

Explore Lab - Delft University of Technology - P4

Architecture — on the move

by Marta Raimundo de Carvalho

HOW TO DESIGN FOR NOMADS
&
AURA homes

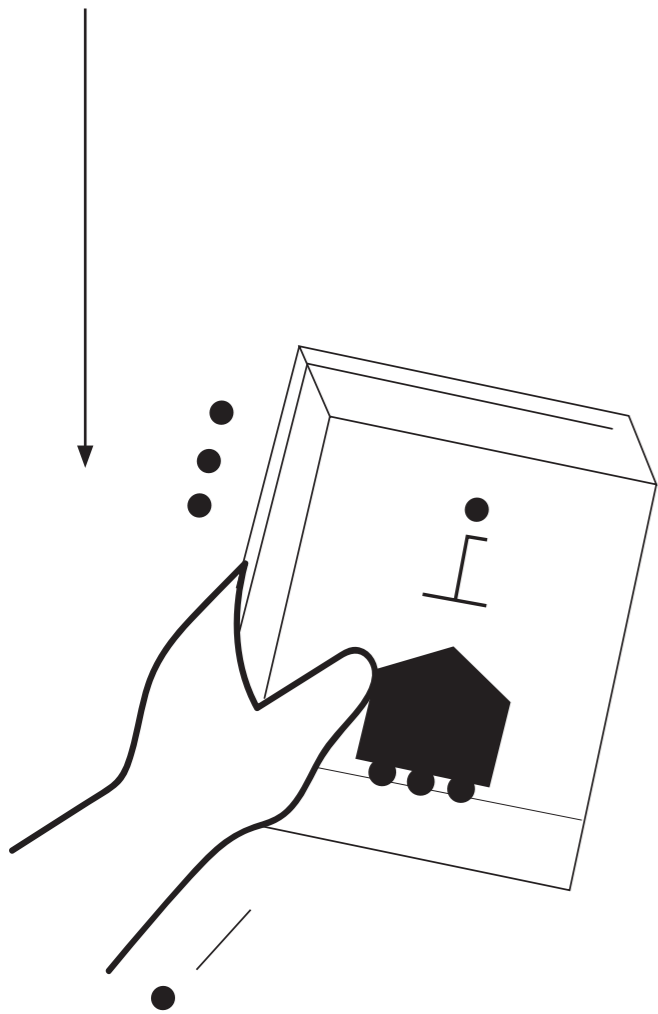
A FASCINATION WITH

MOBILE ARCHITECTURE



RESEARCH QUESTION

WHAT ARE THE SOLUTIONS APPLIED IN THE DESIGN OF MOBILE HOMES THAT CONTRIBUTE TO THE CREATION OF USER CENTERED SPACES? WITH A SPECIFIC FOCUS ON INVESTIGATING THE INFLUENCE OF MOVEMENT ON SPACE QUALITY



RESEARCH GOAL

A RESEARCH IS DEVELOPED TO DISCOVER

HOW TO DESIGN FOR NOMADS





THE WHEELLY



FLIP KIOSK



TRYCICLE HOUSE



TINY WALDEN



MARKIES



MDU LOT-EK



ECOBITAT



PORT-À-BACH



SPIRIT SHELTER



CASA OJALÁ



ECOCAPSULE



ÁPH80



TINI LIVING

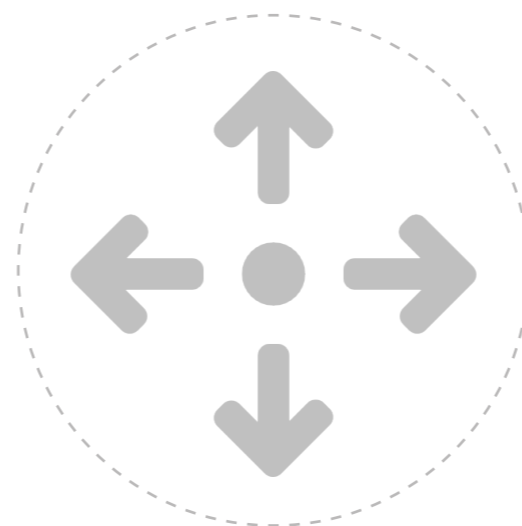
Case Studies

MOVING+ LIVING +

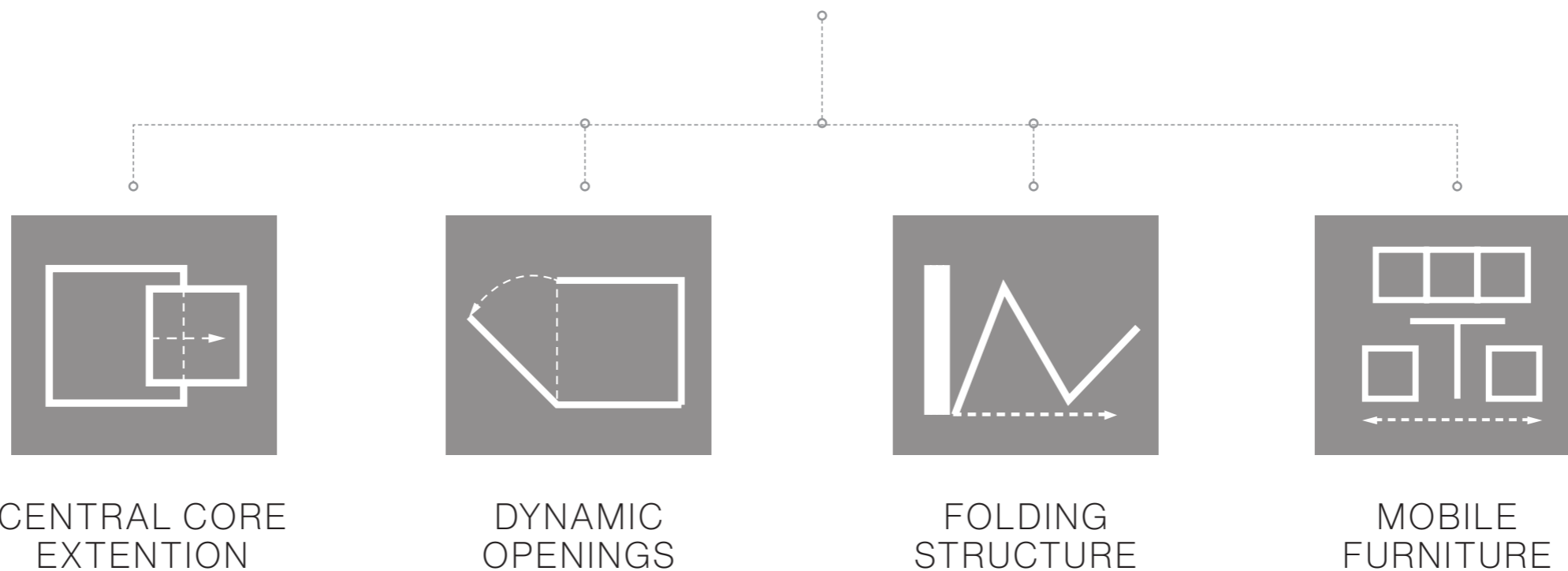
CASE STUDIES CHOSEN SHOWCASE DIFFERENT

TYPES OF MOVEMENT

HOW THEIR STRUCTURE AND DESIGN DYNAMICALLY MOVE

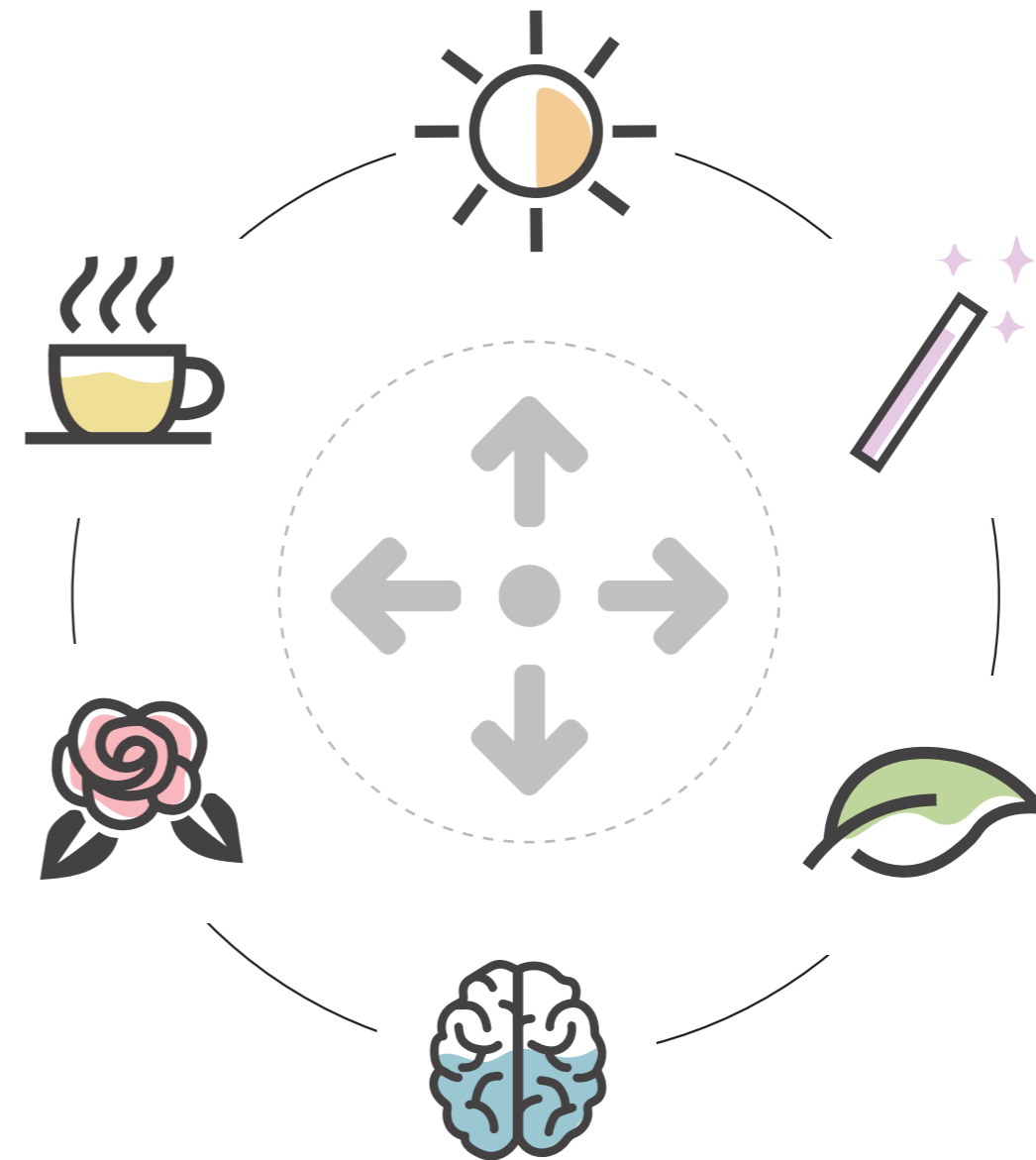


MOVEMENT WITHIN THE BUILDING IT SELF



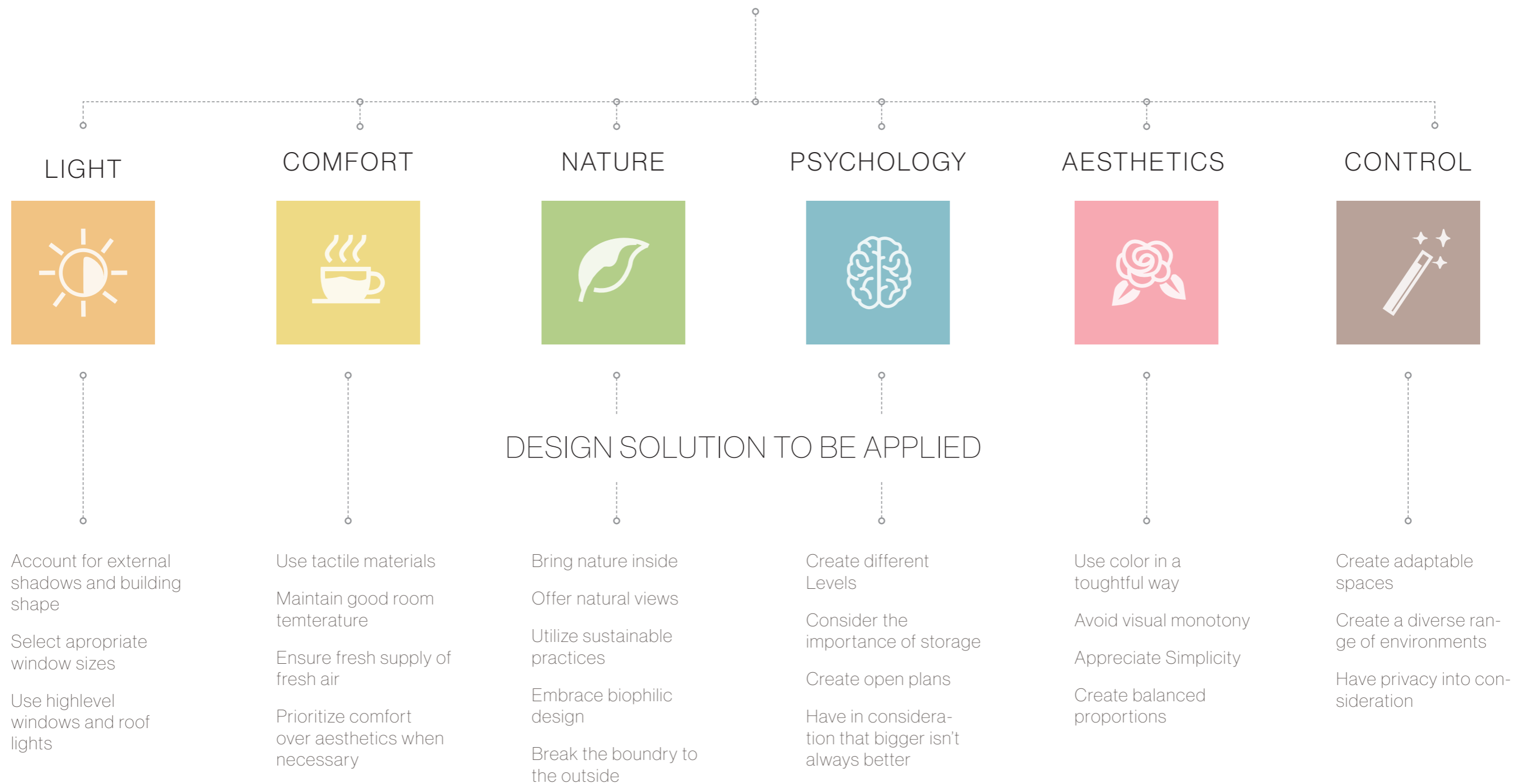
CASE STUDY ANALYSIS CRITERIA

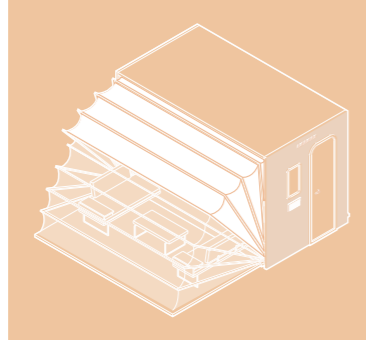
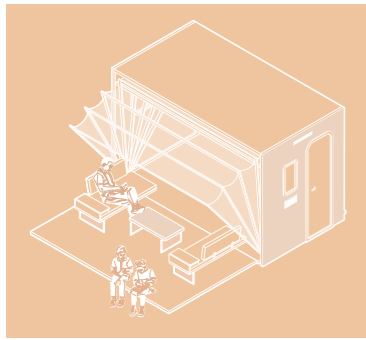
ANALYSIS EXAMINS THE
**INFLUENCE OF
MOVEMENT**
REGARDING THE
IMPROVEMENT OF **DESIGN
FUNDAMENTALS**
CENTERED AROUND
USER LIVING



FUNDAMENTALS TO CONSIDER

DURING THE DESIGN PROCESS OF USER CENTERED DESIGN

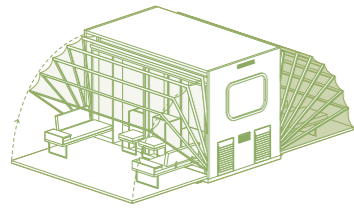




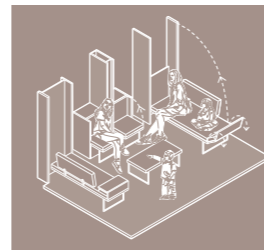
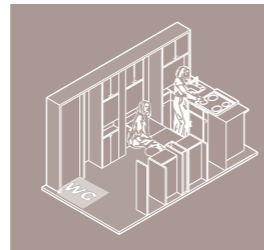
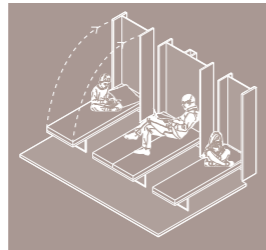
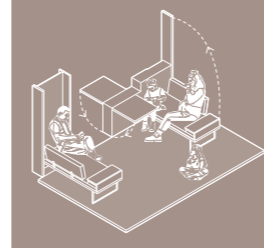
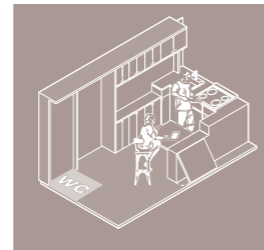
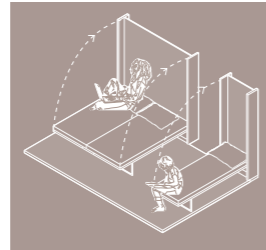
LIGHT.



NATURE.



BREAK THE BOUNDARIES BETWEEN INSIDE AND OUTSIDE

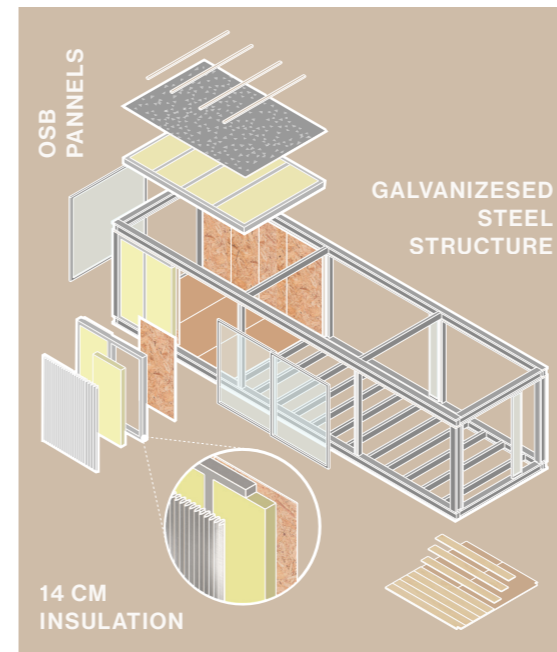
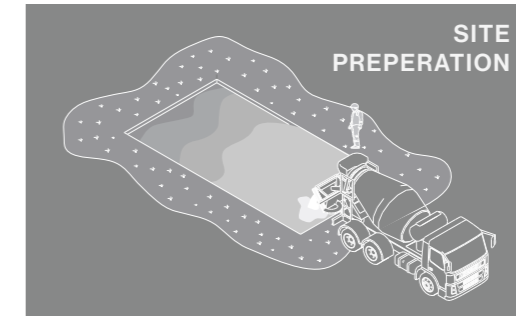


DESIGN FLEXIBLE ENVIRONMENTS

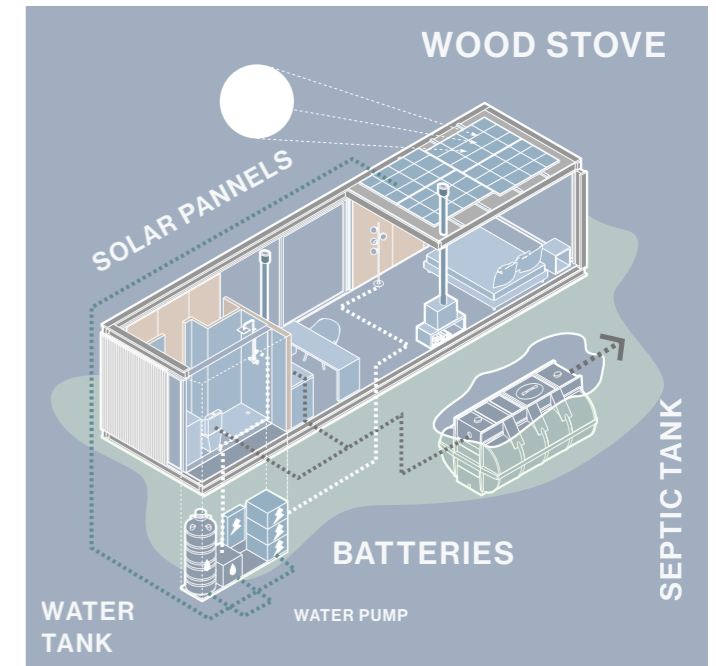
CONTROL.



MOBILITY.



STRUCTURE

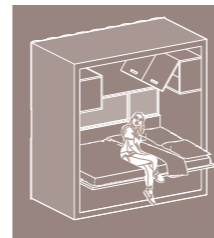
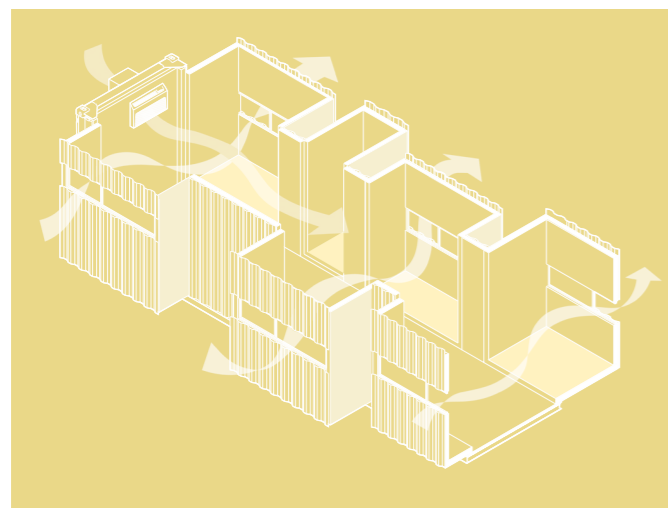


UTILITIES.

PSYCHOLOGY.

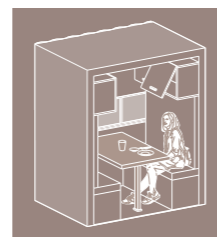
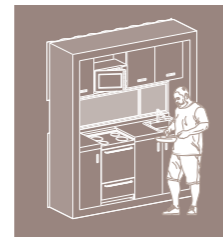
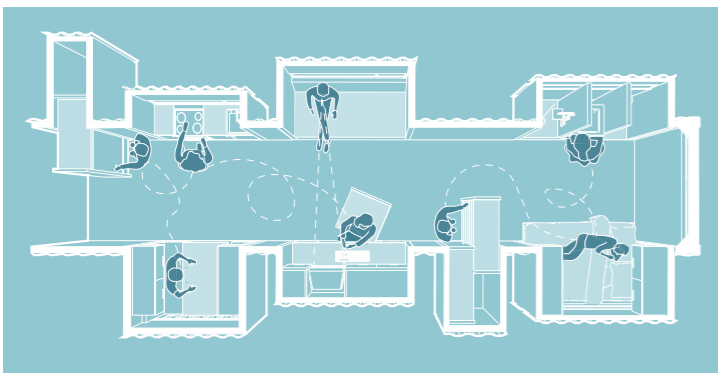
GOOD ROOM TEMPERATURE
SUPPLY OF FRESH AIR

COMFORT.



CREATE DIFFERENT ENVIRONMENTS.

CONTROL.



THE RESEARCH BOOKLET

RESULTS

The results are a deep visual analysis of how this case studies have responded to the criteria presented before. And this Visuals are what create the "How to design for nomads" Booklet.

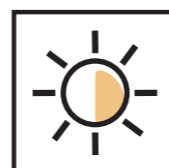
RESEARCH CONCLUSIONS OVERVIEW

IMPORTANCE
OF HISTORY



EMBRACING SIMPLICITY

COLLABORATION OF
DIFFERENT MOVEMENTS



CURIOUS LIGHT

IMPORTANCE OF
COMPACT MODE

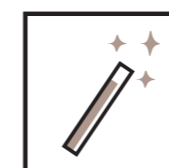


FROM ISOLATION TO INCLUSION

CONTAINER MESURMENTS
AND THE LAYOUTS



THE DYNAMICS OF NATURE
-BREAKING THE BOUNDRIES



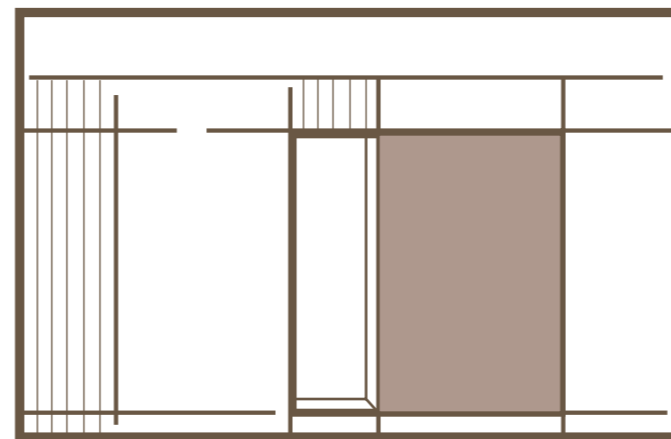
UNITY BETWEEN PSYCHOLOGY
AND CONTROL



UNFORSEEN MATERIALITY

AURA.

ADAPTABLE UNITS WITH RESIZABLE ARCHITECTURE.



DESIGN GRADUATION PROJECT

WHAT IS AURA?

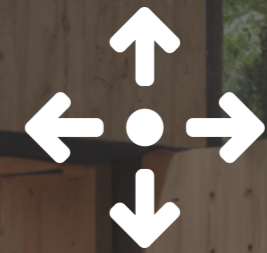
CORE VALUES

Aura is a modular housing system emphasizing movement-driven design, future adaptability, and customization. Its innovative structure allows for easy assembly and personalized spaces, making it ideal for those seeking flexible living solutions.

COSTUMIZABLE



MOVEMENT FOCUSED



SPACE EFFECTIVE



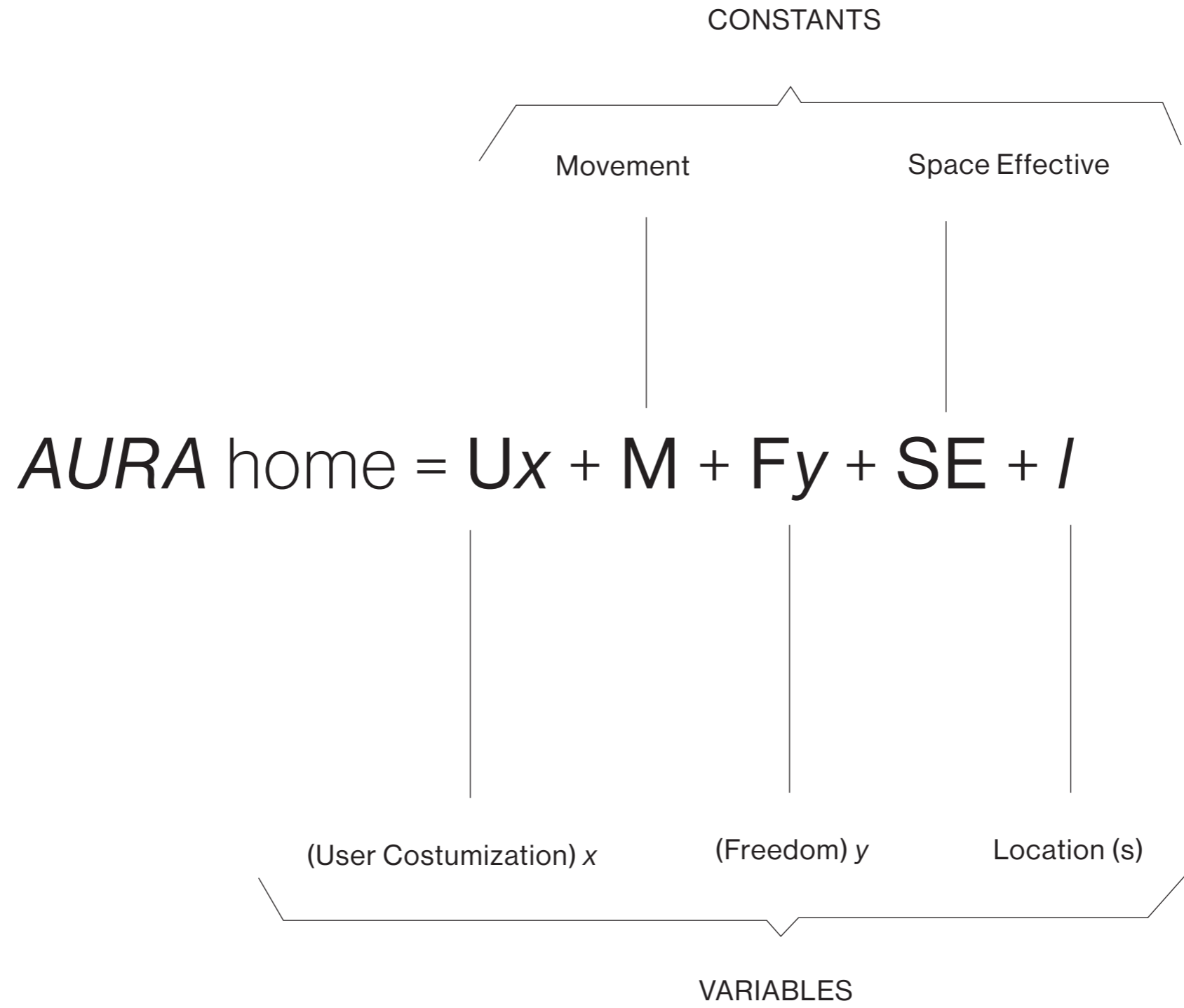
ADAPTABLE



CONCEPT **CREATING A FORMULA**

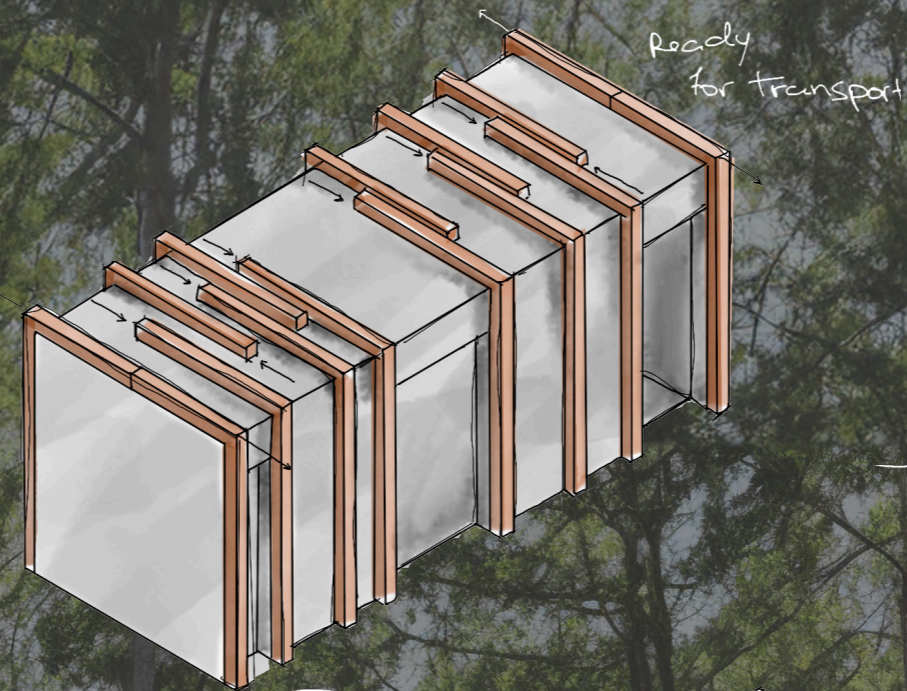
AURA home = **Ux + M + Fy + SE + I**

CONCEPT **CREATING A FORMULA**

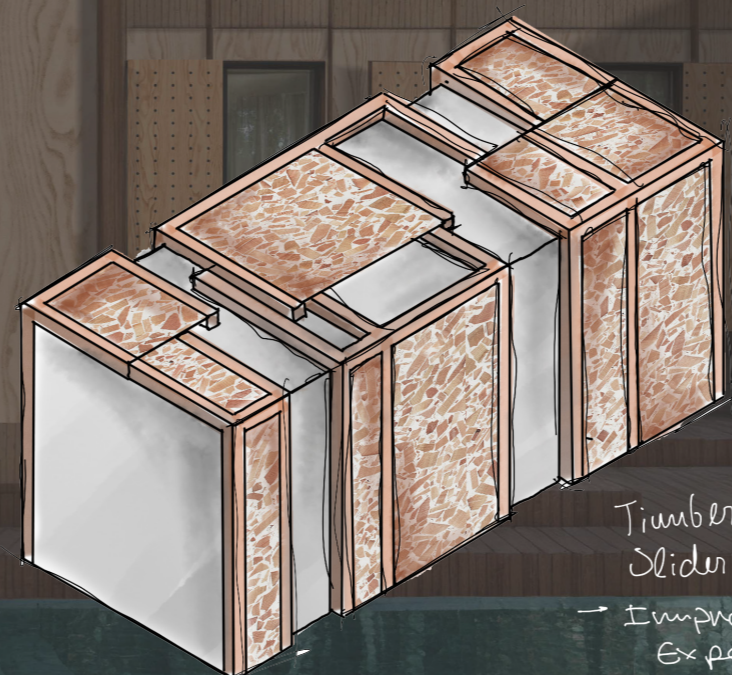


DESIGN PROCESS

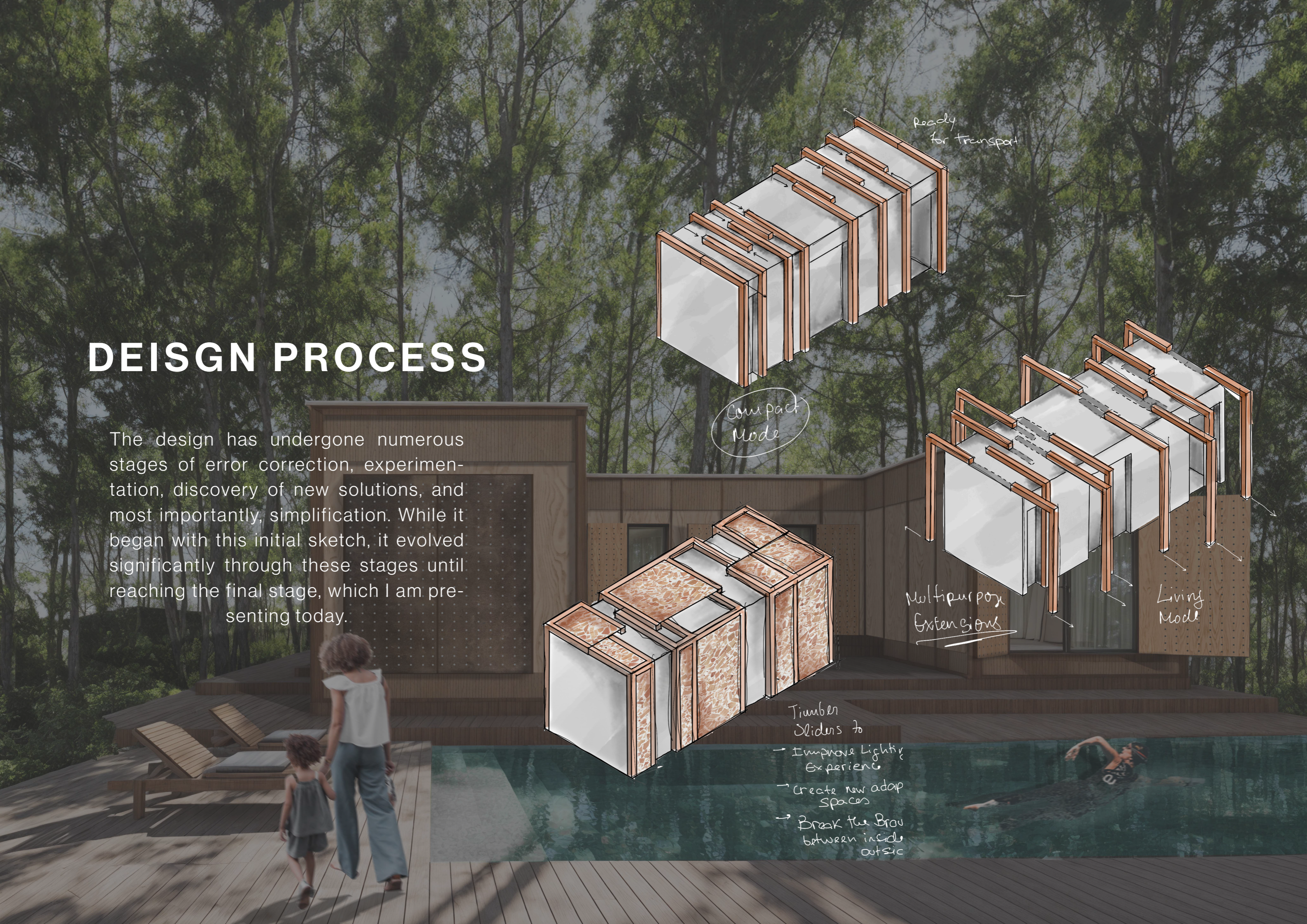
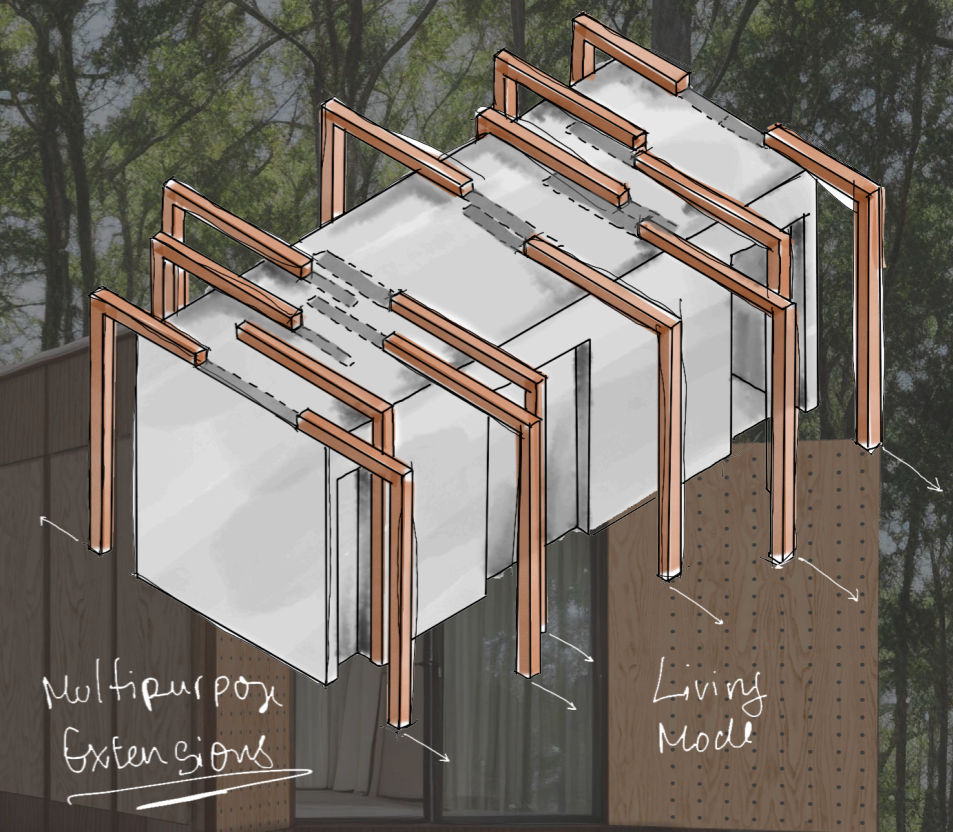
The design has undergone numerous stages of error correction, experimentation, discovery of new solutions, and most importantly, simplification. While it began with this initial sketch, it evolved significantly through these stages until reaching the final stage, which I am presenting today.



Compact Mode

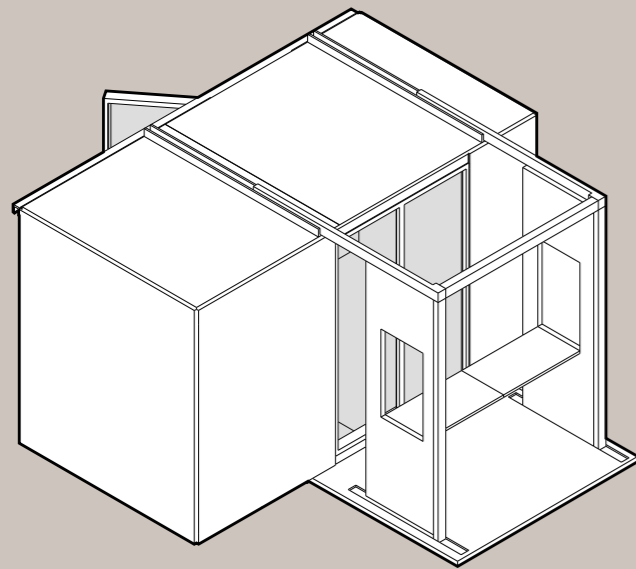


- Timber sliders to
- Improve Lighting Experience
 - Create new adap Spaces
 - Break the Bound between inside outside



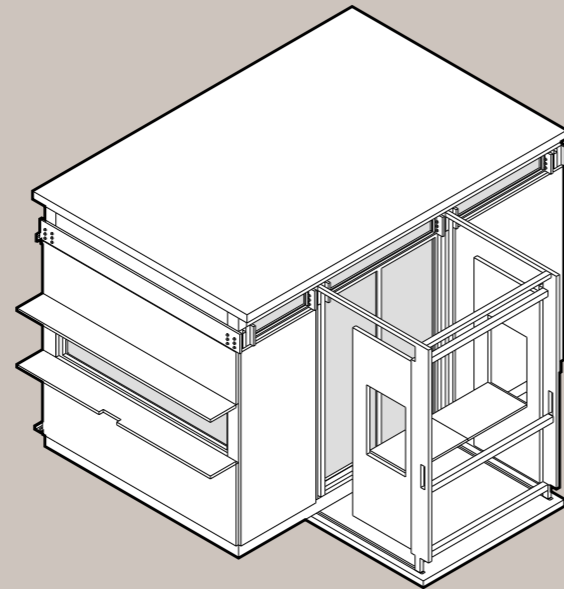
CONCEPT DESIGN DEVELOPMENT

STAGE 1



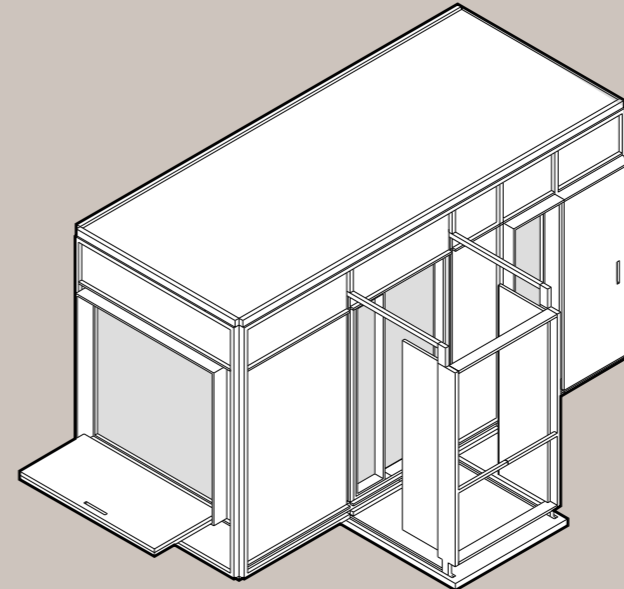
Movable extension working on the outside of the structure, being exposed to the elements could create durability problems that could be solved if it was working on the inside of the building

STAGE 2



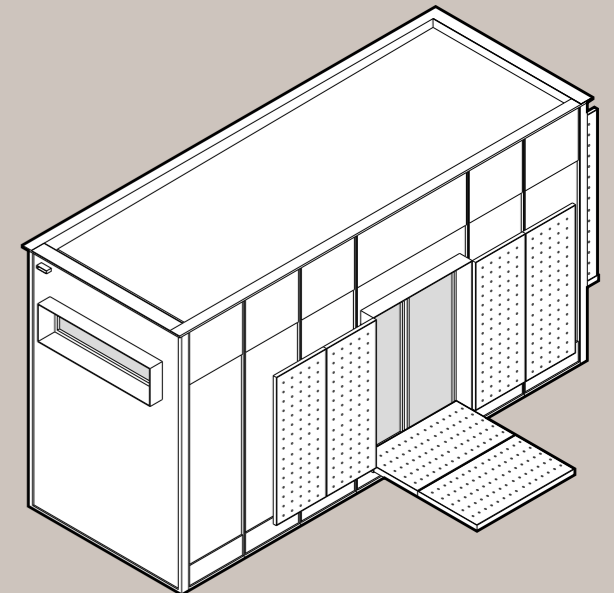
Created a viable system but there was a lack of cohesion with the exterior of the building making the extension to look out of place, also lack of lighting on the inside.

STAGE 3



During the last stage of the design development it was all about developing the rest of the openings and moving parts of the building so that they could create a whole exterior that looked symmetric and cohesive.

STAGE 4



A new Structural approach is introduced. Exploration of new ideas to make the space more accessible and adaptable are explored, and there is a focus on details regarding technical matters.



THE WHEELLY



FLIP KIOSK



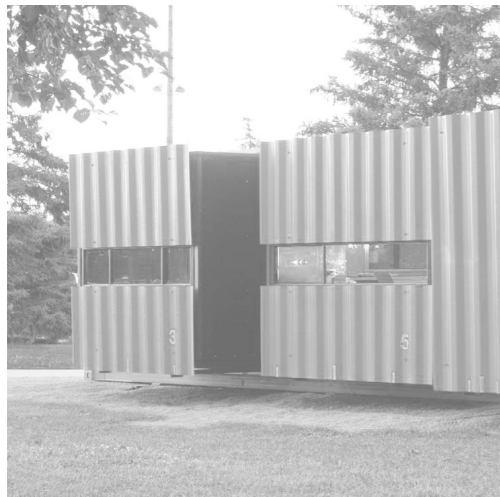
TRICYCLE HOUSE



TINY WALDEN



MARKIES



MDU LOT-EK



ECOBITAT



PORT-À-BACH



SPIRIT SHELTER



CASA OJALÁ



ECOCAPSULE



ÁPH80



TINI LIVING



AURA HOMES

Design project

Becomes a case study

AURA xs.

ON THE MOVE - FULLY OFF GRID MODULE

AS A "HOW TO DESIGN FOR NOMADS"
MOVEMENT + CASE STUDY

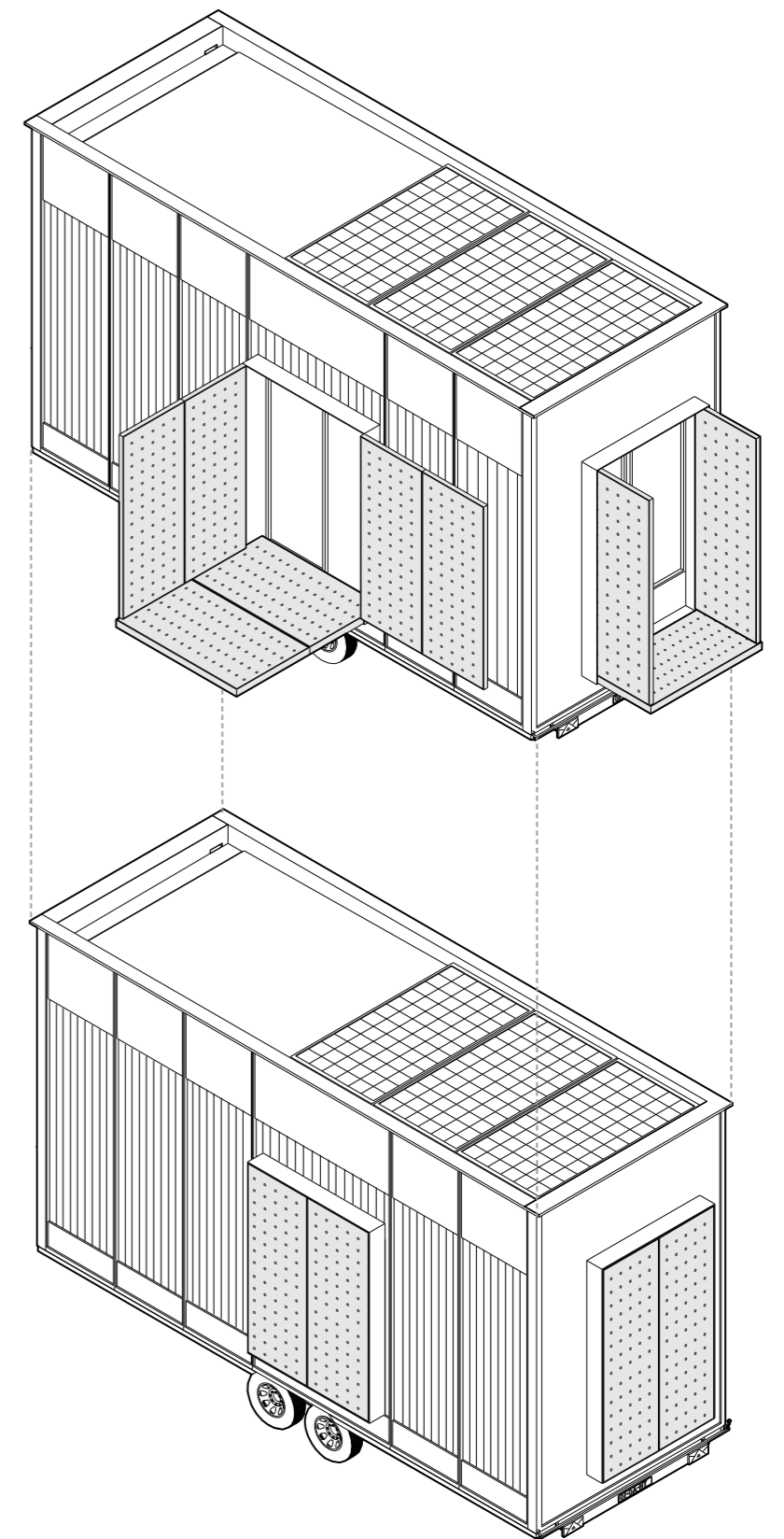


BOOKLET PAGES 100 -107

MOVEMENT TYPOLOGY

Dynamic Openings

& Mobile furniture



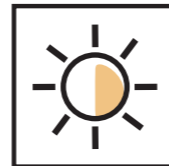
RESEARCH CONCLUSIONS OVERVIEW

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CURIOUS LIGHT

IMPORTANCE OF
COMPACT MODE

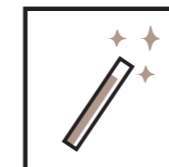


FROM ISOLATION TO INCLUSION

CONTAINER MESURMENTS
AND THE LAYOUTS



THE DYNAMICS OF NATURE
-BREAKING THE BOUNDRIES

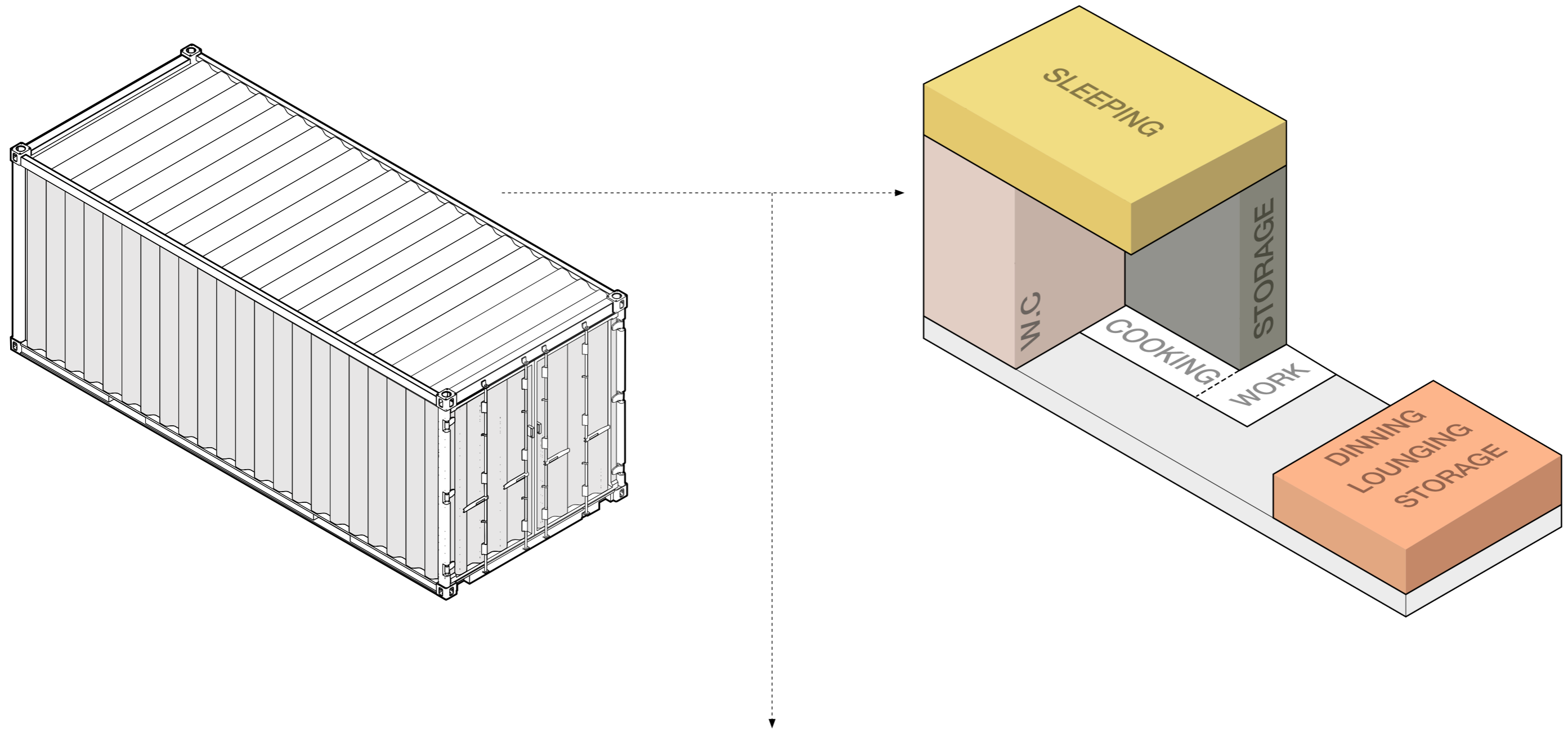


UNITY BETWEEN PSYCHOLOGY
AND CONTROL



UNFORSEEN MATERIALITY

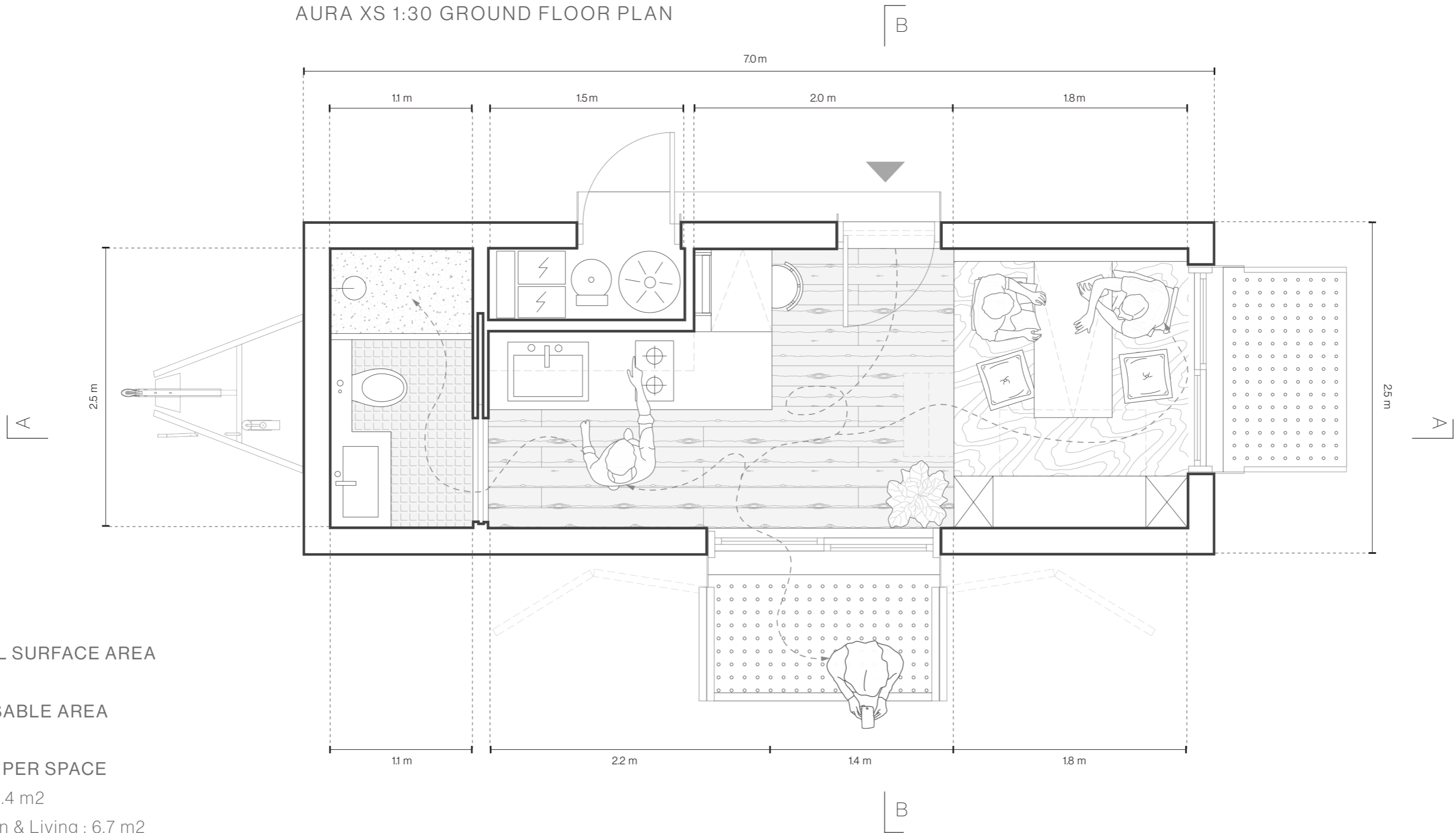
● GENERAL CONCLUSION CONTAINER MESURMENTS & LAYOUTS



To Improve both transportation and layout configuration its wise to apply container size measures to the homes. This concept was applied to the design of all AURA Modules Including the AURA XS mobile.

● GENERAL CONCLUSION **CONTAINER MESURMENTS & LAYOUTS**

AURA XS 1:30 GROUND FLOOR PLAN



TOTAL SURFACE AREA

24 m²

GF USABLE AREA

18 m²

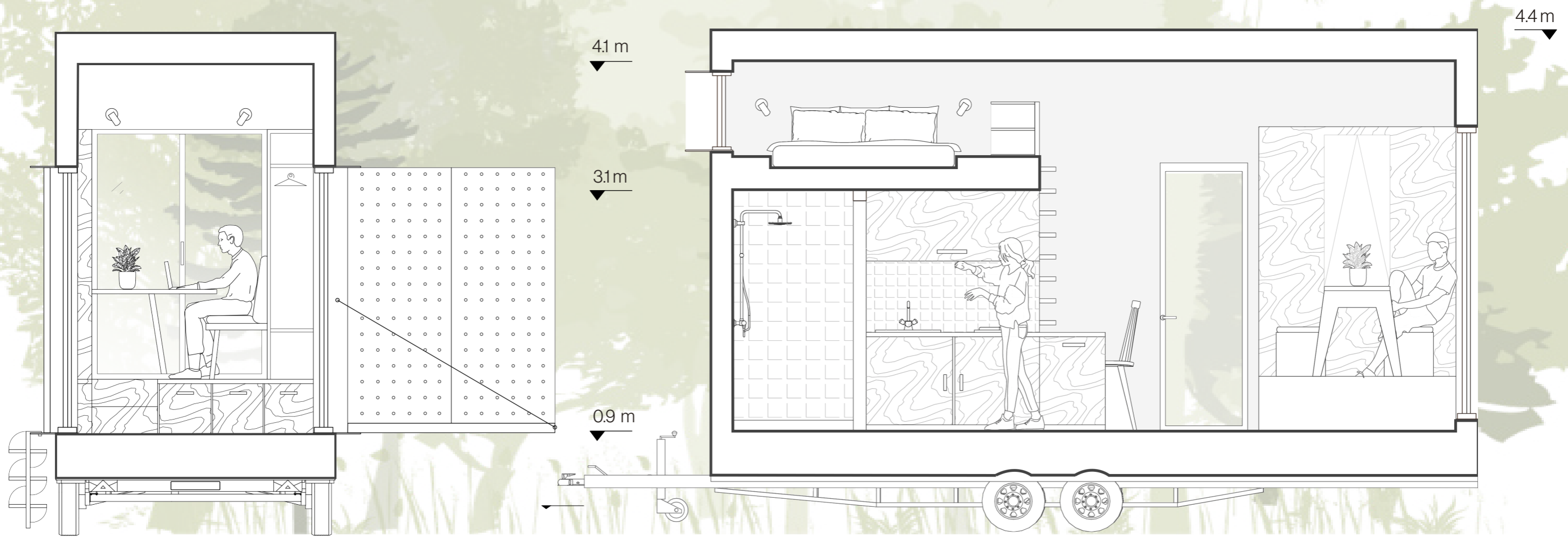
AREA PER SPACE

W.C : 2.4 m²

Kitchen & Living : 6.7 m²

Multipurpose area : 3.9 m²

● GENERAL CONCLUSION **CONTAINER MESURMENTS & LAYOUTS**

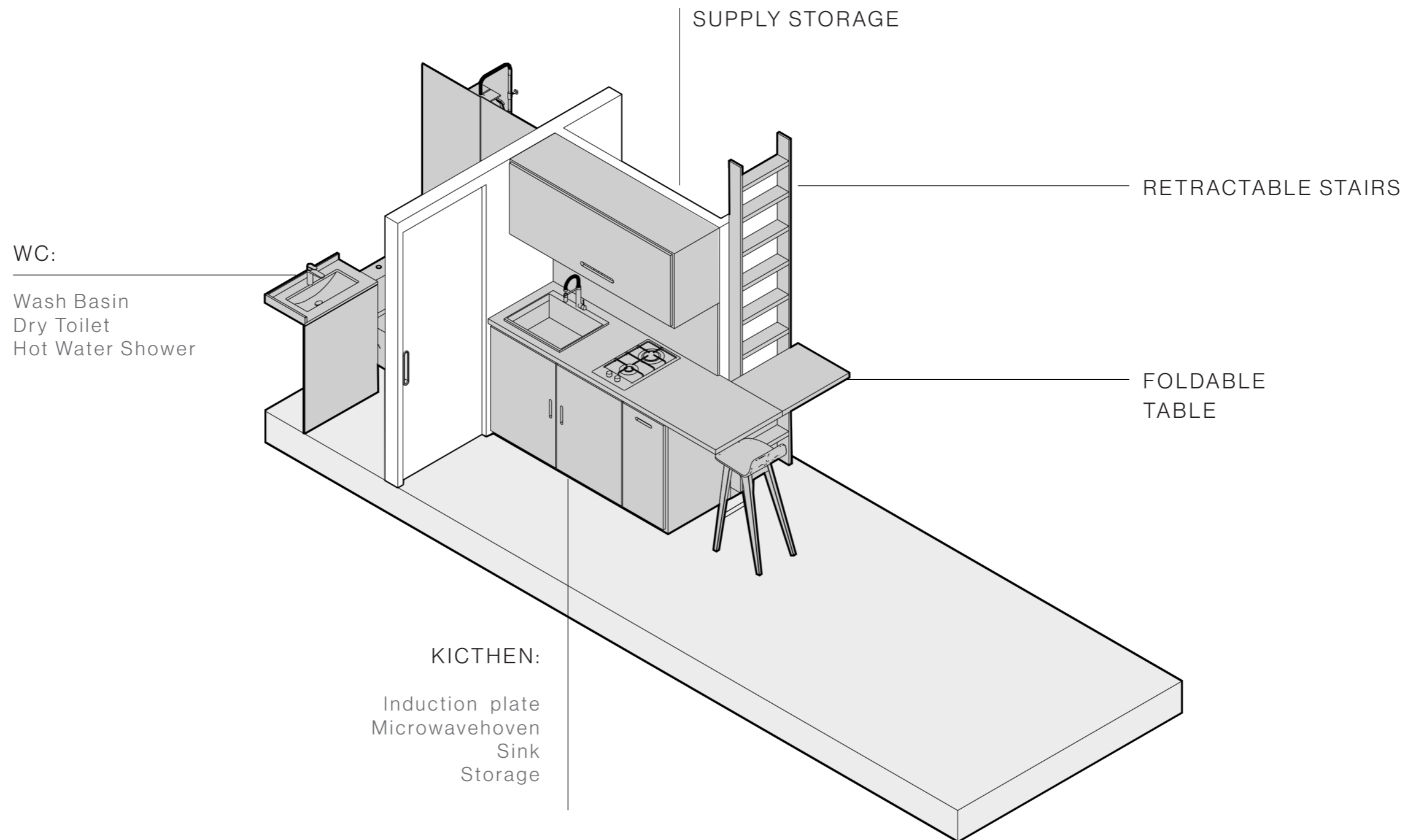


SECTION B -B'

SECTION A-A'

● GENERAL CONCLUSION **CONTAINER MEASUREMENTS & LAYOUTS**

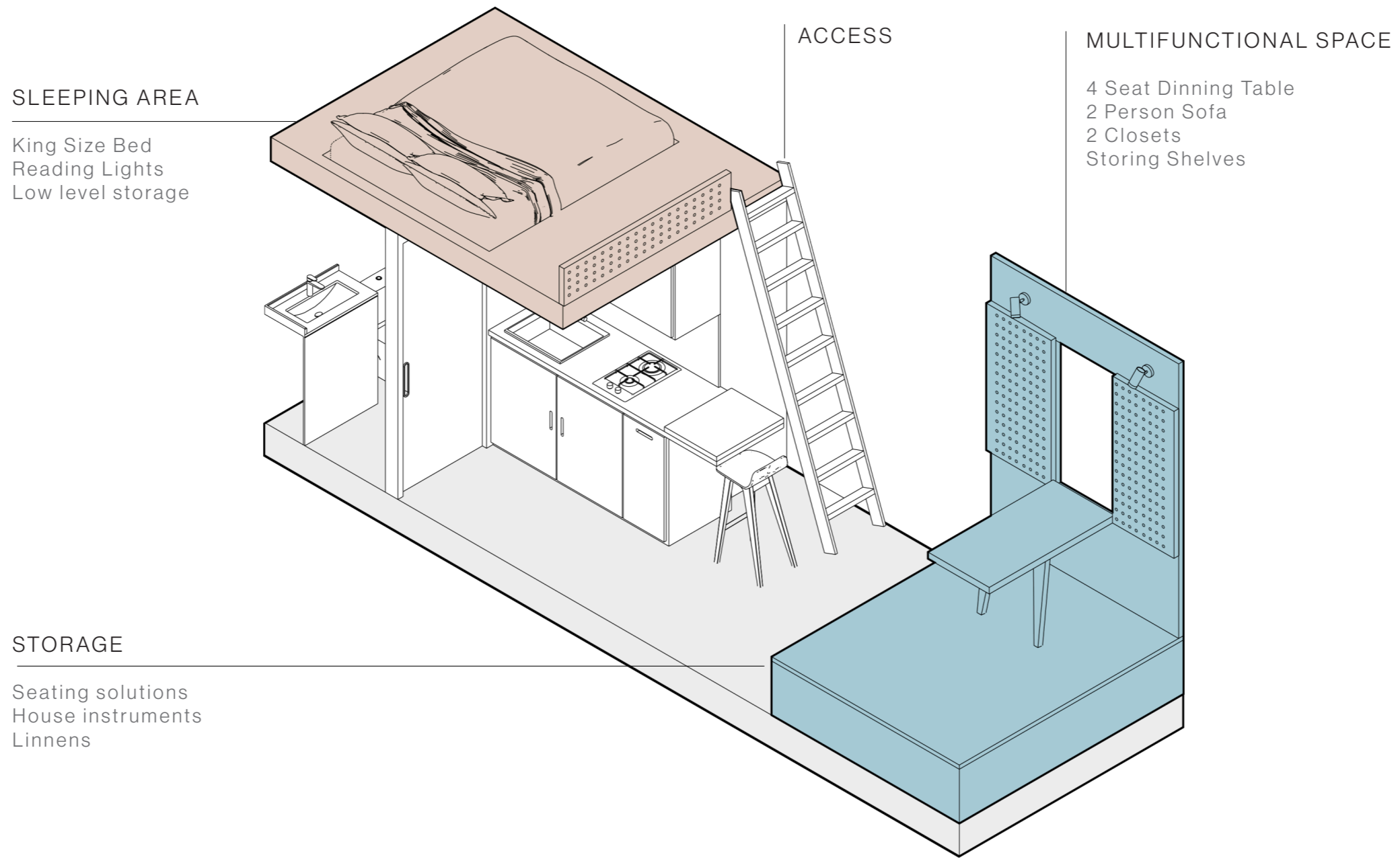
One valid concern in the design of tiny homes is ensuring easy amenity distribution thus making sure that bathroom kitchen and all parts of the house that either supply water or need to dispose of it are closely located within the house layout.



LINK CONCLUSION UNITY BETWEEN PSYCHOLOGY AND CONTROL

CONTROL.

Consider Privacy / Create adaptable spaces

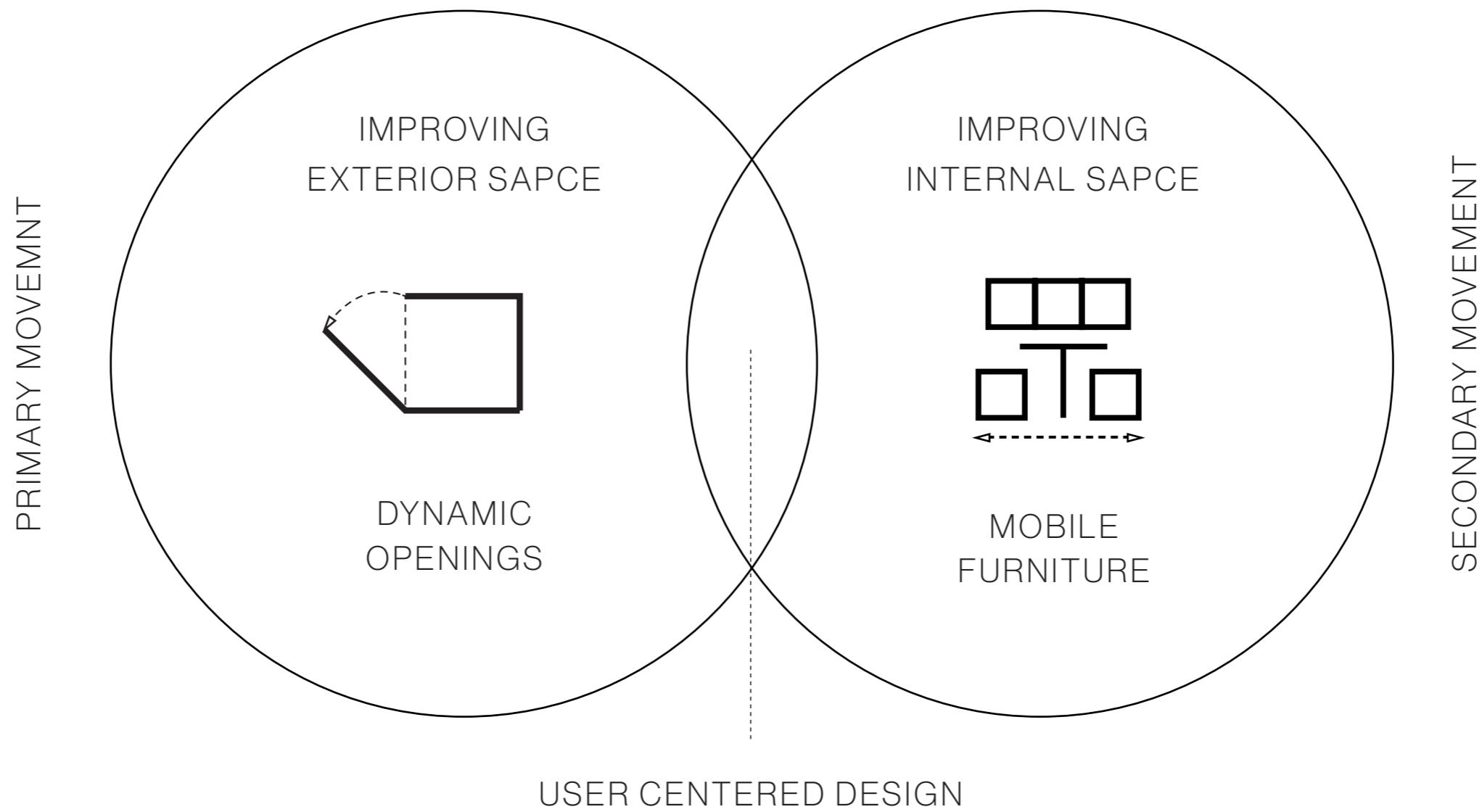


PSYCHOLOGY.

Go Open Plan

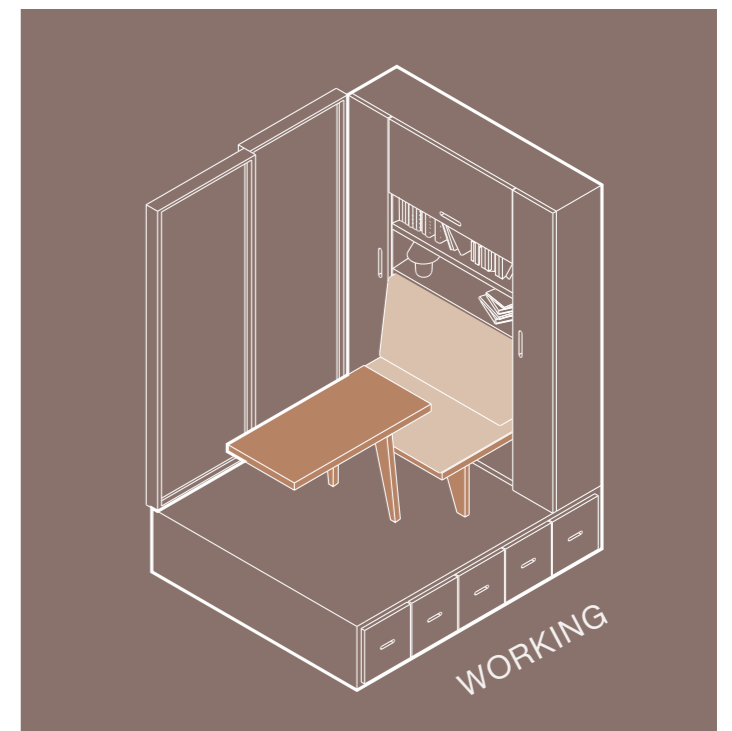
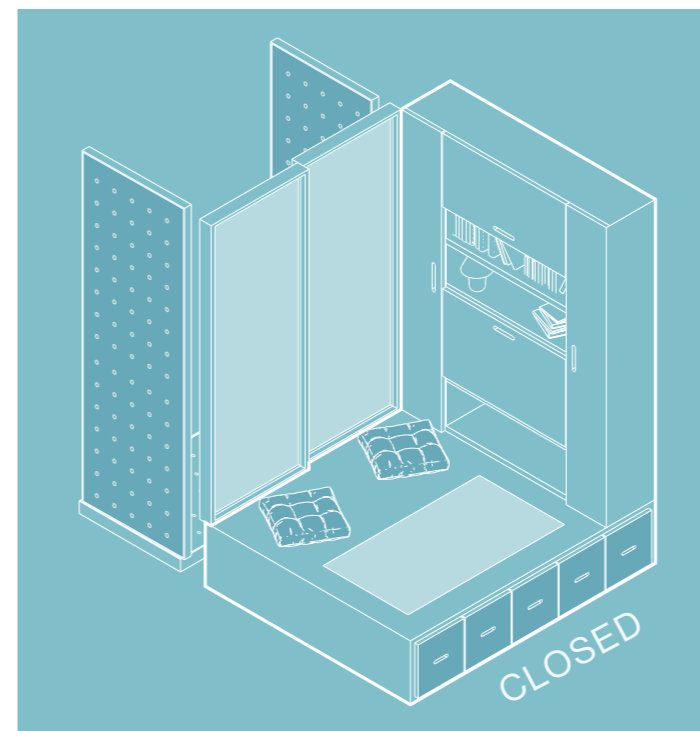
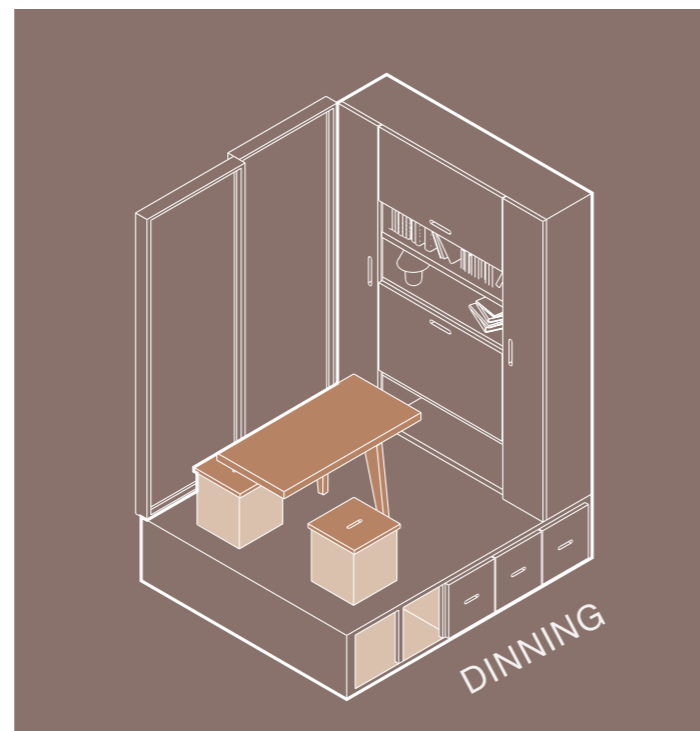
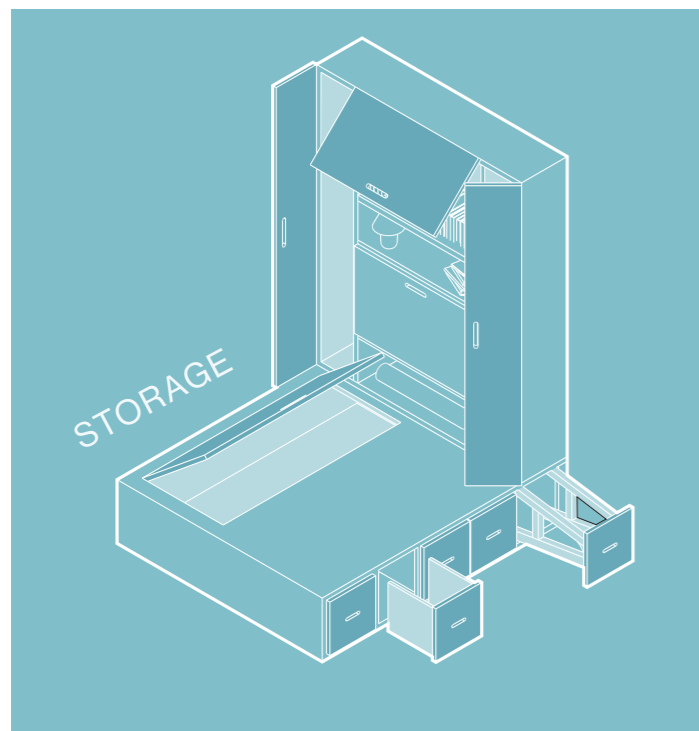
● GENERAL CONCLUSION **COMBINING DIFFERENT MOVEMENTS**

The paper highlights four movements in mobile architecture. Primary movements expand overall space, while secondary movements enhance interior quality. Combining these movements leads to innovative mobile home designs.



PSYCHOLOGY.

Don't Overlook the importance of Storage

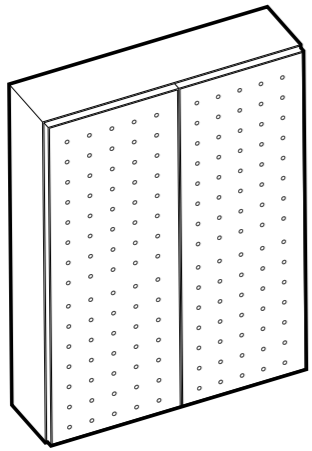


CONTROL.

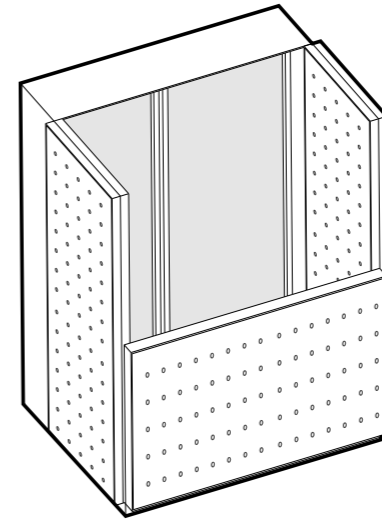
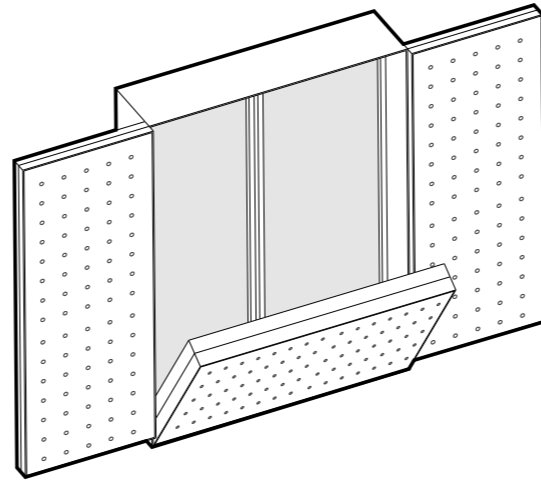
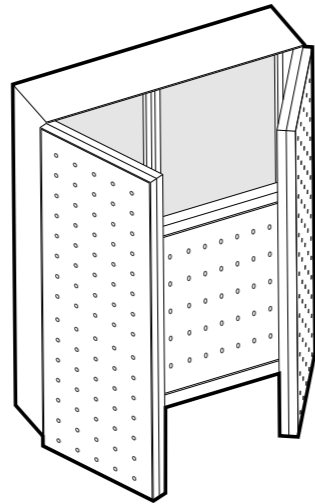
Create adaptable spaces / Provide a range of Diferent Environments

● NATURE CONCLSION **DYNAMIC OPENINGS**

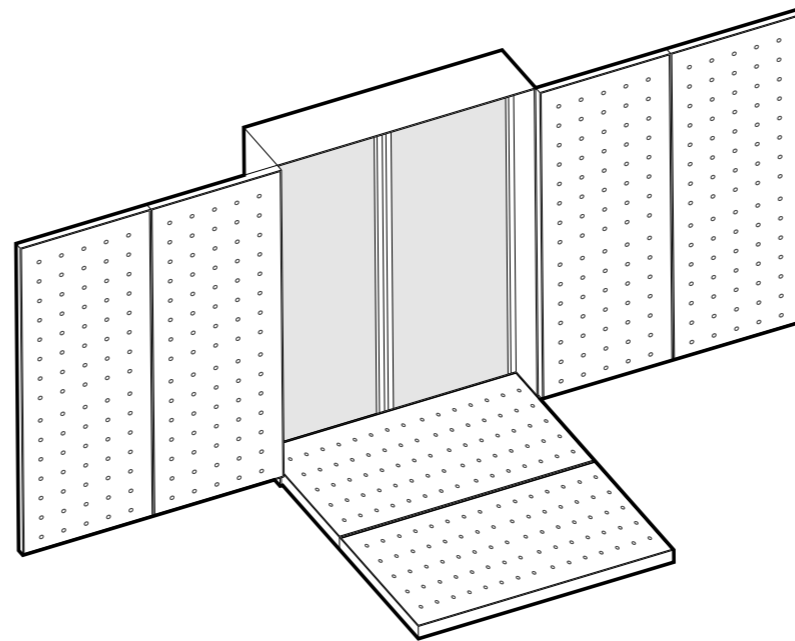
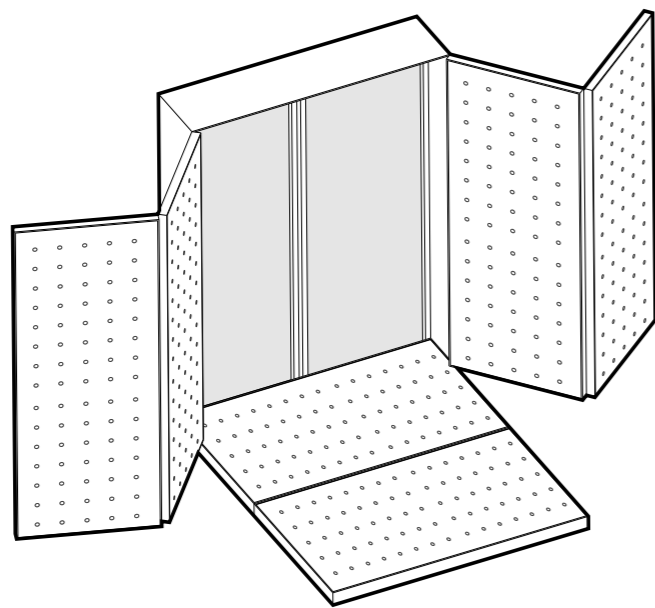
1. FULLY CLOSED



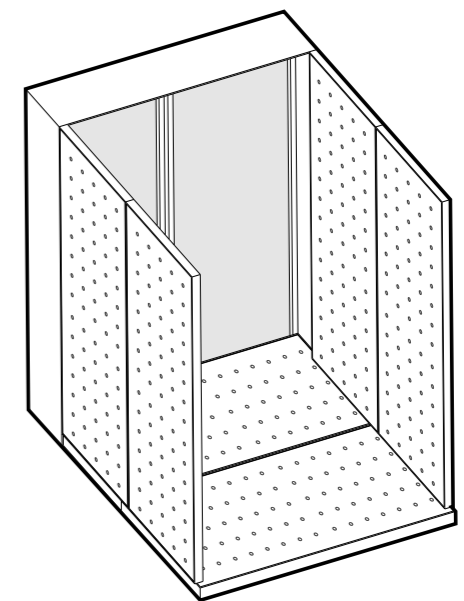
2. BALCONY OPEN



3. FULLY OPEN



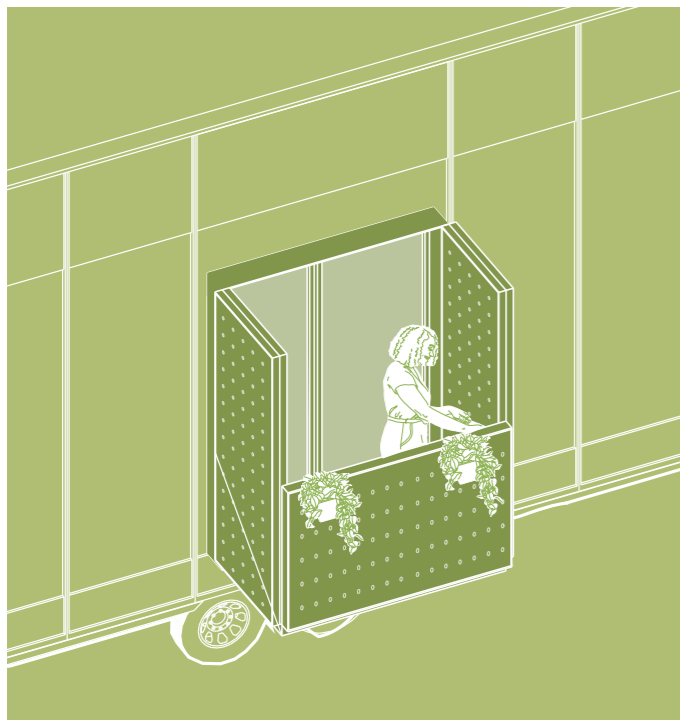
4. BOX OPEN



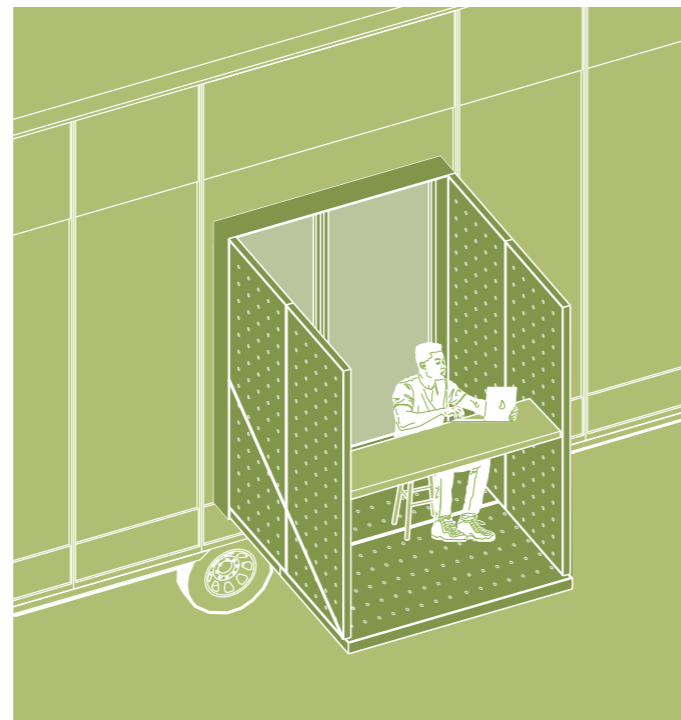
● NATURE CONCLSION **BREAKING BOUDRIES BETWEEN OUTSIDE & INSIDE**

NATURE.

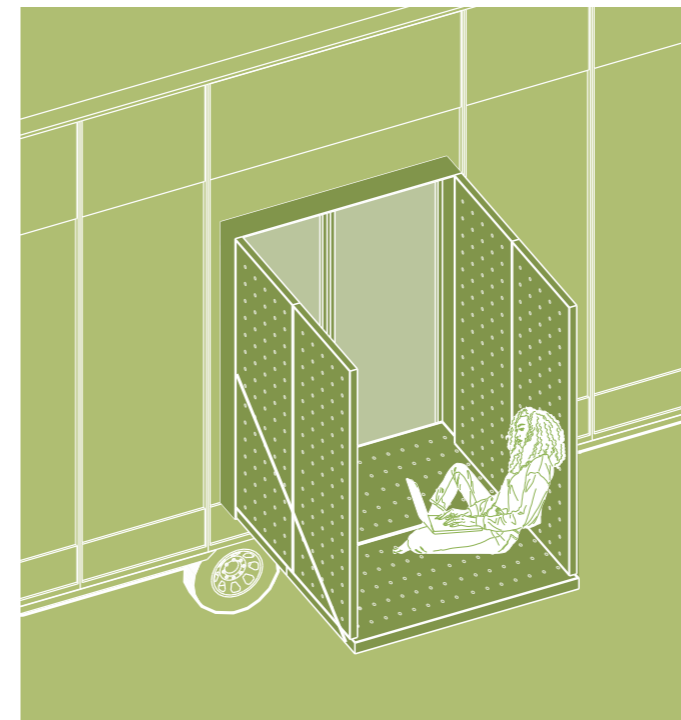
Break the Boundries Between Outside and Inside



Balcony mode



Working Box



Just Box

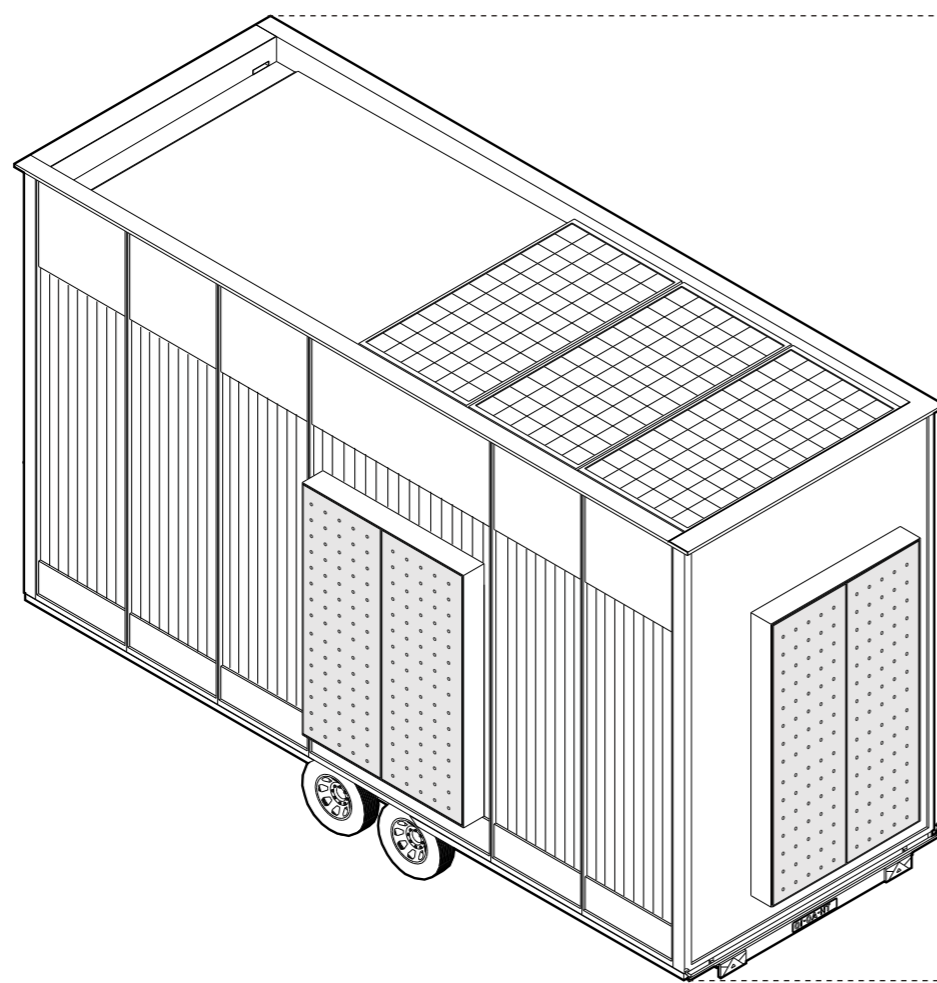


Dinning Outside

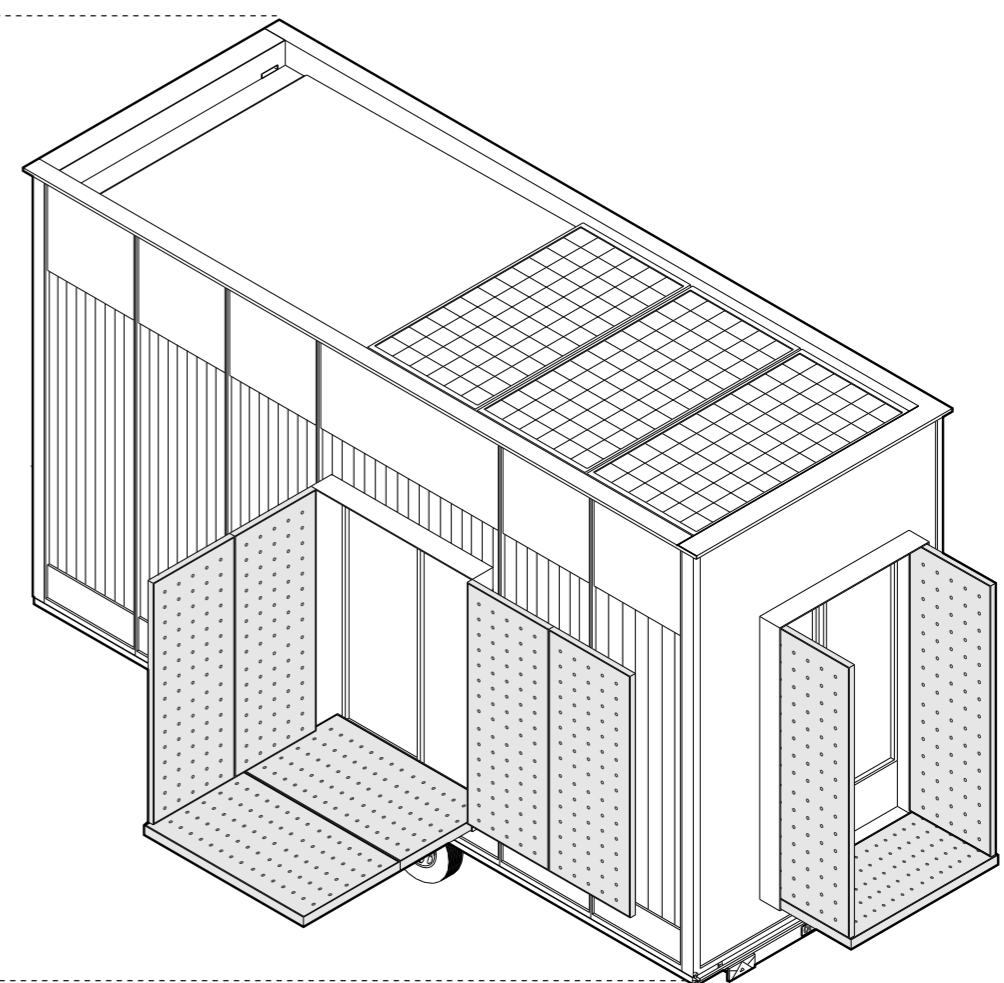
Dynamic perforated panels that allow for external fixtures and can fold into a private space or open setup are designed to break the boundries with nature and give users the oportunity to bring activities outside, offering flexibility between privacy and social interaction.

● GENERAL CONCLUSION **THE IMPORTANCE OF COMPACT MODE**

I've noticed that prioritizing compact design is crucial. Architects use this movements to close and protect living spaces for efficient transportation. This pattern significantly influences my design approach, ensuring practicality in transport.



Compact mode



Fully Open mode

● LIGHT CONCLUSION INTERPLAY OF PRIVACY AND LIGHT

LIGHT.

An interplay of light & privacy



These panels not only control privacy levels and frame views interestingly but also adjust lighting based on the time of day, enhancing both interior and newly created external spaces.

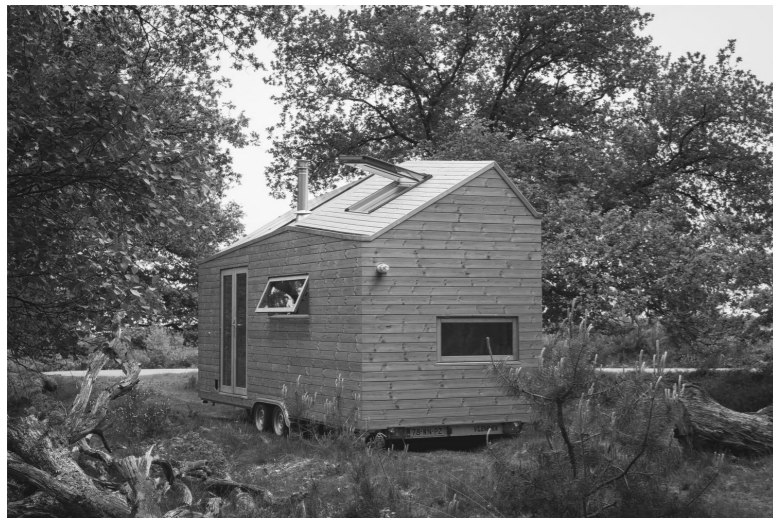
● NATURE CONCLSION INTERPLAY OF PRIVACY AND LIGHT



LIGHT

● LIGHT CONCLUSION **CURIOUS LIGHTING**

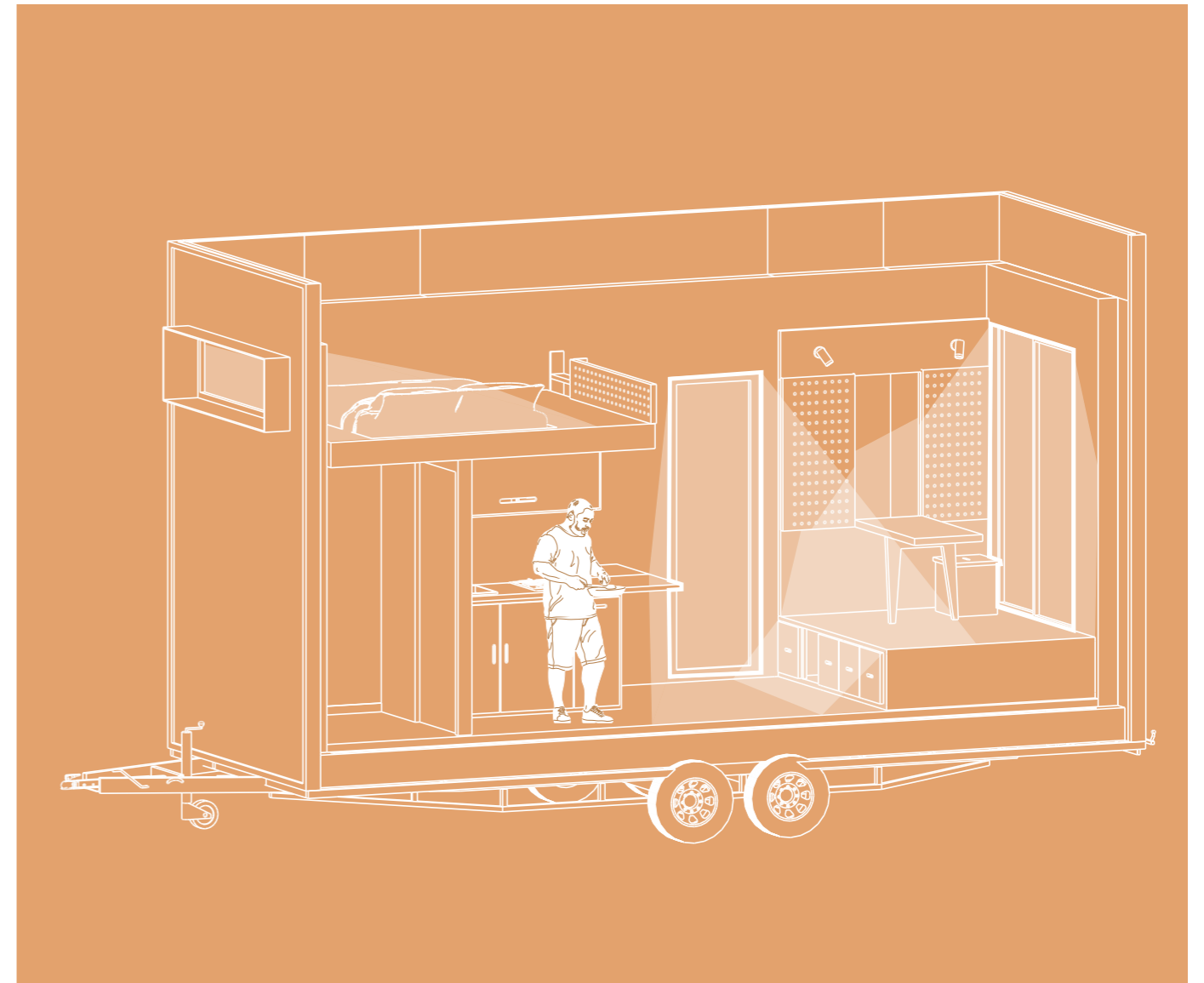
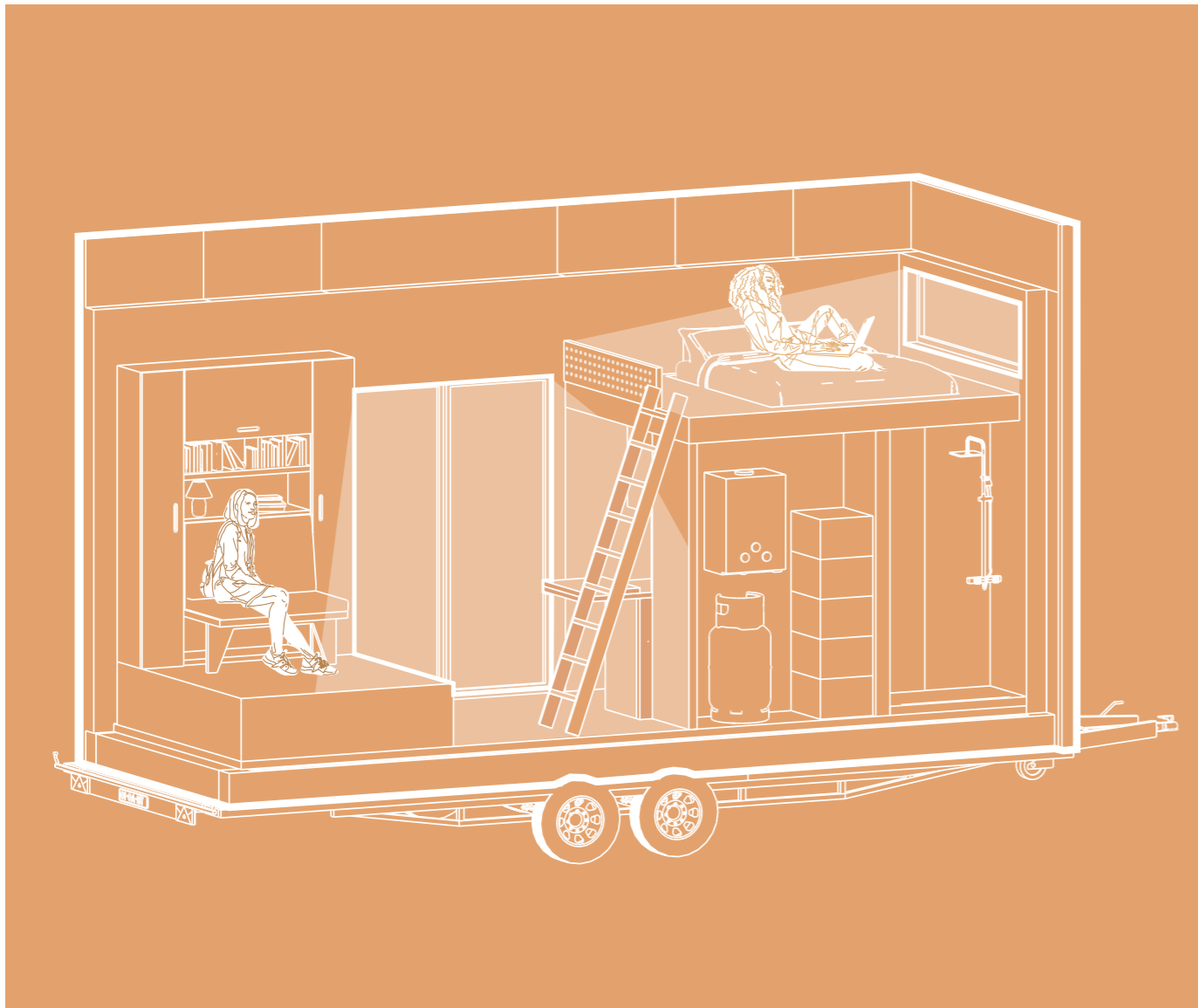
AURA homes optimize lighting in small spaces with strategically placed openings. The ground floor has three windows for all-day lighting, while the top floor features a large panoramic window beside the bed to prevent a cramped feeling.



LIGHT. Using appropriate window sizes

● LIGHT CONCLUSION **CURIOUS LIGHTING**

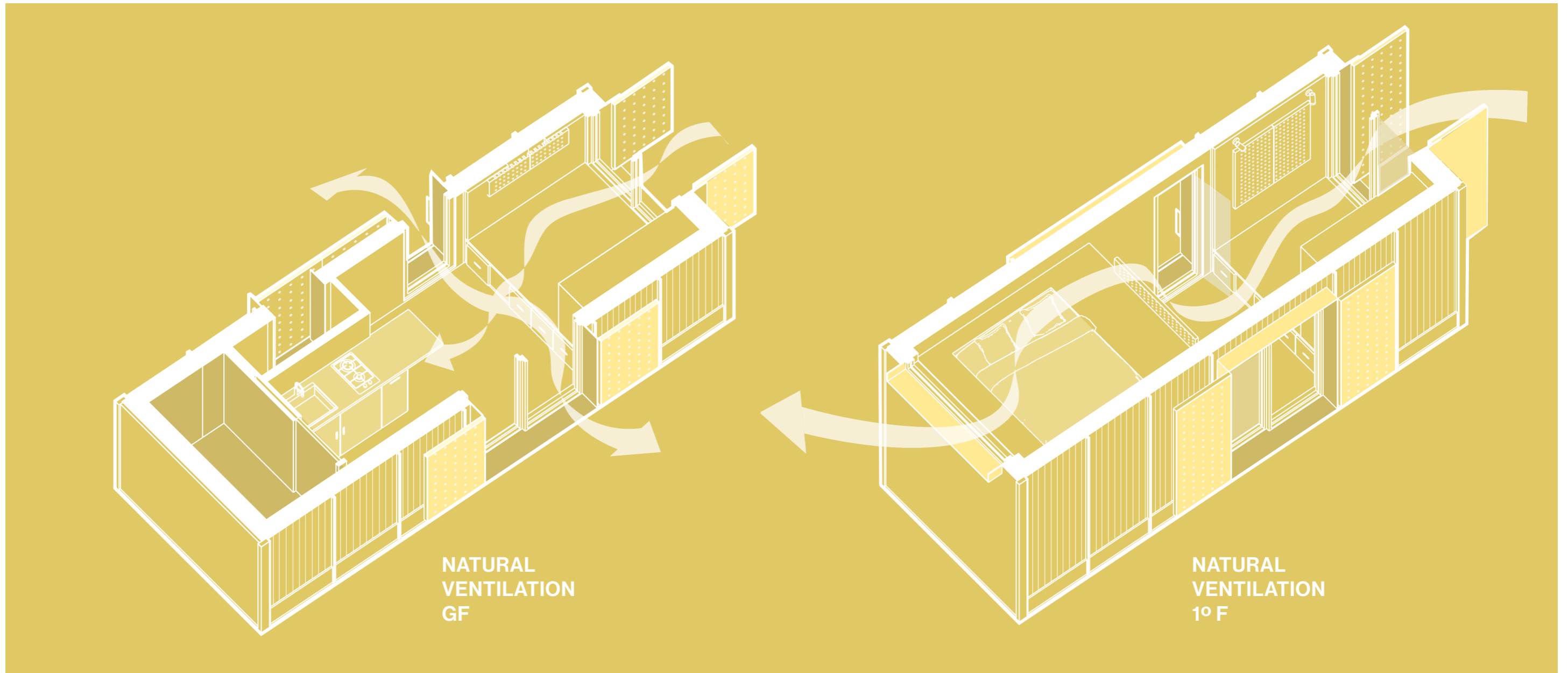
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LIGHT. Using appropriate window sizes

COMFORT.

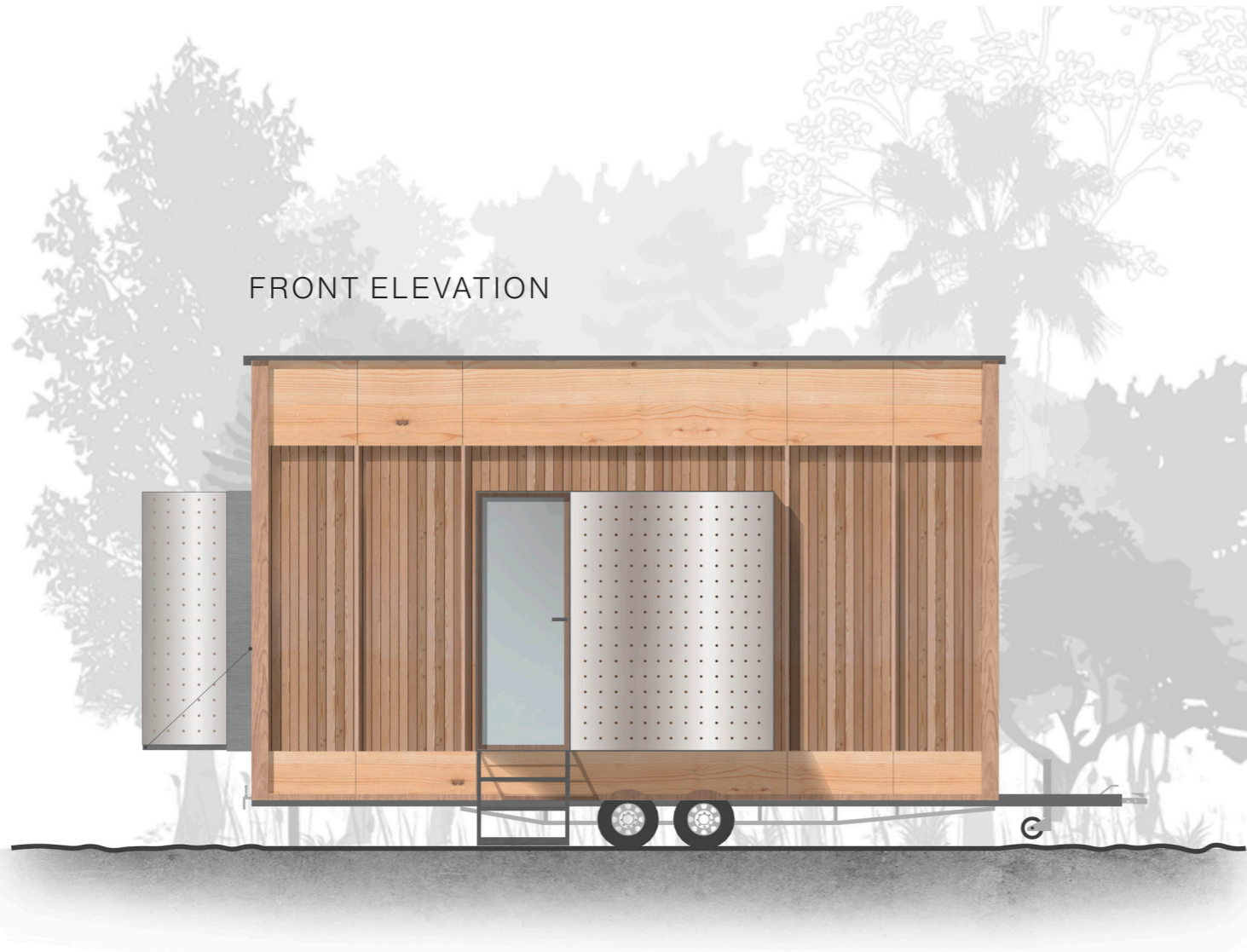
The importance of fresh air



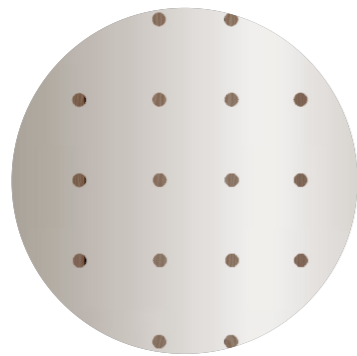
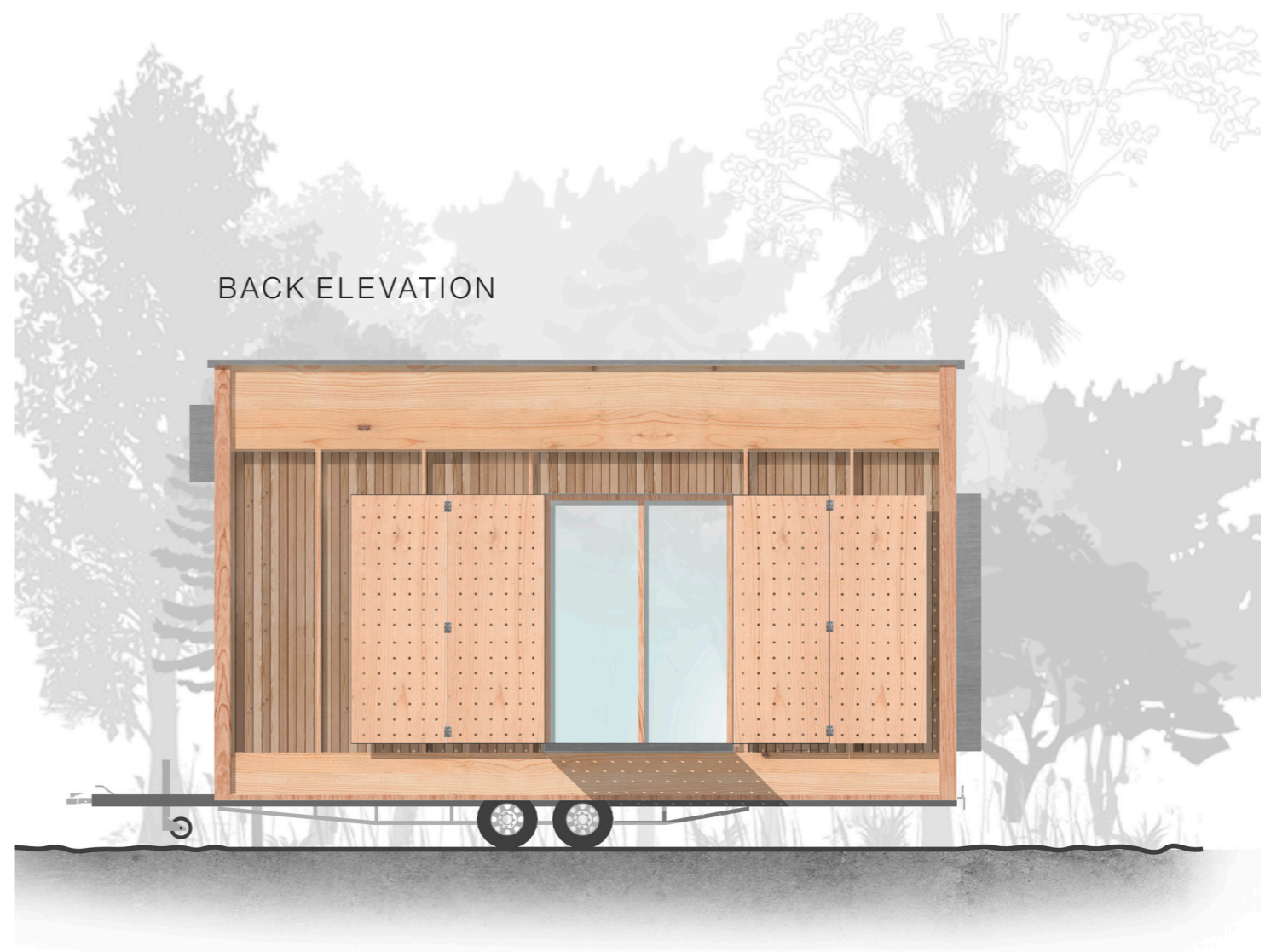
Maintaining good room temperature

● COMFORT CONCLUSION UNFORSEEN MATERIALITY

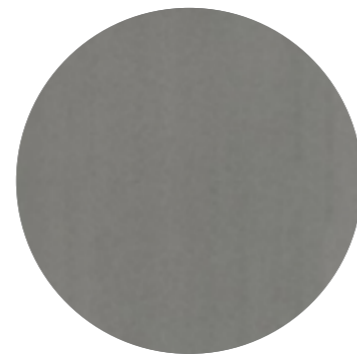
FRONT ELEVATION



BACK ELEVATION



PERFORATED METAL SHEET



STAINLESS STEEL



MASS TIMBER CLADDING



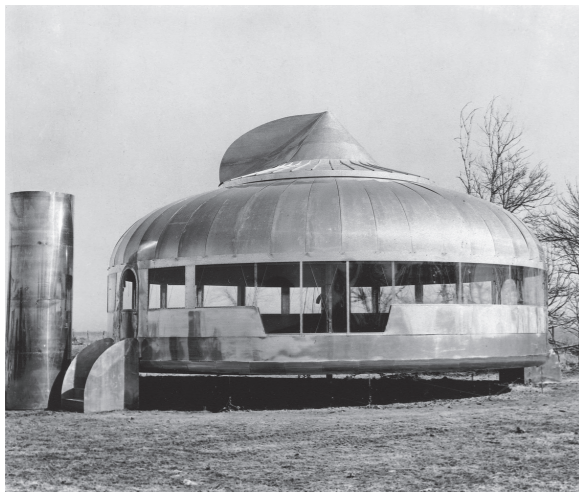
BOARDS TIMBER CLADDING

● GENERAL CONCLUSION **A CONNECTION WITH HISTORY**

HISTORY.

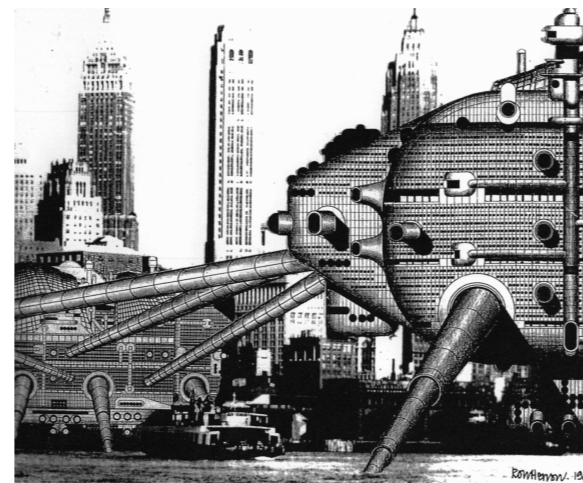
The different ways mobile history influences contemporary projects

RE-ATTEMPTING OLD MODELS



When the designer re-attempts an old unsuccessful models with new technology that wasn't available at the time.

BUILDING PAST SCIENCE FICTION



When the designer tries to bring to life projects and manifestations that at some point in history were only characterized as fictional ideas.

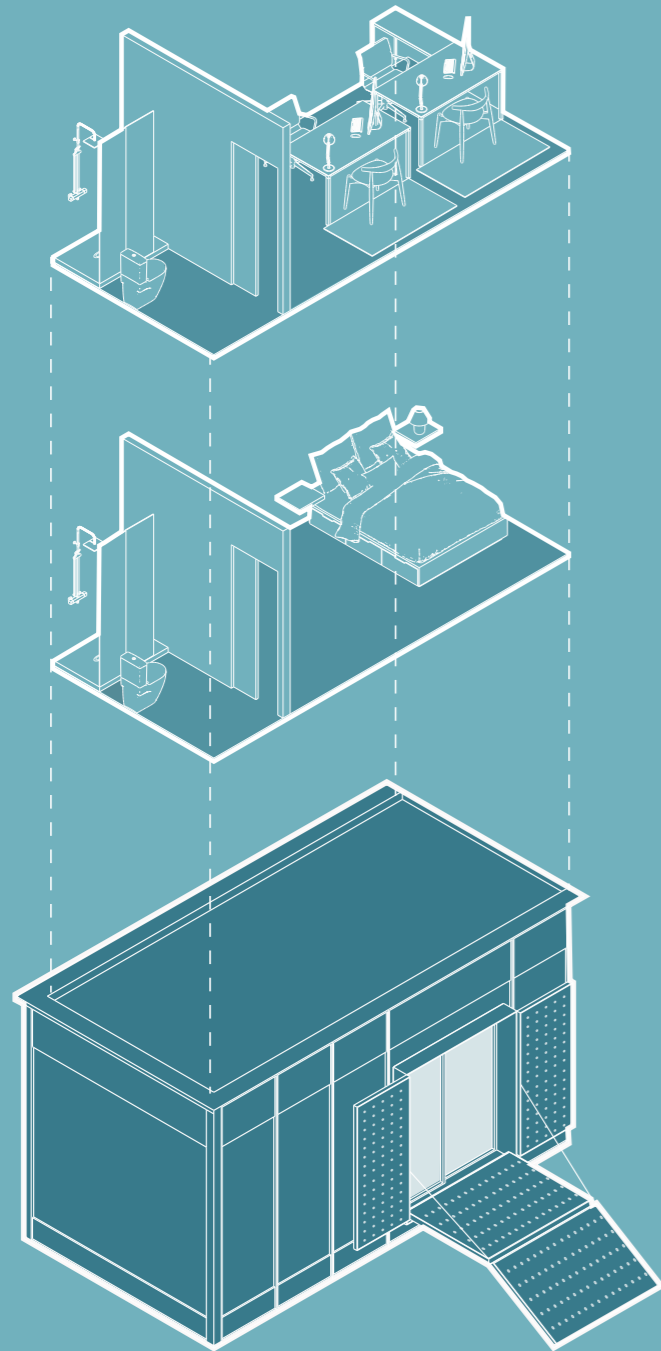
FIXING CRITICISM OF THE PAST



When the designer researches and focuses on critics made to this models and tries to fix them with their design.

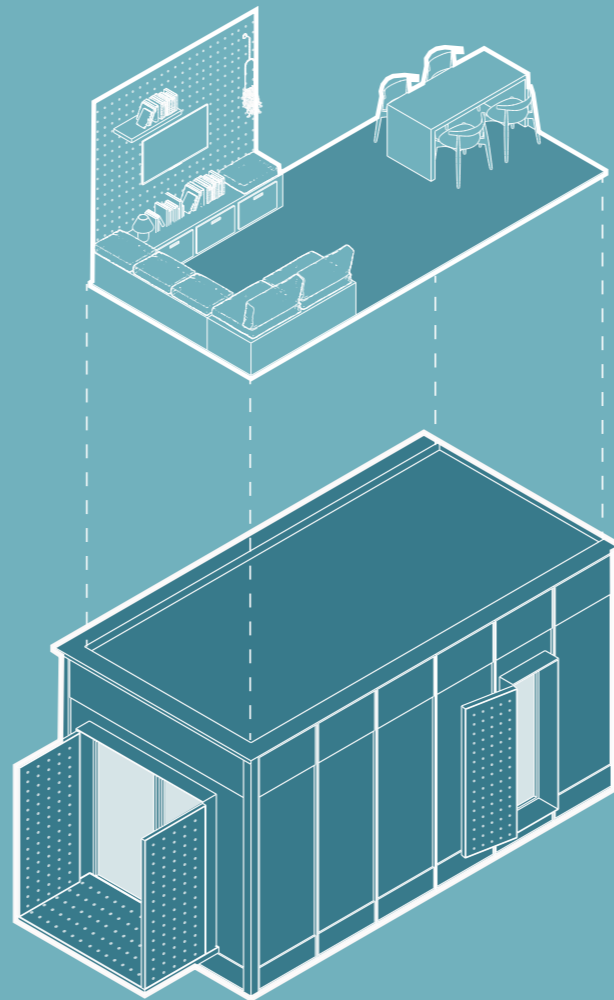
● PSYCHOLOGY CONCLUSION **HOW AURA HOMES BECOME MODULAR**

6 x 3 AURA MODULE
(Independent)



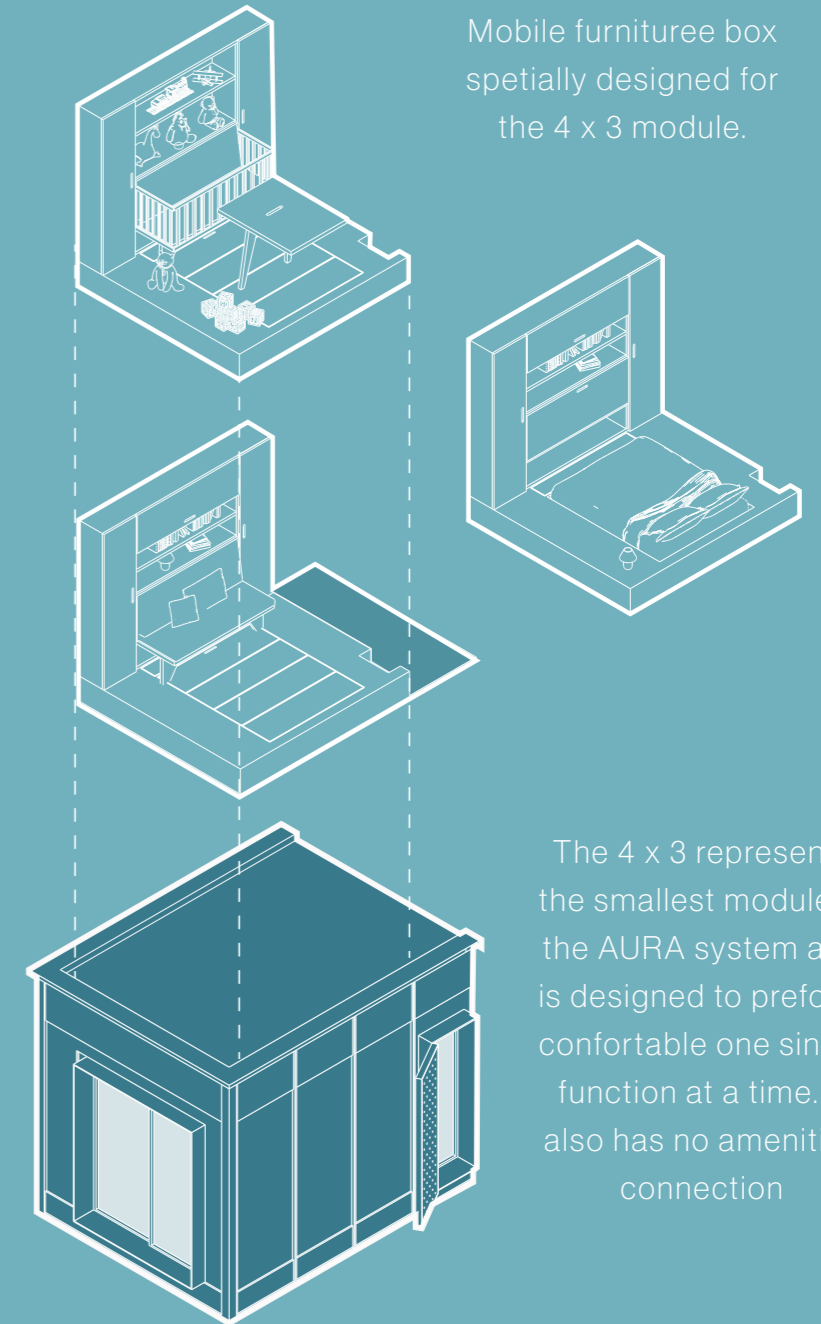
6 x 3 AURA MODULE
(Codependent)

This module was created to work as a connector living module, it has no amenity connections and it should be used together with an independent module.



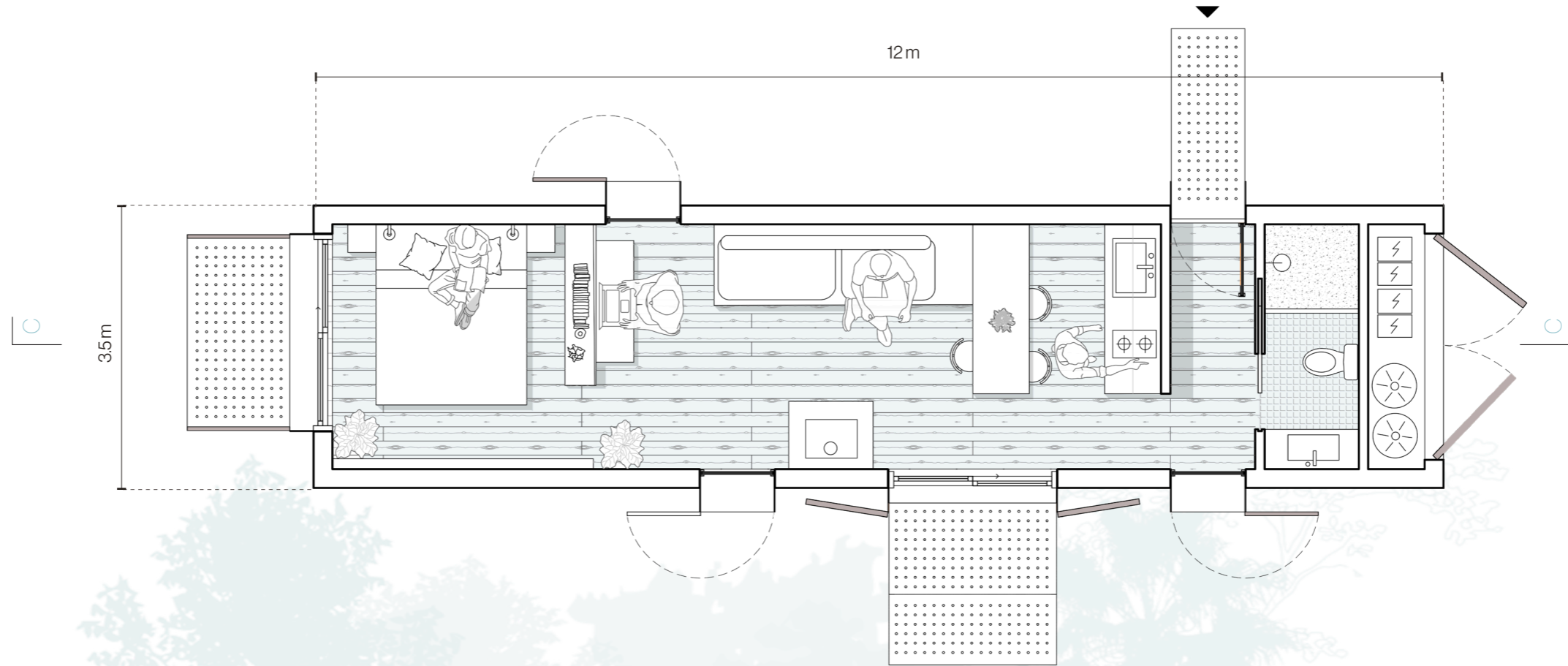
4 x 3 AURA MODULE
(Codependent)

Mobile furniture box specially designed for the 4 x 3 module.

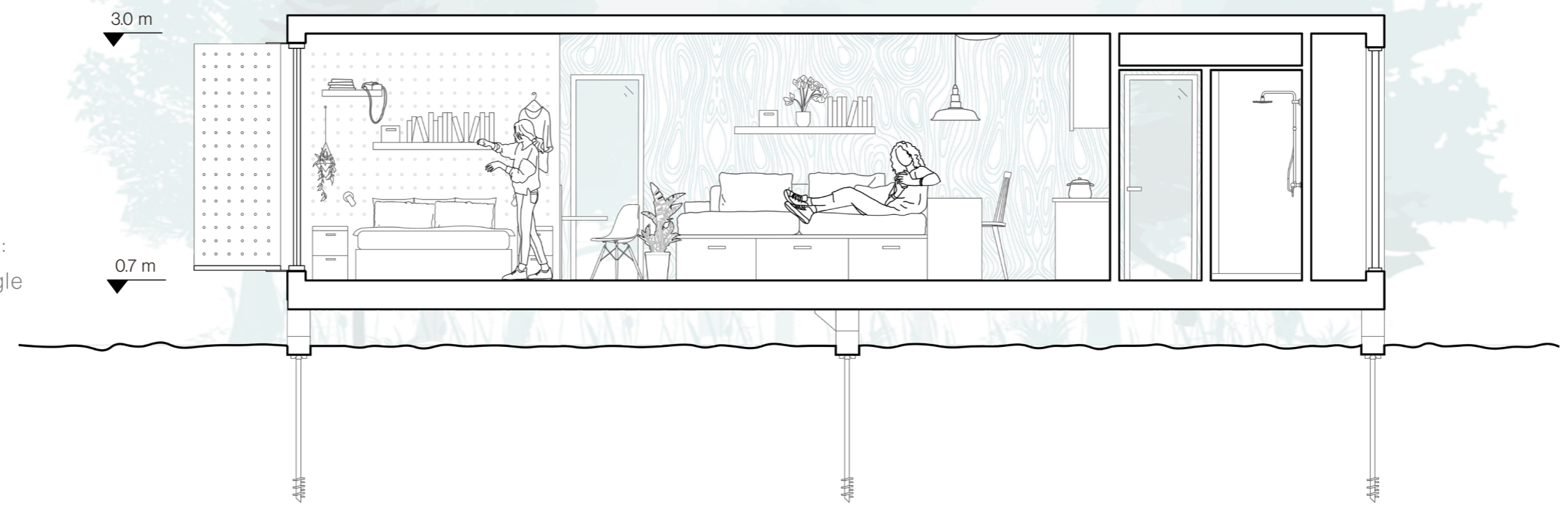


The 4 x 3 represents the smallest module in the AURA system and is designed to perform comfortable one single function at a time. It also has no amenities connection

● PSYCHOLOGY CONCLUSION STARTING POINT AURA M



AURA M 1:30 GROUND FLOOR PLAN



AURA M 1:30 SECTION C-C'

TOTAL AREA

30.1 m²

COMPOSITION

2 Modules together Usable surface :
1 Aura Single 3x6 (empty) 1 Aura Single
3x6 (bathroom included)

HISTORY.

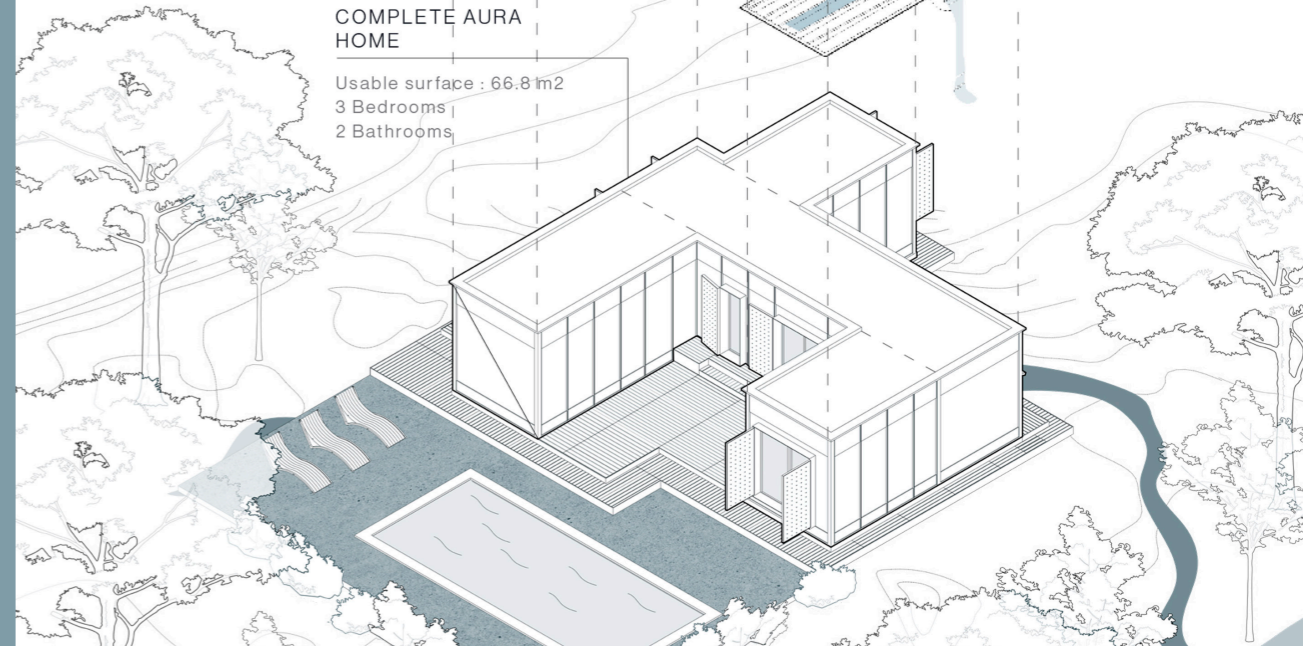
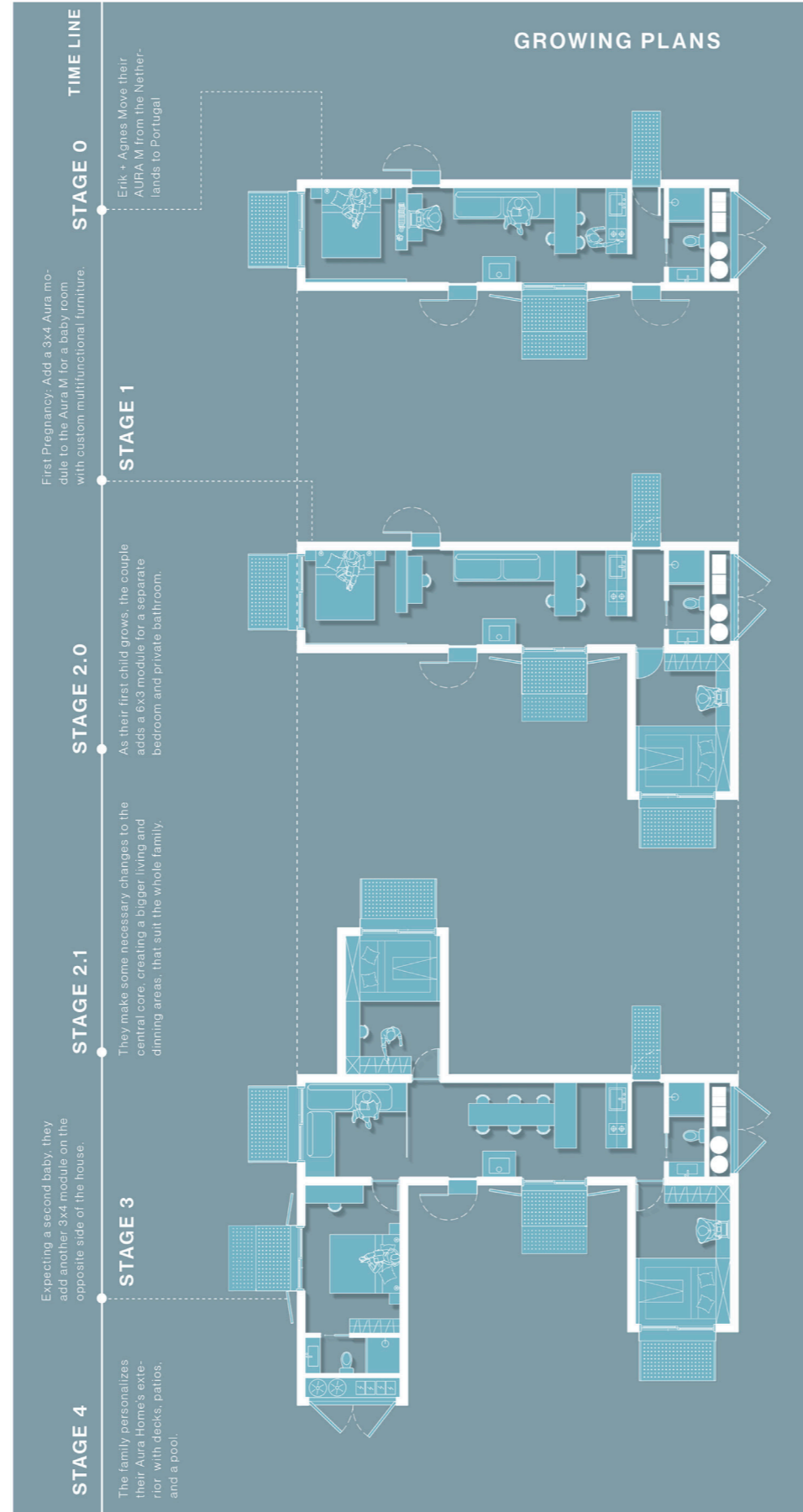
Fixing past criticism

PSYCHOLOGY.

Creating a houses that adapt to users needs over time



GENERAL CONCLUSION THE DEVELOPMENT OF AURA GROW



AURA M(edium)
2 Modules together
Usable surface : 30.1 m²
1 Aura Single 3x6 (empty)
1 Aura Single 3x6 (bathroom included)

AURA SINGLE 3x6
Usable surface : 15.8 m²
Bathroom Included
Machine room

AURA SINGLE 3x4
Usable surface : 9.9 m²
Made to measure multifunctional furniture module

DRAINAGE
Two opposite points of water drainage

● PSYCHOLOGY CONCLUSION **AURA GROW FINAL RESULT**



● CONTROL CONCLUSION **WHAT IT MEANS TO DESIGN ADAPTABLE SPACES**

BABY / CHILD ROOM

Stage 1



TEENAGER ROOM

Stage 2



READING / GUEST ROOM

Stage 3



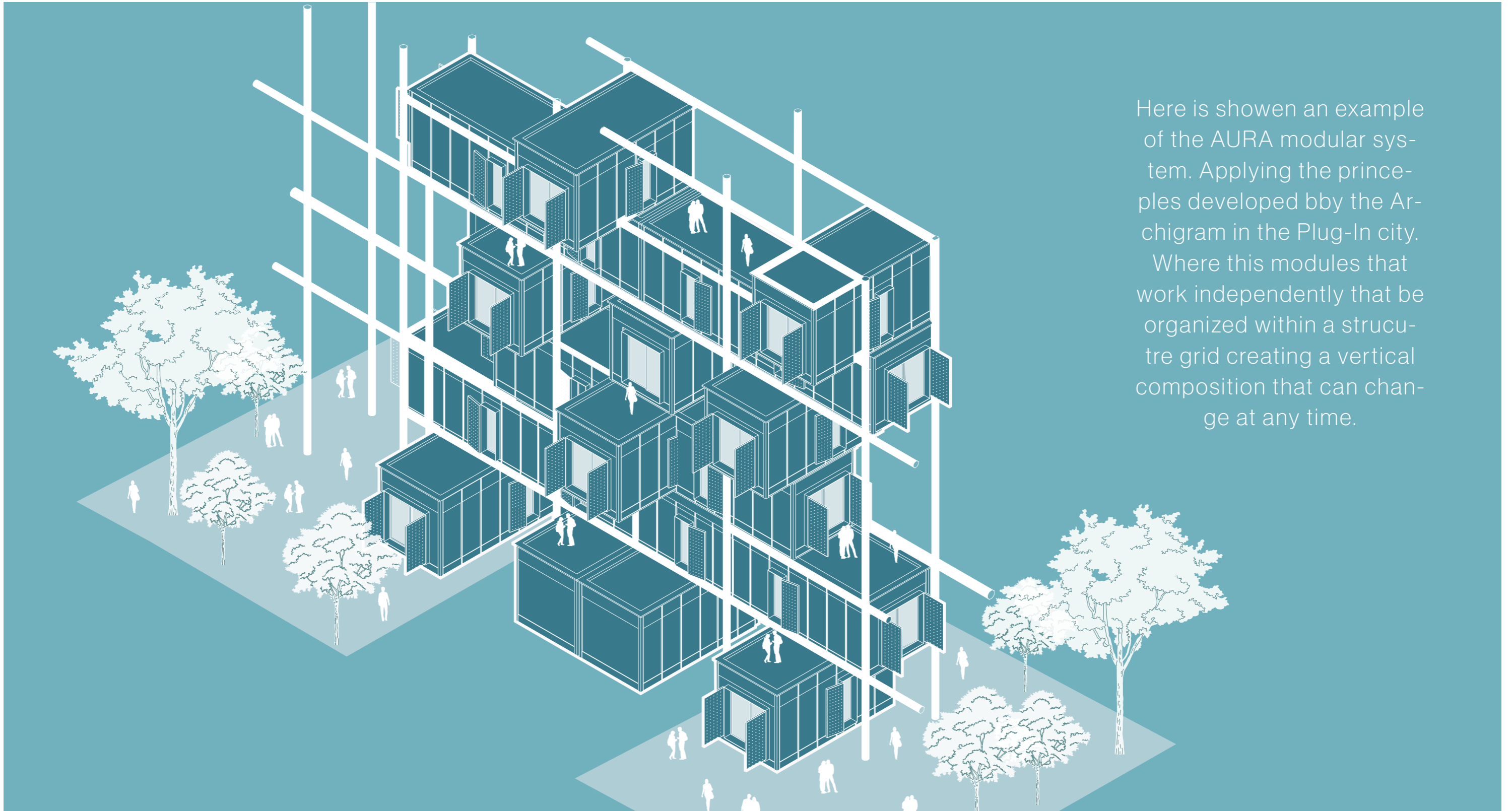
ALLWAYS 10 m2 module

● PSYCHOLOGY CONCLUSION FROM ISOLATION TO INCLUSION



Mobile homes and community bonds

● PSYCHOLOGY CONCLUSION **FROM ISOLATION TO INCLUSION**



Here is shown an example of the AURA modular system. Applying the principles developed by the Archigram in the Plug-In city. Where this modules that work independently that be organized within a structure grid creating a vertical composition that can change at any time.

Mobile homes and community bonds

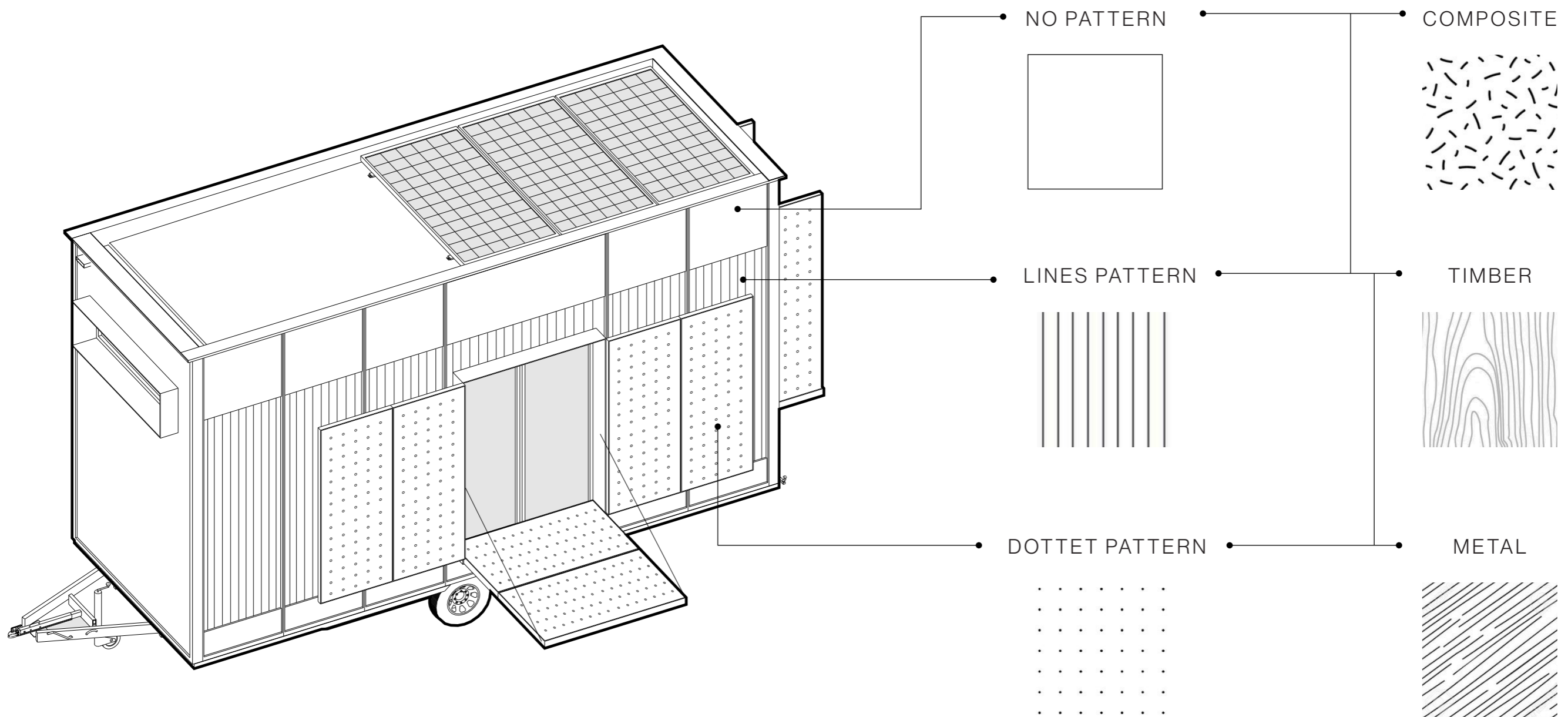
● GENERAL CONCLUSION **PERSONAL CRITICISM**

This homes tend to become more like a product and less like a home due to the lack of personalization available



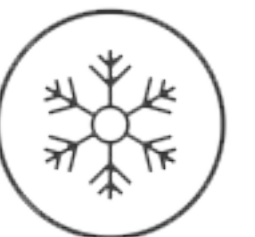
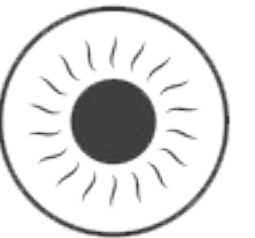
● GENERAL CONCLUSION **PERSONAL CRITICISM**

The building's facades are designed with a variety of patterns, forming a grid that segments the facade. These segmented areas can be customized by users, who have the option to apply different materials to each pattern area. This design allows for numerous combinations, enhancing the potential for personalization.



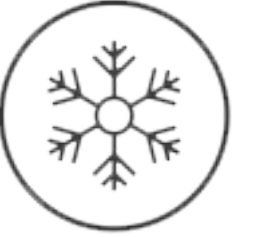
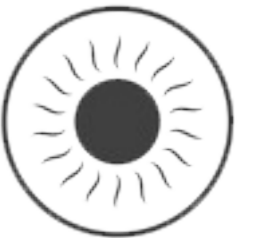
● GENERAL CONCLUSION **PERSONAL CRITICISM**

Design a facade that allows for the combination of different textures and colors to not only make the house more personal to each user but also to improve its performance and durability of materials depending on the climate chosen.



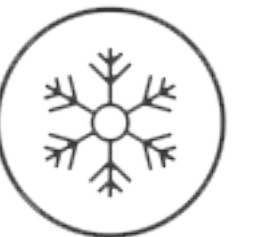
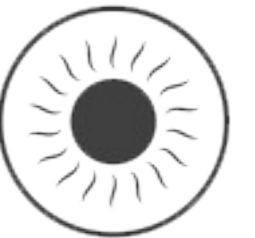
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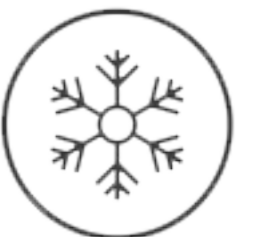
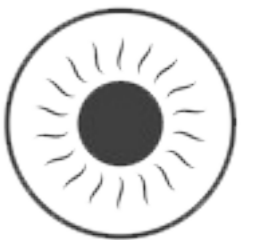
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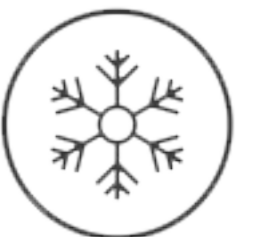
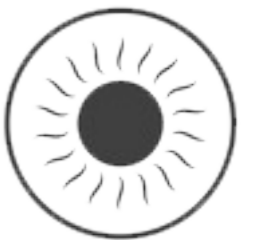
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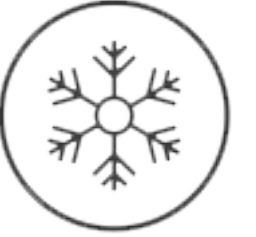
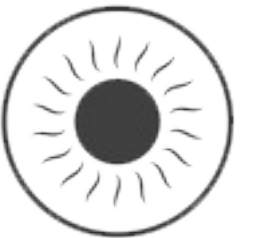
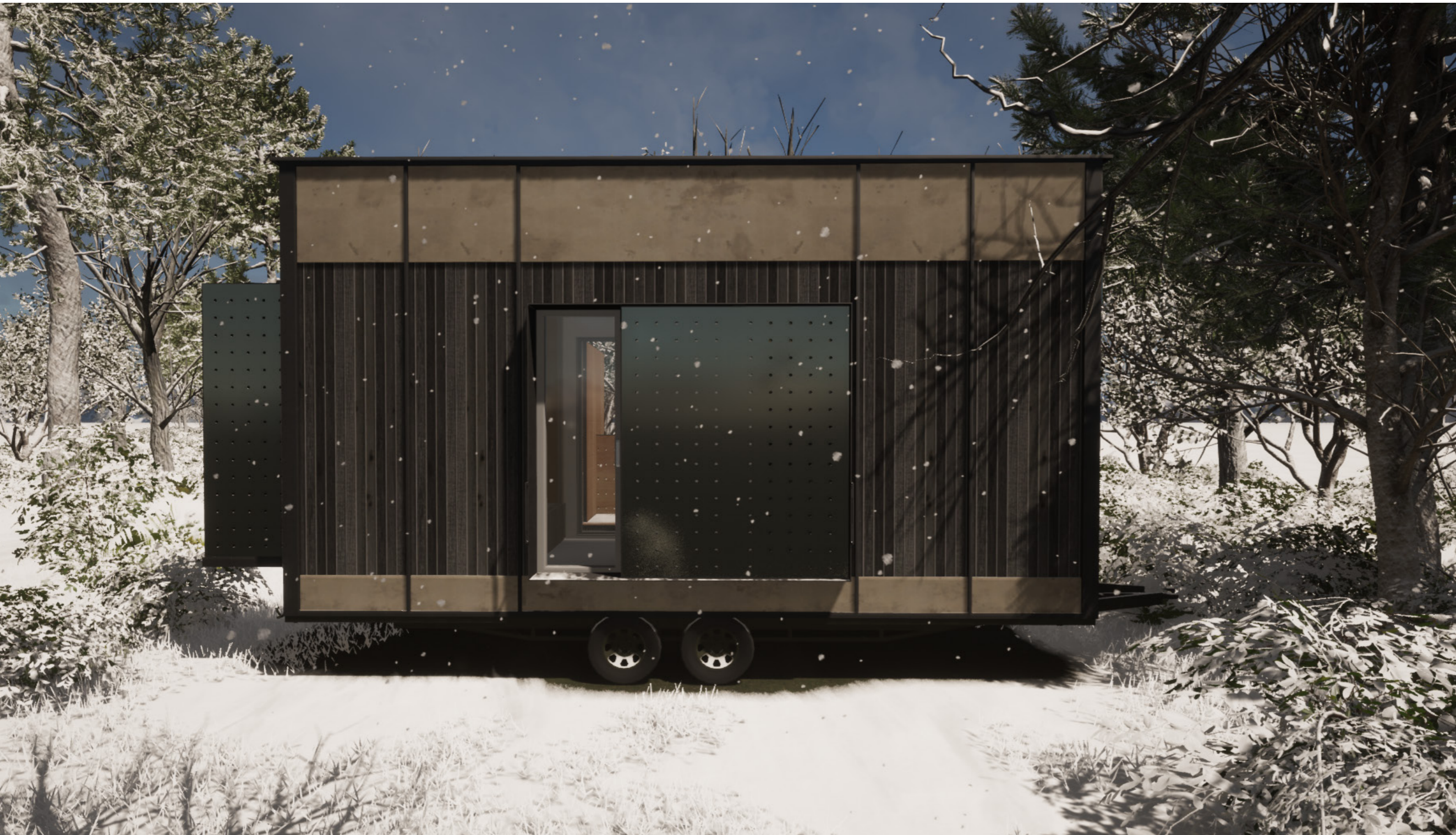
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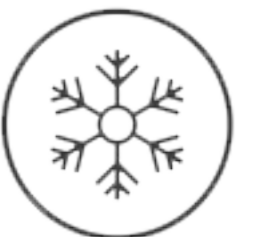
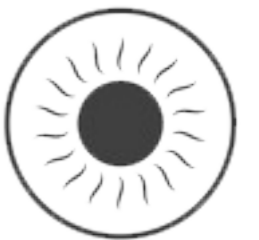
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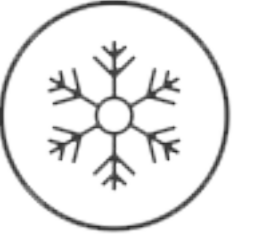
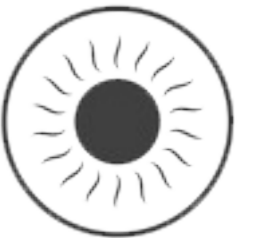
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● GENERAL CONCLUSION **PERSONAL CRITICISM**

Design a facade that allows for the combination of different textures and colors to not only make the house more personal to each user but also to improve its performance and durability of materials depending on the climate chosen.



● GENERAL CONCLUSION **PERSONAL CRITICISM**

Costumization of the interiors



Materiality created for AURA M module



Materiality created for AURA XS module

● GENERAL CONCLUSION **PERSONAL CRITICISM**

Customization of the Layouts : Allowing for different function distributions



Another option explored where a second bed is added to the AURA XS Layout. located underneath the multifunctional module. This bed system allows the user to have guests sleeping over while also being able to store the bed underneath when its not needed with the help of a lever mechanical system.

AURA xs.

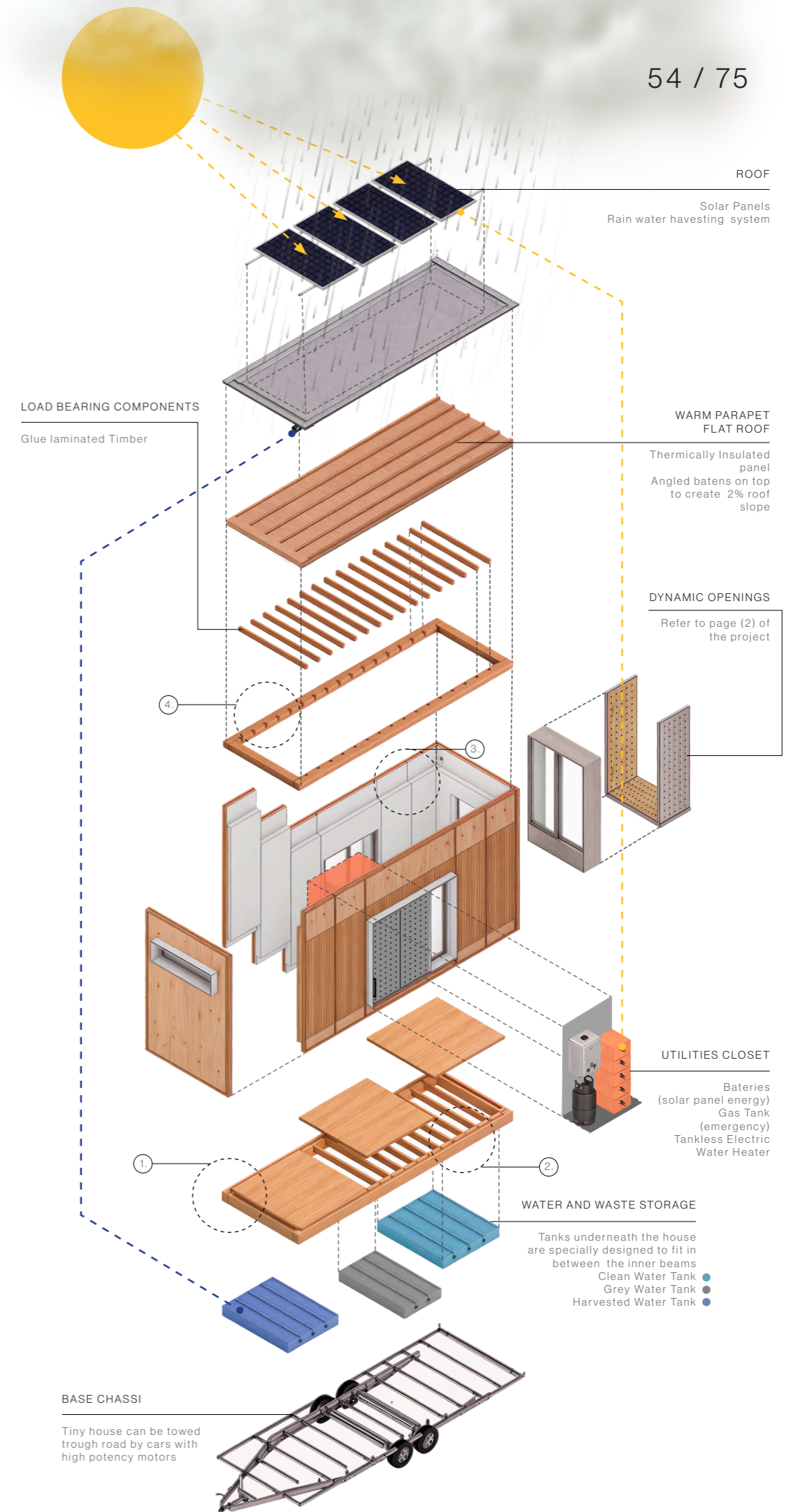
ON THE MOVE - FULLY OFF GRID MODULE

AS A "HOW TO DESIGN FOR NOMADS"
LIVING + CASE STUDY

BOOKLET PAGES 134 - 141



OFF - GRID MOBILE



Analysis

LIVING +

STRUCTURE.

Analyze the structural strategies, elements, and material choices employed in the presented case studies, unraveling their architectural significance and impact.

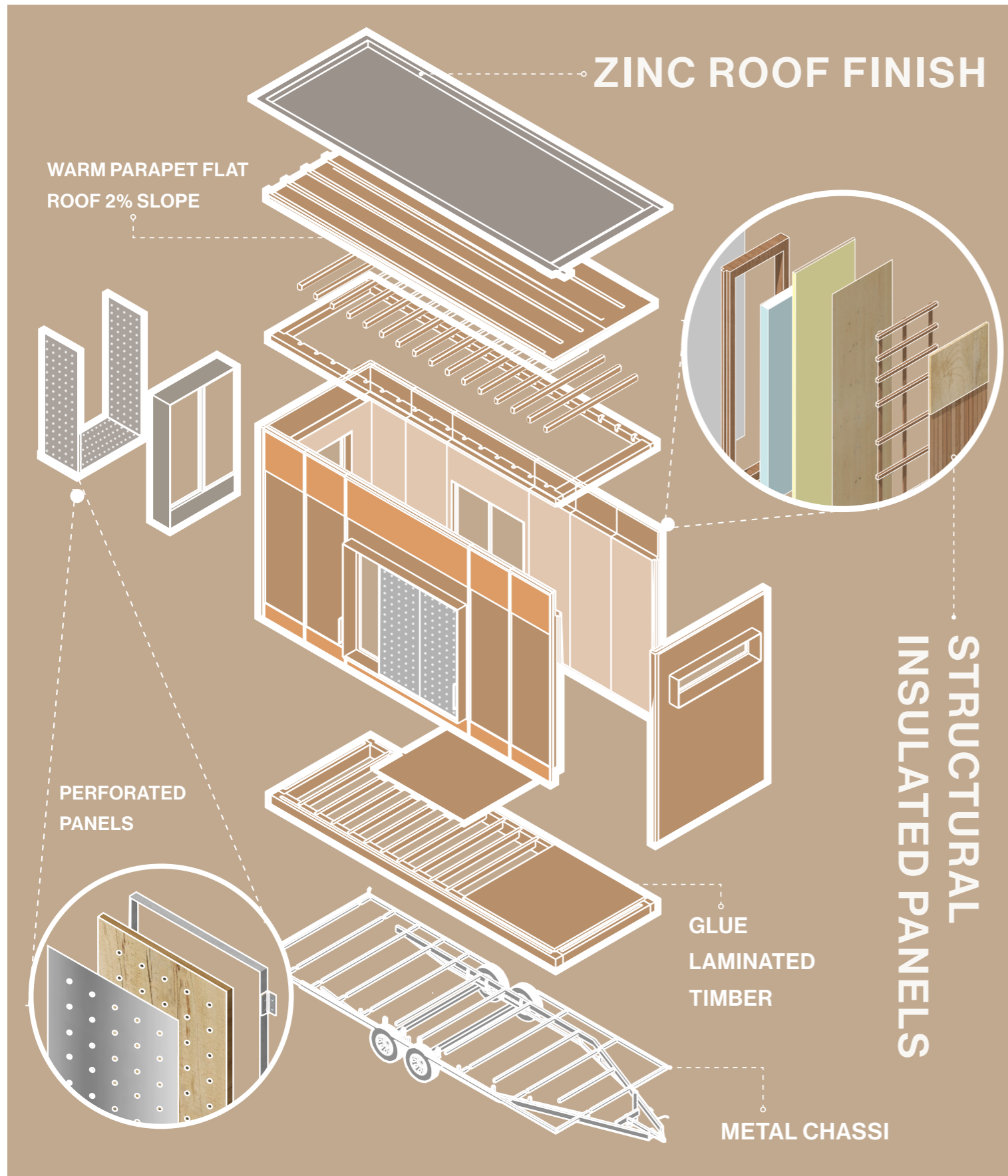
UTILITIES.

Investigate the utility strategies in showcased case studies, dissecting the techniques applied to furnish residences with essential amenities, revealing innovative solutions.

MOBILITY.

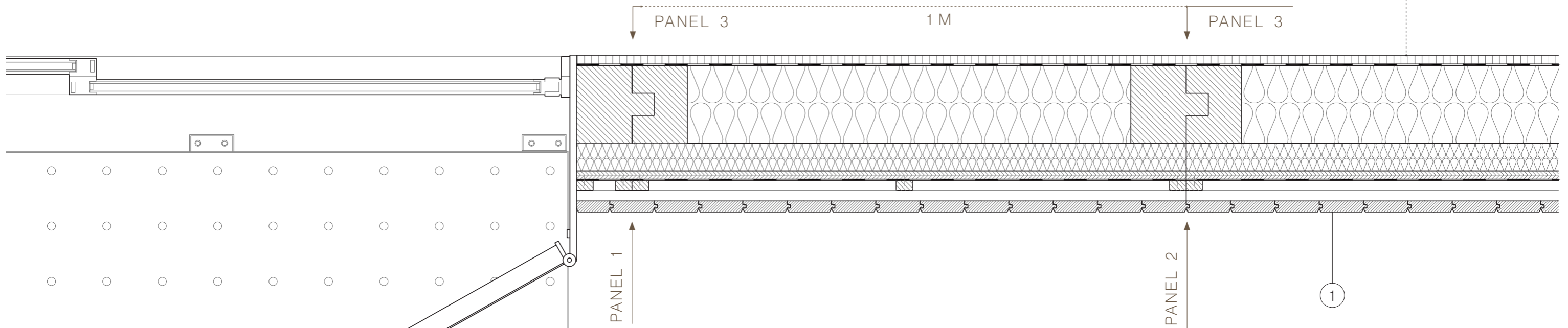
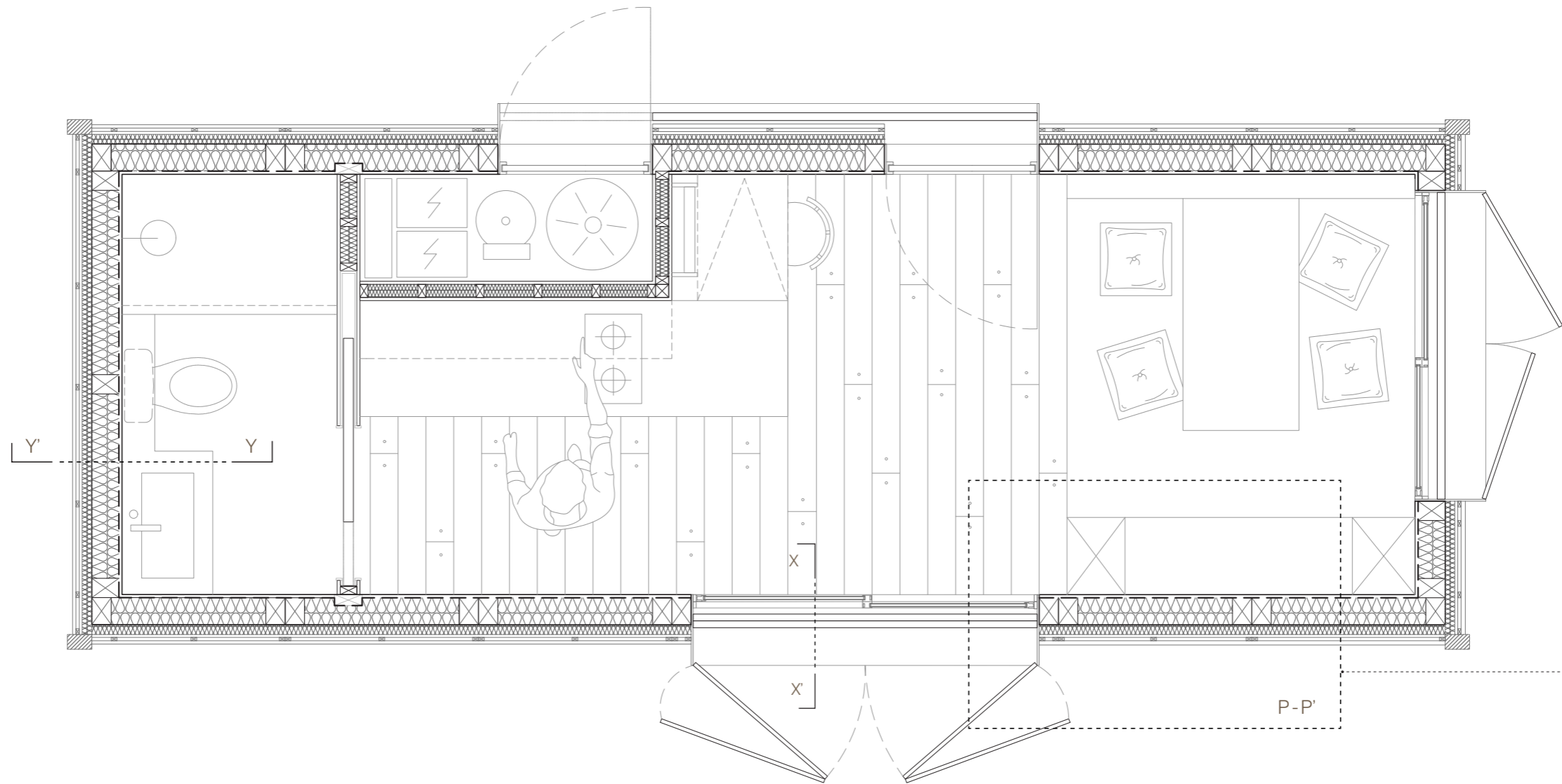
Examine mobility aspects in the featured case studies, building transportation methods and site preparation details, revealing key considerations in construction logistics.

● STRUCTURE OVERVIEW AN ASSEMBLY & DISASSEMBLY SYSTEM

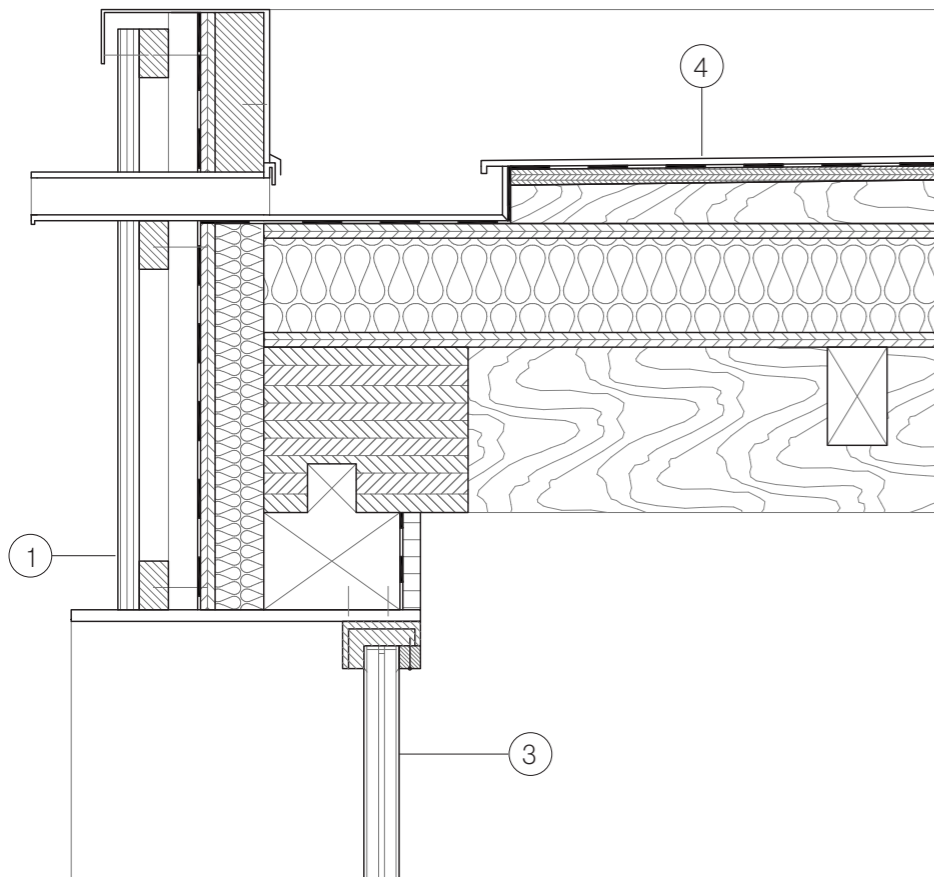


DETAIL JUNCTIONS

● STRUCTURE OVERVIEW AN ASSEMBLY & DISASSEMBLY SYSTEM



● STRUCTURE OVERVIEW AN ASSEMBLY & DISASSEMBLY SYSTEM



1. EXTERIOR WALL

- 12 mm European Larch Timber,
- 30x50 mm Horizontal battens
- 30x50 mm Vertical counter battens
- Waterproof Membrane
- 15 mm Marine Plywood
- 50 mm Acoustic Cork insulation panel
- 100 mm Thermal Insulation Coconut Coir
- Vapour Barrier
- 16 mm Coated Mdf panel (White)

2. INTERNAL FLOOR

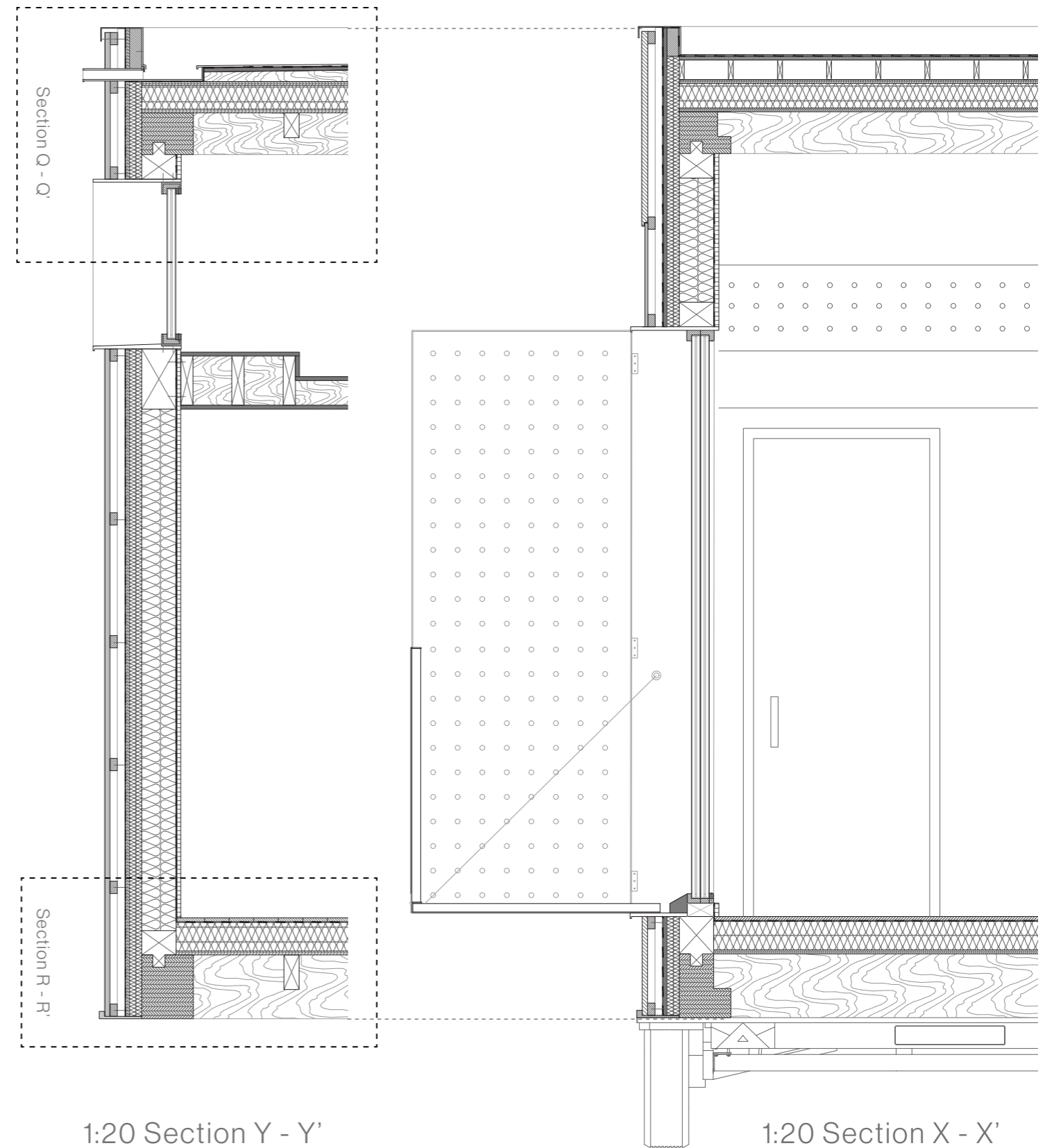
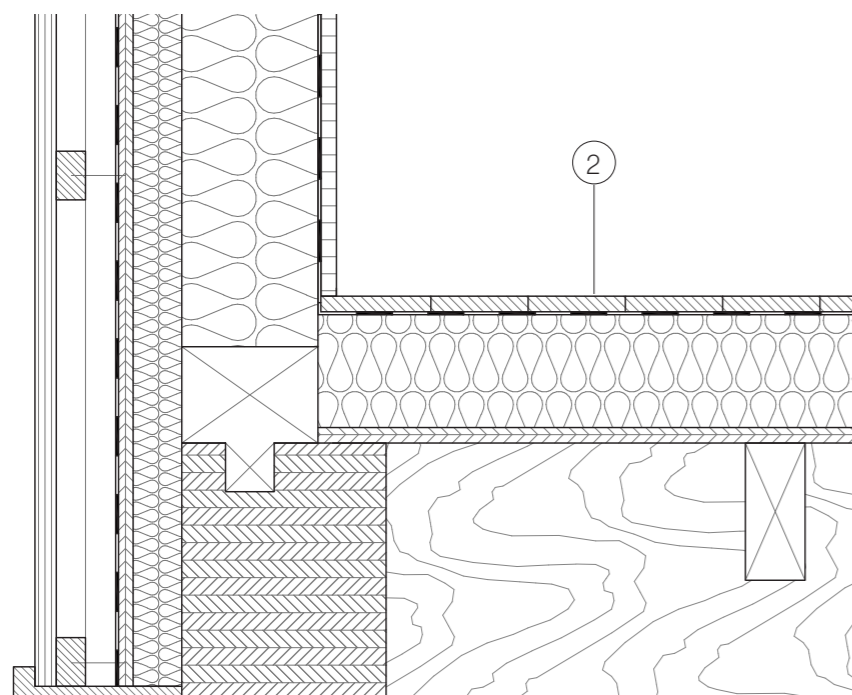
- 16 mm Oak Floor boards
- Vapour Barrier
- 100 mm Thermal insulation
- 16 mm OSB panel
- 60 x 140 mm Gluelaminated Timber Beam

3. WINDOW

- Double Glazing : 12mm + 6mm Cavity + 12 mm
- 100 mm Larch Timber Window Frame
- 12 mm Glavanized Extruded Steel Frame

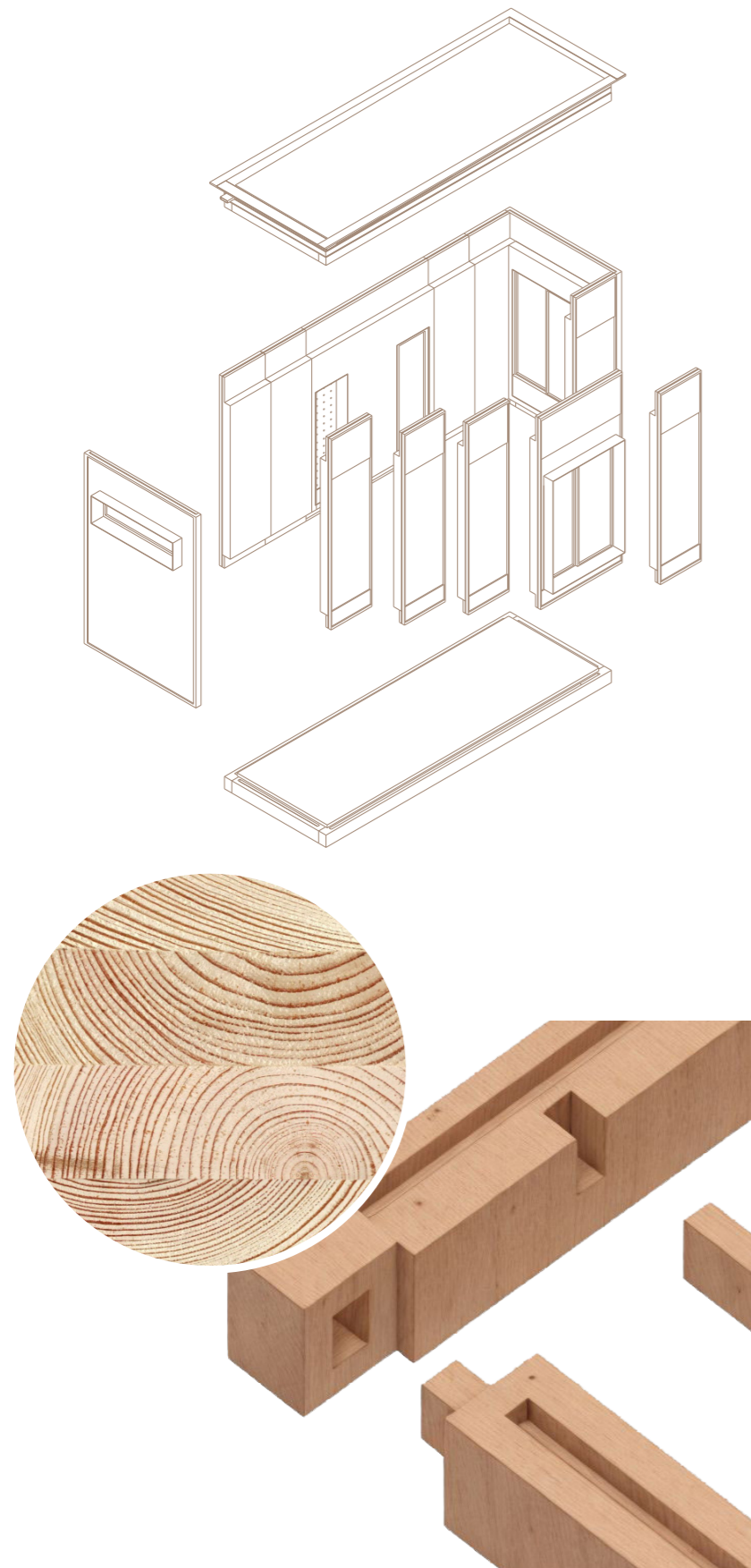
4. PARAPET WARM ROOF CONSTRUCTION

- 3 mm Zinc Roof Finish
- Waterproof membrane
- 15 mm Marine Plywood
- 80 mm Mass Timber Angled Battens
- 15 mm Marine Plywood
- 100 mm Solid Thermal Insulation Board
- 15 mm Marine Plywood
- 60 x 100 mm Gluelaminated Timber Beam

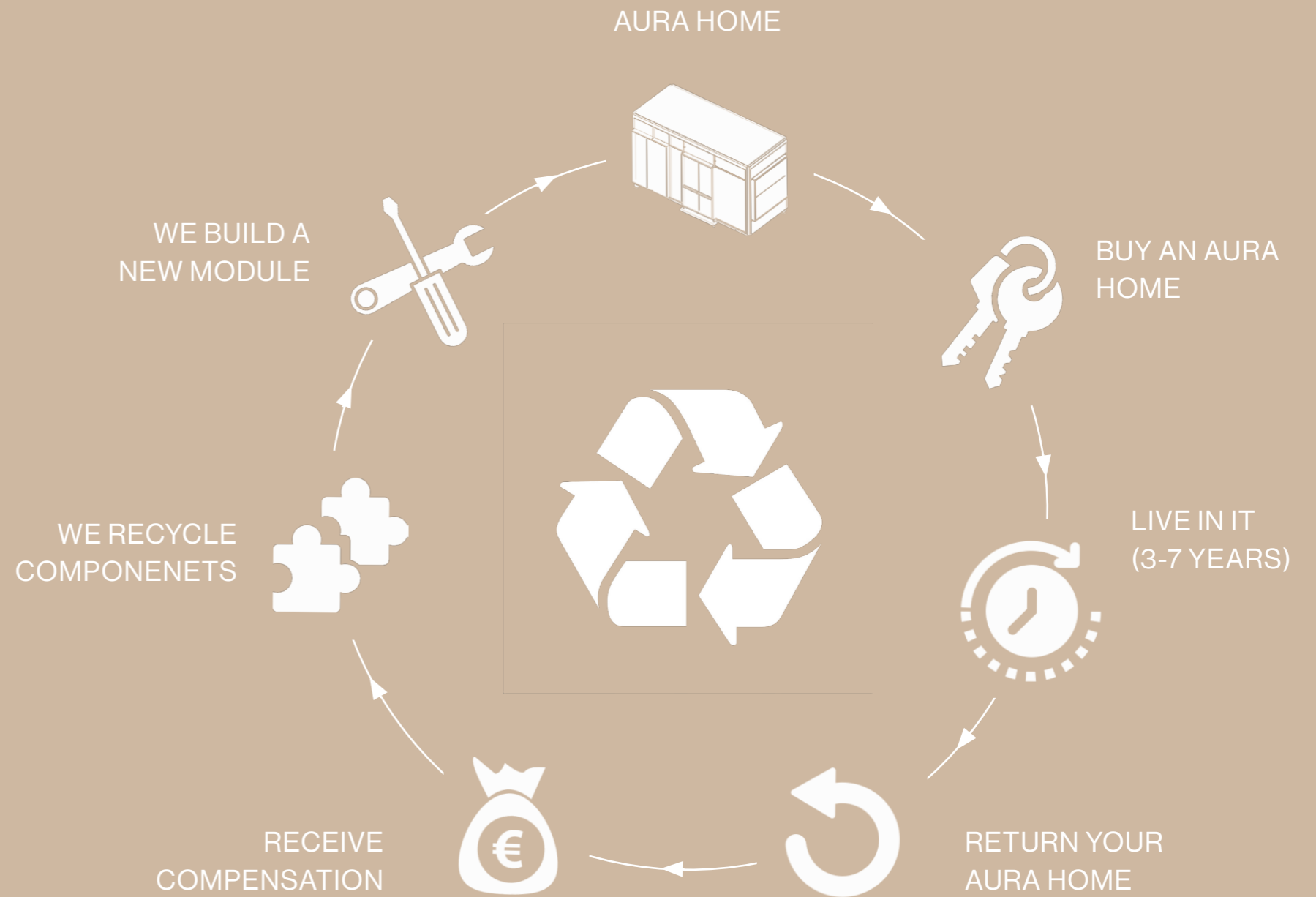


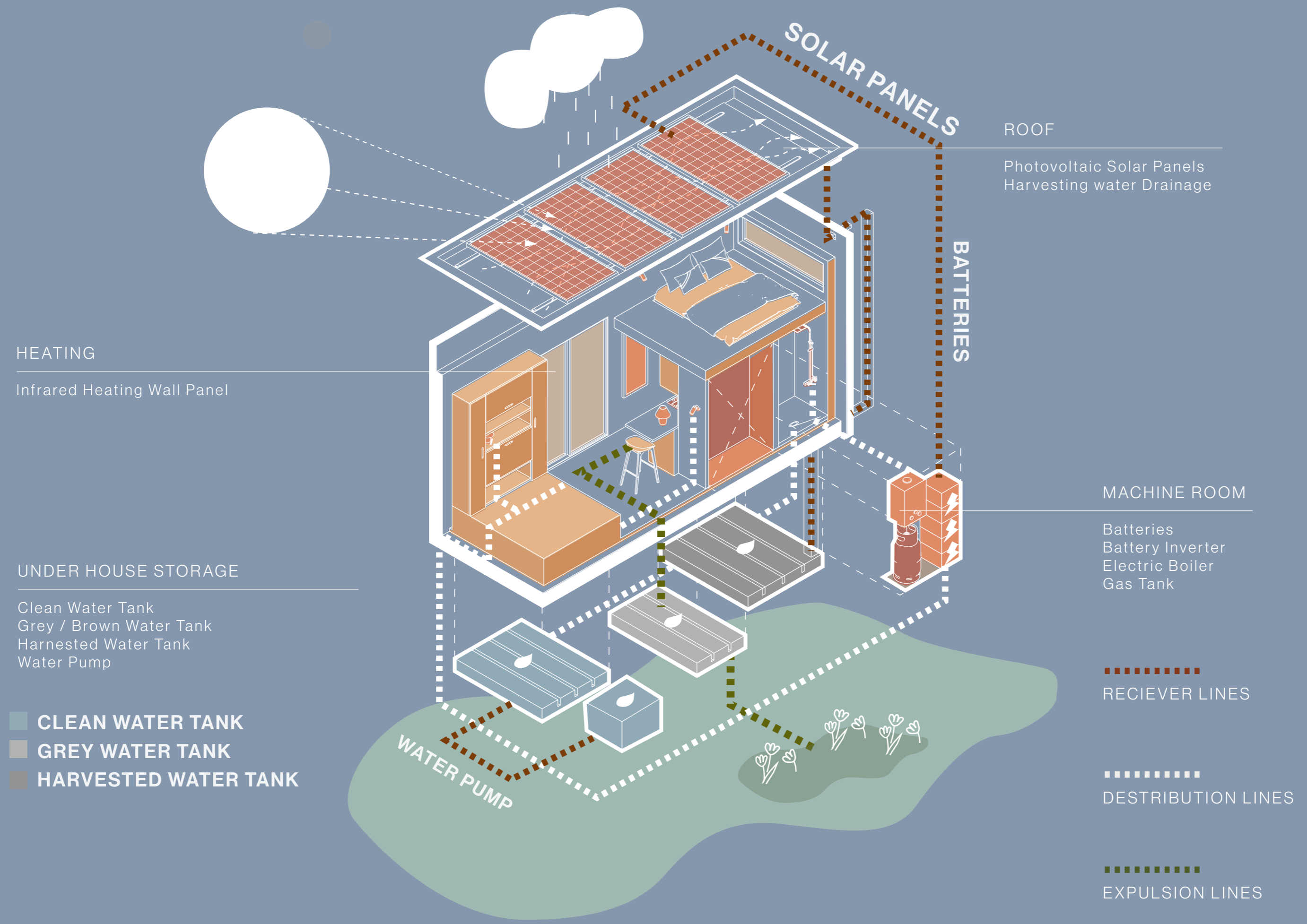
● STRUCTURE OVERVIEW **SUSTAINABILITY AND CIRCULARITY**

USE OF GLUE LAMINATED TIMBER + DETACHABLE STRUCTURE



AURA CIRCULAR STRATEGY:

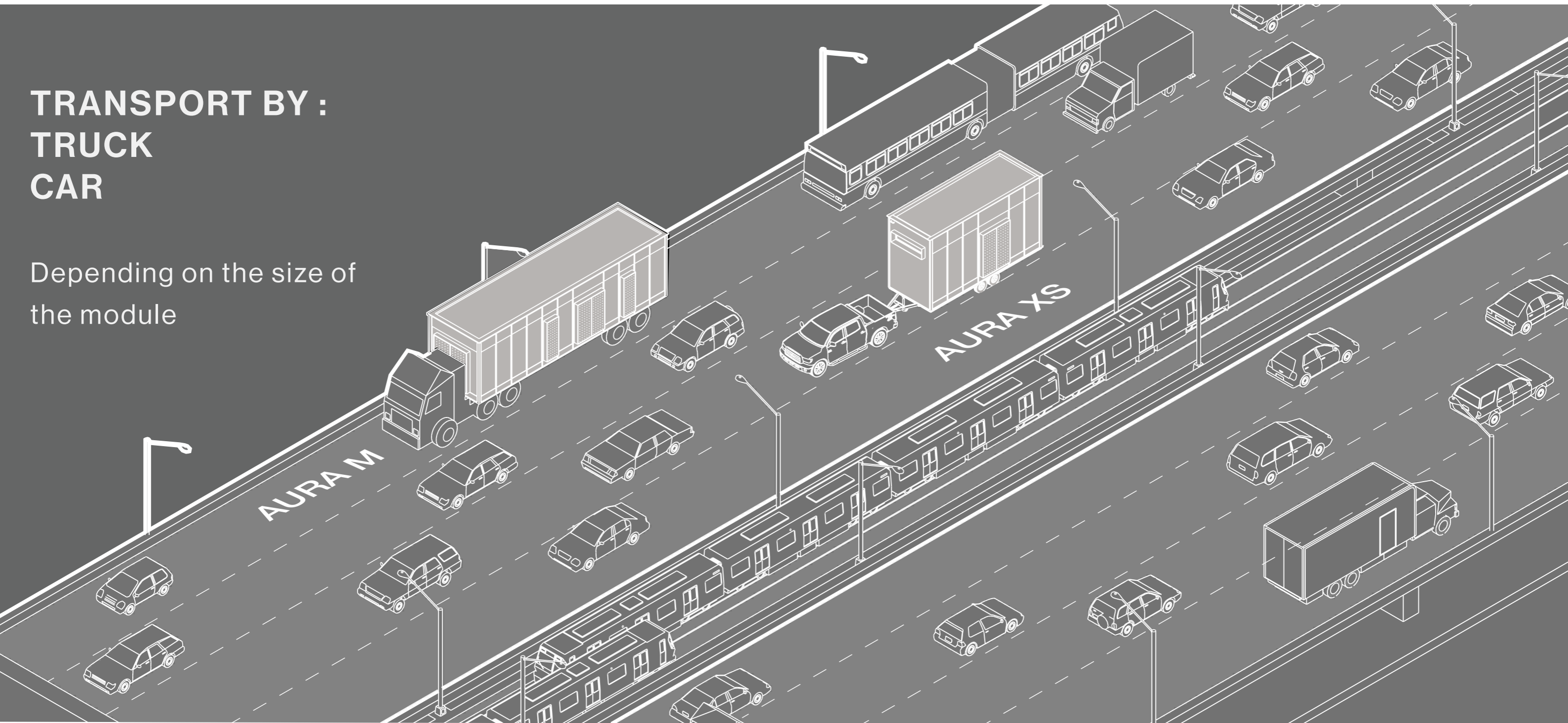




- CLEAN WATER TANK**
- GREY WATER TANK**
- HARVESTED WATER TANK**

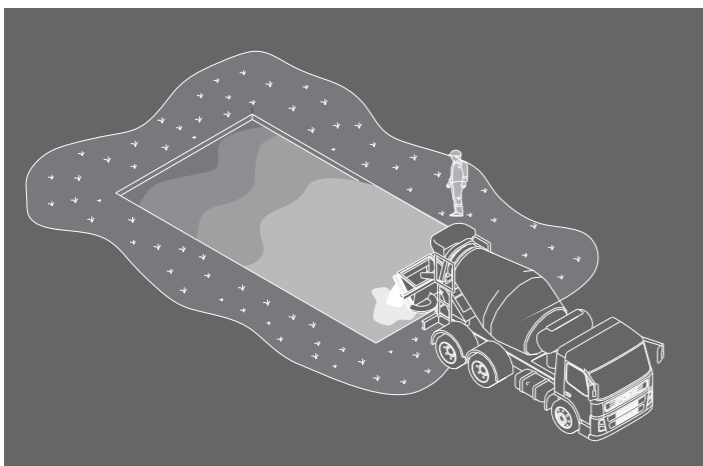
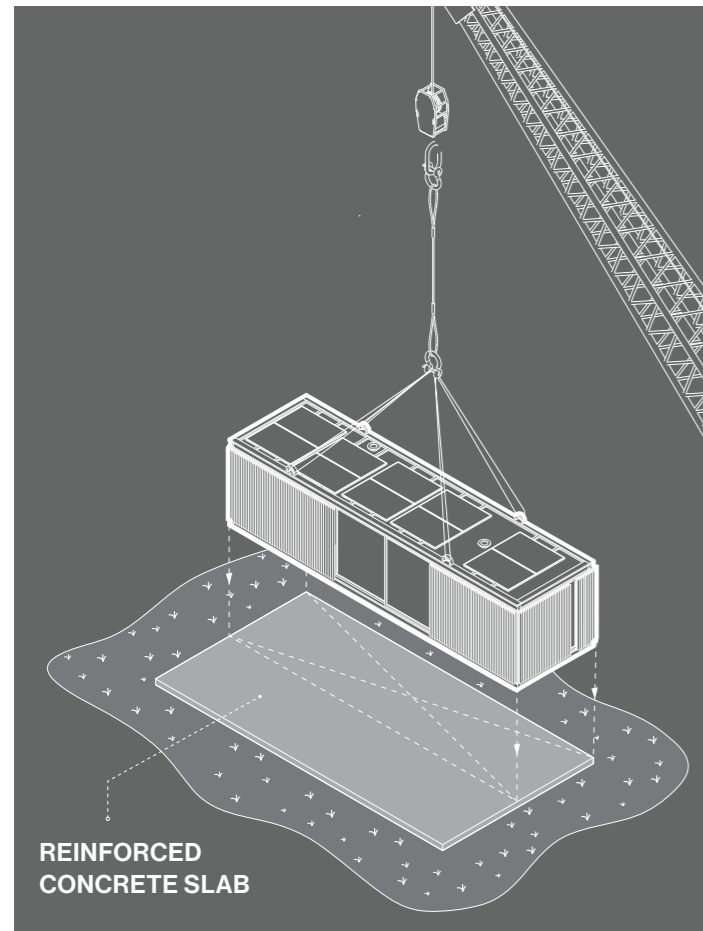
TRANSPORT BY : TRUCK CAR

Depending on the size of
the module

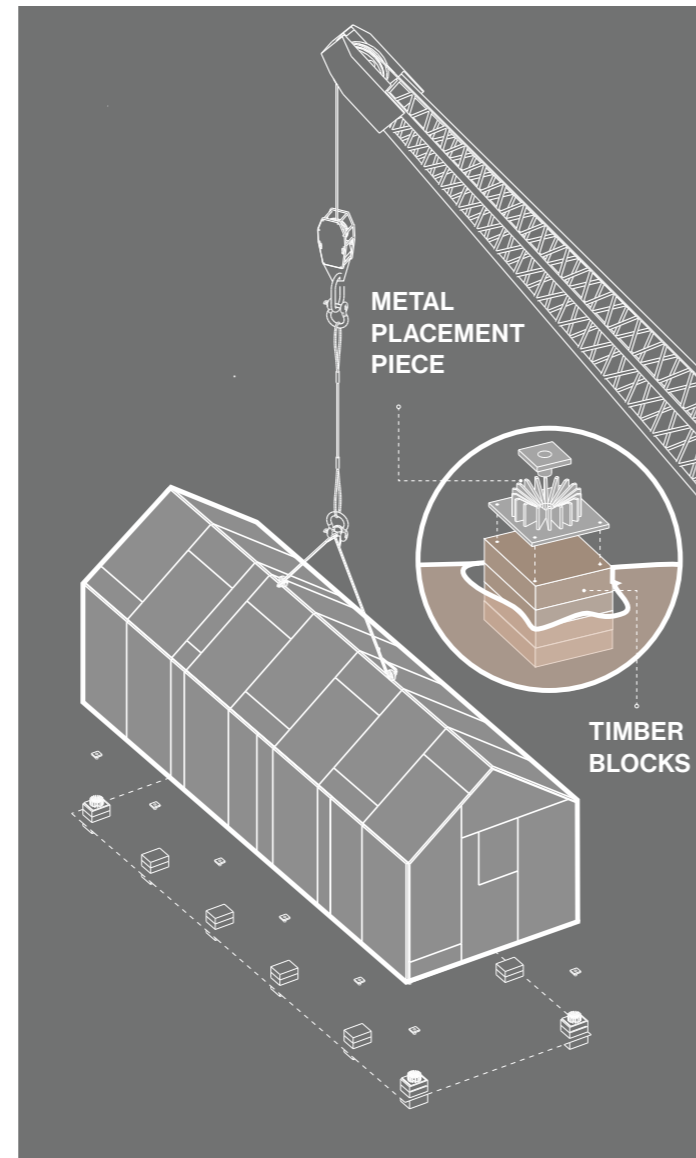


AURA Homes' transportation logistics vary by module size. The AURA XS Mobile, sized at 2.55 by 7 meters, can be towed by cars with strong engines, adhering to road restrictions. Larger modules, like the AURA M at 3 by 12 meters, require truck transport, accommodating up to two modules at once.

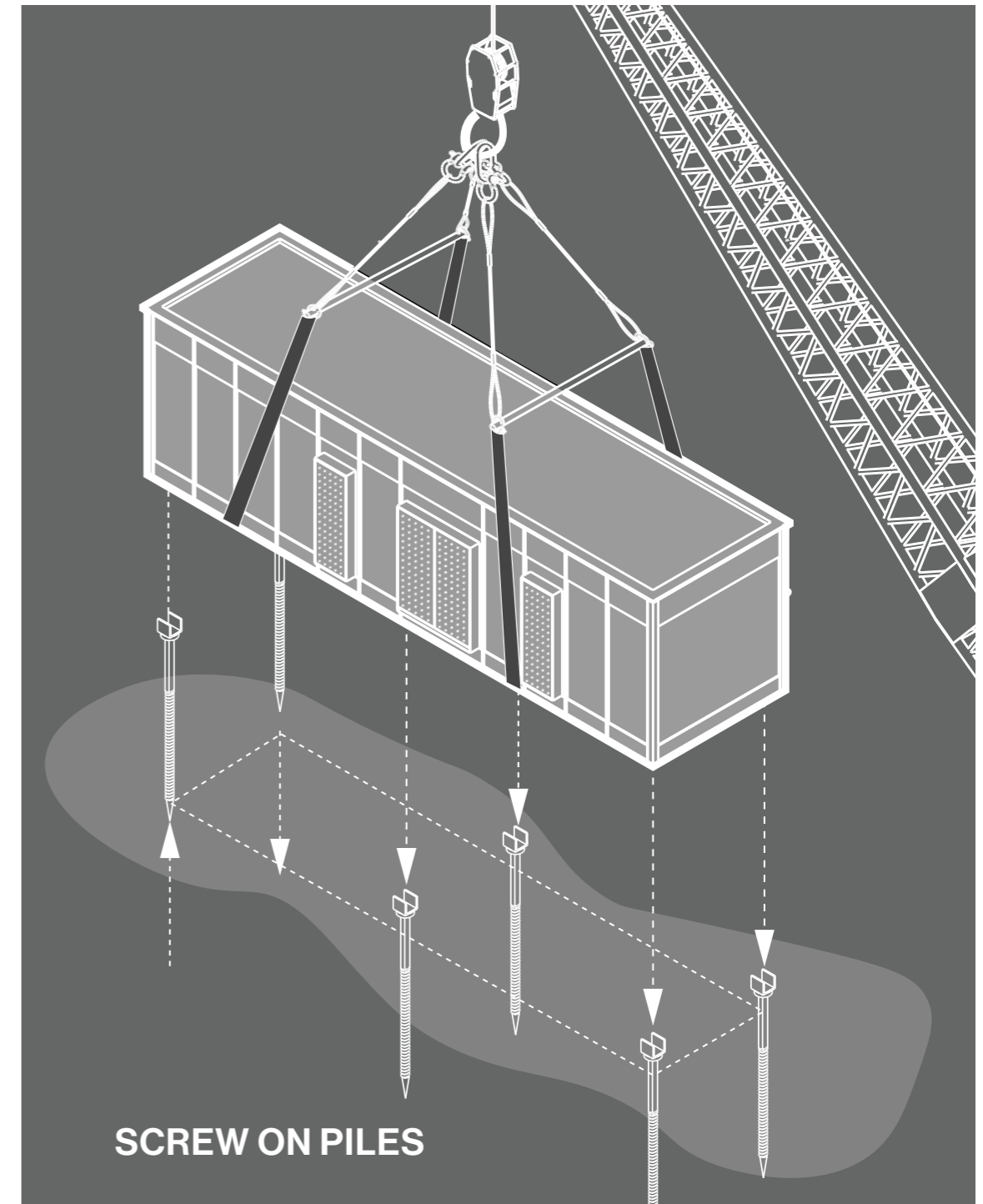
● MOBILITY OVERVIEW **SITE PREPERATION & PLACEMENT**



OTHER FOUNDATION OPTIONS
STUDIED IN THE RESEARCH



SITE PREPERATION



Before installation, a thorough site analysis determines the optimal foundation, often using a crane for precise placement. Screw-on piles are chosen in the specific case of the AURA Grow for their stability in varying soil conditions.

PROJECT REFLECTION.



Thank you
— the end