

KARL KIEM

WEIGH HOUSE

A BUILDING TYPE
OF THE DUTCH GOLDEN CENTURY



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Foreword to the English edition

This is a translation of the German-language book that was published in 2009. A review of the literature that has appeared about Dutch weigh houses since the completion of the original manuscript in 1996 reveals that no significant research has been published on this subject to warrant a revision or require additions to the German text. Today, in German-speaking nations and in Holland, the findings presented here can be seen as the architectural-historical standard work on this subject and as a model for architectural typological research.

For this reason the English language version of this study is made available to an international audience. Certainly, after the identification, documentation, and analysis of the architectural typology of the weigh house, this topic can be seen as an architectural achievement on par with the highly valued painting produced concurrently during the so called Dutch “Golden Century”. The result of this exhaustive investigation is of global interest.

As is so often the case, my heartfelt gratitude extends to Bernd Kreutz, Petra Lohmann and Ann-Christin Stolz for their assistance in the preparation of this publication.

Berlin, August 2016

Karl Kiem

Foreword

This book investigates a unique architectural typology, the weigh house. Until now, standard histories of architecture have not considered the development and proliferation of the weigh house. This kind of building can henceforth be viewed as an independent, clearly defined, architectural typology. The weigh house was found almost exclusively in Holland, where it emerged during the period of the so-called “Golden Century” and proliferated mainly during the seventeenth and eighteenth centuries.

As functional requirements largely dictated the planning and construction of the weigh houses, it was imperative for this study to investigate the manner in which these buildings were used and where they were located in a city. First and foremost, this meant using the methods of historical building research and historical metrology to document and to analyze these structures. The measured drawings that were prepared for this study therefore placed a priority on documenting technical details, such as the trolleys and sliding scales. The buildings were also examined in relation to their wider social and political context in order to understand how broader legal, economic, intellectual, and historical forces impacted their development. Only this methodical unity led to a convincing identification of the weigh house as a unique architectural typology.

For the most part, this publication is my habilitation [postdoctoral qualification dissertation]. The only significant change in the current form was the decision to eliminate the first chapter, which contains a thorough and fundamental discussion of architectural history methodology. This habilitation met the different national requirements at the two institutions where it was submitted and success-

fully defended: the University of Amsterdam and the Technical University of Hamburg-Harburg. During the course of this study, I received considerable support from a variety of sources. A number of archives, libraries, and municipal agencies generously permitted me access to documents and other relevant historical materials. My appreciation extends to both the Deutsche Forschungsgemeinschaft [German Research Foundation] for awarding me a research stipend and several additional grants, as well as to the referees and the additional supporters of my habilitation. I am especially indebted to my students, who, over the course of numerous campaigns, significantly contributed to the preparation of the measured drawings in this volume.

Goerd Peschken (Berlin) generously supported this study at a critical point in its development. For his uncompromising commitment to the freedom and independence of academic research, my heartfelt gratitude goes to Dittmar Machule (Hamburg), who oversaw the submission, refereeing, and defense of my habilitation at the Technical University of Hamburg-Harburg. He demonstrated his admirable and wide-ranging knowledge of architecture and urban history, archeological field research, and the history of technology, during this procedure. His unwavering fidelity to the principles of procedural fairness and correctness was always apparent.

Finally, I would like to extend my deepest appreciation to the doyen of Dutch architectural history, Coen Temminck Groll (Driebergen), for the steadfast encouragement, infectious enthusiasm, and critical insights, which he has generously bestowed upon me over the years. From him, I was able to learn, in a very special way, how intellectual curiosity can lead to a long and sometimes difficult path. In this instance, this path has led one to follow a carefully substantiated, scientific work and has also engendered true friendship.

Berlin, August 2009, for the German edition

Karl Kiem

Introduction

The weigh house, a unique architectural typology, was integral to Dutch culture throughout the seventeenth and eighteenth centuries. This typology is almost exclusively found in the provinces of Holland and Friesland. It is not surprising that the most famous painters of this period resided in these two provinces, as these territories formed the economic and cultural center of the Republic of the United Netherlands. The weigh house developed into an independent architectural typology during the so-called Golden Century. Generally speaking, the weigh house can be seen as the architectural equivalent of Rembrandt and Vermeer's artistic works.

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To understand the weigh house as a unique architectural typology, it is necessary to consider both form and construction. The fact that a building is popularly known as a weigh house does not mean that it precisely conforms to the requirements of this typology or even belongs to it. For this reason, a distinction will be made between the "so-called" weigh houses and the "mono-functional" weigh houses. A so-called weigh house did provide space for weighing, in addition to a number of other activities on its ground floor, yet its architectural design was not greatly impacted by the weighing function. In contrast, because weighing was the only activity that took place on the ground floor of a mono-functional weigh house, this building's design was carefully adapted to serve this function. In this study, only buildings that fulfill the definition of the monofunctional weigh house will be designated as weigh houses. In addition, the term weighing equipment will be used to describe the instruments utilized to measure weight. The building proper, a facility administered by a local municipality, will be identified as the weigh house.

The desire to undertake a study of the weigh house was inspired by the more or less sublime perception of the special architectural qualities of these buildings. For the most part, weigh houses are located on important public squares, dominate their surroundings, and, with their well-proportioned, natural stone facades, clearly set themselves apart from the neighboring brick buildings. The interiors of many Dutch weigh houses also retain an impressive array of small details, furnishings, and equipment, including their trolleys and scales.

Early on in this investigation it was apparent that the weigh houses were a fortuitous subject for further in-depth study. Even if one includes the ambitious, interdisciplinary research and exhibition project “Het Waagstuk”¹, no significant research concerning the development and the proliferation of this building type has been published since the early twentieth century. In the last few decades however, historians have made some progress, delivering new information about individual buildings that is based on written sources.

The initial phase of this investigation revealed that 90 buildings in the Netherlands were designated as weigh houses. To develop data for a comparative analysis, graphic reconstructions of the buildings that had been altered or demolished (in Antwerp, Alkmaar, Amsterdam, and Rotterdam) were produced. Due to the importance of the act of weighing for the development and proliferation of this type of structure, it was necessary to examine in detail the technical equipment and their means of functioning in the buildings that were found.

One of the first results of this comparative analysis revealed a large number of objects (71) that had a small number of shared physical features. This group included a variety of buildings, such as town halls, trade halls, churches, and dwellings, where the need to

1 “Het Waagstuk” is a Dutch wordplay, meaning both “the piece about weighing” and “the endeavor”. Cf. Slechte and Herweijer 1990.

accommodate weighing did not greatly impact the structures' design. These objects were eliminated from further consideration, as they could not contribute in any fundamental way to an understanding of the weigh house as a building typology. A discussion of the buildings in Deventer and Nijmegen, popularly known as weigh houses, will explain and clarify this approach.

In contrast to this group, there was a small number of buildings with shared physical features that remained. These structures not only possessed distinct physical characteristics to accommodate weighing but could be divided into several subgroups, each containing a number of consistent, homogenous features. After these buildings (19 objects) were examined more closely, it was possible to define the weigh house as an architectural typology consisting of four subtypes: the drive-through type, the tower type, the loggia type, and the synthesis type.

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This definition enabled a plausible explanation for the development and proliferation of the monofunctional weigh house as a unique architectural typology. Furthermore, it also became apparent that almost all the relevant buildings were located in the provinces of Holland and Friesland in the Republic of the United Netherlands (1581-1795). An additional distinction, that identified the individual weigh house prototypes along with their subtypes and variations, revealed that the primary architectural solutions were developed during the so called Dutch Golden Century (1585-1670).

When compared with buildings used for trade in England, France, Spain, Germany and Italy during the Age of Absolutism, the mono-functional weigh house typology most likely did not develop anywhere else in Europe. The weigh house in Estonian Narva may be the only exception. The only known reference to a weigh house in the architectural theory of this period — to the building in Amsterdam — provides another piece of evidence confirming the exclusive proliferation of this typology in the Republic of the United Netherlands.

→ 129 et
seqq.

Due to the abolishment of the staple right in the Republic of the United Netherlands the multifunctional, municipal trade hall of the Middle Ages, which contained storage areas and a public scale, became obsolete. Concurrently, the enormously profitable, innovative, and highly unique, techniques to increase the milk production of livestock were developed and implemented in the provinces of Holland and Friesland. Although the mass of grain could be easily determined using a measure of capacity, butter and cheese had to be weighed using a scale to ascertain their weight. A significant demand for facilities capable of weighing dairy products soon emerged in these two provinces. When milk production sufficiently increased to the point of requiring a building to contain two scales, the pre-conditions were met for the construction of a monofunctional weigh house.

The different kinds of dairy production in Holland and Friesland also provide an explanation for the development and proliferation of the four subtypes. Whereas milk was primarily processed into cheese in Holland, in Friesland it was mostly made into butter. As butter needed to be protected from the sun, it made sense to store and weigh this product in the interior of a building. For this reason, the drive-through type of the weigh house was built primarily in Friesland.

The importance of the Dutch's spectacular long distance trade has often been overestimated, as it was the nation's particularly intensive agricultural production that provided the foundation of their material prosperity throughout the seventeenth century. The construction and proliferation of the weigh houses clearly demonstrates this situation. The development of the weigh house, one of this society's many accomplishments, evinces the generally high level of innovation of the Dutch during this period. Details, such as the complex constructions created for the sliding scales, attest to the technological sophistication of this nation at this time.

Source material

The physical substance of the weigh houses that were investigated in this study is largely extant. In a few instances, the original building has been modified due to restoration work undertaken in the nineteenth century. As a rule, these procedures were only undertaken to preserve the exterior of a particular building and did not significantly alter its appearance.

Conversions carried out in the twentieth century, in contrast, greatly altered the original interiors. The remarkable survival of the almost completely intact weighing equipment in Alkmaar and Gouda can be credited to the appeal of these buildings as tourist attractions. The recent conversion of the Hoorn weigh house into a restaurant was a particularly unfortunate loss, however.² At this unique example, the smallest details of the interior furnishings and equipment had been completely preserved prior to the conversion.³

When the weighing halls were remodelled during the twentieth century, the scales — as well as the substructure that was used to hang the scales — were often left in their original position. It was therefore possible to draw ground floor plans that show the original placement of the essential weighing equipment for each building that was closely investigated for this study. In contrast, the additional equipment, including the handbarrows, weighing pans, and their means of suspension, among other items, that a weigh house required, could only be described in a more general manner. As many of these buildings continue to be used for a variety of purposes, it was not always possible to undertake a thorough examination of their supporting structure and their construction details for this study.⁴

2 Debets 1991, 17.

3 Cf. Kiem 1987 (b).

4 Serious architectural historical research investigating weigh houses on a local level is still rare. Cf. below, page 339 et seqq.

Very little is known about the structures standing on a site prior to the erection of a weigh house. Archeological investigations of these earlier buildings are few in number and have rarely revealed new information concerning the development of the weigh house as an architectural typology. Typically, the location of a weigh house that preceded the current one cannot be determined. When a location can be ascertained, it is usually not possible to determine additional information, such as the appearance of the structure.⁵

Extensive written source material supplements the exceptionally well preserved, original building substance of the Dutch weigh houses dating from the seventeenth and eighteenth centuries. These written materials exhaustively document the decisions and financial accounts of the respective municipalities and include information concerning the activities related to the erection of many of the buildings that were closely investigated for this study. In addition, chroniclers in many towns recorded events taking place in conjunction with the construction of the weigh houses and recounted the history of these buildings. In contrast, archival records from earlier periods — that is, prior to the erection of a weigh house on a particular site — are scarce. For the most part, such source material provides little information relevant to the architectural history of the weigh houses that are under consideration here.

In a few instances, when an important weigh house was demolished during the nineteenth century, a sufficient number of drawings and other graphic representations survive to enable a plausible reconstruction of the building. “*There is not a landscape from the eighteenth century,*” wrote Koert van der Horst, “*of which we have retained such a clear image in such detail, as that from the northern part of Holland. In many cases, three generations of artists exactly and reliably depicted all the cities and villages with their important buildings, from the generation of C. Pronk in 1730, J. de Beijer in 1760 and C. Andriessen in 1790 ... (it is) the most*

5 Cf., for example, Sarfatij 1994.

extensive production that has ever been undertaken in the history of representation."⁶ A comparison with the documentation depicting the weigh house in Antwerp (1547-1873) reinforces this observation: not a single reliable detailed image of the original exterior of this building is known.

Overview of the current state of research

Dutch architecture from the seventeenth and eighteenth centuries has been considered somewhat second rate in comparison to contemporary Italian examples, which were directly based on academic precedents from Antiquity. To a certain extent, this appraisal can be traced to the relatively small number of feudal and sacred building projects that were carried out in the Republic of the United Netherlands. Indeed, there are few interpretations that view the more profane Dutch architecture of this period as both a contrasting position to the feudal and absolutist dominated planning found in the rest of western Europe as well as an expression of a distinct national identity and local meaning.

Scholars additionally assume that architecture occupied a minor position in seventeenth and eighteenth century Dutch culture. Henry Russell Hitchcock formulated a typical hierarchy for this established cliché: "*... the genius of the greatest painters can hardly be compared with the admittedly lower level of artistic achievement of even the most talented architect-builders of this period in the north ...*"⁷. Most recently, historians such as Koen Ottenheim, who investigated the "great" Dutch architects of the seventeenth century — Philips Vingboons, Pieter Post, and Jacob von Campen — have partially refuted this assumption.

6 Quoted in Günter 1991, 259.

7 Hitchcock 1978, 12.

Compared with the architectural production in southern Europe of the seventeenth and eighteenth centuries, extensive research has not been carried out on the Dutch architecture of this period.⁸ When this study commenced, the state of research regarding a complete overview of Dutch public buildings of the seventeenth and eighteenth centuries was largely unchanged from that of the early twentieth century: the exteriors of a few representative buildings were described one after another — but not much more.⁹ This was also typical for the research regarding the weigh houses.

Attempts have been made recently to decipher the phenomenon of the weigh house. Local Rotterdam researcher P. den Braber initiated the most important effort. Over the course of a decade, he collected written materials and visual documentation about these buildings that filled nine thick notebooks. He died in 1983 while beginning to formulate a text based on this material. For subsequent scholars, his legacy, with its abundance of facts but devoid of any kind of analysis, had become more of a curse than a blessing. In 1990, den Braber's collection inspired the catalogue entry by L. Berrevoets for the exhibition "Het waagstuk; wegen en waagebouwen in Nederland" (The piece about weighing / The endeavor: weighing and weigh houses in the Netherlands). This text, consisting of an alphabetically organized list and descriptions of the weigh houses in Holland, did not include sources and did not supplement the previously known information about the individual buildings. Despite the pronouncement found in the catalogue's foreword, this entry provided neither an analysis of — nor an insightful approach to — the complex development of the weigh house as a unique architectural typology.¹⁰

8 Cf. Hitchcock 1978, XI.

9 M. A. Post, who organized materials about the weigh houses for a popular, correspondence course in architectural history, came to the same conclusion. Cf. Post (not dated).

10 Slechte and Herweijer 1990, 8.

At roughly the same time, J. R. Leegstra wrote a master's thesis in art history on the weigh houses in the province of North Holland. P. den Brabers' legacy also informed this effort.¹¹ Although J. R. Leegstra's investigation was limited to the weigh houses in the province of North Holland, it did not include graphic analyses to examine the functional differences of these buildings. Whereas this effort merits recognition, it could not serve as a basis for this study.¹²

Considering the state of research when this study commenced, it was necessary to create an adequate database. Reconstruction drawings of all relevant demolished weigh houses were therefore produced to this end. Furthermore, it was necessary to raise the uneven scope and quality of the existing architectural drawings to a uniformly high standard by making supplemental measurements and with corrections taken from the existing building substance. On the one hand, these improved drawings enabled important findings to be obtained, while on the other, they ensured that an informative comparative analysis of the buildings could be carried out.¹³

Because the manner in which the buildings accommodated the process of weighing emerged as a key criterion to determine the characteristics of the weigh house typology at an early point in this investigation, the measured drawings placed great emphasis upon the exemplary documentation of the weighing mechanisms and equipment. No noteworthy graphic documentations of these objects, which straddle the disciplines of architectural history and

11 The author extends his deepest gratitude to J. R. Leegstra (Groningen) for supplying him with the notebooks that were previously separated from the graphic material collected by P. den Braber.

12 Due to the inadequate typological differentiation between the weigh house and the trade hall, the statistics prepared by J. R. Leegstra are of no use for this study. Cf. Leegstra 1991.

13 The author wanted to make exact measured drawings of all the buildings that are investigated in detail here. Such an undertaking would have gone beyond the time allotted for this study and the effort required would not have justified the amount of new information attained.

historical metrology, or investigations of their respective buildings had been previously undertaken.

In the aforementioned exhibition catalogue, G. M. M. Houben made an initial attempt to describe the large, non-sliding scales found in the weigh houses.¹⁴ The related text is limited to a verbal analyses, however.

A comparatively favorable situation regarding written sources was encountered in the architectural historical research concerning the weigh houses. Single, and sometimes multiple, analyses of the municipal invoices and decisions pertaining to all the important weigh houses already existed. Random searches revealed that the renewed examination of all of these written sources would not result in any new insights.¹⁵ However not one distinct and coherent description existed to explain the legal status of the weigh house as a public institution or depict the building's functional routine.

Scope of this study

The research for this study initially focused on the buildings located in the territory of the Republic of the United Netherlands. As the work progressed, the area under consideration was further restricted, without compromising the outcome of this study, to the provinces of Holland and Friesland. At the same time, it also proved necessary to examine the weigh house in Antwerp, which is situated in the southern Netherlands. Although later development of the weigh house occurred only in the northern provinces of the Republic of the United Netherlands, the origin of this typology can be traced to this city.

14 Slechte and Herweijer 1990.

15 Cf. Antwerpen, Hoorn, and Workum.

The weigh houses in Deventer and Nijmegen were also examined in detail although they were not located within the territorial limits of this study. A discussion of these buildings clearly illustrates the difference between the “so-called” and the “monofunctional” weigh houses. For a better understanding of these geographical and typological restrictions, a catalogue of those buildings used for weighing that are located in the Republic of the United Netherlands but that were not investigated in detail is included at the end of the study.

The few weigh houses constructed in the nineteenth century were not considered. This exclusion should not be interpreted as a disregard for the architecture of this period. Rather, this omission is related to the administrative reforms that were carried out in Holland due to the influence of the French Revolution. After 1816 at the latest, these reforms, which instituted a centralized form of government and eliminated direct taxes, greatly diminished the importance of the weigh houses. The dismantling of the weigh house in Amsterdam in 1808 signaled the end of the development of this building typology.¹⁶

Elisabeth Neurdenburg’s remarks concerning her study of seventeenth century sculpture are pertinent when considering the buildings that have been excluded from this study: “... *Er blijft dus nog wel wat over. Ik heb daar geen spijt van ... wanneer men eenmaal het bosch met zijn boomen kent, kan men gemakkelijk nieuwe boomsoorten aan zijn kennis toevoegen.*”¹⁷

16 Krans 1991, 201.

17 Neurdenburg 1948, 9: “*Nevertheless something still remains. I don’t worry about it ... when you have gotten to know the forest with its trees, it is possible to add new kinds of trees to one’s knowledge.*” (author’s translation).

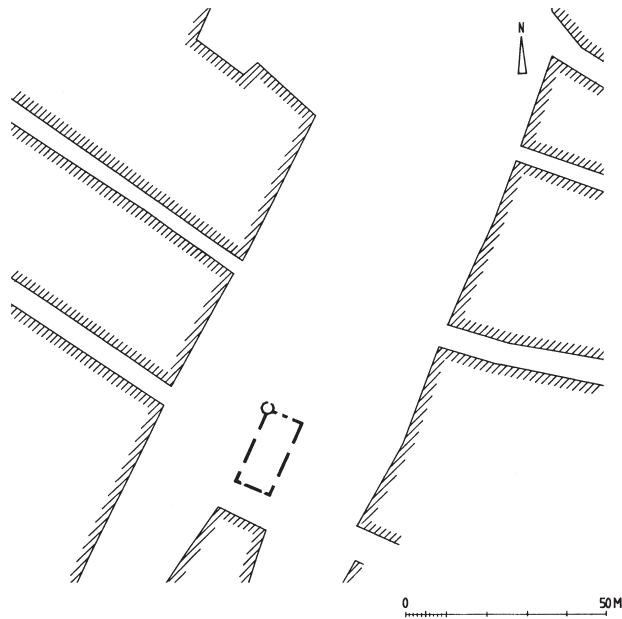
Multifunctional trade halls or the so-called weigh houses

Upon closer inspection, both of the so-called weigh houses in Deventer and Nijmegen contain large hall-like spaces that housed a variety of functions related to trade and public congregation. Weighing was only one of many services performed in these buildings, and distinct architectural provisions are not provided to accommodate this function. These attributes indicate that the so-called weigh houses in Deventer and Nijmegen actually belong to another building typology, namely the medieval trade hall. Trade halls are fundamentally different from the monofunctional weigh house, a distinction that will be explained later in the text.

Deventer, 1528: The typical trade hall from the Middle Ages

In describing the so-called Deventer weigh house in 1710, Frankfurt mayor Conrad von Uffenbach declared: *“I have never seen such a large and beautiful building for a weigh house.”*¹⁸ The location of the freestanding building on the Brink, the city’s large representative marketplace, heightened this impression. Situated on the square’s southern edge and in alignment with its long axis, this so-called weigh house occupied a generous site measuring 21.50 meters in length and 10 meters in width. Its three stories rise 14.40 meters from the street to the balustrade, a dimension that considerably

18 Houck 1893, 698.



1 So-called Deventer weigh house, reconstruction of the surrounding context before/around 1643

overshadowed the neighboring structures along the square. A steep, hipped roof further enhanced this building's imposing appearance.

The facade articulations of the so-called weigh house at Deventer's Brink marketplace are characteristic of those found on trade and assembly halls dating from the Middle Ages.¹⁹ The distinctive, eight-sided guerites placed on three of the building's

19 With the exception of the ground floor, the present day facade of the so-called Deventer weigh house resembles the original. This appearance is the result of a reconstruction carried out between 1917 and 1929. The municipal architect W. Uytenhoudt supervised this work. The exterior was reconstructed according to an image depicted in a 1665 painting by Jan A. Beerstraten. A bombardment damaged the stair tower in 1945, and the same architect from the reconstruction repaired the tower in 1947-48. Compare Uytenhoudt 1926, *passim*; Ter Kuile 1964.



2 So-called weigh house and market square (Brink) in Deventer, painting by Jan A. Beerstraten 1665

corners are crude citations of medieval defense architecture.²⁰ These details indicate the symbolic protection extended to the contents of the building²¹ and refer to the imperial lord of the town, who is physically represented by a statue of Emperor Charles V above the main entrance.²² The belfry-like, eight sided stair tower — another symbolic reference to medieval defense architecture — is found on the right side of the market facade. In contrast the clock, which is located on the front edge of the roof, proclaims the building's importance in a more generic manner.

20 Cf. Schröder 1914. The *guerites* were originally decorated with peaked Gothic helmets. The bell tower was also modernized during the Baroque period. Cf. Ter Kuile 1964, 19.

21 Cf. Meckseper 1982, 173.

22 Kronenberg 1916, 5.



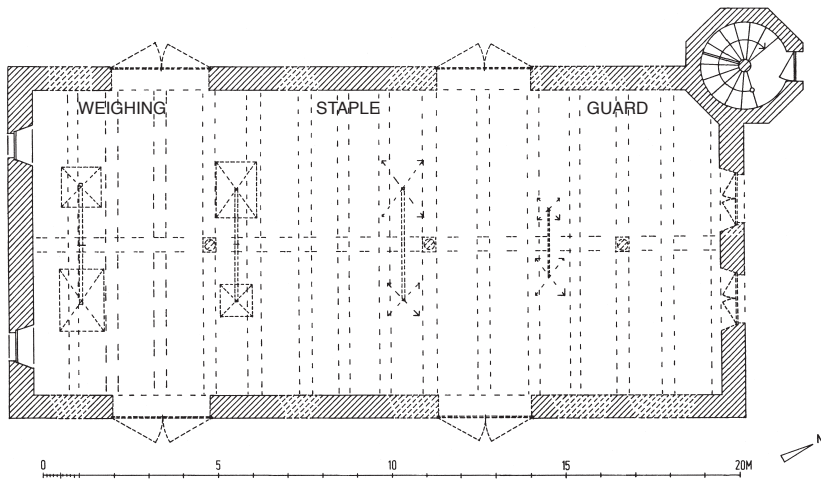
3 So-called Deventer weigh house from the south, photograph 1960

The facade's upper levels display a rich, late Gothic, surface structure. Whereas simple wall pillars support the lower blind arcade, pilasters accentuate the upper one. The surface decoration starts with the trefoil arch frieze over the ground floor and culminates in the late Gothic balustrade, which is articulated with pinnacles along its eaves. At the ground floor level, the two doorways — accentuated with fanlights and sandstone framing and located on the long sides of the building — provide the only noteworthy variety on the exterior.²³ The framework, which also covers the gables, only extends to the ground at the stair tower.

Although multiple remodeling efforts have eliminated almost all traces of weighing in the so-called Deventer weigh house, it is still possible to reconstruct the original floor plan. The original entryways on the long facade can be accurately located using building documentation, probably drawn up for the conversion of the building into a school, supplemented with information found in a painting by Jan A. Beerstraten dating from 1665.²⁴ The reconstructed positions of these openings correspond to the widening of the distance between the beams at these locations, from an average of 1 meter to approximately 1.29 meters. This increase was undertaken to relieve the arches over the entryways.

23 Two of the four entry doors had been blocked up in 1840. One entryway was filled in 1862, when the public weigh house was transferred to a new building on the Welle. The fourth was filled in 1873, when the building was converted for use as a secondary school. At this time the entire interior was dismantled, the wooden ceilings were replaced with plastered ceilings, and partition walls were installed. During the previously mentioned reconstruction of 1917-29, the changes to the windows were corrected and the original fenestration was reconstructed. Furthermore, during the reconstruction work in 1917-29, an exposed chimney was taken from the patrician house "The Twelve Apostels" and placed in the first upper level. Cf. Kronenberg 1916, *passim*; also Ter Kuile 1964, *passim*.

24 "Plattegrond van de Waag te Deventer; vóór het jaar 1862, naar authentieke gegevens". Scale 1/100 (no author, not dated), Community Archive Deventer, inventory no. 7.4.0.1/71.



4 So-called Deventer weigh house, reconstruction attempt of the ground floor plan

In 1616, chronicler Gualtherus Sylvanus observed wagons and carts being driven through the entryways into the so-called weigh house, merchandise being placed on the weighing pans and then emerging from the other side of the building.²⁵ According to this observation, one can assume that a scale was placed along each side of the two reconstructed passageways, totaling, at most, four scales. In 1616, building documents reveal the building possessed another two entryways on the front facade, in the spot where the freestanding stair, with the loggia below and the balcony above it, were subsequently constructed in 1643.²⁶

The reconstructed ground floor plan reveals that this level is considerably wider than would have been necessary to operate the scales for weighing. Hence it can be assumed that booths

²⁵ Kronenberg 1916, 3.

²⁶ The written sources available additionally lead us to assume that a provisional wood structure was located here before the construction of the stone porch in 1643. This fact should not be projected backwards to the time of the building's origin. Cf. Herweijer 1994, 61.

with traders selling goods for everyday needs, such as bread and meat, were placed along the sides of the building. Furthermore, the so-called Deventer weigh house was additionally simply too long to accommodate the scales for weighing exclusively. If the fact that the four scales for weighing were rarely needed at the same time is kept in mind, then the ground floor could be used for another purpose if the weighing pans were taken away when not in use. Considering this arrangement, the weigh house took up roughly one third of the total floor area, and the rest of the large, open space could be used as a multifunctional trade hall. Even as late as 1929, Camille Enlart noted the more complex use of this space: *“à Deventer, le poids public ... c’était simplement une partie de la halle qui abritait la balance publique et les mesures de contenance officielles.”*²⁷

The so-called Deventer weigh house also has a cellar. Its massive, flat, barrel vaults rest on six transverse arches that are supported at their mid-point by sandstone columns. A winding staircase, with a radius of 1.10 meters, leads to the first floor. Goods were probably carried into the cellar through a well, located on the building’s west side.²⁸ Because the cellar could be heated, a wine hall may have been located in this space. While a cellar is not necessary for a weigh house, wine halls were often found in the cellars of medieval trade halls.

The first upper story of the so-called Deventer weigh house was originally used as a representative assembly room.²⁹ The city guards may have used the first and second floors to store their equipment

27 Apparently Camille Enlart (1929, 372) was also aware of the existence of measures of capacity in the so-called Deventer weigh house.

28 The cellar well was most likely the small addition with a shed roof placed between the two entryways. It was depicted in the previously mentioned painting from Jan A. Beerstraten.

29 One should not be surprised by this assumption, as in 1549 — in addition to the celebrations held during the 16th century in the so-called Deventer weigh house — the obeisance of the Estate of Overijssel to Emperor Charles V took place in this — so-called weigh house (Ter Kuile 1964, 19). It was not unusual for a trade hall to contain a large, representative assembly room that occupied the entire floor of

and for celebrations and convivial gatherings.³⁰ In addition, both upper stories were temporarily partitioned into individual storage areas that were probably rented out to merchants during the annual trade fairs.³¹

Deventer also demonstrated a functional and architectural differentiation of its civic institutions with the existence of the trade hall on the Brink. Following the appropriation of the cloth hall (between 1482 and 1551),³² the town hall, located next to the Great Church in the city's old core, gradually developed into an administrative center. During the fourteenth century, the city's trade was transferred to the newly incorporated market square, where the so-called weigh house eventually came to be. After the abolition of the domestic staple right³³ in the Dutch republic, it was possible for institutions such as trade halls to house more representative functions. This probably led to the addition of a loggia in 1643, a detail that many town halls acquired for the announcement of public proclamations. As a result of this change of functions, the architecture of Deventer's town hall remains, to this day, fairly modest.

If the written sources, the building's spatial and functional organization, and the reconstructed floor plans are considered, then the so-called weigh house in Deventer is unmistakably a traditional, multifunctional trade hall of the Middle Ages. In addition, the architectural characteristics of this building are similar to those found in a number of town and trade halls that, as a rule, also have public

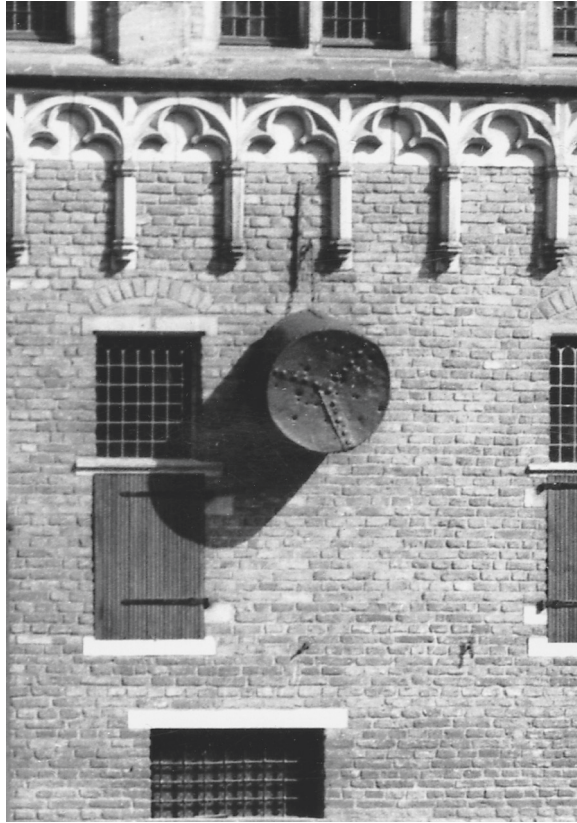
a building. For example, the election of a pope was conducted during a meeting of the Council of Constance in 1414-18 in the local trade hall (after 1388) (Nagel 1971, 138). In addition, the Emperor was received four times between 1474 and 1520 in the upper floor of the Cologne's Gürzenich (1441-47) (Meckseper 1982, 199).

30 The volume of trade, and with it the wealth of the city of Deventer, reached a pinnacle at the end of the 15th and the beginning of the 16th centuries. Cf. Ter Kuile 1964, 4.

31 Kronenberg 1916, 3.

32 Ter Kuile 1964, 11.

33 Cf. below, page 213 et seq. and page 277 et seq.



5 Measure of capacity, commonly known as the “forger’s pot”, found on the western side of the so-called Deventer weigh house, photograph 1958

scales located on their ground floor. This is typical for cities such as Melsungen³⁴ (Germany; 1555-56) or Geraardsbergen (Belgium; end of the fourteenth to the beginning of the fifteenth century). These buildings resembled one another, and their more or less representative character reflected the importance of their respective cities. In this regard and as the main gateway to the province of Overijssel in the beginning of the sixteenth century, Deventer could

34 Fenner 1987.

certainly make some claims, although it was clearly outmatched by the large mercantile cities of Bruges and Leuven. In contrast, the so-called weigh house in Deventer was fundamentally different from the monofunctional weigh houses that arose in Holland during the seventeenth and eighteenth centuries.

The mistaken identification of the trade hall on the Brink in Deventer as being the "*oldest and most beautiful weigh house in the Netherlands*"³⁵ can be explained, first and foremost, by the incorrect and exclusively backward-looking interpretations of the building's diverse political and economic origins found in the written sources.³⁶ The resulting explanations verge on the comical. For example, the measure of capacity found on the building's west side, a device typically associated with a trade hall, was identified as an instrument used to tar and feather forgers.³⁷

35 Stenvert 1985, 22.

36 Due to the establishment of the independent state of the Northern Netherlands, Deventer lost its regional primacy as a trade city that it had enjoyed at the time of the construction of the so-called weigh house on the Brink. After the defeat of Antwerp in 1585, the city of Deventer increasingly became dependent upon Amsterdam. Beginning in the seventeenth century, Deventer and its surrounding countryside further declined as the main trading center of Overijssel. With this loss of prestige, a change in the function of the trade hall on the Brink must have also occurred, and the building was no longer needed to the same extent for market functions. With the intensification of the centralization of the nation states in the 19th century, the building was removed from its earlier regional context and was exclusively identified with the development in Holland. C. H. Peters (in Brugmans and Peters 1909-11, 283), for example, determined that the so-called Deventer weigh house does not look like a weigh house, and then in the next breath described the building as if it actually was a monofunctional Dutch weigh house. The same can be said of other relevant standard works on Dutch architectural history.

37 A similar fairy tale can be found concerning the so-called weigh house in Osnabrück, which should also be considered a trade hall. Cf. Fink and Siebern 1907, 236. The trade hall in Montpazier (France) has retained its iron measures of capacity completely intact in their original positions. Cf. below, page 241 et seq.

Alkmaar, 1582: The conversion of a Holy Spirit Hospital (around or after 1341)

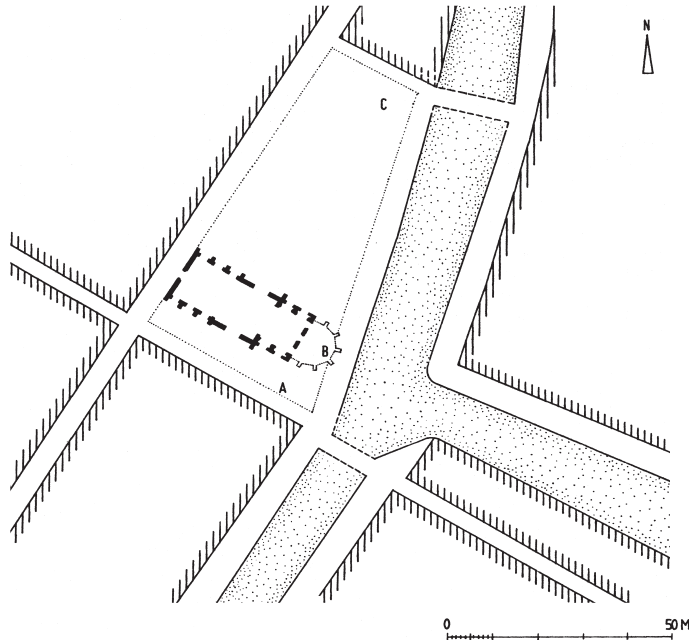
The so-called Alkmaar weigh house came into being as a result of the conversion of a medieval hospital into a trade hall.³⁸ The existing medieval building substance on this site in Alkmaar was so far considered as the church for the Holy Spirit Hospital. This church was to have possessed a three-bay chancel with a 5/10 termination to the east, a square crossing in the middle, and a nave to the west.³⁹ Rooms for the sick were assumed to have been in a separate adjacent area located to the north of the aforementioned church, where the building substance was demolished little by little to build a cheese market after 1605. According to written sources, the erection of the Holy Spirit Hospital probably took place between 1341 and 1391.⁴⁰

This description of the medieval Holy Spirit Hospital is nevertheless somewhat misleading. The typical hospital generally required an intimate connection between the church and the hall for the sick. These two functions are often placed along an axis, with the sacred space located to the east and the room for the sick lying to the west. In many instances — with the increasing expansion of the hospitals' lucrative practice of expanding facilities for prebendaries towards

38 The earlier historical portrayals of the history of the so-called Alkmaar weigh house can be traced to C. W. Bruinvis' 1888 publication, or rather the expanded version from 1889. The author, Alkmaar's first archivist, critically reconsidered the accounts by the chroniclers C. van der Woude (1645) and G. Boomkamp (1747). C. W. Bruinvis' evaluation of the written documents is largely plausible. His conclusions concerning the building process do not always coincide with the typological characteristics and the actual building substance, however. Accompanying his 1977 excavation of the choir, E. H. P. Cordfunke (1978) produced a revised and a critical analysis of the written documentation. For the most part, all the other authors uncritically accepted the explanations provided by C. W. Bruinvis.

39 Cf. Cordfunke 1978, 151. The aforementioned excavation from 1977 has definitively proven the existence of the chancel's three bays. The older reconstruction attempts all assumed two bays.

40 Cordfunke 1978, 154.

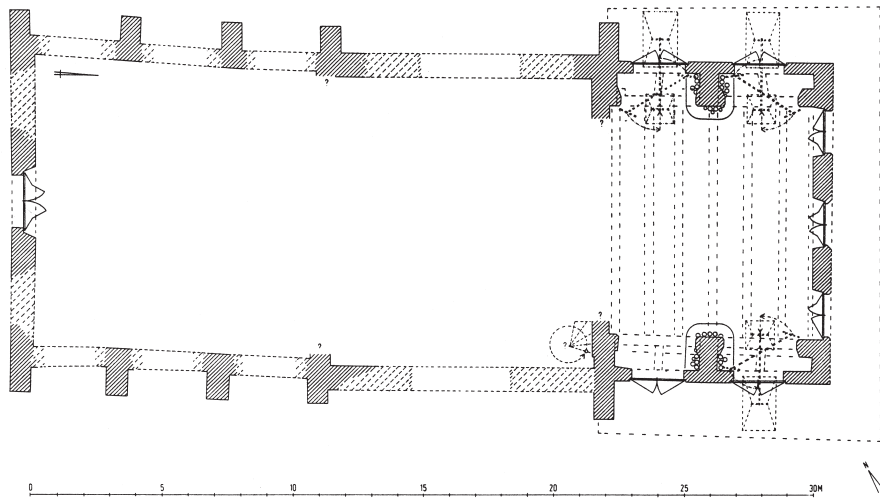


6 So-called Alkmaar weigh house, reconstruction of the context in 1582: A = previously demolished houses, B = chancel, C = the square, created on the site of demolished houses between 1605 and the beginning of the 20th century

the end of the Middle Ages — the room for the sick was extended towards the west to accommodate an almshouse.⁴¹ The sacred and the profane areas are nonetheless normally placed under one roof in the medieval hospital. Due to their external appearance, these two distinct areas are often wrongly identified as being used exclusively for ecclesiastical purposes.⁴²

41 Among others: Spangenberg, founded in 1341; Erfurt 1385 and Braunau, founded in 1417. Cf. Craemer 1963; also Leistikow 1967. A definitive study of the Dutch hospital does not exist. Querido (1965) completed only a peripheral investigation of medieval hospitals. In contrast, Meta Prins-Schimmel's study (1988, a) demonstrates that the Dutch hospitals can be included in the western European development.

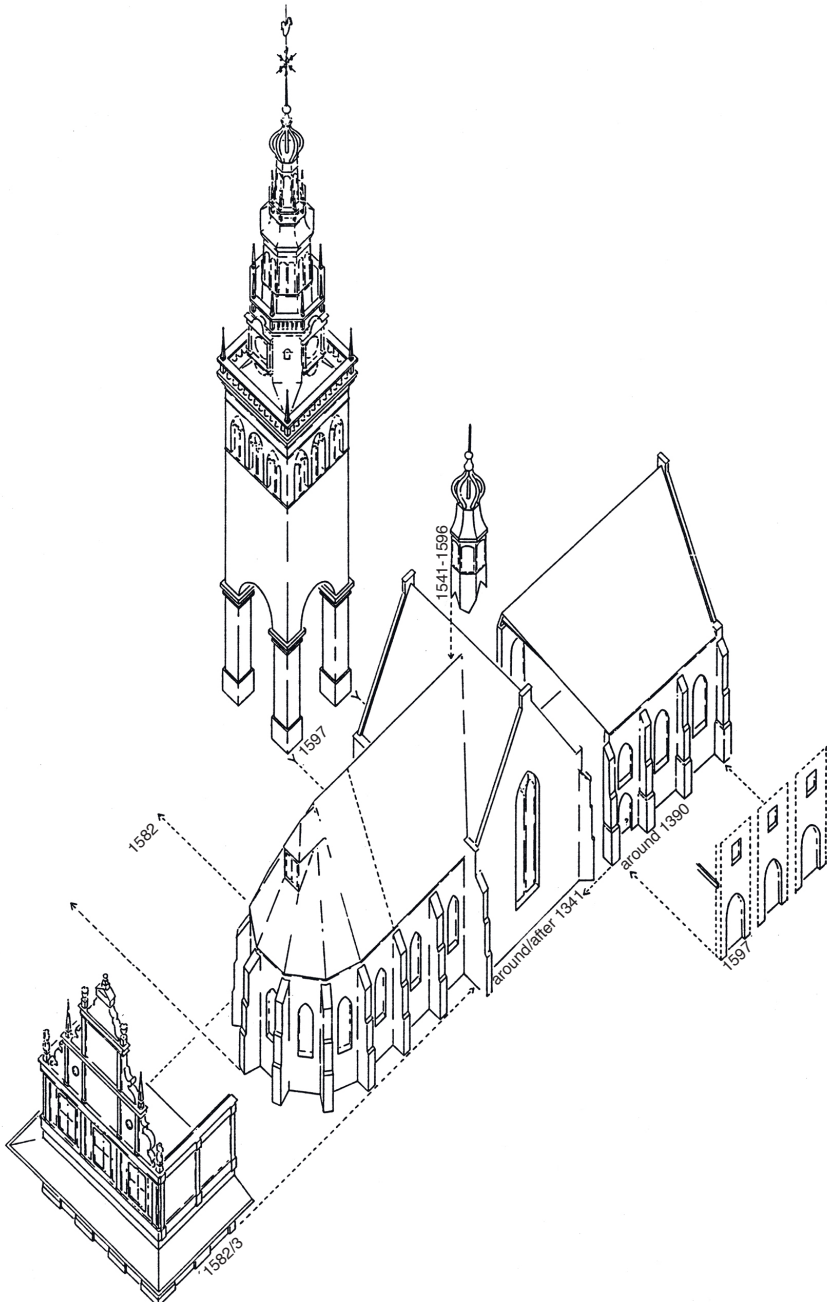
42 Craemer 1963.



7 So-called Alkmaar weigh house, reconstruction attempt of the ground floor plan from 1582

When the characteristics of this typology are taken into consideration, it stands to reason that the medieval Holy Spirit Hospital in Alkmaar can be investigated for evidence of more differentiated uses. Certain inconsistencies in the building substance lead one to believe that the western-lying, medieval building was added at a later date. This extension was not only offset by roughly 20 centimeters from the rest of the building, but also bends to the north at an angle of five degrees. It is also constructed out of brick walls that are thinner than those found in the rest of the existing building and are strengthened with abutments. At the western part of the roof, different kinds of wind bracing and various carpenter's marks also point to two medieval construction phases.⁴³ This physical evidence is likely related to written sources that report a donation for the benefit of building activities of the Holy Spirit Hospital for the

⁴³ Cf. E. J. van Dam's report examining the roof truss of the so-called Alkmaar weigh house (manuscript, not dated, place of origin not indicated, Municipal Archive Alkmaar).



8 So-called Alkmaar weigh house, axonometric drawing showing the different building phases

year 1390: *“tot hulp der timmering van het Heilig-Geesthuis of totter arme luden, die men daer in herbergen zal.”*⁴⁴

This analysis, viewed in connection with the medieval building substance in regards to typology, leads to a more differentiated view of the architectural history of the Holy Spirit Hospital in Alkmaar. It can be assumed that around, or rather after 1341, a hospital with a square plan was erected. Concurrently a chancel, which served as a church, was constructed to the east.⁴⁵ Both areas extended from the ground floor to the roof and were connected by an opening. The roof was formed by a wooden barrel vault⁴⁶, which enabled the tracery windows facing the hall for the sick to extend up to the pediment.⁴⁷

When the almshouse was added in 1390, the chapel's roof was extended to the west. A ridge turret accentuated the crossing of the roof's ridgelines over the middle of the hall for the sick. The donation of a bell that indicated the hours in 1386 was most likely connected with the erection of this building element.⁴⁸ In any event, a clock, which announced the passing of each half hour, was added in 1488. The ridge turret was rebuilt and enlarged in 1541 to accommodate the eleven bells needed for the prelude.⁴⁹

44 *“For the help of the construction of the Holy Spirit Hospital or for the poor people that one will accommodate there.”* Cordfunke 1978, 146.

45 The reconstruction of the original hospital building in Alkmaar displays a remarkable similarity to the old hospital in Deidesheim. Compare, Hassler 1985, 106.

46 Cordfunke 1978, 154. The author probably refers to a triumphal arch depicted in the painting “Caring for the sick” by the “Master of Alkmaar” from 1504. However, this image is apparently not a realistic depiction of the Holy Spirit Hospital in Alkmaar. Using the remains of foundation walls and half of the roof frame, only the wall can be determined thus far. It is not possible to reconstruct the shape of the opening in this wall.

47 E. H. P. Cordfunke (1978, 155) assumes the existence of side aisles. This assumption can be ascribed to the previously mentioned misinterpretations of the Holy Spirit Hospital in Alkmaar as a purely ecclesiastical structure.

48 Bruinvis 1888, 6 and 1889, 2. It has been assumed that the bell was originally installed in a dormer at the elongated termination of the roof ridge.

49 This ridge turret is drawn in contour in a painting illustrating the siege of Alkmaar in 1573 and dating from 1580 from Pieter Ariensz. Cluyt (cf. Wortel 1990, 131).

As the city of Alkmaar gradually expanded eastward in the second half of the fifteenth and at the beginning of the sixteenth centuries, the Holy Spirit Hospital — which had originally been situated on the edge of the city — now occupied a central position in the municipality⁵⁰ near to the waterways. At the same time, however, it could no longer fulfill new functional demands, requiring small rooms for the sick arranged along corridors.⁵¹ The old trade hall located in the ground floor of the town hall (1509-20), meanwhile, now occupied a peripheral location in the city. Presumably the town hall could no longer accommodate the rapidly increasing amount of merchandise to be weighed, while its administrative function also continued to expand.⁵² The conversion of the Holy Spirit Hospital into a trade hall therefore offered a reasonable solution to this lack of space.

During much of 1558 the Magistrate of Alkmaar was occupied with the issue of installing the weigh house either in or adjacent to the Holy Spirit Hospital.⁵³ Following the Siege of Alkmaar from August 21 to October 8, 1573, the ensuing victory by the Dutch over the Spanish troops decisively altered the city's history. Sufficient financial resources became available to undertake large-scale building projects due to the liquidation of the Catholic Church's assets as a result of increasing secularization. The city could thus afford to acquire a permanent weighing concession.⁵⁴ Alkmaar

An unknown artist depicted the same detail in a 1598 painting (Stedelijk Museum Alkmaar). Although the peak of the ridge turret can be seen more distinctly, it resembles the peak dating from 1597.

50 Cf. Gutkind 1971, 68, illustration 48.

51 Cf. Leistikow 1985, 232.

52 Peters 1909-11, 289.

53 Cf. Bruinvis 1889, 16; also Cordfunke 1978, 149.

54 Cf. Wortel 1990, 117 et seqq. In the relevant literature one finds numerous references to the notion that Alkmaar had been granted the right to weigh as a gift bestowed by William of Orange and the Estates of Holland in 1581. Actually, the city bought the right to weigh, as was typical at this time. Cf. Speet 1982, 15; also W. A. Fasel: *Het stadsarchief van Alkmaar, 1254-1815*. Alkmaar 1975 et seqq.

presumably used the establishment of this so-called weigh house to proudly proclaim its hard won freedom, as shown by the declaration inscribed on the building's facade: "S. P. Q. A. RESTITUIT VIRTUS ABLATAE JURA BILANCIS."⁵⁵

The transformation of the Holy Spirit Hospital into a trade hall commenced in 1582. First, the end of the chancel and the adjoining bay were demolished. The two remaining chancel bays and the buttresses thereupon received a new exterior wall on three sides, creating a uniformly wide and high structure out of the hall for the sick and the almshouse. The building now possessed the considerable dimensions of 31.40 meters in length and 12.50 meters in width. The doorways were located at the former chancel windows, whose portals partially survive. The Holy Spirit Hospital's old roof, with its wooden vault, was retained. However the construction of a ceiling fundamentally altered the interior. The cantilevers — apparently additional supports affixed during the conversion — date from the fifteenth century and were probably constructed from dismantled parts of the building.

The new gable on the east side of the building was considered the "... most ornate gable yet erected in the Netherlands, aside from that of the Antwerp Raadhuis".⁵⁶ The ground floor facade was originally clad in ashlar masonry. Of the three doorways articulated with round arches, the center one is accentuated with a late Gothic portal (perhaps taken from the chapel and installed here?). The suspended canopy lends the ground floor zone a distinct horizontal accent.⁵⁷

55 *"The magistrate and the people of Alkmaar have retained the right to weigh with courage and bravery."* (author's translation).

56 Hitchcock 1978, 67.

57 Today the so-called Alkmaar weigh house closely resembles the original building dating from 1582. The front facade is the product of a radical restoration however. In 1884 the whole entire front gable was demolished, as was the side gable in 1885. Both were almost completely rebuilt using new materials. The canopy, which was placed on supports in 1800, was removed during this restoration and the original, suspended construction was reconstructed. The seemingly appropriate



9 So-called Alkmaar weigh house from the north, early 20th century photograph



10 Cheese market and the so-called Alkmaar weigh house, etching by Romeyn de Hooghe 1674

Rusticated pilasters frame the mullioned stone windows with transoms, at the upper floor. The pediment is articulated as a three-tiered, stepped gable with a curved roofline. At the pediment, the arrangement of the pilasters is continued according to the rule of supraposition. Statues, a Justitia to the left, and a Pax to the right, are placed on the sides of the cornice at the height of the eaves. Two stone reliefs, providing indications on the building's function, occupied the pediment's middle axis: below a relief of the city's coat of arm and above originally a scene depicting the act of weighing.⁵⁸

diamond squared stones used on the ground floor are in fact a free invention. The alignment of the sidewalls in the area of the former chancel on the front facade together with the installation of two windows in the upper story are also a product of the 1884-85 restoration. The removal of the late Gothic fluting in the middle doorway can be ascribed to the desire, at this time, for stylistic purity. Cf. Koolwijk 1972, 20; Cordfunke 1978, 149; also Speet 1982, 32-33.

58 P. J. Horstok refurbished this relief in 1783 and M. J. Stucki repaired it in 1855. The ceramic panel, which exists today, was installed during the renovation in 1884-85. Cf. Speet 1982, 32 and 33.

A frontispiece, located above a small molding where the date 1582 is inscribed, articulates the upper part of the facade.

Although the existing structure of the Holy Spirit Hospital largely determined the width and the basic height of the so-called weigh house, it is possible to detect a system of proportions that were used to design the east facade. The upper edge of the cornice marks the middle of the facade above the first upper floor and divides the facade into two equal sections. The bottommost section of the facade is also divided horizontally into two equal parts. Whereas the lower section articulates the height of the ground floor and the first upper floor, the upper section is divided into three sections. A module, repeated seven times, dictates the width of the three doorways and the window at the first upper floor.

Though the city's parish church had to go without a bell tower, the trade hall received a distinct, vertical accent. The old ridge turret was demolished in 1596 due to this construction. The following year, the contractor Cornelis Pietersz. Kunst began to build the new tower.⁵⁹ This structure reached its current height of 52 meters in 1599.⁶⁰ During the same period, an intermediate floor for the storage of grain was inserted into the hall in the western part of the building. In connection with this procedure, the facade enclosing this part of the building was adjusted to accommodate the new interior division.

The tower of the so-called Alkmaar weigh house is situated at the intersection of the roof's ridgelines. Its shaft is placed on four piers, each of which is square in plan. Together the four columns form a square, each side measuring 6.60 meters. The columns, each one topped with a simple capital merge in the form of a compressed pointed arch into the shaft of the tower at roughly the height of the building's eaves. While this shaft retains its external dimensions,

59 Cf. Bruinvis 1888, 15; Georg Galland (1890, 492) was mistaken when he identified the tower construction with its Gothic blind niches as being a product of the 1541 reconstruction.

60 C. W. Bruinvis' (1888, 16) assumptions with regards to the building substance,



11 Mientgracht and the so-called Alkmaar weigh house from the east, early 20th century photograph

the thickness of the wall is reduced to one meter on the interior at approximately the height of the recess of the roof gutter.

A typical Dutch wooden spire completes the tower's shaft. Each of the spire's three levels has a regular, octagonal plan that becomes smaller as one moves upwards. Each level is enclosed with a balustrade, whose corners are accentuated with obelisks. The lower part of the structure is clad with slate and encloses the clockwork. The dial of the tower's clock is aligned with the building's longitudinal and lateral axes. Each side of the spire above the clock dissolves into two high, arched openings supported on thin round posts. The carillon is housed here.⁶¹ Above this level, a lower, convex part leads to the platform for the steeple top. The lower construction repeats the form of the level that houses the carillon, but each side now only has one opening. Finally, at the top of the spire, the openwork, onion-shaped dome holds the weather vane's pointer in place.

Writing in his monograph on the wooden spires in the northern Netherlands, E.H. ter Kuile was not impressed with the artistic quality of this structure: he called it a "*limited and relatively flat imitation of the Oude Kerk's tower in Amsterdam*".⁶² However, matters of taste, such as this, are subjective. Considering its graceful design and its elegant proportions, the tower of Alkmaar's so-called weigh house can be seen as a pleasingly refined version of the tower in Amsterdam (probably Joost Jansz. Bilhamer), which dates from 1587.

The so-called Alkmaar weigh house functioned as a typical multifunctional trade hall. In 1587 the western part of the building was

which are based upon the surviving written documents recording the magistrate's decisions, are not conclusive and will not be referred to here.

61 According to the magistrate's decision from September 4, 1598, six new bells were added to the existing clockwork for the carillon (Bruinvis 1888, 15). In 1688, Melchior de Haze from Antwerp received the commission to cast 35 bells in 1688. One year later these were hung in the so-called Alkmaar weigh house. Compare Bruinvis 1888, 25-27.

62 Ter Kuile 1942, 89.

remodeled to accommodate a meat hall.⁶³ The eastern part of this building was presumably originally used for weighing, as supported by the presence of the authentic scales in their original positions. Written or physical evidence supporting a contrary assumption does not exist.⁶⁴

The scales in the so-called Alkmaar weigh house have trolleys that are only 60 centimeters in length. The trolleys bridge the space between the former chancel wall and the exterior wall and enable the weighing pans to be moved under the exterior canopy. When the doors are closed, the individual scales not only move back into the building but, after the weighing pans are removed, are lowered on one side and turned. When the lowered part of the scale is raised slightly, the scale locks into place in the space between the former choir wall and the exterior wall.

Considering the location of the scales at the periphery of the building, a large area remained on the ground floor of the hall that was not used for weighing merchandise. This area, accessible via three doorways located on the eastern facade, was most probably used in conjunction with the adjoining hall. During the conversion of the hospital into a trade hall, the former partition wall located between the hall for the sick and the almshouse was apparently removed because it was no longer necessary.⁶⁵ Only the large-sized

→ 94

→ 7

63 Originally the meat hall most likely extended up to the wooden barrel roof. Following the installation of two intermediate floors after 1601, a place where furniture was sold and a guard-house was installed in this part of the building. After 1663, this space was also used as a butter and cheese hall. In 1583 the guild of poets occupied the completed upper storey above the weigh house. By 1596 these functions were removed to make way for a cloth hall and a control office for gold and silver. A telegraph office was installed here in 1866. Cf. Bruinvis 1889, 11-20.

64 In 1692, the scale-maker Johann Groengraft from Amsterdam built the four scales that still hang in the so-called Alkmaar weigh house. Cf. Bruinvis 1888, 32.

65 The outlines of the probable hospital partitions can be detected in the building substance. Further investigations could only be carried out through manipulating or making incisions into the existing structure. These procedures were not possible during the course of this study.

piers required for the construction of the tower in 1597 created a clear division between the weighing room and the main trade hall.

6 ← In all likelihood three original scales were located at the side doorways to take advantage of the existing spatial situation. After the conversion of the building, ample open area only existed adjacent to the chancel on the southern side. Adequate exterior space — roughly the size of the opposite market — only became available on the northern side of the building after the demolition of the adjoining houses in 1605.⁶⁶ All subsequent enlargements to the square adjacent to this so-called weigh house were located to the north.⁶⁷ With the increase in tax revenues on weighed merchandise in 1612, a fourth scale was installed in the middle doorway of the east facade. Among other details, this piece of equipment can be seen to this day, even after the remodeling in 1884, as well as in an engraving by J. Schenk dating from 1725.⁶⁸

The name of the architect for the so-called Alkmaar weigh house and its tower has not been handed down. In 1890, Georg Galland suggested master mason Cornelis Pietersz. Kunst, carpenter Maerten Pietersz. van der May, and the sculptor Joost Jansz. Bilhamer as possible candidates.⁶⁹ In 1910, A. W. Weissman asserted that the designer of the so-called weigh house in Alkmaar must have been a German or at least someone who was acquainted with the architecture of northwestern Germany. He refers to the

66 Koolwijk 1972, 17.

67 In 1678 the magistrate of Alkmaar resolved to demolish the houses owned by Adriaan and Meindert Zandvelt on Voordam along with other houses on Houttil. This intention was carried out three years later (Bruinvis 1888, 31; also Koolwijk 1972, 20). In 1876, 1881, 1886, and 1901 additional buildings were demolished (Koolwijk 1972, 13). Finally, at the beginning of the 20th century, the square in front of the so-called weigh house had increased substantially in width and the delivery of goods was so great that it was necessary to construct an additional, small stone building with a scale (Koolwijk 1972, 15, and 65). In 1970 a new building for the tourist office was erected on this site. Today an insignificant commercial and residential building is located here.

68 Cf. the illustration in Speet 1982, 28.

69 Galland 1890, 493.

area influenced by the Weser Renaissance, where, according to his assertion surfaces were also decorated with chamfered, rusticated ashlar stones at an earlier date.⁷⁰ The most recent research is not entirely conclusive and for all intents and purposes gives precedent to a Dutch architect.⁷¹ The Ooster city gate at Hoorn, dating from 1578 and designed by Joost Jansz. Bilhamer, does display similar horizontal bands of chamfered stones.

Subsequent historians did not speculate upon the authorship of the so-called Alkmaar weigh house. The recent research on Adriaen Anthonisz. (1541-1620) of Alkmaar provides a compelling reason to reconsider this question. As was typical of architectural practice in the seventeenth century, Adriaen Anthonisz. was trained as a surveyor and primarily designed fortifications.⁷² In addition to surveying, he worked as an architect and an engineer.⁷³ A letter from the year 1581 attests to this range of activity. In a departure from using the previous title of Landmeter (surveyor), which he previously used, he is identified as “Mr. Adriaen Engineer”.⁷⁴ Adriaen Anthonisz. was also keenly interested in astronomical and mathematical problems, such as the quadrature of the circle. While Anthonisz.’s military fortifications have been fairly well researched, there is comparatively little useful information concerning his other architectural endeavors.

A number of facts point to Anthonisz. as the designer behind the conversion of Alkmaar’s so-called weigh house and the building’s eastern facade. In 1573, he was the architect in charge of the construction of Alkmaar’s city walls. The Friesian Gate, erected there and destroyed in the same year by the Spanish artillery, had a formal language that is quite similar to that of the eastern facade

70 Weissman 1910, chapter 15.

71 Kreft and Soenke 1986, 326 et seqq.

72 Cf. Meischke 1988, 181 et seqq.

73 Taverne 1978, 81.

74 Belonje 1971, 43 and 44.

of the so-called weigh house. Furthermore, as demonstrated by the conversion of the Holy Spirit Hospital in Alkmaar, the fortifications designed by Adriaen Anthonisz. cleverly responded to their existing context. The similarities in the design of the tower of the so-called Alkmaar weigh house with those of the tower of Amsterdam's Oude Kerk can be explained by the fact that in 1578 Adriaen Anthonisz. collaborated with Joost Jansz. Bilhamer (1541-90; alias Landmeter (surveyor), alias Beeltsnijder (wood carver, sculptor) on the fortifications of the harbor district in Amsterdam.⁷⁵

As a member of the municipal council and as mayor of Alkmaar, Adriaen Anthonisz. wielded considerable influence over the design of the so-called weigh house. Being the son of the "Waechmeester van de Coninklijke Majesteits Waege" (Weigh Master of his Royal Majesty's Weigh House), he certainly was aware of the functional requirements and symbolic importance of this building.⁷⁶ In addition, in April 1581, he belonged to a four-member commission that negotiated the purchase of the right to weigh from the Estates of Holland.⁷⁷ Finally, when the construction of the weigh house commenced in 1582, his son, Teunis Adriaansz. laid the first stone.⁷⁸ Adriaen Anthonisz., should therefore first and foremost be considered as the architect of the so-called weigh house in Alkmaar and its tower.

Considering the development of the trade hall as a building typology, the conversion of a hospital for use amongst others as a weigh house in Alkmaar was a notable exception. The volume of the existing building was too large for a monofunctional weigh house. The construction of the belfry-like tower clearly demonstrates that the building was still considered to be a medieval trade hall.

75 Van Zuydewijn 1982; also Wortel 1990, 179. Also Joost Jansz. Bilhamer was a trained surveyor. Cf. Thieme and Becker 1910, 28.

76 Belonje 1971, 42.

77 Bruinvis 1888, 11.

78 Bruinvis 1888, 13.

Nijmegen, 1612: The gradual architectural organization of the building functions

Judging from its exterior appearance, its prominent position in the city, and its generous dimensions, the so-called Nijmegen weigh house can also be regarded as a multifunctional trade hall. For the most part, this so-called weigh house is a freestanding building situated on the city's main square — the triangular-shaped Great Market. Displaying the most substantial volume of any building on this square, it measures 30 meters in length and 9.56 meters in width, is two stories high, and has a steep, pitched roof. The different functions contained in the so-called Nijmegen weigh house are expressed on the building's main, south-facing facade. A two-armed stairway leading to the upper storey is located on the left side. It is situated in front of the larger, ground floor area in the interior of the building.⁷⁹ At ground level, a doorway is located at the middle axis of the stairway. At the top of the stairway, a double doorway provides access to the interior of the building. The right section of the front facade contains a large doorway. A smaller door is located adjacent to it at the outermost axis.

As this description indicates, the placement of the doorways corresponds to the tripartite organization of the ground floor plan. A room with a double nave and four bays articulated with flat cross vaults and Tuscan columns is situated behind the stairway at the western — or left — side of the front facade. The remaining part of the building has a column-free, wooden-beamed ceiling, which is

79 The original, exterior staircase of the so-called Nijmegen weigh house was demolished in 1751 and replaced with a flat canopy resting on six Tuscan columns. This is vilified in the literature for stylistic reasons. This alteration made it at least possible to provide sufficient natural light for the meat hall. In 1886 and in conjunction with the extensive restoration of the building by the municipal architect J. J. Weve, the original exterior staircase was reconstructed. Its design was based upon a drawing by Abraham de Haen de Jonge (1707-48). Cf. Van Schevichaven 1909, 371-373; also De Jong 1954, 16.

divided into five bays. A partition wall separates off the outermost zone from the other four. The meat hall was located in the vaulted room behind the stairway, while the weigh house occupied the center of the building.⁸⁰ The earlier uses for the two heated rooms, which are located in the building's eastern-most axis, are not known.⁸¹

It is no longer possible to determine the original placement of the scales in the so-called Nijmegen weigh house.⁸² They were presumably arranged alongside the passageway, as was often the case for such circulation areas. According to written sources, the weighing hall was also used as a butter market,⁸³ a typical supplemental function for weigh houses that contain a through passageway.

Written sources document the use of the upper stories by the citizen guards and the military sentinels.⁸⁴ The double doors on the stair landing probably separated both groups. With this assumption in mind, celebrations probably took place in the large room to the east. Documents record when it was rented out for this purpose.⁸⁵ Surviving bills and receipts also indicate that the area under the roof was used to store grain.⁸⁶ All in all, the building was used as a meat hall, a butter hall, a weigh house, a guard-house, a granary, and, from time to time, a dancehall.

Grounding his opinion purely on stylistic attributes, Georg Galland has suggested that Hendrik de Keyser, Amsterdam's city architect, designed the so-called Nijmegen weigh house. Elisabeth

80 The meat hall was closed in 1795. Cf. Brinkhoff 1977, 68.

81 In 1625 an open fireplace was built into the room on the eastern side of the building. Van Schevichaven (1909, 373) concludes that this room was used for the weigh master's office.

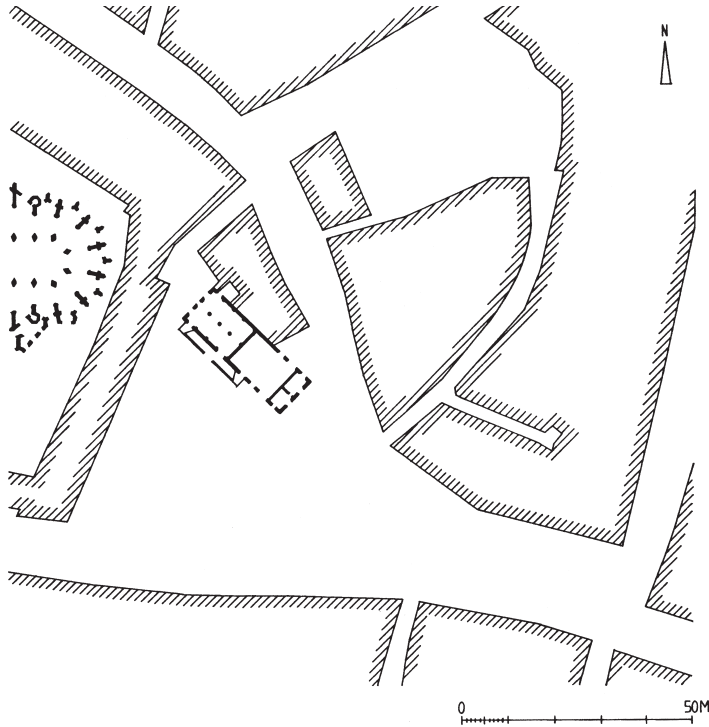
82 Today, the scale is hung to accommodate the present day use of the hall as a restaurant.

83 Brinkhoff 1977, 67.

84 Brinkhoff 1977, 70.

85 Van Schevichaven 1909, 372.

86 In 1674 the ceiling above the upper story collapsed due to excessive loads. Cf. Van Schevichaven 1909, 373.



12 So-called Nijmegen weigh house, urban context from approximately the middle of the 19th century

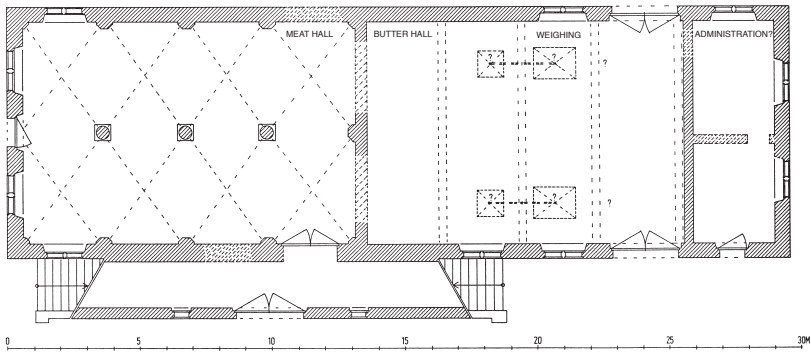
Neurdenburg, de Keyser's biographer, has in contrast suggested it was another Amsterdam architect, Peter Ariaens van Delfft, who was commissioned to prepare the stonework for the so-called Nijmegen weigh house.⁸⁷ Meanwhile, Cornelis Jansz. van Delft, the municipality's master mason, should also be taken into consideration as a possible architect of the building. Written documents identify him as being responsible for the design of all the official structures in this city at this time.⁸⁸

87 Neurdenburg 1930, 79.

88 Brinkhoff 1977, 66.



13 So-called Nijmegen weigh house from the south, photograph not dated



14 So-called Nijmegen weigh house, reconstruction attempt of the ground floor

Hendrik de Keyser most likely had very little — if any — influence upon the design of the so-called Nijmegen weigh house. This building's ornamentation, which appears to have been taken directly from the pattern books by Vredeman de Vries, is fundamentally different from the free and inventive formal language that Hendrik de Keyser developed for the weigh house in Hoorn. With regard to its typological development, the so-called Nijmegen weigh house does display some spatial differentiation to accommodate specific functions in comparison with medieval trade halls. In addition, it no longer contains large unspecified areas. However this building bears little relation to the monofunctional weigh house building typology, which will be described further on in the text.

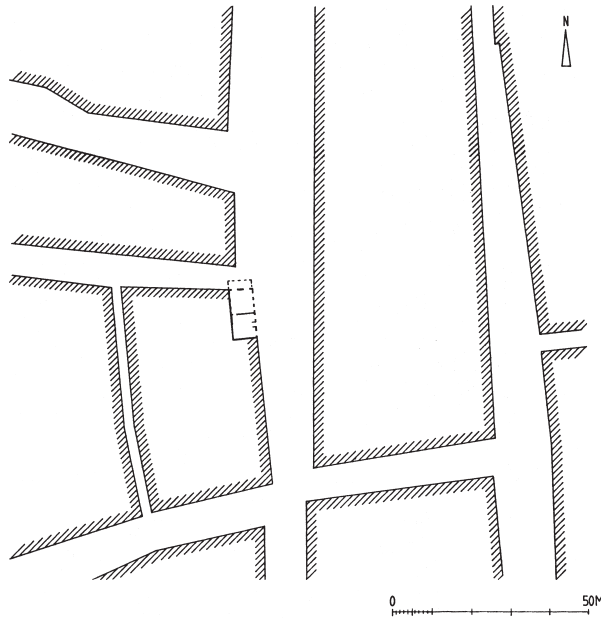
Conversions of multifunctional trade halls

With the elimination of the staple right and the growing emphasis on dairy production within Dutch agriculture, the importance of public weighing in the existing trade halls greatly increased.⁸⁹ In some instances, a building was remodeled to accommodate this surge in activity. This is particularly evident by the supplementary installation of sliding scales in some trade halls.

Enkhuizen, 1559: A weigh house and a tax office (early 17th century)

The so-called Enkhuizen weigh house is a converted, former trade hall. It is situated along a market street, which was created in 1544 by the partial infilling of the old harbor. The building is integrated into

89 Cf. below, page 273 et seqq.



15 So-called Enkhuizen weigh house, urban context from approximately the middle of the 19th century

a perimeter block and forms its northern corner.⁹⁰ The conversion of the trade hall commenced around the beginning of the seventeenth century, when the building's ground floor was divided into a tax office and a weighing room. Both functions were expressed independently on the facade.

The so-called Enkhuizen weigh house is a two-story building with a double-pitched roof. The building plan, measuring 12.80 meters in length and 6.35 meters in width, is proportioned in relation of one to two. The height of the facade, at 7.40 meters, results from a diagonal of 30 degrees drawn from the ground floor corner of the short side to the opposite corner at the cornice, or 60 degrees drawn

90 The only relevant representation of the Enkhuizen weigh house is in Van den Berg 1955, 39.

from the ground floor corner of the long side to the opposite corner at the cornice, respectively. Decorative stone inlays accentuate the brickwork details. Relief stones were inserted into the flat cornice: the coat of arms of King Philipp II is placed in the middle and is flanked on one side by the crest for the city of Enkhuizen and on the other by that of the region of Westfriesland. Indebted to the artistic conventions of the early Dutch Renaissance, the sculptural ornamentation includes depictions of the five virtues, which are placed above compressed pilasters at the top of the eaves.⁹¹

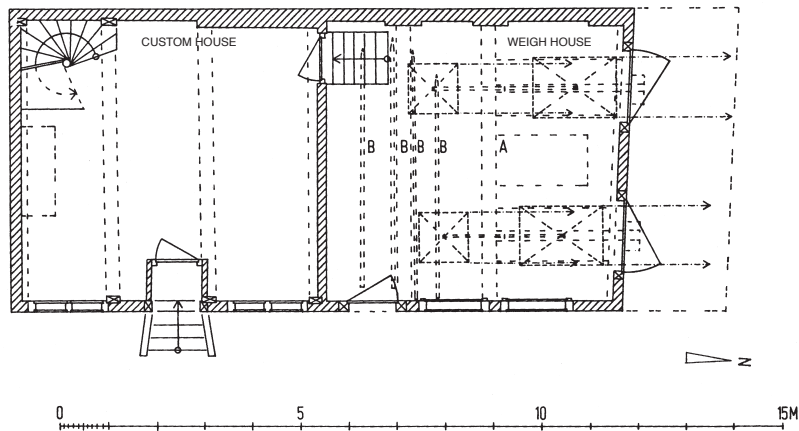
The alterations undertaken to convert the trade hall into a weigh house resulted in a disorganized appearance for the front facade of the so-called Enkhuizen weigh house. On the left side of the facade, small cellar windows are situated above the street level. Those to the left are articulated as double windows, the ones on the right as single units. Two cross-windows with varying openings flank the entry on the left side of the facade. A doorway and two sash windows, each with vertical shutters, are located at street level on the right side of the facade. A second row of windows, whose articulation is the same as the cellar windows and whose uppermost edge aligns with the height of the large window on the left side of the facade, is located above this grouping. Of the facade's four upper level windows, the one on the left greatly deviates from the symmetry established by the middle axis. A gable, with nearly the same form and proportions as the one on the smaller side, is located above the eaves in the middle of the front facade.

The side facade is symmetrically organized for the most part. Two doorways at the ground floor level extend up to the bottom of the upper level's summer beam where the sliding scales are located. The heads of the girders in the middle of both doorways, each of which is covered by a triangular roof, protrude out of the facade.

91 Justitia (Justice) holding her sword and a scale, Spes (Hope) clasping a large book, Prudentia (Wisdom) carrying a small book and a ruler, Caritas (Charity) accompanied by two small children, and Fortitudo (Courage) dressed as a warrior.



16 So-called Enkhuizen weigh house from the north east, photograph not dated



17 So-called Enkhuizen weigh house, reconstruction attempt of the ground floor from the early 17th century; A = trap door, B = rods

The left one lies below, and the right one above, the summer beam. Old photographs show a canopy extending along the width of this facade.

The weighing room occupied the northern half of the ground floor, which is situated at grade level.⁹² Both girders for the scales run above the ground floor ceiling. The slightly different girder heights compensate for the unequal sizes of the scales, so that the point of suspension for the weighing pans of both scales is at approximately the same height.

There is a trap door, situated between the girders in the ceiling over the ground floor near the side facade. Four prominent rods, which extend almost the width of the building, are rigidly attached to the rear of the building and can be pivoted. The rods extend to the opposing side of the building where they are inserted into a u-shaped bracket. They were most likely used to hang and store the

⁹² Today, the so-called Enkhuizen weigh house is a museum. The original, largely extant weighing hall is part of the exhibition.

awnings that were used to cover loaves of cheese when they were stacked outdoors.

A mezzanine level is constructed over the southern half of the ground floor. Two separate single-run staircases, one on the interior and one on the exterior, lead up to this level.⁹³ In the southwest corner, a spiral staircase leads to the upper level. A large hall extends there to the previously mentioned girders. The girders are separated by a light wooden partition that runs along the width of the building. The cross partitioning, which surrounds the shaft at the center of the room and which is designed as a bench, is located along the girders. Additional small rooms are situated along the sides of the upper level.

The girders were clearly not part of the original building substance and were constructed at a later date, most likely in connection with the conversion of the trade hall to a weigh house. As the original ceiling height was not sufficient, the upper floor had to be used to accommodate the girder. Presumably both the ground floor and the upper story originally contained a large, hall-like room. It is also apparent that the partition on the ground floor, which was installed alongside the ceiling beam, was added to the building at a later date. On the upper story, the carved corbels mounted on the ceiling beams deliver additional conclusive evidence pointing to a later installation of the partition walls.

It is not possible to produce a plausible reconstruction of the original facade, as it was constructed of a light masonry shell in front of the supporting wood construction and has been completely altered. Traces of the original facade design are no longer extant. Nonetheless, all openings on the present day facade with wooden lintels should be considered secondary additions. It can also be assumed that the facades' natural stone lintels were re-used at a later date.

93 Like many of the interior details, the open fireplace is a result of the restoration carried out in 1908. Cf. Van den Berg 1955, 39.

When considering the building's straightforward proportions and the flexible use of the large halls, which were initially located on each story, the original fenestration was likely arranged in a regular manner. The building may have had two doorways in order to facilitate the transport of merchandise into the interior. It can be assumed that the entire ground floor was originally located at grade level, as the shoring for the cellar windows was constructed at a later date.

Herma M. van den Berg has identified 1636 as the date for the conversion of the trade hall to a weigh house. Because at that time, the guild of surgeons occupied the large hall on the upper level.⁹⁴ But new scales were most likely acquired when the extensive construction work to install the girders was undertaken. Because the scales are inscribed with the dates 1601 and 1604, one can assume that the installation of the first scale coincided with the completion of the remodeling work, while the manufacture of the second one required more time.

If one considers the original building substance and the symbolic décor of the converted, so-called Enkhuizen weigh house, then this building clearly belongs to the typology of the multifunctional trade hall.⁹⁵ Such a building would have been necessary in Enkhuizen, as the city had acquired the staple right in medieval times. The size and form of these trade halls, such as the one in Enkhuizen, are comparable to contemporaneous Dutch town halls. There also appears to be a particular connection with the town hall in Den Haag (1564-65), where the depictions of the five virtues are arranged in a similar manner. Compared to this building, the so-called Enkhuizen weigh house was considerably less ostentatious.⁹⁶

94 Van den Berg 1955, 39.

95 The building is identified as a weigh house only in the corresponding legends dating from the 19th century on city maps of Enkhuizen.

96 Hitchcock 1978, 52.

Dokkum, 1593: The construction of a weigh house and a guard-house (1754) on the foundation of a trade hall

The so-called Dokkum weigh house was constructed on the foundation of a multifunctional trade hall. The freestanding building is located on the southern edge of a street market.⁹⁷ It measures 15.30 by 7.20 meters and is aligned with the longitudinal axis of this market. A street to the rear of the so-called weigh house passes along the wharf and continues down to the city canal, where the crane was located.

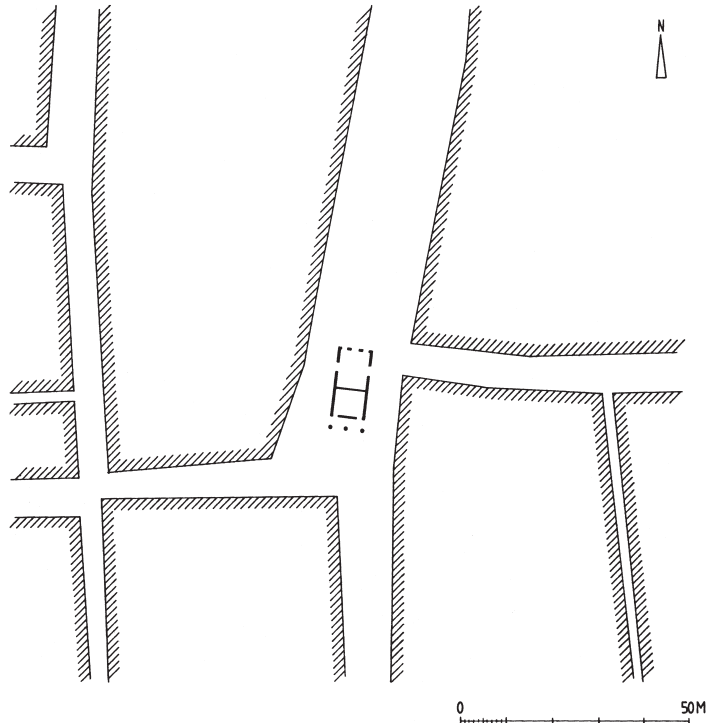
According to written sources, the trade hall dates from 1593 and was used as a weigh house and as a cloth hall.⁹⁸ The city plan drawn by J. Bleau identifies the building as a weigh house for butter and as a leather hall (Looyhall). The building is also depicted in a 1723 drawing from J. Stellingwerf. There it is portrayed as a relatively simple structure with tail gables and massive, unadorned facades with only a few doorways and small windows.

The so-called weigh house, which dates from 1754, served two separate functions. Each gable facade lent expression to one of these functions. The weigh house was situated in the northern part of the building, which faced the street market.⁹⁹ The facade here

97 The Dokkum city council decided to build a new weigh house on December 1, 1752. On January 4 of the following year, the builders Jan and Cornelis Tjebbes from Gorredijk were commissioned to demolish the old trade hall and construct the new building. The first stone was laid on March 19, 1753. The chronicler Wumkes noted that the construction was completed on January 4, 1754. Cf. Dragt 1984, 32.

98 Cf. Dragt, 1986, 64.

99 After it was no longer needed to weigh merchandise, the so-called Dokkum weigh house was used as a fire station. This function dictated the installation of a number of windows on the side facades. These windows can be seen on old photographs taken between 1910 and 1930 (The Admiral's House Museum, Dokkum). The canopy in front of the guard-house on the south side was no longer in evidence at this time. While the former weigh house was used as a garage for the fire department, the guard-house continued to be used as a police station. In 1948 the garage for the fire department was expanded to occupy the whole entire ground floor area, and the partition wall that had separated the guard-house and the weigh house was removed. The enlargement of the doorway with its historicizing frame on the south

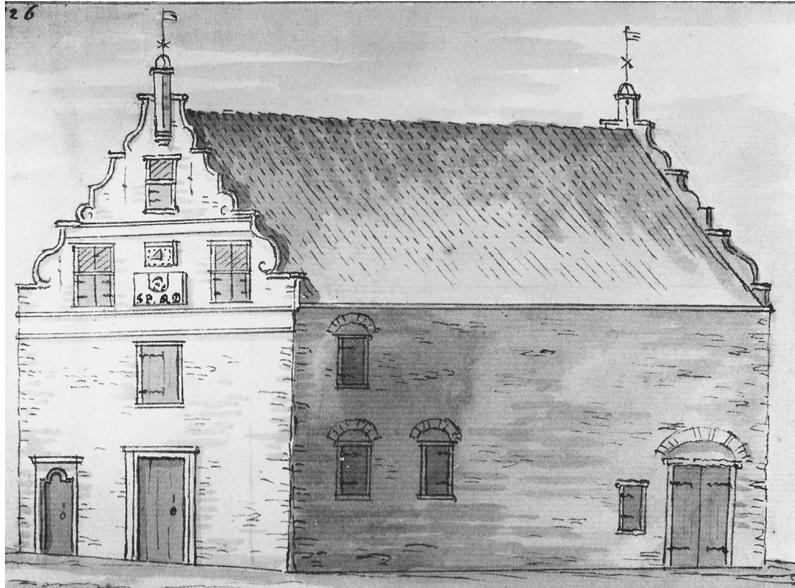


18 Dokkum weigh house and guard-house, urban context approximately middle of the 19th century

has a tripartite organization and is articulated with colossal Ionic pilasters. A double door is located in the slightly wider middle axis on the ground floor and a single panel door is placed on each side axis. A stone, inscribed with the building's two functions, "weegt en waakt" ("weigh and guard"), is located over the center doorway.

A drawing by F. J. van der Elst from around 1790 depicts the original rear gable facade where the guard-house was situated.

side is also a result of this remodeling. Spaces to accommodate a museum to be situated in the upper level were created at this time. Regretably the particularly beautiful, much admired, interior decorations were removed to accommodate this function (cf. Dragt 1984, 37).



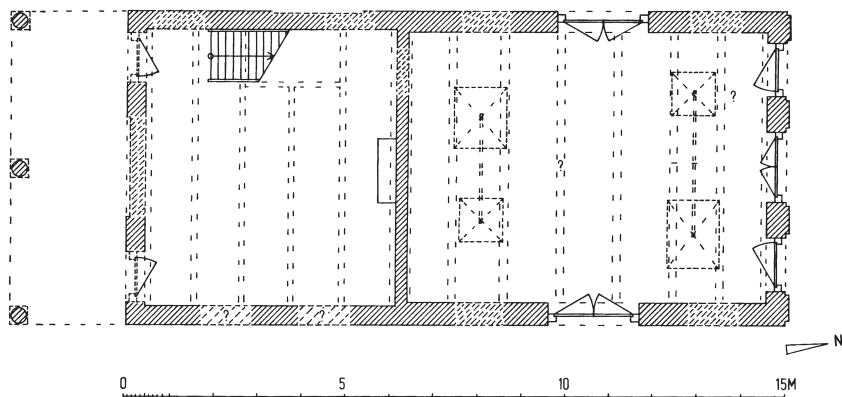
19 Dokkum trade hall, drawing by J. Stellingwerf 1723



20 Dokkum weigh house and guard-house, drawing by F. van Elst 1754



21 Dokkum weigh house and guard-house from the north, photograph 1944



22 Dokkum weigh house and guard-house, reconstruction attempt of the ground floor

This two-story facade had four axes. On the ground floor, doorways leading directly to the interior were located in the two outer axes. On the upper story, the two windows for the officers' apartment were placed on the interior axes. A canopy with a pronounced cornice, which rested on three Tuscan columns and sloped slightly toward the building, was attached to the exterior.

The building's longitudinal facade had two vertical axes. These are articulated on the ground floor by a doorway near the weigh house and by a blind niche near the guard-house. A second, identical door located on the wall opposite the doorway, created a passageway through the weighing room. Due to the disposition of this space, the scales were in all likelihood situated along the passageway.¹⁰⁰

Sjouke Noteboom of Leeuwarden was probably the architect of the combined weigh house and guard-house in Dokkum.¹⁰¹ The triangular relief gable on the small facade may have made reference

100 Because the ceiling was completely covered, remaining physical traces of the original scales could not be detected.

101 Dragt 1984, 34.

to the scrolled gable on the building that had previously occupied this site.¹⁰² The roof's ridge turret, in contrast, refers to a similar detail that is found atop the municipality's town hall.

In terms of typology, the so-called Dokkum weigh house accommodates only two functions typically found in a medieval trade hall. It should be noted that these functions, a weigh house and a guard-house, are accounted for in the design of the building. However, because two distinct functions occupy the ground floor, it can not be considered a monofunctional weigh house.

102 The sculptor Johannes Hardenberg from Leeuwarden prepared the stonework for the Dokkum weigh house. This commission included the city's coat of arms with the turned crescent and the three stars that are directed towards the Grote Breedstraat, as well as the lions holding the coat of arms of Friesland located on the rear of the building. Cf. Dragt 1984, 35.

Monofunctional weigh houses with non-sliding scales

Small buildings

Weigh houses in less important towns were located in small buildings. As the small weigh houses in large cities were demolished to make way for more prominent structures, the few structures that survived provide significant information about an early form of this typology. These small weigh houses have seldom been retained not only out of the need to accommodate larger and more complex buildings, but also due to their use of simple construction techniques and unspectacular appearance.

These small buildings played a significant role in the development of the weigh house as a building typology, despite their relatively modest artistic and technical importance. Certain monumental forms of the weigh house can be regarded as having emerged from innovations found in smaller buildings. This applies primarily to those examples where merchandise was brought only to the exterior of the building and weighing more or less took place outdoors.

Weighing merchandise outdoors was the simplest means of organizing a public weigh house. Written documents record such procedures in Schagen (North Holland)¹⁰³ and Ommen (Overijssel).¹⁰⁴ Public weighing occurred outdoors in many other places as well, although this practice has long been forgotten due to a complete lack

103 Private collection P. den Braber, without documentation of origin.

104 Private collection P. den Braber, according to information from the municipal administration of Ommen, dating from 1968.



23 Vlaardingen weigh house, photograph 1927

of physical evidence and surviving source material. The woodshed, the simplest structure that was used to accommodate scales, has met a similar fate. Such a structure requires a minimum surface area of 2.70 meters by 5.50 meters for the placement and operation of a two-meters long scale.¹⁰⁵ Small wooden sheds commonly served as weigh houses in villages such as Krommenie.¹⁰⁶

Buren, 1612: The wooden shed

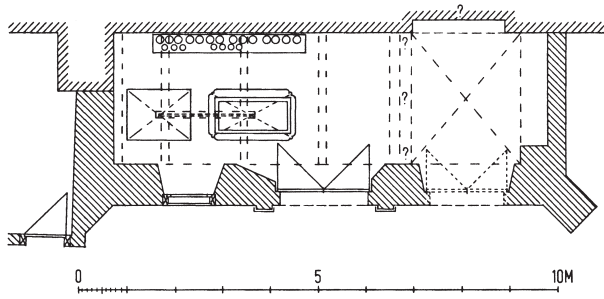
In the small city of Buren (Province of Gelderland), a particularly simple weigh house still exists.¹⁰⁷ It was originally constructed as a wooden shed with a sloping roof that leaned on the western facade of the city's church.¹⁰⁸ The shed extended from the buttress

105 Cf. the Vlaardingen weigh house, page 73 et seq.

106 Private collection P. den Braber, without documentation of origin.

107 The earliest mention of the Buren weigh house in the written records dates from 1612. Cf. Beaufort and Van den Berg 1968, 115.

108 Cf. Beaufort and Van den Berg 1968, illustration 79.



24 Vlaardingen weigh house, reconstruction of the ground floor

at the church's northern corner to the stair tower in the middle. On the same site, and with approximately the same dimensions, a subsequent structure that was designed as a gallery with three axes was erected in 1870.¹⁰⁹

Vlaardingen, around 1600: The stone shed

The Vlaardingen weigh house, a small, long, shed-like structure, was erected on the side of the city church. It is made of stone, and has two windows and a centrally-placed doorway. A basket arch frames the doorway, which is flanked by Doric pilasters and crowned with a frieze.

In Vlaardingen, the weigh house occupies a room measuring 6.00 meters in length and 3.60 meters in width. A wood beam ceiling covers two-thirds of the interior, and a cross vault encloses the

109 The Buren weigh house was completely renovated in 1954. As a result of a second restoration undertaken by the architect J. Vijfwinkel in 1979, the building lost the spandrel arch leading to the buttress and received a hipped roof covered in zinc sheets. Cf. documentation of the existing building substance from November 30, 1979 and the restoration documents from December 11, 1979. The author would like to thank J. Vijfwinkel, in Buren, for copies of the plans of the Buren weigh house.

remaining area. This last detail originally belonged to a room that was accessed from the exterior of the building via a doorway and was probably closed off from the weighing room by a partition wall.

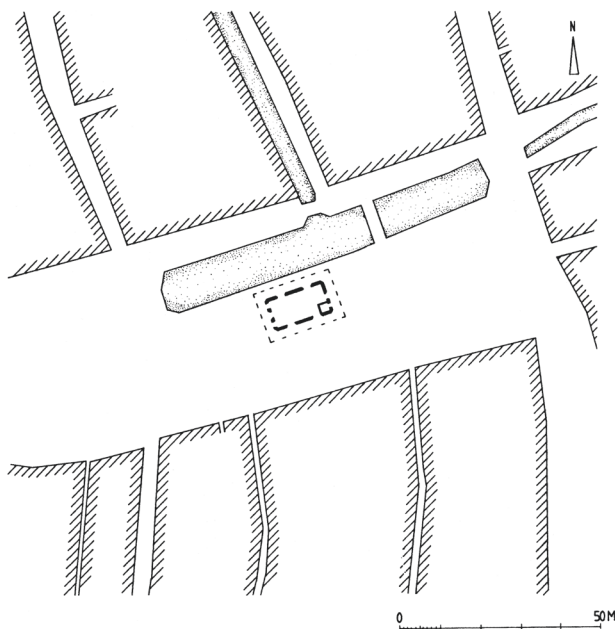
The Vlaardingen weigh house was erected around 1600. In any event it could not have been built prior to 1574, as it stands on the site of the church's northern transept, which was destroyed by fire that year.¹¹⁰ The tufa stone used to construct the weigh house was taken from the damaged part of the church.¹¹¹

The Friesian drive-through type

Several weigh houses, which contained non-sliding scales that were installed parallel to a passageway through the building, were constructed in the Province of Friesland towards the end of the sixteenth century. As demonstrated by the example in Deventer, this configuration had its origins in earlier precedents and is linked to the nature of Friesland's agriculture. During the seventeenth and eighteenth centuries, farmers in this province specialized in the production of butter. Weighing this product inside a building provided protection from the sun, which was apparently more important than the functional advantages that were provided by sliding scales to facilitate the delivery and removal of merchandise.

110 The year 1566 is repeatedly given as the completion date for the Buren weigh house. This date is incorrect as it only refers only to the first mention of the use of Buren weigh house as a public facility.

111 In 1926, the tufa stone on the exterior masonry wall was restored during the renovation of the Vlaardingen weigh house.



25 Leeuwarden weigh house, urban context from the middle of the 19th century

Leeuwarden, 1598: The prototype

The Leeuwarden weigh house (1595-98) resembles a medieval trade hall.¹¹² The freestanding building extends along the main market square of the new town district, which was planned and constructed in the fifteenth century.¹¹³ A canal was located near

112 In the spring of 1595, the Leeuwarden city magistrate resolved to build a new, larger weigh house on a more suitable site (Eekhoff 1846, vol. 2, 18). The date inscribed on the building indicates the weigh house in Leeuwarden was completed in 1598. If it is kept in mind that the mason Wijtse Sjoerdszn. received a payment for the submission of a bill for his completed work, then he can be considered as the architect of the building in the present-day sense. Regional Archive Dokkum, Register of the Directives, 1585-1612, archive no. 204, 284.

113 Cf. Eekhoff 1846, vol. 1, 78.

to the weigh house with a seesaw mechanism that was used to unload barges.¹¹⁴ The two-story weigh house has a high, hipped roof and a wide canopy that is located just above ground floor level and wraps around the building.¹¹⁵ The building's corners, extending from the ground floor to the cornice, are slightly sloped. A sculpted lion, holding a shield and symbolizing of the city of Leeuwarden, appears above the canopy at each corner.

The architectural details found on the weigh house in Leeuwarden are indebted to local building practices and stylistic preferences. These include the profiled jambs surrounding the door and window openings, the basket arches used to span across the ground floor, as well as the cross-windows with Tudor arches located at the upper story. The ornamentation found on the uppermost ledge of the cornice appears to be taken from the pattern books by Hans Vredeman de Vries. The floor plan and the facade are proportioned with a 30-degree and a 60-degree angle, respectively.

The floor plan of the Leeuwarden weigh house, measuring 15.25 by 8.65 meters, is considerably smaller than those of the trade halls in Deventer and Nijmegen.¹¹⁶ The Leeuwarden building has two doorways on each of its long facades. These doorways are situated across from one another to create passageways through

114 The seesaw mechanism was replaced in 1786 by a new wooden crane with a hoist (Eekhoff 1846, vol. 2, 436; note 16).

115 The canopy of the weigh house in Leeuwarden was one of a number of alterations to the building: in 1786 it was repaired, extended, and placed on twenty wooden Tuscan columns. In addition, it was additionally articulated with a wide cornice and four frontispieces. Two years later, an eight-foot wide awning was added (Eekhoff 1846, vol. 2, 436). In 1816 the canopy was extended again, so that 1300 barrels of butter, instead of the previous 900 barrels, could be protected from the sun (Eekhoff 1846, vol. 2, 257). In 1844, the canopy was extended once yet again, but this was only a temporary addition; the loosely attached roof was only used on market days (Eekhoff 1846, vol. 2, 257). The suspended roof was rebuilt during the reconstruction of the Leeuwarden weigh house by the city architect J. E. G. Noordendorp between 1884 and 1890 (Karstkarel 1985, 40).

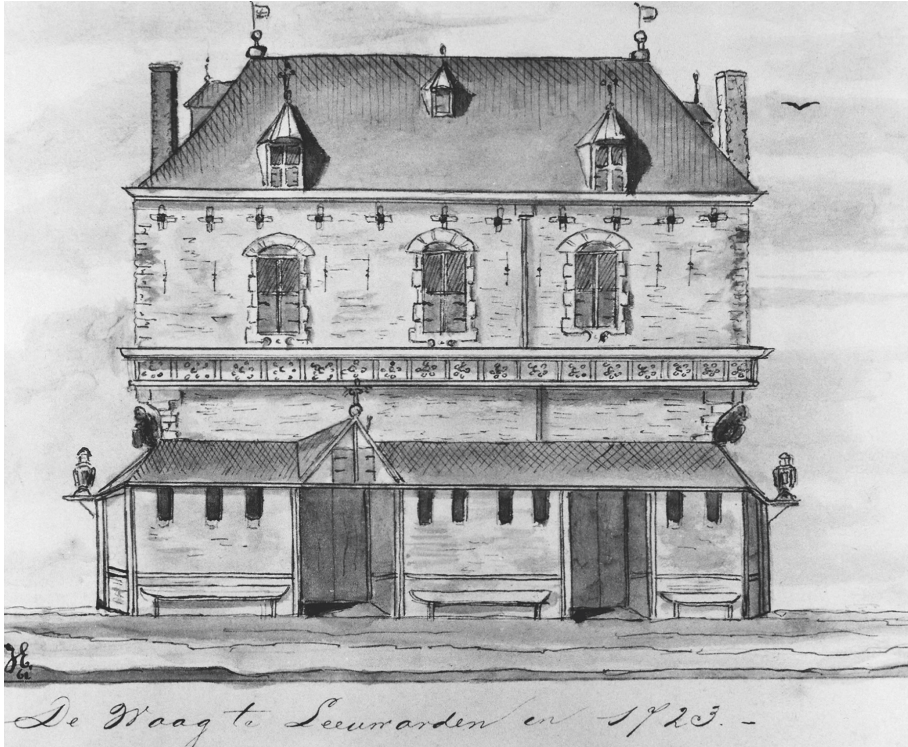
116 This measurement is taken above the base. Below it, there is a measurement of 15.58 (4 Konigsroeden (king's rods) at 3.91 meters = 15.64 meters) by 8.98 meters.



26 Leeuwarden market square and weigh house, painting by E. P. van Bommel 1854

the hall. A doorway located in the middle of each small facade also opens into this space. The eastern facade also contains a side door, which opens into a spiral staircase leading to the upper level. As it is possible to reconstruct the original position of the scales along both passageways in the Leeuwarden weigh house, it can be determined that the remaining ground floor area was used exclusively for weighing. The upper level, in contrast, housed a variety of functions.¹¹⁷ Two fireplaces, located at the middle of each of the small facades, heated this level.

117 The upper story does not appear to have been used as a storage hall for very long. After 1610 the citizen guards shared this space with the night watchmen. After 1643, the stock exchange occupied the large room in the upper level during inclement weather (cf. Eekhoff 1846, vol. 2, 199). In 1841, the room was altered to accommodate a concert hall for the music school. This remodeling effort required the removal of the ceiling to the attic floor along with the installation of a wooden mirror vault (cf. Eekhoff 1846, vol. 2, 258).



27 Leeuwarden weigh house, drawing by J. Stellingwerf 1723

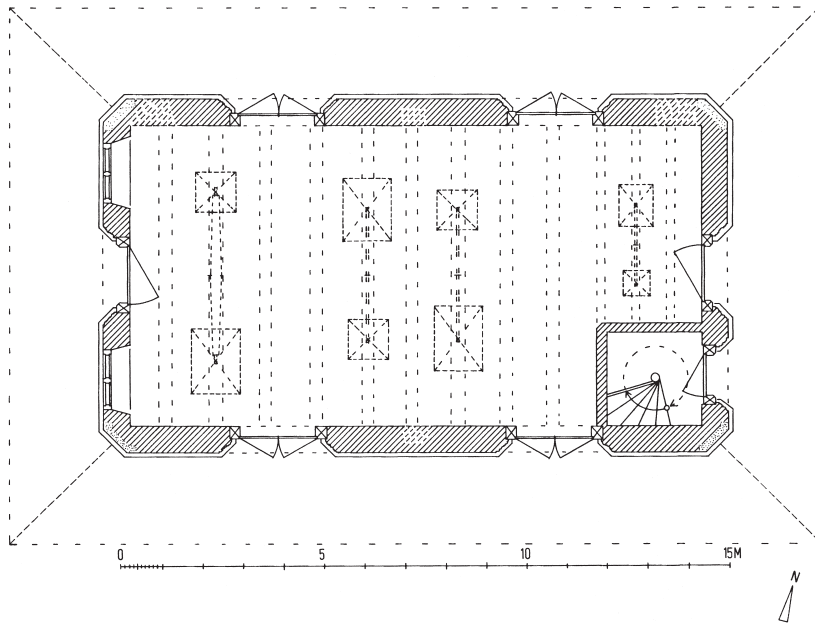
Although not all the scales are authentic, the Leeuwarden weigh house has for the most part maintained its original appearance to this day. A girder was installed on the western side of the building at a later date, in order to move half of one scale outside below the canopy. In order to accommodate this mechanism, the basket arch above was opened up and a cut was made into the canopy.¹¹⁸ This alteration was covered by a small structure resembling a dormer.¹¹⁹

118 Therefore the wooden beam's existing support, which is situated on the middle of the summer beam, cannot be original.

119 The dormer cannot be considered as a building part used to cover a moveable beam.



28 Leeuwarden weigh house from the northwest, photograph 1973



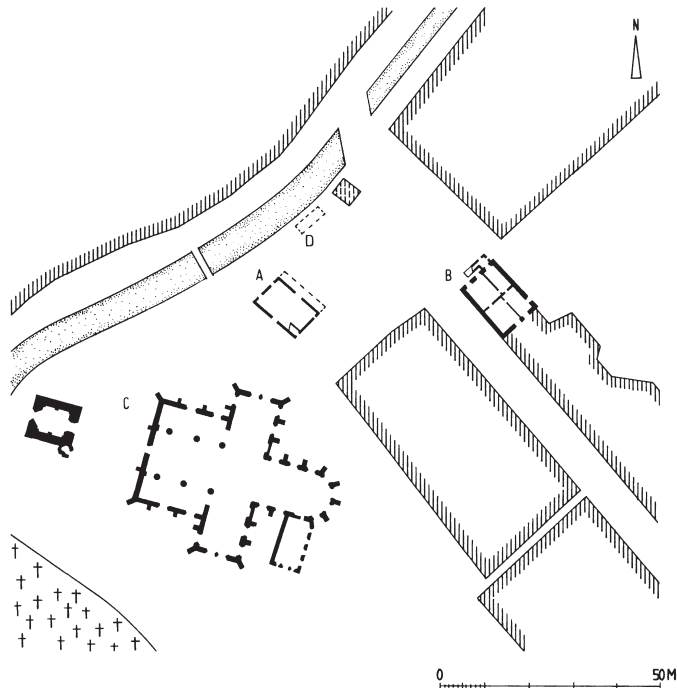
29 Leeuwarden weigh house, reconstruction attempt of the ground floor

The girder, located in the northern doorway of the western facade, is also clearly a later construction.

The Leeuwarden weigh house does share certain similarities with multifunctional trade halls. It must nevertheless be classified as a weigh house due to the monofunctional use of its ground floor and the secondary use of its upper level. The Leeuwarden building is the oldest and largest of the many examples of weigh houses with passageways and non-sliding scales that can be found in Friesland.

Workum, 1650: The rural town version

The Workum weigh house is a prominent expression of the economic prosperity this town enjoyed during the middle of the seventeenth century. The freestanding building is located at the middle of the city's main square and divides this space into a marketplace and a



30 Workum weigh house, reconstruction attempt of the urban context from approximately 1650; A = weigh house, B = city hall, C = great church, D = hoist to unload boats

church square. The main facade of the weigh house is oriented to the northeast and faces the town hall and other secular buildings.

The Workum weigh house's main facade has a tripartite, axial organization. The doorway at the ground floor, a relief depicting a coat of arms at the upper floor, the stepped dormer, and the protruding chimney above the roof ridge accentuate the middle axis. A canopy, which was originally smaller and suspended from the facade, extends along the facade. Benches are attached to the facade and placed at the sides of the central doorway.

Each of the Workum weigh house's other three facades also have a central stepped dormer above the roof ridge and a pronounced middle axis. Despite the building's prominent hipped roof, these

articulations create a varied eave and gable board line. The inclusion of natural stone blocks in the brickwork facade heightens the weigh house's picturesque quality. The profiled door and window jambs and the semi-circular relief arches above these openings add to this impression as well.¹²⁰ Sculptural decorations generously adorn this small weigh house.¹²¹ Figures of lions — each holding a shield — stand atop the slightly bent corner of the eaves, and satyr heads with recessed waterspouts are located below them. Stone reliefs, placed at the middle axis of each facade, declare the building's authority. The coats of arms chiseled into the corner-stones are those of the master craftsmen who worked on the building.

The proportions of the front facade are determined by two horizontally lying squares. A module that is repeated eight times determines the width of the upper level. This module is also used to organize the smaller side facades. The ratio of width to height on the small facades is five to four.

The Workum weigh house possesses a trapezoidal plan, whose long sides are almost parallel.¹²² The oblique angles enabled the building to fit into the surrounding urban context, allowing it to conform to the street line to the west and to align with the edge of the public space to the east. The dimensions of the floor plan average 12.70 meters in length and 8.20 meters in width. The interior of the building is dimensioned to accommodate one large and one small scale along the middle passageway.¹²³ A

120 It can be assumed that all the present day wall openings that are not covered with a round arch are not original.

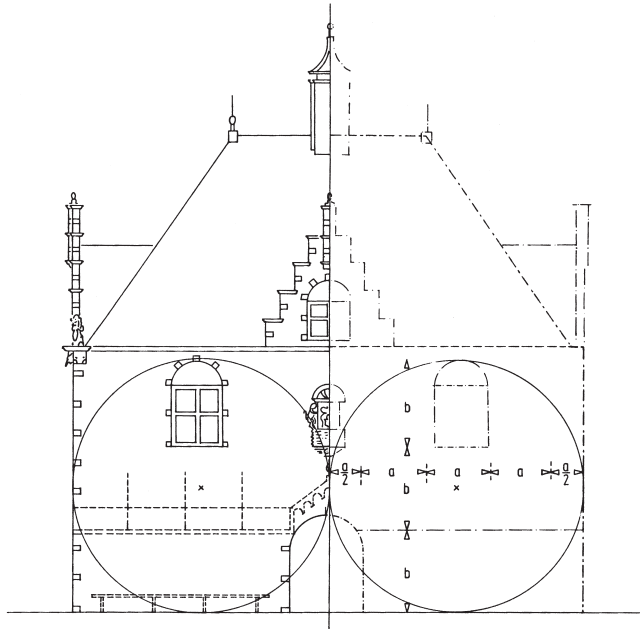
121 Apparently it was not necessary to raise funds to construct the Workum weigh house. The secularization of the church's possessions was sufficient to cover the building costs of 3720 guilders. Cf. Siemelink 1978 ed. 1903, 144.

122 The author would like to cordially thank Mr. G. Bijker from the Workum Municipal Administration for his friendly support during the preparation of the measured drawings of this building.

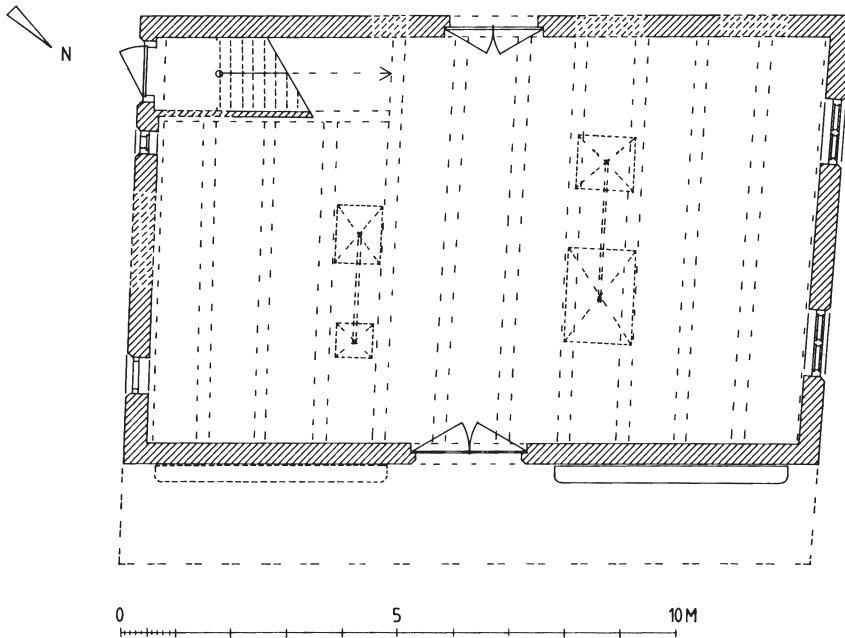
123 No physical traces of the scale installation remain in the Workum weigh house. The dormer-like addition on the original suspended canopy, as illustrated in the rather exact drawings of the building by Jan A. Beerstraten (1622-66) (Federal Office for Art Historical Documents, 's-Gravenhage, no. 62123), which were exe-



31 Workum weigh house from the north, photograph 1924



32 Workum weigh house, analysis of the facade proportions



33 Workum weigh house, reconstruction attempt of the ground floor

single run staircase, situated along the interior of the building's east facade, leads to the guard-house in the upper level.¹²⁴

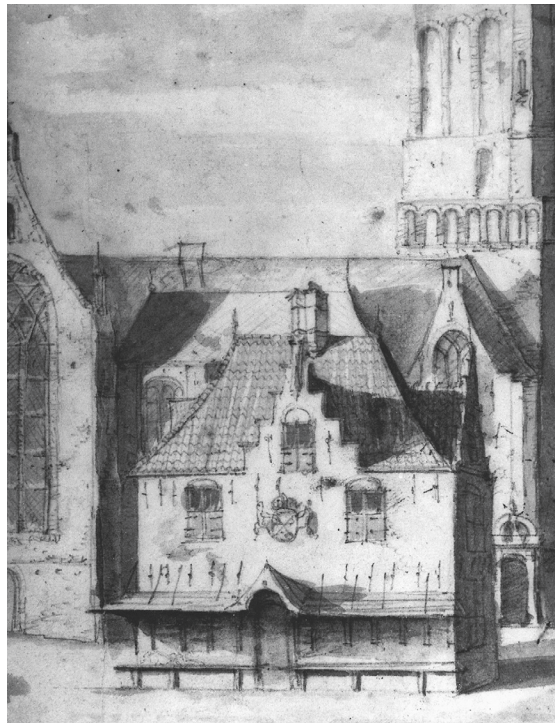
For the most part, the weigh house in Workum has been preserved in its original condition. With the exception of the seven meters-long canopy supported by six Doric columns in the front, the alterations that were carried out in the second half of the eighteenth century and

cuted twelve years after the completion of the building, leave one to assume that a suspended sliding scale was placed in the axis of the doorway. However, considering the weigh house's floor plan with its passageway, this position was not practical. In any event, the enlarged canopy that was added in the 18th century did not have sufficient clearance to accommodate a sliding scale.

124 Judging by its present day appearance, the fireplace located on the eastern side most likely dates from the 18th century (cf. Zantkuyl 1984, 366 et seq.). Probably this detail was a product of the "modernization" of the building, as depicted on the "Landbouwersbaar" (famer's guild bearers) from 1791.



34 Workum weigh house, "Landbouwersbaar" (detail) 1791



35 Workum weigh house, pencil drawing Jan A. Beerstraten (detail) 1662

depicted in the 1791 “Landbouwersbaar” (farmer’s guild bearers)¹²⁵ were removed during the restoration in 1922-23.¹²⁶ On the south and west sides, the few remaining windows that were added at a later date are easily recognized due to the absence of relieving arches and profiled jambs.

The architect of the Workum weigh house is not known. Two local craftsmen, mason Tiepke Pijbes and carpenter Jentje Jouckes, erected the building in 1650.¹²⁷ The blacksmith Jan Lievens, who could not write and thus acknowledged payment of his invoices by drawing a key, also participated in the construction. The city’s coat of arms, displayed on the southeast facade and crafted by Joucke Theunis, was the only part of the building produced in Leeuwarden.¹²⁸

Franeker, 1657: The minimal version

The Franeker weigh house is an extremely modest building. It was situated on the city’s central canal, which has since been filled in. In the seventeenth century, the canal served as a connection between two urban landmarks: the (former) castle and the church. The weigh house formed the western block corner facing this canal and its rear facade opened directly onto a waterway.

125 The “Gildebaren” (guild bearers) are unique to Workum. Every guild in this city has its own litters that are used to carry its deceased members. The guild bear transport caskets from the church to the graveyard using their guild’s litters.

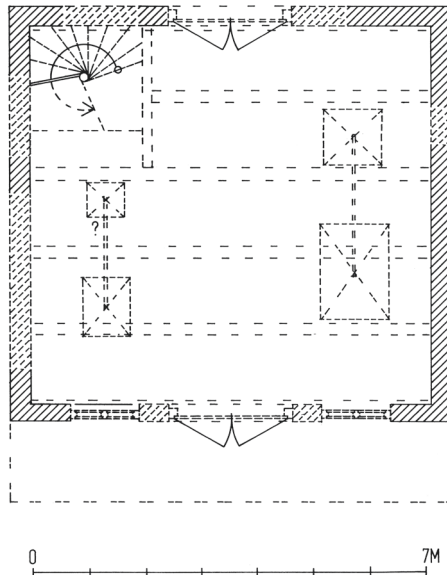
126 The 1750 drawing from C. Pronk is a fairly accurate depiction the Workum weigh house in its original condition.

127 The old Workum weigh house was demolished in 1649 and the parts were auctioned off. Cf. Siemelink 1978 ed. 1903, 144.

128 Siemelink 1978 ed. 1903, 145. Another craftsman probably created the relief on the market facade. The lions have flattened, grimacing faces and their ribs bend down around the upper body. The text on the relief reads: “*Me prius egregiam Construxit Libera Libram/Cura senis: Dominum sic honorabo Meum/Nunc Merces Mercede mea, Nunc pondere justo/Promite qua vobis Plurima Lucra dabunt/INTHIEMA praecipuus tanta Monumenta bilancis/Edidit hunc Merito FAMA perennis amat/Datum 4. Nonar. Febr. A° CD. DC. L.*”



36 Franeker weigh house from the north, photograph 1951



37 Franeker weigh house, reconstruction attempt of the ground floor

The front facade of the weigh house displays a tripartite organization. The ground floor doorway, the cartouches joined by draperies at the upper level, and the peak of the steep hipped roof emphasize the middle axis.¹²⁹ The upper floor windows in the side axes are placed towards the center of the facade and almost touch the cartouches. The weigh house's present-day appearance is a product of the extensive modernization that was carried out during the nineteenth century.¹³⁰ The openings probably received their

129 The inscription on the lower part of the middle shelf reads: *"Paulus van Ghemmenicht die lagh, Als hij zijn elfde jaar insach, Aan dit gebouw den eersten steen Tot wight en wacht van het Gemeen"*.

130 Before 1895, the weigh house in Franeker was used by the fire department (cf. photograph around 1880, no. 14994, T. A. 109-16, Fries Museum Leeuwarden) and afterwards as a lobby for the post office located at the neighboring building at the Voorstraat 51 (Professorenhuis) (Records of the Post Office Franeker, Private archive T. W. Meijer, Franeker).

segmental arch supports during the renovation work and a coat of plaster was apparently applied to the masonry walls. According to references found in the extant bid requests to erect the new weigh house in 1657,¹³¹ the facade articulations originally included a canopy,¹³² a dormer, and cross-windows.¹³³

The plan, measuring 7.85 meters in width and 7.55 meters in depth, offered just enough space to accommodate one large and one small scale. Both were located parallel to the middle circulation zone.¹³⁴ The original spiral staircase was situated on the eastern side, and probably resembled the one that has been reinstalled in the building's southern corner. The rear doorway served to enable boats to unload merchandise with the help of a hoist.¹³⁵ A vault, most likely removed when the canal was filled in, originally formed the flooring at grade level. The reliefs that decorated the building on the site prior to the erection of the weigh house were re-hung in the

131 The weigh house in Franeker is often dated to 1504. The surrounding villages were forbidden to weigh at that time, however (Telting 1867, 3). This fact is not necessarily of relevance concerning the construction of the weigh house. The assumption that the previous building for weighing was situated on another site is incorrect (Berrevoets 1990, 56). With regard to this, the title of the remaining call for bids for the construction of the new building in 1657 contains an explicit piece of evidence: *Besteck van't weder-opmaecken des Nieuwen Boter-Waags* (Call for bids for the reconstruction of the new weigh house for butter; transcription Piet Balhuizen, Rotterdam; cf. Telting 1867, no. 1053). The question arises as to whether the previous building was the old town hall from 1530, which was demolished in 1584 in connection with the construction of a new building in 1591 on another site (cf. Prins-Schimmel 1981). Regardless, the isometric projection of the city by Pieter Bast from 1598 depicts the building previously on the site before the present-day weigh house as an exceptionally simple building.

132 The original canopy was covered with glass blocks (cf. Call for Bids, dated 1657, City Archive Franeker, inventory no. 1053). It was enlarged in 1725. In 1756, after the neighboring building was converted to a weigh house, the canopy was extended (cf. Cobouw from March 11, 1964, Archive P. den Braber).

133 Cf. the call for bids from 1657, City Archive Franeker, inventory no. 1053.

134 After the purchase and the incorporation of the neighboring house, the weigh house in Franeker contained four weighing positions (cf. Cobouw from March 11, 1964, Archive P. den Braber).

135 Van der Aa 1843, 360.

weighing hall. The upper level housed a cheese storage room and contained special built-in wooden furnishings.¹³⁶ The unpretentious nature of the weigh house in Franeker suggests that the two master craftsmen who constructed it — carpenter Schelte Scheltesz. and mason Douwe Sickesz. — were the building's designers.¹³⁷ The Franeker weigh house, with its front and rear doorways and rigidly installed scales at the sides, is the smallest, simplest, and earliest example of the Friesian passageway type.

The monumental tower type

During the Middle Ages, some rulers in Dutch towns lived in fortified towers.¹³⁸ Because public weighing often took place in these buildings,¹³⁹ the tower-form of the weigh house had its origins in the tall, slender residence of the local ruler. Tower-like Tuscan city halls may have served as precedents for the development of this type of monofunctional weigh house (Bargello Florence, after 1255; Palazzo del Popolo Todi, completed in 1267; Palazzo del Capitano Todi, 1290?; Palazzo Pubblico Siena, after 1298) as well. As both the Italian and the German town hall served somewhat similar functions, it is reasonable to assume a connection between these building typologies.¹⁴⁰

However, the functional requirements of the weigh house are ill suited for the tower type. Because sufficient space to accommodate

136 Cf. the call for bids, dating from 1657, City Archive Franeker, inventory no. 1053. Later, the uniforms and the weapons used by the citizen guards were stored on the upper level (cf. Van der Aa 1843, 360). J. Mulder (1892, 43) reported about the multifunctional use of the upper level.

137 Cf. the call for bids dating from 1657, City Archive Franeker, inventory no. 1053.

138 Cf. Temminck Groll 1963, 11.

139 Cf. the Fronwaagturm in Schaffhausen, which will be discussed later in this text, see page 248 et seq.

140 White 1966, 146 et seq.

the scales is necessary only on the ground floor, a building's total number of stories is irrelevant. The tower-type weigh house found in Haarlem was not imitated in the Province of Holland for this reason. The first and only variation was built one hundred years after the Haarlem example in the Friesian place of Makkum. Appearing seventy years after the Makkum building, the Arnhem weigh house should — albeit with some restrictions — also be considered a variation of the tower type. Despite the obvious functional disadvantages, the desire for an impressive architectural appearance must have played a central role in the selection of the tower form for a weigh house.

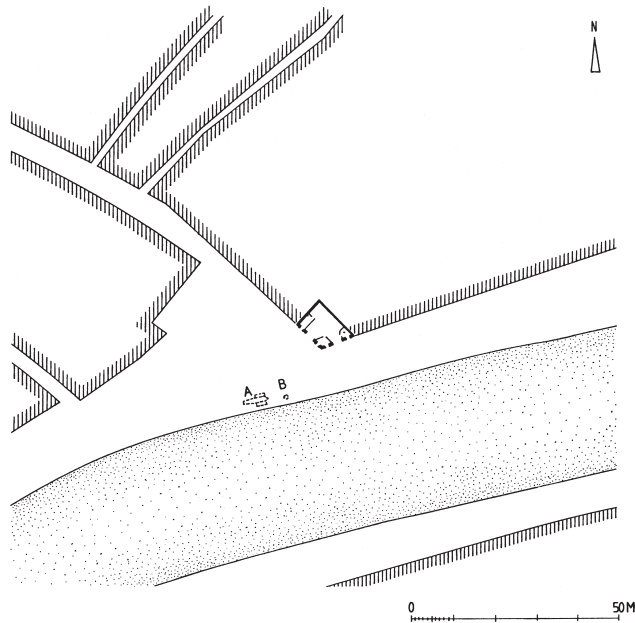
Haarlem, 1598: The prototype

As depicted in a drawing by Gerrit A. Berckheyde, one of the most famous artists of the period, the weigh house in Haarlem forms a prominent corner of one of the most beautiful townscapes of the so-called Golden Age in Holland. One side of the building is situated along the bank of the Spaarne River, and a hoist for unloading boats stands in front of the weigh house on a nearby embankment. The side of the building facing away from the embankment leads to a street of houses, which form the northeastern side of the market square. The opposite row of houses bends along the market square's western edge and turns away from the Spaarne, creating a forecourt for the weigh house.

→ Pl. 1

The materials and the design of the Haarlem weigh house accentuate the building's prominent urban setting. Whereas the weigh house's blue-gray Belgian limestone facade distinguishes it from neighboring brick houses,¹⁴¹ the building's three story height,

141 In 1835 the facade of the weigh house in Haarlem was painted yellow. Around 1915 this color was removed during the restoration of the building (Bettink 1915, 396). The corresponding dating by Uittenhout (1988, 143) to the year 1935 is not probable, because the earlier report from Bettink



38 Haarlem weigh house, urban context from approximately the middle of the 19th century; A = crane, B = hoist to unload boats

prominent balustrade,¹⁴² and hipped roof allow it to dominate its immediate surroundings. In contrast to the lightness and openness of the neighboring facades, the identical massive design that is applied to both corner facades lends the weigh house authority.¹⁴³

was written prior to 1915. In this year the weigh house in Haarlem was converted for use by the fire department. Today this building houses a restaurant.

142 Between 1815 and 1820, the original balustrade on the weigh house in Haarlem was apparently removed. It was reconstructed in 1988. It is to be assumed that the historic preservation authorities in Haarlem reconstructed the balustrade in response to the investigation by Roding (1993). A credible publication documenting the reconstruction of the balustrade does not exist. Cf. Uittenhout 1988, 144.

143 According to Uittenhout (1988, 41), until 1594, a residential building was situated on the site of the weigh house.

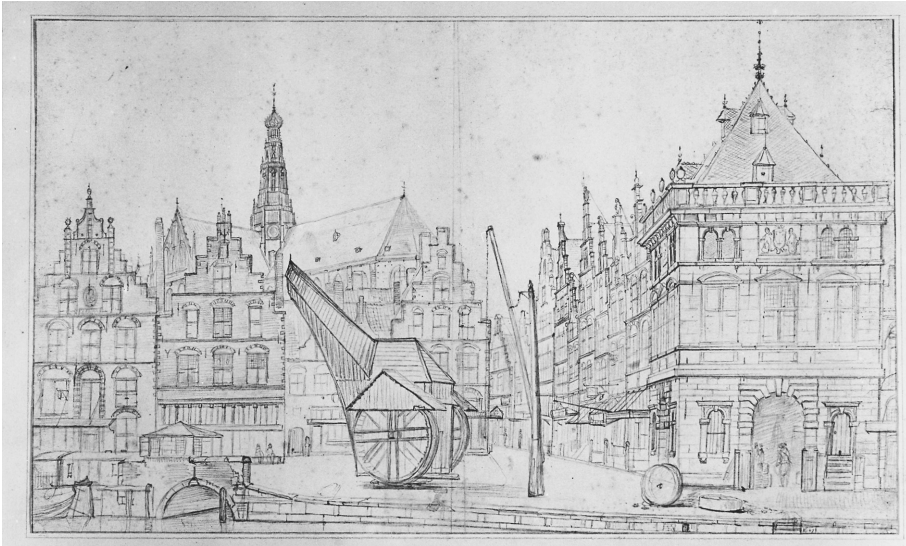
For this type of building the facades of the Haarlem weigh house display an unusual amount of plasticity, which is reliant upon the sculptural effects created by the window jambs and the cornices. A central projection frames the middle, arched doorway and the pronounced rustication of the impost draws further attention to this opening. A protruding horizontal ledge shields two small arched windows that flank the doorway. The small exterior staircase on the eastern corner of the south facade is the only notable deviation from the uniform design of both facades. This staircase is located in front of the northern window, which is turned into a doorway and leads to a stairway in the interior.¹⁴⁴

Rectangular balustrade panels, segmental arches, and flat triangular pediments articulate the area above the windows on the first upper level of the facade. At the relatively low second level, the windows are arranged in pairs and have a square format. A relief is located between the pairs of windows and a balustrade above completes the facade. The intended facade proportions were not realized due to a change in planning.¹⁴⁵

The large scale was presumably non-sliding and was most likely installed in the interior and suspended from the middle of the ceiling beam near to the western doorway where the ceiling beam is reinforced. At a later date in 1623, a second large scale was installed on the side of a beam in the northern side of the building. A moveable, wrought iron mechanism is found on the axis of the

144 Uittenhout (1988, 146) mentions that the exterior staircase on the south side was a later addition. He does not provide an explanation, however. This assumption is probably based upon Roding's research that was published at a later date (1993, 443). Roding suggests the addition of a staircase in 1647. A drawing of the weigh house by Gerrit A. Berckheyde at the Teylers Museum is cited as evidence (Teylers Museum, inventory no. Q 47). It depicts the exterior staircase located exactly at the place where it is today. In addition, the three straight steps, which Roding suggests were used to connect the weighing hall and the staircase, are not documented. Regardless, the measured building documentation from 1908 (Archive of the Historic Preservation Authority Haarlem) does not show this detail.

145 Cf. Kiem 1996 (a).



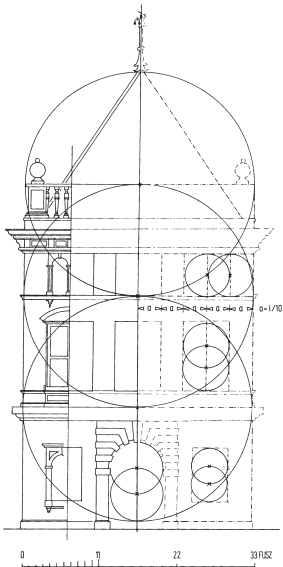
39 Weigh house and crane in front of the Haarlem cheese market, drawing by G. A. Berckheyde 1647

doorway here.¹⁴⁶ Lightweight partitions that are placed on the sides of the windows separate the two small rooms located on either side of the scale.¹⁴⁷

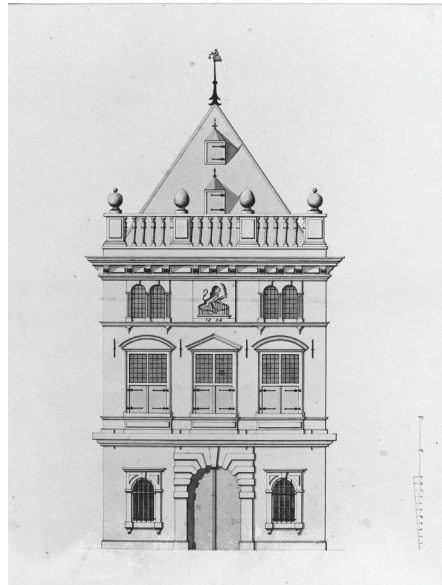
The ceiling beams were constructed to respond to different architectural and structural conditions. On the ground floor and on the second upper level, beams with a facade opening below them have a smaller cross section and alternate with thicker beams. On the first upper level, a mother-and-child beam construction appears. This allows for the top of the ceiling beam to be lowered almost to

146 Regarding the timeless form of this mechanism: it is open to speculation as to whether this is the original piece of equipment. The previously mentioned drawing of the weigh house in Haarlem from Gerrit A. Berckheyde (Teylers Museum, inventory no. Q 47) shows the weighing taking place at this location in the interior of the building.

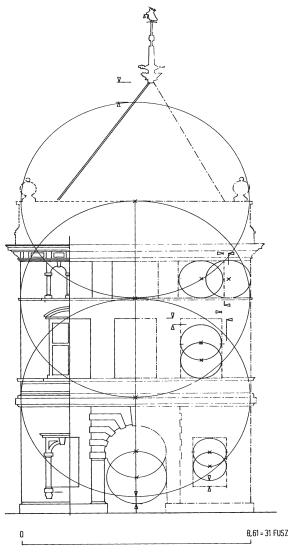
147 The measured drawings produced in 1908 show the original disposition of the rooms. The partition walls, which were documented at this time, were removed during the renovation of the building in 1915. Cf. Bettink 1915.



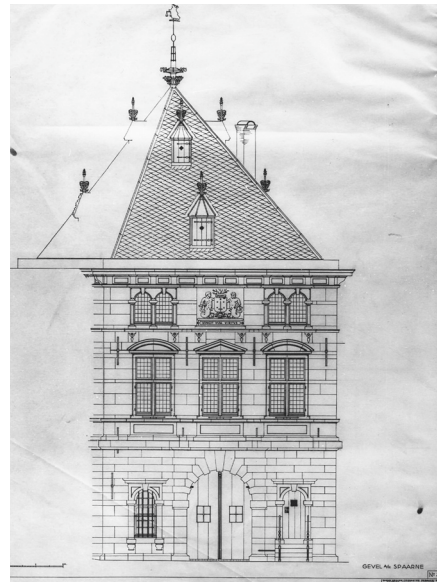
40 Haarlem weigh house, analysis of the facade proportions, design proposal



41 Haarlem weigh house, original facade design by Lieven de Key



42 Haarlem weigh house, analysis of the facade proportions, executed design



43 Haarlem weigh house, measured drawing of the executed facade by H. L. A. Gerfertz. 1942



44 Haarlem weigh house from the south, photograph 1959

the underside of the window's lintel and, in contrast to the exterior appearance of the upper levels in the facade, allows for the same interior height of the two upper stories. The first upper level is also furnished with an open fireplace.¹⁴⁸

The beam trusses in the weighing hall provide strong evidence suggesting that the municipal architect, Lieven de Key, was the masonry contractor responsible for the construction of the weigh house. These details closely resemble those found in the meat

148 The use of the first upper floor often changed. Cf. Uittenhout 1988, 146.

hall in Haarlem, which was also designed by de Key, and he was undoubtedly the architect of the weigh house too.¹⁴⁹

The desire for monumentality and the rejection of the functional advantages of sliding scales found in the weigh house in Amsterdam from 1563, which must have been known in Haarlem when the weigh house was under construction, should be considered with regard to the history of this city. During the siege lasting from December 11, 1572 to July 12, 1573, Haarlem played a decisive role during the long and brutal resistance against the central Spanish authority and was extremely active in the Dutch war of liberation. If Phillip II of Spain had been able to push through his administrative reform, as clearly exemplified by the situation in the southern Netherlands, there would not have been a need for weigh houses. The Haarlem weigh house, with its striking tower-like form, can thus be seen as an expression of this triumph. The imposing building declares: "We continue to weigh!"¹⁵⁰

With regard to the weigh house typology development, the building in Haarlem is the oldest example of a monofunctional weigh house in the province of Holland and is the prototype of the tower version.

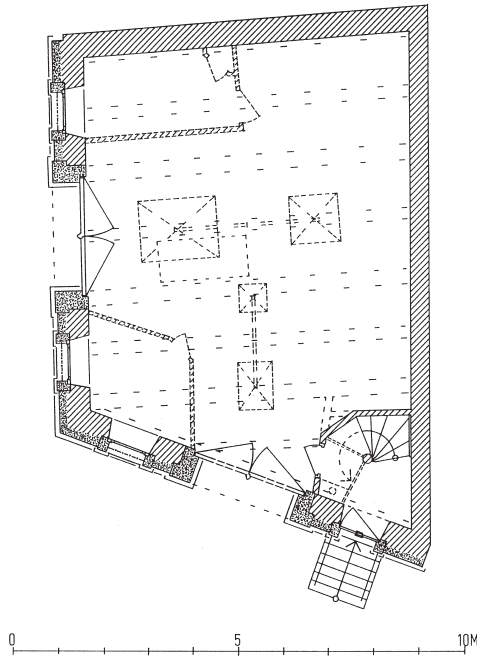
Makkum, 1698: The rural town version

The Makkum weigh house shares several key characteristics with the weigh house in Haarlem. These include the corner location, the two mirror-image facades, and the three-story, tower-like form.¹⁵¹ The Makkum weigh house's simple, unadorned exterior and use of exposed brickwork is typical of the architecture found in provincial

149 Cf. Kiem 1996 (a).

150 Concerning the functioning of the public weigh house and the attempt by the Spanish central authority to do away with these buildings, see p. 279.

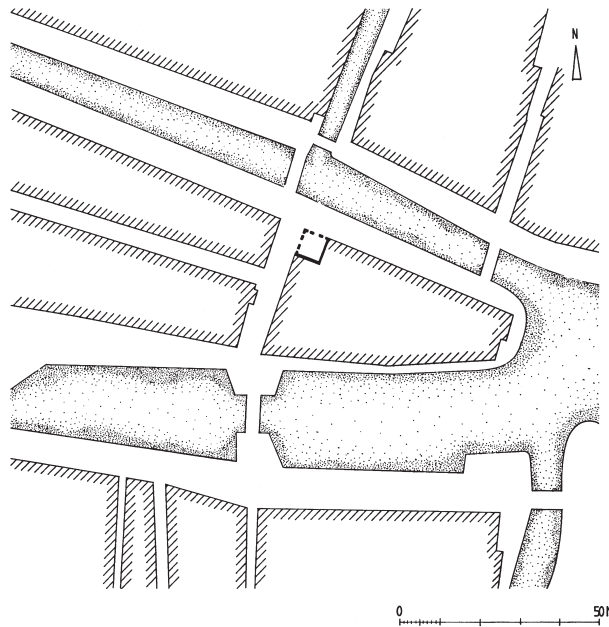
151 The author extends his sincere appreciation to P. Tichelaar (Makkum) for imparting information about the Makkum weigh house and Piet Balhuizen (Rotterdam) for translating the Friesian language texts.



45 Haarlem weigh house, reconstruction of the ground floor

market towns in Friesland. The northern side of the building faces the waterway known as the Zijlroede, whose embankment was used as a market.

When it was constructed, the three-story weigh house in Makkum dominated the surrounding, mostly one-story buildings. When viewed from a distance the building's perspective effect amplified this contrast, as each upper story is slightly set back from the previous one. The gradual diminution in the size of the window openings towards the top of the building also adds to this impression. The middle axis is emphasized by the arrangement of the fenestration. Beginning at the ground floor, the central doorway is surrounded by a raised frame and flanked by pairs of small elliptical windows which are arranged one above the other. A stone relief on the first level, that is placed between the windowsill and the cornice and that marks the floor level and a triple window, extends the axis upwards.



46 Makkum weigh house, urban context from approximately the middle of the 19th century

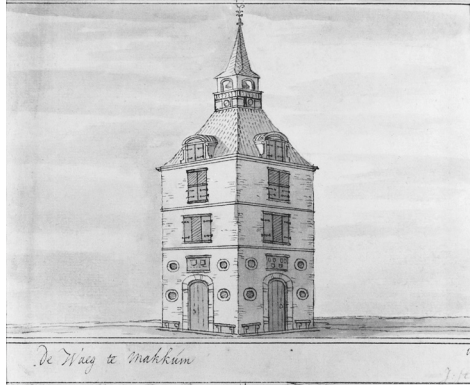
At the second level, a double winged window, of which the lower half was originally adorned with a middle impost and shutters, continues the central thrust and a roof dormer extends it above the eaves. All these details are typical of the local architecture.

The Makkum weigh house has a hipped roof and is topped with a small, square wooden tower. This tower's decorative form apparently dates from the eighteenth century.¹⁵² While the upper shaft was constructed with openings that allow the bells installed here to be heard when rung, the enclosed lower shaft contains the dial of the clock. The Corinthian pilasters, which are situated on the chamfered corners of the upper tower shaft, appear to carry the

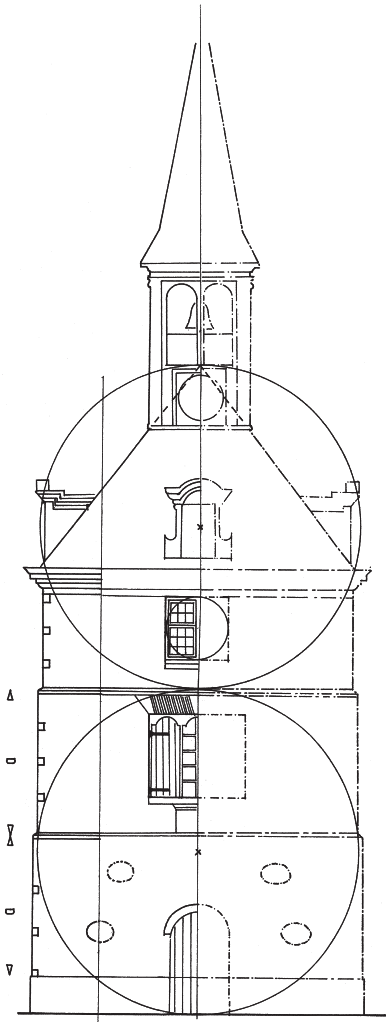
152 Because the wooden spire is located on the tower of the Makkum weigh house in a drawing by J. Stellingwerf dating from 1722, it is probably original. Cf. Postma 1965, 38.



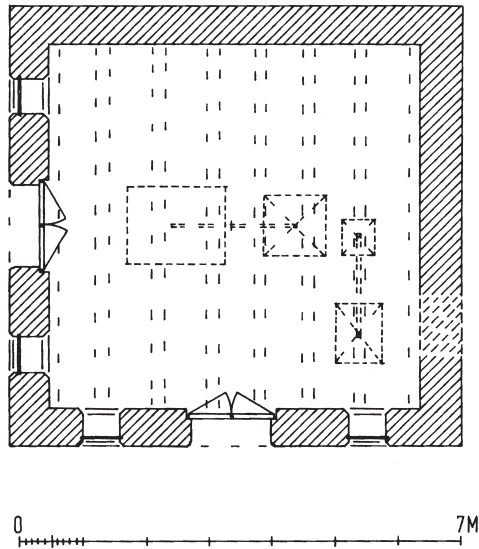
47 Makkum weigh house from the north, photograph from the early 20th century



48 Makkum weigh house, drawing by J. Stellingwerf 1722



49 Makkum weigh house, analysis of the facade proportions



50 Makkum weigh house, reconstruction of the ground floor

elongated, octagonal pinnacle. When the weather vane is included, the building rises to a height of 24.30 meters — a full 3 meters higher than the wind vane found atop the Haarlem weigh house. The proportions of the weigh house in Makkum also reference the Haarlem precedent. Two squares, one placed above the other, determine the width and height of the facade and the width is divided into ten regular segments.

The Makkum weigh house's floor plan is square, each side measuring 7.13 meters.¹⁵³ The stairway that leads to the upper floors was originally situated in the adjacent house for the weigh house master, which is located to the south.¹⁵⁴ The specific uses of the upper levels have not been handed down. Physical evidence indicating the placement of the scales in the weigh house in Makkum does not survive. Considering the low, arched doorways and the absence of a canopy, it can be assumed that non-sliding scales were installed in the interior of the building.¹⁵⁵ Because the floor area in Makkum was too small to accommodate a scale placed at the axis of each doorway, as was the case for the Haarlem weigh house,¹⁵⁶ the large scale was probably aligned with the northern doorway facing the market.

The lack of protection under general municipal law should be seen as an explanation for the Makkum weigh house's unusual height and its deliberate departure from the typological development in

153 This distance probably refers to 24 Friesian (wooden) feet á 0.296 meter. Cf. Verhoeff 1983, 24.

154 It is not necessary to discuss the weigh house master's residence, as it does not belong to the building type of the weigh house.

155 In the 20th century, a green grocer was installed in the ground floor of the Makkum weigh house. In 1950, the architect A. Baart from Leeuwarden restored the building. The weighing hall has been used as a tourist office since 1967. Beginning in 1984, the Friesian Pottery Museum has occupied the upper floor and the former weigh house master's apartment. Cf. Tichelaar 1984, 84.

156 The extant scale is inscribed with the date 1644. In 1697, a new scale and weights were ordered in Amsterdam. Cf. Postma 1965, 38.

Friesland.¹⁵⁷ Special permission had been granted to accommodate a weigh house in this place.¹⁵⁸ As a result, Makkum possesses the tallest weigh house in the Netherlands, the height of which was further emphasized by means of perspective. When the architectural details are considered, the architect was most likely a local builder.

157 On March 15, 1673, it was forbidden to weigh in the countryside in Friesland. Those localities, which had retained a concession to weigh forty years earlier, did not have to comply with this rule. Makkum was the only municipality that was exempted from this rule. Cf. Schwarzenberg en Hohenlandsberg 1768-93, 959.

158 Wijnsma (1988, 37) speculates that the particular height of the Makkum weigh house was determined by the existing urban situation. The main church with a tower stands in the town quarter known as Makkum, while the weigh house is located in the town quarter known as Statum, which did not have a church tower.

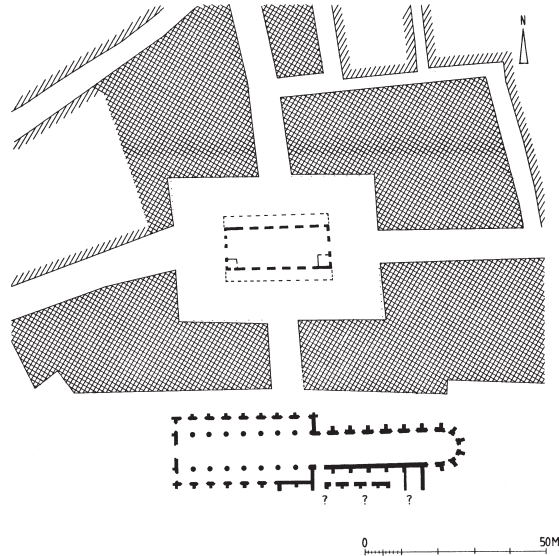
Monofunctional weigh houses with sliding scales

Early forms

The staple right required merchants to store their wares inside trade halls for several days when passing through cities that were in possession of this privilege. The monofunctional weigh house, on the other hand, only sheltered merchandise when it was being weighed and it was neither worthwhile nor was it necessary to undertake the cumbersome task of carrying merchandise into and out of the building. The ultimate innovation in improving the operations of the monofunctional weigh house was the development of a moveable construction for the scales. This mechanism allowed for a scale to be locked securely inside a building and to be driven outside under a canopy for weighing. Although the relocation of weighing to the exterior of the building guaranteed the smooth delivery and removal of the merchandise, it afforded limited weather protection to those who were involved in this process.

Antwerp, 1547-1873: Gilbert van Schoonbeke and the invention of the modern weigh house

In contrast to this study's more closely investigated examples of weigh houses that were built under the jurisdiction of the territorial ruler or a municipal authority, a private businessman, Gilbert van Schoonbeke (1519-56), initiated and oversaw the construction of the weigh house in Antwerp in 1547. He is known for his innovative



51 Antwerp weigh house, reconstruction of the urban context with the surrounding residential buildings by Gilbert van Schoonbeke (shown as hatched area) and the Franciscan cloister (below), approximately mid-16th century

activities as a property speculator, as an urbanist, and as a business entrepreneur.¹⁵⁹

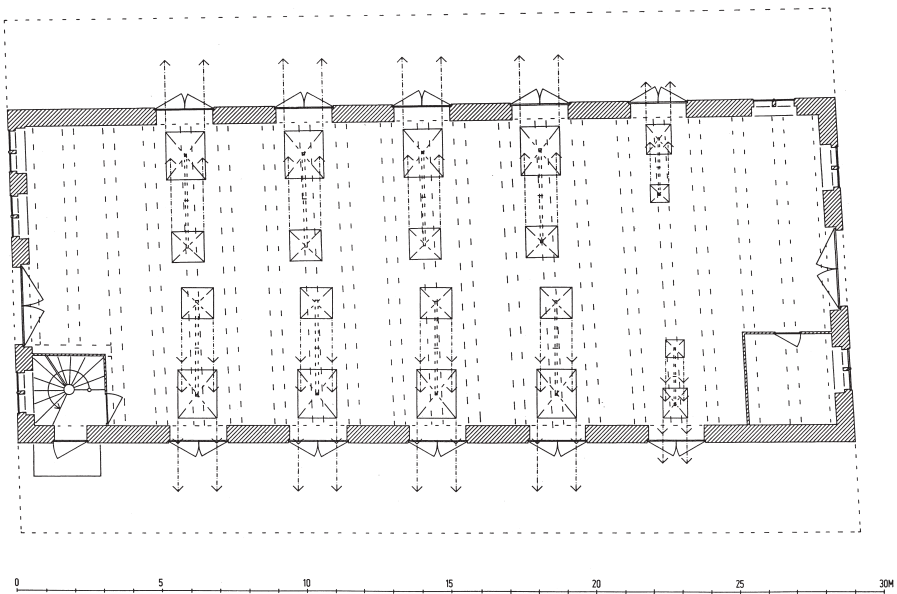
The construction of the weigh house in Antwerp in 1547 comprises only a part of the new urban quarter, encompassing 8587 square meters, which van Schoonbeke developed on the site of the former municipal armory.¹⁶⁰ The weigh house occupied the center of this new quarter. It stood on a square measuring 200 feet (57.40 meters)

159 Soly 1977. My gratitude goes to Hugo Soly for sharing information and providing me with source material concerning the construction of the weigh house in Antwerp from this city's archive.

160 With the construction of the fortification, the armory — an unimportant, wooden construction that could be easily overtaken — was no longer necessary. The quarter developed by Gilbert van Schoonbeke lost its advantageous central loca-



52 Antwerp weigh house, detail of the city plan by Virgilius Bononiensis 1565



53 Antwerp weigh house, reconstruction of the ground floor

in length and 140 feet (40.10 meters) in width. A broad, 32-foot (9.20 meters) wide street provided access to the middle of each of the square's small sides.¹⁶¹ The length of the square was extended from east to west and was parallel to the church of the former Franciscan cloister (after 1450), which was situated to the south of the square.¹⁶² The location of the existing buildings determined the diagonal flow of the northern and western access streets leading into the square.

Whereas most of the urban quarter built by Gilbert van Schoonbeke has been preserved, a fire destroyed the weigh house in Antwerp in 1873. A depiction of the building drawn on the city map by Virgilius Bononiensis in 1565¹⁶³ and details from construction documents created for a remodeling undertaken in 1817¹⁶⁴ are the principal sources of information used for the reconstruction of this building. As opposed to the well-documented Dutch examples presented in this study, not one detailed representation by a draftsman or a painter exists for this building.

The Antwerp weigh house plan measures 100 feet (28.68 meters) in length and 40 feet (11.47 meters) in width. These dimensions correspond to those agreed upon before the start of construction. Situated in the middle of the square, it was surrounded by an open area measuring 50 feet (14.34 meters) in width. According to the cadastral plan, both the weigh house plans and the surrounding square were slightly skewed.¹⁶⁵

tion with the building development of the New Town, which was intended for use as a harbor and a commercial district. Cf. Van Cauwenbergh 1982, 268.

161 Contract from March 14, 1547, affirmed approval by Emperor Karl V. on May 7, 1547. Transcription Piet Balhuizen (Rotterdam). Cf. Soly 1977, 167.

162 The Franciscan cloister in Antwerp was set on fire during the iconoclasm of 1566-67. In 1797, French troops attacked and destroyed it. The Academy of the Fine Arts was erected on the empty site in 1810. Cf. Van Couwenberg 1982, 278.

163 Voet and others 1978.

164 "Plan, coupe et élévation du poids public de la ville (1817)", Antwerp City Archive, Icon. P 4/27.

165 Soly 1978, 107.

The scales were installed on the weigh house's long facades. In the interior of the building, an empty space remained in each of the corners, which could accommodate a staircase or other functions, such as the office for the regulatory board of weights and measures.¹⁶⁶ Both halls in the upper levels were paved and used to store grain. The first upper level also appears to have been regularly used as a dance hall.¹⁶⁷

The city map drawn by Virgilius Bononiensis depicts the installation of the scales in the weigh house in Antwerp. As was typical of depictions of prominent buildings in these kinds of city maps, the number of axes was not precisely represented, but the overall principle was correct. The map shows the weigh house in Antwerp in 1565. Scales for weighing, protected by dormers located above a canopy, extend outwards from the doorways on the exterior facade. When the weigh house assumed operations on March 12, 1548, these details must have been installed in a manner that was similar to those found on the image by Virgilius Bononiensis, as the description of the services rendered in September of the previous year (1547) belatedly noted the additional construction of a canopy with five dormers on each of the building's long facades.

Presumably the weigh house in Antwerp primarily was supposed to be equipped with non-sliding scales. In the original plan, each long facade was to have had four doorways, and the non-sliding scales would have been installed alongside the passageways running between the doorways. The weigh house could accommodate eight weighing positions. Yet if the passageways were not required for through circulation, then ten weighing positions could be accommodated on the building's exterior with the installation of sliding scales. Due to lack of sufficient weather protection, a mezzanine level, with a heated room measuring 20 feet in length

166 Van Cauwenbergh 1982, 268.

167 From 1648 until roughly 1800 the hall was also used as a surgery. Cf. Van Cauwenbergh 1982, 269.

(5.70 meters) and 11 feet in width (3.15 meters), had to be installed in the modified design.¹⁶⁸

As was typical of the buildings executed under Gilbert van Schoonbeke's direction, the weigh house in Antwerp displayed simple, prosaic architectural details, which had their roots in local tradition and which remained largely unaffected by the influence of the Italian Renaissance. One such detail, the stepped gable, terminates the building's pitched roof on both sides. Of the two halls in the upper levels, cross-windows illuminated the lower of the two, while dormer windows situated under the roof lit the upper hall. The walls were constructed of a thin layer of Belgian sand-lime bricks and a thicker layer of Kallebeeker bricks.¹⁶⁹

When the architectural details of the weigh house in Antwerp are considered, one can assume that the architect belonged to the circle of builders involved in the city's municipal construction projects. Of those relevant, the surveyors Pieter Frans and François Drivere as well as the city's master carpenter, Jacob Schooff, were present during the final official inspection of the building.¹⁷⁰ Both surveyors and carpenter, were trained to draw architectural plans and possessed basic design skills at the time.¹⁷¹ It is known, for example, that Pieter Frans collaborated with Gilbert van Schoonbeke on the planning of the bastioned fortifications (1542-53) in Antwerp and the new city extension. He also most likely designed the building in the courtyard of the fortress at Rammekens using vernacular architectural details.¹⁷² Viewed in relation to these activities, we can assume that Pieter Frans was also the architect of the weigh house in Antwerp.

168 Compare Soly 1977, 165 et seqq.

169 Soly 1978, 107. The architectural design and the detailing of the extant brewery (1553-54) in Antwerp, also from Gilbert van Schoonbeke, was probably similar to that of the weigh house.

170 Soly 1977, 168.

171 Meischke 1988, 127 et seq.

172 Cf. Kiem 1987 (a).

Compared to the other buildings in this typology, the weigh house in Antwerp, which dates from 1547, was the first weigh house to be constructed using sliding scales. It was also the largest weigh house ever constructed and with a number of scales that was never exceeded. Knowing Gilbert van Schoonbeke's history and experience as a weigh house master, he was most likely the leading force behind the changes to the original planning,¹⁷³ and it can be assumed that he created the first sophisticated version of the mono-functional weigh house.¹⁷⁴

Amsterdam 1565-1808: A weigh house with a guard-house

The monumental exterior staircase, leading to the guard-house at the upper level, lent the weigh house in Amsterdam its unique architectural identity. This distinct architectural element distinguished this building from the purely monofunctional weigh houses, where the upper level only served a secondary role and was accessed from the interior of the building. The weigh house in Amsterdam was equipped with sliding scales and was probably modeled on the precedent in Antwerp.

The weigh house in Amsterdam was constructed between 1563-65 in accordance with a decision by the magistrate in 1561. Following a decree by King Louis Napoléon Bonaparte (1778-1846), the

173 Following the economic boom of the 1540's, the weigh house that was situated in the center of Antwerp became too small to accommodate the demand for services. Merchandise often had to lie about for three days before it could be weighed. Cf. Soly 1977, 165.

174 Gilbert van Schoonbeke's innovative ideas are apparent when one considers the method in which the new weigh house was financed. The city of Antwerp received this building as a gift from Gilbert van Schoonbeke, who was the project's general contractor. The city provided Gilbert van Schoonbeke with an exceptionally large site for the weigh house. Van Schoonbeke took the surplus area and built houses on it. Cf. Soly 1977, 166 et seq.

building was demolished in 1808.¹⁷⁵ The weigh house can be fairly accurately reconstructed because it was depicted by numerous draughtsmen and painters, and because it was one of the most thoroughly documented buildings in this city.¹⁷⁶ And although it has been significantly altered, the same can be said about the former square — the present day Dam (square) in Amsterdam — where the weigh house and city hall were located.

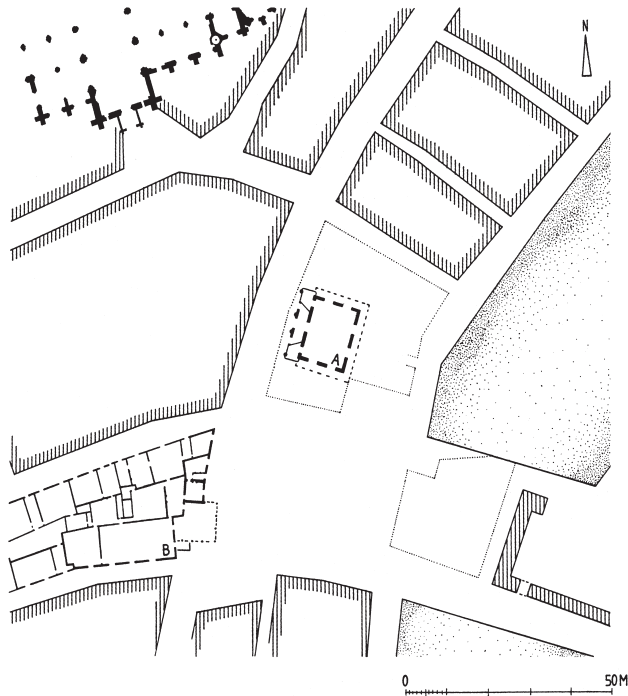
The isometric city plan drawn by Cornelis Antonisz. in 1538 and a measured drawing by Cornelis Danckertsz. de Rij in 1643 that was executed in connection with the planned construction of the new city hall, are the most significant documents which depict the development of the square.¹⁷⁷ The comparison of both drawings shows that a block of houses located between the Nieuwendijk and Damrak was torn down to make way for the construction of the new weigh house.¹⁷⁸

175 Zantkuyl 1978, 129; also Kruizinga 1983, 7. Beginning in 1806, King Louis Napoléon Bonaparte lived in the Amsterdam town hall. The literature about the Amsterdam weigh house asserts that this building was destroyed because it disturbed the king's view from the town hall. However, the French king presumably knew little about — and had little regard for — a Dutch weigh house.

176 Most importantly, Cl. Jsz. Visscher's (1587-1652) engraving of the weigh house, as seen from the west; Community Archive Amsterdam, Historical Topological Atlas, inventory no. M 123-38, neg. no. D-17729; also Jan van Kessel (1641-80), oil painting, weigh house and town hall, view from the east, 1668; Nederlandsche Bank N. V.

177 The city plan by Cornelis Antonisz., dating from 1538, is located in Amsterdam's Historical Museum; the measured drawing by Cornelis Danckertsz. de Rij is in the Community Archive Amsterdam, Historical Topological Atlas, Collection Building Drawings, neg. no. E 6999.

178 There is much speculation about the exact site of the old weigh house in Amsterdam (for example Fokke Simonsz. 1808, 36). These speculations assume a single, monofunctional building. Concerning the weigh house's development as a typology, one must assume that public weighing was accommodated in a multifunctional building prior to 1563. As such, the city hall in Amsterdam, and in particular its ground floor hall, are to be considered possible places for this function. This assumption could explain the fact that a weigh house is not indicated on any city plan of Amsterdam until the middle of the 16th century.

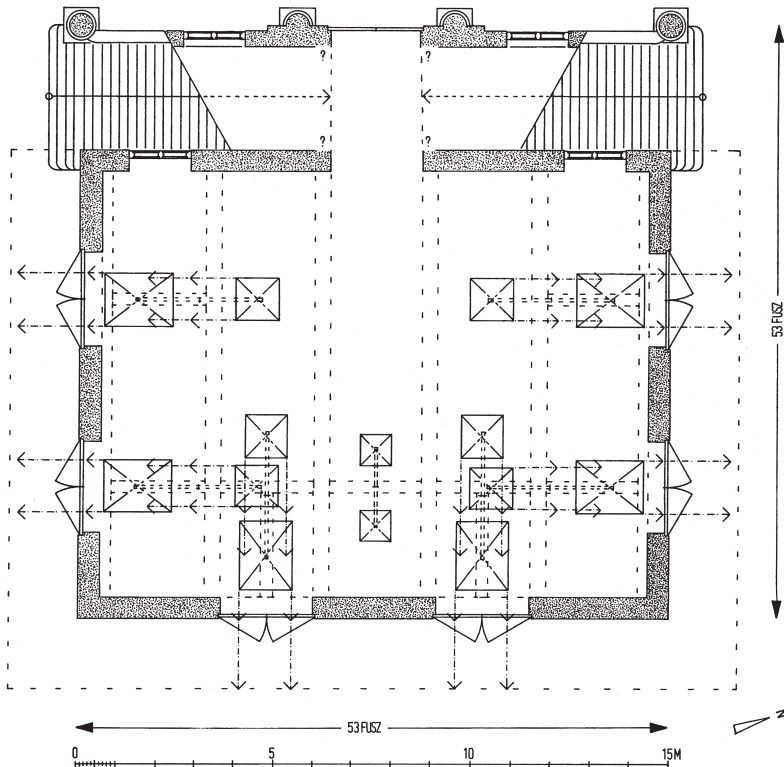


54 Amsterdam weigh house, reconstruction of the urban context in 1565; the weigh house is in the center, the city hall is below left

This demolition enabled the existing square in front of the city hall to be extended to the north of the weigh house¹⁷⁹ to allow for direct access to the Amstel river.

The exterior wall of the monumental staircase on the Amsterdam weigh house's western facade conforms to the line of the former street. The three other sides of the weigh house, in contrast, are set back from the front lines of the former city block in order to provide adequate exterior space for the weighing process.

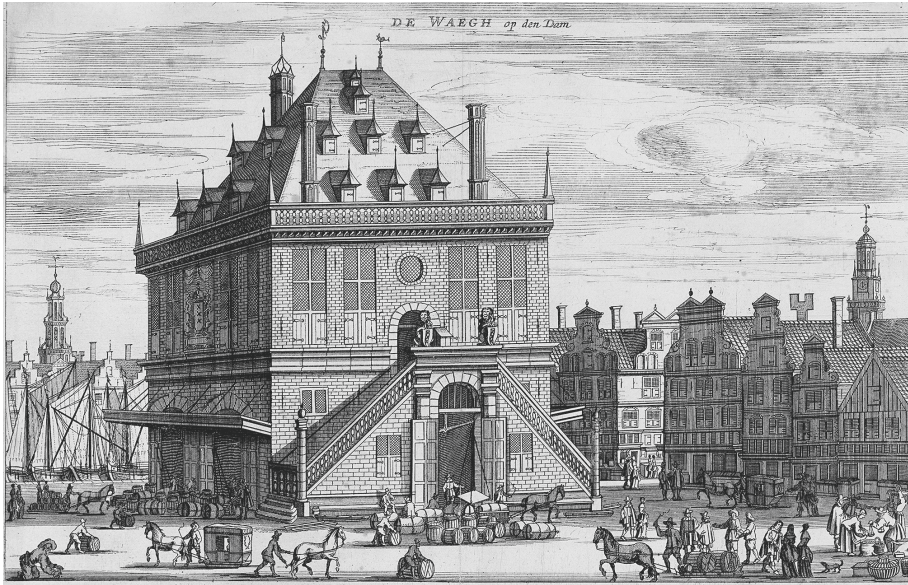
179 After the construction of the monumental city hall by Jacob van Campen in 1648, the weigh house was no longer the dominant building on the Dam.



55 Amsterdam weigh house, reconstruction of the ground floor

When the stair is included, the weigh house had a square plan, each side measuring 53 feet (15 meters).¹⁸⁰ If the dimension of 2.70 meters for the exterior staircase is subtracted, the width of the building measures 12.30 meters. Both small sides as well as the long side, which is situated across from the staircase, contain two doorways.

¹⁸⁰ One Amsterdam foot = 28.3 centimeters. Cf. Verhoeff 1983, 4.



56 Amsterdam weigh house, etching from Claes Jansz. Visscher 1613

A sliding scale was installed in the axis of each doorway.¹⁸¹ On the long side, a distance of approximately 5 meters remained between the axes of the doorways, leaving sufficient space for the additional installation of a small, non-sliding scale on the interior. When they were pushed back into the building, the large scales in the corners did not interfere with one another or disrupt the weighing process, as they could be raised or lowered in this position. When the scales were moved outside of the building, a 1.70 meter wide canopy protected the weighing pans on the exterior.¹⁸² The ground floor extended to include a room located under the staircase, probably

181 Although it is depicted on an old engraving, this investigation does not consider the large scale located in the workers' entrance to the weigh house in Amsterdam to be original.

182 The canopy also protected merchandise that was to be weighed the following day. Cf. Fokke Simonsz. 1808, 43.

used as a storage space for standard weights, as an administrative office, and as an employee entryway.¹⁸³

A side corridor leading from the monumental staircase's upper landing provided access to the rooms in the upper level. The corridor extended to the eastern side and terminated in the large guardroom, which extended across the width of the building. A large open fireplace heated this room. The officer's room located to the left of the corridor and the junior officer's room located to the right of the corridor, in contrast, originally were not heated.¹⁸⁴ Whereas the ceiling beams in the officers' rooms were adorned with decorative carvings, the more modestly furnished guardroom only received a partition with wooden benches for lounging. An additional space for cleaning weapons and manufacturing ammunition was located below the roof.¹⁸⁵

Pl. 2 ←

The Amsterdam weigh house's three side facades, which possess the doorways for the scales, differed from the fourth facade, which featured the monumental staircase. At the ground floor, each of the three side facades had two arched doorways. The building's canopy, attached with tension bars and angled slightly towards the building, was located at the height of the impost stones of the arched doorways. At the upper level, double-winged and three-paneled windows were located on axis and above each doorway. A second, equally high window was placed adjacent to each window towards the corner of the building. A colored relief of the city coat of arms and bearing the inscription "1565" took up most of the area between the double-winged windows in the middle of the facade.

183 Kruizinga 1983, 6.

184 Judging from the secondary chimney on the west side of the building, heating for the rooms on this side of the building was only installed during the middle of the 17th century. Paintings by Jakob Isaacksz. van Ruisdael (1628/29-82), without date, Gemäldegalerie Berlin-Dahlem; Johannes Lingelbach (1622-74), 1656, Historical Museum Amsterdam; and Gerrit A. Berckheyde (1638-98), 1673, Historical Museum Amsterdam, among others, depict the chimney.

185 Fokke Simonsz. 1808, 37.

A flight of stairs originated at each ground floor corner on the western facade and converged at a central landing on the first upper level. One oversized, rusticated Tuscan column marked the threshold to each flight of stairs at the ground level. Similar half-columns flanked the main entrance to the weigh house that was located in the middle of the facade directly below the upper level landing. A lion holding a shield was placed above each half-column on top of the parapet on the stair's landing. One lion carried the Amsterdam coat of arms and the other that of Holland.

Whereas the Amsterdam weigh house's ground floor had massive masonry walls, a lighter construction was used for the upper level. The iron tension bars reveal that a structural wooden framework was connected to the light, exterior masonry shell. On the exterior, both levels appear to have been enclosed with a blue-gray, modestly rusticated Belgian limestone. A cornice wrapped around the middle height of the building. The top of the facade was terminated by a second cornice with a balustrade, and a high, hipped roof with numerous dormers completed the building.¹⁸⁶ On the eastern side, a chimney extended up from the eave and beyond the high ridge beam.¹⁸⁷

The weigh house in Amsterdam was one of the first buildings in the city to be articulated with details influenced by the Italian Renaissance.¹⁸⁸ The name of the architect is not known. Like many

186 Neptune and Fortuna stand across from the flag of Amsterdam at the end of the roof ridge, the towering chimney and a weather vane are located to the east. Cf. Fokke Simonsz. 1808, 38.

187 The two chimneys, depicted on the western side of the weigh house in Amsterdam in earlier images, are not shown on the representations dating from the early 17th century, the most recent being the 1625 perspective drawing by Balthasar Florisz. My deepest gratitude extends to Ruud Meischke, Coen Temminck Groll, and Henk Zantkuyl for their assistance with the reconstruction of the weigh house in Amsterdam.

188 The reconstruction of the plan of the original weigh house in Amsterdam is central to the investigation of this typology. Concerning the later remodeling activities, Jacob Eduard de Witte's restoration and modernization in 1777 is the most important. The roof was capped and the balustrade was removed during this

weigh houses, the municipal architect most likely designed the building. In Amsterdam this would have been Reynier Cornelisz.¹⁸⁹

The Amsterdam weigh house is an important milestone in the development of the weigh house as a building typology. By abandoning the generic form of the trade hall and, for the very first time, being planned to accommodate the functional requirements of the sliding scales, the design refined and optimized the innovations found in the Antwerp weigh house. As it was not only the oldest weigh house with these characteristics, but was also located in the center of the capital of the Republic of the United Netherlands, the Amsterdam weigh house was a noteworthy precedent—a model for the future of such buildings in Holland and Friesland.

Small buildings

Because no weigh house with only one sliding scale existed, it appears that a certain volume of goods requiring weighing was necessary to make the extra effort for the installation of this equipment worthwhile. This is also true of small, one-story buildings.

Schoonhoven, 1617: The secondary installation of sliding scales (1758)

In spite of its relatively modest dimensions, the weigh house in Schoonhoven occupies a prominent location in the city. It is situated on the northern end of the market square, along the canal

undertaking. In addition, the freestanding staircase was repaired, and it received a direct, frontal entrance and an intermediate landing. Cf. Fokke Simonsz. 1808, 63; also Von der Dunk 1999.

189 In 1554 Reynier Cornelisz. was appointed to a three-year term as the city building master (Stadsmetselaar). It can be assumed that this appointment was extended, because in 1564 his name appears in this position in regard to the delivery of stones for the building of the tower of the Oude Kerk. The author extends his ap-

that passes through the middle of the city and intersects the main street, Loopicker Straat (today Kerkstraat).¹⁹⁰ At this end of the square, a vault covering the canal forms the market square and the area surrounding the weigh house. The distance to the wall of the embankment corresponds with the width of the weigh house.

The floor plan of the Schoonhoven weigh house is slightly skewed. The mean length is 8.02 meters and its width varies from 6.53 to 6.85 meters. Both double-winged doors on the front facade face the south, that is, they are oriented towards the market square. Each door is equipped with a sliding scale.¹⁹¹ The workers' entrance is located across from the embankment along the canal and three windows on the rear side provide a source of light for the weighing hall.¹⁹²

A large hipped roof dominates the exterior of the weigh house in Schoonhoven. It has a 3.15 meters wide overhang on the southern, eastern, and western sides. Posts, which are situated on the exterior of the massive sidewalls, support the roof with the help of clamping pieces and projecting edges. At the front of the building, the doorframe jambs carry the roof load. Ionic columns, made of blue-gray Belgian limestone, additionally support the roof's front corners. A partial hipped roof appears at the rear.

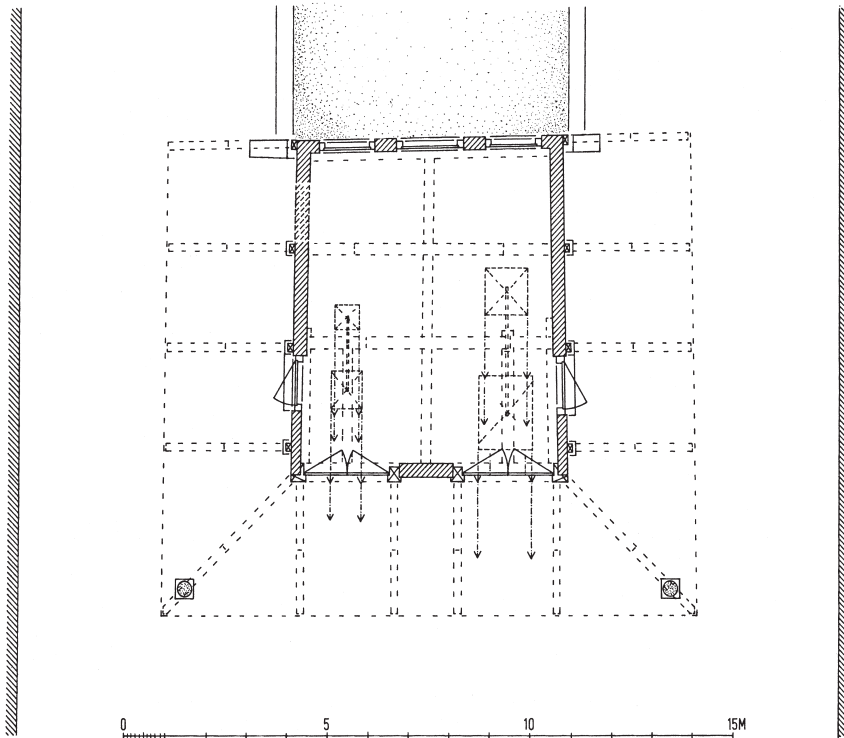
The wooden elements on the front of the weigh house in Schoonhoven are decorated with carvings in the style of the Italian Renaissance. Two dates are inscribed on the front facade. Although the wooden lintel above the doors' fanlights displays the date "1617", the date "1758" is found on the masonry below.

preciation to Henk Zantkuyt for this information, which is included in his duplicates of the invoices of the city of Amsterdam.

190 The weigh house in Schoonhoven has been used as a pancake restaurant since 1972. The installation of a bathroom has unfortunately altered the weighing hall.

191 The scales are no longer in their original positions.

192 Because both of the front-most doors have small ironwork fittings with lilly-shaped endings, they can be considered authentic decorations. Cf. Van Groningen 1995, 123.



57 Schoonhoven weigh house, reconstruction of the ground floor

The building's decorations include an artfully forged sundial that is attached to the middle of the roof front.¹⁹³

An illustration by Joan Bleau in the city atlas dating from 1652 provides an approximate impression of the original appearance of the weigh house in Schoonhoven. The illustration can be relied on for accurate information because the city was measured and precisely drawn for this book. According to this drawing, the original roof had a ridge beam that ran parallel to the canal. The slight roof overhangs on the sides must have been made with an eaves lath

193 The sundial was originally located on the house of the citizen guards and was installed on the weigh house in 1771. Cf. Van Groningen 1995, 123.



58 Schoonhoven weigh house from the south, photograph 1940

as they had a much flatter inclination than is found on the roof. To construct the present roof with its large overhangs, the building was probably given a parapet wall at the same height as the eaves.¹⁹⁴ The different colored bricks — still visible today — on this part of the building indicate the position where the building was walled up at a later date.¹⁹⁵ The fact that the carvings on the front facade completely disappear in the dark shadow from the deep roof overhang is a clear indication that the original canopy was quite small on this side of the building.¹⁹⁶

194 During the research for this investigation, the interior of the Schoonhoven weigh house could only be inspected while the restaurant was in use due to a lack of sufficient understanding on the part of the leaseholder. My gratitude extends to J. Jehee of the (Zeist), who was able to thoroughly document the building for the survey of historic monuments, for further information.

195 The roof truss and the projecting edges of the Schoonhoven weigh house were completely rebuilt in 1936. Information generously supplied by J. Jehee, Zeist.

196 The reconstruction of the Schoonhoven weigh house, which is presented here, differs from the recently publicized drawings by J. Jehee. However, his documents prepared for the reconstruction served as an important point of departure for a more thorough understanding of the original design of the building.

The belated extension of the roof at the front of the building was probably undertaken at a later date in connection with the installation of the mechanism for the sliding scales. The overhang on the sides of the building may have provided weather protection for traders who sold everyday necessities. The dates “1617” and “1758” most likely refer to the erection of the original building and the reconstruction of the roof along with the installation of the sliding scales at the later date.

The Schoonhoven weigh house is unique, as the pyramidal roof creates an exceptionally picturesque appearance. In its reconstructed form, the building displays a certain formal similarity with the Nieuwpoort weigh house, which is actually an extension to a town hall.

Edam, 1778: Originally equipped with sliding scales

The weigh house in Edam is situated on the square where the cheese market was held.¹⁹⁷ Together with two residential buildings, it forms the western side of the square. The weigh house contains two doorways, each of which is equipped with a sliding scale in the middle and a fanlight above.¹⁹⁸ A canopy, which is attached at the lintel above the frame of the doorway and slopes towards the building, extends along the width of the facade.¹⁹⁹

The weigh house’s roof is hipped away from the cheese market. Symbolic decorations adorn the facade facing this public space. These include the city’s coat of arms and an inscription bearing

197 The weigh house in Edam was no longer in use after 1918 (Van Agt 1953, 28). Today it serves as a cheese shop for tourists.

198 Corrie Boschma (1987, 69) assumes that the doorway originally determined the distance between both skylights. This assumption is contrary to the fact that the sliding scale is positioned exactly in the middle of the doorway. Cf. Boschma 1987, 6.

199 The original canopy was not very deep. Cf. the old photograph in Boschma 1987, 4.

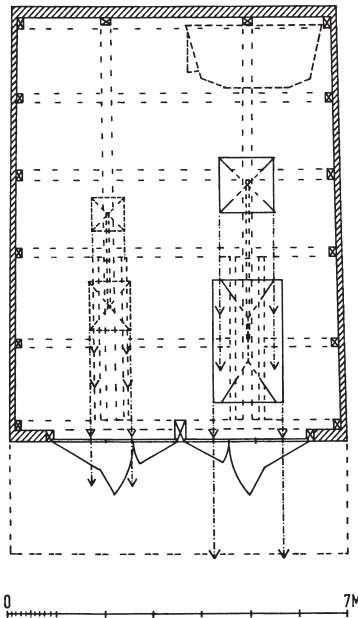


59 Edam weigh house from the west, photograph not dated

the date “1778”, which are located in the middle of the facade, and two round-arched niches housing colored, glazed ceramic figures on each side of the middle axis.²⁰⁰ A parapet wall terminates the front facade. The middle of the parapet extends upwards to form a stepped, closed dormer. An open, six-sided bell tower rises at the rear of the building above the ridge beam.²⁰¹

200 According to Corrie Boschma (1987, 6), the niches with the ceramic reliefs date from the restoration of / around 1880.

201 The substance of the bell tower dates from the 19th century. The original tower was probably repaired at this time. Cf. Van Agt 1953, 28.



60 Edam weigh house, reconstruction of the ground floor

The weigh house in Edam is a lightweight, composite construction consisting of a supporting timber frame structure and clad with a thin masonry shell. Masonry anchors connect these two different materials. The ceiling joists are exceptionally long, measuring 8.27 meters in length. They replaced a ceiling beam in the front area and serve as the girders for the sliding scales.²⁰² The small sliding scale is inscribed with the date “1644” and the large one with the date “1625”. At the rear of the weighing hall, a lightweight partition separates off a small room.²⁰³

202 Due to the extreme deformation of the girder and the settling of the building on one side, when the scale is driven out of the building it must negotiate a significant difference in the heights of the structure and the opening of the facade. A winch with a pulley was therefore installed at a later date.

203 The office room was removed and converted to a toilet.

The site for the Edam weigh house was purchased on February 17, 1778.²⁰⁴ According to the requests for payment submitted by the builders, construction work for the new structure lasted until 1779. Considering the typology of the weigh house, the building in Edam is the only example of a small building that was originally equipped with sliding scales.

The functional loggia type

As will be described in more detail later in this text, buildings that contained large halls, such as multifunctional trade and assembly halls as well as administrative buildings, were widespread throughout Europe in the Middle Ages. Buildings containing large halls frequently possessed an open ground floor loggia, where a public weigh station was located.

Only a few changes were necessary to adapt the traditional loggia to suit the needs of a monofunctional weigh house: doors with locks were required to seal off the arched openings and the facade required a canopy to protect the sliding scales against inclement weather when they were driven outside of the building. However this detail diminished a building's monumental appearance.

The Baroque ideal required a facade loggia to have an uneven number of arched openings in order to create symmetrical design with a clearly emphasized middle axis. All the weigh houses that are detailed in this section have five doorways and were designed in accordance with this principle. As a rule, a scale could be located behind every doorway. Because the scales were located parallel to one another, it was possible to mount them on trolleys. Hence this arrangement is found in all the loggia type weigh houses.

204 Old Archive Edam, inventory no. 210. Transcription Piet Balhuizen (Rotterdam).

Hoorn, 1609: The prototype

Pl. 3 ←

Together with the town hall (demolished in 1797) and the building for the Council of the Estates, the weigh house in Hoorn created an impressive representative ensemble on the city's market square.²⁰⁵ Commensurate with their importance, these three buildings were clad in a blue-gray Belgian limestone.²⁰⁶ The weigh house occupied the southwestern corner of a city block. Whereas the eaves of its canopy align with the edge of the adjoining streets, the body of the weigh house is set back from the street line. The building has a trapezoidal floor plan, whose longer, front facade is oriented to the market respectively to the south.

The advantageous location of this weigh house resulted from a small — but highly effective — urban intervention.²⁰⁷ The previous weigh house, which stood in close proximity, dates from 1559. It possessed the same dimensions, number of scales, and type of canopy as the new building that was completed in 1608.²⁰⁸

205 In 1964, amateur archeologists excavated the foundation of Hoorn's old town hall, which had been demolished in 1797. The plans that were drawn up in connection with this excavation have been lost. The author would like to thank Mrs. Van den Walle from the Archeological Office of the City of Hoorn for providing me with plans of the old Hoorn town hall.

206 The architect J. Cuypers restored the Hoorn weigh house in 1912. At that time, the facade's weathered, blue-gray Belgian limestone was replaced with a more resilient, monochrome granite. Many of the weigh house's interior details were also altered. Cf. Van den Berg 1955, 126.

207 J.C. Kerkmeyer writes that the new weigh house was located on the site of the old one (1911, 235). The subsequent quote from the chronicler Velius on page 241, who noted the demolition of two residential buildings located to the north of the old weigh house, so that the new building could be located 15 to 16 feet inwards, was not considered. In addition, Dröge (1991, 4), who only discovered the municipal bills for the demolition of one house, does not address this chronicler's statement. Velius, however, should be believed. If the measurement known as the Drechterlander foot, or 0.326 meters is applied to the measurements indicated by Velius, then the resulting 4.89 to 5.21 meters correspond to the distance that the still existing 1608 weigh house is set back from the building block.

208 In 1559, Symon Pietersz. from Hoorn, a carpenter, accepted the bid to build the weigh house. Wood was probably the primary building material at the time. After

Nevertheless, it was situated on a site located directly to the south of the current building.²⁰⁹ It was necessary to demolish the old weigh house from 1559, as well as the residential buildings located to the north of it, in order to build the weigh house in 1608.²¹⁰ This procedure not only enabled the new building to assume an important position on the market square, but it also provided a generous forecourt to accommodate the scales when they were moved outside of the building.²¹¹ In addition, the enlargement of the street effectively shortened the path required to transport merchandise between the market square and the weigh house.

The weigh house in Hoorn has two relatively high floors and a hipped roof. Its front facade possesses five axes, of which the middle one is slightly wider than those on the sides. The restrained facade decoration consists primarily of chamfered, rusticated stones,²¹² which selectively accentuate structural details, such as the archivolt and the columns at the ground floor and the straight lintel above the upper story windows. The stone cross-windows are inserted into the wall without decoration.²¹³ A niche replaces a window at the middle

the carpenter, Geryt Gerytsz. from Hoorn, was dismissed, Florys Dircxsz., a master mason from Haarlem, was commissioned to be the architect. Cf. Dröge 1991, 3.

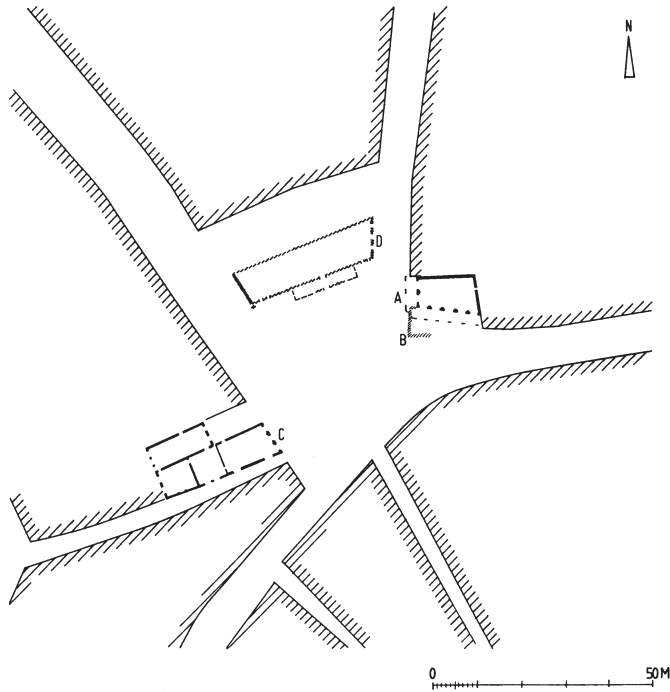
209 A simple, probably one story, building with a square floor plan that was identified as a weigh house must have occupied this corner until 1559 (cf. Dröge 1991, 10). A parcel lying to the east was subsequently acquired. The reconstructions of the plot where the weigh house stood in 1559 show that the area that was occupied by the weigh houses dating from 1559 and 1609 was approximately the same. The isometric representation of the city of Hoorn from Paulus Utenwael (1596) displays a vague image of the weigh house from 1559.

210 Kerkmeyer 1911, 241.

211 Dröge (1991, 4) speculates that the facades were moved back from the edge of the block for aesthetic reasons. He is not correct.

212 Kreft and Soenke 1986, 326.

213 The carvings on the wooden corbels and on the trimmer beams below the open fireplace with their Mannerist ornaments are from the municipal foreman and carpenter Pieter Jansz., or rather, were inspired by the pattern books in his possession.



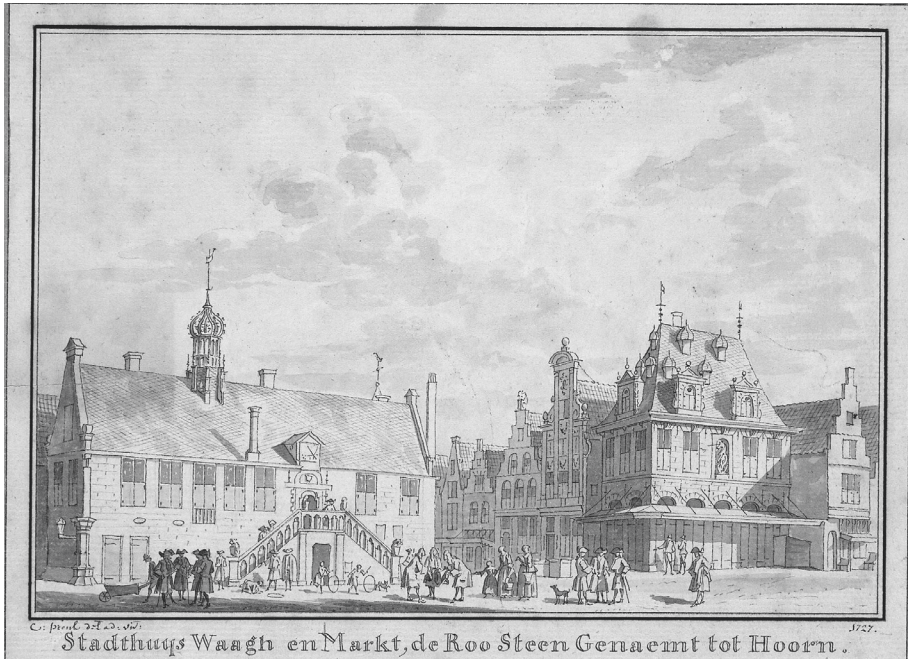
61 Hoorn weigh house, reconstruction of the urban context around 1609: A and B = two earlier demolished houses, C = Council of the Estates, D = city hall

axis on the upper level and houses a symbol of the weigh house's municipal ownership.²¹⁴ Here a sculpture of a unicorn stands atop a pedestal holding the city's coat of arms and carrying an inscription with the date "1609".

The weigh house's facade is clearly proportioned.²¹⁵ The relation of the length to the height of the eaves is two to one-and-a-half. In between, the canopy lies at the height of a half module and the

214 The unicorn on the facade of the weigh house in Hoorn must be considered as the work of Hendrik de Keyser (Neurdenburg, not dated [1930], 110).

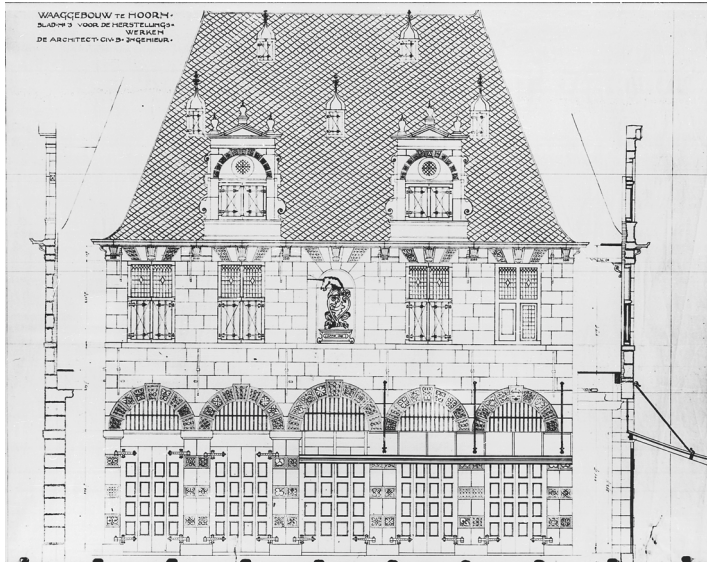
215 It can be assumed that the original ground floor paving was approximately 30 centimeters lower than it is today.



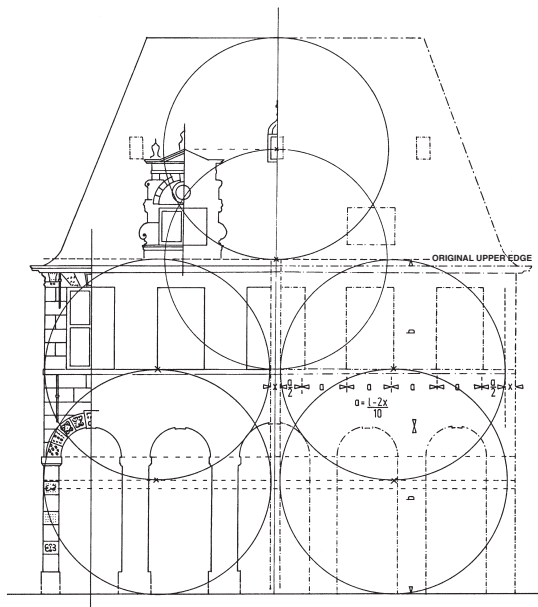
62 Hoorn city hall and weigh house, pen drawing by C. Pronk 1727



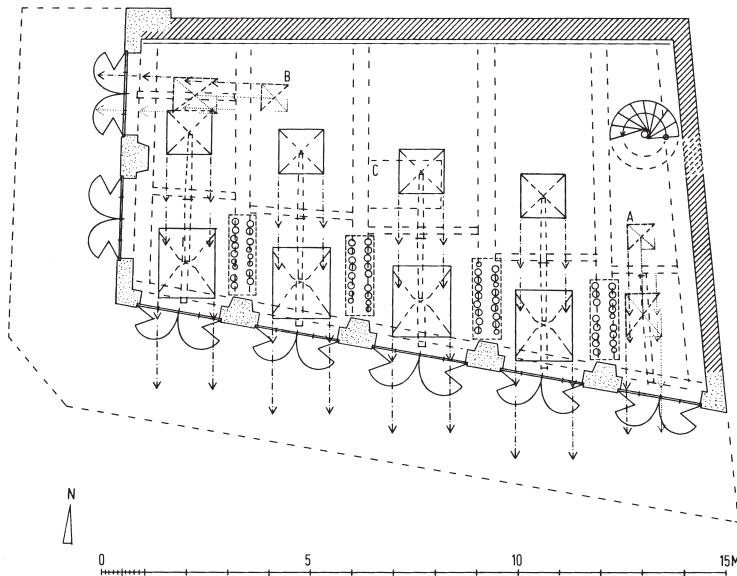
63 Hoorn weigh house from the southwest, photograph before 1930



64 Hoorn weigh house, measured drawing of the front facade by J. Cuypers around 1912



65 Hoorn weigh house, analysis of the facade proportions



66 Hoorn weigh house, reconstruction of the ground floor

windowsill at the height of a whole module, while the roof is also designed to the height of a whole module.²¹⁶ These proportions allow a generous clearance of slightly less than 5.50 meters for the ground floor and a clearance of 4.10 meters for the upper story.

The Hoorn weigh house's ground floor plan dissolves into columns and doorways on both street sides. There are five openings on the long side and two openings on the small side. Because the oblique alignment of the front facade resulted in a narrow, irregularly shaped area immediately behind the doorway to the southeastern corner, this position barely had enough space to accommodate a scale.

216 The canopy was repaired in 1773 and was given the same form. In 1858, it was replaced by a much wider, cast iron construction supported by posts. During the restoration from 1912, it was removed and replaced by a reconstructed version of the original suspended roof. Cf. Kerkmeyer 1911, 244.

In addition, this doorway led directly to the spiral staircase inside, which was cleverly located at the deepest part of the plan. This being the situation, the front of the building had adequate space for the permanent installation of four large scales. Each scale was originally equipped with a trolley containing a mechanism that could be adjusted by using cables.²¹⁷ Both doorways on the small side of the facade were not suited to accommodate larger scales, because when driven inside they would have collided with those located at the doorways on the front facade.

When chronicler Sebastiaan Centen observed in 1740 that the weigh house in Hoorn may have been “invested” with seven scales, he was apparently referring to the number of doorways. Centen observed only four large ones and one small scale.²¹⁸ After the position of the large scales was determined in the plan, the small scale must have then been hung on one of the outside axes, as each also possessed a small girder. The etching published by the chronicler Velius accordingly depicts five doorways on the front facade, each one with a scale, though the weighing pan in the southeastern doorway is actually smaller than the others.

The reconstruction depicting the original placement of the scales contradicts the argument made by J.C. Kerkmeyer. He maintained that the Hoorn weigh house did not originally have a staircase because the large weighing equipment probably blocked all the doorways. Furthermore, the debate that took place with the Hoorn city magistrate concerning the possible construction of a staircase for the weigh house in 1611 by no means infers that the interior was missing a staircase.²¹⁹ It could be that there had been speculation regarding the placement of the entrance at the adjacent residential building, situated to the east, which was purchased in 1613. In this

217 Cf. Kiem 1987 (b).

218 Kerkmeyer 1911, 241.

219 When, on April 16, 1611, the magistrate queried, “*of men een trap aan de waag zal maken*” (whether there should be a stair added to the weigh house) he must

case — at least up to the time of this meeting — it must have been possible to access the upper storey of the weigh house in some way.

In addition, the physical circumstances regarding the connection between the weigh house and the house situated to the east — which was purchased by the city of Hoorn in 1613 and which J.C. Kerkmeyer broadly cites — argue against the assumption that the weigh house did not originally have an internal connection to the upper floor. The natural stone cladding of a passageway to the house adjacent to the east is apparent near the staircase that was restored in 1912. This evidence can only indicate that the entrance to the staircase in the weigh house could also have been accessible through the hallway of the neighboring building. This premise makes sense when the staircase is also terminated by a wooden plank construction, as it enables the upper story to be independent from the business of the weigh house and to be accessible through the neighboring house. The remains of a grilled window additionally show that a certain connection existed between the upper level of the neighboring house and the weighing hall. Because the two buildings did not have the same floor heights, the opening was situated just below the ground floor ceiling of the weigh house. No physical evidence exists to confirm the existence of an original, direct connection between the weigh house's upper level and the neighboring house to the east, however.²²⁰ Thus there is no evidence to suggest that the building originally lacked an internal stairway.²²¹

have been considering the construction of a stairway on the exterior of the building. Cf. Kerkmeyer 1911, 241.

220 During the remodeling of the upper story restaurant in 1990-91, the interior surface of the eastern exterior wall received a new coat of plaster. A documentation of the building substance was not made at this time. According to the municipal architect Jost Buchner, no traces of connections to the neighboring houses appeared when the walls were stripped at this time.

221 In any event, there was not sufficient space for a stair along the middle axis of the rear wall because a large, open Freiplatz was located in this location at this

A large hall, heated by an open fireplace, occupies the entire upper story of the Hoorn weigh house. Only a few documents record its use: in several instances, special events were held in the hall and it is known that from time to time the militia was also accommodated there.²²² The existence of a trap door in the floorboards along the middle axis, however, suggests the use of the upper level also served as a storage room.

The renowned Amsterdam architect Hendrik de Keyser (1565-1621) designed the weigh house in Hoorn. On May 8, 1608, the Hoorn magistrate decided to purchase the necessary building materials to construct the building.²²³ On September 7, 1609, not only was the construction of the new weigh house sufficiently advanced to warrant measuring the natural stonework for the facade,²²⁴ but city mayor Willem Pietersz. Crap was also authorized to ask Hendrik de Keyser in Amsterdam if it was possible to raise the height of the upper level without compromising the design (“... *sonder het werck in zijnen forme enich hinder te doen ...*”).²²⁵ In

place on the upper level. As it appears today, the fireplace was designed by the architect J. Cuypers and installed during the restoration in 1912. The prominent chimney, which originally rose above the roof ridge, was removed (cf. Kerkmeyer 1911, 243). The vault below the ceiling, which covers the ground floor and upon which the open fireplace rests, is original, however. The author extends his sincere thanks to H. J. Zantkuyl (Hoorn) for this information, based on first hand observations of the original building substance of the Hoorn weigh house.

222 Cf. Kerkmeyer 1911, 243.

223 “*Ter saecke vande Waege geleijc in deliberatie is goetgevonden datmen de oude Waege zal laten staen, ende preparatie maecken van materialen tot een nieuwe Waege.*” Cf. Municipal Archive Hoorn, Book of Resolutions of the Mayors from May 8, 1608; Invnr. 103. Transcription Piet Balhuizen (Rotterdam).

224 On July 11, 1609, the magistrate discussed and determined the thickness of the masonry walls (cf. Municipal Archive Hoorn, Book of Resolutions of the Mayors, inventory no. 103. Transcription Piet Balhuizen, Rotterdam). In contrast, other decisions made by the magistrate exclusively concerned the approval of the plans drawn up by Hendrik de Keyser. These include, for example, the conception of the building “*aan het Oosteinde wat wijder*” (Kerkmeyer 1911, 235; Partiman-Stet 1989, 21). Dröge (1991, 4) incorrectly assumes that the Hoorn magistrate closely participated in the design process.

225 The exact text reads, “... *gaen na den haege onder Amsterdam, aldaer t’*

light of the weigh house's ideal proportions, Hendrik de Keyser — who fervently believed that God had supplied architects with divine proportions — certainly did not view the magistrate's request favorably.²²⁶ Regardless, the magistrate decided on September 24, 1609 that the new building should have the same roof height as the previous building, and not a flat one as the architect had probably intended.²²⁷ The magistrate's desire for the new weigh house to have a commanding appearance was also demonstrated by the fact that this authority even considered reducing the height of the adjoining houses on May 23, 1609.²²⁸

Until now, Henry Russell Hitchcock's opinion regarding the quality of the architecture of the Hoorn weigh house has been influential: "*Neophyte as he was at Academic design de Keyser, without being able actually to rival the Haarlem Waag's very advanced character, doubtless did intend to emulate it in this stone structure of identical purpose.*"²²⁹ And in his book "Architectura Moderna", Salomon de Bray points to the fact that the architect did not intend to imitate Roman Antiquity: "*Soo en verwacht niet noch oude of vreemde saecken, nochte geenighen Mausolum ofte oude getimmer*

Amsterdam met henrijck de keyser te spreken off men het tweede viercant een voet, twee of drie zouden mogen verhogen ..." (Hoorn Municipal Archive Hoorn, Book of Resolutions of the Mayors; inventory no. 103. Transcription Piet Balhuizen, Rotterdam). J. C. Kerkmeyer (1911, 239) underlined the word "tweede".

226 Cf. Taverne 1971, 2 and 7. J. C. Kerkmeyer (1911) first documented Hendrik de Keyser's activities in connection with the construction of the Hoorn weigh house without explicit evidence of his authorship. An analysis of the architect and of the architect's work was not included. In her monograph about Hendrik de Keyser, Elisabeth Neurdenburg (not dated [1930], 77) noted information published by J. C. Kerkmeyer but did not investigate the Hoorn weigh house in depth. Finally, H. M. van den Berg (1955, 126) reported that T. R. Mulder's intended — yet unpublished — publication of the city's outstanding accounts from 1608 notes the payment of 32 guilders and 2 Stuivers to Hendrik de Keyser for "*verscheijdene uijtwerpen ende patronen.*" In the meantime, J. F. Dröge (1991) has publicized this source.

227 Kerkmeyer 1911, 241.

228 Decision by the magistrate on May 23, 1609, according to Dröge 1991, 19.

229 Hitchcock 1978, 89.

*Semiramide, ofte oock weder eenigen Roomschen Theatrum, ofte de Renbane Neronij: Maer Kercken, Toornen, Raets-Huysen, Poorten, Huysen, Graven, en dergelijke ...” (Don’t expect any old or foreign things, that is, no Mausoleums of Semiramis, and also no Roman theaters or a circus like Nero would have made: but churches, towers, town halls, gates, houses, tombs, and things like this”).*²³⁰ Hendrik de Keyser was guided by a concern for the effects of climate, a respect for local customs, and a desire for individual expression when he developed the building design. For all intents and purposes, the architecture of the Hoorn weigh house displays a high level of artistic sophistication and a pronounced sense of individual expression.

Monnickendam, 1669: The version with the neck gable

Like the typical Dutch house of the time, the weigh house in Monnickendam has a neck gable and a brick facade, although its size, decoration, and prominent location lent it a more public character. The weigh house is located in the corner of a block of houses at the center of the city. The building’s shorter side faces a street, which passes in front of the city hall and crosses over a bridge and a canal. At the canal, the bridge widens to form a small square. The weigh house’s longer facade opens onto the canal. Whereas this side of the weigh house is also set back from the edge of the street, at a distance measuring the width of the building’s canopy,²³¹ the smaller side aligns with the street edge. When it was

230 De Bray 1631, 11.

231 The Monnickendam weigh house has been largely preserved in its original condition. It underwent restorations carried out by J. F. L. Frowein in 1904-05 and by the Monnickendam Technical Sevice Circle in 1988-89. Today the building is used as a restaurant. Because the kitchen is located in a neighboring building, the weighing hall has been largely preserved. Cf. Van Agt 1953, 89.

constructed, the two-story weigh house dominated the surroundings, predominantly one-story, residential buildings.²³²

The main facade of the two-story weigh house in Monnickendam has five axes. A slight projection and a dormer emphasize the middle axis, and Doric pilasters adorn the upper level. A single neck gable rises above the eave on the long and short facade, and each has the same contour. Their ionic pilasters flank the window in the dormer, which is topped by a segmental arch frontispiece and a panel containing a mussel-shaped ornament below.

The ground floor openings are recessed into the wall without articulation and are treated as a pseudo-mezzanine. Thin letters, "DE WAEGH" (The Weigh House), inscribed at the upper level cornice frieze, which adorns the small side's central projection, announce the building's function. The Monnickendam and Holland coats of arms, integrated into the design of the neck gable above the windows, additionally declare the building's authority.²³³ Although this facade displays the rudiments for a system of proportions, the planning for such was not consequently carried out.²³⁴ In contrast, the canopy appears to be an independent structure placed in front of the long facade. It stretches along the entire length of this side and at a width of 4.50 meters, would have been a more substantial covering than was necessary for a scale when it was partially extended outside of the building.

232 Cf. the drawing of the Monnickendam weigh house and its surroundings by H. Tavenier from circa 1796 (Haarlem Federal Archive, Haarlem). Information cordially conveyed by L.Appel (Warnsveld).

233 To this effect, using the unclear drawing by C. Schoon that dates from 1764, A. P. Bruigom (1979, 50) questioned whether the present day window in the middle of the small side above the ground floor is original. An explanation, based on an investigation of the building substance, cannot be made at this time due to the extensive restoration work.

234 It was also not always possible for Philips Vingboons to design city residences with ideal, square proportions. Cf. Ottenheym 1989, 161 et seq.

Whereas one side of the canopy is attached to the weigh house's long facade, six Tuscan columns made from blue-gray Belgian limestone support the side of the canopy that is closer to the canal. The canopy has an architrave with a triglyph frieze and a shallow pitched roof.²³⁵ Although the canopy's small side now has a hipped gable, it was originally articulated with an ogee-arched gable. The unusually deep canopy sheltered the area in front of the weigh house and was probably also used for other functions. One source notes that it was designated as a stock exchange.

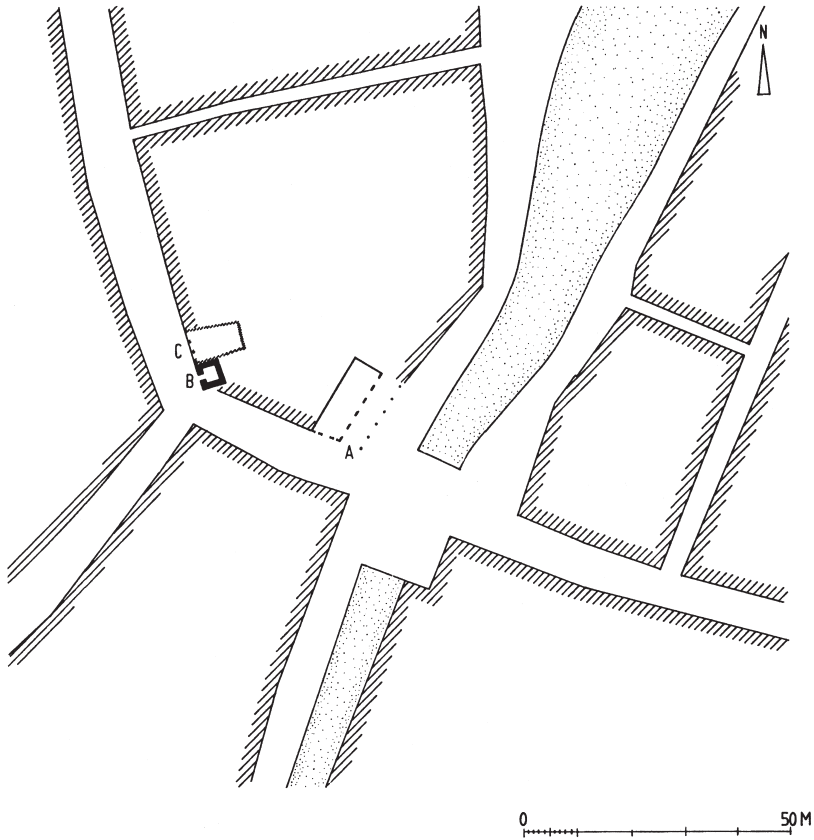
The Monnickendam weigh house's plan measures 15.75 meters in length and 6 meters in width.²³⁶ The double-run staircase leading to the upper level lies in the middle axis on the building's rear side. An open fireplace — an atypical detail for a weighing hall — is situated on the small, northeastern wall on the ground floor. The hall's interior clearance is rather moderately dimensioned at slightly less than four meters. The upper level contains a large open room with a fireplace. As far as is known, the citizen guards used this room as gathering place and for storage.²³⁷ The angled knee braces are decorated with carved wooden corbels on both levels.

In principle, with five doorway axes, the weigh house in Monnickendam was able to accommodate a corresponding number of scales. The extant trolley construction however reveals that weighing mechanisms were only installed on the two southernmost

235 While the slope of the roof is more or less the same until today, the gable was replaced in the 19th century by a frontispiece and in 1905 by a hipped gable. For this last procedure, the entablature was decorated with a triglyph frieze. Cf. Bruijgom 1979, 51.

236 In accordance with the magistrate's July 13, 1666 decision, the new weigh house was to be built on the foundation of the previous building. Cf. Regional Archive Waterland, Purmerend, Old Archive Monnickendam, inventory no. 84; information cordially conveyed by M. A. van der Eerden-Vonk (Purmerend), transcription by Piet Balhuizen (Rotterdam).

237 Van Agt 1953, 89. The citizen guards' guild and the guard-house were also situated in the previous building. After the fire in the old weigh house, a temporary tent was erected. Cf. the magistrate's protocol from October 16, 1666. Regional Archive Waterland, Purmerend, Old Archive Monnickendam, inventory no. 8;



67 Monnickendam weigh house, urban context approximately middle of the 19th century; A = weigh house, B = “play tower”, C = city hall

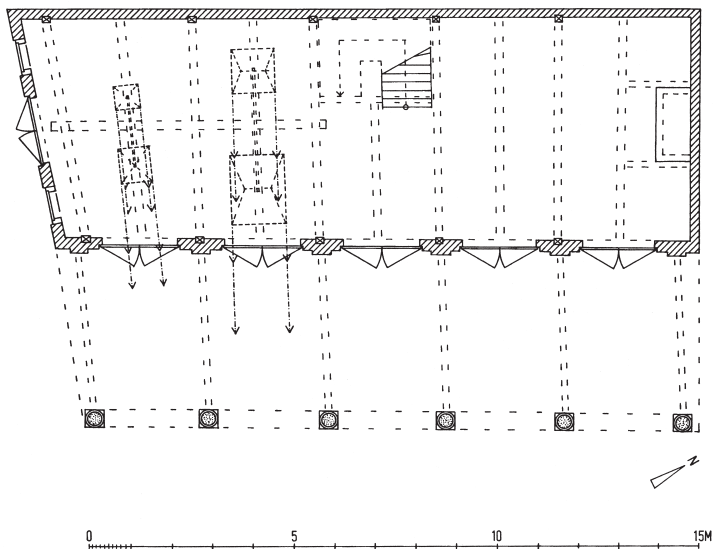
doorway axes.²³⁸ The existence of pseudo-mezzanine windows for both of these axes, and the lack of them at the other three axes, also indicates that the scales were originally installed in this manner. It can be assumed that the part of the hall not taken up by the scales, where the open fireplace was located, had another permanent

Information cordially conveyed by M. A. van der Eerden-Vonk (Purmerend), transcription by Piet Balhuizen (Rotterdam).

238 The small scale bore the inscription “G(eorg?) G(roengraft?) 1688”.



68 Monnickendam weigh house from the south, photograph 1949



69 Monnickendam weigh house, reconstruction attempt of the ground floor

function such as a guard-house. Documents record this function in the weigh house.²³⁹

The construction of the Monnickendam weigh house was agreed to in 1666 after a fire destroyed the previous building.²⁴⁰ The new weigh house was erected in 1669.²⁴¹ The neck gables on the building's facades were apparently influenced by canal houses in Amsterdam — such as those built by Philips Vingboons (1607-78) —, which display multiple variations on this theme.²⁴² As the Monnickendam city hall, which had been completed six years previously in 1660, also had a neck gable, it can be assumed that this facade articulation belonged to the basic design repertoire of the local municipal architect. Records show that both the city master mason, Willem Lubbertsz., and the city carpenter, Jan Jacobsz. Boodt, were involved in the construction of the building, and both can be considered the architects of the weigh house in Monnickendam.²⁴³

239 The light partition, dividing the plan roughly in half, was removed during the restoration in 1904-05. The age of this element cannot be ascertained. Cf. *Begroting van kosten wegens het restaureeren van het Waaggebouw te Monnickendam* from July 29, 1904. Monnickendam Community Archive, inventory no. 507.

240 Measuring 20 by 40 feet (a Waterland foot = 0.302 meter, that is, 6.04 / 12.08 meters) in plan, it would have been smaller than the weigh house that was executed. Berrevoets (1990, 67) incorrectly asserts that the completed weigh house was comparatively modest. My gratitude extends to Pia Oud (Monnickendam) for her help locating drawings, as well as to Mr. Oskar Hennar (Purmerend) for making reproductions of this material.

241 Van Agt (1953, 89) dated the architecture of the Monnickendam weigh house to the third quarter of the 17th century. A. P. Bruigom (1979, 50) identified 1669 as the year of completion, using C. Schoon's drawings of the building dating from 1764 as a reference. The drawings depict the inscription of the original date on the building. This date corresponds to the decisions made by the magistrate, whose protocol for April 17, 1669 notes that a design had been selected for construction. Cf. *Regional Archive Waterland, Purmerend, Old Archive Monnickendam*, inventory no. 84. Information cordially conveyed by M. A. van der Eerden-Vonk (Purmerend), transcription by Piet Balhuizen (Rotterdam).

242 Compare Ottenheym 1989, 75 et seq.

243 *Municipal accounts of Monnickendam from the year 1669* in the *Regional Archive Waterland, Purmerend, Old Archive Monnickendam*, among others, inventory

Rotterdam, 1703-1827: The elongated version

Although the weigh house in Rotterdam was demolished in 1827, it is possible to reconstruct the building, using extant depictions and documentation.²⁴⁴ The dimensions of the weigh house can be determined from a scale drawing of the facade of the old Rotterdam city hall. Made by R. van Kempen, it shows an axis of the weigh house in the background.²⁴⁵ Additional information needed to reconstruct the building is found on the cadastre plan, dating from 1889.²⁴⁶

The Rotterdam weigh house was situated next to the city hall and was separated from it by a small alleyway. Both weigh house facades aligned with the street edge and formed the northeast corner of a city block. The main facade of the weigh house was oriented to the north and faced the milk market (Melkmarkt). To create this market, the canal had been covered with beams and planks and the resulting area was paved. Hatches were made in this construction in front of the weigh house and along the canal in order to enable boats to dock and unload merchandise.²⁴⁷

Along the street side, the ground floor plan had five doorways to accommodate sliding scales. According to the drawing by Van Kempen, each doorway had a width of 9 “Rijnlands” feet (á 0.314 meter = 2.826 meters), while the corresponding measurement of

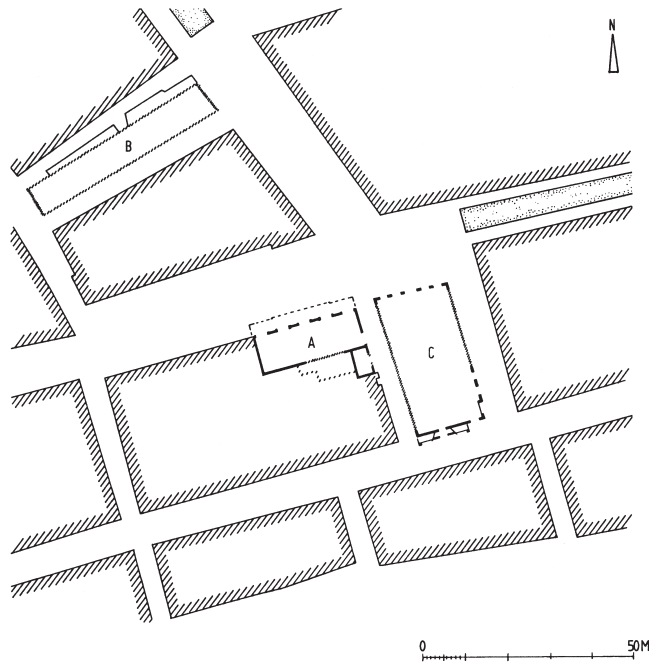
numbers 212 and 229. M. A. van der Eerden-Vonk cordially permitted access to the transcribed texts.

244 Maaskamp, 1790 (inventory no. RI 1068), Chr. Meijer, around 1807 (inventory no. RI IX 1503 b) and D. Moens, 1827 (inventory no. RI 943) made important depictions of the city hall and weigh house in Rotterdam. These images are located in the Community Archive Rotterdam.

245 My deepest gratitude goes to Piet Balhuizen (Rotterdam) for his willingness to collect archival materials and to develop proposals concerning the reconstruction of the weigh house in Rotterdam.

246 “Sectie K, genaamt Rotte”, measured by J. van Campen, Scale 1/1250 (Community Archive Rotterdam). This measurement was made in 1889.

247 Compare Krans 1991, 189.



70 Rotterdam weigh house, reconstruction attempt of the urban context from approximately 1703; A = weigh house, B = meat hall, C = city hall

the four piers between the doorways averaged 8 feet (2.51 meters) and 2 1/2 feet (0.785 meter) remained for the posts on each side. Together, these dimensions added up to the stately length of 82 feet (25.750 meters). This length roughly conforms to the measurements found on the cadastre plan. The weighing hall had a depth of 9.60 meters. When the scale was pushed to the rear of the building, this dimension was adequate for the double-winged doors on the main facade to open into the building. This configuration also allowed for a 2.50 meters-wide walkway along the rear wall leading to an additional doorway on the eastern side of the weigh house.

Each of the five door openings at the front could accommodate one sliding scale. Because such an instrument is never depicted on old images of the westernmost doorway, this opening was probably used as an entrance. It was possible to install a pair of small, non-

sliding scales near to the western side of the weighing hall behind this doorway.²⁴⁸ Keeping this premise in mind, it is possible to construct a drawing with six scales, which corresponds to the information in the written source material.²⁴⁹

On the eastern side, an additional small structure, which extended to the south, was used in conjunction with the weighing hall. This structure was used as a storage room for the sliding scales and the scaffold.²⁵⁰ Additional subsidiary rooms were also located in the back on the rear interior wall of the building. Due to a lack of reliable source material, it is not possible to reconstruct these rooms in a drawing. From the written documentation, however, it is known that the weigh house also possessed a room for workers and an office on the ground floor.²⁵¹ Written sources also record that the cellar was used to store peat and that the building contained an internal staircase.²⁵²

The exceptionally long Rotterdam weigh house displayed nine window axis, a particularly large number for this building type. A central projection embraced the middle five axes, while a large relief displaying various coats of arms emphasized the centermost axis at the upper level. An arched doorway articulated the first, third, fifth, seventh, and ninth axis on the ground floor and a grilled window was placed on the masonry posts located between them. The canopy was hung from the facade and extended across its entire length. The weigh house's eaves were the same height as those of the surrounding residential buildings, yet they exceeded those

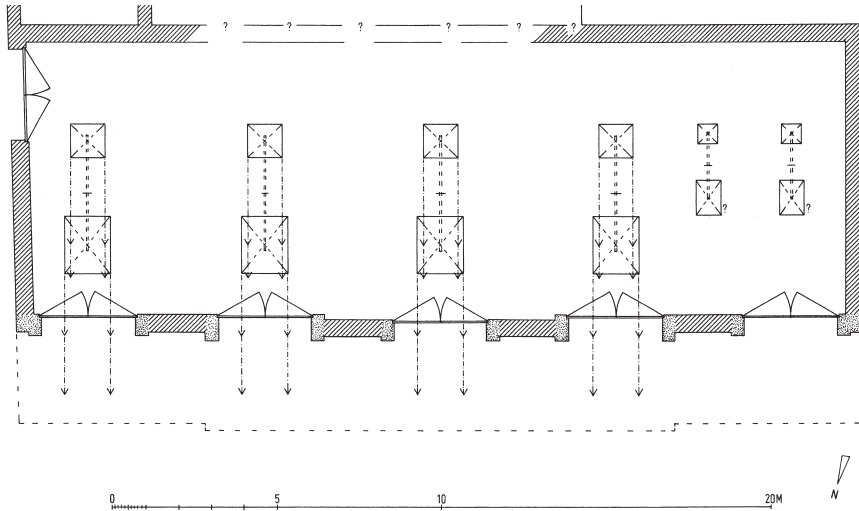
248 Cf. Krans 1991, 190.

249 Krans (1991, 190) reported six sliding scales. Due to the generous length of the weigh house, it was possible to place both small scales between the larger ones. When all the large scales were in operation, however, an entrance leading to the interior would have been blocked.

250 The doorways identified by Krans (1991, 190) cannot be precisely located in the reconstruction drawing.

251 Cf. Krans, 1991, 190.

252 If they were sufficiently small (for example, Haarlem), it would have been possible to locate the subsidiary rooms in the square footage of the weighing hall.



71 Rotterdam weigh house, reconstruction attempt of the ground floor



72 Rotterdam weigh house, drawing by E. Maaskamp 1790



73 Rotterdam city hall and weigh house, colored drawing by D. Moens 1827

of the city hall's mezzanine level. In contrast, the height of both the ground floor and first level of the weigh house corresponded to the floor heights of the city hall. The weigh house's largely undecorated facade was consistent with the dominant architectural style of the time (Strakke Stijl).²⁵³

Until roughly 1700, public weighing was located in the city hall. A decision was made that year to remove the weighing function and place it in an independent building. In February 1703, weighing commenced in the new building. A walkway was installed connecting the upper story of the weigh house with the city hall in 1709.²⁵⁴ To create two additional rooms, this building part was increased to approximately the width of the weigh house in 1790-91.²⁵⁵ Jan

253 Cf. Ter Kuile 1948, 154 et seqq.

254 Krans 1991, 189.

255 Krans 1991, 192.

Jansz. de Ridder, the city's municipal architect from 1694 to 1714, was identified as the architect of the weigh house.²⁵⁶

The building occupies a significant place within the building typology of the weigh house because of its particularly large dimensions. Its three stories approximated the height of the previously described tower type and its nine axes render it the longest weigh house. The reason for these unusual dimensions might be ascribed to the fact that the weigh house in Rotterdam was primarily designed to weigh hemp, which was grown in large amounts in the area surrounding this city. It can be assumed that this substance, which has a low specific weight, required a generous service area on the side of the weighing pan. The same, unusually large distances between the axes of the doorways are found in the nearby trade hall, which was known as the "hemp weigh house", and which was converted into a meat hall in 1623.

The synthesis of functionality and monumentality

Two examples of a subtype of the monofunctional weigh house, which combine the characteristics of the monumental appearance of the tower type (Haarlem) and the repetition of sliding scales found in the loggia type (Hoorn), appeared in the province of Holland. As this subtype attempted to unite the advantages of each type while avoiding their disadvantages, it will be identified as the synthesis type. These weigh houses had a monumental appearance and their sliding scales were now optimally arranged. The development of this building type reaches its conclusion with these two buildings. The renowned Dutch architect, Pieter Post (1608-69) designed the synthesis type and created both the prototype in Leiden and the only variation, which is located in Gouda.²⁵⁷

256 Moquette 1922, 118.

257 Cf. Ottenheim and Terwen 1993 for the complete oeuvre of the architect Pieter Post.

In some respects, the weigh house in Amsterdam can be seen as a forerunner of the synthesis type. In this building, one finds the combination of a u-shaped organization of the sliding scales in the interior and a tower-like building form that is articulated with canopies. The decisive step towards the synthesis type occurs in the rejection of a canopy on the front facade and the placement of the sliding scales and their protective canopies on the sides of the building. As with all monofunctional weigh houses, the upper floor of the synthesis type primarily existed as a means to magnify the importance of the building. Prominently displayed reliefs could adorn the upper story because canopies did not appear on the main facade.

The first design for the weigh house in Gouda demonstrates the tentativeness with which architect Pieter Post moved toward the development of the synthesis type. He not only reverted to the installation of a canopy on the front facade in this design, but also included an entrance with circulation to the upper level on the rear facade, similar to the stairway found at the bi-functional weigh house in Amsterdam. Only his revised design displayed the decisive, new typological innovations.

The freestanding building, a key characteristic of the multi-functional medieval trade hall, reappeared in the synthesis type, and the development of the weigh house as a building typology reached a pinnacle with this design. When regarding the typology as a whole, the monofunctional weigh houses that were constructed after the one in Gouda fall behind the level of development that had been achieved with this building.

Leiden, 1658: The prototype inspired by Antiquity

The weigh house in Leiden was an independent, monumental building annexed to a hall of lesser importance. Each building section occupies a different place on the site, to draw attention to their distinct functions. The weigh house is prominently located

on the southern embankment of the Rijn, at the confluence of the river's so-called old and new arm. At this point, the Rijn forms a wide, triangular basin, where the crane and its platform extend toward the water.²⁵⁸

The front of the weigh house in Leiden aligns with the street edge, although its sides maintain a distance from the neighboring houses. The considerable height of the weigh house, which originally dominated the nearby structures, its natural stone facades, and the differentiated design of its architectural details additionally distinguish it from the surrounding buildings. The butter hall, in contrast, was situated at a less prominent area of the site to the rear.²⁵⁹ As it largely abutted the adjoining buildings on three sides, its length can only be properly seen along a small alleyway, the Mandenmakersteeg. From this vantage it is only one story high and has a simple brick facade.

The Leiden weigh house is square in plan, each side measuring 31 "Rijnlands" feet (9.73 meters). Each of the three free sides has a central doorway and is flanked by side windows. This division allows for the installation of a scale on each of the free sides "*inschuivende, zoals dat in Amsterdam geschiedde*" (sliding as could be seen in Amsterdam).²⁶⁰ Judging from the reconstruction of the girder that was installed on the front facade, the large scale was originally to be situated on the southeastern side. But this location was used for weighing only from 1904 on.²⁶¹ The weigh house's staircase and the

258 A seesaw device replaced the crane that stood adjacent to the Leiden weigh house in the 19th century.

259 Since 1935 an adjacent five-story department store has overshadowed the Leiden weigh house.

260 Jesse 1909, 137.

261 Kooiman 1956, 6. Even today a fence separates the unused space under the western canopy from the street. The corresponding architectural drawing (Community Archive Leiden, inventory no. 20008 M) probably dates from the first half of the 19th century. Even when both K. A. Ottenheym and J. J. Terwen (1993, 189) note that a decision was made to install two small scales on the side doorways, it appears that this intention was not completely carried out.



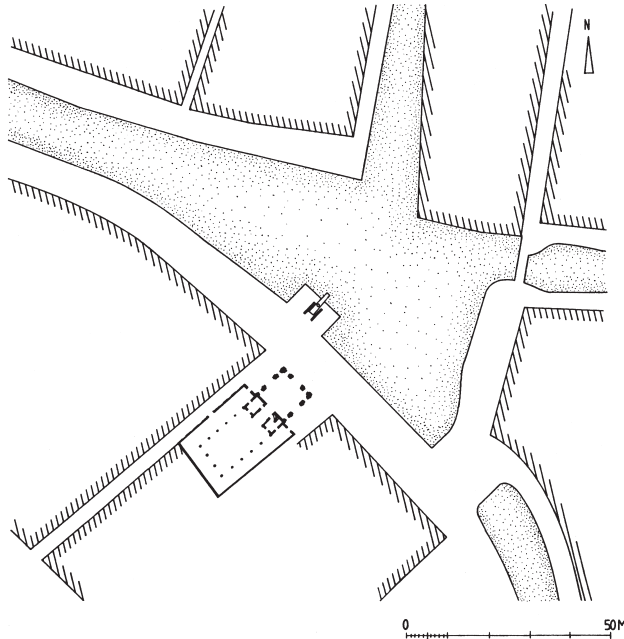
74 Leiden Aalmarkt with the weigh house (left) and the crane (middle), drawing by J. de Beijer 1750

weigh house master's office were situated in the butter hall. The ground floor of the weigh house could hence be used exclusively to weigh merchandise.

The weigh house's upper level originally contained one large hall, that was used for diverse gatherings well into the nineteenth century.²⁶² An open fireplace was located behind the large relief on the front facade. It is flanked by two Ionic pilasters, which frame an oil painting, and terminates in a segmented-arched gable at the ceiling.²⁶³

262 A telephone exchange occupied the upper level in 1896. A stair leading from the Mandenmakersteeg entrance to the upper level was added and the old internal staircase was removed due to this change of function. The upper level served as an office for the market and harbour administration after 1920. The original staircase was replaced in 1956. Central heating was also installed at this time. Cf. Loosjes 1918. 104; also Kooiman 1956, 6-7.

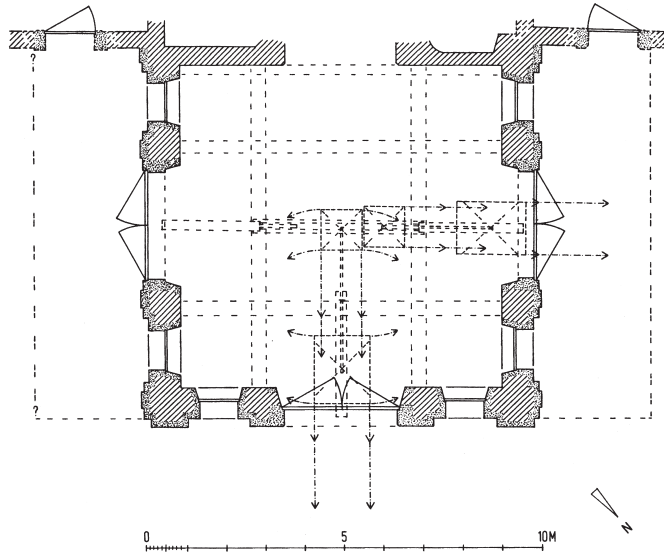
263 The open fireplace on the upper level of the Leiden weigh house dates from



75 Leiden weigh house, urban context approximately middle of the 19th century

The weigh house in Leiden has two high floor levels and a low pyramidal roof, which lend it a majestic, towering appearance. The lower level is treated as an ashlar masonry base. The central doorway, flanked by pilaster strips, is designed as a central projection. The upper level is articulated with Doric pilasters that are set on pedestals and appear to carry a triglyph frieze and a frontispiece above it. However the small and slightly angled cornices, the pseudo-mezzanine windows, and the perpendicularly cantilevering

1704 and was designed by Antonij van Leeuwen. The artist Jacob van der Sluys painted the picture that adorns it. This painting depicts an allegory of the surgery, a play on the guild of surgeons, whose office was located in the weigh house's upper level beginning in 1669. Cf. Thiels 1980, 223.



76 Leiden weigh house, reconstruction of the ground floor

canopies on the sides slightly undermined this pronounced vertical organization.²⁶⁴

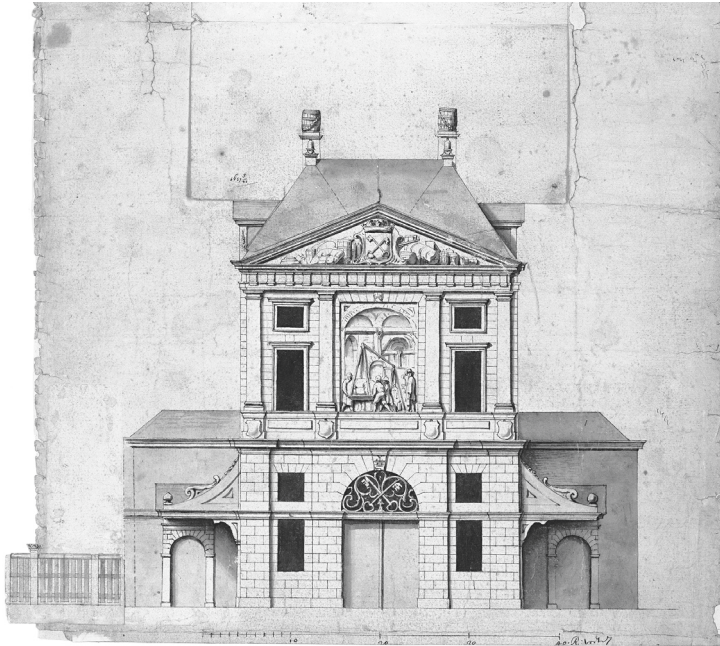
A square marble relief depicting a weighing scene is located at the middle axis of the upper level and extends the entire height of this story. On the side facades, additional reliefs display images of scales and garlands festooned with weights. The coats of arms for families of local regents were placed on the four pedestals of the pilasters and illustrate the power relations in Leiden at the time of the weigh house's construction.²⁶⁵

264 The original knobs on the canopy were removed over the course of the 18th century. Cf. drawings, not signed or dated, inventory no. 20015 K and 20016 aK, Leiden Community Archive.

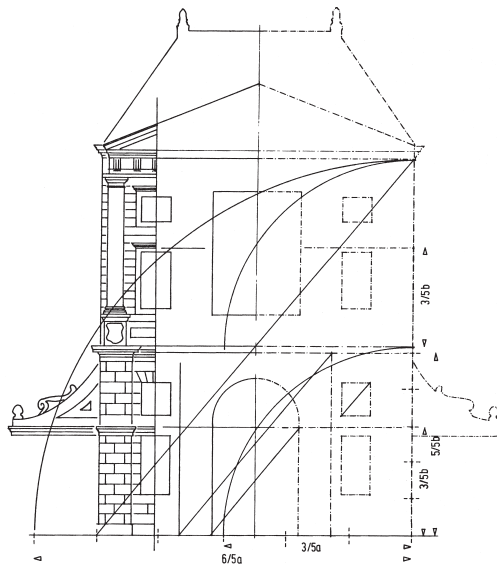
265 As in other places, the original coats of arms of the regents was most probably removed during the so-called Patriotic Time Period (end of the 18th century). Cf. Loosjes 1918, 104.



77 Leiden weigh house, photograph of the front facade 1923



78 Leiden weigh house, design of the front facade by Pieter Post, dated September 9, 1657, executed roof variation



79 Leiden weigh house, analysis of the facade proportions

A commensurable system of proportions underlies the design of this facade. Each level is designed at a relation of 5 to 3. This ratio approaches the Golden Section and forms the major sixth in music. Together, both levels form the relation six to five, that is, a minor third. When examined in further detail, the placement of the entrance doorway, the middle projection, and the additional subdivisions of each storey follow this system of proportions.

On August 21, 1657 the Leiden city magistrate agreed to build a new weigh house,²⁶⁶ and on September 5 they accepted and agreed to construct the design by architect Pieter Post.²⁶⁷ Philips, the son of the mayor Van Buytevest, laid the first stone on the building site exactly two months later. During construction, it was decided to raise the ground floor level by two feet.²⁶⁸ Sculptor Rombout Verhulst received the commission to execute the reliefs in 1658.²⁶⁹ This year was also inscribed in the tympanum of the Leiden weigh house, although the building was officially inspected and declared ready for use on July 16, 1659.²⁷⁰

Apparently Willem van der Helm (around 1625-75), who eventually became the municipal architect of Leiden, participated in the discussion concerning the weigh house.²⁷¹ An alternative design by this architect has survived. It depicts the facade without any architectural orders. In addition, there must have been a discussion concerning the shape of the roof. Although it was initially supposed to be a pyramidal roof, the truncated version with an interior drainage

266 Ter Kuile 1944, 53.

267 Ter Kuile 1944, 54. G. A. C. Blok (1937, 43) dates Pieter Post's acceptance of the commission one day earlier.

268 Ottenheym and Terwen 1993, 186.

269 Notten 1907, 20.

270 Ter Kuile 1944, 54.

271 F. A. J. Vermeulen (1941 (b), 163) asserts that Pieter Post's commission for the Leiden weigh house only involved the improvement of the plans by Willem van der Helm. This assumption is due to the incorrect dating of the plans by van der Helm.



80 Leiden weigh house, executed design of the side facade by Pieter Post from August 8, 1657

that was executed was developed at a later date.²⁷² In light of the completed building, it can also be assumed that the magistrate of Leiden supported the design by Pieter Post with its references to the architecture of Classical Antiquity.²⁷³ This preference probably reflected the predilections of the classically educated middle classes living in this university city.²⁷⁴

272 Jesse 1909, 137. Both roof forms appear in previous buildings by the architect Pieter Post. Cf. Ottenheym and Terwen 1993.

273 H. J. Jesse (1909, 137) claimed the steep roof reflected the “Dutch sensitivity” of Willem van der Helm. Pieter Post had drawn a capped roof over it, whereby his teacher, Jacob van Campen, might have seen this detail in Italy and adapted it to use in the Netherlands.

274 The drawing of the completed facade (Leiden Community Archive. Front facade, inventory no. 20002 M) is not signed, but the council decision concerning the construction of the Leiden weigh house definitively named Pieter Post as the author

The Leiden weigh house's facade, with its sophisticated architectural organization, is an exception in this typology. At the ground floor, the facade of the weigh house in Leiden can be seen as a triumphal arch, while its upper level can be interpreted as a flattened tetrastyle. With this facade design, the weigh house in Leiden departs from an otherwise rather utilitarian building type and transforms into a more resplendent form of architecture. In this regard, the emergence of the alternative design by Willem van der Helm can perhaps be traced back to contemporary misgivings on the part of those who found the completed building's architectural language highly unusual and somewhat inappropriate for a weigh house.

In the end, E.H. ter Kuile asserted that the Leiden weigh house's rich architectural details render it one of the best buildings realized by the not entirely unimportant architect Pieter Post. Ter Kuile even asserted that it was designed with exceptional feeling.²⁷⁵

Gouda, 1668: The refinement

In Gouda, the weigh house's location in the city references the origin of this type in both the town hall and the medieval trade hall.²⁷⁶ The weigh house not only lies on the axis of the free standing town hall, which is located on the market square, but also has the same width as this building. The placement and identical widths of the weigh house and town hall create a highly visible connection between the two buildings.²⁷⁷ The front facade of the weigh house

of the design. Cf. Vermeulen 1941, 384. The corresponding side facade (inventory no. 20003 M) is signed by Pieter Post and dated August 29, 1657.

275 Ter Kuile 1957, 140.

276 The Gouda weigh house is almost completely preserved. Concerning the 1956-59 restoration, cf. Joosten 1962.

277 When the house "De Oude Zalm", seen from the market place to the right, was remodeled in 1670, the magistrate vigorously insured that this construction would

additionally forms a part of the street facade enclosing the market square. It occupies an especially prominent position there, lying at the imaginary intersection of two sides of the market square, one oriented towards the east and the other to the south. Being a freestanding building it also stands apart from the neighboring blocks of houses. As the weigh house occupies only a quarter of the depth of the block, the remaining space is given over to a forecourt at the rear of the building.

The Gouda weigh house's plan is designed to accommodate sliding scales on all four sides: one each on the front and rear facades, and two on each side facade. Canopies protect the doorways of both side facades, and windows also flank each frontmost doorway. The corners that are not needed for the scales provide space on the east or rear side, for a staircase and the room of the weigh house's leaseholder, and on the west, that is, the front side, for the office of the master of the weigh house.²⁷⁸

The plan of the Gouda weigh house's averages 36 "Rijnlands" feet (11.30 meters) in width and 42 feet (13.19 meters) in length. The ceiling beams are carried by a cross girder that is supported in the middle by a timber Tuscan column. A wooden post holds the cross girder at each exterior wall. Three girders and two head plates divide the ceiling lengthwise into four areas. The placement of the girders for the sliding scales is perfectly integrated into this ceiling structure, demonstrating that while the building was under construction, thorough consideration was given to the arrangement and the requirements of the weighing equipment.

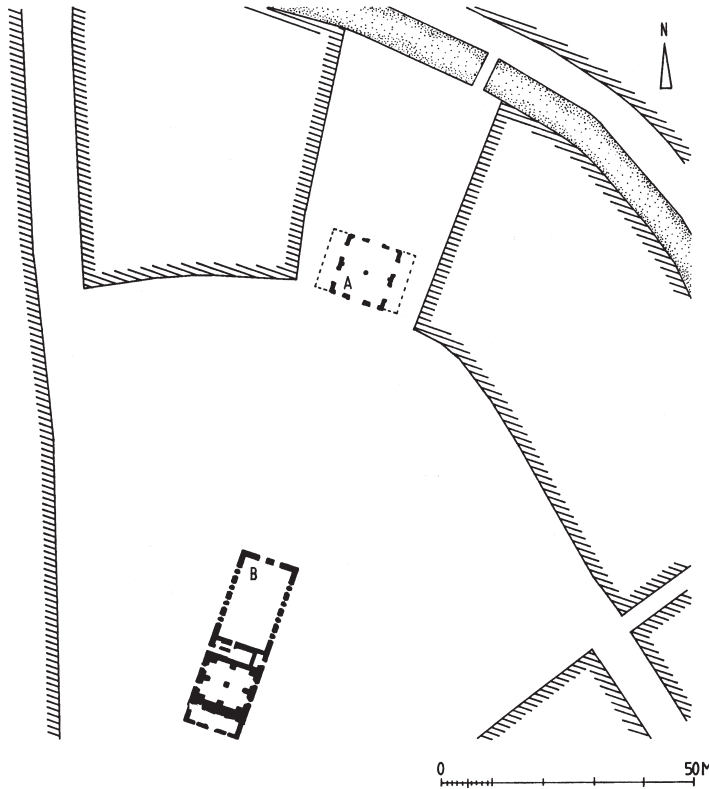
The Gouda weigh house's upper level contains a hall that was not heated originally. A stair leading from the weighing hall provides access to this level. The citizen guards stored their weapons here

not undermine the weigh house's dominant appearance. Cf. the binding articles given to the home owner in Putte 1940, 56.

278 Van der Aa 1715, "Gouda", 4.



81 Gouda city hall and weigh house, etching by Arend Lepelaar 1713

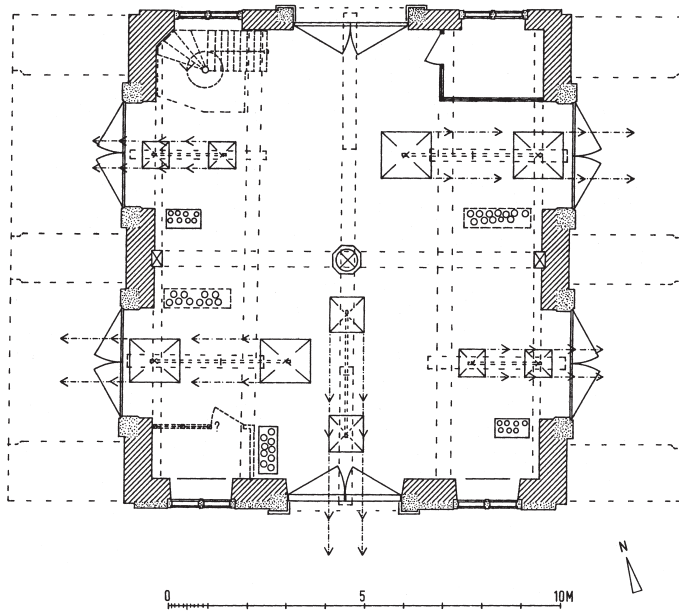


82 Gouda city hall (B) and the weigh house (A), reconstruction of the urban context from approximately 1668

for a long time and it was also rented out for various other uses upon occasion.²⁷⁹

The Gouda weigh house's facade closely resembles the weigh house in Leiden, which was also designed by Pieter Post. Both designs display a number of similarities including a tripartite axial division with a wider middle axis, which is terminated by a Doric entablature and the pediment, and a truncated pyramidal roof. Other shared details include ashlar masonry cladding, the placement of a

279 Van der Aa 1715; as well as Joosten 1962.



83 Gouda weigh house, reconstruction of the ground floor

large relief in the middle axis at the upper level, and the lack of a canopy on the front facade. The cornice lies exactly at the same height on both buildings, and their pediments as well as their roofs also have the same slopes. Of the two weigh houses designed by Pieter Post, only the surface decorations — the reliefs, the coats of arms, the frontispiece, the weighing scene on the front facade, and the high small reliefs depicting weighing utensils on the side facades — display somewhat differing pictorial schemes, which can be attributed to the predilections of the sculptors Rombout Verhulst (Leiden) and Bartholomeus Eggers together with Pieter van Luyck (Gouda).²⁸⁰ The reason for the elimination of the pilaster grouping

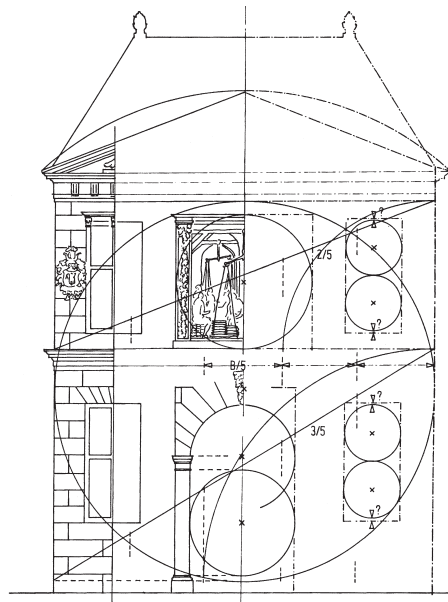
280 As was the case in Leiden, the coats of arms were removed and discarded during the so-called Patriot Time Period (Putte 1940, 56). A new one was cast and mounted on the same position in 1956-57. Cf. Joosten 1962, 16.



84 Gouda weigh house, photograph 1960



85 Gouda weigh house, second design for the front facade by Pieter Post



86 Gouda weigh house, analysis of the facade proportions

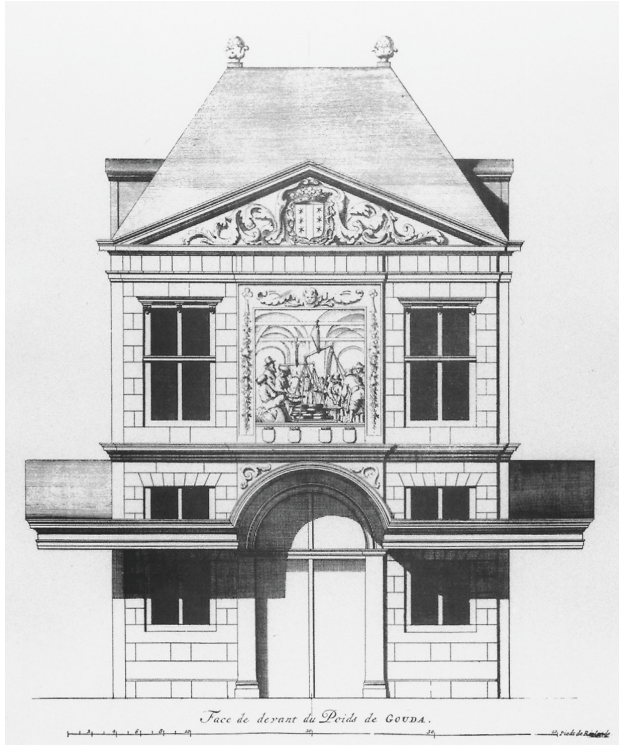
and the use of stone cross-windows, an antiquated window detail at the time of construction, will be discussed at a later point.

The height to width ratio of the Gouda weigh house is proportioned one to one, which creates a harmonious impression. The ground floor occupies three fifths and the upper storey takes up the remaining two fifths of the resulting square facade. The doorway (to the transom) and the relief are also designed as squares. The proportion of one to one repeats at the windows, the dimension of which is determined by two squares placed one atop the other. The regular ashlar masonry, which articulates the side axes, and the recessed canopies on the side facades also contribute to the front facade's pleasing impression.

The Gouda city magistrate established a committee on May 23, 1667 to oversee the construction of the new weigh house. They selected Pieter Post as the architect. On October 31, 1667 they decided to purchase and demolish ten houses on the site of the planned weigh house and to erect an interim wooden structure.²⁸¹ The construction of the new weigh house commenced on April 5, 1668,²⁸² and the building finally began operating in May 1670.

281 The interpretation of the wooden construction as "loose waeg" in the source material regularly shifts in meaning, indicating either the provisory wooden hut used for the weighing during the construction phase (Joosten 1962, 14; Smink 1998, 67) or the built-to-scale model of the future weigh house's facade (Blok 1934, 106; also Terwen and Ottenheym 1993, 190). The verbal analysis leaves both possibilities open: "loos" as "not securely fixed to the earth" or "loos" as "false", "apparent", "without obligation" (cf. Verdam 1981, 338 and 1983, 204). A survey of the municipal accounts leaves one with the conviction that "loose waeg" implies a temporary wooden shed. In May 1670, for example, the city was required to pay the costs arising from the demolition of this structure, that is, at the point in time when the new weigh house was put in use. Therefore, the "loose waeg" could not have stood on the building site. An argument against the model of the facade of the future weigh house is the fact that the "loose waeg" had a canopy wrapped around it and hinges and locks were installed on this building (Smink 1998, 67). Cf. Peters 1908, 192.

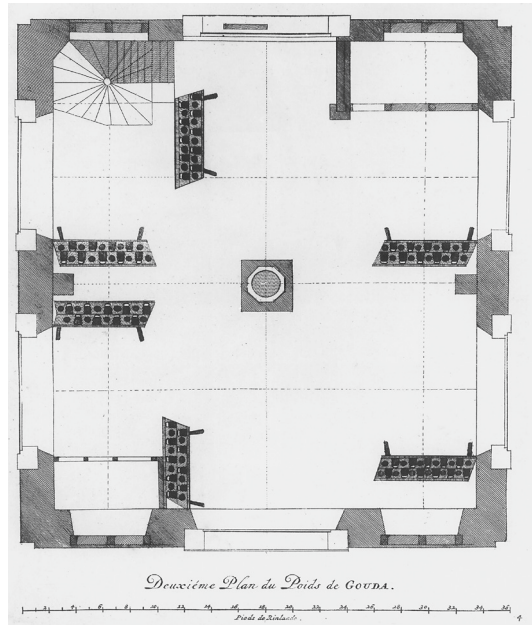
282 Blok 1934, 106; also Putte 1940, 53 and 54.



87 Gouda weigh house, first design for the front facade by Pieter Post

Pieter Post developed two schemes for the weigh house in Gouda.²⁸³ The first design closely resembled the Leiden weigh house. The basic difference was that although the Gouda weigh house had roughly the same lateral dimensions in both schemes, now two doorways, and not one, are located on the side facades and the windows were eliminated there. In addition, just like the weigh house in Leiden, the weigh house master's office and the staircase are placed in a special structure at the rear of the building, so that the scales can be arranged in a u-shaped configuration.

283 Van der Aa 1715.



88 Gouda weigh house, executed ground floor plan by Pieter Post

The proportions of the first facade for the Gouda weigh house designed by Pieter Post are quite similar to those of the weigh house in Leiden. The first facade scheme included elements that were executed, such as the ashlar masonry and the stone cross-windows. The canopy was intended to stretch across the front facade, however.

The second design for the weigh house in Gouda closely resembles the completed building. The width was increased by a dimension of 10 “Rijnlands” feet to correspond to the width of the city hall (measuring 36 “Rijnlands” feet or 11.76 meters).²⁸⁴ The plan now has doorways on all four sides and it is possible to install six sliding scales.

284 C. H. Peters (1908, 192) assumes that the magistrate required wider buttresses

Until now, the weigh houses in Leiden and Gouda have been evaluated solely with regard to their exterior appearance. In 1890, Georg Galland expressed a preference for the “younger sister” in Gouda: *“She resembles the weigh house in Leiden, but surpasses it however, by the straightforward, felicitous proportions of the floors on the four facades ...”*²⁸⁵ Writing in 1908 C. H. Peters, in contrast, praised both weigh houses: *“... they are in actuality elegant buildings that serve their function, fortunate in their form and concept.”*²⁸⁶ Then ten years later, A. Loosjes came along and articulated an opinion that is still repeated today.²⁸⁷ He considered the weigh house in Gouda to be richer but not more beautifully decorated, and found it therefore, *“... a loaded-down twin sister, due to a wealth of material abundance.”*²⁸⁸

A closer consideration of the Leiden and Gouda weigh houses reveals that the differences in their designs arose in response to their contrasting urban contexts. In reality, the weigh house in Gouda, with its more basic and sedate design that was based on older local precedents, fits just as comfortably in a country town as the antiquity-inspired forms of the Leiden weigh house are appropriate to the university city. In terms of typology, the Gouda weigh house marks the pinnacle of development for the monofunctional weigh house. Here, all the essential characteristics of this type have been optimally integrated into a well-functioning and prominent public building.

on at the front to accommodate his coat of arms. This motive cannot be ignored. But the centimeter-exact coordination of the width of the weigh house with that of the city hall indicates that the exactness of these measurements was the decisive concern that influenced the changes to the planning.

285 Galland 1890, 422.

286 *“... t zijn werkelijk, volkomen hun bestemming aangevende, sierlijke gebouwen, gelukkig van vorm en opvatting ...”*. Cf. Peters 1908, 207.

287 Cf. Ter Kuile 1957, 140. More recently Kuyper 1980, 87.

288 *“... een door weelde verslapt tweelingsuster ...”*. Cf. Loosjes 1918, 104.

Weigh house equipment

A functioning weigh house required a variety of equipment, that was used more or less in connection with the building. As a rule, the equipment primarily consisted of simply crafted parts that were intended to fulfill a particular purpose. Today, it is only possible to gain a vivid impression of the manner in which a weigh house originally functioned when these fittings are present and installed in their proper positions.

Weighing equipment

The weigh houses in Alkmaar and Gouda still operate for tourists and have retained a comprehensive collection of instruments and fixtures that are necessary to weigh merchandise. Other weigh houses have also been spared the serious loss of their weighing equipment. This includes the Enkhuizen building, which is used as a museum and, to a lesser extent, the Edam weigh house, which is now a cheese shop. Although the Monnickendam weigh house has been converted into a restaurant, the trolleys and scales — the most essential weighing equipment — have at least been preserved, while in Hoorn some exemplary accessories have also been retained, such as the weighing pans.

This largely fragmentary, surviving evidence does not allow for a comprehensive reconstruction of the development and scope of all the original equipment used at weigh houses. An adequate amount of source material does exist, however, to describe the use and development of the extremely heavy scales and their trolleys. The



89 Interior of the Hoorn weighing hall with the preserved weighing equipment, photograph 1982

remaining equipment, in contrast, whether accidentally retained or documented in photographs, can only be considered in a more cursory manner.

Trolleys

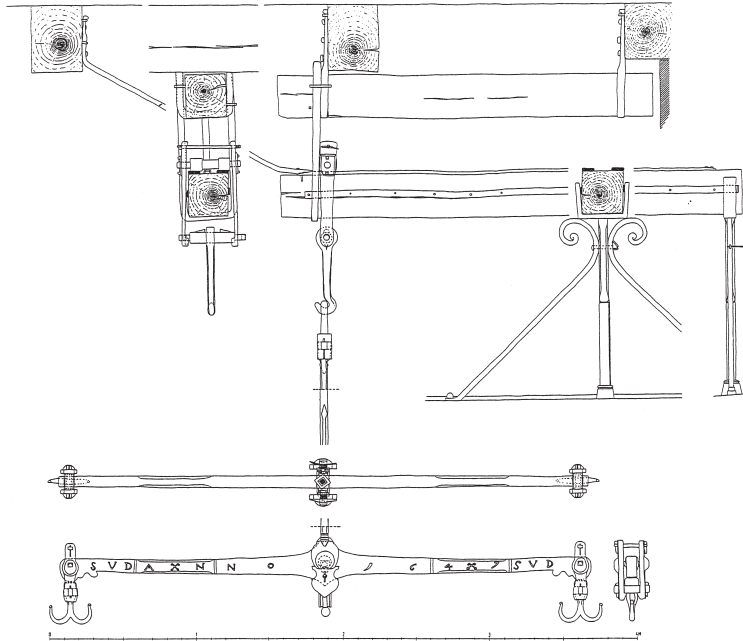
In many of the Dutch weigh houses, the large scales are suspended in such a manner to allow them to be easily driven in and out of the building. Trolleys were introduced to facilitate their movement. They enabled the scale to be driven along a girder to the doorway, so that one arm of the scale extends outside of the building. The girder is typically strengthened with an iron track that is attached to the ceiling construction and lies in the axis of a doorway.



90 Utrecht fish market with (from the left) the so-called weigh house, the city hall, the cathedral, and the crane, painting by Pieter Saenredam 1636

The distance that the trolley was required to travel was calculated to allow the scale and the pans to travel into the building and remain there lengthwise — that is, in a horizontal position parallel to one side of the building. The trolley is usually made from forged iron. It consists of a u-shaped bracket, which surrounds the scale. There are openings at the upper end of the bracket, which allow for a bolt or a cylinder to turn on its axis.

The rigid installation of a scale on a door lintel may be considered an earlier kind of outdoor weighing. Examples of this construction no longer exist, but one was depicted in a 1636 drawing of the Utrecht weigh house from Pieter Saenredam. In this image, a canopy

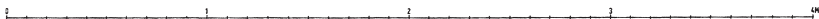
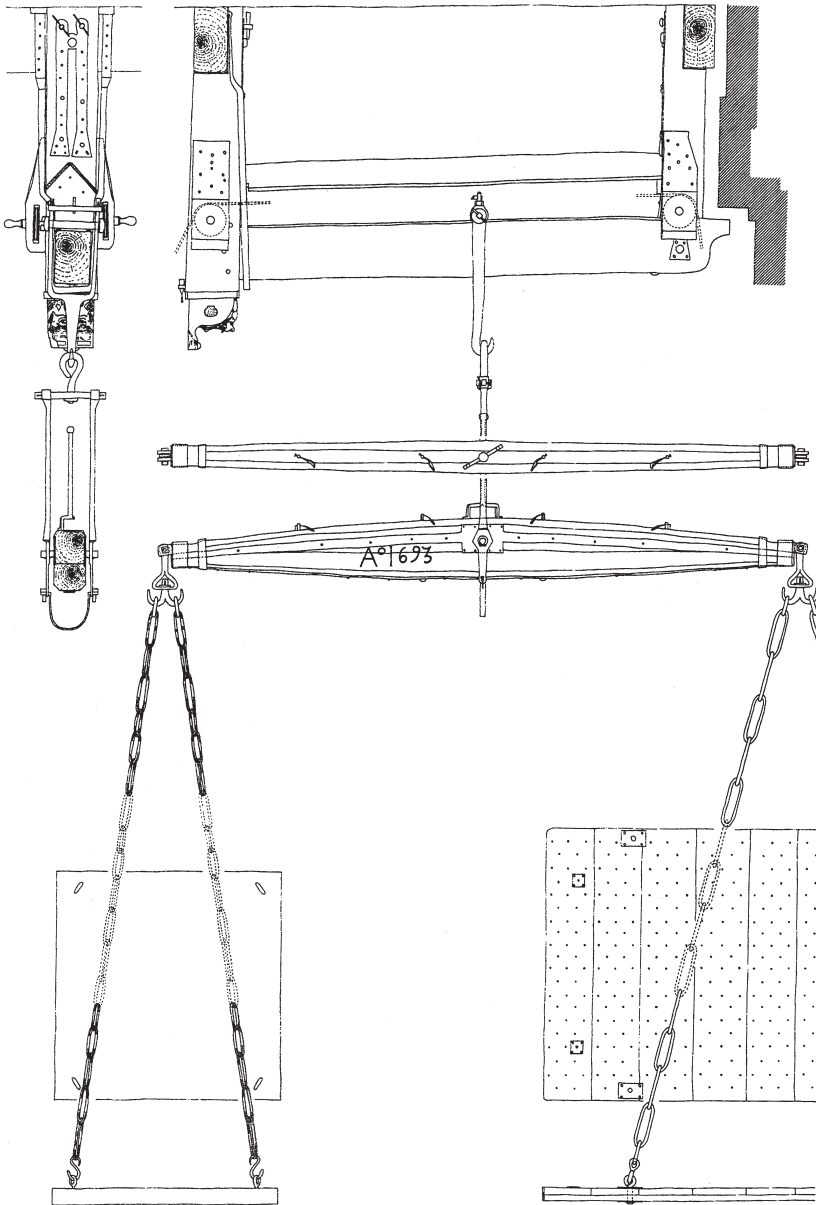


91 Trolley with scale in the Leiden weigh house, measured drawing

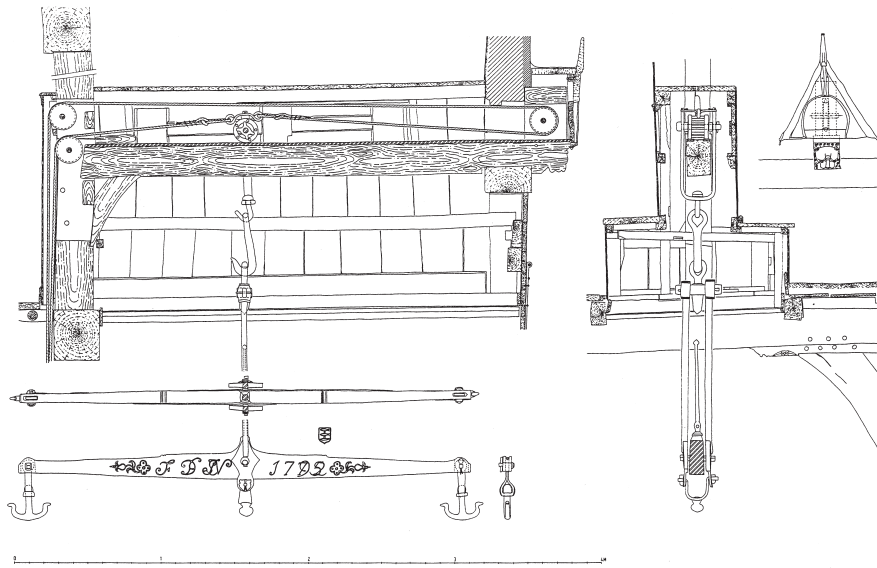
protects the part of the scale that permanently extends outward from the building.

This placement of the scale is disadvantageous, as after business has been completed for the day, the weighing pans along with their chains or ropes must be removed from the weighing arm and secured elsewhere. Furthermore, the additional point load at the middle of the lintel, created by the rigid installation of the heavy scale, places excessive demands on this structural element.

With regard to the building's structural system, the installation of the sliding scales at the weigh houses in Leiden and Gouda is also not unproblematic. Although this piece of equipment is hung from the lower side of the ceiling construction, it is shored to the transom between the doorway and the overhead light on the exterior. The forces are directed here by a small, cast-iron support with ornate, bow-like bracing. The advantage of this construction is that possible



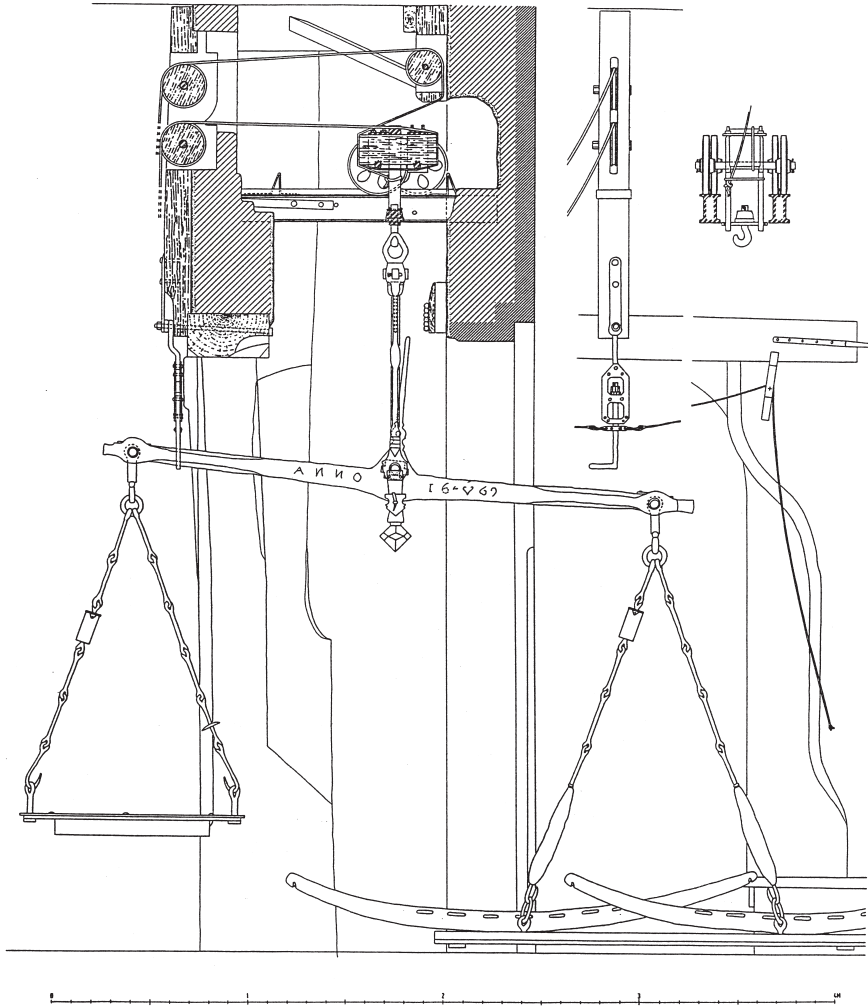
92 Trolley with scale in the Hoorn weigh house, measured drawing



93 Trolley with scale in the so-called Enkhuizen weigh house, measured drawing

impairment of the rolling track by a suspended post is eliminated and the girder can be driven even below the doorway's support directly up to the doorway, where it lies flush with the exterior wall. The disadvantage arises when the scale is moved outside of the building and its pans are weighted, as the load is directed through the middle of the construction's small, horizontal profile.

The trolley in Leiden was required to move a distance of 2.66 meters to the exterior doorway. In all likelihood, this was not the original required distance. The iron bracket, which holds the lower girder on the interior, is attached to a second, shorter girder that is located above it and not directly fastened to the ceiling beam. It can be assumed that the trolley was initially supposed to be suspended from the upper beam. A canopy was not installed on the front facade. Therefore the distance was thought to be sufficient. Both larger scales must have been intended for the sides that were covered by a canopy. The girders were apparently left in this position, despite



94 Trolley with scale in the so-called Alkmaar weigh house, measured drawing

changes that occurred at a later date. In any event, the distance they were required to travel must have been known when the weigh house was built, as both of the scales date from 1664.



95 Hoorn weigh house, ceiling detail with the trolleys and scales, photograph 1982

92 ← In contrast, the distance the trolleys were able to travel was limited in favor of a structurally faultless construction at the weigh house in Hoorn.²⁸⁹ Here both ends of the girders are attached to the ceiling by suspended posts, so that a 2.08 meters long distance remained for the trolley. Another detail in Hoorn — that is not found at any other weigh house — was a structure consisting of two boards and resembling a pitched roof that protected the scale from dirt and dust. The truss posts are clamped onto trimmer beams above and mortised into the girders below. The head of the interior-lying

289 My cordial thanks to Joost Buchner from the Hoorn Municipal Building Office and the leaseholders of the restaurant located in the Hoorn weigh house for their friendly support during the preparation of the measured drawings of the building.

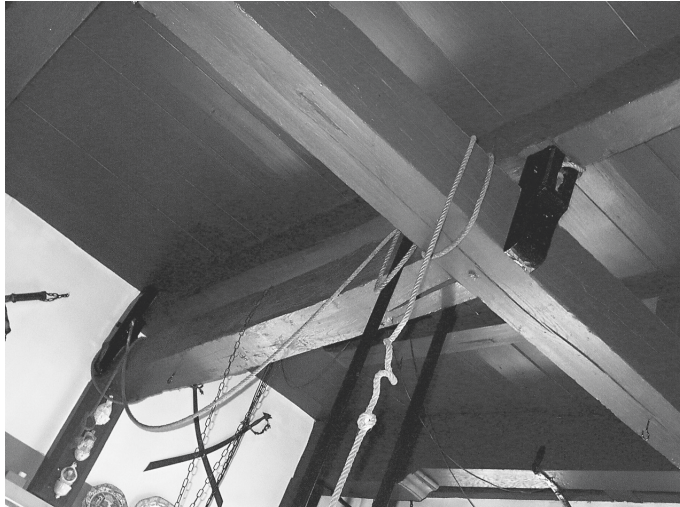
truss post extends slightly beyond the girder and ends in a carved ornament. The ornament's Mannerist style indicates that the trolley trestle, like the weigh house, also dates from 1608.

Because an existing building was converted into a weigh house (1636) in Enkhuizen, special details were developed to accommodate this building's trolleys. The trolleys were placed in the upper level, as the existing building's ceiling was too low to install them in the weighing hall. In their upper level location the trolleys were able to take up the variance resulting from the different heights of the scales, which were not equal in length. A part of the upper level hall was separated and enclosed in order to install the trolley there.

Because the Enkhuizen weigh house's girders rested on the ceiling construction, the tension cables could be directed over the middle of the girder. In order that the clips could be driven up to the exterior wall, the anterior pulley was attached on the exterior facade — where it is covered with a small, pitched roof-like covering for weather protection. In the vertical direction, the cable runs along the upper story through a removable, hollow, wooden pilaster placed in front of a partition that encloses the hall, which is known as the surgeon's room.

→ 16

The trolley at the Alkmaar weigh house is installed between the facade of the former Holy Spirit Hospital and the new exterior wall of the so-called weigh house. The scale here can only travel back and forth 40 centimeters. Each trolley construction consists of a small, four-wheeled wagon that rolls on two connected double-T profiles. To shorten the distance between the wagon's axles, the front track is widened so that the wheels on each side can overlap one another by a half. Vertically, it is bolted onto the axles of the wheels with iron brackets. The wagon is crafted as a square timber construction. A hook attached to a clip at the middle of the timber connects it to the lower bracket. Both tracks are separated by a flattened iron bar, which is inserted between the linked, double-T profiles. Triangles, which are made of flattened iron and attached to the edge of the bar, serve as a buffer stop at the end of the distance.



96 Monnickendam weigh house, trolley and the pulley near the exterior

These details clearly identify the weigh house trolley in Alkmaar as dating from the nineteenth century. Although the cast iron wheels found on the small wagon were in production after 1830-40,²⁹⁰ the double-T profiles used for the tracks were first manufactured in large amounts after roughly 1880. Documentation also exists to verify that the original wooden girder was still in use in the middle of the nineteenth century.²⁹¹ Therefore it can be assumed that this novel and intricate iron trolley construction was developed in connection with the extensive restoration of the weigh house in 1884-85. In any event, because the exterior facade was also repaired during this activity, a support that was necessary for the old girders was removed for a time.

Different techniques were employed to drive a trolley through a weigh house. The simplest were in Leiden (1658) and Gouda (1668).

290 The dating of the iron parts according to information by C. L. Temminck Groll.

291 Cf. the engraving by R. de Vries from the middle of the 19th century (City Archive Alkmaar).

At these buildings, forces were transferred to the trolley only by pulling the scales or suspensions of the weighing pans. To ensure that the clips holding the scales were not too crooked or did not tilt when the beam was pulled, the hook was suspended in such a manner that it could move around the bolt. This solution was one of the oldest of its kind and most likely has been lost along with the buildings in Antwerp (1547) and in Amsterdam (1565). The well-known example of the Amsterdam weigh house was explicitly mentioned in a contemporary report in connection with the sliding scales in Leiden.²⁹²

Although an extremely modest construction, the trolley at the IJsselstein weigh house possessed the advantage of an adjustable mechanism that was controlled by wire cables. A vertical hole was drilled through both ends of the girder, whose surface was also rounded off facing the trolley. A cable that is drawn through this hole is attached to a header on the uppermost end of the trolley. Similar holes are found on the girder in the weigh house in Edam. As opposed to a cable directed over wheels, this construction has the disadvantage of a greater friction.

At the Hoorn weigh house, the wire cables were used to adjust the trolley function in conjunction with pulleys. A cable cannot be placed in the middle of this construction because of the truss post. This is why two cables are placed on the sides running in both directions and prevent the trolley with the sliding scale from tilting. To keep one of the two cables from hanging in the middle of the room and the other in the middle of the doorway, they were brought together at two small, wooden double griffons on the exterior wall post where they are securely tied to anchor the trolleys.

→ 92

Together with the cables, these pulleys are directed through a box-like cut in a small wooden log that is attached to each side of the girder. The log becomes smaller over the opening and takes on the form of a truncated wedge on its upper side in order to connect

292 Kooiman 1956, 5.

with the truss post by means of a number of irregular stamped nails. A conically shaped pole with a lathe-turned handle secures the wheel's axle underneath.

The cable guide at the Monnickendam weigh house is optimally configured (1669). The cables here are directed over the middle of the girders and are collected vertically in one place. This solution was technically possible because each of the girders was not attached to a single truss post. Instead each one is mortised to a continuous girder, which is attached to the main beam and which is carried on the exterior over a square timber located on the doorway's lintel. Enough space remains above it and up to the joist to direct the cable. On the exterior, the pulley was located above the horizontal wood shoring and the second pulley behind the beam.

94 ←

The special conditions that resulted from the conversion of the Holy Spirit Hospital into a so-called weigh house in Alkmaar also lead to an unusual solution to accommodate the channel for the cables. The exterior pulley was housed inside a box cut into a timber that strut diagonally against the ceiling beam from below and is mortised into it above. The guide around the curved underside of the timber always holds the cable at an acute angle to the trolley. Because the corresponding force acts on the inward end of the trolley, the entire trolley can even be driven under the pulley.

For this trolley, both cables were directed horizontally to the interior and then down along the inside of the former choir wall. The corresponding pulleys are placed directly one over the other and are set into a block of timber. A hook is attached to the bottom of the timber that can hold up the arm of the scale, which is loaded with weights. In this way, the merchandise to be weighed does not have to be hoisted up when the weights are left on the pan between the individual weighing procedures.

One unique solution was only found in the Edam weigh house: the direction of the cable over a hoist and a jack on the girder. This construction was necessary due to how the building settled on one side and the warping of the large scale. In this case, the weighing equipment had to travel up a slope when it was driven out of the

building, requiring a great expenditure of energy. In the Edam weigh house, the use of the ceiling beams as girders is also unique. This was only possible as there was empty space in the attic over the weighing hall.

The trolley constructions in Leiden and Monnickendam illustrate the breadth of technical possibilities that were available in the seventeenth and eighteenth centuries. It is possible to classify them by type with regards to the placement of the girders and the arrangement of the construction used to adjust the trolleys, which varied according to situation, local practice, and the experience of the craftsmen building them.

Large scales

Only scales with two equal arms were found in the weigh houses that were investigated for this study. Most of these instruments were made of iron, and only a few out of wood.²⁹³ As they can extend to a length of four meters, they are the largest examples of this kind of instrument. Scales are often created for a particular place in the weigh house. Their weighing capacity is limited to approximately 10 centners (500 kilograms), an amount that a typical laborer can haul to and from a weigh house.²⁹⁴ Both wrought iron scales as well as oak-timber scales, such as those found in the Hoorn weigh house, can carry this load.²⁹⁵

Up until the sixteenth century, the large scales used at public markets were overwhelmingly constructed out of wood. These instruments typically had very simple joints that produced a

293 For the terminology used for the iron construction discussed here, cf. Schreber 1769, 475 et seqq.

294 Haerberle 1967, 51.

295 Assuming a 60% carrying capacity, the oak weighing beams in the Hoorn weigh house have a capacity of 495 kilograms. My sincere gratitude goes to Chuanzeng Zhang from the University of Siegen for this calculation.



97 Leeuwarden weigh house, wooden scale on the south side's left doorway, photograph 1986

great amount of friction and compromised the exactness of their measurements. These very simple wooden scales are rarely preserved. Yet it is possible to gain an impression of a great scale — by means of a single surviving document — dating from 1386 and located in the market hall in Paris. According to the source, the scale's pans were hung on ropes, which were turned like a winch around a wheel.²⁹⁶ A 3.96 meters wooden scale from the sixteenth century has been preserved in the Leeuwarden weigh house.²⁹⁷ There is also a single photograph of the large wooden scale found

296 Enlart 1929, 372.

297 Cf. Eekhoff 1846, vol. 2, 19.

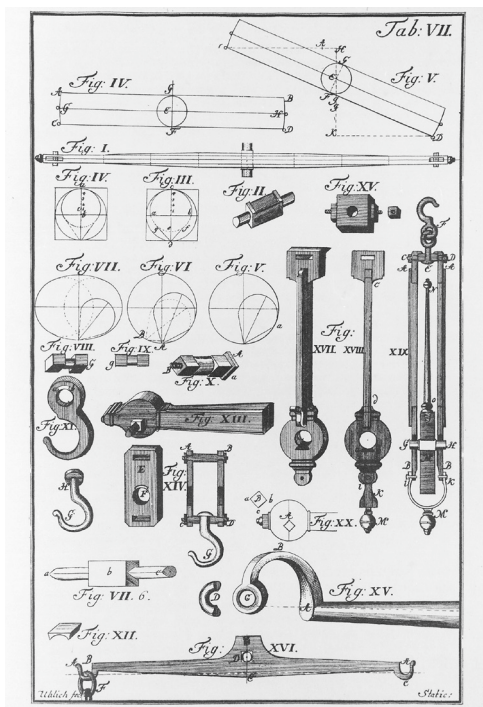


98 Vertical wooden scale below the arch of the so-called weigh house in Silesian Nysa (formerly Neisse)

in the so-called weigh house (1606) in Silesian Nysa (formerly Neisse). This scale was located in the building's loggia and, with the exception of a few wrought iron applications, was completely constructed out of timber.²⁹⁸ The scale rested on a column with a square cross-section and was set into the pavement. The column had a kind of cube-shaped capital and lateral flanges above it to guide the scale.

The underside of the scale in the Nysa weigh house tapered outwards. It was strengthened in the middle by a profiled wooden corbel. A hoop was bound around the heads at the ends of the

298 Lutsch 1894, 109.



99 Parts of an iron scale from the 17th century

scales, and a rigid hook to hang the pans was placed below each hoop. The two wrought iron belts enclosing the middle of the scale probably served to anchor the pivot. A pointer was missing.

The construction of the weighing device in Nysa had the great disadvantage that almost the entire mass of the scale was located above the pivot. As a result, the instrument was unstable. The joints must have additionally produced a large amount of friction, which explains why the mechanism could not measure smaller differences in weight. The large scale in Nysa recalls depictions of scales going far back in history, such as those dating from the time of the Middle Pharaonic Kingdom in Egypt.²⁹⁹

299 Cf. Haeberle 1967, 21; also Kisch 1965, 28.



100 Scales in the Haarlem weigh house, photograph 1993

Towards the end of the sixteenth century, the use of iron made it possible to manufacture scales with extremely accurate measurements and greatly surpassing the precision of previous instruments. Using iron, the various parts could be produced independently and according to specific requirements, such as was necessary for the fabrication of very small and accurate components. Using pins and sockets, these parts could easily be combined and then fixed with splints. Due to their extreme precision, such scales were considered as adequate well into the twentieth century.³⁰⁰

At the close of the sixteenth century, the introduction of edged axles led to the refinement of the construction of the iron scale. The axle bolts were designed with a heart-shaped section as a result of this crucial innovation. It was possible for the load around the middle area of the pendulum to be directed over an extremely

300 Cf. Haeberle 1967, 63.

small surface, so that the sensitivity of the scale was not affected by any appreciable amount of friction. A special tempering of the iron compensated for the extreme compressive force in the support. The development of this frictionless pivot bearing accompanied a new conception of the scale. It now retained its center of gravity below the middle axis of rotation. Thus, when carrying a balanced load, the scale automatically evened out horizontally without any external assistance. The center of gravity could not be placed too low however, as the scale would lose a considerable amount of its sensitivity.

The scale maker's craft after the close of the sixteenth century also required the ability to advantageously position the support so that the scale could be properly used in a particular context. For the larger scales found at public markets, for example, a slightly higher position for the middle point of suspension compared with those of both exterior supports was advantageous because this would enable the scales to be more easily evened out. The loss of precision resulting from this was not considered to be significant for this kind of scale.

The length of the scale arm was also a significant feature. The instrument could function more precisely when the length of an arm was increased because this provision enables it to overcome friction more easily. The ends were tapered to reduce the weight of the arm of the scale and, beginning in the eighteenth century, the arms were crafted with a conical cross-section. An additional iron knob, used to straighten out or level an arm, precisely adjusted the balance of both scale arms.

The increased use of iron also led to a differentiation at the end of the scale arm. The hooks used for hanging the weigh pans were attached vertically by means of a pivot. This detail ensured that friction would not greatly distort the measurement when the scale sloped. It also limited the horizontal movement of the suspended

pans and prevented torsion forces to impact the weighing pan and that could force the scale to move outward and falsify the measurement.³⁰¹

For a modern scale, like those that were developed towards the end of the sixteenth century, an instrument identified as a “clip” was also necessary. A clip contains two continuous vertical profiles, known as the blades. The blades clasp the scale in the middle and transfer the incoming loads through their axes by means of a circular or oval opening. The loads are directed onwards through a crossbar to a hook that can rotate at the point of suspension. The crossbar at one end of the blades and the so-called lock at the other prevent the clip from coming apart. As a rule, a forged, polygonal weight held the so-called “lock” in a vertical position.

With the introduction of the central clip, it made sense to mount a so-called tongue on the scale. Because the sensitivity of the tongue was directly linked to its length, in 1726 Jacob Leupold recommended that the length of the tongue should be two thirds that of the scale arm.³⁰²

The scales found in the weigh houses investigated in this study are generally as technologically sophisticated as the buildings themselves and all date from the seventeenth and eighteenth centuries. The scale at the Haarlem weigh house provides a noteworthy example. The large scale that was installed there dates from 1623 and — judging from the carved initials C and I — was probably constructed by the weight-maker Jan Willem van Copenol from Haarlem. It had a scale measuring one rod (14 feet or 3.92 meters) in length. The height of the scale decreased steadily towards the ends, terminating in a kind of hump-like form.

The large scale in the Haarlem weigh house possessed seemingly ideal qualities for use at a public market, including a relatively small amount of “laziness” and a good reset force. The middle point of

301 Cf. Haeberle 1967, 61.

302 Leupold 1726, 28.

suspension was situated only slightly over the connecting line of the external center of rotation. The bulk of the scale lay under this axis. With the generous distribution of gilded, onion-shaped motifs – three each on the outermost clip and one each at the ends of the scales – this weigh house possessed not only a special instrument for balancing, but also one with an exceptionally picturesque appearance. Even an ornament, such as the plate on the lock of the middle clip that displays the city coat of arm, goes far beyond the basic, functional requirements of a typical scale.

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The large scale dating from 1647 in the Leiden weigh house, in contrast, is not an optimal construction. As its three axle bolts are arranged in a line, there may have been an attempt to build an extremely well-balanced weighing instrument. A so-called rapid, or unstable, drift is generated because the middle point of suspension engages below, while the outer one engages above. Also, because of the even distribution of the bulk of the scale arm amongst the aforementioned centerline, the mechanism cannot independently retain its equilibrium. This scale is therefore less stable and less sensitive, qualities not advantageous for large weighing instruments. This conceptual weakness can be traced to the fact that the commission for the large scale in Leiden was not given to a scale maker, but rather was entrusted to the local blacksmith, Samuel van Dam.³⁰³

92, 95 ←

The large scale in the Hoorn weigh house is unique because it is constructed out of wood. This material suggests that the instrument is much older than the Haarlem and Hoorn instruments, although it actually dates from 1693.³⁰⁴ The detailing, however, reveals that it is as technologically sophisticated as the other examples of highly advanced weighing equipment from this period. The supports are thus edged. As wood is not as strong as iron, this was compensated for with two layers of mortised iron bands and corresponding hoops

303 Kooiman 1956, 99.

304 Wittop Koning and Houben 1980.

at the ends of the scale. Wood was likely selected for the scale material in order to reduce the combined weight of the scales. This concern certainly played a role when one considers the number of parallel, suspended scales installed in the Hoorn weigh house.

The large scales in the weigh house in Hoorn are extremely sophisticated constructions. The bolts for the scale's middle axle are situated as far as possible above the outer axle bolt's axis so that all the centers of rotation align precisely. The centroidal axis lying below the scale arm enables the instrument to automatically retain its horizontal equilibrium. The scale is 3.23 meters in length. According to the local unit of measure, this dimension is equivalent to approximately one rod.

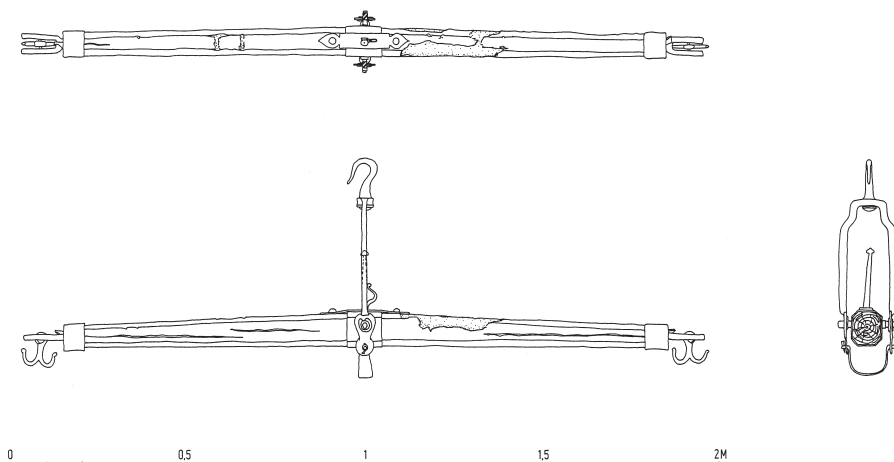
The large scales in the Alkmaar weigh house are made of iron and also date from 1693. The centers of rotation for these instruments also lie in one line, although the bulk of the scale is located almost completely below it. The tongue is thus not at all able to form excess weight. For structural reasons, the scale's arm tapers towards the end. The weighing pan suspension is located in a box-like recess in the weighing arm. The comparatively short length of 3.04 meters is due to the extremely limited amount of space available between the walls of the choir and the so-called weigh house. The builder and contractor for this superbly crafted scale was Johan Groengraft, the general master calibrator from Amsterdam.³⁰⁵

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Small scales

In addition to the numerous large, permanently installed scales, small and mobile scales were also employed in public weigh houses. Among other things, these instruments were necessary to weigh modest amounts of especially valuable materials. For example, surviving documentation confirms the 1612 construction of a small

305 Bruinvis 1889, 41; also Wittop Koning and Houben 1980, 172.



101 Small wooden scale in the so-called Enkhuizen weigh house, measured drawing

weigh house in Amsterdam that was used to measure dyes and pigments weighing less than one pound.³⁰⁶ Considering the few extant, mobile scales in public weigh houses, it can be assumed that most of these small scales were symmetrical, two-armed scales.³⁰⁷ These mobile scales were in general crafted by local blacksmiths — and not by special scale makers.³⁰⁸ One remaining example, located in the Enkhuizen weigh house museum, is made of wood.

Even though there are no surviving one-armed scales, so-called Roman dials, or quick balances (also known as a bismar) in a public weigh house, it can be assumed that these instruments were probably installed in these buildings at a fairly early date. Reliefs

306 Noordegraaf 1990, 22.

307 A small 1.03 meter long scale is attached to an iron trolley in the Haarlem weigh house. Tripods for the mobile use of scales have been preserved at the museum for weights and measures in Delft.

308 In 1650, the scale maker Guillaume de Neeve from Amsterdam built the large scale in Workum, which weighed 344 pounds, and a local Workum smith, Lieven Jansen of Workum, fabricated the small scale. Jansen also crafted the new weigh house's ironwork. Cf. Siemelink 1978 ed. 1903, 144.

depicting one-armed scales that can be found on the side facades of the Leiden and Gouda weigh houses support this assumption. The Roman dial or quick balance delivered less precise measurements, yet this disadvantage was offset to some extent by the instrument's relatively light weight. In all likelihood, this instrument was used for weighing procedures occurring outside of the weigh house.³⁰⁹

The weighing instruments were hung on tripods when the scales were moved from place to place.³¹⁰ A tripod measured approximately two meters in height and had three legs. The legs were held together by an overhead hinged joint, which enabled the legs to be folded up. A hook to hang the scale is attached to this joint. The ends of the legs are detailed as iron spikes to secure the instrument on soft ground. On hard surfaces, small cups attached to tension rods prevented the frame from slipping. The chain links used to suspend the pans were longer than those used for the stationary scales and could be folded into a manageable bundle when they were transported.

Weighing pans and their means of suspension

Due to their enormous weight, large scales were very often connected to the building where they were housed, yet the pans and chains that hung from them could be easily removed. Hence this equipment has only been retained in a few instances. It is often difficult to determine the exact date when they were created, as these were handcrafted, unornamented utensils and fittings. The few extant examples suggest that the pans were usually hung from chains, and very rarely by cables.³¹¹ As a point of reference, the

309 In Bruges in 1282, criticism concerning the imprecision of the Roman quick scale led to its replacement with a two-armed scale. Cf. Houtte 1982, 200.

310 Cf. Houben 1990, 113.

311 Cf. Leupold 1726, 21 et seqq.

length of the suspension of a weighing pan was double the diameter of its pan.³¹²

The weighing pans for large scales are always four-sided and possess a corresponding number of points of attachment for the chains or cables. On the side where the merchandise was loaded, the pans are often larger and made of wood due to this material's lower specific weight. These were generally slabs consisting of two layers of planks that were nailed crosswise. The smaller pans that held the weights were constructed in a different manner and were typically constructed from iron plates that were occasionally lined with wood.

In Alkmaar, the length of the sides of the weighing pan that carried the weights average 1.15 meters. The pan for the merchandise is 2.23 meters long and 1.30 meters wide. These dimensions were devised in 1887 to allow a second tray of cheese to be placed on the weighing pan.³¹³ In contrast, in Gouda the sides of weighing pans for the merchandise are almost equal and measure 1.20 by 1.30 meters. This dimension was selected to accommodate the large loaves of cheese, typical of Gouda, that were placed directly — without the use of a handbarrow — on the weighing pan. The relief on the Gouda weigh house, which will be discussed at a later point, depicts this procedure.

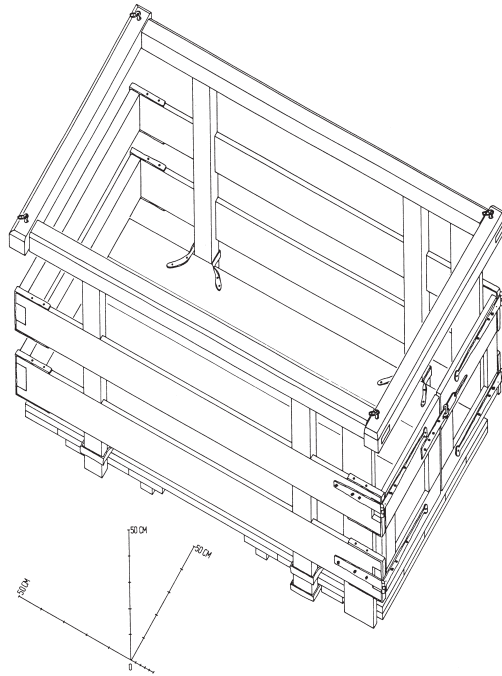
112 ←

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The chains that carry the pans in the Alkmaar weigh house are an astonishingly clever piece of craftsmanship. The individual links of the forged chain are shaped like little rods, whose ends resemble small grommets. These details are just large enough to grip the following link in the chain. In order that the appearance of each connection remains the same, both grommets are turned 90° at each link. Small, can-shaped canisters on each side serve to balance out the scale. The small disc in the middle of the second

312 Kisch 1965, 41; according to Pierre Jaubert: *Dictionnaire raisonné universel des arts et métiers*. Paris 1773.

313 Bruinvis 1887, 41.



102 Wooden cage used for weighing pigs in the Enkhuizen weigh house, measured drawing

lowest rod above the pan that holds the weights is probably used as a spacer. In addition, upholstered leather covers protected the merchandise while being weighed.

The chains holding the pans have forged links with an elongated oval form at the Hoorn weigh house. Depending on the weighing pan, the cross-section of the material is either square or round. An old photograph documents how spacers hold the chain at the level of the fourth highest link diagonal to the scale. These details enabled merchandise to be more easily loaded and unloaded. At an earlier date, these simple and useful spacers were probably found on other kinds of weighing equipment as well.

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103 Handbarrows to transport cheese at the so-called Alkmaar weigh house, post-card



104 "Malle Jan" (right), a two-wheeled handcart to transport cheese used by older bearers

Whereas the cables used to suspend the weighing pans have been retained in Edam, there is only an old photograph to document the cable suspension used in Leiden. In both instances, one cable carries two suspension points of a pan. The cables in Edam are sharply angled upwards along the diagonal due to the unusually wide hook on the corresponding scale arm and therefore hardly come in conflict with the merchandise being weighed. The cable is wrapped around the side of a double hook at the mid-point of its length. It is loosely fastened together by tied cords, which are wrapped around it several times. Metal reinforcements prevent an abrasion of the cable at the places where it comes in contact with the weighed merchandise.

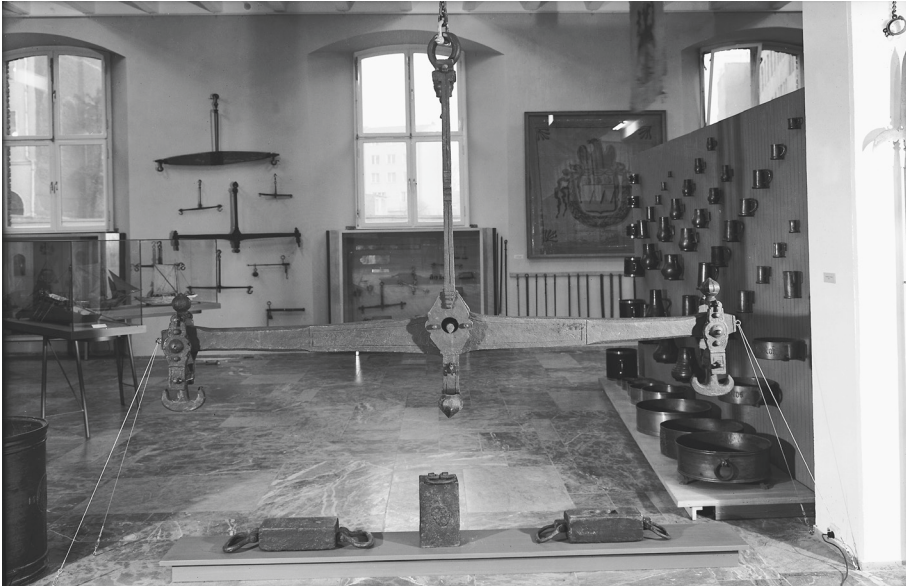
A wooden cage could also be hung from the arm of the scale, instead of the weighing pan, in order to weigh animals. One such device has been retained in Enkhuizen. This cage consisted of a base plate, measuring 1.62 meters by 0.94 meters, into which side barriers were inserted. On the cage's long side, the barriers were made up of two posts, which were covered by two boards with a gap between them. A beam sealed it off at the top. A two-winged screen door on the front side provided access to the cage.

Handbarrows to transport cheese

Specially constructed handbarrows were used to transport cheese back and forth to the weigh house. They remained on the weighing pan during the weighing procedure. Hence the scales had to be tared and specific handbarrows could be used only on specific scales. The handbarrows were painted in different colors in order to avoid confusion.

In Alkmaar, the handbarrows used to transport cheese consisted of two wooden frames on the sides into which planks were mortised. The planks are in the middle and placed apart from one another in such a manner that a grate of sorts is created. The cheese is placed on this so that undesired bits of dirt or refuse, which could upset the

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105 Exhibition in the Cologne City Museum displaying a large scale (middle), hundred pound, iron brick weights (below), and brass measures of capacity (right)

measurement, fall out. Both exterior boards are wider and terminate in an arch-like recess, which is shaped to accommodate the body of a bearer. Above the grate and extending out to the front and the rear, the wooden frame serves as handgrip for the bearers.

The longitudinal section of the handbarrow is shaped like a segmental arch, forming a cavity in the middle to improve the stability of the stacked cheese. The carrying straps were attached to notches at the ends of the wooden frames, enabling the cheese to be transported just above the ground. The cheese handbarrows in Alkmaar, which are constructed in this manner, have a width of circa 0.85 meters and a length of 2.44 meters and can accommodate approximately 80 loaves of cheese.³¹⁴ Similar cheese handbarrows are found at weigh houses in other Dutch cities.

314 Koolwijk 1972, 40.

The “Malle Jan” was specially developed for older bearers. This name applied to a two-wheeled handcart with a container for transporting the loaves of cheese.³¹⁵

Weights

The weights used in the weigh houses that were investigated in this study were mostly made of iron.³¹⁶ With the changeover to the metric system after 1820, most of the old weights were taken out of service and melted down. As collectors rarely accumulate these pedestrian objects, few of these weights survive. Today, the reliefs on several weigh houses (Delft, Gouda and Leiden, among others) depict convincing images of the kind of weights that were employed prior to industrialization.

There are numerous formal variations in weights made of metal. Documents reveal that every city in France throughout the Middle Ages had their own particular weights designed and modeled on a well-known symbol of the city.³¹⁷ Bell shapes were typical at this time for cities in England, in contrast. Pure cylindrical and conical forms were dominant in Europe during the eighteenth century. Independent of the form, extremely heavy metal weights were equipped with a handle, which was formed as a ring or cast as an oval.

Three iron brick weights, each weighing 100 pounds (Centipodium) have been retained in good condition from the so-called weigh house in Cologne. Shaped like a brick, they have an oval handle on both sides that rotates around a nose. One of the brick weights is inscribed with the date 1749.³¹⁸ Similar weights also existed in

315 Postema 1940, 64.

316 Cf. Witthöft 1982, *passim*. My gratitude extends to Cord Meckseper (Hannover) for his mention of this literature.

317 Kisch 1965, 101.

318 Kisch 1965, 95.

France at this time and a comparable object made of brass has been preserved in Vienna.

The collection housed at the Museum De Waag (The Weigh House Museum) in Deventer contains an overview of the smaller weights that were used in public weigh houses. These include seven iron handle weights from the eighteenth and early nineteenth century. They are simple truncated cones with a broken upper edge and a cast, oval handle.³¹⁹ The weights, which were given a coating of lead to comply with the metric system, weighed between 2 and 10 pounds. An example of the number and size of weights that were used in a public weigh house can also be found in Cologne. In this city, the following weights were prescribed for the weigh house, which was located in the large trade hall on the old market square: 19 pieces of one centner; 4 pieces of one half centner; 2 pieces of one quarter centner; two of one eighth of a centner; 2 pieces each of six, three, one and a half pounds; and 2 half mark weights.³²⁰

Hard, corrosion resistant, and expensive materials — primarily bronze and brass — were used for the fabrication of standard weights.³²¹ A sworn calibrator ensured that standards were maintained. To limit deterioration of the weights, he had two series of standard weights at his disposal.³²² One set was the city's so-called "parent weight", which was normally stored in the city hall. The second series was adjusted to this set once a year and served as the standard for the weights built by the craftsmen who fabricated the weights and was used by the townspeople. In Amsterdam, the weights were adjusted twice a year at the weigh house.³²³

The Cologne Mark was the first widely employed standard measure of weight in the Netherlands during the Middle Ages (after the fifteenth century it weighed 233.60 grams). An attempt on the

319 Houben 1990, 28.

320 Kisch 1960, 30.

321 Kisch 1965, 84.

322 Kisch 1960, 31; Kisch 1965, 6; also Leupold 1726, 74.

323 Zevenboom and Wittop Koning 1970, 33.

part of the Burgundian princes to regulate the different systems led to the use of the Troyes mark (244.75 grams), which had supplanted the Cologne standard as a coin weight in the second half of the fourteenth century. The importance of the Cologne mark as a commercial weight was revived somewhat in the southern Netherlands towards the end of the sixteenth century. It was labeled brabantish, after the trade metropolis of Antwerp, and marked with a hand to symbolize this city.

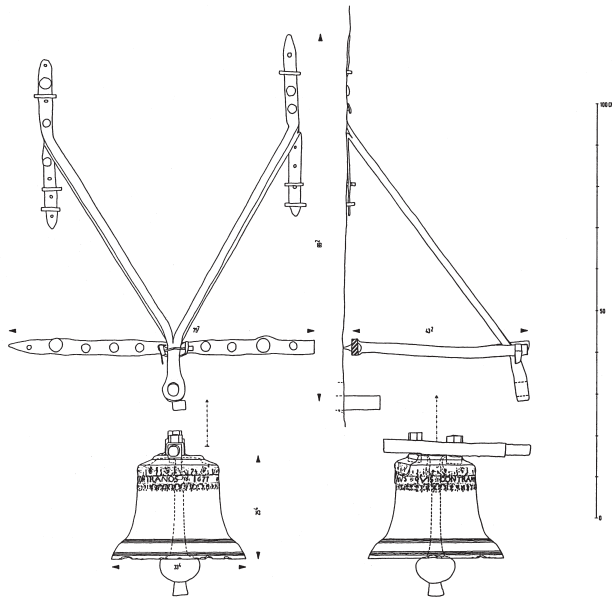
In the seventeenth and eighteenth centuries, weights in the Netherlands were named after individual cities. As a rule, small local differences among the weights were the result of imprecision found among the individual standard weights. Only the especially heavy Amsterdam pound (494.09 grams) can be seen as a separate entity because the city could afford to dictate a standard for itself and its environs beginning in the seventeenth century. Amsterdam also had standard weights from other important trading cities. At the end of the eighteenth century, it possessed 32 in number, including pound pieces from Munich (560.06 grams), Stuttgart (467.73 grams), and “Moschcau” (409.51 grams).³²⁴

Storage and shelves for the weights

To ensure that those weighing the merchandise did not have to stoop down too far to retrieve the weights, they were often placed on a base resembling a footstool. This was typically a wooden construction situated along the side of the scale. Every scale had its own shelf to store weights.

In Alkmaar, the storage space for the weights was constructed out of the special building substance from the extant chancel of the former Chapel of the Holy Spirit. The shelf to store the weights is

324 Zevenboom and Wittop Koning 1970, 18 and 31.



106 Bell on the so-called Enkhuizen weigh house, measured drawing

arranged in a u-shaped shelf that wraps around the buttress. There are small boards above this shelf, at eyelevel, where bottles and jars could be stored.

The weights in Hoorn, by contrast, are stored in mobile compartments — boxes constructed out of thick wooden planks — at the weigh house. The dimension of their post determined their width, and their position was indicated by a mark in the pavement.

Bells

Every weigh house had a bell, which announced the opening and closing of the hours of operation, among other things. When the bell was permanently installed, it was usually located on the building's



107 Butter barrels at the Leeuwarden weigh house, painting by C. F. Frank, shortly after 1796

exterior. In some instances the bell was placed in a tower that was specially mounted on the weigh house (for example, Dokkum, Edam, and Makkum).

In Enkhuizen, the unprotected bell was hung from a wrought iron, double pronged fork on the front of the weigh house. The end of the fork's short shaft is bent to resemble a pan, which serves as a holder for the axle of the bell. Because the axle extended into the other side of the brick wall, it presumably originally continued on completely through the wall and the lever used to ring the bells was utilized on the inside of the building. The axle is separate and demounted along with the bell, so that only a small piece protrudes out of the wall.

The age of this construction, with its undecorated yet timeless design, is difficult to determine and can only be located approx-

imately in the pre- or early industrial period. It could also be as old as the bell, which dates from 1677 and bears the inscription: “SI DEUS PRONOBUS QUIS CONTRA NOS.”

The Hoorn weigh house bell is hung outside on the small side’s middle post, where the canopy protects it. The bracket that holds the bell consists of two, three-pronged forks, the thicker and longer middle rod of which terminates as a pan for the pivot for the bells. The bell-pull was guided downwards through an enclosed chute that was attached to the exterior wall. The chute was terminated above with a profiled ridge.

In Leiden, the bell was hung in the interior of the weighing hall at the crossing point of a ceiling beam with a joist. An iron pole sets the bell-pull in motion.

Butter barrels

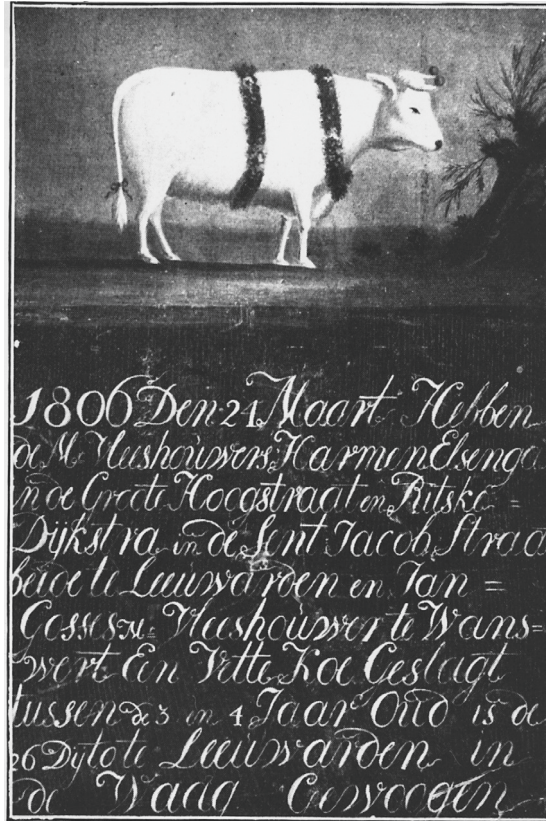
Due to its soft consistency, butter was placed in barrels when it was stored and transported. To determine the weight of butter, the heaviness of this container had to be calibrated, so that the weight of the butter barrel could be subtracted from the total measurement.

The barrel had to be weighed first when it was empty. Then the city’s coat of arms and often the name of the owner were attached to it. In Leiden, one entire butter barrel weighed 40 pounds, a half-barrel weighed 22, and a quarter-barrel weighed 11 pounds.³²⁵ This regulation was in effect after 1508.

Commemorative plaques and lists of fees

In the weigh houses, special plaques commemorated especially heavy merchandise. The object that was weighed is often depicted

³²⁵ Kooiman 1956, 8.



108 Memorial plaque commemorating the weighing of an especially heavy cow (1365 pounds), painting 1806

on these handsome memorials. For example, one oil painting shows a four-year-old cow that brought 1082 pounds of meat and 283 pounds of fat to the Leeuwarden scale in 1806.

The highest desired fees for the most important items of trade were posted at the weigh house. The announcement was made on simple undecorated boards, which were rounded off on top and could be hung by means of a hole for a nail.

Upper levels

The upper stories of the weigh houses' that are investigated in this study rarely possess noteworthy architectural qualities.³²⁶ As a rule, they were not sub-divided into smaller spaces by partition walls and were often heated by open fireplaces.

The decoration of the halls in the upper story often had a representative character. This impression, for the most part, is due to the richly adorned beam corbels and their finely detailed wooden bolsters. This elaborate decoration should be seen in connection with the occasional use of these rooms as a gathering place for celebrations. In any event, the upper levels could be used for different purposes, even when they were in fact designated for only one function.

Sufficient documentation exists to prove the multifunctional use of the upper level in the Hoorn weigh house. A trap doorway located in the ceiling above the ground floor indicates that merchandise could be lifted upstairs. Written sources record more specific uses: for example, the upper story housed the local militia during a visit by the prince in 1617; the inscription for the "Compagnie van Commerce en Navigatie" [Company for Trade and Navigation] was in the same room in 1720; and in 1754, Captain Cornelis Gallis and his night watchmen occupied the floor over the weighing hall. Finally, a lottery was held there in 1777.³²⁷

Whereas various guilds used the floor above the weighing hall for social gatherings in Alkmaar and Delft, this room belonged exclusively to the surgeon's guild in Leiden. Not only was the open fireplace renovated and adorned with an oil painting, which depicted an allegory about medicine for this guild, but a partition was also

³²⁶ The often encountered, superficial descriptions of multifunctional spaces in the relevant literature usually refer to information that was accidentally found in written sources concerning the uses that occurred at one point in time and which were then projected backwards and forwards over a whole period.

³²⁷ Kerkmeyer 1911, 243 et seq.

constructed to create a kitchen that was identified as a wet room around 1682.³²⁸ The weigh houses in Arnhem and Groningen are somewhat unique as the upper storey contained an apartment for the weigh house master.

Reliefs

The facades of the monofunctional weigh houses investigated in this study were modestly decorated. Architectural orders were only applied to the facades in a few instances (Arnhem, Groningen, Leiden, and Monnickendam). The relative austerity of the facades was somewhat softened by the application of reliefs and sculptures.

Some weigh houses bear the inscription “Waag” (weigh house) to indicate the building’s function (Brouwershaven, Monnickendam, Rhenen, De Rijp, and Schiedam), yet there was a number of possibilities that could express the function of the weigh house in a non-verbal manner. In this regard, decorative sculptures and reliefs referenced figures of authority, mirrored political developments, or indicated who held the revenues from the weighing rights. Explicit symbols refer to particular sovereigns at the so-called weigh houses in Deventer (1528) and Enkhuizen (1559), such as a statue of Emperor Charles V at the first building and the coat of arms of Phillip II at the second. The reliefs on the weigh houses in Amsterdam (1563), Haarlem (1598), and Monnickendam (1669) only depict the province of Holland and the weigh house’s respective city. Meanwhile prominent sculptures of heraldic animals found at the weigh houses in Leeuwarden (1595) and Hoorn (1609) alluded to these cities.

328 Thiels 1980, 217.



109 Unicorn at the Hoorn weigh house, sculpture by Hendrick de Keyser, photograph 1984

The increasing use of family coats of arms belonging to members of the local city councils on the weigh houses can be seen as an indication of the growth of the oligarchy in the Dutch Republic during the seventeenth and eighteenth centuries. In Leiden, these coats of arms (1659) still had a fairly modest design, while not quite a decade later in Gouda (1668), they were much more visually important. The power wielded by the families on the city council also found expression on the weigh houses in Franeker (1657), Makkum (1698), and Rotterdam (1702). Gracious inscriptions exalted the regents of the city in Dokkum (1754) and Workum (1650) as well.³²⁹ In turn, the

329 “De E (del) Agtbare Magistraat en Vroetschap deser stede heeft den 1. December 1752 op het voorstel van de Hoogweledelgeboren Heer Jr Epo Sjuk van Burmania Presiderende Burgermeester besloten dit gebouw in Plaetze van het oude tot een



110 Relief on the so-called Nuremberg weigh house,
Adam Kraft

removal of the regents' coat of arms from these inscriptions after 1795 reflects the importation of the ideas inspired by the French Revolution.

Statues with allegories of the virtues only appear to be found on multifunctional trade halls (Alkmaar, Enkhuizen, and Steenwijk). The so-called weigh house in Zaltbommel (1798) displays a virtue devoid of one of its classic attributes — a standing Justitia without a sword — yet holding a scale high up with one hand. The other hand

Publiken Waag en Wagthuis van Nieuws te stigten; en is het selve door bestiering onder het opsigt, vlijt en sorge der Regerende Burgermeesters gelukkig voltrocken, als Duco de Haan, Douwe Ruimsadelaar, Harmen Harmens Potter, Benjamin Rudolf Verucci, Mr. Gerhardus Brantsma, Johannes Tadama, Jacob Jetses de Vries etc. Secretaris Jan Lolkes Suiderbaan” (underlined part retained).

carries a weight and is shored up by a kind of trestle. There are no depictions of virtues on monofunctional weigh houses.

Preference was given to the representation of weighing instruments, trade goods, and weighing scenes on monofunctional weigh houses. These motives are located on the facade and, when necessary, on the pediment. The climax in decoration of the buildings with reliefs was reached in Leiden with the works of Rombout Verhulst and shortly thereafter in Gouda with the weighing scene by Bartholomeus Eggers and the incidental sculptural works executed by Pieter van Luyck.³³⁰ At both weigh houses, weighing scenes, weighing instruments, city arms, and the regents' coats of arms are generously distributed over the exterior. This kind of decoration with reliefs was widespread at weigh houses that were constructed at later dates as well.

An early example of a weighing scene appeared on the weigh house in Nuremburg (Adam Kraft, 1497). The weigh house master is depicted in the middle of a rectangular relief framed by a scale — to his left, a laborer places weights on a weighing pan and a merchant stands to his right. The merchant stands next to the other weighing pan, where a package is placed, and is shoving his hand into his coin pouch. The two upper corners of the relief contain coats of arms and an aphorism, carved in relief on a banner behind the weigh house master's head, commands honesty to prevail: "*To others as to yourself*".³³¹

The relief depicting a weighing scene at the Leiden weigh house is 2.80 meters wide and 3.54 meters high. A covered, basket arch frames the opening. It shelters a scene containing a large scale that hangs on a square timber beam supported by two posts projected into the foreground. A groin vaulted hall, whose front arcade contains the inscription "1658" depicted on a cartouche, takes up the

330 Cf. sculpture of this period as well as the reliefs found on the Leiden and Gouda weigh houses: Neurdenburg 1948; also Ottenheim and Terwen 1993, 185 et. seq.; for the reliefs on the Leiden weigh house: Notten 1907.

331 Compare Boockmann 1986, 105.



111 Relief on the Leiden weigh house, Rombout Verhulst 1658, photograph 1982

background. On the frontmost layer of the relief, the weigh house master, who is easily recognized by his trappings and gestures, stands to the right side of this scene. His distinguished clothing indicates that he belongs to the patrician class. The weigh house master looks at the two laborers who are unloading parcels onto a weighing pan. The right hand of the weigh house master points to a laborer placing weights on the other weighing pan, while his left one holds up a book — demonstrating that he can both read and write and is also conversant with the rules of weighing. On account of their simple clothing, both figures depicted in the background at the feet of the weigh house master can be identified as a middle class couple. Meanwhile the laborers are depicted wearing simple, flowing cloth garments.

This relief was put together in several layers. The joints show that the side posts which frame the image project outwards from the surface of the relief. The different colors of the materials indicate

that both the left end of the scale as well as the rope that is attached to it on the front are made out of bronze. The laborers on the left side, as well as the weigh house master on the right, appear in the front doorway and project out from the plane of the relief. Both the laborers and the master of the weigh house are slightly less than life-size.

The central relief at the weigh house in Gouda depicts the weighing of the large rounds of cheese that are typical to this city. The scale occupies the middle of the image and the layering of arches and beams creates an illusion of depth in the background. At the front of the scene, the weigh house master stands in the right corner while a clerk sits across from him in the left corner. Although somewhat varied in their placement, the remaining figures are similar to those in the weighing scene found at the Leiden weigh house.

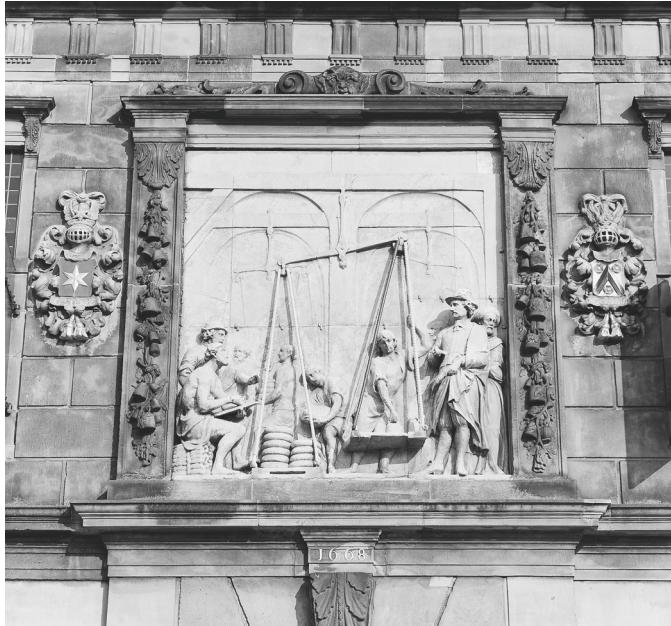
77 ←

The articulation of the pediment with reliefs was an important decorative aspect at the weigh house in Leiden. The city coat of arms are placed at the pediment's center and figures handling merchandise are located on either side of it. A cooper, opening the cover of a barrel, stands to the left and a woman labeling bales of wool, is poised to the right. The pediment on the Gouda weigh house, in contrast, only displays the city coat of arms, which are held on both sides by lions.

Reliefs also adorn the Gouda weigh house's side facades. The middle relief displays exemplary weighed merchandise and weighing equipment, and those to each side show classical garlands with flowers and fruits. In a somewhat different manner, garlands depicting all kinds of weighing accessories were attached to the side facades of the weigh house in Leiden. Another relief in Leiden, located over the side doorway, depicts the butter trade.³³²

The weigh house reliefs in Gouda are much simpler in design and execution than those found on the weigh house in Leiden, and also correspond to the building's modest architectural language.

332 Cf. Notten 1907, 22.



112 Relief on the Gouda weigh house, Bartholomeus Eggers 1668, photograph 1985

The different depictions of the interiors in the weighing scenes on both of these weigh houses also corresponds to the character of the respective buildings. The weigh house in Leiden, for example, is attached to a trade hall where merchandise is typically processed. This difference could be the reason why the relief on the frontispiece of the weigh house in Gouda, which is a freestanding mono-functional weigh house, does not display any merchandise that can be processed or prepared.

Urban context

As a rule, weigh houses were situated on sites that could easily be accessed or were near to the market square in order to facilitate the weighing and distribution of merchandise. Residential buildings

were often demolished to create sufficient free space in front of and surrounding a weigh house in a dense inner city (Amsterdam, Alkmaar, Gouda). Local records in several cities report that stakes were placed in front of the weigh house to define a public space (Arnhem, Groningen). Simple timber guard-houses, which are sporadically indicated on old drawings and which abutted the weigh house, served as a control point to supervise the merchandise as it was being prepared for weighing.³³³

Due to the importance of waterways in Holland, many weigh houses also have a direct connection to a canal. For those situated near a canal, a seesaw and a crane were often located on the embankment in front of the weigh house (Haarlem, Leeuwarden, Leiden, Utrecht). When the waterway did not directly access the market square, priorities had to be determined concerning the selection of the site for the weigh house (for example Haarlem and Hoorn). Monofunctional weigh houses were either freestanding buildings or formed the corner of a city block. They were never inserted into a row of buildings with adjoining structures on either side.

Weigh houses generally tower above the neighboring residential structures. The height of a weigh house primarily underscored the importance of the building but was not necessary for the functioning of a weigh house. In the truest sense of the word, a special regulation even stipulated the superiority of the weigh house in Gouda. According to this ordinance, all subsequent buildings erected in the immediate vicinity had to be lower than the weigh house.³³⁴ As was previously mentioned, thought was given to reducing the height of the adjoining residential buildings after the completion of the weigh house in Hoorn.

333 Cf. illustration 62.

334 Blok 1934, 107.

The function of the weigh house

The public weigh house as a facility to regulate and impose taxes

The public weigh house guaranteed a reliable determination of the mass of a quantity of merchandise for both sides involved in the exchange of goods. Weigh houses were furthermore made available for public use, as weighing instruments were too costly for individuals to acquire, could not be easily transported by traveling merchants, and were only of limited use as units of weight varied from place to place. Although written sources only record the fees that were required to use a public weighing facility beginning in the late Roman and Byzantine periods,³³⁵ similar payments presumably also existed at an earlier date.

335 Dölger 1964. Due to insufficient written source material, it is not possible to determine the regulation of the fees required to organize and operate a public weighing facility during Antiquity. In ancient Greece, it may have been necessary to offer a small fee (*Eukyklia*) for the services provided by a weighing facility (Boochs 1985, 108). In any event, if the *Metronomoi*, who were responsible for the supervision of the measurements and weights, the levying of taxes and the maintenance of the market in Athens, produced surpluses and were required to hand over this money to the state treasury (Wissowa 1894, 884). In contrast, fees were not charged to use the Roman *Ponderarium* (Corbier 1991, 226). If weighing fees were in fact not charged in antiquity, it can be assumed that tax money was used to maintain and repair the public weighing facilities. In ancient Greece, the tax money in question was largely taken from the fees charged at the entrance to the market, at a rate of one percent of the worth of the merchandise (*Eponia*) in question (Boochs 1985, 108). In 375 A.D. under Emperor Valentinian in Rome, the municipal import, export, and transit tolls (*Teloneum*) were used to erect and maintain the public weighing facilities. The same use was made of the sales tax (*Siliquaticum*) at the markets introduced by Valerian III in approximately 444 to 445 A.D. (Karayannopoulos 1958, 149). This tax required that the twenty-fourth part of the traded amount had to be equally paid by the buyer and seller (*Valdea-vellano* 1931, 333) (*Siliquaticum*) at the markets introduced by Valerian III in approximately 444 to 445 A.D. (Karayannopoulos 1958, 149). This tax required that the twenty-fourth.

Since the Middle Ages at the very latest, the public weighing facility played an important role regarding the imposition of market taxes for the wholesale trade.³³⁶ These were fixed in relation to a unit of weight of merchandise and could only be determined after the goods were weighed. In the twelfth century, tax revenue was raised through the introduction of the so-called staple duty. In cities that acquired the staple right, this law required traveling merchants to weigh certain kinds of merchandise at a public weighing facility and afterwards to offer them for sale at a municipal trade hall for a stipulated length of time.³³⁷ At the very least, the staple duty could be limited to the obligation to weigh merchandise at a public weighing facility.³³⁸ Because the public weigh house was often located within a trade hall, the denotation of weigh house could be synonymous for the trade hall, and the weighing tax could be seen as the equivalent of the market tax.³³⁹

During the Karolingian period, the right to levy market taxes belonged to the king.³⁴⁰ As the feudal system declined around the second half of the twelfth century, the revenues from the market duties were largely in the hands of the dukes.³⁴¹ From the thirteenth and fourteenth centuries onwards, the pledging as collateral of the right to tax and the bestowal of the right to tax on local rulers and cities increased, and cities slowly were able to expand the scope of their

part of the traded amount had to be equally paid by the buyer and seller (Valdeavellano 1931, 333).

336 Haeberle 1967, 65.

337 If not otherwise mentioned, the following description refers to the period of the Middle Ages to the Holy Roman Empire and for the 17th and 18th century to the Republic of the Netherlands. Because the regulation of the imposition of taxes in many cities was quite similar, they will only be given a blanket description here. When in doubt, reference made to a specific place can be taken from the source material.

338 Nagel 1971, 65.

339 Sneller 1936, 16.

340 Rietschel 1965, 30.

341 Schröder and Von Künssberg 1932, 646.

tax jurisdiction. The designations Fronwaage (compulsory or public weigh house) and municipal or council weigh house, respectively, reflected these new conditions of ownership.³⁴² This local means of collecting taxes was suppressed in favor of a direct and uniform taxation at a very early point in time in countries with a strong central authority.³⁴³ The role that King Phillip II's attempt to impose such a system of taxation during the 80 Years War played in instigating the Netherlands to revolt — and leading to the establishment of a city state in Holland where almost all cities possessed the right to weigh and impose taxes upon traded merchandise — cannot be underestimated.³⁴⁴

The weigh and market taxes were abolished with the elimination of sectionalism and the liberalization of trade in the nineteenth century. In Holland this occurred in 1821 and the Dutch public weigh houses were only used to determine weight after this.³⁴⁵ Many weigh houses continued to function well into the twentieth century, primarily serving the farmers who produced cheese. Without the additional revenue from the taxes levied on weighed merchandise however, the weigh house's prestige declined.

342 Occasionally the weighing fees were divided up, as was the case in Antwerp in 1522. In this instance the city purchased Emperor Charles V's claim to one third of the revenues for a sum of 40,000 gulden. The remaining parts remained in possession of two aristocratic families (Soly 1977, 133 and 135).

343 Jacques Le Goff (1980, 297) describes the fiscal differences in Flanders and in France. In describing the French system of taxation during the Renaissance, Martin Wolfe (1972) does not discuss the fees charged for weighing merchandise.

344 For example, Rotterdam, 1576; Alkmaar 1581; Hoorn 1602. There were also places without municipal rights and privileges that possessed the right to weigh. Cf. Andreae 1975, 40 and Krans 1991, 186 concerning the attempts by villages to assume this right and the innumerable complaints by the cities.

345 Vrankrijker 1969, 65.

Policy and procedures regulating the imposition of taxes

Cities carefully supervised the imposition of the staple duty. When merchants arrived at a city gate, a clerk documented the nature and the amount of the imported and exported merchandise and the names of those accompanying it. Larger groups of merchants had so-called “captains”, who assumed the responsibility for their colleagues and took care of the necessary formalities.³⁴⁶ At the city limit, clerks at the city gate informed traders of the obligation to bring their merchandise to the public weighing facility and to pay taxes on it. Innkeepers who housed foreign merchants also had to convey these instructions.

Regulations also existed to control the transport of merchandise from the city gate to the public weighing facility and to prevent the evasion of the obligatory taxes. In Cologne, the cargo was sealed and accompanied by a soldier over this distance. When the merchandise arrived at the weigh house, the weigh master additionally checked it against the information provided by the clerk at the city gate. Using a document provided by a soldier, the clerk at the city gate then confirmed the arrival of the merchandise.³⁴⁷ After the taxes were paid in Leipzig, waggoners received a certificate that enabled them to leave through the city gates.³⁴⁸ Innkeepers were also not allowed to permit their guests to depart without this document.³⁴⁹ In cities that were connected to a network of waterways, there was very often a separate customs station for ships at the city’s border, as was the case of the 1622 customs house in Alkmaar.

346 Sneller 1936, 47.

347 Gönnerwein 1939, 314.

348 Kroker 1925, 38.

349 Kroker 1925, 34.



113 Alkmaar customs house (1622), photograph not dated

In the most important trade cities, large merchant associations had their own tax jurisdiction and possessed their own weigh house.³⁵⁰ Some individual merchants also had the option to weigh merchandise in their own warehouses. This convenience was rather expensive however, as two horses had to haul the weighing instruments to the warehouse.³⁵¹ From time to time and in various regions, it was possible to weigh certain kinds of merchandise privately.³⁵² Nonetheless, when goods were weighed in this manner, taxes still had to be paid at the weigh house.³⁵³

350 For example, a special weigh house for wool from England (Ingelsch weechhuus) was erected in Bruges after 1331. Cf. Houtte 1982, 181.

351 Houben 1990, 34.

352 Houben 1990, 27.

353 Kroker 1925, 34.

In Holland, with the establishment of the republic in 1583 and the elimination of the transit staple right for merchandise that was brought to the markets, goods were only weighed when a buyer was found to purchase them. If no buyer was found, the charges were limited to a fee for a market stall.³⁵⁴ In general, local municipal councils adopted existing rules governing market practices and dating from the time of Emperor Charles V and then organized them into a uniform standard. Local municipalities only modified small details of these regulations.³⁵⁵

The most important products that were brought to a weigh house during the seventeenth and eighteenth centuries in Holland were butter and cheese. However, tobacco, rope, iron, lead, copper, honey, hides, raisins, flax, wool, and pigment had to be weighed as well.³⁵⁶ These goods were itemized in lists with corresponding rates of taxation. Changing consumer behavior led to new kinds of merchandise, for example, and foodstuffs such as coffee, cacao, and orange peels were added to the 1749 tariff list in Rotterdam.³⁵⁷

Although weigh houses were popularly known as either the butter weigh house or cheese weigh house, it cannot be assumed that only this kind of merchandise was weighed in these buildings.³⁵⁸ The same can be said of what written records identify as special weigh houses (for salt, fat, iron, flour, cherries, etc.), and which should not be considered as separate buildings created to handle only these products. As a rule, the selective mention of these different weigh houses came about in connection with the leasing of the rights to levy taxes on the corresponding kind of merchandise. Even if a particular kind of merchandise is identified with a weigh house, this product normally represented a large spectrum of somewhat related

354 Koolwijk 1972, 67; also Postema 1940, 72.

355 Krans 1991, 196.

356 Noordegraaf 1990, 21.

357 Krans 1991, 195.

358 Noordegraaf 1990, 21.

products. Among other things, the fat weigh house was responsible for milk products, fruits, meat, tobacco, and stockfish. The grain weigh house was an exception, as weight here was not determined by using weighing equipment but with a measure of capacity. This procedure could take place in a weigh house, where the measure of capacity was usually stored.

Some kinds of merchandise also placed highly unique demands upon both the weighing equipment and the weigh house, however. For example, whereas the high specific weight of iron required especially robust weighing instruments (Amsterdam, Antwerp, Dordrecht), merchandise such as hemp and hay with a particularly low specific weight but a relatively large volume, also necessitated a special layout of the weigh house (Rotterdam).³⁵⁹ There was even a special weigh house in eighteenth century Paris, overseen by a royal weigh master (Peseur privilégié du Roi), that was devised to weigh people.³⁶⁰ When particular kinds of merchandise were not treated in the central weigh house, the main building was sometimes designated as the “mother weigh house” (Nijmegen). Other designations existed, such as the so-called “little weigh house”, which was a facility that supplied standardized weights to the retail trade. Such a “little weigh cottage” — a one-storey, two-axis building — was erected in Nuremberg in 1598.³⁶¹

359 Krans 1991, 192.

360 Küntzel 1894, 27.

361 Cf. Brem 1993, 29 footnote. My gratitude goes to Aenne Ohnesorg (Munich) for the mention of this literature.



114 Alkmaar cheese market, photograph 1924

Cheese markets

Because cheese was the most important merchandise that was weighed in the country towns of Holland, weigh houses there were often known as cheese weigh houses. At the cheese markets, weighing followed an established, carefully proscribed procedure. A typical example can be found in Purmerend. The cheese arrived at the market square the day before the weighing took place.³⁶² First, the ground was covered with straw or sailcloth. After the loaves of cheese had been stacked up, they were covered with sailcloth. The stacks of cheese had to be guarded overnight. The next morning, a loaf of cheese was placed atop the sailcloth covering the pile of stacked cheese to indicate that buying and selling could begin.

362 Postema 1940, 63.

When buyer and seller were in agreement, the latter had to obtain a numbered card to weigh the merchandise.³⁶³

Four weekly market days were held in Alkmaar until 1731. Of these days, a cheese market took place on Fridays and Saturdays.³⁶⁴ The loaves of cheese could only be brought to the market place at 7 o'clock in the morning. The market master determined the place where the cheese was to be stored. The cheese was then placed two layers deep in rows of ten loaves and was covered with grass in order to prevent it from drying out. This protection was removed at 10 o'clock in the morning, so that the buyers could inspect the loaves of cheese. Using a hollow borer, small samples of cheese were removed, smelled, and occasionally tasted.³⁶⁵

Hours of operation

A public weigh house had different opening times in summer and winter. Whereas the weigh house in Rotterdam was in operation from May to September from seven o'clock in the morning until six o'clock in the evening, its opening hours from October until February were only from eight o'clock in the morning until four o'clock in the afternoon. On market days, the hours of operation were increased and the weigh house was open from the break of dawn until the last delivery of merchandise. Personnel were required to be present at the weigh house beginning at five o'clock in the morning.³⁶⁶ In Amsterdam, there was a midday break between twelve noon and two o'clock in the afternoon. Merchandise could also be weighed during the break however, for a payment of twelve extra stuivers.³⁶⁷

363 Postema 1940, 64.

364 Koolwijk 1972, 35 and 61.

365 Koolwijk 1972, 64.

366 Krans 1991, 199.

367 Kruizinga 1983, 6.

Fees

Towards the end of the seventeenth century in Holland, weighing fees were comprised of several payments. In addition to the weighing fee, money was charged to use the weighing pan. This was paid in order to determine the mass of a product so that it would fit properly on a weighing pan.³⁶⁸ There was also a fee for the required certificate issued by the weigh house master that bore a verification of the weight.³⁶⁹ In addition to these payments, money was handed over for the services of the weigh house assistants along with the taxes that were due to the city and the state. Buyers and sellers equally contributed to the total sum.³⁷⁰ The importance of the weigh house revenues for a city can be illustrated by the example of Groningen, where the income from this institution provided a sixth to a seventh of the total municipal budget.³⁷¹

Assistants

In 1282 in Bruges, the seller had to place his merchandise on the weighing pans and the buyer was responsible for unloading it. At this point in time, the weigh house leaseholder was forbidden to accept money for lifting merchandise.³⁷² Throughout Holland in the seventeenth century, however, authorized carriers, who were required to aid the merchants, could be found at all the significant weigh house locations.³⁷³ The authorized carriers were mandated

368 Krans 1991, 197.

369 Kooiman 1956, 14.

370 Krans 1991, 197.

371 Feith 1903, 19.

372 Houtte 1982, 200.

373 Krans 1991, 198.

to transport any kind of merchandise that required weighing, even when it was not being taken to the weigh house.³⁷⁴

In Holland during the seventeenth and eighteenth centuries, the weigh house's authorized carriers were generally grouped in crews of five to seven, though sometimes more, laborers.³⁷⁵ Each member of this crew was identified by a special color and was responsible for a particular scale and its corresponding field on the market square, in weekly rotation.³⁷⁶ According to the Rules of 1773 in Alkmaar, there were 28 permanently employed, authorized carriers and 16 who provided assistance from time to time, referred to as auxiliary helpers. The latter could become a permanently employed authorized carrier when a position became available. A crew leader supervised each group. His assistant, or "pocket man", collected the fees for hauling the merchandise³⁷⁷ and was responsible for placing the weights on the pan.³⁷⁸ Pocket men were also required to ticket and mark up the merchandise, to note the names of the buyers and sellers and, if requested, to produce a copy of a certificate that verified the weight of the merchandise.³⁷⁹

If it was possible, the authorized carriers worked together and balanced out the differences in ages. For example, the oldest and the youngest might form a team and work together. Those carriers who were no longer able to work due to age or weakness received a form of support from funds that were regularly contributed by the active members.³⁸⁰ The authorized carriers were usually housed in a room that was either in or close to the weigh house. In Franeker they even had their own cottage.

374 Fokke Simonsz. 1808, 76.

375 Fokke Simonsz. 1808, 76.

376 Koolwijk 1972, 37.

377 Koolwijk 1972, 35.

378 Koolwijk 1972, 40.

379 Krans 1991, 198; also Koolwijk 1972, 68.

380 Fokke Simonsz. 1808, 70.

Weigh masters

When a weigh house was in operation, the weigh master was the sole person responsible for the determination of weight.³⁸¹ If a weigh house had numerous scales at its disposal, it was required to have an equal number of weigh masters. A chief weigh master was selected from this group. When a load was weighed, the weigh master had to loudly announce the result and record it three times.³⁸² The record sheets were bound in books and preserved for safekeeping.³⁸³ During the eighteenth century, the position of the weigh master increasingly developed into a kind of annuity, which the city magistrate handed out to a family member or a good friend — the actual work was sub-contracted out to another person.

Gilbert van Schoonbeke, the father of the builder of the Antwerp weigh house, was known as a particularly strict weigh master. Beginning in 1515, he worked as a weigh master and was regularly confronted with widespread fraudulence and trickery. As a result of his exacting controls and his numerous legal disputes, substantially less merchandise was brought to the weigh house. Over the course of a year, tax revenues declined drastically and the senior van Schoonbeke was released from his contract. Yet his fierce distrust served him well, and van Schoonbeke subsequently became the cashier in charge of the weigh money, of which he was allowed to keep ten percent. For all intents and purposes, he was quite successful.³⁸⁴ Gilbert von Schoonbeke's son was not a particularly beloved weigh master either. After detecting fraud during the weighing of alum, he vehemently argued with Gaspar Ducci, a

381 Krans 1991, 197.

382 Koolwijk 1972, 67.

383 Krans 1991, 198.

384 Soly 1977, 134.



WILLEM OPPERDOES, geboren te Haarlem 26 Decemb: 1674.
Heeft 14 Jaar ter Zee gevaren. Is mede geweest by de vermaarde Overtocht van Prins-
Willem de 3: in't Jaar 1688. Den 19: Mey 1704 voor Egmond op Zee in een Gevecht zynde tegen
drie Franse Schepen, sprong't Schip daarhy op was in de Lugt. van't Jaar 1724 tot 1768
Waagmeester en Collecteur in de Waag geweest te Haarlem en Leef't er nog in Welstand.

Naar't Levensgette: en in't Koper gebragt door C. V. Noorde, 1774.

115 Weigh master Willem Opperdoes, etching by Cornelis van Noorde 1774

powerful and influential merchant. Ducci arranged to have him murdered, but Gilbert van Schoonbeke Jr. survived the incident.³⁸⁵

The work of a weigh master could also be less eventful, as demonstrated by the example of Willem Opperdoes from Haarlem. In 1724, before he took over the job of weigh house master at the age of fifty, he had been a sailor. He worked as a weigh master until 1769, when he was 95 years old, and abandoned the job only because he was too weak to hold a feather to write. A year before his death in 1775, when he was one hundred years old, he commissioned a portrait of himself. The image depicts a satisfied and self-assured personage in the foreground. Depictions of a battle at sea on one side and the Haarlem weigh house on the other take up the background.³⁸⁶

Willem Opperdoes worked as weigh master for Dorothea van Beek, who officially possessed the weigh master position in Haarlem. She was a relative of the ruling Valckenburg family and was granted the right to the annual income from this position in 1722 when she was 19 years old. When the city of Haarlem eliminated the weighing taxes in 1753, van Beek received a generous settlement and a life-long pension.³⁸⁷

Leaseholders

Although the leaseholders were entrusted with collecting the taxes from weighing, the allotments for the city and the province could be given to different individuals.³⁸⁸ A lease was held for a minimum of one year and a maximum of three years.³⁸⁹ Leaseholders were

385 Soly 1977, 166.

386 Dijkstra 1968, 82 et seqq.

387 Dijkstra 1968, 96.

388 Dijkstra 1968, 95.

389 Feith 1903, 19.

neither allowed to buy and sell the merchandise that was required to be weighed, nor could they be indirectly involved through investments in businesses that traded this merchandise.³⁹⁰ They possessed regional jurisdiction by the prosecution of fraud.

Well into the seventeenth century, the leaseholders of a weigh house were automatically also the weigh masters. Civil servants were increasingly employed to collect the weigh money after the tax revolt of 1748, however.³⁹¹ Whereas the leaseholders still oversaw their business concerns from their homes, the civil servants were installed in the weigh houses to supervise the daily operations there.³⁹²

390 Krans 1991, 185.

391 Krans 1991, 194.

392 Dijkstra 1968, 97.

The development of the public scale and its accommodation in public architecture

Antiquity

In ancient Egypt, large scales were located in the treasuries of temples and palaces. These instruments were primarily used to weigh metal. It is to be assumed that beginning with the Middle Kingdom (2040-1785 B.C.), a public scale was in use at official trade stations and markets.³⁹³

Written records confirm the existence of a public weighing facility at the markets in ancient Greece,³⁹⁴ the first one being at the city of Kyzikos in the 6th century B.C.³⁹⁵ At that time, the public weighing facility was a part of the Agoranomion, the authority that among other things oversaw the regulation of the opening hours, market stands, and shop rentals and also insured that the merchandise complied with standards of quality. In Athens, beginning in the fourth century B.C. at the very latest, the specialized Metronomoi — the state supervisory authority in the Agoranomion — administered all measurements, scales, and weights. It also determined what merchandise had to be weighed.³⁹⁶

393 Cf. Heck and Westendorf 1986, 1082 et seq.

394 Boochs 1985, 188; also Travlos 1971, 37.

395 Cf. Jones 1967, 216.

396 Cf. Böckh 1851, 368.

The Romans took over the Greek Metronomion and named it the Ponderarium. One part, the Mensa Pondaria, was located outdoors and contained the official linear and capacity measures.³⁹⁷ Documentation exists confirming the existence of a public weighing facility in a room at the Macellum, the hall where goods on a daily basis were traded at the Nundium, the weekly market in the cities of Djemila, Pompeji, and Ostia, among others.³⁹⁸

Middle Ages and the Renaissance

During the Middle Ages, the public weighing facility was almost always located in the municipal trade hall,³⁹⁹ which often occupied a part of the ground floor of a city hall.⁴⁰⁰ During this period, even if a city's diverse commercial and administrative operations were located in several buildings, the structures continued to be multi-functional and contained large, flexible halls.⁴⁰¹ It is difficult to determine the respective functions of these municipal trade halls, however, as their popular designation tends to single out only one aspect of their use.

Regardless of whether a public building was identified as a town hall, tax house, storage hall, meat hall, bread hall, wine house, dance hall, leather house, cloth hall, or weigh house, these structures always housed other functions throughout the Middle Ages. When such a building is identified in a city, it can at least be assumed that such a function was not present in the other municipal structures

397 Frayn 1993, 108.

398 Frayn 1993, 113.

399 Cf. Gruber 1943, 24; also Nagel 1971, 69.

400 Gruber 1943, 25.

401 The typology of the city hall developed out of the trade halls of the nobility, as Schweisthal (1907, 52) has shown for Germany, Paul (1987, 337) for Italy, and Nagel (1971, 52) for England. The question — Were the Roman trade halls, such as the Horrea Epagathiana et Epaphroditiana in Ostia (2nd Century A. D.), precedents of the city hall? — is still open to debate.

that contained large, multi-use halls. Towards the end of the fifteenth century for example, Ravensburg had a town hall, a weigh house, a leather house, and a bread stand.⁴⁰² In this instance, one can assume that the municipal council did not meet in the weigh house and that weighing did not necessarily take place in the city hall. It was only the large trading centers, such as Cologne,⁴⁰³ Venice,⁴⁰⁴ or Bruges⁴⁰⁵ during the Middle Ages that were able to provide public weighing facilities in a number of different buildings.

In his investigation of trade halls in southwest Germany, Gerhard Nagel discovered that these buildings housed a wide variety of functions and always included a public weighing facility: Mainz (“large store”, 1316-17),⁴⁰⁶ Constance (“large store”, 1388),⁴⁰⁷ Ulm on the Donau (“Greth”, municipal weigh and storage house, 1389),⁴⁰⁸ Esslingen on the Neckar (“tax house”, around 1430)⁴⁰⁹ and Nördlingen (“dance house”, 1442-44).⁴¹⁰ In addition, it is known that the so-called “wine houses” in Münster (1615)⁴¹¹ and Zutphen (1618, Edmond Hellenraadt)⁴¹² were originally used as public weighing facilities, while the so-called weigh house in Deventer (1528) was probably also a wine house⁴¹³ and the so-called weigh house in Doesburg (around the second quarter of the 16th century) housed also a municipal beer hall.⁴¹⁴ The case of Nijmegen (1612, Cornelis

402 Meckseper 1982, 183.

403 Küntzel 1894, 26.

404 Calabi 1993, 82.

405 Van Houtte 1982, 200.

406 Nagel 1971, 85.

407 Nagel 1971, 135.

408 Nagel 1971, 150, and 156.

409 Nagel 1971, 178.

410 Nagel 1971, 205, and 207.

411 Geisberg 1934, 250.

412 Gimberg 1925, 132 et seqq.

413 Cf. above, page 33 et seqq.

414 Ter Kuile 1958, 58.



116 Constance Large Store (1388) from the southeast, postcard around 1900

Jansz. van Delft) is also of some significance, because the old meat hall there had its own weighing facility. Although the new building, erected on the same site, was also a meat hall, it is identified as a weigh house.⁴¹⁵

The so-called weigh houses in Frankfurt on the Main (1503),⁴¹⁶ Ravensburg (1553-56),⁴¹⁷ Bremen (1586-88),⁴¹⁸ Osnabrück (around 1531-32),⁴¹⁹ and Braunschweig (1534)⁴²⁰ housed a variety of functions, which included the sale and storage of merchandise on the ground floor. A comparison of the Melsungen city hall (1565-66)⁴²¹ with the so-called Deventer weigh house (1528) reveals that these two buildings had extremely similar physical layouts, albeit

415 Cf. above, page 53 et seqq.

416 Nagel 1971, 111.

417 Eitel 1988, 31.

418 Stein 1962, 505 et seqq.

419 Fink and Siebern 1907, 235 et seqq.

420 Kablitz 1993, 17.

421 Fenner 1987, passim.

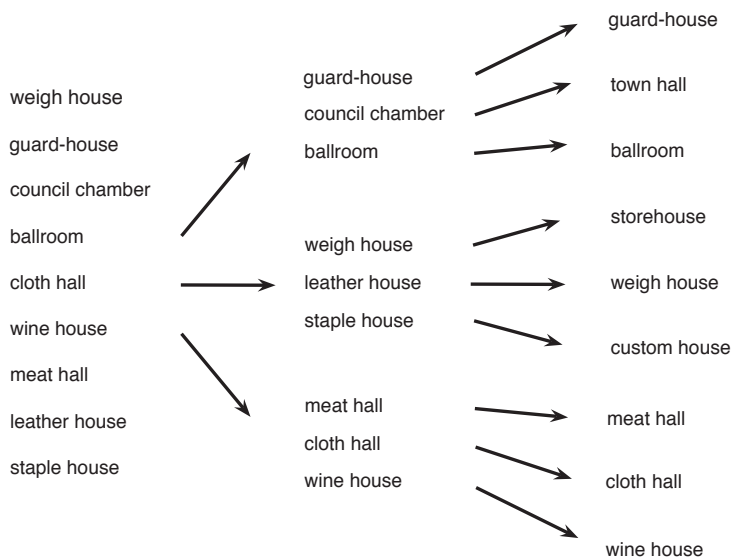


117 So-called Braunschweig weigh house (1534), photograph around 1935



118 Melsungen city hall (1566), photograph around 1960-70

different designations. When considering this observation, it is not of concern here that the commercial, administrative, and assembly functions are united under one roof in the Melsungen city hall, while they are only selectively present at the Deventer weigh house. Written documents recording the construction of the so-called weigh house in Wolfenbüttel in 1609 indicate that it was to be used as a multifunctional trade hall: *“Because ... the weigh house, meat hall, and bread hall in other cities commonly tend to be nested together, such a proposed weigh house ... could be regulated most conveniently and comfortably in such a way that the court of law is also in the same building and the weigh house is under, so one can drive into it and unload and store new arriving merchandise inside, and then also the meat and bread halls on the sides and the cloth hall above, which at the same time protects one during the*



119 Development from the multifunctional trade hall to the monofunctional weigh house

annual fairs in the occurrence of rainy weather and permits the sale of merchandise⁴²²

In many instances, several functions typically found in a trade hall were removed and relocated to a new building, which was often in the trade hall's immediate vicinity. In Wolfenbüttel, the new building for the so-called weigh house was not only located next to the city hall, but also closely resembled it, so that the two buildings appeared to be one seemingly uniform building. When a trade hall required increased capacity, the new structures were not always as representative as the original building. This was typical of the Den Briel city hall (after the fourteenth century),⁴²³ where small buildings were constructed somewhat haphazardly at the rear of the property. In this case, the public weighing facility and the prison were placed in

422 Thöne 1954, 89.

423 Don 1992, 92 et seqq.



120 Cremona city hall (13th century) with an open trade hall in the ground floor, the guard-house is to the left, photograph 1994



121 Casa di Mercanti in Verona (14th century), photograph 1994



122 Lonja in Valencia (1482-1548), photograph 1995



123 So-called Edinburgh weigh house

the same building. In Lübeck, the public weighing facility was situated behind the ground floor loggia of an extension to the meeting room of the municipal council, the so-called *Kriegsstubenbau* (1442-44), which was located in a wing of the town hall.⁴²⁴ The weighing facility could also be independent of a trade hall and housed at the weigh master's residence, or placed temporarily in a building.

These observations, drawn from German and Dutch examples, were typical of the situation in Europe at this time. For example, public weighing facilities (*Bilancia publica*) in Italy were usually located in the city hall (*Palazzo comunale*, *Palazzo del Popolo*) or

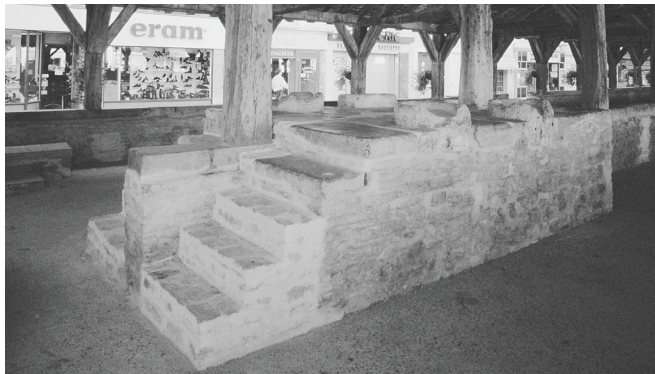
424 Rahtgens 1974, 130.



124 Monpazier market square with the trade hall (left), photograph 1995



125 Iron measures of capacity in the Monpazier trade hall, photograph 1995



126 Mensa Ponderaria in the Crémieu trade hall, photograph 1995

in a trade hall (Fondaco, Loggia dei Mercanti) during the Middle Ages. As in other parts of Europe, the Italian city hall retained its administrative functions with increasing commercial activity, while those facilities concerned with trade were removed and placed in a separate building.

The example in Florence illustrates this development. There the public weighing facility was removed from the Palazzo Vecchio (originally Palazzo dei Priori, after 1299) and relocated to an extension, the custom house (Dogana). This structure, built in 1495, occupied the entire width of a city block and its materials and proportions closely resembled those of the Palazzo Vecchio.⁴²⁵ In Venice, the public weighing facility was situated in a customs building (Dogana Terra) that was surrounded by an irregular, motley complex of trade halls on Rialto Island near the bridge of the same name. It burned down in 1513 and a new building, the Palazzo dei Dieci Savi (Antonio Abbondio, known as Scarpagnino), with the same function was erected on the site.⁴²⁶

Important trade halls were mainly found in southeastern Spain (Alhóndiga; also Lonja, Almudí, Alholí, Alfondega): Barcelona (1352-57),⁴²⁷ Palma de Mallorca (first half of the fifteenth century), Valencia (1482-1548),⁴²⁸ and Zaragoza (1541-51).⁴²⁹ These are often one-story buildings and have interiors that resemble church-like halls.⁴³⁰ Manuel Basas notes that the Alhóndiga in Bilbao originally contained a public weighing facility (Peso Público or Peso Real)

425 Bargellini 1968, 26. Nikolaus Pevsner (1984, 28) ruled out an original market function from the enclosed ground floor area at the Palazzo Vecchio in Florence. Such an assertion is not convincing however.

426 Calabi 1993, 82.

427 Torres Balbás 1952, 249.

428 Aldana 1991, 46. My gratitude extends to Margarita Fernandez Gomez (Valencia) for the tour of the trade halls in Valencia.

429 Lampérez y Romea 1993, 213 et seqq. Nikolaus Pevsner (1984, 194) incorrectly classifies the Spanish trade halls as stock exchanges.

430 Aldana 1991, 36.



127 Measures of capacity carved into the balustrade of the Pont du Marché in Billom, photograph 1995

and that other trade halls in Spain typically housed one as well.⁴³¹ Leopoldo Torres Balbás has determined that a public weighing facility was installed in the Alhóndiga in Seville.⁴³²

In Spanish cities that did not have a trade hall, it can be assumed that the public weighing facility was located on the ground floor of the city hall.⁴³³ As in the rest of Europe, the names of the Spanish trade halls (de Legumbres, del Carbon, del Vino) indicate that these buildings also accommodated a number of related functions.⁴³⁴

In England, surviving records confirm the existence of public weighing facilities in municipal trade halls (town hall, moot hall, market house, council house, or tollbooth).⁴³⁵ As cities were not

431 Basas 1970, 8.

432 Torres Balbás 1946, 470.

433 In Spain, the city hall (Ayuntamiento) is also often differentiated from the trade hall (Alhóndiga) not by means of an architectural analysis but a verbal one. Cf. Ricón García 1988, *passim*.

434 Torres Balbás 1946, 451.

435 Titler 1991, 28 and 133 et seq.



128 Michelstadt city hall (1458), ground floor with scale in situ, photograph 2008

locally administered and trade within national borders was generally carried out with few legal restraints, the English trade halls were generally relatively small and modest.⁴³⁶ The exceptions to this rule are found in harbor cities that were entrusted by the central authority to levy the royal export tax.⁴³⁷ During the first half of the fifteenth century, particularly grand and handsome trade halls were erected in a number of large cities in eastern England including Norwich, King's Lynn, and York.⁴³⁸ The largest English trade hall was in London (Guild Hall, 1411 through around 1430, John Croxtone).⁴³⁹ There was even a building called a weigh house in Scottish Edinburgh (1352, demolished before 1820),⁴⁴⁰ although it

436 Nagel 1971, 53.

437 Gönnerwein 1939, 372.

438 Schofield 1984, 107.

439 As has been illustrated here using many Dutch and German examples, the mention of "houses" in connection with the London Guild Hall, should not be literally understood as individual (residential) buildings, but more as a facility for a specific function. Cf. Barron 1974, 31.

440 Avery Archive, Birmingham. Considering its architectural detailing, the doorway of the weigh house in Edinburgh dates from the 17th century and the roof from the 18th century. Reference supplied by C. L. Temminck Groll (Driebergen).

belongs to the typology of the multifunctional trade hall, as has been previously discussed.⁴⁴¹

France's strong central authority also restricted the emergence of the municipal trade hall as an independent building type. Only very simple variations of this building are found in French cities, such as a simple protective roof without permanent enclosures on the sides. The public weigh station was usually located in this structure (Poids Public, Poids du Roi).⁴⁴² In Crémieu and Monpazier, the protective roofs of the Mensa Ponderaria still exist. In Crémieu, three standardized measures of capacity that are chiseled into stone are still in evidence, although they are missing the nozzles that were made of metal. In contrast, the measures of capacity in Monpazier — just as in Deventer — were comprised of iron cylinders. Here, three cylinders of different sizes were flexibly mounted on a frame so that once they were filled their contents could be easily poured out. In Billom (near Clermont-Ferrand), the measures of capacity are carved into stone. The Mensa Ponderaria is located outdoors on the balustrade of the Nôtre-Dame bridge, however.⁴⁴³

Monumental city halls, such as the one in Compiègne (beginning of the sixteenth century), are exceptions in medieval France⁴⁴⁴ and only appeared in greater number during the Renaissance.⁴⁴⁵ As a rule, the few two-story buildings with large flexible halls, containing

441 David Daiches' (1978, 27 et seq.) history of Edinburgh does not mention a weigh house. He does note the existence of a customs house (tollbooth). It supposedly dates from the 15th century and was demolished in 1817. When information concerning the respective locations is correct (weighing facility on the intersection of Castle Hill / Lawn Market and the customs house on High Street, to the northwest of St. Gilles) and it does not involve different names being applied to one and the same building, the two buildings were located quite close to one another. Regarding the customs house, the author describes the typical multifunctional uses that were found at trade halls and notes a representative assembly room on the upper level.

442 Enlart 1929, 371 et seq.

443 Brunet and others, 1921.

444 Bonnet-Laborde and Callais 1993, 50; also Cattois and Verdier 1972, 134.

445 Cattois and Verdier 1972, 136.

a market in the ground floor and an assembly room above (Ghialle, Guyale, Entrepot, Entrepotdok, Maison de l'Etape, Douane), were erected before their surrounding territory was annexed to the French crown.⁴⁴⁶

In contrast to the situation in England and France, the trade halls in the southern Netherlands were exceptionally capacious,⁴⁴⁷ and were often much greater in size than the city halls in their respective cities. Trade halls also enjoyed an exalted status in Eastern Europe in isolated instances. According to Cord Meckseper, the hall in Thorn was "*the most monumental trade hall of the Middle Ages*".⁴⁴⁸ The public weighing facility was located in the northwest corner of this building, without any special architectural articulation. The large scale in the extensive Breslau trade hall complex (after 1242), in contrast, was housed in a small, independent building in front of the main hall. It was open on three sides, and was covered with an onion-shaped roof that was topped with a lantern.⁴⁴⁹ The smaller weighing facility and the customs office were located inside the main trade halls.

The public weighing facility was an essential piece of urban infrastructure in the European city of the Middle Ages. The type of building that was selected to house this function was dependent upon local political, cultural, and economic conditions. During this period and throughout the continent, no public weighing facility was housed in a monumental building that was solely constructed for this purpose. In many instances, weighing took place in a two-story

446 The Etape aux laines (15th century) in Calais (French after 1558) can be ascribed to the English, the Maison de l'Etape in St. Omer (French since 1678) to the Flemish, the Lodge in Perpignan (French since 1659) to the Catalanian, and the Large Store (15th century) in Metz (French since 1552), Strasbourg (1358), as well as Colmar (1480) to the German development.

447 Schröder 1914, 55. There, the old weigh house in Bruges is identified as the Water Hall (24). In addition, a scale under the stairway is pictured in the Halle des Consaux in Tournai (34, illustration 25).

448 Meckseper 1982, 177.

449 Cf. Nagel 1971, illustration 177 and 178.

building containing a market hall on the ground floor and a large room on the upper story. With the removal of the weighing equipment and fittings over the course of the nineteenth century, these buildings lost all physical traces of their public weighing function. The city hall in Michelstadt (1458) is an exception, as the scale on the ground floor loggia has been retained in situ.⁴⁵⁰

Seventeenth and Eighteenth Centuries

In order to determine the significance of the monofunctional weigh houses that were primarily erected in the Provinces of Holland and Friesland during the first half of the seventeenth century, it is necessary to compare them with contemporary commercial buildings that were used for trade in neighboring countries. The weigh houses in Haarlem, Hoorn, and Leiden, which can be seen as prototypes, will be used as a standard. These cities are relevant in this regard because they were important trading centers at this time.⁴⁵¹

Building activity was sharply curtailed throughout Germany in the seventeenth century due to the Thirty Years War. In addition to the arsenal and the new city hall (1616-20) in Augsburg, an impressive number of commercial buildings was erected shortly before the outbreak of the war and during the lifetime of the renowned municipal architect Elias Holl (1573-1646). These included the bread hall⁴⁵² (1602, ground floor: bread hall, upper level: leather hall), the sealing house — a hall where merchandise was inspected, sealed, and approved — (1604-06), the meat hall (1606-09, ground floor: meat hall, upper level: cloth hall), the dance hall (1608), and the imperial

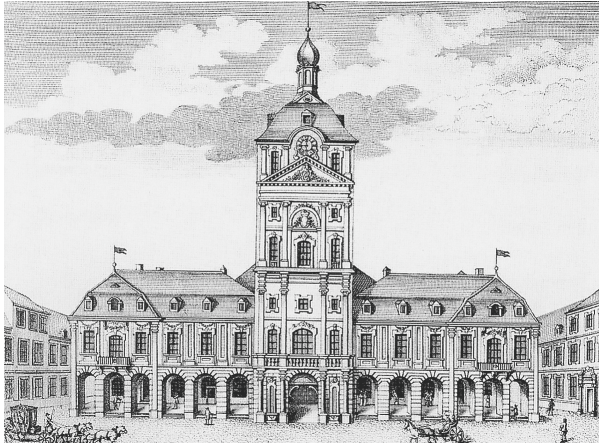
450 Gruber 1943, 45.

451 When a building is not identified as providing this function, the location of the weigh house in a city is often determined only after copious, local, historical research.

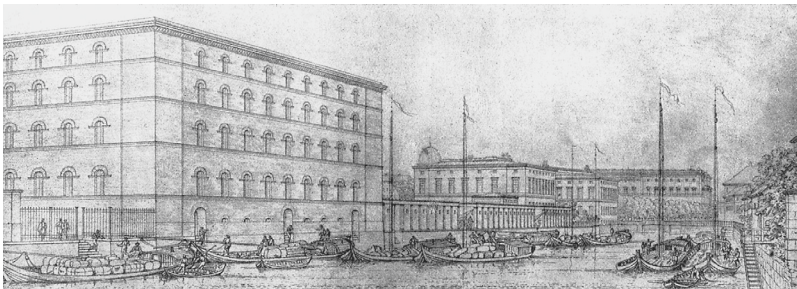
452 This building suffered fire damage in 1944 and was demolished in 1950. Cf. Beseler and Gutschow 1988, 1337.



129 New Building in Augsburg (1614), photograph around 1960



130 Large Store in Mannheim (around 1698)



131 Neuer Packhof in Berlin (1831)

municipal storage hall (1611).⁴⁵³ These buildings were all variations of multifunctional trade halls, a type that had carried over from the Middle Ages. Similar to the weigh house in Hoorn, the New Building (1613-14) had a front facade with six axes and an arcade. The New Building in Augsburg, however, catered to the retail trade and was therefore divided into small shops, each of which was connected to the upper level by a modest stair.⁴⁵⁴

It took almost a century for construction activity in Germany to recover from the ravages of the Thirty Years War. An early example of the growing economic revival was the construction of the new seat of baronial power in Mannheim after 1698. A large storage hall (1724-46, Alessandro Bibiena) was one of the city's new public buildings.⁴⁵⁵ As the funds from the provincial budget were primarily directed to build the royal residence, it took more than twenty years to complete this structure.⁴⁵⁶

The large storage hall in Mannheim was situated on the central square and occupied the width of an entire city block. A belfry-like tower accentuated the middle of the Baroque facade. A two-story building was placed on either side. Each side building had six axes and a ground floor arcade. The organization and function of the large storage hall remained indebted to medieval tradition, however. It primarily functioned to enforce municipal rights related to the storage and taxation of merchandise, which included the installation and operation of a public weighing facility among other functions.

453 While Baum (1908) cites the records of Elias Holl, he selectively gives a limited description of the original use of each building. The literature otherwise assumes, in general, a monofunctional use based on the building's name. Cf., for example, Roeck 1985 (a).

454 The location of the weigh house in Augsburg has not been investigated. Information cordially conveyed by Jürgen Zimmer (Berlin).

455 The large storage hall in Mannheim was damaged in 1943 and the ruin was removed in 1965. Cf. Beseler and Gutschow 1988, 1200.

456 Perry and Walter 1910, 1 et seqq.

The municipal tax authority and a typical representative assembly hall were additionally housed in the building. In 1728 it was identified as the “weigh or storage house.”⁴⁵⁷

In 1714, a building was erected in Leer that was called a weigh house. When considered in terms of typology, it was actually a multifunctional trade hall.⁴⁵⁸ Just as trade halls were arbitrarily named after one of their diverse functions in the Middle Ages, this means of identification persisted well into the Baroque period.

The Neue Packhof (new storehouse) (1829-31) in Berlin demonstrates the longevity of the multifunctional trade hall in Germany.⁴⁵⁹ Designed by Karl Friedrich Schinkel, this building complex was comprised of several structures, including a five-story hall containing the warehouse with a one-storey wing that housed the weigh house. The entire complex became obsolete with the formation of the German Customs Union shortly after the completion of the Neue Packhof. It was demolished in 1896.

In Switzerland, a noteworthy weighing facility can be found in Schaffhausen. It was housed in a tower-like structure, whose ground floor was exclusively used for weighing.⁴⁶⁰ The building is known as the Fronwaagturm (public weigh tower). It has two axes, four stories, and at a height of 23 meters, roughly approximates the size of the Dutch tower types in Haarlem and Makkum.⁴⁶¹ Despite its placement on a corner site, the weigh house in Schaffhausen can only be accessed via a relatively small doorway facing a square.⁴⁶² The ground floor accommodated the large scale.⁴⁶³

457 Perry and Walter 1910, 14.

458 Robra 1986, *passim*.

459 Gönnerwein 1939, 269, 326, and 343; also Rave 1962, 107.

460 Frauenfelder 1951, 231 et seq. The trade hall, known as the Herrenstube, was located on the market place in Schaffhausen adjacent to the weigh house.

461 “Fron” means “belonging to the state” or “public”. Cf. Kluge 1975, 221.

462 My cordial appreciation extends to Bernhard Furrer (Bern), for his information regarding the Fronwaagturm in Schaffhausen.

463 The large scale (end of the 18th century) in the Fronwaagturm in Schaffhausen



132 Fronwaagurm in Schaffhausen (1747),
photograph 1995

The unusual height of the Fronwaagurm in Schaffhausen is a result of the original use of this building, namely as a residential tower for the lord of the city. It dates from 1299 and was initially twice as tall. Its present-day form dates from 1747 when the building partially collapsed. Although the weigh house in Schaffhausen was not particularly adapted to the requirements of weighing, it is significant because it evinces that at an earlier point in time the public weighing facility was placed in the residence of the lord of the

was removed when the building was converted for its contemporary use as the tourist information office and is now located in the Museum zu Allerheiligen.



133 Dogana del Mar in Venice (1682), photograph 2004

city. In terms of building typology, the weigh house in Schaffhausen can be classified as a fortified patrician residence.

Due to economic stagnation throughout the seventeenth century, Italian cities only made modest investments in their municipal infrastructure. Venice was an exception to this trend, as it was able to use this period to restructure its trade facilities.⁴⁶⁴ An important example of this activity was the construction of the Dogana del Mar (Giuseppe Benoni, 1676-82). The building is located on the southern most point of land at the mouth of the Canale Grande and served as a storage hall as well as a customs house for merchandise brought to Venice by sea.

464 Bellavitis and Romanelli 1985, 111.

The Dogana del Mar in Venice is a one-story complex, whose triangular plan derives from the shape of its site. The facade is articulated with doorways and semi-circular fanlights above them. The tip of the building, where the mouth of the Canale Grande flows into the Canale della Guidecca, is accentuated by a small tower. The Dogana del Mar houses a large hall that is primarily illuminated by shed roofs. It is not known if a weighing facility was installed in this building.

The city of Verona, which was under the jurisdiction of Venice, administered tariffs placed upon merchandise that came from Germany and Flanders. Verona had a customs house with a weighing facility, the Dogana d'Isolo, which was supplemented in 1745-46 by the Dogana di San Fermo (Alessandro Pompei).⁴⁶⁵ This building was arranged around a large, rectangular courtyard. It had three two-story wings and one single-story wing, all of which have the same cornice height.⁴⁶⁶ On an old engraving, the two-story wings are identified as the "Loggie con li Fondachi", whereas the one-story hall is labeled the "Dogana".⁴⁶⁷ This building typology, the Fondaco, contained a hall to store merchandise and also provided overnight accommodation for merchants. These architectural characteristics fundamentally distinguish the Venetian Dogana from the Dutch weigh houses that are analyzed in this study.

465 The drawing by the architect Adriano Cristofali (1717-88) depicts the Dogana d'Isolo in Verona as a small, one-story, simply designed building (by Michele Sanmicheli?). It primarily consisted of a large room, accessed by one doorway on each small side. The side oriented to the river was equipped with a canopy that was supported by three posts. Two offices were located on the side, one for the supervisor (Sovrastante) and one for the customs officer (Doganiere). The Dogana d'Isolo in Verona controlled the flow of merchandise and served as a weigh house: "*Il dazio di entrata, di uscita e di transito ..., propriamente definito come dazio della Stadella (o Stadera, da statera, un tipo di bilancia con cui si pesavano le merci*". Cf. Sandrini 1982, 11 et seqq.

466 The Dogana di San Fermo was extended by the Dogana di Fiume towards the Adige River in 1792. The Dogana di Fiume is a one-story, double span building with five axes, with a doorway in the transverse direction. Cf. Sandrini 1982, 36.

467 This engraving is illustrated in Sandrini (1982, 81).

The Dogana Ducale in Modena (Pietro Termanini, 1764-66) shares a certain formal similarity with the weigh house in Hoorn.⁴⁶⁸ Both have facades with five axes and a ground floor arcade. Aside from a few formal details — such as the three stories and the arrangement of the pilasters in the upper stories — the key difference is the placement of an open loggia on the ground floor of the Dogana Ducale in Modena. The loggia's exterior wall only has three entryways and is set back from the building line. The two exterior entryways are not suited for sliding scales, as they have doors.⁴⁶⁹ The loggia only forms a covered place to unload goods from the arriving wagons and carts.⁴⁷⁰

The Loggia in Arezzo (Giorgio Vasari, 1573-93), a trade hall with an extremely long facade, should be mentioned in this context. It is 126 meters in length and has 20 axes. A mezzanine level is located above its upper level. A more or less closed room on the ground floor, used for storage or as a shop, was situated behind each axis of the continuous arcade. Like the Dogana, a facility to weigh merchandise was also probably located in the building.⁴⁷¹

Although the Spanish economy went into decline around 1580,⁴⁷² this did not interfere with the importation of precious metals from the South American colonies. To administer the various overseas enterprises, the Lonja del Contratacion (Juan de Herrera, 1530-97) was erected in Seville. The imposing two-story building was organized around an interior courtyard and occupied an entire city block. With its 11 axes, it extended a length of 56 meters. Because merchandise was stored and sold in the building,⁴⁷³ one can assume

468 Braglia 1985, 183 et seqq.

469 Upon completion, the Dogana in Modena was not used as a weigh house. Cf. Braglia 1985, 185.

470 Braglia 1985, 183.

471 Conforti 1993, 243 et seqq.

472 De Vries 1976, 48 et seqq.

473 Cf. Lampérez 1993, 237.



134 Lonja del Contratacion in Seville (1597), photograph 1995

that it was also weighed there. It is not known if a facility to weigh merchandise was located in this building.⁴⁷⁴

In Priego (Province of Córdoba) there was an Alhóndiga (constructed at the end of the sixteenth century, demolished in the twentieth century), which shared several exterior features with the loggia type weigh house. The two-story Alhóndiga had a ground floor arcade.⁴⁷⁵ Extending to seven axes, it was wider than the typical Dutch loggia type weigh house, which only had five axes. Because the Alhóndiga in Priego had an open market hall at the

474 Perez Escolano 1989, 228 et seqq. My gratitude extends to this author for his friendly tour of Seville.

475 Lampérez 1993, 245. The Alhóndiga in Priego was demolished in the 1960s. Information cordially relayed by Antonio Garrido (Priego).

ground floor—where it was used for different functions — it was significantly different from the monofunctional weigh house.⁴⁷⁶

In Spain, as was typical in other nations throughout the seventeenth and eighteenth centuries, public weighing facilities were located in the city hall. Documentation exists confirming that the equipment necessary for weighing was found at the city hall in Haro (Province of Rioja; Franciso Alejo Aranguren), 1775-78.⁴⁷⁷

The medieval tradition of building trade halls, which were comprised of a roof without enclosing side partitions, continued during the seventeenth and eighteenth centuries in France: “*Des halles ..., comme au Moyen Age, sont de simples toitures portées par des poteaux de bois ou des piliers de Pierre*” (*The halls like the ones from the Middle Ages are simple roofs carried by wooden posts or pillars of stone*).⁴⁷⁸ As shown in the 1775 painting “*Interieur d’une douane*” by Nicolas-Bernard Lépicié (1735-84), merchandise was weighed at the city gate where the excise taxes were paid in France.⁴⁷⁹ The construction of the small custom house in this piece corresponds to the previously mentioned trade halls in France.⁴⁸⁰

The example at La Rochelle clearly demonstrates the special economic position of several Atlantic port cities in France.⁴⁸¹ The Grande Galerie — an exceptionally grand city hall by French

476 Lampérez 1993. After the Bourbon dynasty assumed the throne, Spain was able to eliminate internal tariffs and centralize the tax administration, leading to the construction of a considerable number of large and representative custom buildings (Aduana), such as those in Valencia 1758, Madrid 1769, Barcelona 1783-92, and Malaga 1791-1810.

477 Rincón García 1988, 207.

478 Hauteccœur 1966, 327.

479 The painting, identified as “*El patio de la Aduana*”, is located today in the Museo Thyssen-Bornemisza, Madrid. Due to unreasonable licensing terms, this image unfortunately cannot be reproduced here. Cf. Gaston-Dreyfus 1923, 216 et seq.

480 The light construction shown in Lepicier must have been erected after the demolition of the fortification of the bastion in 1670. Compare Vidler 1990, 209.

481 My gratitude goes to Nathalie Albin-Portier from the Centre National de Documentation du Patrimoine in Paris for her research in the central data base of historical monuments to locate weigh houses in France.



135 So-called La Rochelle weigh house (today, restaurant “Chez Lapébie”), photograph 1995

standards — was constructed in 1605-06 under the rule of the Huguenots.⁴⁸² The economic prosperity, which came about after the seizure of the city by royal troops (1628) and the departure of the Huguenots in a mass exodus following the abolishment of the Edict of Nantes (1685), was represented in the construction of the stock exchange (P.-M. Hue, 1760-65).⁴⁸³

In contrast, the weigh house in La Rochelle was a small, inconspicuous building on the embankment of the old harbor (Quai Duperré). The telling piece of evidence which confirms the site's former use as a place where merchandise was weighed is found on the sign of a restaurant at this location today, named “Chez Lapébie: Poids du Roi” (Lapébie House: The King's Weigh House). In addition, around the corner on the Rue de Port, a small relief situated on the side of the building bares an image of a scale attached to a

482 The architect is unknown. Cf. Deveau 1995, 18.

483 Hauteceur 1952, 173.



136 Custom house, Bureau de Chartres in Paris (1789), photograph 1995



137 Market Cross in Wymondsham (1617), photograph 1995

frame. In the building's interior, a plaque gives information about the building's earlier use: *"A cet emplacement se trouvait le Poids le Roi ... Là, moyennant le paiement d'un droit, les négociants étaient tenus de faire peser leurs marchandises. En 1645 une partie de revenus du Poids le Roi fut concédée par Louis XIV aux oratoriens, en dédommagement de terrains dont ils avaient été epropriés pour la construction des fortifications de La Rochelle"* (The King's Weigh House was located at this site ... Here, for the payment of a fee, merchants were obliged to weigh their merchandise. In 1645 a portion of the revenues from the King's Weigh House were granted through a decree by Louis XIV to the Oratorians in compensation for

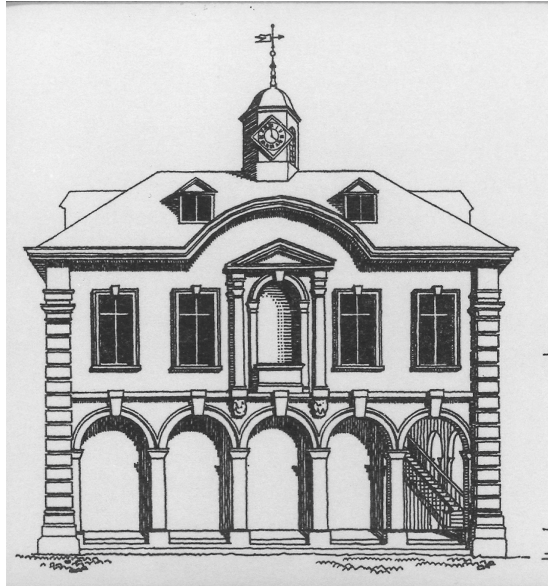


138 Custom House in King's Lynn,
photograph 2007

the land which had been appropriated from them for the construction of the fortifications at La Rochelle). There is no evidence to indicate that the building had a special interior design to support this function.

The significance placed upon collecting taxes at the gates of a city in France was demonstrated with particular clarity in Paris shortly before the end of the Ancien Régime. With the construction of the custom houses for this city by the architect Claude-Nicolas Ledoux (1736-1806) from 1785-89, a monumentality was achieved which was certainly equal to that of the Dutch weigh houses that have been previously discussed.⁴⁸⁴ The Bureau de Fontainebleau's facade composition recalls the Hoorn weigh house, and that of the Barrière du Trône is somewhat similar to the weigh houses in Haarlem and

484 Cf. Vidler 1990, 209 et seq. My gratitude extends to Werner Szambien for his tour of the remaining customs houses in Paris.



139 Butter market in York (1706)

Leiden. It is not known if weighing equipment was installed in the Parisian custom houses designed by Claude-Nicolas Ledoux.⁴⁸⁵

In England, the construction of trade halls in the seventeenth and eighteenth centuries also continued the medieval tradition. There, a two-story type, with a market hall on the ground floor and an assembly room above, was employed in a number of instances (for example, Wymondsham, Market Cross, 1617;⁴⁸⁶ Peterborough, Guild Hall, 1670-71;⁴⁸⁷ Abingdon, County Hall, 1678-82; King's Lynn, Custom House, 1683;⁴⁸⁸ Morpeth, Town Hall, 1714; Blandford, Town

485 Cf. Vidler 1990, 224.

486 Lloyd 1989, 61.

487 The Guild Hall in Peterborough was originally called "The chamber over the cross". The building was renamed in 1876. Compare Mackreth 1994, 57.

488 The Custom House in King's Lynn was constructed to function as a stock exchange. Shortly after completion it was used for other purposes. My gratitude



140 Court of the London custom house (1718)



141 Narva weigh house (Estonia, 1741)

Hall, 1734).⁴⁸⁹ The same can be said of the Custom House in King's Lynn (1683) and the Guild Hall in Peterborough (1670-1), whose architectural details were evidently influenced by Dutch precedents. In Kerry Downes' publication, an image of the Butter Market in York (1705-06) shows a building with a five-axis facade, a ground floor arcade, and a niche containing a figure in the middle axis at the

extends to David Pitcher (King's Lynn) for the friendly tour of the building, which has been restored according to his plans.

489 Cf. Summerson 1958, 151.

upper level — an arrangement that clearly resembles the weigh house in Hoorn (1605).⁴⁹⁰ The ground floor of the Butter Market in York was completely open and used for diverse functions however. Although all of these English city halls and trade halls from the seventeenth and eighteenth centuries may have included weighing somewhere at the ground floor, they cannot be classified within the typology of the monofunctional weigh house.

London expressed its status as the capital of England through the construction of especially large and monumental trade halls. This applies to the Custom House, erected after the great fire of 1666 to the east of London Bridge and according to a design by Christopher Wren.⁴⁹¹ With its 17 axes, the two-storey building not only had enormous dimensions, but through the configuration of the building around a cour d'honneur and with the grouping of the corps de logis as a projection on the front facade, it possessed a distinctly representative character. An engraving from 1714 (J. Harris) illustrates the manner in which the building functioned, showing carts laden with merchandise being driven inside the building. After another fire in 1718, Tomas Ripley constructed a new building, which was depicted on an engraving dating from 1754 (L. P. Boitard) and included in a publication by Felix Barker and Peter Jackson. The 1754 engraving shows a large courtyard filled with people and merchandise as well as three freestanding, mobile scales.⁴⁹² Despite their formal designation, both of the London Custom Houses belonged to the trade hall building typology.

The one exception to the rule is probably found in Estonian Narva, where possibly a monofunctional weigh house (1741-1944, probably Franciscus Ludwig von Franckenberg) was located.⁴⁹³ Architectural

490 Downes 1966, 111.

491 Barker and Jackson 1974, 142 and 149.

492 Barker and Jackson 1974, 182.

493 Karling 1936, 366; also Kocenovskij 1991, 106. The weigh house in Narva was destroyed during the bombardment of the city in 1944 and was not reconstructed.

drawings of this building no longer exist. The building might have contained sliding scales and, like the weigh houses in Leiden and Gouda, had canopies along the sides. The reason for the typological similarity can be ascribed to the great influence of Dutch architecture in Narva.

A consideration of trade halls in Western Europe also demonstrates that no monofunctional weigh houses existed outside of Holland from the Middle Ages to the end of the eighteenth century. The only exception, as has been noted, was probably the weigh house in the Estonian city of Narva. All other buildings that were popularly known as weigh houses were, in fact, multifunctional buildings containing large halls. In these buildings, weighing was only one of many functions located on the ground floor.

The weigh house as a building type in architectural theory

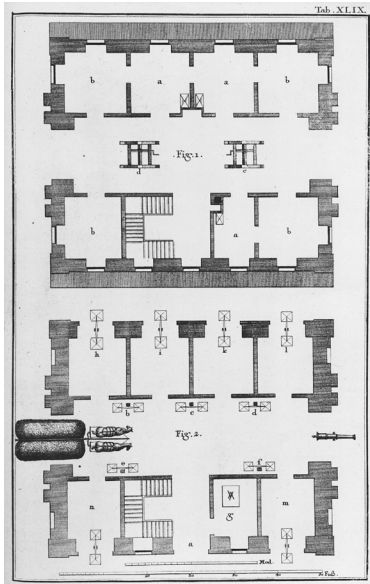
The weigh house building typology is rarely considered in architectural theory. For example, although the Dutch architectural theoretician Simon Stevin was fascinated with technology and even wrote a book about weighing instruments, his well-known urban treatise “Vande oirdeningh der steden” [On the planning of cities] (around 1600), which included a city hall, a prison, a penitentiary, a fish house, and a meat house did not mention a weigh house.⁴⁹⁴

The only theoretician who discussed the weigh house as a building type to any significant degree was the German architectural theoretician J. F. Penther (1748).⁴⁹⁵ After defining the purpose of

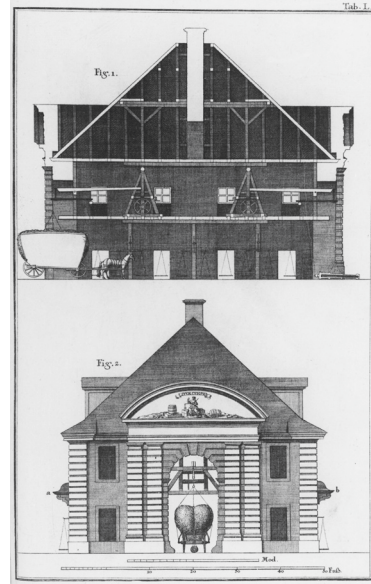
Information cordially conveyed by Merike Ivask (Narva). Cf. Kocenovskij 1991, *passim*.

494 Stevin 1649.

495 Antonio Averlino Filarete (circa 1400-69) identifies the custom house (Dogana) as part of the infrastructure connected with the market square. Its rear facade faces a canal, it is 60 cubits (Braccie, 53-68 centimeters) long and 40 cubits wide,



142 Municipal and hay weigh house, ground floor plan, according to J. F. Penther 1748



143 Municipal and hay weigh house, facade according to J. F. Penther 1748

the building, the author focused on the weigh house in Amsterdam: “We have a considerable example of a weigh-house with ... the Amsterdam Weigh House, which has been standing for 180 years already. It has an esteemed appearance of hewn stone, albeit that of a somewhat older kind of design.”⁴⁹⁶ More broadly, J. F. Penther criticized the Amsterdam weigh house as it lacked a scale for hay, which could also be used to weigh cannons.

J. F. Penther even designed a weigh house to illustrate his ideal type.⁴⁹⁷ It had an almost square plan, each side measuring

and has an interior courtyard measuring 20 by 20 cubits. This space is articulated as a columned hall on three sides. The storage and administration rooms are located there. Cf. Von Oettingen 1890, 318 et seq.

496 Penther 1748, 58.

497 Penther 1748, table 49.

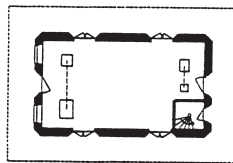
approximately 65 feet. A passageway cut through the building on the middle axis. A large scale, whose machinery was situated in the upper level, was located at the beginning and end of the passageway. Eleven scales were installed at the ground floor, each six feet in length and of which five were placed along the sides of the passageway. Four small cubicles are located on each side of the passageway for a total of eight rooms. Six of these rooms contain a scale. The weighing pans that are situated towards the exterior extend outward from the facade of the building and are covered by a three-foot wide canopy. Penther also drew a variation of this design showing the building placed on a corner site, which had nearly the same surface area, but only provided space for four scales.⁴⁹⁸

J. F. Penther admitted that his design has disadvantages, noting that due to the considerable amount of space required to accommodate deliveries from hay wagons, it was not suitable for placement on a representative urban market square. He suggested that it should be located on a secondary square instead. Yet his design also had functional problems. The spaces servicing the scales interfere with the movement of the hay wagons in the passageway. The canopy is also too short and — with the slightest breeze — offered very little protection from precipitation. In any event, this design is not as carefully developed as the highly sophisticated, functional Dutch examples. It is not known whether Penther ever built a weigh house.

498 Penther 1748, table 51.

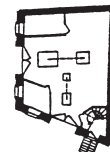
PROTOTYPE

PASSAGEWAY TYPE



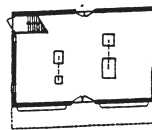
LEEUWARDEN, 1595 - 98

TOWER TYPE



HAARLEM, 1598

VERSION 1

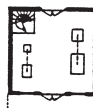


WORKUM, 1650



MAKLUM, 1698

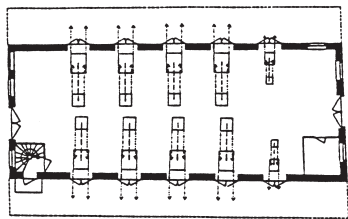
VERSION 2



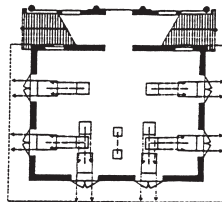
FRANEKER, 1657

144 Types and variations of the monofunctional weigh houses

PRECURSORS

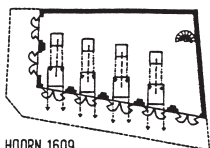


ANTWERPEN, 1547



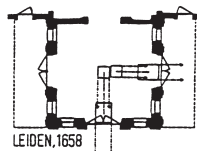
AMSTERDAM, 1563 - 65

LOGGIA TYPE

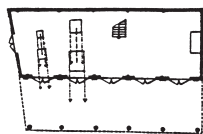


HOORN, 1609

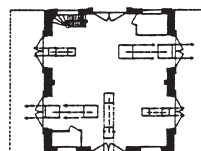
SYNTHESIS



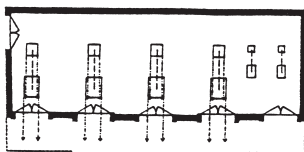
LEIDEN, 1658



MONNICKENDAM, 1669

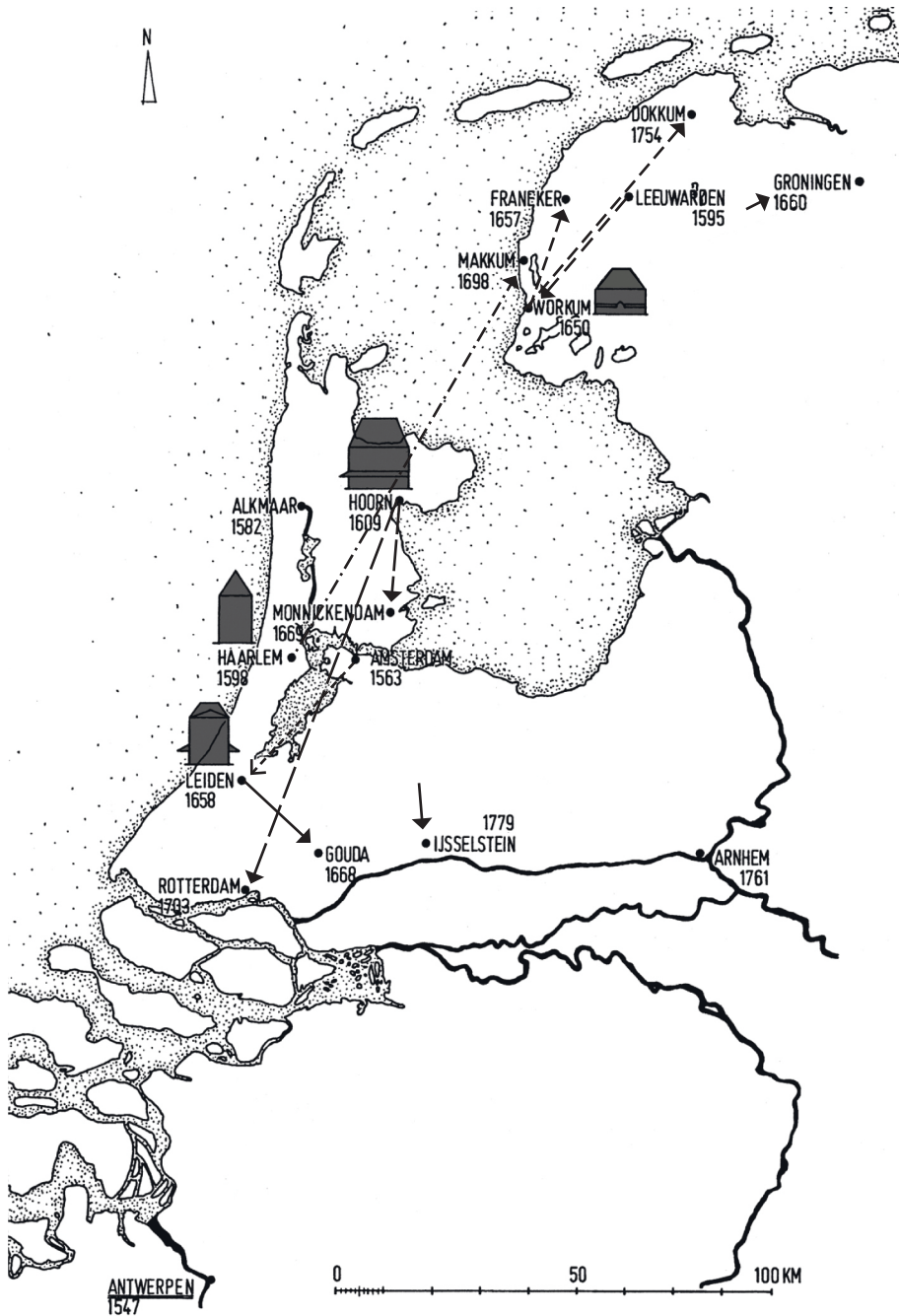


GOUDA, 1668



ROTTERDAM, 1703





145 Dissemination of the types of monofunctional weigh houses

Summary of the development of the weigh house in the Provinces of Holland and Friesland

Until the middle of the sixteenth century, the public weighing facility had only a few architectural requirements. In its simplest manifestation, the weighing equipment was placed out of doors or under a protective roof. When a locality could afford to install weighing equipment in a room that was enclosed on all sides, the building was required to have sufficient space around the scales, strong beams or a vault to hang the scales, and a doorway wide enough to deliver and carry away the merchandise that was to be weighed.

When merchandise had to be brought into a trade hall to be weighed, stored, and sold in accordance with the staple right, it made sense to locate all of these functions in one building. Therefore the introduction of a passageway through the building was advantageous because it enabled wagons and carts to enter a building at one end and exit it at the other. Various kinds of buildings, such as a weigh master's house, an adapted residential building, or an area at a city gate or a church, could also accommodate a weighing facility. The weigh house was not thought of as a unique building typology until the middle of the sixteenth century in the Netherlands. Monofunctional weigh houses prototypes, with their different modifications, came into being and were widely disseminated only after this point in time.

Not only the construction of the first monofunctional weigh house, but also the invention of sliding scales occurred in Antwerp in 1547. This development reflects the position this city enjoyed as the commercial, industrial, and financial center of the world during the sixteenth century.⁴⁹⁹ Antwerp's exceptional economic prosperity led to the construction of an extraordinary number of large trade halls: the meat hall (1501-03), the old and new stock exchanges

499 Soly 1977, 391.

(around 1515 and 1531-33, respectively), the carpet hall (1551-55), the Easterners House (1554-63), the Hansa house (1562-65), the Hesse house (1563-65), the city hall (1561-65), and even the weigh house (1547).⁵⁰⁰ These buildings were all highly specialized for this period.

144 ←

The design of the Amsterdam weigh house (1563-65) was based on the Antwerp prototype. Yet as the weighing instruments in the Amsterdam weigh house were placed on three sides of the building, its plan was devised to respond to a specific urban context. Strictly speaking, the weigh house in Amsterdam cannot be considered a monofunctional weigh house due to the pronounced accentuation of the upper level guard-house. Traces of the prototype in Antwerp — the leading economic city of the day — are also in evidence at the so-called weigh house in Alkmaar (1582), with its ornate gable that recalls the one on the Antwerp city hall. When considered in terms of architectural typology, the Alkmaar so-called weigh house is a traditional multifunctional trade hall.

The main feature of the simplest, monofunctional weigh house was the rigid installation of a scale along each side of a passageway. This configuration was already in evidence in medieval trade halls. In this study, the passageway type is identified as the basic form of the analogous monofunctional weigh house. It may be identified as a trade hall without any market or administrative functions at its ground floor. Being a freestanding, two-story building, the passageway type weigh house closely resembles the multifunctional trade hall of the Middle Ages. The addition of a second level on a weigh house, however, was primarily necessary to represent civic authority. It was not important for the functioning of a weigh house, and its only role was to draw attention to the importance of this building. A secondary use had to be found to occupy the space in the upper level.

500 Soly 1977, 390. Until the carpet hall was constructed, carpets were sold in the Carmelite church or in the meat hall. Cf. Soly 1978, 111.

hall, a bi-functional building — part guard-house, part weigh house — was created. This example demonstrates the limited amount of space required by a monofunctional weigh house in contrast to the more generous area needed by a multifunctional trade hall.

The dominant weigh house type found in Friesland, a building with a passageway and non-sliding scales, sometimes appears in combination with a city hall. This is the case when the weigh house is located on the ground floor, and the hall above is used as a chamber for the municipal council. In the Province of Friesland, this arrangement has been documented in Kollum (1779)⁵⁰¹ and Oldeboorn (after 1735).⁵⁰² Similar examples are found in the Province of North Holland in Graft (1613), Grootschermer (after 1639), and Jisp (1650).⁵⁰³ The monumental exterior staircase at the city hall in De Rijp (1630) distinguishes this building from the typical monofunctional weigh house. This staircase leads to and directs attention towards the upper level, where the city hall is located, whereas the ground floor, where the weighing takes place, is articulated as an inferior function.⁵⁰⁴

Another kind of monofunctional weigh house was derived from an urban residential typology: the fortified dwelling. Due to its characteristic relationship of width to height, it is identified as the tower type. The tower type is always placed on the corner of a block and has two facades, which mirror one another. Each facade has a doorway on its middle axis, and one scale can be placed in each doorway. Although the area of the ground floor was quite small, the additional two upper levels had a relatively large combined floor area, which was not required to operate the weigh house. The tower must have therefore been selected because of its powerful symbolic form. In the development of the tower type, the weigh

501 Andreae 1885, 39.

502 The year of construction according to information from the parish of Utingeradeel in Akkrum, in the Friesland file, private collection P. den Braber, Rotterdam.

503 Mens 1960.

504 Van Agt 1953, 119 et seq.

house in Haarlem (1598) was the prototype, which was executed in a smaller and simpler version in Makkum (1698). In contrast, as the two facades of the weigh house in Arnhem (1761) were different, it is only with considerable reservations possible to include this building as an example of the tower type.

The distinguishing characteristic of the loggia type is the sequence of five doorways on the main facade. This can be seen as variation of the weigh house in Antwerp, whose plan is divided in half along its long axis. Because the loggia type weigh house was only accessed from one side, it made sense to integrate it into a city block. As the eaves of the projecting canopy over the doorways — and not the facade of the building — aligned with the edge of the street, attention was focused on the sliding scales and the manner in which the use of this equipment enlivened the streetscape. This spatial provision defined a prominent zone directly in front of the building which was removed from the flow of traffic, so that merchandise could be loaded onto the weighing pans.

The Hoorn weigh house (1609) was the prototype of the loggia type. The weigh houses in Monnickendam (1669) and Rotterdam (1703) were subsequent variations. With some limitations, the weigh house in IJsselstein (1779) can be considered a variation of the loggia type. But this building only has three axes and does not have a canopy. So, it misses two important features of this type.

The combination of the distinguishing features of the loggia type and the tower type, namely monumentality and functionality, were united in the synthesis type. This weigh house also had sliding scales, which were generally arranged on the sides where they were protected by a canopy. The main facade had only one sliding scale, which had to function without a canopy. This disadvantage was tolerated in order to create a continuous, monumental facade on the front of the building. As this type stood apart from the surrounding buildings, its site recalled a distinctive feature of the trade hall: namely, its placement in the city as a freestanding building. In the

synthesis type, the weigh house prototypes found their completion and their culmination.

The weigh house in Amsterdam can be considered a precursor of the synthesis type. This freestanding building displays most of necessary characteristics of this type — the orientation on three sides for weighing, the sliding scales, and a tower-like form. The weigh house in Leiden (1658) can be seen as the prototype of the synthesis type, although due to the annexation of a butter hall, it harkens back to earlier examples of multifunctional trade halls. The only example of the fully realized synthesis type appeared in Gouda. This building was the first and only freestanding, monofunctional weigh house that accommodated weighing on all four sides.

All the prototypes of monofunctional weigh houses were developed between 1598 and 1658: Haarlem, Hoorn, and Leiden. The prototypes were disseminated during the second half of the seventeenth century. While the prototypes all have a facade that is made of natural stone, the variations have brick facades as a rule. By the second half of the eighteenth century, the technology of the sliding scales also appeared in the small buildings.

The distribution of the types of the monofunctional weigh houses reveals distinct regional concentrations. The passageway type was limited to the Province of Friesland. In contrast, the weigh houses with sliding scales are almost exclusively found in the Provinces of North and South Holland. This variation first appeared in the first half of the seventeenth century in the Province of North Holland, while South Holland only played a role in this development beginning in the second half of the seventeenth century.

The only monofunctional weigh house located outside of the Provinces of North Holland, South Holland, and Friesland in the seventeenth century was found in Groningen (1660). On the outskirts of the Republic of the United Netherlands in the second half of the eighteenth century, two noteworthy monofunctional weigh houses were erected in Arnhem (1761) and IJsselstein (1779). However, the lingering architectural features that were characteristic of the weigh house typology and that were found in these three buildings — which

lie beyond the central core of the Netherlands and whose dates are far removed from the nation's period of great cultural activity and economic prosperity — are weak and indistinct.

The weigh house as a building type of the Golden Century in Holland

The Dutch weigh houses examined in this study comprise a unique typology in Baroque Europe. Therefore the special political, economic, and cultural circumstances that enabled the building type of the monofunctional weigh house to develop are worth closer scrutiny. Because agricultural products were predominantly weighed at the weigh houses under consideration, this sector of the economy will first be investigated as a probable factor influencing the development of this type. Relevant correlations have already been suggested during the preceding analysis of the individual buildings.

A consideration of Dutch agriculture during the seventeenth and eighteenth centuries reveals that this economic sector occupied a special position in Europe. It was exceptionally efficient, innovative, and market-oriented, and was two to three times as productive as the agricultural production in the rest of Europe.⁵⁰⁵ More so than the spectacular colonial trade, this activity formed the basis for the economic rise of the Dutch in the seventeenth century. The extraordinary profit made from export-oriented agriculture provided the Dutch with the freedom, economic resources, and infrastructure to develop their wide-ranging commercial and trading activities.⁵⁰⁶

A beneficial situation arose in Holland during this period of enormous agricultural productivity. Because the traditionally weak nobility had little influence, the free farmers were largely able to cultivate their own land. As a result, they invested a reasonable percentage of their profits to increase production and to adjust to market demands. This development began in the late Middle Ages in the regions surrounding the urban centers in Flanders

505 De Vries 1974, 1 et seqq.

506 De Vries 1974, 30 et seqq.



147 Dutch cities with the staple right

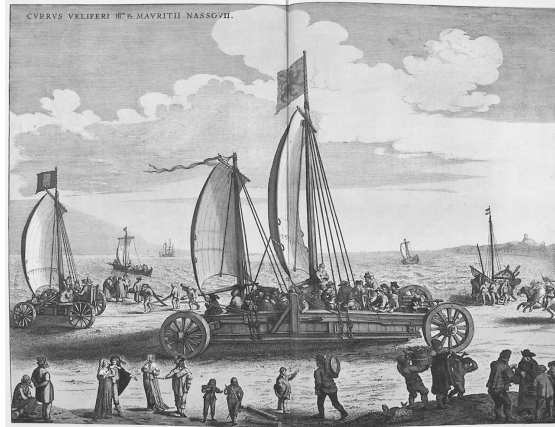
and Brabant and extended to the coastal regions of Holland and Friesland with the construction of the dikes during the end of the sixteenth century.⁵⁰⁷

The specialization in milk production and milk products accompanied the significant increase in the productivity of seventeenth and eighteenth century Dutch agriculture. Milk products were extremely profitable. The success in this sector of the market came about as a result of natural conditions, such as the presence of moist, lush fields, but also through improved feeding for cattle and breeding to increase the milk yield from cows. As a result, the Dutch were able to export ninety percent of their cheese and became the cheese suppliers of Europe, from which they derived enormous revenues.⁵⁰⁸ The less profitable cultivation of grain, in contrast, was left to the estates of Eastern Europe that were mainly tilled by serfs.

Butter and cheese had to be weighed to determine their mass. The specialization of Dutch agriculture in these products can therefore

507 De Vries 1974, 149.

508 De Vries 1974, 167.



148 Wind-powered automobile for 28 people, construction by Simon Stevin around 1620

be seen as an important reason for the development of the building type of the monofunctional weigh house. This fact explains the situation in the city of Hoorn, where the main export harbor for Dutch cheese was located. Even prior to 1559, Hoorn possessed a weigh house with four scales. After this, an extension to this building increased the capacity by a scale, giving this weigh house the same number of weighing positions as that of the weigh house that was erected in 1609.⁵⁰⁹ In contrast, the multiplication of the necessary weighing positions in connection with the construction of the new weigh house in Gouda (1668), whose surrounding region had been devoted to the cultivation of grain in the sixteenth century, reflects the change in milk production that took place there during the seventeenth century.⁵¹⁰

In Holland, the increase of available arable terrain through drainage procedures was an additional important factor leading

509 Dröge 1991, 3.

510 De Vries 1974, 157.

to the intensification of agricultural production. An undertaking of this dimension was an occurrence unparalleled worldwide in the seventeenth century.⁵¹¹ One early and extensive drainage procedure took place in 1561 at Kroonmeer near Alkmaar and was overseen by Klaas Hendricksz. Around this time, complaints arose concerning the insufficient capacity of the Alkmaar weigh house, which eventually led to the conversion of the Hospital of the Holy Spirit.⁵¹²

The typological differences between the weigh houses in the Provinces of Holland and Friesland can also be seen in relation to local agricultural production. While the processing of milk into cheese dominated in the Province of Holland, butter was the primary product in the Province of Friesland. Butter is extremely sensitive to heat and, in contrast to cheese, can only be placed in the sun for short periods of time. Because butter was best weighed in the sun-protected interior of a building, the passageway type weigh house best accommodated the requirements of this dairy product. Yet the ability to weigh cheese directly in front of a weigh house using sliding scales also provided a considerable functional advantage, as the loaves did not have to be transported into the interior of the building.

A comparison of the Province of Holland with the Provinces of Overijssel and Drenthe illustrates the extreme disparities among the levels of productivity in the Dutch agriculture. In Drenthe and Overijssel during the seventeenth and eighteenth centuries, an antiquated, unproductive, and rigid pattern of farming persisted and this is why these regions were dependent upon agricultural imports. Furthermore, the areas to the south of the great rivers were not able to benefit from the prosperity that existed in other Dutch provinces at this time.⁵¹³ Commensurate to this fact, no monofunctional

511 De Vries 1974, 37.

512 Cordfunke 1978, 148.

513 Cf. Huizinga 1933, 7.

weigh houses are found in these areas. Similar to contemporary developments in the visual arts, the proliferation of the weigh houses was limited mainly to the same, remarkably small, area of roughly 100 square miles, which more or less encompasses the Provinces of North Holland and South Holland.⁵¹⁴

In addition to these economic factors, there were also political decisions that determined the proliferation of the weigh house building type. The early development of the weigh house would have been obsolete if the tax reform, initiated in 1569 by Philip II of Spain's decree, which would have required a permanent, ten-percent sales tax that was levied by civil servants as well as the elimination of all the weighing taxes, had succeeded.⁵¹⁵ With the establishment of the Republic of the United Netherlands (1579), an independent legal form was created in this territory. This reform saw the elimination of the staple right, that is, the obligation imposed on traveling merchants to weigh and store merchandise and offer it for sale in favor of free trade within the borders of the republic. Due to the influential position of the cities, however, this reform retained the staple right in the urban hinterlands and preserved the tax on weighing.⁵¹⁶

With the establishment of the Dutch republic, the spatial and architectural consequences of the new trade policies do not seem to have been immediately apparent. In cities with large trade halls (for example Deventer and Enkhuizen), the elimination of the obligation to store and weigh merchandise brought about a sudden increase in the amount of empty space in these buildings.⁵¹⁷ The conversion of the so-called weigh house in Alkmaar seems to have extended into the phase of tax reform initiated during the reign of Philip II. In Hoorn, in contrast, the city did not even think about including

514 Cf. Huizinga 1933, 8.

515 Cf. Parker, 1979, 135.

516 Cf. Gönnerwein 1939, 234 et seqq.; also Parker 1979, 172.

517 Cf. Gönnerwein 1939, 315.

storage space in the new weigh house that was constructed in 1609. At this time, monofunctional storehouses, which were not overseen by the municipality but which were owned and managed by local merchants, were constructed in Hoorn.

The requirement to store, weigh, and offer merchandise for sale as well as the need to use trade halls varied among Dutch cities, and these regional differences impacted the proliferation of the weigh house building typology. The Province of Friesland was a completely blank slate when it came to cities that could exercise the staple right, which is why during the economic prosperity of the seventeenth century a number of cities in this province were newly equipped with weigh houses. Whereas the cities on the island of Walcheren — Middelburg, Vlissingen, and Veere — in contrast were especially important and prosperous stations on the trade route that passed through municipalities possessing the staple right, the economic development in the seventeenth and eighteenth century in the Province of Zeeland languished. This region thus did not produce any noteworthy contribution to the development and the spread of the monofunctional weigh house. The situation was again different in the Province of Groningen, where the capital city of the same name possessed a particularly extensive staple right in regard to goods that were produced in the surrounding region, leading to the construction of a sophisticated, monofunctional weigh house (1660-61).⁵¹⁸

In addition to these concrete and verifiable, economic and political conditions, it is useful to consider the intellectual climate in seventeenth century Holland in relation to the development of the weigh house building typology. During this time, an intensive scientific compilation and analysis of natural phenomena occurred.⁵¹⁹ René Descartes (1596-1650), the French philosopher, mathematician, and natural scientist, who had immigrated to Amsterdam,

518 Weigh houses also were found in Appingedam and Farmsun in the Province of Groningen. Cf. Feith 1903, 28.

519 Wilson 1968, 93.

should be mentioned as the most important representative of this “Res Cogitans”. The sophisticated weighing equipment’s ability to subject the natural, subjectively different amounts of matter to a comprehensible, objective evaluation must have appealed to the mentality of the Dutch.

A further trait of the Dutch in the seventeenth century, their passion for forward-looking technical innovations, also should be mentioned. In this regard, among others, the invention of the telescope by the spectacle maker H. Lipperhey from Middelburg in 1608 and the development of a precursor of the automobile that was powered with wind energy by Simon Stevin, are noteworthy.⁵²⁰ Seen against this backdrop of innovation and invention, the highly specialized equipment of the Dutch weigh houses, with their characteristic moveable constructions for the scales, are also products of this period of great ingenuity. The Dutch’s enthusiasm for practical innovation also can be witnessed in the development of the weigh house, which is without precedent anywhere in the world. This typology demonstrates how leading Dutch architects, time and again, pushed themselves to new limits to find the best solutions for an architectural problem.

There is also a temporal connection between the Dutch culture of the seventeenth century and the development of the weigh house building type. Just as important politicians, seafarers, painters, and writers emerged in the astonishingly short period between 1600 and 1670,⁵²¹ the four prototypes of the monofunctional weigh houses were also developed during these six decades: Leeuwarden (1598), Haarlem (1598), Hoorn (1609), and Leiden (1658). Shortly thereafter, in reaction to the mercantilist policies on the part of foreign nations, the Dutch economy and culture began to stagnate and monofunctional weigh houses, which were only minor variations of the previously developed solutions, were constructed.

520 Wilson 1968, 101.

521 Huizinga 1933, 4.

The symbolic function of the larger weigh houses is obvious. This quality can be explained by the desire on the part of Dutch cities to express the prosperity they acquired during the eighty-year long war for independence and to proclaim their status as nearly independent city-states. An important weigh house not only expressed the economic well being of a city, but it also represented authority when taxes were collected. The revenues taken from the sale of secularized churches in many instances facilitated the decision to construct a new, monumental weigh house.

While the monasteries in Holland almost completely disappeared at this time, the weigh house emerged as a new and important feature of the cityscape. These buildings were distinguished from the surrounding less pretentious residential buildings by their great height, sumptuous materials, elaborate facade decorations, and architectural quality. A painting of the Haarlem Spaarne by Gerrit A. Berckheyde (2nd half of the seventeenth century) illustrates the weigh house's significance as an urban landmark of the Dutch city at this time. The relation of the buildings represented here should be seen as a mirror of the rather flat hierarchy found in the Dutch society. The delicate and incremental design of the public squares, largely a result of local conditions that arose with the construction of the weigh houses in Amsterdam, Alkmaar, and Hoorn, also reflected the small scale outlook of the oligarchy, with their local roots and their close ties to the middle class.

In conclusion, the monofunctional weigh house in Holland is an especially diverse and appropriate testament-in-stone to the so-called Golden Age of the Netherlands. Acknowledging these qualities, the weigh house can be considered an architectural equivalent of the Dutch painting of the seventeenth century. The Dutch weigh houses can be seen as analogous to these works of art and regarded as an especially friendly, confident, and unpretentious middle class counterpart to the monumentally formal, feudal, and sacred buildings found in the surrounding territories under absolutist rule.

Appendix

Catalogue of the buildings with a weighing function located in the Republic of the United Netherlands, which were not investigated in depth in this study (through 1795)

The following buildings are located outside of the limits that were chosen for this study. For the most part, these buildings accommodated weighing, but cannot be included in the weigh house typology. The few monofunctional weigh houses that were not erected in the provinces of Holland and Friesland are also mentioned here. The weigh houses constructed during the nineteenth century and those found in the Dutch colonies are also excluded from consideration.⁵²² Furthermore, a multitude of places, where a former weigh house is only referred to in written records but its physical traces no longer exist, are not discussed. The absence of physical evidence probably indicates the marginal architectural development of the particular weigh house. In conclusion, this catalogue is intended to demonstrate the credibility of the limits that were placed on this study.

⁵²² Cf., for example, for Paramaribo (Suriname) Temminck Groll 1973; for Willemstad (Curacao) Ozinga, 1959, 23; and, in general, Temminck Groll 2002.

Monofunctional, multi-story weigh houses

Three monofunctional, multi-story weigh houses exist outside the Provinces of North Holland, South Holland, and Friesland. These buildings lie spatially and temporally on the margins of the typology's development, and primarily illustrate the dissolution of the key characteristics of the weigh house.

Arnhem (Gelderland), 1761-68 (Hendrik Viervant)⁵²³: three story corner building, topmost level as a mezzanine; the sides almost identical (16.99 meters in length, 16.30 meters in width), a tripartite organization on the shorter (market) side and a five-axis organization on the other; on the five-axis side, both axes to the right of center originally for upper level access.⁵²⁴ The facades with different architectural details; portals framed with columns, corner pilasters, and a wrought iron balcony like an urban palace. Interior destroyed during the Second World War. Rebuilt from 1958 to 1960 with an altered plan.⁵²⁵ Not possible to determine the original number and length of the scales. A sliding scale not consistently possible on the doorway axis, a non-sliding scale presumably installed there. Partitions at the first-story guard-house and the second-story weigh house master's apartment not preserved.⁵²⁶

523 Although the source material does not record Hendrik Viervant as the architect of the Arnhem weigh house, his name is frequently mentioned in the municipal invoices in connection with the design and construction of the building. When this fact is considered together with his position as municipal carpenter, little doubt remains concerning his role as the architect of this weigh house. Cf. Van Veen 1924, 33; also Tiemens 1961, 1128.

524 The topographical drawings dating from the end of the 18th century show the original arrangement of the openings (cf., for example, neg. no. B 164/6, Community Archive Arnhem; author and date not noted). Today, this arrangement has been restored on the side facing the market. During the reconstruction after the Second World War, the side doors were converted into windows.

525 Cf. Tiemens 1961, 1130; also the property files, Community Archive Arnhem.

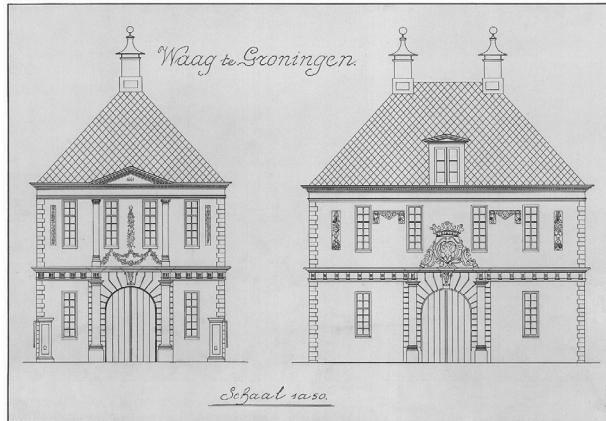
526 Since the Second World War, the congregation of the Dutch Reformed Church uses the reconstructed Arnhem weigh house for office space. A cellar was added at a later date, and a heater for the neighboring church was installed in the cellar. Cf. Markus 1907; also Tiemens 1961.



149 Arnhem weigh house, photograph 1960

Groningen, 1660-1874 (Coenraet Roeleffs): freestanding building, each side with a tripartite organization and a middle doorway; non-sliding scales on the interior and perhaps aligned with the axis of the doorway; doorway originally not covered with a canopy.⁵²⁷ Upper level apartment for the weigh house's leaseholder via spiral staircase in a corner. Doorways framed by Doric pilasters, upper level decoration continued with Ionic pilasters; slit-like windows.

⁵²⁷ Because the canopy, which was added to the building in the 19th century, covers the triglyphs of the Doric entablature, it cannot be an original detail.



150 Groningen weigh house, drawing by C. H. Peters after 1874



151 Ijsselstein weigh house, photograph 1959

Demolished in 1874. Perhaps a contribution to the typology's development in Friesland.⁵²⁸

Ijsselstein (Utrecht), 1779: two-story building with a tripartite organization and without a canopy. A round-arch doorway in the middle, a door with a fanlight on each side. Left door to the penal institution at the building's rear and the staircase, which accesses the school, originally at the upper floor. Later use of the upper level as a hospital and a guard-house; the large scale from 1764 with a sliding construction retained in situ in the middle of the street side; the right door possibly for loading the small scale from 1661. A stone relief dated 1599, probably from the previous building on the same site. 1924 conversion into a police station.⁵²⁹

Small buildings

The term "small building" designates a one-story structure that accommodated weighing. As a rule, they only have one — and rarely two — doorways. Typically they were equipped with one large scale. Numerous small buildings for weighing have been demolished.

Brouwershaven (Zeeland), 1646: tripartite facade with a doorway approximately in the middle, parapet wall.⁵³⁰ Restoration in 1819, original building substance altered; in 1976 installation of a doctor's office.

Groenlo (Gelderland), 16th century?: double pitched roof on a round arch colonnade, demolished in 1854.⁵³¹

Lochem (Gelderland), after 1640: on the side of the town hall from 1640, weighing equipment possibly removed from the town hall for

528 Feith 1903; also Schuitema Meijer 1956. W. K. van der Veen of the Municipal Archive Groningen cordially conveyed information concerning the history of Groningen weigh house.

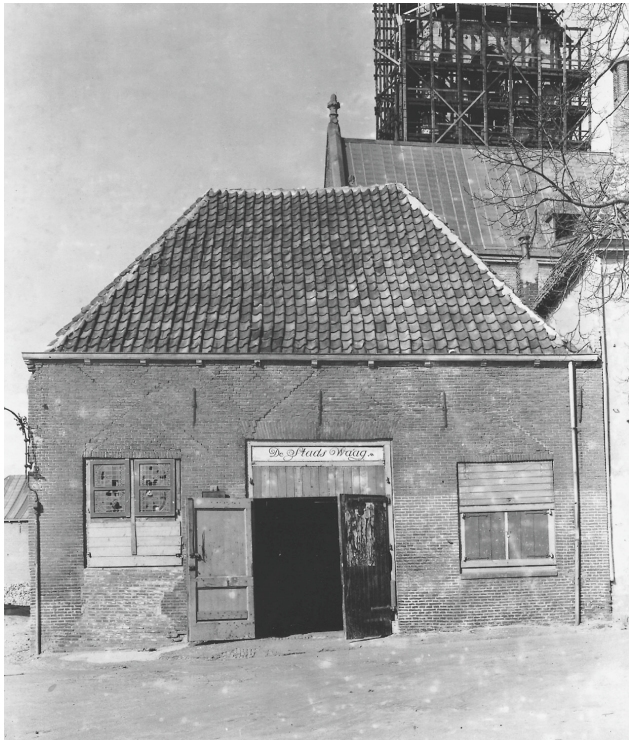
529 Rietveld 1983; also Murk 1991, 317-30.

530 Private collection P. den Braber, Rotterdam, without source.

531 Vemer 1966.



152 Brouwershaven weigh house, photograph 1979



153 Rhenen weigh house, photograph not dated

this structure. Probably dismantled during the extensive restoration and alteration of the town hall in 1898.⁵³²

Maastricht (Limburg), weigh house for wool, 1721: single story with a dominant middle doorway, one small window on each side.⁵³³

Meppel (Drenthe), 1617: small shed without windows, primarily for weighing equipment storage.

Montfoort (Utrecht), 1615: an arched doorway and a double-pitched roof, partially restored in 1896. Demolished several decades ago.⁵³⁴

Rhenen (Utrecht), 1738: tripartite facade with a middle doorway and a hipped roof. Demolished in the 1950s.⁵³⁵

The accommodation of weighing in other types of buildings

The following section lists buildings that provided on their ground floor space for weighing along with other functions. In addition, buildings are listed in this section that were originally constructed for another use and were remodeled at a later date to accommodate weighing.

Town halls

The two-story town hall type with a market hall in the ground floor and a meeting and administration room in the upper story is widespread in the Netherlands. Until the end of the sixteenth century, market halls were frequently identified as meat halls and afterwards they

532 Noted on the cadastre plan from 1813.

533 Nispen 1926-53, 146 et seqq.

534 Private collection P. den Braber, Rotterdam, without source.

535 Van Jterson 1960.



154 Bolsward city hall, photograph 1974

were often known as weigh houses. This building type probably housed a number of functions because it contained a large amount of space.

Appingedam (Groningen), 1630: the scale probably originally below the pergola. Use by the municipal administration in 1911.⁵³⁶

Bolsward (Friesland), 1614 (Abraham Jacobsz. and Marten Domenici Douwesz.?): a weighing facility with the stock exchange in the western wing, that is, to the staircase's left and taking up roughly one third of the ground floor. Two rounded-arch doorways

536 Ozinga (1940, 2 et seq.) surmises that the whole ground floor was used for the weighing. However, such an assumption is at variance with the characteristics of this typology.

on each street side onto the street; a later canopy, removed during the restoration in 1895-96. No traces indicating the location of weighing equipment.⁵³⁷

Culemborg (Gelderland): weighing facility from the fifteenth century, integrated into the new building from 1534-39 (Rombout Keldermans). Completely remodeled during the 1949 restoration. No traces indicating the location of weighing equipment.⁵³⁸

Enschede (Overijssel), 1585: destroyed by a fire that devastated the city in 1862.⁵³⁹

Goedereede (South Holland), 1530: originally a simple, two-story building, connected to the neighboring residence with a new facade in 1850. Weighing room altered.⁵⁴⁰

Goes (Zeeland), 1771 (Boudewijn Kramer): weighing facility in the middle section, four doorways with rounded arches opened onto it. The interior altered.⁵⁴¹

Gorinchem (South Holland), 1437: a market hall with several functions including a meat hall, a wine house, and a cloth hall on the ground floor. 1593 an additional wing constructed for weighing. Demolished in 1859, replaced with a new building.⁵⁴²

Harderwijk (Gelderland): the weighing facility installed in a neighboring building in connection with the 1726 extension to the medieval town hall. Completely rebuilt in 1837.⁵⁴³

Harlingen (Friesland): weighing facility in the town hall from 1730, renovated in 1756.⁵⁴⁴

537 Karstkarel and Terpstra 1986.

538 Beaufort and Van den Berg 1968.

539 Benthem Gz. 1920.

540 Unger 1930; also Prins-Schimmel 1988 (b).

541 Waal and Vervoorn 1896.

542 Van Groningen 1992, 117; also the literature noted there.

543 Private collection P. den Braber, Rotterdam, information received from the unnamed director of the Public Service Administration, Harderwijk.

544 Wumkes 1930.



155 Jisp city hall, photograph 1950

Hasselt (Overijssel), around 1500 and again around 1550: weighing facility in an older part of the town hall.⁵⁴⁵

Hindelopen (Friesland), 1683: weighing facility in the eastern half of the ground floor; entrance on the side in the 19th century due to the installation of the present day staircase; the large scale originally non-sliding.⁵⁴⁶

Hulst (Zeeland), 1528: weigh house behind the town hall's tower.⁵⁴⁷

Jisp (North Holland), originally from 1611, remodeling in 1650: Weighing facility in the ground floor, accessed via two doorways, one leading directly to the canal. After weigh house facilities removed,

545 Private collection P. den Braber, Rotterdam, without source.

546 Private collection P. den Braber, Rotterdam, letter from the (unnamed) curator of the Hidde Nijland Museum, from 1969.

547 Potter 1845.

use for the town hall. The original equipment for the weighing hall not retained.⁵⁴⁸

Kollum (Friesland), 1779: an existing, original tripartite organization on the upper level, presumably the same on the ground floor; probably with a middle doorway as in Oldeboorn. Due to the conversion of the ground floor into an apartment extensively altered in 1895.⁵⁴⁹

Kuinre (Overijssel), 1776: the weighing facility next to the prison and the staircase. Use by the municipal administration after the 1956 remodeling.⁵⁵⁰

Maastricht (Limburg), 1659 (Pieter Post): next to the guard-house and prison; divided into weigh stations for fat, malt, and grain.⁵⁵¹

Middelharnis (South Holland), 1639 (Arendt van 's-Gravesande): weigh house on the front facade right side, accessed by a doorway from the flight of steps leading to the upper level town hall.⁵⁵²

Naarden (North Holland): date of construction and the original layout not known, perhaps used as a hospital; after 1572 a town hall. Spanish troops murdered citizens of Naarden here. Exclusively used for weighing beginning in 1615. Different functions after weighing abandoned. Only the position of the former doorway for the weighing facility discernable in the masonry joints.⁵⁵³

Nieuwpoort (South Holland), 1697 (Van der Willigh): one-story annex to the rear of the almost contemporary two-story town hall. A doorway located on each side, the one in front with a canopy. The weighing equipment completely removed during building's remodeling.⁵⁵⁴

548 Van Agt 1953, 65 et seqq; also the literature there.

549 Douma 1932.

550 Kamman, not dated.

551 Ottenheim and Terwen 1993, 176 et seqq.

552 Verheul Dzn. 1905.

553 Cf. Drijver 1936; also Vrankrijker 1978.

554 Van Groningen 1992, 121; also the literature there.



156 Nieuwport weigh house, photograph 1917

St. Oedenrode (North Brabant), from 1691: 1881 demolished.⁵⁵⁵

Oldeboorn (Friesland), 1735: two-story tripartite building. Weighing facility on the ground floor, middle doorway with a rounded arch, typical for Friesland. Upper level with the town hall, a single run stairway on the side between the levels. A library on the upper level in 1921, exhibition space on the ground floor in 1970.⁵⁵⁶

Ooltgensplaat (South Holland), 1616: two-story with six axes, weigh house doorway to the left; weigh house partially in the basement.

555 Mommers 1928.

556 Archive Grouw city hall, file E1, no. 7.



157 Weighing facility in the De Rijp city hall, photograph 1978

De Rijp (North Holland), 1630 (J. Az. Leegwater): entrance to the weigh house under a freestanding stairway, the second door from the canal. A wooden scale in the weighing room, not in the original position.⁵⁵⁷

Schellinkhout (North Holland), 1759: simple, two-story building, original weighing equipment on the ground floor not extant.⁵⁵⁸

Sloten (Friesland), 1759: use as a museum.⁵⁵⁹

Sluis (Zeeland): weighing facility in the “lay judge house”, part of the town hall complex from 1390; dismantled in 1798.⁵⁶⁰

Venlo (Limburg), 1597: market hall on the ground floor.⁵⁶¹

557 Van Agt 1953, 119 et seqq.; also the literature there.

558 Van Agt 1953, 202 et seqq.; also the literature there.

559 Wassenbergh and Van der Molen 1964.

560 Krook, not dated.

561 Private collection P. den Braber, Rotterdam, information courtesy of the director (unnamed) of the Goltzius Museum in Venlo from 1968.

Wijk bij Duurstede (Utrecht), 1666: weigh house master's apartment on the ground floor next to the weighing hall.⁵⁶²

Willemstad (North Brabant), 1589: "Vleeshalle, Waghe oft ander gerieff van de ingesetenen" (meat hall, weigh house, and other municipal facilities) on the ground floor.⁵⁶³

Zierikzee (Zeeland): lower tower part of the town hall complex; weighing at the end of the fourteenth century in the former meat hall.⁵⁶⁴

Trade halls

Amsterdam (North Holland), 1619-20: identified as a meat hall, located on the Westermarket. Upper level guard-house, installation of weighing equipment after the dismantling of the weigh house on the Dam in 1808; demolished in 1857.⁵⁶⁵

Delfshaven (South Holland): on the south side of the New Market, identified as the Sack Bearers House. After 1685 installation of a weighing facility for hemp, concurrently a weigh house for pigs; a new building on the site in 1761.⁵⁶⁶

Den Haag (South Holland): also known as the large butter house. A large hall, constructed in numerous phases, with a uniform exterior appearance. The main building phase after 1650 (Bartholomeus van Bassen) and 1681 (Jacob Roman). The non-sliding scale from 1682, hung from a vault.⁵⁶⁷

Doesburg (Gelderland), around 15th century: trade hall, originally known as the "City Beer House" and "Het hoge huis Gelria". Today

562 Private collection P. den Braber, Rotterdam, information courtesy of the archivist (unnamed) of the Old Community Archive, Wijk bij Duurstede.

563 Dane 1950.

564 Postma (1969).

565 Quarles van Ufford, not dated, 83.

566 Krans 1991, 192.

567 Brinkgreve 1983.



158 So-called Doesburg weigh house, photograph 1955

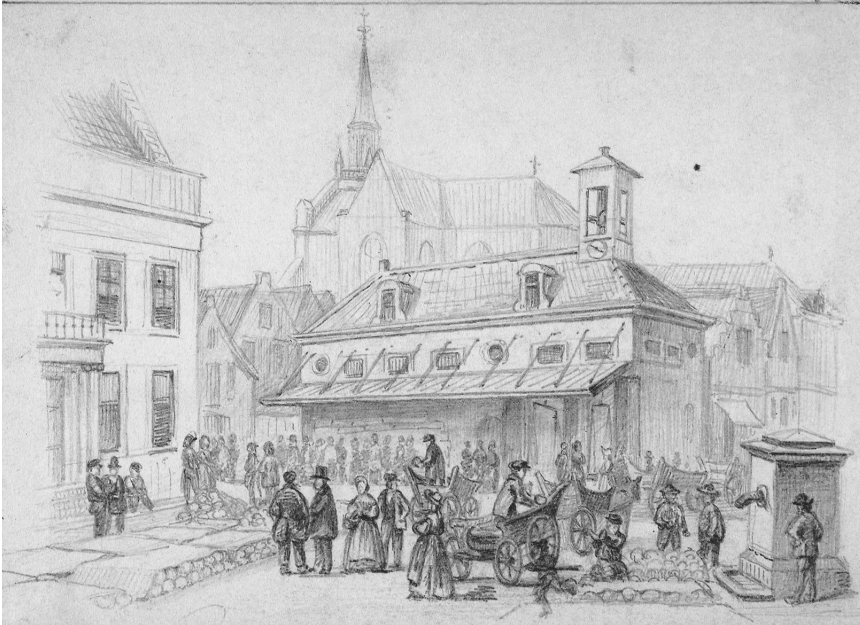
largely a product of the 1947-49 restoration. Scales in the present-day ground floor restaurant as decoration.⁵⁶⁸

Purmerend (North Holland), 1744: after removal of the weighing facility from the town hall, remodeling of the existing, so-called butter hall from 1709, also known as the butter weigh house. A one-story building with a hipped roof. Separation of the weighing from the other functions in the adjoining hall visible in the asymmetrical organization of the main facade. Demolished in 1883.⁵⁶⁹

Rotterdam (South Holland), 1619: known as butter house, on the northern side of the New Market next to the Prinsenkerk; three

568 Ter Kuile 1958, 58 et seqq.; also the literature there.

569 Postema 1940.



159 So-called Purmerend weigh house, drawing by A. Eversen 1858

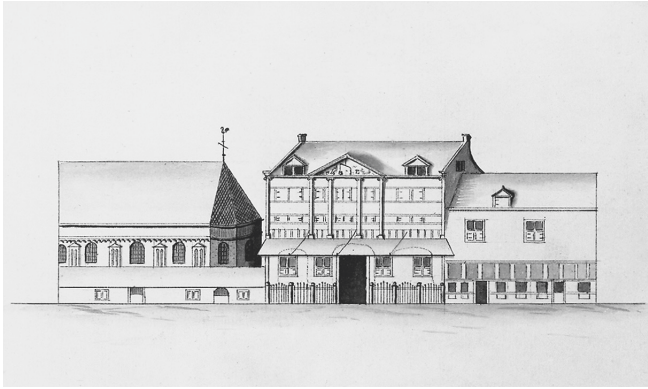
stories with eight axes. The frontispiece above the middle four axes with weighing utensils. Perhaps the ground floor remodeled as a weighing facility for hemp from 1654 until 1685; demolished in 1923 for the new municipal library.⁵⁷⁰

Rotterdam (South Holland), 1620: identified as meat hall, located on the southwest corner of the New Market; after 1625 and until 1654 a weighing facility for hemp and a butter hall; demolished in 1875.⁵⁷¹

Steenwijk (Overijssel), 1642: one story, tripartite organization, with a stepped gable. Considering the doorway's width (2.80

570 Information cordially conveyed by Piet Balhuizen (Rotterdam).

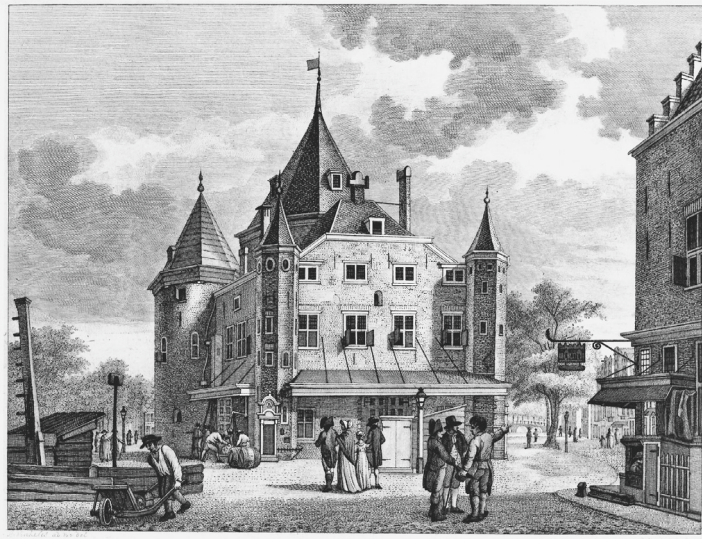
571 Verheul Dzn. 1937; also Hazewinkel 1940-42.



160 Rotterdam butter house (1619), drawing by P. van Leeuwen



161 So-called Steenwijk weigh house, photograph 1963



162 St. Anthonis weigh house in Amsterdam (Nieuwmarkt)

meters), the building accommodated the through movement of carts; considering its depth, probably additional functions.⁵⁷²

Zutphen (Gelderland): originally the municipal lodge, identified as a wine house in the nineteenth century. The hall from the Middle Ages, extensive remodeling between 1616-20, the tower from 1637-41 (Edmond Hellenraet). The large non-sliding scale under the stairs and behind the entrance. Dismantled in 1863 and rebuilt. The tower destroyed by fire 1921 and devastated again by fire in 1945. Rebuilt.⁵⁷³

Zwolle (Overijssel): two-story corner house, originally a meat hall. Weighing equipment installed in 1616, wooden scales added in 1696. Remodeling in 1743 and 1880.⁵⁷⁴

572 Private collection P. den Braber, Rotterdam, information courtesy of the municipal secretary (unnamed) of Steenwijk, not dated, around 1968.

573 Gimberg 1925.

574 Hoefler 1912.

City gates

Amsterdam (North Holland), New Market, 1488: St. Antoniespoort, not used after the demolition of the city wall in 1601; remodeling and used for weighing as “Nieuwe Waag” (New Weigh House) in 1617. Among other details, a roof constructed over the courtyard between the front and main gate. One doorway with a canopy on each of the four sides. Weighing equipment not retained.⁵⁷⁵

Amsterdam (North Holland), Rembrandtsplein, 1655, Regulierspoort (J. H. Koek): gate not in use after 1668 due to urban expansion. Subsequent conversion to a “butter weigh house” in 1668; three large scales and one small scale. Upper floor guard-house for the citizen guard; demolished in 1874.⁵⁷⁶

Elburg (Gelderland): weighing facilities in the Goor gate, a part of the medieval city gate; demolished in 1854.⁵⁷⁷

Kampen (Overijssel): weighing facilities in the Veene gate (demolished) and the Cellebroeder gate (extant)?⁵⁷⁸

Churches

During the Middle Ages the churches were often required to provide a place to weigh merchandise because public buildings lacked appropriate space. New uses also had to be found for existing sacred buildings following the Dutch Reformation in the sixteenth century.⁵⁷⁹

575 Cf. Kalf 1917; Zürcher 1929; Krielaart 1975; also Kurpershoek 1994.

576 Kalf 1917; Kruizinga 1983.

577 Private collection P. den Braber, Rotterdam, without source.

578 Private collection P. den Braber, Rotterdam, information courtesy of the municipal archivist, 1968.

579 Van Groningen 1995, 121.

Dordrecht (South Holland), Weigh house for iron: originally chapel of the wine buyers guild from 1325. Iron scale installed in 1594, building demolished in 1841.⁵⁸⁰

Schiedam (South Holland): until 1572 the baptismal chapel of St. Jan Church, later the municipal armory. 1579 removal of the weighing facility from the town hall, placement in the baptismal chapel. The facade from 1748. Hooks to hang the scales in the interior extant. Conversion to an office for the parish congregation in 1989.⁵⁸¹

Dwelling houses

The installation of weighing equipment in dwelling houses can be traced to the Middle Ages, when weighing was often located in the home of the weighing concession's leaseholder.⁵⁸² From time to time, a dwelling house was purchased for use as a public weigh house.

Delft (South Holland), 16th century: two typical local houses, each two stories high with a split level at the rear side (a kitchen below, a sleeping room above); the first house converted to a weighing facility in 1593; the house to the south purchased for expansion in 1644. Half of the shared partition removed to connect the houses; entryways at the front and rear, also a canopy across the front of both houses. According to a seventeenth century engraving, the right house originally with a stepped gable, the left one with a hipped roof. Unification of both houses in 1767; both houses with a common front facade and a frontispiece displaying weighing utensils over the

580 Sels 1854.

581 Van der Feijst 1975.

582 Fokke Simonsz. 1808, 68.



163 Schiedam weigh house, photograph 1988



164 Delft weigh house, photograph not dated



165 Medemblik weigh house, photograph 1972



166 So-called Zaltbommel weigh house, photograph 1911

central projection. Conversion to a theater in 1973-74. The large non-sliding scale from 1647 extant, the small scale removed.⁵⁸³

Dordrecht (South Holland) around 1360: representative patrician house with a gable containing Gothic tracery. Building purchased in 1594 from the city for use as a weigh house; conversion in 1834, demolished at the beginning of the twentieth century.⁵⁸⁴

Medemblik (North Holland), the front house from the 17th century: two stories with a stepped gable; installation of weighing equipment in 1692. A stone relief depicting a weighing beam and inscribed with "1773", probable reference to a remodeling. Ceiling on the front side raised to the windowsill height at the upper story at a later date; two girders for sliding scales inserted there, similar to Enkhuizen. Two large entryways with an overhead fanlight extend to the summer

583 Doorenbos, among others, 1974; Raue (1983, 221-223) assumes a medieval weigh house near to the present day weigh house. This was apparently a projection of the much later monofunctional type.

584 Sarfatij 1994.

beam on the facade. Since around 1972 used as a florist shop. Original weighing equipment is still functional, the small booth for the weigh house master extant.⁵⁸⁵

Oudewater (South Holland), according to the inscription, from 1595: one-story building with a pitched roof. Known as the witch's weigh house. Today a museum.⁵⁸⁶

Utrecht House Keizerrijk, Gothic patrician house, dates from approximately 1410: building purchased in 1473 by the city. Weighing facilities installed in 1614, concurrent use as a tax office for beer. According to a drawing Pieter Saenredam from October 1636, a built-in wooden scale installed over the lintel of the entryway on the gable side with a canopy and a dormer to protect the end of the scale. The canopy on the gable side not on a 1764 painting by P. J. Linder. The canopy however along the side terminated by the eaves. Weighing facilities removed in the 19th century; building today part of the town hall. No traces of weighing.⁵⁸⁷

Zaltbommel (Gelderland): two-story house, facade from 1798 (C. van Leeuwen). Ground floor entry, with Tuscan pilasters to the sides and a frieze with triglyphs. A non-sliding scale in the interior.

Miscellaneous

Amersfoort (Utrecht): former Latin school, remodeled for weighing in 1622; a cloth hall in the ground and first floor in 1655. At a later date inclusion of a guard-house at the ground floor. Destroyed by fire in 1865.⁵⁸⁸

585 Van den Berg, 1955; as well as the literature noted there.

586 Visser 1941. The literature concerning the weigh house in Oudewater almost completely involves stories related to the persecution of witches. It is not relevant here.

587 Haslinghuis 1956; also Temminck Groll 1963.

588 Bemmel 1760.



167 So-called Brielle weigh house, photograph 1974

Bergen op Zoom (North Brabant), 1751: two-story building, the facade fenestration arranged along four axes; due to remodeling, weighing function no longer recognizable.

Breda (North Brabant), 1659: possibly with the incorporation of older building substance. Half of the ground floor used for weighing. Due to the lateral support by columns, the weighing mechanism probably added at a later date. Only a small entryway on the gable side. A room with an open fireplace, accessible from the other gable side, at the other ground floor half. Upper level meeting room for the citizen guards. Seven extruded columns for a canopy on the long side. Stepped gable on the front facade faced Vismarktstraat. Gable with a dormer on the rear facade. Dismantled around 1865.⁵⁸⁹

Brielle (South Holland), 1623 (Maerten Cornelisz. Paeyse): bit by bit functions were removed from the town hall and located on the backside. Weighing facility there in a separate structure: the smaller weighing room on the street side, next to it a transverse hallway, and a prison on the remaining, larger ground floor area. The weighing

589 Van Goor 1744; also Kalf 1912.

room was furnished with an iron scale from 1655, doorway on both street sides.⁵⁹⁰

Hattem (Gelderland), 1621: weigh house originally on the ground floor, the guard-house in the upper level, reached by a double-run staircase; facade fenestration arranged in three axes with a dormer. Part of the ground floor originally used as an apartment. Staircase dismantled in 1875. No traces of weighing. Often mistaken for the town hall from von 1625. Weighing only from 1875.⁵⁹¹

Middelburg (Zeeland): stables used by the abbey, weigh house installed in 1523, the building demolished in 1823.⁵⁹²

Sneek (Friesland), 17th century (?): two-story corner house with five axes, a stepped gable and a bell-shaped dormer; Canopy from 1725, enlarged in 1756 in connection with the purchase of the neighboring house. Door to the stair on the upper floor at the middle axis, door opening to the right of it and on the gable side. Interior furnishings for cheese storage. Weighing equipment probably installed as a secondary function. Original use was presumably as a residential building or a hall. Demolished in 1854 and construction of a new building.⁵⁹³

Vianen (South Holland), 17th century (?): small, simple one-story building, traces of numerous remodelings; hence the original use for weighing questionable.⁵⁹⁴

590 Don 1992, 123; and the literature noted there.

591 Hoefler 1923; also Van der Wielen 1979, 258.

592 Lantsheer and Nagtglas 1879.

593 Napjus 1969 ed. 1772.

594 Van Groningen 1989, 393 et seq.

Plates



Plate 1 The weigh house and the crane on the Spaarne river in Haarlem; painting by G. A. Berckheyde, 2nd quarter of the 17th century



Plate 2 The old city hall and the weigh house on the Dam square in Amsterdam during the procession of the lepers; painting by A. van Nieuwlandt 1633



Plate 3 Market square in Hoorn with the weigh house (right), the city hall (middle), and the Council of the Estates (left); painting by I. Ouwater 1784



Plate 4 Plundering the house of the tax collector Stripiaan in Leiden, weigh house to the right; painting by Pieter Cattel, 18th century

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All site plans drawn by the author are based on the earliest cadastral land register that date from approximately the mid of the 19th century. The measured drawings were made with the help of students of the Technical University Berlin: Nicole Alle, Dörte Andree, Erik Bartscht, Peter Bleckmann, Martin Bücken, Jenny Daun, Christopher Didt, Mathias Effinger, Rainer Evertz, Christian Fehr, Kay Fingerle, Martina Gasteiger, Katharina Greve, Paul Gronert, Cheng Guohua, Steffen Hagedorn, Stephan Haman, Natalie Heger, Wiebke Hennig, Carmen Hummer, Csilla Koglerova, Christian Kommer, Claus Krapf, Julie Krause, Roland Kraushaar, Karsten Kröger, Caroline Lange, Beate Lendt, Maja von Lersner, Anna Lutz, Christian E. Meyer, Nina Mielke, Ilic´ Milyan, Silke Moedebeck, Esther Mohr, Dagrun Möller, Mai Nebelin, Daniel Neuer, Cedric Nieser, Nicole Ott, Dietmar Otto, Andrea Petzold, Karin Reimer, Peter Richter-Peill, Ivonne Rieger, Jule Rosenthal, Alexander Sarges, Marius Schliekmann, Christiane Schulze, Thorsten Schulze, Jenny Sieg, Thorsten Soetbeer, Hoggatolah Soltani, Elke Stamm, Andreas Steinhilper, Kerstin Sterthaus, Susanne Stier, Catharine Stigt, Maria Terhalle,

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20 years later

Since the first version of this study appeared in 1996, a modest number of scientific works about the Dutch weigh houses that are investigated in this book have appeared. The majority of these publications are either irrelevant or are only of marginal interest to the research presented in this volume. Only few require examination in greater detail.

Those publications, which will not be given further consideration here, include reports about archeological excavations that were carried out in the immediate vicinity of weigh houses, investigations focusing on later alterations to weigh houses, and historic preservation reports. For example, the discovery of a knight's armor lodged in the foundations of a weigh house or the need to renew a worm-eaten beam in a roof truss are irrelevant to the typological development of the weigh house. In the same vein, publications about buildings that housed a weighing function but belong to another typology or are located outside of the area of investigation are not considered in detail here.⁵⁹⁵ Furthermore, other recent studies, which have

595 Beijers, Henk: *"De bouw van het Waaggebouw"*. In: *Historische Kring Almelo*, vol. 4, no. 3, 1996. 9-12. Glaudemans, R[onald].: *"De Waag onderbelicht; bouwgeschiedenis onder de Nieuwmarkt"*. In: *Amsterdam monumenten & archeologie*, vol. 4, 2005. 60-67. Groen, Arthur: *"Booven memorye van menschen ...; de geschiedenis van de Uitgeester waag."* In: *Hutgheest; jaarboek*, vol. 21, 2000. 42-57. Graauw, J. J. de: *"De Middeleeuwse bouwgeschiedenis van de Amsterdamse Sint-Anthonispoort; de Waag op de Nieuwmarkt nader onderzocht"*. In: *Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond (KNOB)*, vol. 110, no. 3/4, 2011. 117-128. Hooren, D[ion]. van: *"Het Markt- en Waaggebouw"*. In: *Oud-Nijkerk*, vol. 16, no. 3, 1997. 3-7. Kips, David: *"Het Spaanse huis in Naarden;*

analyzed written sources pertaining to individual weigh houses that I researched, did not deliver any significant new information. In the case of the weigh house of Hoorn,⁵⁹⁶ for example, I was able to make use of the transcriptions of the city invoices pertaining to this building that were made by Piet Balhuizen for the first version of this study. In the other instances, the documentation of the building operations did not further illuminate the architectural history of these buildings.⁵⁹⁷

My methodology, which encompassed the architectural historical reconstructions of the weigh houses — with their equipment — including the scales, the consistent investigation of the relation of form and function, as well as the placement of these buildings within the typological development — allowed these buildings to be viewed in a startlingly new way. Using this method, for the first time the collected data was arranged to form the basis of an empirical classification of this architectural type. Needless to say, the weigh houses that are investigated here have become the objects of further

een monument van de vaderlandse geschiedenis". In: De Omroeper; historisch tijdschrift voor Naarden, vol. 10, no. 1, 1997. 1-21. Kouwenhoven, Gerrit: *"De bouw van de Waag en Hoofdwacht in 1621"*. In: Heemkunde Hattem; tijdschrift van de Vereniging Heemkunde Hattem, no. 123, 2010. 104-106. Luning, H.: *"De Asser stadswaag"*. In: Asser historisch tijdschrift; tijdschrift van de Asser Historische Vereniging, vol. 8, no. 2, 1998. 3-9. Weyts, J.: *"De Waag, Zuivelstraat 24-26"*. In: De Waterschans; geschiedkundig tijdschrift en mededelingenblad, vol. 34, no. 4, 2004. 181-184.

596 Cf. above, page 126 et seqq.

597 Bruin, Jan de: *"De Waag en Hendrick de Keyser; bronnen in het Hoornse stadsarchief"*. In: Kwartaalblad van de vereniging Oud Hoorn, vol. 23, no. 4, Hoorn 2001. 139-146. Friso, W.: *Archiefonderzoek naar de Waag in Workum*. Groningen 2006 [manuscript]. Herweijer, Nina and Henk Nalis: *"De Waag als weeghuis", "De Waag als hoofdwacht"* in addition to *"Van tekenschool tot schatkamer"*. In: Bloemink, Wijnand et al.: *De Waag te Deventer; 475 jaar geschiedenis*. Zutphen 2003. 77-129. Jonkhoff, Laura and Pieter Meijers: *De Waag van Hoorn*. Hoorn 2014 (Bouwhistorische reeks Hoorn; dl. 18). Passim. Smink, J[oop].: *"De bouw van de Goudse Waag"*. In: *Tidinge van Die Goude*, vol. 16, no. 2, Gouda 1998 (a). 65-73. Smink, J[oop].: *"De bouwers van de Goudse Waag"*. In: *Tidinge van Die Goude*, vol. 16, no. 3, Gouda 1998 (b). 93-108.

research. Although these later studies are of great importance, only two publications that deal with the substance of these buildings warrant further consideration.

One of these investigations focuses on the so-called weigh house in Deventer. In this volume, the contribution of Wijnand Bloemink⁵⁹⁸ o. a. concerns the removal of the plaster on the interior surfaces of the exterior walls. This undertaking should have brought forth new insights about the original function of the ground floor. However, the traces that were uncovered in the building's construction only reveal that a large number of renovations and restorations took place at this level. This is why no new information can be presented about the original divisions and the use of the hall at the ground floor. Only some traces found in the original building substance confirm the location of the original doorway openings that are depicted in the painting by Jan A. Beerstraten from 1665. In addition to reconstructing the ground floor of this weigh house, I drew a plan that is included in this publication and shows these doorways. Furthermore, during the removal of the plaster, a bricked-up arch on the interior side of the small front side came to light, a potentially significant detail that was not investigated in any further detail.

→ 4

The modest results of this investigation are supplemented by bizarre speculation. The first example: A print by Franz Hogenberg from 1578 shows a freely drawn representation of the weigh house in Deventer. Needless to say, this image bears no relation to the real building. Nevertheless, the original exterior staircase, of which there is no surviving documentation, is supposed to be represented correctly in this image. A second example: The transport of merchandise to the two upper levels of the so-called weigh house in

598 Bloemink, Wijnand: *"Gebouw en functie in 1528"*. In: Bloemink, Wijnand et al.: *De Waag te Deventer; 475 jaar geschiedenis*. Zutphen 2003. 23-49.

Deventer was to have taken place in such a manner that the loads would have been lifted on the exterior up along the stair tower to the roof, and then passed back down over the small winding staircase to their final destination. Third example: Without proof and with disregard for the current state of research, this publication asserts that initially the ground floor was used exclusively for weighing. These unfounded speculations do not warrant serious consideration.

The other recent monograph focuses on the weigh house in Hoorn. Compared to the speculations in the previous example, the architectural historical chapter by Pieter Meijers in this publication is fairly solid.⁵⁹⁹ This result is due to his decision to focus, for the most part, on the current state of research and to base his text on this information. However, concerning several details, such as the original location of this building, its equipment including the scales and the location of the initial staircase, his account does not reflect the most current research. This study offers no new information when compared to the information about the weigh house in Hoorn that is presented in my publication.

Because no relevant new research about the construction and use of the individual weigh houses within the period of the study presented here has been undertaken since my work was first presented in 1996, it can be assumed that the empirical evaluation of these buildings as a typology, which underwent a unique development and was subsequently disseminated, is still valid. This conclusion is confirmed by the adoption of my ideas and analysis about this building typology in the following publications.

In the previously mentioned monograph about the so-called weigh house of Deventer, in addition to several unfounded speculations, Ronald Senvert's extreme plagiarism in regards to the typological categorization of the weigh house must be mentioned.⁶⁰⁰ His

599 Jonkhoff and Meijers, 2014, op. cit.

600 Ronald Stenvert: "*Stijl en intentie*". In: Bloemink, Wijnand et al.: *De Waag te Deventer; 475 jaar geschiedenis*. Zutphen 2003. 50-64.

chapter contains an extensive paraphrasing of the results of my research. To feign independent thought and research, this author disguises his adoption of my ideas by using an intentional and thoroughly executed, highly developed and differentiated method of falsification. This includes omitting references to my research, the restriction of the reference to a citation about the definition of a term, the neutralization of a citation in the main text, and the false citation.⁶⁰¹ This chapter does not contain new, pertinent research that this author carried out on his own.

Furthermore, in the publication “Bouwen in Nederland 600-2000”, F[reek]. H. Schmidt’s two-page entry about the weigh house largely summarizes the results of my research. However, he fails to include a bibliographical reference to my publication. Meanwhile, his text repeats a refuted assertion advanced by the editor of this collection, K[oen]. A. Ottenheim. Namely, when the construction of the weigh house of Gouda commenced, a one-to-one, wood model of the facade was supposedly erected. When F. H. Schmidt’s text appeared, evidence supplied by written sources proved without a doubt that the afore-mentioned wooden structure provisionally housed the scales of the new weigh house, and was not a facade model.⁶⁰²

In a different manner, Pieter Meijers describes the typological classification of the weigh house in Hoorn by making extensive references to my research. These are acknowledged in a global way.⁶⁰³

601 Cf. <http://de.guttenplag.wikia.com/wiki/PlagiatsKategorien> from May 16, 2016. My gratitude goes to Matthias Leistner (Chair for Civil Law, Intellectual Property and Competition Law, University of Bonn) for his help identifying the plagiarism of Ronald Stenvert.

602 Cf. Smink, J[oop].: “*De bouw van de Goudse Waag*”. In: Tidinge van Die Goude, vol. 16, no. 2, Gouda 1998 (a). Smink 1998 (a) 66 f. and Smink, J[oop].: “*De bouwers van de Goudse Waag*”. In: Tidinge van Die Goude, vol. 16, no. 3, Gouda 1998 (b), 98 et seq. a. a. O. As well as above, page 164, footnote 281.

603 Meijers, Pieter: “*Waaggebouwen — Typologie*”. In: Jonkhoff and Meijers, 2014, op. cit., 47-51.

In conclusion, after the original manuscript was made available to the public in 1996 and following the publication of the slightly reworked German-language version in 2009, only three subsequent studies have appeared about the subject of the weigh house that merit attention at all. A careful consideration of these publications demonstrates that even though twenty years have passed, regarding the here presented work no significant new research has been published about the Dutch weigh house. Therefore it was not necessary to rework or amend my original text for the English-language edition.

“... the monofunctional weigh house in Holland is an especially diverse and appropriate testament-in-stone to the so-called Golden Age of the Netherlands. Acknowledging these qualities, the weigh house can be considered an architectural equivalent of the Dutch painting of the seventeenth century.”

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