What about tomorrow?

Design for the unknown future in healthcare architecture

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Chalmers School of Architecture
Department of Architecture and Civil Engineering
Architecture and Urban design, MPARC

ACEX35
2021-05-10
Supervisor Lin Tan
Examiner Cristiana Caira

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CHALMERS
UNIVERSITY OF TECHNOLOGY

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ABSTRACT

We have for a long time researched on history but at the same time we are striving towards an unknown future. To be able to become more sustainable we need to plan for the future in the new environment we build. If the building is out of date when it is finished, you have wasted both time and resources.

How can you design hospital buildings for changing needs over time and an unknown future?

Hallands sjukhus Varberg is in the near future in need of extensive renovations of several outpatient clinics and wards. They are therefore in need of an evacuation building in the form of an extension for two outpatient clinics/wards at a time. This to be able to continue providing care during the renovations. (C. Olsson, personal communication, October 29, 2020)

This master thesis investigates how you can create a building suitable for outpatients' clinics and wards but is also considering the future. The physical changes should be as easy as possible and provide a good hospital environment for both patients and staff. The building itself should not be a temporary structure because the intention is to use it for other hospital services after the renovations. The temporality in the building is the activity that takes place within the building structure.

Through case studies, interviews and literature research this thesis has result in an overview of future proofing approaches in healthcare architecture that is showcased in a design proposal for an extension at Hallands sjukhus Varberg.

The design proposal consists of different future proofing approaches, generality, flexibility, redundancy and elasticity. The proposal presents different possibilities of how the building could be used for outpatient clinics, wards and is also showcase some future scenarios. As a main material in the construction and visible surfaces wood is suggested. This because of its benefits for both human's wellbeing, the earth and its flexibility capacity.

We do not know what to come. To future proof is therefore of importance to make the building possible to use in another purpose.

KEYWORDS *Future Proof, Flexibility, Generality, Healthcare Architecture*

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STUDENT BACKGROUND

LOUISE SIVERTSSON
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I started my architecture education at Chalmers university of technology year 2014 and took my bachelor degree 2017. After the bachelor I did one year internship before I started my master 2018. With one year study break during the master for parental leave I am now on my final semester and about to finish my master during spring 2021.

BACHELOR OF ARCHITECTURE
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COURSES AT MASTER LEVEL
- Sustainable development and the design professions
- Studio: Future visions for healthcare, housing and work 1: Housing for seniors
- Managing Design Projects
- Studio: Future visions for healthcare, housing and work 2: Housing inventions
- History, Theory and Method 4 - Color & light
- Studio: Planning and design for sustainable development in a local context
- Master Thesis preparation course 1 & 2
- BIM - Building Information Modelling

REFLECTION

During both my education and internship I have bumped into projects that relates to this Master thesis in different ways.

The course Housing Inventions relates to the master thesis through the theme flexibility/adaptability. Even though it focused at residentials buildings there are design approaches, definitions and aspects of flexibility that could be useful to have in mind.

The course Housing for Seniors that focused on dementia patients also contributes to good knowledge for the Master thesis. The course dealt with the complexity of designing a good place for the last time in life and at the same time a good working environment. The zoning of private and public were up for discussion since it is a housing but at the same time a healthcare institution. This will be good to have in mind when designing part of a hospital where the patients are in a vulnerable situation. To plan for being able to have a good view outdoors without feeling exposed.

At Bachelor level I have designed a building for a Health Center, Dentist and Family Center. That project made me realize the complex structure of room configurations that different departments need to work properly. The focus was also to find common areas they could share and cooperate within. This relates to the Master thesis since it will demand a mapping of common needs to be able to make the general structure suitable for the most without changes.

ACKNOWLEDGEMENT

"If you want to go fast, go alone.
If you want to go far, go together"
African Proverb

Thank you for all support and advise during the work with my Master Thesis. People that have shared their knowledge and thoughts with me. People that have taken their time to listen to me and give feedback of what I have done.

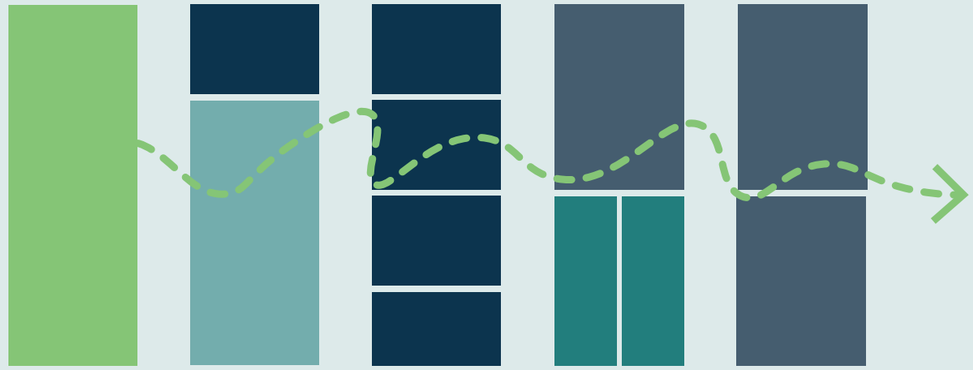
I could not have managed this without you!

Interviewed, Sandra, Lin, Family & Friends.

CONTENT

01. Introduction

"Planning for Uncertainty – Designing for Change"
Susan Francis (Aarhusarkitekterne et al. 2013-02-07)



RESEARCH QUESTION

How can you design hospital buildings for changing needs over time and an unknown future?

PURPOSE

Investigate how you can prepare for future changes in architecture. With the special focus of how to design a building suitable for outpatient clinics and wards. Have in mind the unknown future and prepare for what the building might contain in a future further away.

METHOD

LITERATURE RESEARCH
To get an understanding of the importance of future proof healthcare buildings and what flexibility in healthcare buildings could be I have read literature in the theme flexibility, future proofing and layers of the building. After getting this understanding I read about the requirements for outpatient clinics and wards to understand how you can design them with a future proofing approach.

INTERVIEWS
I have interviewed professions that are involved in hospital projects. Asked about their future proofing perspective and what they have done and do today to make the building prepared for future change. This to get a better understanding of the process and what parts you as an architect could affect and what to think of when designing for healthcare and the unknown future. The interviews were conducted by Zoom due to the Covid-19 restrictions. All interviews were held in cooperation with Sandra Kärnstrand who also is doing her Master Thesis in the theme future proofing healthcare architecture with Hallands sjukhus Varberg as a focus.

CASE STUDIES
Connected to some of the interviews and the read literature I have studied some real projects. I have looked at their future proofing approaches, compared them and study the plans to get an understanding of functions and room configurations. In some cases, the interviewed had some feedback from the staff and patients to share but due to the pandemic there has been impossible to get in touch with staff and hear their comments.

DESIGN INVESTIGATIONS
Sketches and testing of volumes, space plans and facades will be conducted in the 3D-program Revit where the surrounding buildings and terrain also will be visible. This enables possibilities of having a quick overview of how the proposal will look in the context. The final proposal will also be drawn in Revit where renderings and drawings are possible to export.

DELIMITATION

The design proposal will consider low intensity care, outpatient clinics and wards at Hallands sjukhus, and future possible use of the building will only be discussed briefly. The outpatient clinic X-ray needs evacuation because of extensive renovation but has special spatial needs and will therefore not be included in the design proposal.

The thesis will just grasp upon the surface of the economical perspective and will not dig into detail in economical aspects of different materails and design solutions. During the thesis, the intention is to get more understanding of the economic and what effects different choices can have but not to calculate the design proposal. The architecture and future proofing is in focus.

The design proposal suggest wood as a main material in both construction and visible surfaces inside. The construction is just an estimation, and the dimension of load bearing structure will not be calculated. Focus is on the esthetic, health benefits and sustainability aspects of wood as a material.

READING INSTRUCTIONS

This Master Thesis is divided in chapters with subcategories within. To fully understand the choices made in the design proposal the thesis should be read from start to finish.

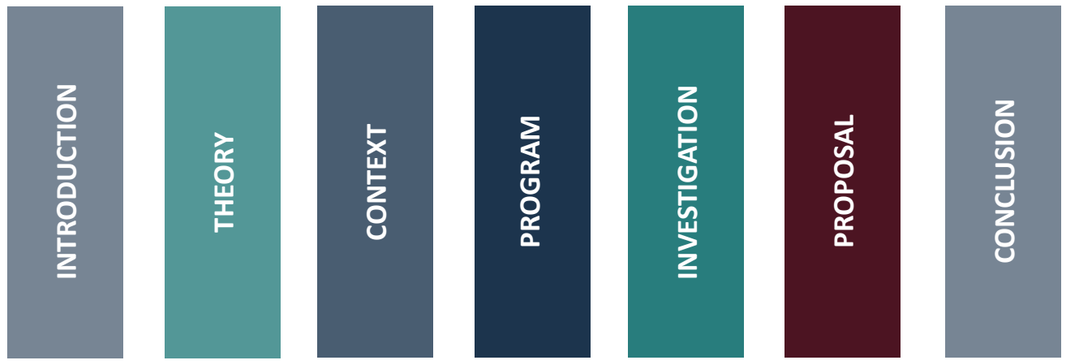
THE INTRODUCTION CHAPTER describes the background and introduces the question and design project.

THE THEORY CHAPTER could be read individually to get an understanding of future proofing principles and themes connected to it. It also gives an overview of how an outpatient clinic and a ward functions and facts about wood as a material.

THE CONTEXT, PROGRAMME and **DESIGN INVESTIGATION CHAPTERS** is showcasing the preconditions and process leading to the design proposal in this specific project.

THE DESIGN PROPOSAL CHAPTER present the suggested building extension at Hallands sjukhus Varberg.

THE CONCLUSION CHAPTER discuss the design proposal and interesting knowledge, findings and problems gained during the work.
In the end of the chapter, you find the reference list.



02. Background

"Every building is adaptable
– but to what end and at what cost?"
Austin, Schmidt (2016)

The long facade with the existing wards facing east at Hallands Sjukhus Varberg.

CHANGING NEEDS

We do not know what to come, it is fascinating but also a tough challenge. We are in a world of continuous changing needs and the buildings often have a longer life than the activity taking place within it the walls. This is especially a phenomenon within healthcare architecture where technic and ways of working changes even during the projects planning phase(Andrén, 2008). Lots of the healthcare facilities we have in Sweden today are built in the sixties and seventies (Andrén, 2008). We therefore stand in front of an extensive renovation and/or new building period. To build and/or renovate the new hospital facilities in a future proof approach is of great interest since they then are prepared for further changes in the future. This Master Thesis have the purpose of looking into the question:

How can you design hospital buildings for changing needs over time and an unknown future?

Since flexibility in different ways have been and is an interest for me as an architect this question will be interesting to dig into. The in real project at Hallands sjukhus Varberg will be a way of try out the research material I collect in the initial part of the Master Thesis work.

HALLANDS SJUKHUS VARBERG

EXISTING HOSPITAL
Hallands sjukhus Varberg is a structural hospital built during year 1960 - 1979 (bebyggelseregistret, February 17, 2021). The clinics are spread out in the entrance floor and the wards are situated in a building volume of 6 floors in the east part of the hospital area (Revellé; Arias, personal communication, February 17, 2021). Underneath the entrance floor there are a culvert floor for goods transportation and logistics. Due to the difference in heights on the site the culvert floor is in the ground level to the south and there are also some clinics located.

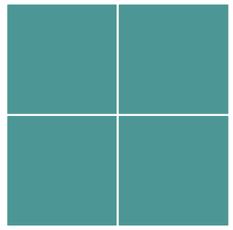
NEW EXTENSION
The new extension building is appreciated to about 1200-1300 sq.m. building area. It is supposed to contain two outpatient clinics/wards at the time. The reason for renovation of the outpatient clinics and wards listed in the program is that the building now is about 50 years old. The renovation is too extensive to be done while the care continues and they therefore need to evacuate during the renovation (C. Olsson, personal contact, 29 oct 2020).

03. Theory

"A sustainable building is not one that must last forever, but one that can easily adapt to change."
Graham (2005)

FUTURE PROOFING

GENERALITY



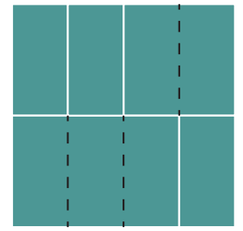
When the building remains the same but allows for a variation of use due to a general solution that suits the most (Karlsson, 2019). The building is convertible (Austin, Schmidt, 2016).

To build with generality is to think of different possible usage of a space when dimensioning it. The building methods used to accomplish this could be a facade module and pillars with a well assign grid system to allow for a general floorplan solution that creates rooms that suits the most activities you imagine taking place in the building.

In Adaptable Architecture (Austin, Schmidt, 2016) one of the most common future proofing approaches is to make the building convertible which is another term of generality.

To calculate the load-bearing capacity of the floor are also of importance for making the floorplan general. If it is calculated for the extreme case, it would allow the activities in the building to move around freely.

FLEXIBILITY



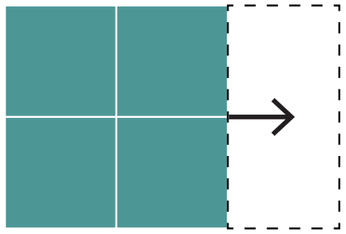
Building design that enables changing circumstances by change the design itself (Karlsson, 2019). Connected to the term adaptability meaning the capacity of a building to adapt to new demands of the users and environment (Austin, Schmidt, 2016).

To have a flexibility approach is to prepare the building for future possible changes such as creating a doorway in another position, move/deconstruct a wall, create a new opening in the floor to fit another elevator/staircase. It is changes that are in need of going into the construction of the building but the building is prepared for the changes so they are possible to do without that much effort.

To easy be able to deconstruct and reconstruct a wall where it suits the users are the most frequently used future proofing approach (Austin, Schmidt, 2016). It is common to build plaster walls as interior walls in hospitals in Sweden because they are easy to move, deconstruct and change (Karlsson, 2019).

Creating flexibility could also be to consider the placement of the shafts and vertical communications carefully. They are hard, and expensive, to move (Karlsson, 2019; Andrén, 2008) which makes their originally placement important. Often there are benefits in having them gathered because then you leave more space free to be distributed without considering the shafts. A common strategy is to have them centrally in the building volume to enable the space along the facades to be fully adaptable.

ELASTICITY



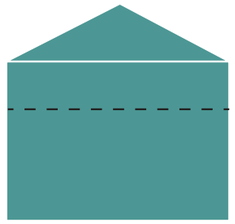
Their is a possibility for expanding or shrinking in area (Karlsson, 2019) e.g. through taking or giving space from/to a neighboring ward/clinic/hospital area or to expand in a new building volume vertically or horizontally.

To build with an elasticity approach demands different solutions depending of the intended thoughts of how the building and/or the different departments within the building should be able to extend or shrink.

To prepare the building for elasticity within the building volume you look at how the divisions could be moved in the space plan to give or take space from a neighboring department (Karlsson, 2019). Often this kind of elasticity is possible due to a division in a hallway that could be moved either way to adjust the sizes of the departments of each side of it. Another solution for elasticity within the building volume is the possibility for a space to switch belonging through closing an opening and making a new opening to the department in need of more space. This kind of elasticity could be seen in residential buildings where a room might belong to different apartments at different floors to create a larger variation of apartment sizes.

To plan for an elastic building volume, you must think of how the space plan is possible to connect. If the intension is to prepare for a vertical expansion there are need for calculating the load-bearing structure to manage the extra load of the intended future floors. Are the intension to make a horizontal expansion there must be free space for the expansion and the space plan must be possible to connect to the new part.

REDUNDANCY



To build with a buffer zone of extra space in advance for what future installations and/or requirements may need.

It could be extra space in the installation ceiling/floor or double shaft systems. The extra space may be in need when the hospital reorganizes or renovate since they then have possibility to move care with higher demands within the hospital because of the prepared installation spaces. The double shaft systems are good as a backup system in case of a disruption in the ordinary system (Karlsson, 2019) and for handling a pandemic in need of extra ventilation or other services.

Creating a loose-fit plan to have space in redundancy for future possible needs (Austin, Schmidt, 2016). The more space you got the more possibilities you have to change the purpose of the room in the future. But there is a balance of the space, if it gets too loose it might even be hard to use it for its purpose right now (Austin, Schmidt, 2016).
A use of this approach in Healthcare Architecture could be to prepare a single room to be possible to use for a double room if needed in a crisis (Austin, Schmidt, 2016).

ECONOMICAL PERSPECTIVE

There are of course economic factors to take into considerations when future proofing. To make the most viable decision you need to consider the whole project.

In Fullt Flexibelt (Andrén, 2008) they present an estimated calculation of how much percentage of the building costs some different generality and disturbance reduction solutions would cost. The solutions listed are functional generality, such as general room sizes and a grid system for pillars and facades, that is estimated to 0 to 5 % of the building costs. Technical generality such as floor height (1%), capacity of the floors (0,3%) and general installations (1-3%). Disturbance reduction solutions listed is plumbing installations above the floor (4-5%) and prepare for future material transportations during renovations (1%). The total percentage of the building costs for these solutions would then be about 7-16%. These costs are then motivated since it will make the hospital possible to use for a larger extent than a non-flexible hospital.

To find the appropriate level of future proofing in a project it could be good to imagine different scenarios during the planning of the building (Andrén, 2008). This to be able to understand which kind of future proofing approach the project benefits the most from and which to let go because of costs and little effect gain from it.

To be able to make the hospital as future proof as possible without dimension for the high intensive care in every single space Fullt Flexibelt (Andrén, 2008) present a strategy. If you separate high intensive care from low intensive care you will have two different demands to design for. The separation could either be in different buildings or at different floors (Andrén, 2008). The result of this separation will be that the low intensive care is possible to build to a lower cost since the demands are lower. A consequent of the separation is that the hospital does not get totally flexible in where to locate the different clinics but depending on the project it might not even be relevant to do so either.

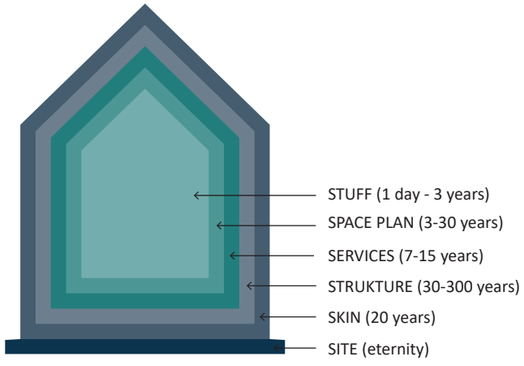
LAYERS

"A building is no longer a single object, but a combination of systems, each system with its own design process, production process and lifetime."
Leupen (2005)

To plan for a sustainable building the circularity of the materials is of interest. It connects to both economic, environmental and future proofing aspects. To design a building that stands for a long time you need to consider the whole lifespan of the building itself and all the layers of it.

In these physical layers of materials with different lifespans you can also add the aspect of future proofing. Is it built in a way that enable changes, then it has been designed for meeting the needs of a future we have not yet seen.

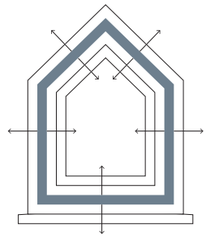
The illustration shows the different layers in a Building and an estimated lifetime for the layer based on the figure of "Shearing layers" from "How Buildings Learn"(Brand, 1994).



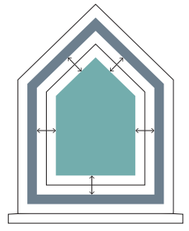
In Adaptable Architecture (Austin, Schmidt, 2016) they have added two extra layers to the building, the social- and the surrounding layer. This since they explain those as crucial factors when considering the building changes during time. They further in the book goes through how different building layers relate to each other. The space plan was identifyed as the layer with most relation to other layers.

STRATEGIES FOR LAYERS

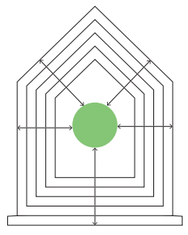
Three strategies of how to reduce the effects of a future change of the building is presented in Adaptable Architecture (Austin, Schmidt, 2016).



KEEP MATERIAL OUT OF THE STRUCTURAL LAYERS
This means to separate the structure such as pillars and beams from the skin (facade) and space plan elements to enable a flexible change of space plan and/or skin(facade) in the future without need of demolishing the structure that have a longer lifespan.



SEPARATE SHORTEST AND LONGEST LIFESPAN
To enable easy changes of the buildings for the users when their requirement changes and because the layers of shorter lifespan need maintenance often than the layer with longer life span.



SEPERATE MOVABLE SOLUTION
This to be able to use them as thought as movable elements independent of other layers.

PLAN FOR LAYERS

Related to the first and second strategy Andrén (2008) writes about how often and much of a hospital renovates yearly.

5-15%

of the space are the number mention. Since it is so much space there is a value to build with that in mind and make the renovations as easy as possible to accomplish. A construction method Andrén (2008) mention linked to this is to place the plumbing above the floor instead of underneath (up in the ceiling in the level underneath). Then the renovation just affects the actual floor that is renovated and not both the floors surrounding the floor/ceiling.

To get all this layers with a lot of elements/materials in each layer to work as intended there are a lot to consider when choosing methods for each building part. In Adaptable Architecture (Austin, Schmidt, 2016) they present some useful tactics of how to plan for a building in layers. Some of the repetitive descriptions of how to design the building parts are standardization, grids and demountable, movable and removable. They also advise to have high story height, wide spans and a 20 % surplus the needed capacity. Many of the ideas is linked to the future proofing approaches in the subchapter before. The redundance in capacity and space. The flexible idea of being able to deconstruct a wall and move it to another location or maybe divide a room into two. The elasticity of preparing the structure for a future expansion. The generality of a grid system that allows for different usage within the same frame.

An example of a project where the layers of the building where in focus from the very beginning is an addition to INO Hospital in Switzerland. The Hospital was divided in three parts and where announced in a three steps competition depending of the life span of the building parts, primary layers 50-100 years(structure and skin), secondary layers 15-20 years(services and space plan) and tertiary layers 5-10 years(stuff) (Kendall, 2005).

A design strategy connected to the strategy of the layers of a building and life span of materials that also have the changeability in mind is "design to disassembly". In that strategy you also need to be aware of the layers of the building and all the connections between different materials to be able to disassembly and then reassembly the whole building or parts of it.

WOOD

CONSTRUCTION

The report ”Sjukhusbyggnader i trä” (Smart Housing Småland, 2019) investigates possibilities of building hospitals in wood. Their result shows that it is possible and sometimes even better to build in wood than convention solutions when it comes to flexibility.

A loadbearing structure in wood can manage about the same space plans as other loadbearing structures. Depending on space plan different systems for the load bearing structure are suitable (Smart Housing Småland, 2019). For a hospital a pillar and beam system often are used.

Since hospitals have a lot of installations, they benefits of having installations above the floor as well as in the ceiling. This would also help the wooden construction to fulfil the requirements of sounds between different floors (Smart Housing Småland, 2019).
For fulfil the requirements of sounds between rooms a double wall construction could be used or a wall in Cross-laminated timber (CLT).

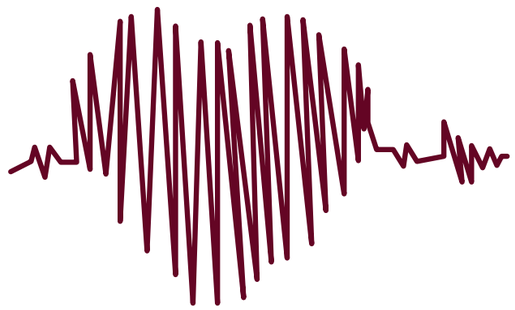
To keep down the height in the system of joists a collaboration floor system could be used where the material strengths of concrete and wood is used.

SUSTAINABILITY

The carbon emissions during production is much lower than a similar building in concrete or steel and during the life time of the building the stored carbon dioxide is even greater than the use during constructing it (Smart Housing Småland, 2019).

Wood is a renewable material and possible to reuse when the building is demolished. In Sweden wood is a local material that also helps the local economy.

Wooden elements are easy to prefabricate which enable an effective use of material and shorten the construction time on site (Smart Housing Småland, 2019).



HEALTH BENEFITS

Wooden surfaces have effects of the convalescence time, decrease the stress and creates a higher degree of well-being says Marjut Wallenius, doctor in psychiatry. The effects of visible wood in the interior have similar effects as the nature itself (Smart Housing Småland, 2019). There are also benefits of it creating a good interior climate with an optimal degree of humidity.

TO THINK OF

The low intense care are no problem but there are rooms in hospital with disorder sensitive equipment where it is hard to motivate a wooden construction (Smart Housing Småland, 2019).
There is also equipment sensitive to vibrations that could be hard to fulfil the requirements for in a wooden construction Often this equipment is big and heavy and therefor placed in the base floor. In higher wooden buildings the base often is made in concrete and then there is no problems for this equipment (Smart Housing Småland, 2019).

The safety in case of a fire is important to think of in every building. A hospital has the classification Br0 since they have great need for protection. This means that the dimensioning of fire protection must be done analytically (BBR, 2011). A sprinkler system could prevent and reduce the result of a fire, but it is of importance to also think of the finish surface of walls, floors and ceiling. Often plasterboards are used as a finish but if there is an intention to have the wood visible you can use a fire retardants (Brandexperten, 2021-03).

OUTPATIENT CLINICS

Outpatient clinics are healthcare units for treatments and investigations within different specialities such as eyes, therapy, blood and urology.

They take care of patients that are not hospitalized but are often placed near a ward with the same specialization or together other outpatient clinics. The layout of an outpatient clinic have similarities with a Health Center. There are a reception close to a waiting room, rooms for examinations, treatment and administration. Depending of the outpatient clinics specialty there are also special equipment and examination rooms for that. (PTS, Chalmers, GU, 2016)

FIRST IMPRESSION

For the patient, the visit might be a tough journey with nervousness and a lot of thoughts. The first impression of the outpatient clinic is therefor of great importance. The way to the outpatient clinic should be easy to understand, the reception should feel safe, and the waiting area should be relaxing and calm (PTS, Chalmers, GU, 2016).

ATTRACTIVE DESIGN

An attractive designed environment is in the report ”Lokaler för öppenvård”(PTS, Chalmers, GU, 2016) found correlating to a perception of good quality healthcare and work environment. They also present research of the positive effects of designing for person centered care. To plan for the individual patients but also staff. Because it is of importance that every patient and staff feel good in the built environment.

TREATMENT

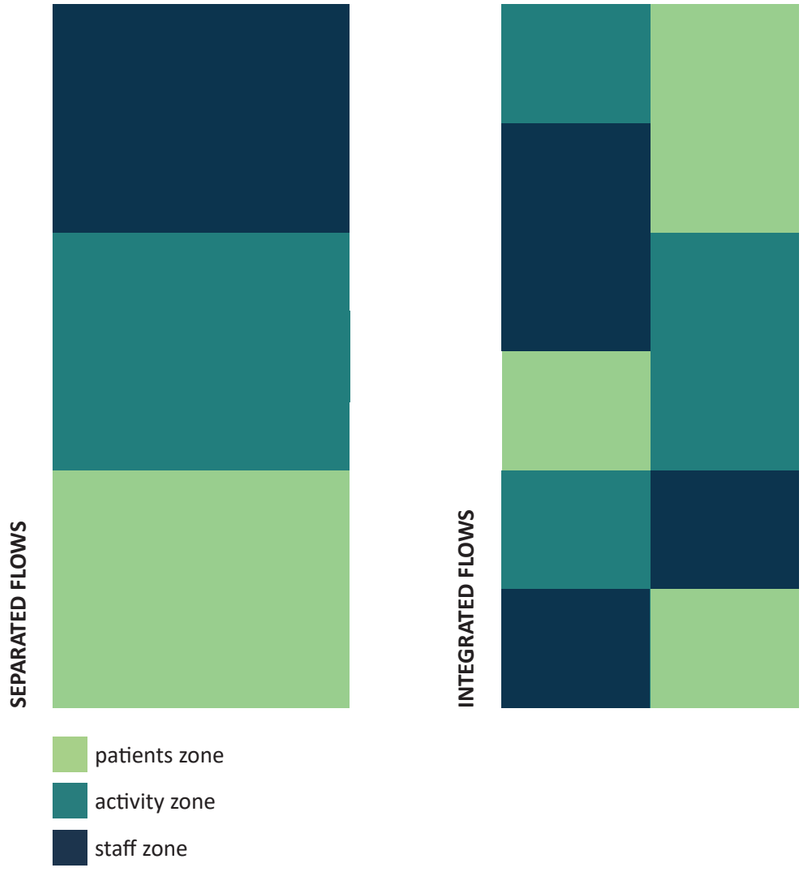
The examination rooms are preferably close to the waiting area and have easy access to an administrative area (PTS, Chalmers, GU, 2016). Depending on which kind of treatment or examination there are different requirements of the equipment, placement and size of the room. If the examination room also have an administrative place there are need for daylight.

ADMINISTRATION

The administration could be conducted in different ways. It could be placed in the examination room, in a separate office space or in a shared open office. Each variant of administrative place could either be personal or a space shared with colleagues (PTS, Chalmers, GU, 2016). The different variants have different positive and negative effects of the flexibility, degree of use and cooperation possibilities.

LOGISTICS

Logistics of patients, staff and gods are of great importance. To plan for the different flows to make them as efficient and natural as possible. Two different types of logistic plans is described in the report ”Lokaler för öppenvård”(PTS, Chalmers, GU, 2016) separated flows and integrated flows.
In a solution with separated flows the area is divided in three zones, administrative, activity and patients’ zone. The solution aims for the staff to have their own area without patients running around and for the patients to have a clear view of where it is allowed to be. This is a clear structure, but research has shown that there is also value in not creating unnecessary boarders between staff and patients (PTS, Chalmers, GU, 2016). The separation between the zones could be design in another way than massive walls.
In a solution with integrated flows for patients and staff there is need for a well design space plan to guide the patients. The space could be interpreting as more relaxing because of the visibility of the care activities taking place there. But it could also turn out more stressful if it is hard for the patients to find their way and if they feel exposed in their care situation.



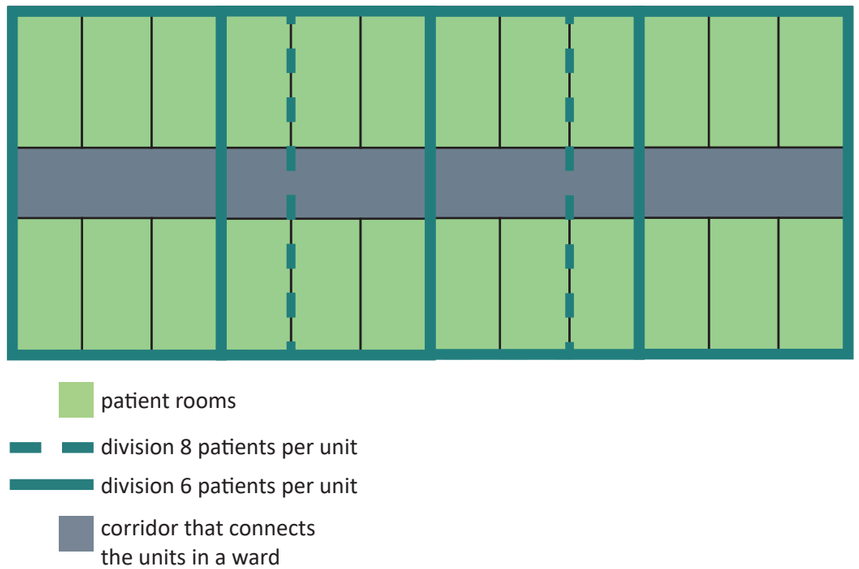
WARDS

A ward often consists of 2 to 4 units with 5-8 patients each (Chalmers, CVA, PTS, 2019). The number of patients in each unit depend of lot of factors. How ill are the patients, how do they work, what competence have the staff and how is the logistic?

The different units in a ward could be fluent between each other or strictly separated depending on which kind of plan layout there are. The teams of the staff could be arranged in different ways and the working structure shift over the hours of the day. Since there are less staff during night hours the plan solution needs to support this and enable staff to arrange and divide the patients in a good way during nights as well.

Within the unit there are supportive functions needed frequently and supportive functions needed less frequently are shared with the other units in the ward (Chalmers, CVA, PTS, 2019).

ORGANISATION OF A WARD



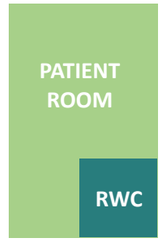
PATIENTS ROOM

The most frequent room in a ward is the patient room and it is also here the patients spend the most of their time when being hospitalized.

The recommendations from the report Den goda vårdavdelningen 2019 (Chalmers, CVA, PTS, 2019) are to plan for single patients' rooms in new hospitals.
The positive effects of single patients' rooms are more integrity, person center care, less fall accidents and healthcare-associated infections, quieter and calmer environment, better teamwork among staff and better sleep.
The negative effects are that it causes a longer walking distance for the staff to reach all patients and harder to monitoring the patients since they are spread out in separate rooms. Some of the negative effects is possible to reduce in the design of the rooms and corridors.

LAYOUT OPTIONS PATIENT ROOM
In Den goda vårdavdelningen 2019 (Chalmers, CVA, PTS, 2019) three layouts of patient rooms are shown. They all have their pros and cons and depending on project one could be a better option then another.

RWC placed in the room
Pros: Gives a private zone for the bed and a hall with place for a basin.
Cons: Could be hard for staff and patients to see each other from the door/bed.



Visual contact with the corridor.
Visual contact with the door from the bed, for the patient to see who is coming and for the staff to see the patient.

RWC placed half in the room/corridor
Pros: Gives a private zone for the bed and a niche in the corridor that makes the door out of the way.
Cons: Could be hard for staff and patients to see each other from the door.

The basin visible for staff when entering, to remind of hand washing.

RWC placed in between the rooms
Pros: Free view towards the door and the room could be a bit smaller since it has no hall.
Cons: Longer corridors.

View the outside from the bed, preferible towards greenery.

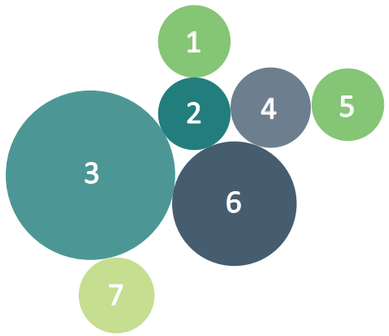
ROOM CONFIGURATIONS

OVERVIEW

To be able to switch between outpatient clinics and wards in an easy way I have looked at the flows of the two activities and compared them. Fixed installations that you need to keep at the same positions because it is economic and time consuming to move needs to be position in a way that suits both outpatient clinics and wards.

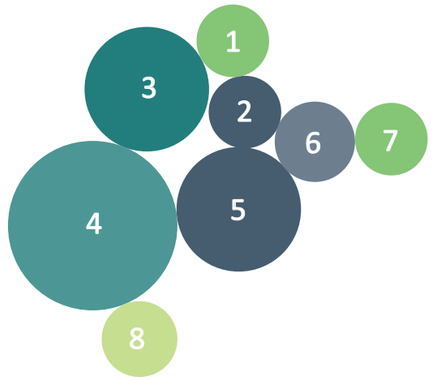
If you look at the overall room configuration of a ward and an outpatient clinic you can see both similarities and differences.
The illustrations indicate the relation between different function and the size indicates how many of that room there is.

WARD



1 Entrance patients
2 Hall/small waiting area
3 Patients rooms
4 Staff area
5 Entrance staff
6 Administration
7 Supportive functions

OUTPATIENT CLINIC



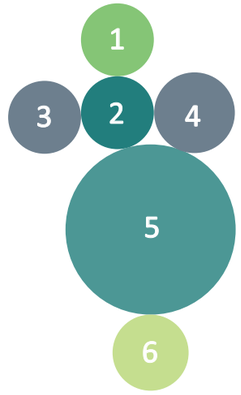
1 Entrance patients
2 Reception
3 Waiting area
4 Examination rooms
5 Administration
6 Staff area
7 Entrance staff
8 Supportive functions

MOST COMMON ROOMS

When you look into the layouts of the most common room in the two activities you find the obstacles. In a ward the patients rooms are the most frequent room and in an outpatient clinic the examination, treatment and expedition rooms are most common. The most obvious and costly difference between the ward and the outpatient clinic are that the patients room have a bathroom that will be redundant if you switch to an outpatient clinic where the need of bathrooms are less. The patient room are in need of daylight and preferably a green view but the examination and treatment room have not demands for that. An examination or treatment room could therefor be placed in the middle of the building without windows but will then not be possible to switch to a patients room.
The illustrations are made by the auther and a result of the knowledge learned during the literature research, interviews, tutorials and own experiences of hospital and health center visits.

WARD

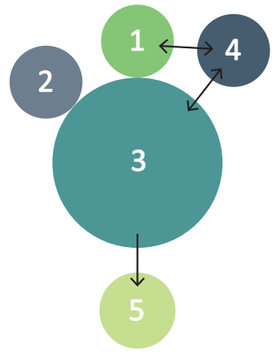
PATIENT ROOM



1. Corridor
2. Hall
3. Basin
4. RWC
5. Patients room
6. View outdoor

OUTPATIENT CLINIC

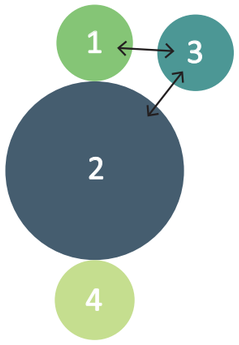
EXAMINATION/TEATMENT ROOM



1. Corridor
2. Basin
3. Examination/Treatment
4. Administration
5. View outdoor

OUTPATIENT CLINIC

EXPEDITION ROOM



1. Corridor
2. Administration
3. Examination/Treatment
4. View outdoor

PLAN LAYOUT OPTIONS

CORRIDORS

ONE CORRIDOR

Pros

All rooms are along the facade with natural daylight (Chalmers, CVA, PTS, 2019).

Cons

The corridor gets long and gives the staff a long walking distance.

Hard for the supportive functions to grow since they are squeezed in between patients´ rooms/examination rooms.

WIDE CORRIDOR UNIT

Pros

The supportive functions are placed in the corridor which shortens the walking distance for the staff.

Possible for the supportive functions to grow and change since they stand freely in the plan (Chalmers, CVA, PTS, 2019).

Cons

There is no natural daylight or view outdoors from the supportive functions.

DOUBLE CORRIDOR UNIT

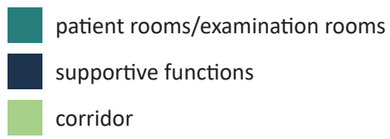
Pros

The supportive functions are placed in the corridor which shortens the walking distance for the staff.

Cons

There is no natural daylight or view outdoors from the supportive functions.

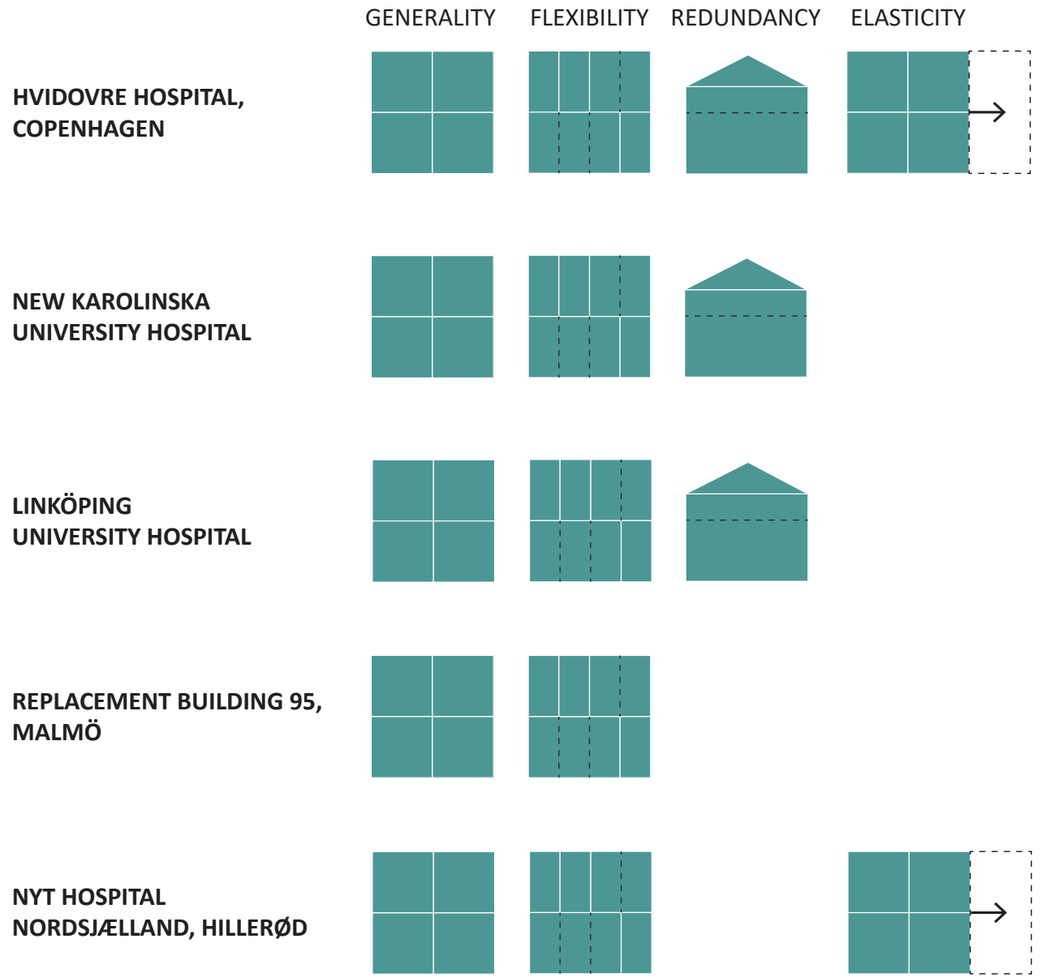
In compare with the wide corridor the supportive functions have a more fixed solutions in the core, so it takes a bit more effort to change.



CASE STUDIES

To get a picture of how future proofing approaches has been used in hospital projects before I have studied some real examples. Projects has been chosen out of the read literature and some have come up during tutorial and interviews as interesting projects to investigate.

In the table below you can see an overview of the projects I have investigated and what kind of future proofing approaches they have used.



CASE STUDIES

HVIDOVRE HOSPITAL, COPENHAGEN

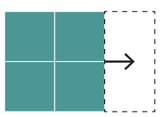
750 hospital beds
3300 staffs

INTRODUCTION
The hospital was built in two steps during the seventies. It is a horizontal block building and the base floor of it is a 110 times 350 meter rectangle for clinics and administration. On top of this base there are four transversely parts placed with two floors each consisting wards (Andrén, 2008).
Along the years there has been lots of changes in the hospital and the flexibility of the building has been used. The requirements have changed but the building has been able to adapt for them and the hospital is still seen as an attractive place to work (Andrén, 2008).

GENERALITY
Even though the rooms have changes functions the original logistics of the building has remained and still function well. The loadbearing structure consists of a pillars and beams with a 8,4 times 9,6 meters grid (Andrén, 2008).

FLEXIBILITY
There are today one-, two and four patients' rooms placed along the facades with a double corridor solution where the dark core is used for supportive functions. An ongoing renovation is to transform all patients' rooms to single rooms (Andrén, 2008).

REDUNDANCY
The floor height, installation space and the load capacity of the original building have made all the adaptions possible.
The base of the building has a big technical space in the ceiling for horizontal distribution of media, ventilation and plumbing. The space is 1,6 meters heigh and the total height of the base floor is 5,1 meters (Andrén, 2008).



ELASTICITY
An elasticity possibility to the west is something they plan to use when expanding with some new building volumes (Andrén, 2008).

NEW KAROLINSKA UNIVERSITY HOSPITAL

330.000 sq.m.
1600 patients per day, about 10% emergency
6000 staffs, 1000 researchers and students

INTRODUCTION
The whole complex consists of five building volumes that are connected in the entrance floor. The care volume is divided in five cores within a shell. There is different possible arrangement of the activities, they can be arranged to connect horizontally or vertically to their cooperative activities (Andrén, 2008). All installations are placed within the own floor underneath the ceiling and the plumbing is placed above the floor in a casting (Andrén, 2008). This makes future renovations only affect the floor that is renovated.

GENERALITY
The most requiring activities has been ruling the dimensioning of the building. The load capacity of the floor structure is set to manage 10 kN/sq.m. (Andrén, 2008).
The five cores in the care block are 36 meters wide and follows a grid system of 9 times 12 meters. The floor height is 4,8 meters, with a free height of 3,2m. A double corridor system with 3 meters wide corridors is used in the cores. Along the facade there are 9 meters deep rooms. Between the two corridors there are a 12 meters wide support area (Andrén, 2008). The dimension of the patient rooms makes them possible to use for an IVA-patient.

FLEXIBILITY
Two patient rooms could be merged into an IVA-room for three patients. It is also possible to transform the patient room into an isolation room, just install a sluice in the door opening (Andrén, 2008).

REDUNDANCY
A redundancy is built in the installations and they have prepared to serve a 100.000 sq.m. additional space and that the consumption of media could be increase with 20% (Andrén, 2008). Three big elevators serve each core and there are two media shafts in each corridor end.

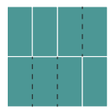
CASE STUDIES

LINKÖPING UNIVERSITY HOSPITAL

Approx. 55.000 sq.m. new building
Approx. 55.000 sq.m renovation of existing building
(Bergehed; Edström, personal communication, February 17, 2021)

INTRODUCTION
The project is called Framtidens US and is including both renovations of some existing parts of the hospital and new extensions with both wards and clinics. They have worked with six overall guiding principles:
Flow principle - Prioritize the patient flows
Generality, flexibility - Design standardized rooms.
Patient safety - E.g. prioritize one-patient room.
Holistic principle - Overall values are prioritized.
Orientability - It should be easy to find your way.
Sustainability - Long-term solutions priorities.
(Bergehed; Edström, personal communication, February 17, 2021)

GENERALITY
The wards and clinics are made of standardized rooms and have a structure that should enable a use for different activities in the future (Bergehed; Edström, personal communication, February 17, 2021).



FLEXIBILITY
The interior walls, installations and interior that connects to the activity should be easy to change because the development of the activities in a hospital is fast (Bentzel et al. 2011).
They have planned for making future renovations only disturb the actual floor by making it possible to turn of the media and installations for a specific floor (Bentzel et al. 2011).

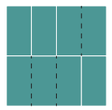
REDUNDANCY
Shaft for plumbing is install along every pillar to prevent disturbance from renovations at floors above (Bentzel et al. 2011).

REPLACEMENT BUILDING 95, MALMÖ HOSPITAL

28 hospital beds
(Spannel, personal communication, February 9, 2021)

INTRODUCTION
The replacement building 95 is one of two buildings that was built because of the need of temporary buildings to evacuate hospital activities during the construction time of a new hospital. The initial thought was to build with modules but during the work it changed to a prefabricated concrete structure because of a lower bid. This meant that the building got more permanent than the initial thoughts. With the new construction the estimated lifetime of the building raise to more than 25 years. The client also got a building that is more able to change since the double walls, floors and ceilings that you get with modules had disappeared. It got easier to make openings between rooms and floors without double structures or installation joints between modules. (Spannel, personal communication, February 9, 2021)

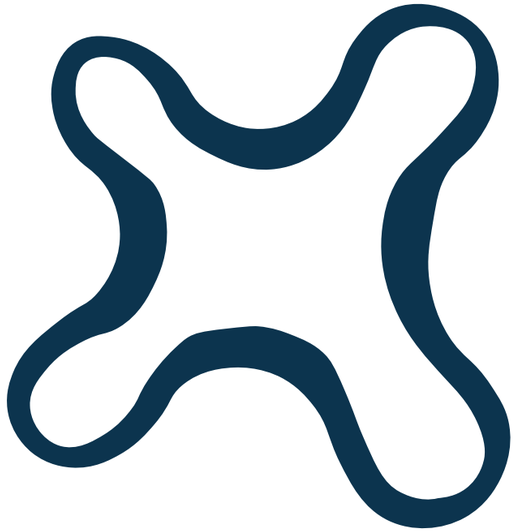
GENERALITY
The initial aim of using modules have left traces in the space plan that have a rational grid system based on modules. The measurements have been ruled by what is possible to transport in combination of the needs of the activities in the hospital (Spannel, personal communication, February 9, 2021). The rooms are general in size and shape and could contain either a patient room or an examination room.



FLEXIBILITY
In the wards the bathrooms are placed in between the patient rooms and in the clinic the same space become an expedition room instead. If they would need to switch from clinic to ward or the opposite the space plan allows for this change.

CASE STUDIES

NYT HOSPITAL NORDSJÆLLAND, HILLERØD

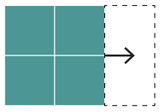


118.000 sq.m.
540 hospital beds (Regionh, 2021-02).

INTRODUCTION
This is a hospital not yet built but it is an ongoing project and there is some information available on the region Hovedstaden website (Regionh, 2021-02).
The work of this project started off with a citizen dialogue and during the pre study some workshops have been made with staff and patients to get their view of the new hospital (Regionh, 2021-02).
Characteristics for this project is the presence of nature, the form of the building volume creates lots of views out towards greenery (Regionh, 2021-02).
In the competition brief for the hospital, they have written about future proofing and listed requirements for what kind of solutions they imagine. They have also stated 10 principles for the space management, three of them connects to the theme future proofing:
Flexibility for the future - Prepare for change.
Standardization - Room sizes, layouts and furnishing.
Simple, obvious and optimized - Smart solutions, clear systems and logical connections. (Aarhusarkitekterne et al. 2013-02-07)

GENERALITY
The hospital should be design with standard solutions that could be modified into new requirements without changing the loadbearing structure, installations and logistics (Aarhusarkitekterne et al. 2013-02-07).

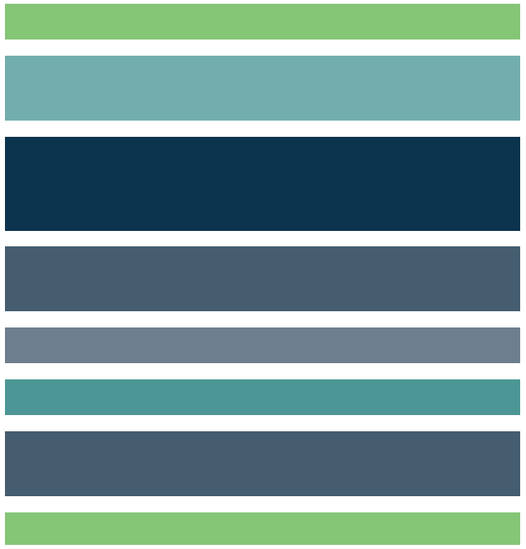
FLEXIBILITY
There should be possibilities to rearranging the physical space to meet future requirements and during rearranging the disruption of the healthcare activities should be avoid (Aarhusarkitekterne et al. 2013-02-07).



ELASTICITY
There should be possible to reduce or expand in space to meet future needs. A possibility of using the space different during the hours of the day (Aarhusarkitekterne et al. 2013-02-07).

REFLECTION THEORY CHAPTER

When designing a hospital building or part of a hospital there are a lot of aspects to consider. The buildings main focus is to support the staffs work and the patients journey towards recovery. During reading and interviewing people within the field of hospital project it both got more complicated and clearer. It is a tough task to plan and build a hospital. It is a matter of cooperation between many experts and challenging to combine wishes from everyone involved. The experience of patients and staffs, economy -in short and long terms, sustainability, maintenance -costs of it and related to possibilities of managing them during an ongoing activity and the future need and requirement. The last one listed is where this thesis got its focus even though every piece listed is connected to each other more or less.

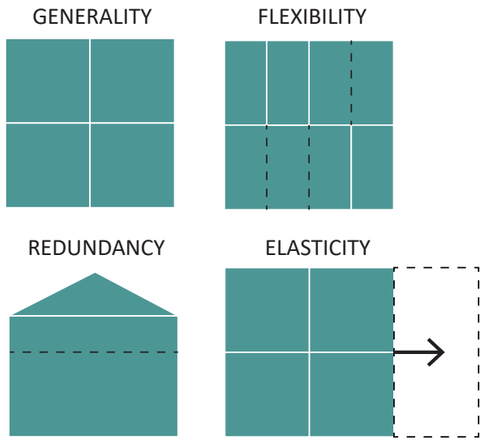


LAYERS

In a close relation to future proofing, I identify the theory of layers of the building and the design strategy design to disassemble. The chosen construction methods could have big impact of how easy the building can adapt to future change. To keep the layers as separate as possible and think of which component you would like to be able to maintain, replace, deconstruct or move in the future I think is of great importance for the future proofing aspects. Design to disassemble are in the building extension at Hallands sjukhus Varberg most of interest in the interior parts since they want the building itself to be seen as a permanent structure with a temporary content. But in projects where the need of a whole building might change there might be of interest to deconstruct whole buildings or parts and reconstruct in another site where they are in need for it.

The example of dividing the building in three parts depending on their life span and plan them one by one I think is a good start. Then you get an overview of what layers of the building that suits different future proofing approaches. Since a building itself is complex and it just gets more complex when it is a hospital you need to break down the projects in parts to be able to manage the whole. For the extension at Hallands sjukhus Varberg where the building itself should be seen as permanent the primary layer, structure and skin, could benefit of being as general as possible so that you will not need to change them when changing the content in the building. The placement of windows and chose of loadbearing structure will be of great importance that it suits different activities well. A redundancy in the loadbearing structure is also of interests since future technology might mean heavier equipment. If there are a thought of being able to build additional floors on top later the redundance in the loadbearing structure together with installations also are of importance to prevent costly reinforcements on the load-bearing structure afterwards. The secondary layers, services and space plan, should in the extension be possible to make some changes with to suit the specific activity. There are therefore important to plan for the required changes from start and make them possible to conduct with as few resources as possible.

REFLECTION THEORY CHAPTER



SPACE PLAN

Different layouts of space plans have their pros and cons. The double corridor enables a shorter distance since the supportive functions are place in a dark core. The single corridor brings more daylight to the supportive functions, but the distance grows. The positive effects of single patients' rooms make them the first choice in new buildings even though the walking distance for the staff increase (Chalmers, CVA, PTS, 2019).

The new extension at Hallands sjukhus Varberg will have single patients' rooms and the arrangement of the rooms will be of importance to think of. How can you make the walking distance for the staff shorter and how can you break up the long corridors. Some sort of mixture of double and single corridor might be the solution. The layout of the wards also must consider different possibilities to divide the 24 patients. In "Den goda vårdavdelningen" (Chalmers, CVA, PTS, 2019) they mention 5 to 8 patients per unit depending of how they work in different teams. The possibilities of arranging the rooms 3 times 8 or 4 times 6 could be a start. During nights they often merge units because of less staff, and this should also be consider during planning. Positions of supportive functions needs to be in a strategic location for every unit and function for the night staff.

FUTURE PROOFING

If you, like in the replacement building 95, go for the solution with bathrooms in between the patient rooms you get a longer corridor but also the possibility of using the same grid system in an outpatient clinic where the bathrooms turn into expeditions.

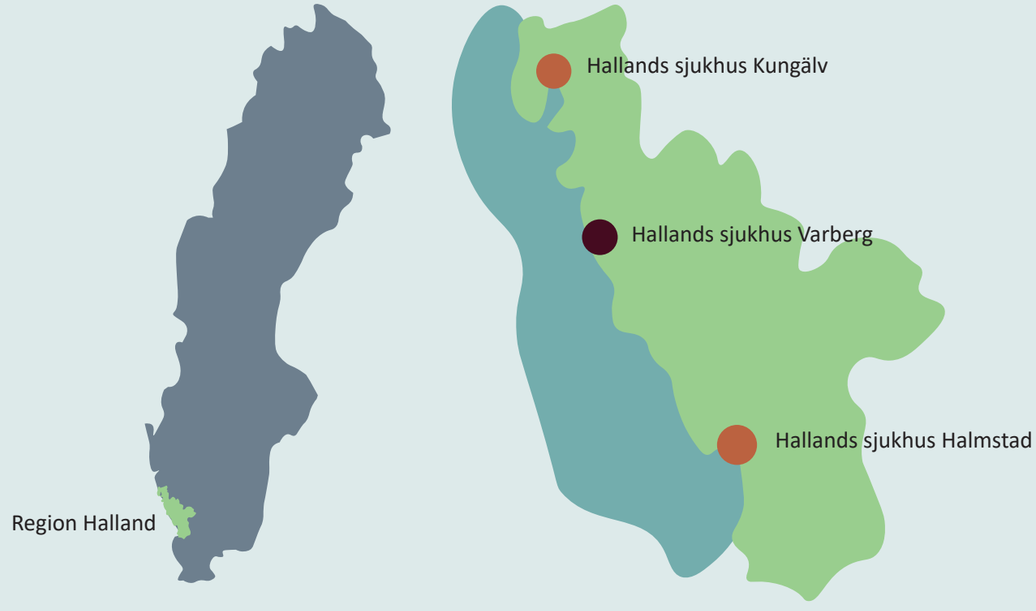
If the bathrooms are placed in the patient rooms, they need to be bigger but you gain a hallway in the patient room with space for a basin. When the wards should turn into an outpatient clinic you take the unnecessary bathrooms away and you get spacious rooms for examinations, expeditions, treatments. It could be good with extra space in many cases but sometimes it might get too inefficient with that extra space.

There is also a version of having the bathroom half inside the room and half outside in the corridor. This could be a way to make the space more efficient when switching from ward to outpatient clinic. Then the former bathroom might suit perfect to storage or a small waiting area in the corridor depending on position. The grid structure will then be a bit more inconsistent and there will be need of quite big interventions to switch between the activities.

04. Context

Hallands sjukhus Varberg is one of three Region Hospitals in Region Halland. The hospital is located a bit east of the center of Varberg and have a lot of greenery surrounding it. On the east side of the hospital there are an area with villas and then the fields spread out before the road E6 comes.

SWEDEN **REGION HALLAND**



VARBERG

- Health facilities
- Transportation
- Landmarks and activities

1. Hallands sjukhus Varberg
2. Site for extension
3. Women's Health Care
4. Youth Clinic
5. Children Youth Psychiatric Clinic
6. Health Center
7. Health Center
8. Train Station
9. Bus terminal
10. Bus stop at the hospital
11. Cold Bath House
12. Varberg Fortress
13. Varberg District Court
14. Chapel
15. Church
16. Town Hall
17. Church
18. Varberg Arena
19. Beach Walk
20. Allotment Garden

Satellite photo from Lantmäteriet's mapping tool, ©Lantmäteriet. Location markings made by the author.

HALLANDS SJUKHUS VARBERG

In this illustration you see the current situation of Hallands Sjukhus Varberg. Main activities and entrances are marked out and the activities in the building volumes around the site are listed.

P. Parking
1. Bus stop
2. Farmacy
3. Main reception
4. Café
5. Restaurant
6. Central kitchen
7. Gods
8. Hospital church
9. Emergency
10. Libraryw

351 . Speech therapy clinic
Occupational therapy
343, 342. Maternity ward
344. Surgery
341. 2 Conference rooms
353. Pain rehabilitation clinic
Kidney clinic
Dialysis clinic
Conference room

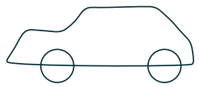
Based of drawing material made by White with permisson from Region Halland. The coloring and markings are made by the auther.

PRECONDITIONS

Hallands sjukhus Varberg is a structural hospital built during year 1960 - 1979 (Bebyggelseregistret, February 17, 2021). The clinics are spread out in the entrance floor and the wards are situated in a building volume of 6 floors in the east part of the hospital area (Arias; Revellé, personal communication, February 17, 2021). Underneath the entrance floor there are a culvert floor for goods transportation and logistics. Due to the difference in heights the culvert floor is in the ground level to the south and some clinics are located here as well.

The site for the new extension is situated in the south of the hospital area with a close connection to the southern parking lot and views towards greenery. In the existing detailed plan, you are allowed to build a two floor building with a maximum building height of 8 meter plus an attic. The attic floor is suggested to be a service floor for ventilation and other technical systems (Olsson, personal communication, October 29, 2020).

TIME TO VARBERG CENTER BY:



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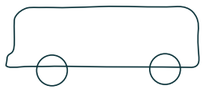


10 min

10 min

30 min

The site viewing towards north-east.

CULTURAL-HISTORICAL VALUE

Hallands sjukhus Varberg is listed as a building with Cultural-Historical Value classification B by Swedish National Heritage Board (Bebyggelseregistret, February 17, 2021). Hallands sjukhus Varberg is describe having an architectural, architectural history, identity, environmental creation, pedagogical and social historically value. The classification puts no legal boundaries for the new extension but as an addition it is important to consider how to connect to the existing building and environment in the exterior and interior.

MATERIALS

The existing hospital have a concrete structure and the main parts have a brick facade with elements of metal sheets. The windows are placed in bands and the impression of the hospital is robust and horizontal. The connecting parts consists of a black corrugated metal facade with a large band of glass. The expression is still horizontal but these parts look airy and less robust than the brick facade.
On the ground you find different types of stone paving and details in the outdoor environment are mainly metal, stone and wood.

Pavilion in wood and red brick paving

Bench in metal

Bicycle parking in black metal

Concrete and stone paving

EXISTING FACADE TYPES

Brick and metal sheet facade with a band of windows. The facade of the buildings east and west to the site looks like this.

The window band is broken up by windows all down to the ground. This is seen in the buildings east and west to the site.

Corrugated metal facade with a band of glass. This is seen in the building north of the site where the new extension will connect.

Brick facade with a band of windows and white facade sheets. This is the facade of existing wards.

FLOWS

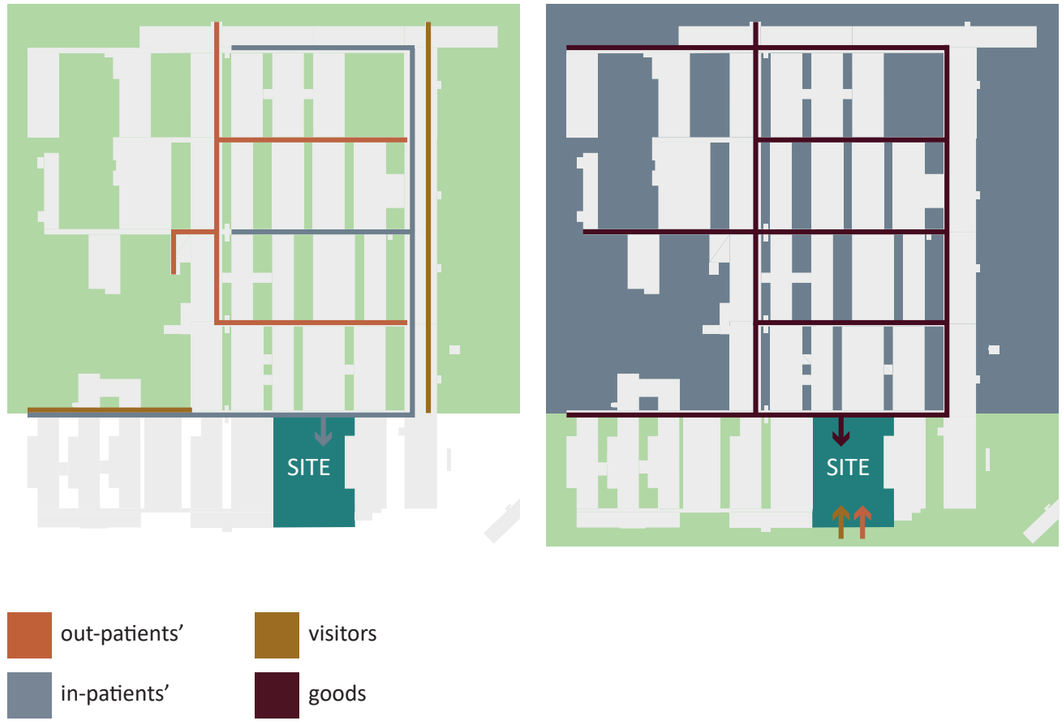
The flows of out-/in-patients and visitors that are seen in the illustration below is based on an illustration in Varberg Originalskrift(1971) that was shown in the interview with Arias and Revellé (February 17, 2021). During the interview these flows were discussed. It turned out that the intended separation between out- and in-patients is not function as planned. In-patients and out-patients are mixed in the corridors since they take the shortest route to the goal.

For the goods there are a culvert system in the basement that connects to the site in the ground level because of the height difference. The second floor in the new extension will connect to the level where the main entrance for the hospital is located.

The location of the site enable the new extension building to have its own entrance to not disturb the existing flow in the hospital. In-patients, staff and goods could still enter from the existing hospital, but the out-patients and visitors are directed to the southern parking lot and to enter the new extension directly from its own entrance.

ENTRANCE FLOOR (SECOND FLOOR ON THE SITE)

BASEMENT FLOOR (GROUND FLOOR ON SITE)



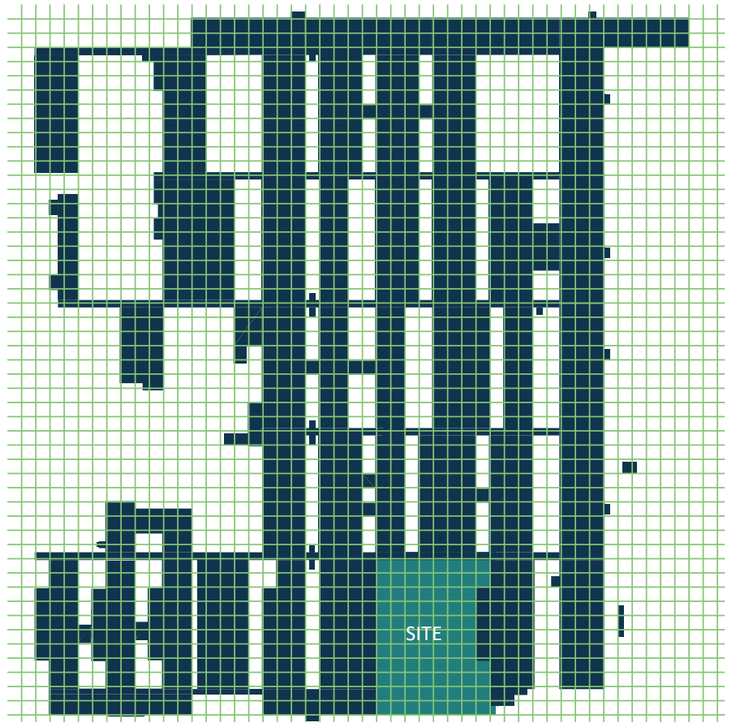
STRUCTURE

There is a clear structure in the existing hospital that from the beginning intended to make it flexible. The illustration shows the grid system of 7.2 times 7.2 meters that are the base of the loadbearing structure. Building volumes with a width of 2 times 7.2 meters are single corridor, the ones with 3 or 4 times 7.2 meters width has a double corridor solution.

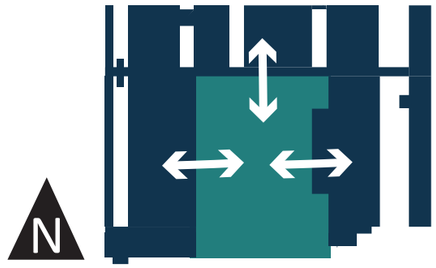
Within the 7.2 meters grid there are a division into a 1.2 meters grid where the rooms are possible to divide in 1.2 meters interval. The facade is supporting this grid with bands of windows possible to connect interior walls every 1.2 meter.

The measurement of the grid has been successfully used in both clinics and wards. Sometimes it results in a bit more space then necessary but the gain of a general structure that suits the most is worth it (Arias; Revellé, personal communication, February 17, 2021).

During site visit, 2020-10-29, Olsson showed examples of where they in different parts of the existing hospital has been forced to build in the corridors to get the required space. The corridors then got a bit too narrow then they had wished for. There is therefore a need of testing how the grid structure suits today's requirements and explore other measurements.



SWOT ANALYSIS



Well Integrated
Good Sun Condition

Narrow Site
The final surface

STRENGTH

WEAKNESS

OPPORTUNITY

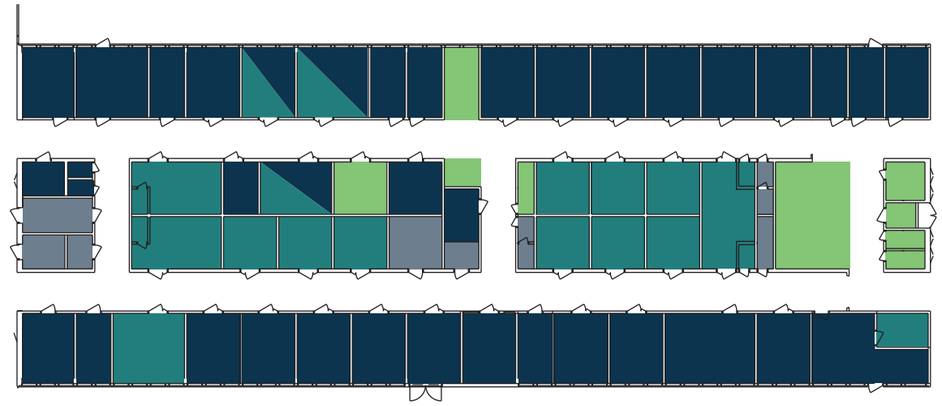
Test New Strategies
Become a Role Model

THREAT

Political decisions
The Unknown Future

CURRENT SITUATION

OUTPATIENT CLINIC



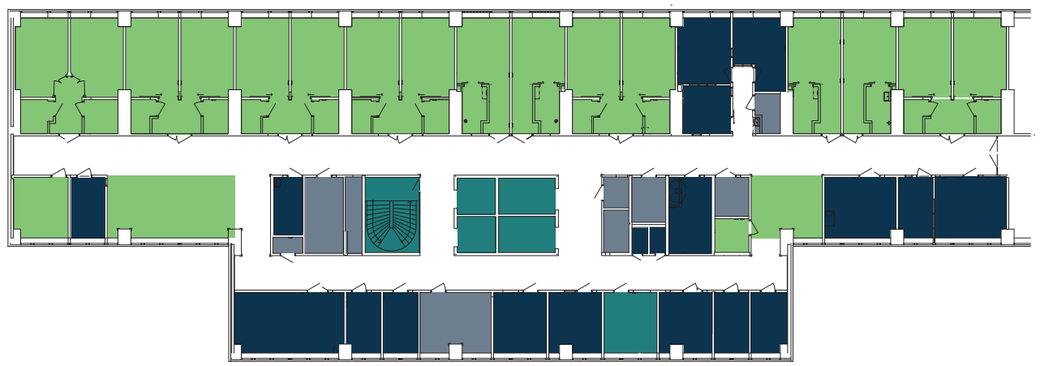
patients' zone
activity zone
staff zone
storage, technical room

This double corridor solution of an outpatient clinic at Hallands Sjukhus Varberg has a clear structure of rooms. There are two waiting areas for the patients, one big in the entrance asides a reception and one smaller in the middle of the clinic. The examination rooms and service functions are placed in the dark core between the corridors. Along the facades there are expeditions and a few treatment rooms, some of them in combination with expeditions.

Pros
The double corridor solution makes the walking distance shorter.

Cons
A dark core.
The big waiting area have no daylight and view outdoors.
No possibilities to wait outside.

WARD



patients' zone
activity zone
staff zone
storage, technical room

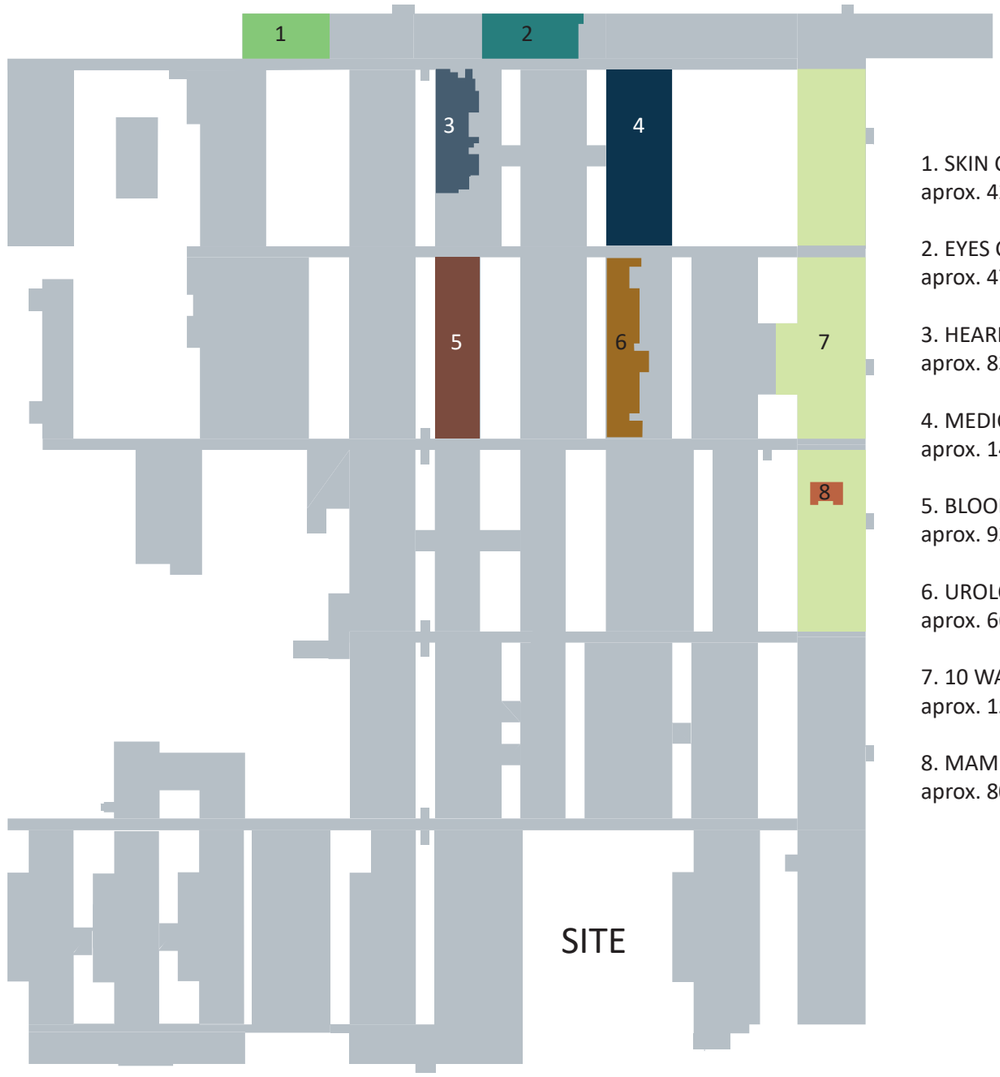
This partly double corridor solution of a ward clinic at Hallands Sjukhus Varberg has a mix of single patient and double patients' rooms. All the patients' rooms facing the facade with a free view out towards the greenery and further away the ocean. The staff zone is mostly facing the hospital yards and in the dark core you find supportive functions.

Pros
Views towards nature from the patient rooms.
Multi-patient rooms make the walking distance for the staff shorter.
Multi-patient rooms make the patients less alone.

Cons
Lack of privacy in a multi-patient room.
Infections could spread from patient to patient.
Medicines could accidently be mixed up.

CURRENT SITUATION

Outpatient clinics and wards marked in this illustration are in need of renovation and will be in need of moving out during the renovation. (Olsson, personal communication, October 29, 2020).



1. SKIN CLINIC
aprox. 420sq.m.

2. EYES CLINIC
aprox. 470sq.m.

3. HEARING CLINIC
aprox. 830sq.m.

4. MEDICINE CLINIC
aprox. 1400sq.m.

5. BLOOD CENTRAL
aprox. 930sq.m.

6. UROLOGY CLINIC
aprox. 660sq.m.

7. 10 WARDS
aprox. 15000sq.m.

8. MAMMOGRAPHY
aprox. 80sq.m.

05. Program

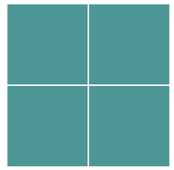
"We need to think of the future patient
and not oppose change"
User process 2012 (Regionh, 2021-02)

The different outpatient clinics, wards and the unknown future have different demands for the building to fulfill. The people coming to the building as patients, relatives and staff have different needs. This all are of importance to consider during designing.

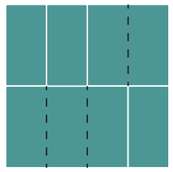
The new extension building is appreciated to about 1200-1300 sq.m. building area. It is supposed to contain two outpatient clinics/wards at the time. The reason for renovation of the outpatient clinics and wards listed in the program is that the building now is about 50 years old. The renovation is too extensive to be done while the care continues and they therefore need to evacuate during the renovation (Olsson, personal contact, 29 oct 2020).

DESIGN CONCEPT

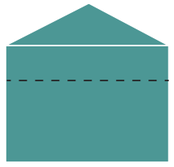
FUTURE PROOFING



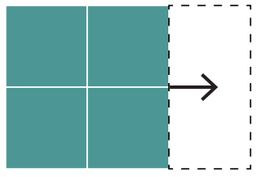
GENERALITY
A grid structure of the loadbearing elements that enable a varied use of space, rooms with measurement that suits different activities.



FLEXIBILITY
A facade system with possibilities to connects interior walls in strategical positions to make different widths of rooms possible.



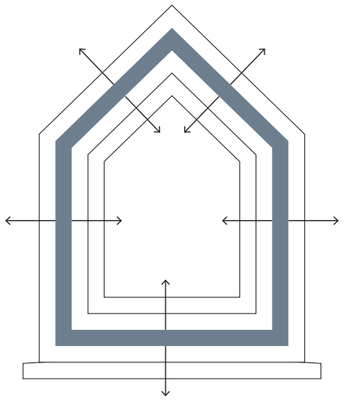
REDUNDANCY
Shafts and ceiling height with space for extended installations in case of more demanding activities in the future.



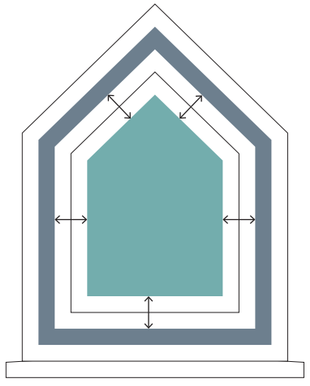
ELASTICITY
Possibilities of arranging the work in different ways, divide the units in a ward in different sizes and in different constellations.

LAYERS

Choose building methods that enable the different layers to be replaced and reorganized without need of demolishing layers that still function.
The illustrations are based on the figure of ”Shearing layers” from ”How Buildings Learn”(Brand, 1994).

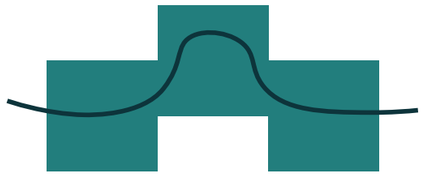


Keep material out of the structural layer.

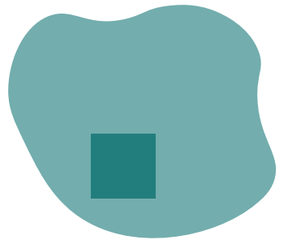


Separate layers with different life span.

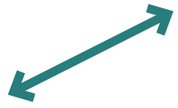
ARCHITECTURAL



Break up the corridors.



Get the feeling of small scale in a large complex.



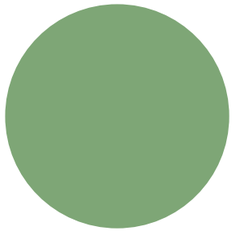
Sightlines for staff and patients, be able to see who/what is coming.

Views towards greenery.
Natural daylight.
Outdoor possibilities.

MATERIALS & COLORS

Material and colors from nature and the surroundings that supports the well-being of patients, relatives and staff.

Wood as the main material inside together with soft beige colors creates a calm and warm atmosphere.
A harmony in the interior environment and a connection to the nature outside where it is possible.



Accent colors for orientation.

Facade material that connects to the site, a brick facade in grey tones together with details in wood. The wood will during time get a grey tone that melts into the brick facade.

Outdoor environments with plantings, paving in stone and furnishing in wood.

OUTPATIENT CLINIC

GENERAL SOLUTION

The aim is to design a general outpatient clinic in the extension to Hallands sjukhus Varberg that suits the different clinics with as few changes as possible when changing from one to another.
Outpatient clinics for Blood lab, Eyes, Hearing, Mammography, Medicine, Skin and Urology should all be possible to move into the new extension.

Most of the outpatient clinics listed have a very varied patient group, from young adults to elderly, men and women, people coming on a control and people coming continuous or occasional for treatments. The different clinics also have some more specific demands of the patients, e.g. the ones coming to the eyes clinics will need clear contrasts and signs to be able to find their way independently and the ones coming to hearing clinic will need a well design acoustic environment. But since a patient with eyes or hearing disabilities also might visit some of the other clinics there are a need for a universal design in a hospital environment. If a design is helping one patient to be more independent, it would certainly be a good design solution for everyone.

All the outpatient clinics could have the same base structure and some functions are common among them like:

- *Reception*
- *Waiting area*
- *Expeditions*
- *Examination rooms*
- *Treatment rooms*
- *Disinfection*
- *WC/RWC*
- *Storage*
- *Cleaning storage*
- *Recycling/Garbage room*
- *Staff area*
- *Technical space*

SPECIAL NEEDS

The outpatients' clinics will need some special solutions adjust for their specific demands. This is solved with some flexible rooms with space for special equipment that easy could be changed to fit next outpatient clinic or ward that moves in.

SKIN CLINIC
Light treatment room - should be placed dark.
Sample room

EYES CLINIC
Operating room for small operations - an examination room with higher hygiene standard.
At least one examination/treatment room with possibilities of having a 5 meters distance to an eye testing painting.
The equipment does not require more area, but it is much equipment hanging down from the ceiling.

HEARING CLINIC
A hearing testing room- high sound classification, small and with a comfortable armchair for the patients to sit in during testing.

MEDICINE CLINIC
Test working-EKG - requires more ventilation, access to a RWC with shower, changing space and close to a resting room.
Emergency room - care panel.

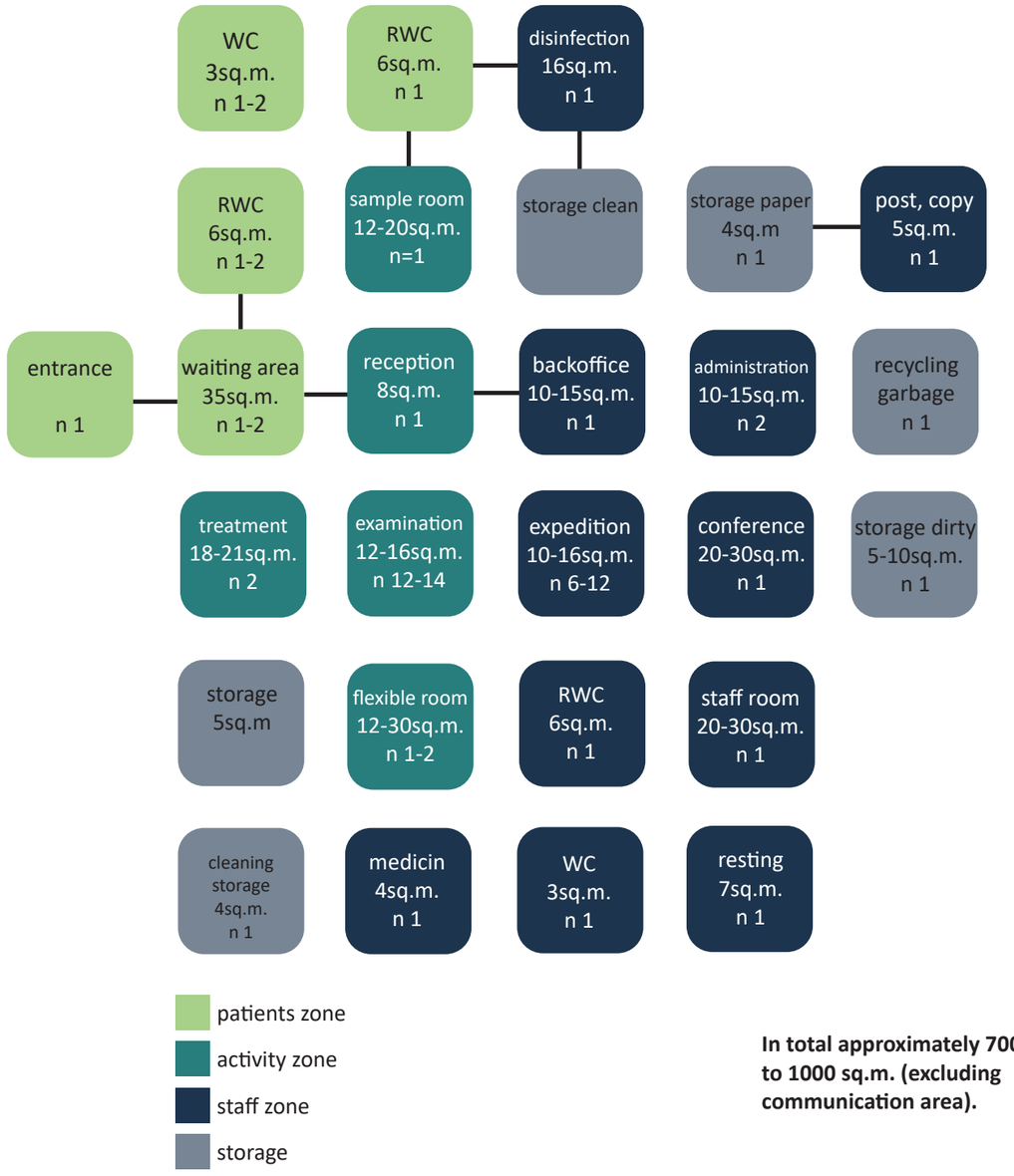
BLOOD CENTRAL
Coagulation/glucose measurement room - in need of a cooling room.
Room for leaving blood - access to a resting room.

UROLOGY CLINIC
Ultrasound - in need of a bigger examination/treatment room to be able to fit the ultrasound equipment. Be able to place the bed with access from both sides, it could not stand towards the wall with the long side.

MAMMOGRAPHY
X-ray room

ROOM CONFIGURATION

This illustration shows information of the area, number and logistic of the rooms in an outpatient clinic. The rooms are placed near other rooms they belong to, the most important connections are illustrated with a line between the rooms.
The color indicates the main user of the room.



In total approximately 700 to 1000 sq.m. (excluding communication area).

WARD

GENERAL SOLUTION

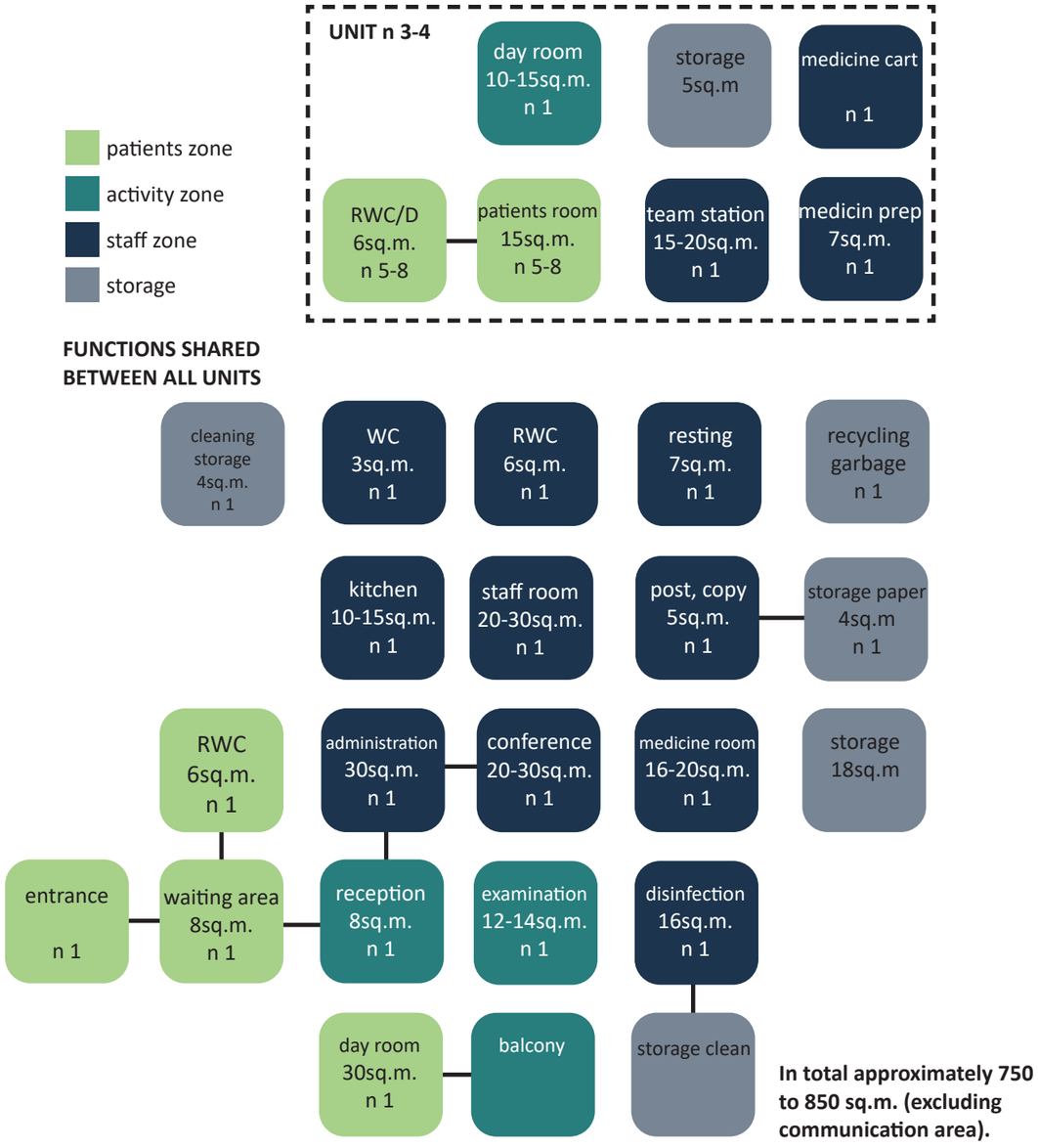
All, 10, wards in the higher building are need renovation in the existing hospital and will be in need of moving out during renovation. (Olsson, personal communication, February 22, 2021).

Patients that stay in a ward are a very varied patient group, from younger adults to elderly, men and women, people staying for a night or a longer stay, first time stay or recurring visits. Often the wards are divided in different fields connected to a clinic, like urology, medicine etc.

For the recovery process access to stimulating environments are of importance. Day rooms that the patients feel safe in and attracts to visit is good. Easy to access outdoor environment as a balcony and to have views towards greenery is also helping the recovering process.

ROOM CONFIGURATION

This illustration shows information of the area, number and logistic of the rooms in a ward. The rooms are placed near rooms they belong to and the most important connections are illustrated with a line between the rooms.
The color indicates the main user of the room.



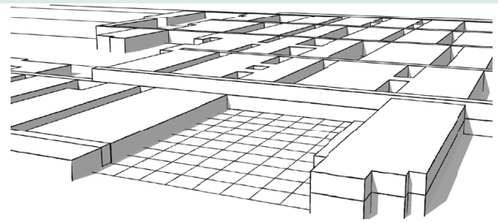
In total approximately 750 to 850 sq.m. (excluding communication area).

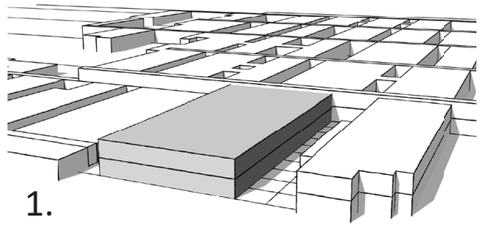
06. Design Investigation

"There must be room for things we
haven't even invented yet."
User process 2012 (Regionh, 2021-02)

VOLUME STUDY

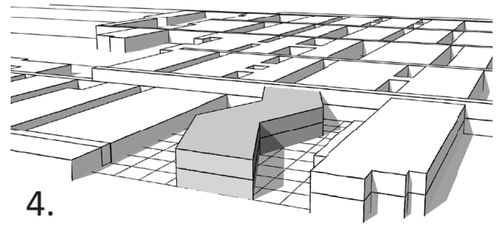
To explore how the new extension affects the existing hospital a volume study has been made. The buildings width is varied and based upon the existing structural grid system for the hospital, 7.2 times 7.2 meters, and creates varied sizes of the space in between the buildings.





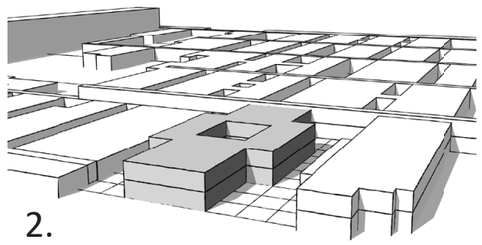
1.

Maximize the volume and just leave a gap of 7.2 m to the neighboring buildings. Result in overcrowding the space and insights from other buildings.



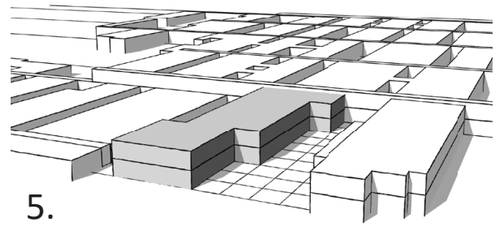
4.

Angles the volume to break up the long facades. Feels more dynamic and interesting on the site but is breaking the structural grid.



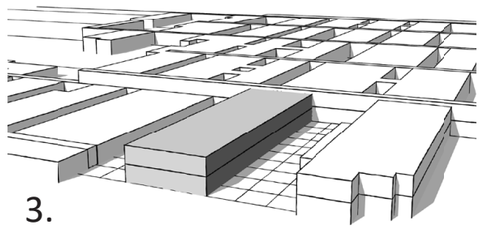
2.

Shrink the building in both ends and add a yard. It gets better but still some parts gets close to the neighboring ones.



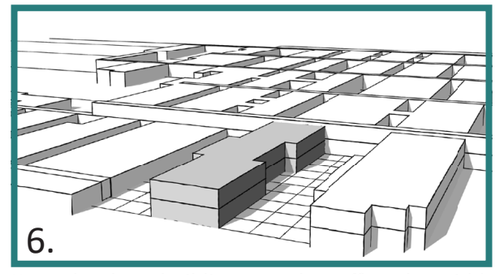
5.

Changing the volume to 90 degrees angles and test to gradient the facade in three steps. Gets a sunny welcoming yard but close to the neighboring building to the left.



3.

A slim volume with a gap of 7.2 times two and times 3 to the other buildings. The facade gets long and plain but the distance to other buildings is good.

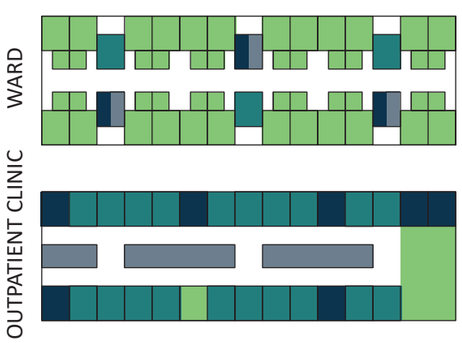


6.

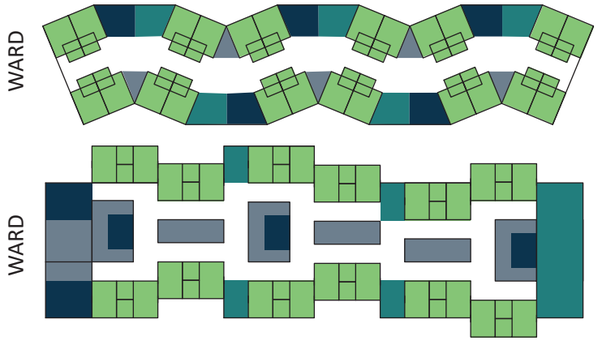
Keep the three building parts but offset the middle part a bit to get variation in the facades but keeping it in the center of the site. This is the volume I decided to continue to work with.

PLAN SKETCHES

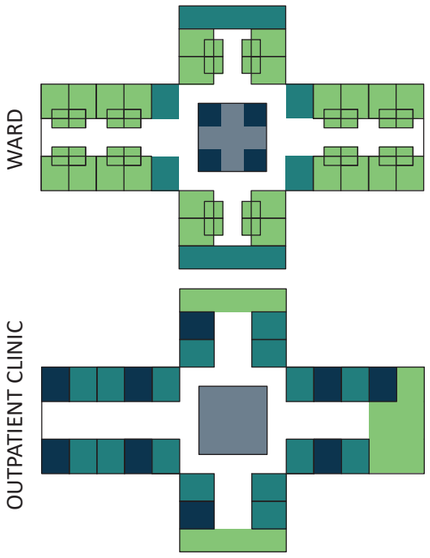
In parallel to the volume study the exploration of layouts for the plans of wards and outpatient clinic started.
I started to test layouts for wards and then I tried to switch them into outpatient clinics with as few changes as possible. After testing different placements of the bathrooms in the wards I conclude that the plan for an outpatient clinic would benefit from having them placed in between the patients' rooms. This makes the space and placement of the two bathrooms good for merging into an expedition when it becomes an outpatient clinic.



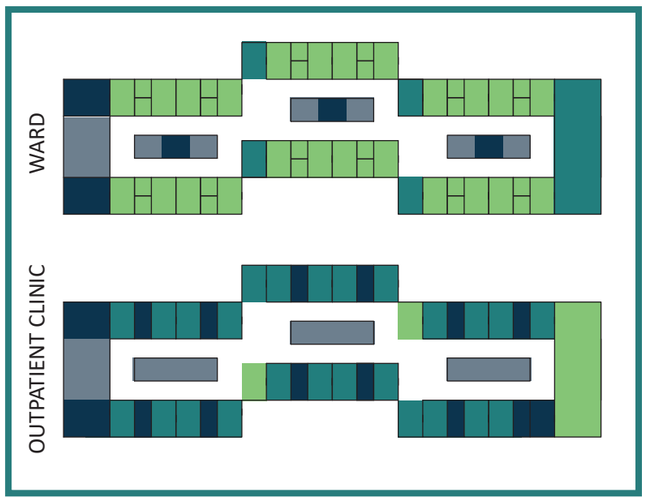
The line of bathrooms in the ward turns to a double corridor in the outpatient clinic and the corridor becomes a dark core of functions.



Try to break up the corridors in different ways. Result in a varied corridor but with some weird angels and it could feel messy to find your way. It also gets hard to find a repetitive system when many parts are special made.



Trying out a layout with wings to shorten the corridors but when testing the volume, it is hard to fit it on the narrow site.



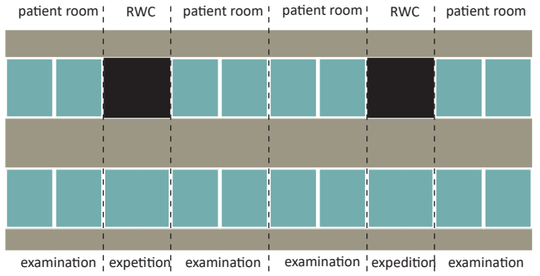
Ends up with a layout with broken corridors but in a more rational grid with a repetitive motive of rooms.

ward
outpatient clinic
patient room
waiting area
team station
expedition
day room
examination
supportive functions

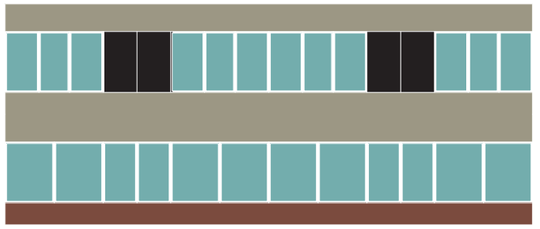
FACADE SKETCHES

After sketching volumes and plans I started to look at the expressions of the facades. I want them to connect to the existing facades but at the same time bring something new to the site. The existing facades are mostly made by bricks and metal sheets. Those materials I also want to integrate in the new extension's facades.

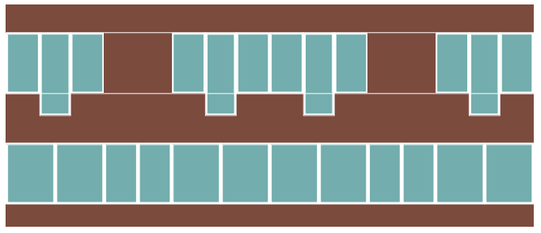
In the facade sketches I have assumed that there is a ward at the upper floor and an outpatient clinic on the entrance floor. To connect to the existing facade expression and to enable a flexible plan layout I have decided to go for a band of windows in some kind.



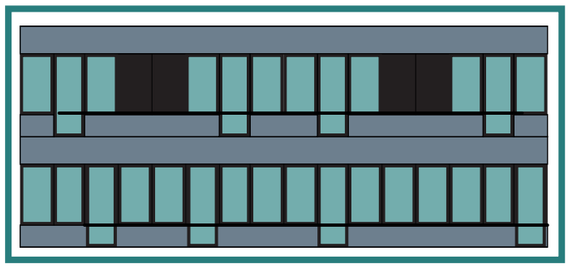
In this sketch I have explored how it would look like if there are two windows in each patient room/examination room and one window in the expeditions. The bathrooms have no windows, and a metal sheet is replacing their place in the band. Despites the metal sheets all the facade are in wood. The frames of the windows are white as in the existing facades.



This sketch explores how different materials can be mixed in the facade. Here the patients' rooms got a division of three windows and the metal sheet gets a division. The first floor with the outpatient clinic keeps a division of two windows in examination rooms and follows the metal sheet division in the expeditions with two windows. The facade is mainly of wood but have a plinth in red bricks.



To give the facade more life and variation a French balcony is put in each patient room. This gives the facade a rhythm. Here I have tried to have the whole facade in red bricks.



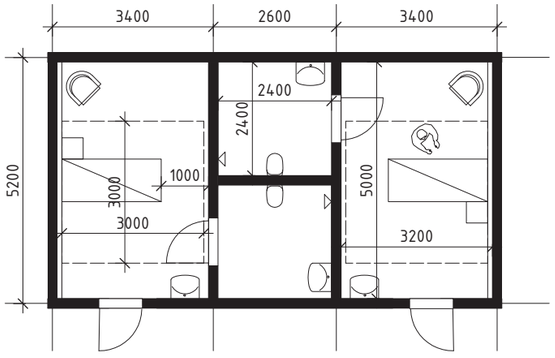
Metal sheets fills in when windows are not needed. Here there are window doors on the ground floor as well and the red bricks are replaced with a grey one. It could be hard to find the right red color on the bricks so that they match the existing facades. The grey brick facade would connect to the existing facade in materiality and the composition of windows. Here I have also tested to change color of the window frames to black which matches the metal sheet.
The design proposal is a development of this facade sketch.

wood
metal
red bricks
grey bricks

GRID STUDY

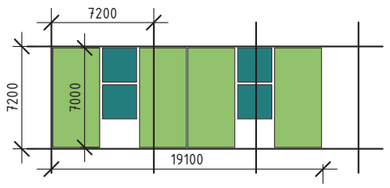
RULING DIMENSIONS

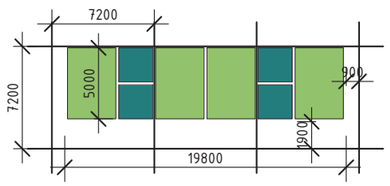
The ruling dimensions has been the needed measurements for bathroom and patient room in a ward. This since an examination room in an outpatient clinic could be smaller and then fit in either patient room. In the sketches I have used a 200 mm thick wall and the gridline is drawn in the middle of it. This means that the grid system should have space for a 100 mm wall at each side of the line.
The patient room should at least have a 3 times 3 meters care area (PTS Forum). To be able to pass with a wheelchair there must be at least 1 meter in front the beds short side (Bodin, Hidemark, Nyström, Stintzing). This result in a measurement of about 3.2 meters wide patient rooms. The measurements for the bathrooms rule the depth of the patient rooms since it has to be at least 2.4 times 2.4, which result in about 5 meter depth.



EXISTING GRID

The existing hospitals grid structure of 7.2 times 7.2 meters became the starting point for me when exploring different solutions for the loadbearing structure. The sketches is of half a ward unit, four patient rooms with one RWC each, that is supposed to be mirrored down with a dark core of functions in between.





patient room

bathroom

The result I got when using the 7.2-grid in these first sketches are of various quality.

If I did the patient rooms just the necessary width and did not match the walls to the horizontal grid the placement of loadbearing structure would be inconsequent and hard to foreseen. The shape of the patient room also got long and bigger than necessary.

When matching the walls to the horizontal grid and make it the necessary depth of the patient rooms also ended up bigger than necessary, with a good shape, and that could be useful in terms of some extra space if needed in the future. But the corridor becomes a bit too narrow, 1.9 meters.

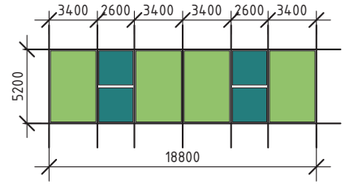
Another result of this grid is that the building gets too long on the site when fitting three of these units in a line with day rooms in between.
The reasons that the grid functions well in the existing hospital might be because of older standards and that they have multi-patient rooms with shared bathrooms that do not reach today's requirements of bathroom measurements.

NEW GRID

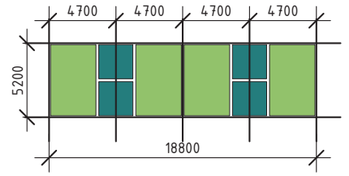
I decide to test another grid structure where the horizontal grid line is along the wall towards the corridor to enable a wider corridor. The measurements for the bathrooms rule the depth of the patient rooms and the width of the patient rooms is set to 3.2 meters to fulfill the measurements of care area and space to pass with a wheelchair in front the bed.

When I had these rooms placed out, I tried different placements of the grid lines.

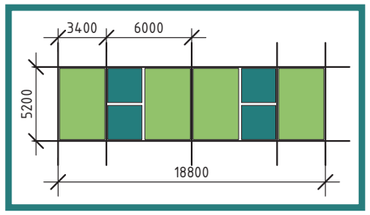
At first, I placed one grid line along each wall. This works but to be as flexible as possible it is better with a wider grid structure and less loadbearing structure to take into consideration.



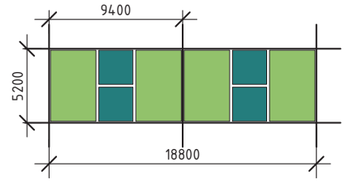
I then tested to place four grid lines with an equally measurement. This results in a pillar in the middle of the bathroom wall both towards the corridor and in the facade. This makes the shift to an outpatient clinic hard since a door and window placement to the expedition is not possible.



I adjust the grid lines to be along the walls again but skipped one grid line at each bathroom so that the grid lines varied between 3.4 meters and 6 meters. This span could allow for a wooden construction. I have decided to go for this principle in the design proposal.



Depending of the capacity of the loadbearing structure it might even be possible with a greater span.
It could maybe be possible to have a span over two patient rooms with bathrooms in between.



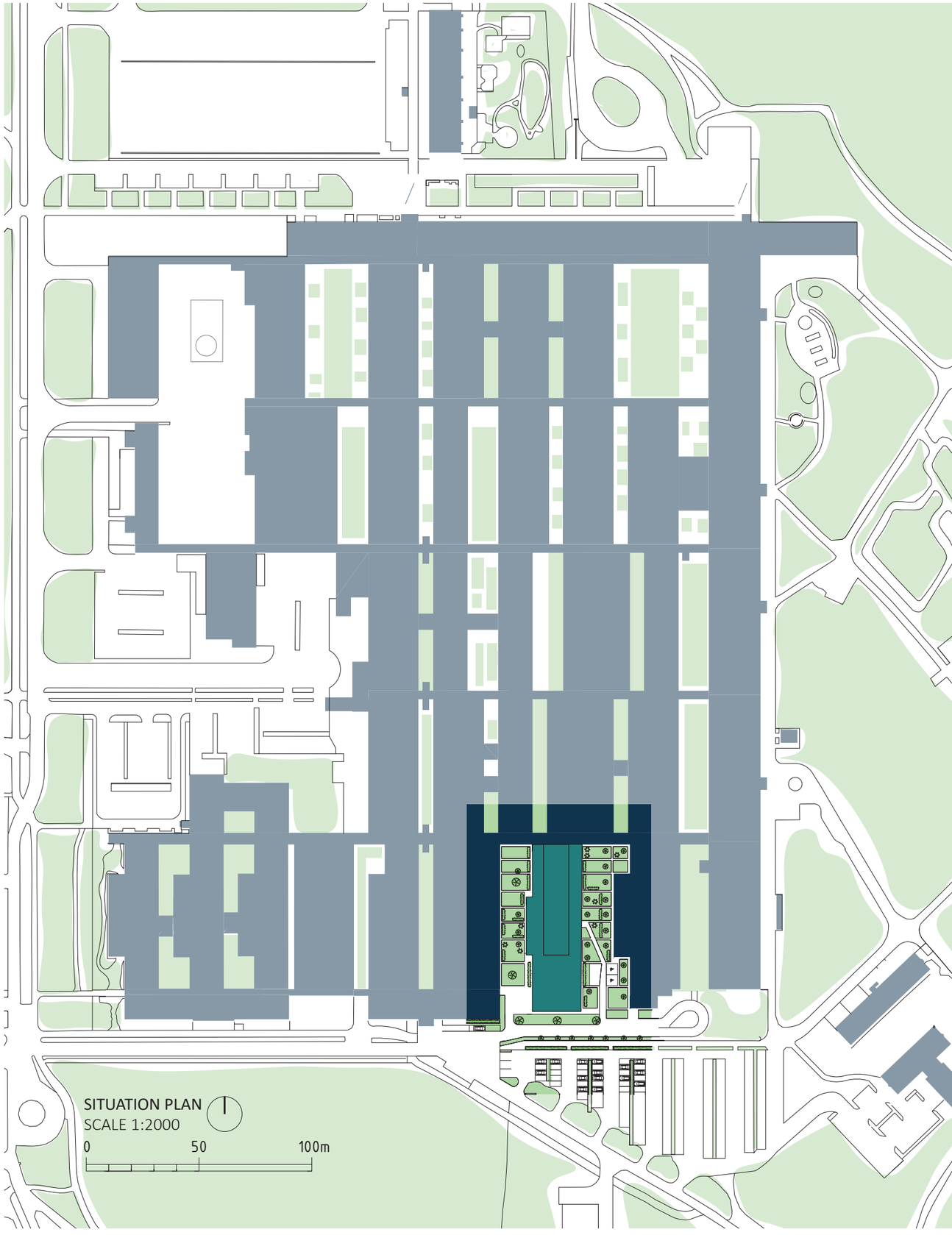
patient room

bathroom

07. Design Project

"It feels good to breathe in fresh air.
The sky is high and the horizon wide.
There is room for many things."
User process 2012 (Regionh, 2021-02)

Overview of the new extension and its relation to the existing hospital.



The view as you approach the hospital from west.

The view as you approach the hospital from east.

FILLS UP THE LAST PLOT

The new extension fills up the last plot of the hospital area. Its shape and materials correspond to the existing buildings expression in a new way.

A WELCOMING ENTRANCE

The entrance is surrounded by wooden details and are a warm greeting to the patients and visitors.
Before the entrance you walk through a green yard with places to sit and wait outside for your appointment or to rest a bit before heading home after the visit.

Close up of the entrance situation.

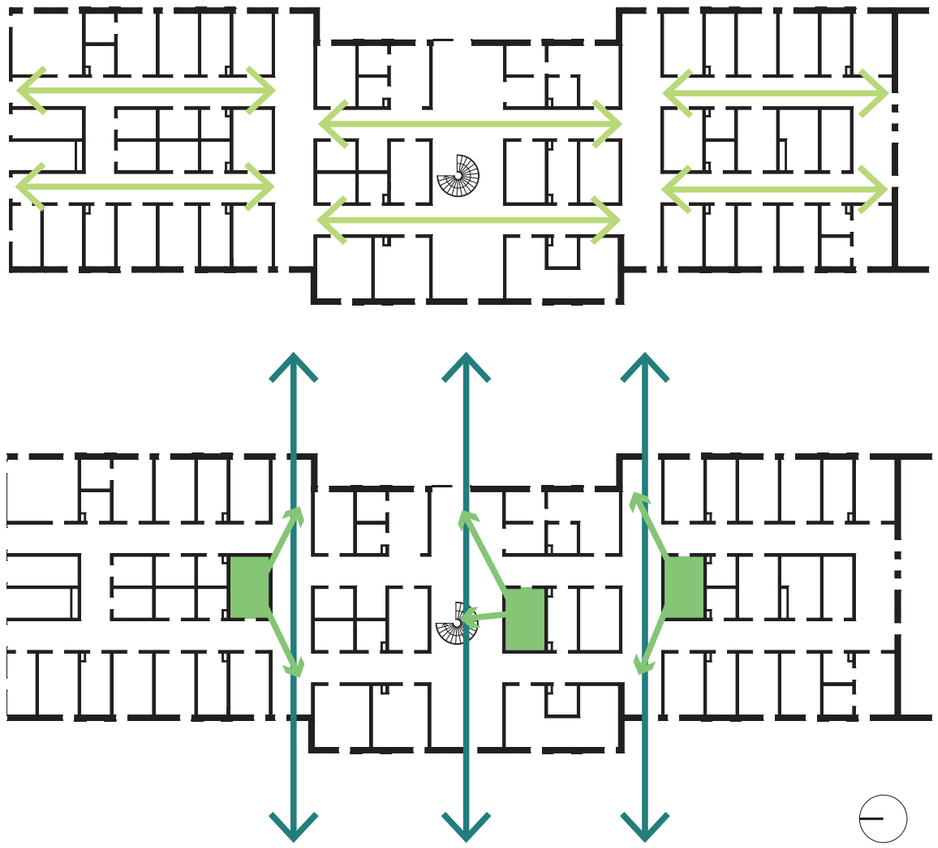
ARCHITECTURAL QUALITIES

BREAK UP THE CORRIDORS

The building is divided in three main parts and the middle one is offset to scale down the volume and break up the corridors. The corridors end up in the day rooms/waiting areas and is helping the patients and visitors to orientate. Different characters of the day rooms/waiting areas and different views outdoors helps to find the right way.

SIGHTLINES

The day rooms/waiting areas goes from facade to facade and is letting the day light flows through the building volume.
The teams' stations in a ward are placed to have an overview of the day rooms and the central staircase. This to be close by if something happens and to help visitors find their way to their relative.



DAY ROOMS & WAITING AREA

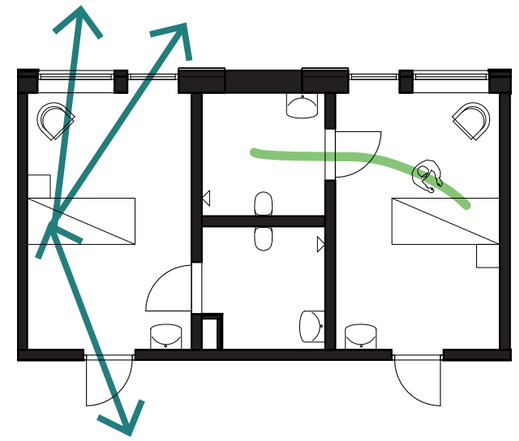
The day rooms and waiting areas are design for having a good sunlight condition and a connection to the outdoor environment. There are on the entrance floor possibilities of going outdoors to wait and rest in the green yard. On the second floor there are two balconies to go out and have some fresh air. And the roof top garden is also easy to access from the central staircase.

OUTDOOR SPACES

The aim of the outdoor spaces is to encourage the patients to spend time outside and feel the calm of nature. The nature helps towards recovery and if a patient is not able to go outdoors the nature could be viewed from inside.

PATIENT ROOMS

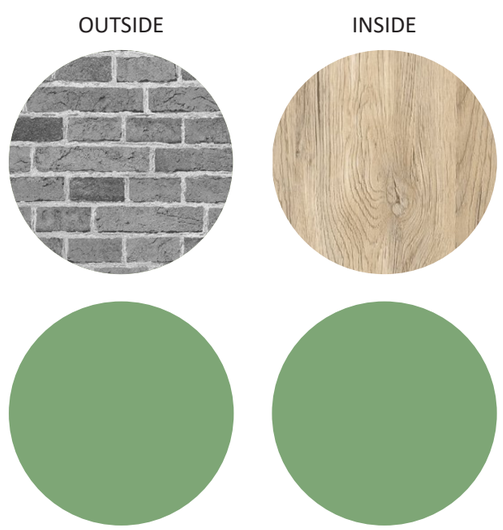
The patient rooms are design for having a good overview for both patients and staff. The patient can see the door from bed and see who comes and glimpse the life in the corridor through the glazed part of the door. The glazed part of the door also gives the staff possibility to have a glimpse of the patient when walking pass and to see the patient before stepping into the room. Two windows, one wide and one long, gives the patient a various view outdoors. The placement of the bathroom gives a short walking distance from bed to bathroom.



MATERIALS

The grey bricks in the facade are the most dominant material in the exterior together with the green yard. The wood is present in the exterior as details in the facade and as furnishing in the yard.

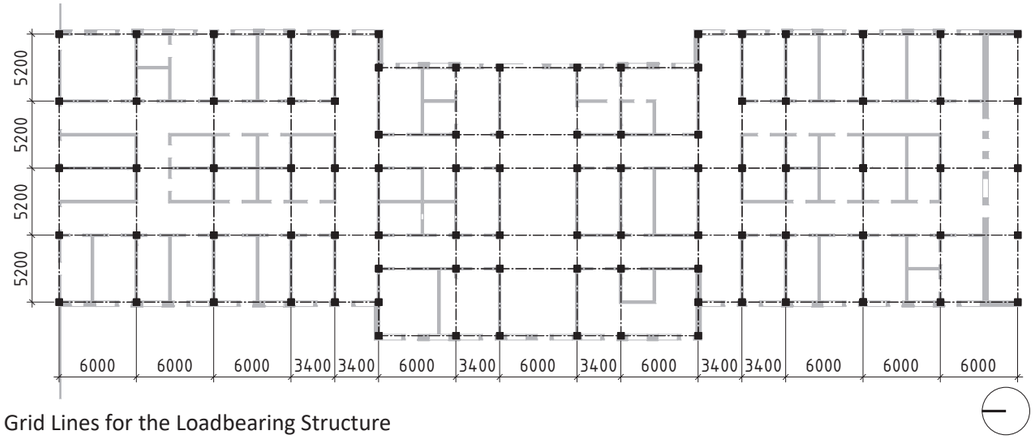
Inside the wood takes over the expression. The interior walls are made of CL wood and most surfaces have the wood finish visible. There is also a green wall along the central staircase to get greenery inside and attract to use the stairs and visit the roof terrace.



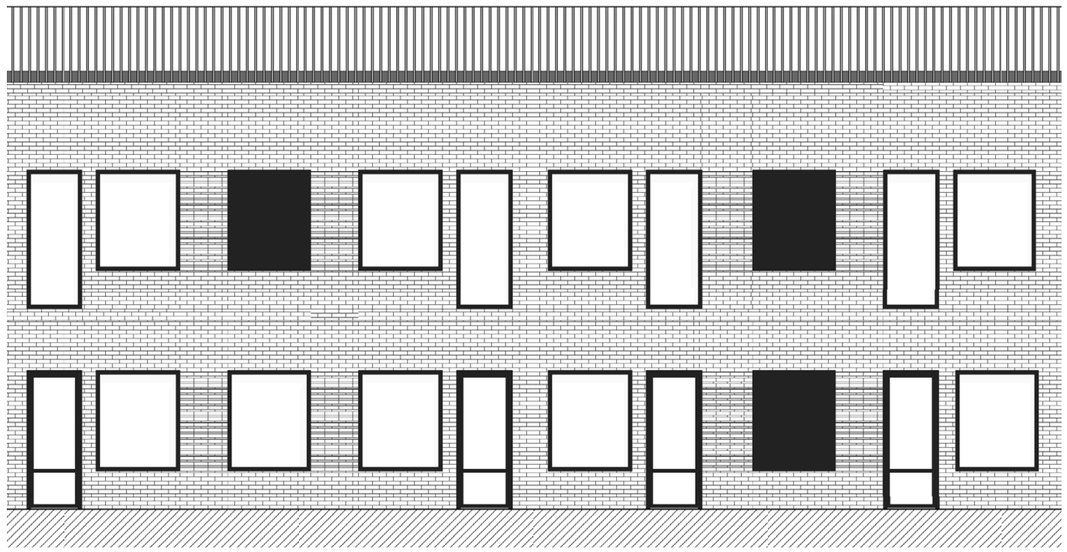
GENERALITY

PRIMARY LAYER

The loadbearing structure and facade are the primary layer of the building and will stand for about 50 to 100 years. To have a general approach in this layer have therefor been a goal in the proposed extension.
The loadbearing structure and windows are placed to suit both outpatient clinics and wards. In those cases, there are a bathroom or an interior wall towards the facade the window is replaced with a blind window of black metal sheet as a placeholder for a possible window in the future. This makes the shift to a room with or without window easier to implement without sacrificing the exterior expression.



Grid Lines for the Loadbearing Structure

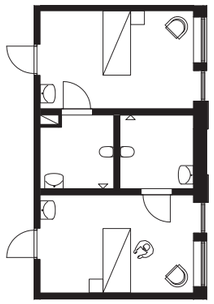

Close up on the Facade Structure.

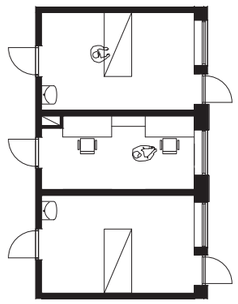
FLEXIBLITY

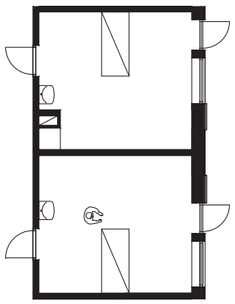
SECONDARY LAYER

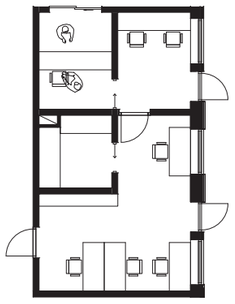
There are a lot of variations possible in the space plan. All depending of the need of the activity that should take place in the room it could adapt with as few changes as possible because of strategical placements of loadbearing structure, shafts, windows and bathroom equipment.

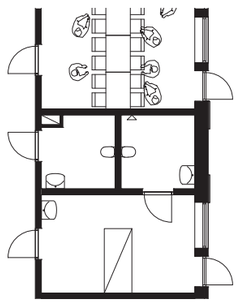
Here are some examples of how the same amount of space are used to different functions in the proposed extension:

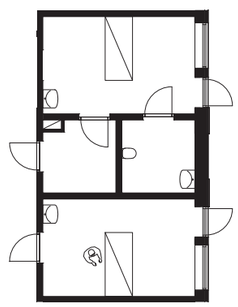

Two patient rooms with the bathrooms in between.

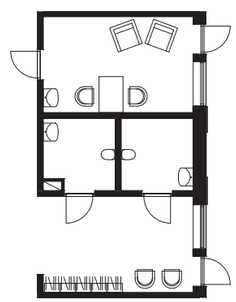

Two examination rooms with an expedition in between.

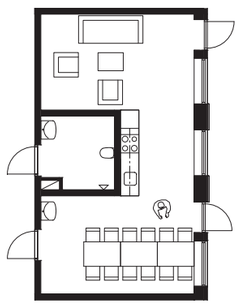

Two flexible rooms for examinations that are in need of more space for the equipment.


Reception, back office and administrative area with a post and copy room.


A bed waiting room and part of a conference room. The bathroom along the corridor serves the staff and those using the conference room.


One ordinary examination room and one for infection patients with direct connection outdoors, own bathroom and a sluice before the corridor.


A room for conversation and a hall with coat shelf and two RWC for the waiting area.


Staff area with kitchen, dining and resting. A bathroom along the corridor to serve the staff.

SCALE 1:200

REDUNDANCY

SECONDARY LAYER

Section C shows a close up of the installation space.

To allow for redundancy in the installation space have not been easy since the new extension is connecting to the existing hospital and its floor heights.
When having a ceiling height of 2.7 meter the free space above is 0.6 meter on the first floor and 1.08 meter on the second floor. At the second floor there are therefore greater possibilities of having more demanding activities. Since that floor connects to the existing hospitals main activity floor and are close to the operation clinic it could maybe be useful in case of expanding the operation clinic.

The shafts are placed along the loadbearing structure grid to not limit the possible space plans. One bigger shaft is placed behind the elevator in the north and another big shaft are placed in the core of the southern building part.

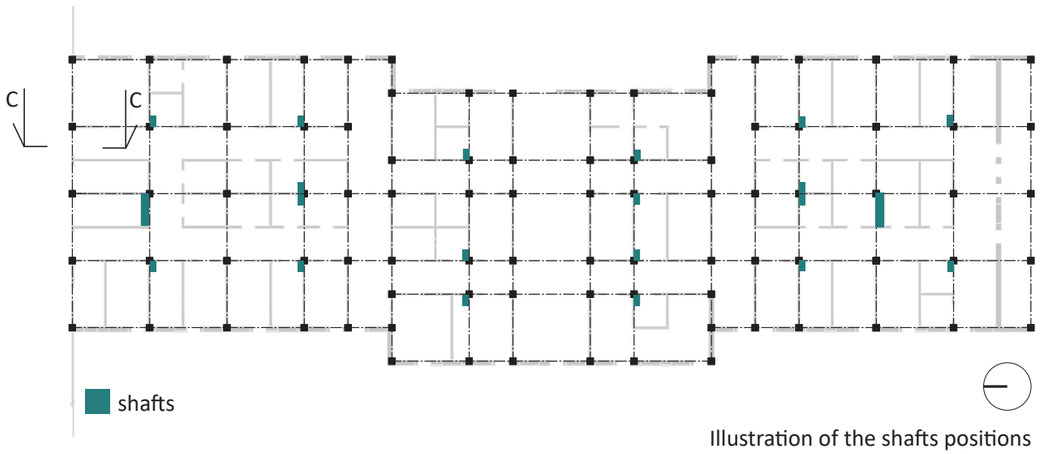
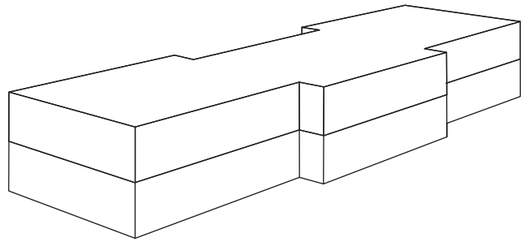


Illustration of the shafts positions

ELASTICITY

THE BUILDING VOLUME



TERITIARY LAYER

The division of units in a ward and different outpatient clinics are elastic and could be adapted to the need of the activity and how they prefer to work.

Since the building is planned for being able to have either a ward or an outpatient clinic at either of the floors there are many possible combinations of how to use the building.

The shared functions are gathered in the central building part to make the distance equal for everyone.

Either the whole floor is one outpatient clinic, or it is divided into two to four outpatient clinics with less need of rooms. If the floor is used for a ward one whole floor consists of 24 single patient rooms. In the proposal they are divided into three 8 patient units, but the space plan enable to divide into 6 patient units, then they could work back to back from the two team stations in the left and right building part and use the middle one during nights.

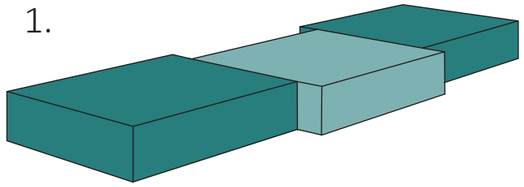
The illustrations shows, how one floor could be divided and the building consists of two floors with any of these alternative. In the proposal the alternative 1 are on the second floor and the alternative 4 are on the entrance floor.

WARD UNITS

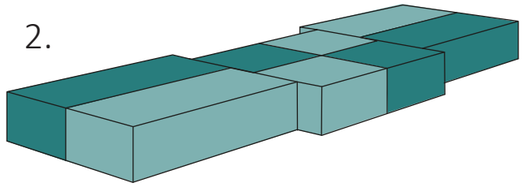
OUTPATIENT CLINICS

ALTERNATIVE DIVISIONS OF A FLOOR

1.



2.



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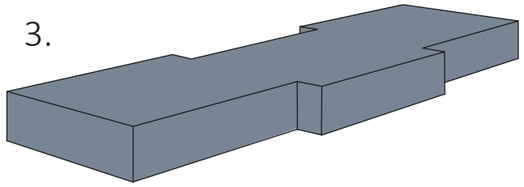

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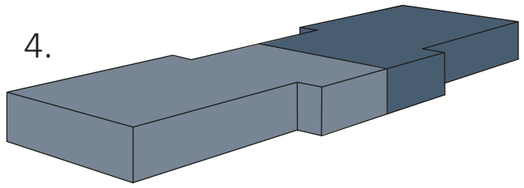
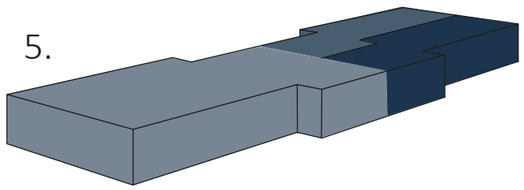
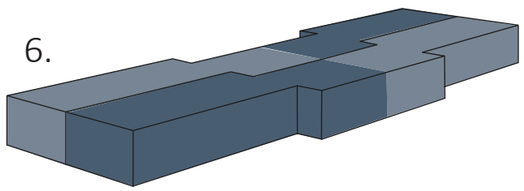


5.



6.



1. Examination room
2. Expedition
3. Treatment
4. Flexible room
5. Room for conversation
6a. Disinfection, clean
6b. Disinfection, dirty
7. Sample room
8. RWC with connection to sample room and disinfection

9a. Waiting area
9b. Bed waiting area
9c. Infection waiting area
10. Reception
11. Back office
12. Administration
13. Staff area
14a. Storage
14b. Medicine storage
14c. Cleaning storage

15. Conference room
16. Technical room
17. Unpacking room
18. Laundry
19. Resting
20. Rehab/Training
21. Bicycle parking

OUTPATIENT CLINIC

ENTRANCE FLOOR

The outpatient clinics where the patients come for a visit over the day are primarily placed in the entrance floor where they are easy to access from the southern parking lot.

The thoughts I have had when designing it is to make it possible to either have one clinic or divide it into two clinics or even up to 4 smaller ones. The entrance and main waiting area are therefore placed in a central position together with supportive functions like reception, sample room, staff area, disinfection and administration.

From the waiting area you have a close connection to the central staircase and an elevator which enable the waiting area also to serve the second floor if there are a clinic there as well.

WARD

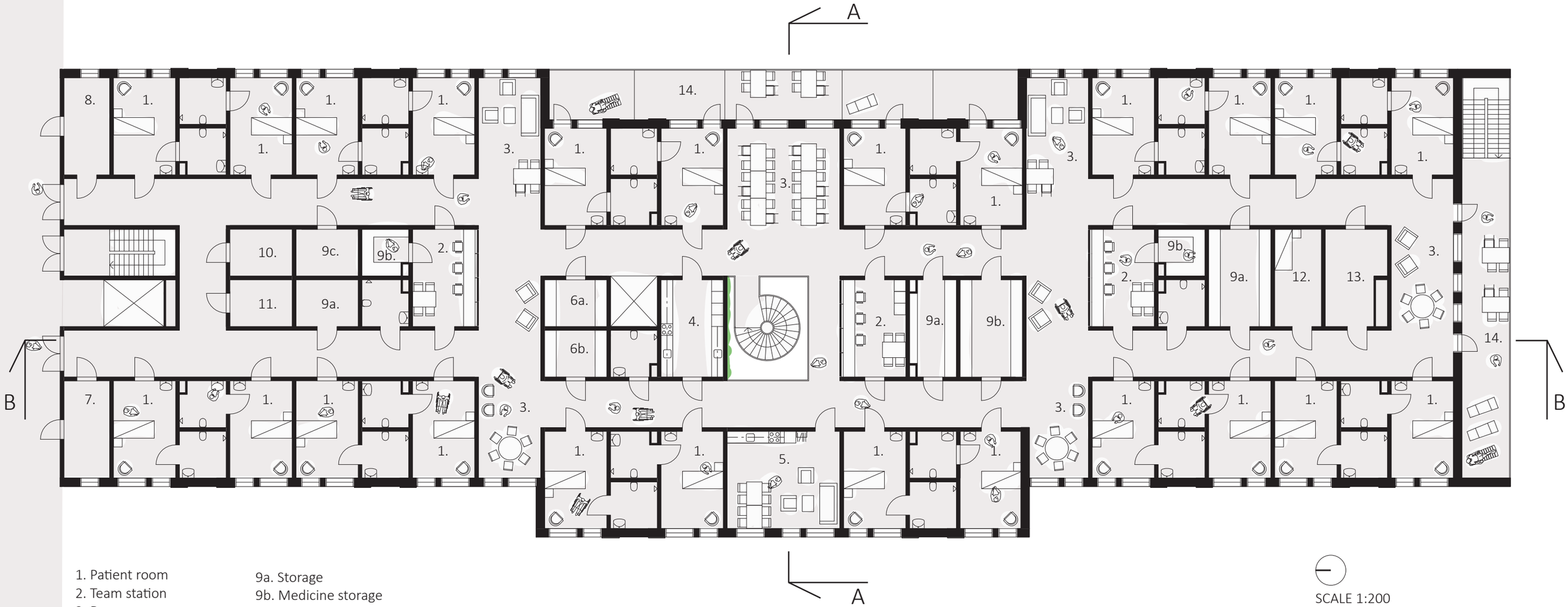
SECOND FLOOR

To give the patient rooms in the wards more privacy and calmer surroundings they primarily are placed at the second floor.

The plan solution enables different divisions of the units, either 6 patients each or 8. In the presented plan there are 3 units with 8 patients each.

The teams' stations for each unit are placed with an overview over the day rooms and central staircase to be able to see who is coming and to be close by if something happen. During nights when only a few staff have responsibility of the whole ward they use the middle team station as a base. Then they have equal distances to the rooms in both directions and if there are a ward at the entrance floor as well they also got easy access to the central staircase and could see who is coming.

The day rooms have a great amount of daylight and are design to attract the patients to spend time there to help towards recovery.



1. Patient room
2. Team station
3. Day room
4. Kitchen
5. Staff area
6a. Disinfection, clean
6b. Disinfection, dirty
7. Laundry
8. Recycling

9a. Storage
9b. Medicine storage
9c. Cleaning storage
10. Technical room
11. Unpacking room
12. Resting
13. Rehab/Training
14. Balcony

SCALE 1:200

0 10m

SECOND FLOOR

ROOFTOP GARDEN

The rooftop is possible to reach either from the central staircase or from the outdoor staircase towards south.

Here you find a green garden with places to sit and in the building, there are a café with serving area inside, in a winter garden and outside to make it possible to adapt for the weather and season. Perfect for having a "fika" before or after your appointment or for patients on their way to recovery to meet their relatives in a more homelike environment.

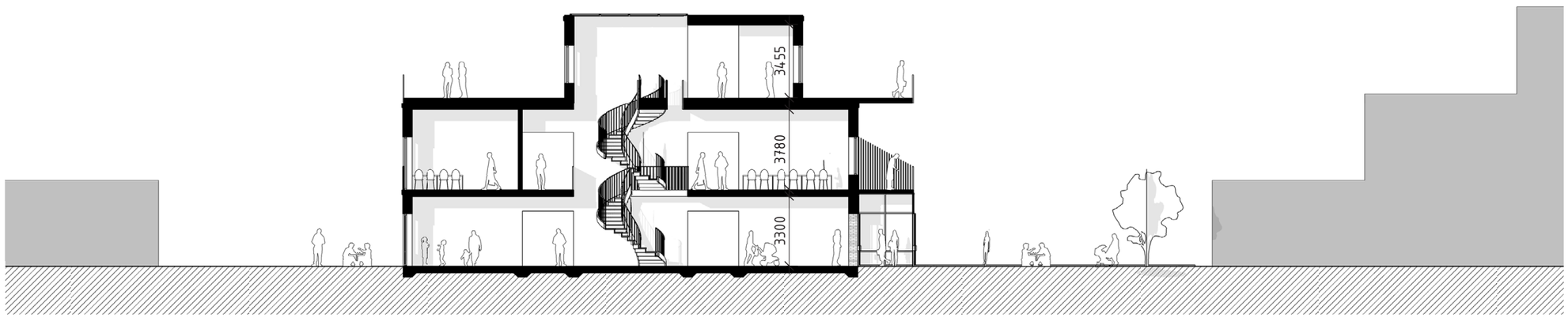
1. Café
2a. Serving area, indoors
2b. Serving area, winter garden
2c. Serving area, outdoors
3. Rooftop garden
4. Kitchen
5. Staff area
6. Changing room
7. Kitchen garden
8. Technical space

SCALE 1:200

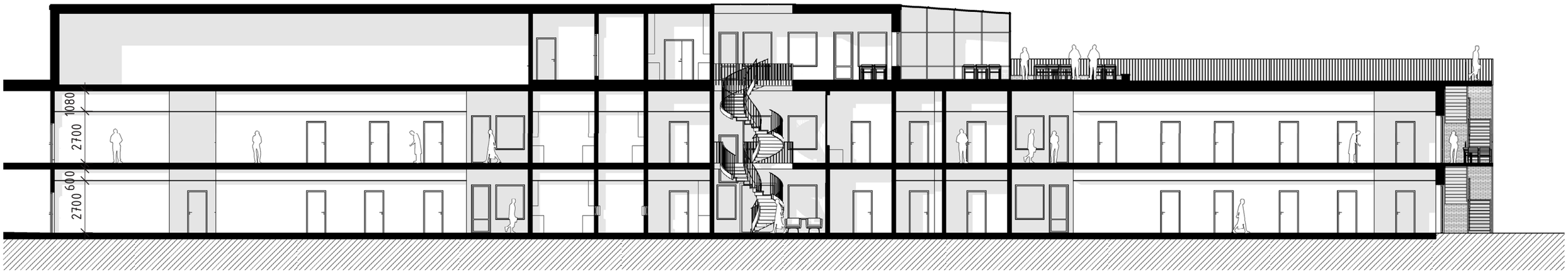
0 10m

TOP FLOOR

SECTIONS



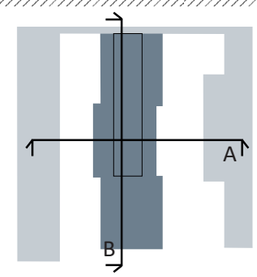
SECTION A



SECTION B

HEIGHTS

The new extensioncorresponds to the neighboring building to the east its shape. The floor level is matching the existing hospital to make the border between the new extension and existing hospital invisible.



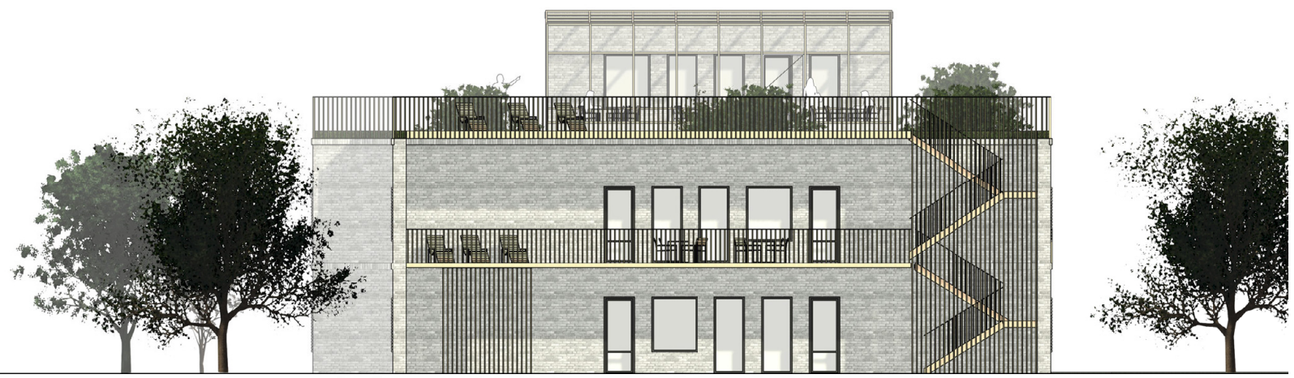
SCALE 1:200

0 10m

FACADES

EAST

WEST



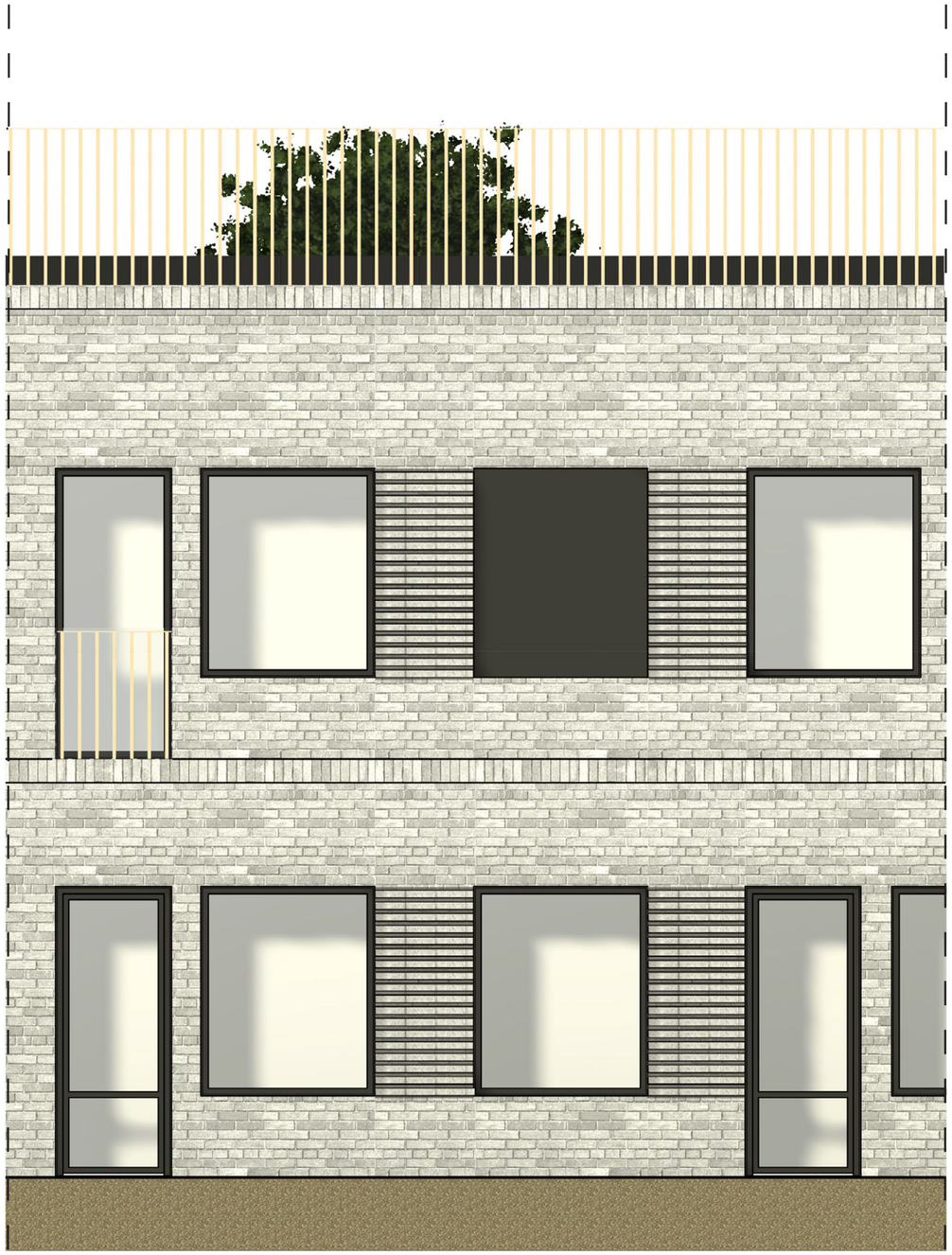
SOUTH

FACADES

The main facade material is bricks and connects to the existing hospitals brick facade in materiality. A grey color palette is used which goes well together with the light wooden details in railings that after some time outside will turn grey and melt into the bricks. The composition of windows is connecting to the neighboring buildings. The black metal is related to the facade of the neighboring building in the north that have a black corrugated metal facade.

SCALE 1:200

0 10m



FACADE DETAIL

SCALE 1:50

0 1m

FACADES

Here are a close ups of the shifting grey bricks together with the dark aluminum frames on windows and doors and the wooden railings.

The bricks got some details like a board that goes along the facade between the floors and as a finish of the wall. There is also some detailing between the windows of the bathroom/expedition and the window/door next to it. This details creates a shadowing effect on the facade and makes it feel alive.

FUTURE

What activity the building will contain after the use as an evacuation building for wards and outpatient clinics during the renovation is unknown.

There are a few speculations that have been up for discussion during our interviews with Olsson (personal communication, Octobre 29, 2020), Arias and Revellé(personal communication, February 17, 2021). One is that the psychiatry clinic at Hallands sjukhus Varberg has grown lately and since this new extension is near the other psychiatry clinics they might expand in this building. Another case could be that the extension becomes an administration building since they today are using some space originally planned for wards. There are also possible that something totally different happen with the new extension.

PSYCHIATRY

To adapt the building for a psychiatry clinic from an outpatient clinic will not demand much. The room configuration is the same but there is less need of technical installations in a psychiatry clinic and more important to think of the security for staff and patients. As in a ward and outpatient clinic the patients, relatives and staff will feel better in a calm environment with connections to the nature outside.

ADMINISTRATION

To adapt the building for administration space will mostly require changes in the space plan. It is not an activity that demand more of the technical installations than already existing from the wards and outpatient clinics.
Places for discussions, quiet rooms for phone calls, calm office spaces that could be arranged in both open landscape solutions and smaller rooms will be needed. The spaces need to support the activities taking place in them. It is important with good daylight condition in the office space and the activities taking place in the darker core should be short term.

UNKNOWN FUTURE

What if Region Halland decides to put their effort in one of the other hospitals in the Region, Halmstad or Kungsbacka, or build a new one? Then Hallands sjukhus Varberg might be discontinued partly or totally. The new extension and other parts of the hospitals maybe could be transformed to residentials or education facilities. Parts of the hospital might still be used for a Health Center with some specialties and the rest of the buildings is then maybe used for education and student apartments. It could become a new campus area for health studies.

08. Conclusion

DISCUSSION & REFLECTION

COMPLEXITY

What I have learned during the work with this thesis are a lot.

To begin with, to plan an addition to a hospital was way much harder than I imagine before I started this work. There are lots of factors to take into consideration and in a real project many experts in different fields are involved to get all things as good as possible. I hope that I with my suggested design proposal could add some new thought into the field of healthcare architecture since I do not have all regulations in mind and might get a little freer base for my decisions. With that said I understand that my proposal has unresolved parts that I might not even know of.

To plan for the future often result in a higher cost and a bit larger rooms. But this is often not a bad thing for the people using the building today and in the future since it gives room for things that the planners of the project do not know. Because of the situation we are in now, in the middle of a pandemic, I have not been able to reach out to the people working in the hospital. The knowledge of the actual users would have been valuable for me since I myself just got minor experience of hospital visits. I believe though that even when you have the possibility of talking to the actual users there will be a difference in how different people and teams prefer to work. And you still got to consider the unknown future in the decisions you take.

To prepare for that unknown future are hard since the budget often is slimmed and with the aim of getting the building as cheap as possible but still got all qualities asked for. This is where the argument for future proofing comes in. Especially in buildings own by the municipality, region and state where they have a long-time span of ownership of the building in front. To build a building that gets out of date when it is finished would be a waste of tax money. To future proof I therefore see as an obligation to the people.

RESEARCH QUESTION

How can you design hospital buildings for changing needs over time and an unknown future?

During this thesis I have deepened my knowledge of future proofing approaches and how they can be used in healthcare architecture. The projects I have investigated and heard lectures about have made me even more curious of learning more in the field. I have gotten the expression that Swedish researchers and architects have gotten far in the field. That there are a common interest of creating healthcare architecture that stands for a long time and support the staff in their work and the patients in their way to recovery.

How have I then solved the design proposal with the theory as a base and connected it to the site of Hallands Sjukhus Varberg? And will this proposal be possible to use in the unknown future and adapt for changing needs?

I believe that my proposed plans would work for the asked activities of wards and outpatient clinics. If there are needs for changing between outpatient clinics and wards, I think it is possible to do with some few changes. This because of the used strategies of future proofing, having a general structure, flexible space plan, redundant installation space and elastic organization of rooms.

As discussed in the thesis the bathrooms are the most tricky part that differs between the two. Bathrooms are also among the most costly rooms to build. With this in mind I do not believe that you build wards and have a plan to remove the most bathrooms soon to make it into an outpatient clinic. But the opposite way I think is much more realistic. To prepare for the bathrooms in the expeditions in an outpatient clinic and then after some years make it into a ward. Or maybe when it's time for the bathrooms to be renovated you could have a second thought of if you should change it into an outpatient clinic instead of renovating the bathrooms.

CHALLANGING SITE

The site for the design proposal has in addition to the future proofing approach also been a challenge. Not just for its narrow shape but also because it is a hospital with a homogeneous visual expression and the same kind of materials and structure used all around the hospital area. To break from this and at the same time respect and connect to the existing hospital has been and is a great challenge.

Since the site is in an existing hospital area the new extension should dock into the existing structure. This has framed the section to adapt for the existing heights of the floors. On the second floor this has been no issues for the future proofing approach since it there are space for a ceiling height of 2.7 meters and installation space of about 1 meter. On the entrance floor the height is a bit more narrowed than you would prefer and there are only about 0.6 meter installation space. This makes the two floors in the new extension a bit various future proofed. But since the second floor are close to the operation clinic the need of more technical space might be good to have in a building close by. The second floor might suit an IVA-ward? I have not dig deeper into measurements of a patient room for an IVA-patient, since the focus have been of low-intensive care, so the patient rooms in my proposal might be a bit small for that. But if I would go one round more with the project that would be a future scenario to investigate.

PLAN THE ORDER

In total there are 7 outpatient clinics and 10 wards that need renovation and some of them will move into the new extension temporary. It is not necessary for all outpatient clinics and wards to move to the new extension. Once one outpatient clinic and/or ward is renovated the next one could move into that renovated part to make the moves as few as possible (Olsson, personal communication, February 22, 2021).

The order in which the different outpatient clinics and wards moves into the new extension of the hospital is of importance to plan carefully. This to make as few, timely- and cost-effective changes as possible. Outpatient clinics with as similar requirements as possible are preferred to move in after each other. If I would work further with this project the timeline would be interesting to investigate.

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PERSONAL CONTACT

All the interviews is conducted together with student Sandra Kärnstrand that is doing the same kind of Master Thesis. We have together prepared questions for the interviews and taking turns to ask questions and take notes during the interviews.

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Semi-structured interview over Zoom.
2021-02-09:
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Semi-structured interview over Skype.
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ILLUSTRATIONS & PHOTOS

All illustrations and pictures are made/taken by the author if no source is mention.