P5

A-Common Houses

AR3AE100 Architectural Engineering Graduation Studio

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The best timber is from the forest behind.

Japanese Proverbs

State of the Art. Point of Reflection

I believe among the list of apparent 'needs', like more speed, square area, efficiency, etc. will never satisfy our thirst, because simply human are too prone to changes and even the definition of needs can be so much differed.
With the dwindling of resources, we ask are we going to pursue in this method of building? Can we sustain or even afford to do so?

Common Reeds: a Local Inventory

Out of fascination, I focused on Common Reeds as building material. It may sound to be a less competent local material, but I believe that this soft, archaic, informal, material has much to offer to our building industry. Apart from being a carbon-sequestering agent, mitigating peat oxidation, sustaining local craftmanship & heritage, it is a beautiful material that grows in the Dutch wetlands.

To materialise this relatively abstract idea of questioning our way of building, I believe the key lies in substance: building material.

Collection / Archive Photo collection Anefo Report / Series Construction in the Betuwe (1945). Description [The thatched roof of a farm is covered] Date 1945 Location Betuwe Photographer Unknown / Anefo. https://www.nationaalarchief.nl/onderzoeken/fotocollectie/ac1a028e-d0b4-102d-bcf8-003048976d84

Counterpoint

I believe rather than looking "ambitiously" towards grander, bigger, faster methods of building, I believe by improvising with the current & local resources, there is still so much possibilities in our building industry.

A Study on Common Reeds

Before we delve into the exploration of reeds as a building material, which the values in bringing comfort will be justified in the design proposal later on, we first have to understand how reed performs, its properties, possibilities & limitations.

Performance of reeds in :fire retardancy, thermal insulation, maintenance ease, sound absorption:

- How reeds can be applied in compliance to the stringent building standards,
- How it **affects the architectural** aspects &
- What are the **decisions made**.

\+ **Case studies** on realised projects to see the different iterations of reeds applied

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A set of design guidelines on how to apply Common Reed in contemporary architecture design.

Research Paper

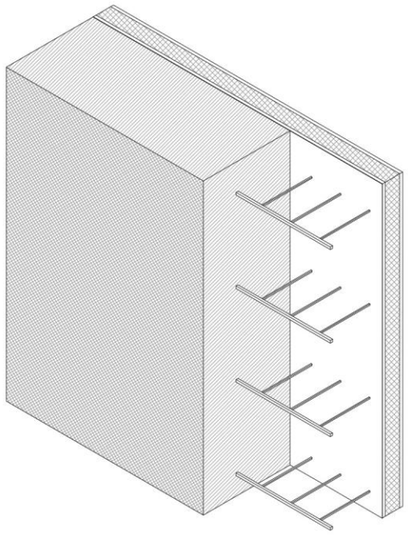
Before we delve into the exploration of reeds as a building material, which the values in bringing comfort will be justified in the design proposal later on, we first have to understand how reed performs, its properties, possibilities & limitations.

Beerstraten, J. (n.d.). The Great Fire in the Old Town Hall Amsterdam 1652 [Painting] https://www.myartprints.co.uk/a/beerstraten-jan/the-great-fire-in-the-old.html

Fire Retardance

According to Van Hemert et al. (1990, p.9), the earliest record issuing reed's fire hazard can be dated back to 1406, when the city Council of Leiden announced that for new houses whose side walls were higher than sixteen feet, a 'hard' roof (made of hard materials such as roof tiles or slates) is mandatory. In May 20,1450 the use of thatched roof for new houses is eventually banned.

Appendix 1: Illustrated Design Principles



300mm
untreated
reeds

Stainless steel
wire

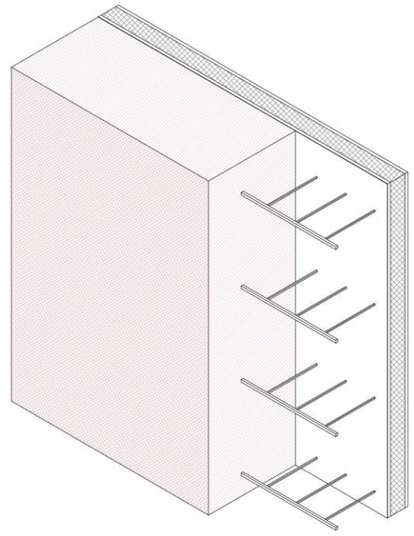
Stainless steel
threaded screw
at 280mm
interval

Debricoat Lapfix
self-adhesive membrane

Promatech-H Fire class
A steam-hardened
calcium silicate board,

Mineral wool
insulation panel

Benchmark Fire Retardance Criteria



300mm
impregnated
reeds

Stainless steel
wire

Stainless steel
threaded screw
at 280mm
interval

Debricoat Lapfix
self-adhesive membrane

Promatech-H Fire class
A steam-hardened
calcium silicate board,

Mineral wool
insulation panel

Revised Fire Retardance Criteria
(Incorporated Vernacular Solution: Sludge Paint
Coatings)

FUNCTIONAL REQUIREMENT: Fire Retardance

DEFINITION: The ability to slow down or halt the spread of fire. Measured in Retardance Time, Rt, in minutes (min)

STANDARDS / BENCHMARKS: Building Decree 2012 Fire Class B: 1. The fire resistance of the entire facade package (reed + substructure) must have a fire-resistance, Rt of 60 minutes from the outside to inside against fire penetration and fire spread. 2. The fire brigade must control the fire between 30 and 60 minutes after the start of fire.

MAJOR MANIPULATING VARIABLE (FACTOR WHICH INFLUENCES ITS PERFORMANCE): Construction Method

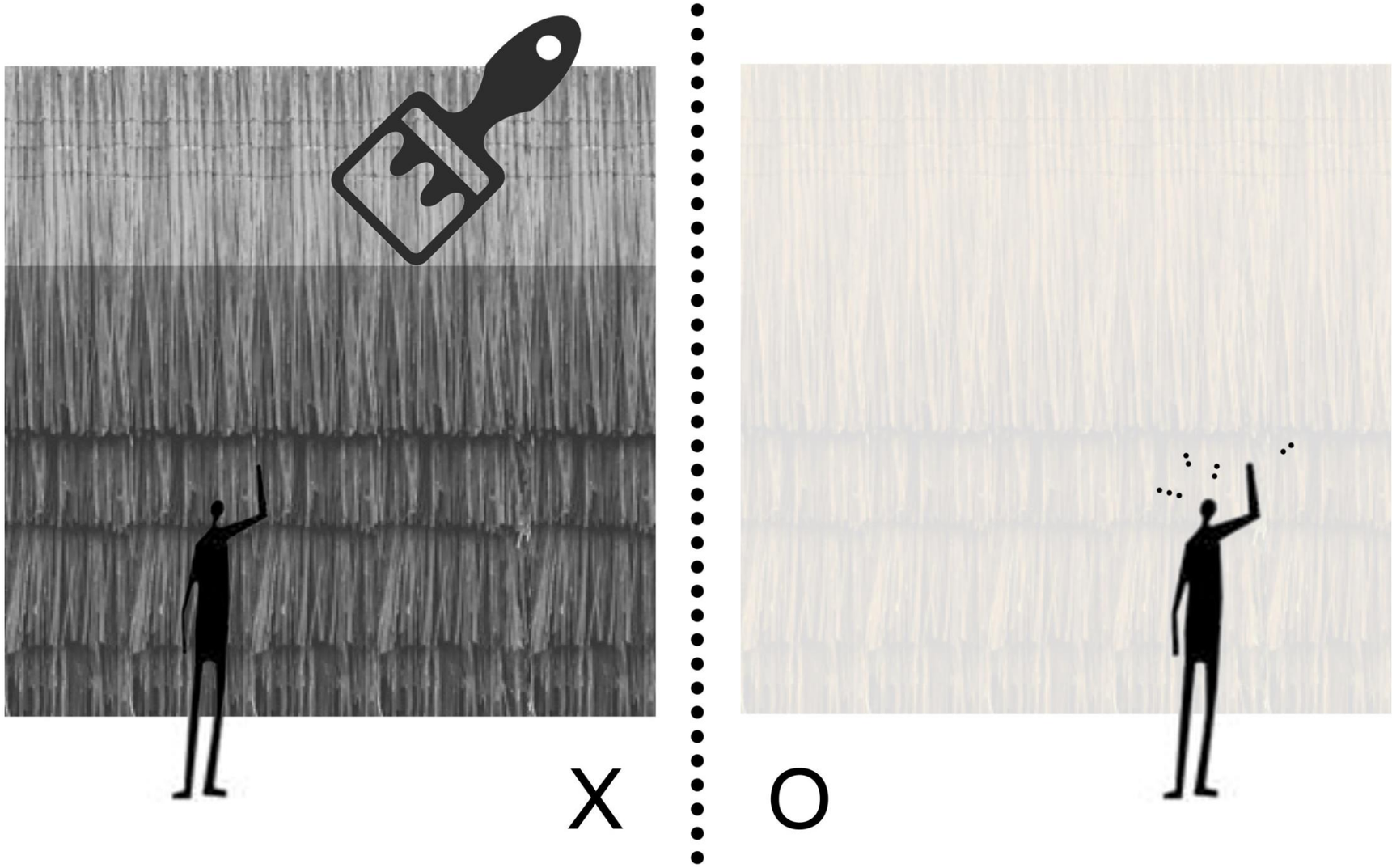
SCALE : 1:15

Performance of reeds in:
a. Fire Retardance
one of the biggest issue in building conventions. Can be resolved using closed construction.

b. Thermal Insulation
c. Maintenance Ease
d. Acoustic Insulation
e. Operational Ease

Fire Retardance

Fire retardance: Closed construction is sufficient to provide enough fire protection. Application of coatings such as ammonium chlorides are not advisable. The location is also important, meaning application should be away from potential heat source or fire hazards.



Fire Retardance

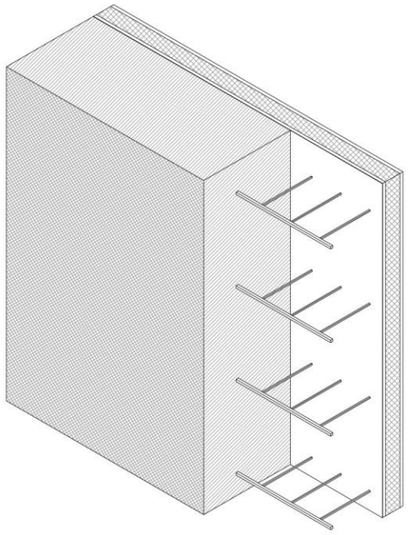
Effect on Architecture: Raw reeds are not suitable at place susceptible to fire hazard such as kitchen or ground floor public area. Also, with the closed-construction, meaning the reeds cannot be felt or see from the internal view anymore.
Decision-made: To use closed-construction as fire-proofing method. Since the reed cannot be seen from the interior, what if we allow the user to experience it from the external side.

Moerman, A. (n.d.) Winter Landscape [Painting] https://rita314.wordpress.com/2009/01/11/more-cold-dogs/

Thermal Insulation

Cold & wet climate in Dutch context make insulation a critical point of assessment.

Appendix 1: Illustrated Design Principles



300mm
untreated
reeds

Stainless steel
wire

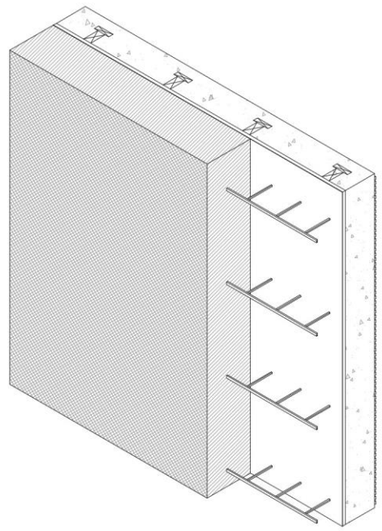
Stainless steel
threaded screw
at 280mm
interval

Debricoat Lapfix
self-adhesive membrane

Promatech-H Fire class
A steam-hardened
calcium silicate board,

Mineral wool
insulation panel

Benchmark Thermal Insulation Criteria



180mm
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Stainless steel
wire

Stainless steel
threaded screw
at 280mm
interval

Debricoat Lapfix
self-adhesive membrane

Promatech-H Fire class
A steam-hardened
calcium silicate board,

100mm clay-rich light
earth, bulk density, d=
300kg/m3

Reed lath, t=+/-10mm, 70
pc./m, fastened with zinc
plated narrow gauge wire

Revised Thermal Insulation Criteria
(Incorporated Vernacular Solution:
Light Earth Hybrid)

FUNCTIONAL REQUIREMENT: Thermal Insulation

DEFINITION: The capability of a material to reduce the transmission of heat between objects in thermal contact or range of radiative influence.
Measured in thermal insulative value, R-value in (m^2K/W)

STANDARDS / BENCHMARKS: According to NZEB, a requisite R-value of 4.7 m^2K/W need to be complied.

MAJOR MANIPULATING VARIABLE (FACTOR WHICH INFLUENCES ITS PERFORMANCE): Thatch thickness

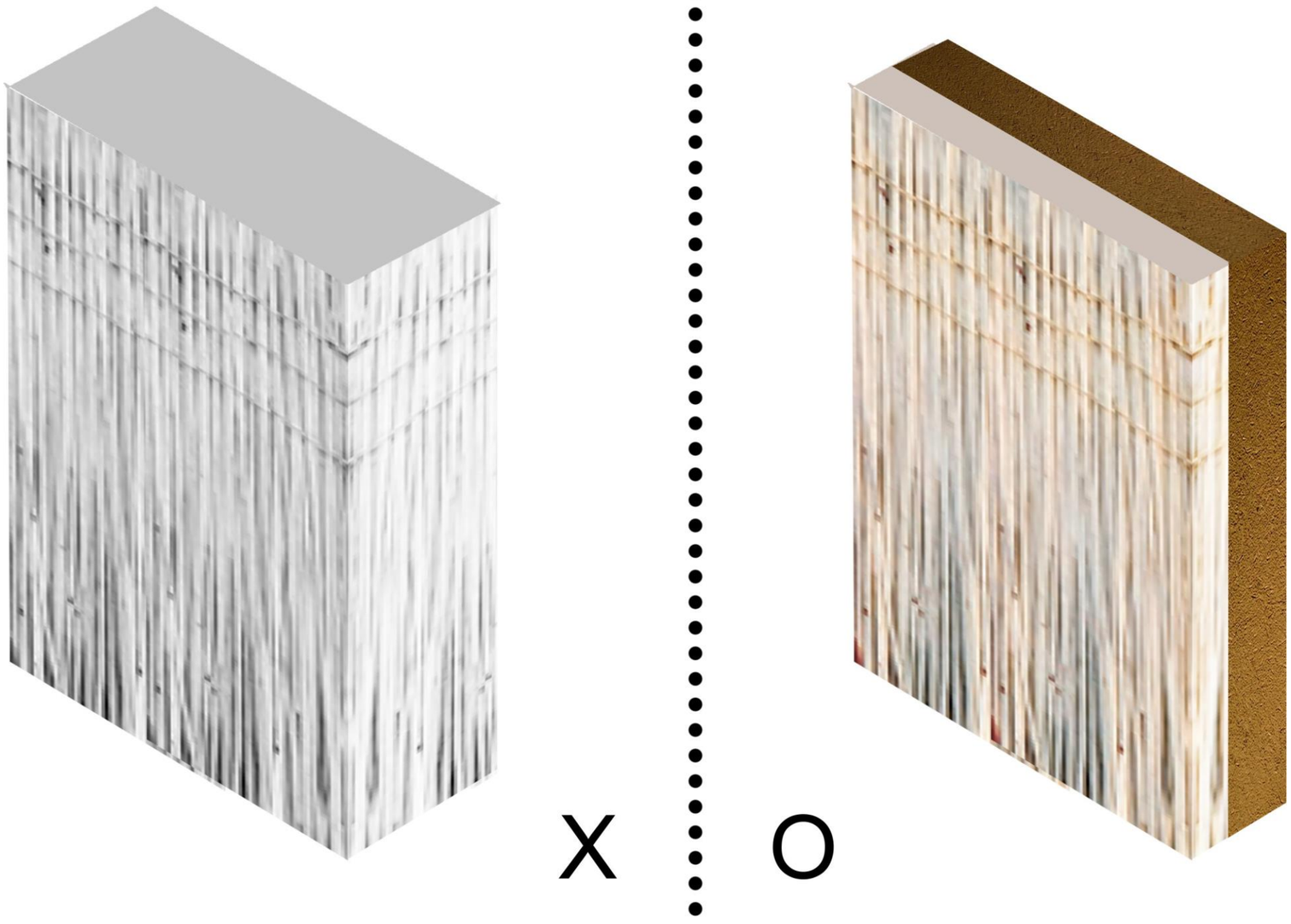
SCALE : 1:15

Performance of reeds in:
a. Fire Retardance
b.Thermal Insulation
is relatively mediocre.
Therefore natural composites
can be opted to overcome
this limitations.

c. Maintenance Ease
d. Acoustic Insulation
e. Operational Ease

Thermal Insulation

Thermal insulation: Reed thatch need to be very thick to achieve the NZEB requisite, which can either be an architectural statement or an encroachment on usable floor area. Thus, rather than evaluating the dos and donts on this criteria, we believe that the decision on the thickness of thatch depends on the architectural position of the designer.



Thermal Insulation

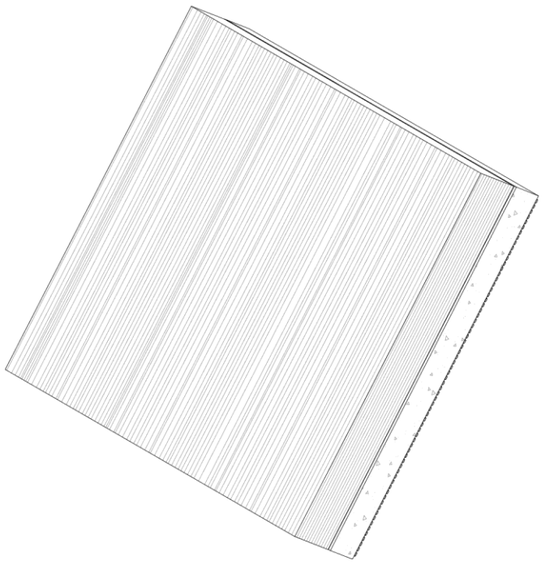
Effect on Architecture: Thick threshold which meaning less usable floor area, but also some architectural statement (with the deep depth and ingress from the threshold).
Decision-made: To incorporate other biobased materials such as light earth as composite. This also brings a new render to the face, which is a more earthy ambience.

Dutch School. (19th century). Landscape with figures on a path by a windmill, rain clouds beyond [Painting] https://www.sothebys.com/en/buy/auction/2019/old-masters-online-part-i-property-from-the-soer-rusche-collection-part-ii-property-from-various-owners/dutch-school-19th-century-landscape-with-figures

Maintenance Ease

Wet & Cloudy weather make thatches more susceptible to wear & tear.

Appendix 1: Illustrated Design Principles



180mm untreated reeds fastened vetically on **45 degree** inclined substructure

Stainless steel wire

Stainless steel threaded screw at 280mm interval

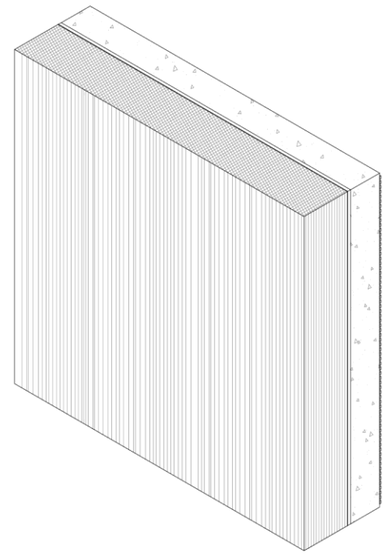
Debricoat Lapfix self-adhesive membrane

Promatech-H Fire class A steam-hardened calcium silicate board,

100mm clay-rich light earth, bulk density, d= 300kg/m3

Reed lath, t=+/-10mm, 70 pc./m, fastened with zinc plated narrow gauge wire

Benchmark Maintenance Ease Criteria (45 degree slope)



180mm untreated reeds arranged vertically on **90 degree (plumb)** substructure

Stainless steel wire

Stainless steel threaded screw at 280mm interval

Debricoat Lapfix self-adhesive membrane

Promatech-H Fire class A steam-hardened calcium silicate board,

100mm clay-rich light earth, bulk density, d= 300kg/m3

Reed lath, t=+/-10mm, 70 pc./m, fastened with zinc plated narrow gauge wire

Revised Maintenance Ease Criteria (90 degree slope)

FUNCTIONAL REQUIREMENT: Maintenance Ease

DEFINITION: The ease of preserving an optimal operative condition of the material. Measured in the lifespan of the original material, time (years).

STANDARDS / BENCHMARKS: Minimum 25 years

MAJOR MANIPULATING VARIABLE (FACTOR WHICH INFLUENCES ITS PERFORMANCE): Slope Angle

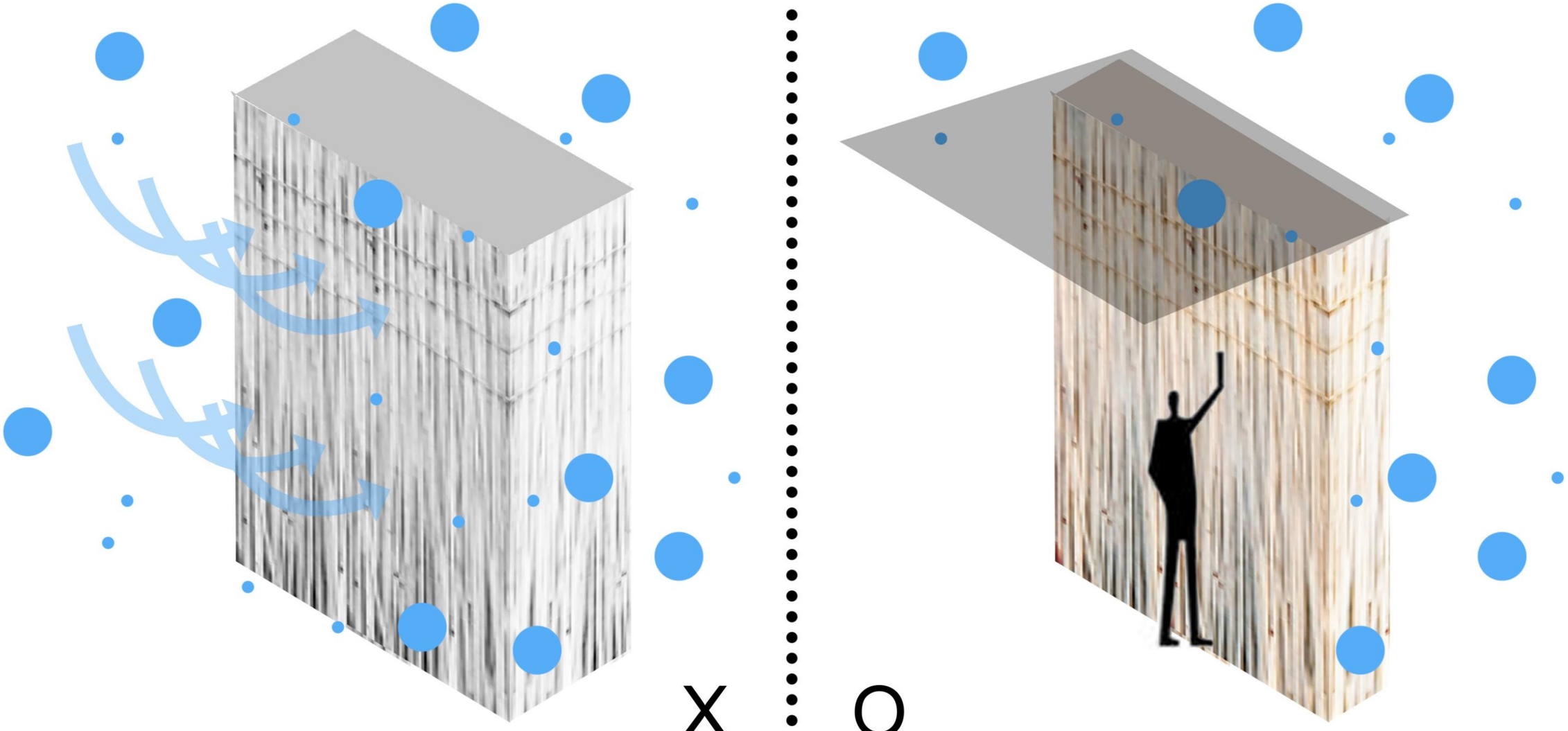
SCALE : 1:15

Performance of reeds in:
a. Fire Retardance
b. Thermal Insulation
c. Maintenance Ease
Is within 30 years lifespan. To strike a balance between convenience and calling on our conscient to take care of our built environment, reeds can be applied carefully in sheltered or protected facades in high-rise.

d. Acoustic Insulation
e. Operational Ease

Maintenance Ease

Moisture, pest and fungus are the major issue. Thus, minimum slope of 45 degree is advised to ensure fast water drainage.
Direct exposure of sun can also help to dry the thatch faster and prevent the growth of pests and fungus. Also, direct contact with ground, abutting surface etc, should be avoided to reduce moisture retention.



Maintenance Ease

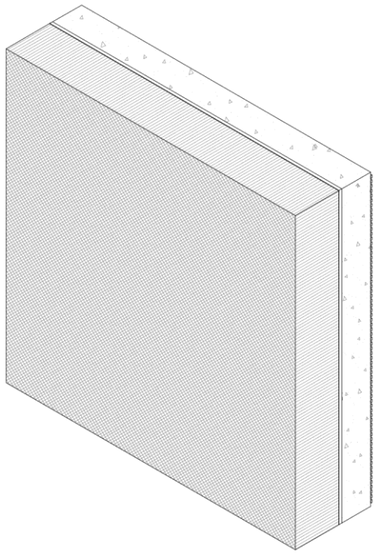
Effect on architecture: Gives a vertical rhythm on the wall, which is pleasant. Also, with this fragility highlighted, we use architecture as a tool to inspire users to take care of their house, fostering a close-relationship with our surroundings.
Decision-made: This lifespan is relatively shorter than many materials such as concrete and bricks, but we are celebrating the idea of a living material which age together with us. Therefore, we would like to use reed as a bridge to rekindle this sensitivity towards our environment. Also, since it requires maintenance, we see the possibility to allow users to easily access their thatch and maintenance can be done on own's effort.

Steen, J. H. (1668). The Merry Family [oil on canvas] https://www.rijksmuseum.nl/en/collection/SK-C-229

Acoustic Insulation

A house should too provide a sense of protection and serenity.

Appendix 1: Illustrated Design Principles



180mm untreated reeds arranged in **lateral direction** to incident sound waves

Stainless steel wire

Stainless steel threaded screw at 280mm interval

Debricoat Lapfix self-adhesive membrane

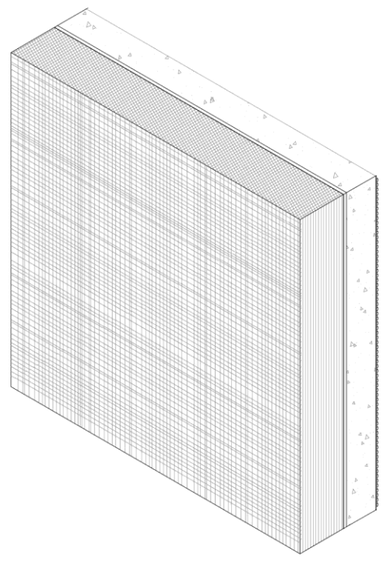
Promatech-H Fire class A steam-hardened calcium silicate board,

100mm clay-rich light earth, bulk density, d= 300kg/m3

Reed lath, t=+/-10mm, 70 pc./m, fastened with zinc plated narrow gauge wire

Acoustic Insulation Criteria for High Frequency Absorption

Grounded reed insulation panel



Stainless steel wire

Stainless steel threaded screw at 280mm interval

Debricoat Lapfix self-adhesive membrane

Promatech-H Fire class A steam-hardened calcium silicate board,

100mm clay-rich light earth, bulk density, d= 300kg/m3

Reed lath, t=+/-10mm, 70 pc./m, fastened with zinc plated narrow gauge wire

Acoustic Insulation Criteria for Low Frequency Absorption

FUNCTIONAL REQUIREMENT: Acoustic Insulation

DEFINITION: The ratio of sound energy absorbed by a material(E) to the overall sound energy previously spread and reaching the surface of the material(Eo). Measured in sound absorption coefficient(α). 1=total absorption, 0=total reflection

STANDARDS / BENCHMARKS: Minimum 0.8 sound absorption coefficient.

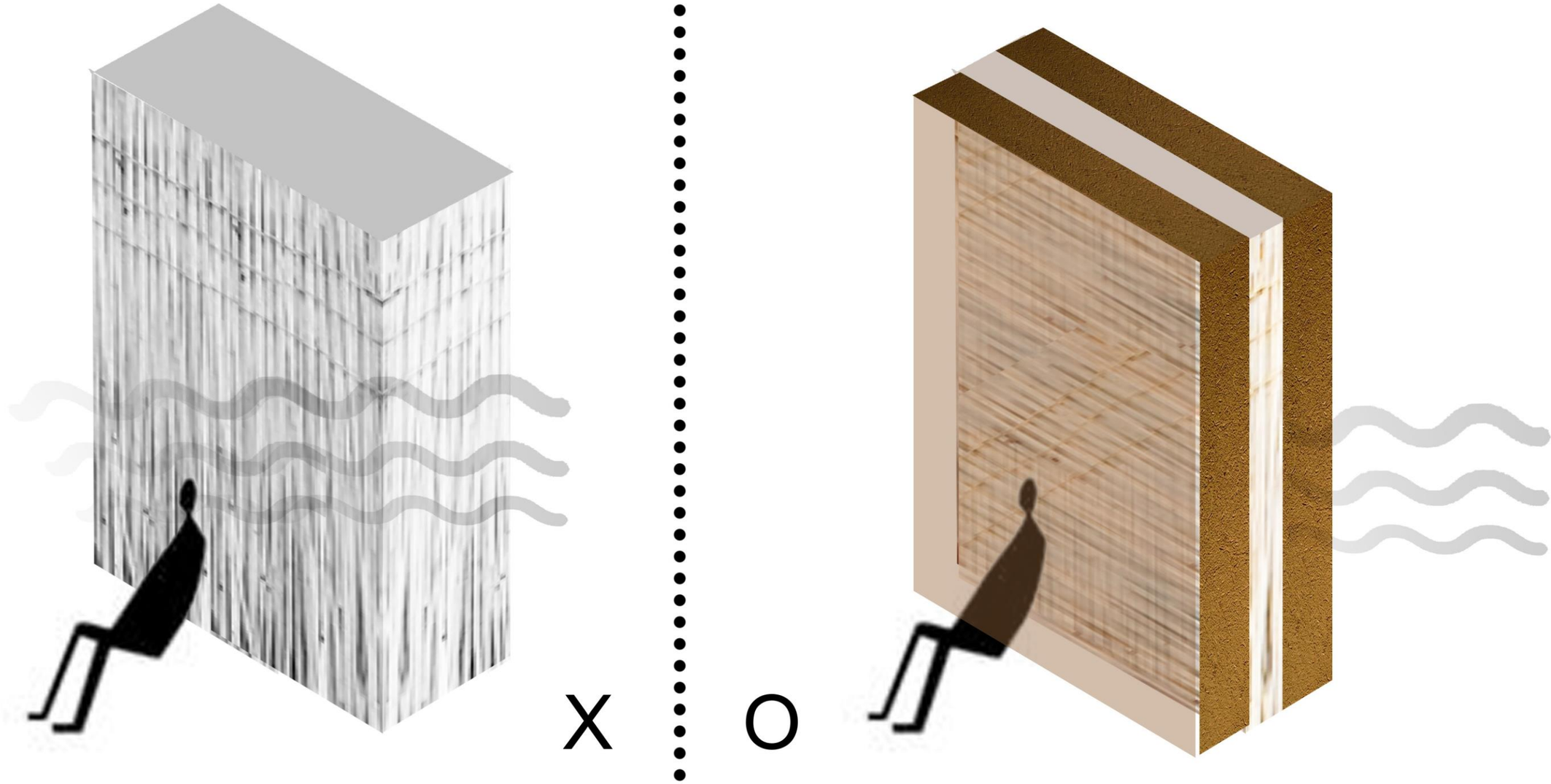
MAJOR MANIPULATING VARIABLE (FACTOR WHICH INFLUENCES ITS PERFORMANCE): Stalk's orientation (direction towards incident sound waves)

SCALE : 1:15

Performance of reeds in:
a. Fire Retardance
b. Thermal Insulation
c. Maintenance Ease
d. Acoustic Insulation
e. Operational Ease

Acoustic Insulation

As a fibrous material, reed thatch provides acoustic insulation which is directly influenced by the stalk's orientation & density.
In our urbanised context, with sound pollution mainly from low-frequency noises like road vehicles, industry mechanics and AHU, reed in grounded panels provide excellent dampening effect.



Acoustic Insulation

Effect on architecture: Grounded panel is better to be protected from the weather as the small porous surface can accumulate dust and moisture. The effect is mainly in the thickness of the wall since it is more feasible to use as a backing for renders.
Decision-made: Reed panels can be integrated in the external wall layers to provide extra sound absorption. Especially on the façade which faces heavy traffic. To further enhance the sense of enclosure, reeds can also be integrated at the ceiling.

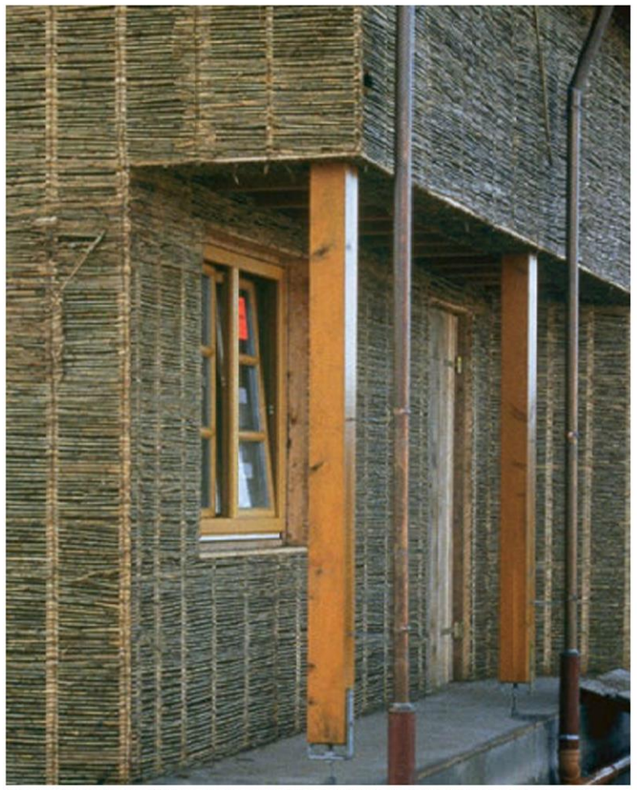
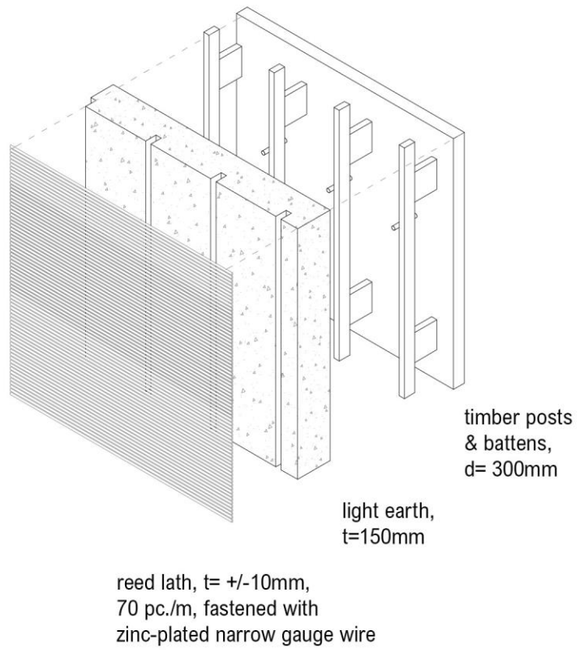


Figure 4. Lost formwork for woodchip light earth using reed plaster lath. From *Light Earth Building*.(p. 94), by Volhard, F., 2016, Birkhäuser.



FACADE CODE: F04

TITLE OF FACADE:
Reed lath light earth composite wall.
Unknown, from Volhard's Light Earth Building

SCALE : 1:20

BUILDING PROGRAMME TYPE: Residential

CLIMATE & CONTEXT: Temperate, Germany

STRUCTURAL MEMBERS: Light earth structural wall

PERCENTAGE OF REED USED IN SINGLE MODULE: 0.01%

EVALUATION ON FACADE TYPE AS COMPARED WITH BENCHMARK OF 1000mm x 1000mm x 300mm UNTREATED REED THATCH:

	Poor		Satisfactory (similar as benchmark)		Excellent
FIRE RETARDANCE:	☐	☐	☐	☐	■
THERMAL INSULATION:	☐	☐	☐	☐	■
ACOUSTIC INSULATION:	☐	☐	☐	☐	■
MAINTENANCE EASE:	☐	☐	☐	☐	■
OPERATIONAL EASE:	■	☐	☐	☐	☐

NOTES:

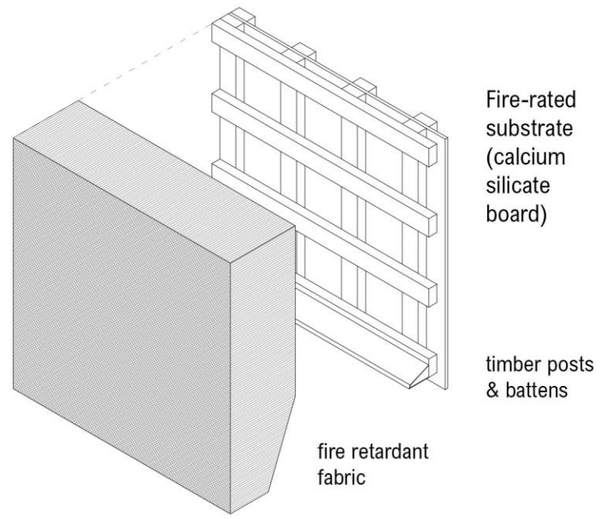
Excellent hybrid solution which harnessed the strength of light earth to improve reed's limitations. However, it is of low operational ease as it is a permanent solution and the reeds are seen as a lost formwork.

AMOUNT OF CARBON ABSORBED*: 0.45kg per module

Case Studies: Different application of reeds:

Reeds as lost-formwork in light-earth wall

Figure 2. DORTE MANDRUP WADDEN SEA CENTER. From Divisare by Coast, R. H., 2018 (https://divisare.com/projects/395006-dorte-mandrup-rasmus-hjortshoj-wadden-sea-center?utm_campaign=journal&utm_content=image-project-id-395006&utm_medium=email&utm_source=journal-id-217).



FACADE CODE: F02

TITLE OF FACADE: Seamless reed thatch in closed construction. Wadden Sea Center, Dorte Mandrup A/S

SCALE : 1:20

BUILDING PROGRAMME TYPE: Exhibition center

CLIMATE & CONTEXT: Temperate, Denmark

STRUCTURAL MEMBERS: Timber substructure

PERCENTAGE OF REED USED IN SINGLE MODULE: 96.15%

EVALUATION ON FACADE TYPE AS COMPARED WITH BENCHMARK OF 1000mm x 1000mm x 300mm UNTREATED REED THATCH:

	Poor		Satisfactory (similar as benchmark)		Excellent
FIRE RETARDANCE:	☐	☐	■	☐	☐
THERMAL INSULATION:	☐	☐	■	☐	☐
ACOUSTIC INSULATION:	☐	☐	■	☐	☐
MAINTENANCE EASE:	☐	☐	■	☐	☐
OPERATIONAL EASE:	☐	☐	■	☐	☐

NOTES:

Optimum performance, high sculptural value whereby the thatch can be sculpted according to substructure's form of various designs and expressions.

AMOUNT OF CARBON ABSORBED*: 21.45kg per module

Case Studies: Different application of reeds:

Reeds in thatch.

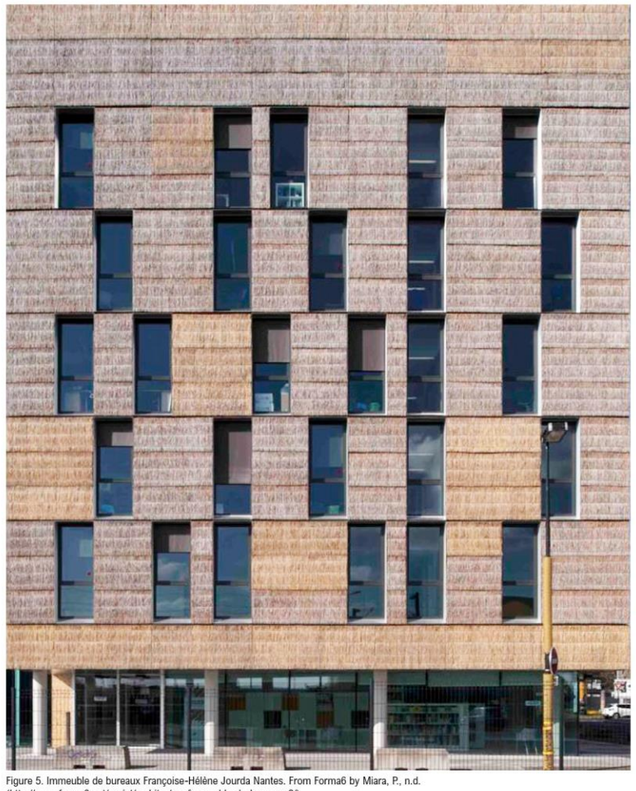
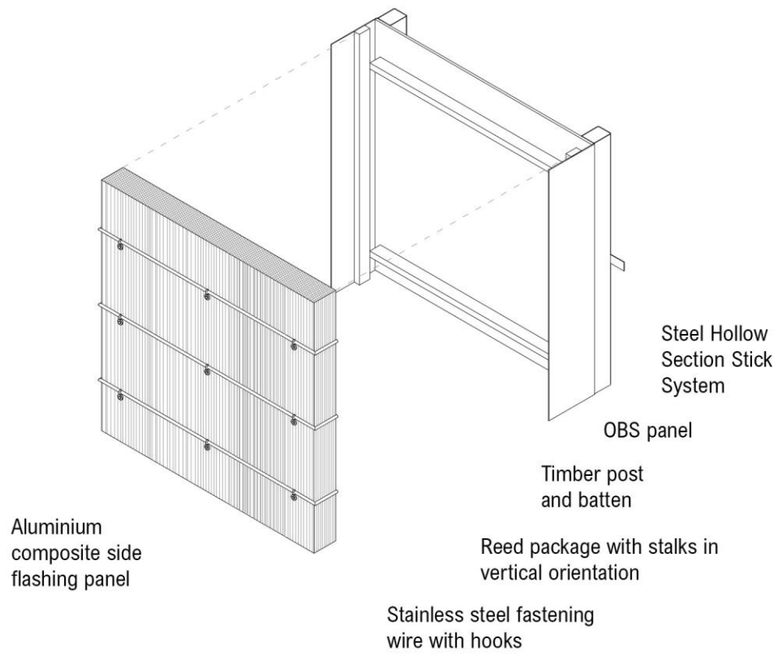


Figure 5. Immeuble de bureaux Françoise-Hélène Jourda Nantes. From Forma6 by Miara, P., n.d. (http://www.forma6.net/projet/architecture/immeuble-de-bureaux-3/).



FACADE CODE: F05

TITLE OF FACADE:

Reed thatch facade panels
Françoise-Hélène Jourda office building, Forma6.

SCALE : 1:20

BUILDING PROGRAMME TYPE: Office building

CLIMATE & CONTEXT: Temperate, France

STRUCTURAL MEMBERS: Steel hollow section

PERCENTAGE OF REED USED IN SINGLE MODULE: 45.22%

EVALUATION ON FACADE TYPE AS COMPARED WITH BENCHMARK OF 1000mm x 1000mm x 300mm UNTREATED REED THATCH:

	Poor		Satisfactory (similar as benchmark)		Excellent
FIRE RETARDANCE:	☐	☐	■	☐	☐
THERMAL INSULATION:	☐	■	☐	☐	☐
ACOUSTIC INSULATION:	☐	■	☐	☐	☐
MAINTENANCE EASE:	☐	☐	☐	☐	■
OPERATIONAL EASE:	☐	☐	☐	■	☐

NOTES:
Reaslised in a 6 storey high office block. The vertical stalks arrangement ensure superior water drainage, along with the side flashing panels that prevents water seepage into the thatch implying longer lifespan. It is also lightweight thus reducing the need of extra structural reinforcement.

AMOUNT OF CARBON ABSORBED*: 7.21kg per module

Case Studies: Different application of reeds:

Reeds in modules.

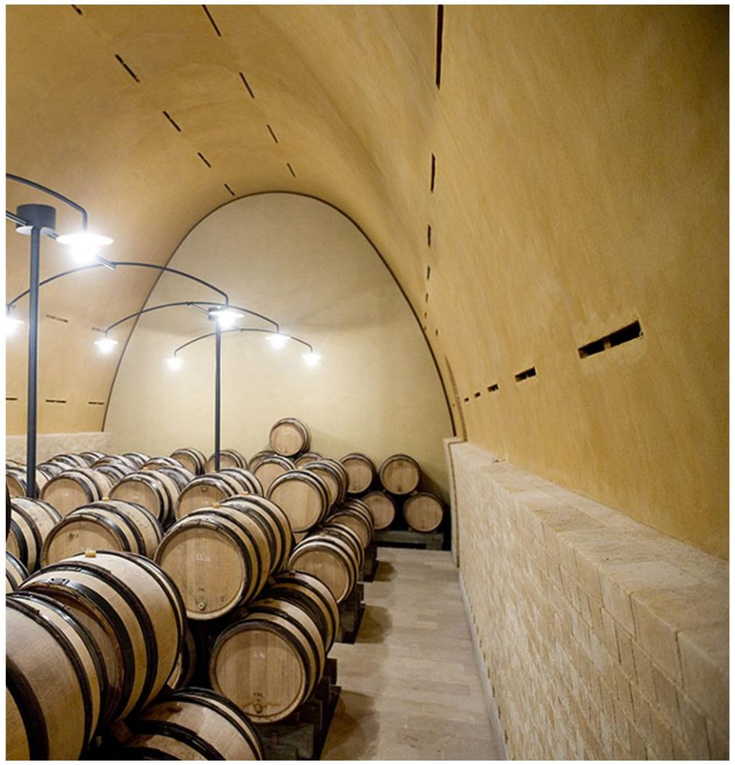
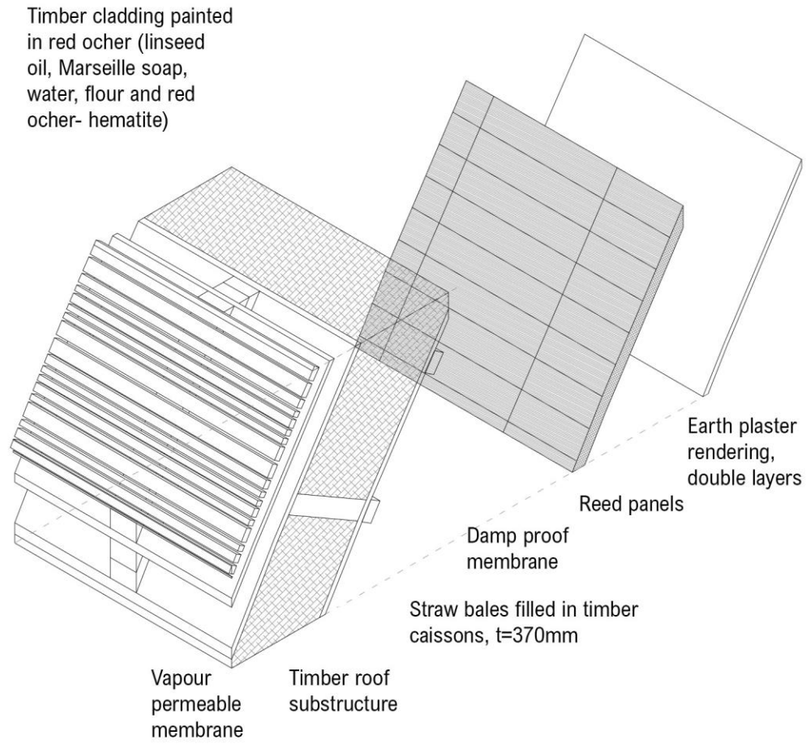


Figure 7. LA CAVE DE L'ŒUF. From Fibra Award by Goussard, C., 2013. (https://www.fibra-award.org/portfolio/la-cave-de-loeuf/).



FACADE CODE: F07

TITLE OF FACADE:
Reed plaster reinforcement mesh
La cave de lóeuf, Atelier Zero Carbone Architectes

SCALE : 1:20

BUILDING PROGRAMME TYPE: Wine Cellar

CLIMATE & CONTEXT: Temperate, France

STRUCTURAL MEMBERS: Arched timber frame

PERCENTAGE OF REED USED IN SINGLE MODULE: +/- 7.57%

EVALUATION ON FACADE TYPE AS COMPARED WITH BENCHMARK OF 1000mm x 1000mm x 300mm UNTREATED REED THATCH:

	Poor		Satisfactory (similar as benchmark)		Excellent
FIRE RETARDANCE:	☐	☐	☐	☐	■
THERMAL INSULATION:	☐	☐	☐	☐	■
ACOUSTIC INSULATION:	☐	☐	☐	☐	■
MAINTENANCE EASE:	☐	■	☐	☐	☐
OPERATIONAL EASE:	■	☐	☐	☐	☐

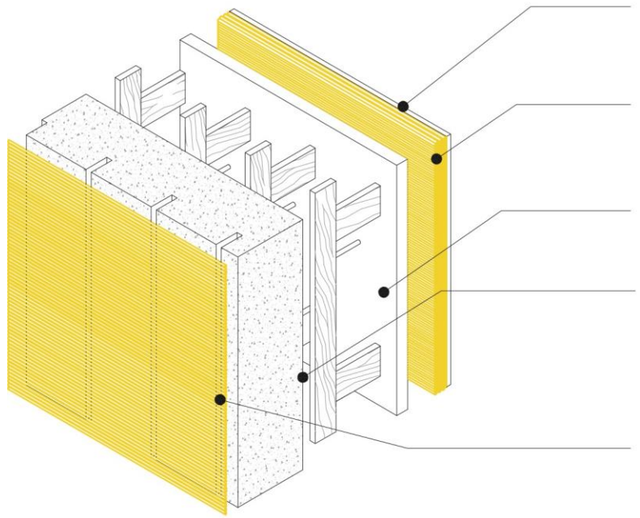
NOTES:

Excellent fire retardance, thermal and acoustic insulation due to the incorporation of straw bales and earth plaster rendering. Achieved high hygrothermal stability which is crucial in wine cellar.

AMOUNT OF CARBON ABSORBED*: 3.62kg per module

Case Studies: Different application of reeds:

Reeds as binder for earth renders & reeds as aggregates in lime plasters.



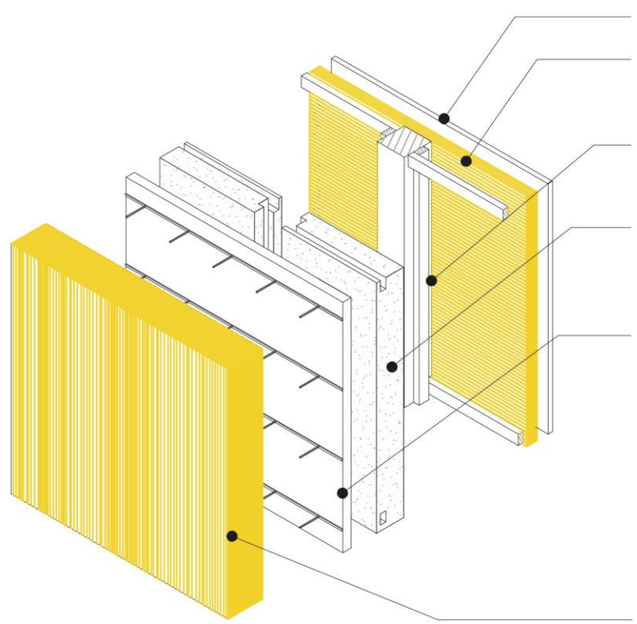
20mm clay-reed plaster

50mm reed board as insulation & backing for plastering

timber substructure

250mm clay-rich light earth, bulk-density, d= 300kg/m3

10mm reed lath as lost formwork, 70+/-pc/m fastened with zinc-plated narrow gauge wire



20mm clay-reed plaster

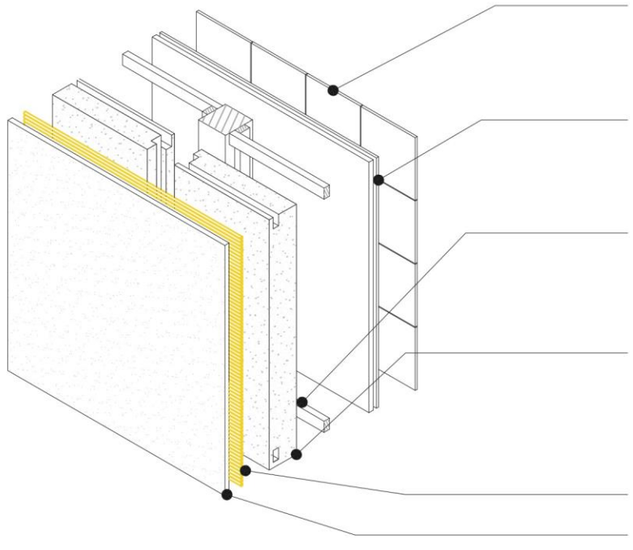
50mm reed board as insulation & backing for plastering

timber substructure

150mm clay-rich light earth, bulk density, d=300kg/m3

stainless steel threaded screw at 280mm interval, Debricoat Lapfix self-adhesive membrane, Promatech-H Fire class A steam-hardened calcium silicate board

160mm untreated reeds



10mm homogenous ceramic tile

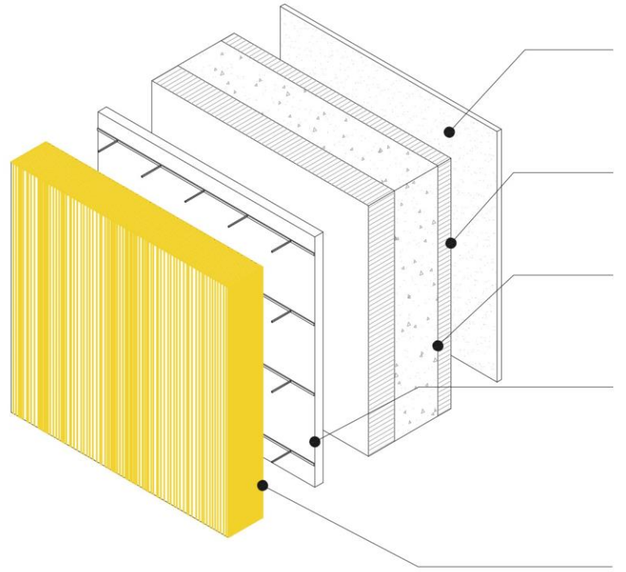
trass-lime mortar embedded with reinforcement mesh, moisture-resistant drylining-board

timber substructure

150mm clay-rich light earth, bulk density, d=300kg/m3

10mm reed mat

20mm clay-reed plaster



20mm clay-reed plaster

60mm GUTEX Ultratherm woodwool insulation panel

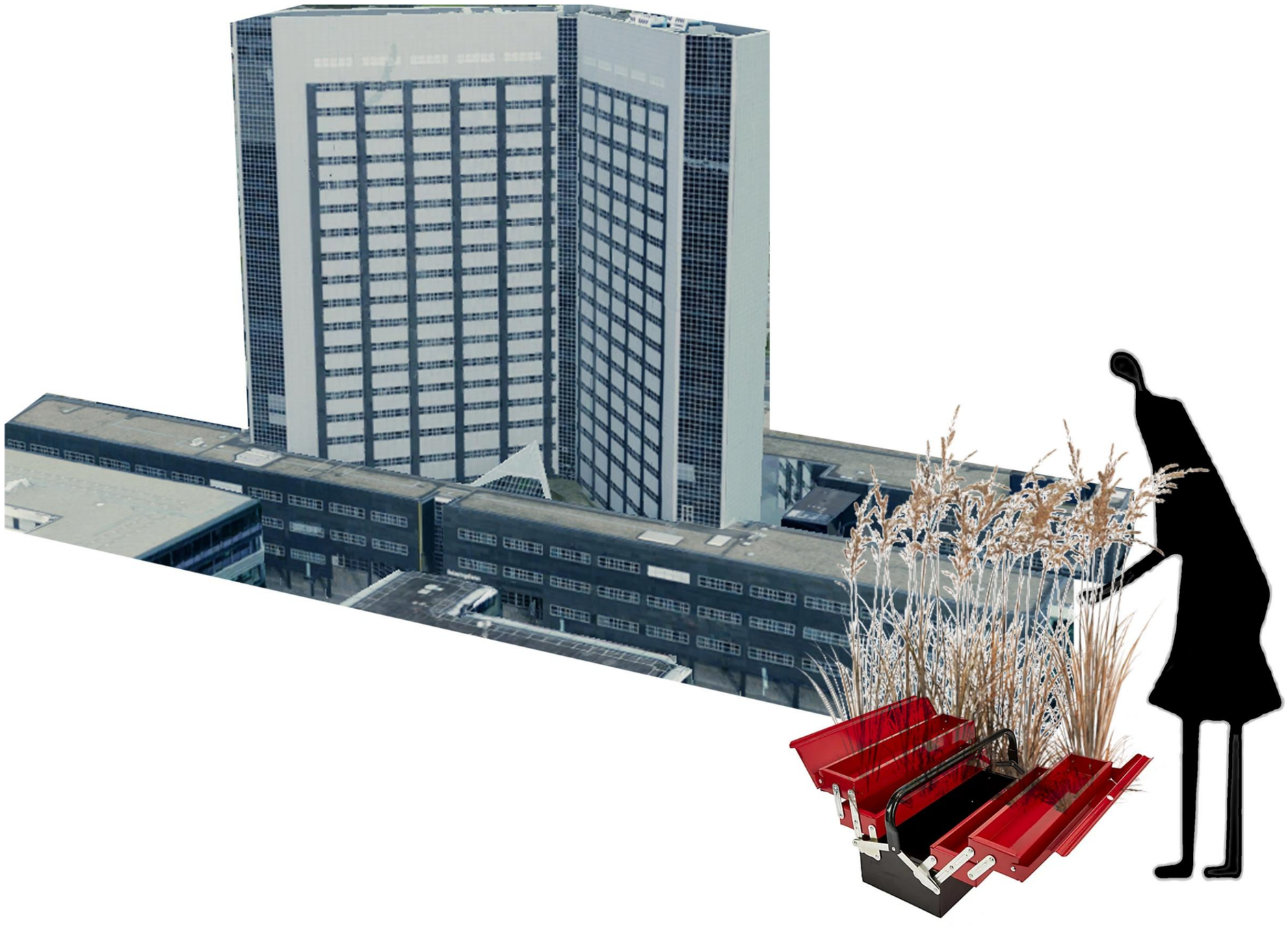
existing reinforced concrete structure

stainless steel threaded screw at 280mm interval, Debricoat Lapfix self-adhesive membrane, Promatech-H Fire class A steam-hardened calcium silicate board

10mm reed lath as lost formwork, 70+/-pc/m fastened with zinc-plated narrow gauge wire

Biobased material

Learnt & redesigned. Scale 1:20

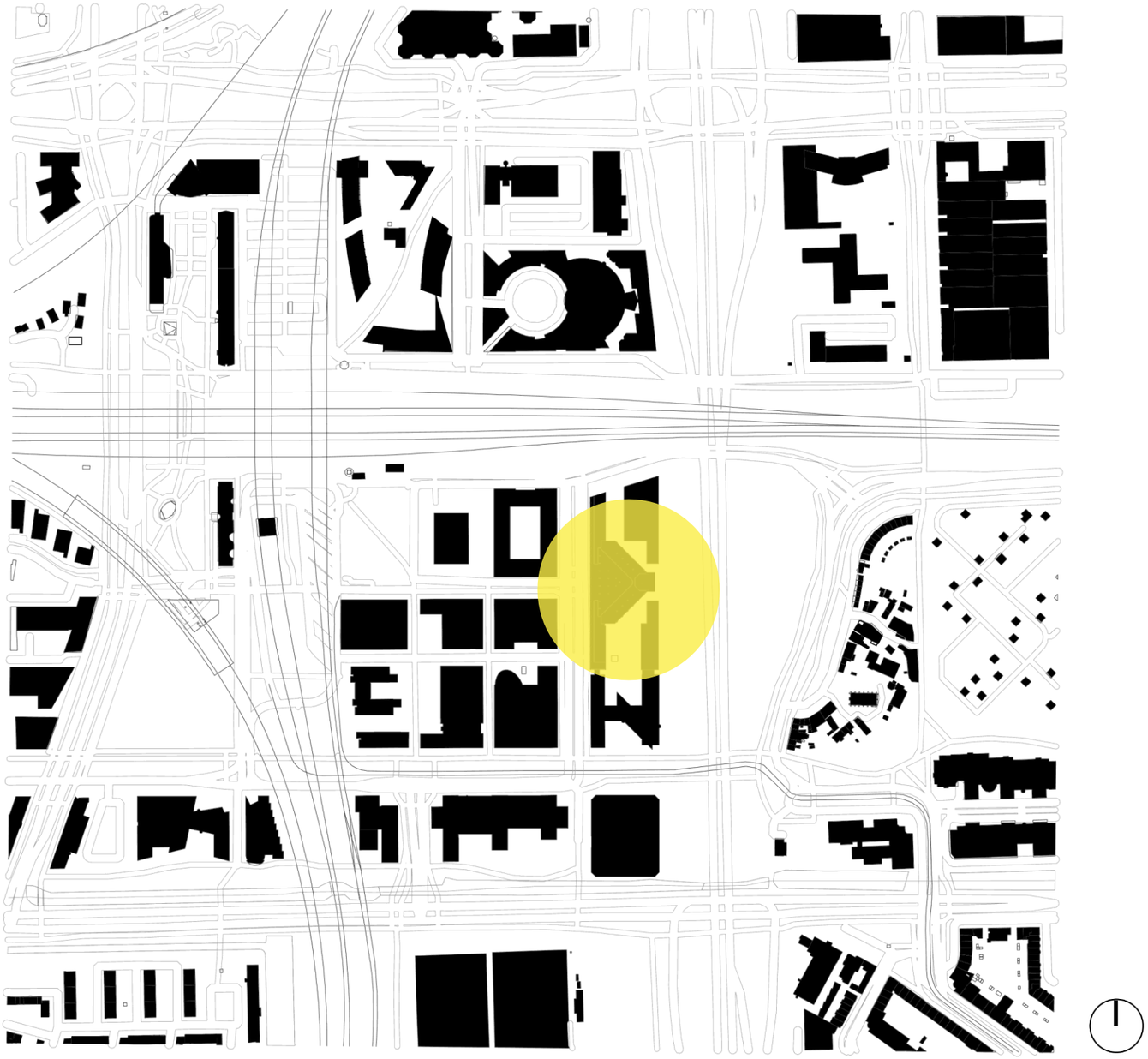


Design Challenge: De Knip as a subject to transform

With this design tool set, we now ask: how can material, common reeds inform the design of De Knip, the government tax administration office subjected to adaptive-reuse into a comfortable housing complex.

Design Challenge: De Knip as a subject to transform

Landmark: De Knip. It is Dutch government's tax administration office building. Due to the scandal as well as the COVID-19 situation, the building is vacant. We see a possibility of answering the ministry's quest to adapt these office buildings in Sloterdijk area into new purpose, which in this case: mixed-residential.



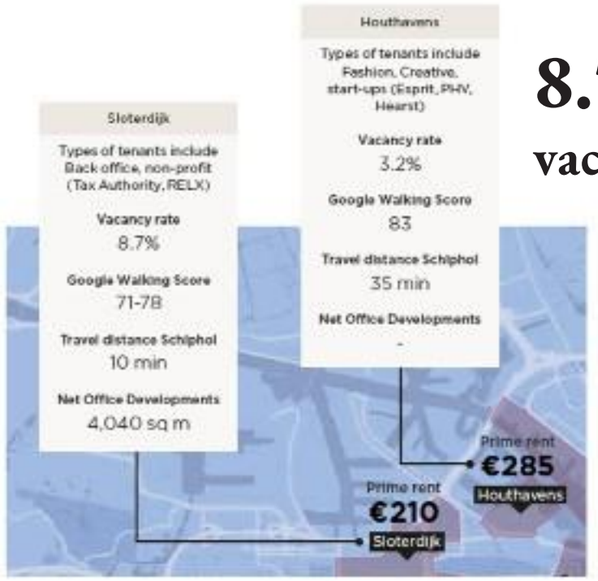
Context: Sloterdijk, Amsterdam

Site plan 1:5000

Figure X. Roel van Duijn ea plant first Christmas tree with root ball for Geuzenbos near Amster…. From Nationaal Archief, by G.R. Anefo, 1987 (https://www.nationaalarchief.nl/onderzoeken/fotocollectie/detail?limitstart=183&q_searchfield=sloterdijk)

Google maps. https://www.google.com/maps/place/Sloterdijk,+Amsterdam/@52.3836038,4.8308305,415a,35y,55.08h,64.85t/data=!3m1!1e3!4m5!3m4!1s0x47c5e262ffe57b73:0x57046d460e5daafe!8m2!3d52.3867847!4d4.8468019

Context then & now: Sloterdijk, Amsterdam.



8.7%
vacancy

+ 23.3%
1,503,234
population at 2040

Savills (2018),

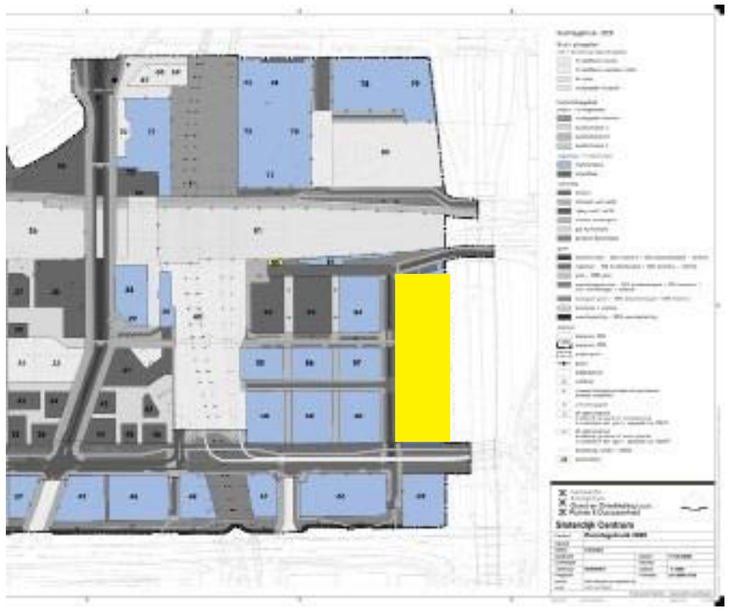


Figure X. Sloterdijk Centrum Ruimtegebruik 2020. From Gementee Amsterdam, by Gementee Amsterdam Grond en Ontwikkeling i.s.m. Ruimte & Duurzaamheid, 2020 (https://www.amsterdam.nl/projecten/sloterdijk-centrum/plannen-publicaties/)

Figure 1. Overview of the office sub-areas in Amsterdam. From "Amsterdam ICT saves the day" by Savills Research, 2020 (https://research.euro.savills.co.uk/netherlands-pdfs/city-special-amsterdam-2020.pdf)

What ?. 8.7% vacancy rate, with 53% building stocks built in year 1980-2000

Who ?. Young Starters to work & study age group: 17-27 years

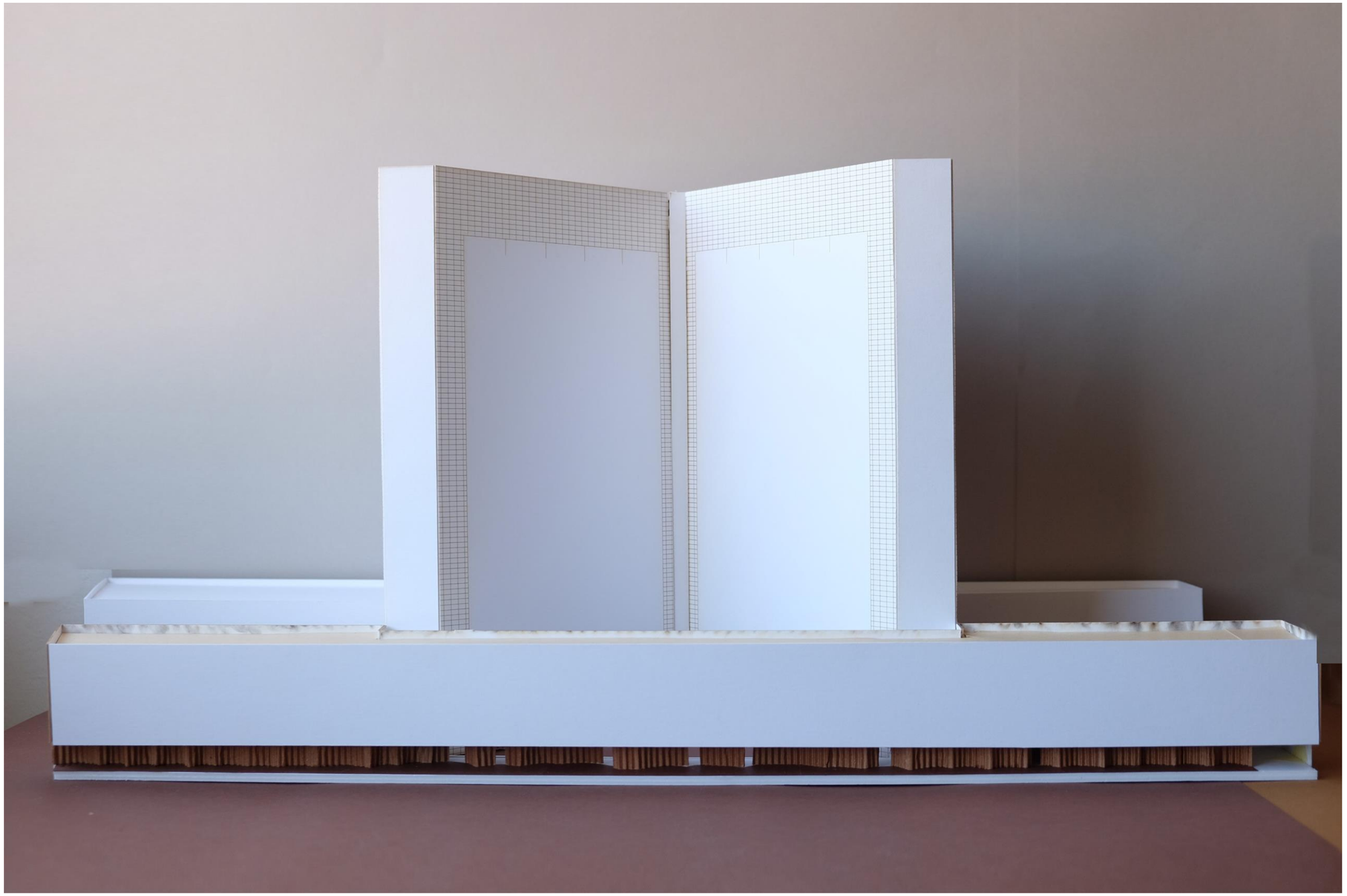
How ?. Adaptive reuse of vacant offices into mix-use housing, as proposed by Gementee Amsterdam

Context & Challenge

Sloterdijk, Amsterdam

As an adaptive-reuse project, I believe the essence is in the term ***adaptive***, meaning less demolition, less drastic changes. Therefore, I give priority to keep the intervention as ***modest*** as much as possible on the existing state, which reeds will come in to ***guide*** the design with a subtle and less intrusive gesture. In other words, the ***reeds complement the existing structure***, rather than having dominance over the existing members.

Thus, the central idea is an **adaptive-reuse,** dwelling project for **starters.** It is a house to rekindle our innate, **physical sensitivity towards our environment**, which has been slowly eroded in the mass standardisation in architecture. The interventions are **added** in **modest, archaic or non-canonical** approaches to challenge the conceived idea of comfort and home, **materialised in reeds** & relevant complementary biobased materials.



Journey

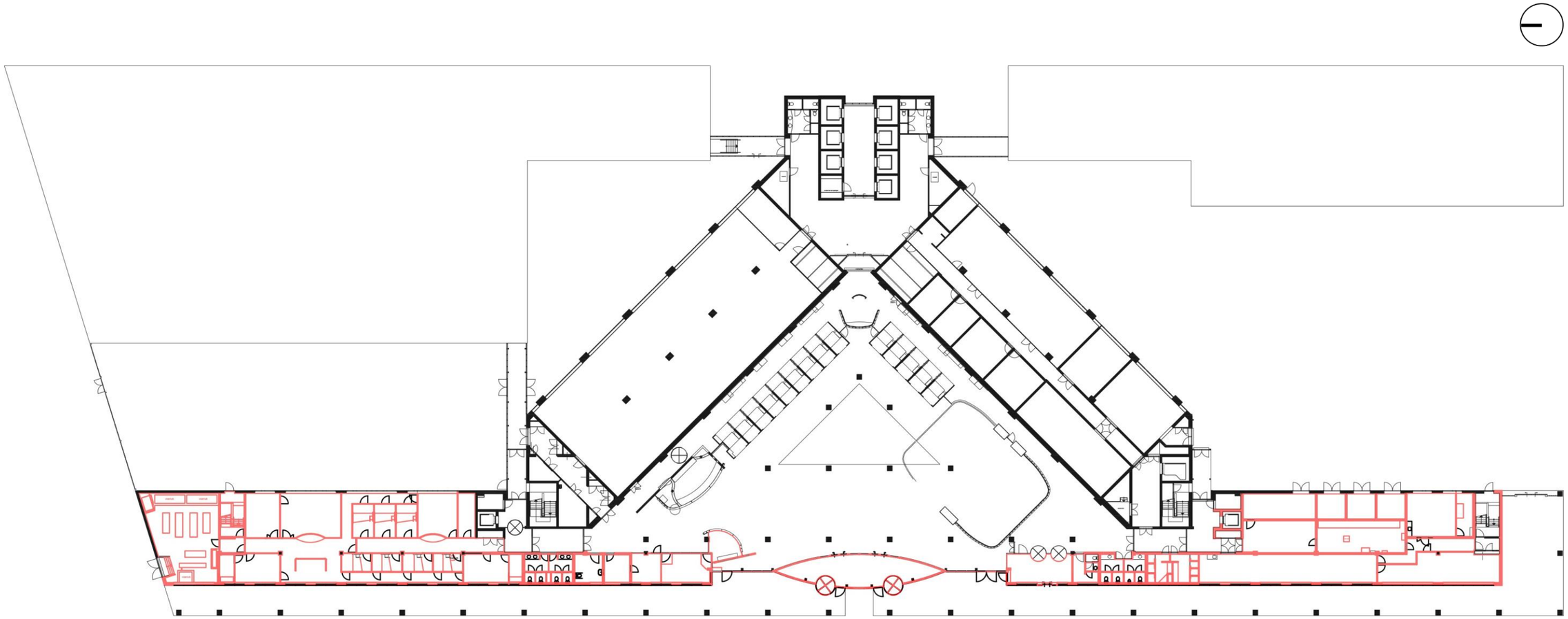
I will start the journey from a dweller's point of view to tell the narrative of experiencing the space. Therefore, I will go from the outer most plinth, to the inner most private balcony.

Greetings: Gallery. Existing

The key to invite people into the building is a welcoming gesture. Narrowing down to human scale, a building serve the surrounding urban context not only in enriching the skyline, but also suggesting new gesture to its surroundings, namely the way a building meets the ground, greets the people.

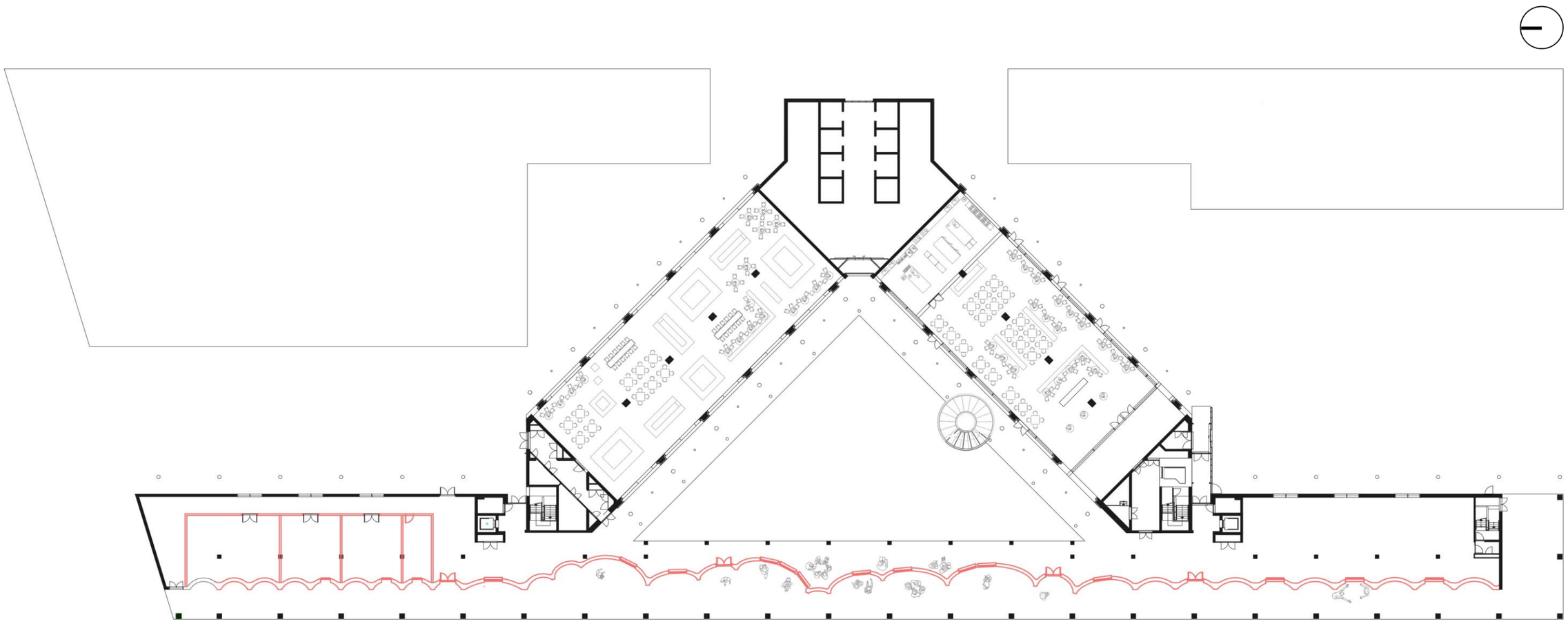
Greetings: Gallery. New

Narrowing down to human scale, a building serve the surrounding urban context not only in enriching the skyline, but also suggesting new gesture to its surroundings, namely the way a building meets the ground, greets the people.



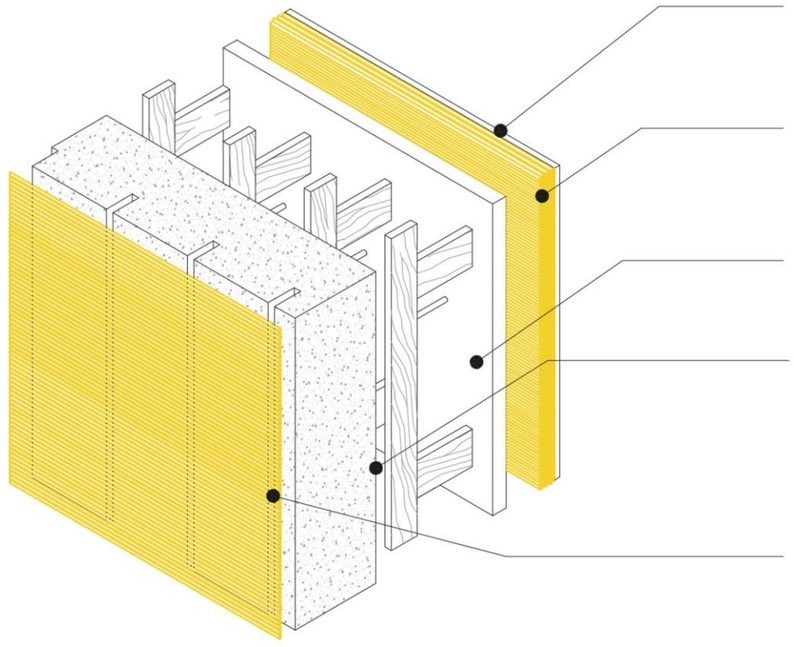
Common Gallery. Existing

Currently the plinth corridor it is a gallery with columns cladded in dark granite & set in with glass panels held by aluminium mullions and transom in grids, giving the sense of organised structure order and strong integrity.



Common Gallery. New

Therefore, I would like to close the design with the strip of gallery which De Knip receives its patrons. This is a gallery with curved walls, built of light earth with reed formwork.



Light Earth Wall with Reed Formwork

A wall with strong haptic texture. It is robust and thick yet welcoming and warm.

Common Gallery

These curvatures of various radius and angle gravitates people towards the building by slowing down the movement of passerby.

Day Scenario

It provides sheltered niches for various activities.

Night Scenario

It lights up the way, to show the city dwellers their way home.

Journey

I will start the journey from a dweller's point of view to tell the narrative of experiencing the space. Therefore, I will go from the outer most plinth, to the inner most private balcony.

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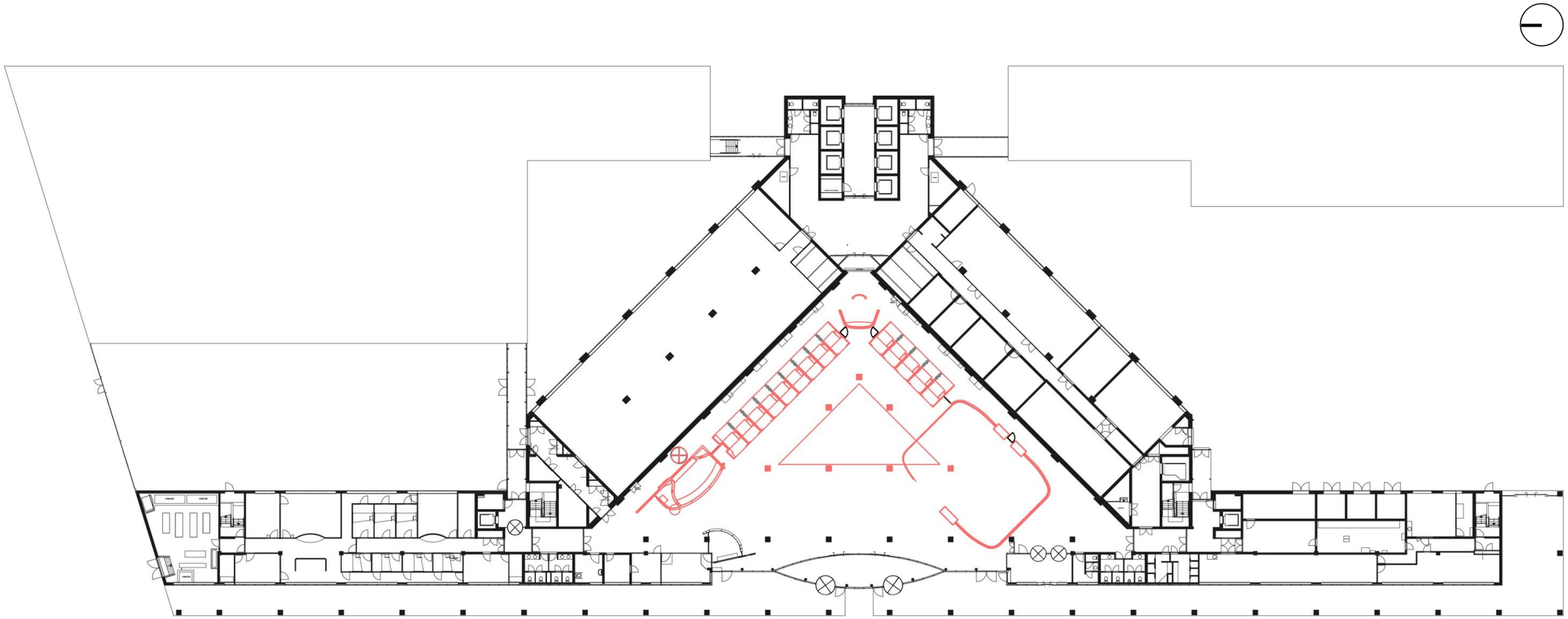
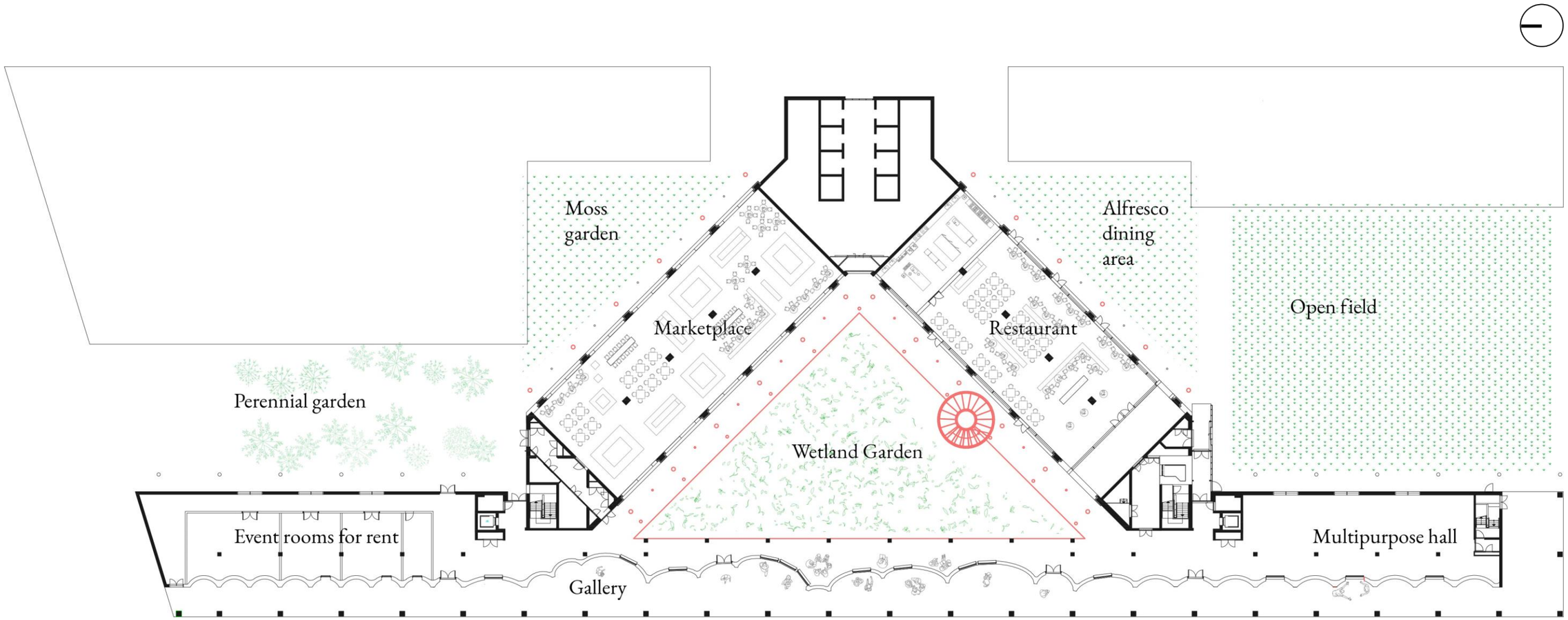
Hearth of the complex: Wetland Garden

Passing through this thick earth wall, we entered the building compound.



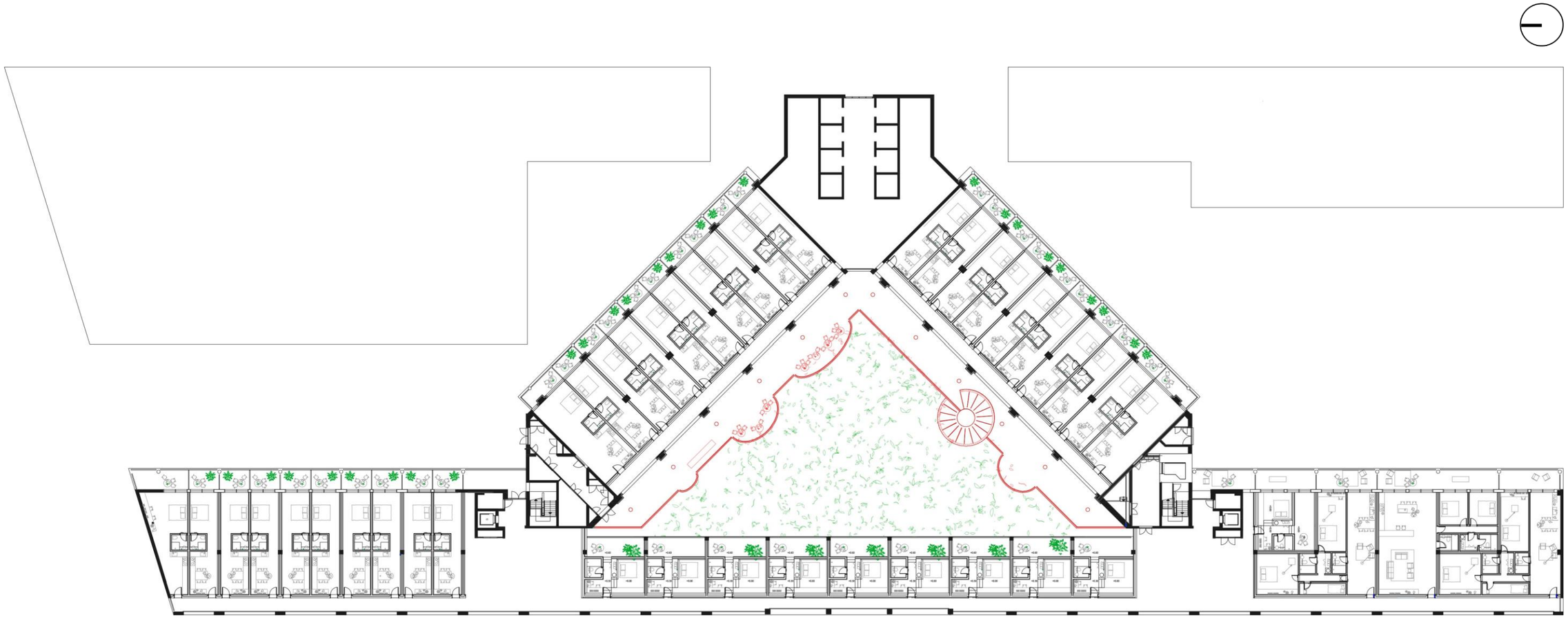
Hearth of the complex: Bioretention Reed Garden

Currently, the existing public zone is a covered space, with a glass pyramid sheltering the empty counters.



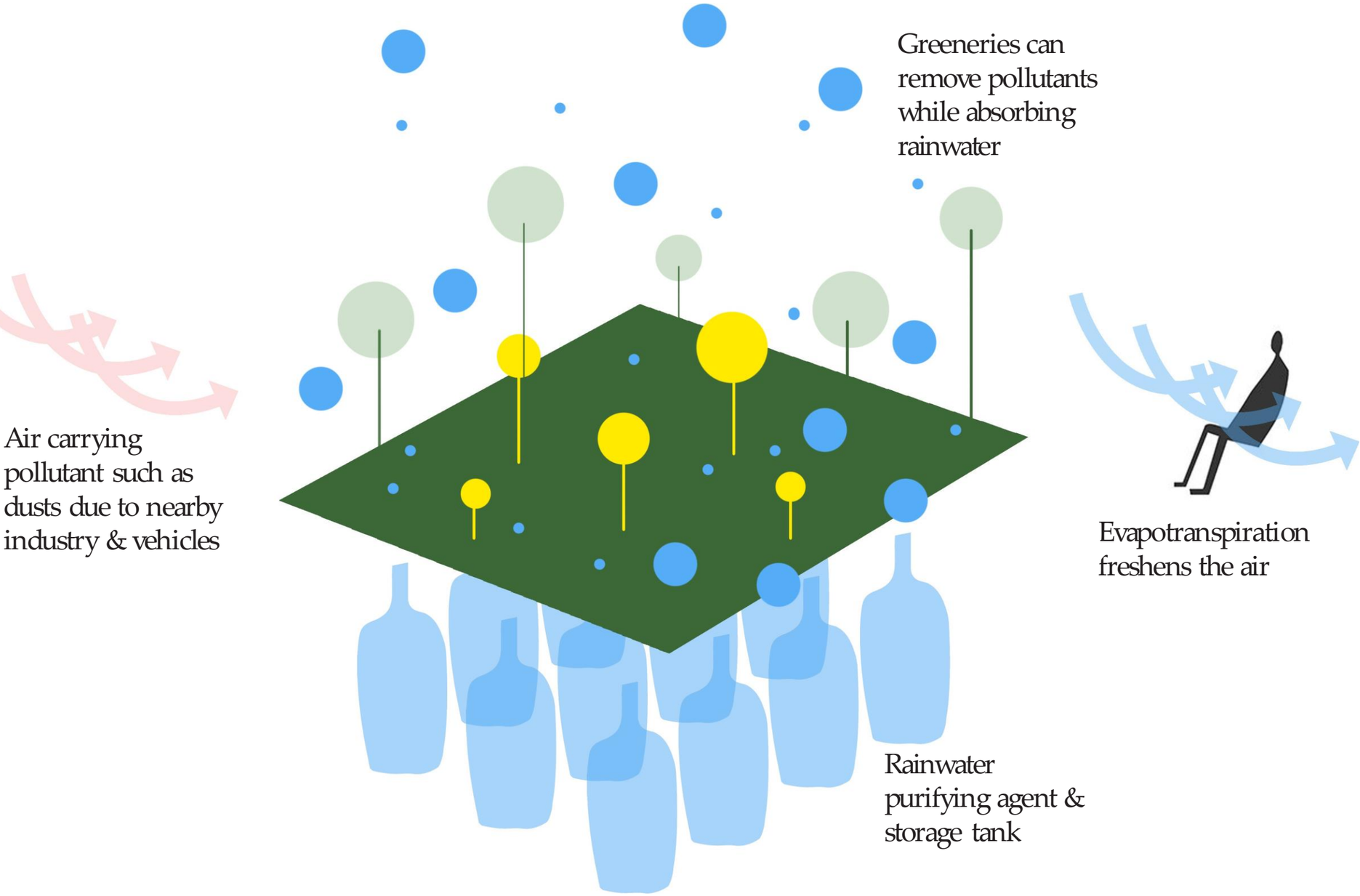
Hearth of the complex: Bioretention Reed Garden

Since our building is dedicated to reeds, being harvested for building purposes, perhaps then can we integrate living reeds into the design at the core? To give tribute and celebrate living reeds as the hearth of the building which drives the project. By removing the existing glass pyramid and covering roof, we added new timber deckings and platforms on the perimeter of the garden to allow public to enjoy the beauty of reeds.



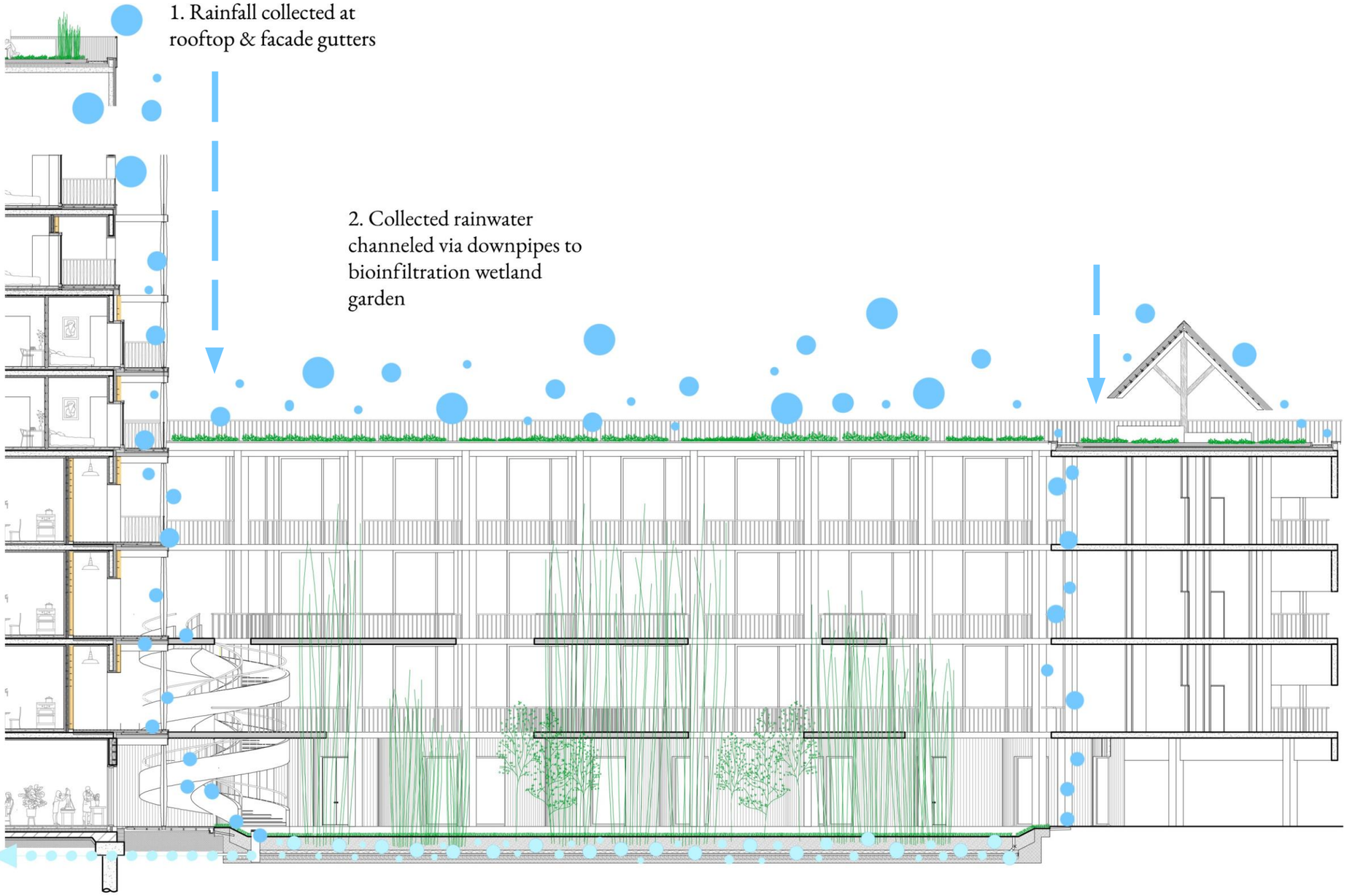
Hearth of the complex: Bioretention Reed Garden

The platform also continues to the 1at level, publicly accessible via the spiral staircase. The semi-circular cantilevered patios are provided for users to enjoy the views of the reeds while sitting around with friends.



Bioretention reed garden: Passive water collection system

Schematic diagram

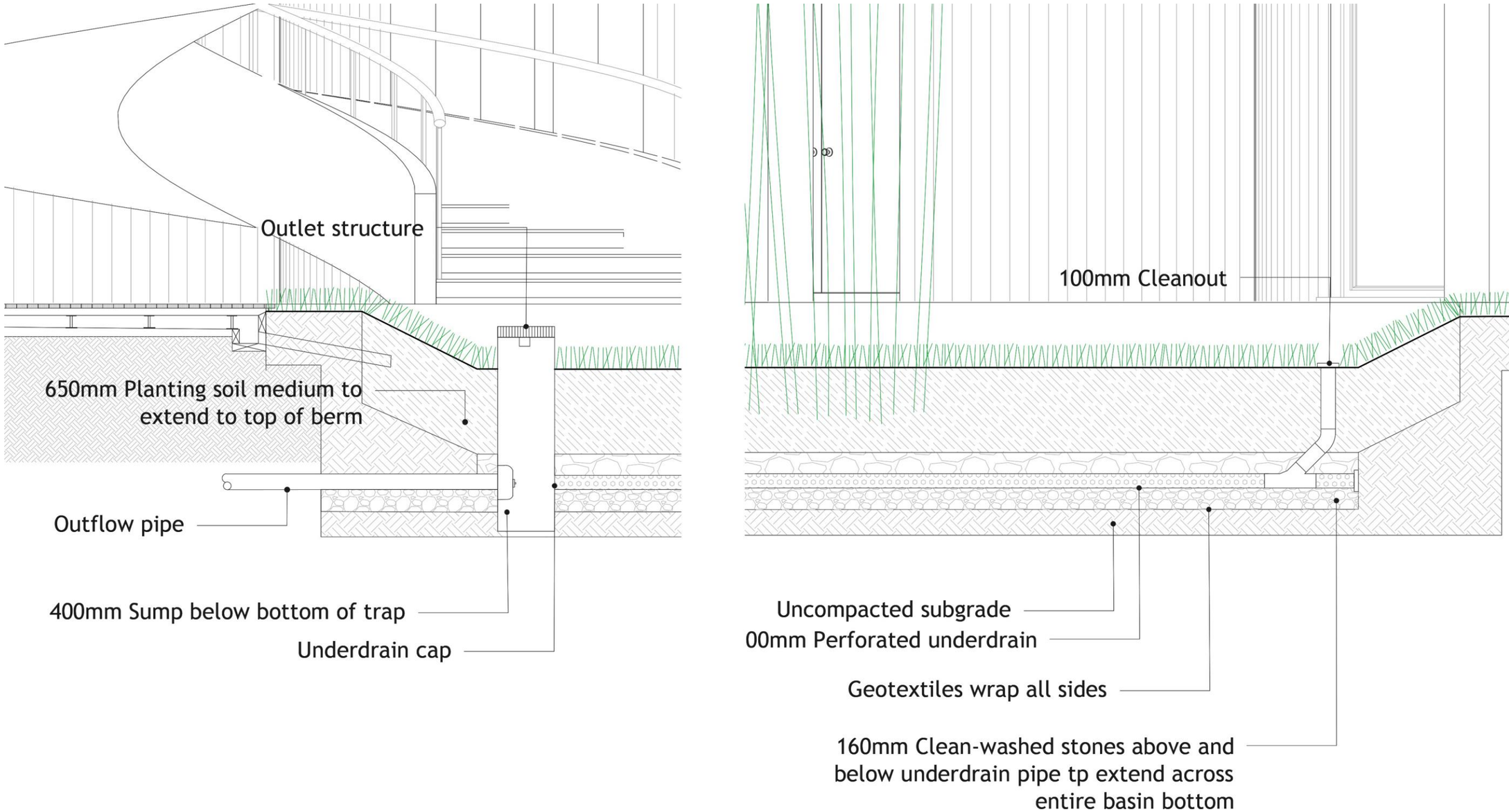


3. Vegetated soil medium remove stormwater via infiltration into surrounding soils. It also reduce pollution by filtering runoff & promote evapotranspiration.

4. Excess water drained through flow-regulating underdrains to sumps. Water channeled for cleaning.

Integrated Water Purification & Retention System

Overall mechanism

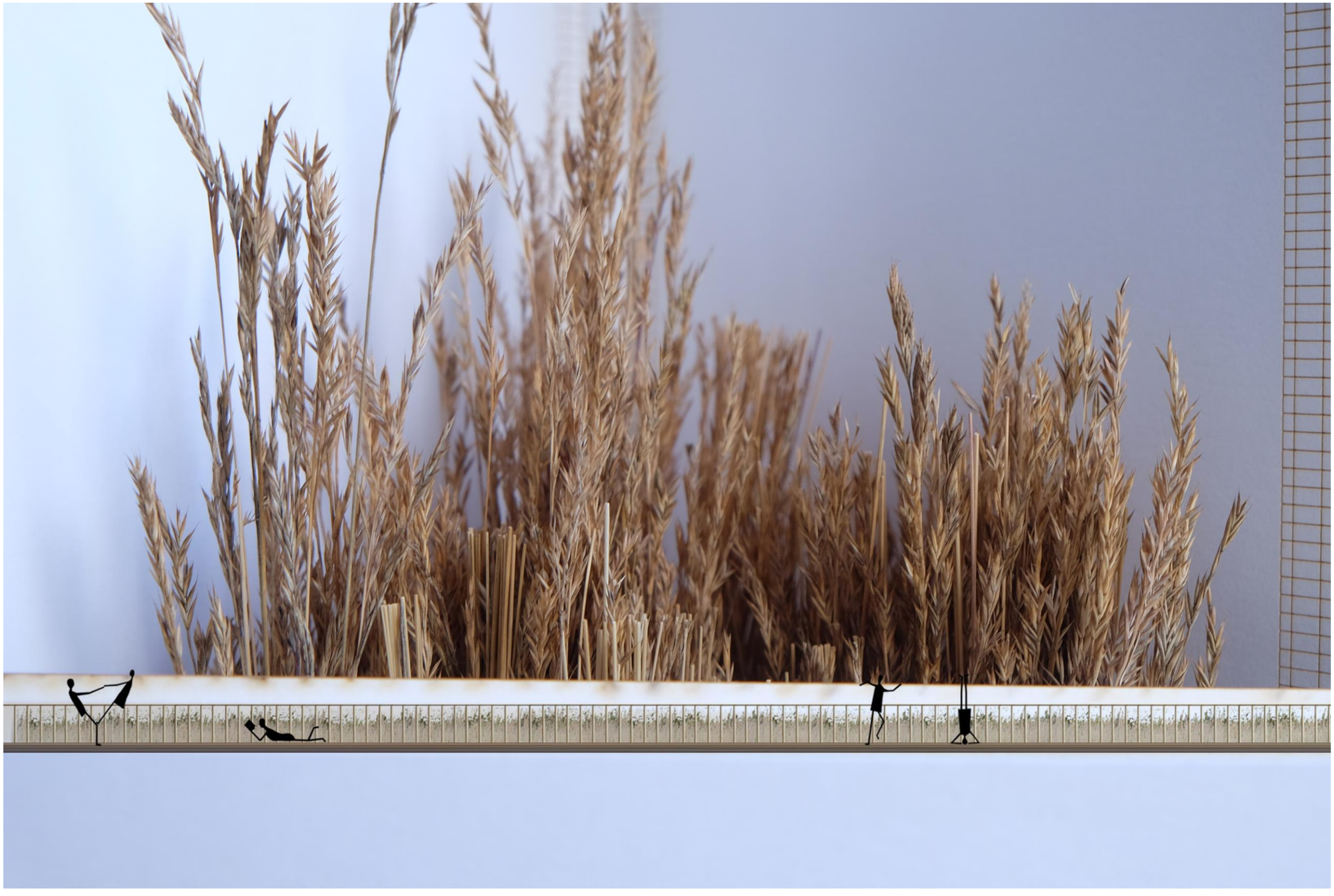


Bioretention reed garden: Passive water collection system

Detail drawing 1:30

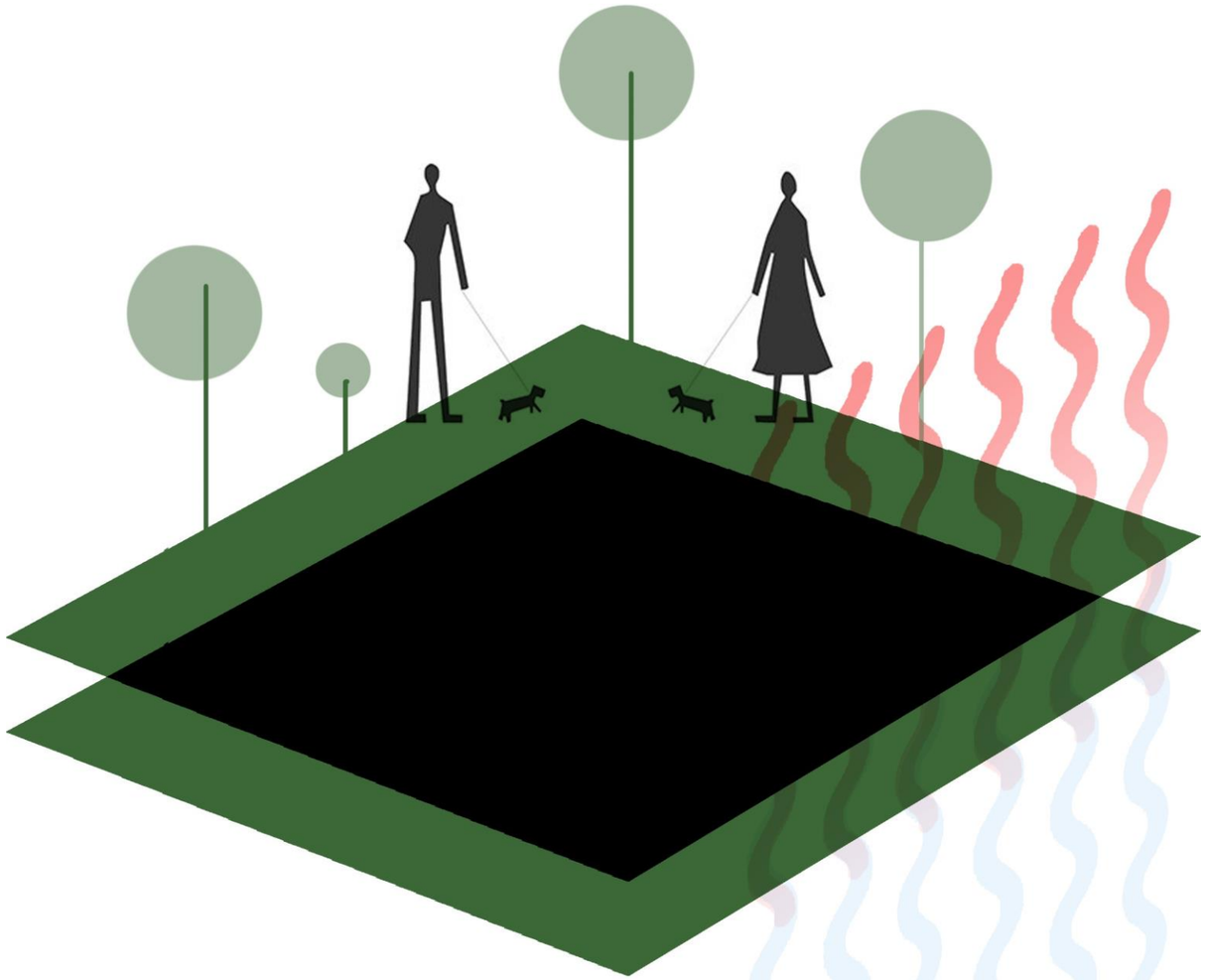
Impression of Bioretention reed garden

Apart from a water catchment area, it also adds quality to the overall space.



Intensive Green Roof

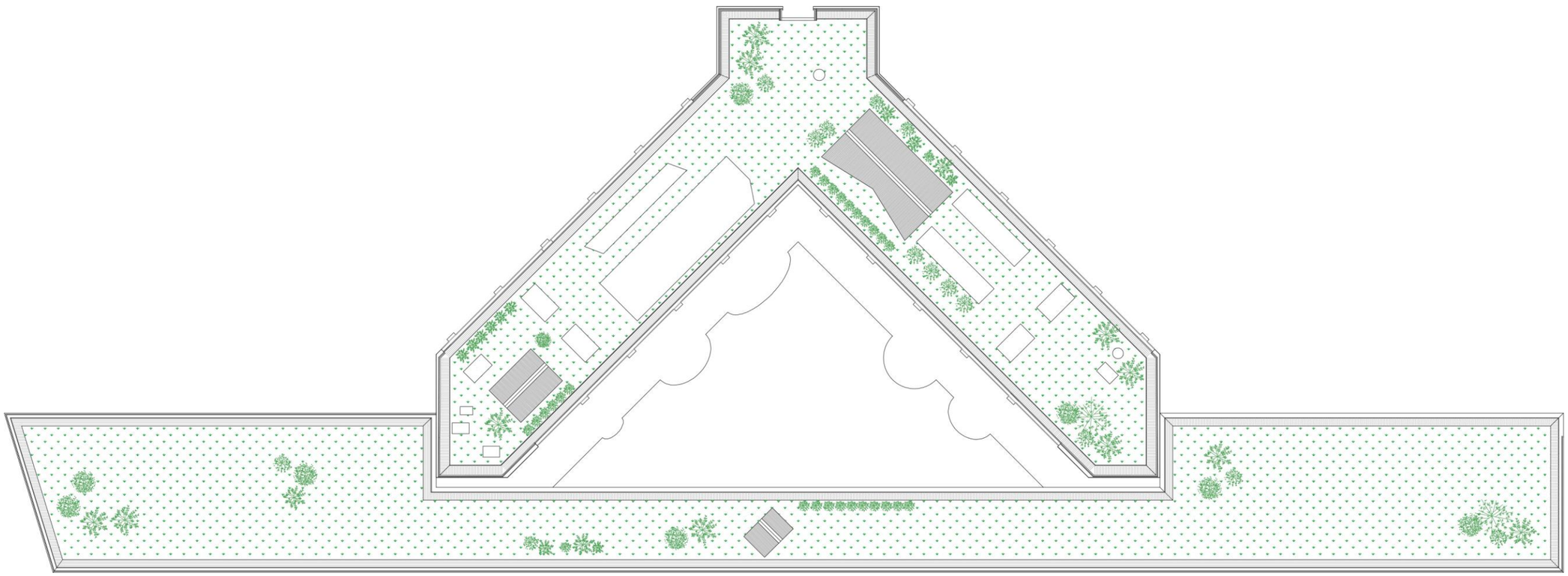
Extra greenery & open space



Extra greeneries &
communal space

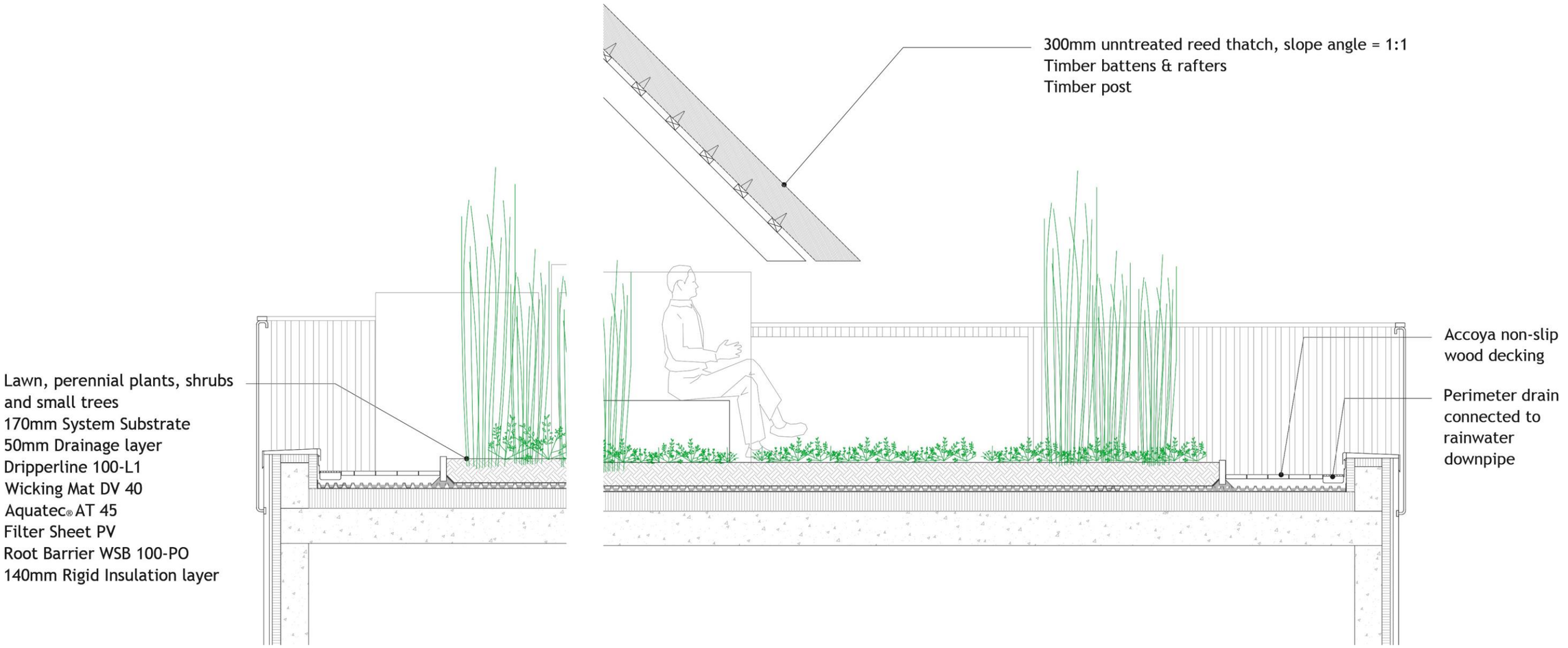
Insulative layer for
underlying level

Intensive Green Roof
Schematic Diagram



Intensive Green Roof

Roof plan. Scale 1:300



Intensive green roof: extra insulation & greeneries

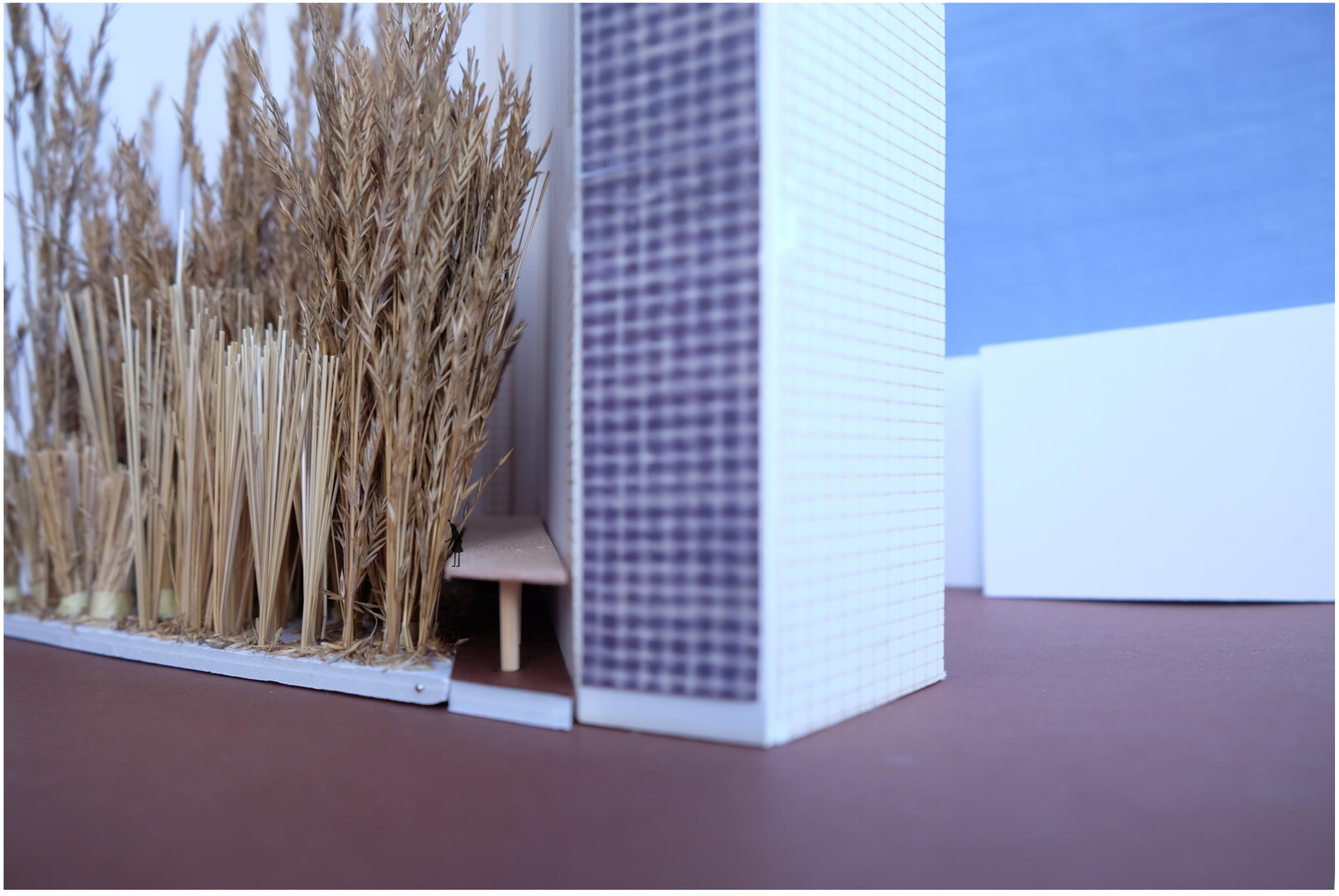
Detail drawings, scale 1:30

Impression of Intensive green roof

Provide thermal mass to underlying units and to offer extra communal area and greeneries.

Up

Now, we would like to access to our individual dwellings. As for the circulation, we conform to the existing circulation system, with the lift cores at the central and the emergency escape core at the end of each wing.



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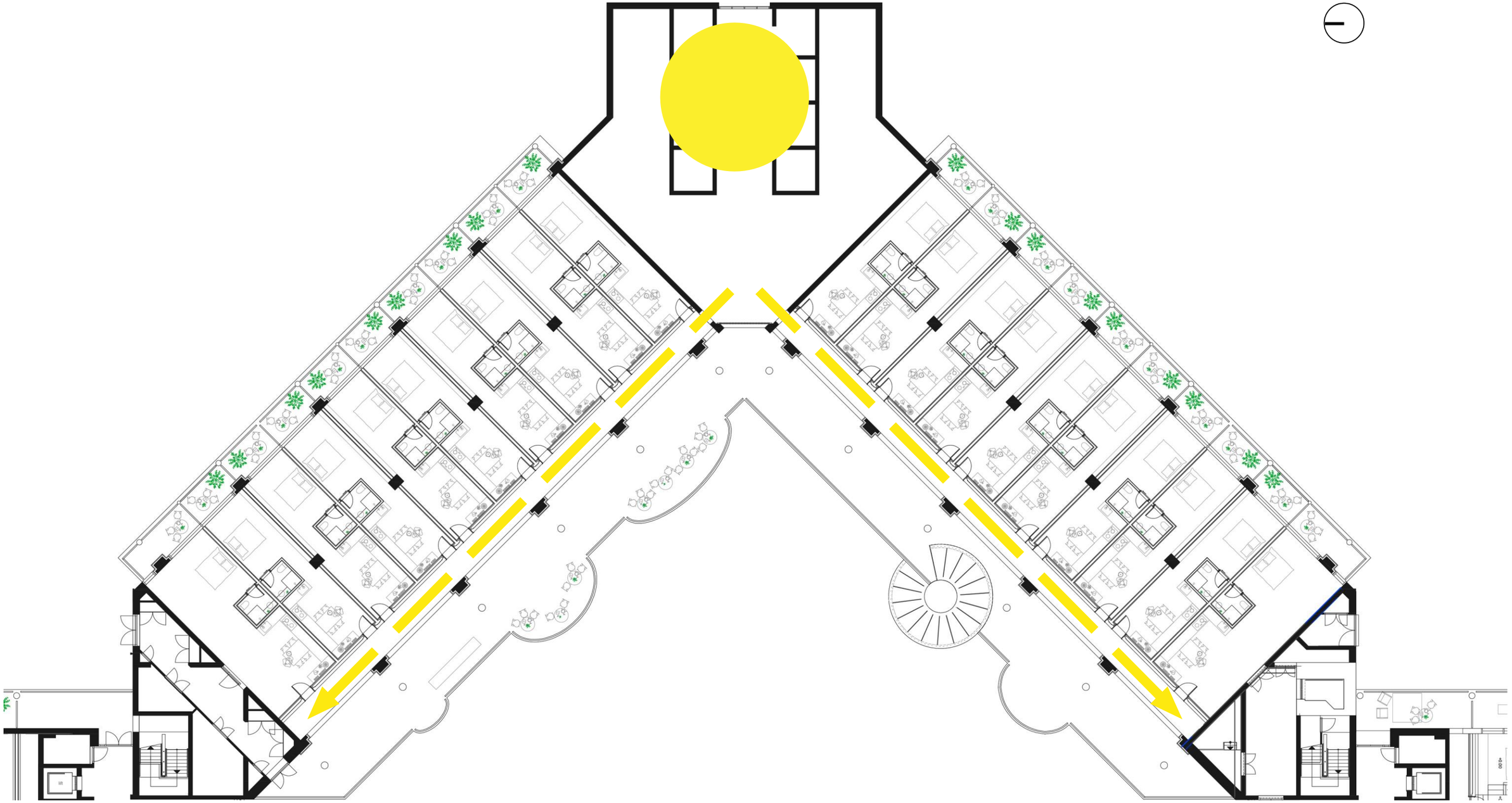
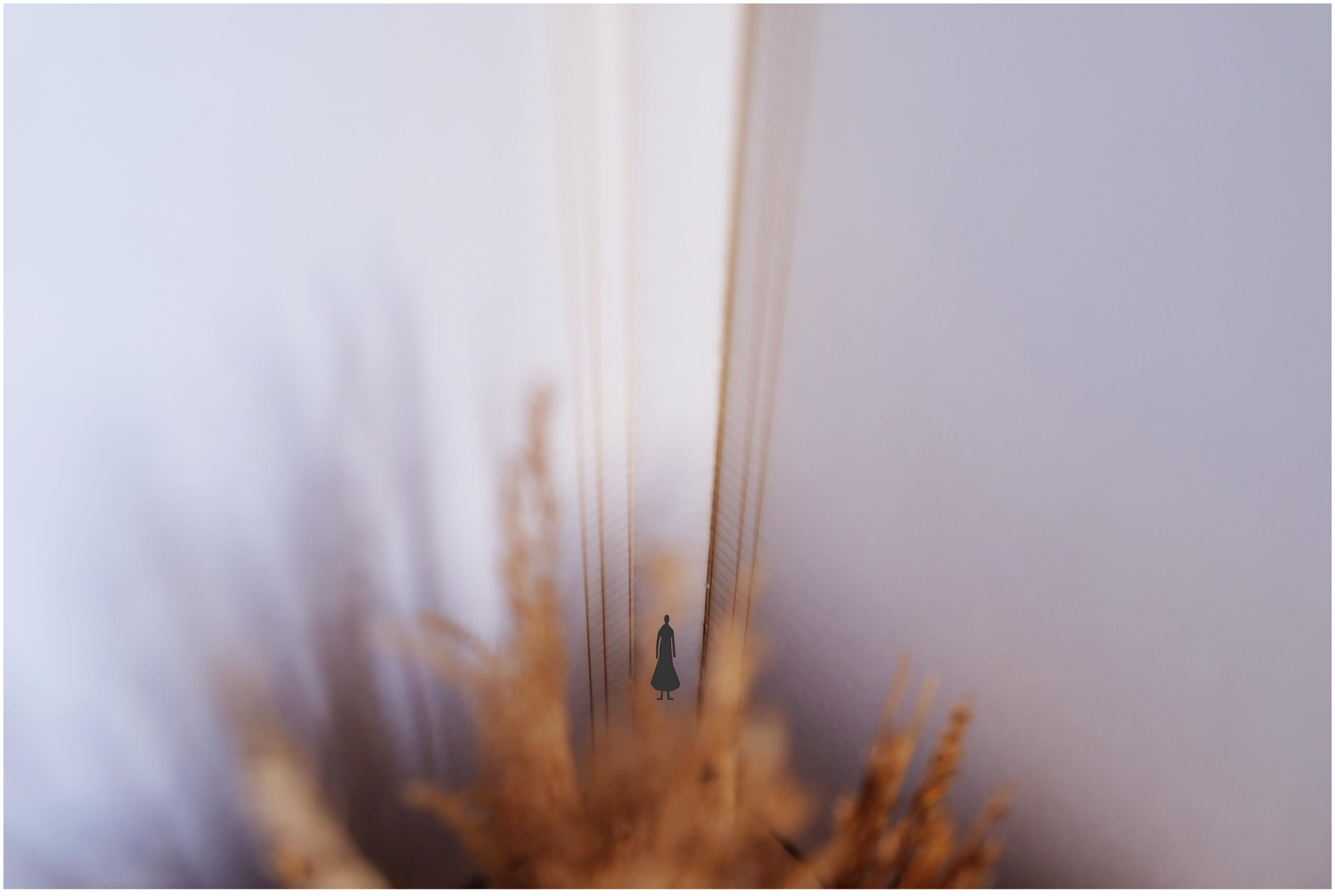


Typical Floor Plan A. Level 2.

Front access route. Scale 1:250



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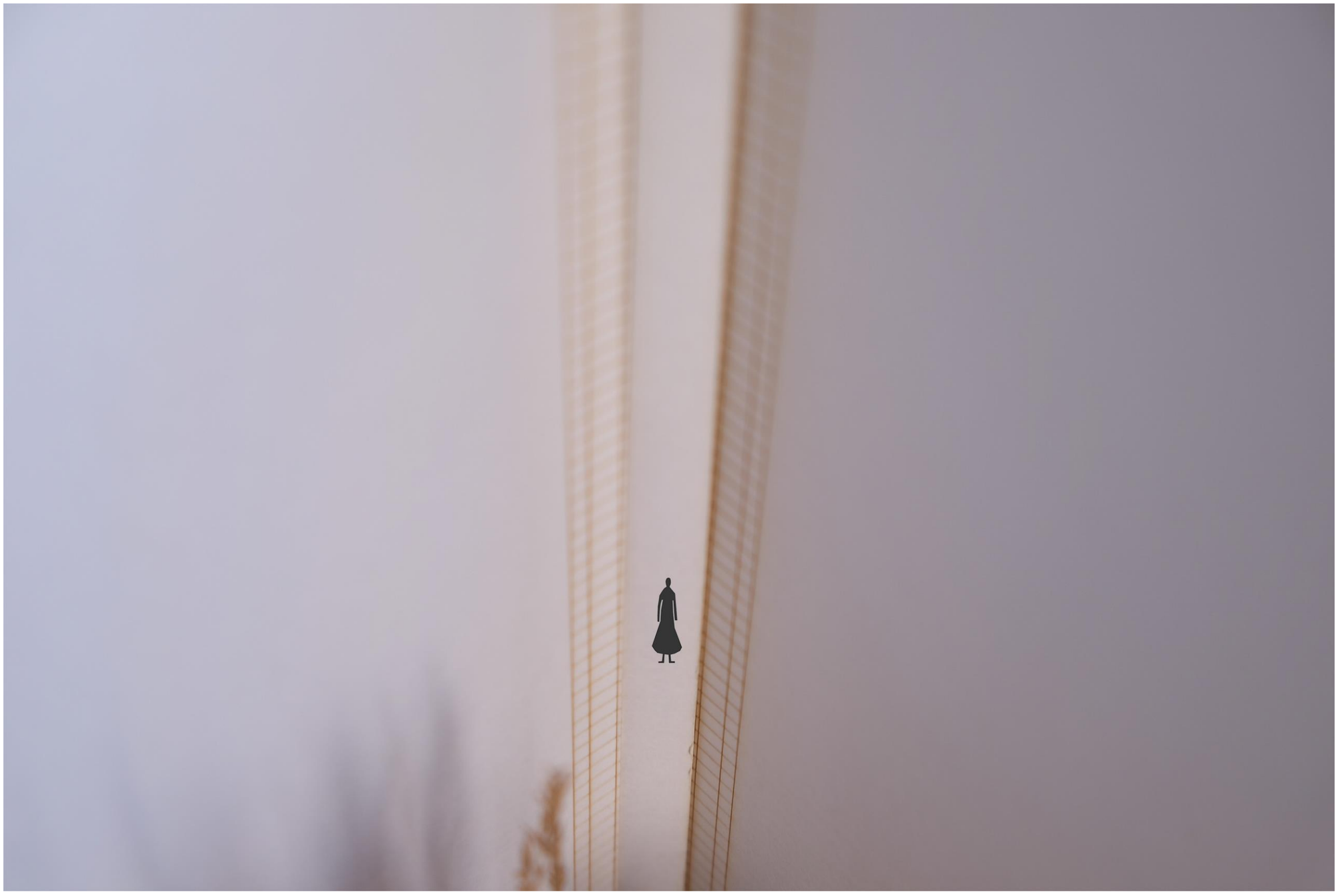

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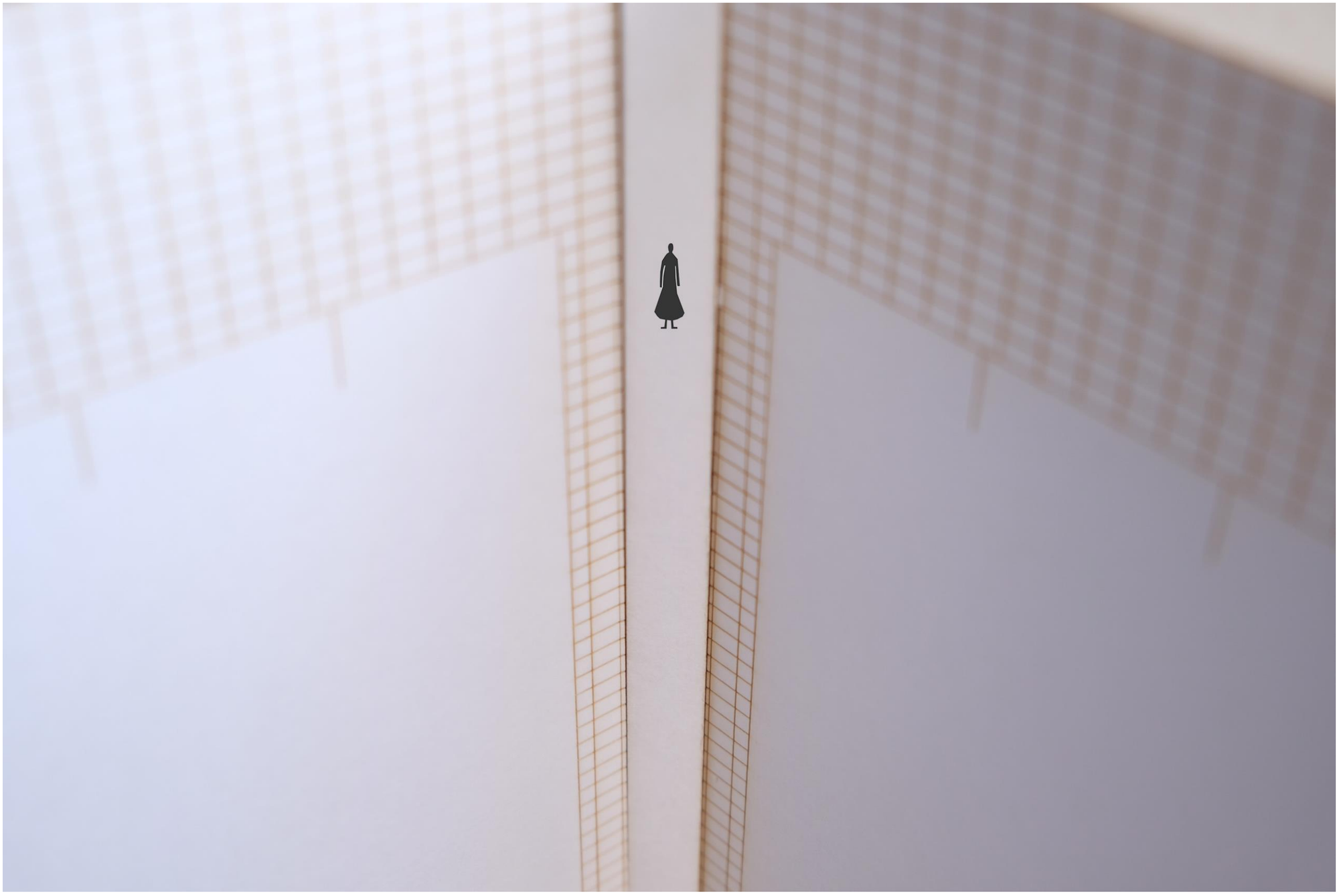

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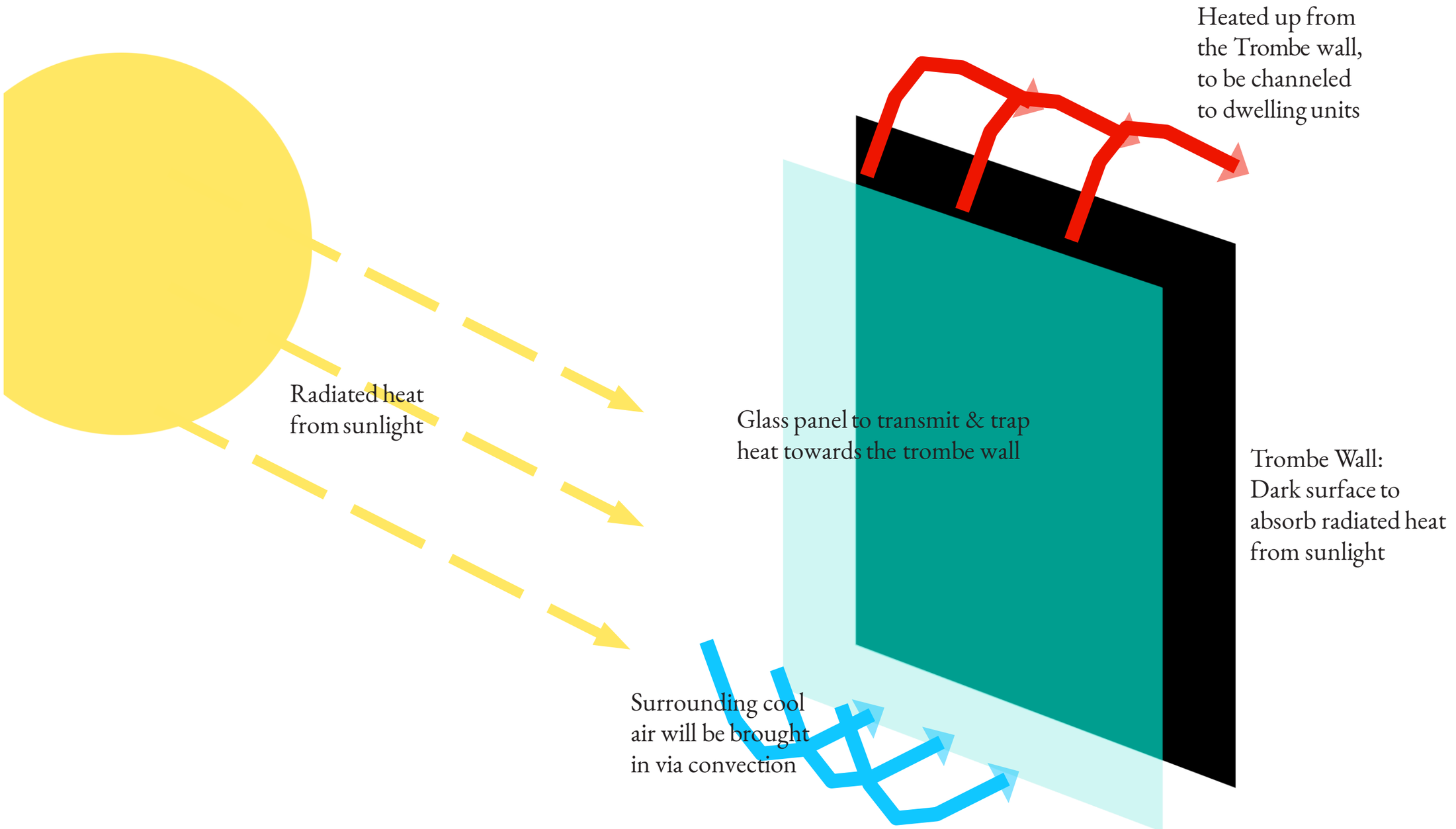
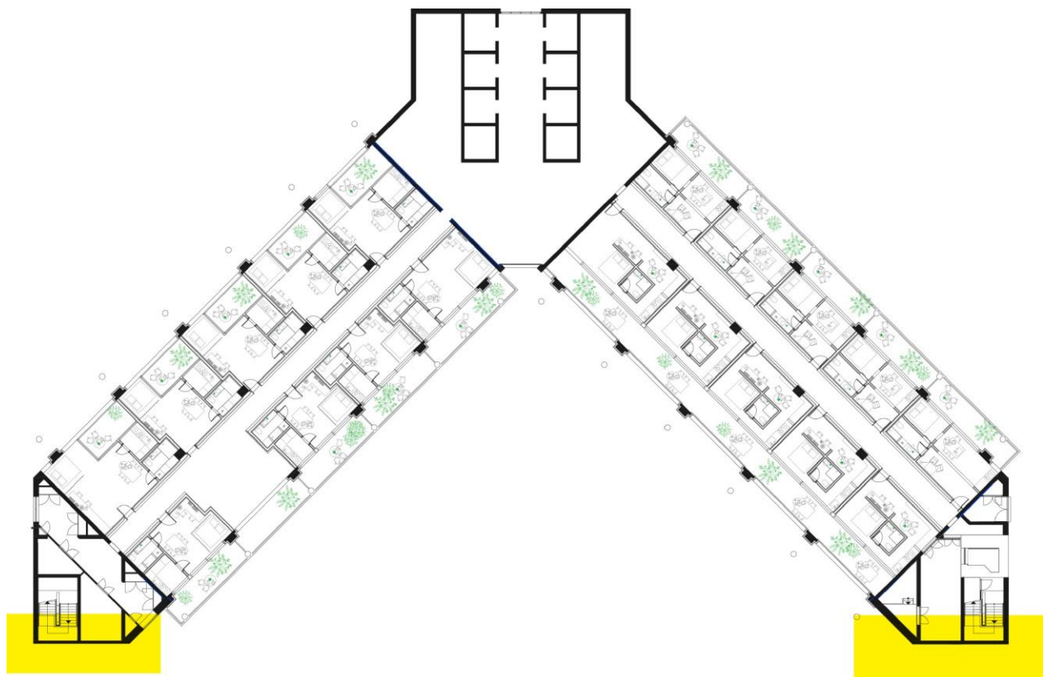
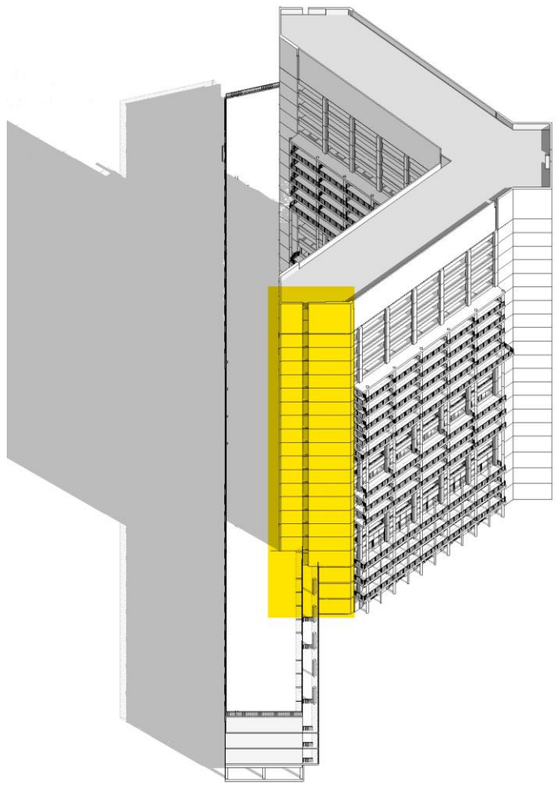
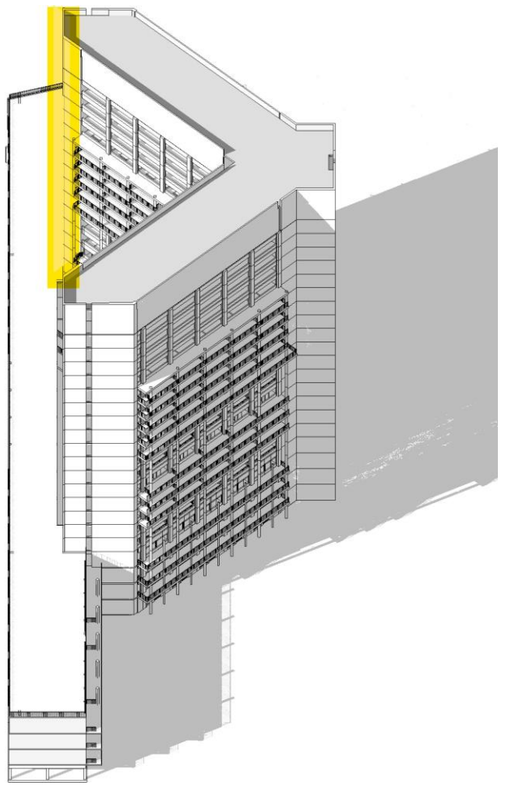


Trombe Wall System Diagram

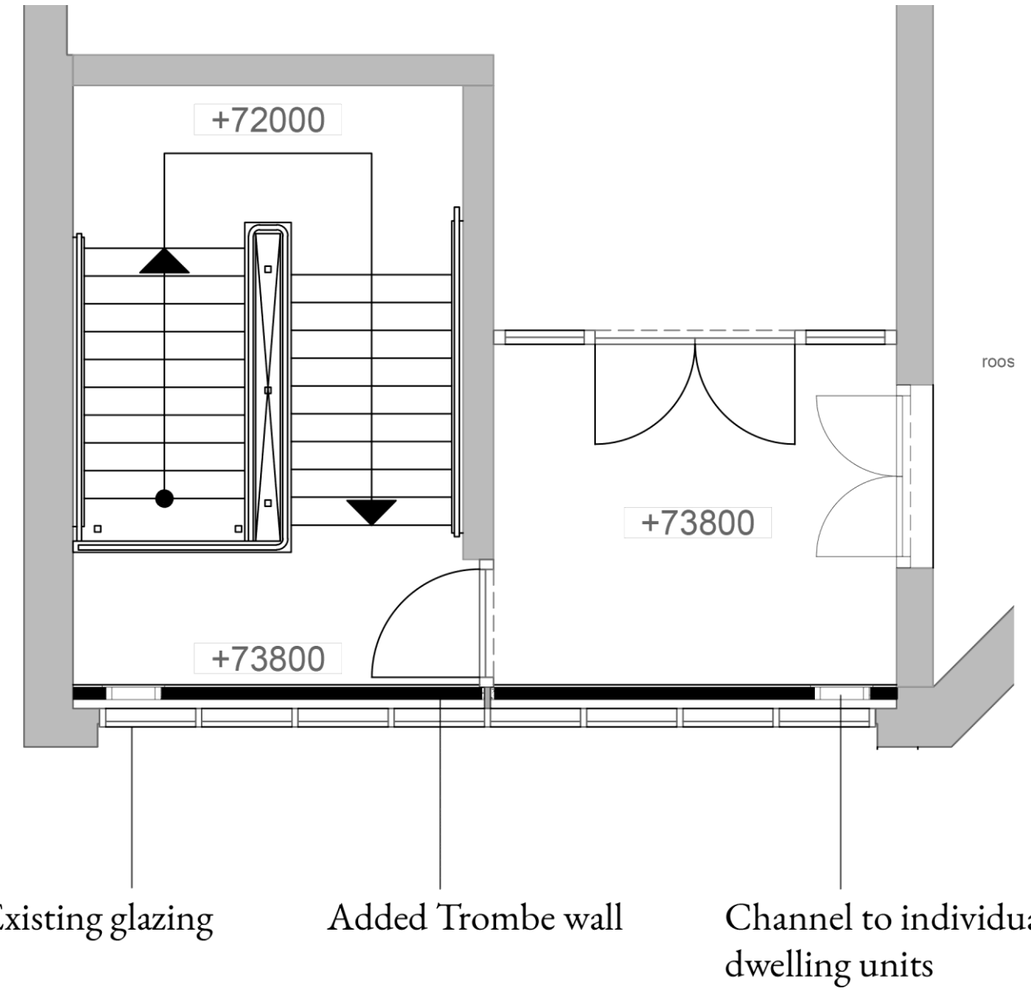






Up

As we traveling up, we see the possibility of incorporating Trombe Wall at the strip of existing glass wall at the vertical shafts which are not used for most of the time



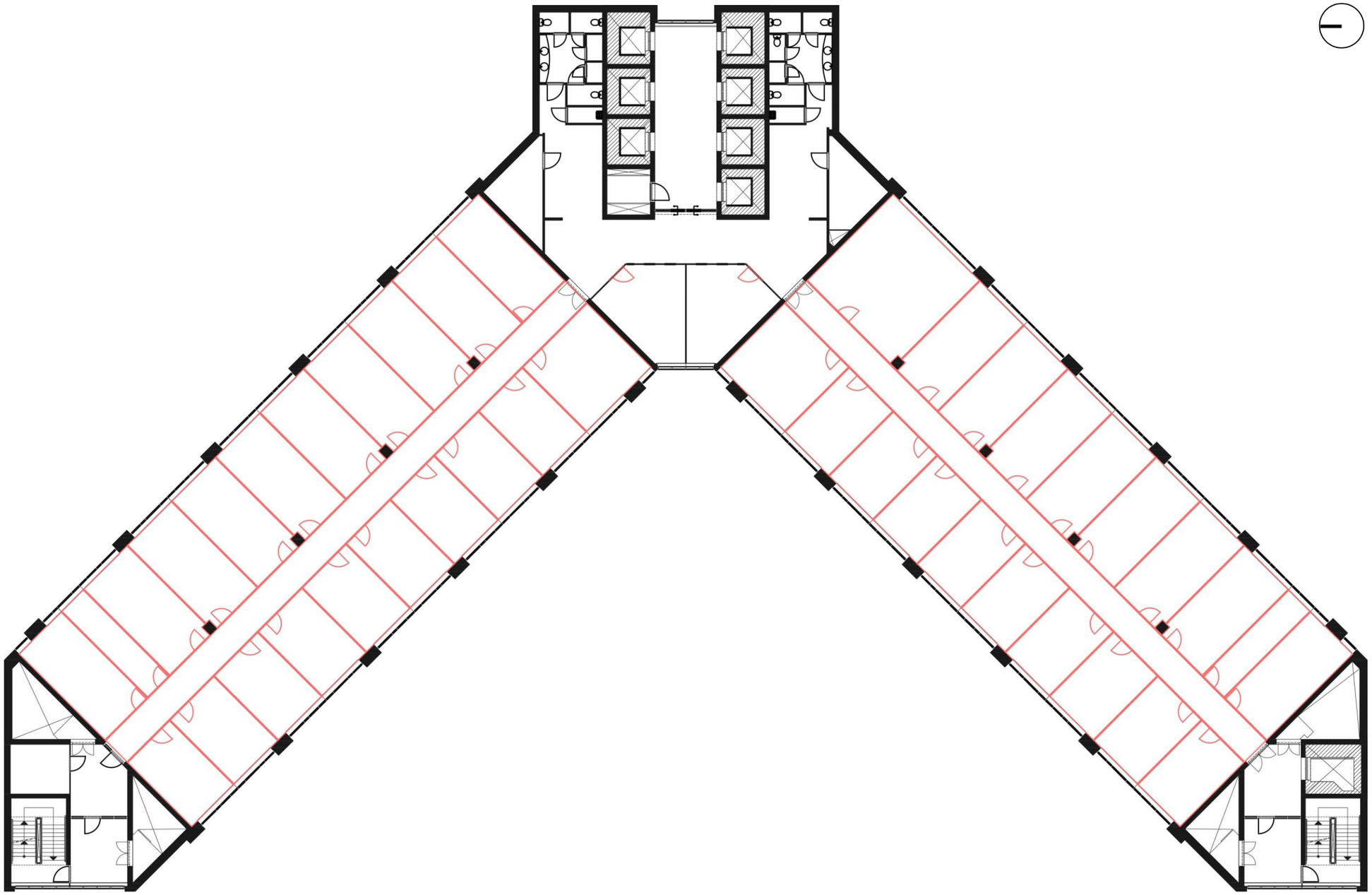
Trombe Wall System Diagram

Since trombe wall is a dark wall, we do not like to put it in the dwelling quarters which will block out a lot of daylight, therefore, we utilise the emergency shaft, which is already having a glazed façade from bottom to top.

How will the interior space look like guided by the reeds?

Arrived

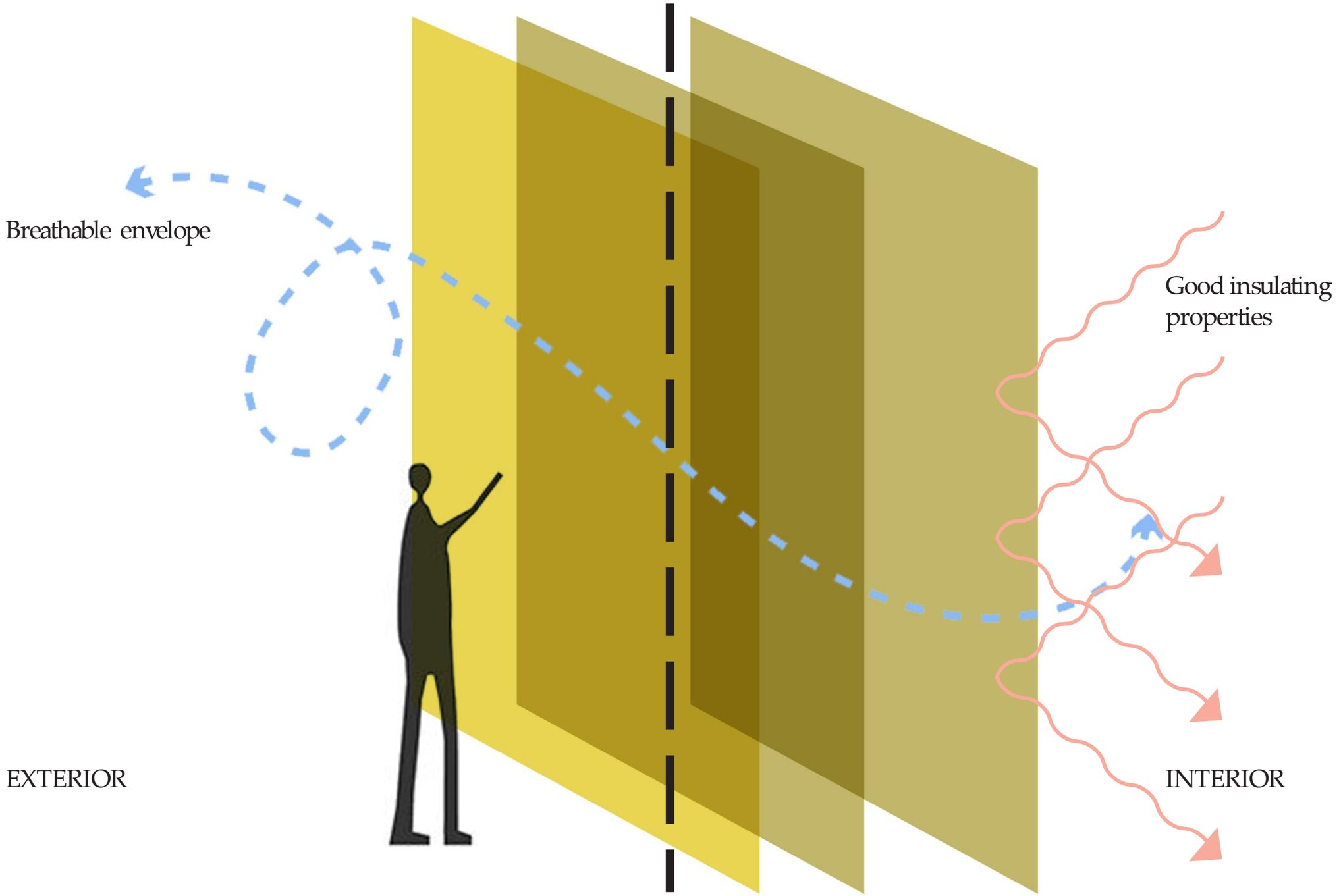
Arriving at the selected floor, we now see Starting from the internal spaces, which starters will be living in most of the time: How are we configuring the interior spaces with the aid of reeds?



Existing Floor Configuration

Currently, it is an open plan supported by columns, with interior partitions made of softboards, repetition, and no hierarchy in privacy, which is in total contrast to what a house should provide.

“Let the **materials help choreograph** the spatial configuration & bring out the quality of living. We shall be **a total work of sight, warmth, acoustics & tactility.**”

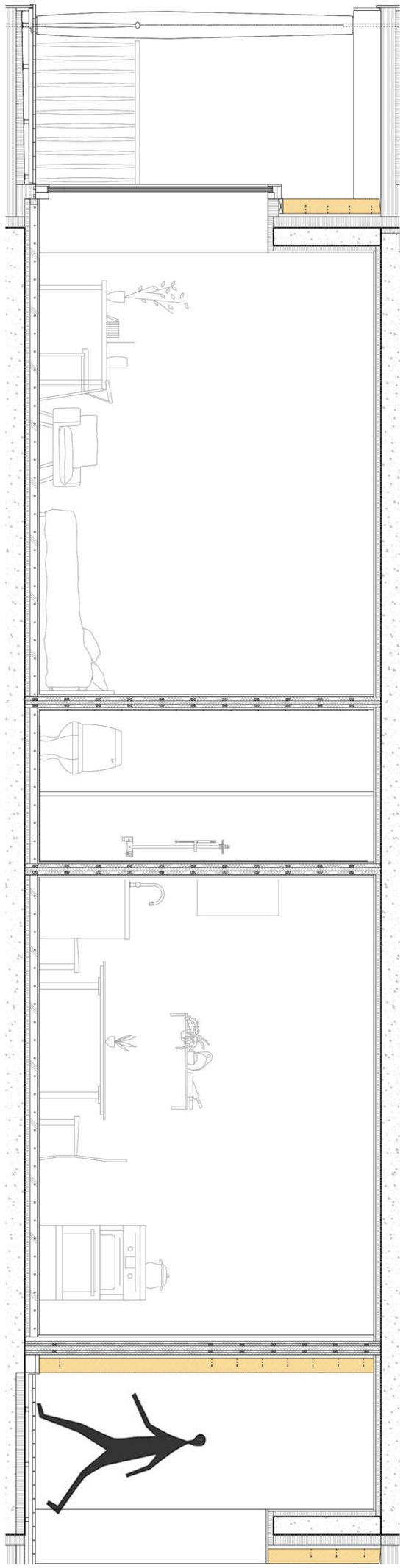


Biobased material

The common goal of these walls is breathable envelope with good thermal insulation, made of biobased material.

Biobased material

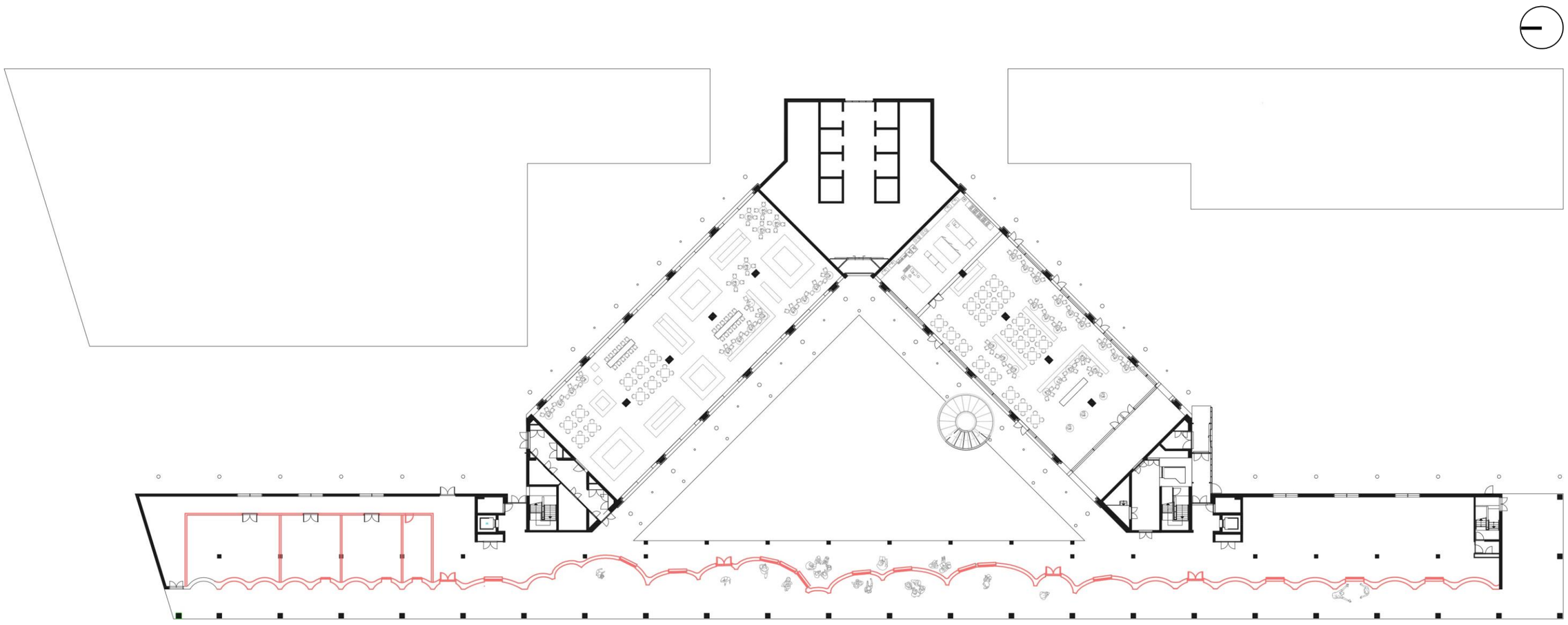
Diverse they may sound, these 5 types of houses share the similar range of material, which is being improvised from the research. Mainly, there are 3 types of walls being used: Type B, C & D. This is also low tech passive solutions to address climatic challenges.



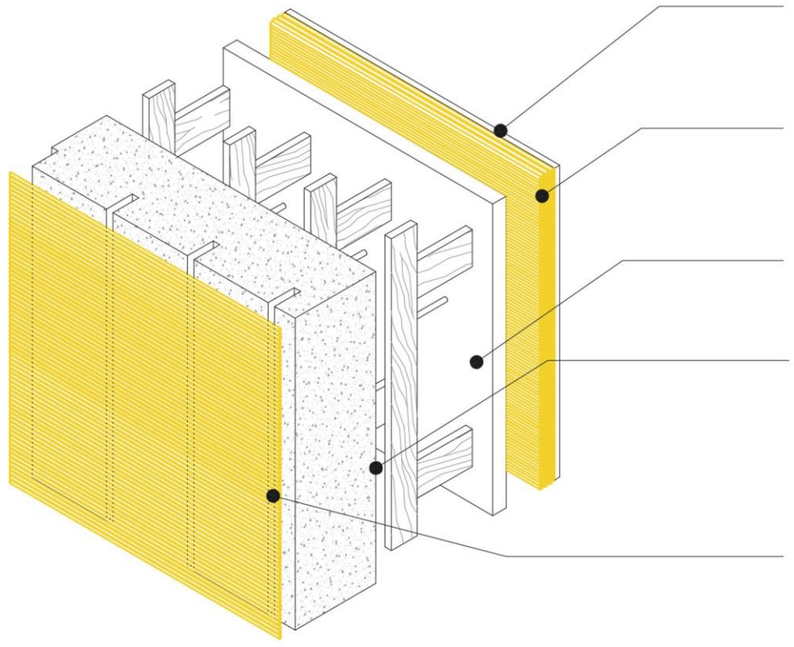
Wall type D:
Opened to exterior environment, Semi-sheltered

Wall type C: Interior wall,
One side facing wet zone

Wall type B:
Sheltered & protected, Facing internal corridor

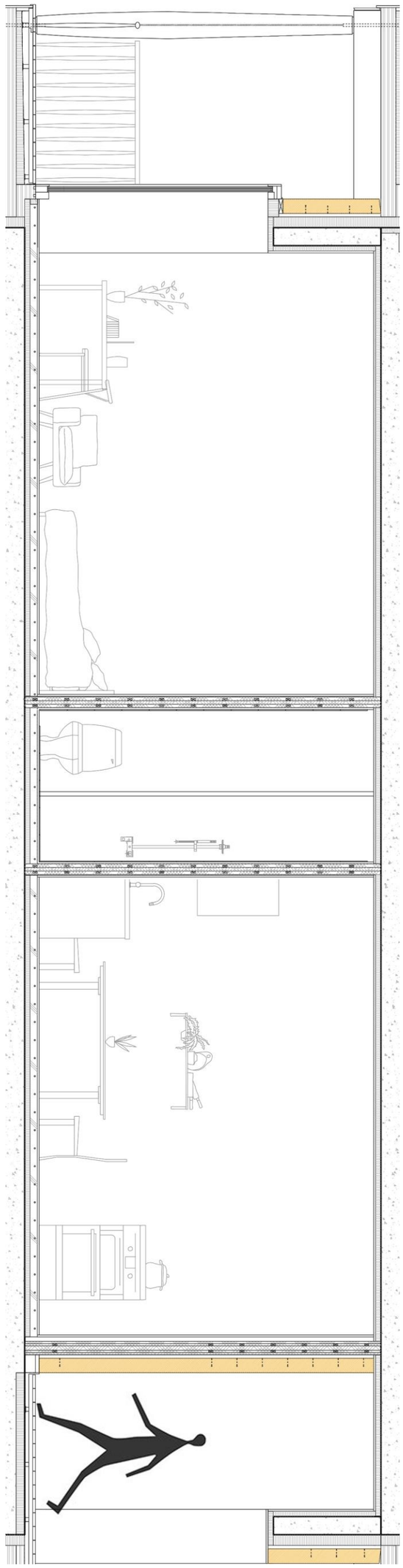


Wall type A



Wall type A

Scale 1:16



Wall type D:
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Wall type C: Interior wall, One side facing wet zone

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Biobased material

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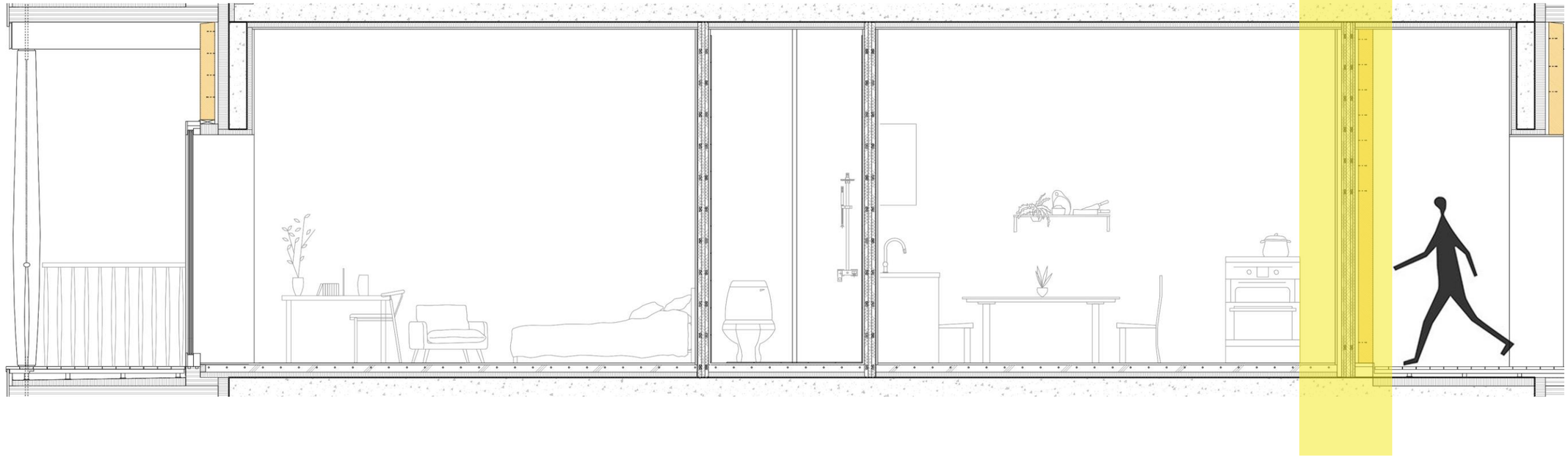

Biobased material

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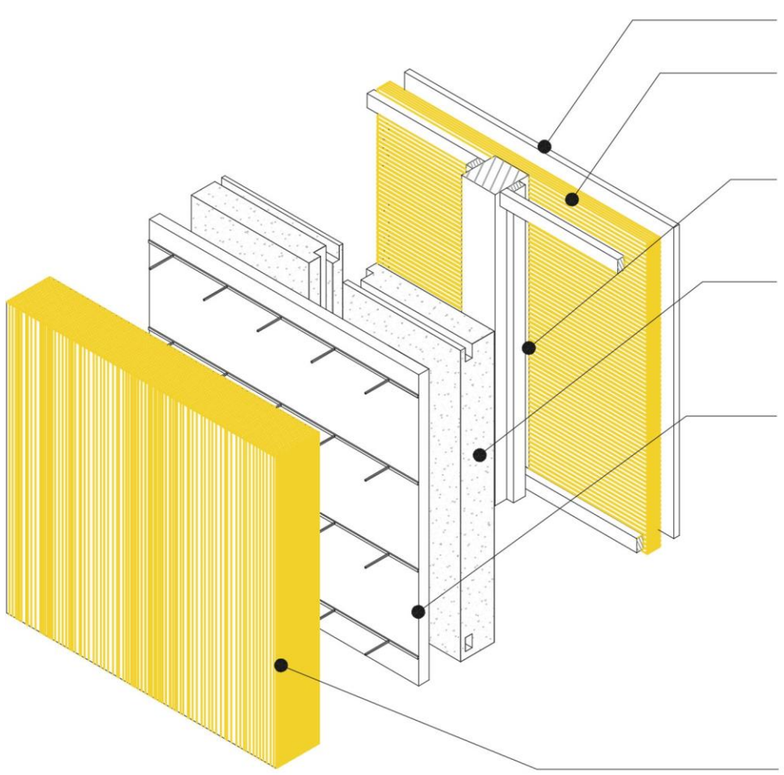


20mm clay-reed plaster

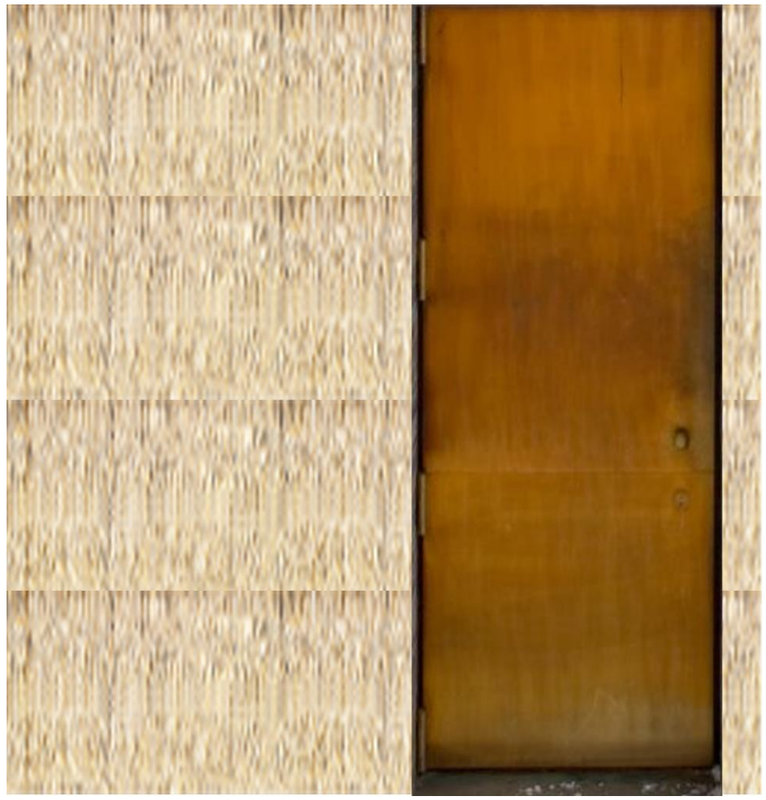
50mm reed board as insulation & backing for plastering

timber substructure

150mm clay-rich light earth, bulk density, d=300kg/m3

stainless steel threaded screw at 280mm interval, Debricoat Lapfix self-adhesive membrane, Promatech-H Fire class A steam-hardened calcium silicate board

160mm untreated reeds



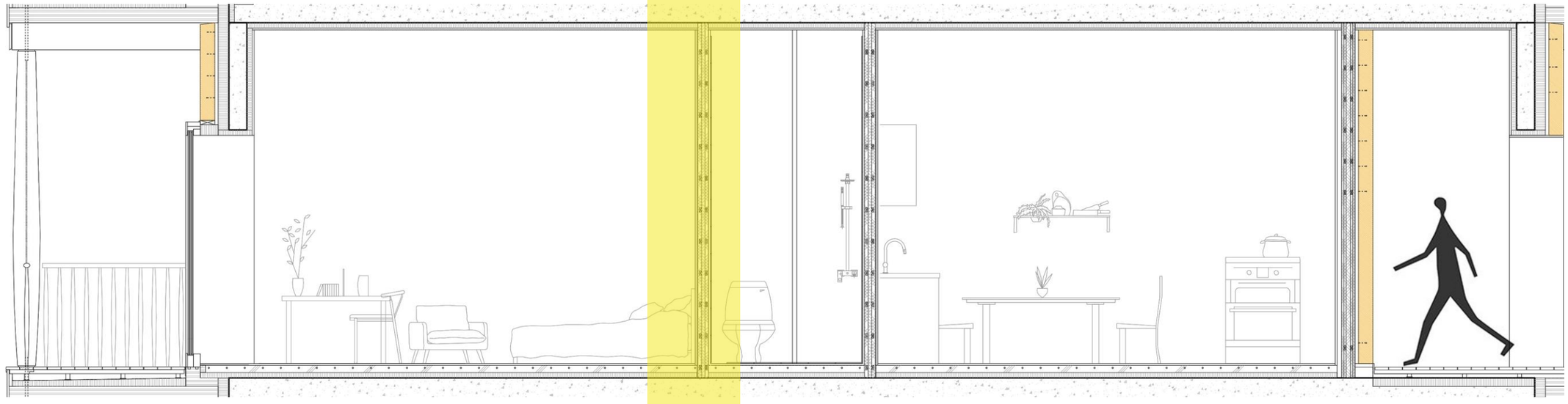
Wall type B

Scale 1:16

Wall type D:
Opened to exterior environment, Semi-sheltered

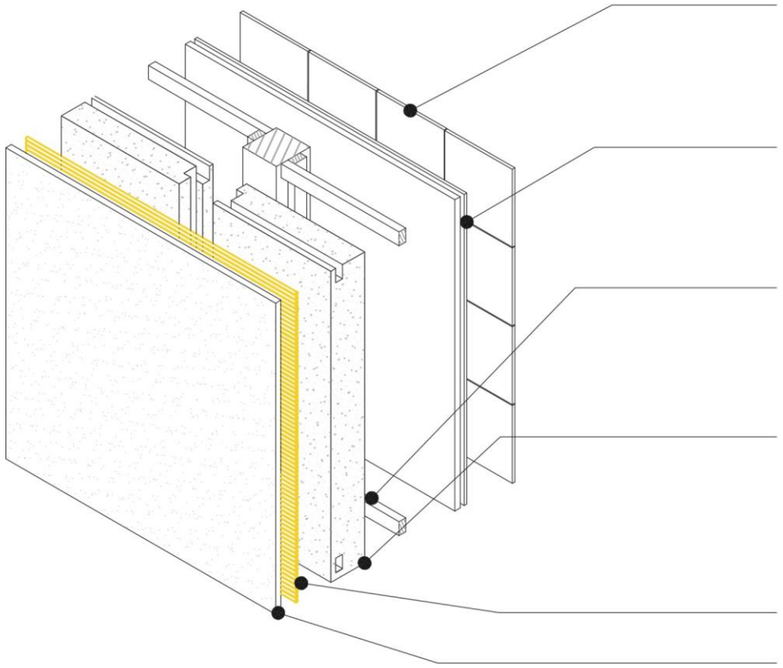
Wall type C: Interior wall, One side facing wet zone

Wall type B:
Sheltered & protected, Facing internal corridor



Biobased material

Diverse they may sound, these 5 types of houses share the similar range of material, which is being improvised from the research. Mainly, there are 3 types of walls being used: Type A,B & C. This is also low tech passive solutions to address climatic challenges.



10mm homogenous ceramic tile

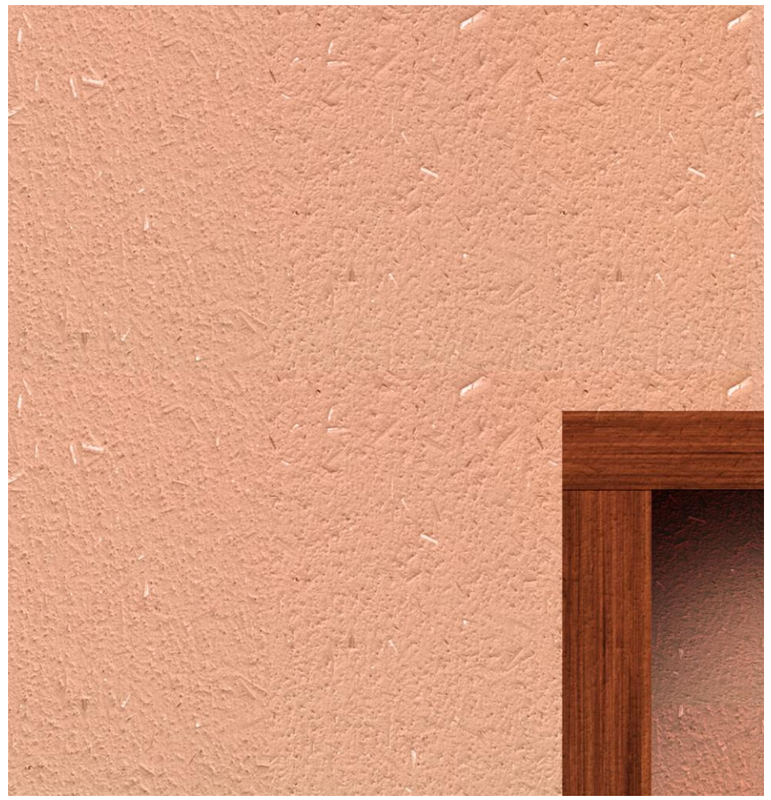
trass-lime mortar embedded with reinforcement mesh, moisture-resistant drylining-board

timber substructure

150mm clay-rich light earth, bulk density, d=300kg/m3

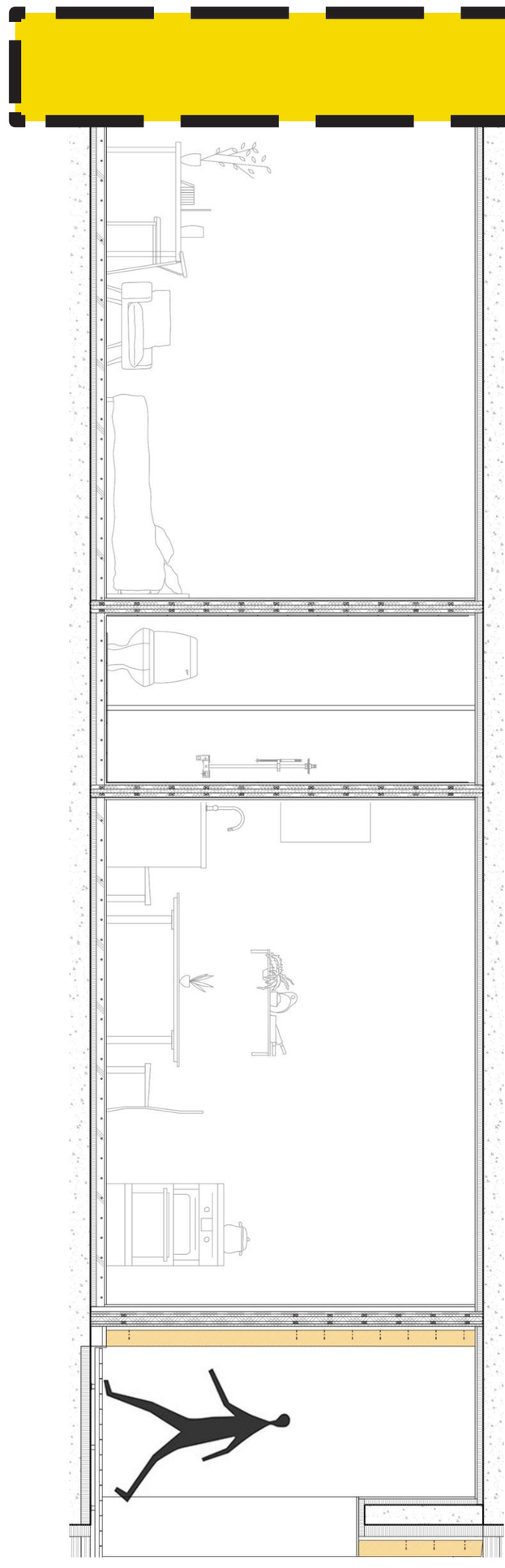
10mm reed mat

20mm clay-reed plaster



Wall type C

Scale 1:16



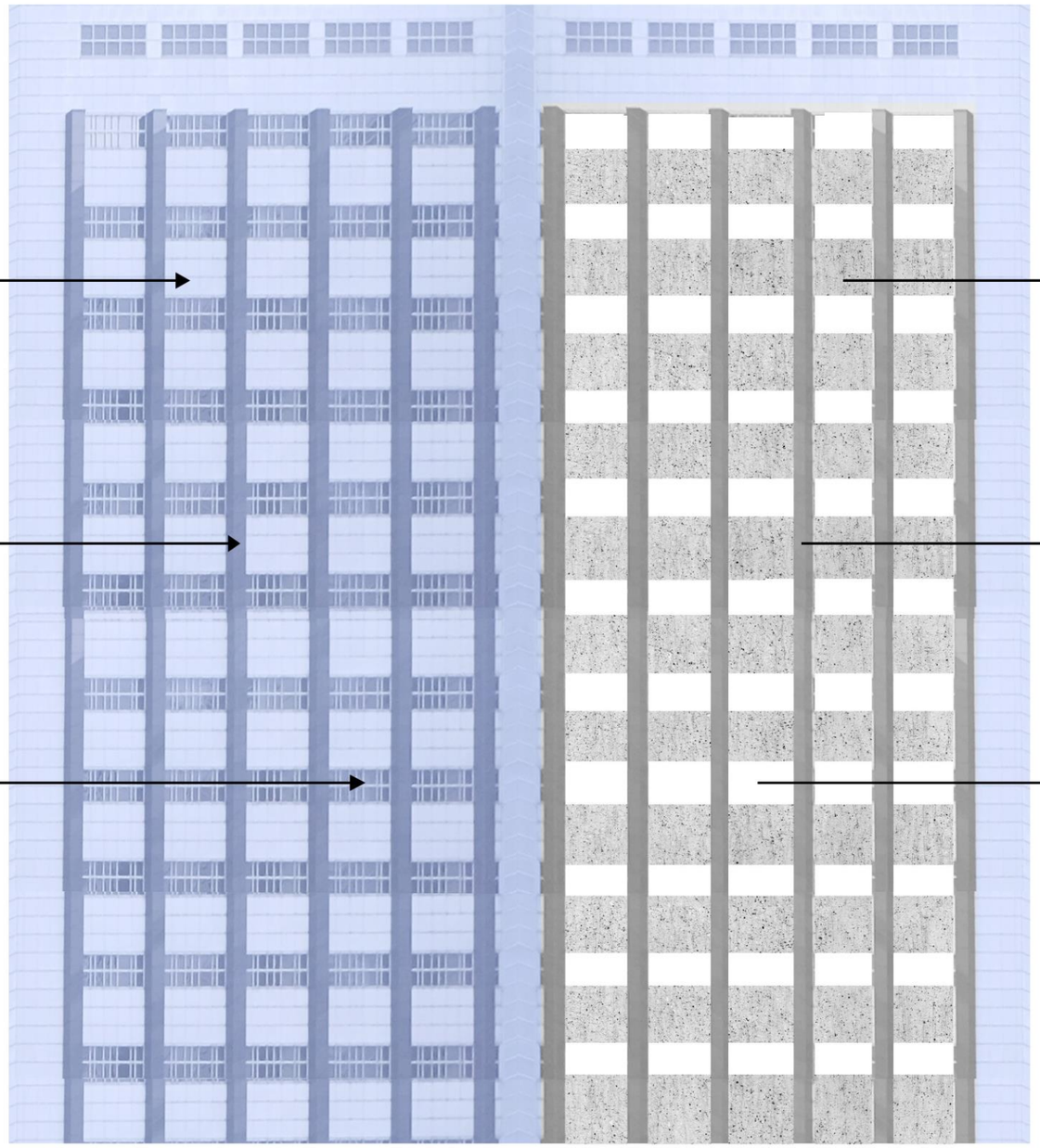
Wall type
C: Interior
wall,
One side facing wet
zone

Wall type B:
Sheltered &
protected, Facing
internal corridor

Wall type D

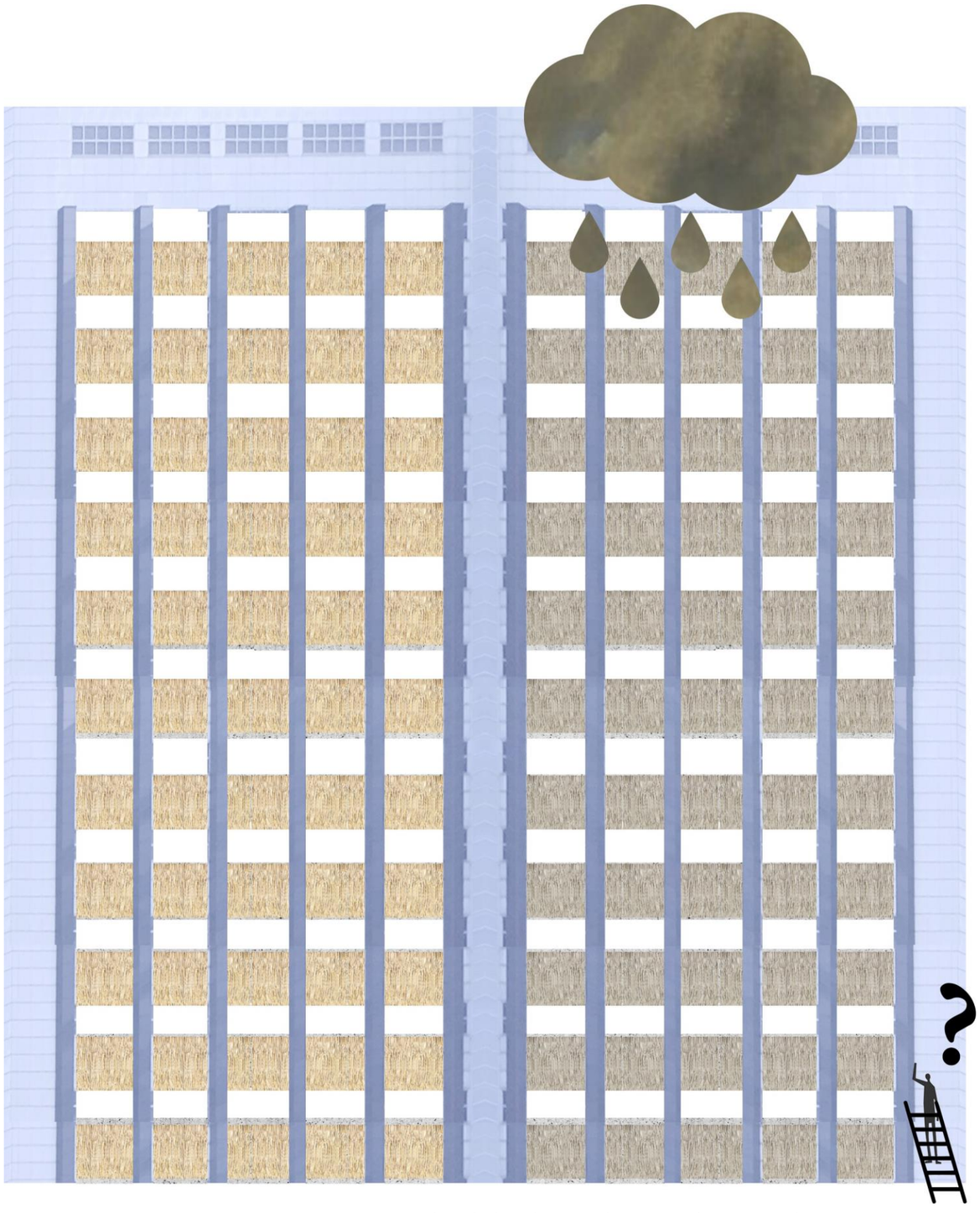
Scale 1:16

The most prominent layer we would encounter is the exterior façade, with the largest area coverage. It bears the identity of the tower. Currently, cladded with aluminium composite panels, in a repetitive grid and limited openings toward the interior.



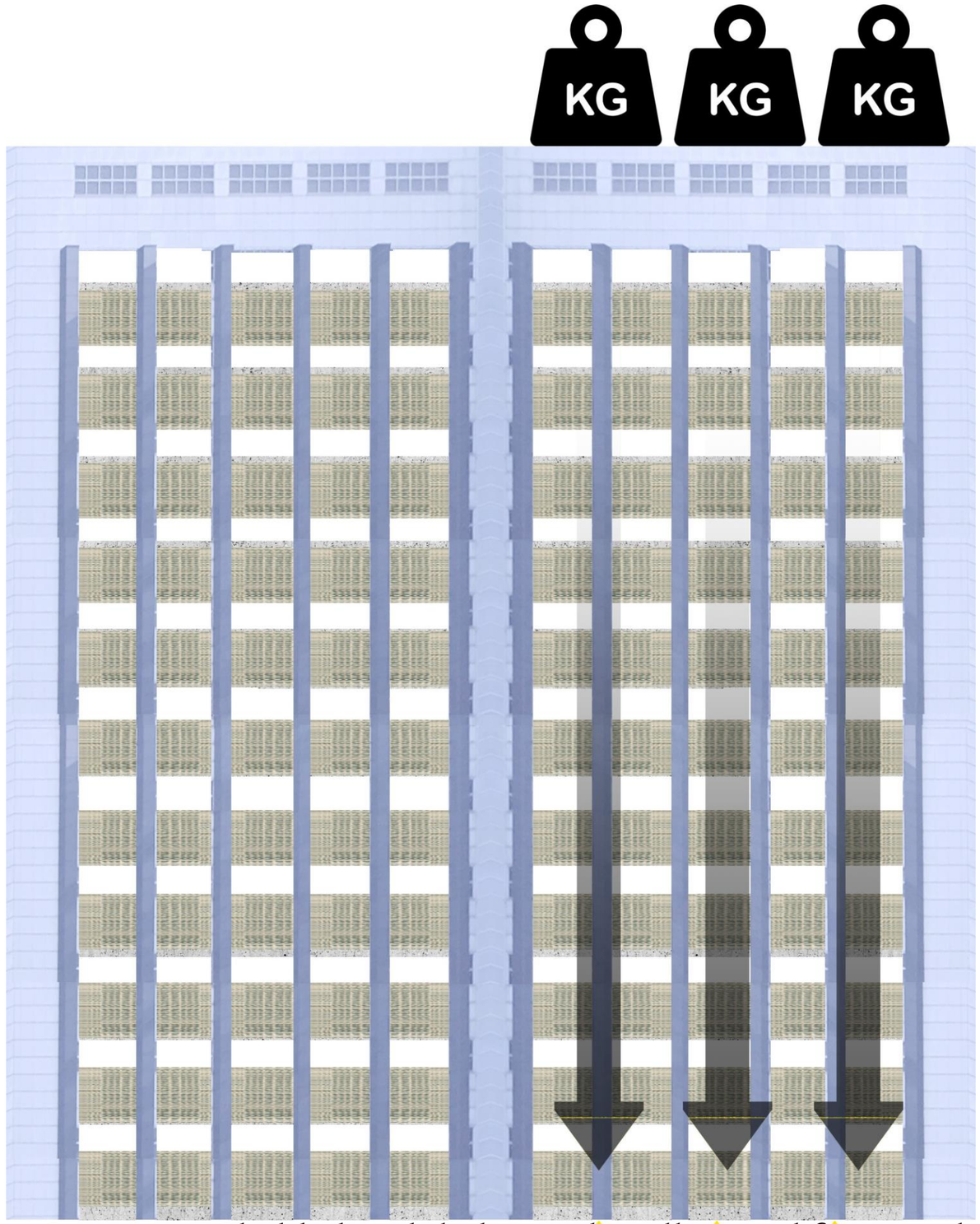
Extent of transformation

Structural elements preserved, with claddings removed & recycled for new uses.
From the existing, we will remove the lower architrave & window frames, opening up these spaces for new picture window.



Option 1: Cladded with reed panels

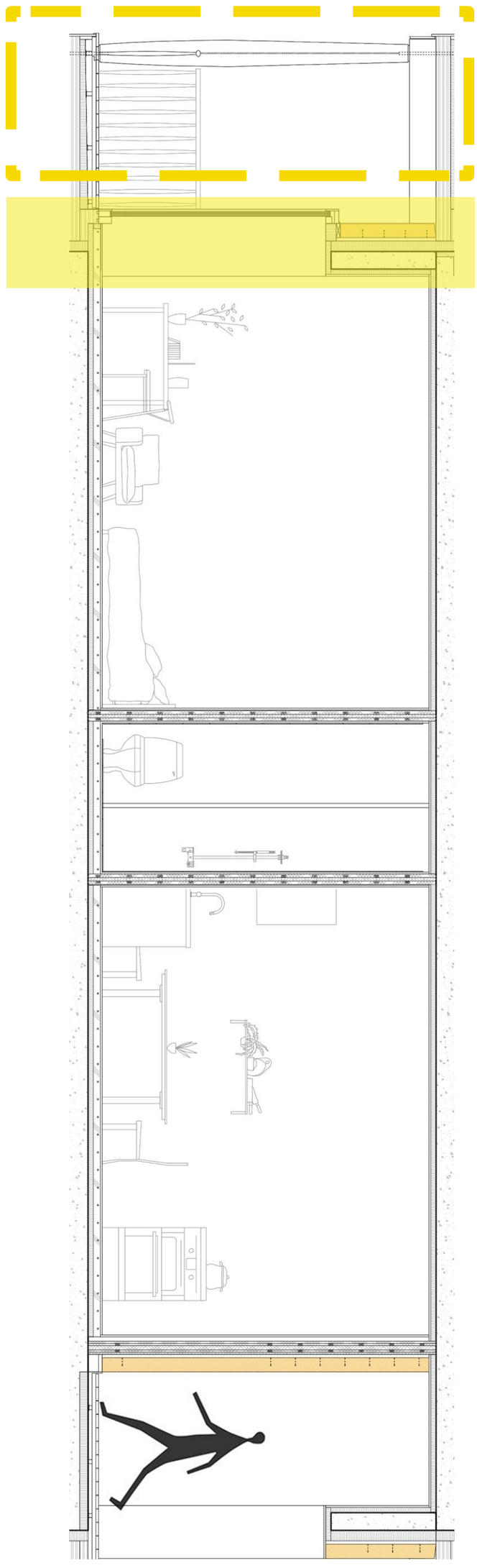
Prone to weathering & need regular maintenance. Not easily accessible and more of an exterior impression.



Option 2: Cladded with light-earth wall in reed formwork

Too much load added to the existing structural members.


What do you want, reed?
I like a shelter.

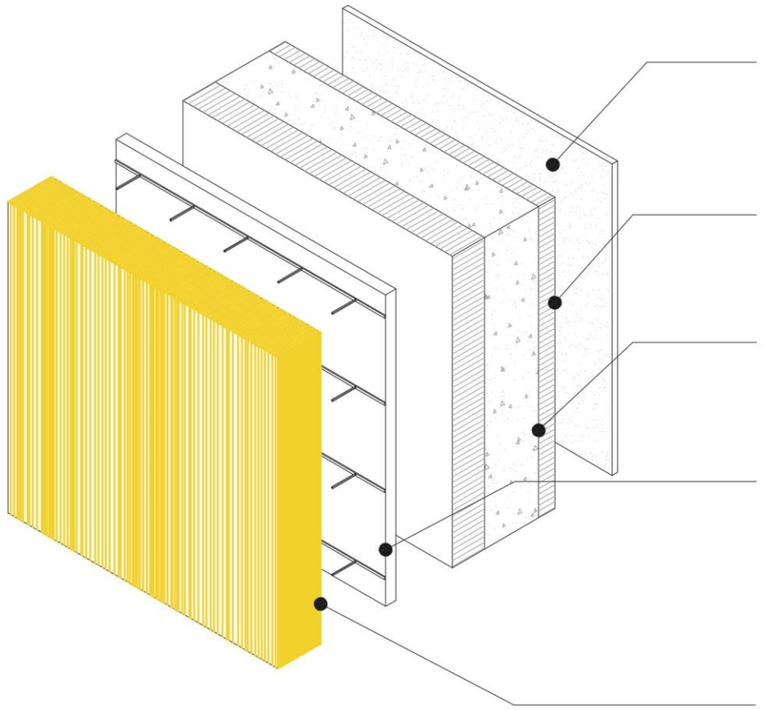


Wall type D:
Opened to exterior environment, Semi-sheltered

Wall type C: Interior wall, One side facing wet zone

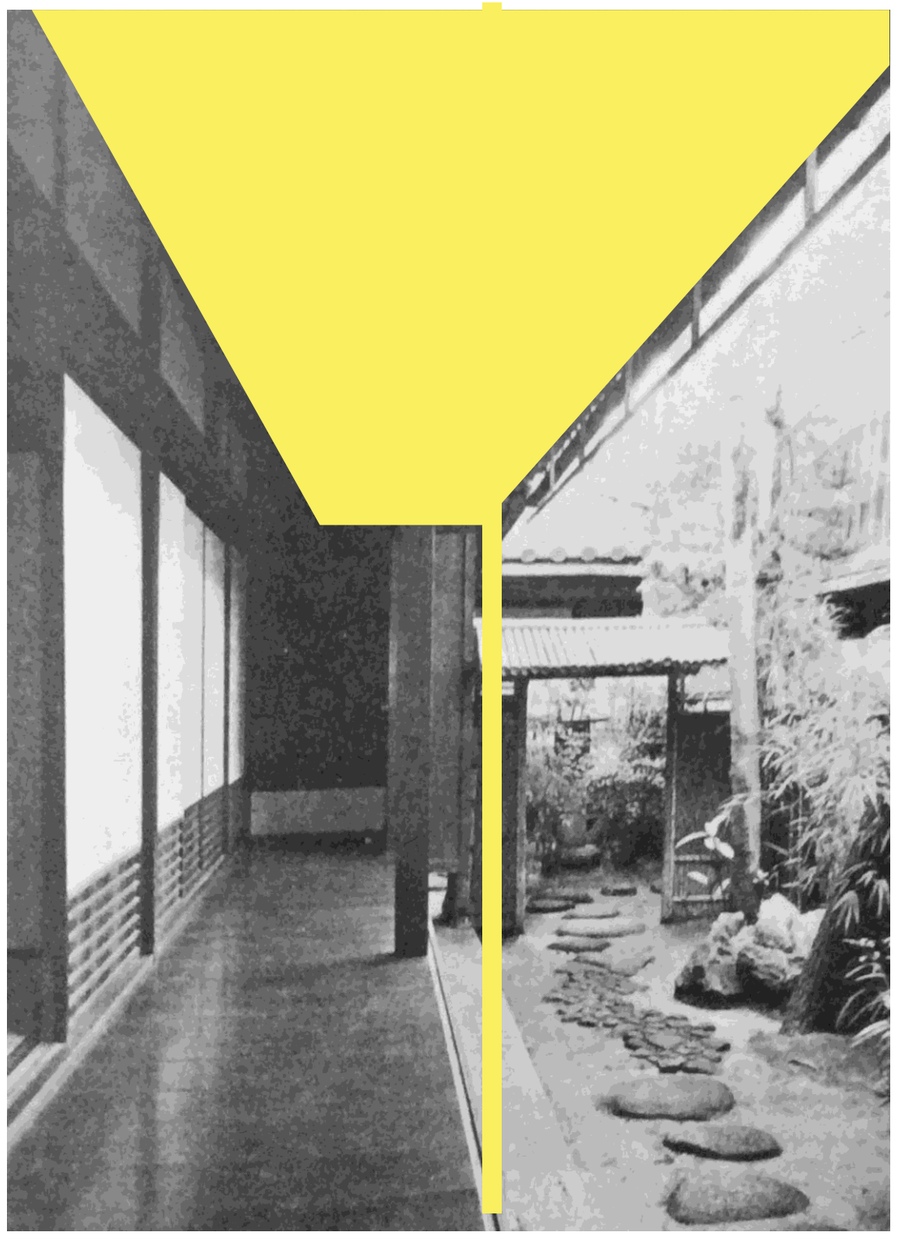
Wall type B: Sheltered & protected, Facing internal corridor

a. Wall type D
Scale 1:16



a. Wall type D

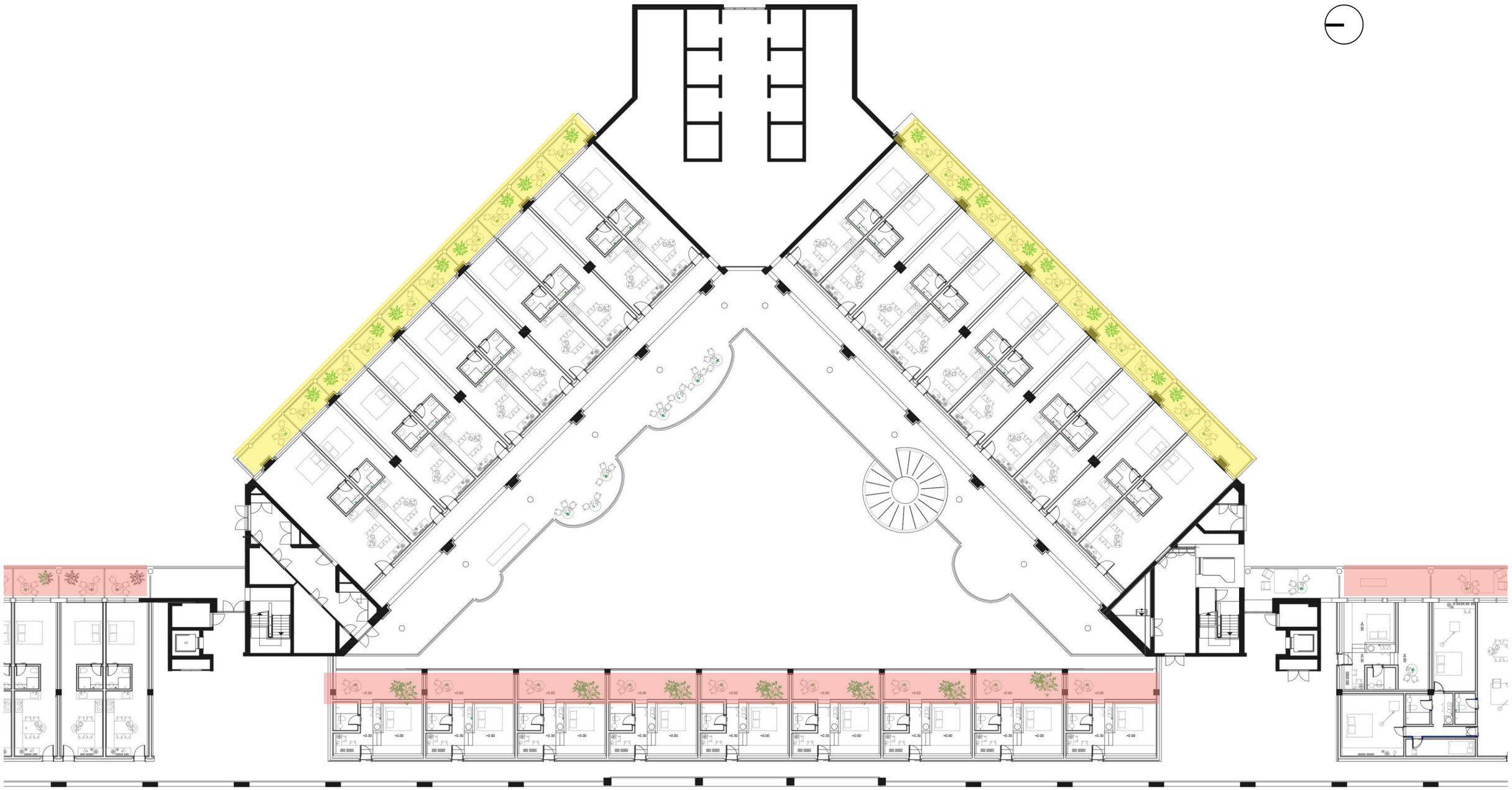
Scale 1:16



Harada, J. (1936). Engawa & garden stepping stone [Photograph]. https://siujui.medium.com/a-study-on-engawa-evaluation-on-the-contemporary-learning-from-tradition-e2d1dc4727c0

Design Principles in reference with Japanese Architecture: Threshold

Which is closely informed by the environment's possibilities & limitation.

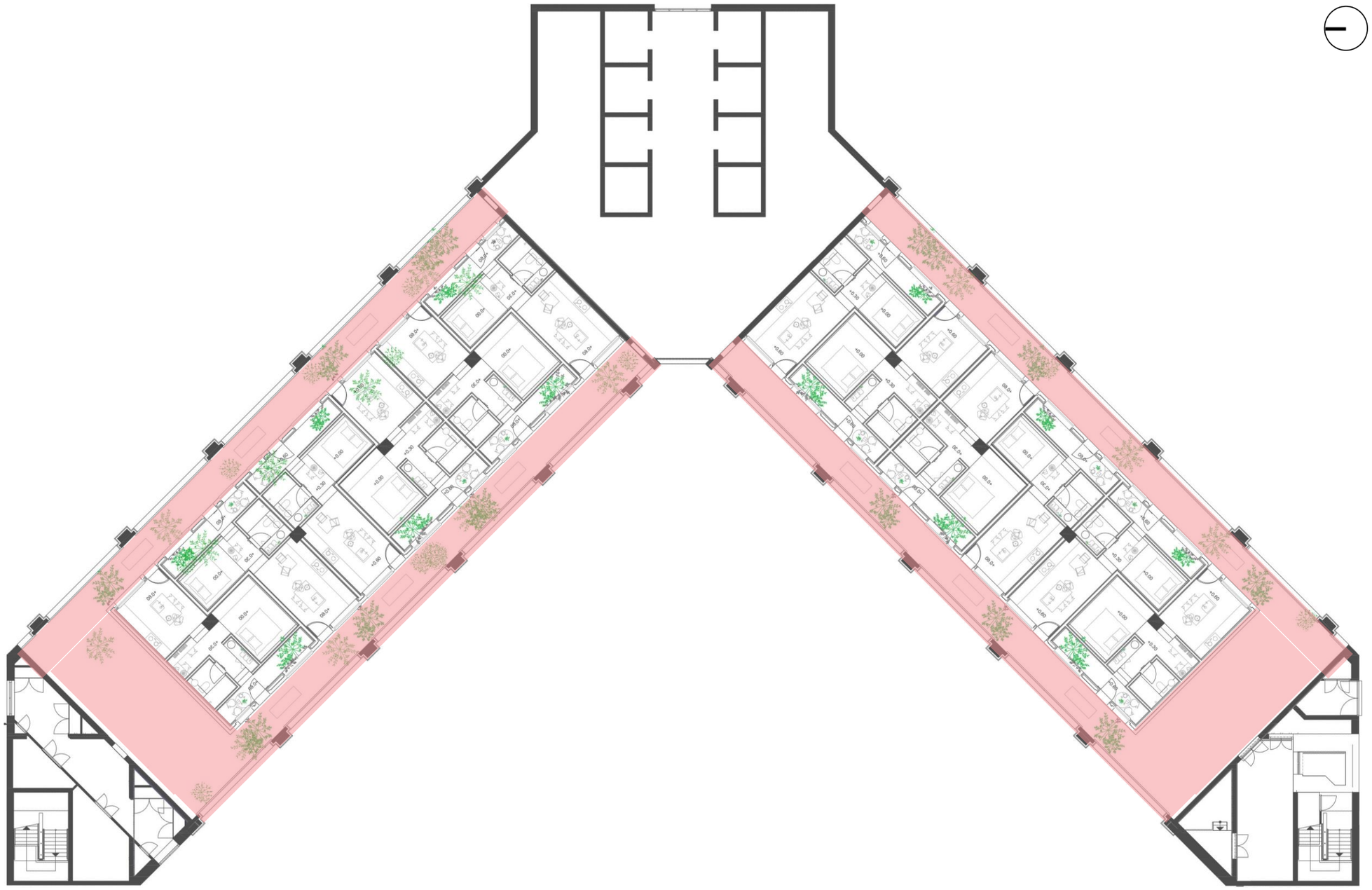


Typical Floor Plan A. Level 2.

2 types of engawa:1. added part which stands on structural columns, highlighted in yellow 2. inset space which carved in from the existing building layer, highlighted in red.

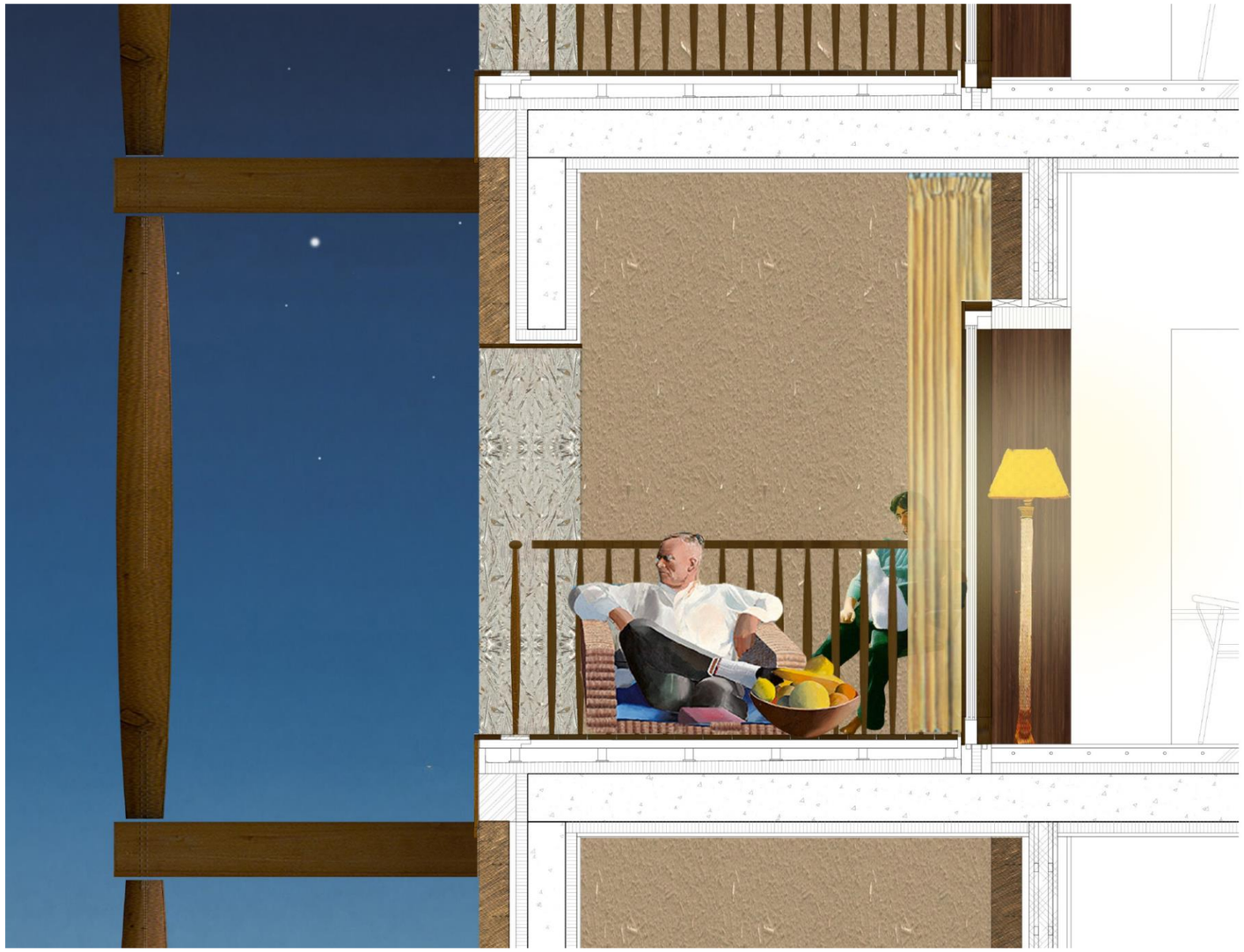
Typical Floor Plan B. Level 3

2 types of engawa:1. added part which stands on structural columns, highlighted in yellow 2. inset space which carved in from the existing building layer, highlighted in red.

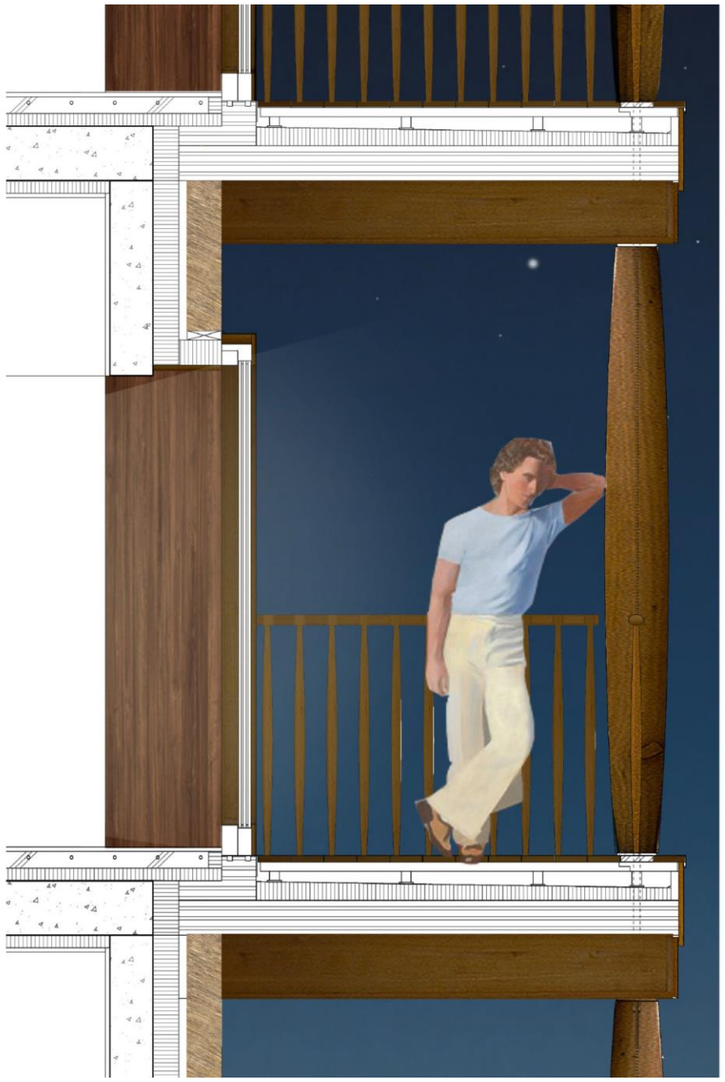


Typical Floor Plan C. Level 15

2 types of engawa:1. added part which stands on structural columns, highlighted in yellow 2. inset space which carved in from the existing building layer, highlighted in red.



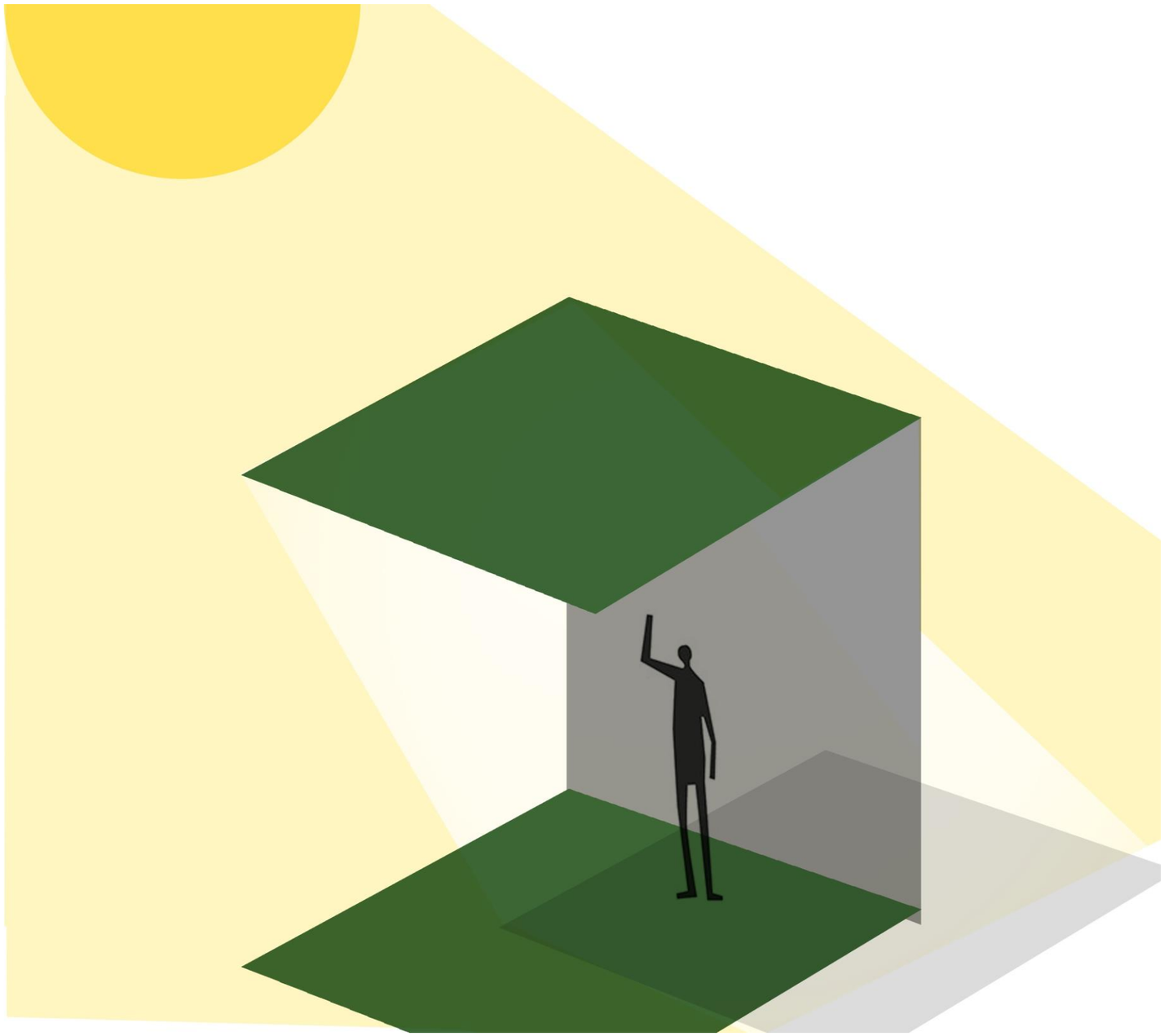
Engawa



Engawa

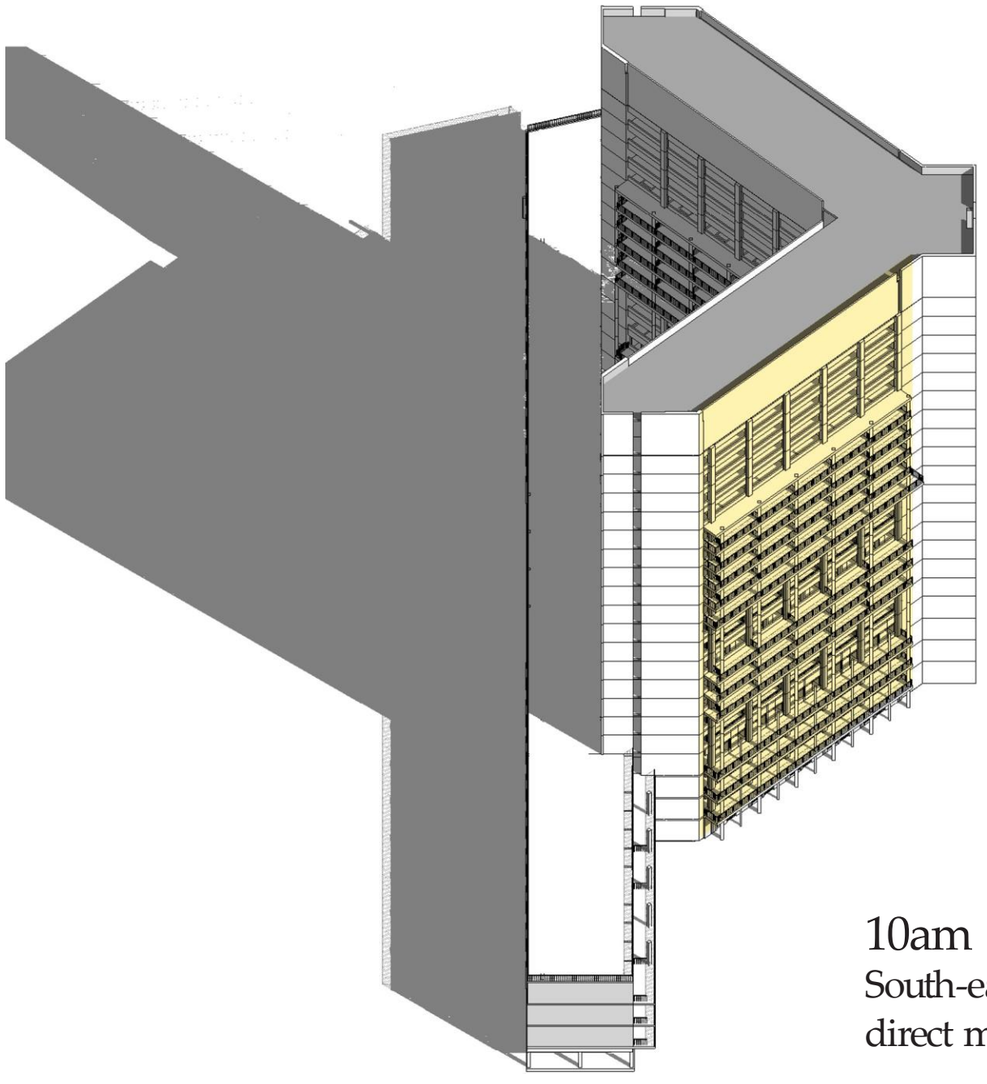
Engawa Design

Creating sheltered semi-outdoor area for all units to enjoy different seasons, time in a day and weather.

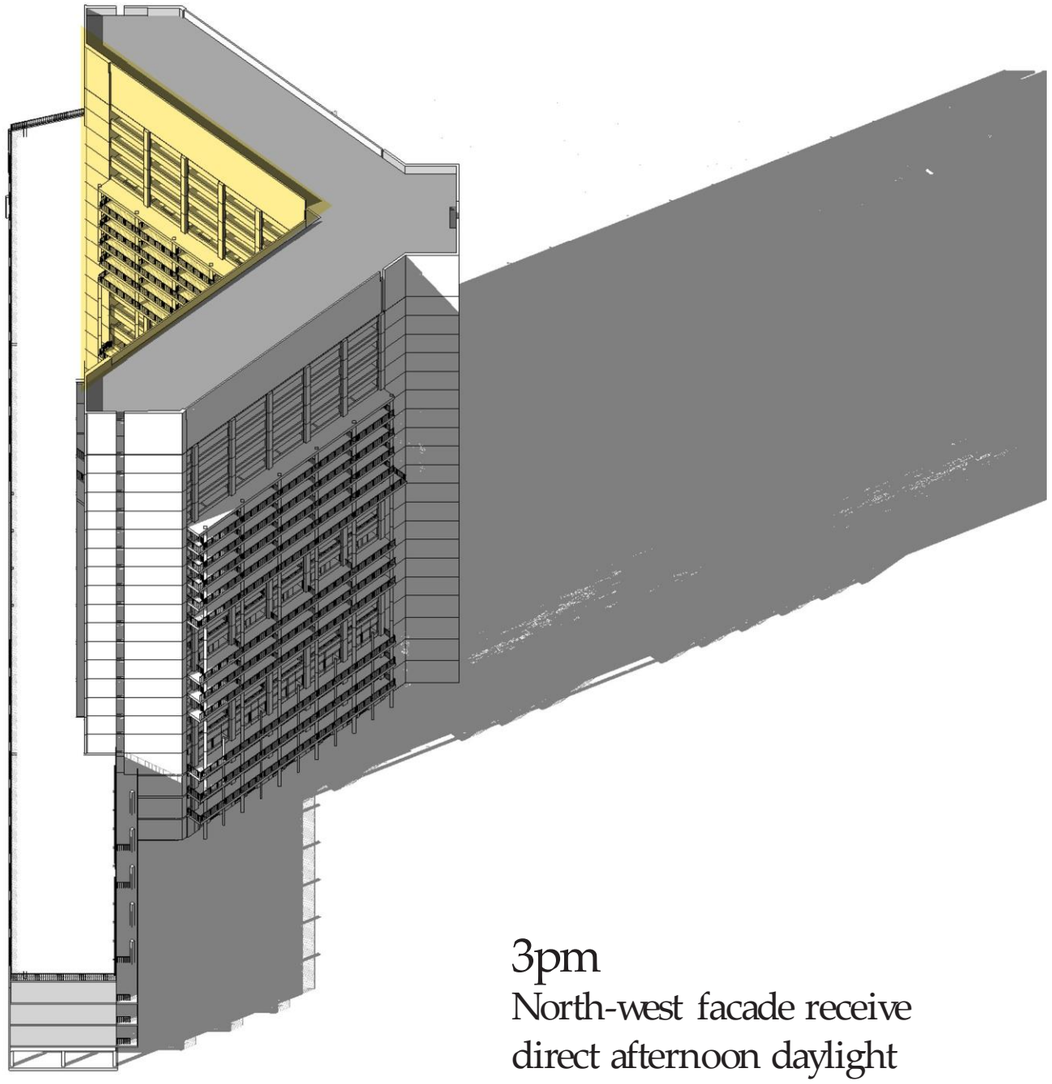


Engawa design: shading devices

to reduce direct daylight glare and to add quality semi-outdoor spaces for the dwellers.



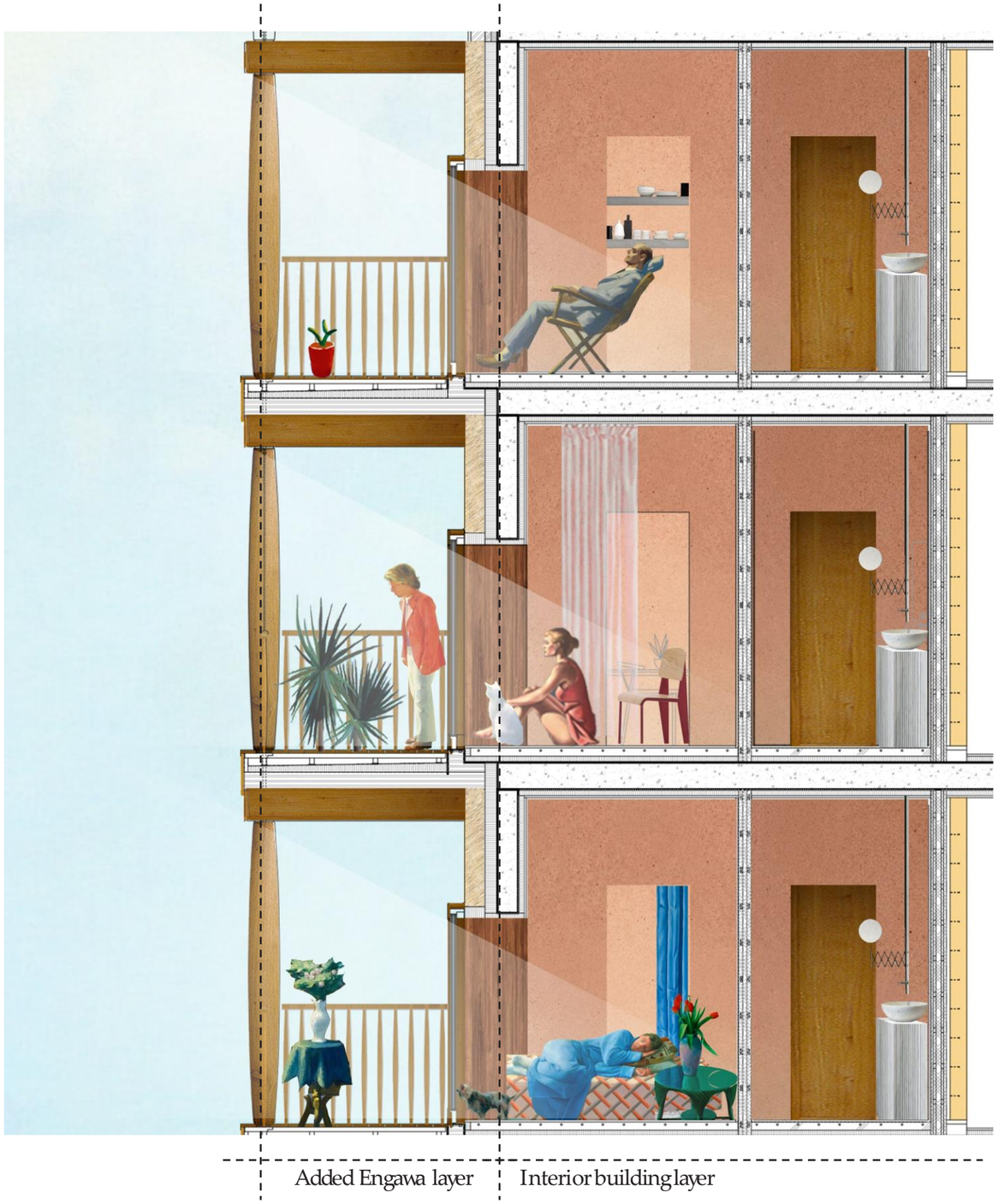
10am
South-east facade receive
direct morning daylight



3pm
North-west facade receive
direct afternoon daylight

Engawa design: shading devices

to reduce direct daylight glare and to add quality semi-outdoor spaces for the dwellers. to provide heated air for dwelling, reducing on the reliance on public heating source.



b. Engawa design: shading devices

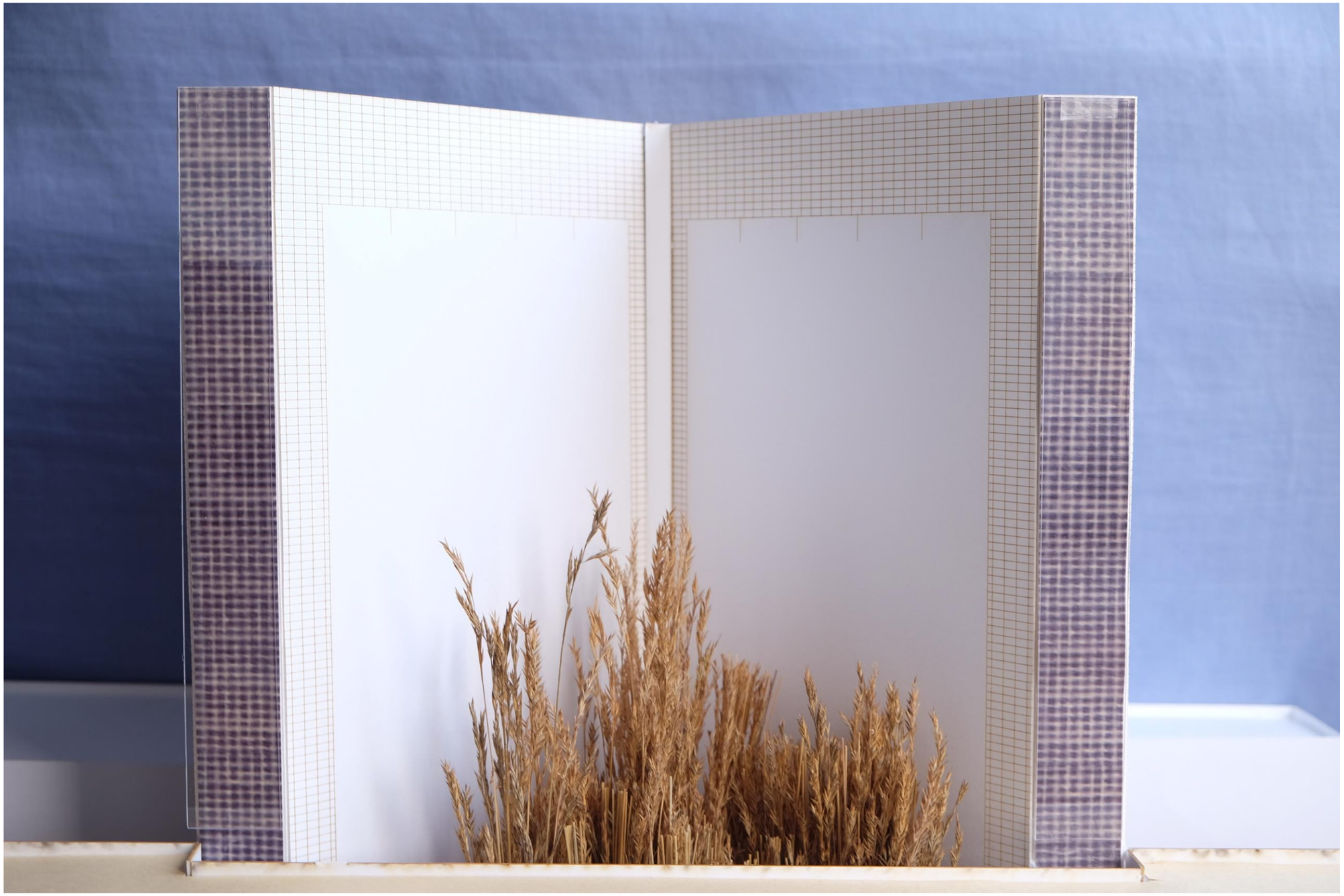
to reduce direct daylight glare and to add quality semi-outdoor spaces for the dwellers.

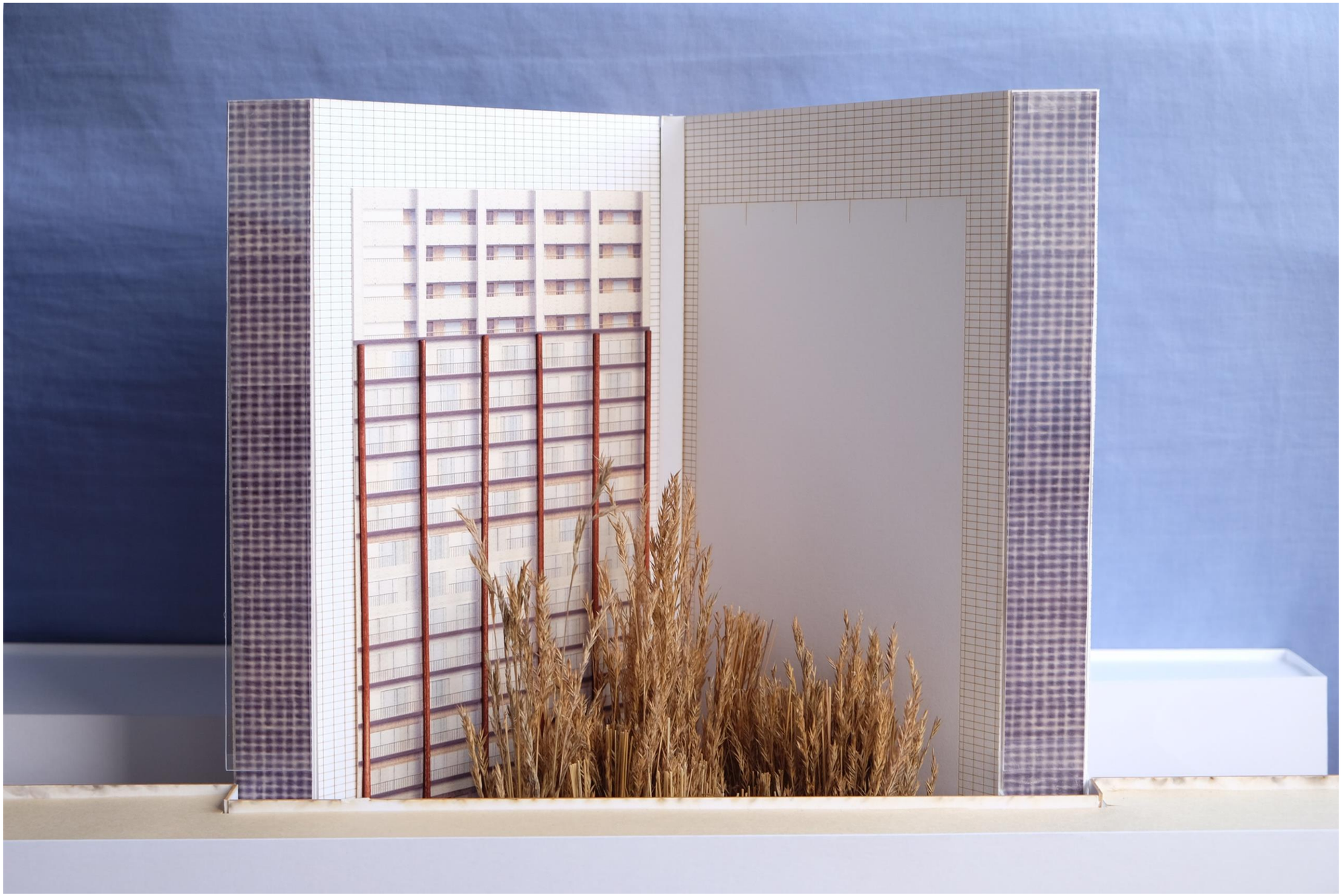
b. Engawa design: shading devices

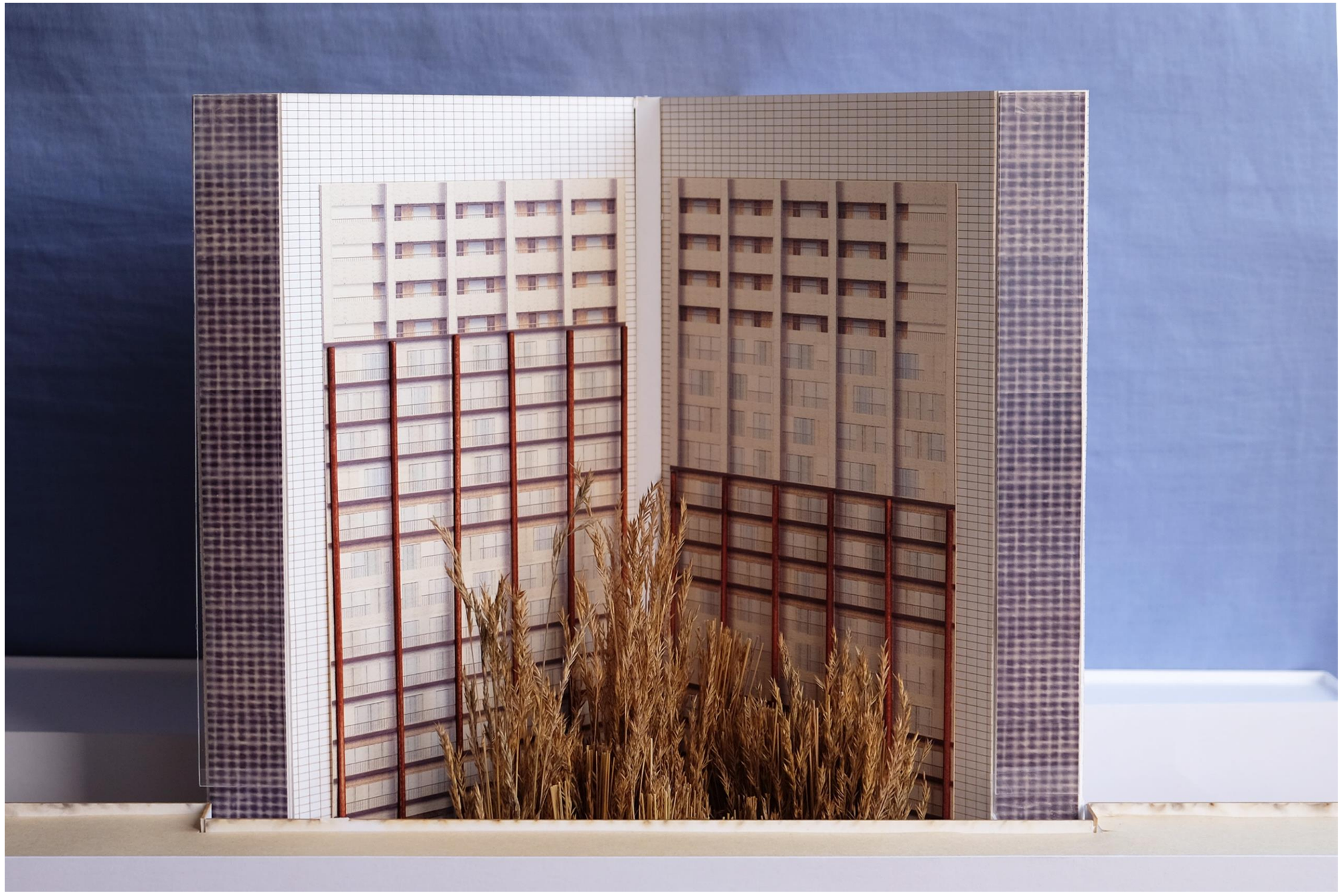
to reduce direct daylight glare and to add quality semi-outdoor spaces for the dwellers.

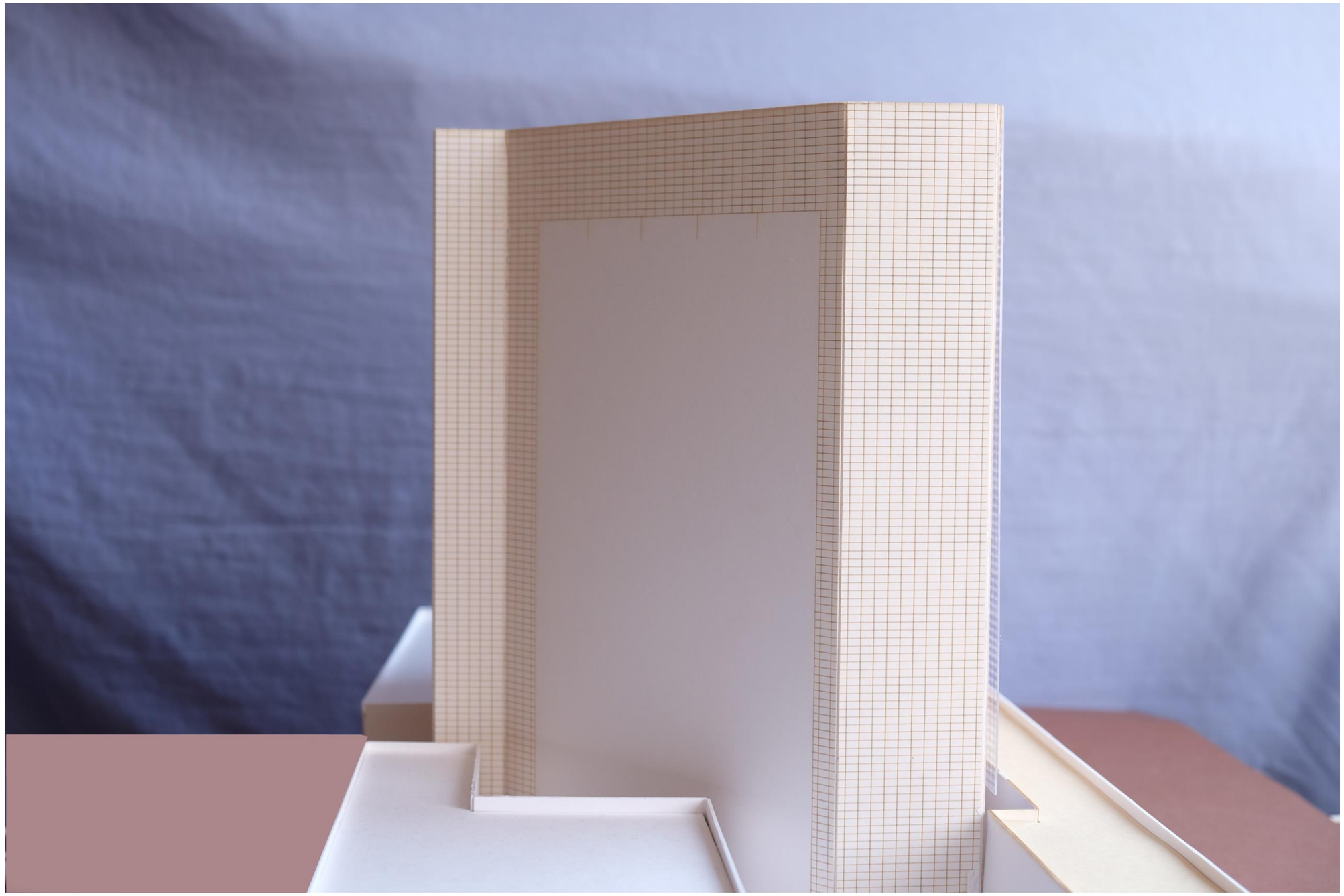
b. Engawa design: shading devices

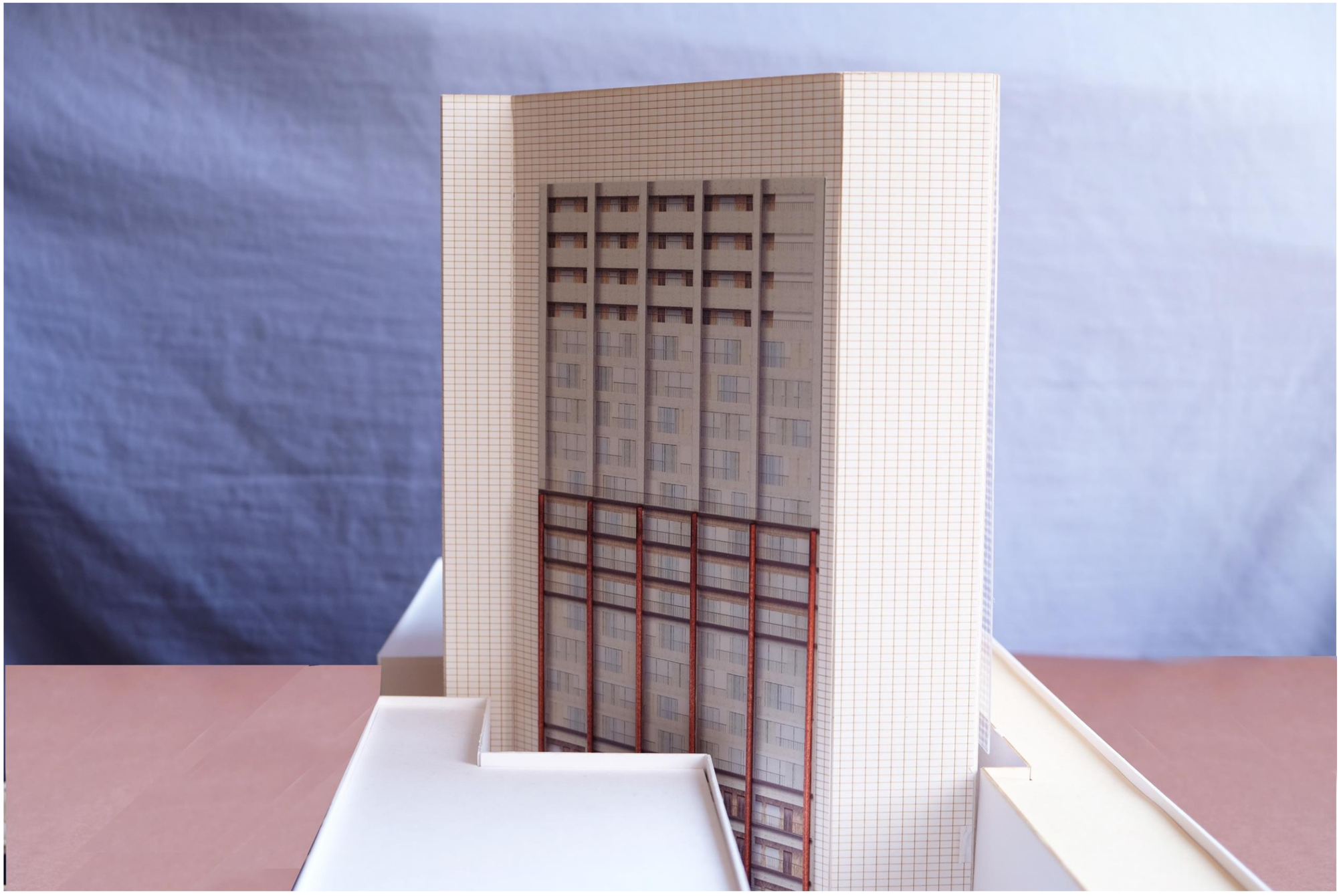
to reduce direct daylight glare and to add quality semi-outdoor spaces for the dwellers. detail drawings scale 1:40

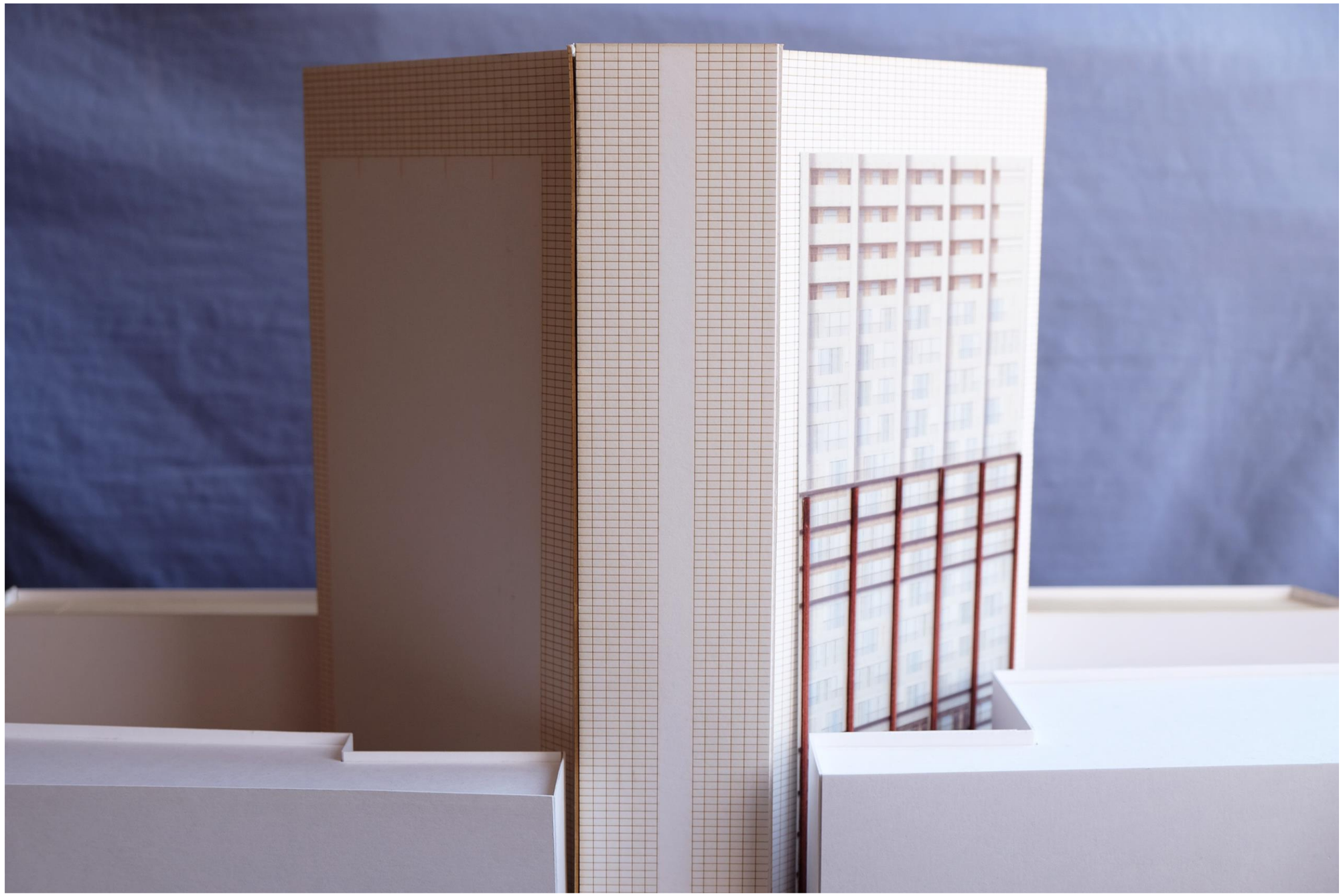


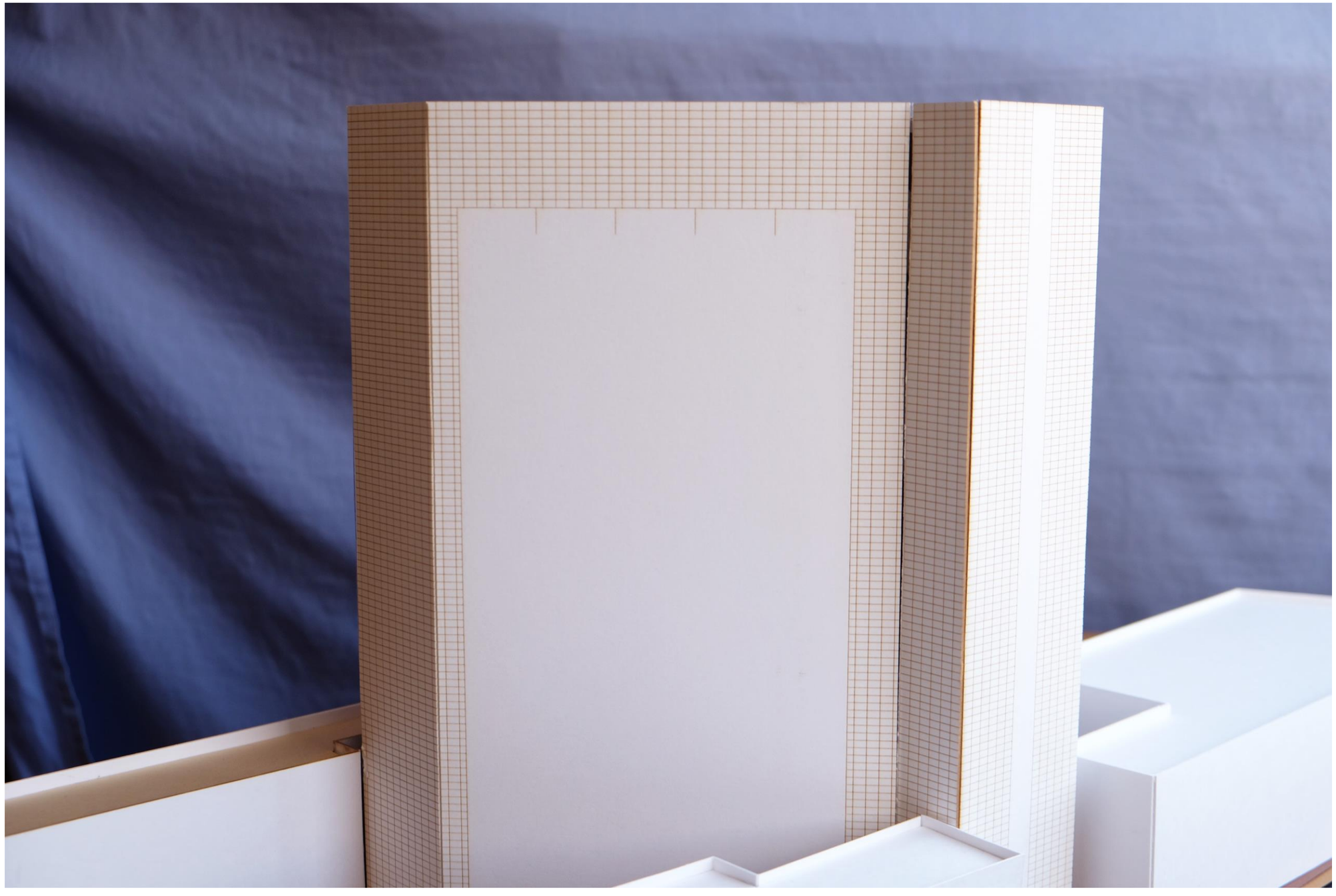


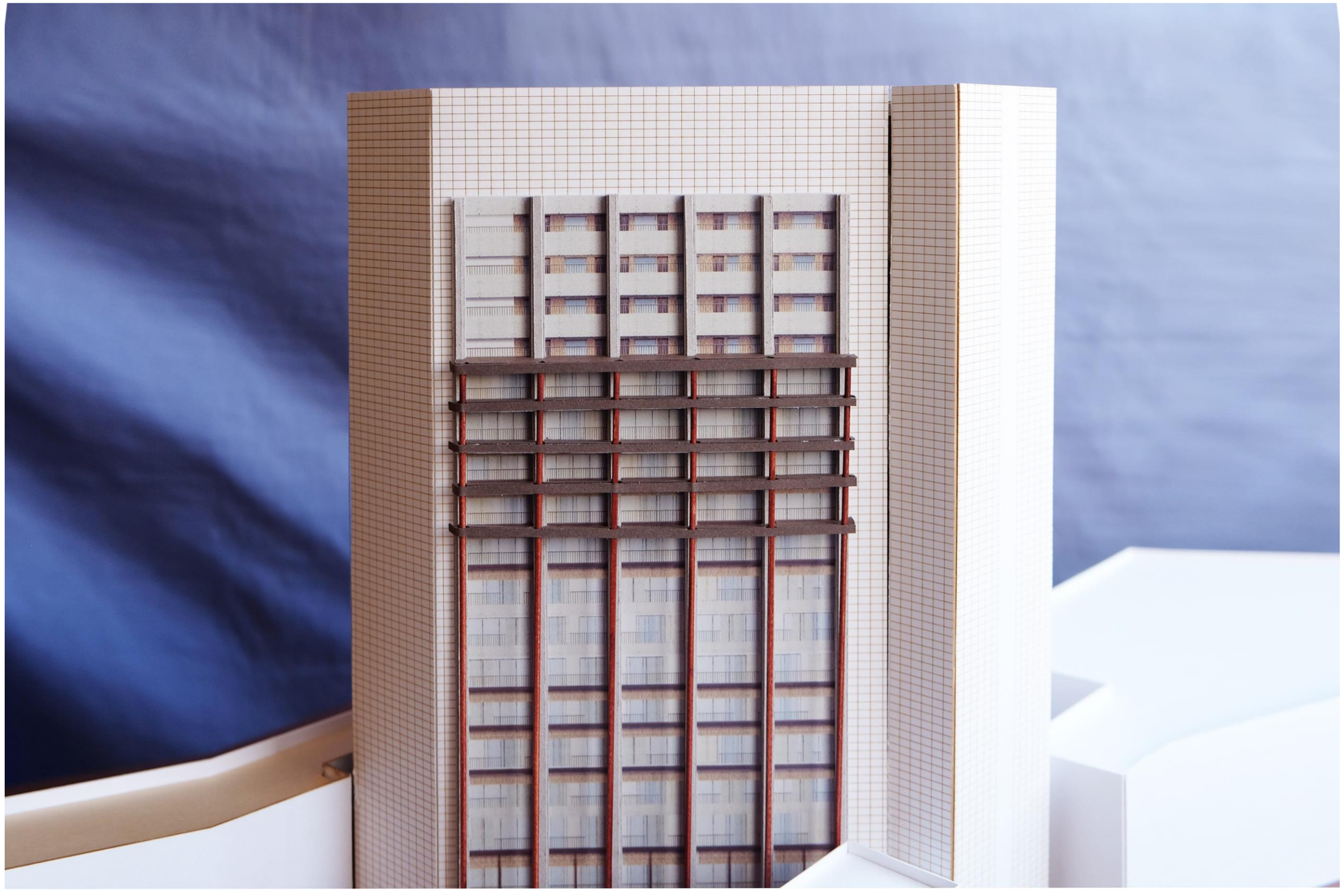


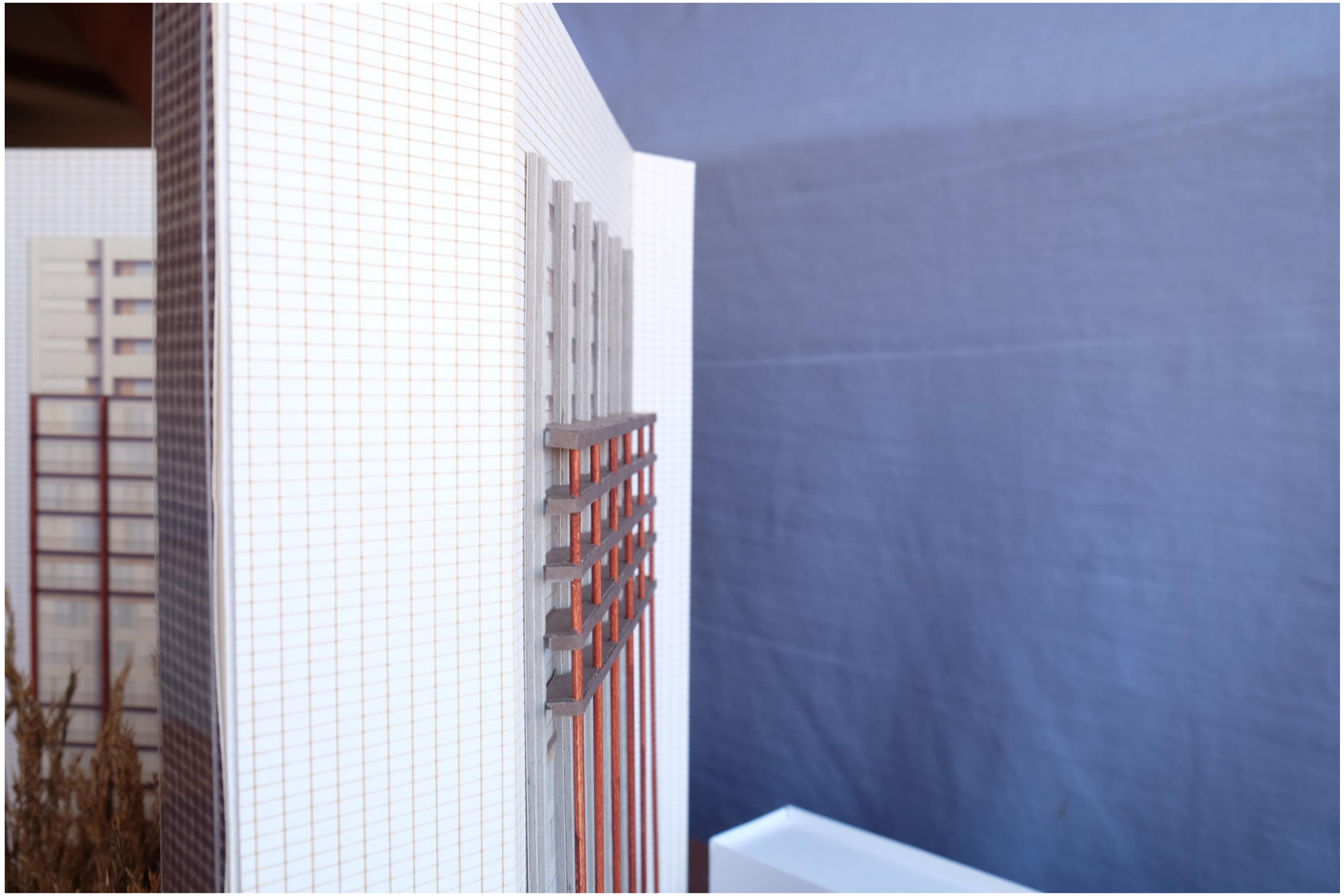


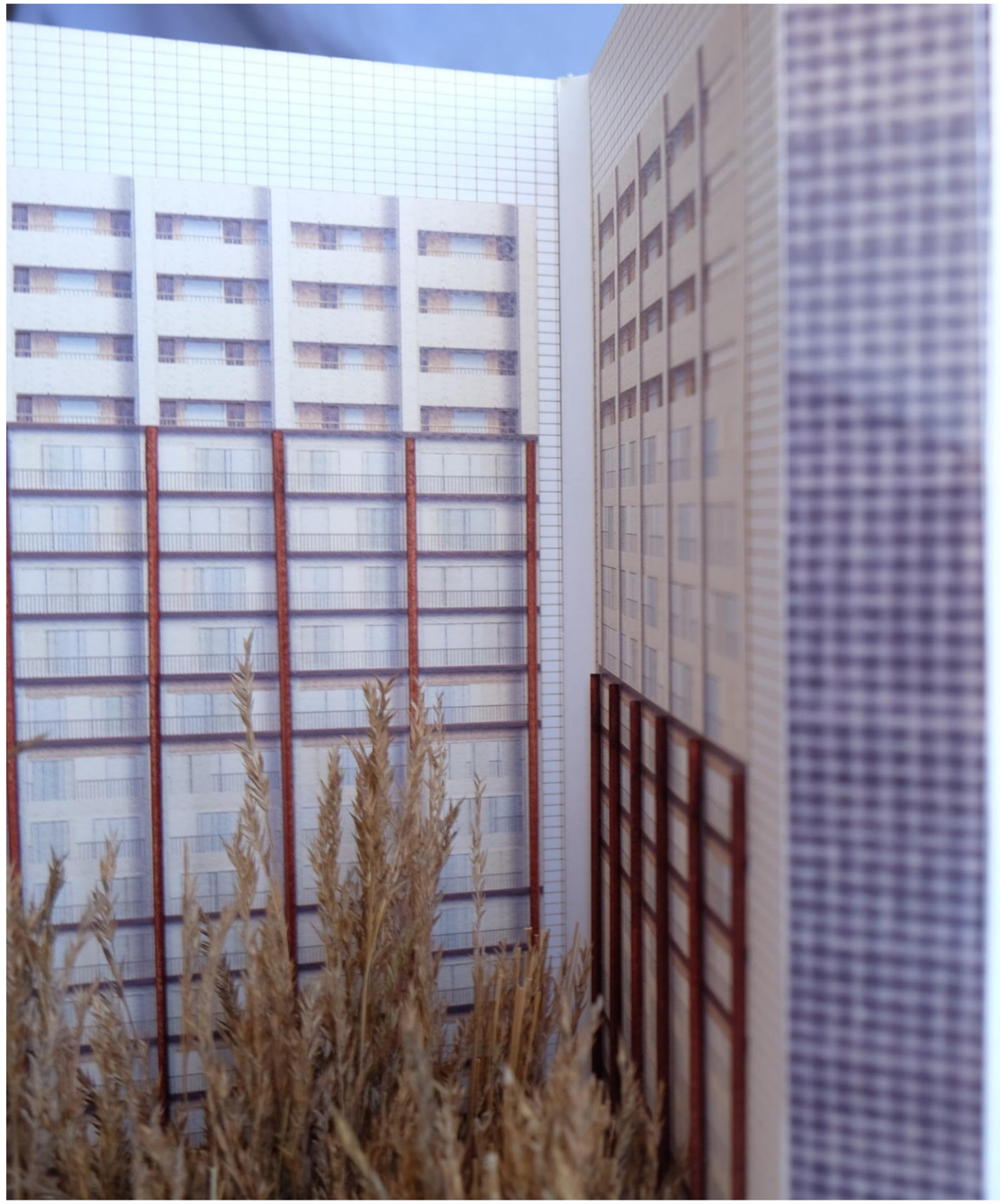


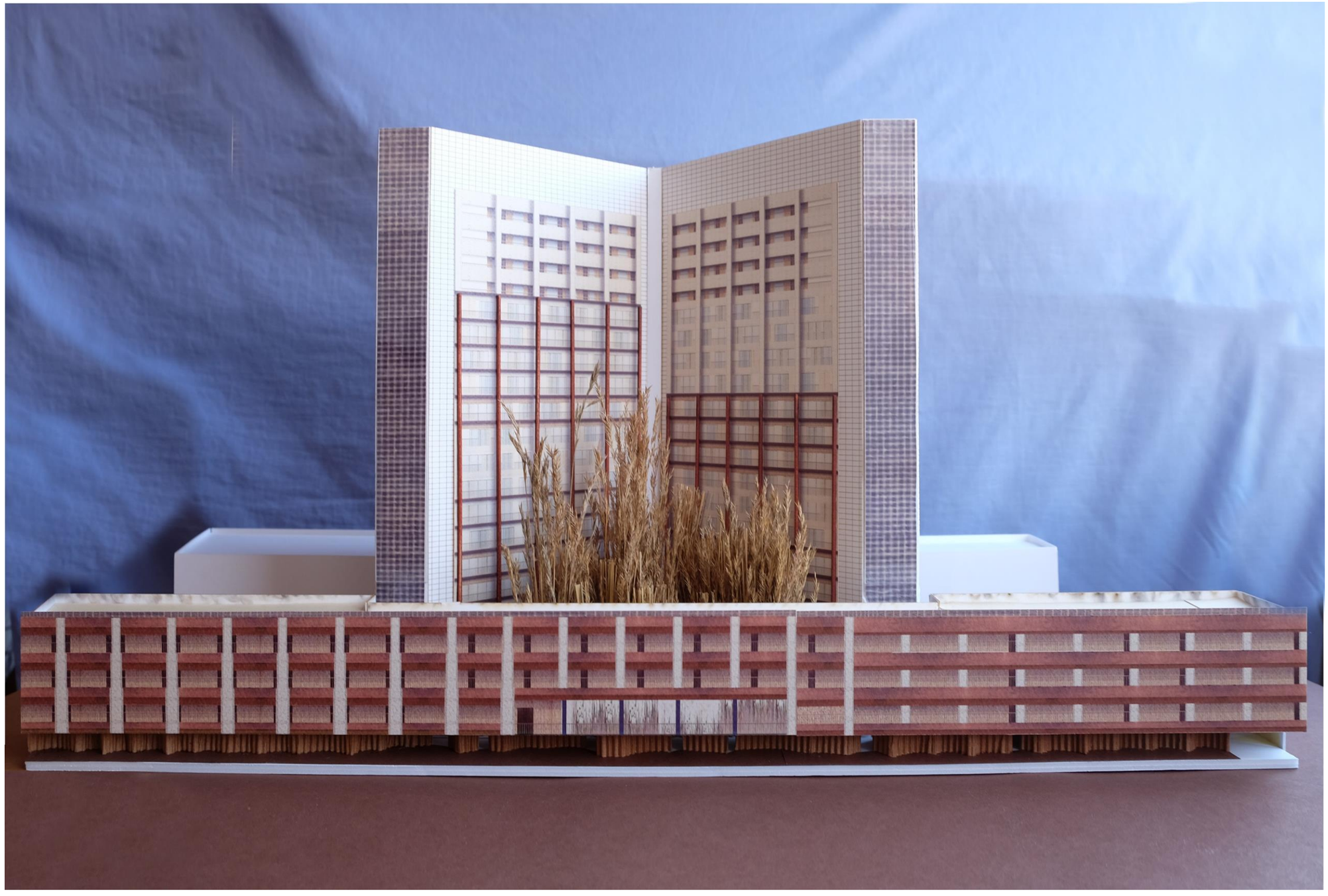




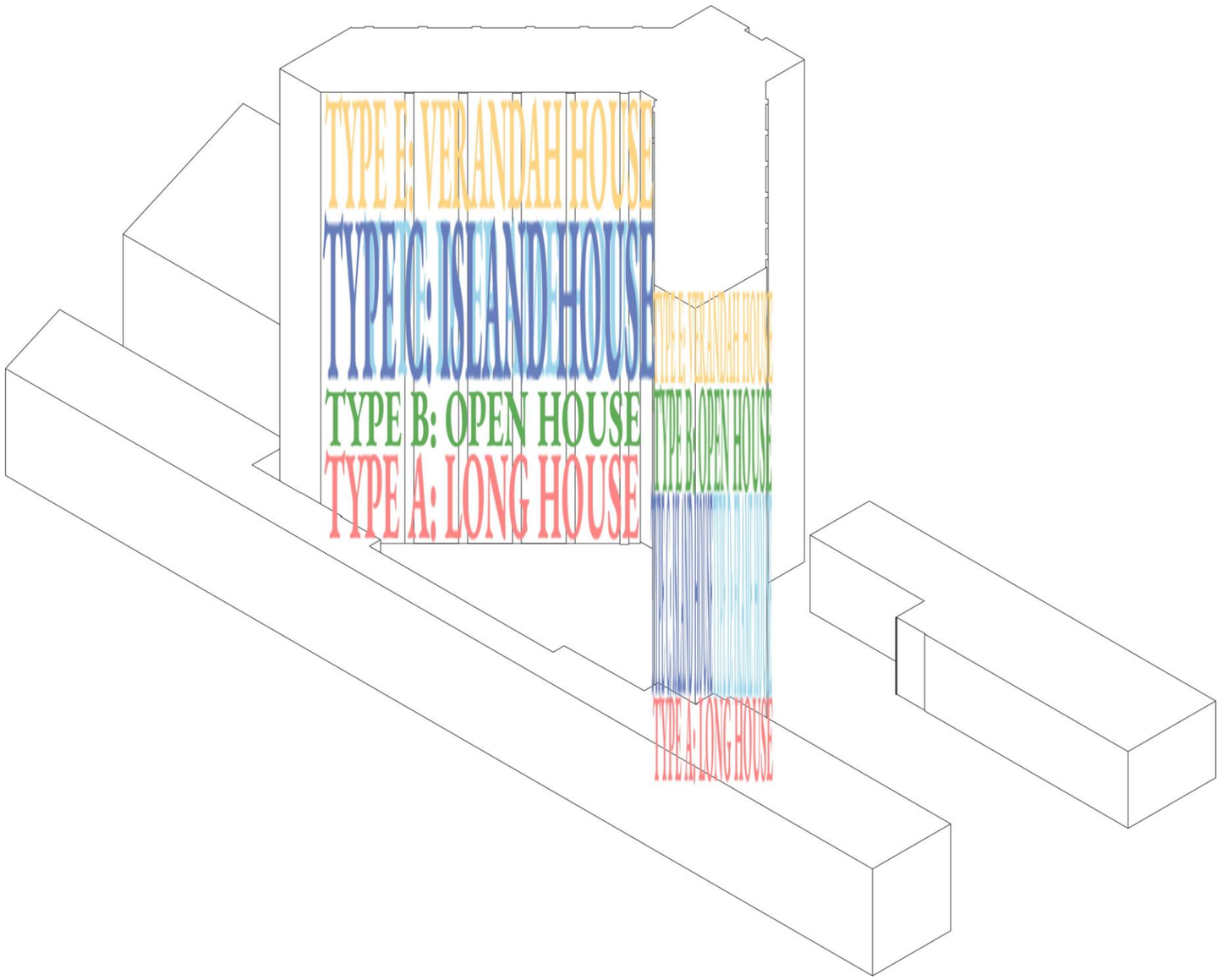








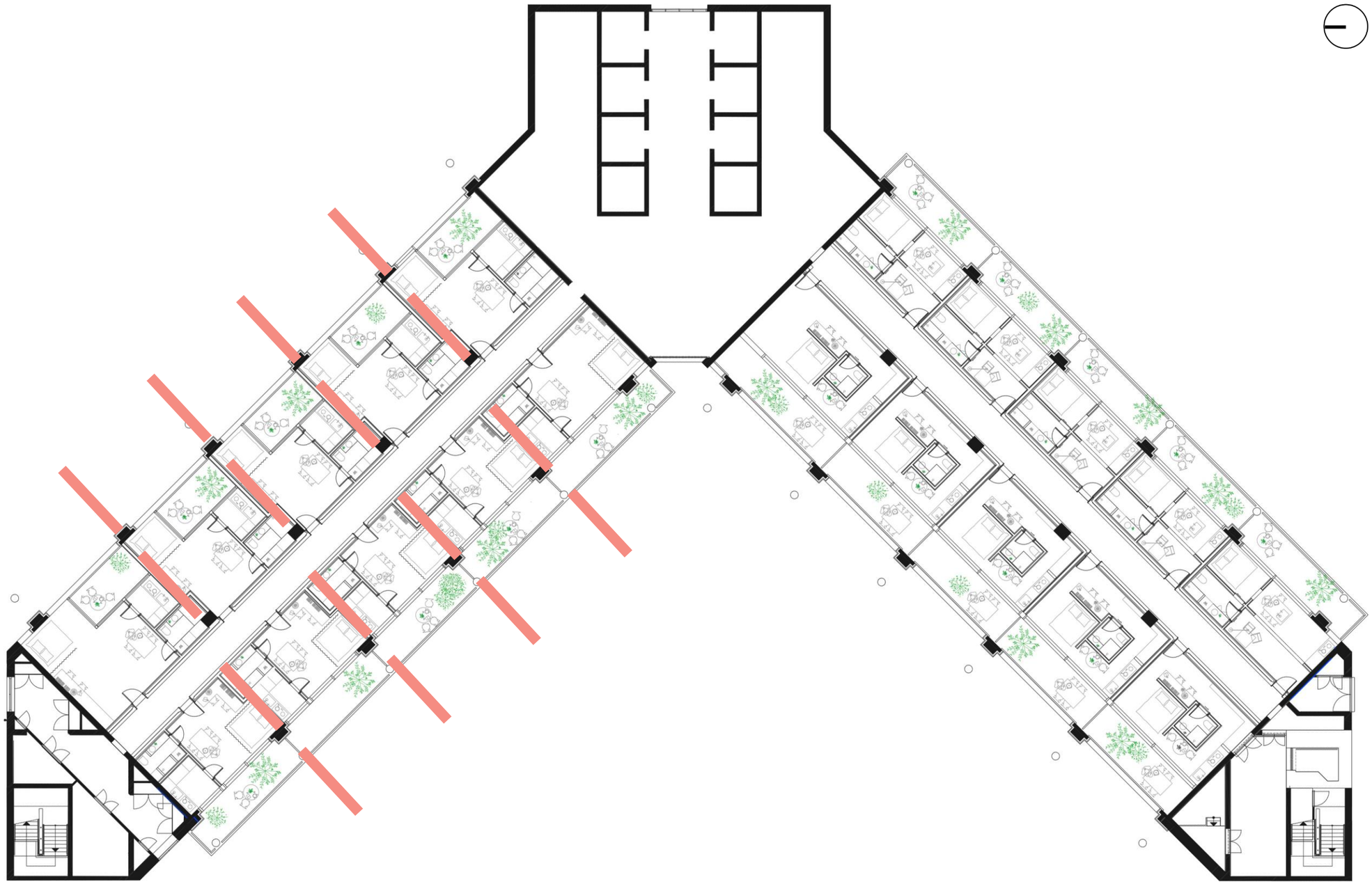
To accentuate the quality of living close to nature, which is raw and intimate, the spatial configuration is designed in **small footprint**, making the house **intimate, warm & affordable** for starters, usually inhabited by one or two.



Tower Schematic Diagram: Small & Diverse Typology
in clusters.

Typical Floor Plan A. Level 2.

Unit division in-line to grids. Scale 1:250

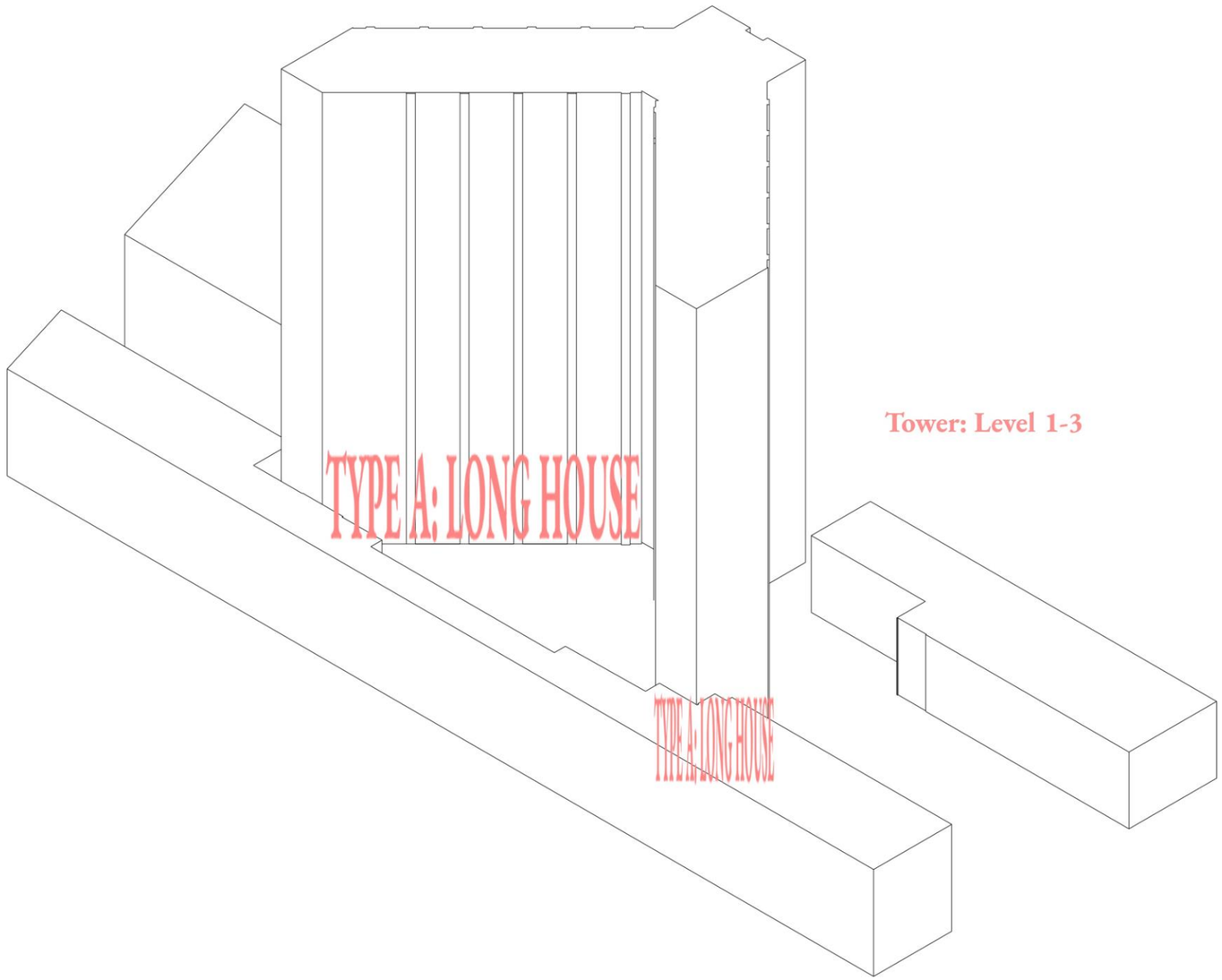


Typical Floor Plan B. Level 3

Unit division staggered off from grids. Scale 1:250

Typical Floor Plan C. Level 15

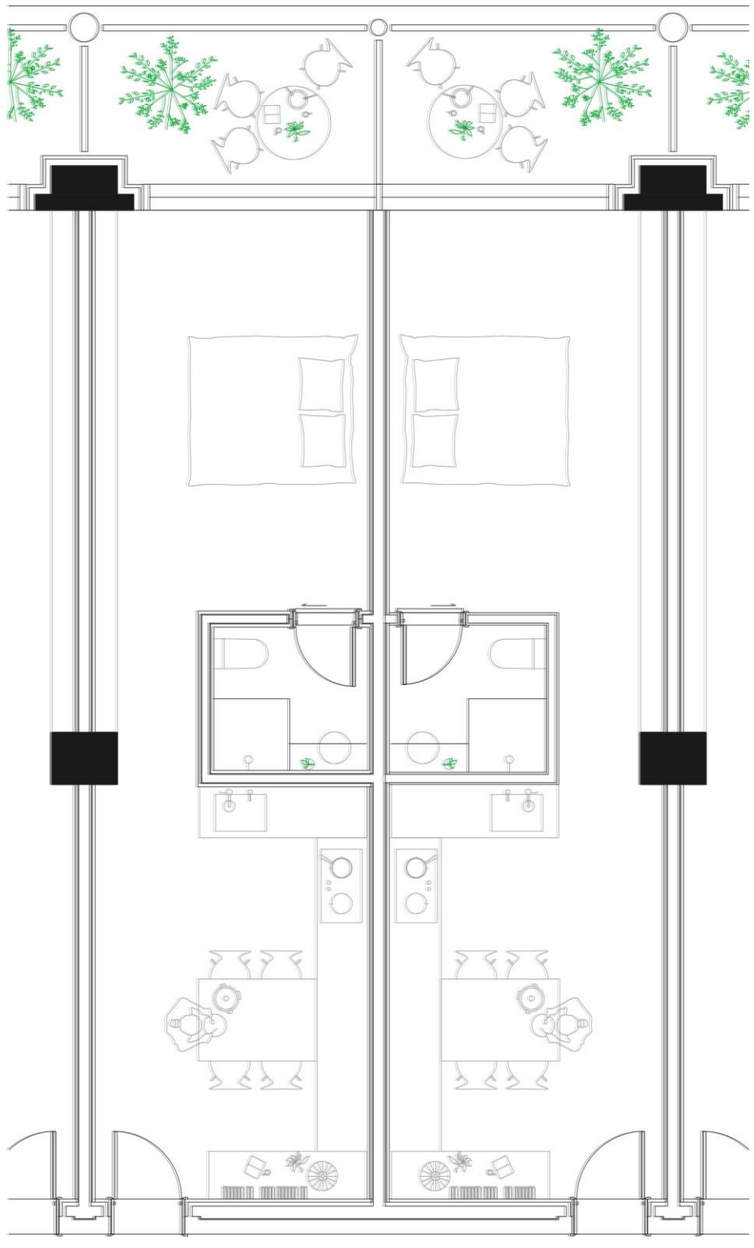
Unit division independent of grid. Scale 1:250



Type A: Long house (41.3m2)

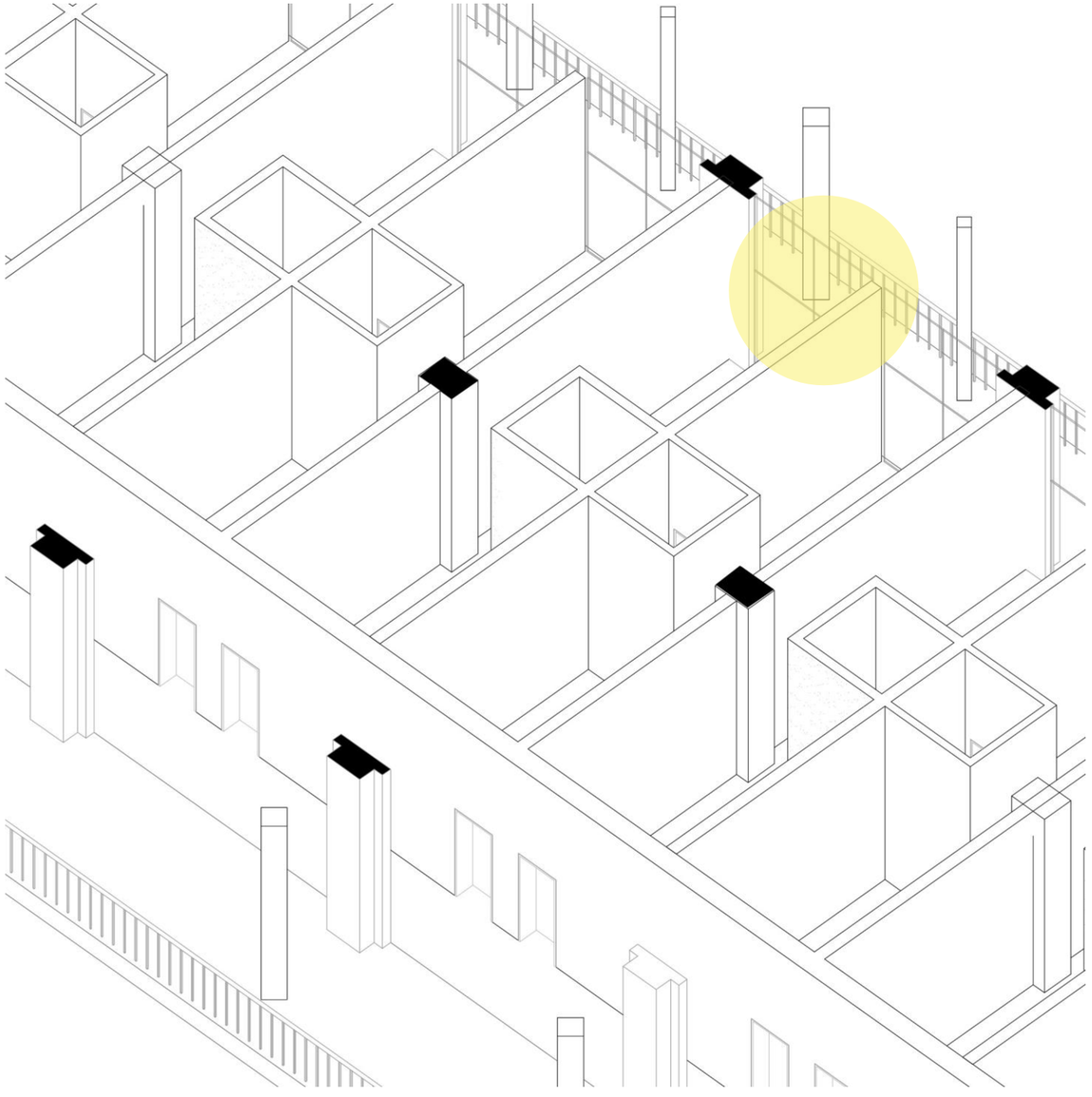
Type A: Long house (41.3m2)

The house has a long linear progression, implying depth towards the hortus conclusus: the private balcony.



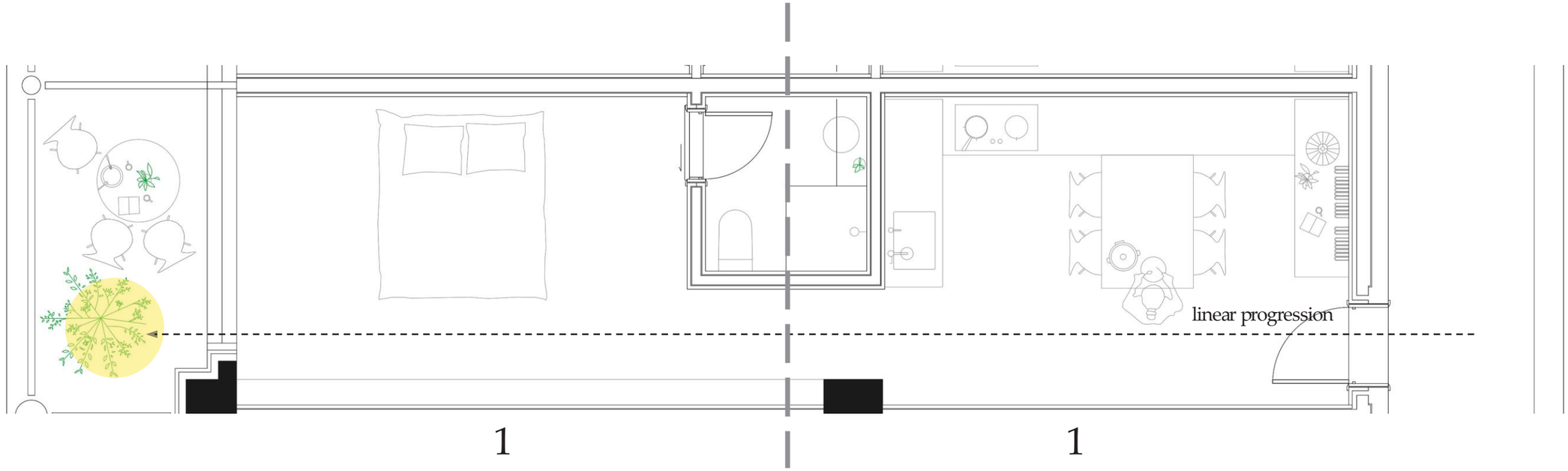
Type A: Long house (41.3m2)

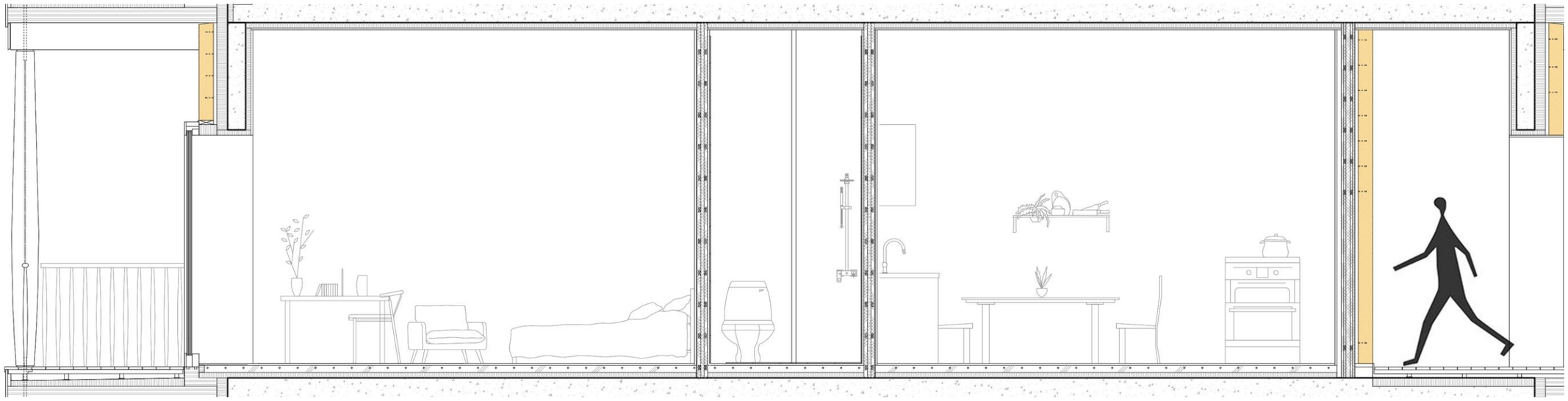
Configuration: Long narrow house with washroom as central division element to separate communal & private zone. Long linear progression imply depth to the more private bedroom.
Facade: Enjoys the contrast of both the front (more enclosed) & back (more transparent) facade.



Type A: Long house

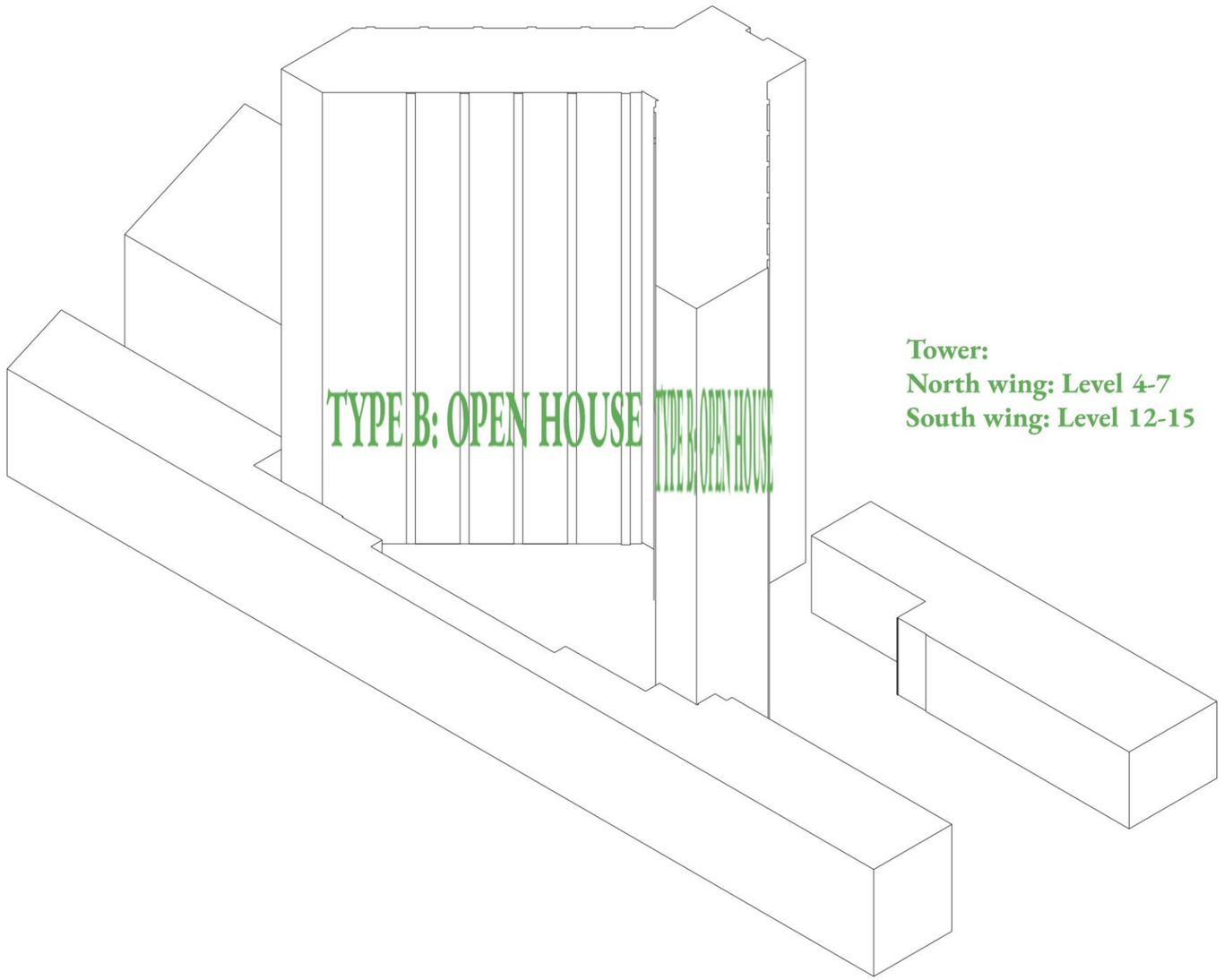
Central focal point towards the private balcony.





Type A: Long house

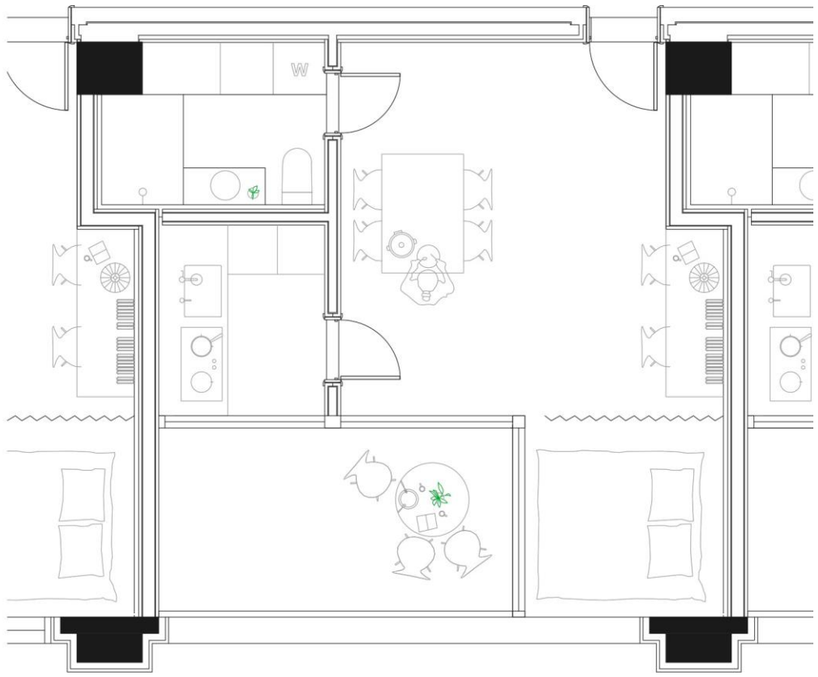
Characteristics: No clear demarcation of space, one room which flows from front to back.
Users: Enjoys balanced distinction of work (LDK space) and resting area, heightened with the provision of a private balcony open to the nature.



Type B: Open House (47.6m2)

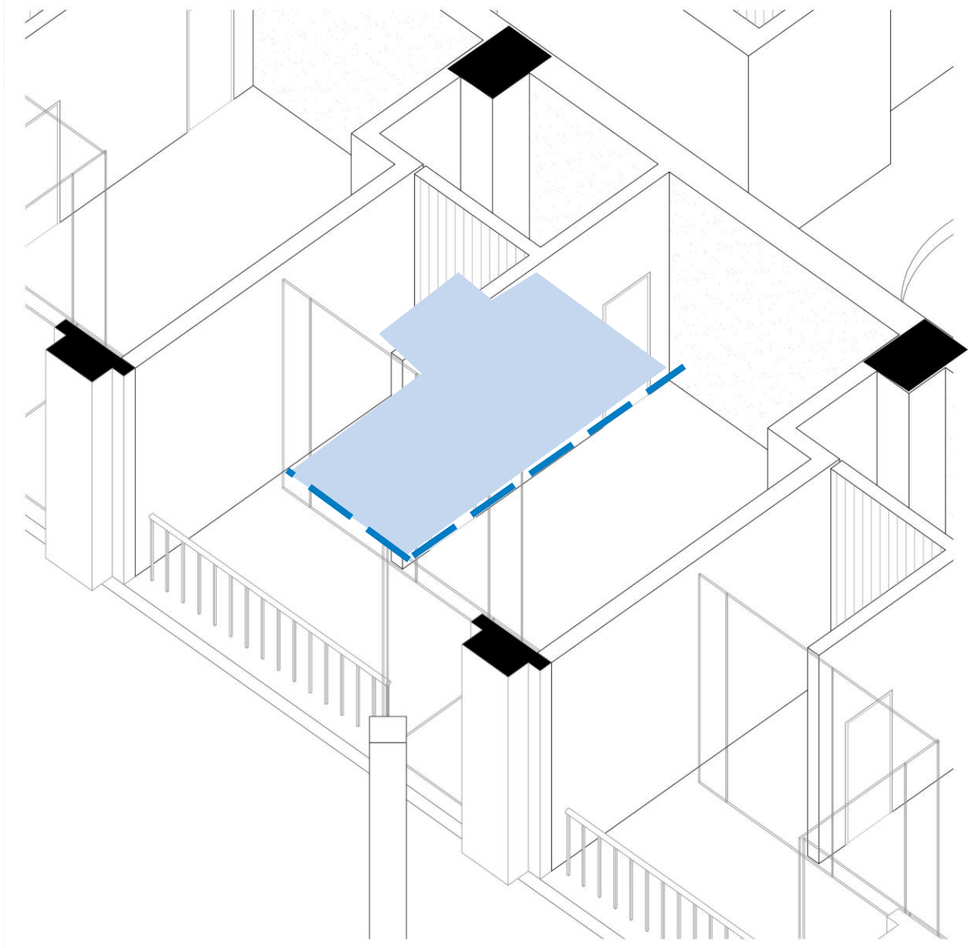
Type B: Open House (47.6m2)

This is a house with layered folding planes, to enrich the spatial layering of the relatively small footprint in open plan, which is usually empty.



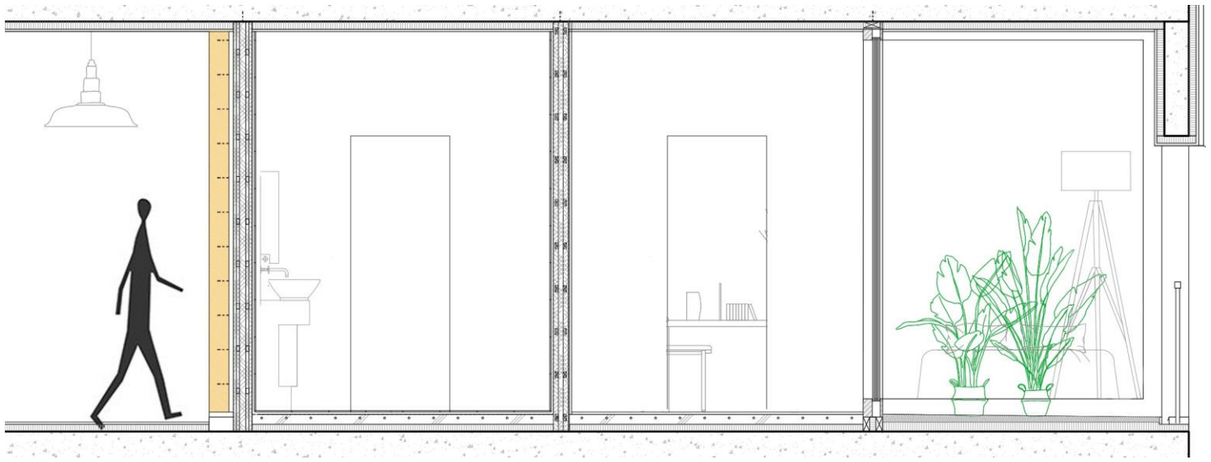
Type B: Open House (47.6m2)

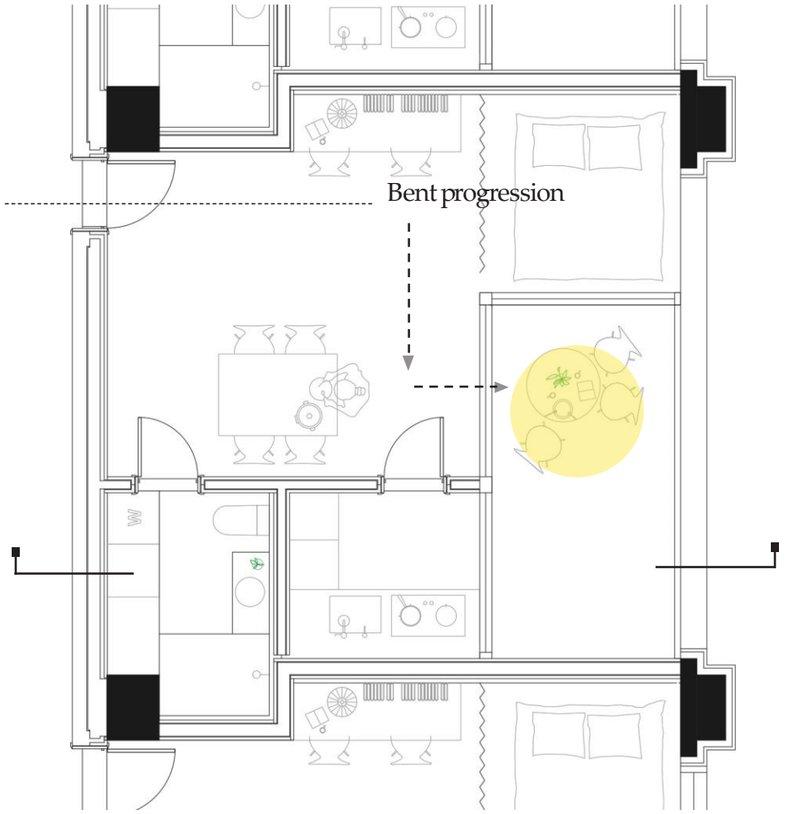
Configuration: Open plan with its perfect square plan being nudged by the parallel zig-zag partition walls which introduced niches in the relatively open plan.
This is to guide the spatial organisation of space in open plan, which can easily fall into disorganisation. Spatial division mainly addressed by furnitures and curtains.
Facade: Front facade facing indoor corridor (dark) & the back facade having high transparency (bright).



Type B: Open House

This is also a house with clear separation of enclosed service and open served space..

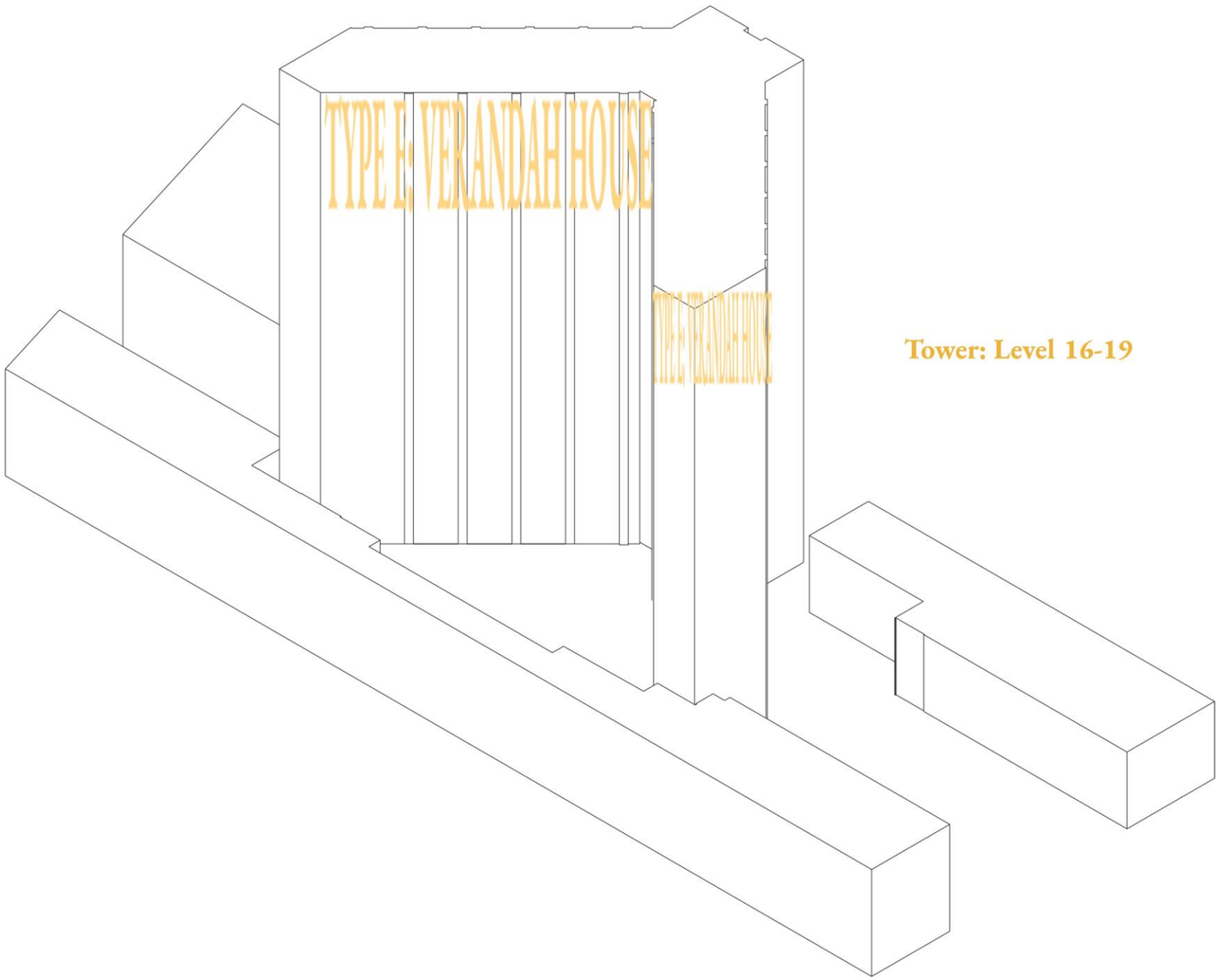




Type B: Open House

Characteristics: layering of spaces, one cannot directly see the full view of the house. Rather, user have to turn around to reach the hearth (garden). This is to enrich the spatial experience of the small open plan.

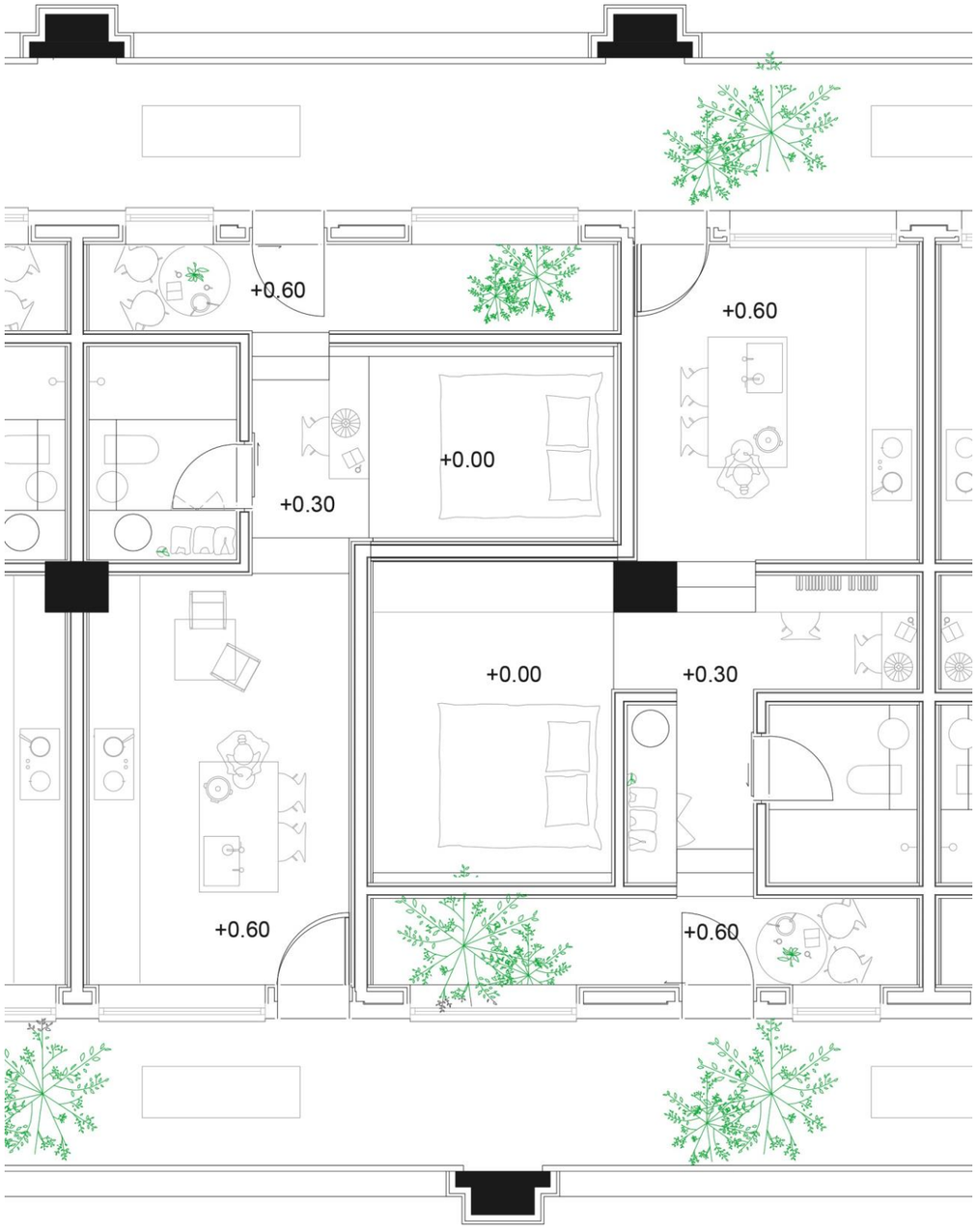
Users: Who prioritise flexible changes in lifestyle. Also, for those prefer to have clear separation of service and served area.



Type E: Verandah House (51.7m2)

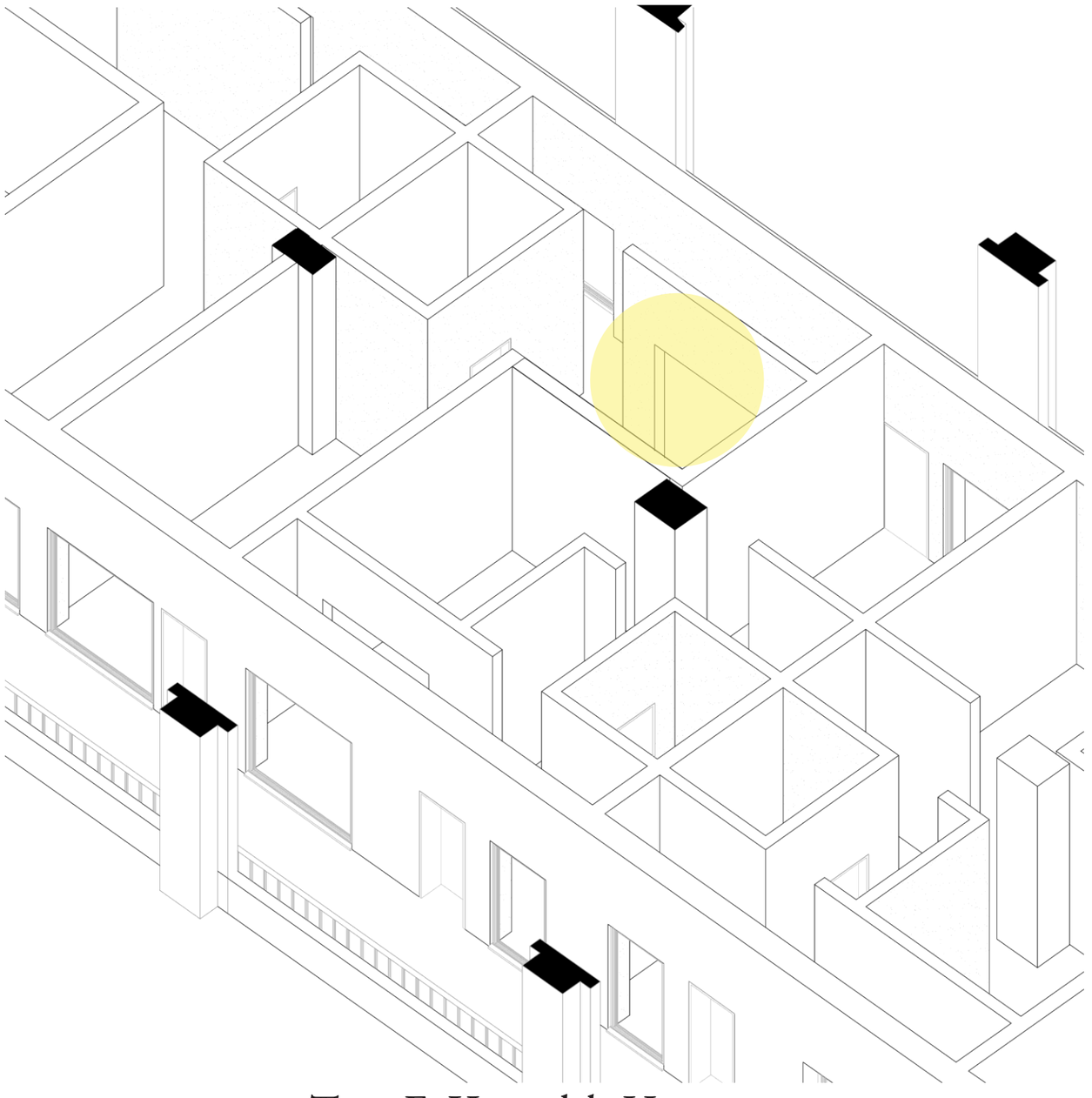
Type E: Verandah House (51.7m2)

A house playing with hide-and-seek, constantly engaging with its surrounding neighbours but also have enough privacy against others.



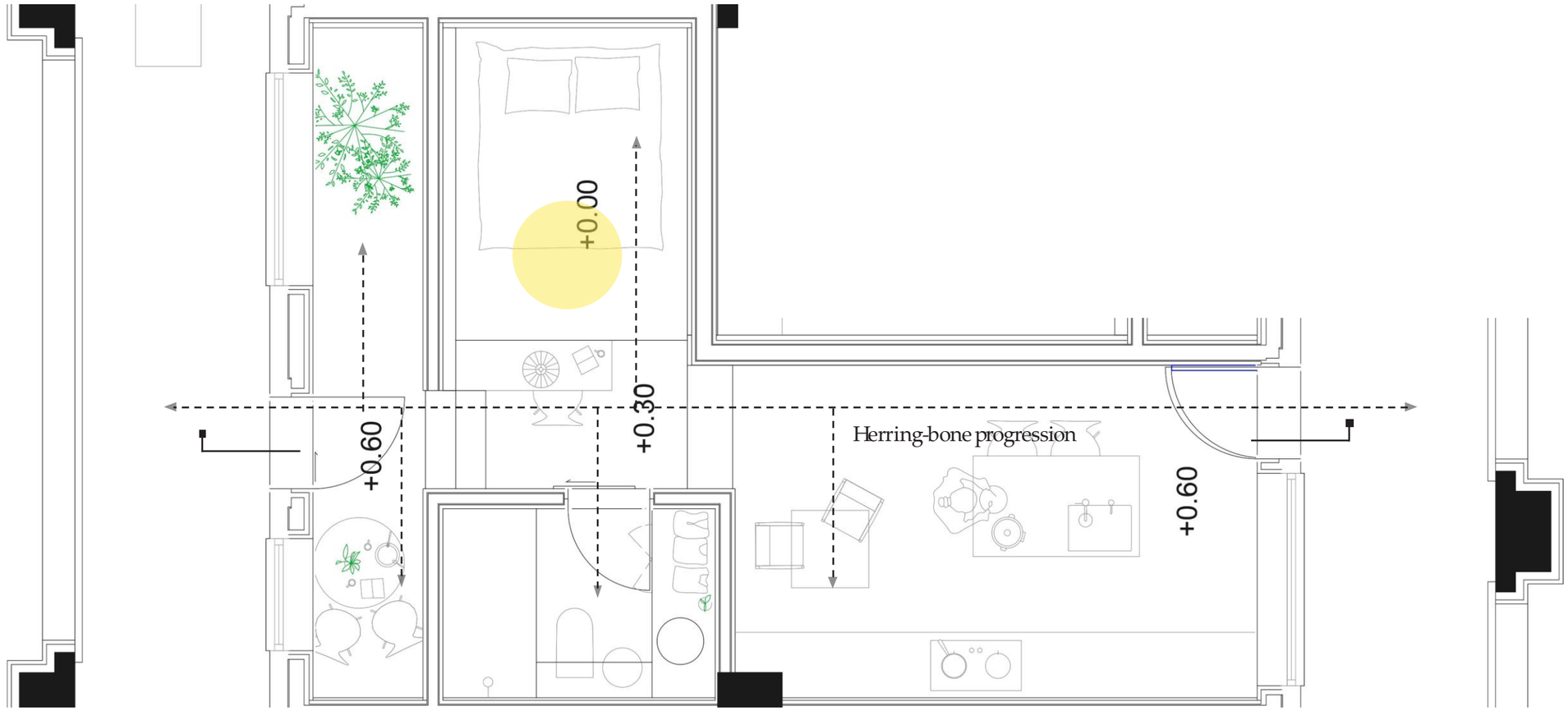
Type E: Verandah House (51.7m2)

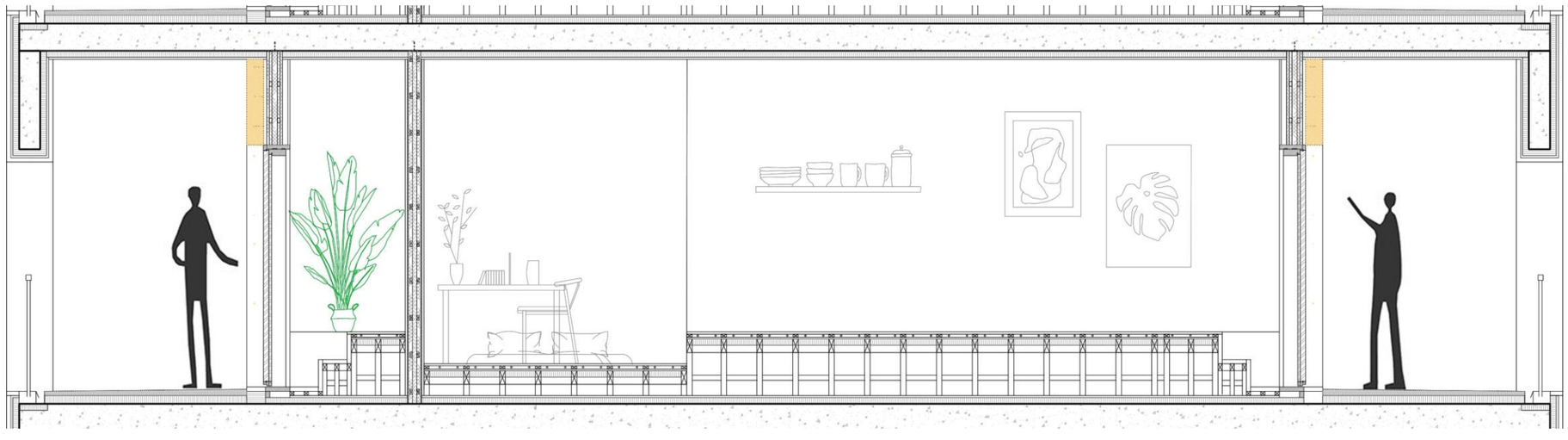
Configuration: L-shape interlocking units with floor plates in alternating heights. Two access point to give users freedom to enter from either sides of the house.
Facade: Both front and back carved in from the existing building boundary, providing protection against the rowdy weather experienced at the top section of the tower.



Type E: Verandah House

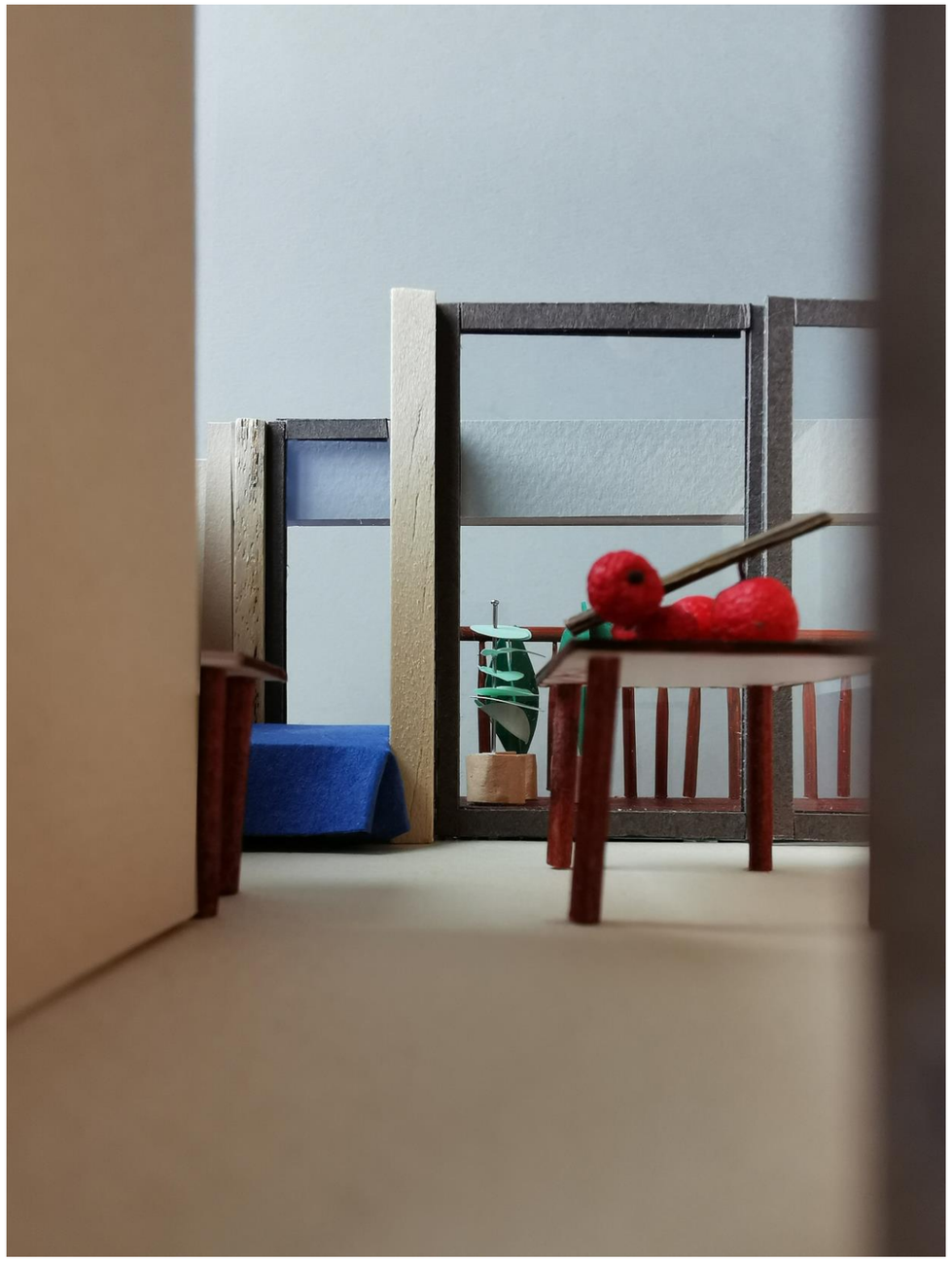
Inner most sanctum of the house located at the middle section, which is furthest away from the facade. The elevated floor plates also provide extra storage space.

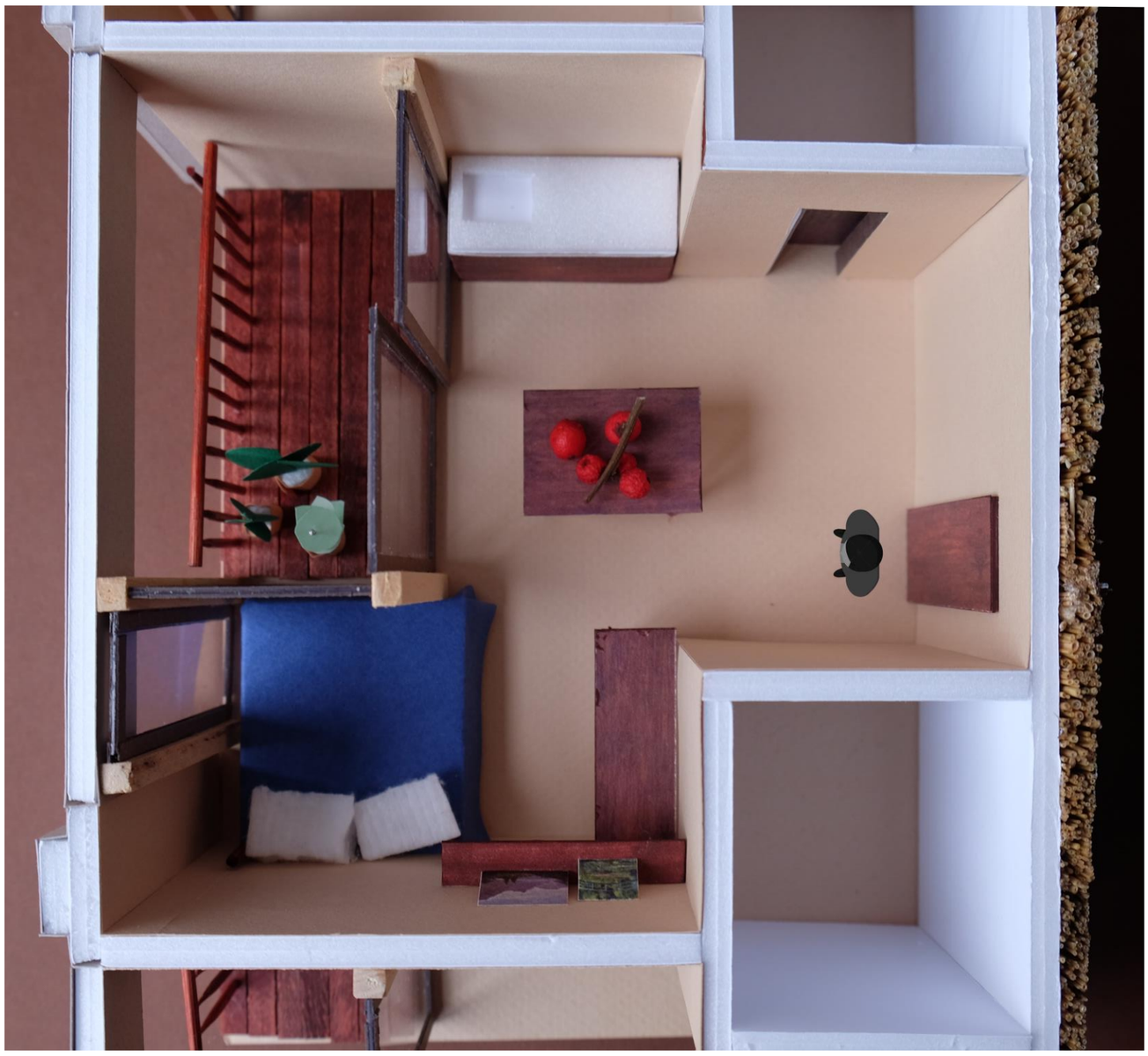


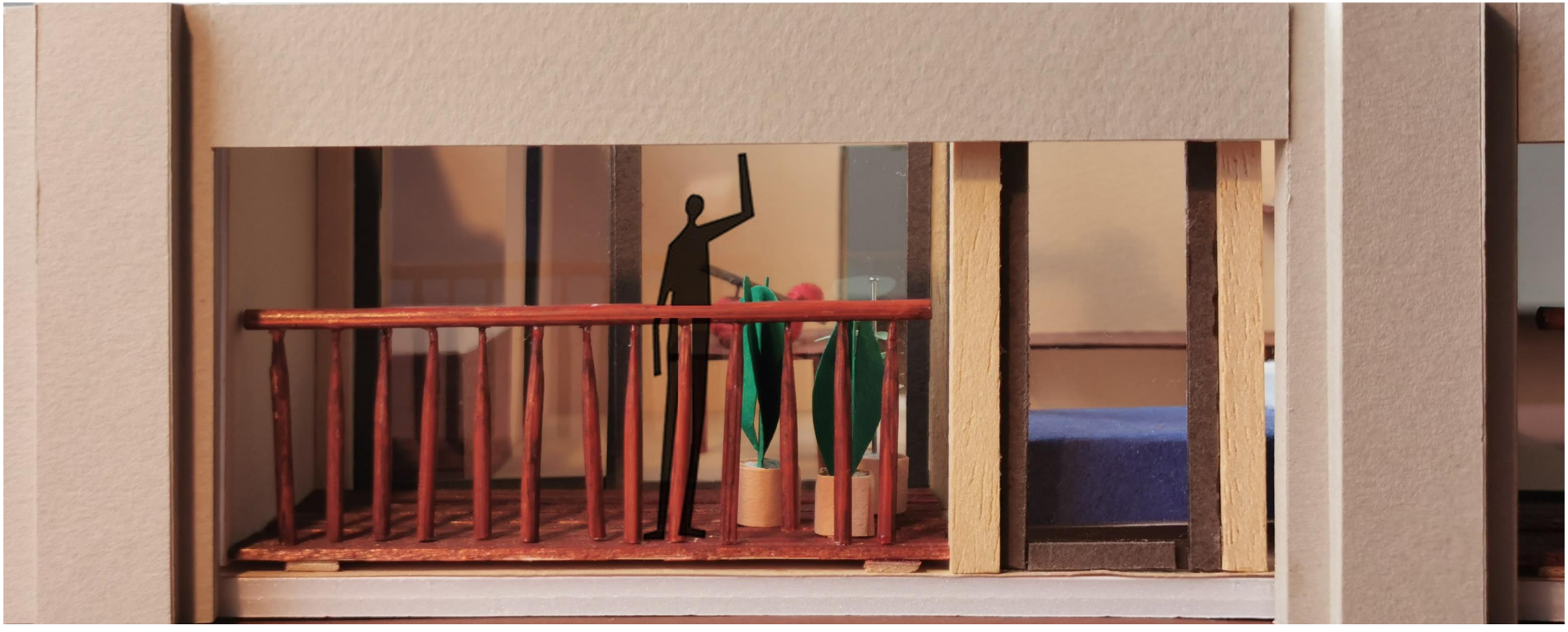


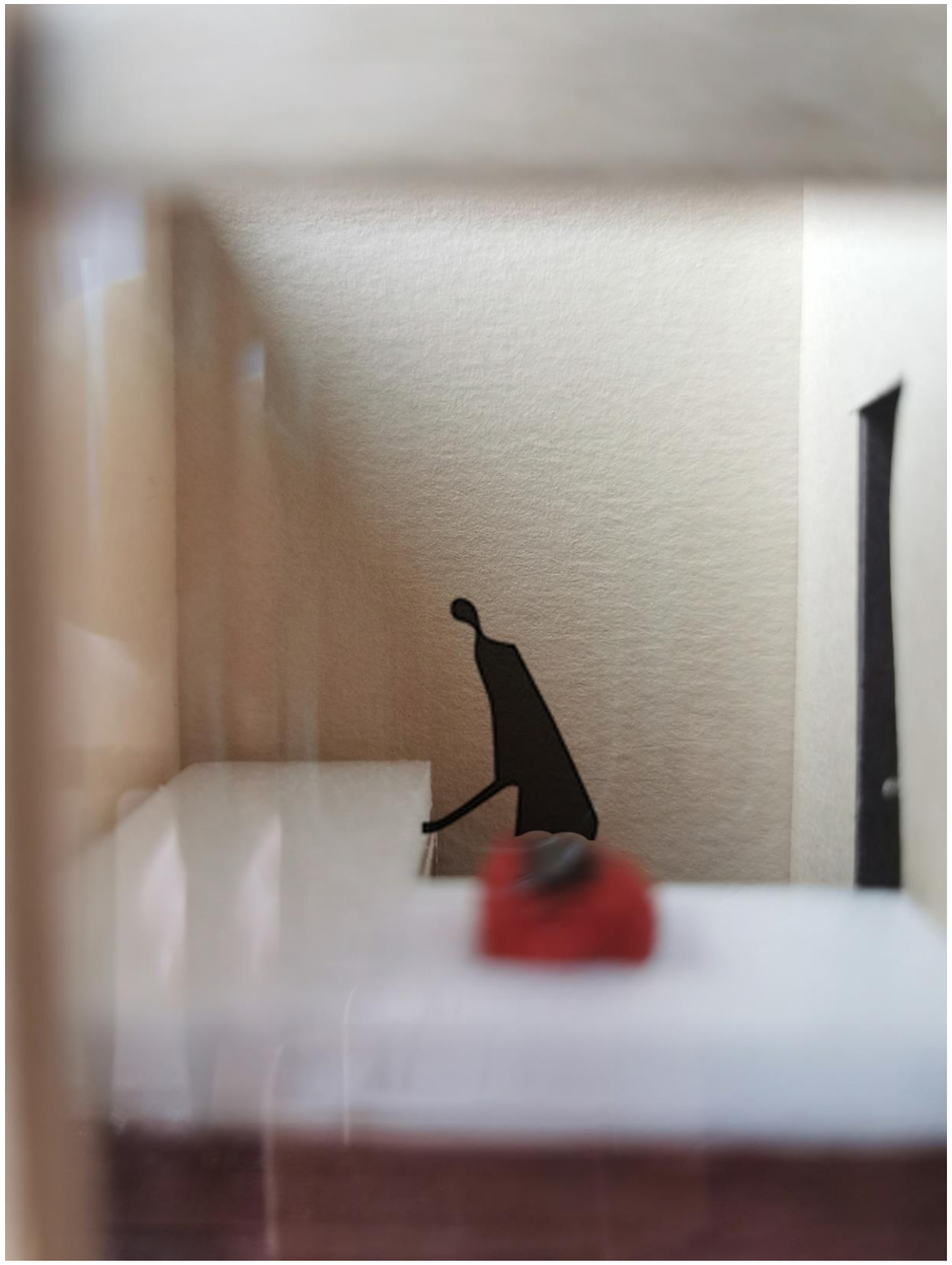
Type E: Verandah House

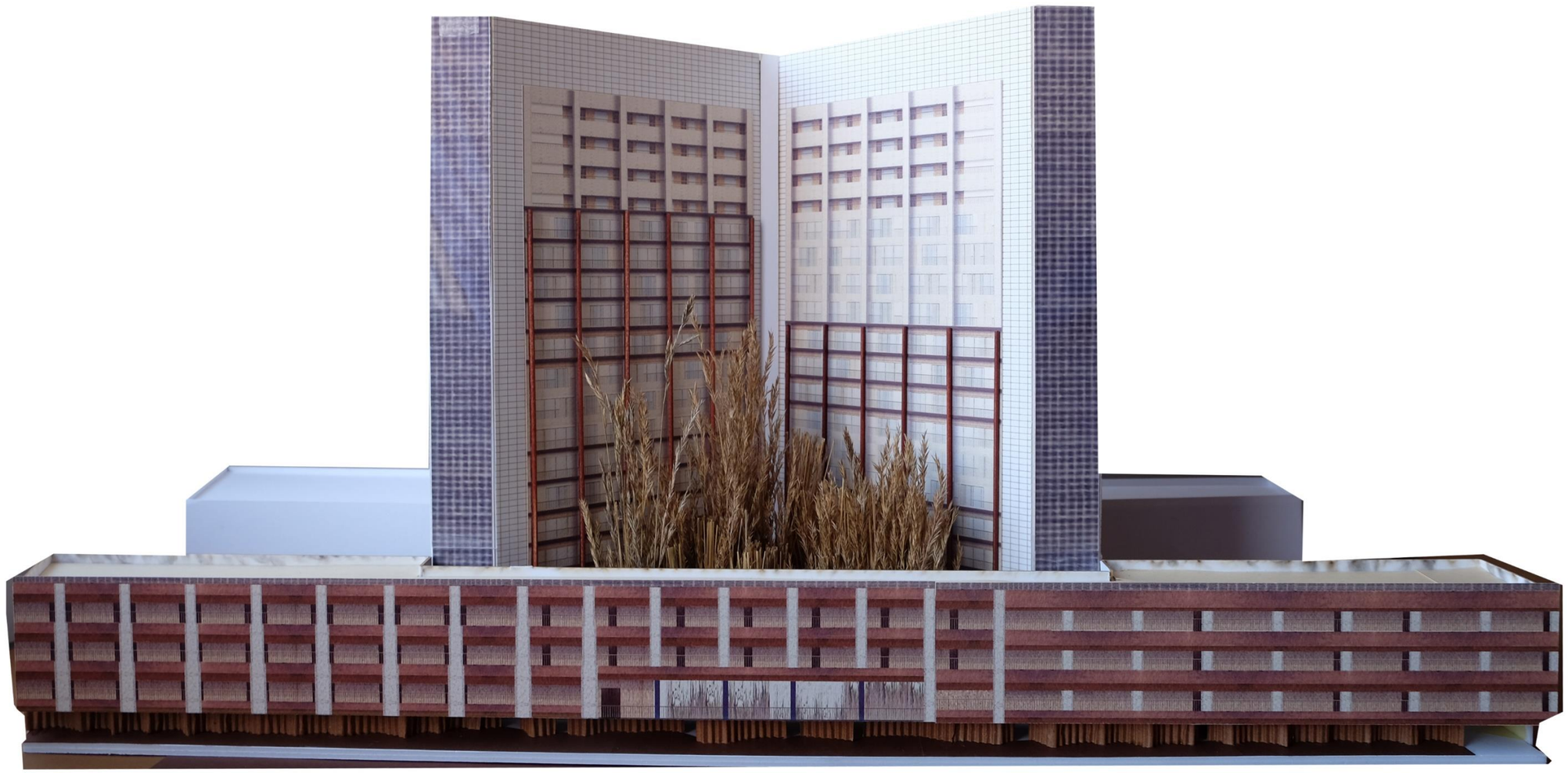
Characteristics: House with different heights in floor plates which gives a sense of verandah overlooking the corridor.
The alternating floor heights hinting the use of space (higher vantage piont to glance towards he passerby and lower bunker area for sleeping).
Users: Who prefers active connections to its surrounding yet securing own privacy.











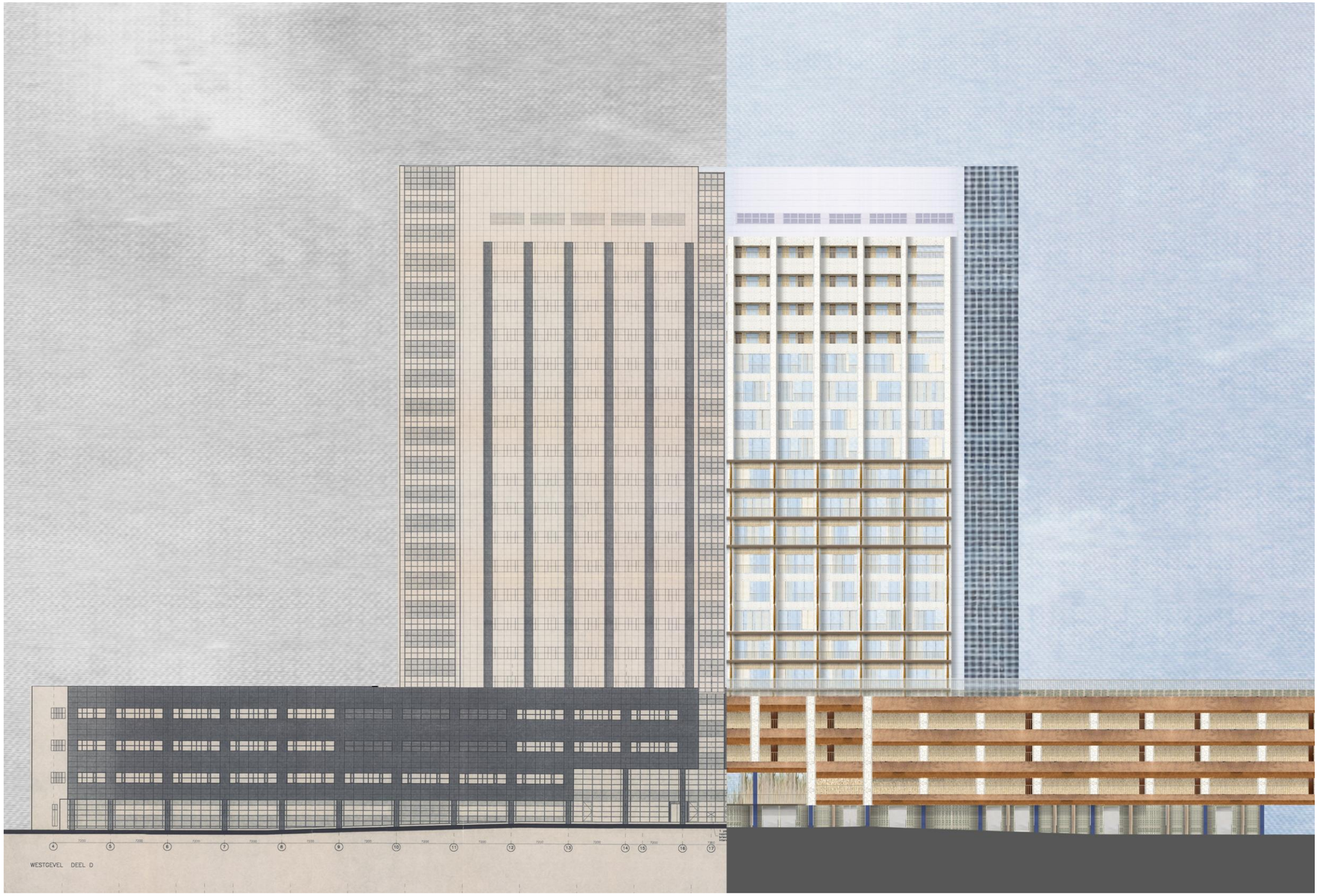
Urban Change

Before

After

Before

After



Conclusion: Before & After

We respect the original modernist structural framework, which is still functionally fit and has a distinct historic architecture attribute. We improvise what is available to create economically viable and sustainable solutions. To quote from le Duc, to reinstate the ‘former beauty’ of an idealised style by filling in the missing elements to perfect a completed image of a ‘historic situation that perhaps never had existed’, in our case through material: reeds.

The best timber is from the forest behind.

Japanese Proverbs