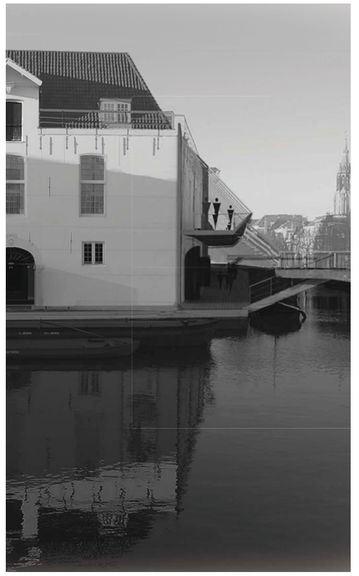
THE ARMAMENTARIUM: A REFLECTION OF DELFT

A creative mix of functions within valuable interior spaces



GRADUATION REPORT

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Graduation date: 04-07-2014

FRAMEWORK

As a student of the Technical University of Delft I have developed an interest in the field of cultural heritage. This resulted in my decision for the studio of RMIT. RMIT stands for Research, Modification, Intervention and Transformation of the built environment. These four domains are greatly determined by the value of the concerned object as cultural heritage. Restoration, conservation and reuse are central topics, all implemented on several scale levels, from material to the built environment.[1]

Prior to designing comes the exploring and analyzing of what is there. Every work of architecture includes its own layers of history. It is crucial to get to know the history of the building and its context on all scale levels. With analyzing comes understanding and being aware of the meaning of the architectural object. The actual designing then means dealing with these historical layers. Making an intervention means adding a new layer of architecture while respecting the valuable historical layers that are already present.[2,3]

As a student I have to take into account research, a value assessment, materiality and design.

MOTIVATION

Monumental buildings have gotten my interest for the last few years. Nowadays a lot is changing around the re-use (*herbestemming* in dutch) of monuments. Where in history programs were chosen that fitted the monument, the current situation is more about adapting the monument to a new program. This can be translated to expanding the monuments by adding modern extensions.[4] A reason for my interest is that monumental buildings are vulnerable to interventions. Values -both material as immaterial- of a building and the effect on its context have to be maintained and strengthened the best way possible. In my eyes a complementing intervention can stand out, but can also be unnoticeable to the passerby.

[1] VAN BOMMEL, A.J. January 2014.
[2] TU Delft, Department of Architecture, 2013.
[3] ZIJLSTRA, H. 5 september 2013.
[4] VON SANTEN, J. 2013. Pages 20, 21

THE OBJECT

As you have seen in the title of this report, the object of this graduation studio is the Armamentarium in Delft. Before presenting the structure of this report, I would like to give a concise version of the complex' history.

The Armamentarium, a 17th century building, has an extensive history. Several building periods, interventions, functions etc., make this building unique in its own way. Delft, war, Golden Age, East-Indian Company, warehouse, power, accessibility, renaissance, classicism, army-museum. These are all key-words for explaining the history of the Armamentarium.

In the end of the 16th century the economic position of the Netherlands improved. DELFT, as the third largest city in Holland, took an important position in this wealth. Artillery was an important aspect in this period, concerning the Dutch rebellion against Spain: 80 years of WAR. This war ended mid-17th century. Nevertheless, 1602 was the year of the GOLDEN AGE, the founding of the EAST-INDIAN COMPANY, and the construction of the Armamentarium as a WAREHOUSE for artillery items. The 17th century in the Netherlands knew economic, scientific, cultural, political and military POWER. The East-Indian Company as world's largest overseas trading company played a great part in this wealth. Both expansion as protection of this powerful position was necessary. This is where the military power was utilized.

For Delft the desire of having the Armamentarium was great, likely a matter of status. For the Armamentarium the desire of a perfect ACCESSIBILITY was great, a matter of functioning of the building. Delft offered the location and context the building needed. During the 17th century the Armamentarium slowly expanded. By the 19th century a large area of the peninsula on which it is situated belonged to the building. Parallel to the building styles at the time, the buildings of the Armamentarium are built in RENAISSANCE and CLASSICAL style.

After the 17th century military operations slowly decreased. The end of the East-Indian Company was around 1800. During the 19th century moreover, warehouse functions are moved to Amsterdam, made possible by the new railroad. The function of the building gets lost. In the end of the 20th century, the building became the ARMY-MUSEUM.

Right now the building lacks a function. What significance do these key-words have when thinking of a new use of the building in the future?

Appointed as state monument the Armamentarium with its several layers of history is a challenging object for the RMIT studio.

Having been of great importance for the economical wealth of Holland the complex is anchored in the history of the city of Delft. My assignment as a student is to design an intervention that relates to the complex as well as to its surroundings, and to make The Armamentarium a place of meaning for the city again.[5]

[5] TU Delft, chair of RMIT. 2013.

This P5 report presents to you the research and design that I fulfilled in the RMIT graduation studio, in the academic year of 2013–2014. This introduction will explain the structure of the graduation report.

The graduation process is built up out of the following steps: research and value assessment, design, reflection. It is therefore obvious to divide this report into corresponding steps, starting with the research. In the research the analysis is presented. The analysis is executed on the following scale levels: the urban–, architectural– and technical scale level. This analysis is accompanied by a number of research questions which are treated in the relevant scale level. After the analysis, the essence of the Armamentarium is summarized in a value assessment. The outcome of the analysis and value assessment forms the starting points of the design. In the design part naturally the design is presented. The last part treats the conclusions, containing a reflection upon the graduation project. Final, a list of references is given, followed by the appendix.

In the end I hope this report provides a complete picture of my graduation project, and that you will enjoy reading it.

URBAN ANALYSIS

In the urban analysis the relation between the Armamentarium and its surroundings is analyzed. After orienting the following research questions came up:

- What is the relation between the growth of the city and the meaning of the Armamentarium within this city?
- What is the position of the Armamentarium within the diverse program of the city?

As a start therefore the growth of the city over time is investigated, starting in 1200. This growth does not stop right in the present; the future plays a role in this investigation as well. The Armamentarium is situated in an area that is redeveloping, which could mean that it might have a different relation with its surroundings. Water, building morphology, and infrastructure are influencing aspects. After this investigation some turning points are pointed out: moments in history and future that changed/will change the meaning of the Armamentarium within Delft.

To find out what the position of the Armamentarium is within the diverse program of the city, an analysis on the current program and functions in the city is done. What different areas (private, public etc.) are present in Delft, and in what kind of area lies the Armamentarium? In my opinion Delft is a creative city; a city that contains business, tourists, culture, technique, and more that makes it a city full of life. According to the book 10x Delft there are ten themes that make Delft a famous city: history, growth, industry, university, tourists, markets, festivals, music, water and green.[6] Motivated by the themes in the book, and by the vision of Delft[7], I investigated which functions are present in the city that for me make Delft a creative city. This research question resulted in the goal to reflect the creative program of the city on the Armamentarium, and to connect the building in a physical way with the city center.

[6] TUURENHOUT, T. & VERHOEVEN, G. 2011. Page 7
[7] De Visie en agenda binnenstad 2020, opgericht door het college van B&W van Delft in december 2012.

GROWTH

1. 1200

Delft is an important trade center; it has good connections over water. The green arrow shows the main route over the *Oude Delf* through the city. Almost all traffic is over water. Little traffic (by horse or walking) is over land. The red dotted lines point out the two oldest waterways in Delft (the *Oude Delf* on the left and the *Nieuwe Delf* on the right).

2. 1300

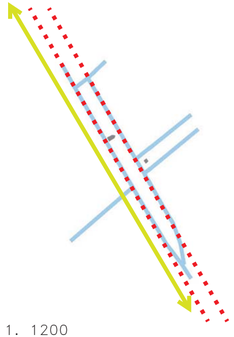
In 1246 Delft obtains city rights. From this moment Delft starts growing in size and inhabitants. An important city like Delft had to be protected by canals and city walls. Already we can see a small part of the city border, though it is not a city border yet, this we can see in the next drawing.

3. 1365

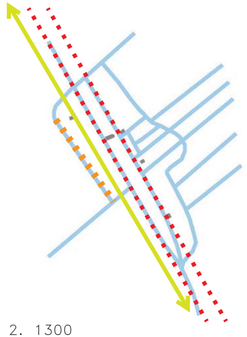
The *Schie* connected Delft with the 'Maas' in the south. In 1389 Delft got its own sea–harbor here: *Delfshaven*. The *Vliet* in the north connected Delft with The Hague, Leiden, Harlem and Amsterdam. From the 14th century on, Delft was defended by canals, city walls and six gates (of which two are double gates).

4. 1536

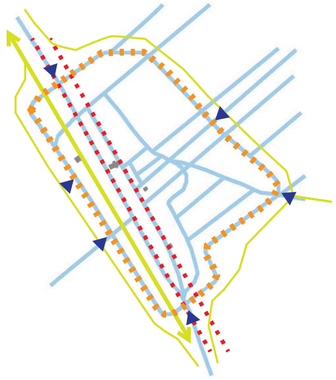
Delft is the third largest city of Holland. It had two large churches, a town hall, monasteries, two hospitals, an old men– and an old woman house, an orphanage, chapels, towers and mills. In 1536 a big city fire demolishes hundreds of buildings. This means that nowadays there are almost no buildings left from the middle ages.



1. 1200



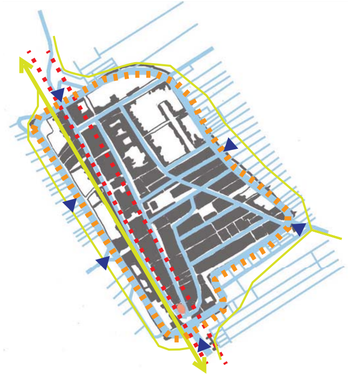
2. 1300



3. 1365

4. 1536

strong axes
city border
city gates
main routing: water
main routing: land



5. 1675

6. 1860

7. 1981

8. 2013

5. 1675

The Golden Age started in 1602, the year the VOC was founded and the Armamentarium was built in between the two oldest canals of Delft, in front of a city gate. This age Delft was teased by disasters: a town hall fire in 1618, an explosion of a gunpowder tower in 1654 which demolished many buildings in the northeast. The Government did not want warehouses in the city anymore.

6. 1860

In 1847 the railroad came. More traffic arose on land. Military functions now moved to Amsterdam, there was a lack of space in Delft for these functions; it no longer was one of the biggest cities. Delft lost its military function. No longer were the city wall and –gates needed. All got demolished except for the *Oostpoort*. Settlements along the waterways start to grow, close to the Armamentarium.

7. 1981

Delft has expanded a lot outside of the city borders, towards every direction. After removing the city wall Delft became attractive for new industries. A freeway replaces the canal on the west side of Delft. In 1965 the railroad was moved, it made place for the freeway and it was raised. From the beginning of the 20th century traffic is mainly over land. South and west of Delft traffic passes by. The canals lost their function as main traffic ways.

8. 2013

Not a lot changed during the end of the 20th century and the beginning of the 21st century. The structure of the middle ages is still present, with the two oldest canals as strong axes.

SOURCES:
TUURENHOUT, T. & VERHOEVEN, G. 2011. 10xDelft, Schiedam, Scriptum.
In een notendop. http://www.delft.nl/Monumenten/Cultuurhistorie/in_een_notendop [Online]. Gemeente Delft. [Accessed 03–11–2013.
De stadmuur van Delft en haar acht stadspoorten. http://www.wikidelft.nl/index.php?title=De_stadsmuur_van_Delft_en_haar_acht_stadspoorten [Online]. WikiDelft. [Accessed 03–11–2013.
Spoorzone Delft. http://nl.wikipedia.org/wiki/Spoorzone_Delft [Online]. Wikipedia. [Accessed 03–11–2013.

TURNING POINTS

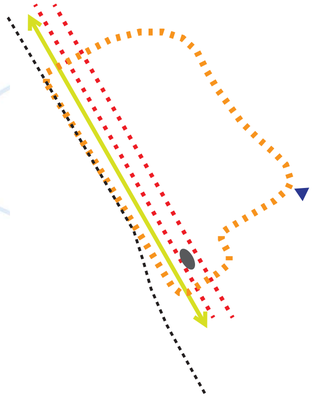
9. 1536

This represents the situation before the Armamentarium is built. Delft has developed into a large city. Most traffic takes place over water; the main route goes straight through Delft, via one of the oldest canals. The city border is formed by canals and a city wall with gates. The spot the Armamentarium will take has a prominent position within the city: In front of the gate connecting Delft with the *Schie*, routing always passes the building.

10. 1860

The railroad caused the disappearance of military functions in Delft. It took the place of the former canal that formed the city–border. In this situation, traffic is over water as well as over land. It is right after the coming of the railroad on land, but right before the coming of cars and freeways. Delft lost its military function so the Armamentarium lost its purpose. The city wall and –gates started disappearing. The surroundings opened up towards the Armamentarium.

9. 1536



10. 1860

strong axes
city border
city gates
main routing: water
freeway
railroad

11. 2013

The old city–border is no strict line anymore. It is a visual line, but Delft has expanded a lot outside it. The Armamentarium is clearly visible from the south side of Delft. The building has a view on the *Schie*, with its *Zuidkolk* and industry terrains. On this side a lot of traffic passes by. The function of the canals as traffic ways is lost; this was the function the Armamentarium depended on. The building, with the water almost unused, is now less attainable.

12. Near future

The railway zone wants to achieve a connection between the inner city and the southwest part outside of the inner city. Until now there is a clear border here, defined by a 'wall' of buildings, a freeway and the railroad. With the railway going partly underground, and on the west side of Delft bringing back part of the old canal together with a green ribbon, how will the connection between the Armamentarium and its surroundings be? I think the Armamentarium will still be embraced by its canals with their houses (illustrated on the next page).

11. 2013

12. near future

SOURCES:
TUURENHOUT, T. & VERHOEVEN, G. 2011. 10xDelft, Schiedam, Scriptum.
In een notendop. http://www.delft.nl/Monumenten/Cultuurhistorie/In_een_notendop [Online]. Gemeente Delft. [Accessed 03–11–2013.
De stadmuur van Delft en haar acht stadspoorten. http://www.wikidelft.nl/index.php?title=De_stadsmuur_van_Delft_en_haar_acht_stadspoorten [Online]. WikiDelft. [Accessed 03–11–2013.
Spoorzone Delft. http://nl.wikipedia.org/wiki/Spoorzone_Delft [Online]. Wikipedia. [Accessed 03–11–2013.

PROGRAM AND FUNCTIONS

This research shows the themes that I associate with Delft. According to the vision of Delft, the city is a city of tourism and technology. They name four main aspects: technology, history, creativity and innovation. Written in the vision is the wish for a creative mix of public functions in the Armamentarium. They want to achieve this by working together with partners out of the city, creating a lively work–, creation– and meeting place where innovative developments are possible and are stimulated.

The ten themes named in the book *10x Delft* that make Delft a famous city are: history, growth, industry, university, tourists, markets, festivals, music, water, green. By investigating several themes I can find out what for me makes Delft a creative city.

13. Market

The market in the historical city center on Thursdays and Saturdays brings life and movement into the city.

14. Food

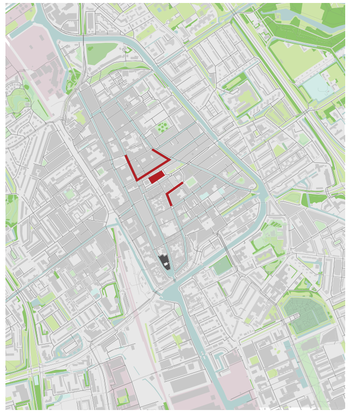
Delft is full of restaurants and cafes, especially in and around the historical city center.

15. Shopping

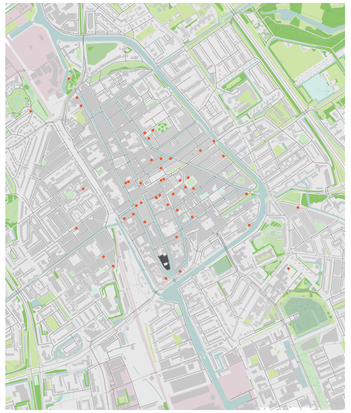
The historical city center and the more modern *Zuidpoort* area contain a lot of shopping places.

16. Hotels

Around the city center hotels are present for tourists and visitors.

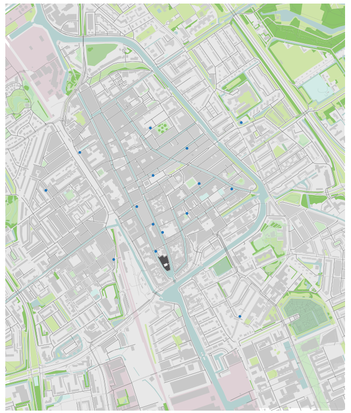


13. Market

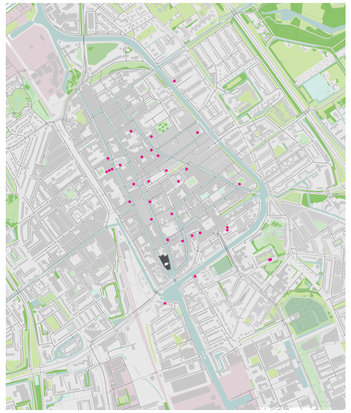


14. Food

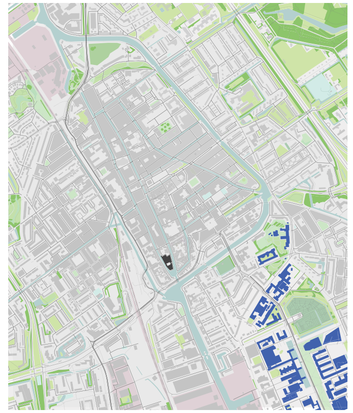
15. Shopping



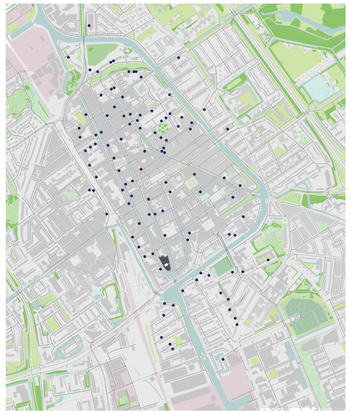
16. Hotels



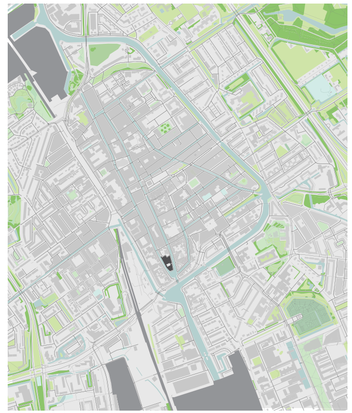
17. Cultural/ touristic



18. Technical University



19. Offices (architecture)



20. Industrial areas

17. Cultural/ touristic

The city center contains a lot of cultural attractions for tourists and visitors.

18. Technical University

Delft is known for its technological university, it is placed outside the city center.

19. Offices (architecture)

The large amount of architectural offices shows the great presence of business in Delft.

20. Industrial areas

Close to the city center are industrial areas. The one along the *Schie–oevers* is visible from the building.

SOURCES:
Gemeente Delft 2012. Binnenstad, vitaal en gastvrij: Visie en agenda Binnenstad 2020.
TUURENHOUT, T. & VERHOEVEN, G. 2011. 10x Delft, Schiedam, Scriptum.
http://www.orangesmile.com/travelguide/delft/index.htm [Online]. orangesmile.com. [Accessed 09–09–2013.
www.maps.google.nl

The vision on Delft speaks about Delft as being the cozy living room of the *Randstad*. This triggered me. Therefore I analyzed the creative and public areas and the more private and intimate areas of Delft. The Armamentarium is in a mixed area, close to the public area of the city center. Its direct surroundings have no strong public or private characteristics.

21. Public

This image shows the public area of Delft, containing all places that are accessible for public.

22. Mixed

These areas contain both public as well as private functions. For example: buildings with shops on the ground floor and living spaces on the upper floors.

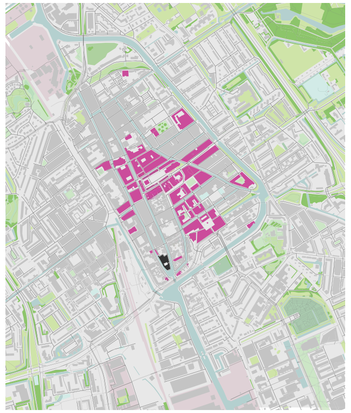
23. Private

The private character of Delft exists out of mainly residential area, but also some private or public courtyards. All these are far away from the Armamentarium though.

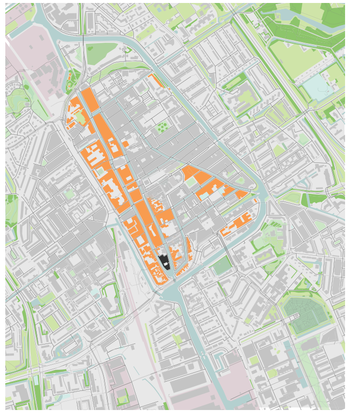
24. Public and private

There is a quite clear division between the private, public and mixed areas. Interesting to see is that the borders of these areas mostly follow the canals. It is as if the structure of canals divides the city into different areas.

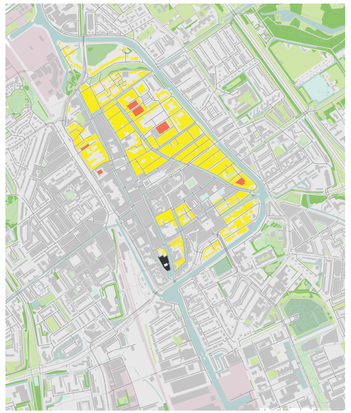
This research has made me seen opportunities to connect the Armamentarium in a physical way with the creative program of the city center.



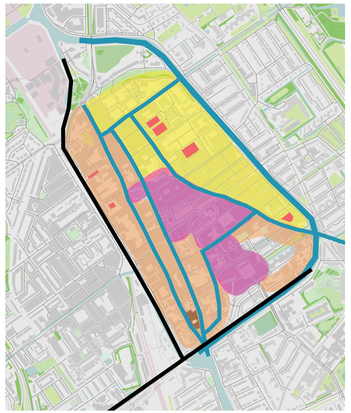
21. Public



22. Mixed

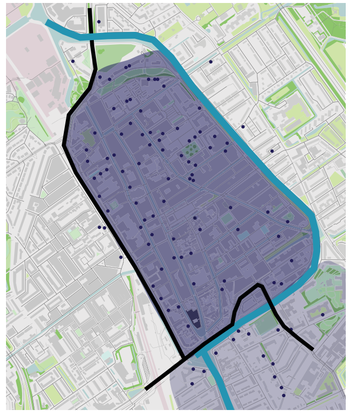


23. Private



24. Public & private

25. Creative area: visitors & inhabitants



26. Creative area: business & innovation

So far I have pointed out several themes as being part of the creativity of Delft. There is however a significant difference between for example tourist attractions and architecture offices.

25. Creative area: visitors & inhabitants

The purple colored creative area contains functions for tourists, visitors and inhabitants. I agree with the vision of Delft to give the building a creative mix of public functions. In this image I want to show the possibilities of the Armamentarium to connect physically to the public area of the city. The public area appears to be embraced by two canals. The position of the Armamentarium within these canals seems to make it possible to connect it with this area.

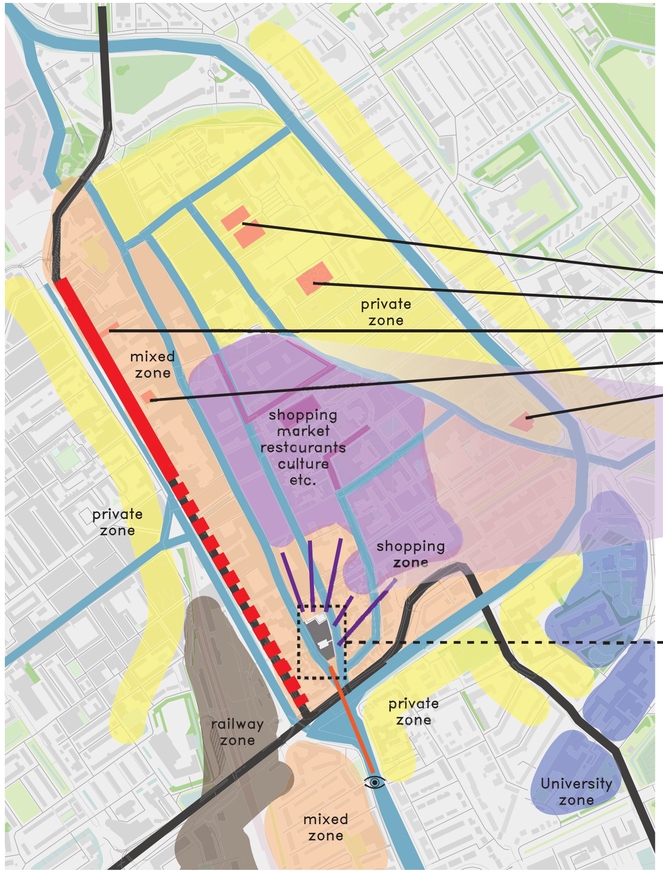
26. Creative area: business & innovation

Business and innovation is present in the whole city and outside of the city. On the south of the Armamentarium an industrial area is present along the *Schie*, and right next to those the TU Delft. The Armamentarium is in open connection with the *Schie* and its industrial area, so there is a strong visual connection with the water. A strong visual or physical relationship between the Armamentarium and the creative area discussed in this image however does not exist in my opinion. Therefore I do not fully agree with the vision of Delft. I think the Armamentarium should be a building that is attractive for all to visit, assigning public functions based on working, creating and innovation might shut out a great part of inhabitants.

SOURCES:
http://www.ruimtelijkeplannen.nl/web-roo/roo/bestemmingsplannen?planidn=NL.IMRO.0503.BP0014-2001# [Online] .ruimtelijkeplannen.nl. [Accessed 09-09-2013.
Gemeente Delft 2012. Binnenstad, vitaal en gastvrij: Visie en agenda Binnenstad 2020.
www.maps.google.nl

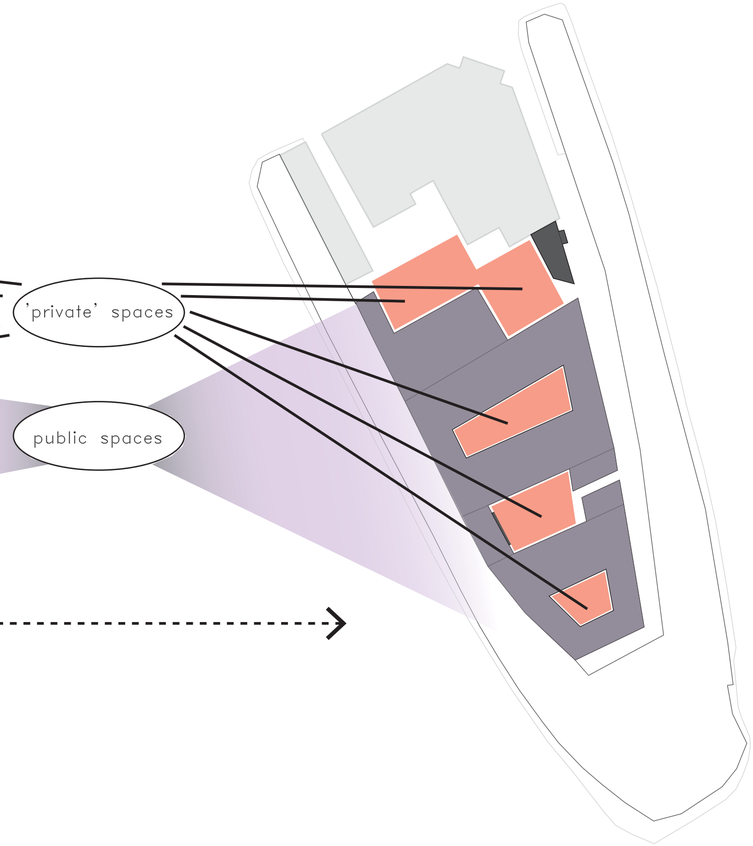
REFLECTING THE PROGRAM OF THE CITY CENTER ON THE ARMAMENTARIUM

Having analyzed moments in the urban growth that affect the meaning of the Armamentarium, as well as the current program that for me makes Delft an interesting city, a conclusion can be drawn. I took into account the close surroundings of the Armamentarium.
The west side of the city center works as a visual border. The freeway and a wall of buildings separate the center from the west side of Delft. The red dotted line shows this border. It is dotted because at some points the wall is penetrated by a street or small alley for people to reach the center. With the coming of the new railway zone the connection between the center and the west side will not be increased. For me the Armamentarium is embraced by its surrounding canals and buildings, and does therefore not have a visual connection with all but the south side of Delft. On the south side the building has a wide view on the *Schie* with its mixed program of industrial, private and public functions. This connection is more visual than physical. The program of this mixed area I will therefore not reflect on the Armamentarium. A physical connection can be made with the north and east: the city center. The purple lines illustrate my idea of adding the Armamentarium to this public area. The program of this creative public area can be an inspiration for the new program of the Armamentarium.



public area
mixed area
private area
courtyards
market: temporary use of public space
railway zone
Technical University
freeway
canals
visual border
visual connection
physical connection

27. Concluding illustration



Besides reflecting the public program of the city on the Armamentarium, I also see possibilities to reflect some more private aspects on the building. Courtyards are not in the direct surroundings of the building. However, the building itself has some closed off, outside spaces that could be interesting. Furthermore the building lot used to contain a courtyard in the 16th and 17th century, that was later moved to another spot in the city. I would like to investigate in Q2 if I can create more intimate spaces within a public area. These spaces are in my eyes not private (they will be a part of a public zone), but can have the sense being a quiet and peaceful place within a busy context. In these outside spaces you might experience of the bustle of the public functions less.

ARCHITECTURAL ANALYSIS

The main focus of the architectural analysis derived from a problem I stated. Therefore prior to introducing the architectural analysis, is the explanation of the problem statement: The Armamentarium is not built as one building; it exists out of various buildings put together. Together these buildings do not give a clear overview of the complex as a total. The complex is divided into buildings, which are again divided into several interior spaces.

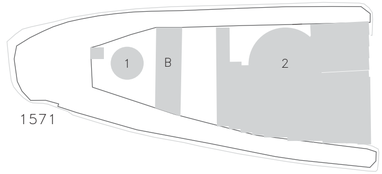
Walking through the buildings, I developed a fascination for the interior spaces. What triggers me is to find out what interior spaces these buildings on their own have: not looking at the total, but at the smaller and more individual parts that together fill the total. The following research question came up:

- What interior spaces in the Armamentarium I find valuable, and what aspects (material and immaterial) define these spaces?

With the help of literature I chose a number of aspects that play a role in defining interior spaces. This literature furthermore helped me putting my thoughts into words that You, as a reader of this report, can understand. These words do not go without drawings, sketches and diagrams that give an impression of the interior spaces. With the use of 3D computer models and perspective drawings I am able to show the appearance of the spaces. With the use of reduction drawings I can show the impact a specific aspect has on shaping a space. Moreover, a research about the functionality and routing – which are strongly related to each other– of the building now and in history helps me find the immaterial value of the spaces. Conclusions that are drawn out of this analysis are used later to emphasize the quality of the interior spaces.

Besides this main theme, several other matters are analyzed. This architectural part starts with an analysis on the growth of the building, linked to happenings in economical/ military and architectural history. Then, after treating the research question, an inventory on the changing of the facades over time is given. Analyzing all of these matters helps to value the building on its architecture.

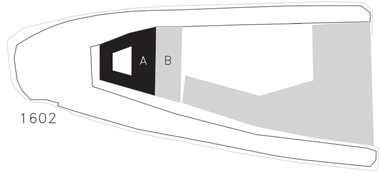
For a more detailed description of the main focus of this architectural analysis I would like to refer you to my position paper in the appendix, in which I explain my position within the field of heritage, in relation to the focus of my research in the graduation project.



GROWTH OF THE BUILDING

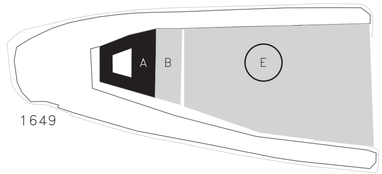
1571

1: This City Shipyard was already here in 1571, with probably a stone house.
B: 'Hofje van Gratie', founded in 1571 in between the shipyard and the Breestraat.
2: A large Brewery, also already there.



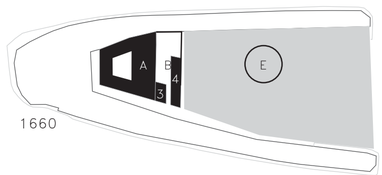
1602

Building 1602 (building A) was built (commissioned by the States of Holland and West–Friesland) to store guns, firearms, bullets and more.



1649

On the *Oude Delft* was a warehouse, which did not have enough space. In 1649 a malt house on the peninsula was bought. This building was not yet part of the Armamentarium.



1660

In 1660 there almost was a fire in one of the small houses of the courtyard.
The courtyard *Hofje van Gratie* was bought and all the buildings that were on this plot were demolished. The courtyard itself was moved to another place in the city.
A wall was built around the courtyard with a gate in the east wall.
3: This small 1 storey guardhouse was built.
4: This forge was also built at the same time, at a safe distance from the warehouse.

28. Growth of the Armamentarium

MILITARY/ ECONOMICAL HISTORY

End 16th century
- Expansion transport over water
- Large army
- Artillery was an important aspect

1568 – 1648
- Dutch rebellion against Spain

17th century
- Golden Age
- Economic, scientific, cultural wellbeing
- Trading
- Political power
- Military power, especially at sea
- New warehouses are built

1602
- The beginning of the Golden Age, founding of the VOC (Largest overseas trading business in the world)

<1621
- Economic growth

1618 – 1648
- 30 Years of (religious) war

>1648
- Economic growth, especially in the industry

>1672
- Dutch war, attacked by England, France and parts of Germany
- Economic downturn
- Crisis in the Netherlands

End 17th century
- Amsterdam wants to stop paying for military operations

1799
- End of the VOC

End 19th century
- Lack of space: warehouse functions to Amsterdam (new railroad)

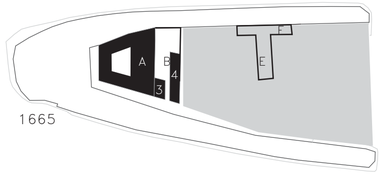
ARCHITECTURAL HISTORY

Beginning 17th century
- Gothic and renaissance style

1647 – 1672
- Building on a larger scale
- Monumental buildings with ornaments
- Digging of new canals

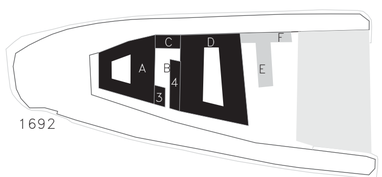
Mid–17th century
- Classicism, vertical elements, less ornaments, natural stone preferred over brick

End 17th century
- No decoration
- The entrance is the most present and central element



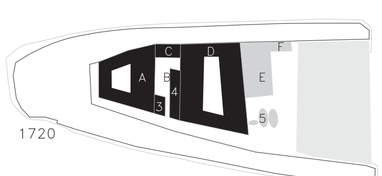
1665

Other terrains and houses were added to the malt house and all together it became the *Oost–Indisch Pakhuis*: a warehouse.
Building F is an oil cooking house. When this small house was built is not clear.



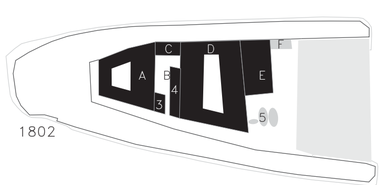
1692

There was not enough space in Building A. In between Building E and terrain B two new buildings were built. Building D: the *new warehouse*, and building C: a small warehouse and connection building between the *new*– and the *old warehouse*.
The west wall and partly the north wall of the courtyard were demolished to build the 1692 buildings (buildings D and C).



1720

From 1682 until 1720 the East–Indian Warehouse was considerably enlarged. Several other houses that were already present were added.



1802

This year the East–Indian Warehouse was added to the Armamentarium, as the *large warehouse*.

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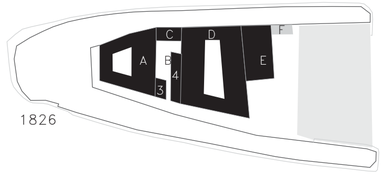
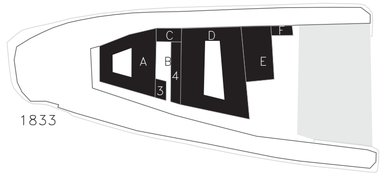
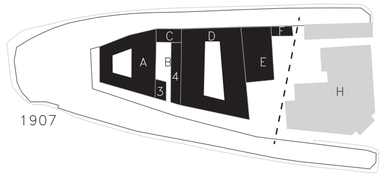


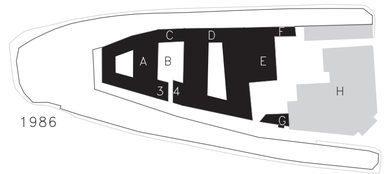
1826
The small buildings (5) were demolished.



1833
The forge (4) was extended until Building C.
An oil smokehouse (building F) was built next to the 'large warehouse', on the spot of the older oil cooking house.



1907
Until this year the Armamentarium had bought up almost the entire peninsula.
In 1907 the district court (building H) was built and with that several service homes. Former service homes on this spot were demolished.
The Armamentarium had to give up some space. Also a wall had to be built in between the district court and the Armamentarium terrain.



1986
During restoration work in 1976–1986 the forge was demolished, including the part of the north wall that was left. In 1986 a new building was built on this spot.
Also in the end of this century building G was built, a guardhouse and museum shop.

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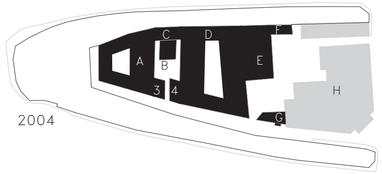
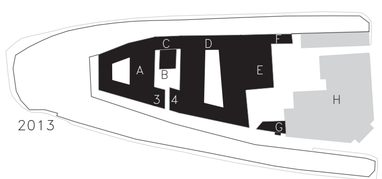


2004
A new entrance was built in connection with building C.



2013
The situation as it was in 2013, during the analysis of this graduation project.

After analyzing the growth of the Armamentarium on the peninsula the following can be said: The expansion of the Armamentarium was parallel to the happenings in the military and economical history.
- With the start of the East–Indian Company and the Golden Age > the Armamentarium was built.
- During the Golden Age there was military power > the Armamentarium got expanded.
- With the ending of the East–Indian Company > the Armamentarium stopped expanding significantly.
- When military functions moved to Amsterdam > the Armamentarium sells some space on the peninsula.

Looking at the architectural history the following can be said: The building style of the Armamentarium was parallel to the prevailing building style at the time.
- The 1602 building is built in renaissance style.
- The 1962 building is built in classical style. (More about these styles is treated in a later part of the analysis)

SOURCES:
Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Afbeeldingen (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)
Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Tekst (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)

SHAPING SPACES

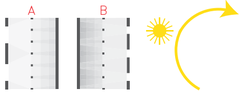
"Pots are formed from clay, but the empty space within it is the essence of the pot. Walls with windows and doors form the house, but the empty space within it is the essence of the house." Lao–tzu[8]

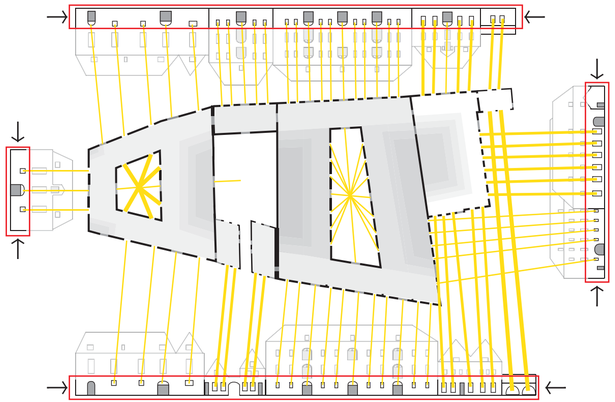
Intrigued by the several interior spaces of the Armamentarium, I have read some literature that handles the perception of architectural spaces. Especially the book of Lou Michel –Light: the shape of space– I would like to introduce in this part.
Michel wrote: "*To know how people see is to know how to design for them.*"[9] Exactly this is what I want to achieve. Knowing how spaces are defined, and thus how people see them, will help me in the further design.
As a start, I analyzed how daylight is present in the building. As Michel writes, light defines our visual world, light and architectural space have a close relation to each other, they influence each other.[10] With light comes shadow, how are the spaces in the Armamentarium influenced by light and shadow.
After this I focused on the routing and function of the building. These two aspects are closely related to each other and have a strong influence on how the spaces inside the buildings are shaped.
Continuing, I searched for the spatial envelope. According to Michel, architectural spaces are defined by its boundaries. These boundaries can be walls, floors, ceilings and other major surfaces. Together these boundaries form the spatial envelope. Michel makes it clear that this spatial envelope is a conceptualization of space, without any temporary or movable objects inside.[11] Apparently, edges and outlines are the first aspects the eye sees, after this it scans the surfaces within these outer contours. [12] Sudden breaks –objects that disturb the continuous surface– weaken the perception of the outer contours. These sudden breaks can be windows, patterns, shadows in the surface, but they can also be objects within the space that is defined by surfaces. I therefore decided to leave objects within the spaces out of this analysis. In a later stadium, when I have defines the spaces, I could try to integrate them and see the effects on the perception of the spaces. Openings in the facades however I will take into account, simply because they have a permanent character, and in some cases they have a positive effect on the perception of the space. Besides boundaries, focal accents have influence on the perception of a space. They can attract or distract. Windows for me could work as focal accents, to attract one's eye.
In short: What is shaping the spaces inside the Armamentarium? I will focus especially on the elongated areas in the building, where the edges and borders are clearly perceptible.

[8] MICHEL, L. 1996. Page 141
[9] ,, ,, Page xv
[10] ,, ,, Page 31
[11] ,, ,, Page 102
[12] ,, ,, Pages 11,12

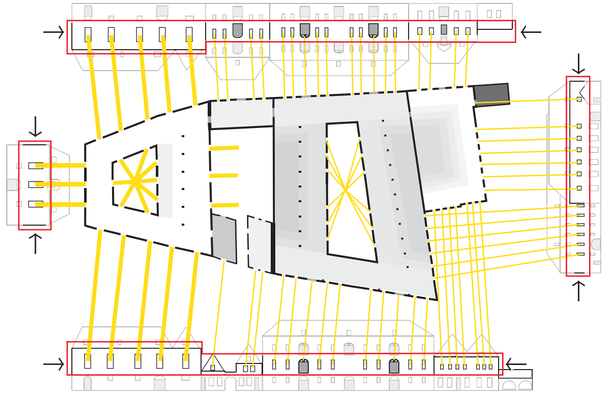
DAYLIGHT FILTRATION

Daylight infiltration has impact on the spaces inside. It is a matter of visualizing the things that are present and that we see. Some areas are relatively dark; they have large and deep floor plans and smaller window openings. Some areas are relatively light; they have smaller, less deep floor plans and larger window openings. According to Michel shadow is one of the finest features of light. They influence each other (MICHEL, L. 1996. Page 31). Below I drew two diagrams to make clear how the daylight infiltration creates shadows. The columns work together with the light to create light nuances, and they are the border between brighter and darker areas.



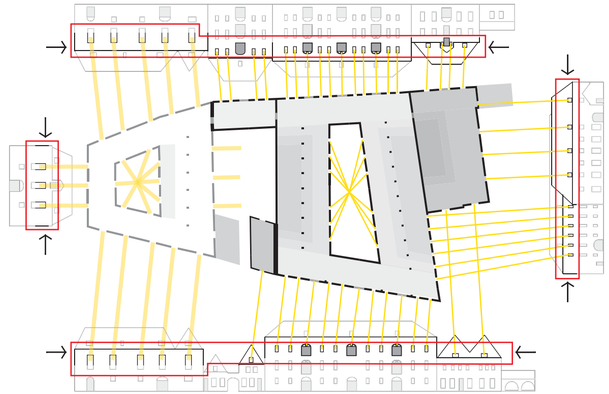


29. ground floor

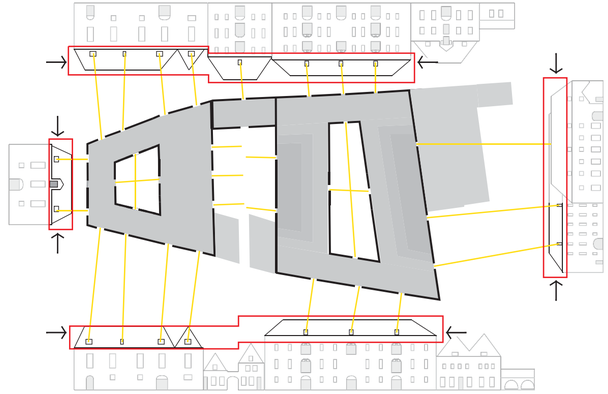


30. first floor

frame to clarify the analyzed floor level
large window >5m2
medium window 2–2,5m2
small window <1,5m2



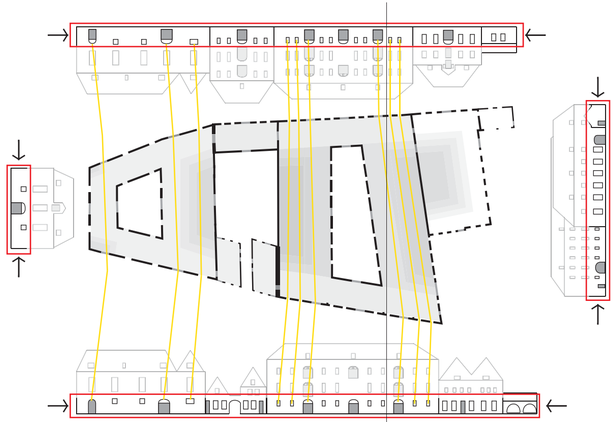
31. second floor



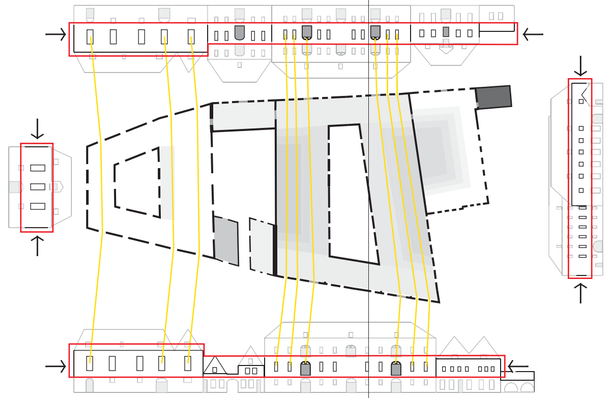
32. third floor

DAYLIGHT FILTRATION: WINDOWS AS FOCAL ACCENTS

Some window openings are on the end of elongated areas. In the introduction of this analysis I wrote about windows working as focal accents. Here I point out the positions of windows in elongated areas in the building. Being bright, these windows have the power to attract the eye. When standing in these areas, the windows work as focusing points. They are bright and striking elements in a sometimes relatively dark space. In these drawings for every floor plan is marked where these focusing points are present. Some are stronger than others (small windows in dark areas versus large openings in lighter areas). More about these focal accents is shown in the research for the spatial envelope later on.

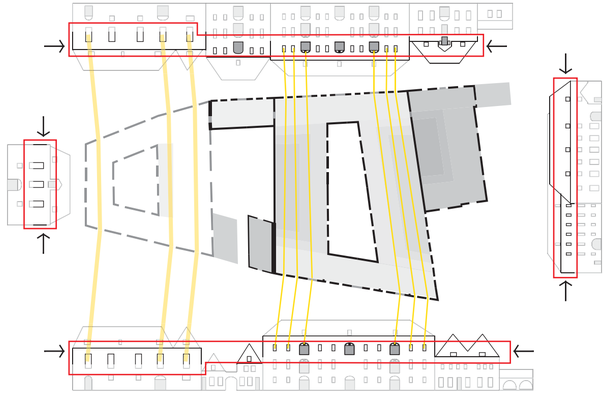


33. ground floor

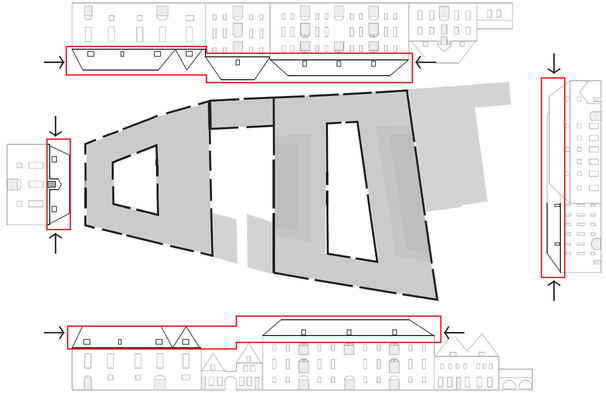


34. first floor

Frame to clarify the analyzed floor level
Lines to clarify windows opposite each other



35. second floor



36. third floor

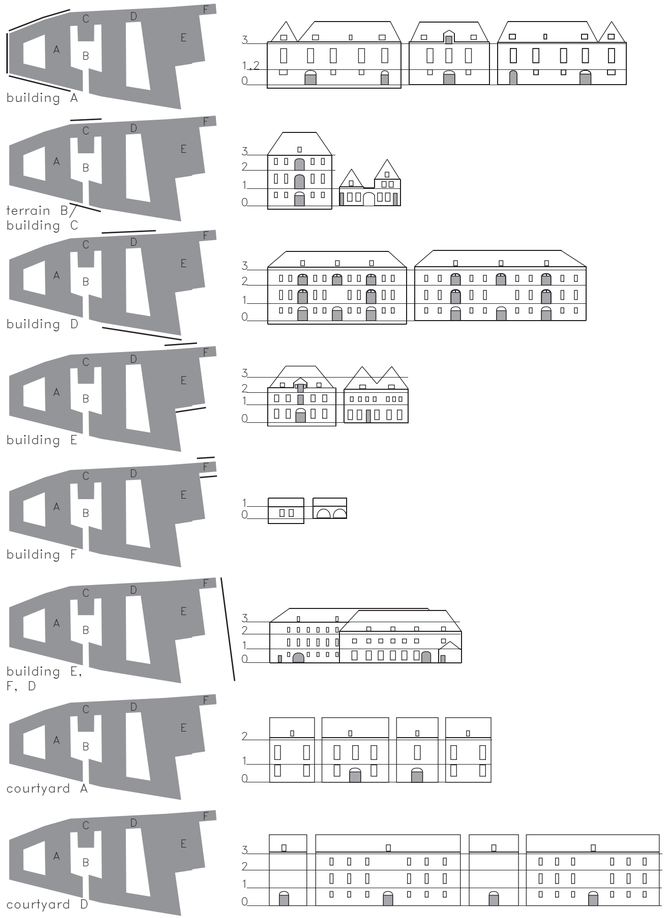
DAYLIGHT FILTRATION: PERCENTAGES

When calculating the amount of daylight entering the building, the different facades can be compared with each other. I did not take into account the courtyard facades; these spaces are relatively small so less daylight enters the interior through these facades. I wanted to find out if there is a relation between the percentage of openings and the size (noted above the roofs) of the floor plans. To find out what impact opening the doors could have I calculated the percentages for the situation without and with open doors.

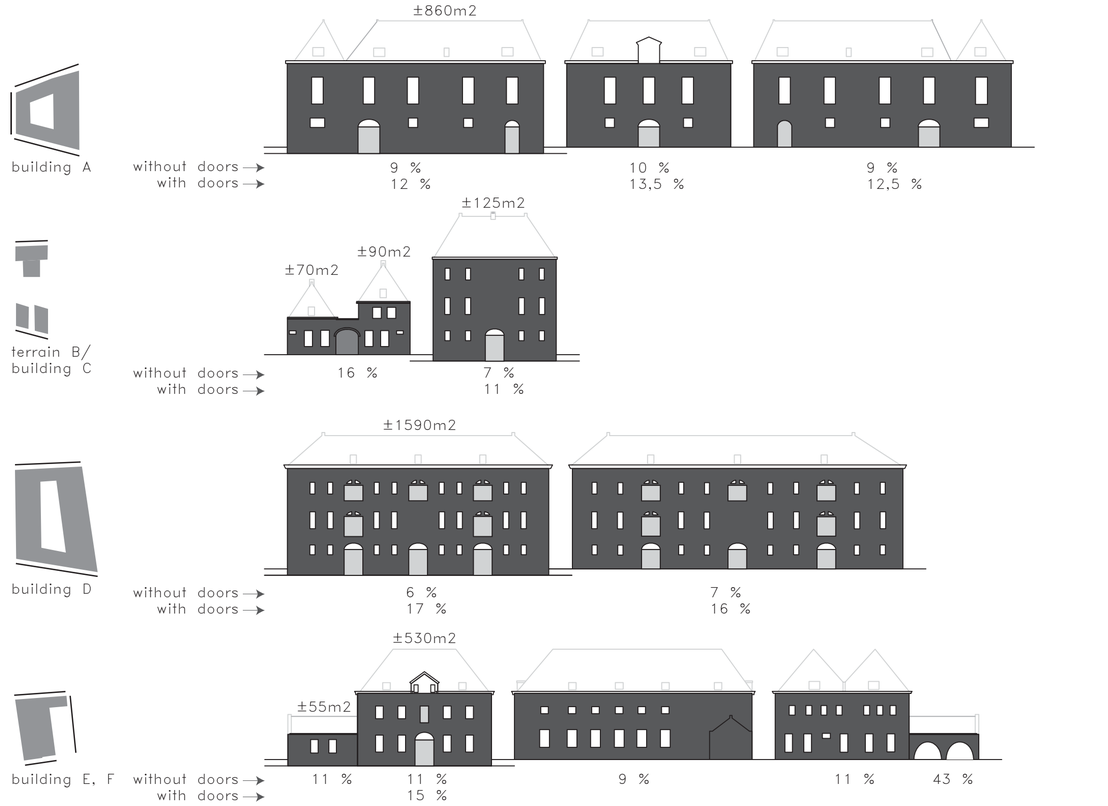
Building A: ± 860 m2
- ± 9,5 % openings without doors
- ± 13 % openings with doors

Building D: ± 1590 m2
- ± 6,5 % openings without doors
- ± 16,5 % openings with doors

A floor plan almost twice as large, has a smaller percentage of openings. The percentages change significantly when the doors are opened.



37. daylight filtration: percentages



Some of the facades differ in their opening percentages on each floor level. These percentages I calculated, again with and without open doors.

Building A, ground floor:
- Doors closed ± 5,5 %
- doors open ± 15 %

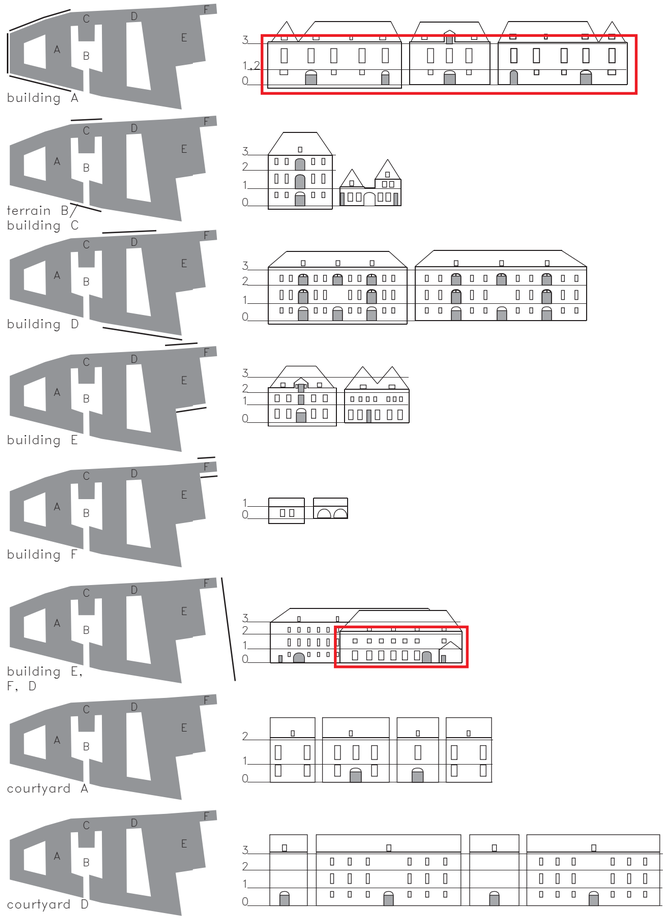
Building A, level:
- No doors ± 12 %

Building E, ground floor:
- doors closed ± 15,5 %
- doors open ± 18,5 %

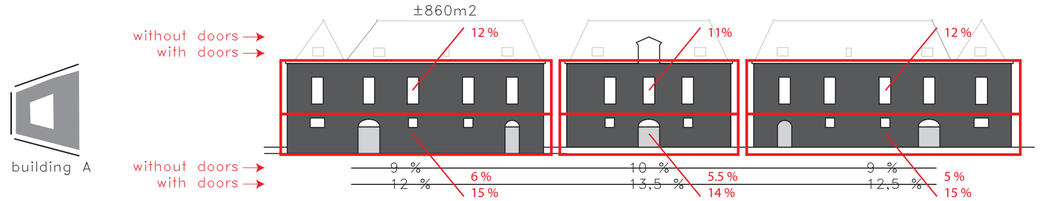
Building E, level:
- Doors closed ± 6,5 %
- doors open ± 8 %

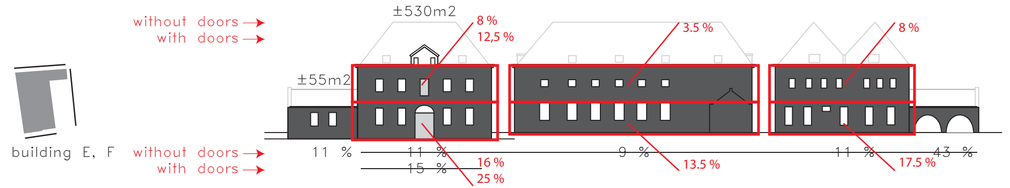
Building A has a more closed off ground floor, the plinth is higher. The higher level has a percentage of openings twice the amount of that of the ground floor, not taking into account the doors. With the doors however, the percentages differ less. Building E has a more open ground floor; the plinth of the building is low. The way the openings are situated in the lower level define in a way the character of the building.

High and small windows make the building look more introvert, the plinth is high. Larger windows that make you able to look inside make the building look more extrovert.



38. daylight filtration: percentages per floor level



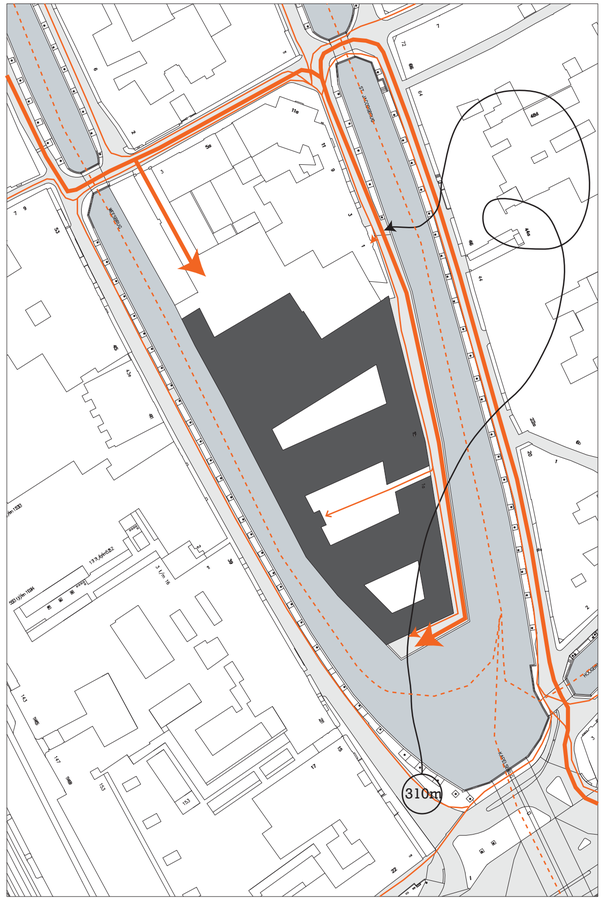


ROUTING

Routing used to be mainly over water. Via the canals artillery items could be transferred into the Armamentarium. Because the building was embraced by canals from three sides (east, south and west), this loading and unloading was very accessible.

Nowadays the building is not accessible anymore via the water, though it is possible; it is not the way of entering. People can enter the site by foot, but only on the north side.

The entrance in the north–east corner was the most used one during the time the Armamentarium was used as a museum. The black circle shows the very spot from where walking to the building while seeing it is the longest; 310 meters. If we want to enter the building from the *Zuidkolk*, we have to go around the canals to reach the main–entrance in the north–east corner. This natural separation of the water between the building and the streets makes the building (appear) less accessible.



39. situation 2013, no function

40. situation 17th – 19th century, artillery warehouse

by water – main route

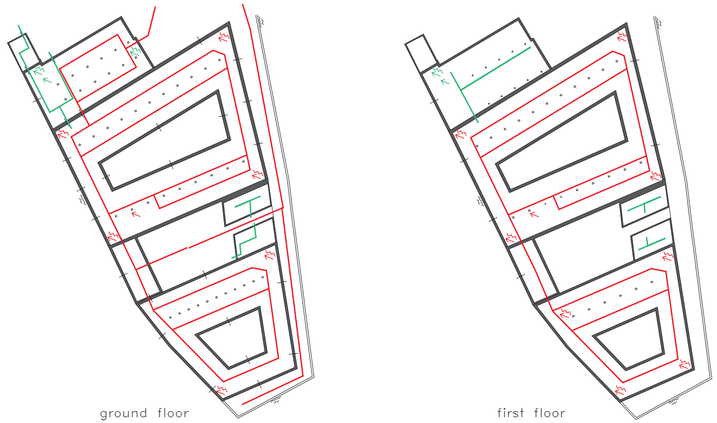
by water – fun route

by car

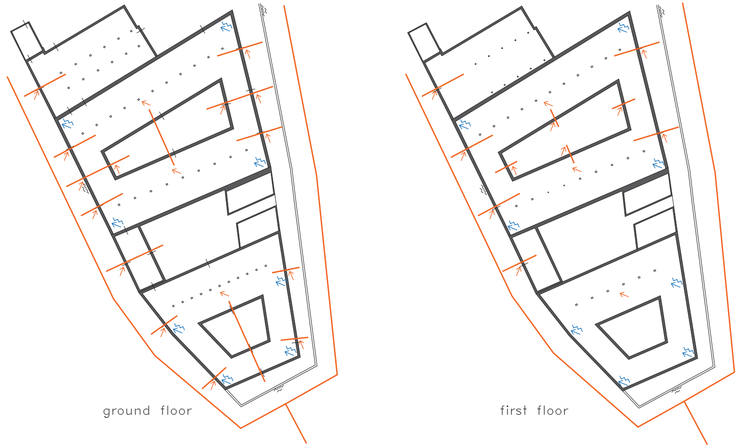
walking

no walking route!

If the routing in the (empty) complex now is compared to the routing of the complex when it functioned as a warehouse there are not a lot of similarities.
The warehouse did not have a large internal routing plan. It was more about getting inside the building with goods and after that storing them.
As the Armamentarium got its museum function, several objects were built inside the former free floor plans. The routing of the complex changed because of these additions. With this museum function, the building became accessible to the public. This required an internal routing through the buildings. With this routing the different building parts got connected. Because the buildings did not give a lot of opportunities to connect, it resulted in a slightly complicated routing plan. The empty building now, has a less clear routing because of all the new permanent additions the museum required.



41. situation 2013, no function



42. situation 17th – 19th century, artillery warehouse

image 41

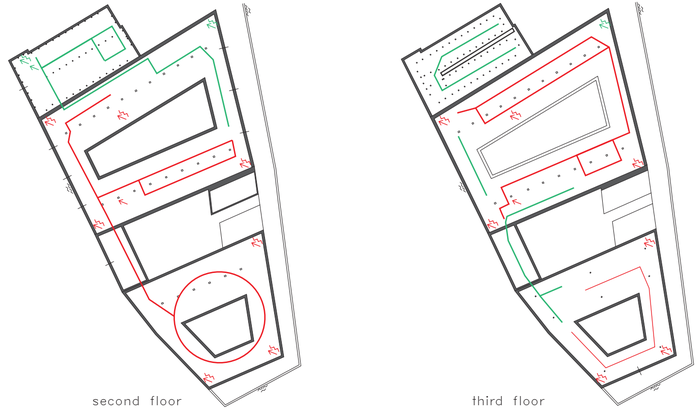
public
stairs
elevator

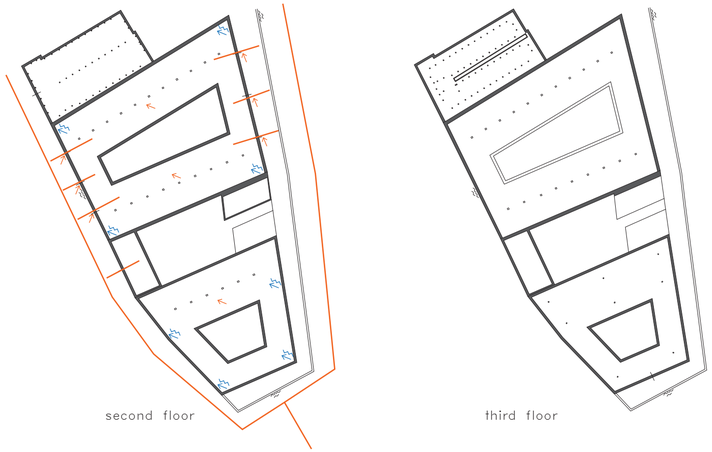
private
stairs
elevator

image 42

goods
horizontal movement
vertical movement

people
stairs





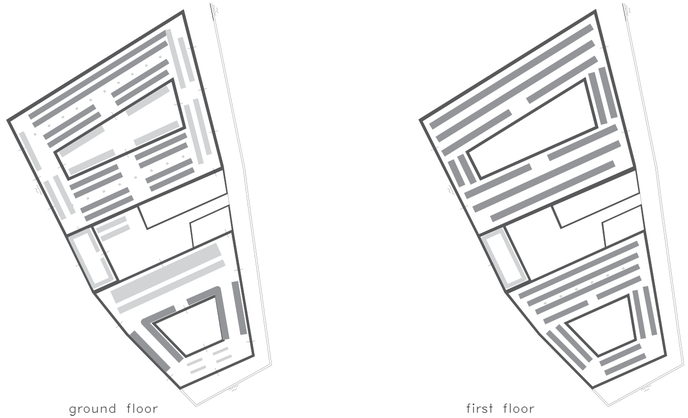
FUNCTION

To investigate the routing in 2013 I chose the museum function. This explains better which areas are open and which are not. The composition of the functions in the museum is different from that of the artillery warehouse. The purple areas are exposition areas. An interesting point is that the buildings 1602 and 1692 are kept open on the ground floor and on the first level (the most public areas). By that I mean that there are hardly any permanent walls or items placed, except for the sanitary cells/elevator shaft.

The composition of the functions in the Armamentarium as a warehouse was clear: straight axes of storage space with in between space for walking and bringing the items to its place. Unfortunately I could not find out what the function of the light grey areas is (see appendix for the reference). They are drawn different so they don't look like storage space. These areas are also seen outside of the building. It could be possible that these areas are indicated zones for packing and unpacking, since they are either close to the entries, or outside where there is daylight.

The comparison of the routings already showed a great change. The functions are much more fragmented in 2013 than they were in the 17th to 19th century.

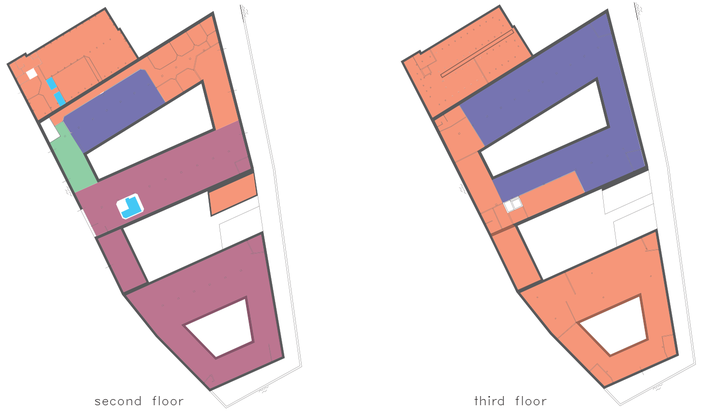
43. situation 2013, museum

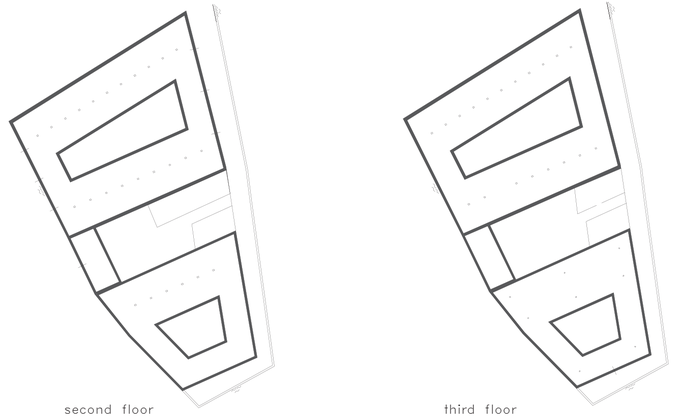


44. situation 17th – 19th century, artillery warehouse

image 43
- entrance
- exposition area
- public cafeteria
- sanitary
- library
- reading room
- courtyard
- private

image 44
- storage space
- unknown use





SOURCES:
Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Afbeeldingen (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)

ROUTING & FUNCTION

Function and routing have always been in close relation to each other. Together with the change of the function (from warehouse to museum) the routing changed drastically.

The concluding drawings here show that the routing of the warehouse was all about the connections between the inside and the outside. It was based on the transport of items, getting them inside the Armamentarium. The internal route was as clear as possible, and based on an easy transport of the items to their storage places.

The museum was a public function; this change resulted in a completely different way of using, and therefore walking through the building. The connection with the outside got reduced significantly, and the internal route got longer and more complicated. The route connected the different buildings with each other. Suddenly from the inside all buildings were approachable, and not from the outside.

With the building being emptied from all of the museum items, the floor plan seems to be freer, but the internal route remains complicated, as can be seen in image 46.

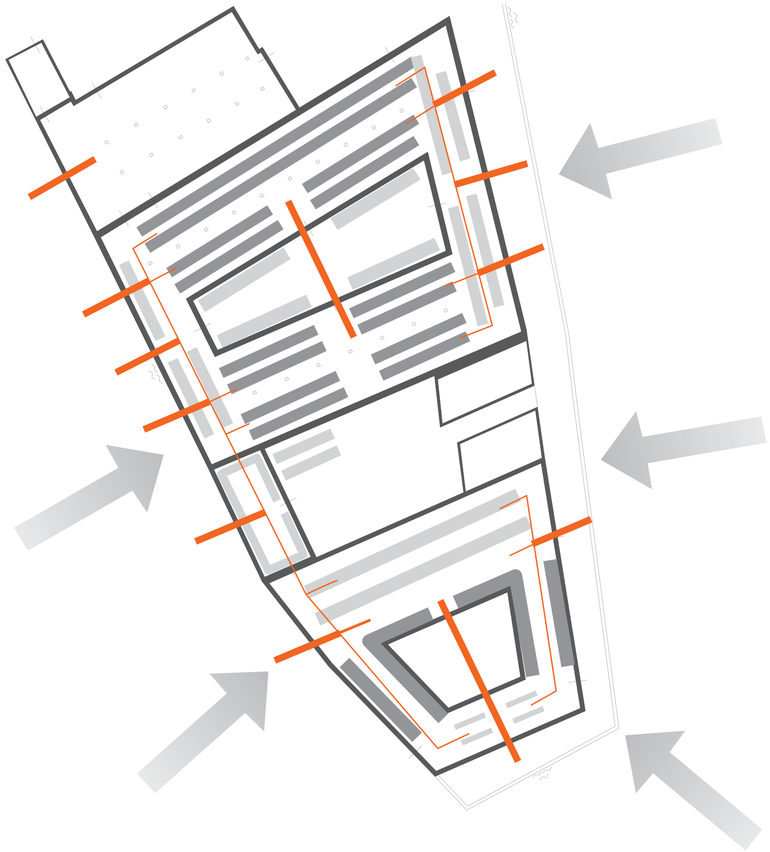


image 45
- storage space
- unknown use
- exposition space

image 46
- main routing
- sub routing

45. situation 17th – 19th century, artillery warehouse

46. situation 2013, no function

SOURCES:
Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Afbeeldingen (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)

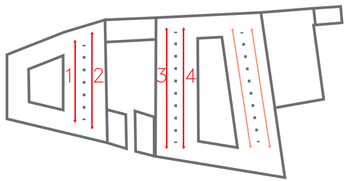
SPATIAL ENVELOPE

The images on this page show impressions of the spaces. The edges and contours of the surfaces are pointed out. Spatial boundaries can be located in the forms of walls, floors, ceilings and other major surfaces (Michel, 1996, page 102). Together these boundaries form the spatial envelope. Furthermore, Michel writes that a spatial envelope is best identified by the dominant boundaries that shape a clearly defined volume (page 103).
Building A (image 47) and building D (image 48) contain several elongated areas, in my opinion these are the spaces that are defined the most by their boundaries.
Looking at the impressions, I decided what boundaries form the spatial envelope:

- Floor and ceiling are horizontal boundaries
- Rows of columns together form boundaries
- Walls are vertical boundaries.

Also I decided what aspects have influence on the appearance of the surfaces of the boundaries:

- depth/shadow
- color/material
- focal accents
- breaks/ disturbing objects on a surface



space

boundaries

ground floor space 1

ground floor space 2

first floor space 1

first floor space 2

47. building A (1602)

space

boundaries

ground floor space 3

ground floor space 4

first floor space 3

first floor space 4

48. building D (1692)

For the interior spaces of building A the aspects are shown that have influence on the appearance of the surfaces for building A.

space

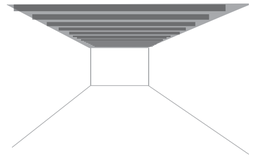
ground floor space 1

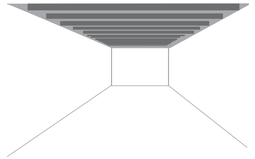
ground floor space 2

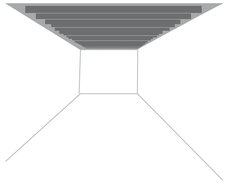
first floor space 1

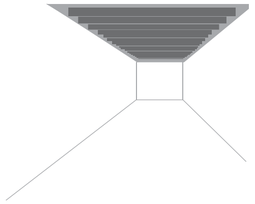
first floor space 2

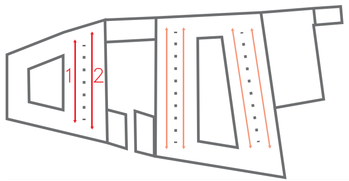
depth/shadow





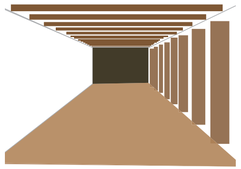


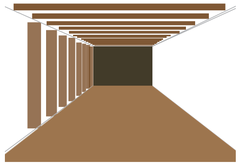


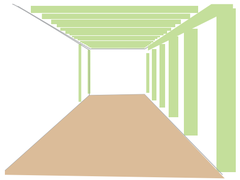


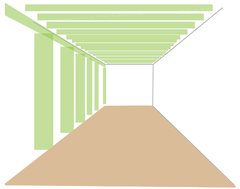
47. building A (1602)

color/material

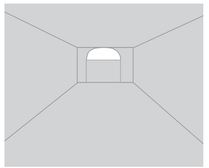


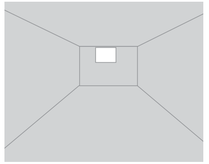


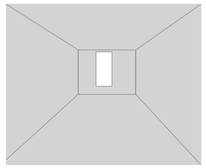


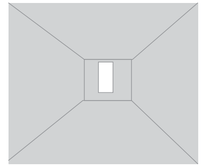


focal accents

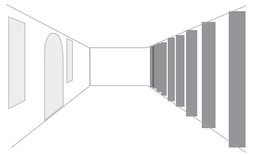


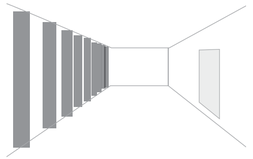


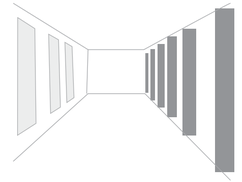


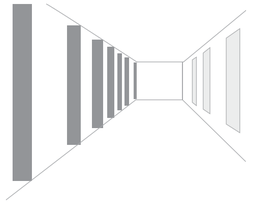


breaks









– depth/shadow:
When a texture has shadow, this shadow gives visual "weight". (Michel, 1996, page 40). The wooden beams in the ceiling create shadows. The constant repetition of the beams creates a constant relief of depth and shadow on the surfaces.

– color/material:
Colors and materials make the surfaces differ from each other. This is more obvious in image 47 and 48, where different colors are used. Every color attracts light in a different way, and is therefore brighter or less bright than others.

– focal accents:
Focal accents catch the eye when scanning the environment (Michel, 1996, page 62). Michel names a few things that could be focal accents: People, movement, brightness, high contrast, vivid color, strong pattern. The windows work as focal accents in my opinion. They possess brightness and are contrasting with the sometimes dark interior. I think only windows at the end of an elongated area work as focal accents, the others are more distracting than attracting (see next).

– breaks/disturbing objects:
Things like shadow, shape, or color patterns lying on the plane of a surface can interrupt a surface by creating edges. These edges compete with the edges of the boundaries (Michel, 1996, page 11, 12). In my opinion the windows are forming breaks, some more than others. In image 47 and 48 for example, the windows together form a more continuous composition. This I find less disturbing than the window/door composition in image 45 and 46, where there is no repetition of windows of the same size and type.

SOURCES:
MICHEL, L. 1996. LIGHT: The Shape of Space: designing with space and light, New York, Van Nostrand Reinhold.

CONCLUSION SHAPING SPACES

To define the quality of the space I analyzed several aspects that were of influence:

Material aspects:

– Boundaries that together form a spatial envelope: walls, ceiling, floor, rows of columns.

– Aspects of influence for the perception of the spatial envelope: depth and shadow, color and material, focal accents, breaks/ disturbing objects.

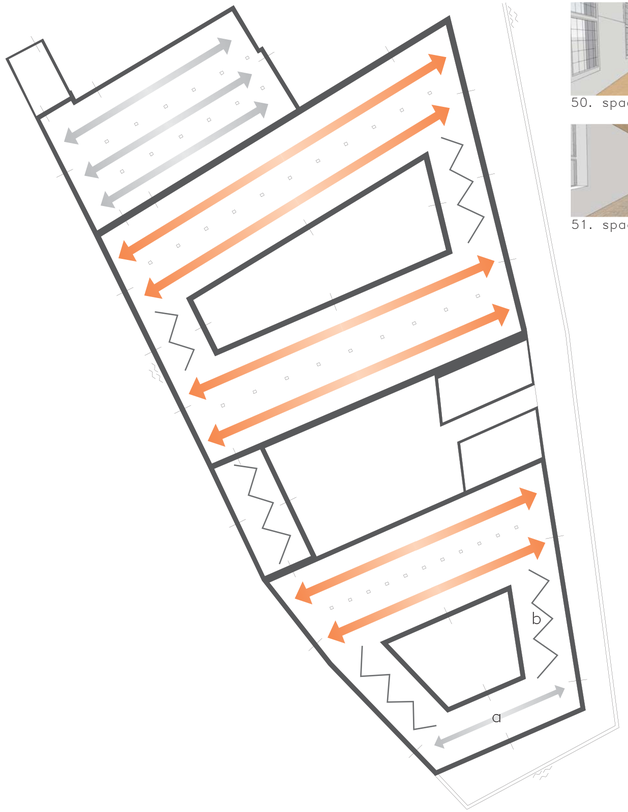
Immaterial aspects:

– The routing over time.

– The function over time.

Together for me these aspects define strong interior spaces pointed out with orange arrows in image 49. These spaces I find valuable. Material aspects are responsible for perceiving the space as it is. Immaterial aspects like function and routing have also been of great influence in shaping these elongated spaces.

The grey arrows are spaces that I think have less strong boundaries. I have no extensive analysis of these spaces, so that may not give me the right to draw conclusions for these spaces. However, images 50 and 51 already show that the spatial envelope here is less defined. The area is shorter and boundaries are less defined. The zigzag lines show areas that for me have the least strong boundaries, which are in my opinion the spaces in between the valuable interior spaces.

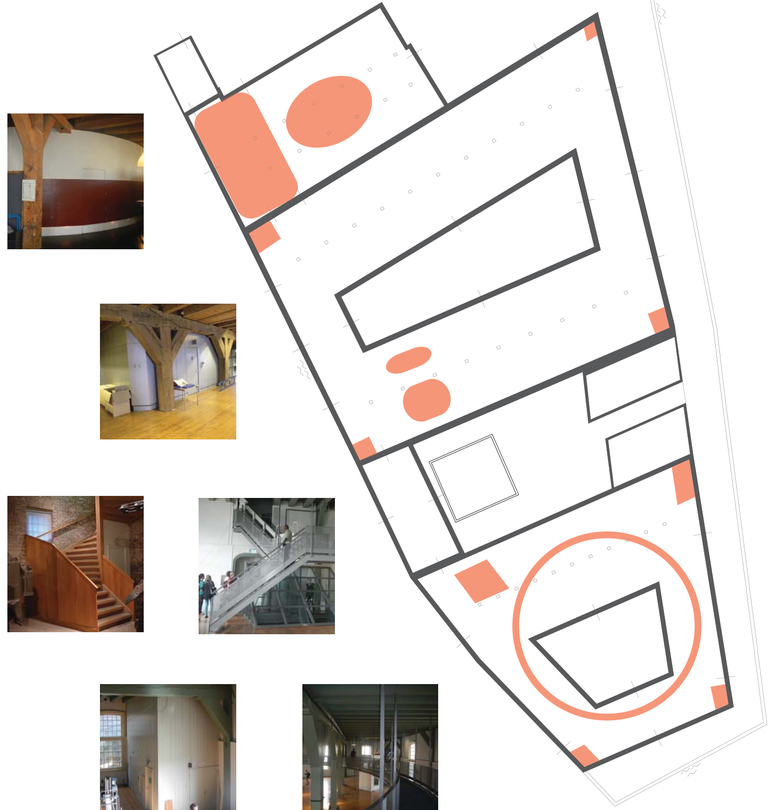


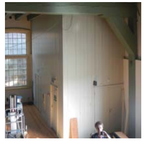
50. space a

51. space b

strong defined space
less strong defined space
space in between

49. defined interior spaces

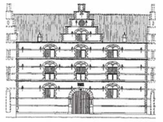
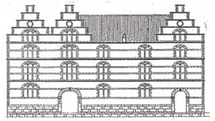
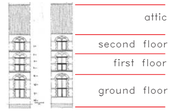
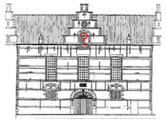
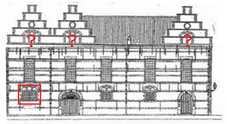
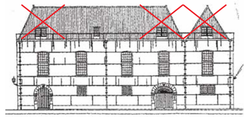
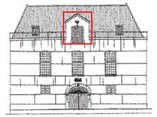
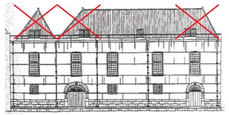
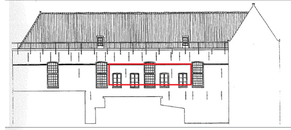
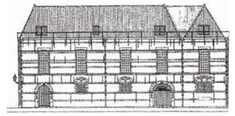
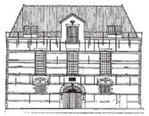
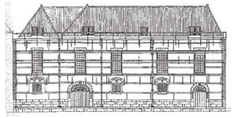
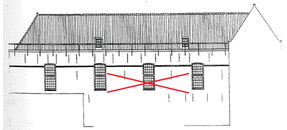
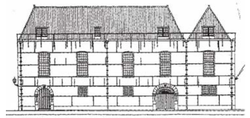
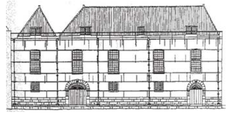
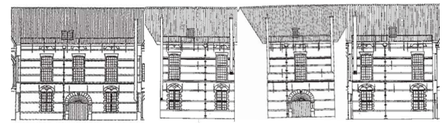
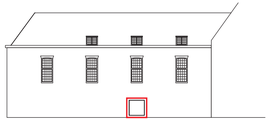
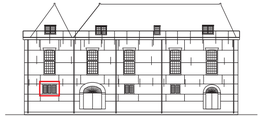
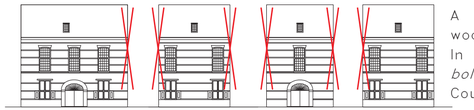




52. objects in the interior spaces

There are also objects within the interior spaces (not accents on the surfaces) that change the perception of the spatial envelope (image 52). I did not show these objects in my analysis. This does not mean that I already eliminated them. To find the quality of the interior spaces I used reduction drawings, in which I only show the aspect I am analyzing. I will either find a way to work with them without them affecting the quality of the space, or still eliminate them.

HISTORY FAÇADES BUILDING A (1602)

	north	east	south	west	courtyard	
1602						Renaissance style masonry with *speklagen* of natural stone Cross frame windows with wooden and/ or stone framing 3 Building layers Gables
1751						2 Building layers Attic floor was lowered 0,5 meter Placement of the current window framing (question marks mean that I am not sure how those windows looked like after the intervention) On the east and west facade two *bolkozijnen*, *drielichten* are replaced by *tweelichten*. Courtyard: 6 pane windows were placed in the cross-frames
1860–1890						Plastering of the facade Removal gables, without making changes to the roof structure Flemish facade with lifting hatch was placed on the south facade
1951						De-plastering of the facade, the renaissance decorative facade can be seen, but it is damaged. Already in 1934 the 4 small windows on the north facade were placed.
1976–1986						Renewal of the six pane windows in the courtyards Re-plastering of the facade The 4 small windows in the north facade are removed
2013						A large square window replaced a wooden door in the north facade. In the east and west facade the *bolkozijnen* are again *drielichten* Courtyard: the chimneys are removed

53. facades building A over time

SOURCES:
Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Afbeeldingen (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)

HISTORY TERRAIN B (1660) & FAÇADES CONNECTION BUILDING C (1692)

	north	east	south	west	east	west	
1660							Some small buildings present on the 1660 terrain are demolished and a small guardhouse and workplace building are built.
1692							The connection building is built.
1833							The workplace building gets lengthened up to the connection building; it also now exists out of an extra building layer. Two small windows are added to the east facade of the connection building.
1934							This year the roof of the workplace building is flattened.
1976–1986							The north facade of the small guardhouse is changed into the current composition; the large window in its west facade got replaced by two smaller windows. In the roof a window is placed. The workplace building is demolished and a new building is built in 18th century style. The two small windows and the chimney are removed in the east facade of the connection building. In the connection buildings' west facade a window in the first floor gate is removed and in front of all three gates glass is placed.
2013							The facades of the small guardhouse have only changed during 1976–1986. End of the 20th century the addition to the east façade of the connection building was made; the modern entrance building.

SOURCES:
Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Afbeeldingen (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)

54. terrain B & facades connection building C over time

HISTORY FAÇADES BUILDING D (1692)

55. facades building D over time

SOURCES:
Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Afbeeldingen (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)

Classical style façade: masonry with sharp edged openings.
The north facade was blind.
The south facade was blind. The workplace building with its roof was in front of this facade.
Courtyard: A lot of blind niches are present.

Window openings were made in the north facade.

In the courtyard the lower windows were enlarged.
In some of the blind niches glass is placed.

In 1834 the roof of the workplace building got lowered, this meant that openings could be made in the south facade.
During the Second World War doors were added to the north facade.

The two large doors in the north facade were removed and replaced by the current wooden door. The windows are replaced by windows similar to the windows above.
Openings in the south facade are closed off.
The glass above some of the gates in the east and west facade is replaced by the same *spinnekopramen* as in the others.
In some wooden doors glass is removed.
Courtyard: Some middle openings are closed.
The large dormers are replaced by smaller windows.
Chimneys are removed.

The east and west facade did not change significantly.
Overall, the classical style is maintained in all facades.

TECHNICAL ANALYSIS

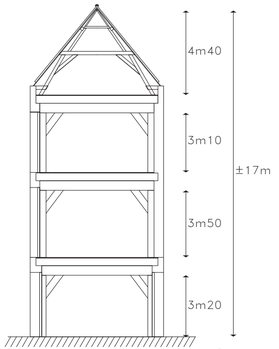
The technical part of the analysis handles an inventory on the structure, the structural elements, and the technical aspects that contribute to defining the interior spaces of the Armamentarium.
The following research question came up:

- What structural elements have influence on the appearance of the spatial boundaries?

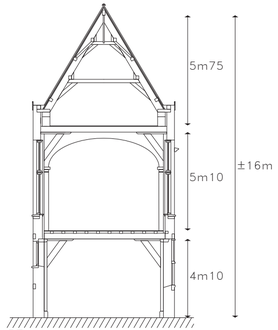
The technical analysis in a way complements the architectural analysis. However, here I will illustrate the structure of the building more detailed. This way I can emphasize arguments I have already introduced in the architectural analysis.
The analysis starts with an analysis on the overall measurements in the building. After this, the structure of the building is analyzed: the load bearing structure and the structure of floor beams. Here I will search for either disturbing or positive things in the structure that have influence on the boundaries of the spatial envelope. The last part zooms in a bit more on structural elements within the building. These analyses I can use later to value the building on its technical aspects.

MEASUREMENTS

The sections shown in images 56 and 57 give vertical measurements of the buildings A (1602), C (1692) and D (1692).



56. section building C & D
scale 1:200



57. section building A
scale 1:200

58. ground floor, scale 1:500

Image 58 gives all the horizontal measurements of the buildings. Some common measurements are present. For example in both building A and building D, the bay size is the same (marked orange). There is an exception in building D: the measurement from wall to wall on the east and west side (marked green).
To measure all these sizes I used the floor plans provided on blackboard. I traced the outlines and tried to do this as exact as possible, but this means that not all measurements are exact.

SOURCES:
Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Afbeeldingen (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)

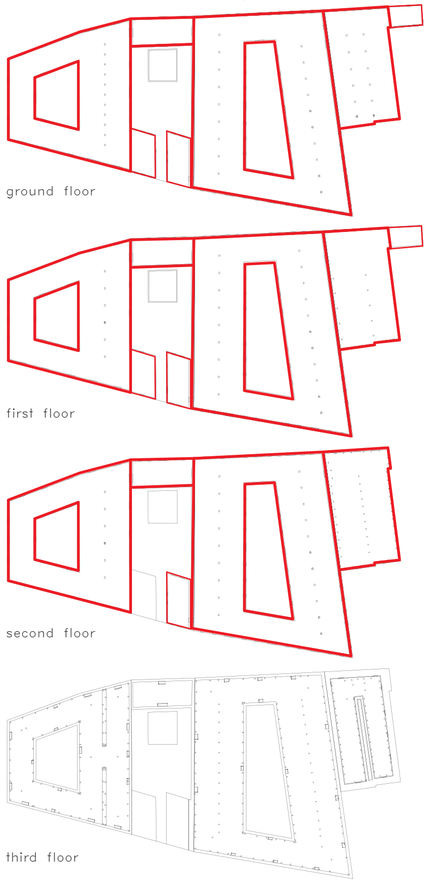
STRUCTURE

These drawings show the importance of the masonry shell as an important structural part of the building. This shell together with column rows (*standvinken*) carry the girders and with that the floor. These column rows in building A and D are situated on the line where two slopes of the roofs come together. These roof caps are equally sized, thus the column rows split the areas exactly in half. These areas have the same width in both building A and D (already illustrated in image 58). With this I would like to refer to the definition of the interior spaces I mentioned in the architectural analysis. The column rows not only work as surfaces, they also create areas with equal widths. Also, these column rows do not function as closed off surfaces, they are perforated surfaces. This makes it possible to see the column rows as objects in the middle of a larger spatial envelope, emphasizing the shape of the elongated interior spaces. In the image below the larger spatial envelope is shown.

Girders carry the floor. On the ground floor of building A the girders work together with joints (*kinderbalken)*, here the density of the girders is lower than in de rest of the building, where only girders are used.

In the longest directions of the buildings, the whole of wooden girders goes from wall to wall, east to west (see green arrows for direction). In the shorter directions you see the girders change direction (orange arrows). These girders together create a balanced surface, without distractions of girders moving directions (disturbing accents).

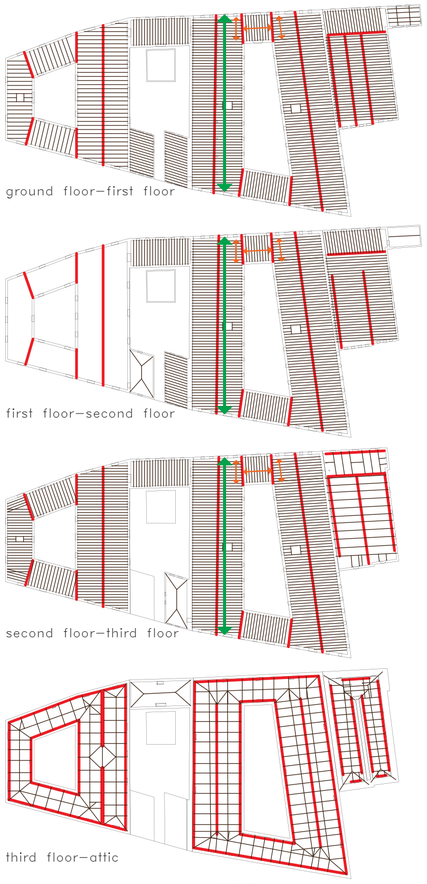
load bearing walls



59. structure of the Armamentarium

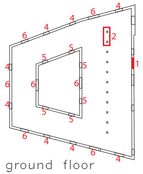
rows of columns

structure of beams

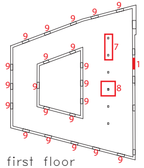


SOURCES:
Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Afbeeldingen (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)

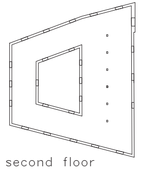
INVENTORY BUILDING A (1602)



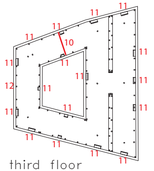
ground floor



first floor

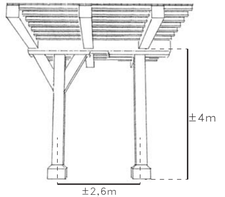


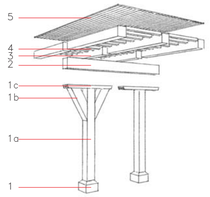
second floor



third floor

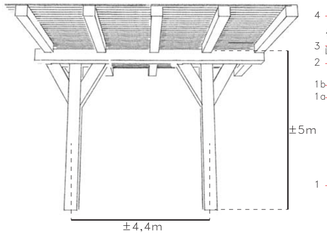
(supporting) structure

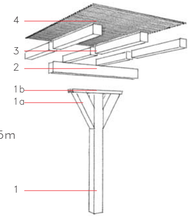




2
Wooden columns:
1. wooden column with:
stone base (a),
'korbeels' (b) and
'sleutelstuk' (c)
2. wooden 'onderslagbalk'
3. wooden girder
4. wooden joints ('kinderbalken')
5. wooden floor

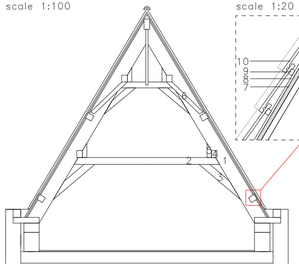
1
solid
masonry
wall



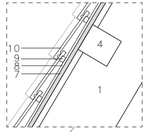


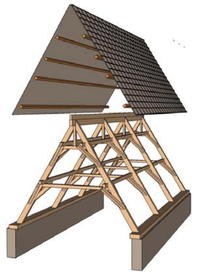
7,8
Wooden columns:
1. wooden column with:
'korbeels' (a) and
'sleutelstuk' (b)
2. wooden 'onderslagbalk'
3. wooden girders
4. wooden floor

scale 1:100



scale 1:20

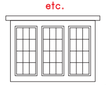


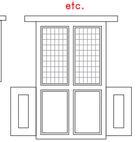


10
Roof structure:
1. 'spantbeen'
2. 'tussenbalk'
3. 'korbeel'
4. 'gording'
5. 'standzoontje'
6. 'windschoor'
7. 'dakbeschot'
8. 'tengel'
9. 'panlat'
10. 'dakpan'

60. inventory building A

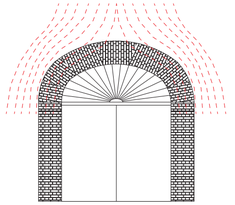
openings, scale 1:100



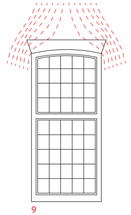


4
Wooden window framing
Single glazing
Wooden lintels

5
Stone cross-frame
window framing
Single glazing
Wooden shutters
Wooden lintels



6
Wooden gates with brick curved 'frame'
Sometimes a window with single glazing above doors.



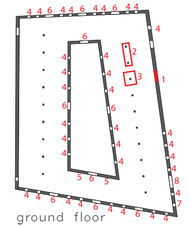
9
wooden window
framing with
single glazing
Brickwork lintels
transfer the load
to the walls

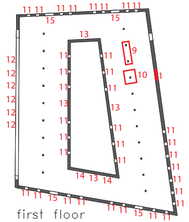
11
Wooden window framing
Single glazing
Little load bearing (wind, rain)

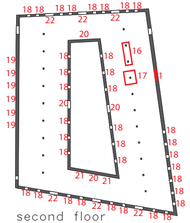
12
Wooden door
Wooden frame
Brickwork lintel

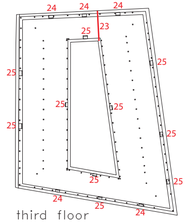
SOURCES:
Bouwhistorische documentatie: Armamentarium, Korte Geer 1
Delft, Afbeeldingen (Rijksgebouwendienst, Bureau
Rijksbouwmeester, augustus 1997)

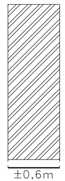
INVENTORY BUILDINGS C (1692) & D (1692)





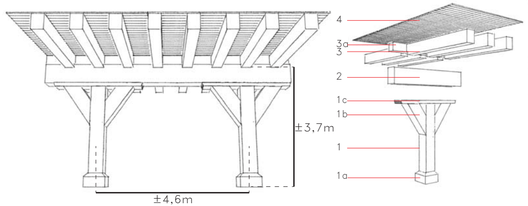




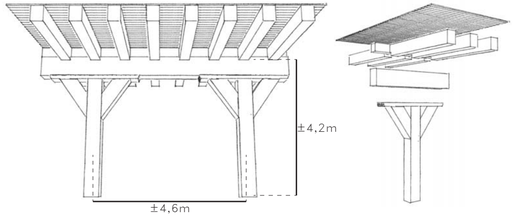


1
solid masonry wall

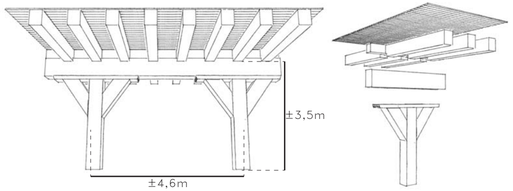
(supporting) structure



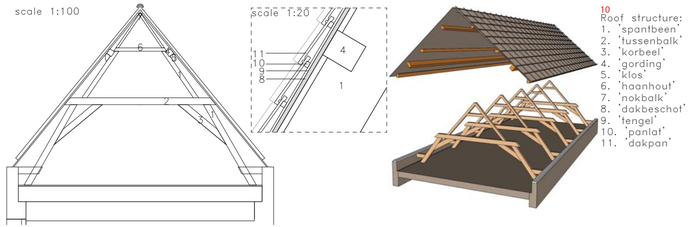
2,3
Wooden columns:
1. Wooden column with: stone base (a) 'korbeels' (b) and 'sleutelstuk' (c)
2. Wooden 'onderslagbalk'
3. Wooden beam with: girders (a)
4. Wooden floor



9, 10
Wooden columns, same as ground floor but without stone base.



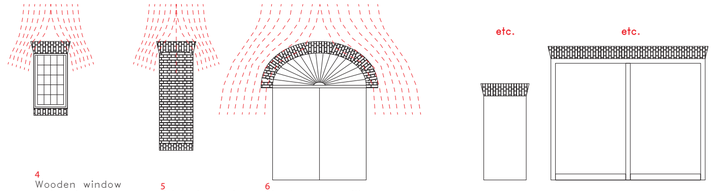
16, 17
Wooden columns, same as ground floor but without stone base.



10
Roof structure:
1. 'spantbeen'
2. 'tussenbalk'
3. 'korbeel'
4. 'gording'
5. 'klos'
6. 'haanhout'
7. 'nokbalk'
8. 'dakbeschot'
9. 'tengel'
10. 'panlat'
11. 'dakpan'

61. inventory buildings C & D

openings, scale 1:100

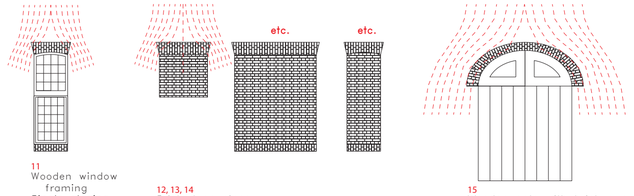


4
Wooden window framing
Single glazing
Masonry lintels

5
Bricked opening (blind niche)
Masonry lintels

6
Wooden gate with brick curved 'frame' and 'spinnekopraam' above doors.

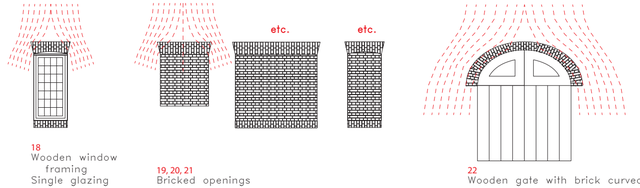
7,8
Wooden gates
Brick lintels



11
Wooden window framing
Single glazing
Masonry lintels

12, 13, 14
Bricked openings
Masonry lintels

15
Wooden gate with brick curved 'frame' and windows above doors.



18
Wooden window framing
Single glazing
Masonry lintels

19, 20, 21
Bricked openings
Masonry lintels

22
Wooden gate with brick curved 'frame' and windows above doors.

24,25
Wooden window framing
Single glazing
Little load bearing (wind, rain)

SOURCES:
Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Afbeeldingen (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)

VALUE ASSESSMENT

The value assessment exists out of two parts. The first part is a matrix in which aspects are placed opposite dimensions.

Dimensions:
- general historic value
- urban values
- architectural historic values
- construction historic values
- functional values

Aspects:
- location and context
- form and design
- spaces
- materials
- construction elements
- construction detailing
- tradition and techniques
- use and function

Every dimension has aspects that are important for that dimension. But not every aspect is important for every dimension, in this case a cross is placed. When a specific dimension only has two aspects that are filled in, this does not mean that this dimension is less important. Important aspects are marked green.

For the value assessment I used as references:

– Richtlijnen bouwhistorisch onderzoek

– The Nara grid: An evaluation scheme based on the Nara Document on Authenticity

Together with these two references, and my own thoughts about what for me was interesting to evaluate, I chose the dimensions and the aspects.

The second part is the value assessment in image, based on the information in the matrix. Drawings of facades and floor plans show how I value specific elements.

SOURCES:
Richtlijnen bouwhistorisch onderzoek (RCE, Stichting bouwhistorie Nederland, VNG, Atelier Rijksbouwmeester, RCD, april 2009)
The Nara grid: An evaluation scheme based on the Nara Document on Authenticity (Van Balen, 2008)

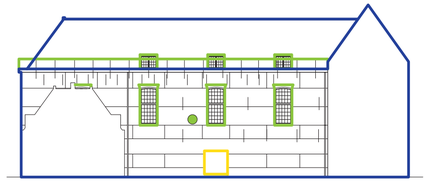
SCHEME

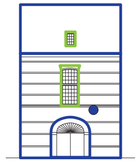
aspects ↓ / dimensions →	general historic values	urban values	architectural historic values	construction historic values	functional values
location and context	In 1602 the VOC was founded, this can be seen as the beginning of the Golden Age. The VOC was the largest overseas trading business in the world. It had its own army to protect and expand its position. Delft became an important city in terms of economical and military power, several warehouses were built here. In 1602 in Delft the Armamentarium was built as an artillery warehouse. Delft was well accessible via water. The complex was built on a prominent spot in the city, the spot where all traffic over water entered Delft.	Delft was one of the most important cities for the economical and military wealth of the country. Several military warehouses were located here. For the appearance of Delft the building was of importance; the city gave the building lot and offered to pay one third of the building costs. The lot has always been a prominent place in the city. The entrance for all traffic (over water) was in front of the building. It was the first building to see when entering the city. The surrounding canals were the first existing canals in Delft, the city expanded towards the northnand east. With changes over time in the traffic situation, the place became of less significance for the city. A lot of traffic over land passes Delft and the 'Zuidkolk'. From here there is a wide view on the building.	X inapplicable	X inapplicable	The location and its context was of major importance for the function of the building. The building needed this location with its great connections over water and the accessibility via the canals into the building. The building also needed a city like Delft, powerfull in its economical and militairy wellbeing and its size.
form and design	The Armamentarium is built with a thick and solid shell of masonry, together with a more light wooden floor– and roof construction with tiles, a typical construction for these warehouses. Often warehouses were small and deep. The Armamentarium followed the shape of the lot, and therefore exists out of trapezium shapes. Also it has inner courtyards, less common in warehouses. The building had, just like other typical warehouses, facades ending in tops (gables) with large openings with shutters and lifting beams serving for the transport of items. In 1860–90 the gables were removed, one, on the south facade of building A, got replaced by a flemish gable.	X inapplicable	The Armamentarium exists out of large, monumental buildings. Building 1602 was built in a renaissance style, which can still be seen in the facades of the courtyard. The use of renaissance style was very common in the beginning of the 17th century. Now the renaissance facade is hidden under a layer of plaster. Due to several other interventions both in the facade as the interior, the appearance of the typical renaissance style faded. Building 1692 and the connection building were built in classical style. Also this style was very common at the time. The classical style in the facades is still visible today. Little interventions were made on the facades facing the canals.	The building overall has a trapezium shape. The two largest buildings (1602 and 1692) have inner courtyards. Besides the walls as outer load bearing shell, inside the building rows of wooden columns ('standvinken') are placed for load bearing. The rows are placed there, where the slopes of two roofs meet. The roof caps of the 1602 and 1692 buildings have the same measurements from wall to wall. The column rows therefore split these areas in two equally wide spaces. The form of the building is mostly based on the shape of the peninsula, it follows the borders of this lot. The building is built as large as possible.	The form of the building follows the form of the peninsula, so it is built as large as possible. The building needed to be large, to have the possibility to store great amounts of artillery items.
spaces	Common are the elongated spaces in the warehouses, to have an optimal use of storage space. The Armamentarium existed out of elongated interior spaces. These small and deep spaces were used for storage. The less elongated spaces were, besides as storage space, also used as transport zones.	X inapplicable	The colors inside have influence on the interior spaces. The wooden girders create darker surfaces with shadows. The stone or wooden floors and the plastered facades also create surfaces. Because all these surfaces have different colors, or the same color but different densities, they accentuate their borders. These borders create several spaces in the building.	Some construction elements have influence on the interior space. The columns work together as vertical surfaces, just like the walls, the ceilings and floors work as horizontal planes. These planes are visual borders, and create several spaces inside the building.	Spaces are either elongated storage spaces, or spaces in between these elongated spaces, used for storage, transporting items and connecting the buildings with each other.
materials	X inapplicable	X inapplicable	The facade of building 1602 has masonry walls with natural stone 'spieklagen', wooden and/or stone window framing, single glazing and wooden gates. The interior walls are plastered. On the first floor also the 'standvinken' and window frames are painted. A lot of the original materials are covered. The 1692 buildings have masonry walls, wooden window framing, single glazing and wooden gates. In the interior the rough materials are visible. The outside brick floor continues on the inside. Floors on the levels in the whole building are wooden.	The materials used for construction are wood, bricks and stone: – Wooden columns, sometimes with a stone base. – Wooden roof structures. – 400 to 600 mm thick, solid masonry walls.	X inapplicable
construction elements	X inapplicable	X inapplicable	Construction elements in the whole building are: – the wooden 'standvinken', working together with a large beam for the support of many wooden girders, who together with the 'Kinderbalken' support the wooden floors. – The wooden roof construction of 'driehoeksgebinten' with two beams in between and abutments. – 400 to 600mm thick, solid masonry walls, which support the wooden girders and the roof construction.	Construction elements in the whole building are: – Wooden 'standvinken' under a large beam to support wooden girders (with 'kinderbalken' in between in building A), that support wooden floors. – The wooden 'driehoeksgebinten' roof construction with two beams in between and abutments. – 400 to 600mm thick, solid masonry walls, that support the girders and the roof construction.	The use and function of the building asked for a specific arrangement of construction elements. Long, deep and open spaces were required for both the transport as the storage of items. Construction could not be a restrictive aspect in this use.
construction detailing	X inapplicable	X inapplicable	Interesting details are: – The gutter in between the two roofs for the drainage of rainwater in building 1602, the 'zakgoot'. – When the attic floor of building 1602 was lowered, changes were made to connect it with the old roof construction. The old roof construction was not changed. – Several typical details like the connection between girders and wall, and the roof construction.	Interesting details are: – The gutters ('zakgoot') in between two roofs for drainage of rainwater. – When the building 1602's attic floor was lowered 0.5m, the old roof construction got connected with the new lower floorlevel through slight changes. – Several typical details like the girders–wall connection, and the roof construction.	X inapplicable
tradition and techniques	Typical is the thick and solid masonry shell, the lighter wooden floor– and roof construction and the tiled roof. Also typical is the flemish gable on the south facade of building A, which was placed when all the original gables were removed. Other typical elements are the large openings with shutters and at some places still the lifting beams in the facade. They represent the tradition of the transport of items into the warehouses.	X inapplicable	The traditional facades in renaissance and classical style are still partly present. The facade of the 1602 building undertook the most changes: plastering, deplastering, plastering again, removal of gables, replacing the south one with a flemish one, removal of one floor level and with that adding new windows. These historical layers are visible in different parts. The facade of the 1692 buildings did not change much, most of the inner courtyards' openings were removed and replaced by masonry. The modest and detached architecture with its bare surfaces, sharp cutted window frames and only decoration in the middle is very traditional. The facades of the VOC warehouse is changed a lot over time, the west facade has some original window framing left.	Traditional warehouses were small and deep (approximately 30 meters). The lifting beams are traditional, though in Buildig 1602 placed during later interventions.	X inapplicable
use and function	The storage function for military items was common in the 17th to 19th century. It was built in 1602, when the VOC was founded and the Golden Age started. Therefore it can be seen as a pioneer in its kind. The museum function it had untill 2013 was appropriate regarding the military theme. The use however changed drastically, the typical routing that was present in the warehouse function was exchanged for a complicated route through all buildings.	The location of the Armamentarium regarding its use and function was of major importance. The storage of items needed good possibilities for loading and unloading. With traffic only over water, connections to surrounding cities and the sea over water was required.	The use and function did not ask for a specific architectural style in means of facades, ornaments etc. The city however, wanted a warehouse on this prominent spot, therefore it is likely that the few ornaments the building has were added to obtain a building of more distinction.	The use and function of the building asked for a specific arrangement of construction elements. Long, deep and open spaces were required for both the transport as the storage of items. Construction could not be a restrictive aspect in this use.	X inapplicable

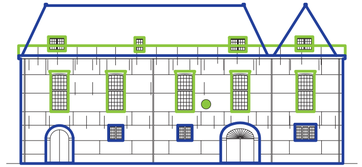
DRAWINGS

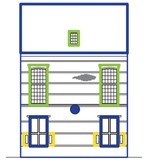
Building A (1602), outer facades:
The plaster layer has a positive value because it protects the masonry. When removing the plaster, damage will be done to the bricks. This was the case already when the plaster layer was removed in 1951.

Building A (1602), courtyard:
The original appearance of the facade of the 1602 building is still visible in the courtyard.

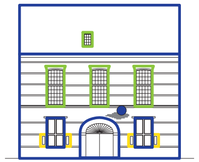

North

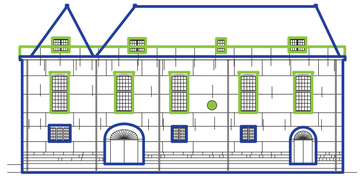

North

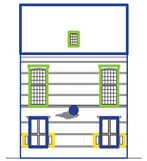

East


East


South


South


West


West

high monument values
positive monument values
indifferent monument values
monument values ceiling/roof
monument values exterior/interior aspects

62. outer facades building A

63. outer facades building A


North

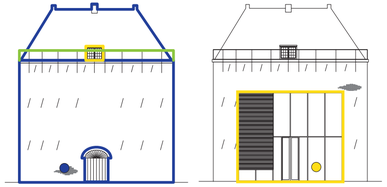

East


South


West

Guard houses terrain B, facades:
The masonry of the small guardhouse is still original, except where old windows have been removed and new bricks had to be added.
The workplace building has been demolished completely in 1976–86; therefore the masonry does not have a high value. The shape of the east façade however reminds of the shape of the old guardhouse.

Connection building C (1692), facades:
The connection building has original masonry. The entrance building in front has no valuable exterior aspects.


East


West

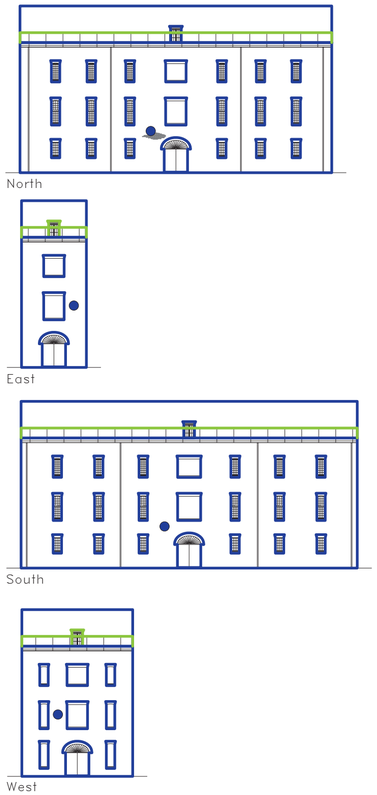
64. outer facades guardhouses

63. outer facades building C

Building D (1692), outer facades
The original masonry has never been covered; all of the original materials are present and visible.
The original sculpture in a blind niche in the center of the east facade dates from 1692. It represents the weapon of Holland.
The original ornament in the center of the west facade dates from 1692. It represents the weapon of Holland together with 4 family weapons.

high monument values
positive monument values
indifferent monument values
monument values ceiling/roof
monument values exterior/interior aspects

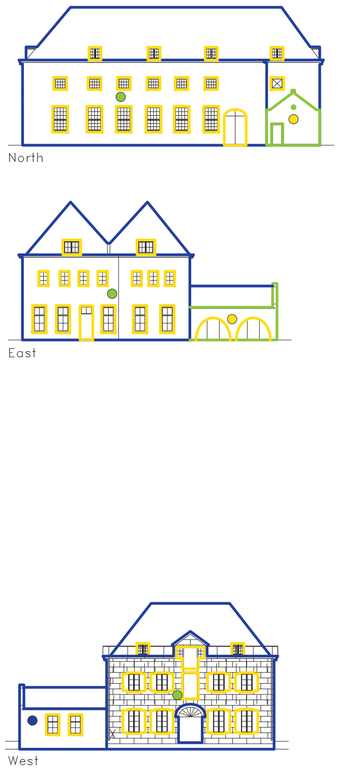
66. outer facades building D



67. facades courtyard building D

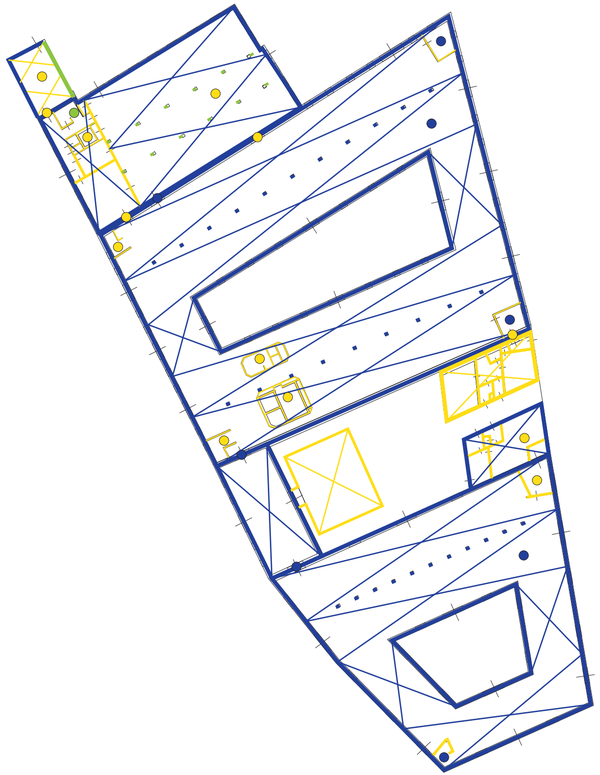
Building D (1692), facades courtyard:
The original masonry has never been covered; all of the original materials are present and visible.

Buildings E & F, facades:
The original masonry of the VOC building is covered by a layer of plaster; this layer has never been removed. It is not known when this layer was applied.
The west facade of the oil smokery is original; this is a part of the old wall that was the border between the terrain of the Armamentarium and the water/other building properties. The other two walls have been replaced later.



68. facades buildings E&F

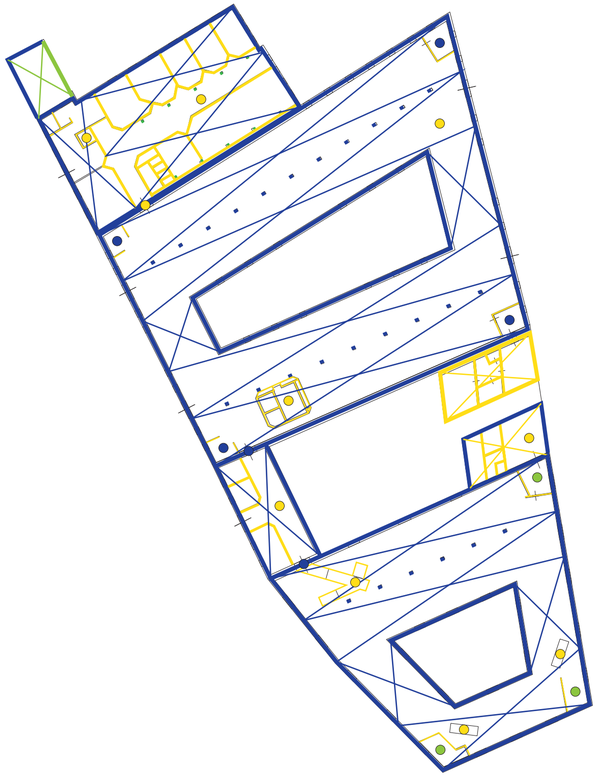
Ground floor:
Building A: The pavers on the floor date back to either 1602 or 1751.
Guard houses: All interior aspects are modern.
Connection building C: Facades might have been plastered originally.
Building D: The pavers on the floor probably date back to 1837.
All interior walls were originally plastered.
Building E: The floor is modern (including the sunken theatre floor). The interior walls are plastered, not original.
An original (1826) spiral staircase is present next to building F.
Building F: The floor tiles are modern. All interior walls are plastered, not original.



high monument values
positive monument values
indifferent monument values
monument values ceiling/roof
monument values exterior/interior aspects

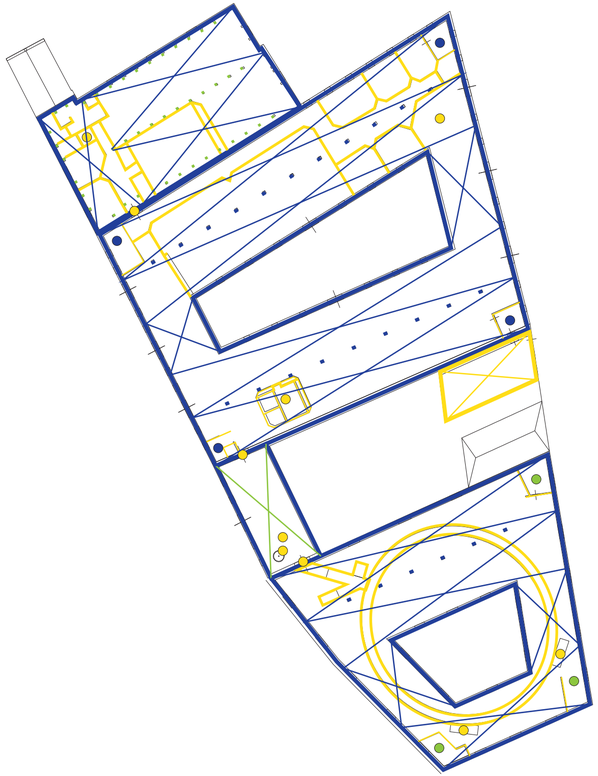
69. ground floor

First floor:
Building A: The wooden floor is modern, approximately 20 cm beneath are parts of the original wooden floor from 1602.
All staircases are probably from 1751.
Guard houses: All interior aspects are modern, including the roof.
Connection building C: The floor is modern. Facades might have been plastered originally.
Building D: Underneath the modern wooden floor are parts of the 1837 floor and maybe even the 1692 floor.
All interior walls were plastered originally.
Building E: The floor is modern. An original (1826) spiral staircase is present next to building F.



70. first floor

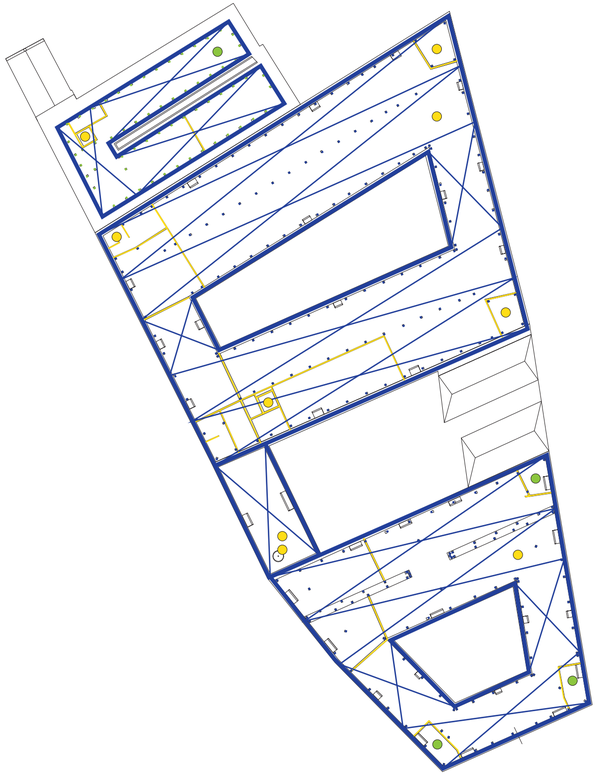
Second floor:
Connection building C: The floor is modern.
Building D: Underneath the modern wooden floor are parts of the 1837 floor and maybe even the 1692 floor. All interior walls were originally plastered.
Building E: All interior walls are plastered, not original.



high monument values
positive monument values
indifferent monument values
monument values ceiling/roof
monument values exterior/interior aspects

71. second floor

Third floor:
Building A: The wooden floor is modern, beneath this floor are parts of the old wooden floor from 1602.
Connection building C: The floor is modern.
Building D: Underneath the modern wooden floor are parts of the 1837 floor and maybe even the 1692 floor.
Building E: The floor may contain original parts.



72. third floor

CONCLUSIONS

The conclusion of the research provides a link between the outcome of the analysis and the starting points of the design. The research forms the base of the graduation project. The true values of the Armamentarium came forth out of this research. In this conclusion the research questions are concisely answered.

URBAN ANALYSIS

- What is the relation between the growth of the city and the meaning of the Armamentarium within this city?

The Armamentarium takes up a prominent spot in the city. It was the entrance of Delft. Delft grew all around this spot. A big change in the meaning of the Armamentarium within the city came with the shift from traffic over water to traffic over land. Where traffic used to pass the building over water directly, it now passes by over a freeway, not directly passing the building. Nowadays the Armamentarium has a clear visual connection with the *Zuidkolk* on the south. No strong connection has grown between the Armamentarium and the west part (railway zone, freeway) outside of the city center.

- What is the position of the Armamentarium within the diverse program of the city?

The diverse program of the city can be reflected upon the Armamentarium. A physical connection can be made both with the creative and public program of the city center, as well as with the more private and intimate program of the city. The connection with the south (*Zuidkolk*, *Schie-oevers*) is purely visual. The Armamentarium and the city have no strong visual and physical connection with the technical university of Delft. A physical connection in the new function is therefore not feasible.

ARCHITECTURAL ANALYSIS

- How, and by which aspects, are spaces shaped inside the building?

The interior spaces of the Armamentarium are defined by material and immaterial aspects. For me, valuable interior spaces are shaped through spatial boundaries and the routing and function the building had in history. The spatial boundaries create some clear elongated areas. The function and routing were in close relation to each other, they caused a clear and rectilinear layout of the floor plans. Objects on the surfaces of the boundaries or within the interior space can strengthen or weaken the perception of the space.

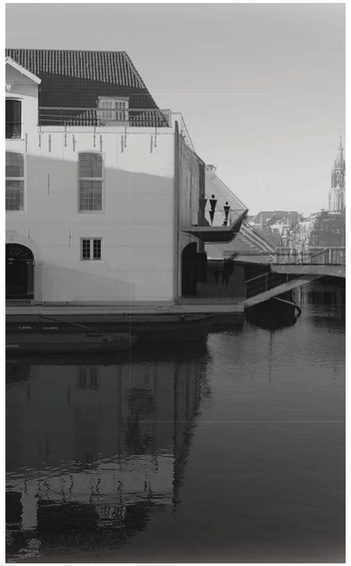
TECHNICAL ANALYSIS

- What structural elements have influence on the appearance of the spatial boundaries?

In the architectural analysis I stated that the column rows work as surfaces, they are one of the boundaries that form the spatial envelope (the interior space). Analyzing the structure of the building I found out that the column rows can also work as objects within the interior space, emphasizing the shape of a larger spatial envelope. This I stated because the surface of columns is not closed off, it exists out of a repetition of vertical elements with nothing (air) in between them. They split this larger spatial envelope exactly in half and can therefore in my opinion emphasize the shape of the interior space.

THE ARMAMENTARIUM: A REFLECTION OF DELFT

A creative mix of functions within valuable interior spaces



GRADUATION REPORT

K.S. (Kelly) de Jong, 1352717

Mentor architecture: Nol Hermkens
Mentor building technology: Wido Quist

TU Delft, Studio RMIT
Graduation date: 04-07-2014

PROBLEM STATEMENT

The Armamentarium is not built as one building; it exists out of various buildings put together. Together these buildings do not give a clear overview of the complex as a total.
The complex is divided into buildings, and the buildings are again divided into several interior spaces.

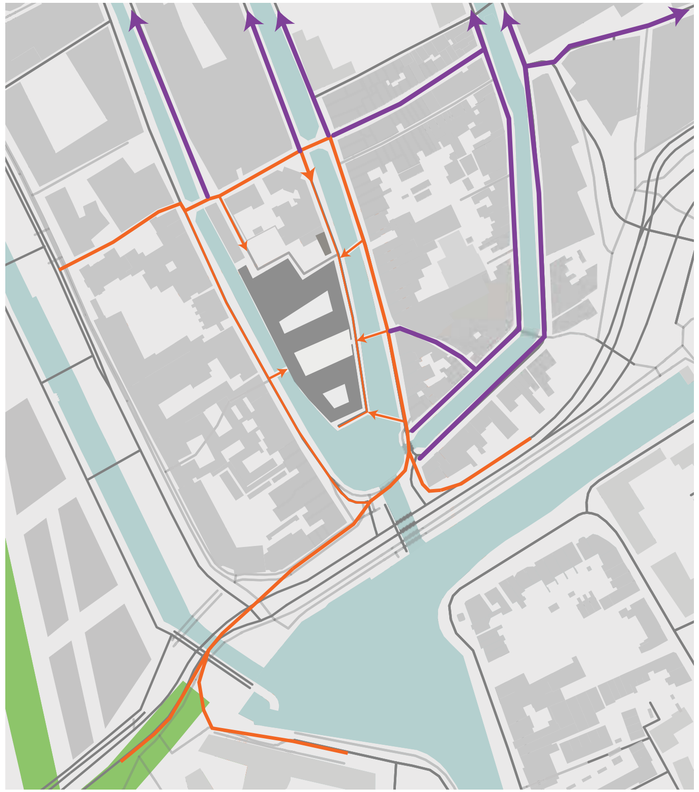
GOAL

The new program is a reflection of the creative program of the city center. Together with the shapes of the interior spaces the interventions create a harmonious arrangement.

The goal is achieved whilst on the one hand connecting the individual buildings with each other, and on the other hand embracing the fact that the buildings work as individuals.

ACCESSIBILITY

The masterplan makes the accessibility between the Armamentarium and the direct surroundings better. the complex will appear more accessible and therefor invites the passerby to enter the peninsula.



building
city center

A REFLECTION OF DELFT: CREATIVITY & HISTORY

market

Bazaar, Beverwijk

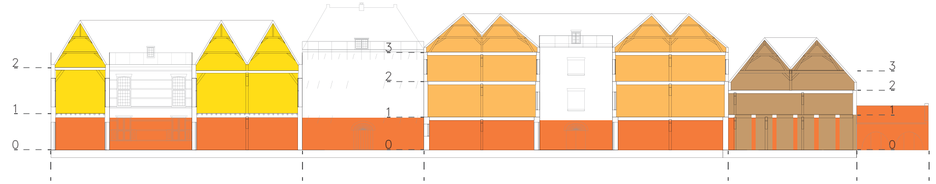
Horeca & conference center

workshops

public archive Delft

De horecafabriek, Utrech

UNITY
VERSUS
INDIVIDUALS



ground floor

upper floors

market
horeca/ conference
workshop
public archive

The chosen program one the one hand refers to the past, and on the other hand to the present.
The market function refers to the VOC and its history of trading goods and spices. The other buildings with their functions refer to the current creative program of the city center.
An important decision in my design was to divide the complex into a merging ground floor layer and a layer of individuals on the levels. The market theme does not only bring the several buildings together, but also makes a connection between the complex and its surroundings. The individual functions on the higher levels are just as public, but in a more tranquil way.

The main focus of the exterior intervention was making the Armamentarium accessible and inviting. A lifted street triggers to visit, but also takes care of entering the higher levels and a shelter on the ground floor. The street may also appear like a ribbon, embracing the individual buildings and therefore enhancing the fact that the ground floor is now one merging layer.
An important restriction I gave myself was to keep the front facade: the Zuidkolk facade, free of objects. This was the water reflects the front facade and makes the Armamentarium look even more grand and monumental.

STARTING POINTS

OPEN & PUBLIC
VERSUS
CLOSED & LOGISTIC

VISIBLE & INVITING

ROUTING

EXTERIOR INTERVENTION: LIFTED STREET

The water is free to reflect the image of the front facade, nevertheless the lifted street is visible and inviting.

MARKET

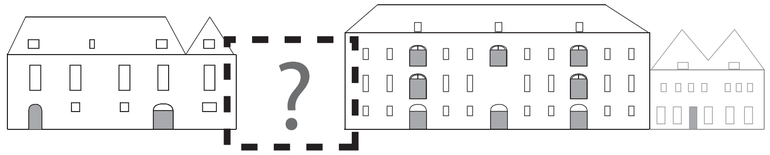
public route
logistic route
ground floor

east facade: public

west facade: logistic

As written on the previous page, the market function refers to the VOC past. Not only in function, but also in use. In the floor plan therefore the routing of the artillery warehouse is brought back. As an extra addition I created a public and a logistic side: the public side on the more open east side, and the logistic side on the more closed off west side. The logistic theme of the market is exploited some more by adding a route for loading and unloading on the outside of the building. This way all doors will be used again, just like in history.

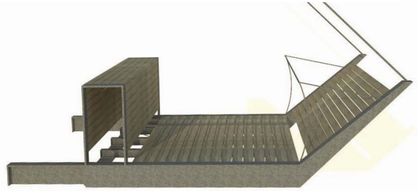
To make the routing as clear as possible, the two small guardhouses are demolished. A new facade is necessary to maintain the ensemble of individual facades, which for me was a valuable gicen. With the new facade a new and stronger connection is made with the direct surroundings of the complex. The old gate that was present in between the two guardhouses is brought back in a modern way. The new facade also makes it possible to continue the hanging of the lifted street.

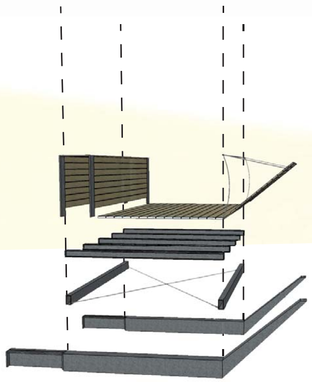


elimination guard houses: new addition

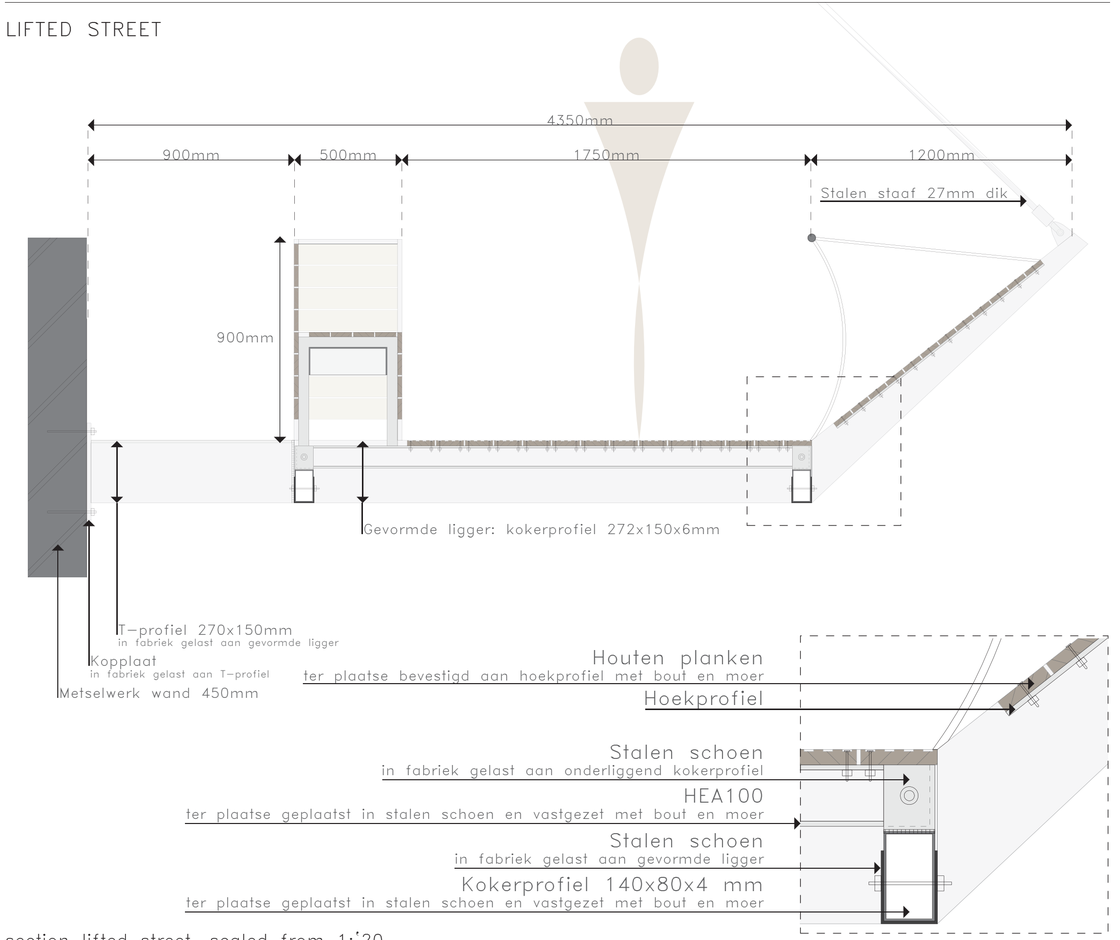
LIFTED STREET

The shape of the lifted street is designed to appeal inviting. A formed girder makes the gesture of opening up, pointing to the sky. This form makes it possible to hang the street to the facades. A thick element on the side of the facade is one the one hand used for sitting benches and on the other hand to store lighting for during night. The street does not seem to touch the facade, since in be-tween the street and the facade an open space is kept. This way the facades are not strongly splitted up into a part be-neath and a part above the street.
The design of the lifted street allows enough daylight to penetrate underneath the street.





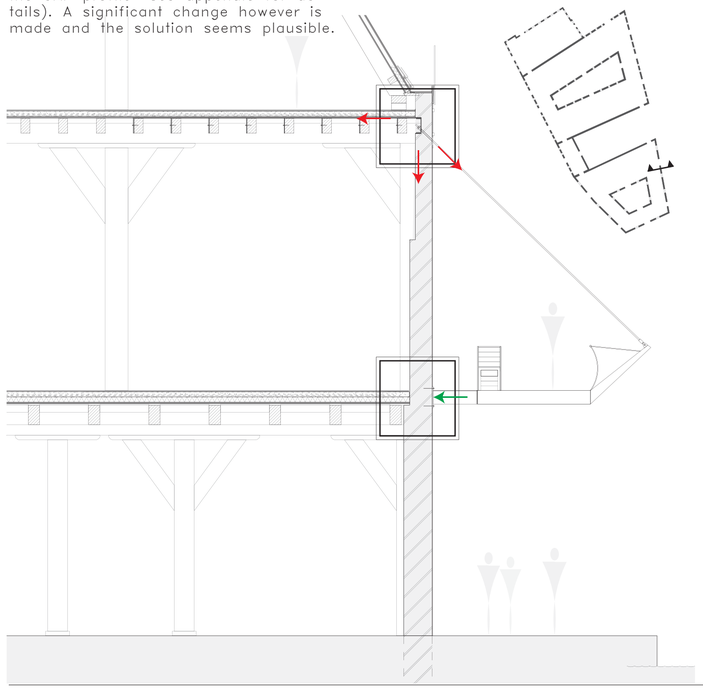
LIFTED STREET

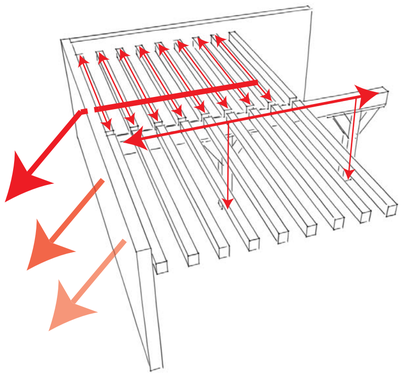


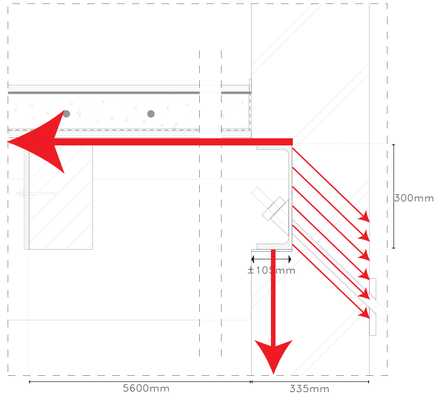
section lifted street, scaled from 1:'20

As has already been shown in images, the street is hanging on the facades by steel cables. As we know a masonry wall is only strong in taking pushing forces. This street however will produce a high pulling force. These forces will be translated onto the interior construction of girders. These girders are again transferring the forces to the columns and again the masonry shell. The forces are thus divided over the total construction. Of course it is not possible to reduce the pulling forces completely. Also the largest part of the pressure will still be located on the spot where the steel cable meets the UAP profile *see appendic for details). A significant change however is made and the solution seems plausible.

LIFTED STREET

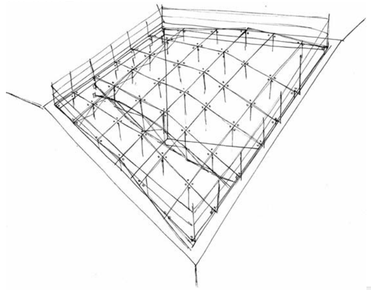


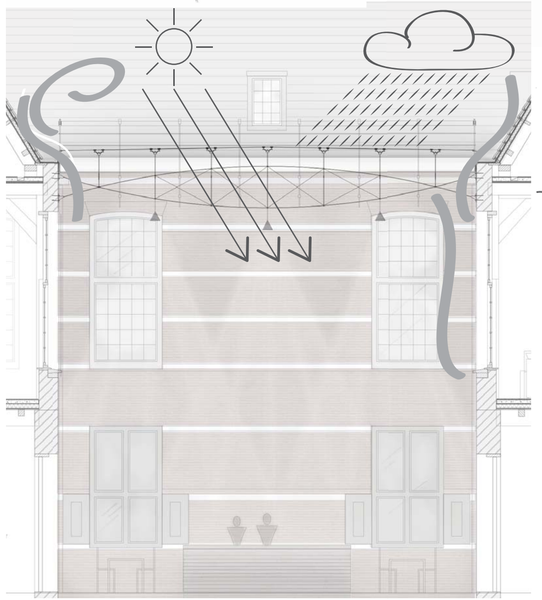




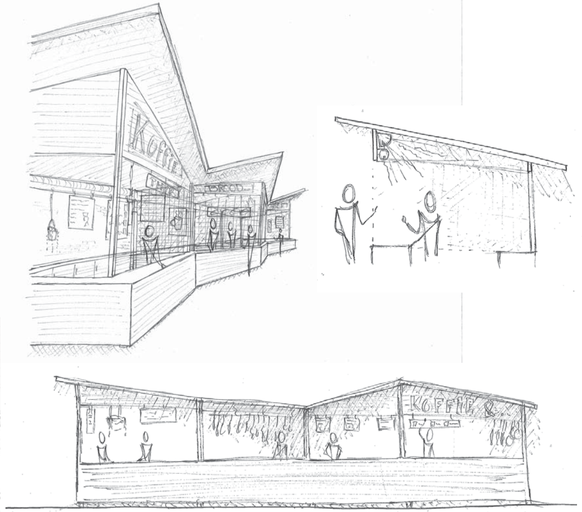
detail connection cable lifted street & facade, scaled from 1:5

MARKET





courtyard 1602 with glass cover

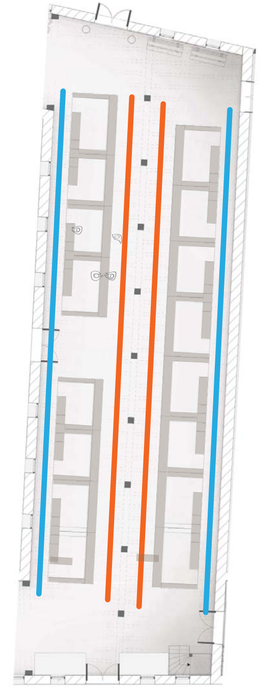


market stalls terrain B

Though the market has an outside climate, a shelter is desirable for when it rains. The courtyards are covered by a structure of cables and a point-fixture system for the glazing. I have chosen for this construction because of the light appearance it has. There will not be a heavy structure of girders to carry the glass. This way the appearance of the courtyards will not be affected in a negative way. In my calculations in the appendix you will read more about this process.
Terrain B is not covered, here the market stalls themselves will provide in shelter by large roof caps. These oversized roof caps will at the same time distract you from only seeing the high and plain facades around the terrain.

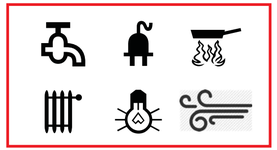
MARKET

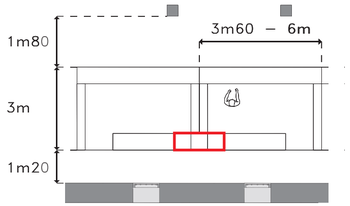
The market stalls inside the buildings are organized in a way that the rows of columns are the center objects of the spaces. Along the columns the public route is placed. Along the masonry walls the logistic route is placed. Within the furniture of the stalls, heating, electricity and water is kept. This furniture also gives the opportunities for merchants to present their items to trigger the visitors.



public route
logistic route

market stalls 1692

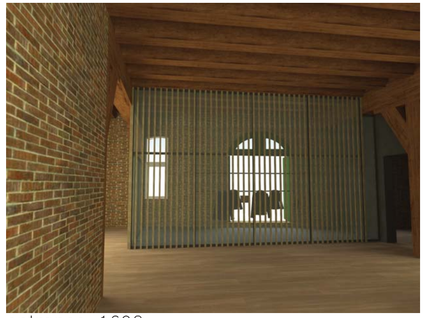




Market stall floor plan

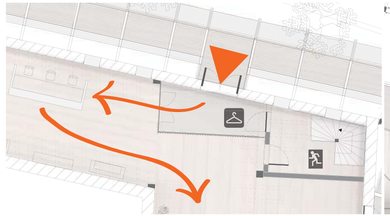
Market stalls 1692

ENTRANCES

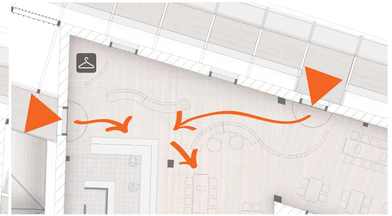


entrance 1692

entrance 1602



entrance 1692



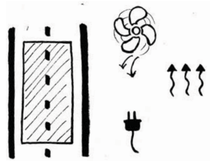
entrance 1602

Via the lifted street the individual buildings can be reached.
In the 1692 building both entrances are connected to a glass entrance. these entrances lead you to the welcoming area. For these entrances fire resistant glass is used (pyrobel), since they are directly connected to the flight route.
In the 1602 building there is no permanent division between the entrance door and the interior space. A thick curtain as a non space taking object keeps most of the draft away. Further furniture leads you to the welcoming area (bar).

Interventions in the interior should be subordinate to the existing structure of the monument. As is clear by now I value the interior spaces highly, and do therefore not want to divide the floor plans by using objects that prevent you from seeing the total space. This results in a clear routing, as in the ground floor market. At the same time this means that I integrate technical aspects within interior objects and floors/ ceilings.

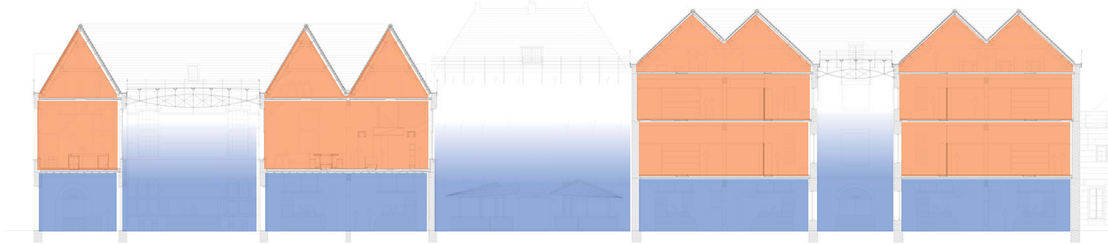
MARKET

NEW = SUBORDINATE TO OLD IN INTERIOR



TECHNICAL ASPECTS INTEGRATED IN INTERIOR OBJECTS

ROUTING

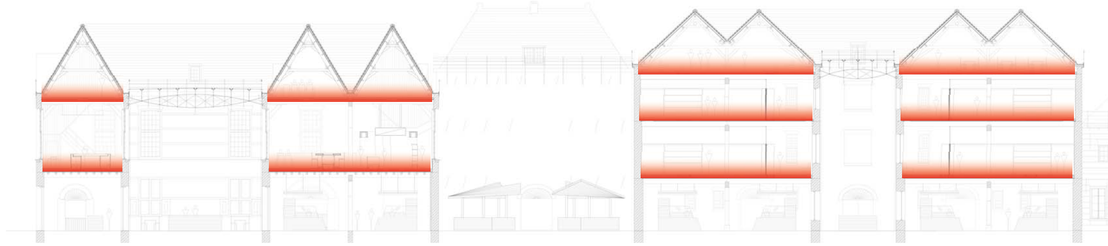


interior
exterior

insulation

ENTRANCES

monumental glazing



floor heating: water based system

ventilation in: through furniture
air out: through ceiling

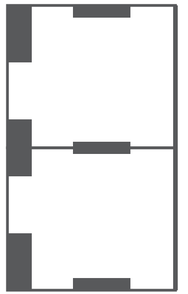
ORGANISATION

furniture with technical aspects integrated

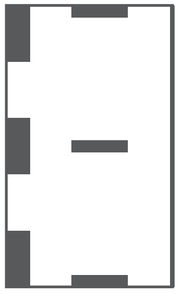
Using furniture as objects to hide technical aspects as well as to divide several spaces within the interior, a free floor plan arose. From most of the interior a clear overview of the total interior space is possible. Also important is the fact that the spaces can be used in their totallity whenever needed; mostly there are no permanent defined spaces. Flexibility is a key word here.

routing

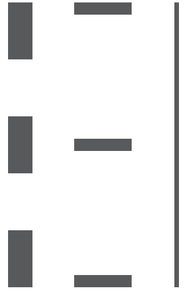
ORGANISATION



several closed off spaces

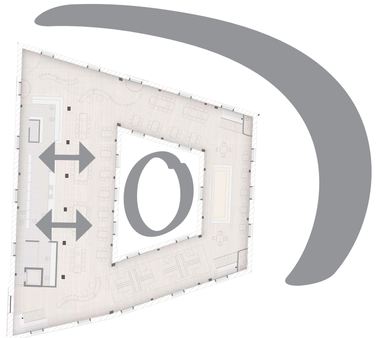


1 large closed off space

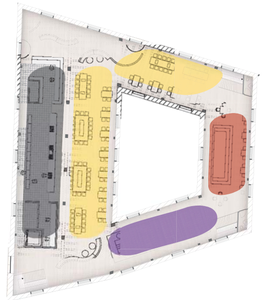


open space

For the 1692 building (the workshop building) I designed furniture with sliding doors. The images show how it is possible to create various interior spaces, but never to loose the awareness of the total interior space. The whole surface of the ceiling id not interrupted, as well as the surfaces of the walls and the columns.



interaction



restaurant
lounge
bar
kitchen

various athmospheres

The 1602 building is in closer connection with the courtyard (smaller floor plan, larger windows, higher ceiling). Reacting upon the direct surroundings the floor plan is divided into different athmo-spheres. The lounge on the quiet side is designed with curtains, soft furniture and baffles hanging from the ceiling, to reduce noise. Kitchen and restaurant have a strong visual relation with each other. By playing with lighting on the east and south side I can make the building look inviting during night time.

ORGANISATION

Introduction

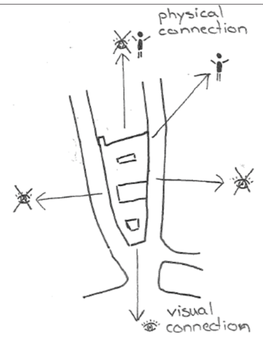
In this document I will reflect upon my graduation project. I will explain the relationship between my design and the research I have done, and how my approach in the whole process did or did not work.

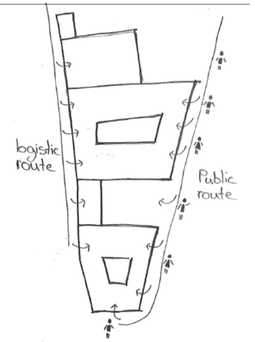
Studio

The graduation studio I am joining is the RMIT studio: Research & Education of Modification, Intervention and Transformation. The concerning building is the Armamentarium –also known as the army–museum– in Delft. This complex used to belong to the East–Indian Company and functioned as a military warehouse. After serving this storage function it became the army–museum. The building is now empty and unused.

1. The relationship between research and design

My research started with an analysis on the urban, architectural and technical scale, as well as a value assessment.
In the urban analysis I did a research on how Delft grew throughout the ages. I also investigated the creative program of the city center. I analyzed these subjects in relationship with the Armamentarium. This urban analysis gave me a clear opinion about the relationship between the complex and its surroundings, in terms of visual and physical connections and boundaries. As a result of this analysis, I decided to reflect the program of the city on the Armamentarium. The new program also reacts upon the close visual surroundings.
Images 1 and 2 show my findings in a brief sketch. In the design I am connecting the program of the Armamentarium with the creative program in the city center. This physical connection resulted in a public route on the one side, and a logistic route on the other side of the complex. The wide view on the south is maintained.





Images 1&2. Own illustrations. Visual and physical connections/ barriers. Public and logistic route.

In the architectural analysis I focused on the interior spaces. Fascinated by the shapes of the interior spaces I did a research on what aspects, material and immaterial, made these spaces appear the way they do. Image 3 shows the basic material aspects within the spatial boundaries of a certain interior space, that for me define the appearance of this interior space.

Image 3. Own illustration. Aspects that have influence on the appearance of the spatial boundaries, from left to right: depth/shadow, color/material, focal accents, breaks/disturbing objects.

This analysis helped me designing a composition within the interior spaces, subordinate to the boundaries (walls, floor, ceiling, columns) of the spaces. I eliminated objects that did not, and added objects that did harmoniously integrate in the interior spaces. Throughout the whole process I have been busy trying out different shapes and compositions to fit in the building.

In the technical analyses I focused on the primary technical supporting system. This analysis is overlapping a great part of the architectural analysis. Walls and rows of columns are striking elements that define how we perceive the spaces within the complex. As a part of the technical analysis I investigated the direction of beams carrying the floors. In the design these directions serve as a guiding matter.
The value assessment has helped me finding arguments to underlay my interventions. Throughout the whole design process my decisions were tested to the value assessment. Overall I have eliminated one large element that I found valuable in the assessment: a small guardhouse on terrain B. My argument for demolishing this guardhouse was the value the terrain B got by this move. This upgrade meant that other values I stated in my value assessment, could be strengthened more. Overall I still feel a slight sadness for removing the guardhouse. It is a valuable historical building which can never be brought back.
For the chosen program on the ground floor (a market) I did several small analyses on markets and their floor plans. Though this helped me understanding how market stalls could be configured, overall these analyses were not used during designing. An explanation for this is that I was very much bound to the typology of the floorplan. I wanted to bring back the former routing of the artillery warehouse, and had to design my market stalls around this routing.

2. The relationship between the theme of the studio and the subject/case study chosen by the student within this framework.

RMIT stands for Research, Modification, Intervention and Transformation of the built environment. These four domains are greatly determined by the value of the concerned object as cultural heritage. Restoration, conservation and reuse are central topics, all implemented on several scale levels, from material to the built environment. Students are to take into account research, a value assessment, materiality and design.
The Armamentarium as a state monument, is a challenging subject for the RMIT studio. The complex has several layers of history, since it has been built in several stages of time. As a building it was of great importance for the economical wealth of Holland. The complex is anchored in the history of the city of Delft.[1] The interventions will have to relate to the complex as well as to its' surroundings. How can it become a place of meaning for the city again?[1]

3. The relationship between the methodical line of approach of the studio and the method chosen by the student in this framework

In the studio of RMIT, prior to designing comes the exploring and analyzing of what is there. Every work of architecture includes its own layers of history. It is crucial to get to know the history of the building and its context on all scale levels. With analyzing comes understanding and being aware of the meaning of the architectural object. The actual designing then means dealing with these historical layers. Making an intervention means adding a new layer of architecture while respecting the valuable historical layers that are already there.[2,3]
To find out the meaning and the value of the complex, my research was greatly based on investigating how the interior spaces are perceived. By researching the typology of the building I could implement this investigation. Being aware of the meaning of the architectural object for me meant being aware of its structure, material and spaces. My way of dealing with this within the complex is making interventions that are always subordinate to the original interior spaces. Though from different viewpoints, it is always possible to see the buildings' boundaries that capture the interior spaces.
Overall, research and design are closely related throughout the whole graduation project: Research by design and design by research.[3] During analyzing I was already designing, during designing I will keep on reflecting back to my analysis.

4. The relationship between the project and the wider social context

The new program is a reflection of the program of the city center: a creative mix of functions.
The new program makes both a connections with the past as well as with the present. The former artillery warehouse brings back the VOC in a modern context: a large market hall. This is not the only history it brings back: the (public) archive of Delft is placed in the VOC building. As a result of the urban analysis, the remaining program exists out of a restaurant and meeting rooms in building 1602, and workshop spaces in building 1692. The complex will be used by a diverse group of people. Activities will take place from early in the morning until late in the evening. Spaces within the complex can be used in a flexible way, so that the use can be adapted to the needs.
An improvement of my intervention is that people passing the Armamentarium will now be triggered to enter the complex. Not only it is made easier to access the complex, due to the activities/noises, lighting that will take place throughout the whole day and evening, you are invited to enter.

[1] Brochure_RMIT_Masters_2013–2014_semester_1
[2] TU Delft, Department of Architecture, 2013. Lecture 1. *Episteme and Positions in Architecture*.
[3] ZIJLSTRA, H. 5 september 2013. Introduction lecture.

RESEARCH

LITERATURE

VON SANTEN, J. 2013. Het fundament onder het monument. Rijksdienst voor het Cultureel Erfgoed, volume 3, pages 20, 21.

GEMEENTEDELFT 2012. Binnenstad, vitaal en gastvrij: Visie en agenda Binnenstad 2020.

TUURENHOUT, T. & VERHOEVEN, G. 2011. 10x Delft, Schiedam, Scriptum.

MICHEL, L. 1996. LIGHT: The Shape of Space: designing with space and light, New York, Van Nostrand Reinhold.

GIBSON, J. J. 1950. The perception of the visual world, U.S.A., The Riverside Press.

DOCUMENTS

Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Afbeeldingen (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)

Bouwhistorische documentatie: Armamentarium, Korte Geer 1 Delft, Tekst (Rijksgebouwendienst, Bureau Rijksbouwmeester, augustus 1997)

Demarcatierapport Armamentarium OR501426 (Rijksgebouwendienst, Ministerie van Binnenlandse Zaken en Koningkrijkrelaties, 8 december 2010)

Bouwhistorische documentatie en waardebepaling, Armamentarium, Delft, het voormalig Oost-Indisch pakhuis (Rijksgebouwendienst, Bureau Rijksbouwmeester, adviesgroep monumenten in rijksbezit,april 1986)

Structuurschets legeruseum Delft (atelier Rijksbouwmeester, juni 2005)

Richtlijnen bouwhistorisch onderzoek (RCE, Stichting bouwhistorie Nederland, VNG, Atelier Rijksbouwmeester, RGD, april 2009)

The Nara grid:An evaluation scheme based on the Nara Document on Authenticity (Van Balen, 2008)

Constructie gebouwen, dakconstructies, deel 1 en deel 3 (Wattjes)

Brochure_RMIT_Masters_2013-2014_semester_1

TU Delft, Department of Architecture, 2013. Lecture 1. *Episteme and Positions in Architecture.*

ZIJLSTRA, H. 5 september 2013. Introduction lecture.

WEB PAGES

In een notendop, http://www.delft.nl/Monumenten/Cultuurhistorie/In_een_notendop [Online]. Gemeente Delft. [Accessed 03-11-2013.

De stadmuur van Delft en haar acht stadspoorten, http://www.wikidelft.nl/index.php?title=De_stadsmuur_van_Delft_en_haar_acht_stadspoorten [Online]. WikiDelft. [Accessed 03-11-2013.

Spoorzone Delft, http://nl.wikipedia.org/wiki/Spoorzone_Delft [Online]. Wikipedia. [Accessed 03-11-2013.

http://www.ruimtelijkeplannen.nl/web-roo/roo/bestemmingsplannen?planidn=NL.IMRO.0503.BP0014-2001# [Online]. ruimtelijkeplannen.nl. [Accessed 09-09-2013.

http://www.orangesmile.com/travelguide/delft/index.htm [Online]. orangesmile.com. [Accessed 09-09-2013

DESIGN

LITERATURE

HAAK, A. J. H. 2005. De menselijke maat, Delft, Delft University Press.

SCHALKOORT, T. A. J. 2009. Klimaatinstallaties: Integratie van gebouw en installaties & Overige gebouwinstallaties, Delft, TU Delft

WEB PAGES

http://vrom.bouwbesluit.com/Inhoud/docs/wet/bb2012 [Online]. bouwbesluit.com. [Accessed various times.

Tabellen: 2.10 Beperking van uitbreiding van brand
2.12 Vluchtroutes
3,6 Luchtverversing
4,4 Bereikbaarheid en toegankelijkheid, nieuwbouw

15 01 2014

Graduation studio information
Architecture: RMIT
Assignment: An intervention for the Armamentarium, Delft
1st Teacher: Nol Hermkens
2nd Teacher: Wido Quist
Title: The Armamentarium: a reflection of Delft

Introduction and motivation
In this Graduation Plan I will introduce my graduation studio and explain the research and design methods that I use during graduating. I will conclude with a time planning showing my schedule for the graduation year.
The graduation studio I am joining is the RMIT studio: Research & Education of Modification, Intervention and Transformation. My interest in the field of heritage is the possibility to design with existing architecture: Adding a new layer of architecture respecting the older layers, and by that creating a harmonious whole. Creating Architecture that stands out does not have to be done by drawing attention to the new layer. At the studio of RMIT I have the chance to design while being humble to the history of the architectural work and its context.

Product
Problem statement
The Armamentarium is not built as one building; it exists out of various buildings put together. The problem I find here is that together these buildings do not give a clear overview of the complex as a total. The complex is divided into buildings, and the buildings are again divided into several interior spaces.
Research questions
During analyzing the Armamentarium and its surroundings in Q1 I formulated several research questions concerning the urban, the architectural and the technical analysis.
Research questions concerning the urban part:
- What is the relation between the growth of the city and the meaning of the Armamentarium within this city?
- What is the position of the Armamentarium within the diverse program of the city?

Research question concerning the architectural part:
- What interior spaces in the Armamentarium I find valuable, and what aspects (material and immaterial) define these spaces?

Research question concerning the technical part:
- What structural elements have influence on the appearance of the interior spaces?

Design assignment
Arising from the problem statement and research questions is my design assignment.
The creative program of the city centre of Delft is reflected on the Armamentarium, this results in a physical connection between the complex and the city centre. The new program of the Armamentarium collaborates with the valuable interior spaces and main structure of the complex. Elements needed for the new function provide for a harmonious arrangement within the interior spaces.
While translating this assignment into a design, close attention is paid to how the several buildings are related to each other at all times. It is my intention to take advantage of the problem I stated. Partly I am connecting the several buildings with each other, but partly I also am embracing the fact that these several buildings work as individuals. A connection is realized through a public function and routing that unify these several buildings physically and visually on the ground floor level. Here I do not only include interior but also exterior space of the Armamentarium, so that this level opens up to its surroundings. On the higher levels the buildings function more as individual buildings.
Goal
The new program is a reflection of the creative program of the city centre, and together with the shapes of the interior spaces the interventions create a harmonious arrangement.

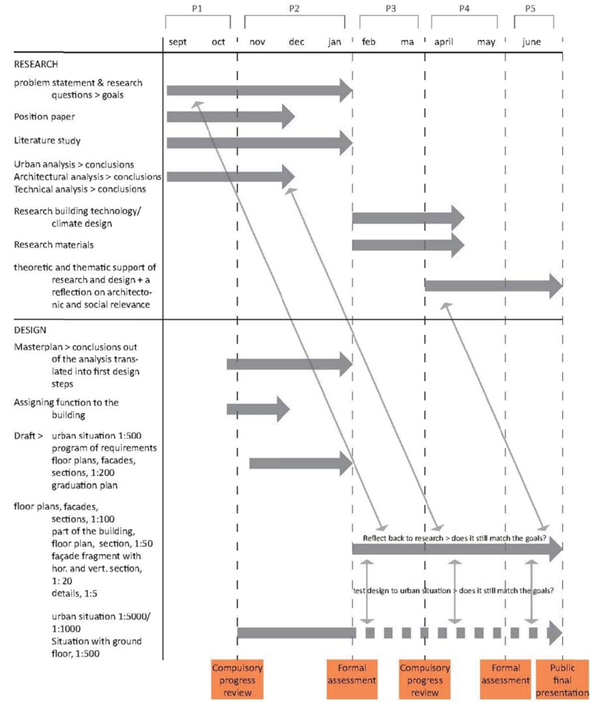
Process
In the studio of RMIT, prior to designing comes the exploring and analyzing of what is there. Every work of architecture includes its own layers of history. It is crucial to get to know the history of the building and its context on all scale levels. With analyzing comes understanding and being aware of the meaning of the architectural object. The actual designing then means dealing with these historical layers. Making an intervention means adding a new layer of architecture while respecting the valuable historical layers that are already there.
Method description
A description of my research and design methods in the graduation project can be divided into two parts.
The first part handles the method description on a larger scale: the Armamentarium within the urban situation. This part is also in the design itself the first part to be treated.
The research methods basically handles the research questions named above. An investigation on the growth of the city over time, including the (near) future, helps me finding out what moments in history and future change(d) the meaning of the Armamentarium within Delft. An investigation on the current program and functions in the city helps me to find out what aspects for me are important in defining what Delft is as a city.
The design method is about translating the results of the research into a design. These are the first steps of the overall design process. A new function is sought that connects the Armamentarium physically with the creative program of the city centre. A new routing in- and outside of the complex takes care of a fluent transition from the surroundings of the complex to the interior of the complex.
The second part handles the method description on a smaller scale, zoomed in on the interior spaces and the technical components of the Armamentarium. This part will be treated continuously in the process of the design.
In this part the research in my graduation project is based on phenomenology. I have been reading literature from several authors and architects about how we perceive architectural spaces. This literature study helped me to form my own opinions about how we experience an interior space. To be able to experience architectural spaces we need spatial boundaries: frames that capture the interior space. This has a lot to do with the typology of the floor plans and the technical structure of the building. The composition of the walls, floors and ceilings together shape the interior space. With analyzing the typology of the floor plans and building structure of the Armamentarium I could show resulting valuable interior spaces. The way I present these interior spaces is by using reduction drawings that I made using a 3D computer model. To be able to show all boundaries I eliminate all objects inside the spaces.

In the design then my goal is to present the interior spaces within these boundaries without losing the experience of the shapes of the interior spaces. Elements that are needed for the function work together with the structure of the Armamentarium, resulting in a harmonious interior space. In 2D I am drawing my interventions in floor plans, facades and sections. In 3D then I am depicting my interventions into the 3D computer model to test if the design still matches my goal. A strategic viewpoint (from which you see most of the interior space) is chosen out of which snapshots are taken. By comparing the snapshots of several interventions I decide what the best solution is. These results are translated again into the 2D drawings. When new interventions come up this cycle occurs again. In a later stadium, a non-computer 3D model shows how the interventions are designed, this ensures that the impact of the interventions can be seen from all possible sides.
Designing and reflecting back on the research outcome is repeated until the design meets the goals. Overall, research and design are closely related throughout the whole graduation project. During analyzing I was already designing, during designing I am reflecting back on my analysis.
Literature and general practical preference
During Q1 and Q2 I already consulted several works of literature, articles and web pages. A list of these references is shown here below. Together with these references, the meetings with my teachers have a continuous influence on my design decisions.

Literature
VON SANTEN, J. 2013. Het fundament onder het monument. Rijksdienst voor het Cultureel Erfgoed, volume 3, pages 20, 21.
GEMEENTEDELFT 2012. Binnenstad, vitaal en gastvrij: Visie en agenda Binnenstad 2020.
TUURENHOUT, T. & VERHOEVEN, G. 2011. 10x Delft, Schiedam, Scriptum.
MICHEL, L. 1996. LIGHT: The Shape of Space: designing with space and light, New York, Van Nostrand Reinhold.
GIBSON, J. J. 1950. The perception of the visual world, U.S.A., The Riverside Press.
MCCARTER, R. & PALLASMAA, J. 2012. *Understanding Architecture: A Primer on Architecture as Experience,* New York, Phaidon.
LOBELL, J. 1979. *Between Silence and Light: Spirit in the Architecture of Louis I. Kahn,* Boulder, Colorado, Shambala Publications.
KLEIJER, E. 2004. *Instrumenten van de architectuur: De compositie van gebouwen,* Amsterdam, SUN.
ZEVI, B. 1957. *Architecture as space: how to look at architecture,* New York, Horizon press.
PLUMMER, H. 2003. *Masters of light: First volume: Twentieth-Century Pioneers,* Japan, A+U Publishing Company.
documents
All documents about the Armamentarium provided on blackboard.
Richtlijnen bouwhistorisch onderzoek (RCE, Stichting bouwhistorie Nederland, VNG, Atelier Rijksbouwmeester, RGD, april 2009)
The Nara grid: An evaluation scheme based on the Nara Document on Authenticity (Van Balen, 2008)
Constructie gebouwen, dakconstructies, deel 1 en deel 3 (Wattjes)

Reflection
Relevance
The value of this graduation project lies in the fact that the history of the Armamentarium and of Delft continues in the new use of the complex. The Armamentarium also absorbs the current and future social developments of Delft. The creative character of the city centre is reflected on the Armamentarium.

Time planning



12 12 2013

THE EXPERIENCE OF THE INTERIOR SPACE

Image 1. Own photo of an interior space in the Armamentarium, Delft. November 2013.

Introduction

In this Position Paper I will explain my position -in relation to the focus of my research in the graduation project- within the field of heritage. After explaining my position within this field I will discuss my research- and design methods, followed by arguments based on literature and examples of architecture.

The graduation studio I am joining is the RMIT studio: Research & Education of Modification, Intervention and Transformation. My interest in this field is the possibility to design with existing architecture: Adding a new layer of architecture respecting the older layers, and by that creating a harmonious whole.

I will propose an intervention for the Armamentarium -also known as the army-museum- in Delft. This complex used to belong to the East-Indian Company and functioned as a military warehouse. After serving this storage function it became the army-museum. The building is now empty and unused.

Background, Motivation and Position

The Armamentarium is not built as one building; it exists out of various buildings put together. The problem I find here is that together these buildings do not give a clear overview of the complex as a total. The complex is divided into buildings, and the buildings are again divided into several interior spaces. Having stated this, I was interested in how people actually experience interior spaces in architecture. By interior space I mean the internal space of a building, defined by its walls, floor and ceiling (better explained later on).

Robert McCarter and Juhani Pallasmaa write that architecture cannot be understood without our experience of it.[1] These two architects made it clear to me that experiencing architecture is not about what a building looks like, but how several aspects affect what the building is like to be in: Architecture should not create aestheticized objects or space, but should provide frames, horizons and settings that offer the possibility to interpret architecture in our own way. Not only McCarter and Pallasmaa write about the experience of architecture. Louis Kahn for example is known for his words about the measurable (light) and the unmeasurable (silence), and how architecture is the meeting of those two.[2] With the measurable he meant things that are already made, like the instruments we use to build an architectural work. With the unmeasurable he meant the sense, the realization we feel when being in the architectural work, the desire to express. If good instruments are used, thus if the measurable is good, it brings out the spirit within you.

I am intrigued by the fact that an interior space evokes a certain feeling within us when we are in this space. This feeling can be a different feeling in every room, and a different feeling for every human being.

Studying *Instrumenten van de architectuur* written by Evert Kleijer, made me realize that a lot of elements (both material and immaterial) are important when judging architecture, but feeling might be the best of them all.[3]

I share Kleijer's opinion that this instrument, *feeling*, is not faultlessly or pure. Struggling with the abstract given of *feeling*, I started searching for a more tangible approach to tackle my interest in the experience of an interior space. This is where I got inspired by the frames, horizons and settings McCarter and Pallasmaa write about. Within these frames our experience of the interior space takes place. As a research question for the analysis of the Armamentarium therefore I had chosen: what interior spaces in the Armamentarium I find valuable, and what aspects define these spaces?

The position I take in this paper is the following: To experience the interior space, using objects that prevent the eyes from seeing the total interior space should be avoided.

Notes

1 MCCARTER, R. & PALLASMAA, J. 2012. Page 5
2 LOBELL, J. 1979. Pages 3-14, 20
3 KLEIJER, E. 2004. Page 6

Interior space

To explain my position I will show what for me defines the interior space. As I already wrote, by interior spaces I mean the spaces inside a building, enclosed by its frames. As an example I have chosen one specific interior space in the Armamentarium (image two).

Image three shows the boundaries of this interior space. According to Lou Michel, an architectural space is defined by its boundaries.[4] He writes that these boundaries can be walls, floors, ceilings and other major surfaces. Together these boundaries form the spatial envelope.

Image 2. Own illustration. The interior of the Armamentarium.

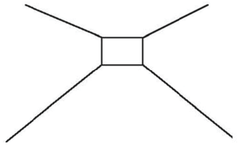


Image 3. Own illustration. The boundaries that create the spatial envelope. Based on image 2.

Apparently, the edges and outlines of these major surfaces are the first aspects the eye sees, after this it scans the surfaces themselves within these outer edges.[5] There are several aspects that have influence on the appearance of the major surfaces, they can change the way we experience the space. Reading Lou Michels' *LIGHT: The Shape of Space*, made me realize that objects within these major surfaces, for example patterns or windows, can weaken or strengthen the perception of the outer edges. After studying this book I could point out aspects that in my opinion have these influences of weakening or strengthening in the Armamentarium. Image four shows the aspects I found.[6] The depth and shadow make a surface 'heavier', and therefore more present. Materials and their colors cause difference between the major surfaces. Every material and color attracts light in a different way and is therefore brighter or less bright. Focal accents -here in the form of a window, a bright object within a more or less dark space- attract glance. Last, breaks or disturbing objects can distract glance, here also seen in the form of a window.

Image 4. Own illustration. Aspects that have influence on the appearance of the spatial boundaries, from left to right: depth/shadow, color/material, focal accents, breaks/disturbing objects.

By knowing that boundaries are the main elements that define an interior space, and that there are aspects that can weaken or strengthen our perception of these boundaries the next step is to underpin my position: To experience the interior space, using objects that prevent the eyes from seeing the total interior space should be avoided.

Arguments

- The space within the boundaries

Why the focus on the objects within an interior space, rather than the focus on the envelop; the walls, floors and ceilings that determine the shape of the interior space? Rightly, Evert Kleijer writes that architectural space does not exist without space provisions like the walls, floor and ceiling.[7] The first thing you would think of when trying to create an interior space with strong boundaries might be tackling the boundaries themselves. Transforming major surfaces, for example by removing or adding windows or even changing the building structure, has straight impact. The Armamentarium however is a monument. Besides the fact that the envelop that contains the interior space is already there, this envelop contains historical value. If I refer again to Louis Kahn, I could say that I already have the great part of the measurable and by transforming the composition of objects within the interior I can influence the unmeasurable. My priority therefore is to influence the experience of the total interior space with objects within the interior space.

Bruno Zevi writes in his book *Architecture as space: how to look at architecture*, that internal space is the essence of architecture but the value of an architectural work is not defined by this only.[8] He makes clear that a beautiful room can be negatively affected by using unsuitable objects like furniture, sculptures, paintings etc. Nevertheless Zevi writes that these objects are less important than the space, because the objects are easily removed but the space itself is static.

Though I agree with the fact that objects within the interior space are indeed easier to change, in my opinion this does not make them of less importance. The impact they have on the total space can be great, regardless their state of changeability.

- The way of analyzing and the way of designing

To find out what interior spaces are present in the building that I find valuable, I only took into account the boundaries when analyzing. In images three and four this is shown. By eliminating objects like furniture, stairs, elevators etc., I could show the essence of the spaces. Without disturbing objects that blocked the view of the total interior space, the dominant outer contours were all visible.

As Michel wrote, the architectural space is defined by its boundaries. Together these boundaries create a conceptualization of a space, stripped of movable or temporary furnishings. Michel's' goal is to achieve visual order. It is for this reason he analyzes spaces without including the objects within, showing only the dominant boundaries of the space.[9]

It was after analyzing the interior spaces of the Armamentarium and reading Michel's book, that I realized that for me the way of analyzing space was at the same time the way of designing space. I realized that several objects present in the Armamentarium for me had a negative impact on the experience of the spaces. They blocked my sight, so I eliminated them on paper. The next step is to eliminate them in my design, to enable a clear overview of the interior space.

Notes

4 MICHEL, L. 1996. Page 102
5 MICHEL, L. 1996. Pages 11,12
6 DE JONG, K. 2013. Page 22
7 KLEIJER, E. 2004. Page 221
8 ZEVI, B. 1957. Pages 28-32
9 MICHEL, L. 1996. Pages 102,115

- Distraction or attraction

By now I hope to have made clear that objects within the interior space have the power to change the way we experience the space. It is for this reason that I do not want to use objects that prevent you from seeing the total interior space. There are however also objects that can have a positive influence on our experience of space. With transforming the Armamentarium I will give it a new function. A new function needs a new composition of the interior space, thus it needs objects (furniture, walls, stairs etc.). To underpin my position I will in this argument point out the distracting and attracting effect of objects.

According to Michel freestanding objects can interrupt the experience of an enclosed room. He introduces focal accents as objects or surface details that catch the eye when scanning its environment, that can attract or distract the eye. Focal accents he names are: people, movement, brightness, high contrast, vivid color and strong pattern. The perceptual strength of focal accents can be used to attract human vision. A focal accent can be effectively distributed as a visual lead through a space.[10]

These focal accents called my attention. I studied them and already showed this in image four. It is clear that focal accents have the power to attract and distract the eyes. In the third picture of the image for example a window is present almost in the middle of a wall, attracting vision towards the back of the interior space. The fourth picture shows a window in the right wall, here the accent is more like a sudden interruption in the further monotonous surface. So in the third picture the focal accent attracts rather than distracts, whereas in the fourth picture it is the other way around.

More architects write about the effect of objects within space as attracting or distracting. In Zevi's opinion it is possible to lose sight of hierarchy and to be confused and disorientated whenever interior space is not dominating over other arts in architecture.[11] Henry Plummer tells us that modernists were looking for abstract simplicity; they did this through emptying surfaces of busy decorations and reducing volumes to quiet geometric shapes. Though Plummer writes about rooms stripped of layers and images, he by that does not mean complete emptiness of spaces; *"It is not staticity that is needed, but a rhythmical calm, not vacancy, but a presence of absence"*.[12]

This information makes again clear that when leaving out interrupting forms in space when designing, the perception of the space becomes clearer. But it also includes that objects can be used as guiding and orienting forms, such as the attracting focal accents. Examples for this can be seen in the images five and six.

furniture in the oval room in the Teylers museum follows the shape of the room, it *accentuates* the shape. Objects attached to the wall surfaces in an interior space in the Rijksmuseum are *guiding* the eyes towards the back of the space. Image seven shows an example of how the grey elevator shaft is an *interruption* of the perception of the total interior space.

Image 5. Photo of the oval room in the Teylers Museum, Amsterdam.

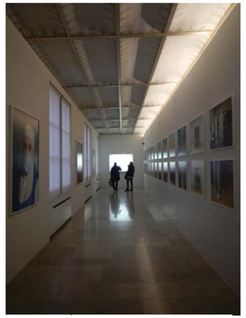


Image 6. Own photo of an interior space in the Rijksmuseum, Amsterdam. November 2013.

Image 7. Own photo of an interior space in the Armamentarium, Delft. November 2013.

Notes
10 MICHEL, L. 1996. Pages 49,62,161
11 ZEVI, B. 1957. Page 32
12 PLUMMER, H. 2003. Page 58,64

Conclusion

To conclude my argumentation I will state my position once more: To experience the interior space, using objects that prevent the eyes from seeing the total interior space should be avoided.

A focus on the objects within an interior space is important, they are convertible. The envelop itself that contains the interior space is much more static.

A common used method of analyzing space is leaving out objects that interrupt the vision on the total interior space. This way of analyzing is at the same time a way of designing. Creating a kind of clarity in the analysis drawings can be translated into creating the same kind of clarity in the design.

Objects do not necessarily disturb your perception of the space; they can also guide your sight and accentuate the totality of the space. They can be a harmonious integrated in the perception of the space and work together with the surrounding boundaries.

Research- and design methods

In the studio of RMIT, prior to designing comes the exploring and analyzing of what is there. Every work of architecture includes its own layers of history. It is crucial to get to know the history of the building and its context on all scale levels. With analyzing comes understanding and being aware of the meaning of the architectural object. The actual designing then means dealing with these historical layers. Making an intervention means adding a new layer of architecture while respecting the valuable historical layers that are already there.[13, 14]

The research in my graduation project is based on phenomenology. The way we experience an interior space is based on how we feel when being in this particular space. To actually be able to experience anything at all, spatial boundaries are necessary: frames that capture the interior space. This has a lot to do with the typology of the floor plans and the structure of the building. The composition of the walls, floors and ceilings together shape the interior space. With analyzing the typology of the floor plans and building structure of the Armamentarium I could show resulting valuable interior spaces. The way I presented these interior spaces was by using reduction drawings. To be able to show all boundaries I eliminated all objects inside the spaces.

Then the design method comes in. In the design my goal is to present the interior spaces also by showing the frames that enclose them, just like I did in the research. This matches Kleijer's idea: the elements we use to analyze and judge architecture are the same as the elements we use when designing architecture.[15] A first step in de design is to find a function for the building, of which the program of requirements fits to my idea of presenting the spaces. This means that objects that are needed for the function work together with the enclosing frames, resulting in a harmonious interior space. After this the function will be translated into a design. Throughout designing, I will use my analysis drawings to test if the design still matches my goal. I will accomplish this by depicting my interventions into these drawings. Designing and reflecting back on the research outcome will be repeated, until the design meets the goals.

Overall, research and design are closely related throughout the whole graduation project: Research by design and design by research.[16] During analyzing I was already designing, during designing I will keep on reflecting back to my analysis.

Notes
13 TU Delft, Department of Architecture, 2013.
14 ZIJLSTRA, H. 5 september 2013.
15 KLEIJER, E. 2004. Pages 7
16 ZIJLSTRA, H. 5 september 2013.

References

- literature

MCCARTER, R. & PALLASMAA, J. 2012. *Understanding Architecture: A Primer on Architecture as Experience,* New York, Phaidon.

LOBELL, J. 1979. *Between Silence and Light: Spirit in the Architecture of Louis I. Kahn,* Boulder, Colorado, Shambala Publications.

KLEIJER, E. 2004. *Instrumenten van de architectuur: De compositie van gebouwen,* Amsterdam, SUN.

MICHEL, L. 1996. *LIGHT: The Shape of Space: designing with space and light,* New York, Van Nostrand Reinhold.

ZEVI, B. 1957. *Architecture as space: how to look at architecture,* New York, Horizon press.

PLUMMER, H. 2003. *Masters of light: First volume: Twentieth-Century Pioneers,* Japan, A+U Publishing Company.

- Other

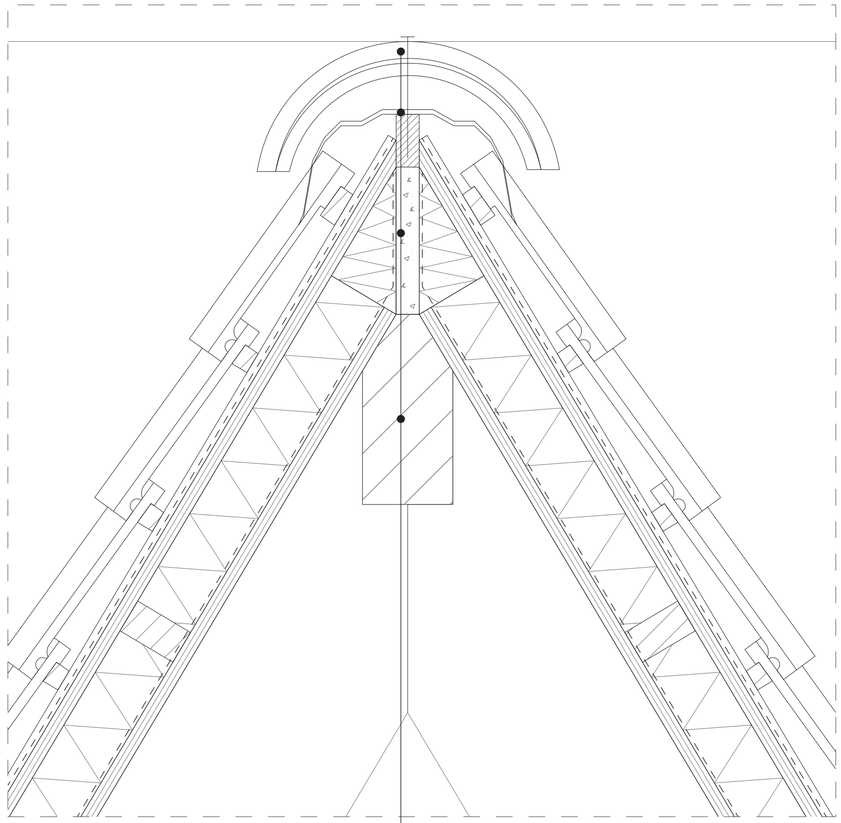
DE JONG, K. 2013. P1 report: Armamentarium.

Teylers museum. www.teylersmuseum.eu

ZIJLSTRA, H. 5 september 2013. Introduction lecture.

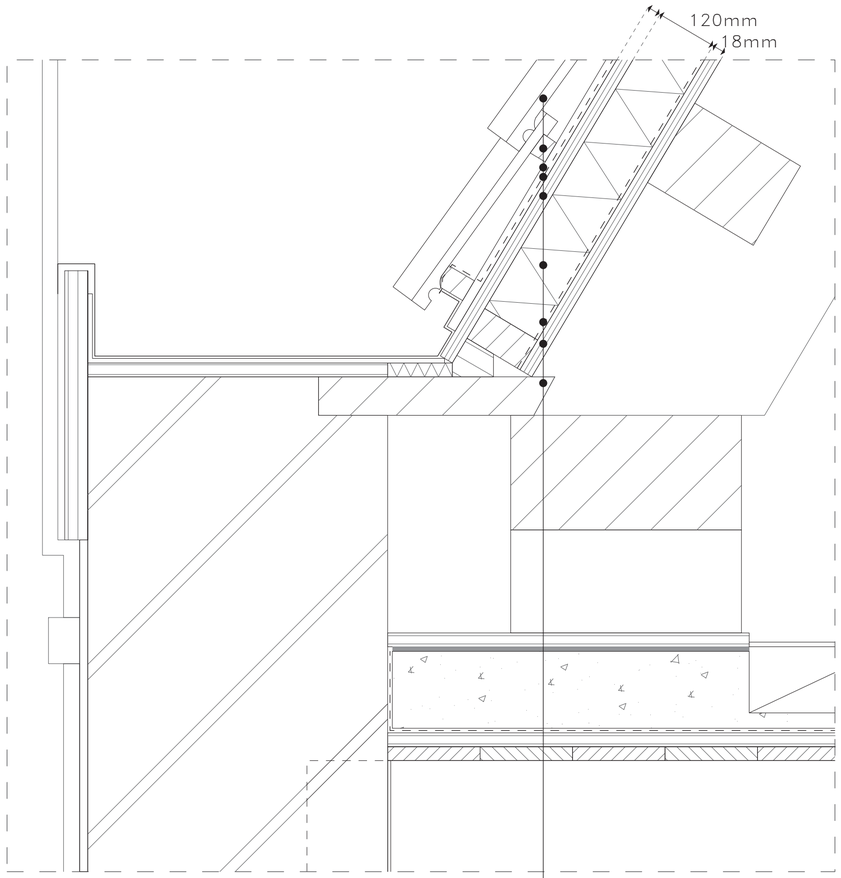
TU Delft, Department of Architecture, 2013. Lecture 1. *Episteme and Positions in Architecture*.

roof top, scale 1:5



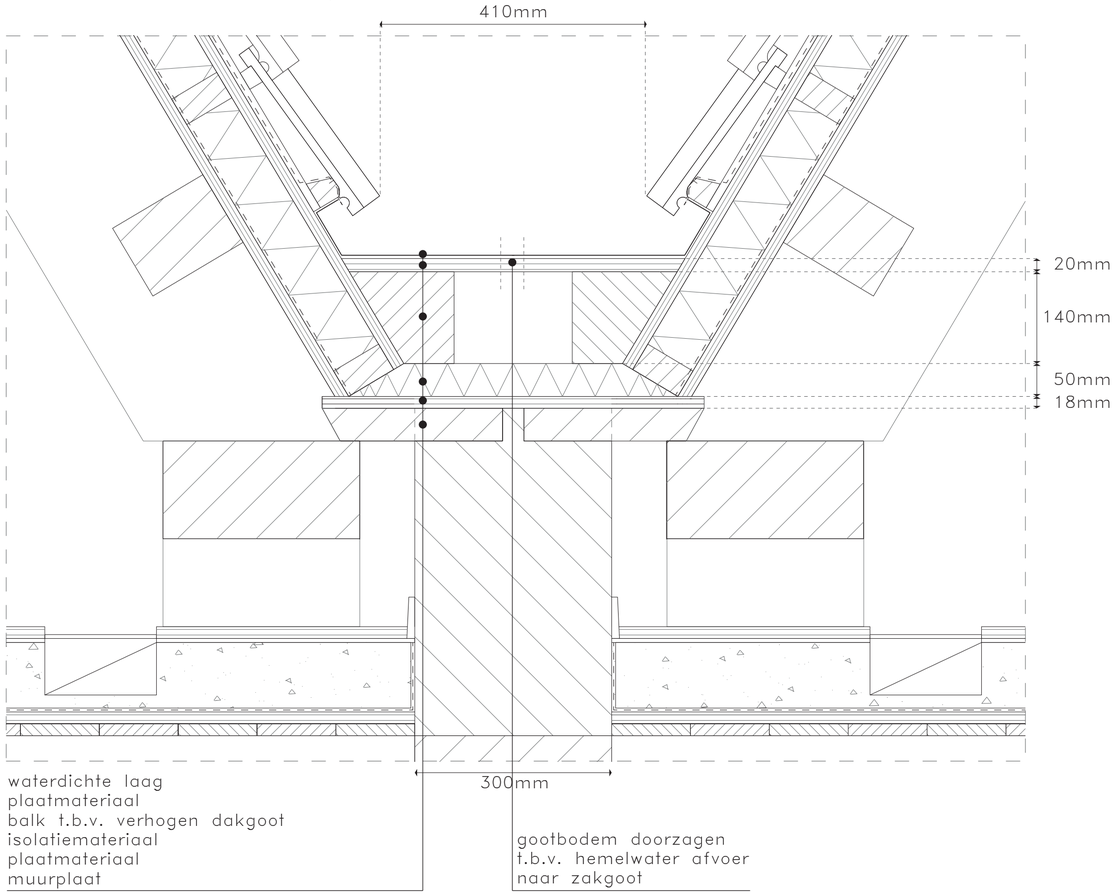
nokvorst
ondervorst
ruiter
afdichting
gording

roof edge, scale 1:5

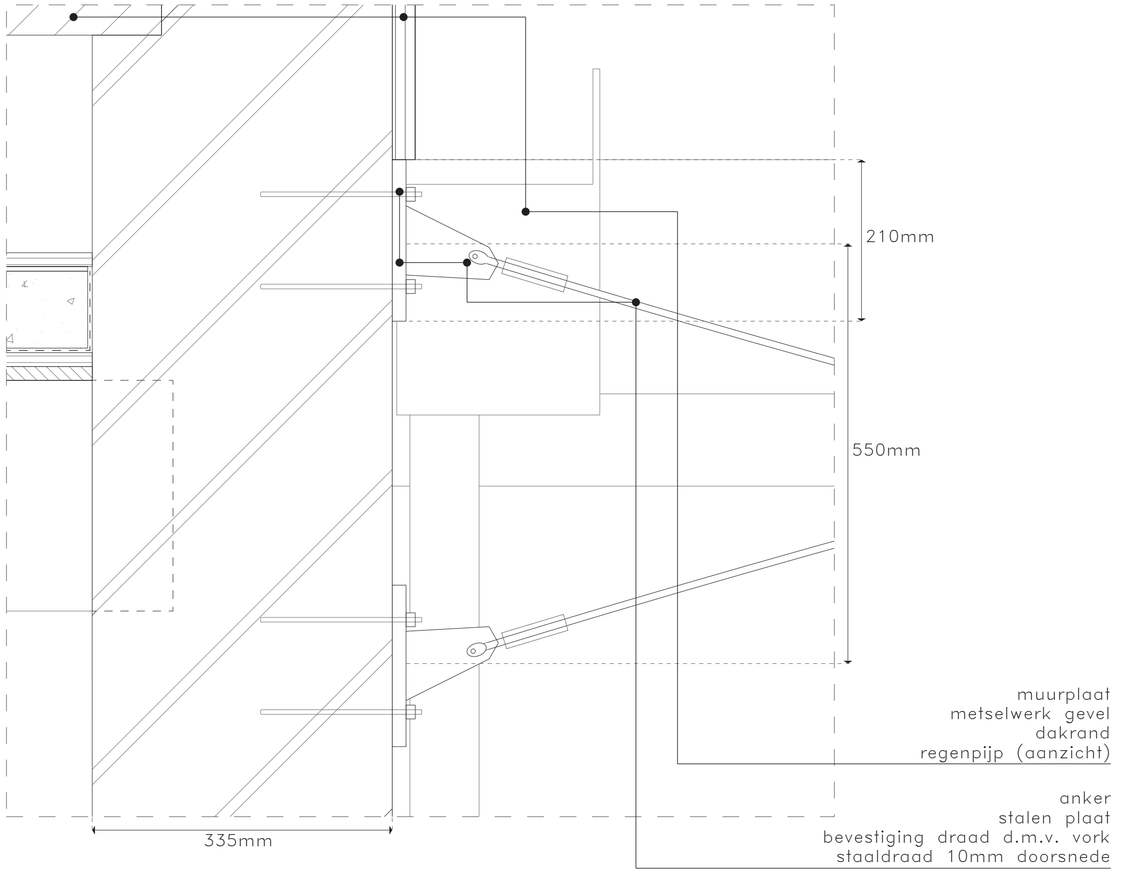


dakpan
panlat
tengel
waterwerende &
dampdoorlatende laag
plaatmateriaal
minerale wol +
sporen h.o.h. 600mm
dampremmende laag
houten planken (originele)
muurplaat

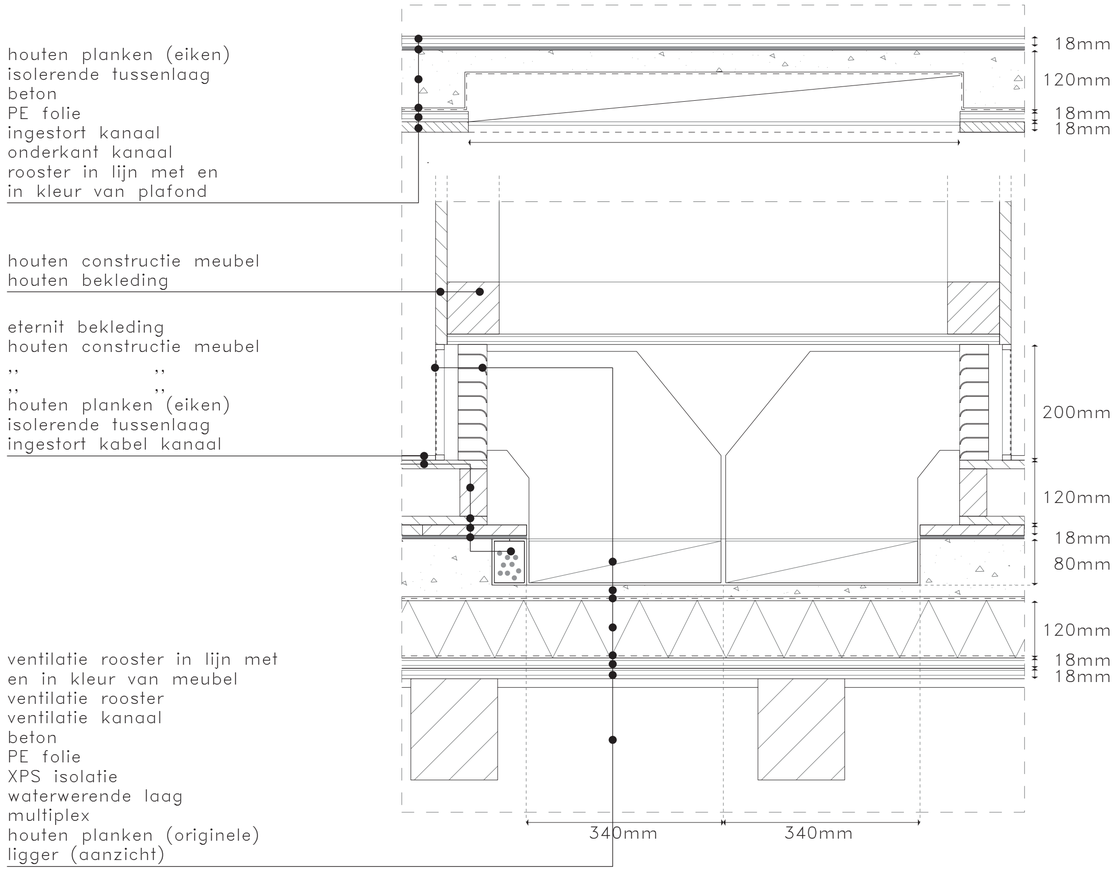
roof in between roof slopes, scaled **from** 1:5



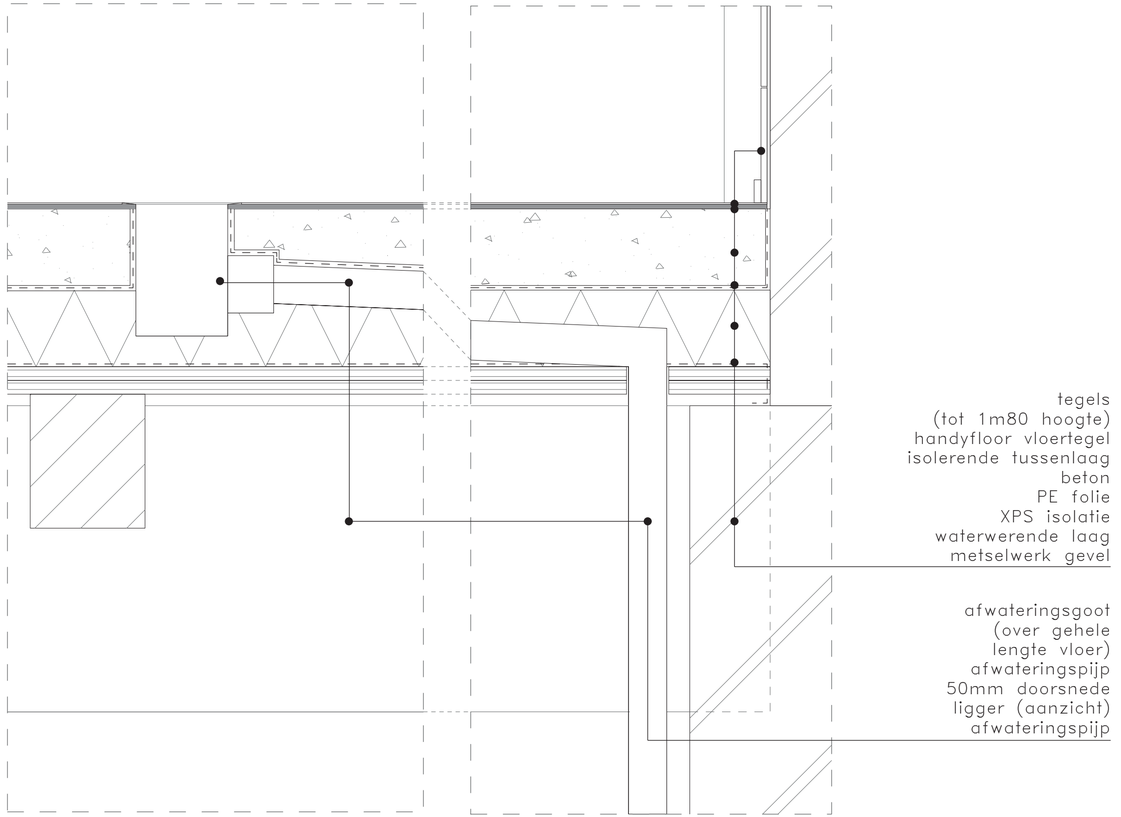
roof cover connection courtyards, scale 1:5



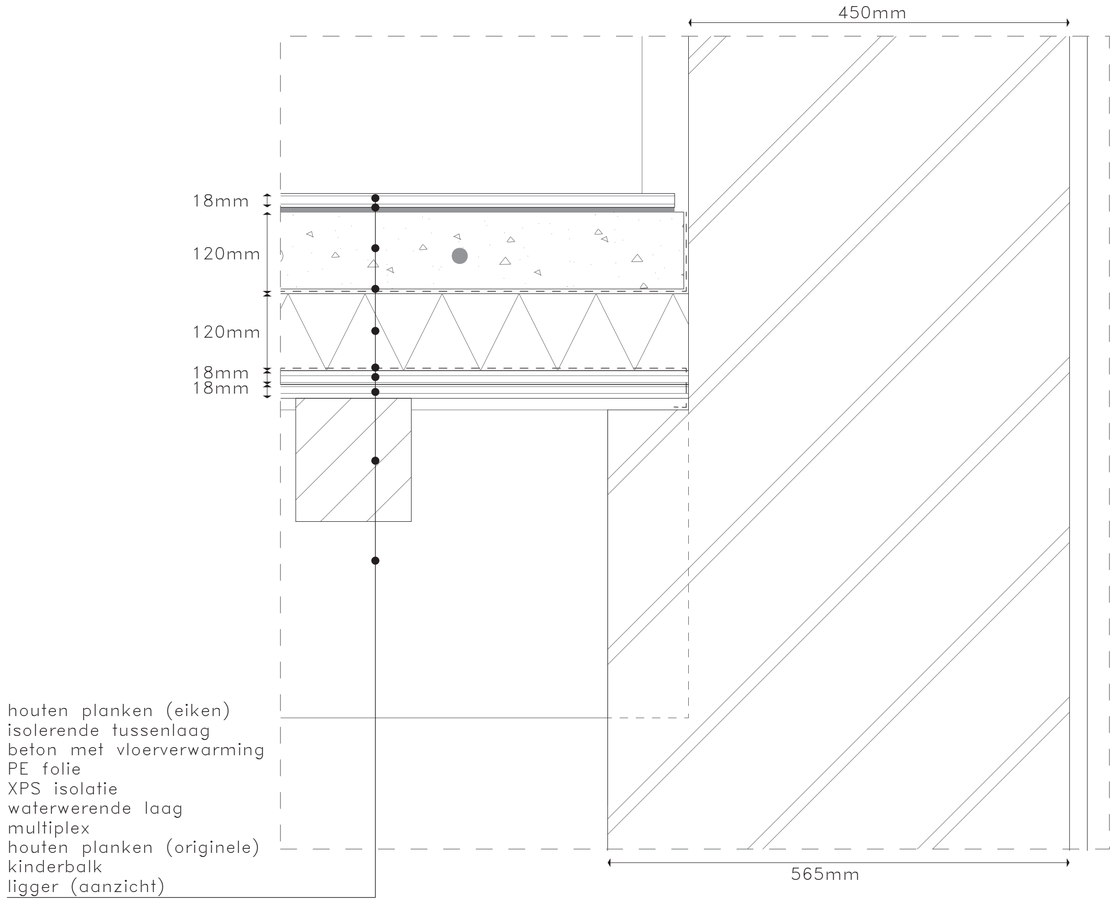
ventilation in & air out, scaled **from** 1:5



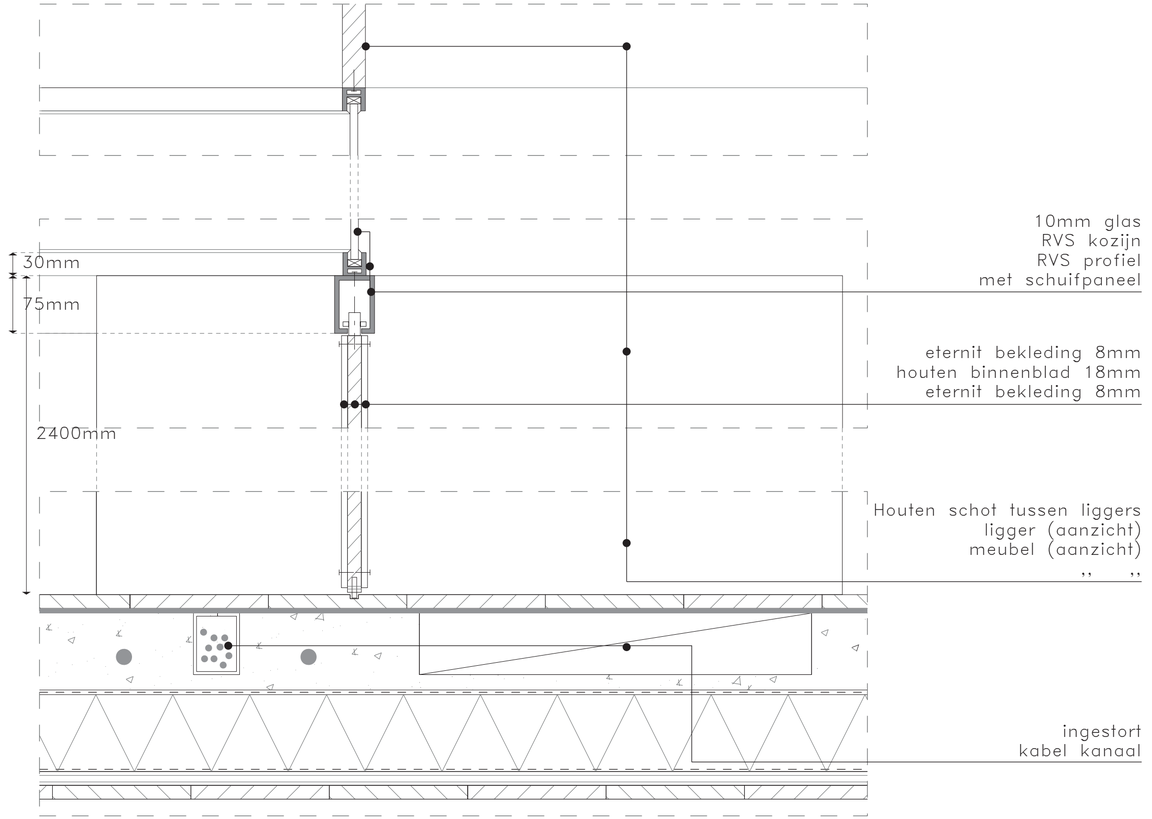
drain kitchen, scale 1:5



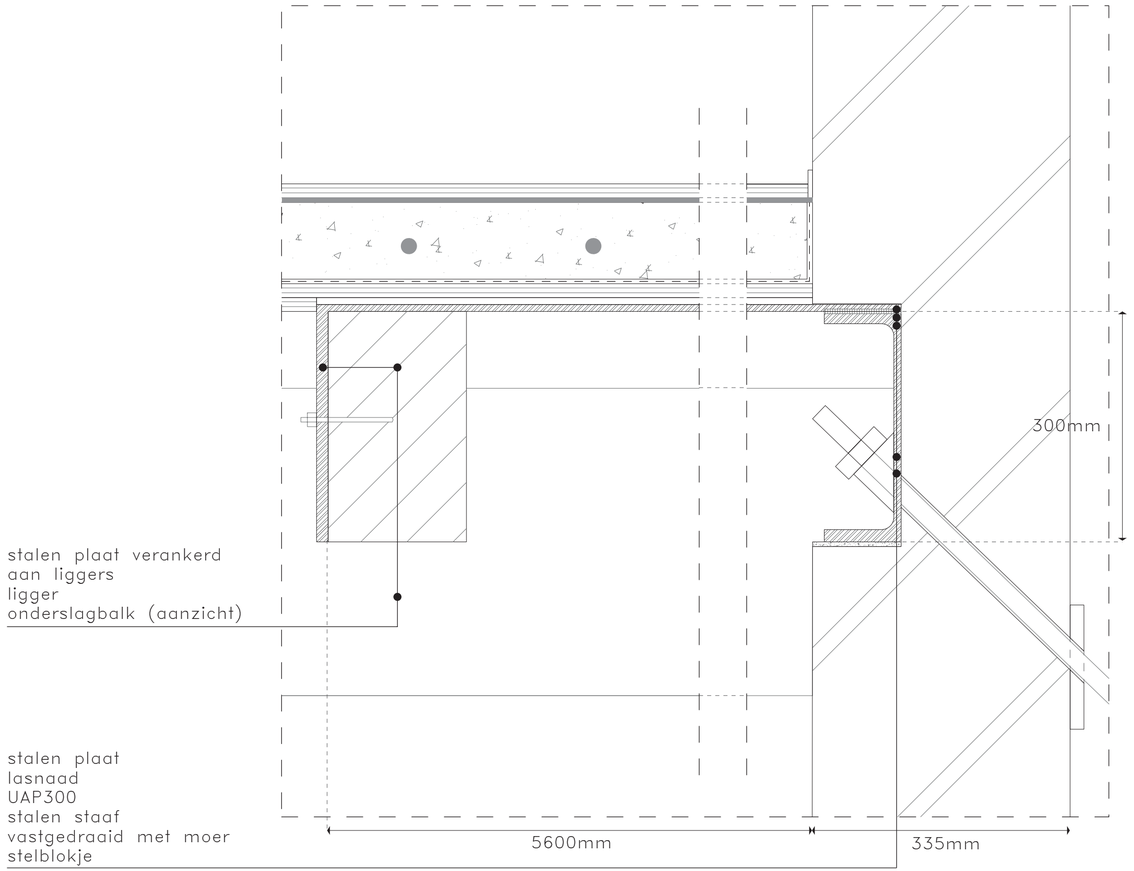
floor–wall, scale 1:5



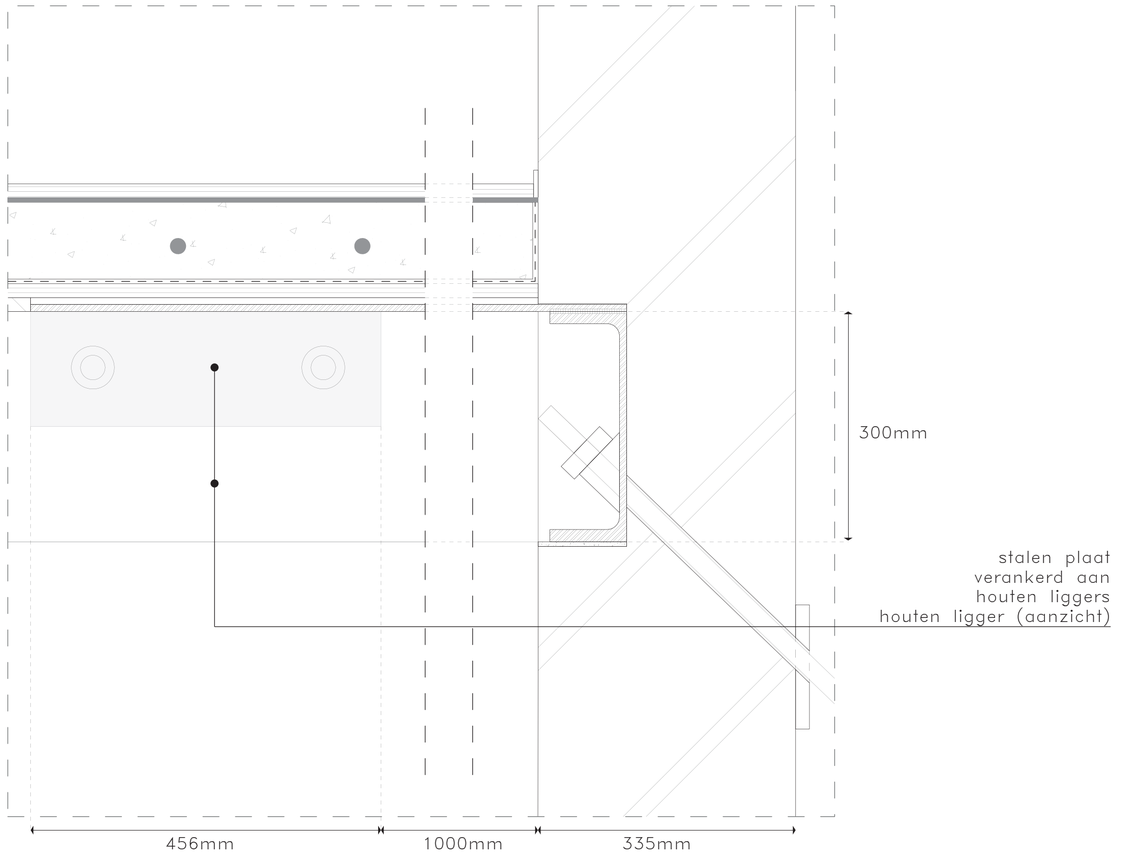
sliding panel furniture building1692, scale 1:5



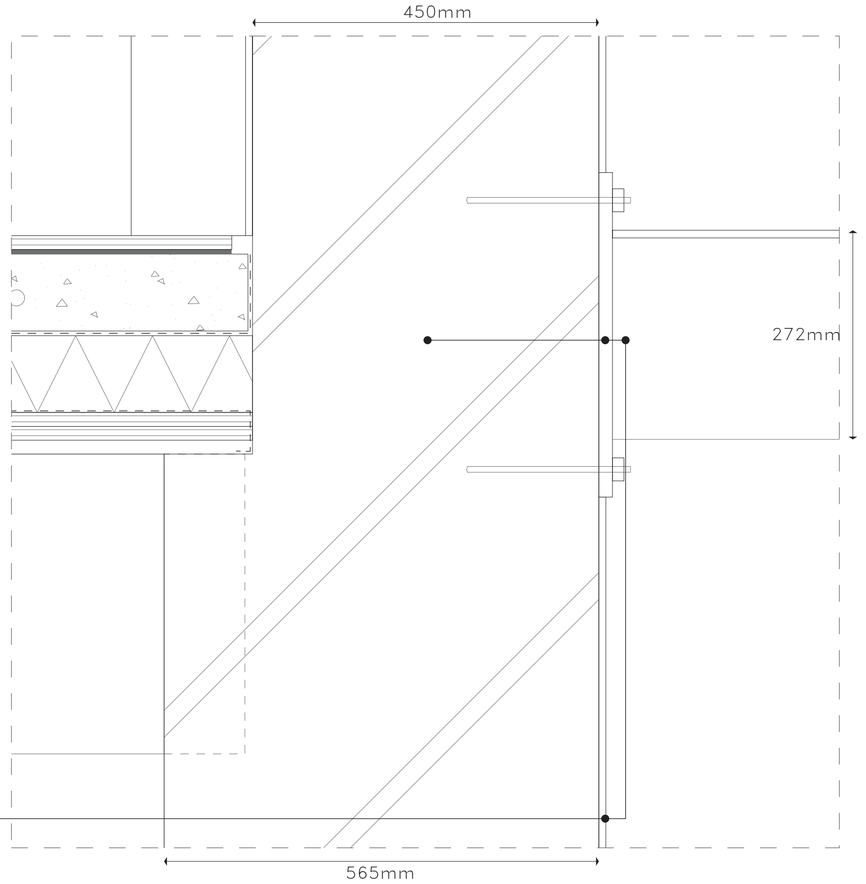
lifted street–facade & girders (girders parallel to facade), scale 1:5



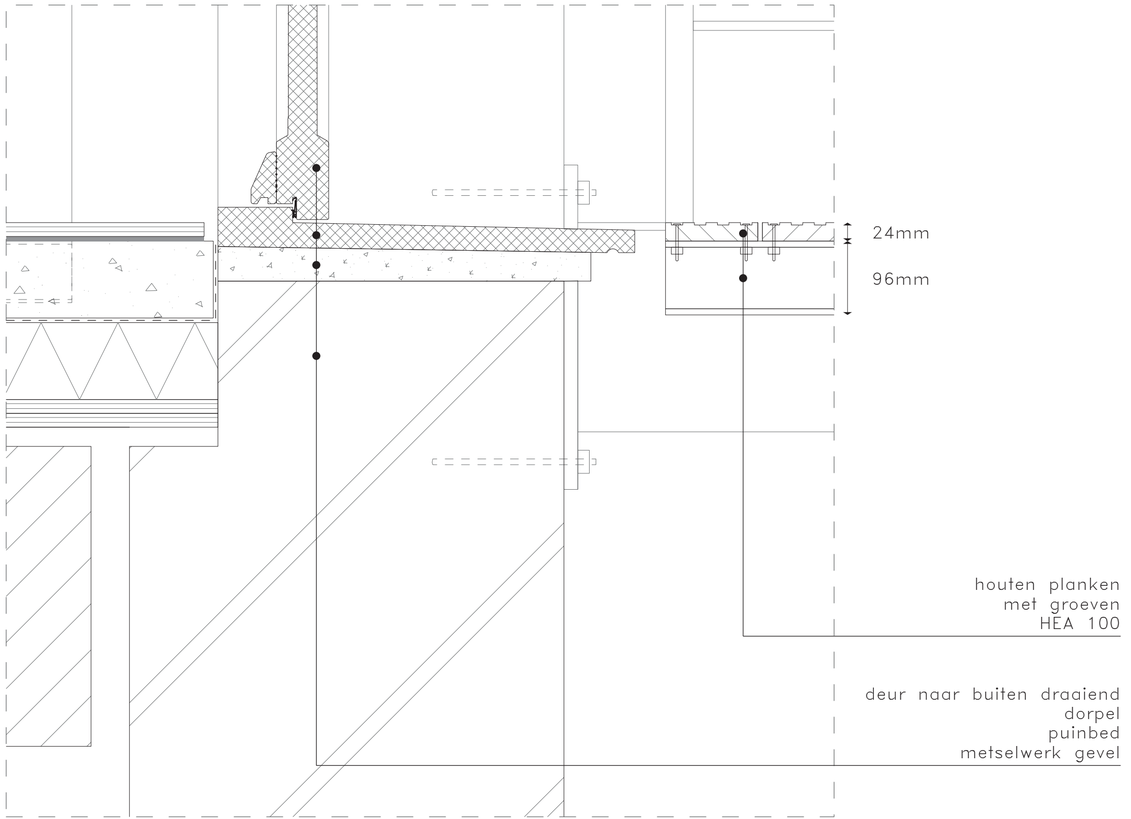
lifted street–facade & girders (girders perpendicular to wall), scale 1:5



lifted street–facade, scale 1:5



lifted street–facade (door), scale 1:5



Berekeningen aan de constructie

Dakligger Binnenplaats 1602

Buisprofiel: 100 x 200 x 10 mm
Lengte buisprofiel: 10,2 m
Breedte dakvlak: 1,2 m

Permanente belasting glas: 2,5 kg/m^2 x 4mm (dikte) = 10 kg/m^2 = 0,098 kN/m^2
1,2 x 0,098 = 0,1176 N/m
Veranderlijke belasting (wind): 0,46 kN/m^2
1,2 x 0,46 = 0,552 kN/m
Eigen gewicht buisprofiel: 41,3 kg/m = 0,405 kN/m

DOORBUIGING (BGT)
U_{max} = $l_{rep.}$ X 0,003
10,2 x 0,003 = 0,0306 m = 30,6 mm
U = (5/384) x (ql^4 / EI)
q = 0,1176 + 0,552 + 0,405 = 1,0746 kN/m = 1,0746 N/mm
l = 10,2 m
E = 210000 N/mm^2
I_y = 2444 x 10^4 mm^4
U = (5/384) x (1,0746 x 10200^4 / 210000 x 24440000) = 29,5 mm doorbuiging < 30,6 mm = veilig

Doorbuiging (UGT)
Belastingsfactor permanente belasting: 1,2
Belastingsfactor veranderlijke belasting: 1,5

Permanente belasting: 0,1176 + 0,405 = 0,5226 kN/m
Veranderlijke belasting: 0,552 kN/m

σ_{max} = 235 N/mm^2
q = 1,2 x 0,5226 + 1,5 x 0,552 = 1,46 kN/m
σ_{max} = M/$W_{y,el}$ =
M = ql^2 / 8 = 18,99 kNm
$W_{y,el}$ = 244 x 10^{-6}
σ_{max} = 18,99/ 0.000244 = 77828 kN/m^2 = 78 N/mm^2 < 235 N/mm^2 = veilig
Dit buisprofiel voldoet aan de eis met betrekking tot de uiterste grenstoestand.

Op zijn minst is er dus elke 1,2 meter een buisprofiel van 100 x 200 mm nodig. Dit zorgt voor een zwaar ogende constructie die bovendien een duidelijke richting geeft. Gezien binnenplaats 1602 geen duidelijke richting aangeeft om te overspannen, en de profielen van 100 x 200 mm er een duidelijke richting aan zullen geven, wil ik kiezen voor een andere aanpak.

Dakligger Binnenplaats 1692

Voor de binnenplaats van gebouw 1692 geldt dat de langste ligger een lengte van 10 meter heeft. Voor de constructie zal dus eenzelfde buisprofiel gebruikt worden: 100 x 200 x 10 mm. Deze binnenplaats heeft een duidelijke richting, die zich voortzet uit de typologie van de plattegrond. Deze richting mag hierom doorgezet worden in de binnenplaats. Ik heb echter de voorkeur beide binnenplaatsen eenzelfde te overkappen, en dus zal ik ook hier niet een ritme van 100 x 200 mm buisprofielen gebruiken.

Oplossing overkapping binnenplaatsen 1602 en 1692

Voor de glazen overkappingen heb ik gekozen voor een systeem van kabels die op trek- en drukspanning werken. Aan dit systeem van kabels koppel ik een point-fixture systeem dat de glazen platen op hun plaats houdt. Dit voorkomt een lijnenspel van kozijnen. Al met al vormt het kabelsysteem een dik constructiepakket, maar oogt zeer transparant en licht. De systemen volgen de vormen van de binnenplaatsen. Hierdoor zijn de vormen van de binnenplaatsen bovengeschikt en zal het overkappingspakket hier geen visuele veranderingen in aanbrengen.

Gevormde ligger verhoogde straat

1/20 x l
1/20 x 4350 mm = 217,5 mm
Kokerprofiel 250 x 150 x 6 mm

Secundaire ligger verhoogde straat

1/20 x 2850 mm = 142,5
Kokerprofiel 140 x 80 x 4 mm

Dwarsliggers verhoogde straat

1/20 x 2090 mm = 104,5 mm
HEA100: 96 x 100 mm

Het pakket van secundaire liggers, dwarsliggers en houten planken (25mm dik) komt tussen de gevormde liggers in te liggen, De hoogte van dit pakket moet dus overeenkomen met de hoogte van de gevormde liggers: 250 mm. Echter maak ik ook gebruik van stalen schoenen om de ligger in te leggen. Deze hebben eenzelfde dikte als de erin gelegde liggers. Dit betekent dat het pakket in totaal 140 + 4 + 96 + 8 + 24 = 272 mm dik zal zijn.
De gevormde liggers zijn uiteraard niet standaard te verkrijgen en zullen dus zelf geproduceerd moeten worden. Hierom neem ik de vrijheid de standaard afmeting van 250 x 150 x 6 mm te veranderen naar 272 x 150 x 6 mm. Er is zo ruimte voor het pakket tussen de gevormde liggers in.

BEREKENINGEN AAN VERSE LUCHTBEHOEFTE

Aan de hand van verschillende bronnen en eigen inzicht/ervaring heb ik een tabel opgesteld met eisen ten behoeve van de luchtverversing.

Functie & ruimte	Opper-vlakte m^2	Vloeropper-vlakte per persoon m^2	Percentage gebruikt vloeropper-vlak %	Maximaal aantal personen	Verse lucht-behoefte per persoon m^3/h
markt begane grond	n.v.t.	n.v.t.	n.v.t.	n.v.t.	n.v.t.
restaurant 1602, verdieping 1	563	2	40	113	25
keuken restaurant 1602, verdieping 1	135	12	100	11	75
vergaderruimte 1602, zolder	...	5	...		30
workshopruimte 1692, verdieping 1,2, 3	1184	3	50	197	50
toiletten	...	...	...	...	12

Onderstaande tabel is overgenomen uit Klimaatinstallaties I-310

	Schacht rechthoekig breedte x hoogte mm				
Schacht rond diameter mm					
100	70 x 170				
125	80 x 170				
160	150 x 150	125 x 175	100 x 200		
200	200 x 200	150 x 250	125 x 300	100 x 400	
250	250 x 250	200 x 300	175 x 350	150 x 400	125 x 500
315	300 x 300	250 x 350	200 x 400	175 x 500	150 x 600
400	400 x 400	250 x 500	200 x 800		
500	500 x 500	350 x 700	300 x 800	250 x 1000	
630	600 x 600	500 x 700	400 x 800	350 x 1000	300 x 1200
800	800 x 800	500 x 1000	400 x 1600		
1000	1000 x 1000	700 x 1400	500 x 2000		
1250	1200 x 1200	800 x 1600	600 x 2400		
1600	1600 x 1600	1200 x 2400	800 x 3200		

Nota Bene:
Ik had de mogelijkheid te kiezen uit twee methodes voor het berekenen van de verse luchtbehoefte. Van deze twee methoden heb ik per ruimte de best passende methode gekozen. Doorgaans bereken ik de verse luchtbehoefte aan de hand van het aantal aanwezige personen. Enkel bij de berekening voor de keuken van het restaurant (volgende pagina) ga ik uit van de andere methode. Het aantal benodigde luchtwissels is hier representatiever dan het (lage) aantal aanwezige personen.

Schacht: Verticale schacht, rechtstreeks uit de luchtbehandelingskast komend
Ruimte: Afsplitsingen van de verticale schacht.

Voor de berekeningen van de luchtbehandelingskasten moet genoemd worden dat deze volgens oude methoden berekend zijn. De hedendaagse luchtbehandelingskasten zullen naar waarschijnlijheid kleiner uitvallen. Ik heb ervoor gekozen de afmetingen van mijn berekeningen precies te vertalen naar de plattegronden, zodat ik zeker weet dat dergelijke installaties zullen passen in het gebouw.

Restaurant – 1602, verdieping 1

BENODIGDE HOEVEELHEID LUCHTVERVERSING
aantal personen in de ruimte: 113 personen
hoeveelheid verse lucht per persoon: 25 m3/h
Verse luchtbehoefte Q: 113 x 25 m3/h = 2825 m3/h
2825/3600 = 0,785 m3/s

Of:
Volume ruimte: 3769,2 m3
Aantal luchtwissels: 6
Verse luchtbehoefte Q: 3769,2 x 6 = 22615,2 m3/h
22614,2/3600 = 6,282 m3/s

LUCHTKANALEN
Oppervlakte schacht A = Q/v
$V_{max.\ Schacht}$ = 9,0 m/s
$V_{max.\ Ruimte}$ = 4,0 m/s
Aschacht = 0.785 / 9,0 = 0,087 m2
Aruimte = 0.785 / 4 = 0,196 m2

A = π x d2 / 4
d = √(A x 4 / π)
$d_{schacht}$ = √(0,087 x 4 / π) = 0,333 m
d_{ruimte} = √(0,196 x 4 / π) = 0,500 m

Schacht: 400 mm = 400 x 400 mm
Ruimte: 630 mm = 23 kanalen van 80 x 170 mm

LUCHTBEHANDELINGSKAST
V max. = 2,5 m/s
Behoefte: 0,785 m^3/s
A = 0,785 / 2,5 = 0,314 m^2
√(0,314) = 0, 560 m
630x630mm
LBKtoevoer: 1:1:5 = 630 x 630 x 3150 mm
LBKafvoer: 1:1:3 = 630 x 630 x 1890 mm

Keuken – 1602, verdieping 1

BENODIGDE HOEVEELHEID LUCHTVERVERSING
aantal personen in de ruimte: 11 personen
hoeveelheid verse lucht per persoon: 75 m3/h
Verse luchtbehoefte Q: 11 x 75 m3/h = 825 m^3/h
825/3600 = 0,229 m^3/s

Of:
Volume ruimte: 5,4m x 135m^2 = 729m^3
Aantal luchtwissels: 15
Verse luchtbehoefte Q: 729 x 15 = 10935 m^3/h
10935/3600 = 3,038 m^3/s

LUCHTKANALEN
Oppervlakte schacht A = Q/v
V max. Schacht = 9,0 m/s
V max. Ruimte = 4,0 m/s
Aschacht = 3.038 / 9,0 = 0,338 m2
Aruimte = 3.038 / 4 = 0,760 m2

A = π x d2 / 4
d = √(A x 4 / π)
$d_{schacht}$ = √(0,338 x 4 / π) = 0,656 m
d_{ruimte} = √(0,860 x 4 / π) = 1,046 m

Schacht: 800 mm = 800 x 800 mm
Ruimte: 1250 mm = 90 kanalen van 80 x 170 mm

LUCHTBEHANDELINGSKAST
V max. = 2,5 m/s
Behoefte: 3,038 m^3/s
A = 3,038 / 2,5 = 1,215m^2
√1,215 = 1,102m
1250x1250mm
LBKtoevoer: 1:1:5 = 1250 x 1250 x 6250 mm
LBKafvoer: 1:1:3 = 1250 x 1250 x 3750 mm

Workshop gebouw – 1692, verdieping 1,2,3

BENODIGDE HOEVEELHEID LUCHTVERVERSING
aantal personen in de ruimte: 197 personen
hoeveelheid verse lucht per persoon: 50 m^3/h
Verse luchtbehoefte Q: 197 x 50 m^3/h = 9850 m^3/h
9850/3600 = 2.736 m^3/s

LUCHTKANALEN
Oppervlakte schacht A = Q/v
V max. Schacht = 9,0 m/s
V max. Ruimte = 4,0 m/s
Aschacht = 2.736 / 9,0 = 0,304 m^2
Aruimte = 2.736 / 4 = 0,684 m^2

A = π x d2 / 4
d = √(A x 4 / π)
$d_{schacht}$ = √(0,304 x 4 / π) = 0,622 m
d_{ruimte} = √(0,684 x 4 / π) = 0,933 m

Schacht: 630 mm = 600 x 600 mm
Ruimte: 1000 mm = 58 kanalen van 80 x 170 mm

LUCHTBEHANDELINGSKAST
V max. = 2,5 m/s
Behoefte: 2.736 m^3/s
A = 2.736 / 2,5 = 1,094 m^2
√1,094 = 1,046 m
1250x1250 mm
LBKtoevoer: 1:1:5 = 1250 x 1250 x 6250 mm
LBKafvoer: 1:1:3 = 1250 x 1250 x 3750 mm

Workshop gebouw – 1692, verdiepingen 1,2 en3 samen

BENODIGDE HOEVEELHEID LUCHTVERVERSING
Verse luchtbehoefte Q: 3 x 2.736 = 8,208 m^3/s

LUCHTKANALEN
Oppervlakte schacht A = Q/v
V max. Schacht = 9,0 m/s
V max. Ruimte = 4,0 m/s
$A_{schacht}$ = 8,208 / 9,0 = 0,912 m^2
A_{ruimte} = 8,208 / 4 = 2,052 m^2

A = π x d2 / 4
d = √(A x 4 / π)
$d_{schacht}$ = √(0,912 x 4 / π) = 1,078 m
d_{ruimte} = √(2,052 x 4 / π) = 1,616 m

Schacht: 1250 mm = 1200 x 1200 mm
Ruimte: 1600 mm = 148 kanalen van 80 x 170 mm = 49 kanalen per verdieping

LUCHTBEHANDELINGSKAST
V max. = 2,5 m/s
Behoefte: 2.736 m^3/s
A = 8,208 / 2,5 = 3,283 m^2
√3,283 = 1,812 m
1812 x 1812 mm
LBKtoevoer: 1:1:5 = 1812 x 1812 x 9060 mm
LBKafvoer: 1:1:3 = 1812 x 1812 x 5436 mm

Gekozen is voor de oplossing de benodigde luchtbehoefte van alle verdiepingen te combineren in 1 luchtbehandelingskast.

Bronnen
http://www.bouwbesluitonline.nl/Inhoud/docs/wet/bb2012_nvt/artikelsgewijs/hfd3/afd3-6/par3-6-1/art3-29
http://www.arboportaal.nl/onderwerpen/fysische-factoren/klimaat/luchtverversing.html
http://nl.wikipedia.org/wiki/Bezettingsgraad_%28bouwkunde%29
Klimaatinstallaties: Integratie van gebouw en installaties & overige gebouwinstallaties. T.A.J. Schalkoort

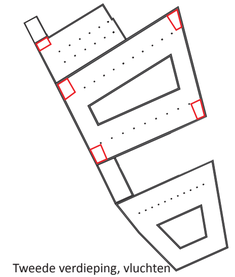
BRANDCOMPARTIMENTERING EN VLUCHTEN

Gedurende het gehele ontwerp heb ik rekening gehouden met de brandveiligheid van het gebouw. Opmerkelijk is dat er toen het gebouw een publieke functie had (museum) niet de richtlijnen van het bouwbesluit volgde met betrekking tot brandveiligheid.
Zo goed als mogelijk was heb ik geprobeerd dit probleem aan te pakken.
Onderstaande tabel geeft voor mijn ontwerp de verdeling in brandcompartimenten weer in het complex.

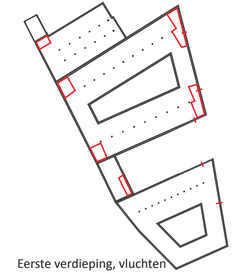
Brandcompartiment	Oppervlakte m^2
Gebouw 1602 Eerste en tweede verdieping	1045
Gebouw 1692 Eerste verdieping	1140
Gebouw 1692 Tweede verdieping	1205
Gebouw 1692 Derde verdieping	1205
VOC gebouw Begane grond, eerste en tweede verdieping publieke ruimtes (entree, workshop- en activiteiten, bibliotheek)	936
VOC gebouw Eerste verdieping (kantoor en vergaderruimte)	79
VOC gebouw Tweede verdieping (kantoor en opslag)	79

Te zien is dat in 4 gevallen de grens van 1000 vierkante meter wordt overschreden. Hiervan ben ik mij bewust, ik heb er echter voor gekozen om geen brandscheidende elementen toe te passen. In de afbeeldingen hiernaast is het aantal vluchtpunten te zien. Door in gebouw 1692 in elke hoek een vluchttrappenhuis aan te brengen, waarbij de route hiernaartoe nooit de grens zoals genoemd in het bouwbesluit2012 overschrijdt, denk ik genoeg mogelijkheid tot vluchten te hebben geimplementeerd.
De gehanteerde grenzen zijn:
<20 meter: Directe lijn van verblijfsplaats naar vluchttrappenhuis
<30 meter: Een (indirecte) route van verblijfsplaats naar vluchttrappenhuis.
<22,5 meter: Een (indirecte) route vanuit een cel naar vluchttrappenhuis
Een indirecte route betekent het ontwijken van objecten als meubilair, waarbij de afstand tussen persoon en objecten minimaal 30 centimeter is.
Gebouw 1602 zou enigszins problematisch kunnen zijn met betrekking tot het vluchten vanaf de zolder. In mijn ontwerp heb ik deze verdieping niet tot in detail uitgewerkt. Vluchten vanaf deze verdieping gebeurt via de eerste verdieping (het restaurant). In enkele gevallen zal de verblijfsplaats op de zolderverdieping dus ook verder dan 30 meter verwijderd zijn van veiligheid. Indien deze plattegrond verder uitgewerkt zou worden, zal er dus rekening gehouden moeten worden met het gebruik van de plattegrond. Plaatsen die ver verwijderd liggen van veiligheid zullen bijvoorbeeld gebruikt worden als opslag of technische ruimte. Plaatsen die wel binnen de 30 meter vallen zullen dienen als vergader en ontmoetingsruimtes.

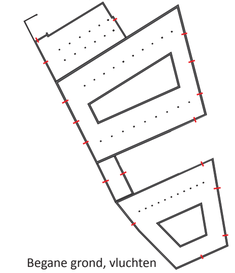
Alle vluchttrappenhuizen komen ofwel uit op de verhoogde straat, ofwel in de markthal op de degane grond, vanwaar vrijwel direct de buitenruimte kan worden bereikt.



Tweede verdieping, vluchten



Eerste verdieping, vluchten



Begane grond, vluchten

Bronnen
Bouwbesluit 2012 online, afdeling 2.12 vluchtroutes