on a voluntary basis. As long as building historical research has not (yet) been made mandatory by law, the initiatives of such working groups are of great value. In this way, since 1994, a large part of Zutphen (approximately 200 buildings) has been investigated. And as a result of this thesis, an initiative has started with setting up a Haarlem building history workgroup, to map the cellars there.

In conclusion, it can be stated that the cooperation between different partners is essential.

9 Glossary

Back house	Rear part of the house; in Dutch called *achterhuis*.
Bel étage	Floor above the semi-cellar, usually containing the prominent rooms of the house.
Bouwblokonderzoek	Method in which buildings are systematically approached within the context of the building block.
Brick bond	header bond, stretcher bond, wild bond
Cob floor	Floor made out of loam; in Dutch called *leemvloer*.
Corbel	Piece of stone jutting from a wall to carry a weight, e.g. floor joists.
Dielenhaus	Building with a large high hall (up to 6 m), which occupies a considerable part of the building and served as the main living- and working space (Gläser 2001, 298). In English called *hall house*.
Eavesdrop	Strip of soil between timber houses to drain rainwater.
Front-gabled	Houses of which the ridge is at a right angle to the street; in Dutch called *diephuis*; in German *giebelständig*.
Front house	Front part of the house; in Dutch called *voorhuis*.
Giebelhaus	houses with a front-gabled orientation firewalls and *Vorkeller* (Brüggemann 2006, 28).
Grubenhaus	Medieval cellar like construction; in English called *sunken featured building* (SFB); in Dutch *hutkom*.
Lunette	Smaller vaults transversely placed to the direction of the barrel to provide extra space (Enderman 2016, 95); in Dutch called *steekgewelven* or *steekkappen*.

Pothuis	Small buildings in front of the main building giving access to (street)cellars.
Semi-cellar	Cellar that partly protrudes above the ground.
Shared walls	Common wall between two buildings; in Dutch called *gemene muur*.
Side-gabled	Houses of which the ridge is parallel to the street; in Dutch called *dwarshuis*; in German *traufständig*.
Stadskeuren	Statute in which the privileges and regulations of cities were recorded during the Middle Ages.
Ständerbau auf Schwellen	Type of half-timber work house of which the posts in the walls were going continuously from the threshold up to the roof. These posts formed the supporting system of the building and constituted at the same time the side walls (Grütze 2007 in de.wikipedia.org). This house type was typical for Lübeck in the Middle Ages.
Sunken featured building	See *Grubenhaus*.
Trapportaal	Construction consisting of a brick portal with a lockable door on cellar level which enclosed the entire staircase leading to a pothuis at street level. The staircase was enclosed by a wall and underneath it was a half barrel vault constructed for extra support (Haans and Frank 2003, 32). This feature is typical for the 14th cellars in the city of Arnhem.
Versteningsproces	Process that is typical for the Netherlands and took place during the Middle Ages. During this process, timber constructions were systematically replaced by brick constructions, often including a reclassification of the plots. It is assumed that this process was related to the economic prosperity of the cities and also that the presence of administrative and religious functions in cities accelerated this transition. In addition, the availability of building material probably played a

role and urban fires and subsequent regulations influenced this as well (Brand 2017, 354).

Vorkeller — Small vaulted cellar to the street and built into public space below the stoop (Brüggemann 2006, 20). Possibly similar to the street cellars in 's-Hertogenbosch.

10 Abstract

This thesis discusses the development of medieval house cellars in an urban context. This will be done through the study of cellars in three Dutch towns ('s-Hertogenbosch, Arnhem and Deventer). The questions addressed in this study concern their characteristics (such as vaulting types, visible chronology and city specific types) and their functions (such as fire-safe spaces and general functions of medieval districts). Following an introduction, Chapter 2 focuses on the concept of *cellar* which includes an explanation of the various definitions used, a general history of cellars, their types and the difficulties regarding the dating of them. The cellar types are subdivided into orientation (front-gabled or side-gabled), the degree to which the cellar is underground (semi-cellar or full cellar), location on the plot (under the front-, back-, entire house or street) and variety in ceiling constructions (beamed, barrel vault, cross vault, trough vault). Chapter 3 is all about previous cellar research in European context, focusing on cities in the United Kingdom (including York, Chester and Norwich) and Germany (Lübeck, Soest and Stralsund). Chapter 4, 5 and 6 all have the same layout and focus on the cellars investigated respectively in 's-Hertogenbosch, Arnhem and Deventer. The chapters consist of an introduction, after which the history of the city is briefly discussed. This is followed by the current state of affairs regarding cellar research, the methods used and the presented dataset. In the following section, the findings from the cellar investigations are presented and subsequently the results. Finally, in Chapter 7 the research questions are answered. This will highlight which characteristics are distinguishable. Primarily, that the 15th century is the appropriate era for cellars and that there is a large local variation with city-specific cellars, which is particularly the case in Deventer. An overview of the dimensions of all the investigated cellars is given. Cellars were not only used as storage, but also as a workshop or living space. They might also be related to city fires and the demand for fire-safe areas. Finally, cellars can only contribute to a limited extent to the identification of the functions of urban districts.

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15 Appendices

15.1 Dataset ‘s-Hertogenbosch

Nr.	Location		Monumental status				Still present		Accessible		Dating		Situated				Dimensions (in m)		
Building nr.	Address	Building block nr.	National	Municipal	Iconic	None	Yes	No	Yes	No	Specified dating	Normalised dating (in centuries)	Front	Back	Beneath street	Entire house	Length	Width	Height
H1	Hinthamerstraat 85-87	8.1					1				1465	15		1			7.6	4	1.95
H2a	Hinthamerstraat 89-91	8.1						1		1	1647	17	1						
H2b	Hinthamerstraat 89-91	8.1						1		1	1647	17		1			< 8.9	< 5.9	
H3	Hinthamerstraat 93	8.1				1		1			1400-1500	15		1					
H4	Hinthamerstraat 101	8.2					1	1			1400-1500	15	1	1			5.3	4	
H5	Hinthamerstraat 103-105	8.2					1				< 1500-1600	16		1			4.5	4.3	
H6	Hinthamerstraat 107	8.2	1				1				1400-1500	15		1			5.9	4.3	2.3
H7	Hinthamerstraat 109	8.2					1				1558 >	16		1			5.6	3.4	
H8	Hinthamerstraat 111	8.2						1			1536+/-6	16		1			7	3.6	
H9	Hinthamerstraat 113	8.2			1		1				1464	15		1			< 4.7	< 4.5	
H10	Hinthamerstraat 115-117	8.2		1			1				1464	15		1			4.55	3.9	
H11	Hinthamerstraat 119-121	8.2				1		1			1466	15		1			8	4	
H12	Hinthamerstraat 123	8.2					1				1600-1800	17	1				8	4	
H13	Hinthamerstraat 125	8.2			1		1			1	1400-1500	15		1					
H14	Hinthamerstraat 133	8.2						1			1400-1500	15		1			< 6.1	< 4.6	
H15	Hinthamerstraat 135	8.2	1				1		1		1400-1500	15		1			< 6.9	< 5.2	
H16a	Markt 35	1.4	1				1				1400-1500	15	1				13	4	
H16b	Markt 35	1.4	1				1				younger than H16a	16		1			6.5	4	
H17a	Markt 37	1.4	1				1				1400-1600	15	1						
H17b	Markt 37	1.4	1				1				1400-1600	15		1					
H17c	Markt 37	1.4	1					1			younger than H17b	16			1				
H18	Markt 39-41	1.4				1		1		1	1400-1500?	15			1	?			
H19a	Markt 39	1.4	1					1			1630	17	1						
H19b	Markt 39	1.4	1					1			1630	17		1					
H19c	Markt 39	1.4	1					1		1	1630-1700	17			1				
H20	Markt 41	1.4				1		1			1700-1800	18				1			
H21a	Markt 43	1.4				1		1		1	1200-1300	13				1			
H21b	Markt 43	1.4				1		1		1	1300-1600	14			1				
H22a	Markt 45	1.4						1			1400-1600	15	1						
H22b	Markt 45	1.4						1			younger than H22a			1					
H23a	Markt 55	1.4					1			1	1200-1325	13				1			
H23b	Markt 55	1.4					1			1	-	-		1					
H23c	Markt 55	1.4					1			1	1612	17			1		6.9	2.3	
H24a	Markt 57	1.4	1				1		1		-	-	1						
H24b	Markt 57	1.4	1				1		1		ca. 1350	14		1					
H25a	Markt 59	1.4					1		1		1300-1500	14	1						
H25b	Markt 59	1.4					1		1		1300-1500	14		1					
H25c	Markt 59	1.4					1				1400-1600	15			1				
H26a	Markt 61	1.4	1				1				1300-1400	14	1				20	5	
H26b	Markt 61	1.4	1				1				-	-		1				< 5	
H27a	Markt 63-65	1.4						1		1	1400-1500	15	1						
H27b	Markt 63-65	1.4						1		1	1500-1600?	16		1					
H27c	Markt 63-65	1.4						1		1	1400-1600	15			1				
H28	Markt 67	1.4					1				1400-1500?	15				1			
H29	Markt 69	1.4									1300-1400	14				1			
H30a	Markt 71	1.4									1300-1400	14	1						

Nr.	Orientation to street		Ceiling/vaulting type									Above ground			Aisles		Entrances			Other facilities (open & closed off)						
Building nr.	Front-gabled	Side-gabled	Beamed ceiling	Barrel vault	Barrel vault + quarter barrel	Cross groined	Cross ribbed	Trough on diaphragm arch	*Deventer type*	Trough on girders	Flat ceiling (modern)	Yes	Height (in cm)	No	Double	Multiple	Street	Backyard	Internal	Passageways	*Trapportaal*	Light niches	Cellar light / dumping chute	Hearth	Water well	Cess pit
H1	1			1								1	80						1			3				
H2a	1			1										1												
H2b	1		1									1	60						1							
H3																			1							
H4										1									1				1			
H5				1								1	100						1							
H6	1			1								1	80					1	1							
H7				1								1	80						1							
H8	1			1														1								
H9	1			1								?	1					1	1							
H10	1			1								1	60					1	1						1	
H11	1			1?								1	58					1?	1?							
H12										1				1				1					2			
H13								1										1				1				
H14			1?	1								1	60						1							
H15							1					1	60						1							
H16a	1				1												1			1		1	1	1		
H16b	1			1														1		1			1?			
H17a	1				1												1			1				1		
H17b	1			1														1		1		1	1			
H17c	1			1																1						
H18																	1	?		1				1		
H19a	1			1													1									
H19b	1			1														1								
H19c				1?																1						
H20	1			1													1	1								
H21a	1					1									1		1	1		3						
H21b																				1						
H22a	1		1														1							1		
H22b	1																	1								
H23a	1						1								1		1			3				1		
H23b	1																	1		1				1		
H23c																				1						
H24a	1																1			1		2		1		
H24b	1																			2		2?				
H25a	1			1													1									
H25b	1			1														1								
H25c	1			1													1			2						
H26a	1			1													1					1		1		
H26b	1			1																			2			
H27a				1													1									
H27b																										
H27c		1		1																1						
H28	1			1								1					1	1		1		2		1		
H29	1			1								1					1	1?								
H30a	1			1										1			1	1						1		

Nr.	Wall finishing		Brick bond		Brick sizes vault (in cm)			Brick sizes sidewalls (in cm)			
Building nr.	None	Plaster	Vault	Walls	L	W	H	L	W	H	10 lyr
H1											
H2a					21.5	10.5	4.5				
H2b											
H3											
H4											
H5											
H6											
H7											
H8											
H9					21	10.5-11	4.5-5				
H10											
H11											
H12											
H13											
H14											
H15											
H16a						11.5-12	6.5				
H16b											
H17a								12.5-13	6-7.5		5L=37-39
H17b											
H17c											
H18											
H19a											
H19b											
H19c											
H20											
H21a											
H21b											
H22a											
H22b											
H23a											
H23b											
H23c											
H24a											
H24b											
H25a											
H25b											
H25c											
H26a				L = Flemish	22	10	4.5-4.8	27-28	13-14	7-7.5	82
H26b					25	6					
H27a											
H27b											
H27c											
H28											
H29											
H30a				L = Flemish							

Nr.	Brick sizes front wall (in cm)				Brick sizes rear wall (in cm)			
Building nr.	L	W	H	10 lyr	L	W	H	10 lyr
H1								
H2a								
H2b								
H3								
H4								
H5								
H6								
H7								
H8								
H9	20-22	9.5-11	4.5-5	52				
H10								
H11								
H12								
H13								
H14								
H15								
H16a				5L=37				
H16b								
H17a	12.5-13	6-7.5		5L=37-39	12.5-13	6-7.5		5L=37-39
H17b								
H17c								
H18								
H19a								
H19b								
H19c								
H20								
H21a								
H21b								
H22a								
H22b								
H23a								
H23b								
H23c								
H24a								
H24b								
H25a								
H25b								
H25c								
H26a								
H26b								
H27a								
H27b								
H27c								
H28								
H29								
H30a								

Nr.	Location		Monumental status				Still present		Accessible		Dating		Situated				Dimensions (in m)		
Building nr.	Address	Building block nr.	National	Municipal	Iconic	None	Yes	No	Yes	No	Specified dating	Normalised dating (in centuries)	Front	Back	Beneath street	Entire house	Length	Width	Height
H30b	Markt 71	1.4									-	-		1					
H30c	Markt 71	1.4									1300-1600	14			1				
H31a	Markt 73	1.4	1					1		1	1200-1300	13				1			3.9
H31b	Markt 73	1.4	1					1		1	< 1520	15			1				
H32	Markt 75	1.3						1		1	< 1473	15				1	< 12.5	< 5	
H33	Markt 77	1.3						1		1	1300-1500	14				1			
H34a	Markt 79-85	1.3	1				1		1		1275-1350	14	1						
H34b	Markt 79-85	1.3	1				1				1300-1400	14		1					
H34c	Markt 79-85	1.3	1								1300-1400	14			1				
H35a	Verwersstraat 1	1.20			1					1	1463 >	15	1				< 8	< 6.2	
H35b	Verwersstraat 1	1.20			1			1		1	1463 >	15		1					
H36	Verwersstraat 3	1.20			1			1		1	1463 >	15		1?			< 8.4	< 4.9	
H37	Verwersstraat 5	1.20			1		1			1	1463 >	15		1					
H38	Verwersstraat 7	1.20	1				1				1463 >	15		1			< 8.9	< 5.8	
H39	Verwersstraat 9	1.20	1					1		1	1463 >	15		1			< 6.3	< 4.3	
H40	Verwersstraat 11	1.20					1			1	1463 >	15		1			< 19.8	< 5.3	
H41	Verwersstraat 15	1.20									1750-1825	18		1			< 19.8	< 5.3	
H42	Verwersstraat 19	1.20			1		?			1	1463 >	15		1			< 7	5	
H43	Verwersstraat 21	1.20	1				1		1		1463 >	15		1			6.7	4.5	1.7
H44	Verwersstraat 23	1.20	1				1				1500-1600	16		1			7.1	4.6	1.9
H45	Verwersstraat 25	1.20									1463 >	15		1					
H46	Verwersstraat 35	9.3	1				1				1600-1700	17		1			6.7	2.75	1.6
H47	Verwersstraat 37	9.3			1						1400-1500	15		1			7.5	3.5	
H48a	Verwersstraat 47	9.3									1500-1525	16	1						
H48b	Verwersstraat 47	9.3									1500-1525	16		1					
H49	Verwersstraat 59-61	9.3		1							1400-1500	15		1					
H50	Verwersstraat 63	9.3			1						1500-1600	16		1					

Nr.	Orientation to street		Ceiling/vaulting type									Above ground			Aisles		Entrances			Other facilities (open & closed off)						
Building nr.	Front-gabled	Side-gabled	Beamed ceiling	Barrel vault	Barrel vault + quarter barrel	Cross groined	Cross ribbed	Trough on diaphragm arch	*Deventer type*	Trough on girders	Flat ceiling (modern)	Yes	Height (in cm)	No	Double	Multiple	Street	Backyard	Internal	Passageways	*Trapportaal*	Light niches	Cellar light / dumping chute	Hearth	Water well	Cess pit
H30b				1														1								
H30c				1																1						
H31a			1									1					1	1?				5	2			
H31b																				1						
H32				1													1									
H33				1													1	1								
H34a			1									1					1					5				
H34b																										
H34c																				1						
H35a	1			1										1					1							
H35b											1			1												
H36				1								1	100						1?							
H37																										
H38	1			1										1				1	1							
H39	1			1								1	70					1	1							
H40	1			1								1	50						1				1?			
H41				1														1	1				1			
H42				1															1							
H43	1			1															1							
H44	1			1								1	80						1							
H45				1?															1							
H46														1					1							
H47	1			1										1				1					1			
H48a				1													1									
H48b				1														1								
H49				1								1	100						1				1			
H50	1			1								1	45						1			1	3			

Nr.	Wall finishing		Brick bond		Brick sizes vault (in cm)			Brick sizes sidewalls (in cm)			
Building nr.	None	Plaster	Vault	Walls	L	W	H	L	W	H	10 lyr
H30b											
H30c											
H31a											
H31b											
H32											
H33											
H34a								29	14	8	5L=44
H34b											
H34c											
H35a											
H35b											
H36											
H37											
H38											
H39											
H40											
H41											
H42											
H43								25-26	11-12	6-6.5	
H44											
H45											
H46											
H47											
H48a											
H48b											
H49											
H50								24	12	5.5	62

Nr.	Brick sizes front wall (in cm)				Brick sizes rear wall (in cm)			
Building nr.	L	W	H	10 lyr	L	W	H	10 lyr
H30b								
H30c								
H31a								
H31b								
H32								
H33								
H34a								
H34b								
H34c								
H35a								
H35b								
H36								
H37								
H38								
H39								
H40					26	12	5-5.5	64
H41	27-28	13.5	7-8	5L=42	23	10.5	5	
H42								
H43	22-22.5	5.5-6						
H44								
H45								
H46								
H47								
H48a								
H48b								
H49								
H50								

15.2 Dataset Arnhem

Nr.	Location		Monumental status				Still present		Accessible		Dating		Situated				Dimensions (in m)		
Building nr.	Address	Building block nr.	National	Municipal	Iconic	None	Yes	No	Yes	No	Specified dating	Normalised dating (in centuries)	Front	Back	Beneath street	Entire house	Length	Width	Height
A1a	Arke Noachstraat 8			1			1		1		m.e.	-	1						
A1b	Arke Noachstraat 8			1			1		1		younger than A22a	-		1					
A2a	Bakkerstraat 5		1				1		1		1300-1400	14	1						
A2b	Bakkerstraat 5		1				1		1		1400-1500	15	1						
A2c	Bakkerstraat 5		1				1		1		1750-1800	18		1					
A3a	Bakkerstraat 11a			1			1		1		late m.e.	-	1						2
A3b	Bakkerstraat 11a			1			1		1		1600-1700	17		1					4
A4	Bakkerstraat 12-12a			1			1		1		1400-1525	15	1				5.7	4.5	2.3
A5a	Bakkerstraat 12b		1				1		1		1500-1600?	16	1						
A5b	Bakkerstraat 12b		1				1		1		1500-1600?	16		1					
A6a	Bakkerstraat 19		1				1		1		-	-	1						
A6b	Bakkerstraat 19		1				1		1		-	-		1					
A6c	Bakkerstraat 19		1				1		1		-	-		1					
A7a	Bakkerstraat 25-26		1				1		1		m.e	-	1						
A7b	Bakkerstraat 25-26		1				1		1		m.e	-		1					
A7c	Bakkerstraat 25-26		1				1		1		1400-1500?	15		1					
A7d	Bakkerstraat 25-26		1				1		1		1400-1500?	15		1					
A8a	Bakkerstraat 57-58-59		1				1		1		1400-1600	15	1						
A8b	Bakkerstraat 57-58-59		1				1		1		1400-1600	15		1					
A8c	Bakkerstraat 57-58-59		1				1		1		1400-1600	15		1					
A9	Bakkerstraat 60		1				1		1		1300-1350	14				1			
A10	Bakkerstraat 60b-61		1				1		1		1700-1825	18		1					
A11	Bakkerstraat 74			1							1300-1325	14	1				8.8	4.7	2.5
A12	Broerenstraat 41			1			1		1		late m.e.	-	1						
A13a	t Eiland 6			1			1		1		1400-1500?	15	1						1.9
A13b	t Eiland 6			1			1		1		1400-1500?	15	1						
A14a	Grote Oord 15		1				1		1		1400-1500?	15	1						2.8
A14b	Grote Oord 15		1				1		1		1400-1500?	15		1					2.8
A15	Hoogstraat 23			1			1		1		1400-1500	15				1	7	4.5	2.2
A16	Jansplaats 13a			1			1		1		1500-1600?	16					5.3	3.9	2.3
A17	Jansplaats 28		1				1		1		1500-1625	16	1					2.8	2
A18	Jansstraat 18			1			1		1		1300-1400	14				1	13.4	6.5	3.5
A19a	Jansstraat 23a-25			1			1		1		1300-1500	14	1				6.1	4.9	2.4
A19b	Jansstraat 23a-25			1			1		1		-	-		1			3	2.1	1.9
A20	Jansstraat 29			1			1		1		1300-1500	14	1						
A21	Kerkstraat 33		1				1		1		1500-1600?	16	1				5.9	3.6	1.5
A22	Kerkstraat 34-35		1				1		1		late m.e.	-		1			6	3	1.8
A23	Koningstraat 55			1			1		1		1600-1700	17	1						
A24a	Kortestraat 10-10a				1		1		1		1500-1600?	16	1				9.9	5.3	2.8
A24b	Kortestraat 10-10a				1		1		1		1800-1900?	19		1			5.8	5.8	3
A25	Kortestraat 17-18			1			1		1		1300-1350	14	1				6	5.5	1.8
A26	Kortestraat 19-19a			1			1		1		-	-					6	5	2.5
A27	Kortestraat 21			1			1		1		1700-1800	18		1			4	2.6	1.9
A28	Kortestraat 22-23			1			1		1		1400-1500	15	1				5.5	3.6	2.2
A29a	Rijnstraat 5			1			1		1		1300-1350	14	1				8	5	3
A29b	Rijnstraat 5			1			1		1		1450-1500	15		1			5	3	3

Nr.	Orientation to street		Ceiling/vaulting type									Above ground			Aisles		Entrances			Other facilities (open & closed off)							
Building nr.	Front-gabled	Side-gabled	Beamed ceiling	Barrel vault	Barrel vault + quarter barrel	Cross groined	Cross ribbed	Trough on diaphragm arch	*Deventer type*	Trough on girders	Flat ceiling (modern)	Yes	Height (in cm)	No	Double	Multiple	Street	Backyard	Internal	Passageways	*Trapportaal*	Light niches	Cellar light / dumping chute	Hearth	Water well	Cess pit
A1a	1			1													1					1	3			
A1b	1			1																1						1
A2a	1			1													1			1						
A2b	1			1													1			1						
A2c		1								1								1?		2						
A3a	1			1																						
A3b	1			1														1								
A4	1			1													1?		1				2			
A5a	1			1																						
A5b		1		1																		2				
A6a						1											1?		1							
A6b						1									1			1								
A6c				1														1								
A7a	1									1																
A7b	1									1																
A7c		1		1																		1				
A7d		1		1																						
A8a				1																						
A8b				1															1							
A8c				1															1?				2			
A9	1			1													1			2		1				
A10				1																						
A11	1			1													1				1	1	2			
A12	1			1													1						1			
A13a		1		1																						
A13b						1									1		1									
A14a	1			1													1?									
A14b	1			1																						
A15		1		1				1								1	1					1				
A16	1			1													1						3			
A17		1		1													1					1				
A18	1			1													1			1	1	4	3			
A19a		1		1													1									
A19b	1			1																						
A20	1			1																		1	2			
A21	1			1													1						2			
A22		1		1																						
A23				1															1							
A24a	1			1													1									
A24b	1			1													1									
A25	1			1													1					2	2			
A26	1			1															1							
A27	1			1														1		1						
A28				1																			1			
A29a	1			1													1			1	1?	2	1			
A29b		1		1														1	1	1			1			

Nr.	Wall finishing		Brick bond		Brick sizes vault (in cm)			Brick sizes sidewalls (in cm)			
Building nr.	None	Plaster	Vault	Walls	L	W	H	L	W	H	10 lyr
A1a											
A1b											
A2a											
A2b											
A2c											
A3a											
A3b											
A4		1							5.5-6	12.5	72
A5a											
A5b											
A6a											
A6b											
A6c											
A7a											
A7b											
A7c								28		13	5lyr=37-38
A7d											
A8a											
A8b											
A8c											
A9											
A10											
A11											
A12											
A13a					28	13	6				
A13b								26.5-27			76
A14a											
A14b											
A15											
A16											
A17											
A18											
A19a								30		7.5	5lyr=42
A19b											
A20								28	13	6.5-7	
A21											
A22											
A23					22-24						
A24a											
A24b											
A25											
A26								28	14	6	
A27											
A28								28	14	6.5	77
A29a			header	wild		13	7-7.5	30-31	13.5-14	6.5-7	82
A29b			header	wild	27.5-29	12-13	6.5	27.5-29.5	13	6.5-7	74

Nr.	Brick sizes front wall (in cm)				Brick sizes rear wall (in cm)			
Building nr.	L	W	H	10 lyr	L	W	H	10 lyr
A1a	27	13.5	7					
A1b								
A2a	28	12-13	6					
A2b								
A2c	22	10-11	5					
A3a								
A3b								
A4								
A5a								
A5b								
A6a	25-25.5	12-13	5-5.5	5lyr=35				
A6b								
A6c								
A7a								
A7b								
A7c								
A7d				67				
A8a	25	13	5.5	63				
A8b								
A8c								
A9	30	14	7					
A10	22	11	4					
A11					31	14	8	
A12	26	13	7					
A13a								
A13b								
A14a								
A14b	27	13	6-6.5	79.5				
A15	27	13	6	76		13-13.5	7	
A16	24-25.5	12-12.5	5	66-69.5				
A17								
A18								
A19a					27-28	13	6.5	78
A19b								
A20					27-28	13	6.5	78
A21	25-26		6	5lyr=36				
A22	28		6					
A23								
A24a								
A24b					26.5	13-14	5-5.5	68
A25					31.5-32	14	7	84
A26						14.5	7	5lyr=41
A27								
A28								
A29a	29	12	6.5-7					
A29b					27	12-12.5	6-6.5	73

Nr.	Location		Monumental status				Still present		Accessible		Dating		Situated				Dimensions (in m)		
Building nr.	Address	Building block nr.	National	Municipal	Iconic	None	Yes	No	Yes	No	Specified dating	Normalised dating (in centuries)	Front	Back	Beneath street	Entire house	Length	Width	Height
A30	Rijnstraat 6			1					1		1350-1400	14				1	7.7	4	2.5
A31a	Rijnstraat 7			1					1		1500-1550	16	1				8.8	5.4	2.7
A31b	Rijnstraat 7			1					1		1800-1900	19		1			5.7	3.5	2.8
A32	Rijnstraat 8					1			1		1350-1400	14	1				4	4.2	2.5
A33a	Rijnstraat 9			1					1		1400-1450	15	1				6.4	4	2.5
A33b	Rijnstraat 9			1					1		1900-1950	20		1			9.7	5	2.5
A34	Rijnstraat 10			1					1		1400-1425	15				1			
A35	Rijnstraat 11			1					1		1400-1450	15				1	9.4	3.8	
A36	Rijnstraat 14a			1					1		1450-1475	15				1	7.5	4.5	2.5
A37a	Rijnstraat 14b			1					1		1425-1450	15				1	7.8	6	3
A37b	Rijnstraat 14b			1					1		1800-1900	19					5.5	2.5	
A37c	Rijnstraat 14b			1					1		< 1800	18					1.5	2.3	
A38	Rijnstraat 17			1					1		1300-1350	14				1	10.8	5	2.7
A39	Rijnstraat 18								1		1450-1500	15				1	8.2	3	2.5
A40a	Rijnstraat 19/20			1					1		1450-1500	15	1				8	6.3	
A40b	Rijnstraat 19/20			1					1		1500-1600	16		1			4.3	1.7	
A41	Rijnstraat 67			1			1		1		1400-1450	15				1	10	3.8	2
A42	Rijnstraat 68			1			1		1		1450 -1500	15				1?			
A43a	Rijnstraat 69			1			1		1		1300-1400	14	1						
A43b	Rijnstraat 69			1			1		1		1400-1500	15		1					
A44a	Rijnstraat 70			1			1		1		1300-1400	14	1				9.5	3.6	
A44b	Rijnstraat 70			1			1		1		younger than A16a	14		1			4.8	4.2	
A45a	Rijnstraat 71		1				1		1		1353/54	14	1				14.2	7	3.9
A45b	Rijnstraat 71		1				1		1		1353/54	14		1			8	7.1	3.6
A45c	Rijnstraat 71		1				1		1		1880-1890	19		1			10.2	5.5	3.9
A45d	Rijnstraat 71		1				1		1		1850-1900	19		1			7	6.4	
A46a	Rijnstraat 72			1			1		1		1360-1370	14	1				8.3	5.5	3.3
A46b	Rijnstraat 72			1			1		1		1450-1475	15		1			6.4	5.8	3.3
A47	Rijnstraat 73			1			1		1		1350-1375	14				1	7.7	4.5	3
A48	Rijnstraat 77			1			1		1		1450-1500	15				1	8.3	3.9	2.5
A49	Rijnstraat 78-79			1			1		1		1350-1375	14				1	11.3	6.3	3
A50	Varkensstraat 19			1			1		1		1400-1500	15	1				8.8	4.8	2.4

Nr.	Orientation to street		Ceiling/vaulting type									Above ground			Aisles		Entrances			Other facilities (open & closed off)						
Building nr.	Front-gabled	Side-gabled	Beamed ceiling	Barrel vault	Barrel vault + quarter barrel	Cross groined	Cross ribbed	Trough on diaphragm arch	*Deventer type*	Trough on girders	Flat ceiling (modern)	Yes	Height (in cm)	No	Double	Multiple	Street	Backyard	Internal	Passageways	*Trapportaal*	Light niches	Cellar light / dumping chute	Hearth	Water well	Cess pit
A30	1			1													1	1	1	3	1	1	2			
A31a	1			1															1	2	1	2	3		1	
A31b	1		1?																	1						
A32	1			1													1			2	1?		2			
A33a	1			1													1			2	1	3				
A33b	1										1							1	1	1						
A34	1			1													1			1	1		3			
A35	1			1													1		1	2	1	2	3			
A36	1			1															1	1			2			
A37a	1			1													1			1	1	3	1		1	
A37b	1			1															1	1						
A37c		1		1													1									
A38	1			1													1			2		3	7			
A39	1			1													1	1		1	1	?	?			
A40a	1			1													1?			1			2			
A40b		1		1														1		1						
A41	1			1													1				1	1	3			
A42				1													1			1	1	2	1			
A43a	1			1													1			1	1		1			
A43b	1			1														1				6	1			
A44a	1			1													1			3	1	2	2			
A44b	1			1														1					2			
A45a	1			1													1			4	1	3	1			
A45b	1			1																2		3	2			
A45c	1			1														1		4		1	1			
A45d	1									1									1	2			2			
A46a	1			1													1		1	1	1		2			
A46b	1			1																		1	1			
A47	1			1													1		1	1	1	3	2			
A48	1			1													1									
A49	1			1													1				1	8	1			
A50	1			1													1			1						

Nr.	Wall finishing		Brick bond		Brick sizes vault (in cm)			Brick sizes sidewalls (in cm)			
Building nr.	None	Plaster	Vault	Walls	L	W	H	L	W	H	10 lyr
A30			wild	wild	30-31	14.5	7	30.5	13-14	7	74
A31a	1		wild	wild	25.5	12.5-13	5.2	25.5-26	12.5-13	5-5.5	65.5-68
A31b	1		wild	wild							
A32		1	wild	wild	29-30	14	6.5-7	29-30	13.5-14	6.5-7	82-86
A33a	1		wild	wild	27-28	14	6-6.5	28	13-14	6-6.5	84
A33b											
A34		1		wild	27-28	13.5	5.5-6	27-28	13-13.5	5.5-6	77
A35			stretcher	wild	28	14	6.5	28	14	6-6.5	77
A36			header	wild	26-27	13	6.5-7	26-27	13	6.5-7	76
A37a			header	wild	31	13.5	6.5-7	30-31	13-13.5	6-6.5	85
A37b			stretcher	cross	22	10.5	5-5.5	22	10.5	5.5	60
A37c											
A38			wild	wild	26.5-27	13.5	6.5-6.8	26.5-27	13.5	6.5-6.8	79
A39			wild	wild	26-27	13.5	6.5-7	30-31	15	6.5-7	78
A40a			wild	wild	25-26	12.5	5.5-6	26.5-27	12.5-13	5.5-7	76
A40b			wild	wild	25	12.5-13		24.5	11	5.5-6.5	73
A41	1		wild	wild	27-28	13-14	6.5	27-28	13-14	6-6.5	78-79
A42			wild	wild	26-27	13	6	31	15	6	84
A43a	1										
A43b	1										
A44a			header	wild	30	15	7	30-31	15	7	78
A44b			header	wild	30	15	7	27-28	13-14	6-6.5	
A45a			stretcher	wild	30	14.5-15	7	30	15	7	81
A45b			stretcher	wild	30	14.5-15	7	30	15	7	81
A45c			stretcher	cross	21	10	4.5-5	21	10	4.5-5	55
A45d			stretcher	cross							
A46a			stretcher	wild	30	15	6.5	30-31	14.5-15	6-6.5	78-79
A46b			stretcher	wild	26-27	12-13	6	25-27	12	6	78
A47			head/stretch	wild	32	14.5	6.5	31-32	14	6.5-7	77
A48			stretcher	wild	27-28	13	6-7	26-27	12	6-6.5	77
A49			header	wild	30	14.5-15	7	30-31	14	7	80
A50					28-29	13.5	6-6.5	26-27	13	6	

Nr.	Brick sizes front wall (in cm)				Brick sizes rear wall (in cm)			
Building nr.	L	W	H	10 lyr	L	W	H	10 lyr
A30	27.5-29	13.5-14	6.5	75.5	27-28	13.5	6-6.5	79.5
A31a	25.5	12.5	5.5	65.5		13.5	6-6.5	
A31b								
A32	29-30	13.5-14	6.5-7	87				
A33a	28	14	6-6.5	82				
A33b								
A34	27-28	13.5	6-6.5	69				
A35			6.5-7	82	28	14	6-6.5	77
A36	26-27	13	6.5-7	76				
A37a	30-31	13-13.5	6-6.5	85	30-31	13-13.5	6-6.5	85
A37b	22	10.5	5.5	60	22	10.5	5.5	60
A37c								
A38	31-32	15	7	79-80	30	14	6.5	80-82
A39								78
A40a						12.5-13.5	6.5	77
A40b								
A41	27-28	13-14	6-6.5	78-79	27	13	6	78
A42	26-27	13	6	79	27	13	6	80-81
A43a								
A43b								
A44a	30	15	7	77-78				
A44b					28	12-13	6-6.5	79
A45a	30	15	6.5-7	80-81	30	14-15	6.5-7	84
A45b	30	15	6.5-7	84	30	14-15	6.5-7	81
A45c	30	14-15	6.5-7	81	21	10	4,5-5	55
A45d								
A46a	29-30	14.5	6-6.5	78-79				
A46b					26-27	12	6	78
A47	32-33	13.5-14.5	7	77.5	32-33	13,5-14,5	7	80
A48	26-27	12	6-7	77	26-27	12-13	6-7	77
A49	30-31	14	7	80	30-31	14	7	80
A50								

15.3 Dataset Deventer

Nr.	Location		Monumental status				Still present		Accessible		Dating		Situated				Dimensions (in m)		
Building nr.	Address	Building block nr.	National	Municipal	Iconic	None	Yes	No	Yes	No	Specified dating	Normalised dating (in centuries)	Front	Back	Beneath street	Entire house	Length	Width	Height
D1a	Assenstraat 55-57		1								1475-1525	15	1						
D1b	Assenstraat 55-57		1								1475-1525	15		1					
D2	Bergschild 14		1				1		1		-	-				1			
D3	Bergschild 16		1				1		1		-	-				1	5.6	± 4.1	2.2
D4	Brink 3-4		1				1		1		1325-1500	14				1	9.4	7.3	2.3
D5a	Brink 20			1			1		1		1400-1500?	15	1						
D5b	Brink 20			1			1		1		-	-		1					
D5c	Brink 20			1			1		1		-	-		1					
D6a	Brink 21		1				1		1		-	-		1			6.5	4.4	2.3
D6b	Brink 21		1				1		1		-	-		1			8.3	3.7	2
D7a	Brink 35		1				1		1		1475-1525	15	1						
D7b	Brink 35		1				1		1		1475-1525	15		1					
D8a	Brink 48		1				1		1		1475-1800	15				1			
D8b	Brink 48		1				1		1		1475-1800	15				1			
D9	Brink 64-B		1				1		1		1350-1400	14				1	5.5	5.4	2.4
D10a	Brink 85A		1				1		1		1600-1900	17	1				5.7	4.4	2.2
D10b	Brink 85A		1				1		1		1500 >	16		1			4.4	3.7	2.1
D11a	Brink 93					1	1		1		1600 >	17	1				11.5	6	2.4
D11b	Brink 93					1	1		1		1500 >	16		1			5	5.3	
D11c	Brink93					1	1		1		-	-		1			14	5.3	2.3
D12	Grote Kerkhof 2		1				1		1		< 1479	15				1			
D13a	Grote Kerkhof 9 right		1				1		1		1300-1325	14				1			
D13b	Grote Kerkhof 9 right		1				1		1		1400-1600	15		1					
D14	Grote Overstraat 46		1				1		1		1500 >	16				1?	7.2	5	2.1
D15	Grote Overstraat 48		1				1		1		1700-1900	18				1	10.3	4.7	2.1
D16	Grote Poot 2		1				1		1		1300-1400	14							
D17	Grote Poot 7/9		1								1500-1600	16				1			
D18a	Grote Poot 19		1				1		1		1300-1400	14				1	9.9	6.3	2.4
D18b	Grote Poot 19		1				1		1		-	-				1	6	3?	2.1
D19	Kleine Overstraat 46		1				1		1		1700-1900	18				1	8	4.8	2.5
D20	Kleine Poot 6					1					1300-1400	14							
D21	Korte Bisschopstraat 33					1	1		1		-	-				1	12.8	4.7	1.9
D22	Nieuwe Markt 40		1				1		1		1445	15				1	12.2	6	1.6?
D23	Papenstraat 17					1	1		1		1546	16				1	11.3	4	1.9
D24	Papenstraat 19					1	1		1		1546	16				1	10.9	4	1.8
D25	Polstraat 7						1		1		1400-1600	15				1	14.5	7.5	
D26	Polstraat 18 left						1		1		1505	16	1						
D27a	Polstraat 18 right						1		1		1450-1498	15	1						
D27b	Polstraat 18 right						1		1		1450-1498	15		1					
D28	Rijkmanstraat 13		1				1		1		1612	17				1	12.2	4.7	2.7
D29a	Smedenstraat 46		1				1		1		1634	17				1	9.8	2.8	2.5
D29b	Smedenstraat 46		1				1		1		1500 >	16				1	9	3.3	2.1
D30a	Walstraat 61		1				1		1		1700-1900	18	1				6.1	5.2	2
D30b	Walstraat 61		1				1		1		1700-1900	18	1				5.8	2.1	1.8
D31a	Walstraat 125-127		1				1		1		1400-1600?	15	1				5.7	4	
D31b	Walstraat 125-127		1				1		1		1500-1700?	16		1			4.7	2.7	

Nr.	Orientation to street		Ceiling/vaulting type									Above ground			Aisles		Entrances			Other facilities (open & closed off)						
Building nr.	Front-gabled	Side-gabled	Beamed ceiling	Barrel vault	Barrel vault + quarter barrel	Cross groined	Cross ribbed	Trough on diaphragm arch	*Deventer type*	Trough on girders	Flat ceiling (modern	Yes	Height (in cm)	No	Double	Multiple	Street	Backyard	Internal	Passageways	*Trapportaal*	Light niches	Cellar light / dumping chute	Hearth	Water well	Cess pit
D1a	1							1									1?						2?			
D1b	1								1						1								1?			
D2		1						1										1					1			
D3		1		1													1									
D4	1								1						1		1		1				1			
D5a	1								1						1		1		1	1			2			
D5b	1							1																		
D5c		1		1													1									
D6a	1							1									1?			1			2			
D6b	1							1											1	1			1			
D7a	1								1						1		1		1	1						
D7b	1								1						1					1						
D8a	1								1						1		1			1						
D8b	1			1																1						
D9	1				1												1			1			2			
D10a		1		1													1?			2		1		1		
D10b		1		1														1?	1	1						
D11a	1			1													1			1						
D11b	1										1									1						
D11c	1			1																			2	1		
D12		1							1						1		1	1					2			
D13a	1								1						1		1					2	1			
D13b	1			1																						
D14		1							1							1	1?		1	2			1			
D15	1							1									1	1		1			2			
D16		1							1						1											
D17	1								1						1		1						1			
D18a		1							1						1				1?			3	3			
D18b	1			1													1									
D19	1				1												1?	1		1?			2?			
D20	1								1						1		1									
D21	1			1													1	1?					2?			
D22	1								1						1				1						1	
D23	1			1													1		1	1			2			
D24	1			1													1			1			2			
D25		1							1						1								6			
D26	1							1																		
D27a								1?																		
D27b																										
D28	1							1									1	1?		2?		4				
D29a	1			1													1?			2			1			
D29b	1			1														1		2			1			
D30a		1						1									1		1	2			1			
D30b	1			1															1	1						
D31a	1			1													1								1	
D31b	1			1														1								

Nr.	Wall finishing		Brick bond		Brick sizes vault (in cm)			Brick sizes sidewalls (in cm)			
Building nr.	None	Plaster	Vault	Walls	L	W	H	L	W	H	10 lyr
D1a		1									
D1b		1									
D2					28-29	13.5-14	6-7	28-29	13.5-14	6-7	78-83
D3											83
D4		1			28-28.5	13-14.5	6.5-7	28-29	13-13.5	6.5-7	
D5a		1									
D5b		1									
D5c		1									
D6a		1								7.5-8	
D6b		1									
D7a		1									
D7b		1									
D8a		1									
D8b		1									
D9		1									
D10a		1									
D10b		1			28		6-8	26-27	12-14	6-6.5	
D11a				Flemmish	20.5-23	10.5-11	4	21.5-23.5	13.5-14.5		87
D11b								26	12-13	6.5-7	76
D11c					20-25	12.5-13	6-7				
D12		1									
D13a		1						29	14	7.5-8	85-86
D13b											
D14		1						20	12-14	6-6.5	
D15		1									
D16											
D17											
D18a	1				29-30	14-15	6-7	27-28	13-15.5	7.5-8	90
D18b		1									
D19		1									
D20											
D21		1									
D22											
D23		1						22-23	11-11.5	5-6	71-72
D24		1						22-23	11-11.5	5-6	71-72
D25								29	12	7	80
D26											
D27a											
D27b											
D28								27-29	12.5-14	6-6.5	75
D29a		1									
D29b		1						25	13-14	5-6	81
D30a		1									
D30b											
D31a		1									
D31b		1									

Nr.	Brick sizes front wall (in cm)				Brick sizes rear wall (in cm)			
Building nr.	L	W	H	10 lyr	L	W	H	10 lyr
D1a								
D1b								
D2								
D3								
D4								
D5a								
D5b								
D5c								
D6a								
D6b								
D7a								
D7b								
D8a								
D8b								
D9					21.5-24.5		6-6.5	
D10a								
D10b								
D11a					27-29.5	13-14.5	7.5	
D11b								
D11c								
D12								
D13a								
D13b								
D14								
D15								
D16								
D17								
D18a								
D18b								
D19								
D20								
D21								
D22								
D23								
D24								
D25								
D26								
D27a								
D27b								
D28	27-28	12.5-14	6.5-7	77				
D29a					25-28	10-12	7-7.5	84
D29b								
D30a								
D30b								
D31a								
D31b								

Nr.	Location		Monumental status				Still present		Accessible		Dating		Situated				Dimensions (in m)		
Building nr.	Address	Building block nr.	National	Municipal	Iconic	None	Yes	No	Yes	No	Specified dating	Normalised dating (in centuries)	Front	Back	Beneath street	Entire house	Length	Width	Height
D32	E-886					1		1		1	1375-1530	14	1?	1?				2.5	
D33	S-522/E-883					1		1		1	1400-1425	15		1			3.5	3	
D34	S-523/E-881					1		1		1	-	-					4.2	3.2	
D35	S-379/E-878 & E-879					1		1		1	< 1630	17				1?	9	4.5	
D36	West part of *Lange Huis*					1		1		1	1525	16				1	16.3	9.5	
D37a	*Mr. Geertshuis*					1		1		1	1300-1500	14				1	7	8.7	2
D37b	*Mr. Geertshuis*					1		1		1	1300-1500	14				1	5.5	8.7	2.2
D37c	*Mr. Geertshuis*					1		1		1	1498 >	16				1	26.5	8.7	2.5

Nr.	Orientation to street		Ceiling/vaulting type									Above ground			Aisles		Entrances			Other facilities (open & closed off)						
Building nr.	Front-gabled	Side-gabled	Beamed ceiling	Barrel vault	Barrel vault + quarter barrel	Cross groined	Cross ribbed	Trough on diaphragm arch	*Deventer type*	Trough on girders	Flat ceiling (modern	Yes	Height (in cm)	No	Double	Multiple	Street	Backyard	Internal	Passageways	*Trapportaal*	Light niches	Cellar light / dumping chute	Hearth	Water well	Cess pit
D32																										
D33																										
D34																										
D35																										
D36									1						1											
D37a	1								1						1											
D37b	1								1						1											
D37c	1								1						1											

Nr.	Wall finishing		Brick bond		Brick sizes vault (in cm)			Brick sizes sidewalls (in cm)			
Building nr.	None	Plaster	Vault	Walls	L	W	H	L	W	H	10 lyr
D32											
D33											
D34											
D35											
D36											
D37a											
D37b											
D37c											

Nr.	Brick sizes front wall (in cm)				Brick sizes rear wall (in cm)			
Building nr.	L	W	H	10 lyr	L	W	H	10 lyr
D32								
D33								
D34								
D35								
D36								
D37a								
D37b								
D37c								

15.4 Example of a systematic cellar investigation in Arnhem (Frank and Haans, 2003)

DOCUMENTATIE KELDERS BINNENSTAD ARNHEM: 1

A: Algemeen:

Adres : Rijnstraat 70
Bezoekdatum : 17-2-2000 / 29-1-2002
Kwalificatie : Gemeentelijk monument, kelder was niet in beschrijving opgenomen

Enkelvoudige ruimte met latere scheidingsmuren en overwelfde gang in zuid-oost hoek

B: Ruimtelijke aspecten:

Plattegrondvorm(en) : Rechthoek
Gewelftype(n) : Tongewelf, segmentbooggewelf over gang
Vloeren : Beton in hoog gedeelte noord-oost hoek
Baksteenvloer in overige delen

C: Bijzondere elementen:

Trappen (aantal) : 2
Trappen (materiaal) : Hout (huidige inpandige trap deels gesloopt in 2001)
Hout (oudere inpandige trap deels gesloopt in 2001)
Trappen (type) : Rechte houten open steektrap met kwart
Rechte houten open steektrap met kwart

Nissen (aantal) : 2 (in voorgevel rechts)
Nissen (type) : Kaarsnissen met keperboog (dichtgezet)

Doorgangen naar andere kelders : Drie, waarvan twee in oostwand (naar nr. 69), waarvan 1 met korfboog en één in westwand met korfboog naar nr. 71 (alle dichtgezet, de twee met korfboog zijn bij restauratie in 2001 weer geopend)

Stortkokers/kelderlich : 1 breed kelderlicht in kopgevel, en een 1 stortkoker in kopgevel links van het Kelderlicht. 1 stortkoker/kelderlicht in achtergevel en in zelfde gevel (zuid-west hoek) mogelijk ook een tweede koker (uitsparing in wand en gewelf).
(alle lichten/kokers later weer gedicht)

Overige elementen : Wijnrekken in voorste deel van de kelder uit XIX en XXd (gesloopt 2001)
Scheidingsmuur in voorste kelder, met rekken XXd (rekken gesloopt 2001)
Scheidingsmuur tussen beide kelderdelen en onderverdeling achterste gedeelte XIX (muren gesloopt in 2001), achtergang (overwelfd) uit XIX

Opmerkingen : Aan de westzijde ontspringt het tongewelf op een hoger niveau dan aan de oostzijde in voorste deel, samenhangend met een later gesloopt trapportaal dat zich in de noord-west hoek van de kelder heeft bevonden. Dit portaal is gesloopt toen ter plaatse de doorgang naar nr. 71 is gebouwd, waarbij voorts het gewelf ter plaatse van het gesloopte portaal is aangeheeld.
De kelder was tot 2001 in drie ruimten verdeeld (welonderling via doorgang toegankelijk) door jongere muren. Achterste kelder was volgestort met puin.

DOCUMENTATIE KELDERS BINNENSTAD ARNHEM: 2

D: Metselwerken:

Soort baksteen : Kloostermoppen, machinale baksteen o.a. wijnrekken en scheidingsmuren
Metselverband wanden: Wild verband
Metselverband gewelf : Kops verband

Baksteenformaten : **Achterwand** 28 x 12-13 x 6-6½cm, 10 lagen = 79cm
: **Zijwanden** 30-31 x 15 x 7cm, 10 lagen = 78cm (voorste deel)
27-28 x 13-14 x 6-6½cm (achterste deel)
: **Kopgevel** 30 x 15 x 7cm, 10 lagen = 77-78cm
: **Gewelf** 30 x 15 x 7 cm, gedeelte boven gesloopt portaal: 22½ x 11 x 4½cm
Boog en gewelf doorgang naar nr. 71: 22½ x 11 x 4½cm
: **Trappen** nvt
: **Dichtzettingen/vullingen** Kelderlichten machinale steen, gat/doorgang in oostgevel duroxblokken
: **Vloeren** restanten van moppen, klinkers, tegels (22 x 22 x 4cm)
: **Binnenmuren/rekken:** 21½ x 10½ x 4½cm

Natuursteen (soort en plaats) : Geen natuursteen
Opmerkingen : De kelder is opgetrokken in kloostermoppen, waarbij voor het achterste gedeelte een iets kleiner formaat is gehanteerd dan bij het voorste gedeelte. De overige elementen dateren uit de late 19de eeuw en laatste kwart 20ste eeuw (wijnrekken met scheidingsmuur in voorkelder)

E: Dateringen:

Achterwand : XVA
Zijwanden : XIVc (voorste deel) en XVA (achterste deel)
Kopgevel : XIVc
Gewelven : XIVc en XVA (segmentgewelf achtergang XIXB), herstelling gewelf bij gesloopt Trapportaal in voorhoek XIXA
Vloeren : XIX (met deels gebruik ouder materiaal)
XXd (verhoogde betonvloer in voorkelder)
Trappen : XIX (inpandige houten trap)
XXB (tot restauratie in 2001 gebruikte houten toegangstrap inpandig)
Dichtzettingen/ vullingen : XXA (kelderlichten, kokers, nissen)
XXd (doorgang in oostwand)
Elementen : XIXB Wijnrekken/binnenmuren, overwelfde achtergang. Doorgangen naar nr. 71 en nr. 69 XIXA, gedicht later en in 2001 weer geopend
XXd Deel van de wijnrekken in voorkelder

Opmerkingen : De in oorsprong uit de tweede helft 14de eeuw (na het Petersgasthuis gebouwde) daterende kelder is in de vroege 15de eeuw aan de achterzijde verlengd.

Opmerkingen vervolg: In ieder geval in de vroege 19de eeuw is de trap naar de Rijnstraat, die was opgenomen in een bij dit type passend portaal komen te vervallen, waarbij ook het gehele portaal is gesloopt, waarna men vervolgens het keldergewelf boven het gesloopte portaal heeft doorgezet. De reden van de sloop van het portaal was het aanbrengen van een doorgang naar Rijnstraat 71 in de westwand ter hoogte van het trapportaal. Mogelijk is toen ook de lange overwelfde achtergang met trap naar buiten gemaakt, maar dit kan ook later zijn gebeurd. In het einde van de 19de eeuw volgde nog een verbouwing waarbij een scheidingsmuur is aangebracht die een deel van de achterkelder afscheidde van het voorste deel. Dit gedeelte was voorts (mogelijk reeds eerder) toegankelijk gemaakt via de eerder genoemde een overwelfde gang in de zuid-oost hoek. De voorkelder kreeg wijnrekken en een inpandige trap. In het laatste kwart van de 20ste eeuw is de voorkelder verder voorzien van wijnrekken, met een afgescheiden gedeelte met hogere vloer en nieuwe trap en is de achter-kelder volgestort met puin. Bij de restauratie in 2001 zijn de scheidingsmuren in de achterkelder en de wijnrekken gesloopt. De doorgangen naar nr. 71 en 69 zijn toen weer geopend, waarbij in de verhoogde vloer een doorgang is gezaagd om de doorgang naar 69 weer te kunnen gebruiken.

F: Nadere opmerkingen en conclusies:

Gebruik oorspronkelijk: Opslag/opslag bederfelijk voedsel ?
Gebruik voor restauratie: Geen functie

Bijzonderheden : De kelder is een lange tijd (ongeveer een eeuw) verbonden geweest met de kelders van het Petersgasthuis maar ook met de kelder van Rijnstraat 69. Het voorste gedeelte van de kelder is gebouwd met volledig zelfstandige zijmuren en kopmuur. Het achterste gedeelte is aan de zijde van Rijnstraat 71 slechts voorzien een tegen de muur van Rijnstraat 71 gebouwde dunne klamp waarop het gewelf rust.
Verder is het een 14de-eeuwse kelder van het voor Arnhem gebruikelijke type met tongewelf en (oorspronkelijk) een trapportaal, waarin een trap naar buiten naar de Rijnstraat leidde. De sprong in het muurwerk en gewelf direkt zuidelijk van de wijnrekken in de westgevel van de voorste kelder duidt op een oude scheiding tussen twee kelderdelen (kelder onder voorhuis en minder diepe en iets jongere kelder onder achterhuis.)

Conclusies : De kelder bezit een hoge bouwhistorische waarde, de scheidingswand en wijnrekken in de voorkelder (oostelijke helft) uit de late 20ste eeuw bezitten geen monumentale waarde. Bij de restauratie zijn de meeste van deze jongere elementen gesloopt.

Monumenten Advies Bureau, Nijmegen februari 2000/februari 2002

Onderzoekers: F.A.C. Haans/G. Korenberg

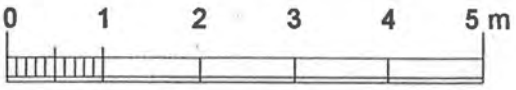
Plattegrond

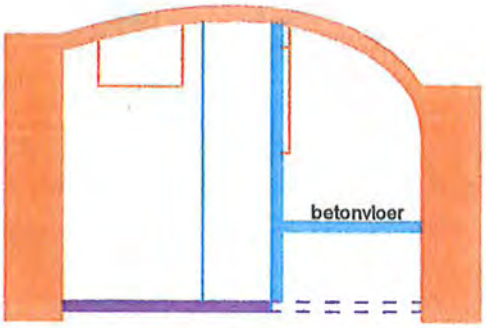
straat 70

JWHISTORISCHE GEGEVENS

opname jan/feb. 2002

MONUMENTEN ADVIESBUREAU
Bredestraat 1, 6542 SN NIJMEGEN





XIVB
XVA
XIXA
XIXB
XX
Onbekend
Onbekend (zand of steenvulling)

Doorsnede A

Doorsnede B

Overzicht achterwand

Rechter achterhoek

Voorste deel rechter zijgevel

Middendeel linker zijgevel

Krassen in wand achtergang; oude situatie

Instorting achtergang; oude situatie

Doorgang naar Rijnstraat 71; oude situatie

Ingang achtergang; oude situatie


Trap tegen linker zijgevel; oude sit.


Doorgang naar nr. 69; oude situatie


Wijnrek naast trap; oude situatie


Detail vloer voorste deel; oude sit.


Sprong in rechter zijgevel; oude sit.


Stortkoker in voorgevel; oude sit.

15.5 Blank field form to investigate Deventer cellars

Adres: Bezoekdatum:

Kwalificatie:

Toegankelijkheid:

Verlichting:

Ventilatie:

Gebruik:

Situering:

Enkelvoudige / meervoudige ruimte

Plattegrondvorm(en):

Afmetingen lengte:

breedte:

hoogte:

Gewelftype(n):

Vloeren:

Wandafwerking:

Trappen (aantal):

Trappen (materiaal):

Trappen (type):

Nissen (aantal):

Nissen (type):

Doorgangen naar andere kelders:

Stortkokers/kelderlicht:

Overige elementen:

Opmerkingen:

Soort baksteen:

Metselverband wanden:

Metselverband gewelf:

Baksteenformaten : Achterwand

: Zijwanden

: Kopgevel

: Gewelf

: Trappen

: Dichtzettingen/vullingen

: Vloeren

Natuursteen (soort en plaats):

15.6 Catalogue of the self-investigated cellars in Deventer

D4

Voorzijde Brink 3-4

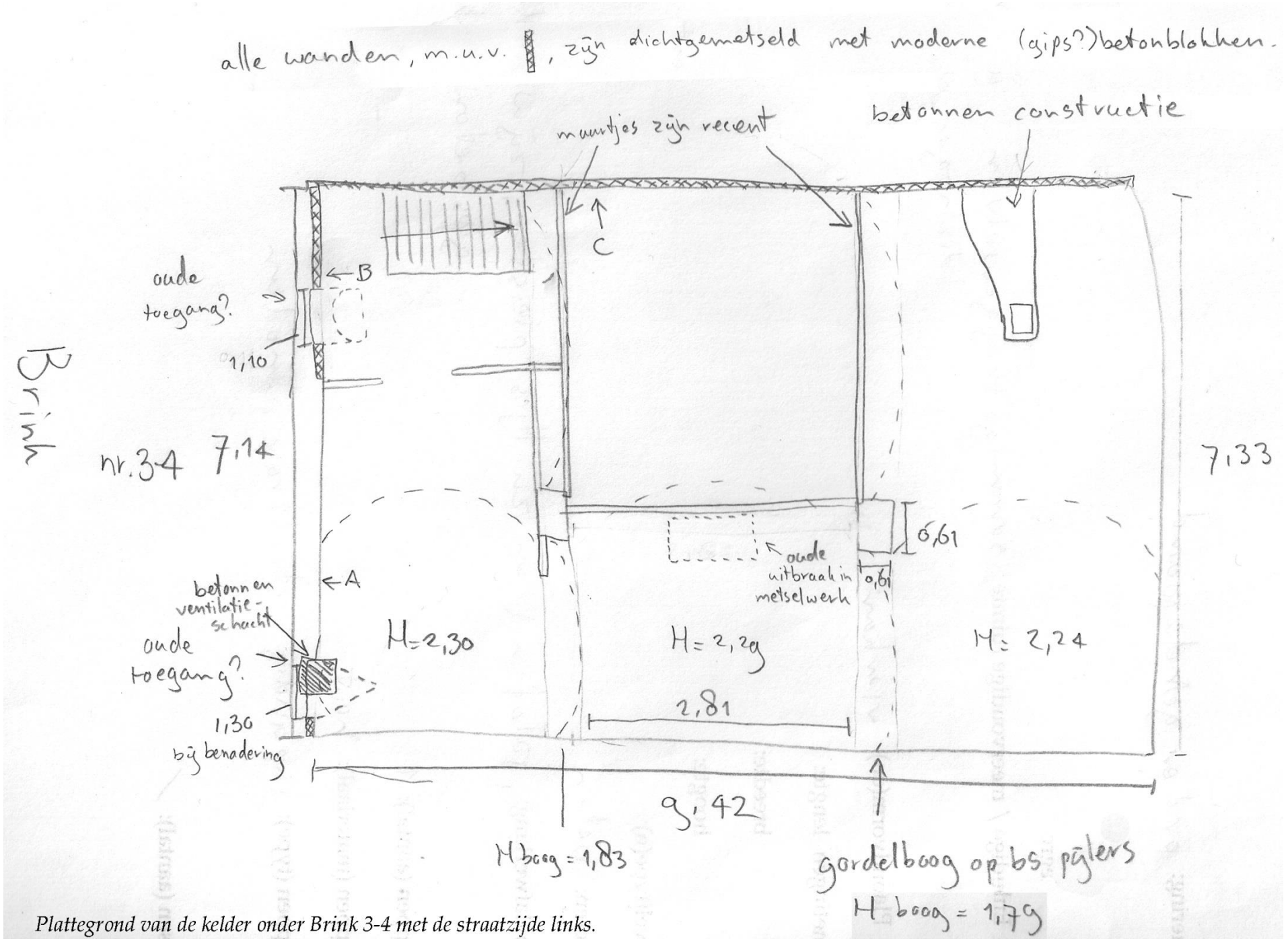
Bezoekdatum:	20/01/2017
Adres:	Brink 3-4 (Foto Hekkert)
Kwalificatie:	Rijksmonument, nr. 12477
Toegankelijkheid:	goed
Verlichting:	ja
Ventilatie:	niet meer
Gebruik:	opslag
Situering:	onder gehele pand

Een van oorsprong meervoudige ruimte bestaande uit drie troggewelven, later opgedeeld in kleinere ruimten door het dichtmetselen van enkele gordelbogen.

Plattegrondvorm(en):	rechthoek
Afmetingen (in m):	
lengte:	9,42
breedte:	7,33
hoogte:	2,30

Gewelftype(n):	troggewelven met gordelbogen steunend op gemetselde zuilen
Vloeren:	beton
Wandafwerking:	het plafond en de zuilen zijn bepleisterd, de zijwanden bestaan grotendeels uit gasbetonblokken, daar waar niet is het oude muurwerk zichtbaar (zie schets).
Trappen:	1 inpandige houten steektrap
Doorgangen:	Er zijn verhalen van doorgangen naar andere kelders, maar als, dan bevinden ze zich achter de gasbetonwanden
Stortkokers/kelderlicht:	aan weerszijden in de kopgevel zijn kleine steekkappen aanwezig, waarschijnlijk is één van beide de voormalige toegang

Baksteenformaten:	
Zijwanden:	28/29 x 13/13,5 x 6,5/7
Gewelf:	28/28,5 x 13/14,5 x 6,5/7 (A)
	22 x 11 x 4,5/5,5 (B)



Plattegrond van de kelder onder Brink 3-4 met de straatzijde links.

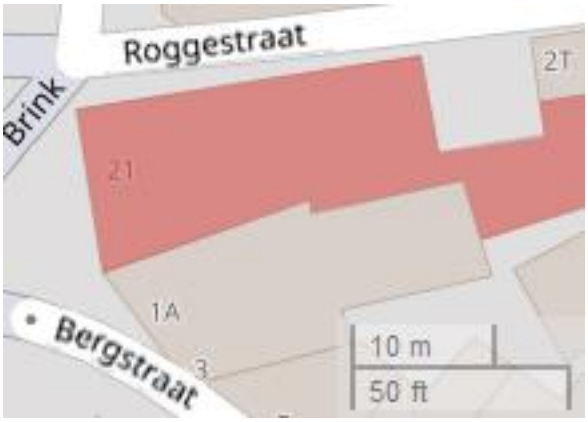
Troggewelven met gordelbogen

Dichtgezette gordelboog

Van de oude toegang rest aleen nog deze steekkap.

Gemetselde zuilen

D6

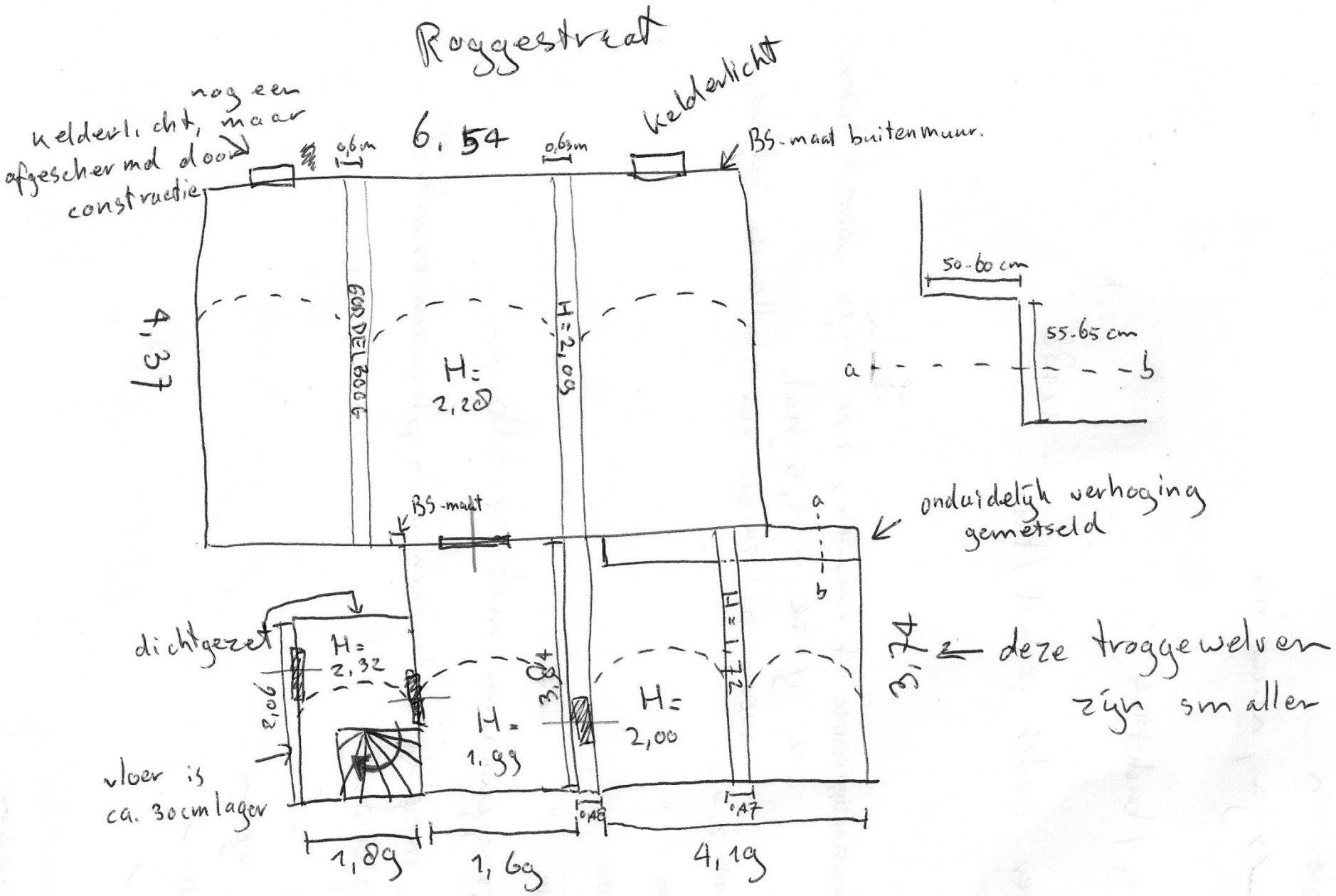


Achterzijde Brink 21

Bezoekdatum:	19/01/2017
Adres:	Brink 21 (De Hip)
Kwalificatie:	Rijksmonument, nr. 12488
Toegankelijkheid:	goed
Verlichting:	ja
Ventilatie:	kelderlichten
Gebruik:	opslag
Situering:	onder het gehele pand, dat achter het pand aan de Brink staat

De kelder is een meervoudige ruimte die lijkt te bestaan uit twee verschillende kelders, gezien de opmetingen, later zijn de ruimtes verder opgedeeld door middel van muurtjes.

Plattegrondvorm(en):	rechthoekig
Afmetingen (in m):	zie schets
Gewelftype(n):	troggewelven met gordelbogen
Vloeren:	beton, zo hier en daar lijken er afdrukken zichtbaar van onderliggende plavuizen
Wandafwerking:	pleister
Trappen:	1 inpandige trap, van vemoedelijke recentere datum (zie schets)
Stortkokers/kelderlicht:	2 kelderlichten naar de Roggestraat, 1 dichtgezette stortkoker naar de binnenplaats
Opmerkingen:	Onder het voorste pand bevonden zich oorspronkelijk ook kelders, maar die zijn bij grootschalige verbouwingen in de jaren ’70 er allemaal uitgebroken.
Baksteenformaten:	
Zijwanden:	7,5/8 cm dik
Buitenmuur Roggestraat:	27 x 12/13 x 6/7; 10 lgn: 74 cm



Plattegrond van de kelder onder Brink 21 met de straatzijde boven (Roggestraat). Alhoewel het huidige pand op de hoek Brink-Roggestraat staat, bevindt de (historische) kelder zich uitsluitend onder het deel dat grenst aan de binnenplaats.

Troggewelven met gordelbogen (grote kelder)

Troggewelven met gordelboog (kleinste kelder)

Detail bakstenen van de gemetselde gordelboog

D8

Voor- en zijgevel Brink 48

Bezoekdatum:	24/01/2017
Adres:	Brink 48
Kwalificatie:	Rijksmonument, nr. 12503
Toegankelijkheid:	goed
Verlichting:	ja
Ventilatie:	ja
Gebruik:	opslag
Situering:	onder gehele pand
Plattegrondvorm(en):	rechthoek
Gewelftype(n):	troggewelf met fordelbogen steunend op natuurstenen zuilen
Vloeren:	beton
Wandafwerking:	pleister
Overige elementen:	in de wand die grenst aan de Boterstraat bevinden zich enkele natuurstenen draagstenen vlak onder het gewelf (zie foto's). Ik vermoed dat deze een balkenlaag gedragen hebben, wat erop wijst dat de overwelving jonger is dan de rest van de kelder.
Opmerkingen:	de info is summier en een schets ontbreekt, omdat ik spontaan kort in de kelder was en er enkel tijd was voor een paar foto's. Overigens is deze kelder al eerder grondig onderzocht door de Vereniging van Hendrick de Keyzer, zie de literatuurlijst.

Troggewelven met gordelbogen steunend op zuilen van Bentheimer zandsteen

Detail Bentheimer zandsteen zuil

Deze draagsteen is een mogelijke aanwijzing dat de gewelfconstructie pas later is aangebracht

Detail draagsteen

D9

Voorzijde Brink 64-B

Bezoekdatum:	24/01/2017
Adres:	Brink 64-B
Kwalificatie:	Rijksmonument, nr. 12397
Toegankelijkheid:	goed
Verlichting:	ja
Ventilatie:	kelderlicht
Gebruik:	restaurant
Situering:	omdat het hier oorspronkelijk om een veel kleiner hoekhuis ging, was de kleine vierkante kelder oorspronkelijk onder het hele pand gesitueerd.

De kelder is tegenwoordig een meervoudige ruimte, bestaande uit een vierkante kelder onder de voorzijde van het pand die is verbonden met een grotere kelder die zich onder het gehele pand uitstrekt.

Plattegrondvorm(en):		vierkant
Afmetingen (in m):		
	lengte:	5,46
	breedte:	5,42
	hoogte:	2,38

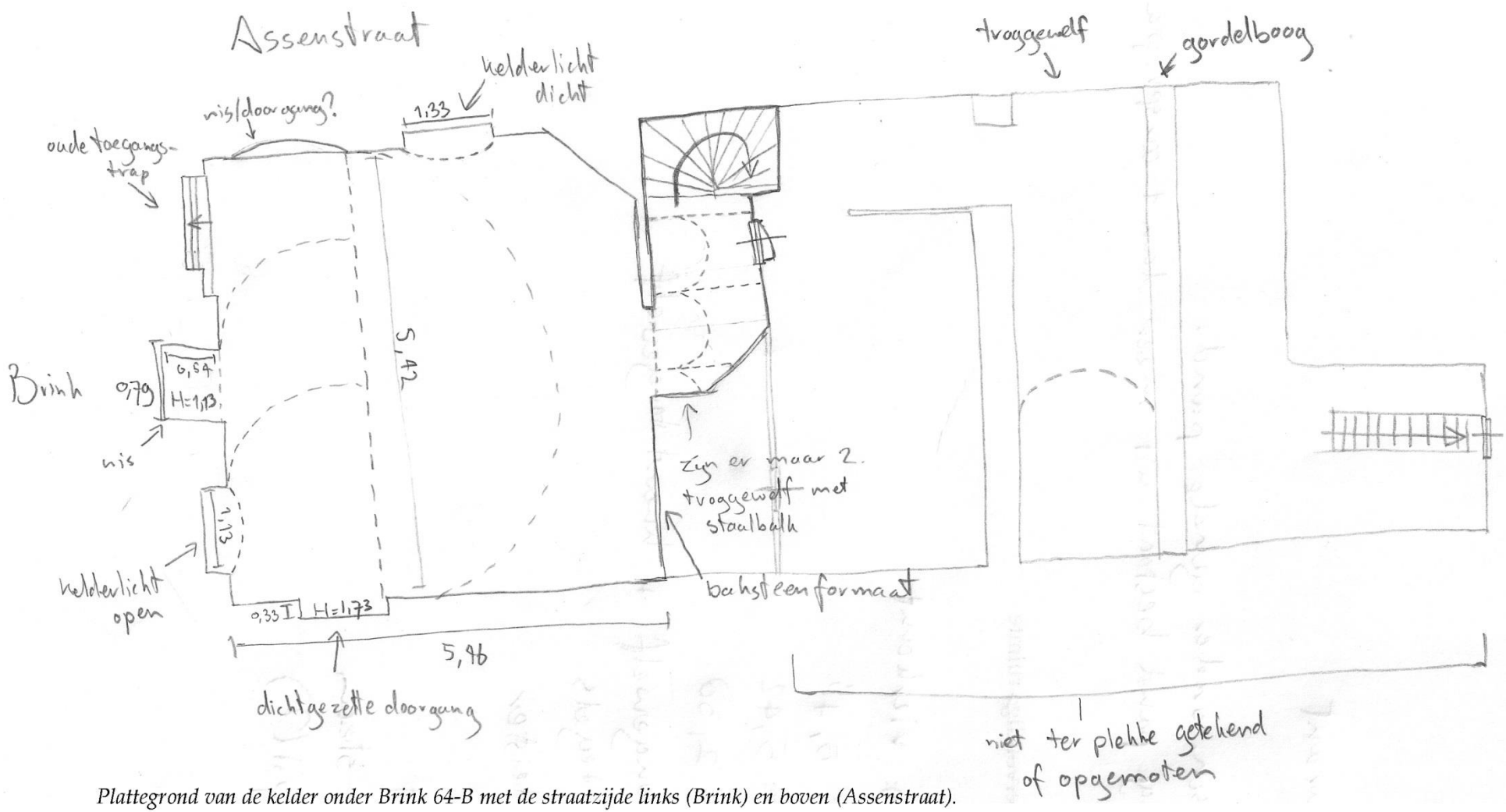
Gewelftype(n):	tongewelf met aan de straatzijde een kwart tongewelf (Zutphens type) en troggewelf met stalen balken
Vloeren:	(tapijt)tegels / klinkers / beton
Wandafwerking:	pleister
Trappen±	twee inpandige trappen van latere datum.
Nissen (aantal):	1
Nissen (type):	waarschijnlijk geen lichtnis ivm het grote formaat, misschien een schouw al is er geen sprake van een zichtbaar rookkanaal
Doorgangen:	1 dichtgezette doorgang
Stortkokers/kelderlicht:	2, waarvan één is dichtgezet
Overige elementen:	in een hoek aan de straatzijde is de aanzet van een trap aanwezig

Opmerkingen: Naast de vierkante kelder, loopt de huidige kelder door onder de rest van het pand. Het muurwerk hier heb ik niet goed kunnen zien, maar het plafond bestaat deels uit troggewelven met staalbalken en recentere afwerkingen, toch is er in de tweede helft nog een ouder troggewelf met gordelboog aanwezig. Evenals een drempel van kleine, geelbakkende klinkers.

Soort baksteen: roodbakkend, handgevormd

Baksteenformaten:

Achterwand: 21,5/24,5 x ?? x 6/6,5



Plattegrond van de kelder onder Brink 64-B met de straatzijde links (Brink) en boven (Assenstraat). Het gedelte rechts van de trap is wél bezichtigd, maar niet ter plaatse opgemeten, dus het betreft hier een globale schets.

Kelder gezien richting straatzijde

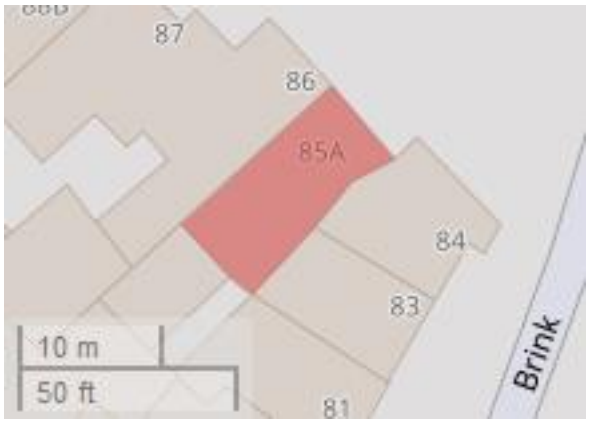
Kelder van het Zutphense type, met een kwart tongewelf aan de straatzijde

De oorspronkelijke toegang naar de straatzijde

Kelderlicht richting straatzijde (Brink)

Troggewelf met staalbalken

D10



Voorzijde Brink 85A

Bezoekdatum:	19/01/2017
Adres:	Brink 85A (Café Glas in Lood)
Kwalificatie:	Rijksmonument, nr. 12529
Toegankelijkheid:	goed
Verlichting:	ja
Ventilatie:	via een dichtgezette strotkoker/kelderlicht/toegang
Gebruik:	opslag
Situering:	onder het gehele pand

Meervoudige ruimte die bestaat uit twee aan elkaar verbonden kelders

Plattegrondvorm(en):		rechthoek
Afmetingen (in m):		
	lengte:	9,90
	breedte:	4,40
	hoogte:	ca. 2,10

Gewelftype(n):	tongewelf
Vloeren:	voorkelder: plavuizen; achterkelder: betonvloer (11cm)
Wandafwerking:	pleister

Trappen:	één bakstenen inpandige trap, die mogelijk oud is

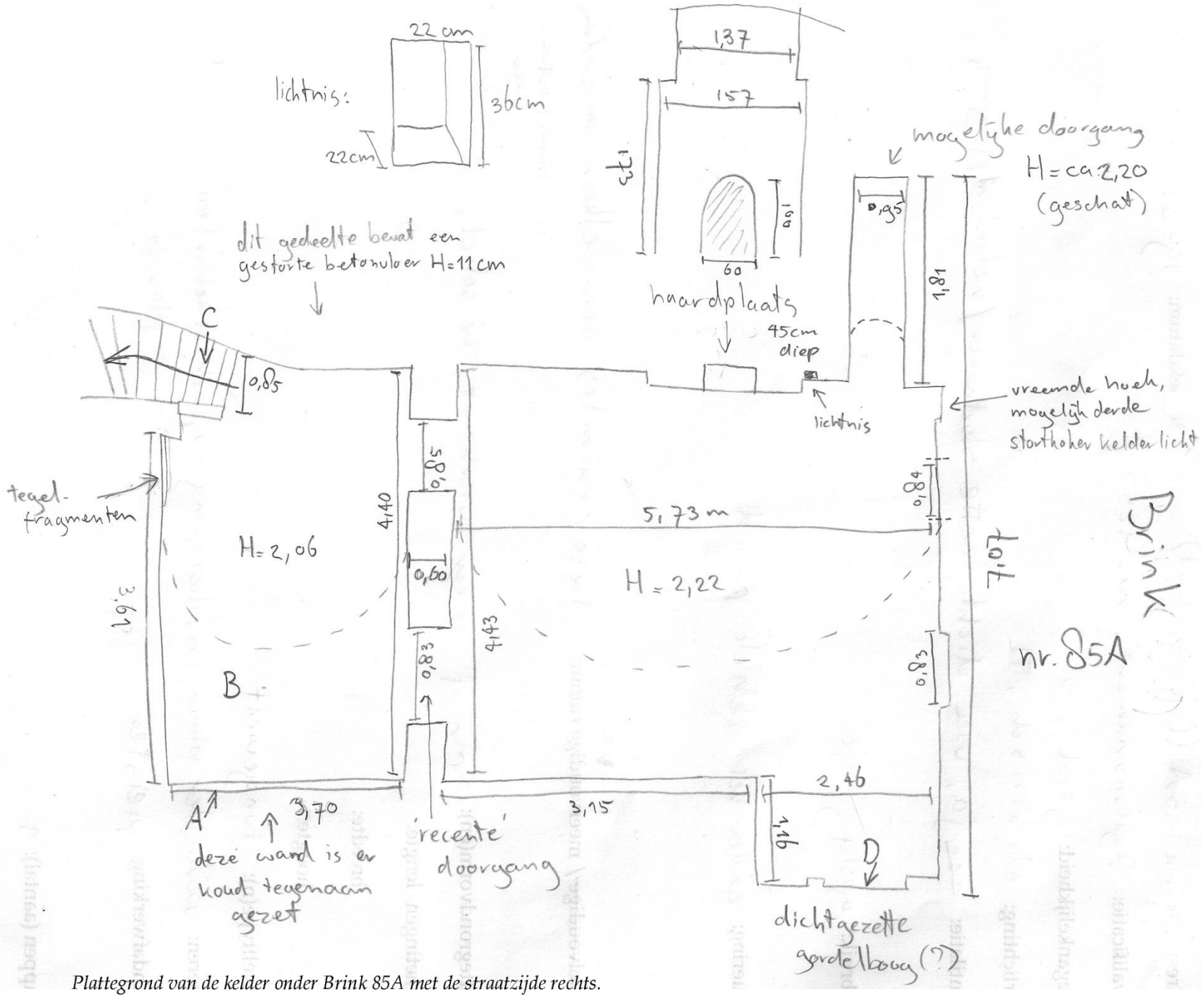
Nissen (aantal):	1 naast de schouw
Nissen (type):	??

Doorgangen:	waarschijnlijk 1, misschien 2. In de voorkelder bevindt zich een dichtgezette manshoge gang in de richting van Brink 86. Daar tegenover is er een dichtgezette gordelboog (?) zichtbaar, maar mogelijk was dit een decoratie.
Stortkokers/kelderlicht:	2, mogelijk 3, ze zijn allemaal dichtgemetseld. Waarschijnlijk is één hiervan de oorspronkelijk toegang.
Overige elementen:	In de voorkelder bevindt zich een haardplaats (!), een onversierde ijzeren haardplaat is nog aanwezig. Ook zijn er in de achterkelder nog enkele tegelfragmenten aanwezig, tegen de achterwand aan.

Opmerkingen: in de voorkelder zijn met name de plavuizen in het midden van de vloer tot aan de voorgevel sterk beschadigd en veelal gebroken.
Één van de zijwanden in de achterkelder heeft een koude naad ten opzichte van het gewelf, waarschijnlijk is dus de kelder of het gewelf pas later gebouwd dan de zijmuur.

Baksteenformaten:

Zijwanden:	26/27 x 12/14 x 6/6,5 (A)
Gewelf:	28 x 225/12 x 6/8 (B)
Trappen:	21 x 10/11 x 4/4,5 (C)
Dichtzettingen:	min. 25/28 x 15/16 x 7/8 (D, slecht zichtbaar)



Plattegrond van de kelder onder Brink 85A met de straatzijde rechts.

Tongewelf voorkelder met twee doorgangen naar de achterkelder, rechts is de haardplaats zichtbaar

De haardplaats met aan de rechterzijde een lichtnis

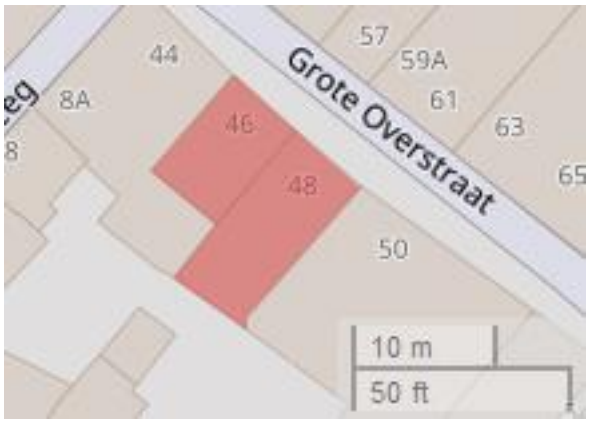
Dichtgezette doorgang of decoratie?

Tongewelf achterkelder

Een koude naad tussen tongewelf en zijmuur is een aanwijzing dat het tongewelf mogelijk pas later is toegevoegd

Tegelfragmenten tegen de achtermuur

D14




Voorzijde Grote Overstraat 46 (r)

Bezoekdatum:	19/01/2017
Adres:	Grote Overstraat 46 (Hoge Ramen)
Kwalificatie:	Rijksmonument, nr. 12577
Toegankelijkheid:	goed
Verlichting:	deels
Ventilatie:	nauwelijks
Gebruik:	sporadisch gebruikte opslag
Situering:	niet zeker of de kelder zich onder het hele pand bevind

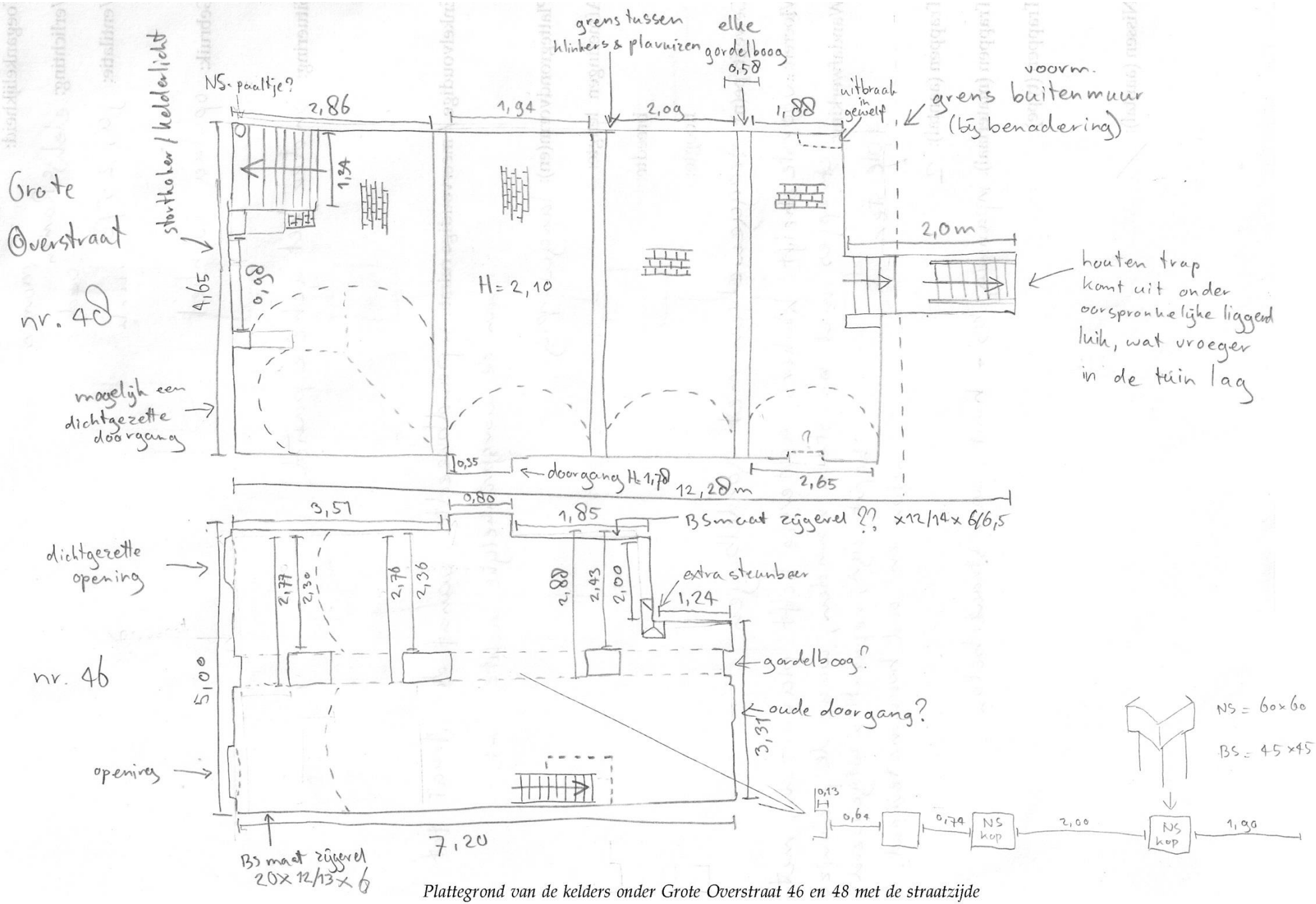
Een enkelvoudige kelder bestaande uit twee naast elkaar gelegen troggewelven met een gordelboog.

Plattegrondvorm(en):		rechthoekig
Afmetingen (in m):		
	lengte:	7,20
	breedte:	5,00
	hoogte:	niet genoteerd, waarsch ca. 2,10

Gewelftype(n):	troggewelven met gemetselde gordelboog steunend op NS zuilen
Vloeren:	kinderkopjes / tegels / baksteen
Wandafwerking:	pleister

Trappen (aantal):	1
Trappen (materiaal):	hout
Trappen (type):	inpandig, trapladder

Doorgangen:	1, mogelijk 2. Een doorgang naar de naastgelegen kelder (nr. 48) is dichtgezet. In de achterwand lijkt nóg een dichtgezette doorgang te zijn.
Stortkokers/kelderlicht:	2, waarvan één is dichtgezet
Overige elementen:	twee forse bepleisterde, bakstenen pijlers met een natuurstenen kapiteel
Opmerkingen:	In de hoek die ‘mist’ bevindt zich een piramidevormige steunbeer (?)



Plattegrond van de kelders onder Grote Overstraat 46 en 48 met de straatzijde links. Rechtsonder een detail van de zuilen in de kelder onder nr. 46.

Troggewelf met gordelboog gezien richting straatzijde

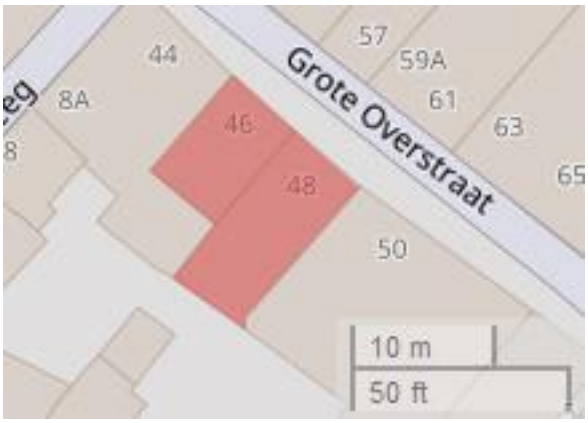
Troggewelven met een gordelboog steunend op twee van deze gemetselde zuilen met natuurstenen bovenzijde

De oorspronkelijke toegang naar de straat is zichtbaar in de rechterhoek

Dichtgezette doorgang naar naastgelegen kelder

Mogelijke oude doorgang in achterwand

D15



Voorzijde Grote Overstraat 48 (l)

Bezoekdatum:	19/01/2017
Adres:	Grote Overstraat 48 (Hoge Ramen)
Kwalificatie:	Rijksmonument, nr. 12578
Toegankelijkheid:	goed
Verlichting:	ja
Ventilatie:	elektrisch
Gebruik:	opslag
Situering:	onder het gehele pand

De kelder is een enkelvoudige ruimte zo breed als het pand, vanaf de straat tot aan de oorspronkelijke achtergevel. Omdat de winkel later is uitgebreid aan de achterzijde, bevinden de toegangsluiken (op laste van de Monumentenzorg) zich tegenwoordig in de winkel in plaats van in de achtertuin.

Plattegrondvorm(en):	rechthoek
Afmetingen (in m):	
lengte:	10,28
breedte:	4,65
hoogte:	2,10

Gewelftype(n):	troggewelven met gordelbogen
Vloeren:	voorste helft klinkers; achterste helft plavuizen met stoepjes met bakstenen randen
Wandafwerking:	pleister

Trappen (aantal):	2
Trappen (materiaal):	inpandig: baksteen/hout; aan straat: beton
Trappen (type):	laddertrap / bloktrap

Doorgangen:	1 dichtgezette doorgang naar de kelder onder nr. 46

Stortkokers/kelderlicht:	in het midden aan de straatkant bevindt zich een ruime koker met staande luiken

Opmerkingen:	De achtermuur verschilt, aan één kant is deze ‘nieuw’ uitgevoerd en minder diep

Baksteenformaten:	
Trappen:	21 x 9 x 4/5
Vloeren:	22/24 x 13/15 x 5/6

Natuursteen: op de bovenste traptrede aan de straatzijde lijkt een kort (32 cm hoog), gepleisterd natuurstenen zuiltje te staan.

Voor de schets, zie pagina 234.

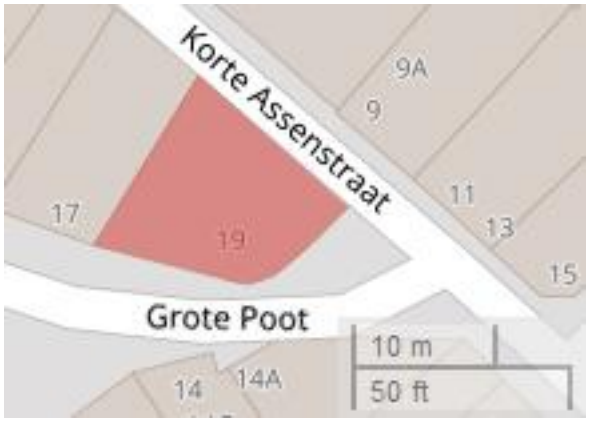
Troggewelven met gordelbogen gezien richting straatzijde

Keldertoegang aan de straatzijde

Het kelderluik dat zich oorspronkelijk in de achtertuin bevondt, ligt nu midden in de winkel, doordat de achtergevel naar achteren is verlengd

De (tegenwoordig) inpandige keldertoegang

D18



Voor- en zijaanzicht Grote Poot 19

Bezoekdatum:	20/01/2017
Adres:	Grote Poot 19 (Jackies)
Kwalificatie:	Rijksmonument, nr. 12586
Toegankelijkheid:	goed
Verlichting:	ja
Ventilatie:	ja
Gebruik:	restaurant/toiletten
Situering:	onder het gehele pand

Een meervoudige ruimte met verschillende delen opgaand muurwerk en doorgangen door oud muurwerk

Plattegrondvorm(en):	spitstoelopend (zie schets)
Afmetingen (in m):	
lengte:	ca. 6,25
breedte:	9,90
hoogte:	ca. 2,40

Gewelftype(n):	troggewelven met gordelbogen steunend op natuurstenen zuilen
Vloeren:	tegels (modern)
Wandafwerking:	niet, gewelf is gepleisterd

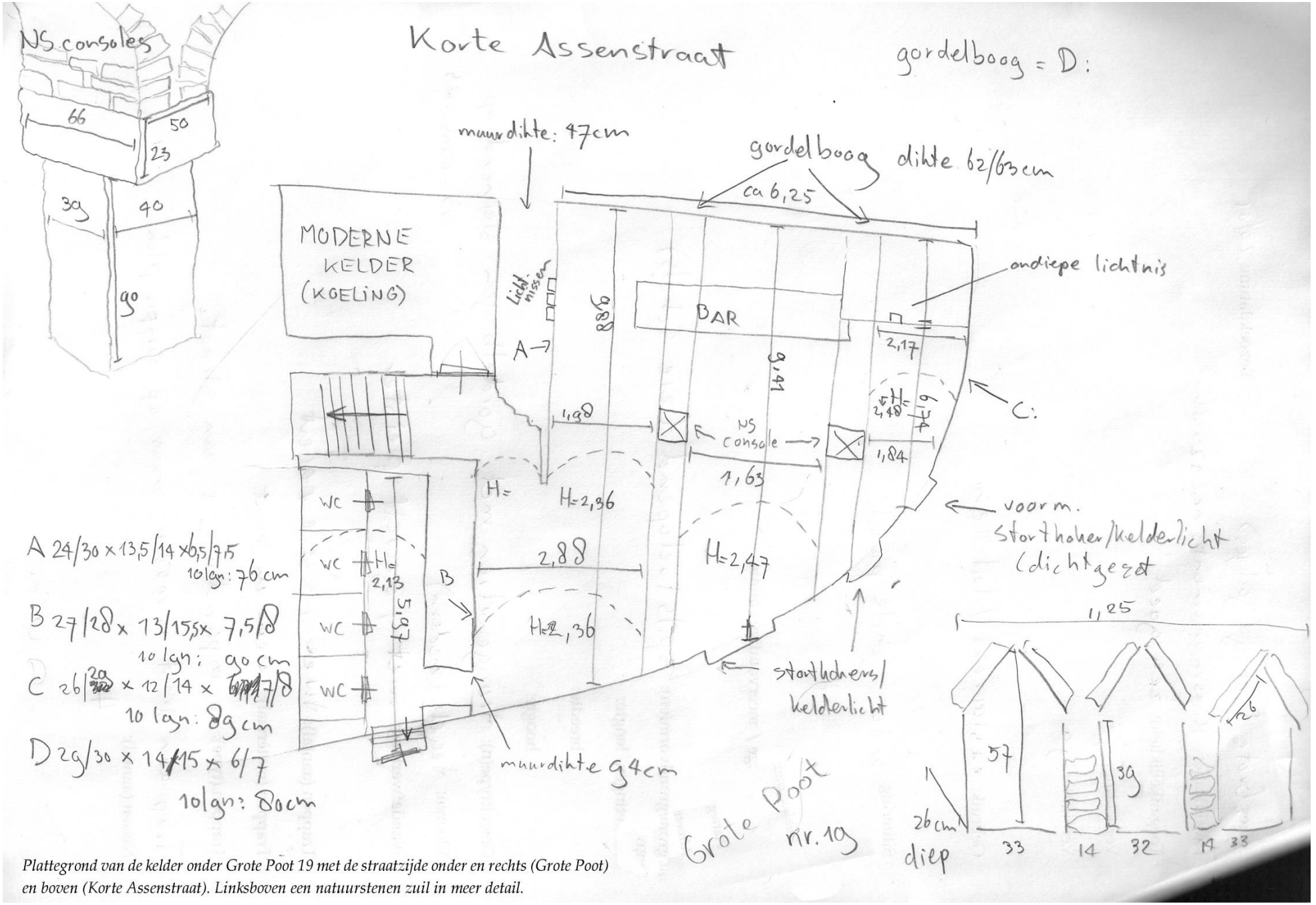
Trappen:	2 trappen, één is inpandig en modern, de ander ziet er modern uit, maar lijkt zich wel op een oorspronkelijke plek aan de straat te bevinden

Nissen (aantal):	4
Nissen (type):	kerperboog

Stortkokers/kelderlicht:	3, waarvan er 1 is dichtgezet

Opmerkingen:	Één van de muurnissen is opmerkelijk ondiep en de stenen zijn wel erg klein van formaat, mogelijk enkel ter decortatie en dus niet origineel. Er zijn enorm dikke muren aanwezig van meer dan 90 cm dik.

Natuursteen:	de twee zuilen in het midden van de ruimte zijn van natuursteen (bepleisterd). In één van de wanden bevindt zich ook nog een blok natuursteen.



Plattegrond van de kelder onder Grote Poot 19 met de straatzijde onder en rechts (Grote Poot) en boven (Korte Assenstraat). Linksboven een natuurstenen zuil in meer detail.

Interieurfoto van de kelder

Troggewelf met gordelbogen steunend op natuurstenen zuilen

Lichtnissen met keperboog

Detailfoto natuurstenen fragment

Muurwerk met een dikte van 94 cm

Detail gemetselde gordelboog met natuurstenen zuil

D19

Voorzijde Kleine Overstraat 46

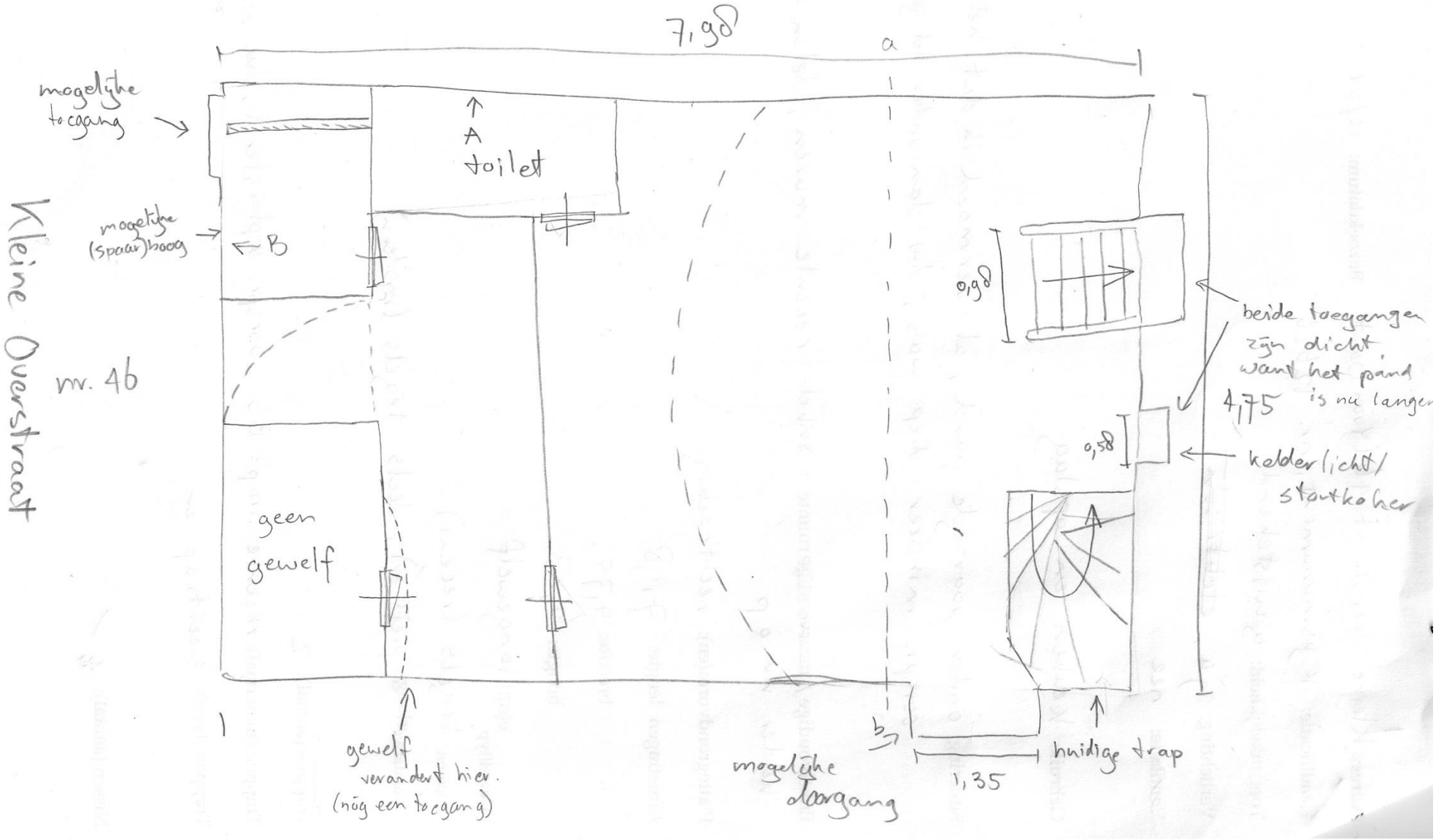
Bezoekdatum:	20/01/2017
Adres:	Kleine Overstraat 46
Kwalificatie:	Rijksmonument, nr. 12626
Toegankelijkheid:	goed
Verlichting:	ja
Ventilatie:	nee
Gebruik:	keuken / opslag
Situering:	oorspronkelijk onder het gehele pand, de begane grond is later naar achteren uitgebreid

Een enkelvoudige ruimte die door recenter muurwerk later is opgedeeld

Plattegrondvorm(en):		rechthoekig
Afmetingen (in m):		
	lengte:	7,98
	breedte:	4,75
	hoogte:	2,48

Gewelftype(n):	tongewelf
Vloeren:	tegels (modern)
Wandafwerking:	pleister, deels tegels (modern)

Trappen:	2, waarvan één inpandige, gemetselde, moderne trap. De ander is de originele trap onder de dichtgezette keldertoegang, waarschijnlijk gemetseld (maar bepleisterd)
Doorgangen:	mogelijk bevindt zich naast de functionele trap een voormalige, dichtgezette doorgang naar de naastgelegen kelder
Stortkokers/kelderlicht:	1, dichtgezet, in de achterwand, rechts naast de oorspronkelijke trap
Overige elementen:	mogelijk was er een tweede toegang aan de straatzijde, in het gewelf is nog net een verloop omhoog zichtbaar. Tevens aan de straatzijde is een klein deel kwart tongewelf zichtbaar, mits dit origineel is dan betreft deze kelder een Zutphens type.
Opmerkingen:	de kelder is zeer waarschijnlijk verdiept (ca. 26cm) gelet op de hoogte van de eerste optrede van de oude trap (ca. 38cm) en een verhoging bij de mogelijke doorgang



Plattegrond van de kelder onder Kleine Overstraat 46 met de straatzijde links.

Overzichtsfoto richting de straatzijde

Het kwarttongewelf aan de straatzijde wijst op een kelder van het Zutphense type, links is nog een aanzet zichtbaar van een mogelijke toegang

Een nis of een oude doorgang? De verhoging is een mogelijke anwijzing voor het verdiepen van de kelder

Oorspronkelijke trap naar het achtererf, tegenwoordig is het pand ongeveer twee maal zo lang

Is hier sprake van een dichtgezette segmentboog in de voorgevel?

D21


Voorzijde Korte Bisschopstraat 33

Bezoekdatum:	20/01/2017
Adres:	Korte Bisschopstraat 33 (Bruna)
Toegankelijkheid:	goed
Verlichting:	deels
Ventilatie:	elektrisch
Gebruik:	opslag
Situering:	onder het gehele oorspronkelijke pand

Enkelvoudige ruimte

Plattegrondvorm(en):	rechthoekig
Afmetingen (in m):	
lengte:	12,81
breedte:	4,70
hoogte:	1,90

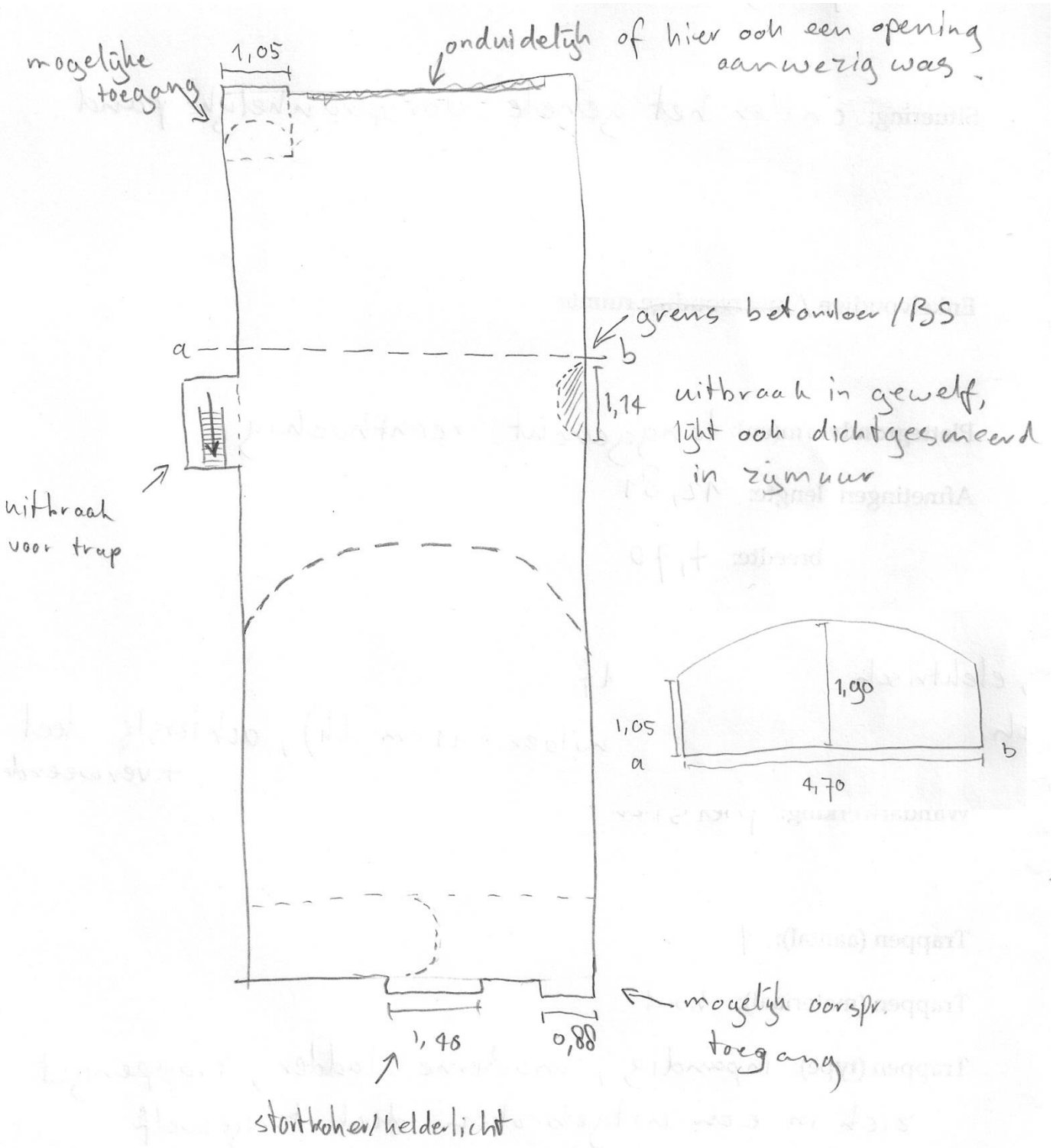
Gewelftype(n):	segmentgewelf
Vloeren:	gestorte betonvloer (11cm), achterste deel baksteen icm (beschadigde) plavuizen
Wandafwerking:	pleister

Trappen (aantal):	1
Trappen (materiaal):	hout
Trappen (type):	inpandig, laddertrap

Stortkokers/kelderlicht:	kopgevel: 1 kelderlicht in midden; achterwand: mogelijk 1 stortkoker (dichtgezet)

Baksteenformaten:	
Zijwanden:	23,5/27 x 13/13,5 x 5,5/6
Gewelf:	25,5/27,5 x 12/13 x 6/7

Natuursteen:	in de baksteenvloer ligt een natuurstenen afdekplaat in een klinker omlijsting



Plattegrond van de kelder onder Korte Bisschopstraat 33 met de straatzijde onder.

Overzichtsfoto richting straatzijde

Overzichtsfoto richting achterzijde

Dichtgezette oorspronkelijke toegang aan de straatzijde

Troggewelf aan de straatzijde, haaks op het tongewelf. Mogelijk om de toegang te vergemakkelijken, zoals bij het Zutphense type

D23


Voorzijde Papenstraat 17 (l)

Bezoekdatum:	21/01/2017
Adres:	Papenstraat 17
Toegankelijkheid:	matig
Verlichting:	ja
Ventilatie:	keldertoegang
Gebruik:	opslag
Situering:	onder gehele pand

Een enkelvoudige ruimte

Plattegrondvorm(en):	rechthoek
Afmetingen (in m):	
lengte:	11,33
breedte:	4,05
hoogte:	1,94

Gewelftype(n):	tongewelf
Vloeren:	beton
Wandafwerking:	pleister

Trappen: 1 uitpandige, gemetselde trap, aan de straatzijde

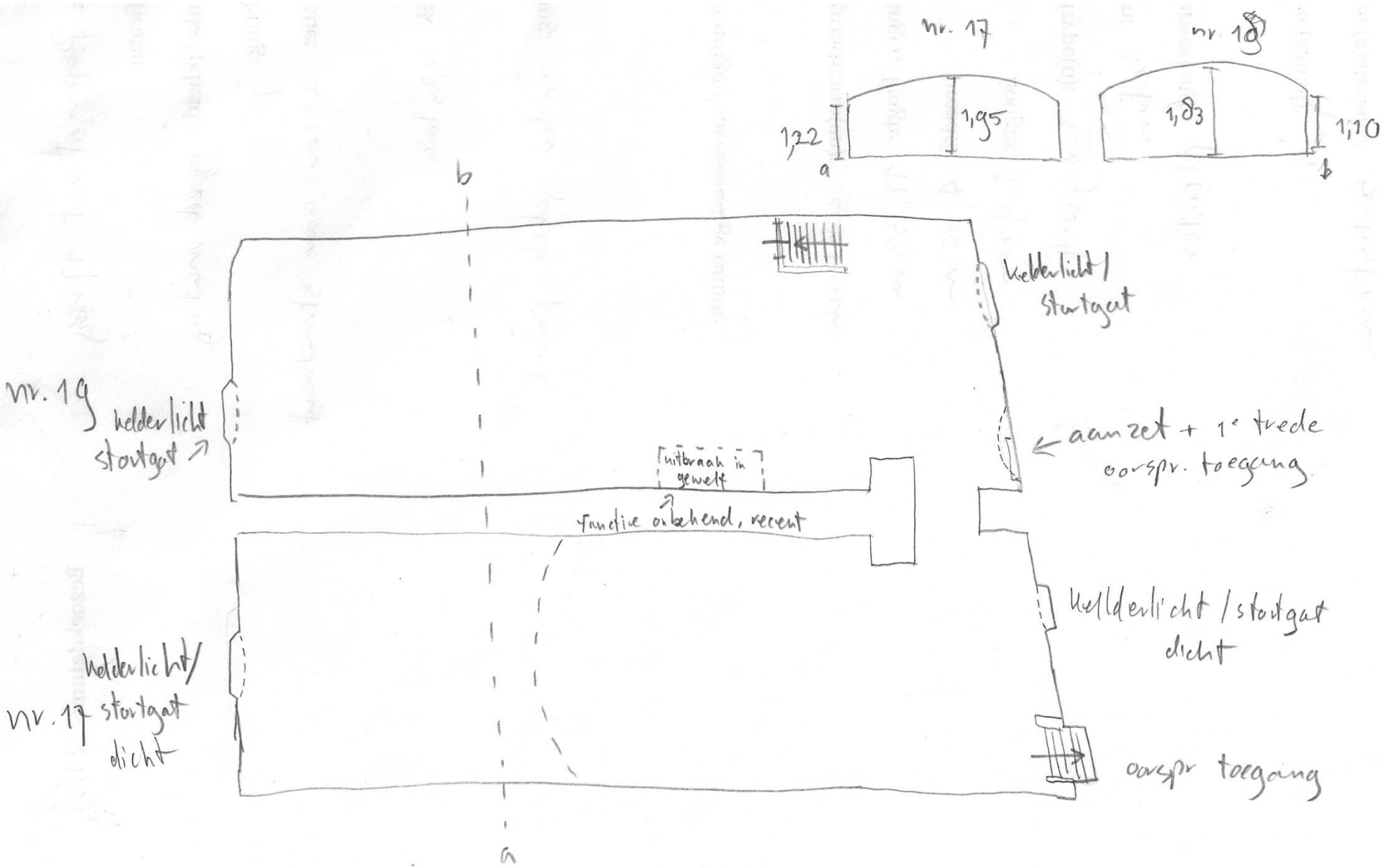
Doorgangen: 1 open doorgang naar de naastgelegen kelder onder Papenstraat 19

Stortkokers/kelderlicht: 2, maar beide zijn dichtgezet

Opmerkingen: het huis heeft een dendro datering: zomer 1546, waarschijnlijk is het gebouwd in 1547/48. Het baksteenformaat van de gemene muur is op de 1e verdieping: 22/23 x 11/11,5 x 5,2/6, 10 lgn: 71/72 cm

Baksteenformaten:

Zijwanden: 28/29 x ?? x 6/7, 10 lgn: 74 cm



Plattegrond van de kelders onder Papenstraat 17 en 19 met de straatzijde rechts. De afmetingen van de bovenste kelder (nr. 19) zijn 10,94 x 3,96 x 1,82 m, van de onderste (nr. 17) 11,33 x 4,05 x 1,94 m.

Overzichtsfoto richting de achterzijde

Doorgang naar naastgelegen kelder onder Papenstraat 19

D24


Voorzijde Papenstraat 19 (r)

Bezoekdatum:	21/01/2017
Adres:	Papenstraat 19
Toegankelijkheid:	goed
Verlichting:	deels
Ventilatie:	kelderlicht
Gebruik:	opslag
Situering:	onder gehele pand

Een enkelvoudige ruimte

Plattegrondvorm(en):	rechthoek
Afmetingen (in m):	
lengte:	10,94
breedte:	3,96
hoogte:	1,82

Gewelftype(n):	tongewelf
Vloeren:	beton
Wandafwerking:	pleister

Trappen: 1 houten inpandige trap

Doorgangen: 1 open doorgang naar de naastgelegen kelder onder Papenstraat 17

Stortkokers/kelderlicht: 2, beide functioneel

Overige elementen: op dezelde plaats als in de naastgelegen kelder is een dichtgezette (oorspronkelijke) toegang te zien in wand en gewelf.

Opmerkingen: het huis heeft een dendro datering: zomer 1546, waarschijnlijk is het gebouwd in 1547/48. Het baksteenformaat van de gemene muur is op de 1e verdieping: 22/23 x 11/11,5 x 5,2/6, 10 lgn: 71/72 cm

Voor de schets, zie pagina 254.

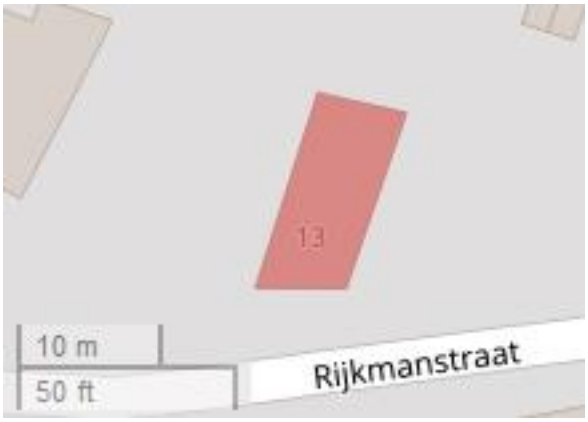
Overzichtsfoto richting de achterzijde

Kelderlicht aan de straatzijde

Stortkoker in de achterwand, in het verleden gebruikt voor het storten van steenkool in de kelder

Dichtgezette keldertoegang naar de straatzijde op exact dezelfde plek, als de nog functionerende in de naastgelegen kelder onder Papenstraat 17

D28



Voorzijde Rijkmanstraat 13

Bezoekdatum:	23/01/2017
Adres:	Rijkmanstraat 13
Kwalificatie:	Rijksmonument, nr. 12788
Toegankelijkheid:	goed
Verlichting:	ja
Ventilatie:	kelderlicht
Gebruik:	opslag
Situering:	onder gehele huis

Een ruime kelder bestaande uit één ruimte met troggewelven en gordelbogen.

Plattegrondvorm(en):		rechthoek
Afmetingen (in m):		
	lengte:	12,20
	breedte:	4,70
	hoogte:	2,70

Gewelftype(n):	troggewelf met gordelboog
Vloeren:	baksteen
Wandafwerking:	deels gepleisterd

Trappen (aantal):	2
Trappen (materiaal):	hout / baksteen

Nissen (aantal):	4
Nissen (type):	lichtnis met kerperboog

Doorgangen:	1, mogelijk 2

Stortkokers/kelderlicht:	mogelijke stortkoker in de achterwand, al is dit waarsch een dichtgezette toegang

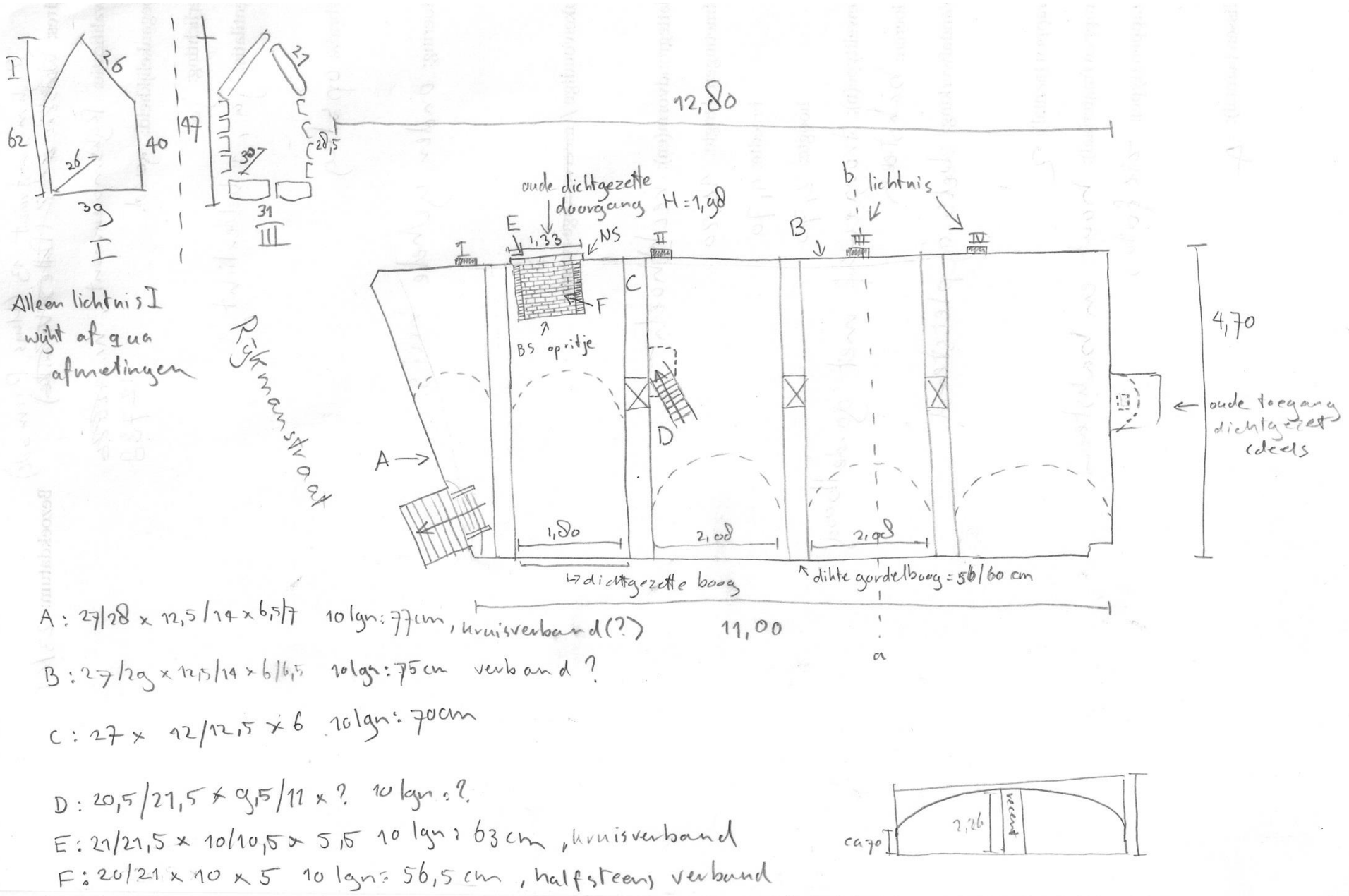
Overige elementen:	vóór de dichtgemetselde doorgang bevindt zich een kleine helling, als ware het makkelijker zaken over de drempel te krijgen of ivm een niveauverschil in de aangrenzende kelder. Daar recht tegenover is nog een dichtgezette segmentboog in het muurwerk zichtbaar.

Opmerkingen: drie van de vier gordelbogen worden in het midden gestut door meer recente pilaren. Gelet op de plaatsing van de lichtnissen ten opzichte van de gordelbogen, is het mogelijk dat de kelder pas later is voorzien van troggewelven en gordelbogen.

Baksteenformaten (voor locatie zie schets):

Zijwanden	(B):	27/29 x 12,5/14 x 6/6,5; 10 lgn: 75 cm
Kopgevel	(A):	27/28 x 12,5/14 x 6,5/7; 10 lgn: 77cm; kruisverband (?)
Gordelboog	(C):	27 x 12/12,5 x 6; 10 lgn: 70 cm
Dichtzettingen	(E):	21/21,5 x 10/10,5 x 5,5; 10 lgn: 63 cm; kruisverband
Vloer	(D):	20,5/21,5 x 9,5/11 x ??
	(F):	20/21 x 10 x 5; 10 lgn: 56,5 cm; halfsteens verband

Natuursteen: Onder bij scharnierpunt oude doorgang naastgelegen kelder



Plategrond van de kelder onder Rijkmanstraat 13 met de straatzijde links. De lichtnissen bevinden zich op verschillende afstanden ten opzichte van de gordelbogen, dit kan erop wijzen dat de gordelbogen later pas zijn aangebracht.

Overzichtsfoto richting de achterzijde

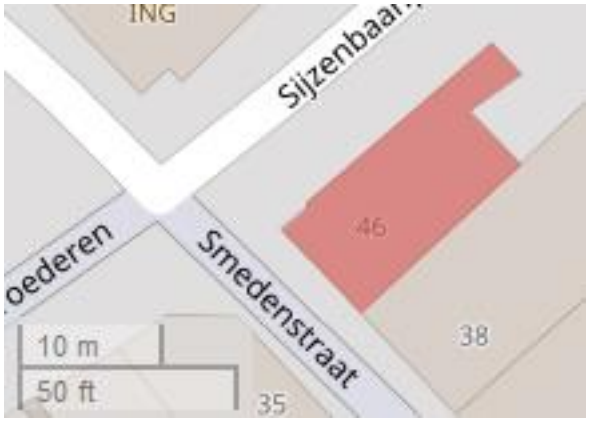
Troggewelven met gordelboog en lichtnissen met keperboog

Dichtgezette doorgang naar een voormalige naastgelegen kelder

Bovenste scharnierpunt naast de dichtgezette doorgang, rustend op een blok natuursteen

Een dichtgezette segmentboog?

D29



Voor- en zijgevel Smedenstraat 46

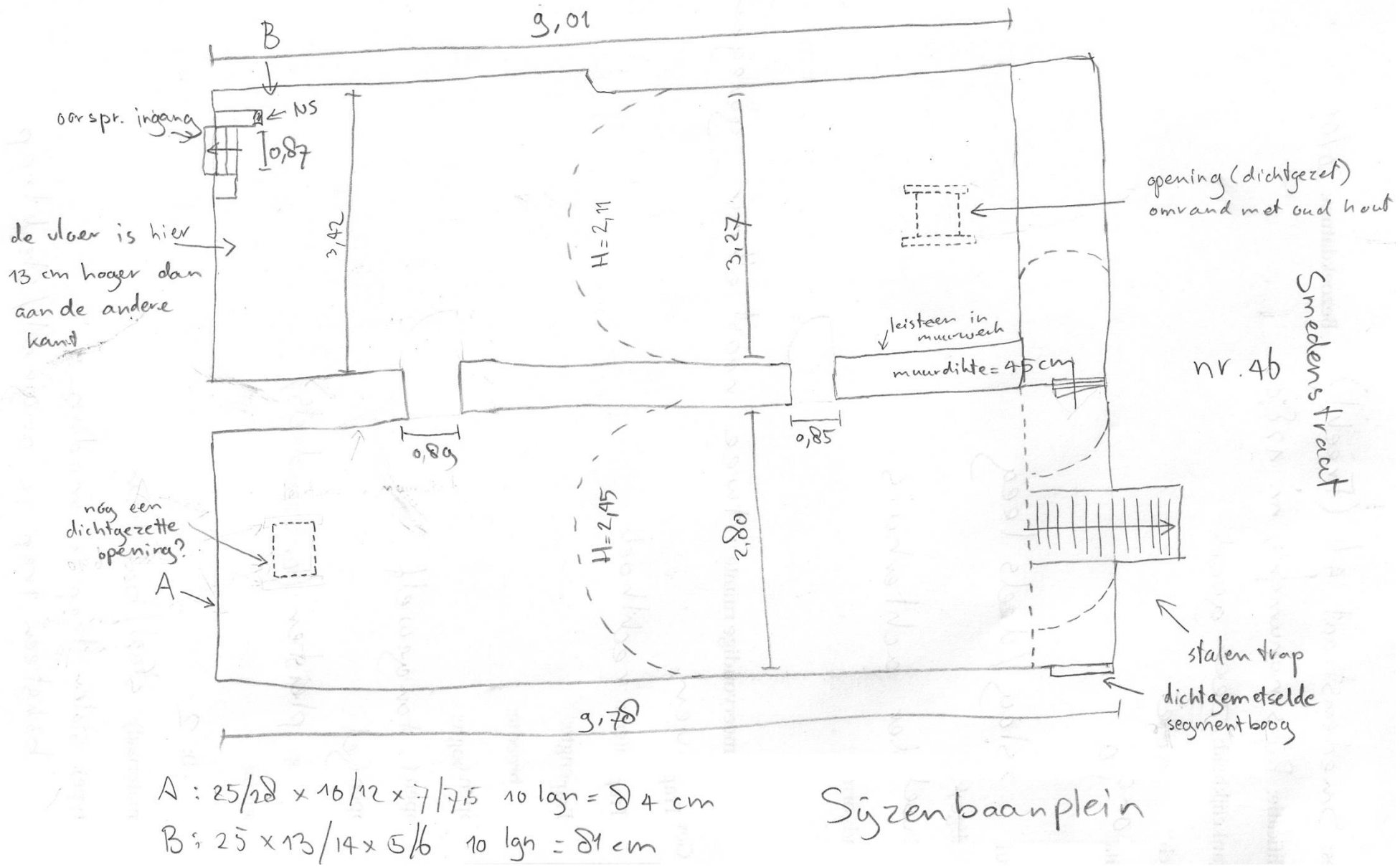
Bezoekdatum:	20/01/2017
Adres:	Smedenstraat 46
Kwalificatie:	Rijksmonument, nr. 12805
Toegankelijkheid:	goed
Verlichting:	nee
Ventilatie:	ja
Gebruik:	opslag / leeg
Situering:	onder achterhuis

Een meervoudige ruimte die uit twee naast elkaar gelegen tongewelven bestaat

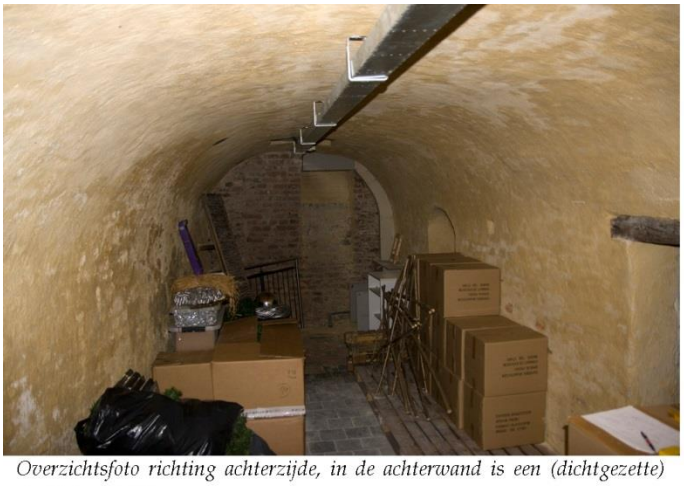
Plattegrondvorm(en):		rechthoek
Afmetingen (in m):		
	lengte:	9,78
	breedte:	6,52
	hoogte:	2,11/2,45

Gewelftype(n):	tongewelf
Vloeren:	tegels
Wandafwerking:	grotendeels gepleisterd

Trappen:	vanuit de winkel is er 1 inpandige, moderne stalen trap aanweizg, achterin de tweede kelder bevindt zich de aanzet van een oude bakstenen trap naar het achtererf (?).
Doorgangen:	mogelijk 1, onder de moderne trap bevindt zich een dichtgemetselde segmentboog in de richting van het Sijzenbaanplein.
Stortkokers/kelderlicht:	2, één in de achterwand, een ander soort van ‘luik’ bevind zich in het plafond in het midden van een van de ruimtes (zie schets), deze dichtgezette doorgang is afgewerkt met hout
Natuursteen:	in een van de muren is leisteen verwerkt (egaliseren?)



Plattegrond van de kelders onder Smedenstraat 46 met de straatzijde rechts (Smedenstraat) en onder (Sijzenbaanplein).



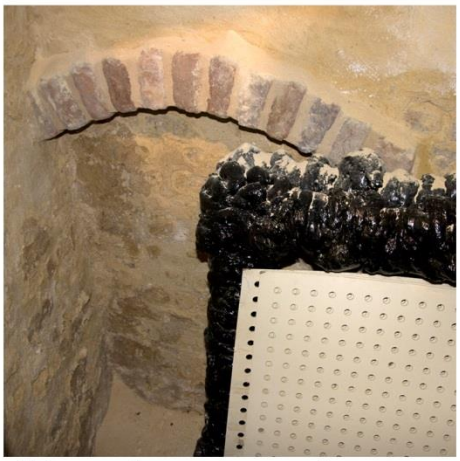
Overzichtsfoto richting achterzijde, in de achterwand is een (dichtgezette) stortkoker zichtbaar

Overzichtsfoto richting achterzijde, in de achterwand is de oude doorgang met trap zichtbaar

Doorgang naar naastgelegen kelder, in het muurwerk zijn leisteenfragmenten zichtbaar

Oude toegang met trap in de achterwand

Een voormalig luik met houten omlijsting?



Dichtgezette doorgang met segmentboog

D11

Voorzijde Brink 93

Bezoekdatum:	21/01/2017
Adres:	Spijkerboorsteeg 24
Toegankelijkheid:	goed
Verlichting:	ja
Ventilatie:	ja
Gebruik:	kantoor en opslag
Situering:	onder het gehele pand, maar niet onder nr. 24 (zie opmerkingen)

De kelder is een enkelvoudige ruimte, maar mogelijk oorspronkelijk waren het hier twee kelders.

Plattegrondvorm(en):	langwerpig
Afmetingen (in m):	
lengte:	31,55
breedte:	5,27/6,0
hoogte:	2,25/2,44

Gewelftype(n):	tongewelf
Vloeren:	beton / baksteen
Wandafwerking:	pleister

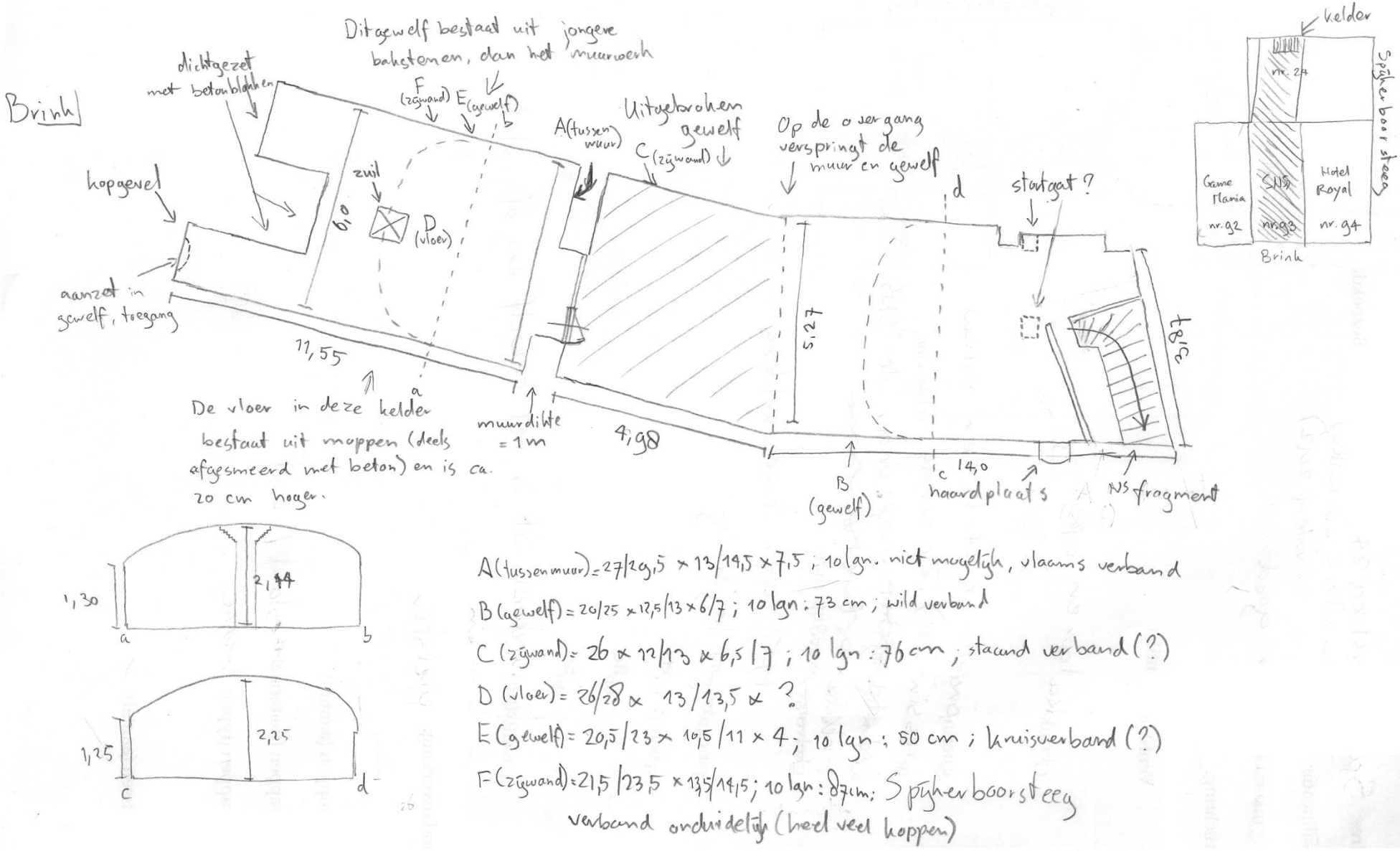
Trappen: een moderne inpandige trap van staal

Stortkokers/kelderlicht: 2 stortkokers, beide dichtgezet

Overige elementen: Aan de Brink zijde is aan de linkerkant de aanzet van een oude toegang nog zichtbaar in het gewelf. In het andere deel is een vermoedelijke haardplaats aanwezig.

Opmerkingen: Dit adres bestaat pas sinds 2012, in OpenStreetMap is nog te zien hoe het perceel samen met Brink 93 eigenlijk uit één geheel bestaat. Dit is ook duidelijk zichtbaar in de kelder. Deze staat haaks op Spijkerboorsteeg 24 en loopt helemaal onder het pand Brink 93 door, tot aan de Brink.
Halverwege is het tongewelf weggebroken en aan de Brink zijde bevindt zich in het midden een gemetselde ruimte (gipsblokken), die bestemd zou zijn geweest voor de bankkluis.

Natuursteen: er is een blok natuursteen verwerkt in de wand (zie schets en foto's)



Plattegrond van de kelder behorende tot Spijkerboorsteeg 24, maar liggende onder Brink 39, met de straatzijde links (Brink) en onder (Spijkerboorsteeg). Rechtsboven een bovenaanzicht van de situering van de kelder.

Overzichtsfoto achterste kelder richting straatzijde (Brink)

Overzichtsfoto voorste kelder richting straat (Brink)

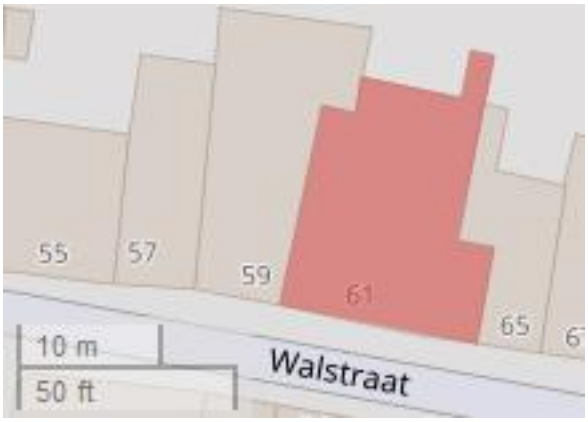
Weggebroken tongewelf

Verschillende baksteenformaten in het muurwerk, de bovenste helft is het gewelf, de onderste helft de zijmuur

Mogelijk een oude haardplaats?

Detailfoto natuurstenen fragment

D30



Bezoekdatum:	24/01/2017
Adres:	Walstraat 61 (Dille & Kamille)
Kwalificatie:	Rijksmonument, nr. 12822
Toegankelijkheid:	goed
Verlichting:	ja
Ventilatie:	nee
Gebruik:	opslag
Situering:	onder voorhuis

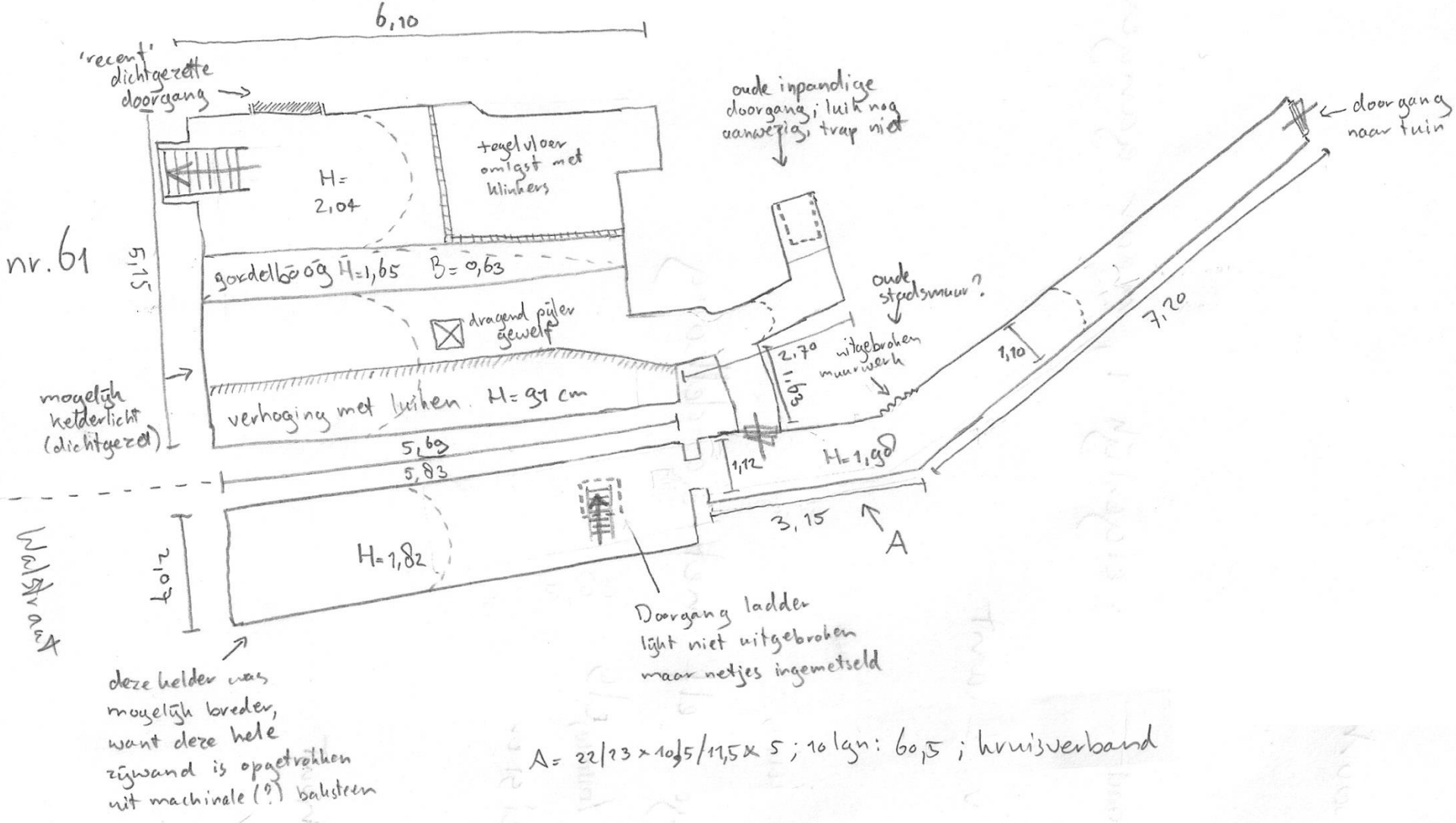
De kelder bestaat uit één oorspronkelijke kelder, maar is via gangen verbonden met een tweede kelder, een inpandige toegang en de achtertuin.

Plattegrondvorm(en):	vierkant
Afmetingen (in m):	
lengte:	6,10
breedte:	5,15
hoogte:	2,04

Gewelftype(n):	troggewelf met gordelboog
Vloeren:	beton / tegels
Wandafwerking:	pleister

Trappen (aantal):	2
Trappen (materiaal):	hout

Doorgangen :	Twee; één is een dichtgezette doorgang naar de kelder onder Walstraat 61, de ander is een gang naar de kleine kelder (zie schets), die tot wél tot hetzelfde adres behoort.
Stortkokers/kelderlicht:	Mogelijk 1, maar dichtgezet
Opmerkingen:	Door de depressie van de oude stadsgracht aan de achterzijde van de Walstraat, bevindt de kelder zich aan de voorzijde onder het maaiveld, maar aan de achterzijde op gelijke hoogte met het maaiveld.
Soort baksteen:	machinaal / handgevormd

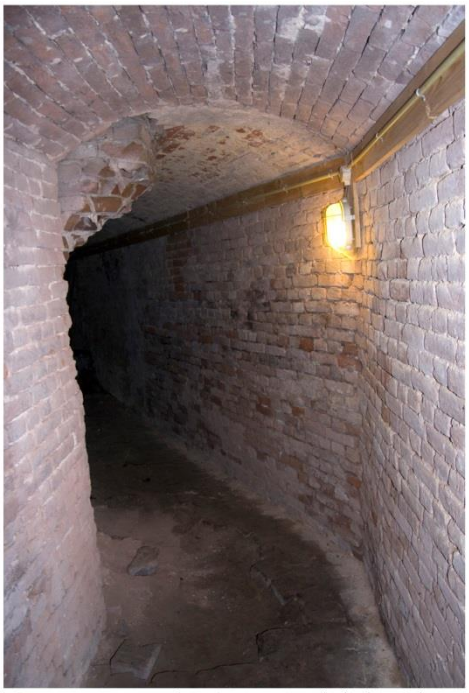


Plattegrond van de kelder onder Walstraat 61 met de straatzijde links. De lange gang eindigd op maaiveldhoogte in de achtertuin. In de knik in de gang bevinden zich restanten van de stadsmuur.

Overzichtsfoto van de grote kelder vanaf de straatkant genomen, zichtbaar zijn de troggewelven en gordelboog en de pekelbakken uiterst rechts

Verschillende fasen muurwerk in de kleine kelder

Korte gang naar de voormalige inpandige toegang (rechtdoor), de bijkelder en de gang richting de tuin (rechts)



Lange gang naar de tuin met aan de linkerzijde restanten van de doorgebroken stadsmuur