

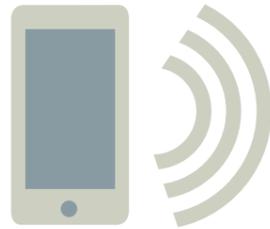


**THREE STRIPES**

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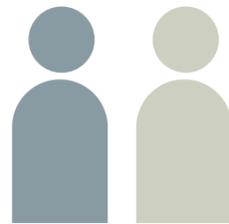
Personal and Digital



Digitalization

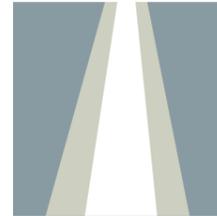


Individual

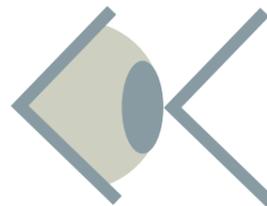


Meeting

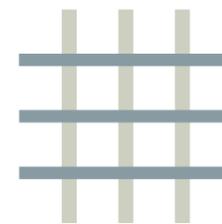
Healing Environment



Light

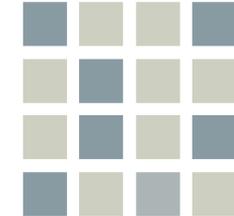


Views

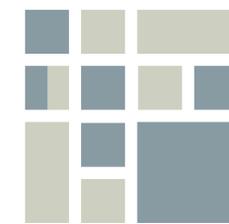


Orientation

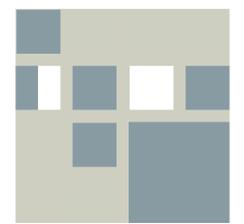
Future Proofing



Generality



Flexibility



Transformation

Modern healthcare faces an ever changing environment as its technological, theoretical and practical tools are in constant evolution. Therefore, the hospitals being built today need to be future safe for possible technological and practical advancements for the upcoming 50 years. As architects, the designers of the built framework for these tools, it is equally important as for doctors and patients to understand and implement these advancements continuously.

As a result, the healthcare architecture is facing difficulties today in the sense of predicting what the future could look like, what types of spaces and equipment that are needed and even how the healthcare system could be structured in general. Some aspects are, however, more certain where the future will clearly face a more digitalised healthcare system meaning increasing the patient's engagement in the process and treatment. Additionally, this digitalisation will affect the architecture and room types in hospitals. A possible outcome might be new types of meeting spaces as the traditional doctor-meets-patient in examination rooms might be replaced by virtual correspondents; heavily decreasing patients' need of coming to the hospital at all. Alternatively, meetings could be increasingly held in groups where the patient meet others of similar status. Finally, digital self-sampling also has the potential of both great time saving combined with an increased patient-engaging process.

The hospital environment is proven to be of high importance for the healing process of the patient. Therefore the architecture is of greatest concern when designing and planning for the future. Within this, several aspects have been proven to be vital when it comes to patients' healing time and comfort, but also for the staff who naturally spend the largest amount hours at the hospital.

Two architectural aspect is the amount of daylight and the views from the spaces. In rooms where these score high, patients tends to spend less time at the hospital, they recover more quickly. Another aspect relating to patients' comfort is the possibility of orientation where a building which is understood as comprehensible and easy to orientate within, increases patient comfort.

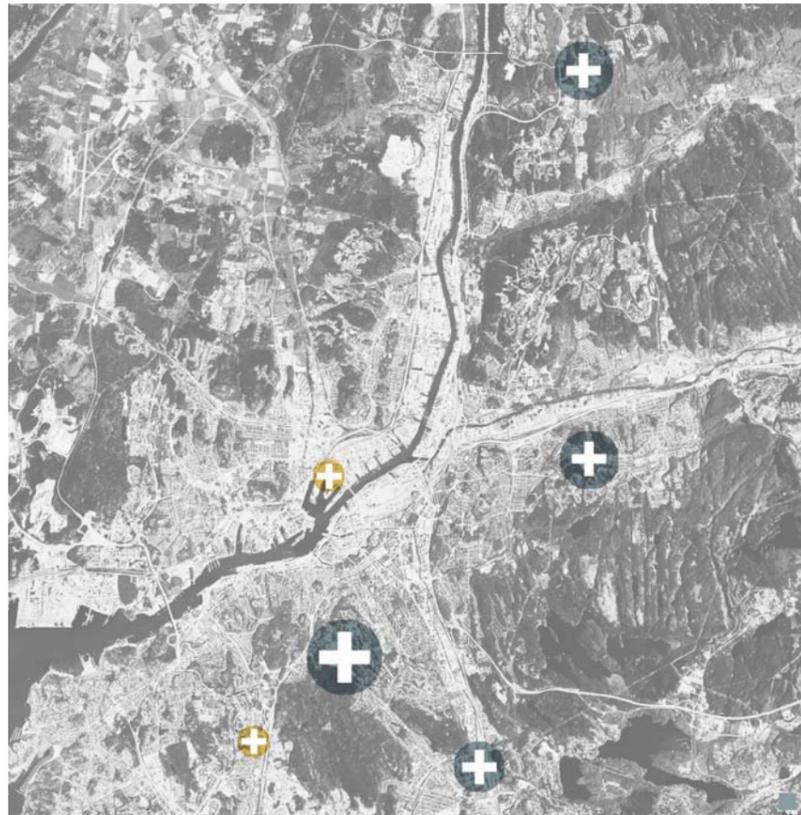
Additionally, an aspect for a good healing environment is the contact with greenery and nature. Access to these qualities has a positive effect on patients' healing process while also creating a better working environment for the employees.

When it comes to healthcare architecture it is of greatest importance with future proofed systems, both when it comes to new technology but also changes in the healthcare organization. Generality and flexibility is important goals to achieve in order to offer rooms and structures which are able to adopt to different functions and activities over time.

A flexible structure makes it possible to change the room arrangements and different hospital departments gets opportunities to expand into each other and share rooms when it is needed. A construction system which makes it possible to increase or decrease the room sizes undisturbed by columns or façade helps the building to adapt for future knowledge and technical equipment.

The large hospital structure needs to allow changes without excessive reconstruction also in a long time perspective. In the future, when digital healing system are more developed, the need for healthcare buildings might decrease and hospitals will be reconstructed into something else. Therefore a general structure that could work for multifunctional uses is preferable.

Region Overall Planning



The Regional Council has decided to support a development and strengthening of the local health services in Gothenburg area by establishing a functionally and cohesive care system outside the acute hospitals. The new hospital system should consist of two new specialist hospitals containing specialist centre for somatic, psychiatric, prevention and habitation activities and a day surgery centre. The two new hospitals will be built in Frihamnen and Högsbo and are supposed to relieve the larger hospitals in Gothenburg today. The plan is to gradually move an equivalent to 10,000 operations from Sahlgrenska University Hospital for day surgery outside the hospital.

The background for the new hospital system is the population increase which, according to the forecast, will reach 80 000 people in total over the next five years. This means that about 100 000 more specialist visits will be carried through annually compared to today. At the same time, more of the open specialist care need to occur outside acute hospitals as a way to increase cost efficiency and to add value for the patient by improving accessibility and continuity. The region needs to invest in new premises and new equipment.

The premises at Frölunda Specialist Hospital and Capio Lundby Local Hospital are outdated and need to be replaced.

The specialist hospitals, together with Angered Local Hospital, form the basis for a functionally coherent local healthcare system integrated with primary care, emergency care and municipal health and welfare.

Frihamnen

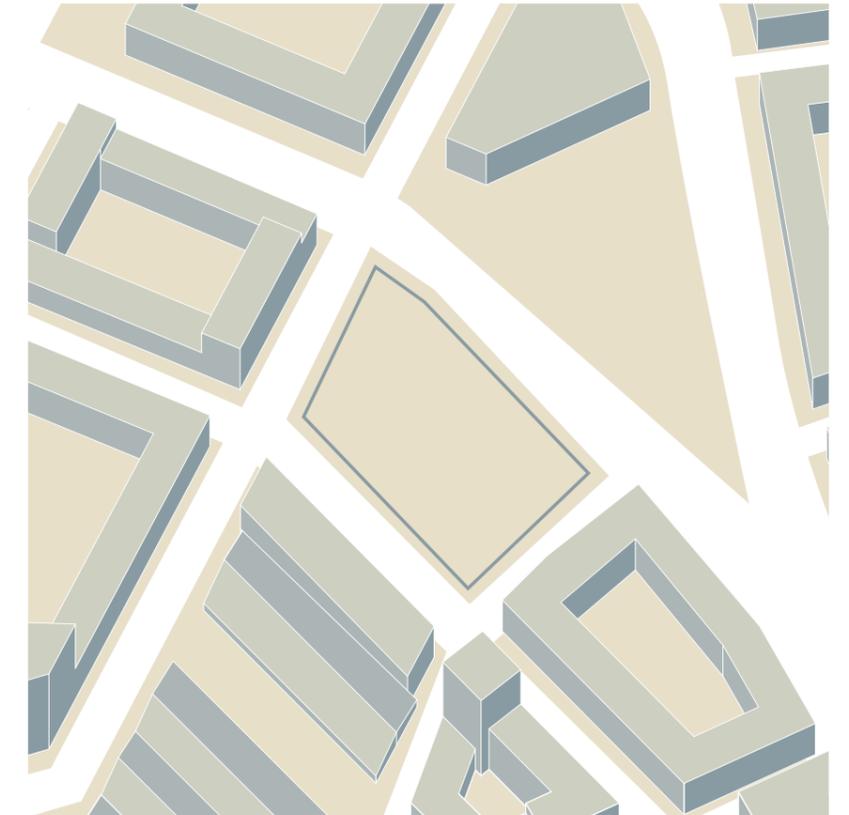


Frihamnen is located in the city centre of Gothenburg on the north west side of the river, on the island of Hisingen. It is today part of Gothenburg harbour and consist of three piers, separating the area with water and only a couple of lower warehouses is located on the site. The new development of Frihamnen, with the first phase to be finished for Gothenburg's 400 anniversary in 2021, will connect the centre of the town with the new areas opposite the bridge, Kvillebäcken, Lindholmen and Backaplan. An axis from the new bridge abutment leading toward Hjalmar Brantingsplatsen will be characterized by higher buildings, average 6-14 floors, meanwhile further out, closest to the water, will carry a lower structure.

The ambitions for the new Frihamnen is a sustainable area with a mix of housing, offices, commercial and culture, and a variety of building types; high and low, open and closed courtyards. Focus for the developments of Frihamnen has also been to create a car independent area, where it should be easier as residents to live without a car, without completely closing off the traffic.

The new area will have 15000 new residents and the same amount workers. The building project is divided into several stages where the first should be finished in 2021. By then 1000 dwellings and 1000 workplaces should be ready as well as larger amount of the new jubilee park. The park and the area will there after continue to grow with about 400 apartments and 15000 m2 facilities/offices will be built annually.

New Specialist Hospital



An increased focus at the local healthcare involves conversion-strategy where hospital specialists become more involved and supportive of the care that is provided outside the hospital, in patients homes or in primary care. Some of the open specialized care that is currently conducted at acute hospitals should move out to other forms of healthcare closer to patients.

The main base for the new hospital is primary care with health centers, child and maternal health and health promotion- and prevention operations. A local health care system with high quality and availability requires a well-developed cooperation between primary care, the open specialist care, emergency care hospitals, regional hospitals, municipal health care, as well as the institutions responsible for research and education.

Calculations are made so that the new specialist hospital in Frihamnen will have 100,000 doctor visits and the capacity of up to 6000 day surgeries annually. The hospital will be supplied with 6 operation theatres. The new hospital will consist of several specialist departments such as specialist care for adults, specialist care for children, pain center, neurology, psychiatry, gynaecology, endoscopy, day-care, X-ray, orthopaedic, sampling & laboratory, primary care, rehab, dialysis and dentist. The estimated floor area for the hospital is 25000 m2 where the bottom floor will be fully used for commercial activities.

# QUALITIES TO ACHIEVE

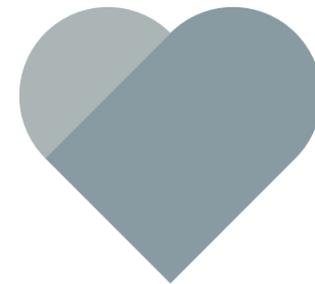
## City



## Building



## Person



Openness



Unexpected



Character



Flexible



Comprehensible



Light



Meeting



Individual



Team

Locating the new nearby hospital in the heart of the new Frihamnen is a statement on its own. The hospital of the future needs to be of easy access and close to its citizens, but also a part of the urban life around it. The new building needs to be inviting and open to its surroundings. Inviting the citizens into the building, not only for doctor visits, but also for pure leisure. The hospital will not be the only function in the building, but also shops, gym, cafés, restaurants and educational spaces.

The urban location of the hospital also requires it to give something back to the street-life, to enrich its surroundings. Healthcare is a field constant change, that is something the new hospital should be able to convey to passers-by. A light phenomena, a intriguing facade or a complex volume could be something unexpected, which could convey just that.

All in all, the building should by its inviting openness and an unexpected element be able to become a strong character in Frihamnen. A caring and loving character which can be part of the everyday life in the streets around and a symbol for the health of Gothenburg.

As all large structures, hospitals need to be flexible and resilient to change. Measurements needs to be carefully chosen to be able to accommodate different spacial needs of different uses. A rigid and regular structure with great flexibility is a top priority.

Due to the intensive use of patients and people not familiar with the spaces, comprehensibility is an important quality. Comprehensibility can like flexibility be achieved through simple forms, which gives clear ways of moving, but comprehensibility also needs disturbance, something that breaks the pattern and forms landmarks.

Abundant daylight is of great importance for health of both staff and patients, but also for the experience of the building, making spaces to enjoy. Where there is light there is also darker and darkness can also be used to emphasize the light itself. The building should be able to offer both darkness and light. The contrast between darkness and light could become a character trait of the building, but also help it to become comprehensible. Light could also brings a poetic dimension to the flexible layout, creating atmosphere.

New techniques and ways of working and receiving care are constantly changing the healthcare. In the middle of this constant wave of new information stands the individuals, trying to figure how this effects their own situation. One thing we can know for certain is that working together, helping each other out, will help us to face these challenges.

The building must be able to support meetings and cooperation between staff, but also between patients and staff, healthy and less healthy. Breaking borders in-between departments will increase the cooperation in healthcare, supporting innovations. Meeting and supporting new ways of working will put emphasis on the team, giving individuals ways of cooperating.

The team spirit is important, but both patients and staff needs a personal space to feel comfortable and content. The building must also offer spaces where one can be alone, be concentrated or just relax. Individual rooms for all patients during all health service and individual workplaces for staff could be strategies to attain that.

# THE NEW WATERFRONT OF GOTHENBURG

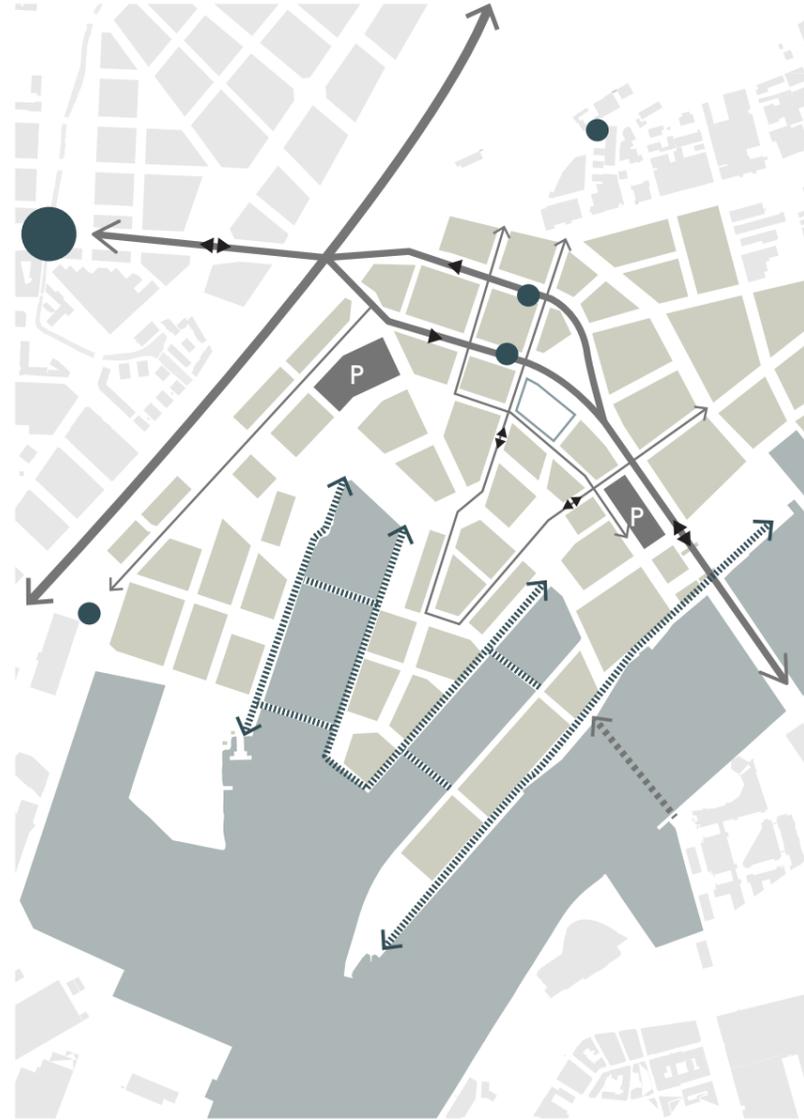
## Green



Green areas

In the middle of Frihamnen the new jubilee park will be situated where a larger part will be a green area. The new park will surround an urban swimming pool which establishes water contact from the park. Smaller green areas mainly connected to the new schools and pre-schools will also be located around the new area of Frihamnen. These green areas will be semi-private, used by the school during daytime and open to the public the rest of the time.

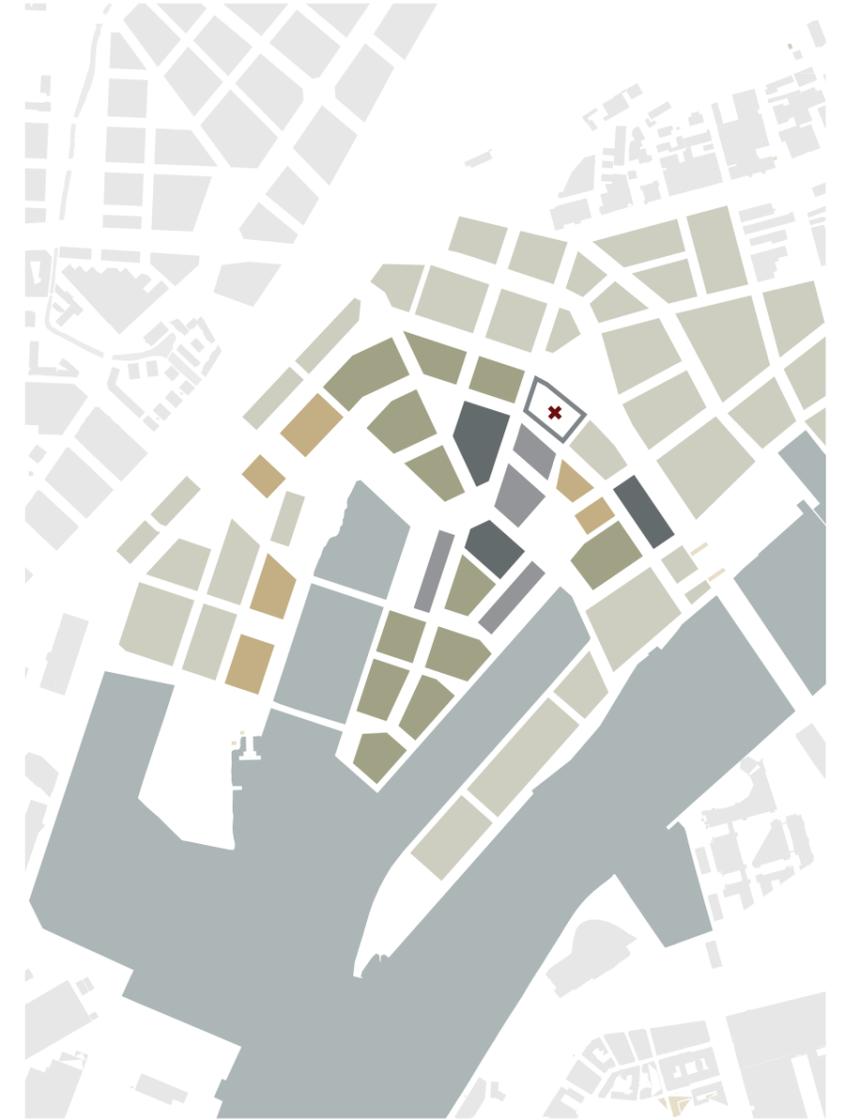
## Movement



Pedestrians Cars Bus/tram stop

Frihamnen will be an area where pedestrians and bicycles are prioritized and the street network will be dimensioned after that. The traffic environment will hence be planned to make most journeys possible by foot, bicycle or public transport. Thus, the car traffic will be limited in the area and parking is suggested to be concentrated in parking houses in the outskirts of the area.

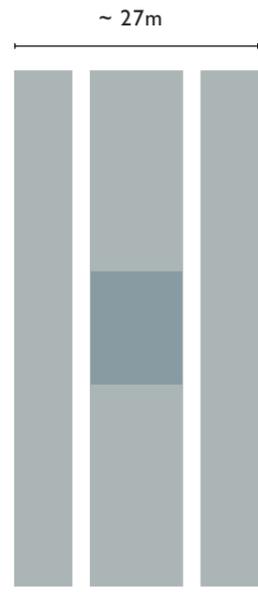
## Structure



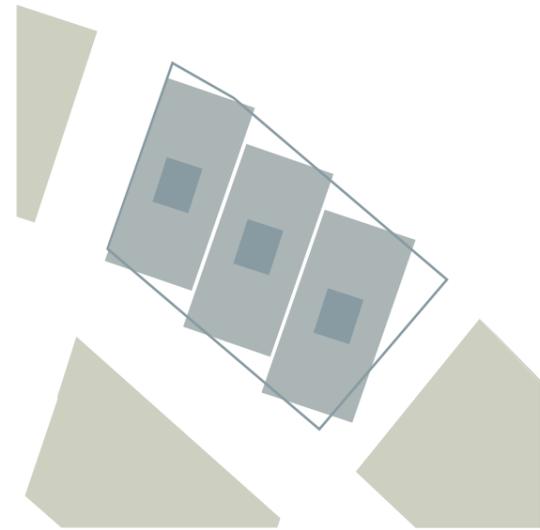
Housing Existing buildings Pre/School Other

The new area of Frihamnen will be a mix of housing and offices/commercial areas. A few of the existing buildings on the site will be remained and integrated into the new urban area. Except for the new hospital, new apartment buildings and offices, there will also be new schools, pre-schools, a church, hotels, sport hall and parking houses on the site. A new public transportation hub will be located directly outside of the hospital.

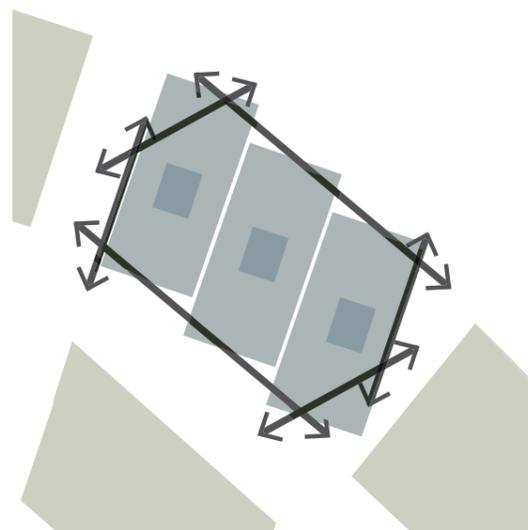
## DEVELOPING A CHARACTER



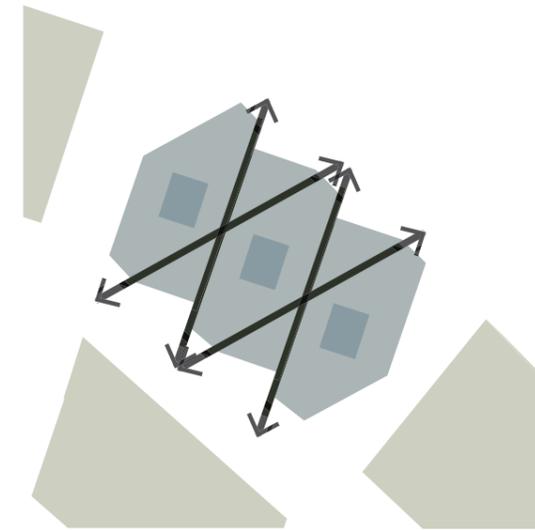
The Lamella  
-Double corridor



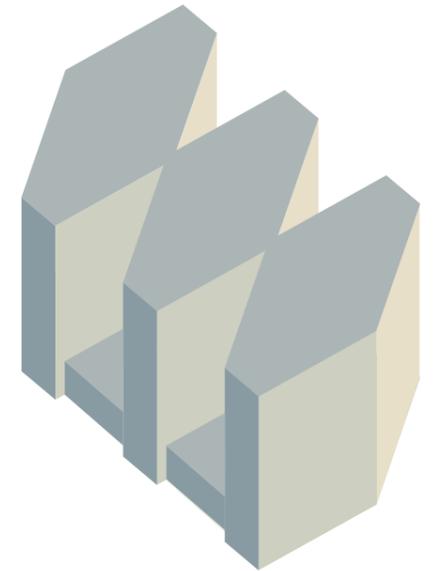
Three Lamellas



Adjustment to site



Light and views



Final main volume

### The lamella

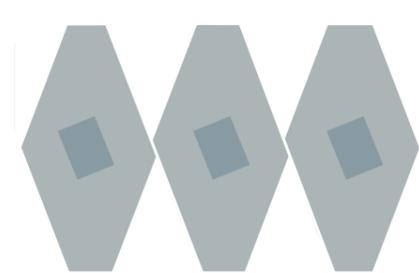
Starting by exploring and developing a well-functioning shape considering the program, different kinds of room types and functions in need of daylight etc. we decided to start working with an ordinary two-corridor lamella that would be between 25-30m wide. It is a classical shape within hospital design that holds a darker core for the functions not in need of daylight; elevators, shafts and storages, and two sides that will hold the most frequently visited program in need of daylight; the patient rooms and the administration areas. The two corridors could make a hierarchy in where staff and patients move. The width of the lamella is in our case mainly depending on how wide the patient rooms can be and also the width of the given plot.

### The volume

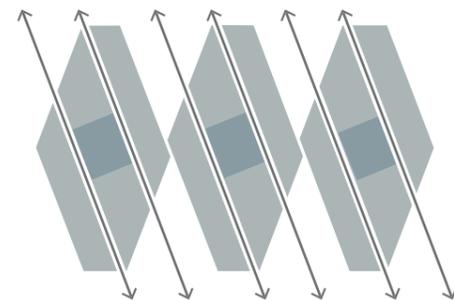
Placing the in the same direction as the western outline of the plot made it possible to fit three lamellas at the given site. By analysing the site and possible flows adjustments to the site were made by cutting off the north-west and south-east corner of the lamellas. To create as much daylight and views as possible a central part of each lamella were cut out and a light shaft was created. The final main volume consist of three equal sized diamond shaped bodies with a central core in each of the three bodies. The first three floors are expanded with the area of the light shafts to fill with more translucent spaces. The functions for these floors are in need for more floor space and the building gets a flat side towards the main square.

### The floor plan

The three bodies connects with one main corridor that will functions as the main horizontal communication on each floor. The main corridor will also function as a meeting place where along the axis larger and smaller places for meeting will be located. Corridors as from the original two-corridor system will function as feeding corridors to the main axis. These corridors will be semi closed in contrast to the larger main corridor and also from where you reach all patient rooms. As an addition to the feeding corridors, the three bodies will be connected with fast cross-connections to simplify the flows and orientation. The final horizontal communication pattern creates an easy-orientated structure so that wherever you are on the floor you should always be able to look out.



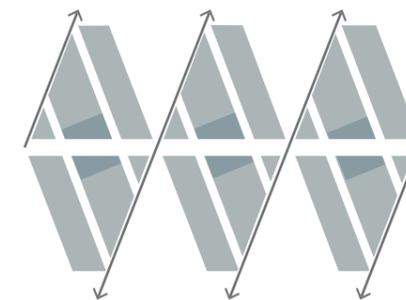
Three bodies



Feeding corridors



Main axis



Fast cross-connections



Plan figure

# URBAN POSSIBILITIES

## Building and the Surroundings

Looking at the urban scale, the new hospital will be higher than the majority of the buildings in Frihamnen but, with its nine floors, in matching height with the highest buildings in the area. It will be visible from the other side of the river and a new landmark of Frihamnen.

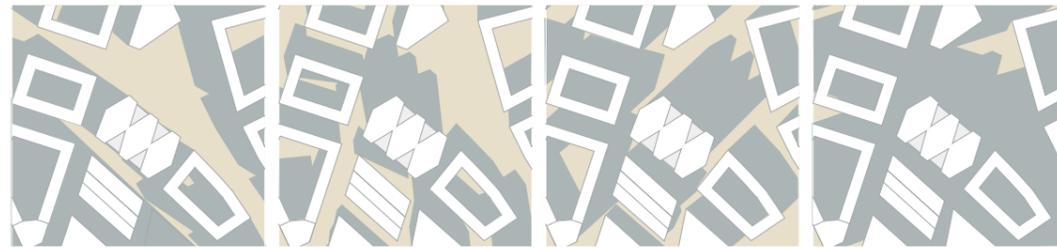
By dividing the building into three bodies the scale of the building is decreased and a more varied façade against the square and the streets is created. The building feels more friendly and human scaled and less monotonous when passing by.

The shadow situation is a challenge at this site, since the large-scaled hospital is located south of the main square of the area and therefore cast its shadows at it. By cutting off the north-west and north-east corner of the site when creating the building the shady parts of the ground

is reduced remarkably and more of the plaza area gets to see the sun rays. Because of the division of the building, the thinnest parts of the building allows the sun to shine through and can therefore be seen from the square.

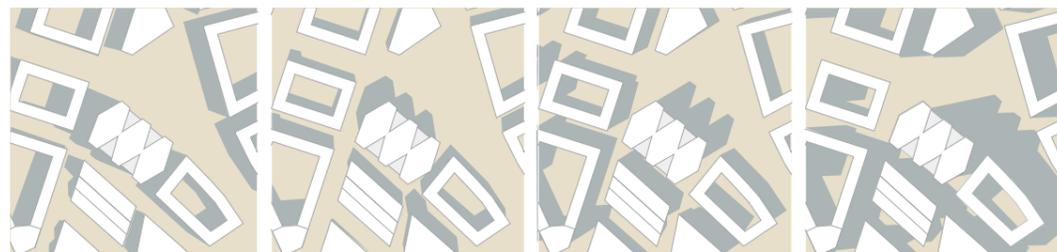
The greenery in this area is always present; the jubilee park with access to water in south-west, the green areas connected to schools, and pre-schools nearby the hospital but also the main square could be a park-like oasis. By cutting off the corners of the building site creates places for small pocket parks directly linked to the hospital which contributes to a healing environment.

### Autumnal equinox

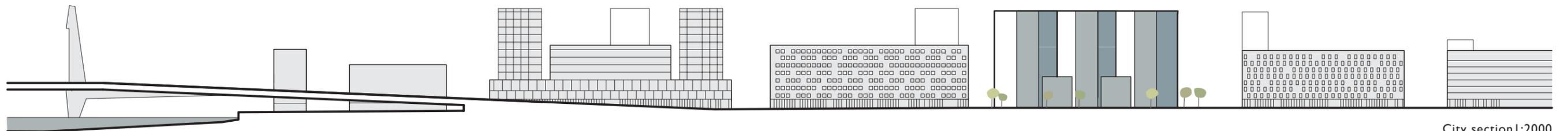


09:00 12:00 15:00 17:00

### Midsummer



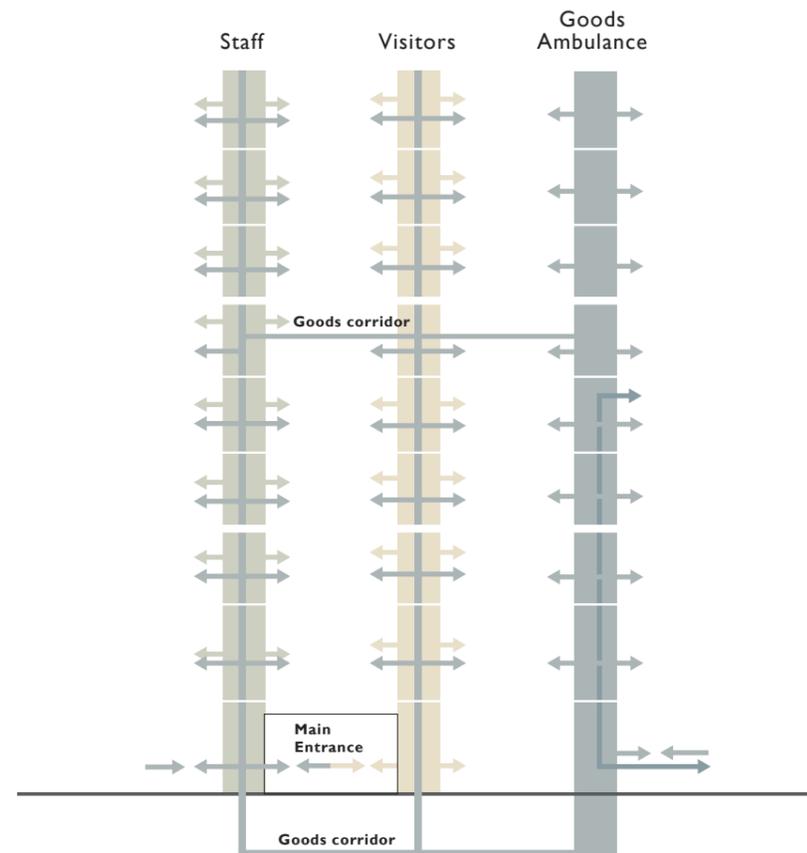
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City section I:2000

# SEPARATION FOR INTEGRATION

## Three Cores

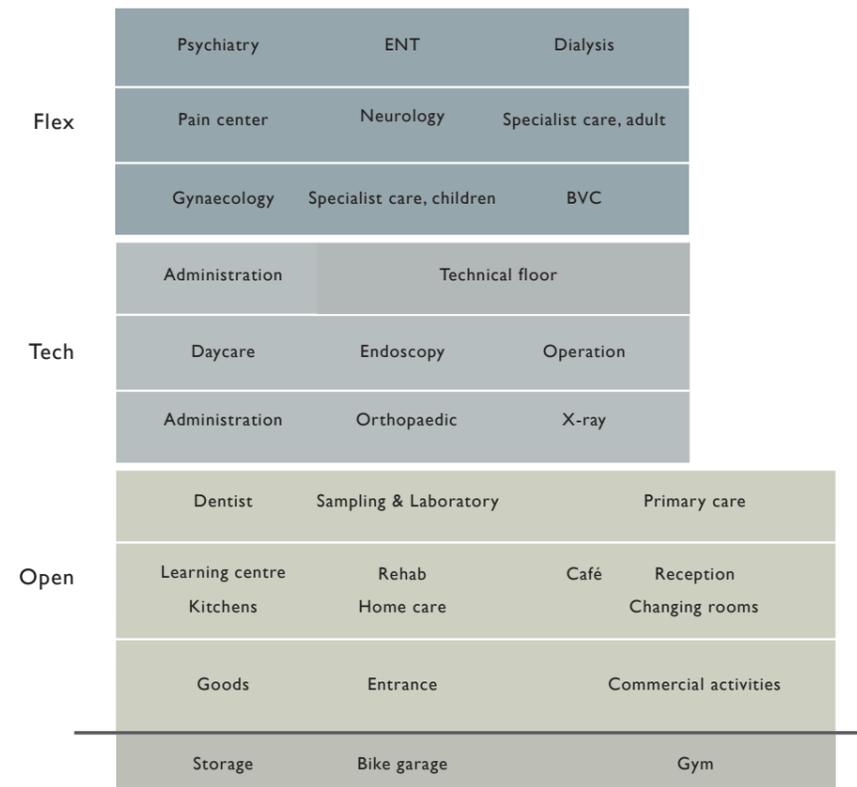


The size of the plot and the verticality of the program distribution means that the vertical flows of persons and goods are critical for achieving effective flows in the volume.

The size of the hospital and the small plot means that it is not space efficient to separate flows in the horizontal direction, instead a separation of the vertical flows are much needed. The three bodies are each given a vertical elevator core for communication. Each core is however given a main specified user, which concentrates different flows in different bodies.

Visitors are concentrated in the middle body, placing the patient in the centre, connecting her to all departments. The western elevator shaft is mainly for staff use, connecting staff entrances and changing rooms with the departments. The eastern elevators are used for ambulances, bed transports and goods, stringing together surgery, x-ray and other departments with goods handling and ambulance garage in the entrance level.

## Three Functional Themes

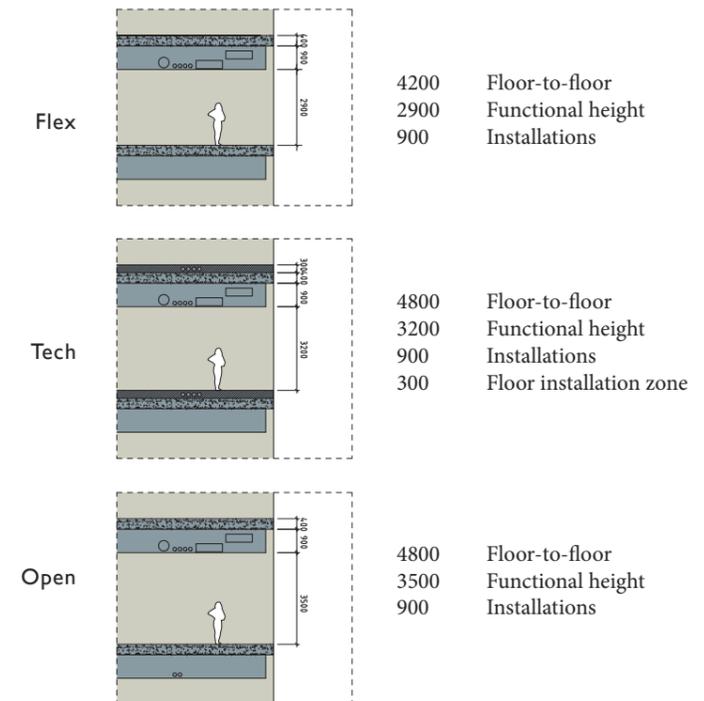


The two main functions of the hospital - to be a specialist centre and conducting day surgery - means the building is fusing two functions with very different needs. The location of the hospital in the centre of the new city district of Frihamnen also means that the hospital have the possibility to be a meeting place and a jewel for the neighbourhood and the whole city.

Given these preconditions, the hospital program is divided into three vertical themes. On the three bottom floors, departments which need to be easy accessible are located, such as commercial, goods loading, café and restaurant, primary care and dentist. On the middle floors more technical departments which are in need of large and specific room areas are located, such as operation and x-ray.

The top floors are looser in the division of departments. All of the departments on the top three floors are categorized in a way so that they can work together and collaborate on each floor.

## Different Performances



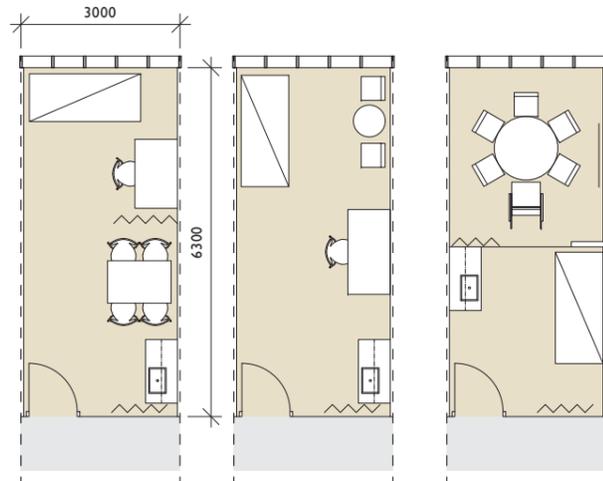
Different needs of the three themes gives three different three different technical floor types. Assigning all floors in a theme with the same floor type gives flexibility for the future, being able to shuffle around activities on and in-between floors within same theme.

The open-floors and the tech-floors all have the same floor-to-floor height, due to their need of large installations and space for commerce and operations. The tech-floors are also fitted with a installation floor which makes it possible to refurbish a floor without having to interfere with the activities taking place in the floor below.

The flex-floors have a more generic office configuration with a generous ceiling height and normal space for plumbing. The generic approach also makes it possible for these floors to be converted to office spaces in the future.

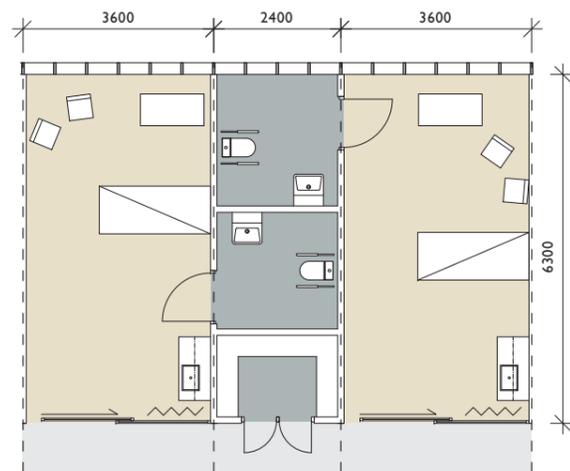
# GENERALITY AND FLEXIBILITY

## Two General Rooms



Examination room  
18 m<sup>2</sup>

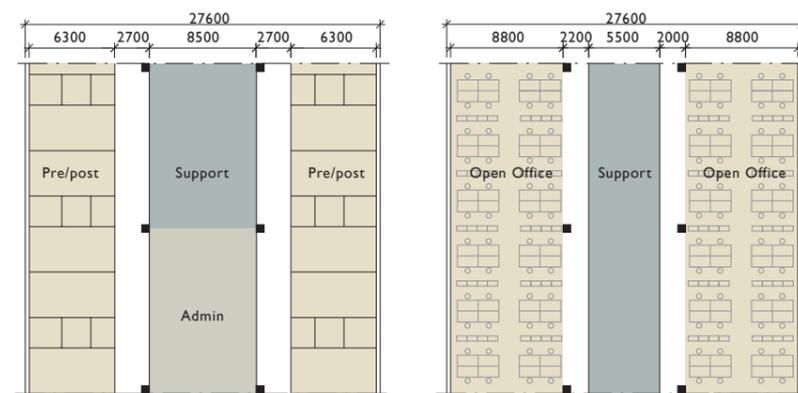
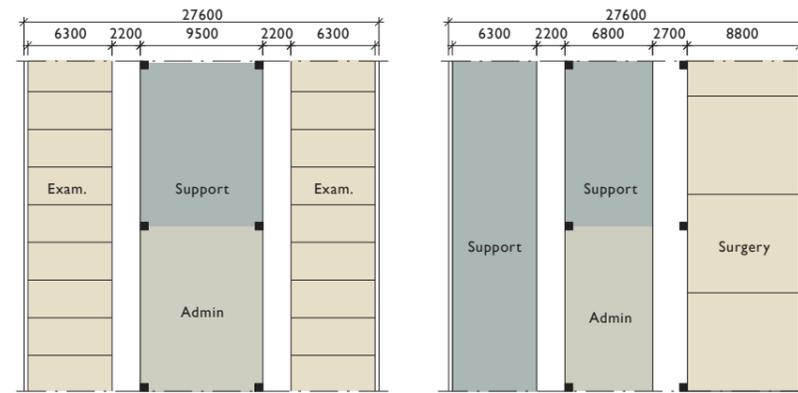
Used by:  
Primary Care  
Orthopaedic  
Children  
BVC  
Pain/Neuro  
Specialist Care  
Psychology  
ENT



Pre/post room  
22 m<sup>2</sup>

Used by:  
Surgery  
Gynaecology  
Specialist Care  
Dialysis

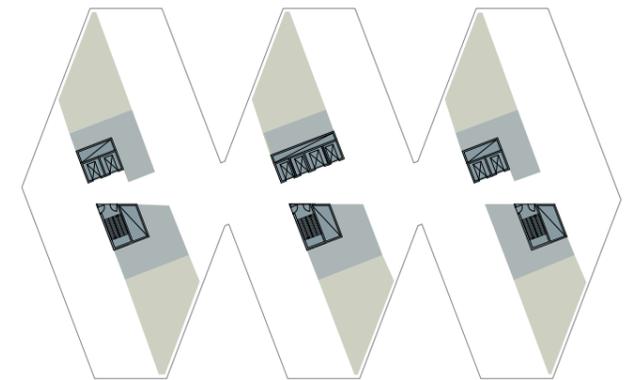
## Given Perimeter - Flexible Stripes



## Plan Concept



### Visitor and Meeting



### Admin and support

For a flexible and effective work flow for the staff a general room approach is crucial. Examination rooms should be used for examinations and meetings with patients, not administration. By concentrating administration in admin areas the staff team have possibilities to interact more intensively and learn and help each other.

When the examination room doesn't become personal for a member of the staff, a more rational approach can be taken. The project proposes two different types of examination rooms which will be used for all departments. The first type is a typical examination room without a toilet, while type two have an accessible toilet connected, and is more spacious, mostly used as a pre/post room for the surgery unit.

Using the same type of examination rooms in all departments, the departments can more easily share and borrow rooms from each other. This way the total floor area can be reduced and the rooms will be used more effective. The staff is also through the organization of rooms encouraged to work together, bridging gaps between different departments.

The width of the bodies are based on a two corridor lamella, a typology which have been shown to be flexible and forgiving for future transformations. The large width of the bodies - 27,6 m - is also a width which can support many different activities in a hospital.

The structural system divides the body into three stripes, all three measuring 9 m, which is enough width to contain both corridor and room. This makes it possible to be very flexible on where to place the corridors, making it possible to convert bodies from surgery units to examination-room units, even transforming whole floors to open office spaces.

The general corridor width is set to 2,2 m, making all corridors wide and inviting. With a width of 2,2 m, it is also possible for occasional bed transports, if it for some reason would be needed. On floors where bed transports occur on a regular basis, all corridors are set to 2,7 m.

The diagrams are showing a type plan and how the different areas are typically used on all the hospital floors. Examination rooms and other types of patient rooms are placed along the longest sides of each body to get as much daylight as possible.

Support functions such as storage spaces are placed in the darker core along with stairs and elevator shafts. Admin areas will be located opposite from the patient rooms as open offices. Openings along the main wider corridor will function as waiting areas and open meeting places for both patient and doctors to meet but also places where the staff can have internal meetings or use as drop down working spaces.

Each floor is a bit over 3000 m<sup>2</sup> which means each individual body is approx. 1000 m<sup>2</sup>. In this way different departments can easily be divided into one half body, full body, or more depending on need. The usable floor space on each floor is approximate 2400 m<sup>2</sup> with each floor will having approximately 80% effective floor area and 20% communication area.

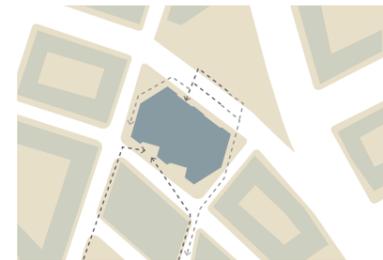
# THE FIRST MEETING

The urban location of the new Frihamnen hospital is one of its strongest qualities, but it also possesses challenges. The large new urban square calls for a main entrance and a main facade of the hospital. The main entrance is located on the north-west part of the facade, facing the planned transport hub building. The square gives good opportunities for commerce and the entrance floor is opened up towards the square.

Because of the square and the extensive public transport stations located north of the hospital, no space is available for drop-off zones or goods deliv-

eries. These functions are instead placed on the street south of the site. The west facade is supporting the planned bustling street between the harbour and the square with shops and a restaurant. It will be a public and quite green street. The east facade gives opportunities for an ambulance garage close to the bridge, and a ramp leading down to a bike garage, clearing the square of bike parking lots.

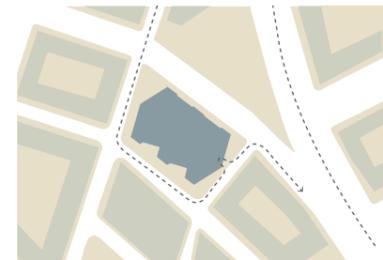
## External flows



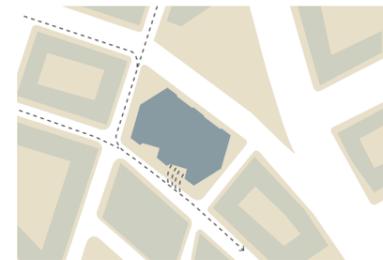
Pedestrians



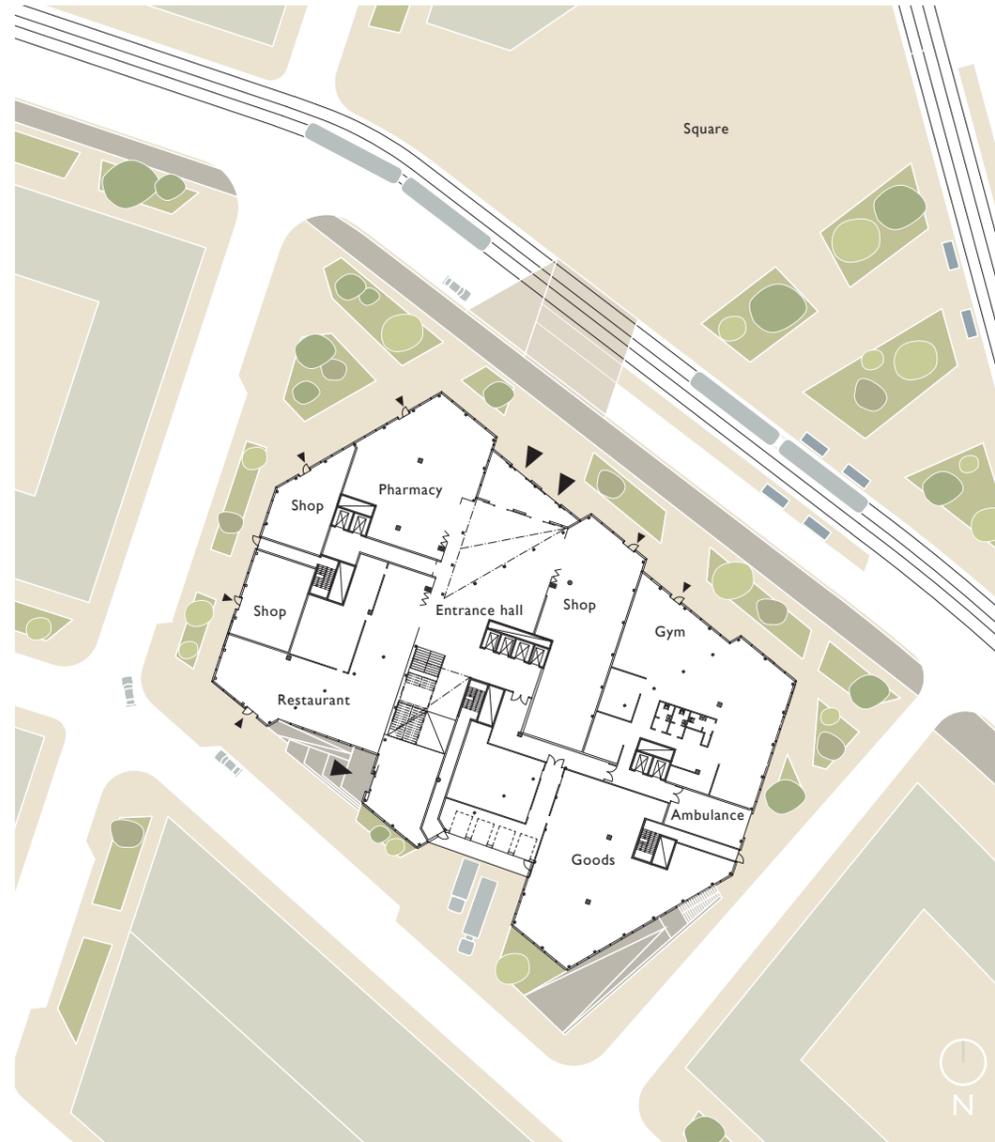
Cars



Ambulance



Goods



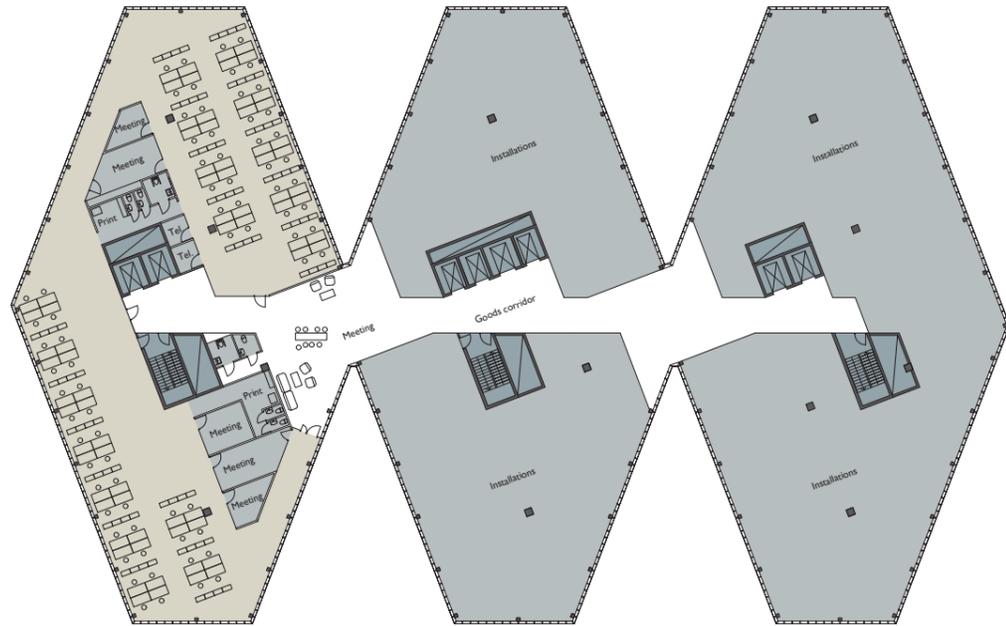
Site Plan 1:1000



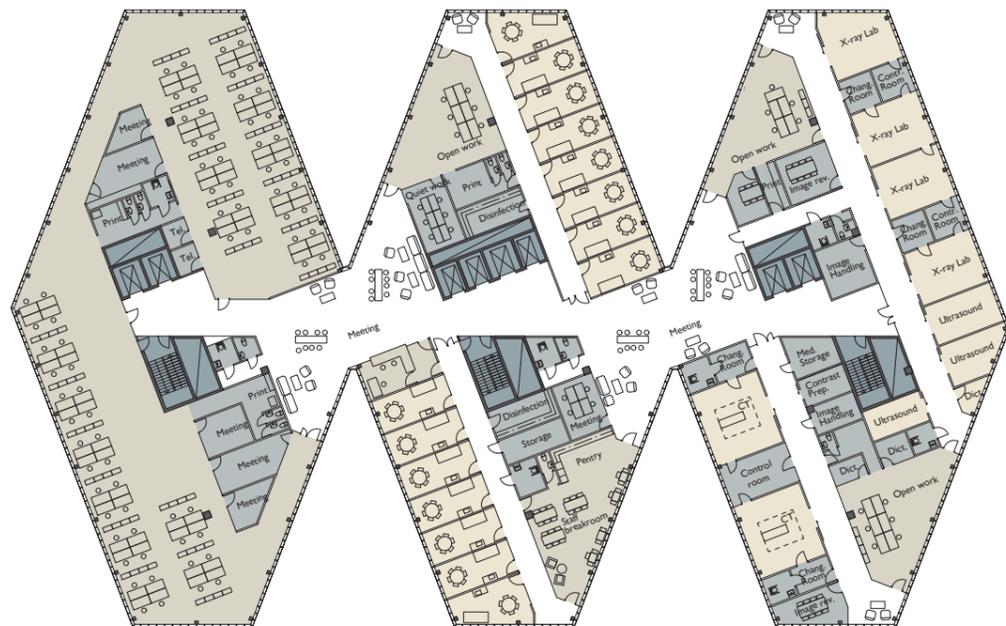
Main Entrance



# TECHNICAL FLOORS



Floor 6 1:600  
Administration - Technical Floor



Floor 4 1:600  
Administration - Orthopaedics - Imaging



Floor 5 1:400  
Day Care - Endoscopy - Day Surgery

## Tech Floors (4-6)

Floor 4-6 are the more technical advanced floors of the building. On the fourth floor a larger administration area is located together with the imaging and orthopaedic departments. Fifth floor is the operation floor with six large operation theatres and three smaller endoscopy rooms connected in one sterile zone. On the same level is also the daycare unit for the patient to rest after the surgeries. There are only single patient rooms in the day care department in order to achieve the highest comfort as possible for the patients.

If the hospital wants to expand in time, it's possible to transform some of the daycare units into operation theatres and expand the day care department down to the administration on the fourth floor.

Directly above the operation department is the technical floor located for the best possible ventilation to the operation theatres. On the same floor is also a larger administration area is located which can be transformed into something else in case of future needs.

# FLEXIBLE FLOORS



Floor 9 1:600  
Psychiatry - ENT - Dialysis



Floor 7 1:600  
Gynaecology - Children Specialist - Child Health Center



Floor 8 1:400  
Pain/Neuro - Adult Specialist

## Flex Floors (7-9)

The three top floors consists more flexible departments which can expand and reduce in size after future needs. Because the three uppermost levels have a more general structure with examination rooms, admin areas and supportive core function, the different departments can share meeting rooms, examination rooms and work spaces without being locked to a specific part of the floor. In this way, staff from different departments can work more closely and in a more collaborative way. The shared use of examination rooms and admin areas also makes it possible to reduce the overall area needed for different departments.

A smaller waiting area is located on each of the three top floors, close to the central elevator shaft. From there the patient will get picked up by the doctor and together they walk to the assigned examination room.

Each of the flexible floors consist of smaller admin areas and with one main staff break-room. Glazed meeting rooms, to keep the easy orientation of the main corridor, are located in both ends of the building and open meeting places are located along the main corridor for both visitors and staff to use.

# LETTING PEOPLE MEET

## Team



Admin workplace 1:200

## Meeting



Meeting place 1:200

## Individual

The focus on the individual, but also the personal meeting is of high importance in today's digital world. Meetings between patient and doctor, but also between staff can look different if not a formal examination room or closed meeting room is needed. Different kinds of meeting places are therefore located throughout the building. Adjacent to the main corridor there are smaller and more informal spaces where people can stop by and have a quick chat. There are also open work places connected to the same corridor for quick working tasks.

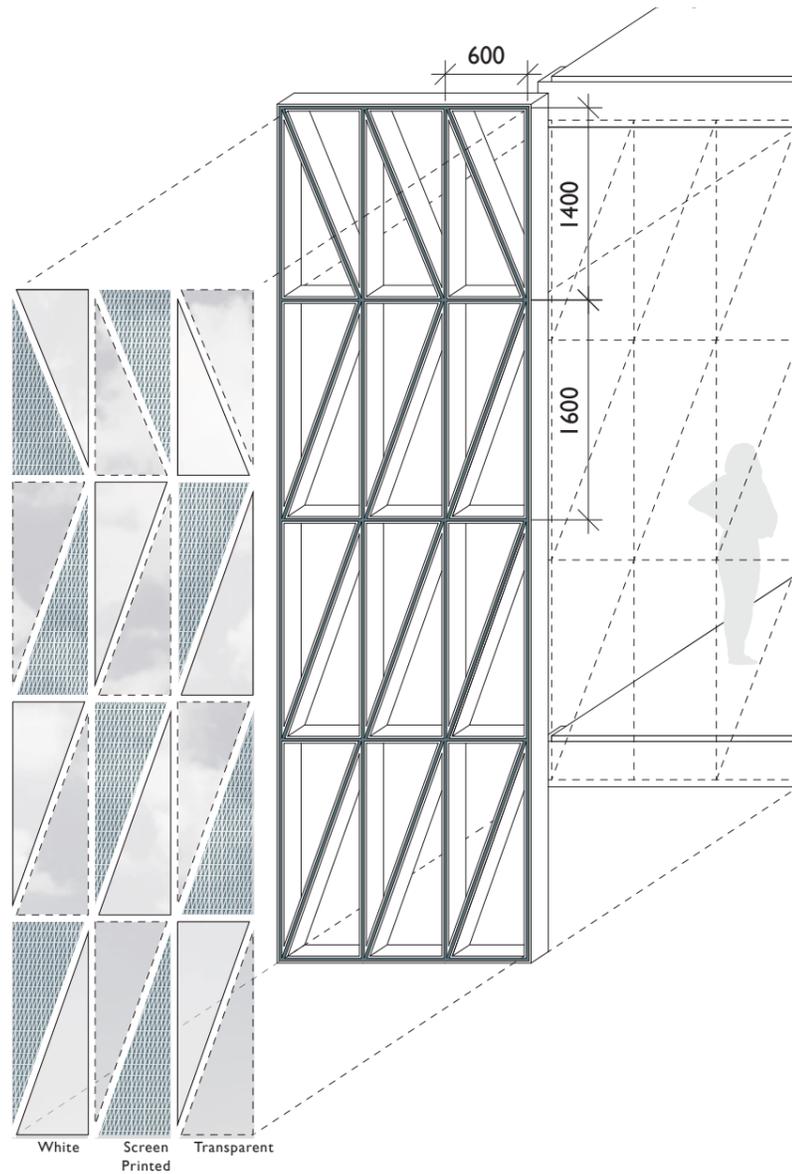
Instead of having individual cell offices for the staff, open working places are introduced. The administration departments are equipped with smaller phone booths in case of need of privacy and there are also smaller rooms for more concentrated and silent work. Working as a team and breaking down the hierarchy is of highest importance in such a conservative work place as the hospital is today.



Lobby floor 2

# THOUSAND PIECES GIVES ONE FACADE

Triangulated glazed facade



Assembly of facade 1:50

The façade is vertically divided into a 600 mm grid system in order to create a flexible and sustainable internal structure where internal distribution will not be depending on a fixed window schedule. The façade is horizontally divided into three sections per floor plan with the height of 1600 or 1400 depending on the floor height.

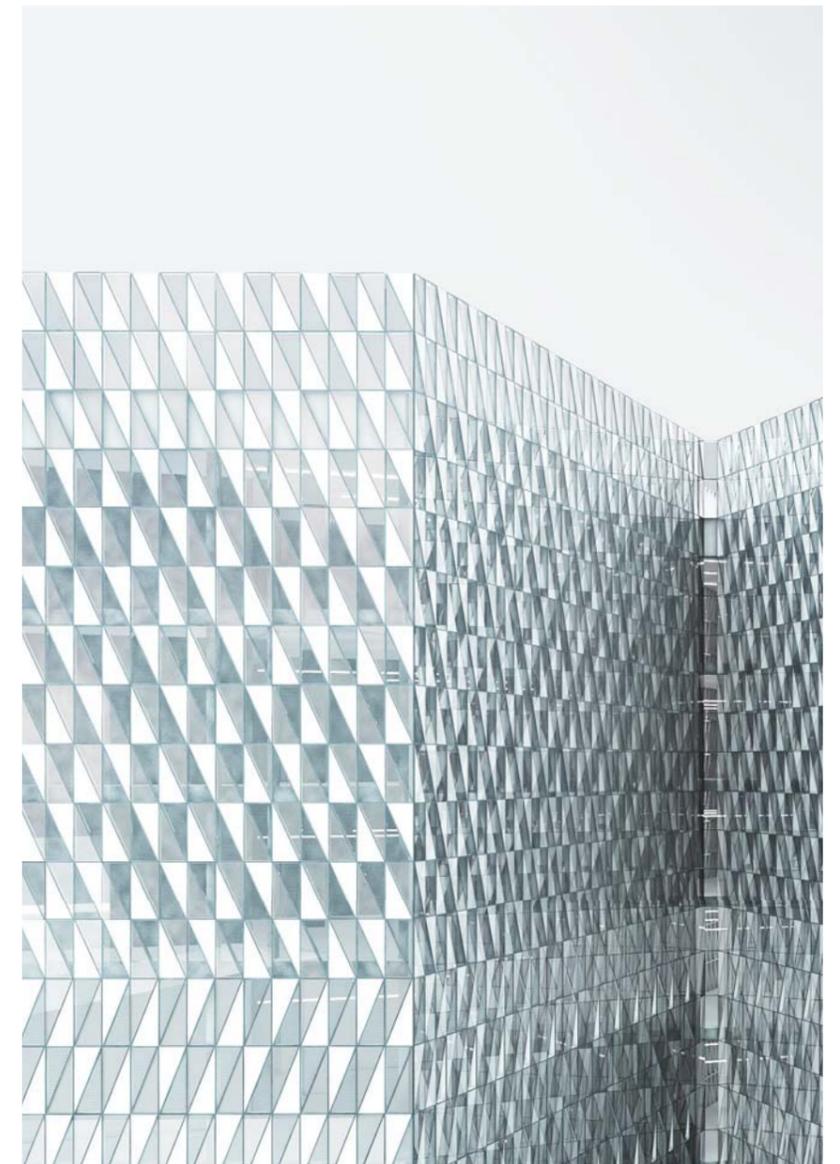
The grid system is a combination of triangular modules with three types of façade material; translucent glass, screen printed glass and fully covered white glass. Together they create a coherent pattern, wrapped around the building.

Horizontal differentiation

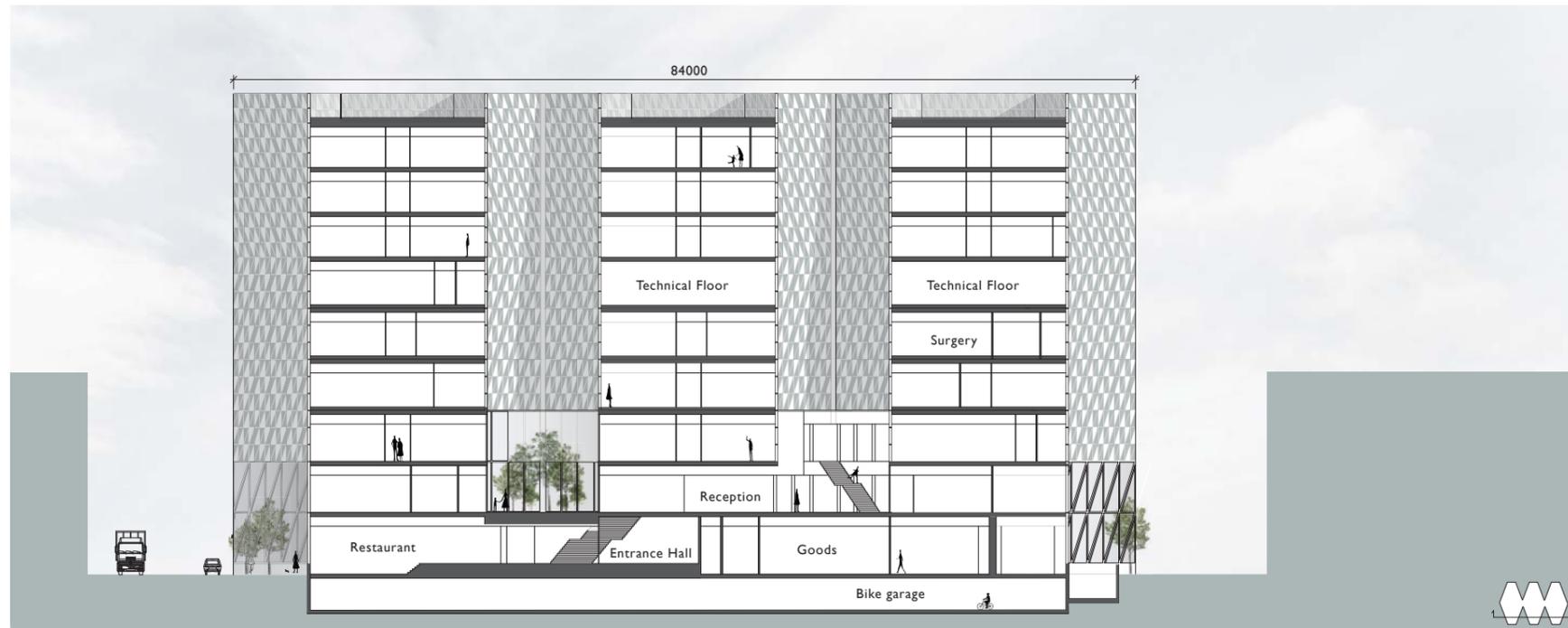


Part of Facade 1:200

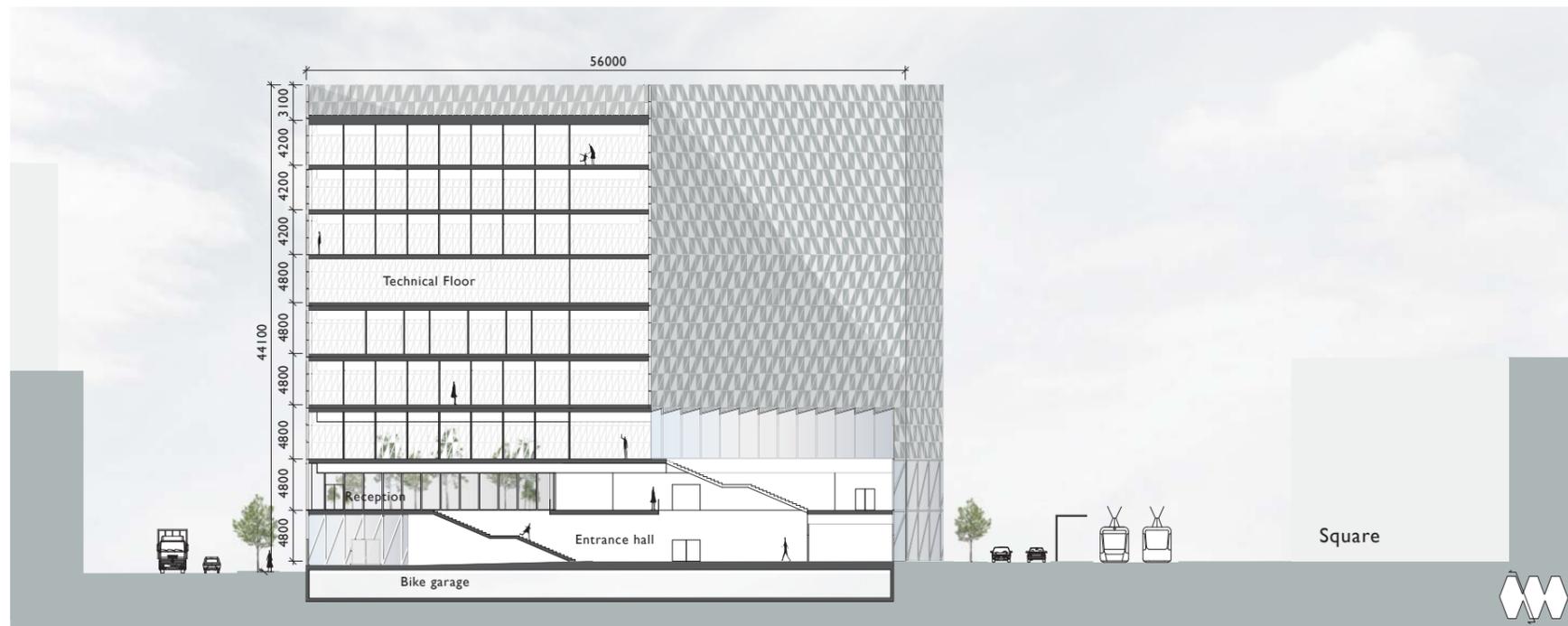
A crystalline volume



# THICK AND THIN



Section south garden 1:600



Section main entrance 1:600

## Numbers

### BTA (m<sup>2</sup>)

Total:	29624
Total (basement included):	33319
Hospital:	28036
Commercial:	1588

Floor 1:	3695
Floor 2:	3806
Floor 3:	3241
Floor 4:	3147
Floor 5:	3147
Floor 6:	3147
Floor 7:	3147
Floor 8:	3147
Floor 9:	3147
Basement:	3147

### Number of examination rooms without toilet

Total:	124
Floor 2:	8
Floor 3:	22
Floor 4:	15
Floor 7:	28
Floor 8:	38
Floor 9:	25

### Number of examination rooms with accesible toilet

Total:	41
Floor 5:	17
Floor 7:	9
Floor 9:	15

### Number of sampling rooms:

Number of sampling rooms:	10
Number of doctor visits per year:	100 000
Number of other visits per year:	120 000

