Belgrade, Serbia | 2026

PORTUGAL | Instituto Superior Técnico | ULisboa

Referent teacher : Manuel de Arriaga Brito Correia Guedes

Naut Engelen

Elena Asselin de Williencourt

COEXISTENCE

Where athletes and nature meet

URBAN CONTEXT

Building in Belgrade

BUILDING IN BELGRADE

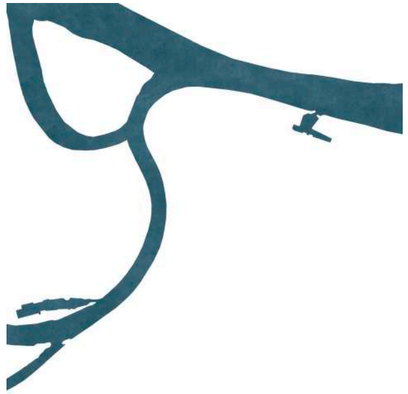
Belgrade, Serbia's capital of 1.7 million people, is one of Europe's fastest-growing urban centers. Known for its vibrant energy and iconic riverfront culture, the city also faces modern challenges.

Green space currently covers just 12% of the urban area, but ambitious plans aim to increase this to 22% to mitigate the urban heat island effect and adapt to climate change. At the same time, there is a growing need for **improved pedestrian** and **cycling infrastructure** to support a more sustainable future. Belgrade now stands at a turning point, reshaping its identity by **transforming its riverfronts** from an industrial past into a more natural environment.

Our project sits at the heart of this urban renewal, occupying a strategic location along the Sava riverbank where a former cement factory once dominated the landscape.

By carefully analyzing Belgrade's **built environment**, **the Sava river**, as well as **current mobility** and **green spaces**, the project aims to harmoniously blend into the existing landscape, while also exploring its potential as **a model for future riverfront development**.

SCALE 1:25000



SAVA RIVER

URBAN FABRIC

MOBILITY

GREEN AREAS

THE APPROACH

The masterplan envisions **a cohesive campus layout** consisting of four buildings, integrated within a comprehensive waterfront strategy and the renovation of the existing Academic Yachting Club. At the heart of the plan lies a circular building, serving as the social and residential anchor of the campus.

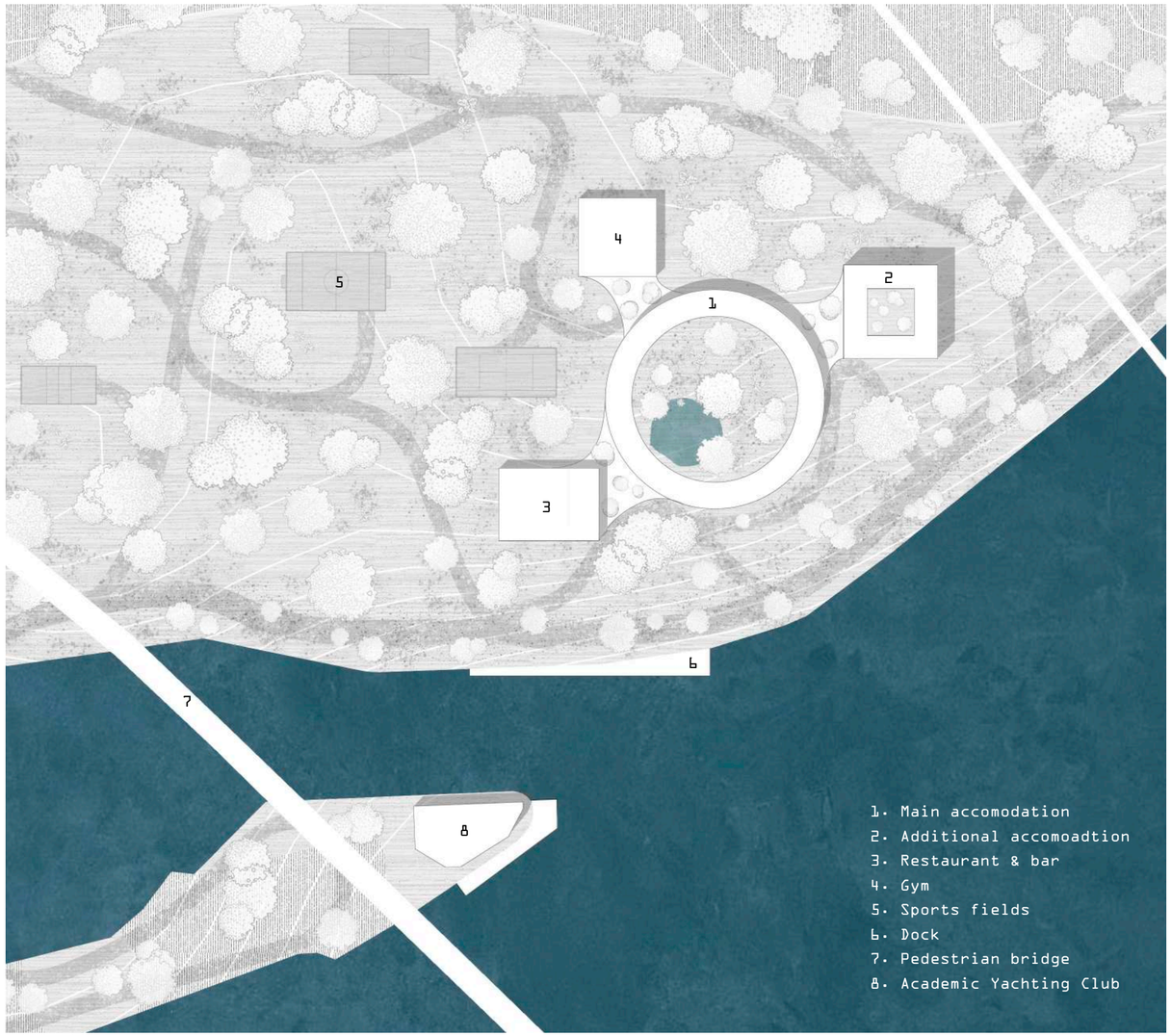
This central volume houses a hybrid accommodation typology, specifically designed to cater to **a diverse audience**, including individual athletes, small teams, and recreational sports enthusiasts. The design emphasizes collective experiences through shared spaces, while each room offers a serene and unobstructed view of the surrounding green area.

Within the accommodation, more than 10% of the rooms are reserved for athletes with disabilities. Thanks to our modular design, this capacity can easily be expanded or reduced as needed.To the north and southeast, the campus extends to include a gym with additional sports facilities and a restaurant with a bar, respectively.

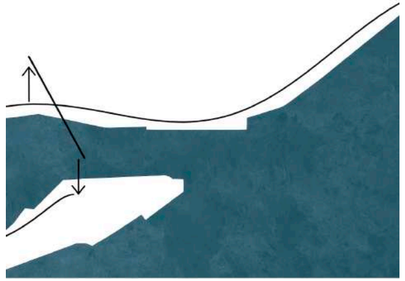
The eastern extension is dedicated to larger sports associations and organizations. This building is fully self-sufficient, enabling it to be rented as a whole for intensive training camps or conferences. Through this programmatic approach, our design responds to **a wide spectrum of needs**, serving various types of users.

The project prioritizes **nature and its ecosystems**, aiming to integrate athletes into the local environment. By limiting building heights to two stories, nature can flow freely around, within, and between the structures. Greenery rises above the buildings, creating a small utopia where athletes live, train, and coexist with nature.

Finally, our project aspires to have an impactbeyond the confines of Site 46. Through the applied strategies, it aims to serve as **a source of inspiration for sustainable development** along Belgrade's waterfront, demonstrating how architecture can harmonize with its ecological and urban context.

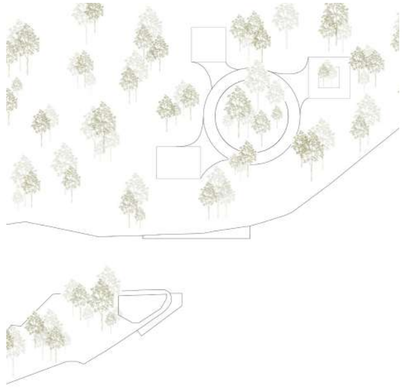


SCALE 1:1500



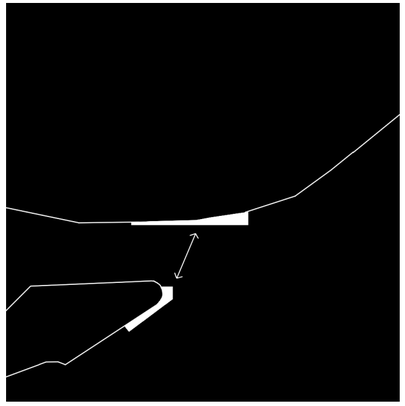
WATERFRONT STRATEGY

A comprehensive strategy is developed for the entire waterfront, improving mobility for **pedestrians** and **cyclists** while ensuring that nature and local ecosystems are respected and preserved.



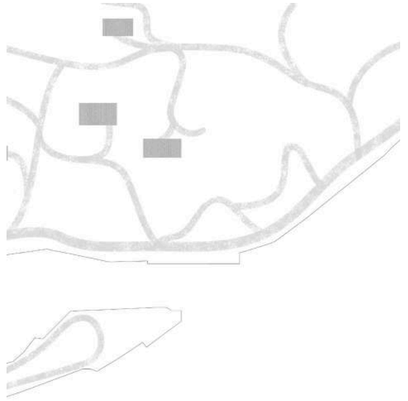
NATURE IN AND AROUND

Nature is allowed to grow **around**, **within**, and **between** the design. As a result, nature rises above the built environment, enabling athletes to be part of the local ecosystem.



VISUAL CONNECTION

The two south-oriented docks not only strengthen the athletes' connection to the water, but also create a **visual link** between the Academic Yachting Club and the new development.

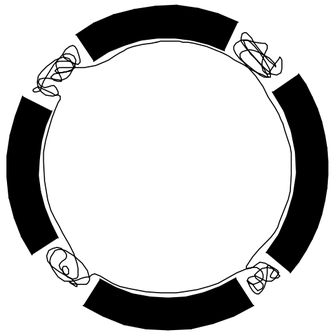


SPORTS FIELDS

The sports fields are integrated through precise, small-scale interventions that preserve the continuity of the forest and its habitat. It offers athletes a **vibrant** training and **living environment**.

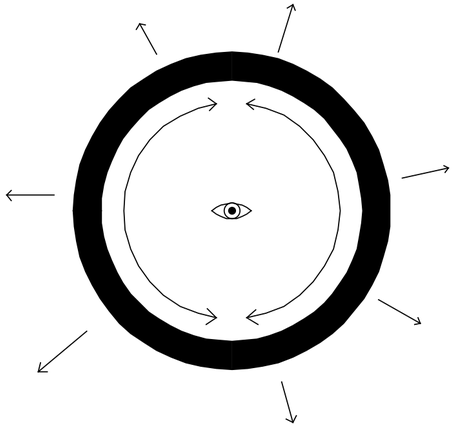
MAIN ACCOMODATION

The social core



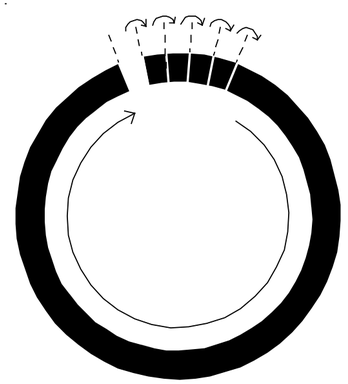
COLLECTIVE CORRIDOR

A collective, glazed corridor on the inside of the circle functions as a place where athletes meet and connect with each other. Regularly, the corridor extends in collective spaces like shared kitchens and lounges, encouraging **community building** among the athletes.



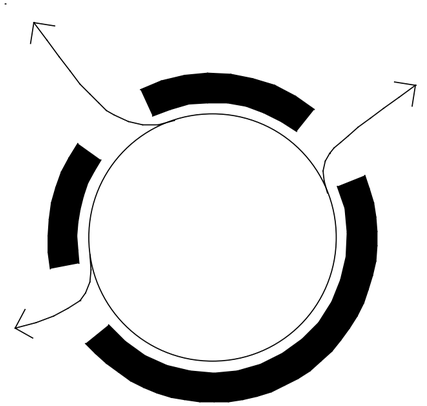
VISUAL RELATIONSHIP

The design focuses on the **positive impact** of the **relationship between athletes and nature**. The circular form results in a layout in which every room has a view of the surrounding greenery, while the collective corridor, offers a 360° view of the local ecosystem within the circle.



MODULAR UNITS

The design of modular room units not only reduces construction costs, but also allows the building to be **easily adapted** to future user needs, making it more future-proof. Rooms can be transformed into collective spaces and vice versa, enabling the building to **evolve** and **grow** alongside its users.

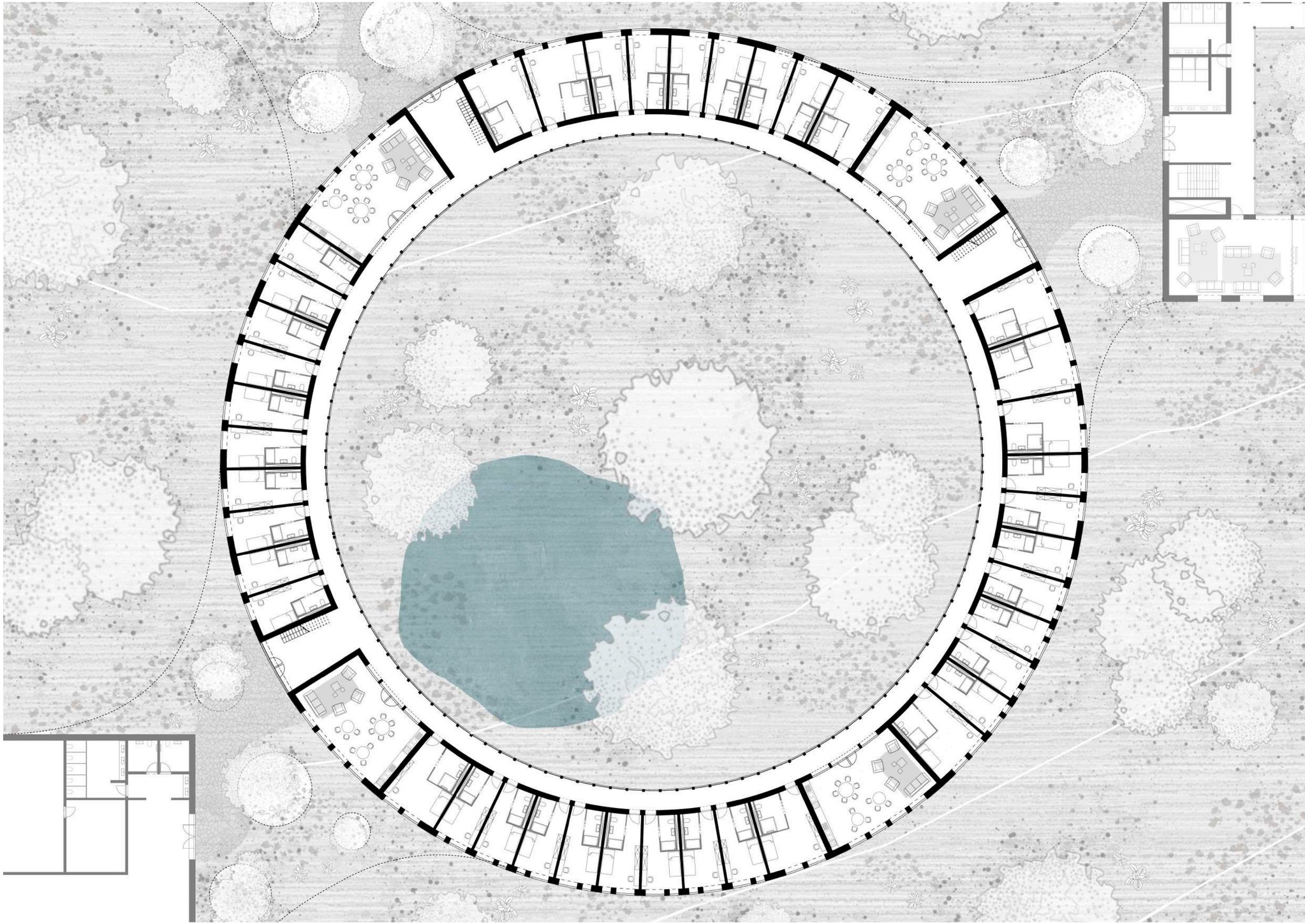


CONNECTION

The circular form, with its strong geometry, literally becomes the **heart of the site**. It not only serves as a place where athletes connect with eachother, but also acts as a central element that links the other programmatic facilities, such as the gym, restaurant, and separate accommodation.

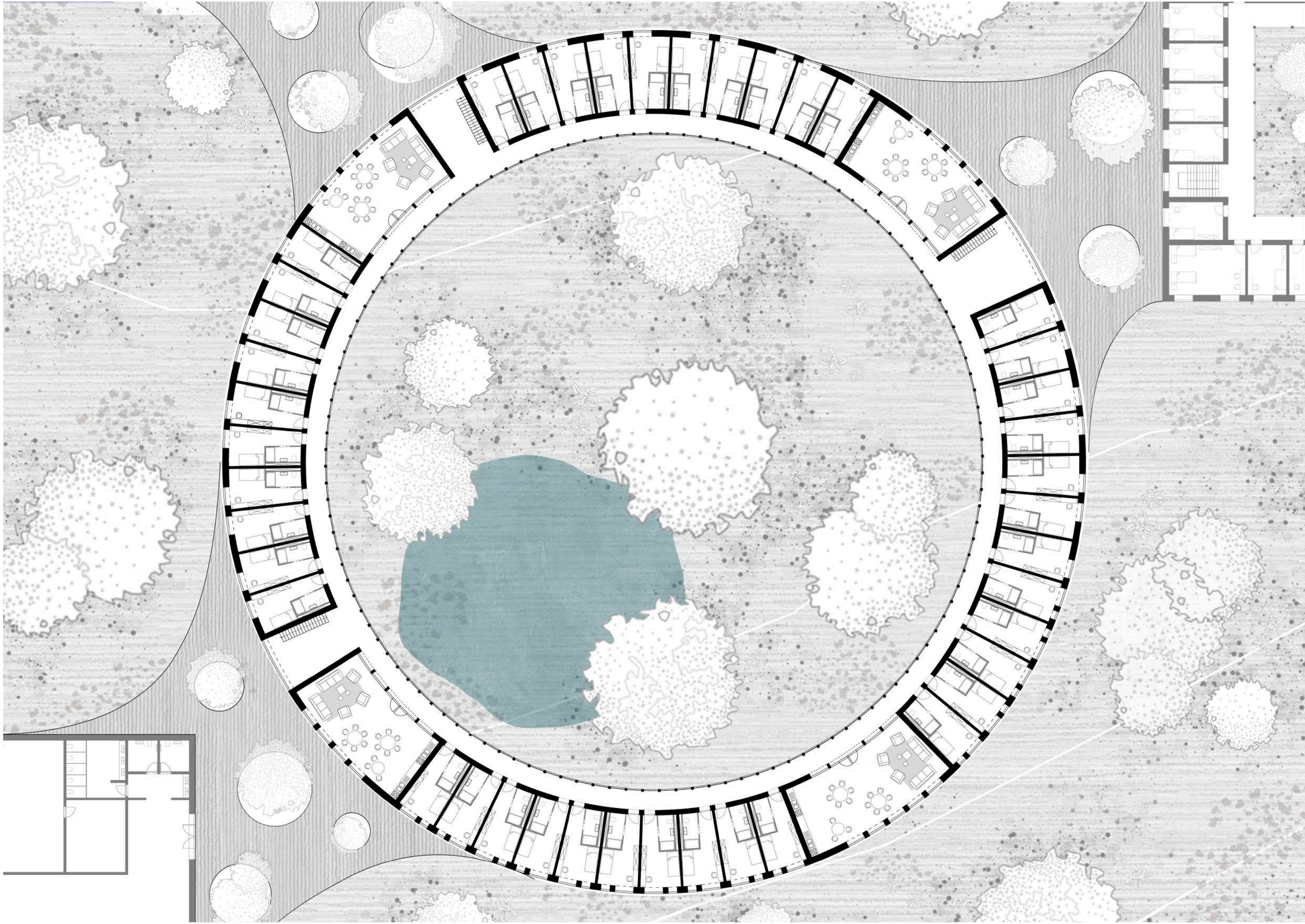
PLAN | Ground floor

SCALE 1:250

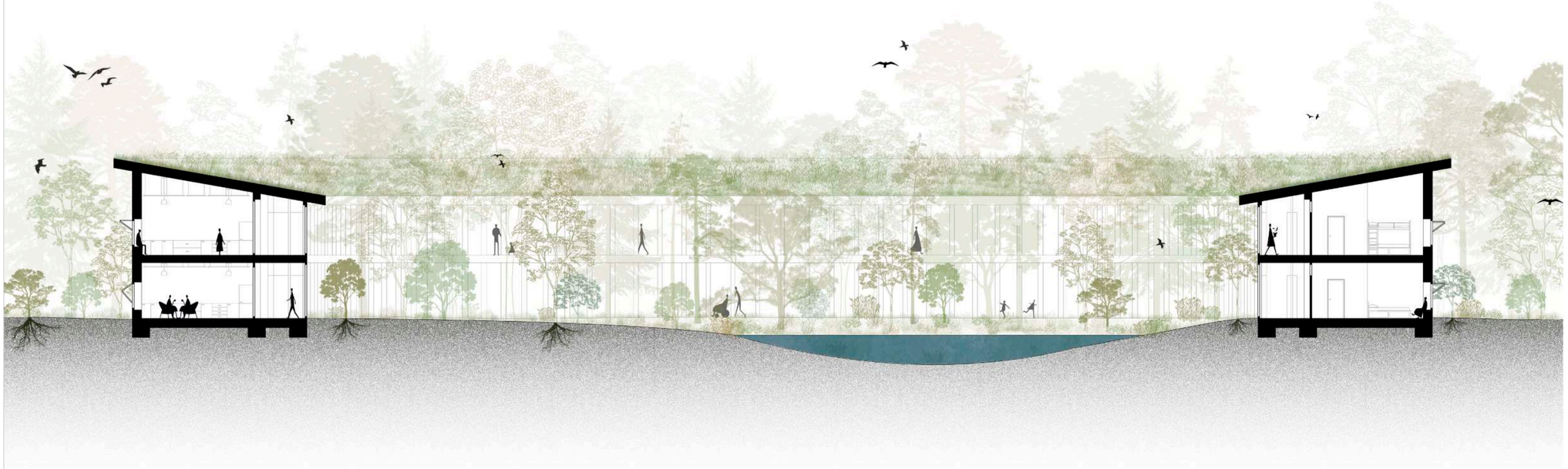


PLAN | First floor

SCALE 1:250



SECTION | Main accomodation



SCALE 1:250

BUFFER ZONE

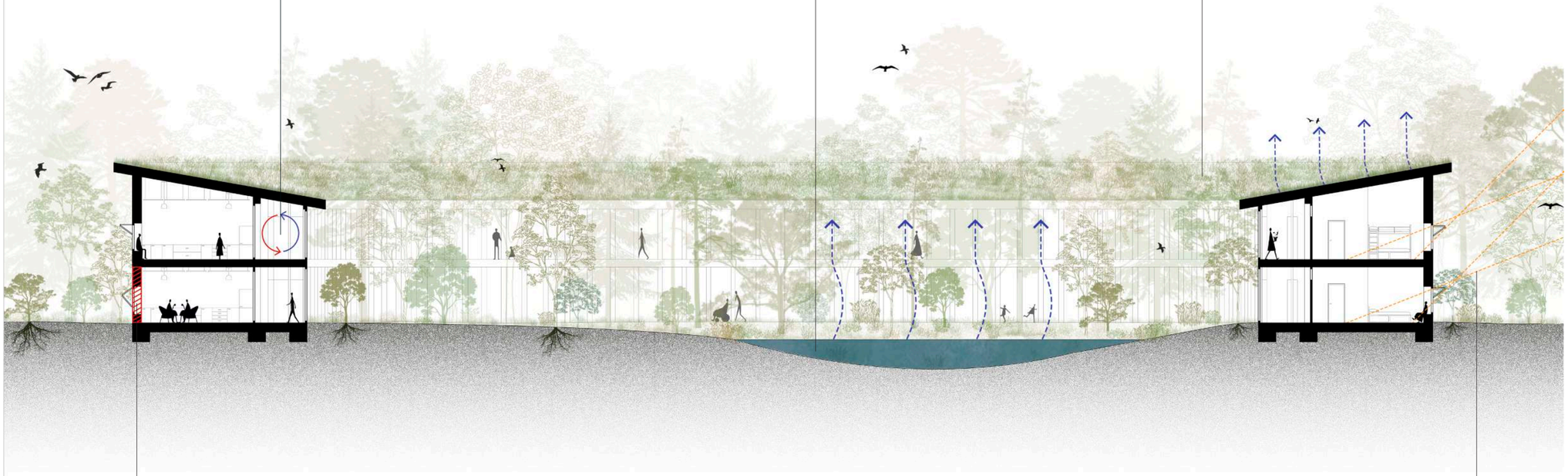
An unheated corridor acts as a climatic transition space to significantly minimize heat loss in winter and prevent overheating in summer.

WATER BASIN

Provides passive natural cooling during summer through evaporation.

GREEN ROOF

ISOVER Biodiverse Green Roof enhances thermal inertia and provides passive cooling through evapotranspiration.



THERMAL MASS

The use of locally sourced hempcrete results in greater thermal stability, outperforming conventional insulation materials.

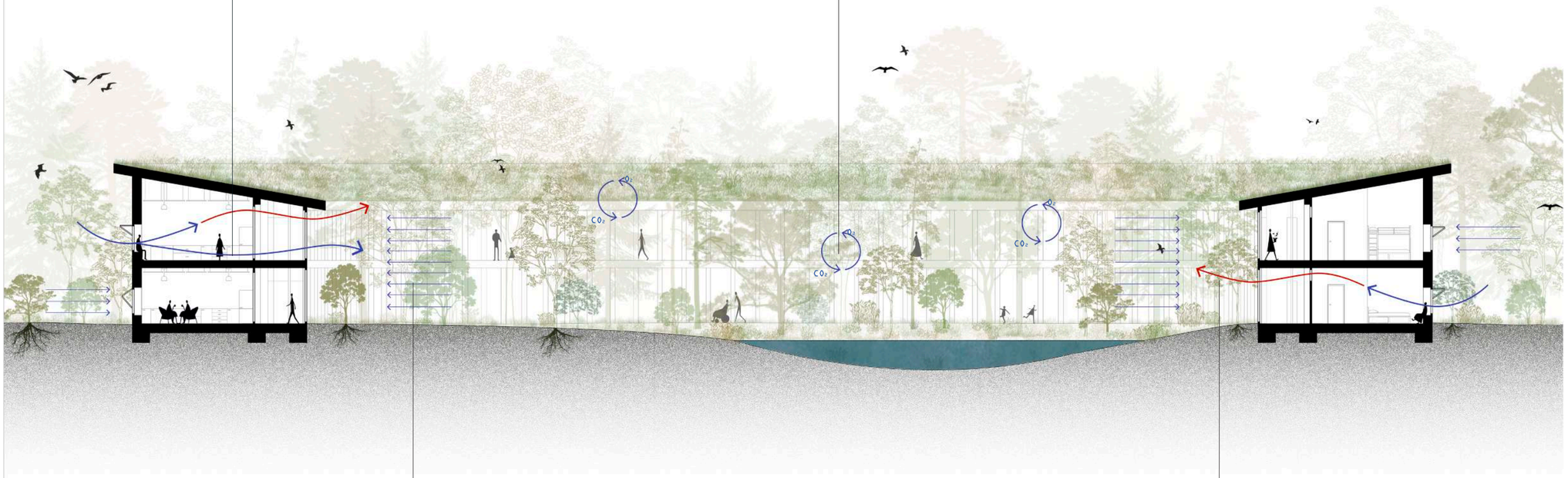
SUN SHADING

Optimizes solar gains by balancing winter warmth and summer shading. In addition, the window area decreases from the south to the north façade to achieve optimal energy efficiency.

SCALE 1:250

NATURAL VENTILATION
Through cross-ventilation.

PHOTOSYNTHESIS
Enhancing the local atmosphere by producing O_2 while simultaneously reducing CO_2 levels.



FRESH OXYGEN
The inside forest provides the athletes with fresh, oxygen-rich air.

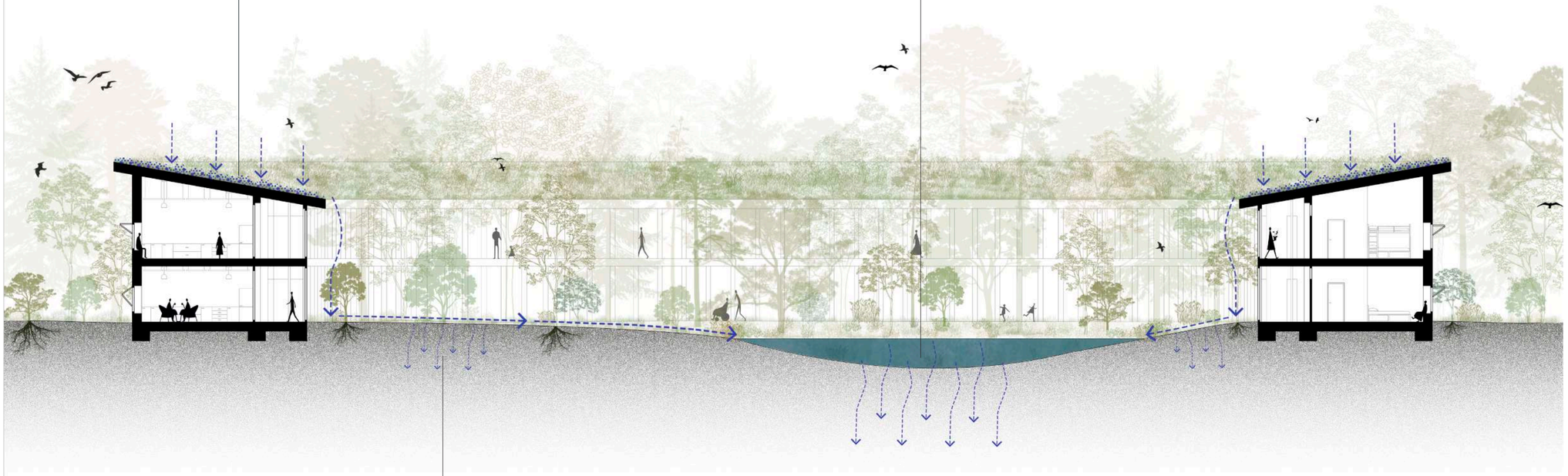
NATURAL VENTILATION
Through Stack-effect.

WATER COLLECTION

Green roofs enable local water retention and evaporation, contributing to a more sustainable urban water cycle.

WATER STORAGE

Any surplus of non-infiltrated water is collected in a water basin, allowing it to slowly permeate the soil. This process replenishes local groundwater levels and creates an additional local microclimate, benefiting the regional fauna and flora.



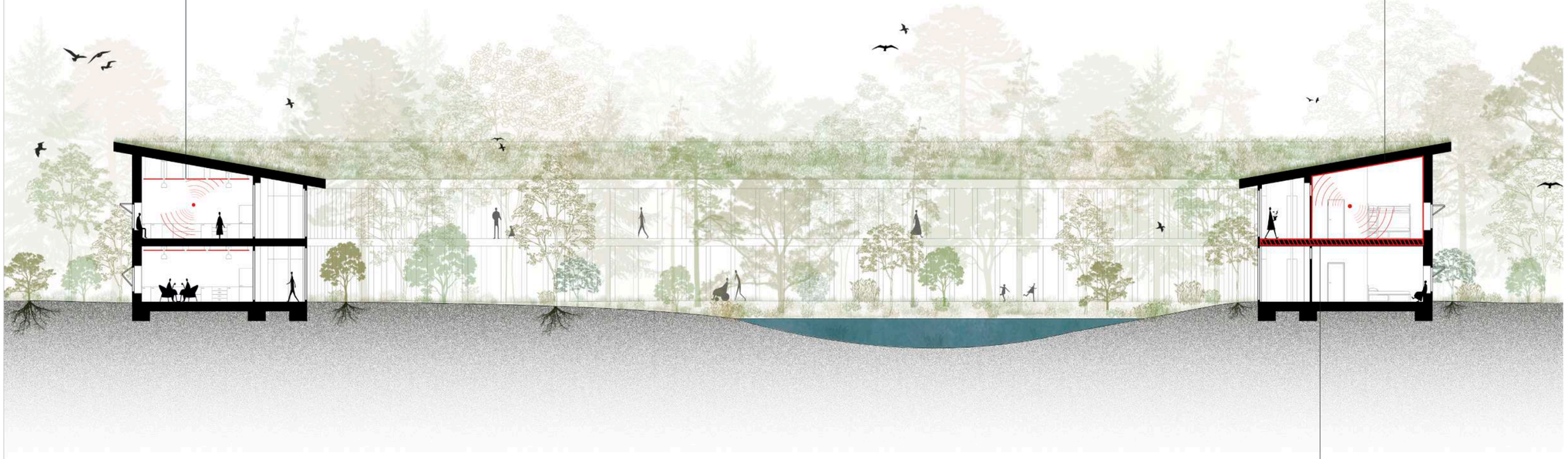
WATER INFILTRATION

The project prioritizes natural water infiltration to support local ecosystems while mitigating Belgrade's flood risks through sustainable drainage.

SCALE 1:250

ECOPHON SOLO
High-performance acoustic panels in the communal areas reduce reverberation, ensuring superior acoustic comfort for all users.

PLACO® Phonique
The use of Placo Phonique improves sound insulation by about 3 dB compared to standard plasterboard, reducing noise levels and creating a more comfortable acoustic environment.



FLOOR DESIGN
Integrating WEBERFLOOR Light floating screed combined with ISOVER Sonefloor insulation ensures significant noise reduction, resulting in superior acoustic comfort.

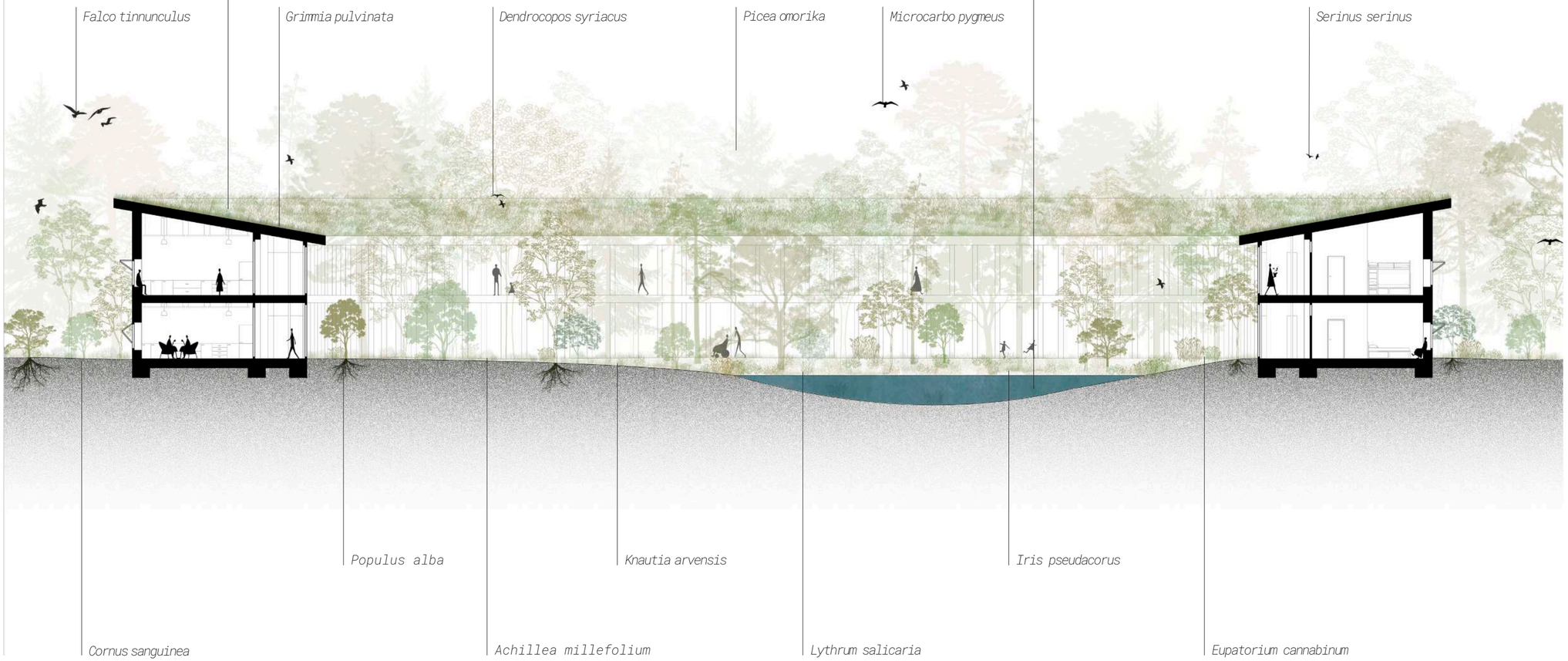
SCALE 1:250

GREEN ROOF

Acts as a catalyst for local environmental improvement. By incorporating a diverse selection of native Serbian plant species, it fosters a thriving micro-ecosystem that enhances local biodiversity.

WATER BASIN

More than a drainage solution, the integrated water basin functions as a dynamic ecological system. Its moist environment supports amphibians such as frogs and toads, while attracting birds and insects at the same time.



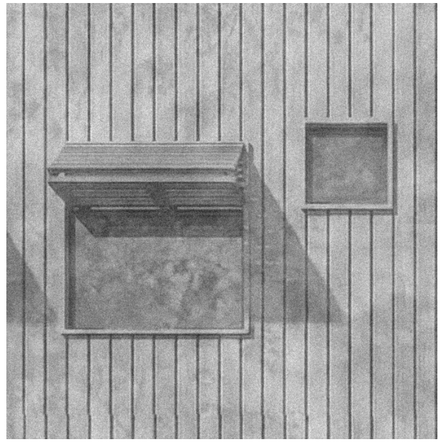
SCALE 1:250

IMAGE | Single room

IMAGE | Entrance

INNOVATION

We strongly focus on innovative strategies such as the use of **hempcrete** as an insulation material. Hempcrete, which is **CO2-negative** in its emissions, helps to minimize the building's climate impact. Furthermore, its high thermal mass enhances the overall building performance, providing superior comfort and energy efficiency.



ARCHITECTURAL VALUE

With our construction details, we aim not only to meet performance criteria, but also to create added architectural value. Each detail seeks to integrate **sustainability**, **spatial quality**, and **function** into a coherent whole.

TRADITION

Even though the construction details are innovative, the design remains rooted in **vernacular architecture**. Inspired by the traditional **Bondruk** construction method, a timber frame structure made from **locally sourced materials** is used. Whereas the framework was historically infilled with clay and brick, it is now filled with locally produced hempcrete.

SAINT-GOBAIN

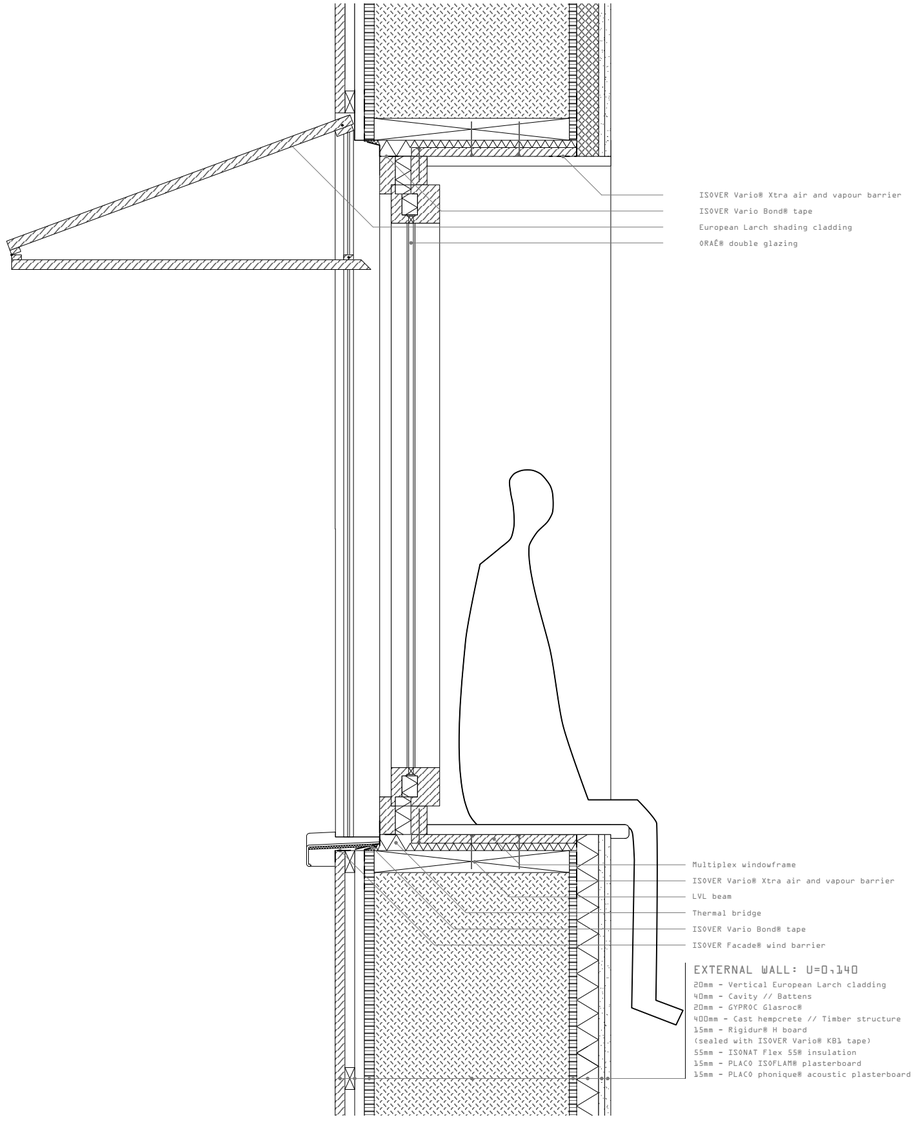
SUSTAINABILITY

By applying innovative strategies, using local sustainable materials, and integrating more than 25 products from the **Saint-Gobain** family, the design achieves performance levels that exceed the required standards, resulting in an average **U-value under 0,10** W/M^2K.

SITTING NICHE

Rather than treating the required thickness of the hempcrete wall, as an constraint, it was reinterpreted as an opportunity. The windows were designed carefully to introduce an additional seating area within the compact rooms. The depth of the wall is activated through the creation of a seating niche, transforming a technical requirement into a **spatial asset**. At the same time, this intervention emphasizes the value of the surrounding greenery by **framing the view**, allowing the athletes to experience the natural environment more directly.

Reference: TATSUMI Apartment House / Hiroyuki Ito Architects

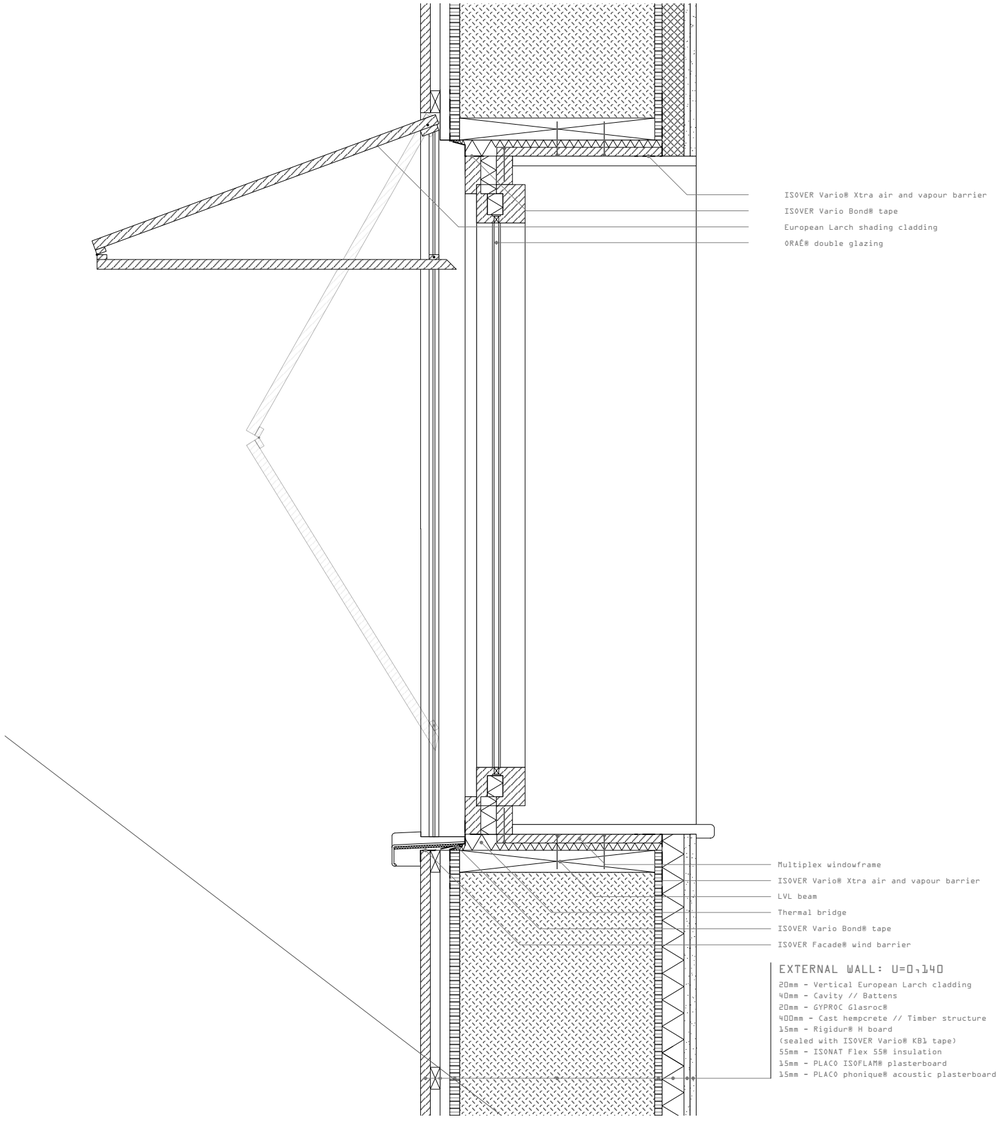


SCALE 1:10

SHADING

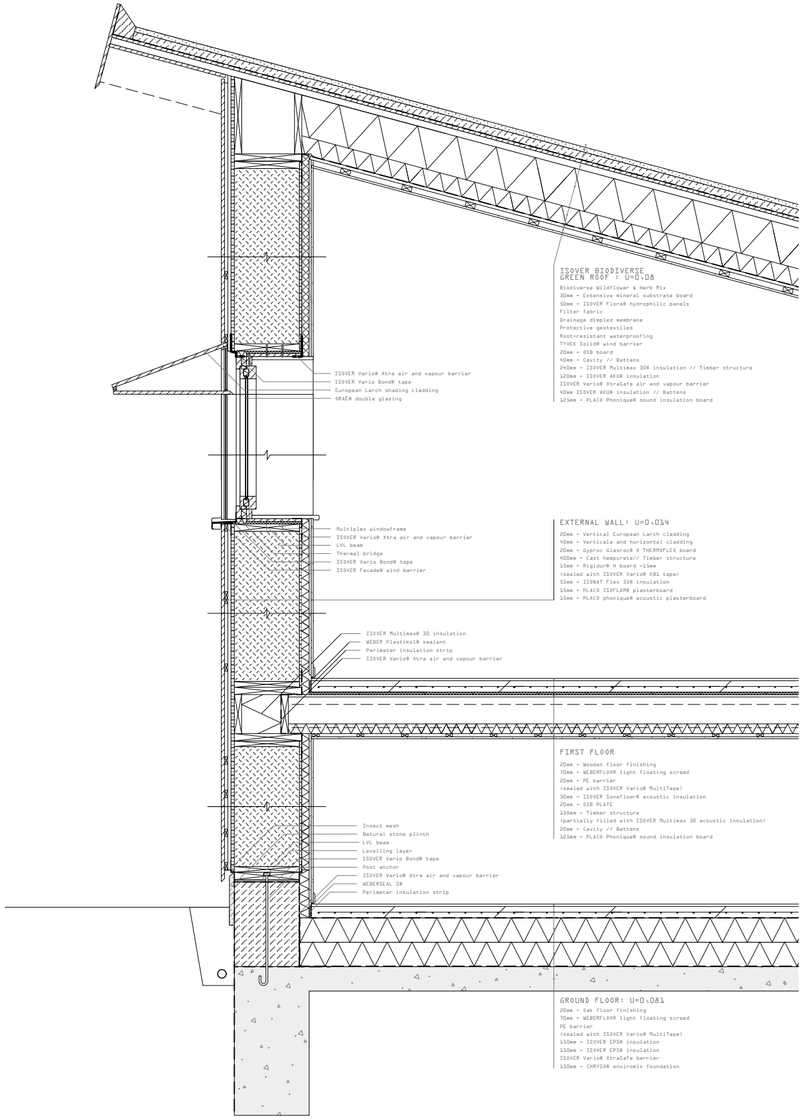
In addition to the seating niche, the sunshading is a notable feature of the window detail. The design explores ways to introduce **dynamism into the facade**, despite the regular rhythm of the window openings. The wooden sunshades ensure that the circular façade always presents a varied, dynamic appearance: some sunshades remain open, while others are closed. At night, when all the shading is drawn, the circle seems to dissolve completely into the surrounding forest, allowing the calm of nature to fully return.

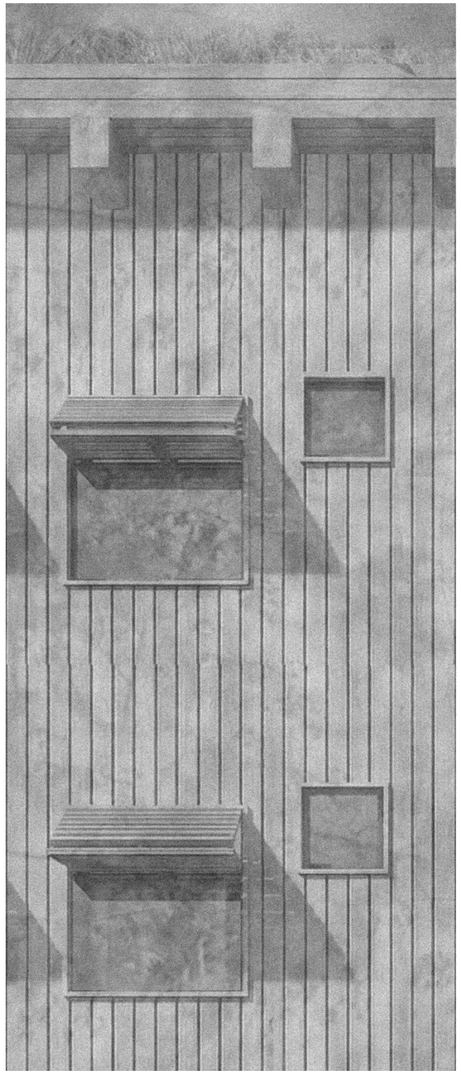
Reference: Paral-lel Building / OHLAB



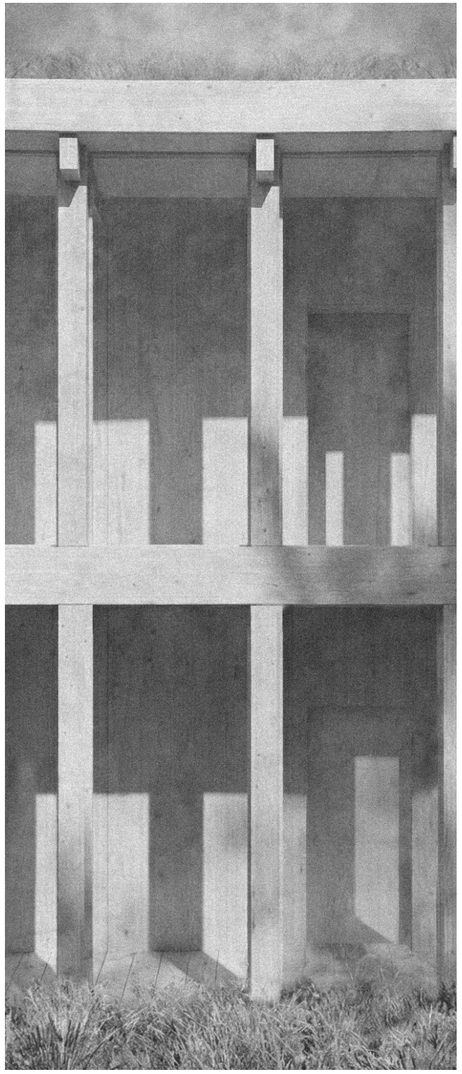
SCALE 1:10

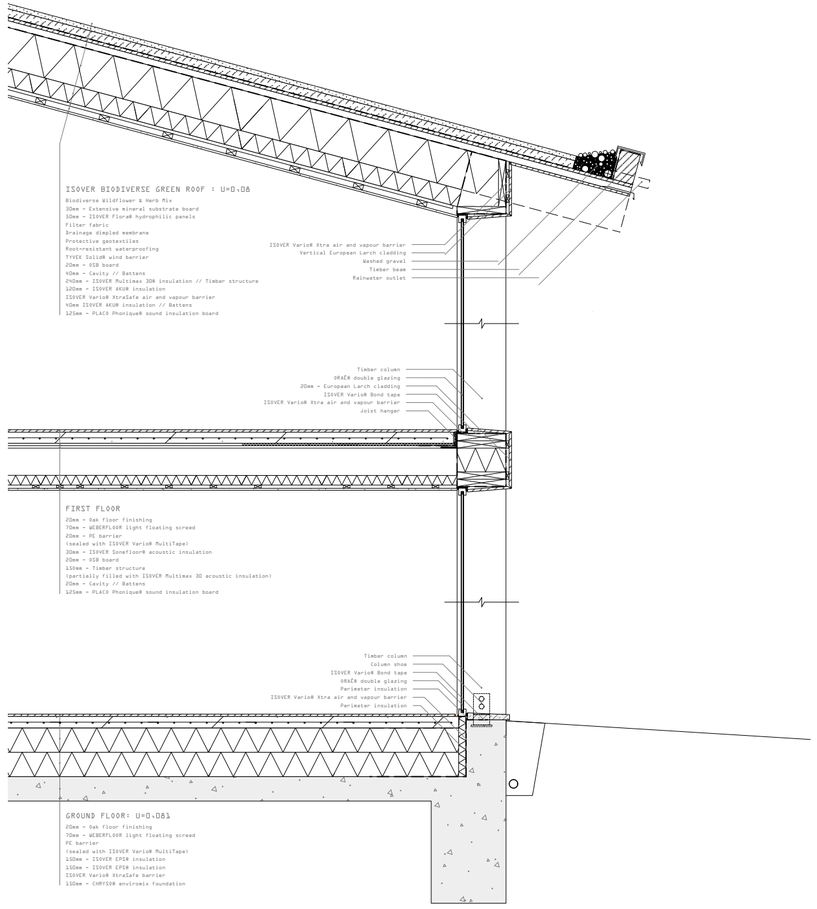
DETAIL | Exterior facade





SCALE 1:30

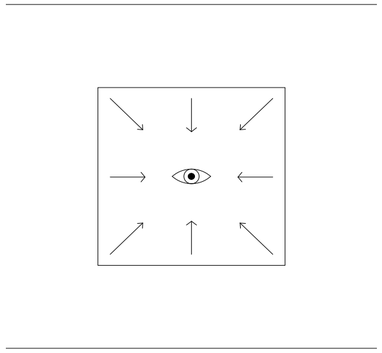



ISOVER BIODIVERSE GREEN ROOF : U=0.08
Biodiverse Wildflower & Herb Mix
10mm - Extensive mineral substrate board
50mm - ISOVER Flora® hydrophilic panels
Filter fabric
Drainage dimpled membrane
Protective geotextiles
Rootresistant waterproofing
TYVEK Solid® wind barrier
20mm - OSB board
40mm - Cavity // Battens
240mm - ISOVER Multimax 32R insulation // Timber structure
120mm - ISOVER ARUR insulation
ISOVER Vario® XtraSafe air and vapour barrier
40mm ISOVER ARUR insulation // Battens
125mm - PLACO Phonique® sound insulation board
ISOVER Vario® Xtra air and vapour barrier
Vertical European Larch cladding
Washed gravel
Timber beam
Rainwater outlet
Timber column
GRAÇA double glazing
20mm - European Larch cladding
ISOVER Vario® Bond tape
ISOVER Vario® Xtra air and vapour barrier
Joist hanger
FIRST FLOOR
20mm - Oak floor finishing
70mm - WEBERFLOOR light floating screed
20mm - PE barrier
(sealed with ISOVER Vario® MultiTape)
30mm - ISOVER Sonafloor® acoustic insulation
20mm - OSB board
150mm - Timber structure
(partially filled with ISOVER Multimax 32 acoustic insulation)
20mm - Cavity // Battens
125mm - PLACO Phonique® sound insulation board
Timber column
Column shoe
ISOVER Vario® Bond tape
GRAÇA double glazing
Perimeter insulation
ISOVER Vario® Xtra air and vapour barrier
Perimeter insulation
GROUND FLOOR: U=0.081
20mm - Oak floor finishing
70mm - WEBERFLOOR light floating screed
PE barrier
(sealed with ISOVER Vario® MultiTape)
150mm - ISOVER CPS® insulation
150mm - ISOVER CPS® insulation
ISOVER Vario® XtraSafe barrier
150mm - CHRYSO® enviromix foundation

SCALE 1:30

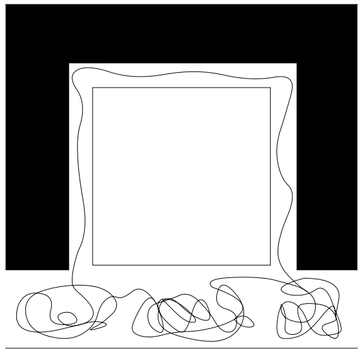
ADDITIONAL ACCOMODATION

A flexible unit



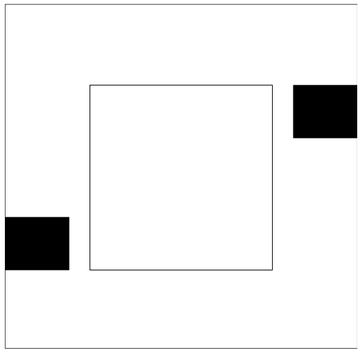
CENTRAL GARDEN

At the heart of the building, a central garden offers a **360° visual connection** to the shared spaces while actively optimizing thermal performance through its bioclimatic design.



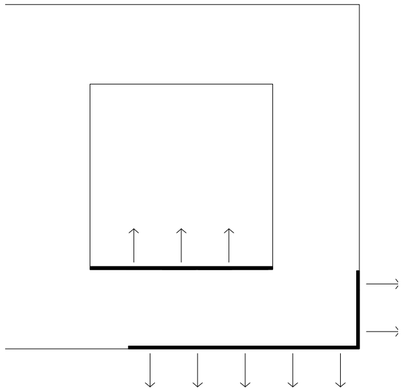
COMMON SPACE

The continuous corridor and common areas merge into a singular collective space that directly **connects to the outdoors.** The open floorplan, together with a flexible wall system allows **various uses.**



VERTICAL CONNECTION

Two staircases, positioned at the opposite sides of the building, provide vertical circulation while integrating seamlessly into the room grid.

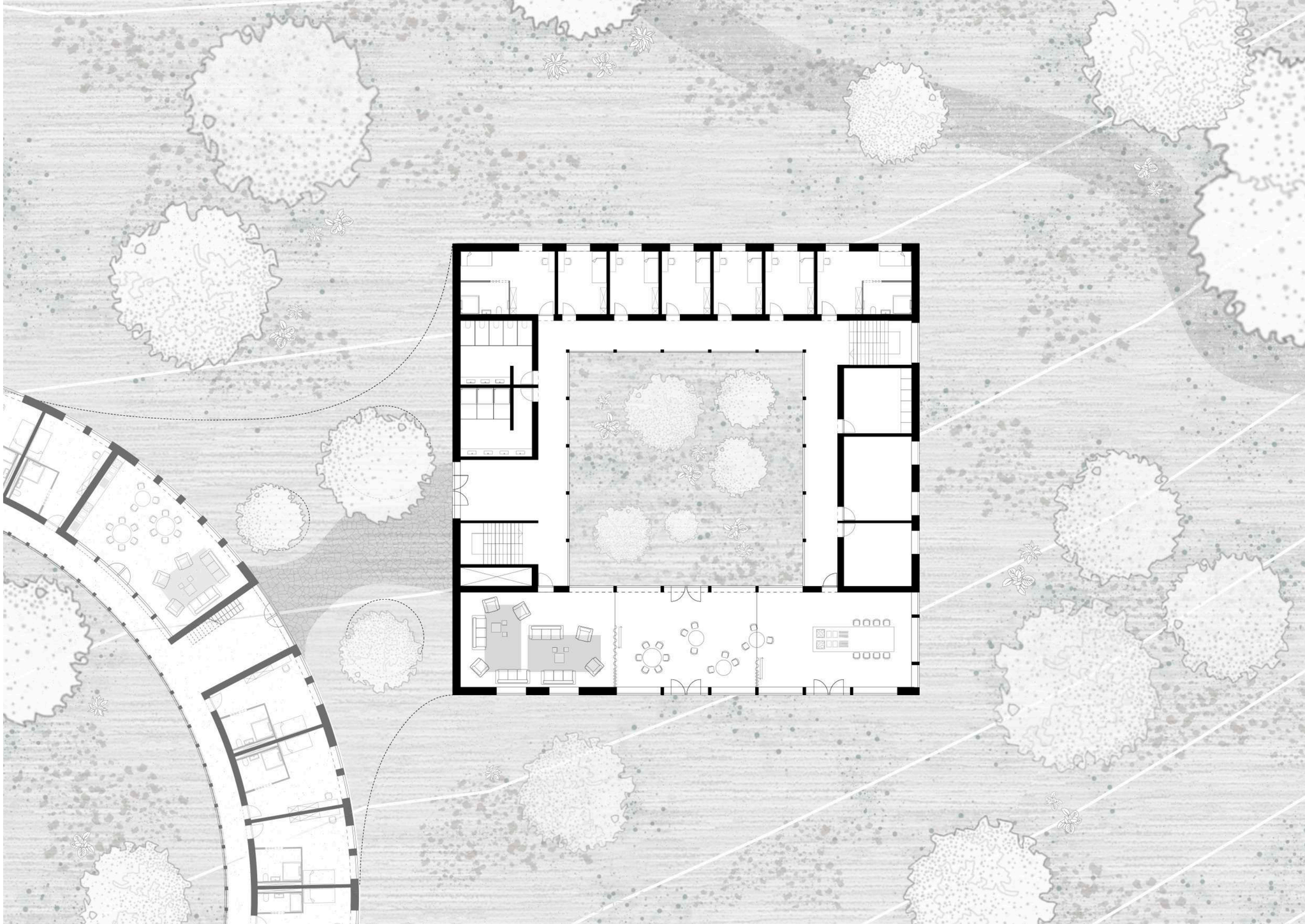


OPEN TO NATURE

The common space is designed to open onto both the interior garden and the surrounding greenery, creating a **seamless connection** between the athletes and nature.

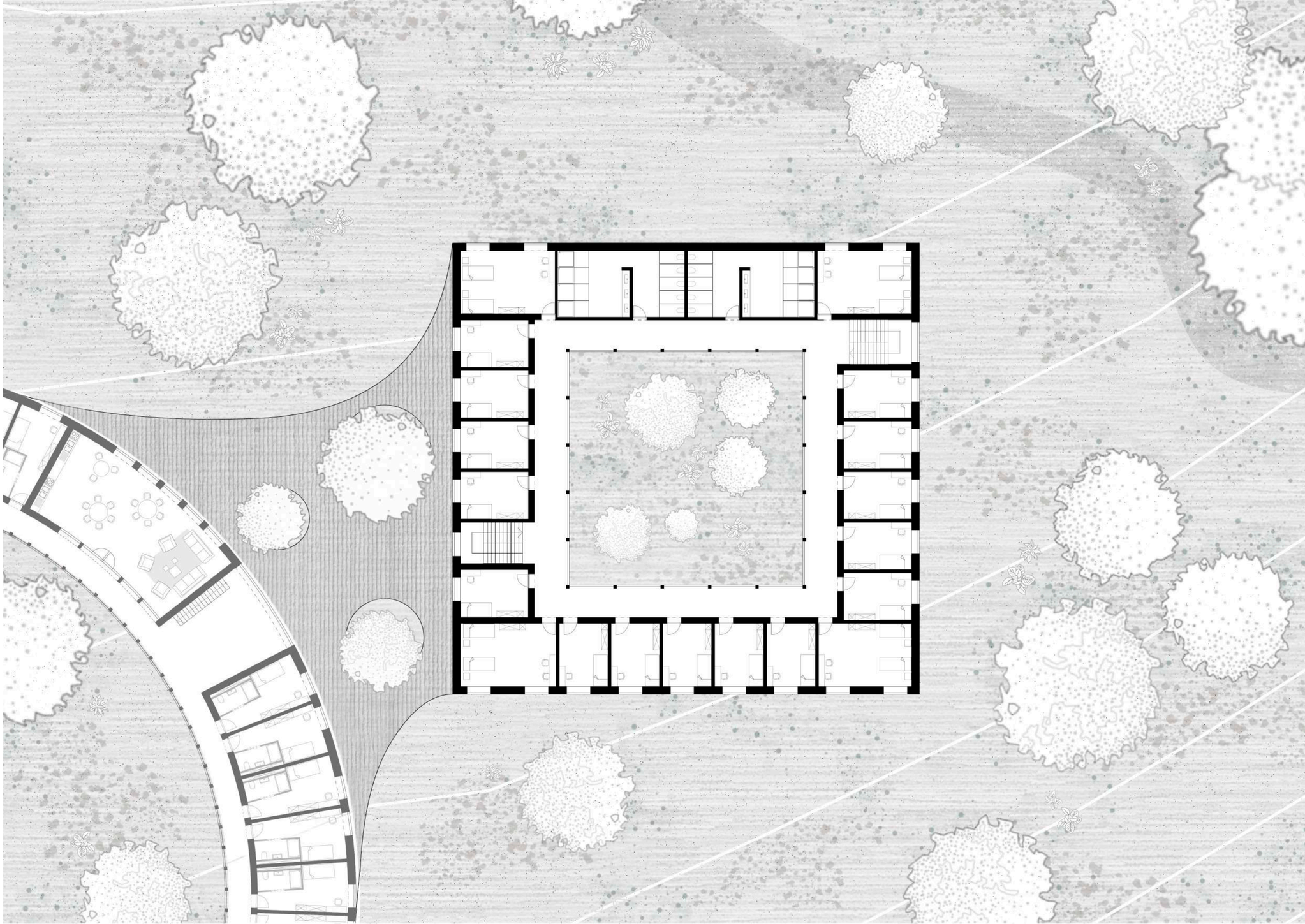
PLAN | Ground floor

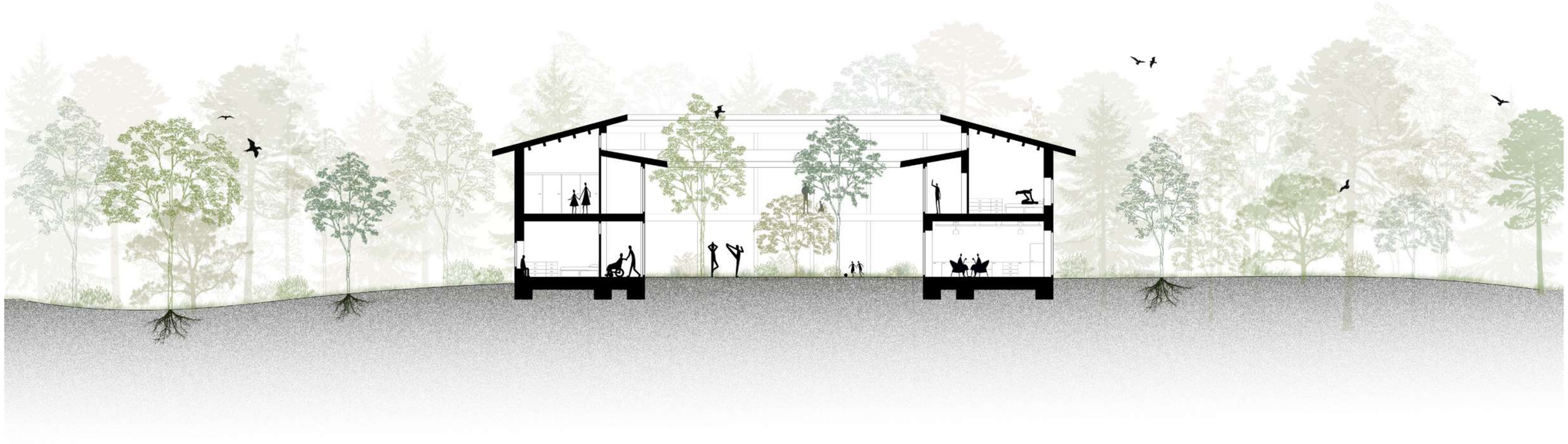
SCALE 1:250



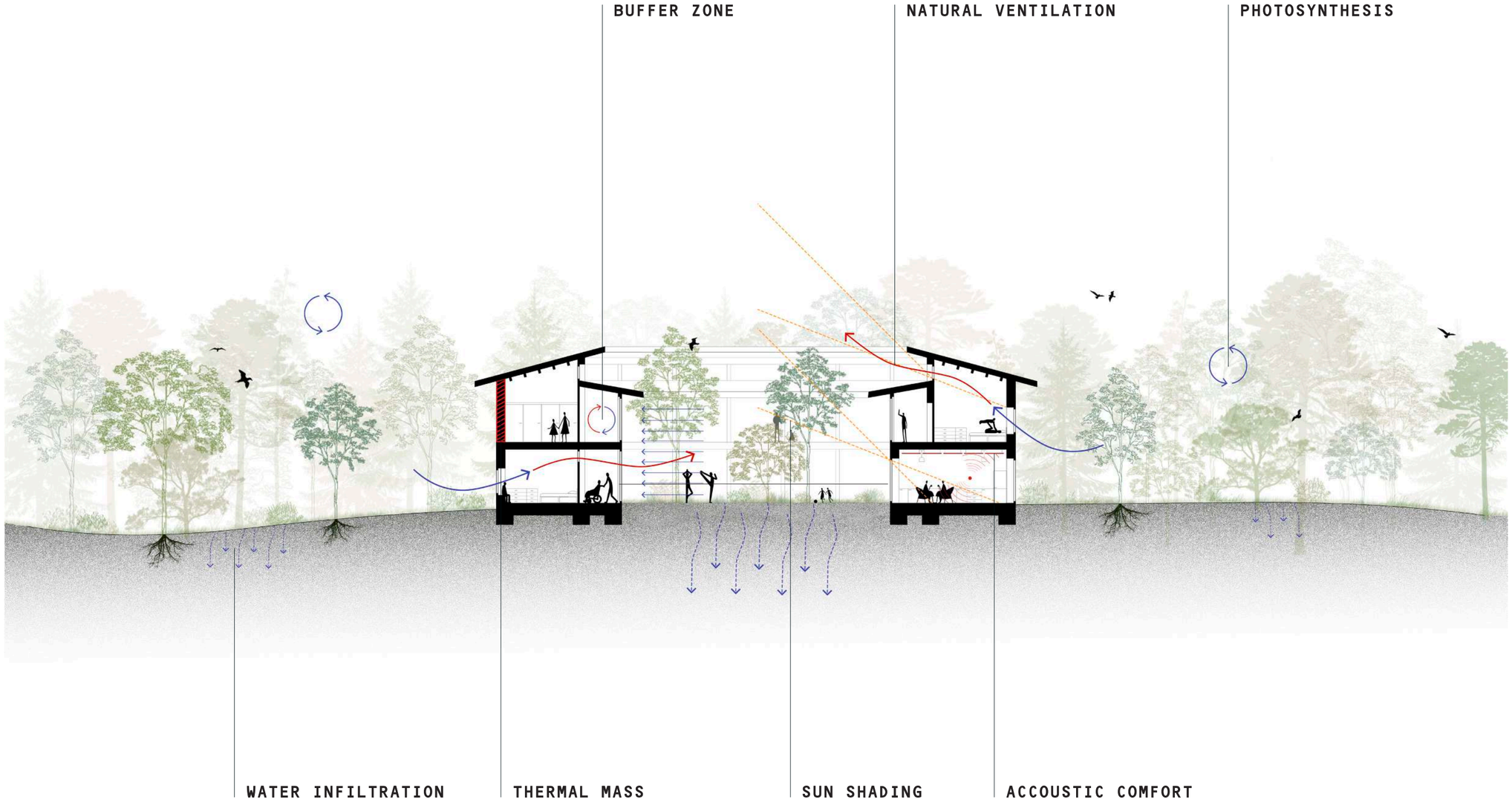
PLAN | First floor

SCALE 1:250





SCALE 1:200


BUFFER ZONE
NATURAL VENTILATION
PHOTOSYNTHESIS
WATER INFILTRATION
THERMAL MASS
SUN SHADING
ACCOUSTIC COMFORT

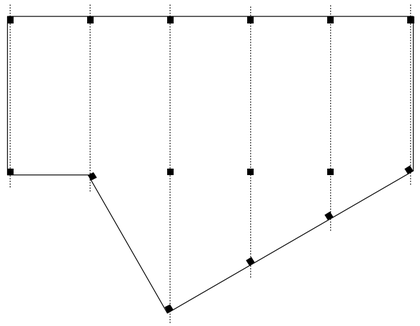
SCALE 1:200

IMAGE | Inside garden

IMAGE | Collective space

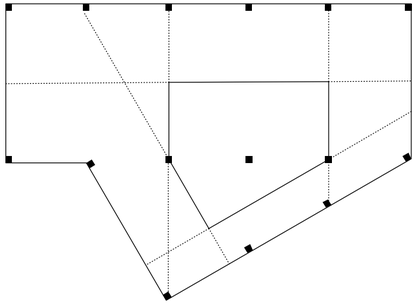
ACADEMIC YACHTING CLUB

Renovation project



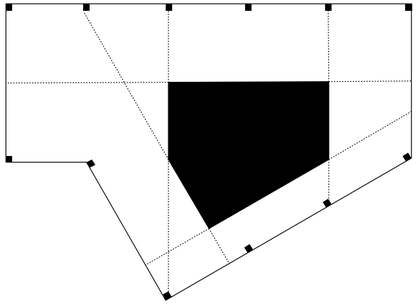
PRESERVING THE EXISTING

The renovation strategy preserves the existing structure and enveloppe, following a **minimalist approach**.



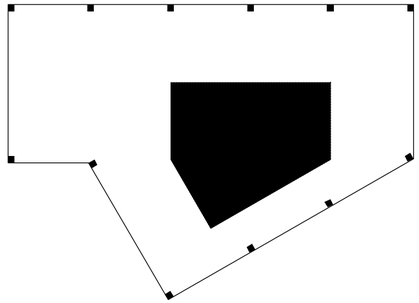
STRATEGIC DIVISION

The interior layout has been redesigned to optimize the use of space. By drawing axes parallel to the exterior walls, more **regular spaces** are created.



COMPACT CENTER

All **secondary functions** and **circulation** are concentrated within a compact center, **freeing up** the rest of the floor plan entirely.

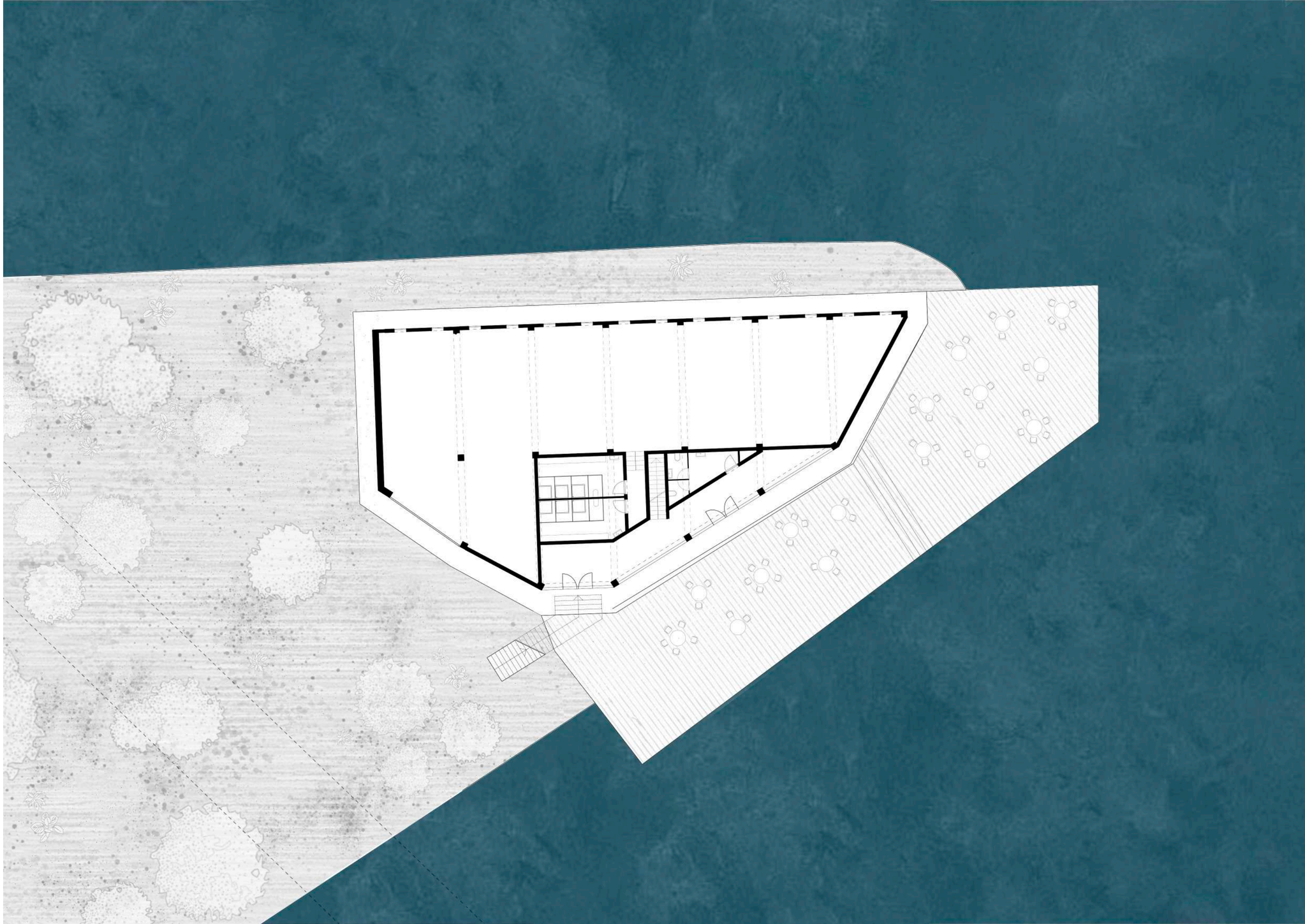


FLEXIBLE SPACE

The open floor plan provides the building with the flexibility to adapt to **evolving needs**. By using the innovative **LoopD® system**, partition walls can be easily reconfigured without material waste, resulting in a truly circular and **future-proof** concept.

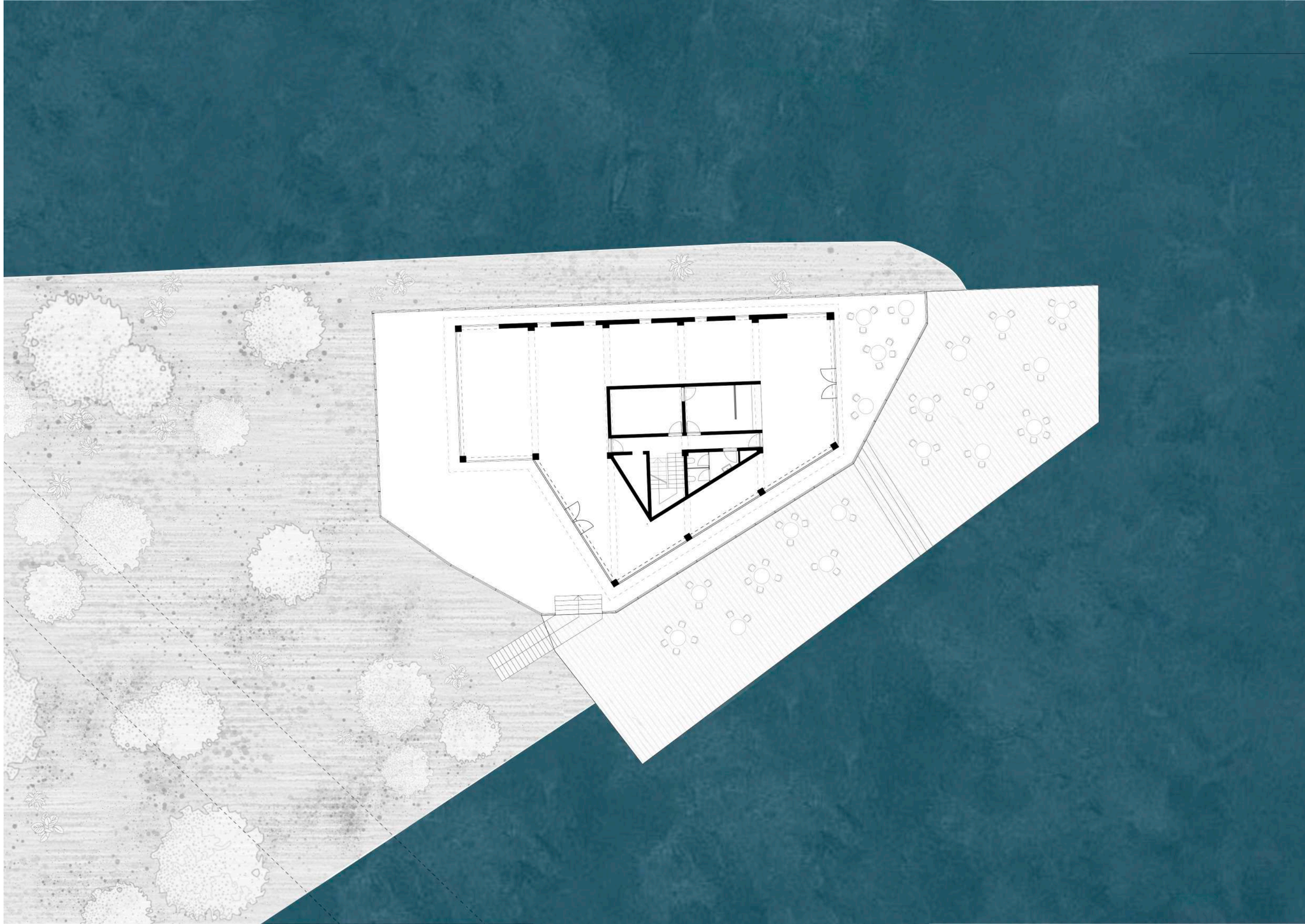
PLAN | Ground floor

SCALE 1:200



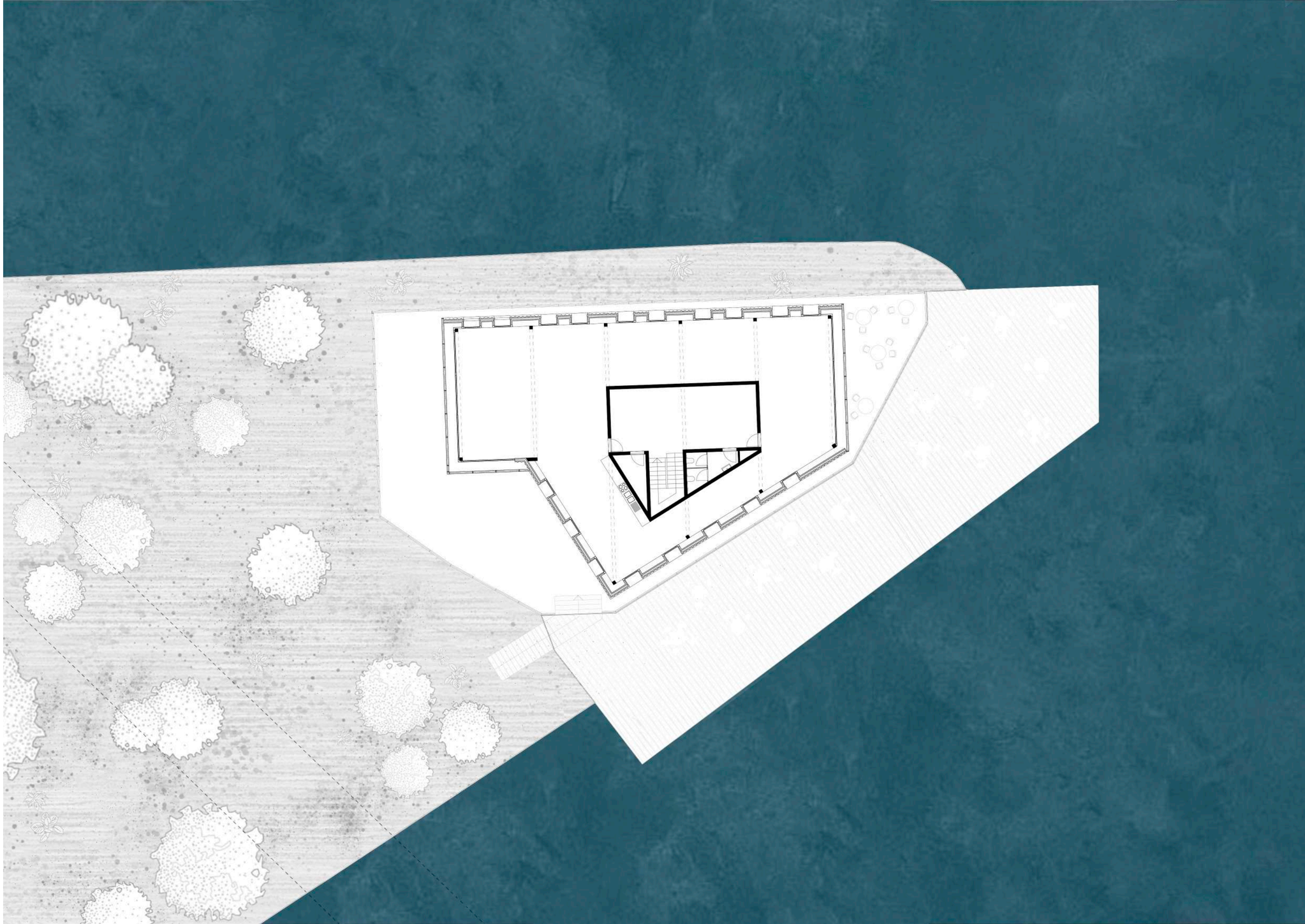
PLAN | First floor

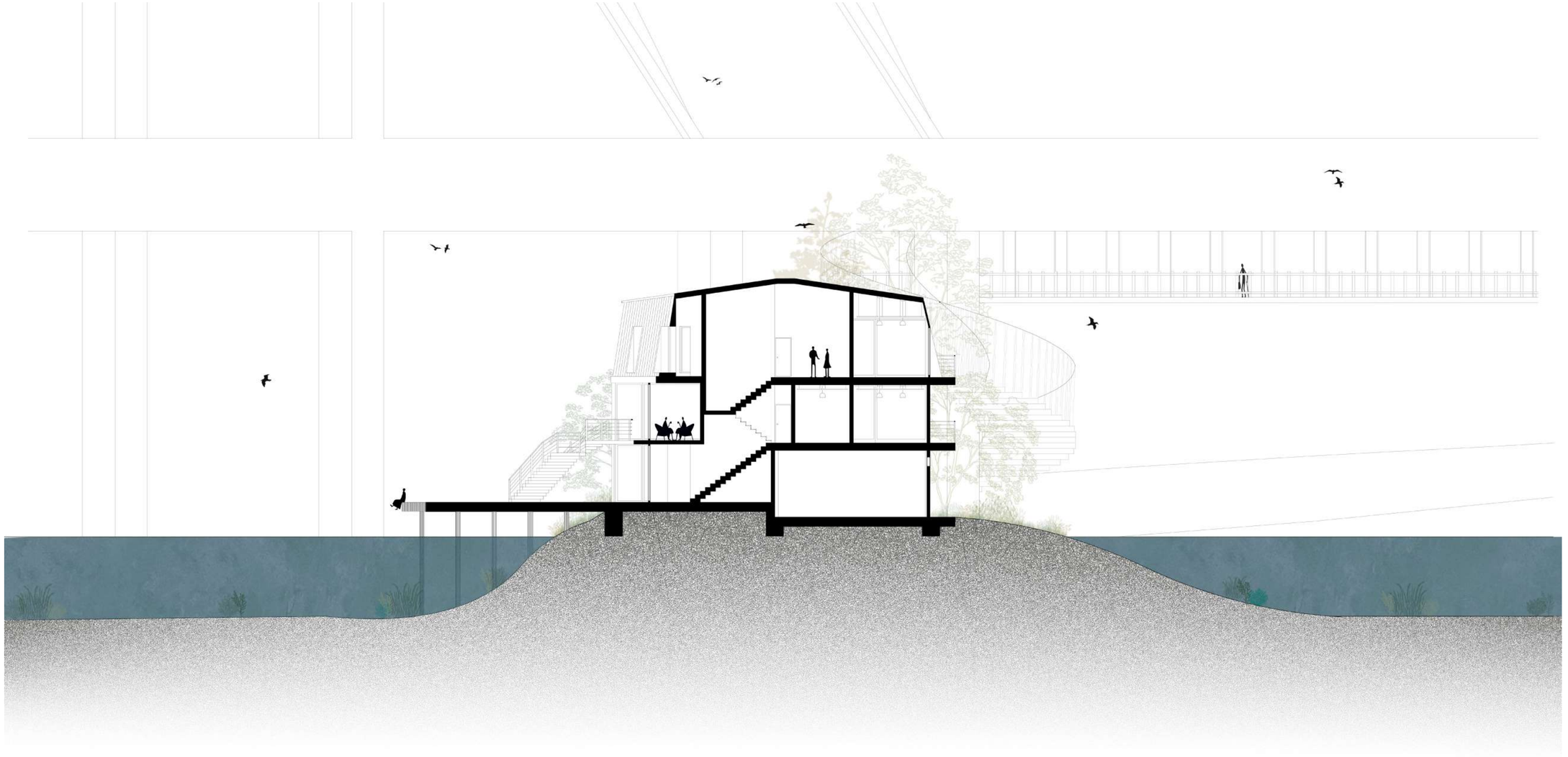
SCALE 1:200



PLAN | Second floor

SCALE 1:200





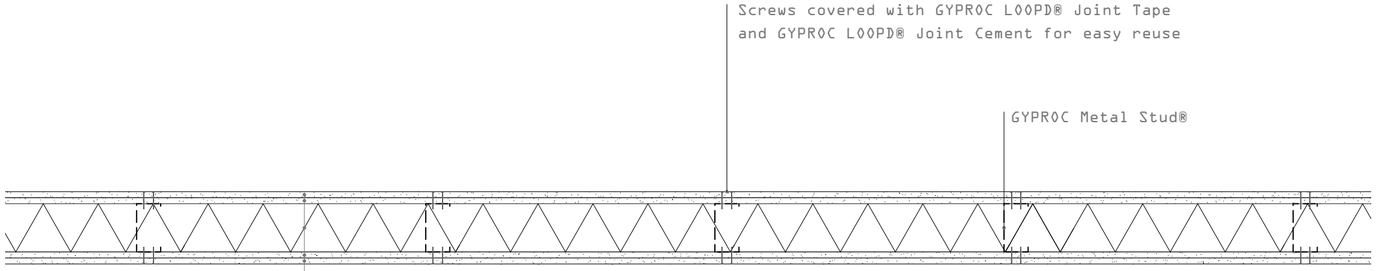
SCALE 1:200

FLEXIBLE WALLS

Together with the new Saint Gobain's innovative LOOPD® system, our open floor plan strategy offers a **future-proof and circular solution** for the Academic Yachting Club.

By concentrating all secondary functions in a compact central core and keeping the remaining space open, the design maximizes a 360-degree view of the iconic surroundings. At the same time, it allows the building **to adapt effortlessly over time**. Spaces can easily be reconfigured to meet **evolving needs**: what is currently designed as a bar, can later be transformed into a gym or additional meeting areas.

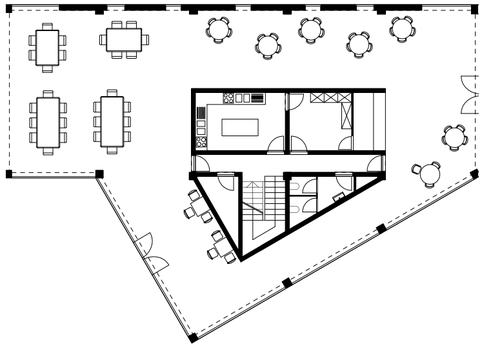
This flexibility is further reinforced by the LoopD® system, developed by GYPROC®, which introduces a fully **circular approach** to interior construction. Unlike traditional partition walls that are demolished, the LoopD® solution allows walls to be dismantled without damage and reused in new configurations. This not only significantly reduces waste, but also makes spatial transformations **faster**, **cleaner**, and **more efficient**.



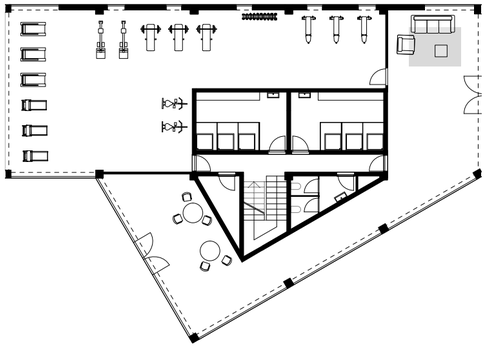
CIRCULAR PARTITION WALL SYSTEM

12,5mm - GYPROC Habito® board
12,5mm - GYPROC Habito® board
100mm - ISOVER Sonepanel®
12,5mm - GYPROC Habito® board
12,5mm - GYPROC Habito® board

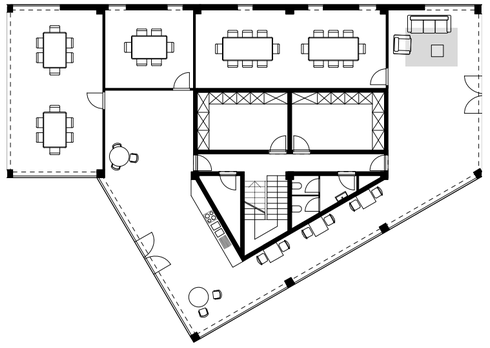
Floorplan option I - restaurant & bar



Floorplan option II - gym



Floorplan option III - office & meeting areas



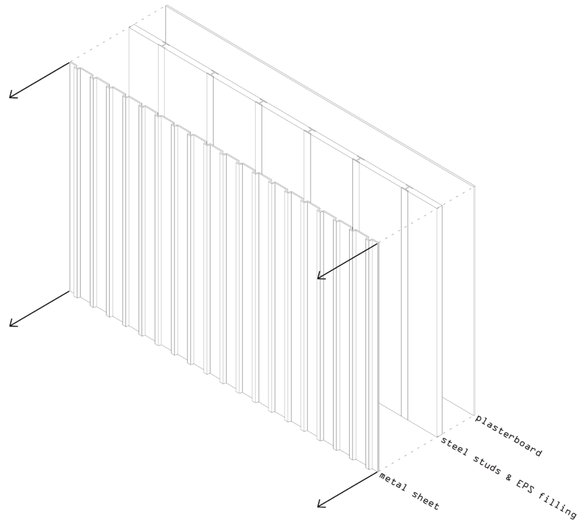
SECOND SKIN

The renovation of the Academic Yachting Club utilizes a «second skin» strategy to improve energy performance while preserving its exterior facade. By treating the roof as a dual-functioning system, an independent thermal barrier beneath a reused existing roof, the project embraces **circular construction**. Reusing the original metal cladding significantly reduces the project's embodied carbon and minimizes waste.

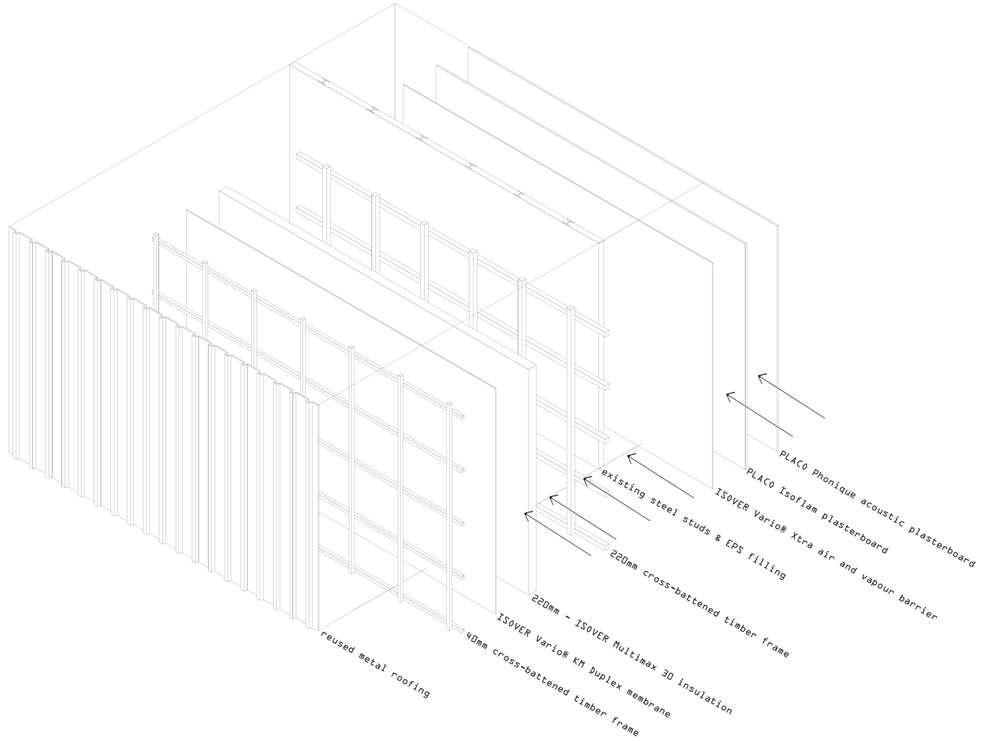
The transformation starts with stripping the metal skin to install a 220mm cross-battened timber frame filled with high-efficiency ISOVER Forte mineral wool. To prevent interstitial condensation, the assembly incorporates the ISOVER Vario® KM Duplex membrane, which regulates seasonal moisture flow to ensure **structural longevity**. A new ventilation gap facilitates **passive cooling**, while the interior is upgraded with a secondary Vario® air-barrier and fire-resistant Rigips Habito plasterboard for **enhanced safety and durability**.

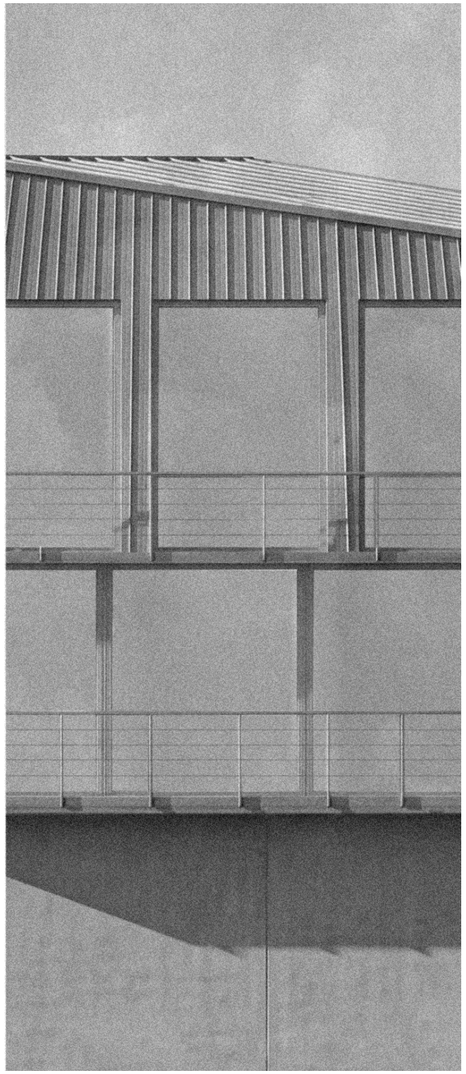
This layered intervention achieves a fourfold **increase in thermal efficiency**, reducing the roof's U-value from 0.77 W/m²*K to an ideal 0.15 W/m²*K.

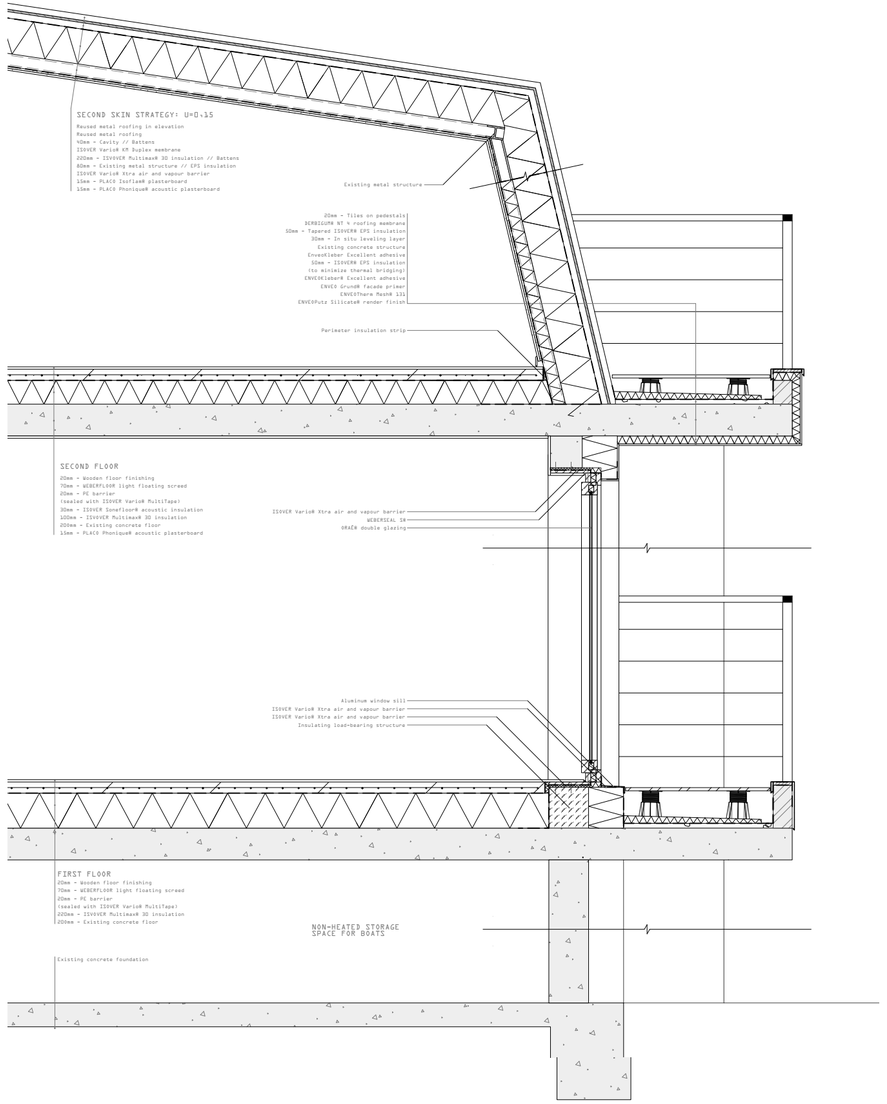
Stripping Metal Roof



Inserting the layers






SECOND SKIN STRATEGY: U=0.15
Reused metal roofing in elevation
Reused metal roofing
40mm - Cavity // Battens
ISOVER Vario® KR Duplex membrane
200mm - ISOVER Multimax® 3D insulation // Battens
80mm - Existing metal structure // EPS insulation
ISOVER Vario® Xtra air and vapour barrier
15mm - PLACO Ispilas® plasterboard
15mm - PLACO Phonique® acoustic plasterboard
Existing metal structure
20mm - Tiles on pedestals
IKOBIGUM® NT 4 roofing membrane
50mm - Tapered ISOVER® EPS insulation
30mm - In situ levelling layer
Existing concrete structure
Enveolieber Excellent adhesive
50mm - ISOVER® EPS insulation
(to minimize thermal bridging)
ENVEOliebor® Excellent adhesive
ENVEO Grund® facade primer
ENVEOTherm Mesh® 131
ENVEOPutz Silicate® render finish
Perimeter insulation strip
SECOND FLOOR
20mm - Wooden floor finishing
70mm - WEBERFLOOR® light floating screed
20mm - PE barrier
(sealed with ISOVER Vario® MultiTape)
30mm - ISOVER Sonofloor® acoustic insulation
100mm - ISOVER® Multimax® 3D insulation
200mm - Existing concrete floor
15mm - PLACO Phonique® acoustic plasterboard
ISOVER Vario® Xtra air and vapour barrier
WEBERSEAL 18
GRACE double glazing
Aluminum window sill
ISOVER Vario® Xtra air and vapour barrier
ISOVER Vario® Xtra air and vapour barrier
Insulating load-bearing structure
FIRST FLOOR
20mm - Wooden floor finishing
70mm - WEBERFLOOR® light floating screed
20mm - PE barrier
(sealed with ISOVER Vario® MultiTape)
220mm - ISOVER® Multimax® 3D insulation
200mm - Existing concrete floor
NON-HEATED STORAGE
SPACE FOR BOATS
Existing concrete foundation

SCALE 1:30

WATERFRONT STRATEGY

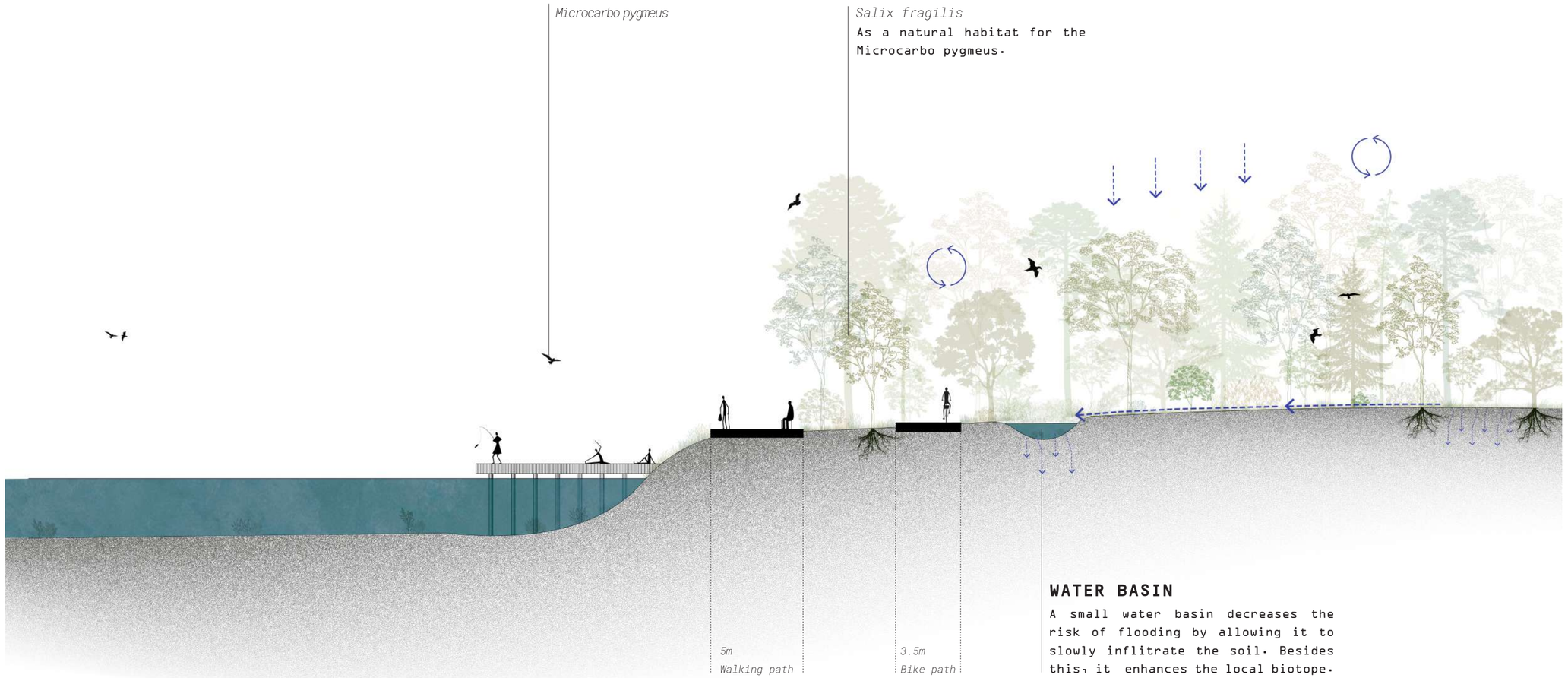
Riverside interventions

WATERFRONT STRATEGY

A comprehensive riverfront strategy has been developed to seamlessly integrate improved green mobility with the preservation of the local ecosystem. By designing a scalable system for pedestrians and cyclists that connects to existing green roads, the project aims to extend its positive impact even beyond the site itself.

To support the coexistence between nature and improved mobility, the design incorporates **nature-based solutions**, such as a new water basin that mitigates flood risks while actively enriching the local biotope. In addition to this implementation, a new pedestrian bridge has been designed to connect the new site with the Academic Yachting Club. Rather than undertaking a large-scale intervention, a **lightweight structure** will be suspended from the existing bridge. This solution maximizes the use of the existing infrastructure, significantly **improves connectivity between the two sites**, and minimizes the need for additional building materials, thereby reducing the overall climate impact.

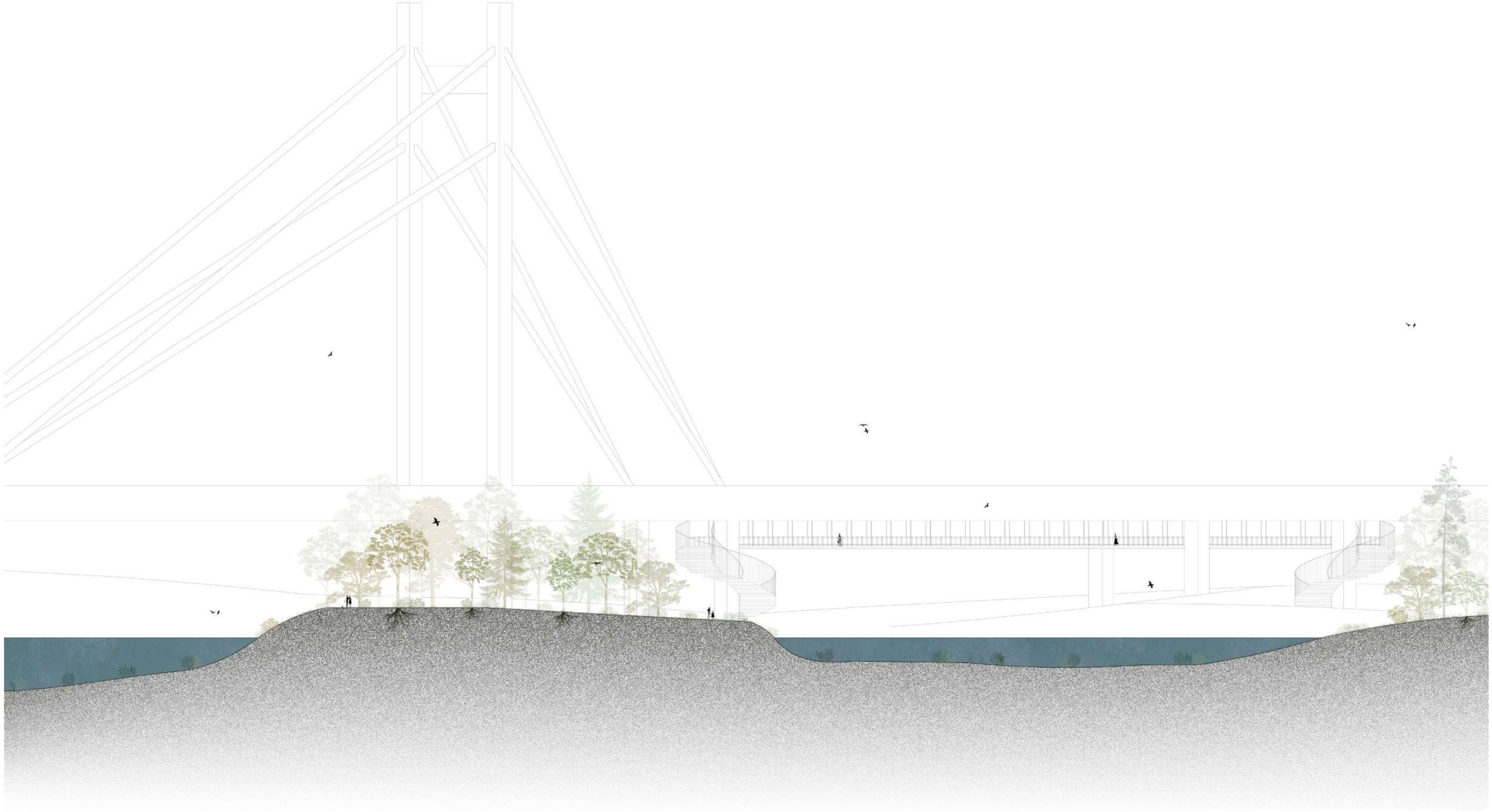
Finally, the riverfront remains a vital sanctuary for the **Pygmy Cormorant** (Microcarbo pygmaeus). Our design **protects and strengthens** this delicate habitat by strictly preserving designated ecological zones and planting additional willow trees (Salix) along the water's edge. These willows provide essential winter roosts, establishing the project as a model for how urban development and local biodiversity can **coexist in perfect harmony**.



WATER BASIN

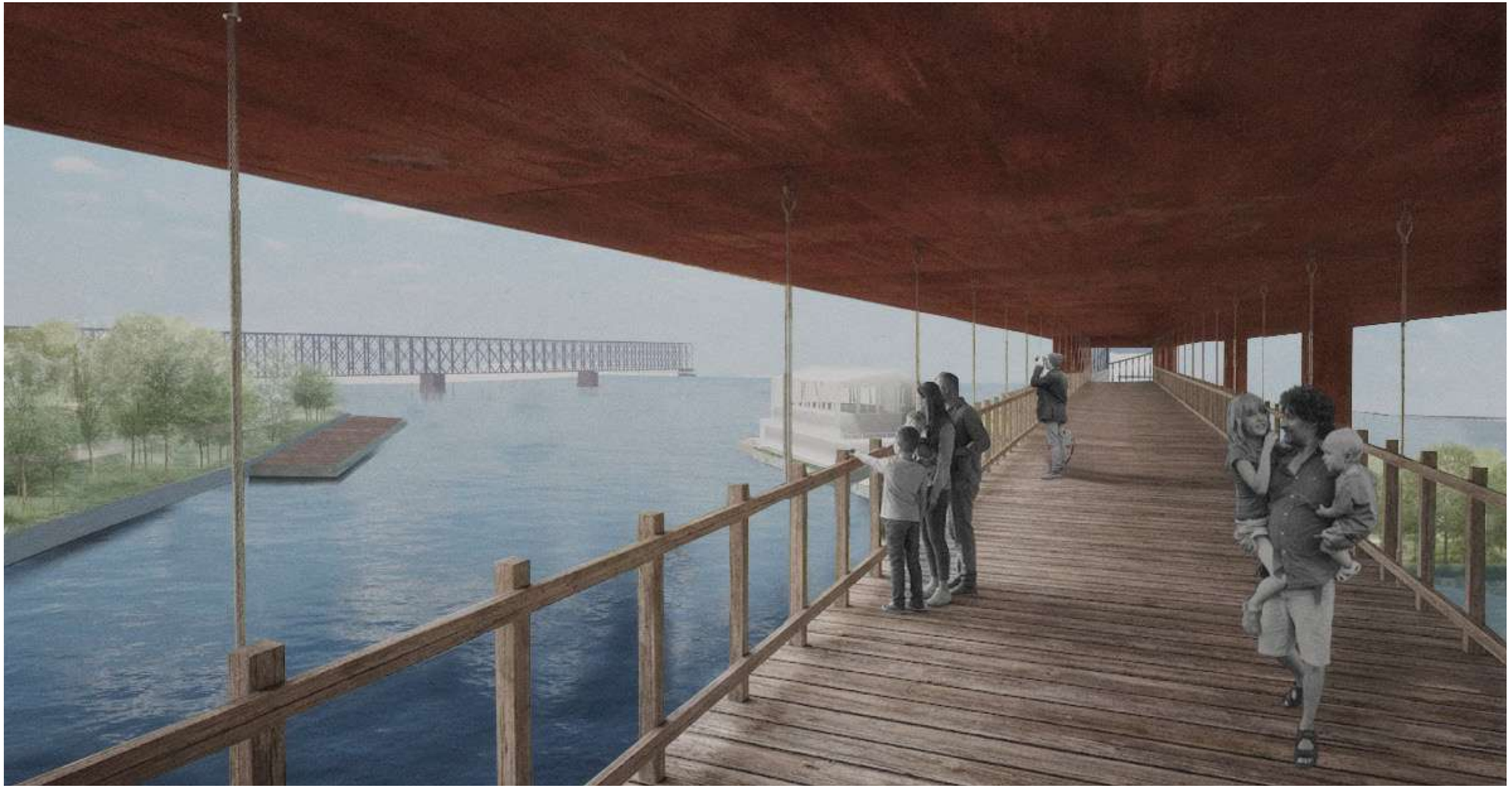
A small water basin decreases the risk of flooding by allowing it to slowly inflitrate the soil. Besides this, it enhances the local biotope.

ELEVATION | Pedestrian bridge



SCALE 1:500

IMAGE | Pedestrian bridge



Reference : Suspended Under-Bridge Walkway Over Peace River, Canada

Reference : Christian Bauer suspends pedestrian and cycle path beneath Pont Adolphe, Luxembourg

SPORTS FIELDS

Training in nature

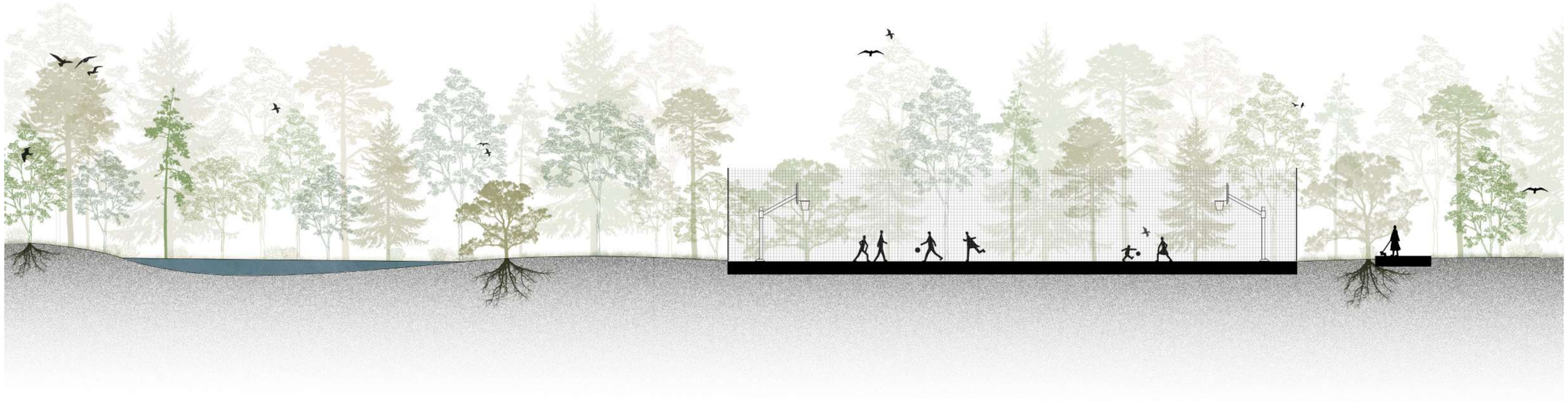
TRAINING IN NATURE

In alignment with the masterplan for the project, where nature and athletes live in coexistence, the sport facilities are implemented based on a precise architectural acupuncture.

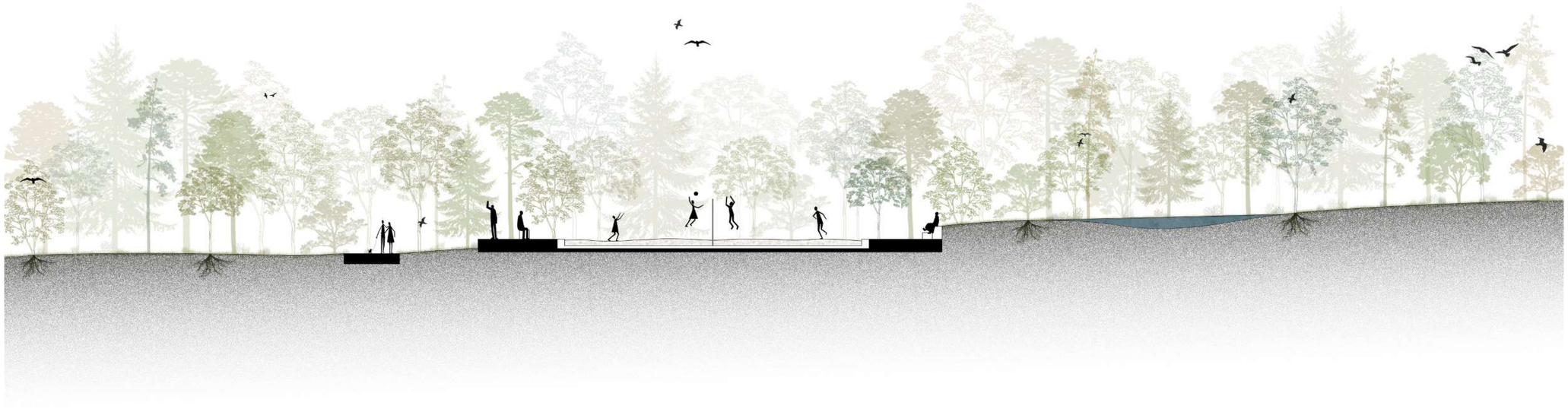
These, small-scale interventions allow to implement the desired sport facilities **without disrupting the local biotope** or interrupting the sensory of a **continuos forest**. This way, the project offers athletes a training environment that is fundamentally optimized for both physical performance and mental well-being.

This final step in the design completes the overarching vision of the relationship between athletes and nature, where they can live, sleep, and train entirely within the rhythm of the local ecosystem.

Reference : Sportkot KULeuven



scale 1:200



scale 1:200

Reference : Sportkot KULeuven

PERFORMANCE ANALYSIS

Software results

NATURAL LIGHTING

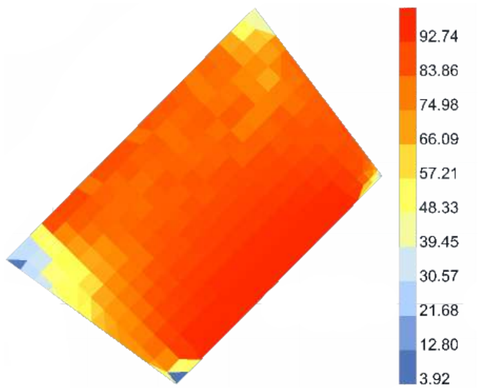
To optimize the balance between **natural lighting** and **thermal comfort**, our glazing strategy varies according to the orientation and function of each space. The analysis was conducted using Grasshopper (Ladybug/Honeybee) to simulate solar radiation and validate the passive heating potential of the building.

The window-to-floor area ratio (WFR) was calculated for each typology to ensure **sufficient daylighting** while **preventing overheating**.

By adding windows to the south facade, this ratio increases, thereby **optimizing passive heat gain** in the winter.

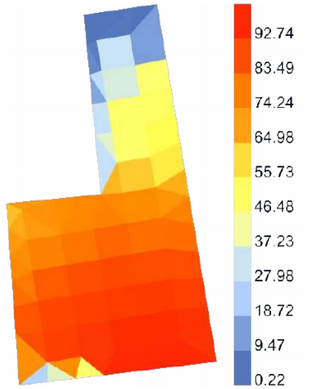
The common areas feature glass doors resulting in a high transparency ratio that creates a seamless visual connection with the landscape while acting as a solar collector for the building.

It should be noted that the simulation is based on a simplified geometric model. In the final design, the peripheral gallery acts as an integrated solar shading device for the common areas, effectively mitigating direct radiation and preventing overexposure.



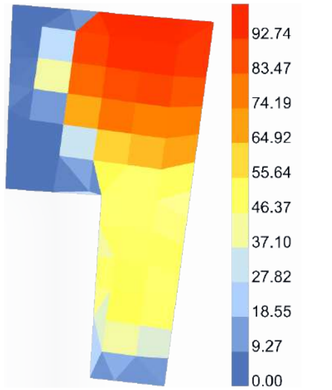
COMMON AREA

Natural daylight autonomy : 70%



SOUTH ROOM

Natural daylight autonomy : 88%



NORTH ROOM

Natural daylight autonomy : 80%

Space type	Floor area	Glazing area	WFR
North-facing rooms	13m²	2.25m²	17%
South-facing rooms	13m²	2.74m²	21%
Common areas	55m²	21.6m²	39%

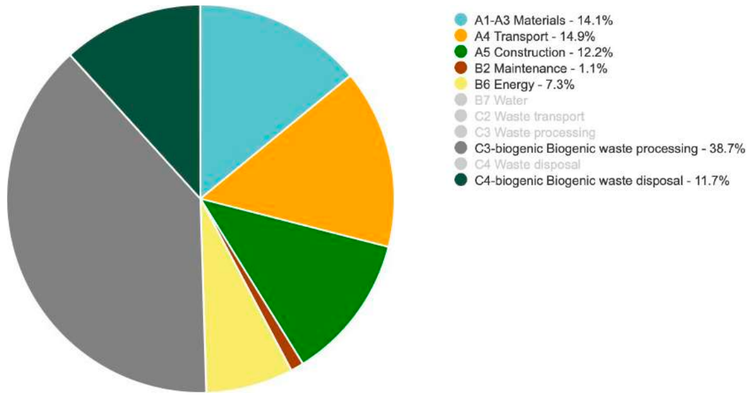
Window-to-floor area ratio

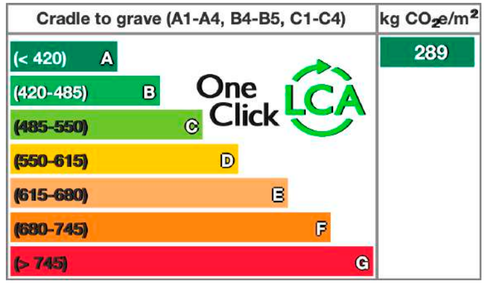
CARBON IMPACT STRATEGY

To minimize the project's environmental footprint, our strategy focuses on **high-efficiency energy systems**, like heat pumps and solar panels, and the extensive use of bio-based materials for the structural frame and insulation. By sourcing timber and hempcrete directly from Serbian production, we significantly reduce transportation emissions while supporting the **local circular economy**.

Our building's lifecycle carbon is dominated by the end-of-life processing of bio-based materials, hempcrete insulation and timber structure. The carbon stored during the growth of hemp and trees is eventually released, but the climate benefit of that 50-year storage period is real and scientifically recognized. Furthermore, our design for disassembly means that timber elements can be reused rather than processed as waste, potentially eliminating a significant portion of this C3/C4 biogenic impact entirely.

GLOBAL WARMING POTENTIAL TOTAL KG CO_2 Ilife-cycle stages



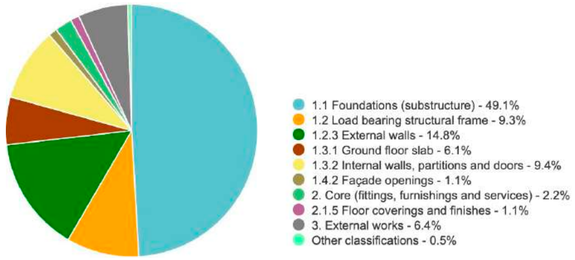


Average number of visitors	20'000 /year
Gross floor area	2770m²
Carbon emission	289kg CO_2/m^2
Total carbon emission	800 Tonnes CO_2
Building circularity	65%

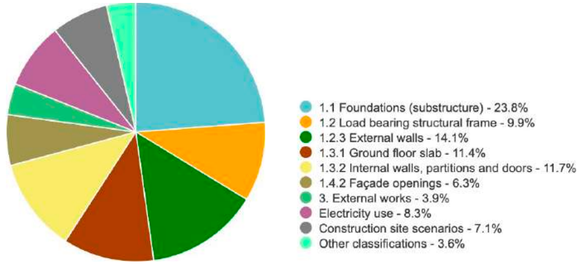
LCA Data used & results

Reference : Self-build hempcrete house, Suffolk Design

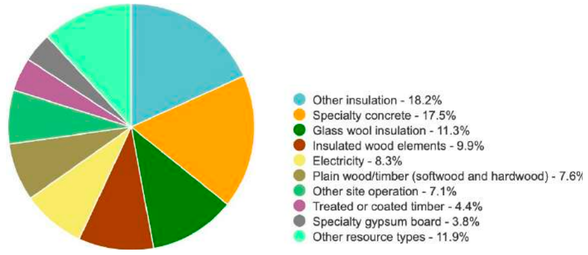
MASS CO_2 IClassifications



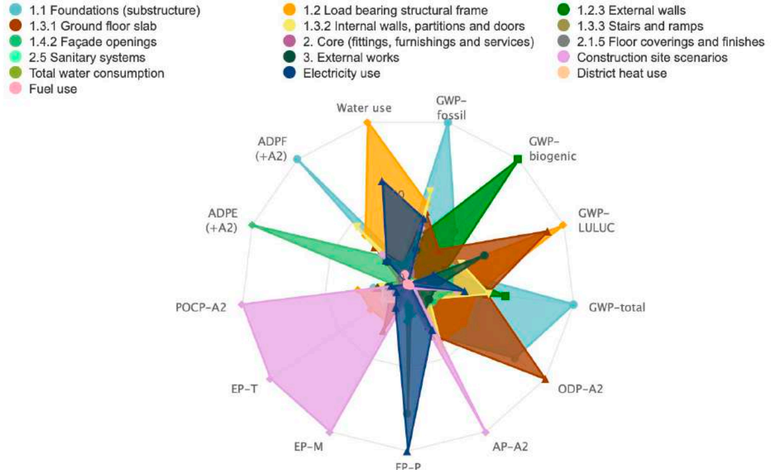
GLOBAL WARMING POTENTIAL TOTAL KG CO_2 IClassifications



GLOBAL WARMING POTENTIAL TOTAL KG CO_2 Iby resource types



SPIDERGRAM GROUPED BY BUILDING PARTS BREAKDOWN



LIFE-CYCLE IMPACTS BY STAGE