

## **Team MIMO extend the roof of Café Ada with residential and communal area** The first wooden elements are being manufactured

Düsseldorf, 23rd March 2022

The *Solar Decathlon Europe* is the largest international university competition for sustainable building and living in cities. In June 2022 (10 - 26 June 2022) the Solar Decathlon Europe 21/22 will come to Germany for the first time and also for the first time it will be dedicated to specific construction tasks in the existing building. The 18 university teams from eleven nations are to develop concepts for sustainable building gaps, additions and extensions.



Figure 1: Visualization of the Café Ada



Figure 2: Visualization of the HDU

We, *team MIMO of Hochschule Düsseldorf - University of Applied Sciences (HSD)*, and 17 other teams from 11 countries have a vision: to make our building and living sustainable. We are very proud that we have come together under the umbrella of the *Institute for Sustainable Urban Development (InLUST)*. As an interdisciplinary team of professors and students of architecture, mechanical engineering and energy technology, design, social and cultural sciences as well as economics, we work together under the guiding principle *«MINIMAL IMPACT - MAXIMUM OUTPUT»*, aka MIMO, to develop a solution for resource-efficient buildings. That means just doing things that give you an added value and maximum benefit with minimal intervention.

Our motivation for fulfilling the *SDE 21/22* relates to Professor Holger Wrede, MIMO team member, as follows: «My vision is to actively be part of the energy transition. In the SDE we have the possibility to interdisciplinary implement a future-oriented technology within a specific task as well as to test it on the HDU and thereby make a contribution to the energy transition.»

In times of worldwide increasing *«urbanization»* and progressing climate change, the SDE 21/22 faces the teams with truly existing challenges of energetic urban redevelopment: closing gaps, additions of storey and renovations.

Our design focuses on the supraregional renowned *Café Ada* in the Mirker Quartier, which is used today as a restaurant, dance and event location. We are currently planning the renovation of a warehouses from 1905 in Wuppertal and its increase with an innovative and energetically optimized residential use that makes the quarter sustainable will appreciate, making good progress. Team MIMO focuses on its own urban compression, taking into account a visible value for the relationships. It means 15 residential modules in wooden construction for all one to four people, which are used under a climate cover, which allows personal ventilation for each individual, and electricity for everyone via solar power systems.

The innovative central energy supply system *energiBUS* links a heat pump for heat and cold supply with household appliances and ensures energy efficiency in the whole system.



Figure 3: Team MIMO

The individual living space is severely restricted in the sense of sufficiency, but the space between the modules should be usable for the community: The coexistence of the relationships will be part of open and community-based living and working relationships as well as a roof terrace. Our shared garden invites you to participate in «urban gardening» by areas and neighbours. In addition to architectural, procedural and personal challenges, the team has been drawn to include and inspire the people in the neighbourhood about energetic and ecological issues and to enable them to become part of the urban energy transition themselves.

«The interdisciplinary work makes it possible, that every participant can broaden one's horizon and get knowledge and experiences in previously unknown thematics. As a team we can make the energy transition and climate change accessible for everyone and show how to integrate it into our daily routines.», says Janina Schleuter, team member in team MIMO, about the motivation to participate in SDE 21/22.

From the middle of May 2022, all 18 teams will set up their representative 1: 1 sections on the «Solar Campus», opposite the Mirke train station on the renowned Nordbahntrasse - as fully functional living modules of around 100 square meters.

Through the development of modular structures and efficient planning and production techniques, we will build components in our own university workshops before the construction period on site and can reduce the emissions associated within the construction phase to a minimum - exemplary for our strategy for inner-city densification.


Keywords: Solar Decathlon Europe 21/22, Hochschule Düsseldorf, University of Applied Sciences, HSD, Team MIMO, MIMO, Minimal Impact - Maximum Output, Wuppertal, Mirke, Café Ada, storey-addition, modular building, renewable energies, climate envelope, wood construction, House Demonstration Unit, HDU interdisciplinary

#### Get in touch:

Team MIMO  
Prof. Dr.-Ing. Eike Musall M.Sc.Arch.  
+49 211 4351-3027  
[solardecathlon21@hs-duesseldorf.de](mailto:solardecathlon21@hs-duesseldorf.de)  
Hochschule Düsseldorf -  
University of Applied Sciences  
Münsterstraße 156,  
40476 Düsseldorf, Germany

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## List of Team Members

Title	First name	Surname	Degree	University course / Reaserch field
Faculty Advisor	Eike	Musall	Prof. Dr.	Faculty of Architecture /Building Performance
Project Manager	Lukas	Horstmann	M.A.	Faculty of Architecture - Architect
Project Manager	Janina	Schleuter	M.A.	Faculty of Architecture - Architect
Project Manager	Sandra	Lohmann	M.Sc.	Institute for Sustainable Urban Development
Project Manager	Lena	Frank	M.Sc.	Faculty of Mechanical and Process Engineering
Project Manager	Maximilian	Rödder	M.Sc.	Faculty of Mechanical and Process Engineering
Project Architect	Dennis	Mueller	Prof.	Faculty of Architecture - Building Construction and Design
Project Architect	Hartmur	Raendchen	M.A.	Faculty of Achitecture - Architect
Project Architect	Stephanie	Weis	M.A.	Faculty of Achitecture - Architect
Project Engineer	Mario	Adam	Prof. Dr.	Faculty of Mechanical and Process Engineering
Project Engineer	Peter	Andres	Prof.	Lightung
Structural Engineer	Christoph	Ackermann	Prof.	Faculty of Architecture
Electrical Engineer	Holger	Wrede	Prof. Dr.	Faculty of Electrical Engineering / Electric Power Engineering and Power Electronics
Student Team Leader	Elias	Hoffmann	B.A.	Faculty of Architecture
Health & Safety Team Coordinator	Janina	Schleuter	M.A.	Faculty of Achitecture - Architect
Safety Officers	n/a			
Site Operations Coordinators	Lukas	Horstmann	M.A.	Faculty of Achitecture - Architect
Site Operations Coordinators	Eike	Musall	Prof. Dr.	Faculty of Architecture /Building Performance
Site Operations Coordinators	Dennis	Mueller	Prof.	Faculty of Architecture - Building Construction and Design
Site Operations Coordinators	Hartmut	Raendchen	M.A.	Faculty of Achitecture - Architect
Contest Captain	Janina	Schleuter	M.A.	Faculty of Achitecture - Architect
Instrumentation Contact	n/a			
Communications Coordinator	Linus	Knappe	B.A.	Faculty of Design
Sponsorship Manager	Janina	Schleuter	M.A.	Faculty of Achitecture - Architect
Team Member	Yasemin	Alma		Dinner
Team Member	Julian	Arts		Affordability & Viability
Team Member	Jana	Bauer		Architecture
Team Member	Philipp	Behrend	M.A.	Interior Architecture
Team Member	Ali Cemal	Benim	Prof. Dr. -Ing. habil.	CFD
Team Member	Carina	Bhatti	M.A.	Affordability & Viability
Team Member	Max	Bierbach	M.A.	Urban Mobility
Team Member	Maximilian	Brockhoff	B.A.	Architecture

Team Member	Lars	Burmann	B.A.	Engineering & Construction
Team Member	Sonja	Cieslinski	B.A.	Architecture
Team Member	Emma	Damm		Communication
Team Member	Chiara	Decher	B.A.	Architecture
Team Member	Antonia	Dickhaus		Dinner
Team Member	Ina	Ehrhardt		Architecture
Team Member	Suleima	El Chafei		Plant Concept
Team Member	Diana	Espinosa Lozano		Mechanical and Process Engineering
Team Member	Alban	Fangmeier	B.A.	Architecture
Team Member	Thomas	Fenner	Prof.	Landscape Architecture
Team Member	Moritz	Fleischmann	Prof.	Architectural Computer Science, BIM
Team Member	Lena	Frank	M.Sc.	House Functioning
Team Member	Philipp	Freitag	B.A.	BIM
Team Member	Eric	Fritsch	M.A.	Communication
Team Member	Sophia	Gerlach	B.A.	Architecture
Team Member	Liwia	Gnoth		Architecture
Team Member	Tobias	Graef	B.A.	Engineering & Construction
Team Member	Till	Harder		House Functioning
Team Member	Christoph	Hartner		Engineering & Construction
Team Member	Johannes	Heitmann		Construction
Team Member	Jens	Herder	Prof.	Augmented Reality
Team Member	Janine	Hering	B.A.	Architecture
Team Member	Mira	Hill	M.A.	Affordability & Viability
Team Member	Marvin	Hillebrand		Communication
Team Member	Georgina	Hogrefe		Architecture
Team Member	Jana	Holländer	B.A.	Affordability & Viability
Team Member	Sabrina	Holz		Architecture
Team Member	Magnus	Hüne		Construction
Team Member	Marco	Ideus		Mechanical and Process Engineering, Affordability & Viability
Team Member	Laura	Kasteleiner		Dinner
Team Member	Patricia	Keck	B.A.	Architecture
Team Member	Paula	Kern		Dinner
Team Member	Melis	Kilic	B.A.	Architecture
Team Member	Franz	Klein-Wiele		Workshop Manager
Team Member	Martin	Klein-Wiele	Prof.	Interior Architecture
Team Member	Tim	Kouroudis	B.A.	Engineering & Construction
Team Member	Anna	Kozlov		Architecture
Team Member	Ansgar	Krajewski	M.A.	Architecture
Team Member	Kim	Krall	B.A.	Architecture
Team Member	Lutz	Laermann		Construction
Team Member	Jörg	Leeser	Prof.	Urban Context Design and Urban Design Theory
Team Member	Maren	Leyendecker	B.A.	Architecture
Team Member	Melanie	Lohmann		Business Administration



Team Member	Kathrin	Lörpen		Mechanical and Process Engineering
Team Member	Rebekka	Loschen	Dr.	Research and Transfer
Team Member	Milena	Marsicek	B.A.	Architecture
Team Member	Moritz	Munkel	B.A.	Architecture
Team Member	Stephanie	Muscat-Bruhn		Communication
Team Member	Matthias	Neef	Prof. Dr.	Engineering & Construction
Team Member	Christin	Obermauer	M.A.	Communication
Team Member	Malcolm	Osafo		Architecture
Team Member	Helena	Pappalardo		Dinner
Team Member	David	Paul	B.A.	Engineering & Construction
Team Member	Horst	Peters	Prof.	Affordability & Viability
Team Member	Hartmuth	Raendchen	M.A.	Architecture
Team Member	Patrick	Rathjen		Mechanical and Process Engineering
Team Member	Mareen	Reinelt		Augmented Reality
Team Member	Judith	Reitz	Prof.	Architecture
Team Member	Fabian	Rother		Affordability & Viability
Team Member	Leonie	Sarbo	B.A.	Communication
Team Member	Katja	Schiebler	Prof.	Lighting
Team Member	Anna	Sigloch		Plant Concept
Team Member	Nina	Sohnemann		Architecture
Team Member	Matthias	Stemmer	B.A.	Architecture
Team Member	Vanessa	Stratmann		Architecture
Team Member	Isabell	Szonn	B.A.	Architecture
Team Member	Ilayda	Uysal		Dinner
Team Member	Anne	van Rießen	Prof. Dr.	Affordability & Viability
Team Member	Harry	Vetter	Prof.	Exhibition Design
Team Member	Naomi	Wang		Mechanical and Process Engineering
Team Member	Andrea	Weiner	B.A.	Architecture
Team Member	Luise	Westphal	B.A.	Architecture
Team Member	Cameron Juna	Wiest		Communication

## Project Description

### *Team's Organisation and Objectives*

Team MIMO of *Hochschule Düsseldorf - University of Applied Sciences (HSD)* is facing the competition and its new urban profile with the motto 'Minimal Impact – Maximum Output'.

It means that implemented techniques and concepts have to add value to the location and create maximum benefit with minimal intervention. Specific subject of team MIMO is the cautious renovation and addition of storeys of an existing warehouse in Wuppertal Mirke from 1905 which is nowadays used as a catering, dance and event location by the supra-regional known Café Ada. The goal and guiding principle for the redesign of the inventory is therefore above all the aspect of preservation – both preservation of the structural history of the object and preservation of the atmosphere, as this is precisely what visitors appreciate about the Ada.

Six faculties and the *Institute for Sustainable Urban Development (In-LUST)* are involved in the interdisciplinary team. The team currently consists of 40 students and nine professors,

supported by other professors, academic and student staff, the *HSD* workshop team and all further partners. Planning and ideas come together in the *Faculty of Architecture* where the concepts for Design Challenge and House Demonstration Unit (HDU) are developed and the subsequent construction is coordinated. Students from the *Faculty of Social Sciences and Cultural Studies* have analysed the clientele of the Mirke district and contribute their thoughts to the planning of the apartments. Members of the *Faculties of Mechanical and Process Engineering* as well as *Electrical Engineering and Information Technology* develop strategies for energy supply and load management. Supported by students of the *Faculty of Design*, the team prepares the concepts and transfers them to public relations via its website as well as Facebook and Instagram.

### **Project Development and Current State**

To have a meeting place for Team MIMO, we already organized a group room to have the possibility to work concentrated and undisturbed together. Unfortunately, due to the current situation, this room cannot be used by everyone at the same time as desired. Therefore, most of our means of communication are still digital. We have created a Share Point to compare our actual results and organize video calls within different task forces several times a week, so that everyone is up to date and can continue with their work.

Under the condition of hygiene and protective measures, some workshops took place with our industrial partners (Berger GmbH & Co. KG, Binder, EDS - Elektro- und Datentechnik Service GmbH, EuroLam GmbH, Gnoth, Häfele GmbH & Co. KG, Holzius GmbH, Petershaus, SUNOVATION Produktion GmbH), who support us in building our HDU for the final of Solar Decathlon Europe 21/22. Together, we discussed the materials, the production and the transport of the components to the *Solar Campus* in Wuppertal. For the students this is a great chance to practice working with companies on an actual real-life project.

For the members of the MIMO team, a first aid course was scheduled at the Düsseldorf University of Applied Sciences so that they could take part in the construction phase in Wuppertal on the construction site.

Before building the entire building on the Solar Campus, we have built a model of our House Demonstration Unit (HDU) on a scale of 1:20.

Our model making group have decided to use solid wood as the main material and thus underline the glue-free wood construction of our modules and support structure. Apart from the insulation which is made of smoked oak and some small details, most of it is built with hornbeam. To demonstrate the high proportion of glass and the high amounts of light entering the building, acrylic has been used as an additional material. The solar cells are directly printed with the board printer onto the acrylic.

The first wooden elements of our house demonstration unit (HDU) which we will built for the final of the Solar Decathlon Europe 21/22 in Wuppertal are currently being manufactured. Our partner «Holzius» is producing the walls and ceiling without the use of any glue. Then it will be sent to our partner «Petershaus» that is responsible for assembling the parts. Besides our «EnergiBUS system» those are the first physical objects of our HDU. We are looking forward to the coming weeks and the SDE21/22!

### **Design Challenge**

Our main emphasis is on the new building's living areas providing communal space for encounters and social exchange between the inhabitants. In order to achieve optimally used living space for everyone, a new living room and lounge is being built for all age groups.

This is guaranteed by adding another storey to the existing building. Individual wooden modules are stacked on top of each other so that living room, common room, 'urban gardening' and a roof terrace can be created. By stacking the modules, a variety of living options are possible.

A range of smaller student and two-person apartments through to maisonette or family apartments is being created. The individual modules can extend over a length of almost 14 meters. The entire building can be accessed by a staircase, as well as an elevator on the north side of the building. There are a total of 15 residential modules designed for a total of 33 residents. In addition, there are the common modules, which generally serve as wash-rooms and cold rooms with a shared kitchen. All module types have a balcony and face north-south and west-east. A wire mesh, which can be found in all the parapets of the design, forms the end of the balconies of the individual modules. Each of these residential modules is equipped with the basic amenities of a common city apartment. A kitchen area with already connected appliances, a bathroom with prefabricated sanitary facilities and a spacious living area that can be furnished by the residents themselves will be provided.

The entire structure, including the stair core, is surrounded by a climate envelope and closes with the fire wall in the east. The grid of the climate envelope adapts to the position of the modules in the interior and thus forms a unit. In this way, there are private retreats in the modules and semi-private common areas in the zones between the climatic shell and wooden modules. A semi-public greenhouse will also be built on the roof, which will provide the residents with their own vegetables.

The facade is an elementary part of the design, as it forms a functional shell around the modules. Both the roof and the facade are covered with photovoltaics. The facade consists of movable glass slats that can be adapted to different situations. For example, the slats are tilted in summer to adapt to the steeper light of the season and to be ventilated and act as sun protection to prevent heat accumulation. The same applies to the roof, which can be opened to prevent heat accumulation. Even night aeration on hot days is conceivable. The opposite effect is desired for winter. Solar gains should be trapped in the shell and activate the heat storage mass of the solid wood walls. For this purpose, the slats remain closed. In this way, a buffer layer can be created, which forms a climate zone around the housing modules, which is warmer than the outside air in winter.

In the public garden, the residents of the house meet the visitors of the café and can thus also use the offers of the Café Ada. In addition, a selection of different activity and interaction options was created, which should cover the bandwidth of the target groups. This should be ensured by addressing different age and interest groups. The terrace at Café Ada will be retained as a lingering area for customers to eat. In the garden, on the one hand, the areas can be used for events such as theatre, music or film combined with catering or food truck offers on weekends, and on the other hand, during the week, for example, it can be converted into a usable area for children playing, urban gardening and bicycle mechanics workshops.

Urban gardening buckets, bicycle workbenches and toy utensils can be stowed in sheds.

On the existing slope you will find seating to enjoy nature paired with a bee hotel. At the eastern end of the scaffolding, a roof-top car park is forming, which has several mobility options, such as electric cars or bicycles, for both the residents of the upper floor and those of the neighbourhood. In this frame there are several self-service machines for a fruit and vegetable sharing box, a seed and honey machine, a letter box and a packing station. There is also a climbing wall for children and teenagers on the south-eastern edge of the courtyard.

With the help of retractable bollards, the street can be converted into two traffic-calmed zones. The lower one serves as a temporary delivery zone for Café Ada, the upper one as a temporary play street and / or venue for street festivals and similar events.

### ***Building Challenge***

Construction sites that are cast in reinforced concrete on site are a major time factor and require a larger number of employees, as well as a significantly higher volume of transport routes. We want to counterpoint and offer an economical alternative by stacking prefabricated wooden modules on top of each other. A module can be prefabricated from planning to exe-

cution in such a way that it can be delivered directly to the construction site by a truck. The modules are structured in a way that they are four times longer than wide.

The dimensions of the prefabricated elements are optimized in their dimensions for transport 14 m x 3.35 m x 3.35 m (l / w / h). The longer sides of the modules are closed so the modules can be lined upside by side and stiffened in themselves. Thanks to the bulkhead construction, in which the load-bearing long sides serve as reinforcement, the modules can be stacked freely. Each module has a central core function including pipelines and sanitary facilities.

The wall structures and thickness are optimized in terms of noise, fire and heat protection to 12 or 18 cm and are insulated with cork in the planned concept. This creates a homogeneous, glue-free and reduced wall structure. As a renewable raw material, cork has good properties in terms of sound insulation, moisture regulation, thermal conductivity and durability, is installed without the addition of fungicides or flame retardants and therefore offers the best conditions as an insulating material between the living modules and the common area. The clay used in many areas and surfaces has similarly good properties. Clay naturally has the binding force necessary for the mechanical strength of the panels; it does not have to be generated through energy- and CO<sub>2</sub>-intensive burning processes. Construction earth is extracted regionally, there are no long transport routes to the factory. From today's perspective, the raw material is available in almost unlimited quantities, and its extraction involves the least possible impact on the environment and nature. This is used on the one hand as CLAYTEC clay plaster of the lightweight walls of the bathrooms and on the other hand as CLAYTEC clay bricks in combination with a plant wall on the inside of the eastern fire wall. This is where the clay unfolds its advantages in terms of heat storage, moisture regulation, sound insulation and freedom from harmful substances. The clay building materials create a pleasant indoor climate.

The residential modules are based on a system of solid wooden elements by our partner ›holzius‹, enclosed by a semi-transparent climate shell. Just like the extension of the Design Challenge, the Building Challenge consists of layered, compact living modules made of wood and is surrounded by a climate cover with openable glass slats. On each of the two different floors there is a living box with minimal housing, which divides the space between the module and shell as a communal space.

The aim is that beyond the individual living space, a social fabric can develop between the neighbors. In addition, Team MIMO consistently relies on the use of ecological, recycled and, above all, reusable materials. The interior design is carried out almost without glue in the university's own prototype workshop.

In addition, there is a technology module inside the climate envelope, among other things for accommodating the *energiBUS4home-system*. The roof of the ground floor module can be expanded as a roof terrace area thanks to the offset layering. In this way, all the important elements (roof terrace, communal area, wooden module construction, climate envelope and energy concept) of the Design Challenge are transferred to the Building Challenge. This will be conveyed to the visitor during the competition on the basis of these architectural and technical aspects.

Both modules together form an apartment with a kitchen unit in the lower module. A special feature of the relationship between the living module and the climate cover is that the cover is pierced in two places, once per module. This gives the resident access to more fresh air and more light without impairing the function of the climate envelope. In the large, communal space in between, a staircase piercing the room opens up the roof garden and contains various usable furniture modules that can be pulled out in their cavity. The main entrance of the building leads the visitor across under the living module on the first floor, when exiting under the module into the climate envelope, a spacious and open feeling of space is suggested. In the winter months it is possible to set up a heat island in the area under the living module on the first floor with the help of a curtain and underfloor heating.



As part of the «Compact Kitchen Unit» (CKU) course, 20 students developed designs for the HDU kitchen. After impulse lectures by the students on the topics of kitchen and food preparation, weekly groups of two worked on classic, functional as well as unusual and unconventional kitchen designs. The result of the seminar was a broad conglomeration of a total of ten drafts, from whose individual components two kitchen concepts for the HDU were combined: On the one hand, a small eat-in kitchen with furniture character, which is limited to the essentials and forms a pleasure space for the residents in the private area. On the other hand, a utility kitchen in the common area of the climate envelope, which includes all the equipment you need, including a mobile stove, which can be connected as an additional fireplace in the kitchen or on the terrace if required. The products of the GROHE Blue water system (Grohe Blue Professional C-Auslauf, Supersteel; Grohe Blue Filter Aktivkohle; Grohe Blue Reinigungsset) will be used in the shared kitchen. The sustainable idea of reducing plastic, water and CO<sub>2</sub> consumption by providing an alternative to drinking water bottles perfectly complements the team's concept.

The bathroom concept of the HDU follows the principle of «glue-free construction». The two bathrooms, which are almost identical in construction, are completely made of wood and clay and are free of adhesives, glue and silicone. With the use of sweet chestnuts, attention is again paid to regionality and sustainability.

The idea of sustainability also prompted Team MIMO to dispense with the usual bathroom seal, which later cannot be separated cleanly from the other components. The floor is sealed by a recycled film that is pulled up the walls and disappears behind the adobe panel or skirting board. The clay building boards have the great advantage of moisture regulation, but must not come into permanent contact with spray water, as is the case with a normal shower. Thanks to the «Grohe Essence New Duschsystem» and the «Grohe Rohbau-Set» for a free-standing bath filler, the shower can be used as a free-standing object in the room. A temporary separation of the shower area from the rest of the room can be created with a shower curtain running around the ceiling to protect the clay plaster and wooden walls. The big advantage of the shower arrangement is that the bathroom can be used with a wheelchair if necessary, despite its minimized area.

The «Grohe Essence New Einhebelmischer Click S» with cold start function is integrated into the washbasin to match the shower system. Single-lever mixers with a cold-start function have a significant advantage over standard faucets: you normally operate the handle in a middle position. The pipe system is automatically filled with hot water and energy is consumed. The cold start function means that the lever can only be turned in one direction. This means that when the handle is in the middle position, only cold water flows and warm water only comes in when you move it to the left. The warm water is only called up when it is actually needed, so that not only energy but also hard cash is saved.

All of the grid modules of the climate envelope facing the inner space are fitted with openable glass lamellas, which are covered with PV-modules to varying degrees depending on their exact position. The energy input into the interior of the building is to be controlled by differently densely covering the horizontal facade slats with PV cells. The final assignment of the facade occupancy is based on the determination of the yield of the photovoltaic system, the design of the exposed areas of the slats and the reduction in the g-value of the glazing. SUNOVATION provides Team MIMO glass-glass modules that are dimensioned and produced specifically for the project. The so-called BIPV glasses can be freely designed in terms of geometry and size. They also have excellent sound insulation thanks to the special silicone embedding. The airborne sound insulation values that are achieved are above the values of comparable glass structures with special soundproofing films. By using crystalline cell technologies, highly transparent glass and a unique production process, glass-glass modules from SUNOVATION achieve the highest and long-term stable energy inputs. They are electricity-generating architectural glasses. One difficulty was laying the electrical cables. These are routed through

hidden edge or rear connections and installed invisibly. In order to be able to use the electricity generated, the BIPV modules are wired by an electrician and connected to an inverter. The transparent glass elements are fitted with square, monocrystalline cells with a total size of 158.75 mm. The cells must have a minimum distance of 12 mm to the sides and 0.5 mm between the individual cells. A maximum of 10 cells in width and 2 cells in height can be installed in the selected slats. One can assume 5 kWp per cell. These are placed floating between two panes of glass. They are then inserted into the slats. Some areas of the facade surface are kept free in order to obtain views from the building and to ensure the undisturbed inflow of daylight into the interior.

Between the mullion and transom facade on the roof there are two stainless steel tubs, each of which contains green roofs, as otherwise too much light would flow into the entire building.

«Fienchen» is a cargo bike service in Wuppertal, with whom we have been planning a collaboration for a long time now. We plan to place a box next to our house demonstration unit, in which one of the bikes from Fienchen will be available, so that the visitors have the opportunity to benefit directly from this sustainable idea. The box will of course be designed strictly according to our principles and will naturally fit into the overall concept of our HDU.

The demonstrator shows one of the many ways in which the modules can be assembled and thus optimally adapted to the size of the resident. From the energiBUS system to the solid wood modules to the multifunctional facade, the team's idea will be shown together with the partners and, following the finale, as part of the «Living Lab. NRW» tested for three years.

### ***Dissemination Activities and Current Impact***

The dissemination of scientific information to the (professional) public is a central idea of the competition. We want to address a broad mass, because we want to educate people about sustainability and the goal of an improved future together - topics that ultimately concern us all.

For our online communication we use different channels and media. Besides our website, the focus is currently on Instagram. Our website «mimo-hsd.de» is the central contact point for our project on the internet. All our media including all social media channels link to the website, which in turn links to all channels. In the section «Updates» we are posting regular updates on our website about the progress of our team and the SDE21/22.

We have completely relaunched our Instagram channel. We changed the primary language of our channel from German to English to reach more international people. But our channel remains relevant to the German audience: Not only because we include a German translation of each post in the post description, but also because many Germans and especially German students are able to understand English. As before, the activities on our Instagram channel follow different strategies, each adapted to the formats: Posts, Story and ig-tv.

For Facebook we apply the same strategies as with Instagram.

Since we also generate video content like on-site footage or architectural animations, a video platform like YouTube fits our means too. Since it is used by practically everyone in the world, YouTube is great for approaching a wider audience.

Another online channel we use is our university's website. There we post the most important updates that are published on our own website. Our university's website is another good contact point for our university's students, but it fails to connect us with new people.

Recently we are also active on LinkedIn. The most important information and articles about our participation in Solar Decadlon Europe and our project are also published there.

The focus of our press work is in NRW. The aim of our press work is to reach as many people as possible who have not previously come into contact with us or the SDE21/22. We have already achieved publicity on local television and in national and international newspaper:

- Eike Musall was invited as an expert to the TV format «Lokalzeit Düsseldorf» in the German public service broadcaster WDR.
- Also the oldest German newspaper on renewable energies called «Sonnenenergie» has now written two articles about SDE21/22 and the German teams including us and our project.
- Team MIMO was featured in the professional journal «energy».
- Dr. Stephan Keller, the mayor of Düsseldorf gave a great video greeting to Team MIMO. A great source for sharing, and a strong connection point for people outside of our natural reach.
- Aside from that the trade journal «Haus und Grund», online in the «Detail» and in the «AIT Dialog» provided information about the SDE21/22 and about German teams, including about Team MIMO.
- The semester newspaper «Bergzeit» of the Bergische Universität Wuppertal also reports on the Solar Decathlon and Team MIMO, as well as a picture of our increase idea.
- In October Eike Musall was at «die 2. lange Nacht der Politik» in Düsseldorf where he talked about energetic city renovation and our team MIMO.
- After Eike Musall listened to the podcast «Geistig Unbewaffnet» in September, our Decathletes were also guests in the 69th episode. Together with the moderators, they talked about our MIMO project, the Solar Decathlon Europe 21/22 and sustainable architecture.
- Other sponsors presented our project, including “CLAYTEC” and “Cellco”.

As a first event highlight the concept models of the 18 participating teams of the Solar Decathlon Europe 21/22 were shown in a big pre-exhibition during the *Dach der Stadt* festival in the *Alte Glaserei*. Around 10.000 visitors have seen the miniature houses and the response has been excellent. People are excited and look forward to seeing the houses on site in June 2022. So are we! Until then, the 1:100 scale models will be on display at prominent locations in Wuppertal – for example at learning facilities such as the Bergische Universität Wuppertal or the Codeks coworking space. Many models can also be observed in cultural centres such as the Wuppertal cinemas, the event location Historische Stadthalle Wuppertal or Utopiastadt. Later, the models will be on tour through North Rhine-Westphalia to make further people aware of sustainable, energy-efficient and socially responsible architecture as well as to draw more attention to the Solar Decathlon. The Team MIMO models were prominently displayed in the City-Arkaden, the largest shopping centre in Wuppertal Elberfeld. Since mid-December, our models have been exhibited at a different location in Wuppertal, namely the Stadtparkasse Wuppertal - Barmen branch.

Further publications in the journals «tab» and «Bauphysik» have already been agreed with the publishers. In addition, there will most likely be a self-published book by the seven German teams after the end of 2022.

Finally, the models of all participating teams are currently being exhibited in public buildings in Wuppertal. The MIMO team models are very prominent in the CityArkaden, the largest shopping center in Wuppertal Elberfeld.

Also we managed to get in touch with the public relations department of our university, in order to increase our range in reaching the press. We are currently talking the local press in NRW like: RP Digital, Düsseldorf Anzeiger, Antenne Düsseldorf, Hochschulradio Düsseldorf or Coolibri. We will talk to newspapers in Wuppertal, the city of the finals: like Wuppertaler Rundschau, Die Stadtzeitung Wuppertal, Radio Wuppertal as well as even more local media of the Mirke district like Utopiastadt.

After each interim delivery, we send a newsletter to our team members, sponsors, students and friends and inform them of the latest information. For example, about the latest status, important news and how to proceed.

Currently we have designed one set of posters that informs about our project and the SDE. The multiple posters cover topics like: The HSD at the SDE, our situation, Café Ada, our vision, our model, the final, our HDU and our team. We distribute these in Wuppertal, Düsseldorf, Essen, Duisburg, Dortmund, Cologne and other cities in the densely populated Rhine-Ruhr area.

### ***Collaborating Institutions and Sponsoring Companies***

<b>Institution / Company</b>	<b>Type of business/branch</b>	<b>Type of Sponsor-ship</b>
AIT Dialog	Communication	Know-How
Albrecht JUNG GmbH & Co. KG	Electrical installation	Material / Items
alware GmbH Ingenieurbüro für Bauphysik und Gebäudesimulation	Building physics and building simulation	Know-How
Apleona	Building services	Building services/ Facility services
ArgillaTherm GmbH	Wall heating	Material / Items
Art-Invest Real Estate Management GmbH & Co. KG	Real Estate	Financial
Barmenia Versicherungen	Insurance	Financial
Berger GmbH & Co. KG	Metal Construction	Material / Items
Binder	Flat roof	Material / Items
BMW i	Ministry as a funding agency	Financial
BPK Fire Safety Consultants GmbH & Co. KG	Fire protection	
Cellco	Cork insulation	Material / Items
Claytec	Earth building materials	Material / Items
DAW SE - Caparol	Building materials	Material / Items
Düsseldorf Institute of Applied Sciences and Arts e.V. (DIASA)	Association	Financial
ECBM GmbH - Enterprise CONNECTED BUSINESS MODELS	Consultant in artificial intelligence	Know-How
eds - Elektro- und Datentechnik Service GmbH	Electrical installation	Implementation
EnergieAgentur.NRW	Association	Know-How
Energy Endeavour Foundation	Organizer	Financial
Erco	Lighting	Material / Items
EuroLam GmbH	Louvre window system manufacturer	Material / Items
Fachbereich Architektur	University of Applied Sciences Düsseldorf	Financial
Fachbereich Maschinenbau & Verfahrenstechnik	University of Applied Sciences Düsseldorf	Financial
Fachbereich Sozial- & Kulturwissenschaften	University of Applied Sciences Düsseldorf	Financial
Fienchen Wuppertal - E Lastenrad	Mobility	Material / Items
Fraunhofer Ifam	Energy / charging infrastructure	Know-How
Gardinia (Alugard)	Curtain rails	Material / Items
Geberit	Sanitary, Ceramics	Material / Items
GFM Junker Massivholz	GFM - solid wood panels	Material / Items



Gira Giersiepen GmbH & Co. KG	Electrical installation	Material / Items
Green4Cities GmbH	Greening	Know-How
Grohe	Sanitary, Fitting	Material / Items
Häfele GmbH & Co. KG	Fitting	Material / Items
Hochschule Düsseldorf	University of Applied Sciences Düsseldorf	Financial
holzius GmbH - S.r.l.	Wood building components	Material / Items
Hottgenroth Software GmbH & Co. KG	Software	Material / Items
Ingenieurbüro Stahl u. Weis, Freiburg	Planning	Know-How
Institut für Baubiologie + Nachhaltigkeit IBN	Specialist planner	Know-How
iRoom GmbH	Entertainment	Material / Items
JUNCKERS INDUSTRIE A/S	Wooden Flooring	Material / Items
KNIPEX-Werk C. Gustav Putsch KG	Tool	Material / Items
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Landeshauptstadt Düsseldorf - Amt für Umwelt- und Verbraucherschutz 19/3.3 Kommunales Klimamanagment	Administration	
Landeshauptstadt Düsseldorf - Amt für Umwelt- und Verbraucherschutz Öffentlichkeitsarbeit, Umweltbildung	Administration	
LEG-Immobilien-Gruppe - EnergieServicePlus GmbH	Real Estate	Financial
Leonhards	Garden landscaping	Implementation
Living Lab NRW	Research project	Financial
Miele & Cie. KG	Home appliances	Material / Items
NRW.BANK	Finance	Financial
Passivhaus Institut	Planning	Material / Items
Petershaus - Holzbau	Timber construction	Implementation
Reinshagen und Schroeder	Sanitary, heating, ventilation, air conditioning	Material / Items
Rockwool	Insulation	Material / Items
Schneider Electric GmbH	Technical building equipment	Material / Items
Schüco International KG	Window, facade	Material / Items
SMA Solar Technology AG	Inverter	Material / Items
Sonos	Entertainment	Material / Items
Stadt Düsseldorf - Landeshauptstadt Düsseldorf - Der Oberbürgermeister Wirtschaftsförderung	Administration	Financial
Stadtwerke Kempen GmbH	Electricity provider	Financial
Steinbacher Consult	Mobility / charging infrastructure	Know-How


STEINEL Vertrieb GmbH	Sensors	Material / Items
Stiftung Mercator GmbH	non-profit private foundation	Financial
SUNOVATION Produktion GmbH	Manufacturer of Photo-voltaics	Material / Items
Vaillant Deutschland GmbH & Co. KG	Heat supply	Material / Items
Ziebell Willner & Partner Ingenieurgesellschaft für Technische Gebäudeausrüstung mbH	mechanical and electrical installations and plumbing systems	Know-How
Zinco	Flat roof	Material / Items

#### Get in touch:

Team MIMO  
Prof. Dr.-Ing. Eike Musall M.Sc.Arch.  
+49 211 4351-3027  
[solardecathlon21@hs-duesseldorf.de](mailto:solardecathlon21@hs-duesseldorf.de)  
Hochschule Düsseldorf -  
University of Applied Sciences  
Münsterstraße 156,  
40476 Düsseldorf, Germany

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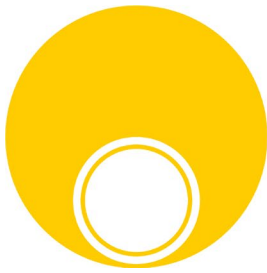
<https://mimo-hsd.de/press/releases/>

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## Project Images



# MIMO

Logo Team MIMO - © MIMO / SDE 21/22



Team-Photo - © MIMO / SDE 21/22



Team MIMO - © MIMO / SDE 21/22





Modelling Design Challenge - © MIMO / SDE 21/22



Model Design Challenge - © MIMO / SDE 21/22





Modelling Building Challenge - © MIMO / SDE 21/22



Model Building Challenge - © MIMO / SDE 21/22





Model Building Challenge - © MIMO / SDE 21/22



Model Building Challenge - © MIMO / SDE 21/22





pre-exhibition in the Alte Glaserei - models of all teams - © MIMO / SDE 21/22



Model team MIMO - © MIMO / SDE 21/22





pre-exhibition in the City-Arkaden - © MIMO / SDE 21/22



pre-exhibition in the City-Arkaden - © MIMO / SDE 21/22





SDE21/22 Workshop in Wuppertal - © MIMO / SDE 21/22



discussion - © MIMO / SDE 21/22



team MIMO - © MIMO / SDE 21/22





Häfele Partners Workshop - © MIMO / SDE 21/22



Partners Workshop - © MIMO / SDE 21/22





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Interview with Mobility Fienchen - © MIMO / SDE 21/22



Test drive with Mobilty Fienchen - © MIMO / SDE 21/22



Model for the cargo bike box - © MIMO / SDE 21/22





First wooden elements are being build - holzius - © MIMO / SDE 21/22



First wooden elements are being build - holzius - © MIMO / SDE 21/22



First wooden elements are being build - holzius - © MIMO / SDE 21/22





First wooden elements are being build - holzius - © MIMO / SDE 21/22



First wooden elements are being build - holzius - © MIMO / SDE 21/22



First wooden elements are being build - Petershaus - © MIMO / SDE 21/2





First wooden elements are being build - Petershaus - © MIMO / SDE 21/22



First wooden elements are being build - Petershaus - © MIMO / SDE 21/22



First wooden elements are being build - Petershaus - © MIMO / SDE 21/22





First wooden elements are being build - holzius - © MIMO / SDE 21/22



First wooden elements are being build - holzius - © MIMO / SDE 21/22

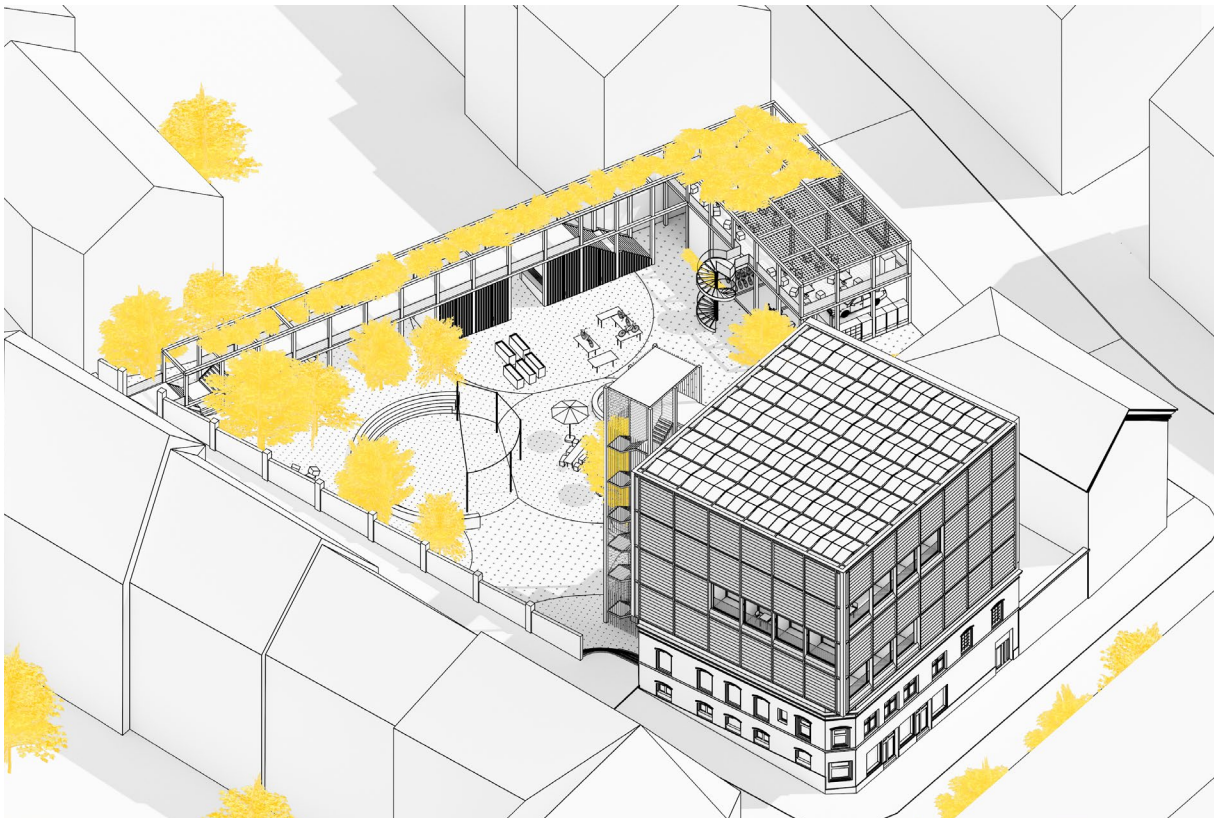


insulating panels of wood - Gutex - © MIMO / SDE 21/22

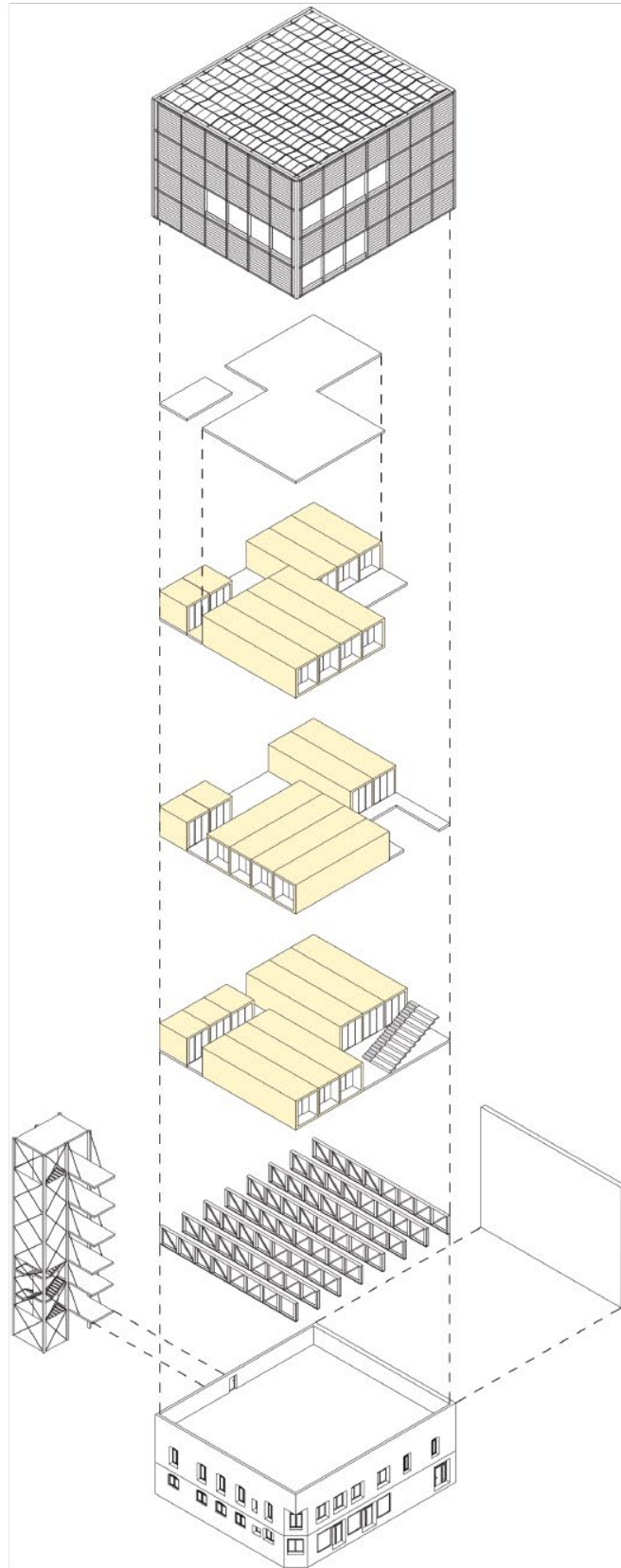




Design Challenge: Exterior Rendering – street view - © MIMO / SDE 21/22

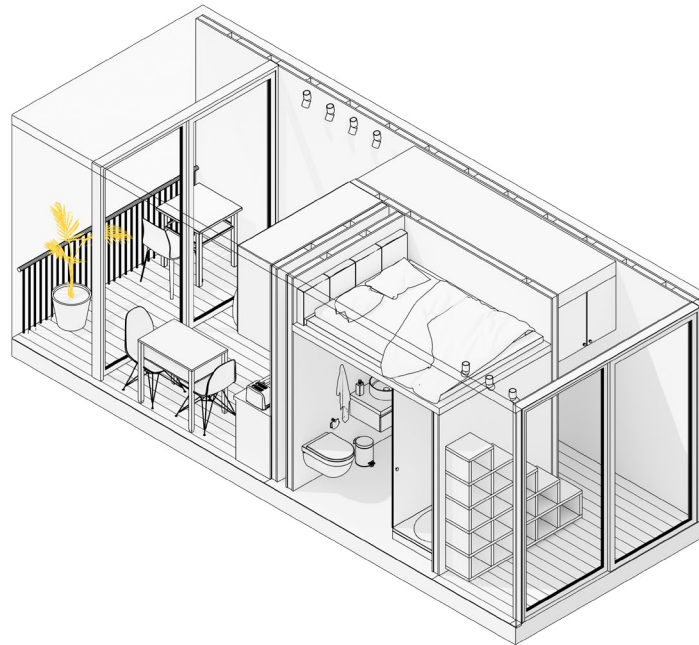


Isometry - Urban context - © MIMO / SDE 21/22

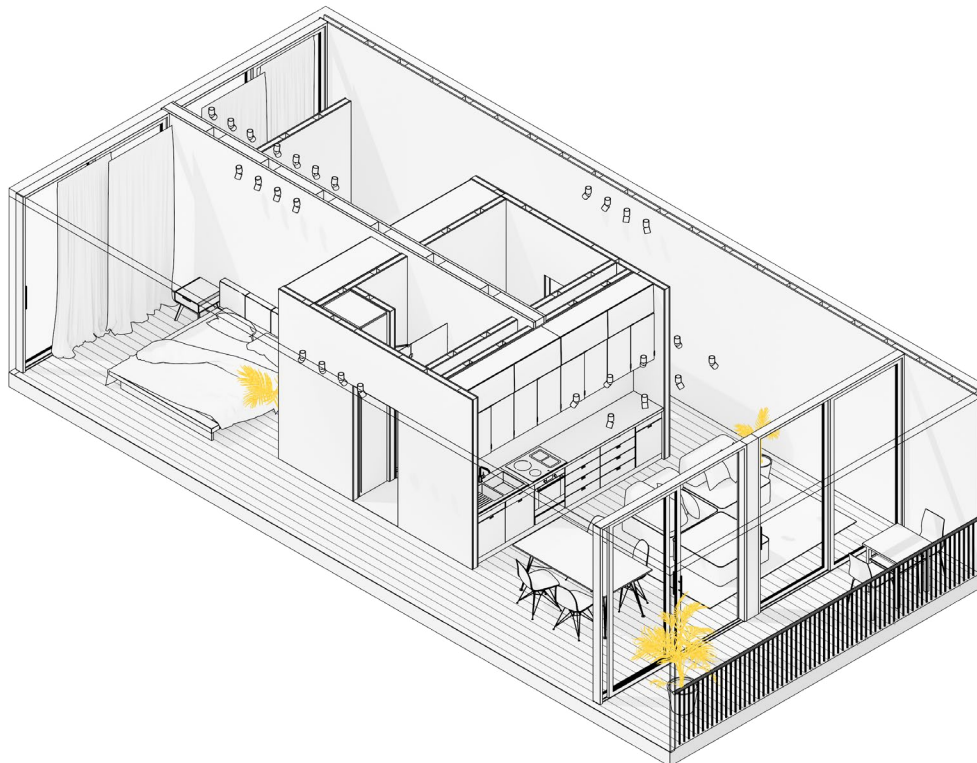


Isometry Building Design - © MIMO / SDE 21/22

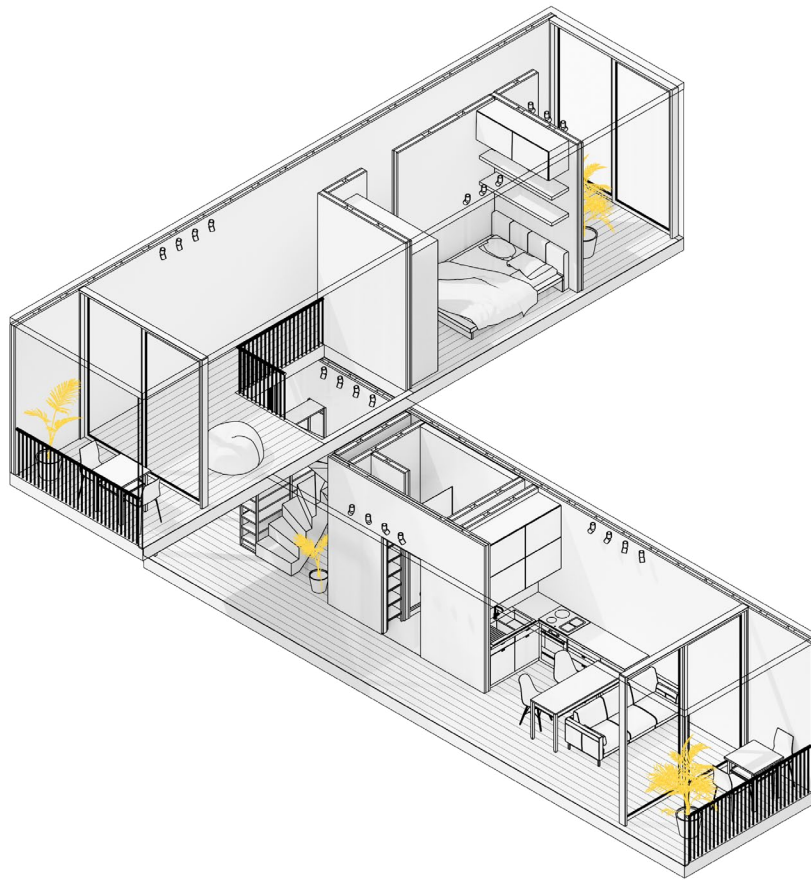




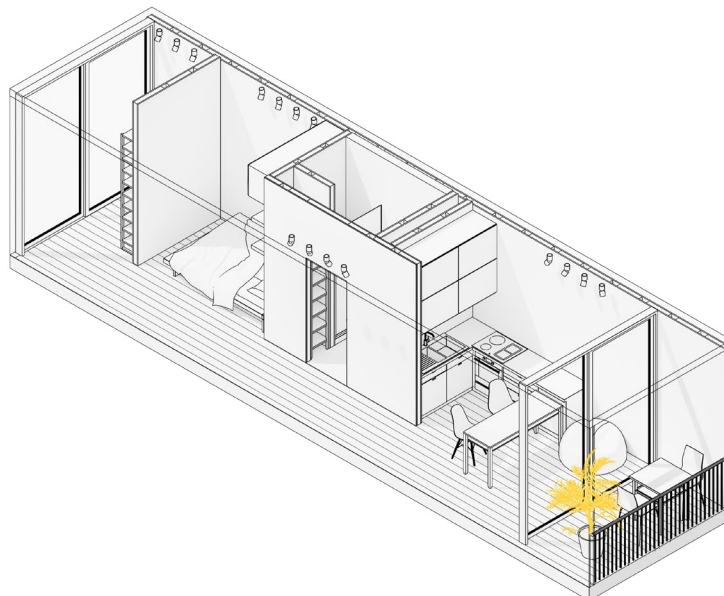
Student apartment isometry - © MIMO / SDE 21/22



Family apartment isometry - © MIMO / SDE 21/22



Maisonette apartment isometry - © MIMO / SDE 21/22



Single apartment isometry - © MIMO / SDE 21/22





single apartment - © MIMO / SDE 21/22



single apartment- © MIMO / SDE 21/22

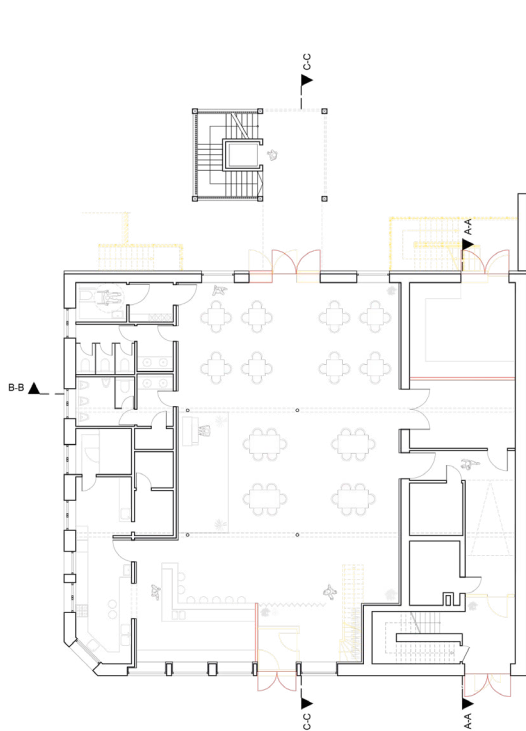




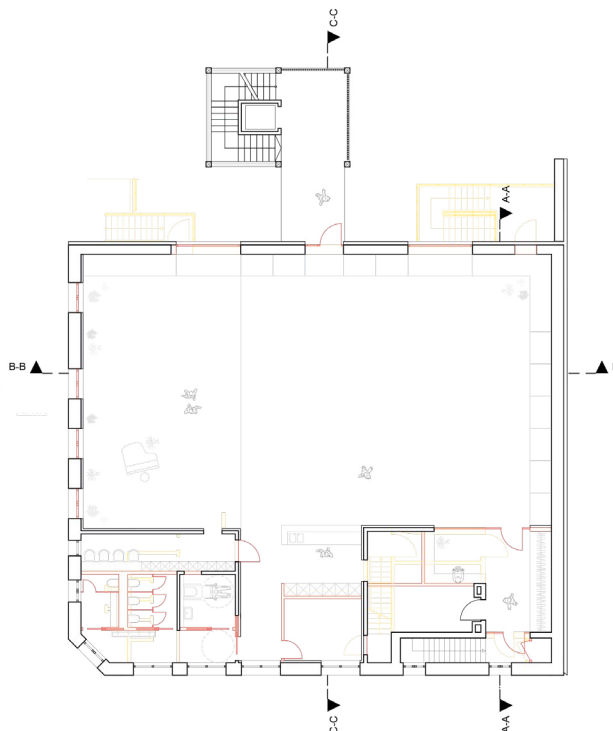
family apartment - © MIMO / SDE 21/22



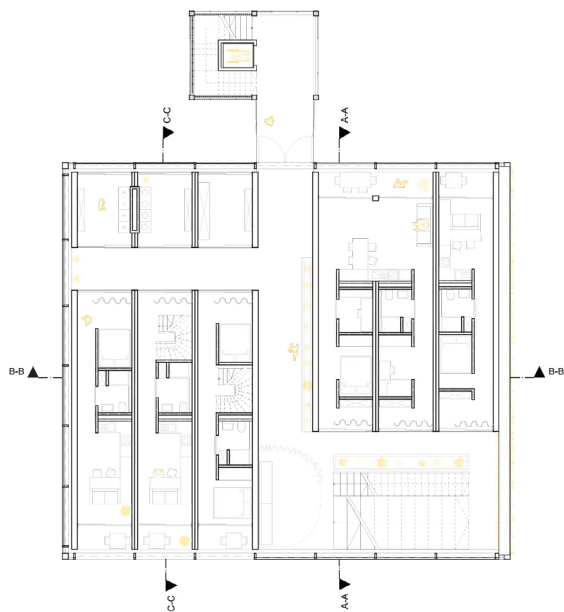
common area - © MIMO / SDE 21/22



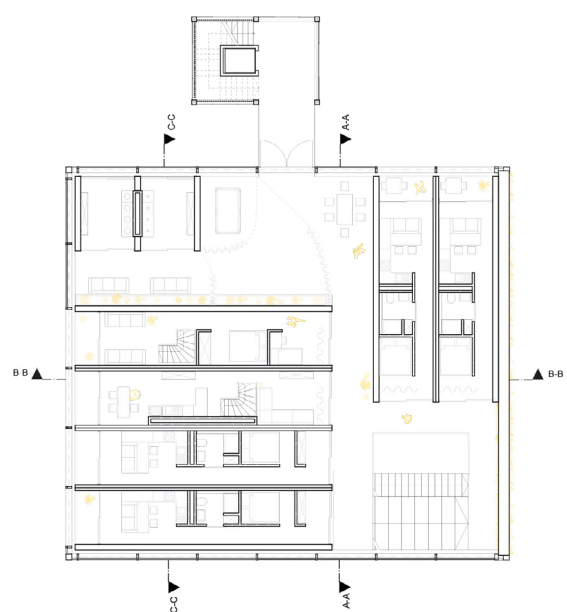
Floor Plan – First Floor  
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Floor Plan – Second Floor  
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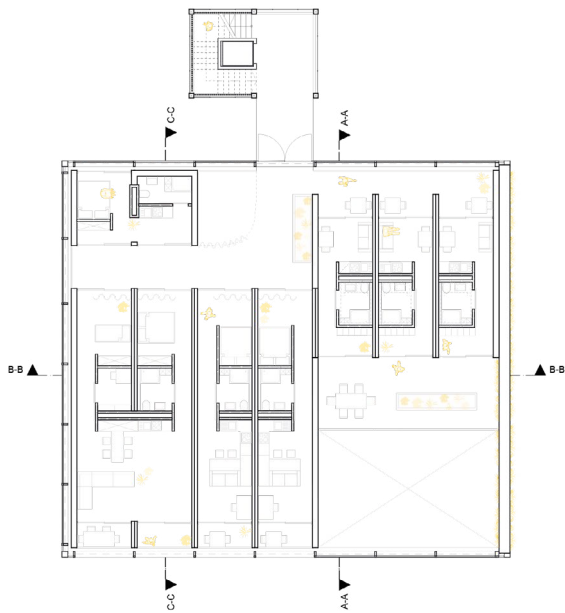


Floor Plan – Third Floor  
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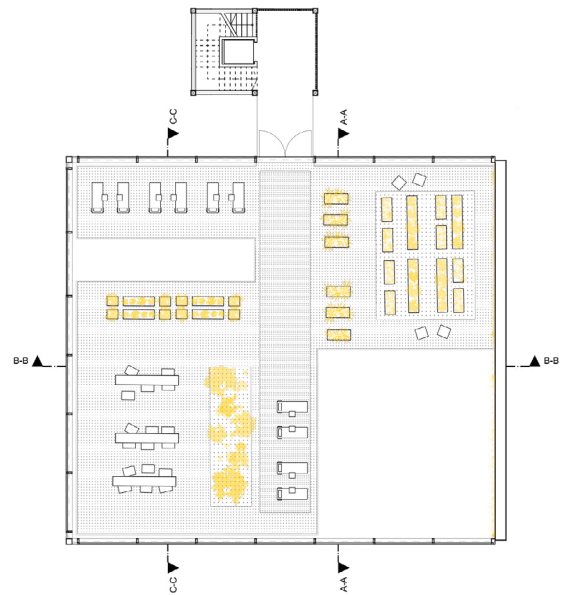


Floor Plan – Fourth Floor  
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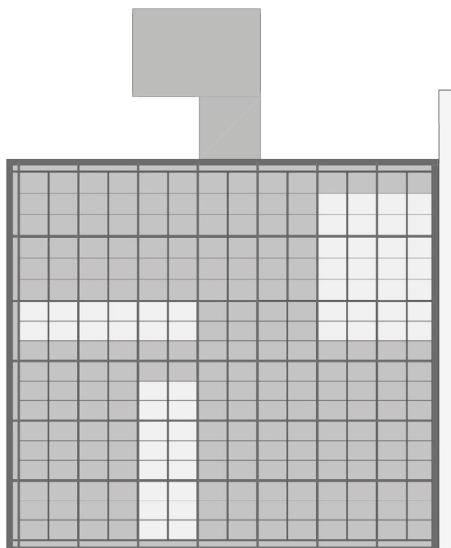




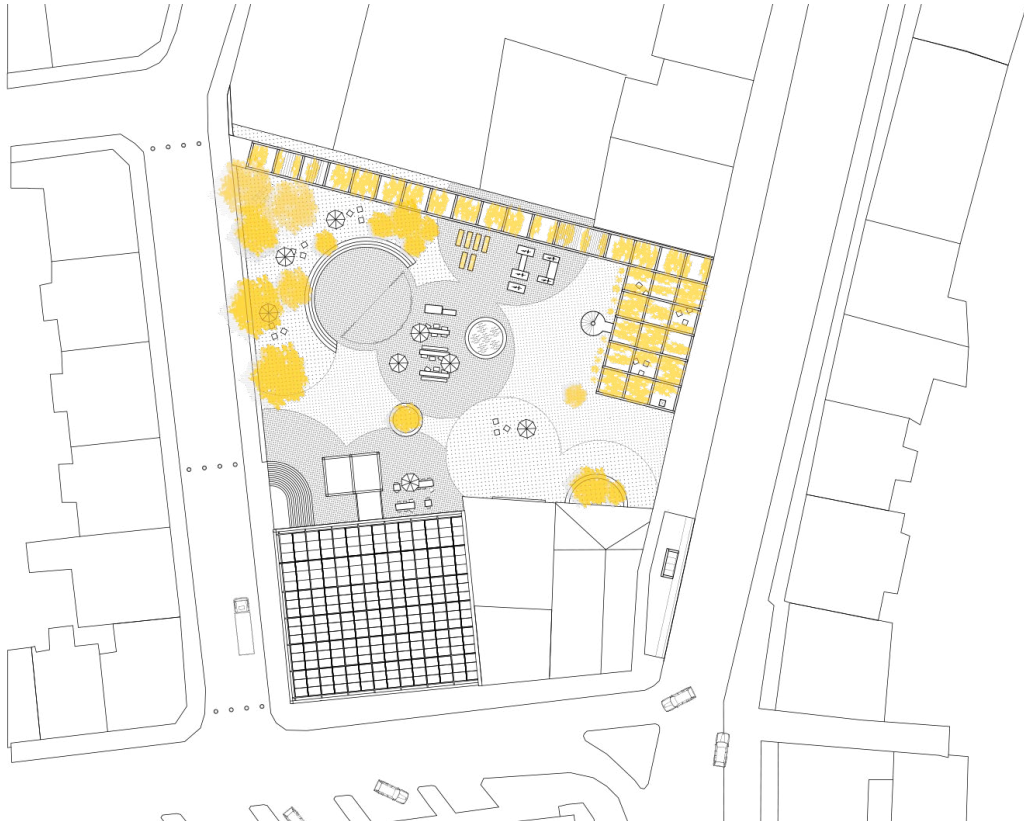
Floor Plan –Fifth Floor  
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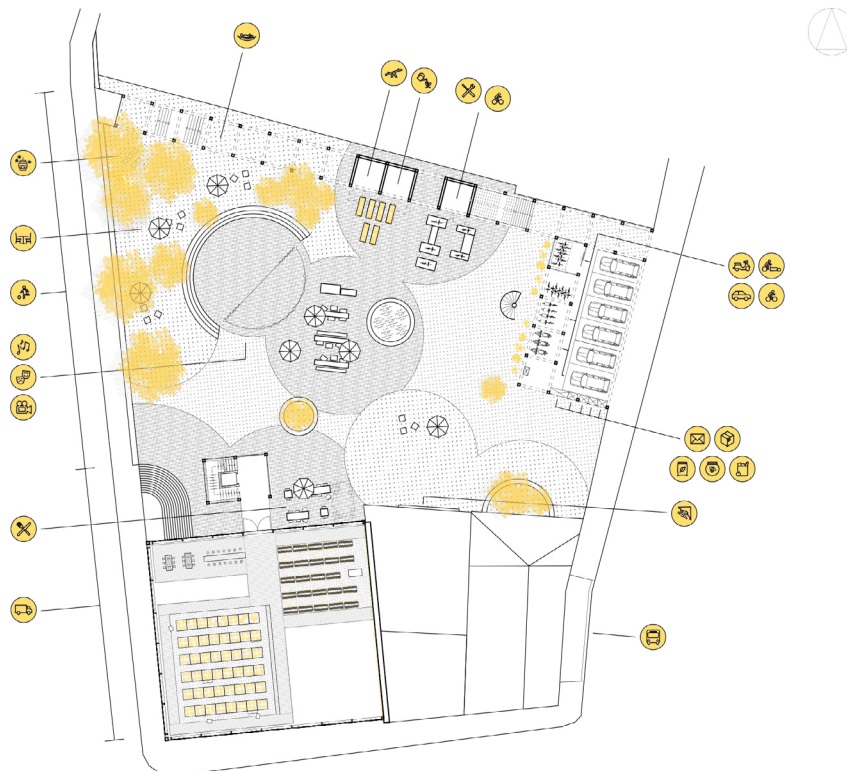
Floor Plan – Sixth Floor  
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Floor Plan – Roof Plan  
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Location Map – Rooftop View - © MIMO / SDE 21/22



Location Map – Activities - © MIMO / SDE 21/22





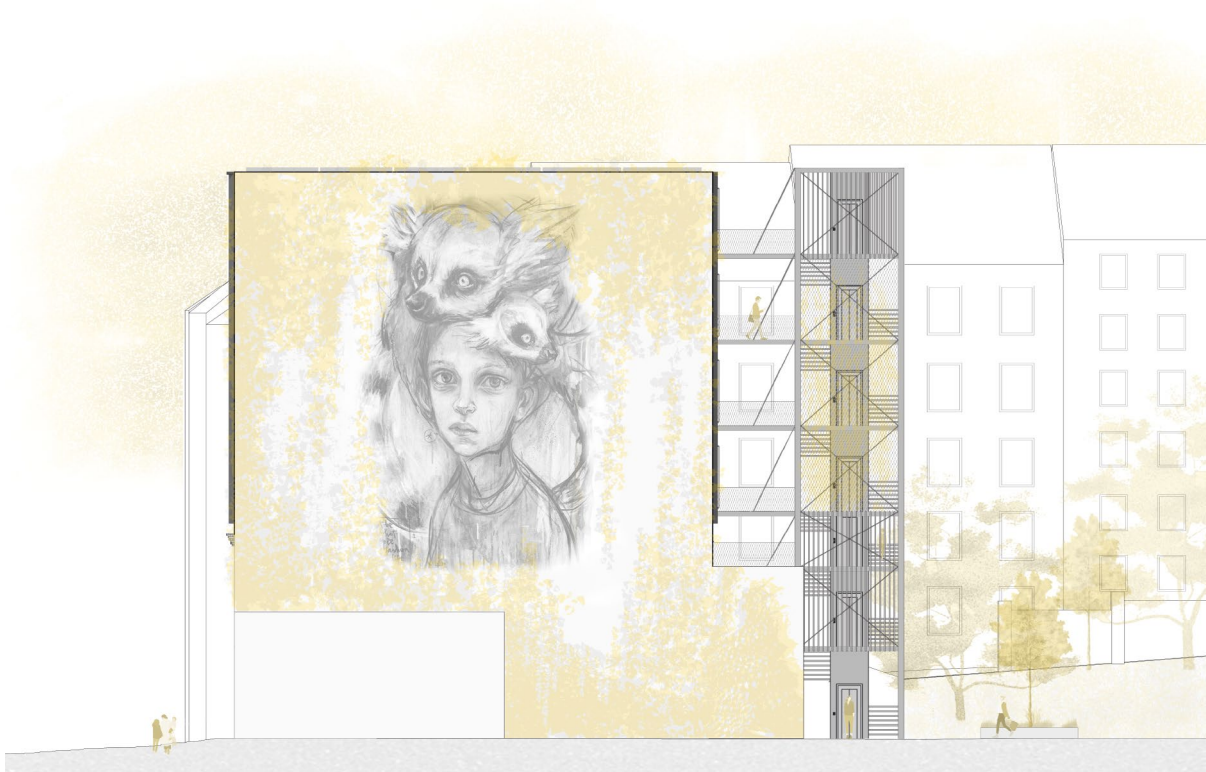
Building Elevation - South - © MIMO / SDE 21/22



Building Elevation - West - © MIMO / SDE 21/22



Building Elevation - North - © MIMO / SDE 21/22



Building Elevation - East - © MIMO / SDE 21/22

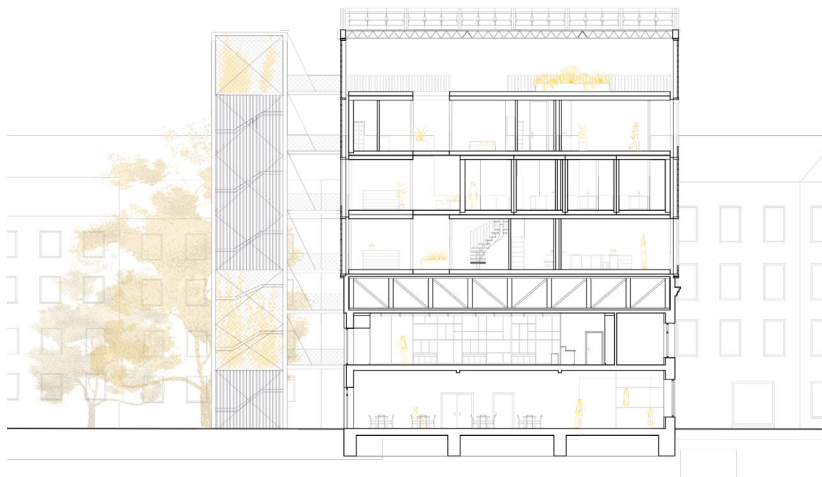




Section AA - © MIMO / SDE 21/22



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Section CC - © MIMO / SDE 21/22



Building Challenge: Exterior Rendering - © MIMO / SDE 21/22



common area - © MIMO / SDE 21/22





Building Challenge: Exterior Rendering - during the day - © MIMO / SDE 21/22

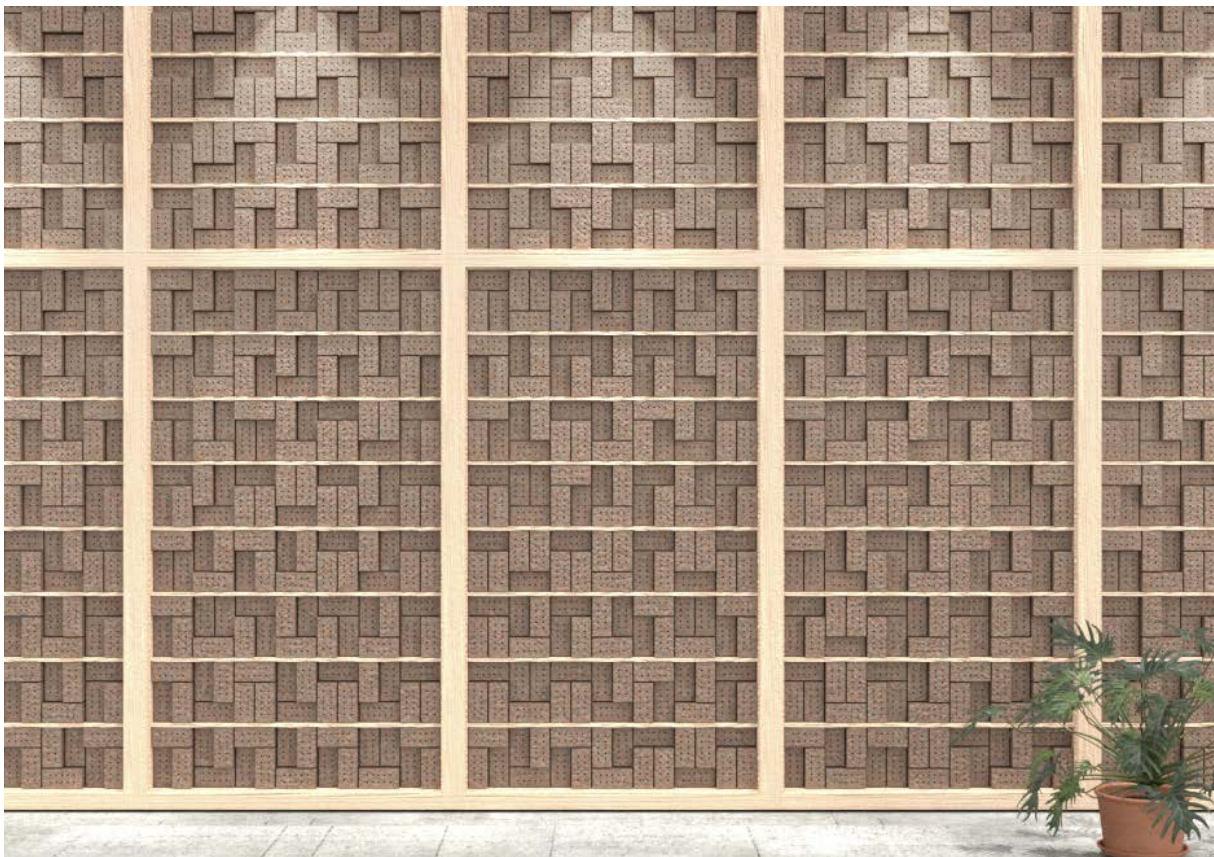


Building Challenge: Exterior Rendering - in the evening - © MIMO / SDE 21/22





Building Challenge: Interieur - © MIMO / SDE 21/22



Building Challenge: Interieur - Clay wall - © MIMO / SDE 21/22





Building Challenge: Interieur - PV cells - © MIMO / SDE 21/22



Building Challenge: Interieur - washroom - © MIMO / SDE 21/22



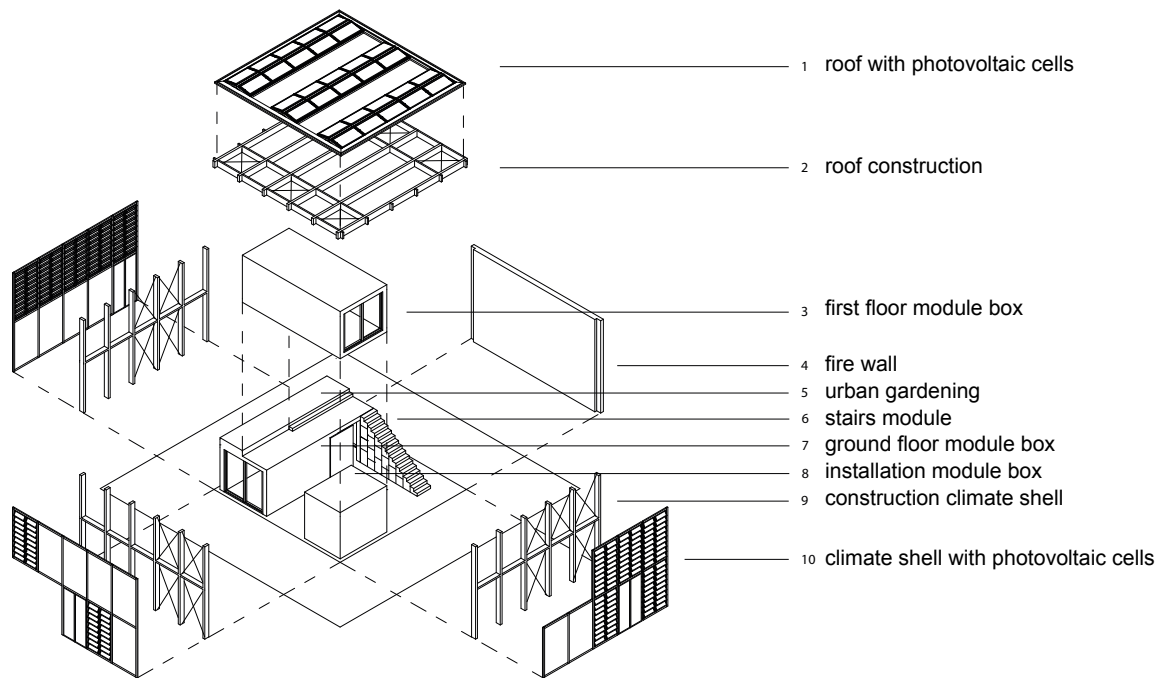


Building Challenge: Interieur - kitchen - © MIMO / SDE 21/22

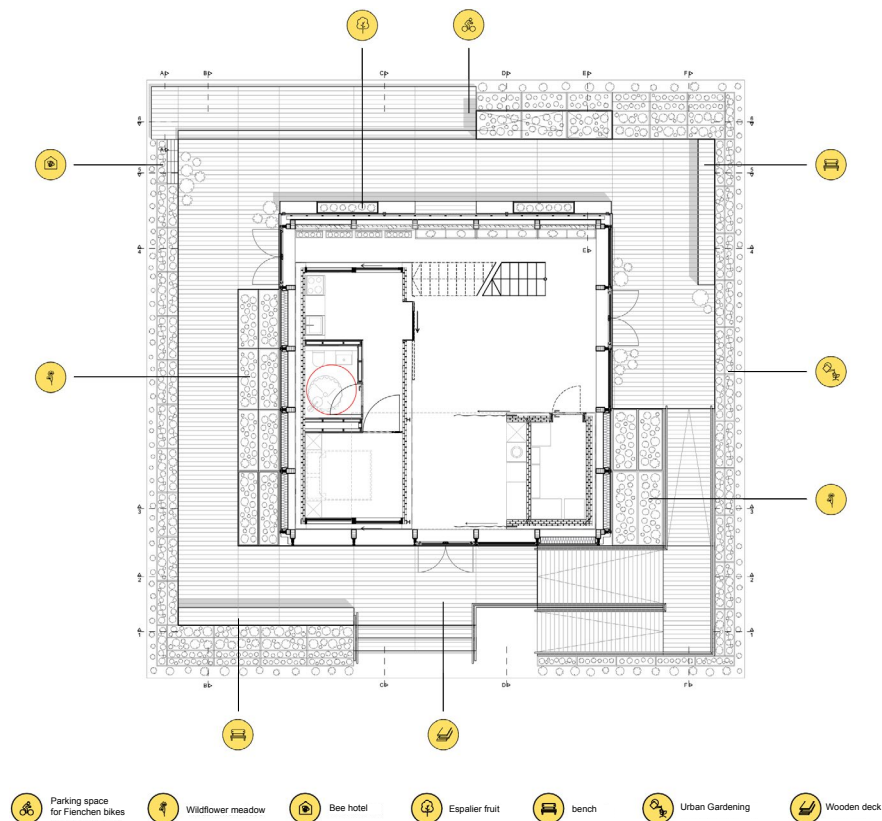


Building Challenge: Interieur - Living room - © MIMO / SDE 21/22

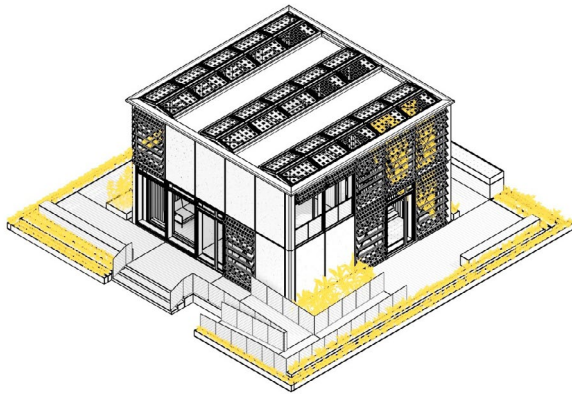




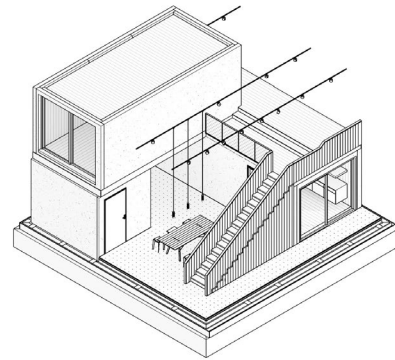
Demonstration Unit – Isometry - © MIMO / SDE 21/22



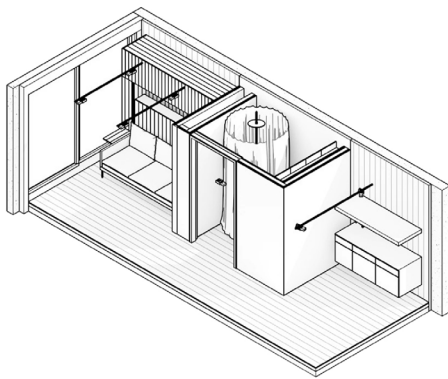
Demonstration Unit – Location Map – Activities - © MIMO / SDE 21/22



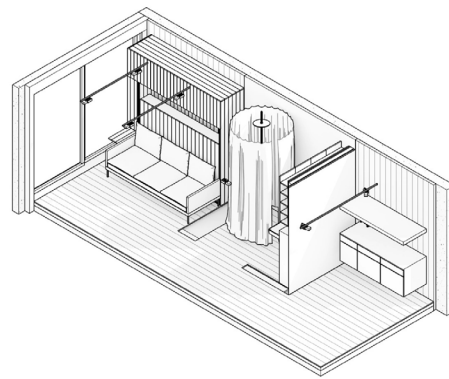
HDU - isometry - © MIMO / SDE 21/22



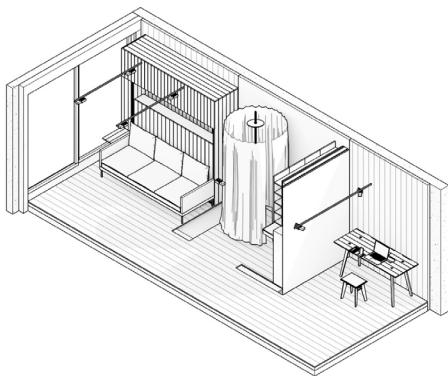
HDU - inside - © MIMO / SDE 21/22



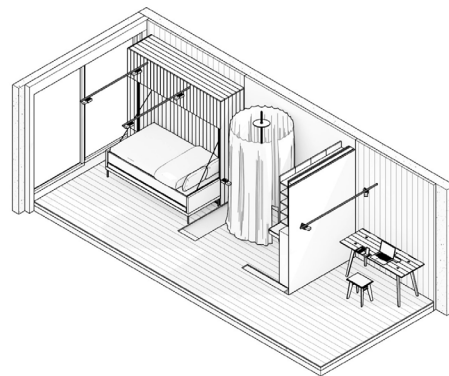
HDU - inside variante 1 - © MIMO / SDE 21/22



HDU - inside variante 2 - © MIMO / SDE 21/22

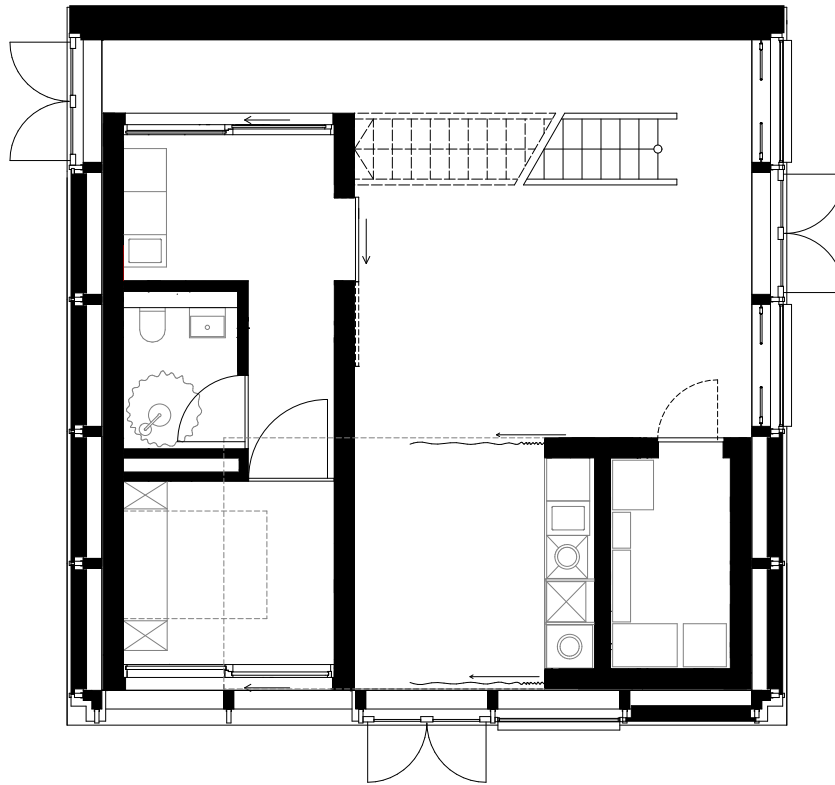


HDU - inside variante 3 - © MIMO / SDE 21/22

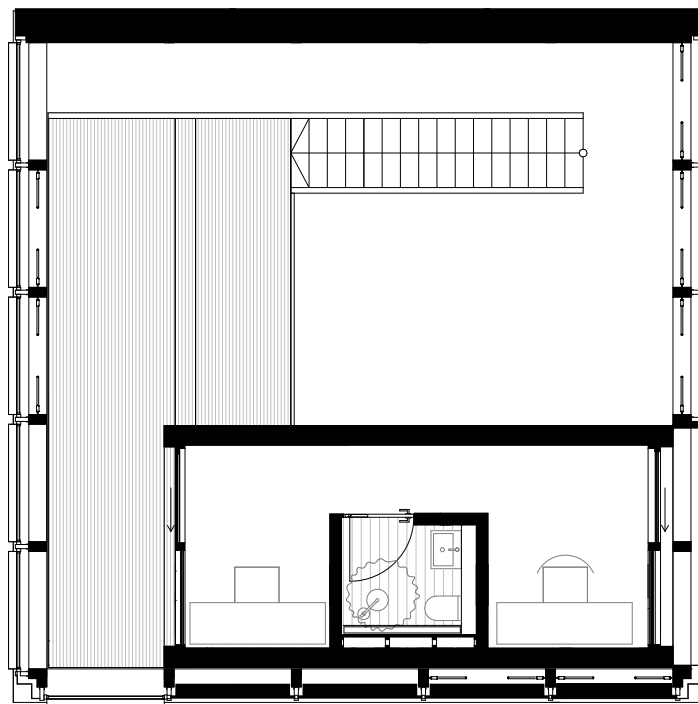


HDU - inside variante 4 - © MIMO / SDE 21/22

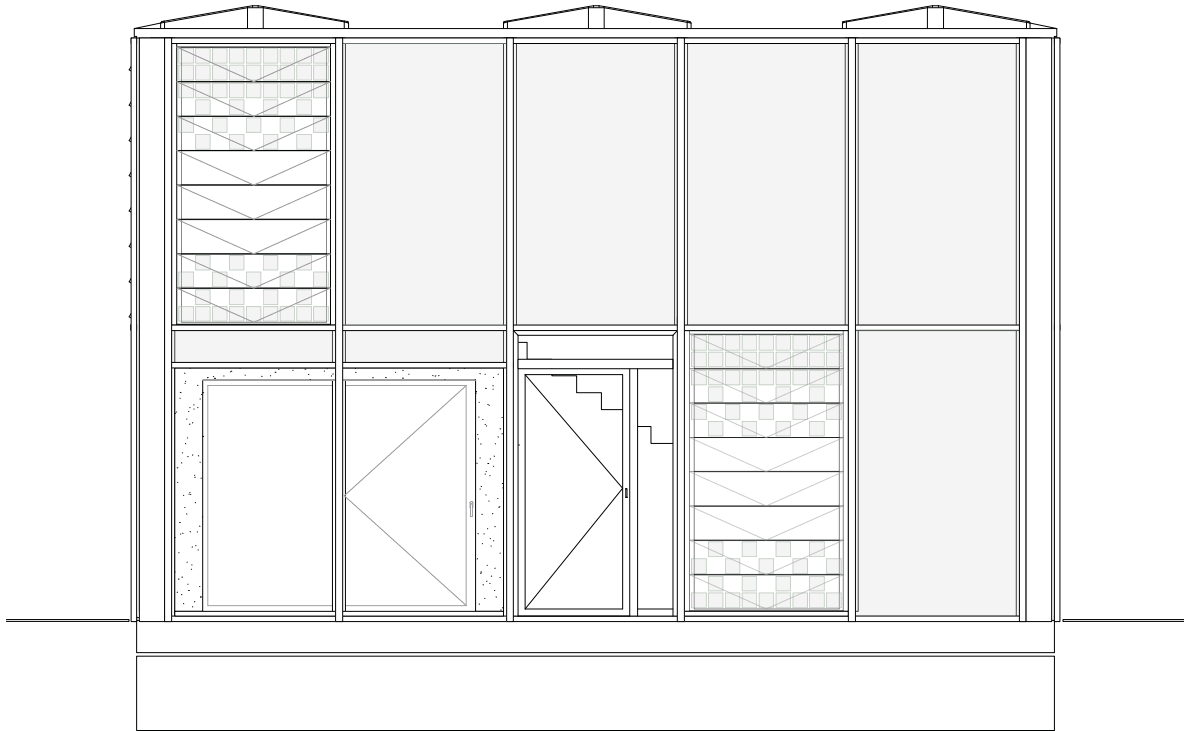




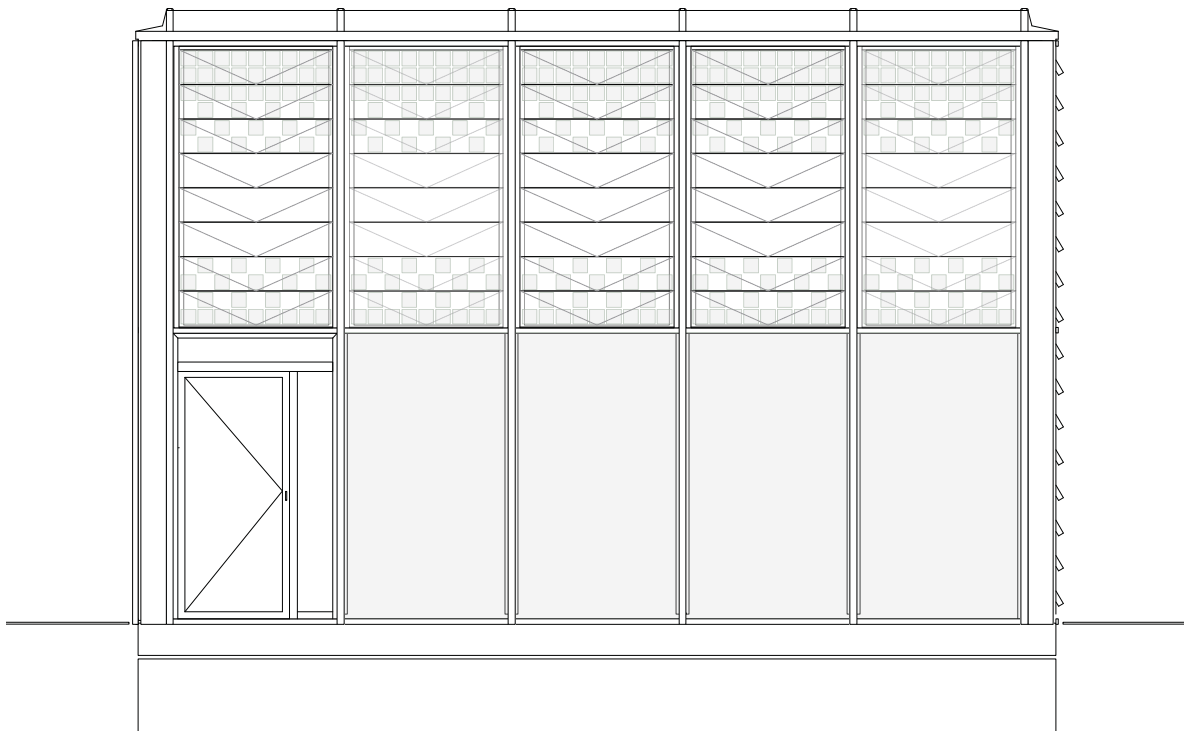
Floor Plan – Ground Floor - © MIMO / SDE 21/22



Floor Plan – First Floor - © MIMO / SDE 21/22

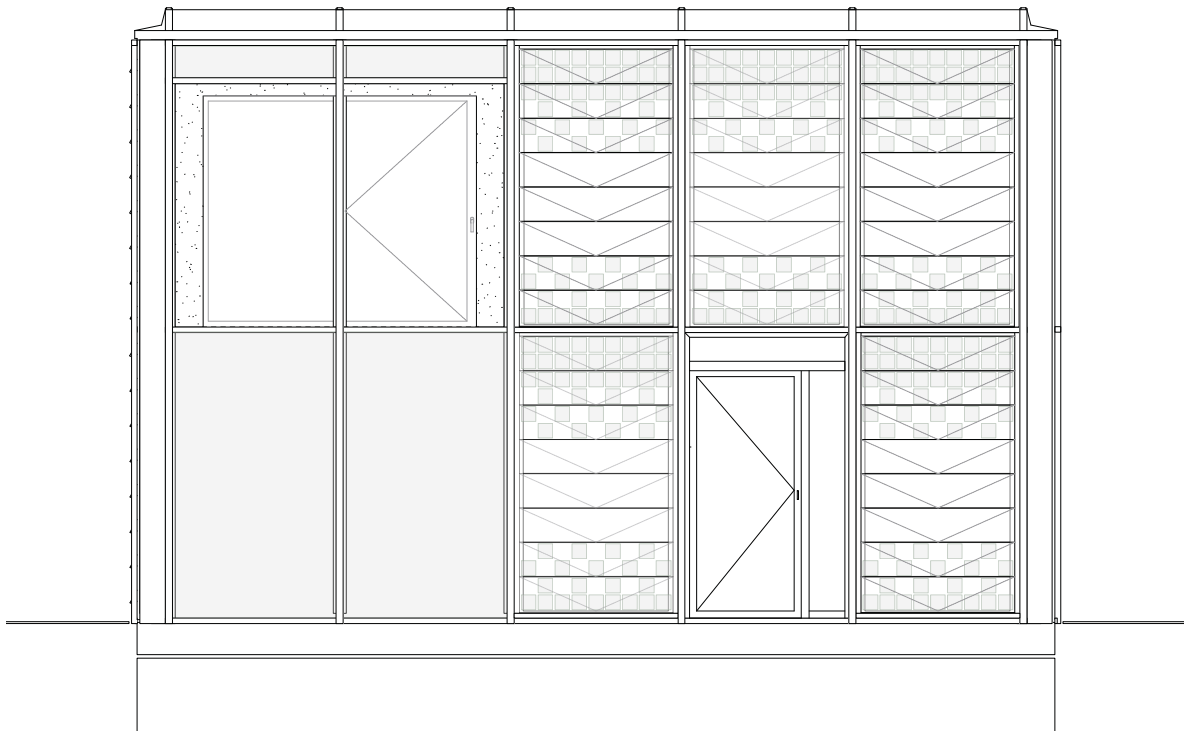


Building Elevation - South - © MIMO / SDE 21/22

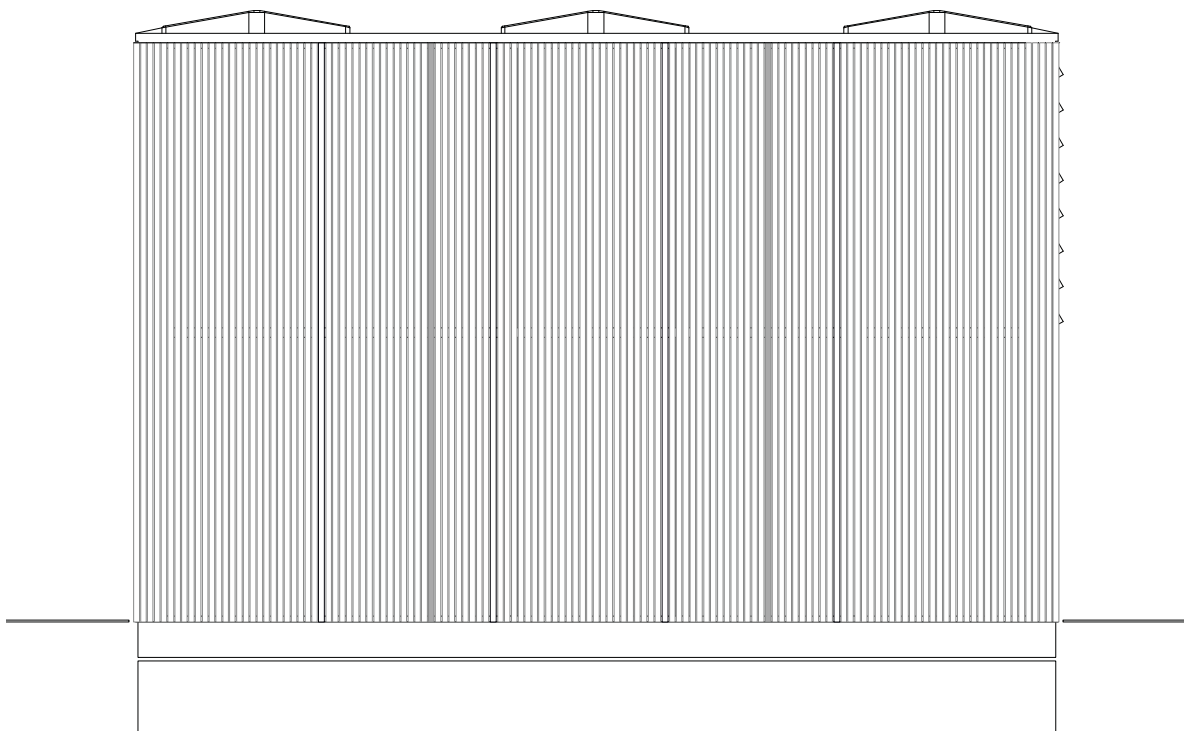


Building Elevation - West - © MIMO /SDE 21/22

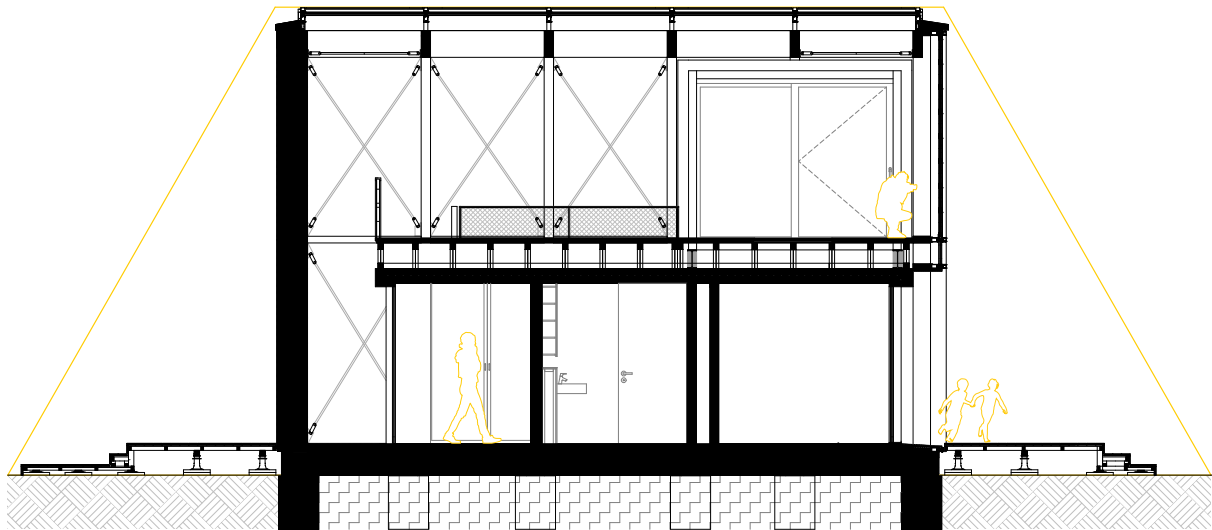




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