



# UNITED ISOLATION

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Healthcare Studio ARK263 | Chalmers 2017

# TASK

- Merge four primary care units into one healthcare center in Örebro.



## UNITE

functions & people



***"Antibiotic resistance is one of the biggest threats to global health..."***

World Health Organization, October 2017

The task, to merge four different units into one, tells us to unite functions and staff. However, our own set condition, to design with the a post antibiotic era in mind, tells us to isolate functions and people to prevent the spread of disease. This contradiction has been the leading star in our project.

# UNITED ISOLATION

Thus, the overall concept for this proposal is United Isolation, and derives from our interpretation of what the project should be about. The healthcare center that Örebro municipality is requesting is estimated to have some 50 000 patients listed, and will therefore be unprecedented in Sweden today.

However, a worrying development can be seen at the horizon: bacterial resistance to antibiotics. Calculations from 2015 has estimated that 25 000 people a year die in Europe in infections caused by multiresistant bacteria, to a cost of 1,5 billion euros. In 2010 a new infection clinic in Malmö was opened. A round shaped building, drawn by architects CF Möller, with the goal of being able to deal with the post antibiotic era and therefore be the last frontier between society and severe infectious diseases. This project now takes on the challenge to see what the post antibiotic era might mean to a primary care unit of tomorrow.

# CONDITION

- Design a primary care unit with a possible post antibiotic era in mind



## ISOLATE

functions & people



# STRATEGY

1

## SEPARATED FLOWS

- Preventing the spread of contagious diseases
- Possibility to isolate different parts of the building

Preventing the spread of disease is a huge task on many levels. To be rational, this project's main focus narrows down to good ventilation and separated flows. This means keeping patients, staff and logistic flows separated throughout the building.

In the post antibiotic era containing diseases through medication will be more challenging. Thus, each unit should be able to be sealed off horizontally, as well as vertically and still work as a functional unit on its own.

2

## WAYFINDING

- Central atrium with visible differences and entrances to examination rooms
- Sightlines and views

When it comes to separated flows there is a potential risk of confusing plan layouts. Combined with this being a public primary care unit that all people should be able to visit, wayfinding has been the second focus point of this project.

Therefore, the idea is that the patients enter the building from a central courtyard. Colored facades facilitate easy navigation to the right examination room. On the other hand, the staff can orient themselves by views and sightlines in the building.

3

## GENERALITY

- General building structure, plans, units and rooms
- Possible future adaptation

The third focus point is generality. A general building structure enables freedom to rearrange walls according to the needs.

The plans' generality creates the possibility for staff to work on each floor depending on the space available to encourage exchange of knowledge and cooperation between the units.

A general plan layout is not only a way to future proof the building, but it also improves the orientation, as each unit works the same way.

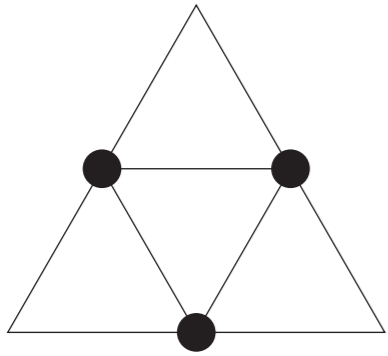
Even after selecting the condition the task proved to be complex with potentially infinite solutions. To ensure the project is focused, three strategy elements for post antibiotic design are chosen.

The separated flows, as the most important condition of designing in the post antibiotic era, takes precedence over the rest of the strategies.

The issue of wayfinding inside the building is selected for its interesting interplay with the concept of isolation, as well as its health promoting aspects of patient empowerment.

And thirdly, as the form of the building grows more and more complex, it needs a logical, general structure to keep it realistic, easily adaptable and ensure an understandable environment for future users.

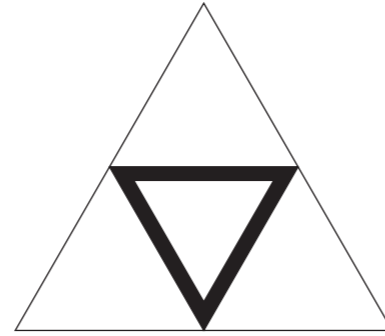
# CONCEPT



Connecting points

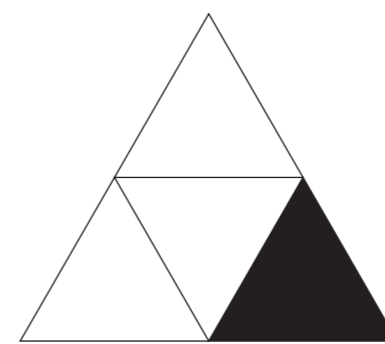
How could United Isolation be turned into physical form?

A triangular shape has the ability to divide bigger shapes into units that still are connected to each other through its nodes. It appears that the triangular shape simply brings the possibility to unite the different primary care units, still being able to isolate them if necessary.



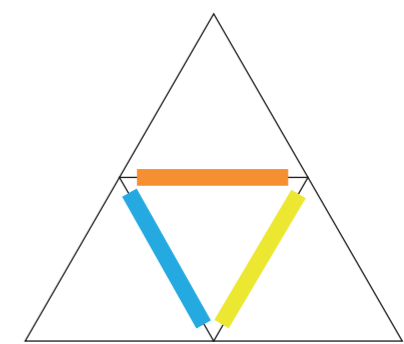
Separate patient & staff

The triangle in the middle becomes the courtyard in the building and the obvious starting point for the patient flow. From here the patients are given access to all different types of care by moving around in the open galleries surrounding the courtyard. The staff on the other hand only moves indoors. The meeting between patients and staff only takes place in the examination rooms.



Possibility to seal off

As the name United Isolation implies: each unit should be able to be sealed off horizontally as well as vertically.



Colors for wayfinding

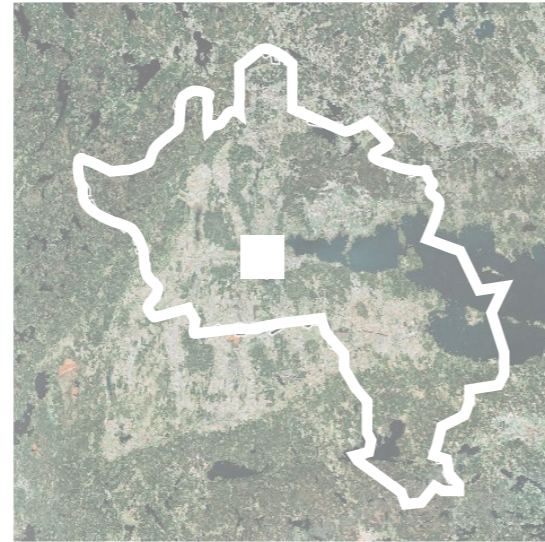
The three sides of the courtyard have different colors to facilitate navigation for patients visiting the healthcare center.



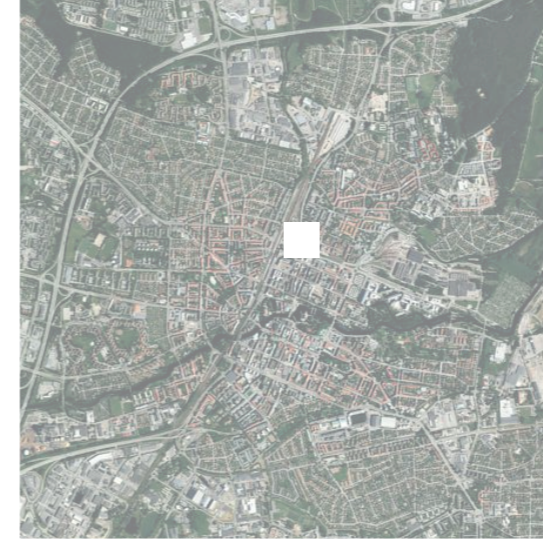
# CONTEXT



Location in Sweden



Location in Örebro län



Location in Örebro city



The site



Building heights



Future buildings:  
 1 Örebro entré  
 2 Post terminal  
 3 Landmark building



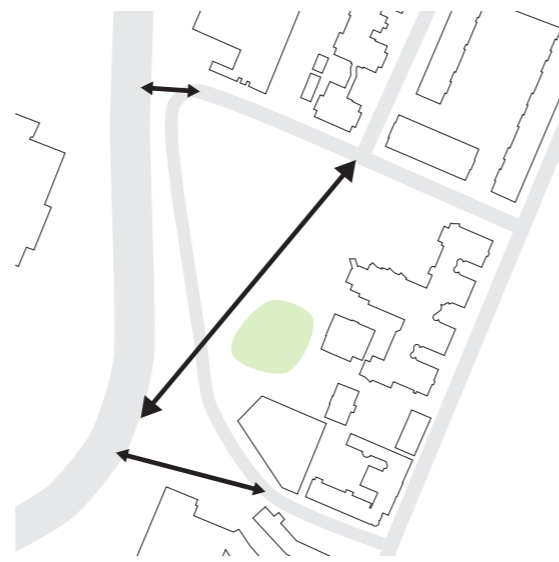
Material in the area:  
 plaster, metal, brick

Örebro is the sixth biggest city in Sweden. The municipality has 149 000 inhabitants. The site is located north of the city center: 400 meter from the central train station and 1000 meter from Stortorget. The site is surrounded by mostly residential areas including a retirement home, but also some municipality departments and a car seller. In the future development of the area, Östra Bangatan will be transformed into an urban street.

# SITE + CONCEPT



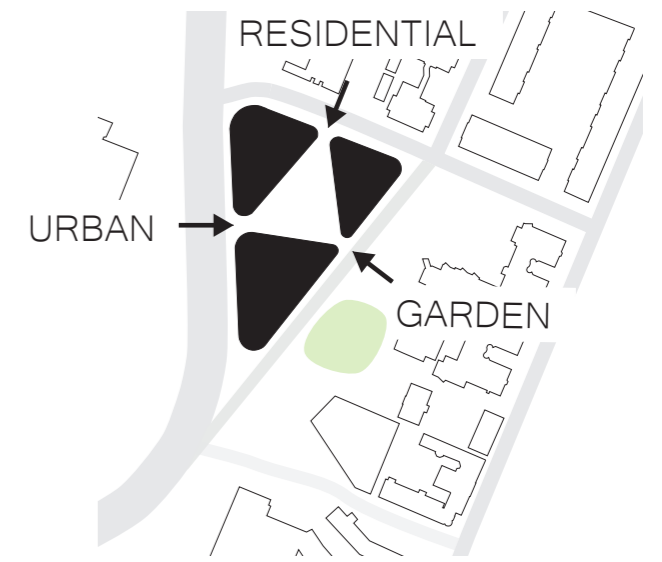
1. Two existing buildings are removed.



2. New connections to preserve the garden and access the urban street are made.



3. Concept is applied to the site. Rounded corners create inviting facades.



4. Three different types of entrances to the building can be found.



5. The three triangles connect on the upper levels.



6. The patient zone is located around the courtyard on all levels.



7. The roofs on the garden side have green terraces.



# SITE PLAN

1:1000



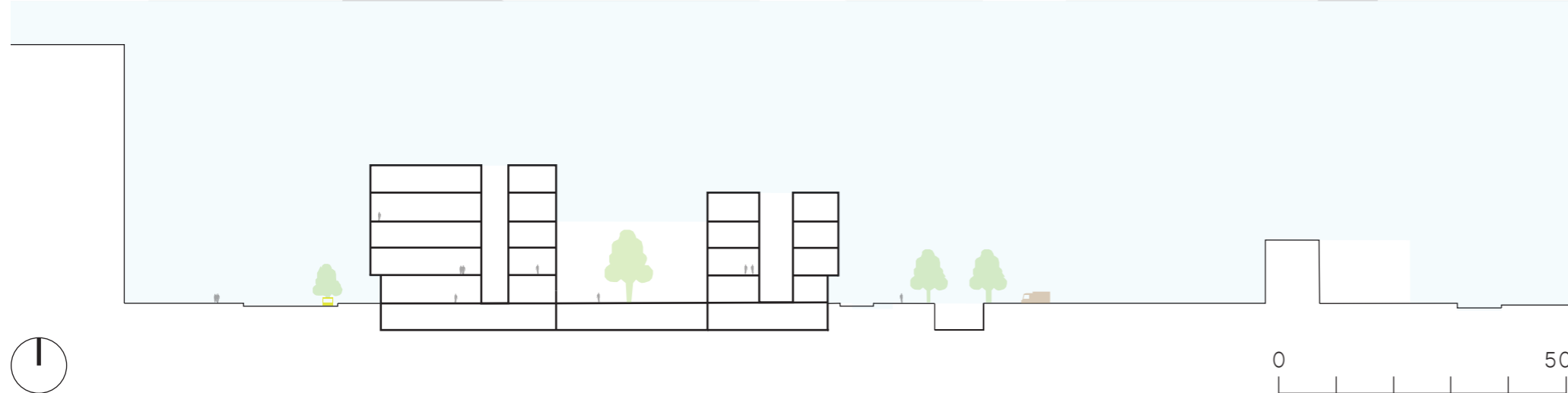
The context is the northern part of central Örebro. An area that during the upcoming years will be highly developed through the reconstruction of Östra Bangatan into a more urban street and some new buildings called “Örebro entré”. A new landmark for the area is also being planned south west of the site and a new post terminal close to Örebro entré. With these ideas realized the site will become a well-visited area and the context will be versatile with a lot of different buildings, functions and typologies.

A site analysis today also shows a complex location in between a bigger street, residential areas and with a private garden to the east.

With the idea from Örebro municipality of expanding the city’s center in the site’s direction, the project is being shaped by possible future connections to different streets.

By expanding the site to the west, the building plays a part in defining the new urban street. With these connections made the site left is a triangular shape that the concept then is adapted to.

This adaptation skews the shape and helps to bring character to the building, which is oriented towards the sun. The highest unit is placed in the north, to let the courtyard become lit.



# FUNCTIONAL PROGRAM

## PATIENT FLOW

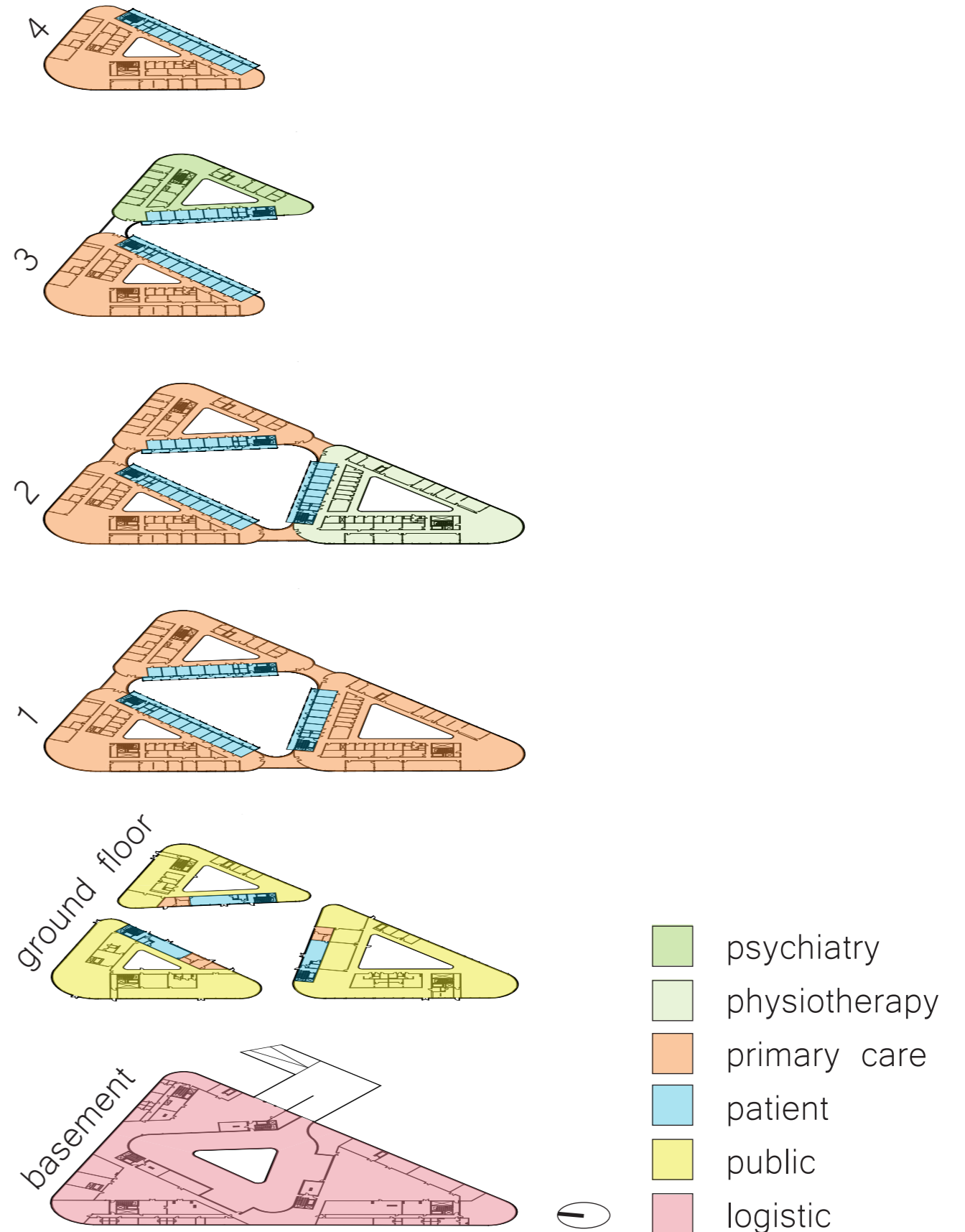
The patient is always the weakest part, in a healthcare situation, compared to the staff as well as the entire care apparatus. We have therefore through wayfinding tried to empower the patients by enhancing their autonomy. Through a defined entrance in the facade the patient reaches the courtyard and sees the self-check in desk. This desk is situated outside for good ventilation although under a roof for weather protection. Here the patient can log in to the system, and in the future perhaps upload or unlock their digital journal, and find out where he or she should go from there. A digital system distributes the patients to different waiting areas for a 66% lower risk at being infected compared to gather all patients in one waiting room. If the patient wants to meet a receptionist or if they need to be triaged the patient goes to the reception in one of the three waiting areas.

When it is time for the patient to see a healthcare professional the patient is contacted through the mobile phone or a borrowed pager telling the patient where to go. For instance: orange 15. This means orange stairwell to orange building and room number 15. The patient enters the stairwell and then moves in the open gallery to the right room. When done, the patient leaves the same way without the need to reenter the waiting area.

## STAFF FLOW

The staff starts their day by entering the building on the ground floor and going down to the changing rooms located in the basement. From here they will go up to the ward. Trying to health promote, the stairs will bring you up to a better spot than the elevator. From here you can leave your lunchbox in the nearby staff room and take your laptop and sit down in the open office before meeting the patient, if you're a health professional.

Inside the examination room the staff can then call for the patient that is sitting in the waiting area down stairs. The visit ends with the staff making an addition in the patient's journal with the patient present. The staff may now leave to throw away contaminated material into the disinfection room, and perhaps another staff member then comes in to take blood tests on the patient. The patient never visits more than one room and after leaving the blood tests are brought to the pneumatic dispatch for transport to the laboratory in the building. From here the examination room can potentially be used by someone else and the staff can go to a meeting room to talk to other members of a patient centered team or perhaps continue to work with documentation on its own. Or perhaps more likely, the staff calls up a new patient.



# GROUND LEVEL

1:400

- healthcare center
- pharmacy
- shop
- insurance office
- gym



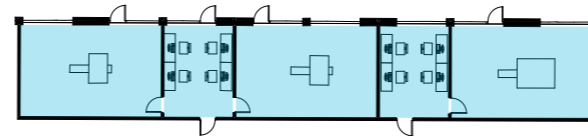
Ribbingsgatan

Östra Bangatan

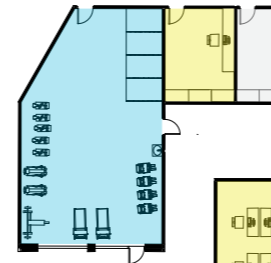


# GENERAL PLAN

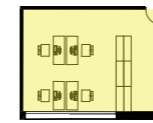
1:400



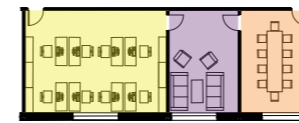
A Floor 2:  
X-ray department



B Floor 2:  
gym physiotherapy



C Floor 2-4:  
mobile teams



D Floor 2:  
call center, 1177

- examination room
- bathroom
- administration
- meeting room
- staff & social room
- cleaning storage
- LAB & research
- technical room
- fresh goods storage
- waste & disinfection





# GENERAL UNIT

1:200

- patient
- staff
- fresh goods
- waste

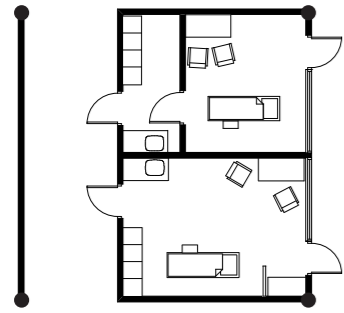


The plans generality will hopefully promote a more patient centered and seamless care. But also, facilitate a somewhat different way of working for the staff with more group rooms and facilities that might lead to shared knowledge between different professions through teams. The examination rooms, that are the same size everywhere in the buildings, are meant to be able to contain whatever is necessary to provide a good and special care. Thus, not to be mixed up with not creating any space for a highly specialized care at all.

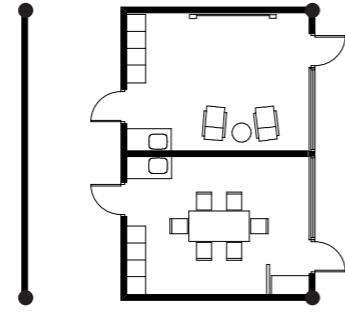
As mentioned before, each unit should be able to function on its own. However, not everything can be found to the same extent in all the units. The laboratory for instance, is placed in one of the units but connected to each floor in all the others by the pneumatic dispatch system. Above, this space is turned into another function as shown in the previous 1:400 plan.

# MODULE EXAMPLES

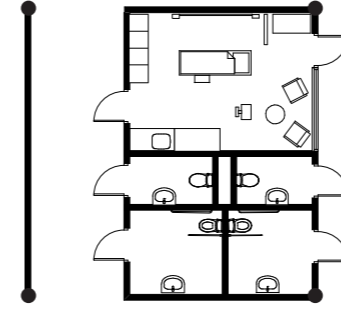
1:200



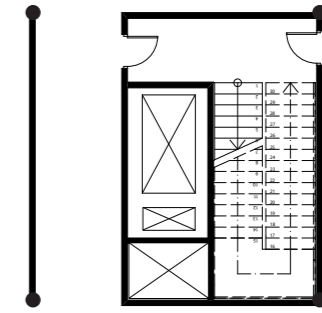
Infection room and  
physiotherapy room  
+ corridor



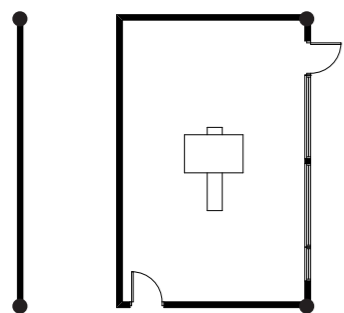
Psychiatric room and  
coordination room  
+ corridor



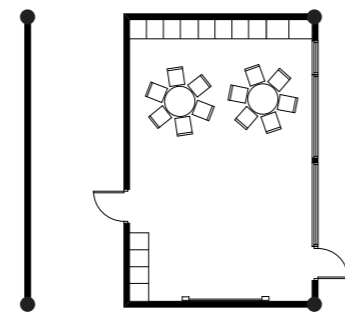
Default examination  
room and bathrooms  
+ corridor



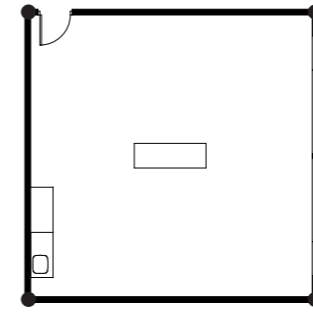
Staircase, elevator,  
shaft + corridor



CT scan + corridor



Group activities  
psychiatry/playing  
therapy family  
center



Module can also  
fit operation theatre  
in the future

The size of the grid (7,6 x 7,6m) has been chosen for being able to fit some of the most common functions in the building, like a staircase in combination with an elevator and an examination room in combination with a 2,4m wide corridor. The size of the grid also allows for one square to be turned into one operation theatre, if this is something that appears to be desirable in the future. As a suggestion, another floor on one of the units can be added creating a ward for surgery along with a sterile unit connected to the elevators to be able to handle soiled and clean goods.







Section through an examination room, where the patient enters from the open gallery and staff from the corridor.

# ROOF + BASEMENT

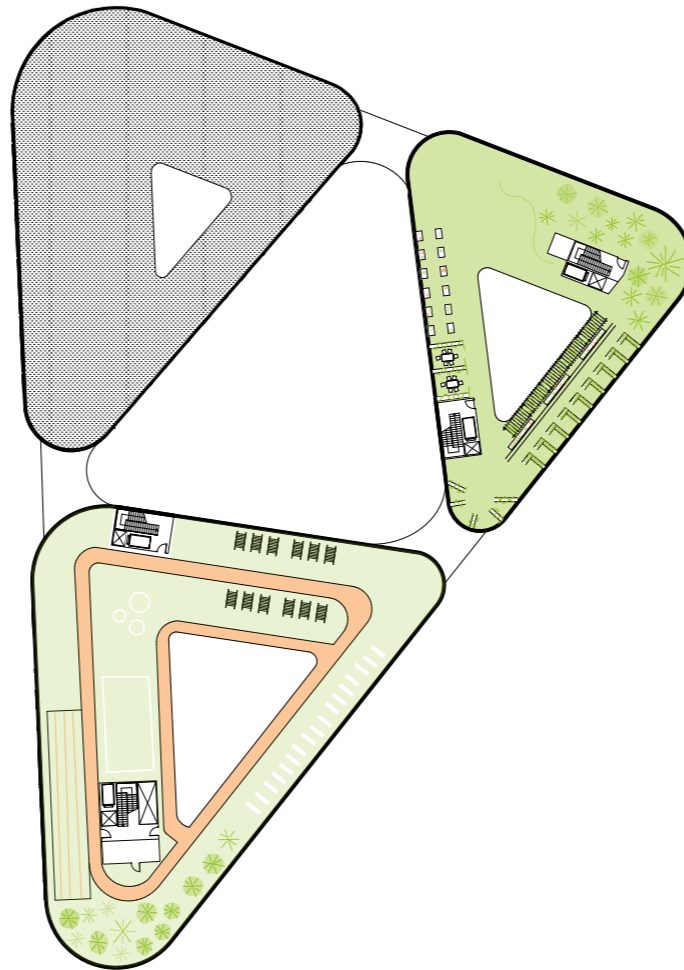
1:1000





## TERRACES






The lowest unit will be a part of the physiotherapist unit to provide them with the possibility to train rehabilitation on the outside. The second highest becomes the terrace for the psychiatry ward. This terrace is designed to provide different levels of interaction with others. Here you can choose to take part in group activities or observe other people from a distance. The power generated by the solar panels on the highest unit could be used to charge the mobile teams electric cars in the basement.

## AIRFLOW

Air is brought in and out of the building from the roof using the shafts close to the elevators. This is complemented by a system between the units. These rooms serve as viewpoints and green relaxing rooms for the staff but also anterooms between the different units. Air is locally brought into these rooms from the outside to be cleaned by air cleaning plants. The anterooms' positive air pressure, compared to the adjacent units, ensures an air flow from the anteroom and into the unit, given that only one door is opened at the time. This prevents disease spreading from one unit to the next.



-  solar panels
-  psychiatry patients
-  physiotherapy patients
-  running track

-  fresh goods
-  waste
-  changing rooms
-  technical rooms
-  storage



# SECTION

1:200

## BASEMENT FLOWS

The logistic flows start in the basement. Goods arrive from a bigger logistic hub outside the city, by "on demand" trucks to keep the larger storage units away from the city's different healthcare centers. The truck goes down underground to dock to the logistic hub in the northeast unit. From here the goods are being unloaded onto trolley trains in the basement distributing it to the different units.

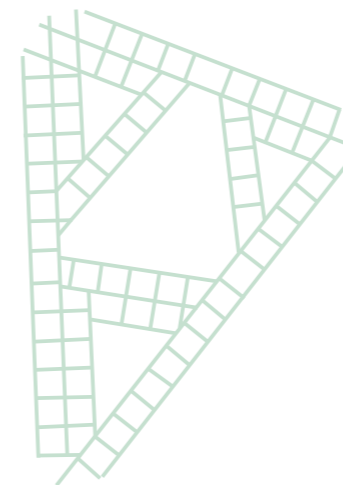
The train arrives to a unit and unloads the goods into a storage or directly into the space created in front of the elevator for fresh goods and staff. The goods go up to a ward and is brought into the wards storage in a closed system with minimal contact with the staff.

Waste is taken down in a different location in the ward in a dedicated elevator that only deals with waste to keep these flows separated. The waste is moved directly from the disinfection and recycling room into the elevator in a closed system. The waste is taken down and stored in a nearby waste storage in the basement until it can be picked up by a train that takes it back to a waiting garbage truck. Underneath the courtyard the mobile teams' cars are situated. This is also the place for ambulance to pick up a patient who needs to be rushed to the hospital.

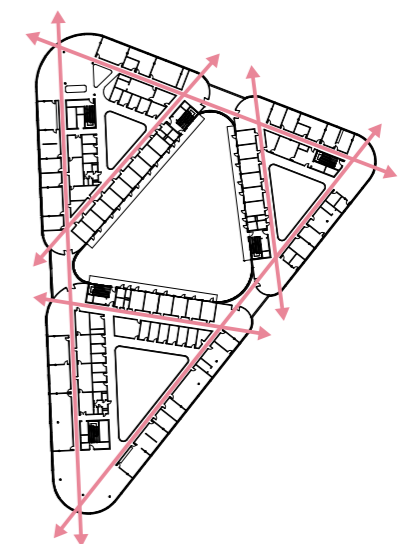


## GRID SYSTEM

Although the somewhat complex form on the outside, the grid system used for the units loadbearing structures is highly rational. It is applied perpendicular from each side of the triangular shape ending up with a "whole" in the middle where the area is turned into atriums for improved lighting conditions in the otherwise deep and dark units. Applying the grid system from different sides also creates the possibility to have a clear movement through each unit but also a clear connection between the different units.



Grid system



Corridors with views



# ELEVATIONS

1:400



Facade towards the courtyard

## THE FACADE

One ambition with the facade has been to express the concept United Isolation. Once more, the grid system provides a rational solution. The columns can indirectly be seen from the outside, and is utilized as a way of dealing with rainwater as some of these places are used as downpipes. The windows are designed to allow for future reconstruction and to create variety. The same window module is kept around the entire outside of the building giving the units a common feature. The module is then divided into three different parts, each of which with the width of 2,4 m and the ones that are not used as windows are turned into wooden panels. Since the

columns will not be moved, this system creates the possibility to change the windows according to the inside even if this is being rebuilt.

The façade also tries to deal with the urban as well as the human scale. The ground floor is glazed to provide display windows for shops, public services and health promoting activities. In the middle of every façade, between the different units, there is an opening into the courtyard. As you walk under the anterooms you enter something else. This is where the primary care unit starts. The courtyard design gently hints where you should be going depending on which entry you come from. From



Facade towards Östra Bangatan

# IMPROVISED WORKSHOP

here you can also clearly see the colors of the different units surrounding you, that tells you where you should go. The open galleries are outside for good ventilation but can be shielded from the weather thanks to its sliding glass panels using the same module width as on the outside.

The materials have been chosen for function and feeling. The building is covered in grey aluminium sheets. Inside the open gallery wood takes over as a warmer material. The anterooms between the units becomes a green divider enhancing health and sustainability.

## THE BUILDING IN NUMBERS

Healthcare center: 18 000 m<sup>2</sup>  
20% corridors  
Basement: 4500 m<sup>2</sup>  
Footprint on site: 4400 m<sup>2</sup>  
Gross area (BTA): 22 000 m<sup>2</sup>  
Height: 29 meters  
Examination rooms: 66  
Gym: 1400 m<sup>2</sup>  
Insurance office: 700 m<sup>2</sup>  
Pharmacy: 450 m<sup>2</sup>  
Shop: 500 m<sup>2</sup>



SYMPTOMS MARTA:  
Fever, cough, throat ache,  
headache, runny nose, fatigue

DISEASE:  
Cold



SYMPTOMS OLLE:  
Fever, cough, breathless,  
headache, myalgia, fatigue

DISEASE:  
SARS



SYMPTOMS ERIK:  
Fever, cough, breathless, hurts  
when taking deep breaths,  
throat ache, headache, fatigue

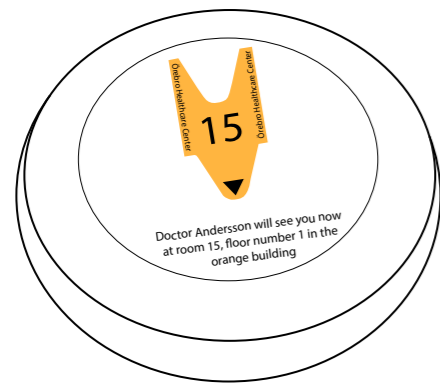
DISEASE:  
Pneumonia



## CONCLUSION

A good doctor will soon realize the difference and diagnose you. However, does the patient know that when he or she comes to visit the doctor? Therefore, this project is not the last frontier of healthcare but tries to deal with the fact that it might be the first..

# WAYFINDING



Wayfinding and digital solutions: either as a cell phone app or a pager borrowed in the reception.

As mentioned earlier, wayfinding is important due to the overall concept. This means that the building should be easy to navigate in whether you are a patient or a member of the staff. The two most obvious parts of this might be the placement of the self-check in desk and the different colors being used in the façades facing the courtyard.

However, the radius of the corners of the units also varies, giving each unit unique corners. This creates a nonsymmetrical shape with different widths in the entrances that is meant to direct the flow of visiting people. The largest entrance is to the urban street where most people are expected to be moving. The second, towards the street in the north and the third towards a new street in the east. The different views from the three entrances will also help people to navigate as they leave the healthcare center.

Since the idea is that the patient never should enter further into the units than the examination rooms, the wayfinding on the inside of the buildings targets the staff. The staff can move throughout one isolated unit but one corridor continuous throughout the entire building, uniting the units in their isolation. This corridor that also is a sight line, gets interrupted as you pass through the anterooms between the buildings. From these anterooms, the staff can more easily navigate as they

here get views towards both the urban environment and the courtyard.

## COLORS

Why these three colors? The colors have been chosen with different people's color perception impairments in mind. There are different types of color blindness but the most common one is red-green color blindness (protanopia) which today affects 8% of the male and 0,5% of the female population.

The three colors in the façade provide the highest contrast possible for at least four of these different diagnoses.

The doors into the examination rooms are in contrast with its surrounding wooden facade and have colorful numbers painted on them.



Normal vision



Red-green color blindness

Colors used for wayfinding

## FUTUREPROOFING & SUSTAINABILITY

Finally, research shows that a hospital is being rebuilt every fifth year or so due to new needs, technology and working methods. The building must therefore be easily adaptable. Since the site has a limited space an expansion of this building will most likely be made vertically, thus the loadbearing structure is oversized. When it comes to installations the slabs have an additional layer of foam concrete to facilitate new piping and the grid system allows for walls to be more easily rearranged. The project shows how the building should be used in a post antibiotic era but all rooms within the grid can potentially be turned into additional examination rooms.

A building that facilitates the treatment of infections, without antibiotics, might need to look different compared to other healthcare centers. But in doing so it may reduce the cost for society, in the long run. It might also be in the nature of such a building to minimize the areas for social interaction due to the risk of infection. Environmentally, the most prominent features in this project are the solar panels, the green terraces and the anterooms bringing greenery and clean air to the staff. By implementing aspects of futureproofing and sustainability, the building has the tools to deal with some of the challenges that might be approaching...





SELF CHECK-IN

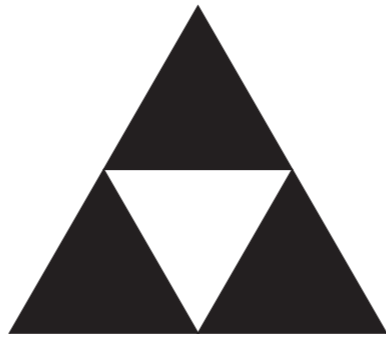




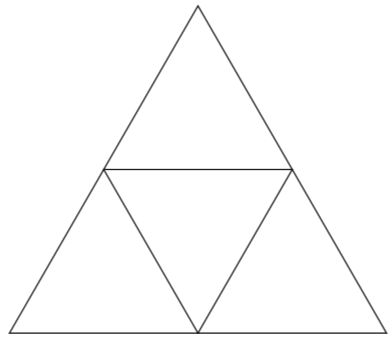








Thanks to our examiner and tutors during the development of this project.  
Peter Fröst | Christine Hammarling | Saga Karlsson | Elke Miedema



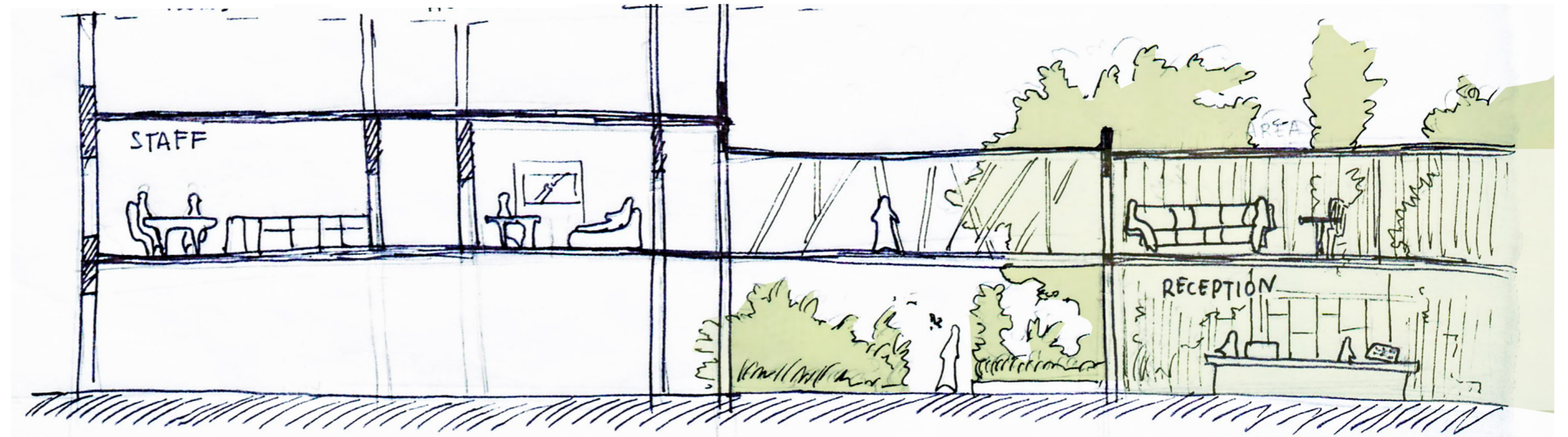
THEMES  
/ PROCESS

# HEALING ARCHITECTURE

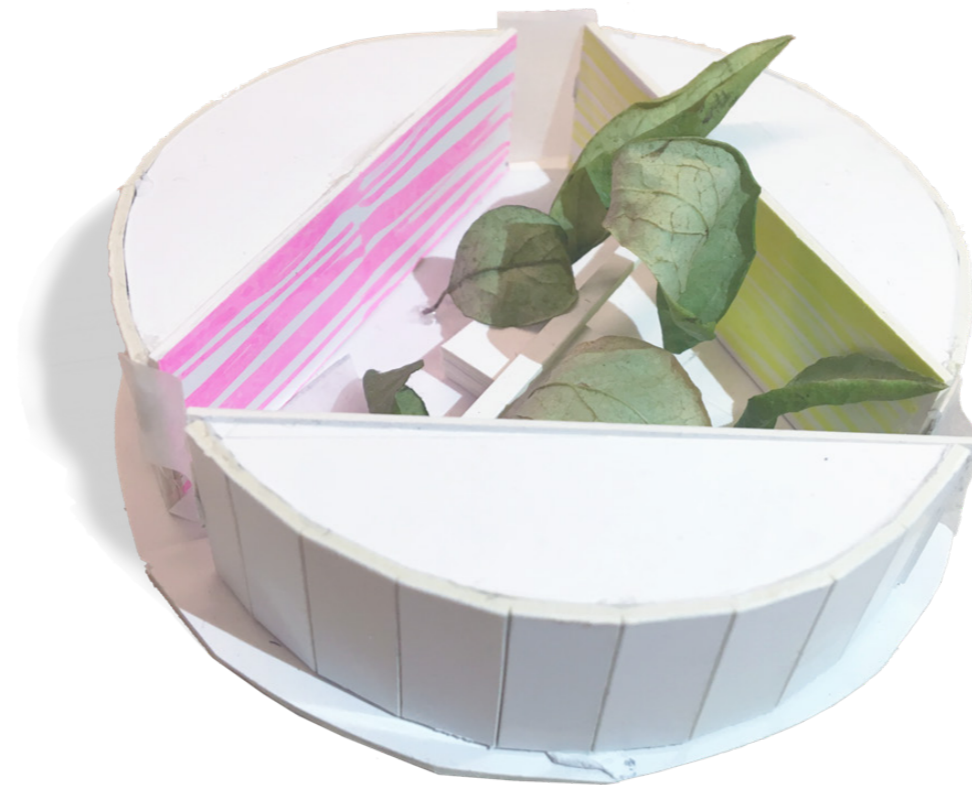
The first theme markedly influenced our building. It told us that most pathogens originate from patients, staff and visitors in a hospital. That is how we realised the importance of separated flows, a major feature in our project.

It was also in this theme we realized that wayfinding is connected to the health of the patients. Research showed that independence of the patients is correlated to their wellbeing.

The physical environment could even have a great impact on the use of medication since a pleasant surrounding leads to reduced medication and stress among the patients. To us, the importance of creating a green attractive space in the courtyard, as well as introducing more daylight inside the building was obvious.



Early sketch showing the green courtyard in relation to the examination rooms and the staff areas



Sketch model showing the first ideas about wayfinding

By placing green areas in the heart of our building we ensure that each patient has a direct access to beneficial qualities of plants and fresh air.

The staff has three small atriums of their own and three winter gardens on each floor placed conveniently between the units. They are filled with air purifying plants and serve as anterooms, as well as common relaxing spaces.



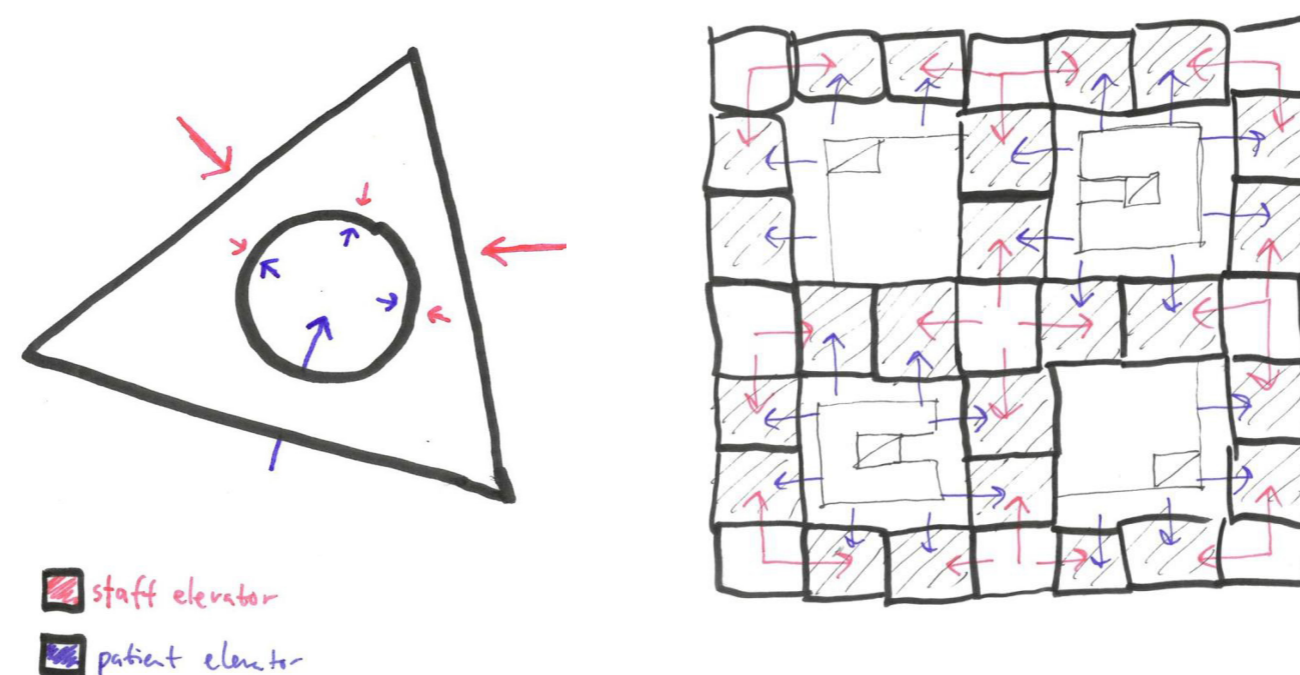
# HEALTHCARE AND ARCHITECTURE

In this theme we were reminded of the fact that hospitals built in the past were working in a time without antibiotics and that the modern trend is to merge new hospital buildings into society. However, in a post antibiotic era the older buildings might have an advantage, being more isolated.

It was also in this theme that we during research found out about one of the few buildings designed for a post antibiotic era: the new infection clinic in Malmö, Sweden. An article written by staff working at the clinic revealed the major faults in the design and we tried to avoid making the same mistakes in ours. Faults like lack of storage and walking long distances in corridors without visual connections.



Plan and perspective showing the infection clinic in Malmö.



Sketches showing the idea about separated flows and movement

MALMÖ INFECTION CLINIC, 2010, CF Möller

It became our main inspiration throughout the design process both in terms of solutions regarding the separation of the flows as well as the wayfinding using colours and sightlines.

# HEALTH PROMOTION

This theme contained the health promotion workshop that really helped us to empathize with potential users of our building and encouraged us to think about the flows and the qualities of spaces. Therefore, this theme also became a major influence for our project.

We emphasized the importance of patients' empowerment through wayfinding and independence from staff. Throughout our design process, we kept in mind the need for designing clear and readable spaces, prominently placed staircases and health promoting green areas.



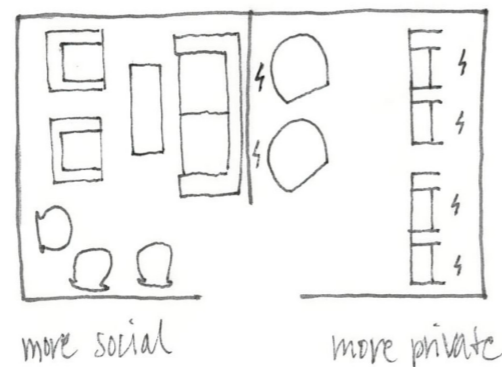
Early sketch showing ideas about the examination rooms

## DEVELOPED PERSONAS

BUSINESS WOMAN WITH CONTAGIOUS DISEASE THAT DOESN'T KNOW ABOUT IT

We decided that this stressed person needs a short way into a reception and examination room. During waiting for the appointment she needs an option to work in the waiting room.

We thought of this persona as we designed our e-health solutions and that you can go directly to the examination rooms from the courtyard.

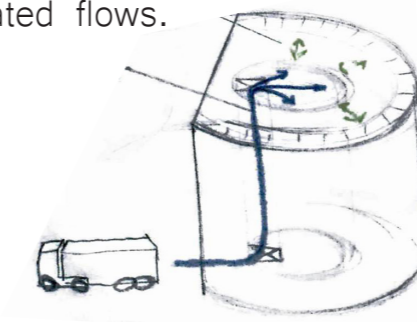


Flexible waiting room

LOGISTICS GUY WHO TRAVELS BETWEEN THE HEALTHCARE CENTERS

We concluded that this person needs to be able to find his way fast into the building and parking, but also between the units. He carries a lot of heavy equipment and require short transportation routes.

From this we brought the idea about the goods in closed system, for a potential logistic person to come up and down to the wards without the need to enter into them. An idea that worked well with the separated flows.

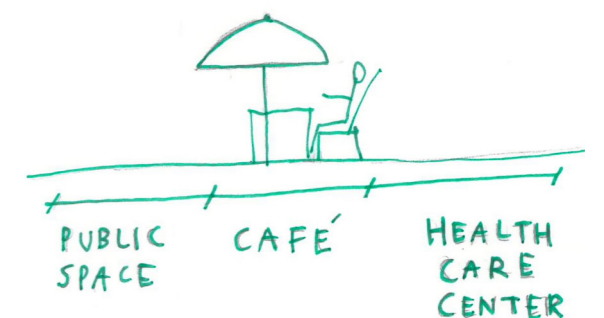


Short, simple delivery routes

CLIENT OF SERVICES WHO LIVES IN THE LOCAL SENIOR HOUSING

This person has difficulty moving long distances and loses orientation easily. She should have many places to rest along her way to the healthcare center.

A persona that once more stressed the importance of wayfinding. Clear signs, clear plan layout for patients, as well as easy access to the public services, like a shop and a pharmacy.



Close proximity to services

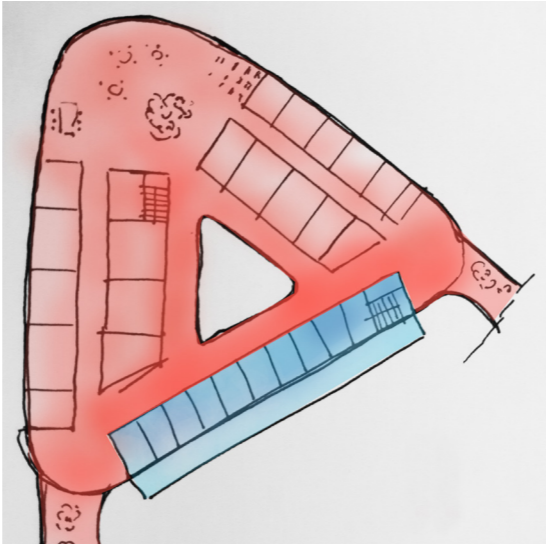


# FUTURE PROOFING, FLEXIBILITY AND GENERIC SPACE

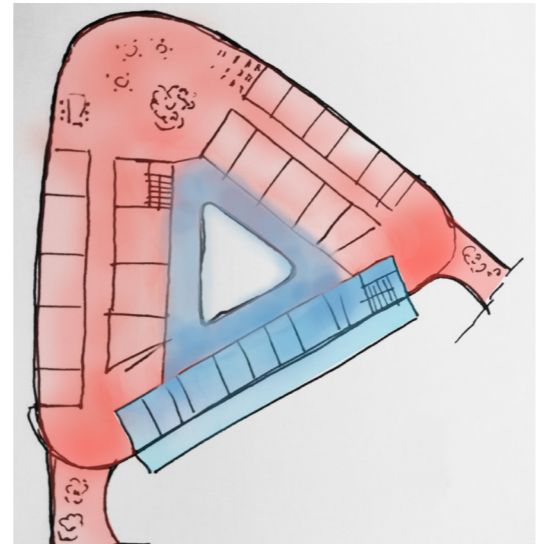
Future proofing is always hard, since the future is not set. However, the workshop during this theme encouraged us to look into different solutions that would enable our building to be more flexible and facilitate potential growth.

From here, we implemented the grid system with interchangeable units and a layer of foam concrete on each floor for easier access to installations. Our construction relies on load bearing columns for more flexibility in rearranging the plan layout.

In case of a disease breakout, each of our three units can be isolated and work independently. However, if in the future the danger of contagious diseases will lessen, the building can be adapted to work in the antibiotic era without compromising its functionality.

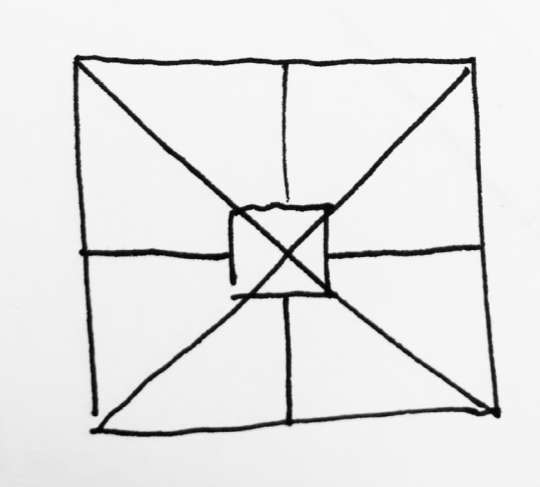


Functioning of the unit in the post antibiotic era - separation of the staff and patients

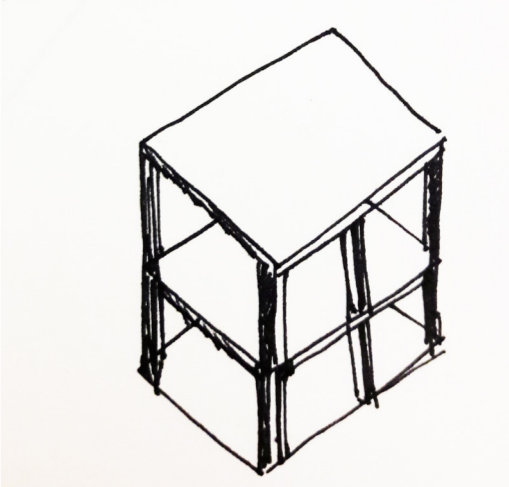


Functioning of the unit in the antibiotic era - letting the patient deeper into the unit

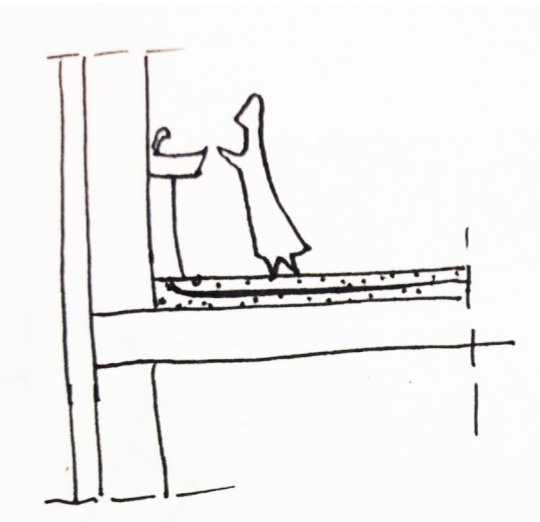
## SOLUTIONS DEVELOPED DURING THE WORKSHOP



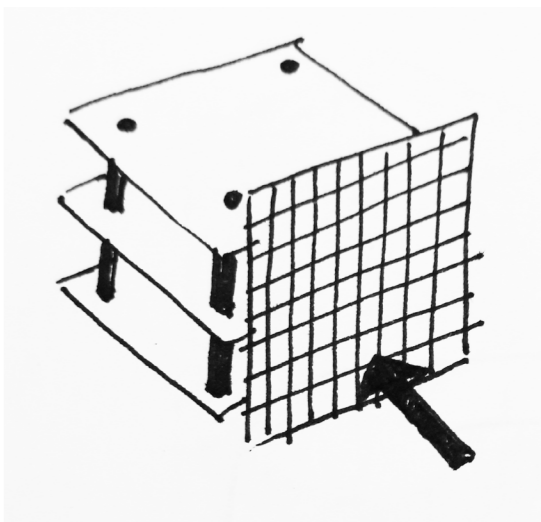
Combined installations create a flexible space layout



Load bearing columns give a free plan layout



Foam concrete on top slabs gives easier access to installations than regular concrete



A "free" facade provide the ability to change the facade

