RETHINKING FUTURE LIVING.

A BLUEPRINT FOR ACTION

come and discover the new way of living.

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CHALLENGE.

Today, our world is in crisis..


PRESSE
AXA
PIZZA
IMMOBILIER

‘we can’t solve global warming because I f*#&ing changed light bulbs in my house. It’s because of something collective.’

Barack Obama

‘In situations of crisis, **visionary thinking** is especially important, because it enables us to challenge hidebound conventions and **to open a path for innovative approaches and solutions.”**

Christian W. Thomsen
‘Visionary Architecture, From Babylon to Virtual Reality’

Population growth.

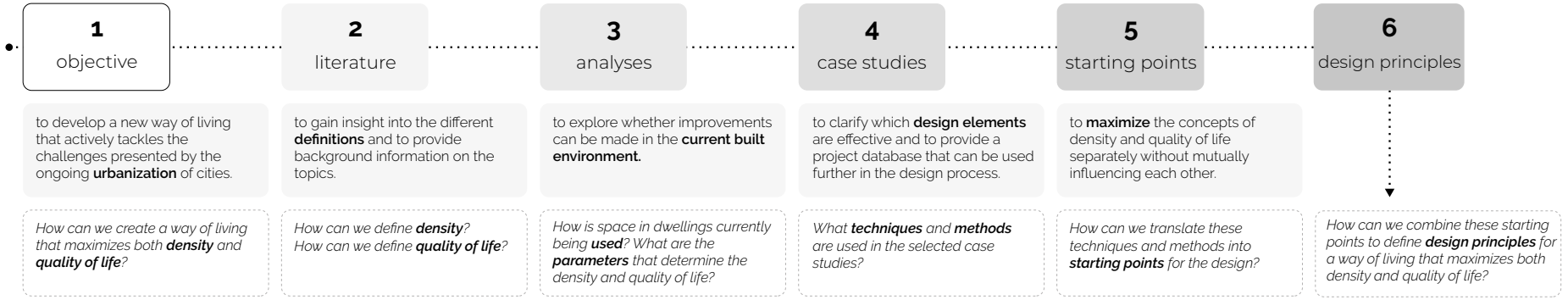
Urbanization.

Population growth.

Urbanization.

How can we create a <sustainable> **way of living that maximizes both density and quality of life?**

RESEARCH.


1
objective
2
literature
3
analyses
4
case studies
5
starting points
6
design principles
to develop a new way of living that actively tackles the challenges presented by the ongoing **urbanization** of cities.
to gain insight into the different **definitions** and to provide background information on the topics.
to explore whether improvements can be made in the **current built environment.**
to clarify which **design elements** are effective and to provide a project database that can be used further in the design process.
to **maximize** the concepts of density and quality of life separately without mutually influencing each other.
*How can we create a way of living that maximizes both **density** and **quality of life**?*
*How can we define **density**? How can we define **quality of life**?*
*How is space in dwellings currently being **used**? What are the **parameters** that determine the density and quality of life?*
*What **techniques** and **methods** are used in the selected case studies?*
*How can we translate these techniques and methods into **starting points** for the design?*
*How can we combine these starting points to define **design principles** for a way of living that maximizes both density and quality of life?*

2.1 density

definition

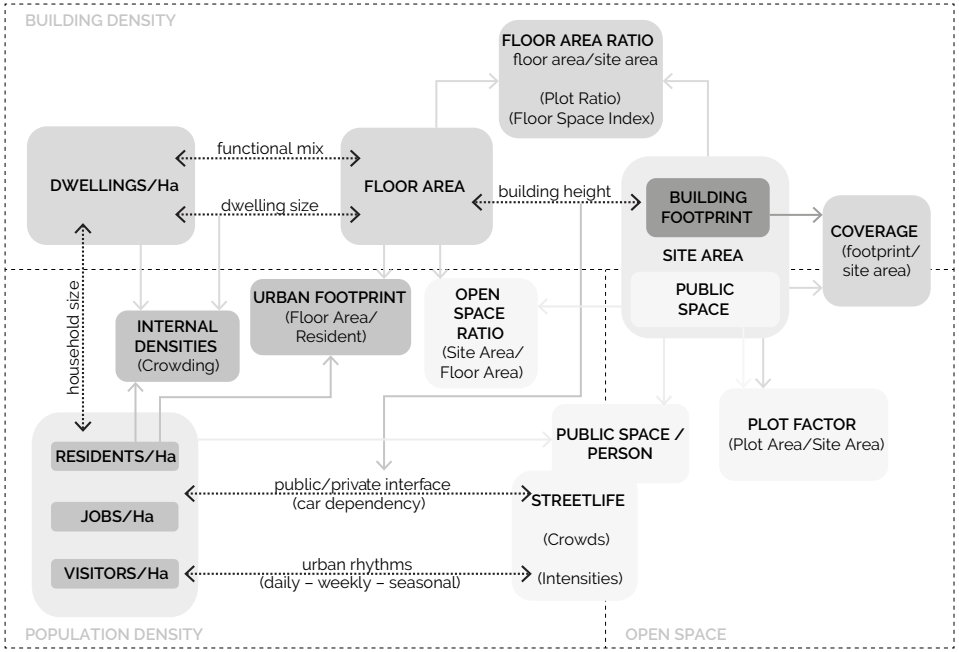
A certain **quantities per unit area.** In the urban environment it is a set of **interrelated variables** which are heavily reliant on each other for their assessment, significance and usefulness.

Net density: measured at the site
Gross density: integrating the larger context of public space

External density: at the level of the neighborhood
Internal density: at the level of the users per room or floor area

Three **domains** of density:
building density, population density, open space

Building density: Central Business Distric, Singapore
Source: https://www.straitstimes.com/business/banking/how-singapore-is-wooing-worlds-biggest-money-managers-with-new-law



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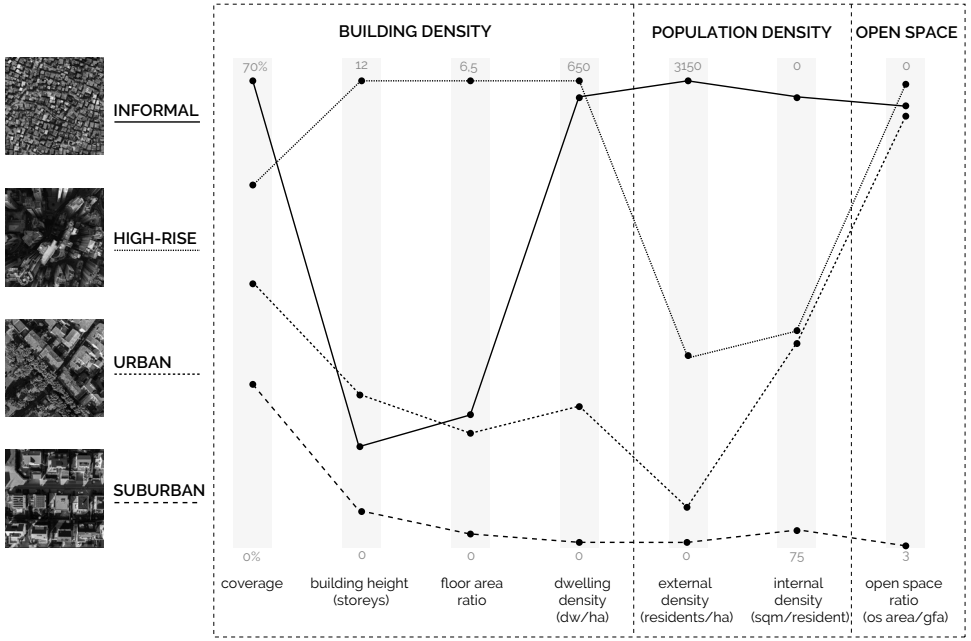

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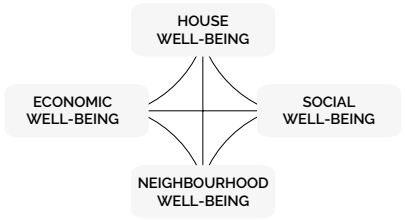
2.2 quality of life

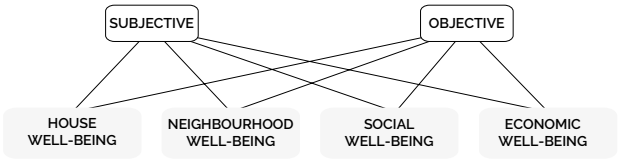
definition

The **level of satisfaction** a person obtains from the surrounding environmental conditions. The quality of life is not linear, but **complex and interwoven**.

Four **domains** of quality of life:
house well-being, neighborhood well-being, social well-being, economic well-being

Objective dimension: the way in which the physical environment can influence behaviour positively or negatively
Subjective: people's perception of how their environment influences their experiences of life and how it shapes their cogenitive interpretation of the quality of life.

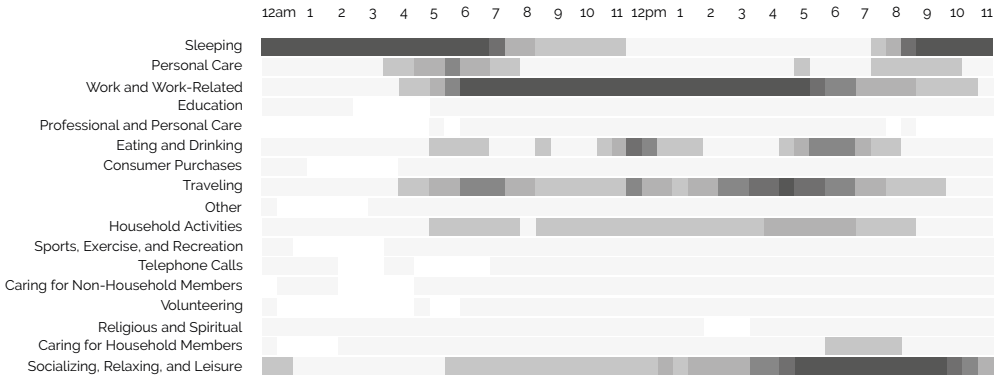




3.1 density

Analysis of what people do throughout the day showed that the **standard timeline** is valid. Most people sleep at night, around 08.00 people go to work and around 17.00 people return home.

Daily activities were projected onto a standard family home in the middle price range, allowing the surface-time to be calculated. The conclusion was that only **30%** of the total **surface-time** of a standard dwelling is utilized.



own image, data based on American TIme Use Survey, 2016

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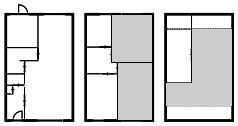
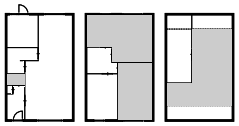
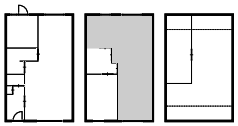


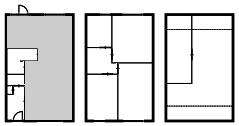
06.30 residents are asleep



06.45 the morning routine starts

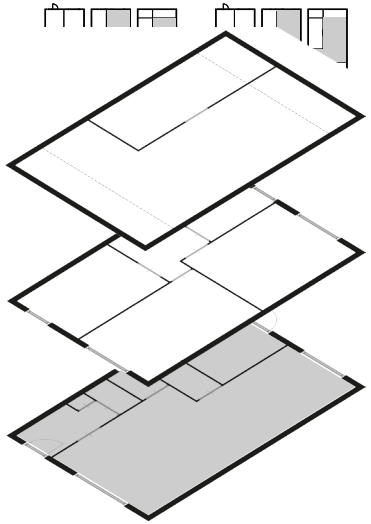


07.00 they take a shower



07.15 they have breakfast together

30%



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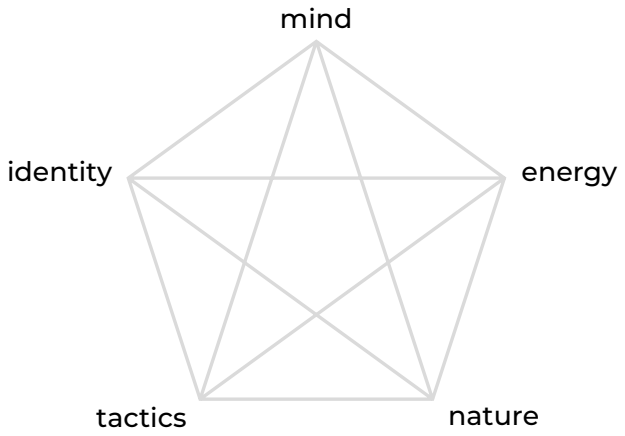
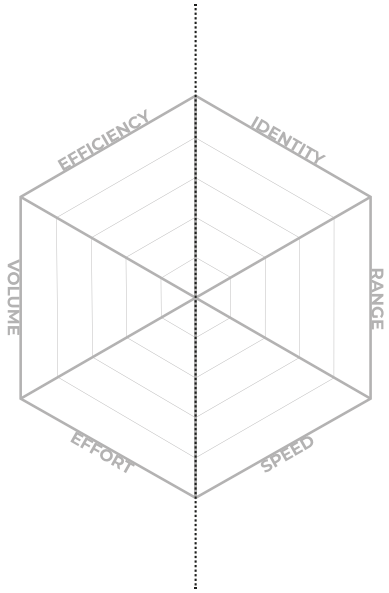
Parameters density:
- **volume**
- **efficiency**
- **effort**

3.2 quality of life

Subjective dimension:
Mind - how we interact with our surroundings
Energy - how we see the world and process information
Nature - how we make decisions and cope with emotions
Tactics - our approach to work, planning and decision-making
Identity - how confident we are in our abilities and decisions

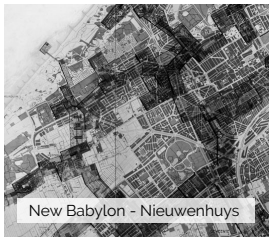


density

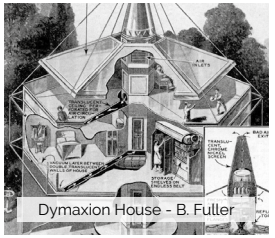


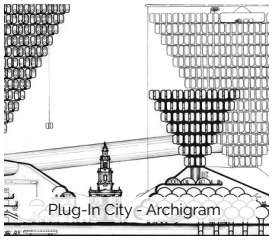
quality of life

Adaptable environments
Predecessors

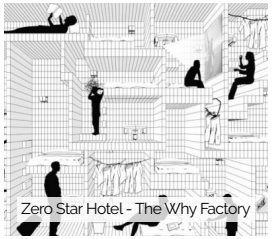

New Babylon - Nieuwenhuys


Fun Palace - Cedric Price


Dymaxion House - B. Fuller


Plug-In City - Archigram

Adaptable environments
Contemporary

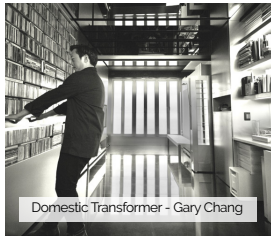

Zero Star Hotel - The Why Factory


Growing Systems - AA School of Architecture

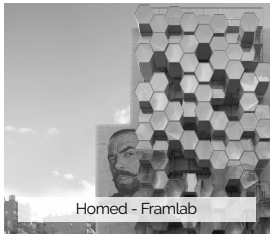

Personalised Capsules - Some People


Silk Pavilion - MIT Media Lab

Micro environments


Domestic Transformer - Gary Chang


Rotating House - George Clarke

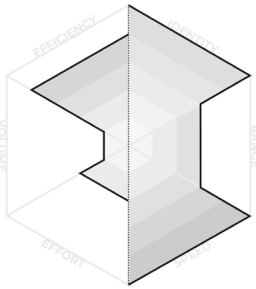

Homed - Framlab


Diogene - Renzo Piano

New Babylon

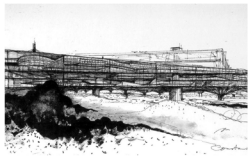
Constant Nieuwenhuys (1958)

New Babylon is a model for a new society in which production is fully automated, resulting in a surplus of free time. The human being should focus on the exploration of the inner soul and becomes the 'homo ludens'. It is based on an immense **volume**, consisting of a large number of 'sectors'. Within these sectors, everything can be adapted to the needs of the **individual**. These changes follow the **speed** of the homo ludens. To make the changes **efficient**, it is based on neutral structures, normalization of dimensions and standardization of production. The **range** is relatively large due to the size of the structure and the location on top of the existing cities. The level of **effort** is average because the homo ludens has the task of changing the environment and traveling to explore and find inner peace.



https://www.archined.nl/2016/07/de-wereld-is-mijn-speelveld/

Elements



Sectors

New Babylon is a network consisting of chains of units 15 to 20 meters above the ground These units, the 'sectors', are constructively independent and are positioned on top of the existing city.

Shared facilities

The project revolves around independence from materials. The collective facilities are therefore located within the sectors.

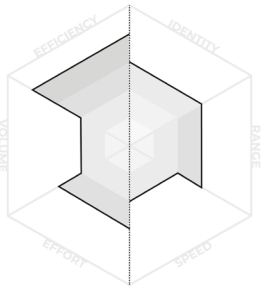
Movable components

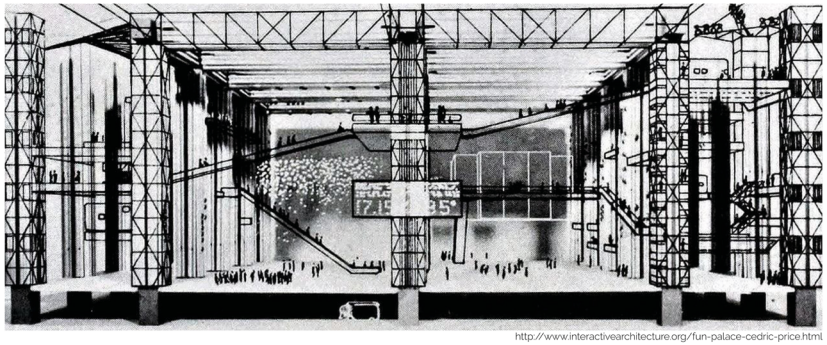
A constantly changing space is created within the sectors through movable walls, stairs and bridges.

Fun Palace

Cedric Price - 1961

Fun Palace is not a conventional building, but a socially interactive machine where ordinary citizens can escape from the everyday life. Users can create their own environment by using cranes and prefabricated modules. Because the modules are standardized, the users cannot give the space their own **identity**. For the positioning of the modules, the users are not limited to a grid but are limited to the **range** of the structural frame. The **time** needed for the change of the building is quite long, and the level of **effort** is high, as the users have to use the cranes themselves to arrange it according to their desires. The space is used **efficiently** because it can be adapted to various functions, but the **volume** is large because is stores all possible modules.





http://www.interactivearchitecture.org/fun-palace-cedric-price.html

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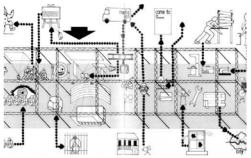
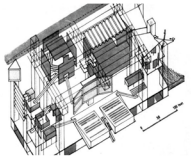


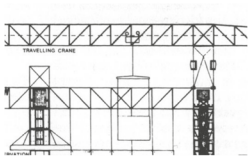
Structural frame

The various modules are integrated in a huge steel structural frame, almost 780 by 360 feet, on a tartan grid of interlocking squares of different sizes.



Modules

The building consists of a 'kit of parts'; prefabricated walls, platforms, floors, stairs and ceiling modules that can be moved and installed by the cranes. Practically every part of the building is variable.



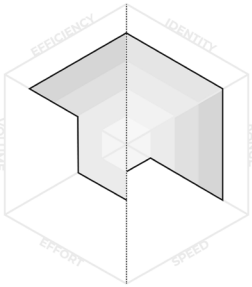
Cranes

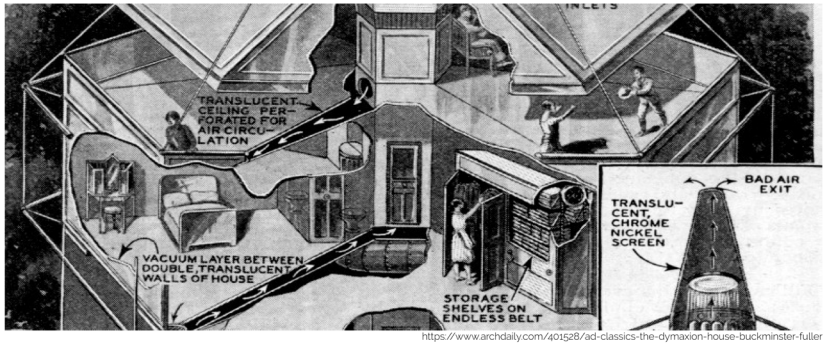
The mobile gantry cranes and cranes installed near the roof covered the entire length of the building. Using the cranes, the users would be able to place the modules and other pneumatic structures where needed.

Dymaxion House

B. Fuller

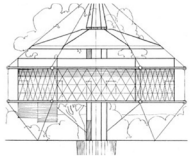
The Dymaxion House was designed by Buckminster Fuller to address the deficiencies of the available housing techniques. It is a hexagonal, single-family house covering an **area** of 100 sqm. It could be mass produced and shipped in a metal tube all over the world, making the **speed** relatively slow. The assembly was with moderate **effort**, since each structure was assembled at ground level and then hung on the central pole. By clustering utilities in this pole, there is a flexible plan that would allow users to transform a wide **range** of spaces according to their **identity**. The plan is **efficient** because the spaces can be easily rearranged. (e.g. during an event, the living room can be enlarged and the bedroom downsized.)





https://www.archdaily.com/401528/ad-classics-the-dymaxion-house-buckminster-fuller

Elements

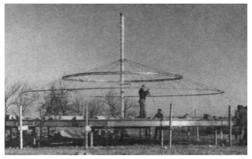


Central pole

The design is based on a central pole on which cables are hung in order to make the exterior walls non-load-bearing. By clustering all permanent utilities in this pole, the rest of the interior space becomes modular.

Prefabricated bathroom

The bathroom consists of four metal sheets that can be easily bolted together. The elements are light enough to be carried by two workers and all the plumbing and appliances are integrated.



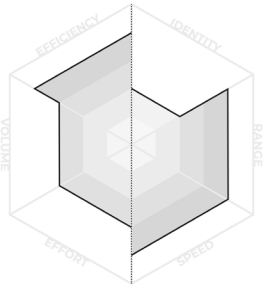
Easy assembly

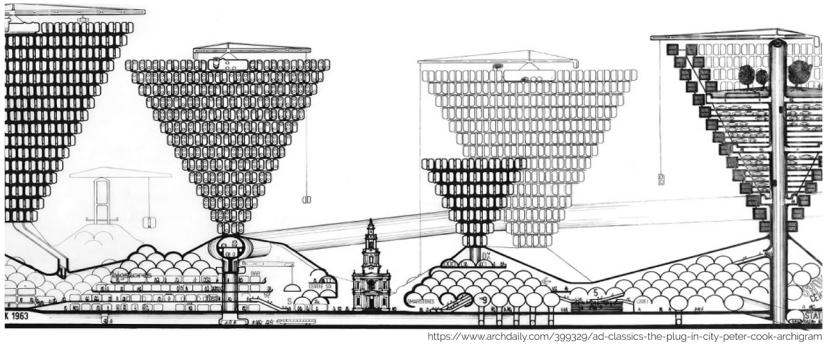
The house can be packed flat, shipped in a metal tube and simply assembled. Each part weighs less than 10 pounds and the total weight of the Dymaxion is 3 tons (compared to an average of 150 tonnes).

Plug-In City

Archigram - 1964

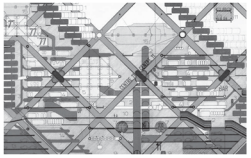
Plug-In City is a utopia consisting of various elements that can be plugged and unplugged in the city according to the users' needs. The dwelling capsules can be placed wherever the users wishes, but the **range** is limited to a grid. The (re)placement of the capsules is carried out by automatic cranes, making the **effort** low for the users and the **speed** of the adaptation relatively high. The dwellings have standardized measurements and a standardized interior. The users cannot give their own **identity** to the dwellings. Each capsule is **efficiently** designed with transformable components, such as a folding screen and a clip-on device wall. Therefore the dwellings fit into the relatively **small** capsules.





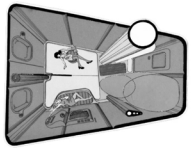
https://www.archdaily.com/399329/ad-classics-the-plug-in-city-peter-cook-archigram

Elements



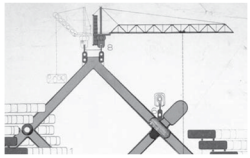
Megastructure grid

The plug-in City is based on a constantly evolving grid that accommodates dwellings, offices, infrastructure and other services.



Capsules

All facilities, such as the dwellings, are in standard size capsules. This allows them to be placed anywhere in the grid. The dwellings resemble hotel rooms.



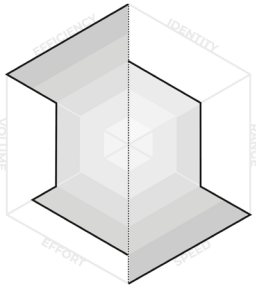
Cranes

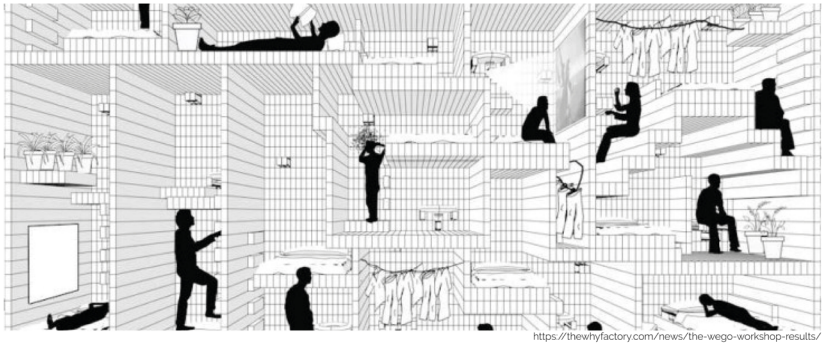
The cranes place the capsules at various places in the grid. They are controlled by a network of sensors that monitor people to ensure that the environment is always tailored to the needs of the user.

Zero Star Hotel

The Why Factory

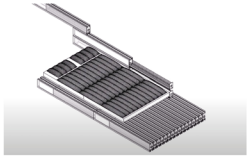
The Zero Star Hotel is a fully adaptable building that explores temporary lifestyles. It consists of a structural frame in which sticks can be moved, allowing various configurations. The **range** is limited to the boundaries of the frame. The residents have full control over the function of their room. However, the **individuality** is moderate because they have to trade space with their neighbours. Using artificial intelligence, the rooms will adapt **immediately** when there is a change in activity. This does not require any **effort** on the part of the residents. The space taken by each resident is small because it only covers the surface area needed for the activity carried out at that time. This **efficient** spatial arrangement ensures that as many people as possible can reside in a small area. However, the **volume** itself is relatively large, as the structural frame is static.





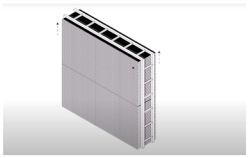
https://thewhyfactory.com/news/the-wego-workshop-results/

Elements



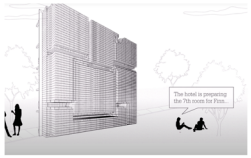
Cartridges

The sticks contain cartridges with various functions such as; inflatable bed, toilet, kitchen etc. These can be pulled out if needed.



Structural frame

The structural frame determines the boundary of the building. In this frame, sticks with various functions can be moved, creating an infinite number of configurations of the space.



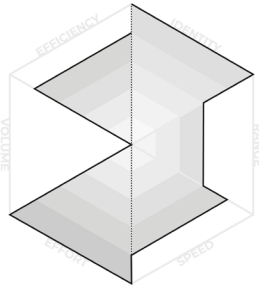
Artificial intelligence

Artificial intelligence ensures that the rooms are always perfectly suited to the needs of the residents. It determines the configuration of the space and when it is necessary to trade space with the neighbours.

Growing Systems

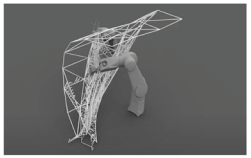
AA School of Architecture

Growing Systems is a project that explores customizable building systems using robotic fabrication. A robotic arm is used on-site, allowing for **faster** construction. Because the structure depends on the robotic arm, the **range** is limited. The applied artificial intelligence minimizes the **effort** as it scans the environment and adjusts the design real-time, thus completely erasing the line between design and fabrication. The meltable bio-based plastic can respond to the dynamics of the city and facilitate programmatic housing changes, making the structure suitable for **individual** needs (e.g. expansion of a home when a family grows). The structure is a system of elasticity that **efficiently** accommodates the site parameters, as well as future adjustments. As this case concerns a construction technique, it is not possible to make a statement on the **volume** of a dwelling.



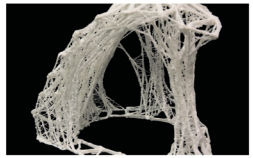
https://www.archdaily.com/793054/aa-school-of-architecture-designs-adaptable-structural-plastic-3d-printing-method

Elements



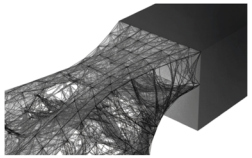
Robotic arm

A robotic arm is used on the site so that the construction can be carried out quickly and with minimal interruption, making scaffolding redundant and reducing waste.



Biodegradable plastic

The plastic is a phase-changing building material, which can easily be connected to other structures because it becomes sticky when heated. Similarly, the plastic can be melted to demolish parts of the structure



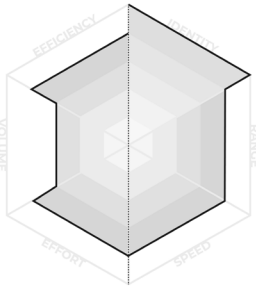
Artificial intelligence

The robotic arm is equipped with artificial intelligence, allowing a quick adaptation to the changing environment and providing feedback.

Personalised Capsules

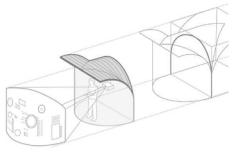
Some People Studio

This project envisages an urban future that uses technology to enhance human creativity. It is based on the idea that the future home should provide a dignified space for each person, expressing his or her **individual** identity and needs. Capsules are providing the facilities to help people design and build their own homes. A projected interface helps the user to design his own home **effortlessly** using machine learning. A mini robotic fabrication space creates a prototype of the design chosen. The **speed** of the adaptation is high because it is built by small robots. These robots are mobile, making the **range** relatively large. The **efficiency** is high because each person ends up with a unique and personalized home, without unnecessary spaces. As a result, the **volume** of the homes can also be kept to a minimum.



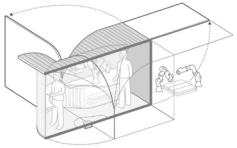
https://somepeople.studio/Personalised-Capsules

Elements



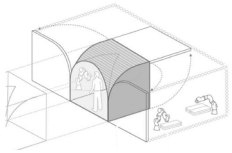
Design space

In the design space the user interacts with a projected interface that uses machine learning to understand people's tastes and preferences and proposes design solutions for their needs.



Fabrication space

The interface generates and proposes a fabrication process. In the fabrication space, the user collaborates with robots for prototyping parts of the new house.



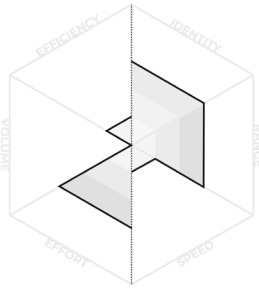
Robots

The fabrication space is equipped with robots that prototype the chosen design and fabricate the new home on site as an extension of the capsule.

Silk Pavilion

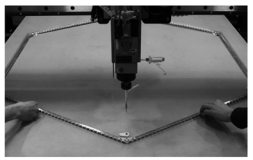
MIT Media Lab

This project integrates Algorithmic design, digital manufacturing, and biologically-inspired fabrication. The pavilion was constructed using a base of robot-woven threads that wrapped a steel frame. The need for this frame limits the **range** of this method. The frame was filled-in by silkworms, making the **effort** low. The pavilion's character lies between a scaled-up version of the insect's own cocoons, and a functional space for humans. The structure is in constant, but very **slow** growth, making the possibilities to adapt to **individual** preferences mediocre. As this concerns a construction technique, a statement about the **volume** of a dwelling cannot be made. With this technique, a dwelling could be designed **efficiently** if we only look at its adaptable character, but it is not feasible because it takes a considerable amount of time.



https://www.archdaily.com/384271/silk-pavilion-mit-media-lab

Elements



Metal frames

Flat polygonal metal frames, which are arranged like a dome, function as scaffolding.

CNC machine

A single silk thread is placed by a Computer Numerically Controlled (CNC) system following a subdivision algorithm until a temporary scaffolding has been covered.

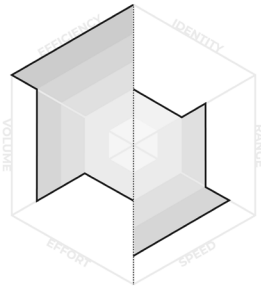
Silkworms

6500 living silkworms were placed around the bottom of the dome and left alone to finish the pavilion, filling in the remaining holes and binding together the CNC-placed thread.

Domestic Transformer

Gary Chang

Chang designed this dwelling in which walls and furniture can be pulled around to create more than 24 rooms according to the user's **preferences**. It is located in a 17-story apartment building in the Sai Wan Ho district of Hong Kong. It covers an **area** of 344 sqft, but due to the wide **range** of configurations it feels infinite to Chang. The dwelling is highly **efficient**, because the space is optimized based on the idea that a resident performs only one activity at a certain time. Instead of the conventional routine of moving from one room to another, the space transforms from one scene to the other while the resident occupies the entire space at all times. Shifting the walls is done **quickly**, but takes quite a lot of **effort** from the residents.

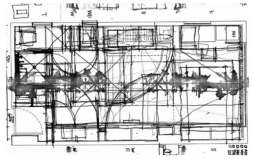


http://www.edgedesign.com.hk/2007domestictransformer

Elements

Materialization

Chang used materials that make the apartment appear larger, such as the granite floor and the reflective ceiling. The yellow tinted windows provide a sunny atmosphere all year round.



Sliding walls

The sliding walls double as storage and, as they are moved around, the apartment can become a variety of spaces. They are suspended from steel tracks bolted to the ceiling and seem to float an inch above the floor.

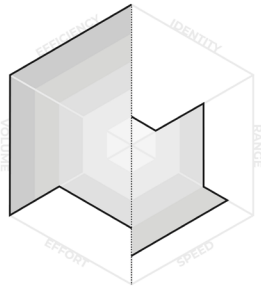
Unused space

Altough most space is taken up by the sliding walls, there is about 180 sqft of unused space. Chang points out that this is essential to make the apartment feel spacious.

Rotating House

George Clarke

The Rotating House is designed to take up as little space as possible, providing four rooms in one, by literally turning the space around. The rotation is carried out by an engine of a second-hand electric wheelchair. It spins **quickly** and turns 90 degrees turn in just 10 seconds. The only fixed section is a small area that houses the bathroom and the controlpanel. The user only has to click the button for the desired function, which makes the **effort** low. The dwelling has a diameter of 4,3 meters and a total floor area of 40 square meters, but only a footprint of 10 square meters. Therefore, the **volume** is low and the space is used **efficiently**. There is no room for **individual** adjustments, as the interior and accessories are custom made to withstand rotation. Due to its small dimensions, the dwelling can be easily transported, making the **range** large.



https://www.housebeautiful.com/uk/renovate/homes-makeovers/news/ag8g/amazing-spaces-george-clarke-william-hardie-futuristic-rotating-house/

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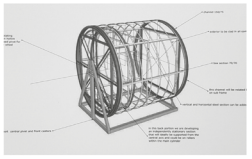


Rotation motor

The dwelling is rotated on its axis, depending on what room is needed. The engine allows it to rotate 90 degrees in just 10 seconds, leaving the door in place as it rotates to give each room an entrance and an exit.

Living wall

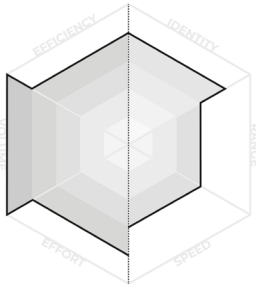
There is a 'living wall' made of moss balls that require little water or sunlight. According to Clarke, having a little piece of green inside the white space makes it feel like it's connected to nature.

Vacuum wardrobe

A special wardrobe has been designed to vacuums clothes so that they don't take up a lot of space and don't get crumpled when the house is rotating.

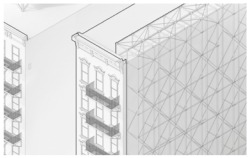
Homed
Framlab

This proposal seeks to solve New York's homeless dilemma by covering the vacant walls with **small** housing pods. The hexagonal 3D printed modules connect to a scaffolding frame up against the side of a building. The honeycomb structures will make it possible to form a densely packed, active community in the most unlikely places. The pods will have furniture, appliances and cabinets that are **efficiently** integrated into the wood-clad interior. By combining different modules from an extensive catalogue, a wide range of different spaces can be created. The 3D printing technology even allows **individual** customization. Using the installation cranes at the top of the scaffolding, the pods can be **quickly** assembled, moved or removed. Therefore, the **effort** for the residents is minimal. The **range** is average, as the application depends on the availability of a façade.



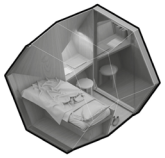
https://www.framlab.com/homed

Elements



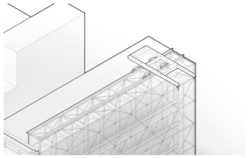
Scaffolding

The pods will be supported by scaffolding attached to the solid facades of buildings. The scaffolding makes it possible to quickly set up, expand, move and remove the system.



Prefabricated pods

The pods are prefabricated and 3D printed, allowing furniture, storage, lighting, and appliances to be integrated into the structure. This results in a minimal space, tailored to the specific needs of its resident.

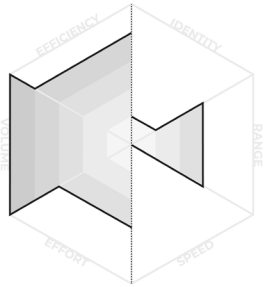


Installation crane

The temporary parasitic structures can be rapidly constructed and dismanteld by the use of installation cranes located at the top of the scaffolding.

Diogene
Renzo Piano

Diogene is a dwelling with a floor area of just 2,5 x 3 meters. The concept stems from a fascination of Piano; the exploration of the minimum space in which a person can possibly live. The small **volume** was achieved by integrating the interior and making it foldable. This ensures that the space is organized as **efficiently** as possible, but also requires a relatively large amount of **effort** from the resident and limits the **range**. The Dionege is equipped with various installations and technical systems to guarantee its self-sufficiency. Furthermore, the small dimensions make it easy to transport. The cabin is presented as an experimental concept rather than a finished product. The Diogene will be mass produced and is not suitable for adaptation to the needs of the users, making the **individuality** low and the **speed** not applicable.

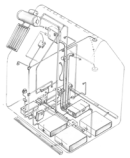


https://www.dezeen.com/2013/06/12/diogene-by-renzo-piano-at-vitra-campus/

Elements

Integrated furniture

The furniture is integrated. The front part serves as a living room: on one side there is a pull-out sofa, and on the other side a folding table. There is a shower, toilet and kitchen behind the separation.



Self-sufficient

The dwelling is designed to be completely off-grid with solar water heaters, solar panels, rainwater collectors, a composting toilet, natural ventilation and triple glazed windows for insulation.

Relocatable

With a surface area of 2.5 x 3 meters when fully assembled and furnished, the dwelling can be loaded onto a lorry and transported anywhere. The off-grid setup makes it possible to live without regulation.

identity

New Babylon - Nieuwenhuys
An immense volume consisting of a large number of 'sectors', within these sectors, everything can be adapted to the needs of the individual, following the speed of the user.

range

Personalised Capsules - Some People
A projected interface helps the user to design his own home effortlessly using machine learning. The speed and range of the adaptation is high because it is built by small robots.

speed

Zero Star Hotel - The Why Factory
A fully adaptable building that explores temporary lifestyles. Using artificial intelligence, the rooms adapt immediately when there is a change in activity.

effort

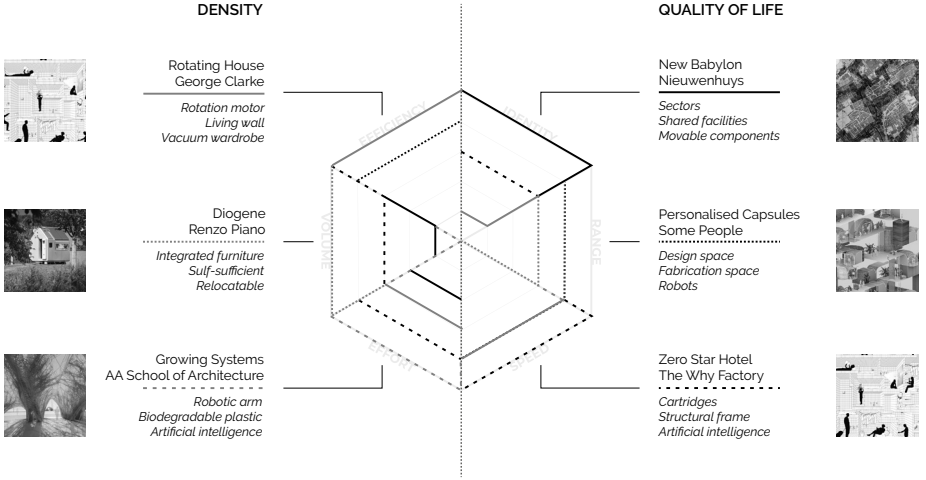
Growing Systems - AA School of Architecture
Artificial intelligence minimizes the effort for the user as it scans the environment and adjusts the design real-time, thus completely erasing the line between design and fabrication.

volume

Diogene - Renzo Piano
The exploration of the minimum space in which a person can possibly live. The small volume is achieved by integrating the interior and making it foldable.

efficiency

Rotating House - George Clarke
Takes up as little space as possible by turning the dwelling around. It has a total floor area of 40 square meters, but only a footprint of 10 square meters.



1 BUILDING DENSITY

1.1 Increase the building footprint as this provides more usable surface area and thus offers the possibility to accommodate more residents.

1.2 Maximize the dwelling density, also known as the dwellings/ hectare, as this results in as many residents as possible within the same urban environment.

1.3 Increase the percentage of dwellings in the functional mix, as this allows for more residents/hectare within the same floor area.

1.4 Reduce the floor area of dwellings because this ensures that more dwellings can be situated within an identical footprint.

1.4 a Limit the volume occupied by a dwelling through integrated interior.

1.4 b Provide a more efficient layout and use of available space by giving the interior multiple functions. Switching functions should be automated, otherwise it will take a lot of effort from the users.

1.4 c Apply prefabricated elements because this ensures that the layout is as efficient as possible since everything fit together seamlessly without taking up unnecessary space.

1.4 d Promote the use of spaces for various functions instead of one, as this reduces the volume of the dwelling. In doing so, avoid the need for a lot of storage space for the various functions.

1.4 e Stimulate sharing facilites between residents as this reduces the total floor area required per person.

1.4 f Make spaces adaptable so they always fit in seamlessly with the usage and do not take up unnecessary floor area (e.g. guest room is only present when there are guests)

1.4 g Do not approach the design of a dwelling as a collection of spaces, but as a sequence of activities.

1.4 h Do not only consider the floor as a usable surface, but also make use of the walls and the ceiling.

1.4 i Apply innovative ways to storage solutions, as storage is one of the main consumers of surface-time.

1.4 j Exchanging space with neighbouring dwellings reduces the amount of floor area required per building block.

2 POPULATION DENSITY

2.1 Increase the external density, also known as the residents/ hectare, through a high dwelling density and a large household size.

2.2 Enlarge the internal density, also called the sqm/resident, by reducing the surface area per resident more people can be accommodated in the same area, regardless of household or dwelling size.

3 OPEN SPACE

3.1 Increase the open space ratio, also known as the open space area/ total floor area, by reducing the area of open spaces and increasing the total floor area.

1 HOUSE WELL-BEING

1.1 Provide all residents with access to well-located, affordable and comfortable housing and upgrade this housing stock on a regular basis.

1.2 Offer a diverse range of housing typologies and promote social cohesion by mixing households of different income groups and ethnic backgrounds.

1.3 Incorporate outdoor spaces such as balconies and patios into the design. Vegetation gives a close contact with nature but also provides a degree of separation and privacy.

1.4 Give the opportunity for people to have a place of their own by giving the ability to personalize their space.

1.4 a Avoid prefabricated solutions in which the residents cannot make their own adjustments.

1.4 b Use free floor plans that allow residents to tailor the space to their activities and preferences, e.g. by clustering facilities.

1.4 c Make the frequency of adaptability high, so it not only adapts to changing life situations, but also to changing preferences or activities.

1.4 d Automate the customization so it takes little effort for the residents and it increases the speed.

1.4 e Make the range of adjustments large because each individual has different preferences. Make sure it is not limited to a framework or grid, but do give the residents some guidance.

2 NEIGHBOURHOOD WELL-BEING

2.1 Activate street life by offering a diverse range of affordable services (retail, utilities, culture, etc), accessible to the entire community regardless of ethnic background.

2.2 Create effective meeting points in dense public areas.

2.3 Enlarge the recreational program by improving existing and adding new public parks, small businesses, marinas, beaches and other cultural amenities.

2.4 Maximize accessibility for all people and improve walkability by adding facilities for pedestrians.

2.5 Protect and increase vegetation in public spaces and promote natural biodiversity.

3 SOCIAL WELL-BEING

3.1 Increase multiculturalism and provide good relationships and daily interaction between people by providing public gathering places.

3.2 Design streets and buildings that reinforce safe environments.

3.3 Remove all barriers that reduce the participation in daily life of certain social groups, such as those with disabilities, women, children and elderly.

3.4 Encourage citizens to participate in the creation and programming of public cultural venues and activities.

4 ECONOMIC WELL-BEING

4.1 Minimize inequity by providing equal access to economic activities, services and facilities

4.2 Promote economic equity by providing a broad range of housing types, tenure types and prices levels

4.3 Provide job opportunities and promote local business by attracting economic activity and mixed use development.

1 objective

to develop a new way of living that actively tackles the challenges presented by the ongoing **urbanization** of cities.

*How can we create a way of living that maximizes both **density** and **quality of life**?*

2 literature

to gain insight into the different **definitions** and to provide background information on the topics.

*How can we define **density**? How can we define **quality of life**?*

3 analyses

to explore whether improvements can be made in the **current built environment.**

*How is space in dwellings currently being **used**? What are the **parameters** that determine the density and quality of life?*

4 case studies

to clarify which **design elements** are effective and to provide a project database that can be used further in the design process.

*What **techniques** and **methods** are used in the selected case studies?*

5 starting points

to **maximize** the concepts of density and quality of life separately without mutually influencing each other.

*How can we translate these techniques and methods into **starting points** for the design?*

6 design principles

*How can we combine these starting points to define **design principles** for a way of living that maximizes both density and quality of life?*

1 objective

1.1 urbanization

Urbanization is one of the most urgent challenges currently being faced by cities across the world. More than half of the world's population (54%) resides in urban areas and the urbanization is expected to continue to grow to 68% by 2050. (U.N. 2018).

The high demand for housing caused by urbanization needs to be accommodated, but available space is limited. More people will make use of the same amount of space, which will increase the pressure on the built environment.

1.2 visionary approach

Through visionary thinking, we can challenge long-standing traditions and pave the way for innovative approaches. Utopian visions are 'one of the most important catalysts for fundamental change' (Robert Klanten and Lukas Feireiss, 2011).

1.3 new way of living

The world is in need for way of living that does not fight against densification, but rather embraces it. This project explores how we can achieve maximum densification of a city while at the same time creating the highest quality of life for its citizens.

1.4 density vs quality of life

The relationship between density and quality of life is complex and has a multi-dimensional character (Searl, 2013). Answering the question how both the density and quality of life can be maximized requires some discussion about what both concepts entail, therefore they are first discussed separately and then recombined when formulating the design principles (see 6).

2 literature

2.1 density

definition — A certain **quantities per unit area.** In the urban environment it is a set of interrelated variables which are heavily reliant on each other for their assessment, significance and usefulness.

Net density: measured at the site
Gross density: integrating the larger context of public space

External density: at the level of the neighborhood
Internal density: at the level of the users per room or floor area

Three domains of density:
building density, population density, open space

Urban morphology study (informal settlement, high rise, urban, suburban) shows that a high building density does not directly cause a high population density and vice versa.

2.2 quality of life

definition — The **level of satisfaction** a person obtains from the surrounding environmental conditions. The quality of life is not linear, but complex and interwoven.

Four domains of quality of life:
house well-being, neighborhood well-being, social well-being, economic well-being

Objective dimension: the way in which the physical environment can influence behaviour positively or negatively
Subjective: people's perception of how their environment influences their experiences of life and how it shapes their cogenitive interpretation of the quality of life.

3 analyses

3.1 density

Analysis of what people do throughout the day showed that the standard timeline is valid. Most people sleep at night, around 08.00 people go to work and around 17.00 people return home.

Daily activities were projected onto a standard family home in the middle price range, allowing the surface-time to be calculated. The conclusion was that only 30% of the total surface-time of a standard dwelling is utilized.

Parameters density:
- **volume**
- **efficiency**
- **effort**

3.2 quality of life

Subjective dimension:
Mind - how we interact with our surroundings
Energy - how we see the world and process information
Nature - how we make decisions and cope with emotions
Tactics - our approach to work, planning and decision-making
Identity - how confident we are in our abilities and decisions

Parameters quality of life:
- **identity**
- **range**
- **speed**

4 case studies

identity — **New Babylon** - Nieuwenhuys
An immense volume consisting of a large number of 'sectors', within these sectors, everything can be adapted to the needs of the individual, following the speed of the user.

range — **Personalised Capsules** - Some People
A projected interface helps the user to design his own home effortlessly using machine learning. The speed and range of the adaptation is high because it is built by small robots.

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effort — **Growing Systems** - AA School of Architecture
Artificial intelligence minimizes the effort for the user as it scans the environment and adjusts the design real-time, thus completely erasing the line between design and fabrication.

volume — **Diogene** - Renzo Piano
The exploration of the minimum space in which a person can possibly live. The small volume is achieved by integrating the interior and making it foldable.

efficiency — **Rotating House** - George Clarke
Takes up as little space as possible by turning the dwelling around. It has a total floor area of 40 square meters, but only a footprint of 10 square meters.

5 starting points

5.1 density

1.4 f — Make spaces adaptable so they always fit in seamlessly with the usage and do not take up unnecessary floor area (e.g. guest room is only present when there are guests)

1.4 e — Stimulate sharing facilites between residents as this reduces the total floor area required per person.

1.4 a — Limit the volume occupied by a dwelling through integrated interior.

1.3 — Increase the percentage of dwellings in the functional mix, as this allows for more residents./hectare within the same floor area.

3.1 — Increase the open space ratio, also known as the open space area/ total floor area, by reducing the area of open spaces and increasing the total floor area.

5.2 quality of life

1.4 — Give the opportunity for people to have a place of their own by giving the ability to personalize their space.

3.1 — Increase multiculturalism and provide good relationships and daily interaction between people by providing public gathering places.

1.4 a — Avoid prefabricated solutions in which the residents cannot make their own adjustments.

4.3 — Provide job opportunities and promote local business by attracting economic activity and mixed use development.

2.3 — Enlarge the recreational program by improving existing and adding new public parks, small businesses, marinas, beaches and other cultural amenities.

6 design principles

Optimize floor area
This results in an increase in the number of dwellings per hectare. It involves considering dwellings as a sequence of activities rather than a collection of spaces, giving spaces multiple functions and applying prefabricated and/or integrated furniture.

Offer adaptable dwellings
For density, this allows the space to be arranged efficiently and, in the case of quality of life, it means that people can adapt the home to their personal preferences. Ensure that the maximum possible frequency of adjustments is high and that the effort for the occupants is low.

Offer a range of typologies
This includes all price ranges and ethnic backgrounds. This ensures that each individual gets a well- located and comfortable home.

Promote facility sharing
The quality of life benefits from sharing facilities as it encourages good relationships and interaction between neighbours. In terms of density, this means that dwellings can be downsized, resulting in more dwellings in total.

Enhance outdoor spaces
To improve the quality of life it is important to maintain open public spaces, such as parks. And by making the urban environment more attractive, this can become the new 'living room' and dwellings can be made more compact, which increases the density.

MANIFESTO.

Challenges.

CO_2 emissions

Mental health

Loneliness

Extremely high rents

Opportunities.

New construction materials
and methods
-> Cross Laminated Timber
-> CNC milling

'Zeitgeist' new generations
-> wanderlust
-> experiences > possessions

a new way of living...

... with the smallest carbon footprint possible.

... that improves mental health and stimulates social contacts.

... that is affordable for all.

... that offers ultimate freedom to enjoy the beauty of our planet.

One backpack. One laptop. Unlimited potential.

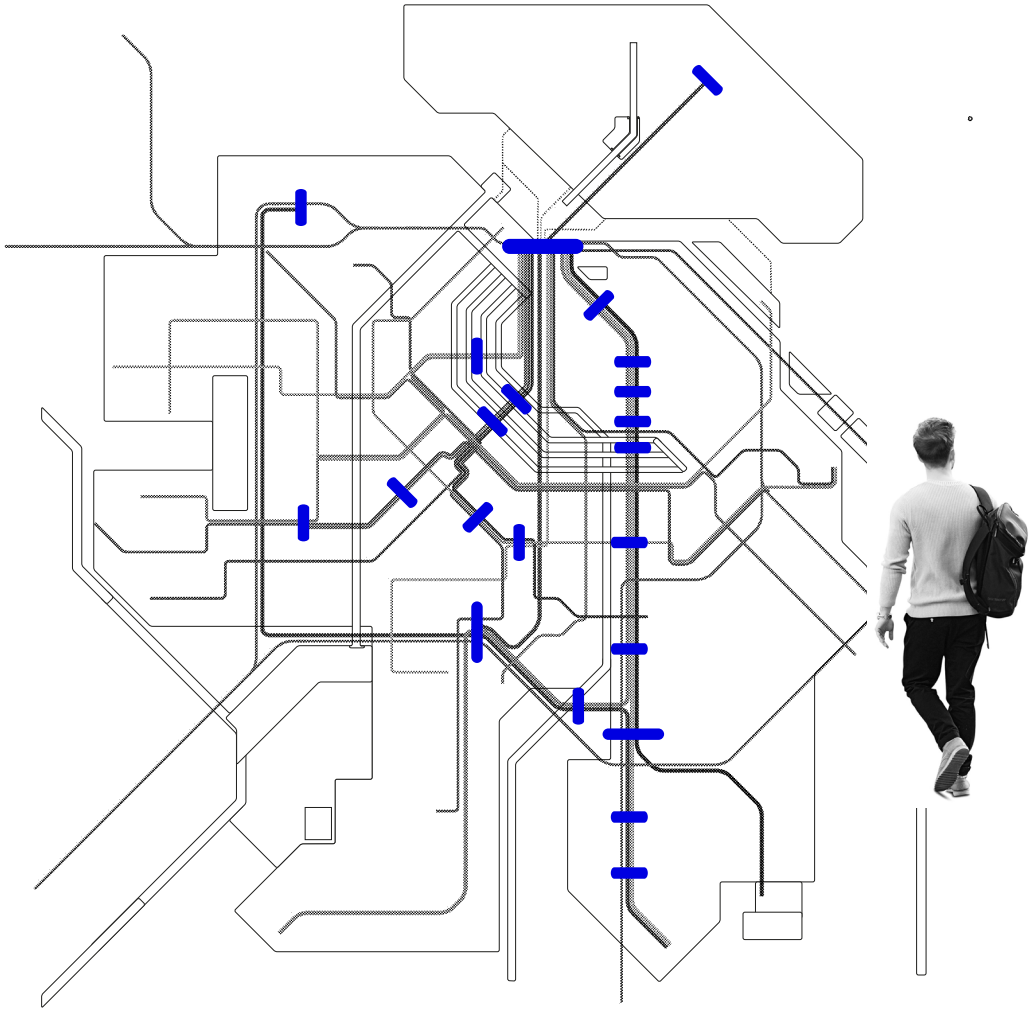
Clothing & Accessories

Productivity & Tech

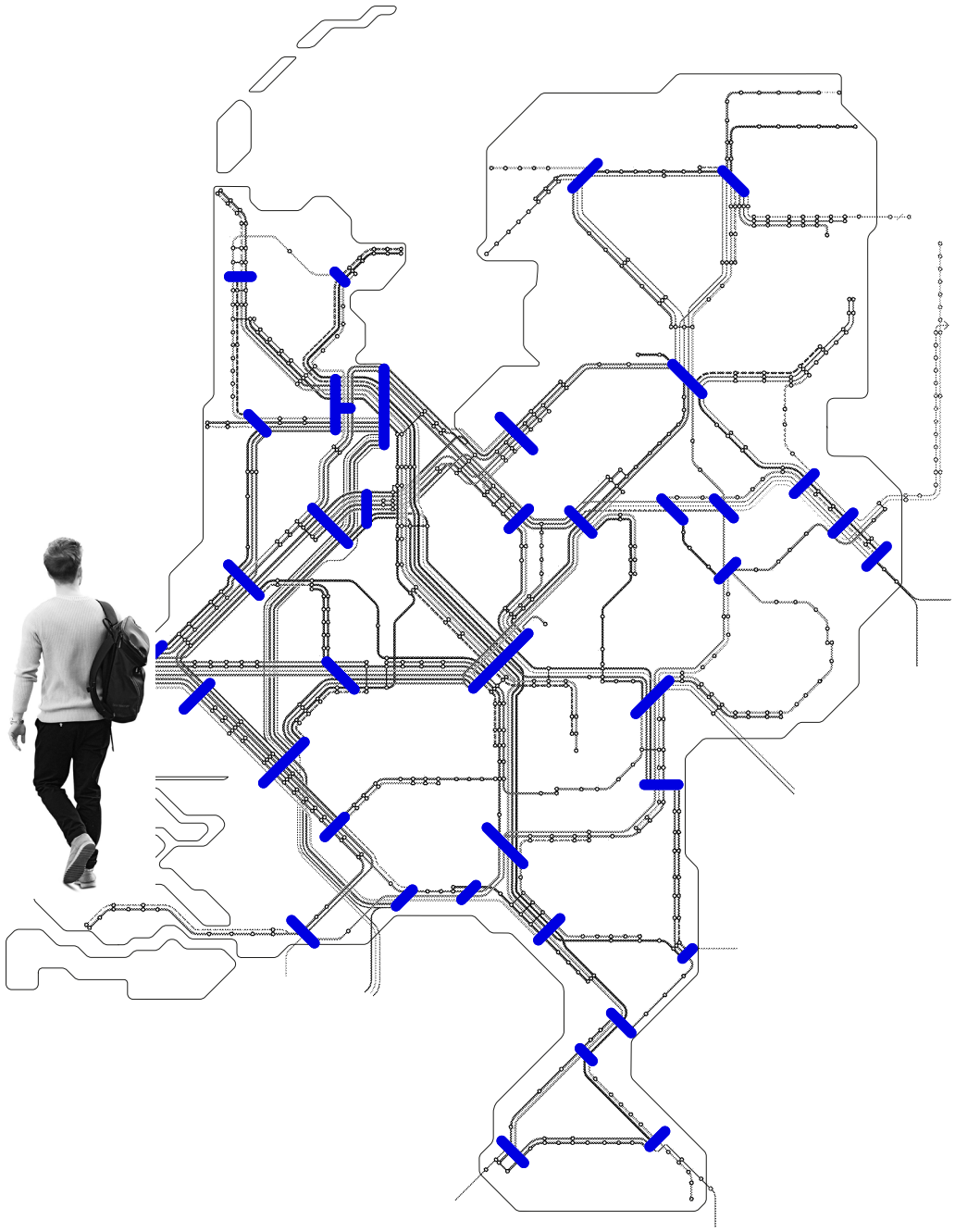
Toiletries & Personal Care

Miscellaneous

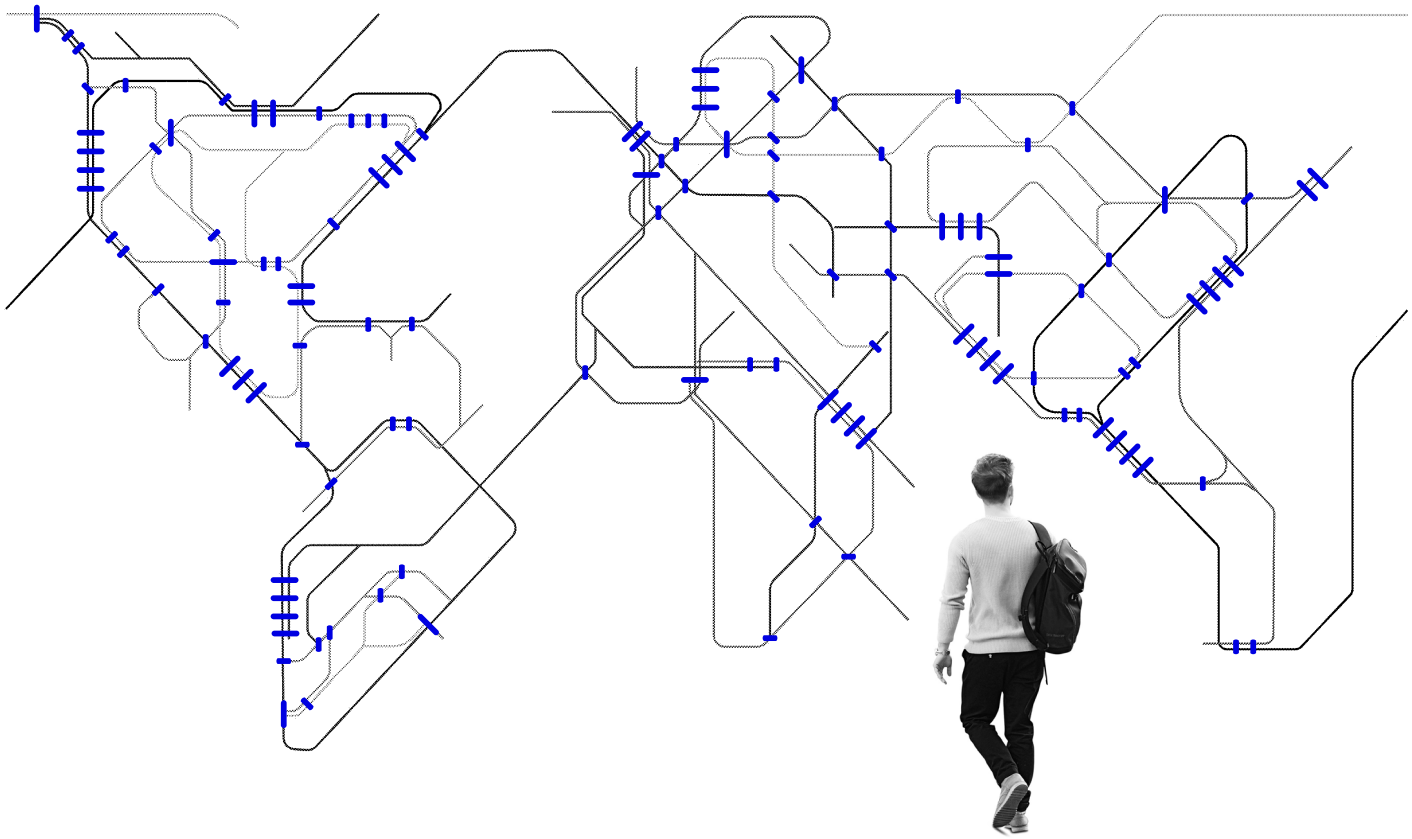
Connected communities.
scale: regional



Connected communities.
scale: national



Connected communities.
scale: global



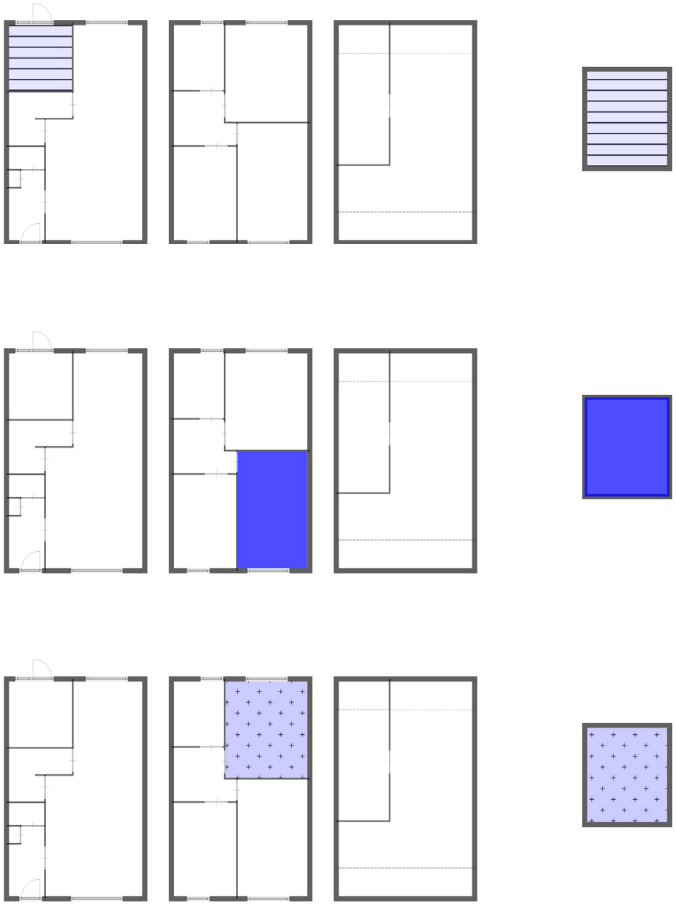
TOOLKIT.

Toolkit.

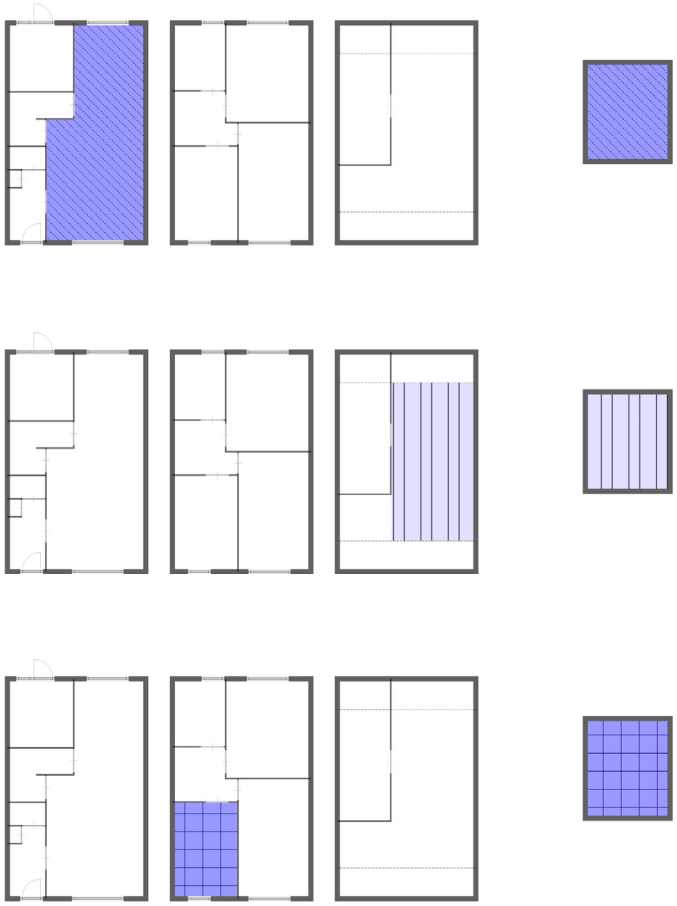
I. dwellings II. shared facilities III. self-sufficiency IV. building

Surface-time.

100% use of surface-time

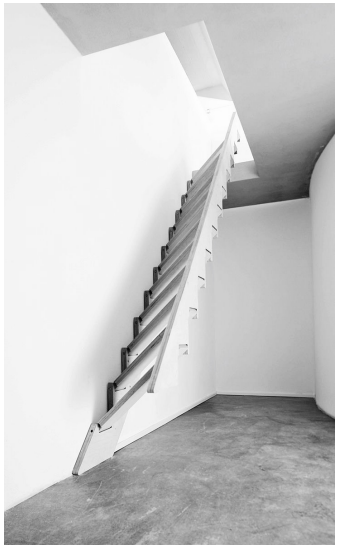


100% use of surface-time



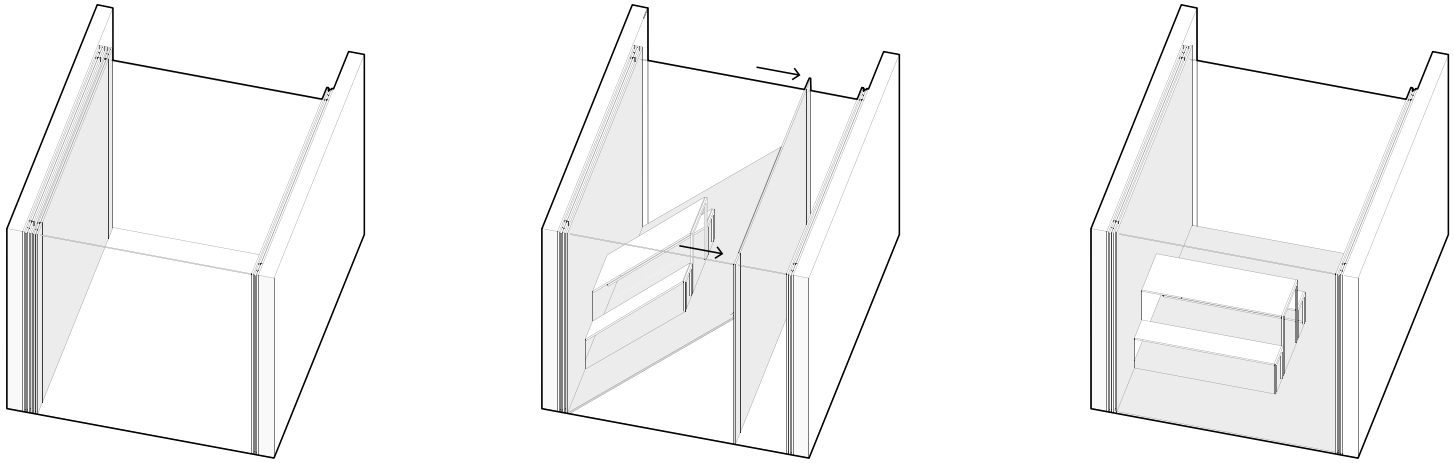
References.

http://www.popupology.co.uk/galleries/7/items/41

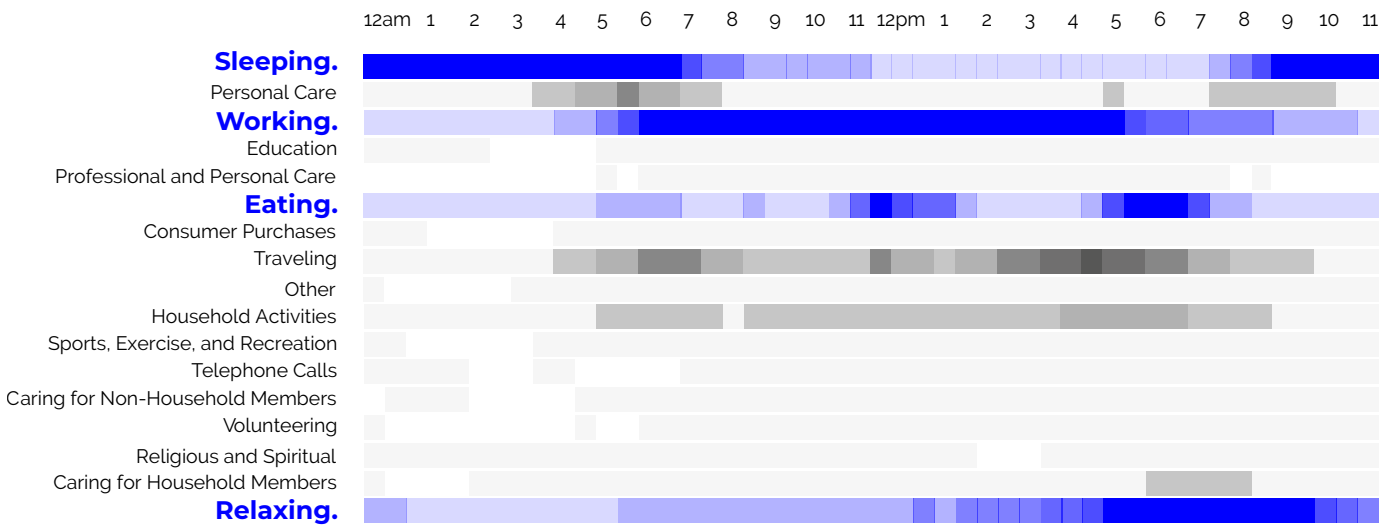


https://www.baudokumentation.ch/innovationen-in-den-bereichen-treppen-und-dachausstiege-168767/news.html

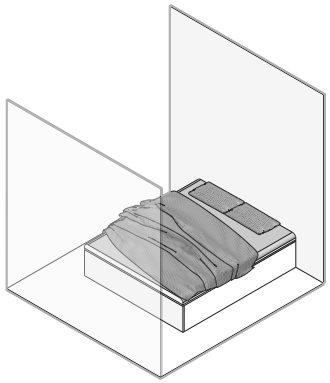
Concept.



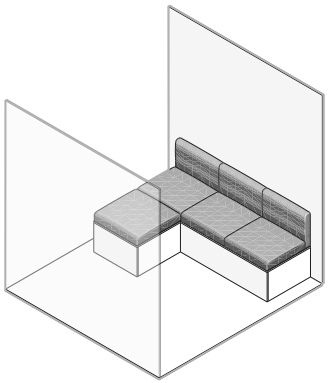
Activities.


12am 1 2 3 4 5 6 7 8 9 10 11 12pm 1 2 3 4 5 6 7 8 9 10 11
Sleeping.
Personal Care
Working.
Education
Professional and Personal Care
Eating.
Consumer Purchases
Traveling
Other
Household Activities
Sports, Exercise, and Recreation
Telephone Calls
Caring for Non-Household Members
Volunteering
Religious and Spiritual
Caring for Household Members
Relaxing.

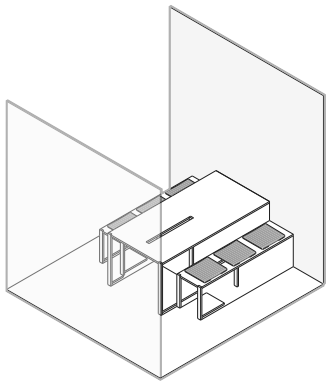
Activities.



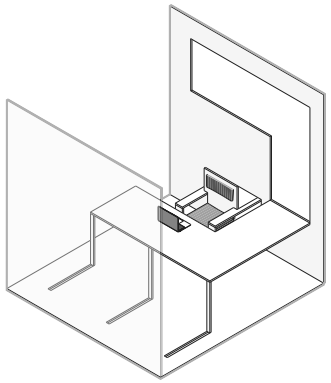
Sleeping.



Relaxing.

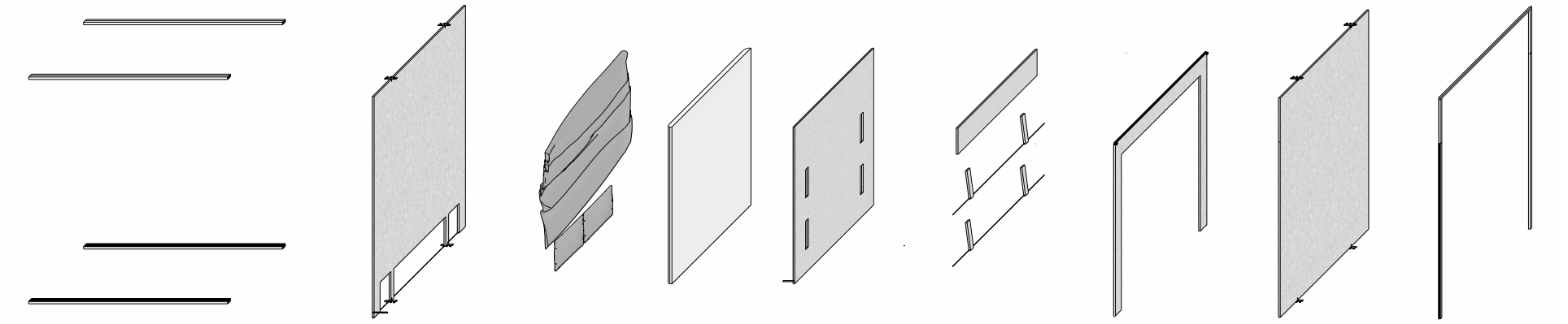


Eating.



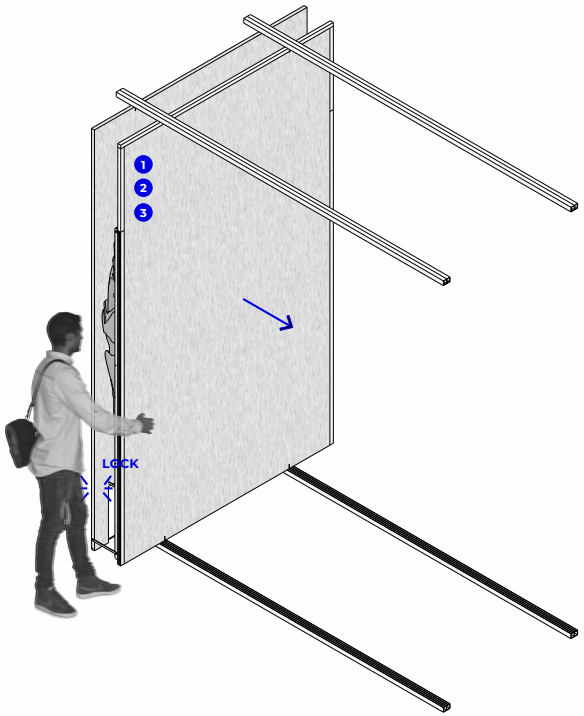
Working.

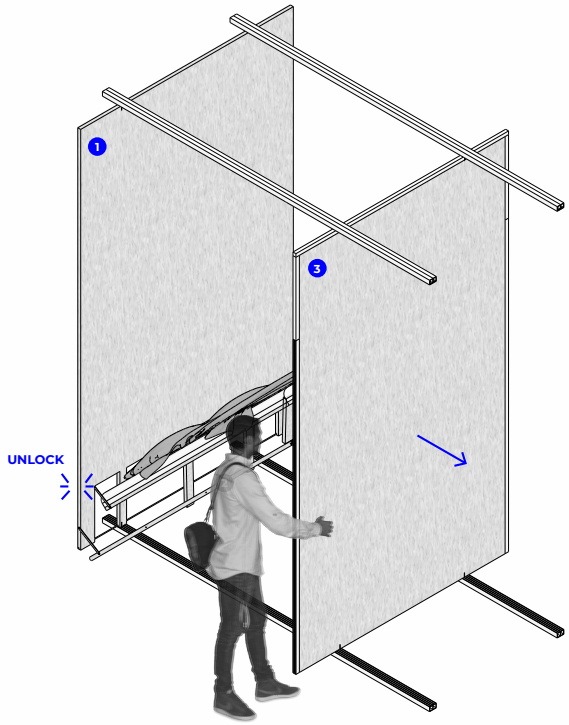
Exploded view.

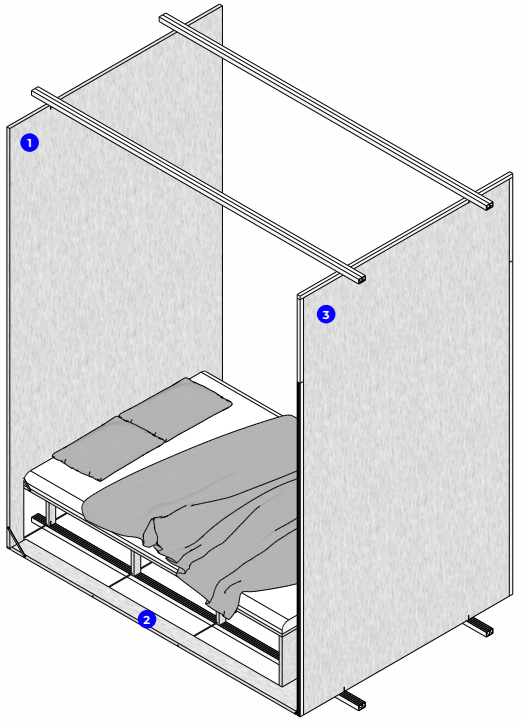


1 Rails. 2 Wall. 3 Blanket. 4 Mattress. 5 Bed. 6 Legs. 7 Floor. 8 Wall. 9 Rails.

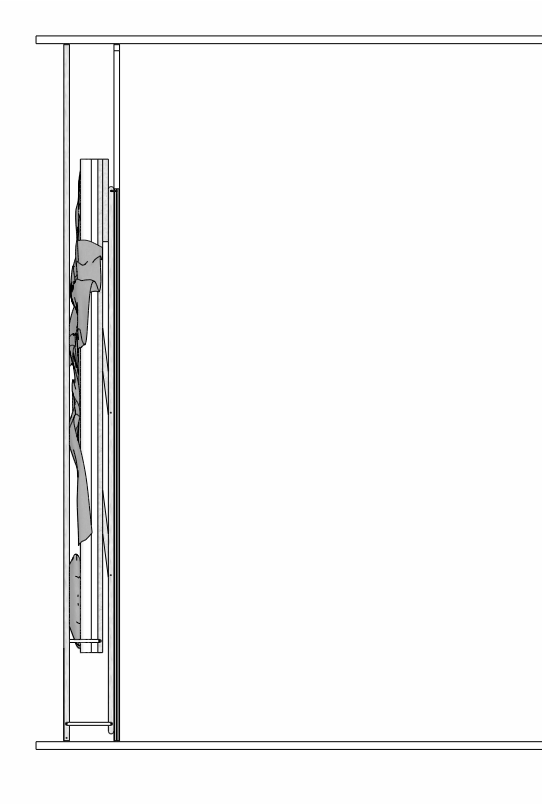
(Un)folding.

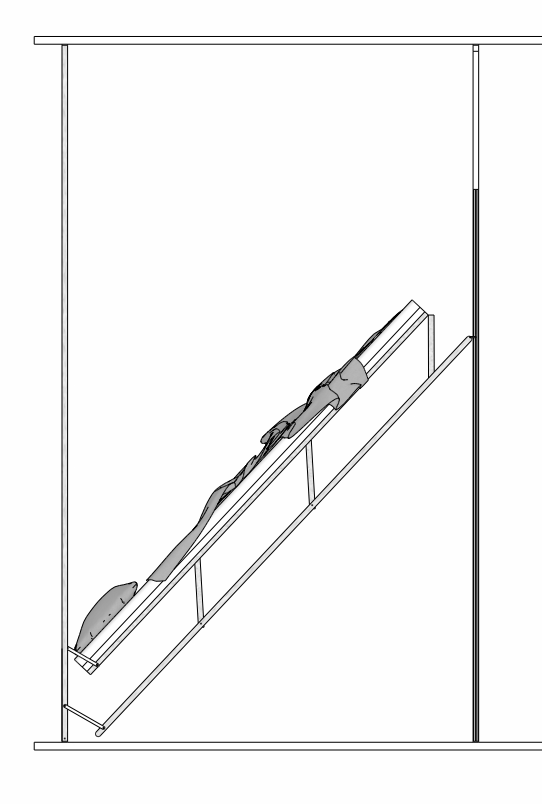


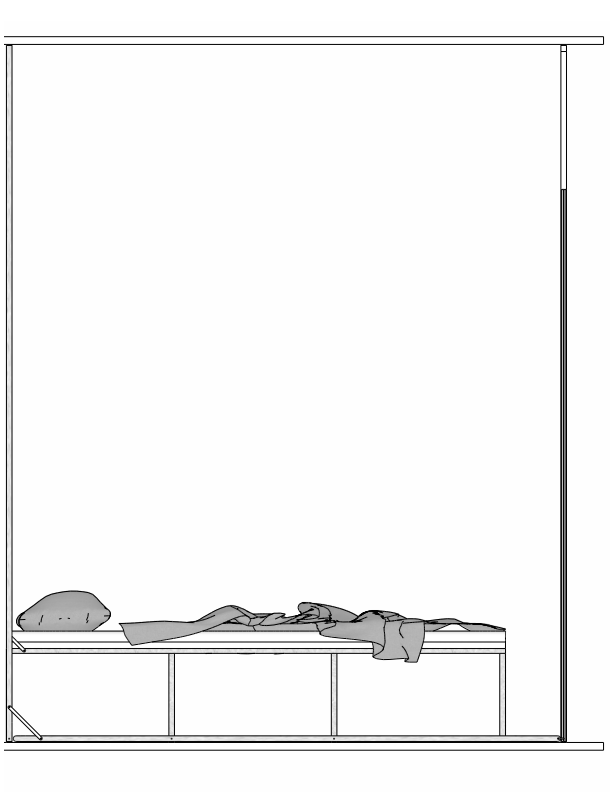




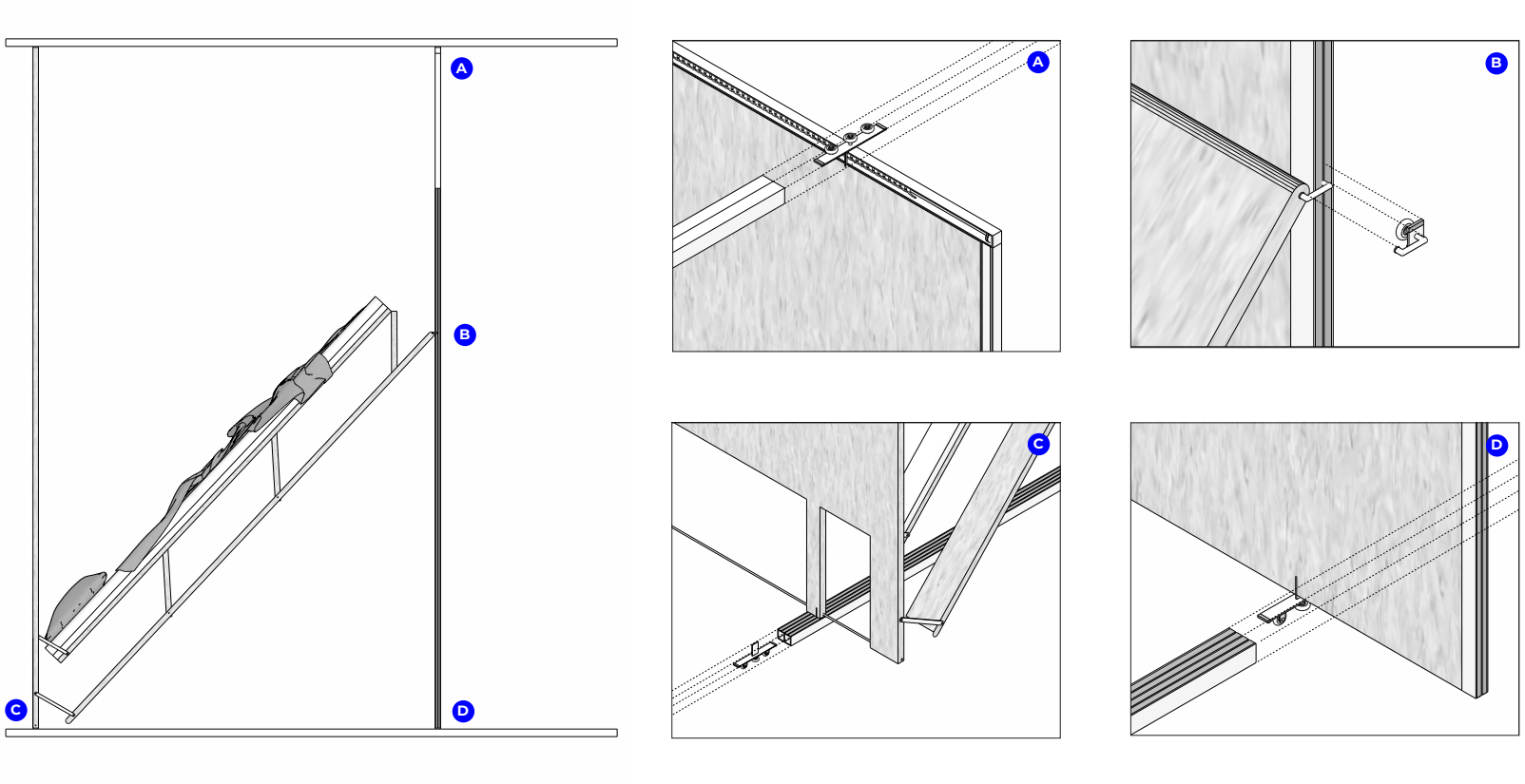
(Un)folding.



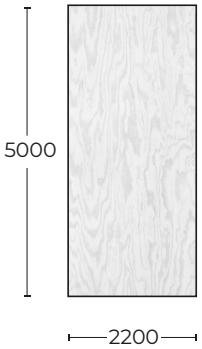


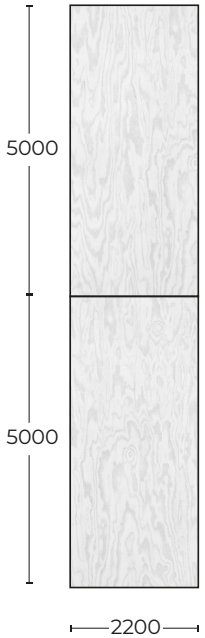


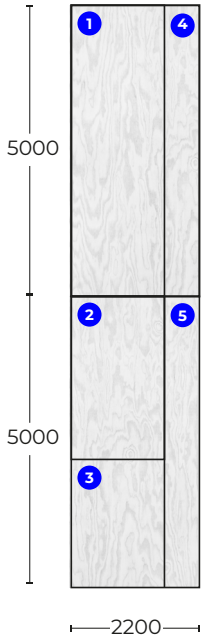
Rails & hinges.

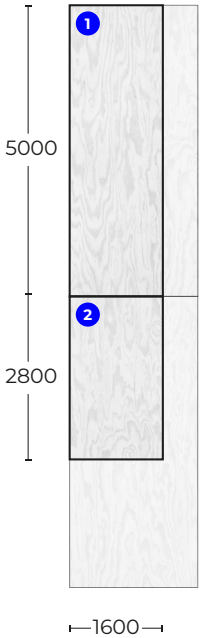


Material use.

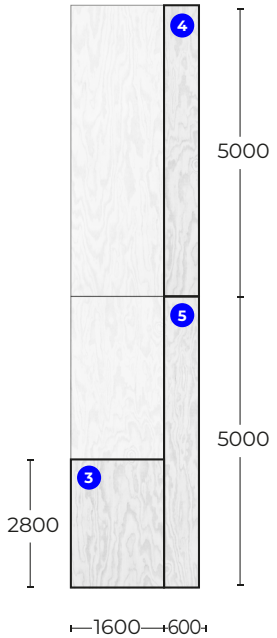






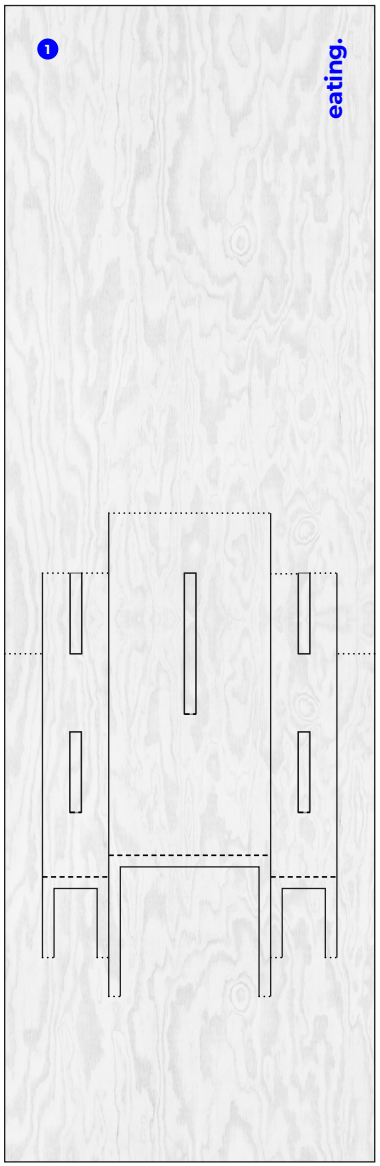


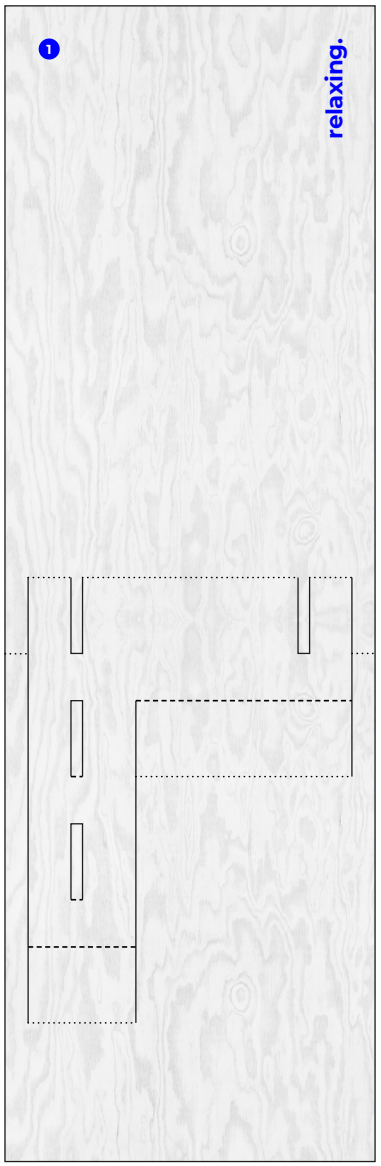
packages.

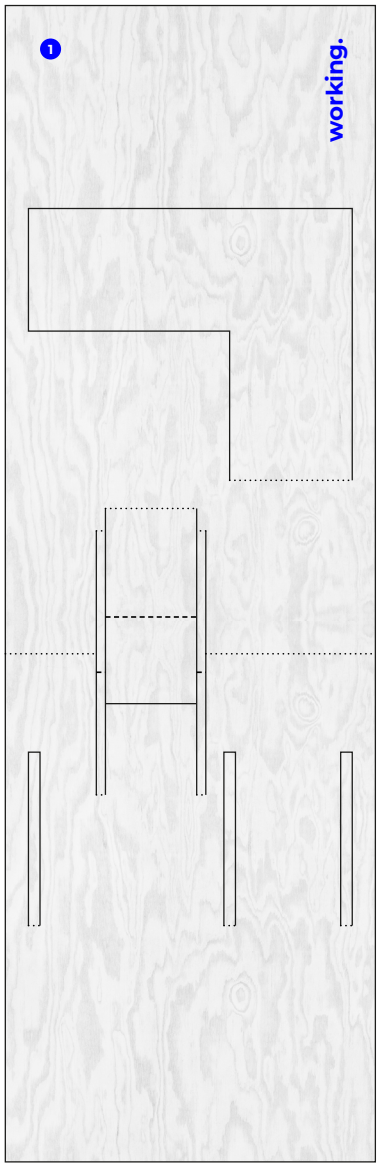


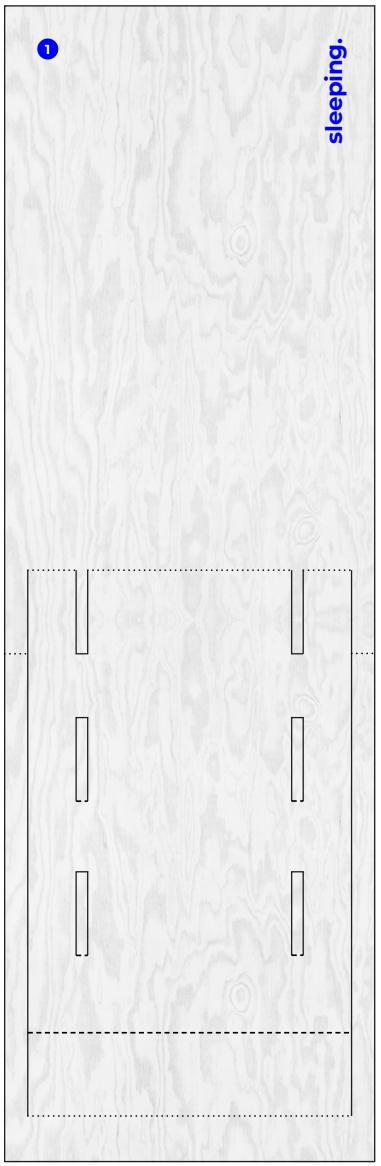
closet doors.

CNC templates.









Material.

Multiplex Okoumé

+ Speciaal voor gebruik buitenshuis en in vochtige ruimtes
+ Sterk en licht plaatmateriaal
+ Buigt niet door onder zware belasting
+ Werkt nauwelijks
-> 47,27 p/m2

Multiplex Meranti

- Splintert snel
- Uitsluitend geschikt voor binnentoepassing
- Afkomstig uit Azie
-> 18,07 p/m2

Multiplex Berken

+ Sterk plaatmateriaal
+ Hoge stootvastheid
+ Duurzaam materiaal
+ Egaal uiterlijk
- Minder geschikt voor gebruik buitenshuis
-> 46,37 p/m2

Multiplex Populier

+ Splintert nauwelijks
+ Gemakkelijk te bewerken
+ Lange levensduur
- Niet geschikt voor gebruik buitenshuis
-> 33,03 p/m2

Multiplex Hardhout

+ Gemakkelijk te bewerken
+ Lange levensduur
- Kans op kromtrekken is groot
- Minder goede zichtkwaliteit
- Kleur en dikte kan per plaat verschillen
-> 18,25 p/m2

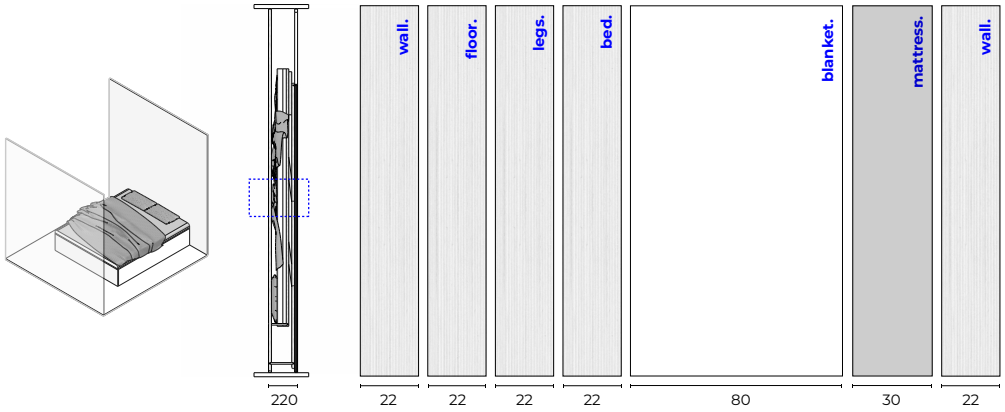
Multiplex Pools Grenen

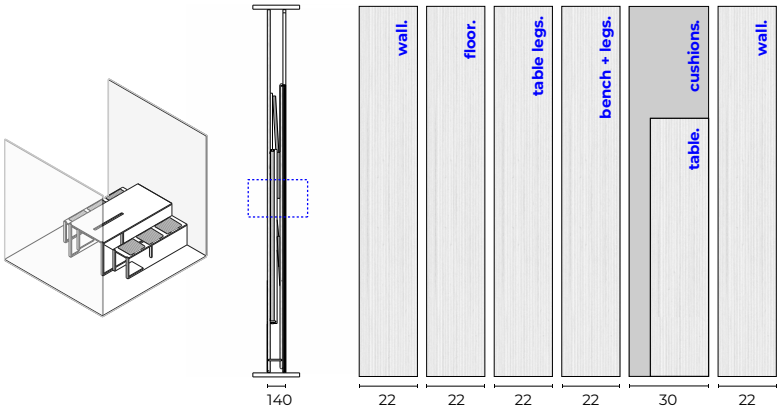
+ Sterk plaatmateriaal
+ Duidelijke en onregelmatige vlammen
+ Gemakkelijk te bewerken
- Alleen voor gebruik in droge ruimtes
-> 85,81 p/m2

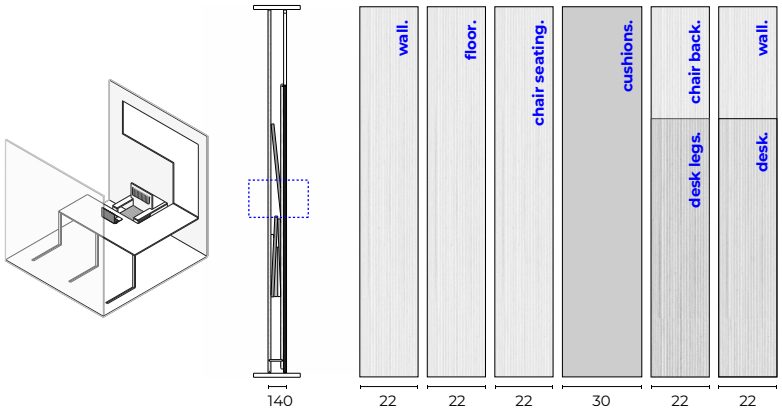
LinoPly

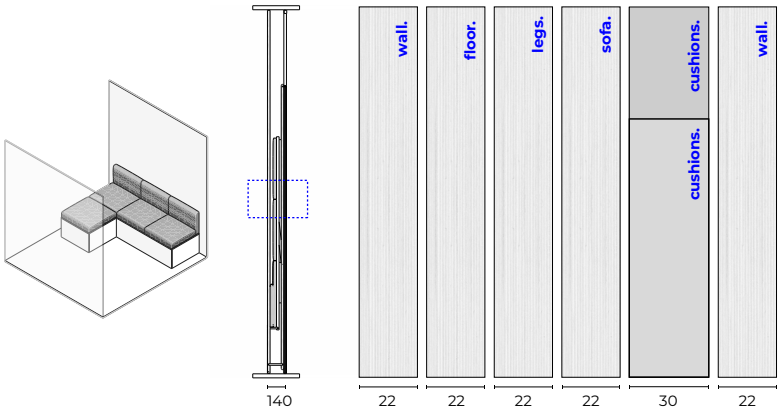
+ Vlakke stabiele plaat
+ Uitstekend te bewerken
+ Geschikt voor binnentoepassingen en voor vochtige ruimtes binnen.
+ Europees product
-> 23,07 p/m2

Thickness.


wall.
floor.
legs.
bed.
blanket.
mattress.
wall.
220
22
22
22
22
80
30
22


wall.
floor.
table legs.
bench + legs.
cushions.
table.
wall.
140
22
22
22
22
30
22


wall.
floor.
chair seating.
cushions.
chair back.
desk legs.
wall.
desk.
140
22
22
22
30
22
22


wall.
floor.
legs.
sofa.
cushions.
cushions.
wall.
140
22
22
22
22
30
22

Objects.

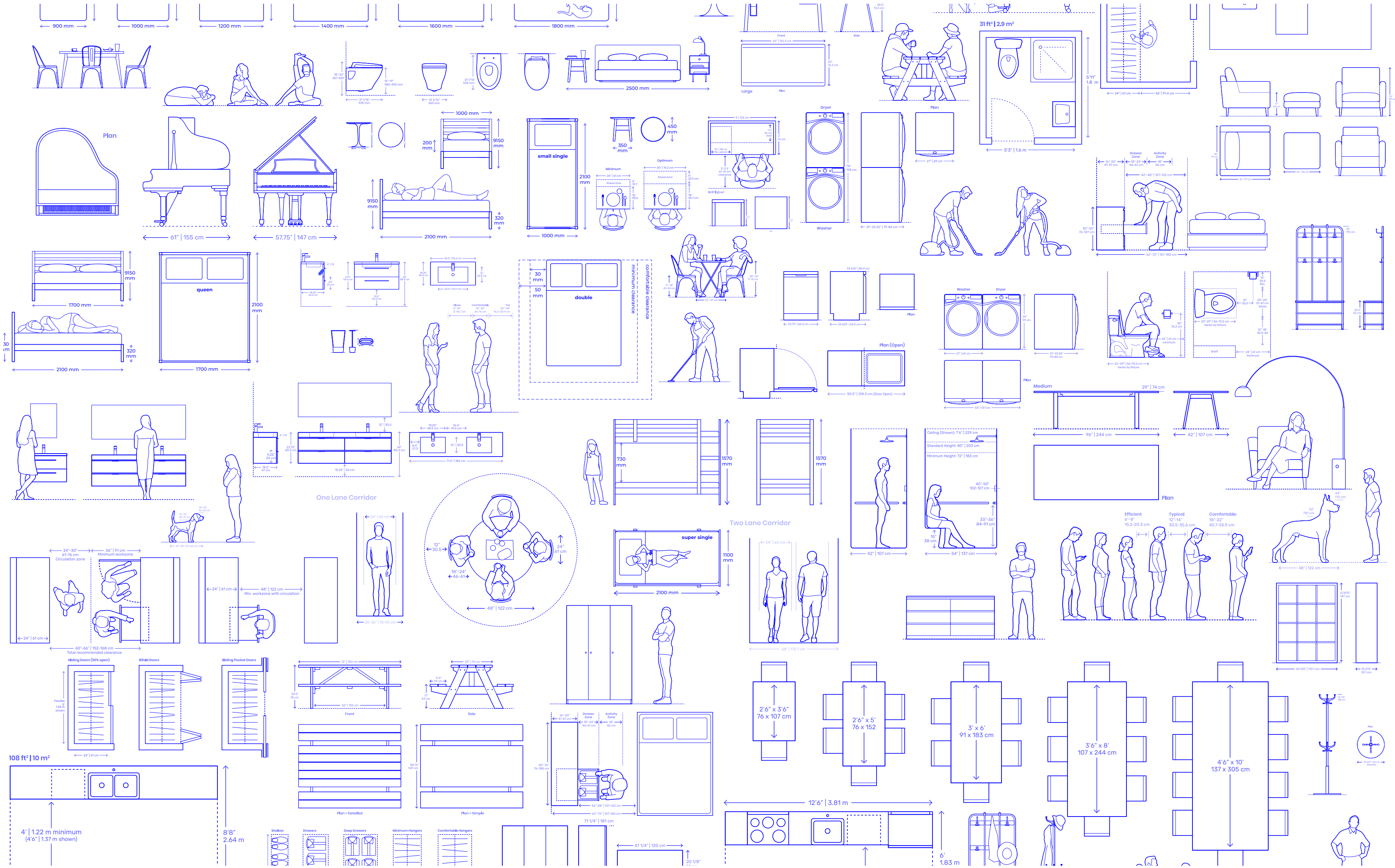
Personalisation.

Furniture.

Long term storage.

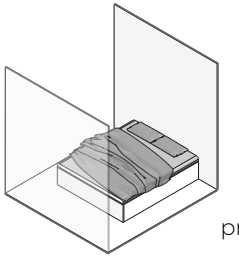
Short term storage.

Dimensions.

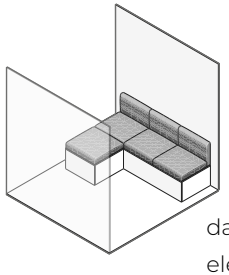


900 mm
1000 mm
1200 mm
1400 mm
1600 mm
1800 mm
2500 mm
31 ft² | 2.9 m²
Plan
1000 mm
200 mm
9150 mm
450 mm
350 mm
small single
2100 mm
1000 mm
61" | 155 cm
57.75" | 147 cm
2100 mm
320 mm
9150 mm
1700 mm
queen
2100 mm
1700 mm
30 mm
50 mm
double
comfortable clearance
minimum clearance
Plan (Open)
Medium
Plan
One Lane Corridor
730 mm
1570 mm
1570 mm
Two Lane Corridor
super single
1100 mm
2100 mm
108 ft² | 10 m²
2'6" x 3'6"
76 x 107 cm
2'6" x 5'
76 x 152
3' x 6'
91 x 183 cm
3'6" x 8'
107 x 244 cm
4'6" x 10'
137 x 305 cm
12'6" | 3.81 m
4' | 1.22 m minimum
(4'6" | 1.37 m shown)
8'8"
2.64 m
6'
1.83 m

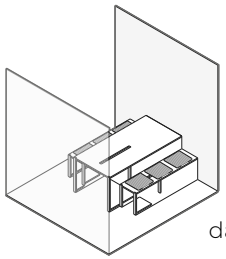
Performances.



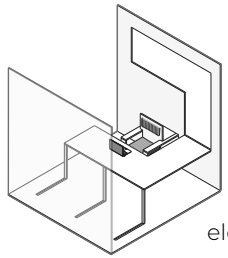
privacy
noise reduction



daylight
electricity

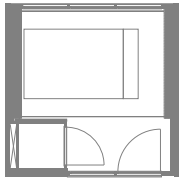


daylight

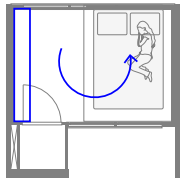


electricity
daylight

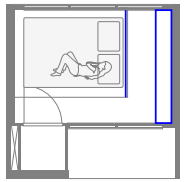
Layout.



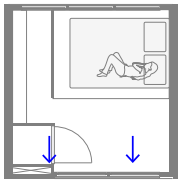
starting point



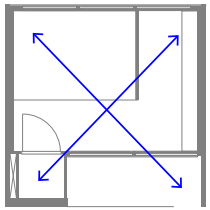
- less daylight
+ storage space



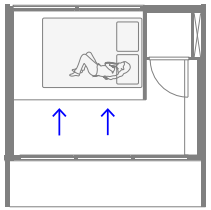
+ partition wall with
storage space
- accessibility door



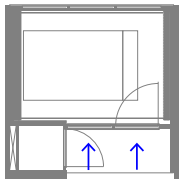
- no balcony
+ more interior space



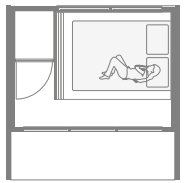
4 x4 instead of 3,5 x 3,5
+ more space
- bigger floor area



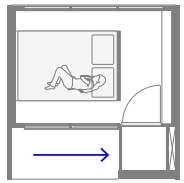
+ too much space?



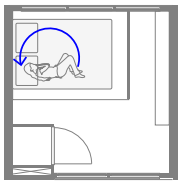
- shower only
accessible from outside



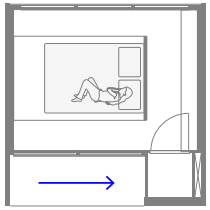
+ larger balcony
- no storage space



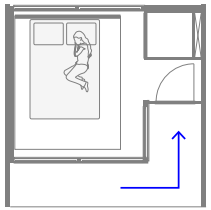
+ toilet accessible
+ space for
personalisation



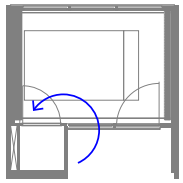
mirror bed



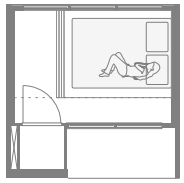
+ interesting space



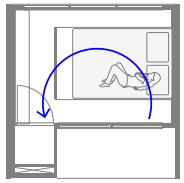
+ big balcony
- less daylight



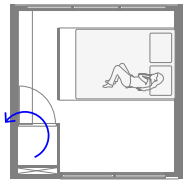
- accessibility hindered
by furniture



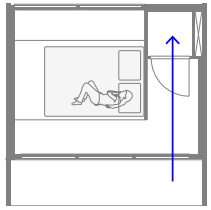
multiple zones/
functions



mirror

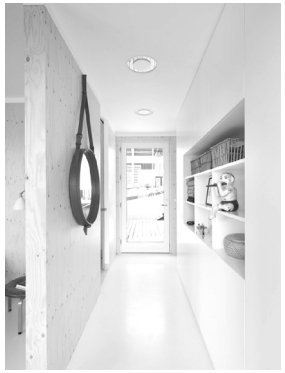


rotate toilet



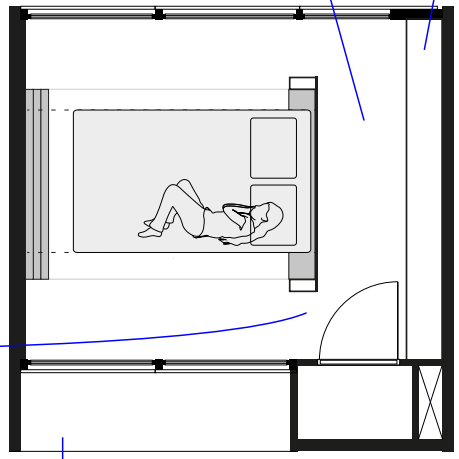
+ bigger balcony
- less storage space
- less daylight

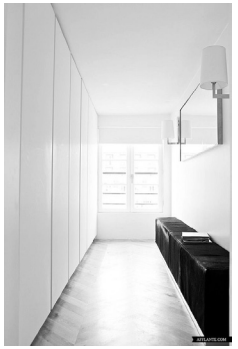
References.



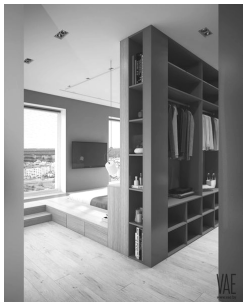
Storage

Hallway



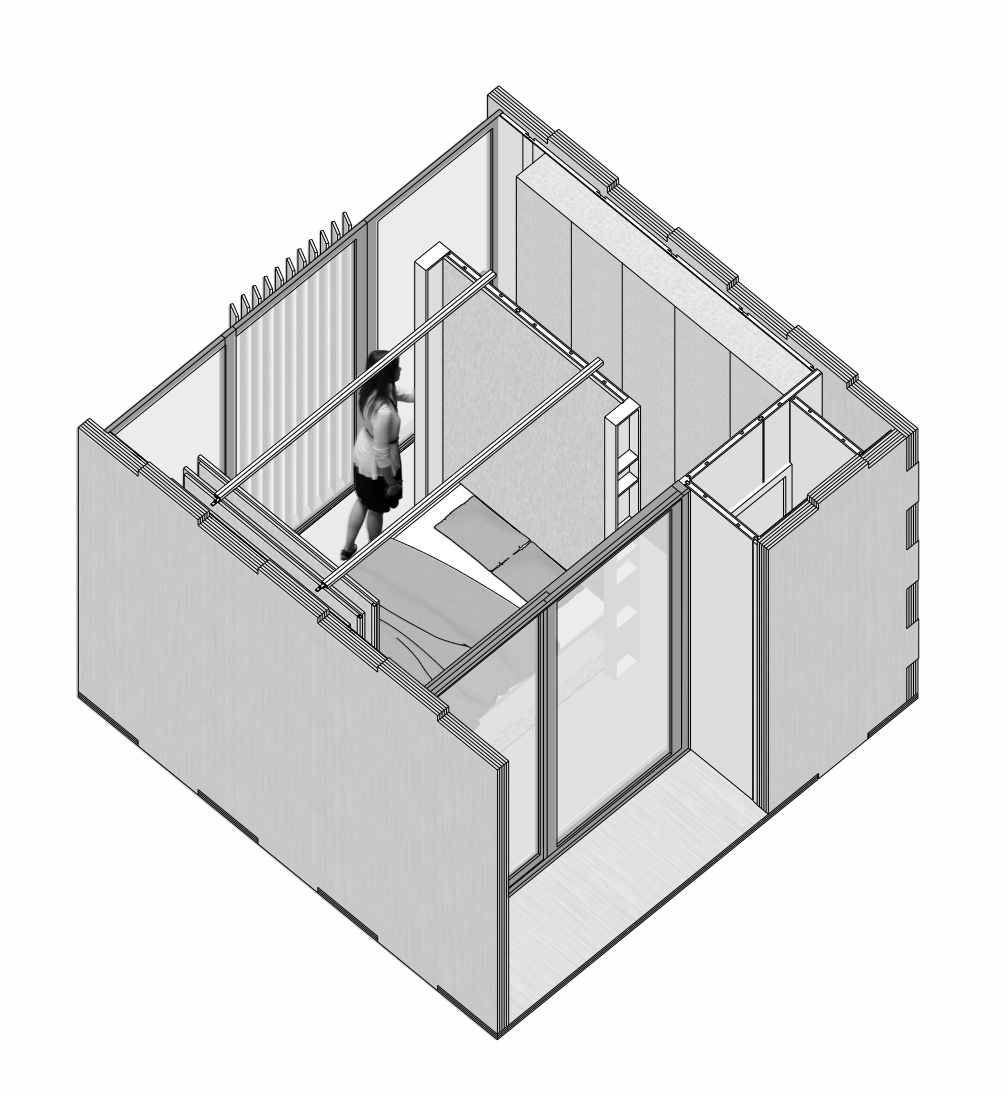


Wall

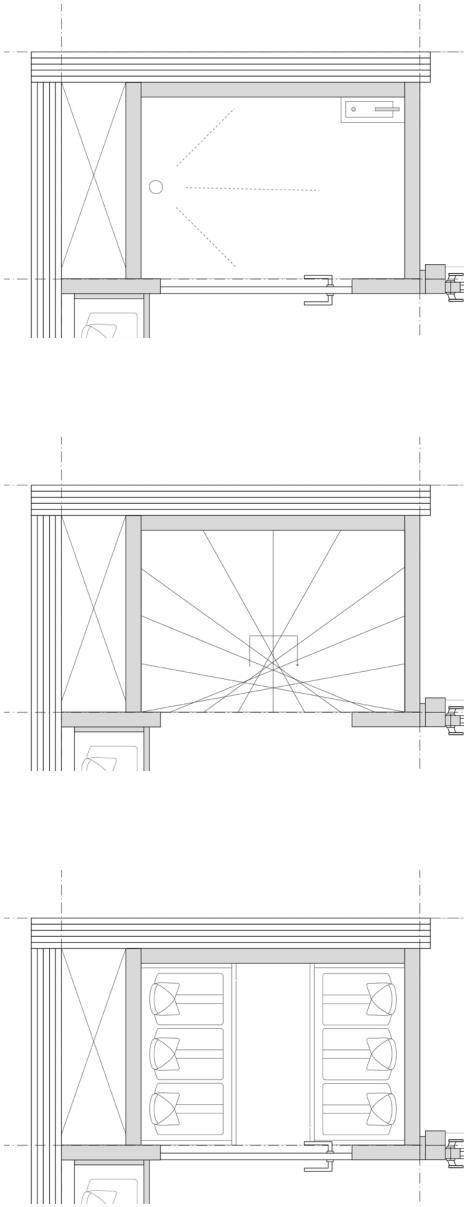


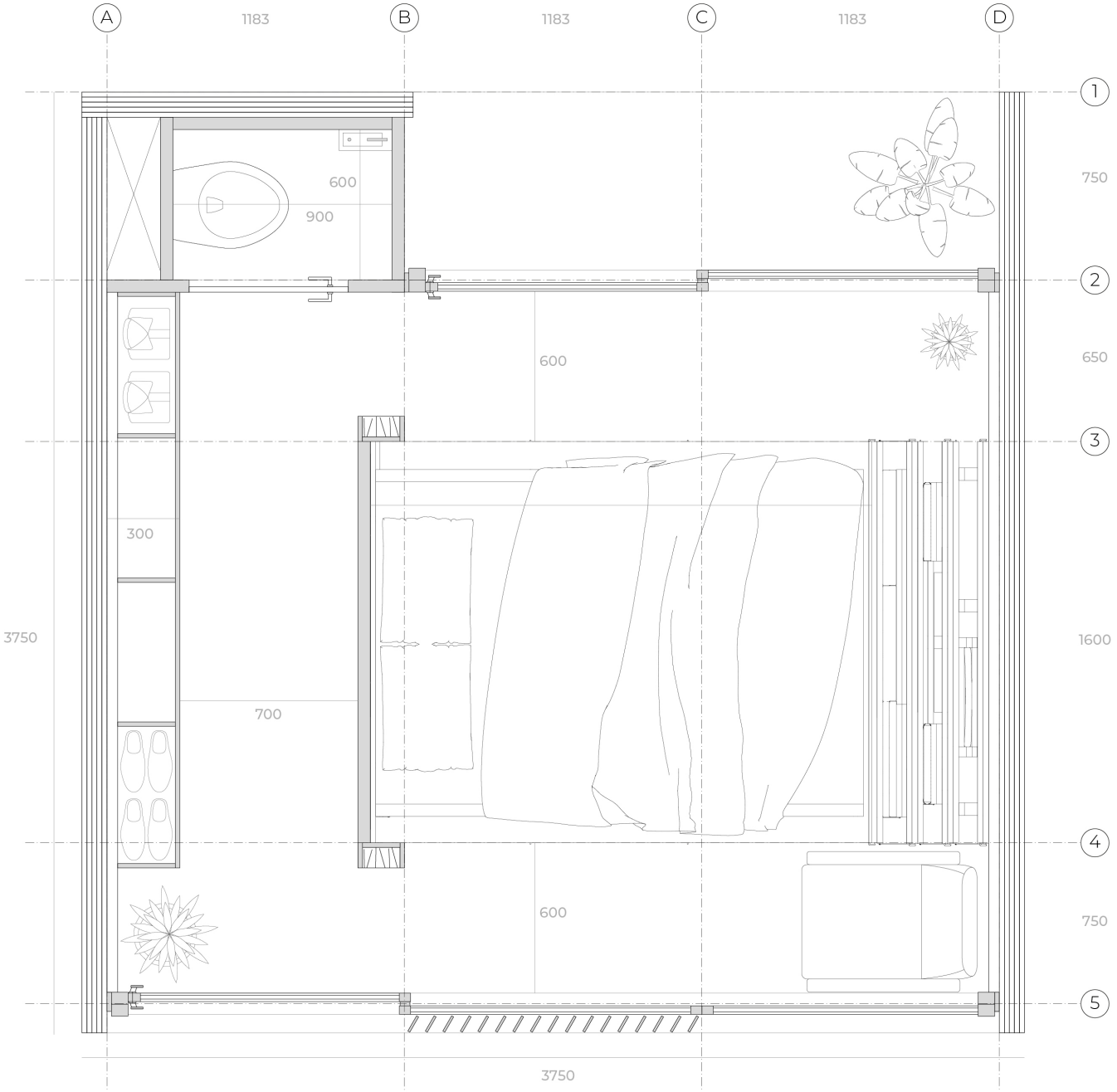
Balcony

Dwelling.

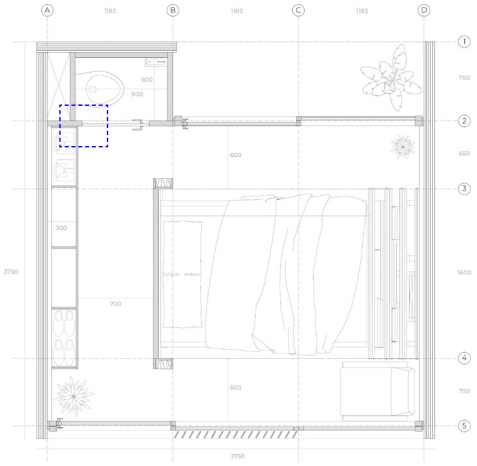


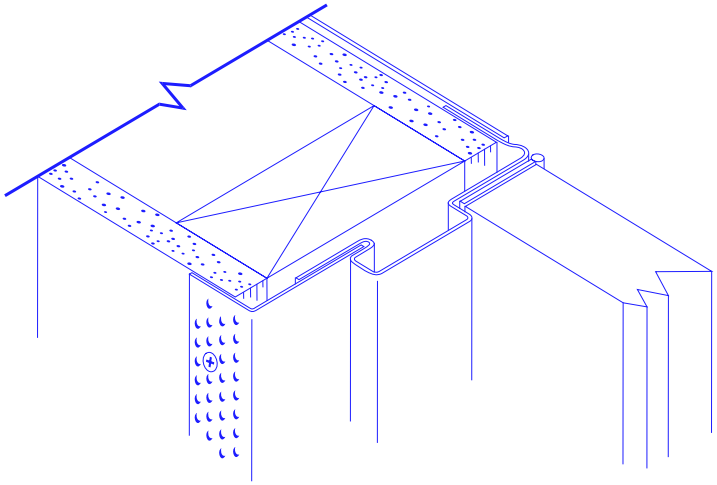
Floor plan.

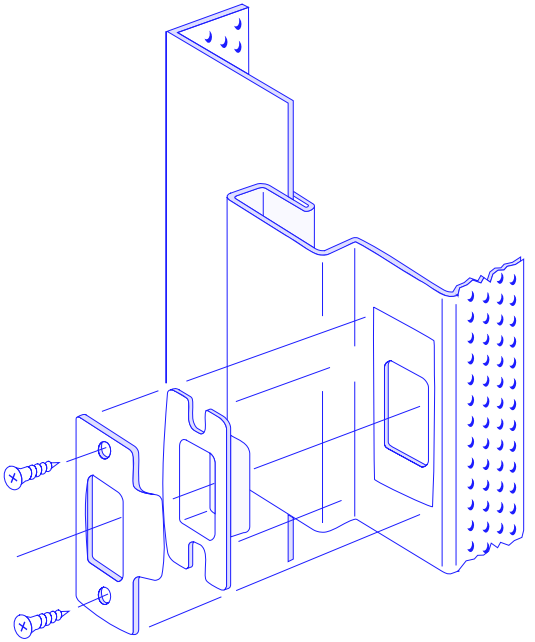



A
B
C
D
1183
1183
1183
1
2
3
4
5
750
650
1600
750
3750
600
900
600
300
700
600
3750

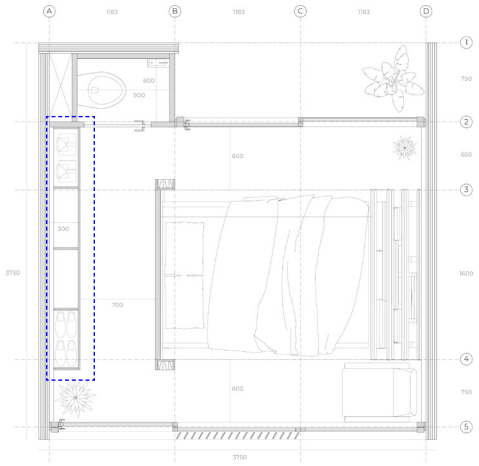
Conceiled door frame.

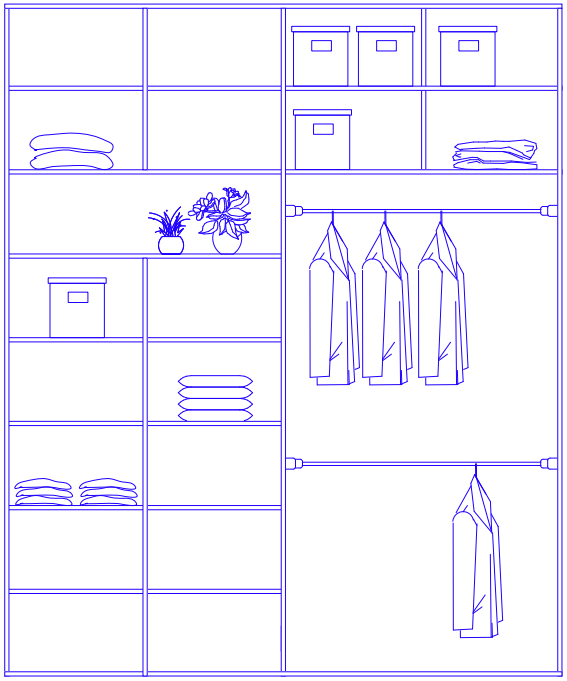


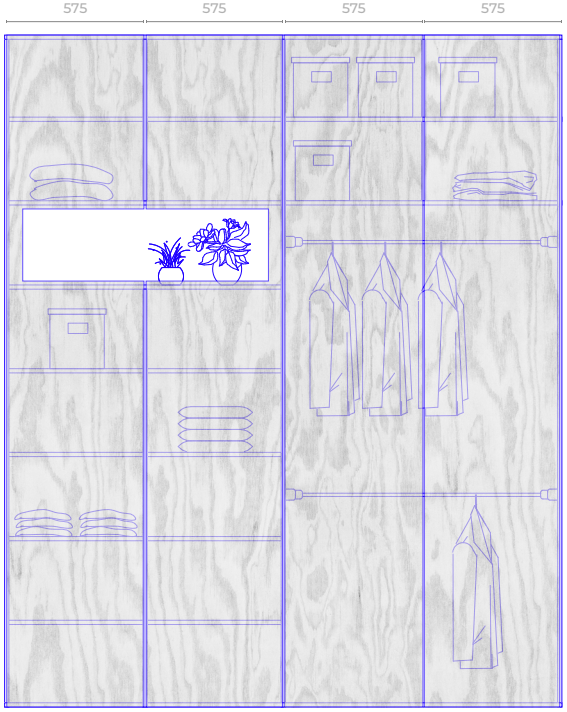




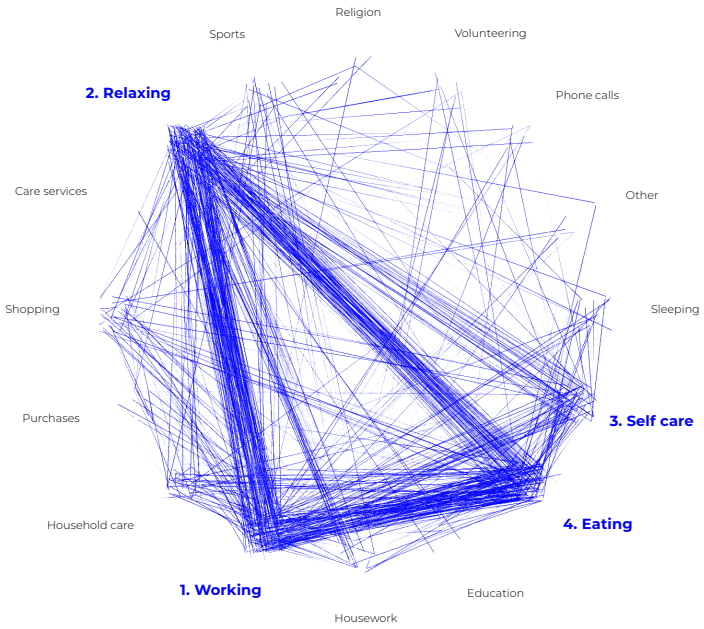
Use of ‘waste’ material.

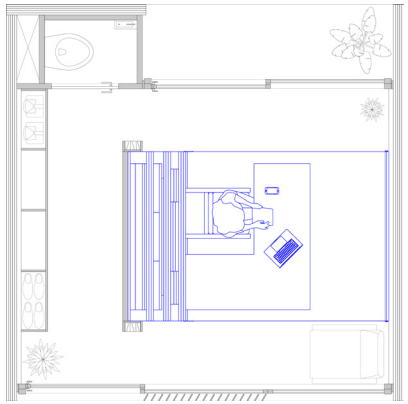




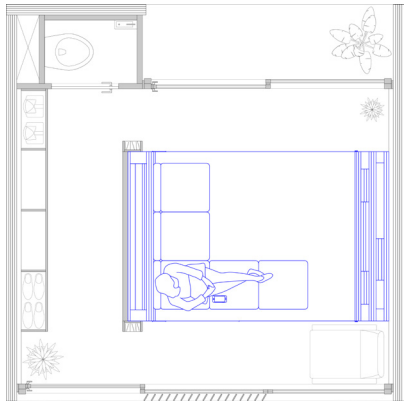


Activity 6-8pm.

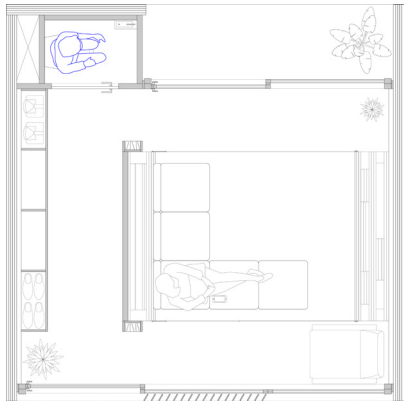




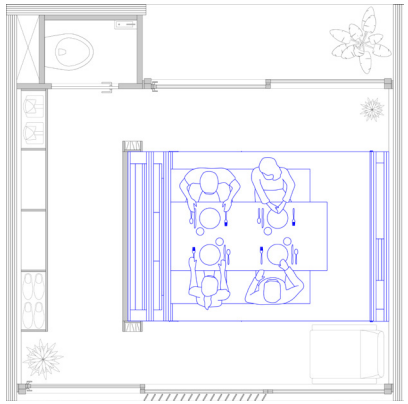
1. Working



2. Relaxing

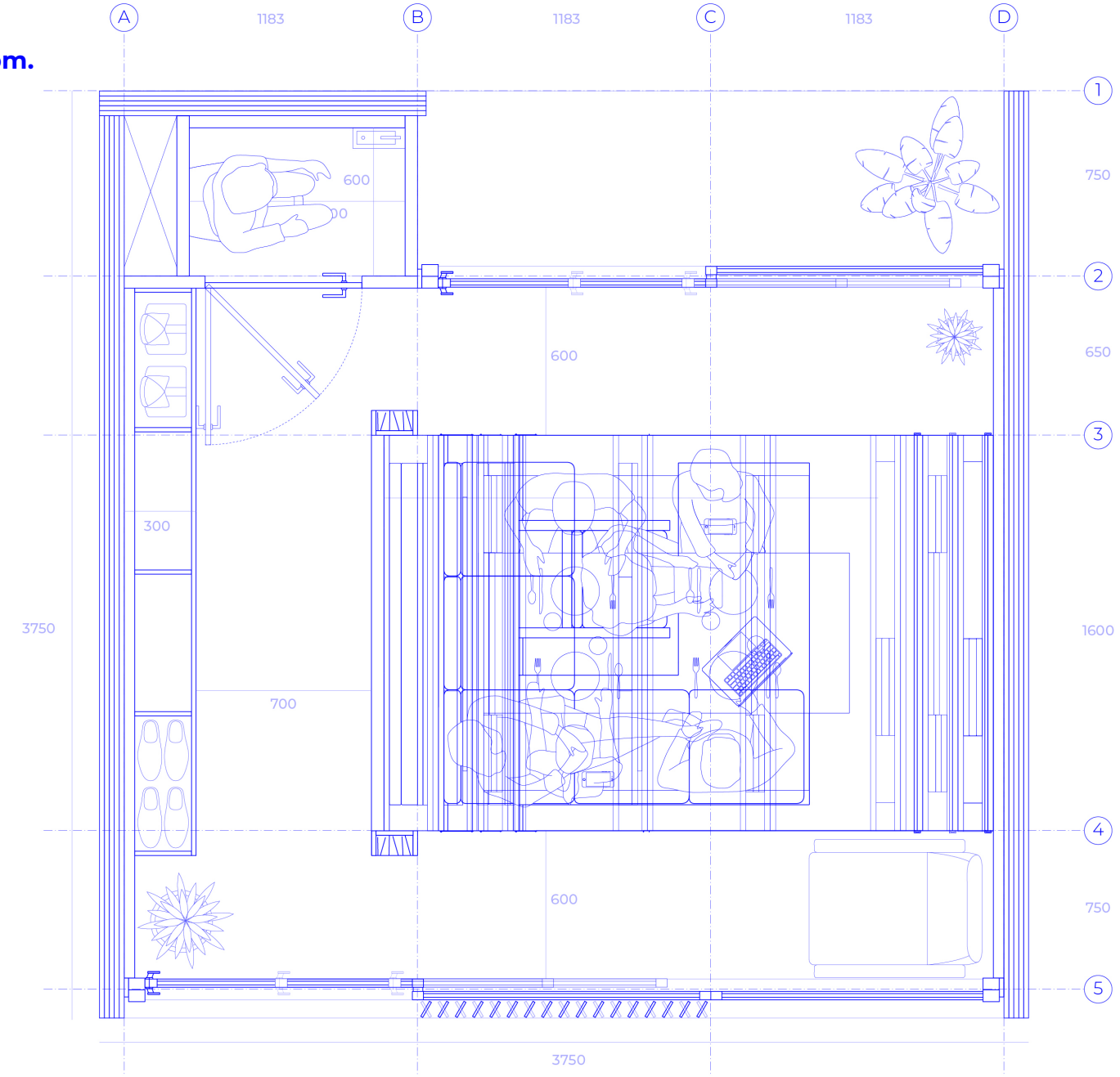


3. Self care

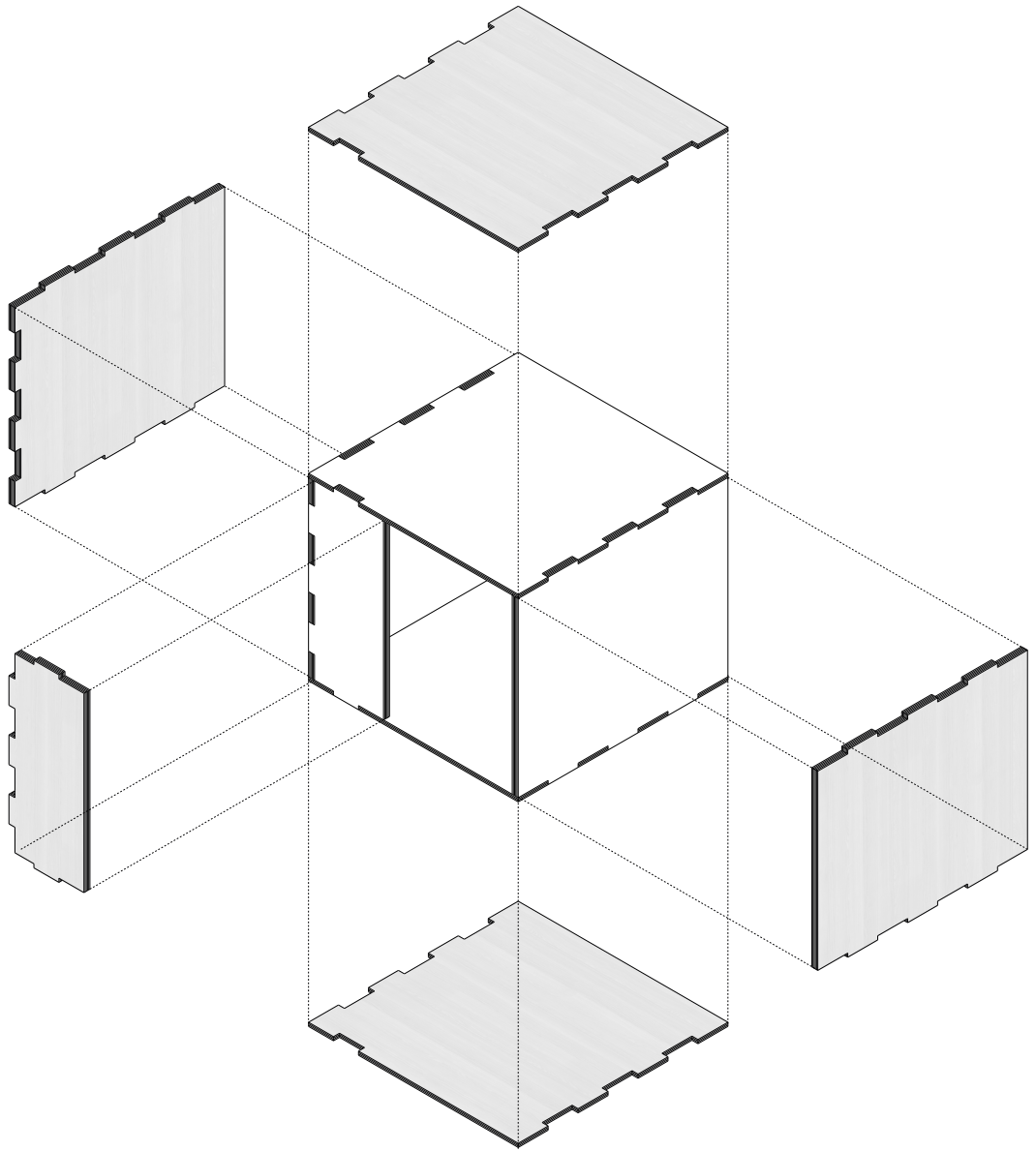


4. Eating

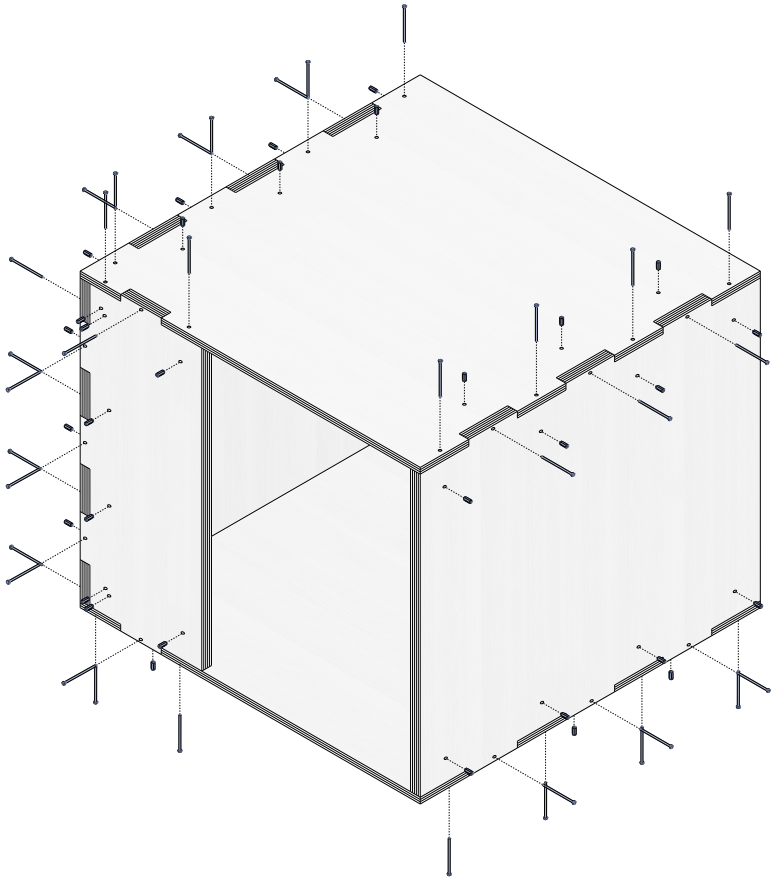
Floor plan 6-8pm.



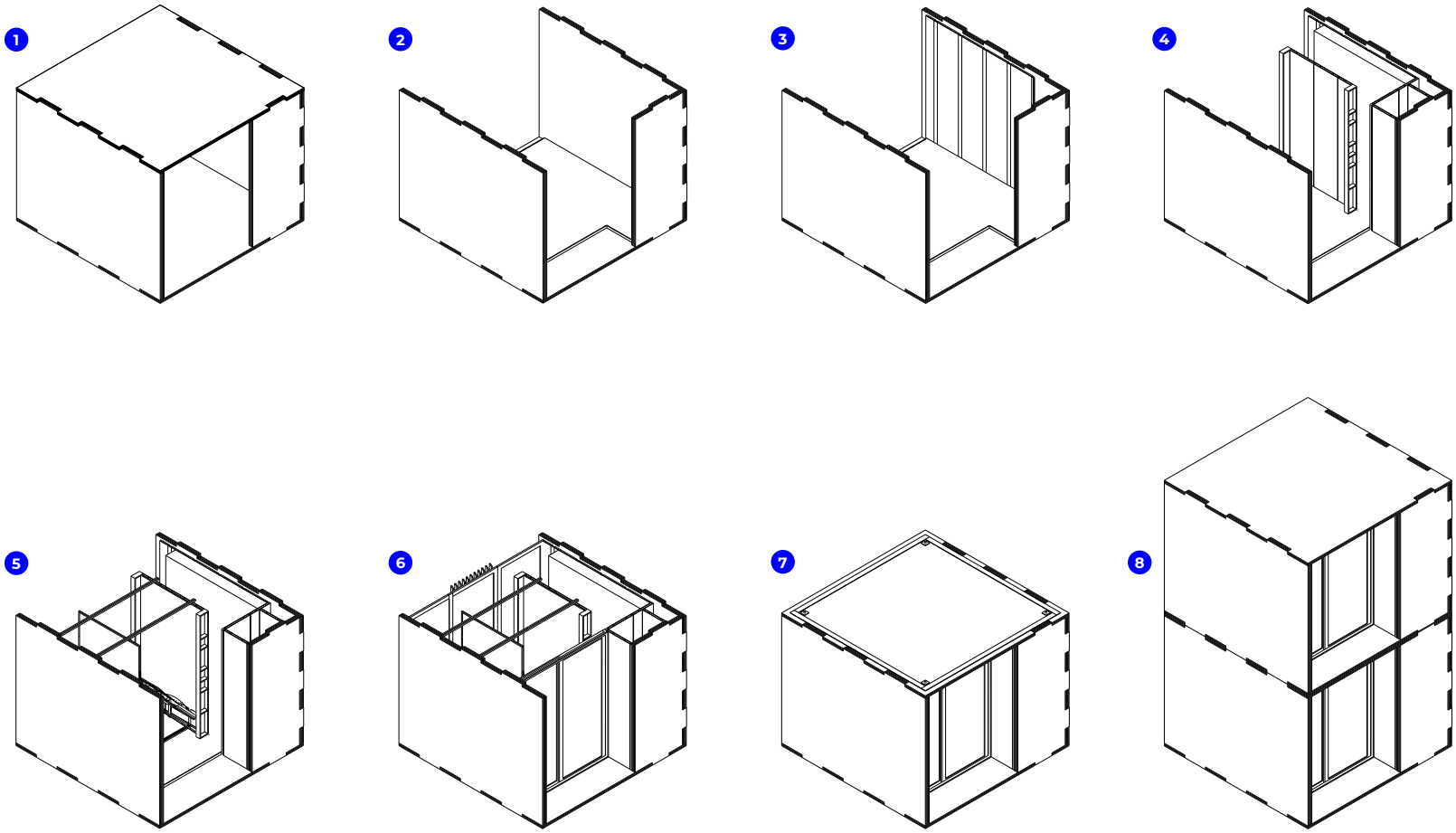
CLT.



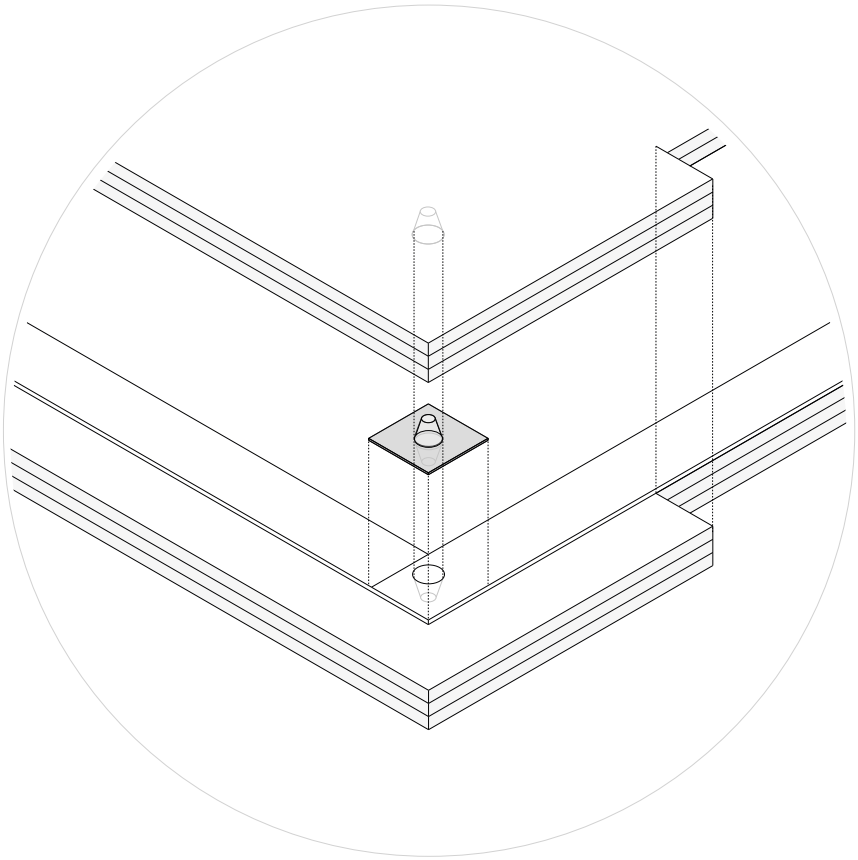
Bolts & cross nuts.



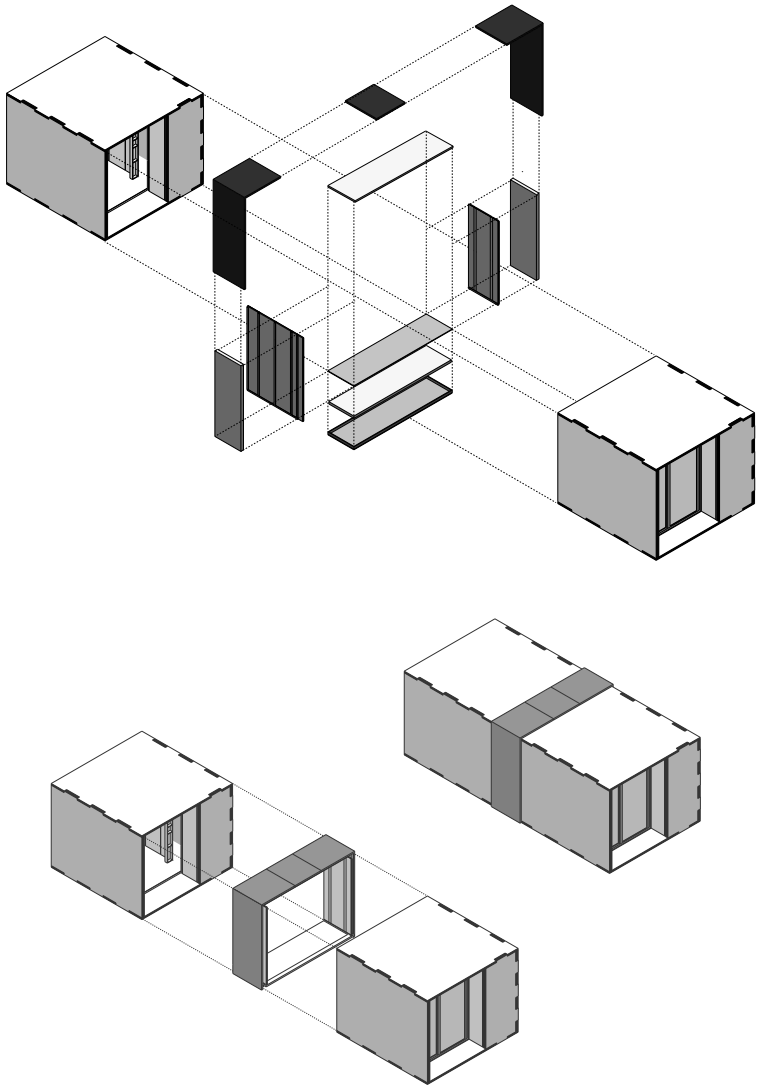
Assembly.



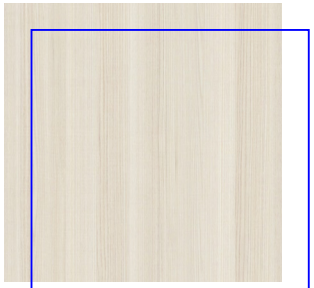
Vertical connector.

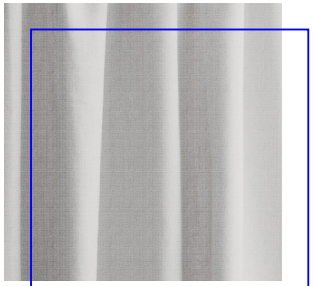


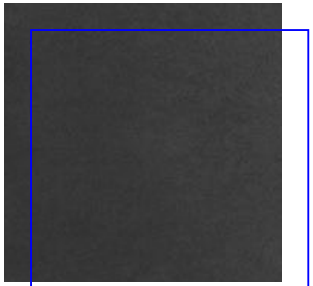
Horizontal connector.

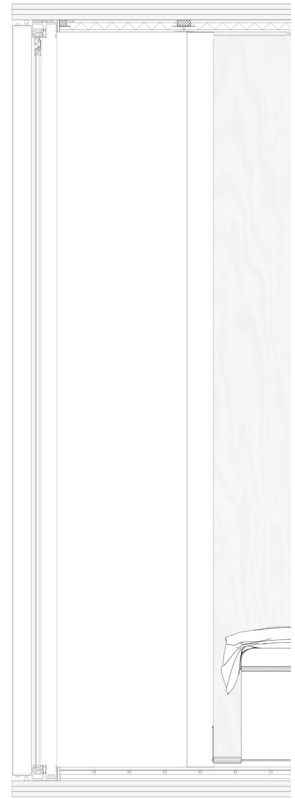


Facade.

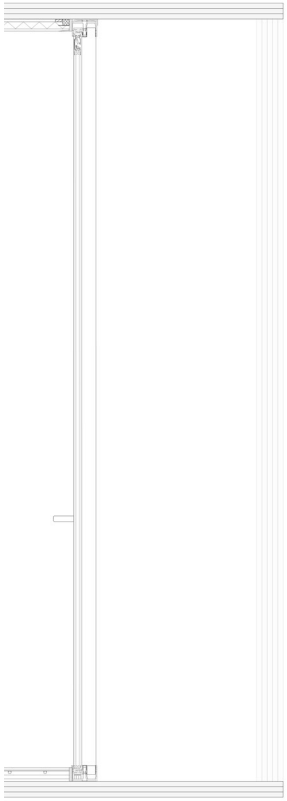


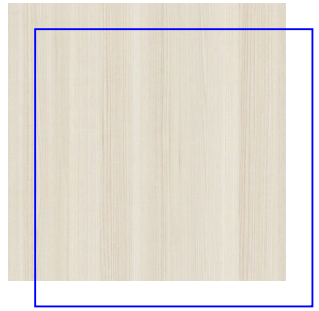


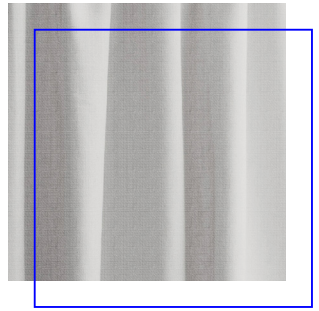


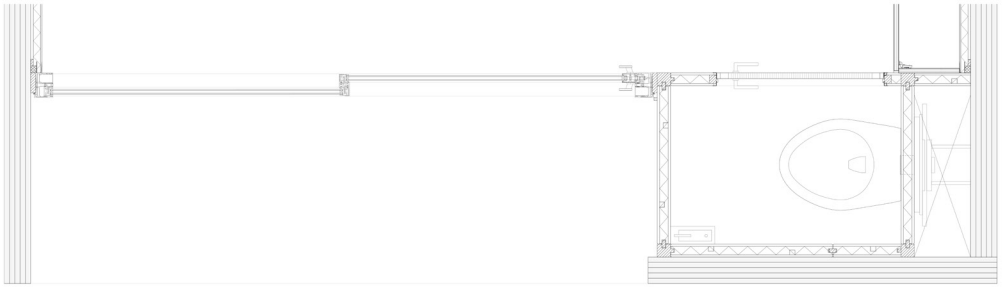


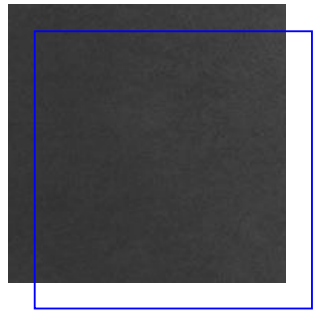
Facade.



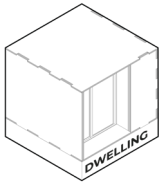


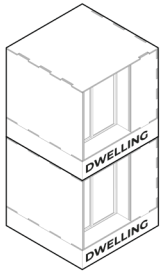


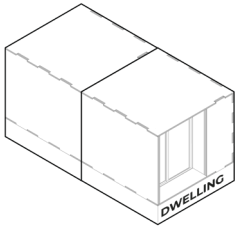


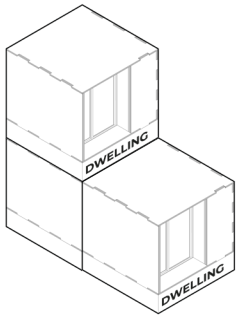


Conclusion dwelling.



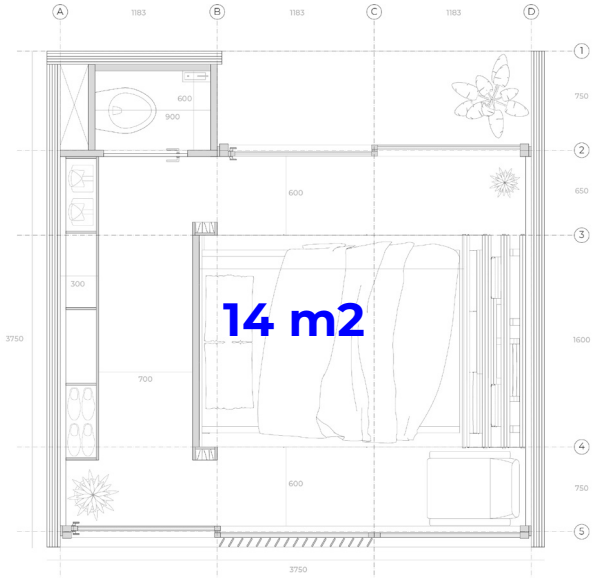






(1-2p) 14 m2

-> 100 x 1 element



Toolkit.

I. dwellings **II. shared facilities** III. self-sufficiency IV. building

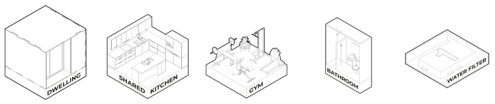
What to share.

own image, data based on One Shared House

Timeline.

08.00 10.00 11.00 14.00 15.00 18.00 20.00 21.00 00.00

At 7 he gets up, goes to the toilet and brushes his teeth, makes coffee in the shared kitchen and then changes the house to an empty room so he can meditate. At 9 he takes a sports class in the shared gym, then he takes a shower and gets changed.

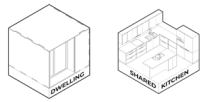


08.00 10.00 11.00 14.00 15.00 18.00 20.00 21.00 00.00

At 10 he makes breakfast in the shared kitchen, and because he doesn't feel like having social contact in the morning he transforms his house into the eating mode. After breakfast he reads an e-book and decides to vacuum his house.

08.00 10.00 11.00 14.00 15.00 18.00 20.00 21.00 00.00

The working day starts at 11. In the morning he wants to be fully focused, so he transforms his house into an office. During the break, he makes coffee in the shared kitchen and sits down in the shared living room for some social interaction.

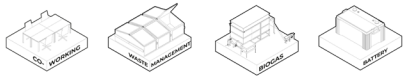


08.00 10.00 11.00 14.00 15.00 18.00 20.00 21.00 00.00

At 2 it is time for a break. He cooks lunch in the kitchen and eats in the shared livingroom to clear his head and to take a break from his screen.

08.00 10.00 11.00 14.00 15.00 18.00 20.00 21.00 00.00

After lunch he has trouble focusing on work, he decides to move to the co-working spaces. Working close to others motivates him. He charges his laptop with bio energy.



08.00 10.00 11.00 14.00 15.00 18.00 20.00 21.00 00.00

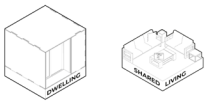
The working day ends at 6. He uses an e-bike to explore the neighbourhood as he just moved to Amsterdam. Afterwards he does some essential tasks, like going to the store and doing laundry. Later he relaxes on his couch at home.

08.00 10.00 11.00 14.00 15.00 18.00 20.00 21.00 00.00

At 8 it is time for dinner. He loves to cook and decides to cook for his neighbours. Most of the ingredients are grown in the aquaponics or are locally produced.

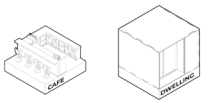
08.00 10.00 11.00 14.00 15.00 18.00 20.00 21.00 00.00

At 9 it is time to relax. He plays a game in the shared living room and decides to watch a movie in his house.

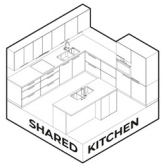


08.00 10.00 11.00 14.00 15.00 18.00 20.00 21.00 00.00

He drinks a locally brewed beer in the cafe and at 12 transforms his house into a bedroom and goes to bed.

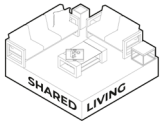


Conclusion shared facilities.



(25p) 4 x 12 m2

-> 4 x 1 element

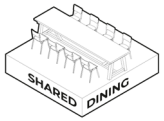


(25p) 4 x 56 m2

-> 4 x 4 elements

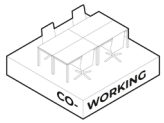
(5p) 20 x 3 m2

-> 4 x 5 element



(25p) 4 x 28 m2

-> 4 x 2 elements

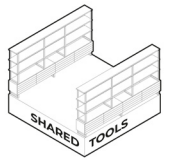


(25p) 4 x 25 m2

-> 4 x 2 elements

12 m2

-> 1 element

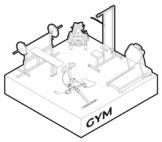


10 m2

-> 1 element

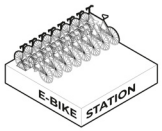
25 m2

-> 2 elements



25 m2

-> 2 elements

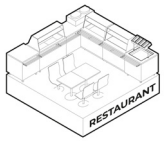


22 m2

-> 2 elements

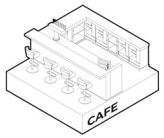
14 m2

-> 1 element



26 m2

-> 2 elements



16 m2

-> 1 element

12 m2

-> 1 element

-> 20 x element 3m2 & 47 x element 14m2

Calculations shared facilities.

Shared facilities
Kitchen
Livingroom
Bathroom
Diningroom
Laundry
Tools
Convenience store
Sensory garden
Gym
Co working
E-bike station
Health clinic

source https://www.corby.gov.uk/sites/default/files/Shared%20House%20Housing%20Standards_1.pdf

KITCHEN
Used by 1-5 persons 7 sqm.
For more than 5 persons an additional 2.5 sqm per person using kitchen.
100/4= 25 users/kitchen **-> 14 sqm**

Dining
Used by 1-5 persons 11.5 sqm.
Used by 6-8 persons 14.5sqm.
Used by 9 – 10 persons 16.5sqm -> **41,25 sqm**

Living
Used by 1-5 persons 11.5 sqm. Used by 6 – 8 person 14.5sqm. Used by 9 – 10 persons 16.5sqm. **-> 41,25 sqm**

Bathroom

toilet+ shower
1-5 users 1 x bath/shower with hot & cold water supply 1 x WC & WHB for each 4 occupants
6-10 users 6-8 occupants - 2 x bath/shower with hot & cold water supply 2 x WC & WHB with hot and cold water.
9 – 10 occupants - 3 x bath/shower with hot & cold water supply 3 x WC & WHB with hot and cold water.

Ideally the WC & WHB should be separate from the bath/shower room where possible.

seperate In addition to the above add 1 x WC & WHB with hot and cold water for 5 occupants.

wash hand basin For Licensable HMO's 1 wash hand basin to be provided within each letting

conclusion

1 T&S per 5 users	toilet size	100 * 80 = 0,8 m2	5*0,8= 4 m2	total 8m2
25/5= 5	shower size	100*80 = 0,8 m2	5* 0,8= 4 m2	

Laundry https://www.hier.nu/themas/snel-en-makkelijk/zo-vaak-doen-nederlanders-gemiddeld-was

gem 2.9 keer per week de was. Was duurt gemiddeld 2 uur.
van 8 ttot 10 wassen draaien -> 14 uur actief
14/2 = 7 beurten per dag
7*7= 49 beurten per machine
49/2,9= 16,9 gebruikers per machine
100/16,9= 5,91 wasmachines
100 gebruikers -> 6 wasmachines
gelijk aantal drogers: 6

12 machines -> 3,5 x 3,5 minimaal

Tools

vacuum cleaner, broom, drill, zaag, gereedschapskist, dweil etc

https://www.brianbohlke.com/single-post/2018/11/27/The-Amazon-Effect-Amazon-Go-Stores-and-The-Future-of-Retail
Convenience store https://www.theverge.com/2018/12/12/18138353/amazon-go-store-small-format-seattle-launch
reference: amazon go stores (300 square feet)
-> 20 tot 30 m2

Gym https://www.precor.com/en-us/resources/hospitality-operators-how-big-should-your-fitness-room-be
vuistregel: 20% goes to gym
100*0,2= 20 mensen
average gym user works out 3 times a week -> 20*3= 60 workouts per week
60/7= 8,57 workouts per day
6 effectieve uren om gym te gebruiken (6-8, 11-1, 5-7) 8,57/6= 1,43 users per hour
conclusie: 1 apparaat per soort is genoeg .

apparaten https://fitness-eq.com/how-much-floor-space-is-needed-for-a-home-gym/
24 m2 https://nl.pinterest.com/pin/241365479728561O5/ interior
https://nl.pinterest.com/pin/549228117059382200/ interior

Co working https://www.entrepreneur.com/article/347781

stel 100% moet een plekje kunnen hebben
100*100= 100 mensen
per community -> 25 mensen per groep

tafel 8 mensen: 250 x 90 cm
-> dit 3x voor 25 gebruikers

tafel ruimte totaal: 270 breed
totaal: 3*(2,5*2,7)= 20 sqm

E-bike station
3 inhabitants per bike -> 100/3 = 33 bikes minimum
0,35 m tussen fiesten in breedte storage
1,85 m in lengte (incl fiets) https://www.fietsenrekkenhandel.nl/fietsenrek-super-4-fietsen.html

33*0,35= 11,6 meter aan opslag
dubbellaags -> 5,8 meter aan opslag

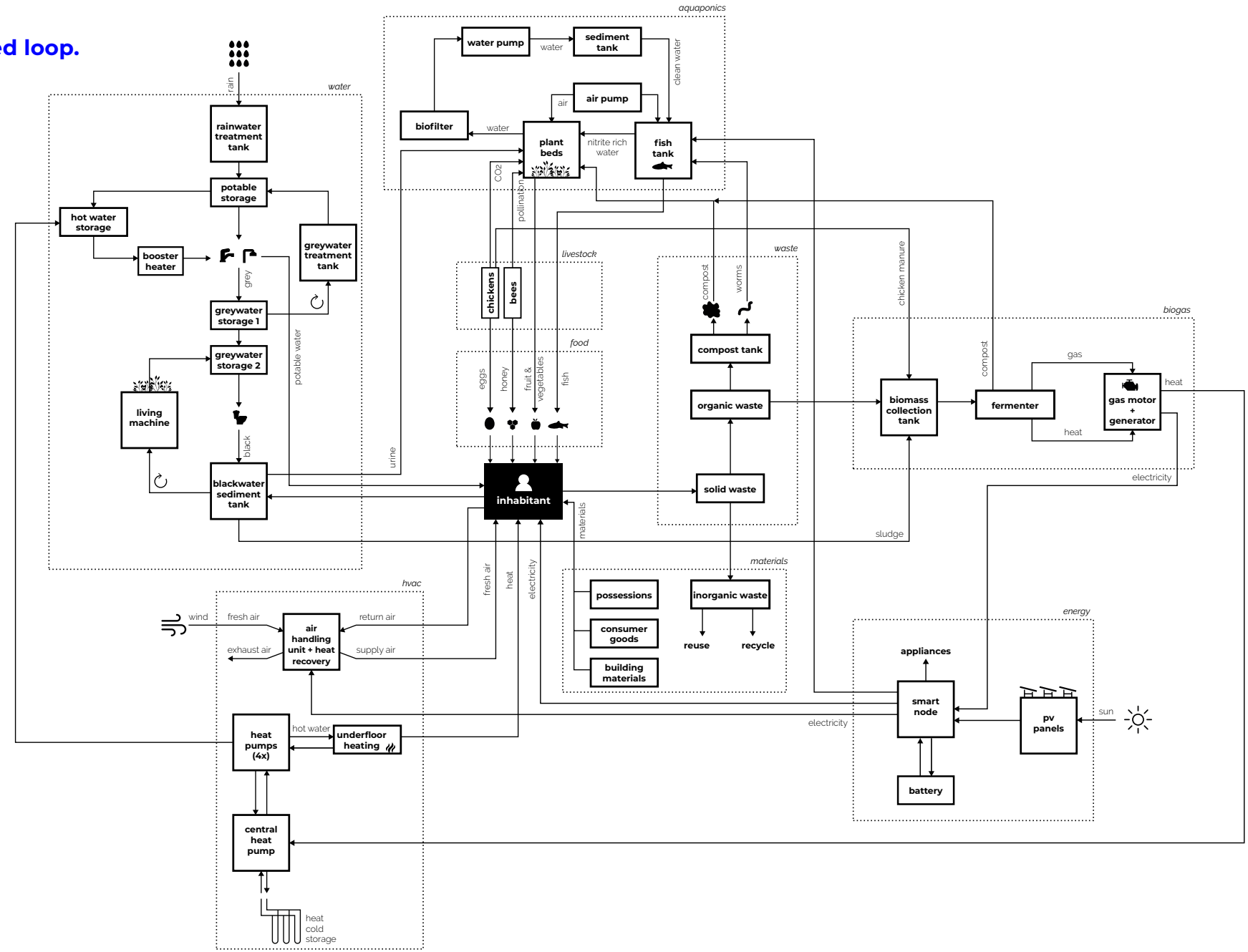
totaal 1,85*2 (ook looppad)*5,8= 21,46 m2

Health clinic https://www.lhv.nl/uw-beroep/over-de-huisarts/kerncijfers-huisartsenzorg?temp-no-mobile=1
norm: 2095 gebruikers per huisarts
1 arts is voldoende
https://www.lhv.nl/actueel/tijdschriften/artikel/hoe-ziet-uw-ideale-spreekkamer-eruit
spreekkamer ong 14 m2

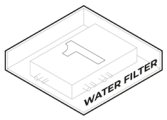
Toolkit.

I. dwellings II. shared facilities **III. self-sufficiency** IV. building

Closed loop.


aquaponics
water pump
water
sediment tank
clean water
air pump
air
biofilter
water
plant beds
nitrite rich water
fish tank
CO2
pollination
rain
water
rainwater treatment tank
potable storage
hot water storage
booster heater
greywater treatment tank
grey
greywater storage 1
greywater storage 2
potable water
living machine
black
blackwater sediment tank
urine
livestock
chickens
bees
food
eggs
honey
fruit & vegetables
fish
waste
compost
worms
compost tank
organic waste
solid waste
chicken manure
biogas
biomass collection tank
compost
gas
fermenter
gas motor + generator
heat
heat
electricity
sludge
inhabitant
materials
materials
possessions
consumer goods
building materials
inorganic waste
reuse
recycle
hvac
wind
fresh air
air handling unit + heat recovery
return air
exhaust air
supply air
fresh air
heat
electricity
heat pumps (4x)
hot water
underfloor heating
central heat pump
heat
cold
storage
energy
appliances
smart node
battery
pv panels
sun
electricity

Conclusion self-sufficiency.

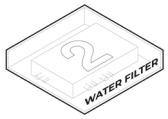


12 m2

-> 4 x 1 element

(25p) 4 x 18,75 m3

-> 4 x 5 elements



12 m2

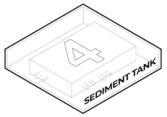
-> 4 x 1 element

(25p) 4 x 18,75 m3

-> 4 x 5 elements

(25p) 4 x 18,75 m3

-> 4 x 5 elements



12 m2

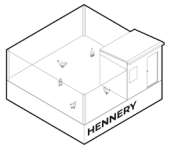
-> 4 x 1 element

(25p) 4 x 18,75 m3

-> 4 x 5 elements

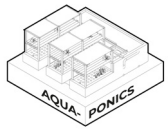
(3p) 57,7 m2

-> 33 x 1/7 element



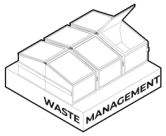
10 m2

-> 2 elements



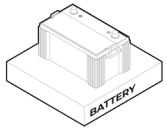
365 m2

-> 26 elements



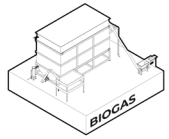
14 m2

-> 1 element



10 m2

-> 1 elements



14 m2

-> 1 element

-> 33 x element 2m2 + 127 x element 14m2

Calculations self-sufficiency

FOOD

AQUAPONICS

Source https://versestad.nl/2016/10/vertical-farming/

greenhouse	1300 m2	->	50.000 kg/y
fish	370 m2	->	20.000 kg/y

fruit& vegetables/p/y	150 kg	->	total 15.000 kg/y
m2 needed: 15.000/50.000= 0,3		->	**0,3*1300 = 390 m2**
fish/p/y	20 kg/y	->	total 2000 kg/y
m2 needed: 2000/20000= 0,1		->	**0,1*370 = 37 m2**

BEES

Source https://www.bijenhouders.nl/files/downloads_winkel/05%20Bijenfolder%20Bestuiving%20090630.pdf

pollination	2500 m2	->	1 family	(traditional farming)
vertical farming: 10% of traditional m2			->	250 m2 -> 1 family
m2 farming: 390 m2		->		**1,56 bee colony**

Source http://www.imkeropleidingensalland.nl/imker-worden/bijen-weetjes/
https://toverleven.cultu.be/oogsten-honing-roven

honey
1 family -> 30 kg/year
30*1,56= 46,8 kg/year

100 persons -> 0,468 kg/person/year

benodigd: 2 kg/year/ persoon (10 l = 14 kg) 15 g is 1 'serving'

HENNERY

Source https://www.voedingscentrum.nl/nl/service/vraag-en-antwoord/gezonde-voeding-en-voedingsstoffen/hoeveel-eieren-mag-ik-per-week-eten-.aspx
https://www.adopteereenkip.nl/hoeveel-eieren-legt-een-kip-2
https://www.grootplezier.nl/blog/hoeveel-eieren-legt-een-kip/

required	130 eggs/p/y	total	1300 eggs/year
chicken lays 5 eggs/week		->	**5*52=260 eggs -> 1300/260 = 5 chickens**

reference https://www.omlet.nl/guide/kippen/kan_ik_kippen_houden/hoeveel_ruimte_heb_ik_nodig/
1 m2/ chicken -> **1*5 = 5m2**

AQUAPONICS https://www.pc.gov.au/inquiries/completed/water-study/submissions/sub046/sub046.pdf

1000 kg fish -> 22.000 l water
7000 kg groente

needed for 100 pers:
2000 kg fish
15.000 kg groente **-> 22/7*15= 47.000 l water needed**

closed water loop

BIOGAS

Source https://www.renergon-biogas.com/en/biogas-calculator/

100.000 kg chicken totaal 1.000.000 kg *10.000 geeft*
900.000 kg biowaste

results in:
202 920 kWh elek per year *2029,2*
23,16 kW CHP power *0,2316*

heat: 240 300 kWh thermal per year *2403*
27,43 kW gross thermal power *0,2743*

organic fertilizer 980 tons per year *9.800*
compost: 400 tonnes per year *4.000*

Design

organic waste	12.600	kg	
sludge	15.000	kg	
chicken manure	60	kg	Bovenstaand x
	27.660	kg totaal	27,66

uitkomst:	**56127,672**	**kWh per jaar**
	6,406056	chp power
	66466,98	**kwh heat**
	7,587138	thermal power
	271068	fertilizer
	110640	ompost

20 l = 4 kg
27660 l
5532 l

Calculations self-sufficiency

ELECTRICITY

car charging https://zerauto.nl/hoeveel-energie-verbruikt-een-elektrische-auto/
2000 kWh/car/year

living

openbare ruimten niet meerekenen, maar uitgaan van traditionele verbruik van wonen geeft realistische vergelijking
https://www.nibud.nl/consumenten/energie-en-water/

900 kWh/user/year

Aquaponics https://www.sciencedirect.com/science/article/pii/S0144860915000643

35.950 l -> 19526 kWh per year mostly for heating

47.000 l needed **25.527 kWh per year**

OPBRENGST

pv panels https://www.energieleveranciers.nl/zonnepanelen/opbrengst-zonnepanelen

1,95 bij 1 meter met een gemiddeld vermogen van ongeveer 300 Wp.

2 m2 = 300 wp = 270 kWh
1m2 -> 135 kWh

WASTE

GENERAL

Source http://www.except.nl/design/Schiebroek-Zuid/Ingredient_Book_2011-01-10_web.pdf
https://www.milieucentraal.nl/minder-afval/afval-scheiden-cijfers-en-kilos/

solid waste
inorganic 163 kg/p/y 163*100 = 16.300 kg/y
organic 140 kg/p/y 140*100 = 14.000 kg/y

compost
10% organic -> 0,1*14.000 = 1.400 kg

Source https://farmityourself.com/why-compost-measured-in-liters-and-how-to-convert-it/

20 l = 4 kg
1 kg -> 5 l
1400 kg -> 7000 l

biogas
90% organic -> 0,9*14.000= 12.600 kg

chicken manure

Source https://torsius-ei.nl/mest/

1 chicken 30 kg manure/y -> 40% organic waste -> 0,4*30 = 12 kg/chicken/year
5 chickens -> 5*12= 60 kg/year

WASTE WATER

urine
1250 ml/24h/p **-> 1,251*365*100 p = 45.625 l/jaar**

Source https://nl.wikipedia.org/wiki/Urineren

WATER

vuistregel: 1 maand op kunnen slaan bron: consult Christien

rain https://nl.climate-data.org/europa/koninkrijk-der-nederlanden/noord-holland/amsterdam-3330/

amsterdam gemiddeld 805 mm/year
max 87 mm, min 44 mm /maand

water use https://www.waternet.nl/service-en-contact/drinkwater/gemiddeld-waterverbruik/

potable		**57,3** l/day	-> 57,3*365*100=	**2.091.450** l/y	174287,5 l/month
douche	44,2				
wastafel	4,9				
afwassen	3				
afwasmachine	2				
overig	1,6				
drinken	0,8				
eten koken	0,8				
non-potable		**49,6** l/day	-> 49,6*364*100=	**1.810.400** l/y	150866,6667 l/month
toilet	32,7				
wasmachine	12,9				
kleding wassen	1				
overig	3				

Source https://www.nibud.nl/consumenten/energie-en-water/
potable: **53,6%** of total usage
total: 36800 l/year/person 36800/12= 3067 l/month/person
potable water per person **3067*0,536 = 1644 l potable/month**

average rainfall per month: 805/12=67 mm/maand
0,067*1= 0,067 m3= 67l/m2 **per m2 valt 67 liter regenwater**

needed m2 1644 l/67 = 24,5 m2 pp

verlies aan water (koken, drinken etc) 3,2l/day/user 3,2*30= 96l/month/user

Storage potable water
christien: 1 month -> **174.287,5 l** per 100 users
175.000l= 175 m3 175/0,3 (hoogte)= 583 m2 oppervlak opslag
1 rij= 3,5m breed 583/3,5= 166 m lang
lengte gebouw= 50m **166/50= 3,3 rijen benodigd**

Storage non-potable water
christien: 1 month -> **150.866,7 l** per 100 users
150.000l= 150 m3 150/0,3 = 500 m2 opp
500/3,5= 142,85 m lang
142,85/50= 2,85

rainwater treatment
duration: 0
month max = 87 mm roof= 51.020*39.875 = 2040 m2 **0,087m*2040= 177,48 m3 = 177.480 l**

settlement tank http://www.except.nl/design/Schiebroek-Zuid/Ingredient_Book_2011-01-10_web.pdf

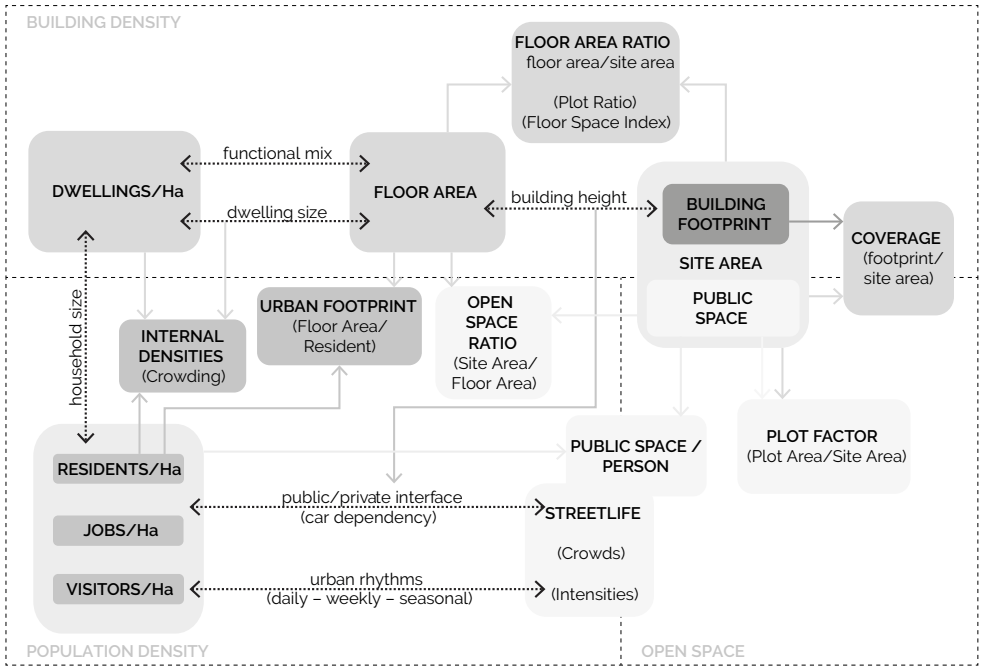
Sludge
bron: 3285.000 l -> 27.700 kg slib 1000l = 8,43 kg slib
total blackwater/year 1810.400 -> **15.265,78 kg**

Living machine https://ecovillage.org/solution/the-living-machine/
duration: 4 days

Toolkit.

I. dwellings II. shared facilities III. self-sufficiency **IV. building**

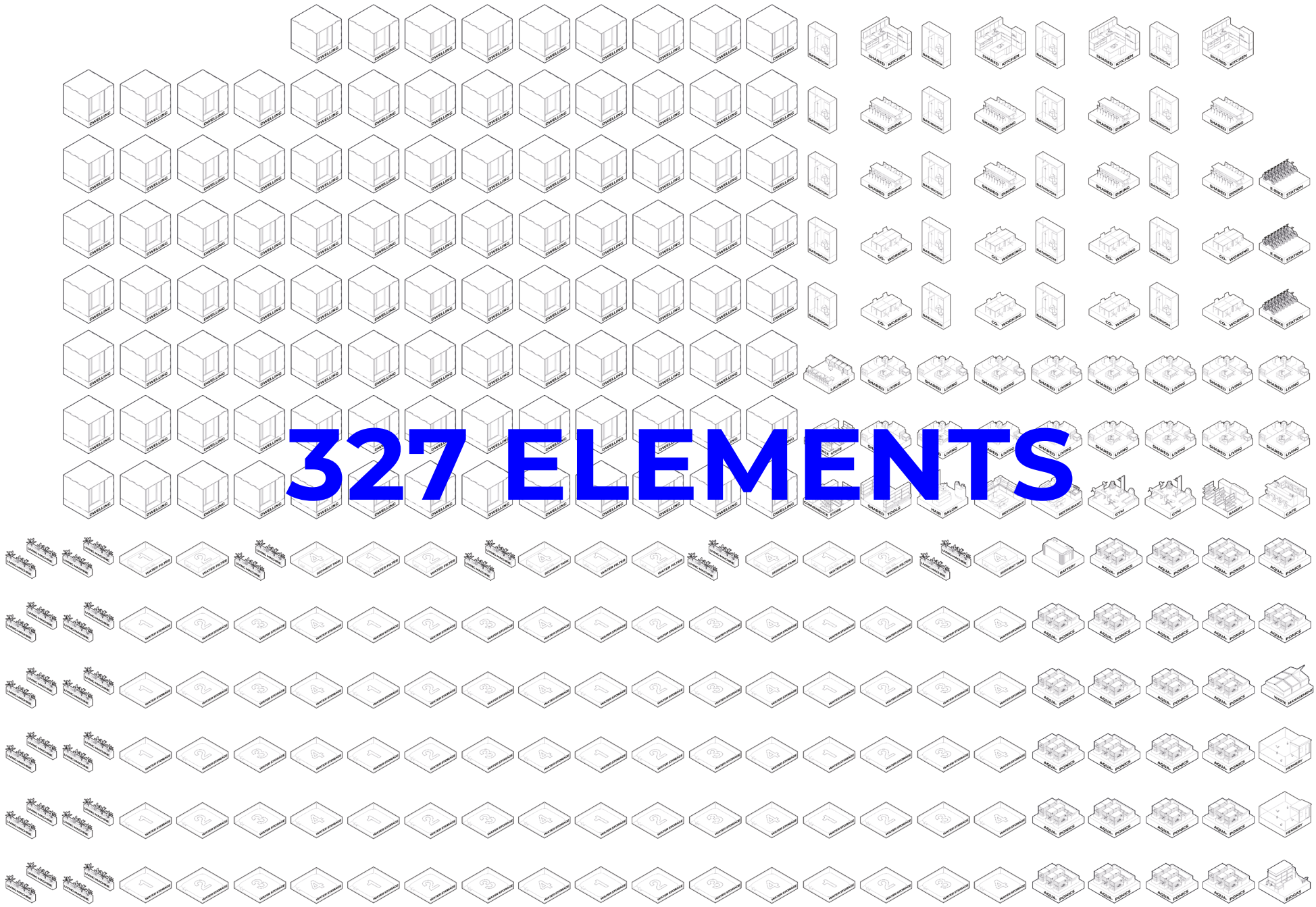
Vacant building.



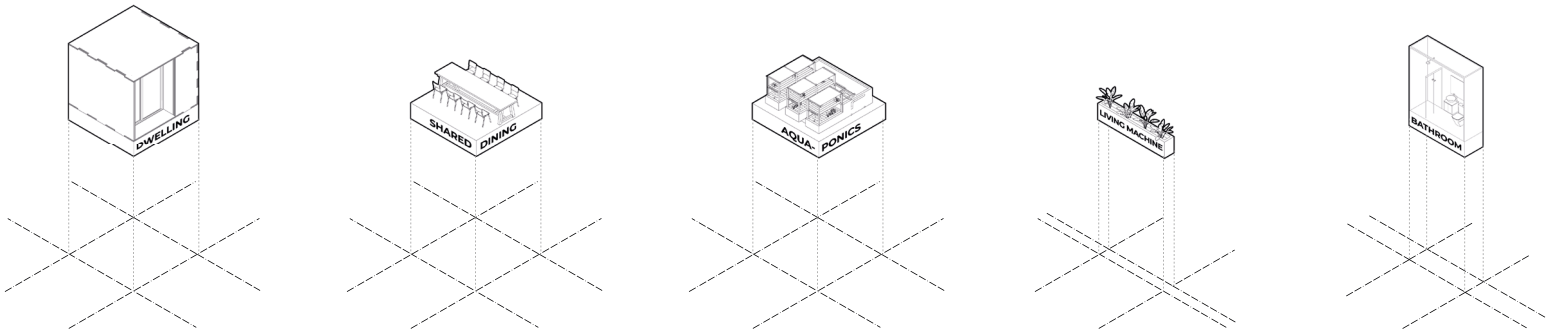
maximize density
of a city

↓

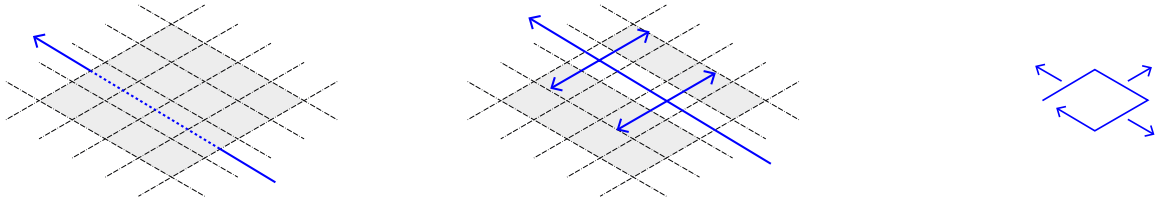
implementation in
existing floor area


327 ELEMENTS

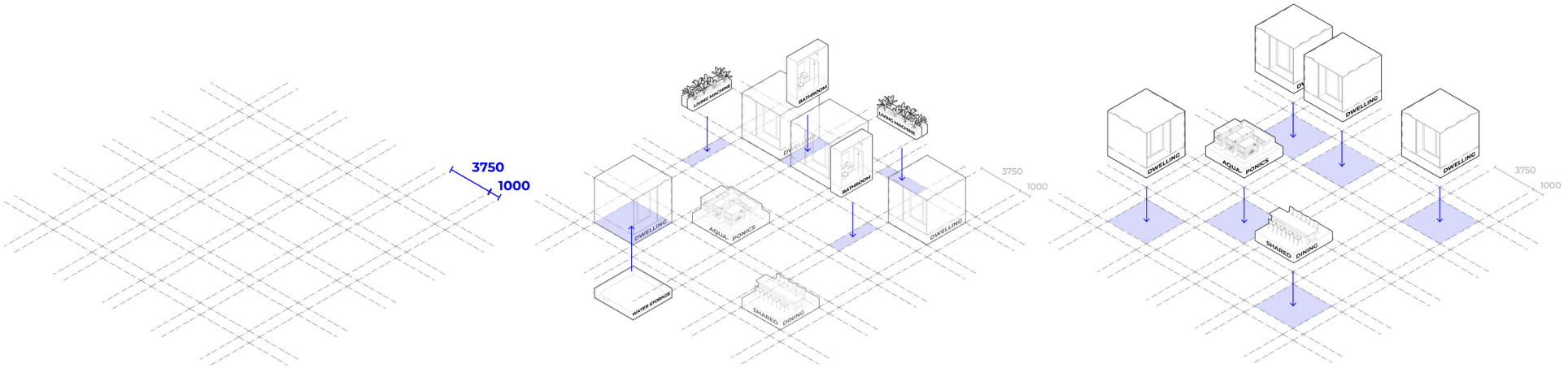
Grid.



Accessibility.



Most efficient grid.



Conclusion building.

Dwellings: **100** elements + Shared facilities: **30** elements + Self-sufficiency: **47** elements **= 177** elements

18 m2

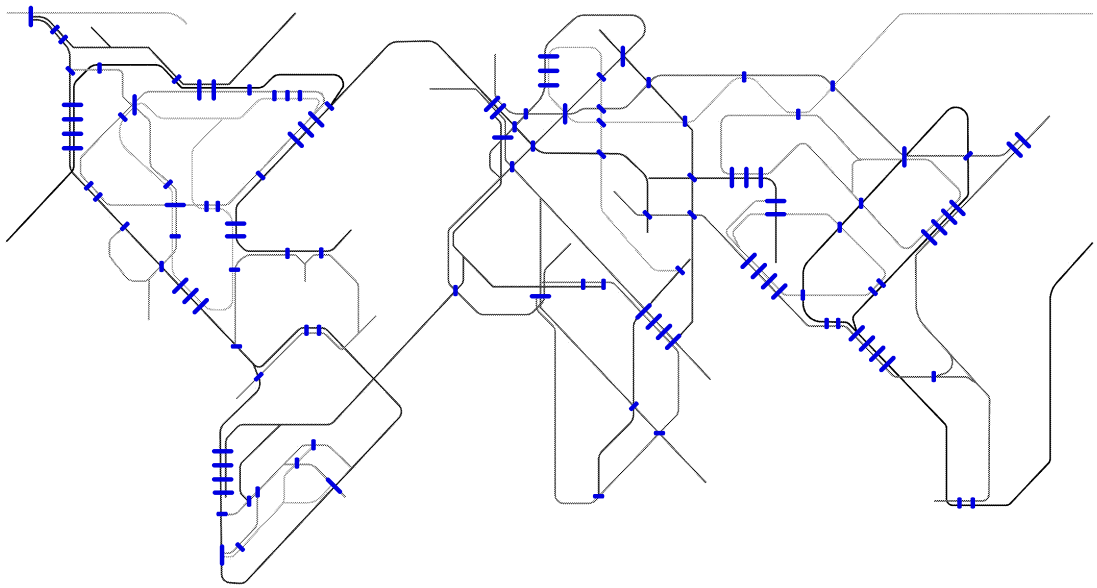
100 users -> 177 units

177 x 18 = min **3186 m2***

*if #floors = 1

ARCHITECTURE.

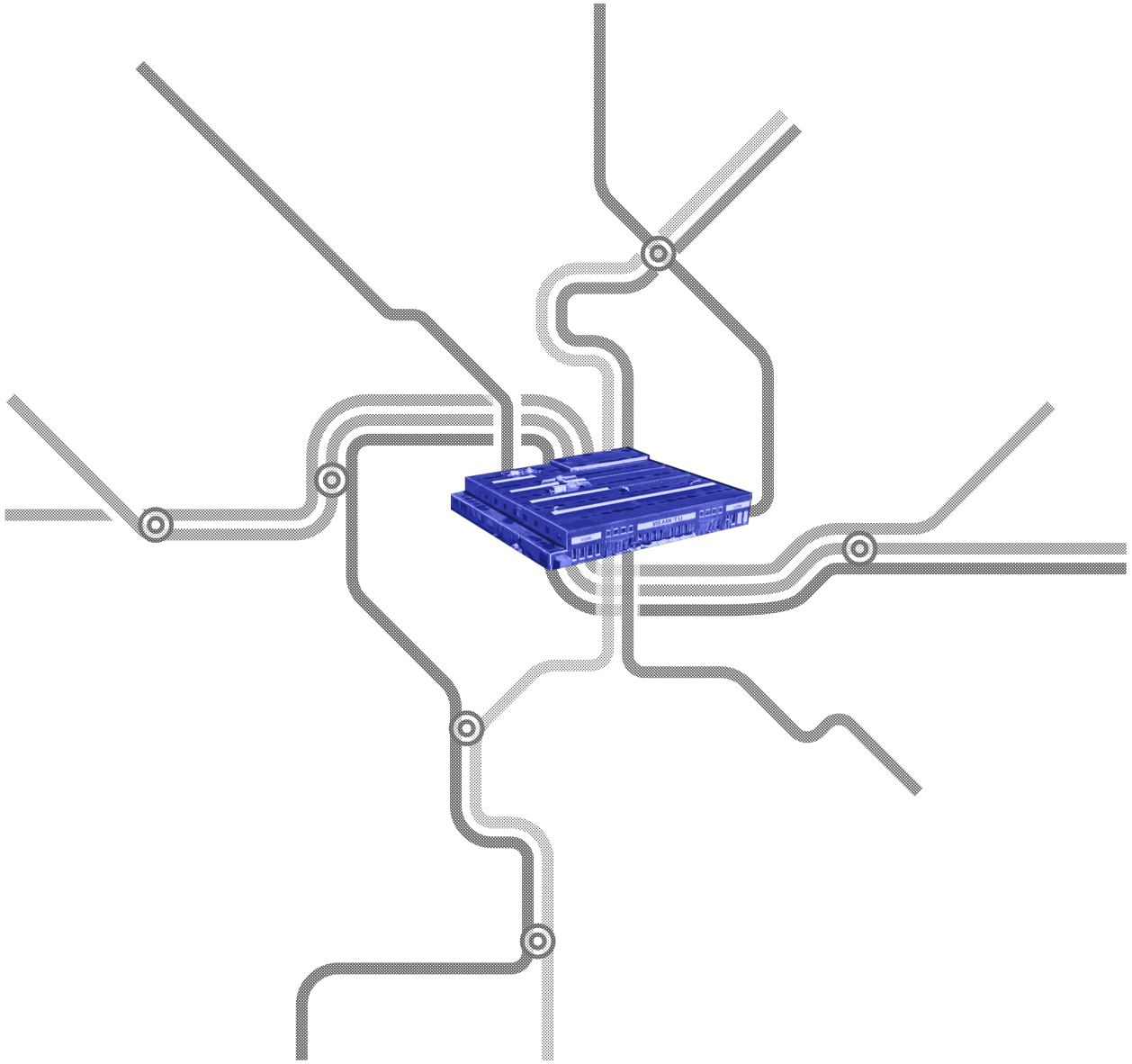
toolbox



Timeline.

I. initiative II. development III. pilot IV. reflection & expansion

Selection site.



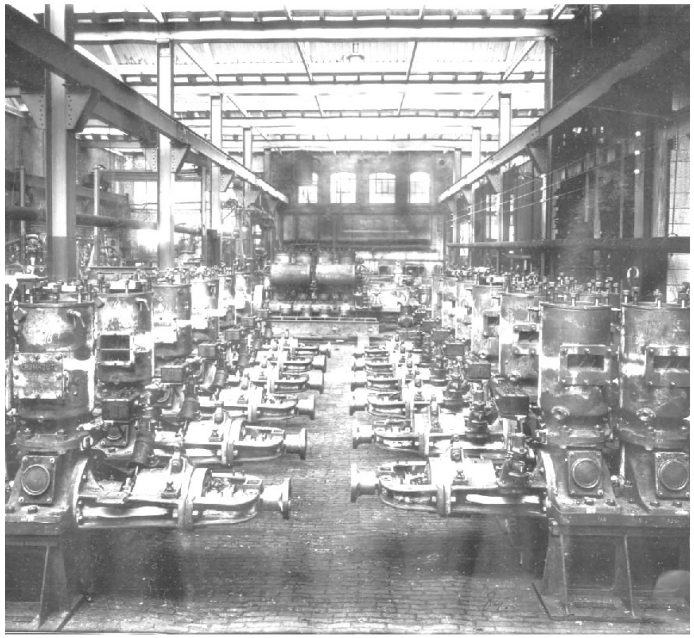
Site.

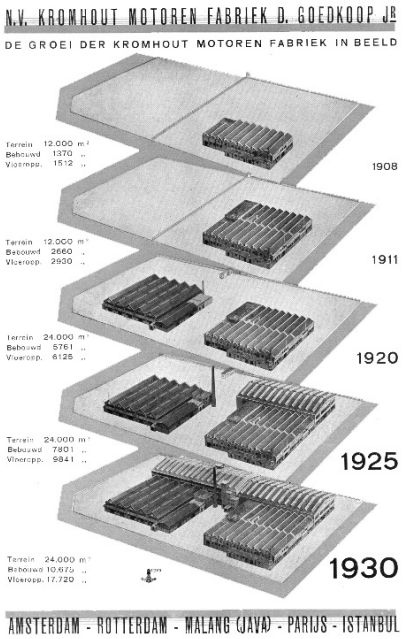
Kromhouthal Cluster 1, Gedempt Hamerkanaal 231, 1021 KP Amsterdam

https://www.loopnet.com/Listing/Cook-Street-Properties/17165250/

Source: Google Earth

Historical value.



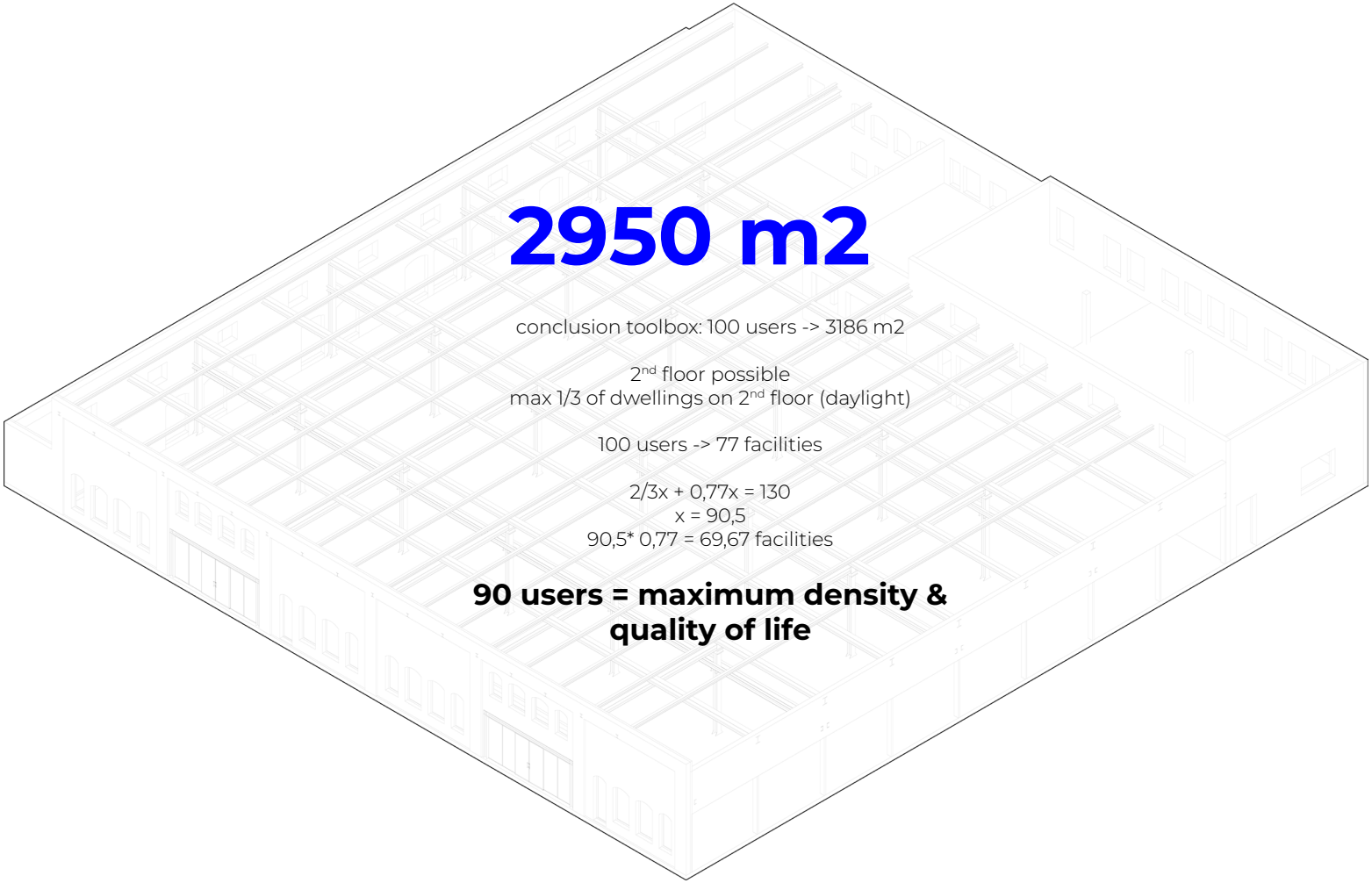


Advertising.

Timeline.

I. initiative **II. development** III. pilot IV. reflection & expansion

Maximum density.



2950 m2

conclusion toolbox: 100 users -> 3186 m2

2nd floor possible
max 1/3 of dwellings on 2nd floor (daylight)

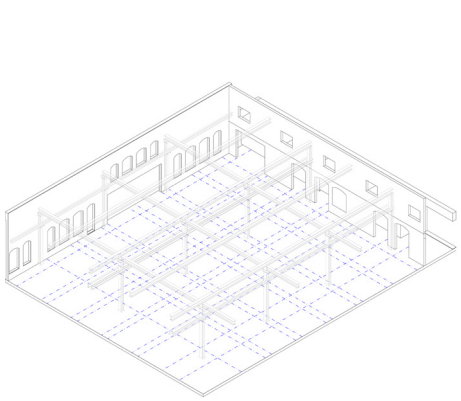
100 users -> 77 facilities

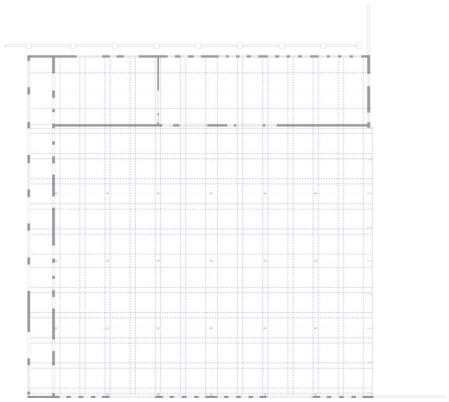
2/3x + 0,77x = 130
x = 90,5
90,5* 0,77 = 69,67 facilities

90 users = maximum density & quality of life

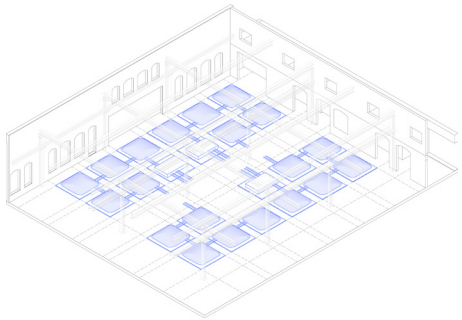
Implementation toolkit.

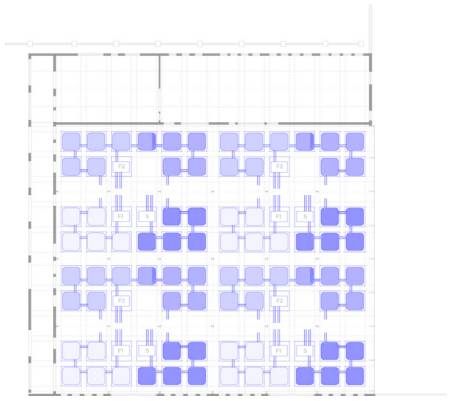
Grid



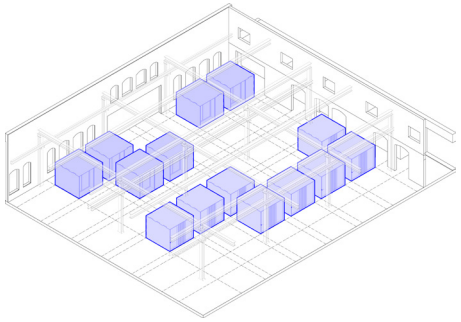


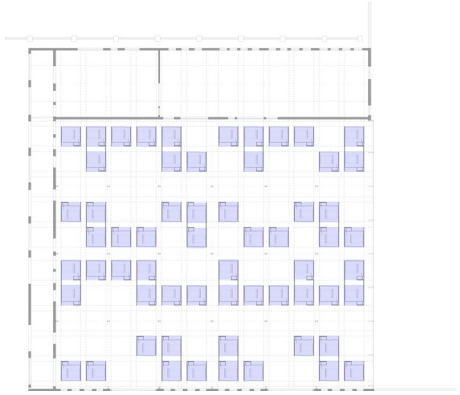
Water storage



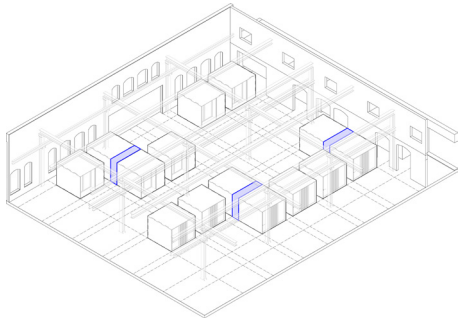


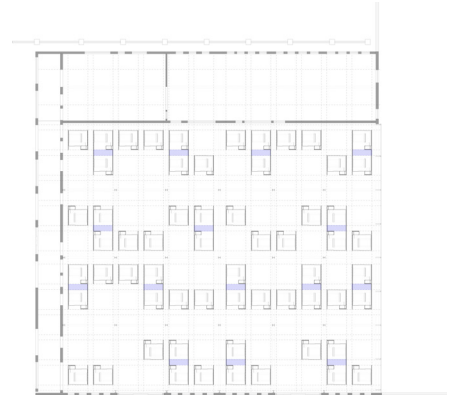
Dwellings



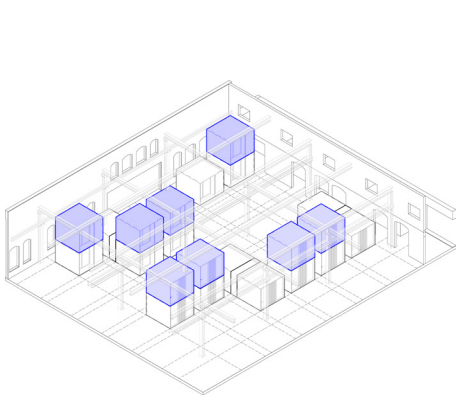


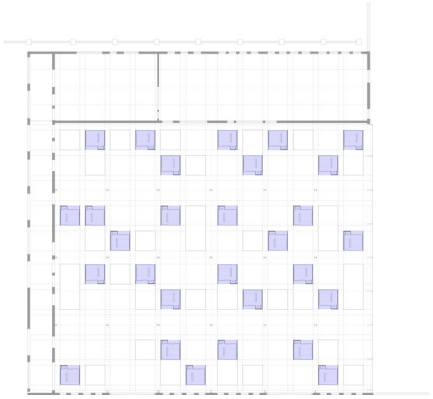
Connecting elements



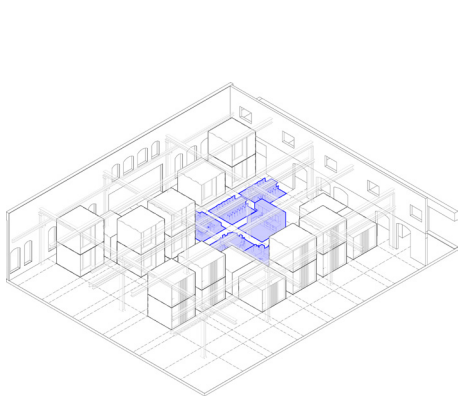


Stacked dwellings

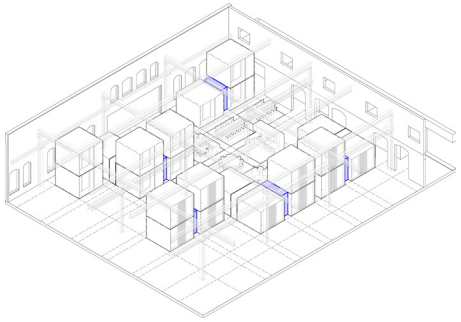




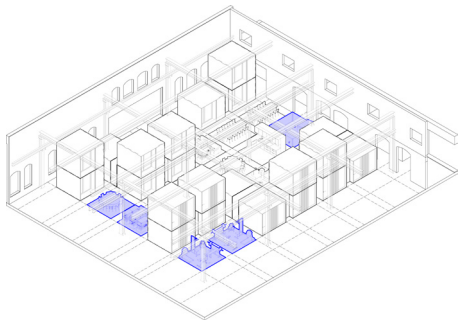
Shared facilities



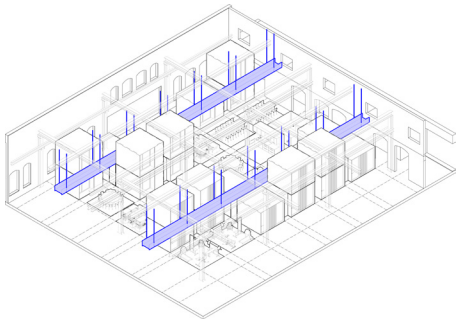
Bathrooms



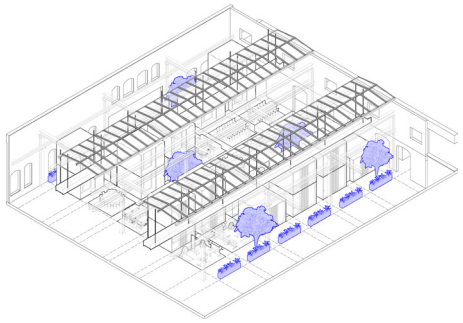
Elements self-sufficiency



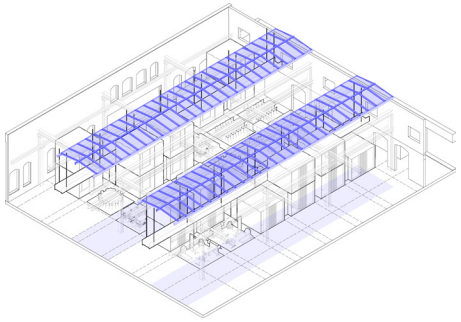
Bridges

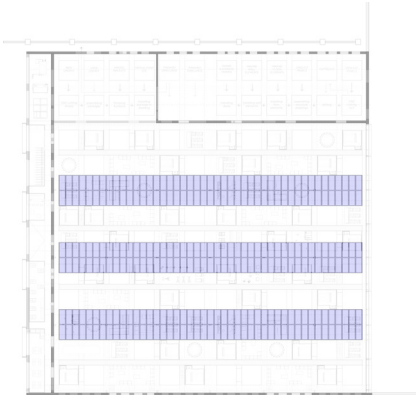


Living machine

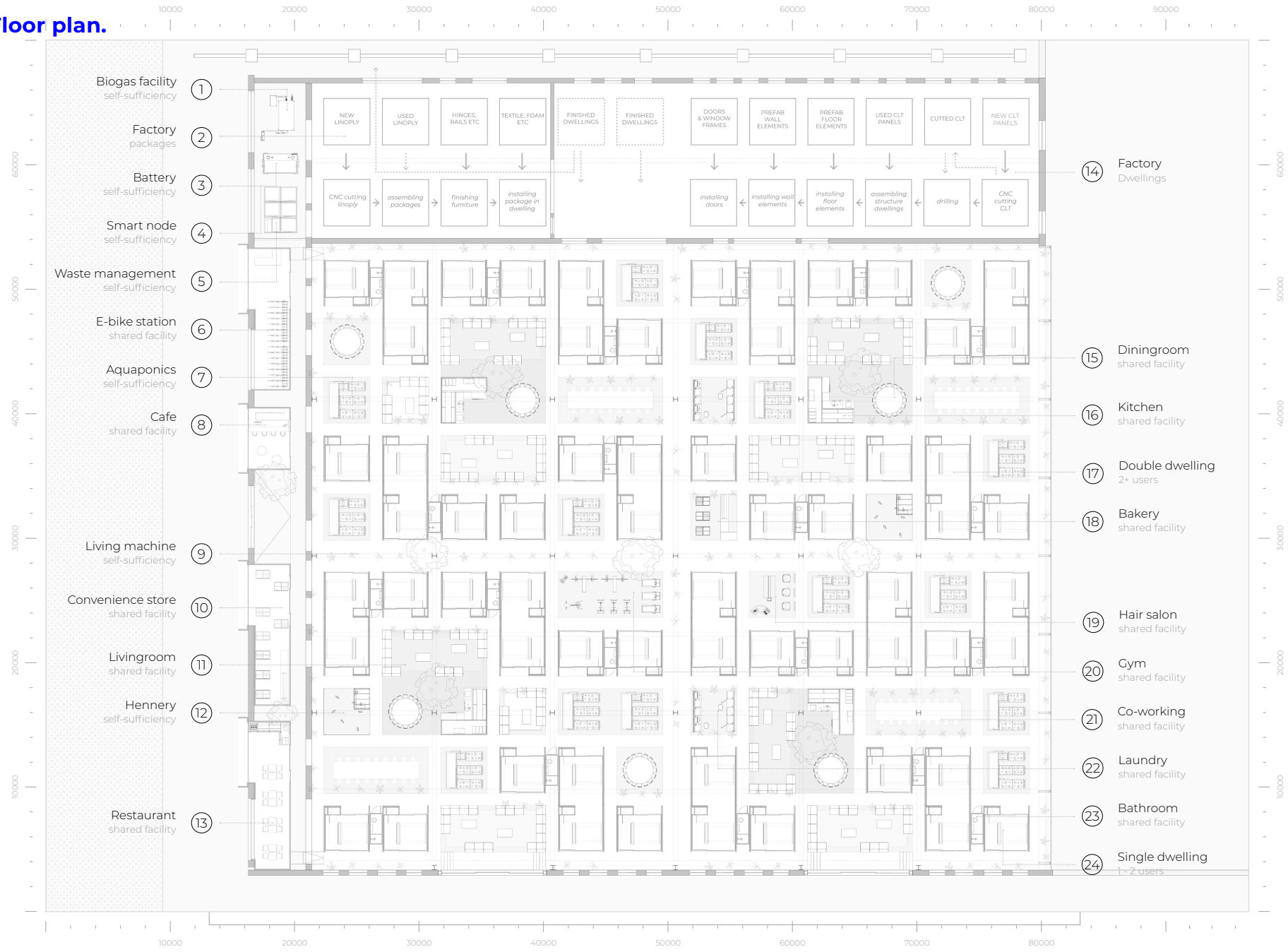


Atriums

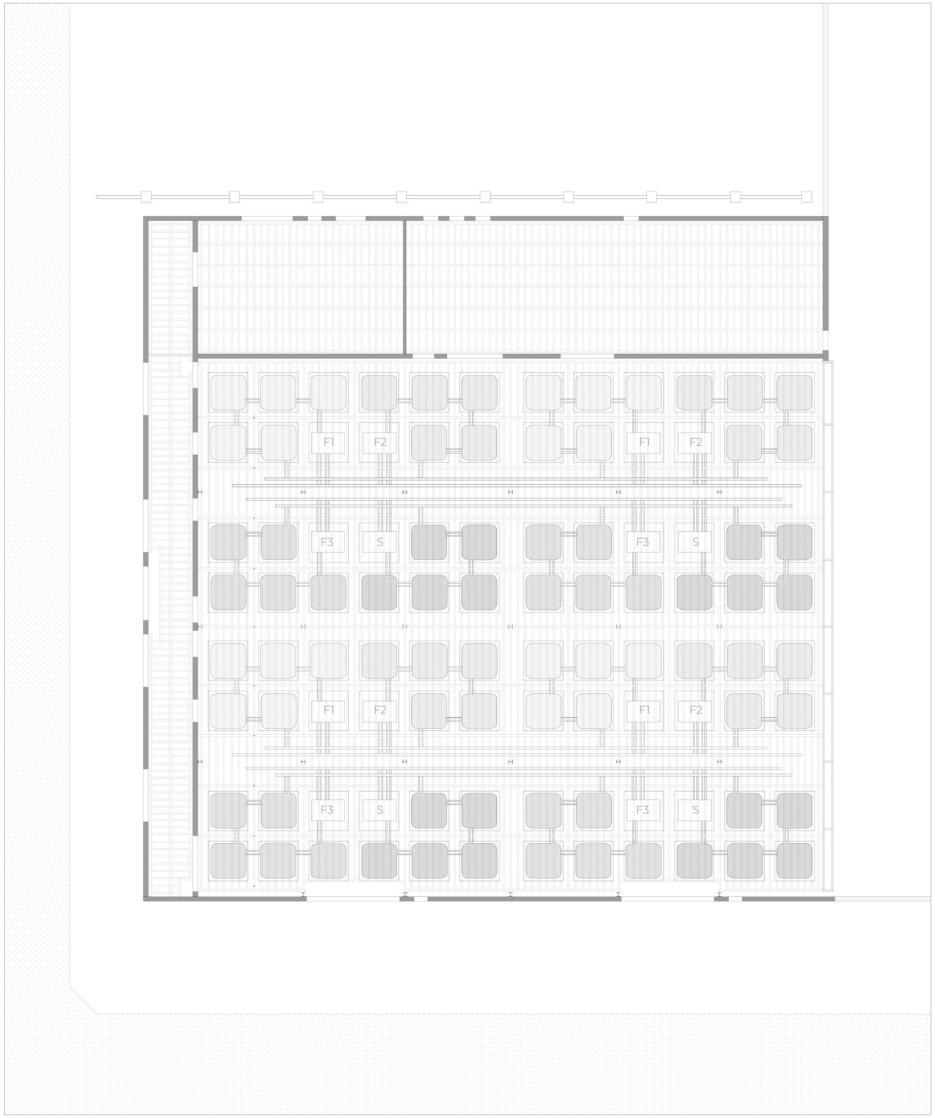




Floor plan.


10000
20000
30000
40000
50000
60000
70000
80000
90000
NEW LINOPLY
USED LINOPLY
HINGES, RAILS ETC
TEXTILE, FOAM ETC
FINISHED DWELLINGS
FINISHED DWELLINGS
DOORS & WINDOW FRAMES
PREFAB WALL ELEMENTS
PREFAB FLOOR ELEMENTS
USED CLT PANELS
CUTTED CLT
NEW CLT PANELS
CNC cutting linoply
assembling packages
finishing furniture
installing package in dwelling
installing doors
installing wall elements
installing floor elements
assembling structure dwellings
drilling
CNC cutting CLT
1 Biogas facility self-sufficiency
2 Factory packages
3 Battery self-sufficiency
4 Smart node self-sufficiency
5 Waste management self-sufficiency
6 E-bike station shared facility
7 Aquaponics self-sufficiency
8 Cafe shared facility
9 Living machine self-sufficiency
10 Convenience store shared facility
11 Livingroom shared facility
12 Hennery self-sufficiency
13 Restaurant shared facility
14 Factory Dwellings
15 Diningroom shared facility
16 Kitchen shared facility
17 Double dwelling 2+ users
18 Bakery shared facility
19 Hair salon shared facility
20 Gym shared facility
21 Co-working shared facility
22 Laundry shared facility
23 Bathroom shared facility
24 Single dwelling 1 - 2 users

Plans.


F1
F2
F3
S


NEW LINOPLY
USED LINOPLY
HINGES, RAILS ETC
TEXTILE, FOAM ETC
FINISHED DWELLINGS
FINISHED DWELLINGS
DOORS & WINDOW FRAMES
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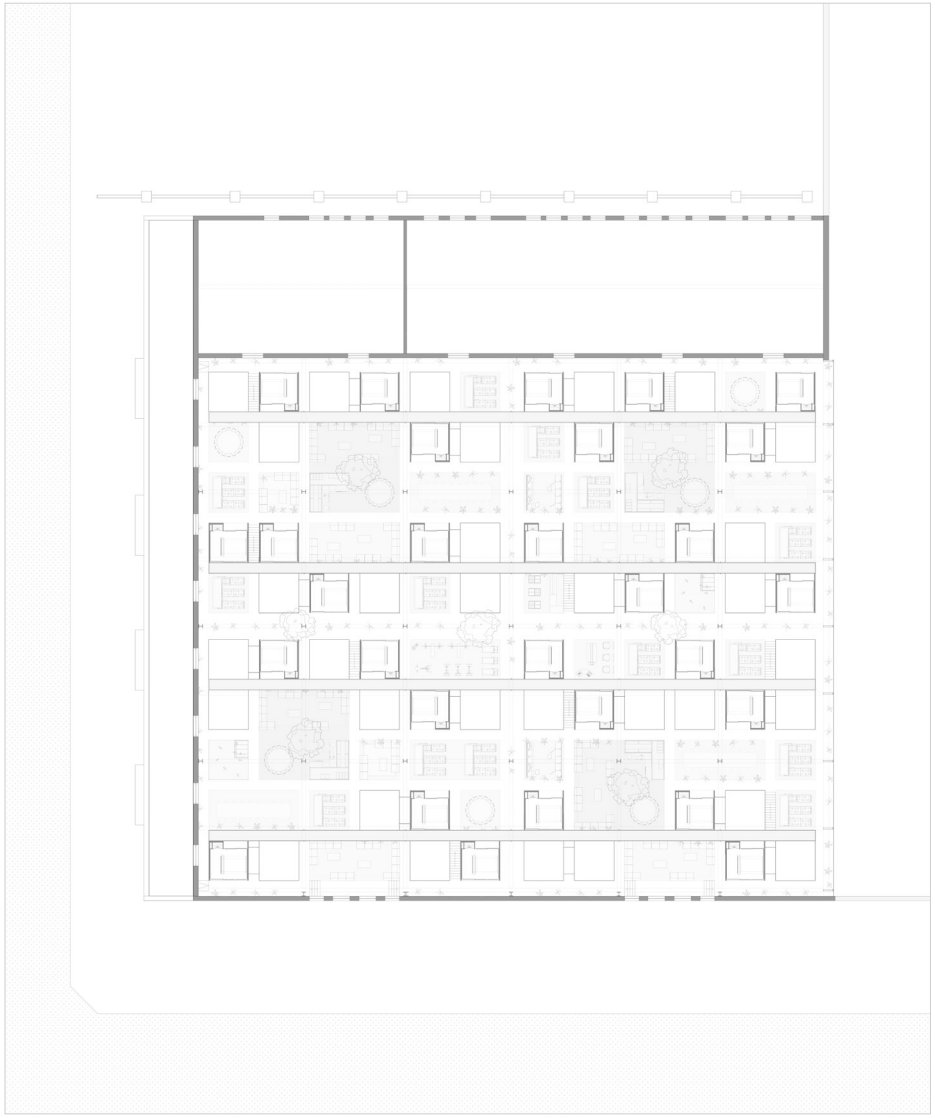
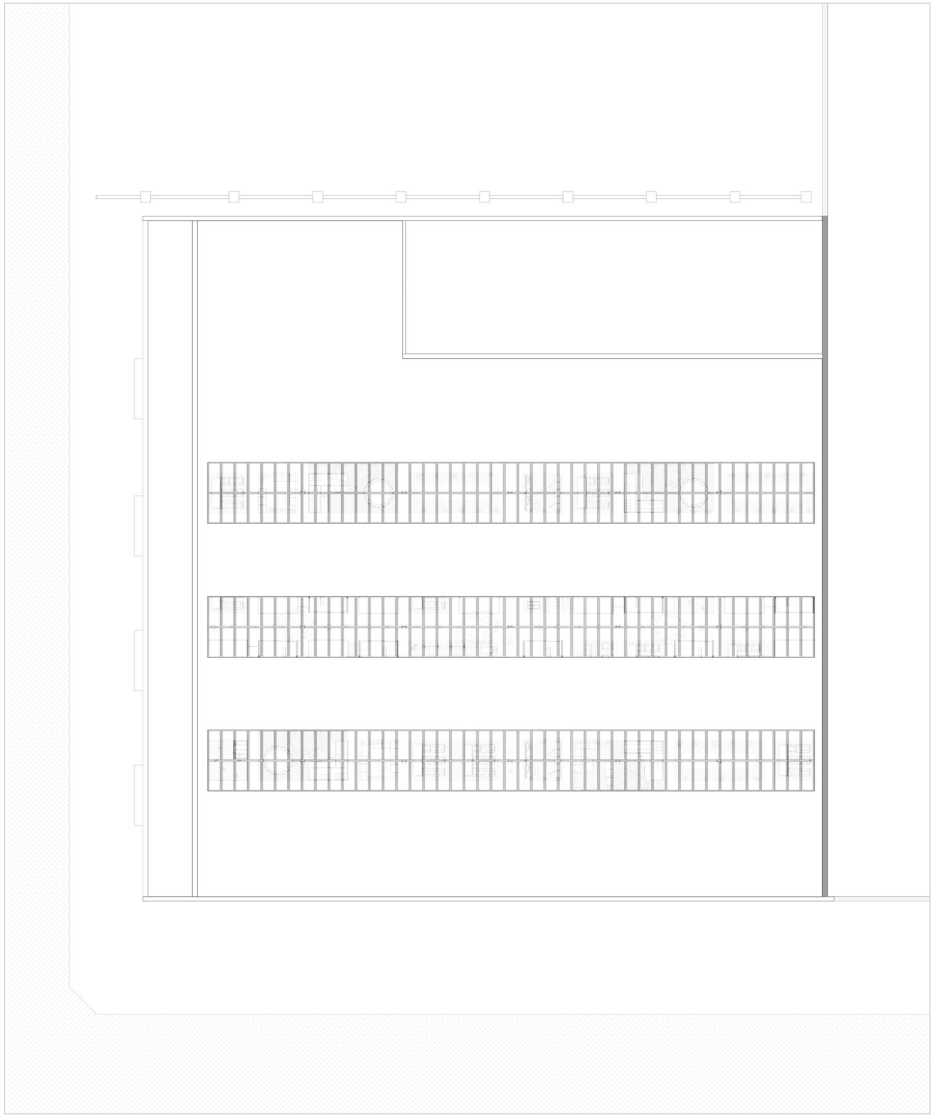
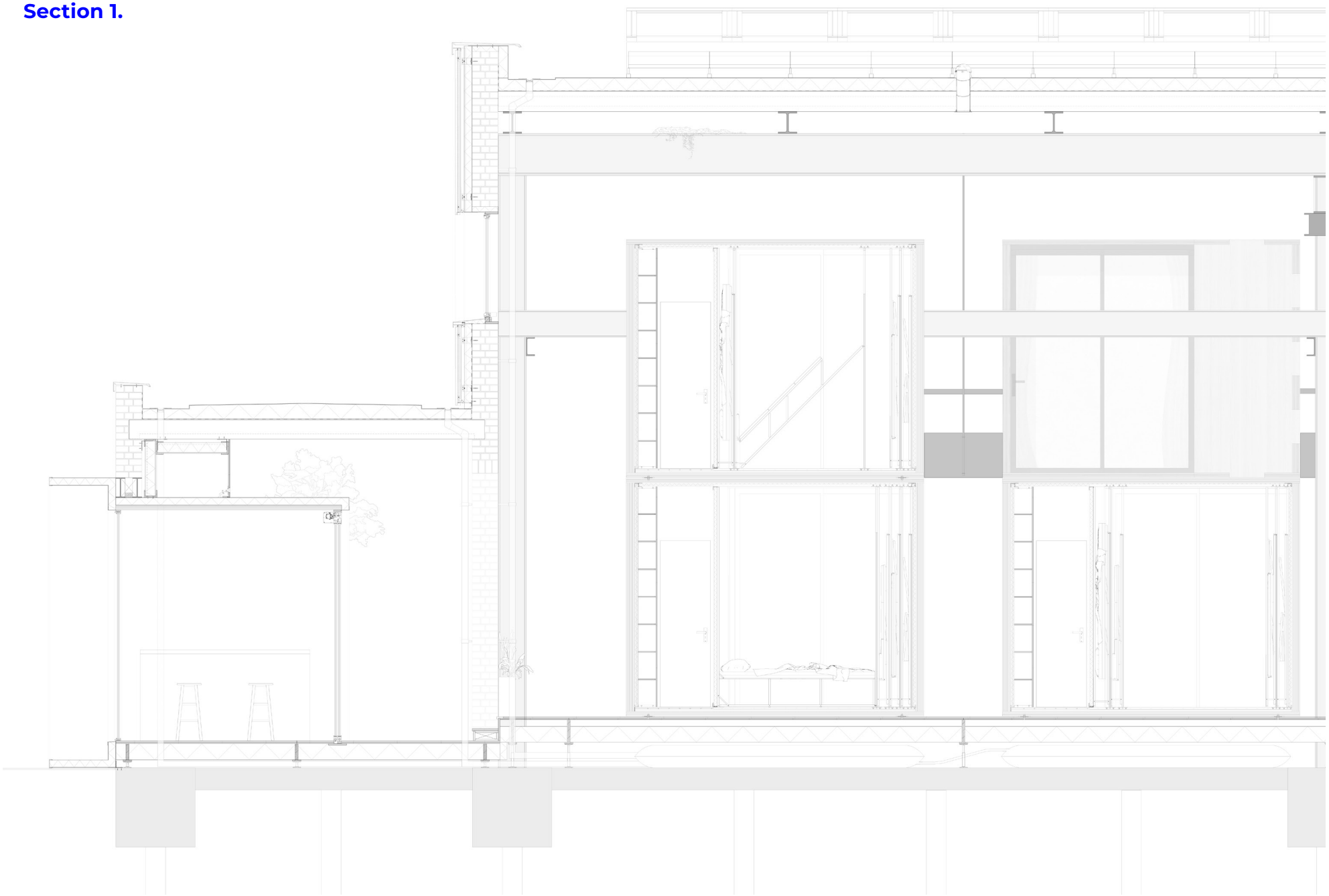
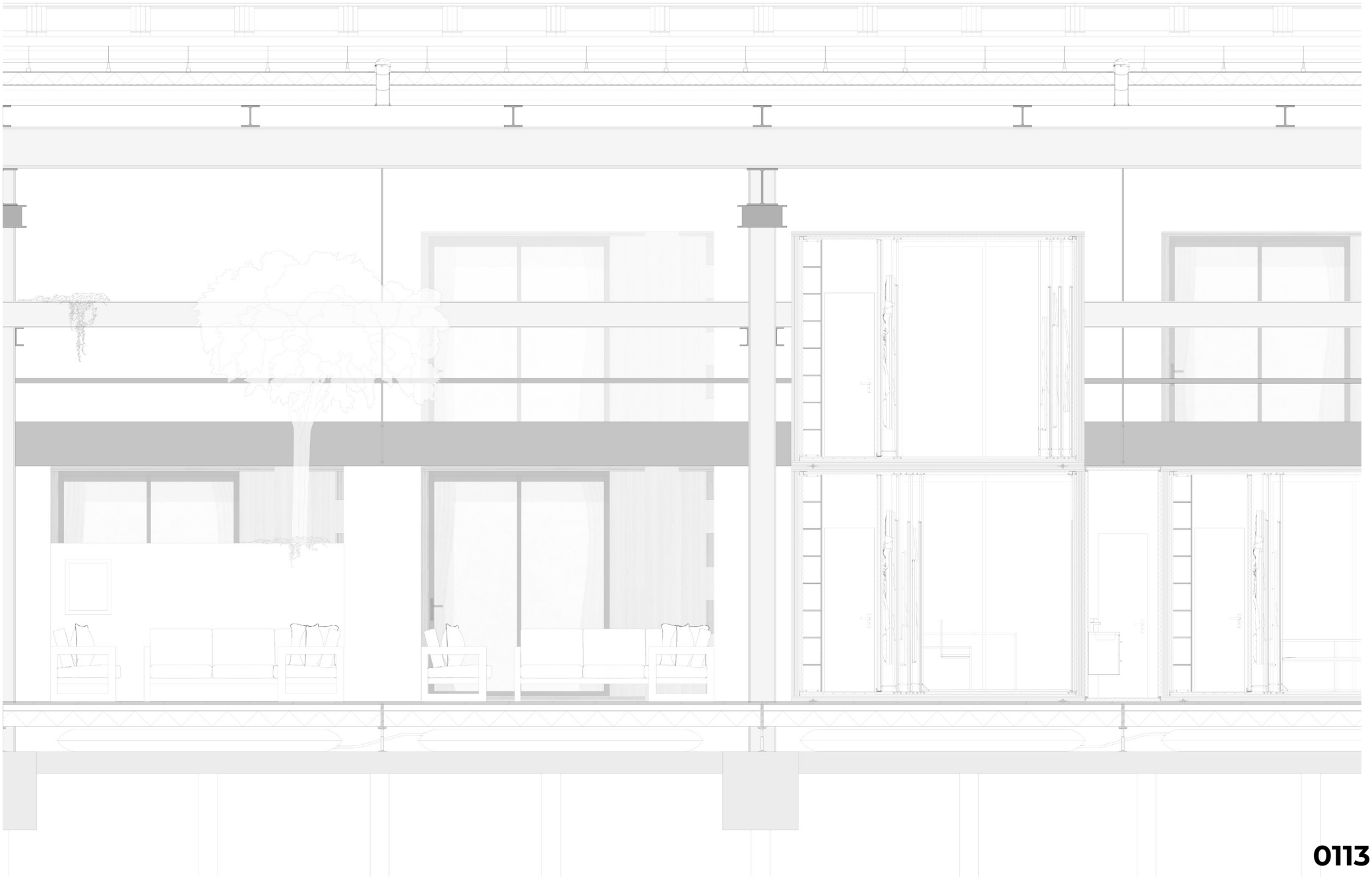
Plans.



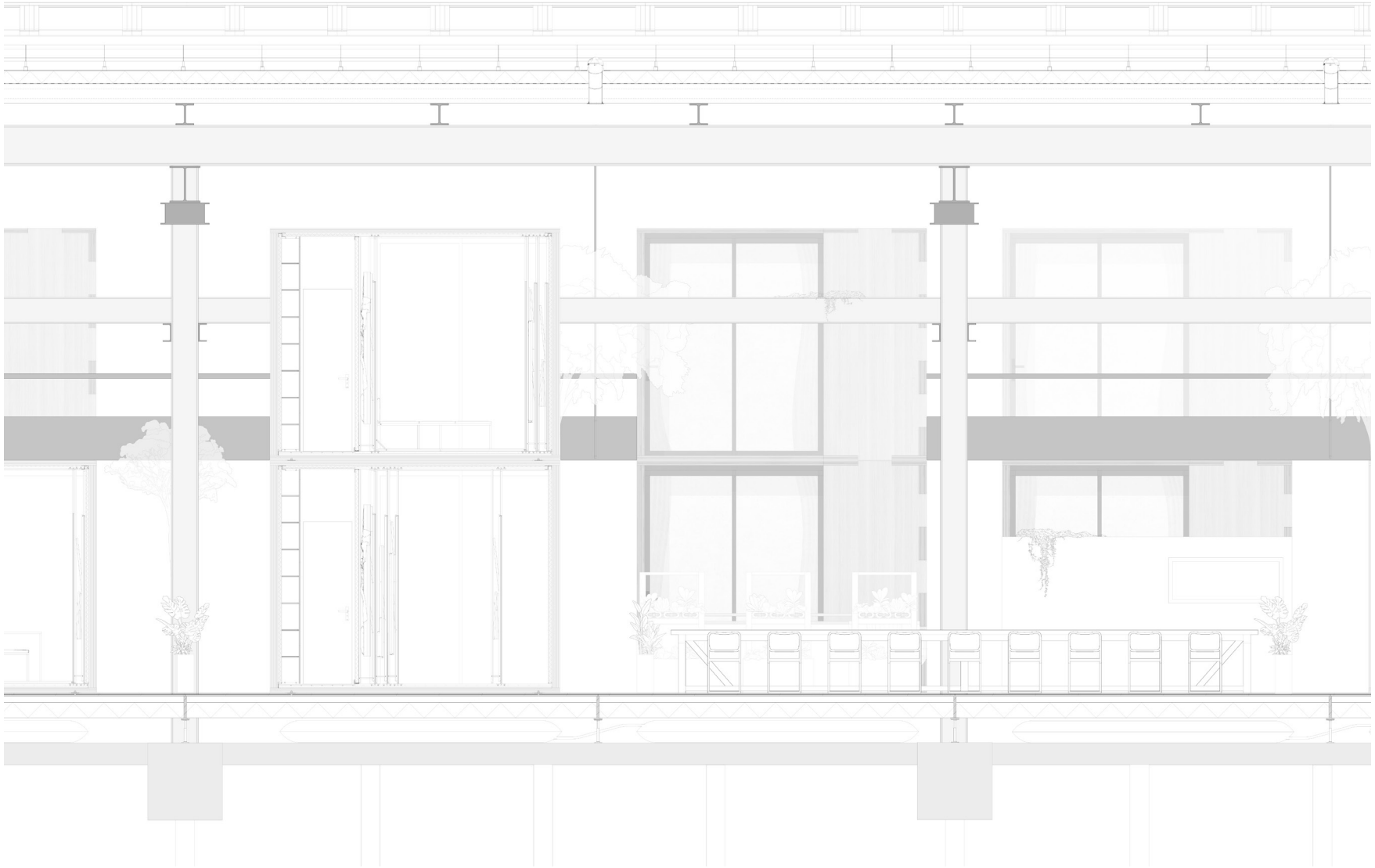


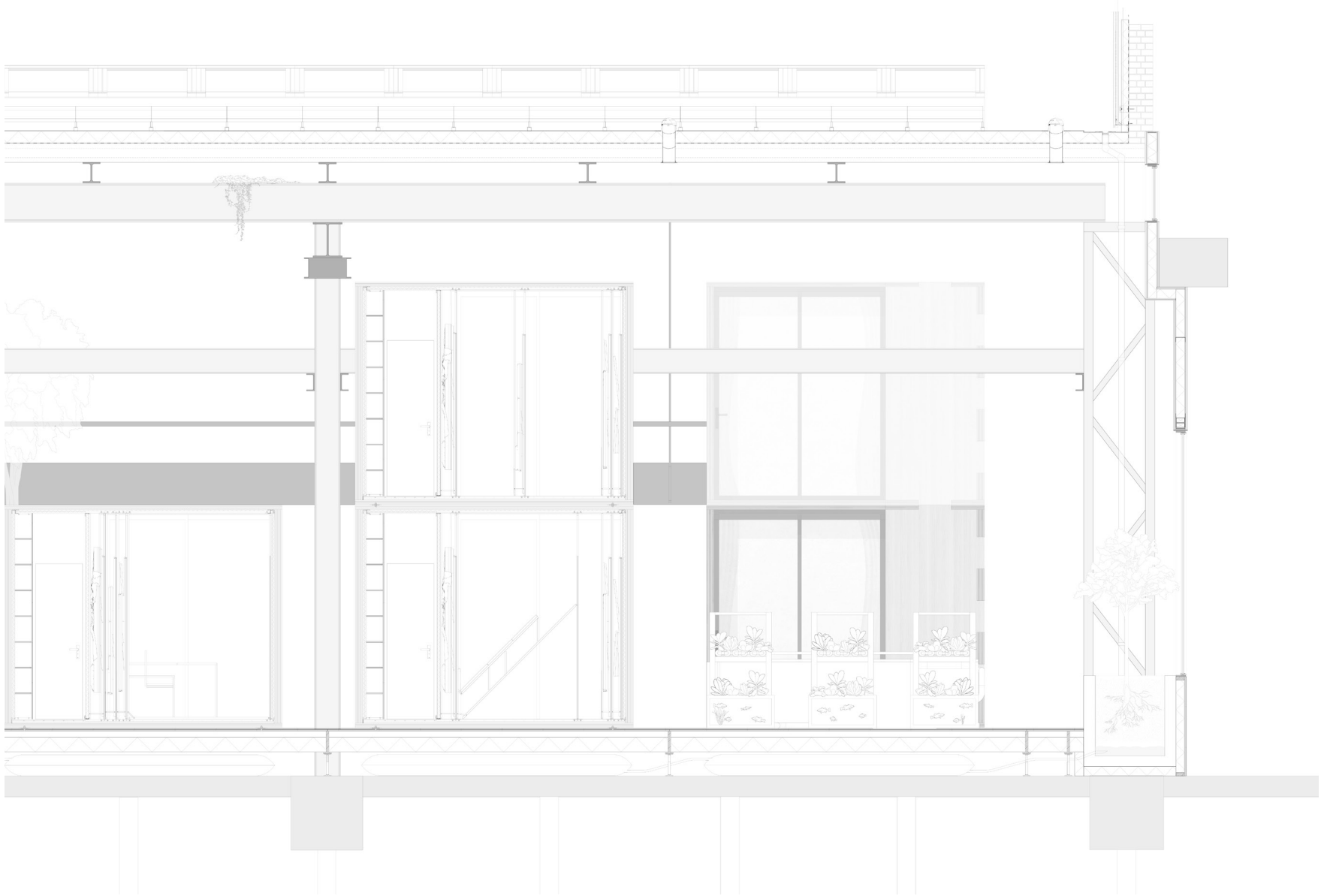
Section 1.



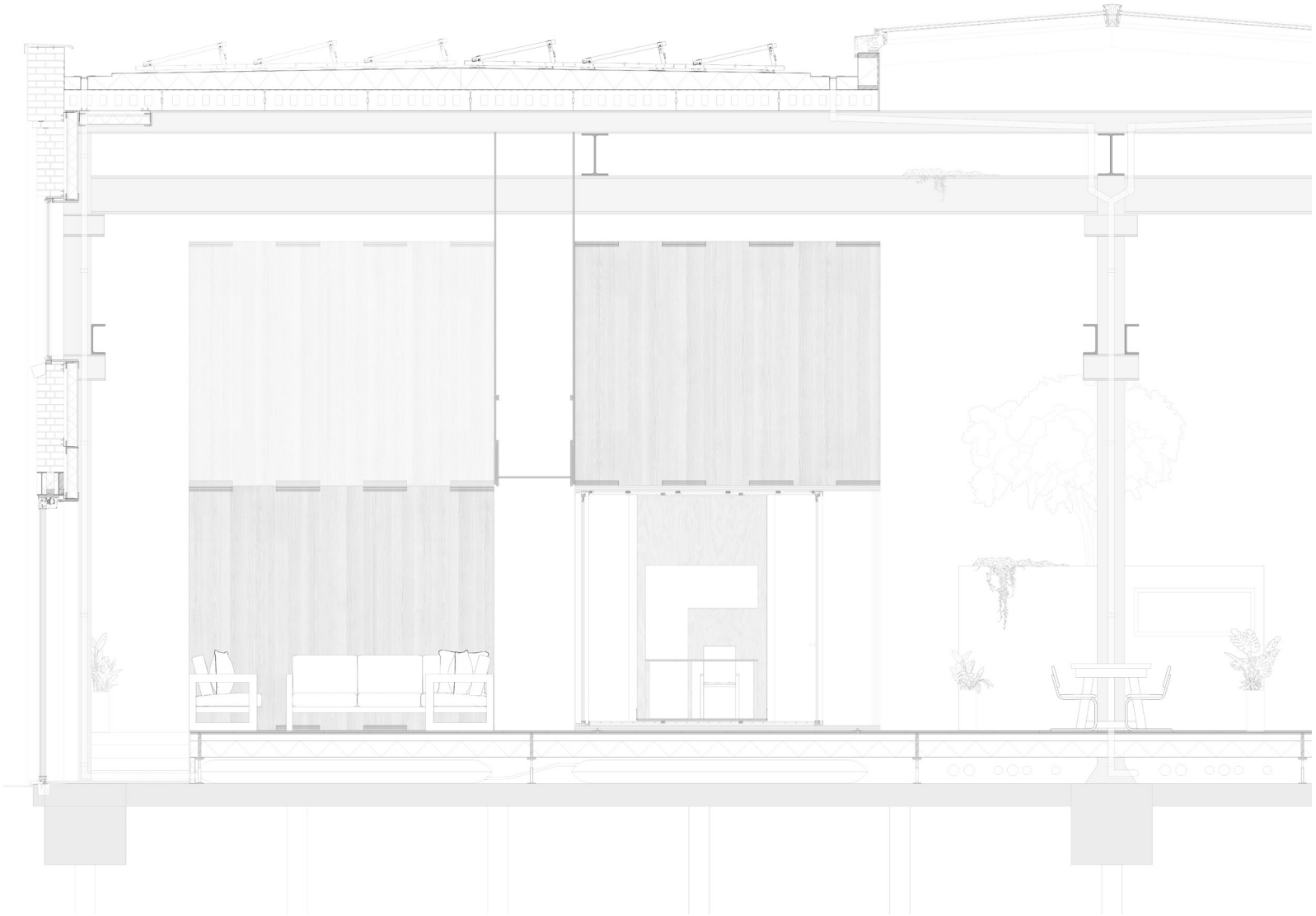


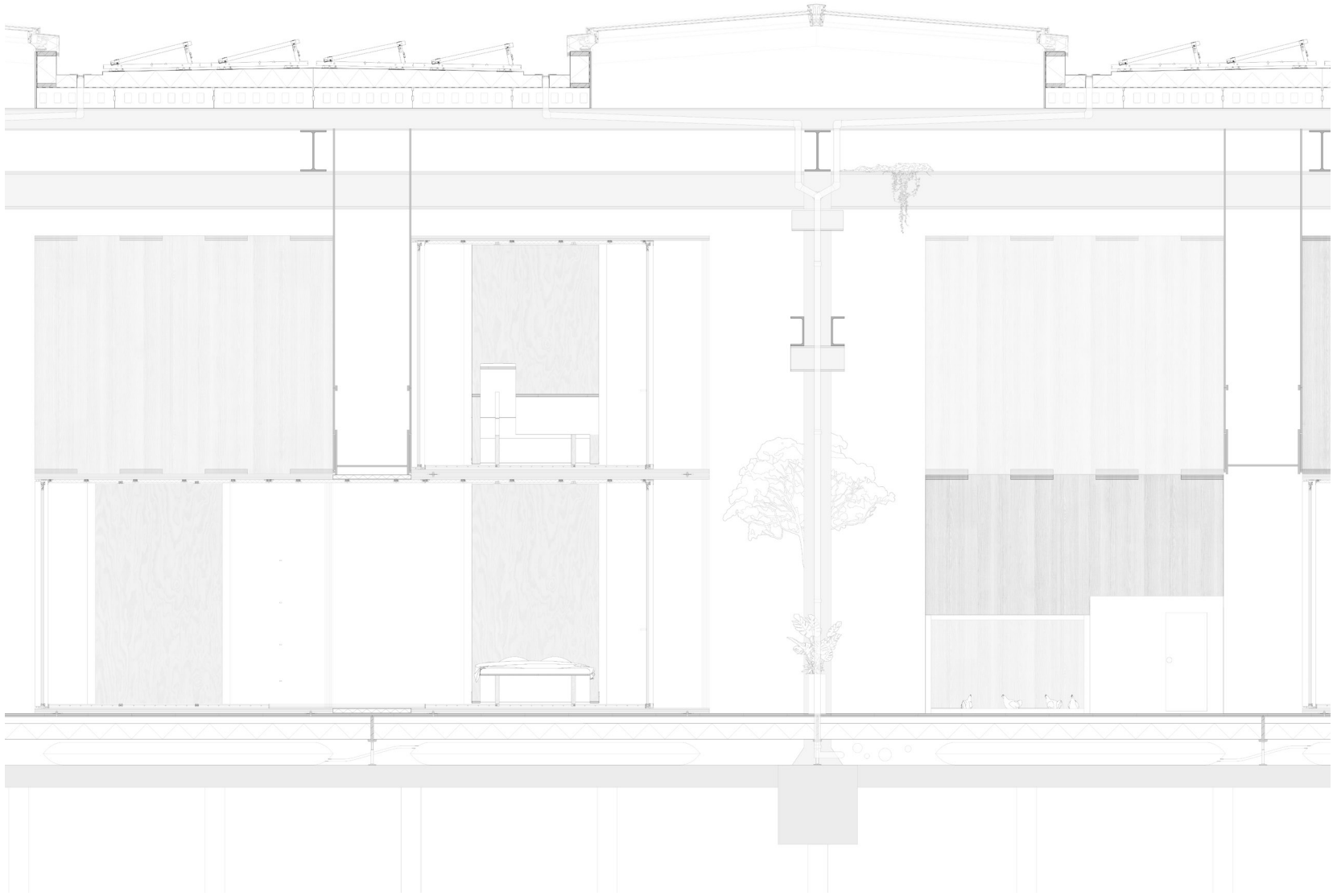
Section 1.



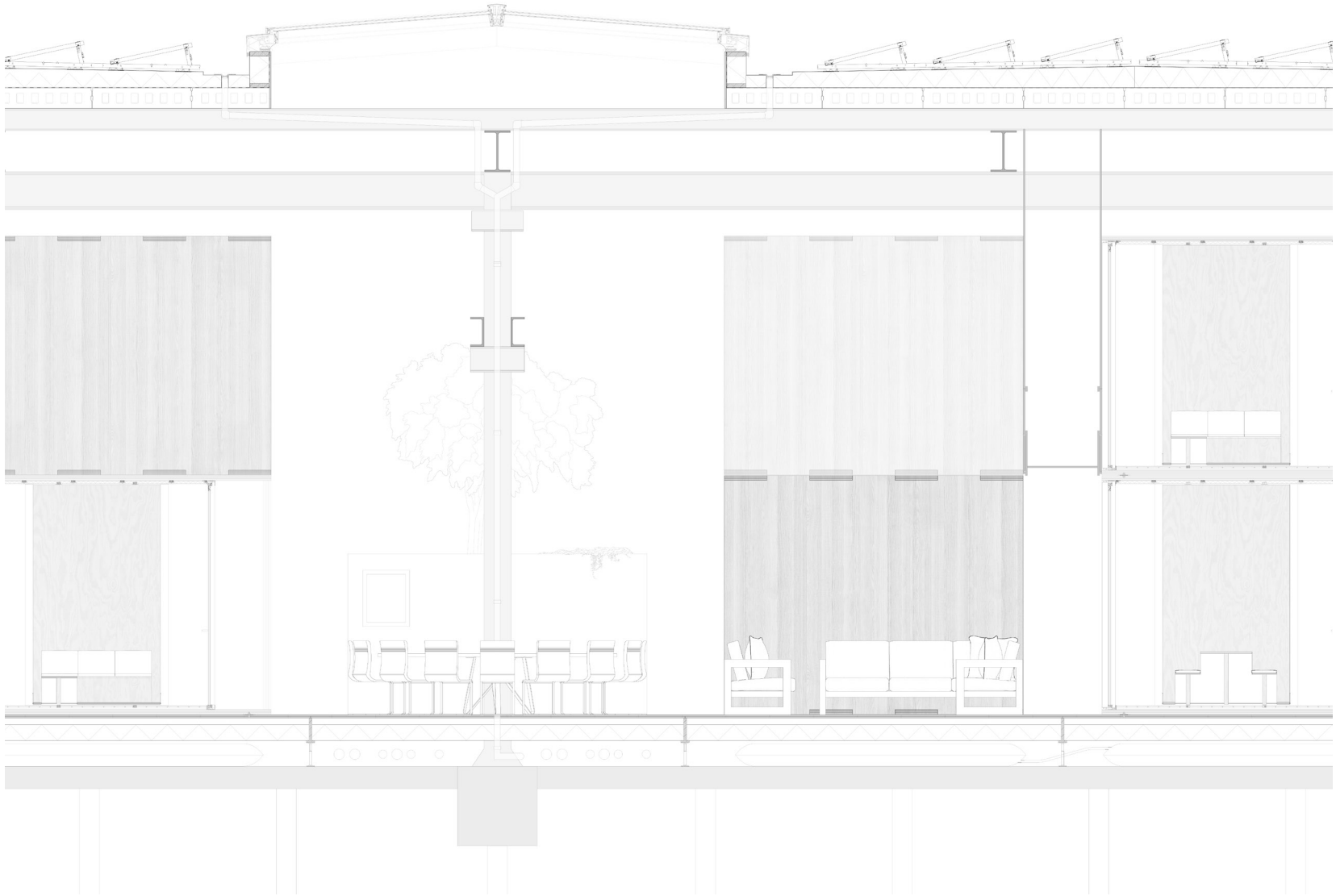


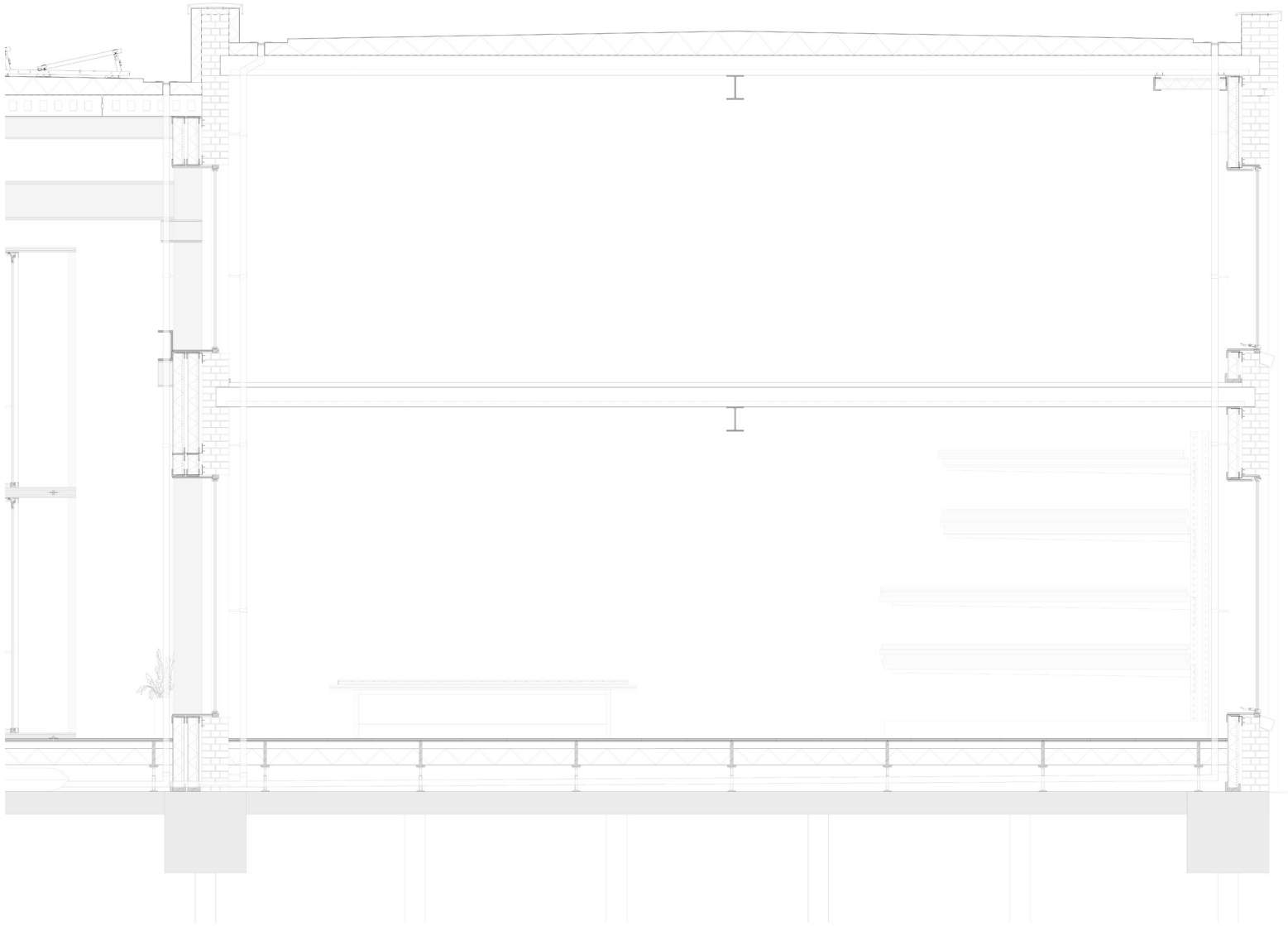
Section 2.



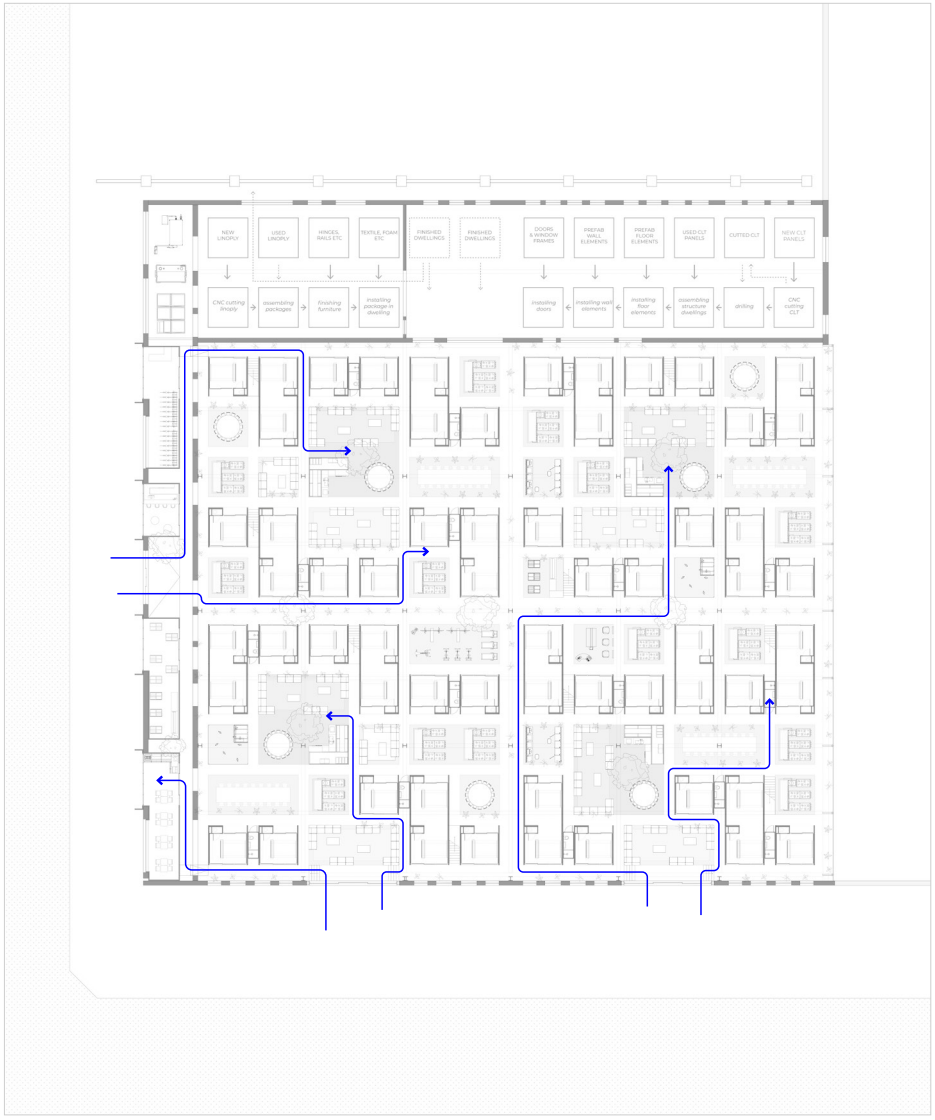


Section 2.

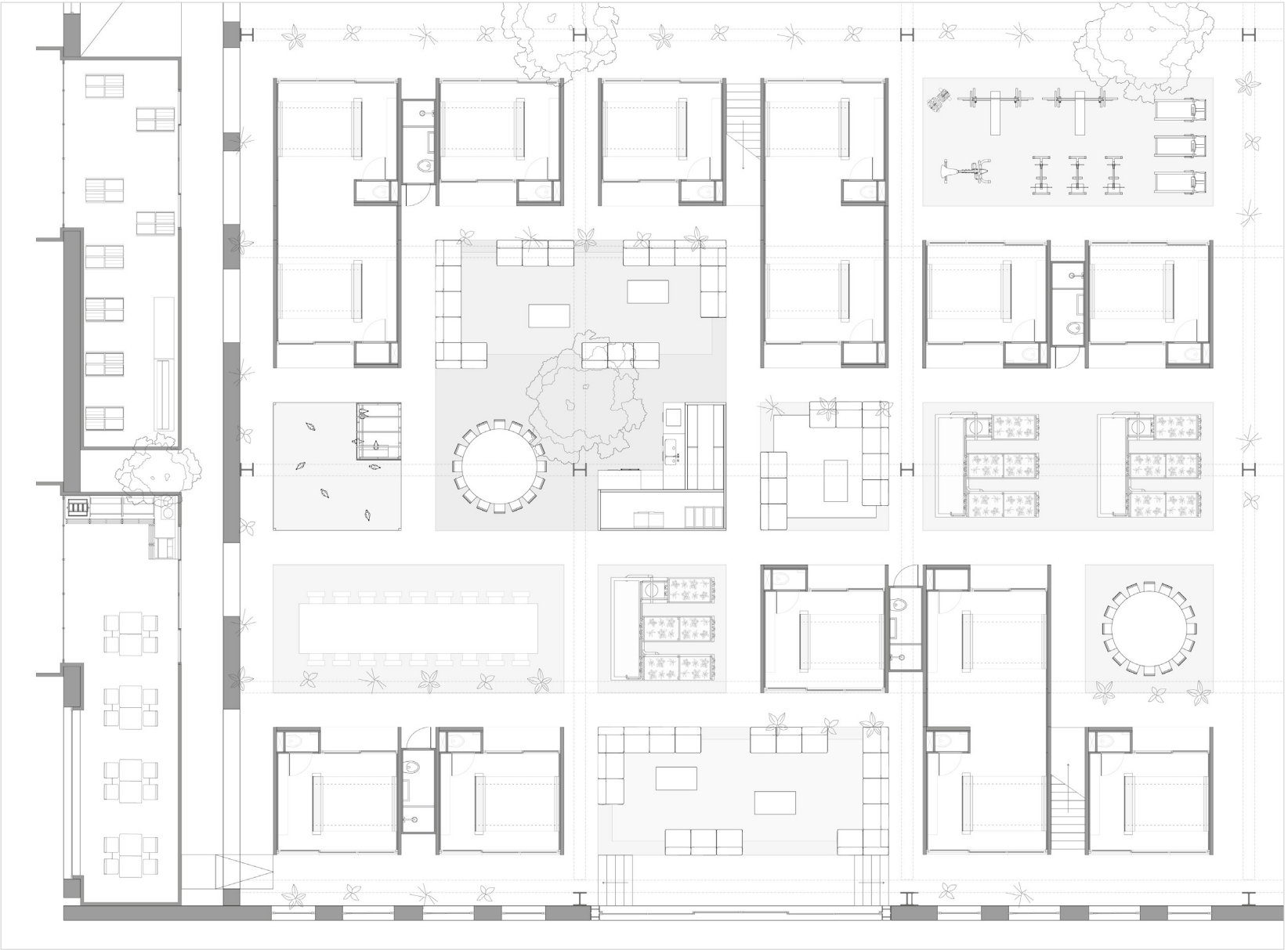




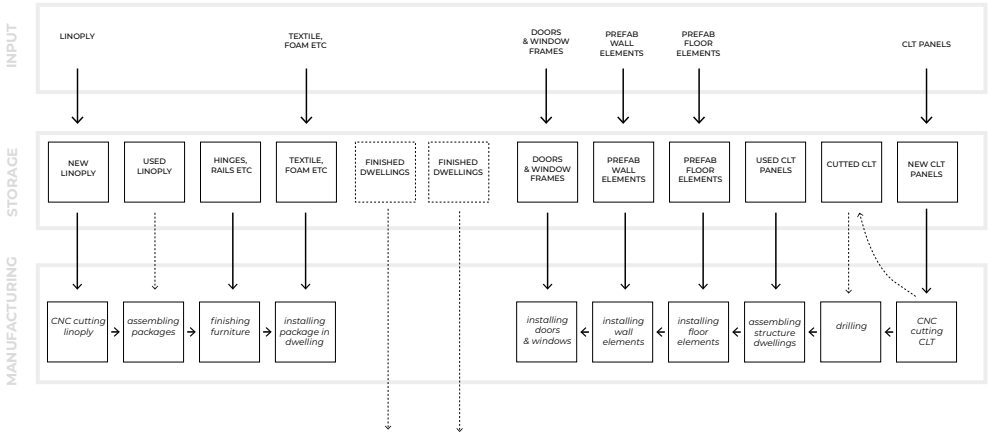
Routing.


NEW LINOPLY
USED LINOPLY
HINGES, RAILS ETC.
TEXTILE, FOAM ETC.
FINISHED DWELLINGS
FINISHED DWELLINGS
DOORS & WINDOW FRAMES
PREFAB WALL ELEMENTS
PREFAB FLOOR ELEMENTS
USED CLT PANELS
CUTTED CLT
NEW CLT PANELS
CNC cutting linoply
assembling packages
finishing furniture
installing package in dwelling
installing doors
installing wall elements
installing floor elements
assembling structure dwellings
drilling
CNC cutting CLT

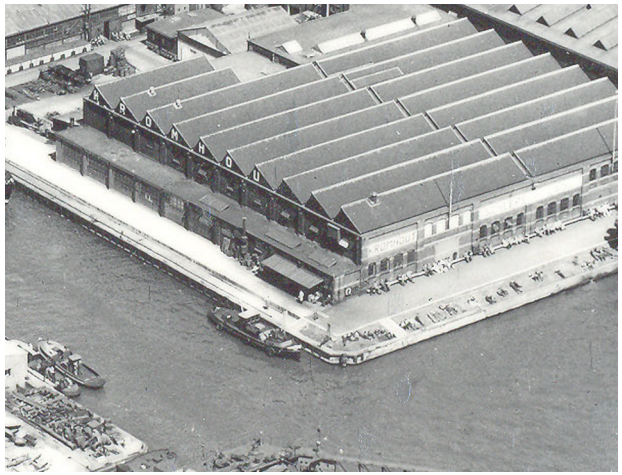
Neighborhood.

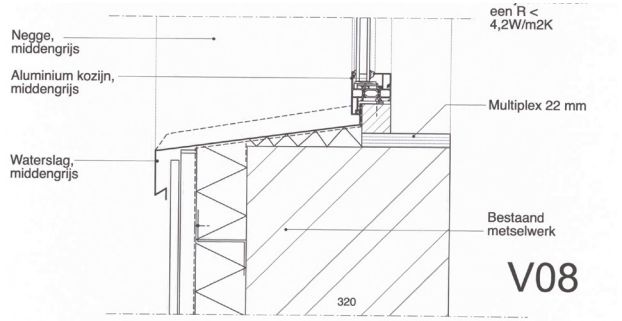


Factory.


INPUT
STORAGE
MANUFACTURING
LINOPLY
TEXTILE, FOAM ETC
DOORS & WINDOW FRAMES
PREFAB WALL ELEMENTS
PREFAB FLOOR ELEMENTS
CLT PANELS
NEW LINOPLY
USED LINOPLY
HINGES, RAILS ETC
TEXTILE, FOAM ETC
FINISHED DWELLINGS
FINISHED DWELLINGS
DOORS & WINDOW FRAMES
PREFAB WALL ELEMENTS
PREFAB FLOOR ELEMENTS
USED CLT PANELS
CUTTED CLT
NEW CLT PANELS
CNC cutting linoply
assembling packages
finishing furniture
installing package in dwelling
installing doors & windows
installing wall elements
installing floor elements
assembling structure dwellings
drilling
CNC cutting CLT

West facade.

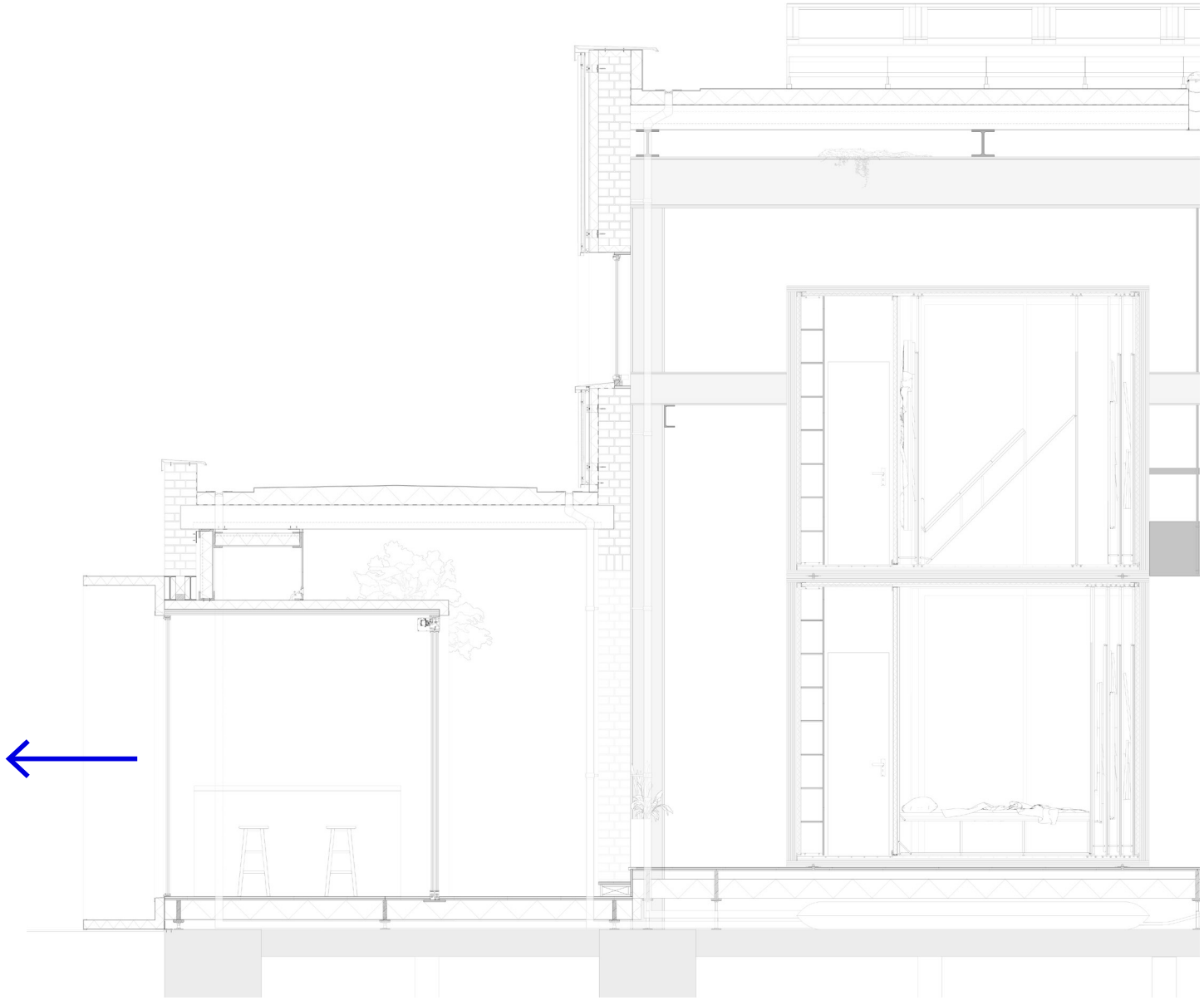




Principedetails teruggebrachte raamopeningen in westgevel (achter de golfplaat is de oude openingen in het metselwerk nog aanwezig)

alle maten in het werk controleren, alle afwijkingen bespreken met architect

CUBE architecten	in samenwerking met: Hendriks Schulten architecten deelnemer aan de architectengroep		V07/V08
projectnr. 1003	opdrachtgever	Eigen Haard	
schaal 1:5	projectnaam	Stork Terrein Noord	
formaat A4	onderwerp	principe details	
datum 16-04-2010	gewijzigd	20-05-2010	

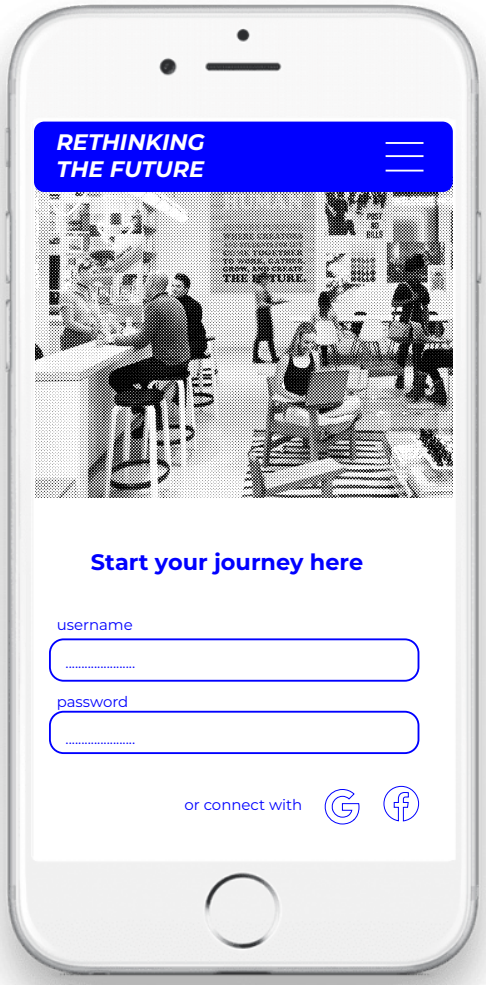


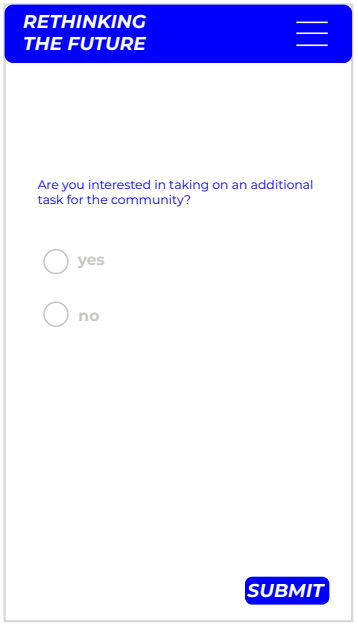
West facade.

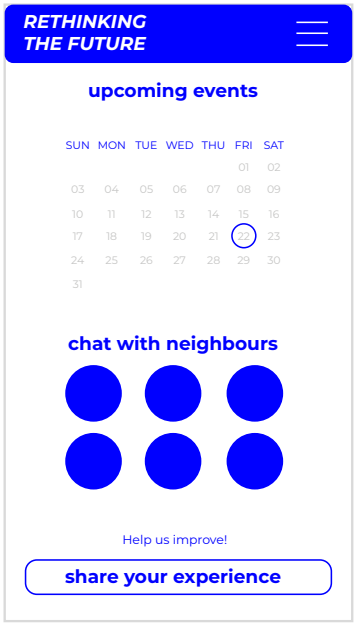
Timeline.

I. initiative II. development **III. pilot** IV. reflection & expansion

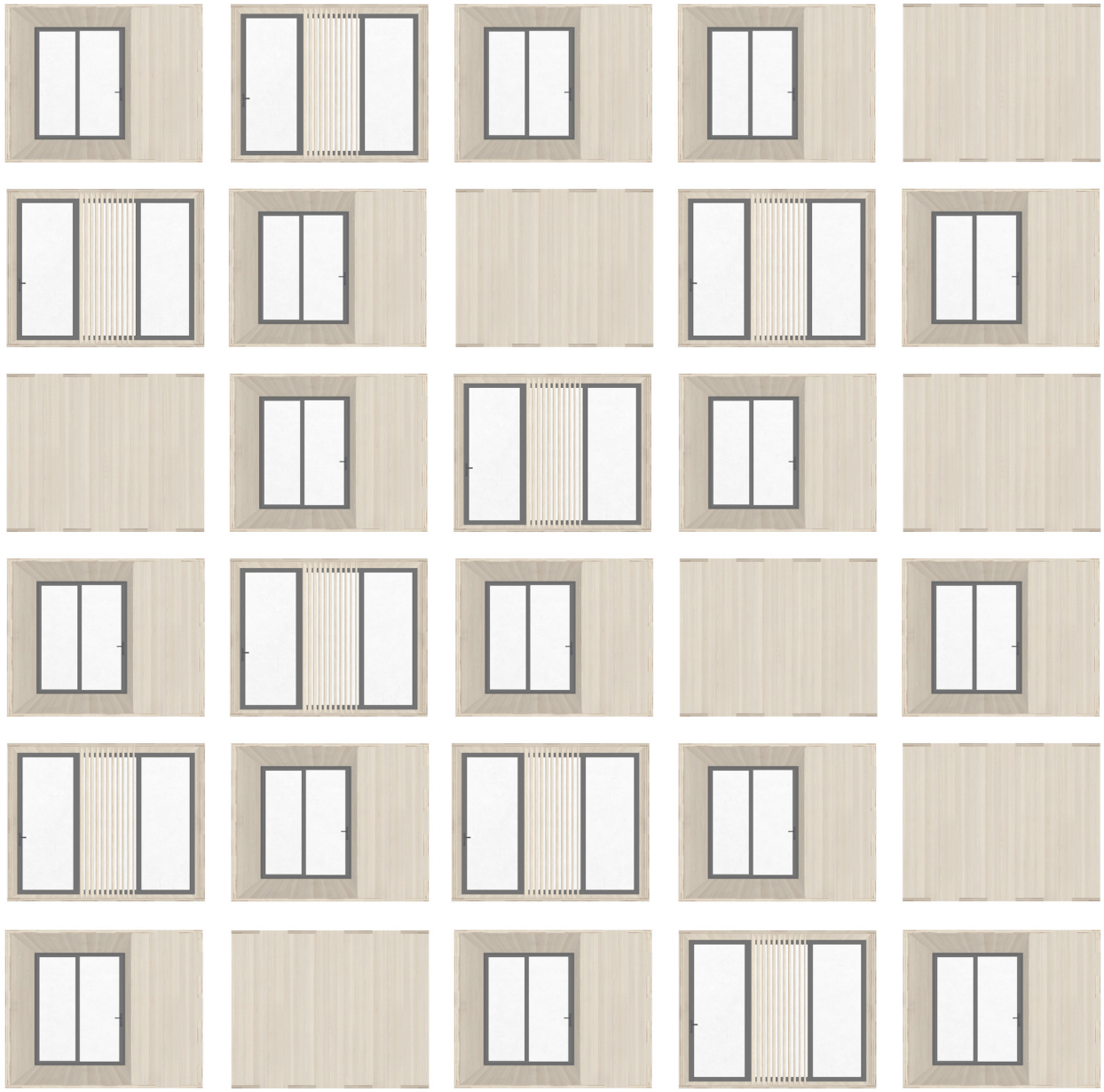
Subscription.







Personalisation.



Personalisation.

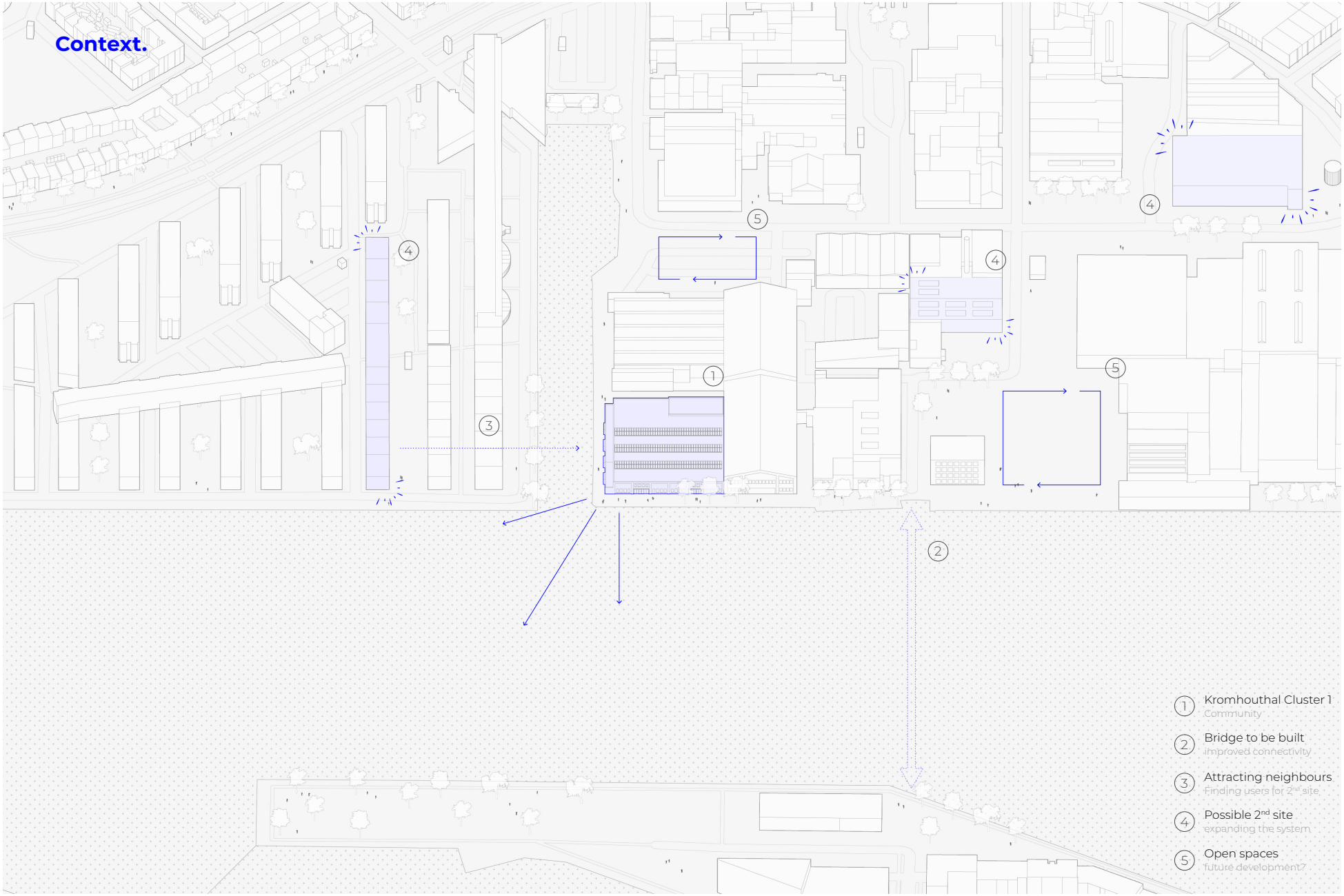
Atrium.

Living machine.

Timeline.

I. initiative II. development III. pilot **IV. reflection & expansion**

Context.


1 Kromhouthal Cluster 1
Community
2 Bridge to be built
improved connectivity
3 Attracting neighbours
Finding users for 2nd site
4 Possible 2nd site
expanding the system
5 Open spaces
future development?

Today, our world is in crisis...

... let’s act before it’s too late.

Maximum density.

Current situation:	NL average =	**65 m2/ person**
	AM average =	49 m2
New way of living:	dwelling =	14 m 2
	circulation area =	4 m2
	elements toolkit =	10,78 m2
		28,78 m2/ person

44,27%

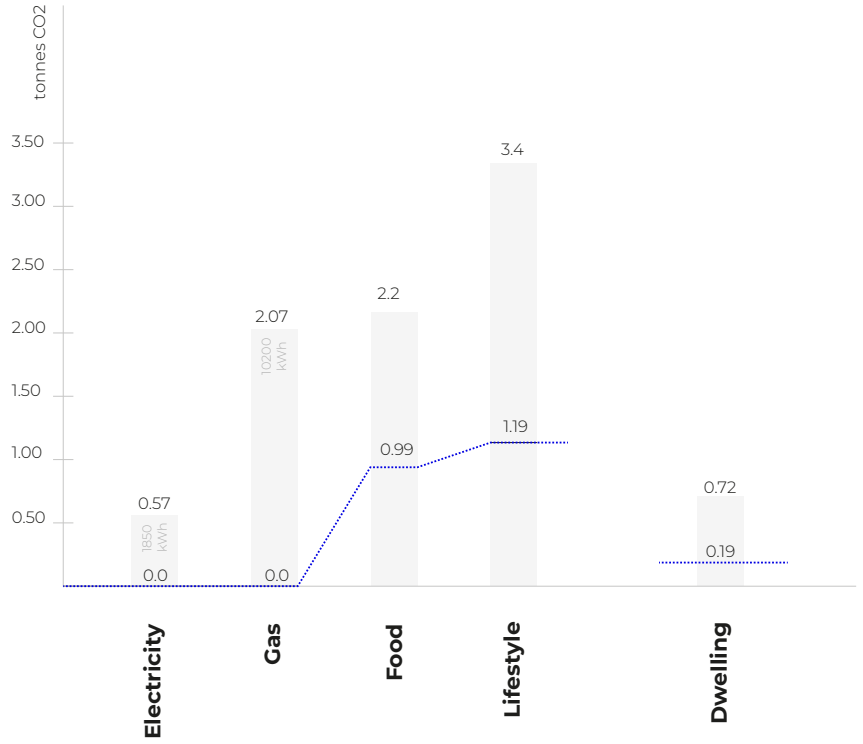
Maximum quality of life.

- affordable housing
- social contacts
- utlimate freedom
- a healty planet to live on

Current carbon footprint= **8,96 tonnes Co²**

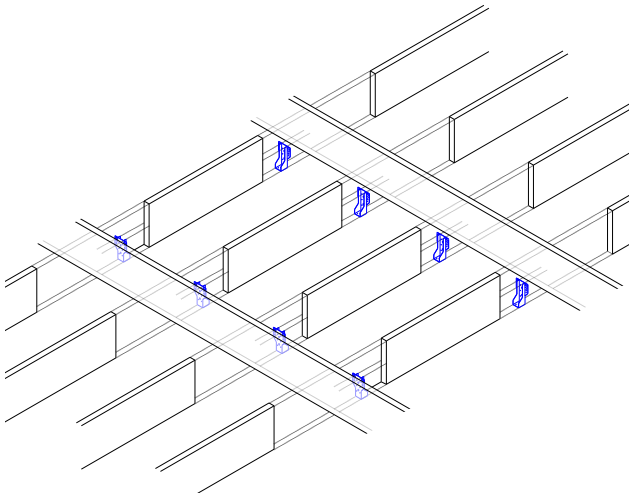
New carbon footprint= **2,37 tonnes CO²**

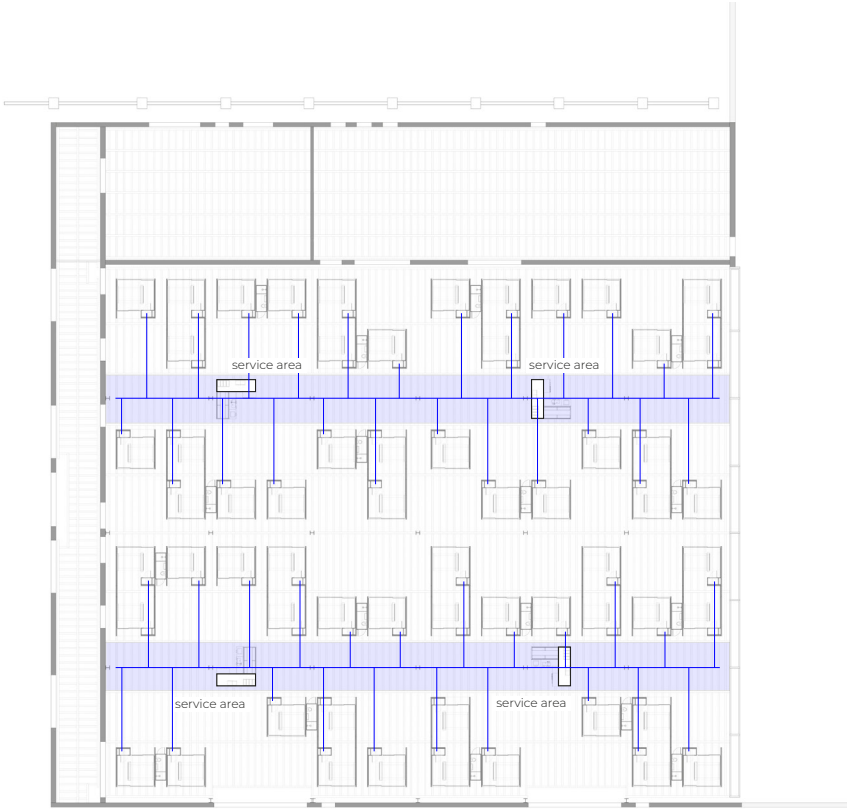
26,45%

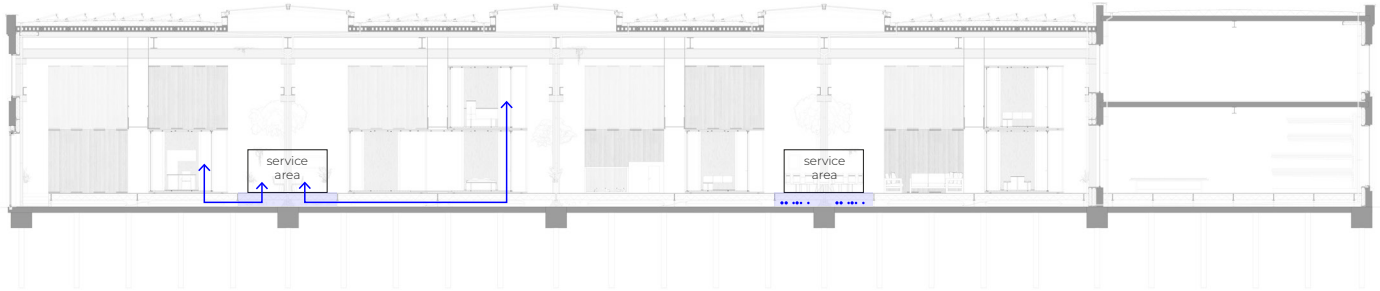


CLIMATE DESIGN.

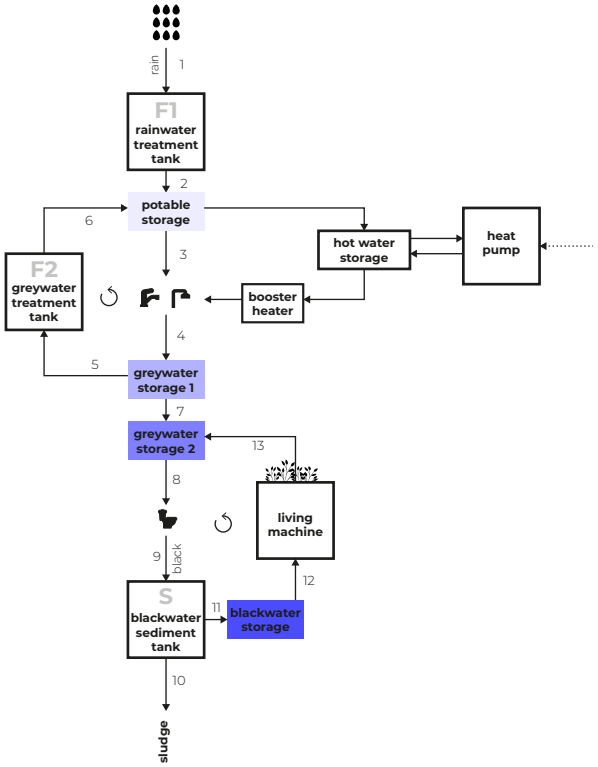
Raised floor.

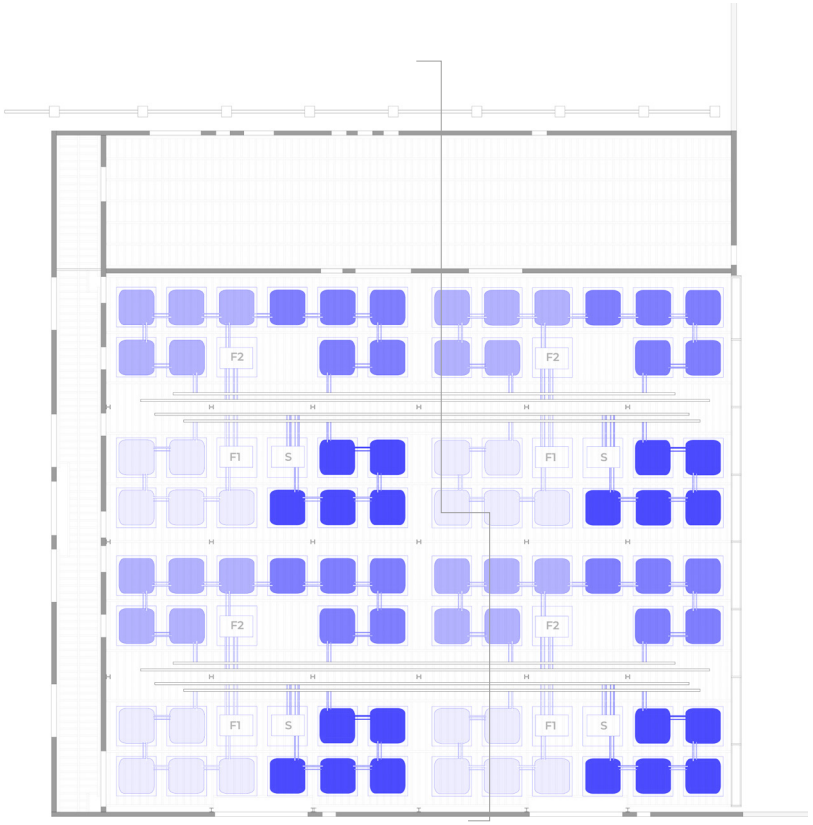


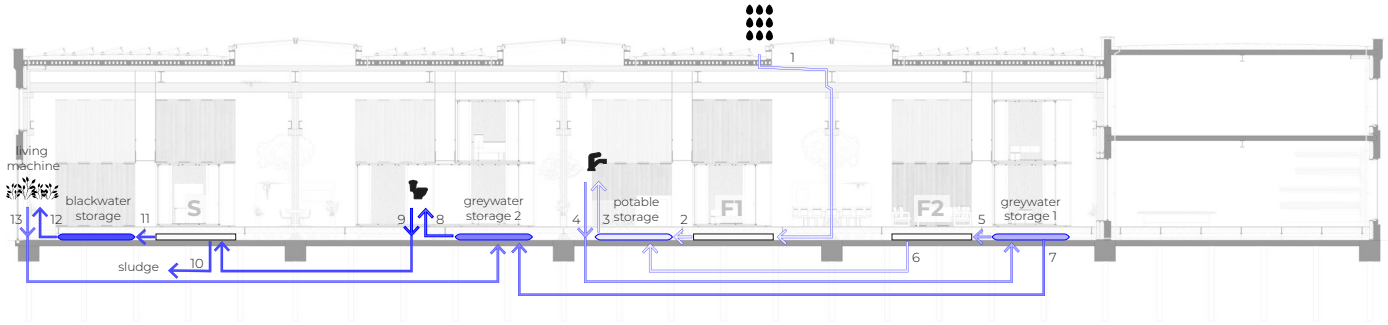




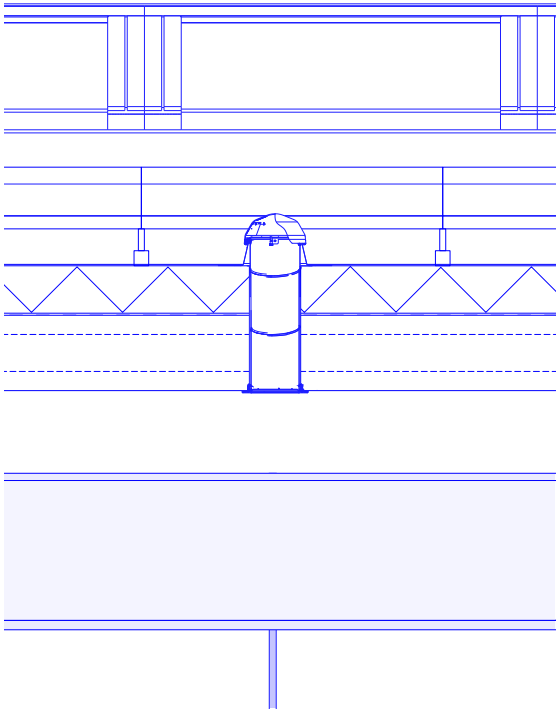
Water storage.

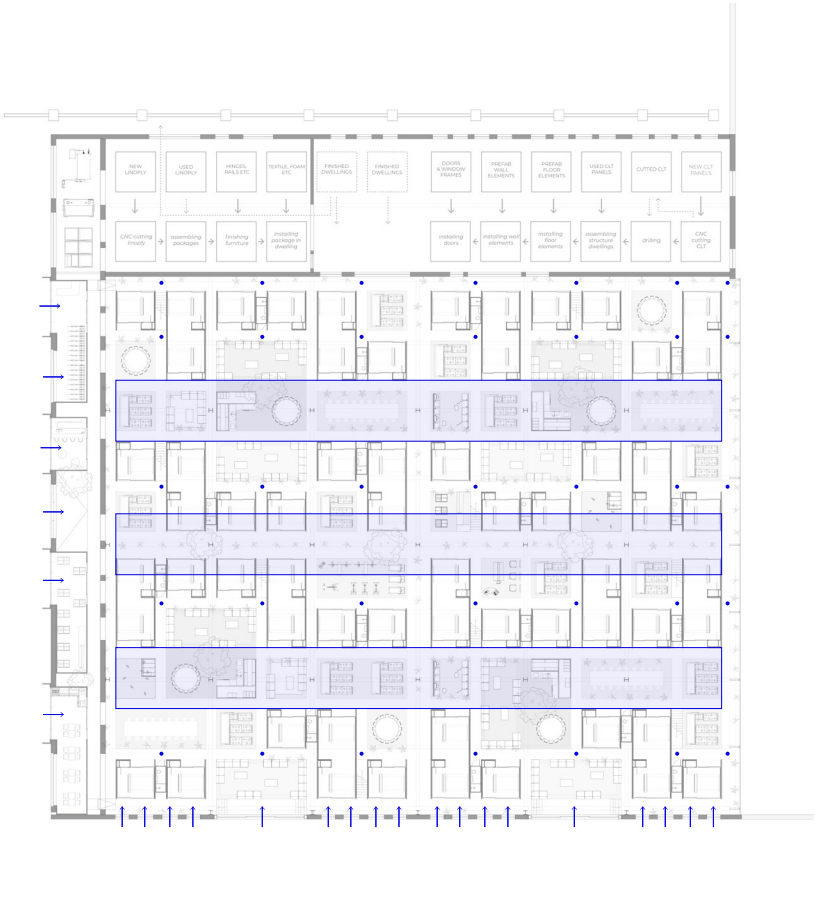






Daylight.




NEW LINDPLY
USED LINDPLY
HINGES, RAILS ETC
TEXTILE, FOAM ETC
FINISHED DWELLINGS
FINISHED DWELLINGS
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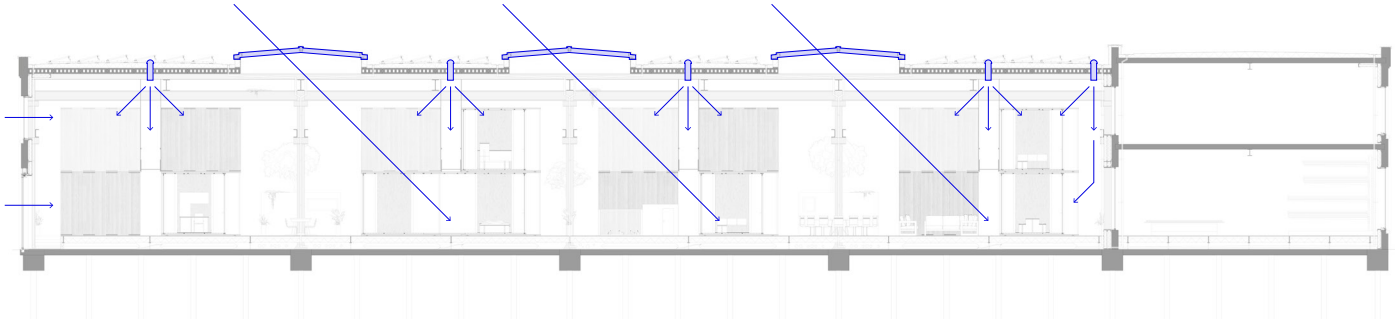
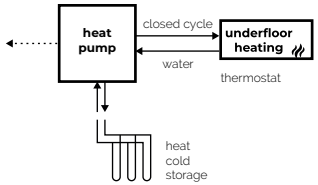
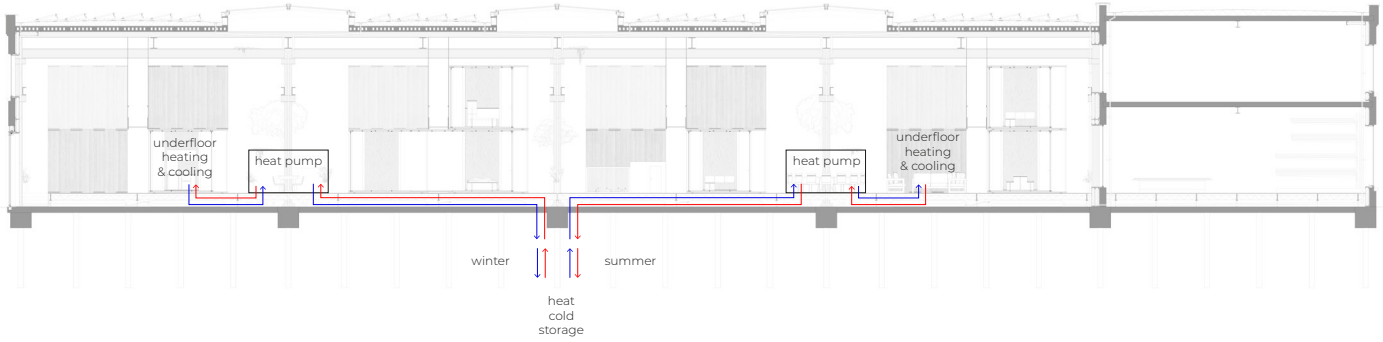
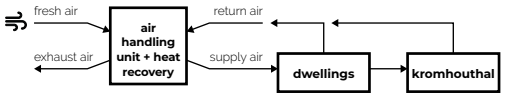


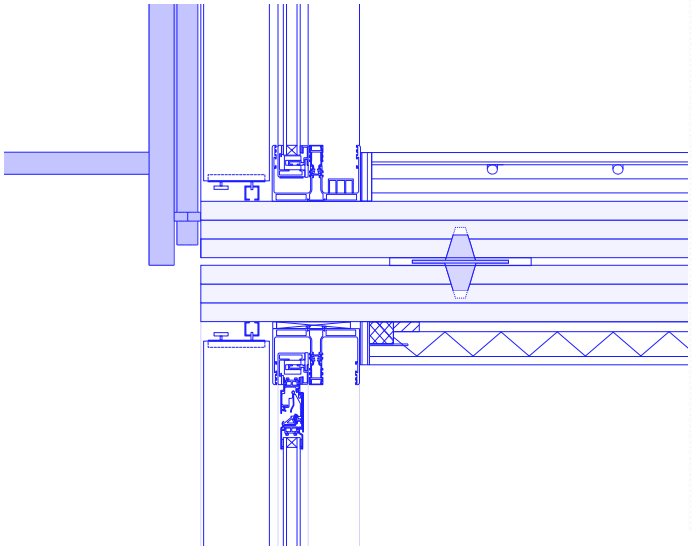
Underfloor heating & cooling.

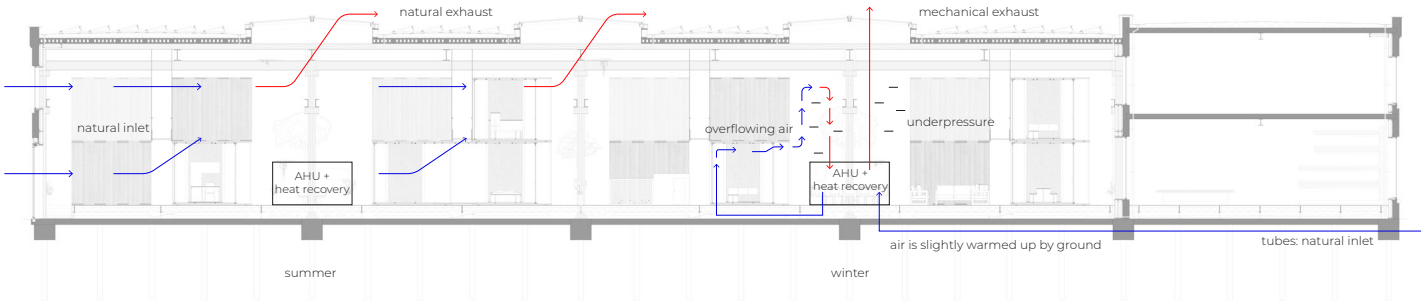




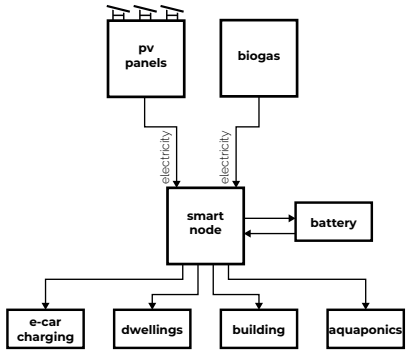
Ventilation.

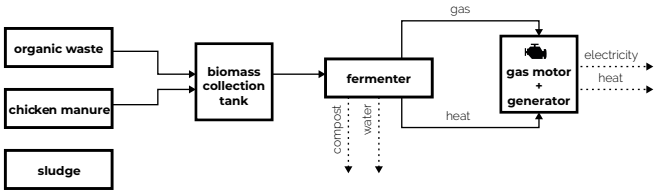


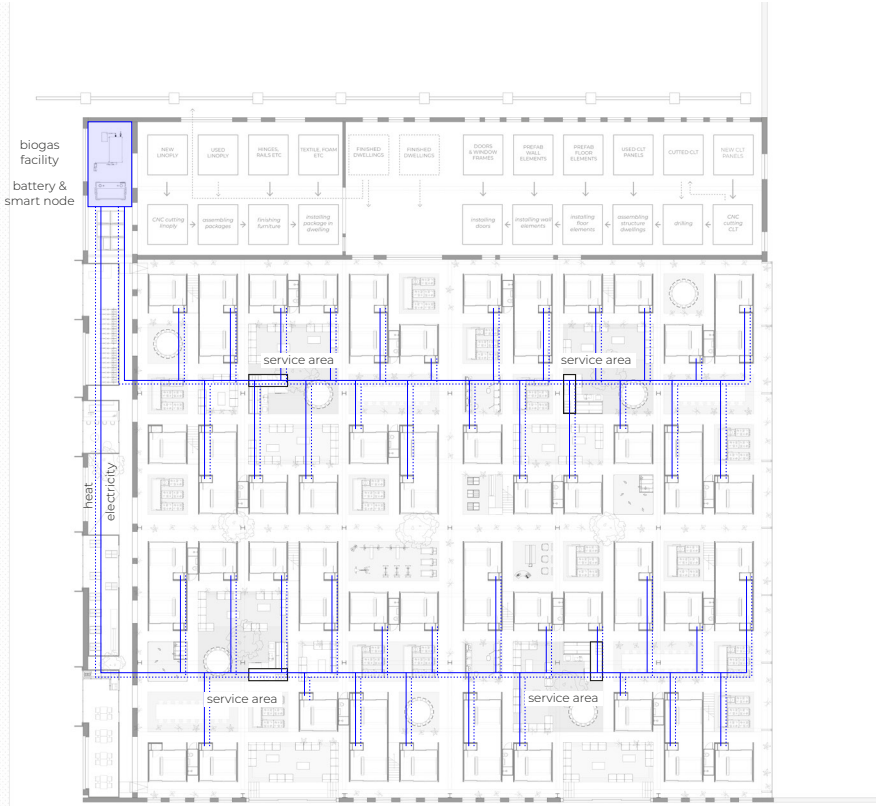


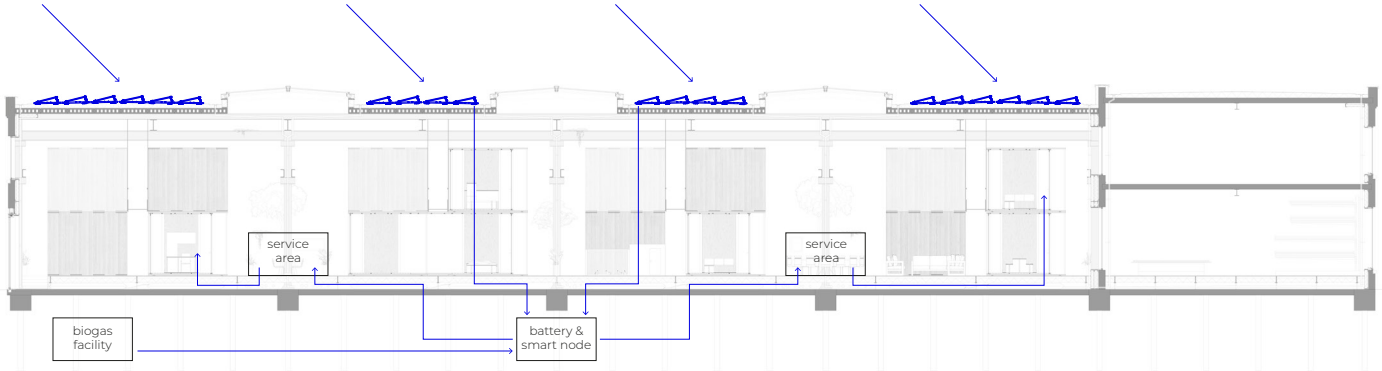


Electricity.

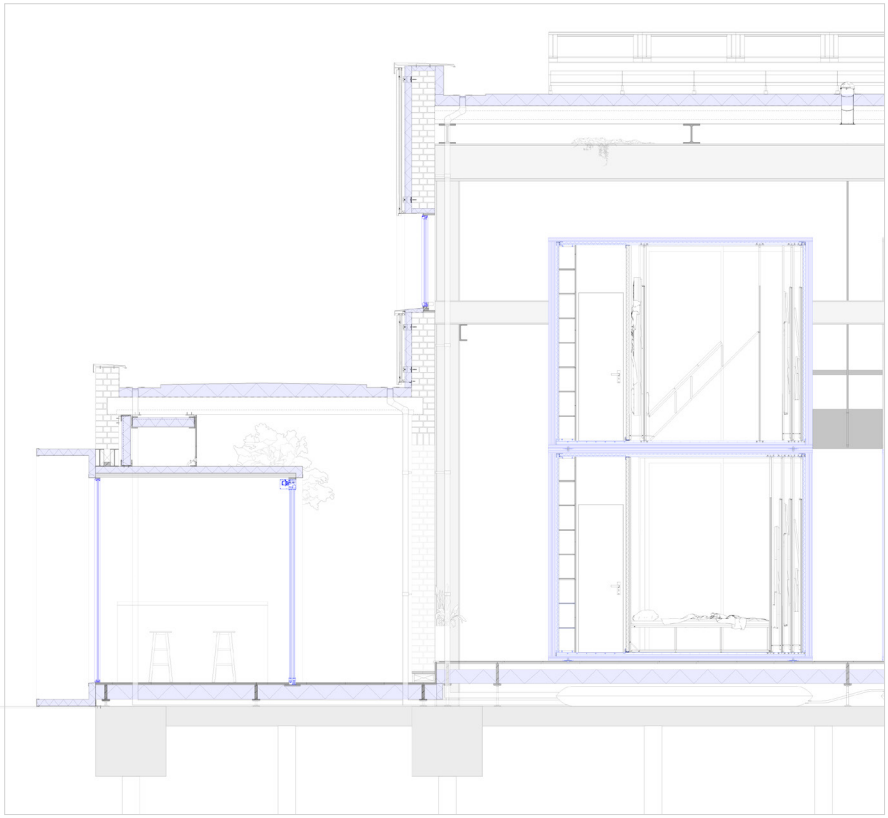


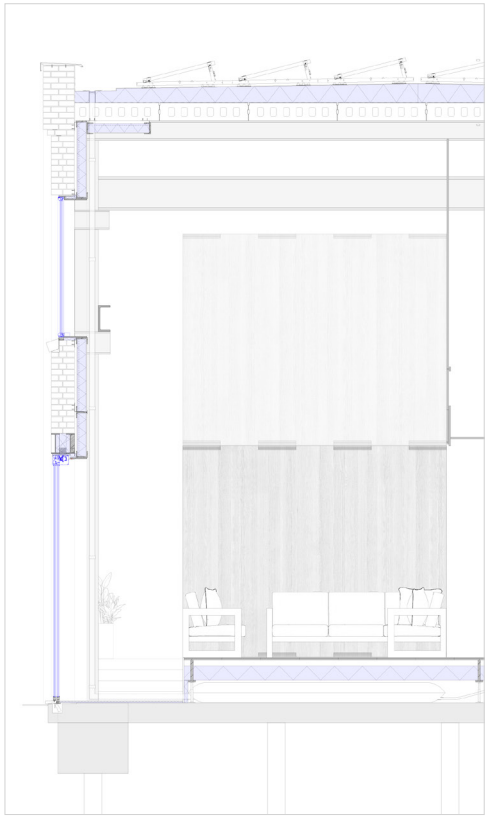


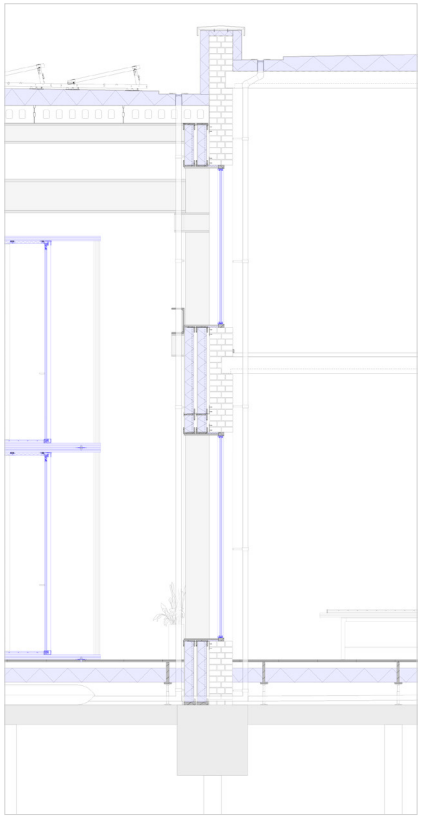




Insulation.



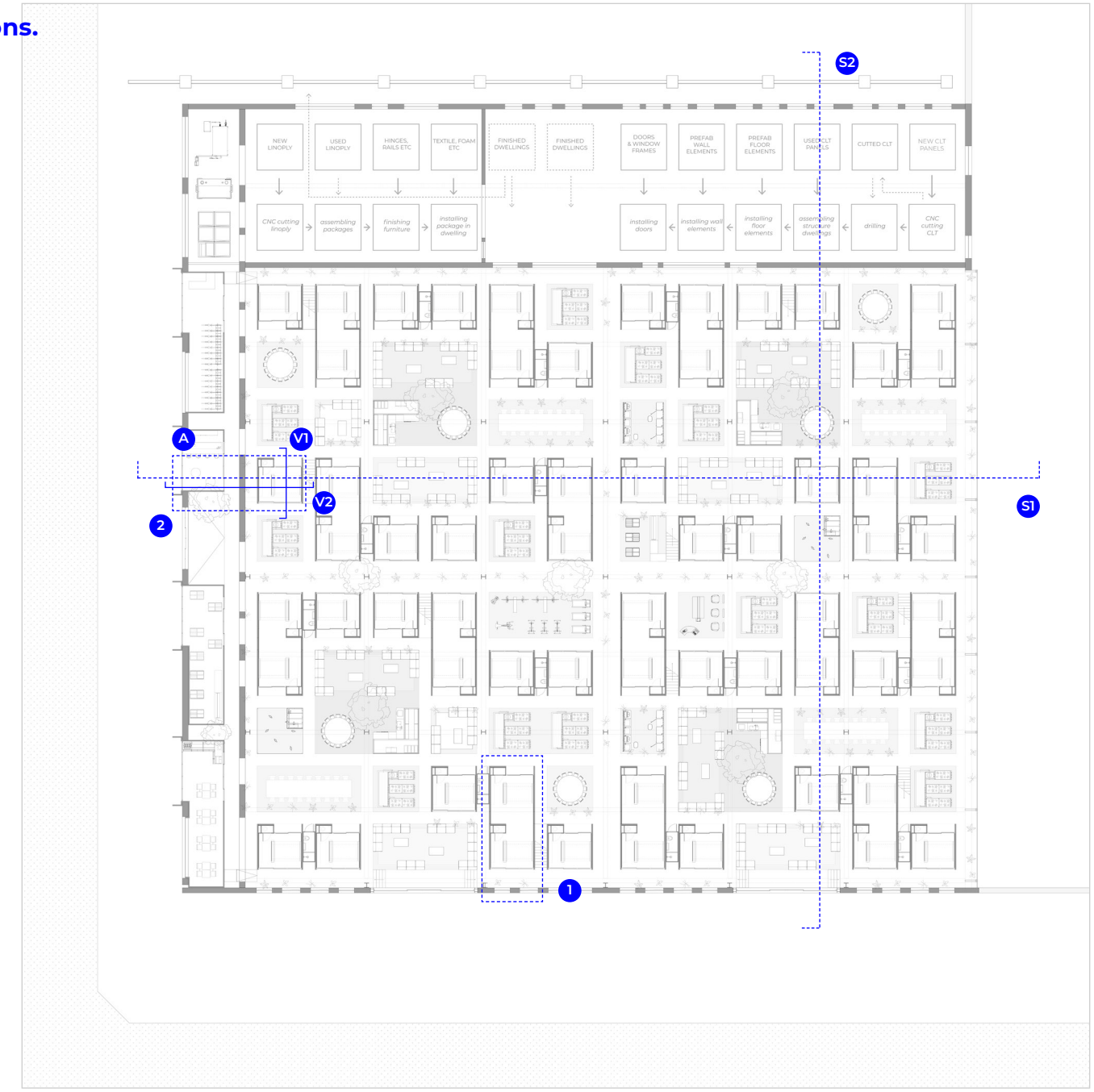




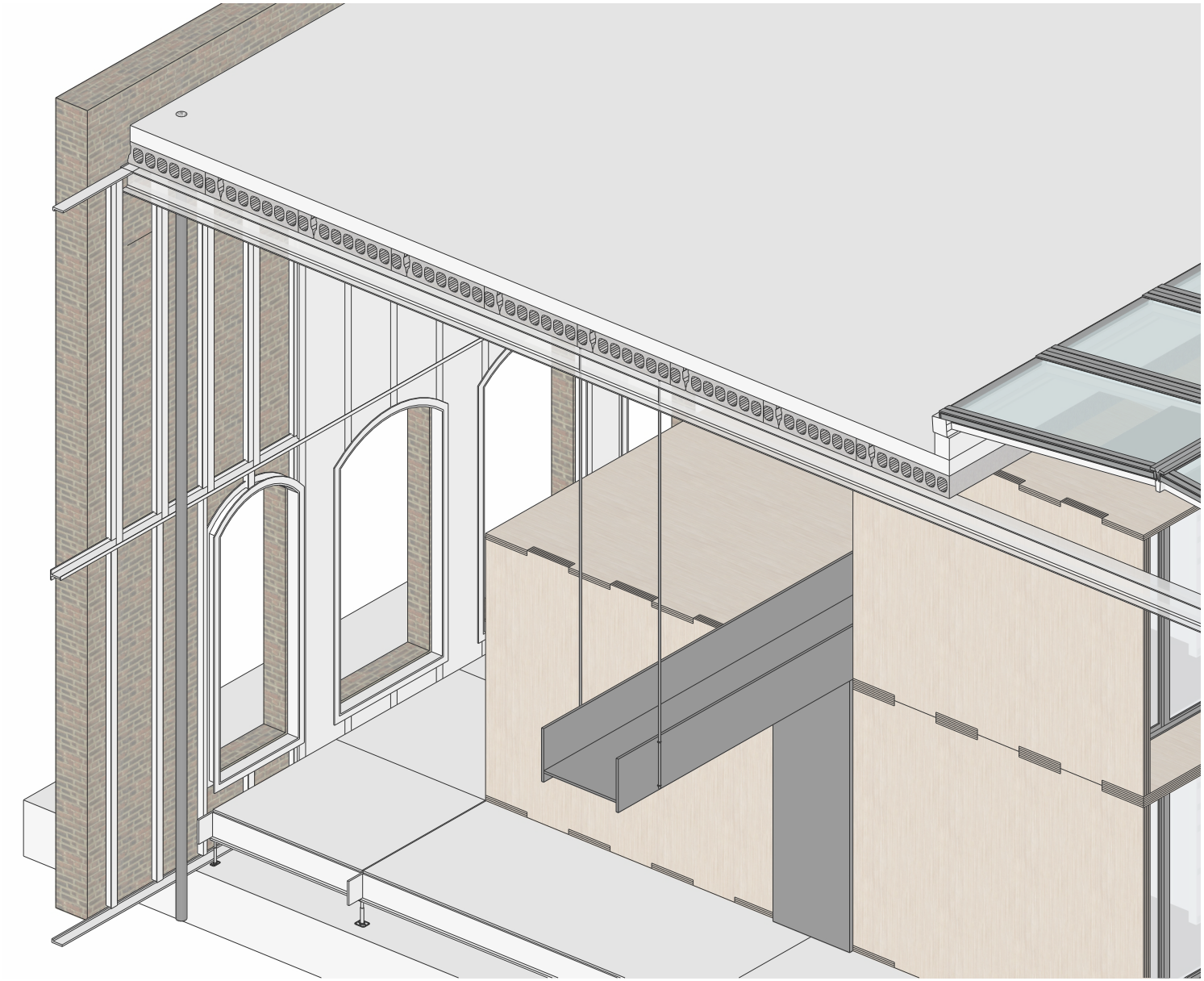
Landmark.

BUILDING TECHNOLOGY.

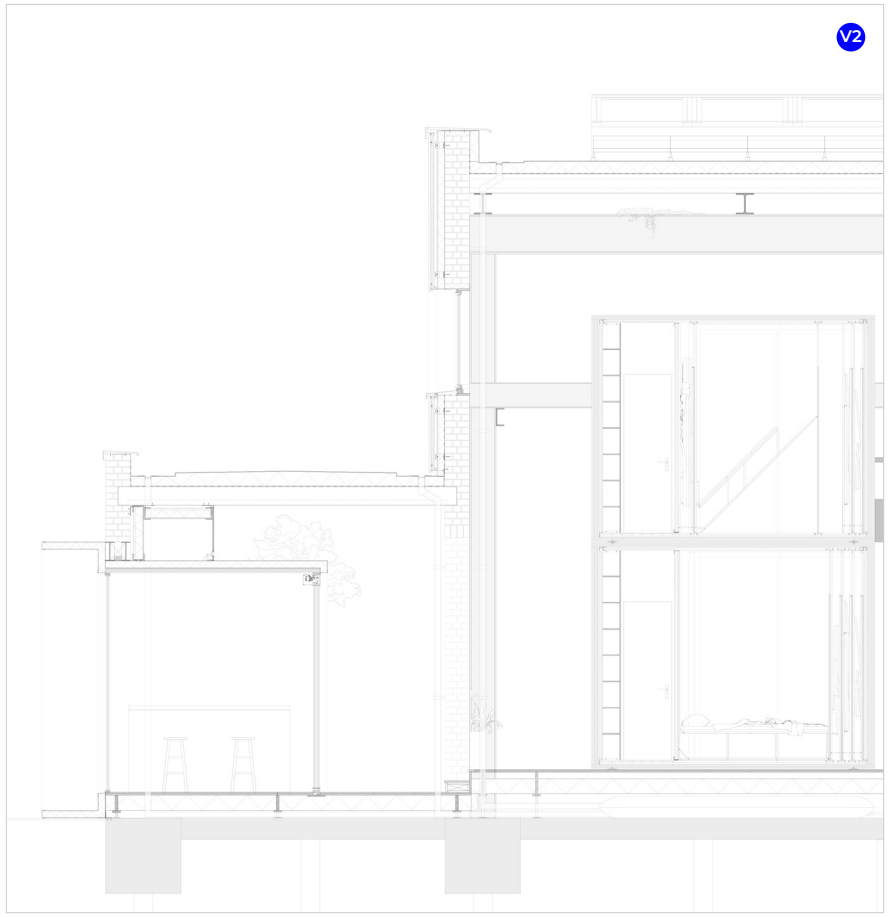
Details & sections.

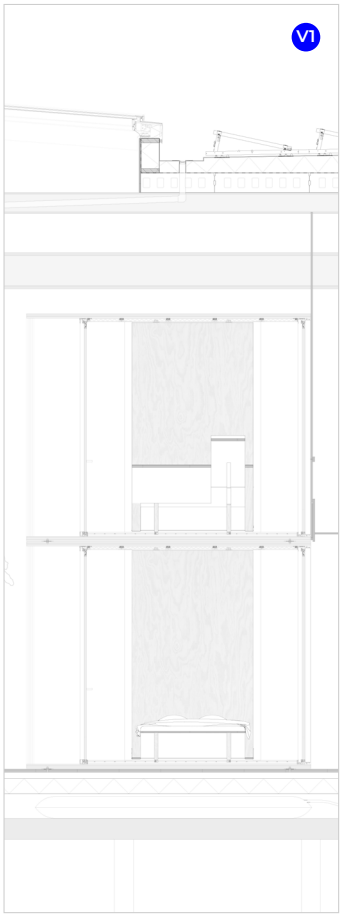


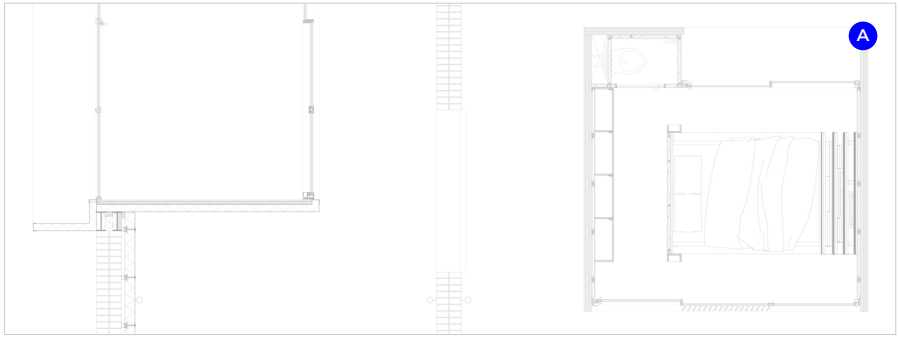
Fragment 1.



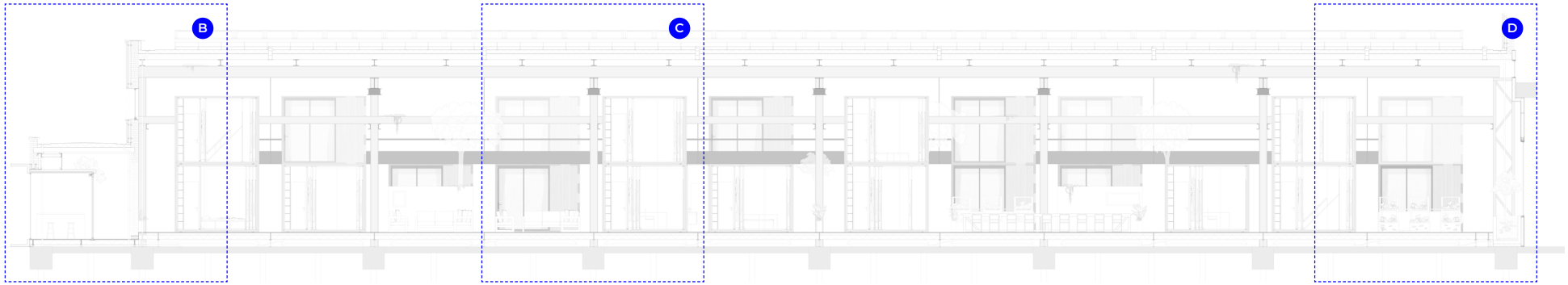
Fragment 2.



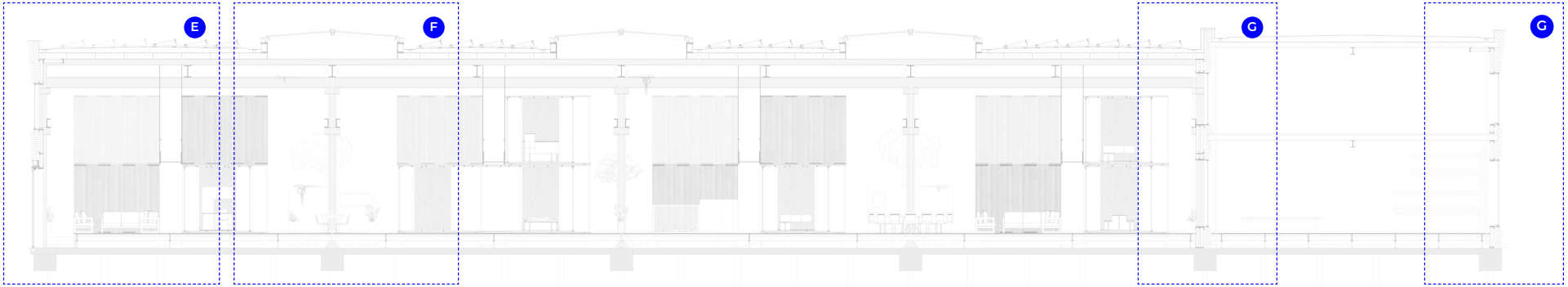




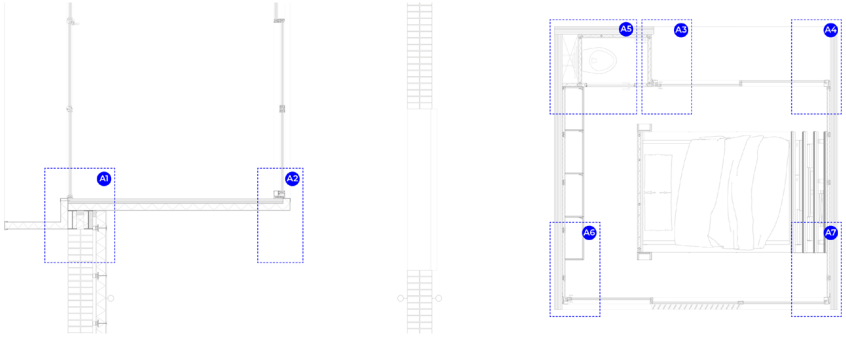
Section S1.



Section S2.

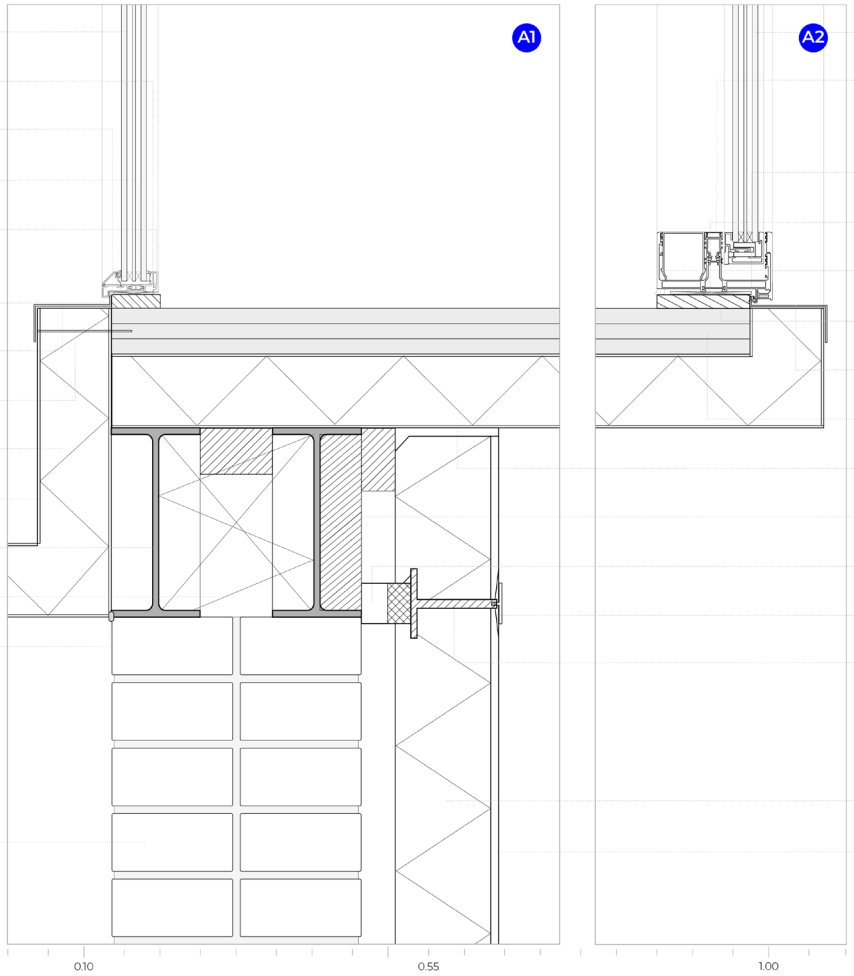


FRAGMENT | HORIZONTAL SECTION A | SCALE 1.100



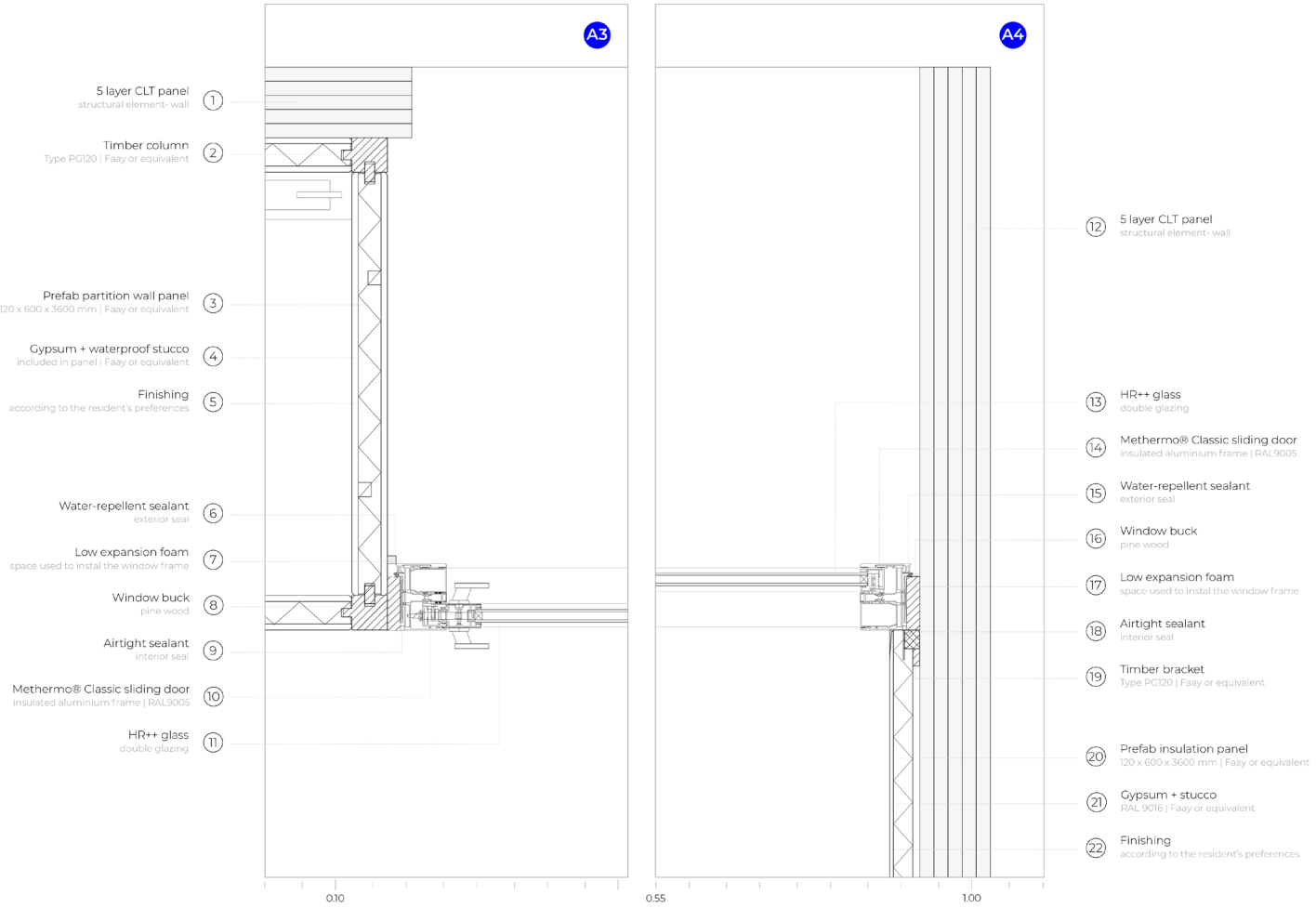
1.00 5.50 10.00

DETAIL DRAWINGS | HORIZONTAL SECTION A | SCALE 1.10

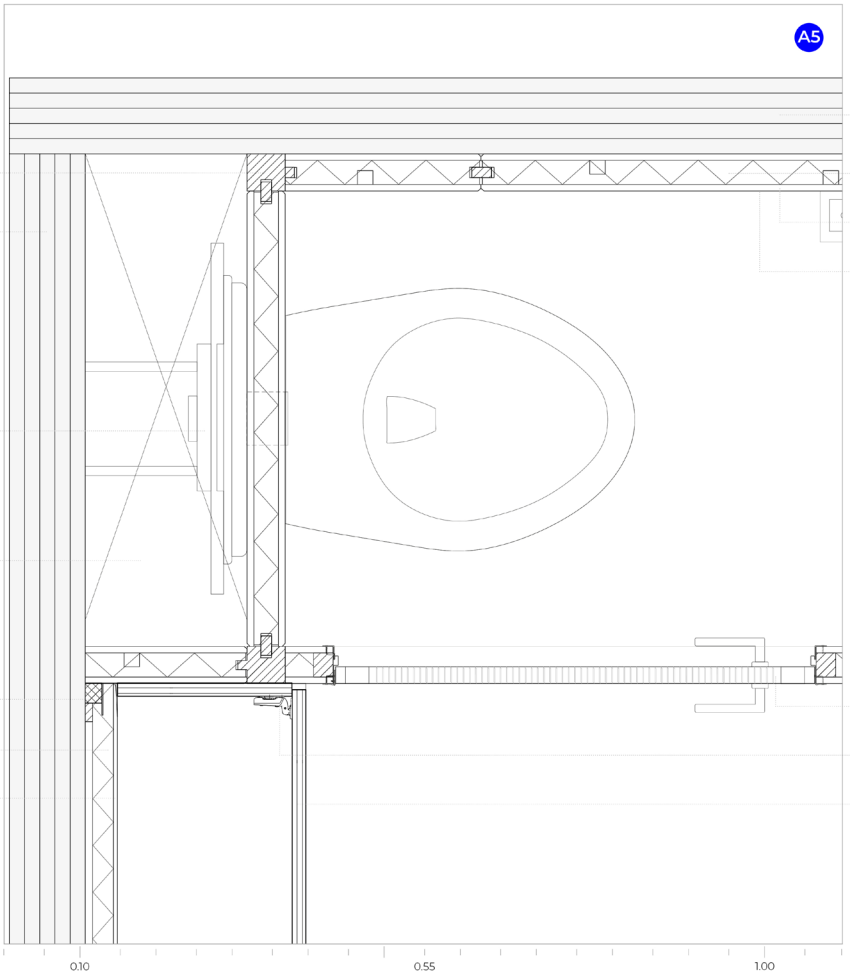


1. HR+++ glass
   triple glazing
2. Methermo® Classic fixed window
   insulated aluminium frame | RAL9005
3. Water-repellent sealant
   exterior seal
4. Low expansion foam
   space used to instal thel window frame
5. Airtight sealant
   interior seal
6. Window buck
   pine wood
7. Exterior flashing
   aluminium RAL 9005
8. Sandwich panel screw
   7 x 145 mm
9. Prefab sandwich panel- insulation
   100 mm insulation | Kingspan or equivalent
10. Prefab sandwich panel - finishing
    metal RAL 9005 | Kingspan or equivalent
11. Steel portal frame
    IPE 240
12. Baffles
    to make a rigid connection
13. Sealant
    to make a watertight seal
14. Brick wall
    English cross bond
15. HR+++ glass
    triple glazing
16. Omni Slide® slim door profile
    Aluminium frame | RAL 9005
17. Water-repellent sealant
    exterior seal
18. Low expansion foam
    space used to instal the window frame
19. Airtight sealant
    interior seal
20. Window buck
    pine wood
21. Exterior flashing
    aluminium RAL 9005
22. 3 layer CLT panel
    structural element- wall
23. Foam
    to close the gap
24. Multiplex 40 x 246 x 200 mm
    to mount the steel bracket
25. Steel angle bracket
    requires a notch in the timber bracket
26. Click profile
    panels fixed without visible screws
27. Timber bracket
    Type PC120 | Faay or equivalent
28. Prefab insulation panel
    120 x 600 x 3600 mm | Faay or equivalent
29. Gypsum with finishing
    RAL 9016 | Faay or equivalent

DETAIL DRAWINGS | HORIZONTAL SECTION A | SCALE 1.10



DETAIL DRAWINGS | HORIZONTAL SECTION A | SCALE 1.10



1 Timber column
Type PG120 | Faay or equivalent

2 5 layer CLT panel
structural element- wall

3 Space-saving conceiled cistern
Geberit Duofix Sigma UP720 or equivalent

4 Space for piping
max slope of the pipes is 300 mm

5 Timber bracket
Type PG120 | Faay or equivalent

6 Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent

7 Gypsum + finishing
RAL 9016 | Faay or equivalent

8 5 layer CLT panel
structural element- wall

9 Prefab partition wall panel
120 x 600 x 3600 mm | Faay or equivalent

10 Gypsum + waterproof stucco
included in panel | Faay or equivalent

11 Finishing
according to the resident's preferences

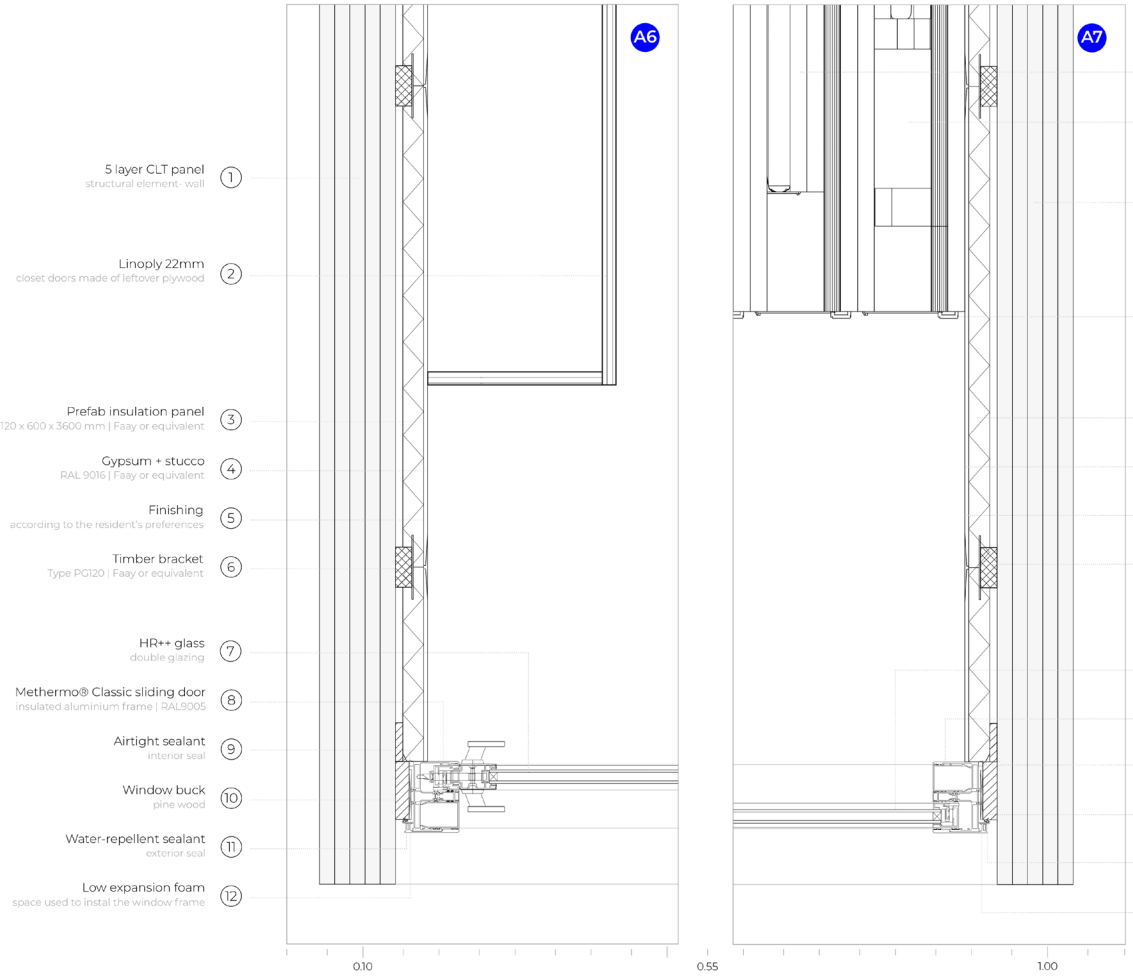
12 Trimless door frame
EzyJamb EZC Classic or equivalent

13 Flush door
RAL 9016

14 Hinge
to open the closet door

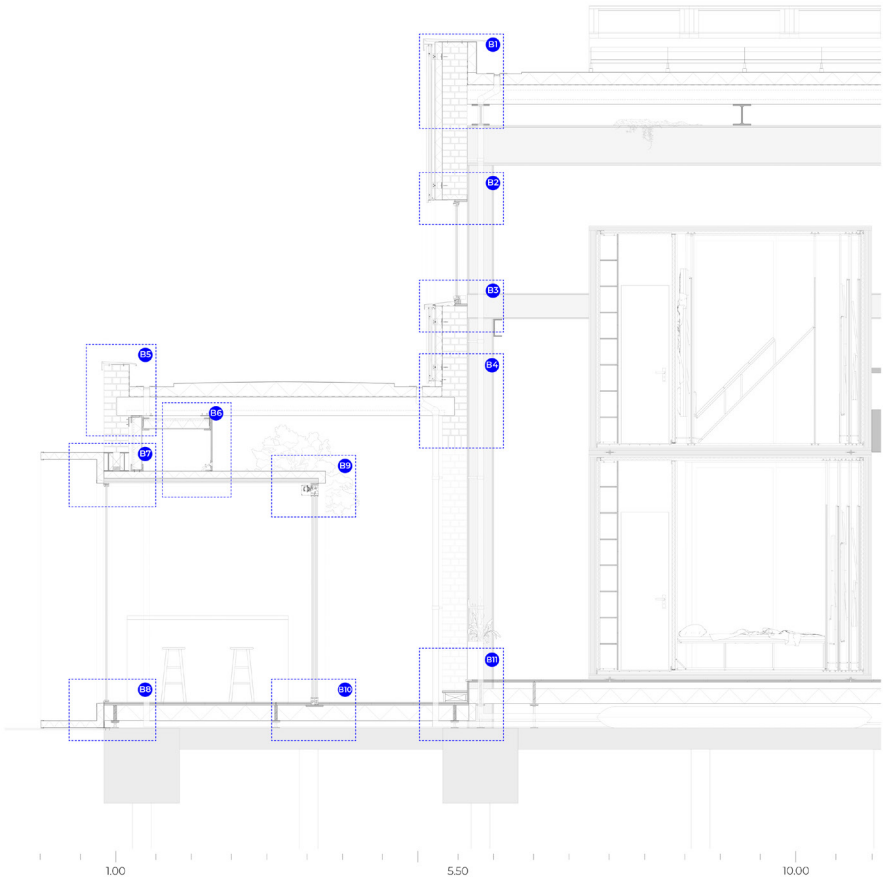
15 Linoply 22mm
closet doors made of leftover plywood

DETAIL DRAWINGS | HORIZONTAL SECTION A | SCALE 1.10

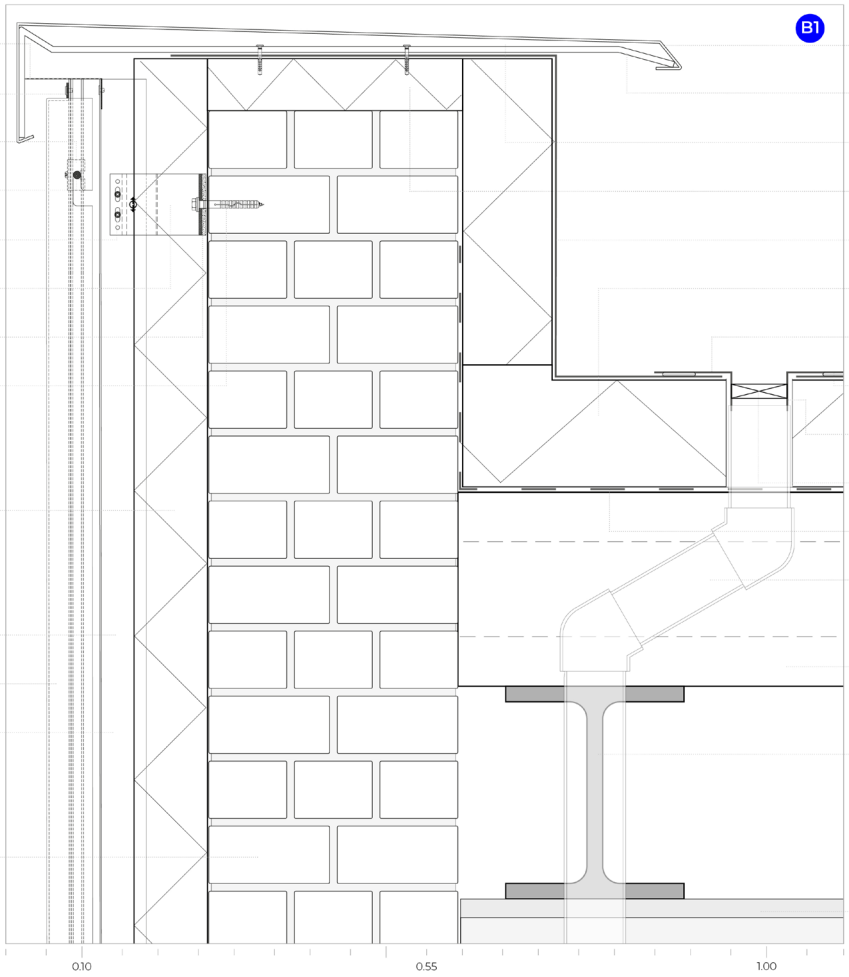


1. 5 layer CLT panel
   structural element- wall
2. Linoply 22mm
   closet doors made of leftover plywood
3. Prefab insulation panel
   120 x 600 x 3600 mm | Faay or equivalent
4. Gypsum + stucco
   RAL 9016 | Faay or equivalent
5. Finishing
   according to the resident's preferences
6. Timber bracket
   Type PG120 | Faay or equivalent
7. HR++ glass
   double glazing
8. Methermo® Classic sliding door
   insulated aluminium frame | RAL9005
9. Airtight sealant
   interior seal
10. Window buck
    pine wood
11. Water-repellent sealant
    exterior seal
12. Low expansion foam
    space used to instal the window frame
13. Package - relaxing
    containing furniture
14. Package - eating
    containing furniture
15. 5 layer CLT panel
    structural element- wall
16. Bracket
    allowing the floor panel to move
17. Prefab insulation panel
    120 x 600 x 3600 mm | Faay or equivalent
18. Gypsum + stucco
    RAL 9016 | Faay or equivalent
19. Finishing
    according to the resident's preferences
20. Timber bracket
    Type PC120 | Faay or equivalent
21. HR++ glass
    double glazing
22. Methermo® Classic sliding door
    insulated aluminium frame | RAL9005
23. Airtight sealant
    interior seal
24. Window buck
    pine wood
25. Water-repellent sealant
    exterior seal
26. Low expansion foam
    space used to instal the window frame

FRAGMENT | VERTICAL SECTION B | SCALE 1.100

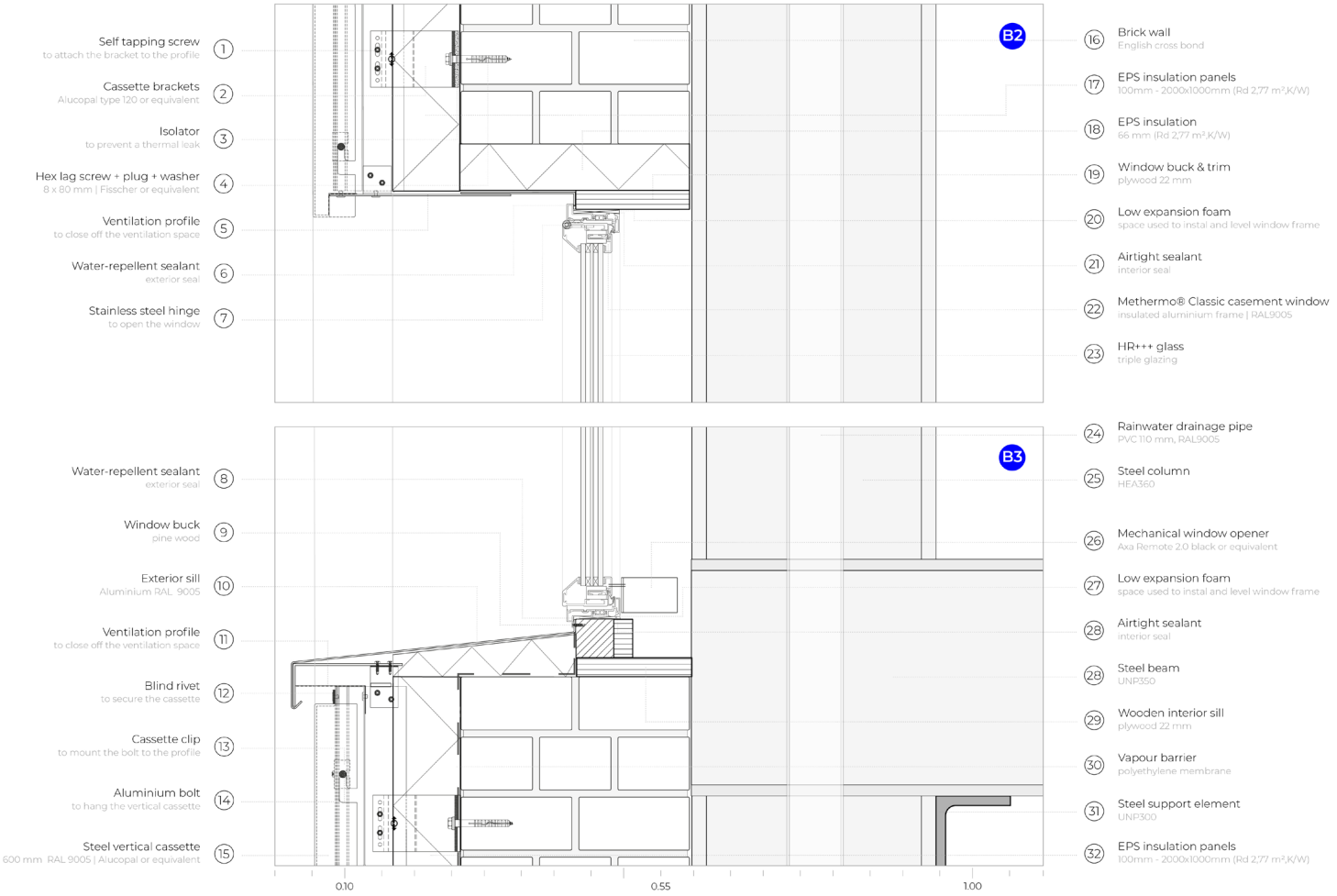


DETAIL DRAWINGS | VERTICAL SECTION B | SCALE 1.10



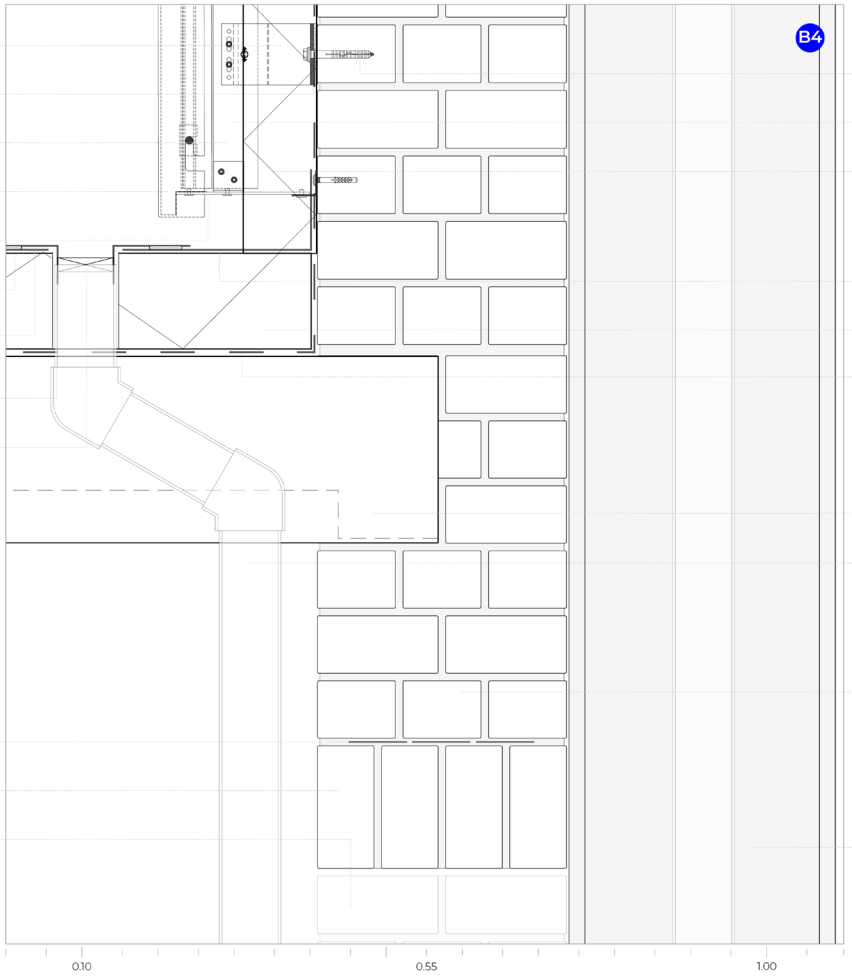
1. Ventilation profile
   to close off the ventilation space
2. Blind rivet
   to secure the cassette
3. Cassette clip
   to mount the bolt to the profile
4. Aluminium bolt
   to hang the vertical cassette
5. Self tapping screw
   to attach the bracket to the profile
6. Cassette brackets
   Alucopal type 120 or equivalent
7. Isolator
   to prevent a thermal leak
8. Hex lag screw + plug + washer
   8 x 80 mm | Fisscher or equivalent
9. EPS insulation panels
   100mm - 2000x1000mm (Rd 2,77 m²,K/W)
10. Omega profile
    invisible cladding fixing system
11. Steel vertical cassette
    600 mm RAL 9005 | Alucopal or equivalent
12. Ventilation space
    allows air circulation between wall and cladding
13. Brick wall
    English cross bond
14. Aluminium coping cover
    RAL9005
15. Continuous cleat
    to secure the coping cover
16. Sealant strip
    Neoprene (factory applied)
17. Hammer-in plug
    6 x 40 mm
18. EPDM membrane
    non-reinforced roofing membrane
19. Tapered EPS insulation panels
    1200x1000 mm | 1000 -> 16 mm
20. EPDM sealing collar
    to seal the rainwater drainage
21. EPDM sealant
    to make a watertight seal
22. EPDM glue
    to fix the collar to the pipe
23. Clamping ring
    to clamp the membrane
24. Vapour barrier
    polyethylene membrane
25. Rainwater drainage pipe
    PVC 110 mm, RAL9005
26. Hollow core slab floor
    255 x 600 x 3300 mm
27. Steel beam
    IPE 270
28. Steel beam
    IPE 500

DETAIL DRAWINGS | VERTICAL SECTION B | SCALE 1.10



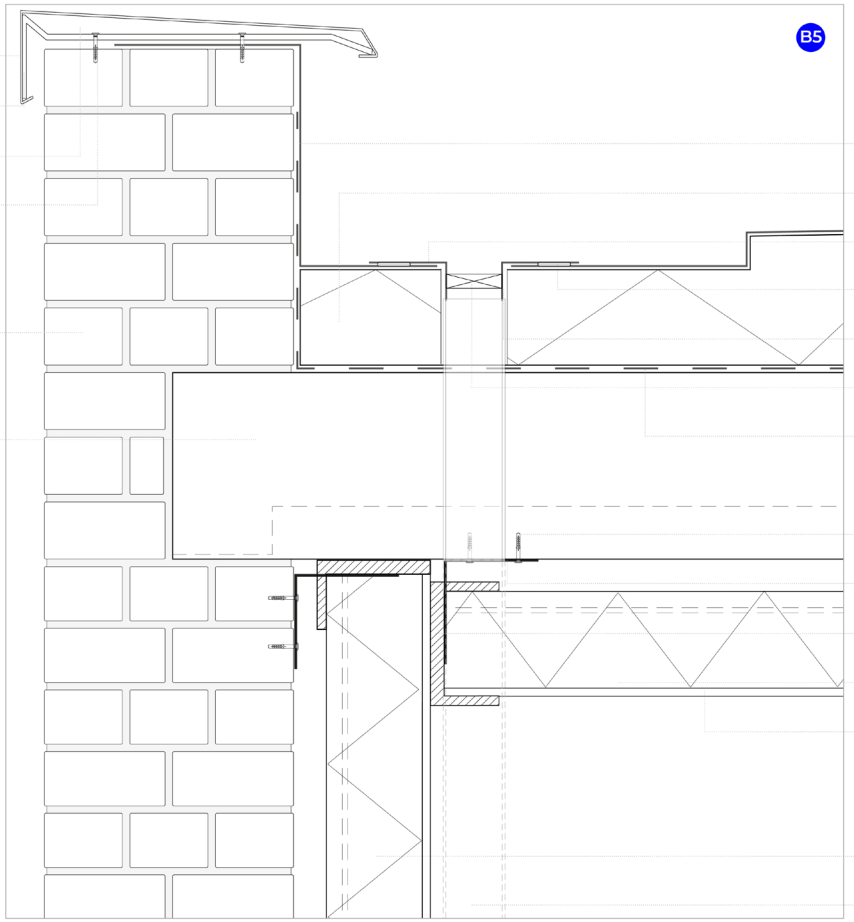
1. Self tapping screw — to attach the bracket to the profile
2. Cassette brackets — Alucopal type 120 or equivalent
3. Isolator — to prevent a thermal leak
4. Hex lag screw + plug + washer — 8 x 80 mm | Fisscher or equivalent
5. Ventilation profile — to close off the ventilation space
6. Water-repellent sealant — exterior seal
7. Stainless steel hinge — to open the window
8. Water-repellent sealant — exterior seal
9. Window buck — pine wood
10. Exterior sill — Aluminium RAL 9005
11. Ventilation profile — to close off the ventilation space
12. Blind rivet — to secure the cassette
13. Cassette clip — to mount the bolt to the profile
14. Aluminium bolt — to hang the vertical cassette
15. Steel vertical cassette — 600 mm RAL 9005 | Alucopal or equivalent
16. Brick wall — English cross bond
17. EPS insulation panels — 100mm - 2000x1000mm (Rd 2,77 m²,K/W)
18. EPS insulation — 66 mm (Rd 2,77 m²,K/W)
19. Window buck & trim — plywood 22 mm
20. Low expansion foam — space used to instal and level window frame
21. Airtight sealant — interior seal
22. Methermo® Classic casement window — insulated aluminium frame | RAL9005
23. HR+++ glass — triple glazing
24. Rainwater drainage pipe — PVC 110 mm, RAL9005
25. Steel column — HEA360
26. Mechanical window opener — Axa Remote 2.0 black or equivalent
27. Low expansion foam — space used to instal and level window frame
28. Airtight sealant — interior seal
28. Steel beam — UNP350
29. Wooden interior sill — plywood 22 mm
30. Vapour barrier — polyethylene membrane
31. Steel support element — UNP300
32. EPS insulation panels — 100mm - 2000x1000mm (Rd 2,77 m²,K/W)

DETAIL DRAWINGS | VERTICAL SECTION B | SCALE 1.10



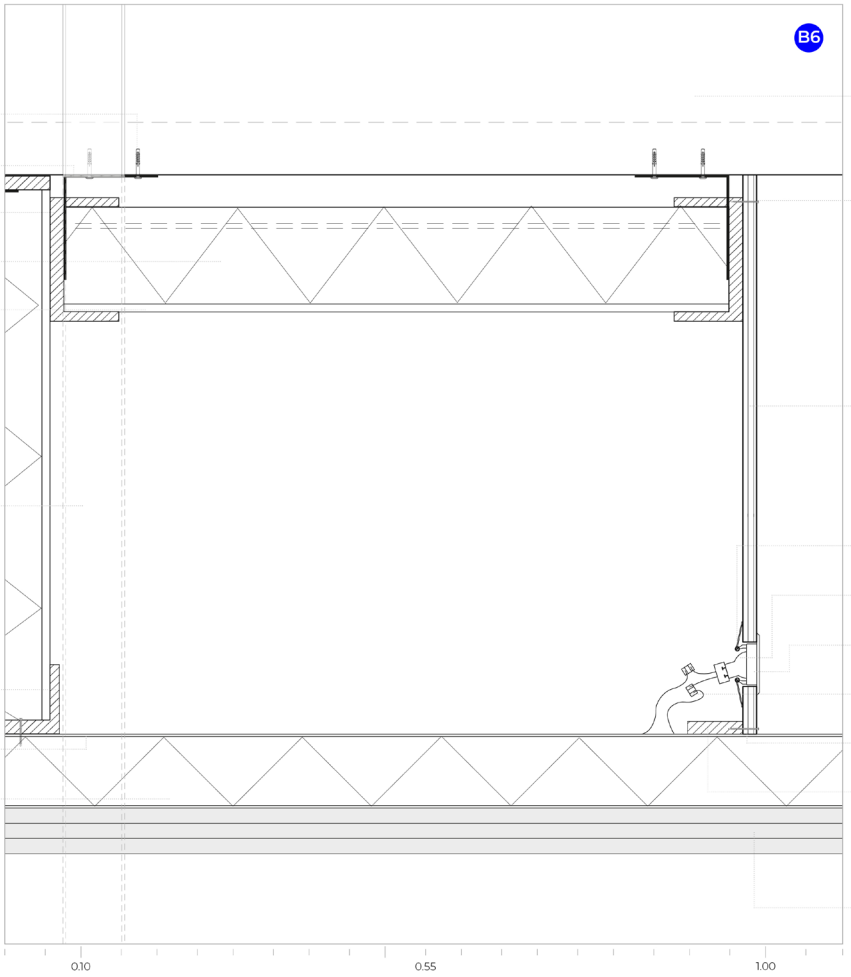
1. Cassette brackets
   Alucopal type 120 or equivalent
2. Isolator
   to prevent a thermal leak
3. Omega profile
   invisible cladding fixing system
4. Steel vertical cassette
   600 mm RAL 9005 | Alucopal or equivalent
5. Ventilation profile
   to close off the ventilation space
6. EPDM sealant
   to make a watertight seal
7. EPDM sealing collar
   to seal the rainwater drainage
8. EPDM glue
   to fix the collar to the pipe
9. Clamping ring
   to clamp the membrane
10. Murfor reinforcement
    to increase the strength of the masonry
11. Soldier course
    acts as a lintel for the wall opening
12. Wall opening
    previous entrance
13. Hex lag screw + plug + washer
    8 x 80 mm | Fisscher or equivalent
14. Ventilation space
    allows air circulation between wall and cladding
15. EPS insulation panels
    100mm - 2000x1000mm (Rd 2,77 m²,K/W)
16. EPDM membrane
    non-reinforced roofing membrane
17. Tapered EPS insulation panels
    1200x1000 mm | 1000 -> 16 mm
18. Vapour barrier
    polyethylene membrane
19. Wideslap floor
    245 mm
20. Rainwater drainage pipe
    PVC 110 mm, RAL9005
21. Brick wall
    English cross bond
22. steel column
    HEA360

DETAIL DRAWINGS | VERTICAL SECTION B | SCALE 1.10



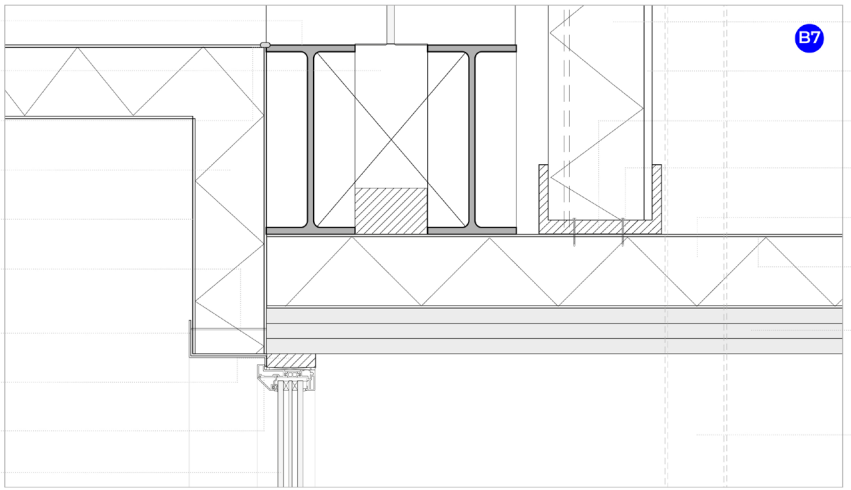
1. Aluminium coping cover
   RAL9005
2. Continuous cleat
   to secure the coping cover
3. Sealant strip
   Neoprene (factory applied)
4. Hammer-in plug
   6 x 40 mm
5. Brick wall
   English cross bond
6. Wideslap floor
   245 mm
7. EPDM membrane
   non-reinforced roofing membrane
8. Tapered EPS insulation panels
   1200x1000 mm | 1000 -> 16 mm
9. EPDM sealing collar
   to seal the rainwater drainage
10. EPDM sealant
    to make a watertight seal
11. EPDM glue
    to fix the collar to the pipe
12. Clamping ring
    to clamp the membrane
13. Vapour barrier
    polyethylene membrane
14. Hammer-in plug
    6 x 40 mm | Fisscher or equivalent
15. Steel angle bracket
    requires a notch in the timber bracket
16. Timber bracket
    Type PG120 | Faay or equivalent
17. Prefab insulation panel
    120 x 600 x 3600 mm | Faay or equivalent
18. Gypsum with finishing
    RAL 9016 | Faay or equivalent
19. Prefab insulation panel
    120 x 600 x 3600 mm | Faay or equivalent
20. Rainwater drainage pipe
    PVC 110 mm, RAL9005

DETAIL DRAWINGS | VERTICAL SECTION B | SCALE 1.10



1. Hammer-in plug
   6 x 40 mm | Fisscher or equivalent
2. Steel angle bracket
   requires a notch in the timber bracket
3. Timber bracket
   Type PG120 | Faay or equivalent
4. Prefab insulation panel
   120 x 600 x 3600 mm | Faay or equivalent
5. Gypsum with finishing
   RAL 9016 | Faay or equivalent
6. Rainwater drainage pipe
   PVC 110 mm, RAL9005
7. Timber bracket
   Type PG120 | Faay or equivalent
8. Prefab sandwich panel - finishing
   metal RAL 9005 | Kingspan or equivalent
9. Prefab sandwich panel- insulation
   100 mm insulation | Kingspan or equivalent
10. Wideslap floor
    245 mm
11. Screw
    4 x 40 mm
12. Plywood panel
    18 mm
13. Clamp
    to fix the fitting
14. GU10 led spot
    5W warm white | Philips or equivalent
15. GU10 fitting tiltable
    tilted towards the ceiling
16. Wago connector
    waterproof connectors
17. Screw
    4 x 40 mm
18. Batten
    pine wood 44 x 69 mm (2" x 3")
19. 3 layer CLT panel
    structural element

DETAIL DRAWINGS | VERTICAL SECTION B | SCALE 1.10



1 Steel portal frame
IPE 240

2 Baffles
to make a rigid connection

3 Sealant
to make a watertight seal

4 Prefab sandwich panel- insulation
100 mm insulation | Kingspan or equivalent

5 Prefab sandwich panel - finishing
metal RAL 9005 | Kingspan or equivalent

6 Sandwich panel screw
7 x 145 mm

7 Exterior flashing
aluminium RAL 9005

8 Window buck
pine wood

9 Methermo® Classic fixed window
insulated aluminium frame | RAL9005

10 HR+++ glass
triple glazing

11 Exterior window sill
Aluminium RAL 9005

12 Water-repellent sealant
exterior seal

13 Low expansion foam
space used to instal and level window frame

14 Airtight sealant
interior seal

15 Window buck
multiplex flooring functions as buck

16 Steel angle bracket
to mount the sandwhich panel

17 Pop rivet
to attach the panel to the bracket

18 Sealing rubber strip
to seal the mounting of the sandwich panel

19 Hex lag screw + plug + washer
6 x 60 mm | Fisscher or equivalent

20 Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent

21 Gypsum with finishing
RAL 9016 | Faay or equivalent

22 Timber bracket
Type PG120 | Faay or equivalent

23 Self tapping screw
to attach the bracket to the sandwich panel

24 Prefab sandwich panel- insulation
100 mm insulation | Kingspan or equivalent

25 Prefab sandwich panel - finishing
metal RAL 9005 | Kingspan or equivalent

26 3 layer CLT panel
structural element - roof

27 Rainwater drainage pipe
PVC 110 mm, RAL9005

28 Abrasion resistant coating
RAL 7038 agate grey

29 Plywood 18 mm
2 layers placed crosswise

30 Insulation
200 mm (Rd 5,55 m²,K/W)

31 Pine wood beam
38 x 285 mm

32 Pine wood beam
38 x 285 mm

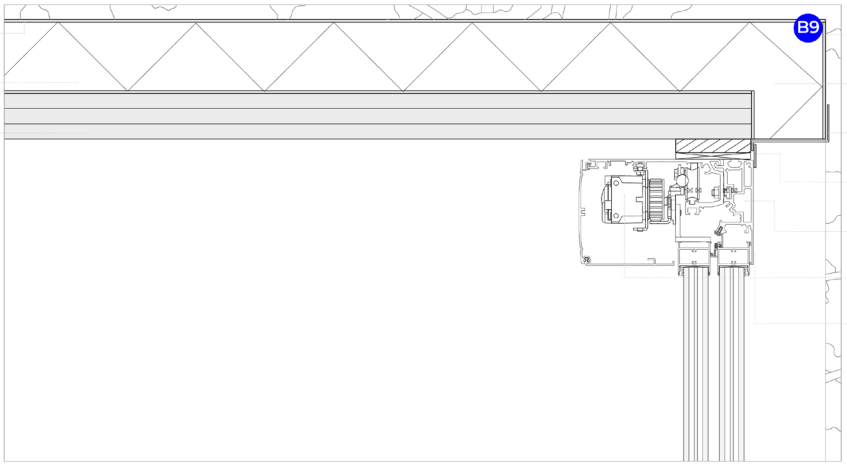
33 Space for piping
max slope of the pipes is 50 mm

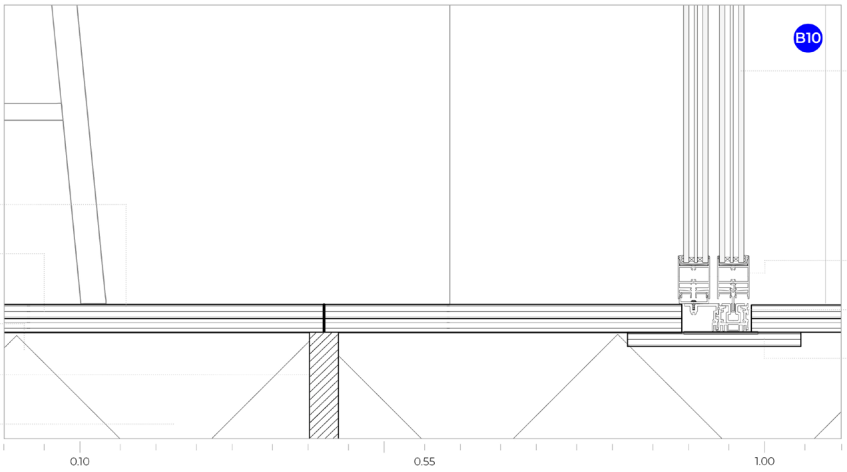
34 Multiplex
to support the EPS

35 Adjustable legs
to level and raise the floor

36 Concrete floor
non-insulated original floor

DETAIL DRAWINGS | VERTICAL SECTION B | SCALE 1.10





1 Prefab sandwich panel - finishing
metal RAL 9005 | Kingspan or equivalent

2 Prefab sandwich panel- insulation
100 mm insulation | Kingspan or equivalent

3 3 layer CLT panel
structural element - roof

4 Abrasion resistant coating
RAL 7038 agate grey

5 Plywood 18 mm
2 layers placed crosswise

6 Insulation
200 mm (Rd 5,55 m².K/W)

7 Pine wood beam
38 x 285 mm

8 Pine wood beam
38 x 285 mm

9 Prefab sandwich panel - finishing
metal RAL 9005 | Kingspan or equivalent

10 Prefab sandwich panel- insulation
100 mm insulation | Kingspan or equivalent

11 Flashing
aluminium RAL 9005

12 Flat aluminium strip
2 mm RAL 9005

13 Activation sensor
to automatically open the door

14 Door motor
to automatically open the door

15 Omni Slide® slim door profile
Aluminium frame | RAL 9005

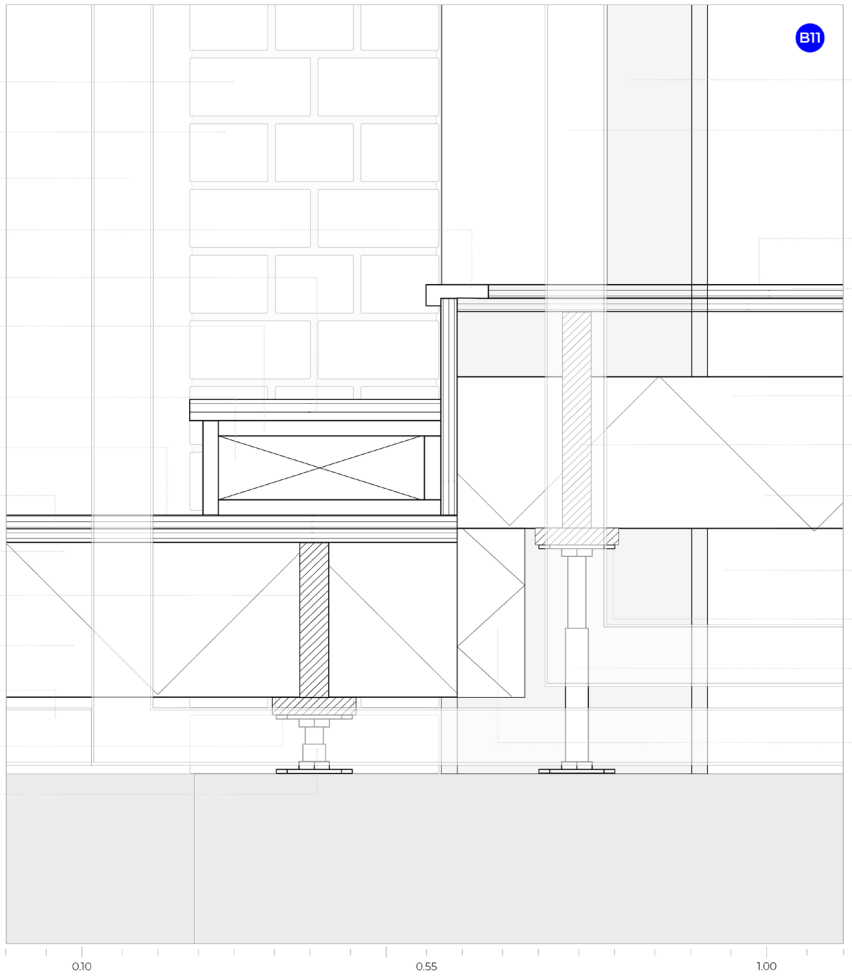
16 HR+++ glass
triple glazing

17 Omni Slide® slim door profile
Aluminium frame | RAL 9005

18 Hidden track
for easy access for disabled

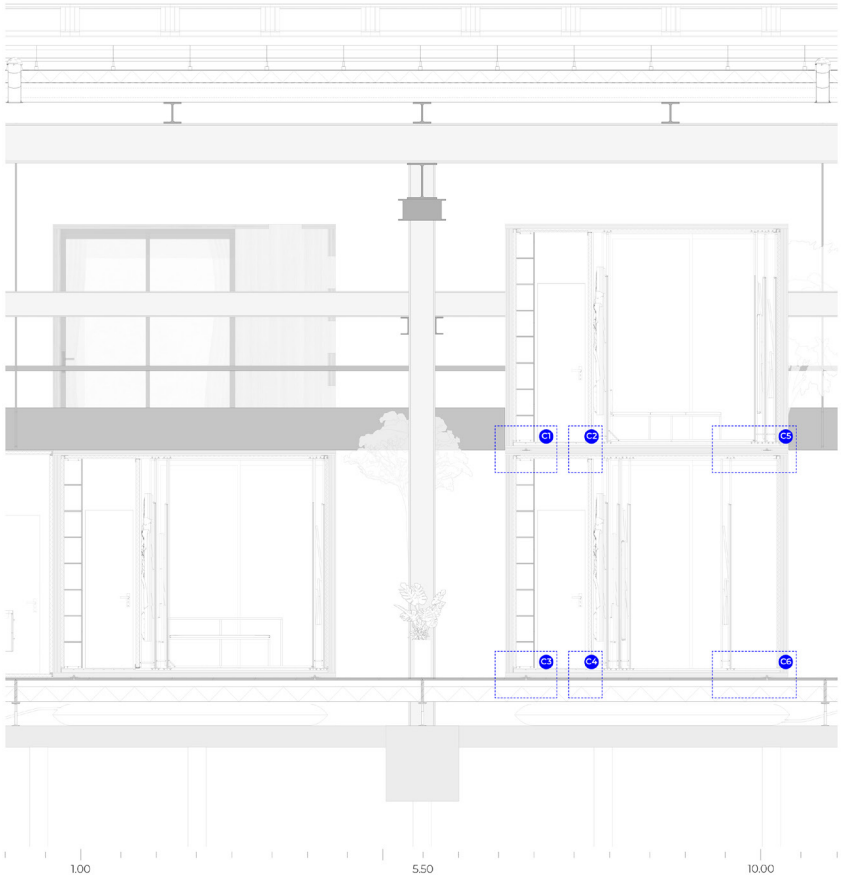
19 Window buck
plywood 22 mm

DETAIL DRAWINGS | VERTICAL SECTION B | SCALE 1.10

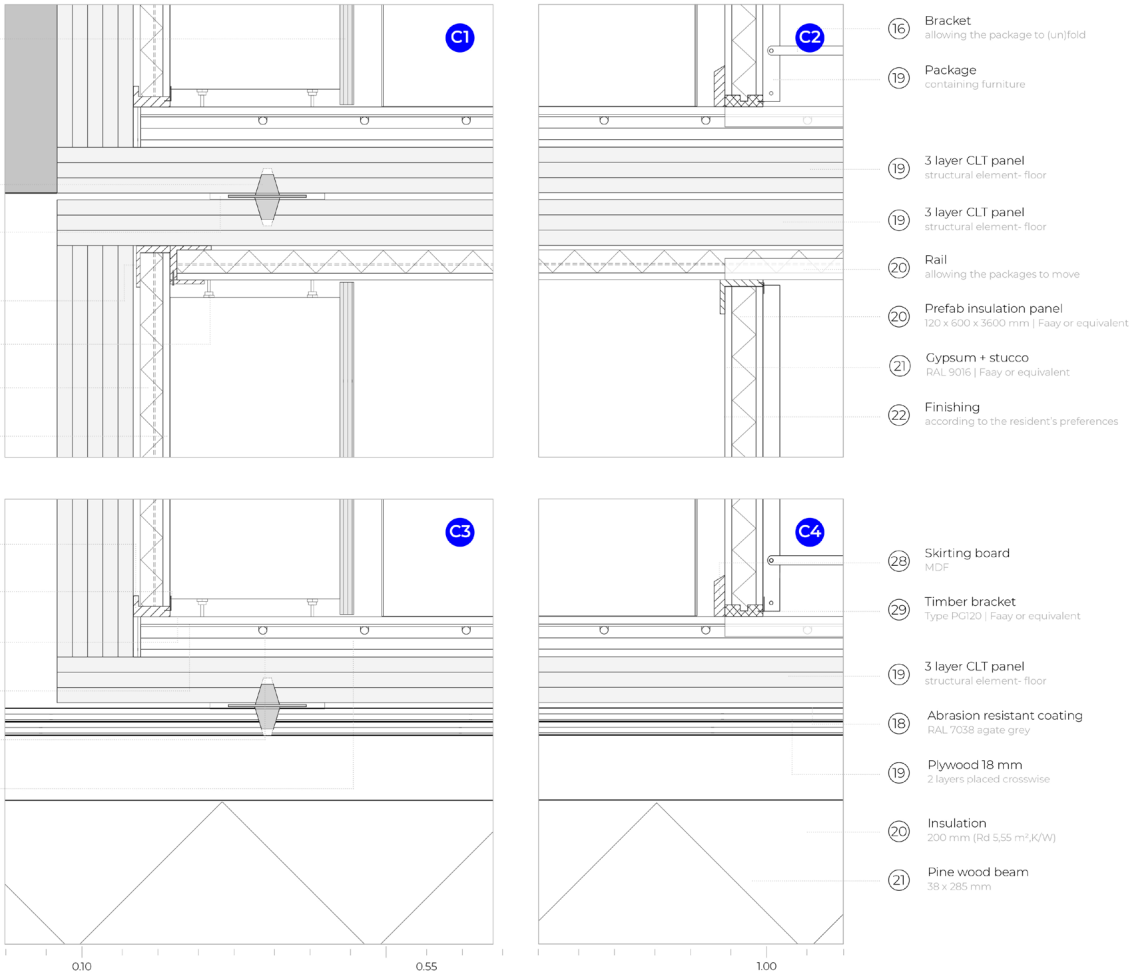


1. Brick wall — English cross bond
2. Wall opening — previous entrance
3. Rainwater drainage pipe — PVC 110 mm, RAL9005
4. Stair nose — plywood
5. Stair tread + nose — 2x Plywood 22 mm
6. Wooden casing — plywood 18 mm
7. Wooden baffles — to make a rigid connection
8. Abrasion resistant coating — RAL 7038 agate grey
9. Plywood 18 mm — 2 layers placed crosswise
10. Insulation — 200 mm (Rd 5,55 m²,K/W)
11. Pine wood beam — 38 x 285 mm
12. Pine wood beam — 38 x 285 mm
13. Space for piping — max slope of the pipes is 50 mm
14. Plywood — to support the EPS
15. Adjustable legs — to level and raise the floor
16. steel column — HEA360
17. Rainwater drainage pipe — PVC 110 mm, RAL9005
18. Abrasion resistant coating — RAL 7038 agate grey
19. Plywood 18 mm — 2 layers placed crosswise
20. Insulation — 200 mm (Rd 5,55 m²,K/W)
21. Pine wood beam — 38 x 285 mm
22. Pine wood beam — 38 x 285 mm
23. Space for piping — max slope of the pipes is 300 mm
24. Plywood — to support the EPS
25. Adjustable legs — to level and raise the floor
26. Insulation — 90 mm (Rd 2,5 m²,K/W)
27. Concrete floor — non-insulated original floor

FRAGMENT | VERTICAL SECTION C | SCALE 1.100

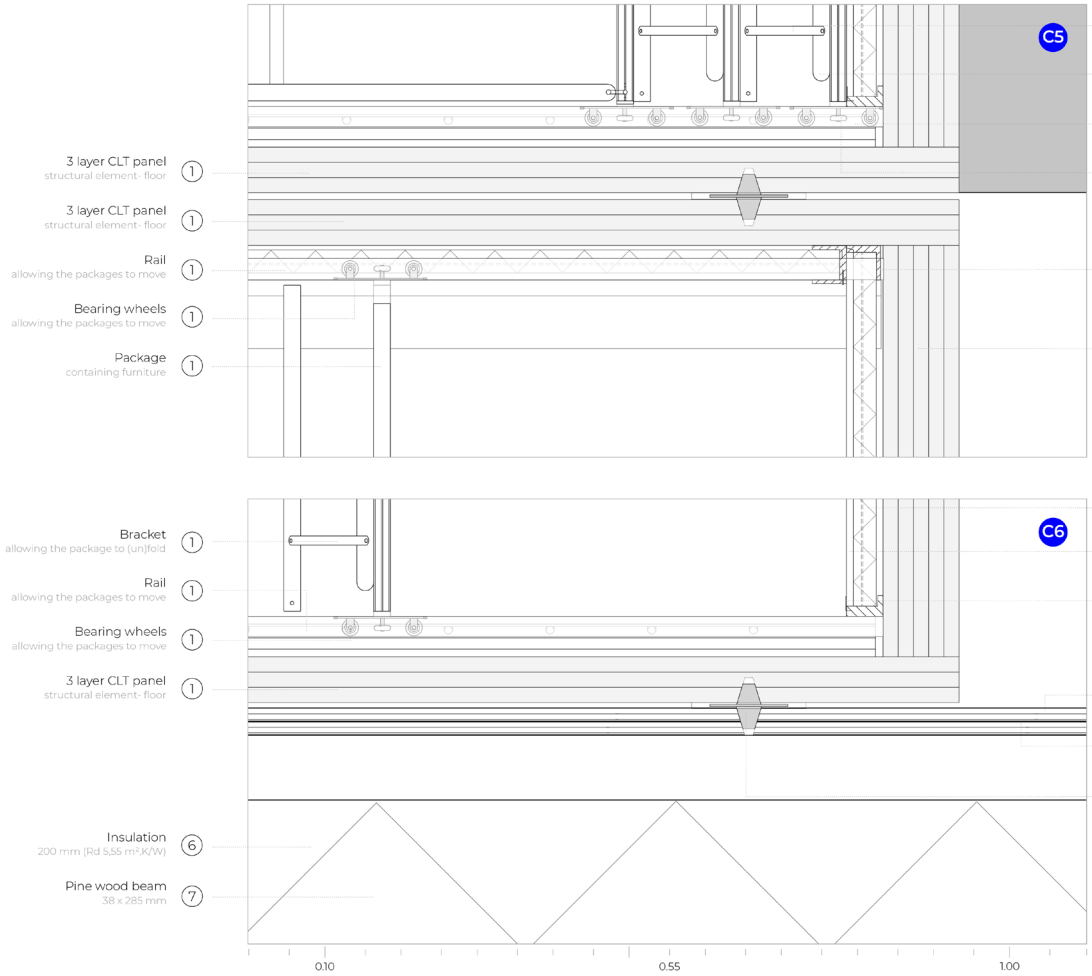


DETAIL DRAWINGS | VERTICAL SECTION C | SCALE 1.10



- (10) Linoply 22mm — closet doors made of leftover plywood
- (10) Tapered connector — to easily connect the dwellings
- (10) Neoprene band — acoustic insulation
- (3) Timber bracket — Type PG120 | Faay or equivalent
- (3) Adjustable legs — to quickly (dis)assemble the closet
- (4) Prefab insulation panel — 120 x 600 x 3600 mm | Faay or equivalent
- (5) Gypsum with finishing — RAL 9016 | Faay or equivalent
- (16) Bracket — allowing the package to (un)fold
- (19) Package — containing furniture
- (19) 3 layer CLT panel — structural element- floor
- (19) 3 layer CLT panel — structural element- floor
- (20) Rail — allowing the packages to move
- (20) Prefab insulation panel — 120 x 600 x 3600 mm | Faay or equivalent
- (21) Gypsum + stucco — RAL 9016 | Faay or equivalent
- (22) Finishing — according to the resident's preferences
- (3) Timber bracket — Type PG120 | Faay or equivalent
- (3) Clamp — to mount the panel to the bracket
- (3) Plywood + abrasion resistant coating — according to the resident's preferences
- (3) levelling agent — Fermacell or equivalent
- (3) Underfloor heating/cooling pipe — 16 mm
- (3) Prefab floor element — for underfloor heating | Fermacell or equivalent
- (28) Skirting board — MDF
- (29) Timber bracket — Type PG120 | Faay or equivalent
- (19) 3 layer CLT panel — structural element- floor
- (18) Abrasion resistant coating — RAL 7038 agate grey
- (19) Plywood 18 mm — 2 layers placed crosswise
- (20) Insulation — 200 mm (Rd 5,55 m².K/W)
- (21) Pine wood beam — 38 x 285 mm

DETAIL DRAWINGS | VERTICAL SECTION C | SCALE 1.10



3 layer CLT panel
structural element- floor
1

3 layer CLT panel
structural element- floor
1

Rail
allowing the packages to move
1

Bearing wheels
allowing the packages to move
1

Package
containing furniture
1

Bracket
allowing the package to (un)fold
16

Package
containing furniture
19

Rail
allowing the packages to move
20

Bearing wheels
allowing the packages to move
20

Timber bracket
Type PG120 | Faay or equivalent
19

5 layer CLT panel
structural element- wall
19

Bracket
allowing the package to (un)fold
1

Rail
allowing the packages to move
1

Bearing wheels
allowing the packages to move
1

3 layer CLT panel
structural element- floor
1

Insulation
200 mm (Rd 5,55 m²,K/W)
6

Pine wood beam
38 x 285 mm
7

Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent
20

Gypsum + stucco
RAL 9016 | Faay or equivalent
21

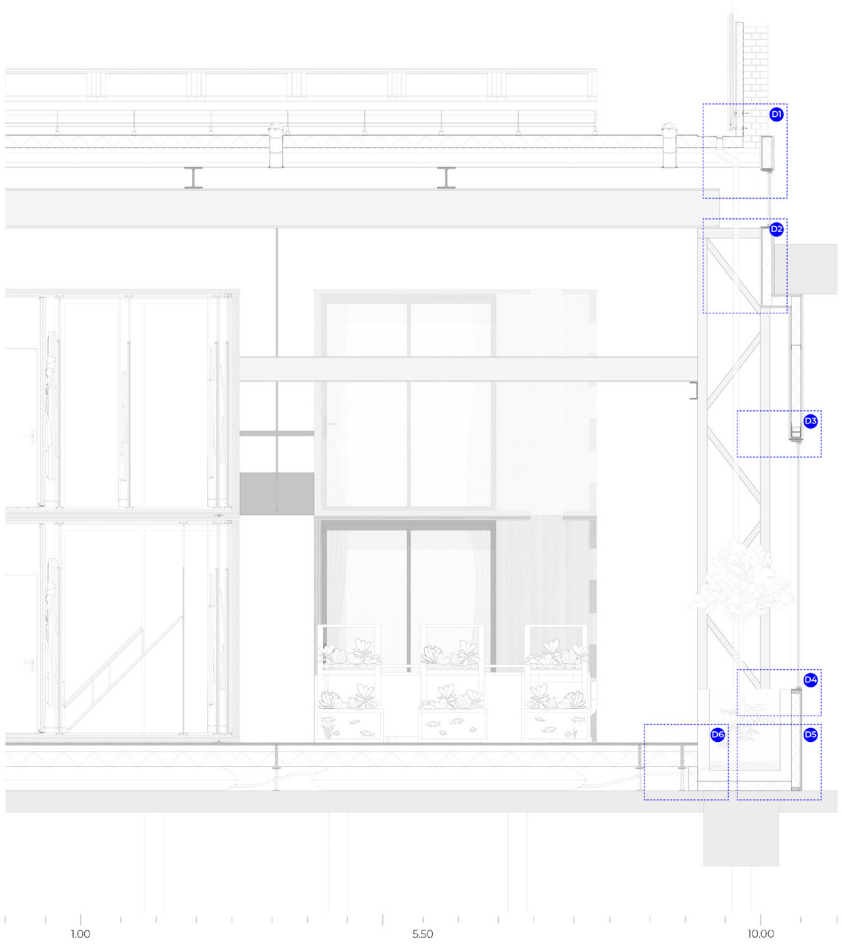
Finishing
according to the resident's preferences
22

Abrasion resistant coating
RAL 7038 agate grey
18

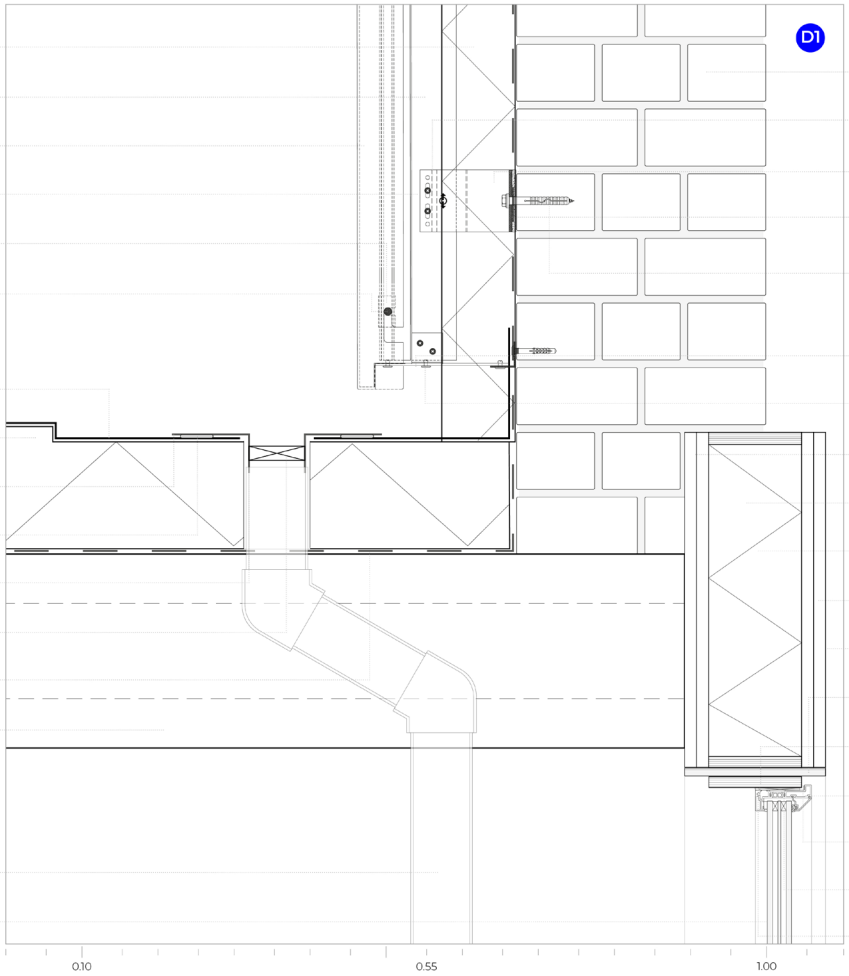
Plywood 18 mm
2 layers placed crosswise
19

Tapered connector
to easily connect the dwellings
22

FRAGMENT | VERTICAL SECTION D | SCALE 1.100



DETAIL DRAWINGS | VERTICAL SECTION D | SCALE 1.10



1 EPS insulation panels
100mm - 2000x1000mm (Rd 2,77 m²,K/W)

2 Omega profile
invisible cladding fixing system

3 Steel vertical cassette
600 mm RAL 9005 | Alucopal or equivalent

4 Ventilation space
allows air circulation between wall and cladding

5 Cassette clip
to mount the bolt to the profile

6 Aluminium bolt
to hang the vertical cassette

7 EPDM membrane
non-reinforced roofing membrane

8 Tapered EPS insulation panels
1200x1000 mm | 1000 -> 16 mm

9 EPDM sealing collar
to seal the rainwater drainage

10 EPDM sealant
to make a watertight seal

11 EPDM glue
to fix the collar to the pipe

12 Clamping ring
to clamp the membrane

13 Vapour barrier
polyethylene membrane

14 Hollow core slab floor
255 x 600 x 3300 mm

15 Rainwater drainage pipe
PVC 110 mm, RAL9005

16 HR+++ glass
triple glazing

17 Brick wall
English cross bond

18 Self tapping screw
to attach the bracket to the profile

19 Cassette brackets
Alucopal type 120 or equivalent

20 Isolator
to prevent a thermal leak

21 Hex lag screw + plug + washer
8 x 80 mm | Fisscher or equivalent

22 Ventilation profile
to close off the ventilation space

23 Blind rivet
to secure the cassette

24 Gypsum
2 layers 9,5 mm

25 Timber framing
100 mm

26 Insulation
100 mm (Rd 2,77 m²,K/W)

27 Gypsum
2 layers 9,5 mm

28 Paint
anthracite finish

29 Window trim
plywood 18 mm

30 Window buck
plywood 22 mm

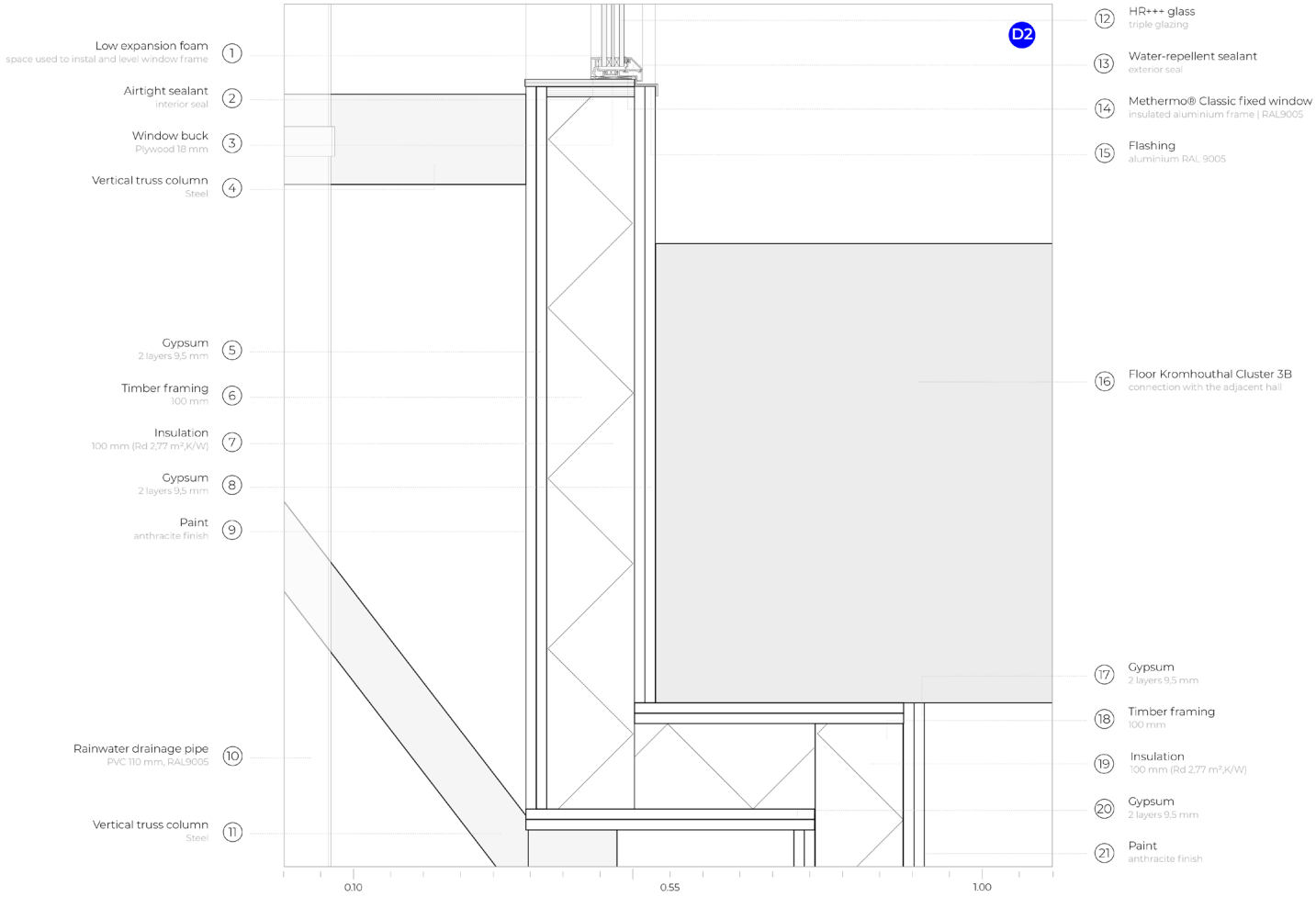
31 Methermo® Classic fixed window
insulated aluminium frame | RAL9005

32 Water-repellent sealant
exterior seal

33 Low expansion foam
space used to instal and level window frame

34 Airtight sealant
interior seal

DETAIL DRAWINGS | VERTICAL SECTION D | SCALE 1.10



DETAIL DRAWINGS | VERTICAL SECTION D | SCALE 1.10

1 Vertical truss column
Steel

2 Rainwater drainage pipe
PVC 110 mm, RAL9005

5 Gypsum
2 layers 9,5 mm

6 Timber framing
100 mm

7 Insulation
100 mm

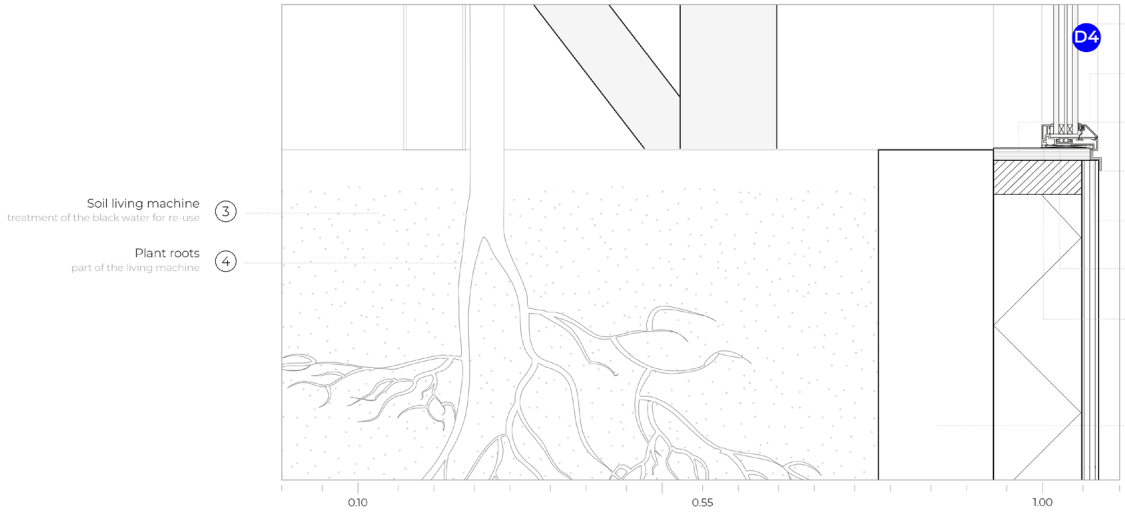
8 Gypsum
2 layers 9,5 mm

9 Steel beam
HEA 100

10 Paint
anthracite finish

11 Window trim
plywood 18 mm

12 Window buck
plywood 18 mm



3 Soil living machine
treatment of the black water for re-use

4 Plant roots
part of the living machine

13 HR+++ glass
triple glazing

14 Methermo® Classic fixed window
insulated aluminium frame | RAL9005

15 Window buck
plywood 18 mm

16 Flashing
aluminium RAL 9005

17 Water-repellent sealant
exterior seal

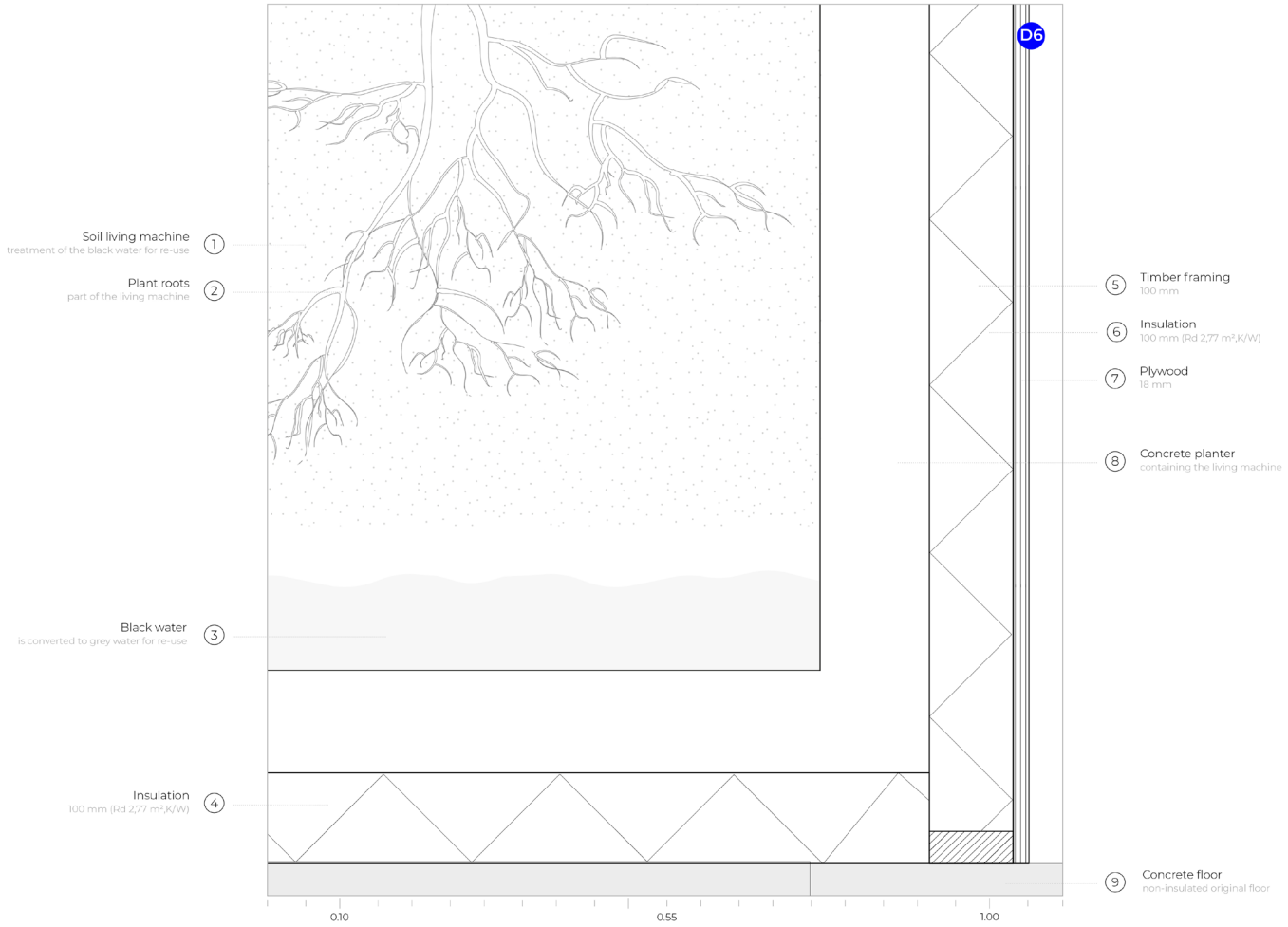
18 Low expansion foam
space used to instal and level window frame

19 Airtight sealant
interior seal

20 Concrete planter
containing the living machine

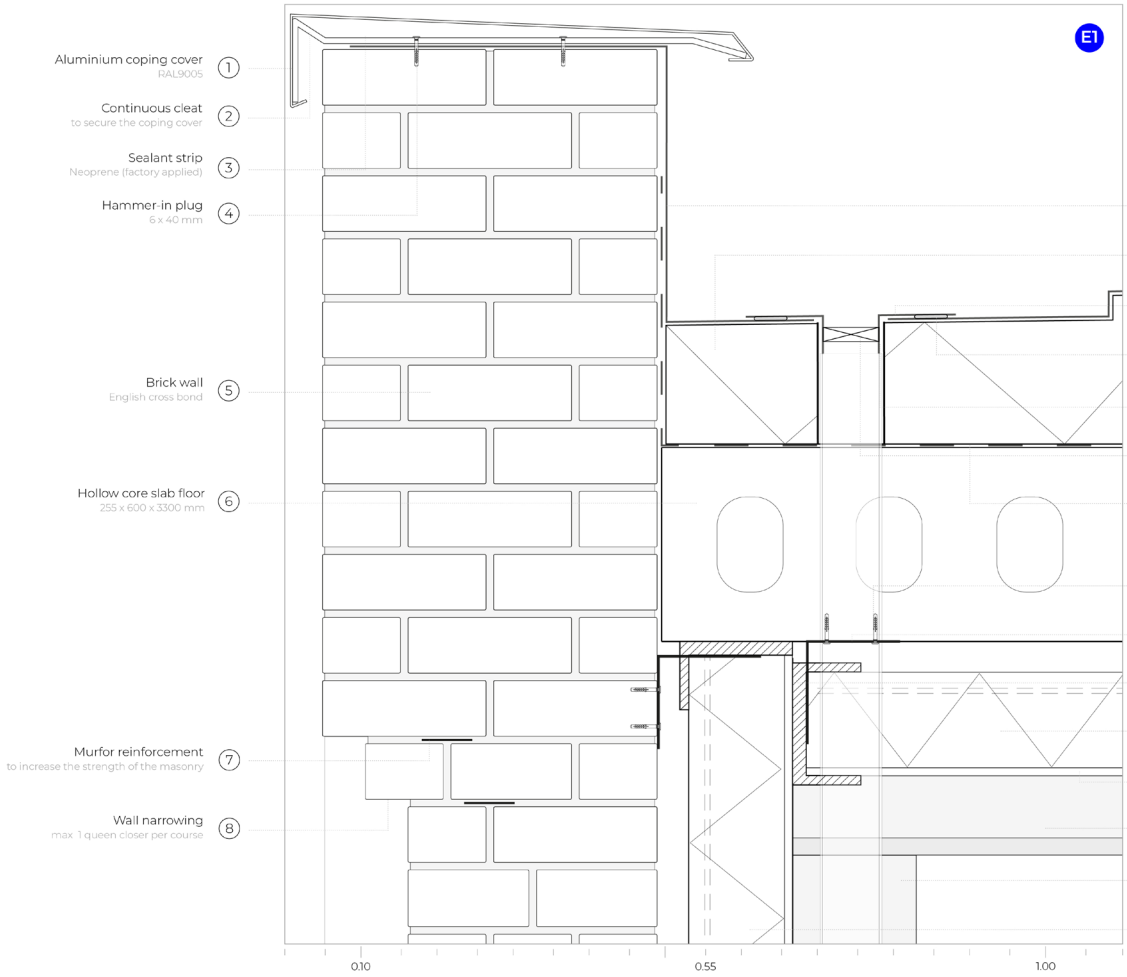
DETAIL DRAWINGS | VERTICAL SECTION D | SCALE 1.10

DETAIL DRAWINGS | VERTICAL SECTION D | SCALE 1.10



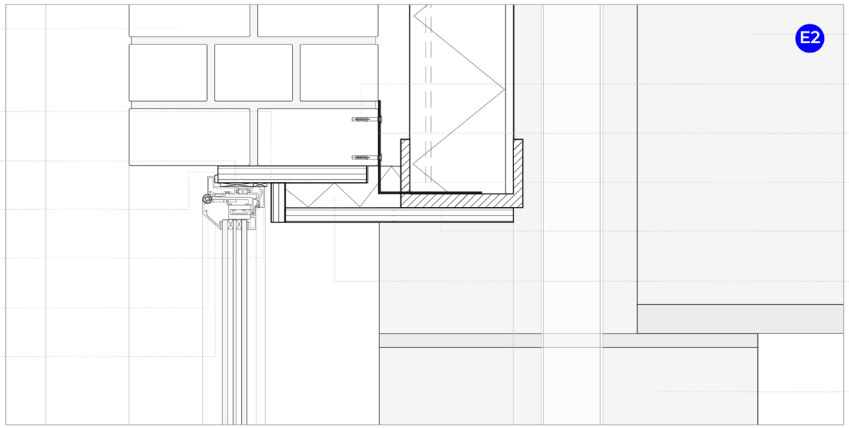
FRAGMENT | VERTICAL SECTION E | SCALE 1.100

DETAIL DRAWINGS | VERTICAL SECTION E | SCALE 1.10



1. Aluminium coping cover
   RAL9005
2. Continuous cleat
   to secure the coping cover
3. Sealant strip
   Neoprene (factory applied)
4. Hammer-in plug
   6 x 40 mm
5. Brick wall
   English cross bond
6. Hollow core slab floor
   255 x 600 x 3300 mm
7. Murfor reinforcement
   to increase the strength of the masonry
8. Wall narrowing
   max. 1 queen closer per course
9. EPDM membrane
   non-reinforced roofing membrane
10. Tapered EPS insulation panels
    1200x1000 mm | 1000 -> 16 mm
11. EPDM sealing collar
    to seal the rainwater drainage
12. EPDM sealant
    to make a watertight seal
13. EPDM glue
    to fix the collar to the pipe
14. Clamping ring
    to clamp the membrane
15. Vapour barrier
    polyethylene membrane
16. Hammer-in plug
    6 x 40 mm | Fisschier or equivalent
17. Steel angle bracket
    requires a notch in the timber bracket
18. Timber bracket
    Type PG120 | Faay or equivalent
19. Prefab insulation panel
    120 x 600 x 3600 mm | Faay or equivalent
20. Gypsum with finishing
    RAL 9016 | Faay or equivalent
21. Steel beam
    IPE 270
22. steel column
    HEA360
23. Prefab insulation panel
    120 x 600 x 3600 mm | Faay or equivalent

DETAIL DRAWINGS | VERTICAL SECTION E | SCALE 1.10



1 Brick wall
English cross bond

2 Window buck
Plywood 22mm

3 Low expansion foam
space used to instal and level window frame

4 Water-repellent sealant
exterior seal

5 Airtight sealant
interior seal

6 Stainless steel hinge
to open the window

7 Methermo® Classic casement window
insulated aluminium frame | RAL9005

16 Steel beam
HEA360

17 Hammer-in plug
6 x 40 mm | Fisscher or equivalent

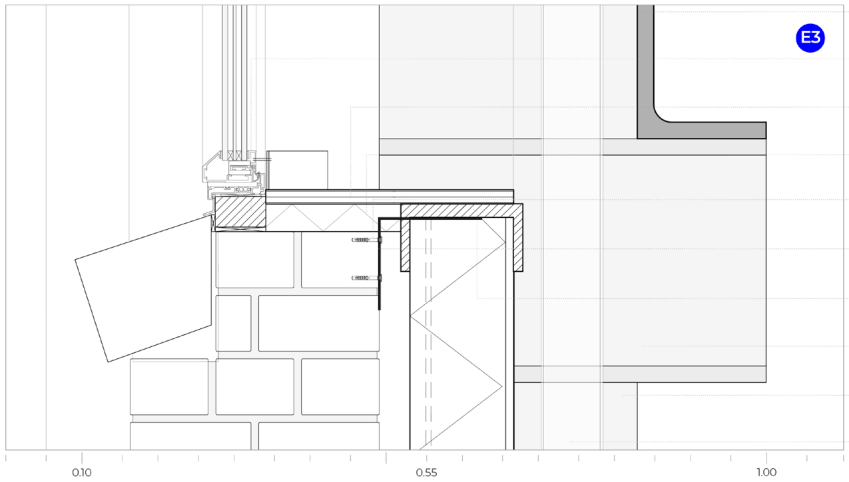
18 Steel angle bracket
requires a notch in the timber bracket

19 Timber bracket
Type PG120 | Faay or equivalent

20 Window trim
plywood 18 mm

21 Insulation
35 mm

22 Steel support element
UNP300



8 HR+++ glass
triple glazing

9 Methermo® Classic casement window
insulated aluminium frame | RAL9005

10 Mechanical window opener
Axa Remote 2.0 black or equivalent

11 Water-repellent sealant
exterior seal

12 Low expansion foam
space used to instal and level window frame

13 Airtight sealant
interior seal

14 Sill flap
flexible PVC

15 Exterior window sill
stone

23 Steel beam
UNP350

24 Window buck
pine wood

25 Wooden interior sill
plywood 18 mm

26 Insulation
35 mm

27 Hammer-in plug
6 x 40 mm | Fisscher or equivalent

28 Steel angle bracket
requires a notch in the timber bracket

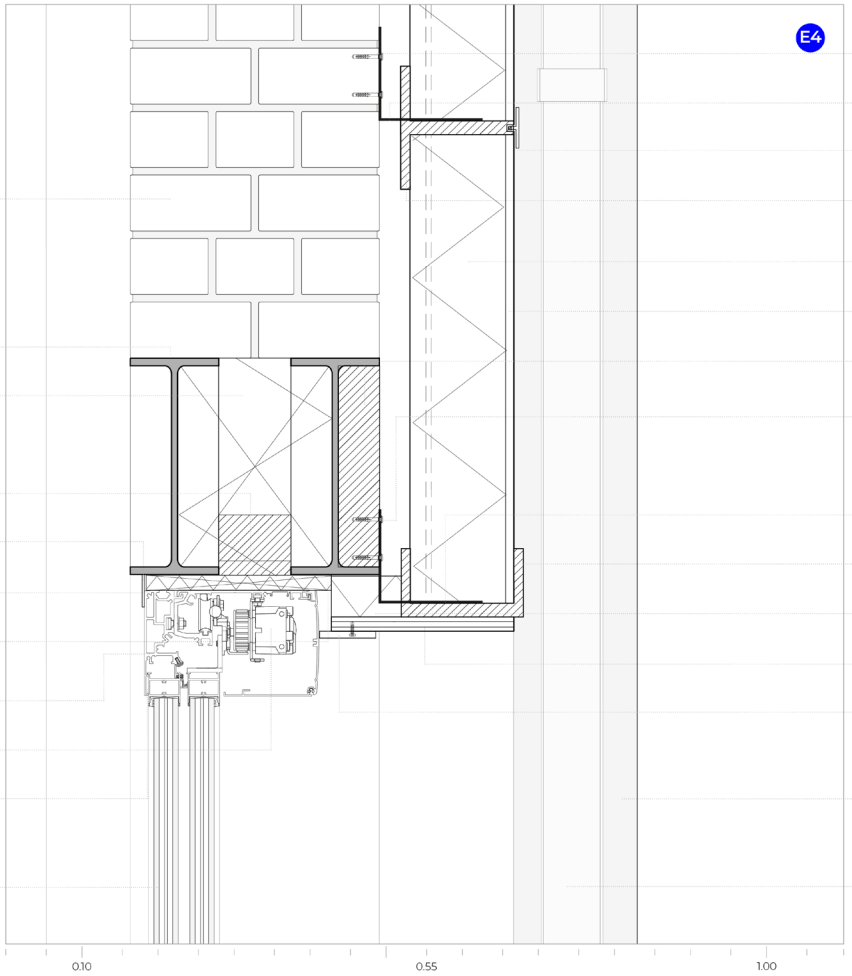
29 Timber bracket
Type PG120 | Faay or equivalent

30 Steel support element
UNP300

31 steel column
HEA360

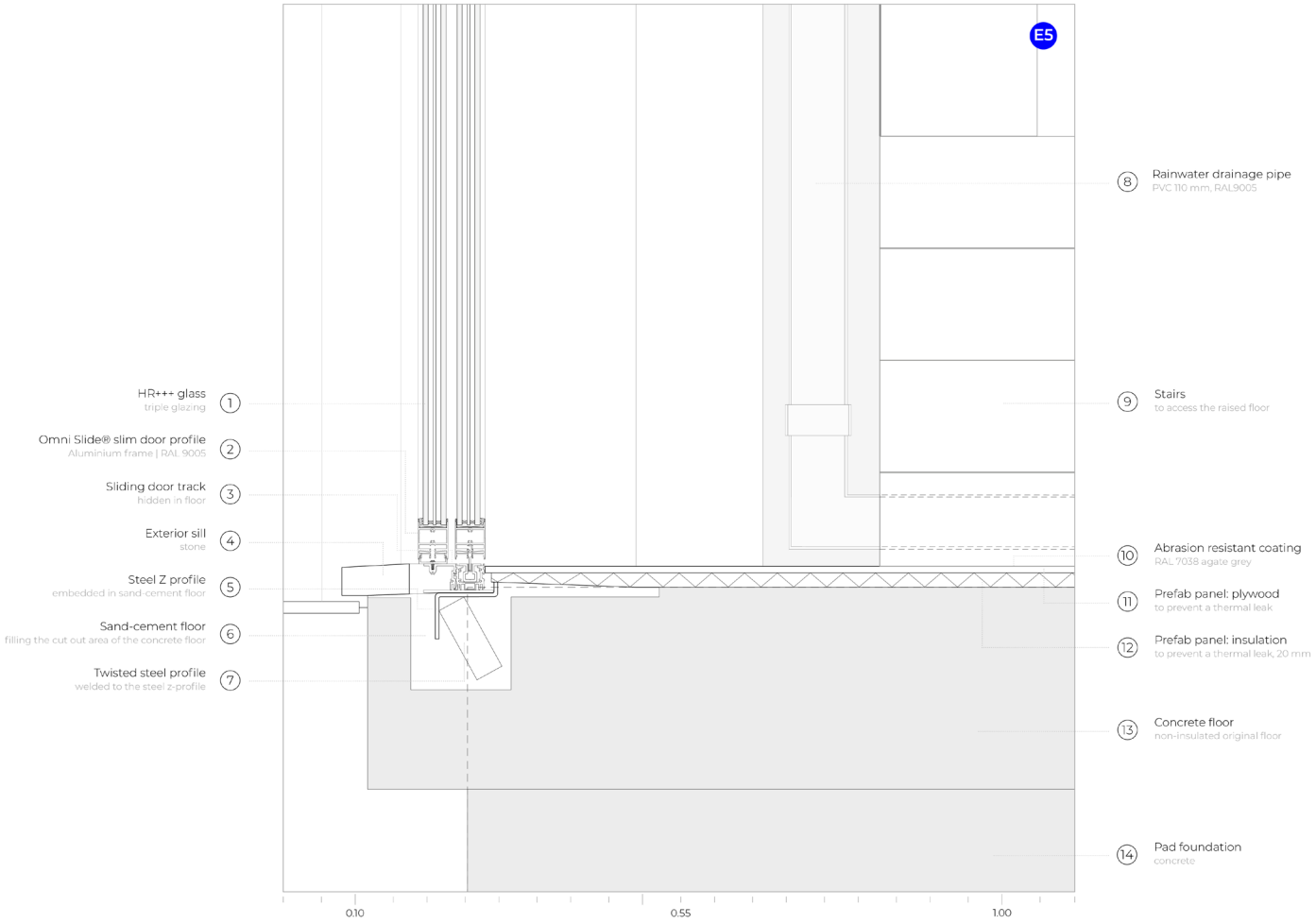
32 Rainwater drainage pipe
PVC 110 mm, RAL9005

DETAIL DRAWINGS | VERTICAL SECTION E | SCALE 1.10

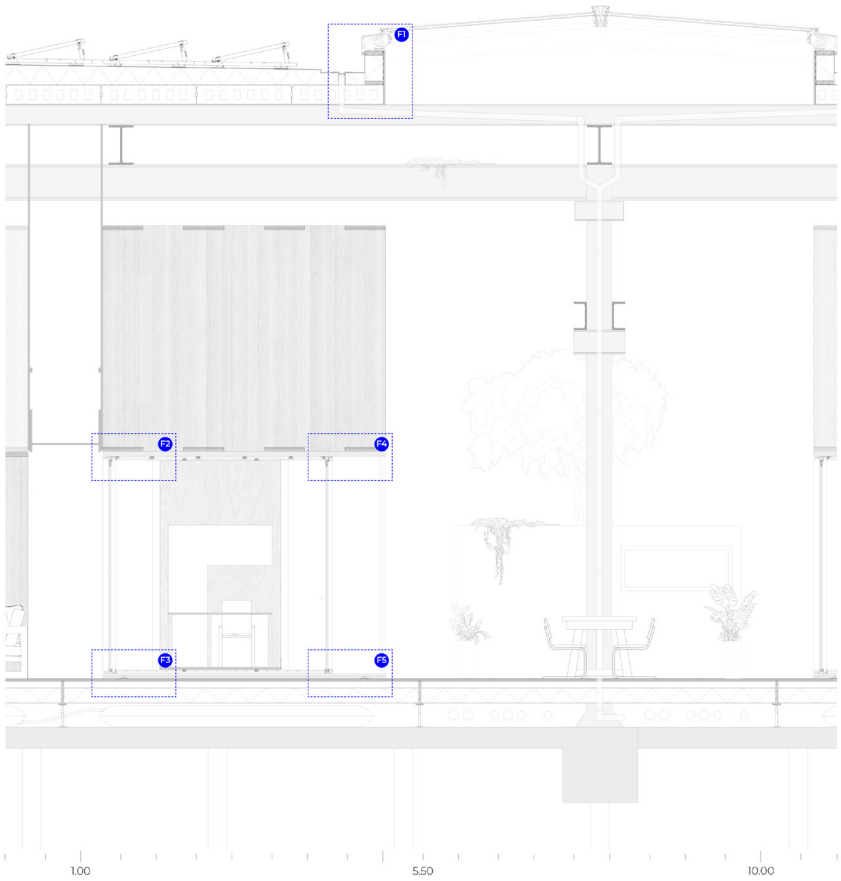


1. Brick wall
English cross bond
2. Steel portal frame
IPE 270
3. Baffles
to make a rigid connection
4. Window buck
plywood 22 mm
5. Flat aluminium strip
2 mm RAL 9005
6. Water-repellent sealant
exterior seal
7. Airtight sealant
interior seal
8. Activation sensor
to automatically open the door
9. Door motor
to automatically open the door
10. Omni Slide® slim door profile
Aluminium frame | RAL 9005
11. HR+++ glass
triple glazing
12. Hammer-in plug
6 x 40 mm | Fisscher or equivalent
13. Steel angle bracket
requires a notch in the timber bracket
14. Click profile
panels fixed without visible screws
15. Timber bracket
Type PG120 | Faay or equivalent
16. Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent
17. Gypsum with finishing
RAL 9016 | Faay or equivalent
18. Multiplex 40 x 246 x 200 mm
to mount the steel bracket
19. Hex lag screw + plug + washer
6 x 60 mm | Fisscher or equivalent
20. Steel angle bracket
requires a notch in the timber bracket
21. Timber bracket
Type PG120 | Faay or equivalent
22. Insulation
50 mm
23. Window trim
plywood 18 mm
24. Demountable strip
allowing the motor cover to be removed
25. steel column
HEA360
26. Rainwater drainage pipe
PVC 110 mm, RAL9005

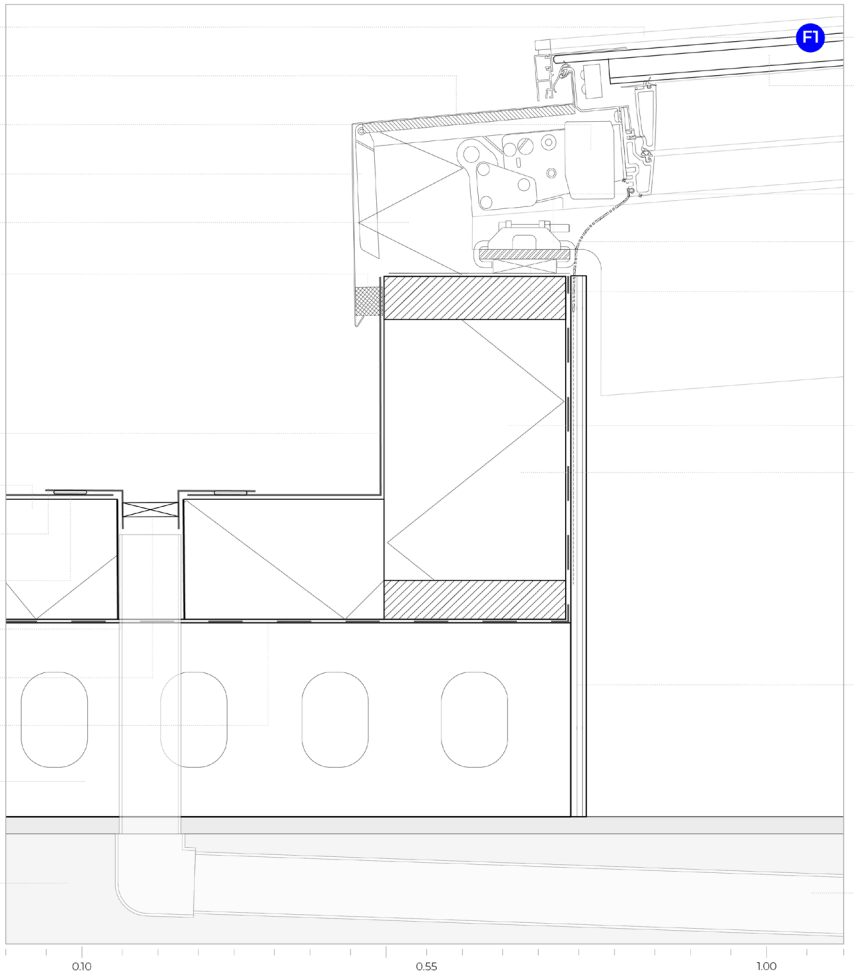
DETAIL DRAWINGS | VERTICAL SECTION E | SCALE 1.10



FRAGMENT | VERTICAL SECTION F | SCALE 1.100



DETAIL DRAWINGS | VERTICAL SECTION F | SCALE 1.10



1 Cladding profile
RAL 9005 | Velux or equivalent

2 Bottom flashing
aluminium

3 Chain actuator
for the control system

4 Drainage profile
aluminium

5 Insulation
150 mm

6 Foam gasket
to seal the connection

7 EPDM membrane
non-reinforced roofing membrane

8 Tapered EPS insulation panels
1200x1000 mm | 1000 -> 16 mm

9 EPDM sealing collar
to seal the rainwater drainage

10 EPDM sealant
to make a watertight seal

11 EPDM glue
to fix the collar to the pipe

12 Clamping ring
to clamp the membrane

13 Vapour barrier
polyethylene membrane

14 Hollow core slab floor
255 x 600 x 3300 mm

15 Steel beam
IPE 270

16 Cladding
Aluminium | RAL 9005

17 HR+++ glass
triple glazing

18 Mounting bracket
to mount the window frame

19 Vapour barrier strip
polyethylene membrane

20 Clamp
for the mounting bracket

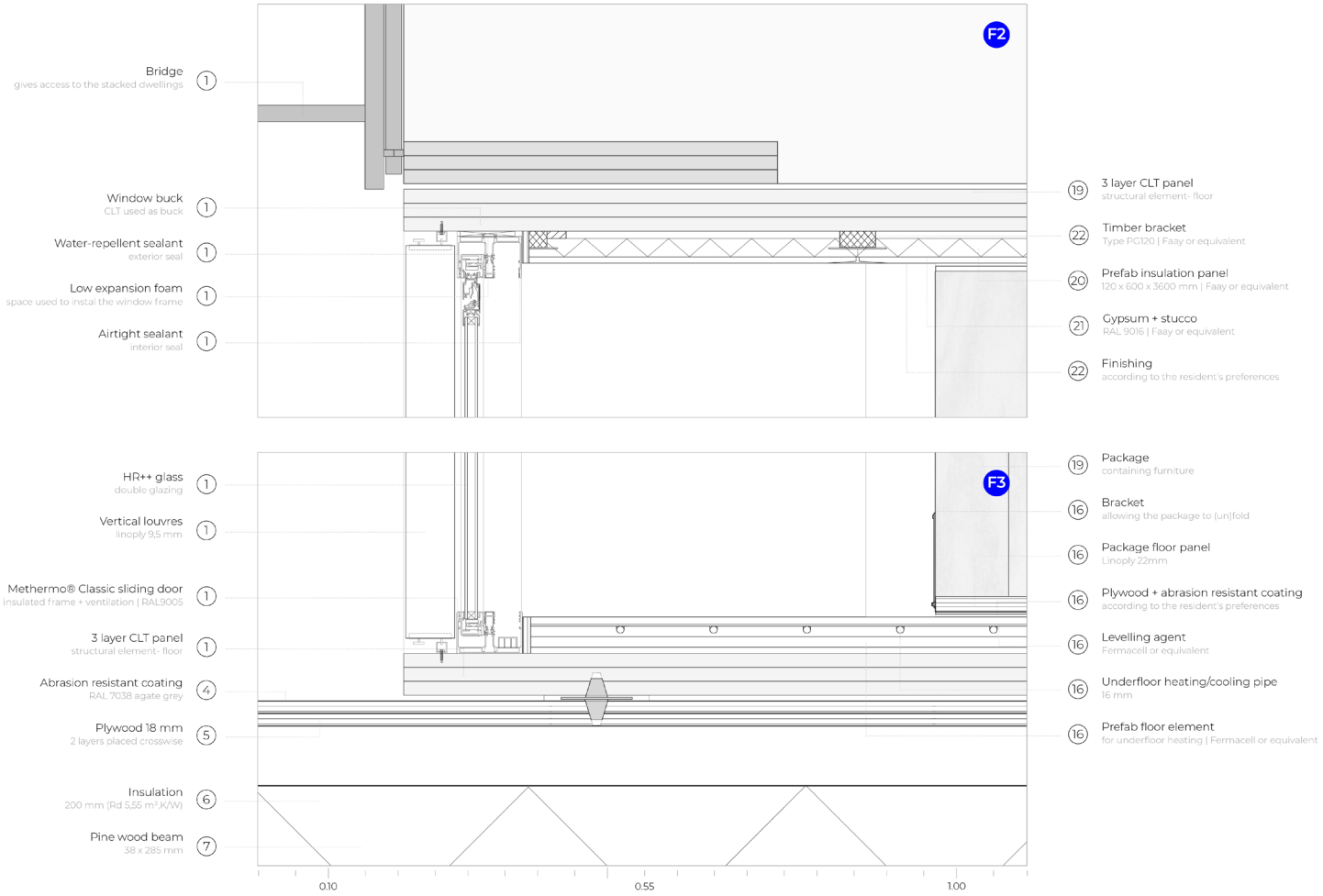
21 Timber framing
240 mm

22 Insulation
240 mm

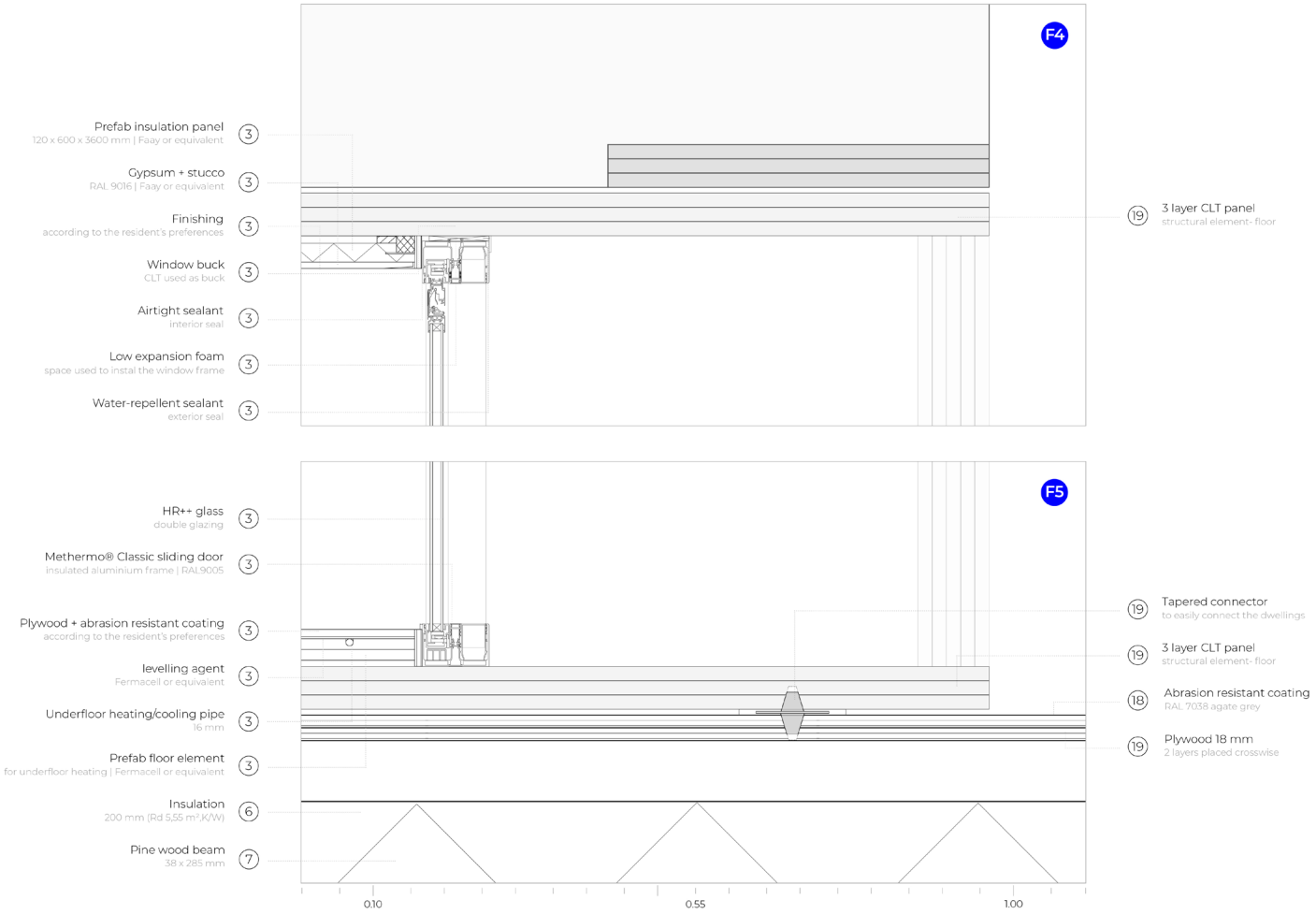
23 Plywood panel
18 mm

24 Rainwater drainage pipe
PVC 110 mm, RAL9005

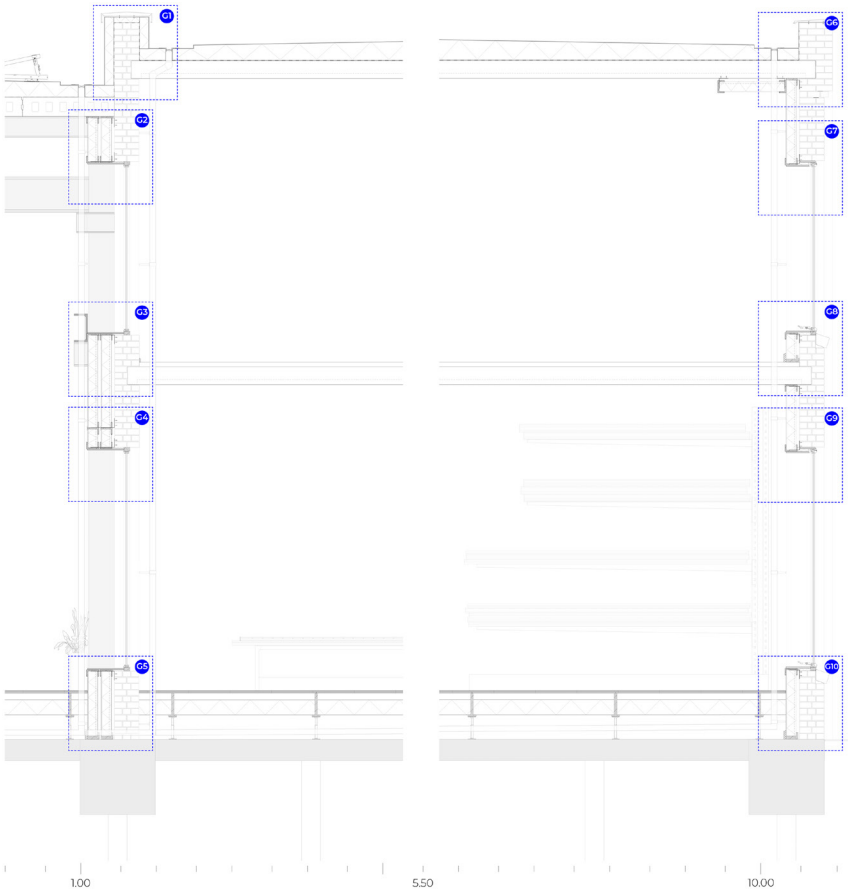
DETAIL DRAWINGS | VERTICAL SECTION F | SCALE 1.10



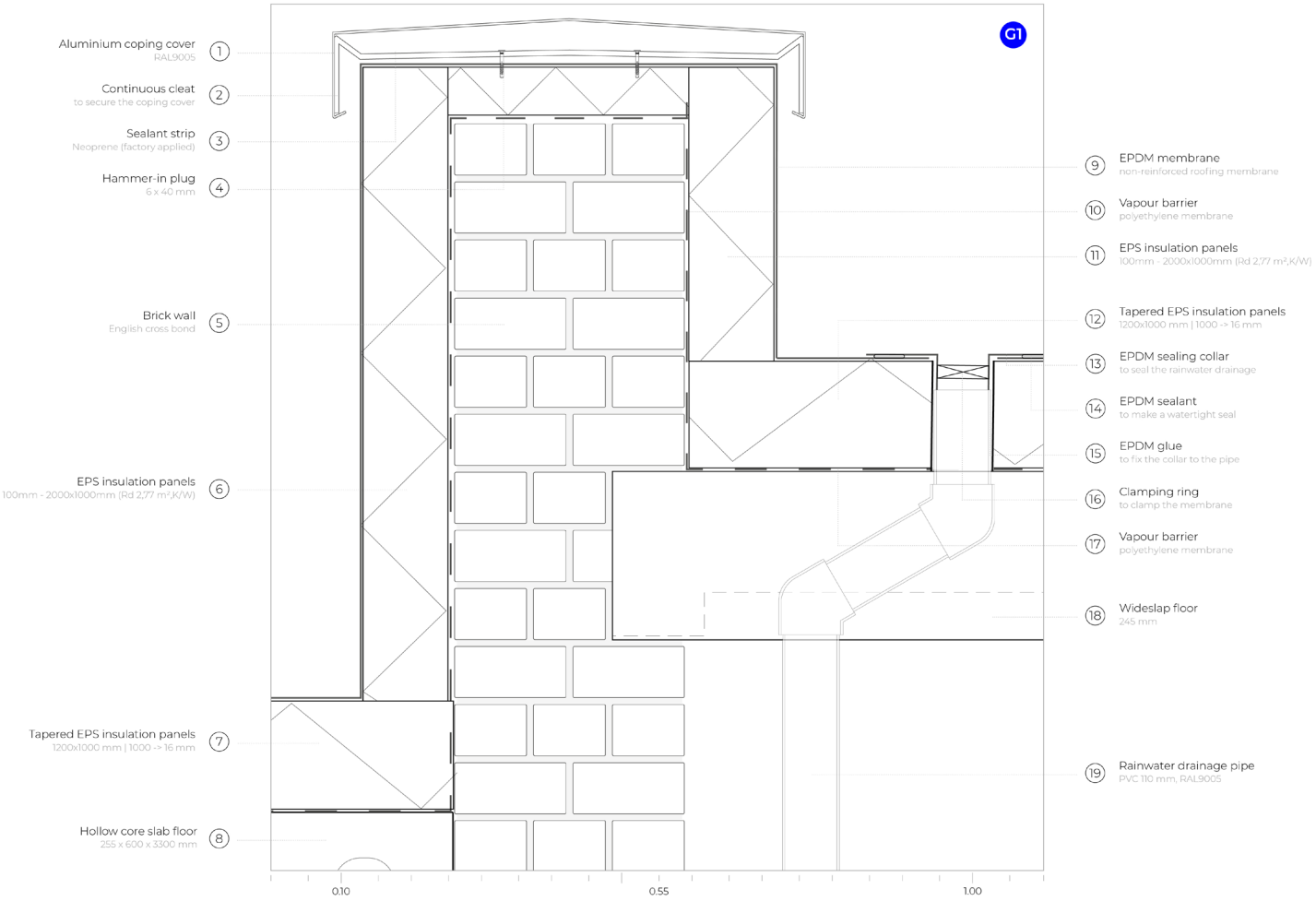
DETAIL DRAWINGS | VERTICAL SECTION F | SCALE 1.10



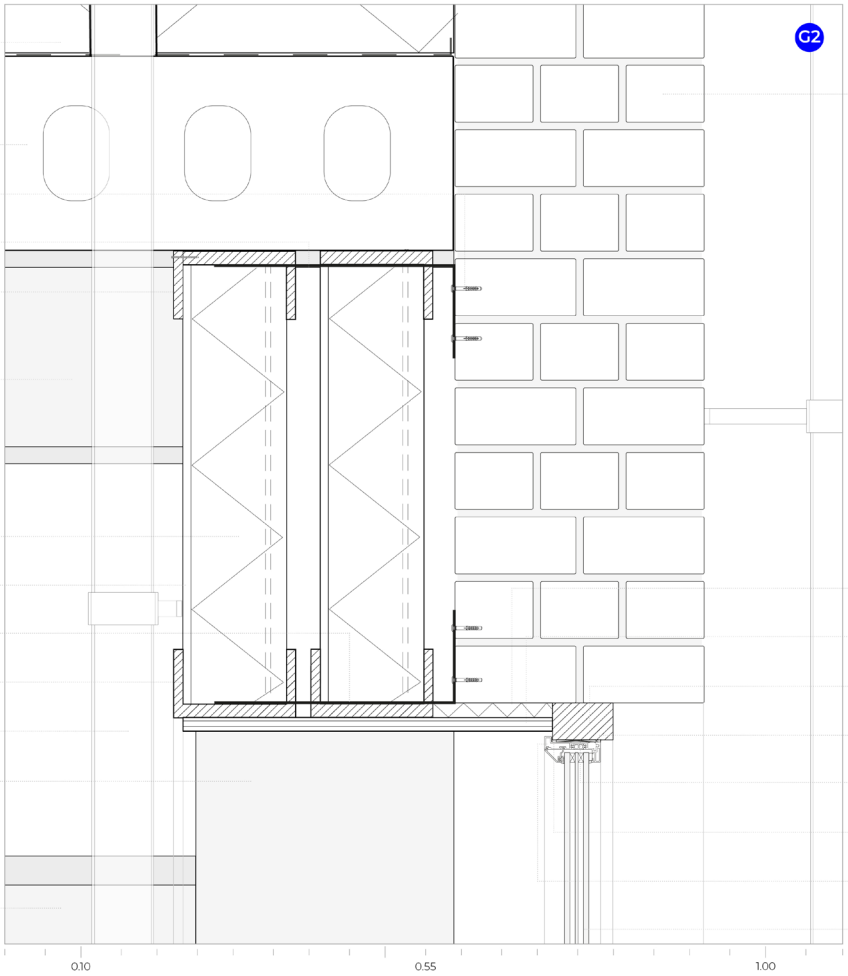
FRAGMENT | VERTICAL SECTION G | SCALE 1.100



DETAIL DRAWINGS | VERTICAL SECTION G | SCALE 1.10



DETAIL DRAWINGS | VERTICAL SECTION G | SCALE 1.10



1 Tapered EPS insulation panels
1200x1000 mm | 1000 -> 16 mm

2 Hollow core slab floor
255 x 600 x 3300 mm

3 Hammer-in plug
6 x 40 mm | Fisscher or equivalent

4 Steel angle bracket
requires a notch in the timber bracket

5 Timber bracket
Type PG120 | Faay or equivalent

6 Steel beam
IPE 270

7 Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent

8 Gypsum with finishing
RAL 9016 | Faay or equivalent

9 Steel angle bracket
requires a notch in the timber bracket

10 Timber bracket
Type PG120 | Faay or equivalent

11 Rainwater drainage pipe
PVC 110 mm, RAL9005

12 Steel column
HEA360

13 Steel beam
HEA360

14 Brick wall
English cross bond

15 Insulation
20 mm

16 Window trim
plywood 18 mm

17 Window buck
pine wood

18 Airtight sealant
exterior seal

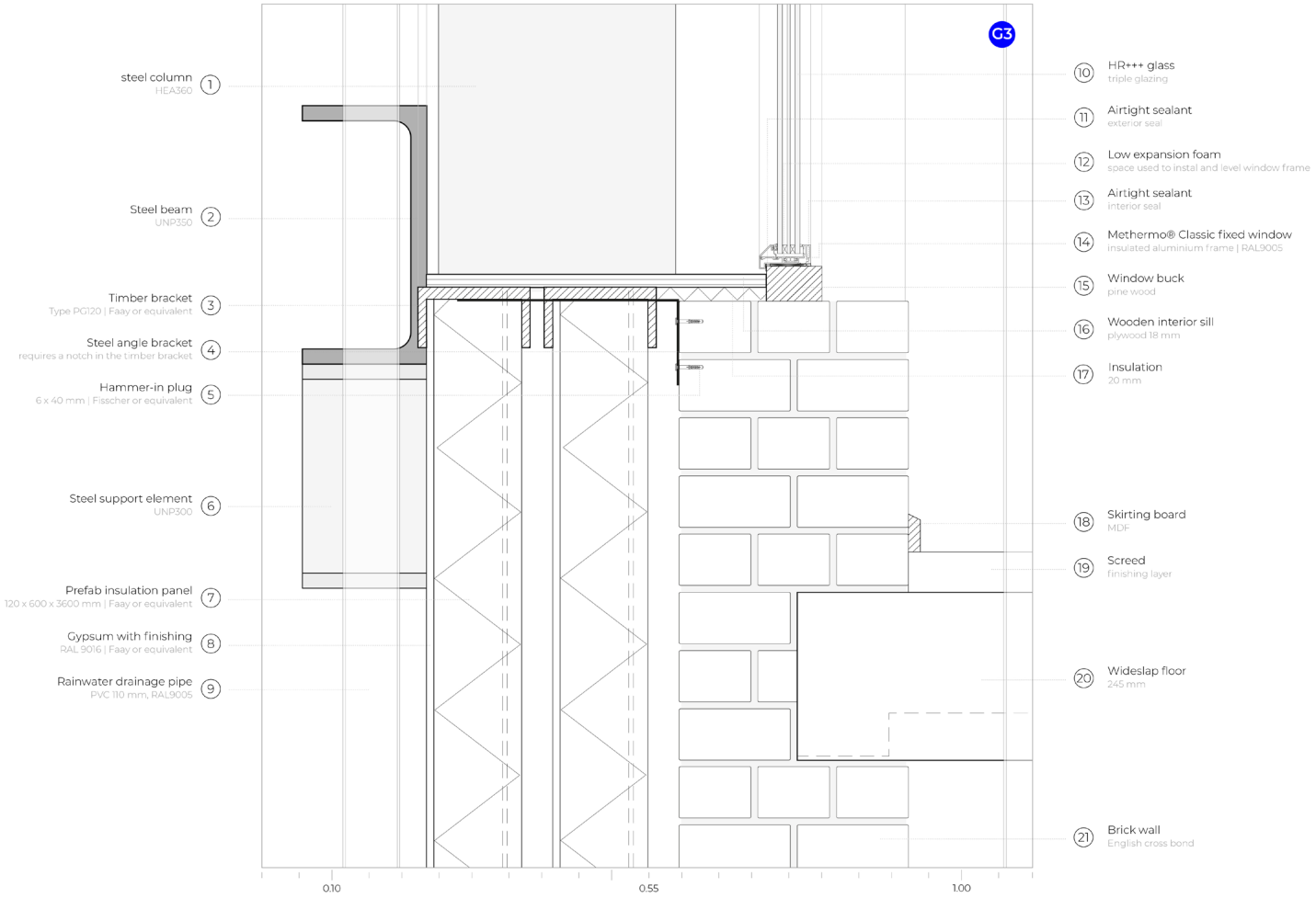
19 Low expansion foam
space used to instal and level window frame

20 Airtight sealant
interior seal

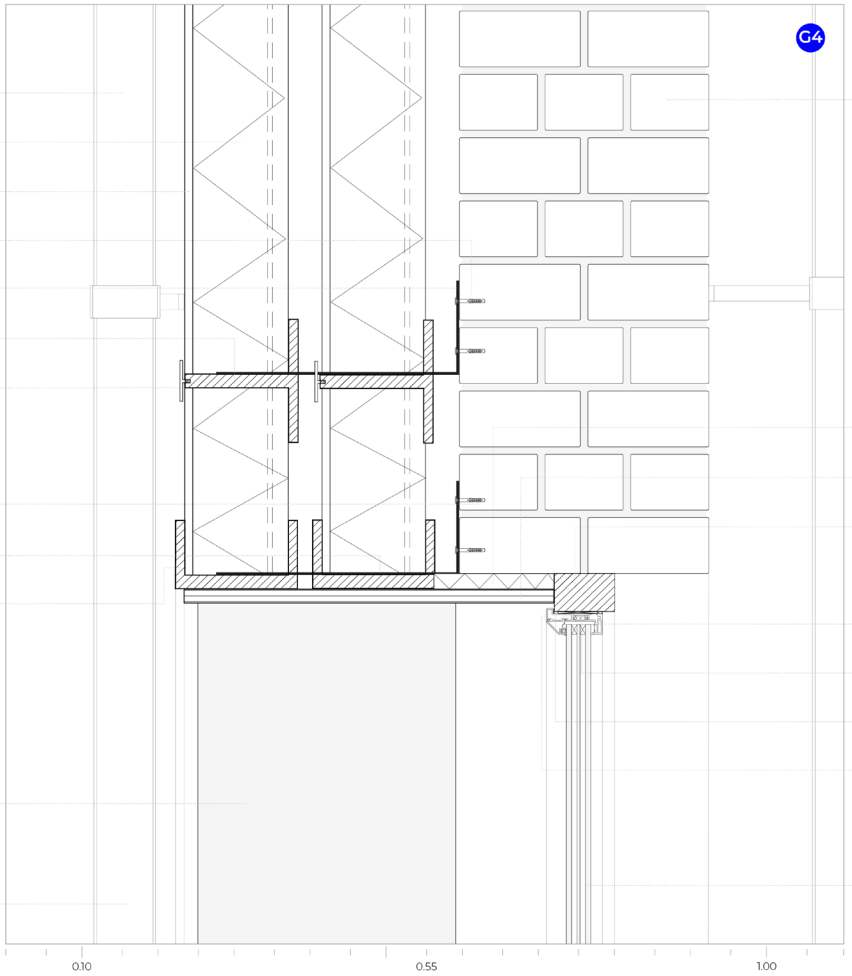
21 Methermo® Classic fixed window
insulated aluminium frame | RAL9005

22 HR+++ glass
triple glazing

DETAIL DRAWINGS | VERTICAL SECTION G | SCALE 1.10



DETAIL DRAWINGS | VERTICAL SECTION G | SCALE 1.10



1 Rainwater drainage pipe
PVC 110 mm, RAL9005

2 Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent

3 Gypsum with finishing
RAL 9016 | Faay or equivalent

4 Hammer-in plug
6 x 40 mm | Fisscher or equivalent

5 Steel angle bracket
requires a notch in the timber bracket

6 Timber bracket
Type PG120 | Faay or equivalent

7 Click profile
panels fixed without visible screws

8 Hammer-in plug
6 x 40 mm | Fisscher or equivalent

9 Steel angle bracket
requires a notch in the timber bracket

10 Timber bracket
Type PG120 | Faay or equivalent

11 steel column
HEA360

12 Rainwater drainage pipe
PVC 110 mm, RAL9005

13 Brick wall
English cross bond

14 Insulation
20 mm

15 Window trim
plywood 18 mm

16 Window buck
pine wood

17 Airtight sealant
exterior seal

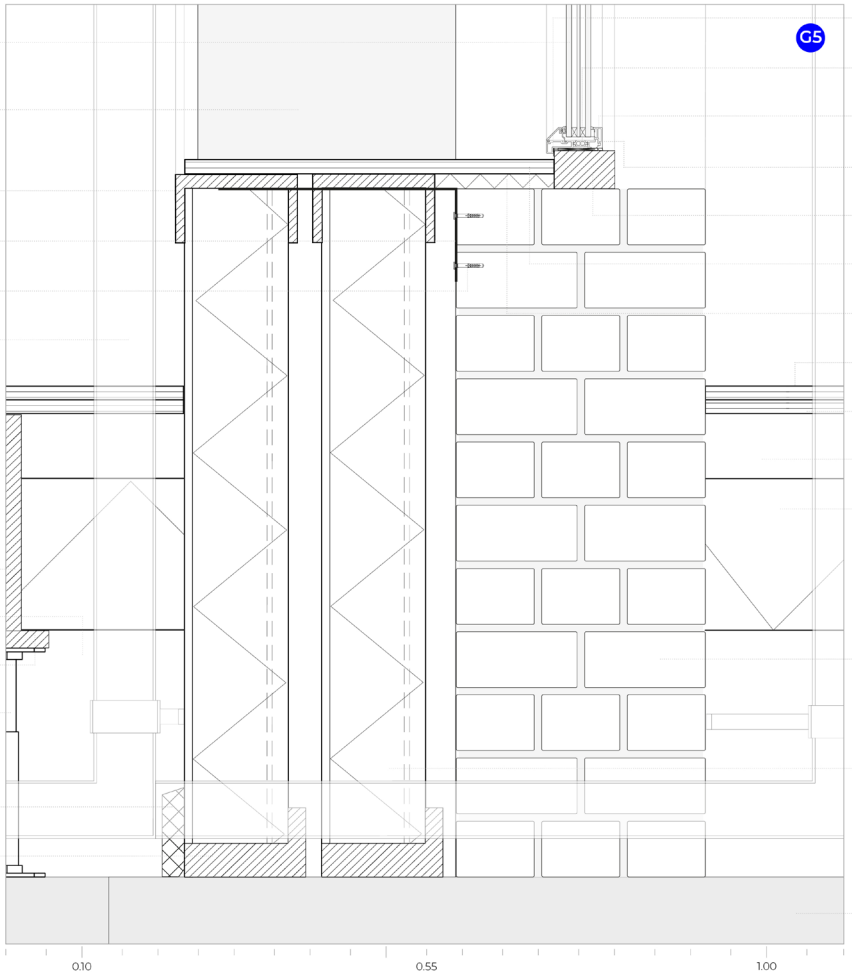
18 Low expansion foam
space used to instal and level window frame

19 Airtight sealant
interior seal

20 Methermo® Classic fixed window
insulated aluminium frame | RAL9005

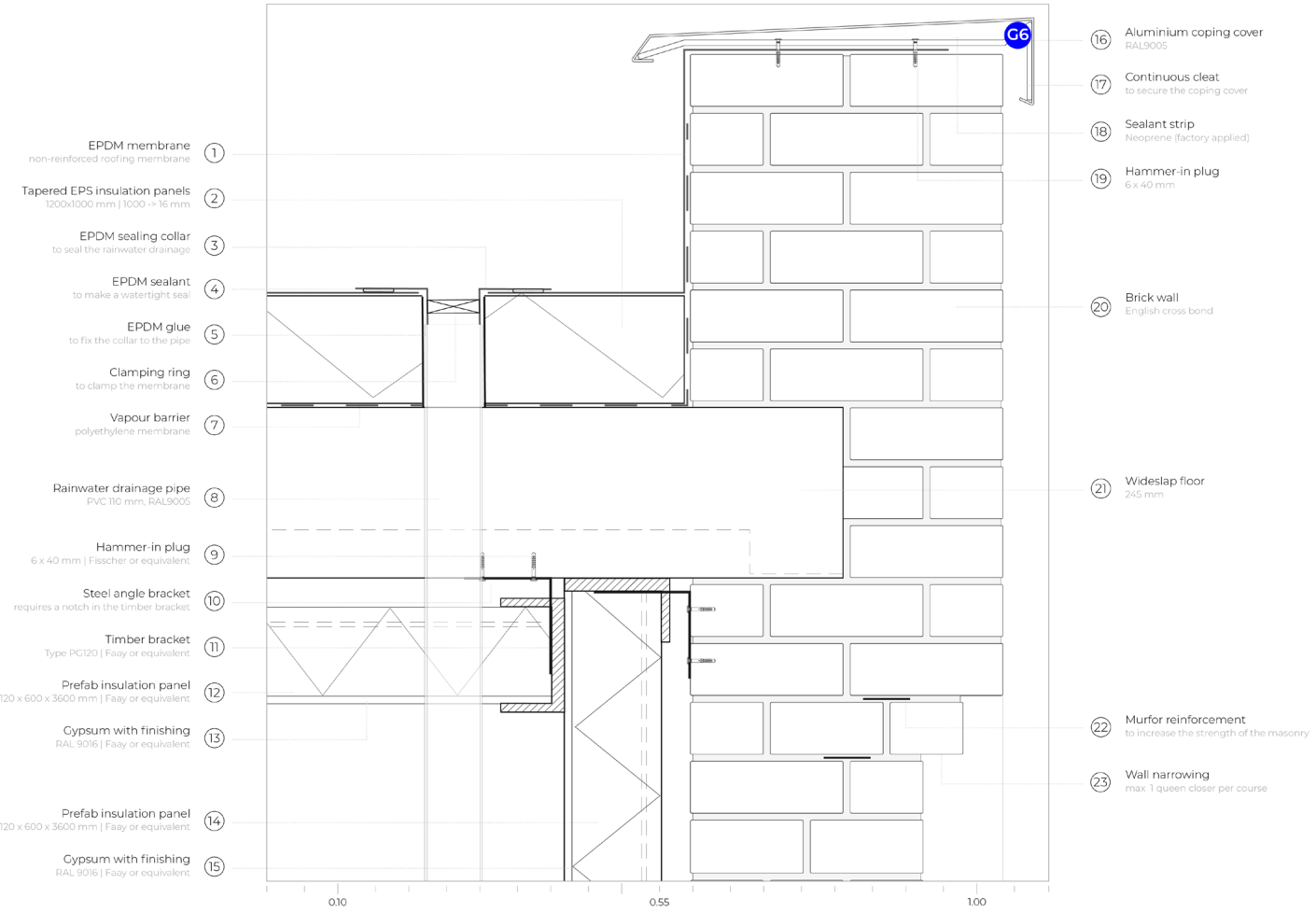
21 HR+++ glass
triple glazing

DETAIL DRAWINGS | VERTICAL SECTION G | SCALE 1.10



1. HR+++ glass
   triple glazing
2. steel column
   HEA360
3. Timber bracket
   Type PG120 | Faay or equivalent
4. Steel angle bracket
   requires a notch in the timber bracket
5. Hammer-in plug
   6 x 40 mm | Fisscher or equivalent
6. Rainwater drainage pipe
   PVC 110 mm, RAL9005
7. Pine wood beam
   38 x 285 mm
8. Space for piping
   max slope of the pipes is 300 mm
9. Plywood
   to support the EPS
10. Adjustable legs
    to level and raise the floor
11. Skirting board
    MDF
12. Timber bracket
    Type PG120 | Faay or equivalent
13. Airtight sealant
    exterior seal
14. Low expansion foam
    space used to instal and level window frame
15. Airtight sealant
    interior seal
16. Methermo® Classic fixed window
    insulated aluminium frame | RAL9005
17. Window buck
    pine wood
18. Wooden interior sill
    plywood 18 mm
19. Insulation
    20 mm
20. Abrasion resistant coating
    RAL 7038 agate grey
21. Plywood 18 mm
    2 layers placed crosswise
22. Pine wood beam
    38 x 285 mm
23. Insulation
    200 mm (Rd 5,55 m²,K/W)
24. Brick wall
    English cross bond
25. Prefab insulation panel
    120 x 600 x 3600 mm | Faay or equivalent
26. Concrete floor
    non-insulated original floor

DETAIL DRAWINGS | VERTICAL SECTION G | SCALE 1.10



1 EPDM membrane
non-reinforced roofing membrane

2 Tapered EPS insulation panels
1200x1000 mm | 1000 -> 16 mm

3 EPDM sealing collar
to seal the rainwater drainage

4 EPDM sealant
to make a watertight seal

5 EPDM glue
to fix the collar to the pipe

6 Clamping ring
to clamp the membrane

7 Vapour barrier
polyethylene membrane

8 Rainwater drainage pipe
PVC 110 mm, RAL9005

9 Hammer-in plug
6 x 40 mm | Fisscher or equivalent

10 Steel angle bracket
requires a notch in the timber bracket

11 Timber bracket
Type PG120 | Faay or equivalent

12 Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent

13 Cypsum with finishing
RAL 9016 | Faay or equivalent

14 Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent

15 Cypsum with finishing
RAL 9016 | Faay or equivalent

16 Aluminium coping cover
RAL9005

17 Continuous cleat
to secure the coping cover

18 Sealant strip
Neoprene (factory applied)

19 Hammer-in plug
6 x 40 mm

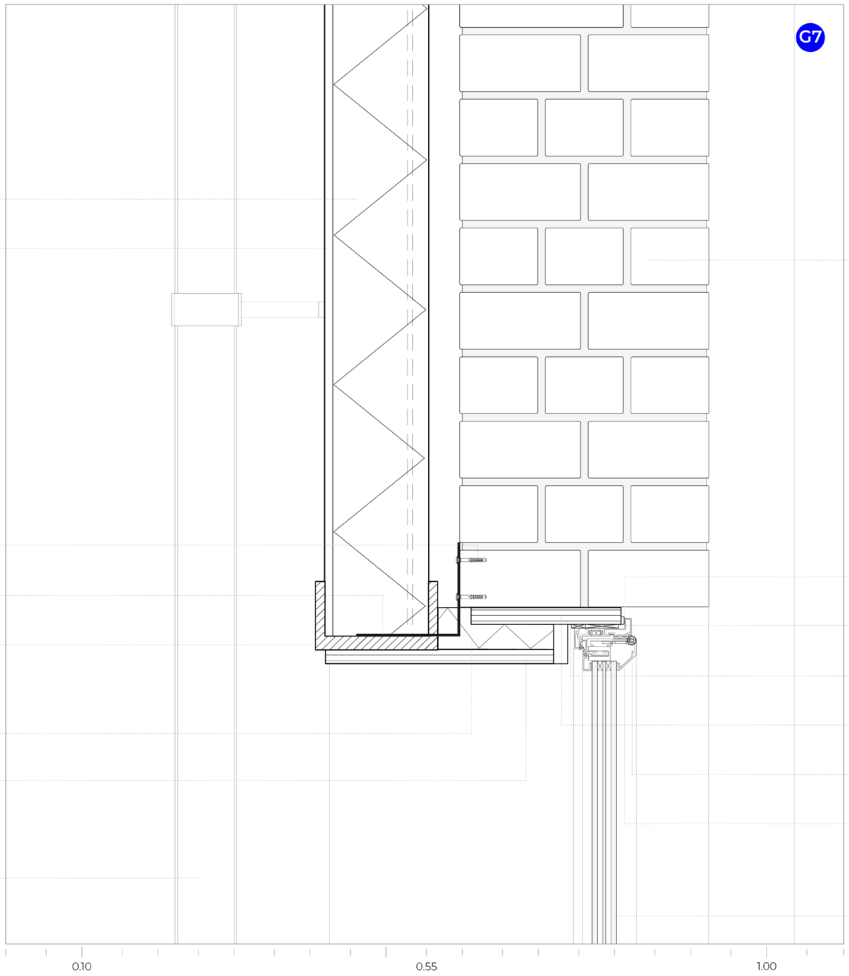
20 Brick wall
English cross bond

21 Wideslap floor
245 mm

22 Murfor reinforcement
to increase the strength of the masonry

23 Wall narrowing
max 1 queen closer per course

DETAIL DRAWINGS | VERTICAL SECTION G | SCALE 1.10



1 Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent

2 Gypsum with finishing
RAL 9016 | Faay or equivalent

3 Hammer-in plug
6 x 40 mm | Fisscher or equivalent

4 Steel angle bracket
requires a notch in the timber bracket

5 Timber bracket
Type PG120 | Faay or equivalent

6 Insulation
35 mm

7 Window trim
plywood 18 mm

8 Rainwater drainage pipe
PVC 110 mm, RAL9005

9 Brick wall
English cross bond

10 Water-repellent sealant
exterior seal

11 Low expansion foam
space used to instal and level window frame

12 Airtight sealant
interior seal

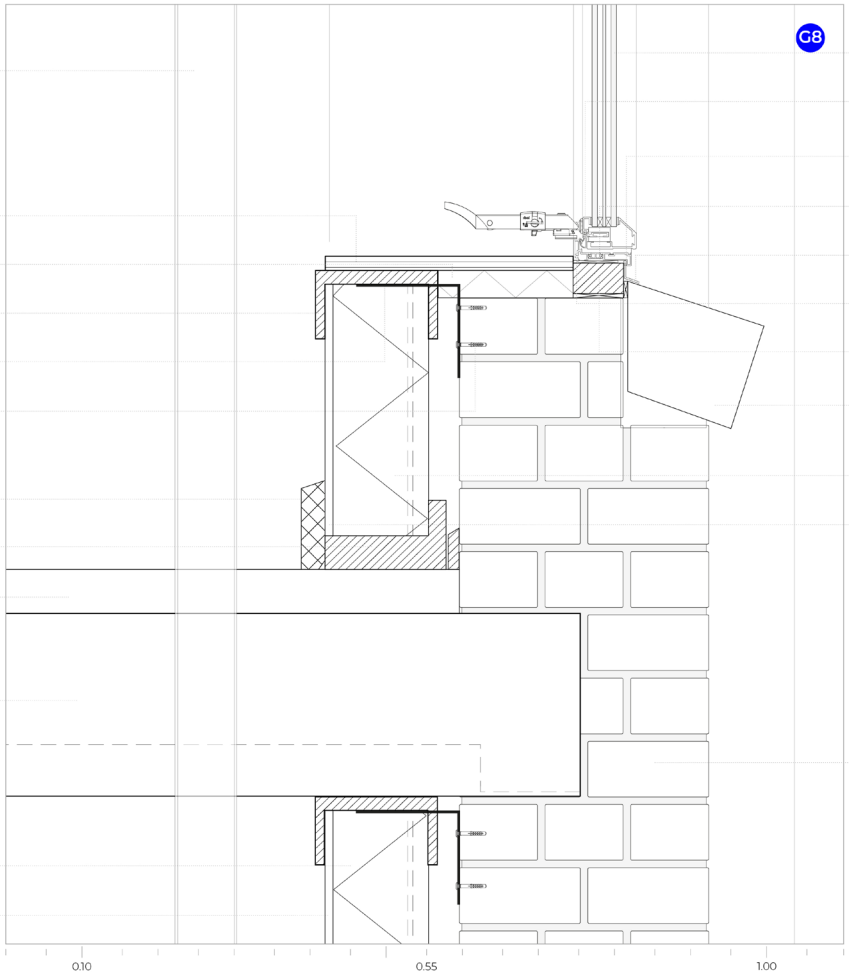
13 Window buck
Plywood 22mm

14 Stainless steel hinge
to open the window

15 Methermo® Classic casement window
insulated aluminium frame | RAL9005

16 HR+++ glass
triple glazing

DETAIL DRAWINGS | VERTICAL SECTION G | SCALE 1.10



1 Rainwater drainage pipe
PVC 110 mm, RAL9005

2 Wooden interior sill
plywood 18 mm

3 Insulation
35 mm

4 Timber bracket
Type PG120 | Faay or equivalent

5 Steel angle bracket
requires a notch in the timber bracket

6 Hammer-in plug
6 x 40 mm | Fisscher or equivalent

7 Skirting board
MDF

8 Timber bracket
Type PG120 | Faay or equivalent

9 Screed
finishing layer

10 Wideslap floor
245 mm

11 Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent

12 Gypsum with finishing
RAL 9016 | Faay or equivalent

13 HR+++ glass
triple glazing

14 Methermo® Classic casement window
insulated aluminium frame | RAL9005

15 Water-repellent sealant
exterior seal

16 Low expansion foam
space used to instal and level window frame

17 Sill flap
flexible PVC

18 Airtight sealant
interior seal

19 Window buck
pine wood

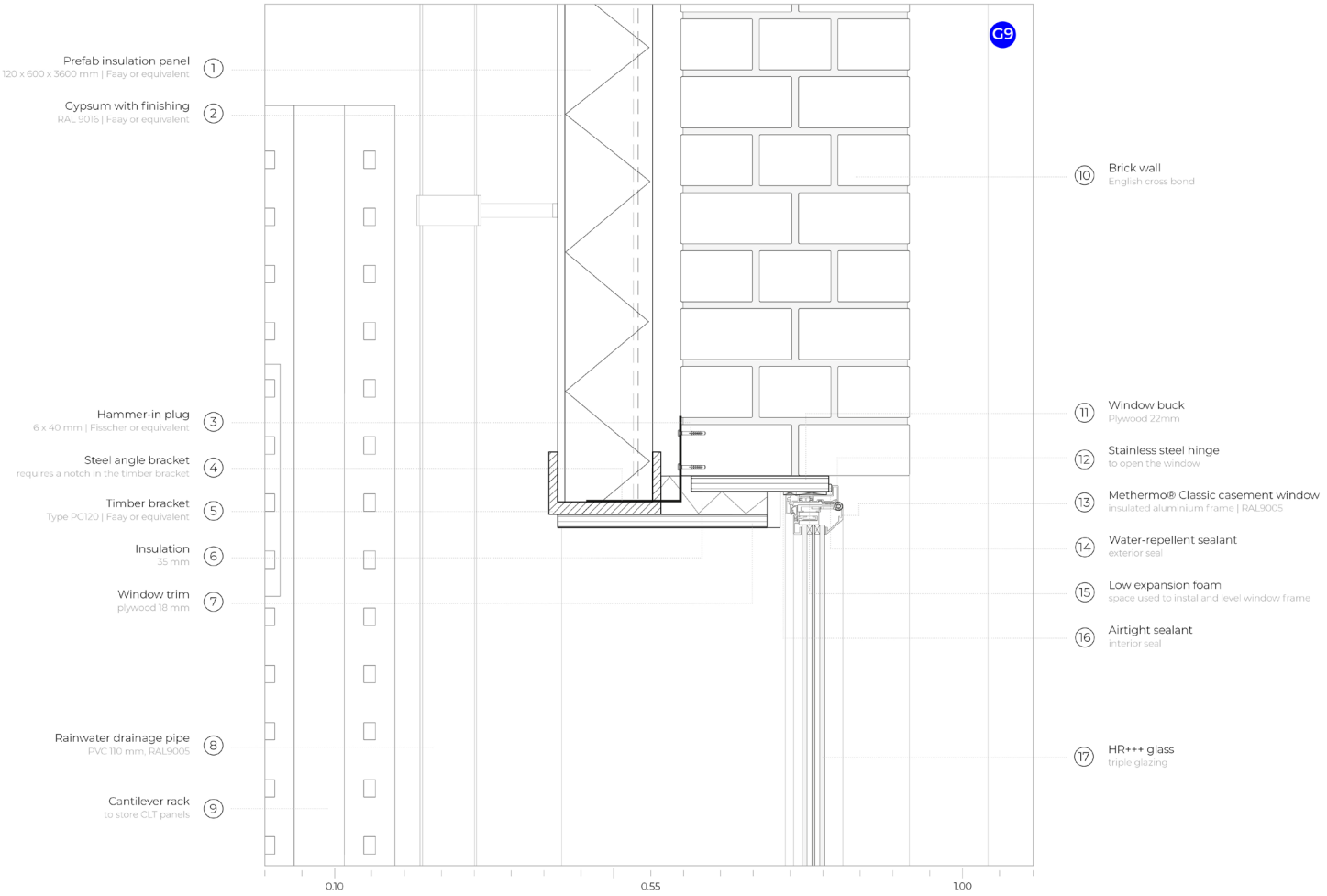
20 Exterior window sill
stone

21 Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent

22 Gypsum with finishing
RAL 9016 | Faay or equivalent

23 Brick wall
English cross bond

DETAIL DRAWINGS | VERTICAL SECTION G | SCALE 1.10



1 Prefab insulation panel
120 x 600 x 3600 mm | Faay or equivalent

2 Gypsum with finishing
RAL 9016 | Faay or equivalent

3 Hammer-in plug
6 x 40 mm | Fisscher or equivalent

4 Steel angle bracket
requires a notch in the timber bracket

5 Timber bracket
Type PG120 | Faay or equivalent

6 Insulation
35 mm

7 Window trim
plywood 18 mm

8 Rainwater drainage pipe
PVC 110 mm, RAL9005

9 Cantilever rack
to store CLT panels

10 Brick wall
English cross bond

11 Window buck
Plywood 22mm

12 Stainless steel hinge
to open the window

13 Methermo® Classic casement window
insulated aluminium frame | RAL9005

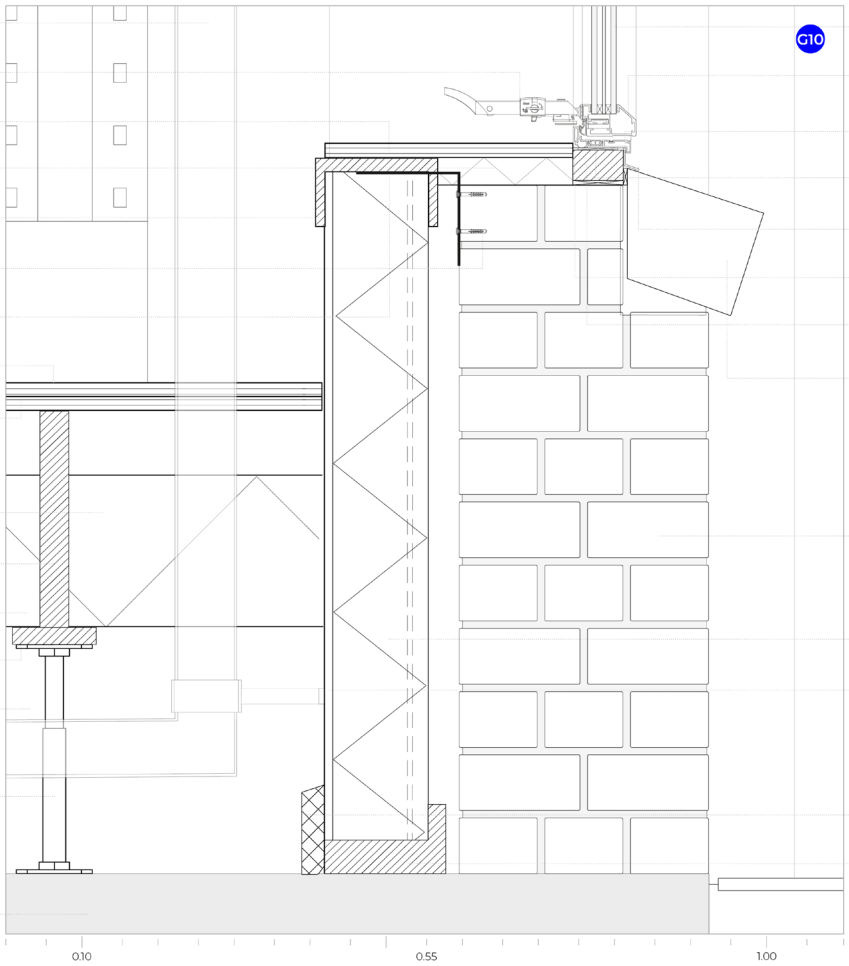
14 Water-repellent sealant
exterior seal

15 Low expansion foam
space used to instal and level window frame

16 Airtight sealant
interior seal

17 HR+++ glass
triple glazing

DETAIL DRAWINGS | VERTICAL SECTION G | SCALE 1.10



1. Rainwater drainage pipe
   PVC 110 mm, RAL9005
2. Manual window opener
   Axa Telescopic black or equivalent
3. Wooden interior sill
   plywood 18 mm
4. Insulation
   35 mm
5. Timber bracket
   Type PG120 | Faay or equivalent
6. Hammer-in plug
   6 x 40 mm | Fisscher or equivalent
7. Steel angle bracket
   requires a notch in the timber bracket
8. Abrasion resistant coating
   RAL 7038 agate grey
9. Plywood 18 mm
   2 layers placed crosswise
10. Insulation
    200 mm (Rd 5,55 m².K/W)
11. Pine wood beam
    38 x 285 mm
12. Pine wood beam
    38 x 285 mm
13. Plywood
    to support the EPS
14. Space for piping
    max slope of the pipes is 300 mm
15. Adjustable legs
    to level and raise the floor
16. Concrete floor
    non-insulated original floor
17. HR+++ glass
    triple glazing
18. Methermo® Classic casement window
    insulated aluminium frame | RAL9005
19. Water-repellent sealant
    exterior seal
20. Low expansion foam
    space used to instal and level window frame
21. Sill flap
    flexible PVC
22. Airtight sealant
    interior seal
23. Window buck
    pine wood
24. Exterior window sill
    stone
25. Brick wall
    English cross bond
26. Prefab insulation panel
    120 x 600 x 3600 mm | Faay or equivalent
27. Gypsum with finishing
    RAL 9016 | Faay or equivalent
28. Skirting board
    MDF
29. Timber bracket
    Type PG120 | Faay or equivalent