

# THE ART FACTORY

THE CULTURAL CENTRE FOR THE FINE AND PERFORMING ARTS

RESEARCH

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# I LOCATION

## I.1 Hembrug

The name Hembrug originates from the peninsula Den Hem, which was surrounded by the Zaandammerpolder. When the North Sea Canal was completed in 1874, new polders were formed around Den Hem on which the Hembrug site was built.

The Hembrug area is part of the Defense Line of Amsterdam, this is the last line of defense in the Netherlands.

The Hembrug site was divided into 3 adjacent factories, with the weapons factory where they produced the M95 rifle on the left, the cartridge factory where the bullets for the M95 were made in the middle and the ammunition factory where heavy explosives were produced on the right. The entrances to the factories are located to the south, and Campus North is located to the rear of the weapons factory.

Over the years, the site has changed from the functionality of the factories. When new techniques were introduced or new production started, buildings were added. When a building became unusable due to these changes, it was demolished. What can be seen here is that the terrain grew enormously around the 1st and the 2nd World War. From the 1970s, mainly civilian products were produced by NV machine tools industry and Euro metal. These left the site in 1996 and the site has been vacant ever since.

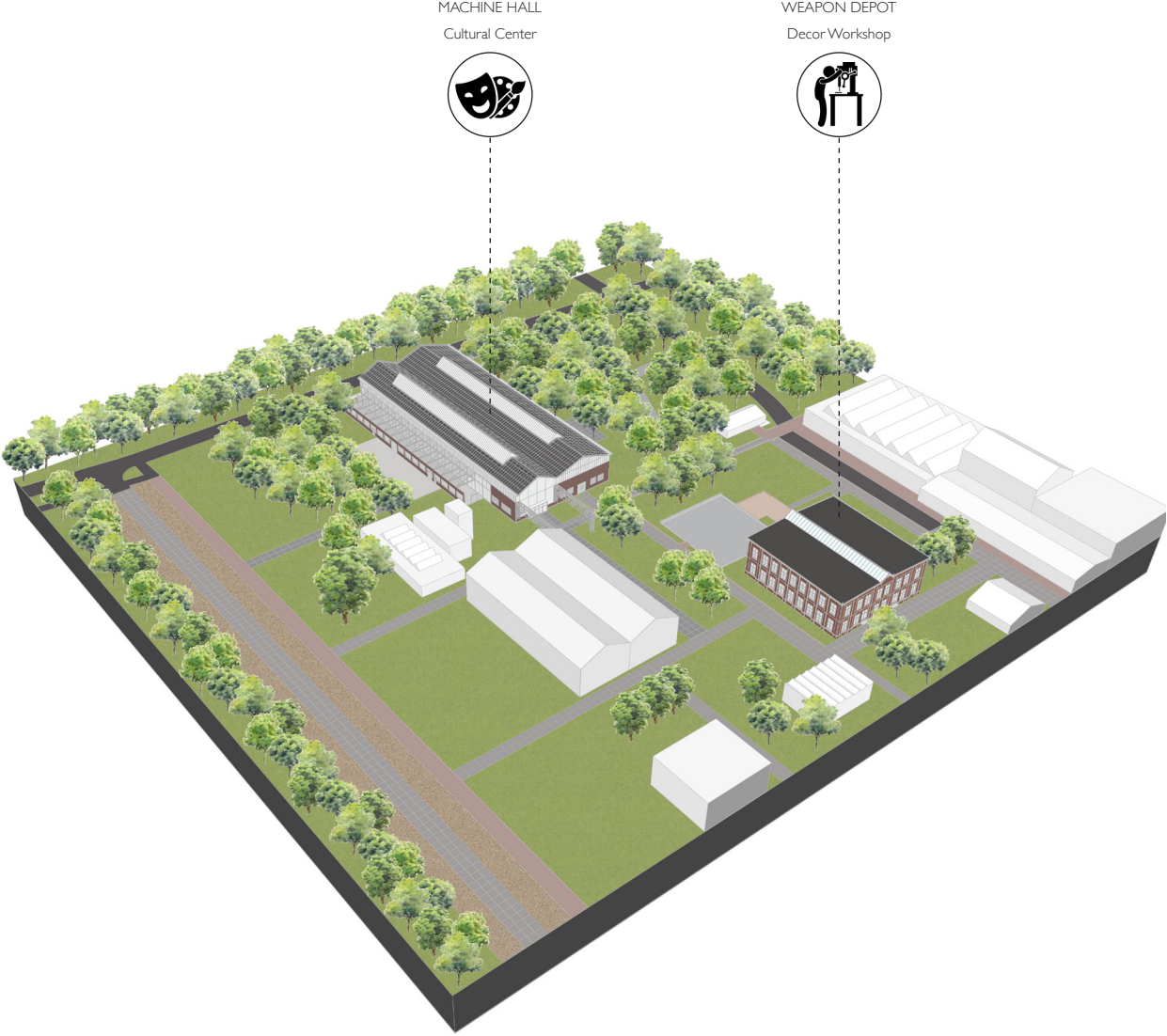
## I.2 Campus North

Where Campus North used to be the back of the weapons factory, it is now located at the entrance of the Hembrug area. The buildings in this area are 2 different typologies, one an industrial factory hall and the other is in neo-renaissance monumental style. The area is adjacent to the poplar forest where explosives were tested at the time of the weapons factory north of Campus Noord. Before the weapon depot, there was previously another building that was too dilapidated and demolished. The foundations of this building can still be seen and today function as a kind of square. This does enhance the monumental character of the arms depot. The reason this area is called a campus is due to the open spaces.

The streets on Campus Noord are made of Stelcom plates and the observation tower, which was used for scouting for air raids, now functions as a landmark within Campus Noord. The crane tracks that protrude into the machine hall also enhance the industrial character of this area.

The area has fallen into disrepair after the closing of Euro Metal, but it is slowly starting to be inhabited again by companies. Today, the immediate vicinity of Campus Noord already houses a variety of creative functions. With the transformation of the assigned buildings I want to expand these functions by designing a cultural center with a decor workshop.

Campus Noord owes its character to the production that took place here. There is designed from functionality. The once functional objects now have a landmark-like function. actually means that the area was created by form follows function, but that the function has disappeared but the form has remained.

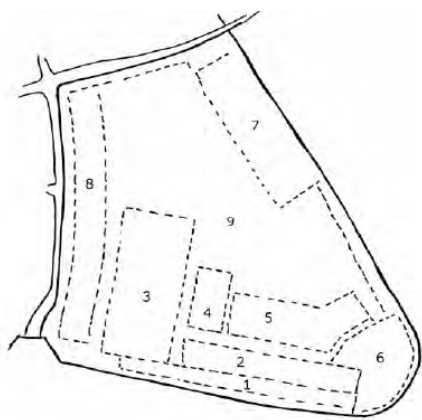


## 1.3 Palmbout vision

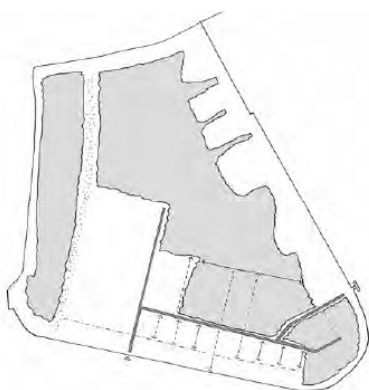
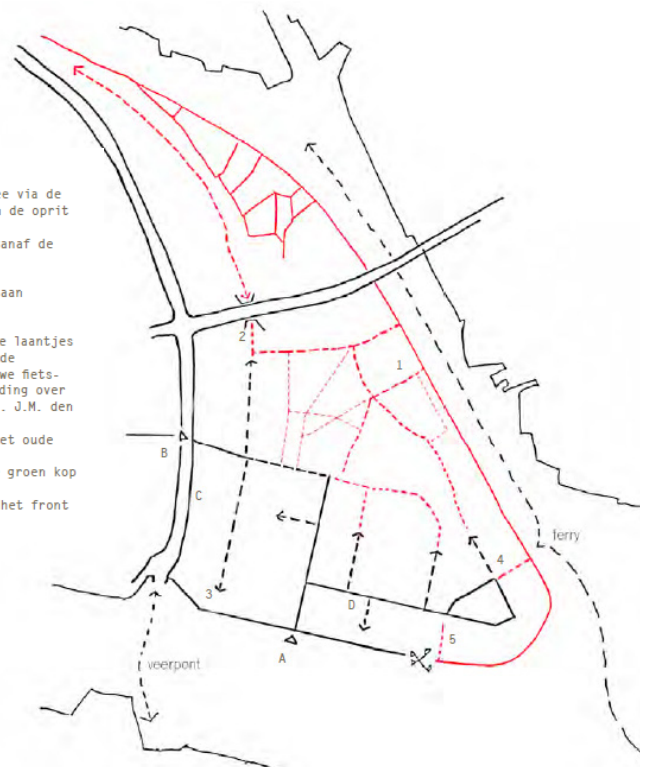
The Campus covers the zone that was originally intended for weapon production. It consists of building fields in a “carpet” of grass with trees, as is the case with a campus. This outdoor area is car-free and consists of a network of footpaths that connect the construction sites with each other, and a central green central area. The construction fields have shifted relative to each other, creating a variety of spaces. The façades of the buildings are staggered by sliding them, resulting in a lively and interesting image. The buildings are designed on all sides and have their orientations towards the grass with the trees. The existing business halls and new buildings can be placed on the fields being added. These new buildings have a maximum of two floors and a roof and several volumes may be placed on a construction site. The existing small electrical houses in the central area will have a catering function with a terrace in the grass. Small kiosks can be added if required. Due to the design of the campus it can be developed by one large party or several small parties with a joint “campus management” (Palmbout, 2011, page 146).

### 15 starting points

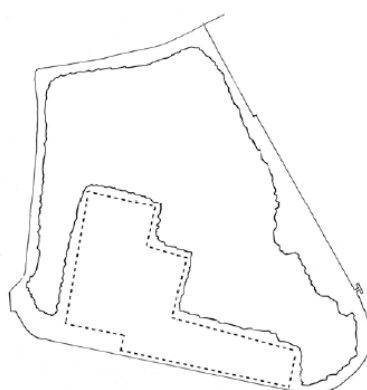
- 1 Strengthening the unique green estate.
- 2 Compacting within the cultural-historical framework
- 3 Restoration of the monumental Front
- 4 Add a new time layer
- 5 Maintain monuments as much as possible
- 6 Sharper boundaries of the estate
- 7 Strengthening the dichotomy in the estate
- 8 More coherence in disclosure
- 9 More connection with the environment
- 10 Variation of nine development units
- 11 Strengthening contact with the water
- 12 Building on existing architecture
- 13 Parking within the units
- 14 Public space as a binding means
- 15 Developing from sustainability



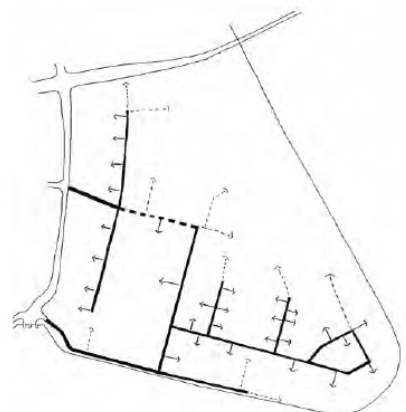
- AUTOVERKEER**
- A bestaande entree via de Noordzeekade en de oprit via het Front
  - B nieuwe entree vanaf de Provinciale weg
  - C Boslaan
  - D Asymmetrische laan
- LANGZAAMVERKEER**
- 1 entrees via drie laantjes vanaf de Zaankade
  - 2 entree via nieuwe fiets- en wandelverbinding over of onder de drs. J.M. den Uylweg
  - 3 entree via de het oude spoortracé
  - 4 entree langs de groen kop van de kaap
  - 5 entrees binnen het front



Cultuurhistorisch kader



Tweedeling van het Hembrug-terrein



Interne ontsluiting van het terrein

## 2 THE BUILDINGS

### 2.1 Weapon Depot



The weapon depot is a monumental building that was renovated in 2015. In 1899 this was the storage for the M95 rifle. The main entrance used to be on the south side and on this side were supporting functions such as an office, the hall and a preparation room for transport. The rest was storage space. Along the building was a narrow train track that was used to transport the weapons from the weapons factory to the weapons depot.

In 1954, the weapon depot was transformed into an office. This became Hembrug's new headquarters, taking on a central and important position. An office layout has been created and a new main entrance has been created on the north side of the building. When the euro metal disappeared from the area, the weapons depot fell into disrepair. The entire building was restored in 2015 and is now an empty canvas waiting for a new interpretation.

### 2.2 Machine hall



However, the machine hall has not been renovated, it is still in a derelict state. Unfortunately, you cannot enter it nowadays because of asbestos danger. Fortunately, there are pictures of what it looks like inside. The main building contains 2 large halls with a side building and an open floor plan. The machine hall has been rebuilt twice over the years. These renovations are the result of the functionality of the building. The production techniques and facilities changed, so the building also changed.

Heavy machines such as the Hembrug lathe were produced in the halls. In order to be able to move these machines from one station to another, 2 cranes were used that drove on a crane track. These could move along the entire length of the building and 1 crane could be rolled out to load the machines onto trucks.



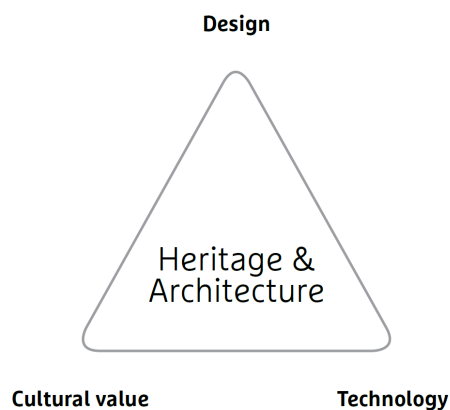
# 3 CULTURAL VALUE

The cultural heritage value of a site is the starting point for the design. Designers have to base their thinking on the qualities of a site and at the same time not giving up the freedom to make their own design choices.

That is why I, as a designer, have to take a position in heritage and ask myself the following questions:

- How can the cultural heritage value gain relevance for the future?
- In what way can a transformation contribute to this and also add a new quality?

The design approach in heritage can be symbolised by a triangle, with cultural value and technology as the basis for the design (Meurs, 2016)



## My position in heritage

I believe that a building has to have the potential to be transformed when the function of that building changes. There is often a mismatch with the existing function and the new function, therefore interventions to that building are required. When the building is not suitable for transformation and the old function of that building is no longer needed, and is most likely to be demolished.

A transformed building gives more depth and meaning than a new building. It has a history. When a building is being transformed, a part of that history is being preserved.

## Transformation with interventions

To transform a building into its new function different intervention methods are being used.

To distinguish the different interventions the terms harmony, contrast and neutral are being used to indicate the method of the intervention that has been made.

**harmony** - the original building is restored to its original state, where it is tried to go back to a certain time in the past.

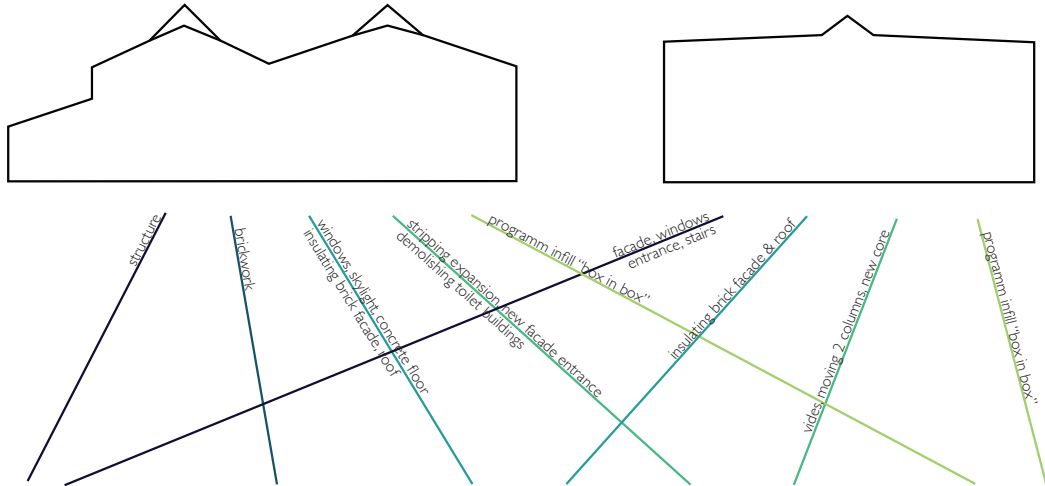
**neutral** - this is a re-interpretation of the original where new elements have been added but where these new elements can not be easily distinguished. With these interventions it is not clear what is existing and what is new.

**contrast** - a big intervention has been made where the new and existing elements are clearly different and can easily be distinguished.

The different interventions that are needed in a building can be treated differently to find a match with an intervention method. There is a balance between the different intervention methods.

Machinehall

Weapon Depot



Preservation

Restoration

Renovation

Intervention

Redesign

Reduce

Reuse

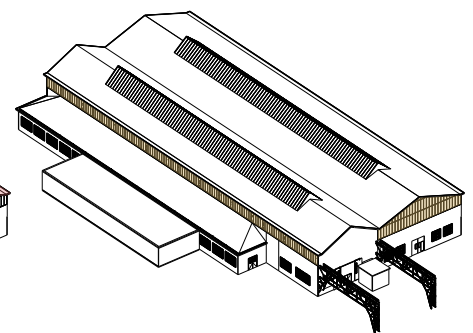
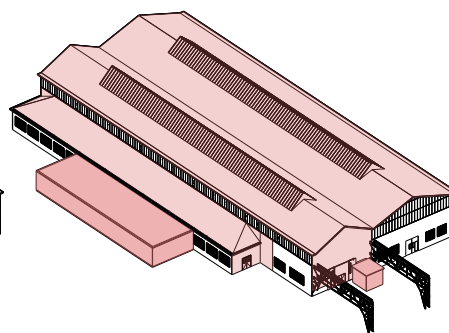
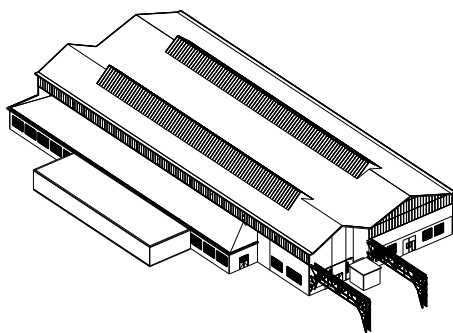
Recycle

Sustainability, Circularity, Durability, Reusability

EXISTING

DEMOLITION

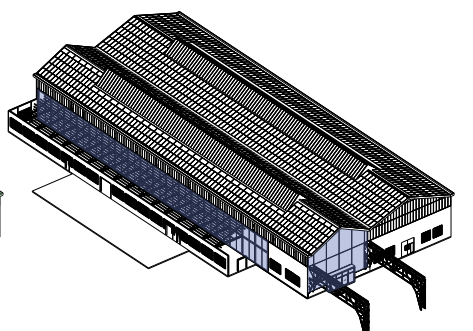
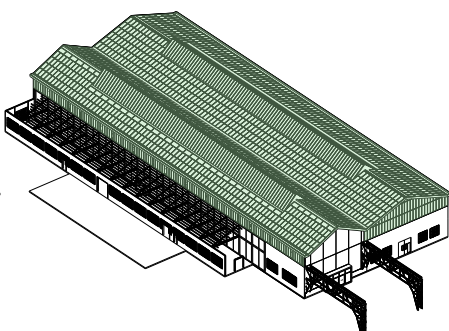
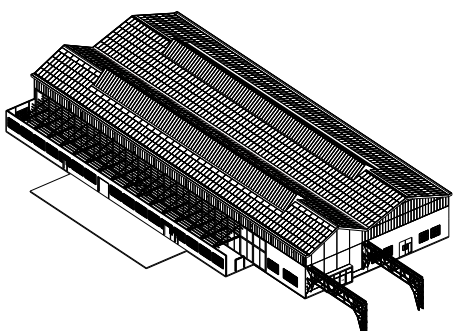
REUSE





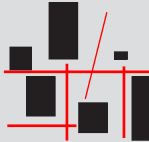


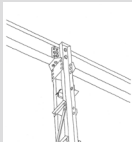






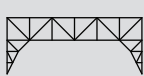





NEW

RENOVATED

INTERVENTION



3.1 Cultural Value Matrix			
	Age value	Historical value	Non intended commemorative value
Surrounding/ setting	 Water structure	 Plofbos	 The roads where the train tracks used to be
Site	 Monumental tree	 Axes of Campus North	 Position Weapon Depot by demolition of 309
Skin (exterior)		 Typology of façade Weapon Depot	
Technical Structure	 State of the art engineering	 Cranetrack & columns Machine Hall	 Extruded crane as visual guide landmark
Space plan		 Lengthwise Machine Hall	
Surfaces (interior)			 Floor tiles of Weapon Depot
Services	 Integrated ventilation Weapon Depot	 Hoist beams Weapon Depot	 Extruded crane Machine Hall
Stuff		 Watchtower 217	
Spirit of place		 Trees next to Machine Hall	 Low Density



Use value

Art value

Rarity value

Other value



Parking lot



Typologies



Hembrug as old military terrain



Connection to the main roads



Connectivity of buildings through public space



Axes road/ viewline to Weapon Depot



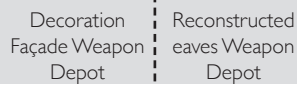
Ensemble on border of Hembrug



Stand-Alone Campus Structure



Changing of entrances Weapon Depot



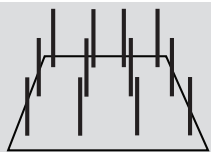
Decoration Façade Weapon Depot  
Reconstructed eaves Weapon Depot



Uniform façades Weapon Depot



Assembly of the trusses



Spatial freedom



Skylight



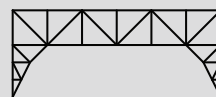
Entrance hall Weapon Depot



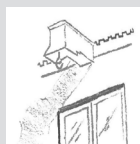
Tiles Weapon Depot



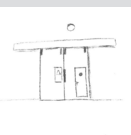
Transport doors Weapon Depot



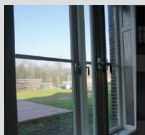
Extruded crane of Machine Hall



Hoist beams Weapon Depot



Sliding doors Machine Hall

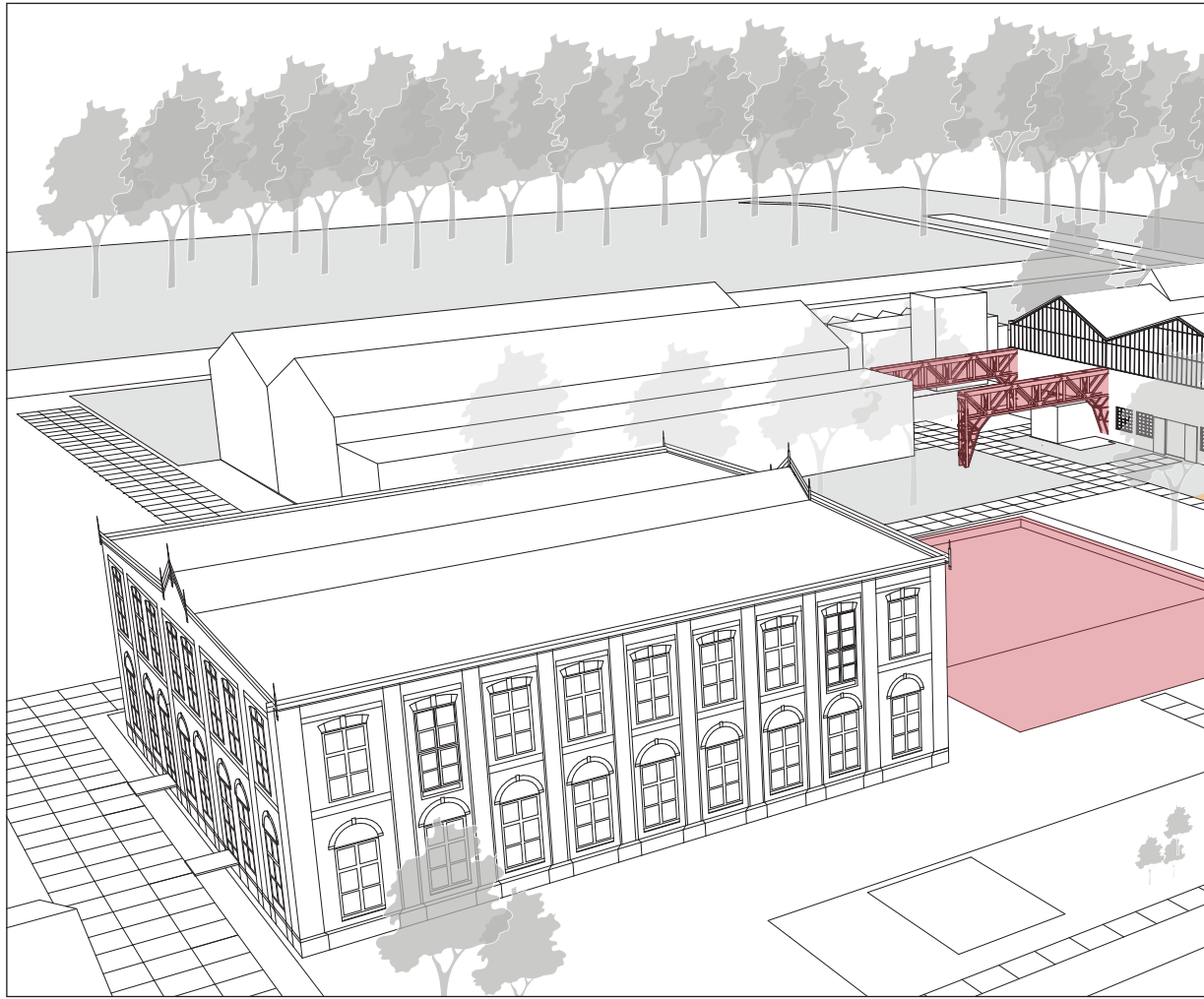


Lighting



Loading docks of Weapon Depot

## 3.2 Value Assessment Campus North



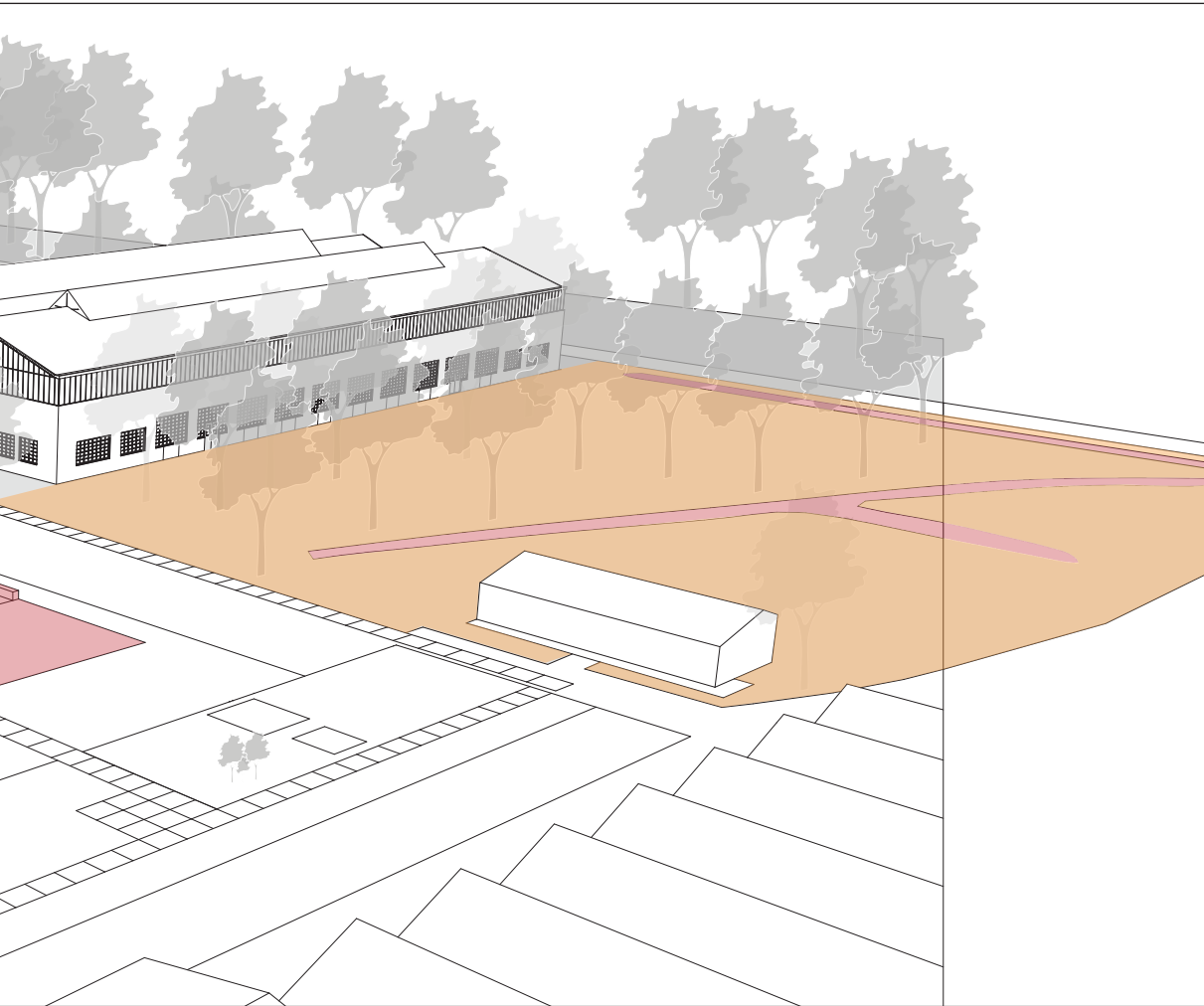
### OUTSIDE CRANE TRACKS MACHINE HALL

The outside crane tracks of the machine hall have a high value for me because I was impressed by it the first time I saw it. It embodies the Dutch engineering from another time period and it fascinates me to see how they built in former times. It also feels like a gate, an entrance.



### WATER

Campus North is one of the 2 ensembles that lies on the border of the former foreland 'the Hem' with the new polder. The waterline symbolizes this border and I like to keep this border visible.



## SQUARE

The weapon depot has a monumental character. Therefore I think that the square in front of the weapon depot is a very important aspect to the ensemble because it gives the building a more monumental feeling. It is a spatial quality that gets lost if there would be a building on this square.



## GREEN PLOT

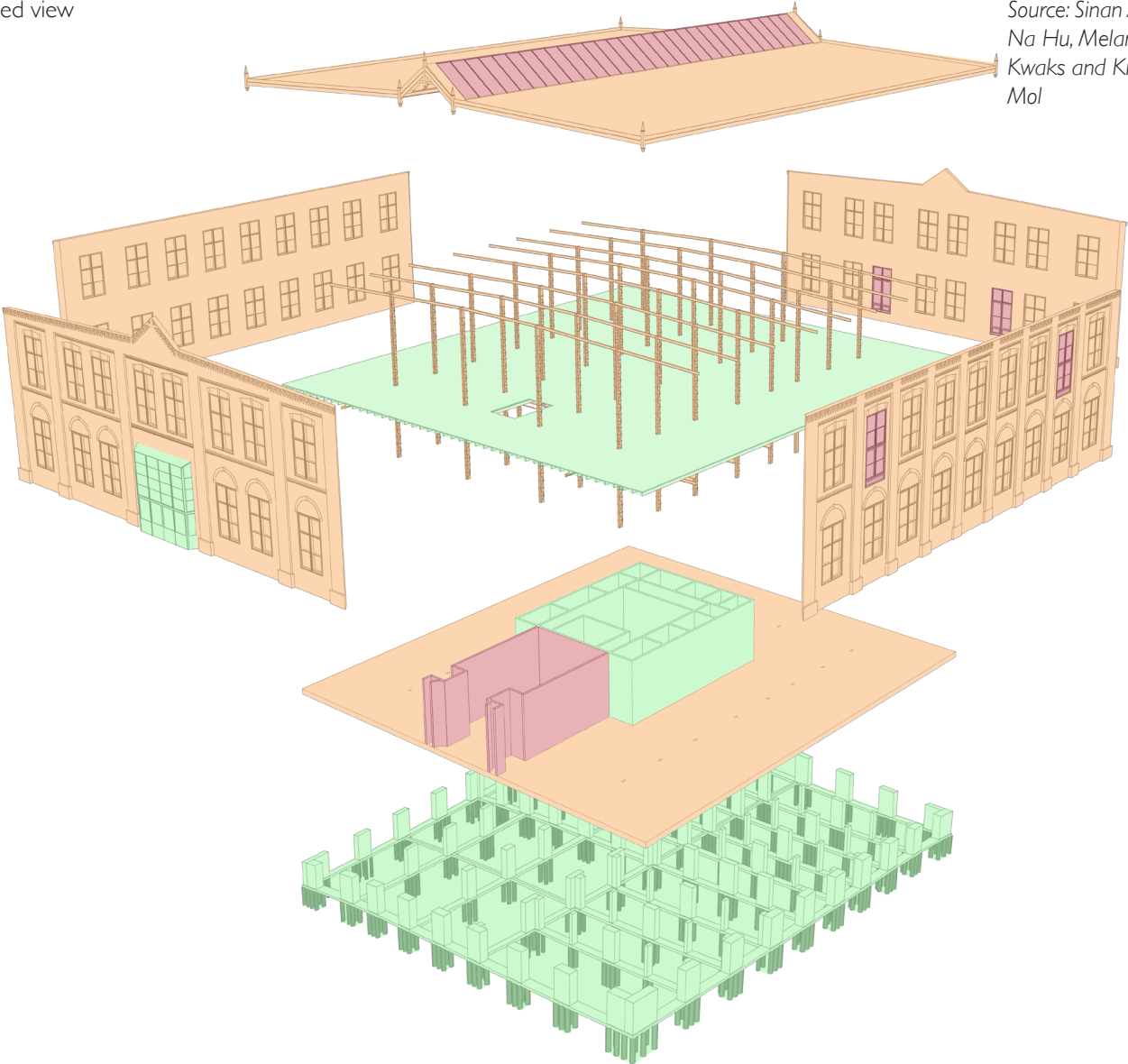
In my eyes, in this world, nature is of great importance. We can't live without nature. On a more spatial level, they provide a connection with the 'plobos' that is across the street. That's why I think this green plot is important, but I don't mind if changes were made to this green plot.



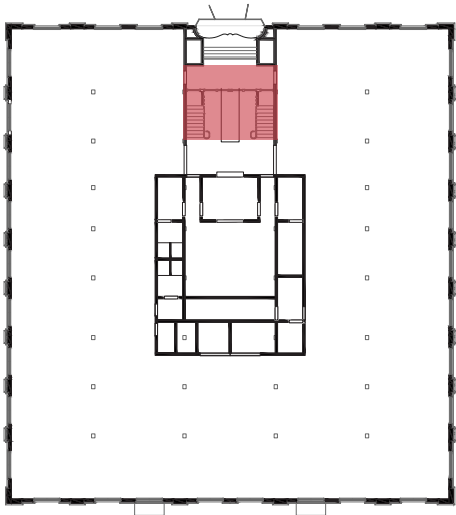
# 3.3 Value Assessment Weapon depot

exploded view

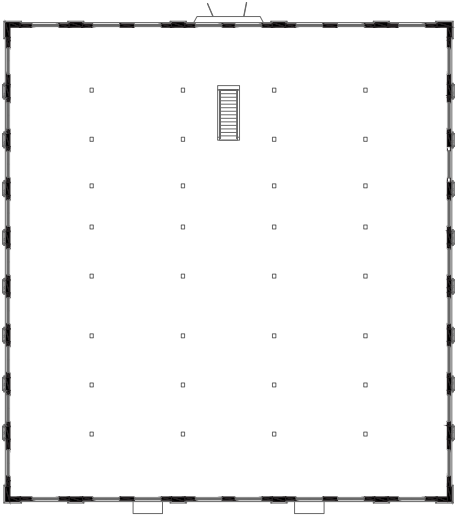
Source: Sinan Aydin,  
Na Hu, Melanie  
Kwaks and Kilian  
Mol



Ground Floor Plan



First Floor Plan



Source: Kilian Mol





## STAIRCASE WITH ENTRANCE

This staircase is renovated in its original state and to me it has art value. I like to keep this staircase as it is because of its spatial effect, the history it has and because it is an eyecatcher. Especially in combination with the entrance doors that were made in the same style as the staircase. The balustrades and doorhandles are matching so does the white color of the wooden door and wooden steps.



## SKYLIGHT

When going up the stairs I was amazed by this skylight and the light that it brought to the first floor. It was a very light, high and open space which created a nice atmosphere to be in. This is a contrast with the ground floor of the building because it has a relatively dark and cold atmosphere.



## TRANSPORT DOORS WITH HOISTING BEAMS

These doors represent the history of this building for me. The hoisting beams and transport doors are from when it was used as a storage space. When it was transformed into an office, steel stairs were going to these transport doors to provide an entrance. It endured the transformations from the past, therefore I want it to last in the next transformation as part of my design.



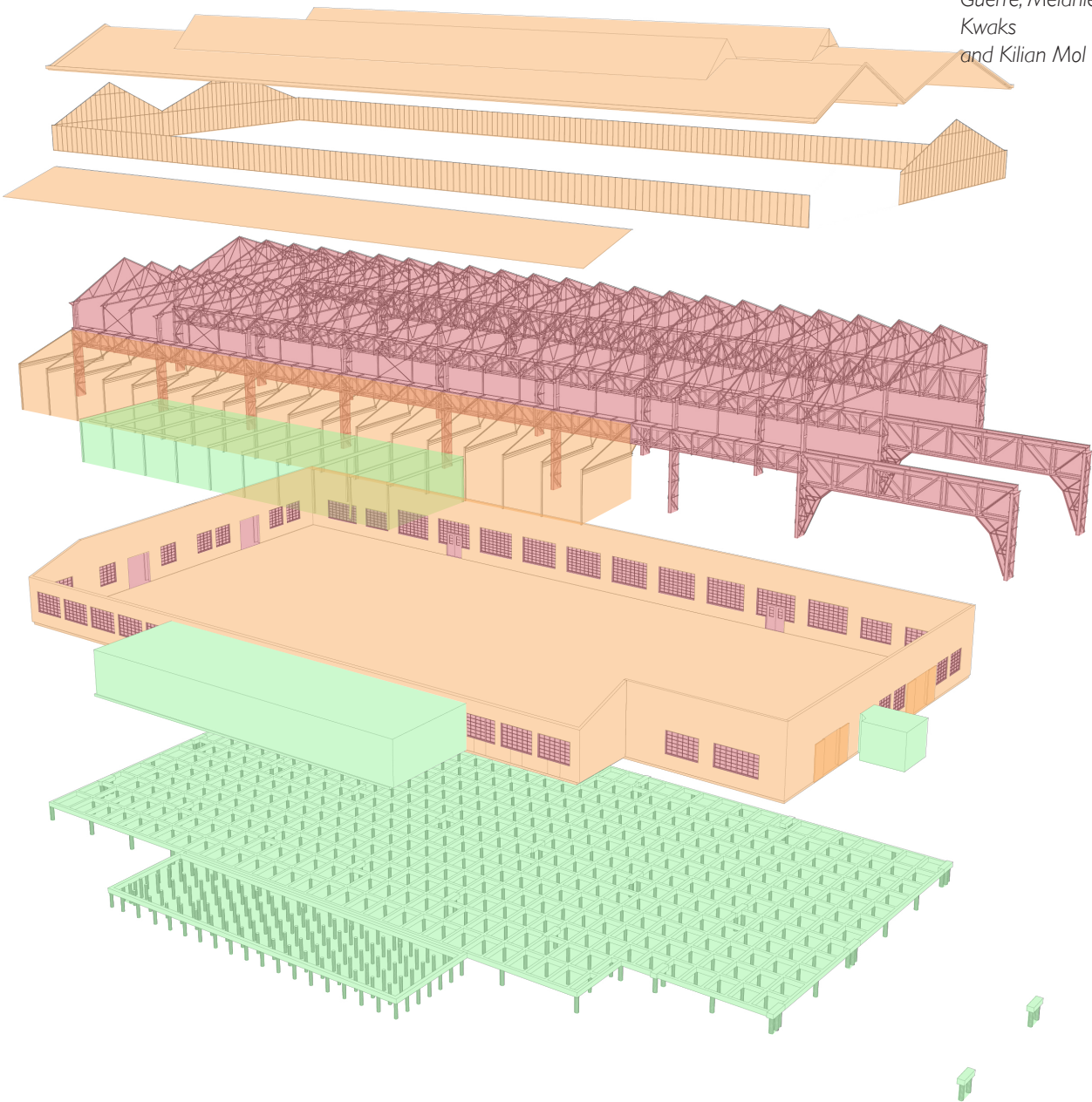
## ENTRANCE

For me it is more about the position and the materials of this entrance. That it is situated on this side and placed in the middle of the facade. I would like to make some changes to this entrance but the material use and the position is important to me.

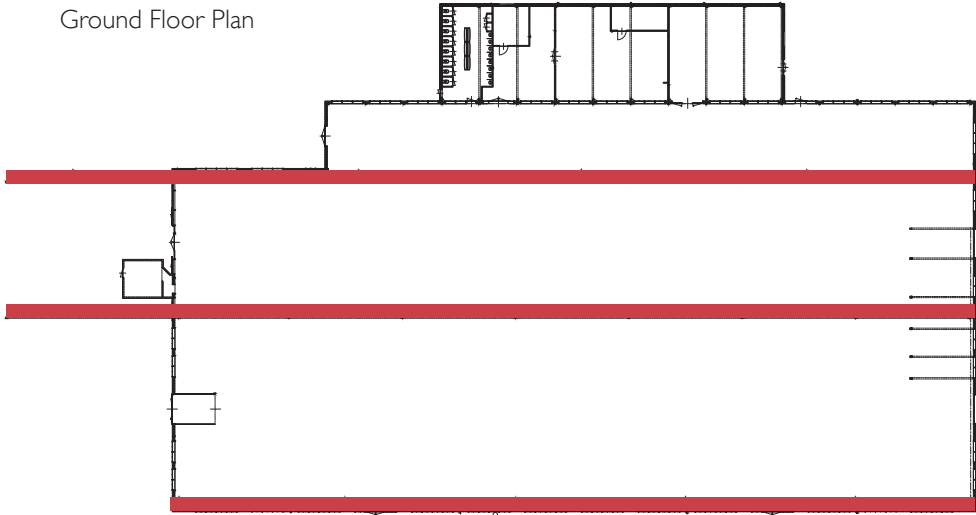
# 3.4 Value Assessment Machine hall

Source: Amélie de Guerre, Melanie Kwaks and Kilian Mol

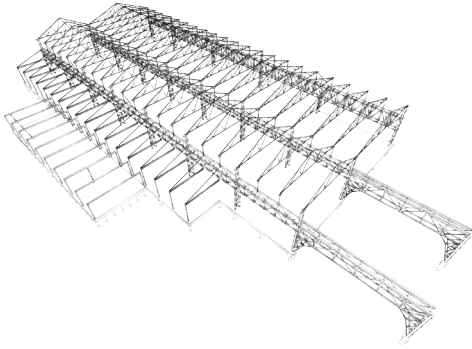
exploded view



Ground Floor Plan



Source: Kilian Mol



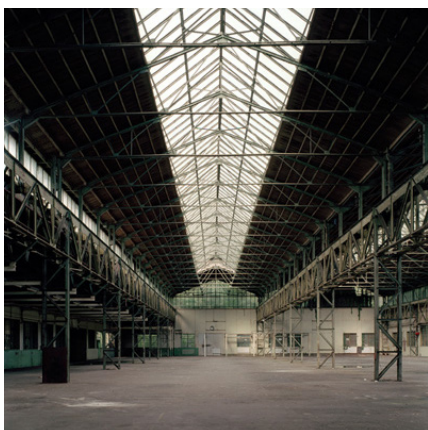
## CONSTRUCTION MAIN HALL

The construction has value for me because of the history it contains as an example of Dutch engineering. The truss beams, columns and roof elements have a certain beauty and an industrial value that makes me want to (re)use it.



## LOGITUDAL AXES

The longitudinal axes I marked as high value because of the crane that was riding on these axes. This crane was very important for the former function of this building, because it moved the machines that were built here. It refers back to the history of this building and keeps this part of the history alive.



## SKYLIGHTS

The machine hall got this skylight in common with the weapon depot because both buildings have the same type of skylight. I think that is a valueable aspect because of the light that it brings into the building which changes the atmosphere within.



## STEEL FRAMED WINDOWS

The steel framed windows are an indicator of the architecture style of industry buildings from that period in time and give the building an industrial atmosphere. I think they are important because of the history of the terrain and that the windows help with maintaining the industrial atmosphere in the new design.



# 4 PROGRAM

The starting point for this project was that the Machine Hall and Weapon Depot would become a cultural center, The Machine Hall will facilitate the performing arts center and the Weapon Depot the fine arts center. But since I decided to focus more on the decor workshop and give this function the space it needs. I need to revise my program and ask myself a few questions:

- Why this program in Hembrug?
- For which user groups am I designing this Cultural Center?
- What function comes where in Campus North?
- What are the requirements for the different functions?
- What role is the decor workshop going to play within my program?

## The History of Cultural Centers

The most independent cultural centers have buildings that are acquired more through accident or chance, than by design. Buildings can be adapted to the needs. A cultural center is usually multi-purpose by nature and does not fit into any of the normal categories. To design a cultural center it has to originate from the planned program and activities of the center.

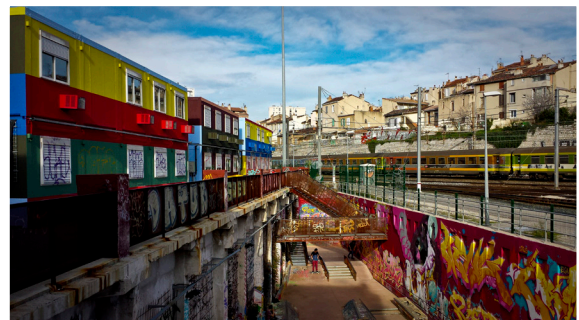
The idea is to provide an open and accessible space where people can be supported in their creativity. The building needs to be inviting because it is the first encounter between the public and the cultural center; make sure is a good one, with the help of a welcoming façade. In the Independent Cultural centres Leadership Training Handbook, Fitzgerald claims that a cultural center should have a commitment to a good design and usage with regard to questions of sustainability and environmentally friendly practices (Fitzgerald, 2008, pp. 12–13).

Quite a few of the early independent cultural centers in Europe squatted old industrial buildings that had become vacant in the post-industrial age. This was illegal but often possible because these places had fallen into an ownership vacuum. In many cases the local authority had acquired the land and didn't know

what to do with it. By definition, a lot of these post-industrial buildings were in abandoned areas of cities, such as docklands of previous manufacturing sites. These centers contributed to the revival of the neighbourhoods where they were based and provided inspiration for local authorities and business to invest in cultural centers as 'loss leaders' for urban rejuvenation (Fitzgerald, 2008, pp. 16).



*Melkweg, Amsterdam  
former sugar factory*



*La Friche de la Belle de Mai, Marseille  
former tobacco factory*



*Kaapelihtedas, Helsinki  
former cable factory*



## About the programming

An independent cultural center's program can be divided under 2 main headings: process-based work and public presentations. The first function describes activities that people participate in and the second function represents events that people attend as an audience. Having a programming policy is very important, as a program should reflect the vision and mission of a center. Besides making it clear to potential users why they may be excluded or included in a center's activities (Fitzgerald, 2008, pp. 25).

## Why this program in Hembrug?

Today Hembrug is an area with industrial buildings that had become vacant in the post-industrial time of the area. This is similar as the early independent cultural centers in Europe that squatted old industrial buildings, the Melkweg in Amsterdam is one of those early independent cultural centers. History shows that a cultural center is a big contributor to the revival of the neighbourhoods where they are based.

The future plans of Hembrug is to make it a residential area. To place a cultural center in Hembrug will help revive Hembrug from a vacant area to a nice place to live in.

Humans are social beings, we naturally seek connection to other people in public venues. We do this in the streets in the public spaces as a part of our daily activities. The cultural center can provide such a public place where people can meet and discuss but also develop themselves in the arts. This is plausible because a cultural center's program can be divided

in 2 main headings: process-based work and public presentations. This way, public presentations can function as a public place where people can gather and discuss the art(s).

My second intention to place a cultural center in the Hembrug area is to make this beautiful secluded place, where not many people are aware of, an important destination for not only the people living in Hembrug but also for the people from Zaandam, Amsterdam, and even maybe the rest of the country.

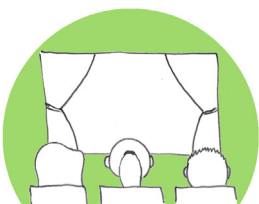
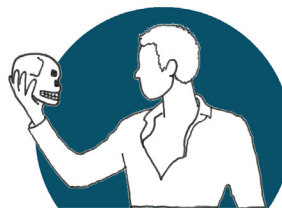
## The usergroup

In order to give form to the program, I need to decide what the usergroup is going to be. Who are going to use this cultural center?

I think the cultural center needs to be a place where there is room for all the different age groups. Where people can take different kinds of cultural classes, according to art, dance, music and theater. Where people can perform and show their learned skills, or where people come to watch a theater or music show. It is a place where everybody is welcome.

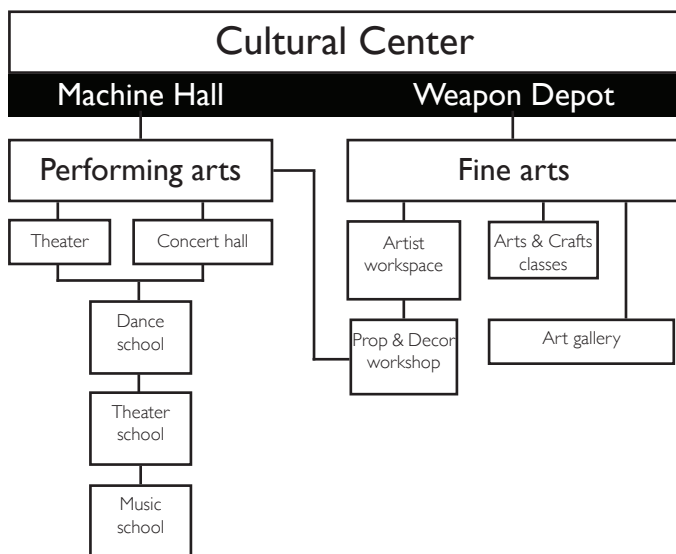
But I also want to bring professional artists and amateurs together in one building.

Therefore the cultural center will be a homebase for professional artists, a professional theatergroup and a professional dancegroup. The decor workshop that lies next to the Machine Hall can make the decors for their productions.



## The Program

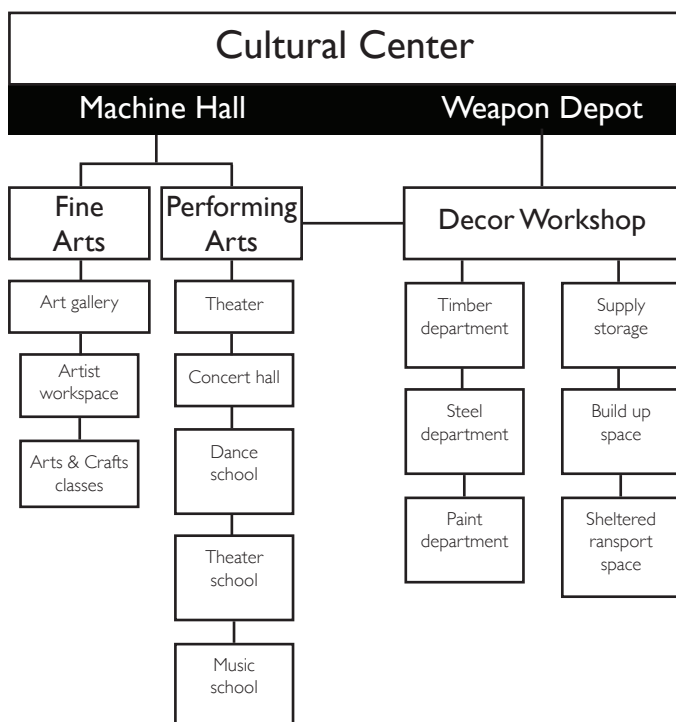
During my P2 I divided the two types of art forms from each other by putting each of them in a different building.



The connection that the two art disciplines had was the prop & decor workshop that was in service for the performing arts.

After visiting some prop & decor workshops I noticed that the space that I reserved for this was small but still plausible if my intentions for it were only to serve this theater in Campus North. I decided to make the decor workshop bigger, so more broader productions could be made here.

Since the decor workshop in this cultural center will now take up the whole Weapon Depot. I decided to move the fine arts to the Machine Hall.



## Theater

This decor workshop will not only serve the productions of the Art Factory in Hembrug, but also for theater productions in the Netherlands and Internationally. This decor workshop will be smaller than the National Ballet decor workshop, so I need to think about for what kind of productions decors can be made here.

In order to do so I have looked into how much space I have to make a stage in the theater and how much space I have in the decor workshop for the build up space.

In the theater I have room for a stage of 19m x 14m, this includes the side and backstage areas. They perform area on this stage is 14x12m, the build up space in the decor workshop is 14 x 12m. This should be enough to make decors for the productions that will be held inside the theater of my project. It will always fit. But will it be enough for theaters outside of Hembrug?

	min	normal	max
	m	m	m
drama	8	10	12
review	10	11	14
musical	10	12	15
opera	12	18	25

### 1 Stage w

Ernst Neufert Architects' Data is a practical manual that provides tools to determine the size of various spaces with their functions. In here there is a tool to determine the minimum and maximum width of a theater for different kinds of productions:

After reviewing this, the theater in my design is suitable for musicals, drama, and opera productions. Because I think these stage width numbers is including the side stages. If it's not, then the theater can only hold small opera productions.

The decor workshop of the National Ballet is the biggest of Europe and maybe even the biggest of the world. They make decors for large ballet and opera productions all over the world.

But in the theater and dance world there are not only big opera productions. Many productions are smaller, like musicals and drama, and there are also small opera productions. The decors for these smaller theater productions can be made in the Weapon Depot of Hembrug.

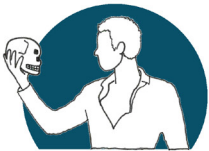
# Starting points

## 4 departments

### Theater/Dance

#### Program of Requirements

- practice rooms:  
*large - medium - small*
- warm-up space
- waiting area
- dressing rooms
- toilets



### Music

#### Program of Requirements

- practice rooms:  
*individual - group*
- performing area
- waiting area
- toilets



### Art

#### Program of Requirements

- individual ateliers
- classrooms
- cleaning sinks
- storage space
- toilets



### Performing

#### Program of Requirements

- theaters  
*ca. 200 persons*
- backstage
- dressing rooms
- seating area

#### additional facilities

- foyer
- bar / café
- wardrobe
- toilets



# 5 RESEARCH

## 5.1 Decor Workshop

During my P2 presentation I reserved in the Weapon Depot a part of the building for a decor workshop. But I did not know if this space was enough and what was needed in a decor workshop. To understand more of this principle, I visited four decor workshops with the following questions:

- How does a decor workshop function?
- What do they need in materiality?
- How much space do they need?
- What machines are used in a decor workshop?

### Departments

In the decor workshop there are different departments that are devoted to a certain specialization. In all four decor workshop there are at least a:

- timber department
- steel department
- paint department

These departments are necessary to build the decors that were designed by (mostly) artists.

The bigger decor workshops have some more departments so that they can provide other specialized products. like a:

- costume department
- sculpt (foam) department

The different departments work closely together to create a final decor that can be placed on stage in the theater.

### Logistics

The most important aspect of a decor workshop is the logistics and work efficiency. Every decor is dismountable so it can be transported from the decor workshop to the theater and between different theatres.

Every decor has to fit at least in a trailer of a truck, but it would be more ideal if it can fit in a sea container. This depends on how international the decors of the decor workshop will travel.

The challenge is to design the decor in such a way that it is easy to dismount and re-ensemble on stage. Another challenge is that the the part where the two decor pieces will be mounted together is not visible.

### Build up space

To be sure that the decor pieces will fit together perfectly and that the decor will fit on the stage, they build the decor up in the decor workshop. In the decor workshop there is a space reserved that is equal to the measurements, in length, width and height, of the stage where they can test the decor. If it fits in the decor workshop it fits on stage.

### Storage capacity & supplies

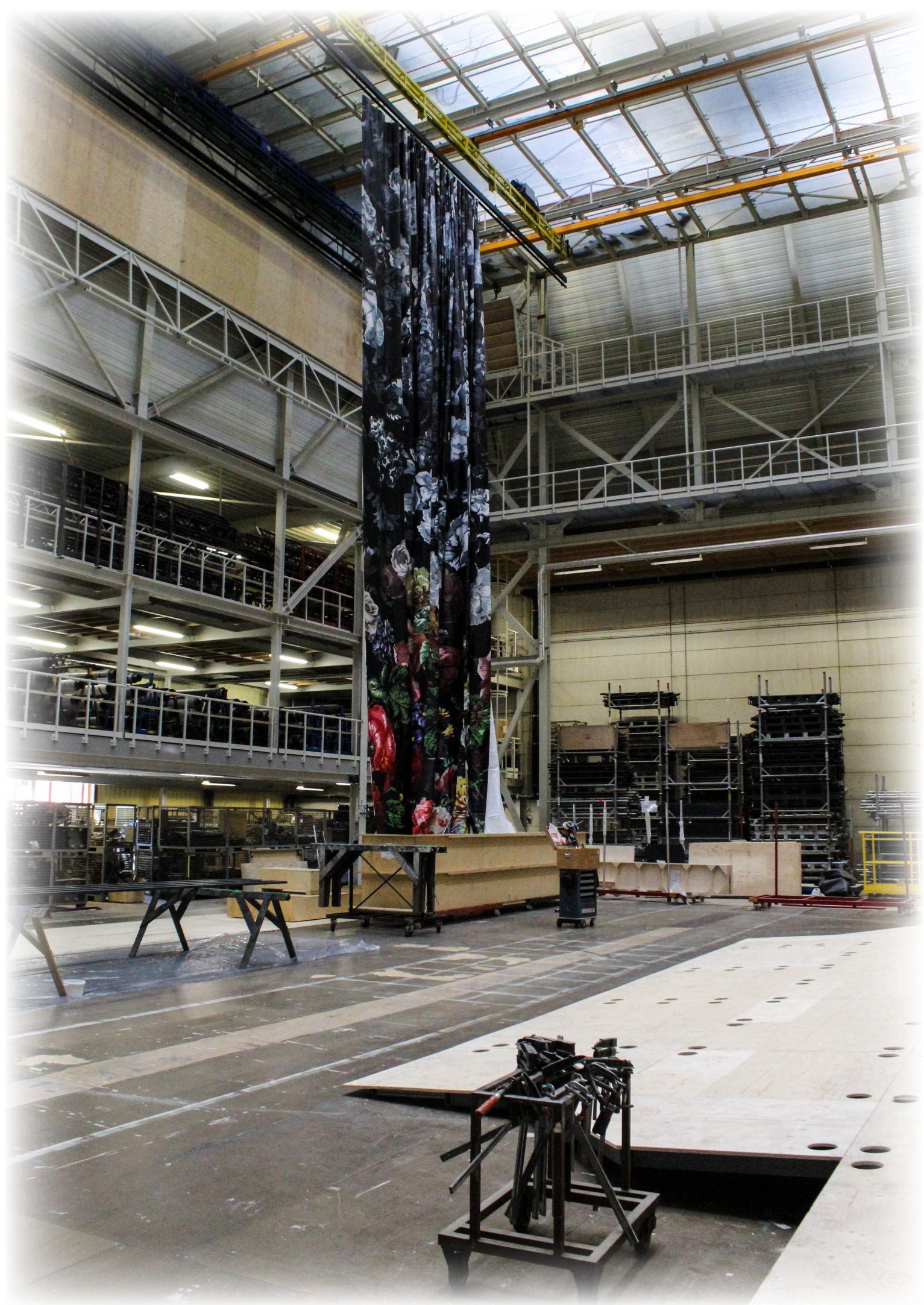
In every decor workshop there were plenty of storage spaces for the supplies that the decor workers need. Think of wood, steel, tools, paint etc. These were all in stock so that the workflow would not be interrupted by the lack of supplies.

In the decor workshop of the National Ballet there was a storage space with enough capacity to store the different decors they made after the production of a certain play/show stopped. Think of big shows like The Swann Lake and The Nutcracker. These shows can return in the future and therefore it has been stored at the decor workshop of the National Ballet.

### Conclusion

The space I reserved for the decor workshop in the weapon depot during my P2 was suitable for a small workshop. Similar like in the AHK. But for my program I decided to go bigger; that the decor workshop would serve theater productions on national and maybe even on international level. The Fiction Factory reminded me in terms of spatiality a little bit of the Weapon Depot. This is why I looked further into this program and tried to translate this to the Weapon Depot.







# Fiction Factory



Timber Department



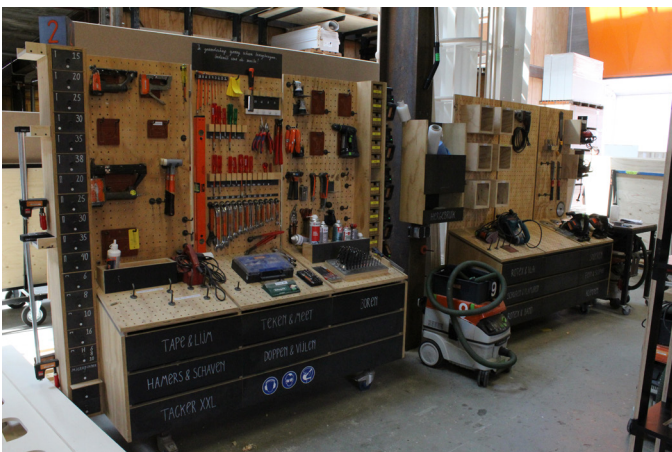
Steel Department



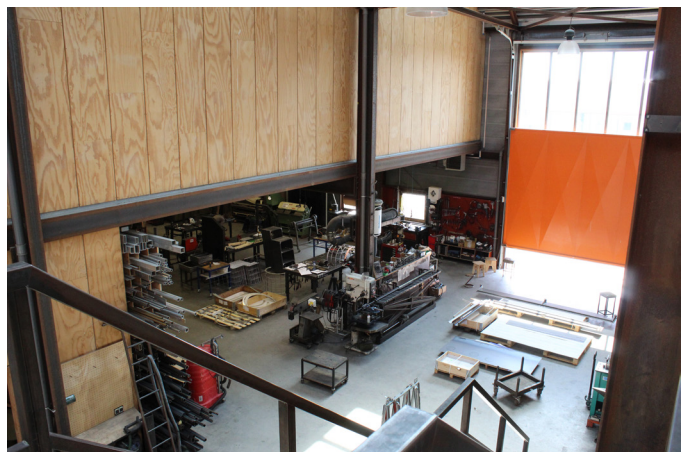
Costume Department



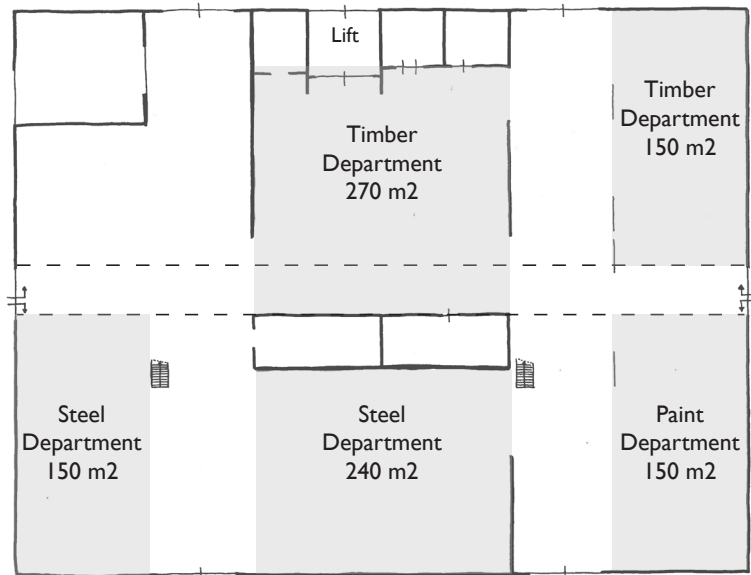
Paint Department



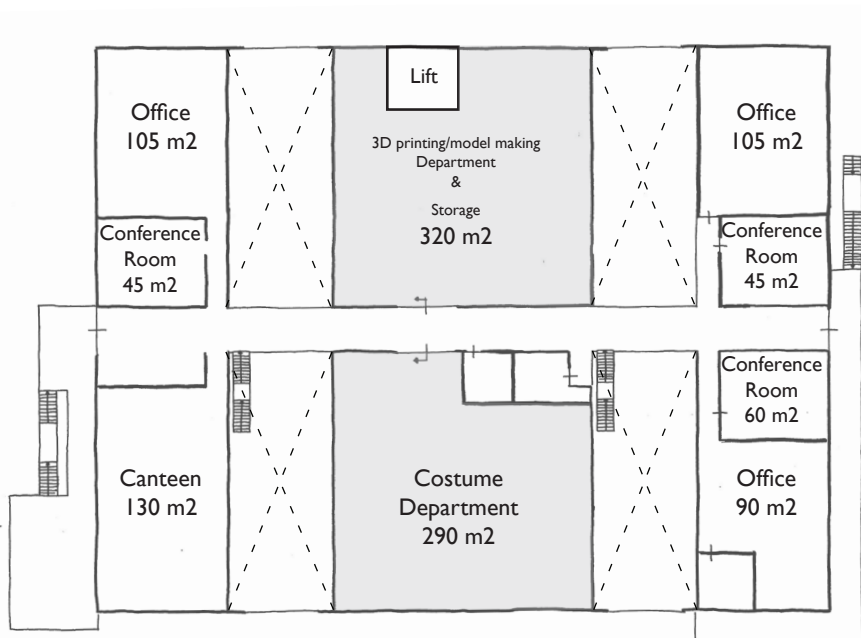
Tool storage



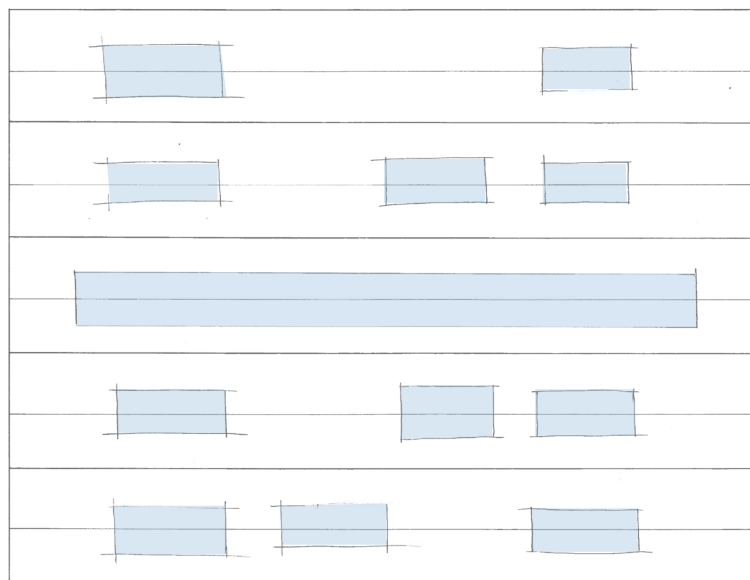
View with transport door



Ground Floor



First Floor



Roof



# Performance Factory Enschede



Timber Department



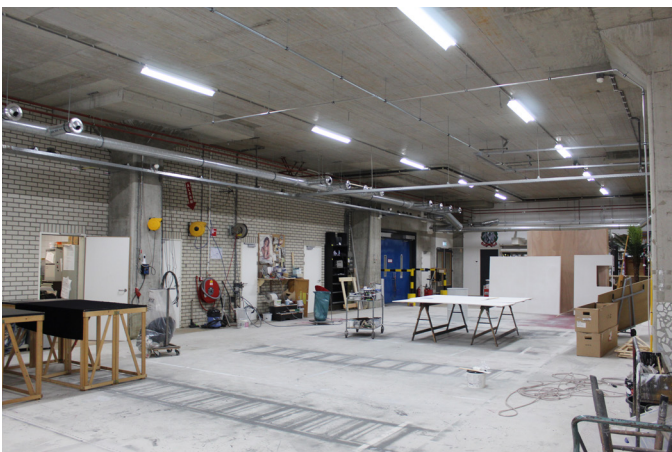
Steel Department



Costume Department



Practice Room



Paint Department



Built up space



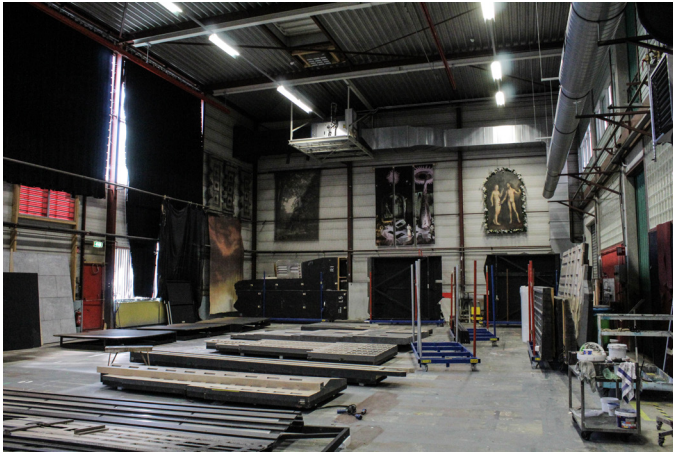
# Decor Atelier National Ballet



Timber Department



Steel Department



Decor Curtain Paint Department



Foam Department



Paint Department



Built up space



# AHK



Timber Department



Steel Department



Theater Space



Theater Space



Hallway



Hallway

	National Ballet	Fiction Factory	Performance Factory	AHK
Timber department	X	X	X	X
Steel department	X	X	X	X
Paint department	X	X	X	X
Supply storage	X	X	X	X
Built up space	X	X	X	X
Indoor or sheltered transport space	X	X	X	X
Costume department		X	X	
Sculpt department	X			
Decor storage space	X			
Rehearsal rooms			X	X

#### Machines - Steel Department

3x Kolomboor	3x drill press
2x Schaartafel	2x scissors table
Profielwals	Profile roller
Buigpers	Bending press
Buizenslijper	Pipe grinder
Polijstmachine	Polishing machine
Draaibank	Lathe
Metaalfrees	Metal cutter
Schuurband staal	Sanding belt steel
Zetbank	Bending machine
Knipbank	Cutting bench
2x Afkortzaag staal	2x Trimming machine steel

#### Machines - Wood Department

Kolomboor	Drill press
Schuurband	Sanding belt
Afkortzaag hout	Trimming saw wood
Vlakbank	Flat bench
Lintzaag	Band saw
Formaatzaag groot	Large format saw
Formaatzaag klein	Size saw small
CNC freesmachine	CNC milling machine
Wandzaag	Wall saw
Deuvelmachine	Dowel machine

#### Other

Vacuumtafel

#### Installations

Lasdampafzuiging

Ventilation that is suitable for a workshop

## 5.2 Theaters

**The Machine Hall will accommodate a school for the performing and fine arts. In this building there will be different stages and a theater where the students can perform. I want to research how these stages and the theater can take form in the Machine Hall. By asking myself the following questions:**

- What different types of stage forms are there?
- How does a theater work spatially?
- How does backstage work?
- What kind of theater do I want in my Cultural Center?

To design an appropriate house for a National Theater and analyse objectively the purpose of it seemed for a long time almost impossible. This is because theater is chaotic and changes so rapidly that there is no tradition to lean on (Mulryne & Shewring, 1995, pp. 16).

In the twentieth century, theater had become a synonym for a framed stage to an audience stacked on every available wall of the auditorium. Like a window into a world of illusion. With the influence of the cinema, the theaters changed. Balconies which had once been partitioned into small individual boxes and balconies now had long rows of seating. This improved the sightlines towards the stage because the sightlines gets worse as seats are placed higher and closer to the stage. With the boxes removed and the balconies no longer curving around the sides of the auditorium, the walls became decorative surfaces rather than a place to seat people (Mulryne & Shewring, 1995, pp. 28-33).

### Types and forms of theaters

Theater buildings evolved from open-air amphitheaters of the Greek and Romans to all the different forms we see today. There is no ideal shape for a theater, but some forms work better for particular types of performance. A theater may house drama, classical or popular music, opera, musicals, ballet, modern dance, spoken word, circus, or any activity where an artist communicates with an audience. How can one kind of building work for all these different types of performance?

A theater is not simply a space for watching a performance. A successful theater supports the emotional exchange between the performer and audience, and the emotional exchange between audience members (Theatre projects, n.d., pp. 3).

### Spaces for Drama

Although theater for drama can happen in many different types of theaters or unusual spaces like warehouses and stairwells. Many of these spaces also support musical theater. There are 3 main theater forms for drama; small drama theaters, flexible theaters and large drama theaters (Theatre projects, n.d., pp. 4).

Small drama theaters usually have between the 50 and 400 seats. They often does not have a separate stagehouse, meaning that the stage is within the same architectural space as the audience. These small theaters often feature an unique or intimate actor/audience relationship (Theatre projects, n.d., pp. 4).

Flexible theaters is a generic term for a theatre in which the playing space and audience seating can be configured as desired for each production. These theaters can be configured in a arena, thrust and endstage forms, but environmental, promenade, black box, and studio theater are other terms for this type of space, suggesting particular features or qualities (Theatre projects, n.d., pp. 6).

Large drama theaters seat audiences between the 300 and 900 with an upper limit of 1100. Large drama theaters are usually some variant of the proscenium stage, but some feature a thrust or open stage (Theatre projects, n.d., pp. 9).

### Spaces for acoustic music (unamplified)

Concert and recital halls are theaters for the performance of music. The requirements of acoustic unamplified music determine the volume, shape, and even the architectural detailing of the hall. At the same



time, the hall must support the visual presentation of the performance and provide an intimate experience. A universal characteristic of these buildings is that performers and audience share the same space, there is no architectural separation between stage and auditorium. Today, concert halls aren't used exclusively for acoustic music. A new hall must have enough flexibility to allow other users, for instance: dance, lectures, meetings, and film presentations (Theatre projects, n.d., pp. 11).

### **Backstage**

Dressing rooms: Rooms where cast members apply wigs, make-up and change into costumes. Depending on the size of the theatre, there may be only a male and female dressing room, or there might be many. Often in larger spaces, cast members in lead roles have their own dressing room. They feature mirrors, which are often lit. Sinks are present for the removal of makeup and sometimes a dressing room will have showers and restrooms attached. Lockers, or costume racks are generally used for storage of costumes. In some performances, dressing rooms are used as a secondary green room because of space limitation or noise, especially by performers with long breaks between stage appearances (Carter, 1994).

Green room: The lounge backstage. This is the room where actors and other performers wait in when they are not needed onstage or in their dressing rooms (Carter, 1994).

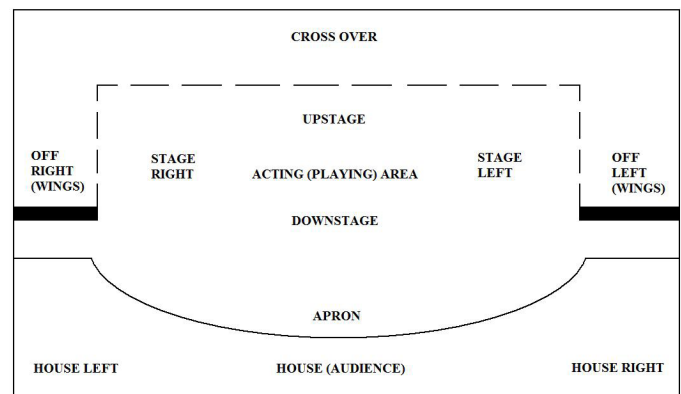
Crossover: A crossover is a hallway, room, or catwalk designed to allow actors in a theater to move from wings on one side of a stage to wings on the other side without being seen by the audience. Sometimes this is built as a part of the theater; sometimes exiting the building is required, and still other times the set includes a false wall to create a temporary crossover. A trap room, orchestra pit, or even the front of house can be used as crossovers (Carter, 1994).

Fly system: A fly system is a system of ropes, counterweights, pulleys, and other such tools designed to allow a technical crew to quickly move set pieces, lights, and microphones on and off stage quickly by "flying" them in from a large opening above the stage known as a fly tower/flyspace (Carter, 1994).

Catwalk: A catwalk is an elevated platform from which many of the technical functions of a theatre, such as lighting and sound, may be manipulated (Carter, 1994).

Dimmer room: The room backstage which contains the dimmer racks which power the lighting rig in the theatre. Often dimmer racks may not be housed in dedicated room, instead they may be in a mechanical room, control booth, or catwalk, or even on the side of the stage as is often the case on Broadway, touring shows, or at corporate events. When the dimmers are stored onstage, this area of the stage is known as the "Dimmer Beach". In the UK it is known as "Dimmer City" (Carter, 1994).

Trap room: A large open space under the stage of many large theatres. The trap room allows the stage floor to be leveled, extra electrical equipment to be attached, and most importantly, the placement of trap doors onto the stage (hence the name). It is usually unfinished and often doubles as a storage area. It is often also used as a substitute for a crossover (Carter, 1994).



### **Choosing a theater form**

Since the performing arts school that I am designing will teach in different kinds of dance and theater forms, I need a theater that can host different kind of productions. This is why my preference goes to the Multipurpose theater.

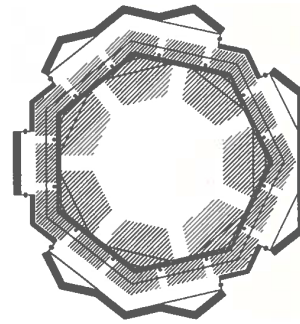
keywords/sentences multipurpose theater:

- suitable for a range of activities.
- seat count: between 1200 to 2800 seats.
- auditorium shape has the acoustic requirements for symphony.
- stagehouse - meets the needs of opera and musicals.
- different configurations possible.

# Spaces for Drama

## ARENA

This is a theater in which the audience completely surrounds the stage or playing area. Actor entrances to the stage are provided through vomitories or gaps in the seating arrangement (Theatre projects, n.d., pp. 4).



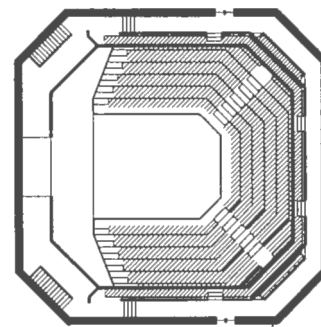
### Royal Exchange Theater, Manchester

The audience, actors and operational crew share the same intimate space, and can enter from all sides. The sharing of this space creates a part of the excitement of theatrical performance. The possibilities seem endless (Mulryne & Shewring, 1995, pp. 160).



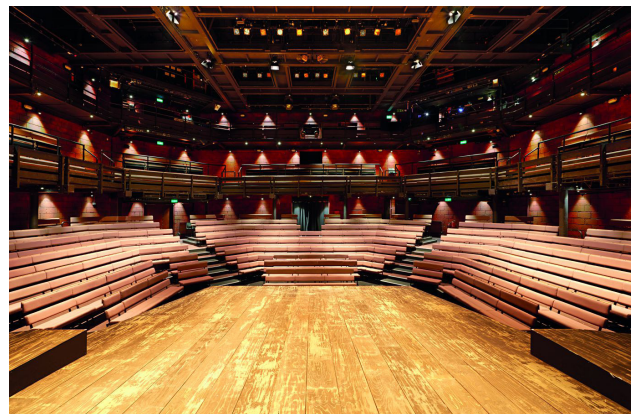
## THRUST

A theater in which the stage is extended so that the audience surrounds it on three sides. The thrust stage can be backed by an enclosed proscenium stage, providing a place for background scenery, but audience views into the proscenium opening are usually limited (Theatre projects, n.d., pp. 5).



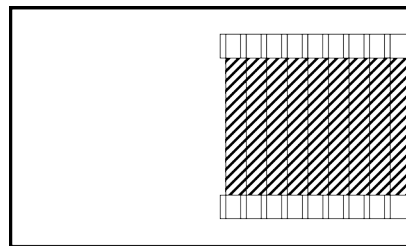
### Young Vic Theatre, London

"The ideal modern auditorium; intimate enough for detail and understanding, open enough for the influence of dance, music and physical theatre. It is informal and yet its shape creates great focus. It is a place of action and sensation" (Mulryne & Shewring, 1995, pp. 172).



## ENDSTAGE

This is a theater in which the audience seating and stage occupy the same architectural space, with the stage at one end and the audience seated in front facing the stage (Theatre projects, n.d., pp. 5).



### Hess Theater, Whitney Museum of American Art

This is a flexible, 171-seat, multipurpose theatre. The venue features retractable seating, an adjustable acoustic ceiling, blackout curtains, and retractable side wall acoustic banners. The Whitney needed a space that had the flexibility to feature live music, lectures, theatrical performances, movie screenings. The Hess Theatre's retractable seating, adjustable acoustic systems, and performance equipment were designed to provide a level of adaptability (Theater projects, 2019).



## ENVIRONMENTAL THEATER

Environmental theater happens in a space in which the architecture of the space fits to the performance, or a theater space that is transformed into a complete environment for the performance. The audience space and performance space are sometimes intermingled, and the action may be single-focus or multiple-focus. In environmental theater, the physical space is an essential part of the performance (Theatre projects, n.d., pp. 6).



Fuerza Bruta at the Daryl Roth Theatre, New York

## PROMENADE THEATER

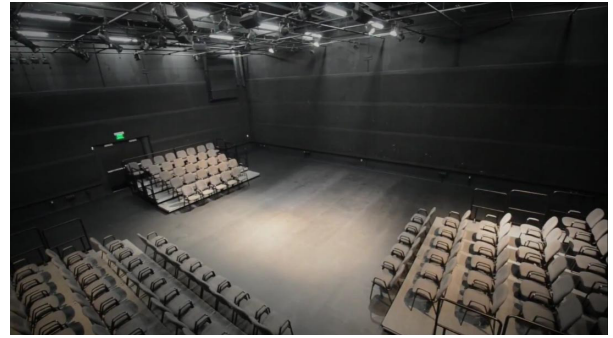
A theater without fixed seating in the main part of the auditorium is suitable for environmental theater. It allows the standing audience to intermingle with the performance and to follow the focal point of the action to different parts of the room (Theatre projects, n.d., pp. 6).





### BLACK BOX THEATER

This is a flexible theater usually without character. It is a “void” space that may indeed be black, but isn’t always the case. Usually, audience seating is on the main floor, without audience galleries, but a technical gallery may be provided (Theatre projects, n.d., pp. 7).



Black Box Theatre at the MCL Grand in Lewisville

### STUDIO THEATER

A flexible theater with one or more audience galleries on three or four sides of a rectangular room. The main floor can usually be reconfigured into an arena, a thrust, a end stage or a flat floor configuration. The room usually has some architectural character (Theatre projects, n.d., pp. 7).



Wanchai Campus, studio theater

### COURTYARD THEATER

The term courtyard theater embraces a range of theater forms, all with the common characteristic of at least one raised seating gallery surrounding a central area. Often this central area is flexible, and can be configured into arena, thrust, end stage, and flat floor configurations. Sometimes the central area has fixed seating that faces a proscenium opening and stage (Theatre projects, n.d., pp. 8).



Alexis & Jim Pugh Theater, Dr Phillips Center in Orlando

### PROSCENIUM THEATER

In a proscenium theater, the stage is located at one end of the auditorium and is physically separated from the audience space by a proscenium wall. This is sometimes called a “two-box” arrangement: the auditorium and stage occupy two separate boxes or spaces. The stagehouse (stage box) provides space that permits a wide variety of scenic and lighting effects. The auditorium box can take many forms. (Theatre projects, n.d., pp. 9).



University of Maryland, Clarice Smith Performing Arts Center

### THRUST AND OPEN STAGE

Some larger drama theaters take the form of a thrust stage. The term open stage can be used with thrust, but implies a more frontal arrangement. These kind of forms can accommodate a high seat count within an acceptable distance to the stage. Audience balconies can increase the intimacy of the room (Theatre projects, n.d., pp. 10).



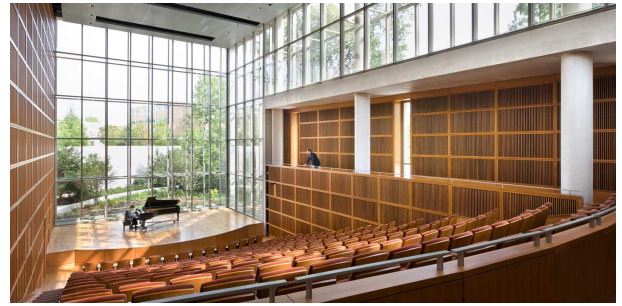
Birmingham repertory theatre



# Spaces for acoustic music (unamplified)

## Recital hall

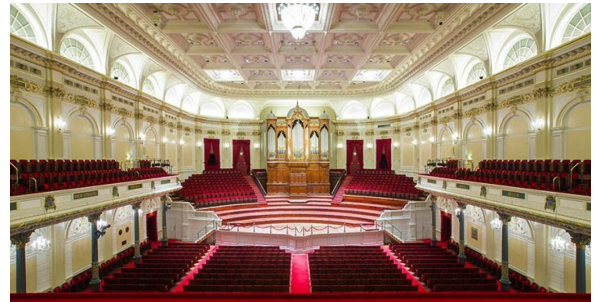
This is a space designed for soloists and small ensembles up to chamber orchestra size, with a seat count in the range of 150 to 800 audience members. This is a descendant of the music rooms of the Renaissance. It is often rectangular in plan, with an open concert platform at one end of the room and seating galleries on the other three walls (Theatre projects, n.d., pp. 11).



Cleveland Institute for Music, Mixon Hall

## Shoebox concert hall

The classic concert hall form is named the shoebox, because of its rectangular shape. It has a high volume, limited width, and multiple audience levels, usually with relatively narrow side seating ledges. (Theatre projects, n.d., pp. 12).



Concertgebouw Amsterdam

## Vineyard concert hall, surround hall

Some modern concert halls have audience seating in terraces in resemblance of a vineyard. The seating may completely or partially encircle the concert platform (Theatre projects, n.d., pp. 13).



New World Center, Miami Beach

# Spaces for opera and dance

## Opera house

The opera house developed as a specific theater form in the late Renaissance and persists to this day. Historically, opera and ballet performances coexist in these spaces, but now more dance performances are held here. An opera house is a proscenium theater in form. The auditorium is almost always multilevel with side tiers or boxes to enhance intimacy. Seat counts range from 1200 to 2000. (Theatre projects, n.d., pp. 14).



Oslo Opera House

## Dance theater

There is no strong identifiable theater form for dance performance. Smaller 100 to 300-seat spaces designed for dance are usually endstage or proscenium. The design of the auditorium emphasizes frontal sightlines and a clear view of the stage floor. Sometimes the seating is on telescopic risers that can be retracted to allow the whole space to be used for rehearsals. (Theatre projects, n.d., pp. 15).



Oslo Opera House

# Spaces for multiple uses

## Multipurpose theater

The contemporary multipurpose theater are proscenium theaters that are designed to accommodate a range of activity such as symphonic music, opera, musical theater, ballet, and touring productions. The seat count is in the range of 1200 to 2800 seats. The auditorium form is heavily influenced by the acoustic requirements for symphony, while the stagehouse is designed to meet the needs of opera and musicals. These rooms are designed with the ability to change configurations (especially in the forestage area) and to adjust the room acoustics to the needs of each performance type (Theatre projects, n.d., pp. 16).



Lyric theater; the lowry

## Multiform theater

A multiform theater can be reconfigured to change the actor-audience relationship and the seat count. By moving large architectural elements, the one-room form of the concert hall can be transformed into a two-room theater, an auditorium and a stage with a proscenium. Side wall seating towers can be positioned to narrow the room or otherwise change its proportion. Often the orchestra floor (stalls) can be leveled and the seats removed to create a large, flexible, flat floor area (Theatre projects, n.d., pp. 17).



Derngate, Northampton

# Spaces for teaching

## Single-purpose spaces

Performing arts venues on a campus are more likely to be single purpose, since it is more likely that the academic program tied to the space occupies it at least for the full school year (Theatre projects, n.d., pp. 22).

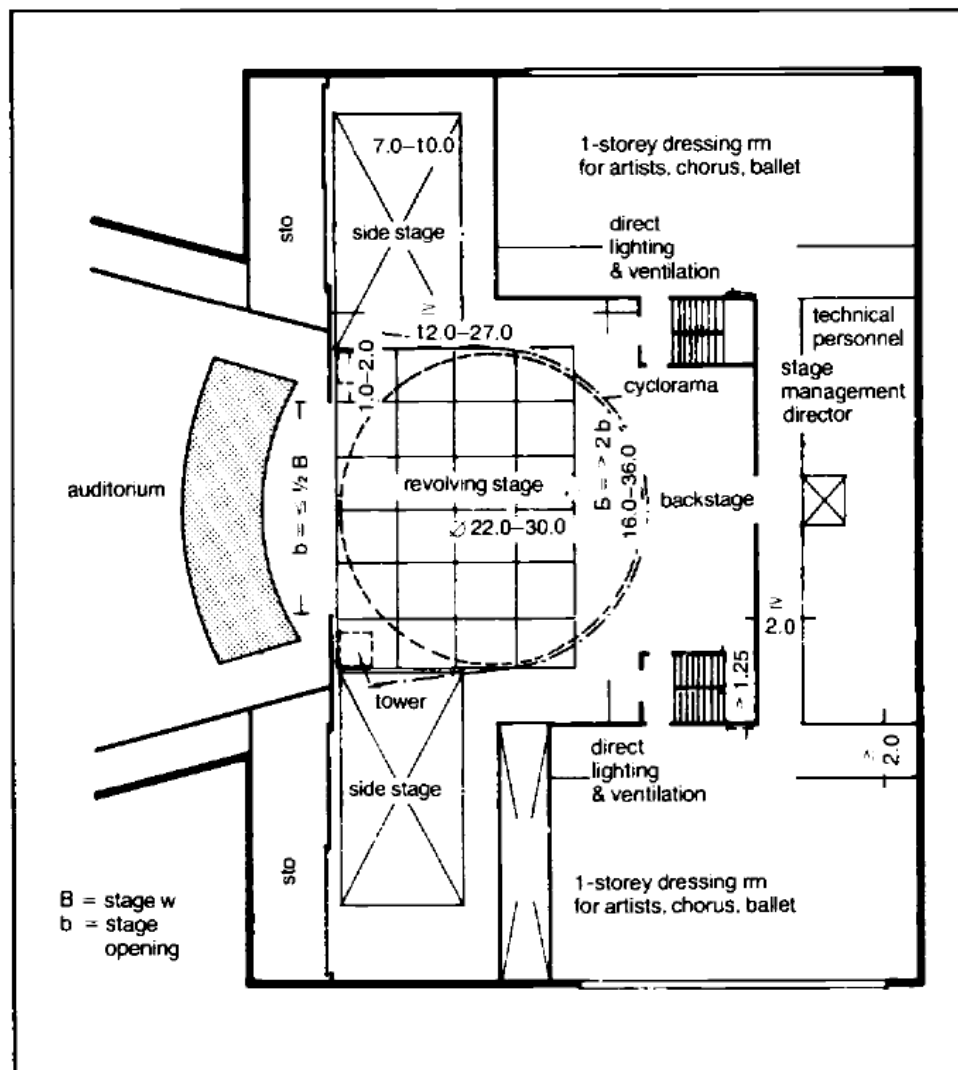
## Instructional spaces

Performing arts venues on campus must be designed as instructional spaces. Auditoriums should be compact and intimate, scaled to, and supportive of, the student performer (Theatre projects, n.d., pp. 22).

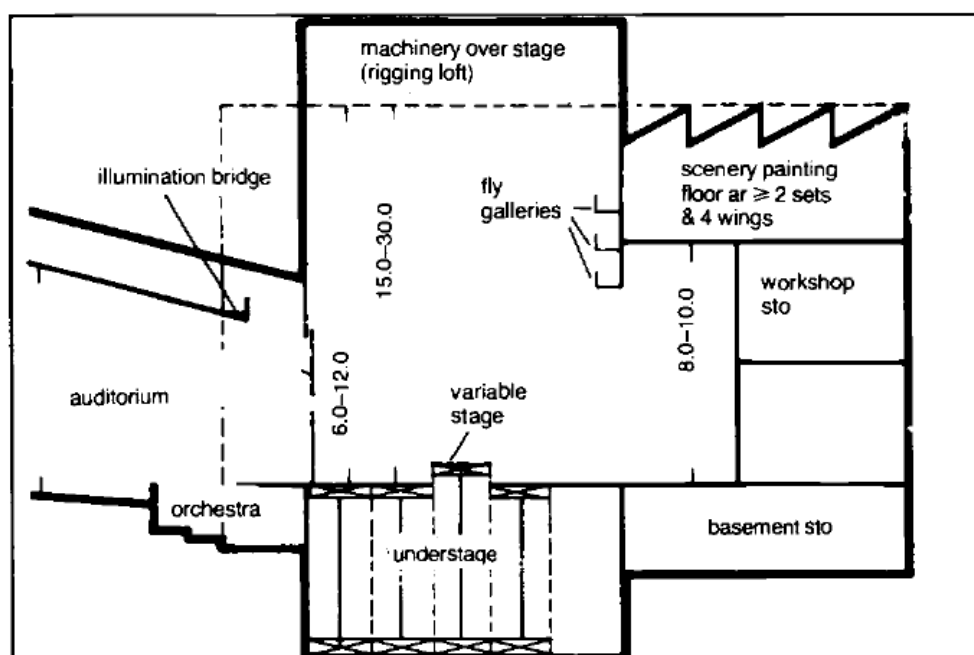
## Stage technology

The theater and stage are also class labs. The theater equipment must be suitable for the productions, but also appropriate for teaching (Theatre projects, n.d., pp. 22).

# Measurements



Diagrammatic plan of stage tower with typical dimensions  
 Ernst Neufert "Architects Data"



Diagrammatic section of stage tower with typical dimensions  
 Ernst Neufert "Architects Data"



## 5.3 Fine Arts

For the Artist department I needed to determine what kind of artist spaces I needed. This is also related to what kind of courses will be given in this cultural center. For this I looked at the cultural center of Delft who has a broad course offer and is also a transformed building.

### Reference project - VAK Delft

#### Ground floor

- 6 music classrooms
- 2 bigger music classrooms
- 1 podium

#### First floor

- 4 music classrooms
- 2 normal classrooms
- 2 dance classrooms
- 1 atelier
- 2 small stages
- 1 dressing room

#### Second floor

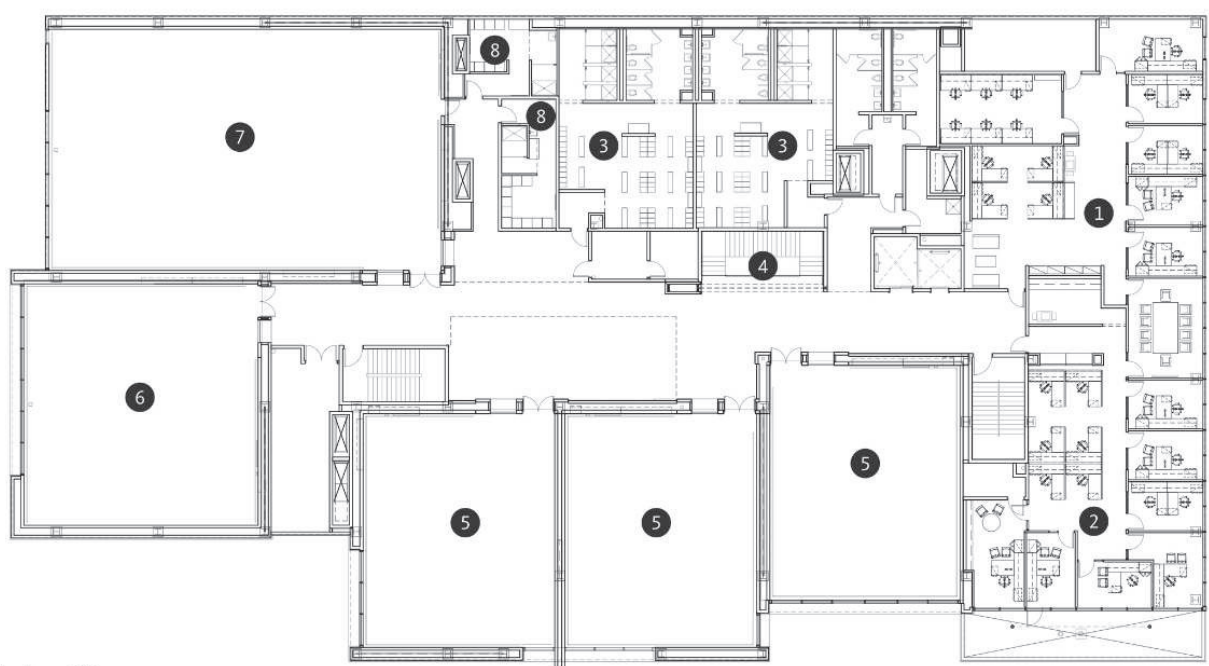
- 1 atelier
- 1 ceramic studio
- 1 screen printing room

<https://www.platformbk.nl/betaalbare-ateliers-een-maatschappelijke-zaak/>

<https://www.kunstraad.nl/tag/atelierbeleid/>



## 5.4 Dance studio



Level 3

- 1 Academy Offices
- 2 Reception
- 3 Academy Dressing Rooms
- 4 Circulation Stair
- 5 Small Rehearsal Studios
- 6 Medium Rehearsal Studios
- 7 Large Rehearsal Studios
- 8 Artistic Staff Changing Rooms

## 5.5 Acoustics

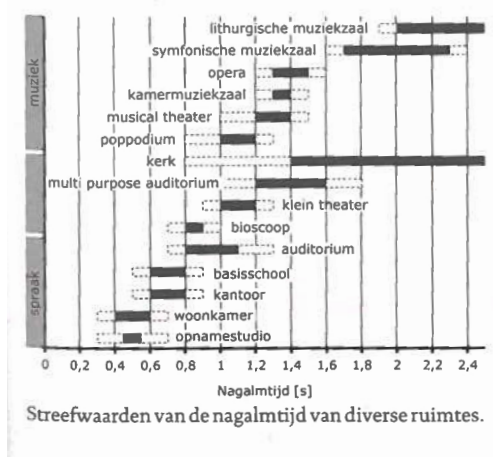
The Machine Hall will accommodate a school for the performing and fine arts. In this building there will be different stages and a theater where the students can perform. An important aspect of this is the acoustics. Not only the acoustics of the theater is of importance but also the practice spaces. That is why I ask myself:

- What makes a room or space acoustically good?
- How does acoustic defects occur?
- How can I design a space that has good acoustics?

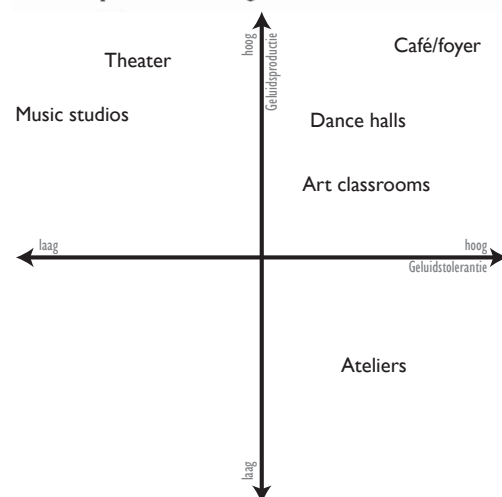
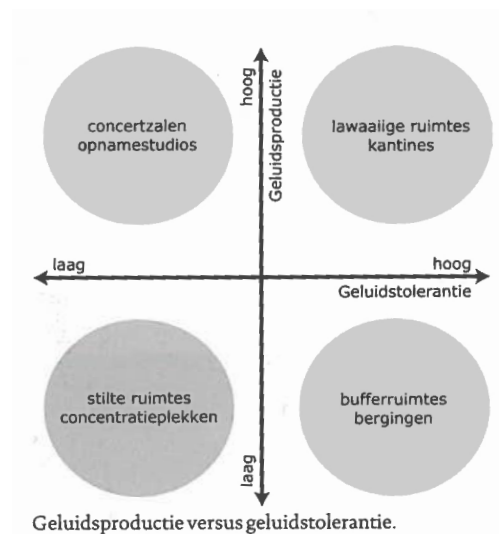
### Acoustic comfort

There is a difference between noise and sound, noise is disturbing and unwanted sound like loud talking people too. Sound can have a positive effect like music or speech. To make a statement about acoustic comfort it is important to make a distinction between various functions of spaces and various sources of sound.

### Reverberation time (Nagalmtijd)



### Noise tolerance



### Theater Acoustics

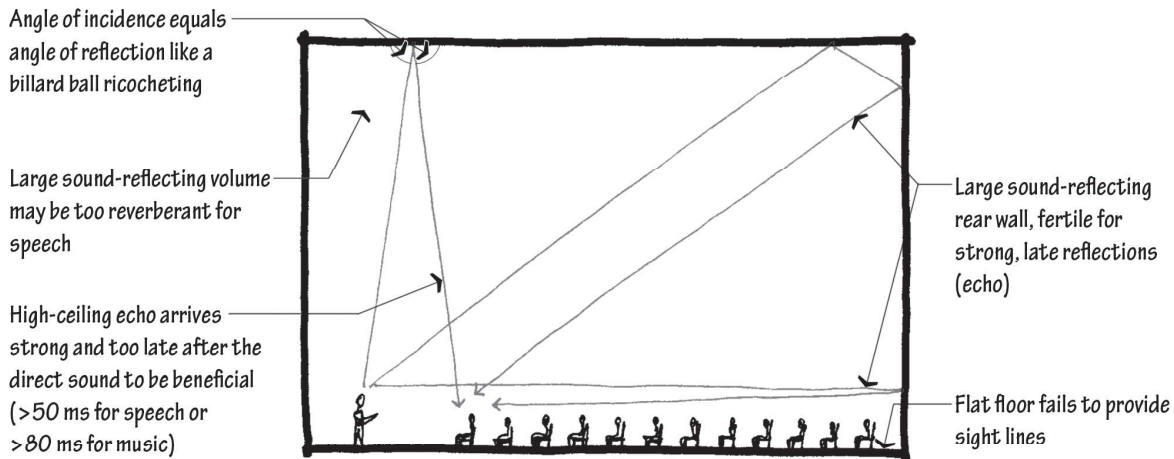
(Ermann, 2015, pp. 97)

(Ermann, 2015, pp. 114)

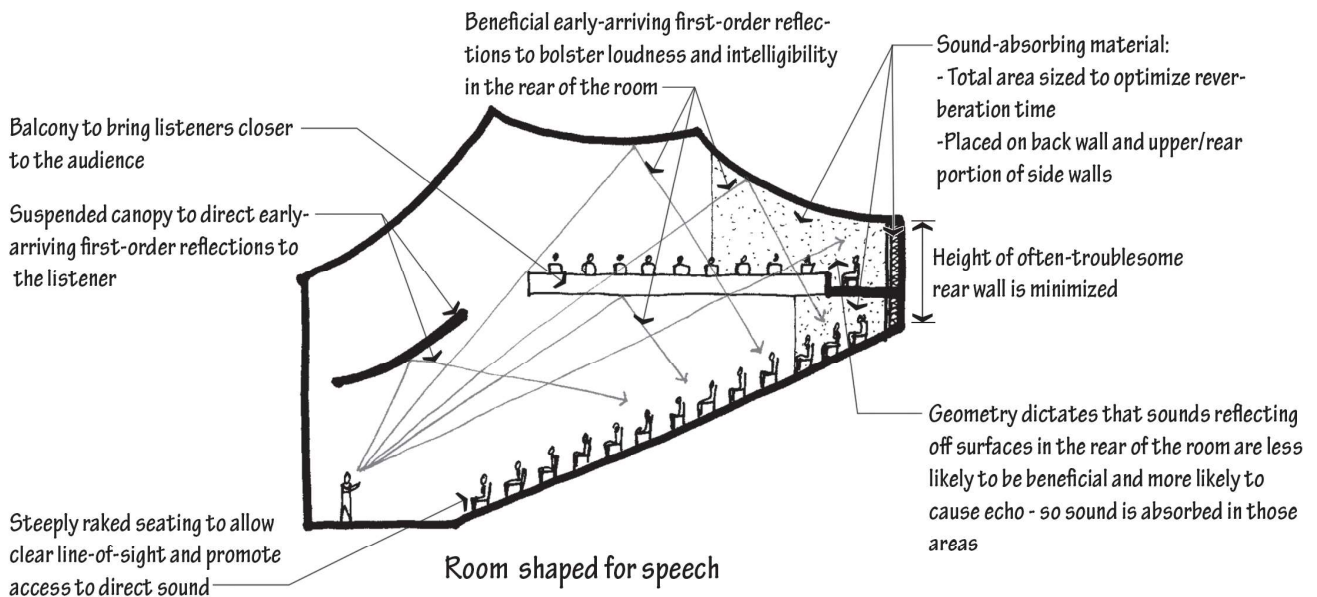
(Ermann, 2015, pp. 118)



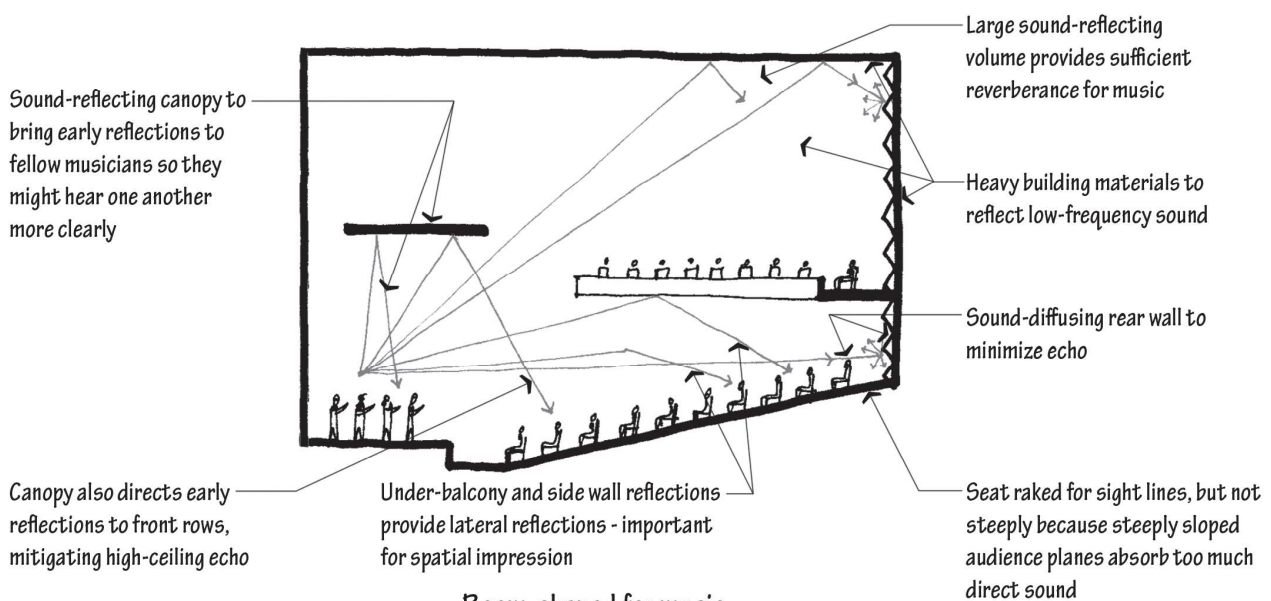
# Room shaping for speech and music



Room not shaped for sound



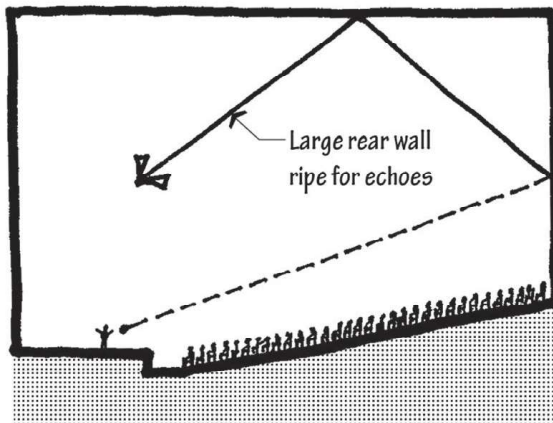
Room shaped for speech



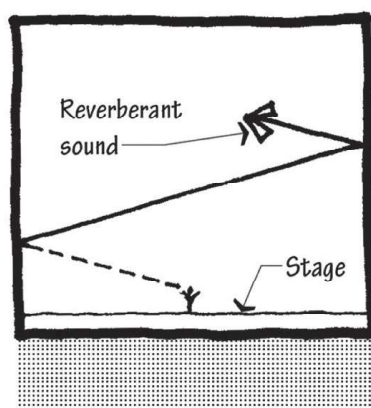
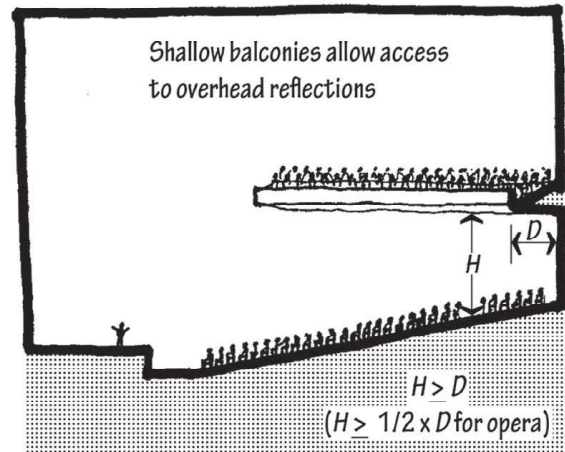
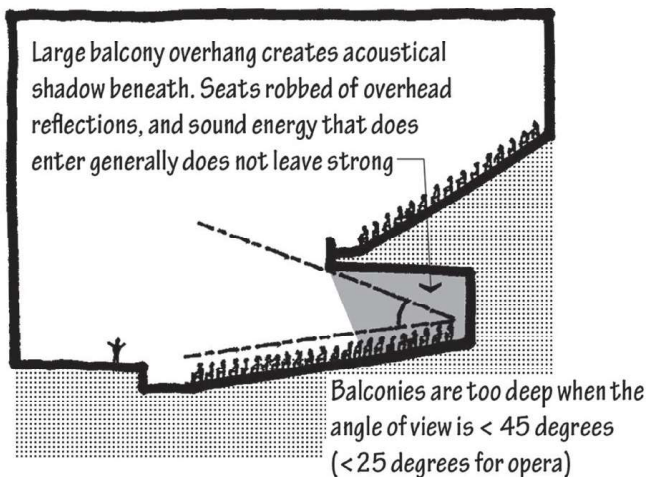
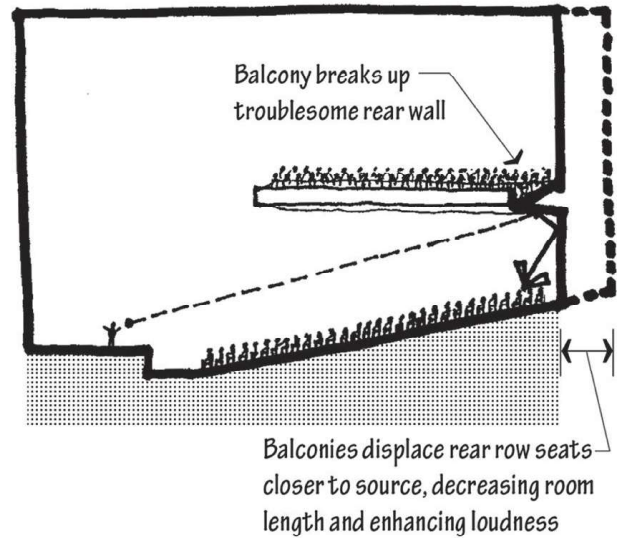
Room shaped for music

# Balconies

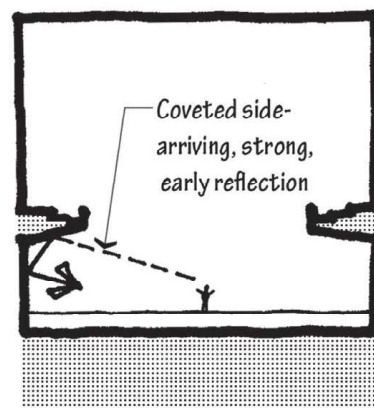
Baseline



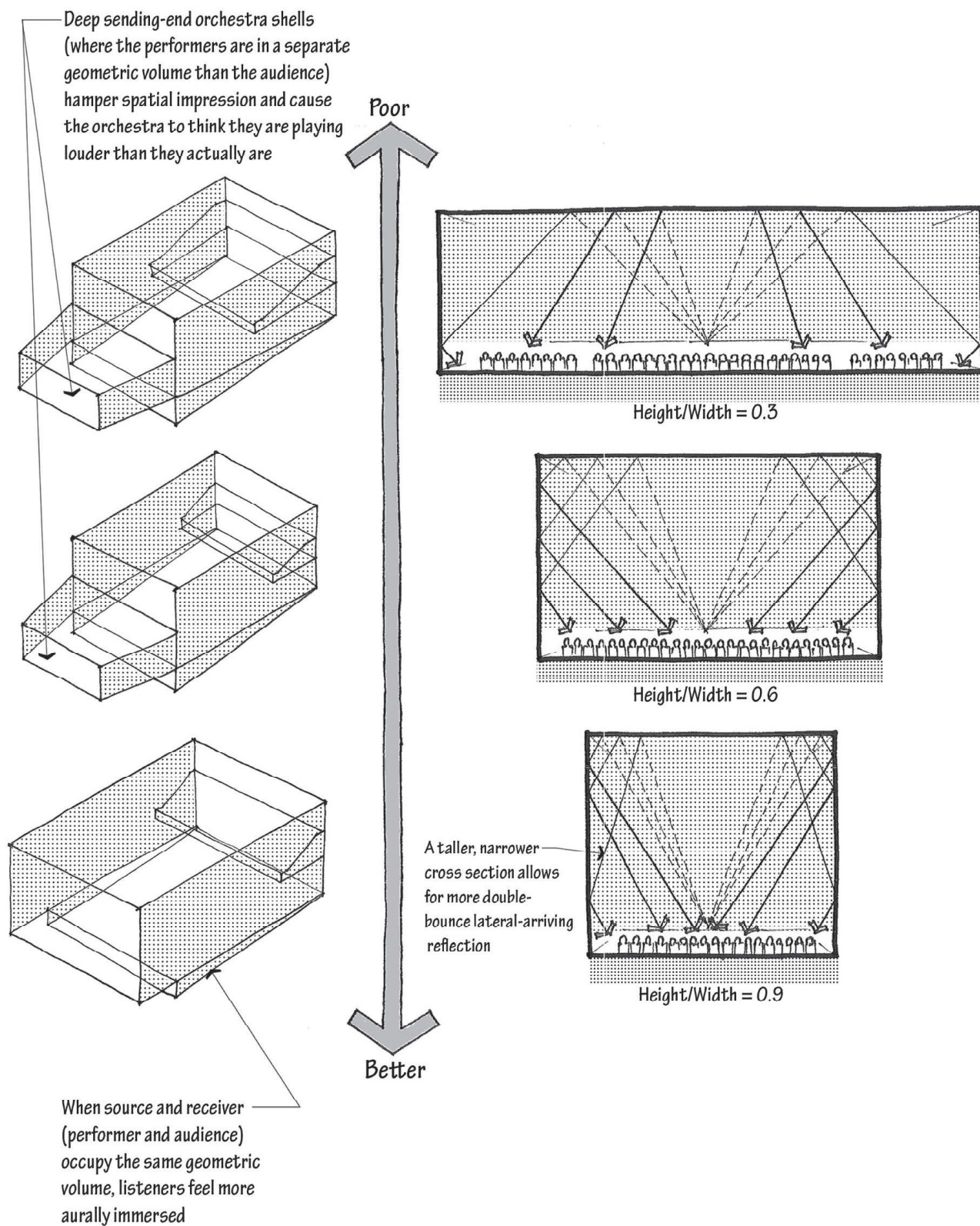
Better



Transverse section

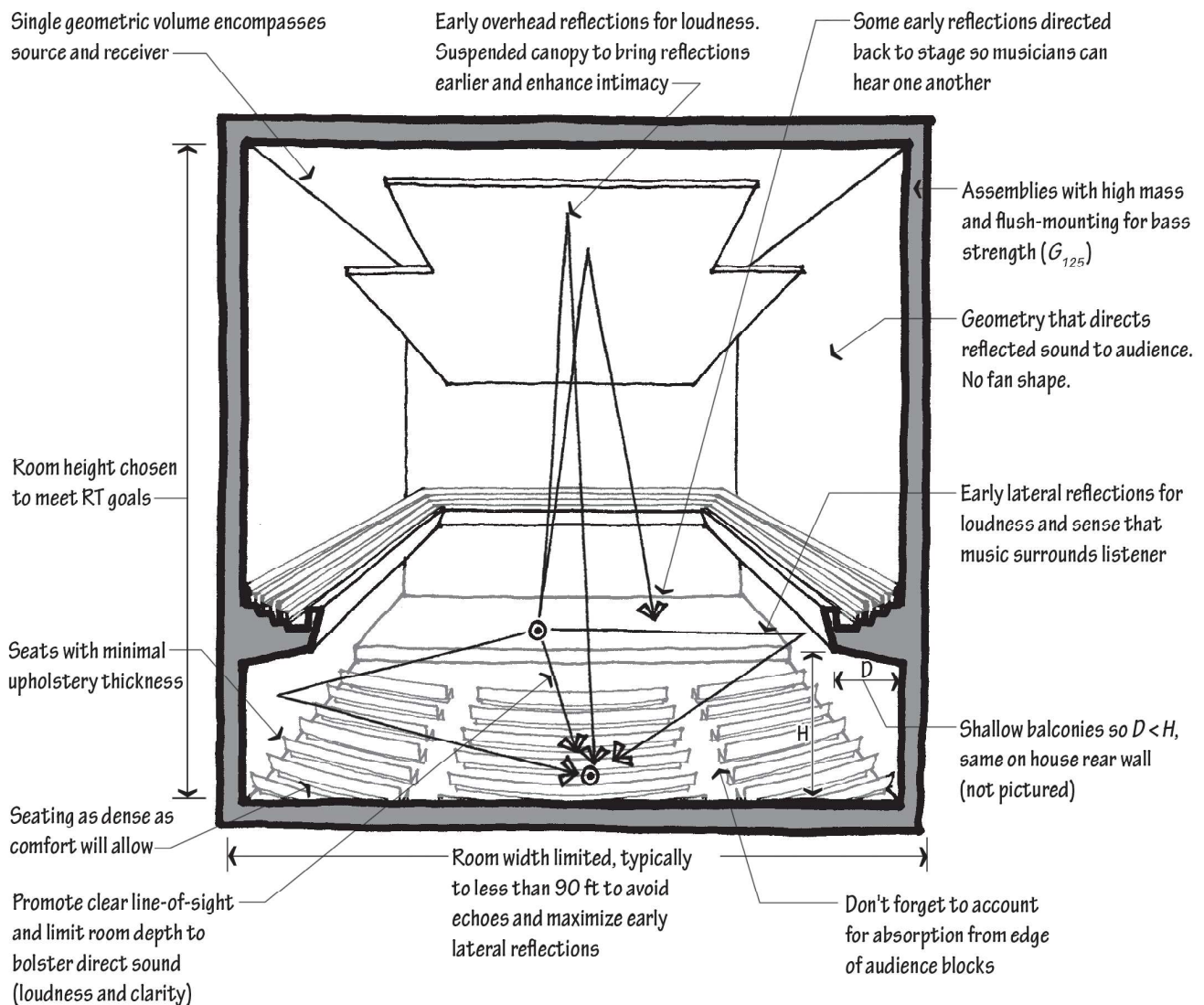


## Stage acoustics



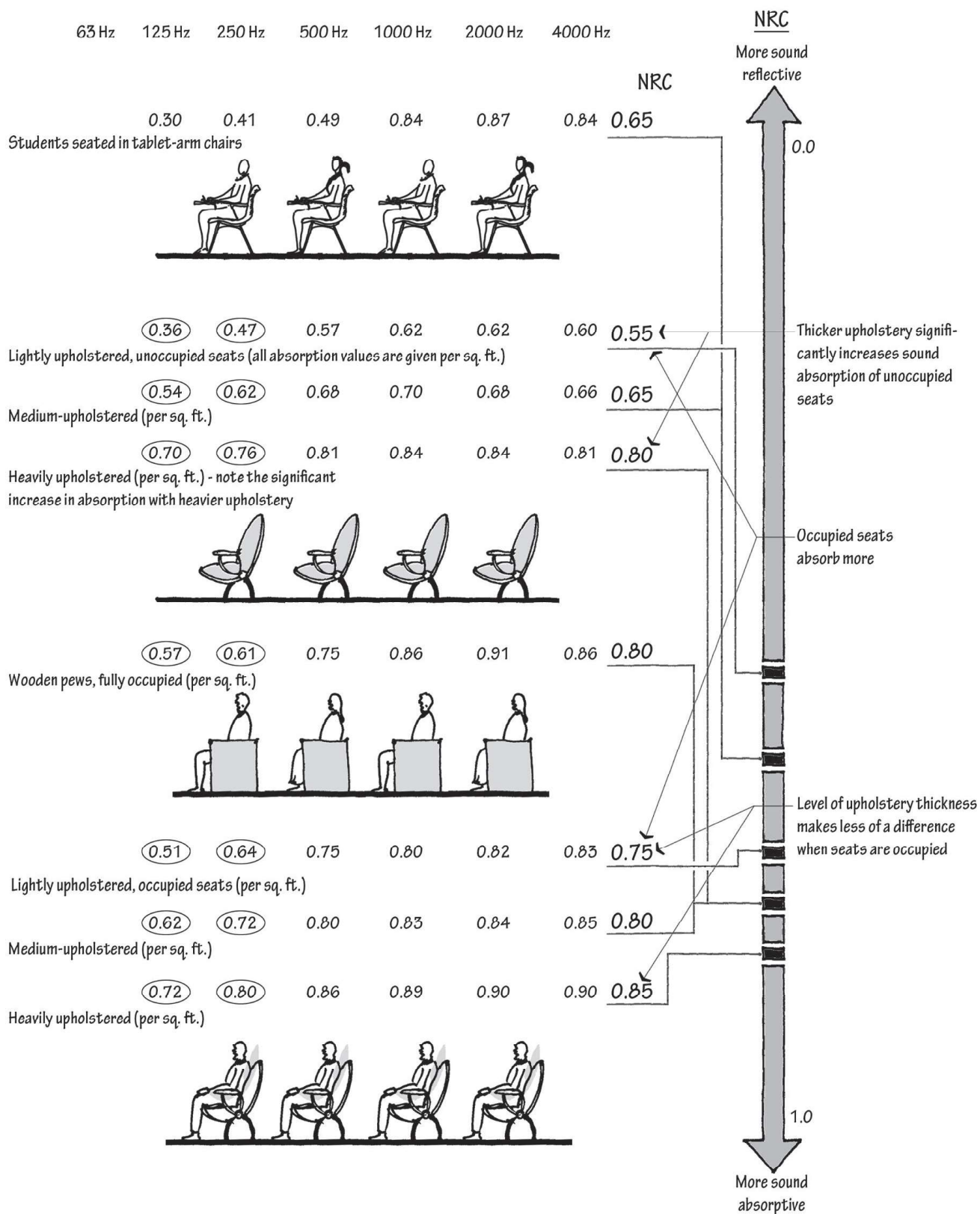


# What makes a good room for music?

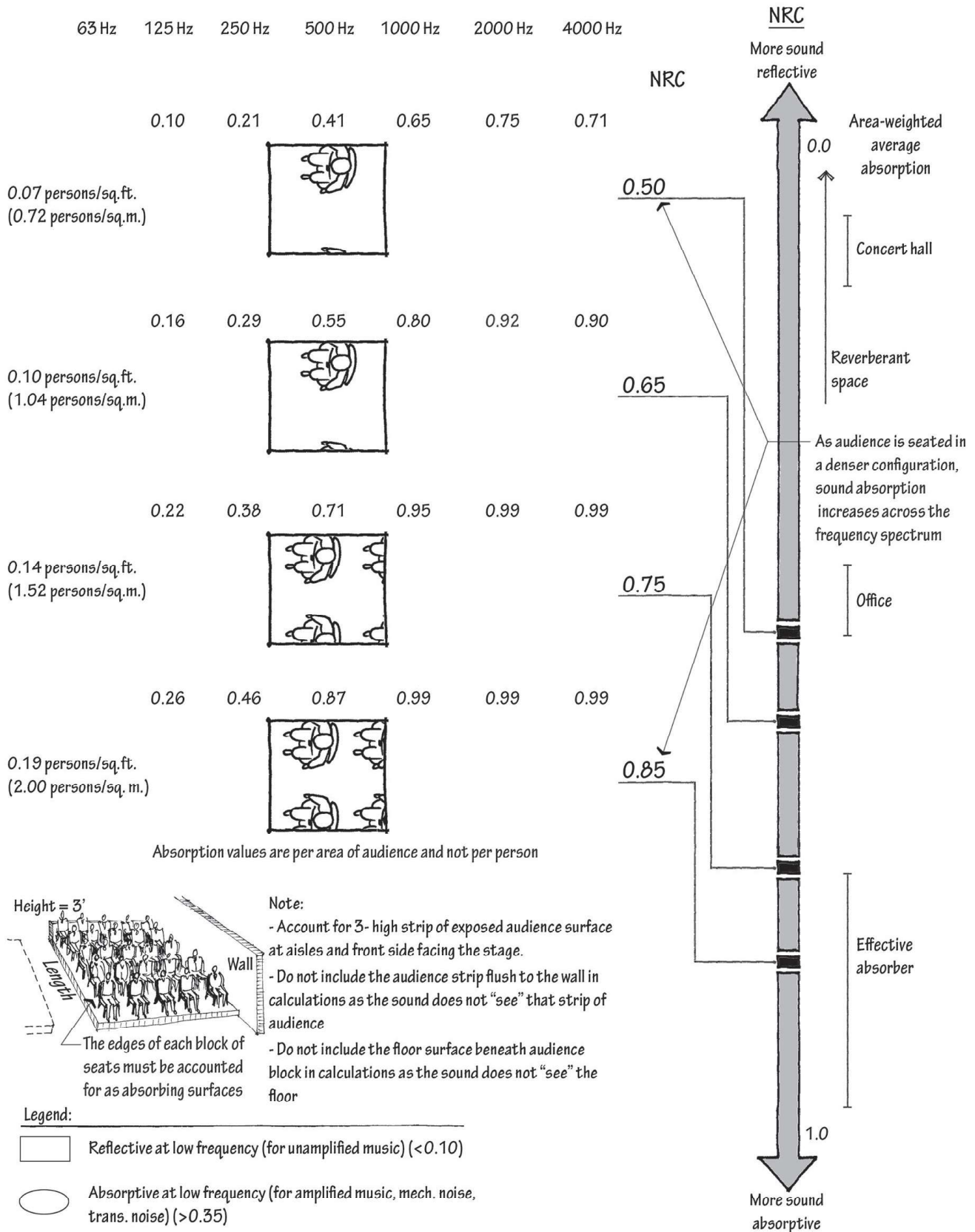


# Audience

## Upholstery and occupancy status

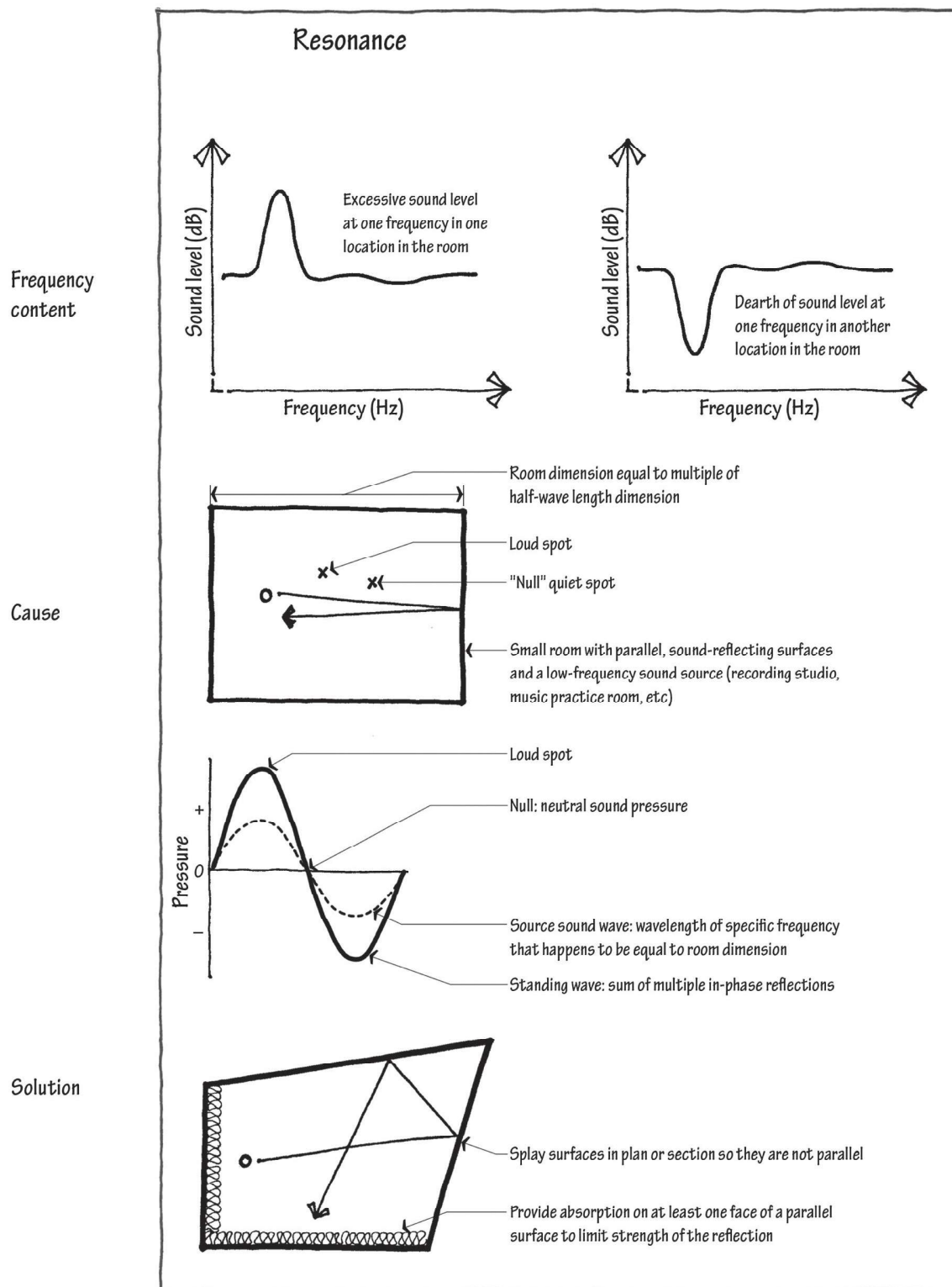


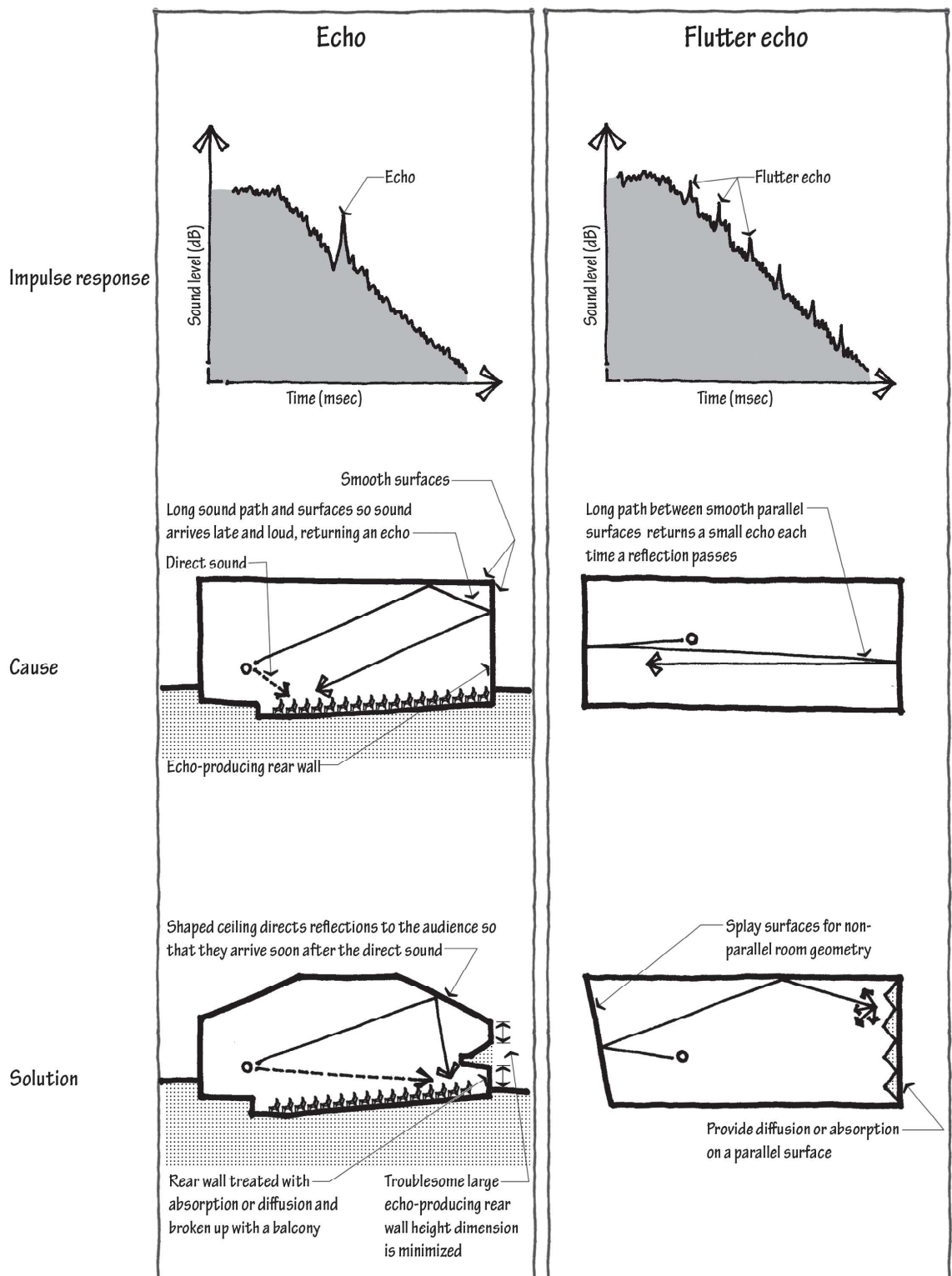
## Seat density



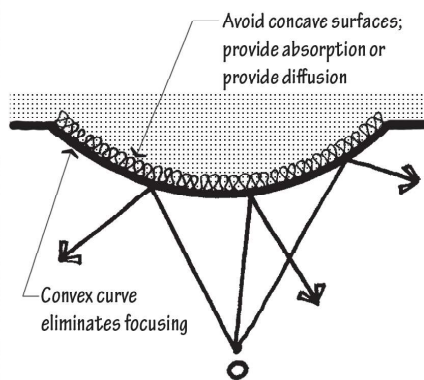
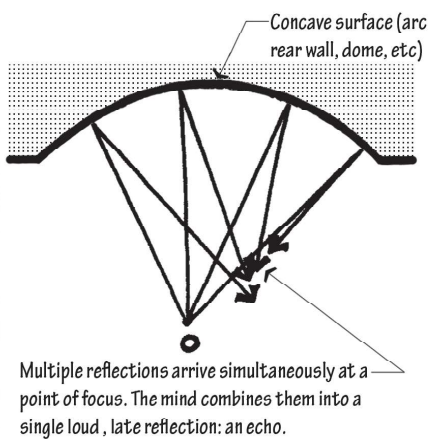
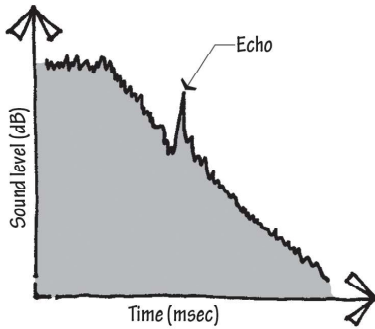


## Acoustic defects

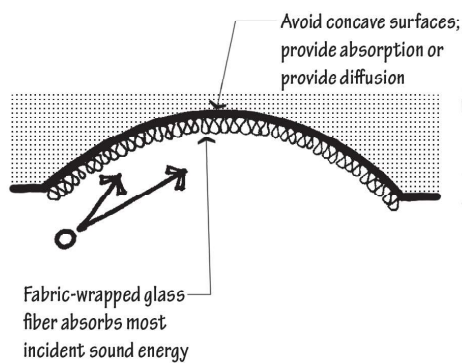
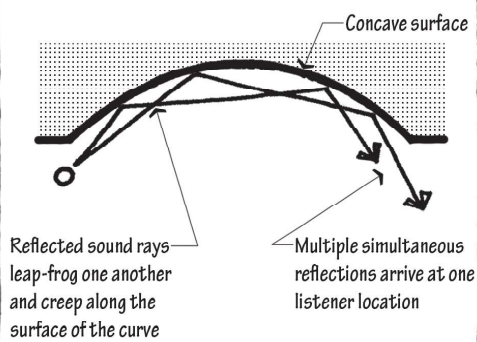
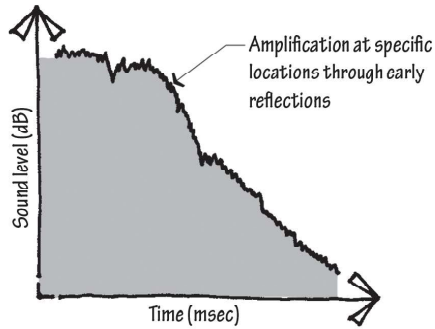




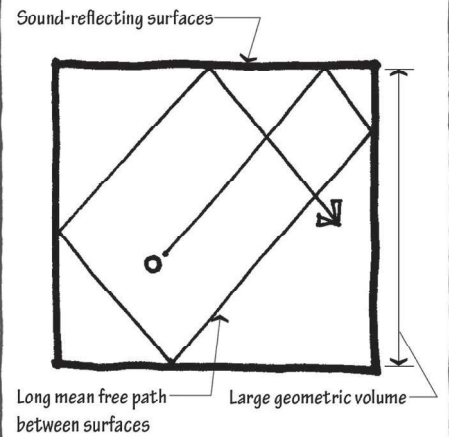
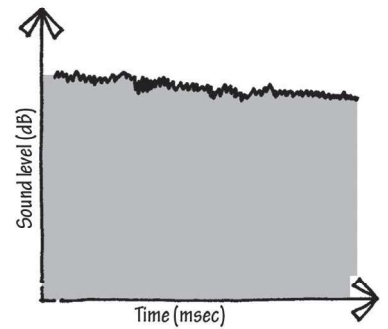
### Sound focusing



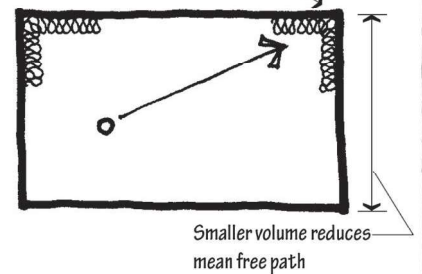
### Acoustical creep



### Excessive Loudness



Bass trap: absorption in corners particularly effective at low frequencies



- $\bar{\alpha} < 0.20 \rightarrow$  Live room
- $\bar{\alpha} > 0.30 \rightarrow$  To eliminate excessive loudness in a restaurant
- $\bar{\alpha} > 0.50 \rightarrow$  To eliminate excessive loudness in an office (but does not provide speech privacy)



## 5.7 Sustainability

In order to make my project sustainable I need to know what this means and how I can accomplish this. Therefore I ask myself the following questions

- What is sustainability?
- How can a building become sustainable?
- What for sustainable solutions are there?
- What can I do to make my project sustainable?

In the book: *Architectuur als Klimaatmachine* (Yanovshtchinsky & Huijbers, 2013) is elaborated on what a sustainable design is and how to achieve this. I made a summary to learn these principles.

*sustainable is everything that future generations want to inherit, use and maintain.*

- Jón Kristinsson

### Triple P (Quadruple P)

In the Triple Bottom Line (Elkington, 1996) is mentioned the three P's of sustainable development: People, Planet, Profit that has been changed to People, Planet, Prosperity. Kees Duijvestein (1997) added Project.

### People

Sustainability starts with its users. This means that the users, this means a healthy and comfortable living space.

### Planet

A sustainable building does not pollute the environment and functions on endless sources. It therefore does not depend on fossil energy and closes the cycles of water and materials. This means that the building itself generates or reuses most of what it uses.

### Prosperity

Sustainable construction provides products that are financially profitable, if not directly then in the longer term. The buildings generate profit for the user within their life cycle. Sustainable real estate has a higher remainder value at the end of its life than unsustainable buildings.

### Project

A sustainable building is adaptable to new functions and to technical or spatial improvements. The design takes into account a growing humanity and its growing demand for space. A sustainable building is forgiving in a sense that errors can be corrected, maintenance is easy and parts can be replaced

### Sustainable climate design

Climate design is the field that combines fundamental knowledge of building physics with the technology of climate systems and their integration into architectural design. A good balance between these 3 is essential for a sustainable climate design.

Step 1: reducing the energy demand

Step 2: reuse of rest energy

Step 3a: solve the remaining energy demand sustainably

Step 3b: waste = food

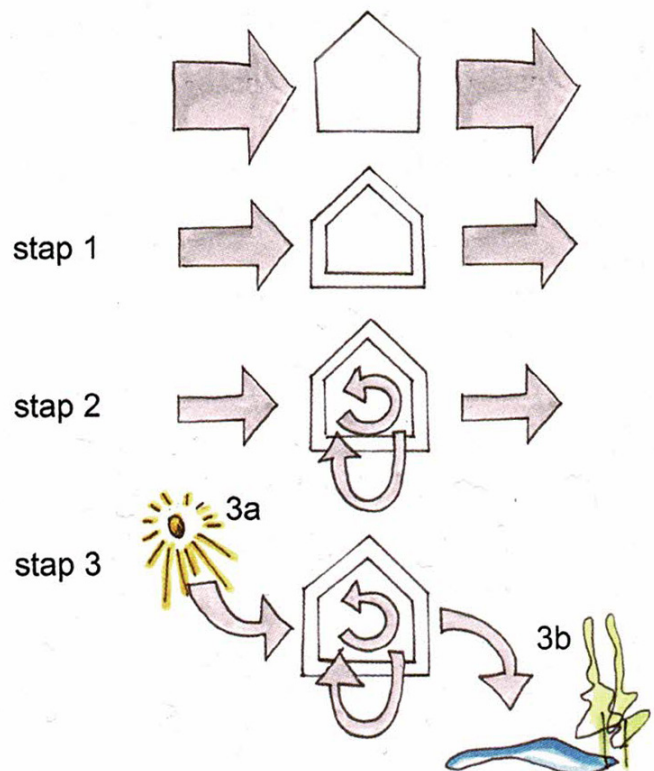


Illustration: The New Stepstrategy  
Yanovshtchinsky & Huijbers, 2013, pp. 45

## Sustainable Energy

I narrowed these options down to the ones that can be used in my design:

### Sun:

- let daylight come into the building, to reduce the use of artificial light.
- generate energy by using solar panels.

calculate how much m<sup>2</sup> solar energy can be generated from the solar panels and if that is enough energy for the building.

Optimal angle: 36°

South orientation

Machinehall: 25° & 18°

West & East orientation still 90% optimal

Weapondepot: 5° - 10°

West & East orientation still 90% optimal

Richting	Hellingshoek						
	10°	20°	36°	50°	60°	70°	85°
West	90	90	85	80	75	70	65
Zuidwest	95	95	100	95	90	85	80
Zuid	95	100	100	100	95	90	80
Zuidoost	95	95	95	95	90	85	80
Oost	90	90	85	80	75	70	65
Noordoost	85	80	70	60	55	50	45
Noord	85	75	60	50	45	40	35
Noordwest	85	80	70	60	55	50	45

Illustration: generated energy in percentages

<https://www.minder.nl/blog/opbrengst-zonnepanelen-hoeveel-wekken-je-panelen-op>

### Soil:

Up to 2m depth the soil has a slightly variable temperature. In winter about 5°C, in summer by heating about 15°C. This depth is suitable for cooling in summer and preheating in winter, which saves energy.

A constant temperature of 8-10°C prevails from 6 to 20m deep; this is the annual average of the local climate. This layer is suitable for exchanging heat and cold, for example with a heat pump, where the heat extracted in winter must be equal to the added heat (extracted cold) in summer.

### Rest energy:

Rest energy is created by producing electricity or heat. This rest energy can be reused by means of heat exchange

## Conclusion to make a sustainable climate design

Step 1: reducing the energy demand.

- Isolation of the outer skin
- Constant inside temperature using PCM, concrete (thermal mass) and wood as thermal regulators.

Step 2: reuse of rest energy

- To reuse rest energy a heat exchanger can be placed.

Step 3: solve the remaining energy demand sustainably

- make use of solar panels and a heat pump below 6m depth to generate electricity and heat.

# VISITED REFERENCE PROJECTS



# Dru fabriek Ulft





# ECI Roermond





RDM Rotterdam





# NDSM Werf





# Spoorzone Tilburg

