modulum

FLOATING CONSTRUCTIONS
FOR THE NEXT CENTURY OF ADAPTATION

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Author
Deya Radeva

Institution
TU/Delft

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Form Studies & Design of Construction:
Technologies & Aesthetics

Mentors
Veerle de Vries
Koen Mulder
Peter Koorstra

CONTENT

We, as humans have undergone profound transformations over time, with an incredible amount of change occurring in just the past century. In this short span of time , we have evolved intellectually, our technology has advanced at an unprecedented rate, nature itself has been altered, and our perception of life and its limitless possibilities has shifted. Now, try to imagine what further changes could unfold over the next 100 years. Everything around us is in a state of constant flux. Change is not a temporary phase; it is the essence of life itself, unfolding perpetually.

In this ever-evolving landscape, aesthetics play a crucial role. Our appreciation of beauty, harmony, and design—profoundly influences how we experience the world. It's not just about how things look; it's about how they make us feel. In architecture and technology, the way something is designed can significantly impact its acceptance. When a design speaks to our senses, we are more likely to embrace it, no matter how novel or advanced it may be.

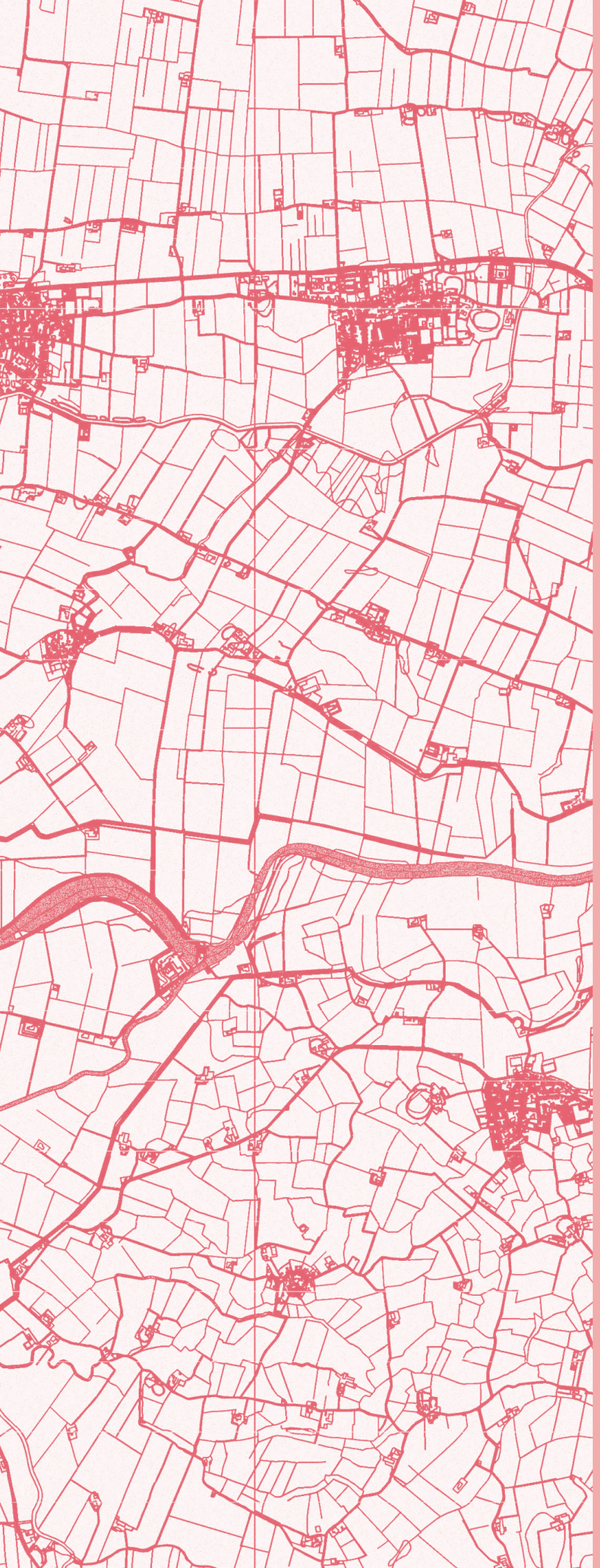
As our surroundings evolve to meet new demands of society, sustainability, and climate, the importance of aesthetic appeal will grow. The future will not only be about innovation but also about the visual and emotional appeal. Ultimately, what we build will reflect the nature of human experience. Just as we have reshaped ourselves and the world around us, so too will our built environment continue to change, reflecting the fluid and ever-evolving nature of human life.

INTRODUCTION

This manual introduces a modular building system designed to provide a future-proof solution for the challenges facing the Reitdiep River area over the next century and beyond. By analyzing the current conditions and projecting future scenarios, it proposes a solution that can adapt to environmental changes, such as fluctuating water levels and climate change. The modular design allows for easy assembly, customization, and future expansion even after 100 years.

The focus then shifts to the chosen material - aluminium - highlighting its potential for construction in the context. The manual gradually expands from the small- to the larger scale, showcasing a catalogue of elements involved in the construction process, including structural components, connectors, panels, etc. It provides an explanation of the techniques required to build the modular systems, along with descriptions of additional features and specialized mechanisms, such as passive cooling and ground leveling. The manual also outlines the variations the system can offer and identifies the limitations of its design.

Finally, a step-by-step guide for constructing a modular house is presented, from assembly to potential future expansions, making it a comprehensive resource for those looking to adapt to the evolving landscape of the Reitdiep.

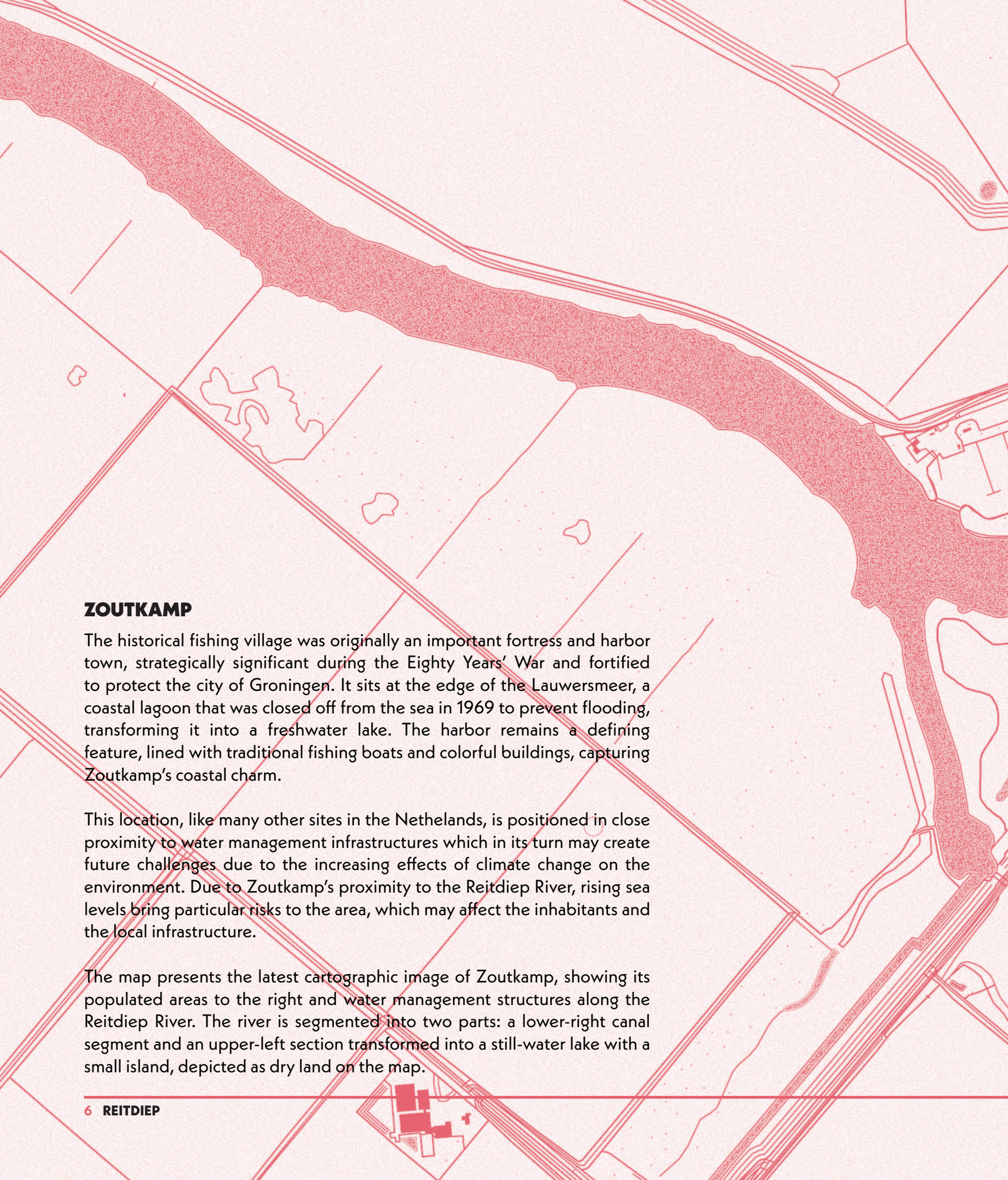


REITDIEP

The Reitdiep River area's landscape is deeply rooted in its rich cultural heritage, characterized by intricate small-scale parceling and a distinct historical presence. This dynamic landscape has been shaped over centuries by the interplay of sea and river forces. Periods when freshwater creeks meandered through the land, leaving deposits of sand, alternated with phases where salty seawater pushed far inland, layering the terrain with clay. This constant ebb and flow of water has created a unique and evolving environment that reflects both natural and human history.

This chapter will further examine Zoutkamp, a historical fishing village located within the Reitdiep River valley. Presently, water levels and land use are managed by a series of controlled dikes and drainage systems, but the future holds uncertainty. Predictions indicate an increase in the frequency of extreme weather events and sea level rise, which could lead to fluctuating water levels. This chapter will delve into Zoutkamp's current water dynamics and anticipate future scenarios, highlighting the implications of these shifts for adaptive architecture and design solutions tailored to both wet and dry conditions.

MAP OF REITDIEP VALLEY **SCALE 1:5000**



ZOUTKAMP

The historical fishing village was originally an important fortress and harbor town, strategically significant during the Eighty Years' War and fortified to protect the city of Groningen. It sits at the edge of the Lauwersmeer, a coastal lagoon that was closed off from the sea in 1969 to prevent flooding, transforming it into a freshwater lake. The harbor remains a defining feature, lined with traditional fishing boats and colorful buildings, capturing Zoutkamp's coastal charm.

This location, like many other sites in the Nethelands, is positioned in close proximity to water management infrastructures which in its turn may create future challenges due to the increasing effects of climate change on the environment. Due to Zoutkamp's proximity to the Reitdiep River, rising sea levels bring particular risks to the area, which may affect the inhabitants and the local infrastructure.

The map presents the latest cartographic image of Zoutkamp, showing its populated areas to the right and water management structures along the Reitdiep River. The river is segmented into two parts: a lower-right canal segment and an upper-left section transformed into a still-water lake with a small island, depicted as dry land on the map.

MAP OF ZOUTKAMP **SCALE 1:1000**

LOCATION VISIT

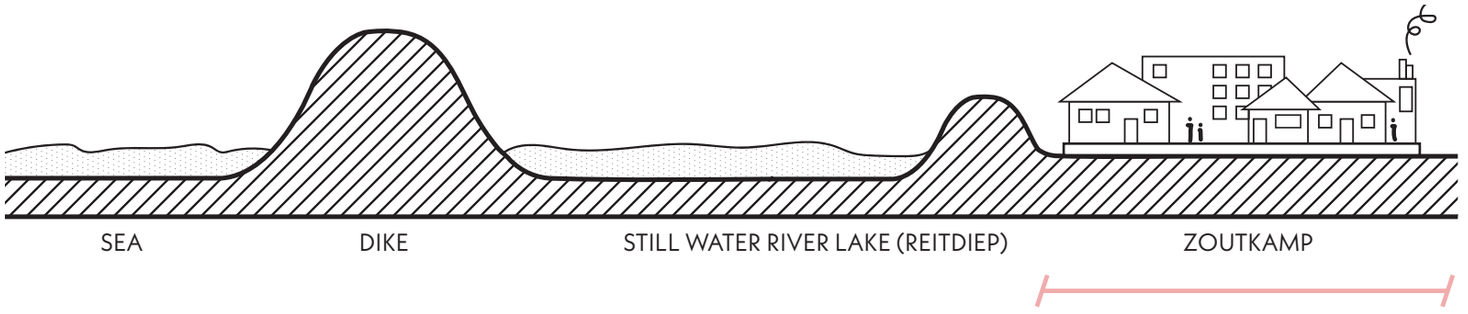
Upon visiting the site however, it was revealed that this area is almost entirely submerged under water up to three meters deep, with only a narrow pathway encircling the small land. After further research, it was found that this specific area experiences alternating wet and dry periods due to fluctuating water levels, a condition influenced by climate change. Seasonal and tidal variations, along with changing weather patterns, lead to significant shifts in water depth, affecting the terrain's accessibility and usability. This natural fluctuation introduces both challenges and opportunities, making it a fitting location for a design proposal aimed at adaptability in water-prone landscapes.

MAP OF ZOUTKAMP - WET PERIOD **SCALE 1:1000**

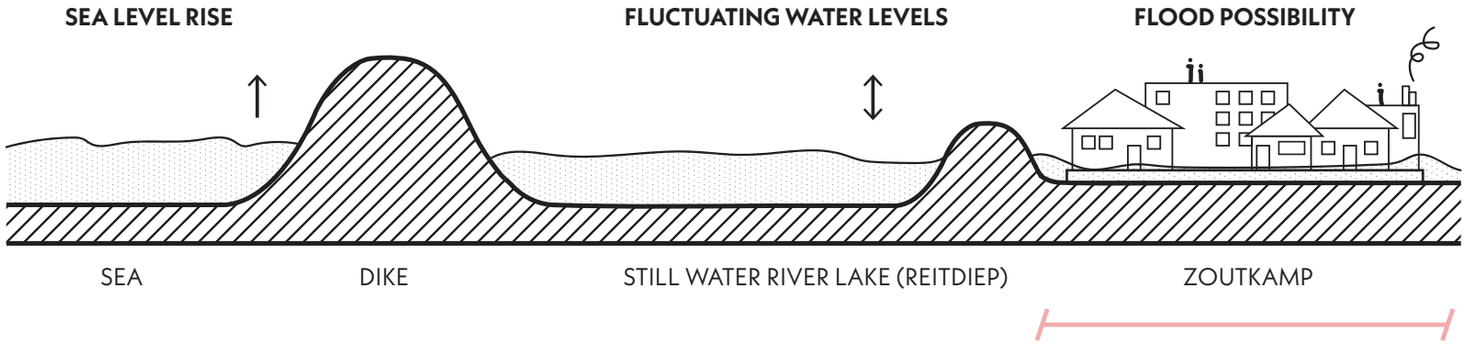
SCENARIO PREDICTION

As sea levels rise and fluctuating water levels become a reality, traditional housing in vulnerable areas like Zoutkamp faces increasing risks. Protected by dikes for now, the village may eventually experience flooding that could damage existing structures and displace residents.

CURRENT SCENARIO



FUTURE SCENARIO



PROPOSAL

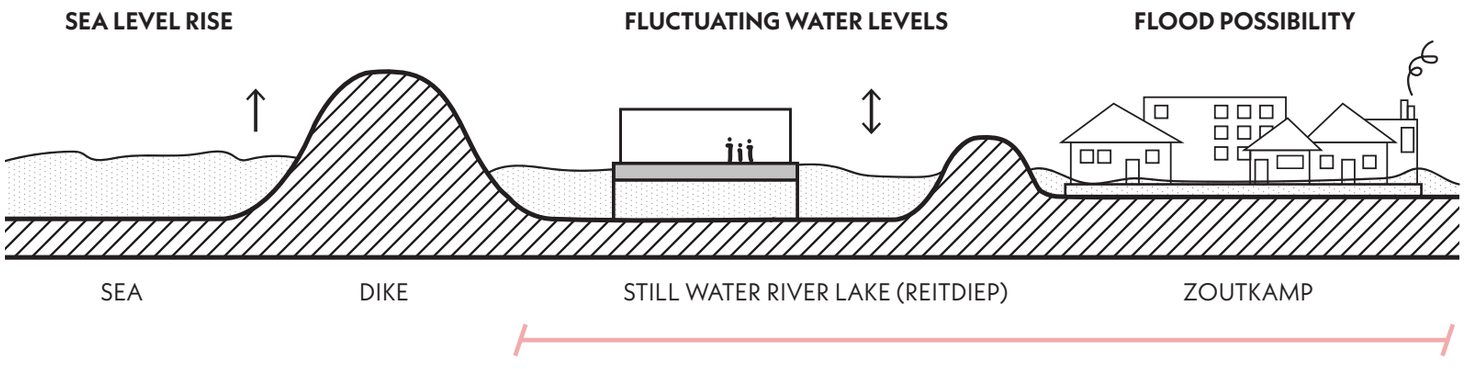
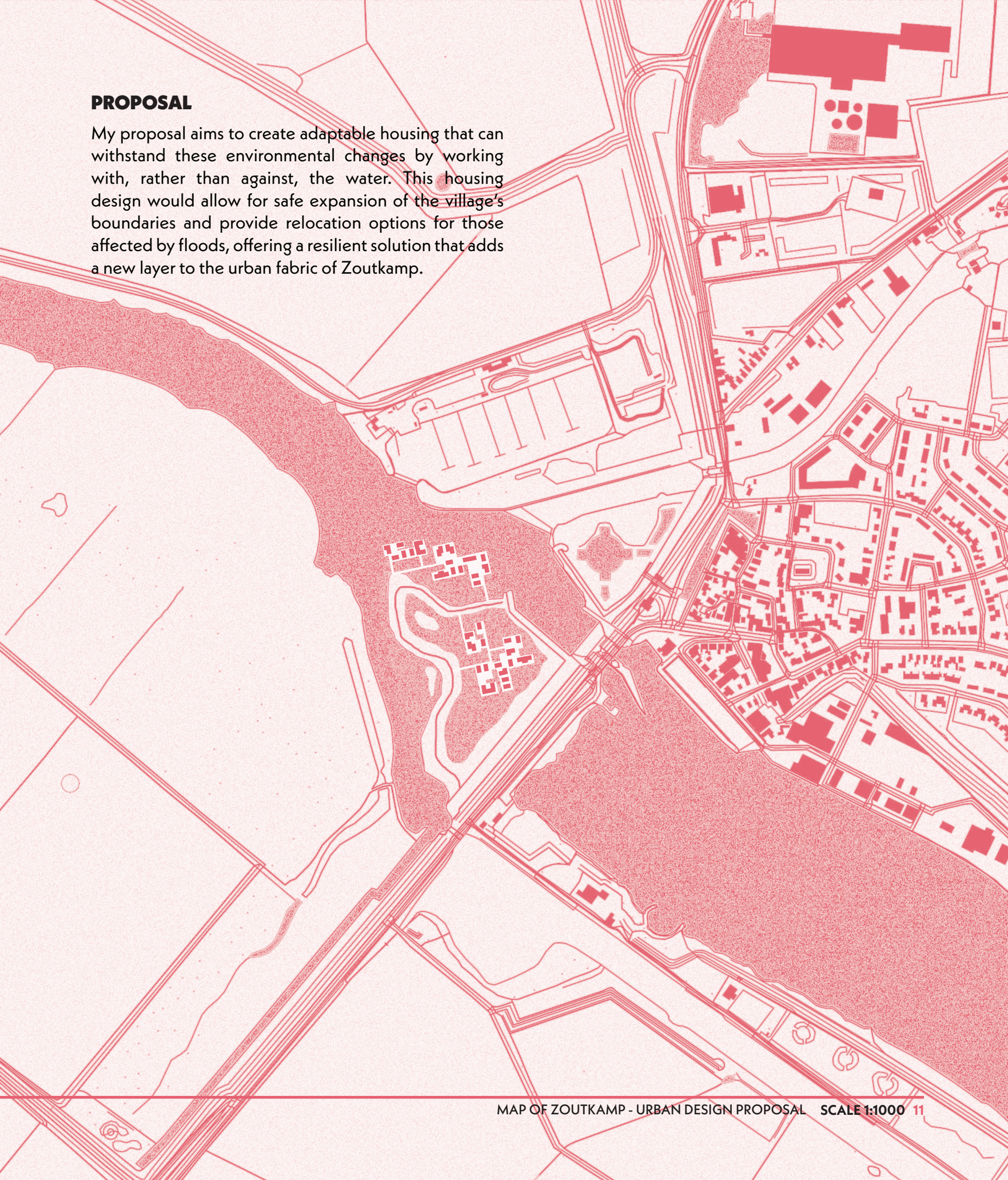


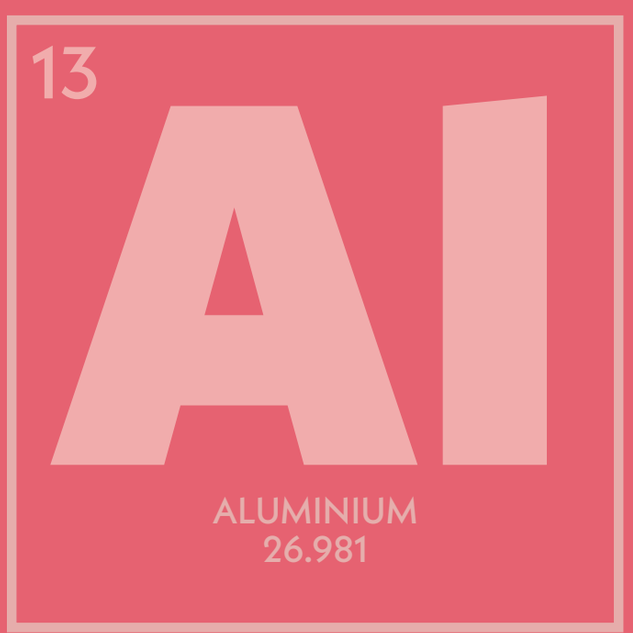
Fig. 1. Present, Future, Proposal schematic representation

PROPOSAL

My proposal aims to create adaptable housing that can withstand these environmental changes by working with, rather than against, the water. This housing design would allow for safe expansion of the village's boundaries and provide relocation options for those affected by floods, offering a resilient solution that adds a new layer to the urban fabric of Zoutkamp.



MAP OF ZOUTKAMP - URBAN DESIGN PROPOSAL **SCALE 1:1000**


13
Al
ALUMINIUM
26.981

MATERIAL

Aluminium stands out as one of the most versatile metals, known for being lightweight, easy to process, and strong. It's widely utilized in architecture in the form of extrusions, profiles, or sheets where its opaque finish gives it an appearance similar to that of steel. Nonetheless, aluminium is a far more corrosion-resistant material, and constructions made of it are often considerably lighter and thinner.

TECHNICAL ASPECTS

Silvery-grey by nature, aluminium is a flexible metal that may be easily rolled into thin foil, pulled into wires, or cast. It is a base material, but because of the protective oxide layer that grows on its surface to screen the underlying metal from air exposure, it is very resistant to oxidation. Pure aluminium cannot be found in nature; instead, it must be recovered by an energy-intensive electrolytic process from mineral ores, primarily bauxite. Although aluminium has a significant environmental impact during manufacture, this is offset by aluminium's high recyclable content. The metal has a low density, is non-toxic, and is not magnetic. It has excellent thermal and electrical conductivity, is quite ductile, and works remarkably well in challenging outdoor environments. Aluminium may be made much stronger than regular construction steel by alloying it with small amounts of other metals.

APPLICATION

In architectural applications, aluminium is often used in prefabricated facade elements, such as sandwich panels, where insulation material is placed between thin, pre-formed, or coated aluminium sheets. Aluminium is also used in load-bearing elements, highlighting its versatility and strength in modern construction. It is increasingly being recognized also as a structural material. Aluminium's ability to be alloyed for enhanced strength allows it to be used in load-bearing applications, such as in the construction of beams, columns, and even entire structural systems.

Colour
silvery grey

Appearance
glossy, satin, matt

Texture
dull

Hardness
hard

Translucence
0%

Temperature
cool

Odour
none

Acoustic opacity
poor

PRODUCTION

Aluminium production begins with the extraction of bauxite ore, which is rich in aluminium oxide (alumina). The process of converting bauxite into aluminium involves two main stages:

Bayer Process

In this step, bauxite is refined to produce alumina. The ore is crushed, mixed with a hot solution of sodium hydroxide, which dissolves the alumina, and the remaining waste is removed. The alumina is then precipitated and heated to produce a white powder, alumina (Al_2O_3).

Hall-Héroult Process

Alumina is then subjected to electrolysis in a smelter to extract pure aluminium metal. The alumina is dissolved in molten cryolite, and an electric current is passed through the solution, causing aluminium to settle at the bottom of the electrolytic cell. The pure aluminium is then tapped off, cast into ingots, and further processed.

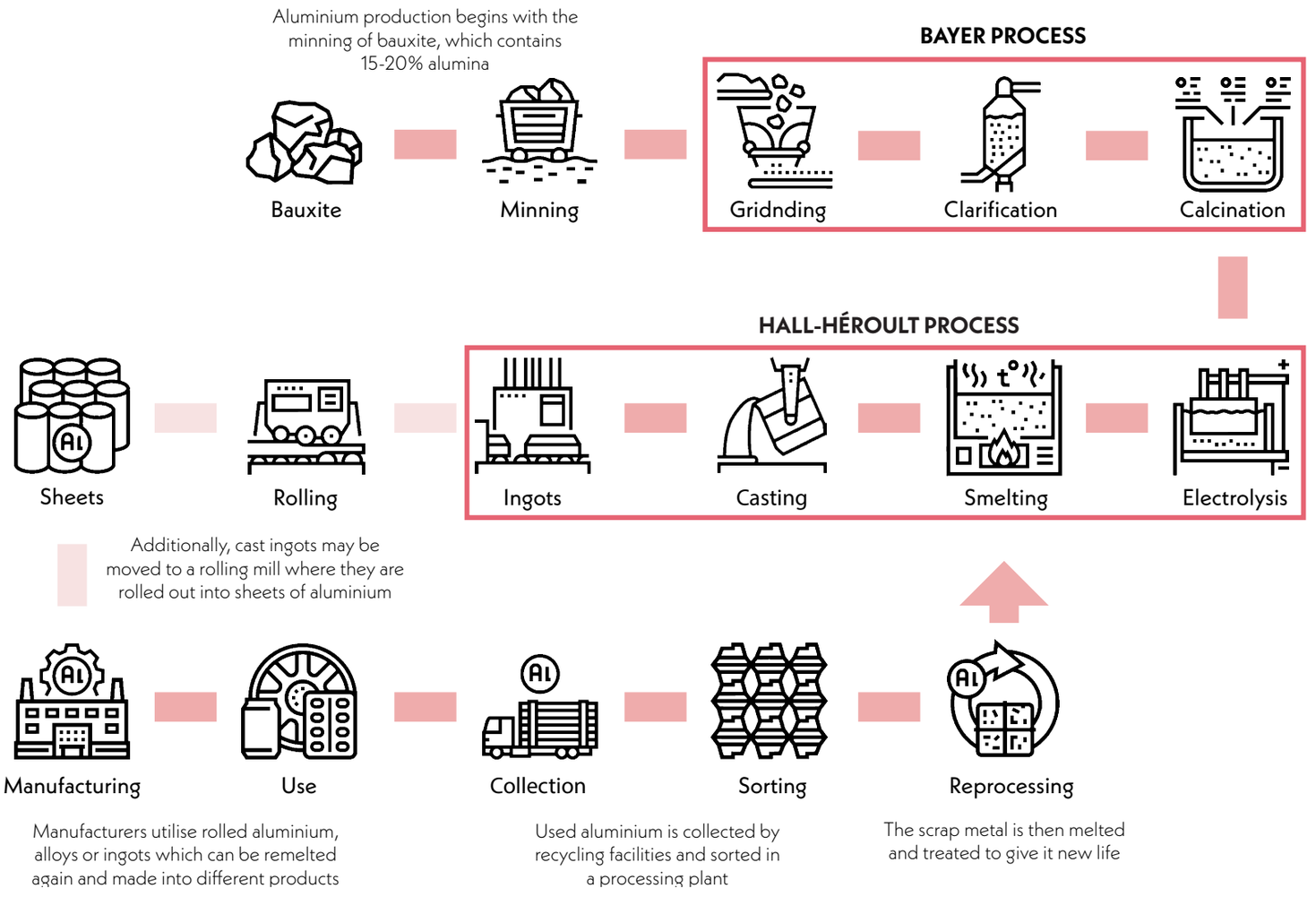


Fig. 2. Process of aluminium production and recycling

The Netherlands does not have significant bauxite reserves, so it relies on imports for raw materials. The country imports bauxite or alumina, primarily from countries with large bauxite reserves such as Iceland, Norway, India, Bahrain, and South Africa. The imported bauxite or alumina is then processed by Dutch aluminium producers or converted into finished products. Additionally, the Netherlands imports aluminium in its semi-finished or finished forms for use in various industries. According to The Observatory of Economic Complexity (2023) in 2022, Netherlands imported €5.08B in Raw Aluminium, becoming the 4th largest importer of Raw Aluminium in the world.

RECYCLING

Recycling aluminium is highly feasible and environmentally beneficial. The process of recycling aluminium requires only about 5% of the energy needed to produce new aluminium from bauxite (Raabe et. al, 2022). This makes recycling a cost-effective and energy-efficient option while retaining quality, durability, and functionality similar to newly produced aluminium. The Netherlands has a well-established aluminium recycling industry, and a significant portion of aluminium used in the country is recycled. The recycling process focuses on aluminium from products that have reached the end of their life cycle, particularly from the following categories:

Packaging Materials - cans, foils, and trays used in food and beverage packaging. Typically, of a lower grade compared to construction aluminium however after processing, it can be used in less critical structural components or in composite materials.

Construction Waste - windows, doors, gutters and structural components. Since it was originally used in buildings, it is often of a higher grade and well-suited for reuse in new construction projects.

Automotive, Marine and Industrial Scrap - vehicles, boats and machinery. Often of high quality and can be alloyed to meet the specific strength and durability requirements for construction. This type of recycled aluminium is suitable for structural components, such as beams, columns, and other load-bearing elements in buildings.

Household and Electronic Goods - discarded items and home appliances. Depending on the grade and purity after recycling, it can be used in a variety of applications within a building, including fixtures, panels, and non-load-bearing elements.

ROLLING, CASTING, EXTRUDING

Aluminum is known for being easily manipulated in desired shapes, making it an ideal material in the architecture and engineering field. It can be processed in three primary ways - rolling, casting, and extruding - each offering unique advantages for different applications.

Rolling aluminum sheets is achieved by passing the metal through rollers to reach desired thicknesses. Rolled sheets are commonly used for lightweight cladding, facade panels, and even roofing. With aluminium's lightweight and corrosion resistant nature, they can be used in outdoor environments with minimal maintenance. In **casting**, molten aluminum is poured into molds to create complex, custom components. This process allows for precise shapes that are otherwise difficult to produce with other methods. Casting is especially valuable for ornamental or unique structural pieces, as it enables detailed and varied designs. Due to aluminum's natural oxide layer, these pieces have long-lasting durability, making them suitable for details or structural connectors. **Extrusion** forces aluminum through a die to produce continuous cross-sectional profiles, ideal for creating uniform shapes like beams, columns, or window frames. Aluminum extrusions are extensively used in both lightweight framing and structural elements. Extruded sections can also integrate with other materials or structural systems due to their accuracy and consistency in dimensions, making them a mainstay in modular and prefabricated construction.

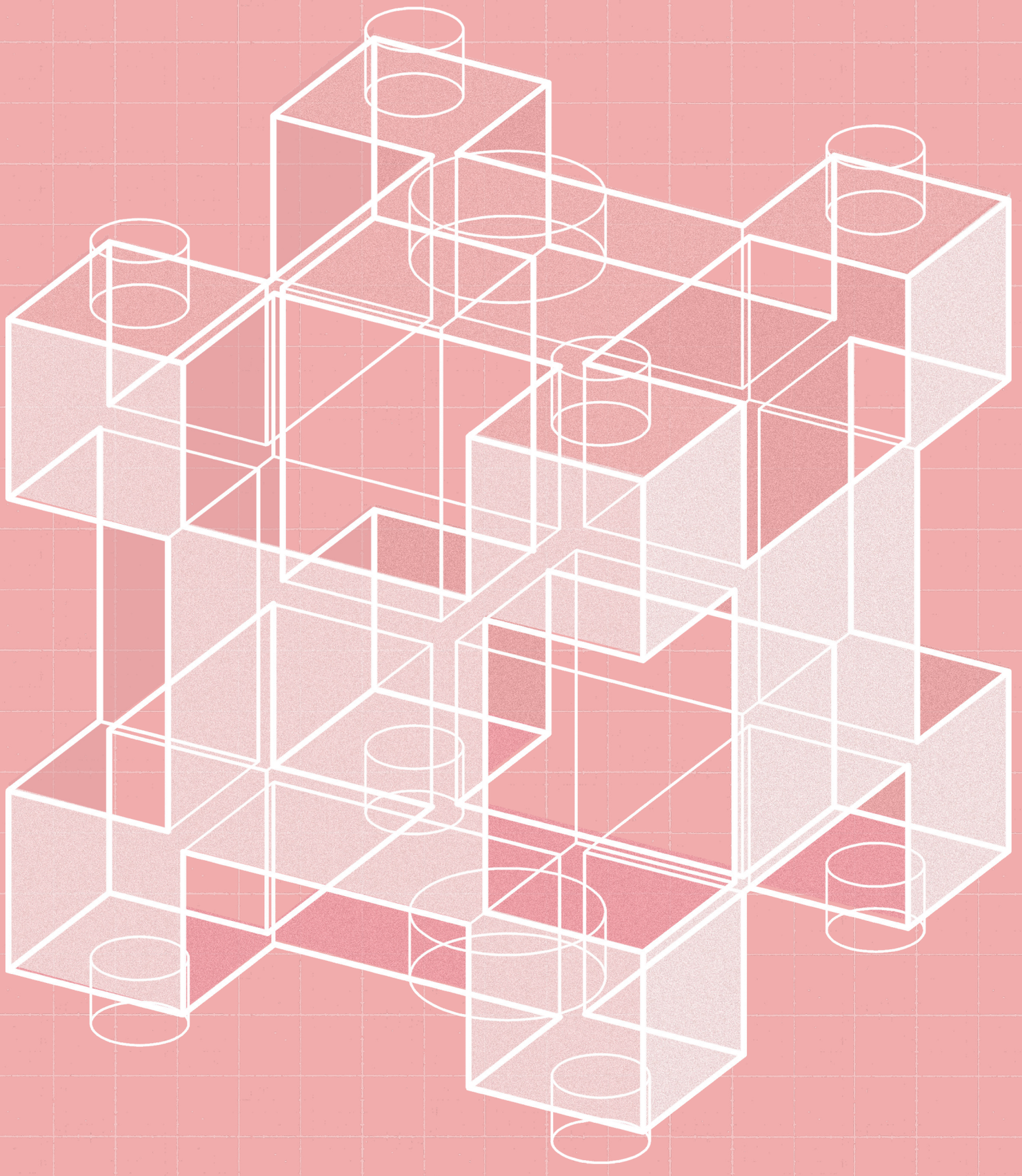
In addition to shaping flexibility, aluminum can be anodized for various finishes, allowing for color options and protective layers that enhance both aesthetics and durability. This versatility in form, combined with options for surface treatment, makes aluminum one of the most adaptable and durable materials in contemporary construction.

LIVING IN AN ALUMINIUM HOUSE

Aluminium is a highly durable and versatile material, making it an ideal choice for modular and floating architectural projects, particularly in flood-prone or challenging environments. Known for its resistance to harsh weather conditions such as wind, rain, and snow, aluminium is both fire and pest-resistant, thanks to its high melting point and immunity to rust, rot, or warping—common issues in traditional materials like wood. Its structural resilience is enhanced further by alloying, which increases its strength and allows for load-bearing applications. Additionally, the low maintenance requirements and lightweight nature of aluminium make it easy to shape into prefabricated elements like facade panels, structural supports, and more.

One key advantage of aluminium is its high recyclability. Recycled aluminium requires only about 5% of the energy needed to produce it from raw materials, making it environmentally sustainable while maintaining quality and durability. However, aluminium's thermal conductivity can make temperature control challenging, as it readily absorbs and transfers heat. Proper insulation is therefore essential to maintain comfortable indoor temperatures and minimize issues like condensation and noise, which are more prominent in metal structures.

Overall, with thoughtful design, aluminium-based homes and structures offer an environmentally friendly, resilient, and adaptable solution well-suited to modern architectural needs, especially in areas vulnerable to environmental change.



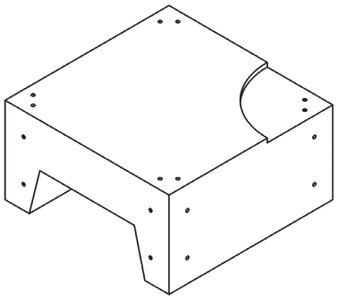
ELEMENTS

This chapter presents a catalogue of the various elements that costitute the modular building system, highlighting the structural components, connectors, and essential integral to the assembly process. Understanding these elements is crucial for appreciating how they contribute to the overall functionality, stability, and aesthetics of the designs.

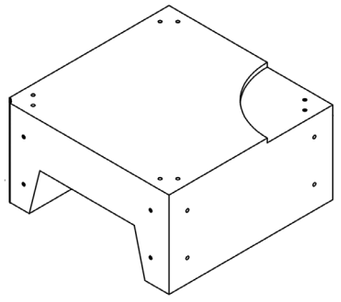
ELEMENT CATALOGUE

STRUCTURAL

BASE *pontoons*

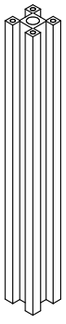


P00 - edges and inner parts



P01 - corners

MAIN STRUCTURE *columns, beams, floor and roof joists**

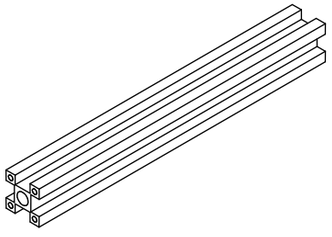


C073 - base

C088 - base

C130 - roof

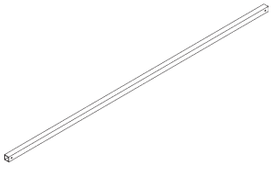
C230 - main structure



B105 - half module exterior deck

B225 - main structure

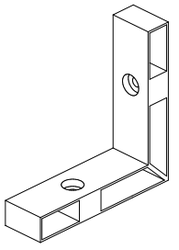
B260 - roof



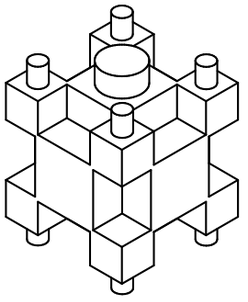
J230 - floor and roof

**serial number dependent on lenght of element*

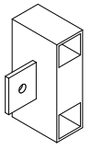
MAIN STRUCTURE *L - shapes, X - connectors*



ML - column to beam

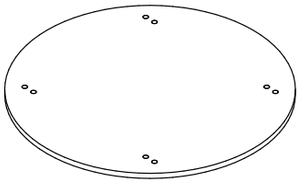


MX - column-beam intersection

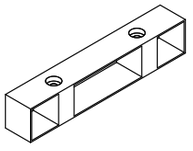


MT - panels and partitions

BASE *aluminium plates, stiffeners*

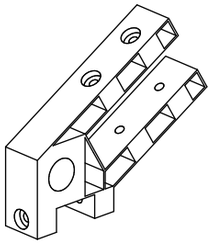


BP - base plate



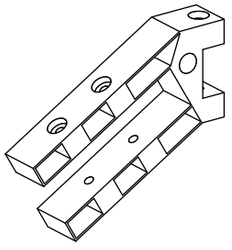
MS - reinforce structural members where doubling occurs

ROOF *U - shapes**



MUB30 - bottom beam (30°)

MUB15 - bottom beam (15°)



MUT30 - top beam (30°)

MUT15 - top beam (15°)

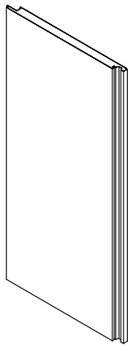
**dependent on choosen roof slope*

ELEMENT CATALOGUE

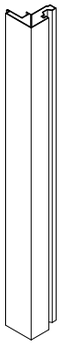
CLADDING AND PARTITIONS

EXTERIOR *walls and roof panels*

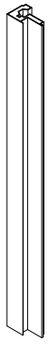
SOLID



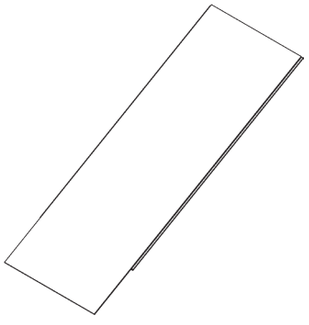
EP00 - wall panel



EC01 - outer corner

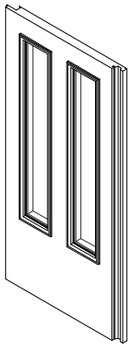


EC02 - inner corner

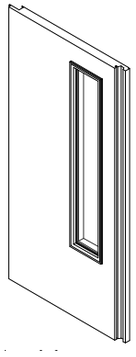


ERP00 - roof panel

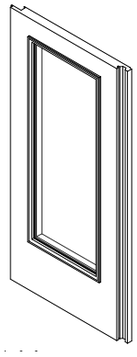
GLAZED



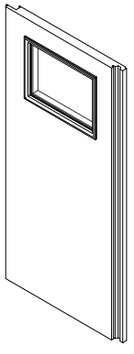
EP01



EP02



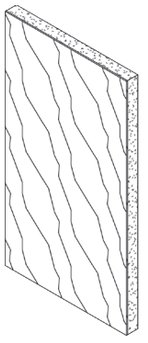
EP03



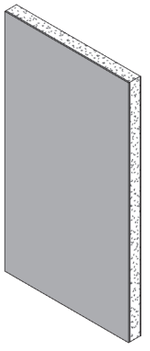
EP04

CLADDING AND PARTITIONS

INTERIOR *partitions, floors and filler*

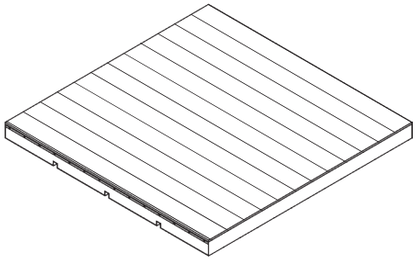


IP01 - wooden finishing



IP02 - aluminium finishing

IPF00 - column and beam filler

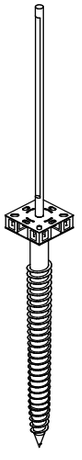


FP

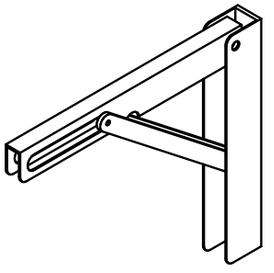
FPF01 - heating pipes floor filler

FPF02 - neutral floor filler

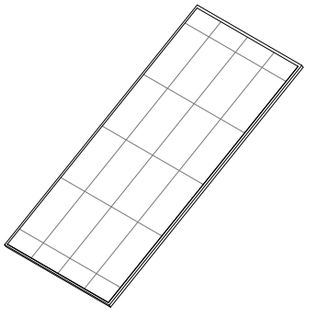
ADDITIONS



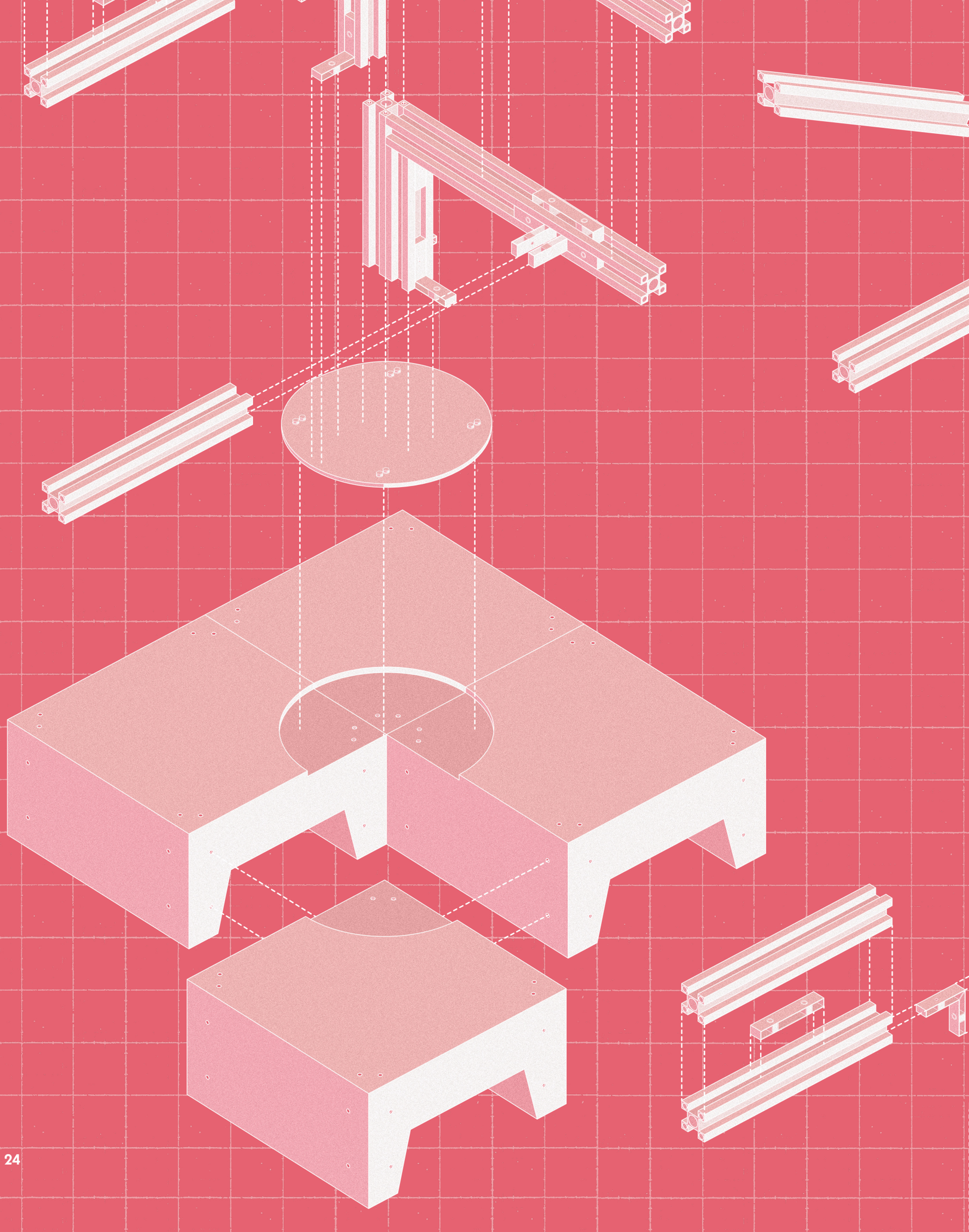
LEVELING PILES

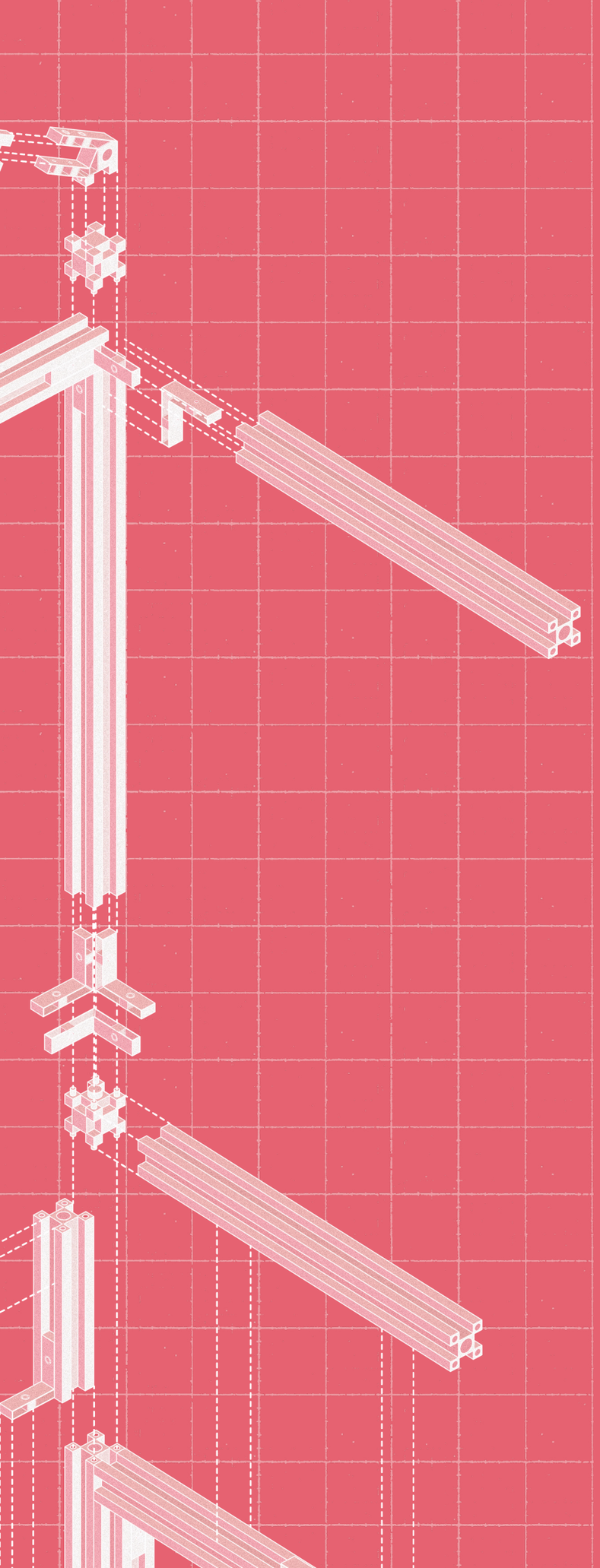


FOLDING CONSOLE



SOLAR PANELS





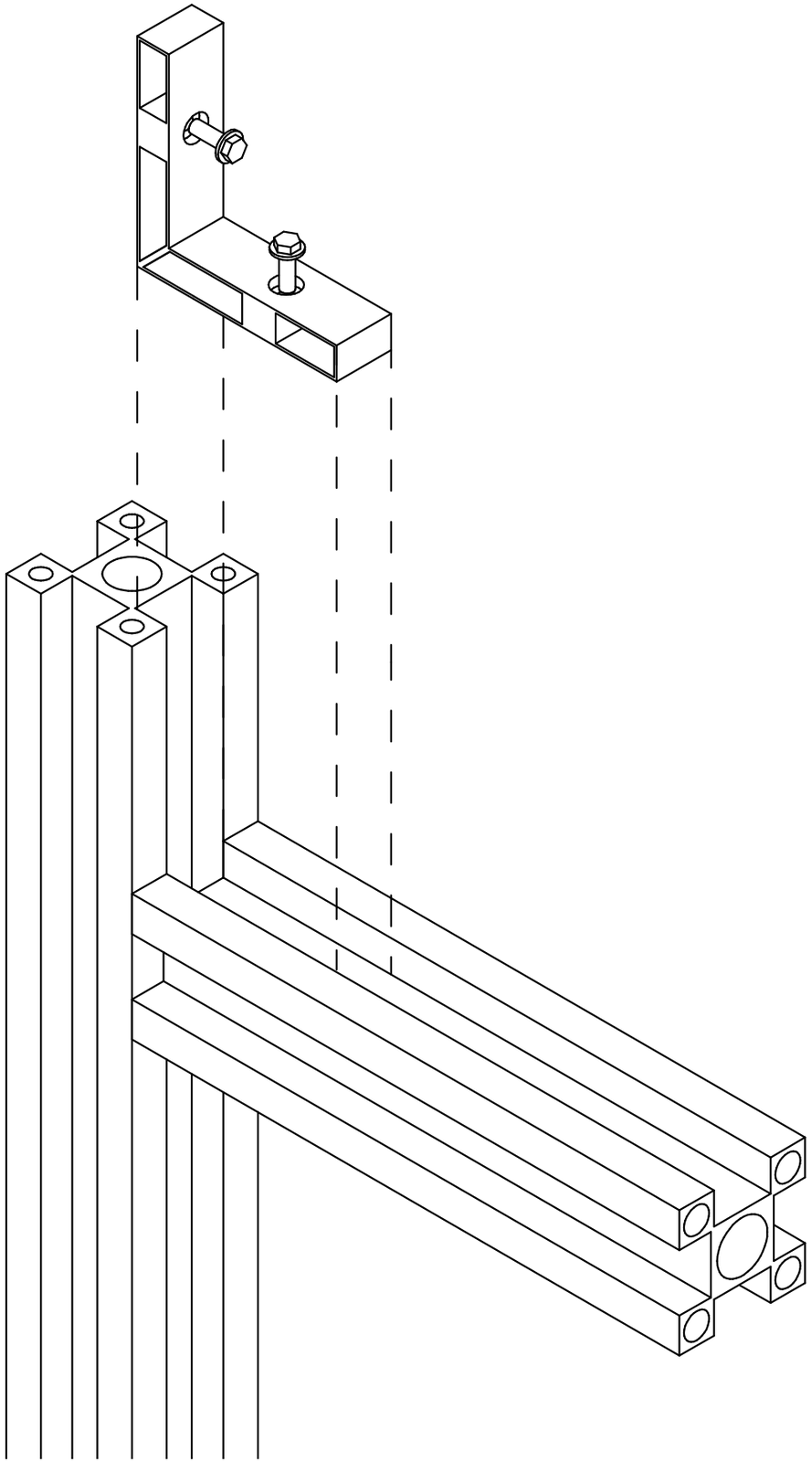
TECHNIQUE

This chapter explores the essential structural connections and various types of assemblies used within the modular system. The integrity of any modular structure relies on the strength and flexibility of its connections, which enable both stability and adaptability. Key joining methods will be discussed, with a focus on how each connection type supports different parts of the structure, from primary load-bearing assemblies to interlocking floor and roof panels.

BASIC ASSEMBLIES

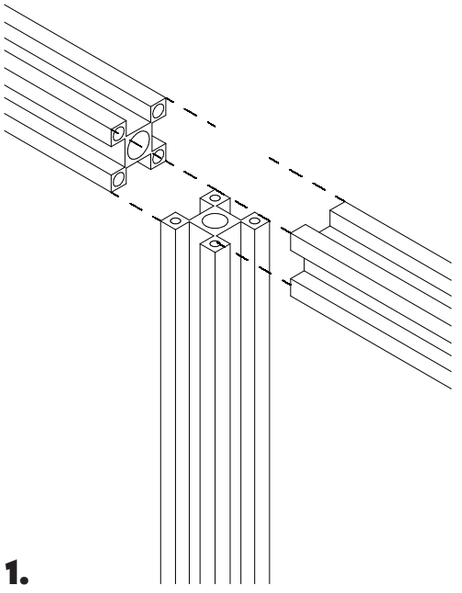
Column to Beam

When a column and beam meet, the connection between them is achieved through an L-shaped connector which easily slides in the groves of the structural elements and is then fastened.



Column and Beam Intersection

When multiple structural elements come to an intersecting point, they are attached to an X - connector. These connections allow for problem free crossings and allow the attachment of other conncetors. The custom element fits in the column like a “Lego”. From there one more column and one to four beams can be attached with the help of L - shapes.



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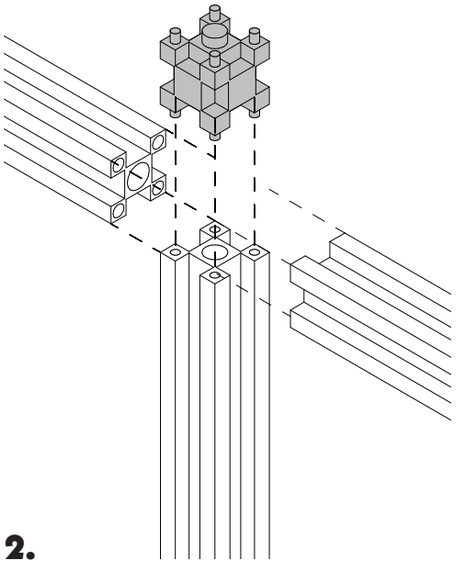

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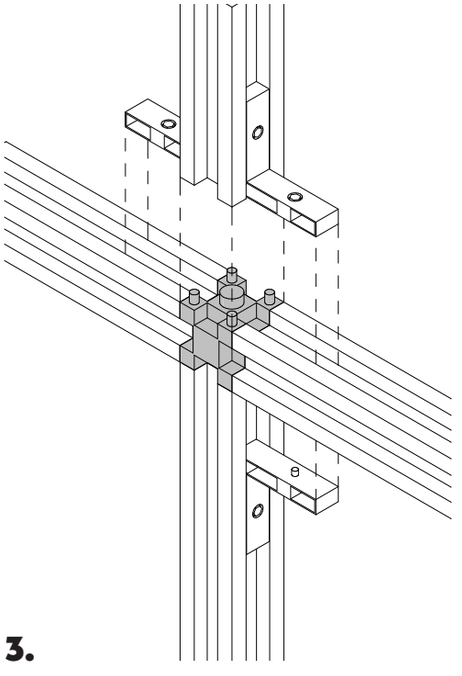

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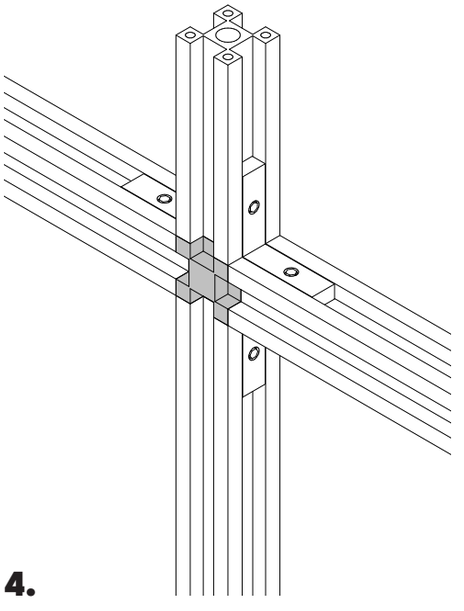

4.

BASE ASSEMBLY

Floating Pontoon System

The pontoons fit together like a puzzle with the help of connection pins which are inserted on the sides and then fastened from the top through rotation.

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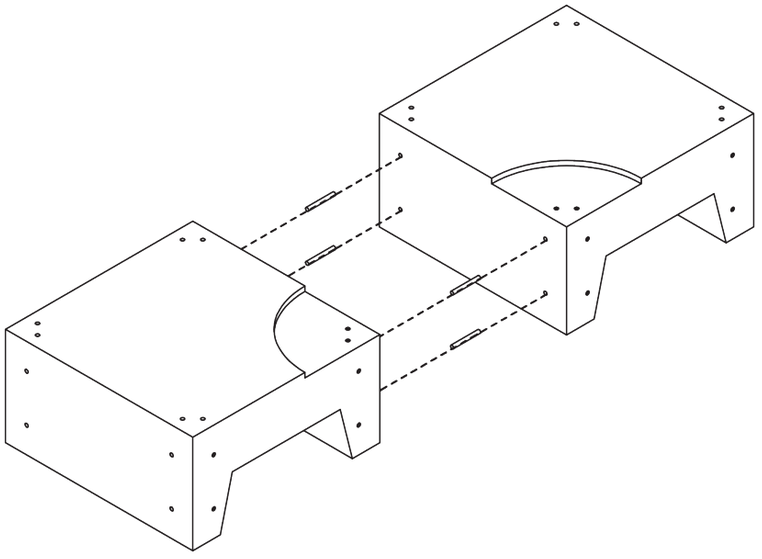

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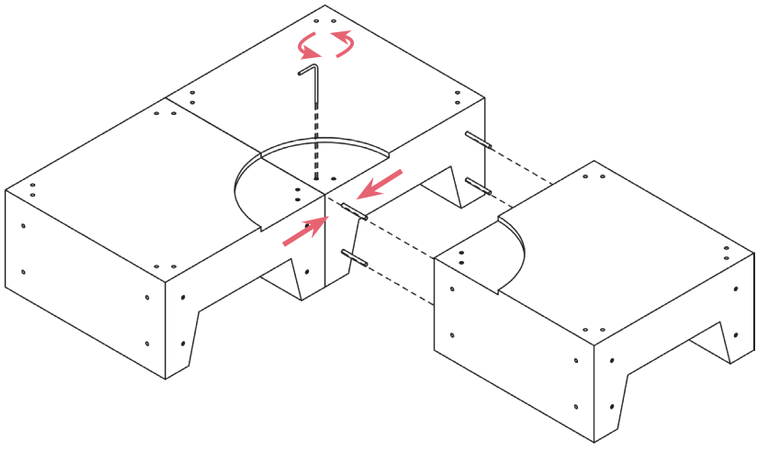

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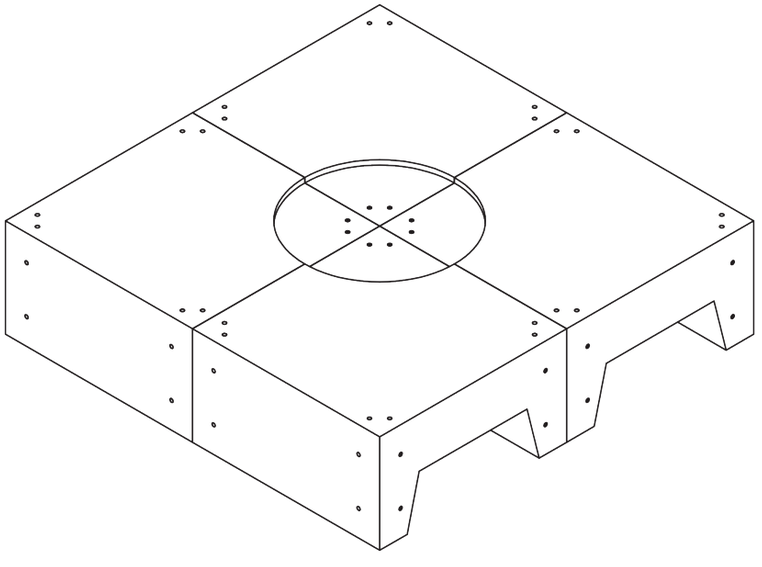
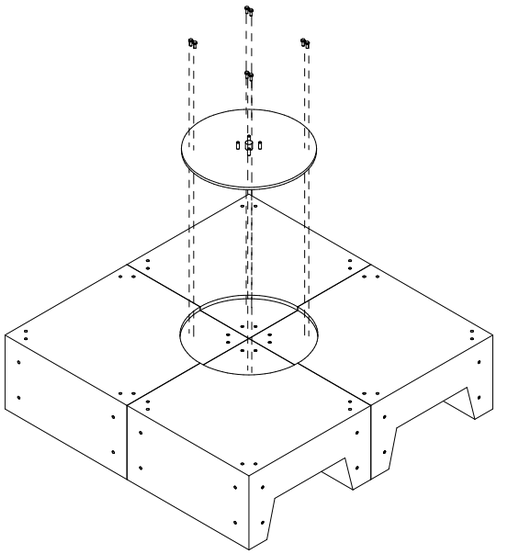


Floating Pontoon System

When the four pontoons are joined, they create a central space that securely accommodates the aluminium plate, which in turn serves as the base for the load-bearing column structure. This setup provides a stable foundation for the structure, ensuring even weight distribution and enhancing the system's overall resilience.



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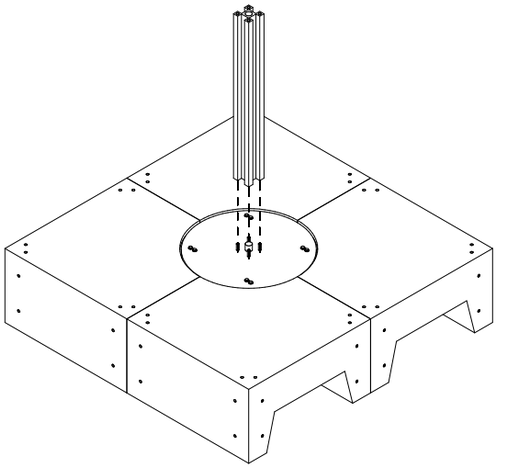

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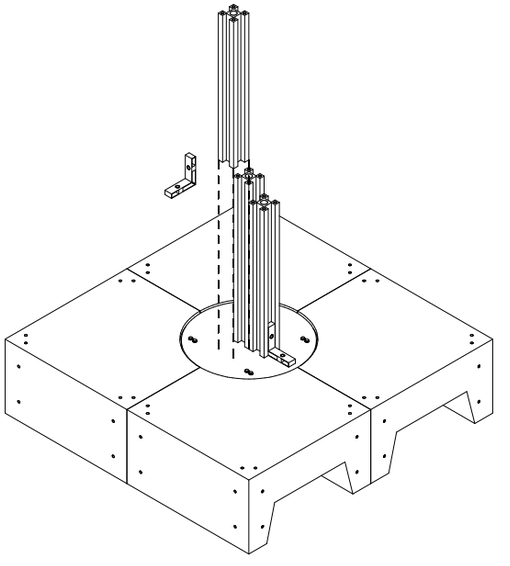


6.

FLOOR AND EXTERIOR ASSEMBLY

Floor system

The floor panels are custom-designed to fit seamlessly atop the structural floor joists, where they are securely fastened from underneath. This installation approach ensures an uninterupted, smooth surface, while providing strong anchorage and stability to the flooring system.

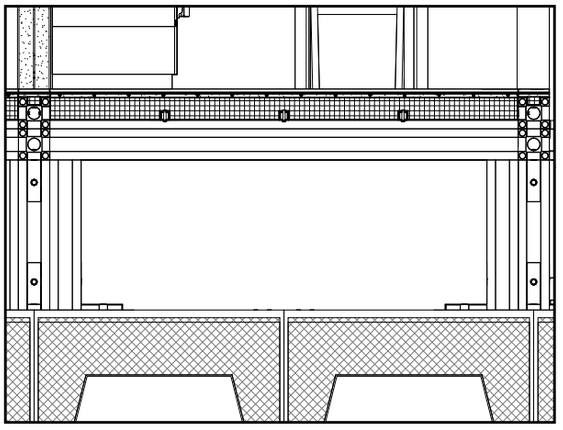
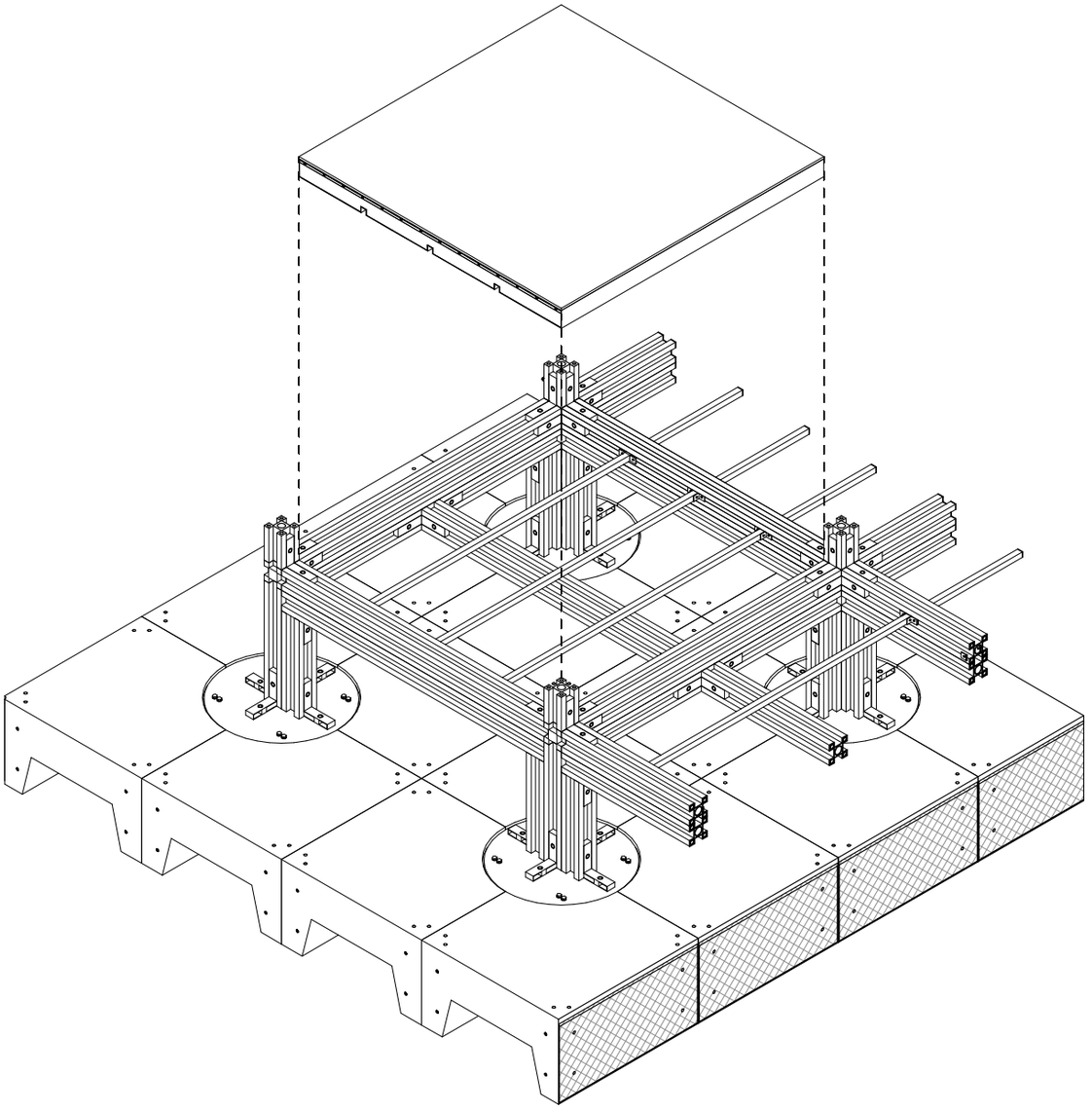
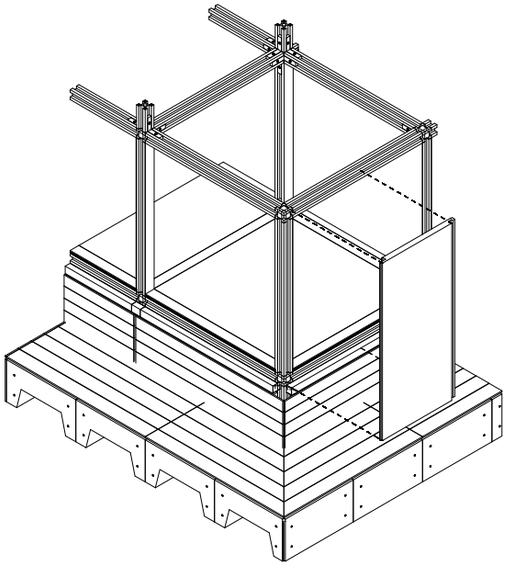


Fig. 3.Floor attachment detail



Exterior Panels

The panels connect on one side to the columns, where they are bolted to structural connectors, providing stability. At their midpoint, where two panels meet, they are fastened together to ensure a cohesive, secure bond, maintaining alignment and integrity across the entire surface.



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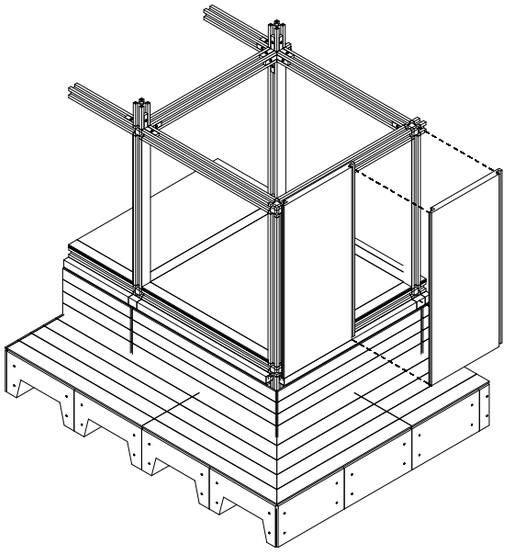

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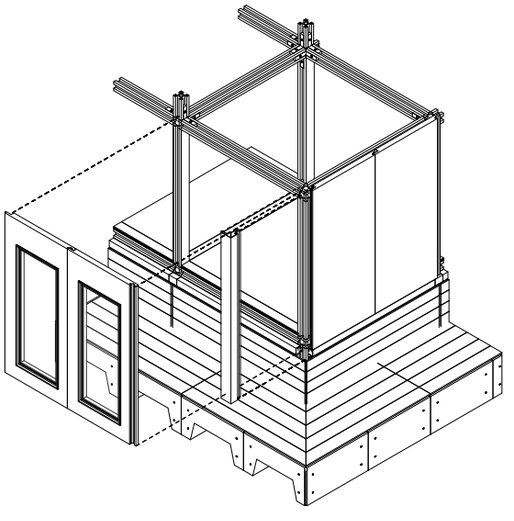
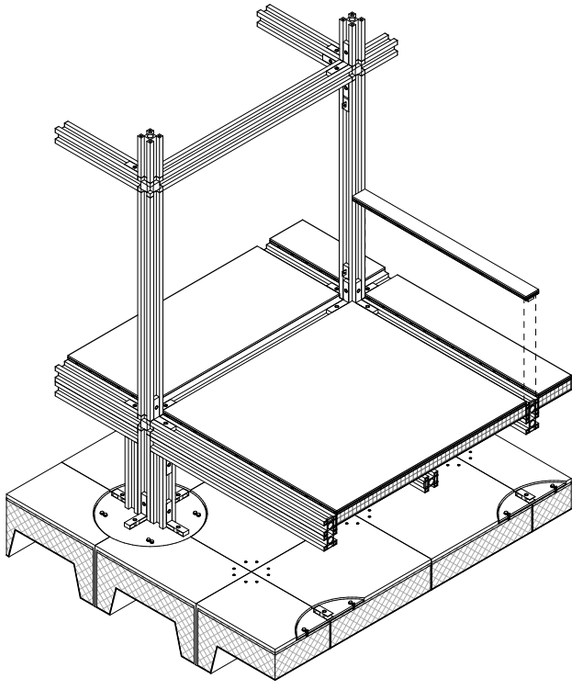


3.

INTERIOR PARTITIONS AND FILLERS

Floor, Column and Beam Fillers

The floor, column, and beam fillers fit seamlessly within the grooves of the structural elements, creating a smooth outer surface. Fastened securely, these fillers enhance the aesthetic cohesion.



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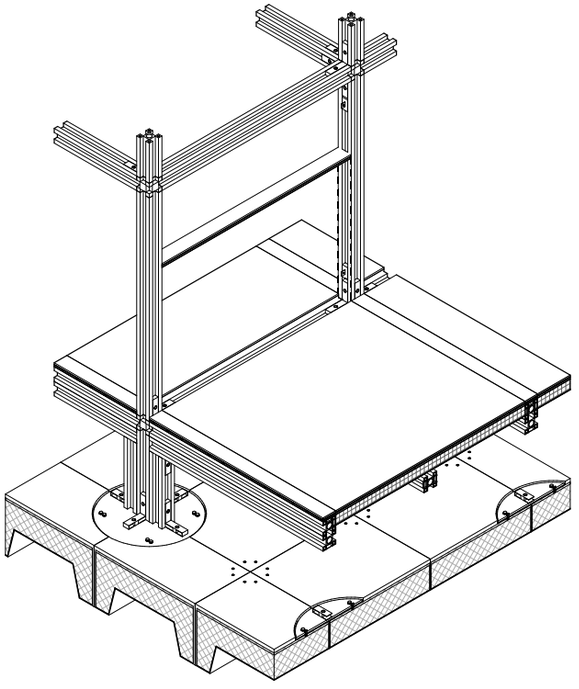

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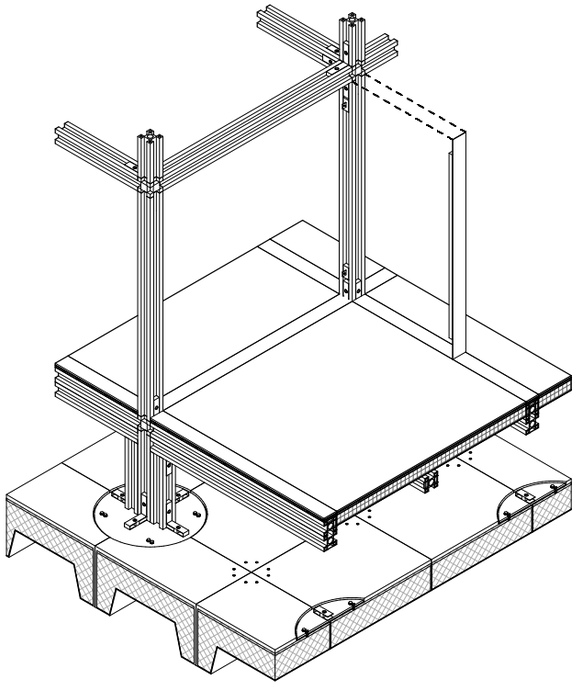

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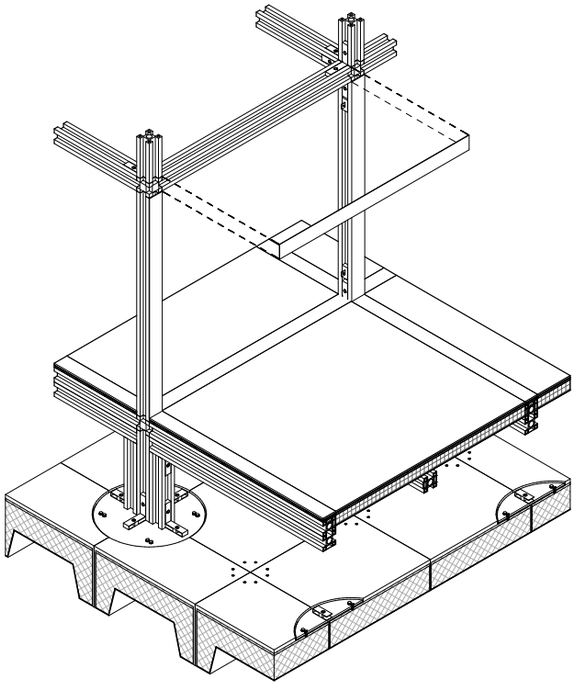
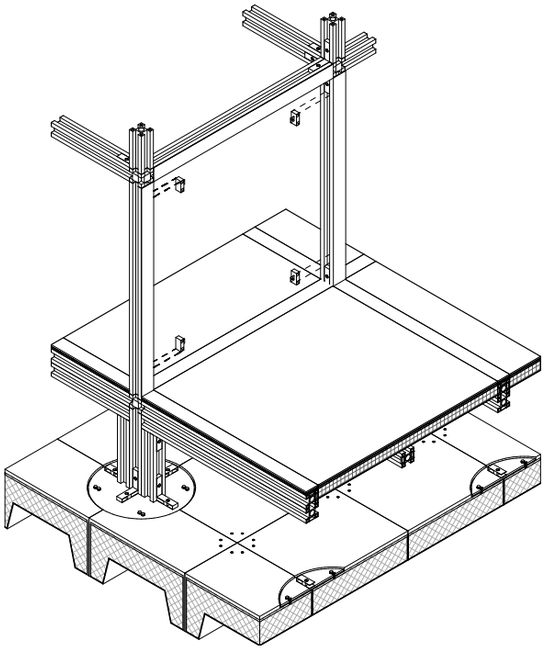


4.

Interior Partitions

The interior walls are assembled by first positioning the connections, followed by sandwiching the panels between them. These panels are then securely bolted to the connectors, ensuring structural integrity and a seamless finish.



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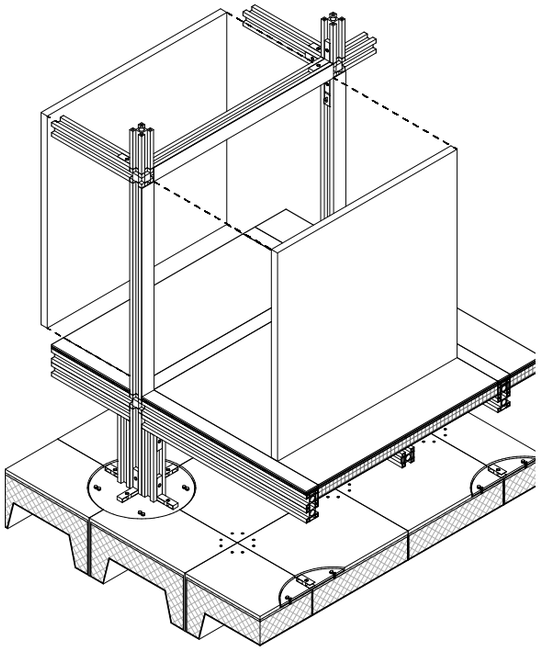

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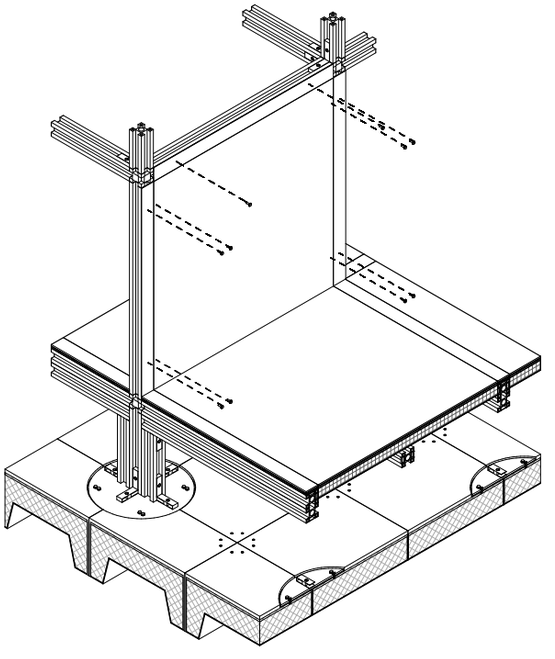
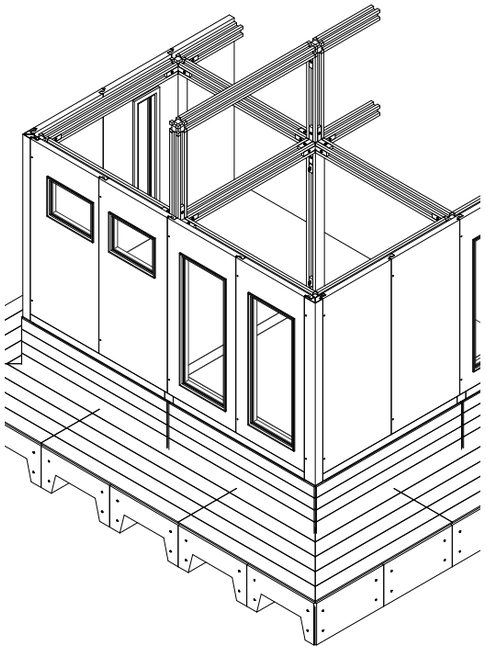


7.

ROOF ASSEMBLY

Structure

Once the initial roof structure is erected, the angular connectors are positioned to secure the alignment and stability of the framework. These connectors are joined by the beams, which lock into place to form the completed roof structure.



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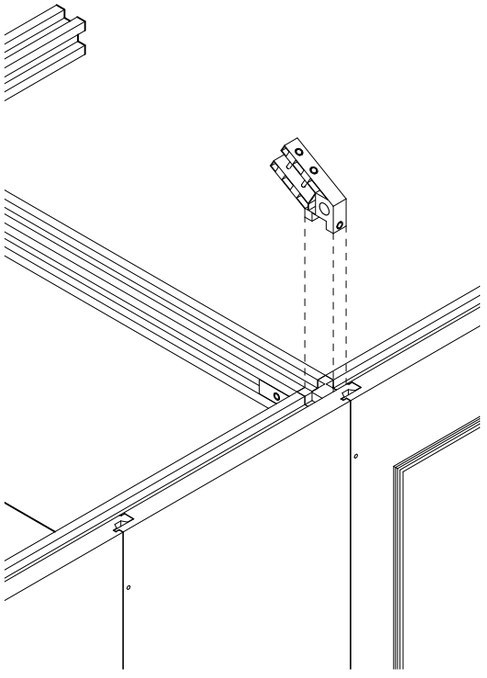

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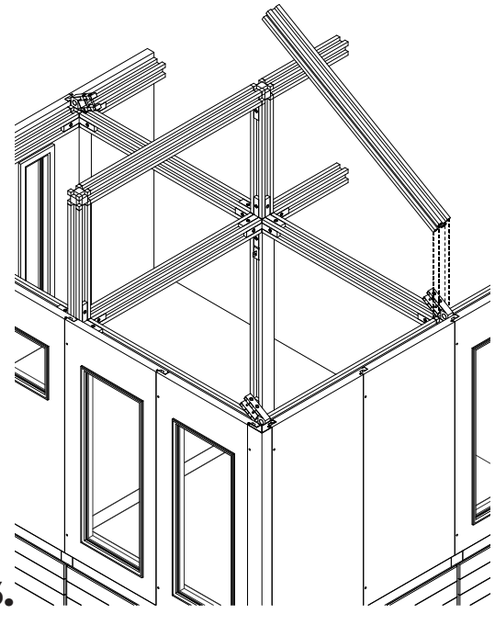

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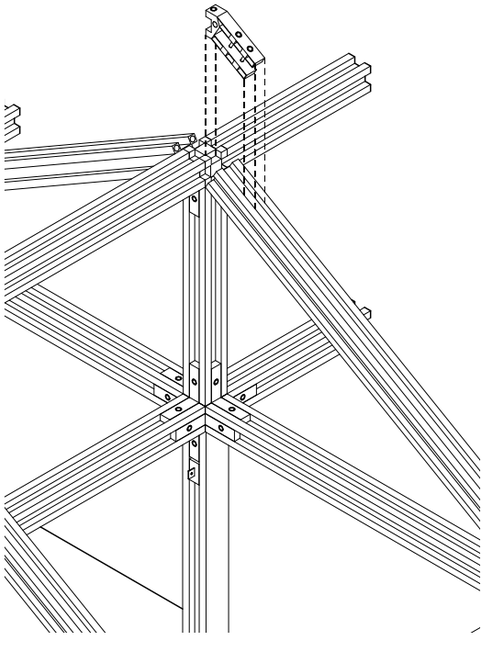

4.

Roof Panels and Edges

Following the initial roof setup, the roof joists are installed, providing a stable framework for the roof panels to be connected. Once the panels are in place, the structure's final touches are added, including the corner fittings and roof edges, which enhance the durability, visual continuity and aesthetics of the completed assembly.

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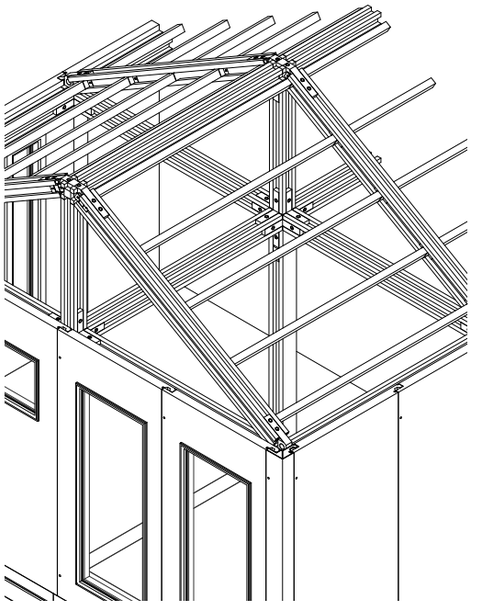

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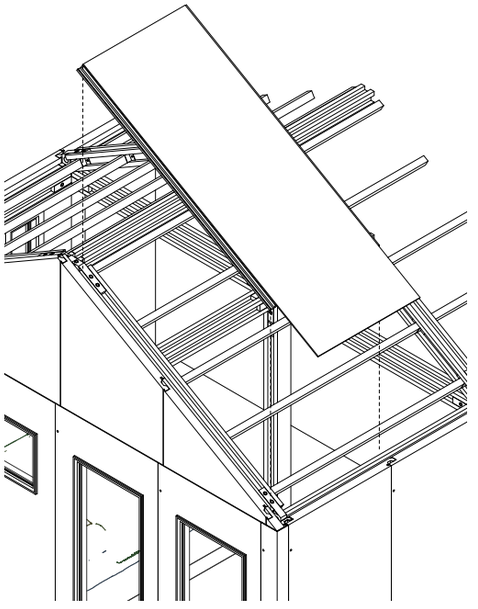

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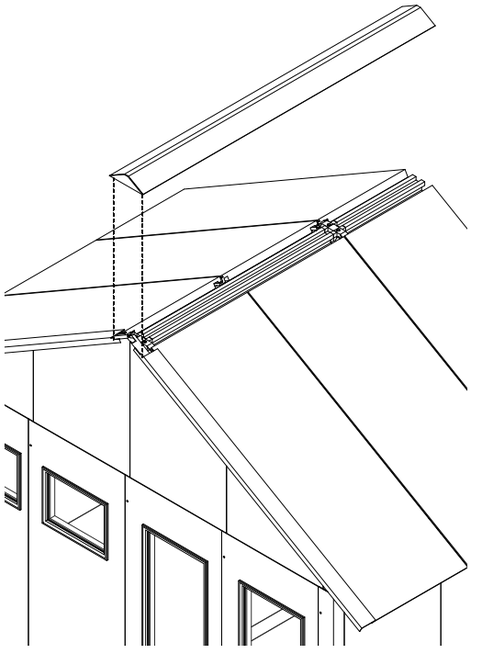

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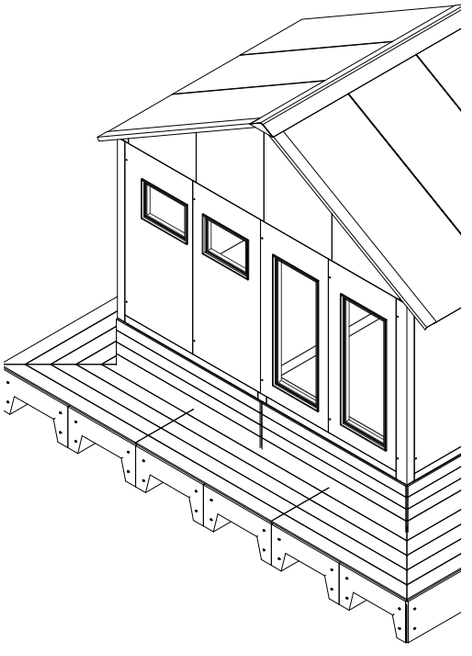
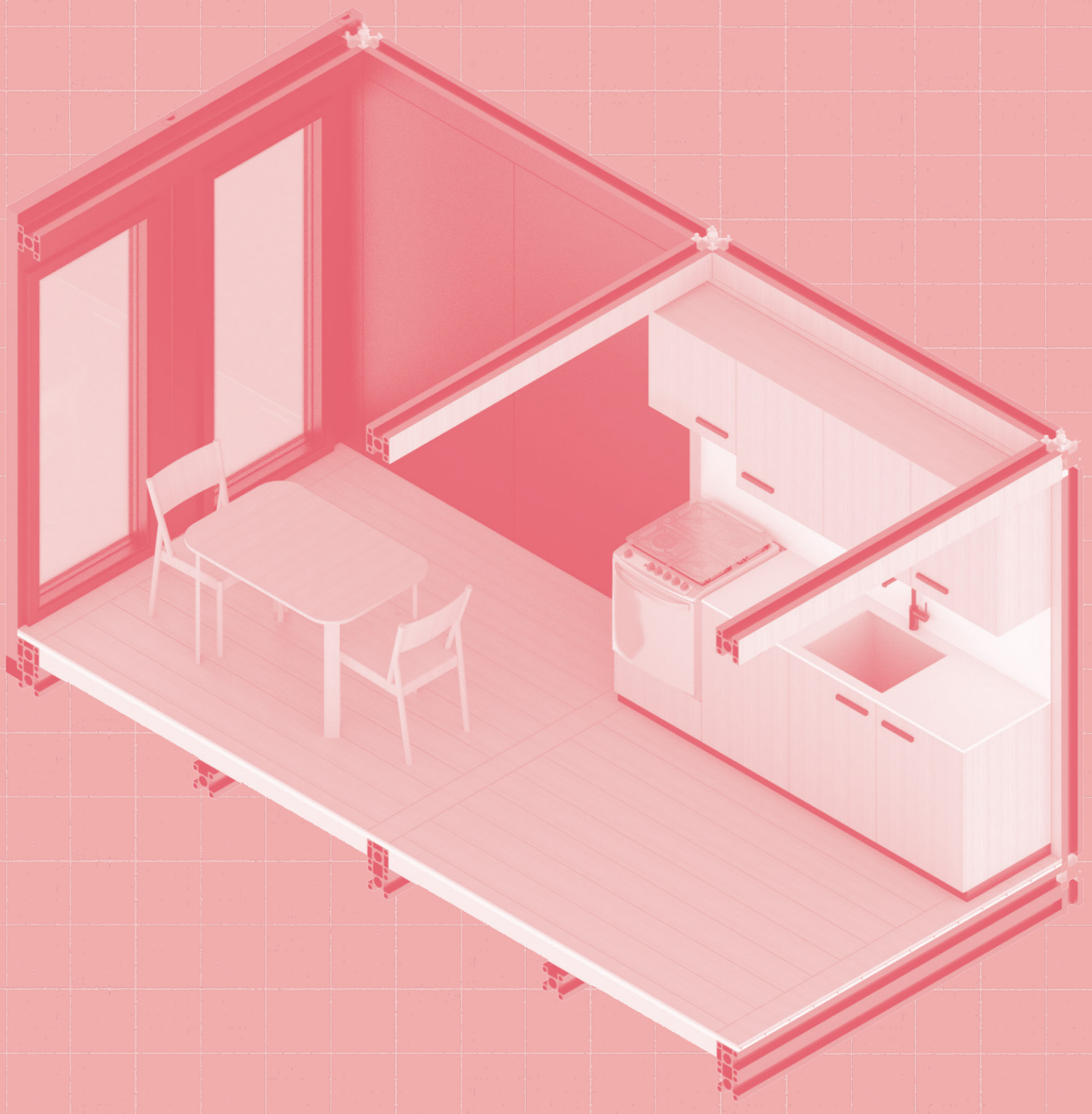




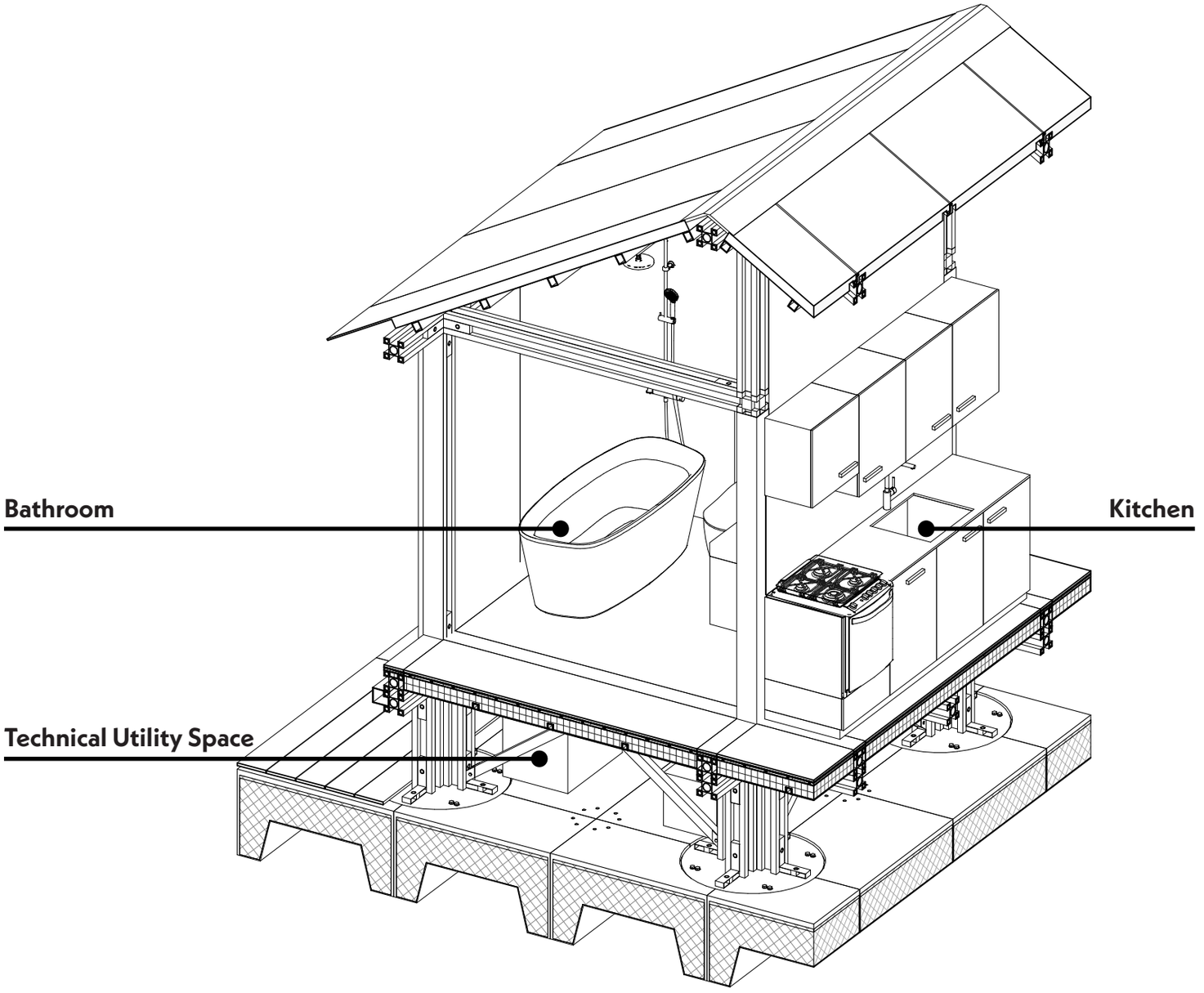
ADDITIONS

This chapter focuses on the crucial elements that ensure the house operates effectively. Without these essential components, the modular home would struggle to meet the demands of its inhabitants and the challenges posed by its environment.

Key focus is the BUC module, serving as the core of the structure. Further, ventilation and climate control solutions, such as passive cooling mechanisms and adaptable insulation, are essential for maintaining comfort within the home. Materialization options provide durability and customization, and bring life to the indoor environment of the habitat. Finally, the ground leveling system stabilizes the structure on fluctuating water levels, enabling the house to adapt to both land and water environments.

BUC (BATH, UTILITY, COOK) MODULE

The BUC module, an abbreviation for Bath, Utility, and Cook, serves as the foundational unit of the modular home system. Designed to combine essential functionalities in one compact space, it houses a fully equipped bathroom, kitchen, and utility room. This module is where the home assembly begins, anchoring the structure and providing stability. The BUC module arrives pre-built, with the kitchen components installed once all the flooring is complete.



FUNCTIONALITY

The BUC module's utility room is carefully engineered to house all core mechanical systems required for autonomous living, consolidating water, waste, and climate control functions. The septic tank, water tank, and heating pump are organized for accessibility and maintenance efficiency, ensuring that critical resources are stored and managed effectively within a compact space. This arrangement optimizes both energy and space, contributing to the sustainability of the home. The utility systems are strategically positioned to minimize interference with other living areas, reducing noise and allowing easy service access through the bathroom's trap door on the floor.

This functional layout also plays an essential role in the structural stability of the modular home. Integrating a truss and additional diagonal bracing within the module's walls enhances its ability to withstand environmental pressures, such as wind or minor ground shifts, that might arise in areas with fluctuating water levels. With its role as both a utility hub and structural anchor, the BUC module is designed to serve as the resilient foundation upon which the rest of the home is built. This allows for the efficient and flexible assembly of additional modules, giving homeowners the flexibility to expand or adjust their living spaces without compromising stability.

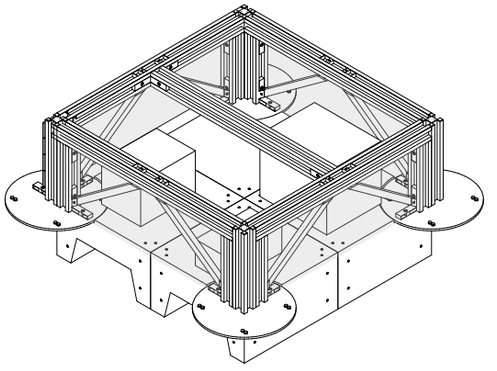


Fig. 4. Technical Utility Space

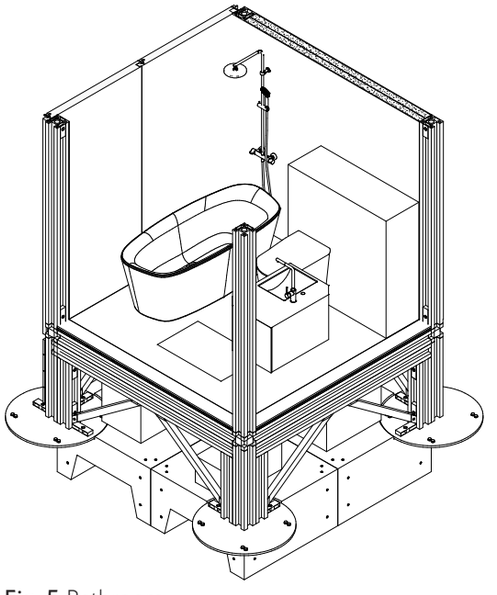


Fig. 5. Bathroom

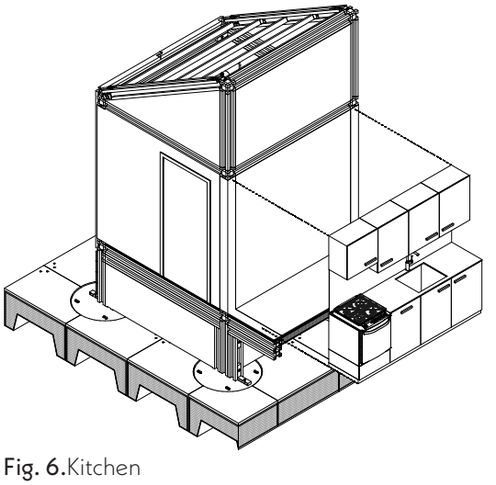


Fig. 6. Kitchen

CLIMATE AND UTILITY SECTION

The building's design and systems support a climate-responsive approach, ensuring a comfortable indoor environment all year round.

The house is fitted with a septic tank connected directly to the bathroom, storing waste until it can be periodically emptied to prevent overflow. This setup minimizes impact on the surrounding environment and is designed for easy maintenance. For water, the house connects to the local water supply line, with an integrated water pump that circulates water throughout the system. A heating pump, powered by a solar battery, raises the water temperature, supplying heated water for floor heating as well as for general household use. The design of the floor panels and fillers ensures equal heat distribution throughout the whole plane. This system optimizes energy efficiency by using solar energy for heating, ensuring that the house maintains comfortable conditions and reduces reliance on external energy sources.

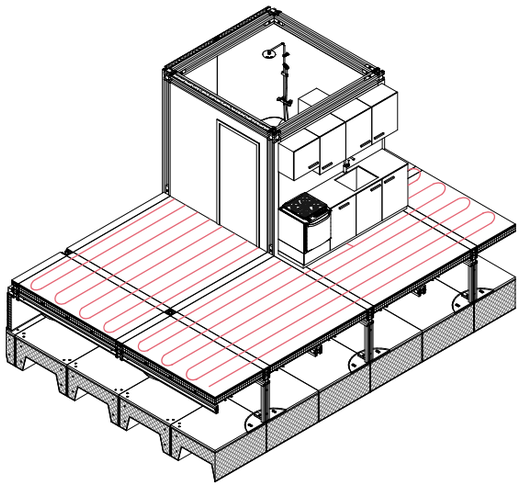


Fig. 7.Floor heating distribution

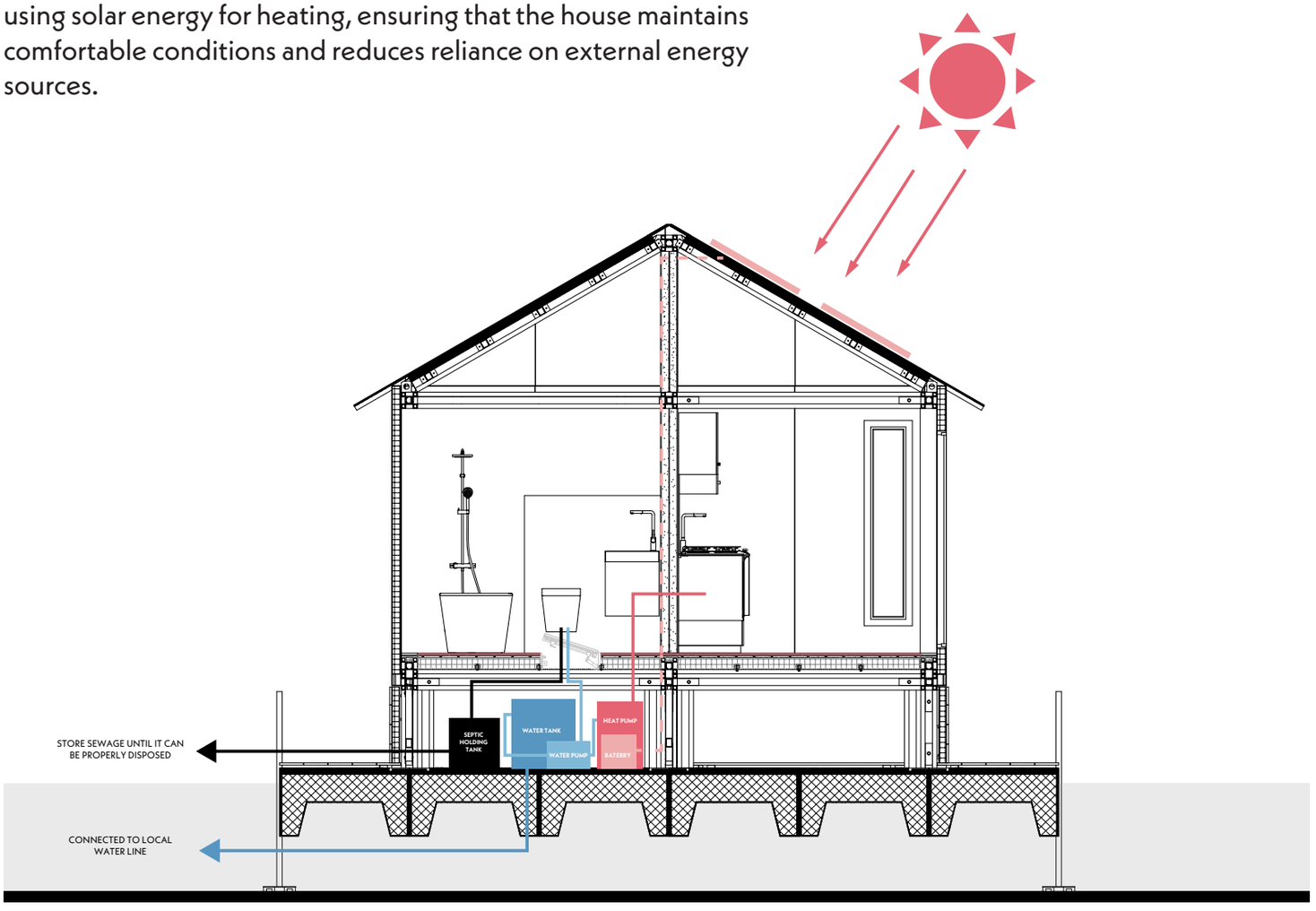


Fig. 8.Climate section

PASSIVE COOLING

Ventilation and cooling systems operates in two main states: open and closed. When fully closed, the structure is highly insulated, retaining warmth and reducing energy loss in cooler climates. Ventilation in this state is achieved through window openings, ensuring fresh air circulation when desired.

To address rising temperatures, the house also incorporates a passive cooling solution. The design features a plinth that can extend outwards to form a deck, thanks to the folding consoles attached to the base columns. This system creates an on-demand insulation layer which can be tured on and off when desired. When opened, the deck not only offers outdoor space but also allows airflow beneath the structure, naturally cooling the building. This passive cooling concept promotes air circulation under the house, which helps maintain a comfortable indoor temperature without relying heavily on air conditioning, making it an efficient option for warmer conditions.

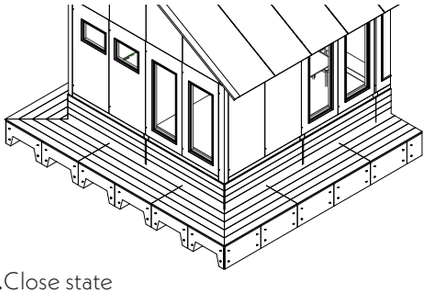


Fig. 9.Close state

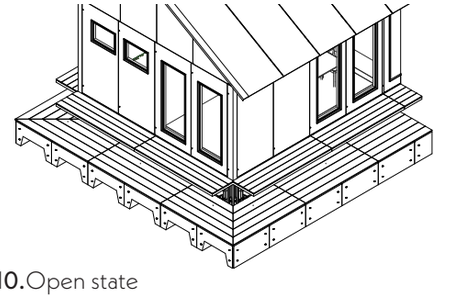


Fig. 10.Open state

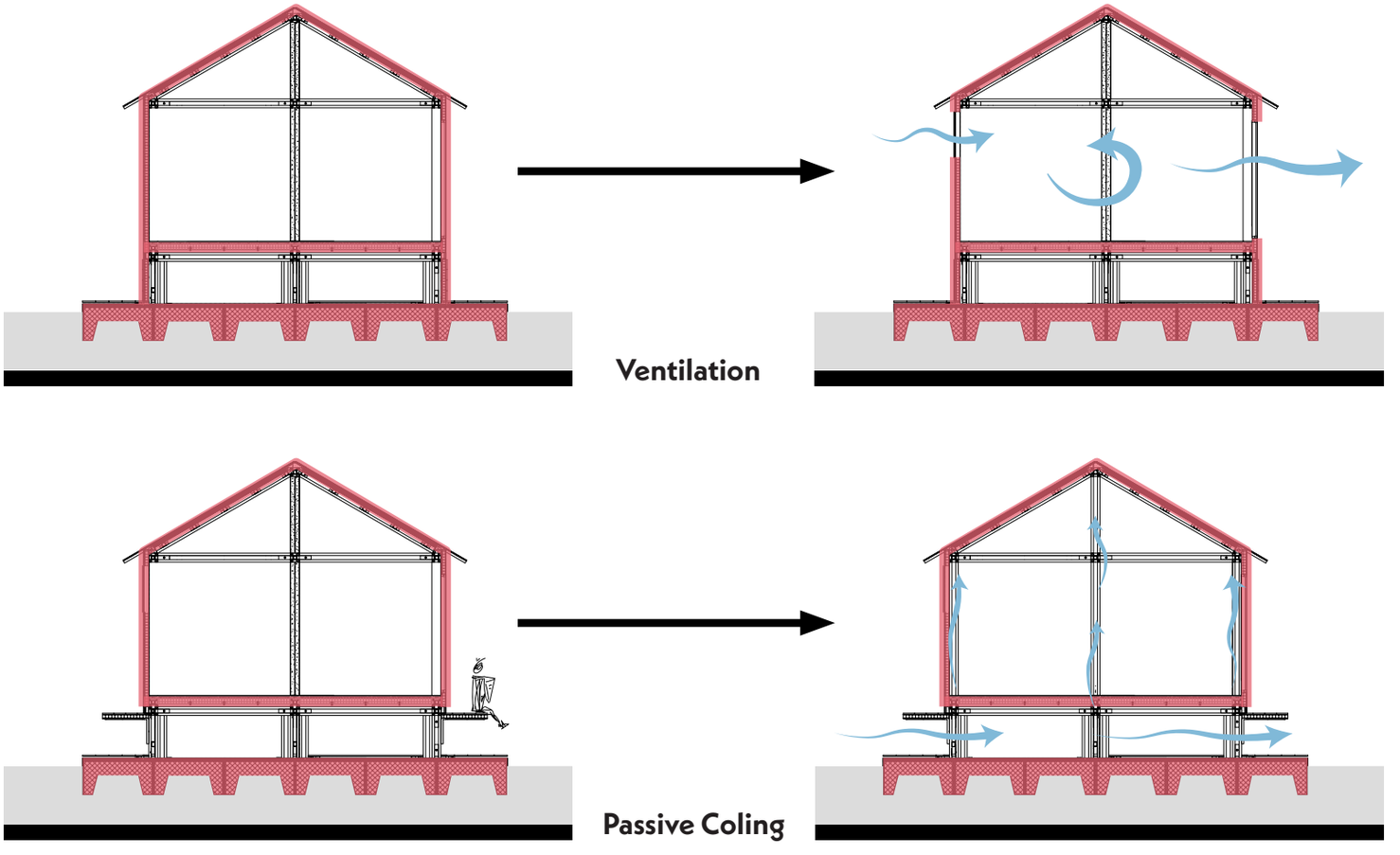


Fig. 11.Ventilation and Passive cooling schematic

MATERIAL PALETTE

The palette for this modular design aims to create a balance between durability and aesthetics. The exterior elements, including columns, beams, and panels, are made of aluminium, which can be anodized to provide a range of colors. Three finish options are available for users to personalize their space: Silky Silver, which maintains the aluminium's natural, refined appearance; Coal Black, offering a modern, minimalist feel; and Soft Bronze, adding a touch of warmth to the metal's finish. Anodizing not only allows for these color choices but also enhances aluminium's resistance to weathering.

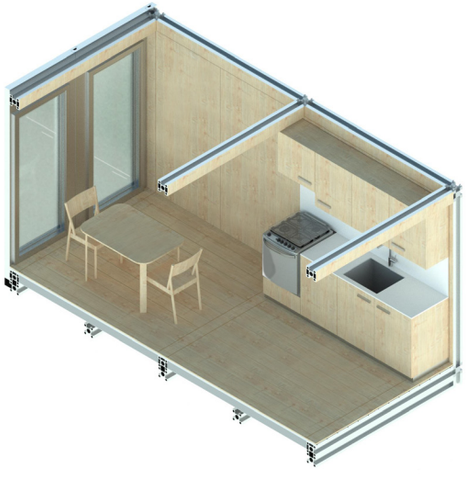
Inside, the design incorporates wood finishes to create a softer, warmer contrast to the coolness of the aluminium. Interior options for floors, partitions, and fillers include both metallic materials and natural wood finishes, with choices ranging from light-colored birch to medium-toned ash, and darker oak. These wood tones bring a natural warmth to the space, making it feel more inviting and comfortable.

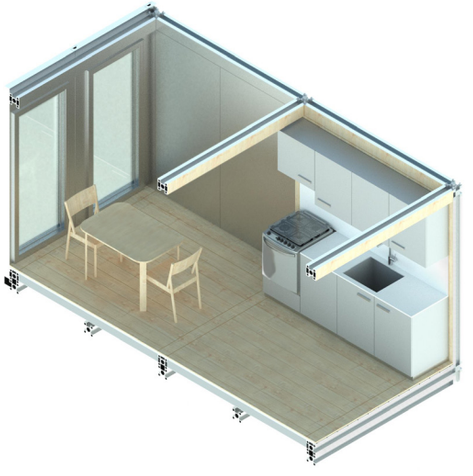
This combination of customizable exterior and interior materials allows for a versatile and user-centered design that balances modern aesthetics with a cozy, home-like atmosphere.

Fig. 12. Material palette

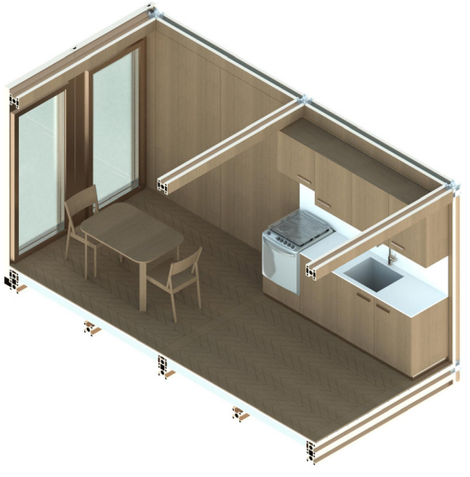
Coal Black + Ash

Silky Silver + Birch





Soft Bronze + Oak



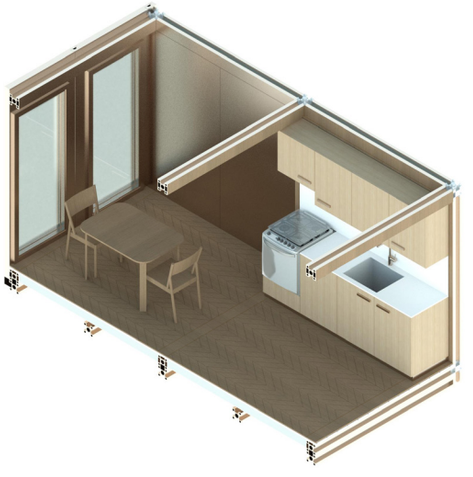


Fig. 13. Interior impressions

GROUND LEVELING SYSTEM

To accommodate fluctuating water levels, the house is anchored with a foundation pile rail system. This system allows for vertical movement while minimizing horizontal drift, keeping the structure secure and stable even as water levels change. Designed to adapt to both land and water, the foundation rail enables the house to remain in place, floating during high water conditions and resting on the ground during low levels. This foundation solution ensures the house's resilience to changing environmental conditions while providing a stable base for occupants year-round.

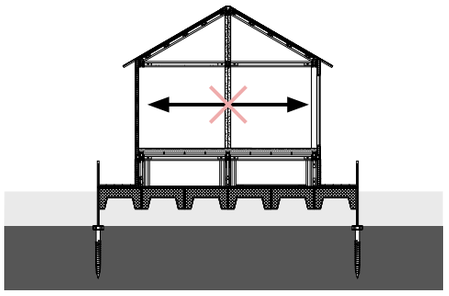


Fig. 14.Minimization of horizontal movement

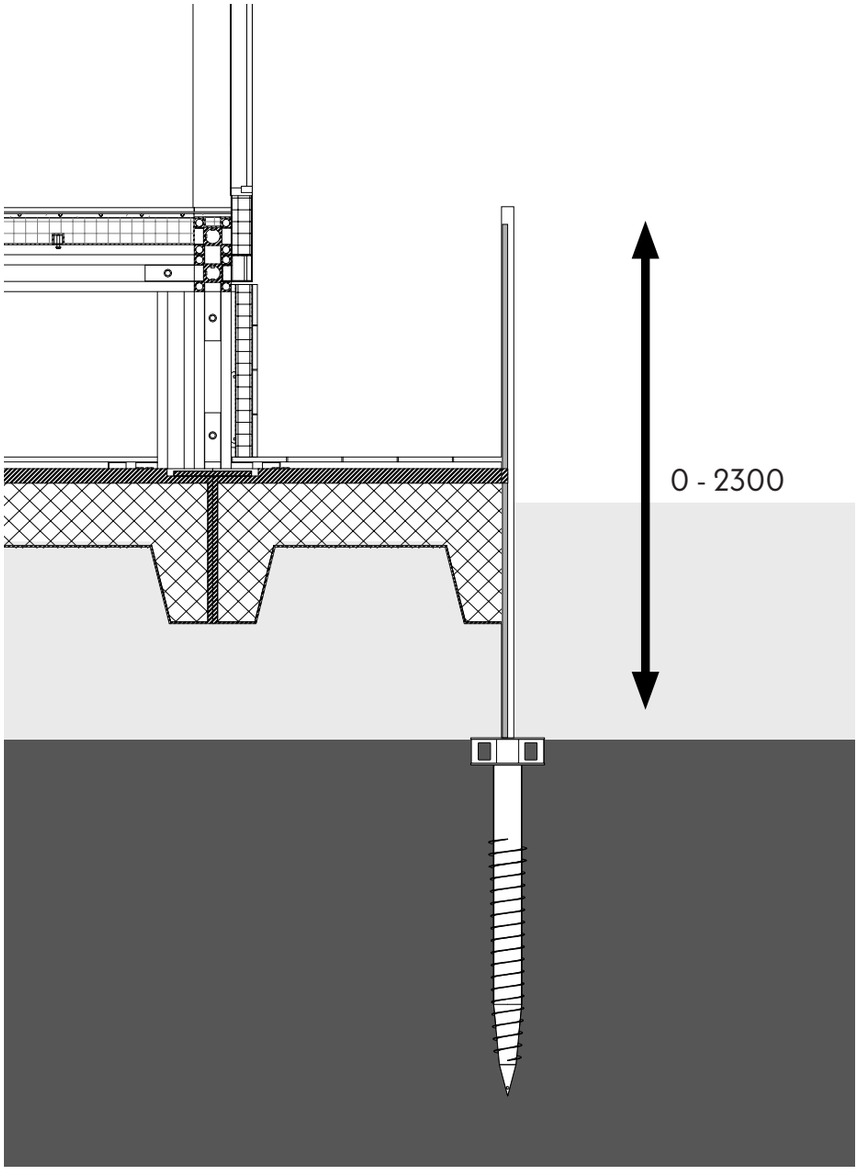


Fig. 15.Building section revealing depth of piles

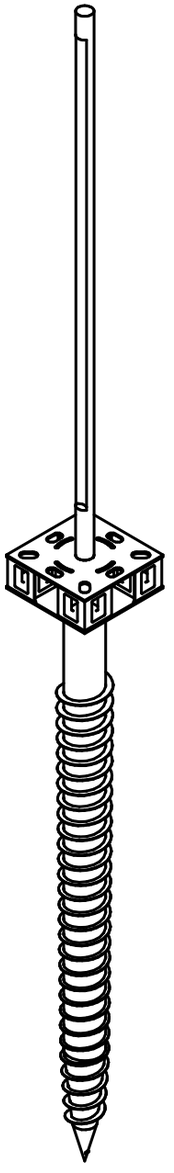
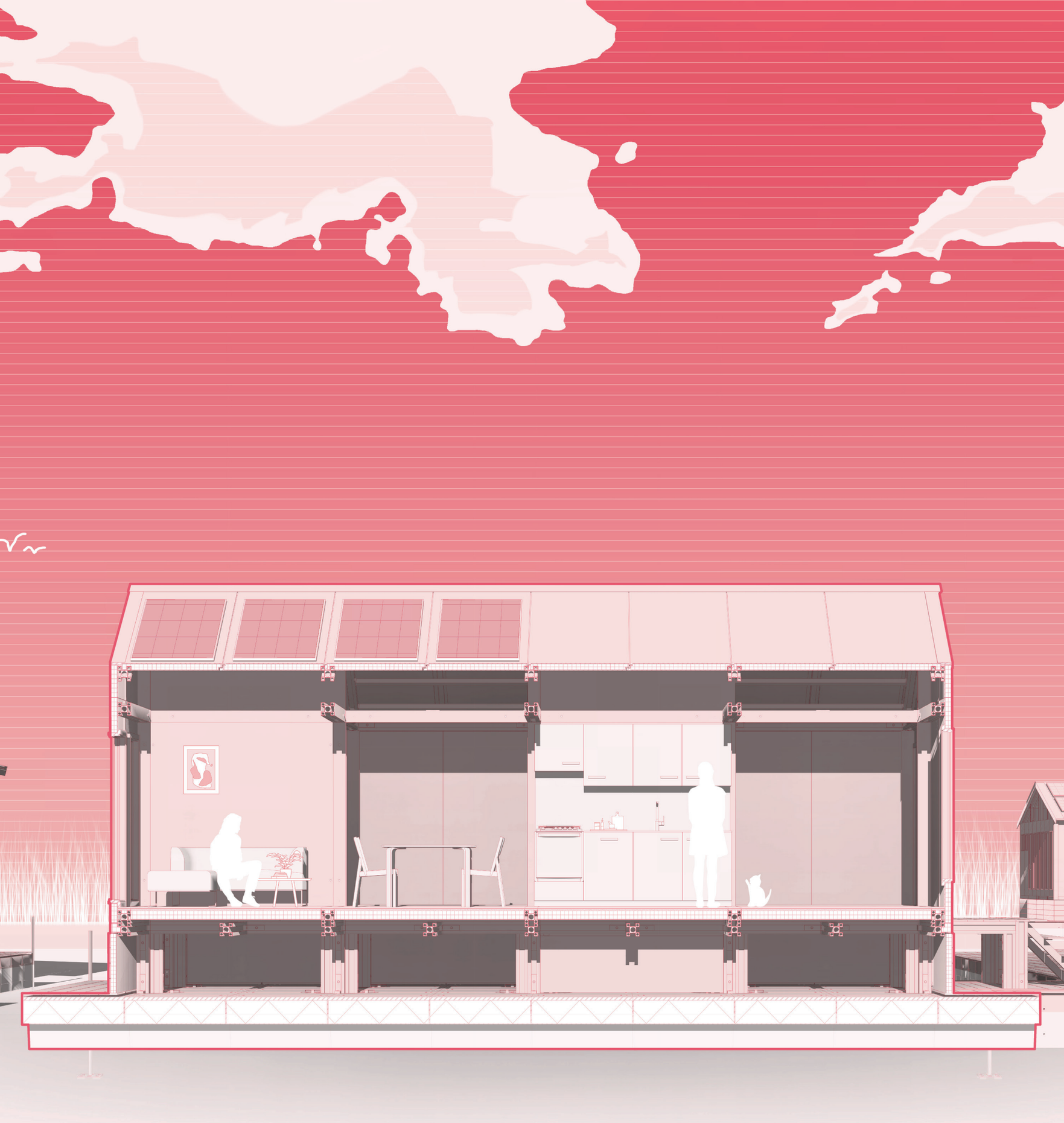
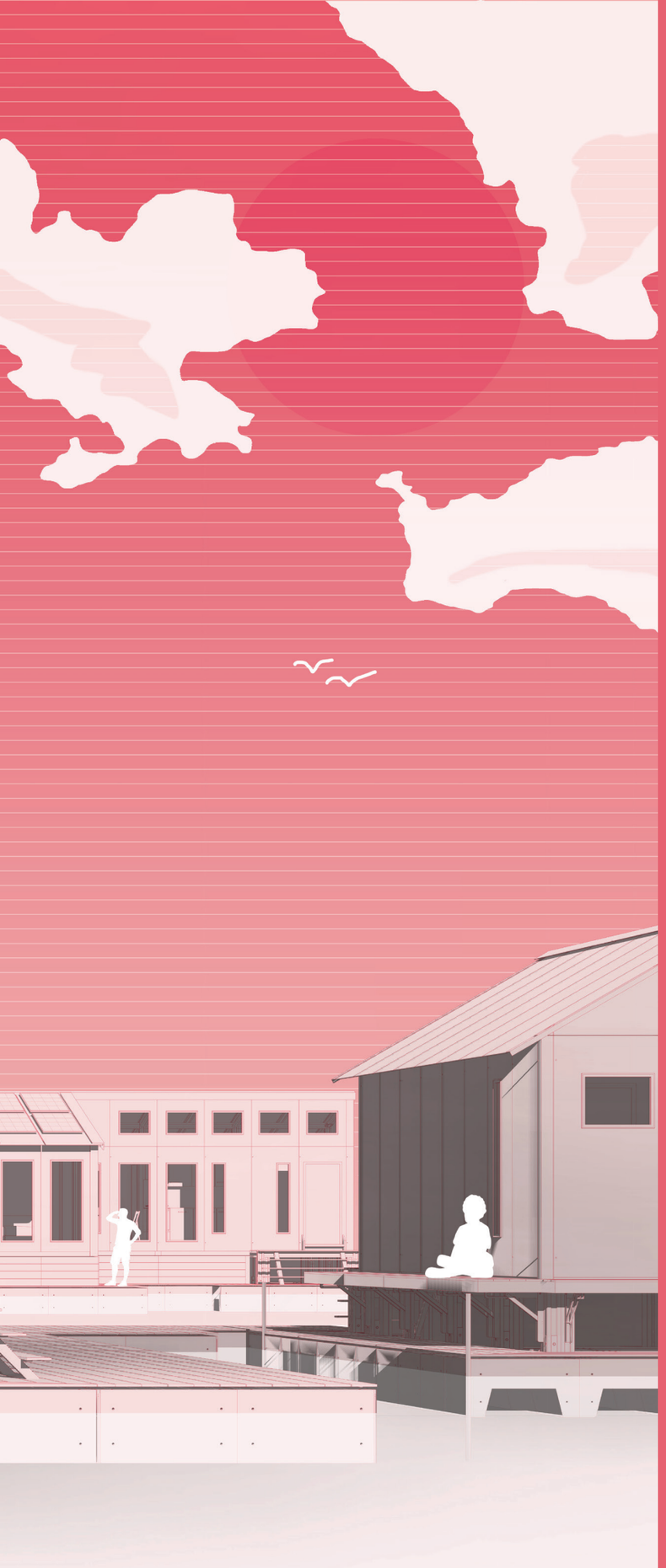


Fig. 16.Pile



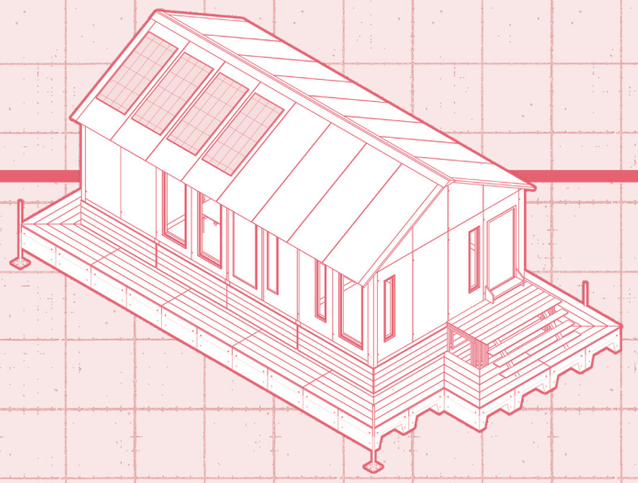


VARIATIONS

This chapter introduces two distinct house types designed within the modular framework. **Type 0** is the foundational model, showcasing a straightforward design that emphasizes speed and simplicity in construction. This compact dwelling is ideal for 1-2 residents, providing an efficient living space.

In contrast, **Type L** offers a more complex, L-shaped configuration, catering to a young couple or a family of three. This design incorporates more intricate shapes, enhancing both aesthetic appeal and functionality while still maintaining the benefits of modularity. Together, these two types demonstrate the versatility of the modular system in accommodating various living needs.

TYPE 0



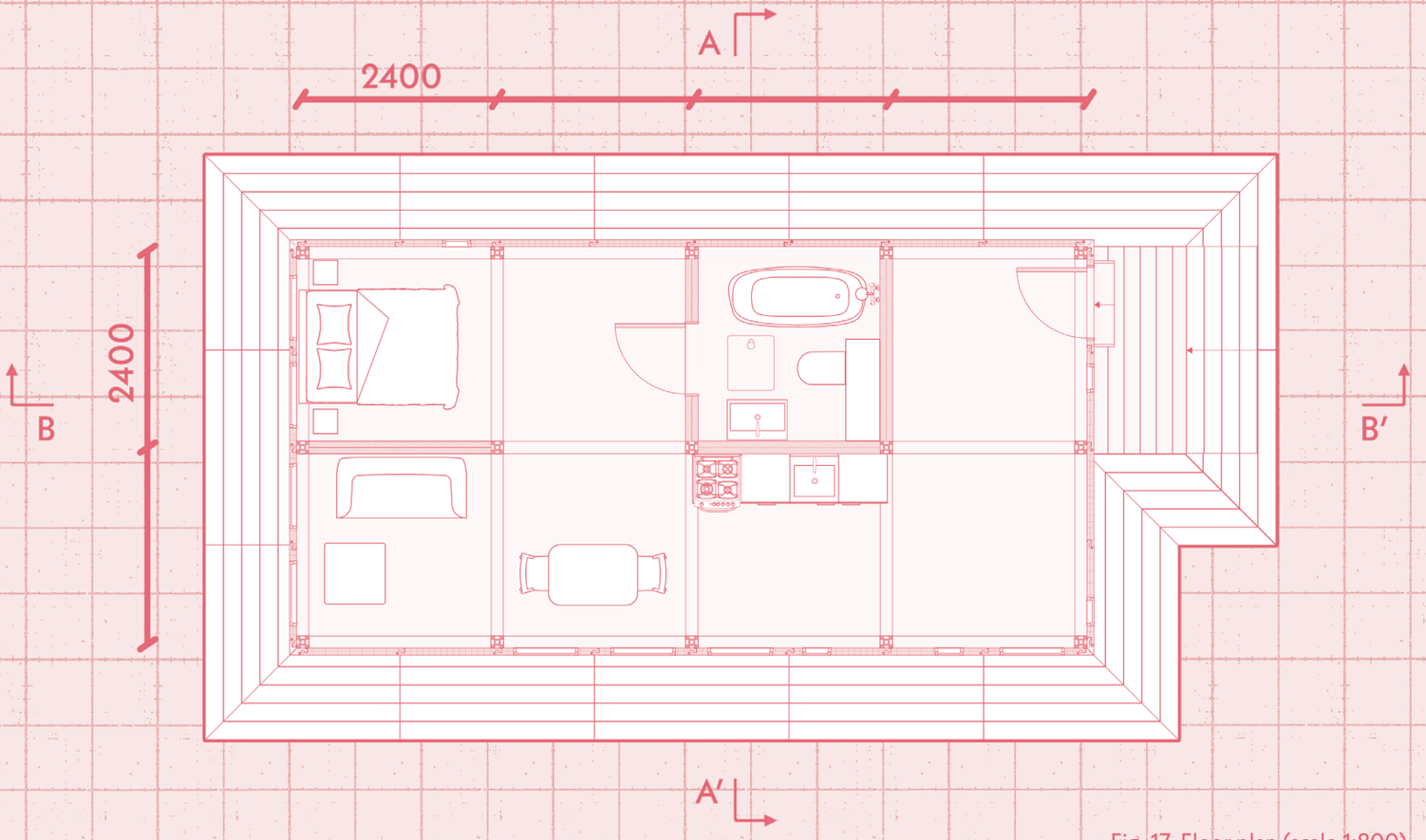


Fig. 17. Floor plan (scale 1:800)

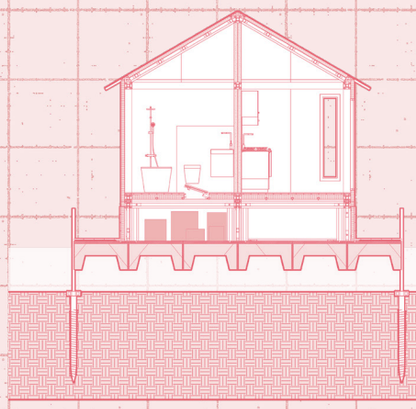


Fig. 18. Section AA′ (scale 1:1500)

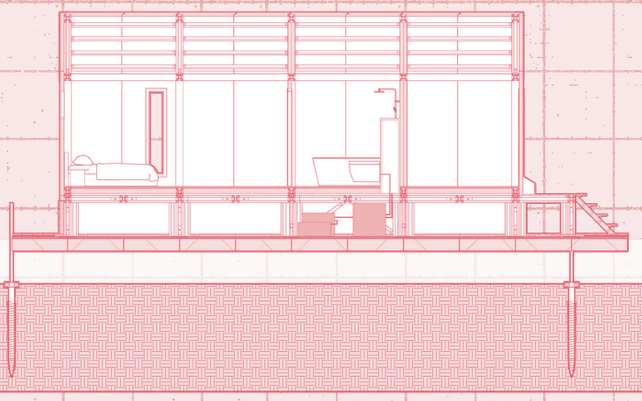


Fig. 19. Section BB′ (scale 1:1500)

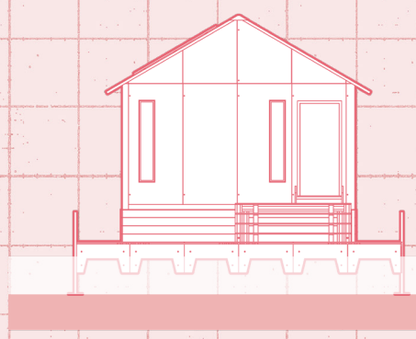


Fig. 20. East elevation (scale 1:1500)

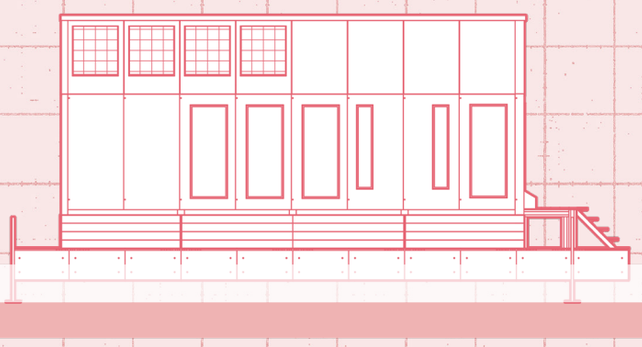


Fig. 21. South elevation (scale 1:1500)

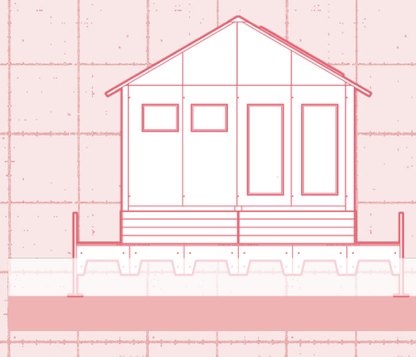


Fig. 22. West elevation (scale 1:1500)

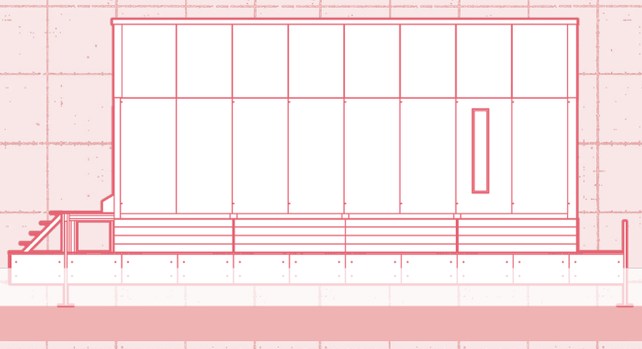
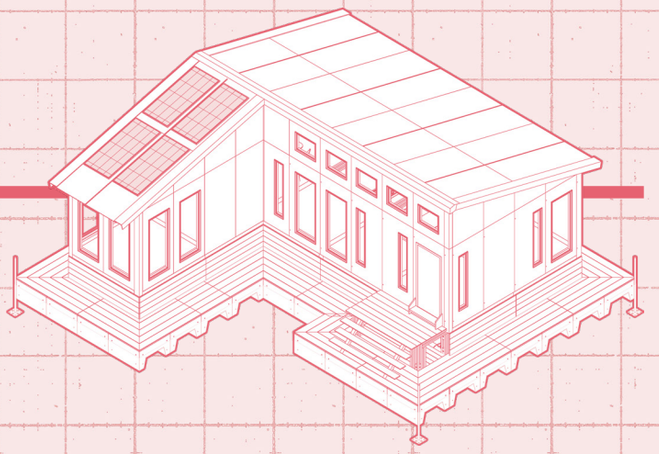


Fig. 23. North elevation (scale 1:1500)

TYPE L



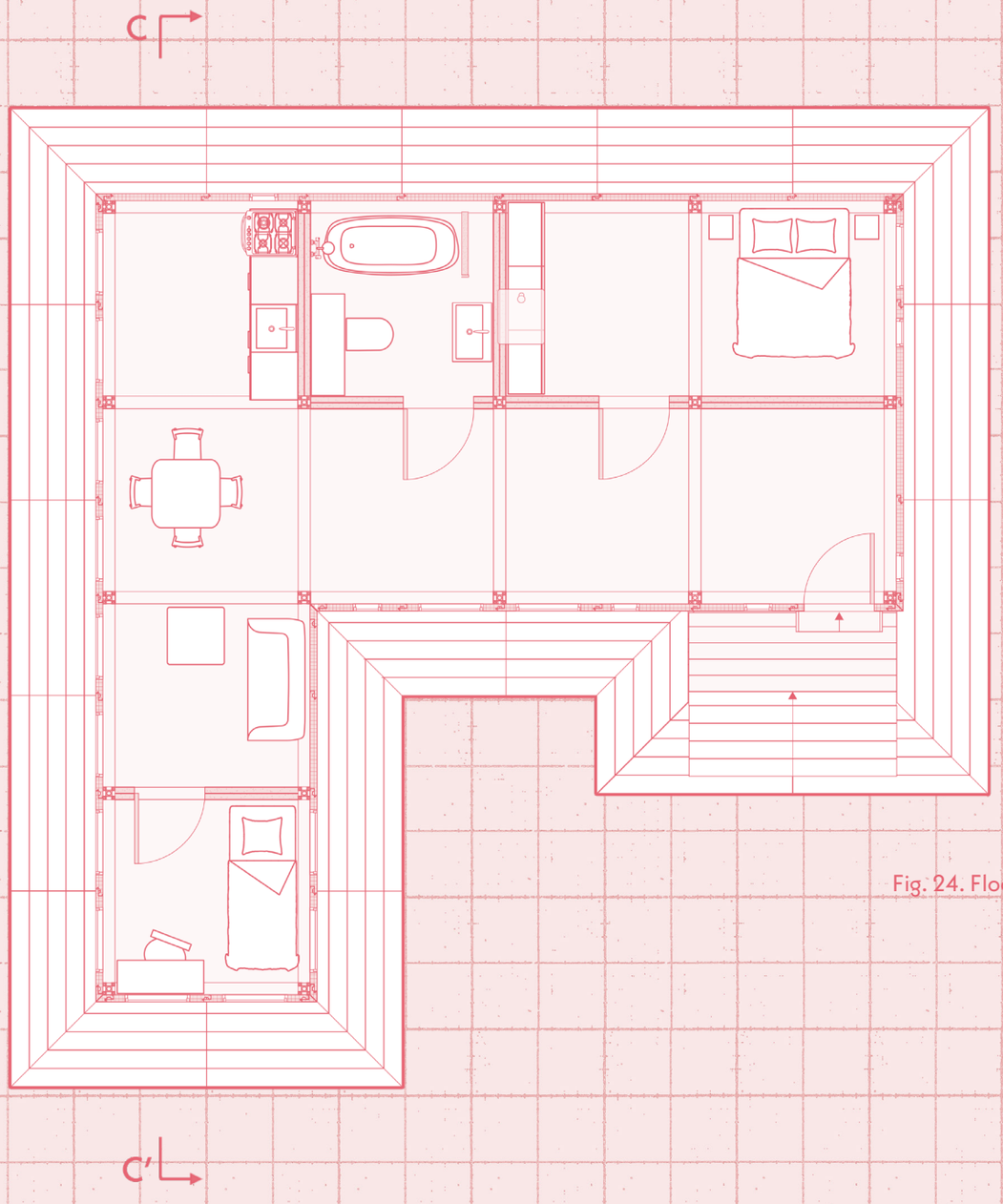


Fig. 24. Floor plan (scale 1:800)

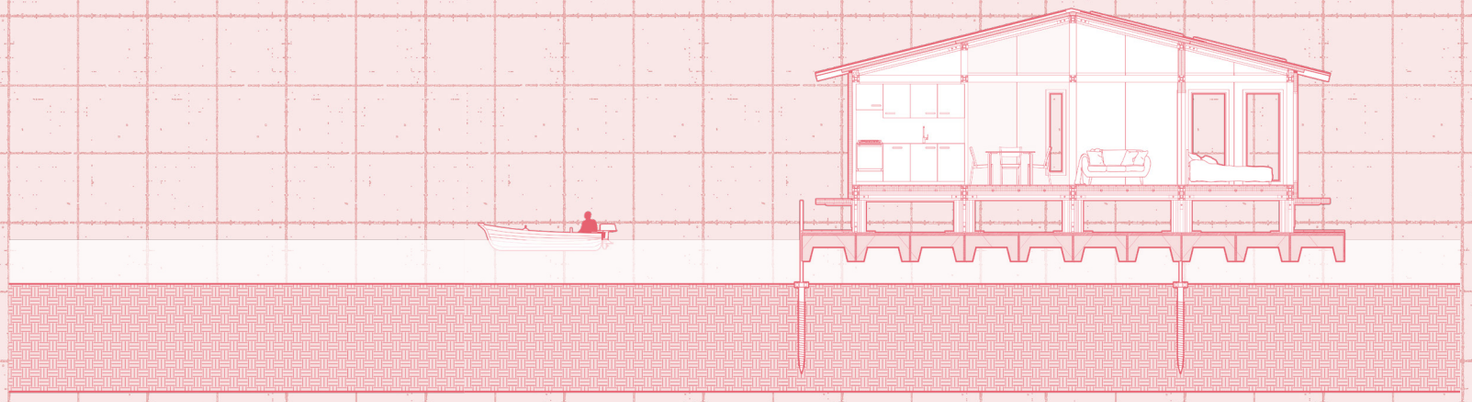


Fig. 25. Section CC′ (scale 1:1500)

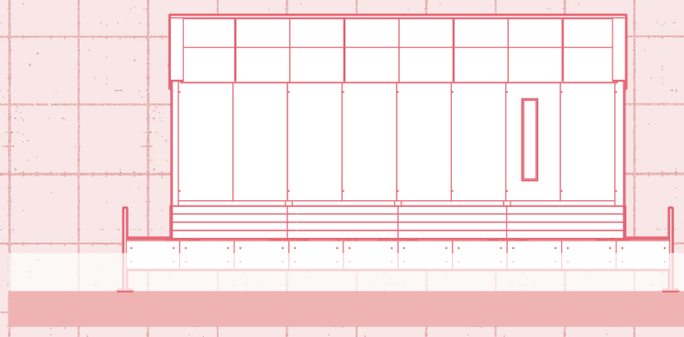


Fig. 26. North elevation (scale 1:1500)

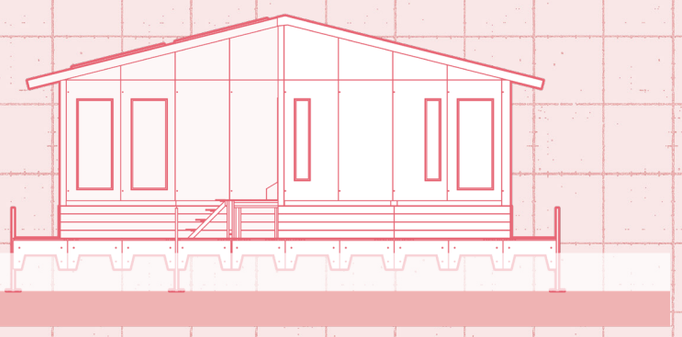


Fig. 27. East elevation (scale 1:1500)

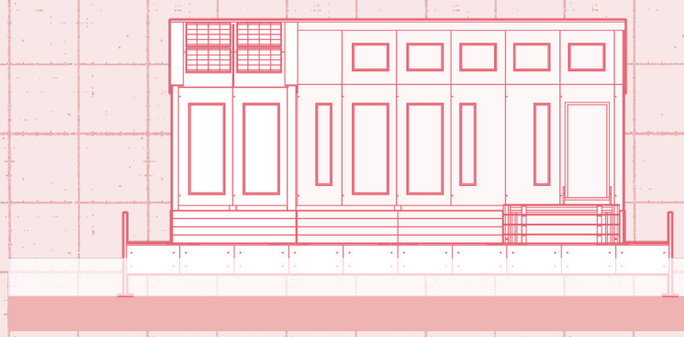


Fig. 28. South elevation (scale 1:1500)

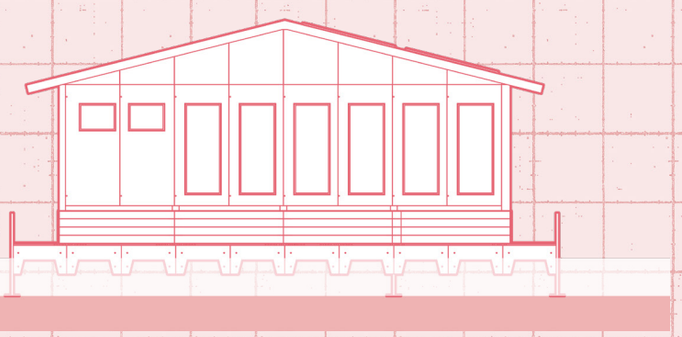
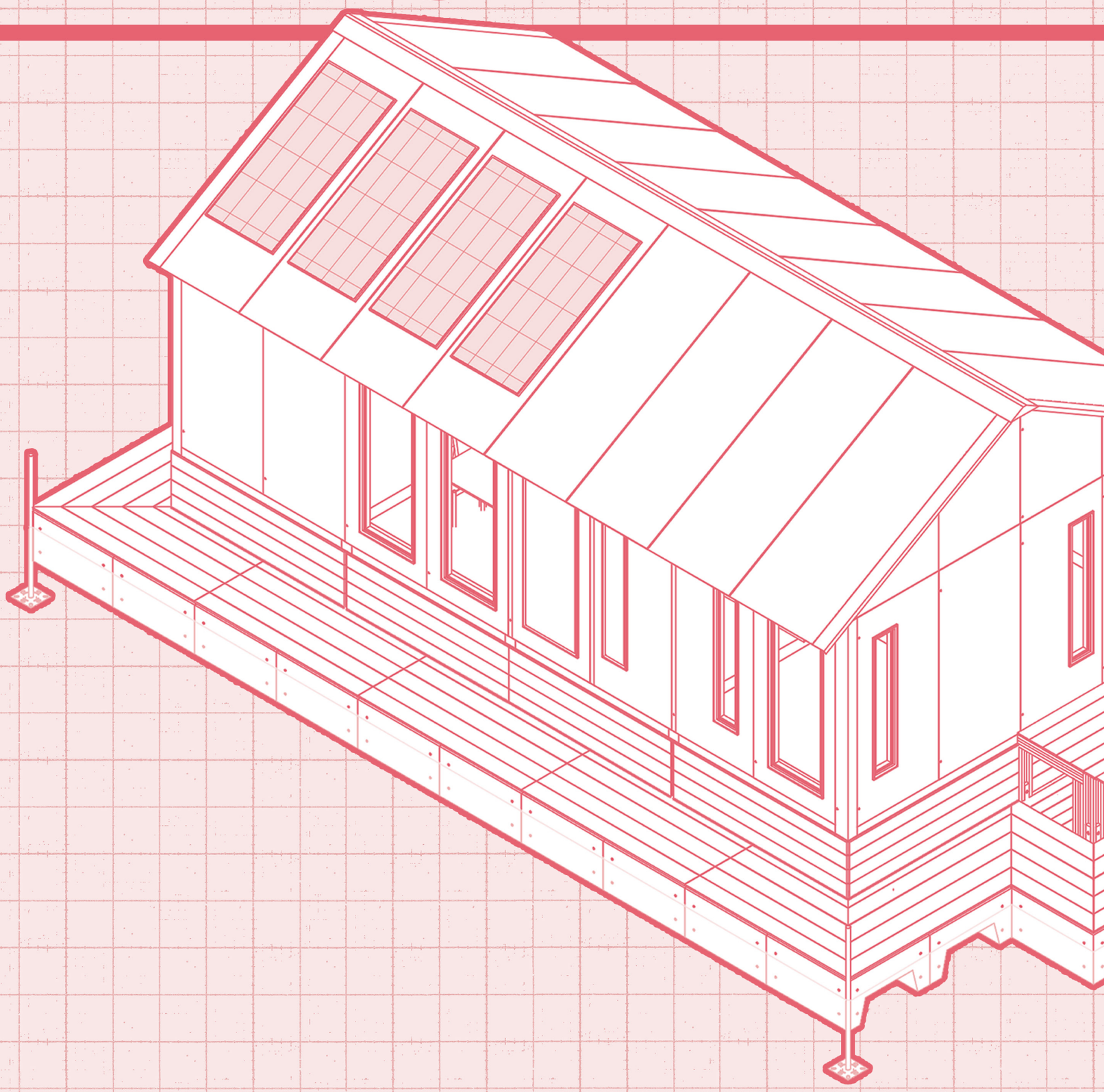
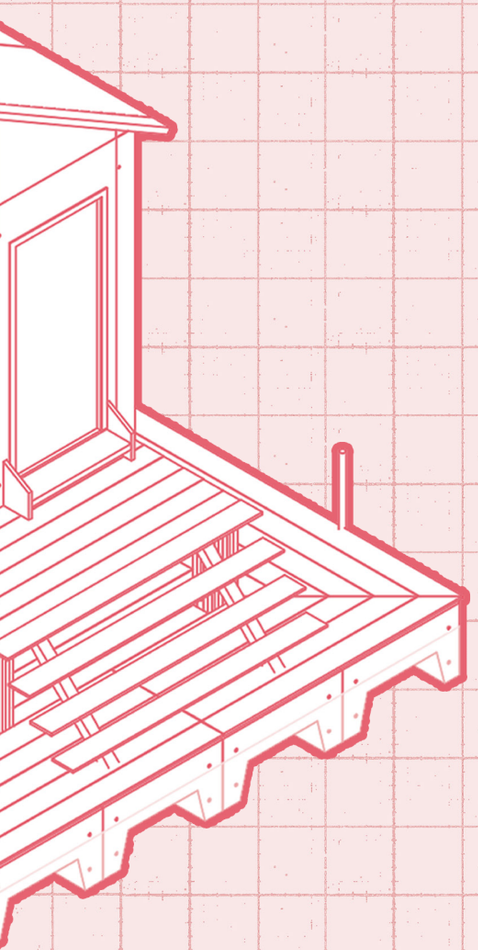


Fig. 29. West elevation (scale 1:1500)

TYPE O



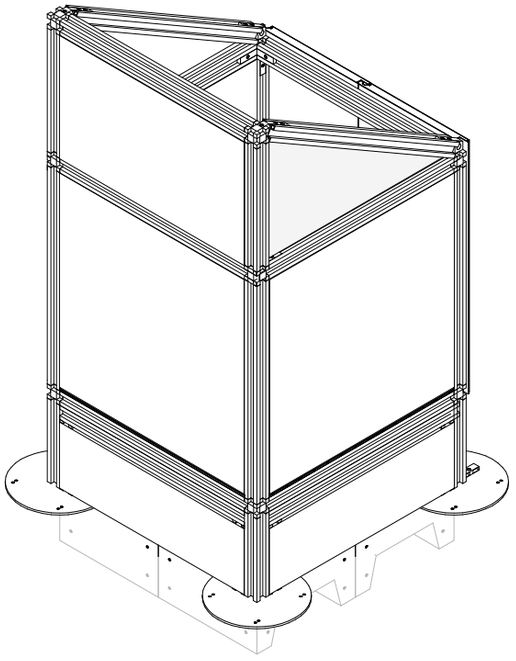


ASSEMBLY

This chapter will provide a detailed, step-by-step guide for assembling Type 0, the basic modular house design. The process begins with the installation of the BUC module. This foundational component serves as the starting point for the entire structure, ensuring stability and alignment for the subsequent assembly.

The assembly process starts by positioning the BUC module on a level surface. Once securely in place, the pontoons are added to create a solid base. Following this, load-bearing columns and beams are erected to support the framework of the house. The roof assembly follows, starting with the installation of angular connectors , beams, roof joists, and finally panels. With these elements in position, floor panels are then fitted onto the structural frame and the exterior panelsare attached. Finally, interior walls are and filler are placed, creating a functional and living space. To complete the assembly, the folding deck is added and alongside it, a half-module entrance deck is installed, creating a welcoming entry point to the home.

This chapter aims to demonstrate the modular system's ease of assembly, highlighting its efficiency and suitability for rapid construction in various environments.



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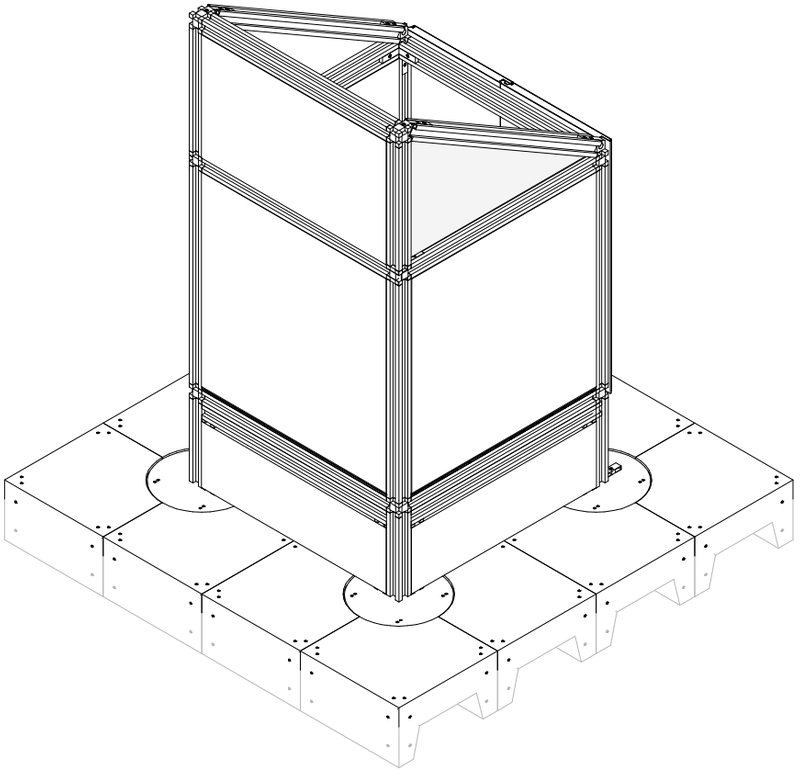

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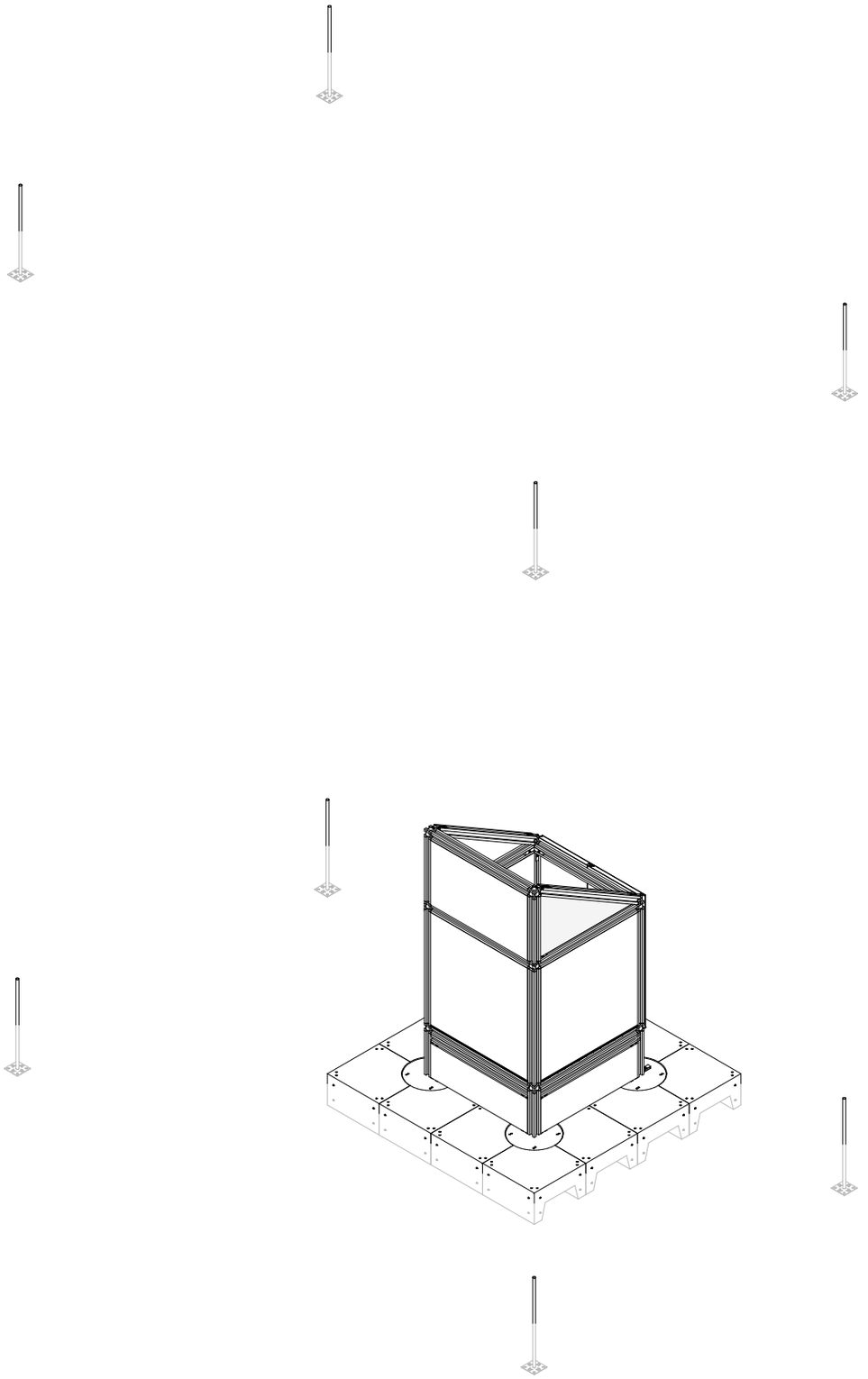

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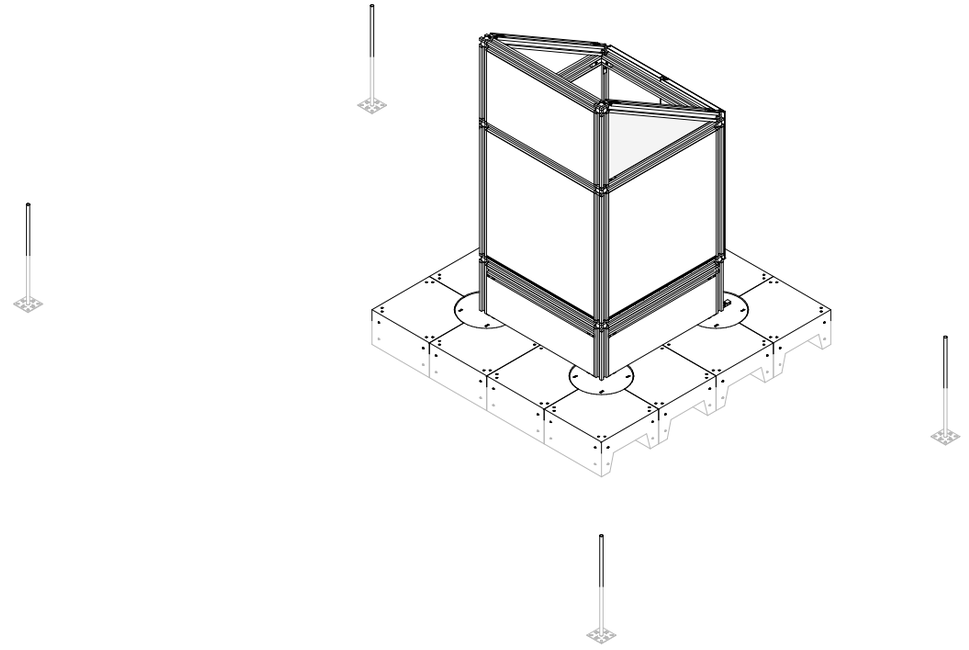

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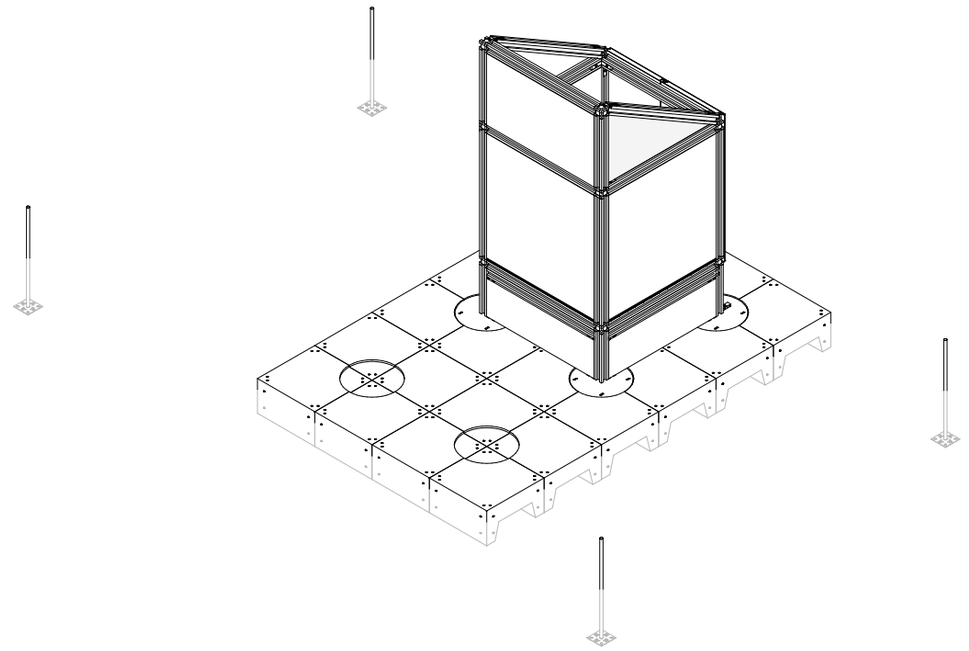

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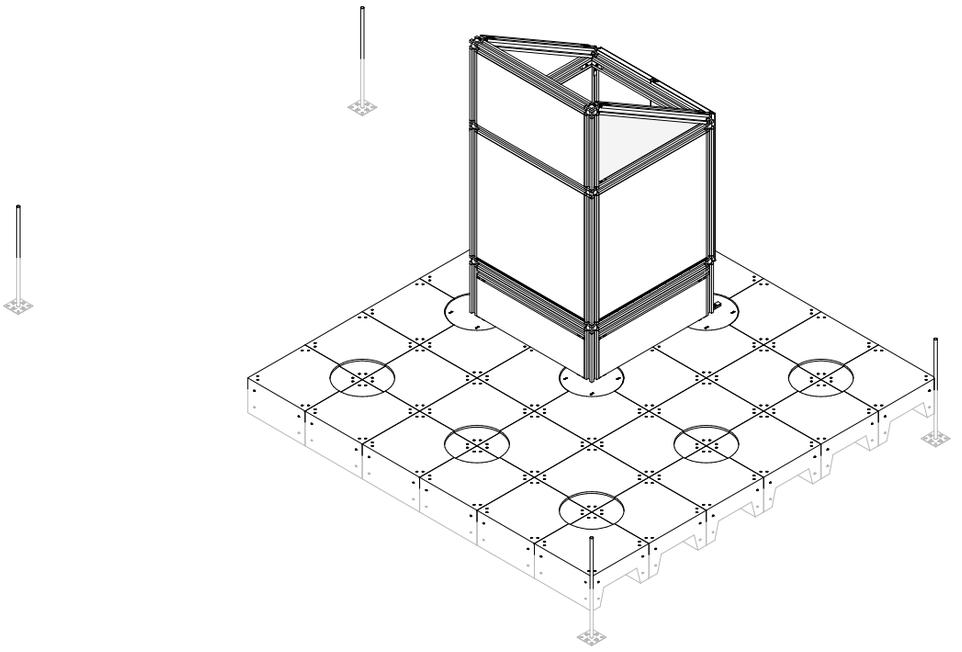

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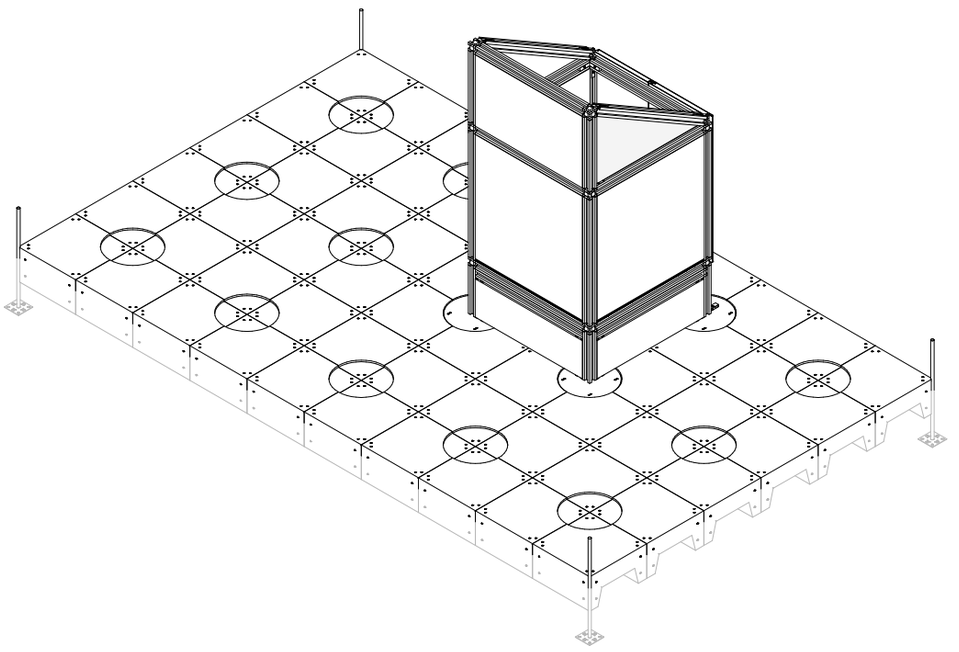

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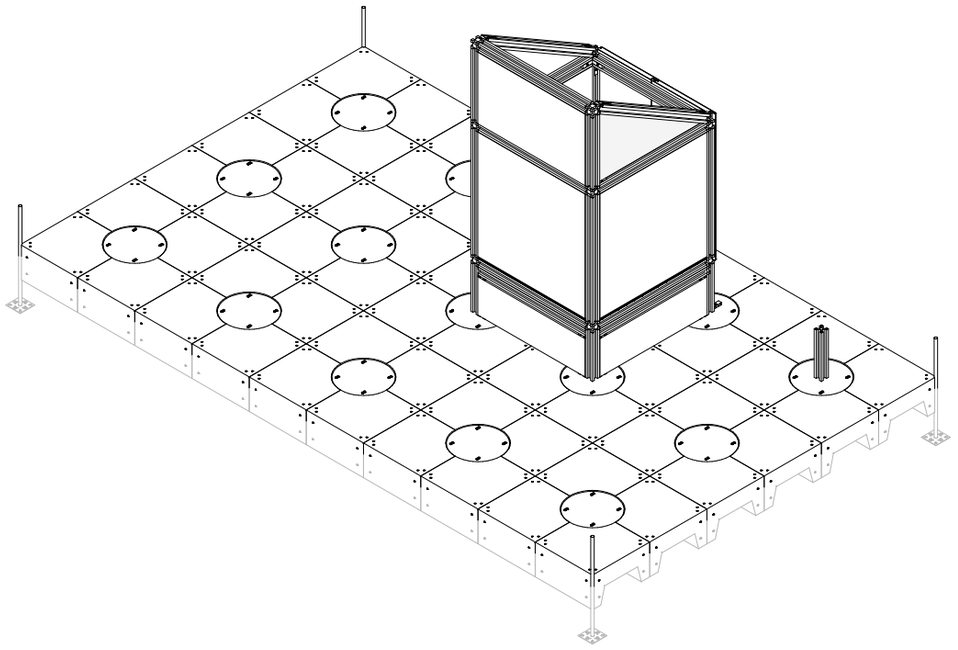

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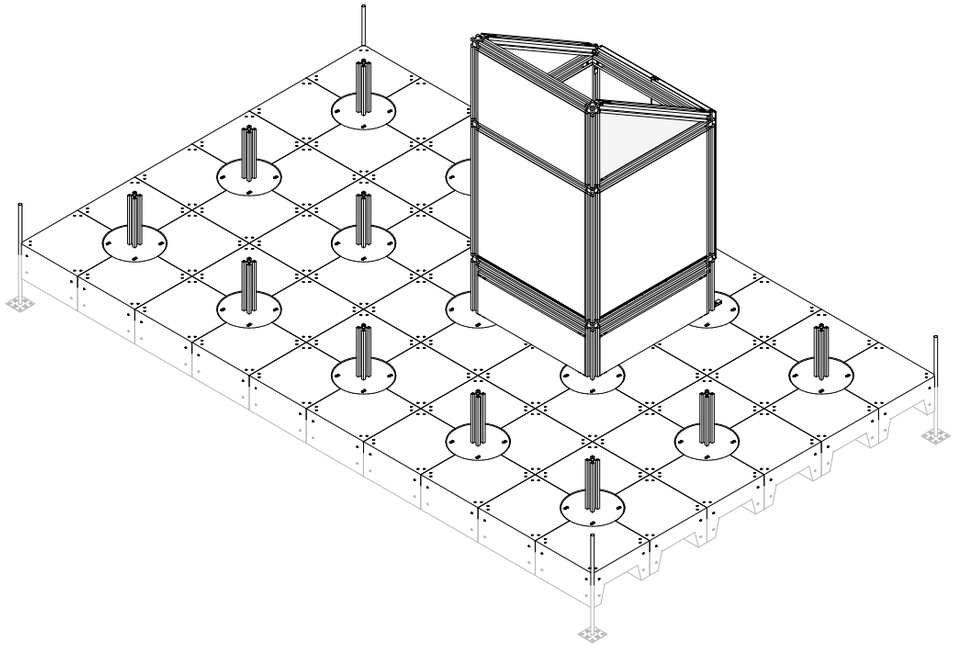

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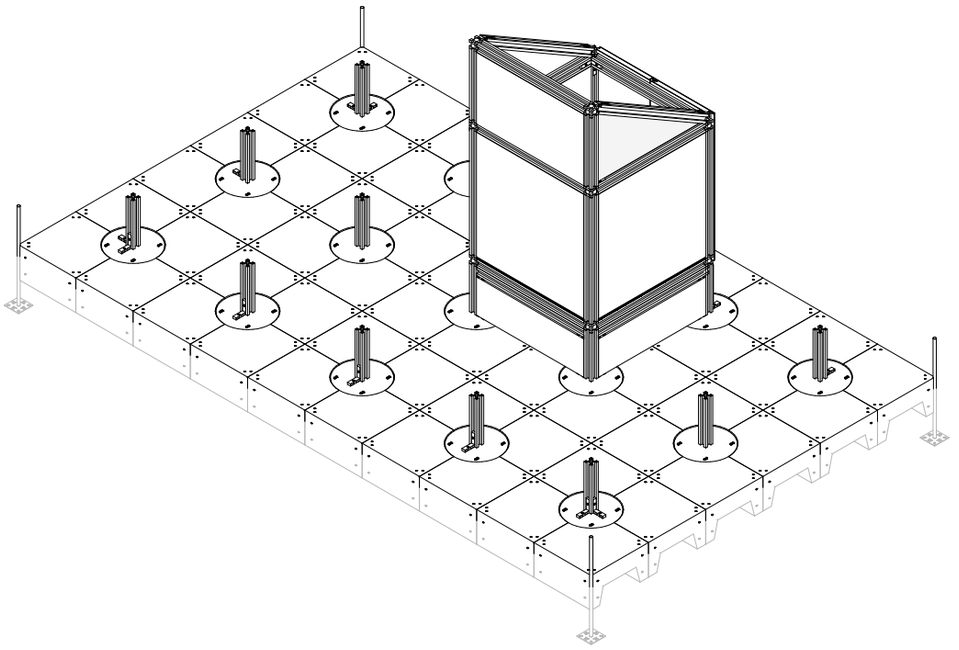

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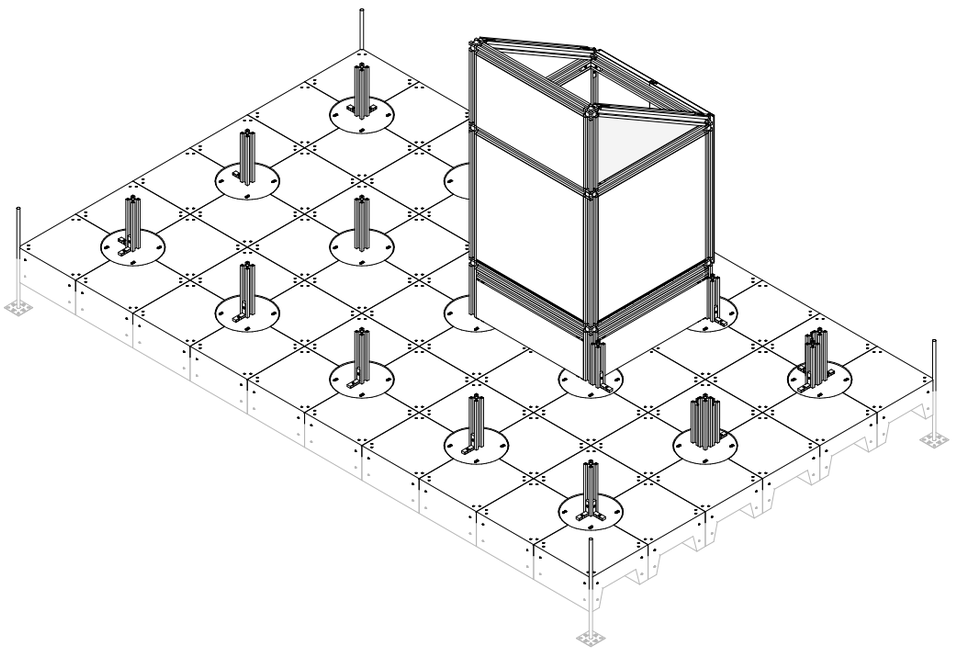

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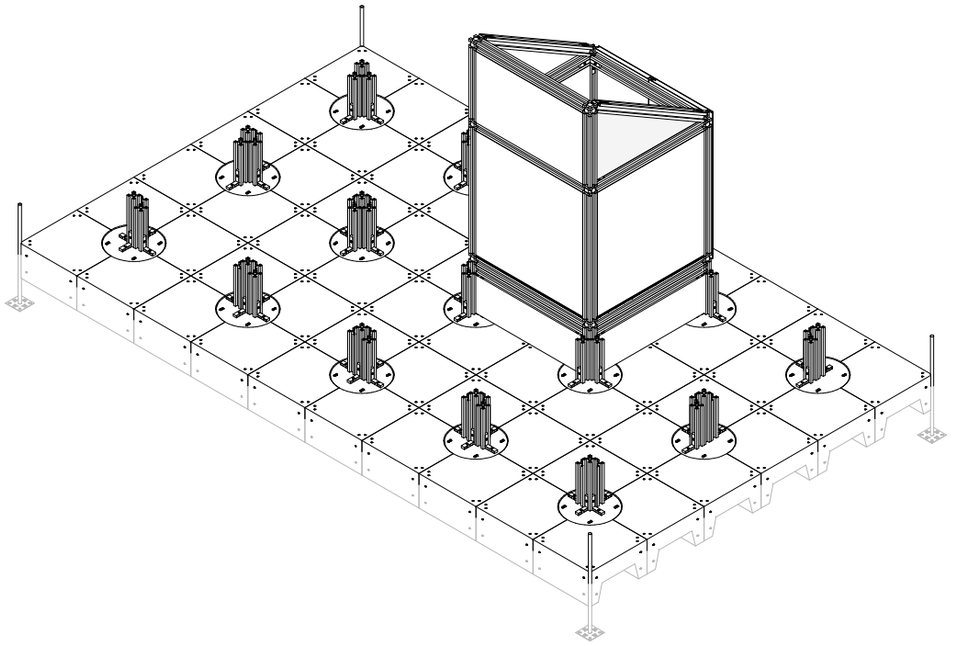

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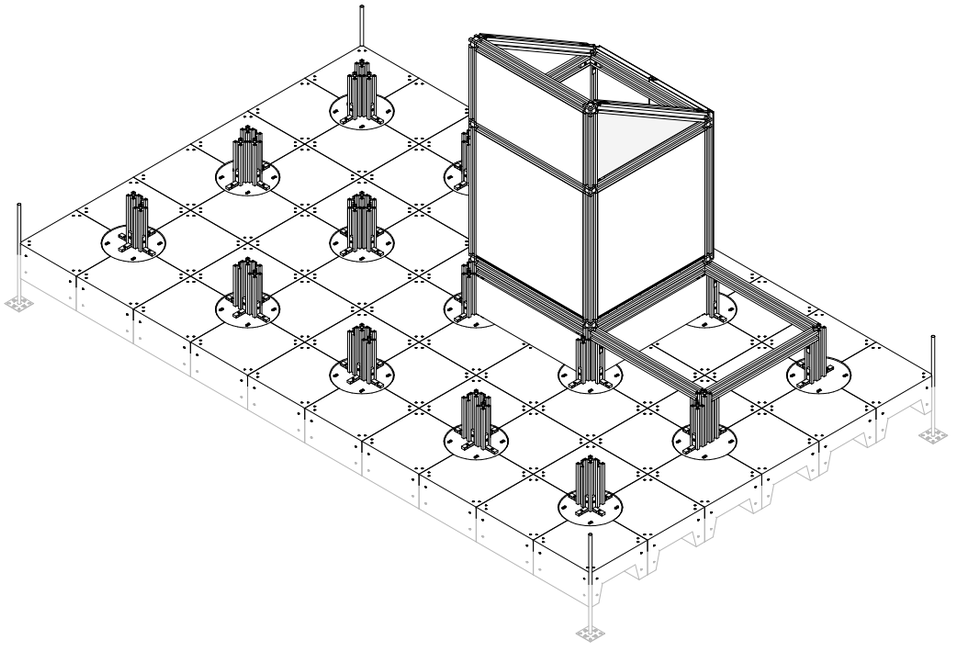

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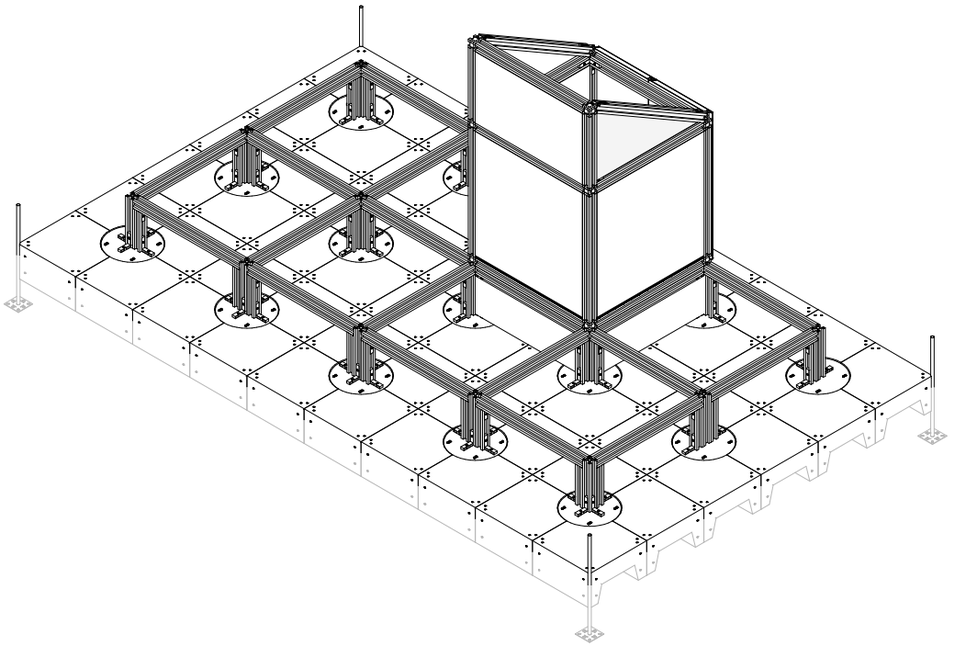

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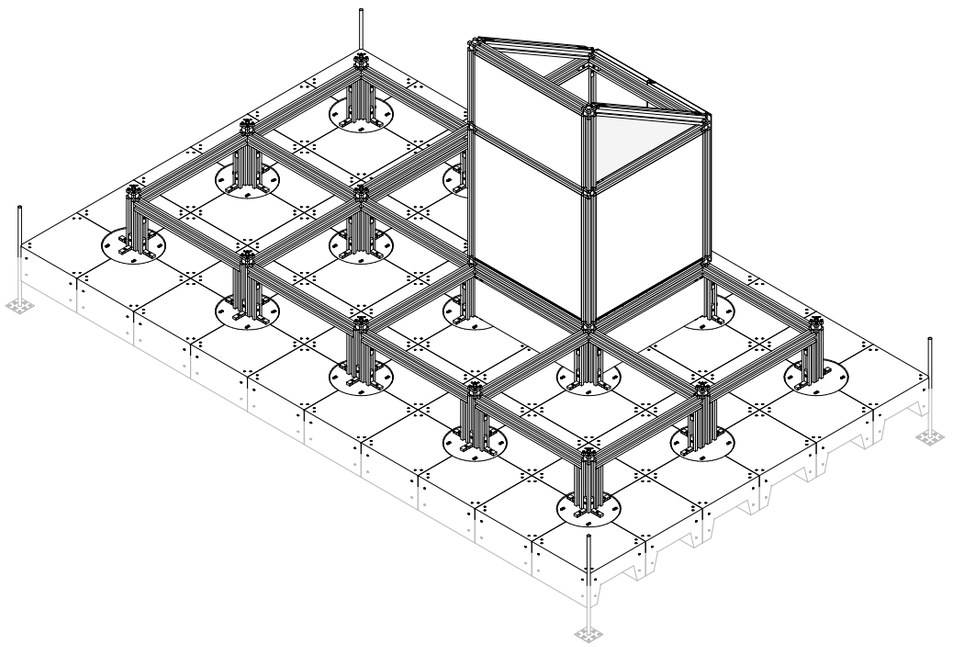

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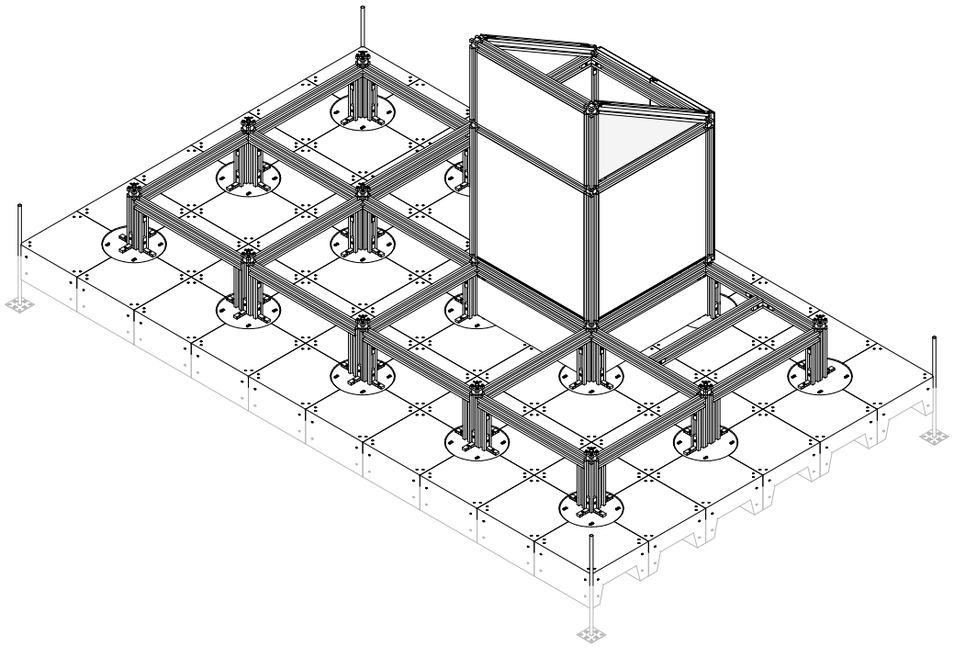

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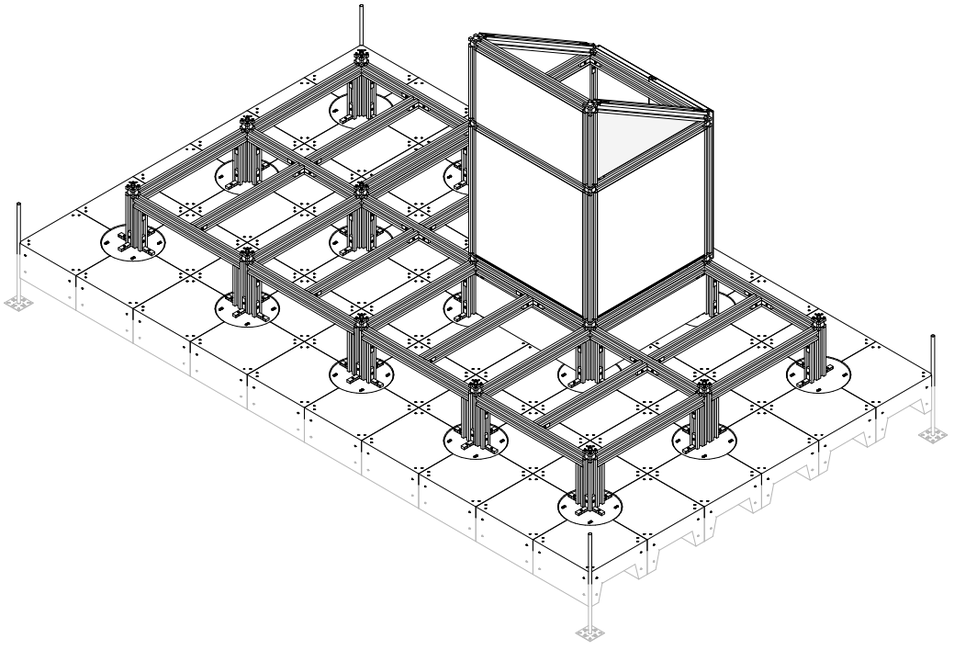

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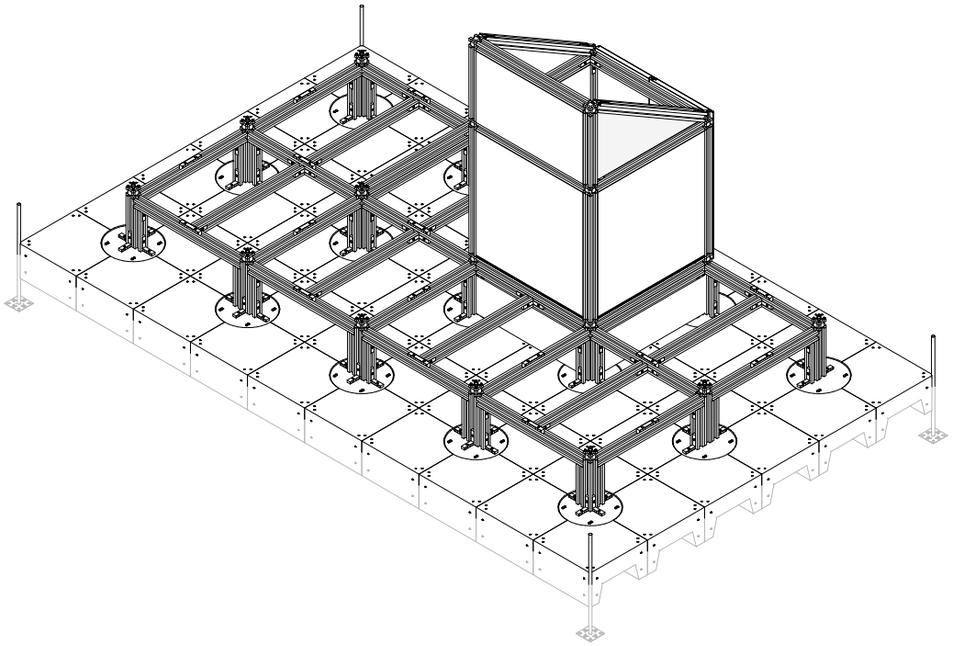

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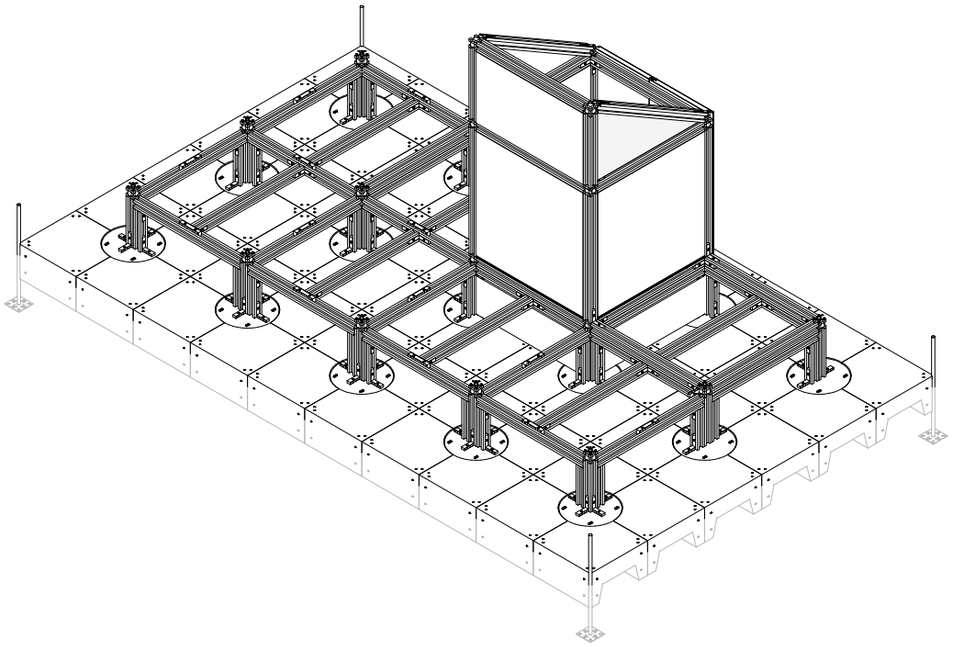

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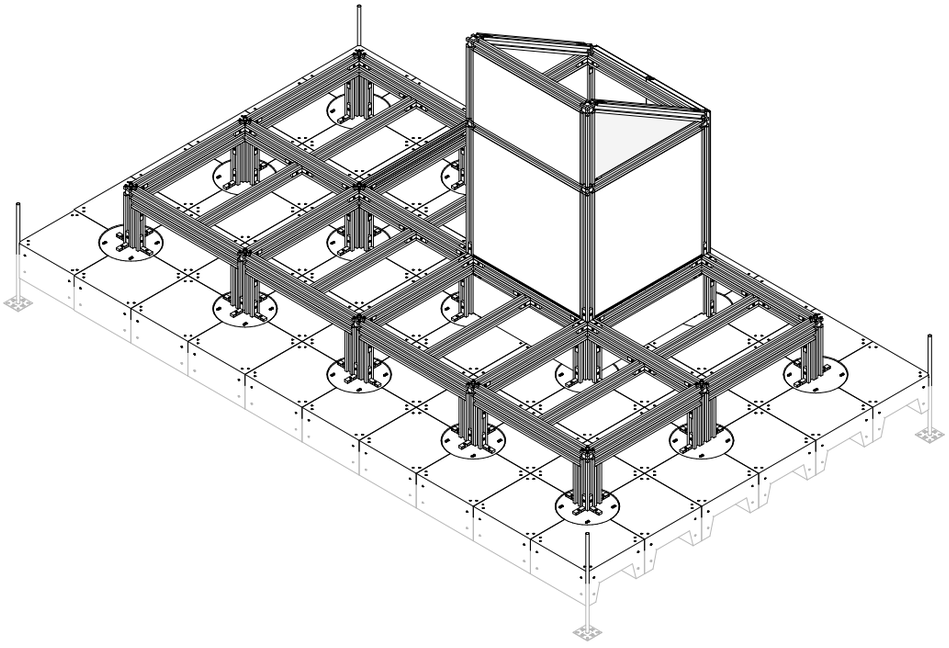

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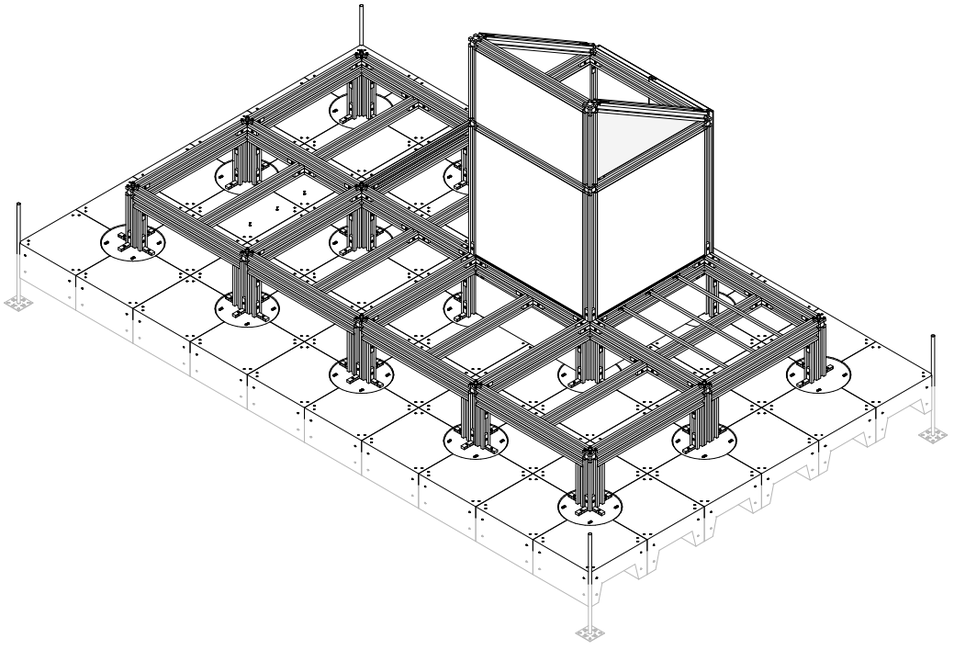

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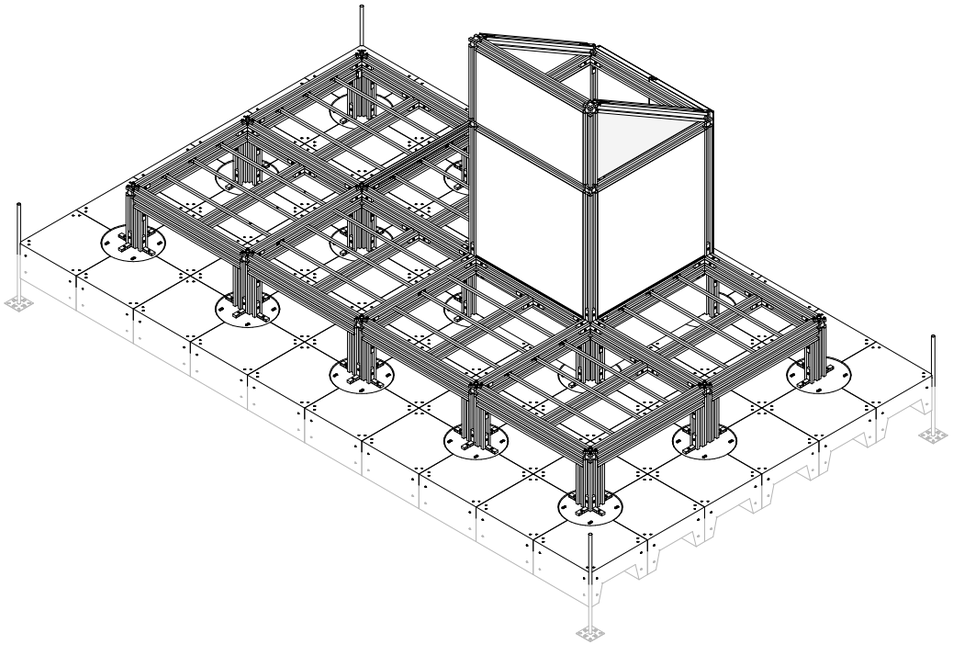

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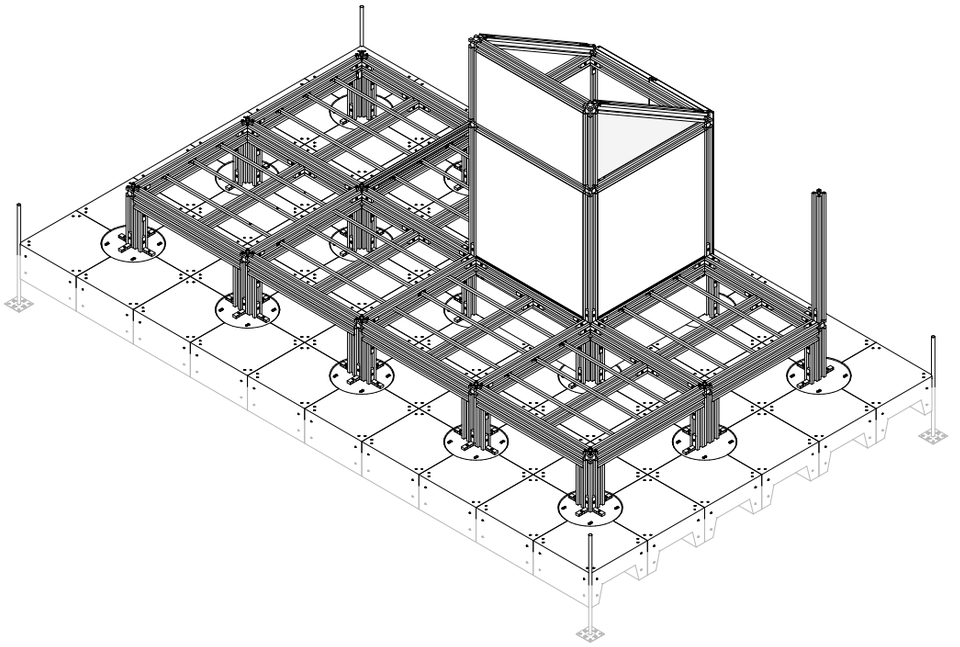

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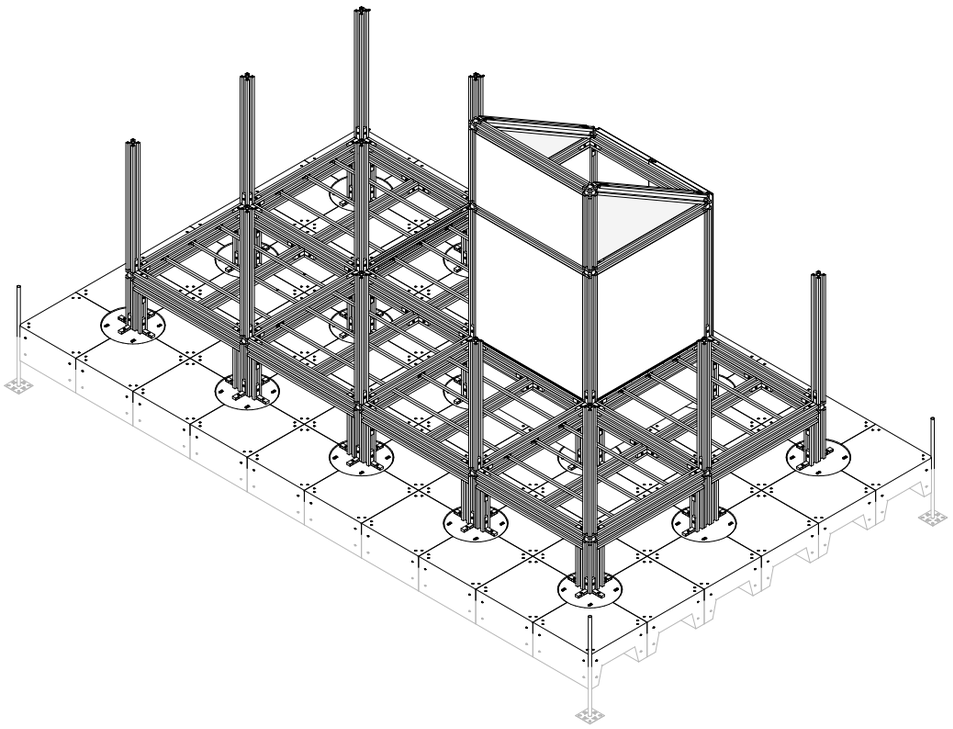

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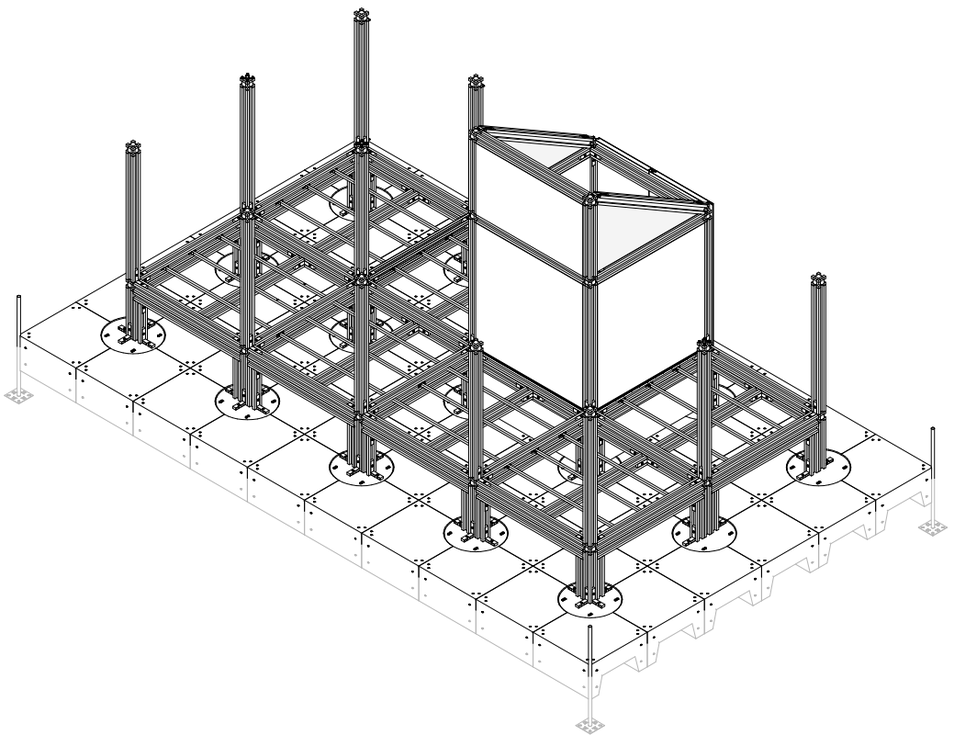

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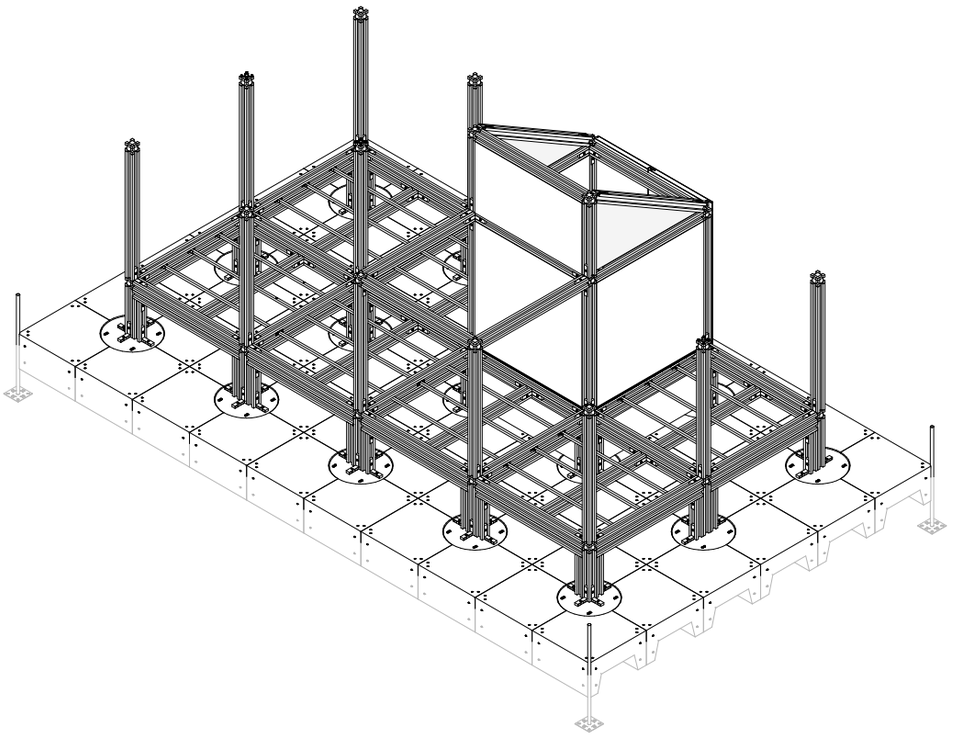

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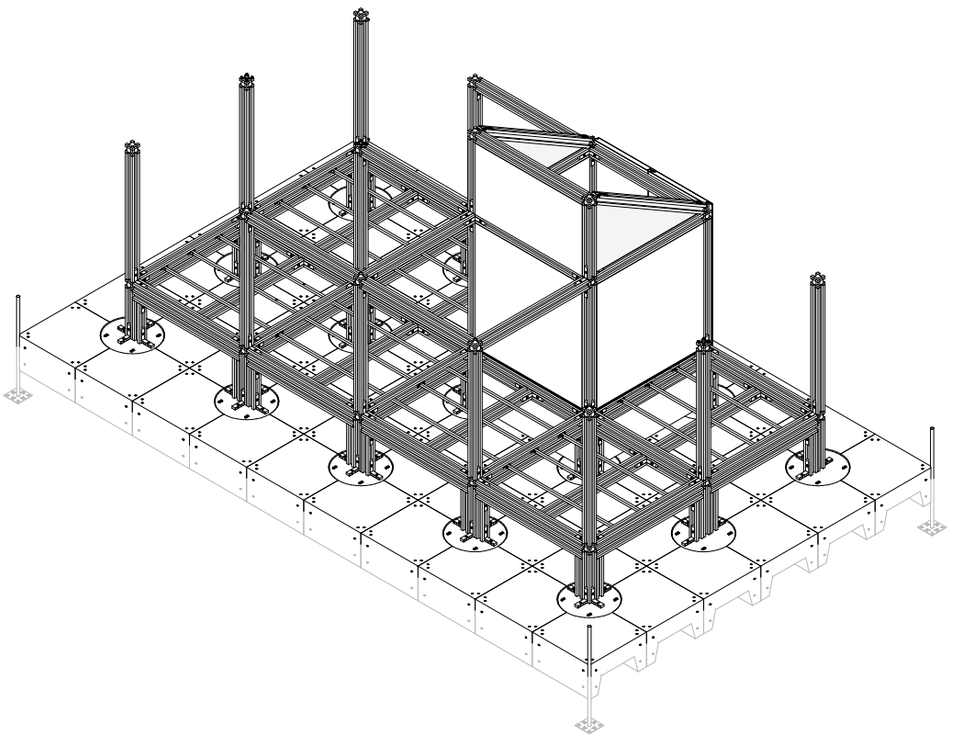

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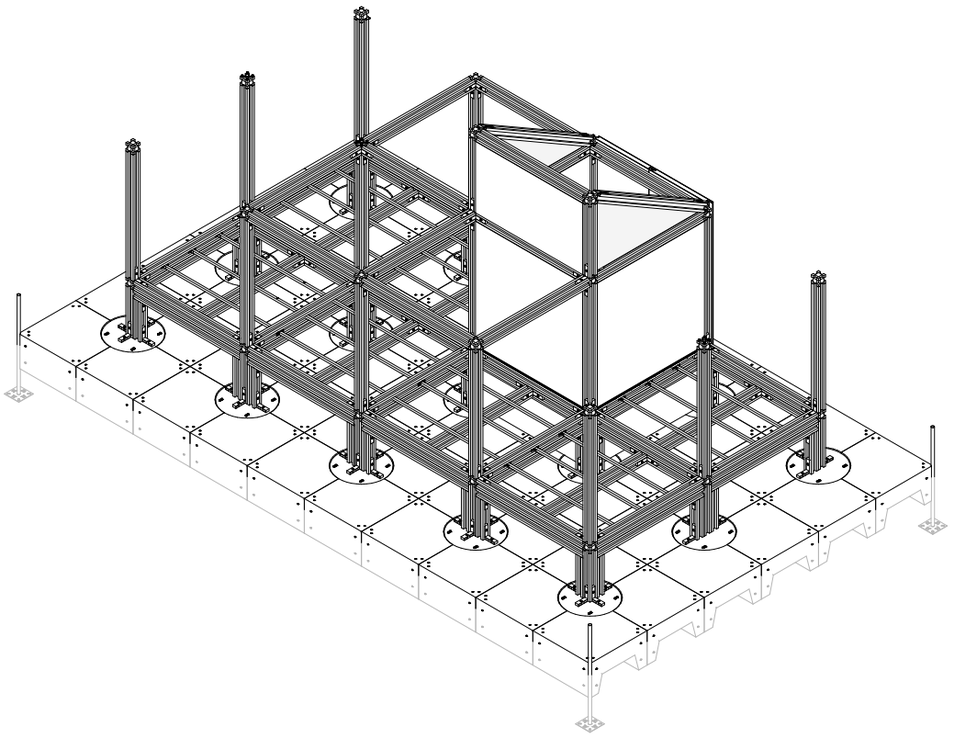

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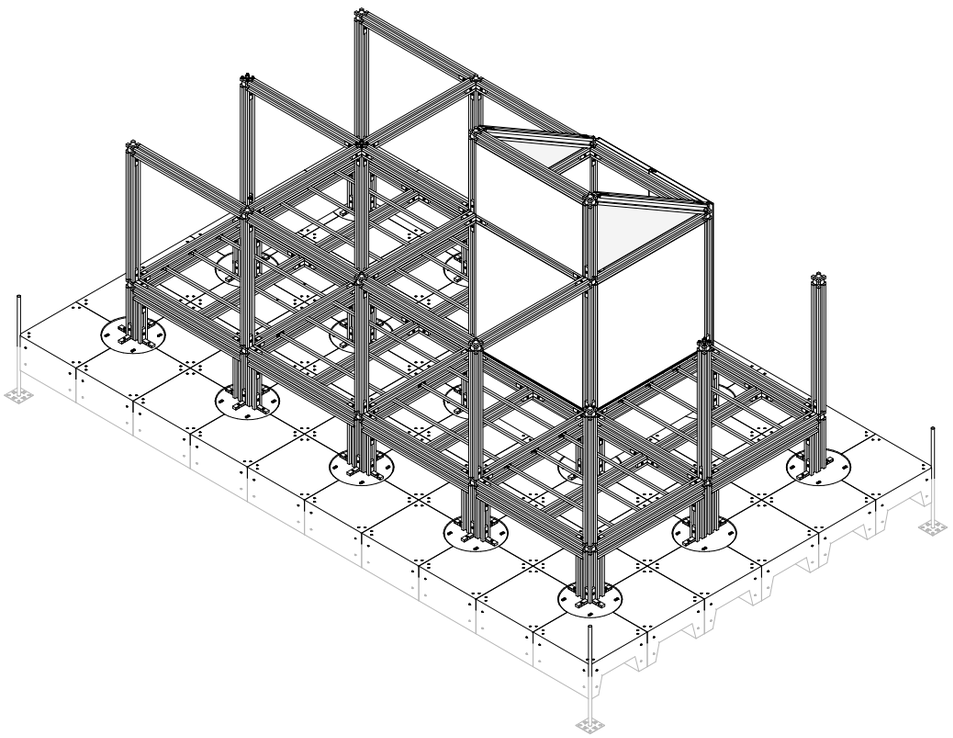

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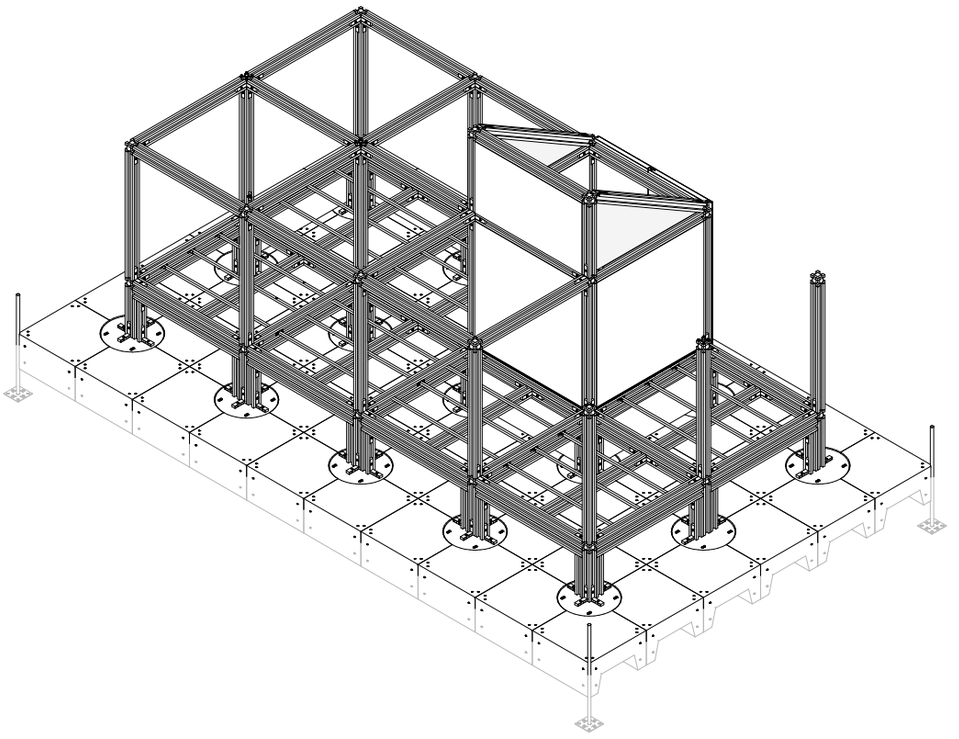

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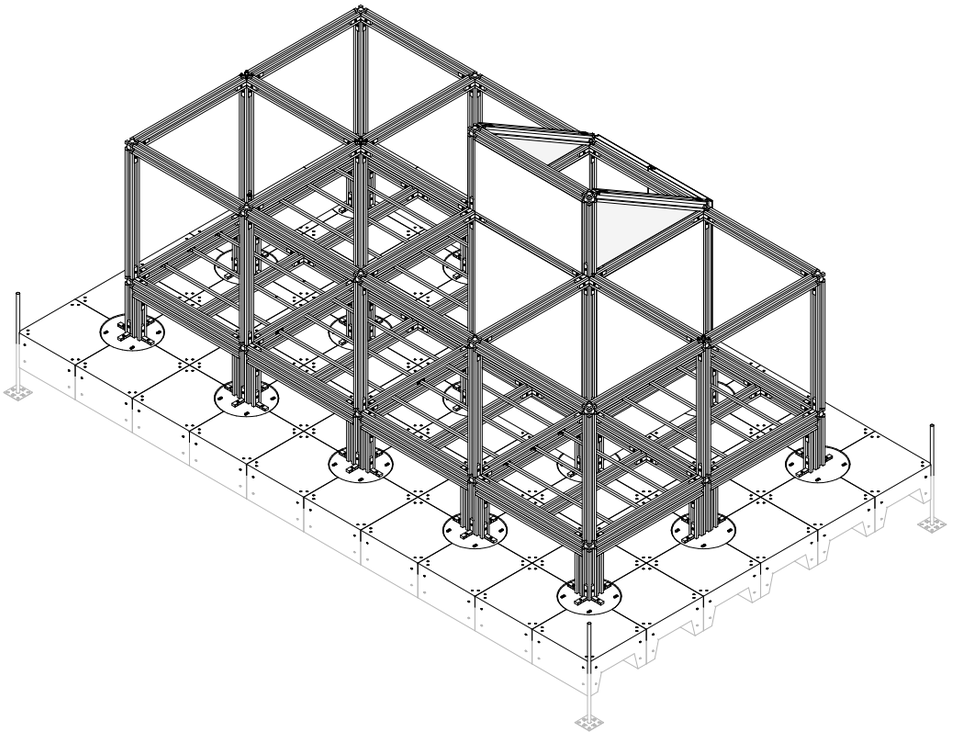

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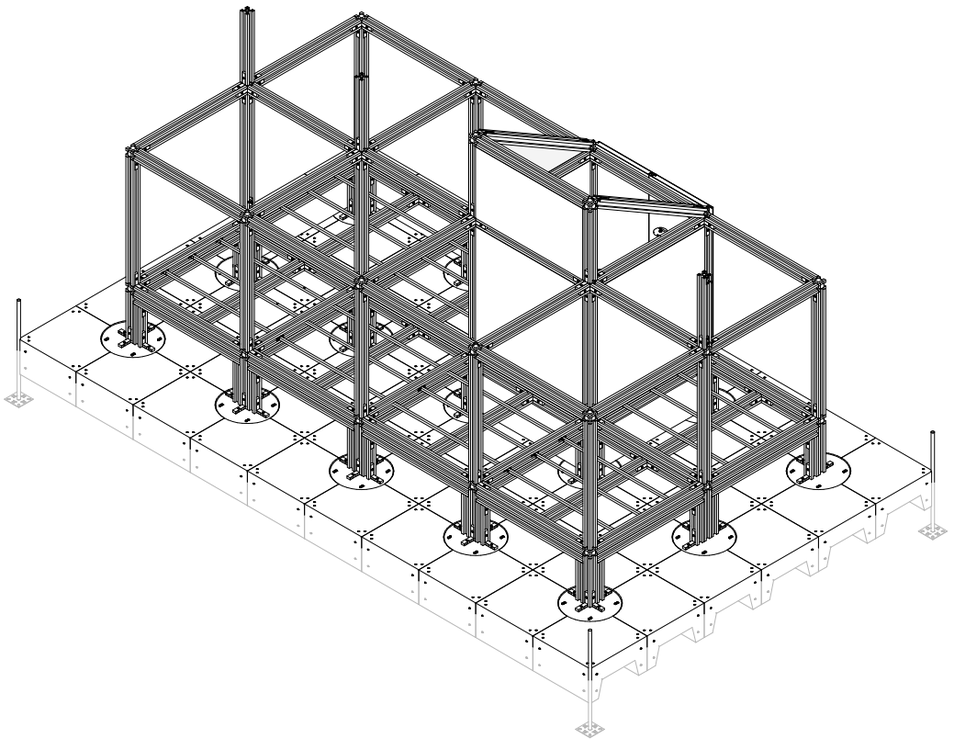

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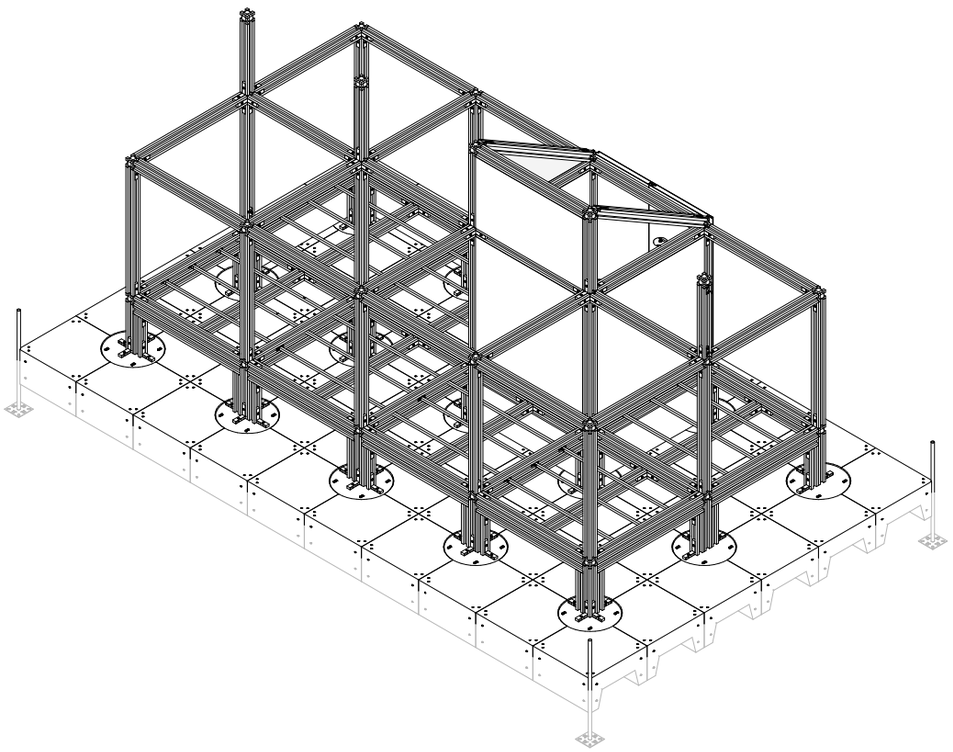

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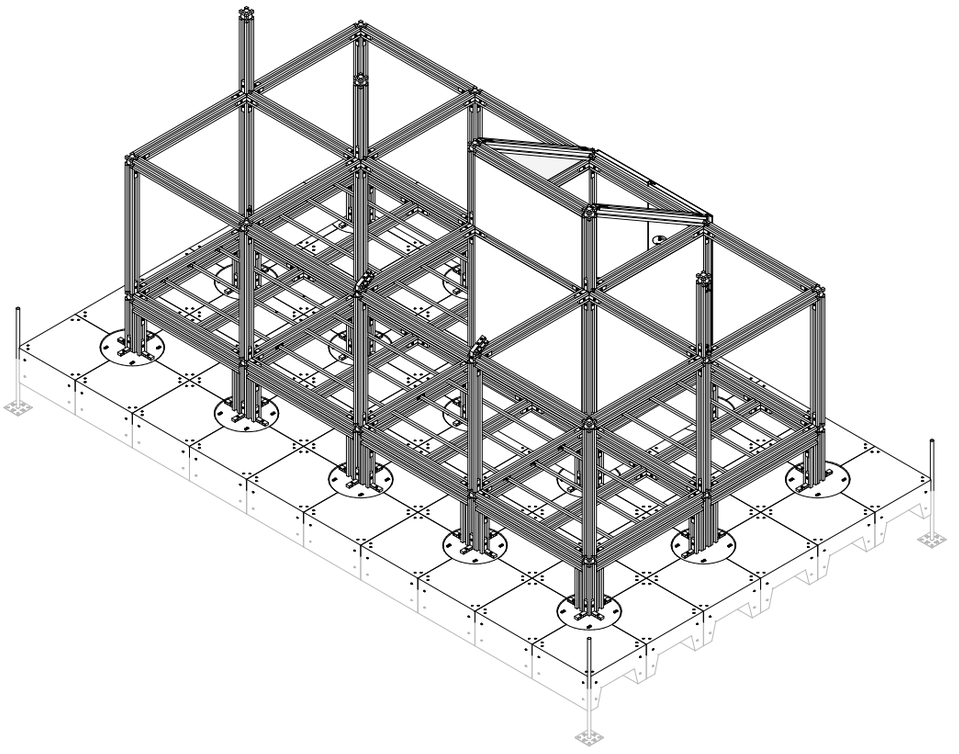

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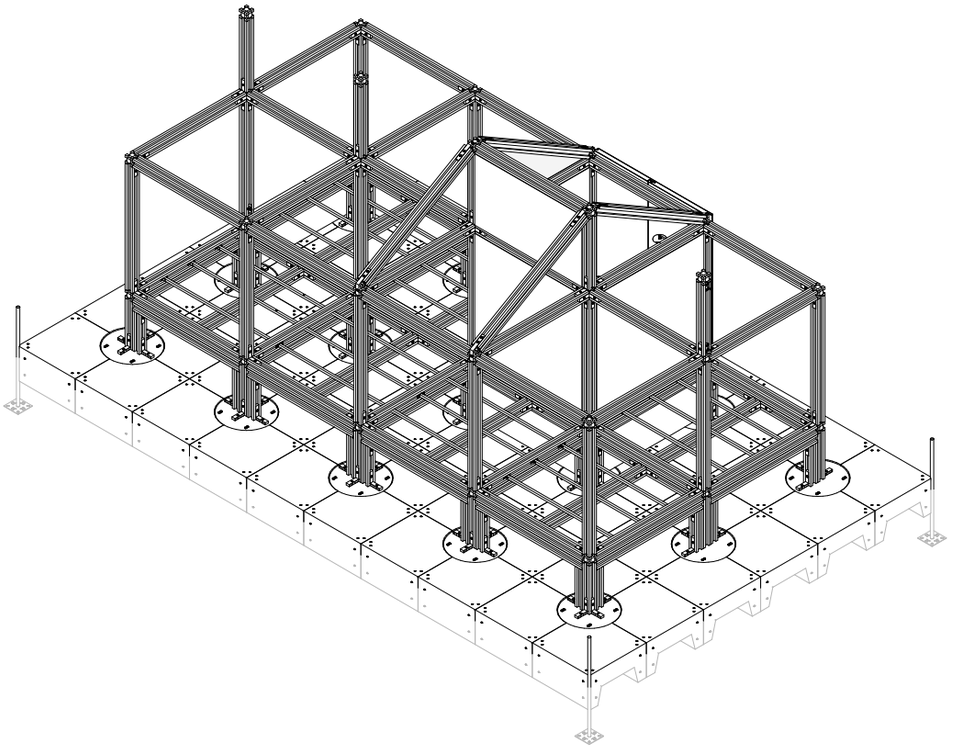

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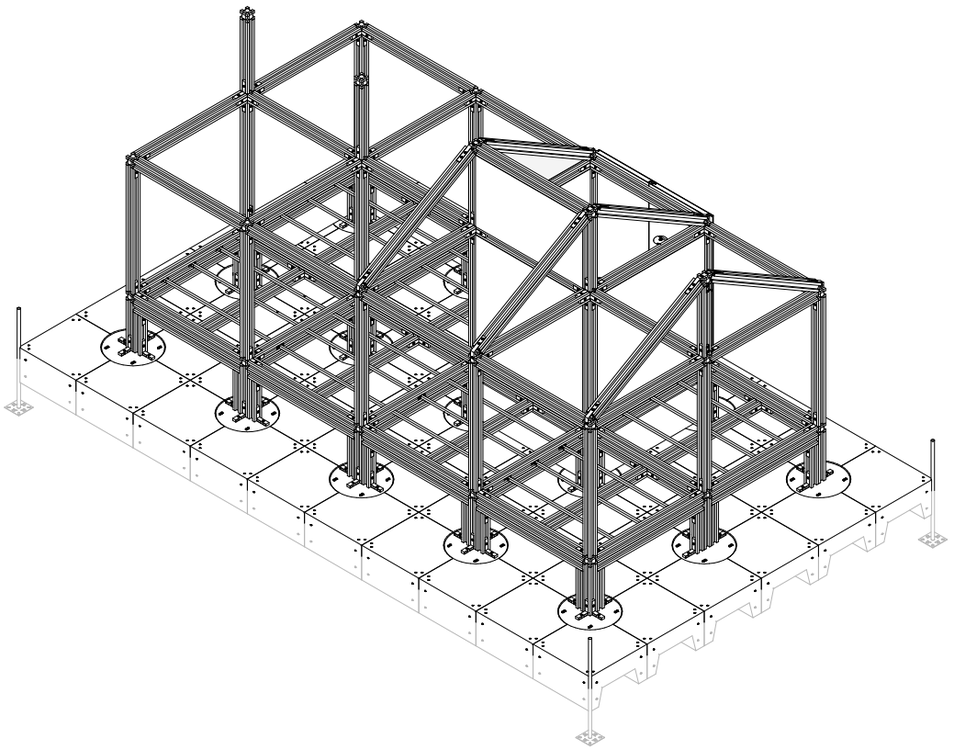

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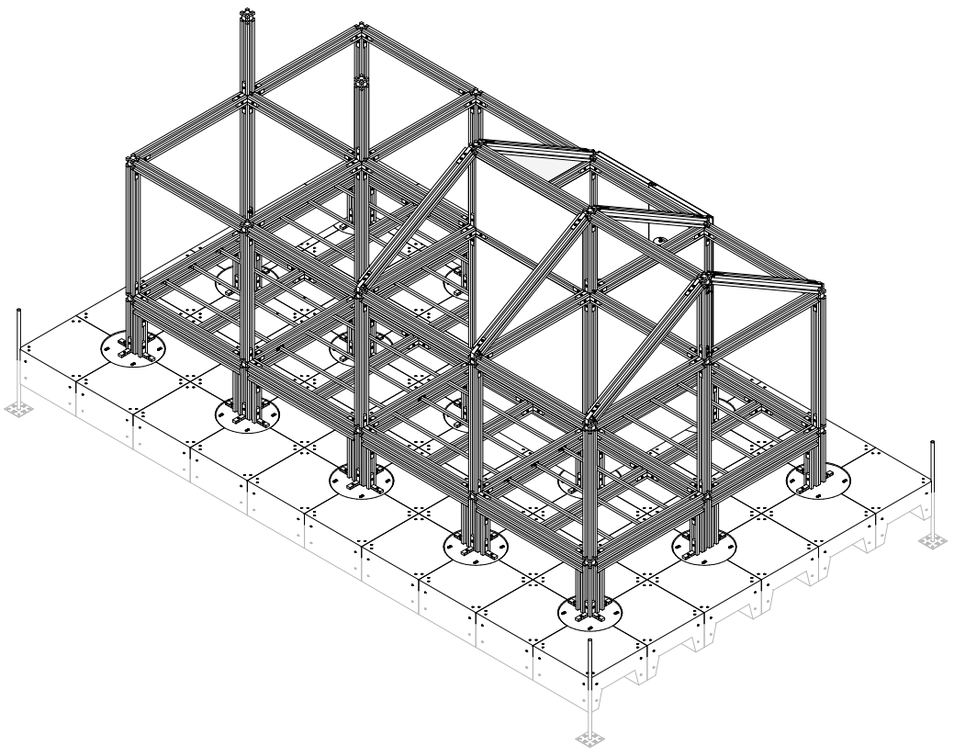

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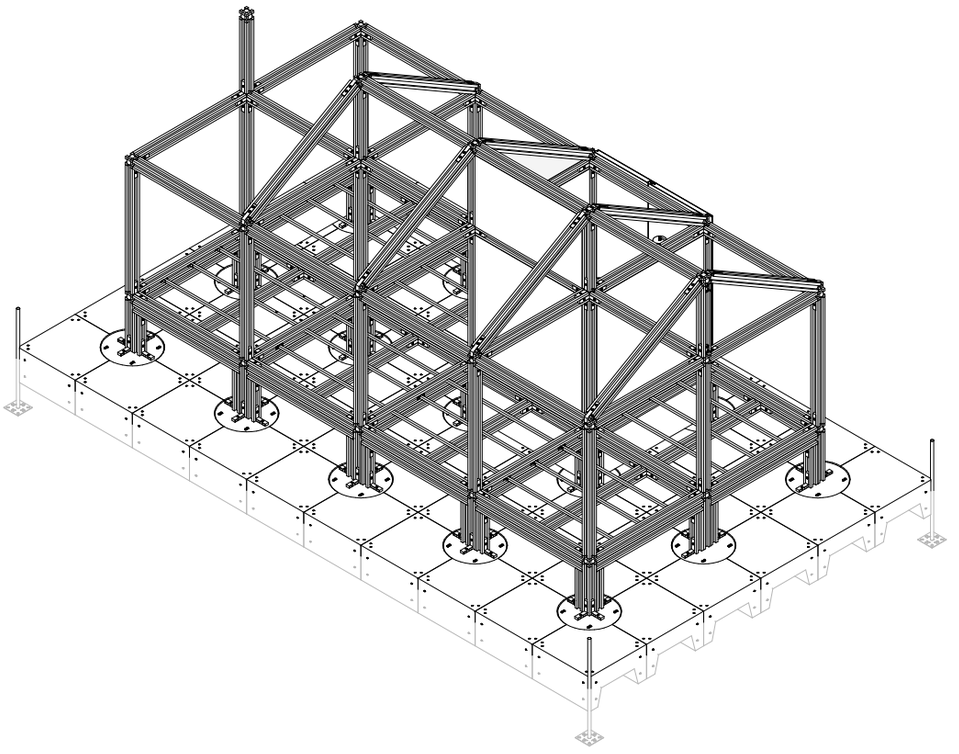

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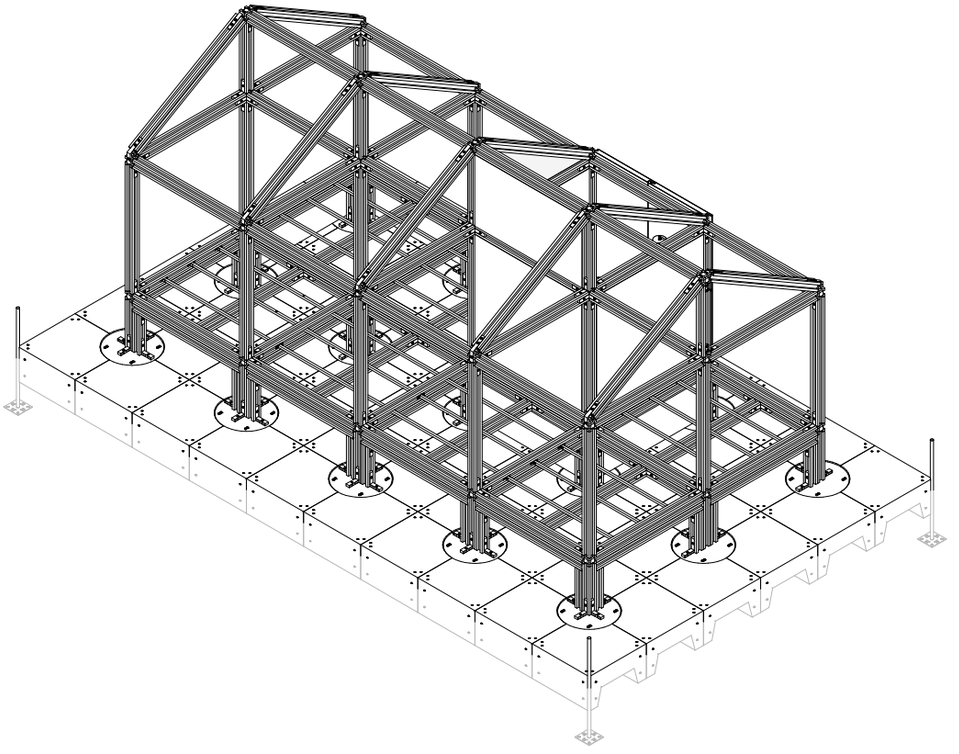

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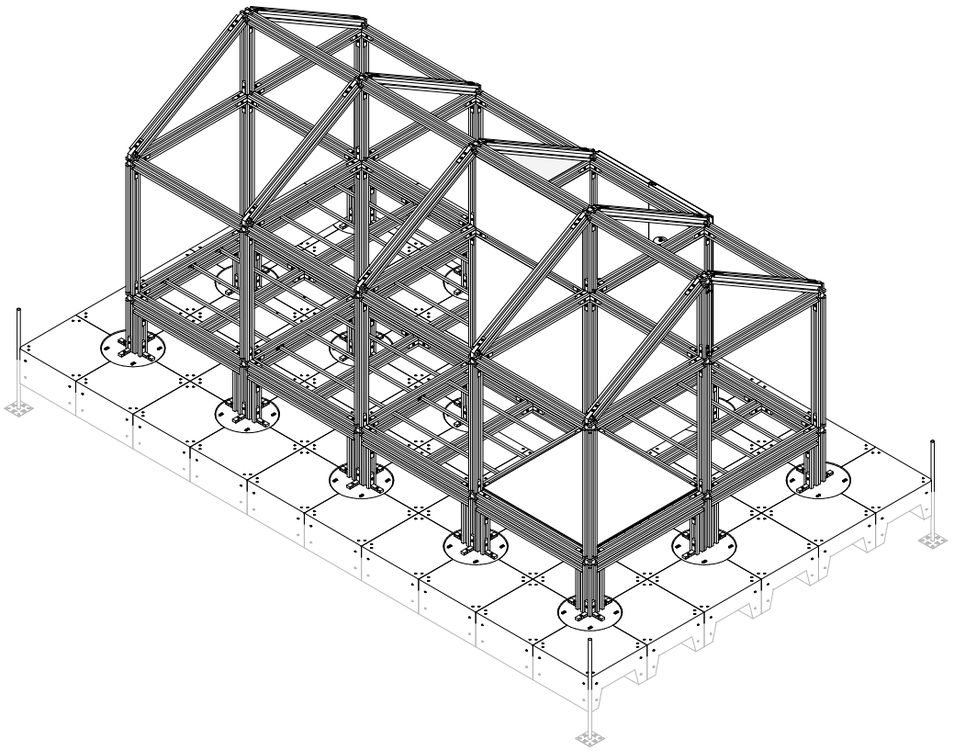

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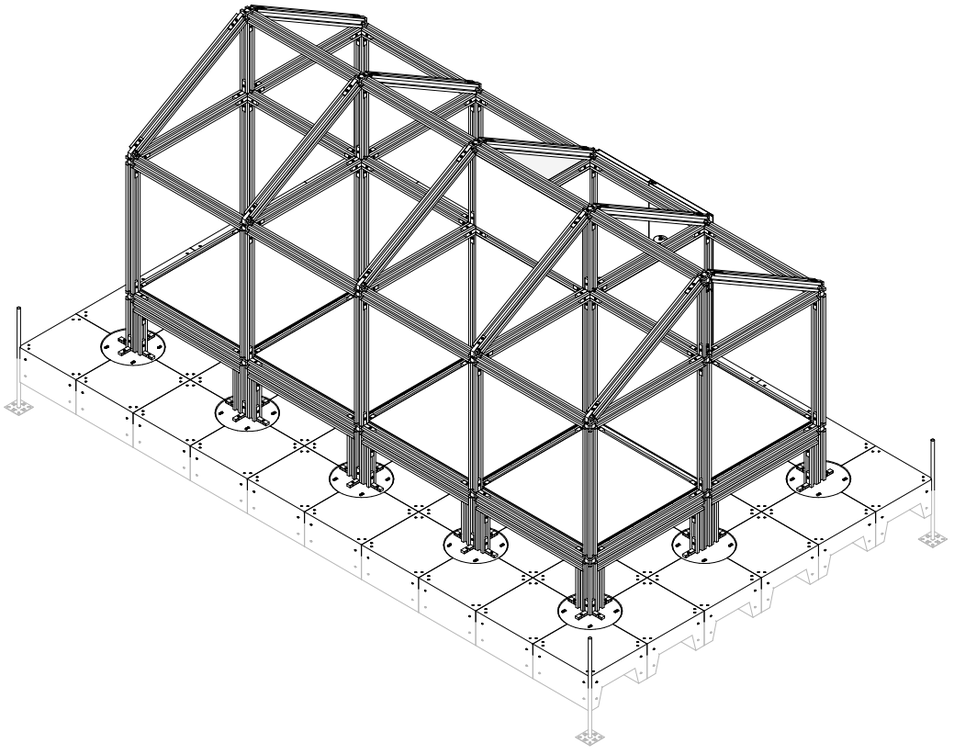

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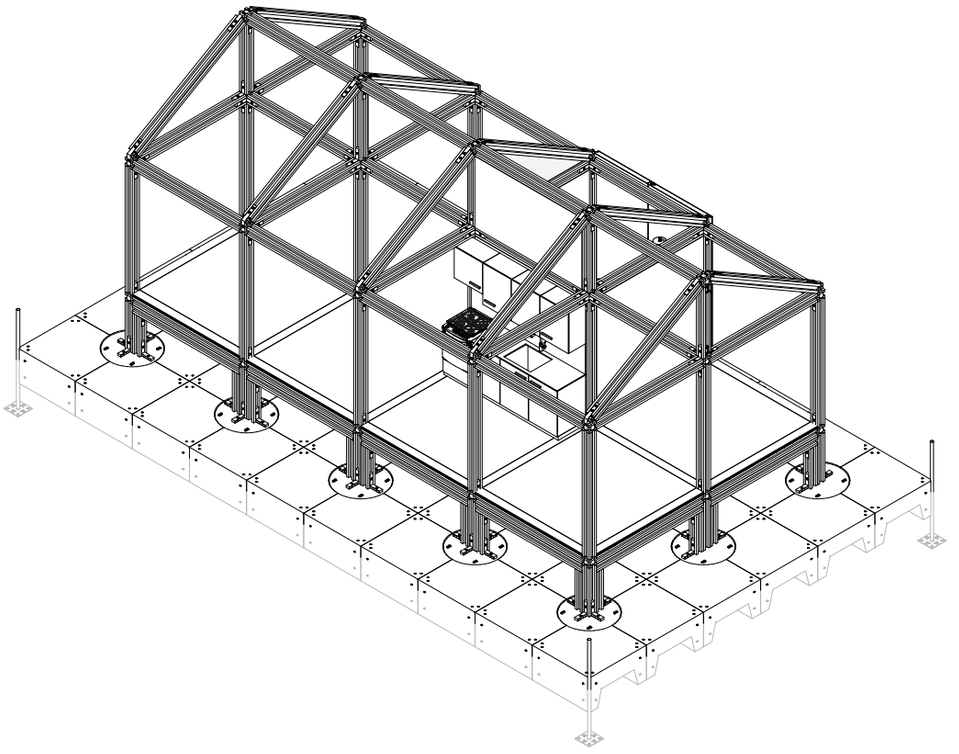

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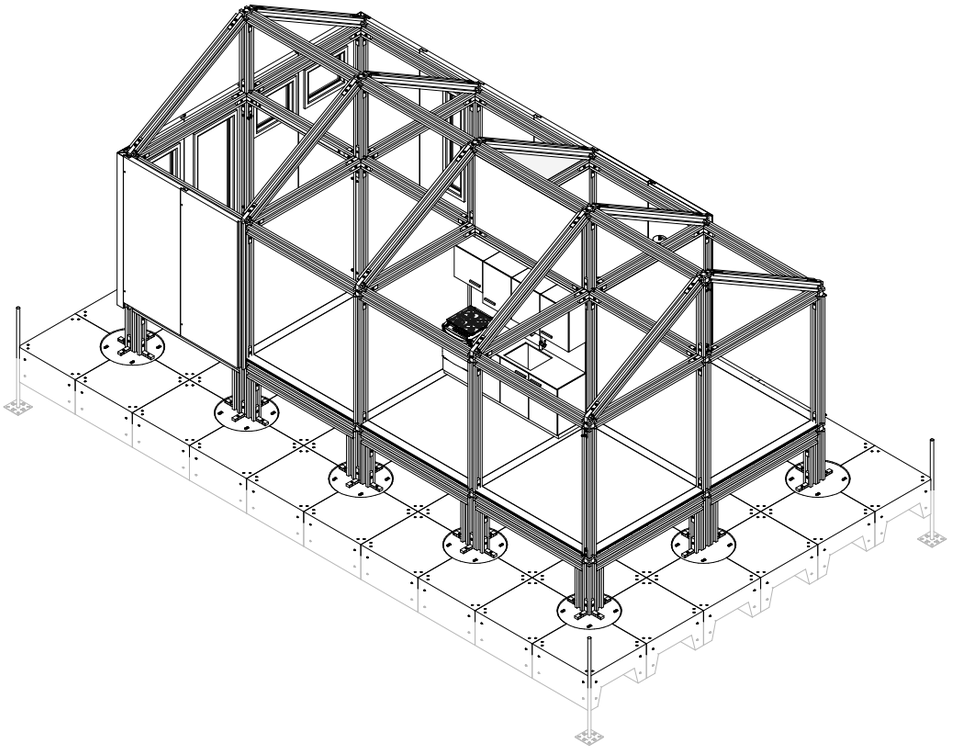

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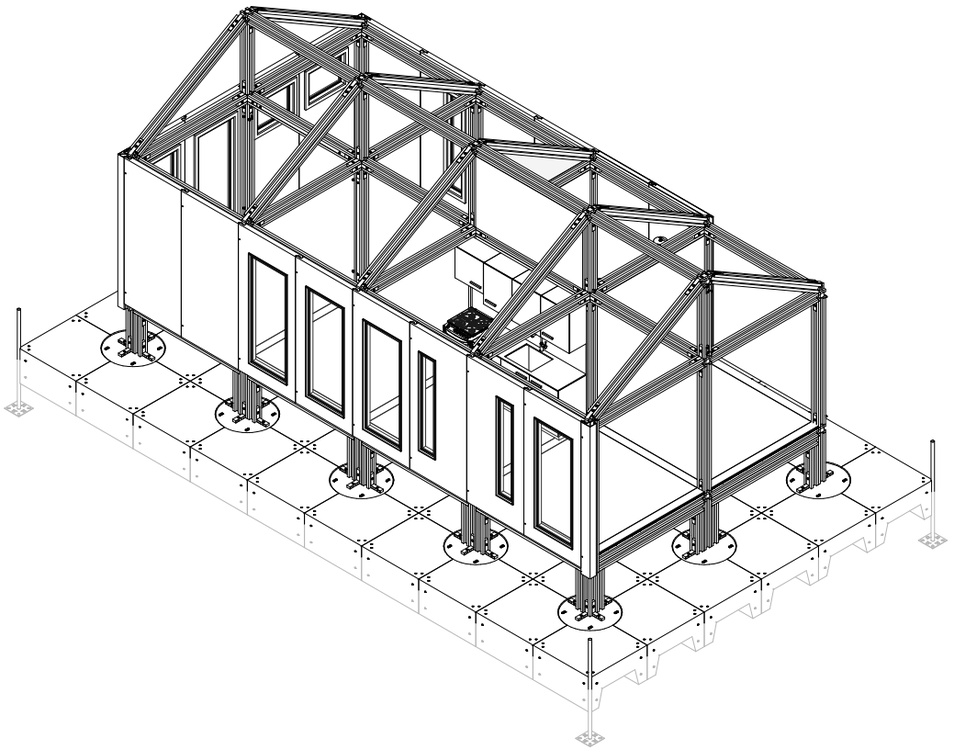

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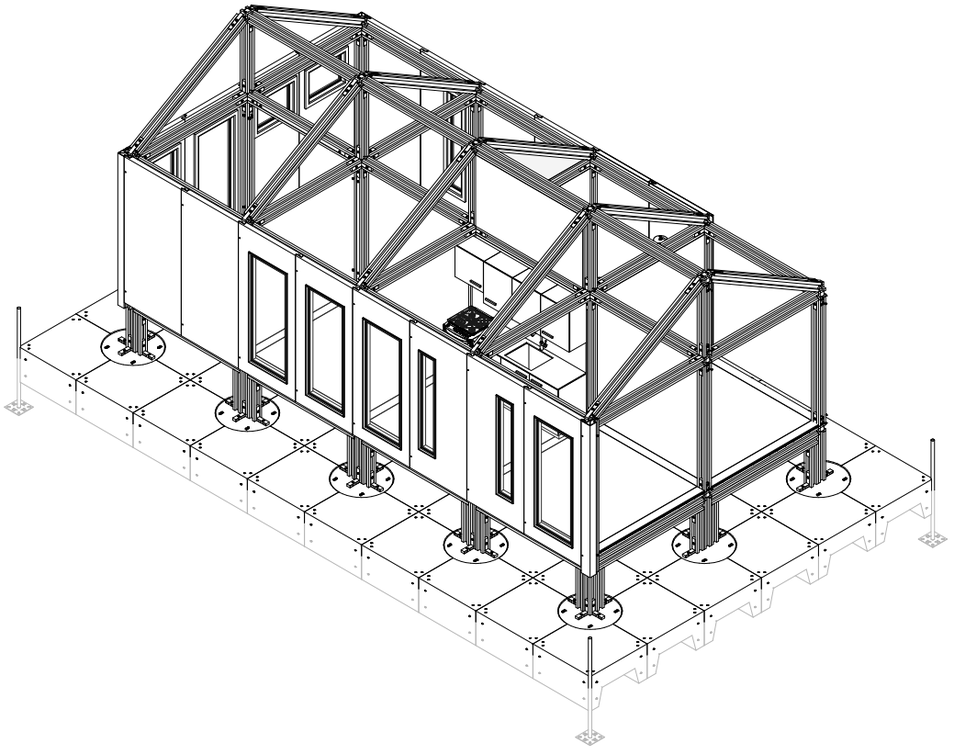

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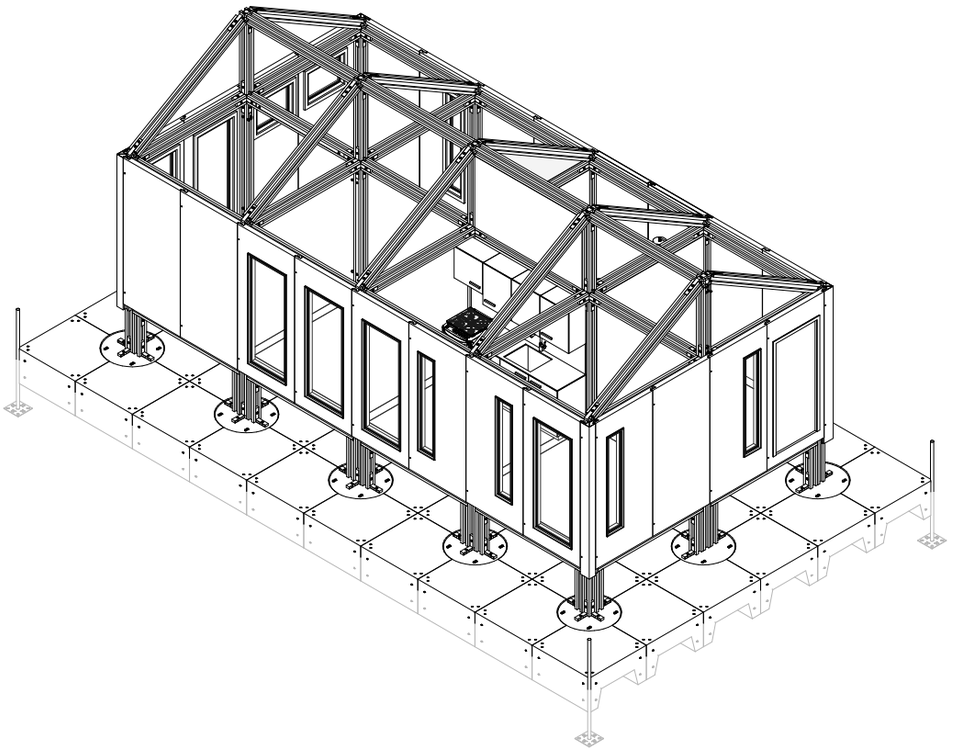

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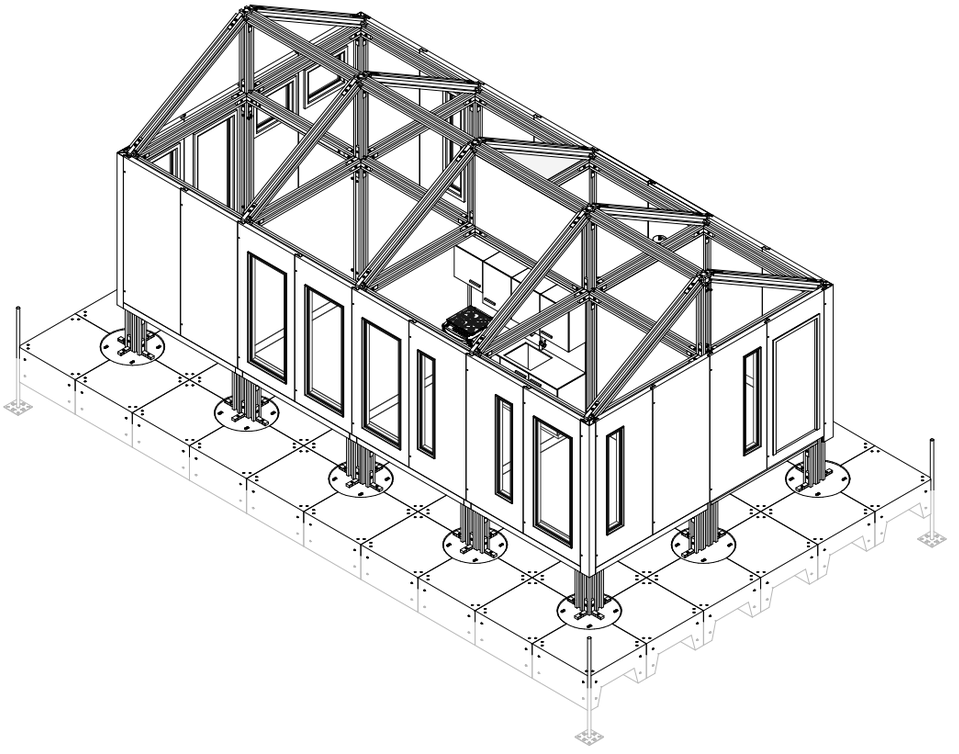

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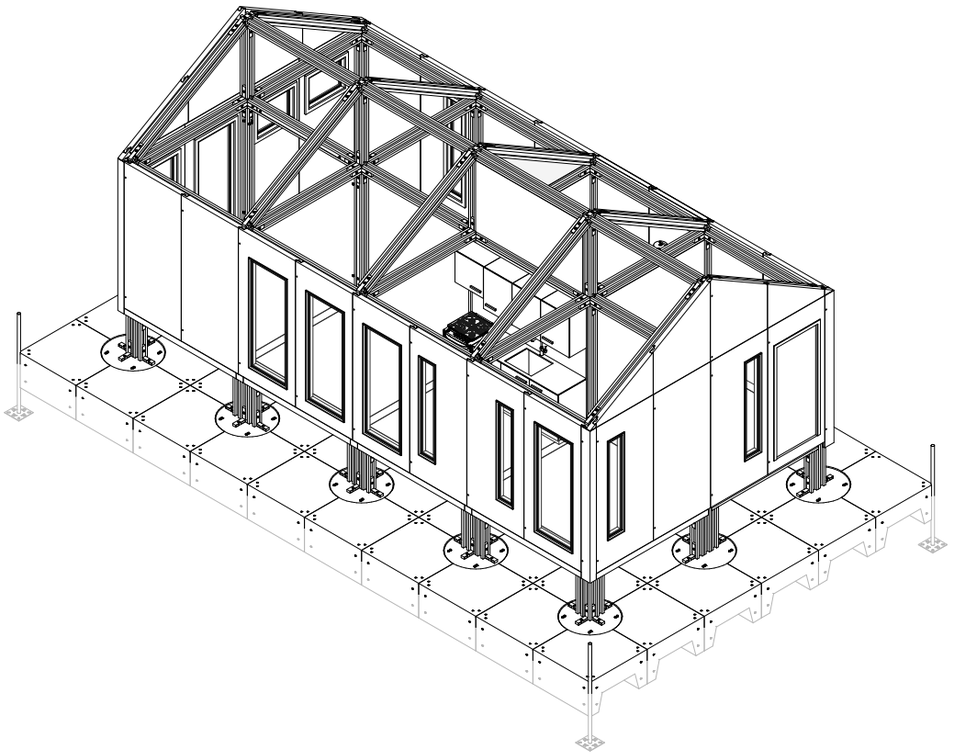

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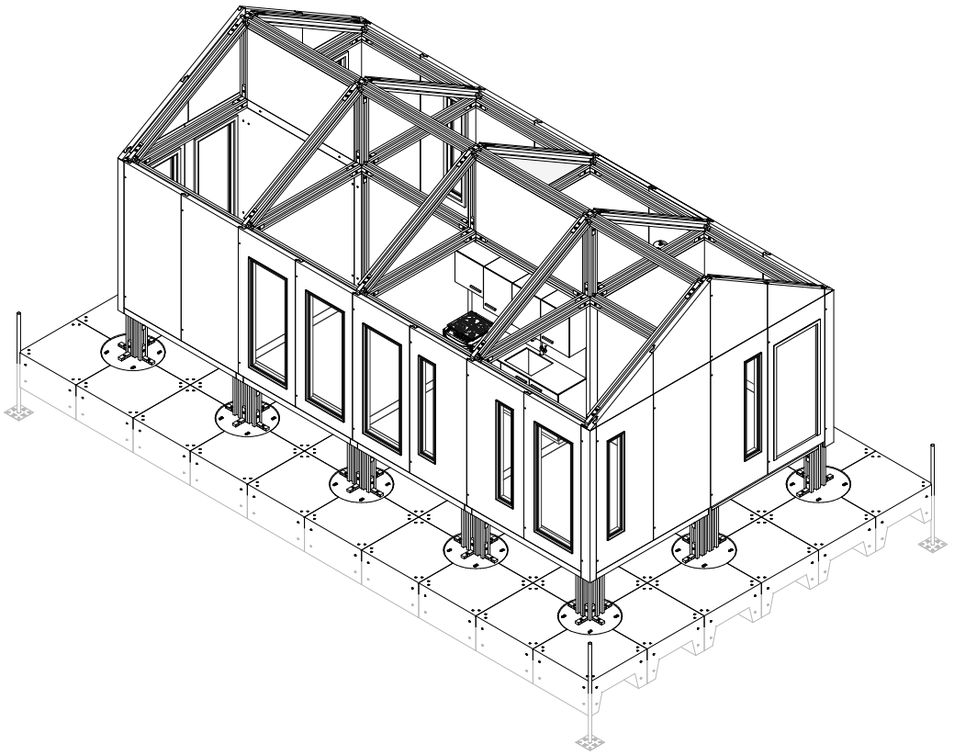

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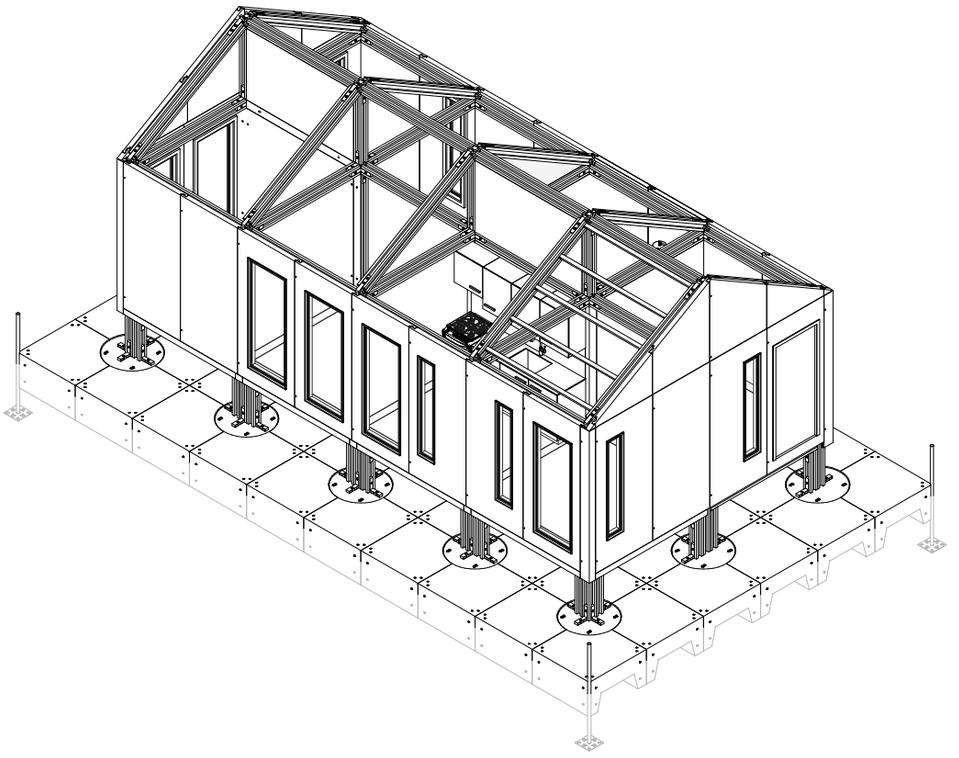

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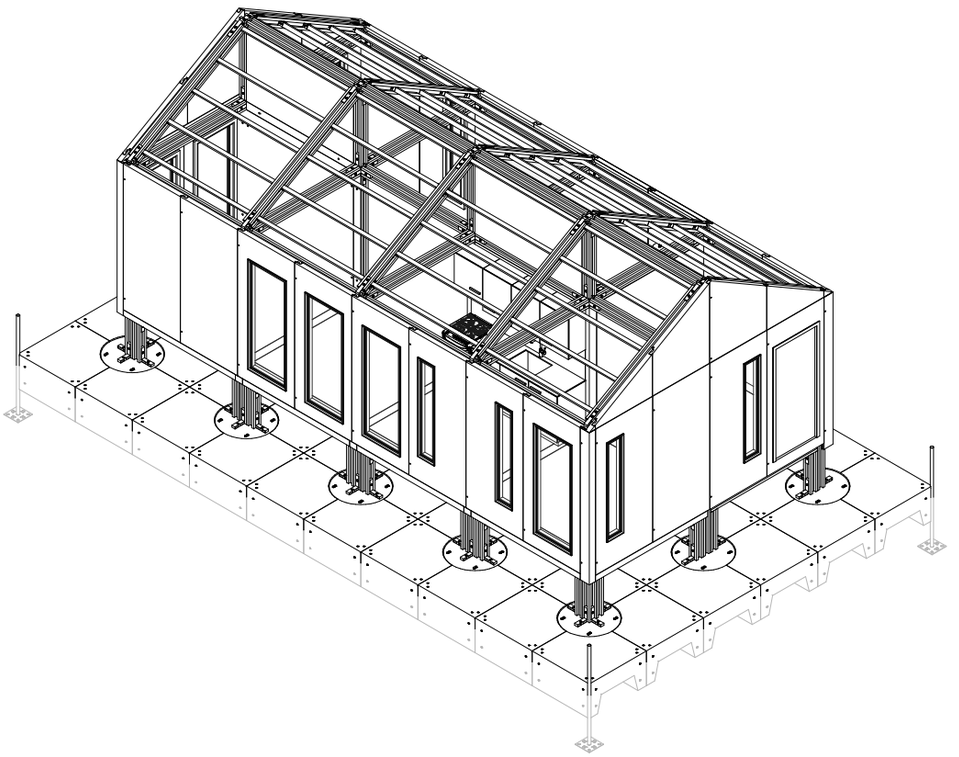

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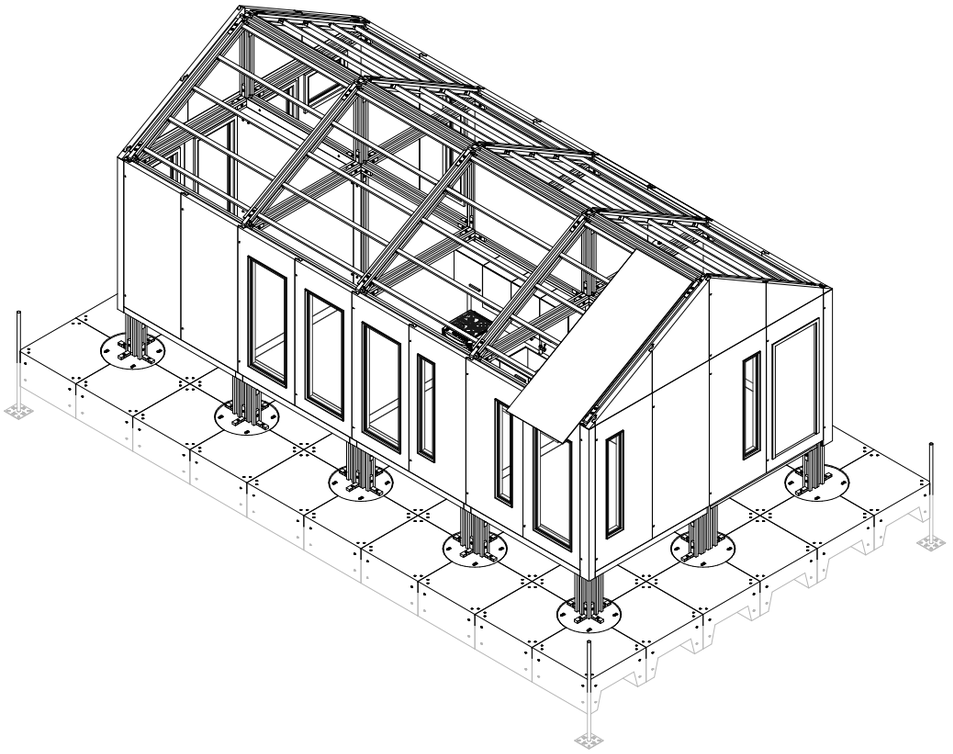

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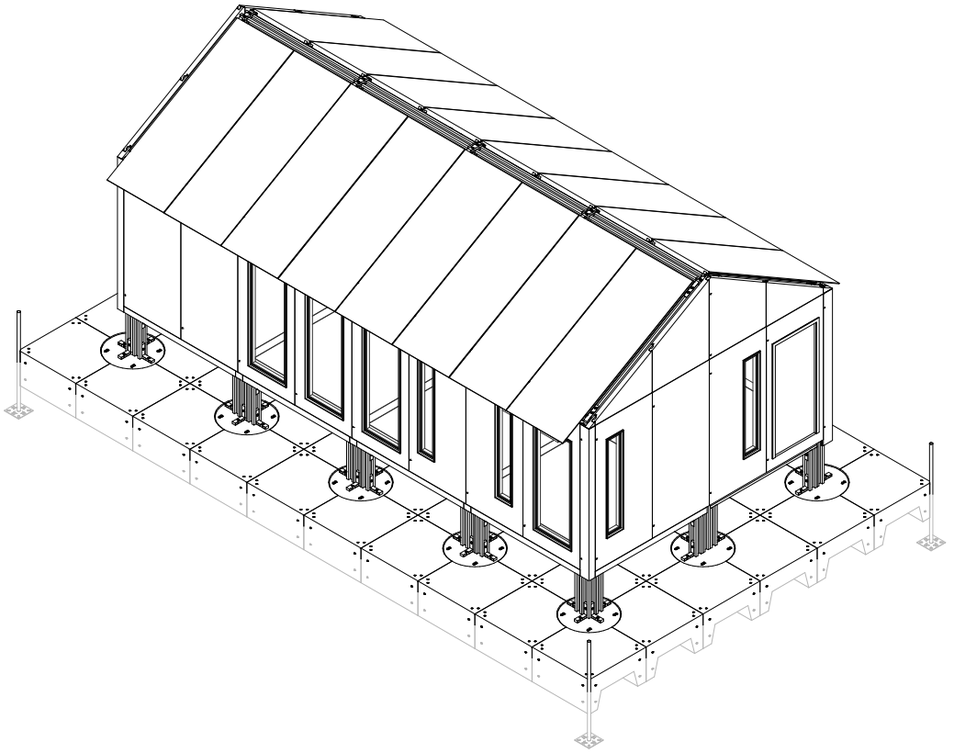

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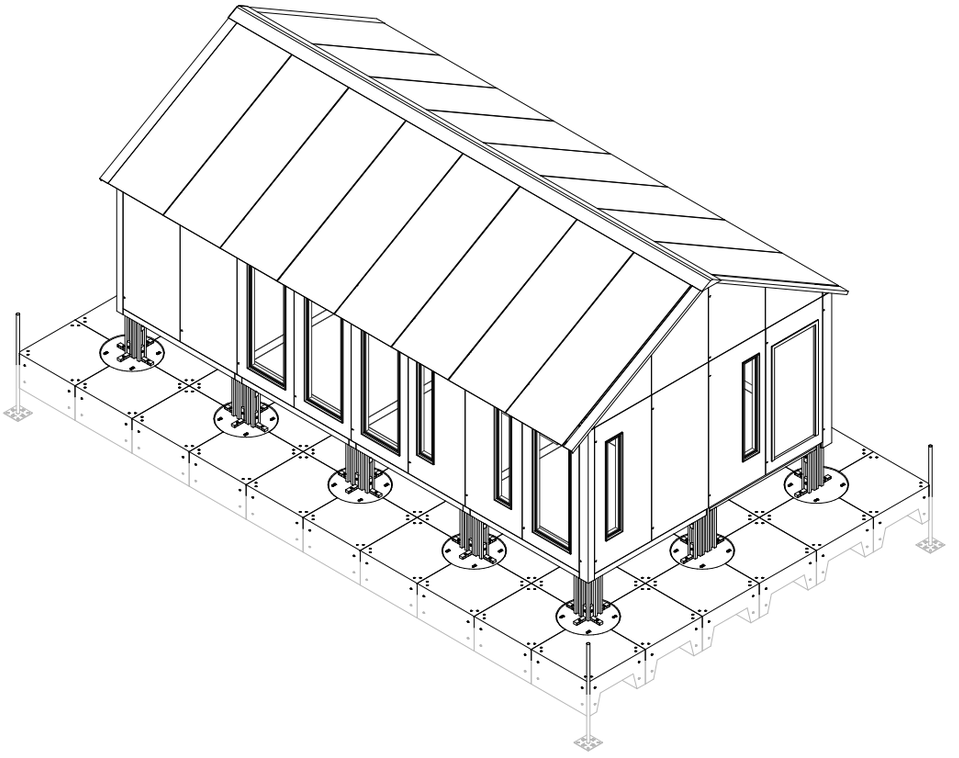

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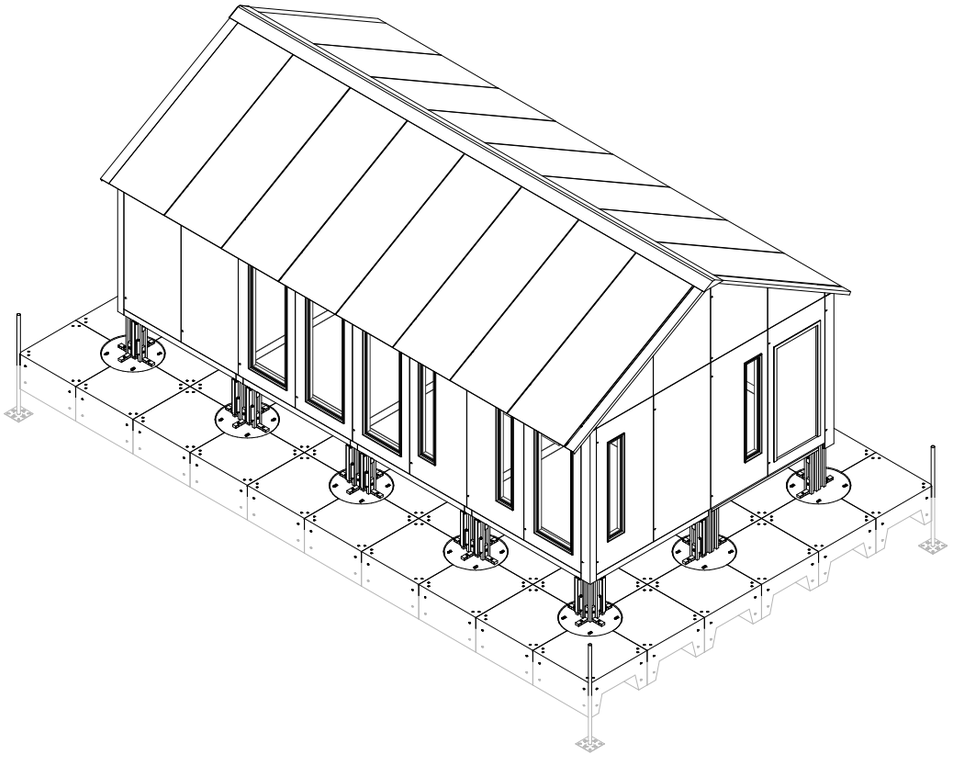

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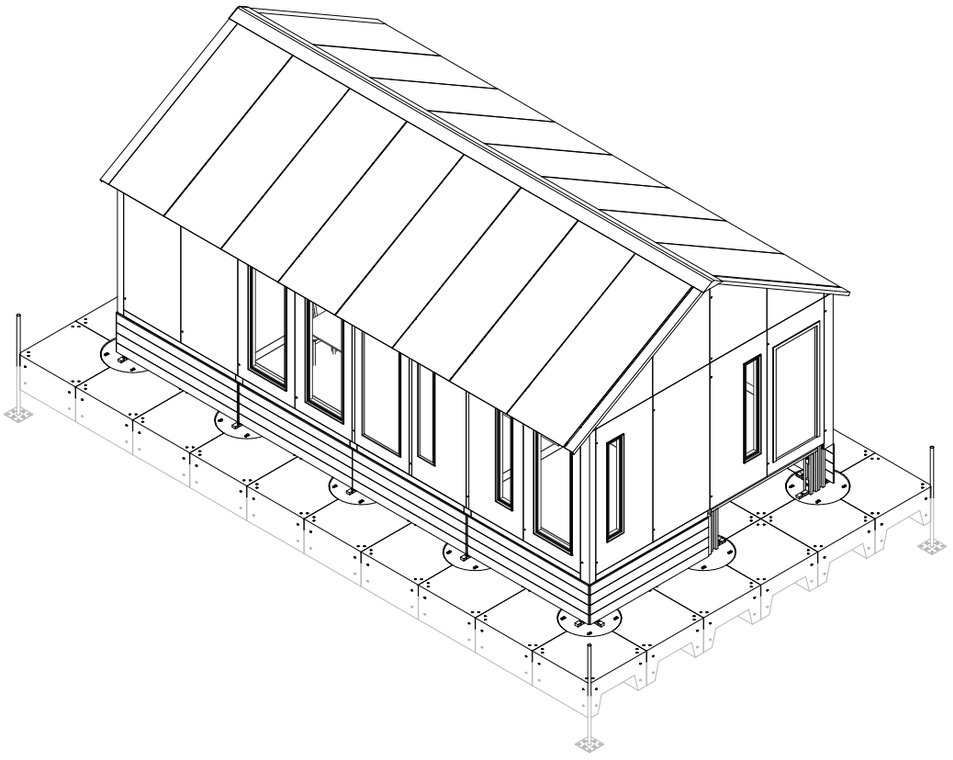

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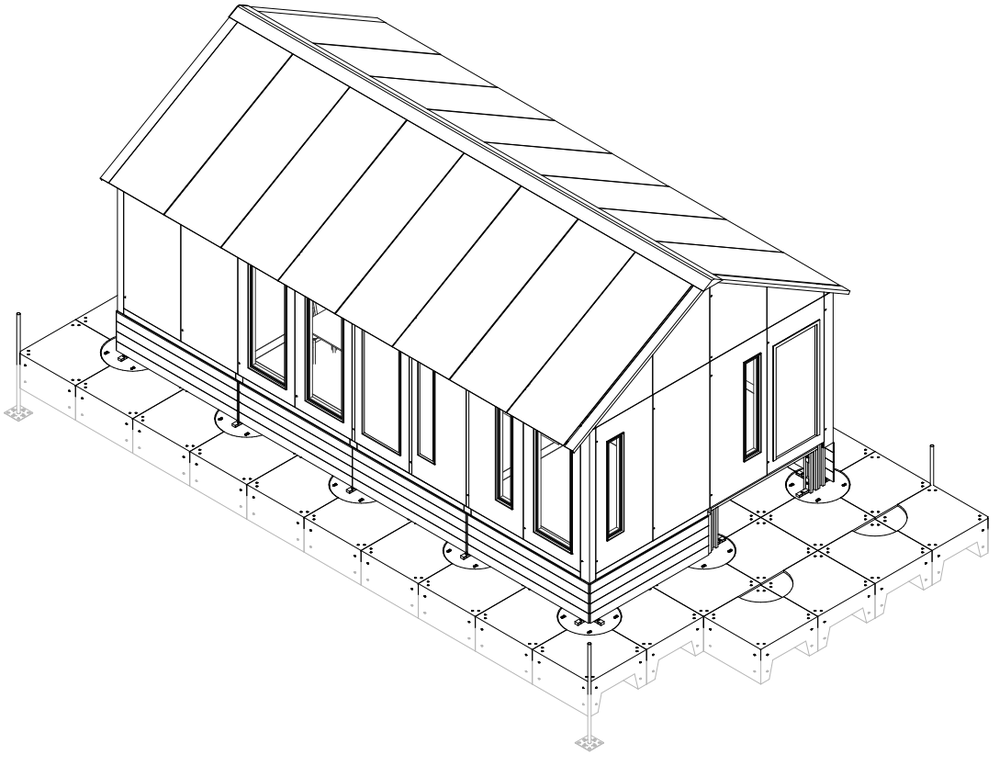

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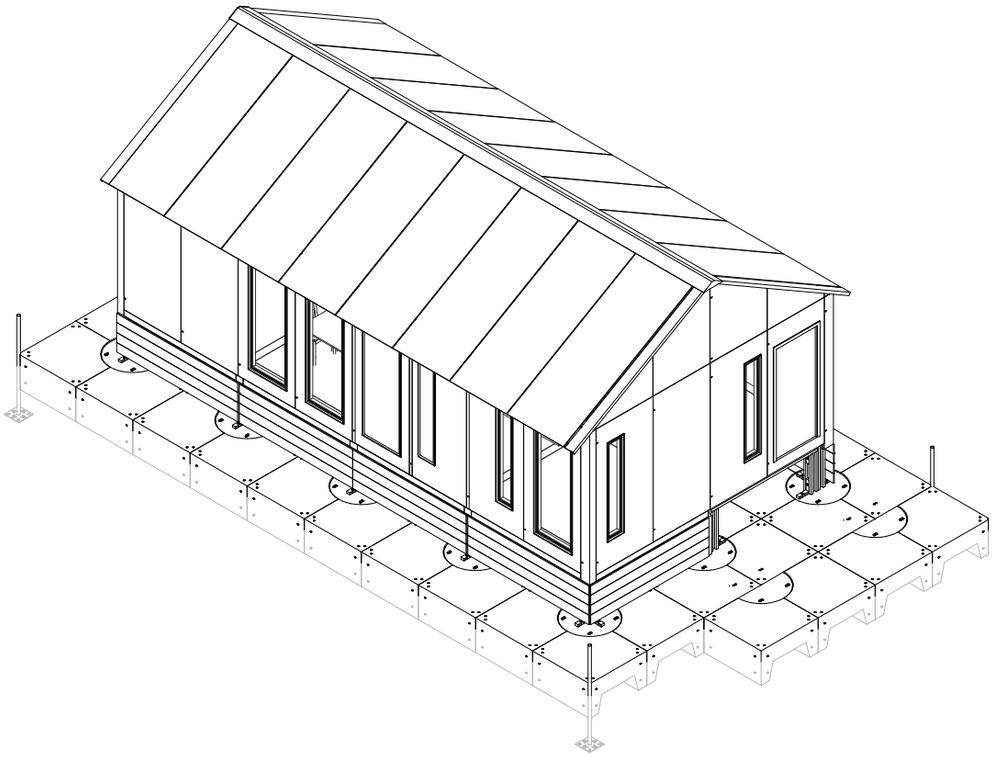

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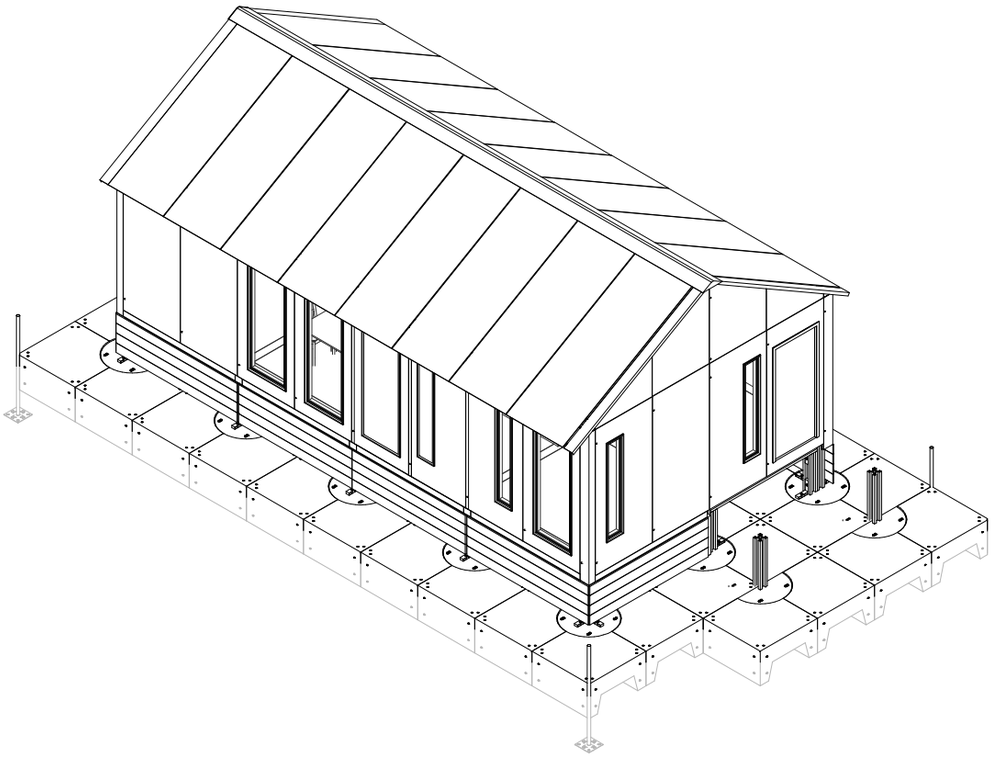

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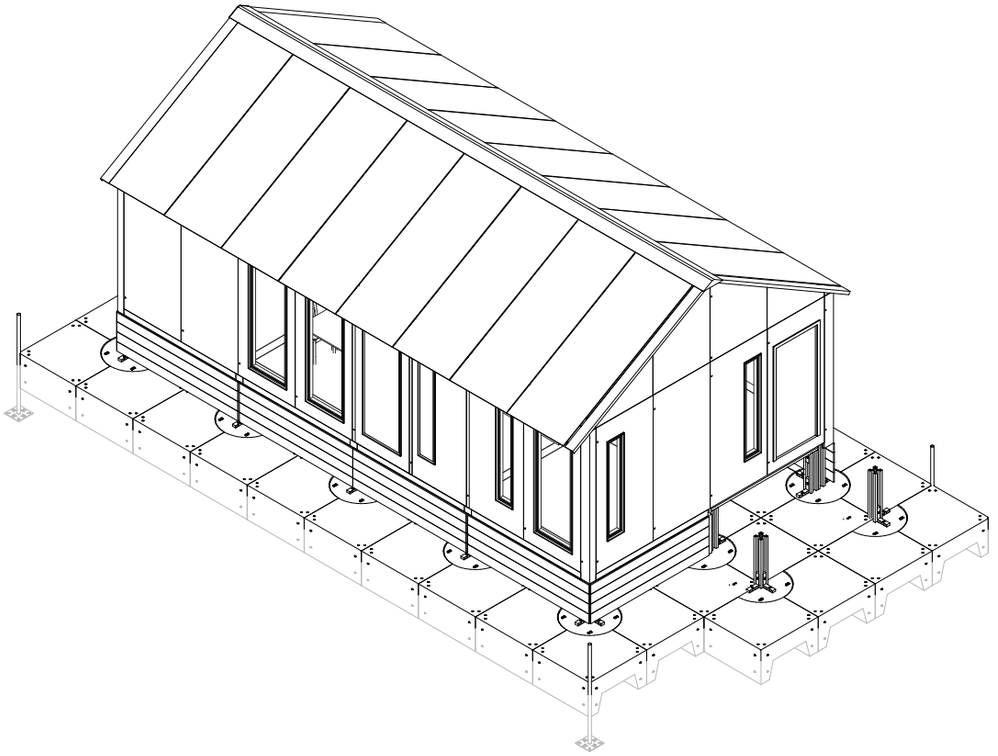

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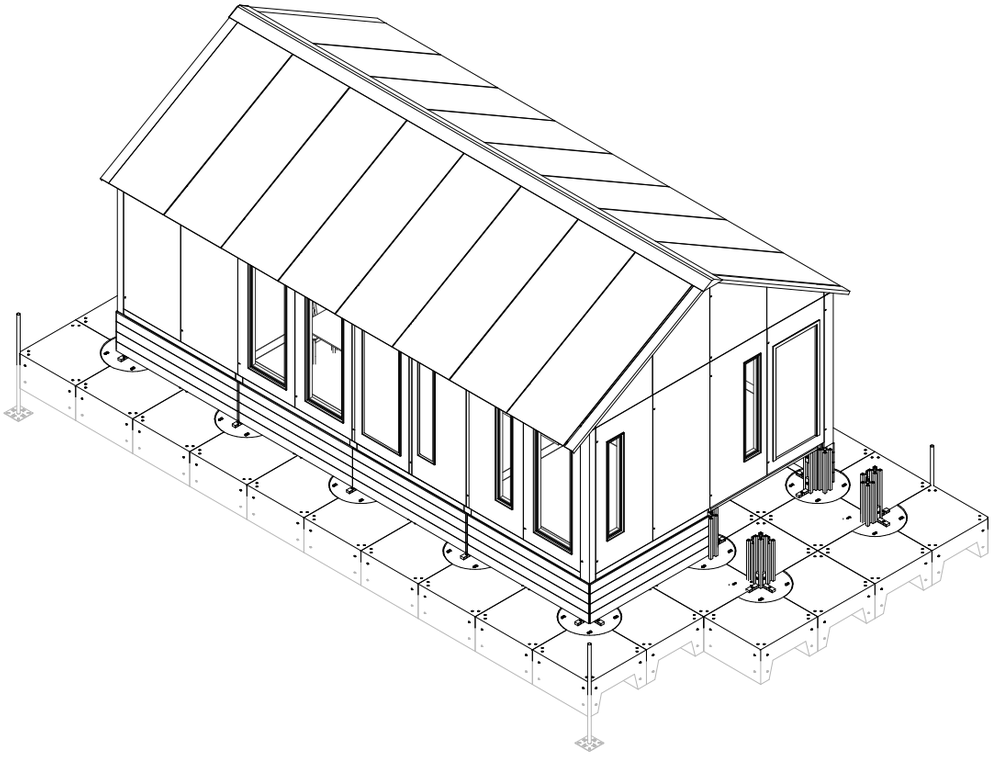

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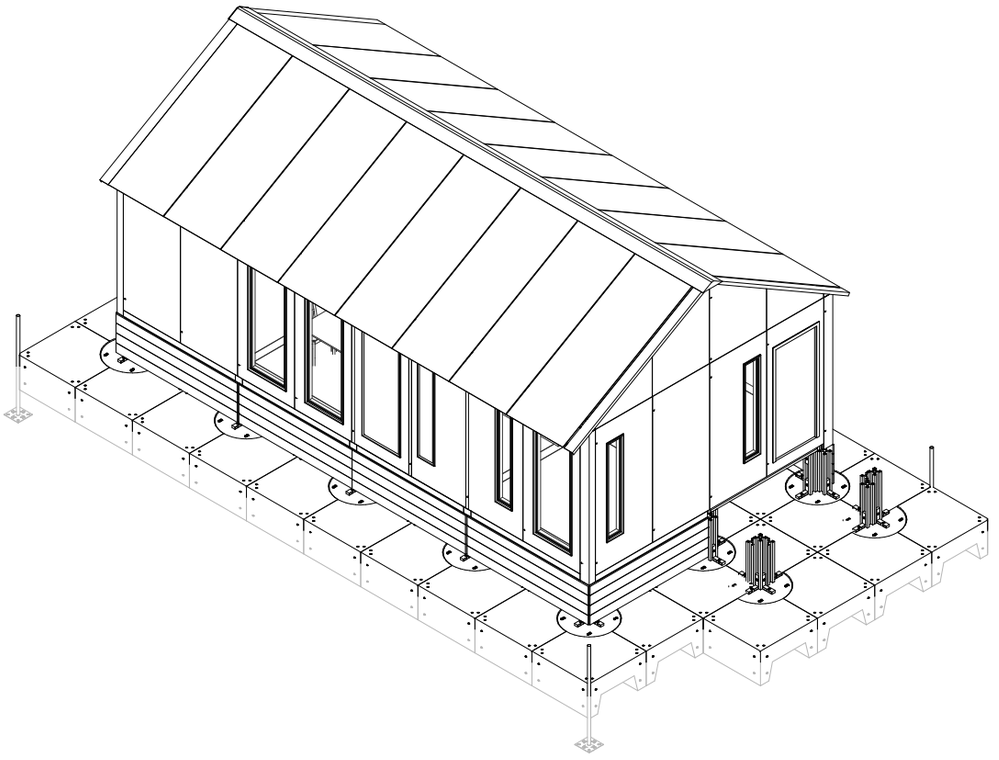

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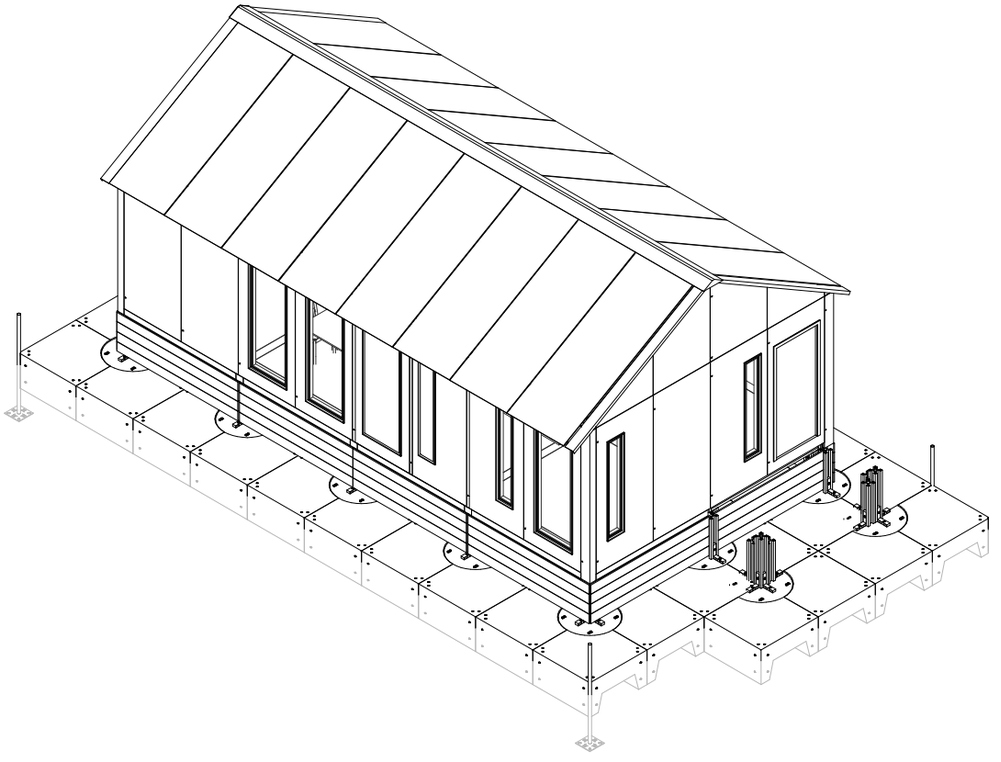

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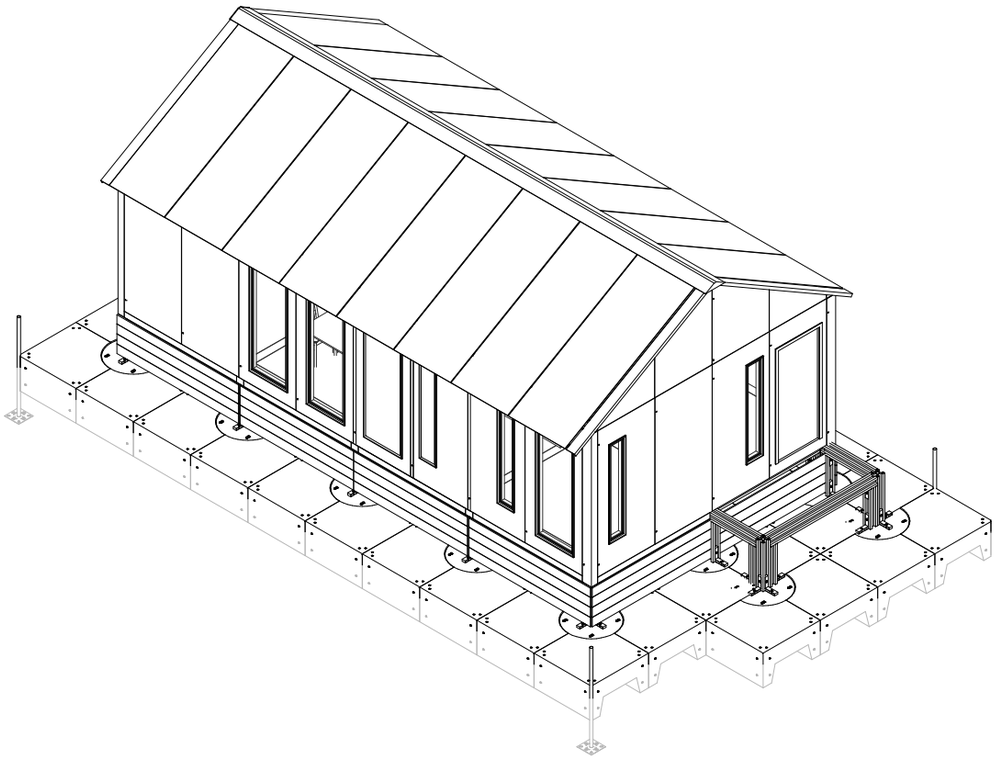

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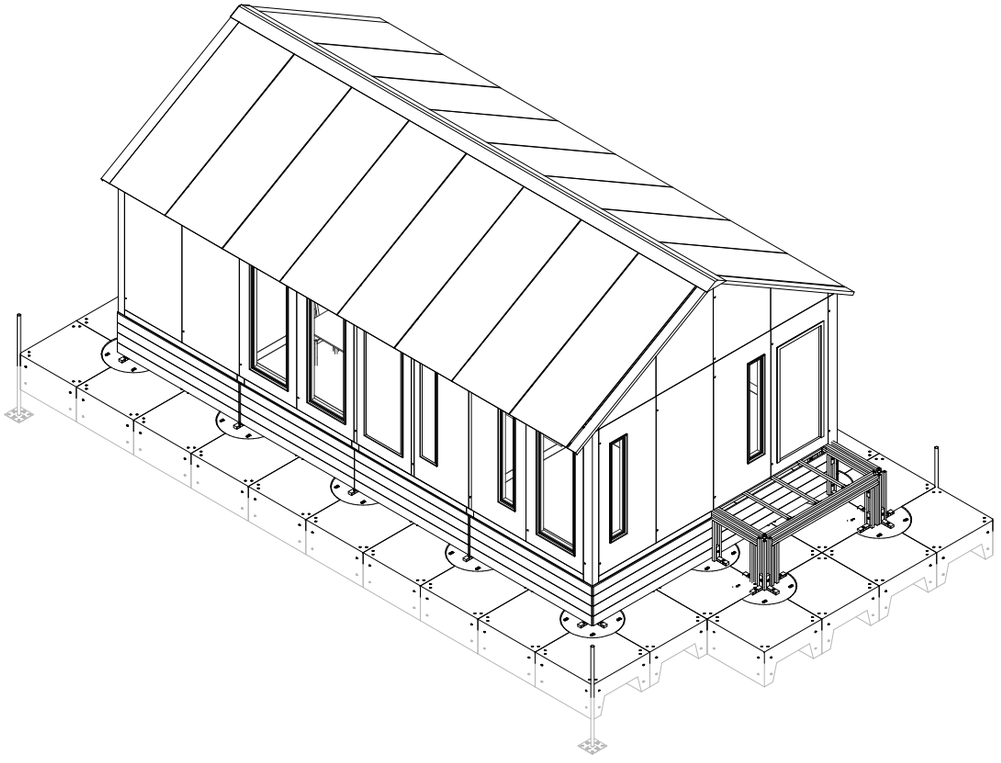

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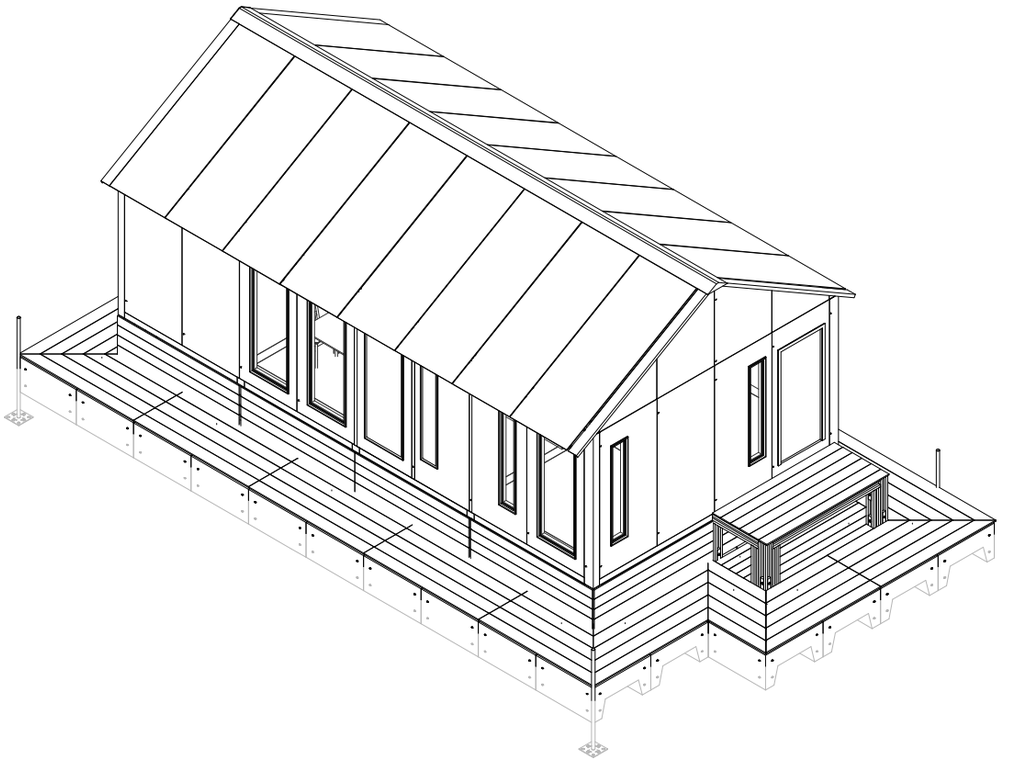

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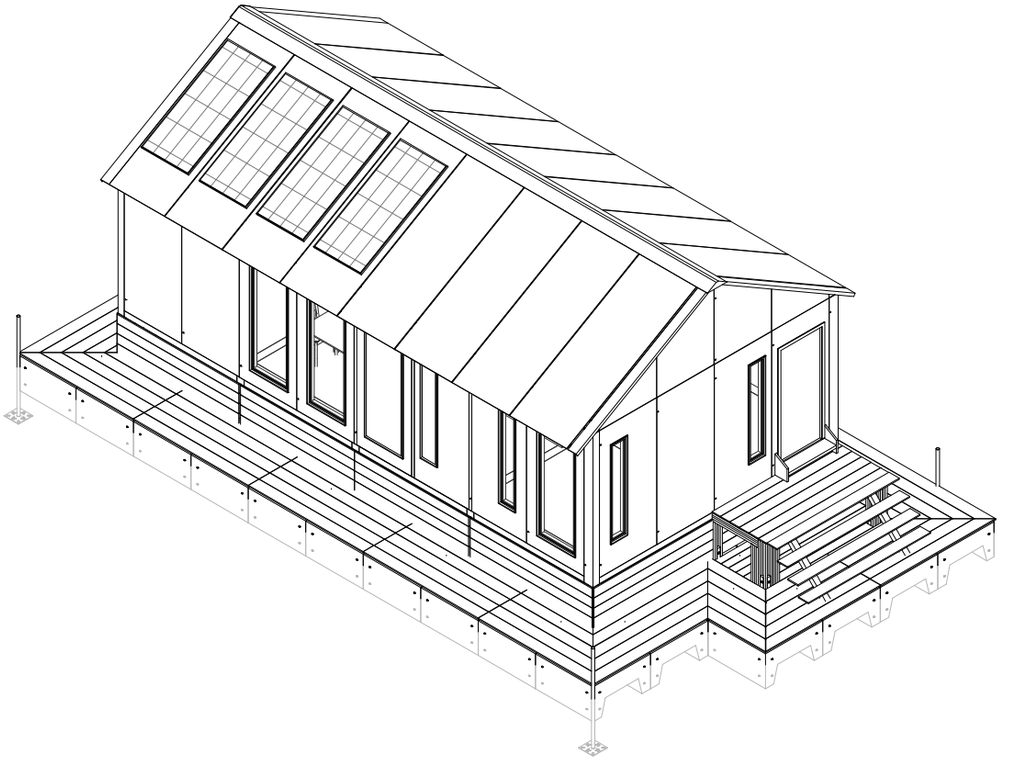

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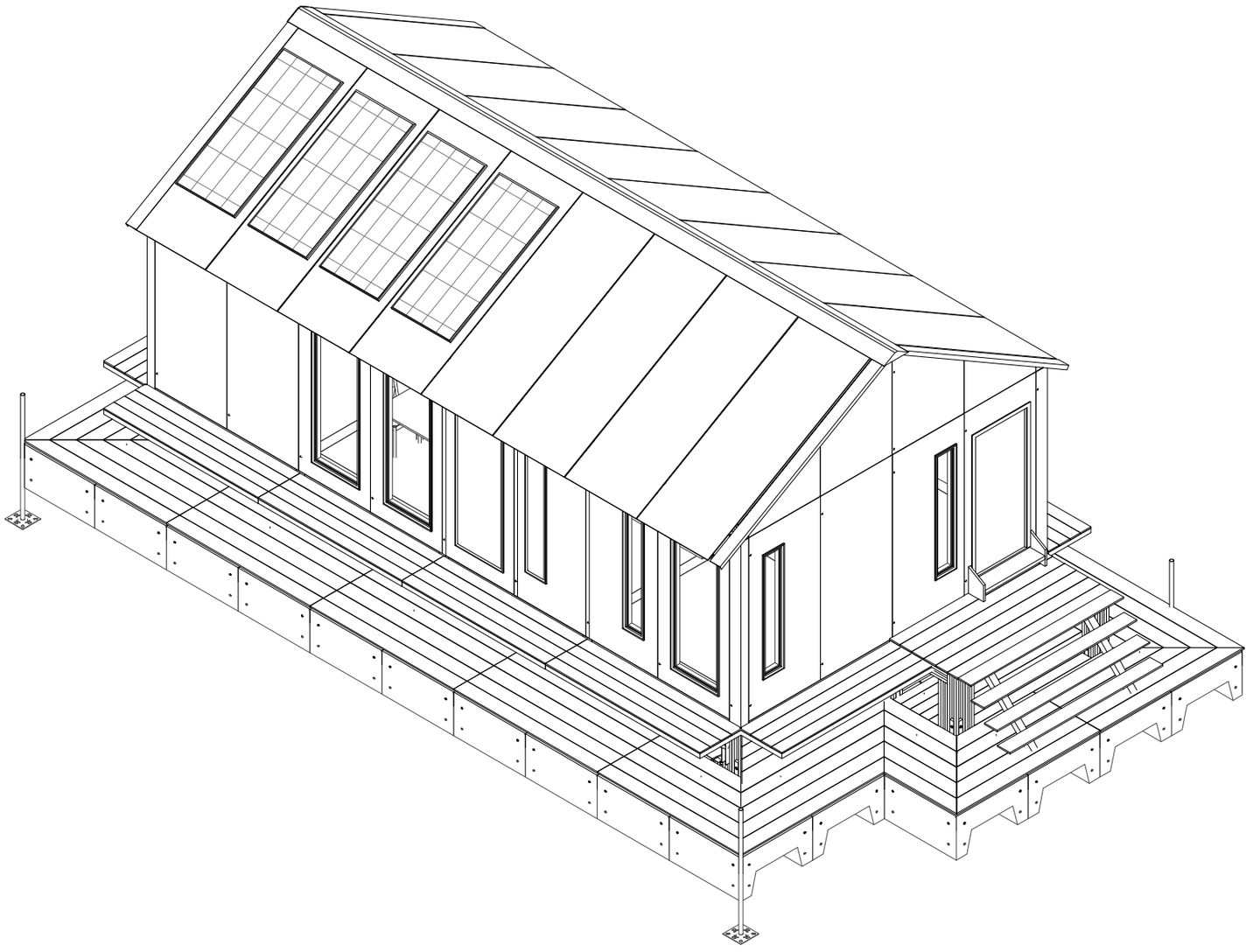

65.

END NOTE

Finnaly, as we consider this design proposal, we're looking towards a future 100 years from now, envisioning resilient and adaptable structures that respond to both environmental and societal needs. The goal is to create a community prepared for the fluctuations of climate change, where sustainable housing solutions support those affected by the evolving conditions like rising water levels and unpredictable weather.

This design proposal doesn't just stop with one design but serves as a foundation - a structure that can evolve with new technologies, materials, and approaches. With the community and environment in mind, this vision is about walking together towards a sustainable and adaptable future.

See you in 100 years!

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