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Rehab Vigiljoch

Center for patients with orthopedic or rheumatic complaints

DIPLOMARBEIT

Rehabilitationszentrum am Vigiljoch

Zentrum für PatientInnen mit orthopädischen oder
rheumatischen Beschwerden

ausgeführt zum Zwecke der Erlangung des akademischen Grades
einer Diplom-Ingenieurin

unter der Leitung

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For my parents and family, who have always been there for me and never lost their faith in me.

Special thank you goes to my mentor DI Dr. Mladen Jadrić, for his countinous guidance and support.

Abstract

Nowadays during the design process of the healthcare institutions, patients often get neglected and the efficiency of the building and technological solutions have higher priority than their comfort. Studies have already been made to explore how nature views and gardens can influence the process of healing. In this thesis a rehabilitation centre is placed on Vigiljoch, close to city of Meran in South Tyrol, allowing a direct contact with nature, but also providing a good infrastructure and possibility for various activities that could complement the process of physical rehabilitation. Mineral water sources close by were also key factor for the decision for Vigiljoch since hydrotherapy should play important role in physiotherapy. Possible users are patients who need therapy after various accident injuries, traumas, operations, strokes or heart-

attacks. The focus is on the analysis of the functional organisation of the rehabilitation centre and is it possible to accelerate the healing through architecture. As every patient has different time of recovery, it is also important to allow them freedom to decide how to use the building. Since some of them will have to stay for a longer period time, depending on the seriousness of the injury, it is necessary to organize additional functions like for example library, projection room, but also to plan different programs and events.

Heute werden die Erwartung der Patienten an den Komfort während des Designprozesses neuer Einrichtungen des Gesundheitswesens der Effizienz des Gebäudes und der technologischen Lösungen untergeordnet. Es gibt bereits erste Studien die erforschen, wie zum Beispiel "der Blick ins Grüne" den Heilungsprozess positiv beeinflussen können. Diese Arbeit befasst sich mit einem Rehabilitationszentrum am Vigiljoch, in der Nähe der Stadt Meran in Südtirol, das einen direkten Kontakt der Patienten mit der Natur ermöglicht, aber auch eine gute Infrastruktur und Möglichkeit für verschiedene Aktivitäten bietet, die den Prozess der physischen Rehabilitation ergänzen könnten. Mineralwasserquellen in der Nähe waren ebenfalls ein wichtiger Faktor für die Wahl für des Standortes Vigiljoch, da die Hydrotherapie in Ergänzung zur klassischen Physiotherapie aufgenommen werden soll.

Das Angebot richtet sich an Patienten, die nach verschiedenen Unfallverletzungen, Traumata, Operationen, Schlaganfällen oder Herzinfarkten Therapie benötigen. Der Schwerpunkt liegt dabei auf der Analyse der funktionalen Organisation des Rehabilitationszentrums sowie der Möglichkeit durch einen architektonische Ansatz die Heilungsdauer der Patienten zu optimieren. Da jeder Patient einen temporär unterschiedlichen Genesungsverlauf hat, ist es auch wichtig den Patienten individuell unterschiedliche Möglichkeiten zu geben das Gebäude zu nutzen. Da einige von ihnen für einen längeren Zeitraum bleiben müssen, abhängig von der Schwere der Verletzung, ist es notwendig, zusätzliche Funktionen wie zB Bibliothek, Projektionsraum, aber auch um verschiedene Unterhaltungsprogramme und Veranstaltungen zu planen.

Introduction

Fig. 01 View from the outdoor pool in Adelboden, Switzerland



Physical therapy

Definition ¹ :

Physical therapy, also called physiotherapy, health profession that aims to improve movement and mobility in persons with compromised physical functioning.

Modern physical therapy started developing in the 19th century through manual muscle therapy and massage, but the expansion of the profession and the establishment of the first educational facilities began during polio epidemics at the beginning of the 20th century. Two world wars that followed after further increased the need for more physical therapist and rehabilitation institutions.¹

However, already thousands of years ago different types of massage and movement therapy were used to treat different musculoskeletal conditions, and more specifically the origins in Europe date back to Greek physicians Herodicus and Hippocrates around fifth century BC. Later in Rome Aulus Cornelius Celsus in first century AD and Galen of Pergamon in second century AD described possible therapies and procedures after various accidents or

military injuries.²

Nowadays after severe injuries or traumas in different types of accidents, also after surgery or stroke or heart attack, it is necessary to take few weeks, months or even years of physical therapy.

There are eleven basic modalities of physical therapy³:

- 1 Hydrotherapy
- 2 Heat or Cold
- 3 Massage
- 4 Exercise
- 5 Ultrasound
- 6 Traction
- 7 Electrical stimulation
- 8 Transcutaneous el. nerve stimulation
- 9 Iontophoresis
- 10 Continuous passive motion
- 11 Mobilization

As a part of the rehabilitation there are also speech, hand and occupational therapy depending on the patient's state of injury. As shown in the basic layout usually the organization of the rehabilitation department is based around big gym area with adjacent smaller spaces that offer more privacy. Seclusion is sometimes quite important, since another patient's expressions of pain can be undesirable, while one has to deal with his own therapy³.

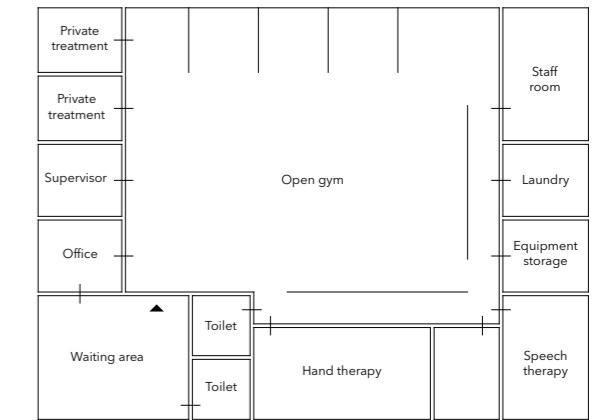
Another crucial point in the organisation of the gym and rooms around is to maintain an easy overview for the physicians, especially because often one physician is monitoring more patients.

Since there is more people and more activities occurring simultaneously, the atmosphere can get quite hectic, quite fast. Therefore fundamental question is: how to make the treatment area more

relaxing, but also more motivational?

Hydrotherapy even though it is first on the list of the modalities of physical therapy, it is often neglected, or to be more precise not used to its fullest potential. Frequently hydrotherapy is reduced to some small portable whirlpools or different devices e.g. Fluidotherapy that uses physical agent to transfer energy in the form of heat to soft tissues by forced convection³.

Along natural light and ventilation and views of green scenery as a quite obvious tool to help patients recover and heal faster, various types of hydrotherapy should be incorporated in exercises during the recovery, also to ease the pain and to help patients to relax.



Typical organization of the rehabilitation department



Fig. 02 "nature view" in a form of a wall sticker



Fig. 03 Therapy room without windows

¹ "physical therapy", *Encyclopædia Britannica. Encyclopædia Britannica Online* Encyclopædia Britannica Inc., accessed February 2, 2017

² Andrea A. Conti, 2014, p. 2

³ Jain Malkin, 2014, p.451, 454, 453

Hydrotherapy

Definitions ^{1,2}

Hydrotherapy (from Greek hydor ‘water’ and therapia ‘healing’), external use of water in the medical treatment of disease and injury.

Hydrotherapy (from Greek patheia ‘suffering, feeling’), therapeutic system that professes to cure all disease with water, either by bathing in it or by drinking it.

Balneotherapy (from Latin balneum ‘bath’), the treatment of disease by bathing in mineral springs.

Thalassotherapy (from Greek thalassa ‘sea’), the use of seawater in cosmetic and health treatment.

Even before technology was capable of heating and transporting water for bathing, the lure of water treatment was powerful. ³

Beneficial effects of water were known already to Paleolithic hunters around City of Bath in England 10 000 years ago where archaeologists found evidence that there was human activity around hot springs. They used them to warm and clean up, but besides that probably the floating feeling was also very relaxing.

Around the world water was used for therapeutic purposes combining hot and cold temperatures, but also in various forms, in solid, liquid or vapor. E.g. Increase of humidity and temperature in a room with a use of steam effects human body in a way that increases perspiration on the skin, dilates blood

vessels, relaxes the muscular system and finally stimulates nervous system and relieves pain.⁴ In different areas of the world, one can observe how these rooms took various forms and how quite distinctive ambiances are created. Native Americans had very primitive sweat lodges in a form of dome-shaped huts; in India as part of Ayurvedic steam treatments a person is put inside of a steam box with just his head staying outside; in Finland saunas are usually quite small wooden cottages; in Russia banyas have similar concept like finish saunas; turkish hammams follow architectural features of mosque and have lavishly decorated walls, so therefore hot room of hammam also seems quite monumental in comparison with saunas, banyas and lodges.

Today the most widely used type of hot air bath is definitely finish sauna which is often incorporated in houses, gyms



Fig. 04 Native american sweat lodges



Fig. 05 Russian banya



Fig. 06 Indian Ayurveda



Fig. 07 Turkish sweat lodgas

and even office buildings. In standard procedure one should take a warm shower or a bath before entering sauna and after followed cold shower or a bath. This combination of hot air bath and cold plunge was already known to Spartans in Greece, who used it in their daily routine after trainings and fights.³

Greek Gymnasium

Sparta was famous for its rigorous training regime for boys already from age 7, but generally physical activity was quite important in whole Greece. The idea of connecting exercise and bathing developed slowly in Greek gymnasium. In the beginning the gymnasium was reserved just for athletes, but through time it was transformed into the center of Greek social activity and learning. ³ Plato argued that virtues of the soul balance three physical virtues: strength,

beauty and health. Accordingly the fundamental concept of gymnasium was the Greek ideal of union and harmony between the body and mind. ⁵

Mens sana in corpore sano –
“a sound mind in a sound body”

Hippocrates

Therapeutic use of hydrotherapy was described in two books by Hippocrates and they were based largely on empirical facts or assumptions. The *Regimen in Health* explain how often should one bath, the influences of cold and warm baths, differences between fresh water baths and salt baths. On the other hand the *Regimen in Acute Disease* advises for which disease bathing is beneficial and for which it should be avoided. ⁵

¹ “hydrotherapy”, “hydropathy”, *Encyclopædia Britannica. Encyclopædia Britannica Online* Encyclopædia Britannica Inc., accessed February 2, 2017

² “ balneotherapy”, “thalassotherapy”, *English Oxford Living Dictionaries* Oxford University Press, accessed February 2, 2017

³ Marybeth Siclair, 2008, p. 3, 4, 4

⁴ Lionel C. E. Calthrop, 1932, p.25

⁵ Yegül Fikret, 1992, p. 353, 353

Hydrotherapy



Fig. 08 Black-figure hydria: Athletes washing



Fig. 09 Reconstruction of the Baths of Diocletian

Thermae

Romans adopted much of the Greek culture, but considered bathing alone more important than the physical activity.¹ The daily routine included business and public affairs in the morning and bathing with exercise in the afternoon.² From open air basins, simple tubs and showers in Greek gymnasium, roman public baths developed into colossal structures organized around rooms and baths with different temperature and humidity. Typical bathing sequence included:³

- 1 light exercise in the gymnasium
- 2 tepidarium (warm room): oil rub
- 3 caldarium (hot room): sweat bath and plunge in 40 °C pool
- 4 laconium (dry heat room)
- 5 tepidarium: cleaning/oil removal
- 6 frigidarium (cold pool room)
- 7 application of oils and massage

Technical advances and inventions like aqueduct (system for transport of the water) and hypocaust (system of underfloor heating), along with use of new construction methods and materials made possible evolution of the thermae to the largest public baths in ancient cultures, e.g. Baths of Diocletian and Baths of Caracalla in Rome.

There is no evidence that any kind of therapy was practiced in roman baths², however Aulus Cornelius Celsus wrote in detail about benefits of hydrotherapy in his book *De Medicina*, so one could assume that some kind of guided therapy was performed in one of the many rooms of roman thermae.

Middle Ages

After the fall of the Roman Empire and destruction of most of the baths and aqueducts, during the dark ages

bathing facilities almost did not exist. Medical use of hydrotherapy was quite limited due to lack of infrastructure and clean water¹, but also due to growing influence of the Roman Catholic church who propagated pray and god worshiping as cure for everything and portrayed baths in general as immoral.

Revival

First attempts to analyse mineral water and its possible curative characteristics took place during 17th and 18th century¹ and interest for bathing started to redevelop among upper class. They encouraged renovation some of the old roman baths, but also later technical advances like better plumbing and travel by railroad made possible to visit different remote baths for various treatments. In the 19th century Vincenz Priessnitz started promoting hydrotherapy again, and 20 years

after him Sebastian Kneipp followed his steps. Kneipp cured himself from tuberculosis by bathing in the cold Danube and ever since he continued to explore the healing power of water.⁴

“Water contains healing; it is the simplest, cheapest and – if used correctly – the safest remedy.”

Sebastian Kneipp

His book *My Water Cure* and his methods are influential still today, and some of his treatments, e.g. contrast foot/arm bath, leg/knee affusion, walking barefoot or increasing temperature foot bath, could be integrated as part of rehabilitation during physical therapy.

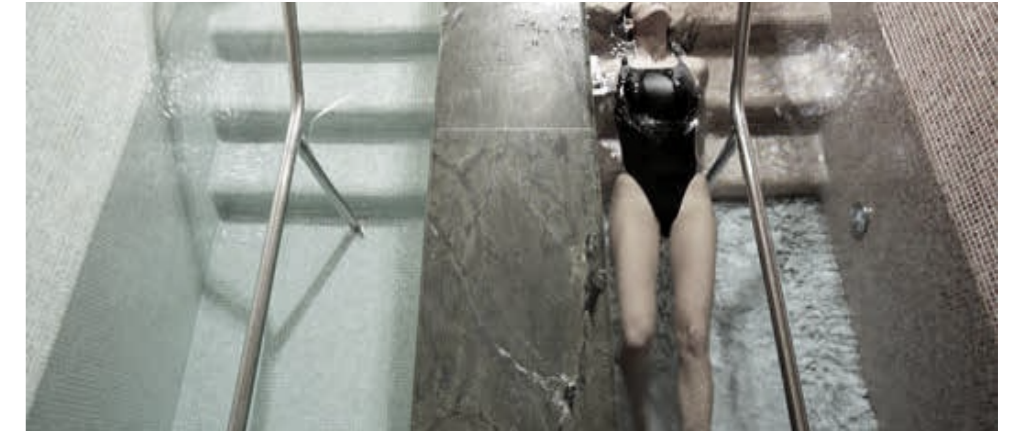


Fig. 10 Kneipp's hot and cold bath



Fig. 11 Kneipp's walk-through leg bath

¹ A van Tubergen, S van der Linden p. 273, 274,274

² Yügel Fikret, 1992, p. 353, 355

³ Marybetts Siclair, 2008, p.6

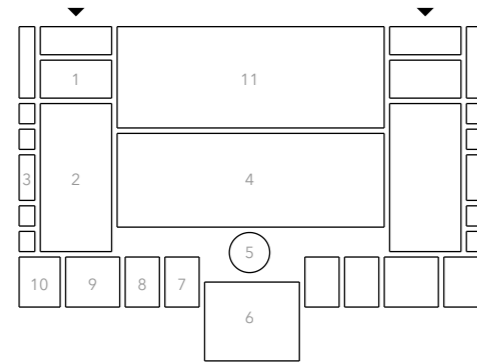
⁴ Kneipp.com

Therme Vals

Peter Zumthor

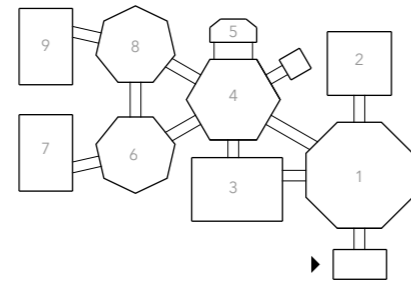
Baths of Diocletian

- 1 Apodyterium
- 2 Peristyle
- 3 Gymnasium
- 4 Frigidarium
- 5 Laconicum
- 6 Caldarium
- 7 Ephebum
- 8 Sudatorium
- 9 Warm baths
- 10 Laconicum
- 11 Frigidarium



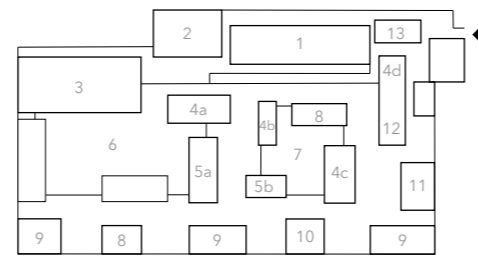
Turkish Hammam

- 1 Changing room
- 2 Barber room
- 3 Connecting space
- 4 Washing room
- 5 Mihrab
- 6 Hot room
- 7 Hot water tank
- 8 Cold room
- 9 Cold water tank



Therme Vals

- 1 Dressing rooms
- 2 Toilets and showers
- 3 Sweat stones
- 4 Fire bath, Cold bath
- 5 Drinking stone, Sounding stone
- 6 Outdoor bath
- 7 Indoor bath
- 8 Shower stone
- 9 Rest space
- 10 Massage
- 11 Bath attendants
- 12 Accessible toilet
- 13 Make-up room



Zumthor's essential idea was to create "bath born of the mountain, just as natural springs are born from the mountain"¹. Because of this logic, but also for the reason of not disturbing the views of the main hotel above, the therme are sunken into the mountain. Entrance through long underground corridor from the main hotel creates sort of a tension and makes one curious what will appear at the end of the tunnel. Spaces are organized around two big pools, one indoor, and one outdoor, but the pools are actually formed around massive blocks. Every block hides a room inside, all with different themes, more specifically different temperatures or features like music background or flower bath. Unique experience is offered through transition from almost private rooms in blocks, through indoor pool with shadows and lighting play to outdoor

pool and open space. Roman thermae had similar functional organization with spaces of different ambiance and level of introversion, respectively from tepidarium to frigidarium. Turkish hammam on the other hand offers similar ambiance throughout the rooms, but different experience in water temperature and water form. One can observe how some of the elements of both roman imperial baths and turkish hammam are incorporated in Vals. Construction style of the building itself is also quite unique. It has 15 units with cantilevered roofs - the overhanging concrete slab is held in horizontal position by metal cables that carry the load to the ground. The cables are invisible and casted in the second layer of concrete. Roofs fit together like a puzzle, but the gap of 8 cm is left between them to allow stripes of light entering interior.¹



Fig. 12 Rest space



Fig. 13 Outdoor showers



Fig. 14 Light cracks

Rehab Basel

Herzog & De Meuron

Rehabilitation center in Basel is a private facility/institution and highly specialised clinic for neurorehabilitation and paraplegiology. Architects tried to redefine healthcare architecture, as client's only directive was not to have a building that looks or feel like a hospital.¹ Rectangular structure with dimension of 112x79 m is pierced through with 9 courtyards, which allow entrance of the daylight to all spaces. Each of the atriums has a different topic, e.g. English and French garden or have a one dominating element like water, rocks or trees and flowers. In one of them, there is a bathhouse as almost freestanding structure with an attractive roof perforated with numerous little oculus like windows. Similar but bigger skylights are also located in the rooms, which almost entirely eliminate need for electric lighting during the daytime. Other

sustainable solutions are included: innovative energy distribution with hydronic heating and no mechanical cooling, user controlled passive natural ventilation and use of low embodied energy materials.² From the outside the building seems like a closed up, one strict unit, where on the contrary from the inside the atmosphere is altogether different, which gives a feeling of openness, lightness and diversification. The architects wanted to have an almost small town organization with streets, plazas, gardens, public facilities, and more secluded residential quarters.¹ There are space oriented completely towards outside e.g. gym on the first floor, patients rooms on the second floor and library on the roof, but also those facing inside like the bathhouse. Patients enjoy great deal of autonomy and liberty.



Fig. 15 Patient room interior

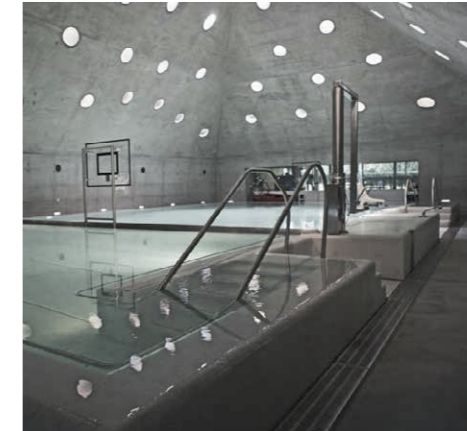


Fig. 16 Bathhouse interior

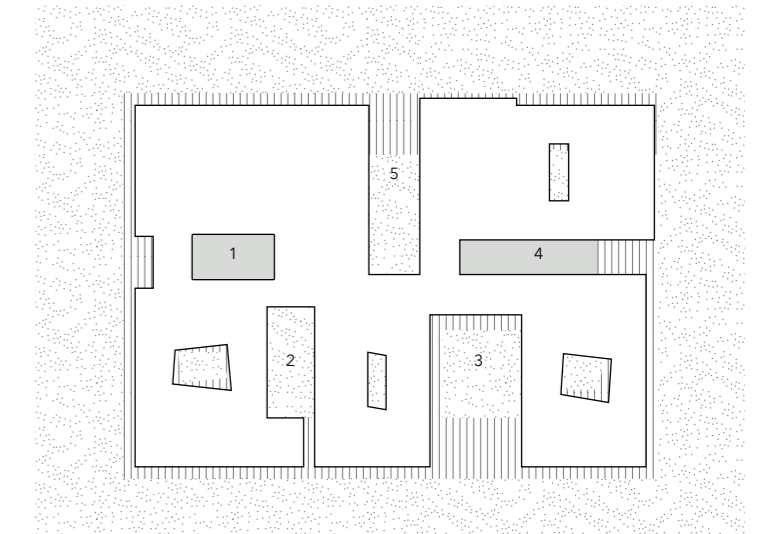
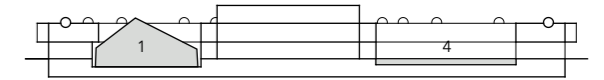


Fig. 17 Courtyard with rocks



Fig. 18 El Croquis

- 1 Pool therapy
- 2 Courtyard with rocks
- 3 English garden
- 4 Courtyard with water
- 5 French garden



1 El Croquis, 109-110, p.158
2 Robin Guenther, Gail Vittori, 2013, p.284

View through the window

Relationship between healthcare architecture and its surroundings is already for a while topic of numerous discussions...

Sometimes between all the regulations and specific demands for healthcare institutions, between newest desires of architects and designers, it could easily happen that the primary target/goal gets ignored or forgotten. Patient's needs should always be most important part in the design process, respectively how can they get better faster. Is there a way how architecture can help them or make their healing faster?

Florance Nightingale was pioneering nurse who dedicated her life to improve medical care and standards. One of her first achievements was during the Crimea war when because of her the death rate of wounded soldiers decreased from 60% to 2% after just

6 months.¹ Later on in her *Notes on Hospital* she described defects in existing hospital plans, how to improve them and about general sanitary conditions and requirements. Her emphasis on access to natural light, air, landscape, attention to diet and cleanliness contributed exceptionally to a better healing environment for patients.

“Artificial ventilation may be necessary, [but] it never can compensate for the want of the open window . . . Second only to fresh air, however, I should be inclined to rank light in importance for the sick . . . Among the kindred effects of light I may mention, from experience, as quite perceptible in promoting recovery, the being able to see out of a window, instead of looking against a dead wall; the bright colors of flowers; the being able to read in bed by the light of a window close to the bed-head. It is generally said that the effect is upon the



Fig.19 Juvet landscape hotel: Sauna



Fig.20 Juvet landscape hotel: Lounge

mind. Perhaps so; but it is no less so upon the body on that account.”¹

Florence Nightingale,
Notes on Hospitals, 1863

During the 20th century healthcare institutions slowly started developing from spread out pavillon type into big compact structures, mainly because lack of space in city areas, but also as result of technological advancements (e.g. long span structures, mechanical ventilation etc.).¹ Naturally this led towards neglecting the needs and comfort of patient, which should be fundamental considerations during the design process. The contact with nature is principally lost, although it could still happen at least through window view. Sadly this is also limited and most of the windows are just looking towards another building, towards a (depressive) wall.

Roger Ulrich was one of the first who tried to scientifically prove the connection between healing and view through a window. In his study he observed patients between 1972 and 1981 in suburban Pennsylvania hospital, which all had same procedure, cholecystectomy – gall bladder surgery. They were placed on either second or third floor in rooms with the same layout and same window sizes. The only difference was in the view, one side was looking out on a small stand of deciduous trees and the other on a brown brick wall. The patients were matched in pairs based on various criteria like sex, age, smoker or no smoker, obese or not etc. and put in rooms with different views.²

“In summary, in comparison with the wall-view group, the patients with the tree view had shorter postoperative hospital

stays, had fewer negative evaluative comments from nurses, took fewer moderate and strong analgesic doses, and had slightly lower scores for minor postsurgical complications. Although the findings suggest that the natural scene had comparatively therapeutic influences, it should be recognized that the “built” view in this study was a comparatively monotonous one, a largely featureless brick wall. The conclusions cannot be extended to all built views, nor to other patient groups, such as long-term patients, who may suffer from low arousal or boredom rather than from the anxiety problems typically associated with surgeries.”

Roger Ulrich, *View through a window may influence recovery from surgery*, 1984

¹ Burpee, 2016, p.2

² Ulrich, 1984, p. 1

Rethinking rehabilitation

There are several points that could be concluded from previously discussed topics.

Use of hydrotherapy

Physical therapy and rehabilitation can, depending on the seriousness of the injury, last for few months or longer and the recovery can generally be quite painful and dreadful process. Therefore extending the therapy program with water treatments could be useful and helpful for reducing the stress and pain, which the patient undergoes during the rehabilitation.

Social activities

The concept of Greek gymnasium and *in mens sana corpore sano* can also partially be translated in the context of the rehabilitation center. Indeed, the connection of body and mind is extremely important during the

therapy, mainly because one first has to decide to get better, so that the therapy actually starts giving result. Obviously this decision does not happen just once at beginning, it happens frequently during the rehabilitation, as sometimes the treatments get harder and one can easily give up. Hence, it is important to extend the program of the rehabilitation center with different social activities, so that as a result patients have other distractions, but also so that they find further motivation and recover faster. Figure 21 shows interesting way of combining social activity and therapy.

Nature

It is proven how natural views and surrounding can help in reducing stressful thought, anxiety and commonly evoke positive feeling.¹ Impressive landscape of South Tyrol gives the perfect background.



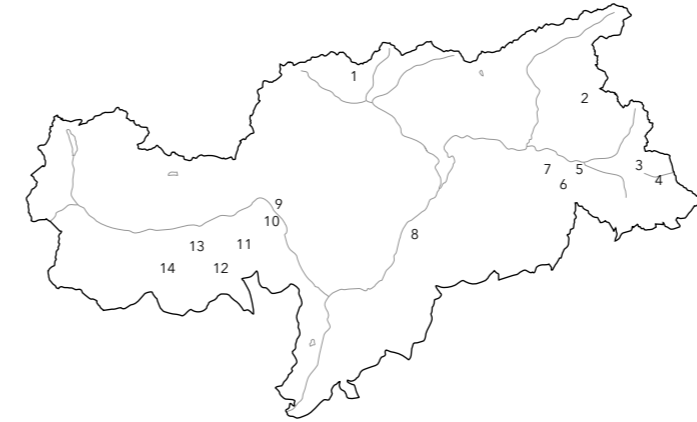
Fig. 21 Blend of social activity and therapy, of younger and older generations, Széchenyi, Budapest

Location



Fig. 22 View from Vigljihoch

South Tyrol



- 1 Brenner Brennerbad
- 2 Antholz Hartmannsbrunn
Stampferbad
Salomonsbrunn
- 3 Innichen Wildbad
- 4 Sexten Bad Moos
- 5 Prags Bad Altprags
- 6 Olang Bad Bergfall
- 7 Enneberg Bad Cortina
- 8 Kastelruth Bad Ratzes
- 9 Marling Bad Josefsberg
Heilquelle Hl. Felix
- 10 Lana Bärenbad (Vigiljoch)**
Völlaner Bad
- 11 St. Pankraz Bad Lad
Mitterbad
Lotterbad
- 12 Ulten Lotterbad
- 13 Staben Bad Kochenmoos
- 14 Martell Bad Salt



South Tyrol (Italian Alto Adige) is located in the northeast part of Italy, bordering with Switzerland on the west and Austria on the north. Originally the region was part of Austrian Empire, but during the First World War it was offered by the Allies to the Italy as an incentive to enter the war on their side and was officially annexed to Kingdom of Italy in 1919.¹ After more than few attempts of Italianization and continuous strong resistance of the German-speaking South Tyroleans, this region succeed to get the rights as an autonomous province and has high level of self-government. Today South Tyrol is the most affluent province in Italy with GDP of more than 34 000 EUR per capita.² One of the main sources of income is tourism, as this alluring alpine area of interconnected valleys and mountains attracts many travelers and adventurers.

1 en.wikipedia.org/wiki/South_Tyrol, accessed February 27, 2017
 2 en.wikipedia.org/wiki/List_of_Italian_regions_by_GDP, accessed February 27, 2017

Vigiljoch/San Vigilius

There were many options as possible site locations for the project, as region's alpine landscape offers more than few attractive vistas. One can not ignore the charm of the mountains, the atmosphere and the striking views from the higher points. However some important factors had to be observed and decision was made in favour for the Vigiljoch, the beginning of the mountain range of Ortler Alps. Following features of Vigiljoch were decisive in selecting the location for the building site:

Microclima

Very specific geographical position below the 3300 m high Texel Group, protects this area from precipitation and wind of the colder climate on the nord. The city Meran adjacent to Vigiljoch for example has around 300 sunny days in a year and almost Mediterranean climate.

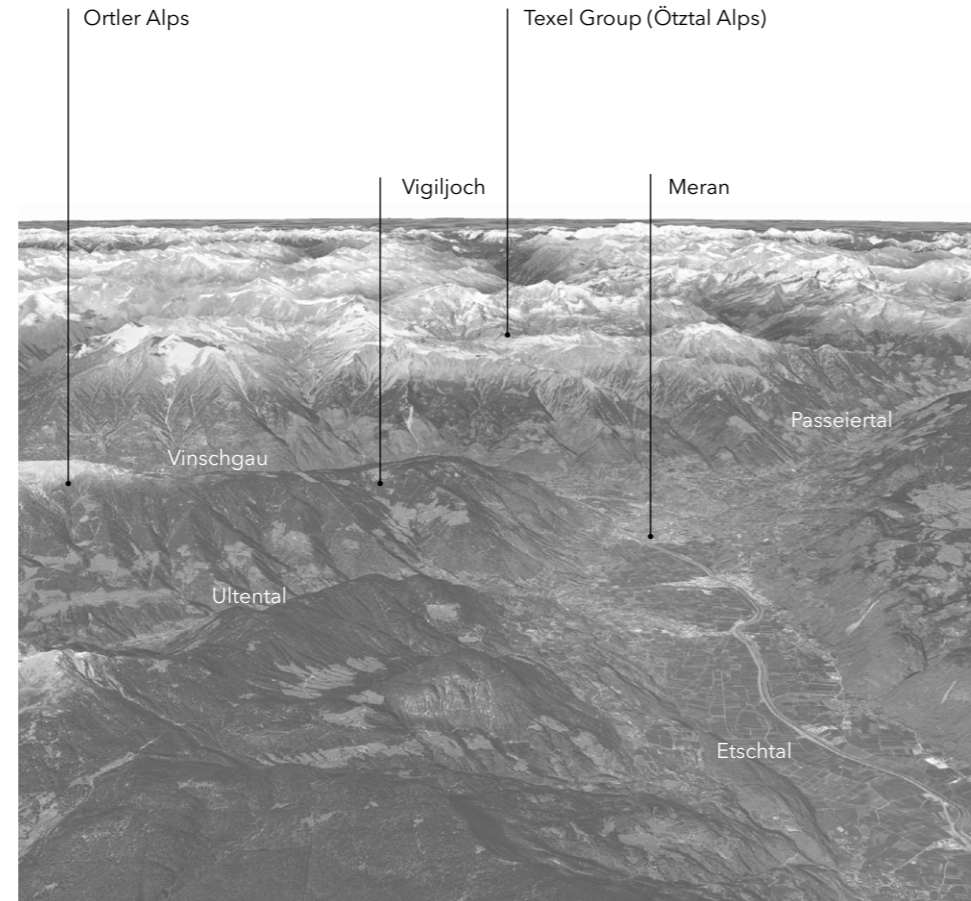


Fig.23 Mountains and valleys around Vigiljoch

St. Vigil am Joch

Gasthof Jocher

Drinking water spring

Bärenbadalm

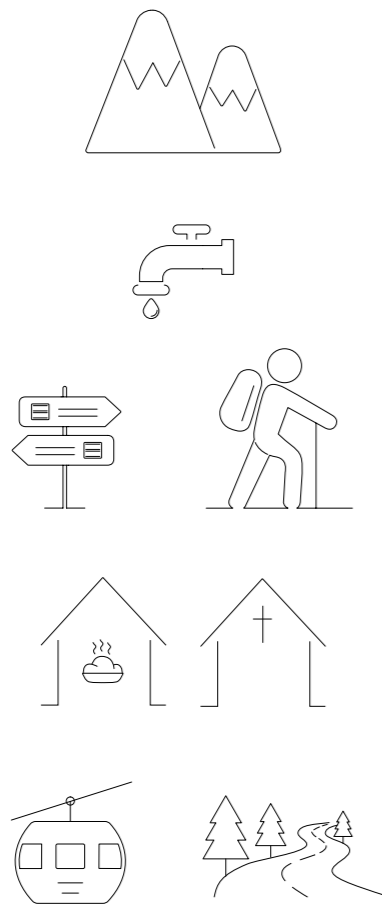
Bärenbad - Mineral water spring



Fig. 24 Facilities and building site on Vigiljoch



Fig. 25 View from the building site



Natural springs

Close to the building site there are several natural springs of mineral and drinking water. The springs were at the beginning just used by the local farmhouses, but around 1960s they discovered also the high mineral quality of water rich in silicon and flouride¹ and started to transport it to Meran where is bottled and sold as Meraner Mineralwasser - San Vigilio. This radon water is also used for cure treatments at Meran Therme due to its soothing and pain reliving effects.² Since rehabilitation center also has a hydrotherapy area, the patients would highly benefit from the water with those special characteristics.

Facilities

Around there are few inns and a church where patients could easily go if they would want to change the ambience.

Activities

The wide network of hiking paths in the area could perfectly support the and further expand the offer of the rehabilitation center. The building itself is placed directly on one of the paths and in this way encourages the patient to move more, to explore the territory around and to faster.

Infrastructure

Even though the idea was to insert the rehabilitation center in nature due to its relaxing effects, it was crucial not to make an oasis cut out from the world. Therefore, already mentioned factors like facilities and activities in the neighbourhood were essential, but also a good transport connection was an imperative. Transport of the patients would be mainly accomplished by using the existing cable cars from Lana and Pawigl and further electrical cars till the building itself.

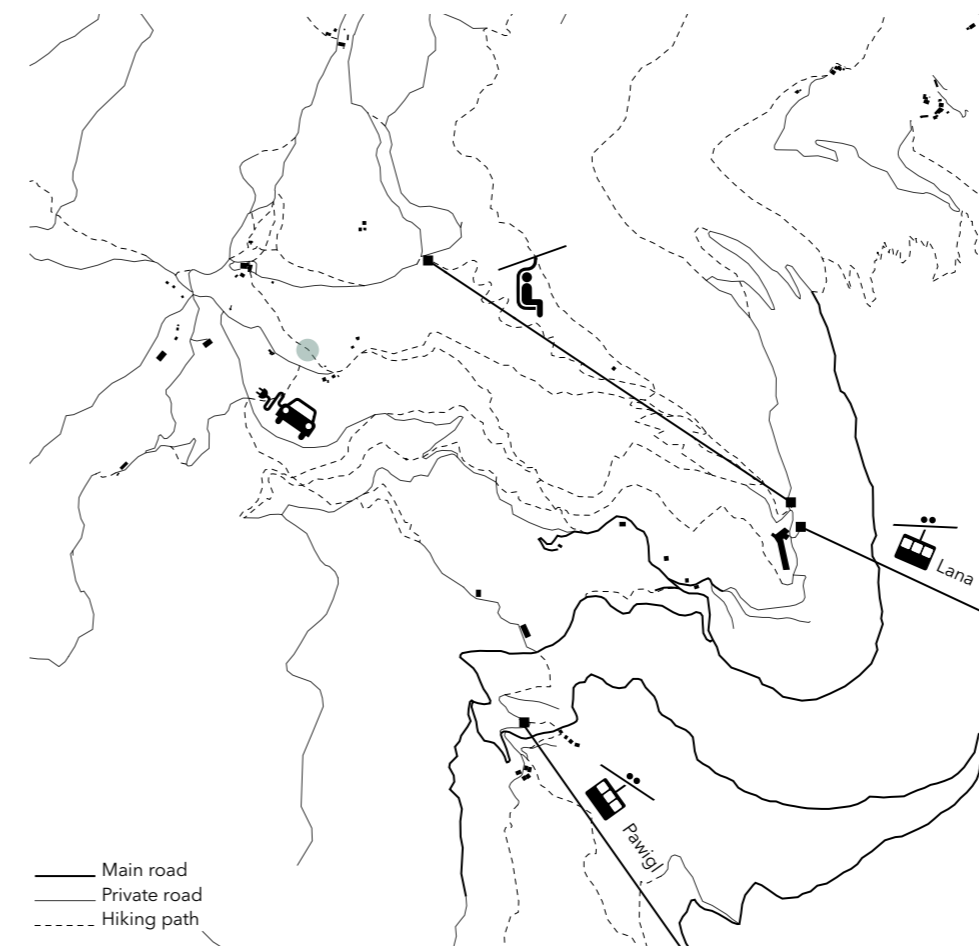


Fig. 26 Cable car from Lana to Vigilihoch

1 vsgm.info
2 vigilio.com



Fig. 27 One of the natural springs on Vigiljoch



Fig. 28 Church St. Vigil am Joch



Fig. 29 Spring on Vigiljoch with Primroses *Primula integrifolia*



Fig. 30 Easy hiking and walking paths in the surroundings

Concept

Fig. 31 Gruppenhof in Finilu, Switzerland



Gruppenhof

First observations showed how existing settlement in the Alpine region of South Tyrol, Austria, Switzerland and France have very authentic texture, more specifically the buildings are actually an ensemble of smaller units divided through various functions. This arrangement is called *Gruppenhof* (from german die Gruppe 'group' and der Hof 'courtyard') and it characterizes the system of separated houses that in this way best adopt to the mountain's slope.

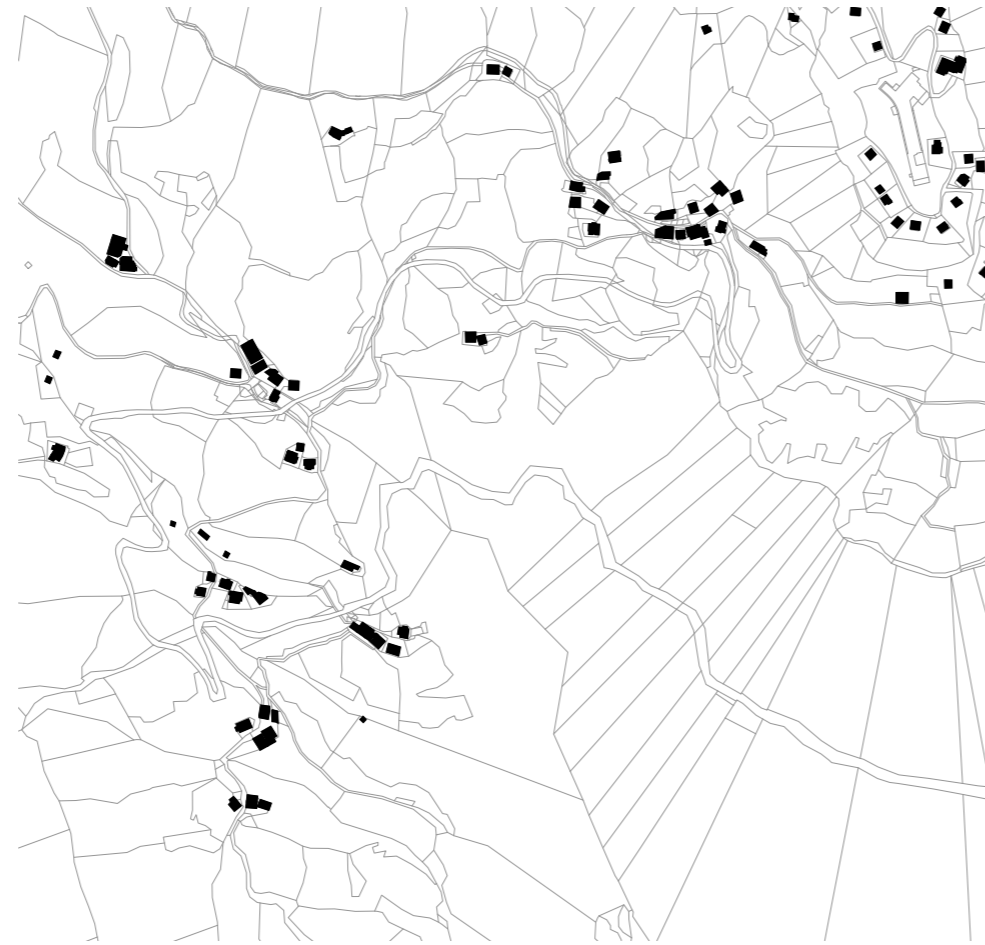


Fig. 32 Gruppenhof in Gimmelwald, Switzerland



Gruppenhof

Gruppenhof is usually formed through following units:

- 1 Living unit
- 2 Livestock unit
- 3 Unit for food storage/feeding
- 4 Equipment storage

Formations like this are specifically distinctive for higher altitudes (*die Almen*), where on the lower mountain areas *Paarhof* (from german *das Paar* 'couple' and *der Hof* 'courtyard') is more frequent. As its name is saying, *Paarhof* has two units - couple of:

- 1 *Feuerhaus* (from german *das Feuer* 'fire' and *das Haus* 'house') heated house for living
- 2 *Futterhaus* (from german *das Futter* 'feed') big agricultural building with stables on lower floor and barn on the upper floor.



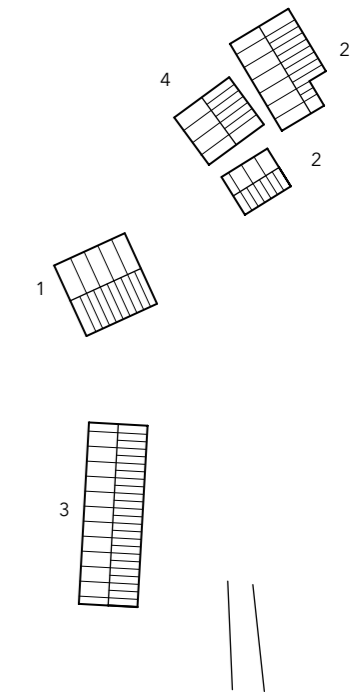
Fig. 33 Alm in Vinschgau, South Tyrol



Fig. 34 Blaa Alm Altausee, Austria



Fig. 35 Londeialm, Ultental, South Tyrol



Site plan Londeialm²

1 Martin Rudolf-Greiffenberg, 1982, p.10
 2 Bauen im ländlichen Raum, p.60

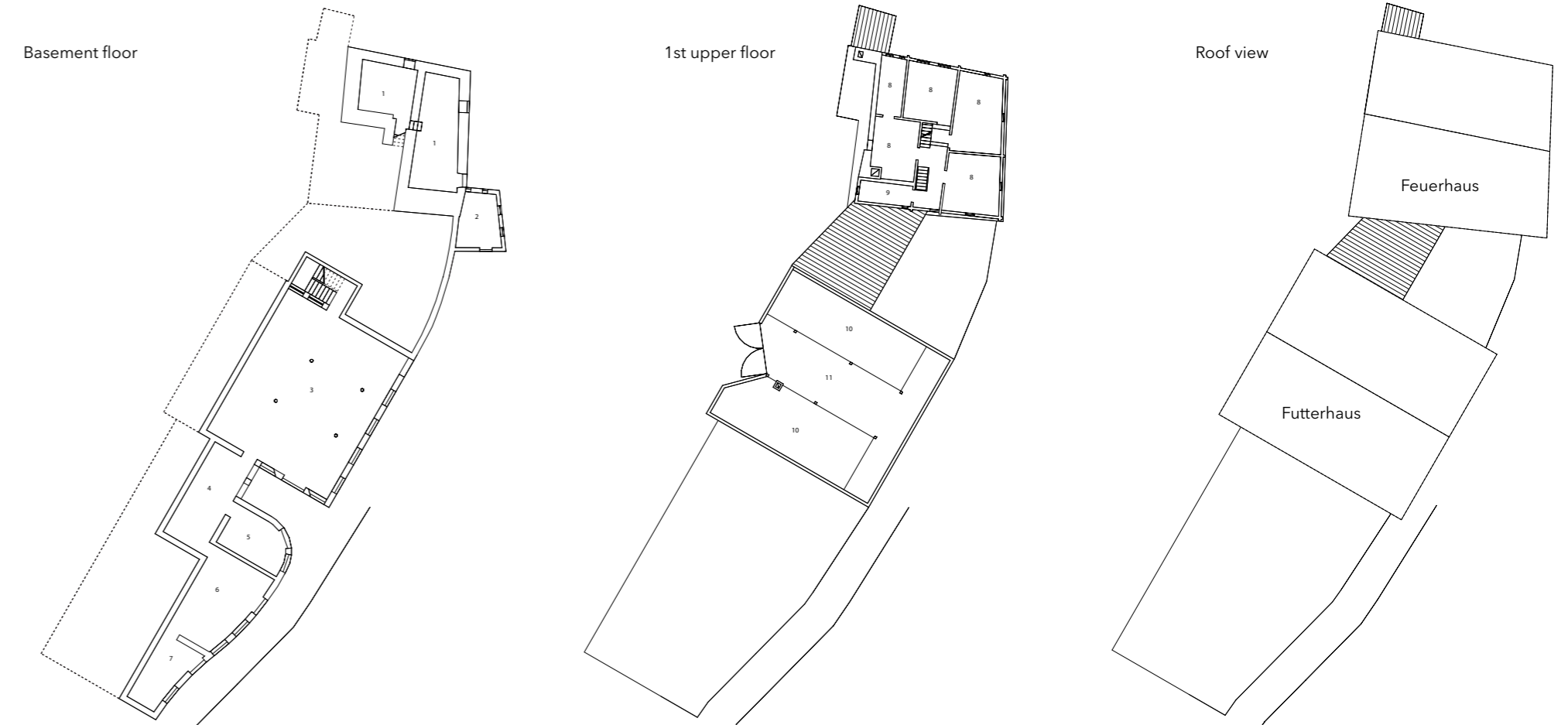
With further growth and expansion the connection between units started to develop through covered, but still open spaces.

Radunhof in Martelltal is typical *Paarhof* and has following spaces:

- 1 Basement
- 2 Chicken stable
- 3 Livestock stable
- 4 Working space
- 5 Dairy room
- 6 Sheep stable
- 7 Storage
- 8 Room (Sleeping)
- 9 Storage
- 10 Hayloft
- 11 Upper barn



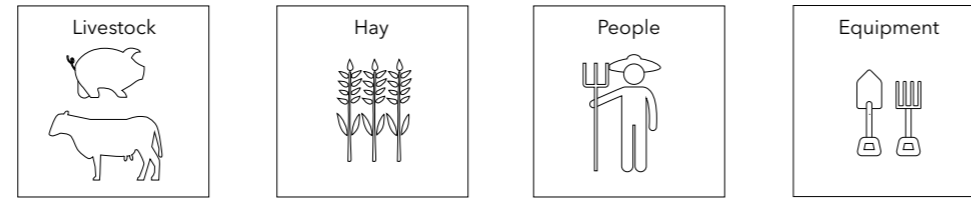
Fig. 36 Martelltal, South Tyrol



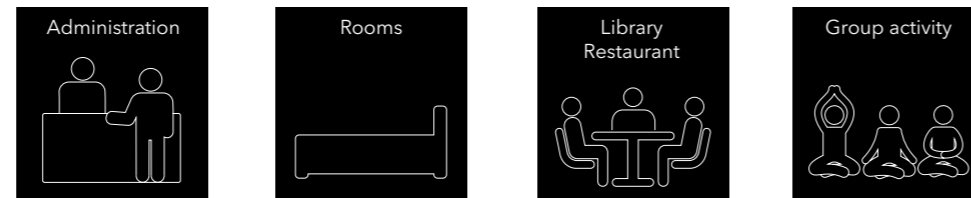
Floor plans Radunhof ¹

Functions

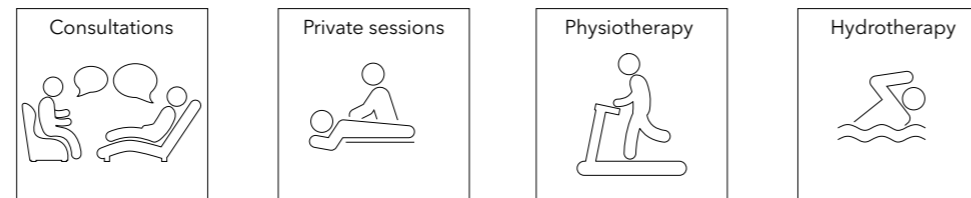
The program of the rehabilitation center was divided in separate units according to different functions. This was done too assimilate the texture of the alpine settlements, but mainly to further investigate the form of *Gruppenhof*. As the *Gruppenhof* has his division into houses for people, livestock, hay and equipment, also the rehabilitation center has houses splitted into two essential programs: social areas and therapy areas.



Gruppenhof

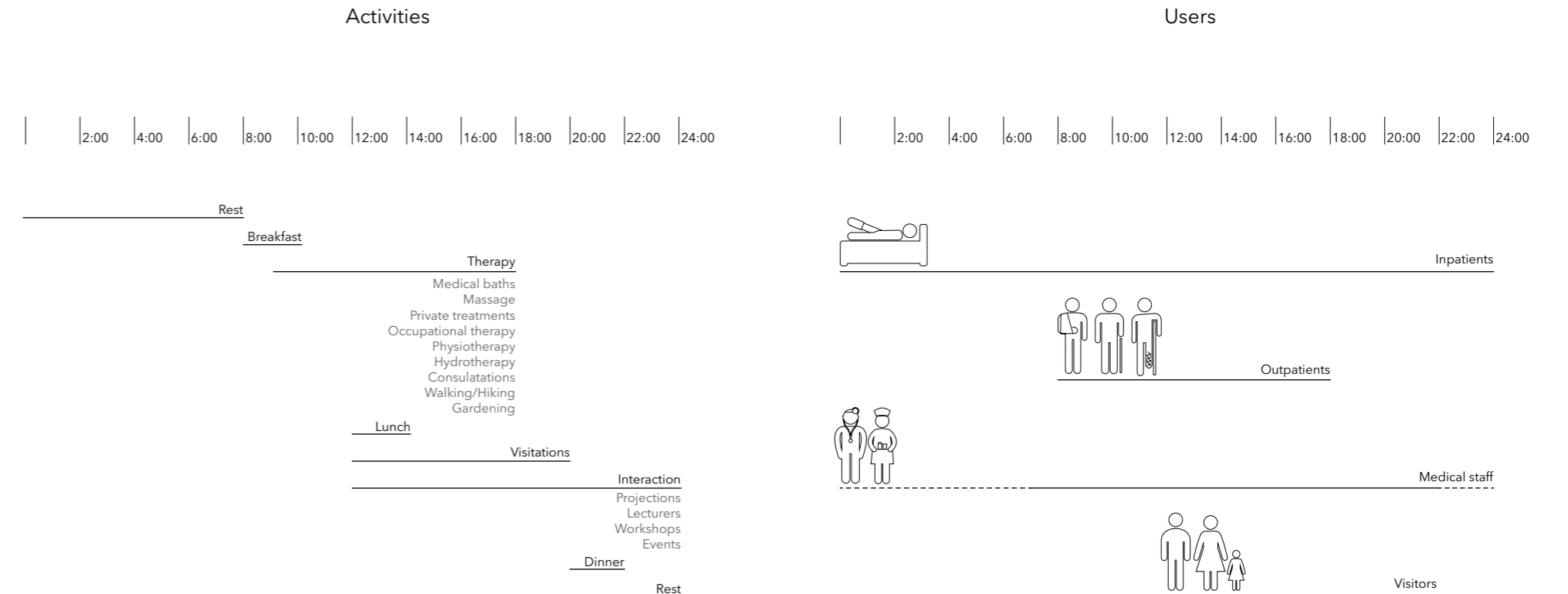


Social areas

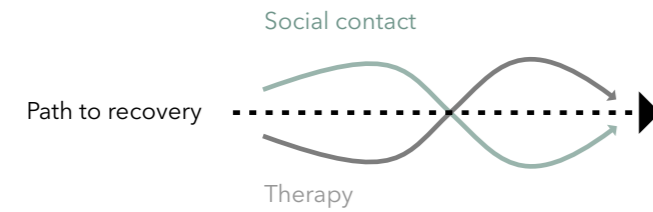


Therapy areas

Daily routines



Organization

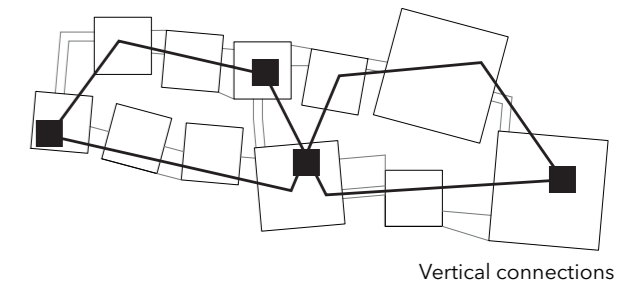
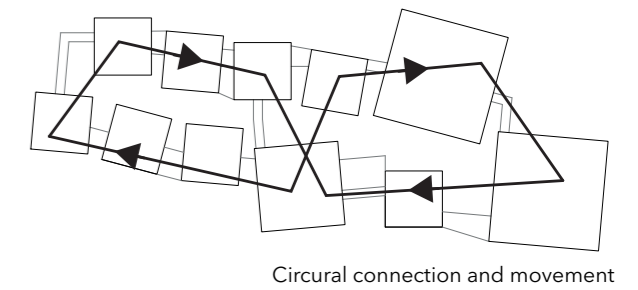
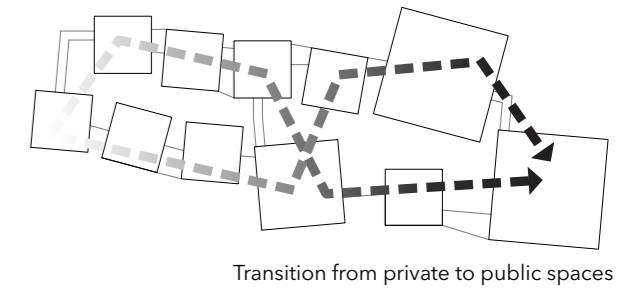
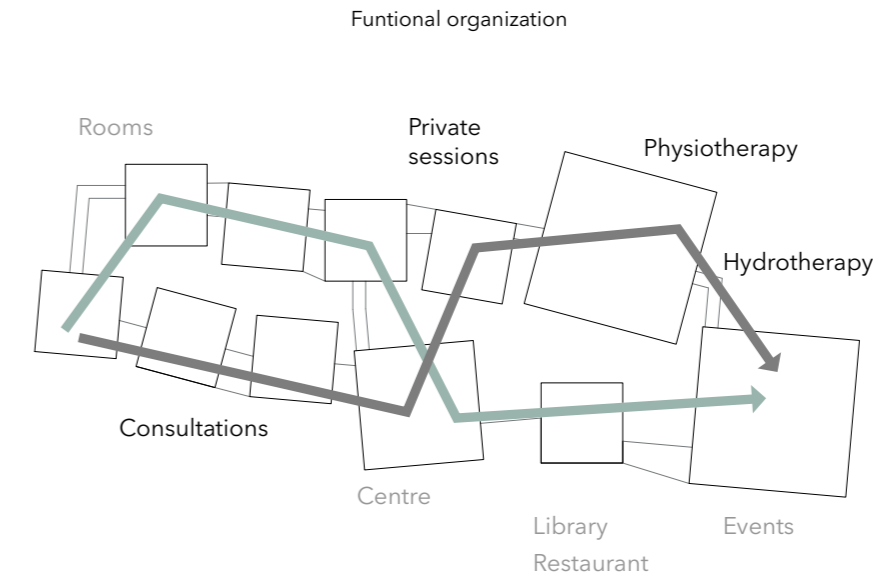


“There is a turning point in the course of healing when you go from the dark side to the light, when your interest in the world revives and when despair gives way to hope. As you lie in bed, you suddenly notice the dappled sunlight on the blinds and no longer turn your head and shield your eyes. You become aware of birdsong outside the window and the soothing whir of the ventilation system down the hall. You no longer dread the effort needed to get up, but take your first cautious steps, like a child, to explore the newfound space around you. The smell of food does not bring on waves of nausea or revulsion, but triggers hunger and a desire to eat. The bed sheets feel cool and soothing—their touch no longer sends shivers through you, like chalk-squeak on a blackboard. Instead of shrinking from others, you welcome the chit-chat of the nurse who enters the room.”

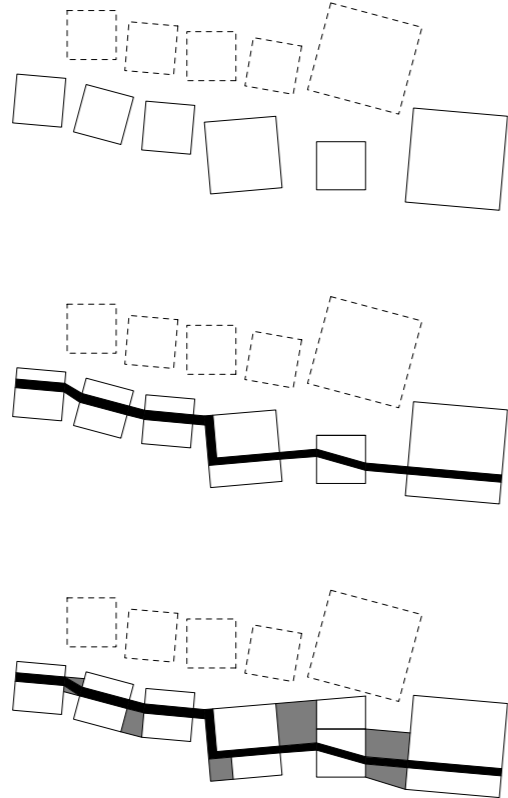
Esther M. Sternberg, M.D.

Healing is a mysterious process in a way that it can not be generalized and same rules can not be applied for every patient. A person after an accident has to process what happened and requires some time to make the decision to get better. This naturally varies from one patient to another and it is depending on the personality, motivation and support from friends and family. However, it could be interpreted that the path to recovery is supported through two basic process. One is supporting the therapy and healing of the body and the other, maybe even more important, is happening through social contact and helps in healing the mind and in finding the motivation to do the therapy in the first place. This is incorporated in organisation of the rehabilitation center where, as already mentioned, there are two interlocking programs, one with therapy areas and the other with

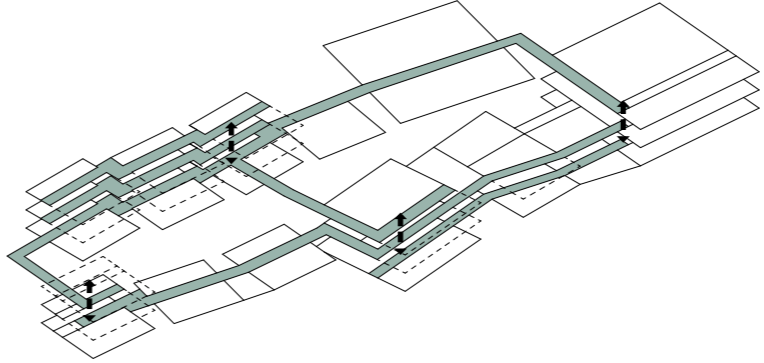
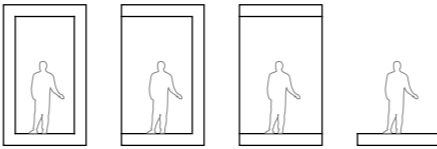
social areas. Further organisation of the social and the therapy line follows the sphere of more private to more public spaces: rooms as a completely private area, then projection room or library where there are other people, but the communication is not necessary, then a restaurant with a bit more interaction and in the end socializing events open for everybody. The same logic applies to therapy line where it starts with private consultations and water treatments, then physiotherapy with other patients and in the end the pool areas for an open interaction with other patients. Obviously the speed of the movement through therapy and social program is up for every patient to decide. Aforementioned organisation allows circular movement and connection between units/houses.



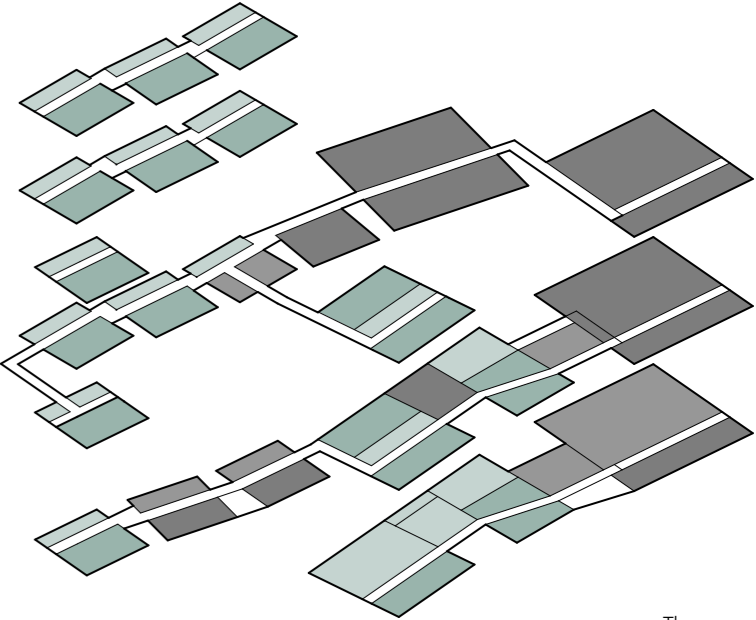
Connections



The houses were first connected through a simple passage, which then got additional pockets along the path through spaces in between the houses. These spaces are either just a rest place with a couch or a chair, or they open up as a terrace or have special purpose e.g. classrooms for occupational therapy. The path is continuously interrupted with these pockets, but also with the views towards outside through window openings.



Horizontal and vertical connections



- Therapy program
- Therapy adjoining rooms
- Social program
- Social adjoining rooms

Space allocation plan

Brutto per floor:

-2	956m ²
-1	1233 m ²
0	1350m ²
+1	582m ²
+2	369m ²

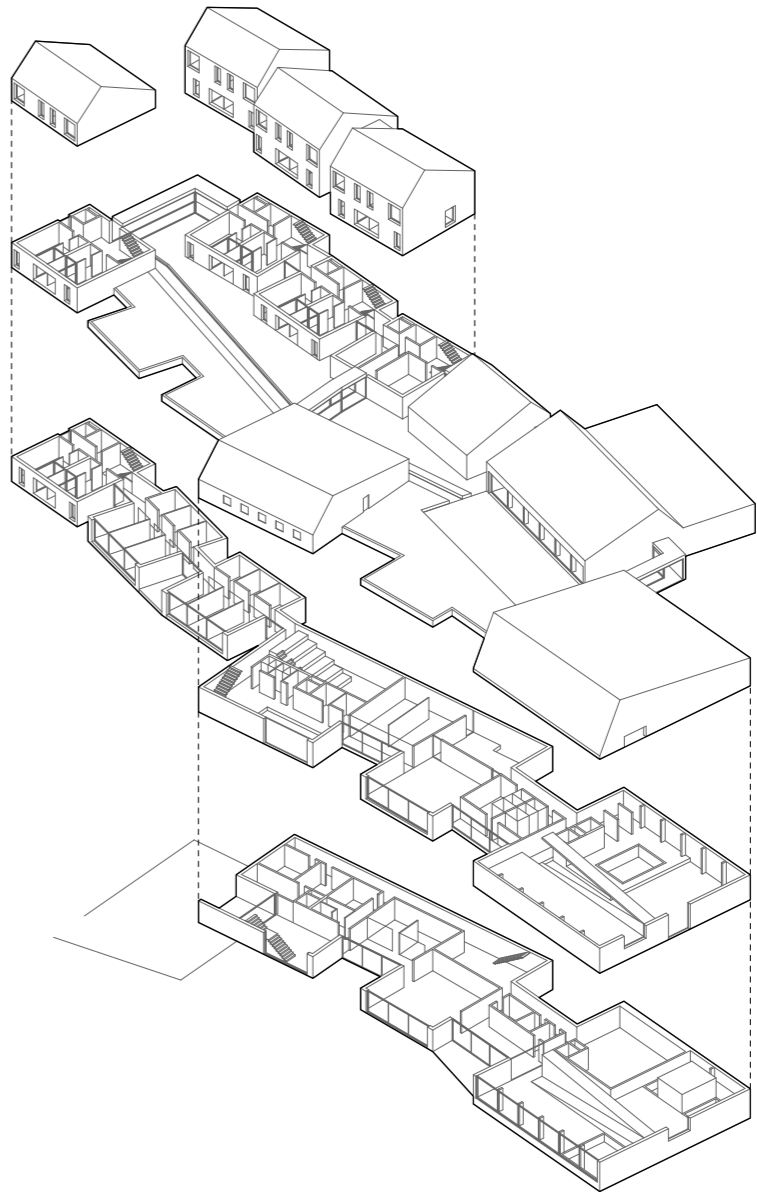
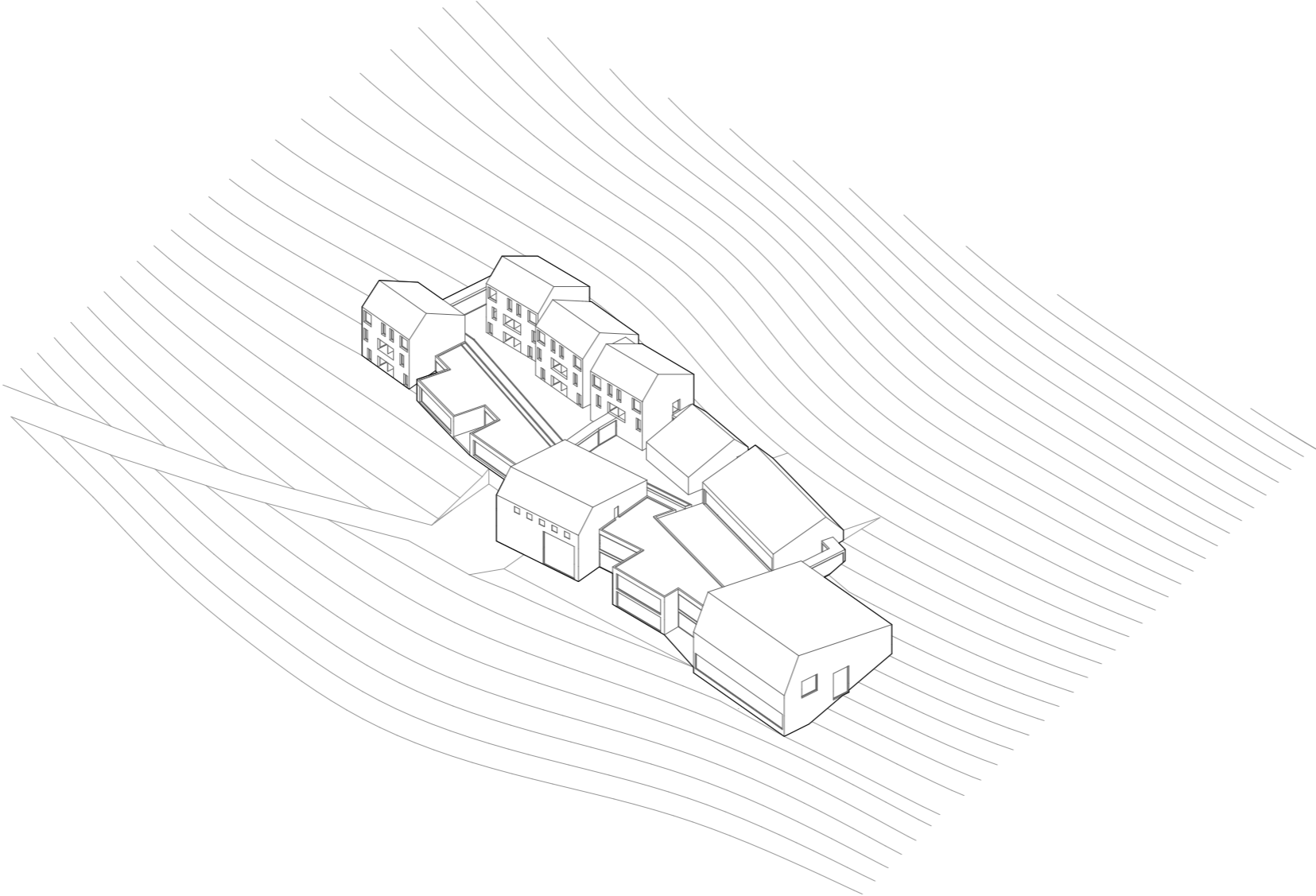
Netto per function:

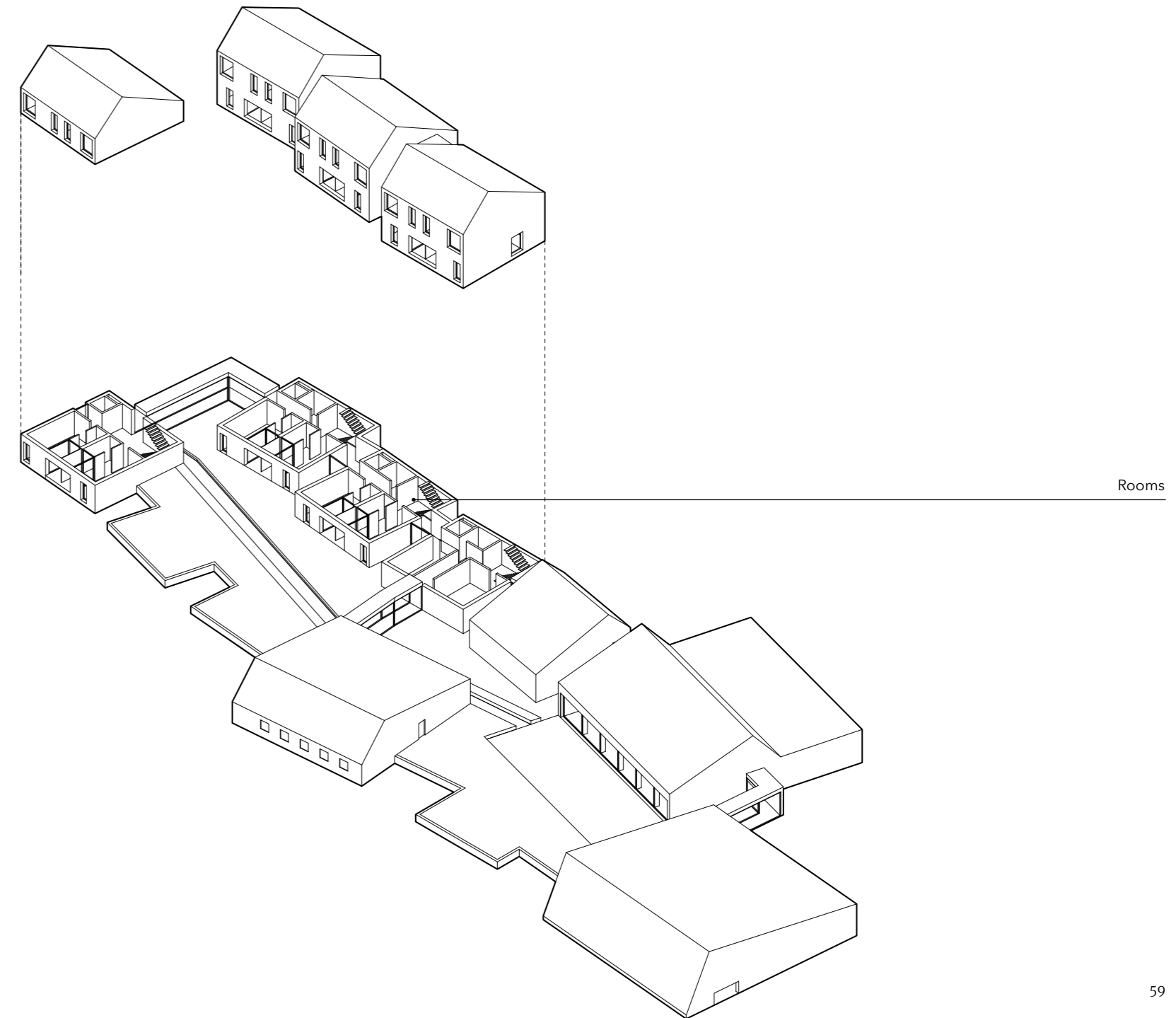
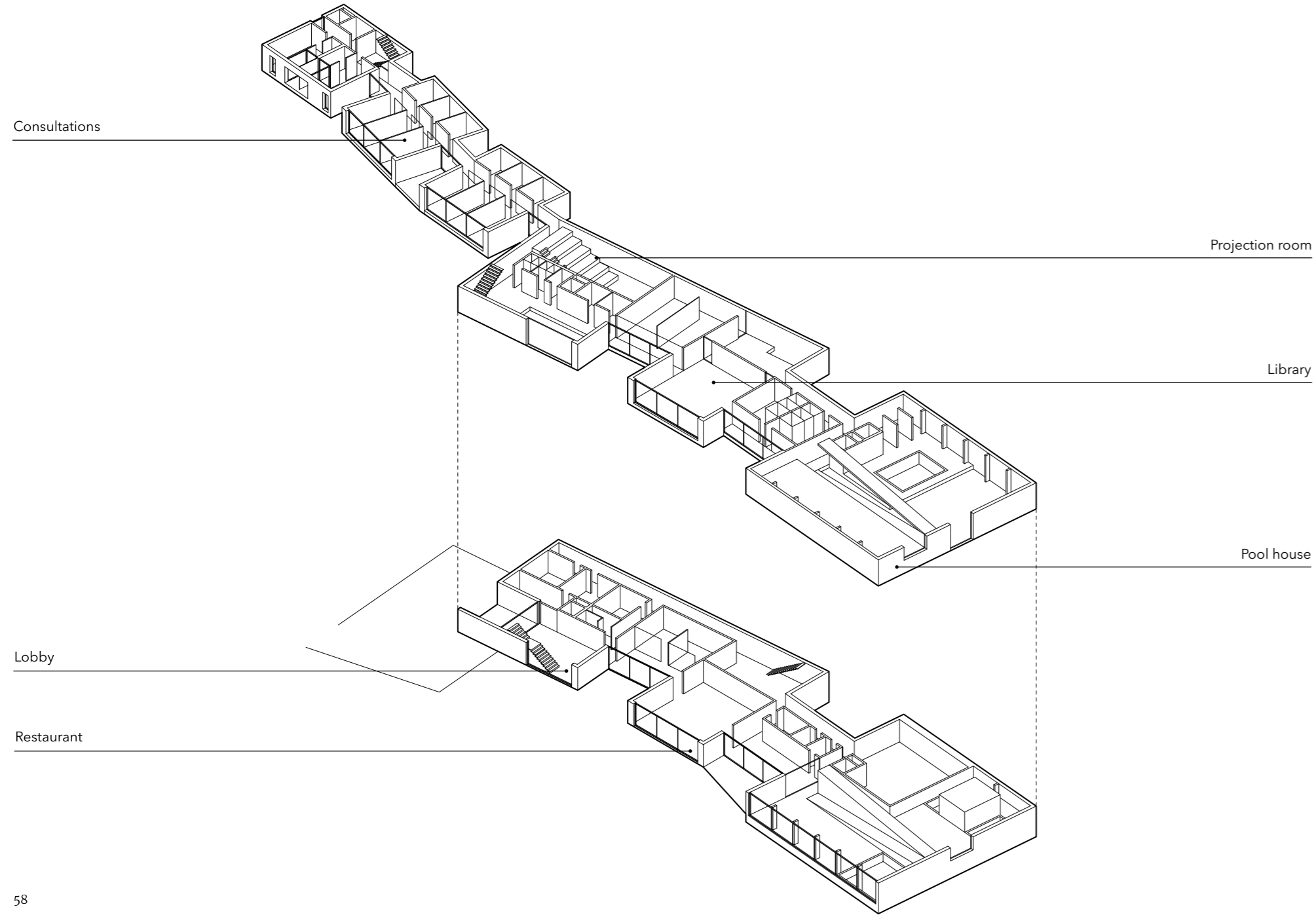
Entrance	140 m²
Loggia	30 m ²
Lobby	60 m ²
Waiting area	40 m ²
Toilets (W, M, Accessible)	10 m ²
Administatrion and Managment	56 m²
Manager office	20 m ²
Administration office	20 m ²
Archiv	16 m ²
Logistics	302 m²
Maintance manager	19 m ²
Deliver/Dispatch room	18 m ²
Garbage	20 m ²
Storage	50 m ²
Technical area	101 m ²
Water tanks	94 m ²
Social Program	451 m²
Restaurant	100 m ²
Bar/Open kitchen	44 m ²
Terrace	34 m ²

Refrigrator room	10 m ²
Washing room	6 m ²
Food Storage	6 m ²
Library	100 m ²
Material storage	10 m ²
Projection room	80 m ²
Material storage	23 m ²
Toilets (W, M, Accessible)	15 m ²
Cleaning storage	14 m ²
Room Unit x4	700 m²
One-bed bedroom x4	18 m ²
Two-bed bedroom x2	23 m ²
En-suite bathroom x6	6 m ²
Clean linien	5 m ²
Dirty linien	5 m ²
Technical area	11 m ²
Therapy Program	1135m²
Consultation room x6	17 m ²
Archiv x2	11 m ²
Toilets (W,M)	11 m ²
Equipment x2	11 m ²
Technical area	11 m ²

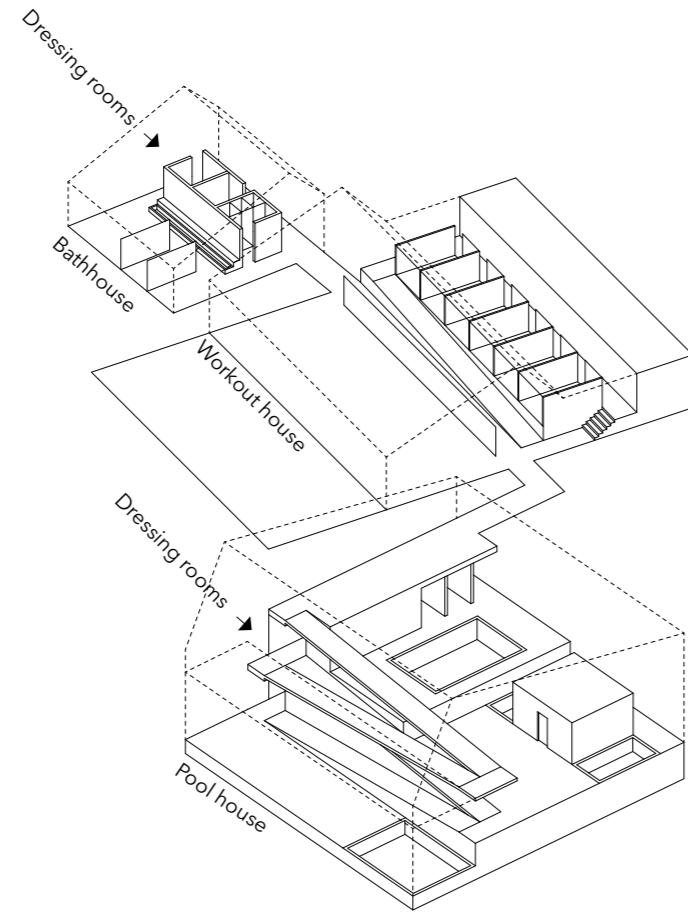
Private water treatments	
Salt room	6 m ²
Walk-in massage shower	6 m ²
Baths	55 m ²
Storage	6 m ²
Physical treatment	
Gym (+Outdoor gym 160 m ²)	160 m ²
Private treatment room x3	11 m ²
Hand/Speech therapy x3	11 m ²
Group exercise room	100 m ²
Toilets (W, M, Accessible)	18 m ²
Clean linien	15 m ²
Dirty linien	15 m ²
Equipment storage	19 m ²
Hydrotherapy	
Exercise pool area	100 m ²
Massage showers	10 m ²
Circulation pool area	80 m ²
Sauna	18 m ²
Relaxation pool area	110 m ²
Equipment storage	19 m ²
Accessible toilet	4 m ²
Occupation therapy	
Classroom x2	40 m ²
Equipment storage	10 m ²

Axonometric projections

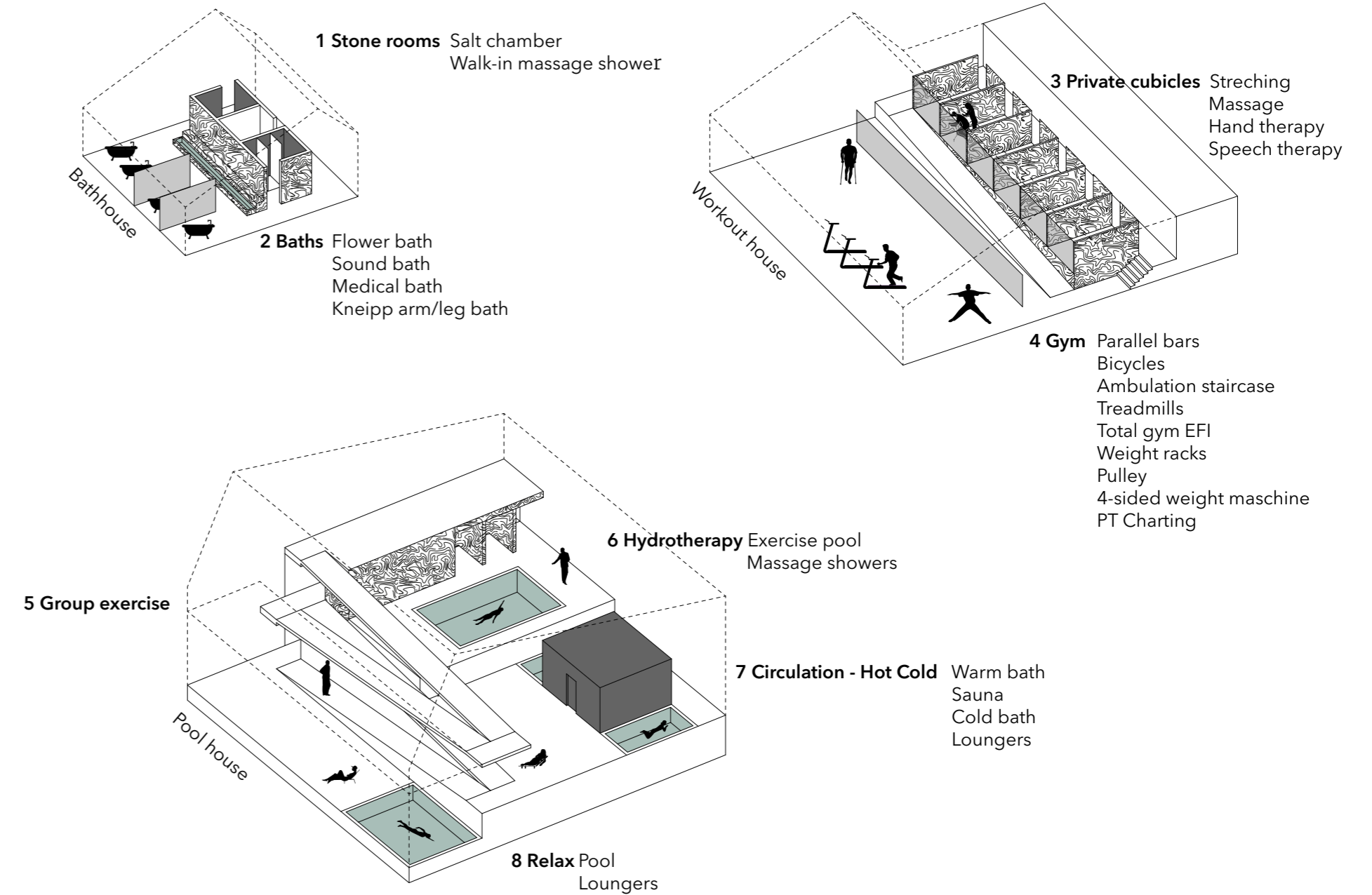




Therapy program



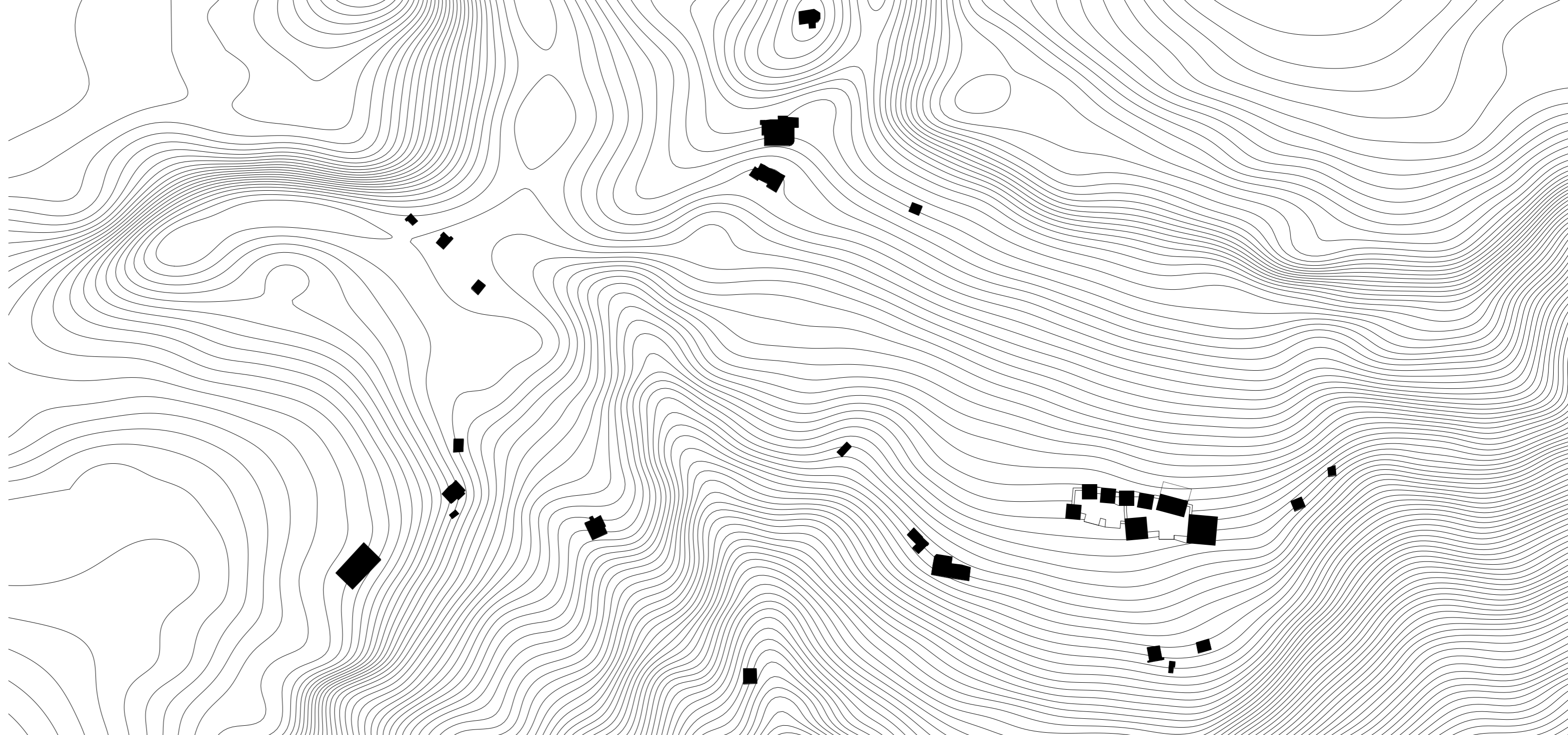
Therapy program is divided in three units/houses. Unit for physical therapy is placed in the middle between two adjacent ones with various water treatments. Alltogether they are “clean” part of the building where one has to pass the dressing room to enter. The patients can freely circulate between them and start with either pool house or bathhouse, order of treatments are decided together with doctors and therapists. Pool house is combining exercises and rest spaces with a wheelchair user friendly ramp in the middle as main connection between different activities. Bath house is on the other hand primarily imagined as more private rest space with different types of baths, massages and walk-in shower massages. Both poolhouse and bathhouse serve as extension of physical therapy for stress and pain relief treatments.



Plans

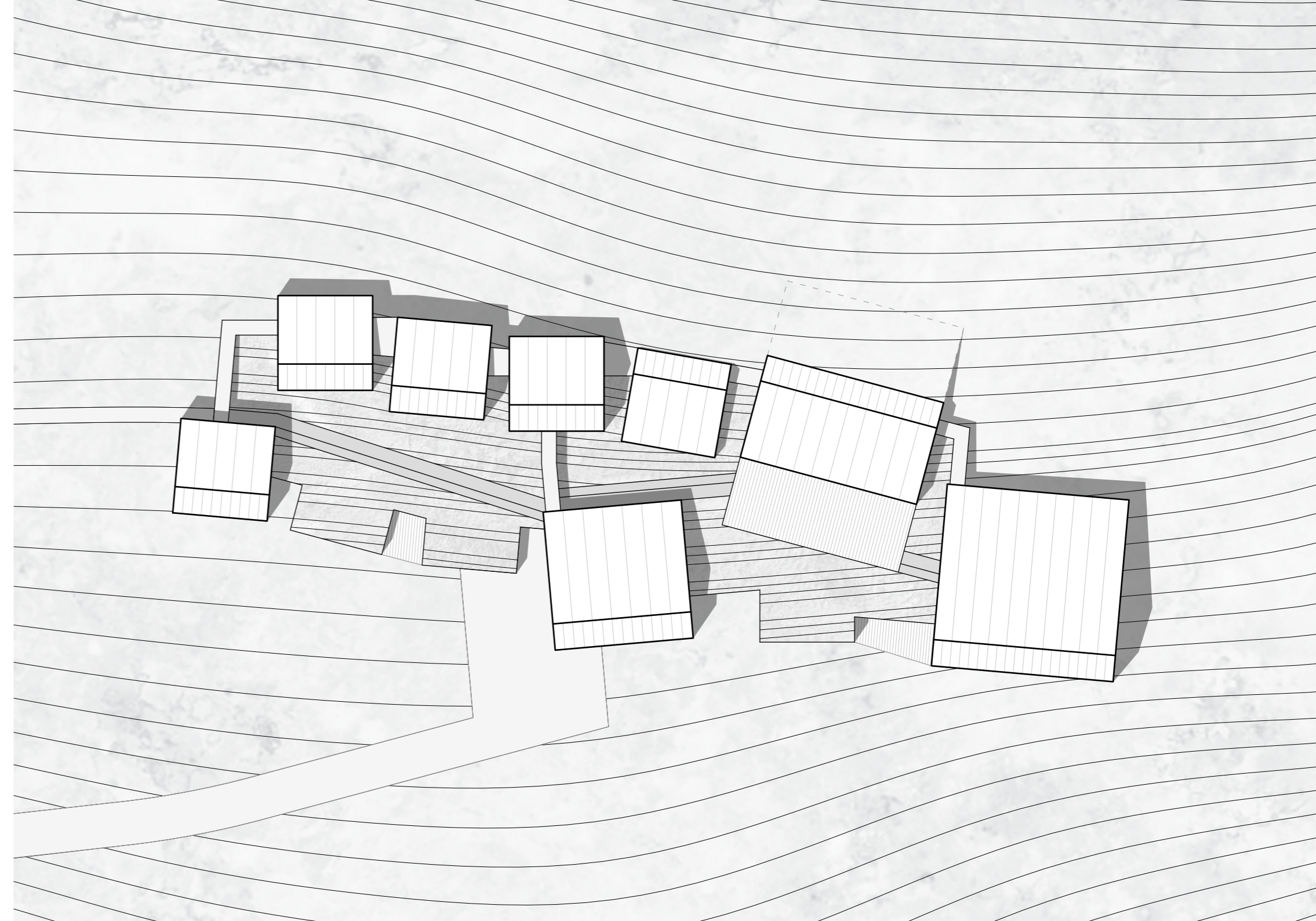
Figure-ground diagram
1:5 000

0 | 25 | | | 100 m



Roof - top view
1:500

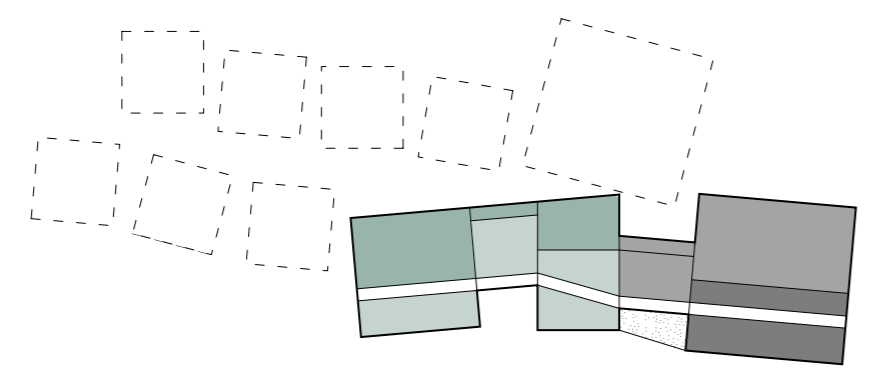
0 2.5 | | | 12.5 m



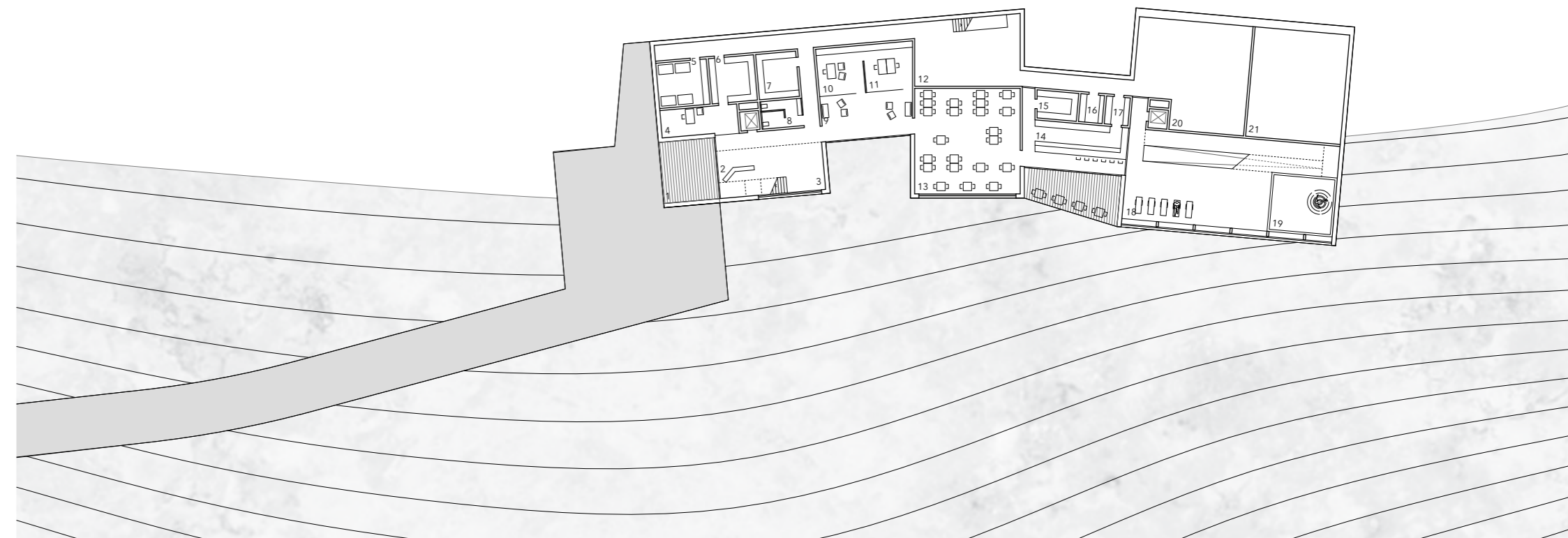
Second lower ground floor

1:500

0 | 2.5 | | | 12.5 m

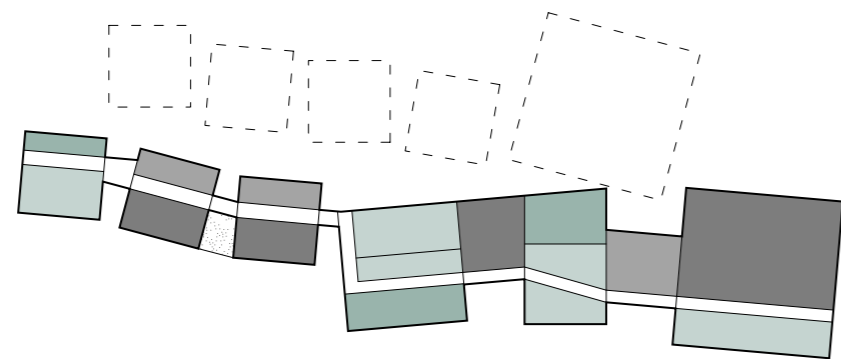


- 1 Covered entrance
- 2 Reception
- 3 Lobby
- 4 Maintenance manager
- 5 Garbage
- 6 Delivery/Dispatch room
- 7 Archiv
- 8 Toilets (W/M, Accessible)
- 9 Waiting area
- 10 Center manager
- 11 Administration office
- 12 Laundry storage
- 13 Restaurant
- 14 Open kitchen
- 15 Refrigerator
- 16 Food storage
- 17 Washing room
- 18 Relaxation area
- 19 Pool
- 20 Technical area
- 21 Water tanks

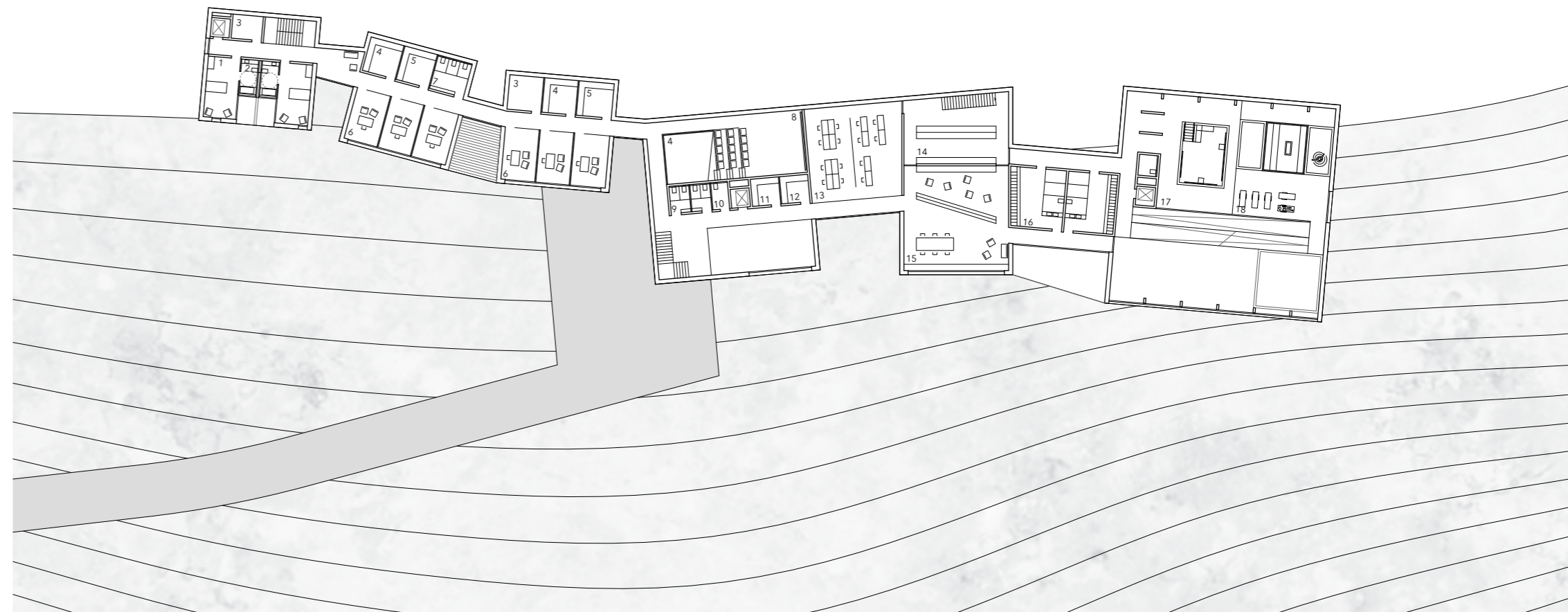


First lower ground floor
1:500

0 2.5 12.5 m



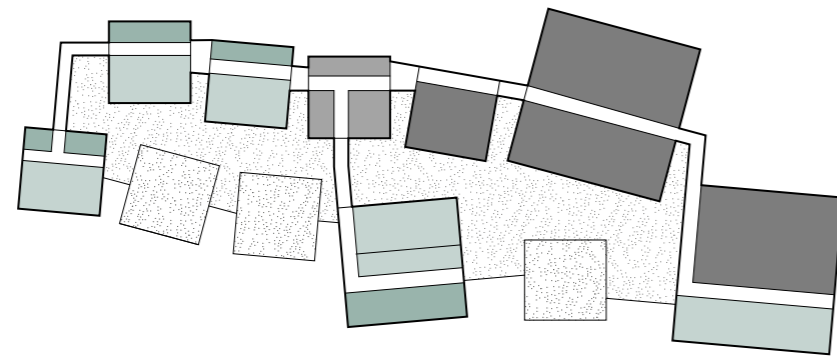
- 1 One-bed room
- 2 En-suite bathroom
- 3 Technics
- 4 Archiv
- 5 Equipment
- 6 Consultation rooms
- 7 Storage
- 8 Projection room
- 9 Toilets (W, M, Accessible)
- 10 Clean utility
- 11 Dirty utility
- 12 Classrooms
- 14 Classroom/Therapy storage
- 15 Library
- 16 Dressing rooms
- 17 Exercise pool
- 18 Circulation pool



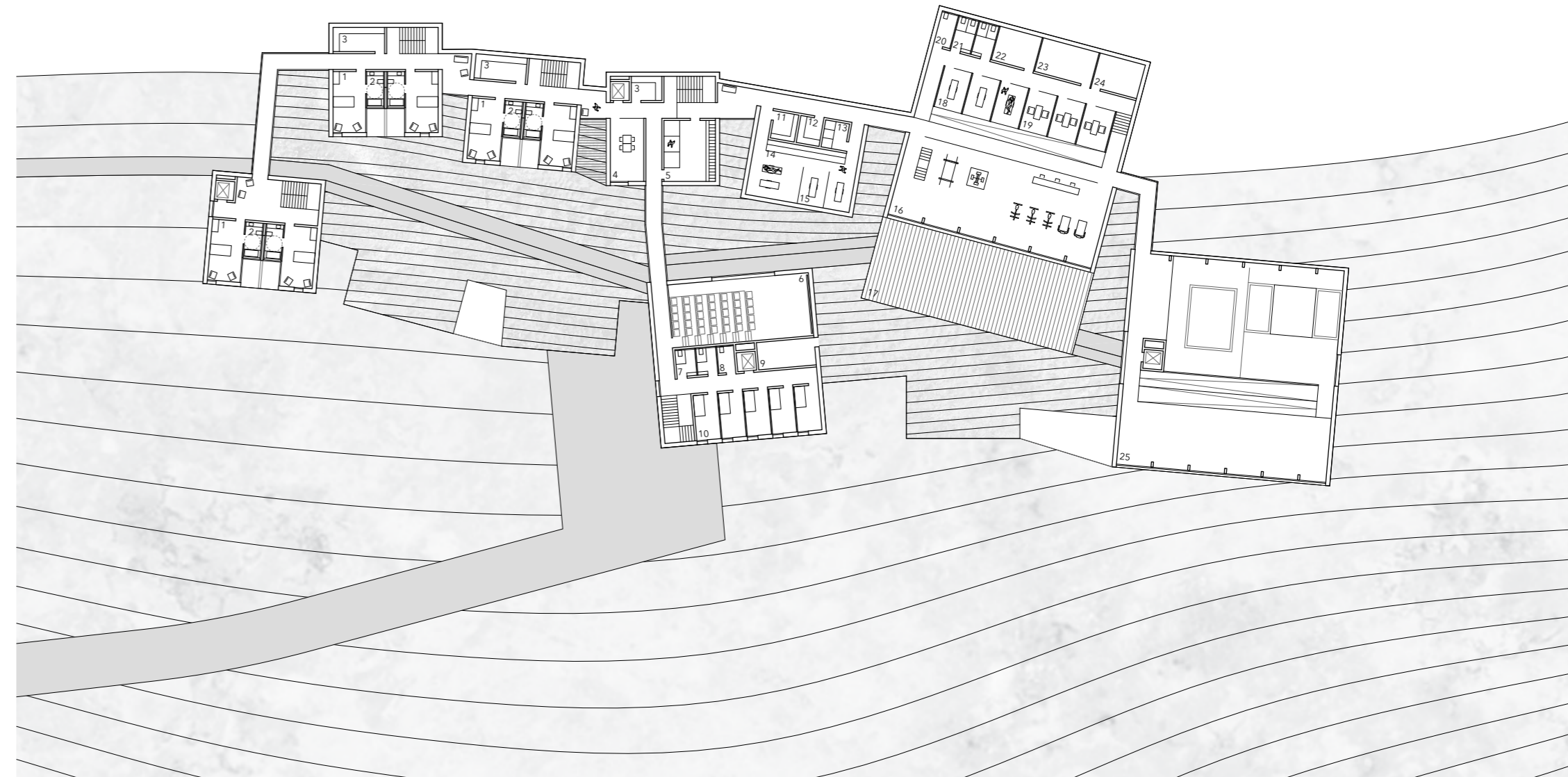
Ground floor

1:500

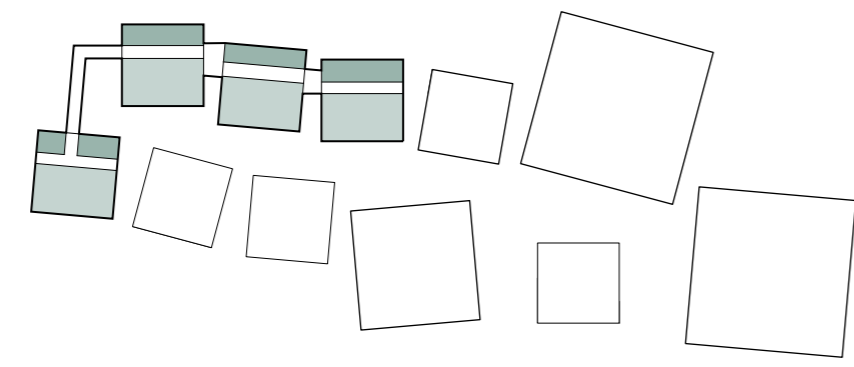
0 | 2.5 | | | 12.5 m



- 1 One-bed room
- 2 En-suite bathroom
- 3 Technics
- 4 Staff Lounge
- 5 Dressing room
- 6 Projection room
- 7 Showers (W, M)
- 8 Accessible toilet
- 9 Garden equipment
- 10 Accomodation for staff
- 11 Salt room
- 12 Storage
- 13 Walk-in massage showers
- 14 Kneipp leg baths
- 15 Medical baths
- 16 Gym
- 17 Outdoor gym
- 18 Private treatments
- 19 Hand therapy
- 20 Accessible toilet
- 21 Toilets (W, M)
- 22 Clean utility
- 23 Dirty utility
- 24 Equipment storage
- 25 Group exercise



1st upper floor
1:500

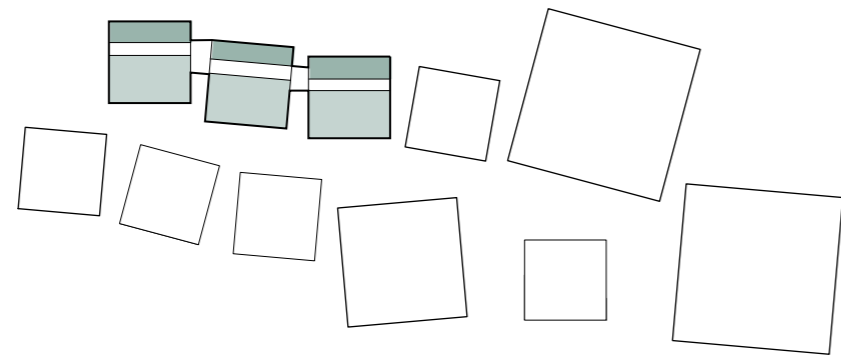


- 1 One-bed room
- 2 En-suite bathroom
- 3 Two-bed room
- 4 Shared en-suite bathroom
- 5 Technics

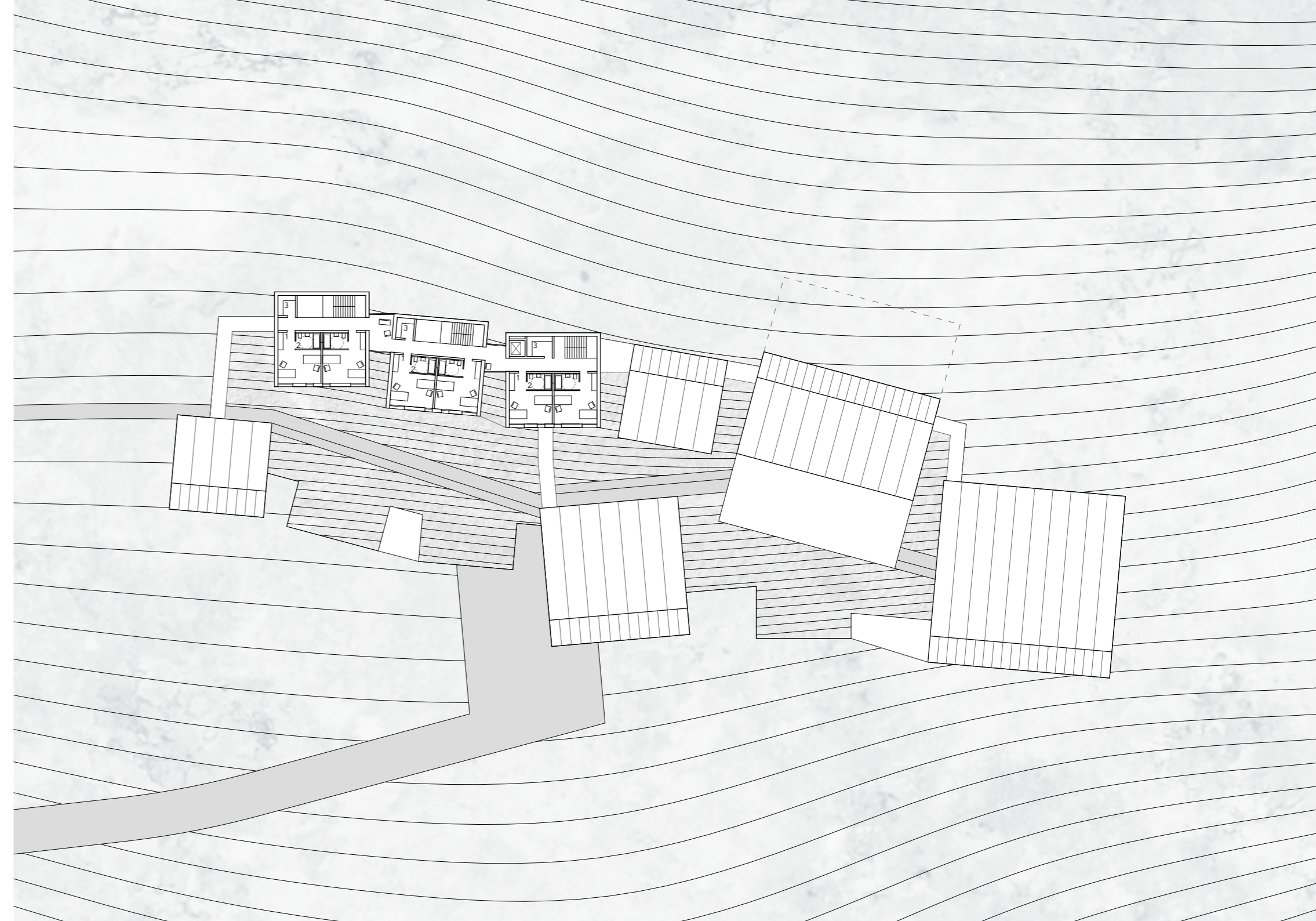


Second upper floor
1:500

0 2.5 12.5 m



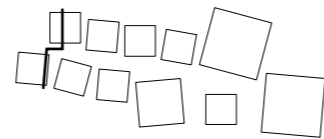
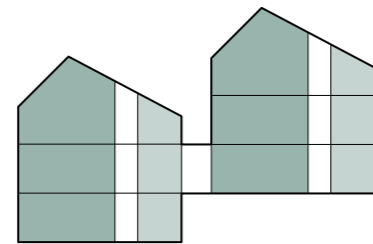
- 1 Two-bed room
- 2 Shared en-suite bathroom
- 3 Clean utility



Section 1

1:200

0 1 5 m



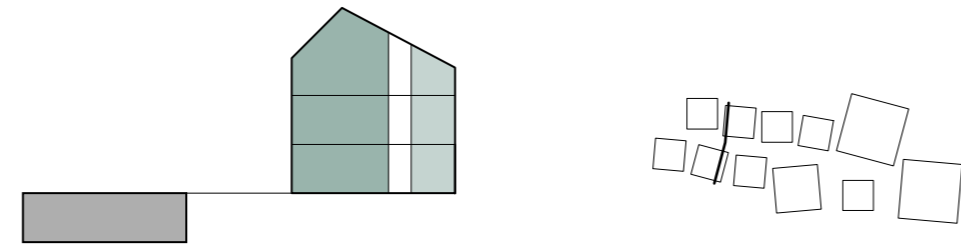
- 1 One-bed room
- 2 Two-bed room
- 3 En-suite bathroom (loggia)
- 4 En-suite bathroom (roof window)
- 5 Rest place
- 6 Technics



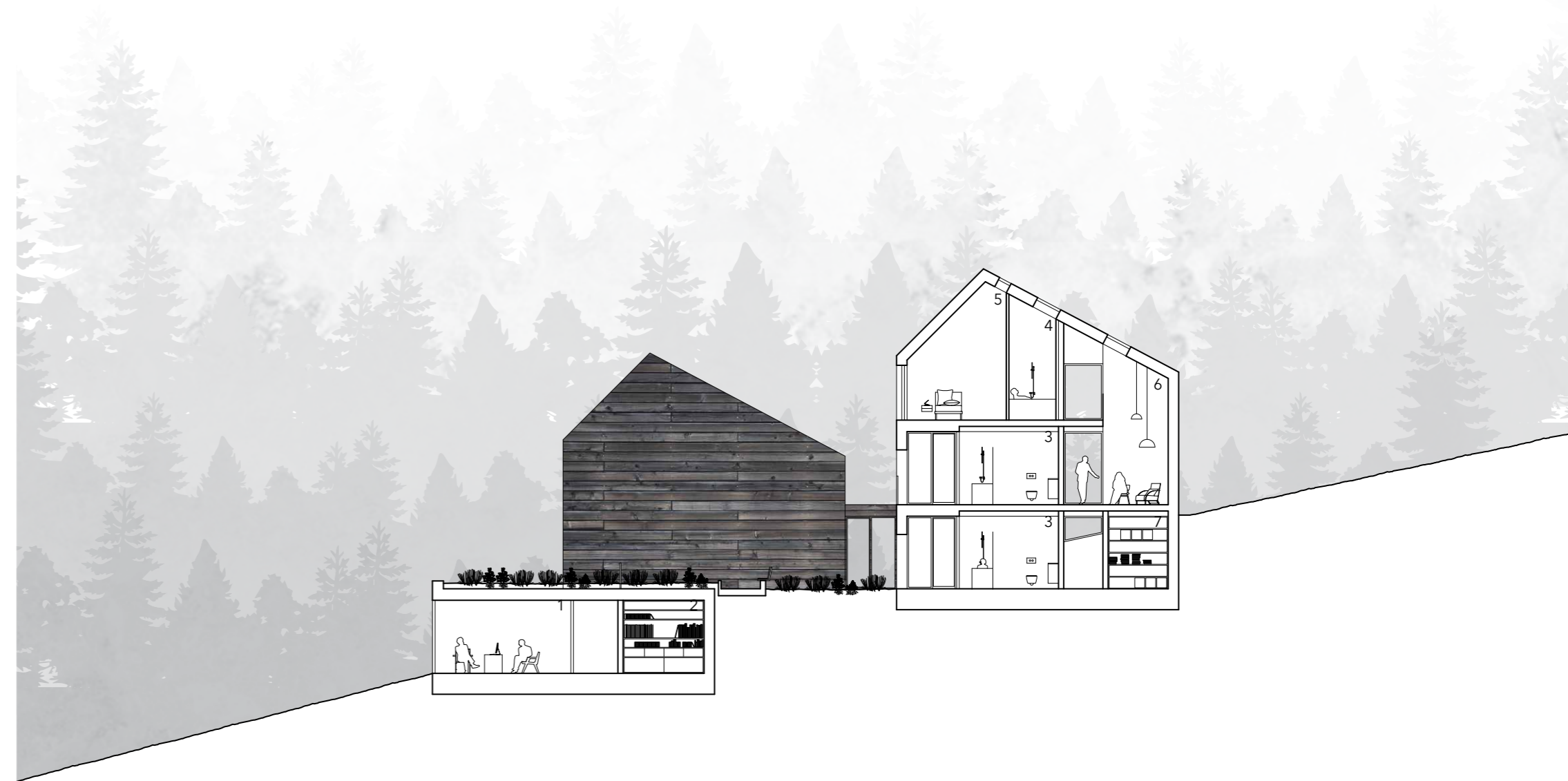
Section 2

1:200

0 1 5 m



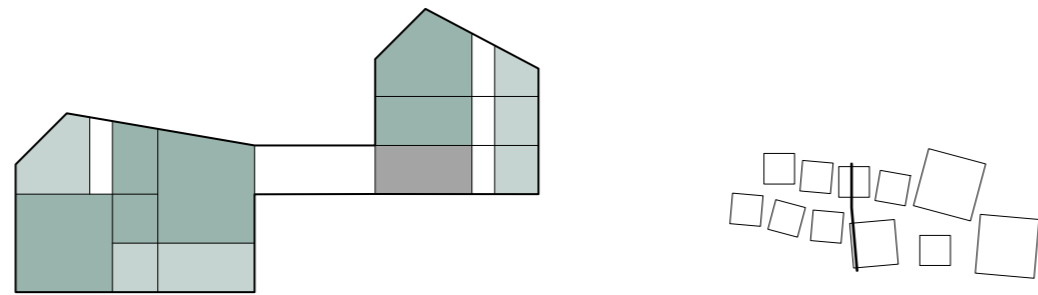
- 1 Consultation room
- 2 Archiv
- 3 En-suite bathroom (loggia)
- 4 En-suite bathroom (roof window)
- 5 Two-bed room
- 6 Rest place
- 7 Technics



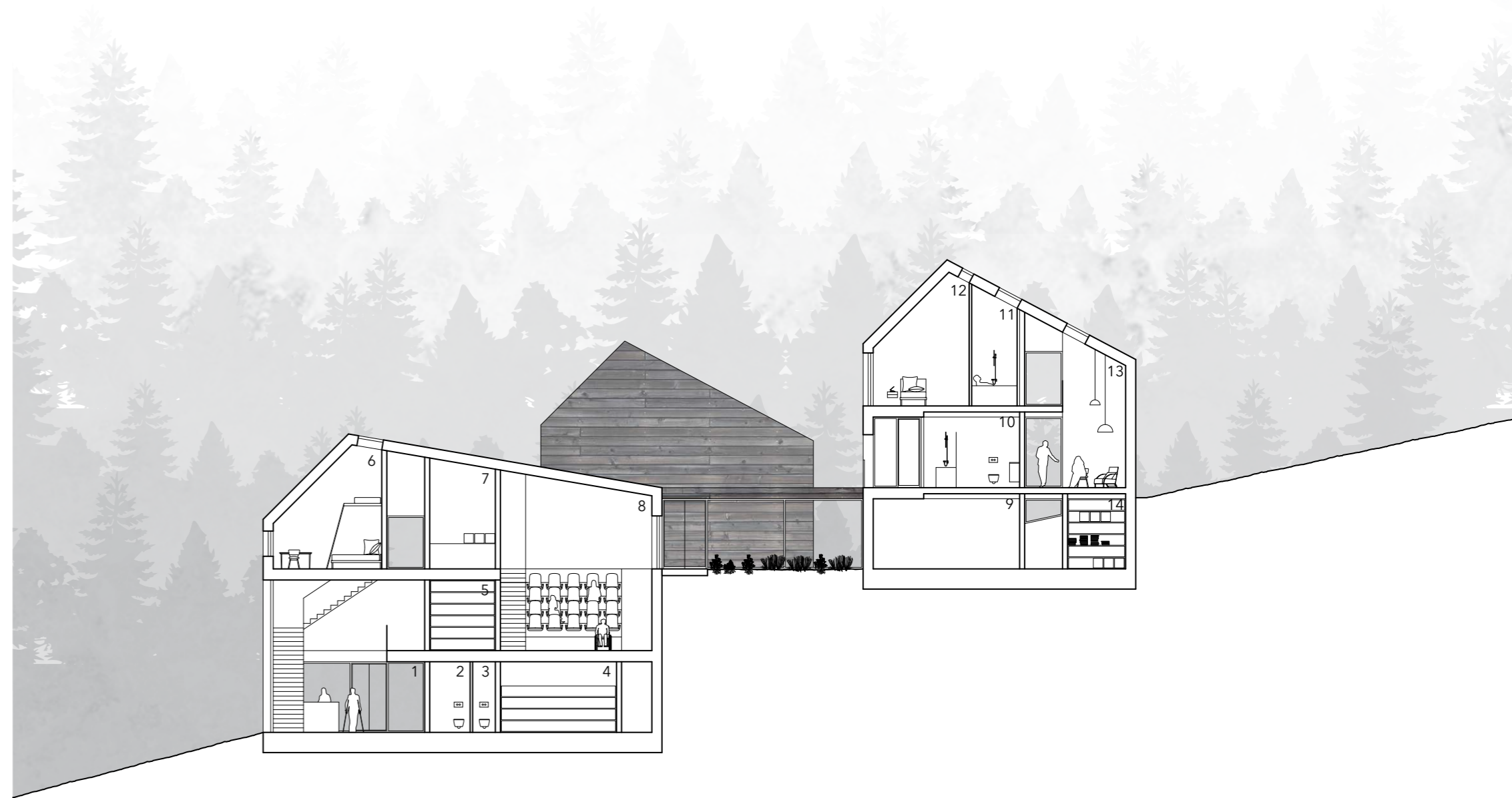
Section 3

1:200

0 1 5 m



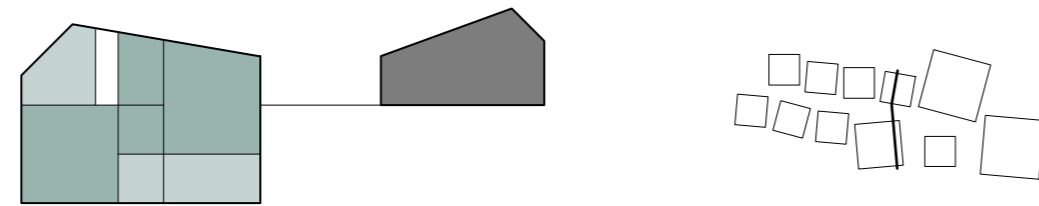
- 1 Lobby/Reception
- 2 Accessable toilet
- 3 Toilet
- 4 Archiv
- 5 Storage
- 6 Accomodation for staff
- 7 Garden equipment
- 8 Projcetion room
- 9 Dressing room
- 10 En-suite bathroom (loggia)
- 11 En-suite bathroom (roof window)
- 12 Two-bed room
- 13 Rest place
- 14 Technics



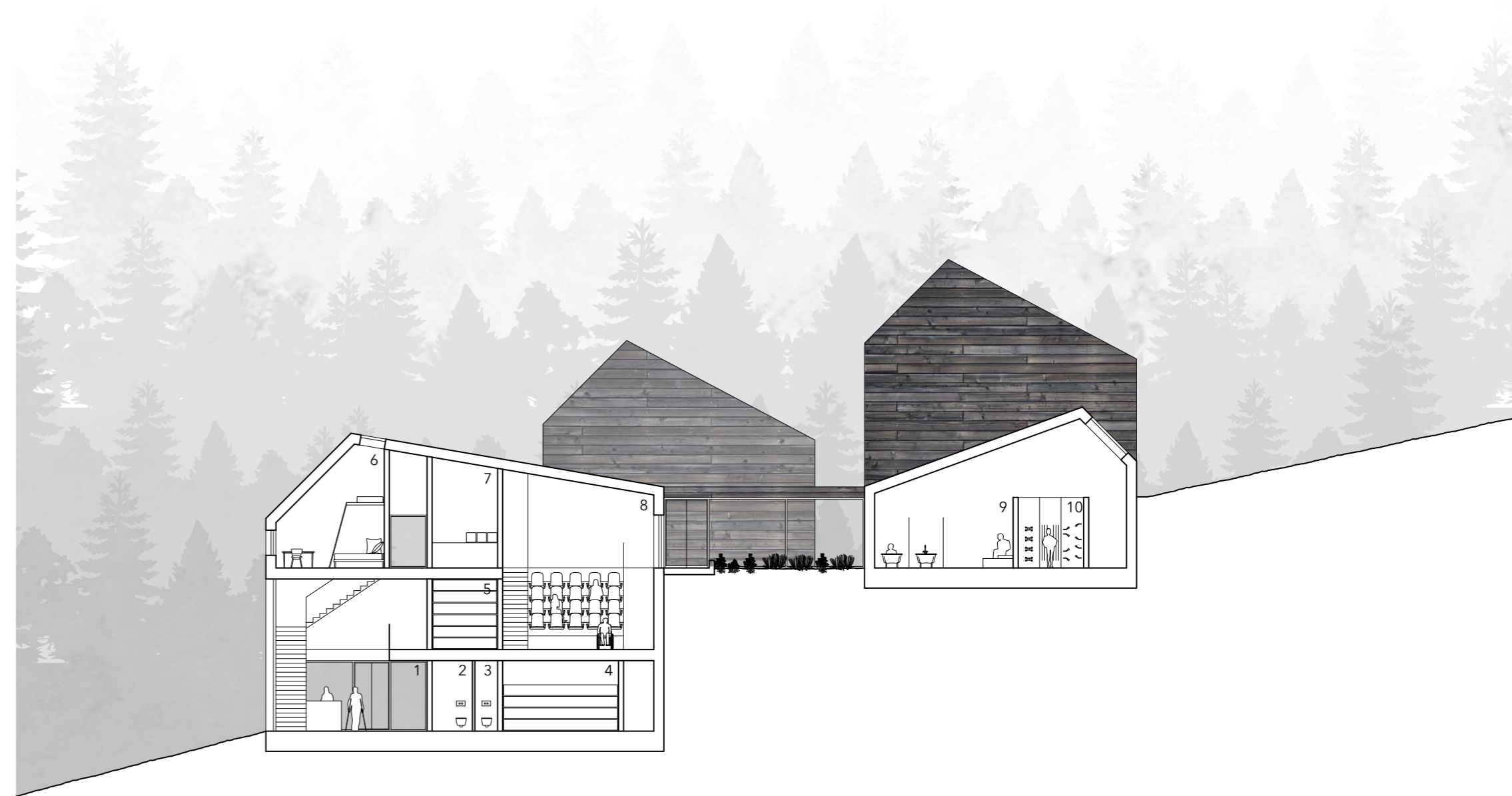
Section 4

1:200

0 1 5 m



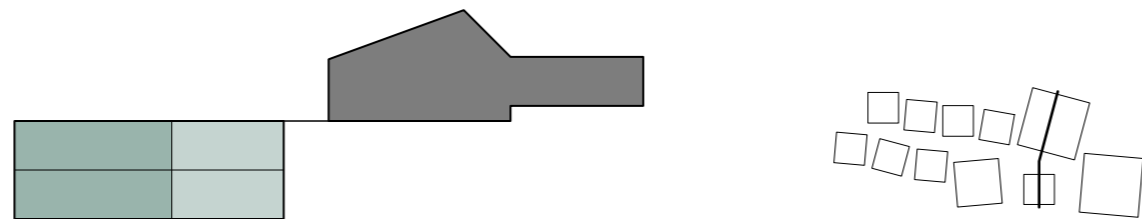
- 1 Lobby/Reception
- 2 Accessable toilet
- 3 Toilet
- 4 Archiv
- 5 Storage
- 6 Accomodation for staff
- 7 Garden equipment
- 8 Projcetion room
- 9 Baths
- 10 Walk-in massage showers



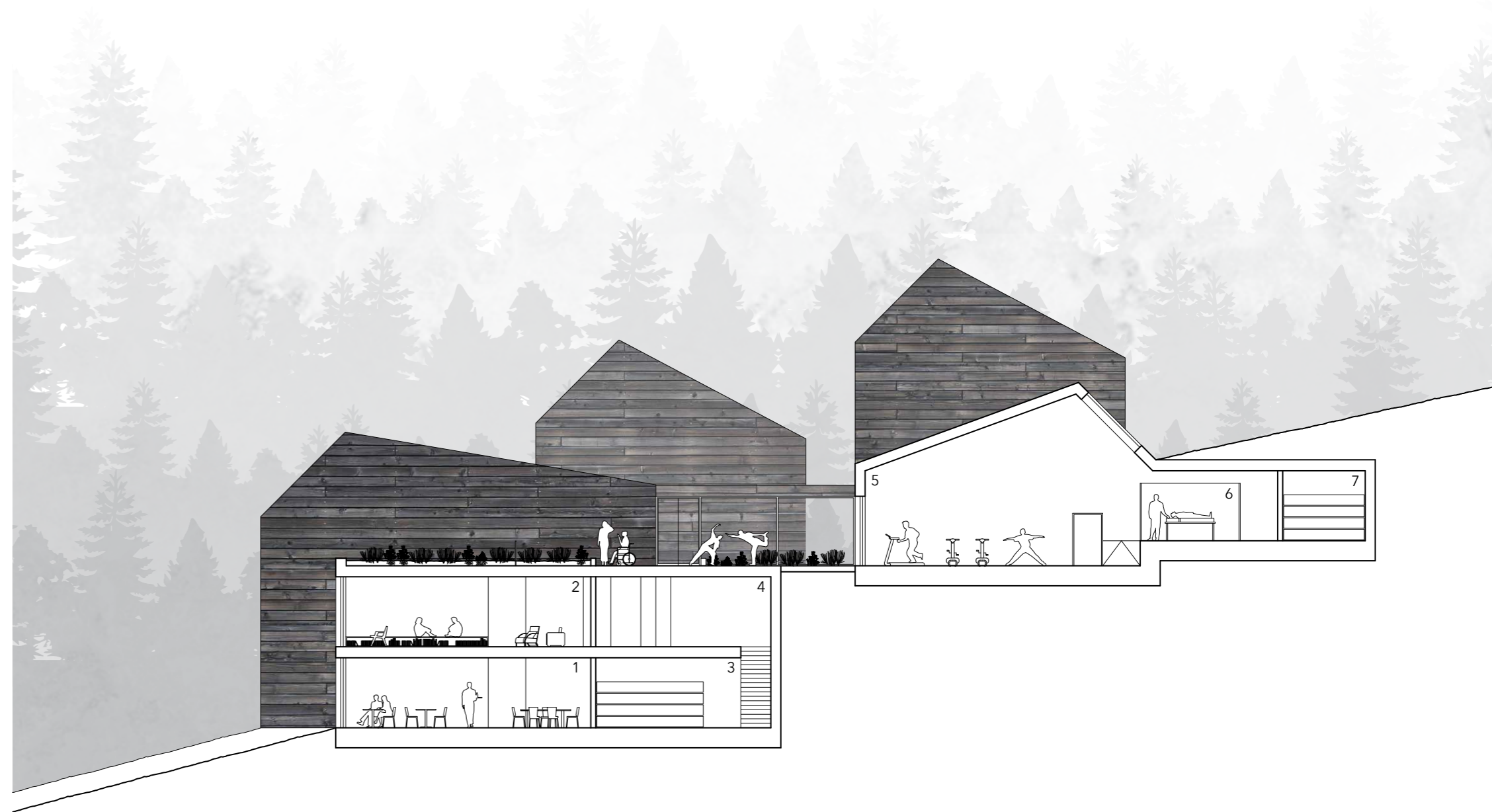
Section 5

1:200

0 1 5 m



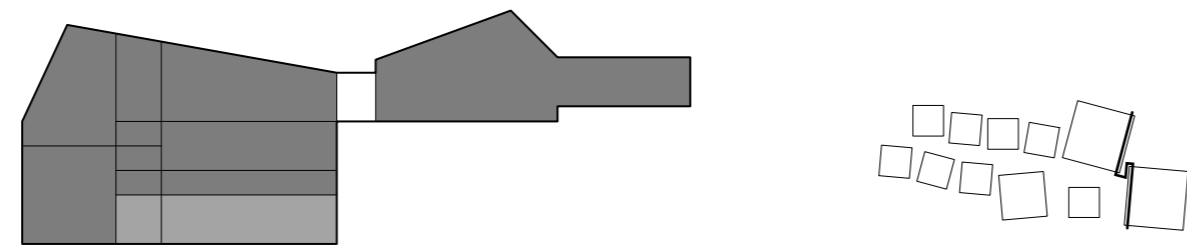
- 1 Restaurant
- 2 Library
- 3 Service storage
- 4 Equipment storage
- 5 Gym
- 6 Private units
- 7 Clean linien



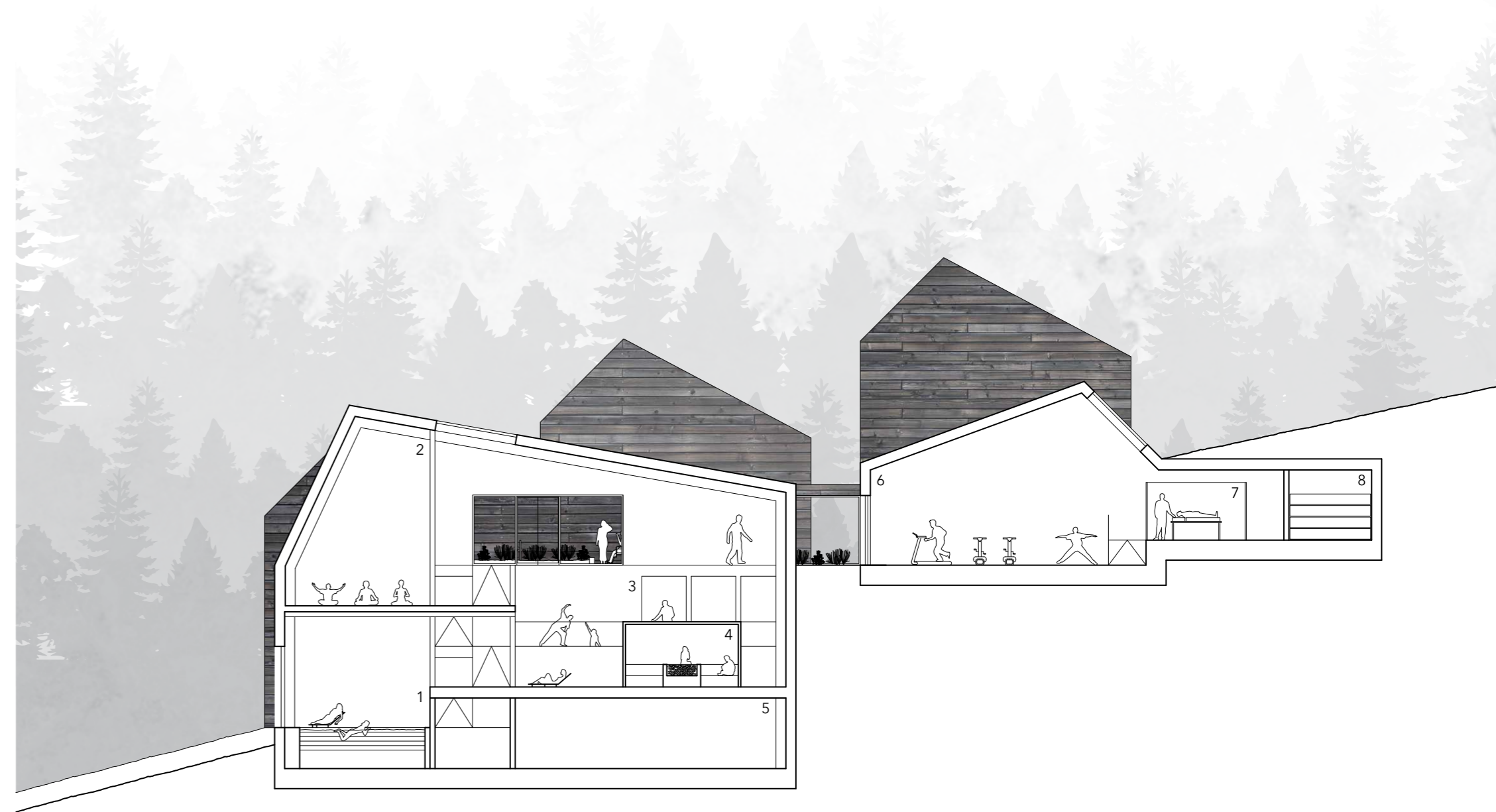
Section 6

1:200

0 1 5 m



- 1 Relaxation pool area
- 2 Group exercise room
- 3 Exercise pool area
- 4 Sauna
- 5 Technics
- 6 Gym
- 7 Private units
- 8 Clean linien



Views



View from the west

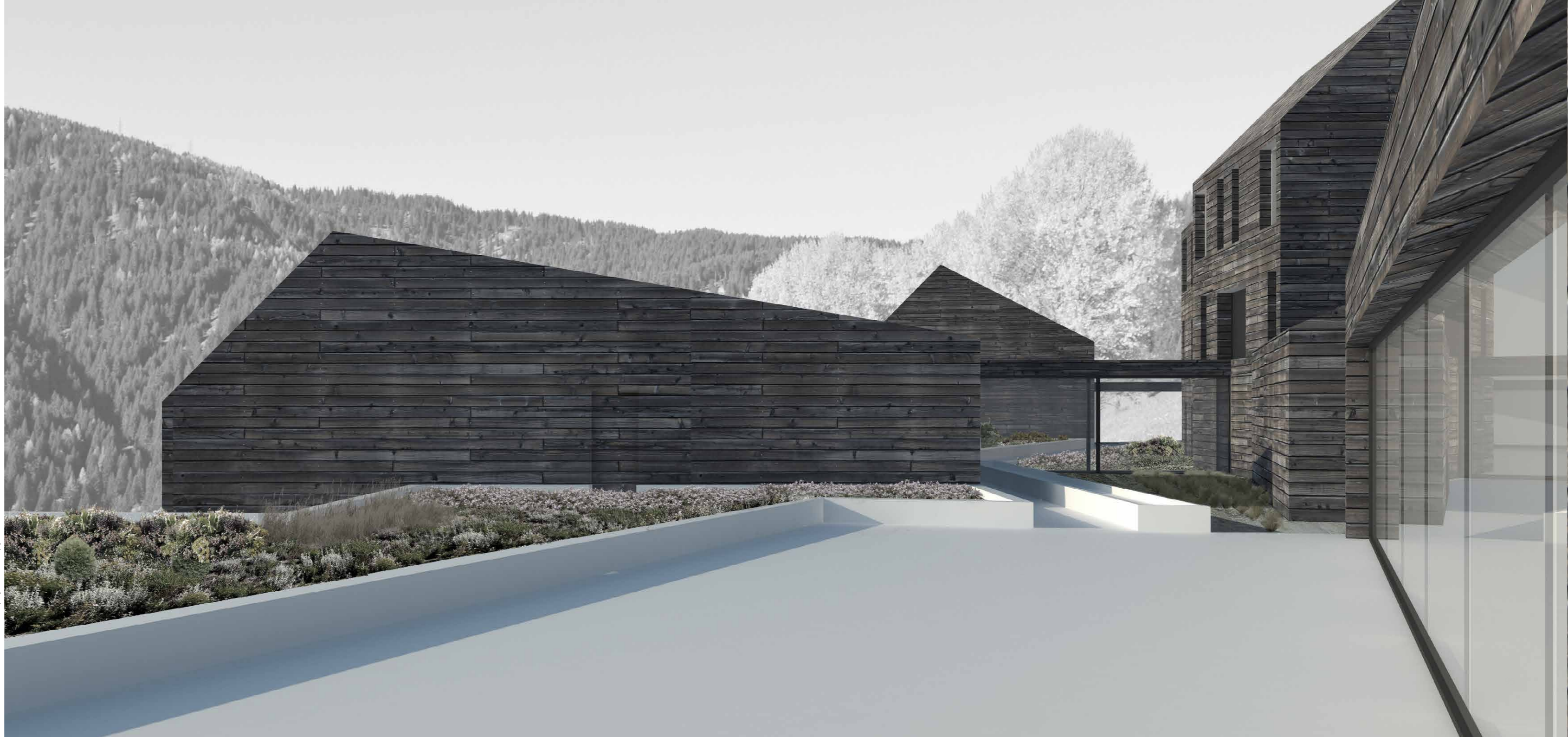


View from the south

View from the east



Outdoor terrace for physical therapy



View from the roof





Entrance/Lobby



Consultation rooms

Private bathroom



Relaxation pool

Details

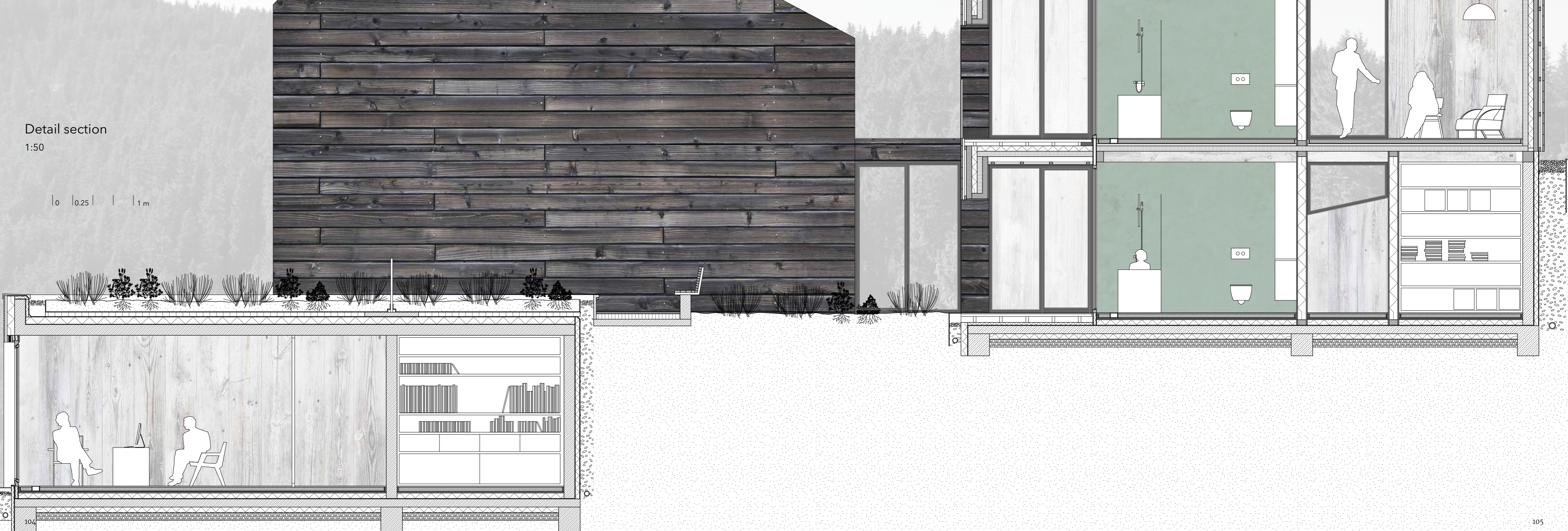
Fig. 37 Facade texture







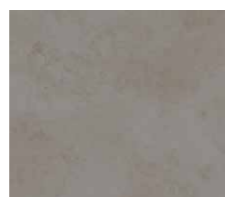
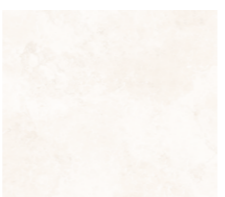
Detail section

1:50

0 | 0.25 | 1m



Material palette

	Walls		Floors	
Rooms		Plywood board with white coat		Linoleum in wood optics
		Naturfloor in stone optics, color 246 damastgrün		White glass mosaic tiles
Bathrooms, pool areas		Naturfloor in stone optics, color 276 mausgrau		Naturfloor in stone optics, color 252 antikweiss

Detail section

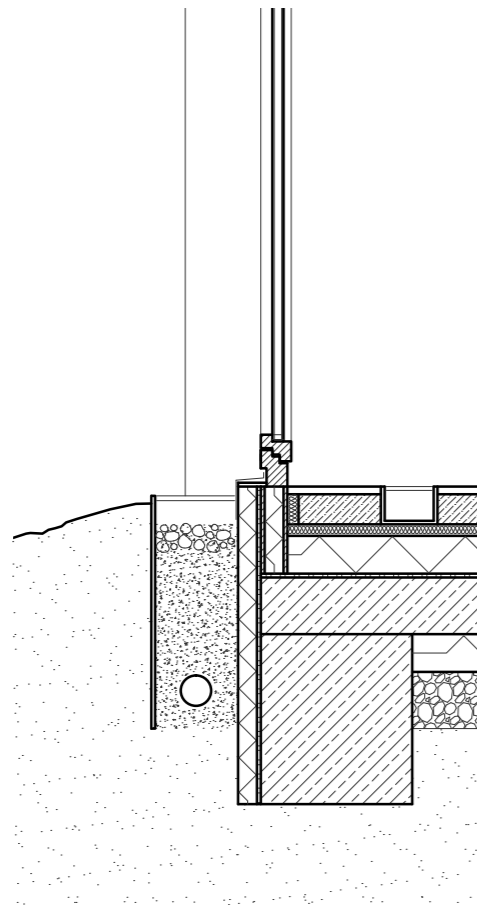
1:50

0 | 0.25 | 1 m



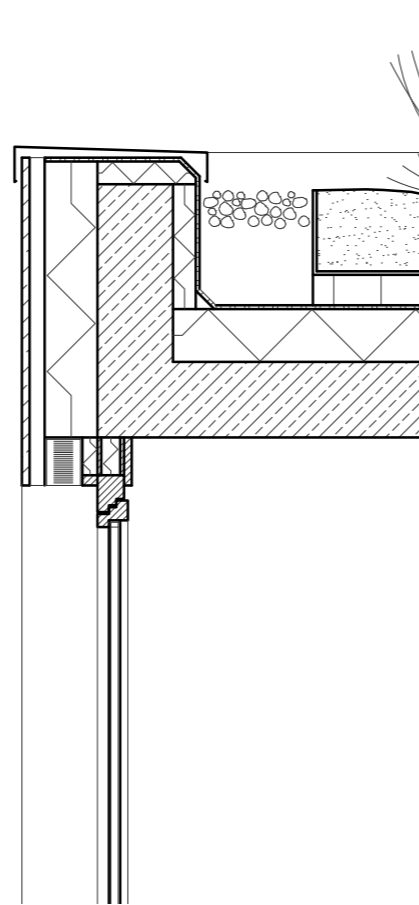
Ground floor

- Linoleum in wood optics 0.5 cm
- Flexible levelling layer 1.5 cm
- Screed (heating pipes) 8 cm
- Vapour barrier PE foil 0.02 cm
- Impact-sound isolation 3 cm
- Insulation 12 cm
- Bitumen waterproof foil 1 cm
- Concrete plate 15 cm
- Insulation 10 cm
- Packed gravel 15 cm



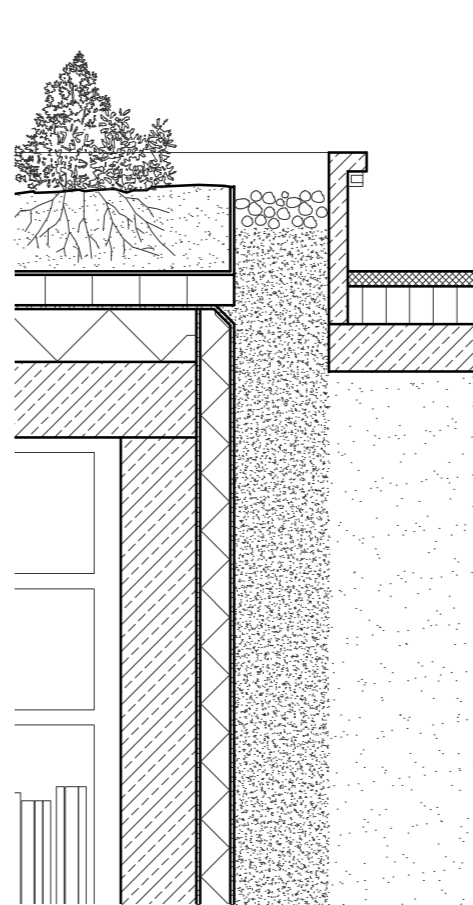
Green roof

- Plants
- Erosion control blanket 0.1 cm
- Growing medium 25 cm
- Irrigation system 0.1 cm
- Filter fabric 0.1 cm
- Drainage layer 10 cm
- Waterproof foil 1 cm
- Insulation 12 cm
- PE foil 0.02 cm
- Concrete slab 20 cm
- Plaster 0.5 cm



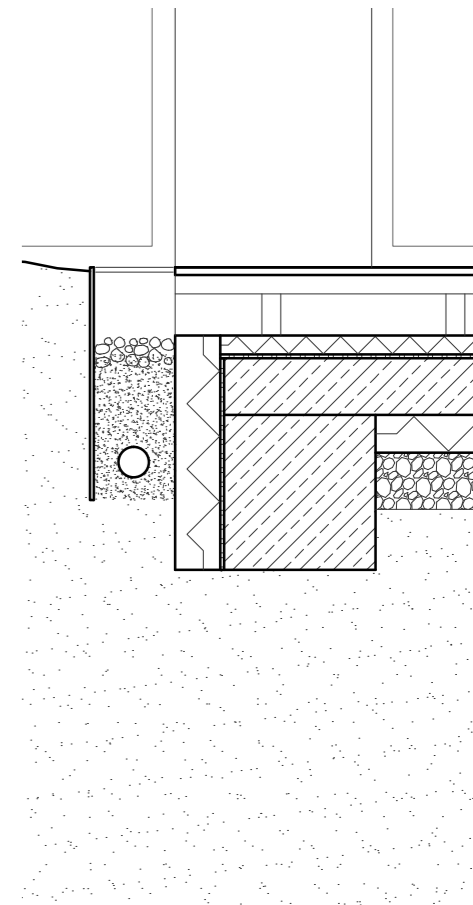
Ground wall

- Plaster 0.5 cm
- Concrete wall 20 cm
- Waterproof foil 1 cm
- Insulation 10 cm
- Drainage layer 2 cm



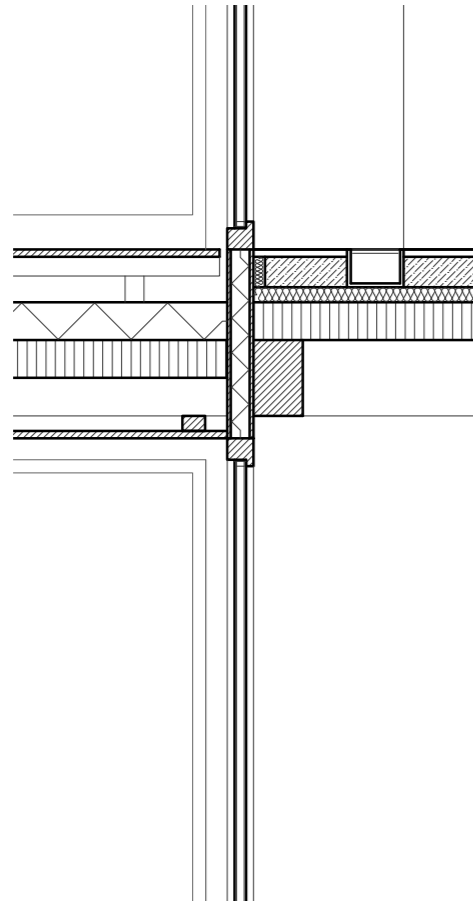
Ground floor

- Wood decking 2.5 cm
- Deck ledgers 5 cm
- Deck footings 15 cm
- Insulation 6 cm
- Bitumen waterproof foil 1 cm
- Concrete plate 15 cm
- Insulation 10 cm
- Packed gravel 15 cm



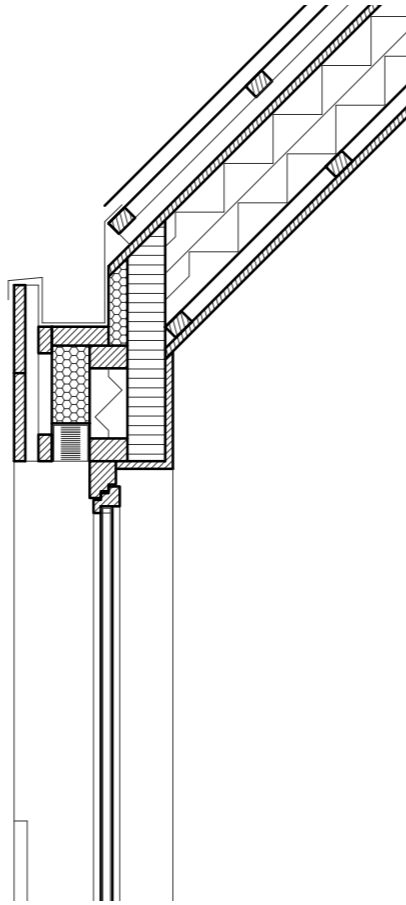
Interior floor

Linoleum in wood optics	2.5 cm
Flexible levelling layer	5 cm
Screed (heating pipes)	15 cm
Vapour barrier PE foil	6 cm
Impact-sound isolation	1 cm
Glued solid spruce slab	10 cm
Glued timber beam	20 cm



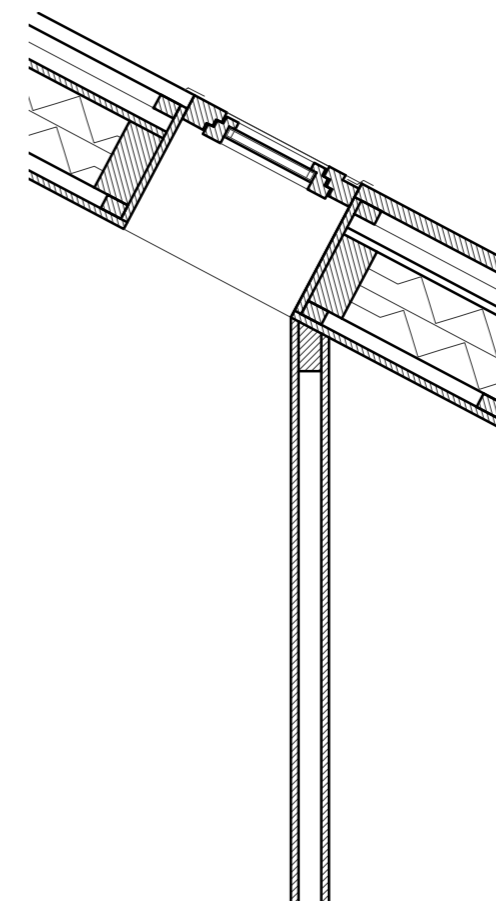
Roof layers

Photovoltaic tiles	2.5 cm
Battens	4 cm
Counterbattens	4 cm
Waterproof board	2 cm
Insulation between timber rafters	16 cm
Battens	4 cm
Larch board	1.5 cm



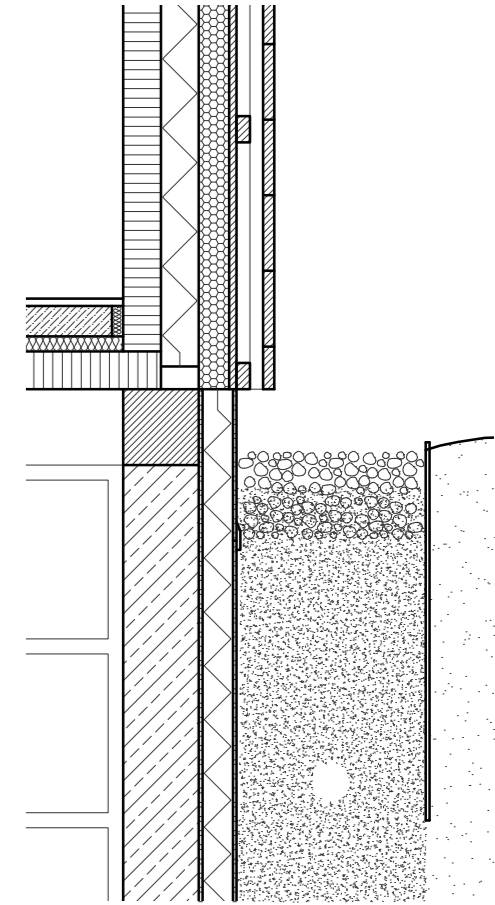
Interior wall layers

Plywood board	2 cm
Timber frame	6 cm
Insulation	6 cm
Plywood board	2 cm



Ventilated facade layers

Impregnated horizontal larch shingles	3 cm
Battens	4 cm
Counterbattens	4 cm
Waterproof board	1.5 cm
Insulation 1st layer	8 cm
Wood frame and insulation in between	10 cm



Green roof

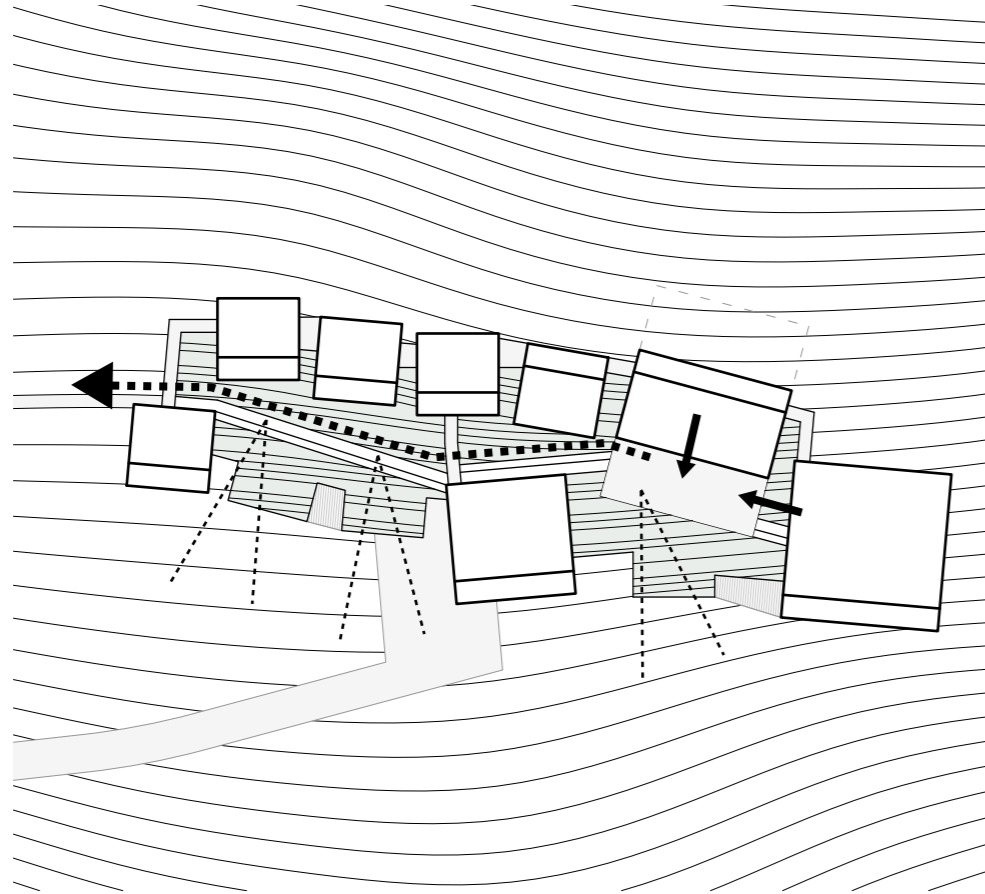
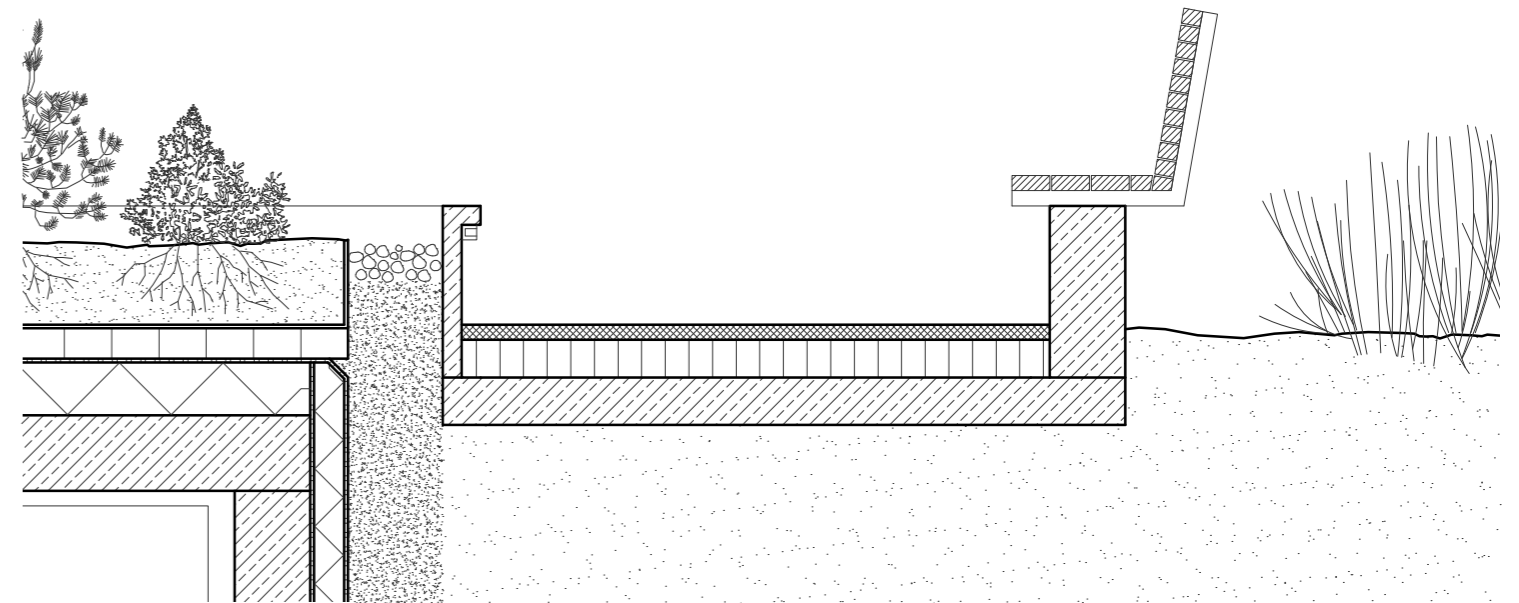


Fig. 38 Speech therapy with plant description



Fig. 39 Rest space for patients and staff

The garden on the roof acts like a transition area between the building and the surroundings. It was important to create flat outdoor space in direct contact with the center since the terrain is quite steep and not all patients would be able to walk on it. The flat roofs allow better views for the upper houses, but also create the needed open space for a terrace and garden. There is a main path in the garden that continues further outside on a hiking path. However for the patients still staying in, there are benches along the path on one side and a belt with healing plants on the other side. Therapists can practice speech therapy outside by asking the patients to describe them some of the plants and greenery around. Likewise the gym of the physiotherapy unit can be extended on the terrace during warmer months.



Group gardening activities are also organized as part of social program and integration. The plants on the roof are distributed in two main groups: first group are herbal plants that can have direct use in rehabilitation center for preparing various remedies for pain and stress relief, for medical and aromatherapy baths, as well as for massage oils; second group has decorative function and is mixed between blooming perennials and evergreen hedges for a continuously changing and adopting garden through seasonal changes during the year. Mixture of decorative plants are shown in figures 40 and 41 as reference examples from Alpine garden in Belvedere in Vienna. E.g. perennials: Winter heath *Erica carnea*, meadow-rue *Thalictrum aquilegifolium*; Hedges: common juniper *Juniperus communis*, spiny madwort *Alyssum spinosum roseum*

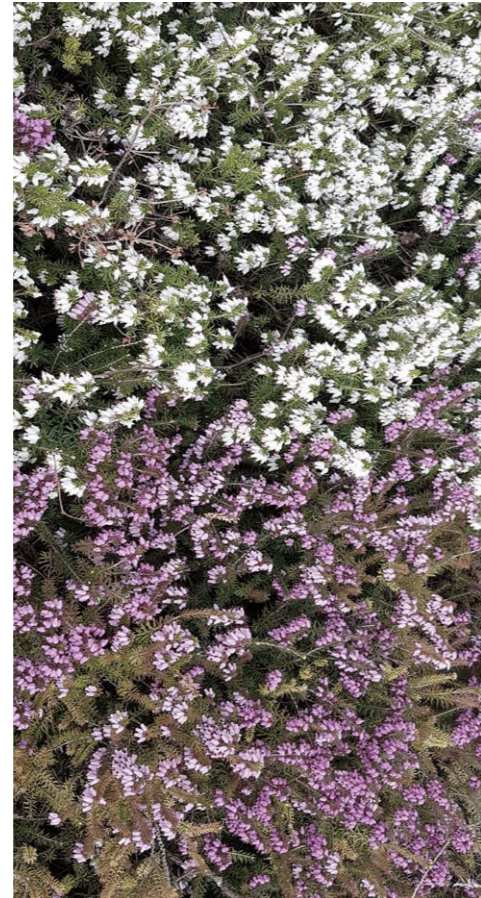


Fig. 40 Blending textures of perennials



Fig. 41 Blending textures of hedges

Rheumatism And Arthritis



Juniper Berries
Juniperus communis

Fig. 42



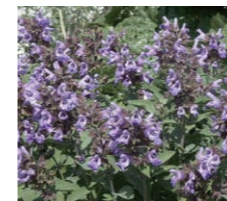
Chamomile
Matricaria recutita

Fig. 43



Thuja oil
Thuja occidentalis

Fig. 44



Sage
Salvia officinalis

Fig. 45

Nervine



Angelica root
Angelica archangelica

Fig. 46



Dwarf mountain pine
Pinus mugo

Fig. 47



Arnica
Arnica montana

Fig. 48



Thyme
Thymus vulgaris

Fig. 49

Muscle Relaxant



Cypress Oil
Cupressus sempervirens

Fig. 50



Cedarwood
Cedrus atlantica

Fig. 51



Corydalis
Corydalis spp

Fig. 52



Comfrey
Symphytum officinale

Fig. 53

Antibacterial



Spearmint
Mentha spicata

Fig. 54



Anise
Pimpinella anisum

Fig. 55



Yellow gentian
Gentiana lutea

Fig. 56



Alpine lovage
Ligusticum mutellina

Fig. 57

Sustainability

Following points are incorporated in the building:

Adopting to the terrain

The houses are placed and organized to reduce the excavation of the terrain to the minimum amounts. Furthermore, the ground removed for the upper houses can be re-used for construction of the flat green roof and terraces and for filling all the additional hollow spaces inbetween.

Solar energy

The position and the height of the sun changes during the year and as result solar panels should have different tilt angles for better efficiency. Therefore the units/houses have different roof angles to produce more energy during the year. There are three different angles that adopt to the position of the sun (Source: Solar Electricity Handbook):

68 ° angle for summer

44 ° angle for spring and autumn

20 ° angle for winter

Photovoltaic system is fully incorporated into the roof through special tiles that have two layers above photovoltaic cells: color louver film (allows cells to blend into the roof while exposing them to the sun above) and tempered glass (extremely durable and impact resistant). Figure 58 shows the tiles seen from street level, and figure 59 shows how the cells are exposed to the sun.¹

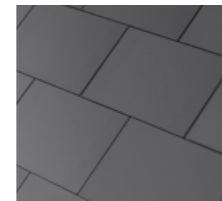


Fig. 58



Fig. 59

¹ www.tesla.com/solar

² M. Wittman, 2010, p. 155

³ www.sustainablebuild.co.uk/insulationmaterials

Rational use of water

There are plenty of water sources and natural springs in the surroundings, however rational use of water is more than necessary. This is achieved through a system where along the clean water tanks for the pools, there are also tanks for already used water from the pools. From the tanks with used water the system distributes and re-uses this water for flushing the toilets.

Natural ventilation

All the spaces where people are sleeping or spending time have user-controlled passive ventilation through windows and openings.

Indoor air quality

Achieved with use of low-VOC (volatile organic compound) and low-emitting materials for wall, floor and paint layers, together with outstanding

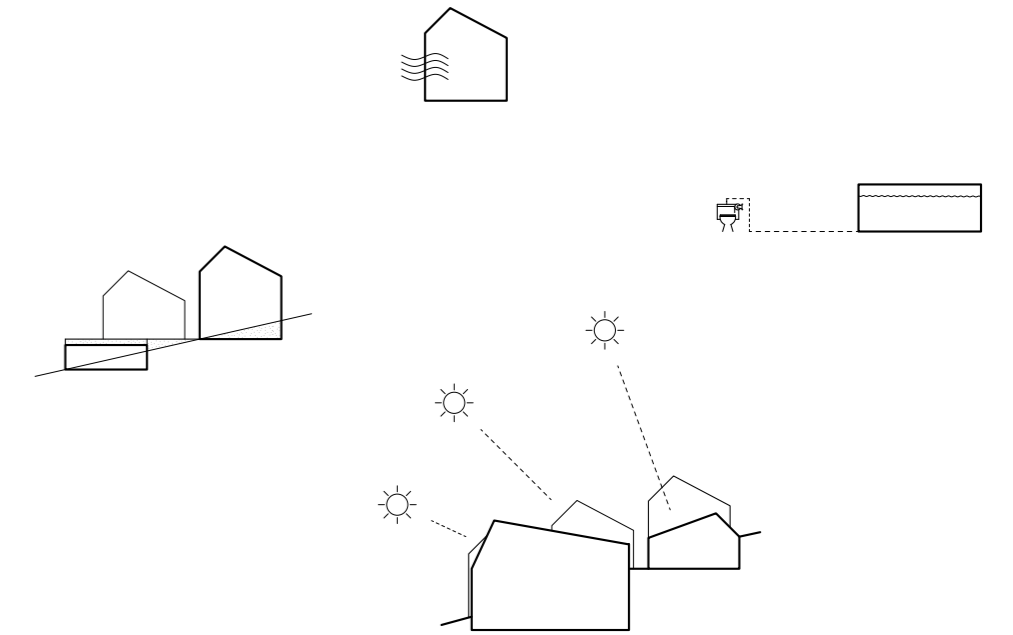
quality of the outside air getting in to the building through passive ventilation and also with using environment friendly cleaning agents.

Materials

To minimize the carbon footprint of the building wood is chosen as main construction material and concrete is used just for construction parts that have direct contact with soil, because of better durability in this area. For insulation ecological wood fibre is used, which is made from wood chips that have been compressed into boards or batts using water or natural resins as a binder.³

Use of daylight

Apart from technical areas and storages, most of the spaces have windows or skylights to reduce the use of electrical energy.



Appendix

Reaction Effects

Table of Reaction Effects of Water by Baths, Douches, etc., according to Temperature ¹
Duration: 15 - 20 minutes

Temperature	Hot 36 - 42 °C	Neutral 32 - 35 °C	Cold 18 - 26 °C
Skin	Heats, softens, dilates vessels, increases perspiration	Warms	Checks perspiration, cools, reduces sensibility
Nervous system	Excites, relieves pain	Soothes, sedative	Stimulates at first, soon depresses.
Muscular system	Diminishes irritability, relieves fatigue effects, weakens contractions.	Relaxes	Increases tone, strengthens contractions
Heart and pulse	Quickens.	Slows, strengthens	Quickens, then slows
Blood vessels	Dilates superficial.	No change	Contracts
Blood pressure	Lowers.	Lowers	Raises
Respiration	Quickens but not deepens	No change	Quickens and deepens, then slows.
Temperature	First lowers, but soon raises.	Raises slightly	Lowers.
Metabolism	Increases in proportion to heat, chiefly in proteids, also fats and sugars.	No change	Increases rate of fats and sugars, not proteids.

Table of Reaction Effects of Air according to Temperature ¹
Duration: 15 - 20 minutes

Temperature	Hot up to 100 °C	Neutral 29 -32 °C	Cold below 10 °C
Skin	Increases perspiration, excretion	Keeps warm	Diminishes perspiration
Nervous system	Stimulates, relieves pain	Sedative	Stimulates
Muscular system	Relaxes, weakens	-	Tones, strengthens
Heart and pulse	Quickens, then slows	No change	Slows
Blood vessels	Dilates superficial, decongests deep	-	Contracts superficial, congests deep
Blood pressure	First raised, then lowered	-	Raised
Respiration	Quickened, evaporation from lungs increased	-	Quickened
Temperature	Raised slightly	-	Lowered
Metabolism	Increased in proportion to heat	-	Increased greatly

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