



FJÄLLSJUKHUSET

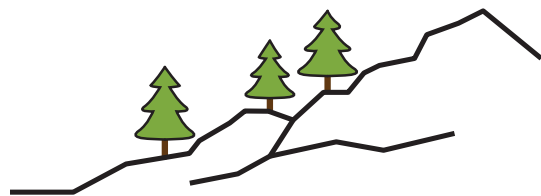
Östersund | Annika Danielsson & Isa Sverneborn | Chalmers Architecture 2014



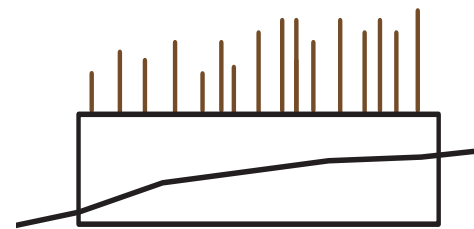
TABLE OF CONTENT

	Page
Design Concept	3
Introduction	4
Themes for healthcare architecture	5
Site analysis	6
Analysis and Design	7
Site plan	8
Functions & levels	10
Communication & flows	11
Floor plans level 2-7	12
Entrance hall	19-21
Wards	22-25
Patient room	26
Facades & materials	27

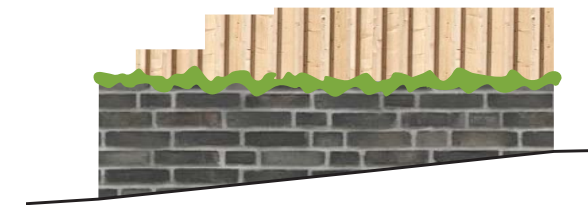
DESIGN CONCEPT



An abstract interpretation of Jämtland's nature.



Transforming it into a simplified concept - solid base, light weight top.



Taking this into a building the result is a solid structure with a light timber facade on top. To loosen up the border between the two expressions, greenery will work as a transition.

INTRODUCTION

This report

This report is produced in the course Healthcare Architecture at Chalmers University of Technology in Gothenburg. The aim of the course is to provide students with knowledge in designing large-scale, complex and sustainable buildings. In total seven student project proposals for developing Östersund Hospital were done in the course, and this proposal was done by Annika Danielsson and Isa Sverneborn.

Background of Östersund

Östersund is located in the middle of Sweden by the lake Storsjön and is the only city in the Jämtland Region. Östersund is a centre for outdoor activities, culture, education and tourism. The region has about 130 000 inhabitants and during the winter season it doubles. Östersund hospital is located in the centre of the city and cares for an area larger than Denmark.

Background of the hospital

The hospital buildings are from the 1950 - 1980s but renovations are an on-going project. The hospital is today around 100 000 m², it contains 416 patient beds and approximately 2500 are employed at the hospital.

Future of the hospital

The County Council, Jämtlands Landsting, has decided that the hospital will be located at the current site for another 50 years and that the need for renovation and new construction is essential to be able to provide modern healthcare to the people of Jämtland. They call it Vision 2025. In October 2014 Chalmers was invited to participate to come up with ideas for the future development of the hospital.

A brief for the commission

We visited Östersund for two days in October 2014 and looked at the hospital and the city, and met with hospital staff and municipality officials. Below follows a summary of the brief for our commission that we got out of the discussions and observations during the visit. In general, what was asked for was a visionary master plan for Östersund Hospital integrating it into the city and making sure that modern healthcare can be provided.

- 420 inpatient beds in single patient rooms.
- 12 operating rooms of 60 m² each with daylight.
- 10 intensive care unit beds.
- New emergency unit.
- A patient hotel.
- Larger X-ray department.
- Develop the outpatient departments.
- A maternity department close to operating rooms.
- A helipad with good connection to the emergency unit.
- Separated logistical flows in culverts.
- A new building for psychiatric care.
- An expanded kitchen with good connection for food delivery to the wards.
- A new infection department.
- Less congested elevators in the high building (#8).
- Clear way finding at the hospital.
- A clear main entrance area.
- Sufficient parking.
- Possibly move the rehabilitation centre to the hospital area.
- Possibly introduce a health centre for primary care that includes academic research.
- Possibly more space for administrative functions for the region.

Our proposal in numbers

New building: 75 000 m²
Existing building that we keep: 50 000 m²
Total: 125 000 m²

Sweden



Östersund



THEMES FOR HEALTHCARE ARCHITECTURE

Working with themes

During the course we have been introduced to different aspects that are important when designing facilities for healthcare. These have then followed us throughout our design process as themes to consider. Here are some explanations of the themes and our interpretation of them.

Past and future of healthcare architecture

To design a modern hospital adapted for the needs of both today and tomorrow it is necessary to start with an understanding of how healthcare architecture as a field has evolved over time. The focus of healthcare has switched from being centered around dreams and faiths, to a belief in the healing qualities of light and air, to thinking that everything is possible to solve through technology, and to the current trend with a more patient/human centered hospital.

Some current healthcare architecture trends:

- Incorporate both technology and natural environments in the care and the healthcare facilities.
- A decentralized care with more care provided at home, less inpatients and more day care visits. A response is less inpatient units, more space for outpatient departments and public functions. The helipad and the patient hotel being integrated in the hospital are also responses to this trend.
- A less institutional feeling, and instead more human feeling of the hospitals. A response is for example to use more natural materials in the indoor environments, and to create an open and public atmosphere in and around the entrance hall.
- Expanding the scope of the hospital to in addition to providing care and cure of the ill and injured, also promote health and wellbeing. A response is to include the primary care working with health promotion at the hospital, and to have a park that promotes physical movement and exercise.

Future proofing

When investing in building a new hospital one naturally wants it to last for a long time - and that is what future proofing as a concept encapsulates. Future proofing is planning for uncertainties of what happens in the future and designing the hospital for being able to change accordingly.

Some future proofing aspects:

- A rational and flexible building structure for emergency care, x-ray and operation among other things. The technology used for providing healthcare is constantly evolving, and hence the spaces in the building has to be able to do the same. The structural grid of the buildings, with general floor heights and building widths, allows for different functions and changes.
- There are well separated flows for emergency care, goods and outpatient visits. There is also a hierarchy in the internal communication spaces, from a public entrance hall, to public corridors, to corridors inside departments and wards, to the more private communication spaces in inpatient rooms. The hierarchy of communication flows allows for partial renovations and functions to change within the hospital buildings.

Healing architecture

Hospitals are areas for healing. During the second half of the 20th century there was a high belief in that technology and treatments would be enough to heal the patients, but today the discussions have changed and the effects of the surrounding environment on healing are acknowledged more. Evidence based design (EBD) explores what design features of a building that can improve the healing process of patients as well as prevent patients and staff from getting injured or ill from being at hospitals.

Some evidence based design aspects:

- Good access to daylight that reduces depression and perceived pain, as well as improves the staff satisfaction.
- Views to nature from all patient rooms, that also reduces stress, perceived pain and anger.
- Single patient rooms, with sufficient space for the patients, staff working with the care, and relatives being present. This decreases the risk of infections, the medical errors and the patient falls. It also helps the sleep quality, the patient satisfaction, the staff-patient communication, and the integrity of patients.

Environmental sustainability

There is currently a destructive feedback loop in which the public health sector contributes to resource depletion, contamination of the environment and waste production which leads to a deterioration of the planet. On the other end, the deterioration of the planet, with climate change and contamination of natural habitats leads to a deterioration of public health.

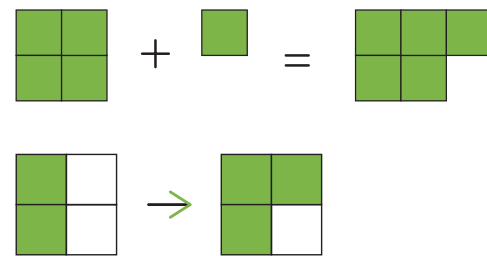
A regenerative healthcare is needed. Where we build green and healthy hospitals that not only sustains life and health, but also repairs and restores what has been degraded or lost.

Some environmental sustainability aspects:

- A well insulated building envelope that is energy efficient.
- Green roofs and two parks at the hospital site that allows for better biodiversity and provides ecosystem services.
- Renovation and reuse of the more flexible existing buildings instead of building a completely new hospital which would use unnecessary amounts of material.
- Extra large areas for sorting of waste in many fractions that later can be reused, recycled or safely disposed of.
- A healthy indoor environment with harmless materials, a lot of light and good sound environment.

Hospital?

~ Sjukhus och hälsocenter ~
~ Sick house and health center ~

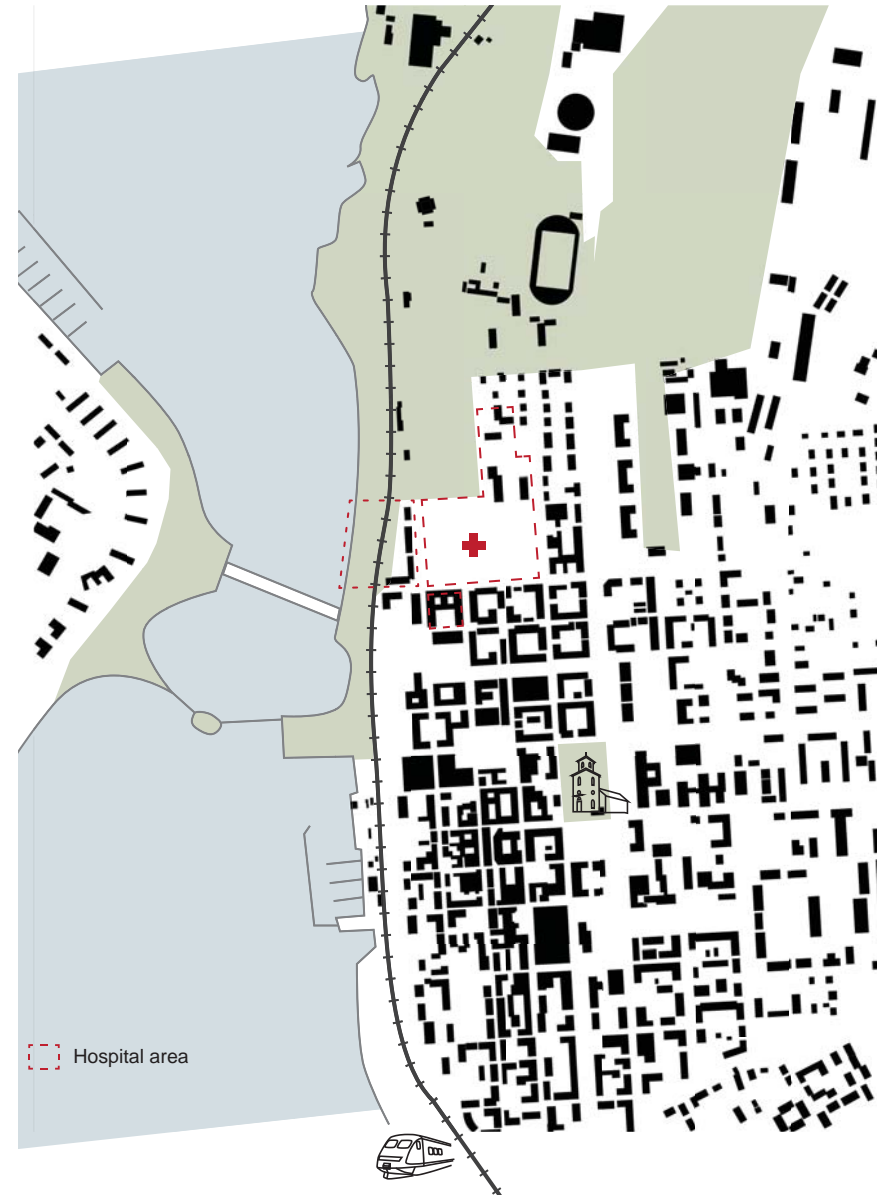


SITE ANALYSIS



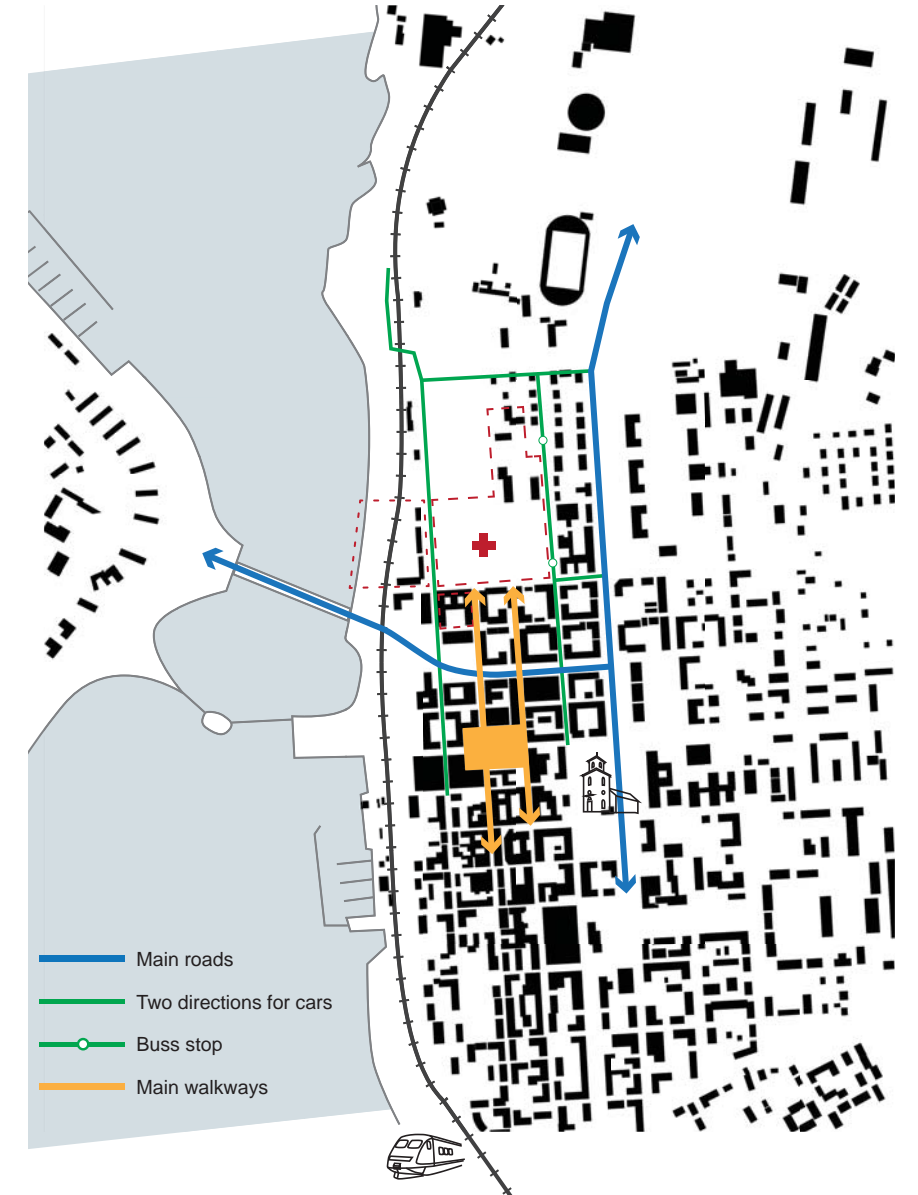
The hospital today

The hospital is situated in a slope down towards the lake. The height difference is 16 m along a 210 m long section (slope 1:13).



Green structure

Östersund has low rise buildings in a grid streets structure to the south of the hospital and more sparsely built up areas with a lot of greenery to the north of the hospital. The hospital and railway are barriers in the movement of people between the urban streets and the greenery and the lake.

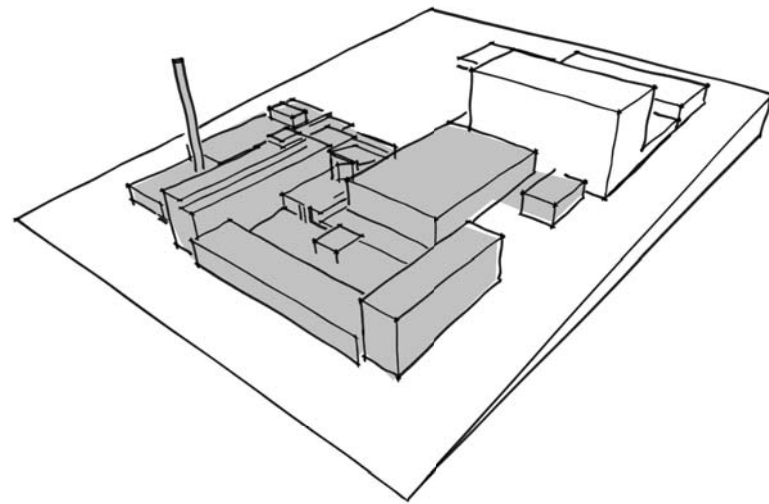


Movements

The two main shopping streets (yellow) pass through the square, Stortorget, and ends up at the hospital site. There is a potential to use these two streets to integrate the hospital better into the city. To create a public atmosphere and more inviting feeling when entering the hospital one may consider the location of the entrance.

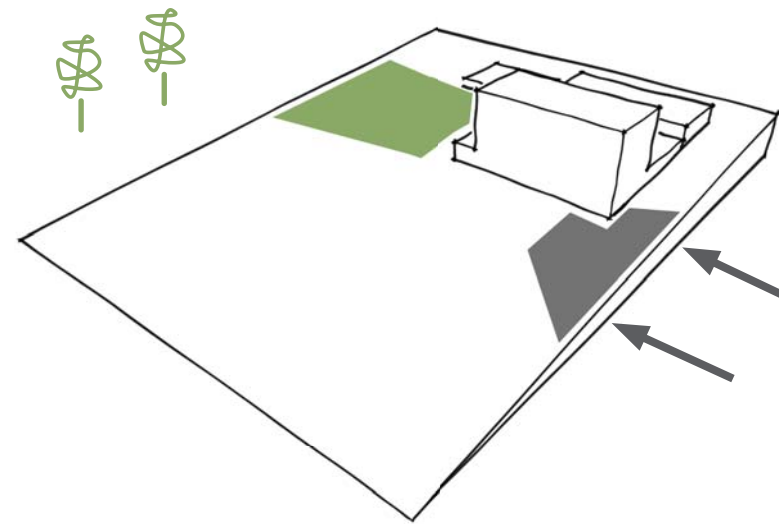
The green lines show the two-way roads for cars close to the hospital site. The road on the south side of the hospital, facing the walkways, is a one-way street. The blue lines show larger main roads in the central area of Östersund.

ANALYSIS AND DESIGN



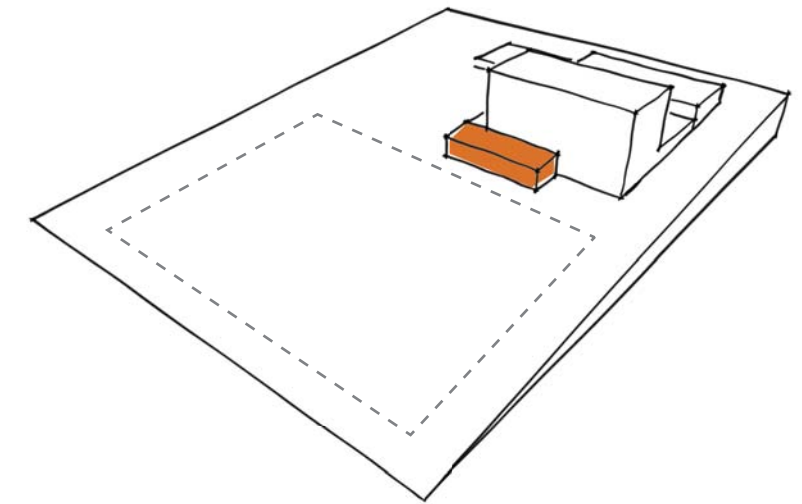
1. The hospital today

Outdated buildings need to change to fulfil the future needs of healthcare.



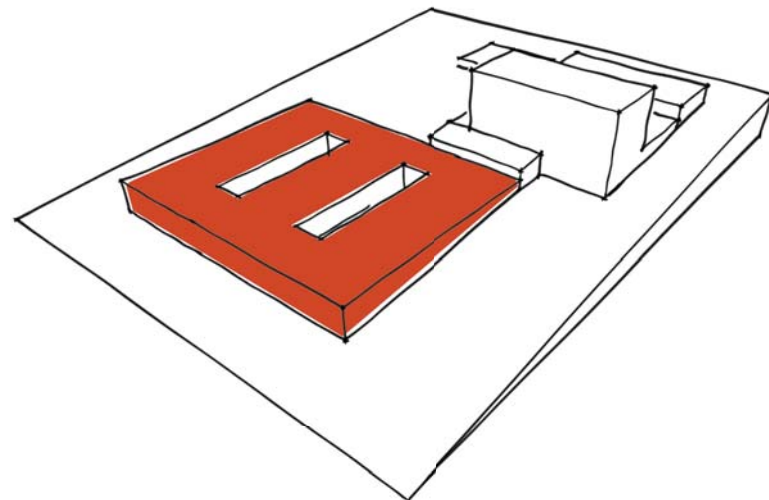
2. Meeting the surroundings

An urban square meets the city and a park meets the existing cemetery with nature.



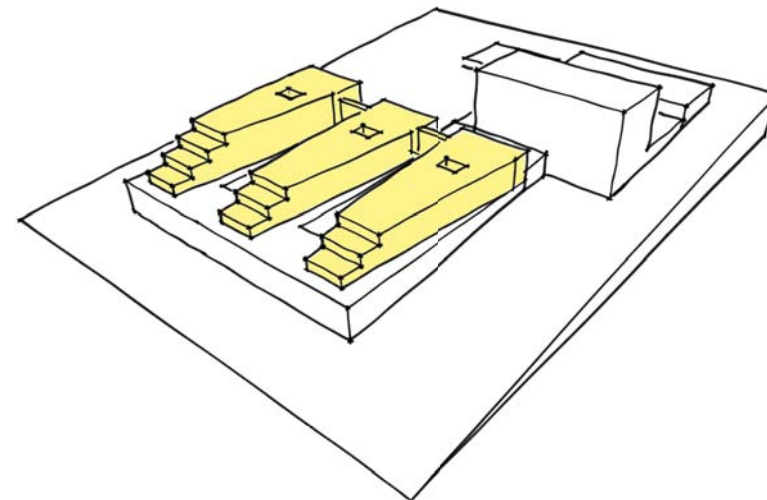
3. A new main entrance

An entrance hall links the old hospital buildings and the site for the new hospital buildings.



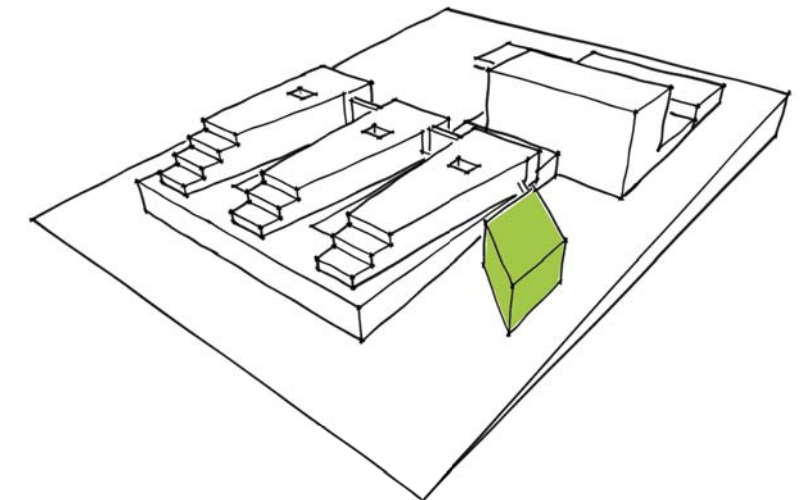
4. A rational structure

A rational building for emergency care, operation, x-ray and other high-tech uses. The structure is flexible and allows changing of functions following different future needs.



5. In-patient wards with views

Above the emergency floors the wards are placed with views of the lake from all patient rooms.

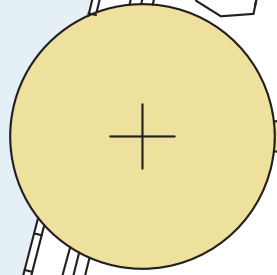


6. A building for research and education

An attractive link between the city and the hospital, and between the students and the staff.

SITE PLAN

Scale 1:1000



A

Järnväg

Frösöbron

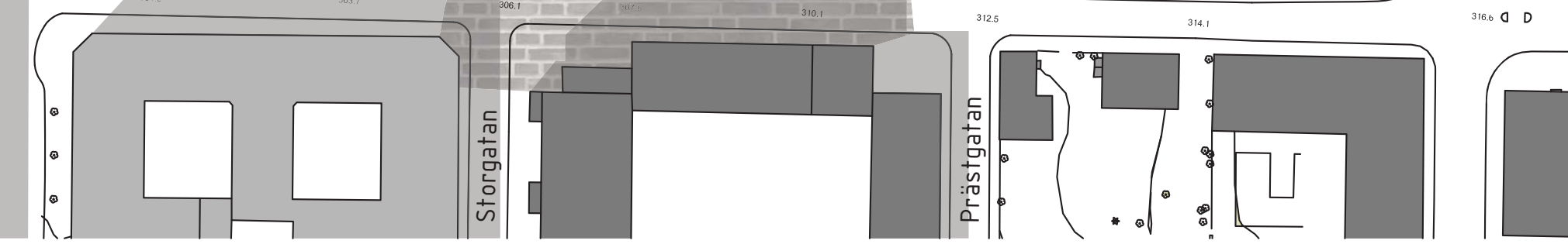
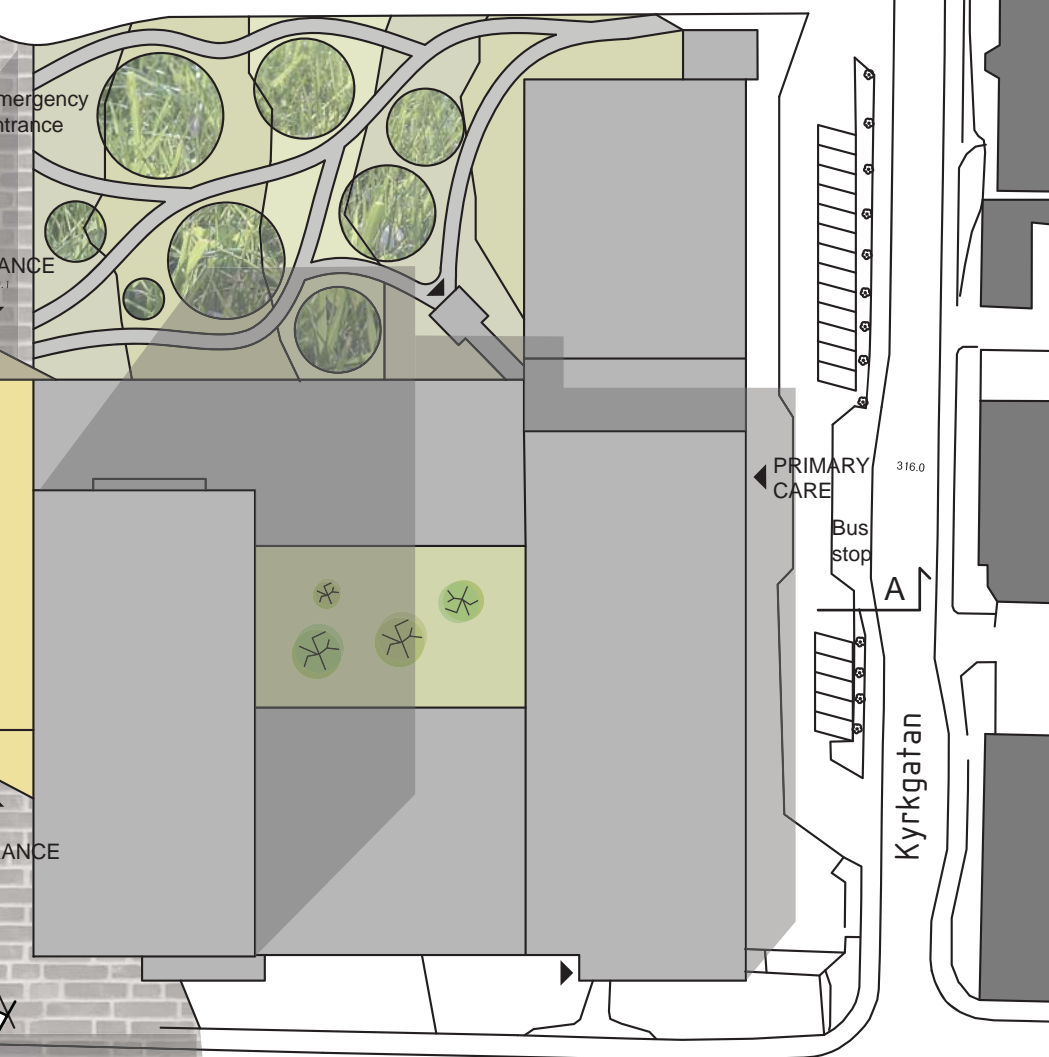
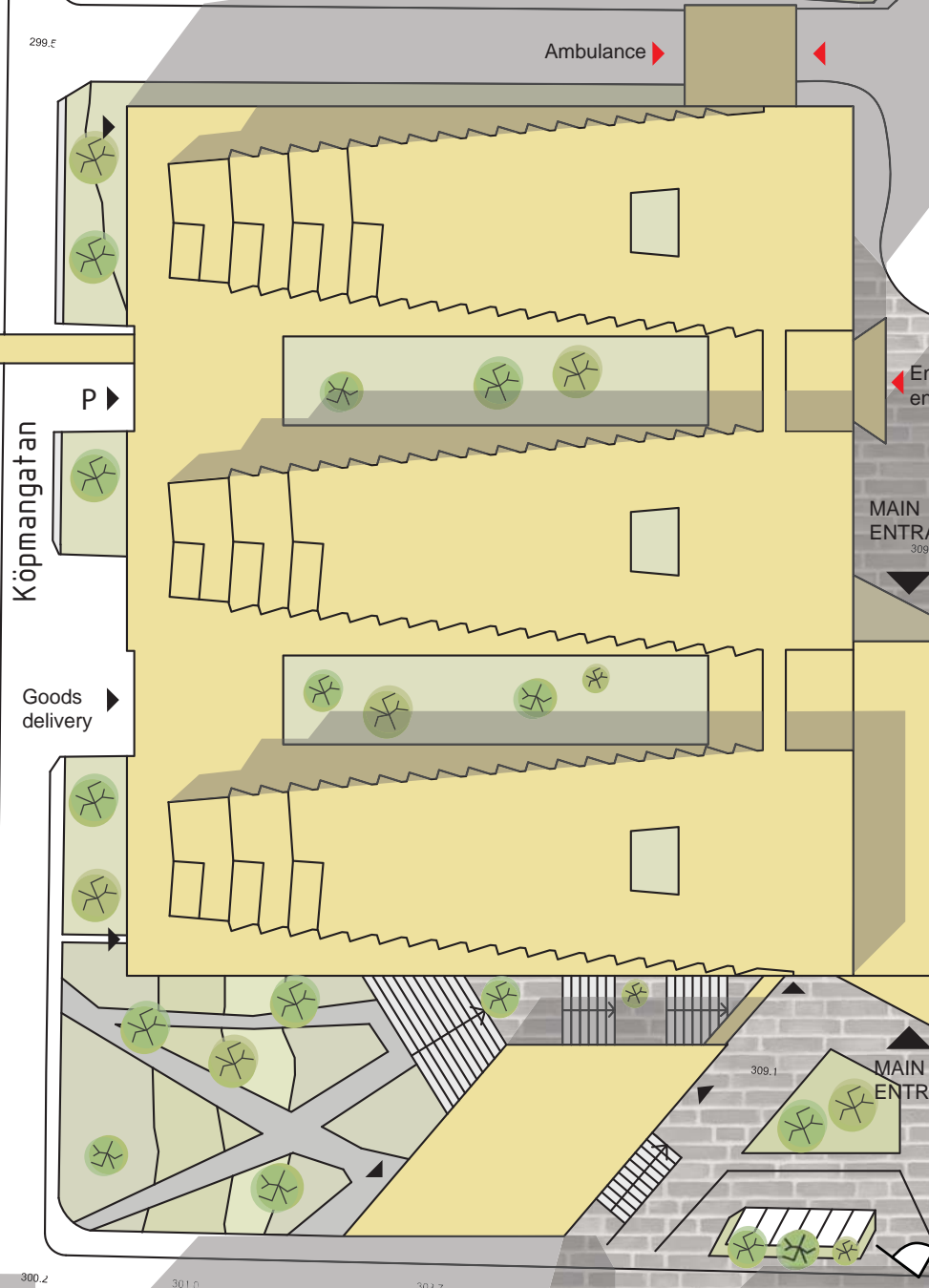
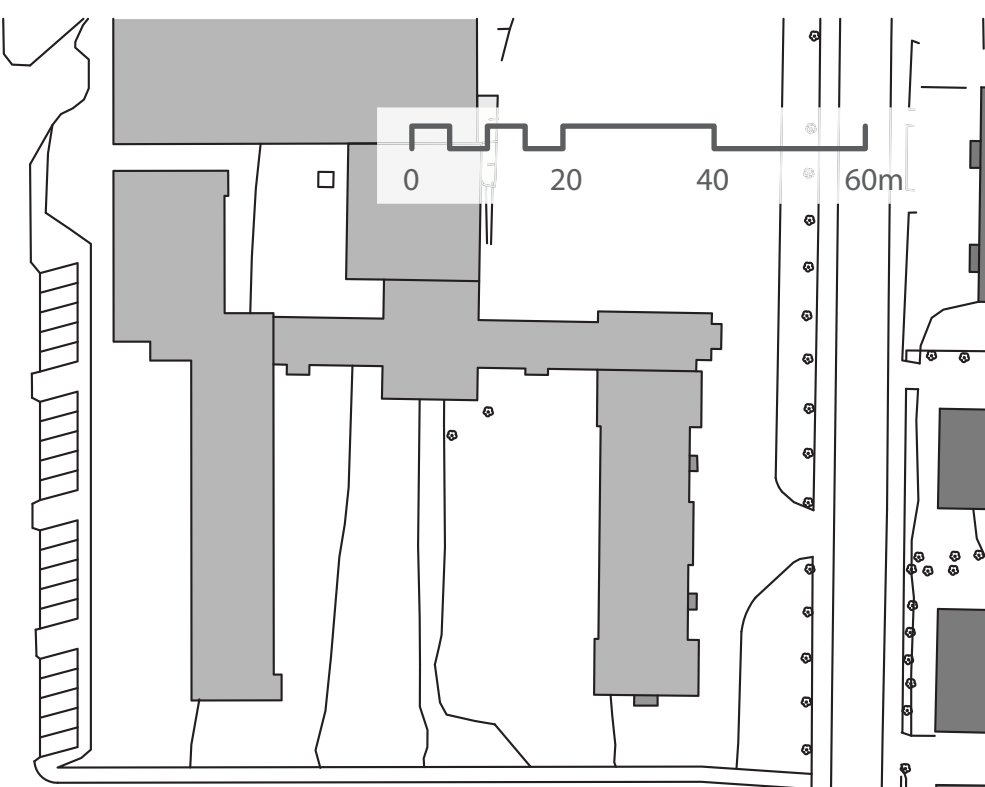
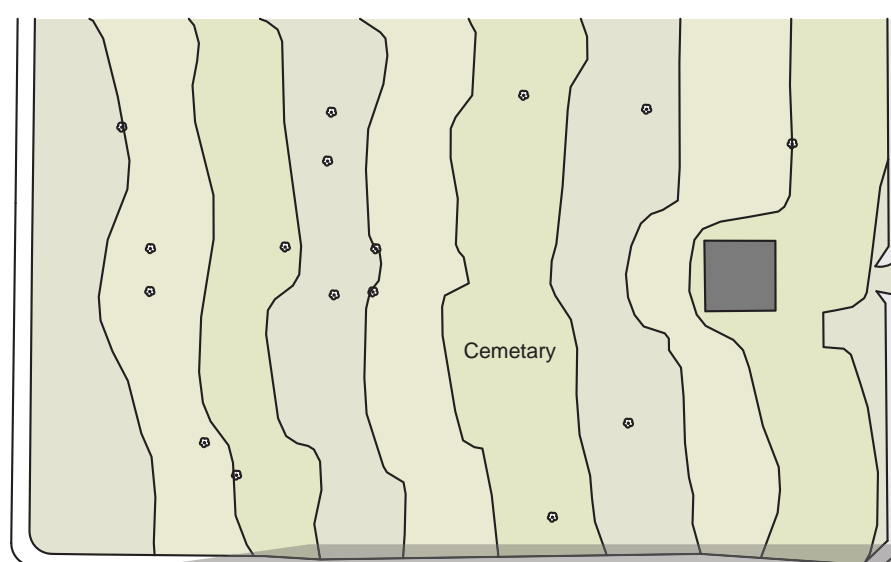
Fältjägargränd

Storgatan

Prästgatan

Kyrkgatan

Tysta vägen



D D

SITE PLAN

The site plan shows the location of the new and old hospital buildings, in relation to each other and the surrounding buildings, greenery, streets and lake.

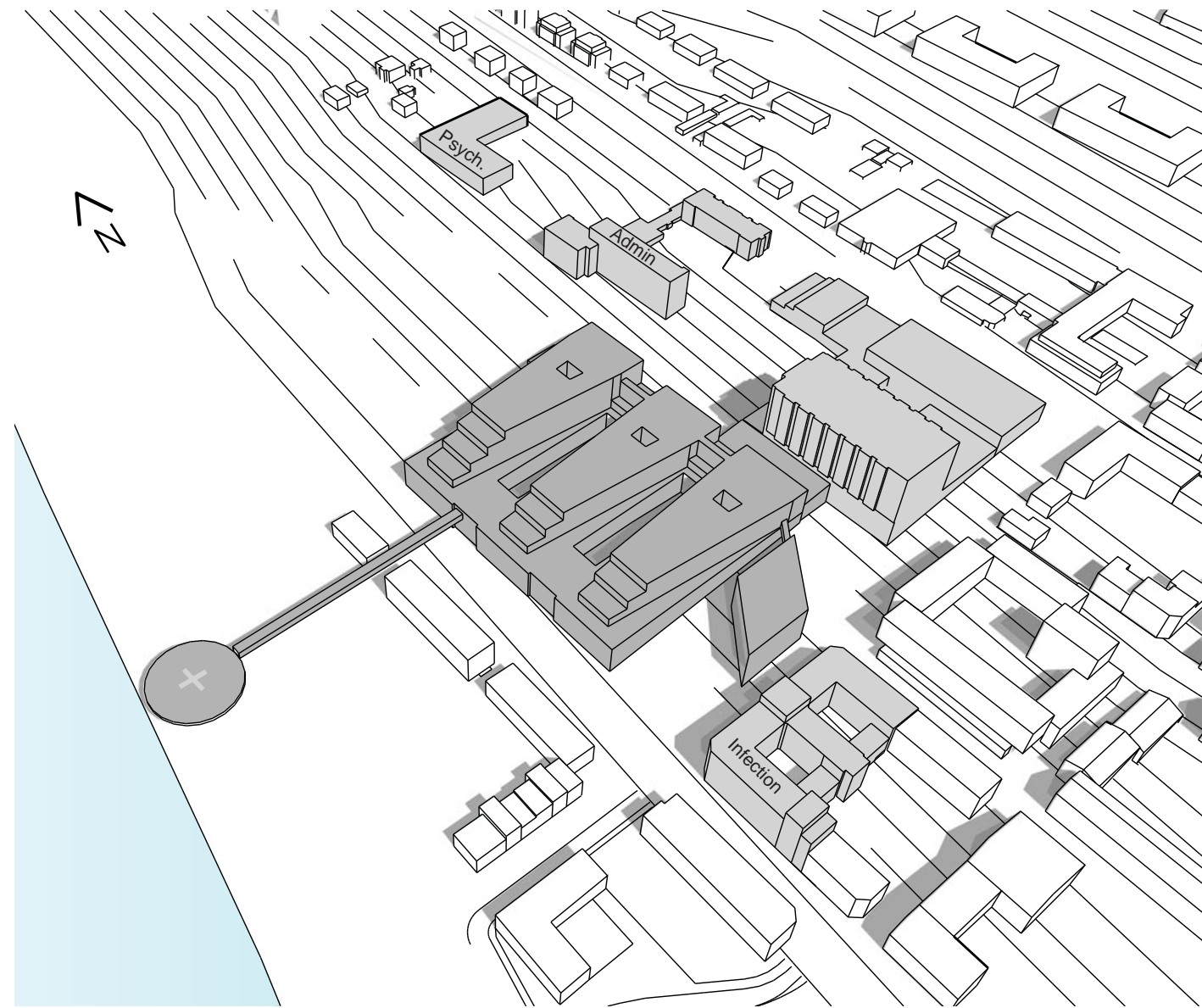
The new main entrance is located between the old hospital buildings and the new, and you can enter the entrance hall from both north and south. The old main entrance towards Kyrkgatan is still possible to use, for example if one arrives to the hospital by bus or is going to visit the primary care which is located by that entrance.

North of the main entrance hall is a new calm park - "Hälsoparken". It connects to the greenery in the cemetery north of the hospital. The park has a variation of natural elements such as plants, water, stones and soil, as well as an outdoor gym, edible plants, and nice seating in arbours from which one can enjoy the surrounding nature.

South of the main entrance hall is a new square - "Sjukhustorget". It is connected to the two main pedestrian walking streets Prästgatan and Storgatan leading to the main square in the city further south. In addition to entering the entrance hall from this square, one can also enter the education and research building, or take a coffee in the café located on the corner of the old highrise building with outdoor seating on the square.

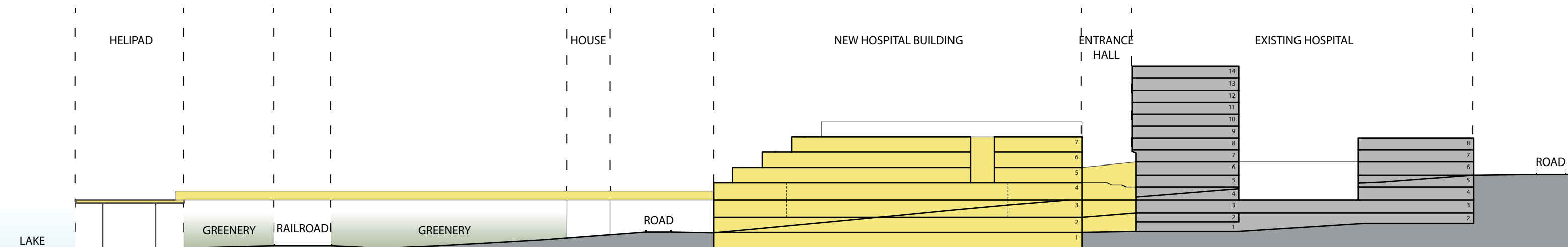
Between the main new building and the cemetery is a street for ambulance access to the hospital. There is an emergency entrance north of the entrance hall if one arrives by car to the hospital and don't want to park in the indoor parking area accessed from Köpmangatan. Goods delivery and waste pick up is also done along Köpmangatan. Above the parking entrance the skybridge connecting the helipad to the emergency unit is located.

In the aerial view it can be seen that the psychiatric care has been relocated to the north of the administration buildings, and the infection department is placed in the existing block next to Fältjägaregränd.



Aerial view of a model

Section A-A Scale 1:1000



FUNCTIONS & LEVELS

This exploded axonometric illustration shows the functions on different levels in the old and the new hospital buildings.

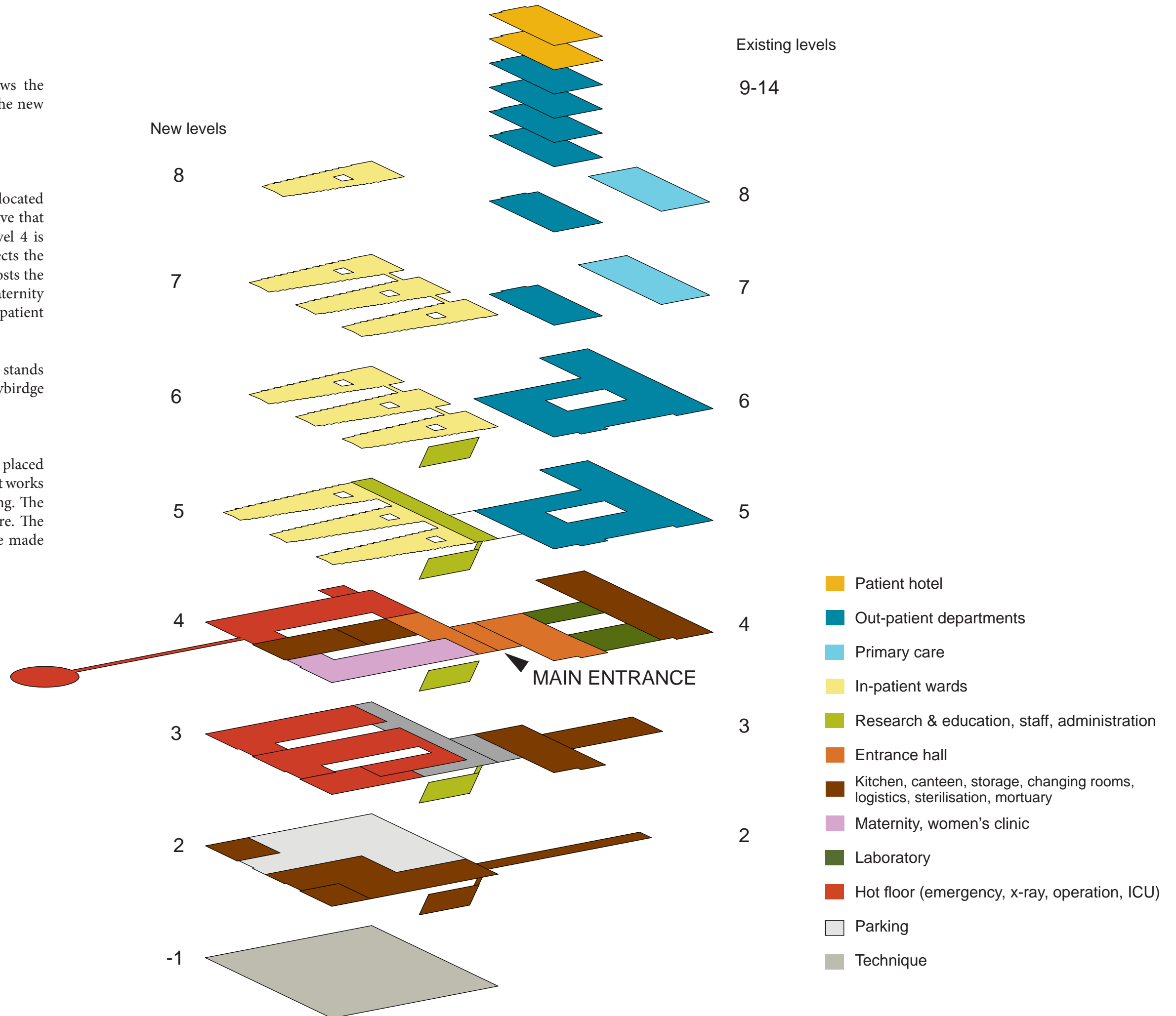
The new buildings

The two lower levels in the new building are allocated mainly to technical things and logistics. Above that in red colour is the hot floor functions. Level 4 is the main entrance floor and this level connects the existing and new buildings for people, and hosts the staff canteen, the emergency unit and the maternity clinic. Above the hot floor functions the in-patient wards in yellow are placed.

The research and education building in green stands a bit on its own, but is connected through a skybridge and culverts.

The old buildings

Mainly the out-patient clinics in dark blue are placed in the old building since that is a functions that works with the existing floor heights in that building. The primary care in light blue is also located here. The upper two floors in the highrise building are made into a patient hotel.



COMMUNICATION & FLOWS

This exploded axonometric illustration shows the main structure for internal communication in the hospital and the paths for different kinds of flows.

Emergency (red)

If one arrives by helicopter there is a straight connection without extra transport in ambulance or elevator to the emergency unit on level 4. The ambulance hall is also placed on level 4, as well as a separate entrance for people entering the hospital to the emergency unit by foot. From the emergency unit one can move easily in designated elevators to the hot floor on level 3, which contains operation, x-ray and intensive care unit. From there transport to the inpatient wards is done through one of the three elevator shafts.

Out-patient (dark blue)

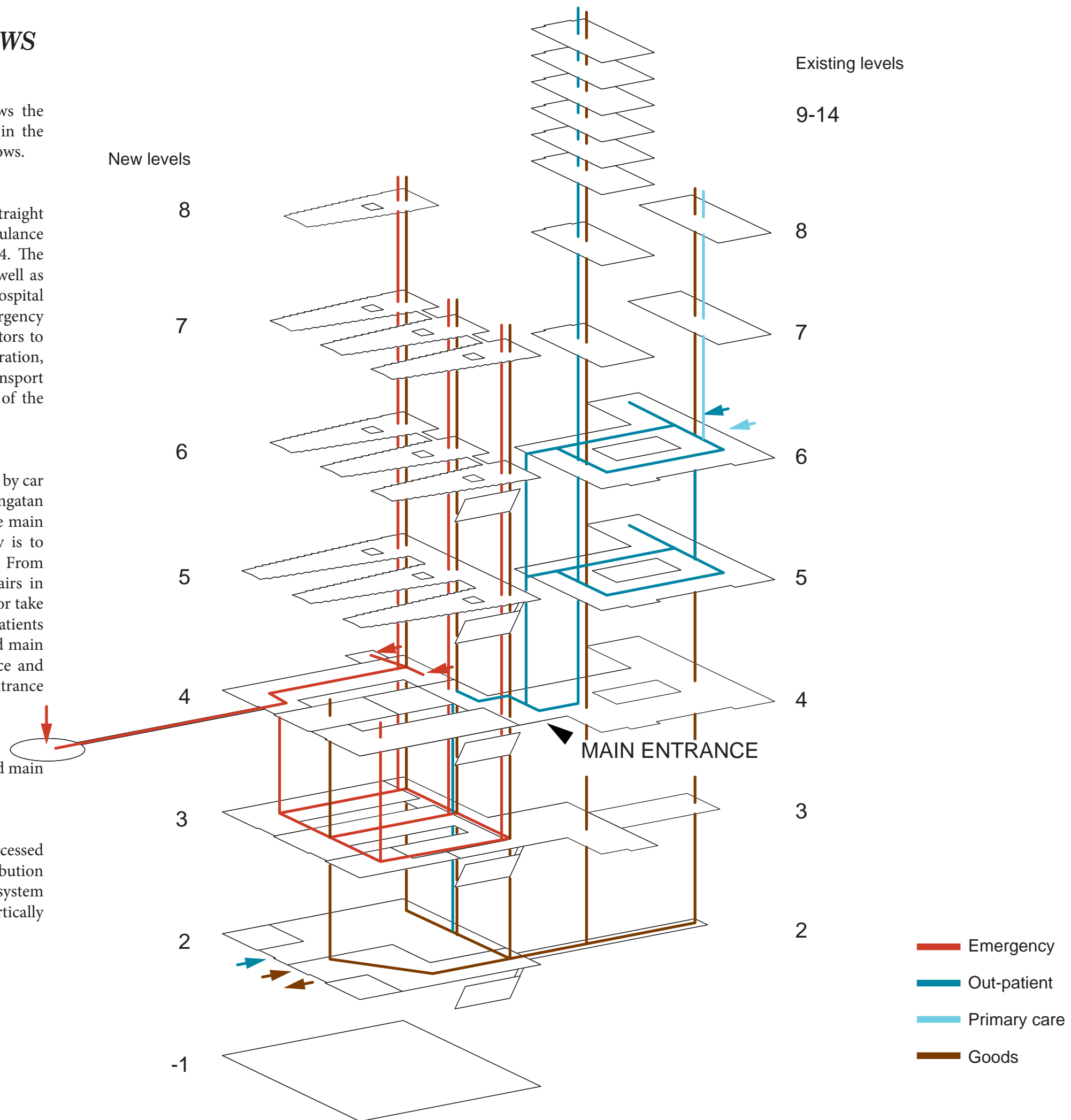
If one arrives for a visit to the outpatient clinic by car one can enter the indoor parking from Köpmangatan on level 2 and then take an elevator up to the main entrance hall on level 4. Another possibility is to arrive by foot straight to the main entrance. From the entrance hall one can move through stairs in the hall up to level 5 or 6 in the old building, or take the elevator in the highrise building. Outpatients who arrive by bus, which is located by the old main entrance on Kyrkgatan, can use that entrance and connect through a public corridor to the entrance hall.

Primary care (light blue)

The primary care centres are located by the old main entrance along Kyrkgatan.

Goods (brown)

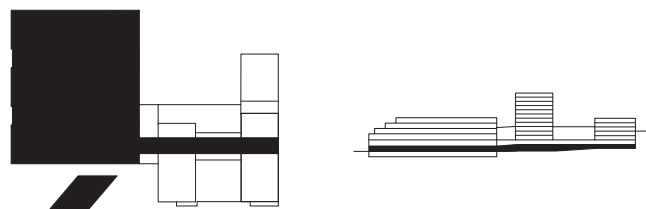
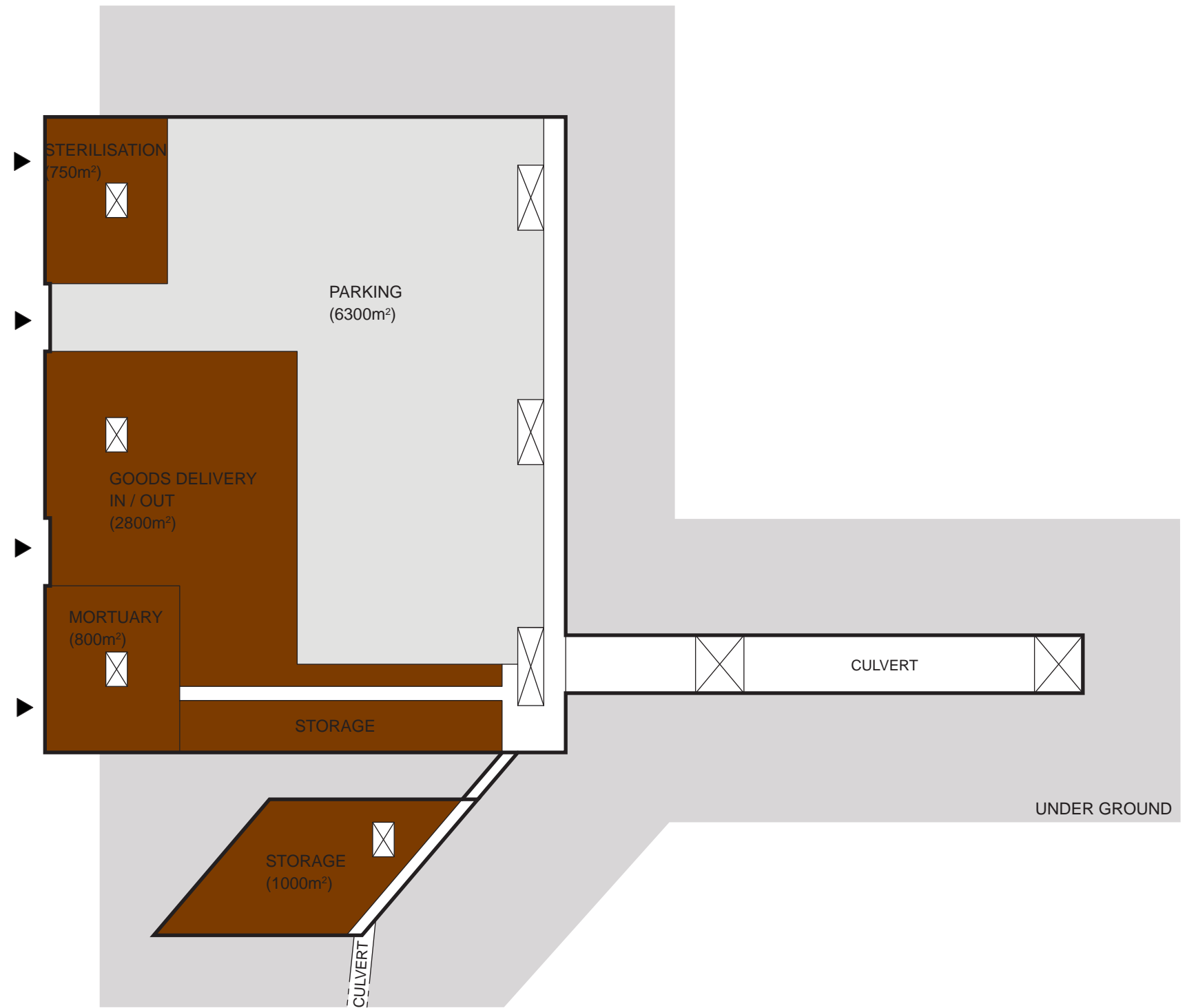
Goods delivery is placed on level 2 where it is accessed from Köpmangatan. The horizontal distribution to the hospital is done through a culvert system connecting the new and old, and then vertically brought in elevators to the departments.



FLOOR PLAN LEVEL 2
STREET LEVEL
SCALE 1:1000

Level 2 is the street level to Köpmangatan where entrances to the functions on this floor are located. An existing culvert system under the old building is on this level, and in combination with easy street access this creates good conditions for goods delivery and waste pick up as main logistical support functions to be located here. The mortuary is also located here to separate the transportation of bodies from flows of patients and visitors. Sterilization is placed on this level as it is directly underneath the operation department.

The white corridors are communication paths that do not belong to any specific department.



FLOOR PLAN LEVEL 3

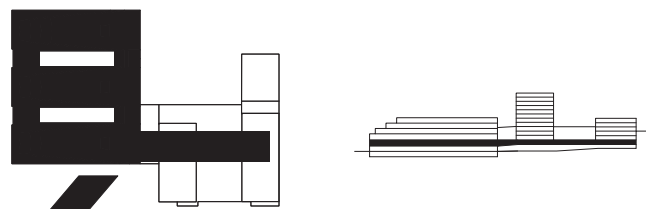
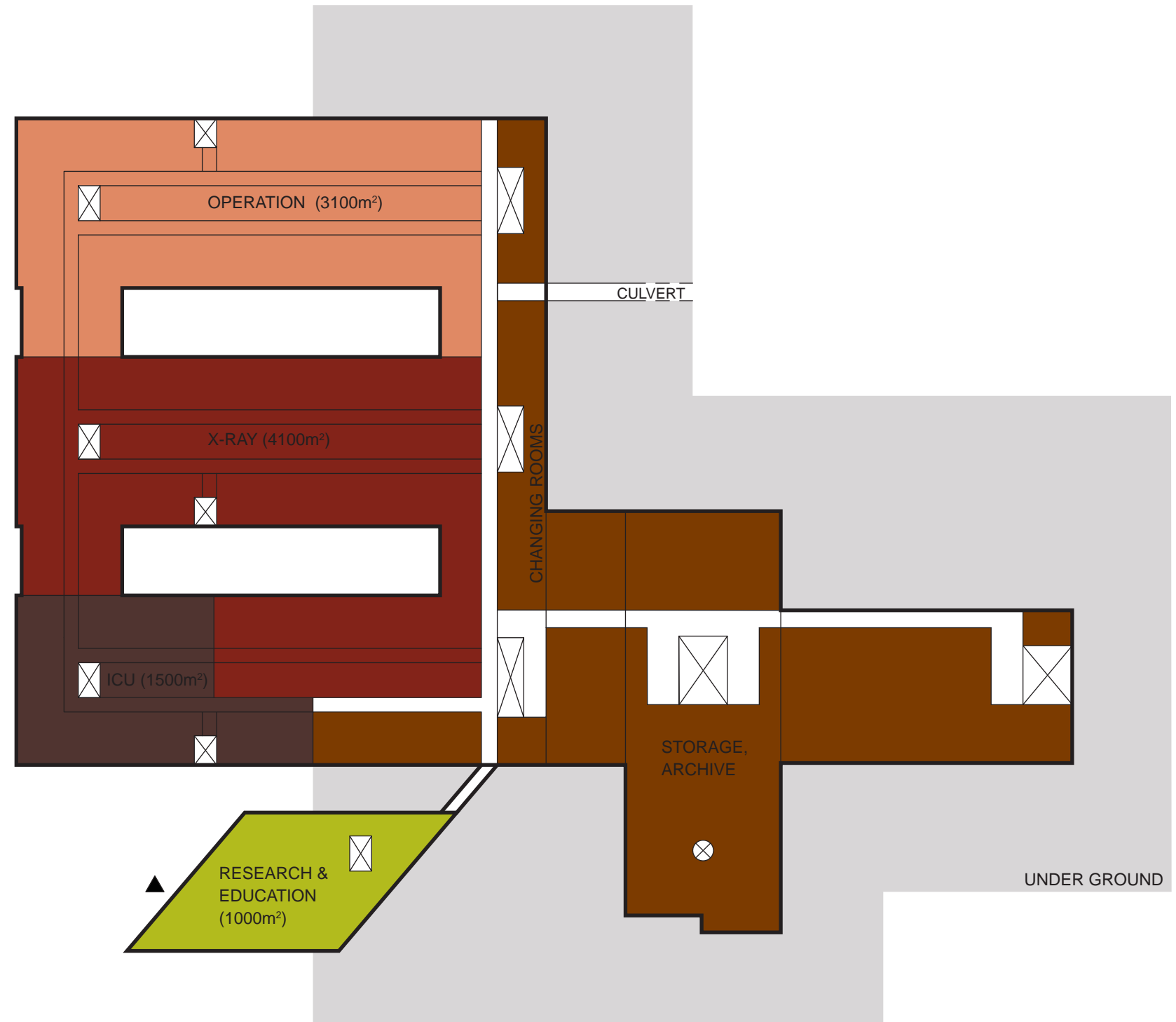
“HOT FLOOR“

SCALE 1:1000

This floor is the “hot floor” with the operation department, the x-ray department and the intensive care unit placed close to each other on the same level. The emergency unit is located straight above the operation and there are specific elevators designated for transport of critical patients from the emergency unit to this level.

As one can see the part to the east on this floor is underground and does not have access to daylight. Hence, functions where nobody spends their whole day such as changing rooms, storage and archives are located there.

The white corridors are communication paths that does not belong to any specific department, but rather function as communication spaces for movement between departments. All three main hot floor functions are possible to reach from a neutral corridor next to the three main elevator shafts.

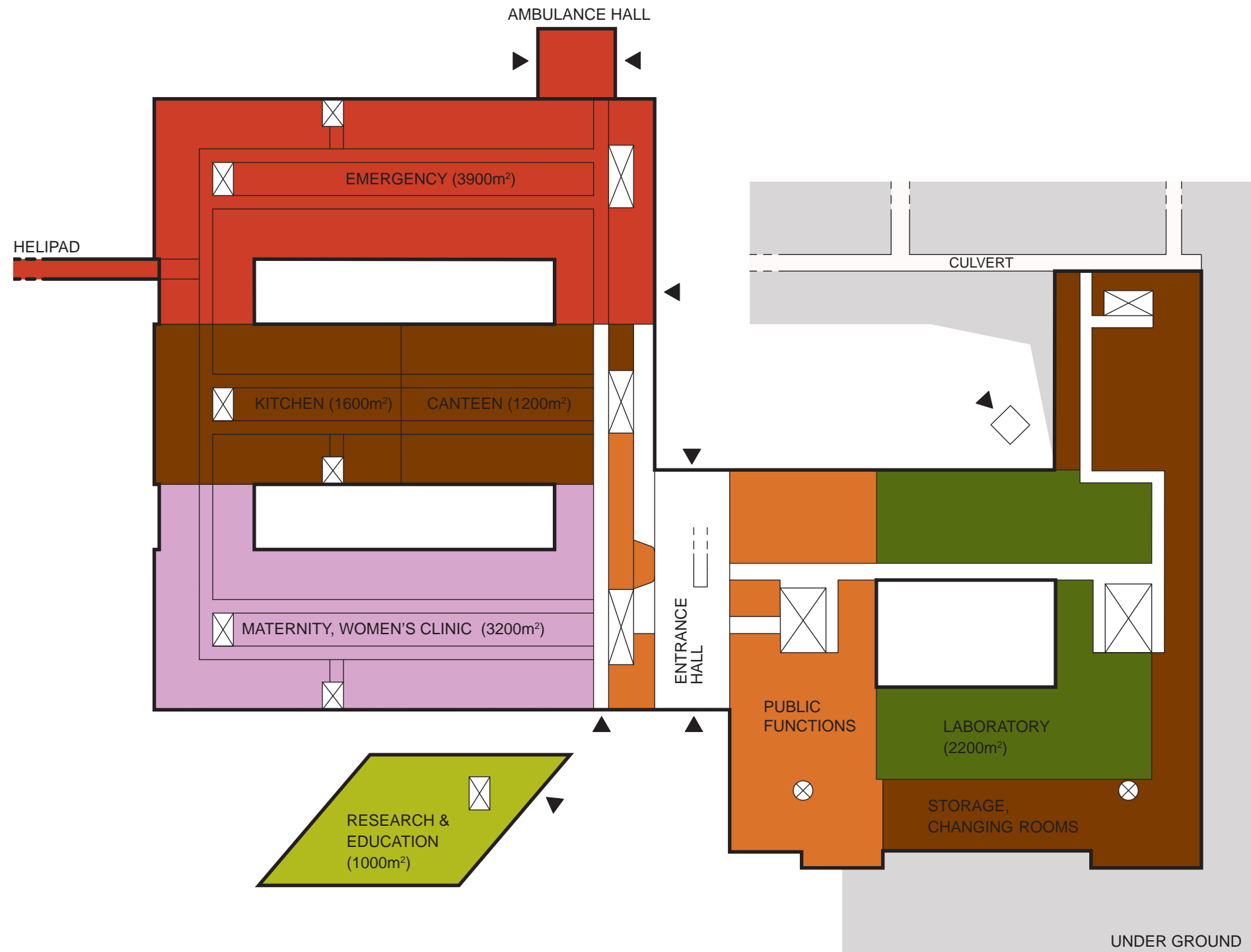


FLOOR PLAN LEVEL 4
MAIN ENTRANCE FLOOR
SCALE 1:1000

Level 4 is where the main entrance hall is located, accessible from both north and south. The white entrance hall and the white corridors are paths for movement that are neutral and used for movement people to move between departments.

In addition to the main entrance, this floor also contains several other entrances such as to the ambulance hall, the emergency unit, the helipad landing, the research and education building, and a separate entrance to the maternity department.

Around the entrance hall there are several public functions. The kitchen and the staff canteen is located on this level, as well as the laboratories. Some spaces without access to daylight exist in the old building, and those are used for example as storage and changing rooms.



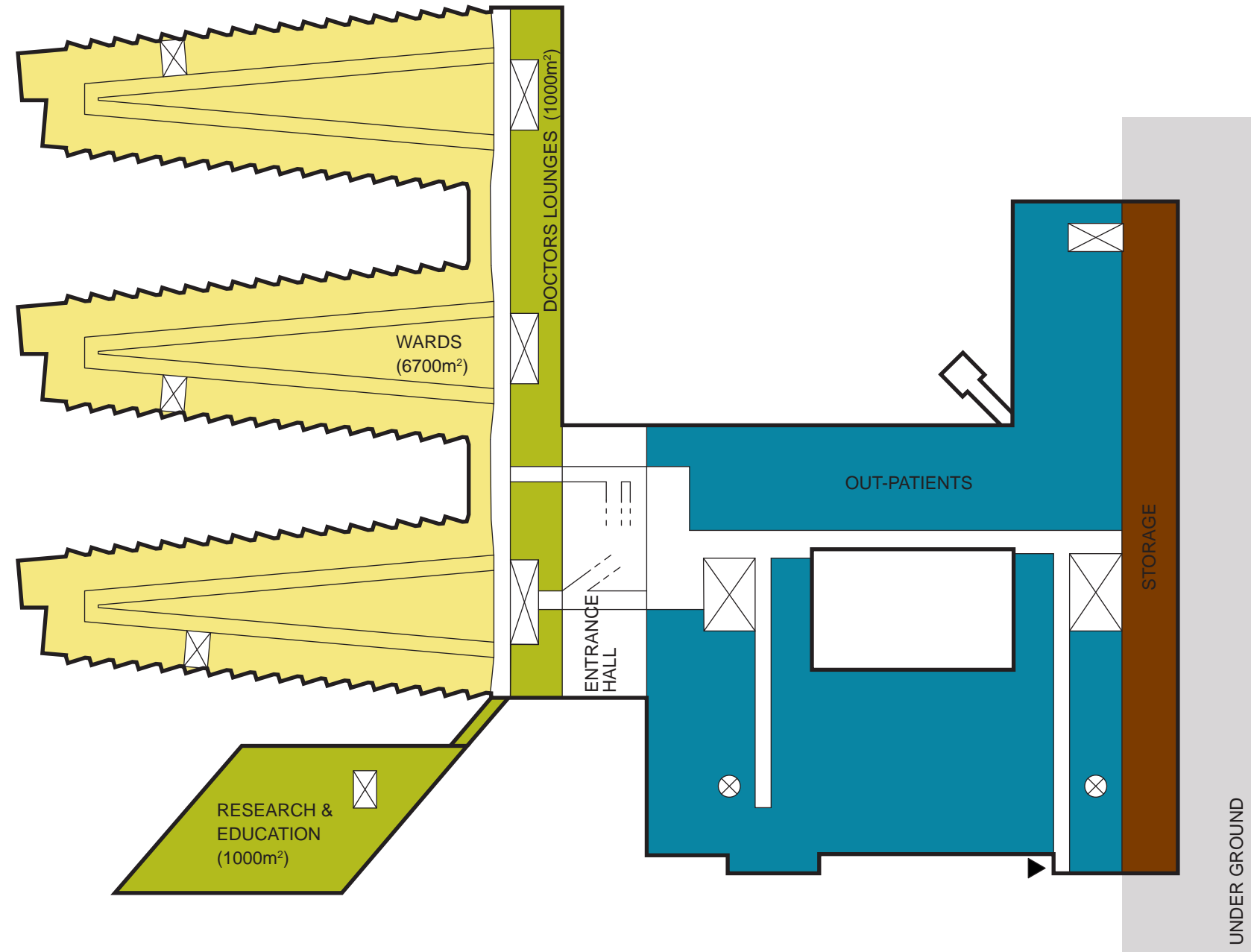
FLOOR PLAN LEVEL 5

SCALE 1:1000

Level 5 is the first floor with mainly wards and outpatient clinics. There are three wards here, each of them has 31 patient rooms.

The white corridors are neutral here as well and used for people to move between departments. There are two bridges above the entrance hall that connects the old and the new buildings.

A doctors' lounge from which the doctors easily can access the wards, the outpatient clinics and the research and education building through a skybridge.

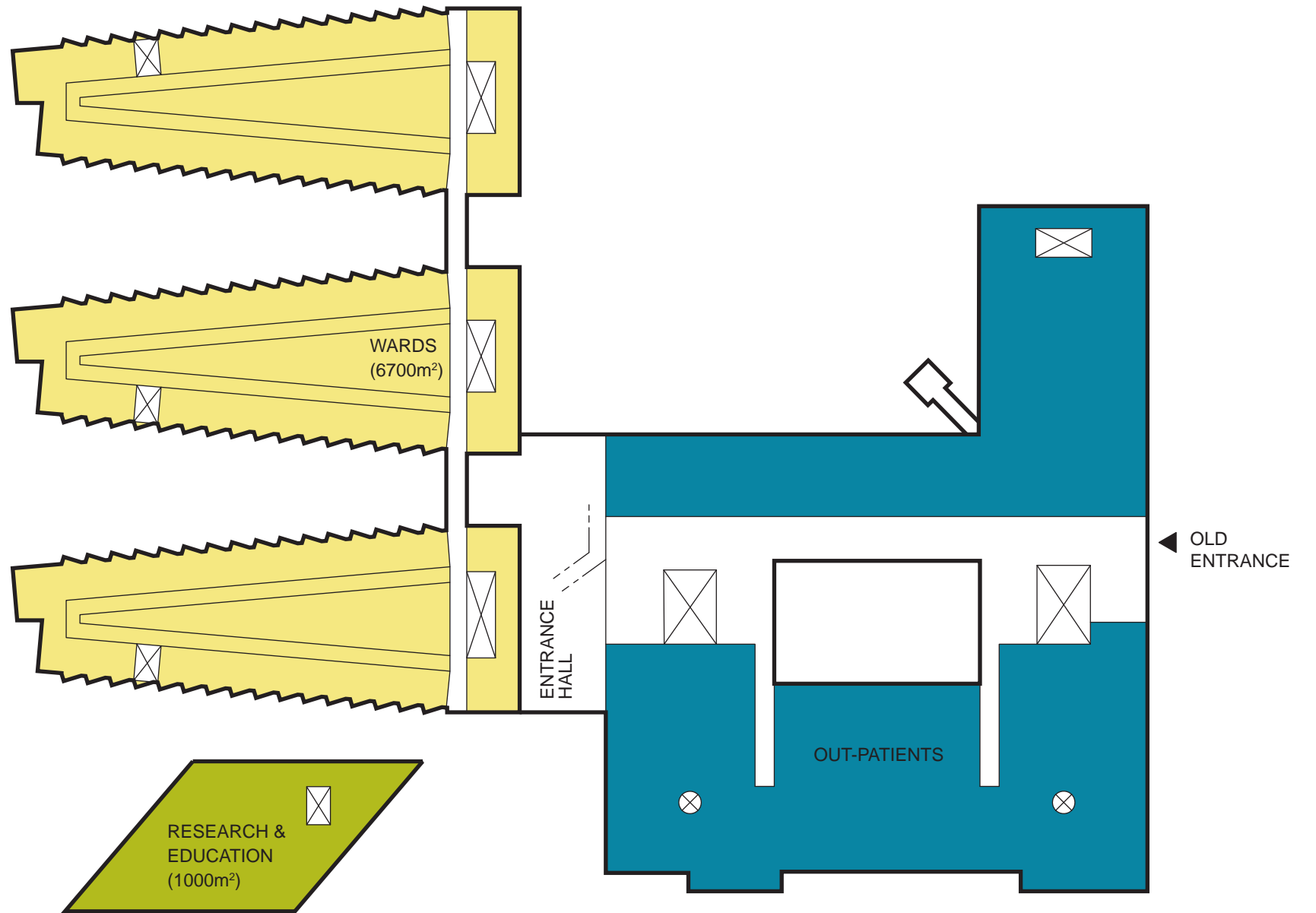


FLOOR PLAN LEVEL 6

SCALE 1:1000

Level 6 is the street level from Kyrkgatan to the east of the hospital. The old entrance on Kyrkgatan is still in use arriving to the primary care centres located on level 7 and 8 in that part of the old building. That entrance is also linked through a public corridor and waiting areas (white) to the main entrance hall. Through stairs in the entrance hall one can walk to level 5 and 4. If one is going to visit the primary care centre,

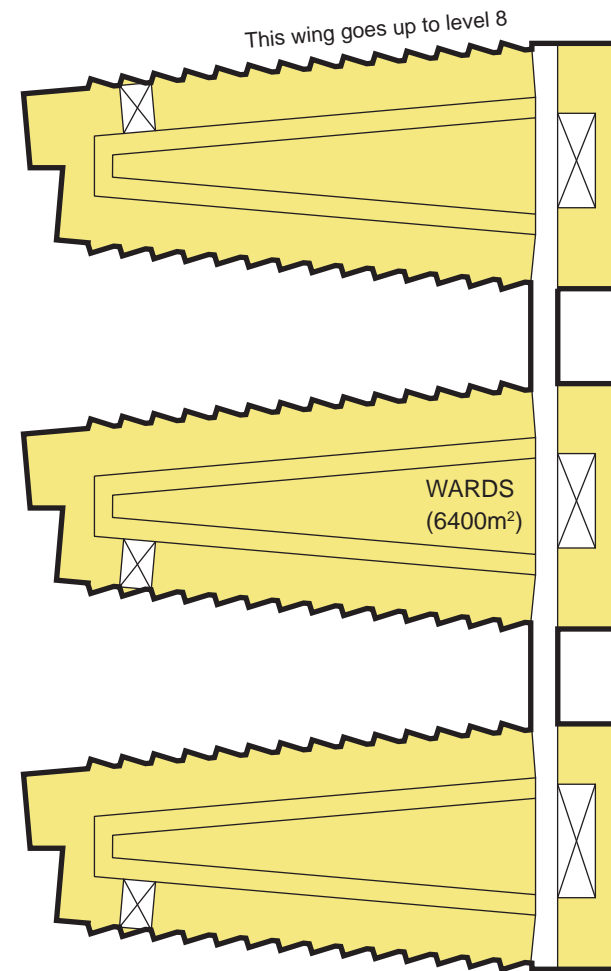
On this level there are three wards, each of them has 31 patient rooms and are accessed by the three main elevator shafts in the new building and the neutral corridor along them.



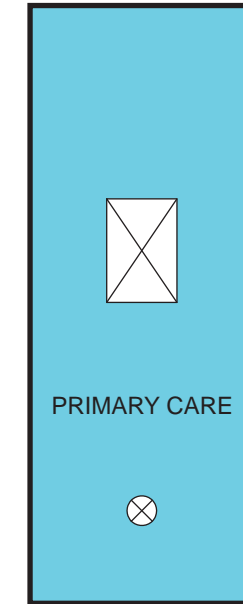
FLOOR PLAN LEVEL 7

SCALE 1:1000

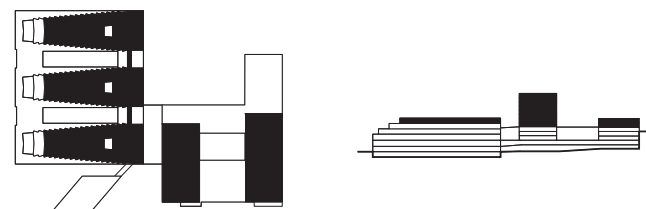
On level 7 there are three wards. Each of them has 27 patient rooms. On level 8 there is one ward with 23 patient rooms. In the existing highrise building there are more outpatient clinics on level 7-12, and on level 13 and 14 there is a patient hotel with 40 rooms. The primary care is located on level 7 and 8 in one part of the old existing building.



Out-patients 7-12
Patient hotel 13-14



Level 7-8





View from the square to the main entrance hall.

ENTRANCE HALL SECTION

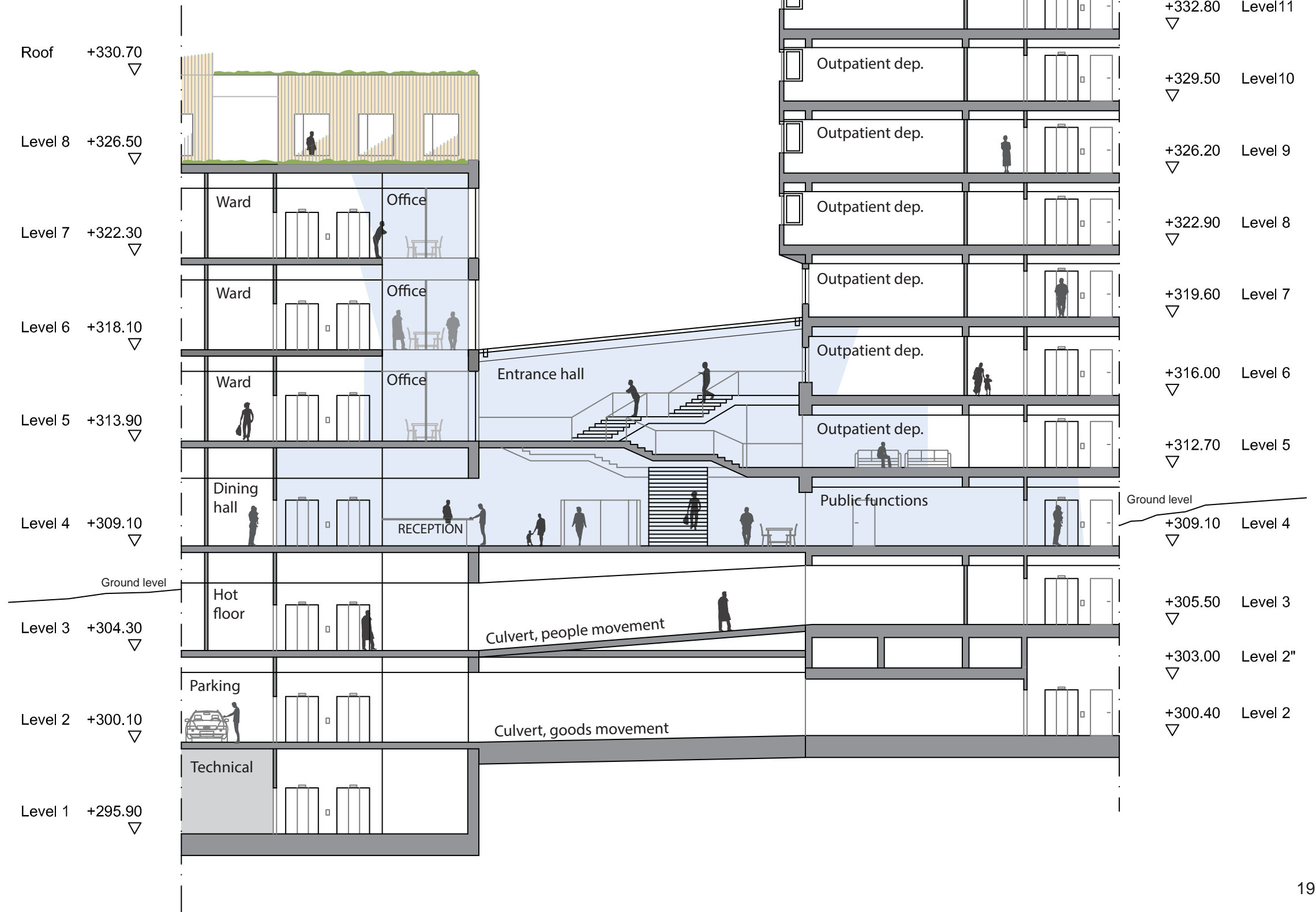
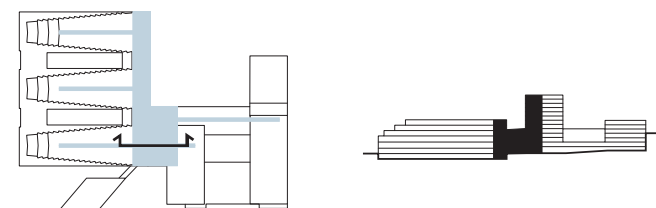
SCALE 1:200

This section shows the relation between the existing high building, the new building and the entrance hall in between.

Floor heights are always an issue when adding new hospital buildings next to existing ones since modern healthcare requires more space. The levels in the existing building are 3,3 and sometimes 3,6 meters from floor to floor. In the new building on level 3 and 4, where the hot floor functions are located, the floor to floor height is 4,8 meters. The other levels in the new building is 4,2 meters high. The entrance hall works as a connection between the old and the new building and solves the issue of the varying ceiling heights.

The main entrance is from Fältjägregränd on level 4. This is the neutral floor in the relation between old and new and the floor where the main movement of people between the two buildings happens. On level 5 there are also two connections with stairs between the old and the new. There is also a stair connection to level 6 in the entrance hall, leading to a public corridor that connects to the old entrance along Kyrkgatan. The blue color illustrates the spatial feeling in the entrance hall and how it merges existing and new.

On level 2 the existing culvert system under the old building is connected to new culverts and together they are used for movement of goods between in the hospital. On level 3 there is a culvert connection under the entrance hall which one can use for moving bedridden people between the new and the existing building.



ENTRANCE HALL LEVEL 4 SCALE 1:300

This plan shows the entrance hall and its closest surroundings. One can enter from both sides of the hall. Those who come by car enter the hall through elevators from the parking area on level 2 underground.

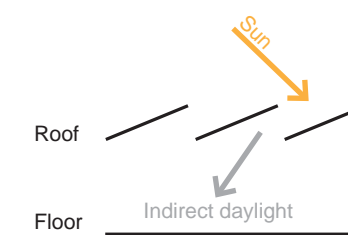
Architectural qualities in this design include the transparency of the hall that connects the park on the north side and the entrance square on the south side, indirect light experienced through the semi-transparent roof, non-institutional feeling by public functions such as café, pharmacy, kiosk, library, flower shop, art gallery and hair dresser.

The reception area is located visibly in the middle of the entrance hall. There is a close connection between the emergency unit and the entrance hall. This way relatives waiting in the emergency area with a sick relative can easily walk over to the entrance hall for a coffee or similar if needed.

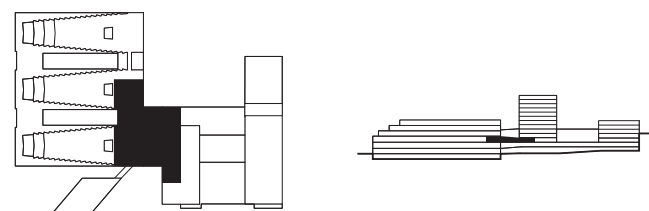
There is a separate maternity entrance close to the drop off at the entrance square for easy access for pregnant women and their company.



Roof principle



- Reception
- Public functions
- Kitchen and canteen
- Maternity, women's clinic
- Public areas

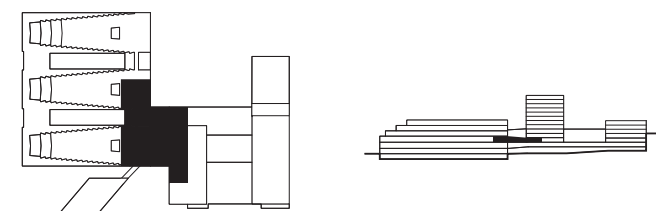


ENTRANCE HALL AND DOCTORS LOUNGE LEVEL 5

SCALE 1:300

This plan shows the areas placed straight above the entrance hall and its closest surroundings. This area is in a way partially seen as a continuation of the entrance hall. There is a stair from the level 4 to level 5. There are two footbridges connecting level 5 in the new and existing buildings to each other. One footbridge is also connected to a stair leading to the level 6 in the existing building.

The importance of short distances for doctors between different departments such as wards, offices, out-patient clinics and hot floor, lead to the idea of placing a doctors lounge (in green) in this central location on level 5. In the doctors lounge there is a variety of spaces to work in, such as one person office rooms, open office space, lounge areas with soft seating, meeting rooms and small reading rooms. There are also lockers to keep personal items in. From the doctors lounge it is easy to reach the research & education building where the new lecture hall is located. This connection facilitates for good exchange between students and staff.



- Doctors lounge
- Out-patient departments
- Public areas
- Wards

WARDS

The beautiful view over Storsjön from the hospital site is a great quality that we wanted all the wards to have since it is a quality that helps the healing process. Hence the ward floors are designed with three wings facing the lake. The wings are more narrow towards the lake, and have long facades that folds to make sure that one can see the lake from all patient rooms. One can say that the ward shape resembles a cone.

All wards have common recreation areas such as a dayroom with a kitchenette, winter garden and a balcony located towards the lake in the west. These areas will have a lot of daylight make full use of the beautiful view. A second dayroom is located next to the inner atrium in the middle of the ward.

There are four work team stations spread out within a ward. This places the staff closer to the patients. Each team has its own working station, team room, room for dictation, a space for trolleys and a WC. The common staff spaces that are used often such as medication room, disinfection, laundry and conversation room are located centrally in the ward to facilitate for easy access from all team stations. Other staff spaces such as staff room and office space is located in the back of the ward.

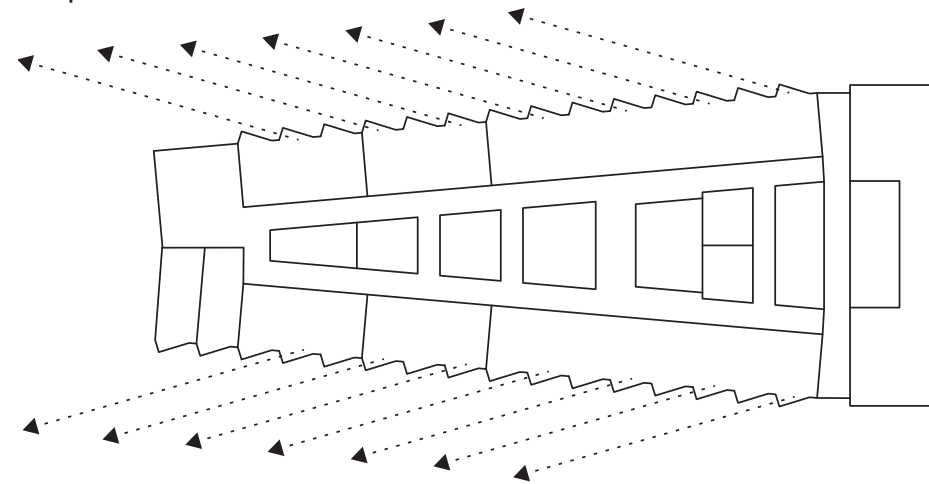
View of Storsjön and Frösön from the hospital site



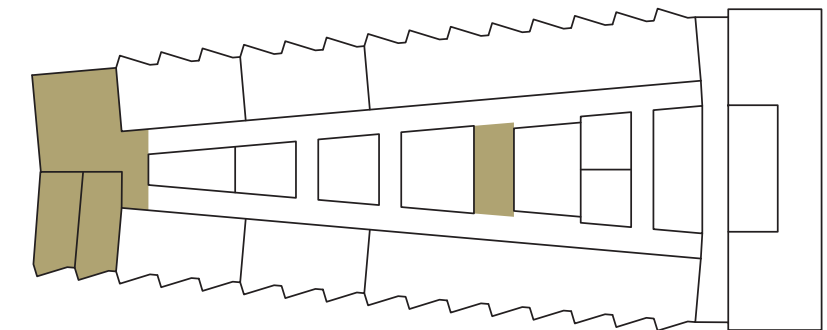
Volume - concept of a cone



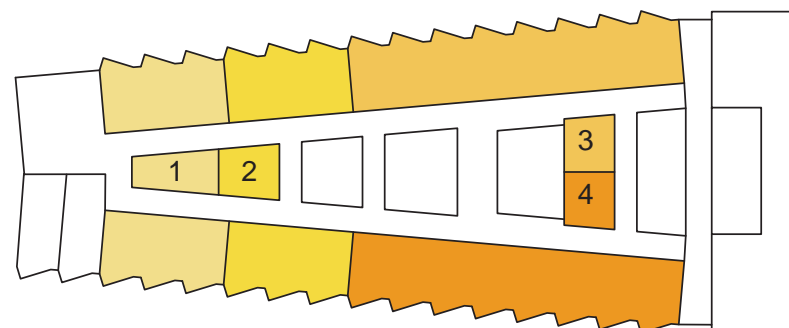
View towards the lake through a private window from all patient rooms



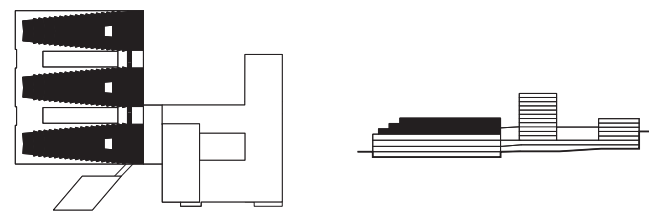
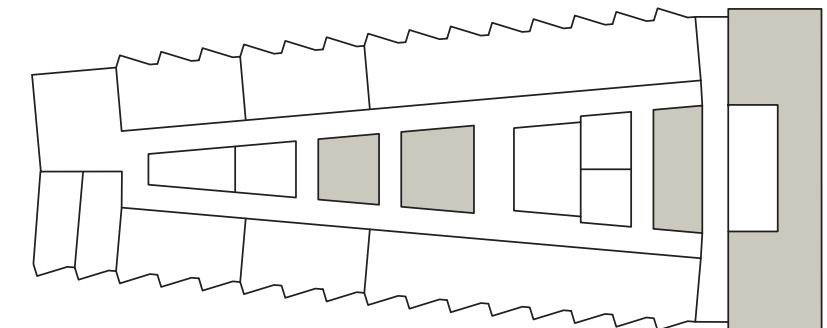
Common recreation areas



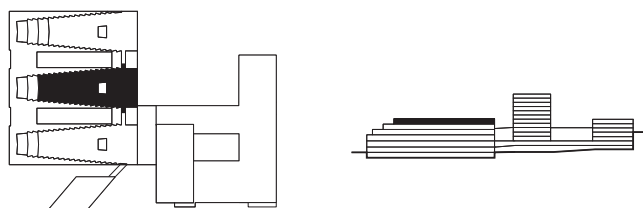
Four work team stations



Shared staff areas



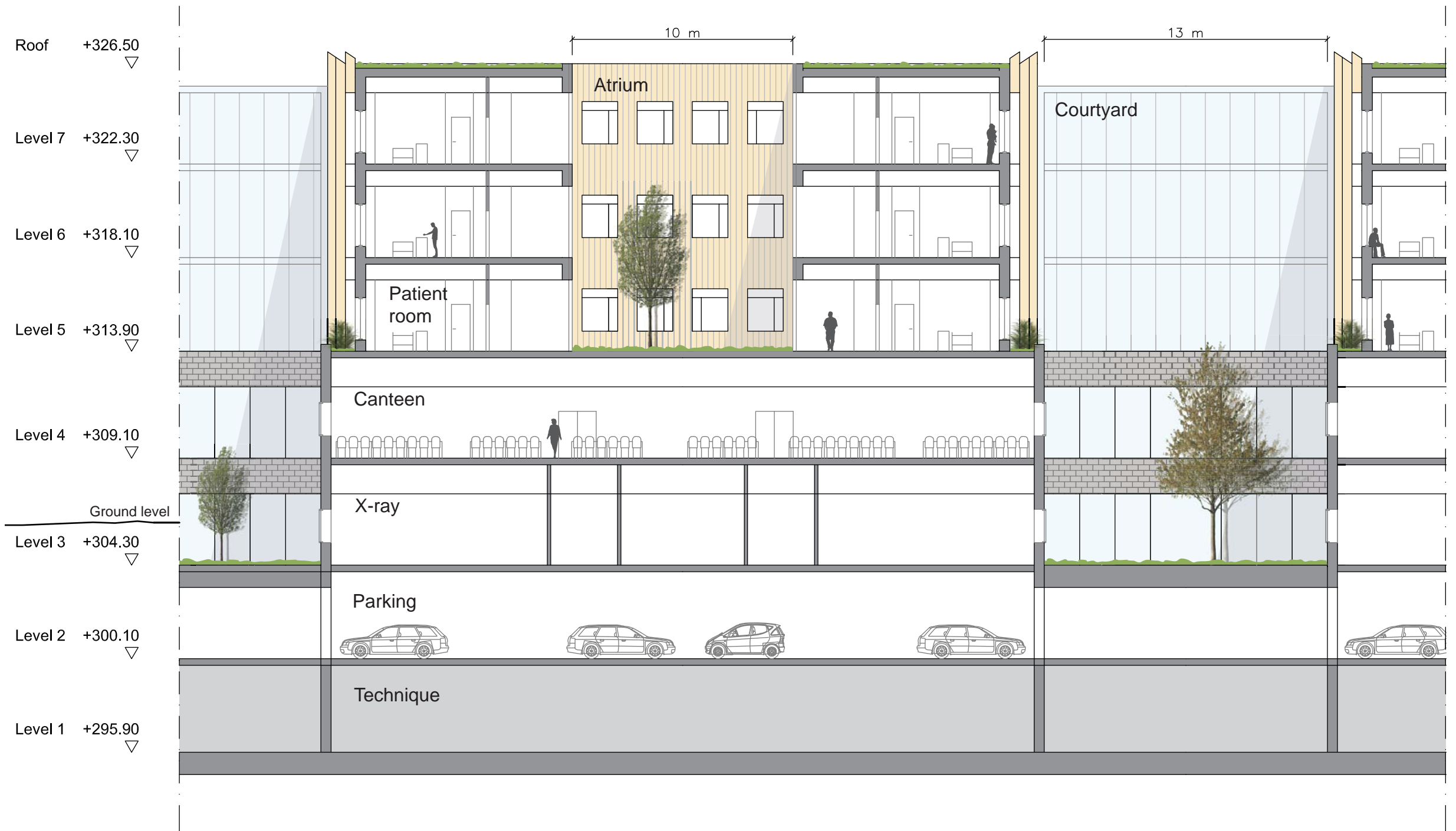
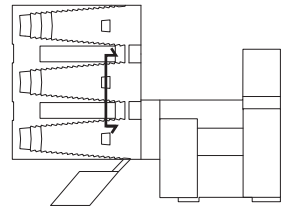
WARDS
MIDDLE CONE LEVEL 7
SCALE 1:200





View from a corridor towards the dayroom, winter garden and balcony.

WARDS
SECTION
SCALE 1:200



PATIENT ROOM

The rooms are designed using evidence based design. All rooms are single patient rooms. In the room there is sufficient space for the patient, work environment requirements are fulfilled, and there is also plenty of space for relatives to be present in the care.

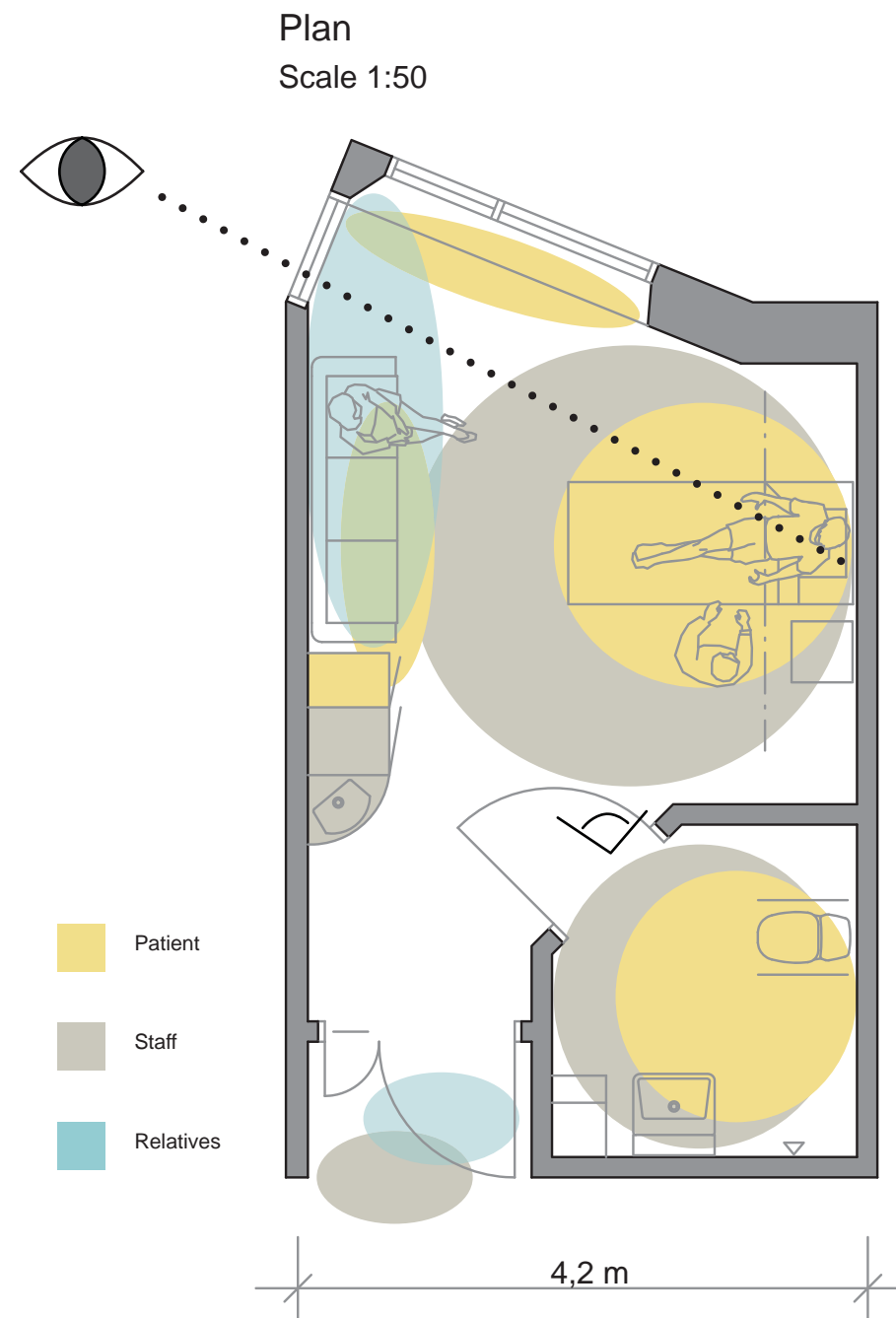
Each room has its own large bathroom which in addition to a sink and toilet also is equipped with a small desinfector. Inside the room the sink for staff to wash their hands is highly visible when entering or exiting the room, and at the same time a bit away from the patient's private zone by the bed. There is also a

medical storage inside the room, only accessible by staff. Above the bed there is a ceiling lift to make it easier and safer to help patients out of bed if needed. Along the wall above the patient is a technical panel with access to oxygen, electricity etc. The patient has a wardrobe in the room to store personal things. The sofa in the room can be used as a bed for a relative wanting to stay over night.

The rooms are also specifically designed to make it possible for the patient to have a view out over Storsjön and Frösön from laying down in his/her

bed. The view is through a floor to ceiling window which also lets in a lot of light to the room. This floor to ceiling window is private and not possible to look in through for people in another ward across the courtyard. The outer wall is 450 mm thick and hence has a deep windowsill that one can sit in and enjoy the light and view. The facade on that wall has timber slats on the outside, out of which some also go up in front of the part of the window closer to the patient, providing him/her with additional protection from being seen by people across the courtyard.

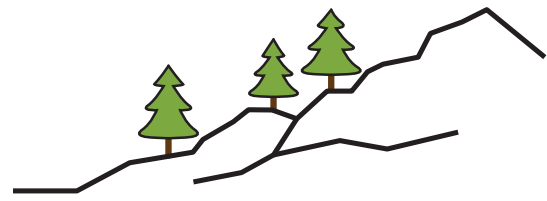
The features incorporated in the design of the patient rooms are together proven to reduce the risk of infections, the perceived pain, the depressions, the medical errors the patient falls, and the staff injuries. It also improves the sleep quality, the patient satisfaction, the staff-patient communication, and the integrity of patients. The wish is that the patients in this hospital will be happier and heal faster!



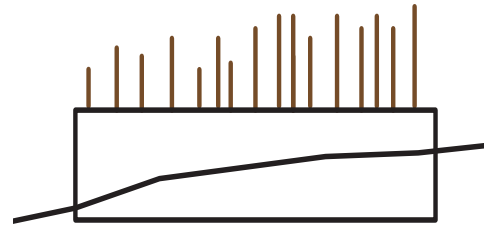
View in a patient room

FACADES & MATERIALS

Design concept



An abstract interpretation of Jämtland's nature.



Transforming it into a simplified concept - solid base, light weight top.

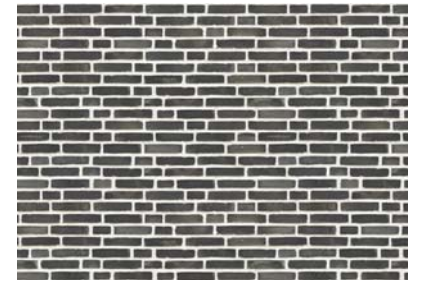


Taking this into a building the result is a solid structure with a light timber facade on top. To loosen up the border between the two expressions, greenary will work as a transition.

Materials



Dark grey brick wall



Dark grey brick wall, light mortar



Timber slats



Green roofs

Source for material pictures:
 Slow Horse by ELASTICOSPA+3
konradcallmer.blogspot.se/2012_01_01_archive.html
www.petersen-tegl.dk

Facade facing south

Scale 1:500



Facade facing west

Scale 1:500

