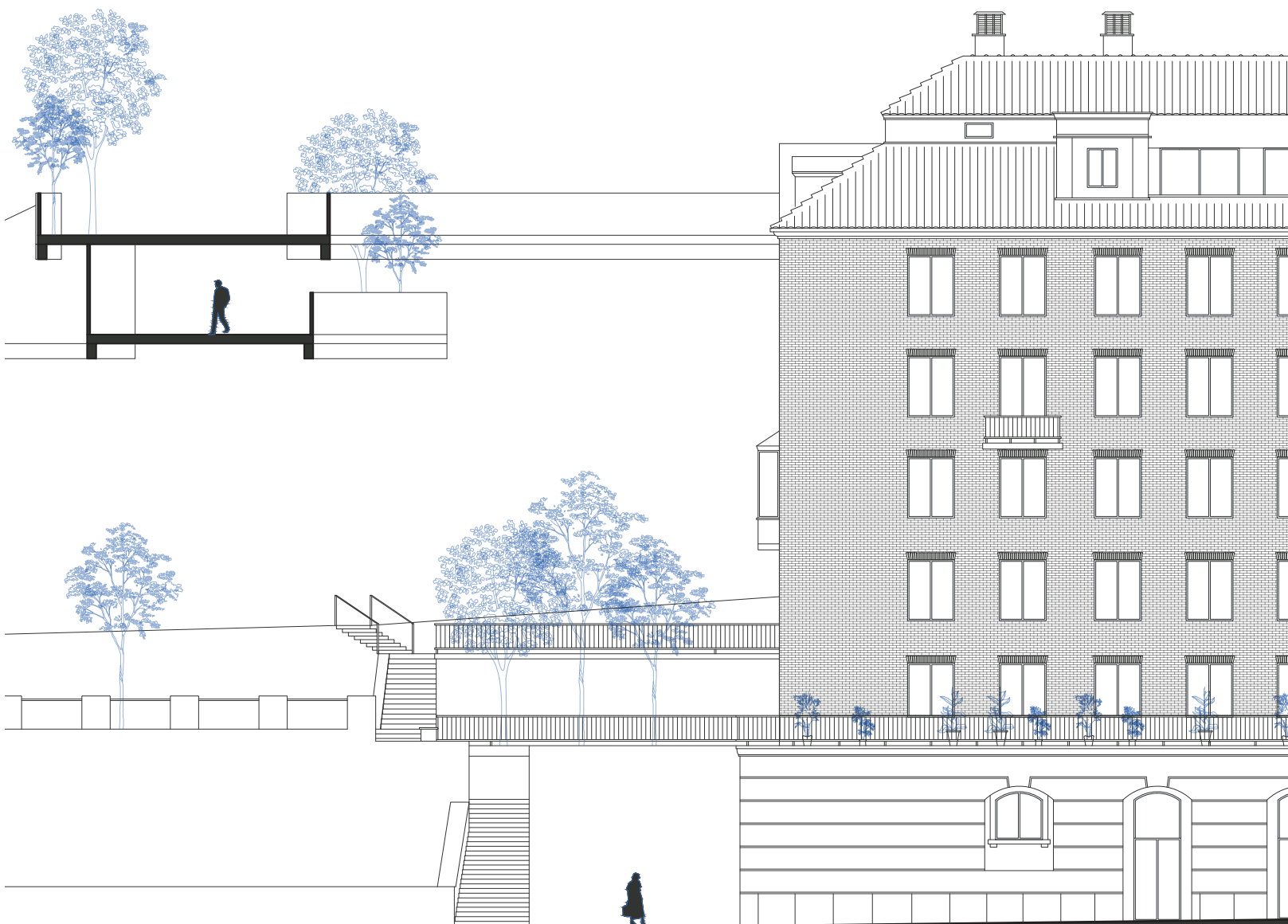




FROM HEALING SPACE TO LIVING SPACE:

Transforming the Ortopediska Kliniken

Valentina Pizzi
Chalmers University of Technology
2026

Examiner: Kaj Granath
Supervisor: Carrie Bobo



CHALMERS
UNIVERSITY OF TECHNOLOGY

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Architecture and planning beyond sustainability
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Profile: Building design and transforming for sustainability
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ABSTRACT

In 2022 the municipality of Gothenburg approved a plan to develop the current Sahlgrenska University Hospital area in Gothenburg. While the project will provide additional space for important healthcare facilities, it also involves the demolition of several historic buildings, including Ortopediska Kliniken. Built in 1926, the structure represents a historical element and is a distinctive landmark of the area.

This thesis explores the possibility of preserving the Ortopediska Kliniken through transformation as an alternative to demolition. The aim is to create a space that responds to the needs of the people of the surrounding area. Through site analysis and research, three potential user groups were identified: students from Gothenburg University, the families of patients at the hospital, and healthcare workers.

In the process was included site visits, investigation of spatial connections as well as study of the history of the building. In addition, academic literature and articles were examined to better understand the needs of the three user groups.

The research has highlighted that a common factor between the groups is the lack of residential facilities close to the area. There is a shortage of student housing in Gothenburg, insufficient temporary accommodations for patients' families and lack of resting places for healthcare workers during extended shifts.

Based on these findings, the thesis proposes the transformation of the Ortopediska Kliniken into a mixed housing facility that will accommodate three different user groups. The project demonstrates how adaptive reuse can preserve a historically important building, contributing to heritage conservation and sustainability, while, at the same time, addressing contemporary social and urban needs.



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BACKGROUND

Sahlgrenska life project

The project is centered on the creation of a new core district within the Sahlgrenska University Hospital area, conceived as a highly interconnected hub where education, healthcare, and research are brought together within a single integrated framework.

The proposal includes a redesign of the public area, prioritizing pedestrian and cycling infrastructure through the expansion of walkways and bicycle lanes, while reducing space allocated to vehicular traffic. The new buildings are organized along a north south axis in order to improve connectivity across the area and strengthen internal links within the hub. New stair connections are also proposed, linking Per Dubbsgatan to the upper parts of the hill, as well as providing access to the green roof above Building 2. (Göteborg Stad, 2021)

The development includes four new buildings:

Hus 1 is planned as a coordinated facility accommodating laboratories, medical functions, and emergency care. Rising to eleven storeys, its construction is divided into two phases. Phase 1, currently underway, involves the foundations and structural frame, while Phase 2 will complete the façade and interior spaces.

Hus 2, a three storey building extending across Per Dubbsgatan, forms the central element of the proposal. It is intended to function as a key connective structure, linking the hospital complex to the south with the university facilities to the north.

Hus 3 is designed as a twentythree storey tower accommodating a mix of academic and healthcare related functions, further reinforcing the integration between university and hospital activities.

Hus 4, rising nine storeys, will be physically connected to the preserved historic building Vanförestaden, establishing a relationship between new development and the site's architectural heritage.

With the presentation of the project, a comprehensive and thorough analysis has been carried out covering the site as a whole, including its buildings, traffic conditions, noise levels, water flow, and both its environmental and cultural impacts. The latter, supported by extensive research as well as illustrations, photographs, and renderings that document the character of the surrounding streetscape, explicitly states that the project would have a significant effect on both the surrounding area and the cultural heritage value of the site. (Tyrens, 2018)

To enable the project, the demolition of several buildings of historical significance has been proposed. In response, five alternative schemes have been developed, each presenting a different approach to preserving the surrounding built environment. Despite the range of alternatives considered, all were dismissed on the grounds that they would result in narrow passages and fragmented spatial conditions, fail to integrate adequately with the existing traffic infrastructure, and ultimately be incapable of establishing an effective north south connection between Medicinareberget and Sahlgrenska. (arkitema architects, 2017) This final point, however, demands closer scrutiny, as such a connection could

still be realized at the proposed location while retaining the Ortopediska building.

A further justification advanced in support of the renewal project concerns the perceived fragmentation caused by the variety of architectural styles already present at Sahlgrenska. This reasoning is likewise open to question, as the proposed development appears less likely to resolve this condition and rather intensify it by introducing yet another architectural expression into an already heterogeneous urban fabric. Built heritage should instead be understood as a shared public good, carrying cultural and historical values for which society bears responsibility in determining how best to preserve, adapt, and carefully “recycle” them for future use. (Malaud D., 2020)

Furthermore, it has been argued that Ortopediska kliniken is unsuitable for conversion to the intended function, with its load bearing structure, internal wall configuration, and floor to ceiling heights cited as incompatible with the contemporary technical requirements of hospital facilities (arkitema architects, 2017). Despite this statement, Ortopediska Kliniken continues to hold potential value, both for the surrounding area and for those who inhabit and use it. The building “affords” new functions to its users, allowing them to interact with it in various ways. The concept of “affordance,” introduced by James J. Gibson, provides a useful framework for understanding the building’s potential. He describes affordances as “what the environment offers the animal” (Gibson J. J., 1979). The process does not consist of merely seeing an object, understanding what it is, and then performing an action. Rather, one first perceives the potential actions that

the object affords, and through these possibilities comes to understand its purpose. Affordance is therefore linked to the interaction between the user and the environment, though it may carry different meanings for different subjects. (Gibson, J. J., 1979). This can be interpreted in relation to the Ortopediska Kliniken as a building that is shaped by the functions it is intended to support, allowing users to perceive possibilities for action rather than simply observing a physical structure.

This thesis therefore investigates the possibility of preserving the building through adaptive reuse, reimagining it as a place shaped by and for its users. As Aldo Rossi observed, when a group occupies a space, it transforms that space in its own image while simultaneously adapting itself to the constructed framework in which it operates. For Rossi, collective memory acts as a formative force, shaping space through the actions and experiences of the collective. (Malaud D. 2020)

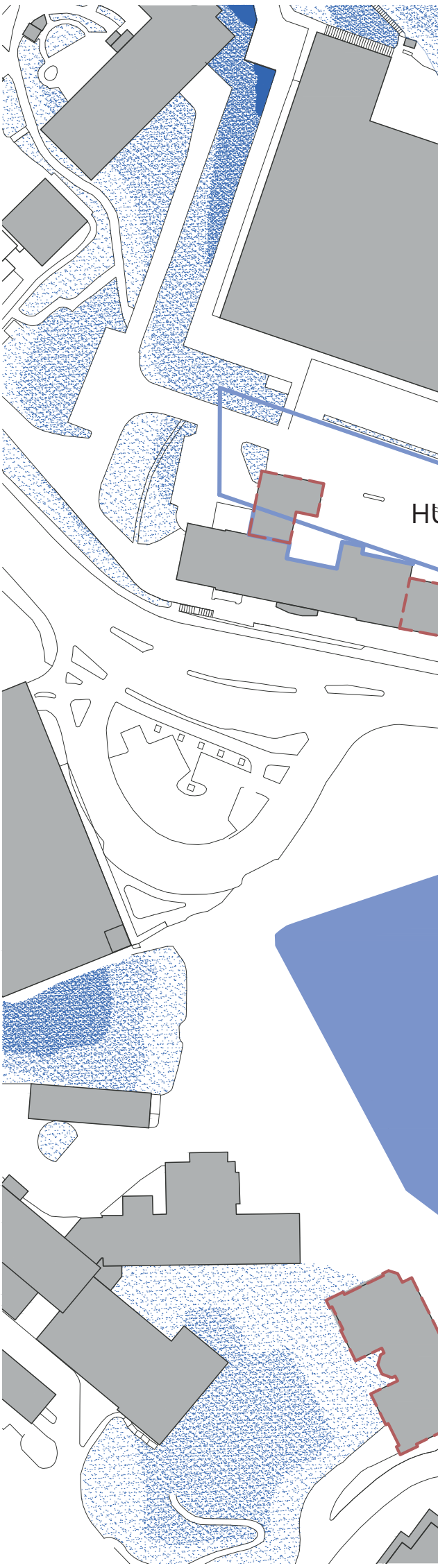
Building on these concepts, the project proposes redefining the function of Ortopediska kliniken to address the needs of the area’s communities, while selectively incorporating aspects of the municipality’s broader vision for the area.

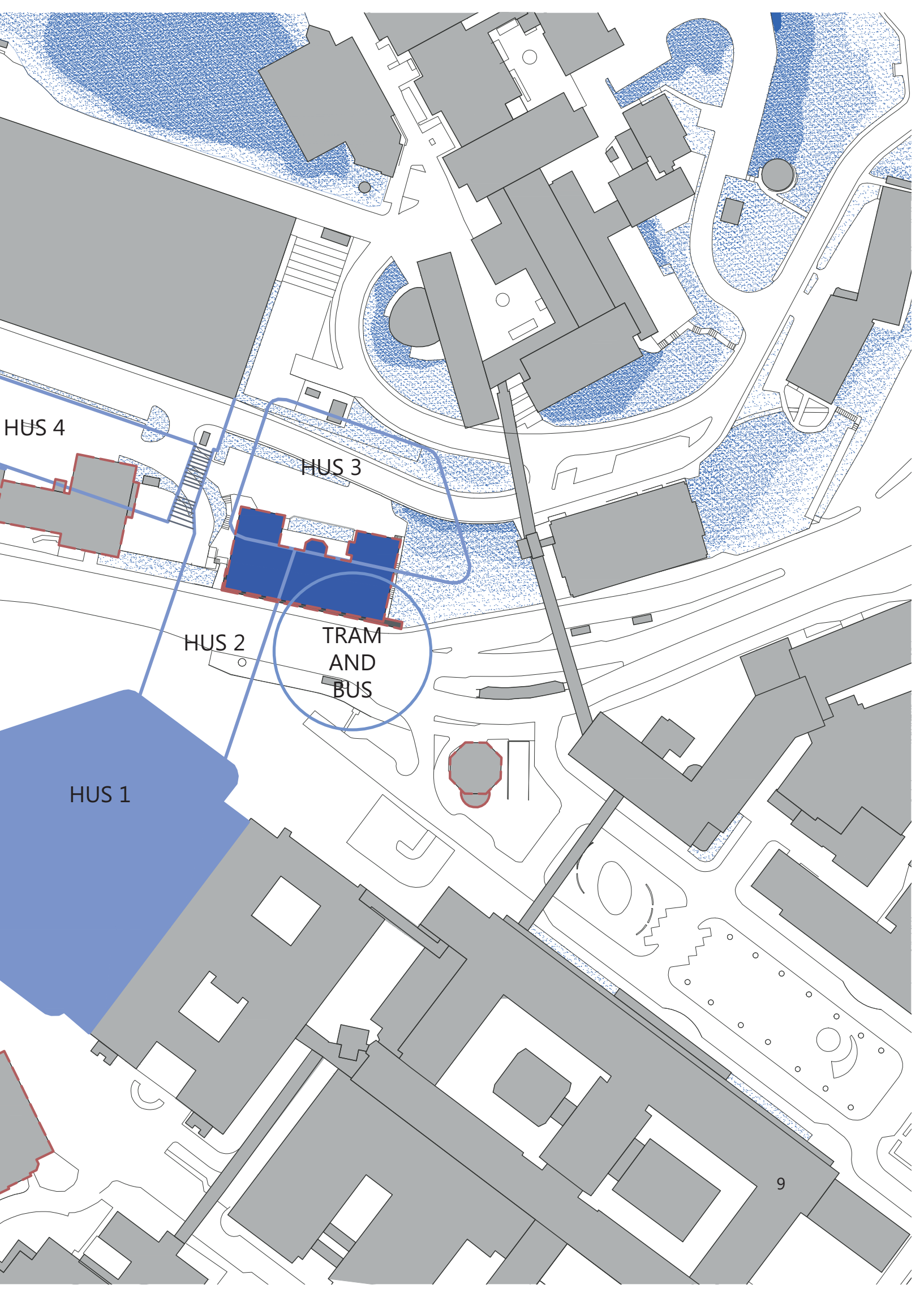
The map illustrates the Sahlgrenska Life project, highlighting the four proposed new buildings, the expanded tram and bus platforms, and the demolitions planned as part of its realization.

As the building is considered unsuitable for continued healthcare use, an alternative approach must be explored to preserve it. As previously noted, the project envisions a building shaped by and used by the community. This raises the question of who constitutes this community and which groups most frequently occupy and navigate the campuses. Several key groups have been identified, namely students, academic staff, patients, patients’ relatives, and hospital personnel. Together, they represent the principal users who interact with both the building and its surrounding context.

The next question concerns what needs these groups share, and how a new intervention within the building could respond to them. From this reflection, the idea emerged that Ortopediska Kliniken could be repurposed for residential use, primarily to accommodate students, patients’ relatives, and healthcare workers who are in greatest need of housing in the area.

- Ortopediska Kliniken
- New project
- Demolitions





HUS 4

HUS 3

HUS 2

TRAM
AND
BUS

HUS 1

This study examines the general housing situation, and where possible the specific conditions in the city of Gothenburg, for the selected groups in order to analyse the current circumstances and the measures that have been taken on this issue.

Student's housing:

According to the SFS Housing Report 2024, nearly 70 percent of students in Sweden live in student housing that is unable to house all new students starting in the autumn semester. This is a serious issue, as many students who cannot secure housing are forced to decline or drop their studies. A survey conducted by Ungdomsbarometern shows that one in four students has chosen not to pursue higher education due to difficulties finding accommodation.

In Gothenburg, one of Sweden's four largest student cities, there are around 67,000 students enrolled at the University of Gothenburg and Chalmers University of Technology, of which 39,000 are full-time students. However, SFS reports that there are only about 12,000 student housing units available in Gothenburg, far from enough to meet demand. Statistics show that 29 percent of students abandon the idea of studying in Gothenburg due to the housing shortage. (Fredriksson M. et al, 2024)

Around 90 percent of Gothenburg's student housing is managed by SGS (Stiftelsen Göteborgs Studentbostäder) and Chalmers Studentbostäder, but both organizations have long waiting lists, ranging from 1.5 to 5 years depending on the type and location of the accommodation.

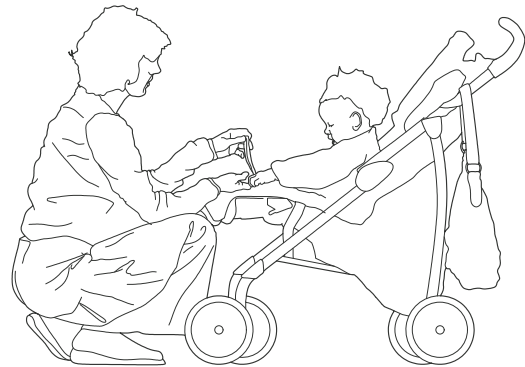


Today, the City of Gothenburg is investing in the construction of new student housing. The Gothenburg Student Union (GFS) is leading the GBG7000+ project, which aims to build 7,000 new student homes between 2016 and 2026. INOBI stated that in 2024 only just over 2000 new homes have been built.

Surveys also show a continuous increase in both Swedish and international students, which further increases the demand for housing. An INOBI assessment predicts that, in order to avoid discouraging students from choosing Gothenburg, at least 5,000 additional student homes need to be built near the universities (Inobi AB, 2024). The Ortopediska kliniken is well suited to meet this requirement, given its proximity to the Medicinareberget buildings.

Patient's family housing:

According to an article on the attitudes and perceptions of healthcare professionals regarding family participation in surgical cancer care (Trulsson et al., 2022), the pandemic restrictions of 2020 highlighted the importance of the physical presence of family members during a patient's hospital recovery. Their survey indicates that family presence has a positive impact on patients during postoperative care.



Research conducted on the impact of family presence on healthcare outcomes and patients' wards design has shown that it is necessary to consider family visitors as partners in patient health, as they help improve the quality and safety of care. (Fakhry M. et al. 2022). Although the study focuses on creating a dedicated family space inside the patient's room, it is still relevant to understand the reasoning behind these design choices.

According to the Sahlgrenska Hospital website, family members are allowed access to rooms where they can stay close to their loved ones. A brochure about the Sahlgrenska area states that the hospital staff can help book overnight accommodation. One option is a family room in the Sahlgrenska culvert, but it is only available for short stays and does not include kitchen or shower facilities. The brochure also lists several nearby hotels as alternatives. Johannesvillan, located within the Sahlgrenska area, was another option that offered rooms for families of seriously ill patients. However Västra Götaland Region terminated the lease agreement in March 2024 and now the building is being demolished as the area for Sahlgrenska life project had been expanded. The municipality paid 5.5 million Swedish kronor for its removal after more than 30 years of welcoming hospital families.

The Family House was founded by Carl-Johan Davoust in 1992 and built in 1995, inspired by the difficult time his family spent in the hospital and by a desire to help other families in similar situations. He has since called for the construction of a new building, and the council has decided to investigate the possibility of building a patient hotel at Sahlgrenska. (Persson F. 2025)

Considering the high number of patients and consequently visiting family members at Sahlgrenska Hospital, it is important to create more spaces where relatives can stay, especially now that they are lacking. Providing adequate accommodation would allow families to remain close to their loved ones during treatment, which is known to have positive emotional and medical benefits.

Health worker's housing:

The pandemic has highlighted the importance of better understand the needs of frontline healthcare workers and to provide them with adequate support. (Malin V. et al., 2023)

The study shows a clear imbalance between job demands and available resources during the COVID-19 pandemic, which may have led to reduced motivation and limited opportunities for recovery compared to pre-pandemic conditions. Similar effects have been observed in other frontline professions, where high work demands negatively impact workers' health and wellbeing. The article specifically analyzes the situation of healthcare workers at Sahlgrenska Hospital, emphasizing the urgent need for measures that protect employee wellbeing. In many cases, healthcare staff work long shifts and experience both mental and physical strain.

The authors suggest that emotional, managerial, and peer support can significantly reduce the burden on frontline healthcare workers in future crises.

A 2023 study about implications for work and health outcomes among healthcare workers, further shows that circadian misalignment (internal body clock not in sync with the outside world) is linked to increased levels of strain at the end of the workday. This strain then affects both work performance and overall health, demonstrating how essential rest and recovery are for general wellbeing. (Janet L. et al., 2023)



However, another article about Sleep Habits and Disturbances in Healthcare Workers, notes that shift work remains necessary in emergency sectors such as healthcare, even though it has negative consequences for workers' health. It suggests that strategic napping could help reduce stress, fatigue, and sleepiness during shifts. The authors argue that hospitals should provide spaces where staff can lie down and rest, and they recommend further research on countermeasures, such as physical activity, nutrition, and scheduled naps, to mitigate the harmful effects of shift work. (Bouchou Y. et al., 2024)

This concept is directly aligned with the thesis project proposal, which then involves creating a dedicated space adjacent to the hospital where healthcare workers can rest, recover, and return to work with renewed energy.

RESEARCH QUESTION

How can the Ortopediska Kliniken be adaptively reused as housing within the redevelopment of the Sahlgrenska hospital area?

How does the needs of the students, patient's families and healthcare workers help transform the Ortopediska Kliniken into housing spaces?

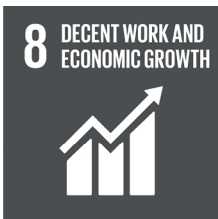


RELEVANCE FOR SUSTAINABLE DEVELOPMENT

This research incorporates a sustainability perspective by proposing a plan to renovate a building in a way that reduces waste and lowers costs. Additionally, for the local community, it could become a valuable project that strengthens the sense of cohesion.



In the case of healthcare workers, there is substantial evidence demonstrating the importance of sleep for effective job performance. Similarly, studies have shown that family participation can lead to improved outcomes for patients during hospital recovery. (Mohamed Fakhry et al., 2022)



By conserving heritage buildings, the energy required for demolition, waste disposal, and new construction is reduced, while also preserving the embodied energy (defined as the energy consumed across all processes involved in a building's production) already stored within traditional materials. (Okba E.M. et al., 2013)



Transforming a building means creating a resilient structure that can adapt to new functions and evolving needs over time, while preserving its cultural and architectural value. (Malaud D., 2020)



Adaptability is a valuable approach, as opinions, ideas, and needs evolve over time in response to the influence of the surrounding community, which plays a role in shaping buildings. This approach enables these changes to be accommodated in a sustainable manner. (Malaud D., 2020)

PASSIVE ENVIRONMENTAL ANALYSIS

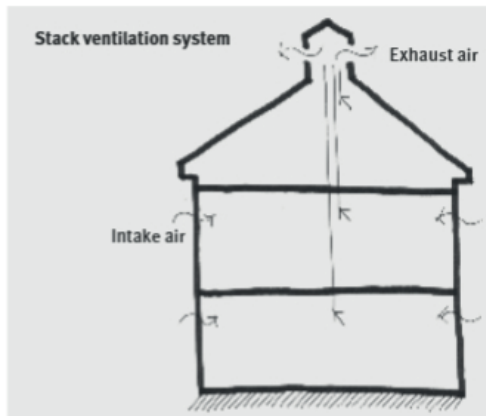
Buildings constructed in the 1920s can be considered sustainable in several ways. As previously mentioned, conserving heritage buildings reduces the energy associated with demolition, waste disposal and new construction, while preserving the embodied energy. (Ehab O., 2013)

In the analyzed building, the brick facade has a high thermal mass, which helps regulate indoor temperatures throughout the year. Like many historic buildings, the Ortopediska Kliniken was designed with natural ventilation, durable materials, and passive architectural strategies that enhance energy efficiency. It is very likely that the building uses a stack ventilation system for temperature regulation.

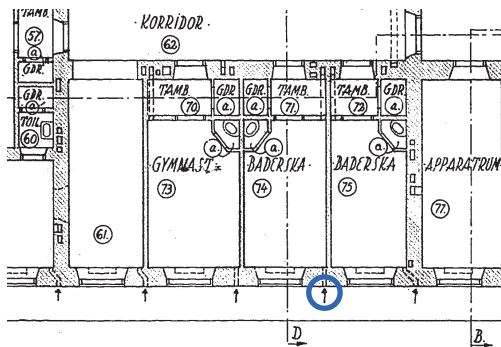
Small openings in the facade are air ducts that bring outdoor air inside. Warm air then rises through brick exhaust ducts and exits the building through the seven chimneys on the roof, taking advantage of the stack effect. Today, some mechanical systems have likely been added to assist in regulating the internal temperature. (National property board Sweden, n.d.)

When working with historic brick structures, it is important to consider heat flow, temperature regulation, and moisture behavior. Continuous maintenance is a strategy essential to preserve their heritage value. (Robertsson S., 2002)

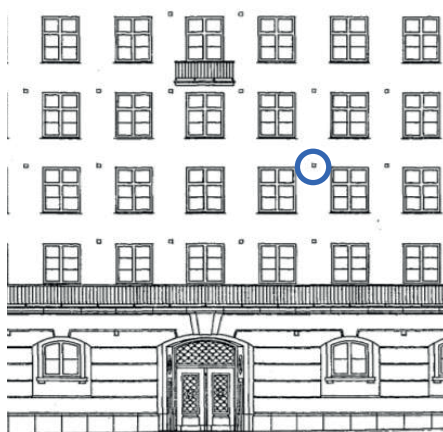
Preserving these features, while integrating upgrades such as insulation or more efficient windows, can improve energy performance without compromising the building's historical character.



1. Stack ventilation



2. Openings on the floor plans (Göteborg Stad)



3. Openings on the facade (Göteborg Stad)



DELIMITATIONS

I will:

- Study the development of the area where the case study is situated
- The connection of my study case building with the near constructions
- Study the specific building
- Understand the intended users and their needs
- Formulate a project for the Ortopediska Kliniken

METHODS AND TOOLS

AI-based tools were employed solely for grammar review and assistance with formatting literature references in accordance with APA guidelines. No AI tools were used to generate original ideas or informational content contained within this thesis.

Research for design:

- Literature studies: Research on the site area and the building case as well as a research on the details of solutions for dividing spaces has been conducted. Finding useful references is beneficial for the development of the project.
- Site visits: Visits to the site has been made to gain a better understanding of its structure.

Research by design:

- Sketching: Helps translate ideas into something more concrete and easier to understand. The design work, is especially useful because it quickly shows what works, what doesn't, and what might be worth developing further.
- 3D and physical modeling: Making a small model is a clear way to communicate an idea and help others grasp how it is meant to function. Being able to handle it, adjust it, and test it physically also makes the design process more intuitive and easier to understand.



THEORY

Building restoration strategies

"The restoration in any case must be preceded and followed by an archaeological and historical study of the monument."

(ICOMOS, 1964, ARTICLE 9)

"New work should be readily identifiable as such, but must respect and have minimal impact on the cultural significance of the place."

(ICOMOS Australia, 2013, Burra Charter, article 22.2)

Since the building under consideration is of historical significance, holding important values both for the city and for its users, it is appropriate to examine the strategies that should be followed in order to respect such heritage assets. The strategies considered are drawn from the book *Five Pillars* (Robertsson S., 2002) and are as follows:

1. Knowledge-building: Before implementing any intervention, it is necessary to investigate the built environment and study its cultural and historical values, in order to justify any proposed action and to understand what has been altered, removed, or added. In the case of Ortopediska kliniken, extensive research on the history of the area has been conducted.

2. Caution: This strategy involves preserving the characteristics and qualities of the existing environment while taking into account the people who use it. It requires a careful approach based on an understanding of why the building was designed in a particular way, as well as thoughtful consideration before making substantial changes. To apply this principle, the transformations that the building has undergone over time have been studied.

3. To manage: Everyday management should be carefully planned on the basis of the cultural values and specific characteristics of the building. Continuous maintenance is essential in order to prevent the need for major interventions in the future. This strategy is primarily applicable in the post completion phase, therefore, at the current project stage, it is not directly applicable to the Ortopediska kliniken.

4. To relate to history: Buildings consist of layers added over time, and any intervention inevitably introduces new layers. The question, then, is what value these layers hold and how they should be approached. While opinions vary, it is generally accepted that new additions should be distinguishable from preserved original elements, without compromising the coherence of the whole. In the case of Ortopediska kliniken, the structure and overall layout have remained largely unchanged from the original design and as a result the primary layer to be preserved is the original one.

5. Materials and technology: The use of appropriate materials and technologies is essential. A thorough understanding of the materials employed, the construction techniques, and the ways in which the structure has evolved should always precede decisions regarding maintenance, reconstruction, or restoration. This strategy is primarily relevant during the design phase. In the case of the project, new additions will be articulated through a distinct architectural expression, while employing materials that are characteristic of the existing building.

Swedish housing regulations

In the process of adapting the Ortopediska building for co-housing, it is important to consider the Code of Statutes issued by the Swedish National Board of Housing, Building and Planning. On 20 November 2024, new requirements were published and came into force on 1 July 2025.

In particular, the documents relevant to this project include BFS 2024:11, which sets out the design requirements for residential buildings. In Chapter 2, under the section 'Residences with accommodation units', Section 7 states that social, cooking, and dining spaces may be shared between several units. These functions should be located adjacent to the residential units, and their size should be appropriate to the number of users. It is further specified that a kitchen may be shared by a maximum of 12 people. Section 8 specifies that a maximum of three people may share one bathroom, and that bathrooms must be adjacent to and located on the same floor as the residential units. It is emphasised that all spaces must be appropriate to the number of users.

Given that an important aspect of the project is the connection with the hospital and therefore the high likelihood of residents with reduced mobility, it is also necessary to consider the accessibility requirements set out in the Regulations of the Swedish National Board of Housing, Building and Planning on the accessibility and usability of buildings for persons with reduced mobility or orientation capabilities (BFS 2024:12).

These regulations specify that the minimum design dimensions include a wheelchair footprint of 0.70 × 1.30 m, a turning diameter of 1.50 m in public spaces, and a minimum clear passage width of 0.80 m. However, in individual dwellings, these dimensions are slightly reduced: a wheelchair footprint of 0.70 × 1.20 m, a turning circle diameter of 1.30 m, and a minimum clear passage width of at least 0.76 m.

In Chapter 2, Section 2, it is stated that where there are level differences within a building, a ramp or lift must be provided, and that a lift is required when the level difference exceeds one metre. Section 5 further specifies that lifts must provide a clear internal space with a minimum short side of at least 1.1 m.

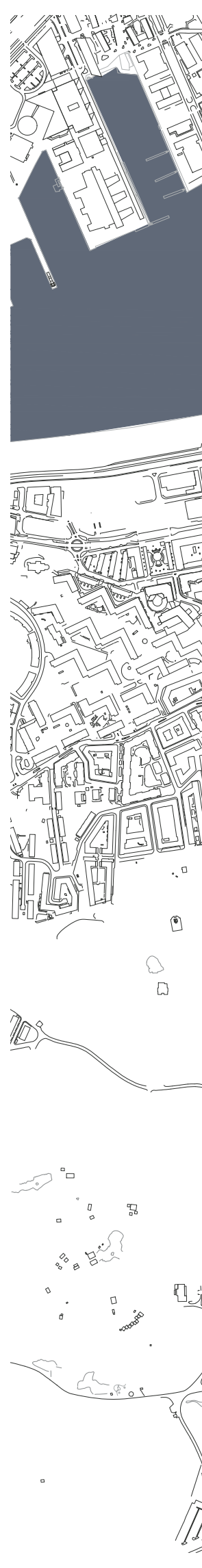
The adaptability of the building for residential use is closely linked to the daylight requirements set out in BFS 2024:8. These regulations state that spaces should be designed to ensure access to a daylight factor of at least 1.0 percent for at least half of the total floor area of all rooms within the dwelling units. In the case of shared functions, this requirement applies both to the individual living units and to communal areas. For projects involving the adaptive reuse of existing buildings, a reduced daylight factor of 0.8 percent may be accepted.

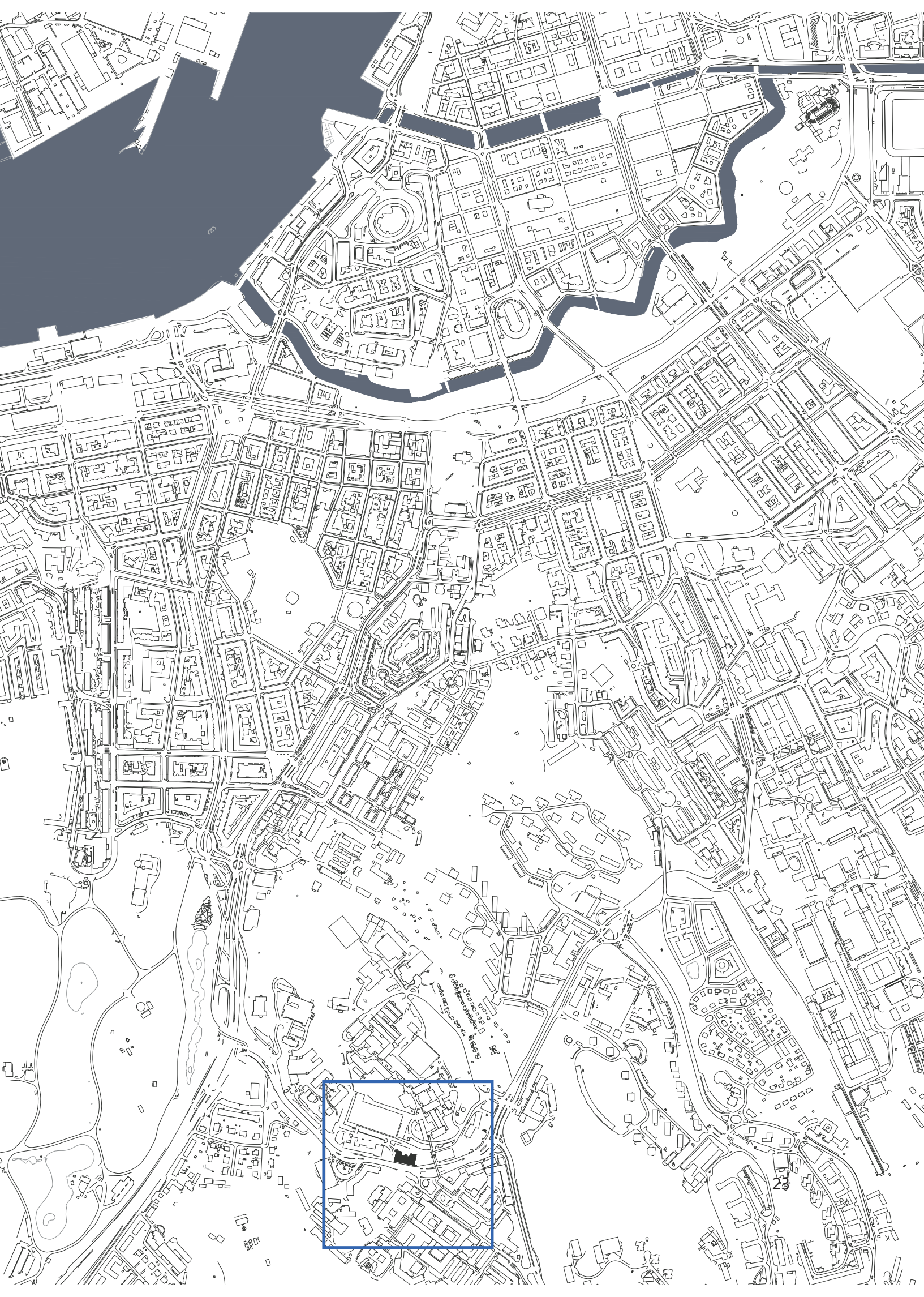
Finally, an equally important consideration in housing design, particularly in this case, is acoustic performance, given that the Ortopediska Kliniken is located along a busy and high traffic road. Relevant guidelines can be found in BFS 2024:10. While this thesis does not include a detailed analysis of internal noise levels within the building, it focuses instead on the external noise environment and potential strategy to prevent excessive noise infiltration. In general, the regulations specify that the maximum permissible total noise level is 45 dB in homes from traffic and other external sound sources.

Having collected all this information will help guide the adaptation of the building to its new function while remaining within the applicable regulations. The building was constructed at a time when general and accessibility requirements differed from today's standards, so adapting it to current regulations will be challenging, particularly as it is situated on a slope with entrances on different levels.

CONTEXT ANALYSIS

The area under study is located to the south of Gothenburg's city center, in the Annedal district, relatively close to Slottskogen and Johanneberg. It contains one of Sweden's most important healthcare facilities, Sahlgrenska University Hospital, as well as several buildings belonging to the University of Gothenburg.





SURROUNDINGS

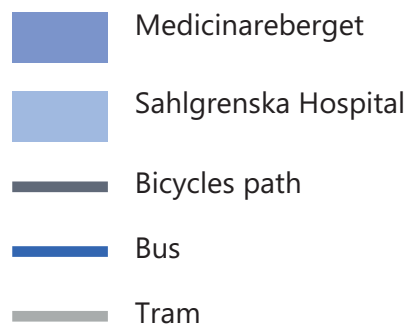
The building occupies a strategic position along the street that marks the perimeter of Medicinareberget and Sahlgrenska Sjukhuset.

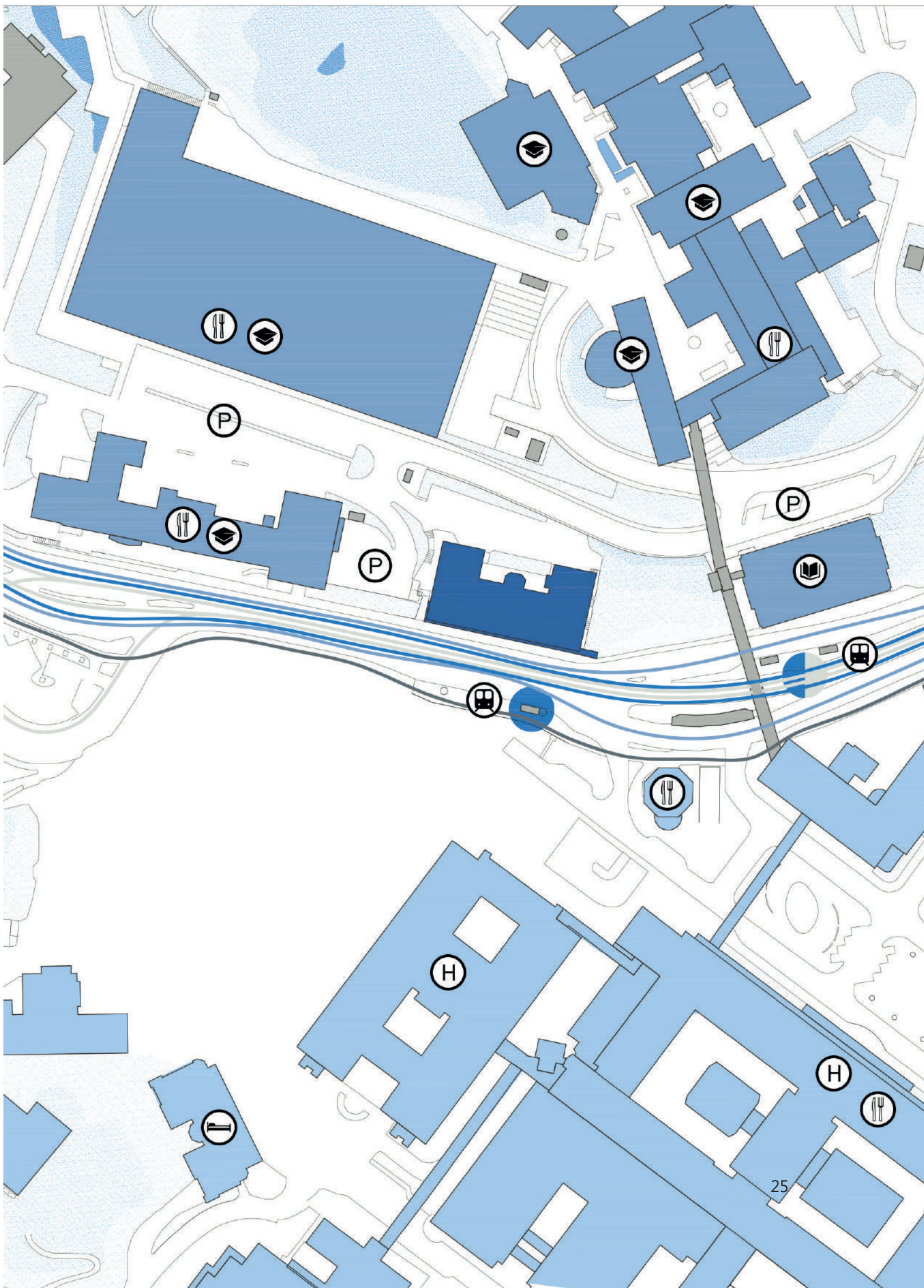
Today the Sahlgrenska area, is a major hub for medicine in general. It can be seen as divided into two main parts. On top of the hill is Medicinareberget, where the main buildings of the University of Gothenburg's Faculty of Health Sciences and part of the Faculty of Natural Sciences are located. At the bottom of the hill is situated the Sahlgrenska Sjukhuset, where the hospital buildings are located.

Medicinareberget is the center of medical and life science research and education at the University of Gothenburg. Approximately 7,000 students and 2,000 employees use the area every day.

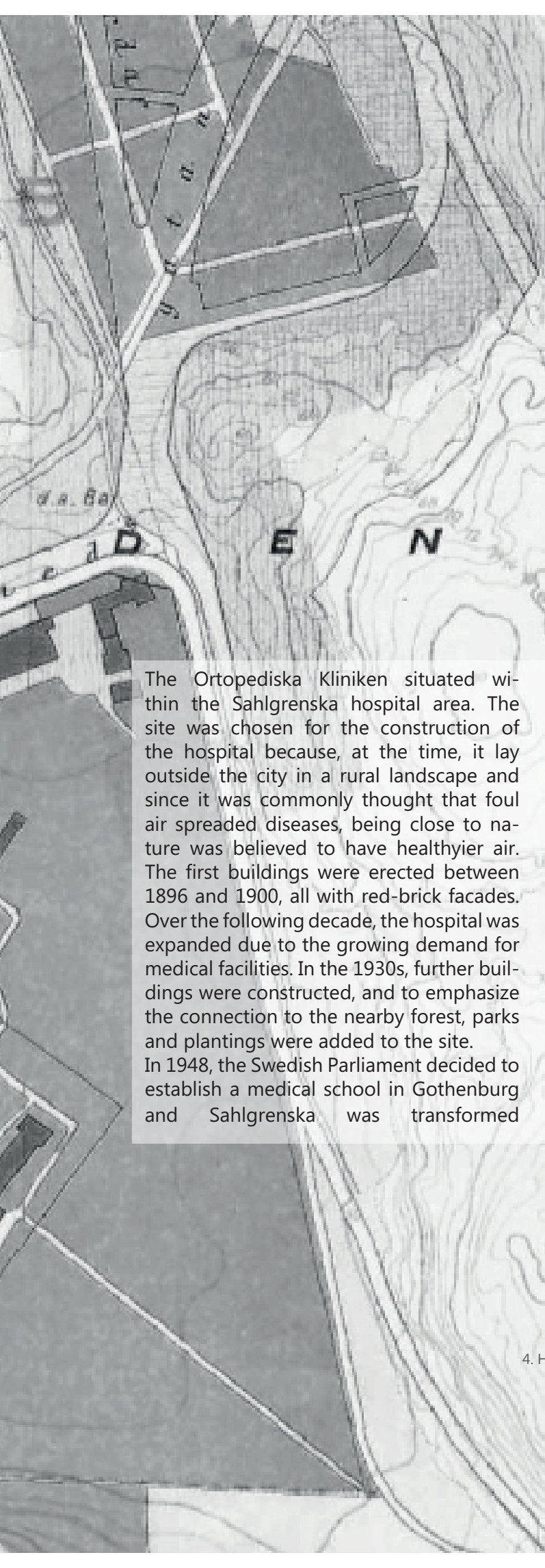
Sahlgrenska Sjukhuset provides healthcare for the Gothenburg region's 700,000 inhabitants and specialized healthcare for western Sweden, serving a total population of 1.7 million. It is a major center for specialized medicine, offering around 25 medical specialties to patients from all over Sweden. The hospital has 820 beds, employs around 7,000 people, and receives about 650,000 visitors per year. (Sahlgrenska Universitetssjukhuset, 2026)

The two areas are closely connected, both spatially and academically. Many hospital employees also hold positions at the university. Together, they form one of Sweden's strongest knowledge environments in Life Science.







A historical topographic map of the Sahlgrenska hospital area in Gothenburg, Sweden. The map shows the city of Gothenburg (Göteborg) to the left, with the river Göta Älv flowing through it. The hospital area is situated to the right of the city, on a hillside. The map features contour lines indicating elevation, and various buildings and structures are marked with lines and labels. The word 'D E N' is visible in the center of the map, likely representing a street or a specific area. The map is oriented with North at the top.

HISTORY OF SAHLGRENSKA

The Ortopediska Kliniken situated within the Sahlgrenska hospital area. The site was chosen for the construction of the hospital because, at the time, it lay outside the city in a rural landscape and since it was commonly thought that foul air spreaded diseases, being close to nature was believed to have healthier air. The first buildings were erected between 1896 and 1900, all with red-brick facades. Over the following decade, the hospital was expanded due to the growing demand for medical facilities. In the 1930s, further buildings were constructed, and to emphasize the connection to the nearby forest, parks and plantings were added to the site. In 1948, the Swedish Parliament decided to establish a medical school in Gothenburg and Sahlgrenska was transformed

into a university hospital. As a result, more buildings were constructed, this time taller with additional floors. By 1959, the central complex was completed with an 18 storey building and some of the older structures were demolished. Additional buildings followed in the 1960s.

During the 1980s and 1990s, the hospital area underwent further expansion to the south, allowing the older parts of the complex to be preserved. In the early 2000s, several historic institutional buildings were modernized and incorporated into the campus. Today, new plans for the Sahlgrenska area include the demolition of some buildings located along Per Dabsgatan. (Lindholm restaurering AB, 2018)





1876-1895

1896-1929

1930-1950

1950-1970

1970-1990

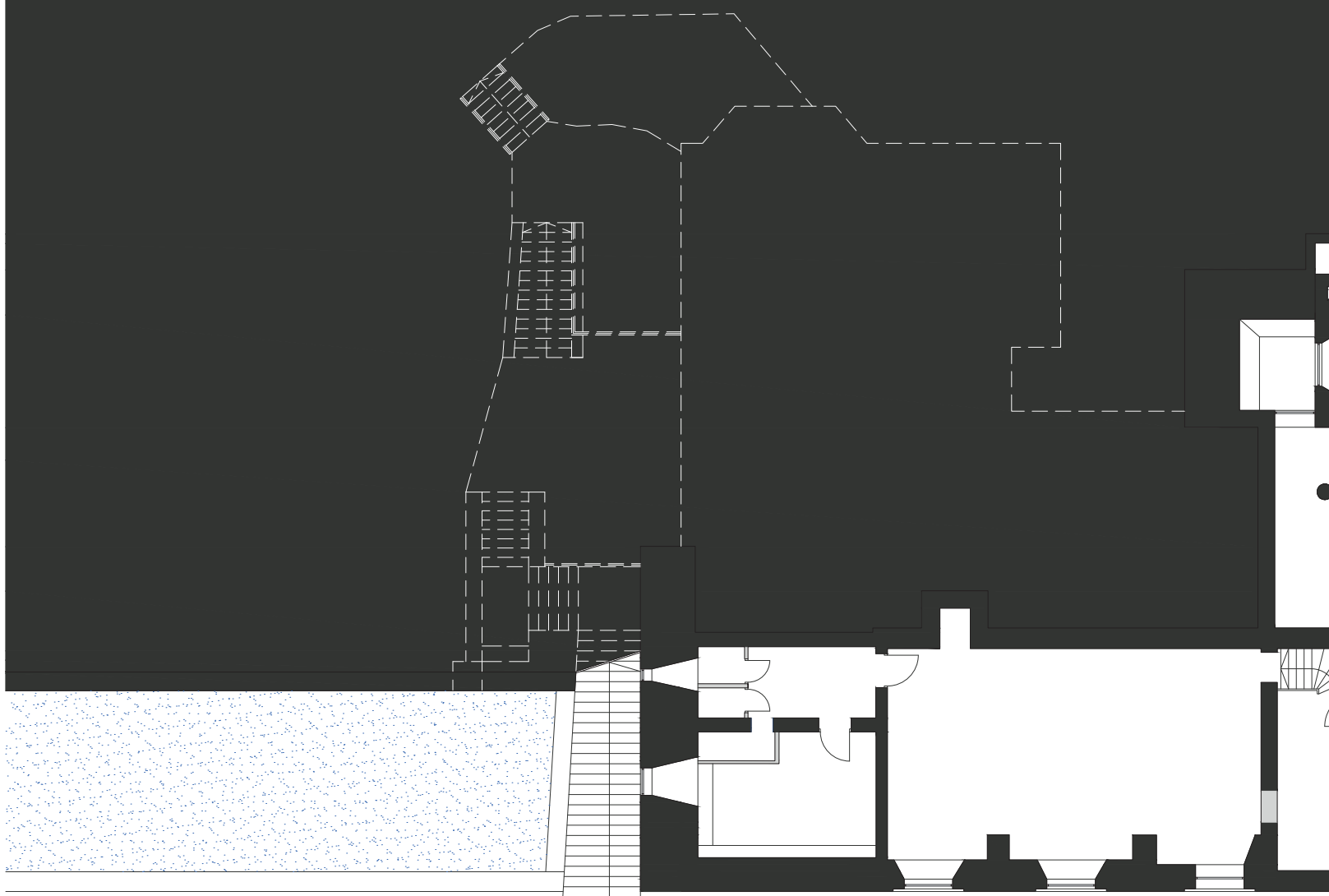
1990-today

HISTORY OF THE ORTOPEDISKA KLINIKEN

The Orthopaedic Clinic was built in the early 1920s, following the polio epidemic, when additional hospital capacity was needed. This led to the construction of orthopaedic clinics near existing hospitals so that patients could receive treatment more efficiently. The building was constructed as an extension of the Vanförestalten in Änggården. The project was designed in 1923 by Ernst Torulf, with L. Hansson responsible for the construction. The new building accommodated approximately 90 patients and included an operating room, bathing rooms, a gymnasium, orthopaedic workshops, an X-ray department, staff housing, and, on the top floor, a sun terrace. Architecturally, the building reflects the classicism of the 1920s, with symmetrical large windows and a centrally

located entrance. The exterior features red-brick facades, occasionally interrupted by natural stone at the base, as well as copper and iron elements on balconies. The building follows the topography of the terrain, incorporating both lower and upper basement levels. Above these, the main body has four floors and an attic. There are exterior staircases connecting all levels, in addition to interior staircases and two elevators. The structure has not undergone major alterations since its construction, only in 1965 was it modernized and internally renovated, which altered some internal functions. Finally, in 1992, several floors were fitted with new WCs and kitchenettes. (Lindholm restaurering AB, 2018)

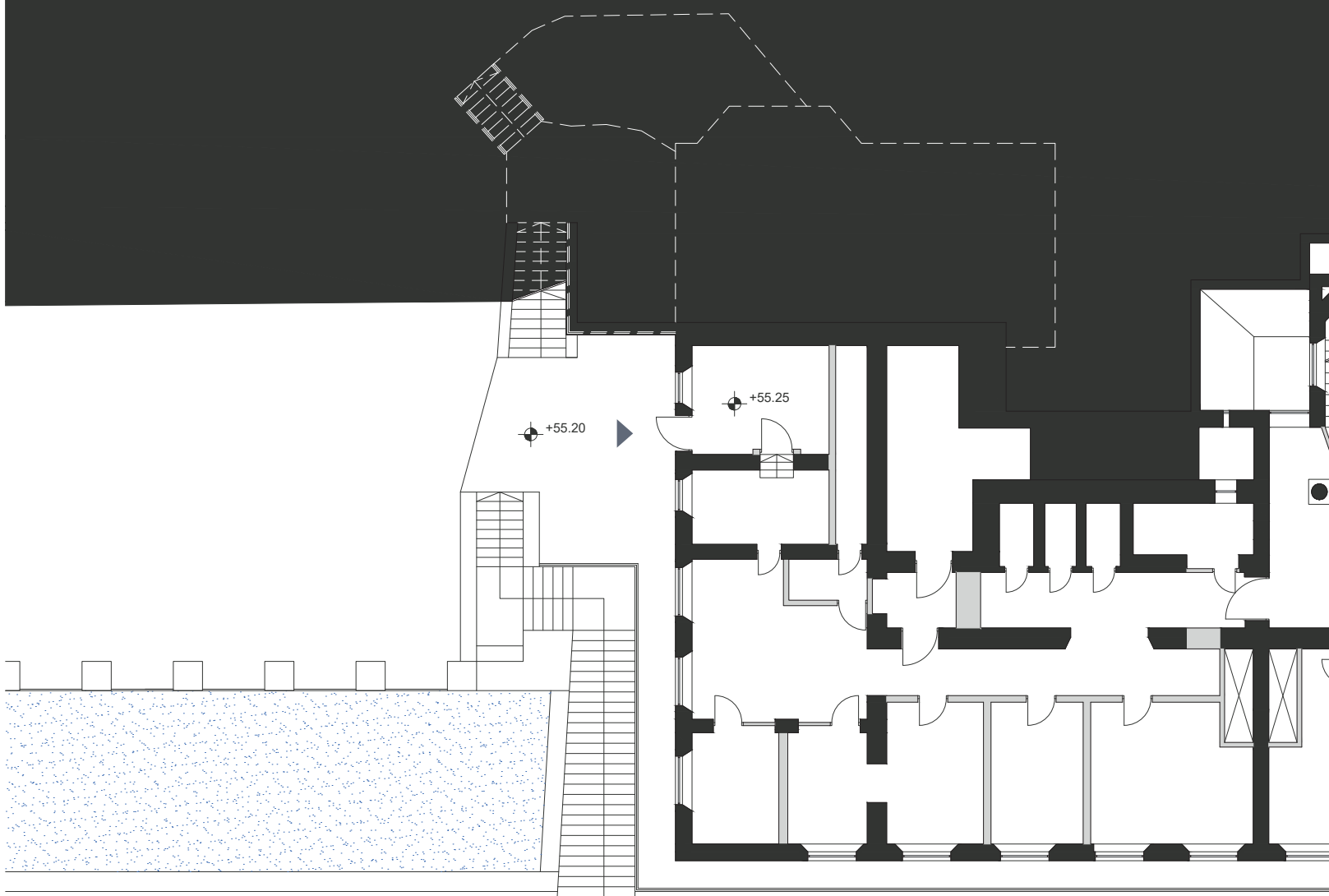




FLOOR PLAN GROUND FLOOR 1:200

The ground floor is currently characterised by a well organised and clearly articulated spatial layout. Entry into the building leads into a corridor, which then opens onto a spacious communal room.

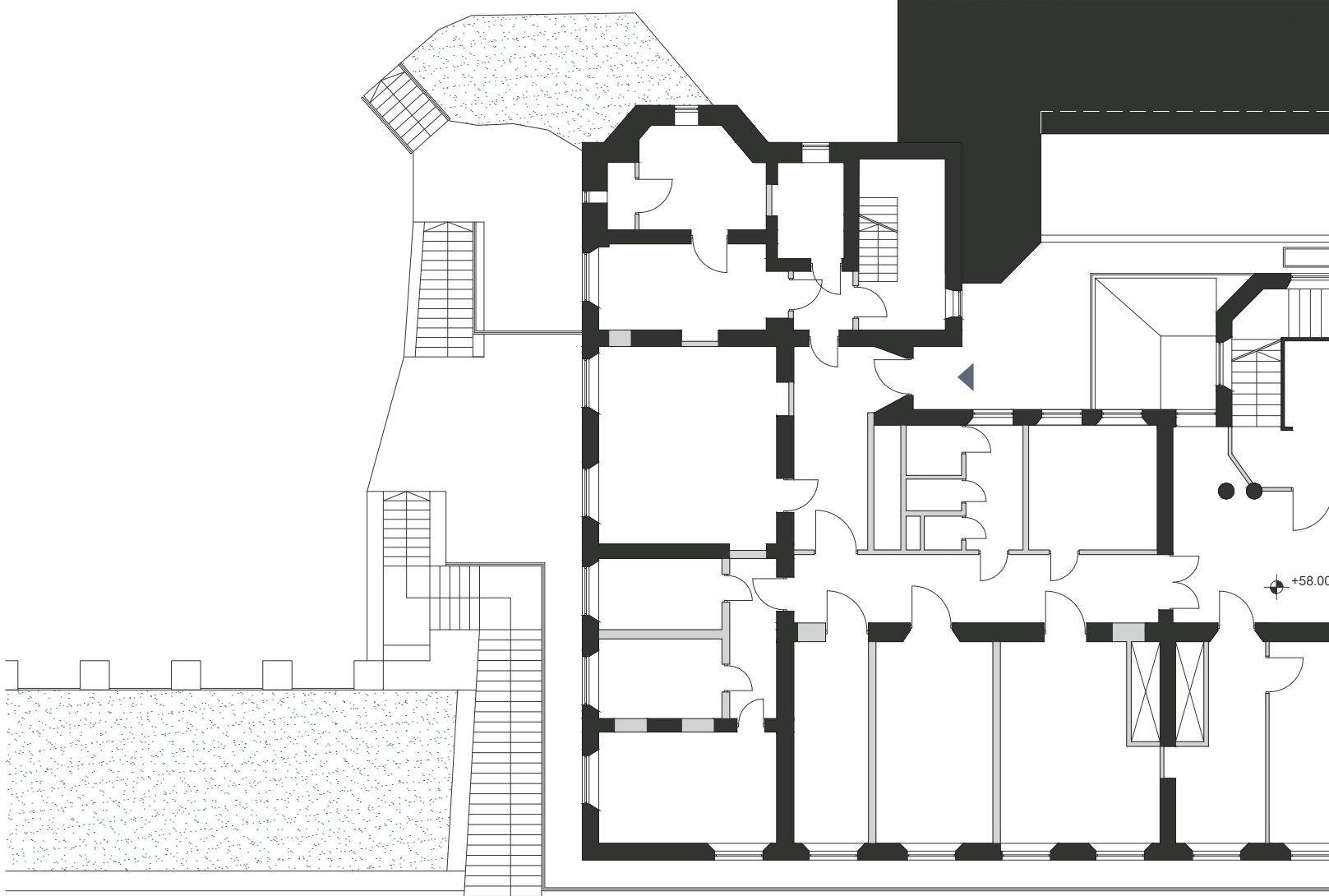




FLOOR PLAN FIRST FLOOR 1:200

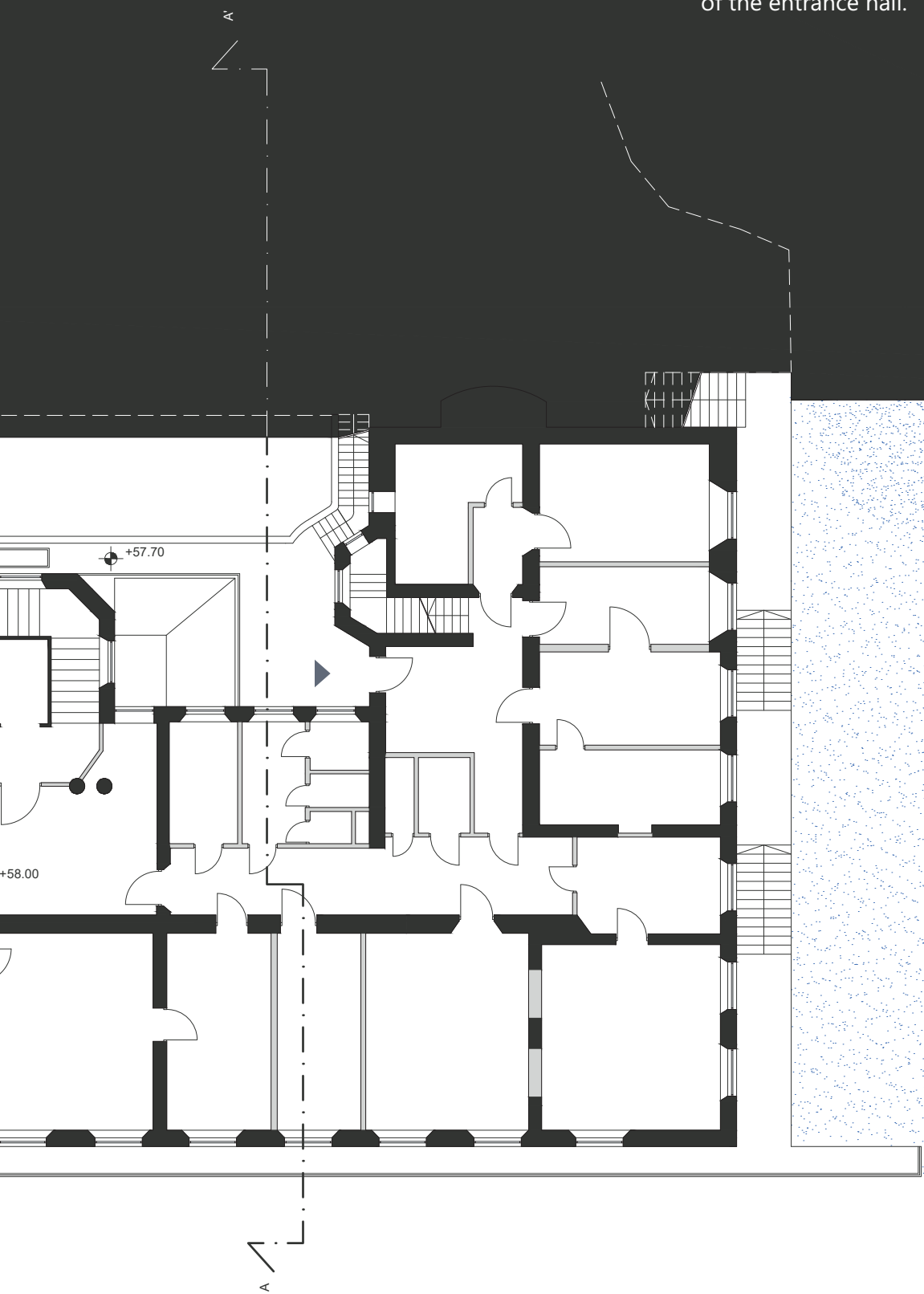
The first floor consists of additional rooms and a more articulated spatial layout. The entrance mirrors that of the floor below and opens into a spacious communal room. From this space, two corridors extend towards bathroom facilities located on either side, while the remaining rooms are accessed via additional corridors.

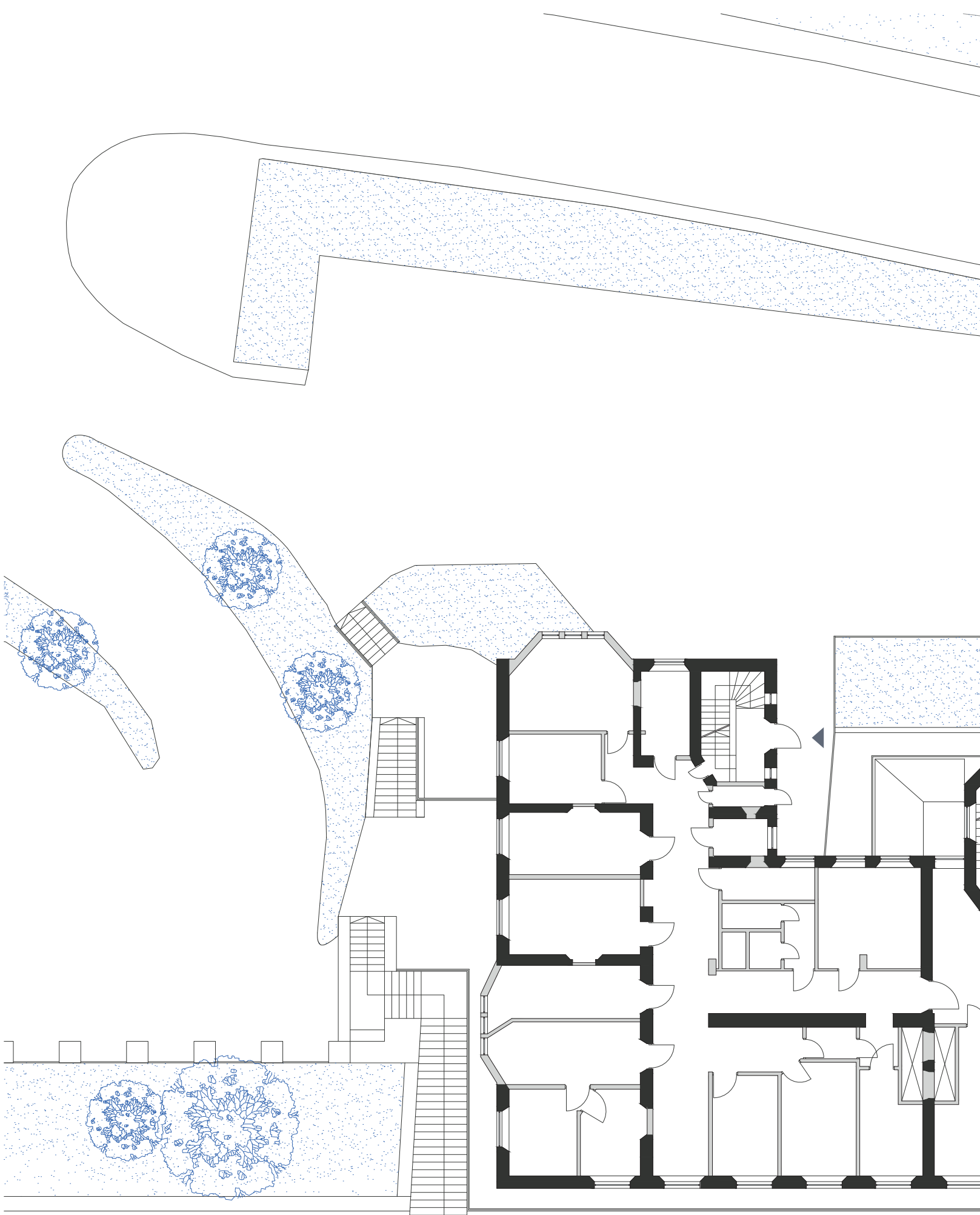




FLOOR PLAN SECOND FLOOR 1:200

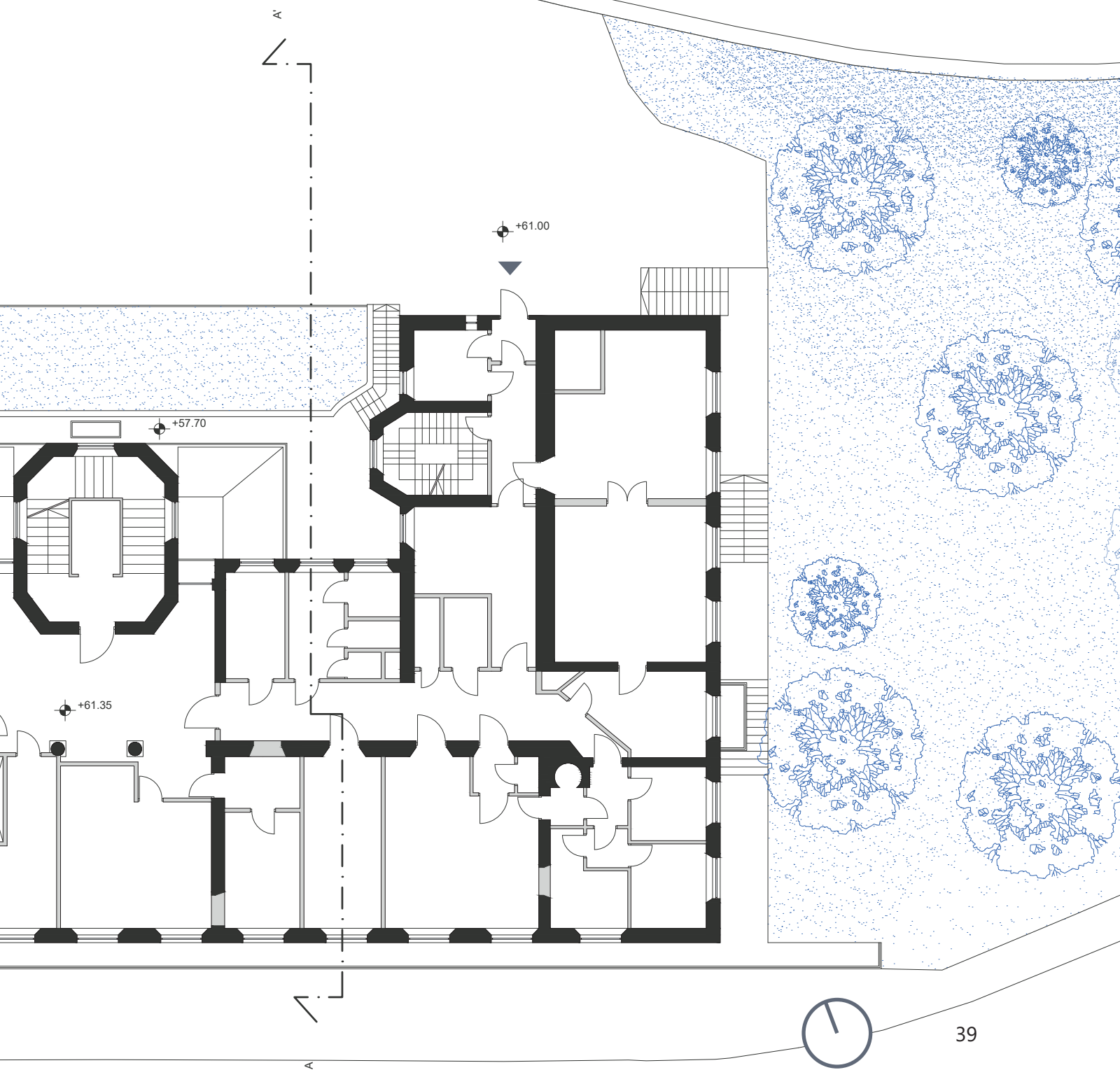
The second floor, similarly to the one below, is accessed via the main staircase, which opens into a large entrance hall. From this space, corridors to the right and left provide access to all rooms. At this level, the two auxiliary staircases located in the building's right and left wings also become present. As on the other floors, the bathroom facilities are positioned on both sides of the entrance hall.

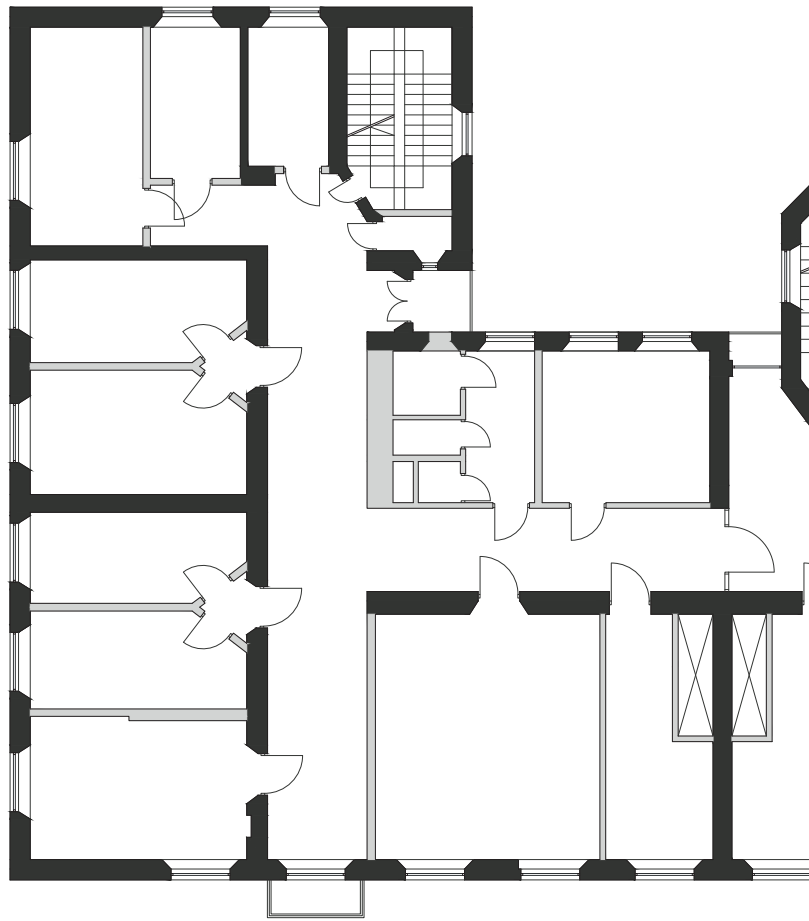




FLOOR PLAN THIRD FLOOR 1:200

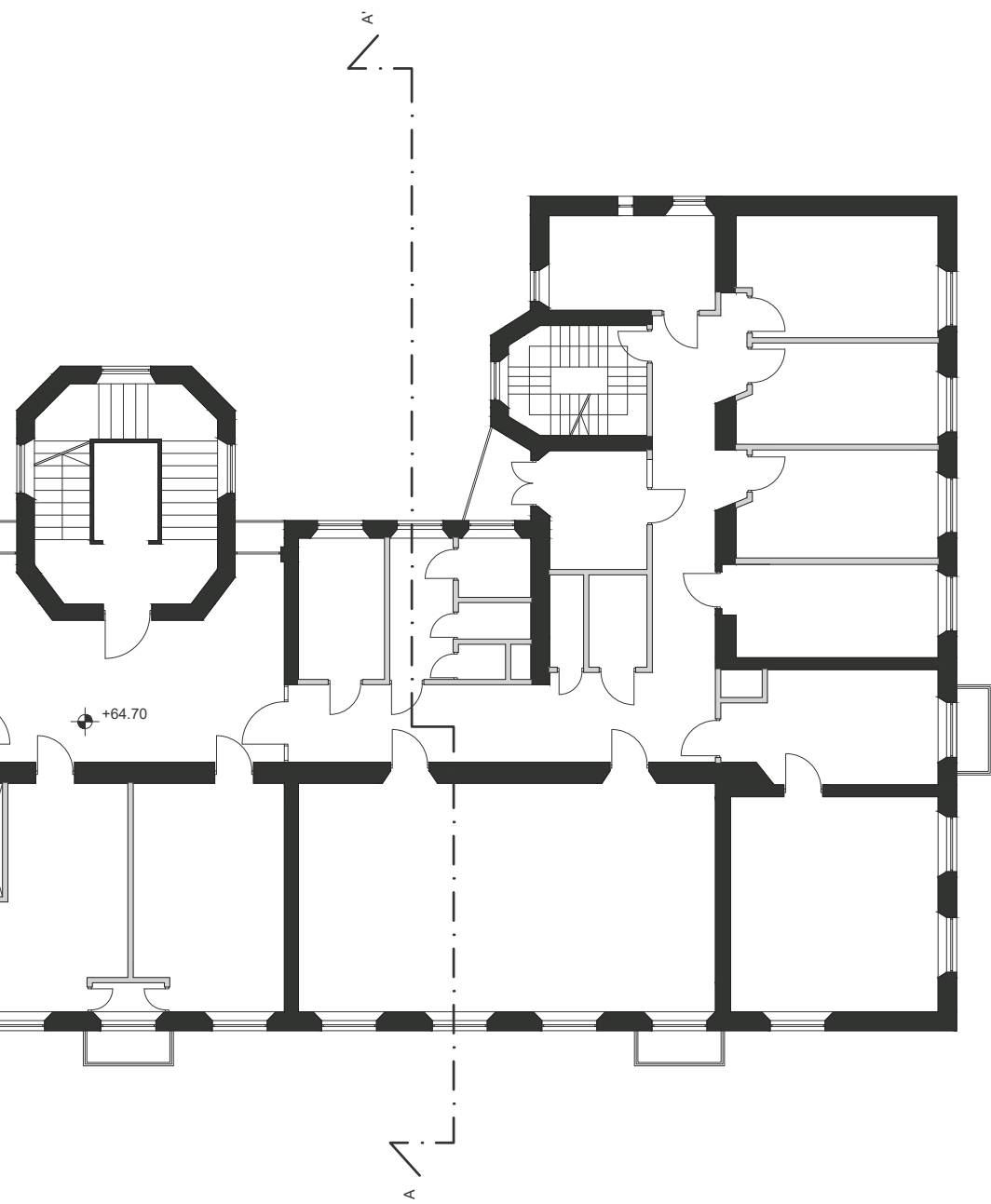
The entrance and spatial layout of the third floor are largely consistent with those of the other floors. The main staircase leads to an entrance hall, from which two corridors extend to the left and right, providing access to the rooms. In this case, it can be observed that an unresolved space has been created behind the two original columns.

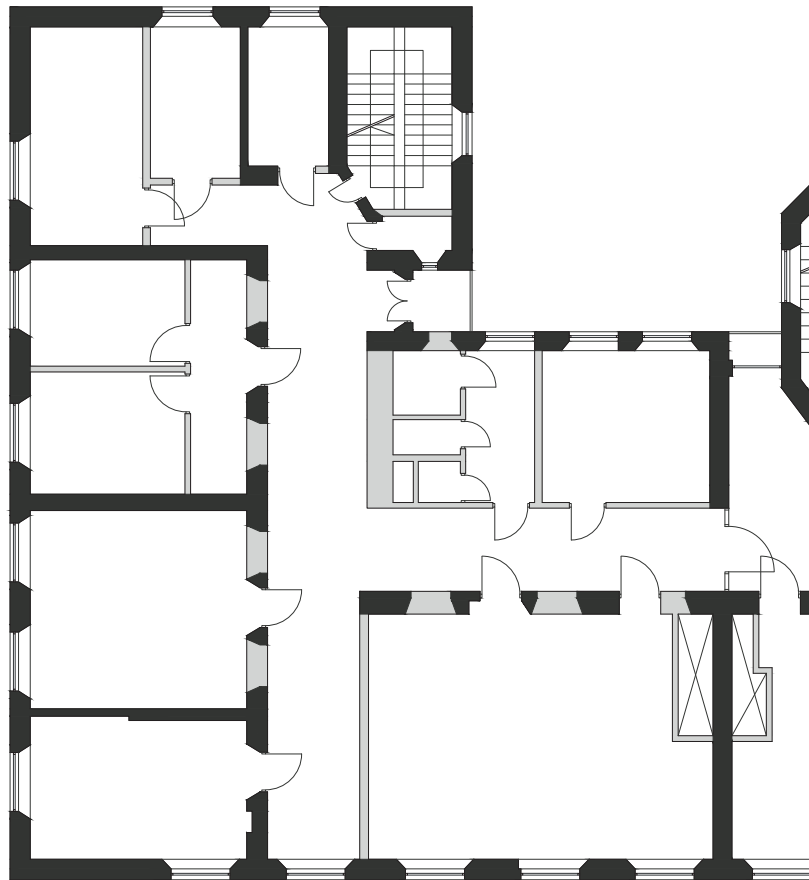




FLOOR PLAN FOURTH FLOOR 1:200

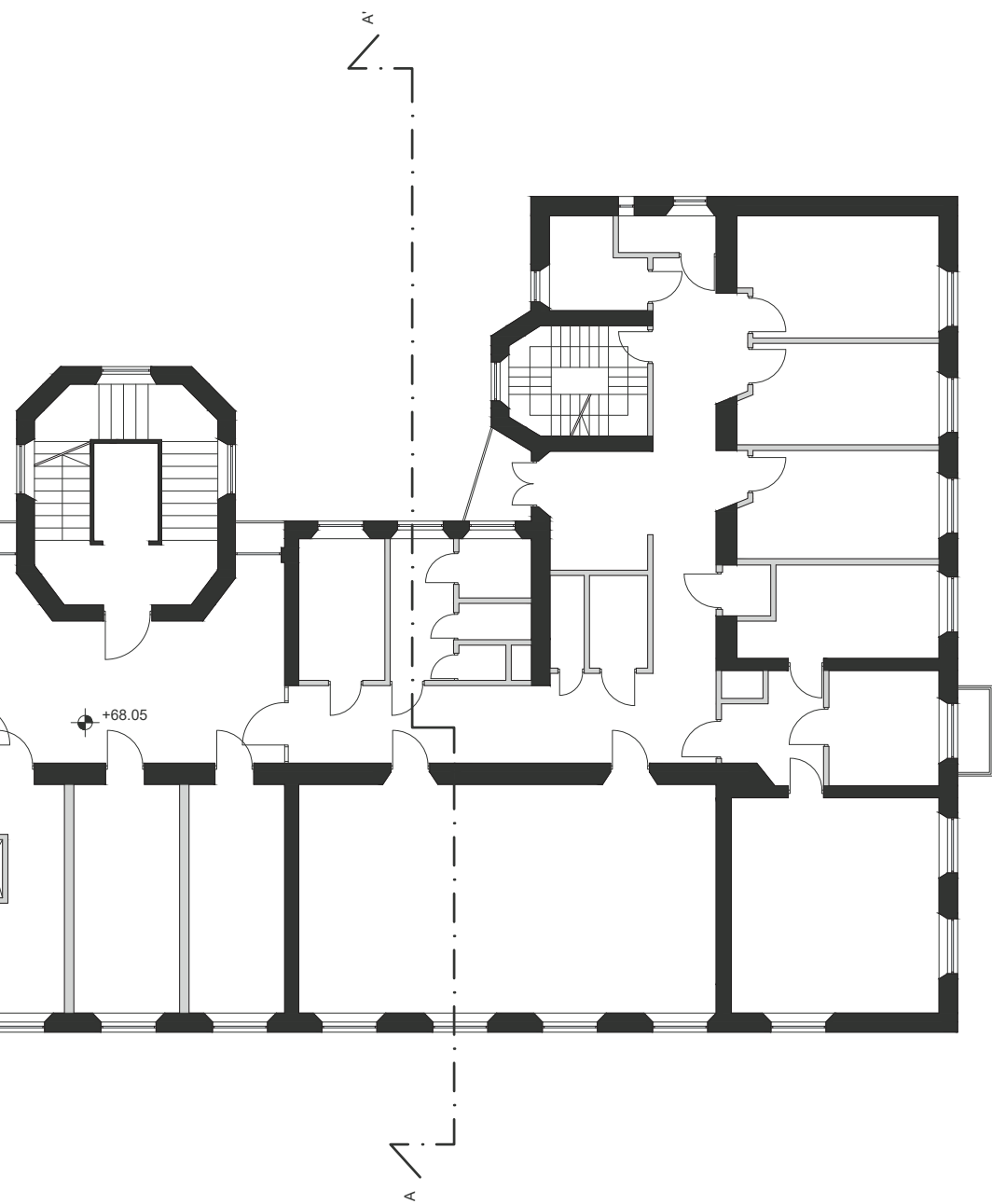
The fourth floor follows the established layout of the lower floors, with access provided via the main staircase leading to an entrance hall, from which corridors extend to the left and right, providing access to both the bathrooms and the rooms.

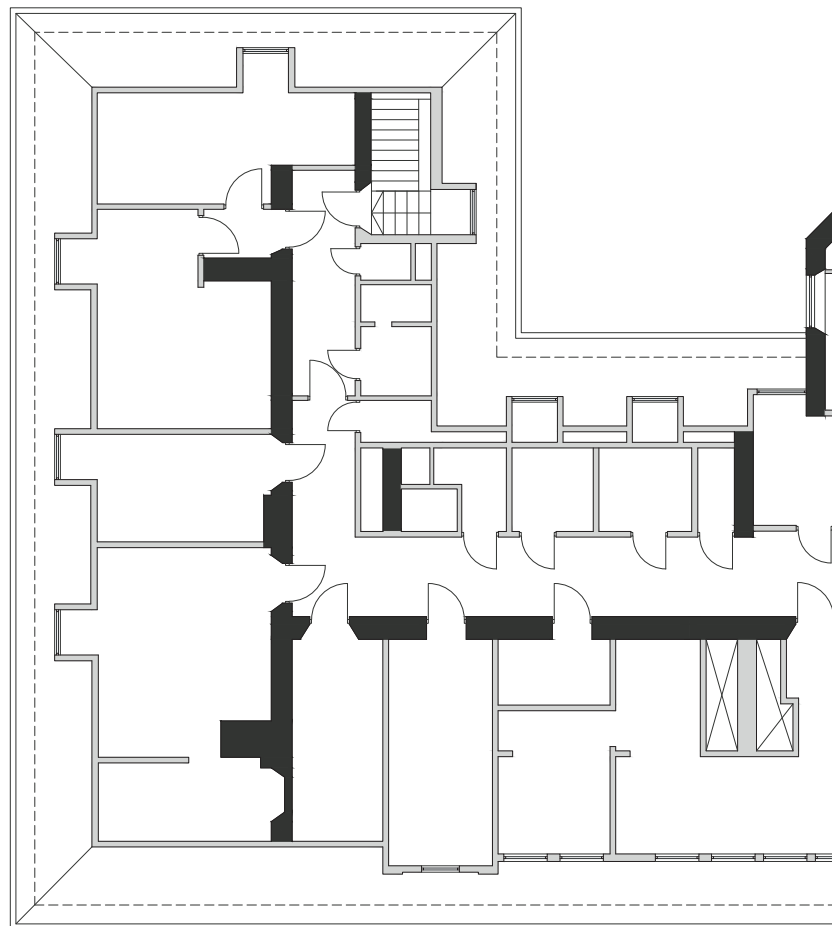




FLOOR PLAN FIFTH FLOOR 1:200

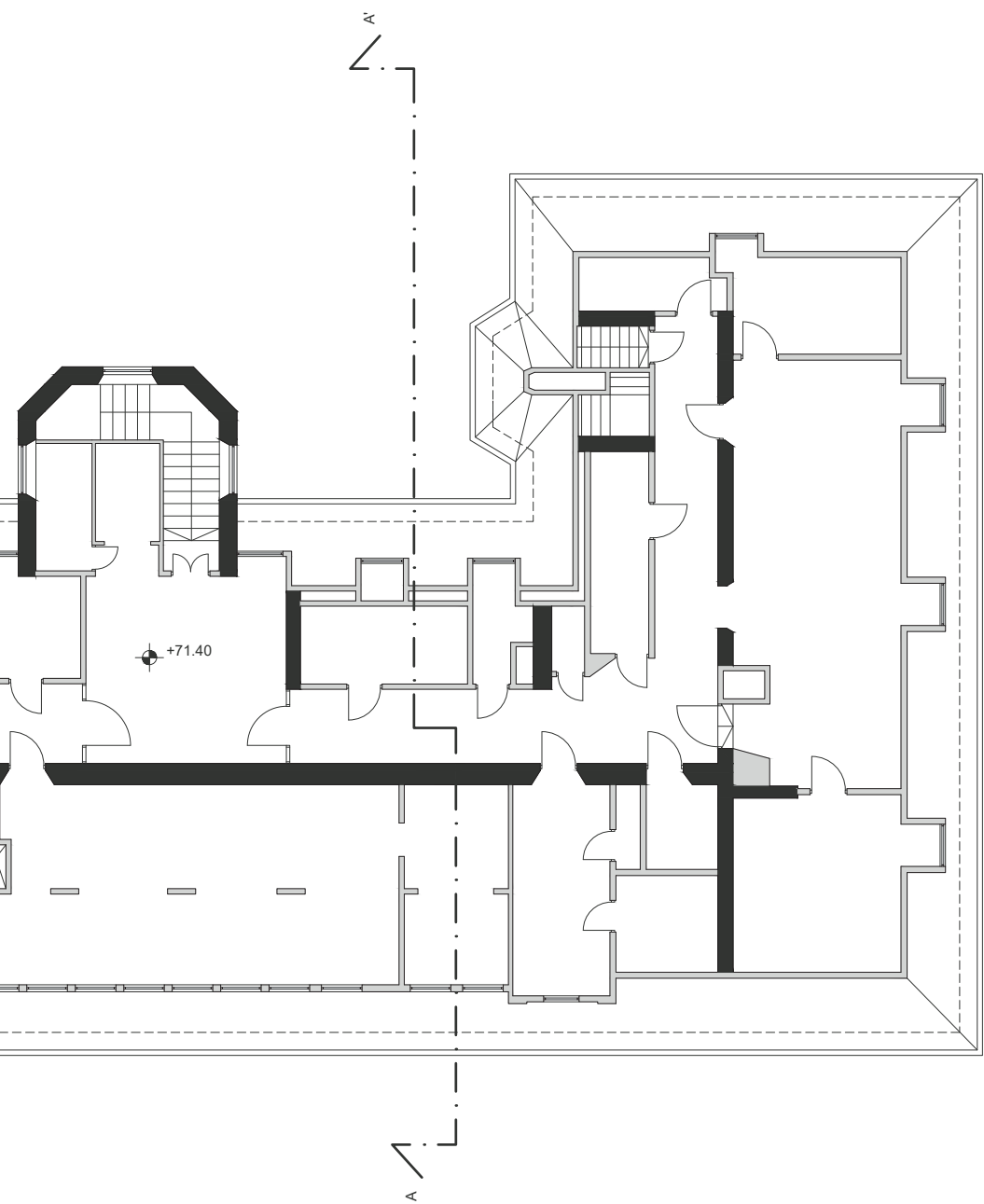
The fifth floor shares the same spatial characteristics as the lower floors, comprising a large entrance hall, connecting corridors, and bathroom facilities located on both the left and right sides of the entrance area.





FLOOR PLAN SIXTH FLOOR 1:200

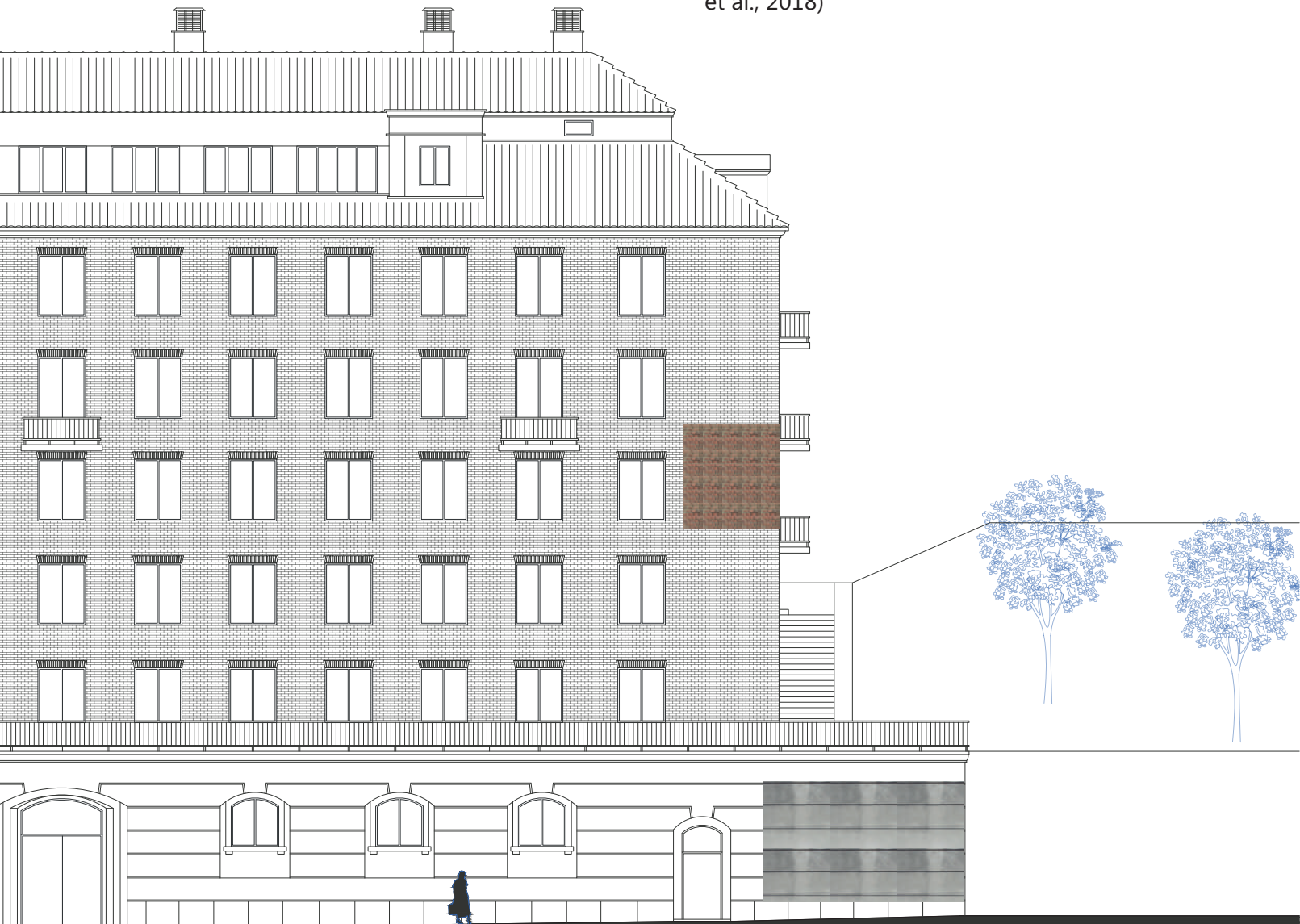
The sixth and top floor is an attic level and, like the floors below, features a spacious entrance area opposite the main staircase, from which corridors provide access to the various rooms.





SOUTH FACADE 1:200

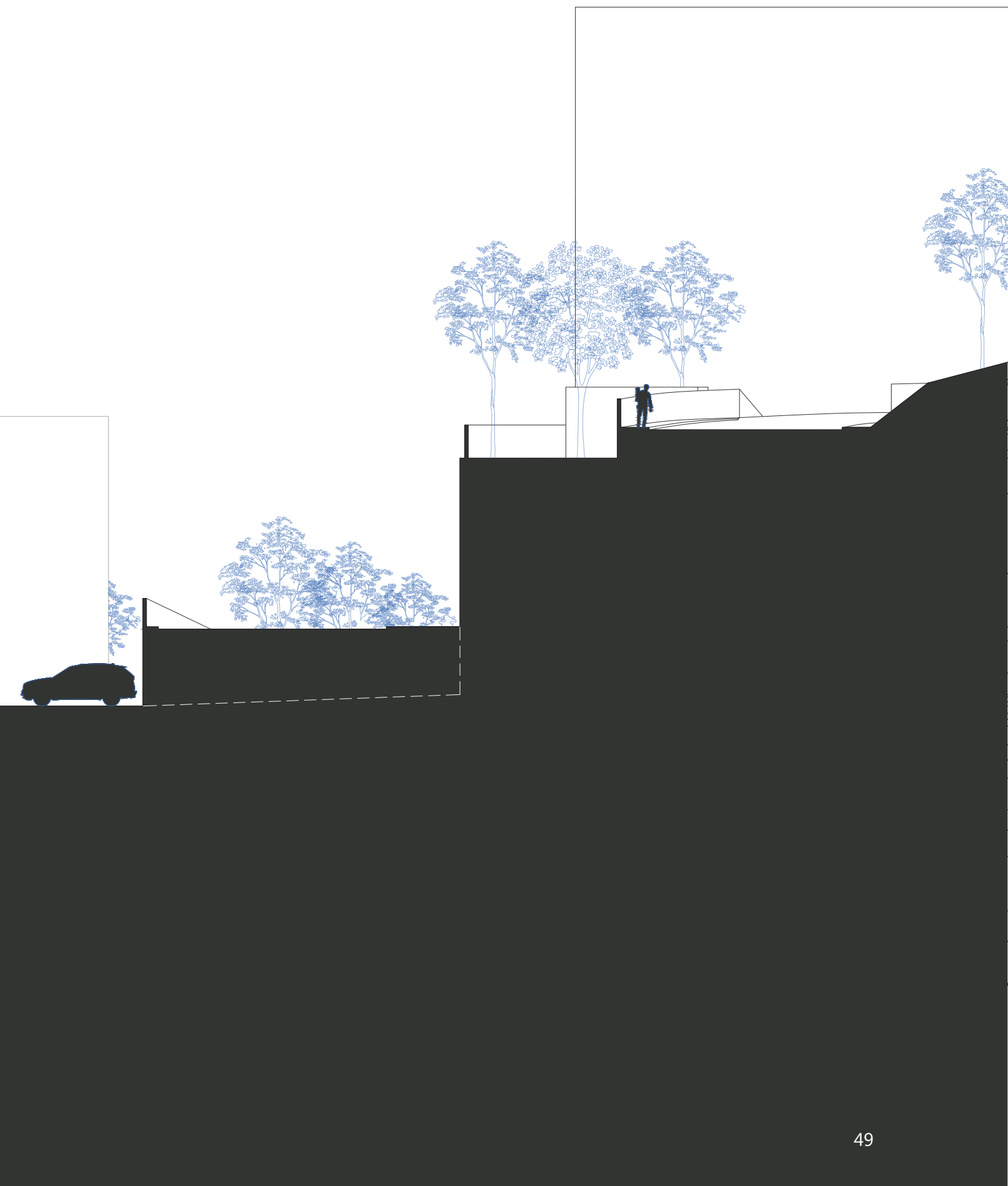
According to the report prepared by Lindholm restaurering AB, the building is founded directly on rock with a reinforced concrete base. Above the foundation, the structure consists of load bearing brick walls and concrete floors, while the staircases are made of concrete. On the ground, first, and second floors, load bearing columns are visible in the entrance halls, probably made of concrete. The roof trusses are constructed of wood. (Johanna Lange et al., 2018)



As previously mentioned, an analysis of the building's location reveals that it occupies a strategic position along the street delineating the perimeter of Medicinareberget and Sahlgrenska Sjukhuset. The building features multiple points of access, including entrances from the upper part of the hill that provide direct access to the upper floors, as well as a main entrance located at Per Dubbsgatan 14.



SECTION AA' 1:200

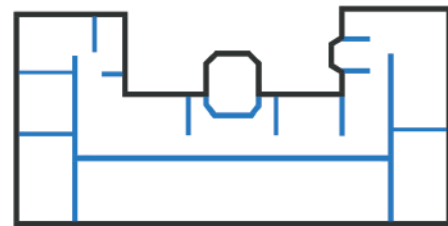


THE PROJECT

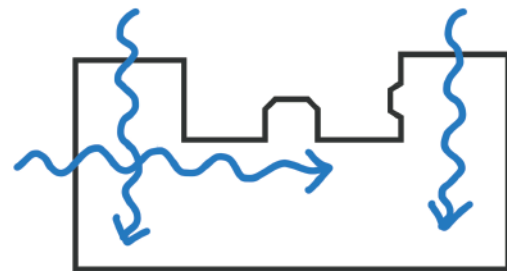
The concept

The Ortopediska kliniken constitutes a valuable case study due to its significant historical and architectural value, which provides strong potential for preservation and adaptive reuse. The objective is to transform the building into a meaningful and functional space that responds to the needs of the surrounding community.

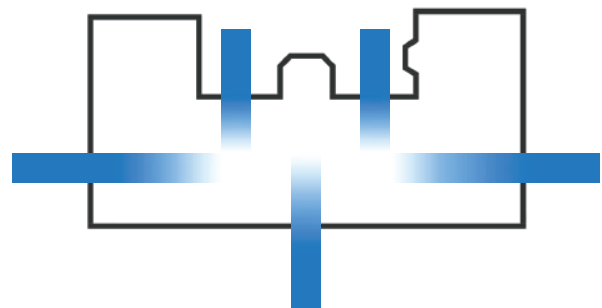
The project is guided by a series of concepts and approaches that together shape the overall design. In the development of the floor plan layouts, a clear hierarchy has been established. First and foremost, the primary structural system is to be preserved and altered as little as possible, therefore, all layout decisions have been made in consideration of the existing structure. Secondly, ensuring accessibility and meeting the specific needs of the building's users are key priorities, emphasizing the importance of providing a comfortable and inclusive environment. Thirdly, light is considered one of the major factors in shaping the spaces, as it contributes to creating pleasant, relaxing, and comfortable environments for all three user groups. Finally, attention is given to the implementation of modular spaces that can be repeated across each floor while still responding to the specific requirements of the different user groups.



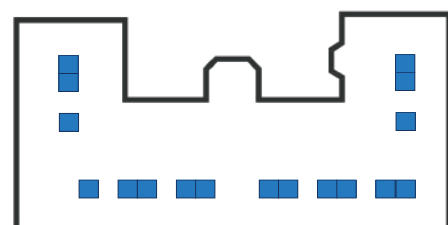
Original structure



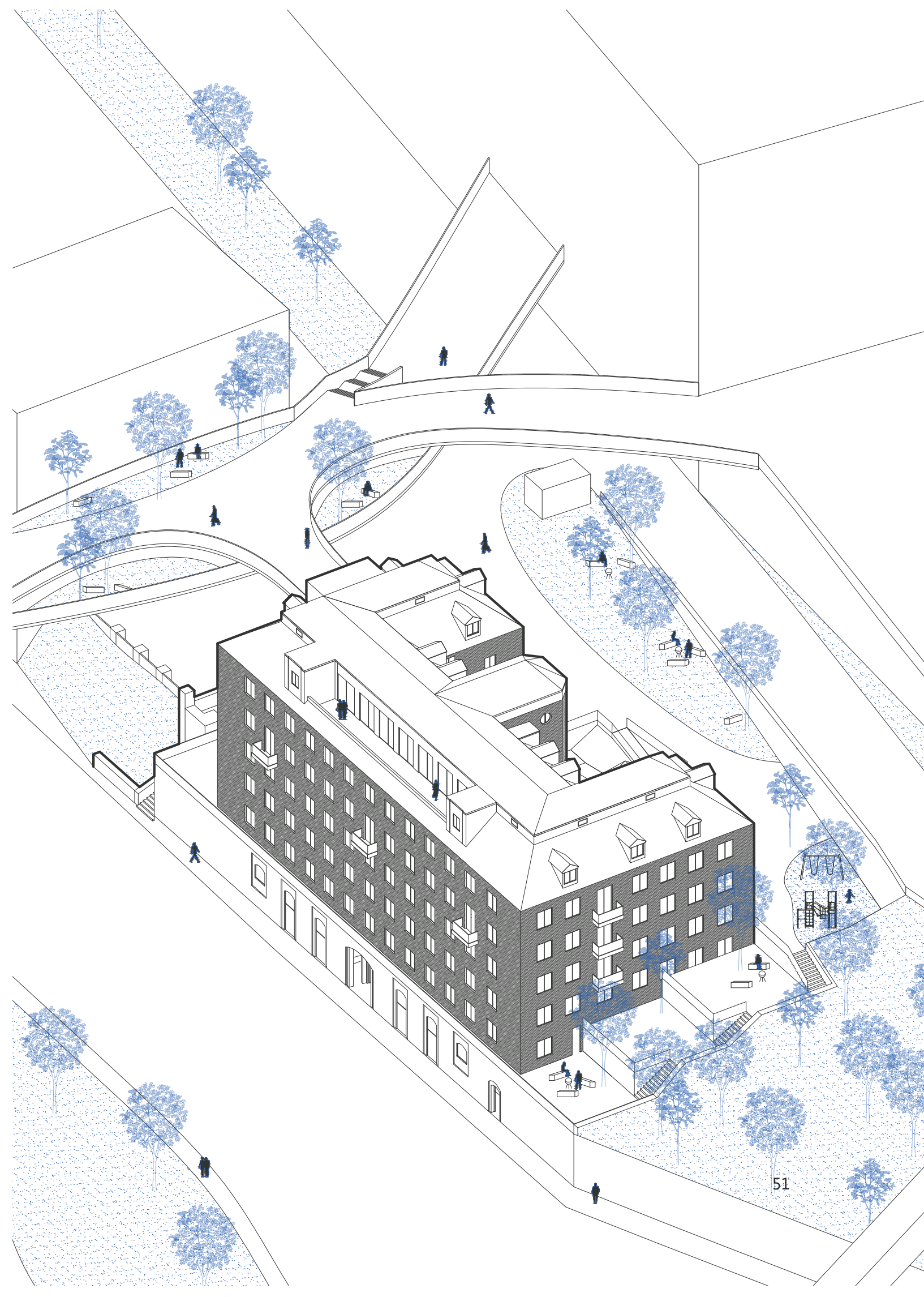
Accessibility/needs



Light



Modularity



Spatial subdivision

Each floor allocates service spaces on the north facing side, while rooms or apartments are oriented towards the south, east, and west. Vertical circulation is provided by three staircases and one elevator, which connect all levels. Although some floors have independent access points from the upper part of the hill, the stairs and elevator ensure internal connectivity, allowing users to move between floors even when entering from different levels.

The spatial subdivision has been organised as follows:

The ground floor accommodates publicly accessible cafés facing Per Dubbsgatan. As there are few cafés in the immediate surrounding area, the inclusion of such functions is considered important in order to activate the street and provide amenities for both users and visitors.

The first floor is designated for students, as its proximity to the café and its location closest to the street make it suitable for more active and social functions. It is considered less appropriate for healthcare related uses or family oriented functions, which generally require quieter and more secluded environments.

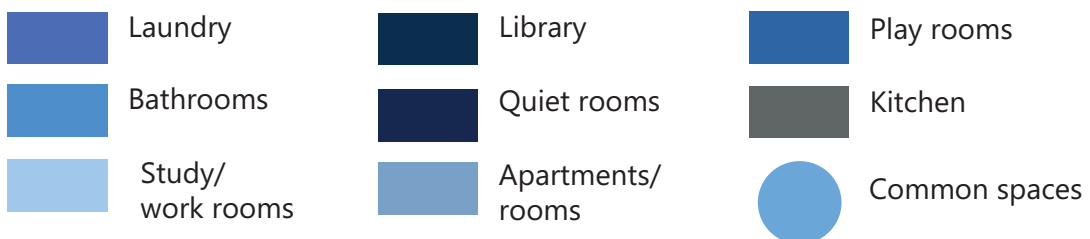
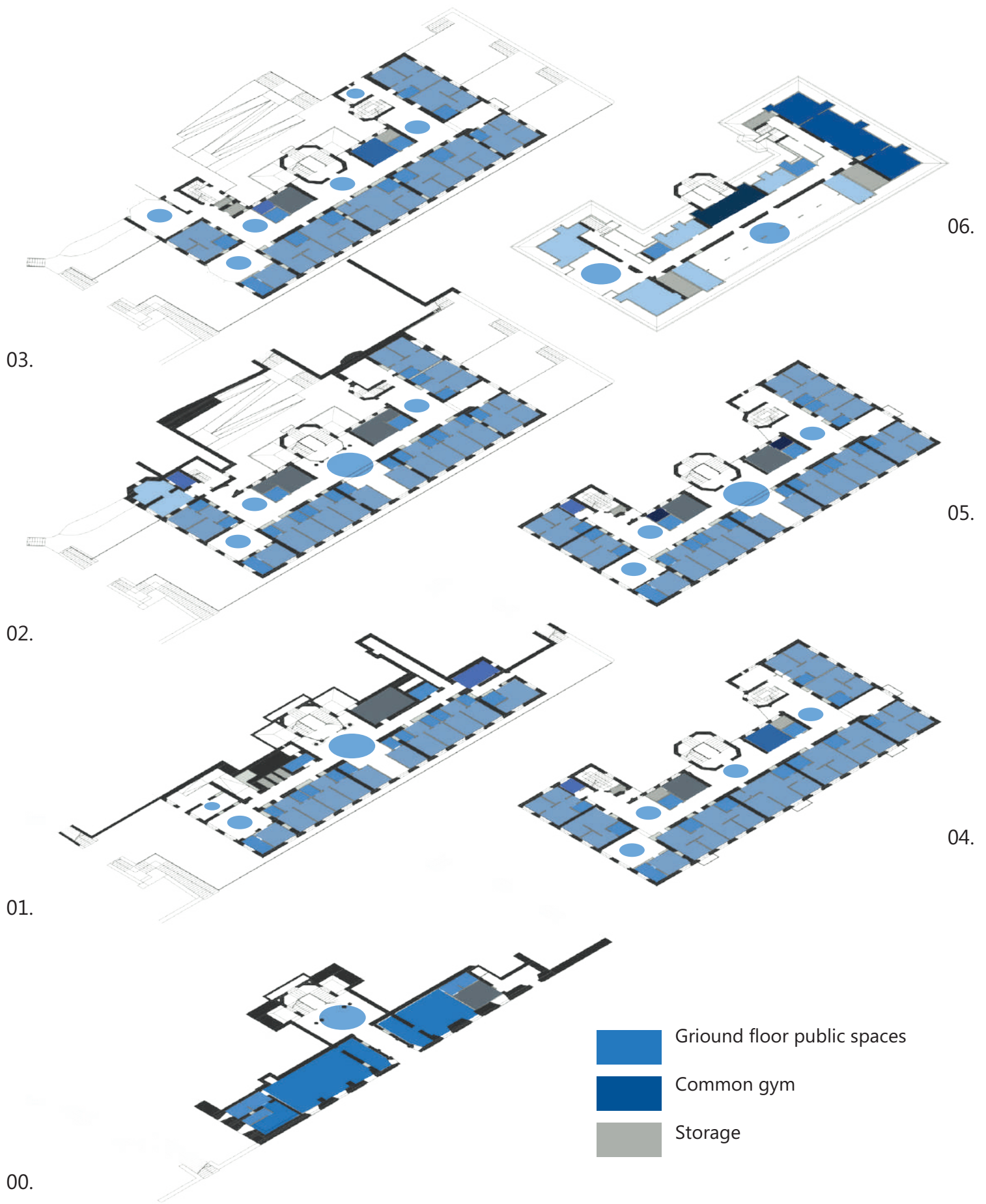
The second floor is also allocated to students, allowing for spatial continuity and functional proximity between adjacent students floors.

The third floor is dedicated to families, with direct access to surrounding green areas and the adjacent children's park, which are essential qualities for this user group.

The fourth floor is likewise reserved for families, maintaining the same spatial organisation and layout.

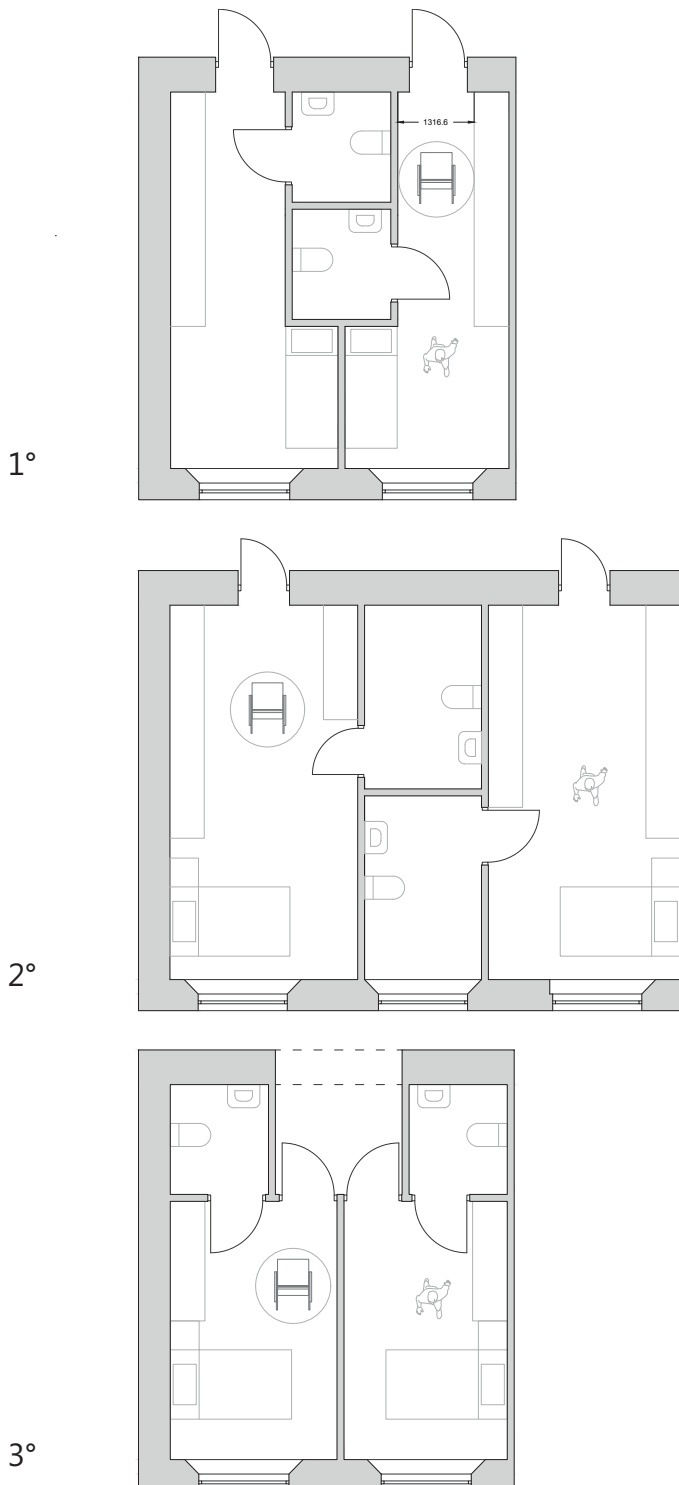
The fifth floor is intended for healthcare workers, providing spaces for rest and recovery before or after long shifts. Each unit includes private bathroom facilities, and the floor also features two quiet green rooms designed as restorative spaces.

The top floor, which connects to the bridge, is conceived as a public level reserved for the building's residents, offering shared communal areas and spaces for collective activities.



DESIGN

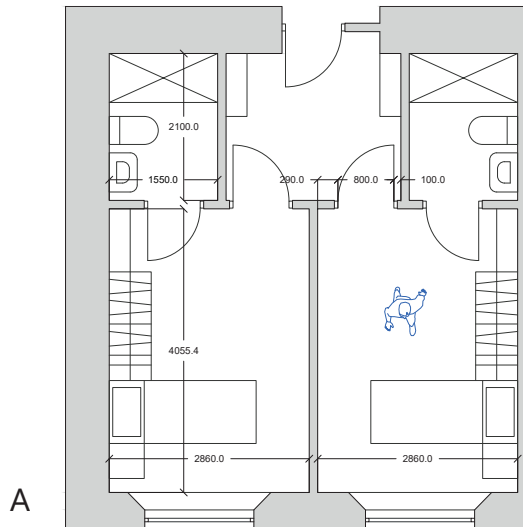
Student's design layout study



The first layout to be studied is the student housing layout. By analyzing the Swedish regulations as well as the nearby Haltermann student housing project and taking into consideration the spatial conditions of the Ortopediska Kliniken, the essential functions required for student housing have been identified. These include a kitchen, which in this case is shared due to the limited space available within each room, a bed and a bathroom, which has been incorporated into each room to ensure greater privacy. In addition, a laundry facility is provided on each floor, together with common shared spaces. Additional necessary functions include study rooms and outdoor gathering spaces.

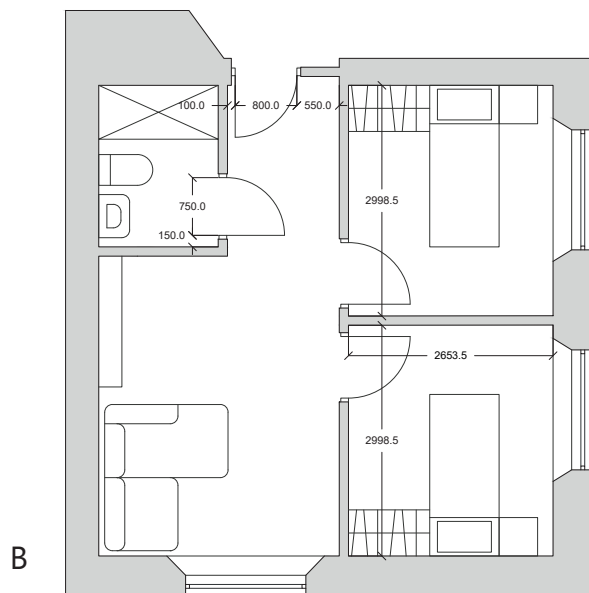
In the first layout proposed, the bathroom was placed within each apartment, it was immediately recognized, however, that the spatial conditions are quite narrow, making the vertical stacking of bathrooms an unfeasible option for the apartments. As a second alternative, it was considered to convert one of the rooms into two separate bathrooms serving the two adjacent rooms. However, this would have resulted in a loss of rentable area and would have led to disproportionately large bathroom spaces. Finally, to improve the rentable area has been concluded that each window would correspond to one room and one of the last proposed solutions placed the bathrooms in the far corners of the apartments, creating a shared entrance space. This alternative is quite close to the final design solution.

Final student's design layout



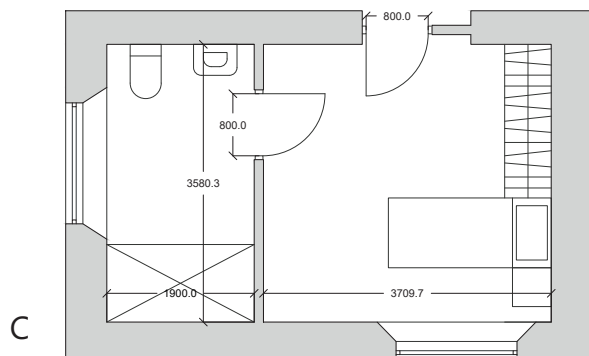
Type A (18 sqm)

In this configuration, the shared entrance has been closed off so that this area can instead be integrated into the apartments. It is used by the students as a small entry space for hanging jackets and leaving shoes. In this way, the space becomes part of the apartment rather than being treated as a corridor.



Type B (36 sqm)

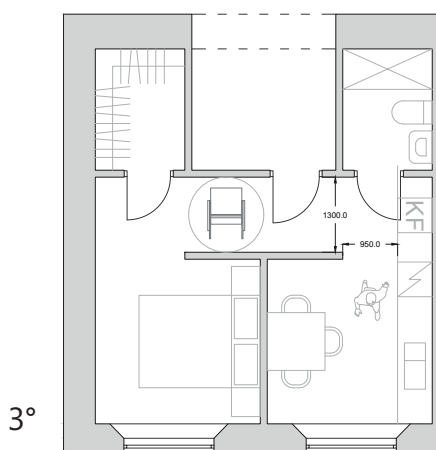
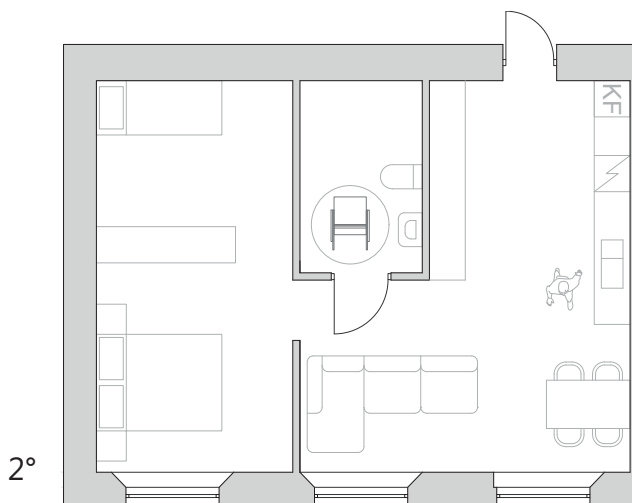
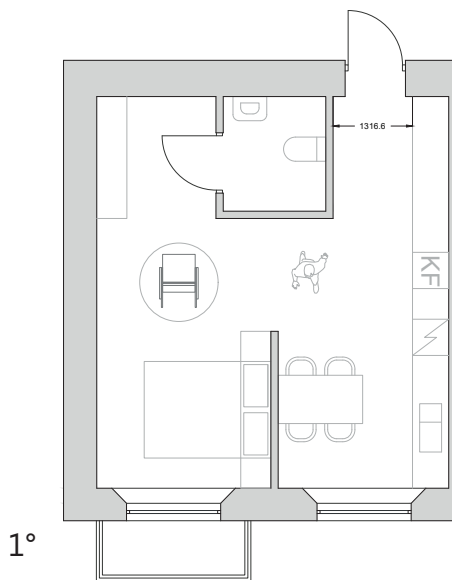
On the same floor, different types of apartments can be found. In this case, the apartment is shared by two students. This responds to situations where students choose to live together. Each student floor includes at least two apartments of this type.



Type C (21 sqm)

This apartment type is fully accessible, and there is one unit of this kind on each floor.

Families's design layout study



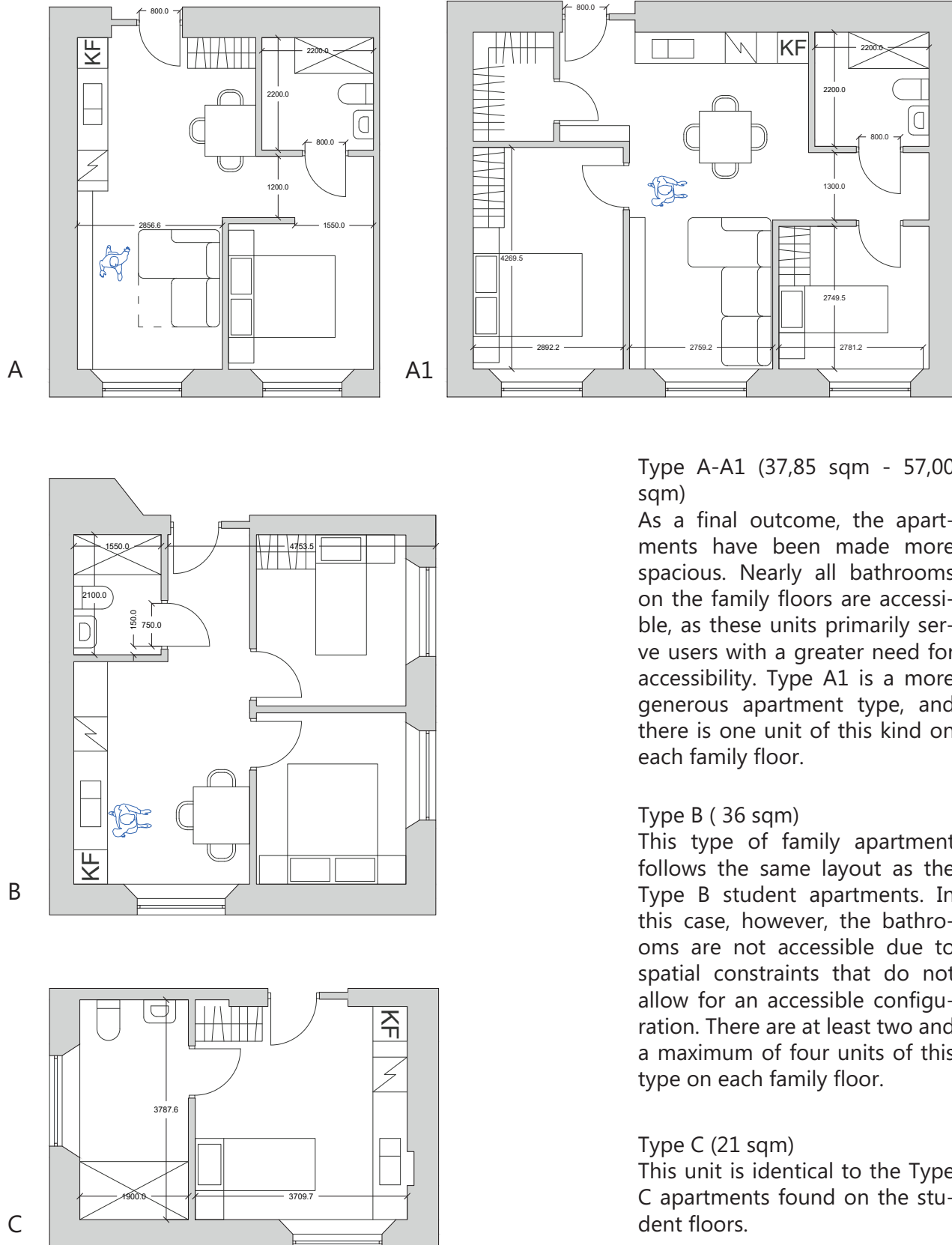
For the family's apartment requirements, the transformation of the Hospital Saint-Vincent-de-Paul into housing in Paris by Lacaton & Vassal has been used as a reference. This project represents an interesting comparison, as it also involves the conversion of a former hospital into residential apartments. The main aspects taken as reference are the required functions, which include at least one bathroom, a kitchen, one or more bedrooms, laundry facilities and green spaces. Beyond these basic functions, spaces dedicated to children's play and activities as well as common areas have also been considered essential.

As a first solution for the family units, an alternative was developed in which the bathrooms were positioned centrally between two adjacent apartments. However, this configuration also presented the issue of an excessively narrow entrance space.

In a second proposal, one of the apartments was instead converted into two bathrooms serving the adjacent units. In this case, the main drawback was the placement of the bathroom entrances within the living room area, which resulted in an uncomfortable and impractical layout.

In the final proposal for the family apartments, the layout followed a similar structure to that of the student units, with one of the bathrooms transformed into a walk-in closet. However, issues remained regarding wasted space in front of the entrance and an insufficiently sized entrance corridor. This was also one of the reasons why it was ultimately decided to integrate the entrance area into the interior of the apartments.

Final families's design layout



Type A-A1 (37,85 sqm - 57,00 sqm)

As a final outcome, the apartments have been made more spacious. Nearly all bathrooms on the family floors are accessible, as these units primarily serve users with a greater need for accessibility. Type A1 is a more generous apartment type, and there is one unit of this kind on each family floor.

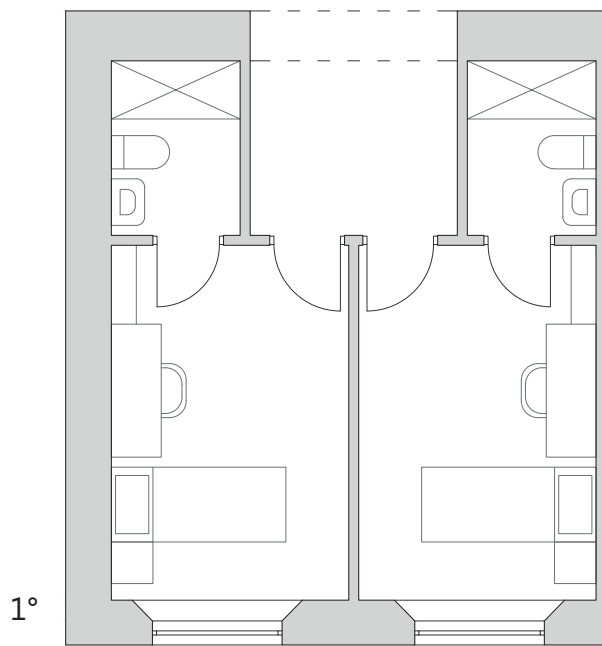
Type B (36 sqm)

This type of family apartment follows the same layout as the Type B student apartments. In this case, however, the bathrooms are not accessible due to spatial constraints that do not allow for an accessible configuration. There are at least two and a maximum of four units of this type on each family floor.

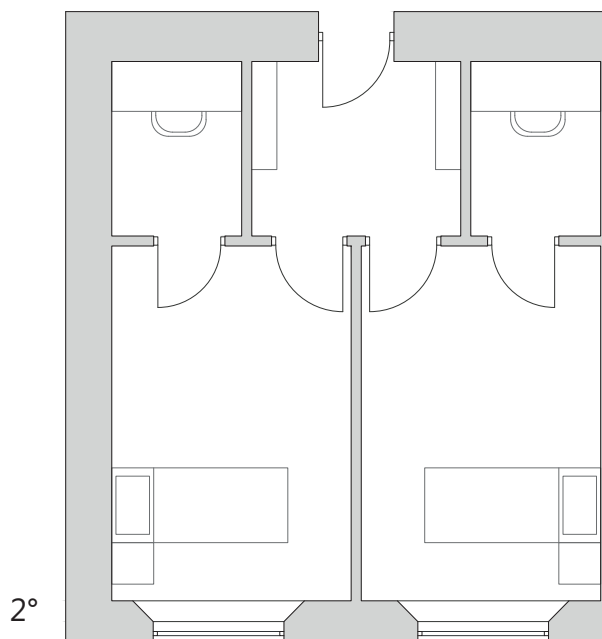
Type C (21 sqm)

This unit is identical to the Type C apartments found on the student floors.

Healthcare workers's design layout study



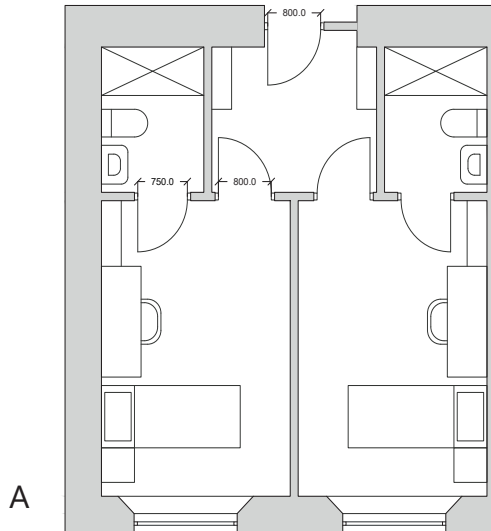
For the healthcare workers' rooms, no specific reference was found that clearly defines the requirements for users' needs. Therefore, the requirements have been derived from the texts and articles reviewed. It has been concluded that the rooms should include a private bathroom, as it is considered beneficial for staff to have the possibility to rest and shower either before or after demanding shifts. As in the other apartment types, a kitchen is also included, in this case, it can be smaller and shared, given its limited use. A laundry facility is also provided to allow staff to change and refresh after shifts, along with work desks to enable quiet and focused work in a more private setting.



The first alternative followed the same layout principles as those used for the student accommodations, based on the assumption that the spatial needs of healthcare workers are comparable to those of students.

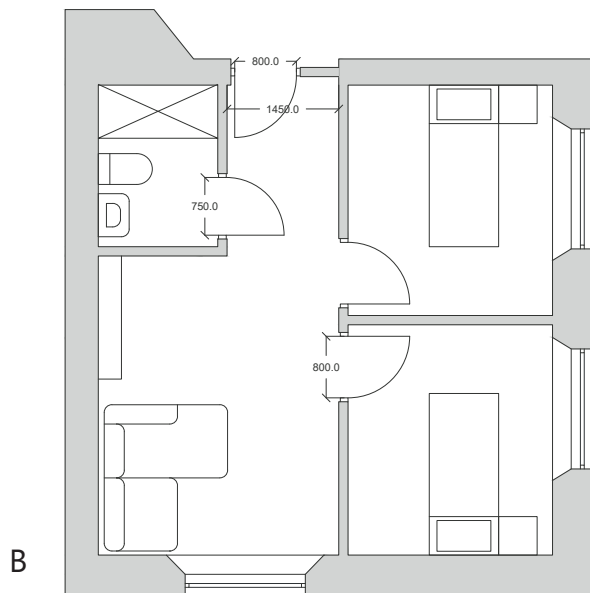
In a subsequent proposal, the option of shared bathrooms for all rooms was considered, with the intention of providing quieter working conditions within the private rooms instead. Ultimately, however, the preferred approach prioritized rest and recovery for staff rather than additional work oriented functions. The rooms, and the floor as a whole, are intended to function as a place of rest, recovery, and disconnection from work demands.

Final healthcare workers's design layout



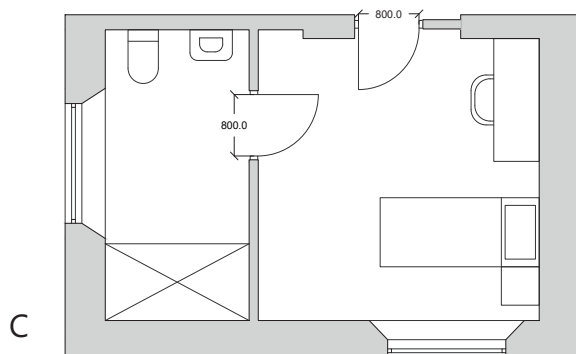
Type A (18 sqm)

The layout of this unit is identical to that of the student rooms on the other floors. The only difference is the inclusion of a desk instead of a wardrobe, as the healthcare workers are expected to stay only for short periods before or after their shifts. Consequently, these rooms are not intended for long term occupation.



Type B (36 sqm)

These rooms follow the same principle as the student Type B units and are designed for shared use by more than one person.



Type C (21 sqm)

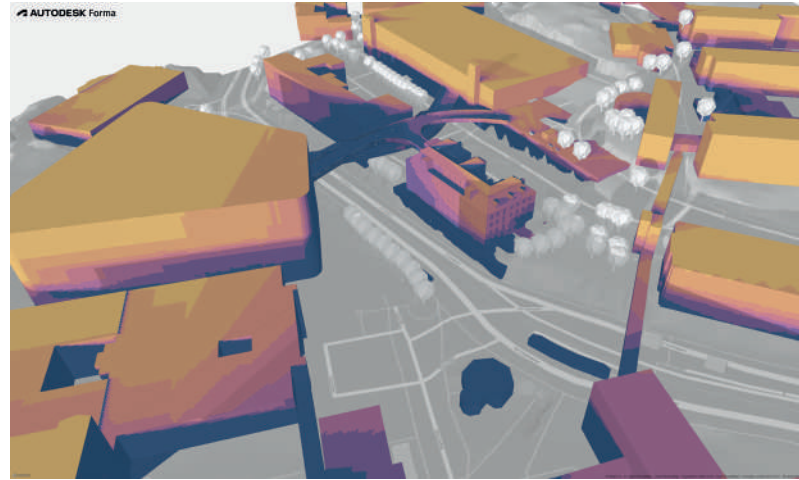
As with the Type C units on the student floors, this is a fully accessible room type.

Light analysis

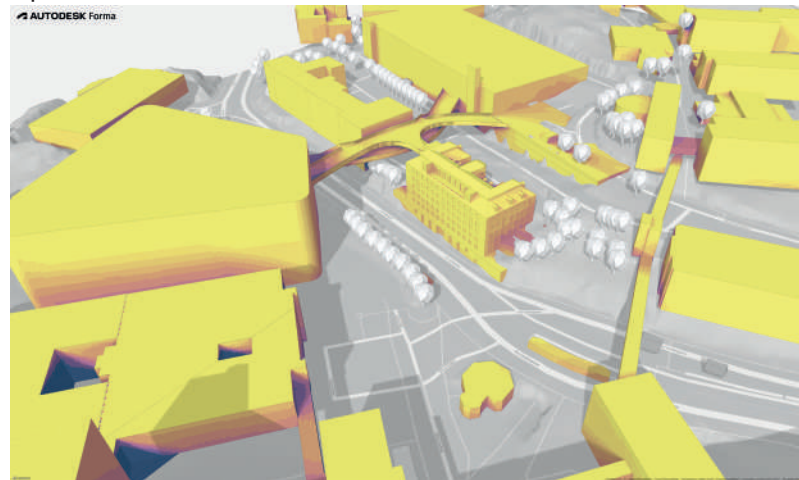
As previously stated, an important aspect of this project is the analysis of daylight conditions, with the aim of maximizing the amount of natural light reaching the otherwise darker alleys and interior spaces. The daylight study revealed significant seasonal variations in solar exposure, with the building's surfaces receiving noticeably different levels of sunlight throughout the whole year. On the right, it is shown how the amount of sunlight received throughout the day varies across different months of the year. By examining them, it can be observed that the building's orientation allows it to benefit primarily from southern exposure, which is particularly advantageous as most rooms and apartments are already oriented in this direction.

Based on these findings, it is both logical and beneficial to preserve the original spatial organization, maintaining the primary living spaces along the southern facade while locating service and utility spaces on the northern side of the building. This arrangement optimizes access to natural daylight and enhances the overall quality of the interior environment.

January 10th



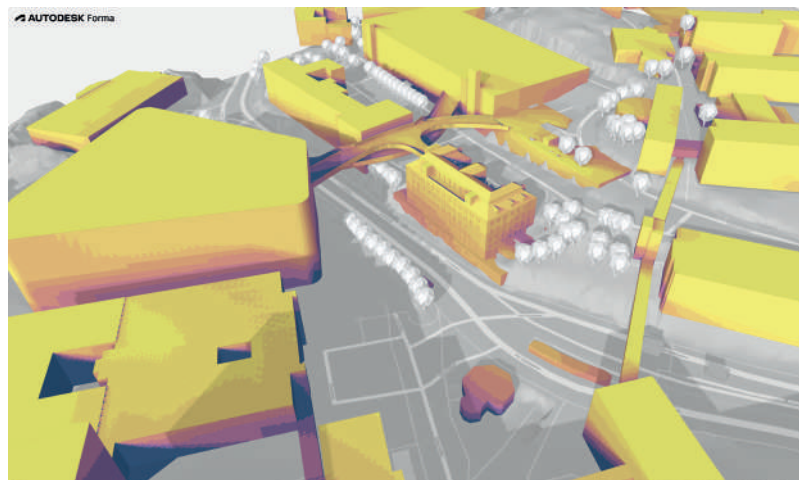
April 10th



July 10th



October 10th

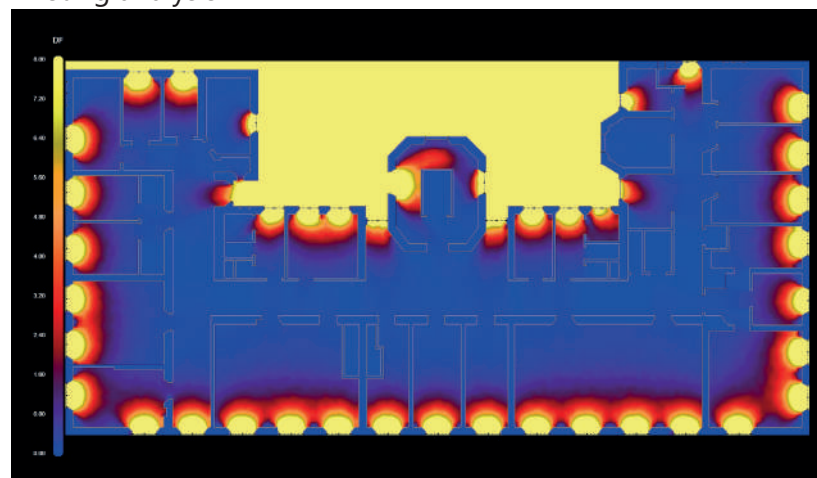


A daylight analysis of the existing building was conducted to evaluate the distribution of natural light within the structure. As shown in the first image, daylight barely reaches the central areas of the building and the limited number of windows opening onto the corridors is insufficient to adequately illuminate these darker spaces.

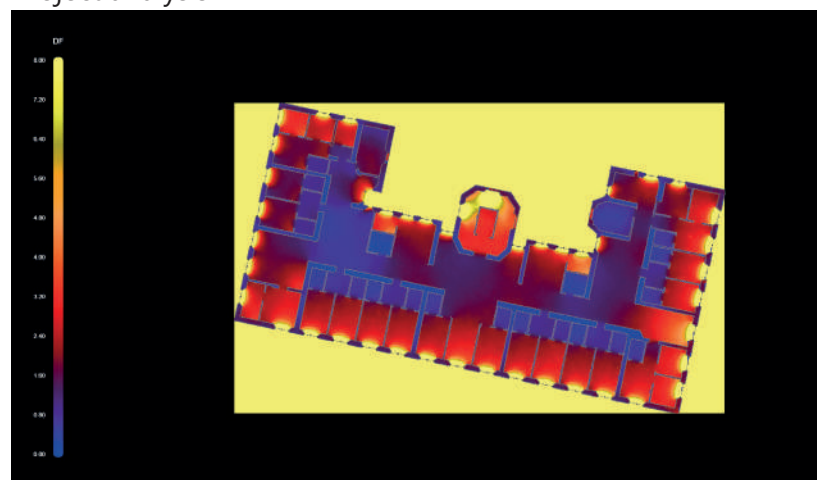
In contrast, the second image illustrates the daylight conditions proposed in the new design. A significant improvement is achieved not only through the introduction of additional openings and windows facing the central areas, but also through the selection of interior materials. To enhance the reflection and diffusion of natural light throughout the building, the use of white or light colored surfaces is recommended, together with glazing systems that maximize light transmission rather than absorb it. Consequently, one of the primary considerations in the design process is the choice of interior colors and materials, as these play a crucial role in improving the overall daylight performance of the building.

As previously mentioned, BFS 2024:8 states that a minimum daylight factor of 0.8 percent is required and this analysis demonstrates that this requirement can be met in the proposed design.

Existing analysis

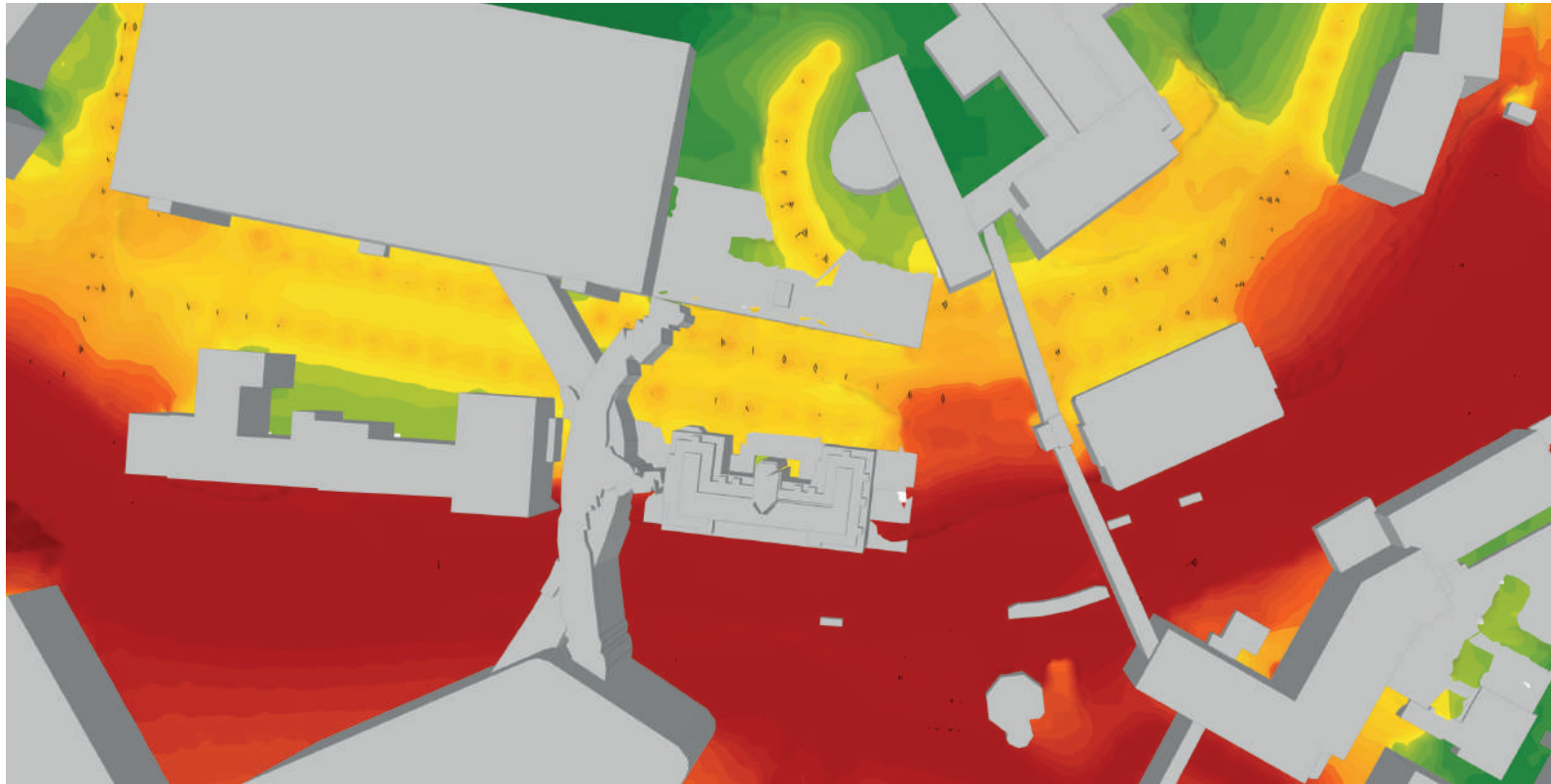


Project analysis



6. Velux daylight analysis

Noise analysis

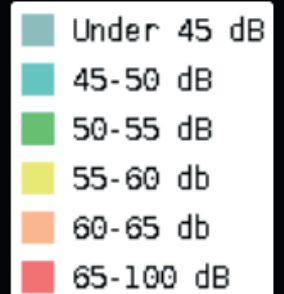


7. Autodesk Forma noise analysis

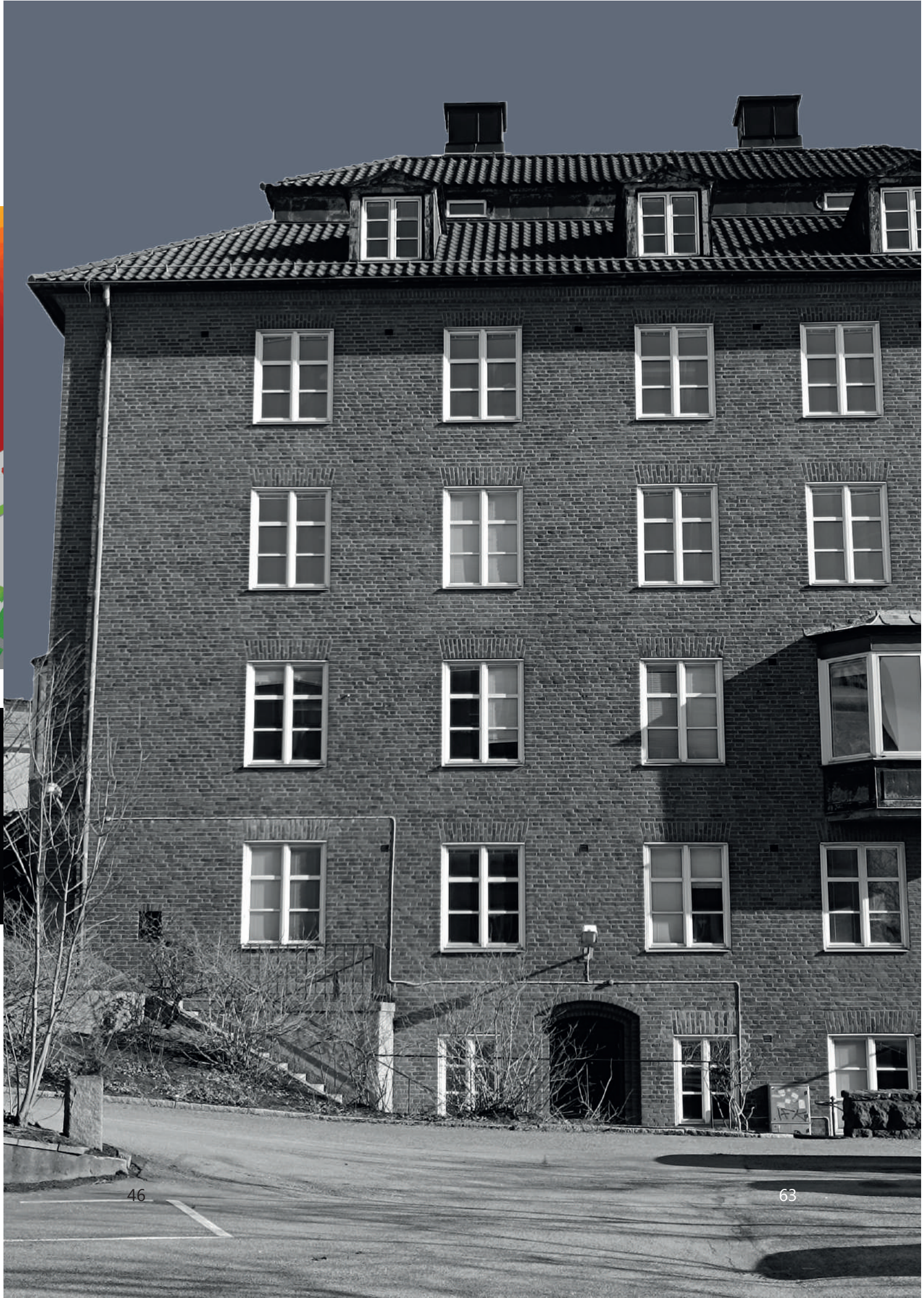
The noise analysis clearly highlights one of the primary challenges affecting the building: its proximity to Per Dubbsgatan, a major traffic route that generates significant levels of noise pollution. This issue is particularly relevant given the proposed residential function of the project, as housing environments require a high degree of acoustic comfort to ensure the well being and quality of life of their occupants.

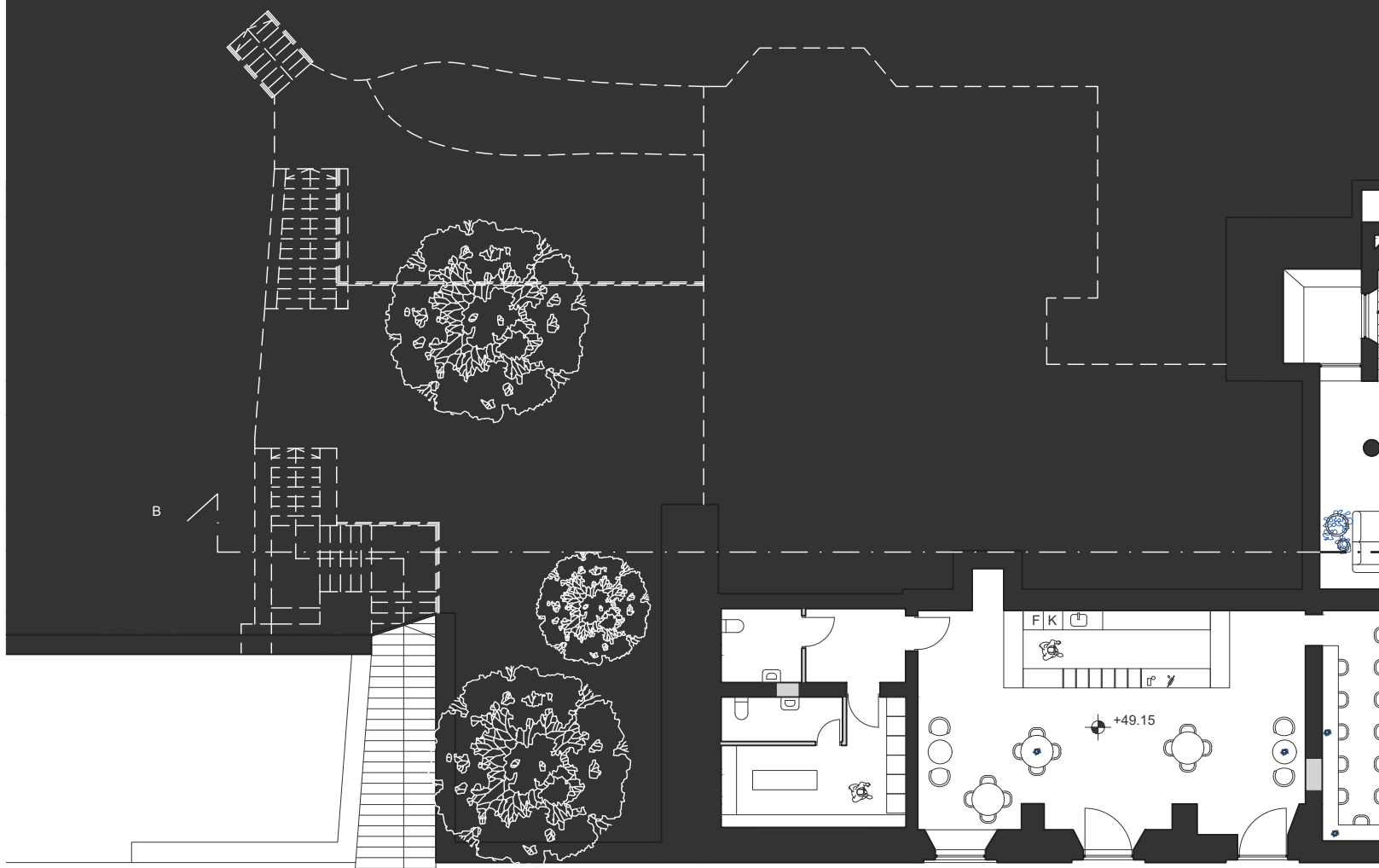
To address this challenge, one of the most effective interventions is the replacement of the existing windows with modern high performance glazing systems. Double or triple glazed windows can significantly reduce the transmission of external noise, creating a quieter and more acoustically insulated indoor environment. Additionally, the existing windows are outdated and in need of replacement, making this intervention both functionally and technically justified.

Additional measures have also been considered, including the introduction of vegetation along the street facing facades. As well as contributing to noise mitigation, planting can provide a visual buffer between the public street and the residential interiors, enhancing privacy and improving the overall quality of the living environment.



In contrast to the street facing side, the back portion of the building benefits from lower noise levels and a more tranquil atmosphere. For this reason, outdoor recreational spaces, green areas, and a children's playground are located on this side of the site, taking advantage of the quieter conditions and creating comfortable spaces for relaxation and social interaction.

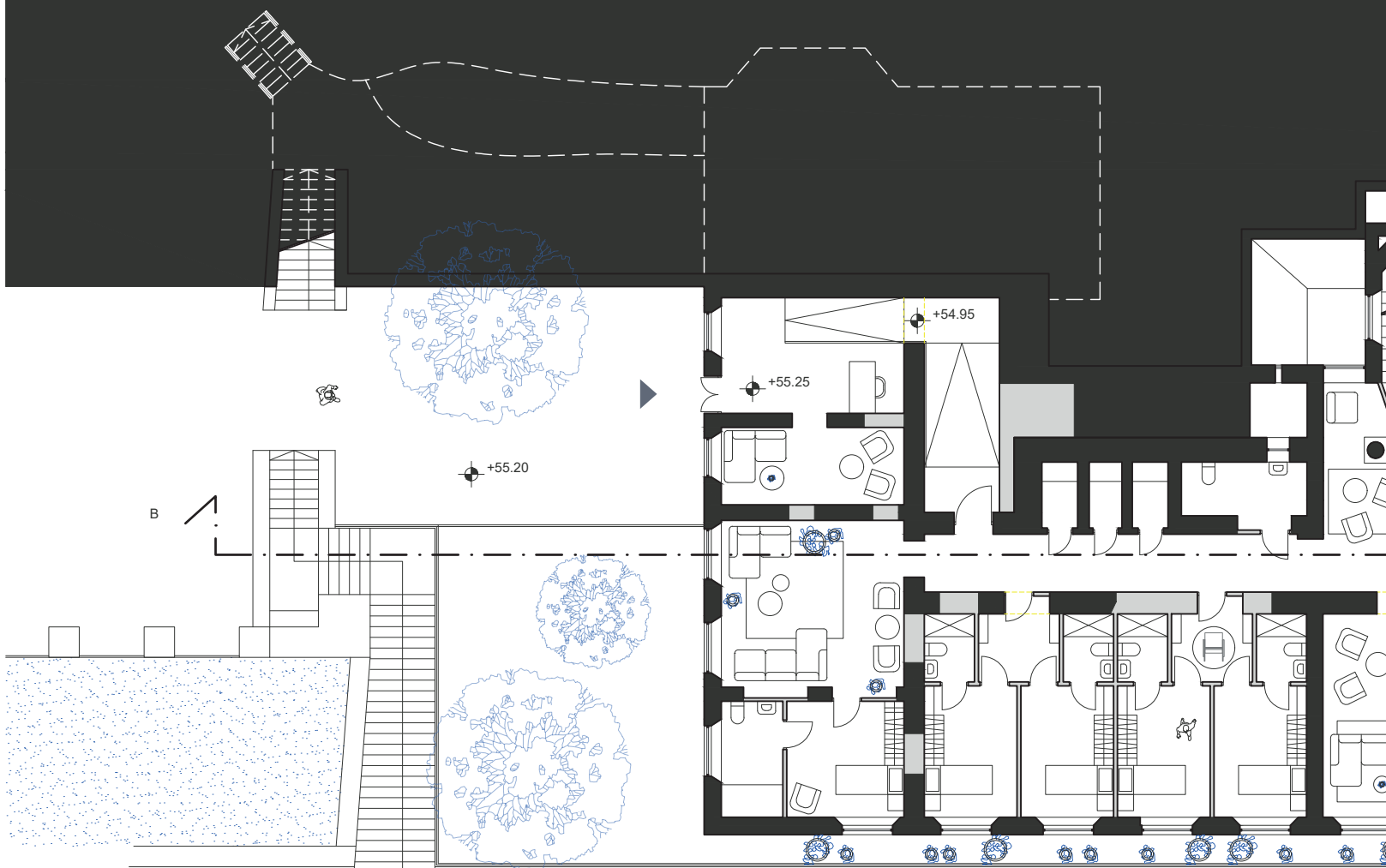




GROUND FLOOR 1:200

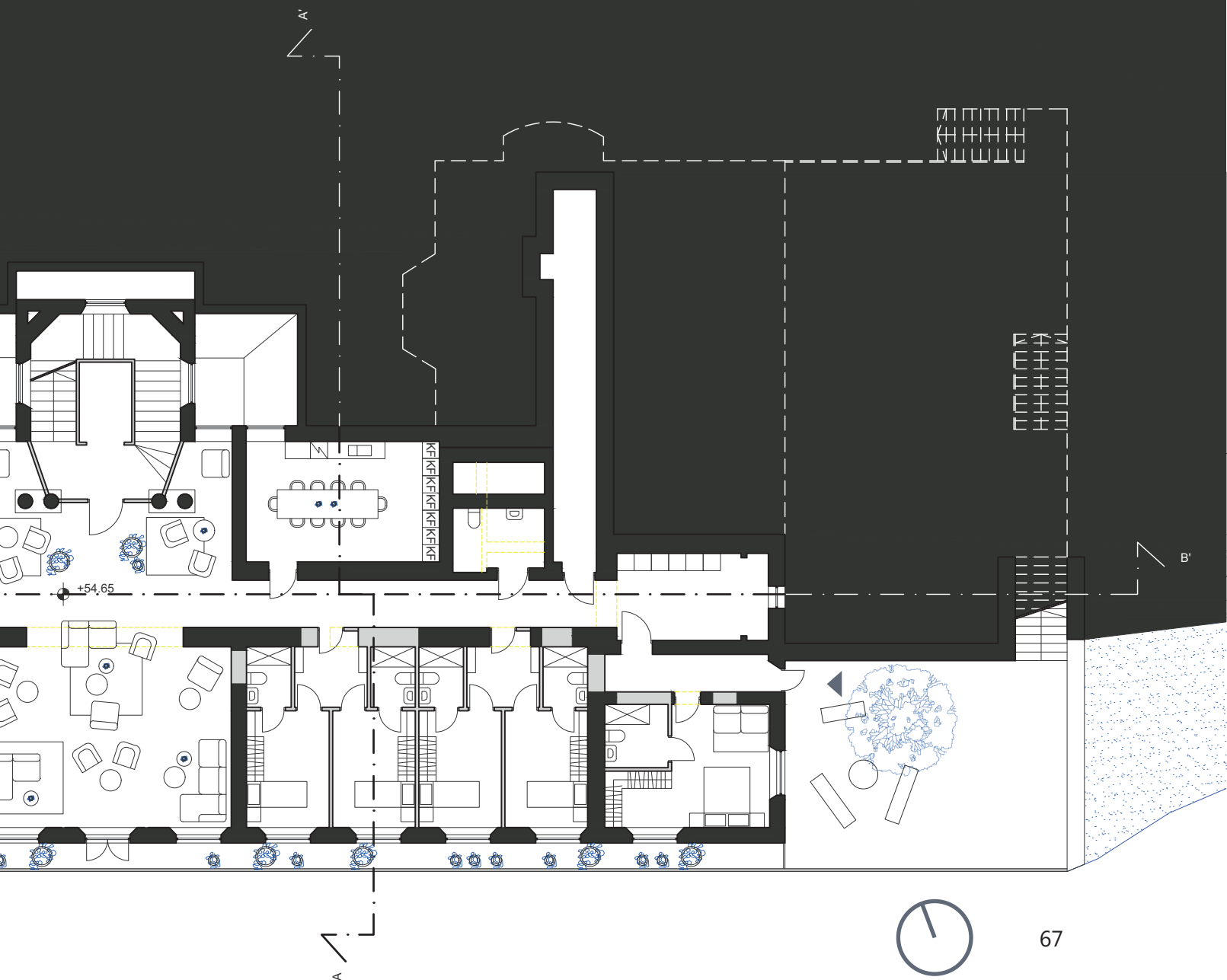
The ground floor will contain publicly accessible functions, such as a café. In order to enhance openness and permeability, the proposal includes transforming parts of the facade windows into entrances. The upper floors can also be accessed from the main entrance at Per Dubbsgatan 14, via the common room, staircase and elevator located on this level.



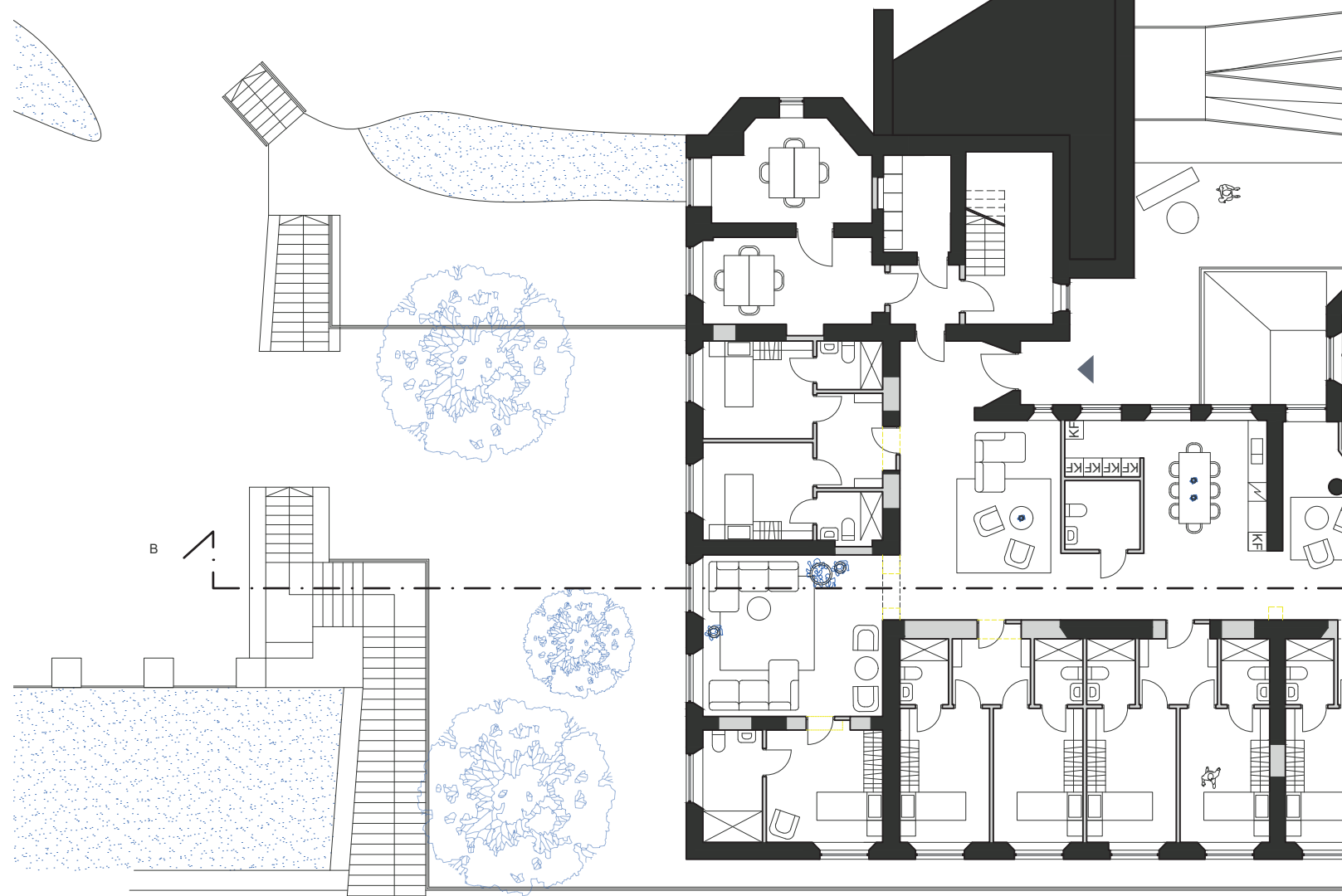


FIRST FLOOR 1:200

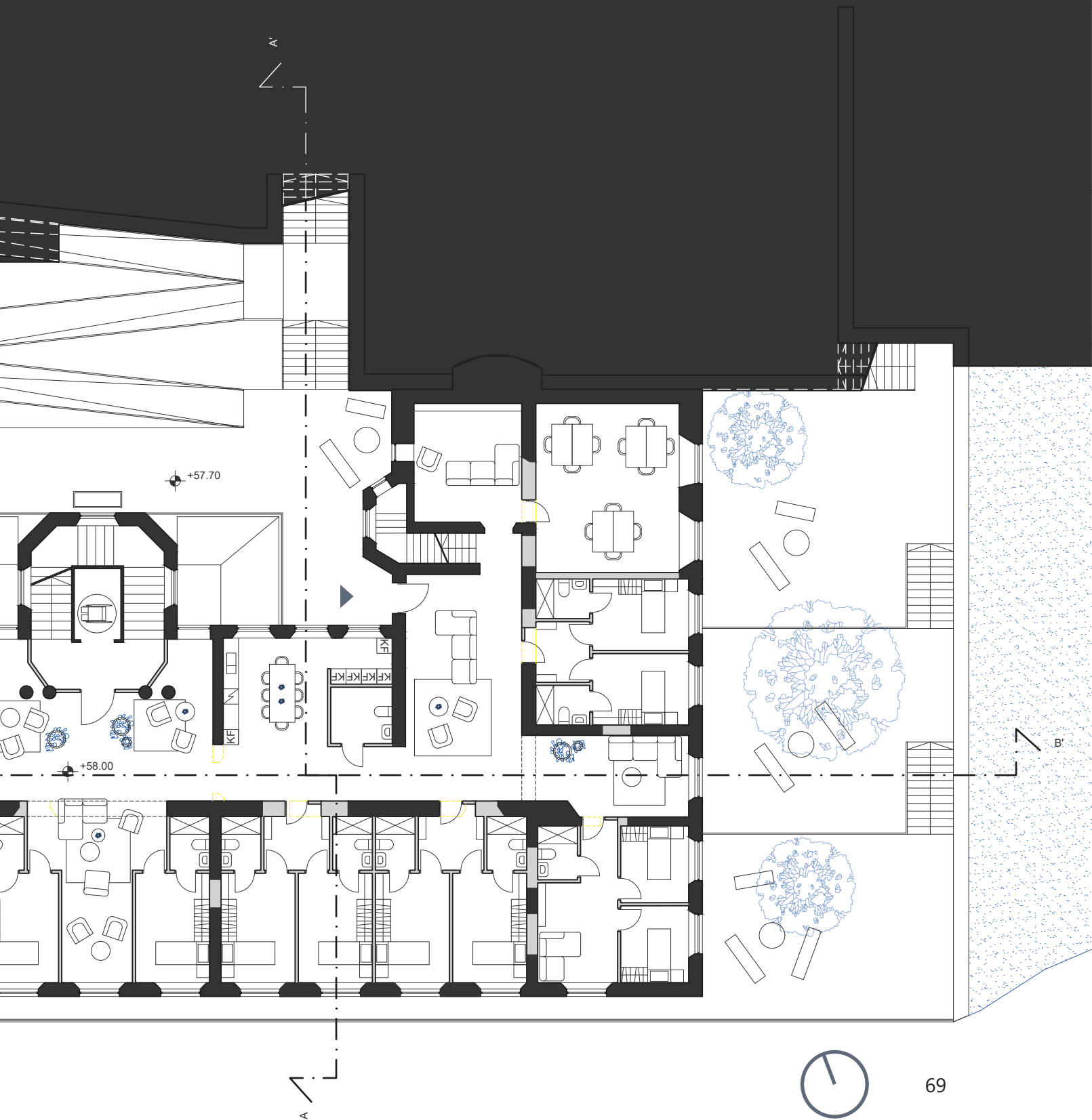
On the first floor, students benefit from quicker and more direct access to the ground floor social spaces. The layout differs slightly from the rest of the building, while still maintaining the essential functions: a shared kitchen, laundry facilities, two accessible bathrooms, and common rooms. A notable feature of this floor is the entrance on the left, which includes a waiting area on the right and is fully accessible via ramps. Also of importance is the guest room located in the south-east corner, intended for visiting friends or family members of students. This room has an independent entrance along the side of the building.



The second floor is again dedicated to student housing, and here the overall spatial logic of the building begins to become more legible. Two shared kitchens are located in the central areas, accompanied by two identical accessible bathrooms. Common rooms are positioned in relation to light axes and window openings. On the left wing, a medium sized laundry facility is placed adjacent to study rooms for students. On the opposite wing, a cinema room is located. The floor is directly accessible from the top of the hill via ramps and stairs. The adjacent outdoor area can be used as a barbecue or picnic space, while additional outdoor seating areas are also located along the right side of the building.



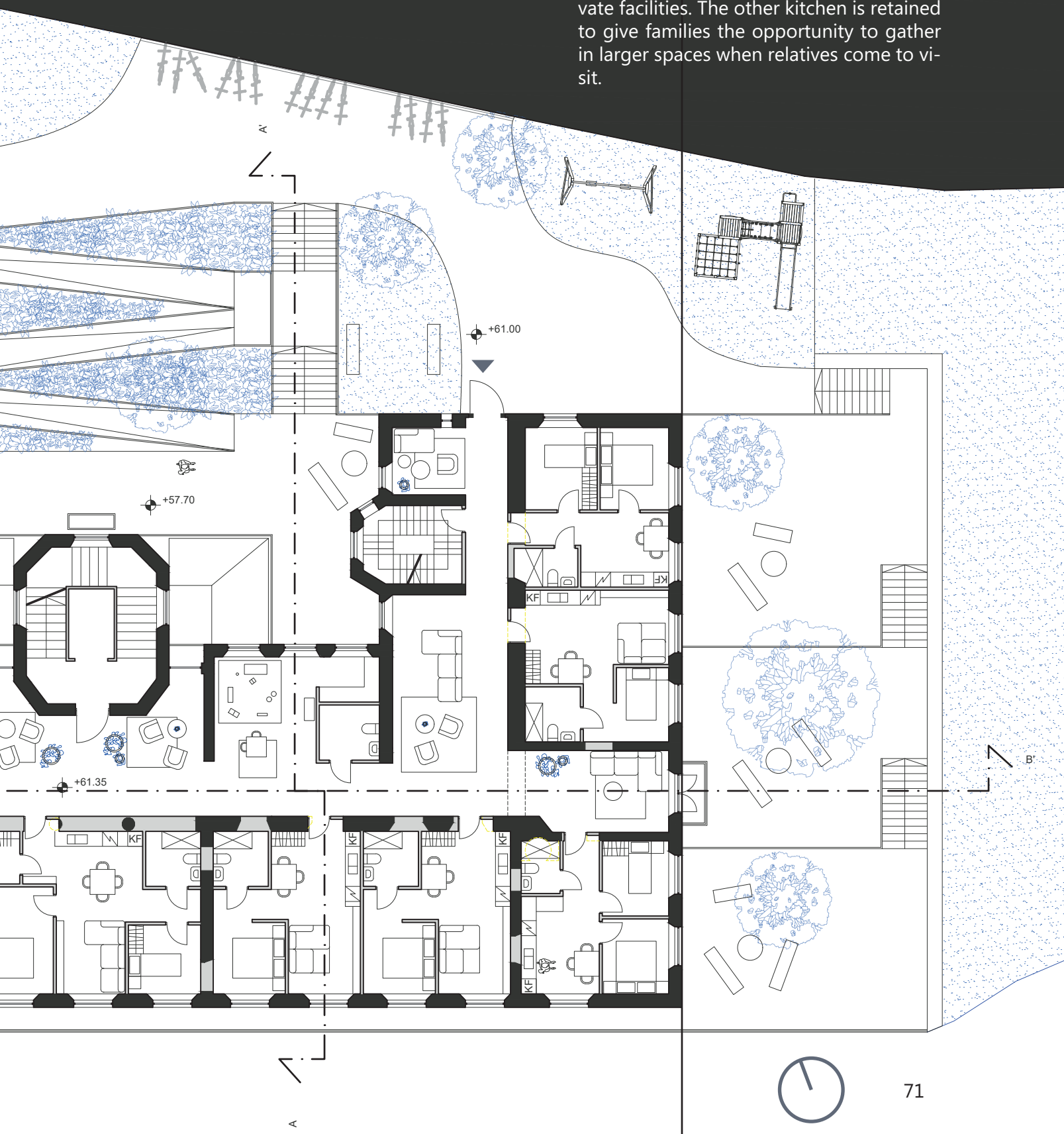
SECOND FLOOR 1:200



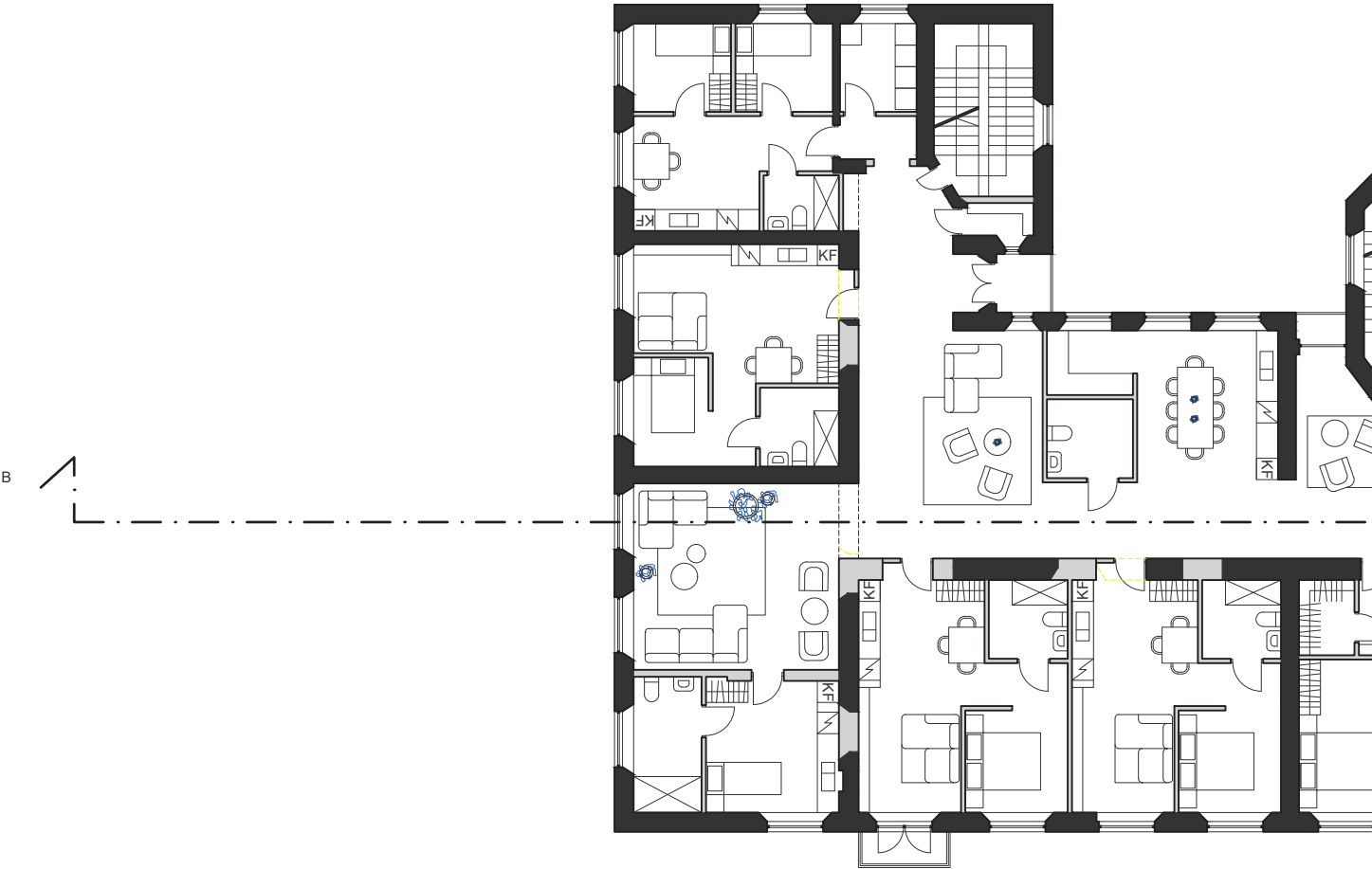
The surrounding outdoor areas have been redesigned to improve accessibility and introduce additional green spaces. These include a children's park, bicycle parking, and a waste shelter designed to facilitate easier collection from the street. A notable modification is the relocation of the staircases on both sides of the building further away from the facade, in order to increase privacy for the building and for the rooms facing outward.

THIRD FLOOR 1:200

The third floor include the main entrance from the upper part of the hill and is dedicated to families of hospital patients. As on the other floors, two accessible bathrooms and one shared kitchen are located in the central area. However, one of the cooking area is replaced by a playroom for children, since each apartment includes its own private facilities. The other kitchen is retained to give families the opportunity to gather in larger spaces when relatives come to visit.

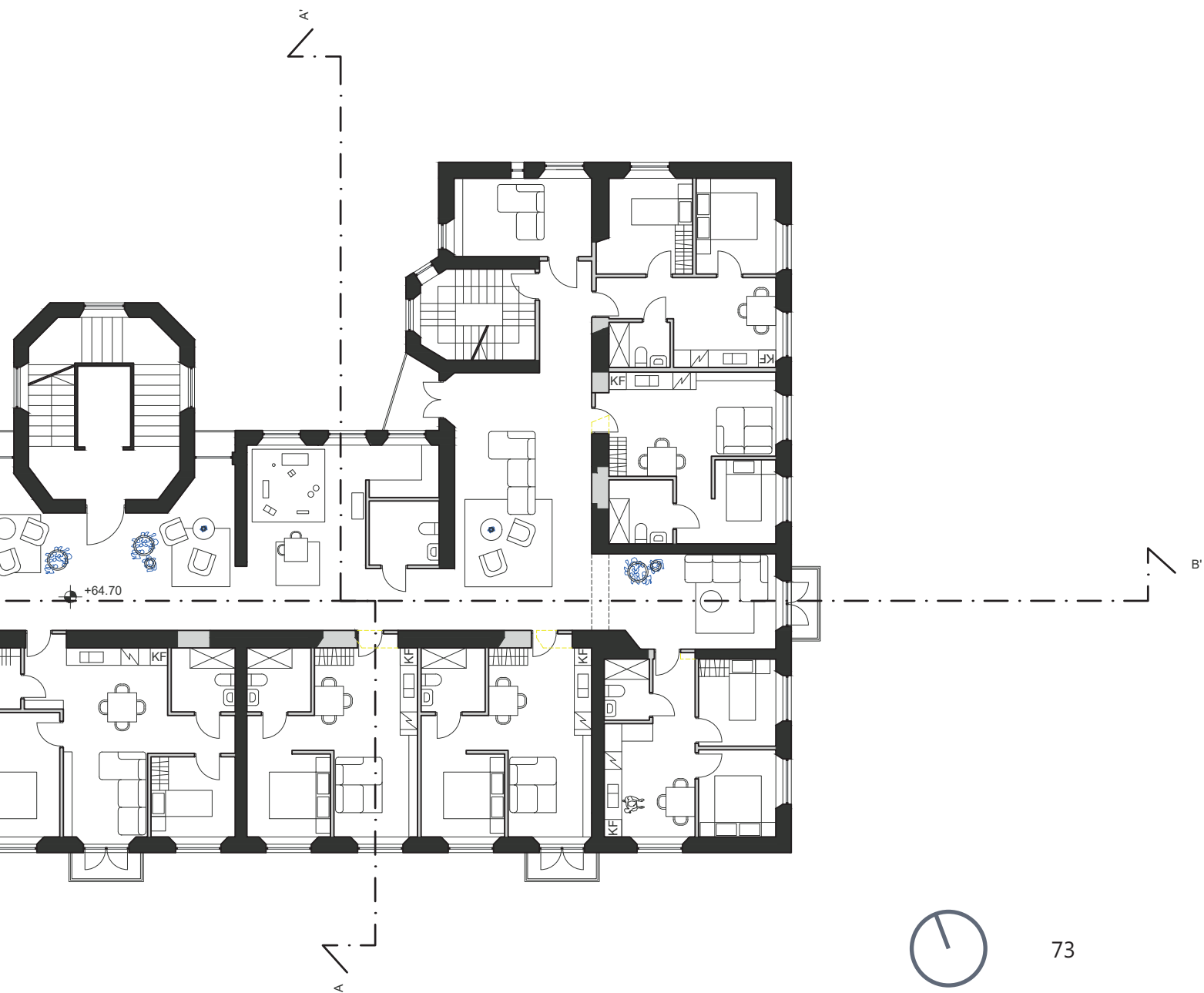


The fourth floor is again dedicated to family accommodation. The layout follows the same organizational principle as the floors below, with a centrally located kitchen, playroom, and two accessible bathrooms. Adjacent to the kitchen and playroom, storage spaces are provided for families, allowing them to store items such as strollers that are more conveniently kept outside the apartments.



FOURTH FLOOR 1:200
72

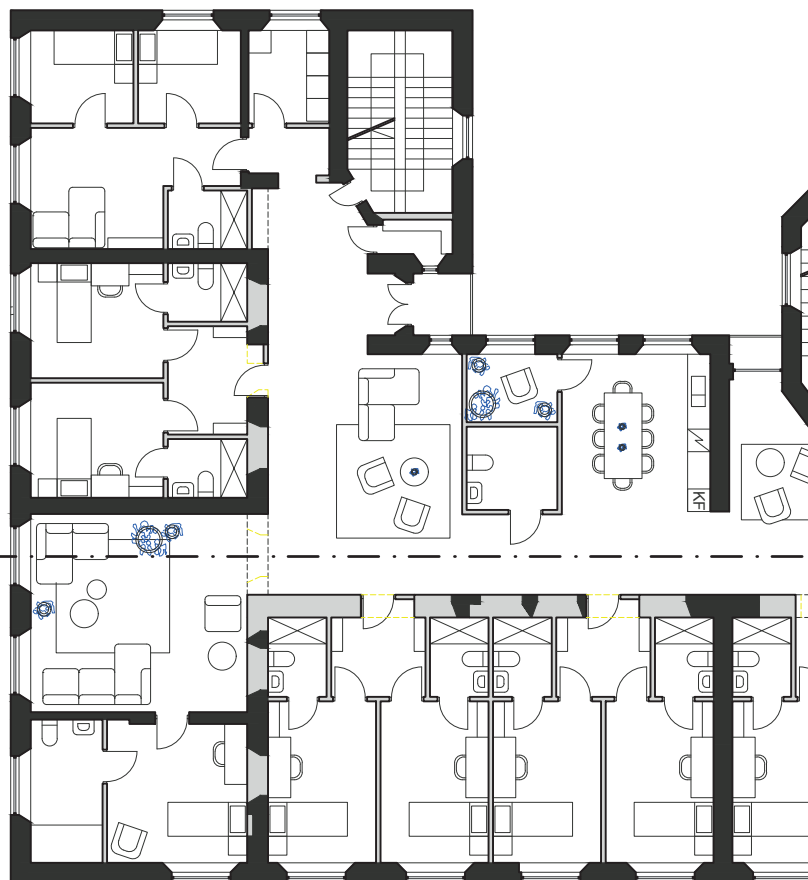
On this floor, a cinema room is again located on the right wing, while the laundry facility is placed on the left wing. Here, three out of eleven apartments do not have accessible bathrooms, due to structural limitations that make such adaptations unfeasible. For family accommodation, however, accessibility remains a fundamental requirement wherever possible.



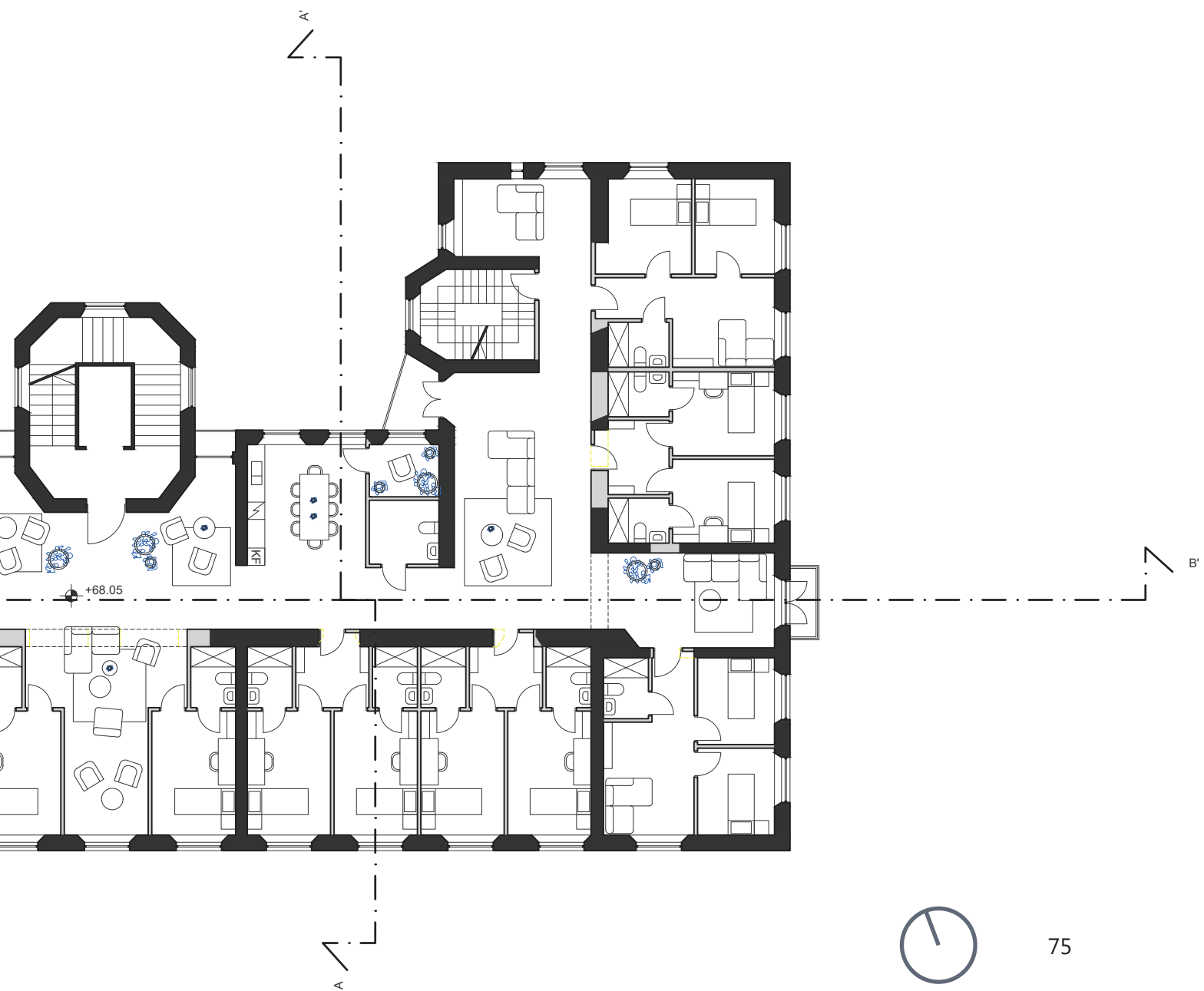
B

FIFTH FLOOR 1:200

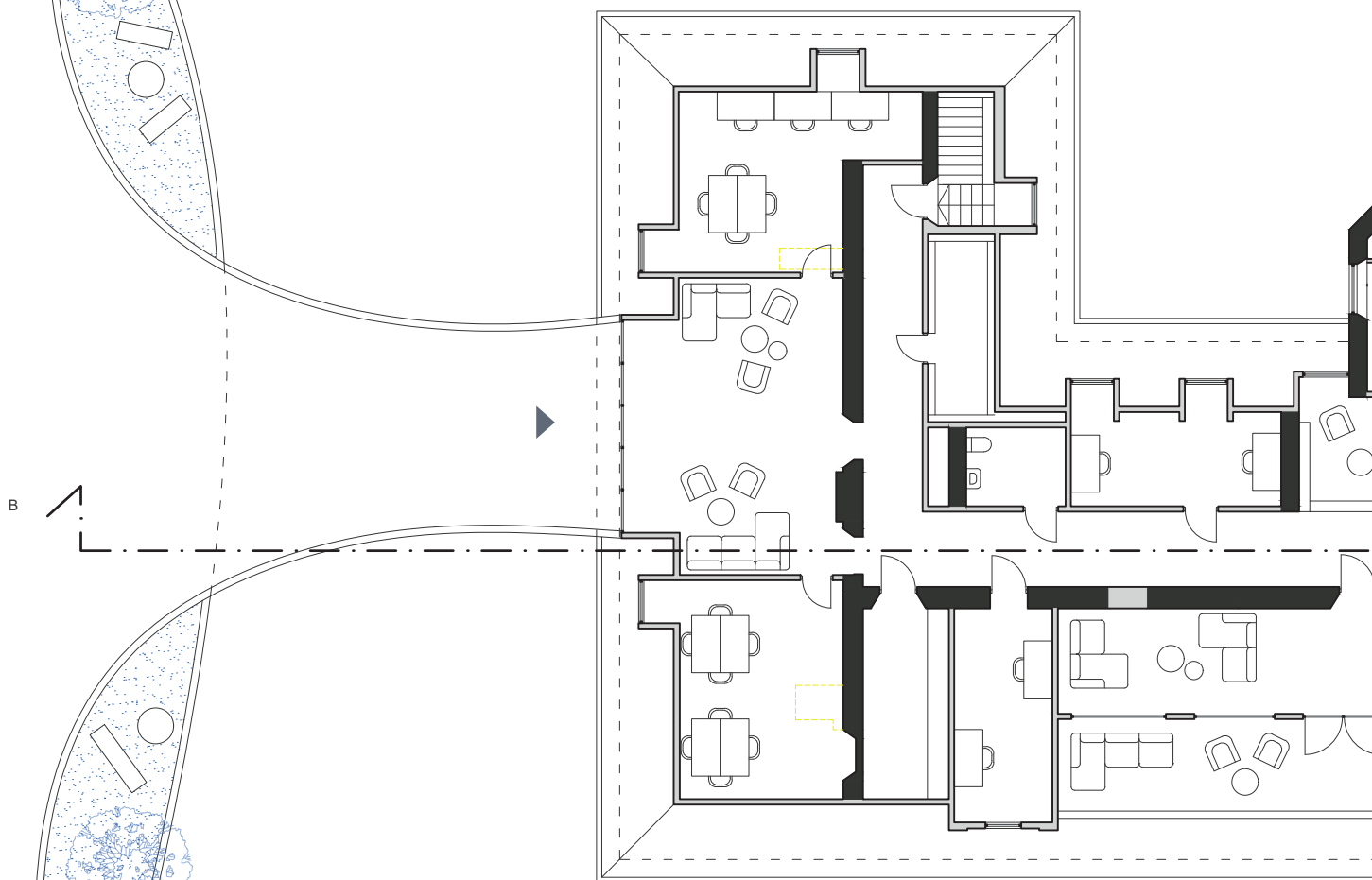
74



The fifth floor is dedicated to healthcare workers, providing a space for rest and recovery after long shifts. For this reason, areas adjacent to the kitchen have been transformed into quiet rooms with greenery, supporting relaxation and disconnection from work. Each room is equipped with a private bathroom, allowing staff to maintain privacy and take long showers to relieve stress. The rooms are not intended for long term stays and are therefore not equipped with wardrobes, however, in cases requiring longer occupation, the type B larger corner rooms may be more suitable.

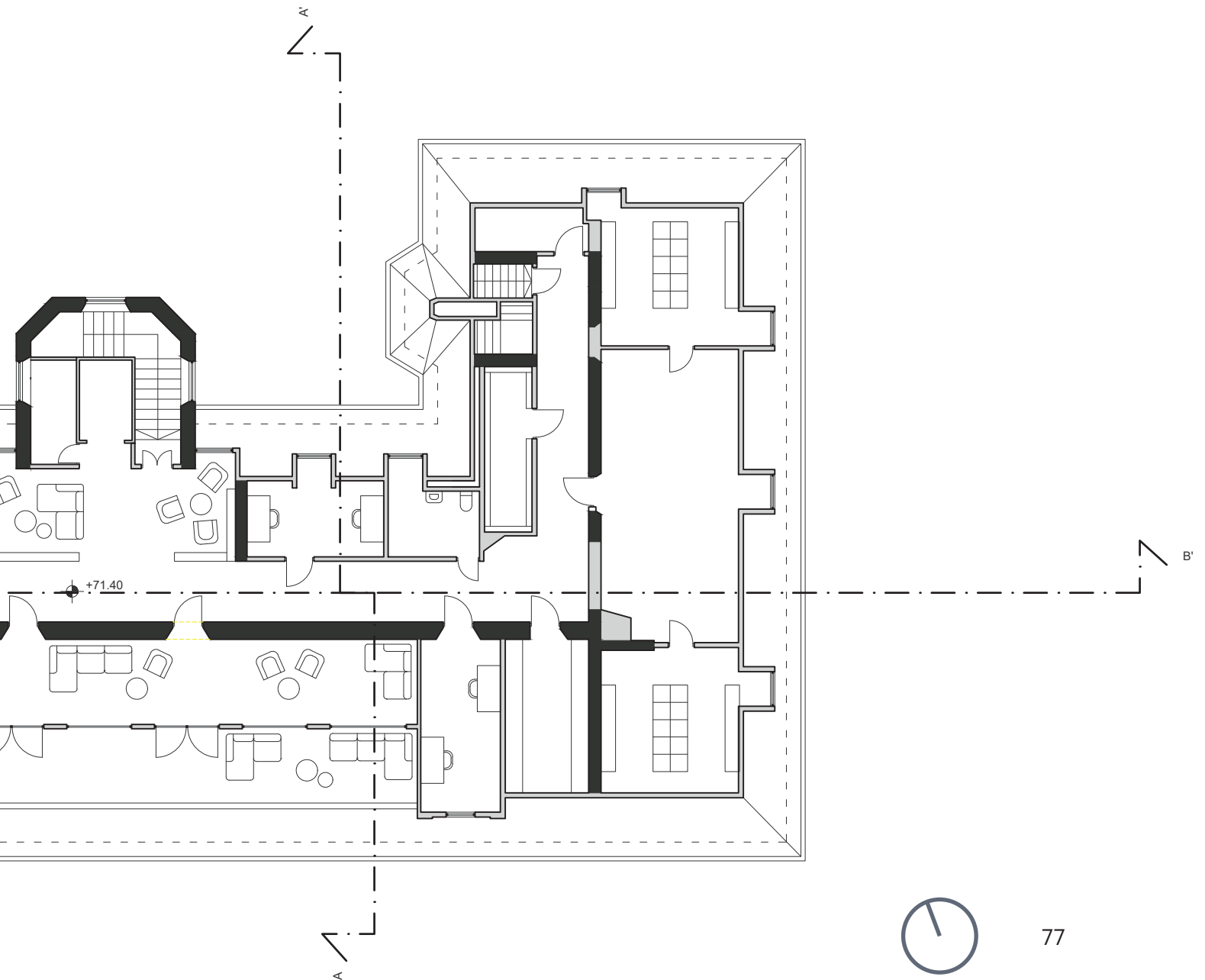


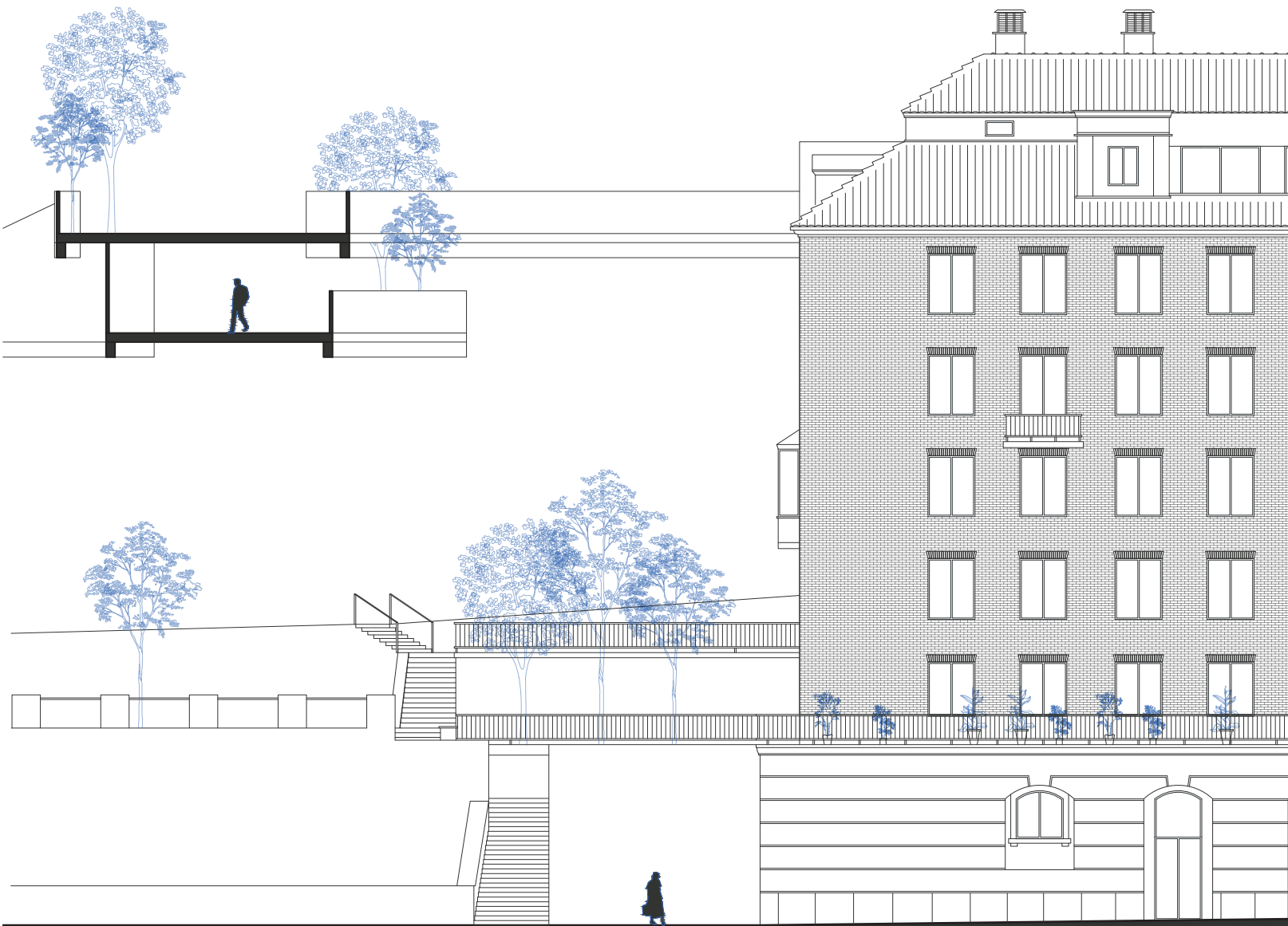
The sixth and final floor is conceived as a shared space for all building residents. At its center is a small library, surrounded by study and work rooms. Two accessible bathrooms are also available on this level.



SIXTH FLOOR 1:200

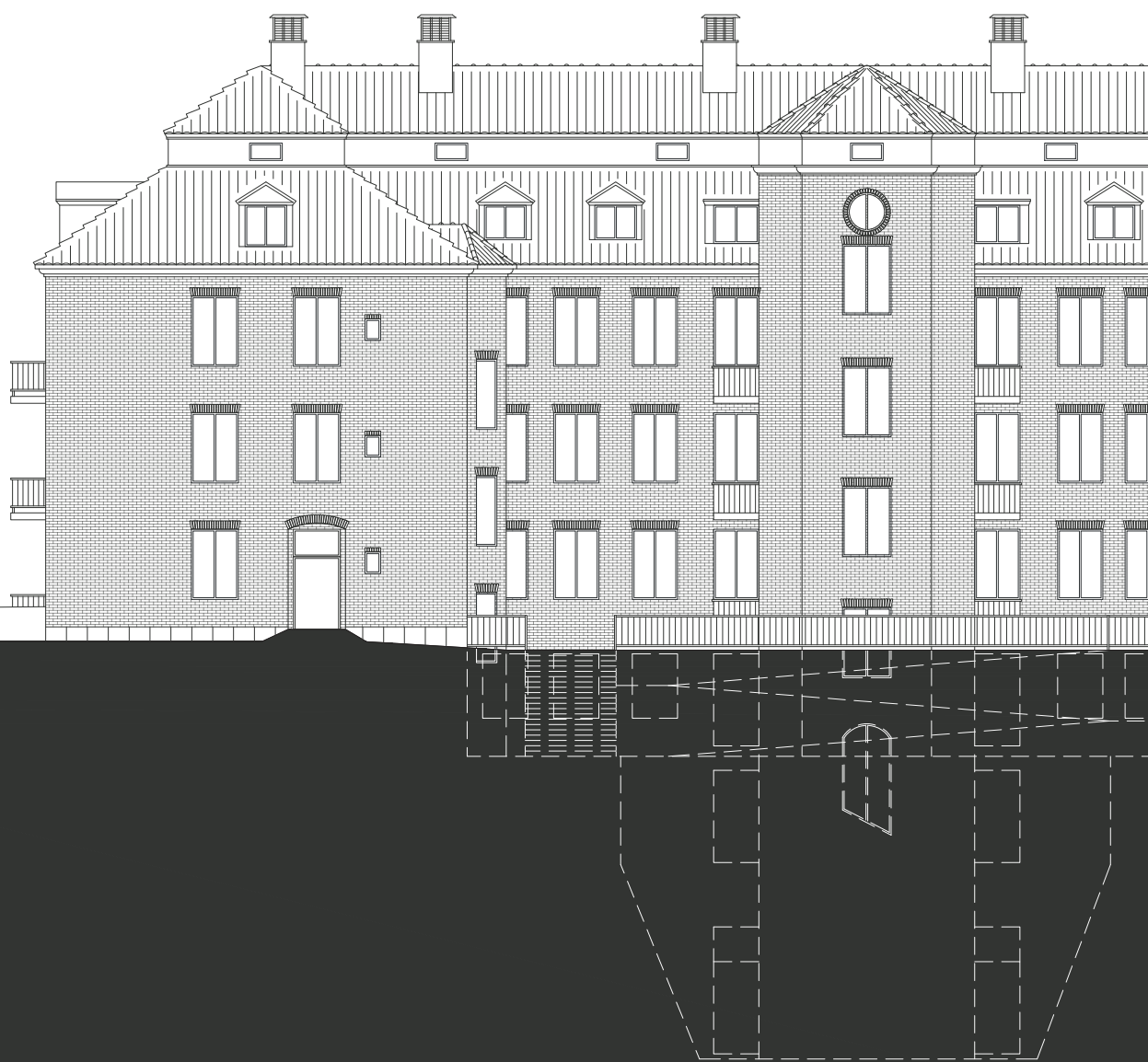
On the right wing, a gym is located, complete with separate changing rooms. The previously enclosed terrace has been reopened and is now intended as a space for barbecues and outdoor social activities. The adjacent indoor spaces function as common areas where residents can gather and play games together. Another main entrance is located on the left side, providing direct access from the bridge connecting the Ortopediska Kliniken to the hospital. Finally, mailboxes are also situated on this floor.



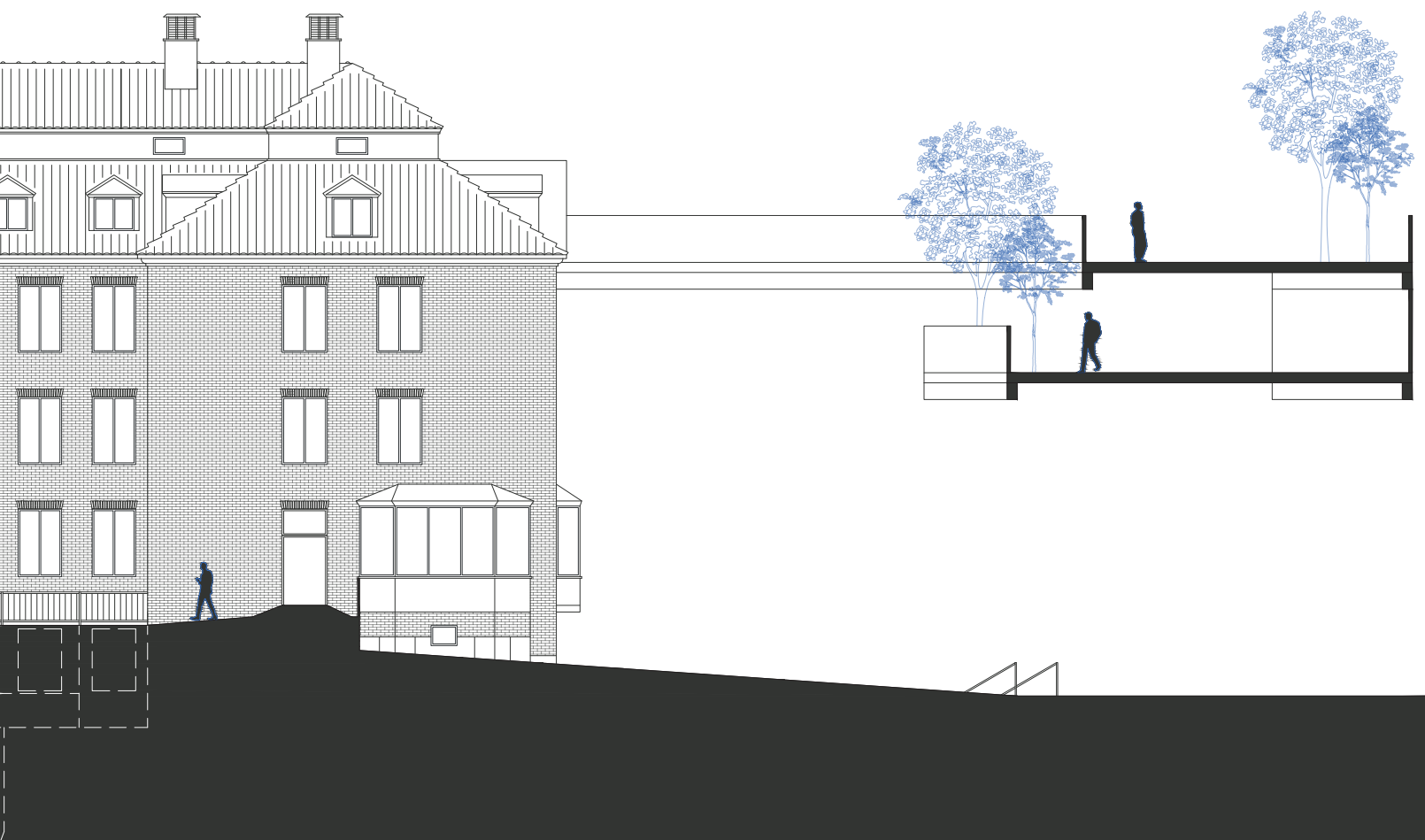


SOUTH FACADE 1:200





NORTH FACADE 1:200

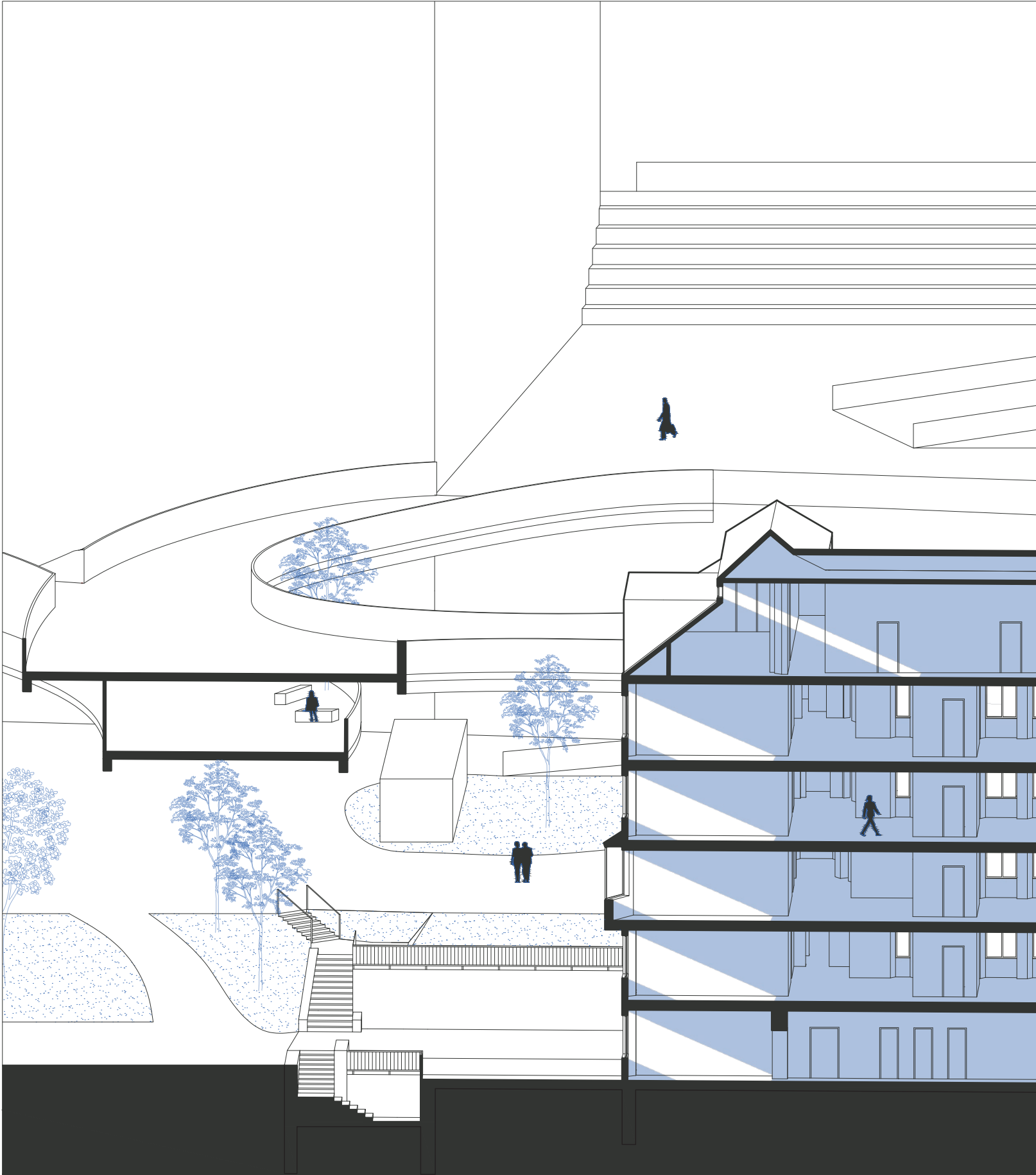




SECTION AA' 1:200



WEST FACADE 1:200



SECTION BB' 1:200

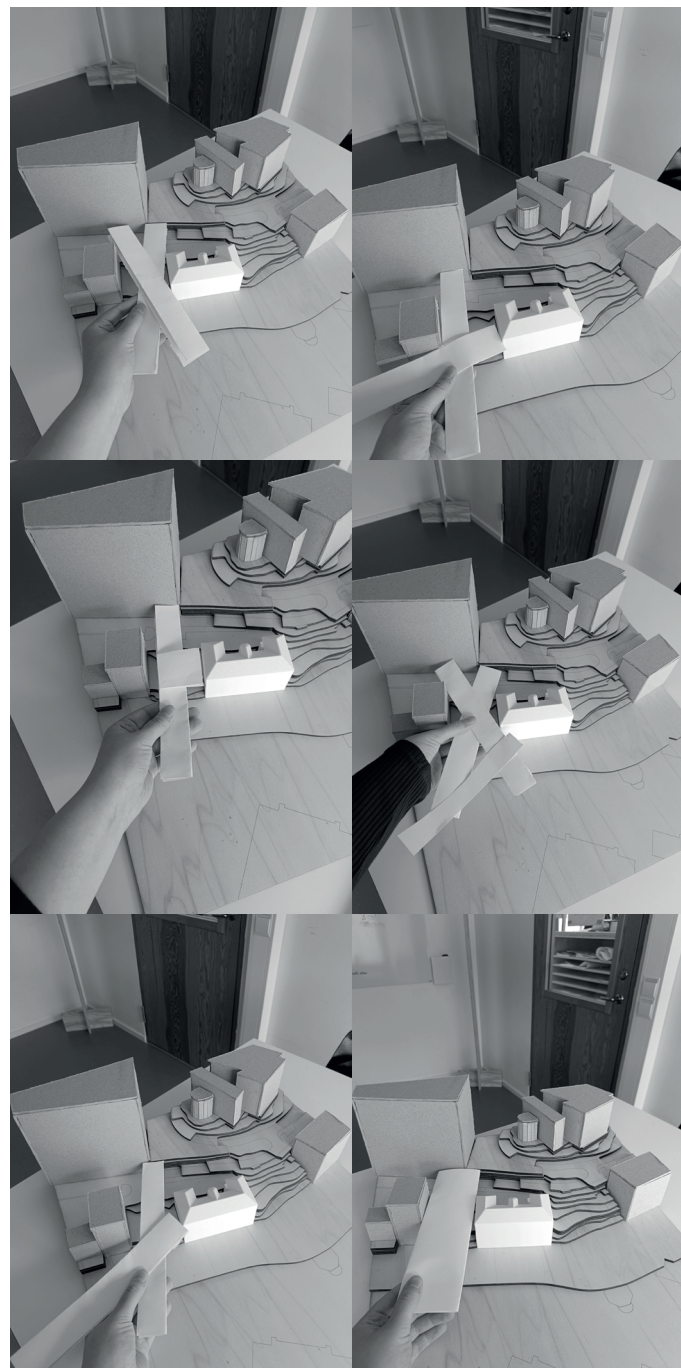


The bridge

A feature considered within this thesis is the proposed bridge system, and more broadly the connection that the new Sahlgrenska Life development aims to establish along a north south axis between Medicinareberget and Sahlgrenska Hospital.

Following studies of the potential configuration of this connection, the final proposal consists of a smaller, two level bridge system linked by two sets of stairs. The two bridges serve different functions: one provides a connection between Hus 1 and the Odontologen building at the top of the hill, while the other acts as a more public route, extending from the hilltop to the upper public floor of Ortopediska kliniken and continuing further to one of the floors of Hus 1.

The bridges are conceived as public spaces, incorporating seating areas and greenery along their length. Within the scope of this thesis, their design remains secondary, as the main focus lies on the transformation and programmatic development of Ortopediska Kliniken. Nevertheless, it has been important to articulate a clear and coherent concept for this infrastructural element in relation to the broader master-plan.



SECOND FLOOR BRIDGE 1:200



FIRST FLOOR BRIDGE 1:200

CONCLUSIONS

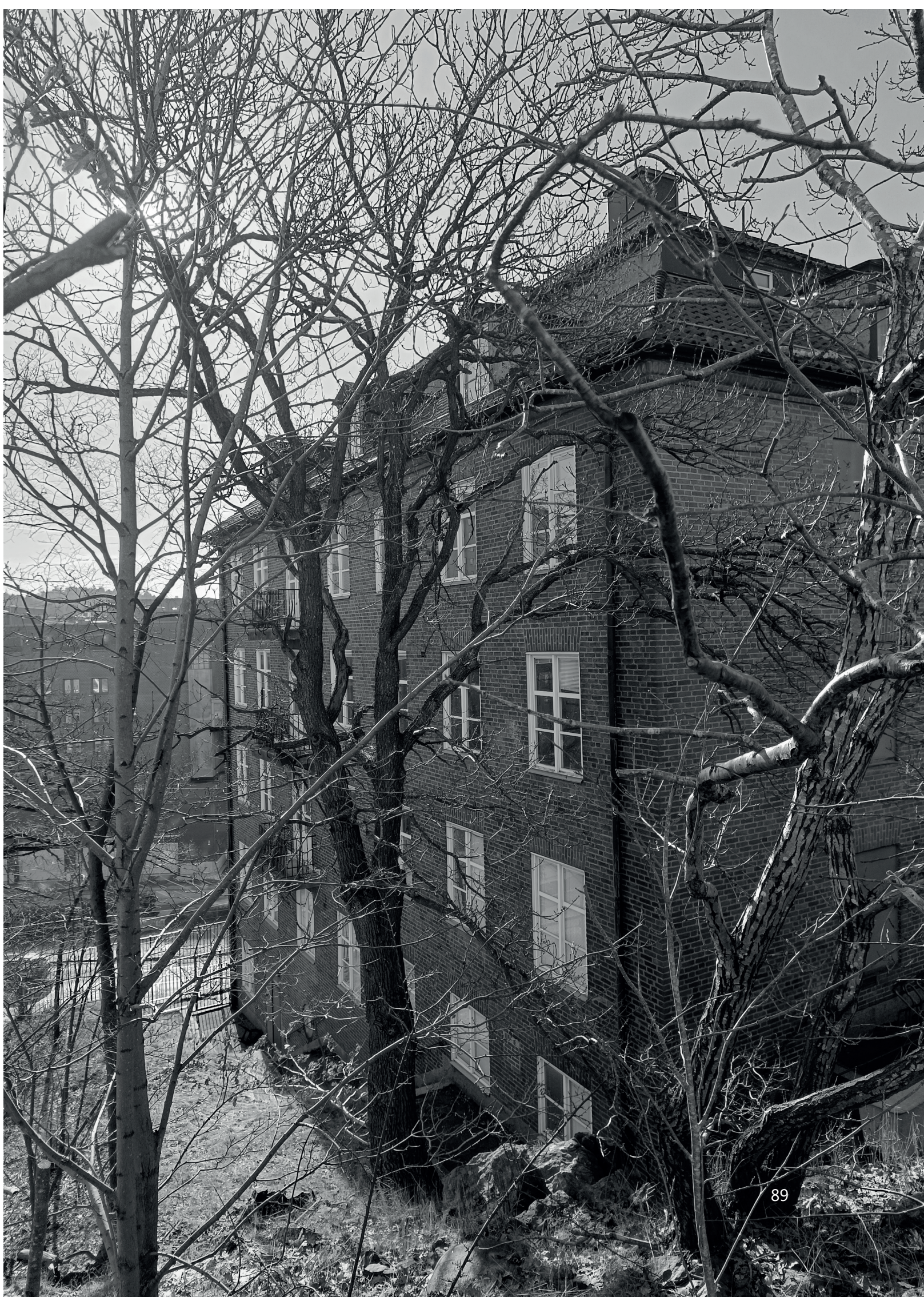
The investigation into how the Ortopedi-ska kliniken can be preserved has led to the exploration of several interrelated themes, ranging from adaptive strategies and the historical development of the site to their translation into a design proposal. The municipality's suggestion of demolition can be questioned, as the area may be understood as a smaller scale of a "deep city", a layered urban condition composed of multiple and interrelated temporal strata (Malaud D., 2020). Throughout the twentieth century, successive additions and removals have shaped the site, however, it is precisely this accumulation of transformations that gives the area its unique character.

Furthermore, the notion of an authoritative physical 'tabula rasa' can be considered problematic, as it risks erasing collective memory while simultaneously representing a significant loss of embodied energy (Malaud D., 2020). In this context, the perspectives of those who regularly use and inhabit the space should be regarded as a crucial factor in future decision making processes.

This investigation outlines one possible approach to the preservation of the building, while acknowledging that multiple alternative strategies remain viable. Enabling community use of the building represents one such solution, and with careful planning, the structure could also be integrated into broader future developments in the area.

The study further demonstrates that, in the case of large scale buildings, it is feasible to accommodate different user groups within the same structure. A key enabling factor in this case is the presence of multiple access points at different levels. Although each group has distinct needs, they can be integrated across the building through a consistent modular spatial system. This approach also allows for future adaptability, enabling functions to be reconfigured should requirements change over time.

The final outcome should not be understood as a completed design proposal, but rather as an open ended inquiry into strategies for the site and its future development within the broader context of the area.



BUILDING REFERENCES

HOLTERMANSKA BUILDING, GÖTEBORG, SWEDEN

The Holtermanska Hospital was a facility for venereal diseases, designed by Adrian Crispin Peterson in 1891, with the buildings completed in 1893. The complex originally included five buildings and has now been transformed into residential units. The renovation carefully restructured the interior spaces to create functional apartments while preserving the exterior and the building's presence within the urban context. (Dwadmin, 2023)

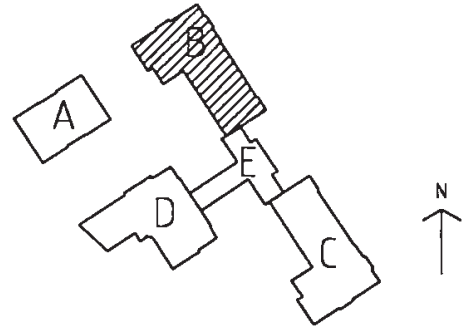


8. Historical photo (Göteborgs Stad)

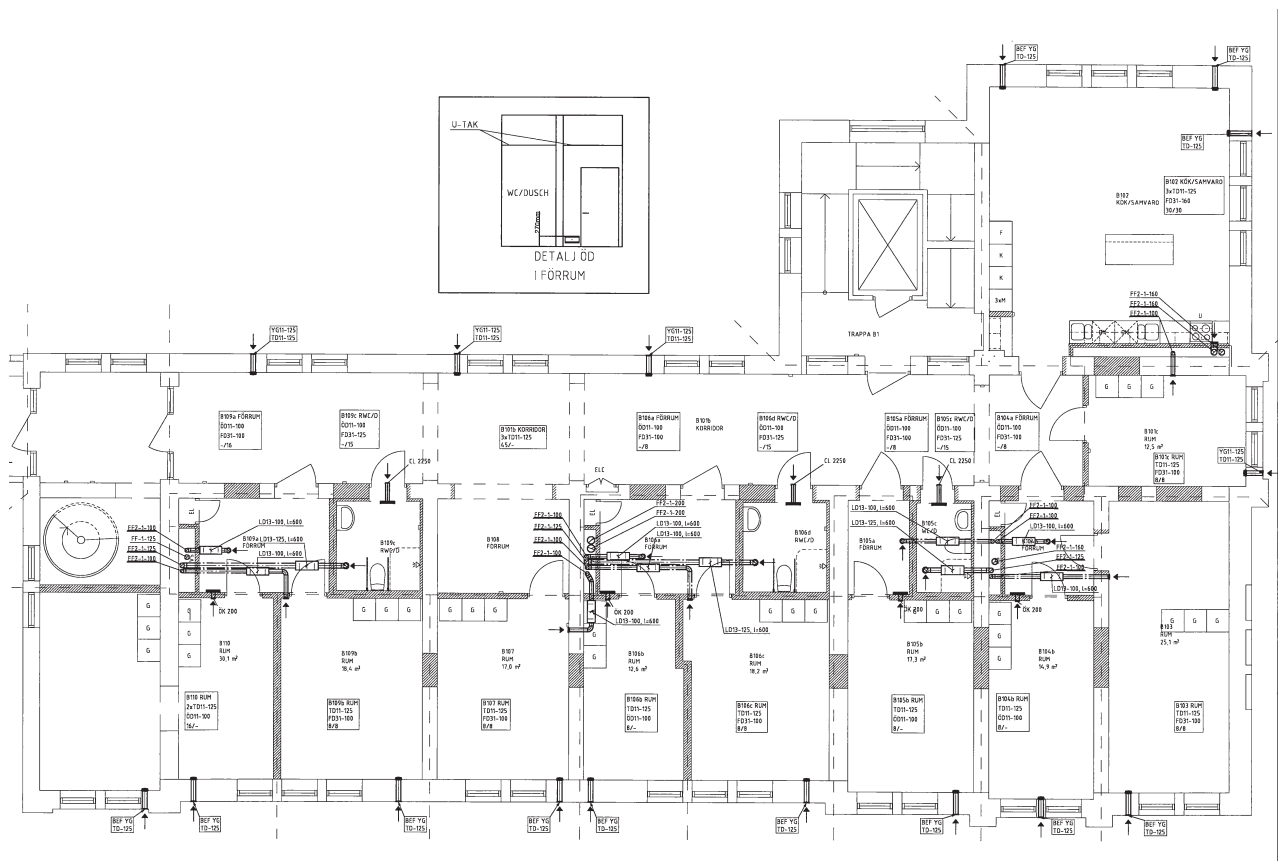


9. Facade from Chalmers tram stop

The building functions both as a hostel and as student housing. Each floor of the student housing includes shared kitchens and bathrooms. This reference is particularly relevant because the case closely relates to the thesis project. The main reason for studying it was to better understand students' needs and to examine how the building has been adapted to accommodate them.



An important aspect of the building is that the main load bearing structure has largely been preserved while allowing for the creation of rooms of different sizes. Here, bathrooms are shared between two or three students. However, since the primary focus of the transformation of The Ortopediska Klinik is to guarantee privacy for its users, the final proposal considers private bathrooms for each room.



10. Example floor plan (Göteborgs Stad)

TRANSFORMATION OF THE HOSPITAL SAINT-VINCENT-DE-PAUL INTO HOUSING, PARIS, FRANCE

The project to transform the Saint Vincent de Paul Hospital into housing by Lacaton & Vassal is part of the larger redevelopment plan for the Saint Vincent de Paul neighborhood in Paris. The project was scheduled for completion in 2024. Their proposal aimed to convert the existing hospital building into residential housing while preserving the majority of the original structure and adding four additional floors. In total, the redevelopment includes 134 housing units and 2,600 square meters of commercial space.

The new residential sections also incorporate balconies and winter gardens, while the design strategy prioritizes minimal demolition in order to preserve as much of the existing building as possible. The project furthermore includes landscaped gardens surrounding the building, as well as cafés, social spaces, and an open communal area intended to encourage social interaction within the neighborhood.

The studio believes that the city is a complex and layered environment, and that architects should work with what already exists rather than creating a “tabula rasa” through demolition and complete reconstruction. In general, their approach prioritizes preserving as much of the existing structure as possible while introducing new and distinctive elements. (Vectorworks, 2023)

The project was chosen as a reference because of its similarity to the thesis case study and its comparable approach to transformation and adaptive reuse. In particular, this example provides valuable insight into the spatial requirements and functions needed for residential housing apartments.



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