HERITAGE & ARCHITECTURE GRADUATION STUDIO

URBAN ECOLOGY LAB HEMBRUG

PORTFOLIO

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Heritage & Architecture Graduation Studio:

REVITALIZING HERITAGE: HEMBRUG

COLOFON

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INTRODUCTION

The graduation studio ‘Revitalising Heritage’ revolves around the former military production site Hembrug. Since the re-opening of the terrain in 2018, Hembrug has been part of the development plans of the surrounding cities. Due to this re-opening, the following two questions for this graduation studio arise: ‘What is the tolerance for change of this cultural historical site of Hembrug?’ and ‘What is the meaning of an ensemble of existing buildings in the context of planned urban development?’

In the MSc 3, the site and its context were analysed, to form a foundation for the design project and an initial design approach was pitched. The MSc4 elaborates on this design approach. The goal is to deliver an in-depth design project, substantiated by the executed research. This reflection is part of the graduation project and contains an answer to the question of how and why the design approach, defined in the MSc3, did or did not work, and to what extent.

This graduation project and the main topic that will be addressed derives from the context of the Hembrug terrain, in which the studio ‘Revitalising Heritage’ is placed. The problem statement, based on the initial site analysis, illustrated that the green and historical character of the Hembrug terrain may disappear due to the new proposed developments. The peninsula Hembrug is located between the expanding cities of Amsterdam and Zaandam. Because of its formerly closed function as a military production complex, the nature on the site and especially the ensemble named ‘Plots in the woods’ has been able to develop and grow without any human interference. Since its re-opening, Hembrug has become part of the expansion plans of the surrounding cities. These plans for extra housing and working spaces are pushing the greenery further outside of the city centres and putting pressure on the ecological quality of the area.

RESEARCH QUESTION

This led to the research question that will be explored in this project. ‘How can the re-design of the heritage site of Hembrug facilitate ecological growth and increase biodiversity while contributing to the public awareness on the importance of preserving nature?’

DESIGN ASSIGNMENT

The re-design needs to address these ecological issues on a social and practical level, while creating synergy between the heritage buildings, the heritage landscape and the new interventions.

GRADUATION TOPIC

The combination of natural preservation and architectural design is a field that has been developing lately under the term ‘urban ecology’. This research field ventures beyond the traditional approach towards ecology and introduces the city as an ecosystem of its own. ‘Urban ecology’ deals with questions such as: ‘How to deal with the intensification of cities while improving the existing ecological systems?’, ‘How is the human health impacted by nature in the cities?’ and ‘What is the role of the architect in these new approach towards designing cities?’.

The location of Hembrug lends itself perfectly to explore the theme of ‘urban ecology’. Traditional ecological institutes, such as the NIOO-KNAW in Wageningen, are typically located in rural areas. However, as Kowarik (2011) states: “Cities can be richer in plant species, including in native species, than rural areas.” Hembrug lays between two major cities which could serve as case studies, the site contains plenty of buildings for possible future expansion and is close to water and greenery which provide for testing locations and field labs. The posed program for the ‘Plots in the woods’ ensemble on Hembrug is therefore a research facility focussed on urban ecology.

MASTERPLAN

PLOTS IN THE WOODS

The master plan is developed for the ensemble ‘Plots in the woods, also known as ‘the pyrotechnics department of the Hembrug terrain. The plots in the woods’ were closed off from the rest of Hembrug for safety reasons which resulted in a very green low-density area. Currently, a lot of the buildings on site are not in use, or only have a temporary function.

In the plots in the woods several elements of interest can be defined. Among the small-scale buildings are the shell roofs, formerly testing buildings, built in the 1950’s and the farms, storage buildings from the 1900’s, listed as monuments. The plots contain one very large-scale building, called the box. It was built in 1991, forming a barrier between the plots and the rest of Hembrug and clashes with the small-scale buildings. These buildings are implemented in the landscape.

Noteworthy landscape elements are the trees and greenery, the pipelines, the earth walls and the ditches. They were all originally functionally designed but now contribute to the ecological quality and aesthetics of the site. The landscape on site is of great importance, especially looking at the surrounding urban environment, where extensive green areas become rarer every day.

The analysis identifies three different kind of issues. Disconnection, lack of activity since the closing of the site in 2003 and pressure on the ecological quality of the region/urban area.

To solve these issues this graduation plan proposes to:
1) Improve the accessibility of the site.
2) Introduce new activities into the area that suit both the heritage buildings and landscape.
3) Contribute to the public awareness on the importance of preserving nature by intervening in the landscape.

All together this will form a coherent intervention combining different scales.

PROGRAMMATIC APPROACH

The posed program for the ‘plots in the woods’ ensemble on Hembrug is therefore a research facility focussed on urban ecology.

The theme of urban ecology is strongly represented in the program envisioned for the area of Hembrug, but also in the design approach for the area itself. The landscape and architectural design should reflect this combination of nature with the existing built fabric and can be viewed as an experiment to test the principles of urban ecological design.

One of the core principles of urban ecology is that the design of the urban environment should benefit both humans and nature. Therefore, both humans, including ecological researchers and public visitors, and nature can be defined as target groups for this design. The proposed program for the site should therefore include research facilities and educational or experience related facilities. The educational and experience facilities will consist of a visitor centre, a café and walking routes through the landscape. The research facilities will contain offices, labs and an event space.

The café, walking routes and event space are where the visitors and research staff can directly interact with each other and with nature. Diagram ... shows the relation between the activities and their scale. The landscape is the unifying element in this programmatic approach.

The placement of the activity is dependent factors, such as the current program and the location. The box is the designated place for the flexible space, because of its size and location along the main road. It will contain the event hall, space of supporting offices and integrating the landscape into the large hall. The café, restaurant and visitor centre will be located in the farm buildings. They provide more intimate spaces and with their central location are accessible from all sides of the plots. The labs and offices will be distributed over the shell roofs. The conditions in the shell roofs because of the former testing functions, suits the new practical research function. They are also spread throughout the landscape, making a direct relation with the possible field labs.

The program proposal brings us to the design proposal for the master plan, consisting of three main interventions.

1) Eliminate the barrier that the ‘box’ forms to ensure visual and physical continuation of the public green space. This means dealing with the existing structure of the building and its surroundings.

2) Emphasize and extend the existing landscape features (ditches, earth walls, green), bringing more differentiation through the plots.

3) Introduce new activity in the small-scale buildings. The current buildings should maintain their authenticity; therefore, the inventions should not clash with the existing.

Besides these interventions, the ecological and sustainable approach towards the program also asks for a position on energy. There the program also proposes a sustainable energy network. A large surface on site is dominated by the box. This scheme proposes to use the roof surface to generate energy and heat. These can then either be distributed over the site through the network, creating a new use for the old pipelines or be stored in the heat cold storage. Redundant energy can be used for the charge stations for electric car, promoting a sustainable attitude towards transportation when coming to the site.

ROUTING

Pedestrian routing

New ecoduct

Bike routing

Car routing

Protected forest

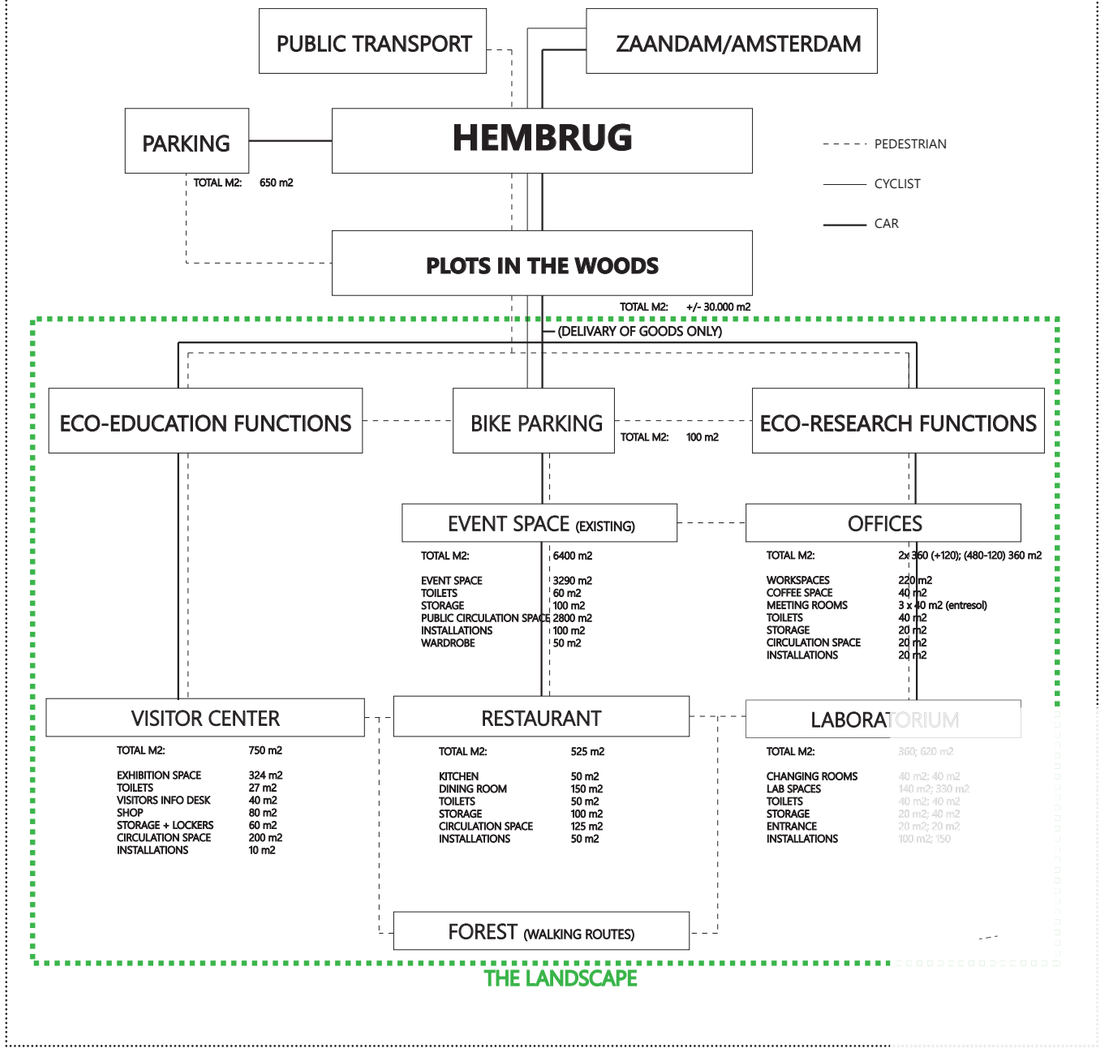
Water

New Ecoduct

Existing forest

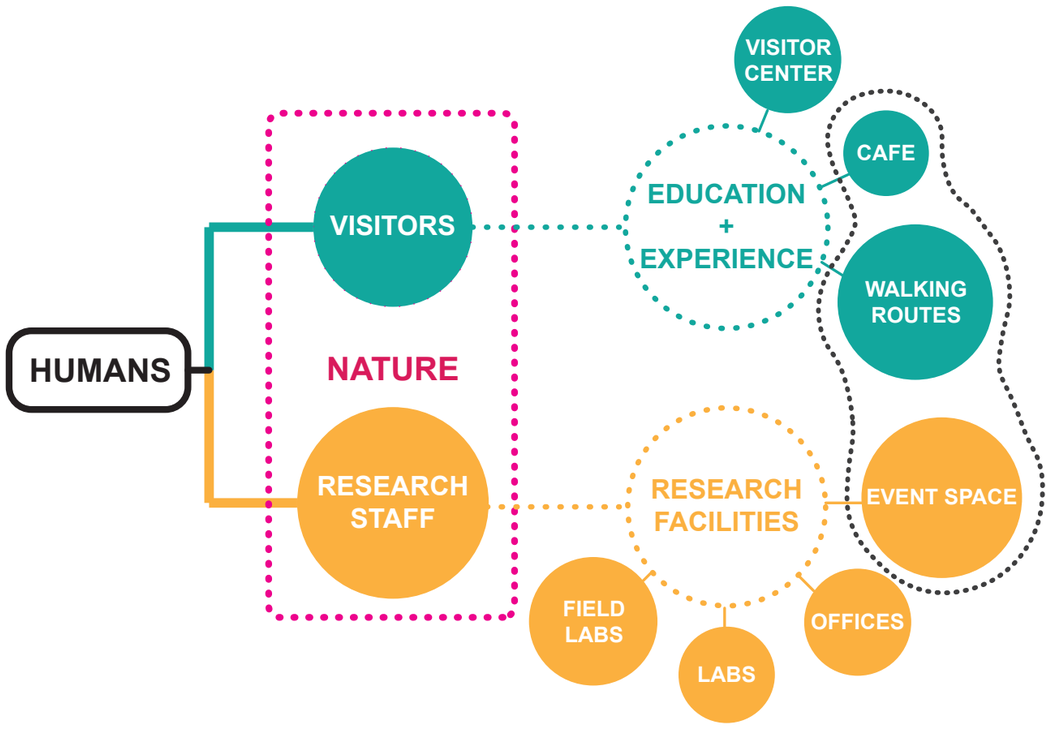
Field lab

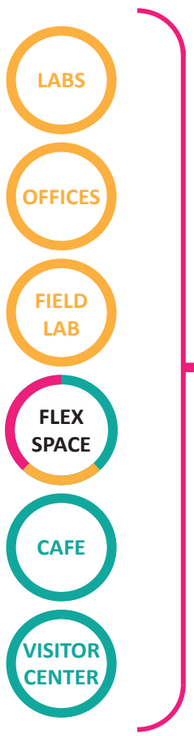
Adapted landscape



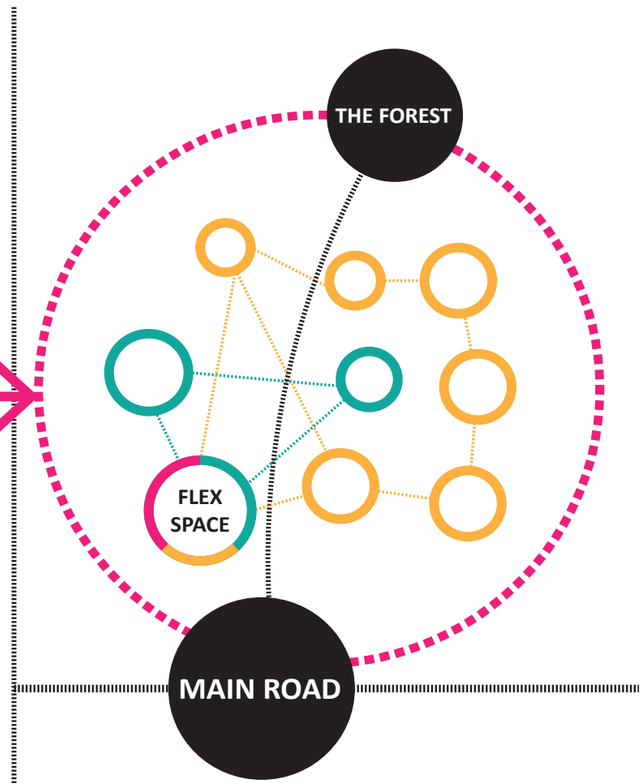
Programmatic organogram

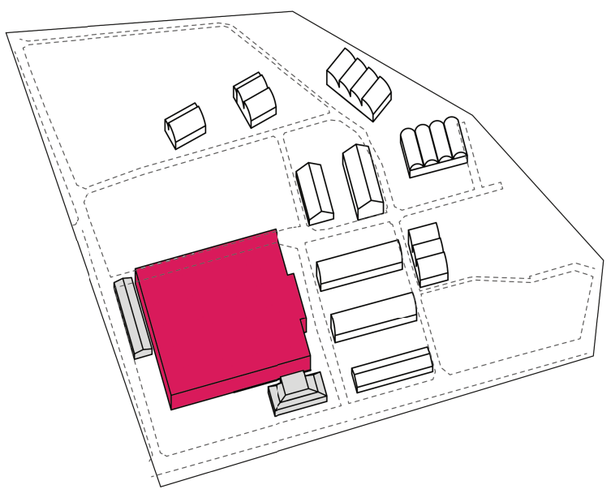
PROGRAMMATIC APPROACH



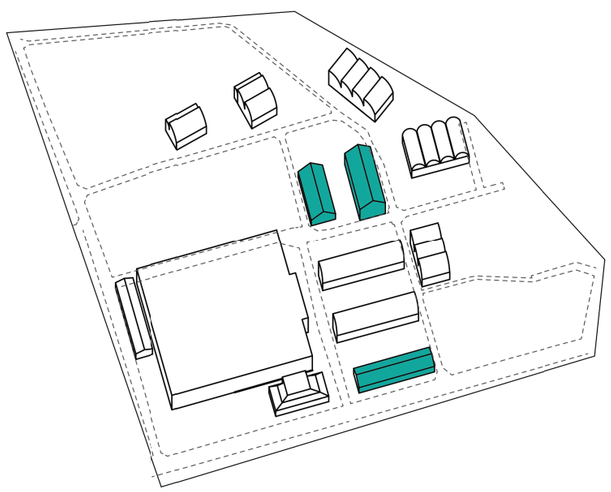


PUBLIC
LANDSCAPE

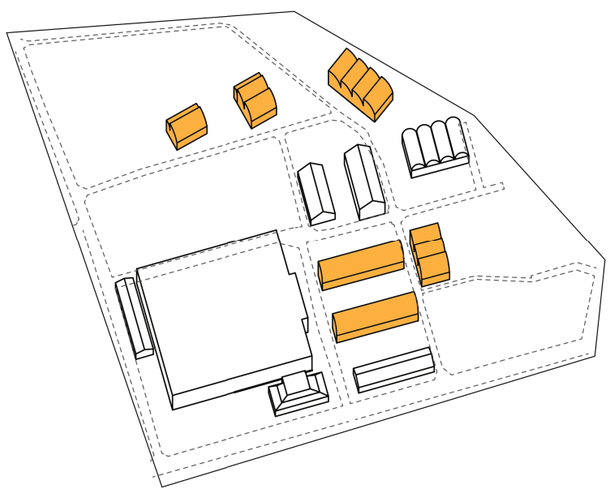




FLEX SPACE = EVENT HALL + OFFICES + LANDSCAPE

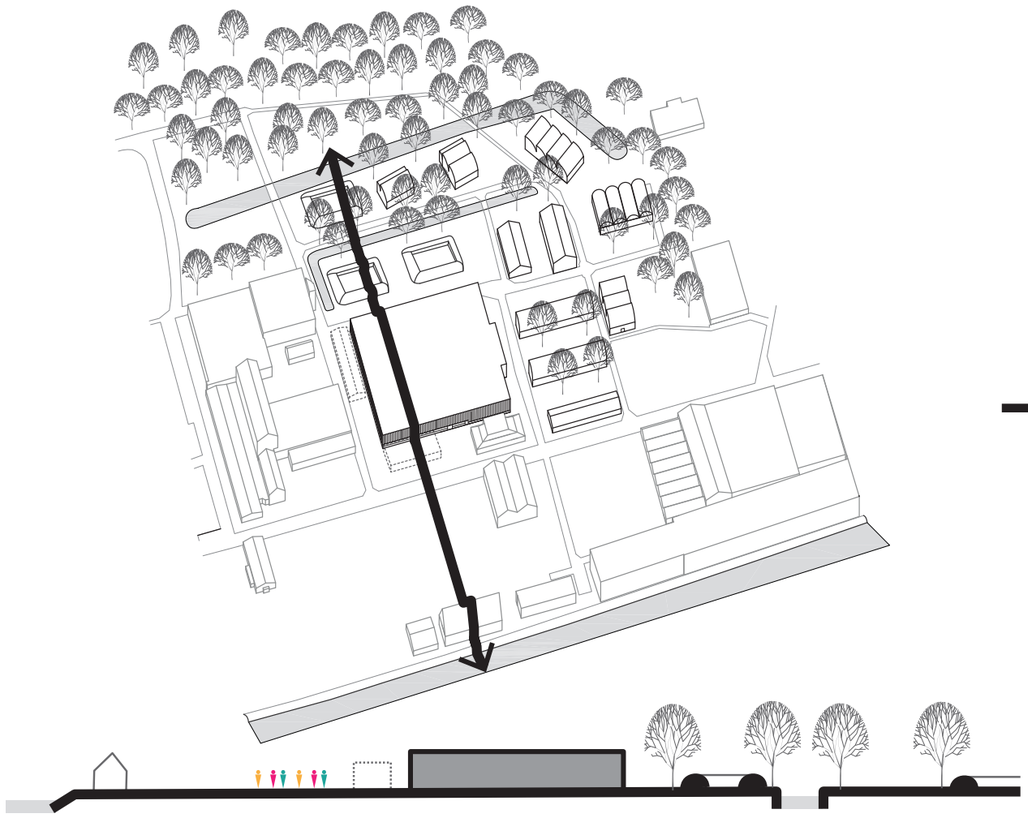


CAFE+ RESTAURANT + VISITOR CENTER

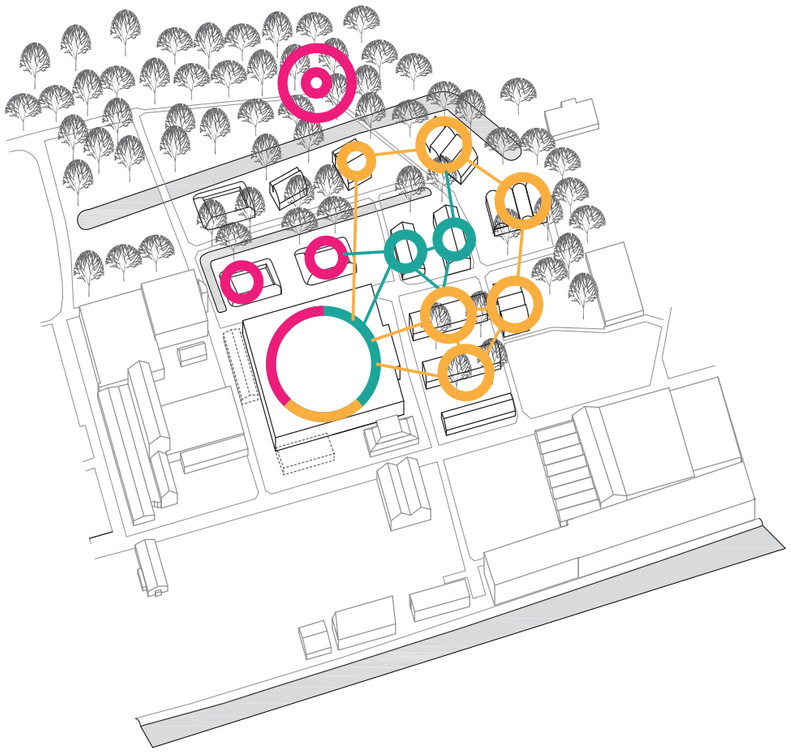


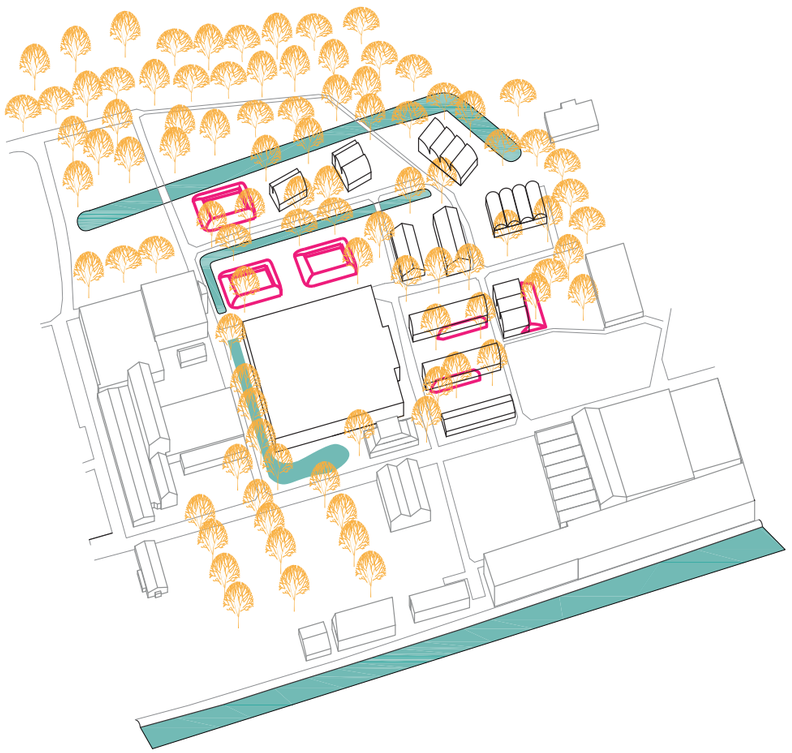
LABS + OFFICES

INTERVENTIONS



INTERVENTIONS





THE BOX

EXISTING

The box is the latest addition on site with a surface of almost 6000 square meters. Because of its function as a production hall, the façades were closed off from the surroundings, with daylight mainly coming from above. The building was constructed using a very minimal steel structure, which is still in good condition and should be re-used to reduce material waste.
The building methods offers an open floor plan, creating flexibility for future adaptations. It is also characteristic for the industrial design approach from the 1990's. Such as large-scale building should maintain this flexibility to extend its lifespan. The scale of the building in contrast to the rest of the plots shows another layer of the historical development of the site.

INTERVENTIONS

The existing façades and roof plating are removed, leaving a stripped steel structure. A new glass façade is placed 10 to 20 meters back, creating a public walkway around the building. The dispersed skylights are replaced by one central skylight above the event hall. Last, internally additional structure is placed to carry the new roof, the second floor and internal walls.

ARCHITECTURAL DESIGN

In most of the other buildings on site, the design aimed to ensure a visual connection of the green. However, the literature research on urban ecology (Mangone) also indicates that: "The design of constructed environments has a significant impact on the performance and value of building projects, from economic, social, and ecological performance perspectives. More specifically, the integration of micro forests into office environments was found to yield a diverse range of building, worker, and ecological performance benefits." This means that the green will not only around the building, but also inside the building. The scale of the box lends itself very well to experiment with this aspect of urban ecology.

So therefore, the designated function for the box consists of space for an event hall, supporting offices and an internal green space. The supporting functions are located in two separate boxes, with the entrance, toilets, storage and installations on the ground floor and space for offices and meeting rooms on the second floor

LANDSCAPE DESIGN

The box is currently in use as an event hall. This might make one think that the function of the box has not changed. However, the new layout and programming of the box is strongly related of the concept 'sustainable in time'. Currently when no event is taking place, the building is closed off. The new design proposed a flexible layout, which can be utilized all day and even when 'empty' plays a role in the ensemble and remains accessible as a public green space.

Sustainability cannot solely be achieved by designing a sustainable building, the users also play an important role. Therefore, the building design aims to promote sustainable and ecological behaviour and awareness. "Extant research indicates that frequent, positive interactions with natural environments and processes, such as in one's daily lifestyle, are particularly effective at promoting ecological behaviour."

The green areas in the central hall will be filled with temperate climate plants, so similar to the exterior vegetation. The layers and seasonal variations offer a diverse spatial experience for the users. With the sight-lines on eye level kept clear along the central routing and the internal seating space sheltered from

exposure by the surroundings plants

CLIMATE

The box is the largest building on Hembrug and is currently not utilized to its full capacity. The climate design for the box is therefore an integral part of the architectural design.

SUSTAINABILITY APPROACH

As the public eye-catcher of the ensemble, the box needs to showcase the possibilities of ecological inclusive and sustainable design. The approach for this design contains three aspects:

Sustainable in energy: With the largest roof area of the Hembrug terrain, the box lends itself perfectly as an energy collector. Over 2000 square meters of PVT (a photovoltaic thermal hybrid solar collector) panels generate both electricity and thermal energy, with can be distributed towards the other buildings on site.

Sustainable in time: The box is currently in use as an event hall. This might make one think that the function of the box has not changed. However, the new layout and programming of the box is strongly related of the concept 'sustainable in time'. Currently when no event is taking place, the building is closed off. That means that a very large space, in a ever densifying surrounding, is empty for most of the day. The new design proposed a flexible layout, which can be utilized all day and even when 'empty' plays a role in the ensemble and remains accessible as a public green space.

Sustainable in experience: Sustainability can not solely be achieved by designing a sustainable building, the users also play an important role. Therefore, the building design aims to promote sustainable and ecological behaviour and awareness. As Mangone (2015) states: "Extant research indicates that frequent, positive interactions with natural environments and processes, such as in one's daily lifestyle, are particularly effective at promoting ecological behaviour. For instance, there is evidence that having repeated, positive experiences in nature while conducting various behaviours and activities may generate positive habits."

REQUIREMENT MATRIX

The requirement matrix shows the interior requirements for heating and cooling, ventilation, acoustics and daylight for 4 different proposed functions inside the event hall, the Box. The main hall of the box can function as a green space, when not occupied. The greenery is a permanent aspect of the building (reference: Performative microforest). The offices and meeting rooms inside the buildings are also permanent functions and therefore have a individual system. The main hall has been developed for three main functions, an exhibition, a lecture and a concert. These three functions all have different requirements, as seen in the matrix below.

The building needs to accommodate all these functions and is therefore equipped with a flexible climate system.

HEATING / COOLING

The climate design of the box utilizes a HVAC system for the heating and cooling of the main hall. Within the flexible use of the building, the main space does not have to be permanently heated/cooled. The HVAC system responds quickly, allowing to adapt to different the functions.
To provide the minimal temperature of 10 degrees Celsius (required for the temperate plants) and the heating and cooling for the offices, a second system of low temperature floor heating is placed on selective areas.

VENTILATION

Active ventilation (combined with the HVAC system) is needed to accommodate for the large groups of people during events. The input and exhaust pipes are connected to a heat exchanger, diminishing energy use. In the summer, skylights can be opened to let the heat out.

ACOUSTICS

The basic acoustic quality of the space is achieved by the perforated steel roof plates (containing glass wool), the interior walls perforated wooden walls and

to some extend by the greenery and soil elements. The offices contain carpet (20 mm) and acoustic walls. Additional acoustic elements are suspended from the roof structure on rails and can be pulled into the main hall, when necessary. The basic reverberation time is T= 1,2. The additional acoustic panels can change this to T= 1, for example for a lecture.

DAYLIGHT

The central hall contains a large skylight, to collect enough daylight for the plants in the space. The heat input can be diminished by opening the skylights. The plants and trees provide shading for the people underneath. In case of an event, shutters can be closed to eliminate daylight entrance. The permanent functions and circulation spaces don't get direct sunlight, because of the overhang of the roof.

WATER

The rainwater from the roof is re-directed towards the interior and exterior green through the pipes running down the exterior columns and underneath the new concrete floor.

ENERGY

As mentioned, the roof also functions as an energy collector, not only for the building itself, but for its surroundings. A general estimate shows that the PVT panels can generate 408000 kWh per year in energy, which can be used in the other facilities on site.

STRUCTURE

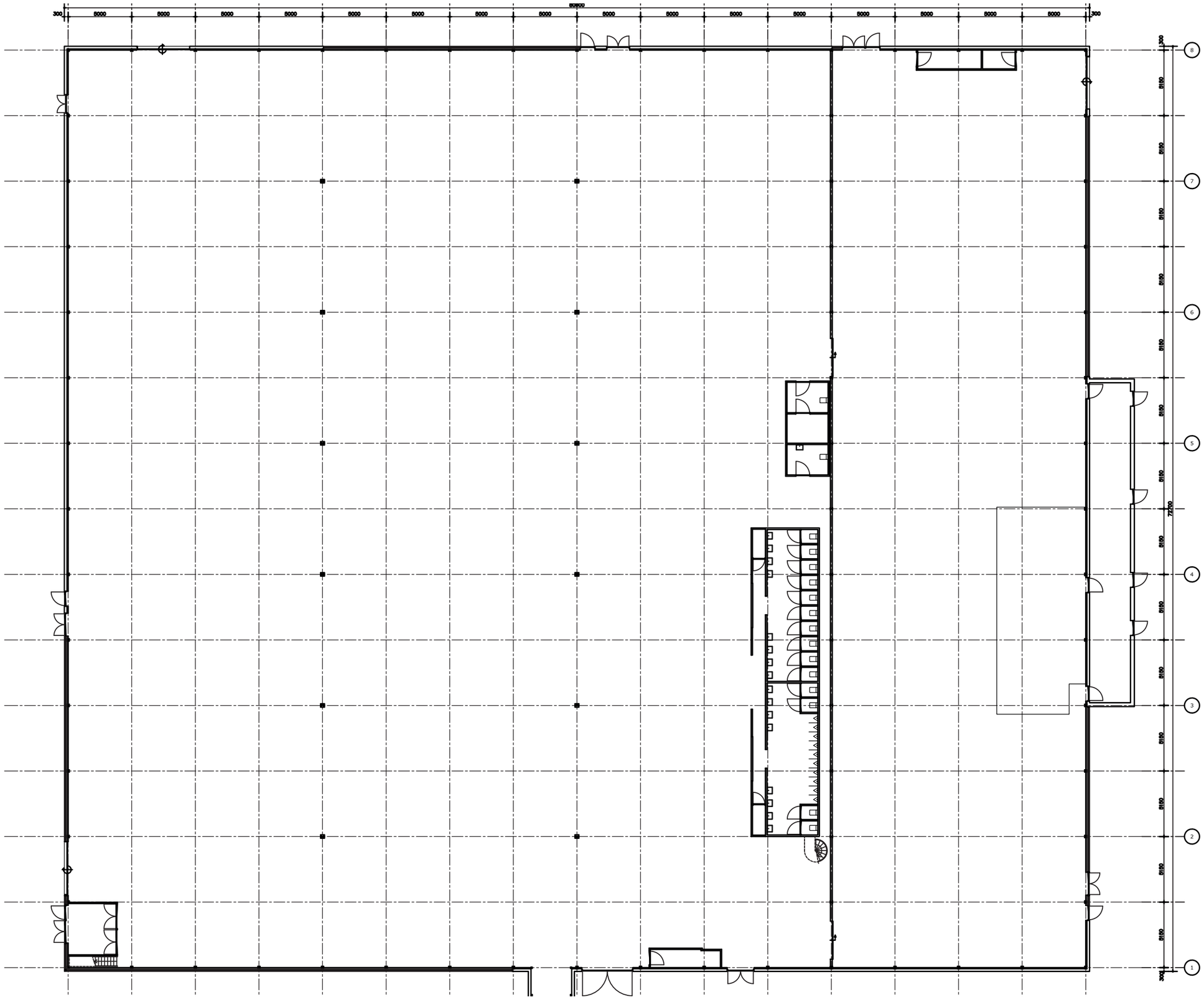
The new skylight is heavier than the existing roof. Because of the minimal capacity of the existing structure, reinforcement is needed to allow for the new skylight. Additional columns are placed and the existing columns are connected to diagonal wooden beams to prevent buckling

DETAILS

The skylights are pitches polycarbonate roofs, to reduce the weight as much as possible. The 16 mm sheets can span 2 meters and are 5 meters long. They are connected to the new insulated roof plates. In-between insulated gutters are placed, which are wide enough so people can reach the roof for maintenance and cleaning. The steel columns are reinforced with diagonal wood beams, to emphasize the contrast between old and new.

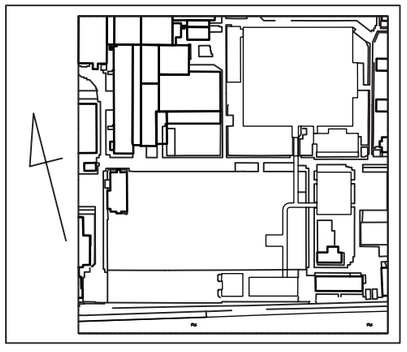
The façades are wood curtain walls, to ensure view from road to forest. The vertical mullion are placed in the same rhythm as steel structure. The facade wraps around the steel columns. As a result, the steel beams on the south and north facade and trusses on the east façade cut through the new façade. Locally tailor-made HSB panels are used to insulate the gaps between the roof and wood curtain wall.

EXISTING SITUATION



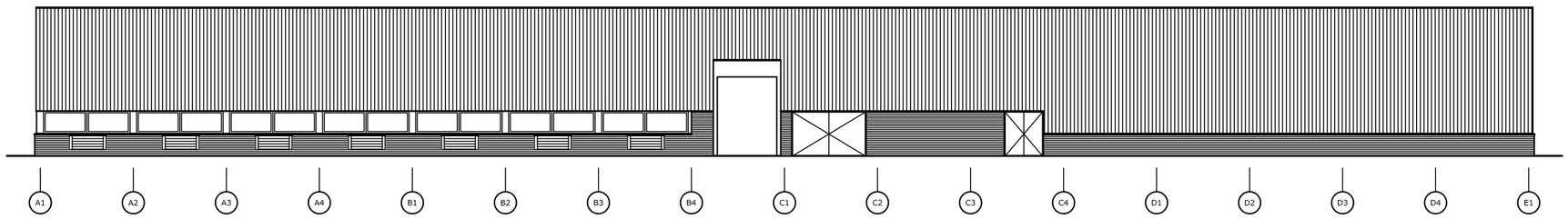
Netto VloerOppervlak
(conform NEN 2580)

ruimtenr.		*NVO*
01.	0.01	4.179 m²
01.	0.02	15 m²
01.	0.03	46 m²
01.	0.04	8 m²
01.	0.05	2 m²
01.	0.06	48 m²
01.	0.07	48 m²
01.	0.08	2 m²
01.	0.09	8 m²
01.	0.10	7 m²
01.	0.11	8 m²
01.	0.20	1.313 m²
01.	0.21	111 m²
01.	0.22	81 m²
01.	0.23	4 m²
01.	0.24	7 m²
totaal		5.887 m²

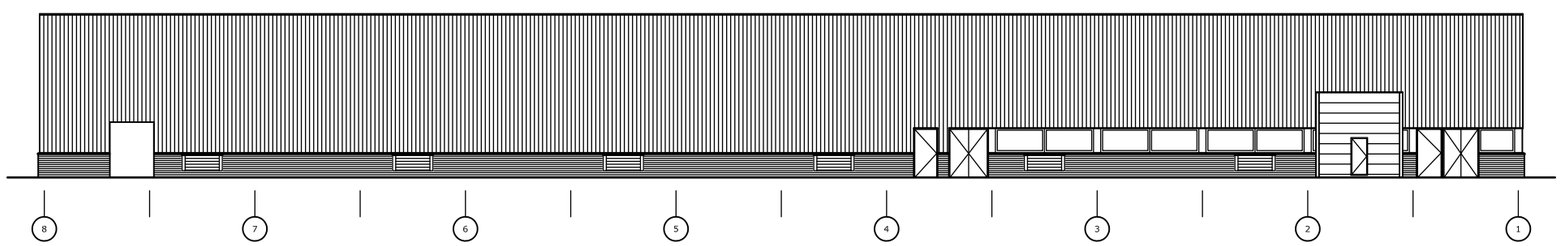


Existing situation ‘Box’ [1:300]

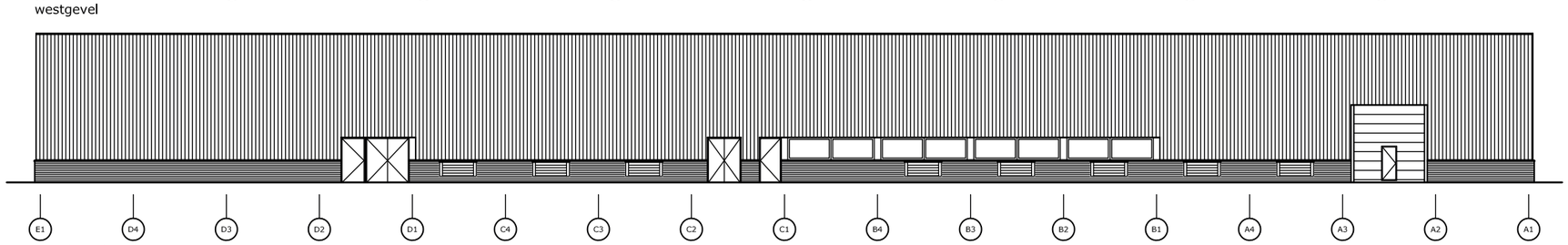
EXISTING SITUATION



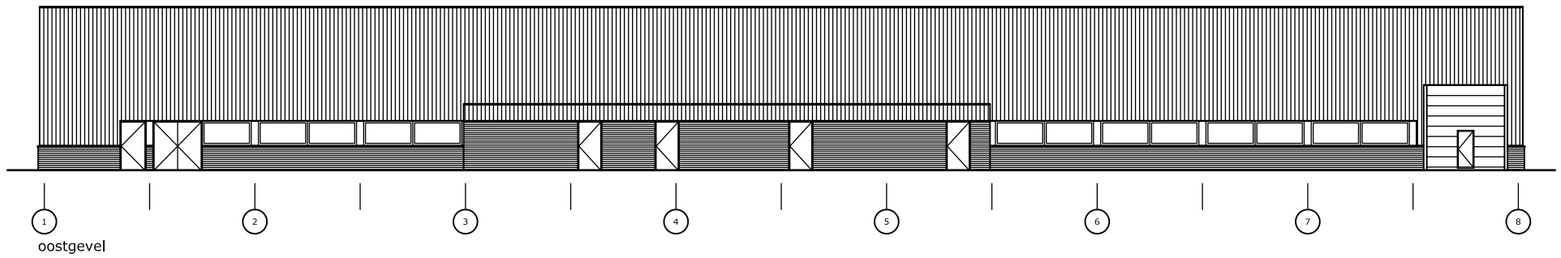
zuidgevel



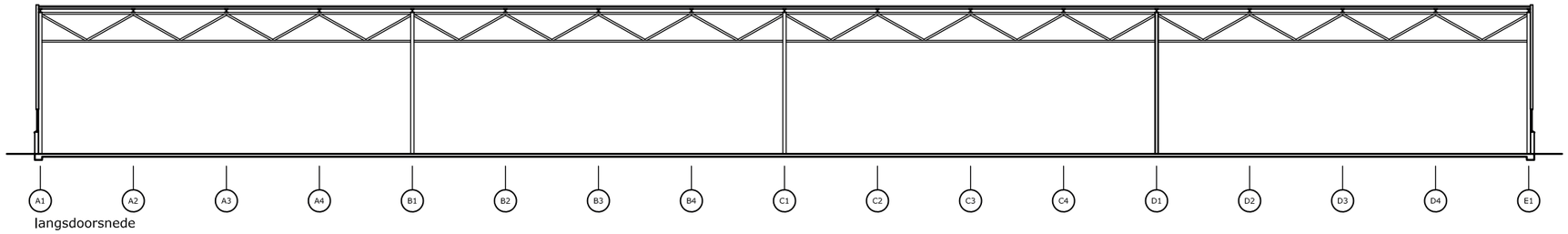
westgevel



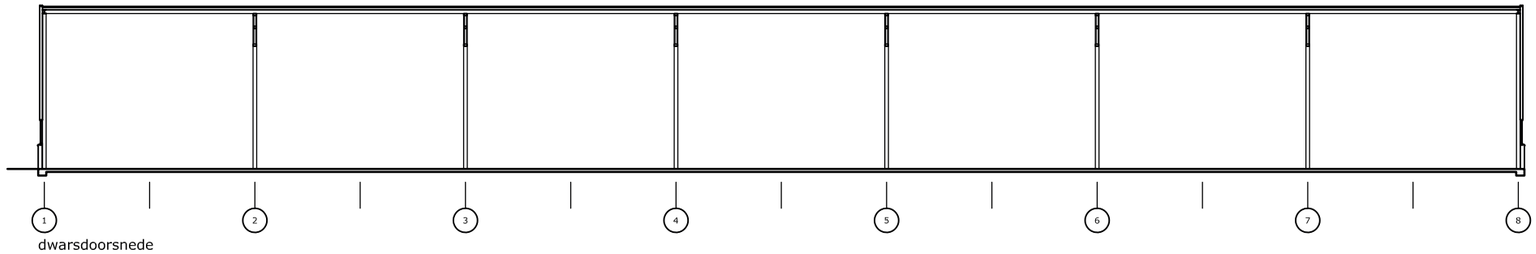
noordgevel



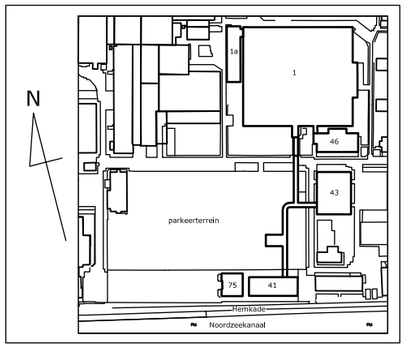
oostgevel



langsdoorsnede



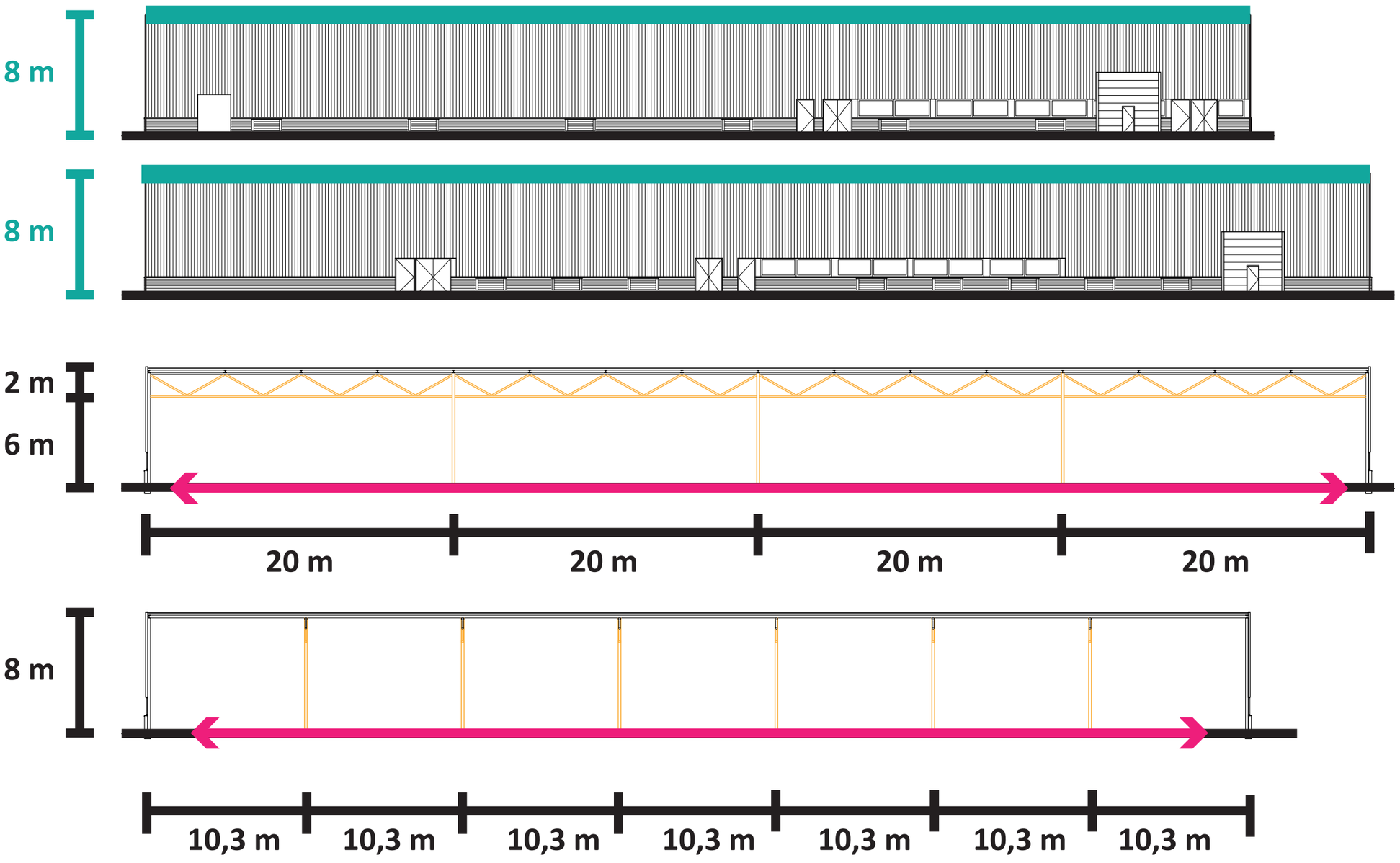
dwarsdoorsnede



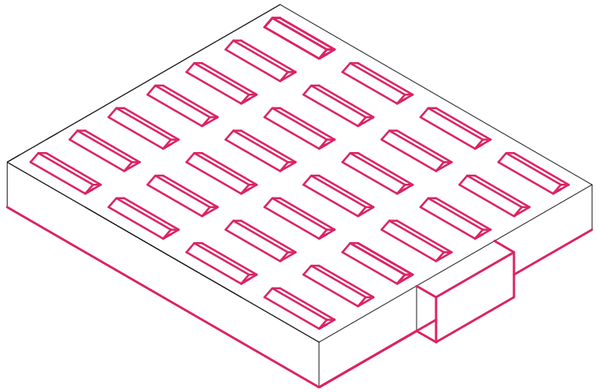
Existing situation ‘Box’ [1:300]

EXISTING [VALUES]

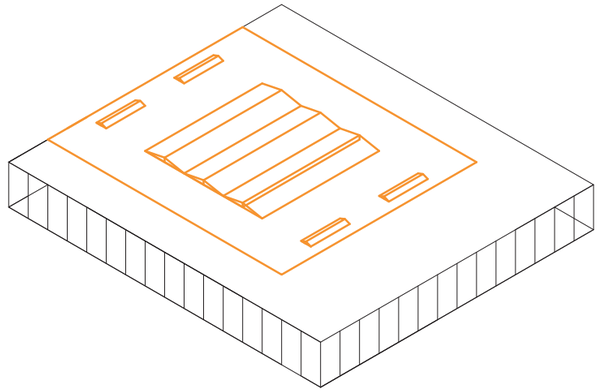
EXISTING STRUCTURE



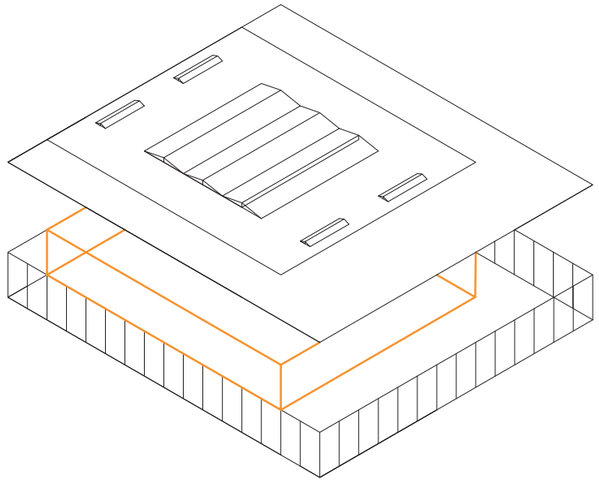
INTERVENTION SCHEME



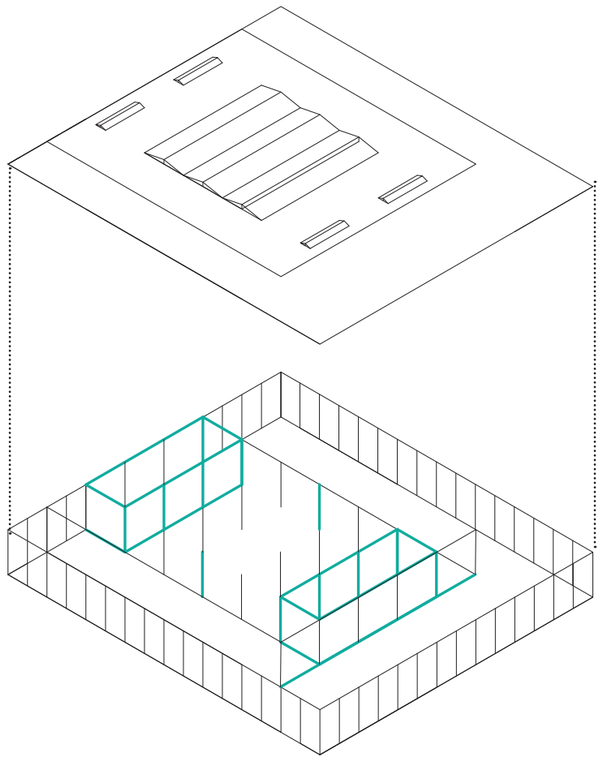
REMOVE EXTERIOR FACADE
+ ROOF PLATING



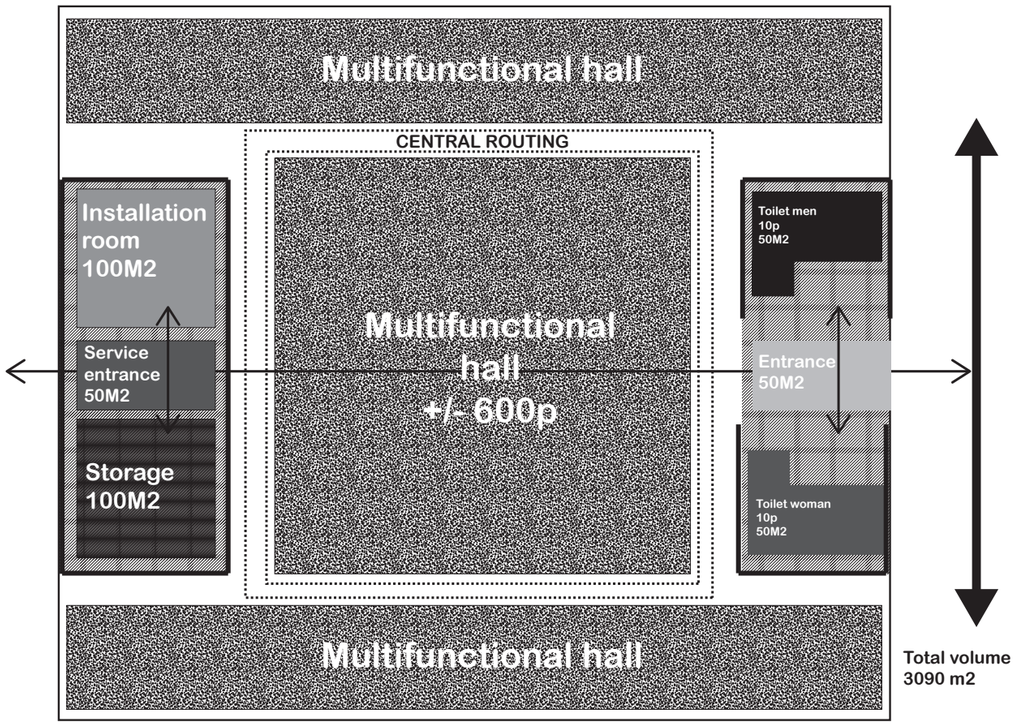
+ CENTRAL SKYLIGHT

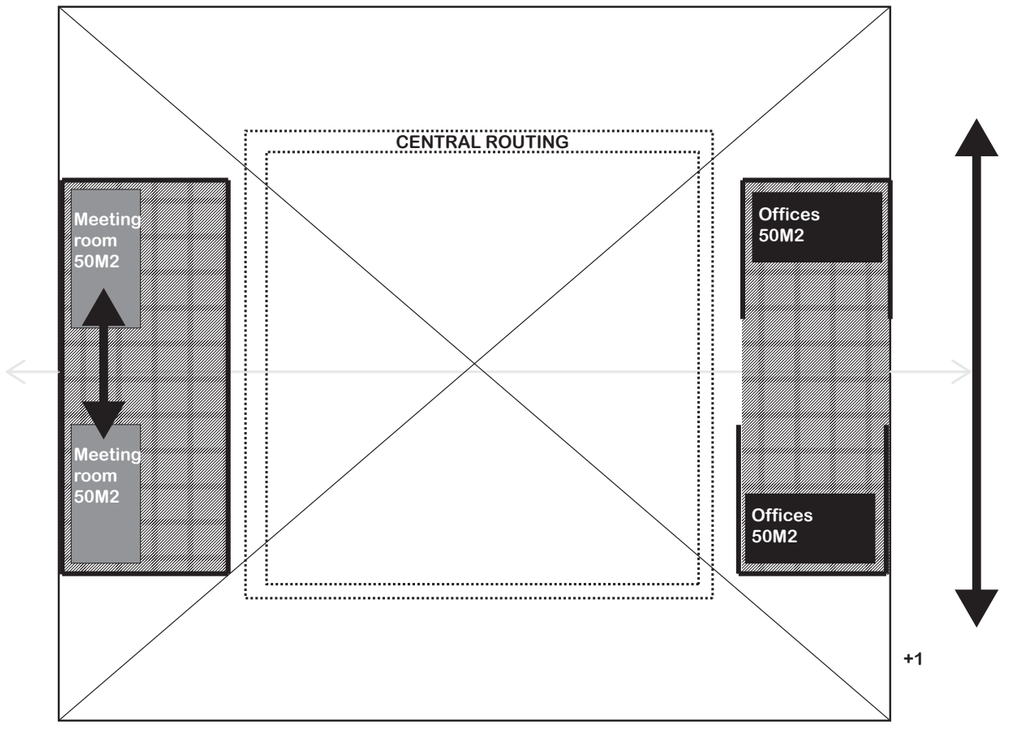


NEW GLASS FACADE



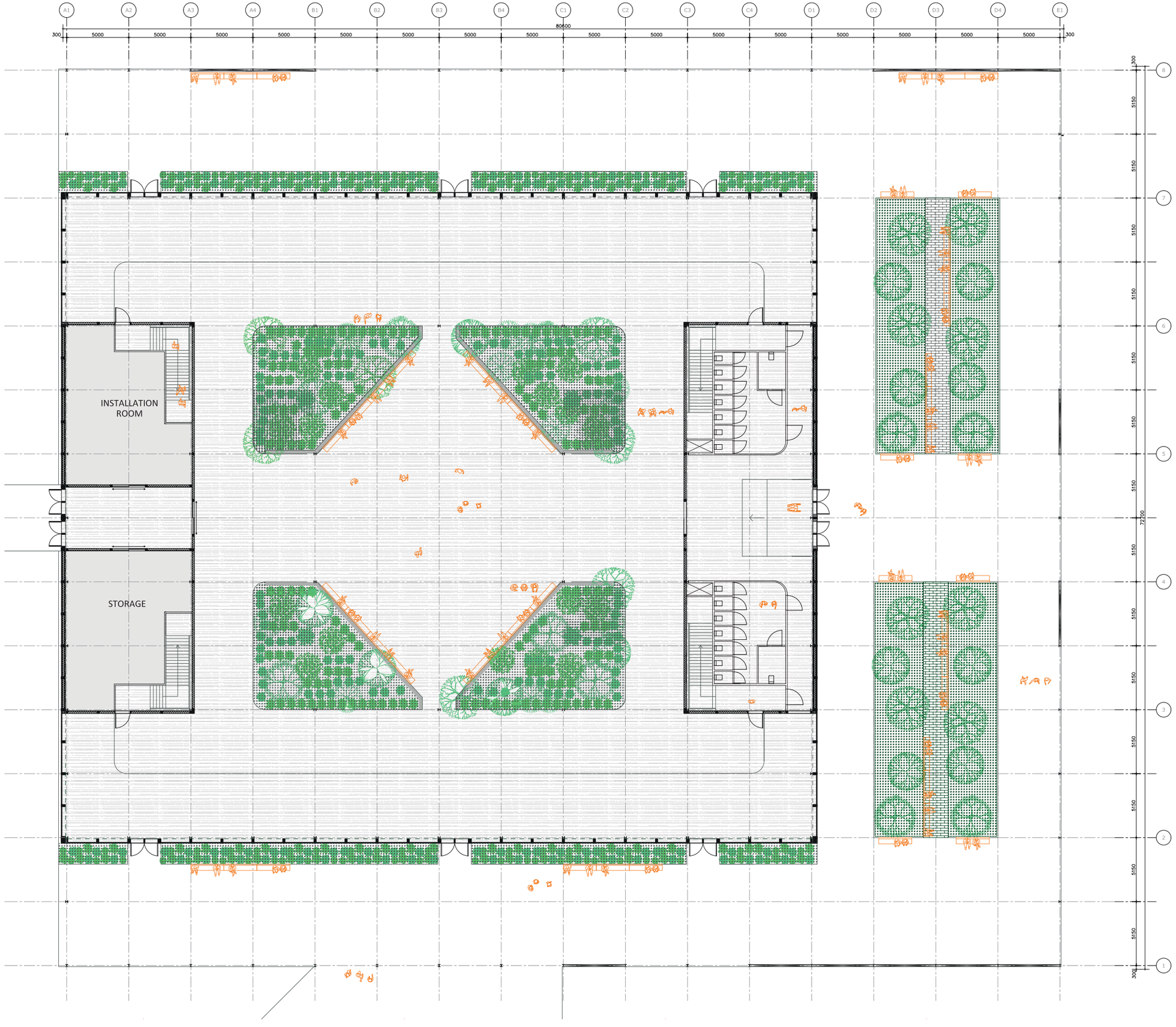
INTERIOR + EXTRA COLUMNS



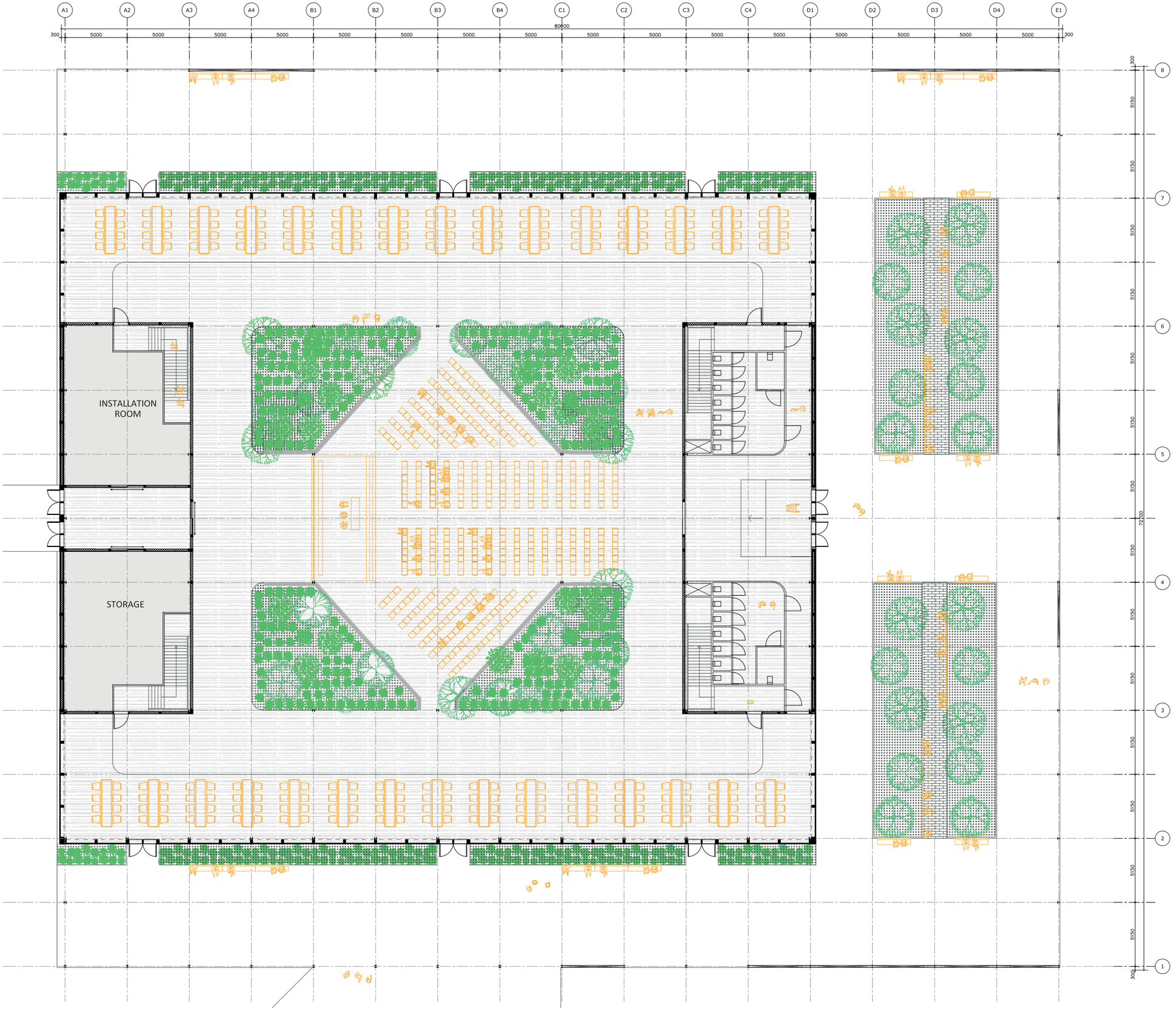


Programmatic scheme ‘Box’

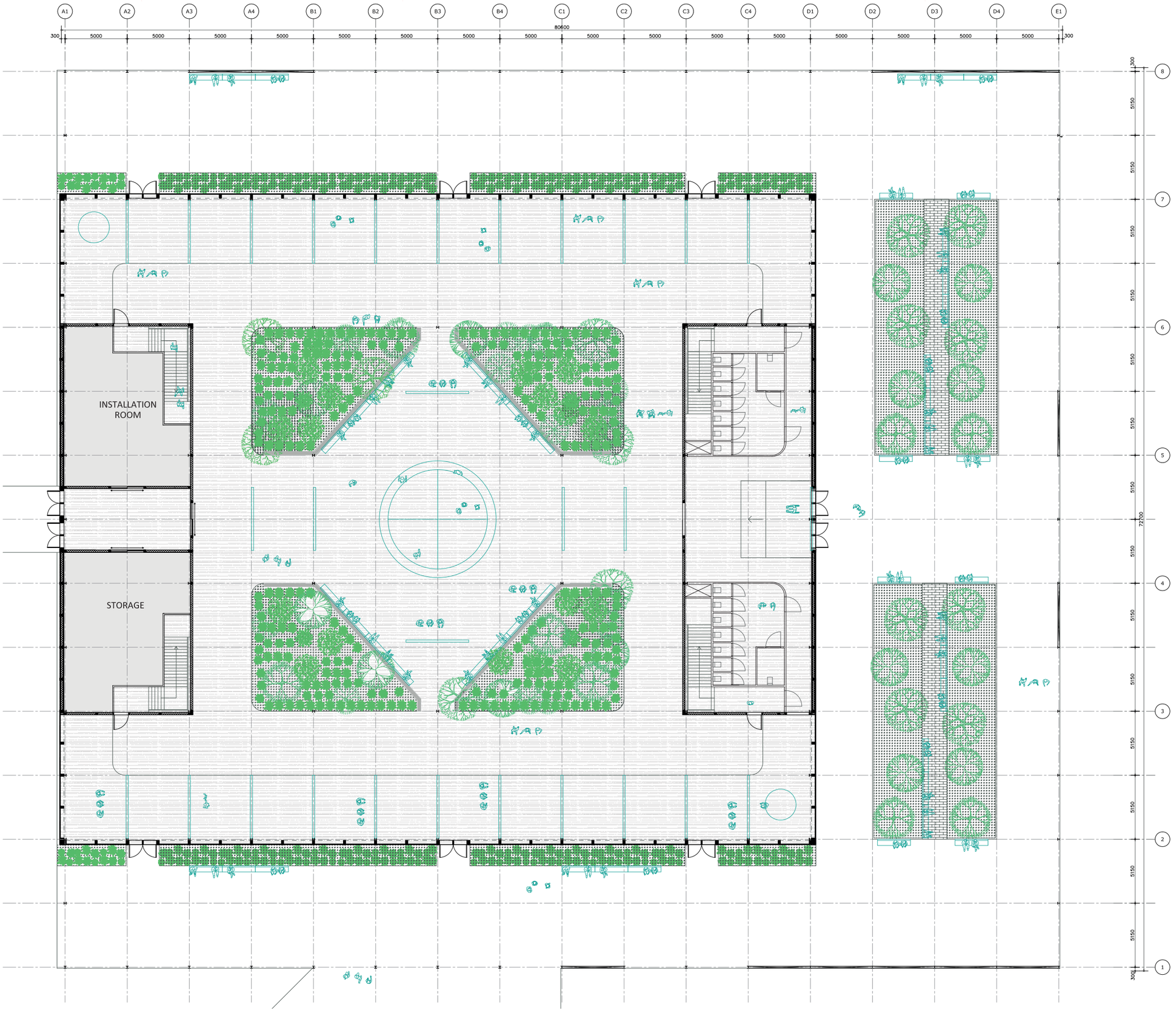
FLOORPLAN [0]
GREEN SPACE 1:300



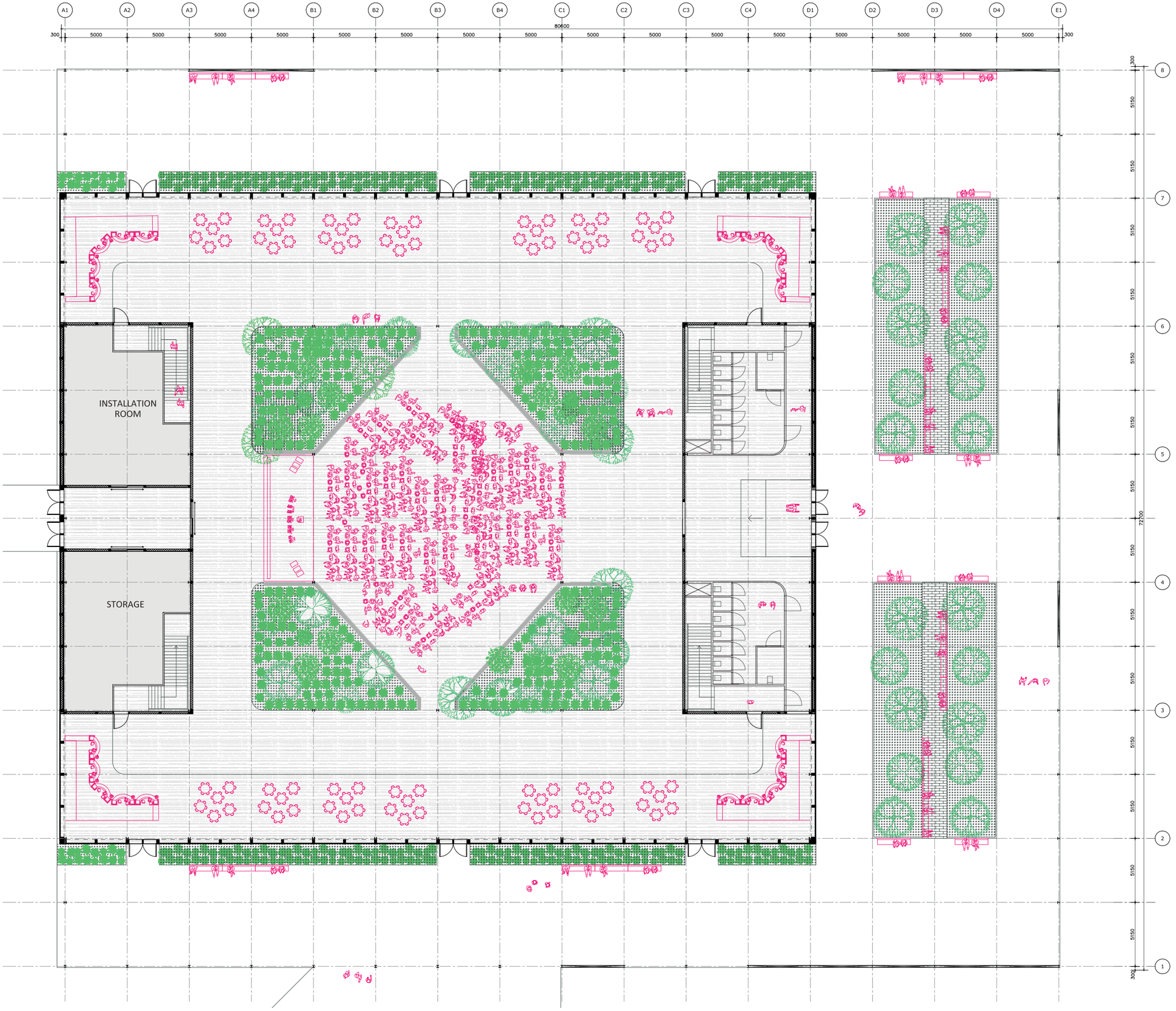
FLOORPLAN [0]
CONFERENCE 1:300



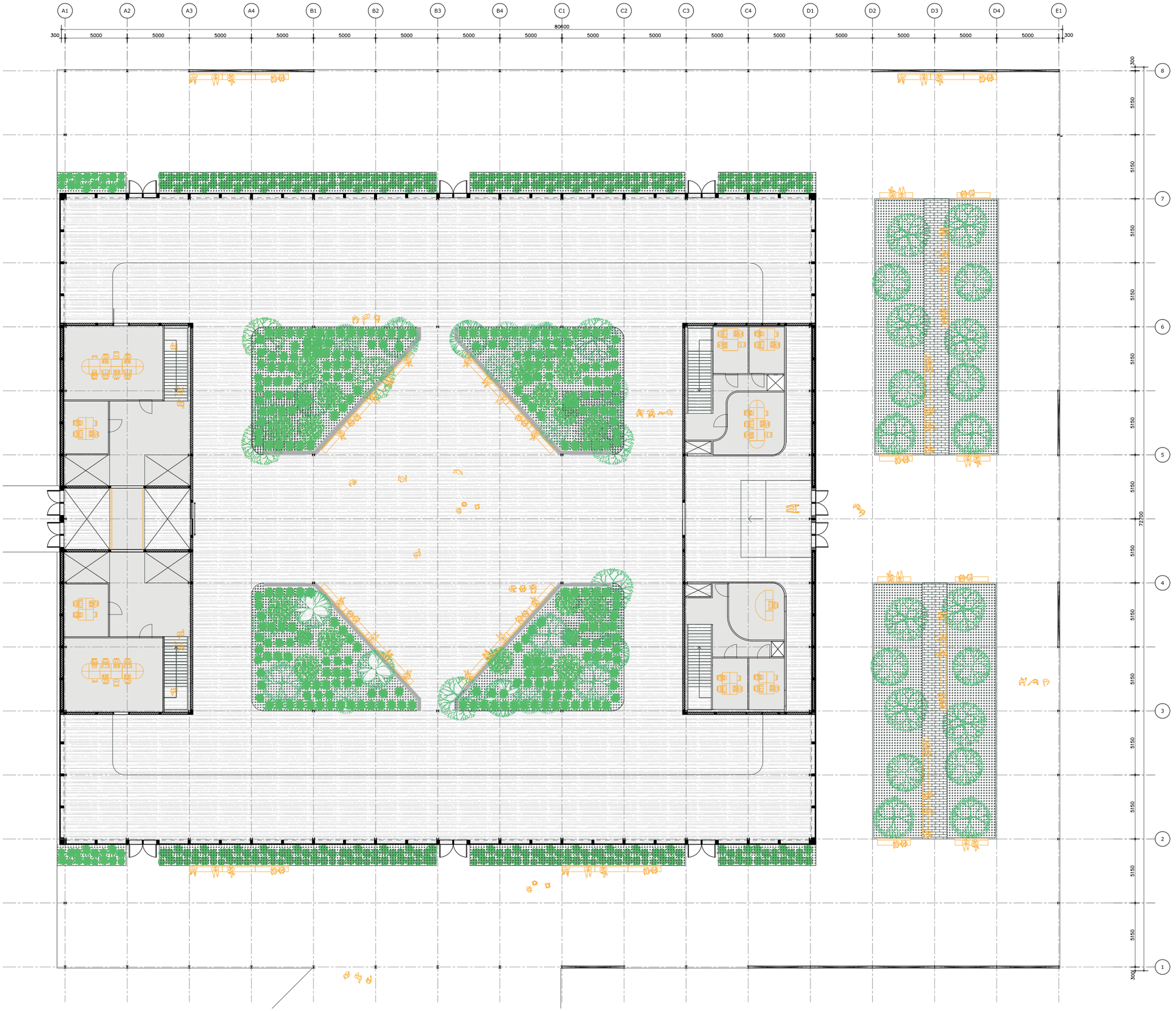
FLOORPLAN [0]
EXHIBITION 1:300



FLOORPLAN [0]
CONCERT 1:300

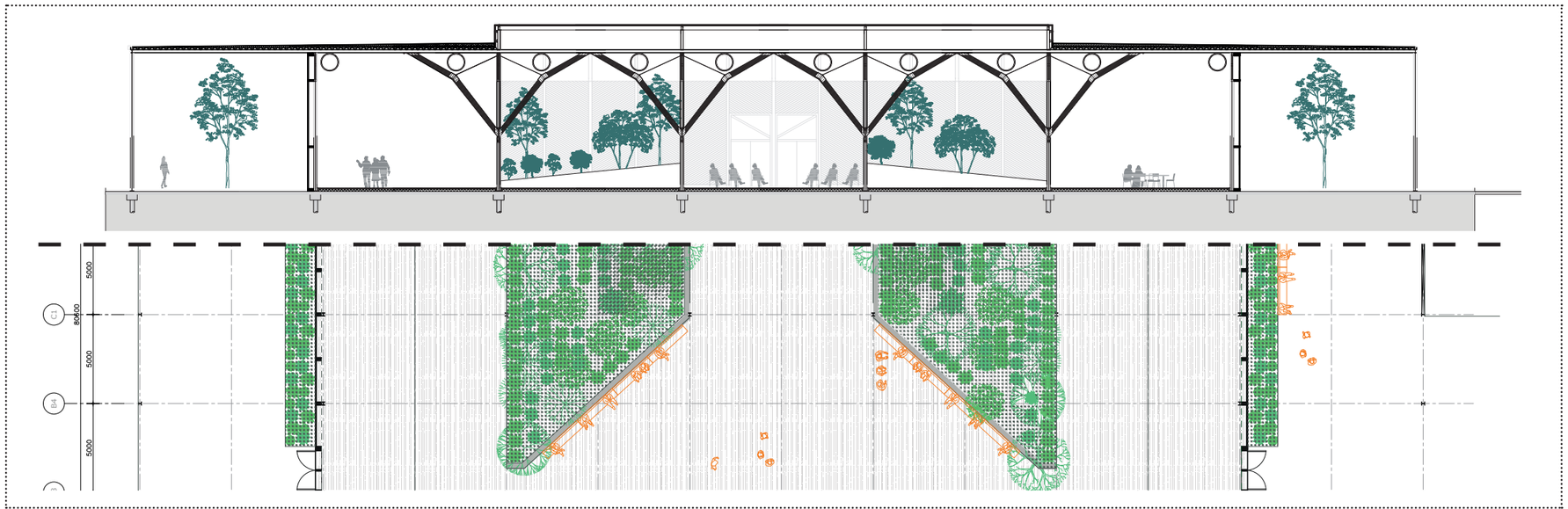


FLOORPLAN [+1]
OFFICES 1:300



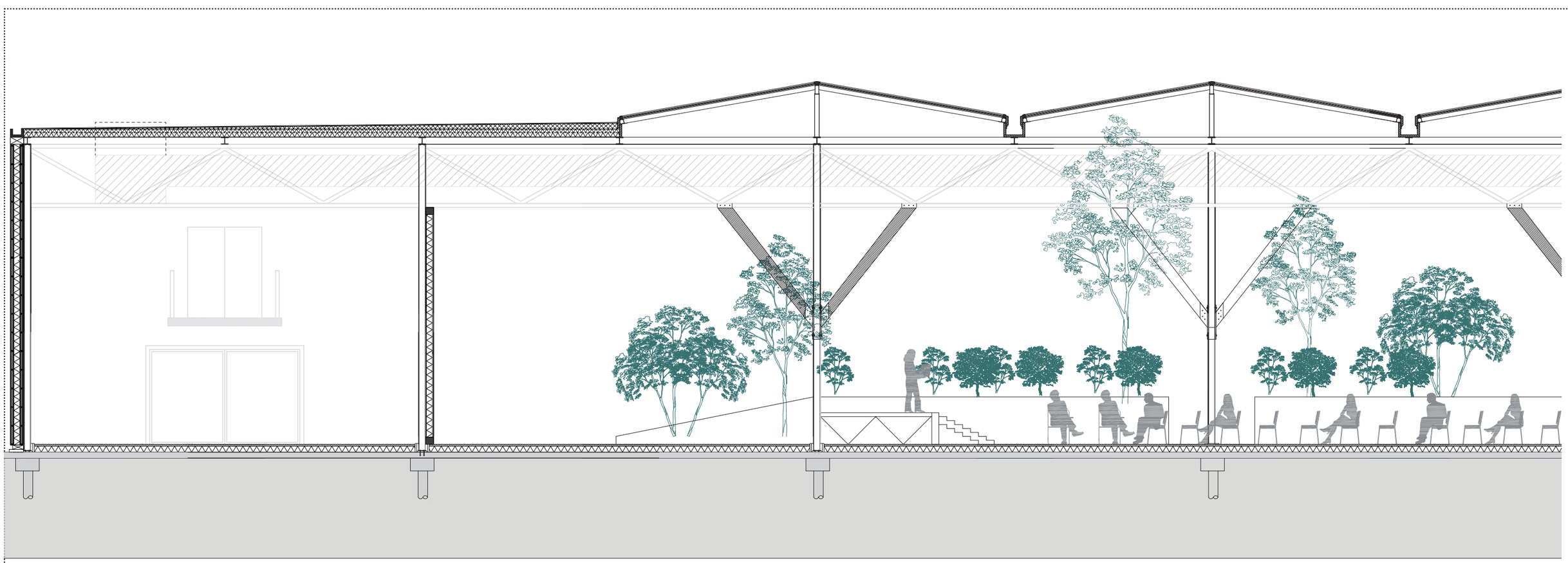
SECTION A+B
1:300

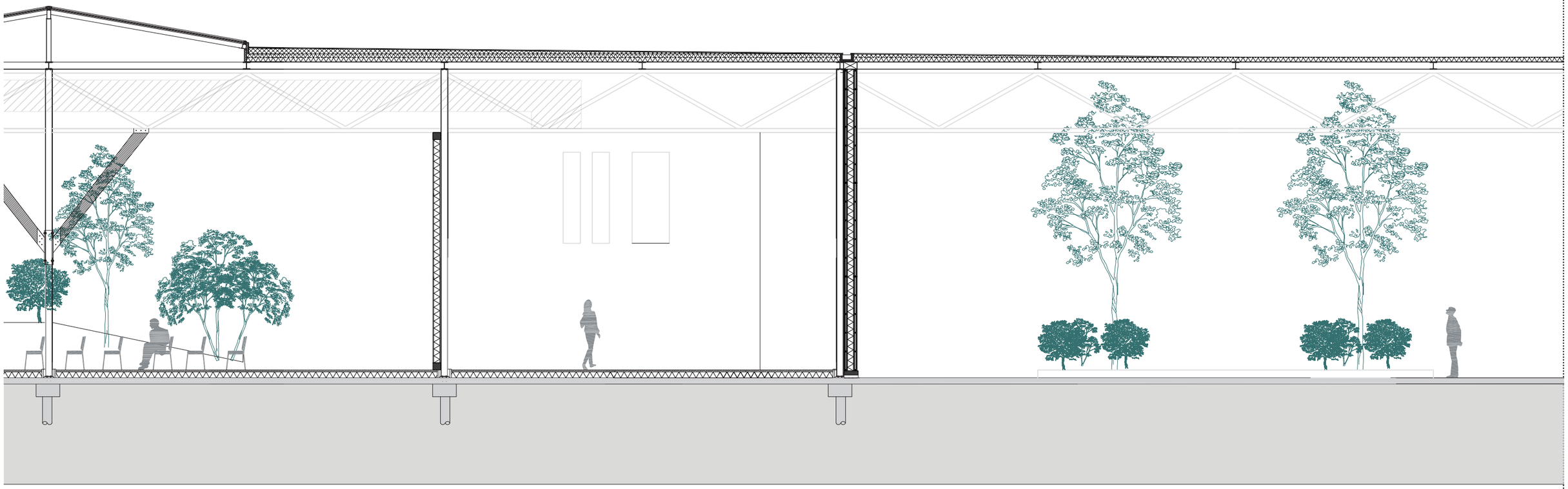
Section A



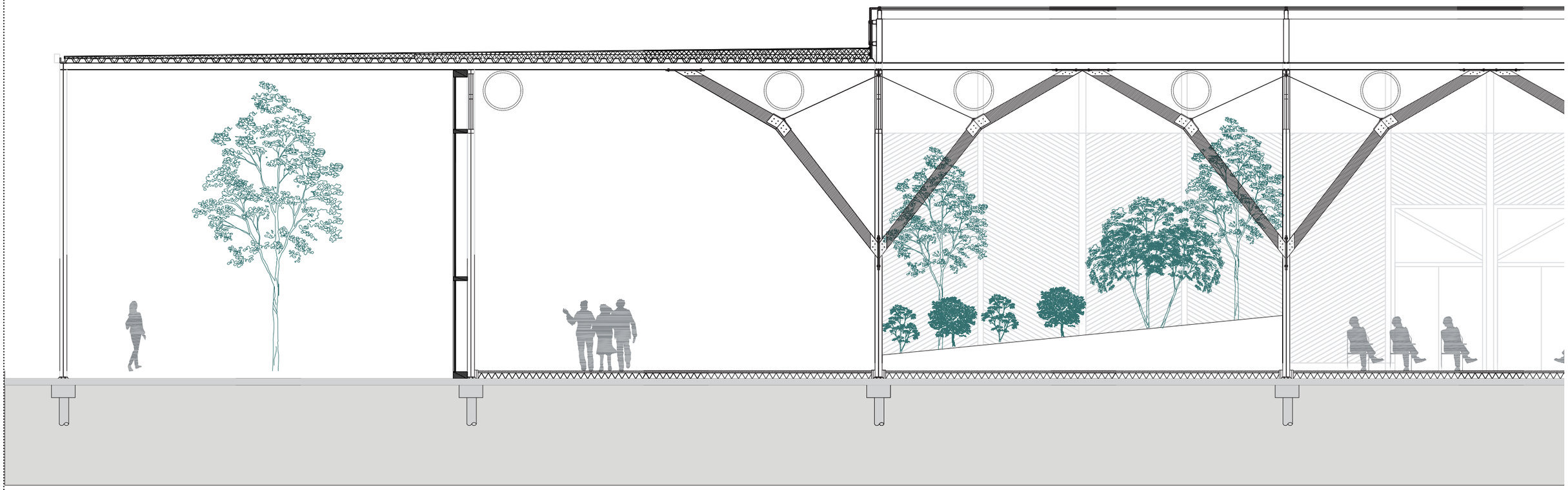
Section B

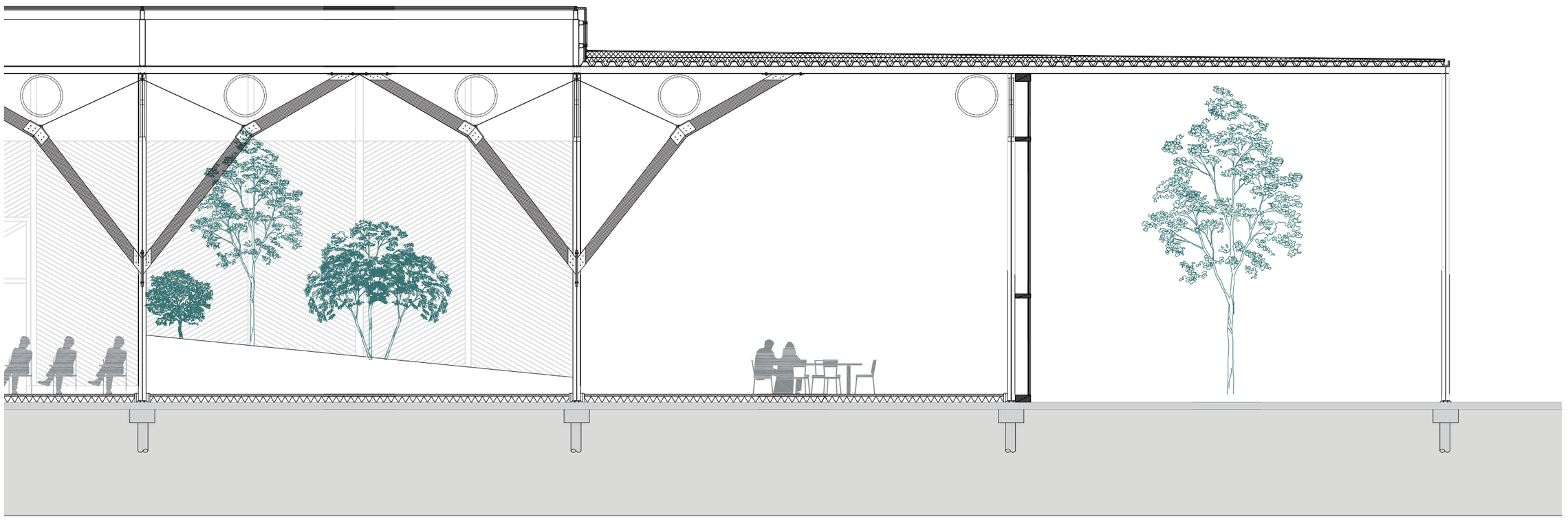
SECTION A
1:100



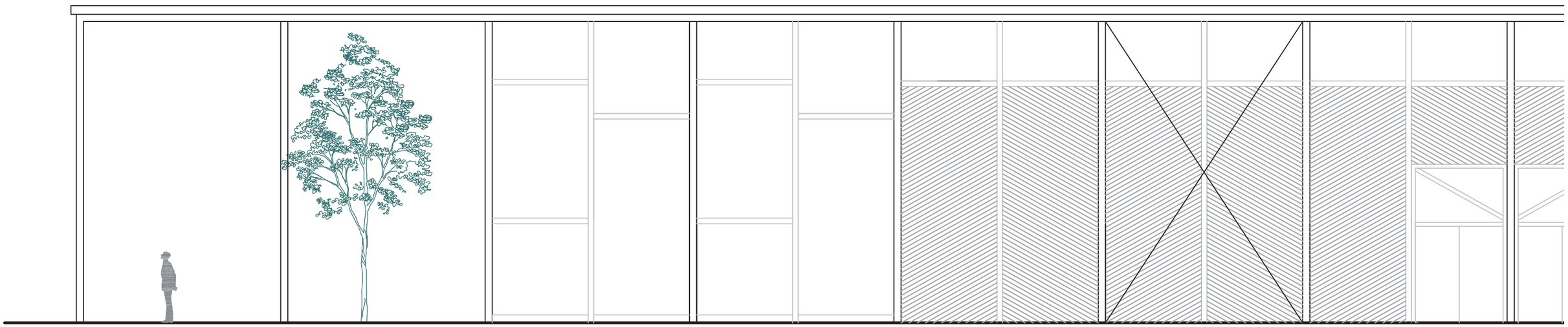


SECTION B
1:100

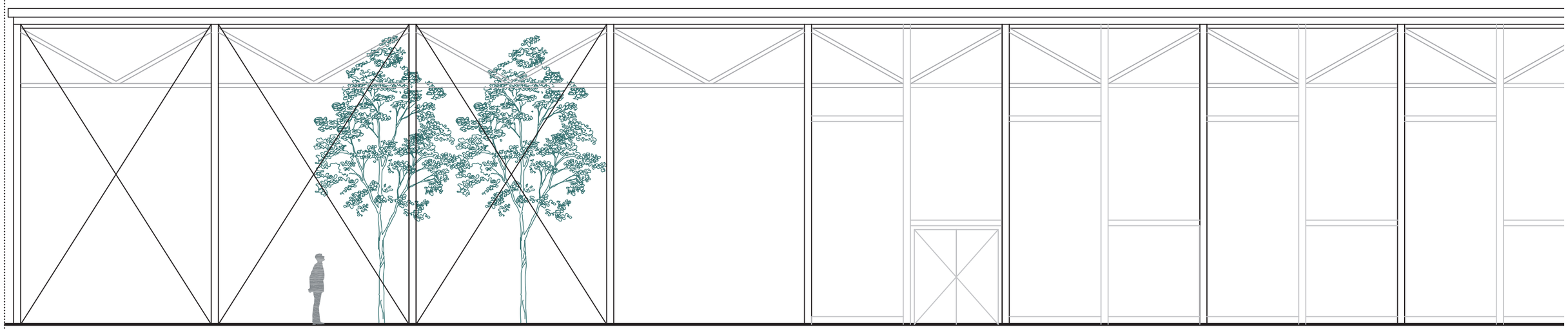




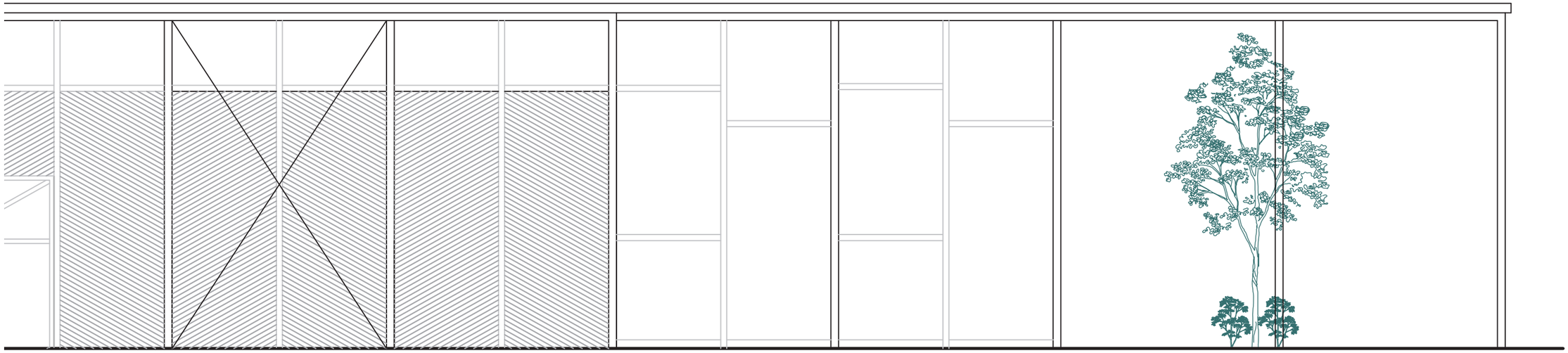
FACADES
1:100

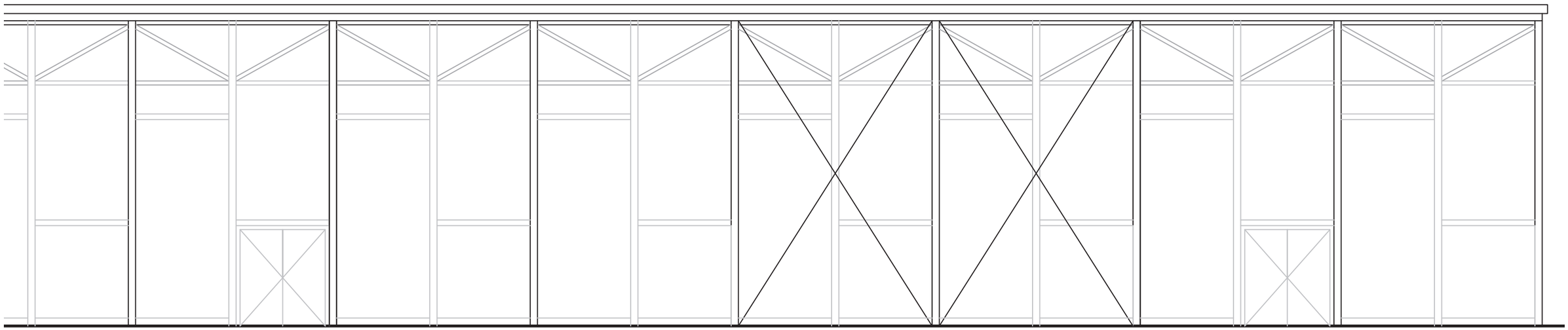


East facade

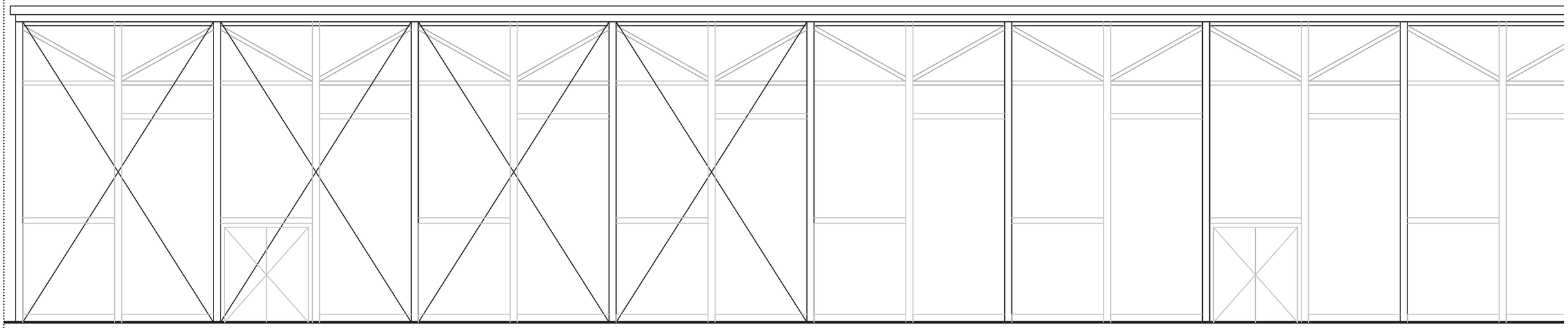


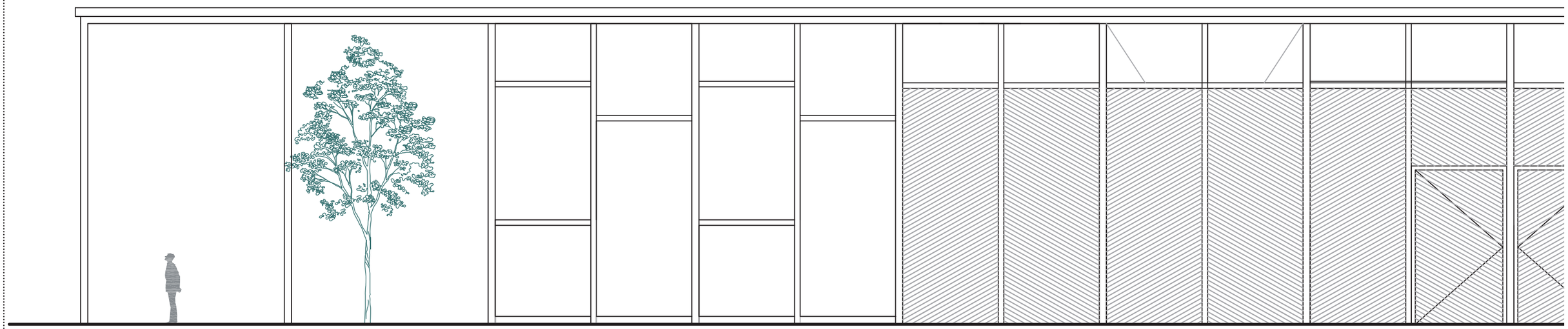
North facade

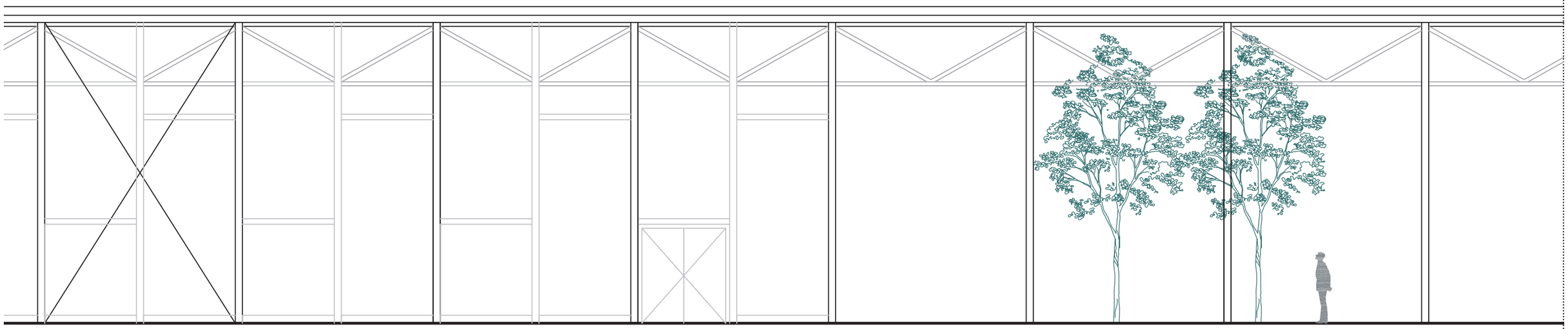


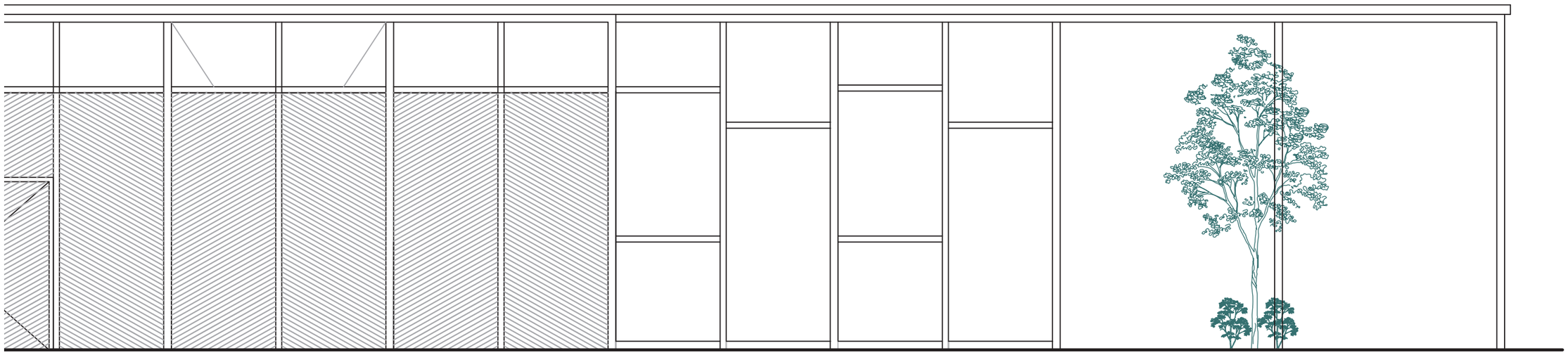


FACADES
1:100

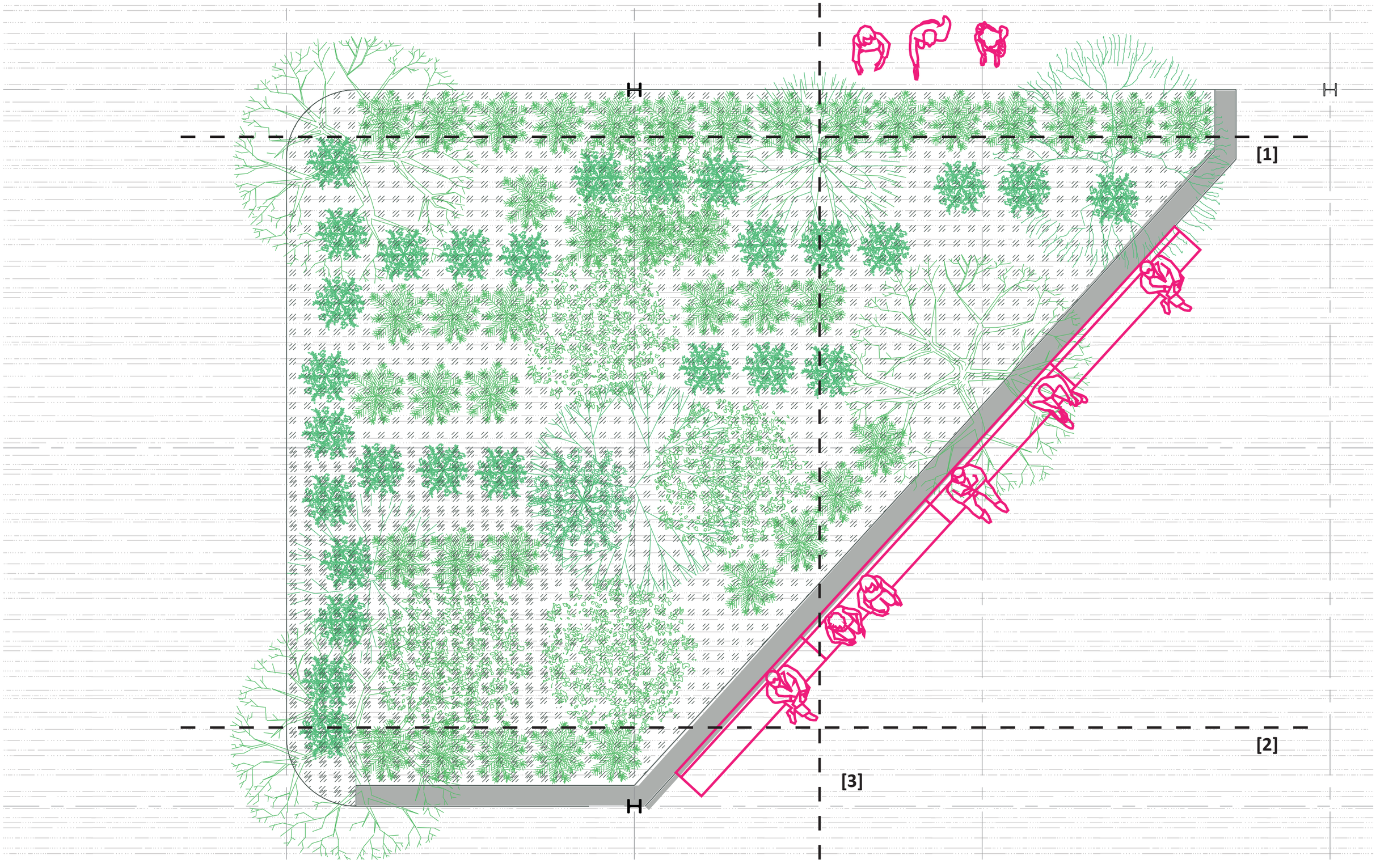




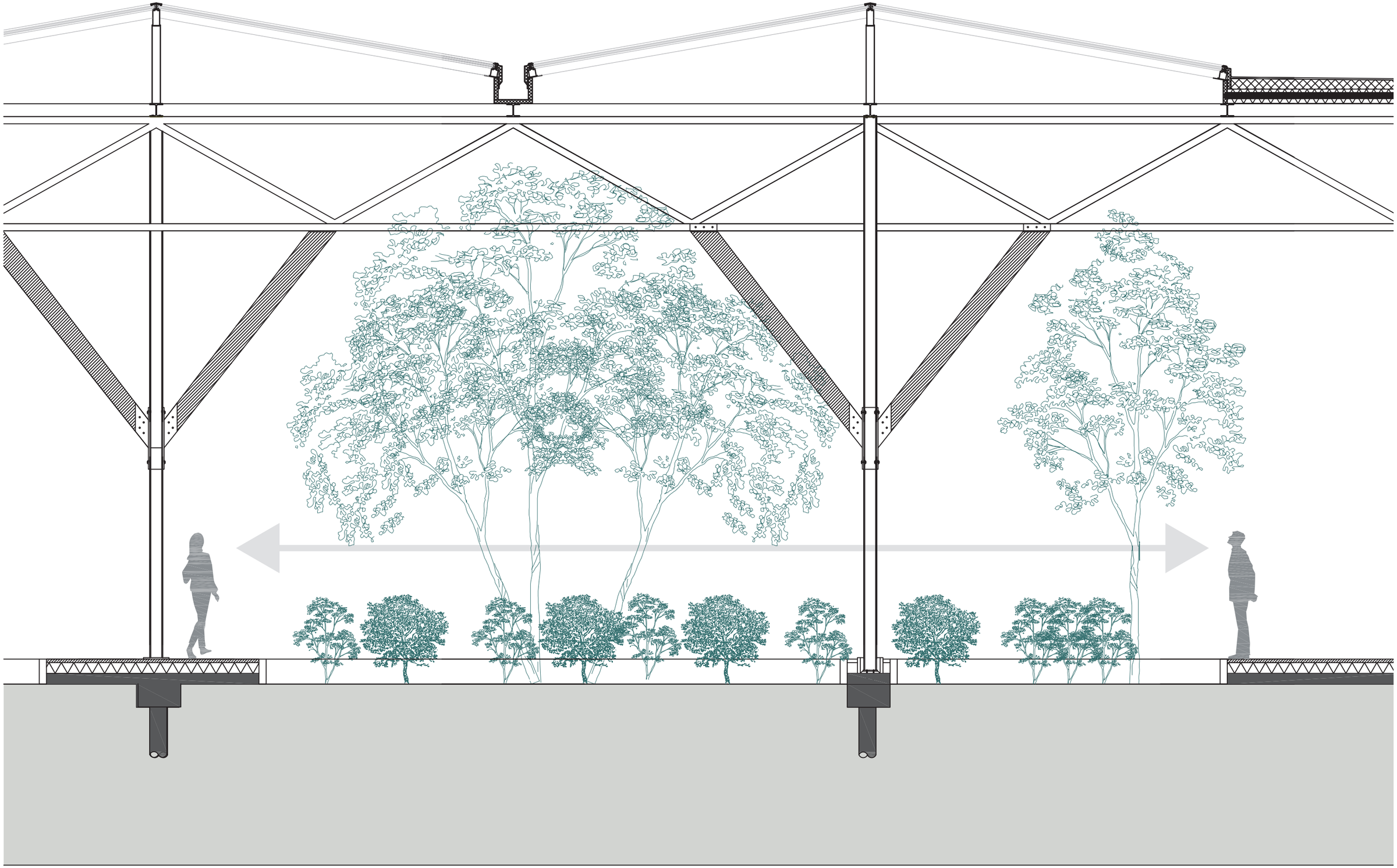




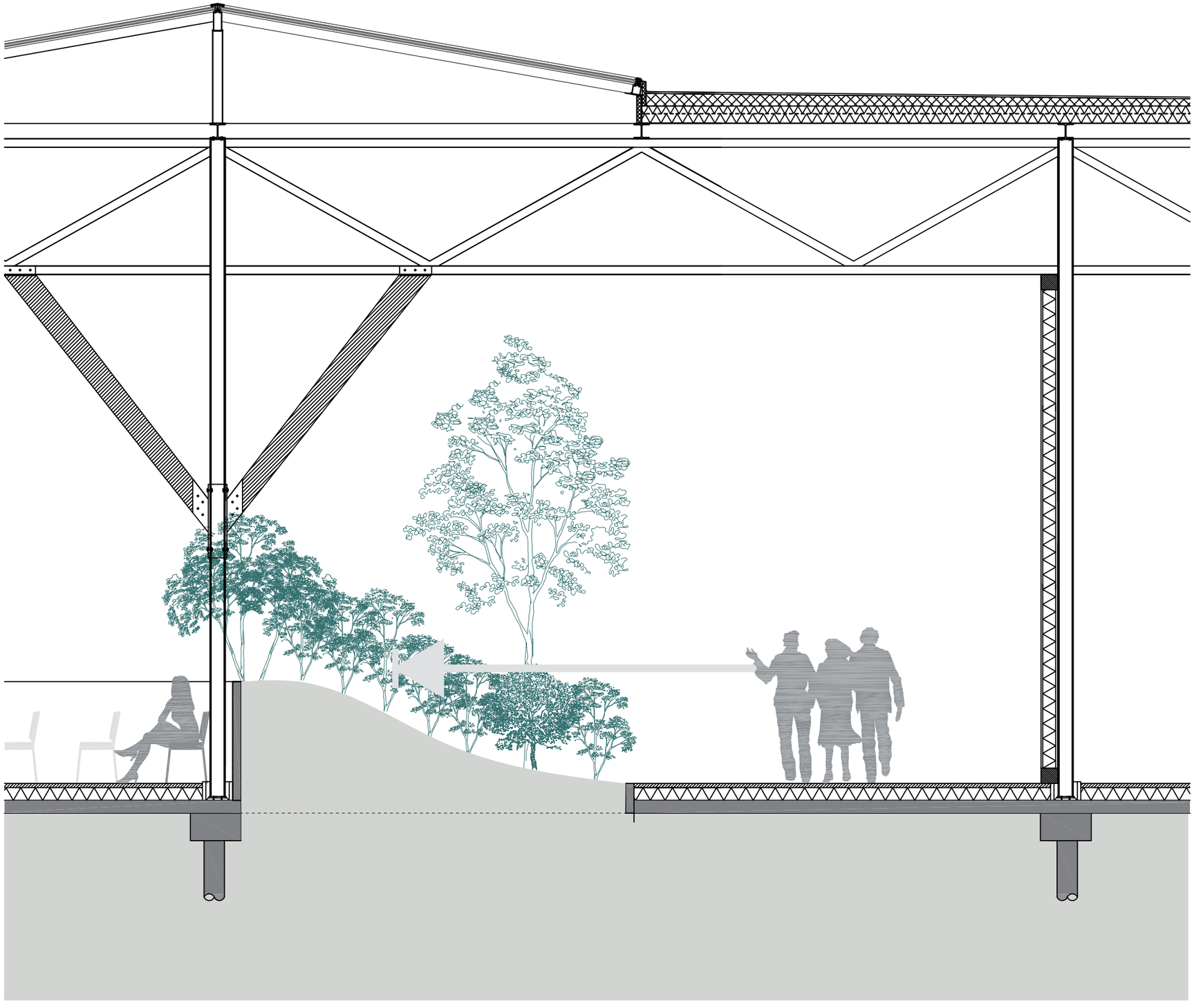
LANDSCAPE PLAN INTERIOR
1:50



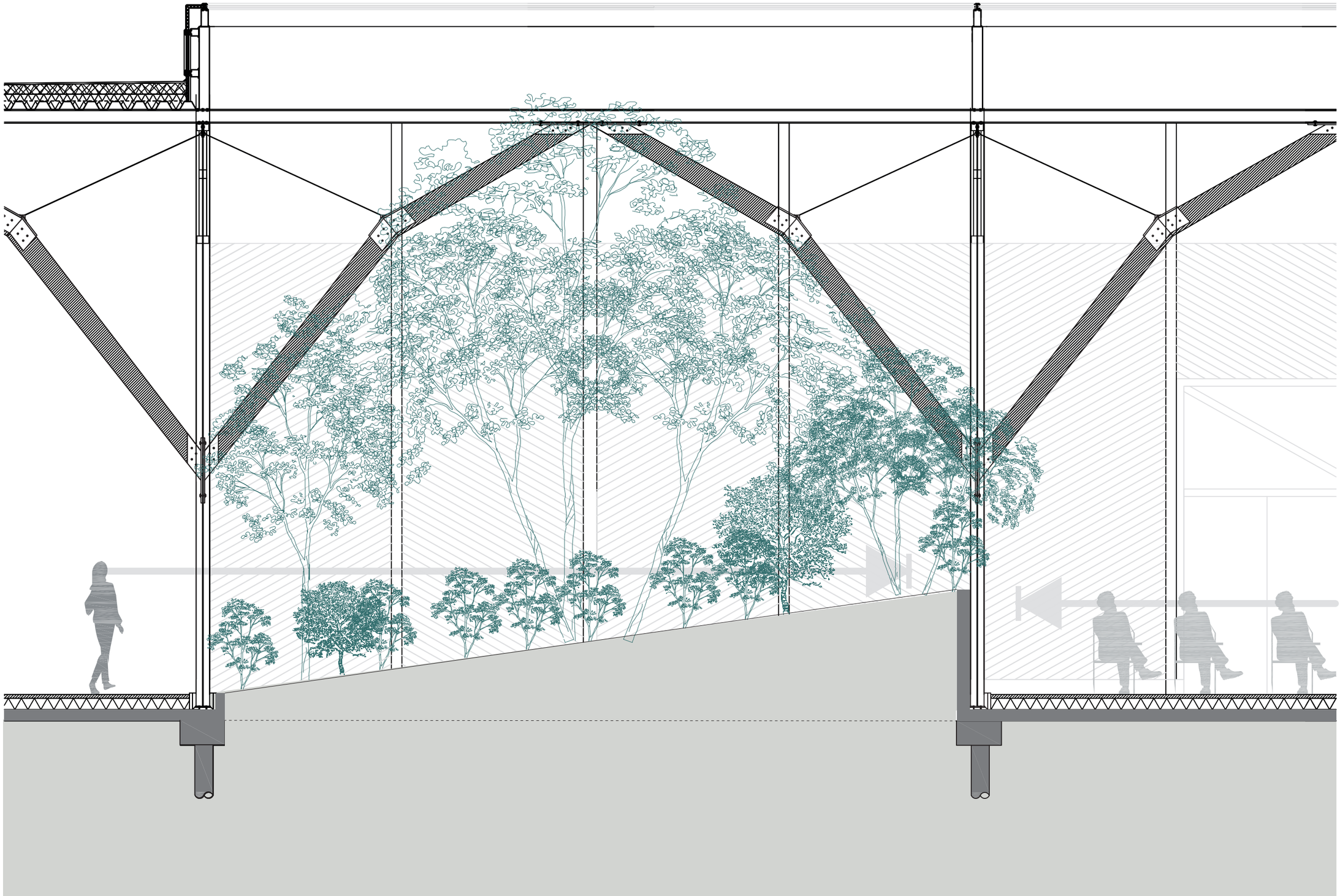
LANDSCAPE SECTION [1] INTERIOR
1:50



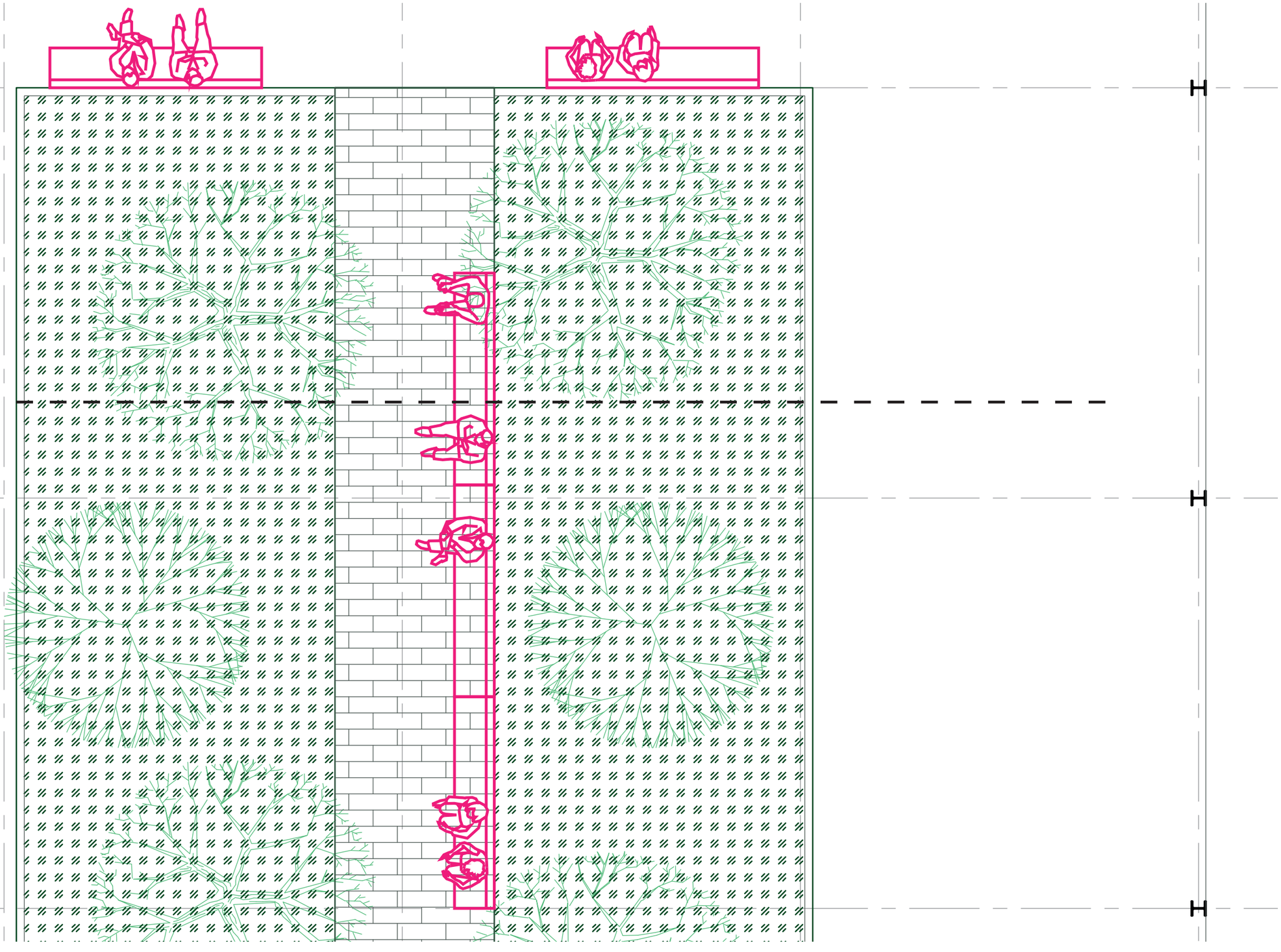
LANDSCAPE SECTION [2] INTERIOR
1:50



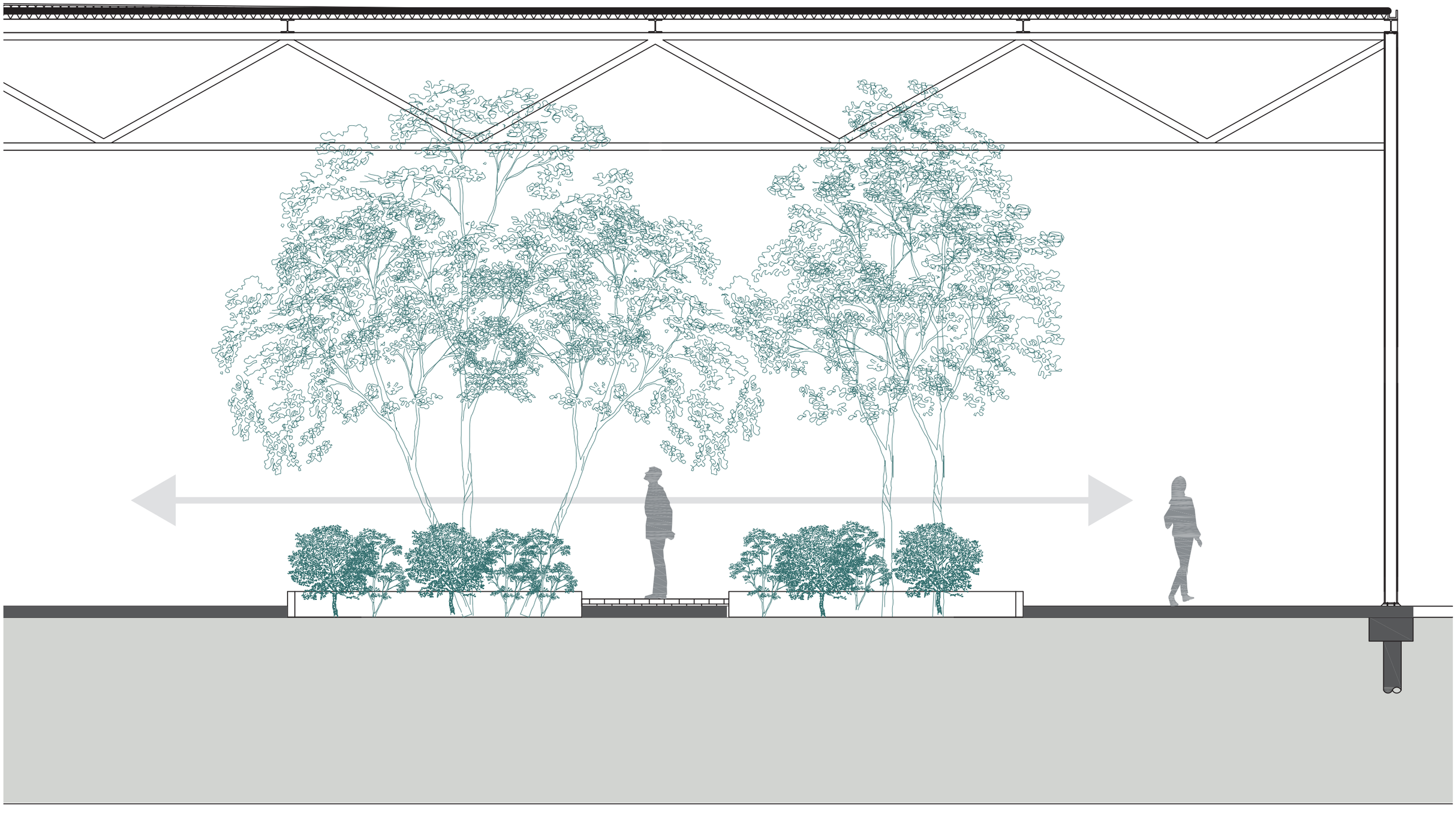
LANDSCAPE SECTION [3] INTERIOR
1:50



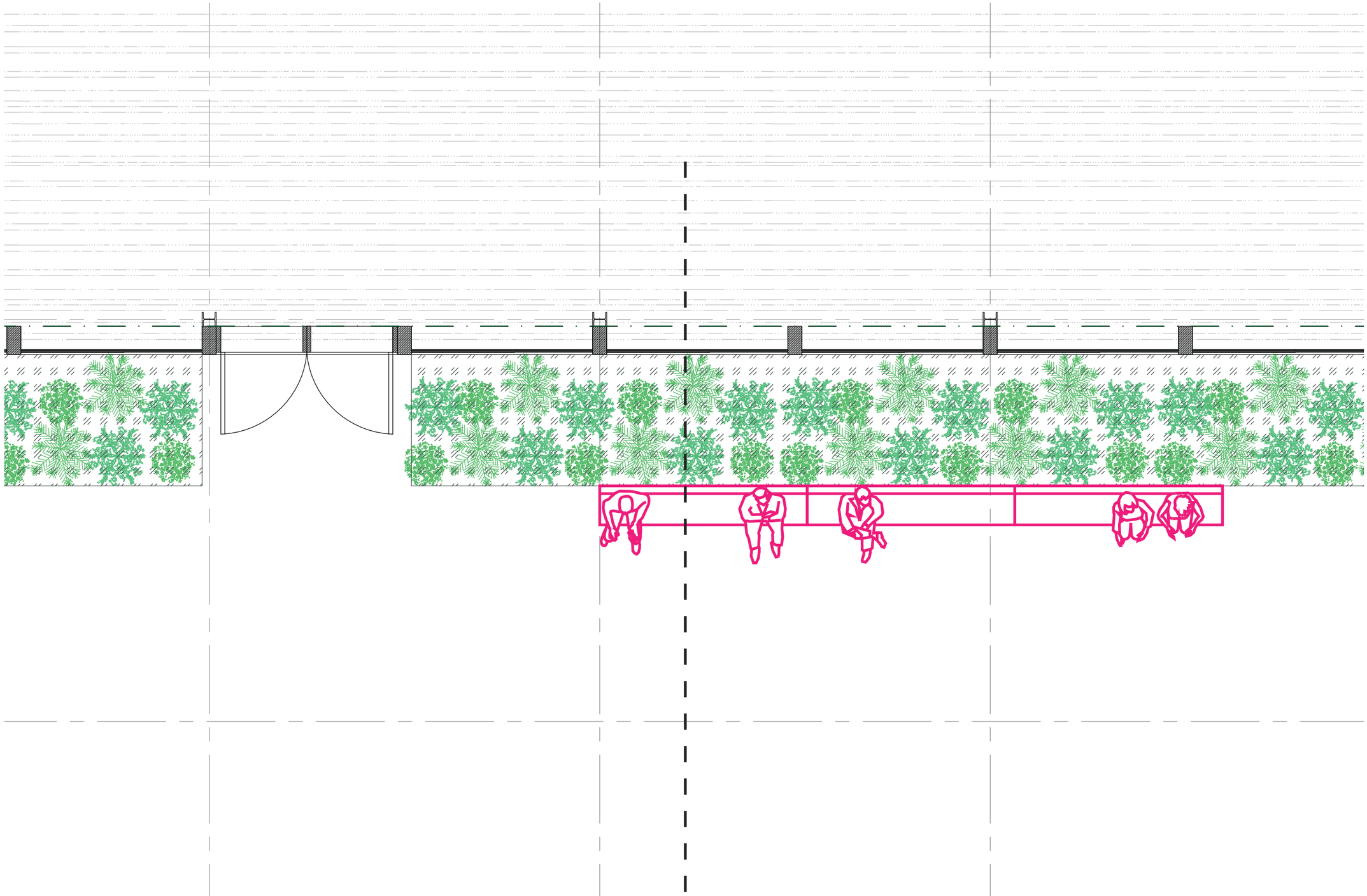
LANDSCAPE PLAN EXTERIOR
1:50



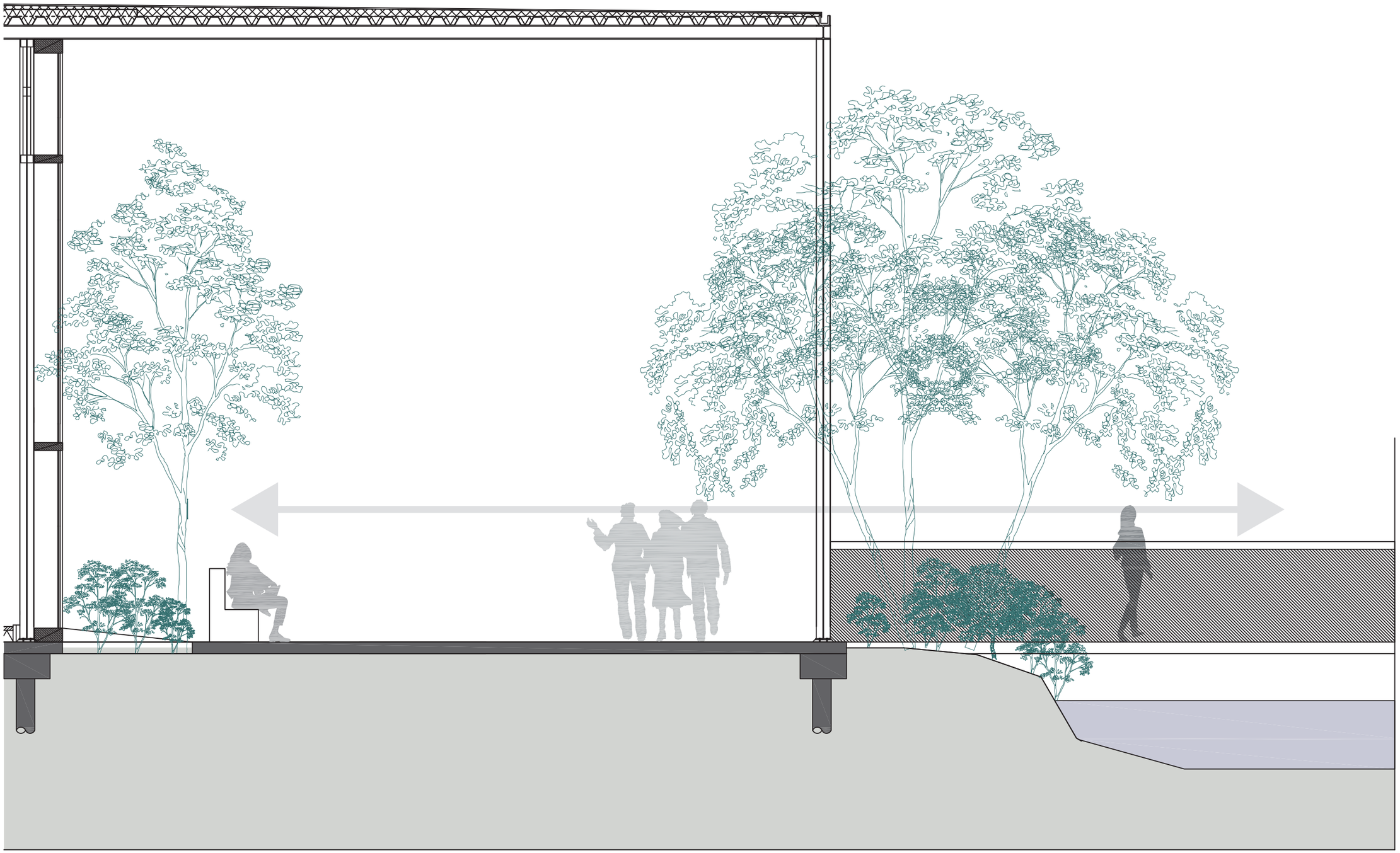
LANDSCAPE SECTION EXTERIOR
1:50



LANDSCAPE PLAN EXTERIOR
1:50



LANDSCAPE SECTION EXTERIOR
1:50



LANDSCAPE DESIGN
SPECIES

Common Bluebell

Layer: undergrowth

Height: 20-30 cm

Blossoms: May- June

Colours: Green, purple, blue

Lavender

Layer: undergrowth

Height: 30-40 cm

Blossoms: May- July

Colours: Green, purple, blue

Rosemary

Layer: undergrowth

Height: 30-40 cm

Blossoms: March- May

Colours: Green, purple, blue

Not deciduous

Acer Palmatum

Layer: Shrub / Canopy

Height: 300- 600 cm

Colours: Green, deep red

Parthenocissus

Layer: Vine

Height: max. 800 cm

Colours: Green, red, yellow, orange

Golden Rain

Layer: Vine / Canopy

Height: max. 700 cm

Blossoms: May- June

Colours: Green, yellow

Birch

Layer: Canopy

Height: 600- 800 cm

Colours: White, Yellow, Green

Tuscan Jasmine

Layer: Vine / Shrub

Height: 400- 600 cm

Blossoms: May- September

Colours: White, Green

Not deciduous

Hypericum

Layer: Undergrowth

Height: 20-50 cm

Blossoms: July - September

Colours: Yellow, Green

CANOPY

VINE

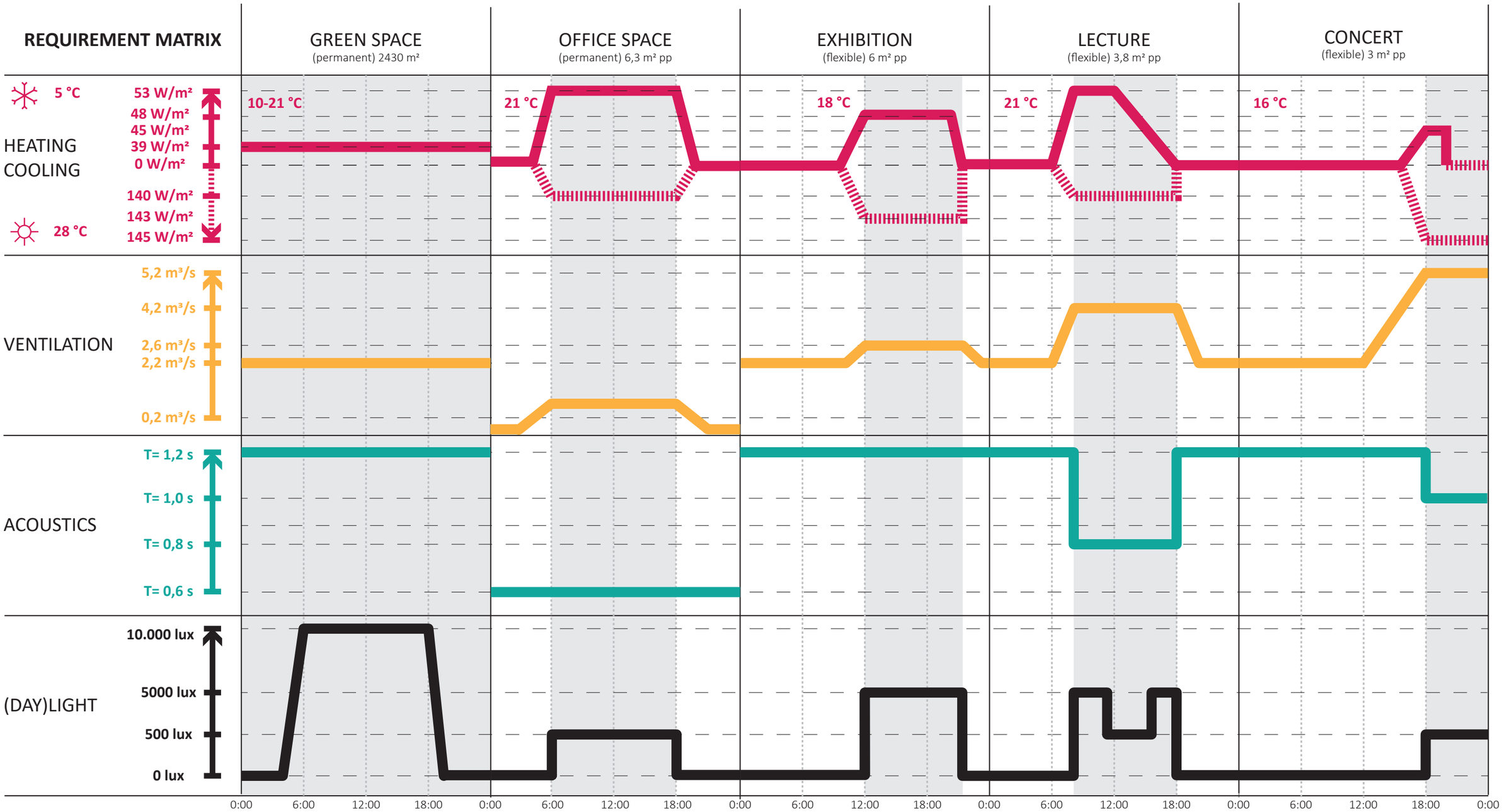
SHRUB

UNDERGROWTH

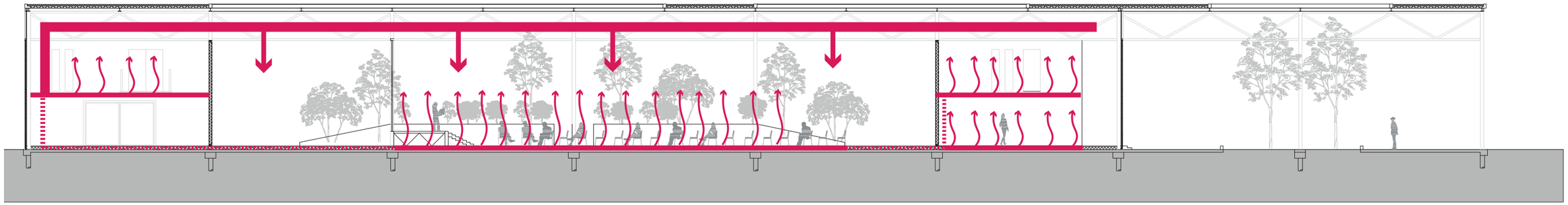
IMPRESSION EXTERIOR

IMPRESSION EXTERIOR

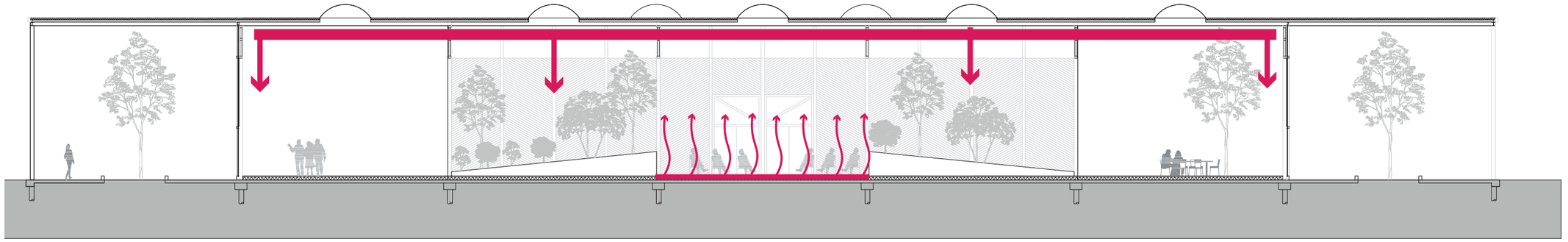
REQUIREMENT MATRIX



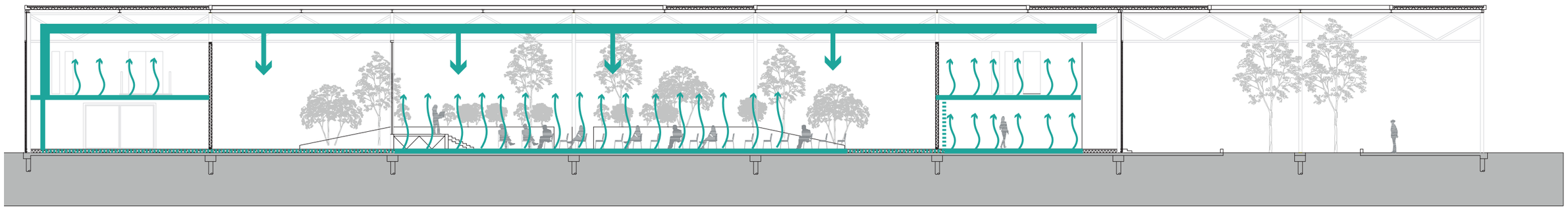
HEATING/COOLING
SECTION



langsdoorsnede



dwarsdoorsnede



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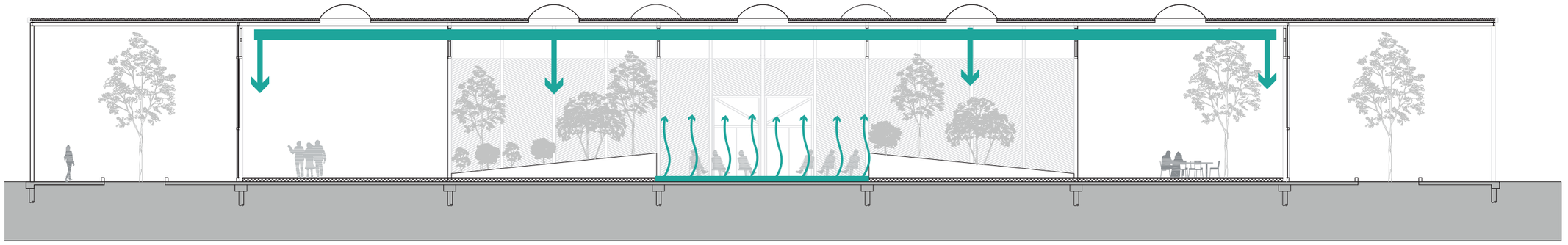
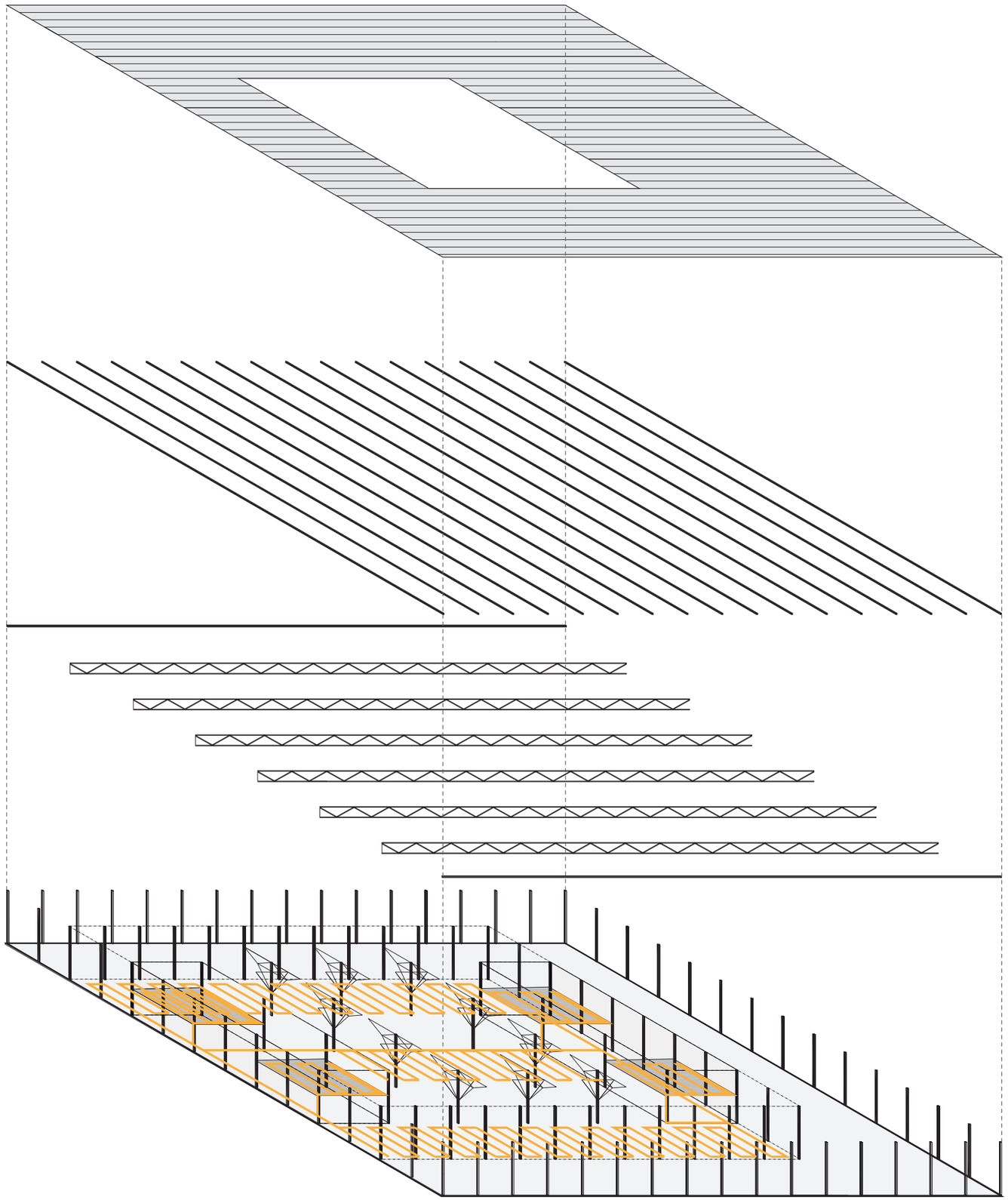


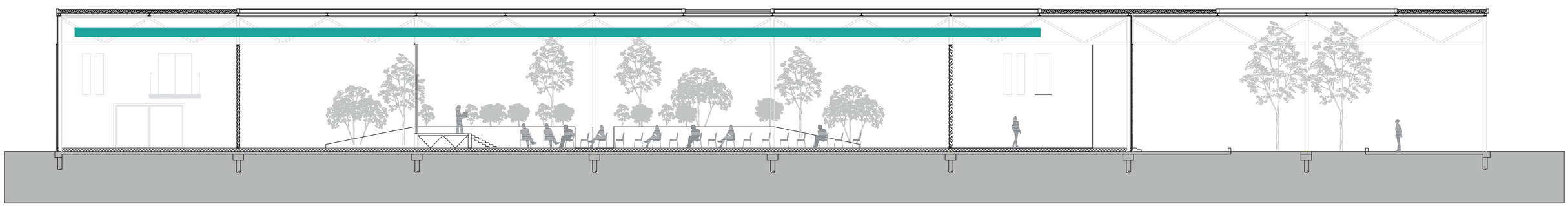
dwarsdoorsnede

HEATING/COOLING
AXO

FLOOR HEATING/COOLING



VENTILATION
SECTION



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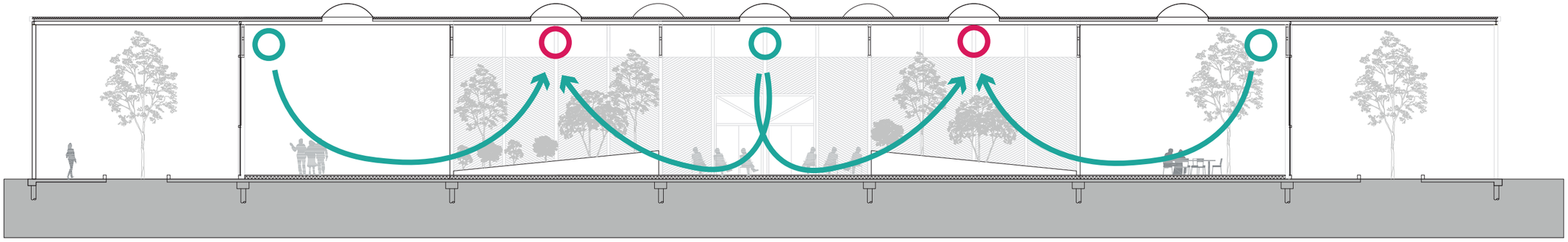
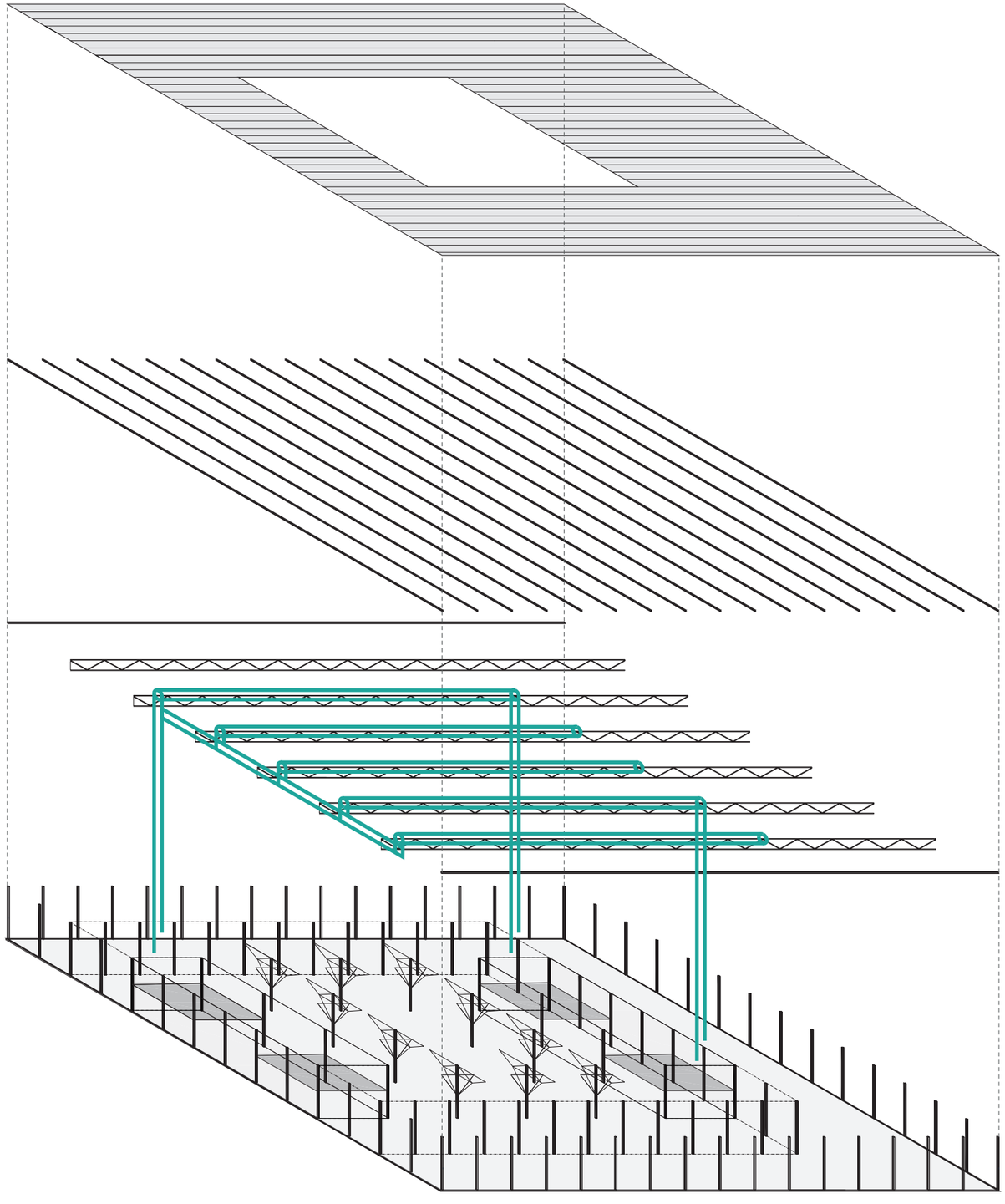


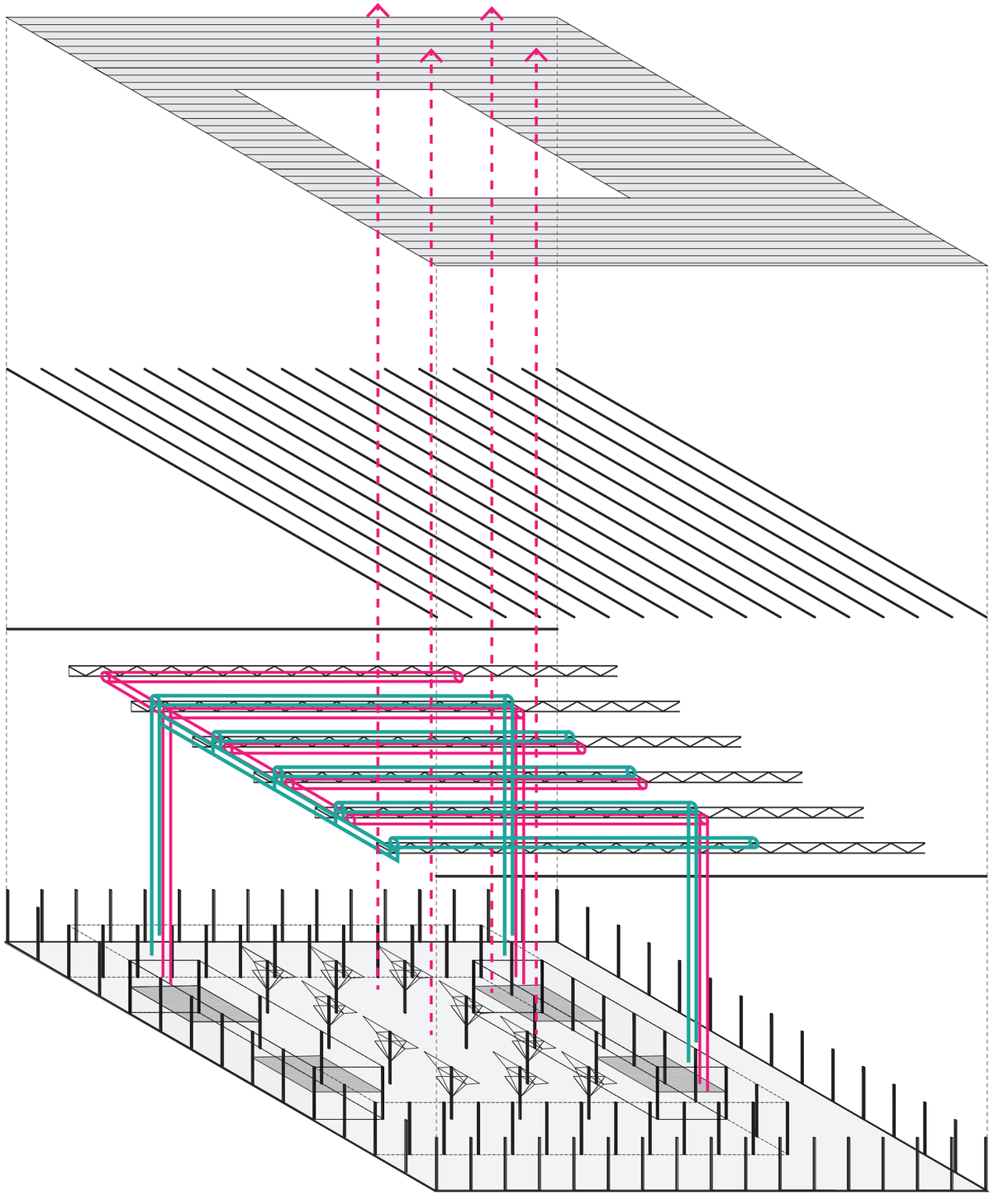
dwarsdoorsnede

VENTILATION
AXO

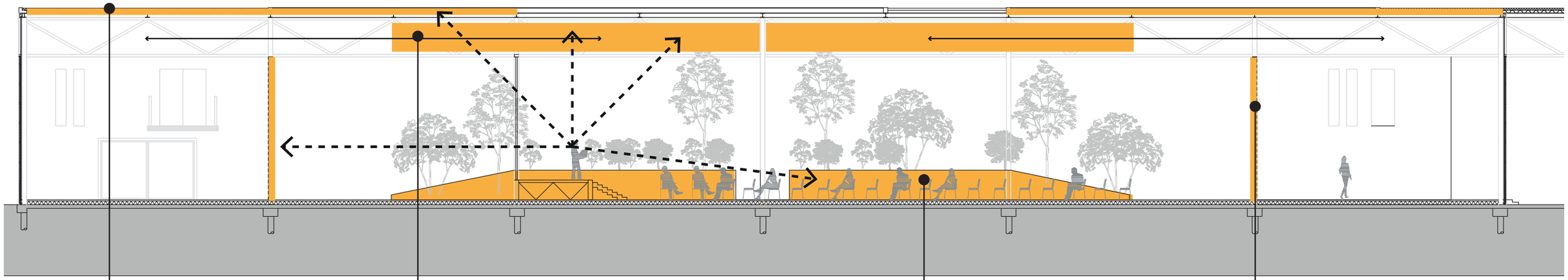
VENTILATION INPUT [HVAC]



VENTILATION OUTPUT [HVAC]

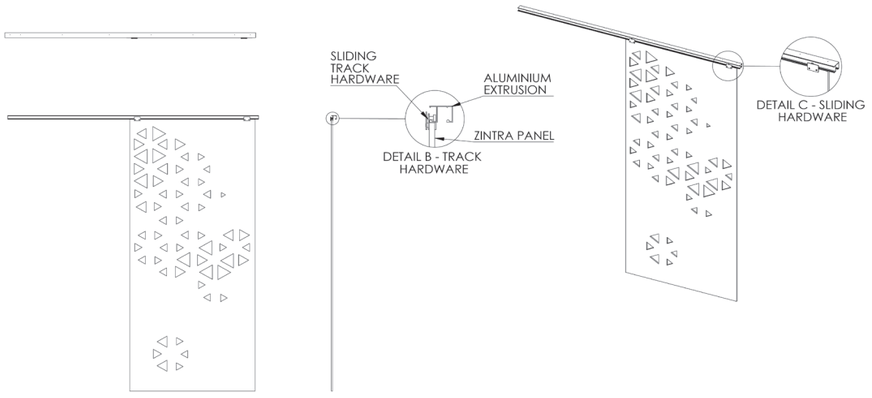


ACOUSTICS

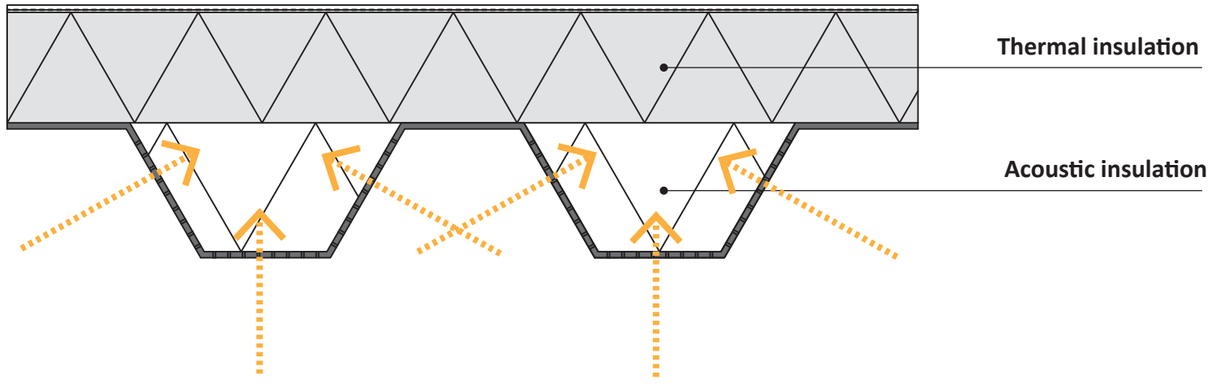


Moveable acoustic panels/curtains (A= 336 m2)

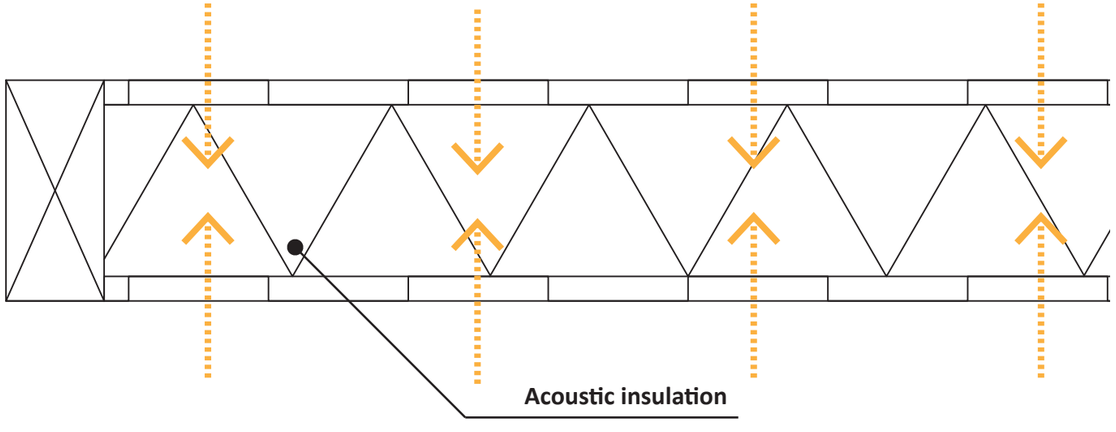
Rammed earth elements (A= 360 m2 x absorption coefficient?)



Acoustic roof: perforated steel plates (A= 1664 m2)
Vertical section

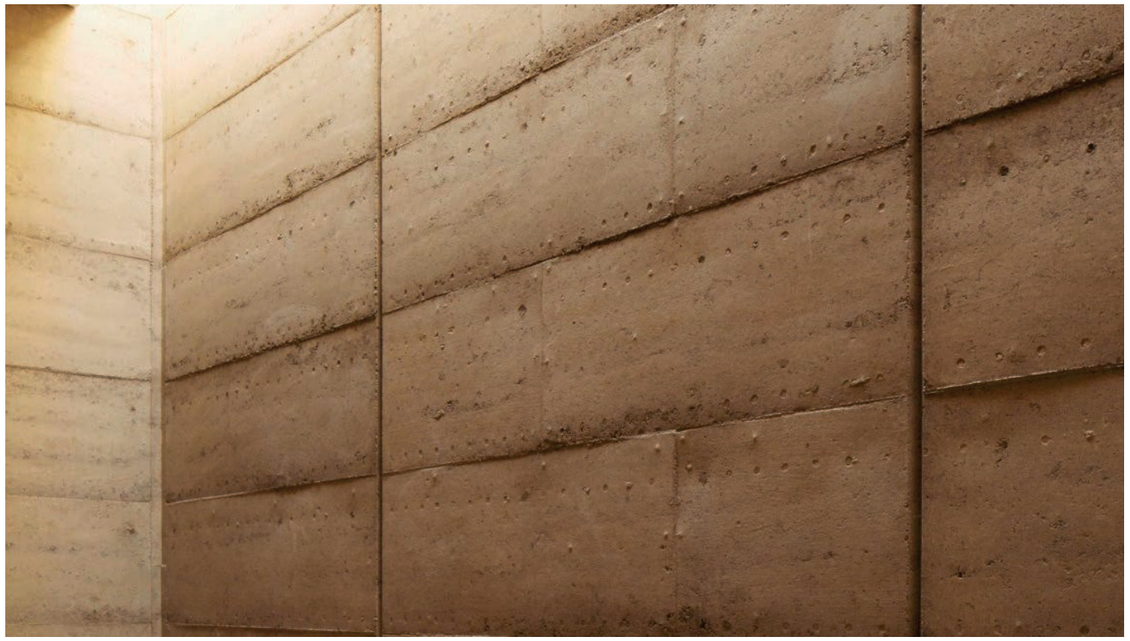


Acoustic walls : slated wooden panels with glasswool behind (A= 612 m2)
Horizontal section



ACOUSTICS

Acoustic roof: perforated steel plates filled with glass or mineral wool



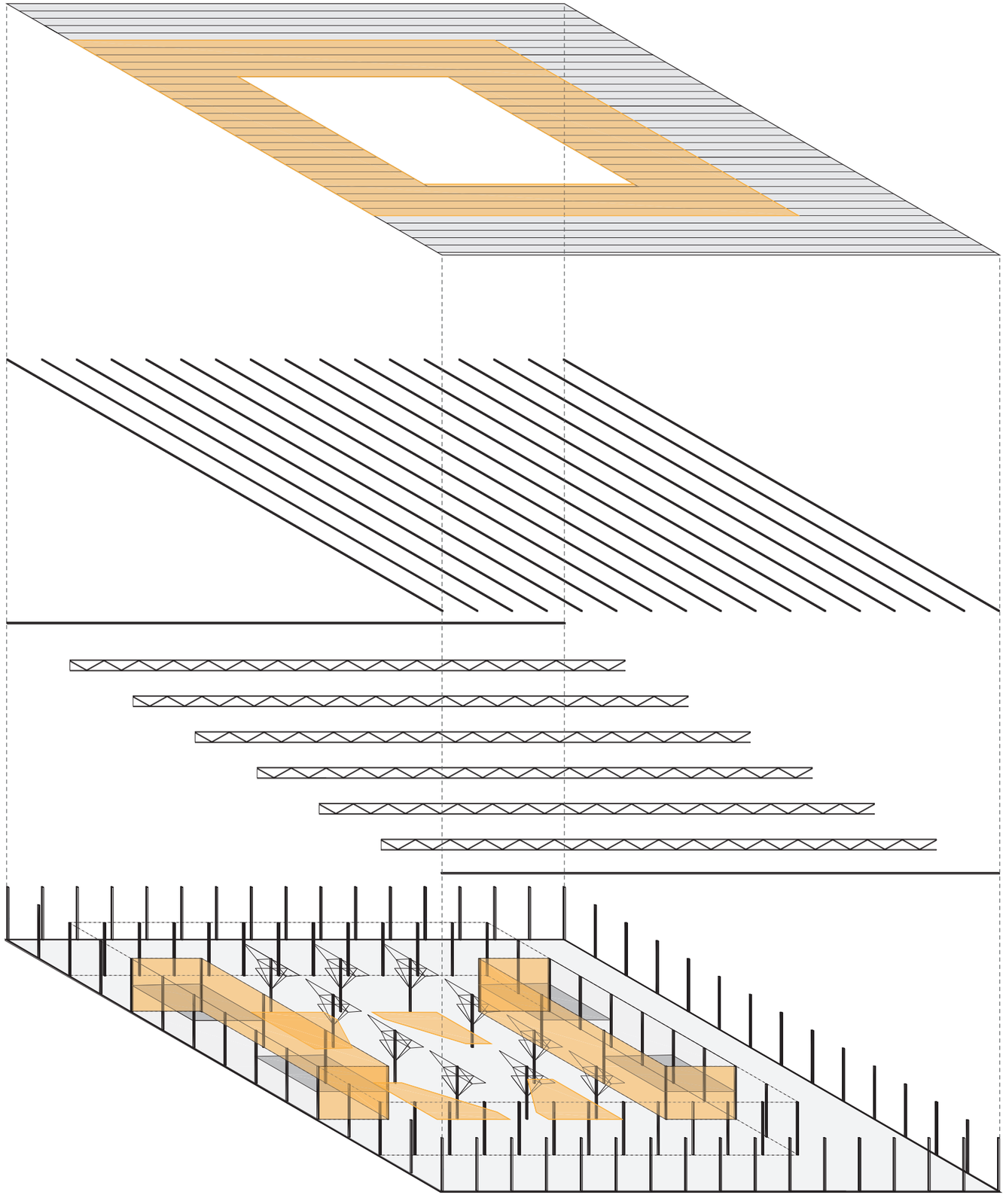
Rammed earth elements

Acoustic walls: slated wooden panels with glasswool behind

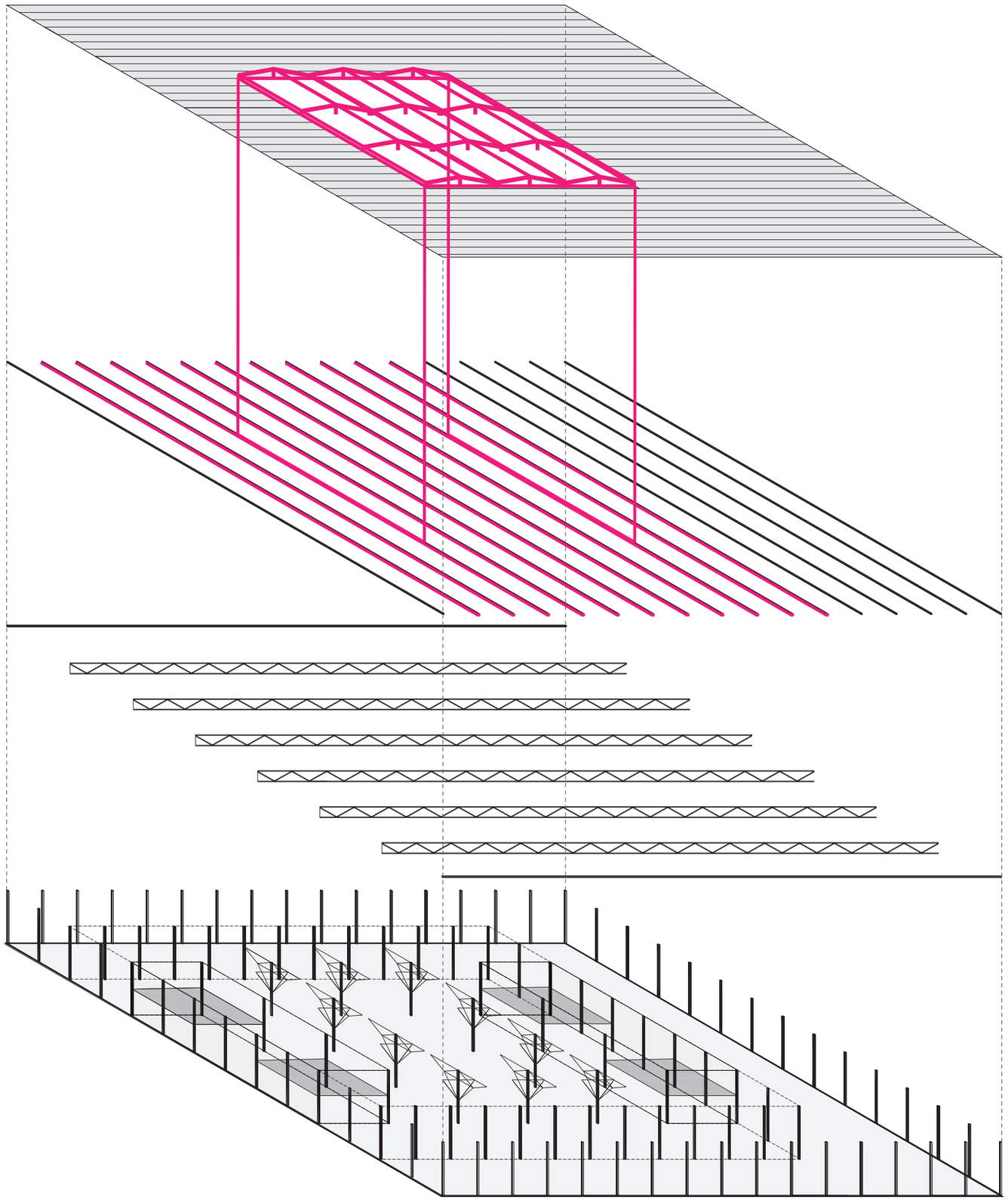
Sliding acoustic panels (Zintra panels)

ACOUSTICS AXO

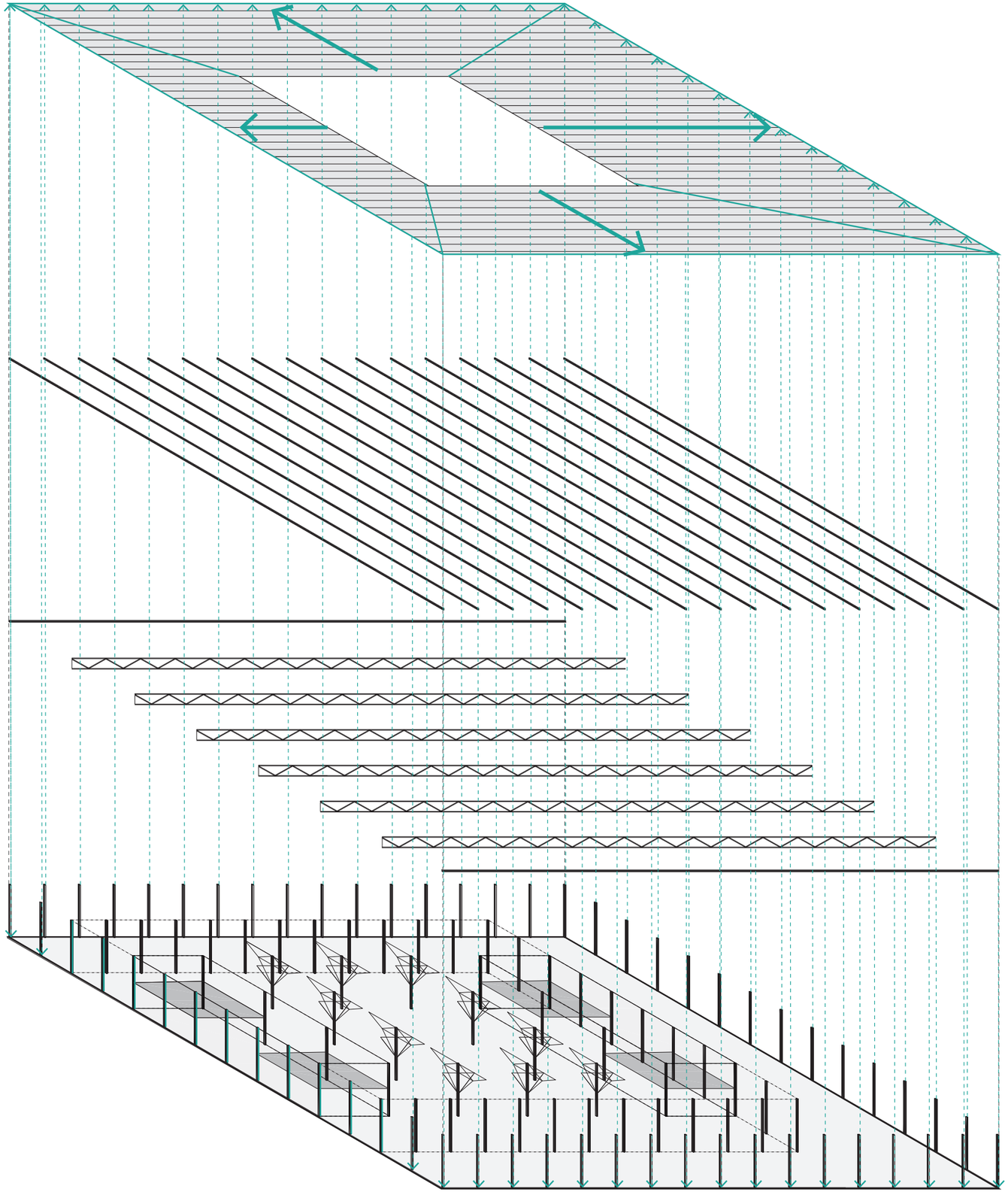
ACOUSTICS



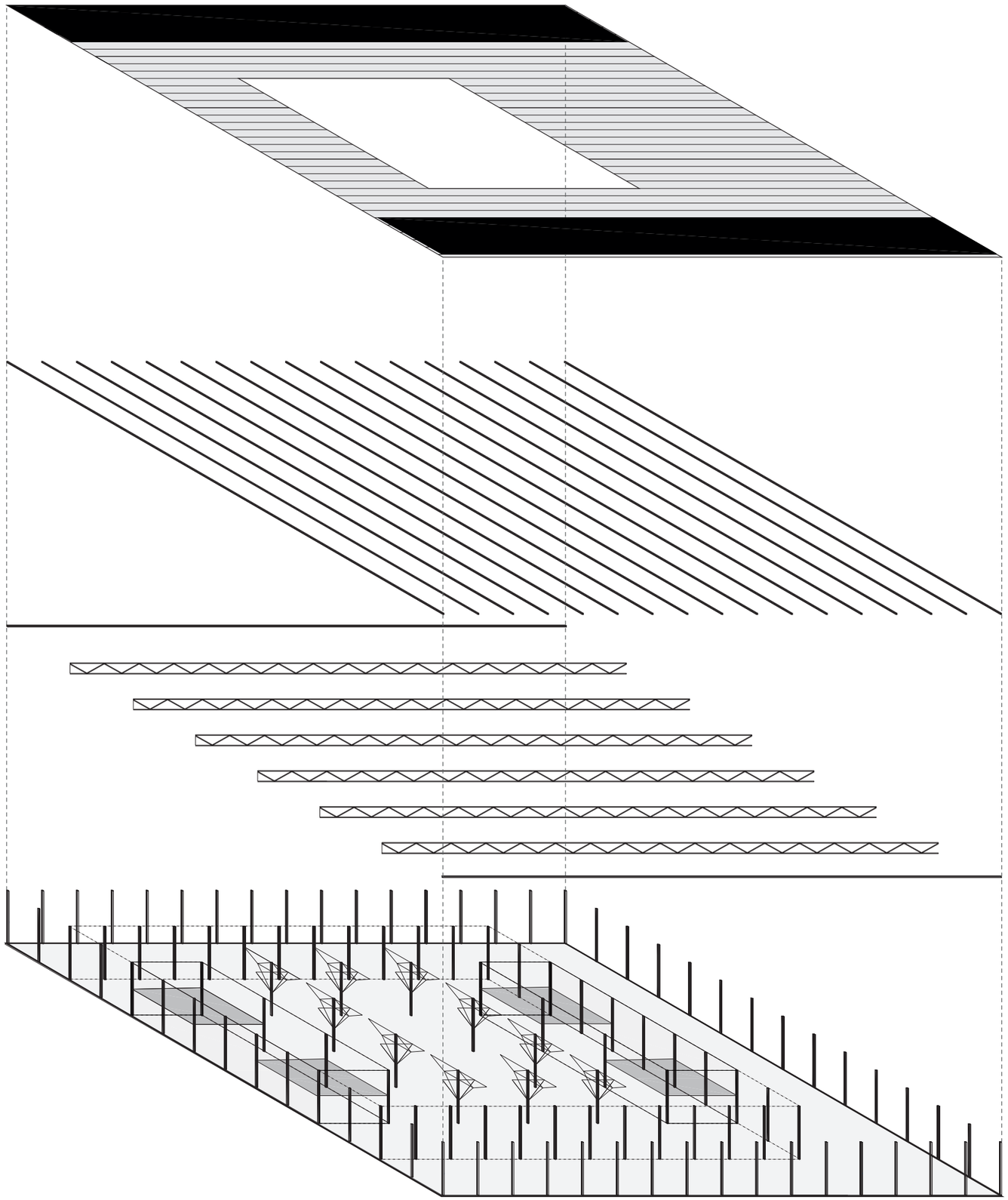
NATURAL + ARTIFICIAL LIGHT



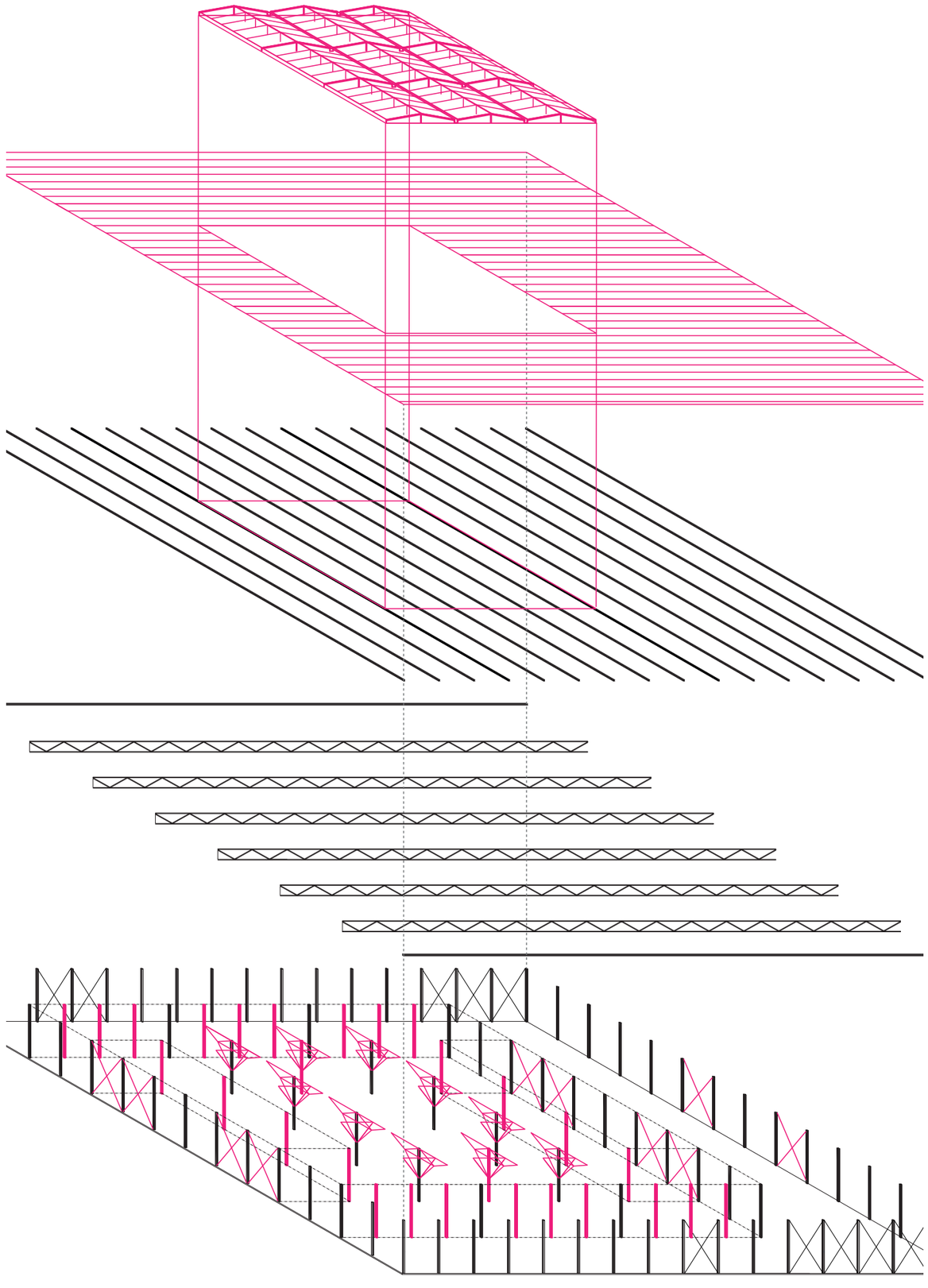
RAIN WATER DRAINAGE



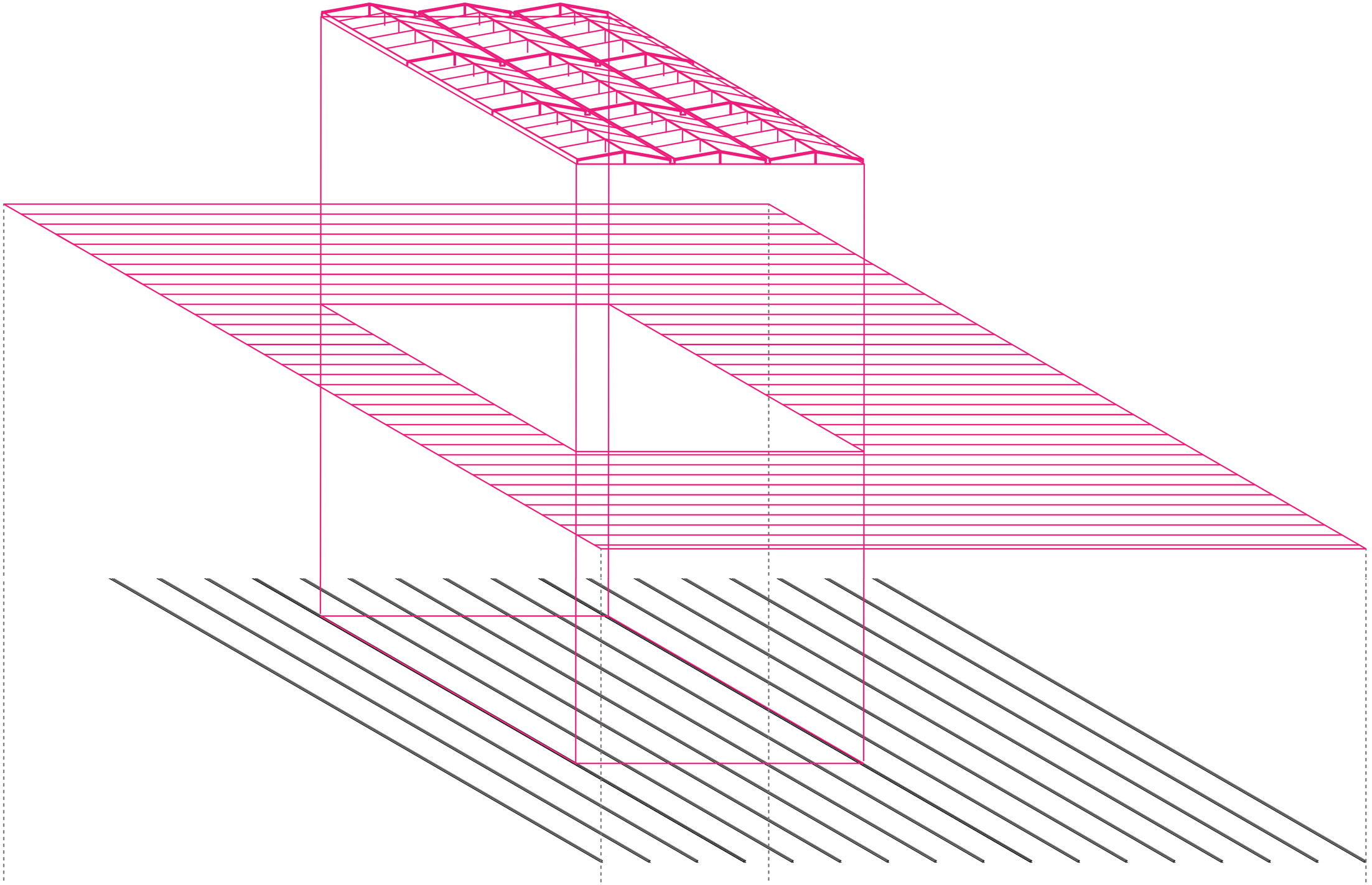
PVT + PV PANELS



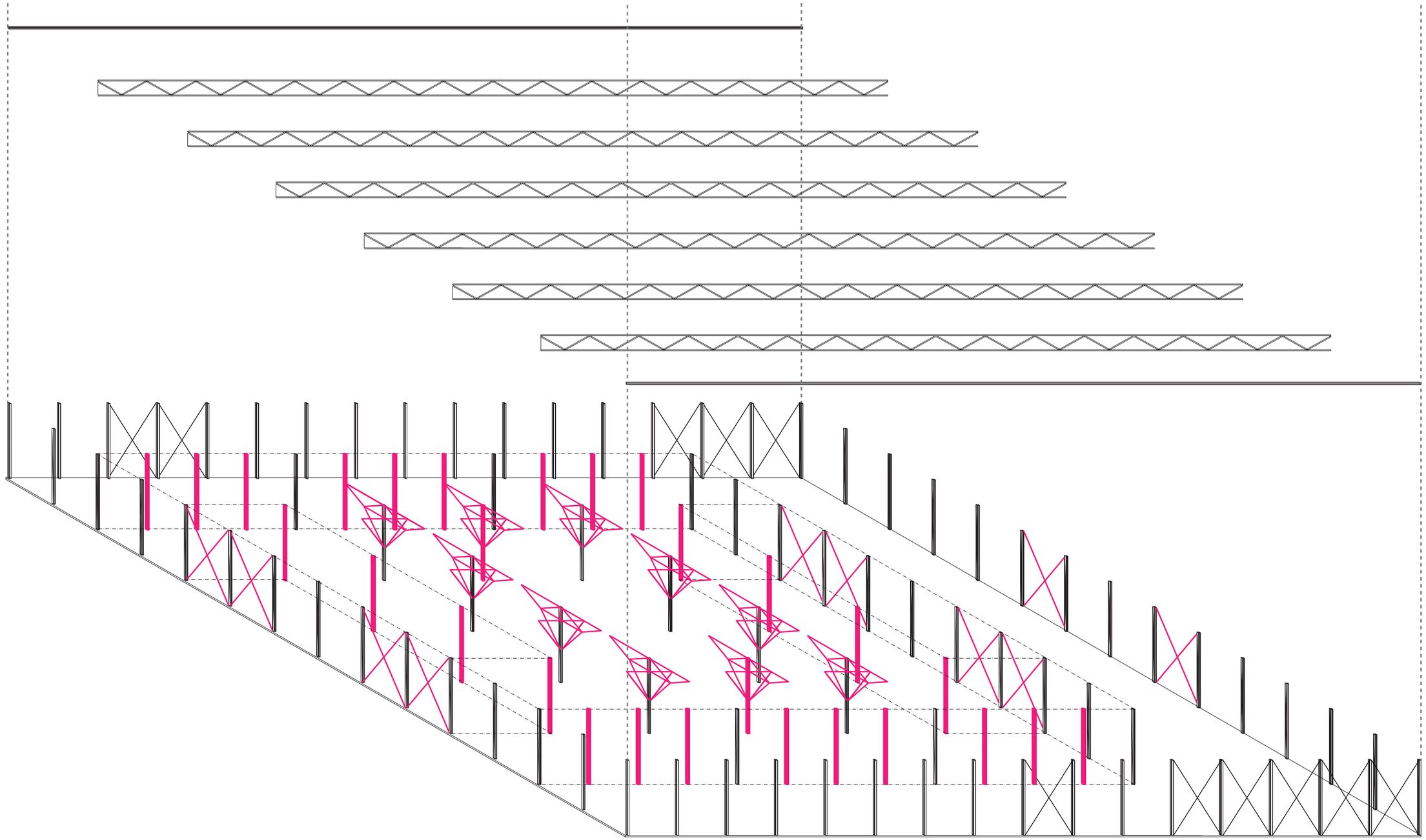
EXPLODED STRUCTURAL AXO
1:200



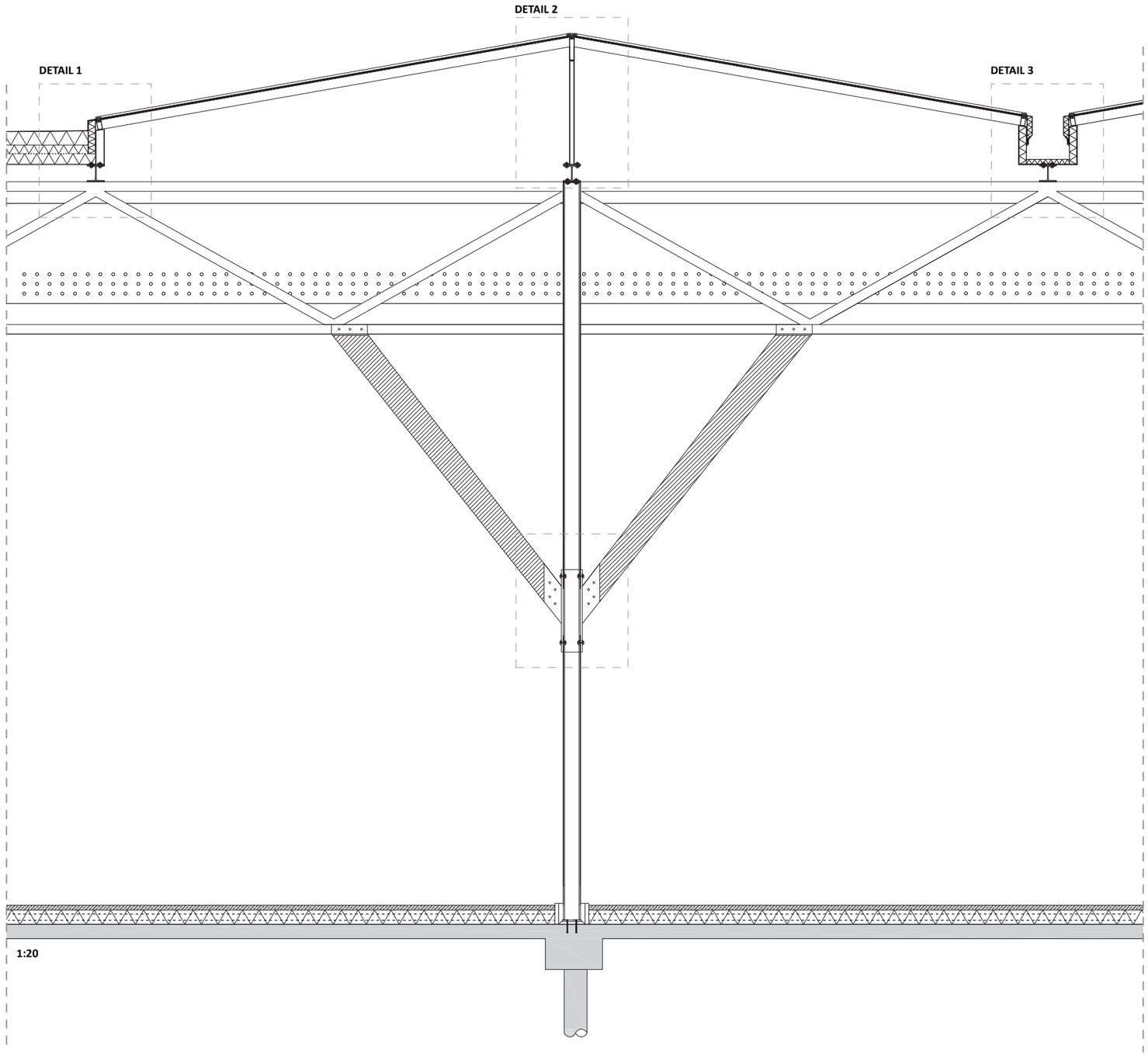
EXPLODED STRUCTURAL AXO
1:200



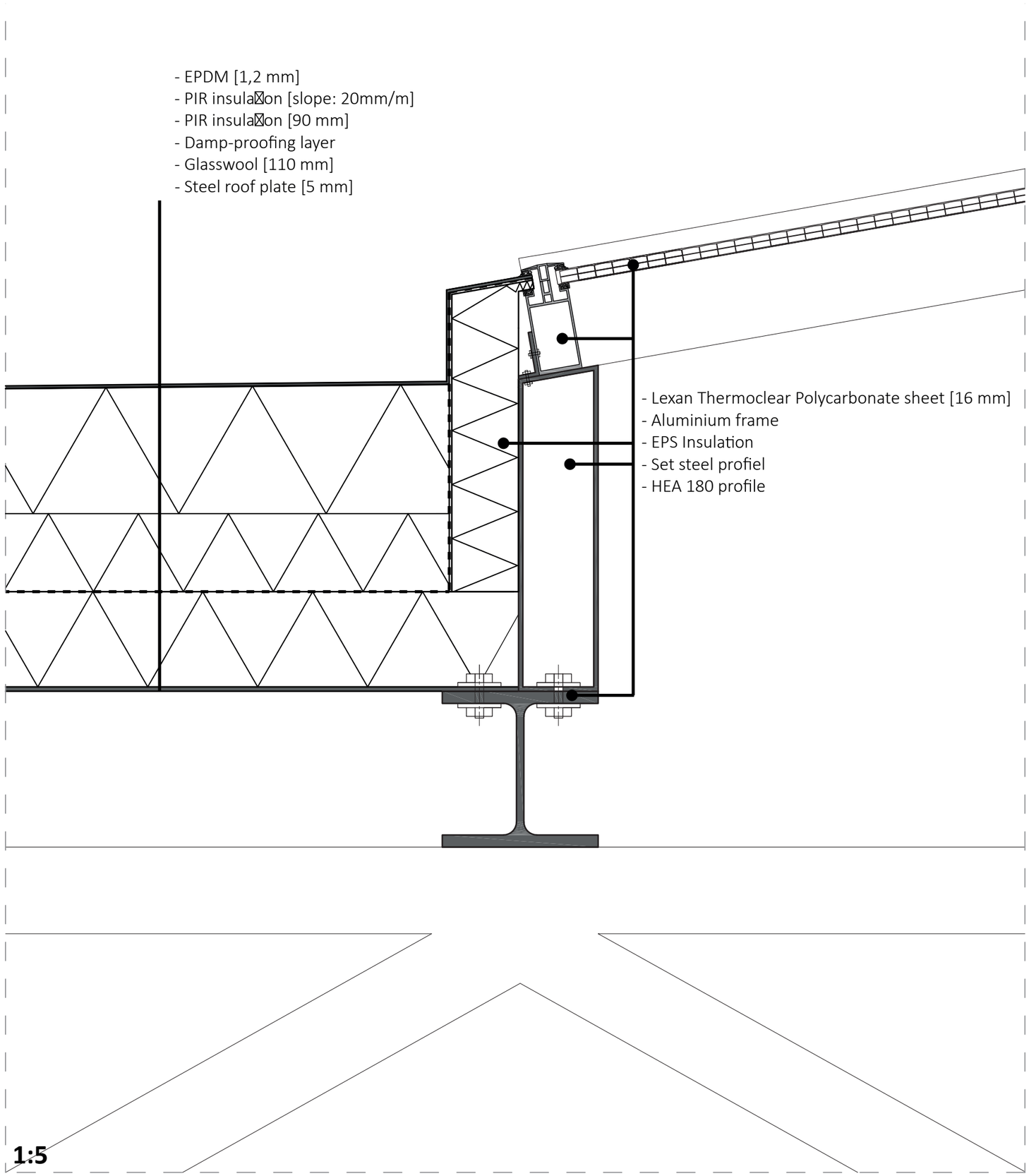
EXPLODED STRUCTURAL AXO
1:200



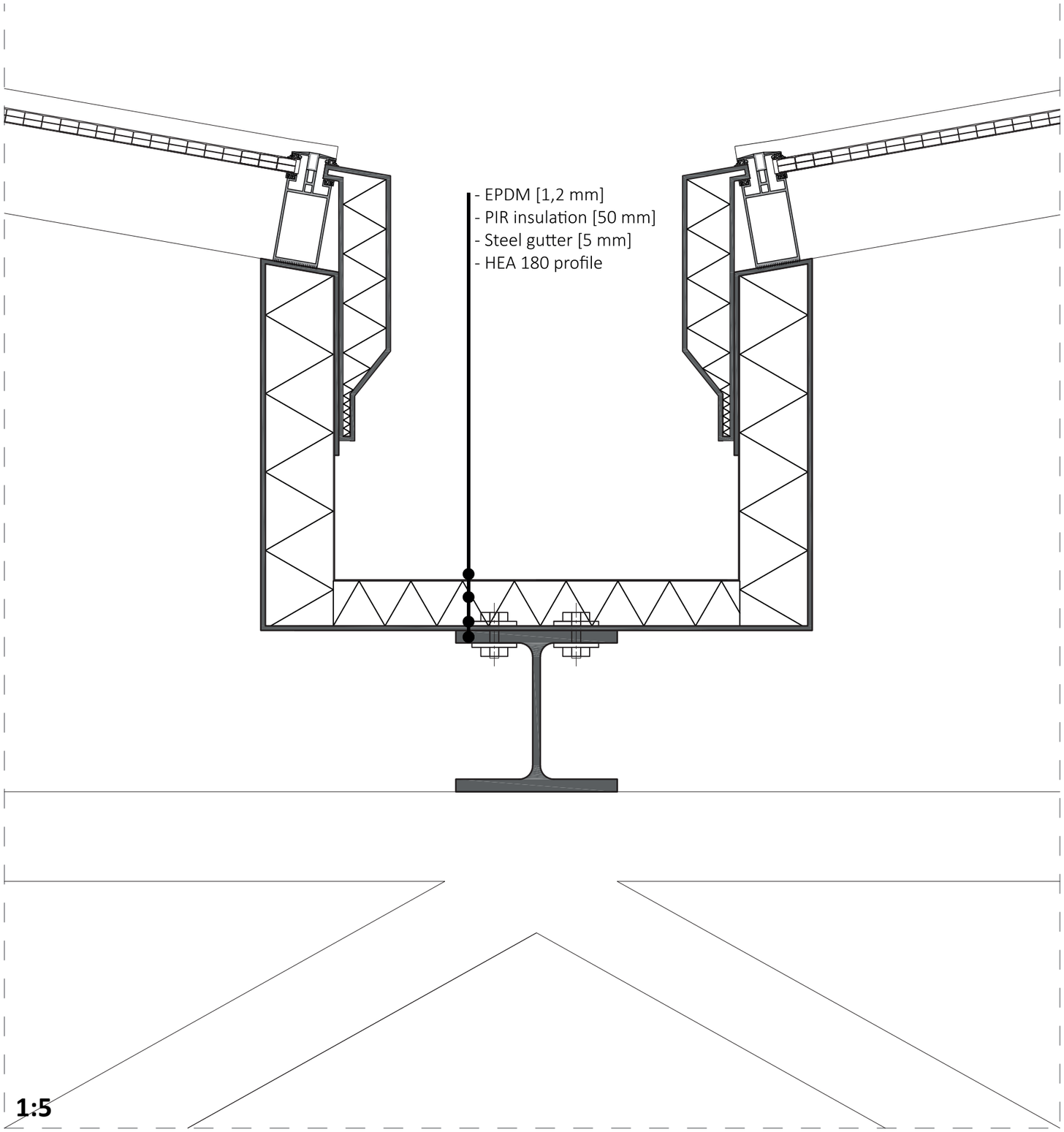
SKYLIGHT FRAGMENT 1:50 [1]



DETAIL 1:5 [1]


- EPDM [1,2 mm]
- PIR insula on [slope: 20mm/m]
- PIR insula on [90 mm]
- Damp-proofing layer
- Glasswool [110 mm]
- Steel roof plate [5 mm]
- Lexan Thermoclear Polycarbonate sheet [16 mm]
- Aluminium frame
- EPS Insulation
- Set steel profiel
- HEA 180 profile
1:5

DETAIL 1:5 [3]



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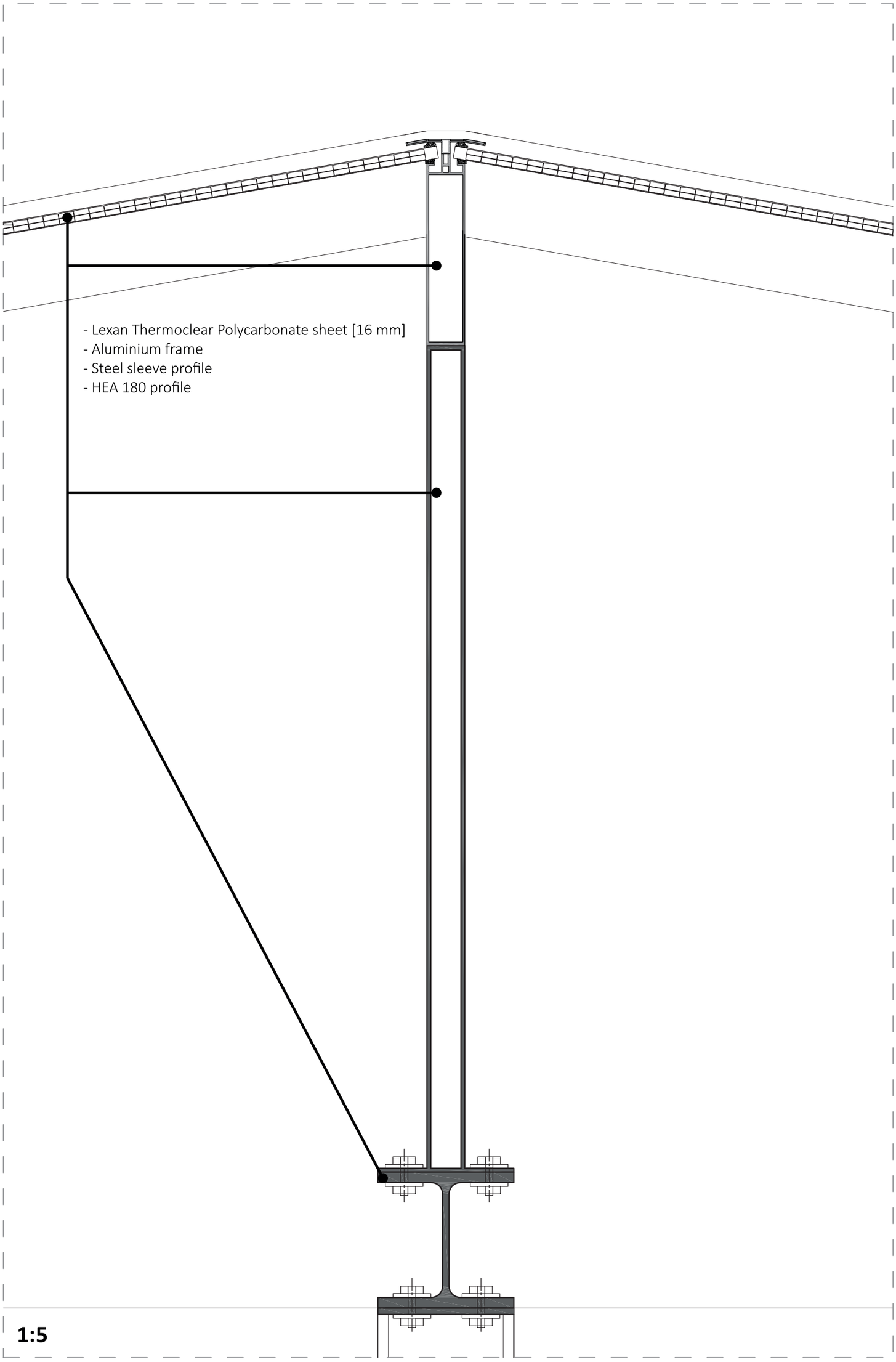
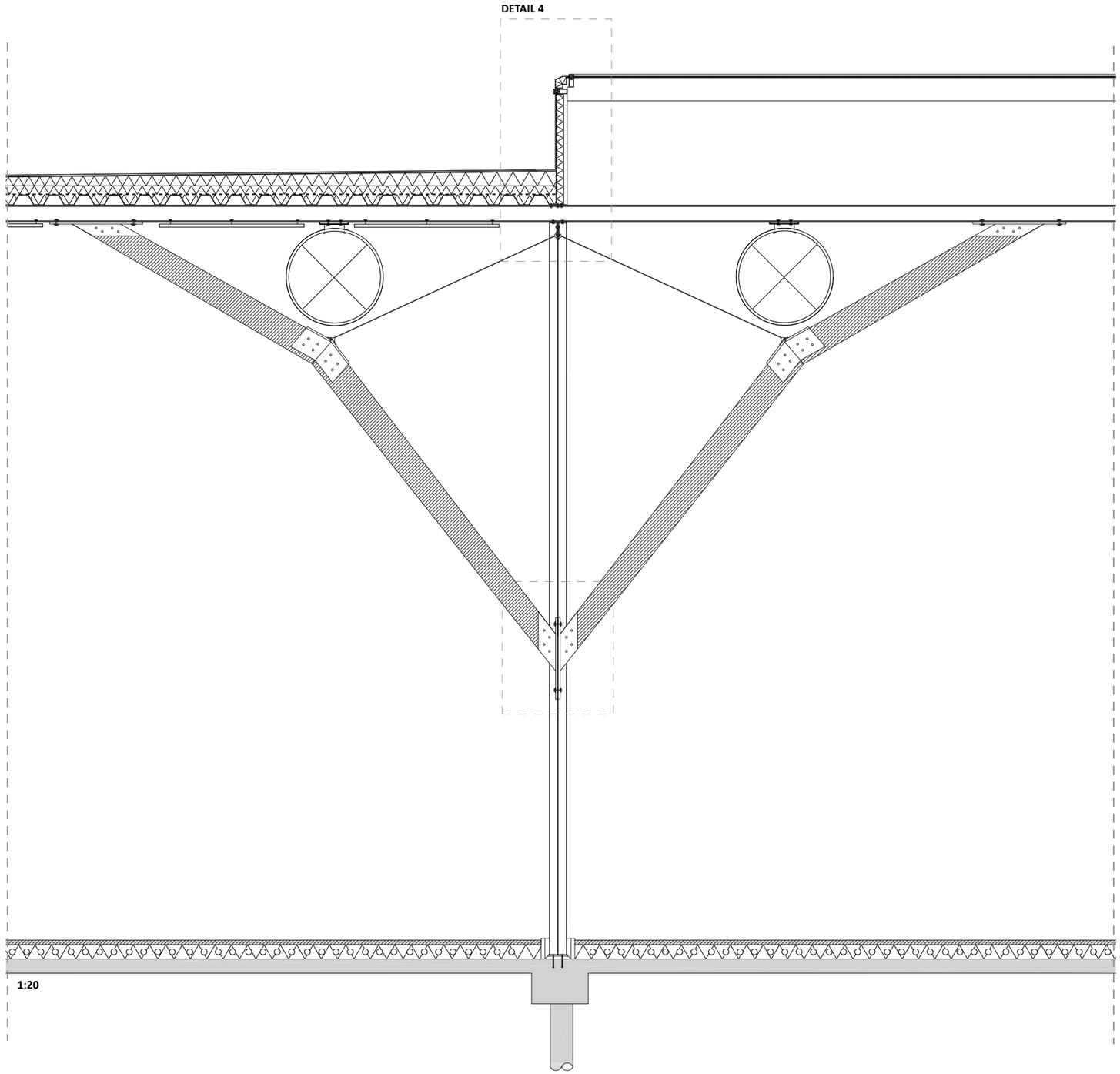
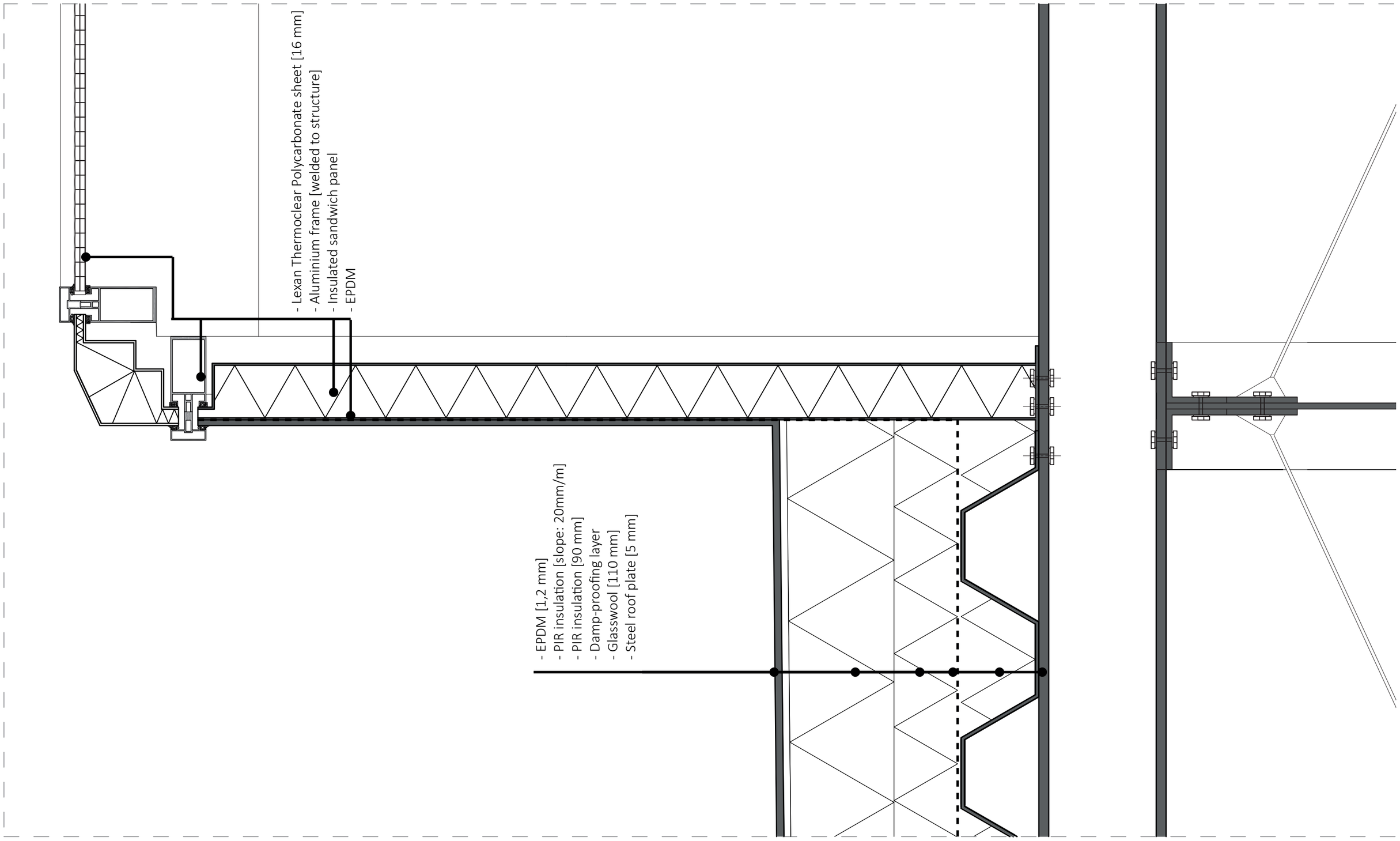
DETAIL 1:5 [2]


- Lexan Thermoclear Polycarbonate sheet [16 mm]
- Aluminium frame
- Steel sleeve profile
- HEA 180 profile
1:5

SKYLIGHT FRAGMENT 1:20 [2]

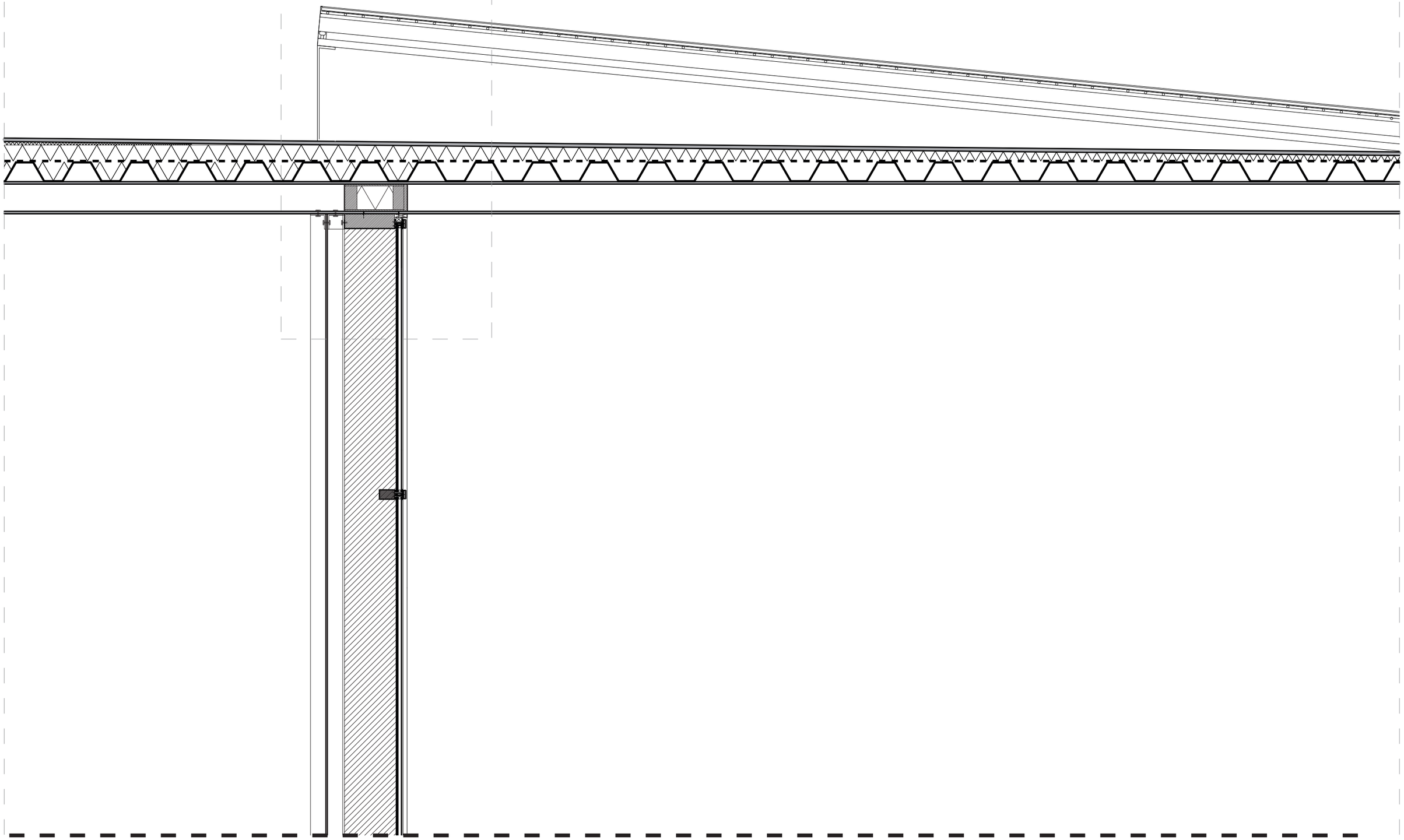


DETAIL 1:5 [4]

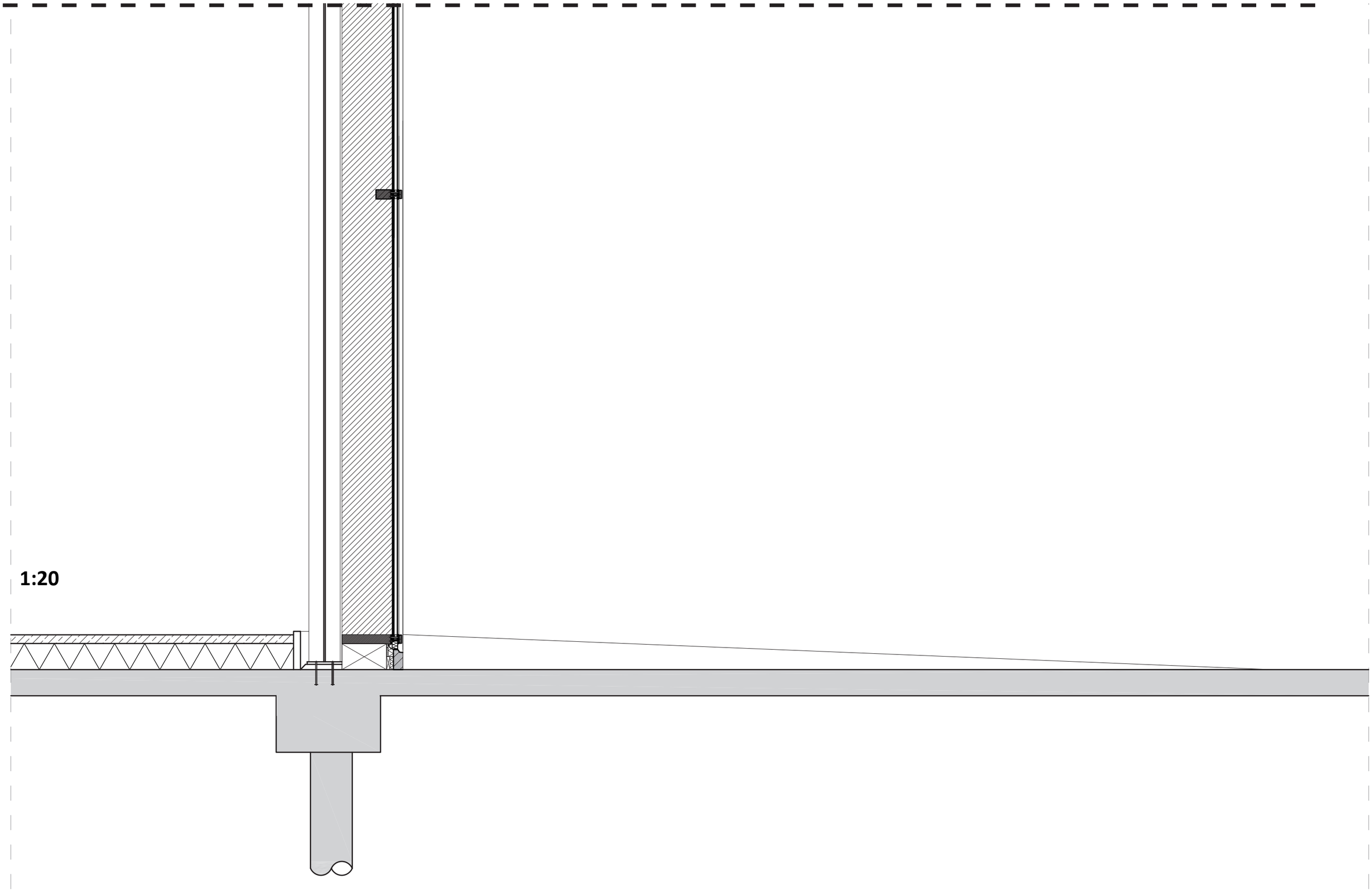

- Lexan Thermoclear Polycarbonate sheet [16 mm]
- Aluminium frame [welded to structure]
- Insulated sandwich panel
- EPDM
- EPDM [1,2 mm]
- PIR insulation [slope: 20mm/m]
- PIR insulation [90 mm]
- Damp-proofing layer
- Glasswool [110 mm]
- Steel roof plate [5 mm]

FACADE FRAGMENT 1:20 [1]

DETAIL 5



FACADE FRAGMENT 1:20 [1]



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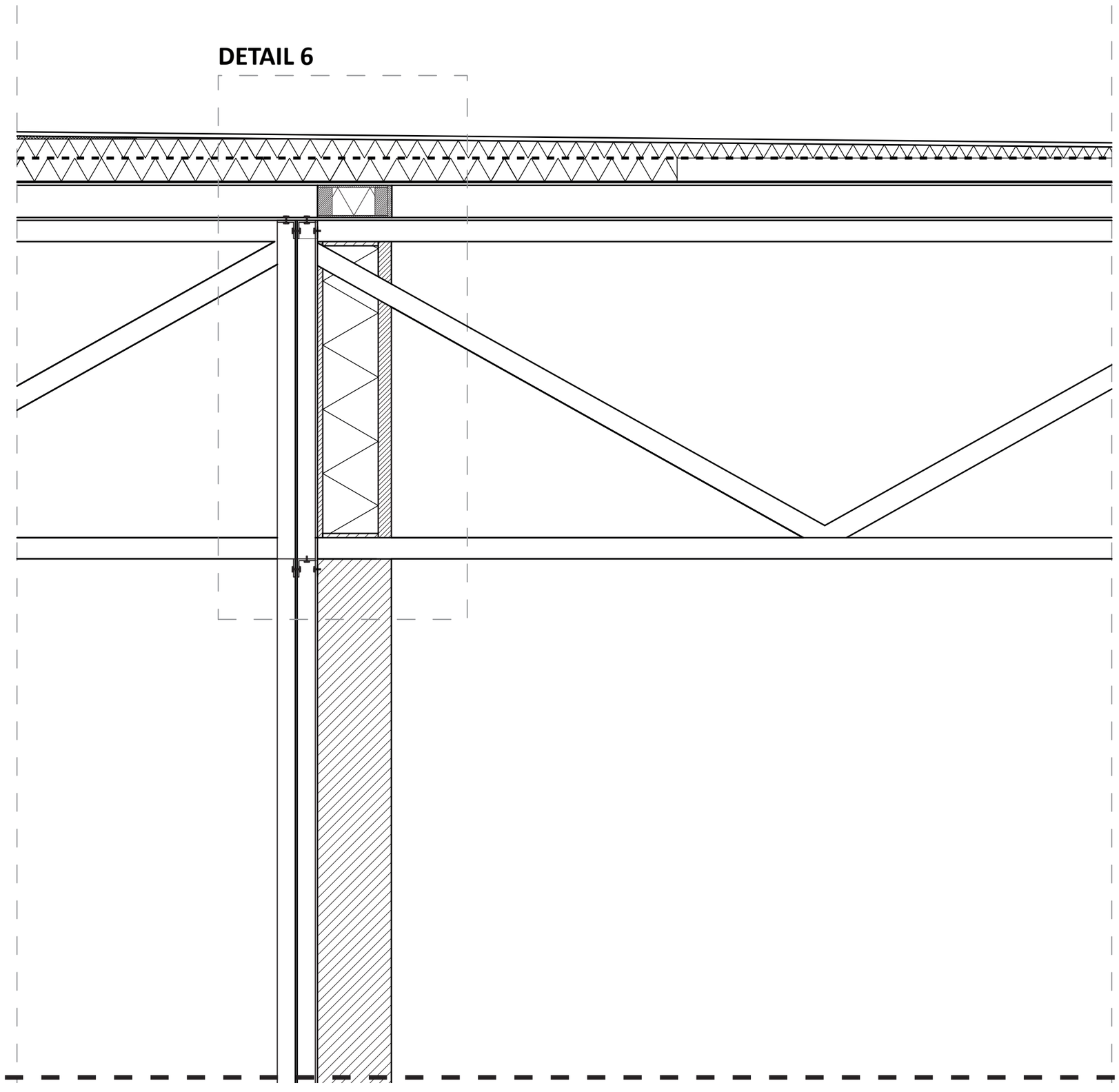
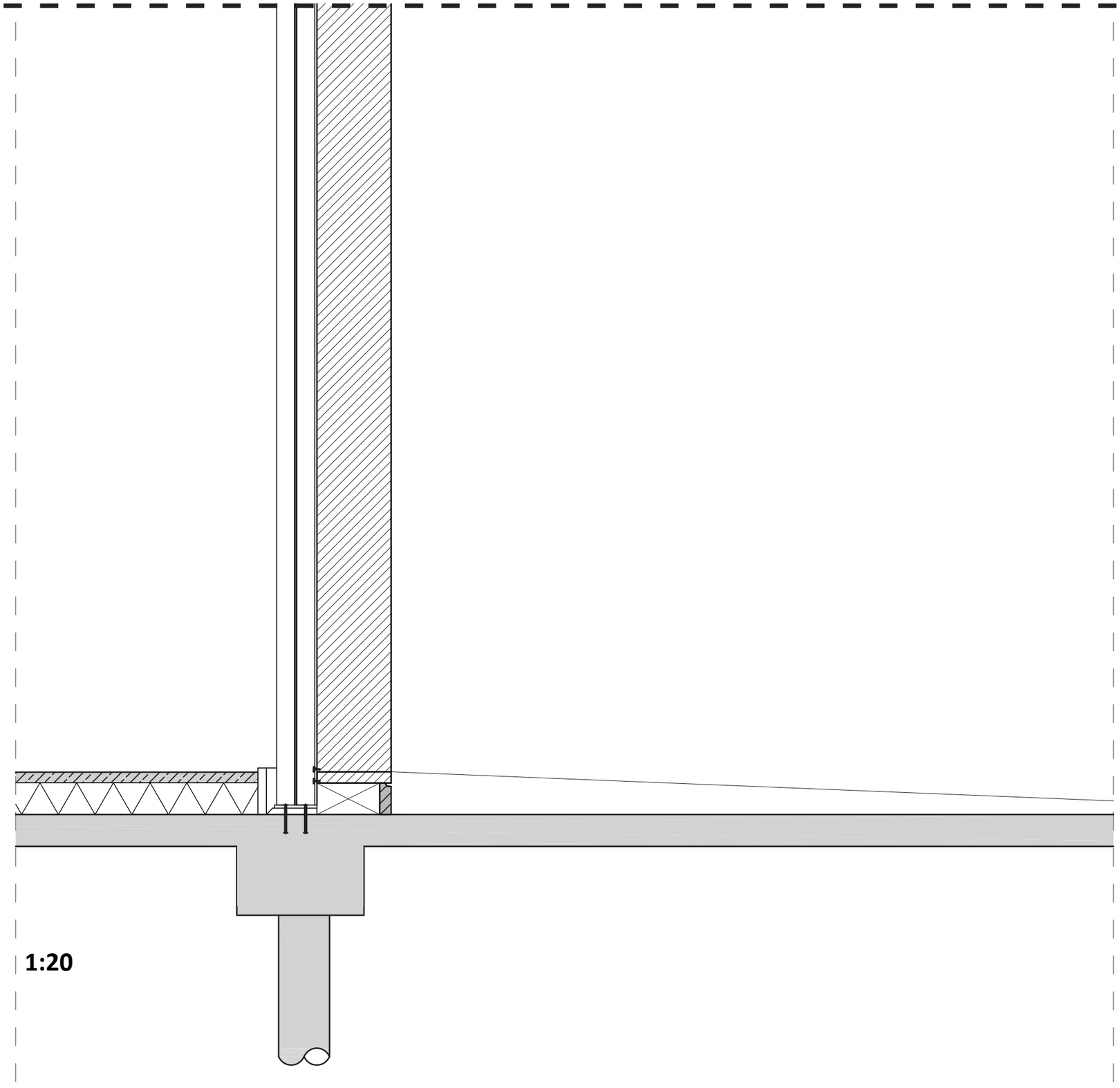
FACADE FRAGMENT 1:20 [2]



FACADE FRAGMENT 1:20 [2]



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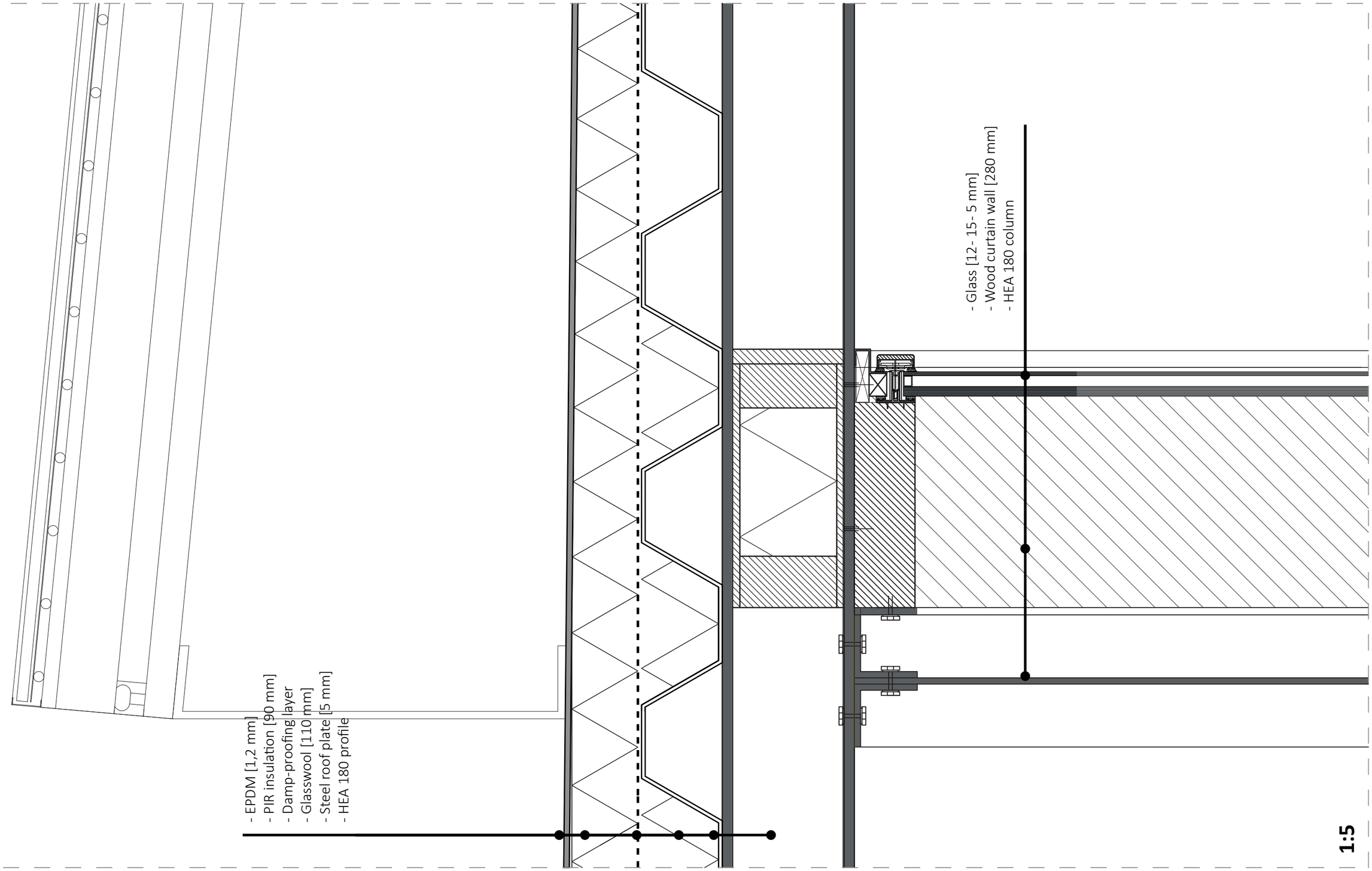
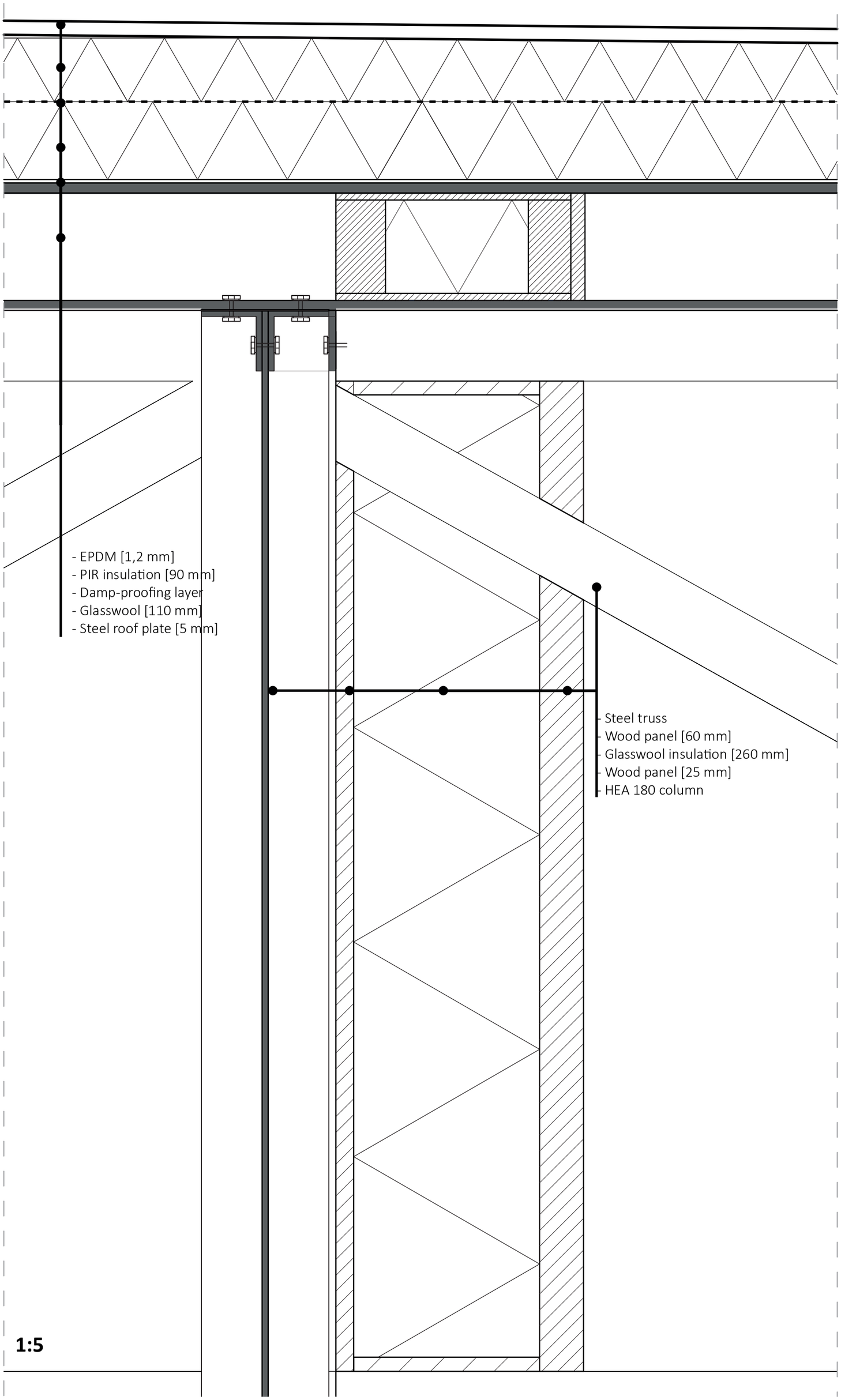
DETAIL 1:5 [5]


- Glass [12 - 15 - 5 mm]
- Wood curtain wall [280 mm]
- HEA 180 column
- EPDM [1,2 mm]
- PIR insulation [90 mm]
- Damp-proofing layer
- Glasswool [110 mm]
- Steel roof plate [5 mm]
- HEA 180 profile
1:5

DETAIL 1:5 [6]



1:5

SHELL ROOFS [LONG]

EXISTING SITUATION

The roof shape derives from the original function as explosive testing building. The cast concrete structure is executed in different variations, but the buildings still share a unity in materiality and overall shape.
The unity in outward appearance and material is valuable to the coherence of the plots in the woods and shows the history of the site. This means that interventions in the façade should be done in line with the existing grid and in similar materials.
Internally the northern constant light provides a pleasant working space, which should be preserved.
The open floor layout of the buildings is both practical and provides great spatial quality. Therefore, no closed volumes should be inserted. The visible concrete structure is the core of the building typology and construction method and should remain visible or even highlighted.

The shell roof typology can be configured in two directions. The first are the longitudinal shell roofs.

INTERVENTIONS

The proposed program for the shell roofs consists of office and laboratory spaces. The open floor plan offers space for the workstations. A direction relation between the workstations and laboratory spaces is needed for an optimal workflow. Therefore, the labs need to be located adjacent to the office spaces. The supporting functions, such as technical spaces, storage and toilets require a closed volume. To avoid clashes with the existing open floor plan and spatial quality, these functions need to be located outside of the existing structure.

The following interventions were defined when combining the proposed program with the before mentioned values. The brick portion of the northern façade is removed and replaced by a new glass façade, in the same grid as the existing glass frames to ensure plenty of indirect daylight and a connection to the green. Four internal walls are placed to separate the labs from the offices and for the service functions an extension is added on the south façade.

ARCHITECTURAL DESIGN

The results of these interventions can be seen in the floorplan. As you can see, the extension intrudes into the green space. This counteracts the goal of the masterplan to extend the current greenery. Therefore, the extension is embedded into new earthen walls, drawing the landscape up to the roof of the buildings and covering the extension. The extension is not visible from the outside, maintaining the material unity of the ensemble, while the adapted north façade offers a great view on the new green outdoor space. And the additional earthen walls complement the shape of the shell roofs and reference the old landscape hills on site.

The open façades promote interaction with the nature, pleasant outdoor space and the sight-line along entire length building is maintained. The labs will be more intimate spaces, but with the same lighting conditions and view as the offices.

CLIMATE DESIGN

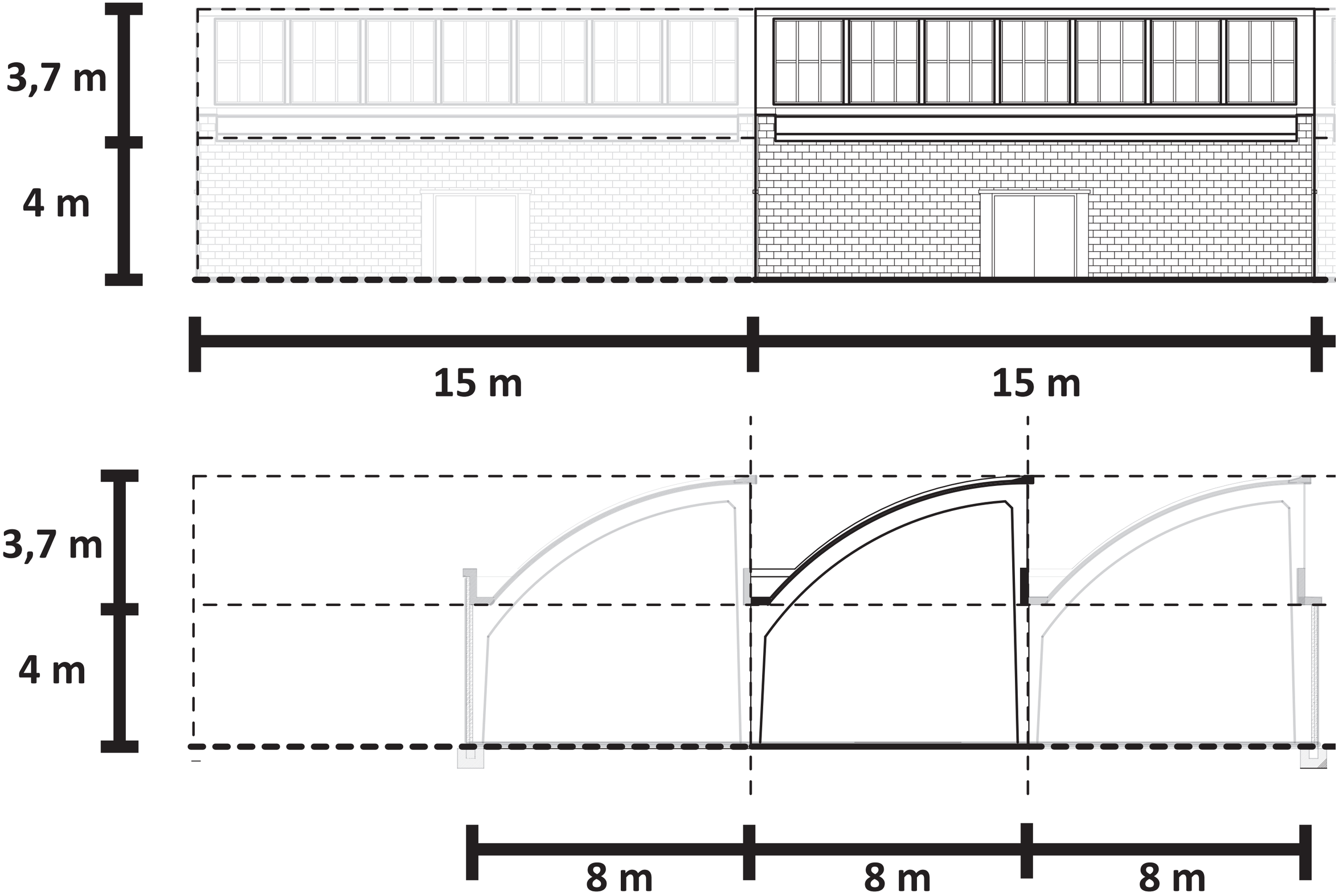
The service corridor is also the central circulation route for the climatic system, with the two separate ventilation systems for the labs and offices.
The minimal climatic interventions in the higher valued buildings, such as the shell roofs, are possible because of the proposed sustainable energy network.

DETAILS

The new internal walls are made of ceramic bricks, filled with acoustic insulation. The colour is remnant of the brick exterior and brings warmth to the interior.

The new corridor in the extension, searches for contrast with the existing interior space and is lined with wood slates. The slates cover the new insulation layer, which continues over the roof.

EXISTING SITUATION



EXISITING [VAL

3,7 m

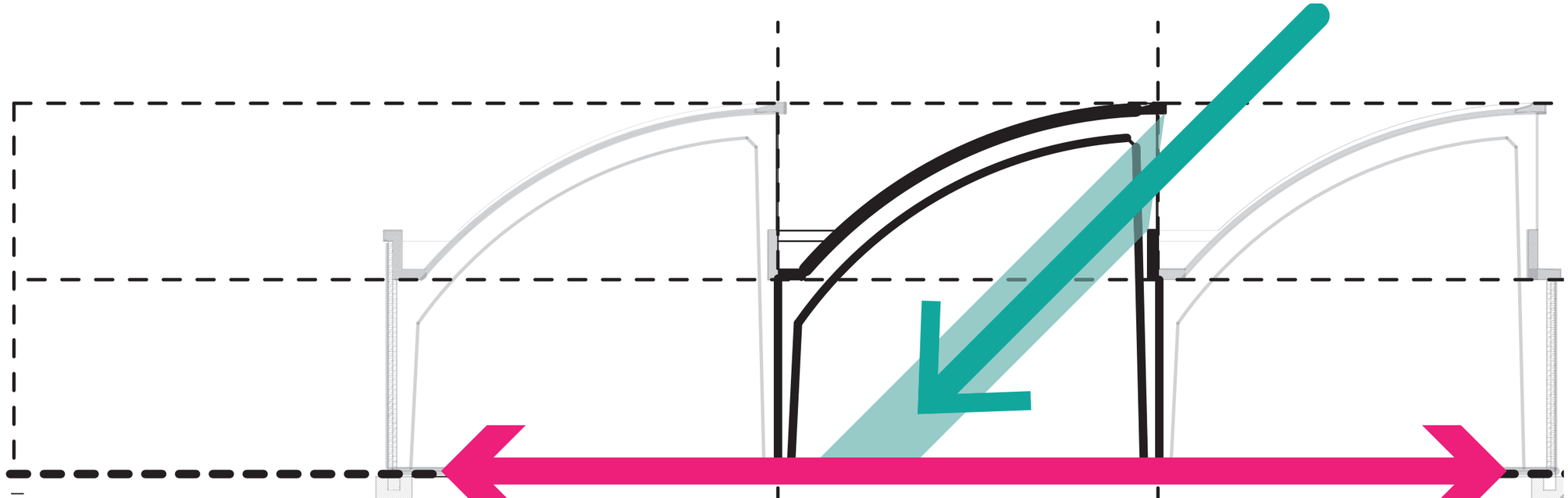
4 m

15 m

15 m

3,7 m

4 m

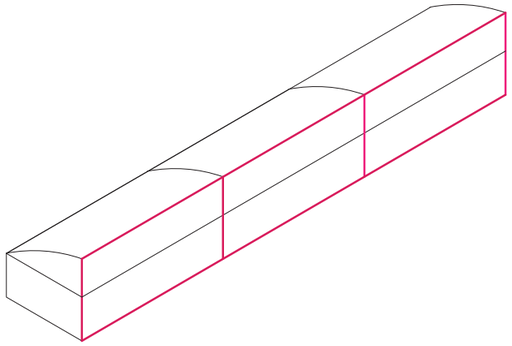


8 m

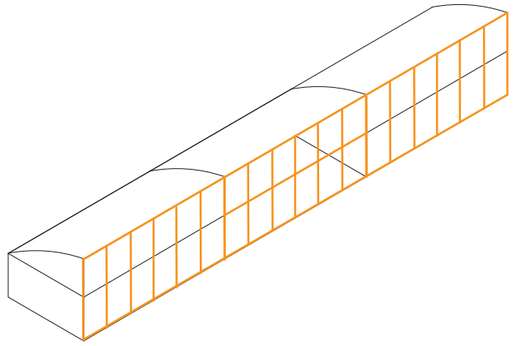
8 m

8 m

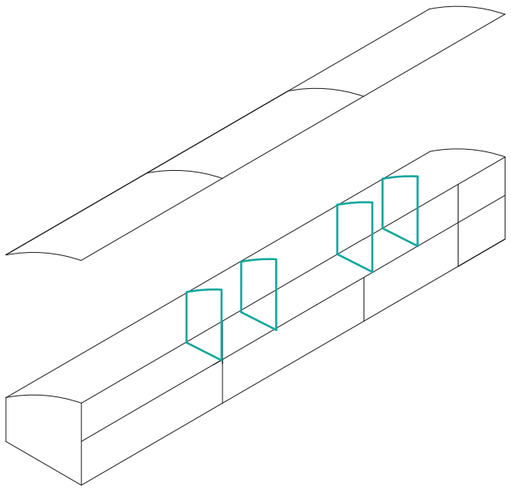
INTERVENTIONS



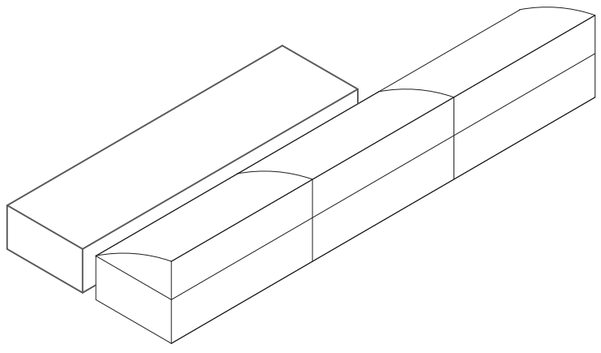
REMOVE NORTH FACADE



NEW GLASS FACADE

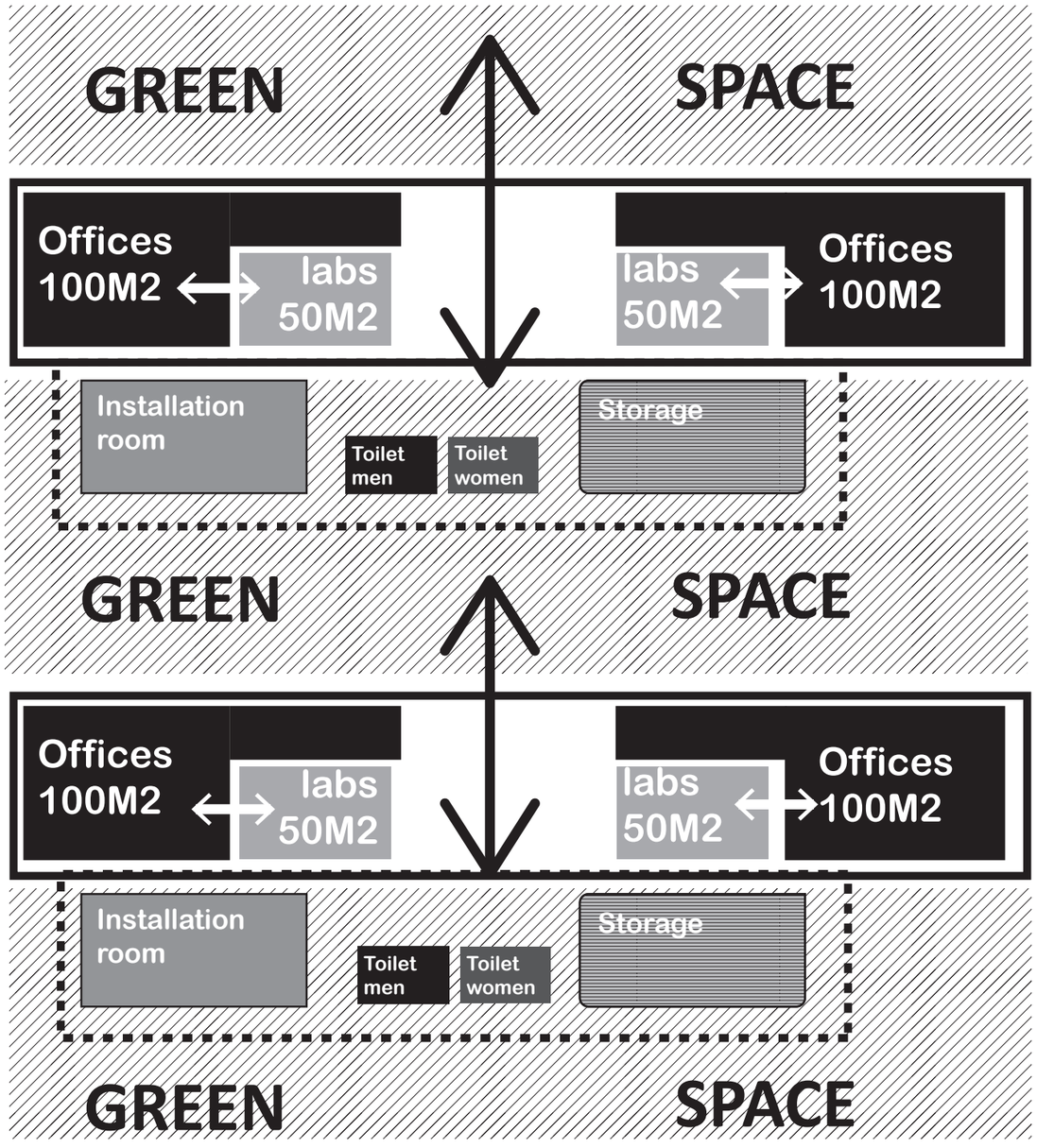


INTERNAL WALLS

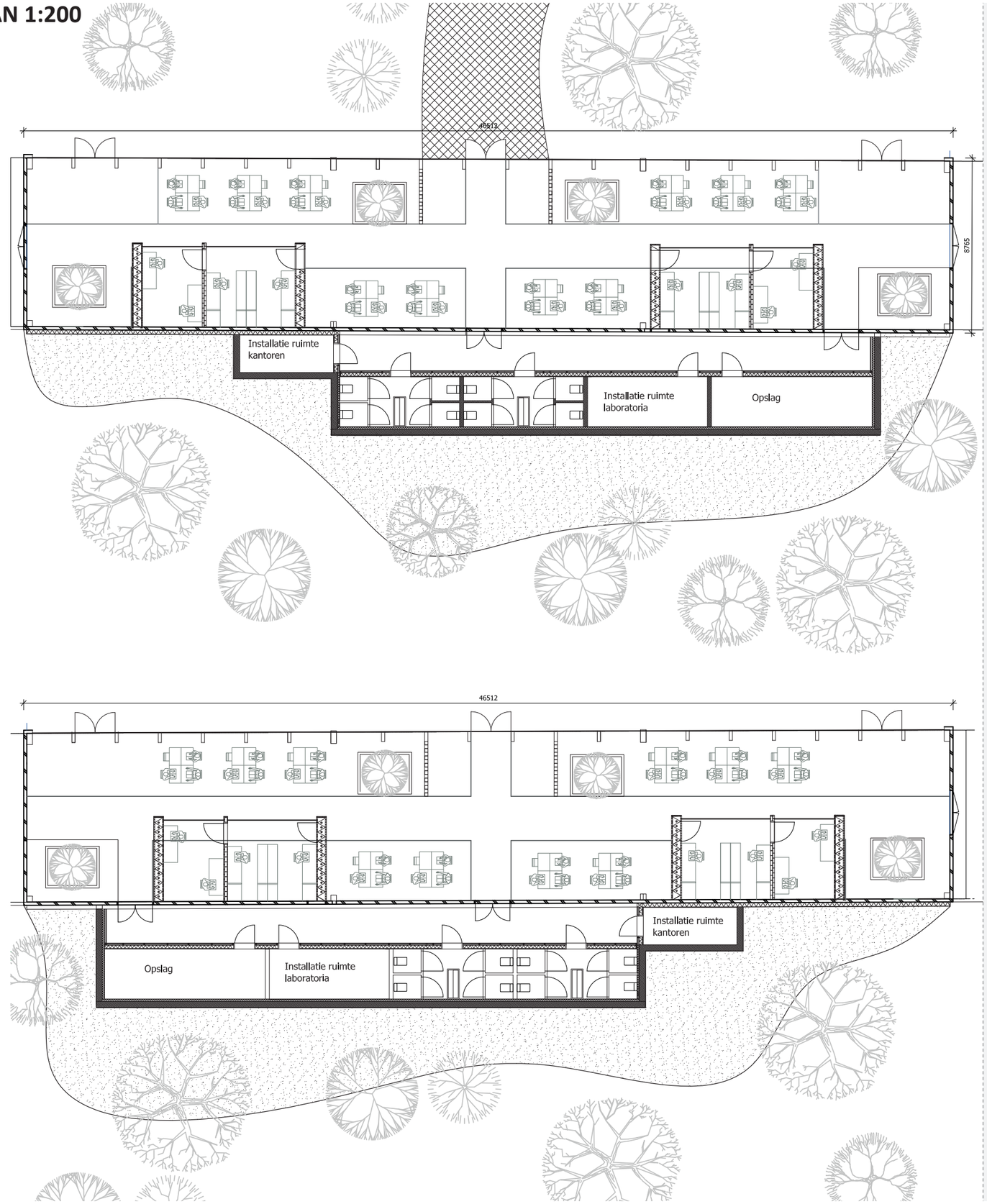


EXTENSION

Programmatic scheme ‘Shell roof long’

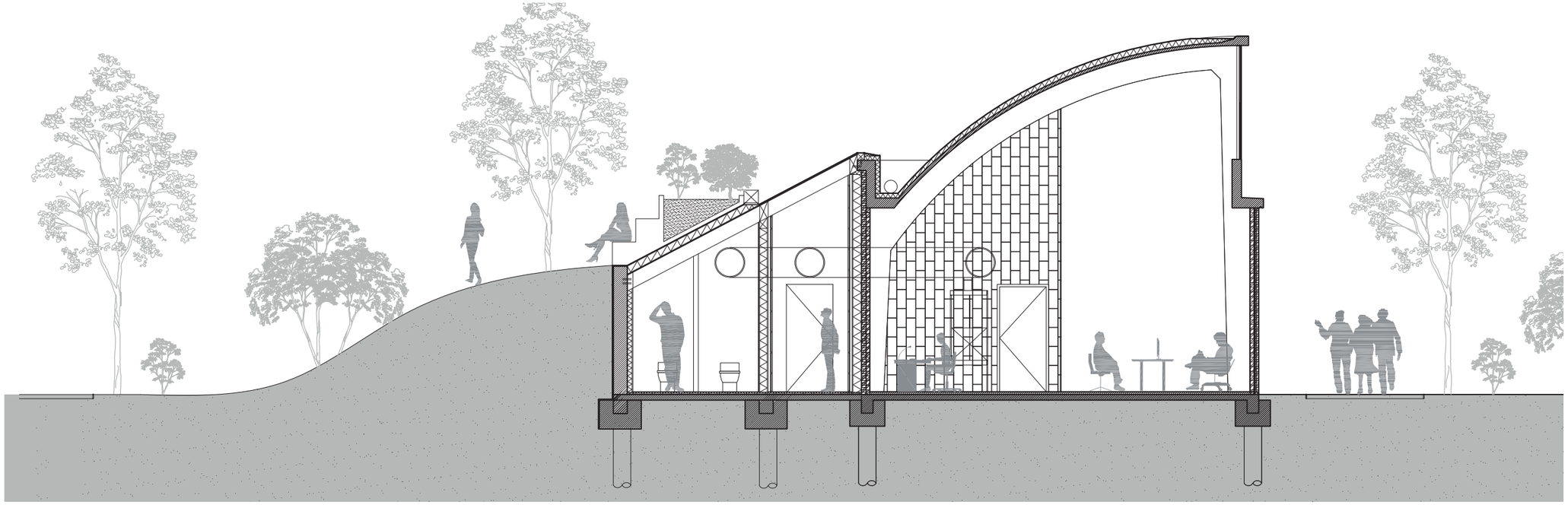


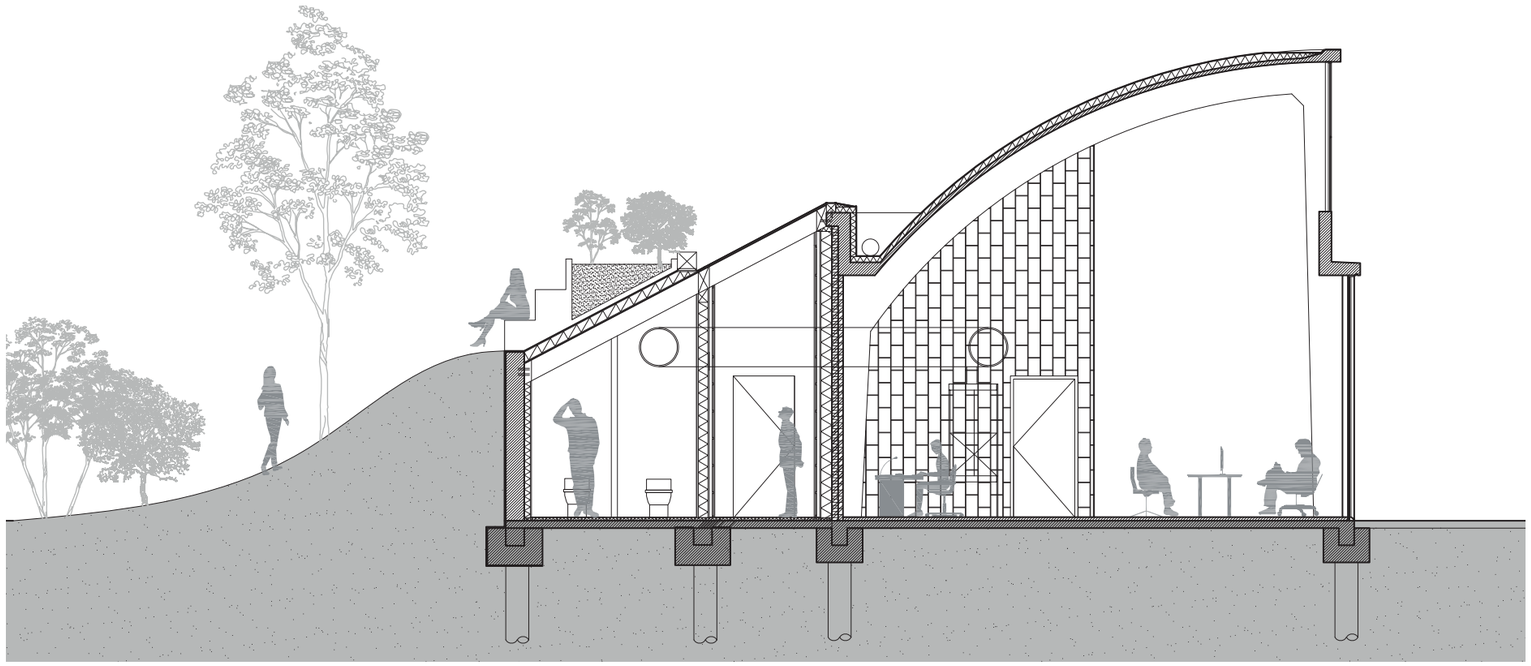
PLAN 1:200

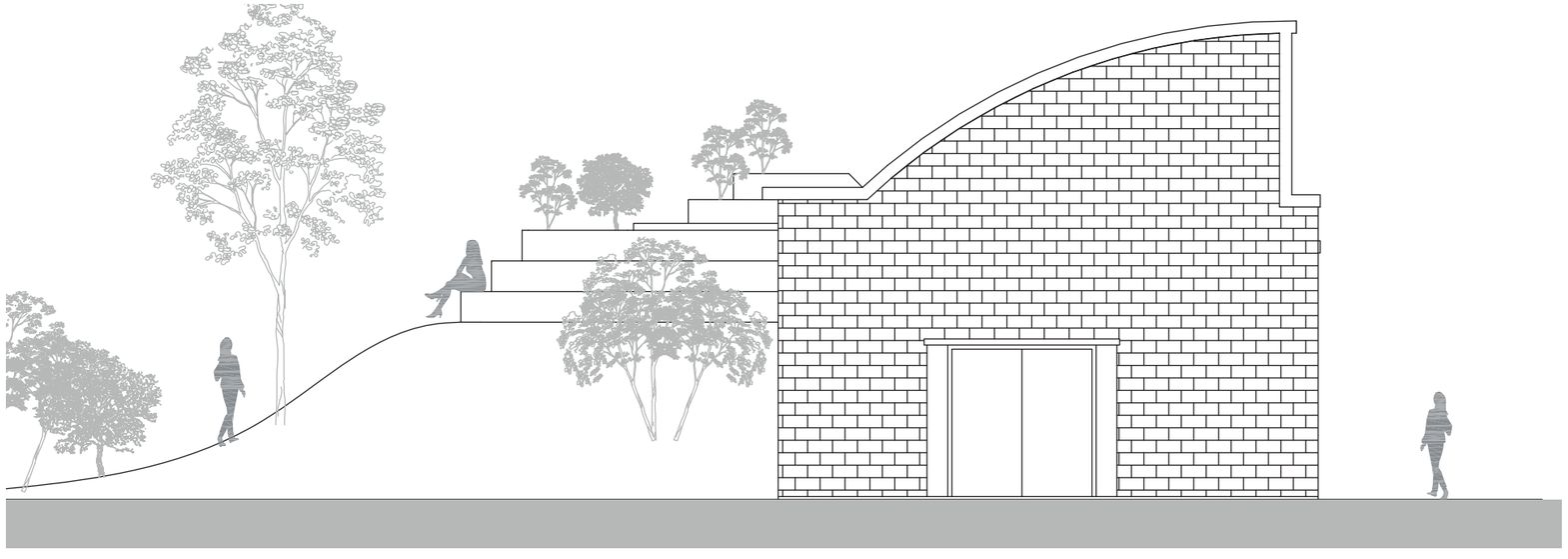

46512
5928
Installatie ruimte kantoren
Installatie ruimte laboratoria
Opslag
46512
Installatie ruimte kantoren
Opslag
Installatie ruimte laboratoria


Installatie ruimte
Opslag

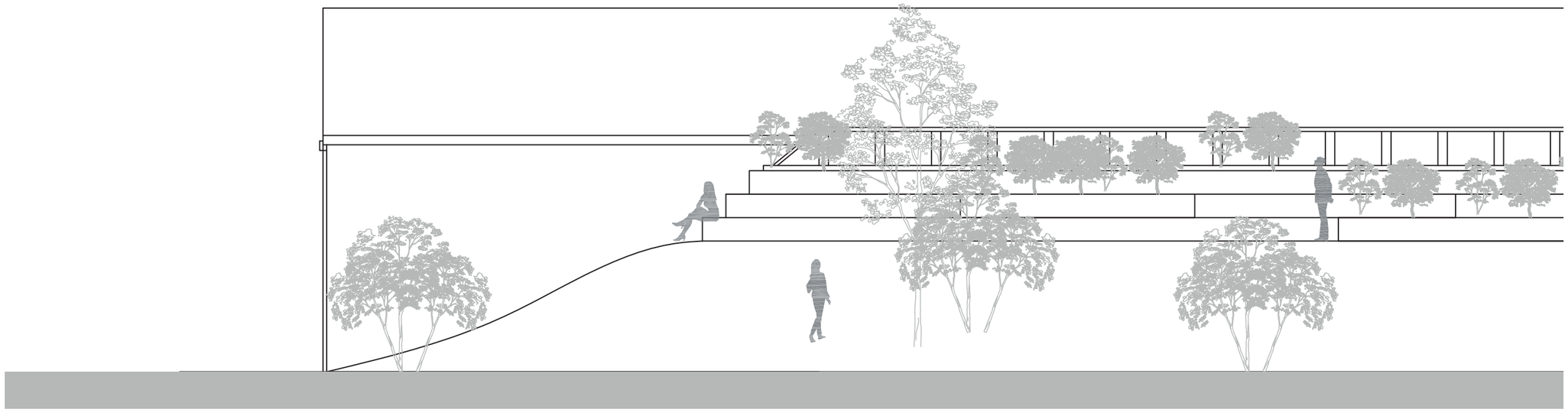
SECTION + EAST FACADE [1:100]

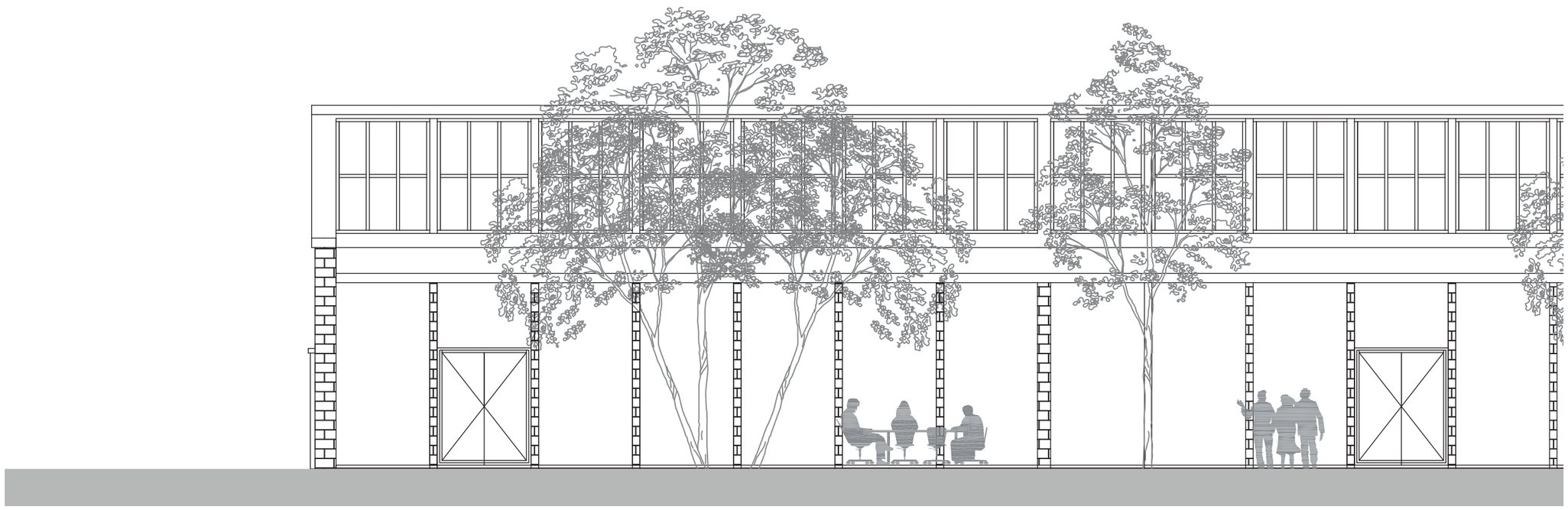


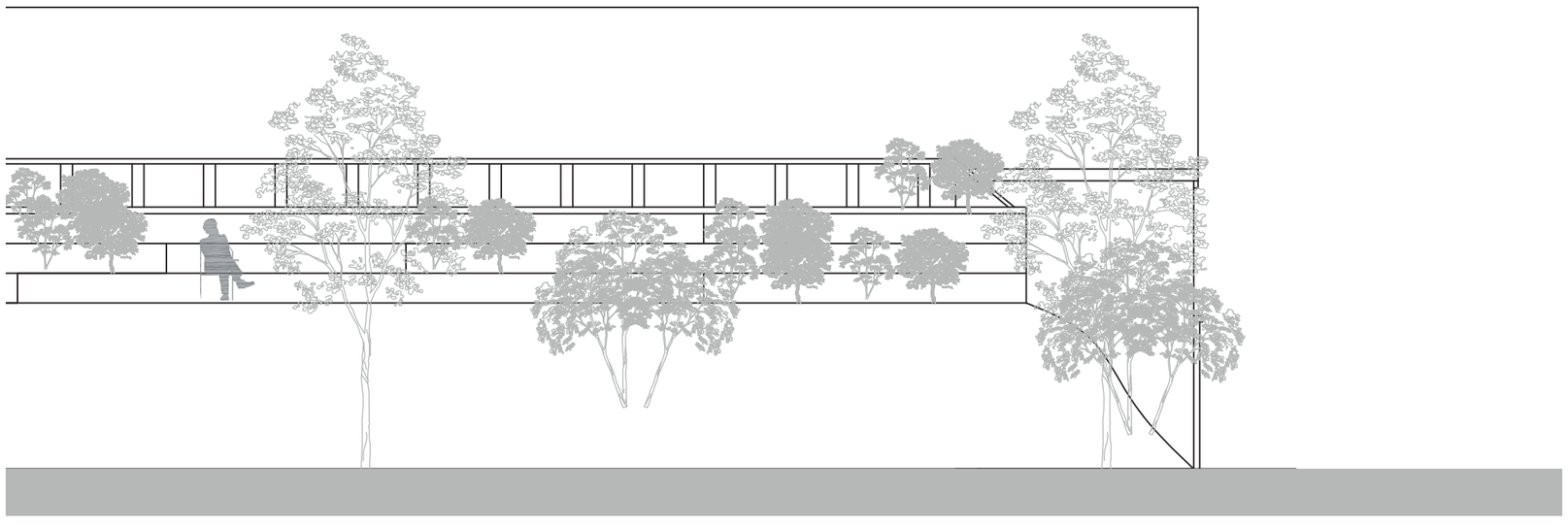


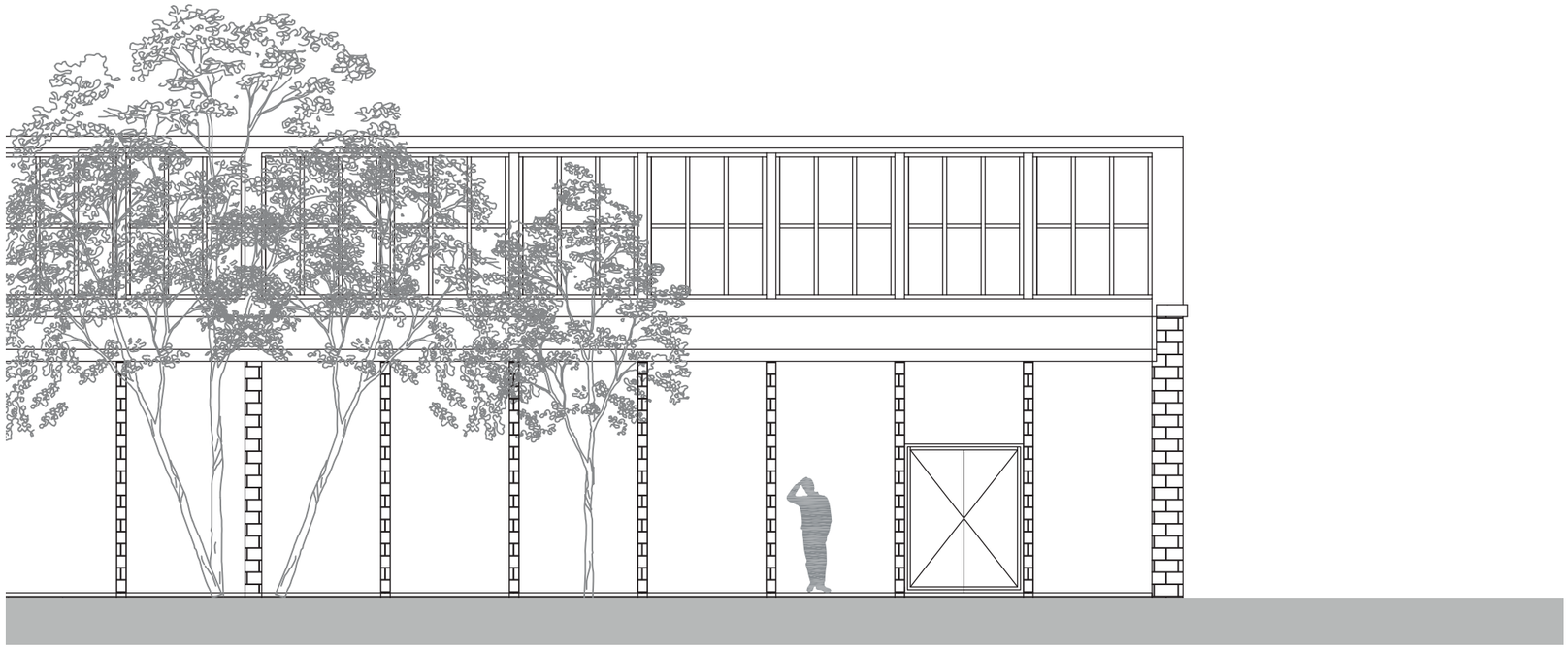


SOUTH + NORTH FACADE [1:100]

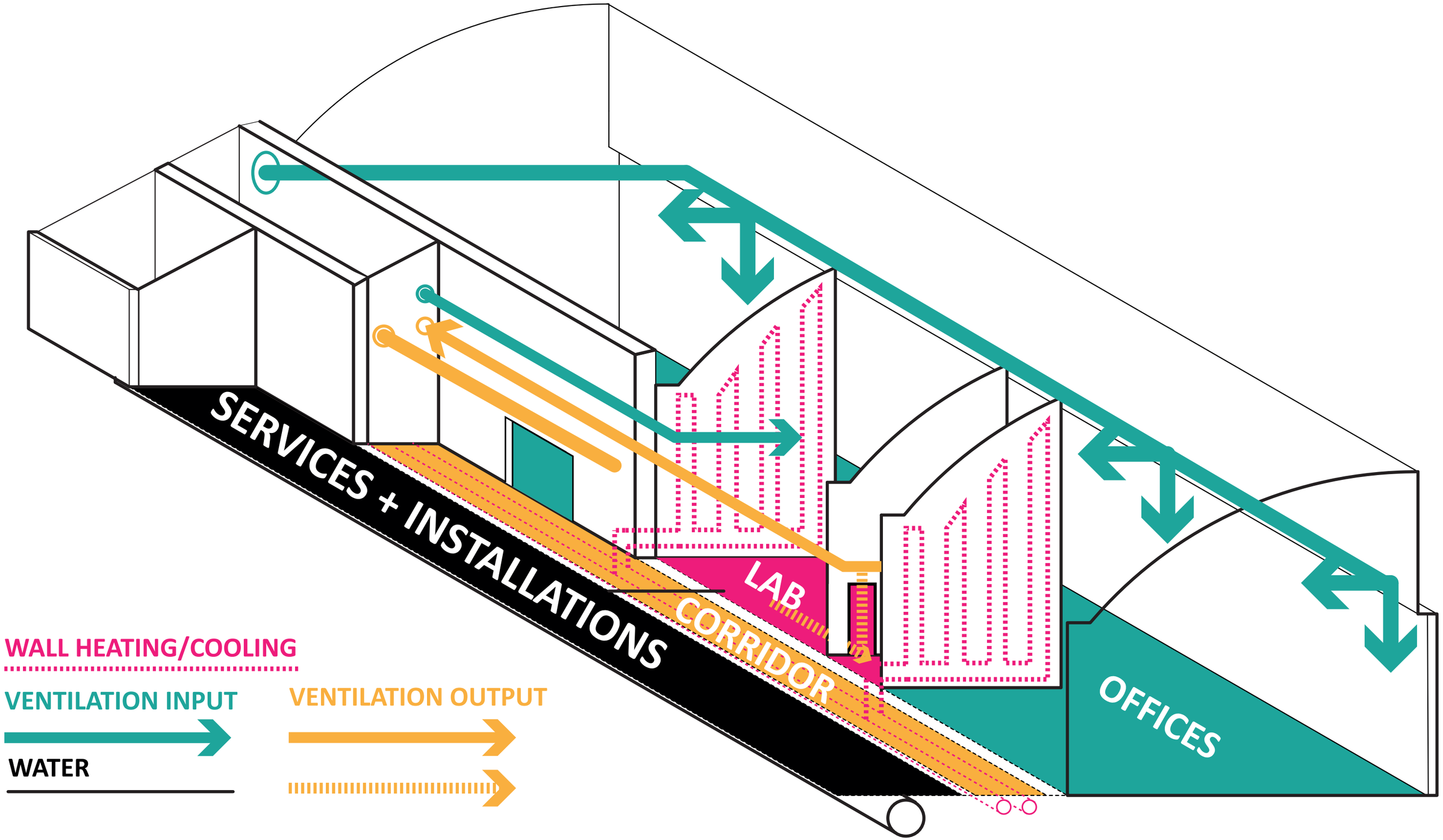




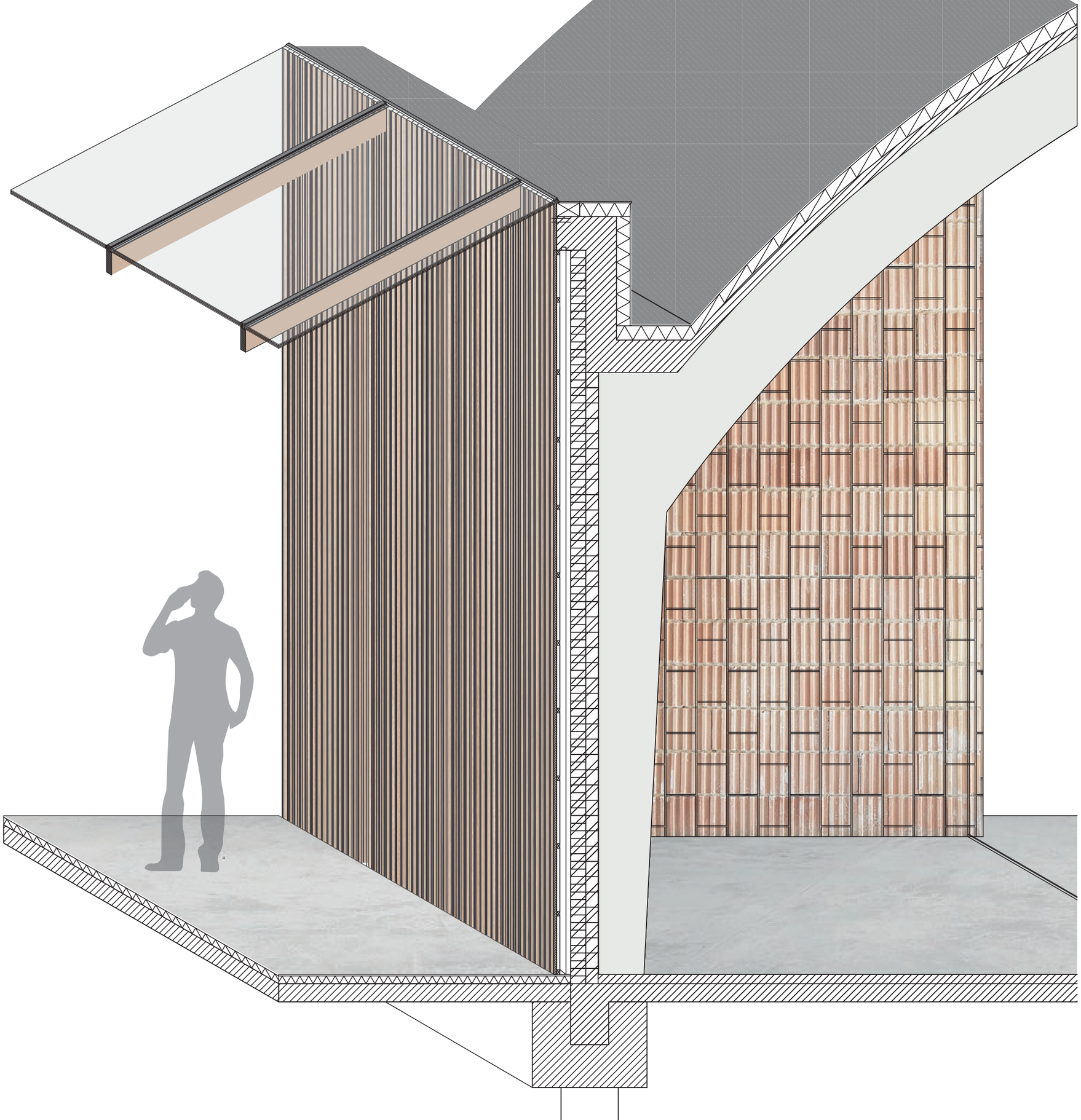




CLIMATE DESIGN



DETAIL AXO



SHELL ROOF [SHORT]

EXISTING SITUATION

This approach can be repeated for the other longitudinal shell roof on side. However, the shell roof typology also occurs constructed in the other direction.

INTERVENTIONS

The programmatic approach for this building is similar to the longitudinal one, with a direct relation between office and lab, and a separate section for the supporting functions.

The different layout and location do however call for slightly different interventions. To increase the internal daylight, openings are made. However, because of the depth of 24 meter of this building, the openings are made on the west façade and are not along the entire façade, to reduce heat gain. Here again, internal walls are placed to separate the labs from the office spaces, but are along the central axis of the building. The extension for the supporting services is on the east side instead of the south side, due to the entrance being located on the south facade.

ARCHITECTURAL DESIGN

In plan this results in a different layout, with a north south orientation of the circulation axis and the labs that require a constant climate on the east side, to eliminate overheating.
The openings on the west façade look out onto the green area and towards the box, while the east façade is covered with an earthen wall. The north and south façade are maintained original.

Internally, the separating walls are shaped around the concrete structure and emphasize the rhythm of the roof, which offer privacy, but simultaneously interesting sight lines through the building. From both the outside and the central corridor.

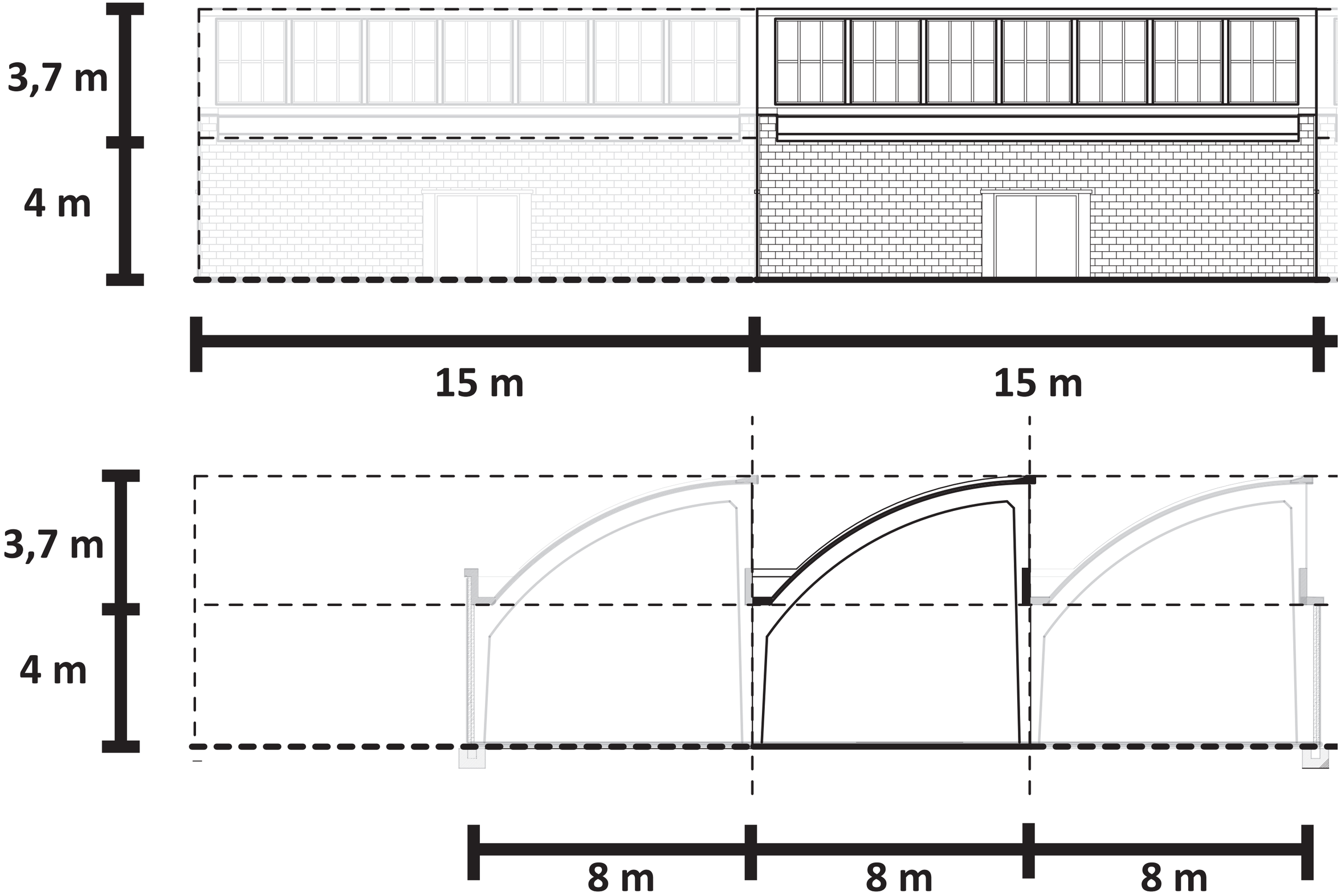
CLIMATE DESIGN

(See Shell roof long)

DETAILS

(See Shell roof long)

EXISTING SITUATION



EXISTING [VALUE]

3,7 m

4 m

15 m

15 m

3,7 m

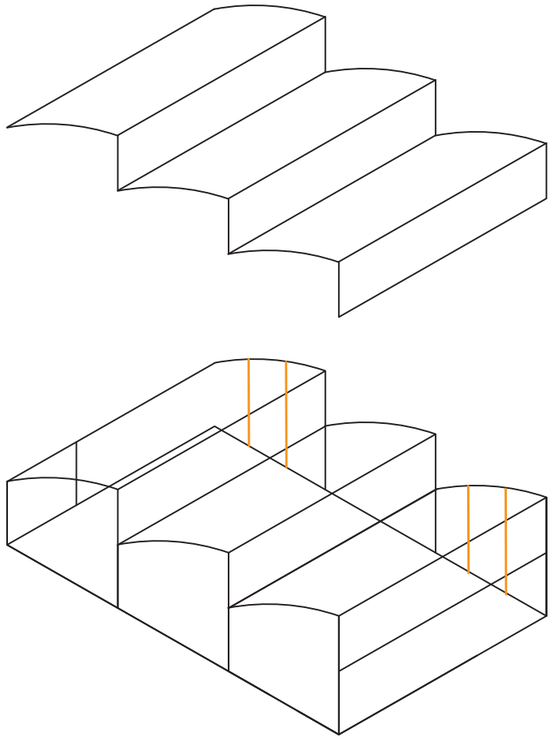
4 m

8 m

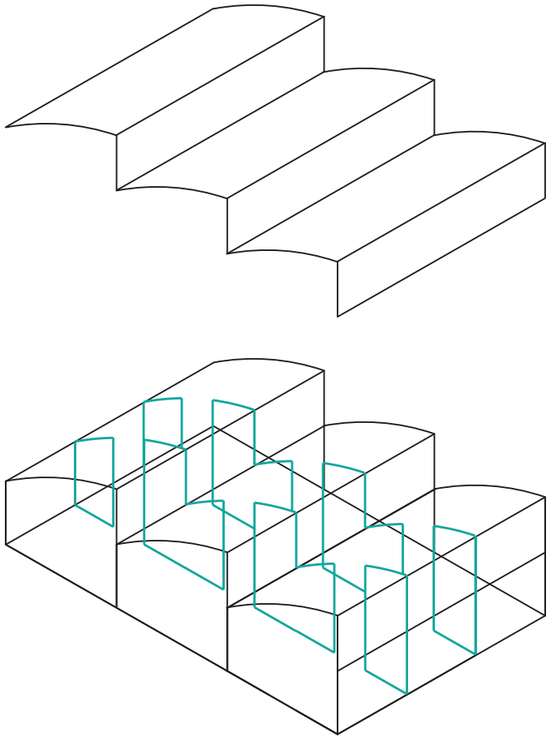
8 m

8 m

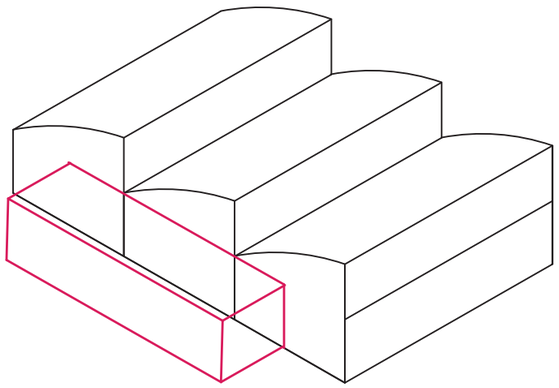
INTERVENTIONS



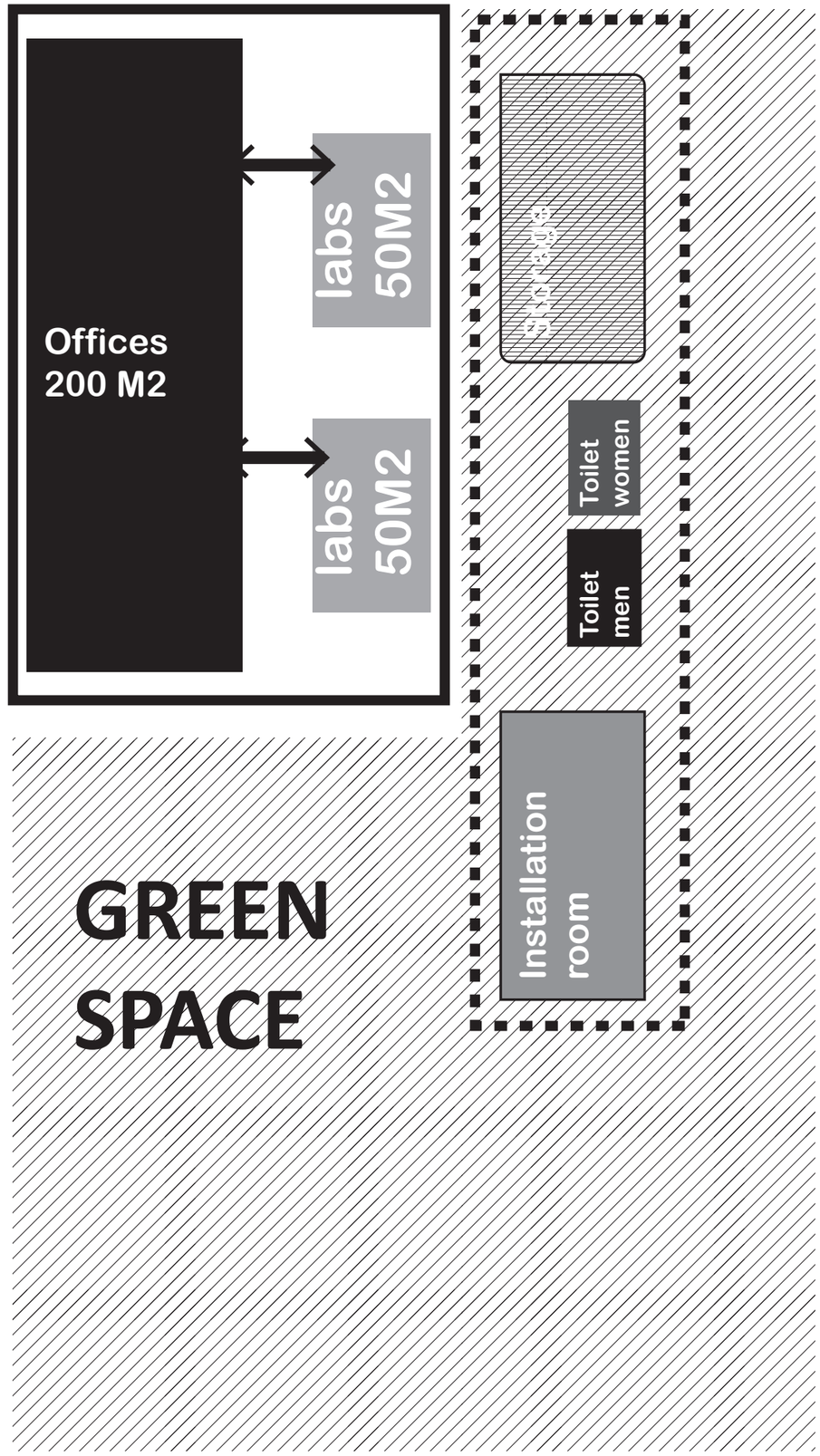
NEW GLASS FACADE OPENINGS



INTERNAL WALLS

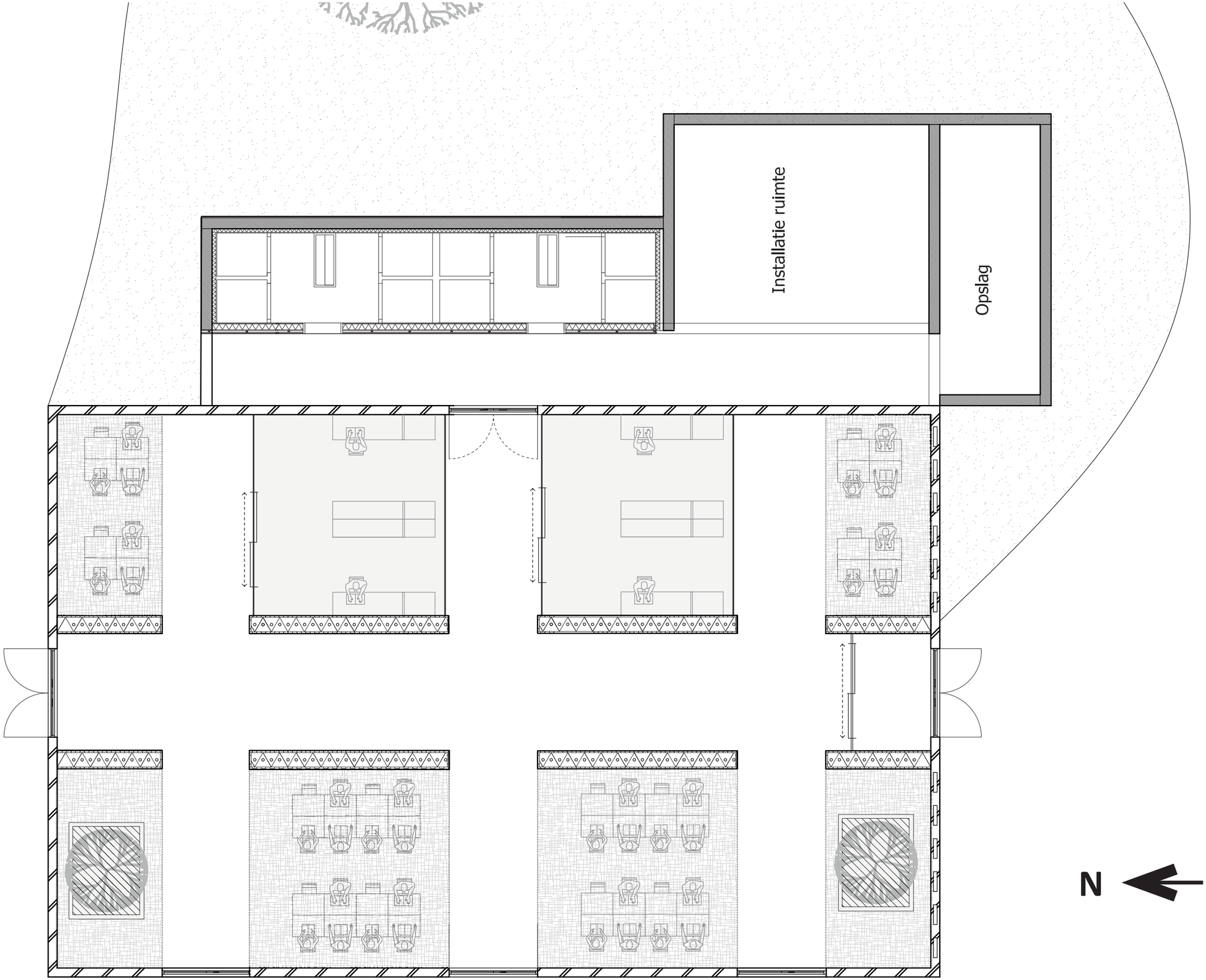


EXTENSION

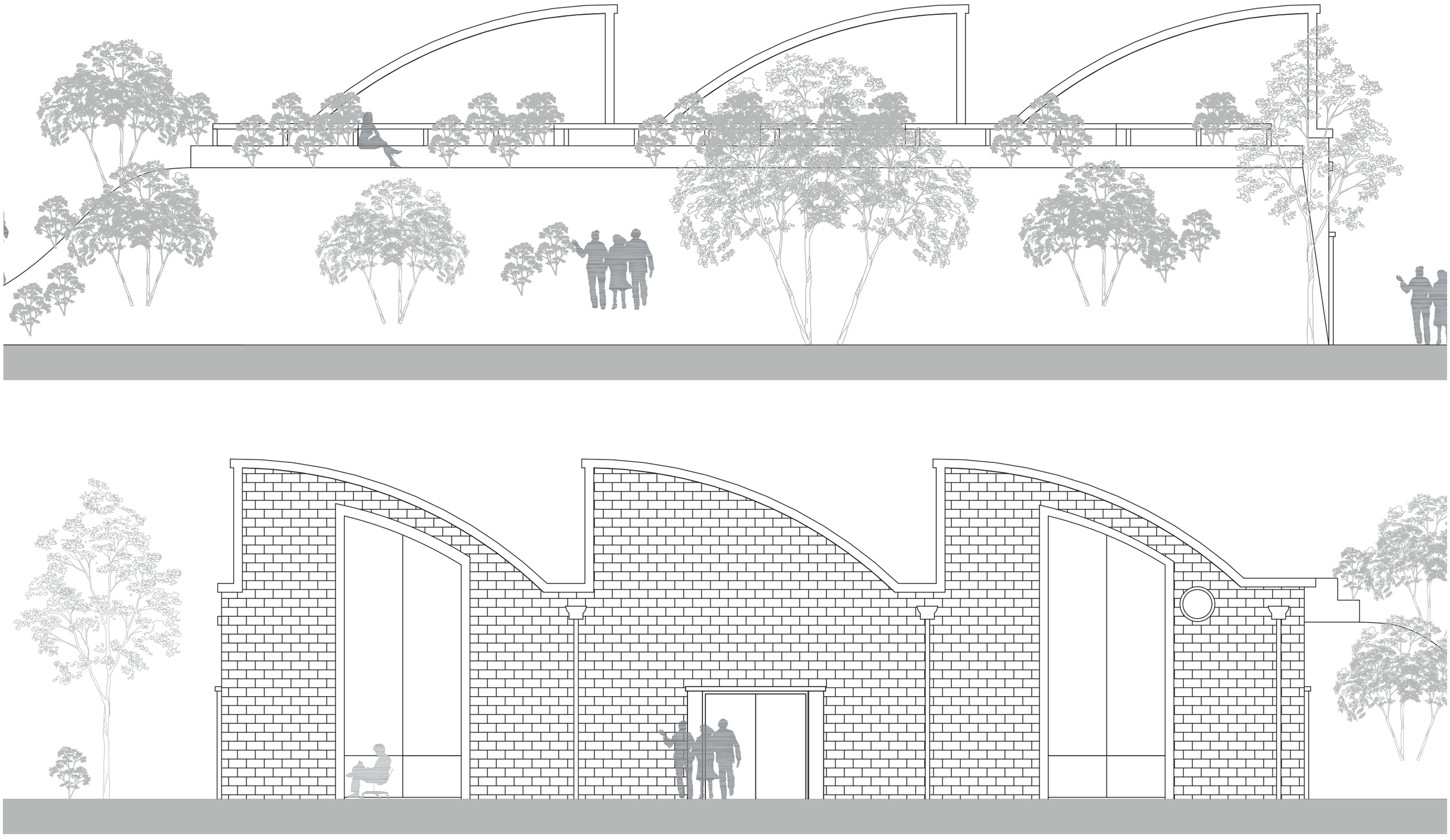


Programmatic scheme ‘Shell roof short’

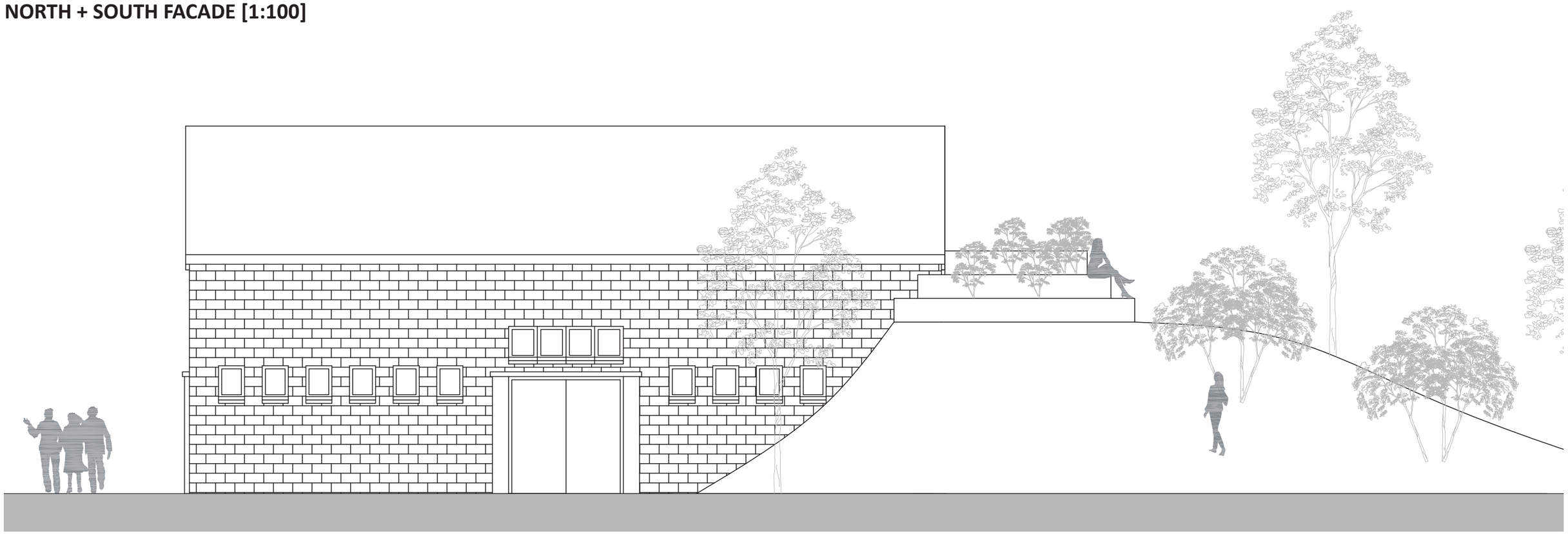
PLAN [1:100]

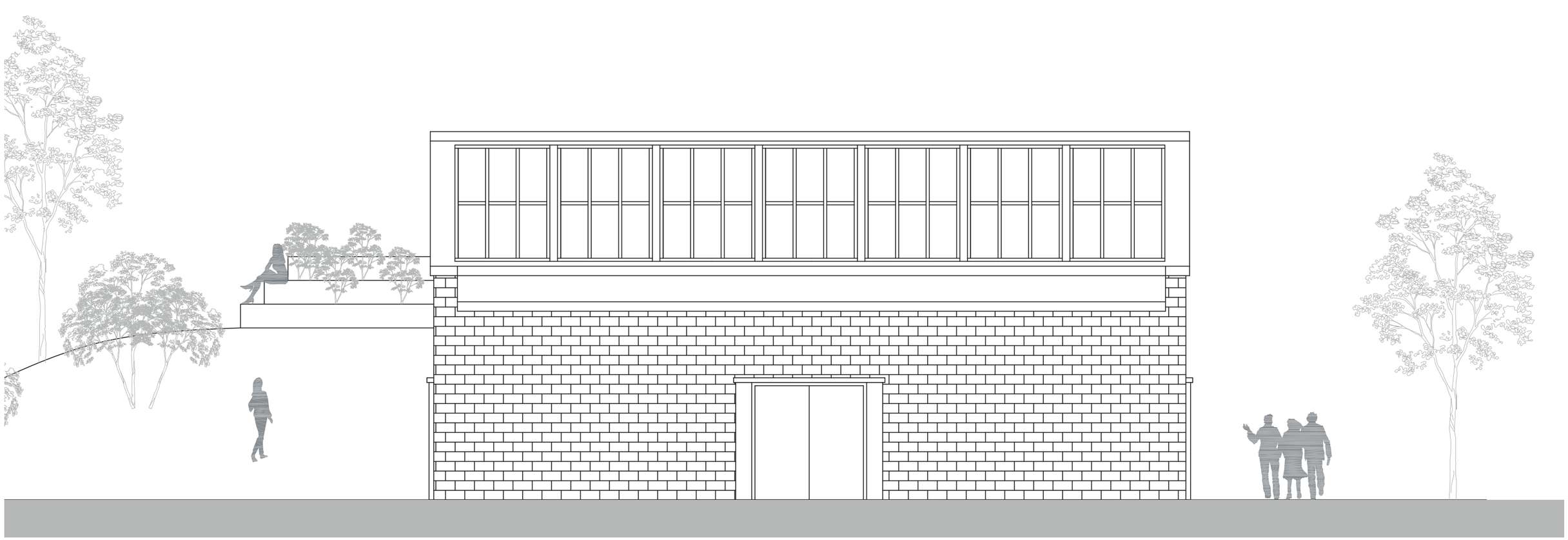


WEST + EAST FACADE [1:100]

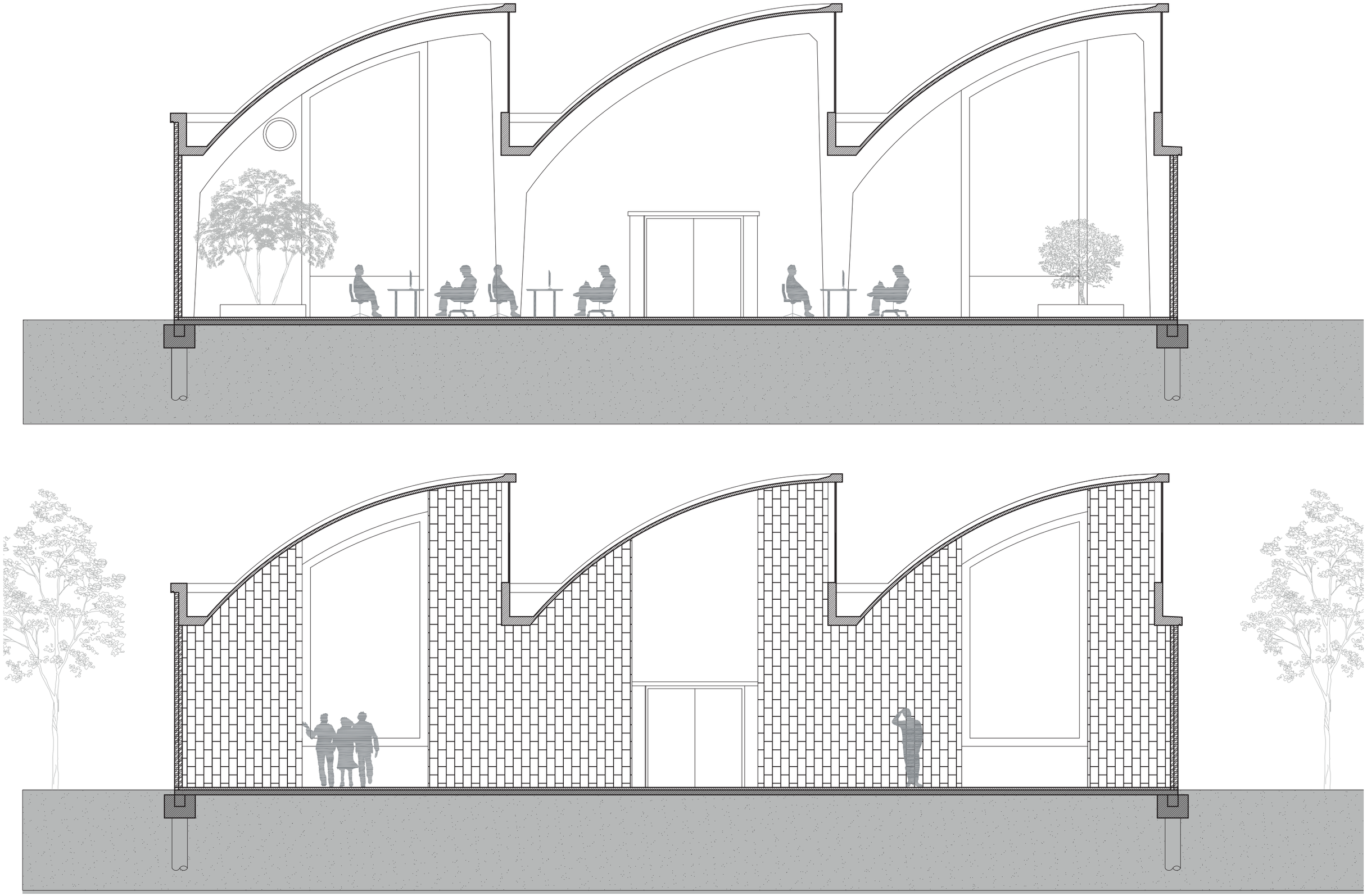


NORTH + SOUTH FACADE [1:100]





SECTION [1:100]



CONCLUSION

During this multi-disciplinary graduation project, the limitations and clashes of the ecological theme within the context of Heritage Architecture became clear (as described in the previous chapters). These limitations and clashes translate to the real-life practice of architecture, as these integral projects require knowledge from many different research fields.

In the graduation project, the feedback from the tutors (architectural, technological and landscape) helped to more closely pinpoint the programmatic approach and the spatial relations between the buildings and landscape. This required more research in the field of ecology and in similar programmatic projects. The research revealed a complex system of functions with different mutual relationships which each need an individual climatic approach. This also influenced the overall sustainability concept of the whole ensemble, circling back to one of the core principles of urban ecology 'benefiting both nature and humans through design'.

To conclude, while under development, the integration of urban ecology in the field of architecture has benefits for both the users of the built environment and for the local ecosystems. The period towards the P5 presentation will be used to spatially visualize this beneficial relation between nature and people in images and models.

SOURCES

Centraal Bureau voor de Statistiek. (2016, 25 februari). Minder landbouw, meer natuur. Geraadpleegd op 26 november 2019, van https://www.cbs.nl/nl-nl/nieuws/2016/08/minder-landbouw-meer-natuur

Koster, E. (1998). Architecture for nature (1ste editie). Haarlem, Nederland: Schuyt & Co Uitgevers en Importeurs B.V.

Kowarik, I. (2011). Novel urban ecosystems, biodiversity, and conservation. Environmental Pollution, 159(8–9), 1974–1983. https://doi.org/10.1016/j.envpol.2011.02.022

Kuipers, M., & de Jonge, W. (2017). Designing from Heritage (1ste editie). Delft, Nederland: Tu Delft Library.

Mangone, G. (2015). Performative Microforests (A+BE | Architecture and the Built Environment). Delft, Nederland: TU Delft.

Schilthuizen, M. (2018). Darwin Comes to Town: How the Urban Jungle Drives Evolution (2nd edition). London, UK: Quercus Publishing Plc.

Wissing, N. (25-9-2019) Symposium Natuur-inclusief Bouwen