Works by

Andrew Friedenberg

2021

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An architect by training, fascinated with uniting the beauty of design, the power of computation, and the complexities of human agency into new objects and environments. I value the importance of a multidisciplinary approach to design that resembles a research laboratory solving local issues with global implications.

References available upon request

Professional

Material Design Intern - Logitech, California USA
12/2020 - 09/2021 I am currently working for Logitech in their Material Futures R&D team investigating the possibilities of 3D print technology with recyclable plastics in future production lines. In coordination with the fabrication lab in the Bay Area, I have been using Grasshopper to computationally prototype and design collaborative work-flows for different objects and materials exploring a range of parameters including lenticular, illusory, and optical materials. I also have been working with a team of designers, technicians, and software engineers on product explorations in the near future dealing with augmented reality and enhancing personal connection between users.

Designer - MARC FORNES / THEVERYMANY, Brooklyn, NY
07/2020 - 12/2020 After finishing my M.Arch, I began working for Marc Fornes within a team of three, collaborating daily across the continent on a series of seven projects including construction documents for a project in Knoxville, three different concepts for structures in California, and a couple competitions in North Carolina and Miami. I was primarily working in Grasshopper / Rhino constructing complex mesh models via form finding and topological design. It was a fast paced work environment with a hyper small team all working remotely, sharing models online for mesh refining, striping, rendering and presenting.

Architect - Behnisch Architekten, Stuttgart Germany
08/2016 - 06/2018 While working as a Junior Architect at the international firm Behnisch Architekten in Stuttgart, Germany, I worked on multiple projects of various scales including the design development phase of a community school in Stuttgart and the winning competition entry for a new commercial district in Vienna. One year of my time in the office was spent working in a ~8 person team progressing a large swimming complex in Konstanz (Germany) from schematic design through construction documents and now into realization. Within the team, I primarily worked on the >3000m^2 roof structure and ceiling, using 3D parametric modeling (Rhinoceros+Grasshopper), and consulting with various engineers on every aspect from lighting and drainage to the steel truss network. The project will complete in 2021.

Architecture Intern - Gensler, Las Vegas USA
06/2015 - 09/2015 At the internationally-renowned design firm Gensler, I learned about the complexities of large scale buildings and the necessity of working with a team on resolving these complex issues. I participated in many aspects of architecture from competition design and rendering, to model making and detailing.

Education

Master of Architecture & Urbanism (AADRL) - Architectural Association, London UK
09/2018 - 01/2020 Within the Design Research Lab at the AA, I took part in Studio Nahmad-Bhooshan run by Shajay Bhooshan, co-founder of Zaha Hadid CODE (Computational Design) and Senior Associate at Zaha Hadid architects, and Alicia Nahmad, founder of Architecture Extrapolated (R-Ex). The studio addressed the future disruption of living through robotic digital fabrication while negotiating the intricacies of dense living through game theoretics. I worked with multiple teams on a series of 1-2 month workshops developing our digital and robotic skills. For the later 9 months, I worked with a team of four, developing our thesis project "Stitch" as a prototypical housing system inserted above the London Overground rail network to alleviate the housing shortage London is experiencing. One month of our course was spent as a *Resident at the Autodesk Build Space* in Boston, Massachusetts where we constructed a 1:1 living prototype using robotic hot wire cut EPS forms on 6 axis ABB robots.

Bachelor of Architecture - University of Oregon School of Architecture & Allied Arts, Oregon USA
09/2012 - 06/2016 The University of Oregon architecture program sparked my interest and established my foundation of architectural knowledge especially in the fields of sustainability where it leads amongst American architecture schools. I spent these years learning from talented professors, working with teams on academic and extra-curricular projects, and one term studying abroad in Rome.

Exhibitions / Print

Construction Agency Exhibition, *Zaha Hadid Gallery*, London. 2020.
Our final AADRL thesis “Stitch” models were selected to be displayed in the famous gallery.

UK Construction Week Exhibition, *National Exhibition Centre*, Birmingham, 2019.
Partnered with the Ministry of Building Innovation & Education (MOBIE), we represented Studio Nahmad-Bhooshan led by Alicia Nahmad and Shajay Bhooshan exhibiting a series of robotically fabricated furniture pieces exploring the future of living.

AADRL XX Exhibition, *The Building Centre*, London. 2018.
This exhibition celebrated 20 years of the AADRL. We designed and exhibited work from past and present students and from recent DRL graduates including Marc Fornes, Melike Altinisek, Alvin Huang, and Li Daode.

Skills

3D Modeling	Visualization (Video + Image)	Game Engines	Fabrication
Rhinoceros / Grasshopper [9/10]	Adobe Creative Suite [10/10]	Twinmotion [9/10]	3d Printing FDM / Polyjet [8/10]
Autodesk Autocad [9/10]	Adobe Premiere / After Effects[8/10]	Unreal Engine [7/10]	KUKA / ABB / NACHI Robots [200+ hours]
Autodesk Maya [9/10]	Keyshot Renderer [10/10]	Unity [3/10]	
Houdini FX [7/10]	Vray Renderer [9/10]		
Blender [4/10]	Arnold Renderer [7/10]		

Stitch / AA DRL Thesis

with structural consultation by akt II

M.Arch Thesis Project // 03/2019 - 01/2020
Professors: Shajay Bhooshan and Alicia Nahmad, AADRL Program Director: Theodore Spyropoulos, AADRL Program Founder: Patrik Schumacher
Team: Aldo Sicilia (Colombia), Alfredo Chavez (Spain), Edward Meyers (Australia), and Andrew Friedenberg (USA)
Support: Structure consulting from AKT II, robot residency with Autodesk

In the final year of the Design Research Laboratory's (DRL) brief Constructing Agency (2017-2020), Studio Nahmad Bhooshan followed this outline.

"1. Digital design and fabrication technologies are maturing with significant progress being made in computational architectural design, computational geometry, structural design, robotic manufacture, etc.

2. Social, economic, and political conditions in large high-productivity cities such as London have evolved, thus, the market conditions are now suitable to engender a demand for mass customised housing.

The two observations together yield the premise of the research: developing real-estate solutions for contemporary living in high-productivity cities are a prime avenue for application of the maturing domain of digital architecture and fabrication"

Stitch proposes a new housing system to redefine modern living within dense urban environments. Hybridizing socially aware architecture with rapidly deployable, high volume, and adaptive fabrication systems was the priority of our teams' research. Prototypical modular fabrication techniques and affordable solutions were designed in order to adapt to new territorial opportunities existing above numerous locations throughout the Greater London railway network. This is what we are calling the 're-railroadification' of London.

Building on such a novel site as above railways while navigating the complexities of peoples evolving social needs at such a large scale requires a new approach to design. We're proposing utilizing a social configurator, using game theory and game dynamics, to negotiate these micro discussions between the different inhabitants, the investors, and other stakeholders.

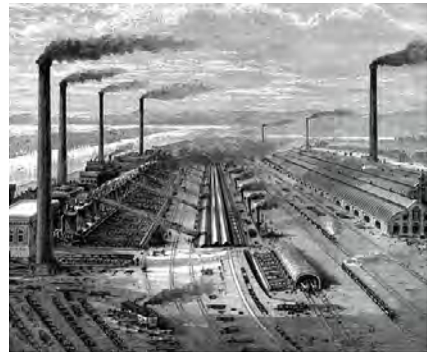
1600

The United Kingdom that we know today was built on the shoulders of locomotive technologies starting in the 16th century.

1.Housing on transportation routes London Bridge, 1616

1700

The densifying of around this rail network has led to divisions in communities, yet now offers new opportunities and territories to re connect and re stitch the urban fabric back together.



2. Steel transport > industrial revolution Barrow, UK, 1880

1800

The industrial revolution saw a birth of rail throughout the UK to serve and deliver materials around the country. This brought with it growth and an intricate rail network that has recently now densely been built around.

3. The Post-War era Kensal Rise, 1921

1900

The de-industrialization of the UK, made London shift from an economy based on industrial production to an economy based on services. Industries are gone but the scars are left. The London of today presents a social opportunity to re-purpose and reuse these sites as new dense communities, transforming these infrastructures into a social catalyst for all of the city.

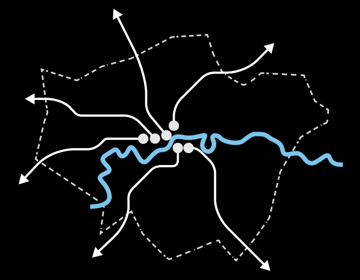
Greater London Rail length total 569 km with 347km of it being exposed.

2000

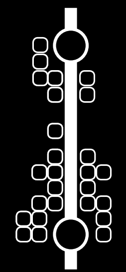
2020

STITCH. The re-railroadification of London's rail network

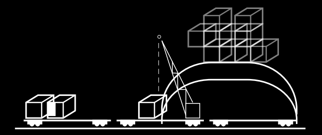
{ Principles of the RE-RAILROADIFICATION of London }



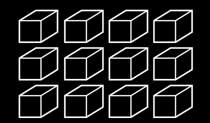
Prolific site opportunities for new artificial territories from Central London out into the countryside. This has the potential to expand beyond just the Greater London area.



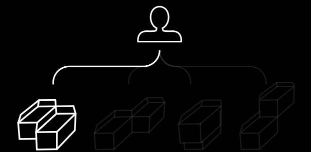
Concentrated urban sprawl with new communities around the existing public transportation network. These communities will also bridge the noisy rail uniting separated communities and converting an undesirable site to new opportunities.



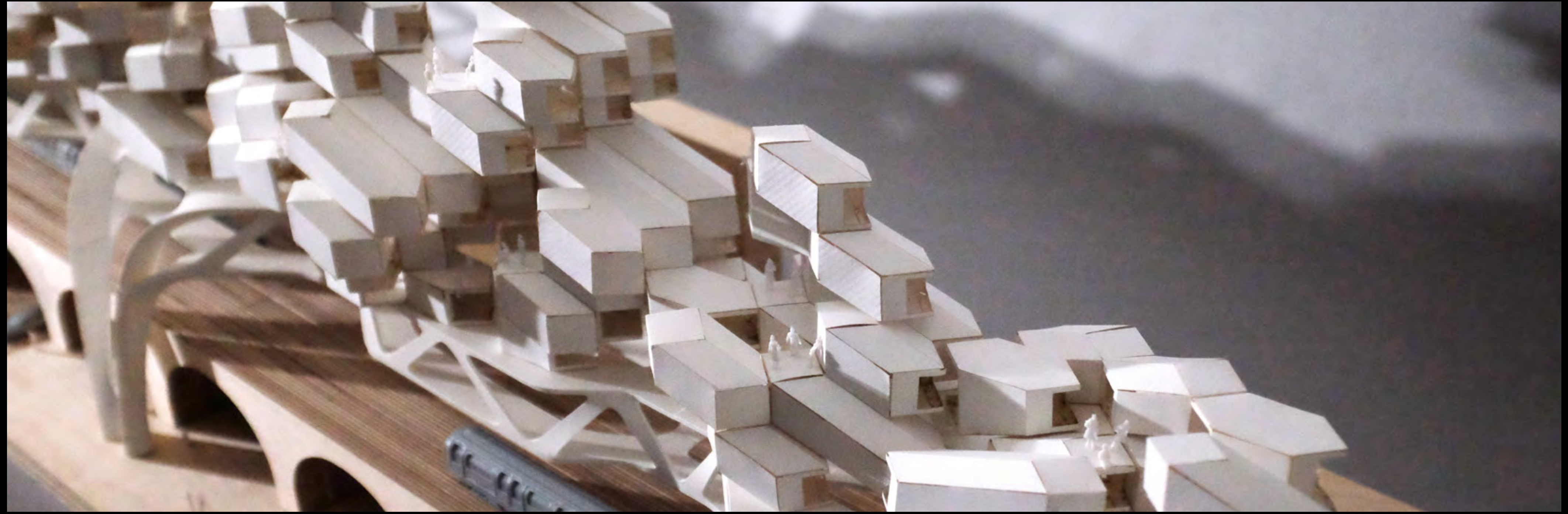
Utilizing the rail network will also provide us with a means of ***fabrication, deployment, and construction***.



Due to the need to maintain the functionality of the existing rail network… this deployment and fabrication must be primarily modular to allow for a ***high volume and rapid deployment***.



A social configurator we constructed using game theory is implemented to create user choice and individual negotiations for a robust, socially and economically successful architecture rather than a top down developer approach to construction.



{ Social Configurator } *The social configurator is a platform that allows the user to pick from different locations around London and virtually build communities with the participation of other users. These locations are going to define the range of prices in each case. Furthermore, the communal areas are at the core of the community and are the triggers that allow the community to get built once the users negotiate and agreed upon them.*

The social configurator works as follows in the various phases below. It goes from a user selecting and customizing their habitation unit to selecting which communal spaces they would like to invest in. Due to the small size of the habitation unit and the principles of co-living, users are highly recommended to participate by backing with investments in additional program such as communal kitchens, gymnasiums, gardens, etc. This alleviates the individual pressure to fund the real estate for a personal kitchen or a garden, which is highly unaffordable in London, and spreads the cost amongst many residents who collectively benefit from the social aspects of collective living.

Users

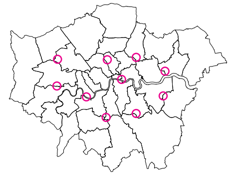
Phase 0

The SOCIAL CONFIGURATOR is launched and can be accessed and used by anyone. The users have the options to select between RESIDENT MODE or INVESTOR MODE. Residents will own a unit in the and reside there. They can also invest in additional communal programs. Investors will only own shares in communal programs and do not need to reside in Stitch,

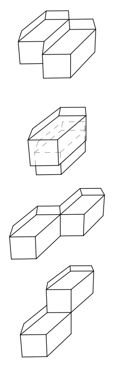
RESIDENT INVESTOR

Phase 1

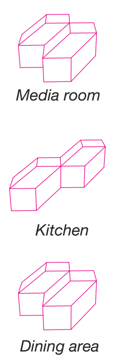
The user selects the site in London (and in a city near you soon!) where they would like to reside or invest.



Residents choose a unit configuration based off of their budget, necessities, and number of family members.



Residents and investors select from a library of additional communal programs to invest in and support through their "backing". Types of communal programs include kitchen, bar, gym, garden, etc.

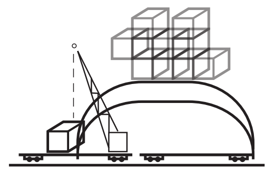


Phase 2

Negotiated customization. If the required backers have come together to fund an individual communal program it is scheduled for creation. If the number of backers was not met, it is culled.

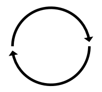
Phase 3

Construction of the community commences if all residents and investors approve. If not the cycle restarts.



Phase Infinity

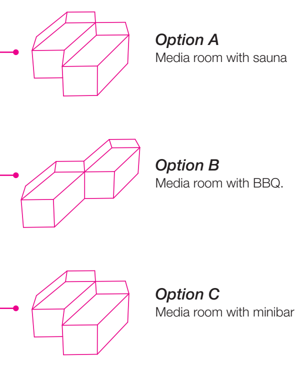
Reconfiguration of the community is constant. Residents can renegotiate to change existing communal programs (selling a bar to purchase a gym) if enough backers support the change.



Contribute more	Contribute more	Negotiate
Kitchen Indoor Kitchen with open outdoor terrace.	***Dining area*** Indoor dining area	***Media room*** Media room with TV and EPL games
Price: 12,000£	*Price*: 9,600£	*Price*: 16,000£
Backers required: 8	*Backers required:* 8	*Backers required:* 5
Backers obtained: 6	*Backers obtained:* 2	*Backers obtained:* 9

Rules
An investor can alter their contribution and backing quantity for social spaces to advance them to the negotiation stage. Note: all backers are considered equal.

Backer	*Backings*
Brody	1
Glenn	3
Colin	1
Nancy	8



Option	*Backings*
A	2
B	4
C	5

User interface (UI)

Site Locater (London)

Dynamic area chart (comparison between Residences, Social Program, and Circulation)

Number of units in community

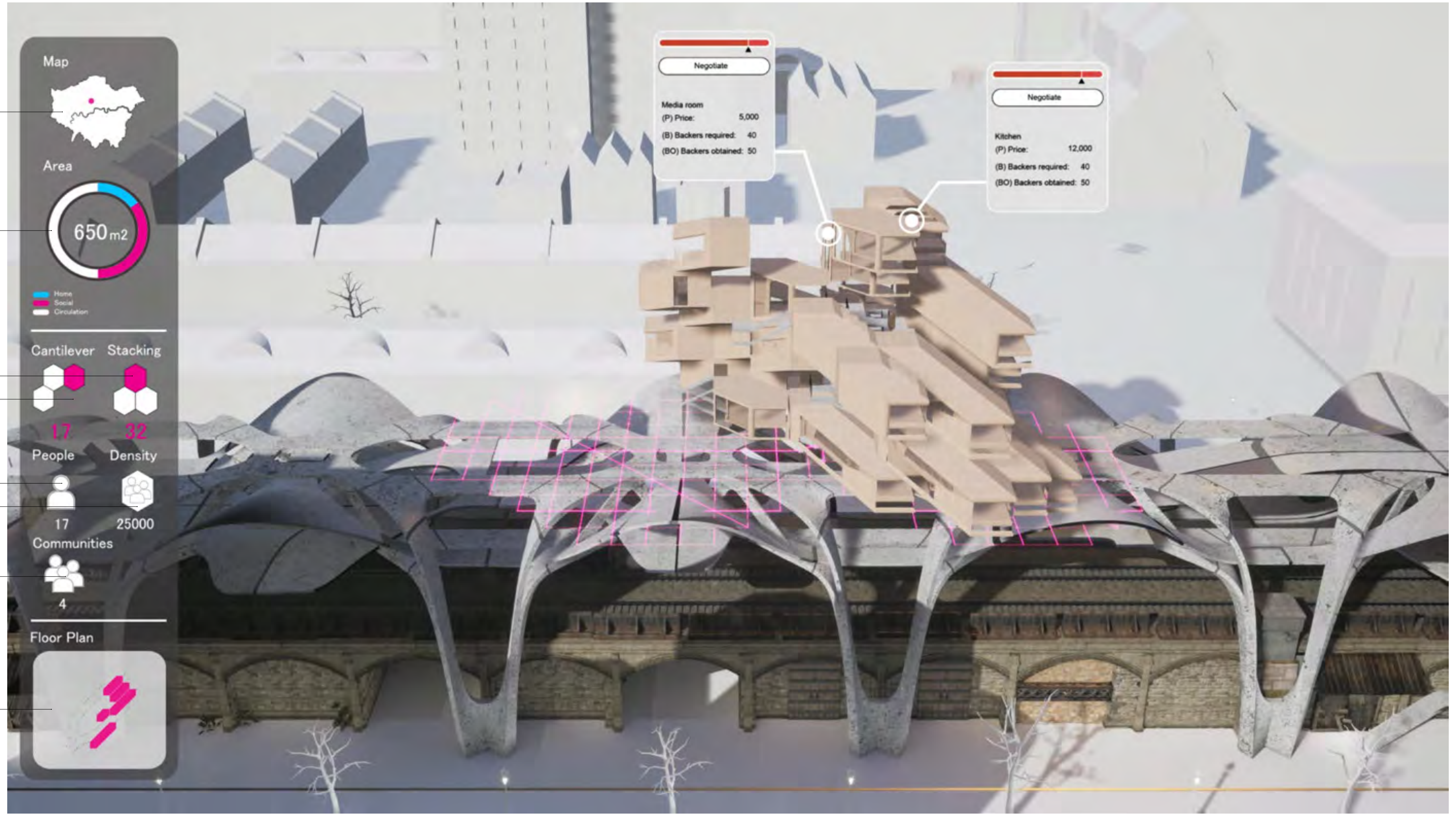
Number of cantilevered units in community

Population indicator

Density indicator

Community indicator

Current community floor plan



User investment interface

Communal investment description

Price per person based on total investors

Slider showing the current status of number of investors compared to investors needed for construction

With the max. investors, the price per person to use the movie lounge is cheapest

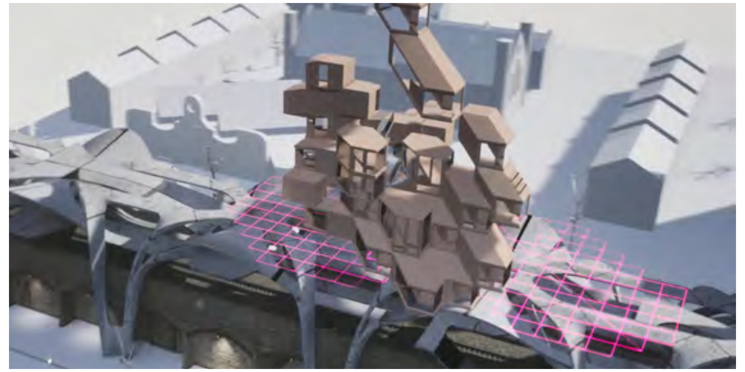
Invest

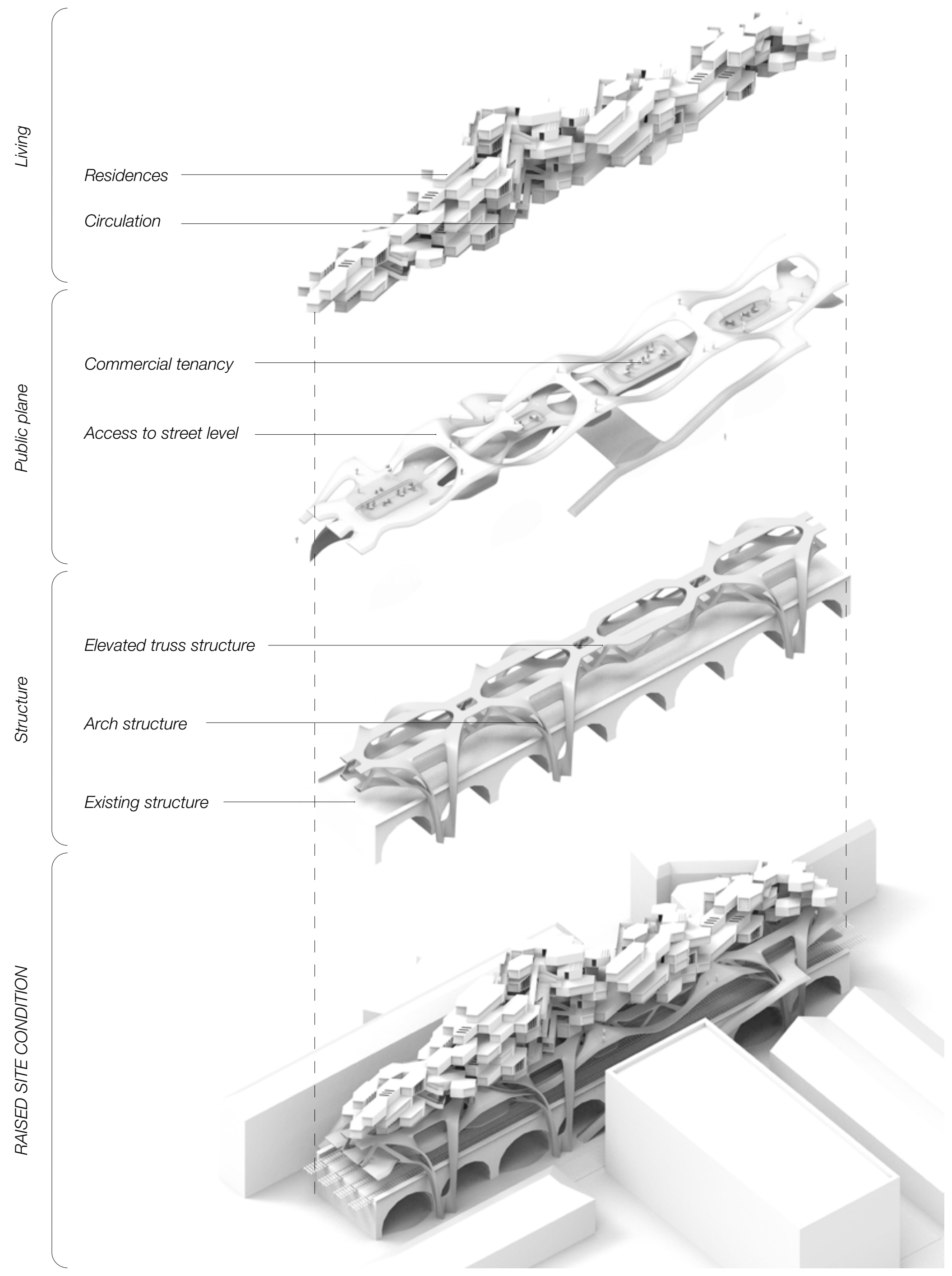
Movie lounge. Have movie nights with you and your friends! Seats (4-10 guests)

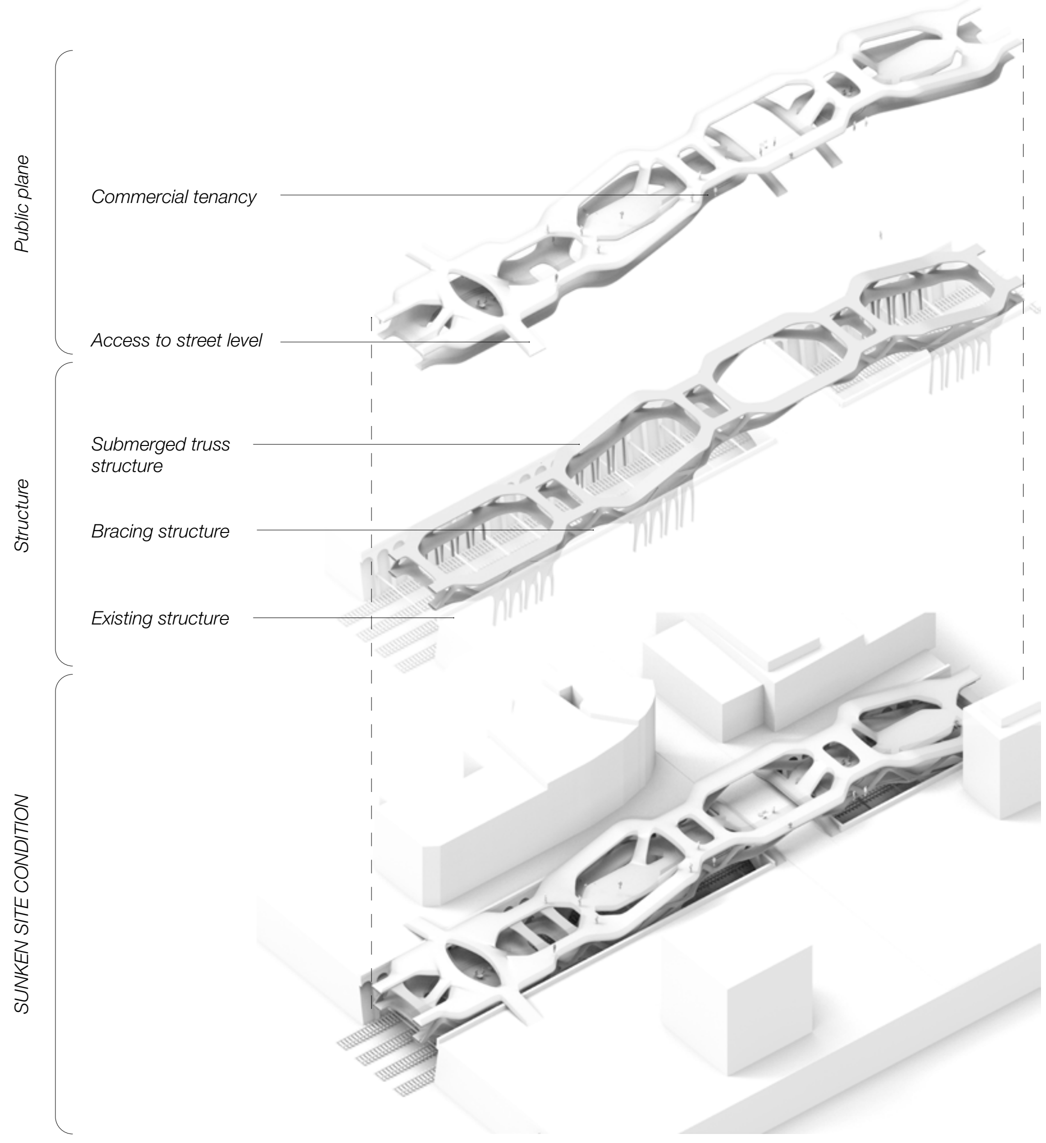
Price PP 3000£ / i = **428.6£**

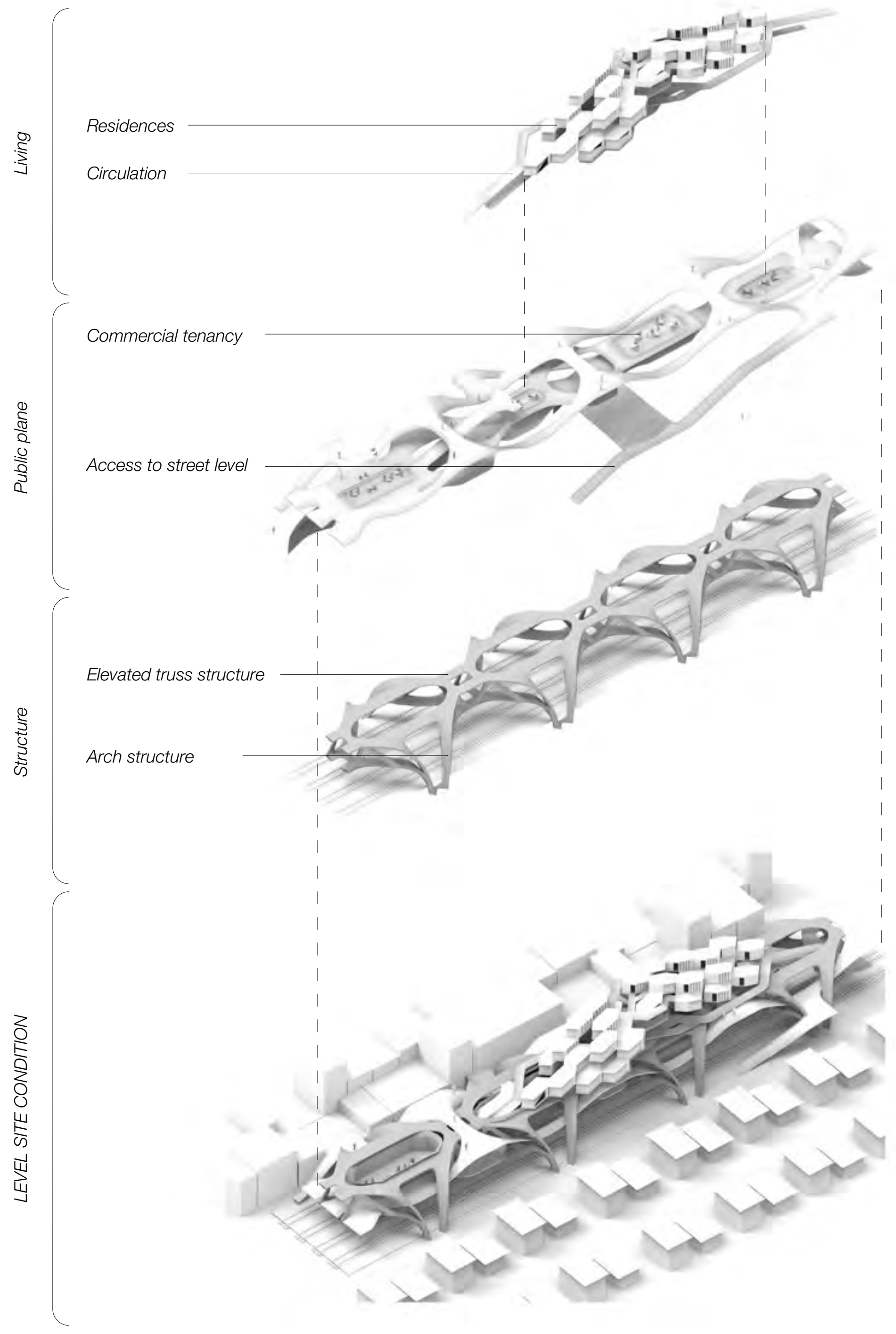
0 — 10 — 20

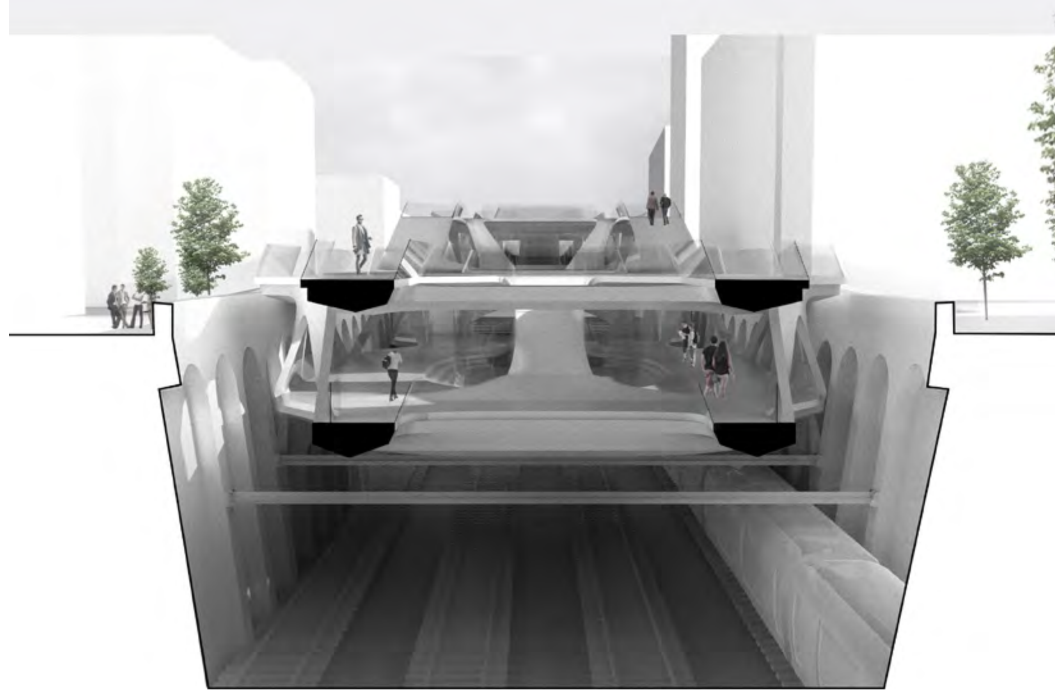
Investors (i)	7
Min. investors needed	10
Max. possible investors	20



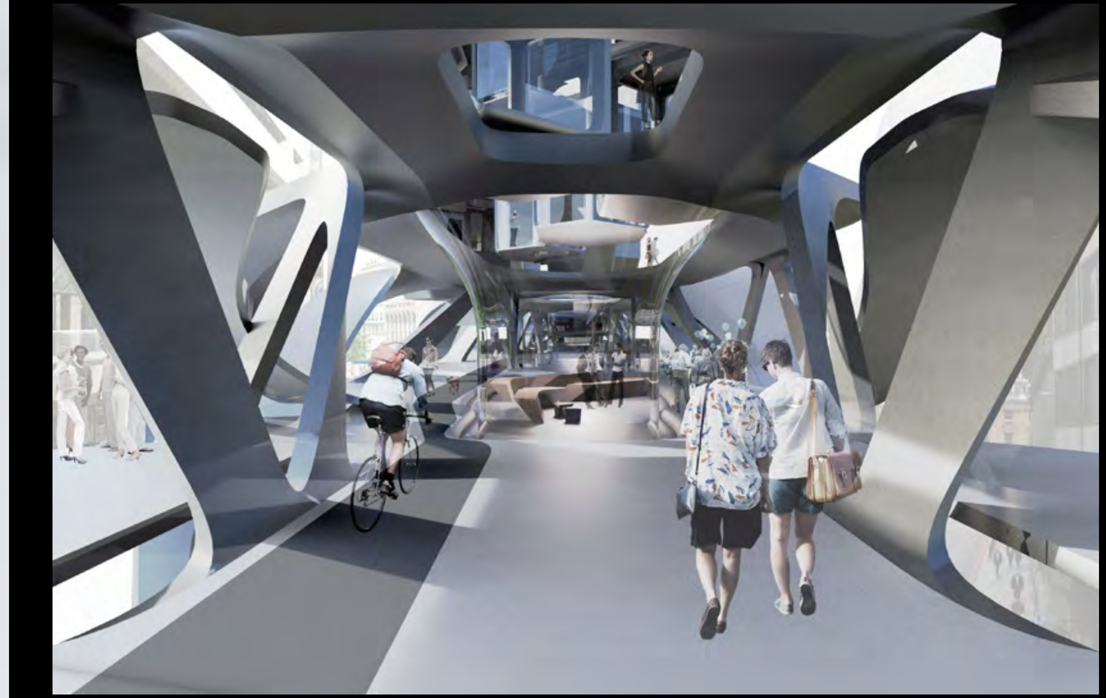

Living
Residences
Circulation
Public plane
Commercial tenancy
Access to street level
Structure
Elevated truss structure
Arch structure
Existing structure
RAISED SITE CONDITION

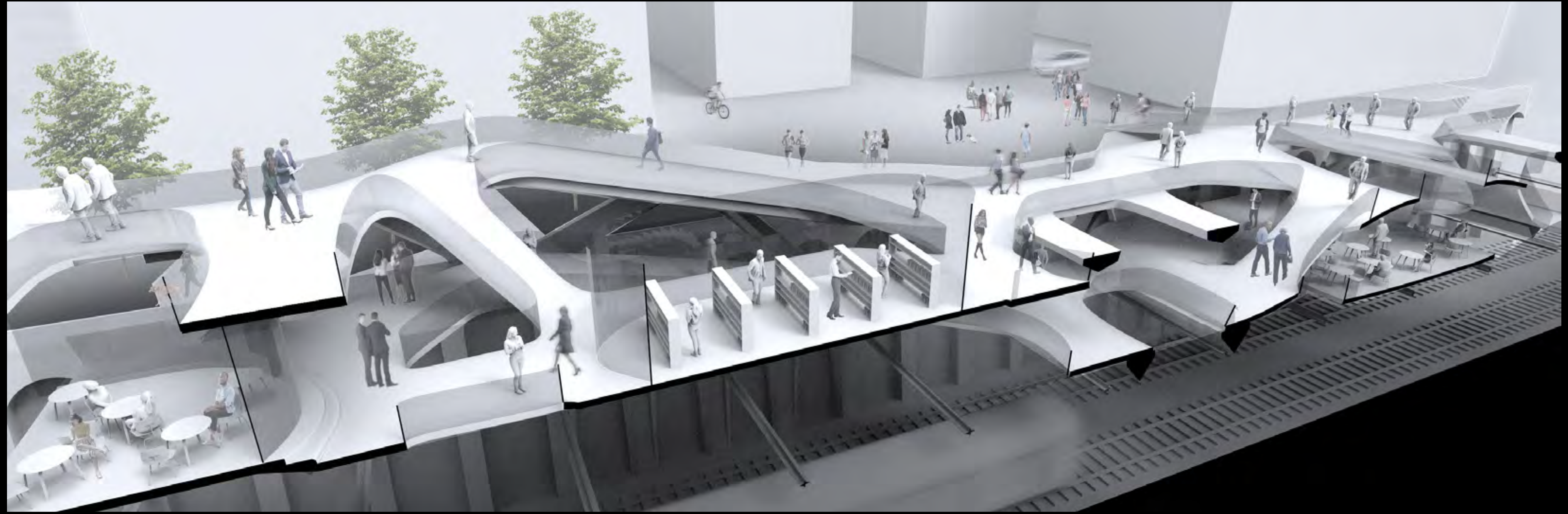

Public plane
Commercial tenancy
Access to street level
Structure
Submerged truss structure
Bracing structure
Existing structure
SUNKEN SITE CONDITION


Living
Residences
Circulation
Public plane
Commercial tenancy
Access to street level
Structure
Elevated truss structure
Arch structure
LEVEL SITE CONDITION



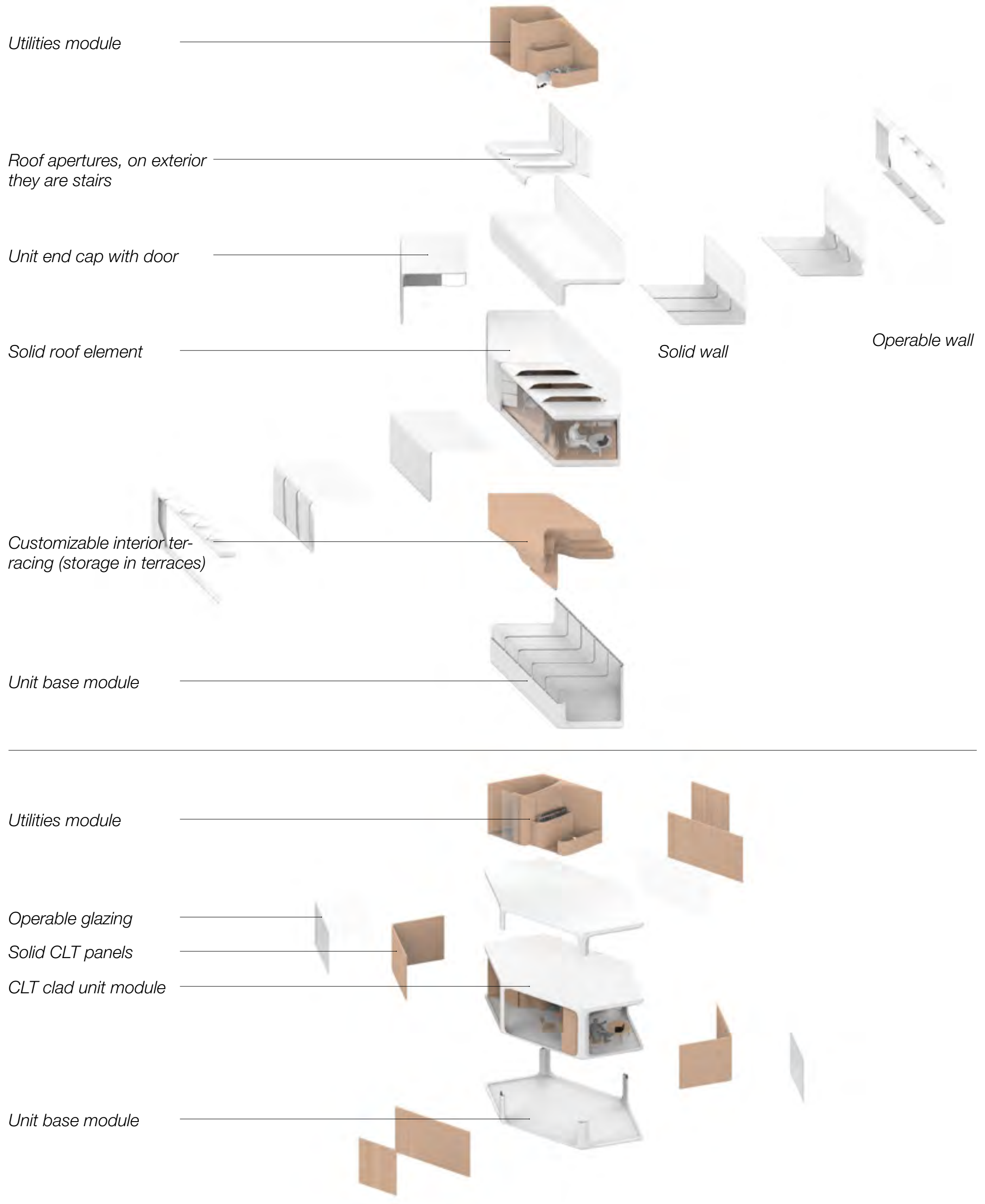
A new oblique community above an elevated London Overground line. There are 1-2 layers of public program (right) with shops, bike paths, and free space below the varying heights of the community above.

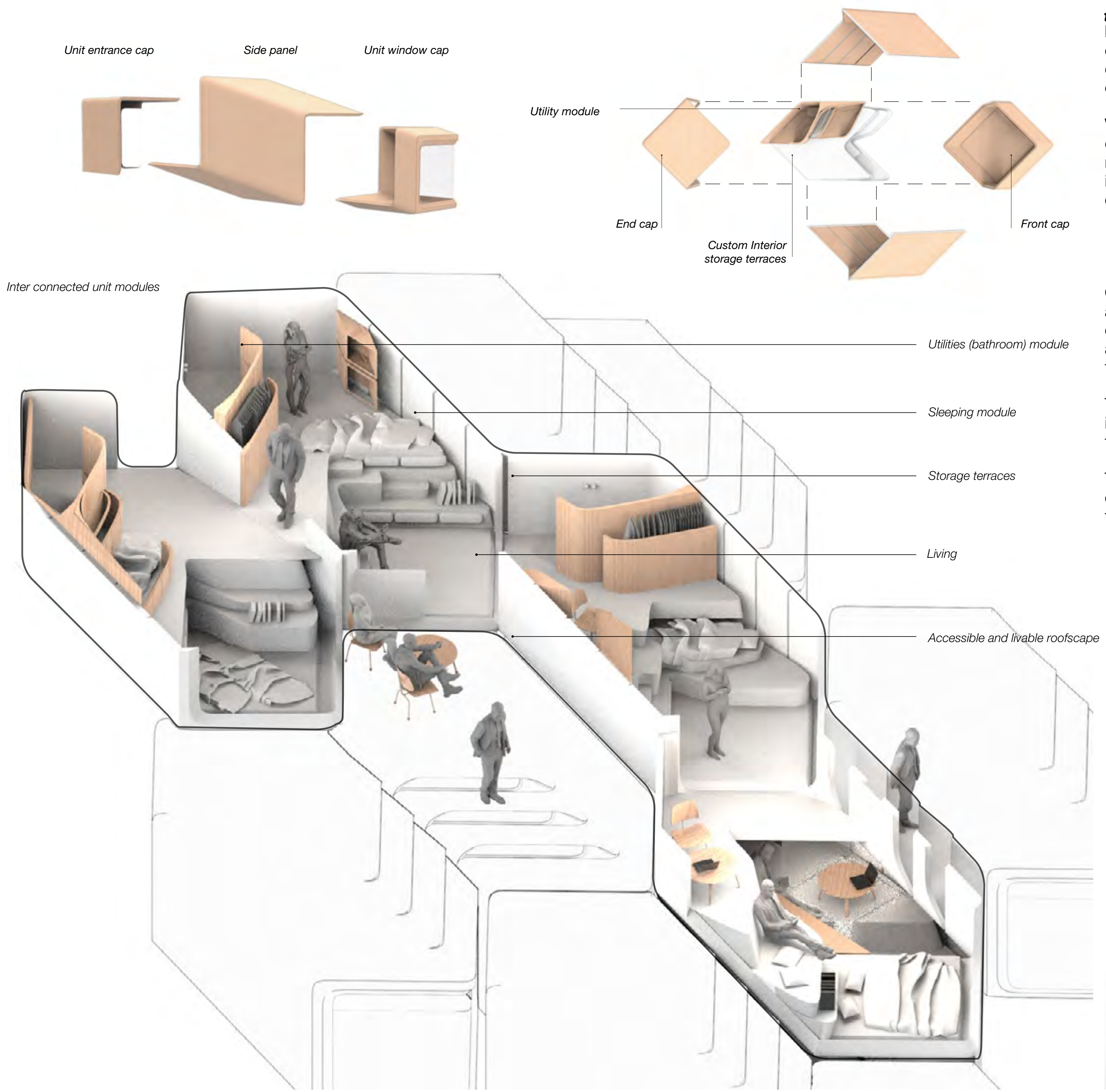




{ Habitation unit } The unit is made up of a series of external and interior parts. The outer shell consisting of three parts (box car strategy) is a mass deployable and simple structural middle and two end cap CLT system. The interior system is a strip system capable of adhering to the sloped unit, breaking the unit up into individual terraces of different uses. The intention is to include storage below these terraces to free up the interior of the unit.

Tiered living solutions stow away storage and free the cluttering of internal walling.





{ *Fabrication and deployment* } Throughout the design process, we have constantly been asked ourselves how our project becomes not only realistic but feasible. We find the answer in understanding two differentiated features that make up our project: first, the management of our design, and second, the management of its construction.

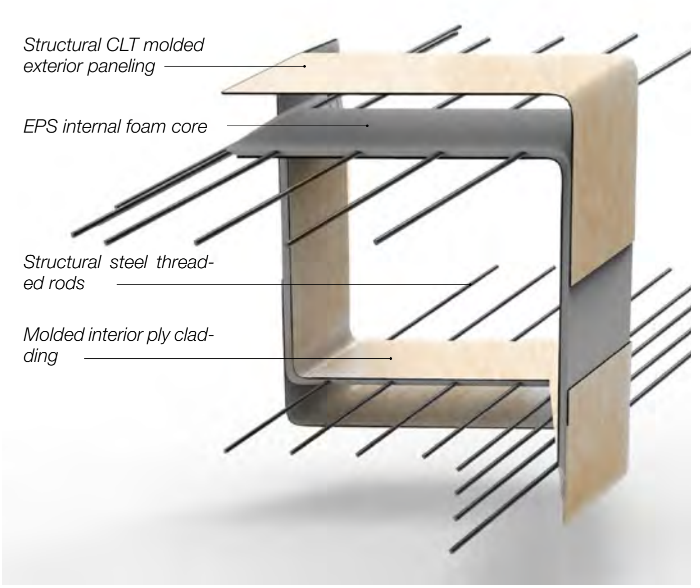
When talking about manufacturing and assembly, we have to look at the dynamic characteristics of the track, defined by a train system that can not be disrupted by us constructing on it. The train tracks have significant impact and that creates three principle topics we must address for our construction management:

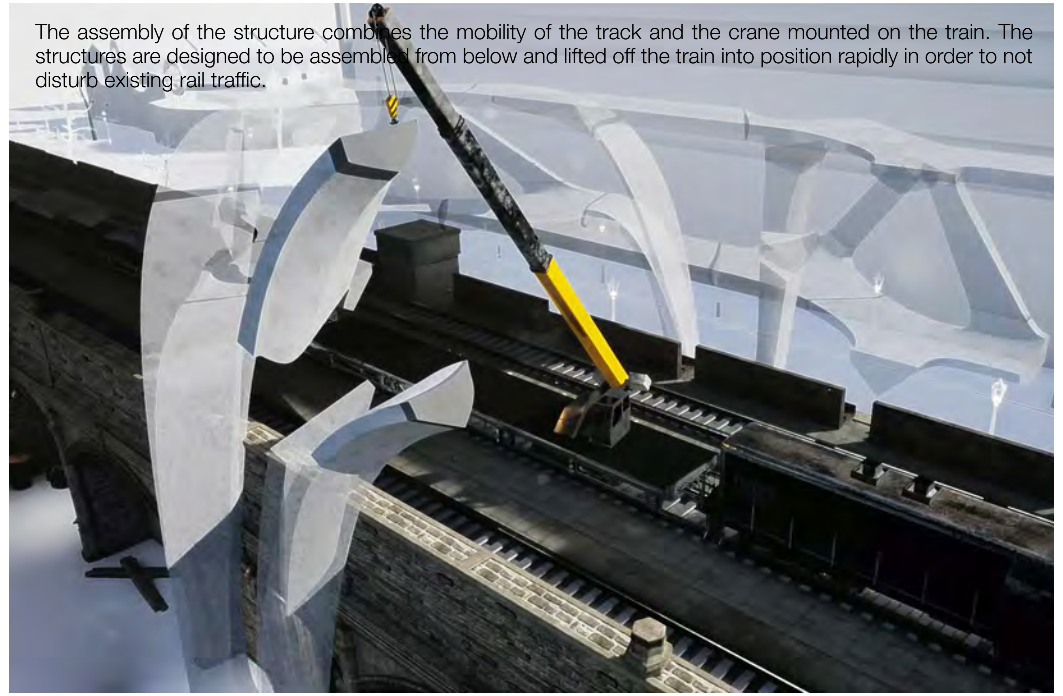
1. Integrated off-site fabrication
2. standardized construction elements
3. a limited deployment time-frame

Off-site fabrication takes place in a factory (shown on the next spread) accessible via the rail. The factory includes programmed robots that create a seamless work-flow from the social configurator designing the architecture, to the final construction documents and physical cut paths of the robots.

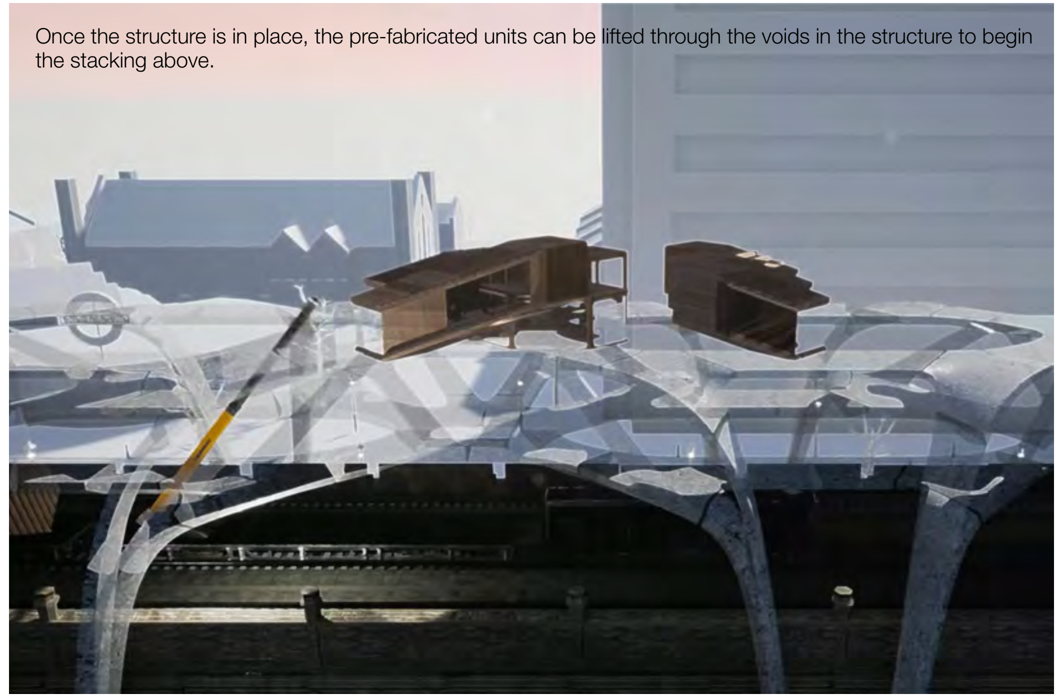
The units are comprised of a structural CLT exoskeleton bent around the internal customizable rings made of EPS foam/insulation. On the interior is timber finishing which can be bent to cover any of the furnishing elements.

The precast concrete structural elements are created in the same factory, complying with the dimensions needed to fit in a train in order to be transported through the rail network and be deployed on-site.

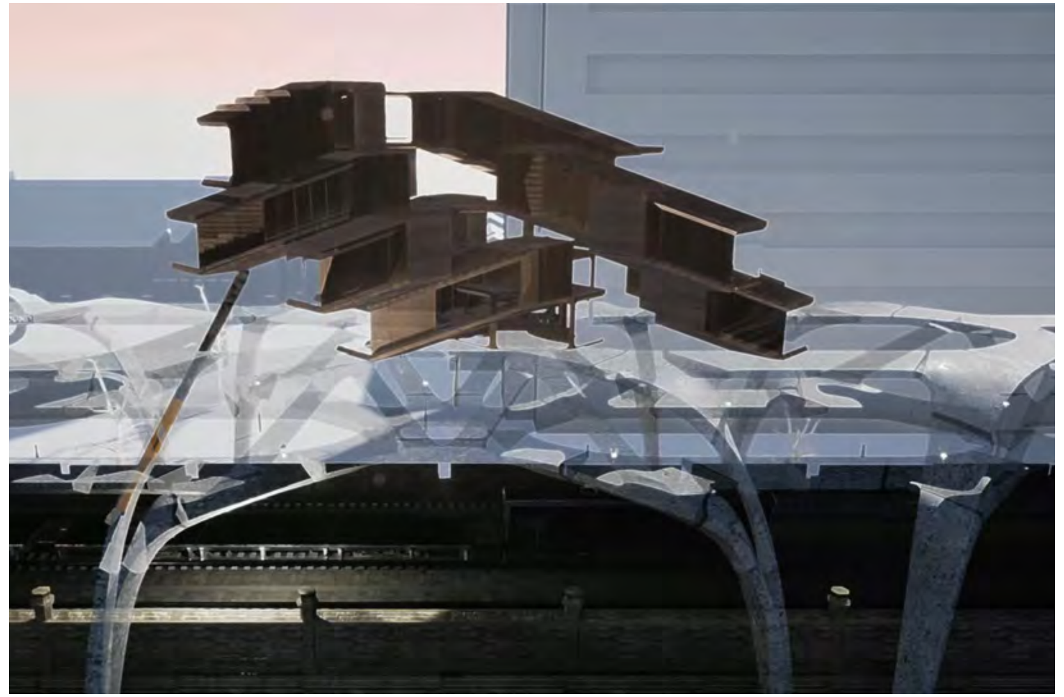


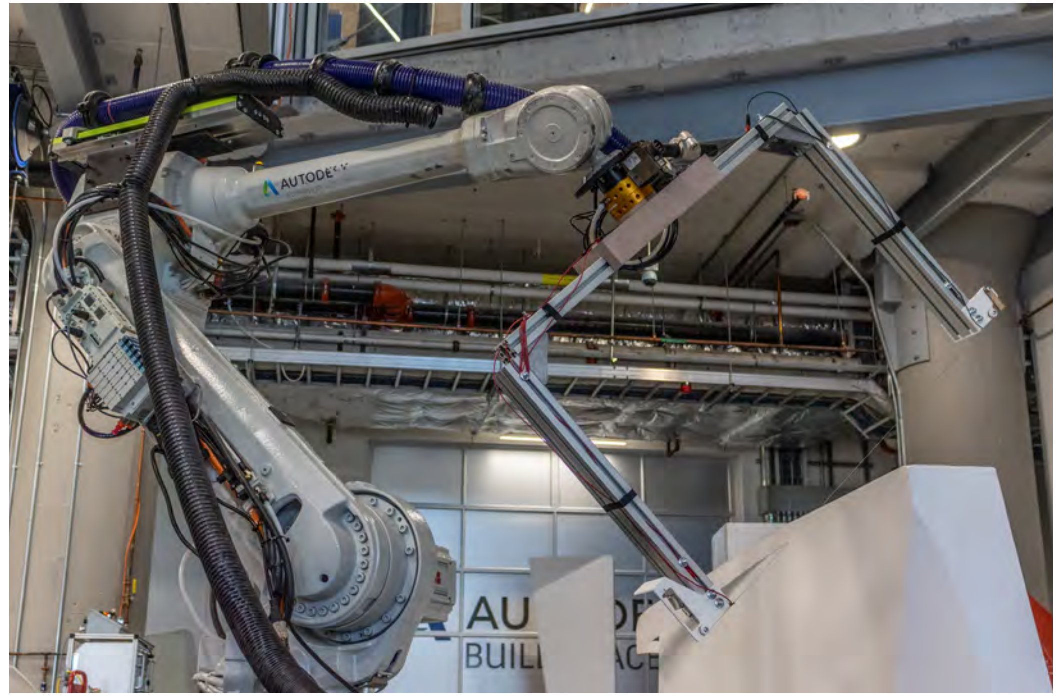


The assembly of the structure combines the mobility of the track and the crane mounted on the train. The structures are designed to be assembled from below and lifted off the train into position rapidly in order to not disturb existing rail traffic.



Once the structure is in place, the pre-fabricated units can be lifted through the voids in the structure to begin the stacking above.



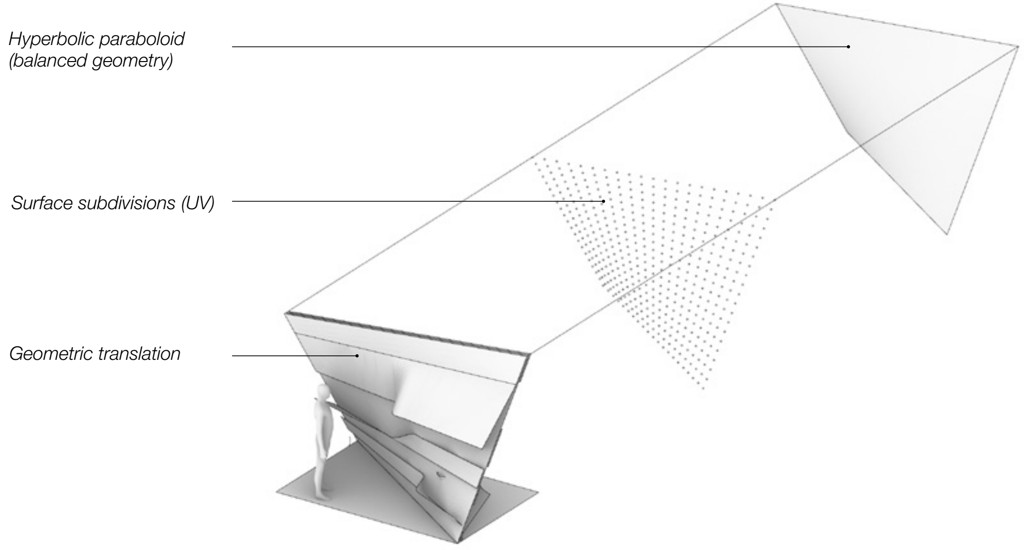


Autodesk Residency

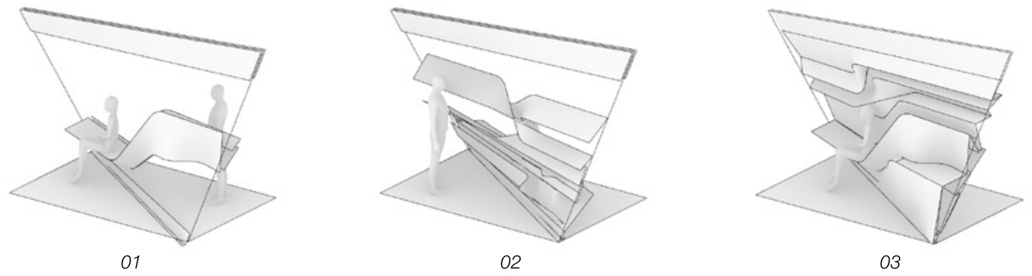
AUTODESK RESIDENCY // July 2019
Team: Aldo Sicilia (Colombia), Alfredo Chavez (Spain), Edward Meyers (Australia), and Andrew Friedenberg (USA)

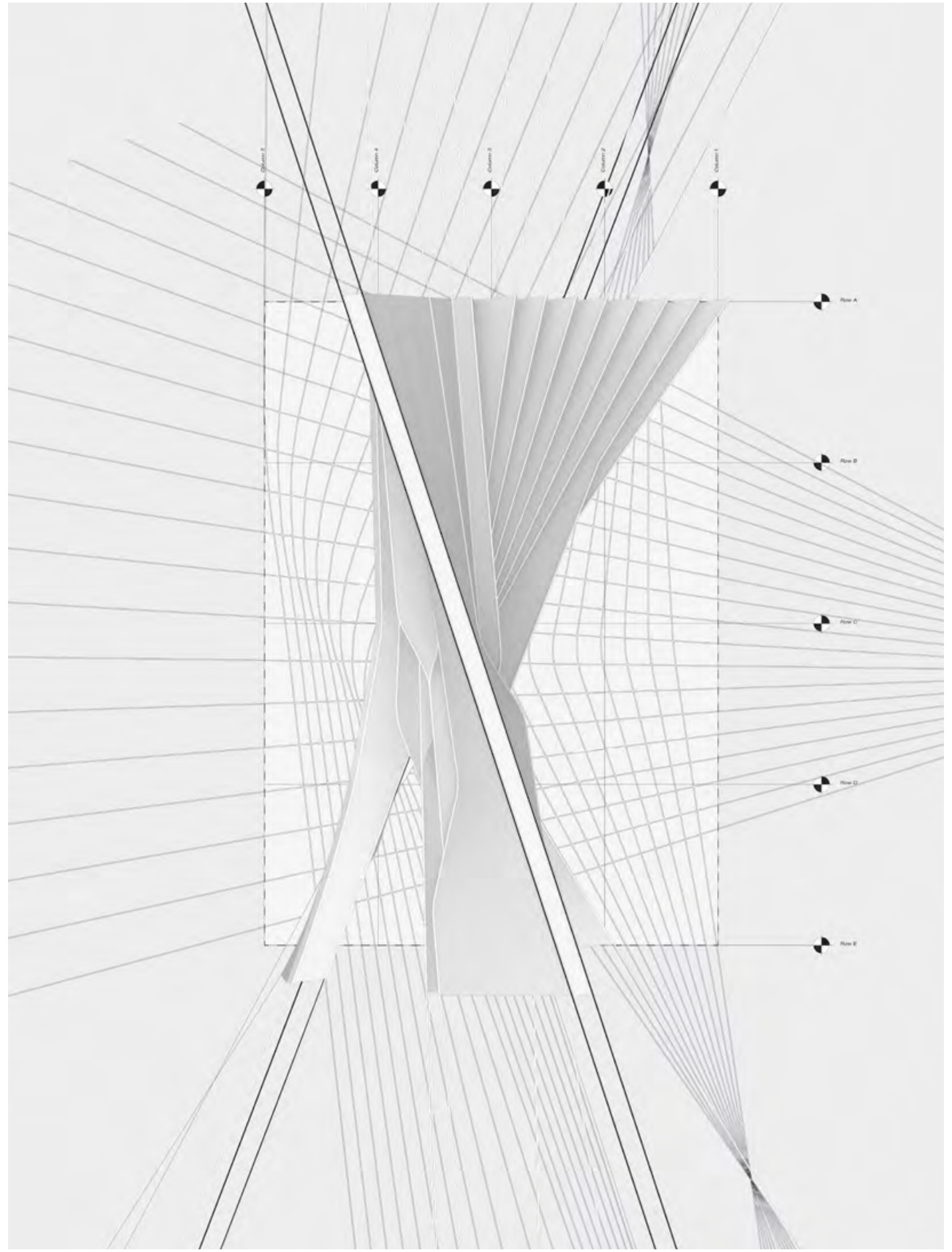
The teams focus at Autodesk BUILDSpace was to experiment with methods of robotic fabrication enabling complex yet buildable and usable geometries (ruled surfaces) including the ability to precisely and efficiently fabricate alternate building materials. The studios focus was to perform hot wire cutting techniques with a goal to redefine the domestic wall, transforming it from an element of seclusion and a divider, to an element of occupation, redefining how efficiently humans can live and utilize space.

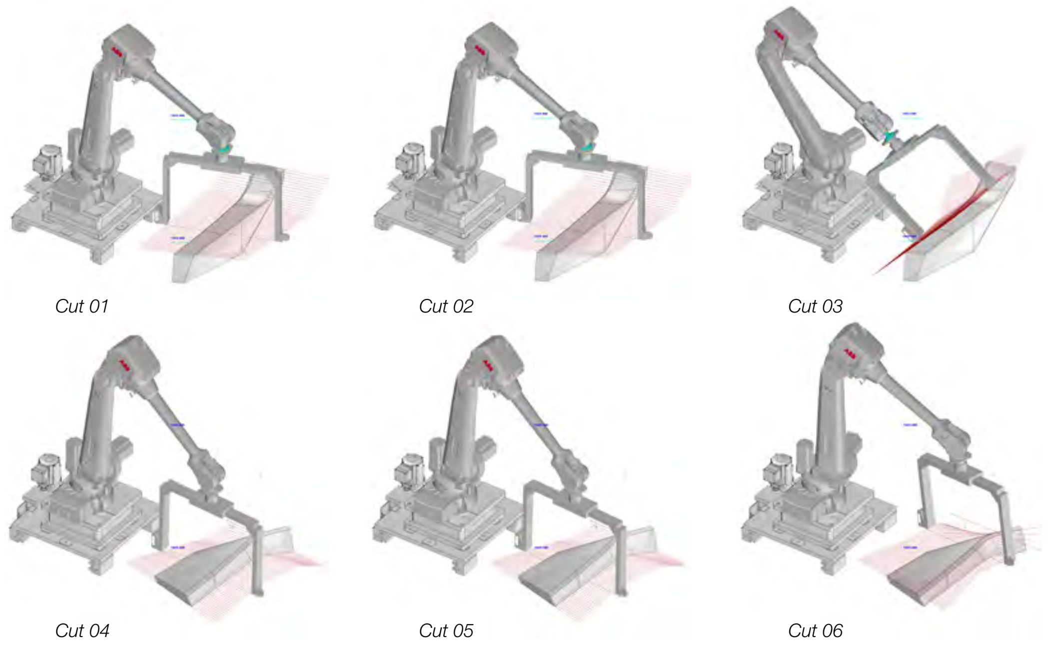
The families of different ‘ruled’ geometries that we explored were a result of the fabrication process and helped us construct a series of different functions within the continuous forms. This method of thinking, comes from a reaction to the current housing crisis in the UK, which demands a redefinition of what exactly ‘dense’ modern living is. With this in mind, a level of domesticity and comfort needs to be at the forefront of the research influencing the types of geometries in order to have a positive influence on making modern living more affordable and livable.

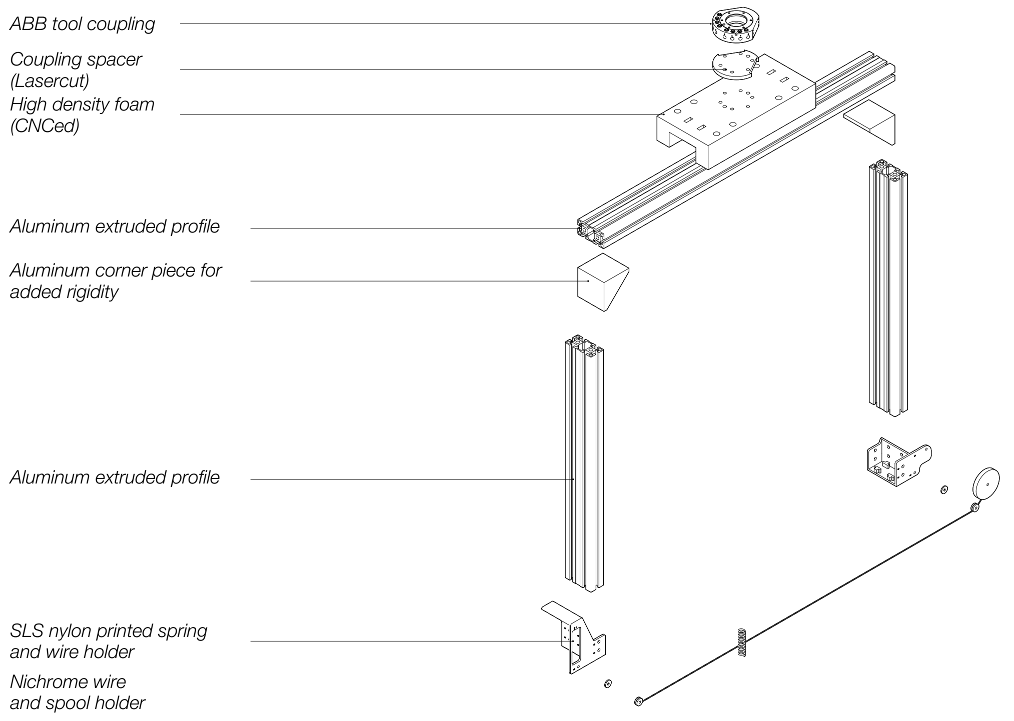


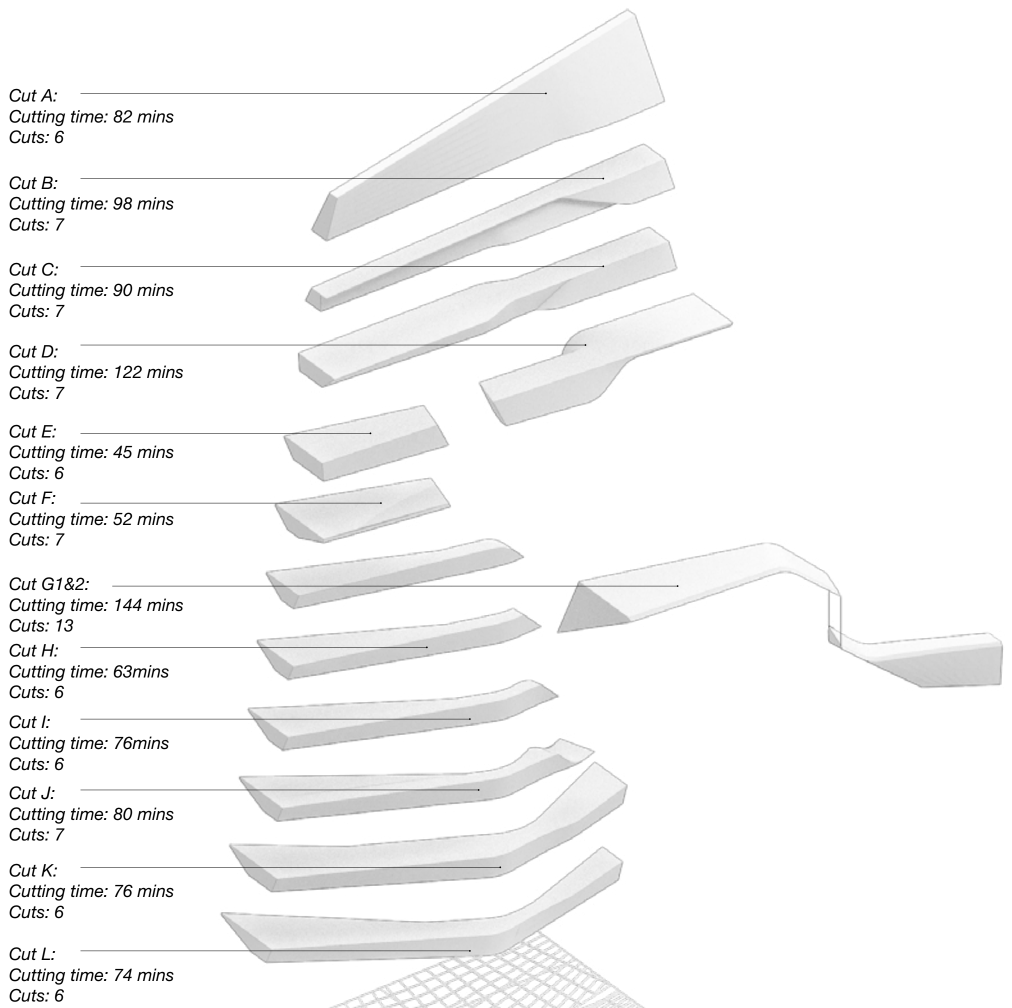
Stages of developing/occupying the “living wall”

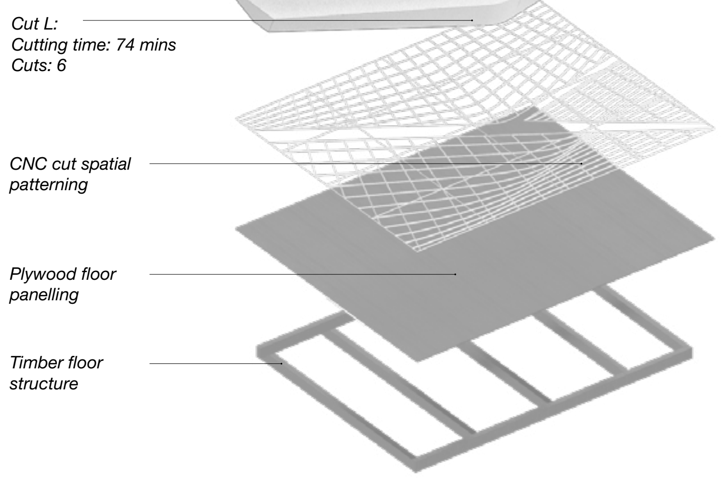












HyPar Wall Metrics
Length: 3000mm
Width: 2400mm
Height: 2520mm
Area: 7.2 m2
Volume: 18m3

Total cutting time:
997 mins (16.6 hrs)

Actual production time:
3.5 days

Total cuts:
85 robotic passes

Total EPS material:
6.48 cubic meters

BEHNISCH ARCHITEKTEN

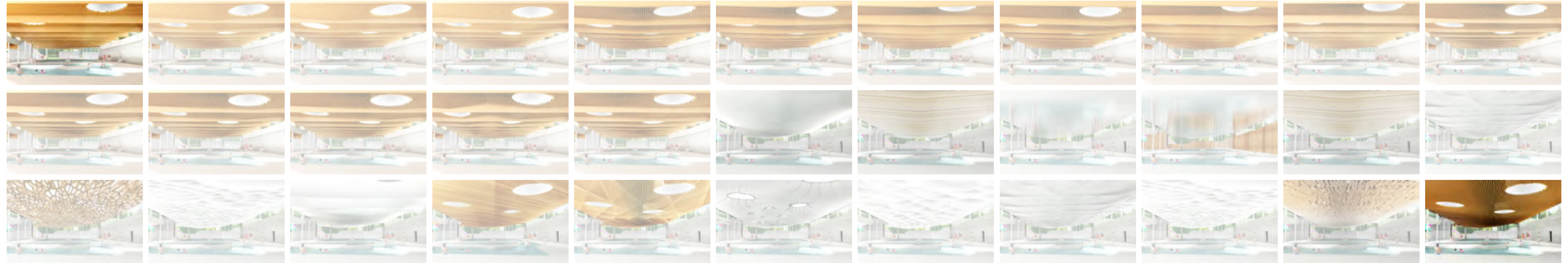
ARCHITECT // August 2016 - June 2018

While working as an Architect at the international firm Behnisch Architekten in Stuttgart, Germany, I worked on a variety of projects shown on the following pages. More than a year of my time in the office was spent working in a ~8 person team progressing a large swimming complex in Konstanz (Germany) from schematic design through construction documents and now into realization. Within the team, I primarily worked on the >3000m² roof structure and ceiling, using 3D parametric modeling (Rhinoceros+Grasshopper), and consulting with various engineers on every aspect from the steel truss network to the lighting and drainage.

When I joined the team right after the competition was won in late 2016, the roof was constructed out of mass timber beams which we quickly determined wasn't the right structure for the building because of their scale; with spans of up to ~18 meters, the beams were almost 2m thick. This scale of beams would block off the proposed overhead clerestory windows. Utilizing grasshopper, I wrote a script that creates a structural envelope using the maximum spans and required steel dimensions for a new proposal for the roof. With this came the freedom of material for our lowered ceiling which after much deliberation (seen in the various sketches on the page to the right), we settled on a wood lamella field that embodies the original concept of a natural wood ceiling landscape above the pools.

The project will completed in 2021.

(Below) An image from the competition phase and (above) our development by the end of my time at Behnisch.

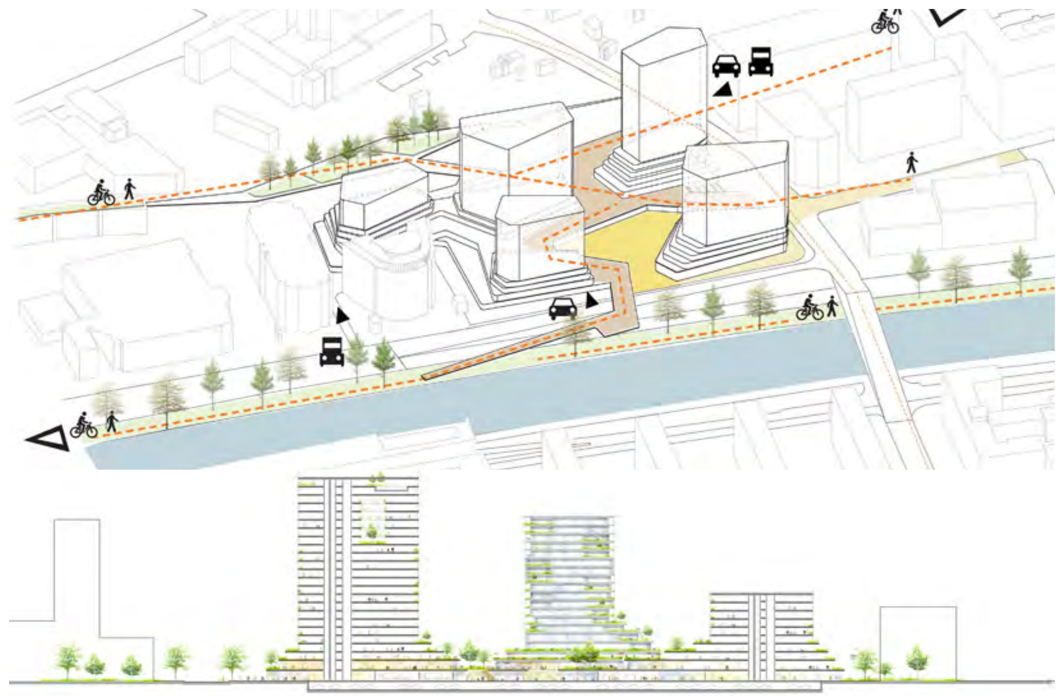


(Above) A series of initial sketches for adapting the structure from mass timber to a lightweight steel framework which ended as shown here (below).

It's under construction!

A landscape of pools sits under the massive roof and will have an intimate relationship with the surrounding woodlands.

I also worked on a winning competition entry for a new commercial district in Vienna...



...and on the design development phase of a community school near Stuttgart.

Research project // Spring 2020 - Current

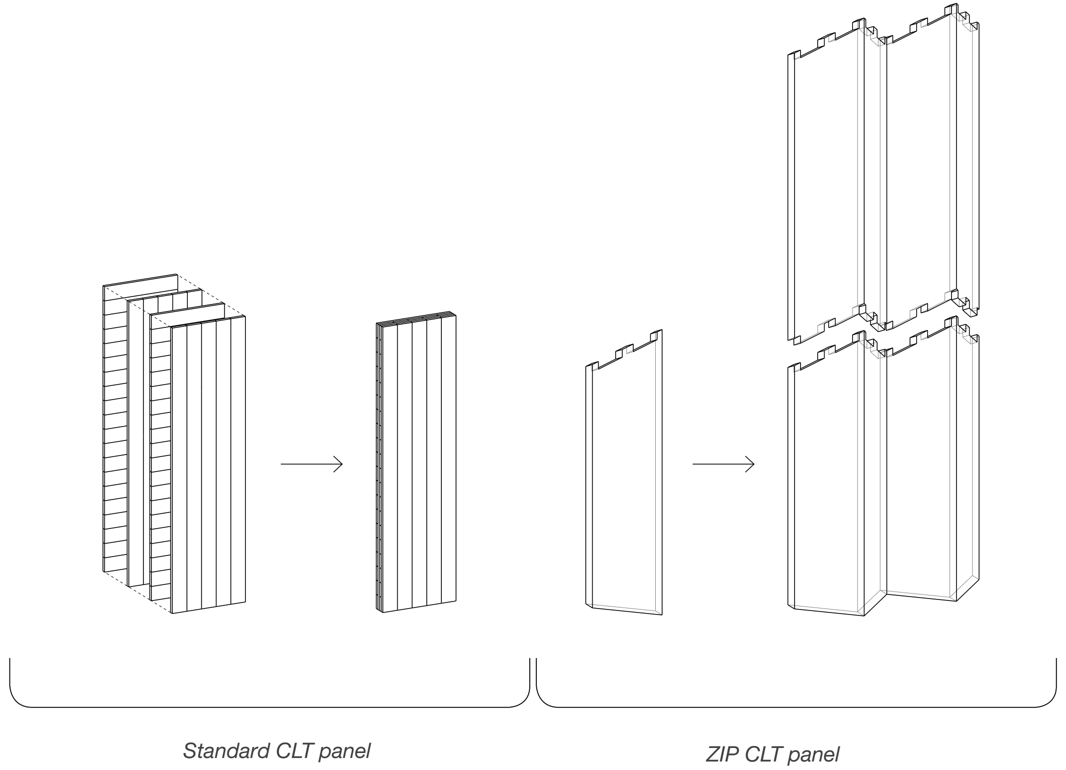
Team: Edward Meyers (Australia) and Andrew Friedenberg (USA)

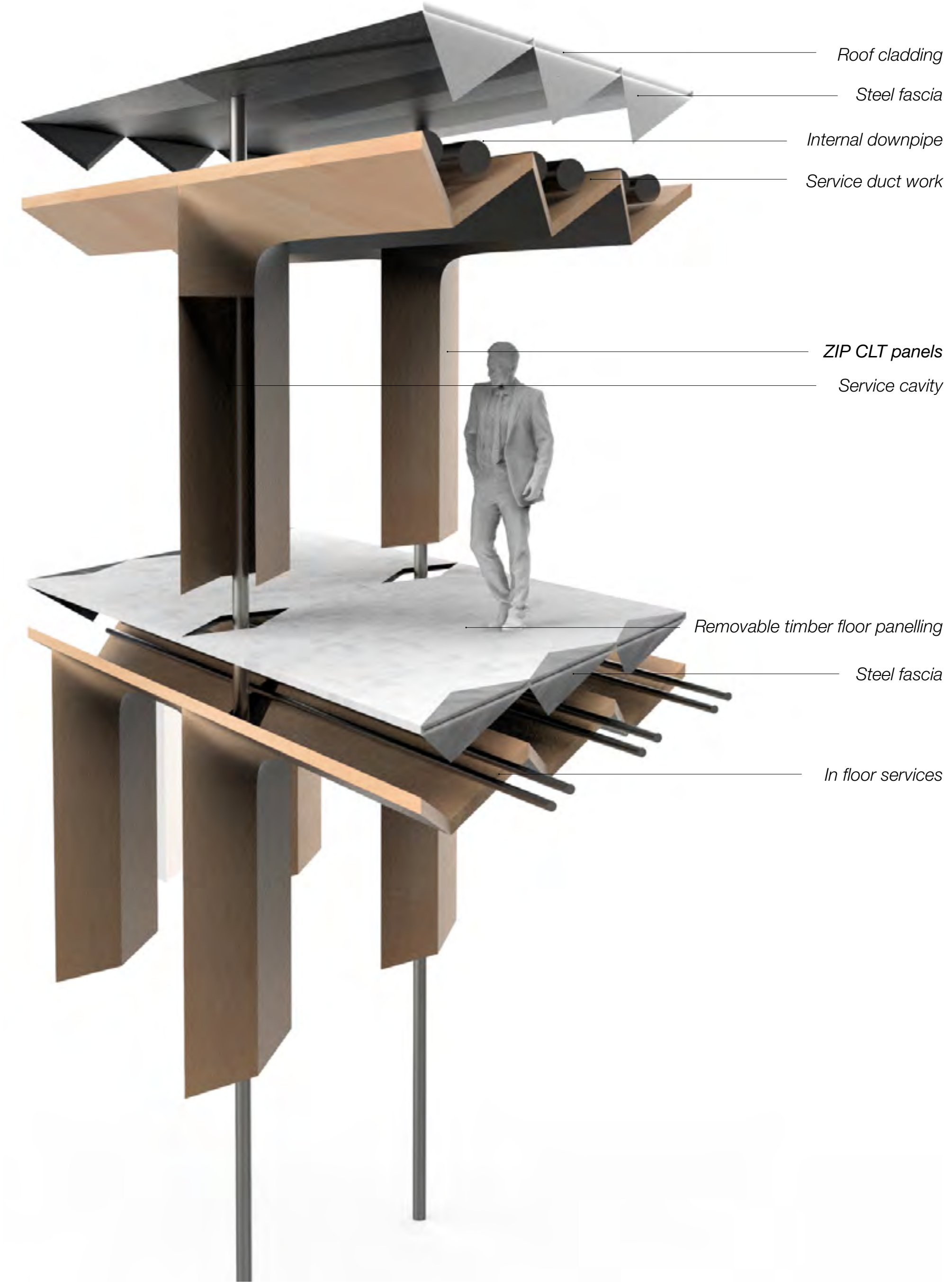
Since graduation from the Architectural Association we have taken our research into housing and fabrication techniques in a new direction using timber as the primary structural and spatial element. We believe this is a very viable material that will revolutionize housing in markets in need of large amounts of quality mass housing. What we are naming the core component of the system is ZIP. This will be a novel 'LEGO-like' component based timber construct. These Zip units are serially combined to create spaces of varying lengths and have the ability to support many building uses. Additionally, these structures can be vertically stacked up to 11 meters in height.

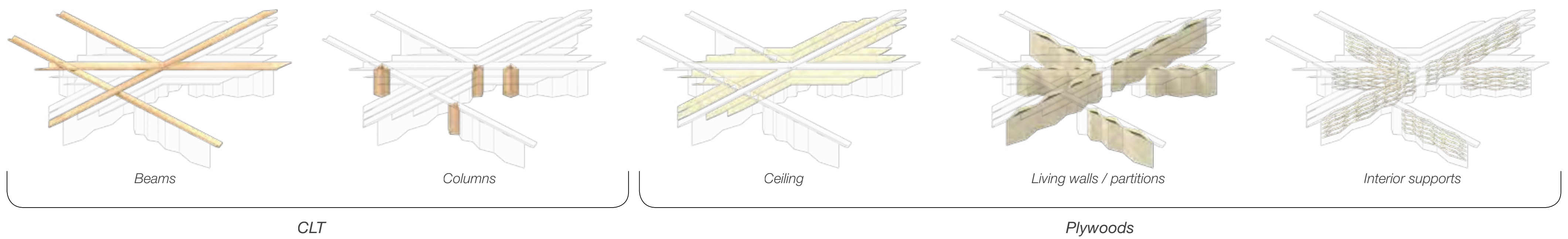
Robotically prefabricated construction – use of CNC cutting machines and 6-axis robots to fabricate and assemble the CLT Zip units. The interior of the house is robotically fabricated and constructed from alternative renewable timber sheet products.

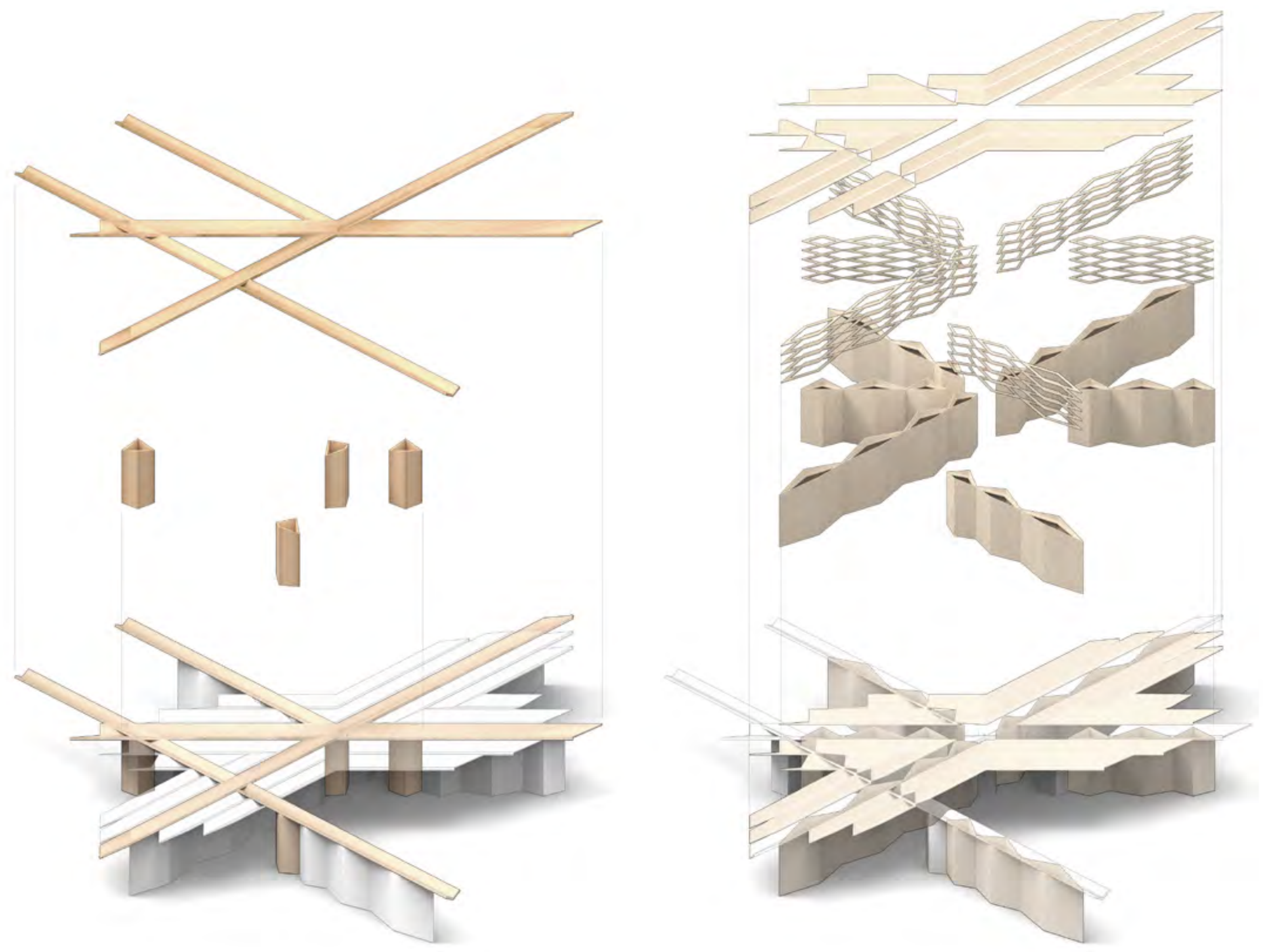
Carbon negative construction – Cross Laminated Timber, the main construction material, allows CO2 to be sequestered from the air and store carbon for the lifetime of the house.

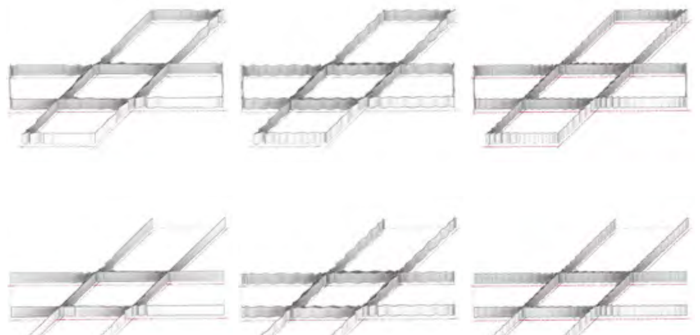
Interior optimisation - Compartmentalised bathroom, sleeping, and storage units have been designed to be easily fabricated and installed within any Zip unit system. Optimised interior units allow an efficient use of 30 meters squared, organizing an interior for up to 4 inhabitants to comfortably live in.



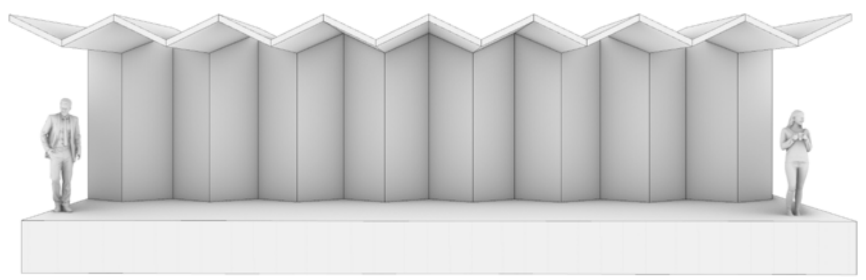






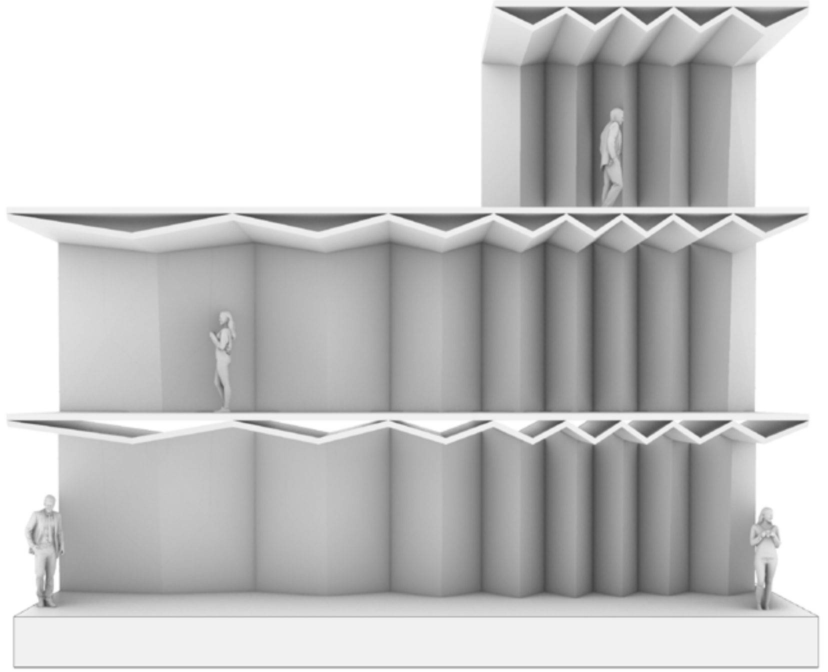


This system we are developing is in its early stages but it will be a full *planning > design > fabrication > construction* workflow. Computation will allow for this seamless process, not only in producing optimum spaces and architectures, but also simplifying stages of construction and fabrication.

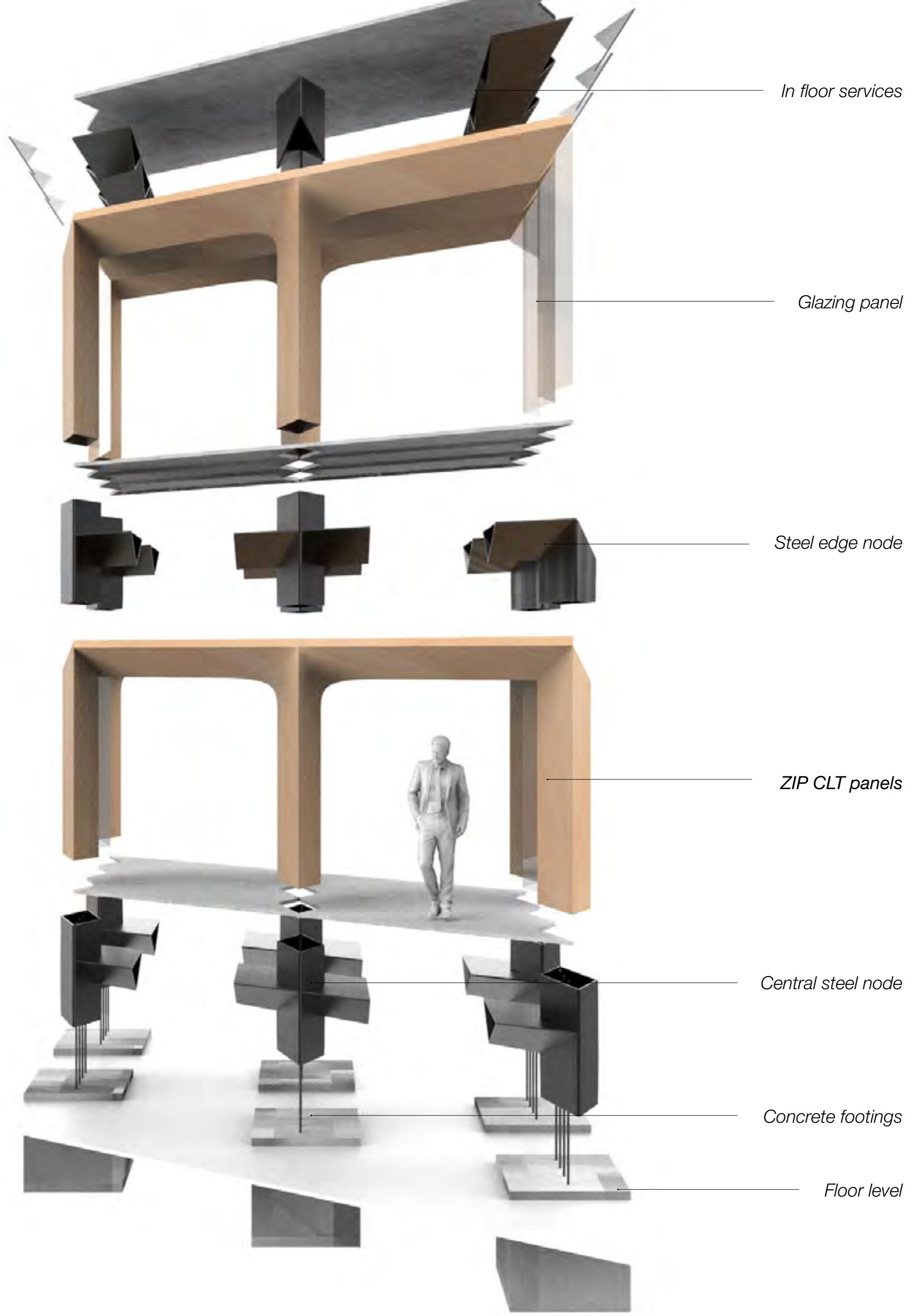


ZIP wall assembly

ZIP wall assembly - 'creased' to optimize structural performance



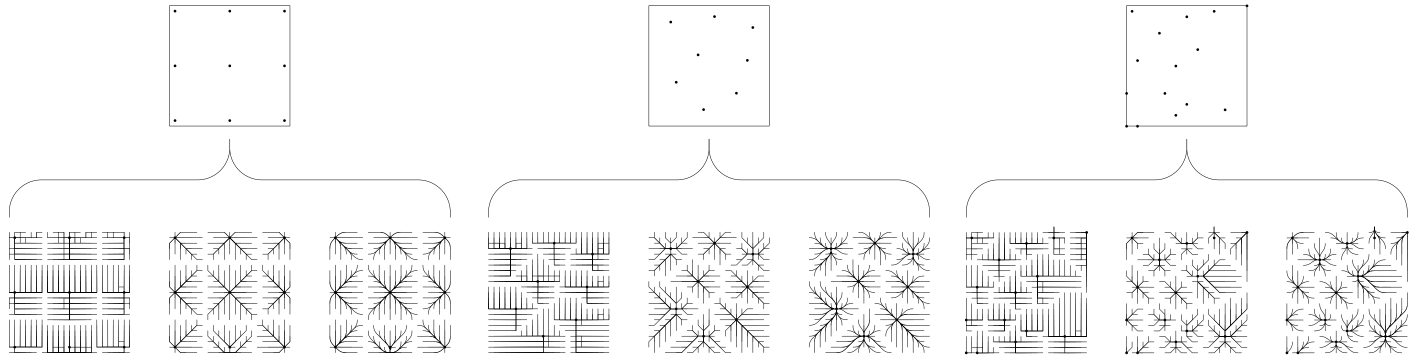
ZIP wall assembly - acting as both divider and structure, column and beam

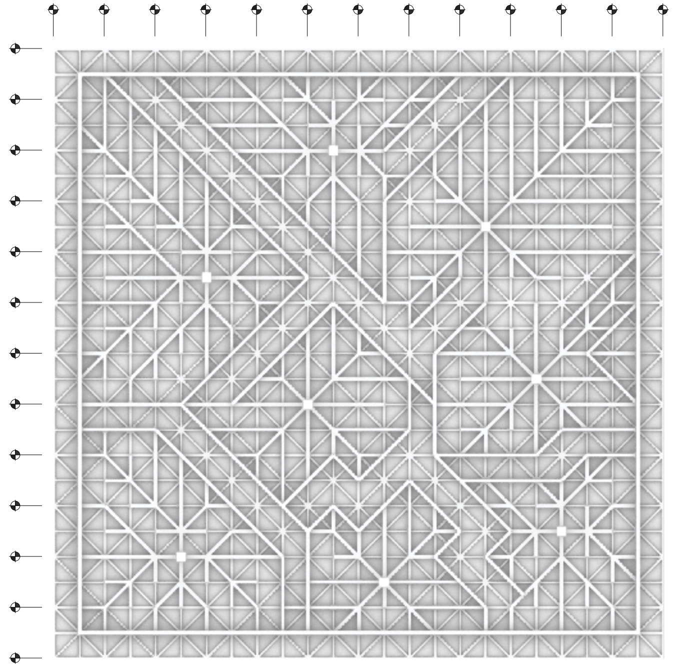


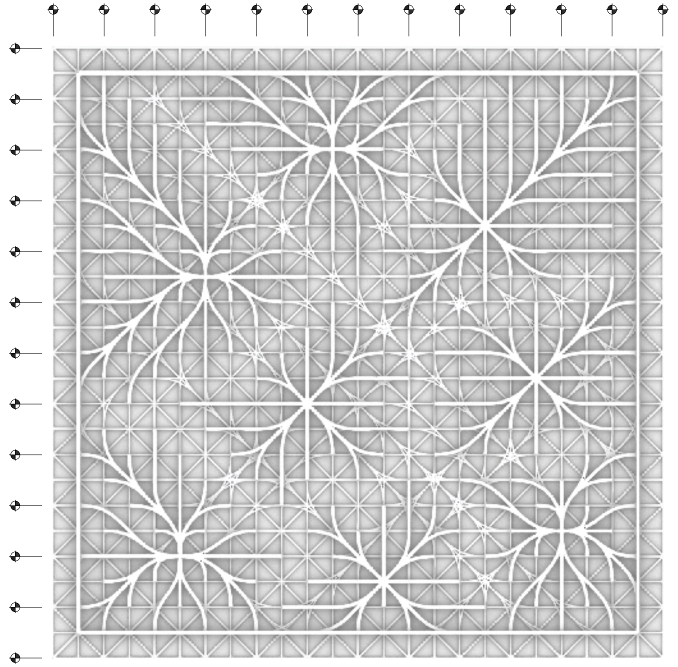
Beams n' Joists

Independent research // Spring 2020

Beams n' Joists is a study of material reduction with mass cross-laminated timber (CLT). Dependent on various column placements (shown in the catalogue below), the network of beams and joists rearrange taking the shortest paths between all load points on the ceiling to the closest respective column. Using these procedural methods can generate lightweight and highly complex structures to replace a classically banal architectural element.







Digital Clay

AA DRL Workshop 1 // 09/2018 - 11/2018

Team: Abhinav Bellam (India), Zhiming Wang (China), Chenyun Tong (China), and Andrew Friedenberg (USA)

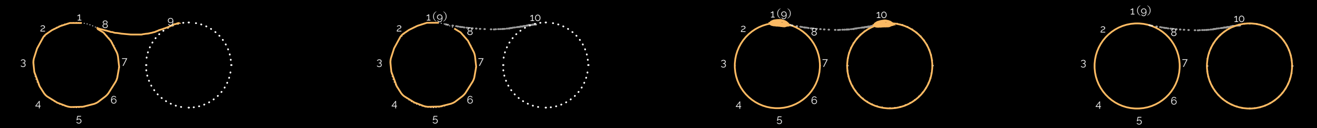
Digital Clay was a hands-on workshop where, in teams of four, we explored an intense work-flow from digital geometries through to physical forms via ceramic extrusions on both small and large robots. Seen below is a diagram documenting the process from simple cylinders to our largest and most complex prints.

Continuous Prints

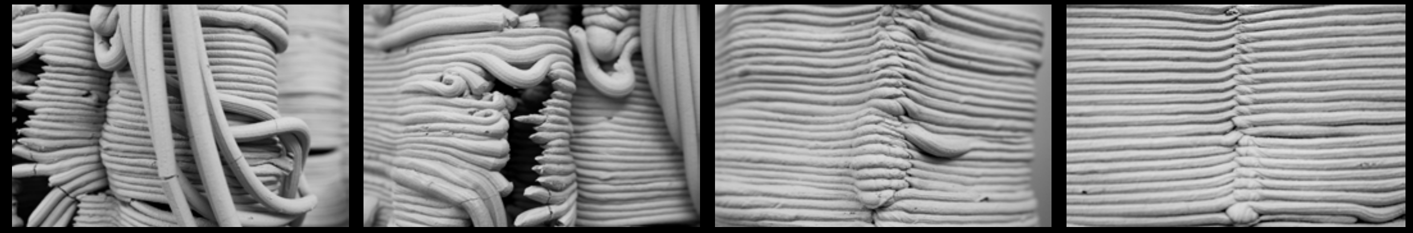
Cylinder
Initial failures in achieving the most simple geometry with a continuous path. The process from digital conditions through one example of some initial tests can be seen to the right.

Cylinder combinations
These tests expanded on perfecting a continuous path print.

Cylinder aggregations



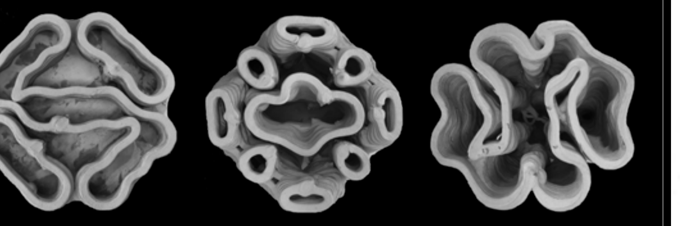
A critical point in our research came when we moved to non-continuous prints. We had to integrate a solenoid to control the pressure in our prints to start and stop the air pressure. This process took many trials to perfect...as seen on the right--from initial tests to more successful ones.

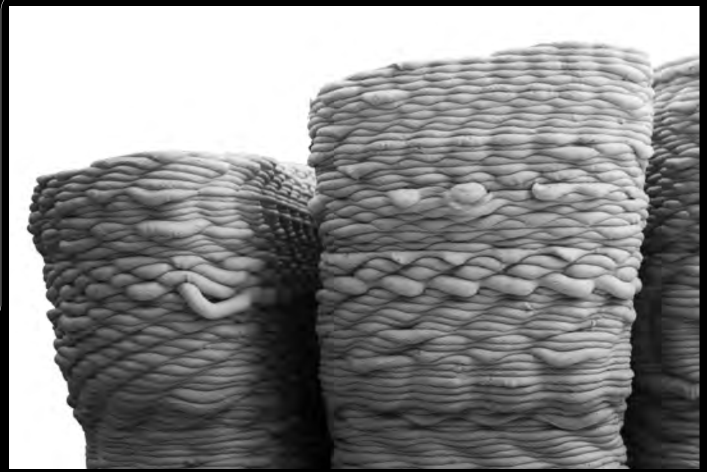


Non-Continuous Prints

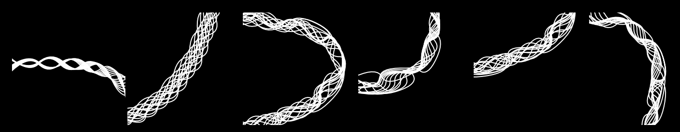
Branching
Utilizing the solenoid to control the pressure in our prints allowed us to print multiple isolated "towers" allowing for a lot more complexity.

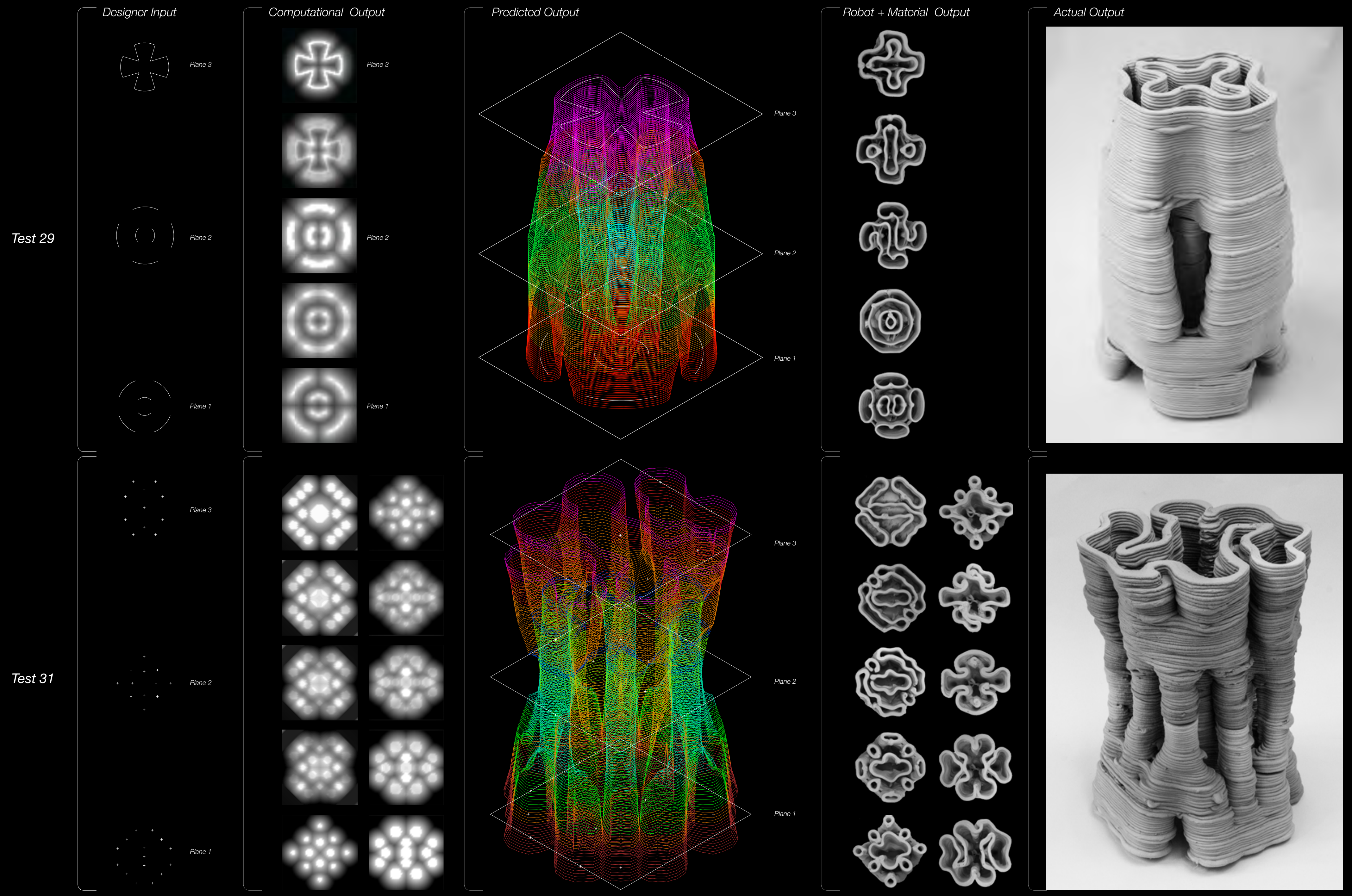
Emerging complexity
Internalization of seam points in contiguous curves creating more stable isolated islands that were further reinforced by intricate geometries. This allowed our prints to reach increasing heights and still maintain their integrity.

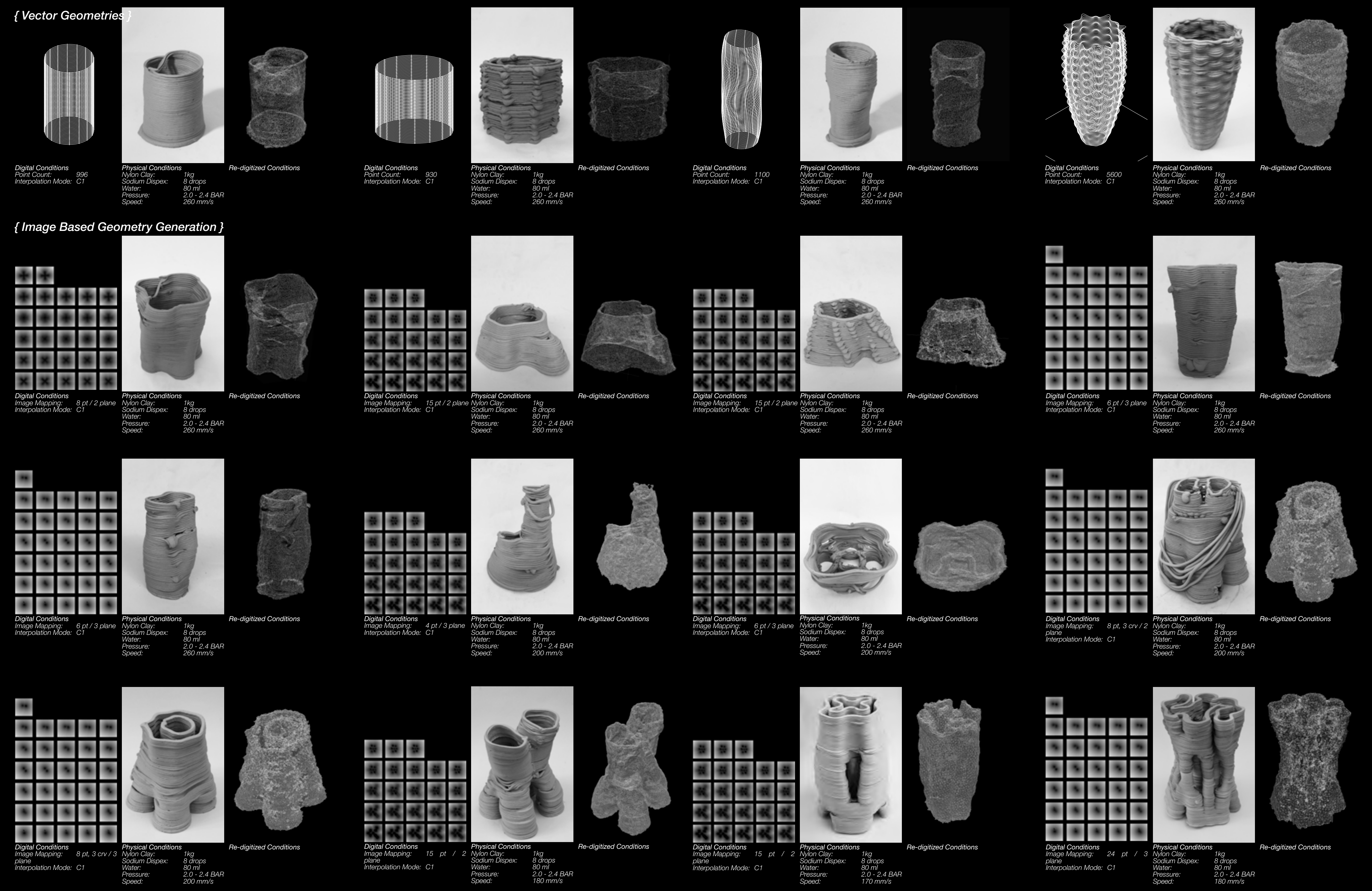




Structural weaving
A last portion of our exploration tested the capacity of structural weaving with the parametrically generated tool-path. If we had more time in the workshop we would have integrated this further with tallest prints we made.



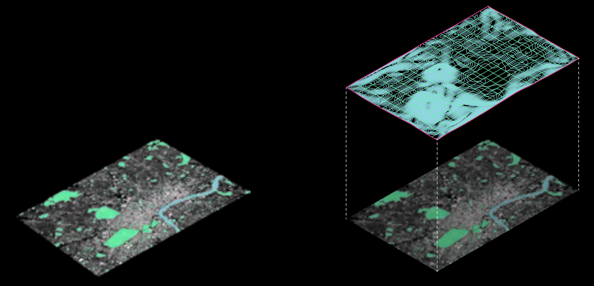

Designer Input
Computational Output
Predicted Output
Robot + Material Output
Actual Output
Test 29
Test 31
Plane 3
Plane 2
Plane 1


{ Vector Geometries }
{ Image Based Geometry Generation }
Digital Conditions
Physical Conditions
Re-digitized Conditions

Urban Analytics

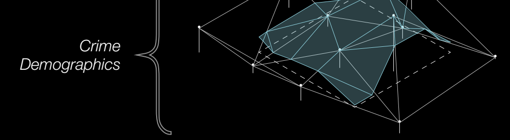
AA DRL Workshop 2. 01/2019 - 03/2019

Architecture and urbanism, specifically the latter, are increasingly relying on big data to make informed design decisions regarding site specific information. Data comes in many different mediums. In order to gather and analyze the maximum amount of data, we developed a method of compiling data sets and converting them to a standard coordinate based system. This includes NUMERIC DATA (Excel), GEOGRAPHIC DATA (SHP Files, Google Earth), and IMAGE BASED DATA (JPEG, PNG).

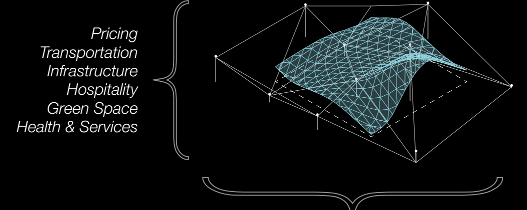


Due to the radically different resolutions of the data sets (ie. neighborhood crime data is low-res compared with noise pollution from railroads measured at 10m intervals is high-res), the quality of the data became a study of METHODS OF INTERPOLATION in order to build our topographic data landscapes.

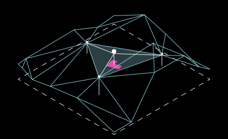
*Delauney Triangulation between data points to create a **RIGID** interpolation.*



*Laplacian Smoothing to subdivide mesh and **SOFTEN** data interpolation.*



Triangulation between data points to interpolate localized site values.



Site A
Area : 12,268m2 underused railroad yard & embankment.

Site B
Area : 3924m2 industrial storage.

Site C
Area : 27,518m2 parking & 6347m2 rooftop of Morrisons grocer.

Site D
Area : 12,061m2 coach parking & storage area.

Site G
Area : 5646m2 unused space along railway.

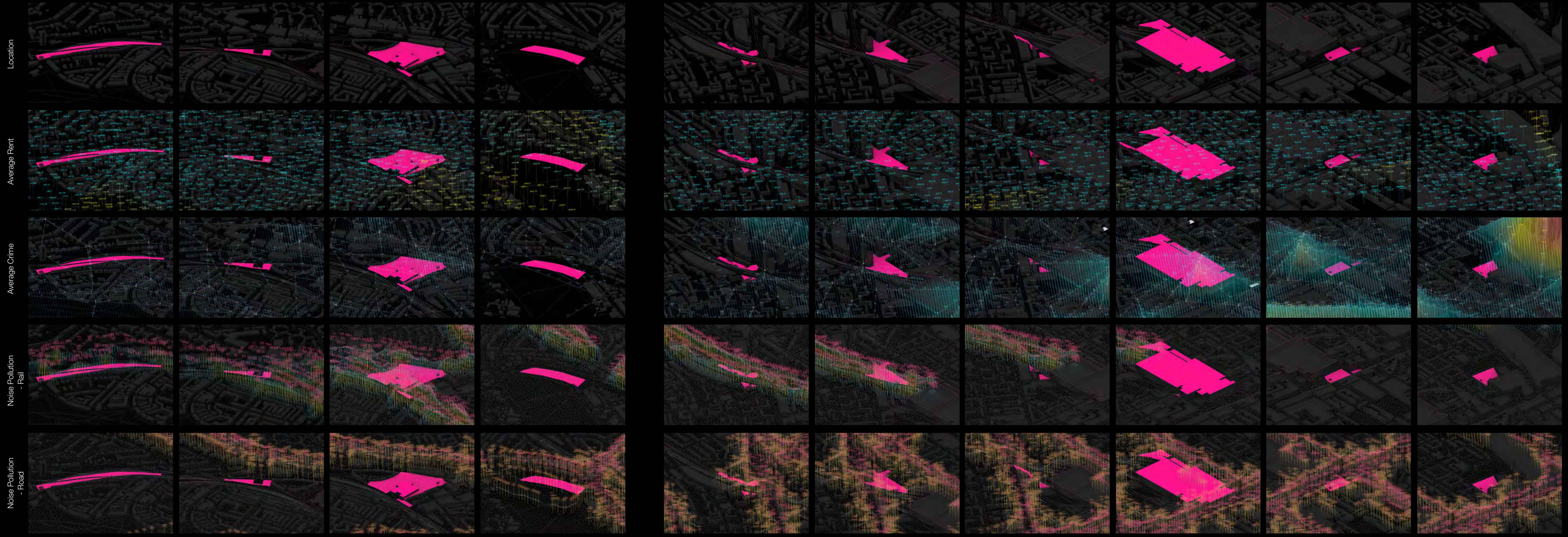
Site H
Area : 13,246m2 grass space & parking lot.

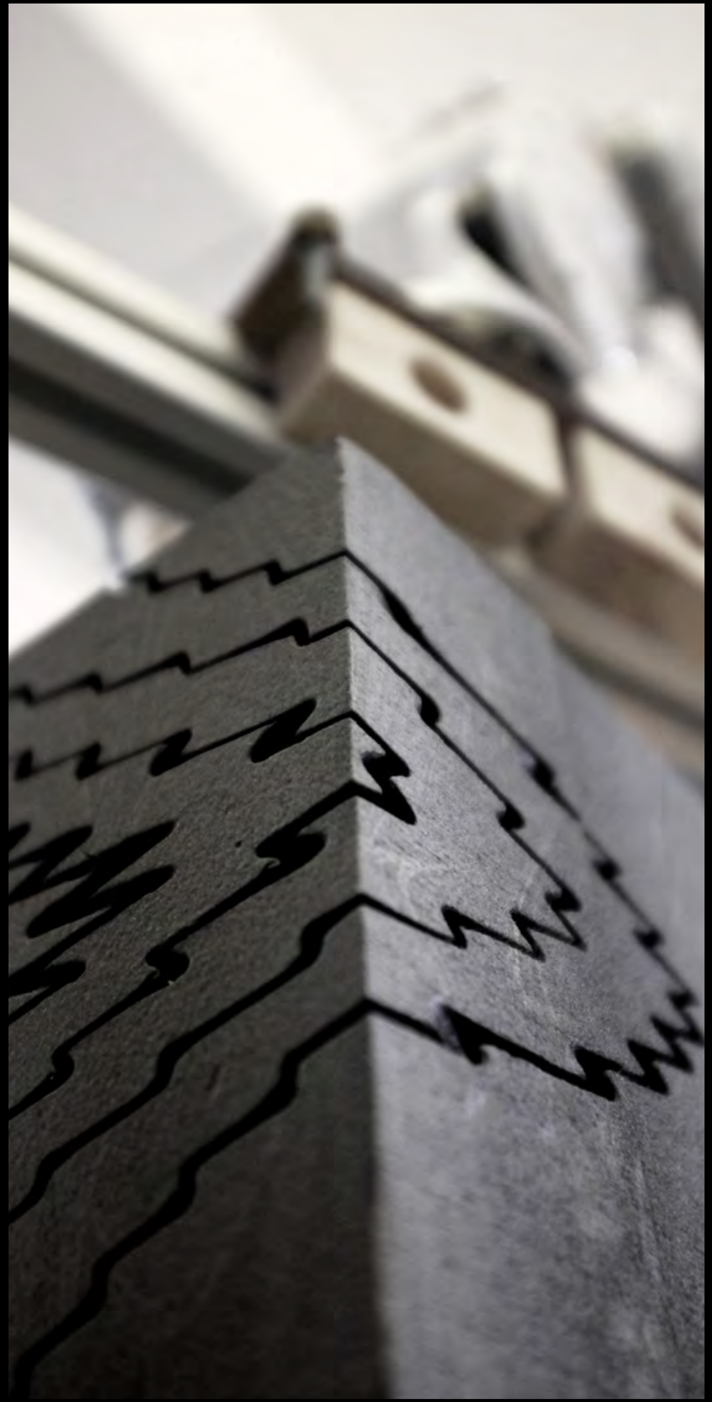
Site I
Area : 3274m2 storage lots.

Site J [Euston]
Area : 69,834m2 roof space.

Site K
Area : 6259m2 grass & parking lot.

Site L
Area : 7238m2 empty lot.

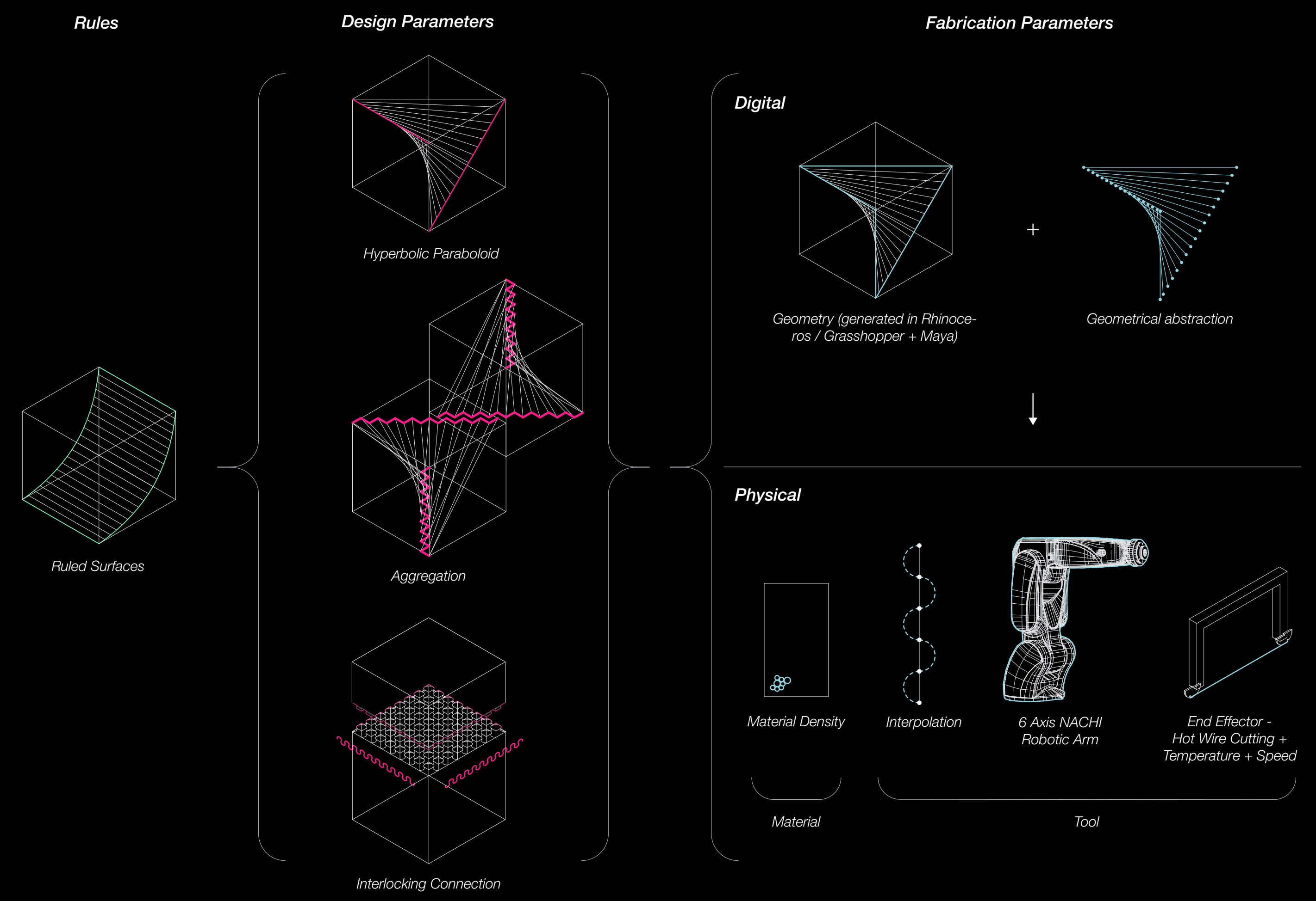




Geometry Studies

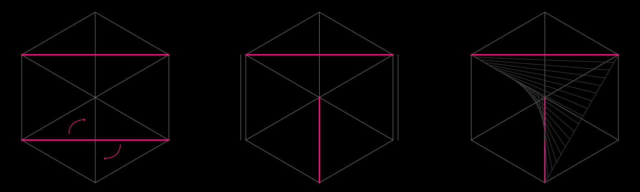
AA DRL Workshop 2. 01/2019 - 03/2019
Team: Aldo Sicilia (Colombia), Alfredo Chavez (Spain), Edward Meyers (Australia), and Andrew Friedenberg (USA)

This workshop was a case study on Hyperbolic Parabolas (HyPar), a mathematical surface which has a large history in architecture with architects such as Felix Candela, Santiago Calatrava, and Frei Otto to name a few. The aim of the study was also to understand the geometric limits of hot wire cutting expanded polystyrene (EPS) blocks using a Nachi MZ07 6 axis robotic arm. This came with many restrictions such as arm reach, wire width in comparison to material width, cut path collisions, and tool collisions. Once a developable geometry was found, iterations of cuts were executed testing different parameters. Additionally we studied the amount of cuts possible in a 20cm x 20cm voxel to understand design and material efficiency. This led to a series of geometries nested in an expandable cube which offered up to 6 different shapes from 6 cuts in a single block. The negative space between cuts became new geometries which were visualized through resin casting.



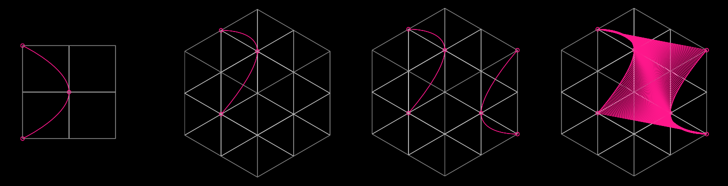
Hyperbolic Paraboloid Generation

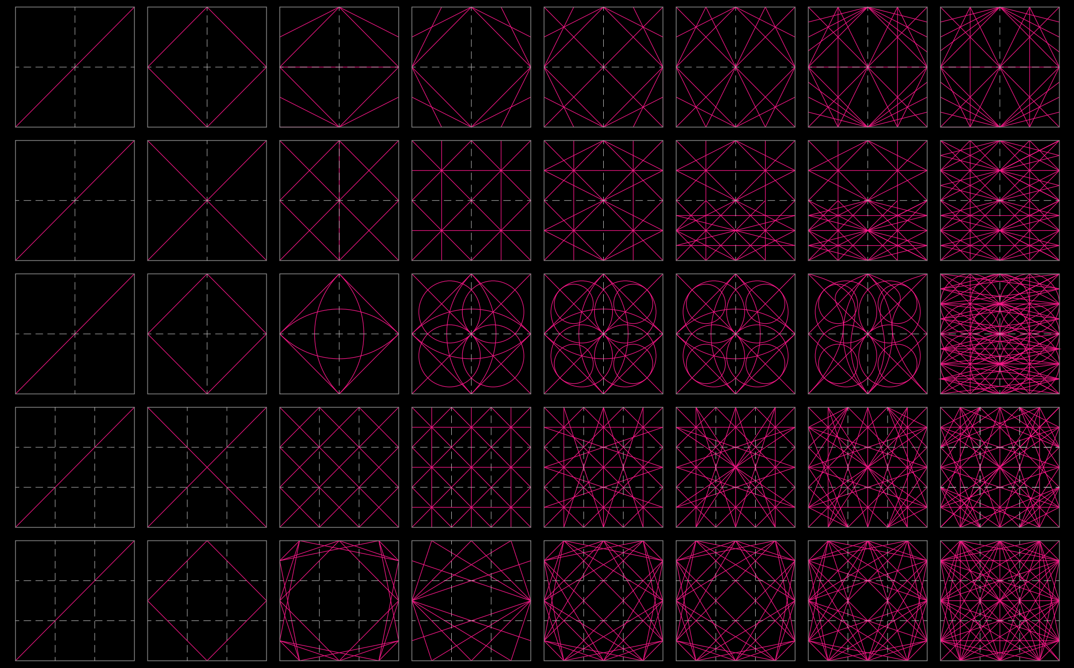
1. A complex ruled surface possible to generate with two cuts with a 6 axis robot.
2. When placed in a square voxel 4 differentiated connection points becomes apparent.

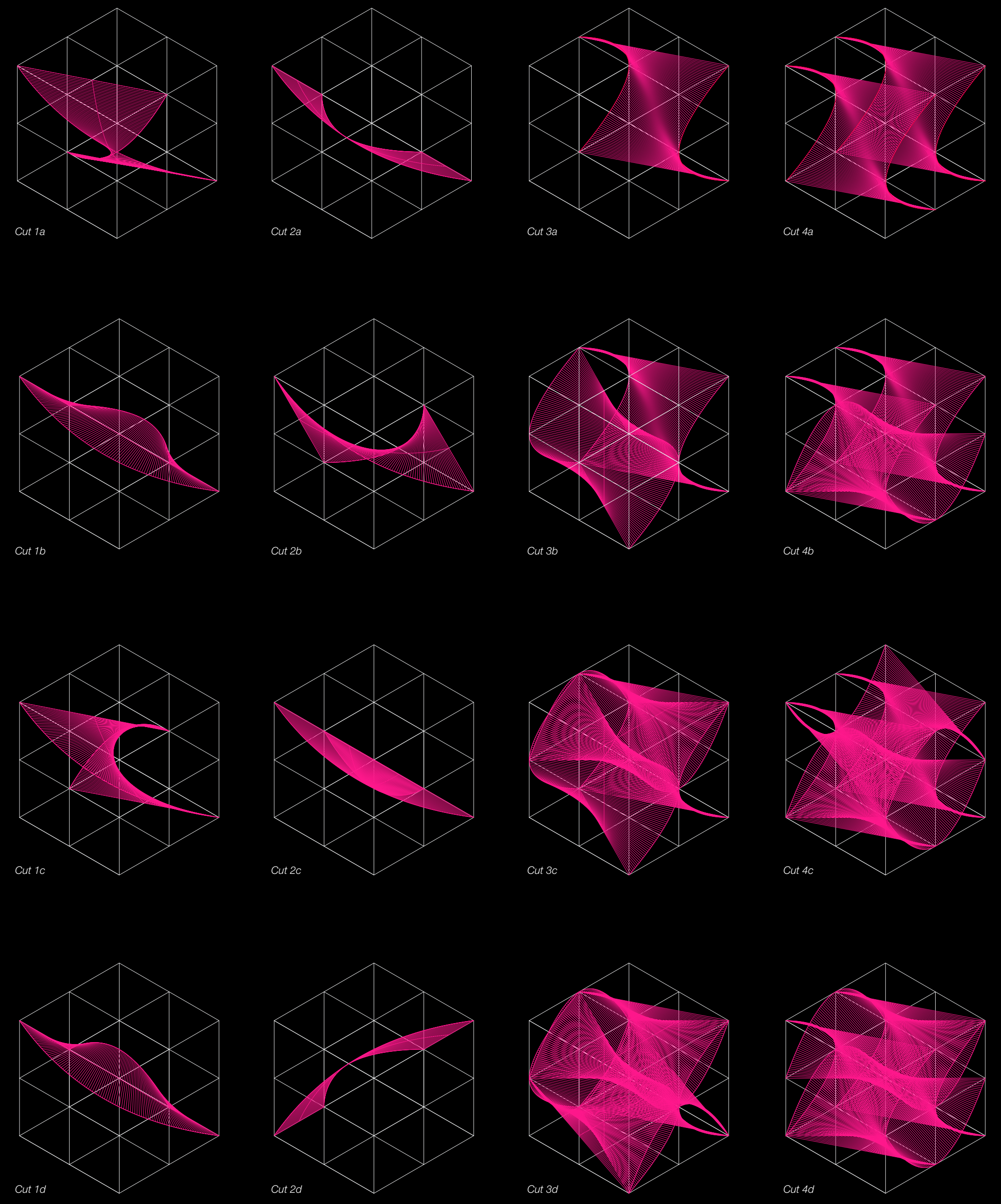


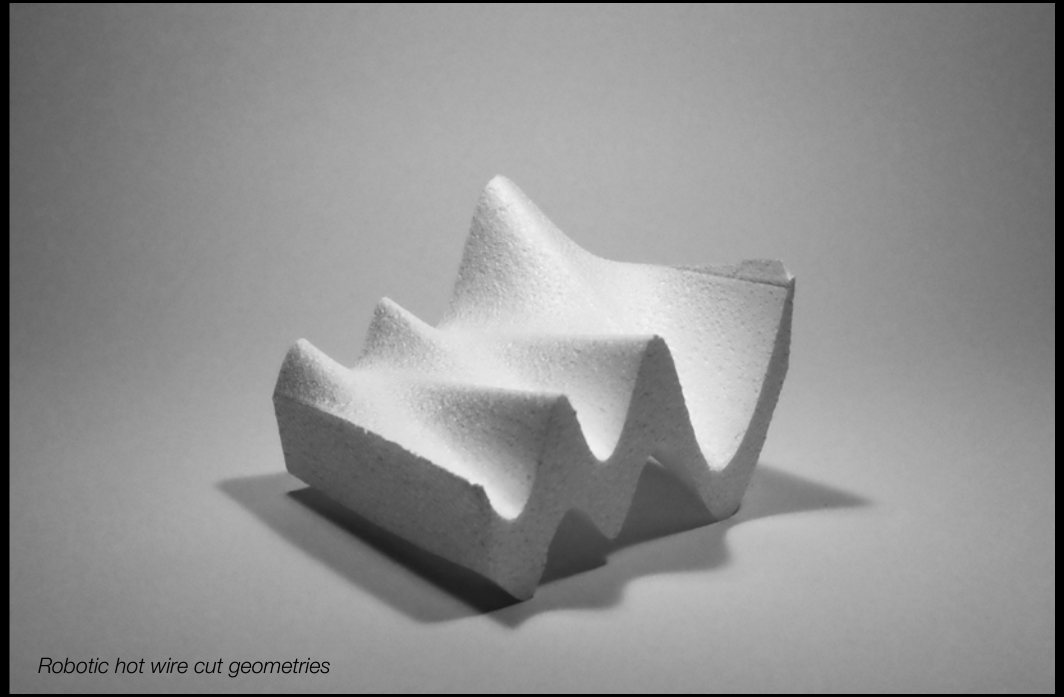
HyPar pattern creation within a voxel system

1. We used a generative design method mapping parabolic curves through various points.
2. These output ruled surfaces which when nested served as many of our geometric tests.

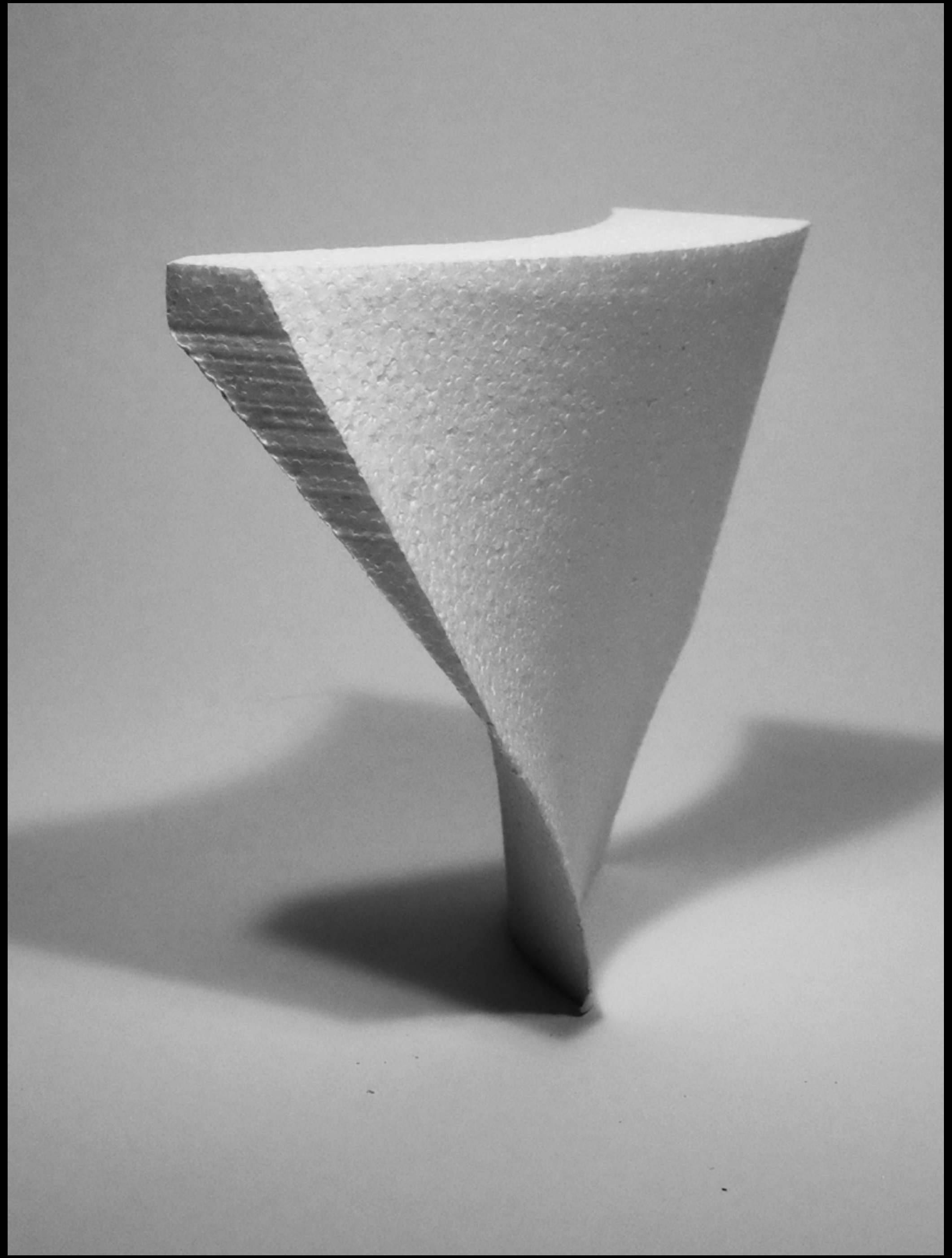








Robotic hot wire cut geometries



Formworks - understanding the geometric negatives

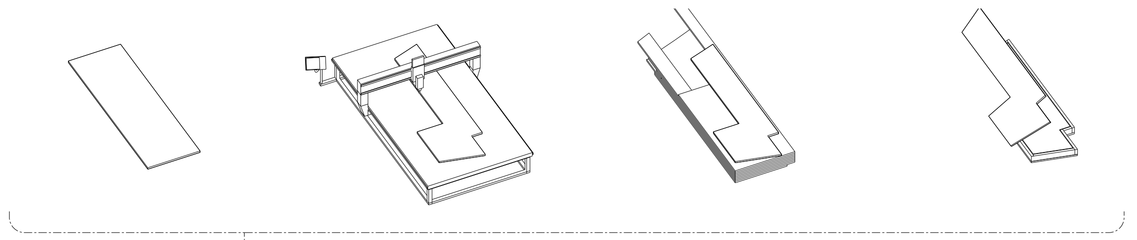
Resin cast

Ryterna Modul Competition // Summer 2020

This competition called for a vacation home/sauna for a middle class couple in rural Lithuania and focused on passive house principles using pre-fabricated SIP (structurally insulated panels) for an off-site fabrication process and lightweight construction. I saw this as a challenge to learn a new construction method and due to the projects small program, focus on the details such as interior design, fabrication, and also realistic visualizations.

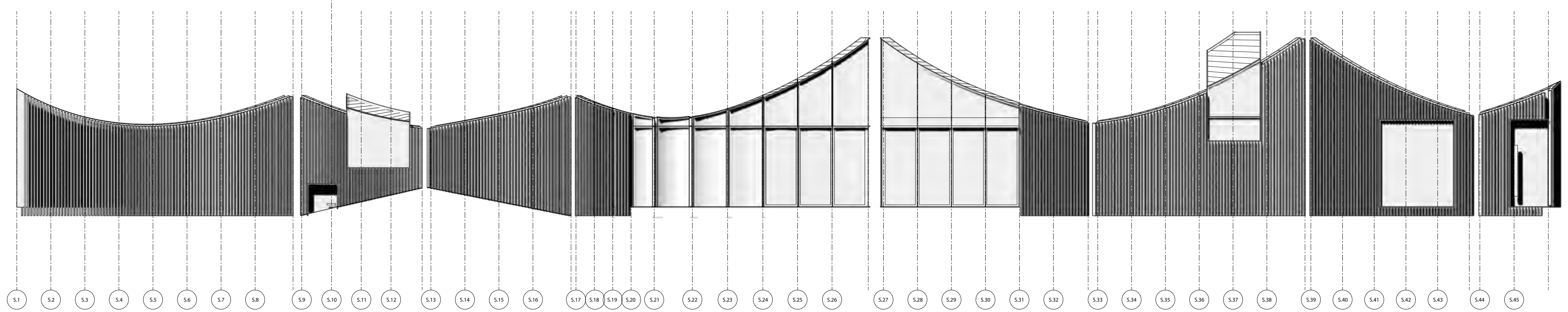
What I developed was a compact home with attached sauna suspended over the lake for proximity for post-sweat dives. Maximizing storage and built in elements were prioritized along with natural materials in order for the Pine House to feel as genuine as possible within its forested context. This project was created with Rhino/Grasshopper and visualized in Twinmotion with minor touch-ups in Photoshop.

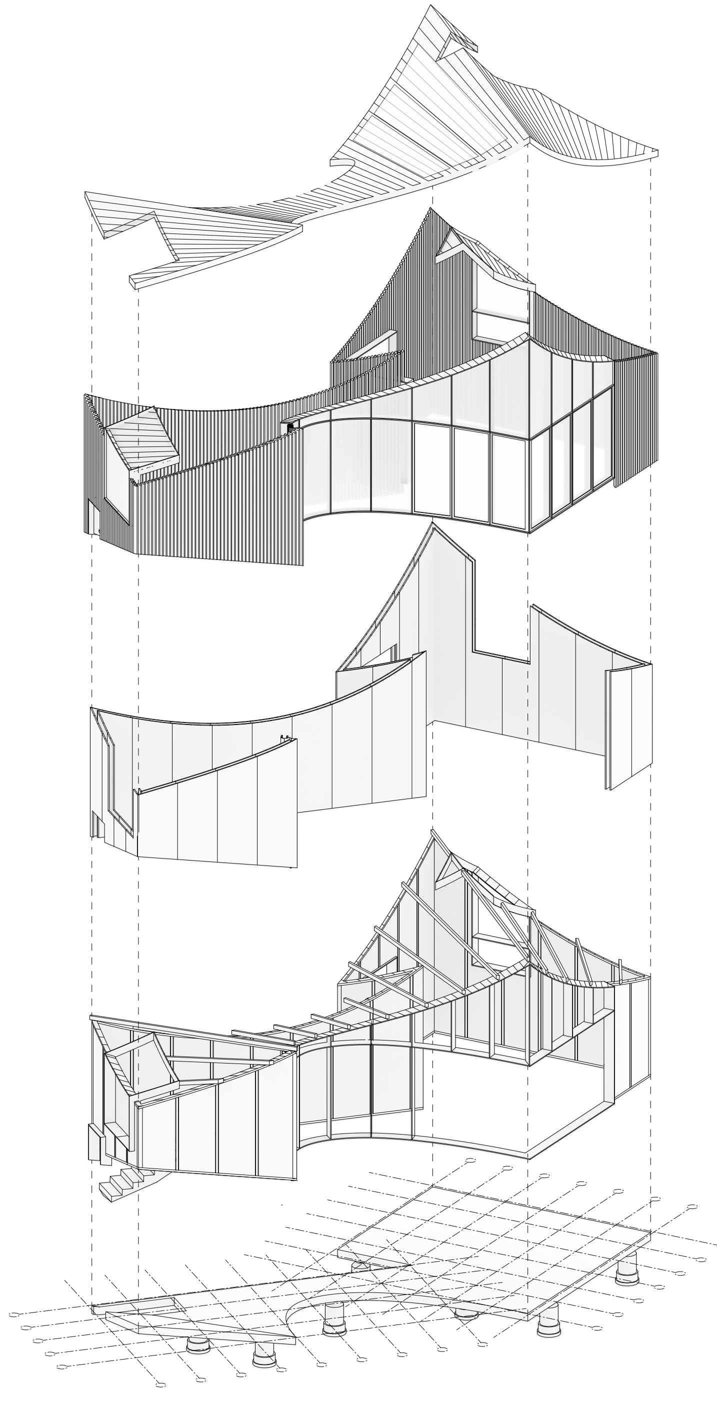
I am awaiting the results of the competition which will be announced the end of August.



Fabrication for pre-fab transportability - The construction of Steam House requires 46 unique SIP panels to be produced which will utilize CNC milling techniques to ensure accurate panel dimensions. The plywood, joist, and insulation packages are assembled off-site to ensure a lightweight and efficient construction that in non disruptive to the environment.

As seen above, the interiors expose the plywood SIP skin and the exterior is treated dark wood lamellas.





Structural Isometric and SIP chunk model.

Roof / Solar Array - controlled as a ruled surface, the roof (6.a) is a peak like structure that sheds water/snow and holds the South facing photo-voltaic (solar) array.

Facade - constructed of blackened timber slats (5.a), this vernacular and low cost facade surrounds the house and situates it contextually into the Lithuanian forest.

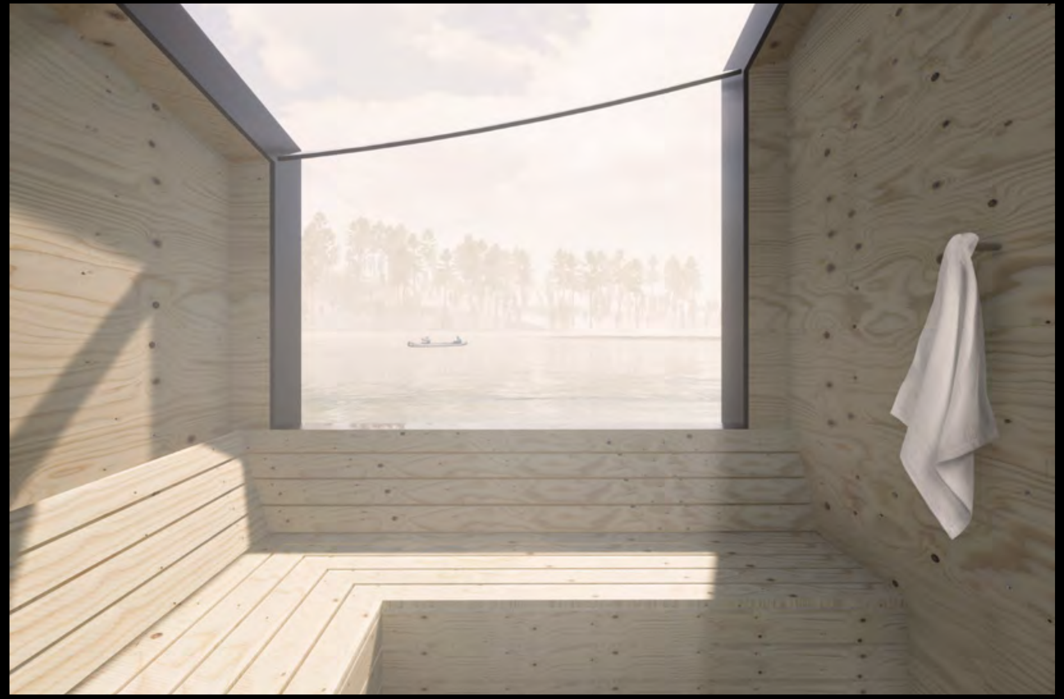
Apertures - pre-fabricated triple-paned windows and doors allow for insulation in the winter and are operable to open up in the summer months.

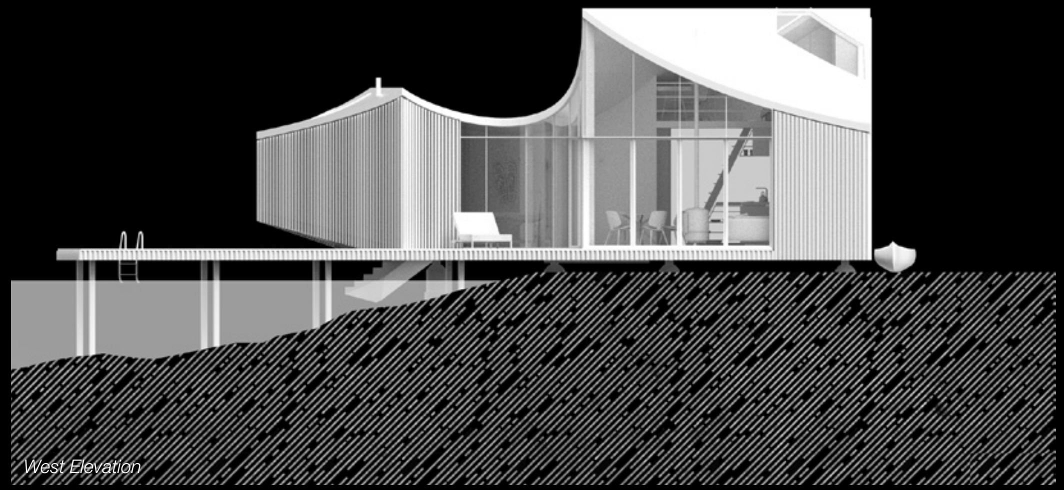
SIP construction (exterior) - Plywood sheets (3.a) cover the pre-fabricated panels serving as both the interior covering and the barrier to the outside.

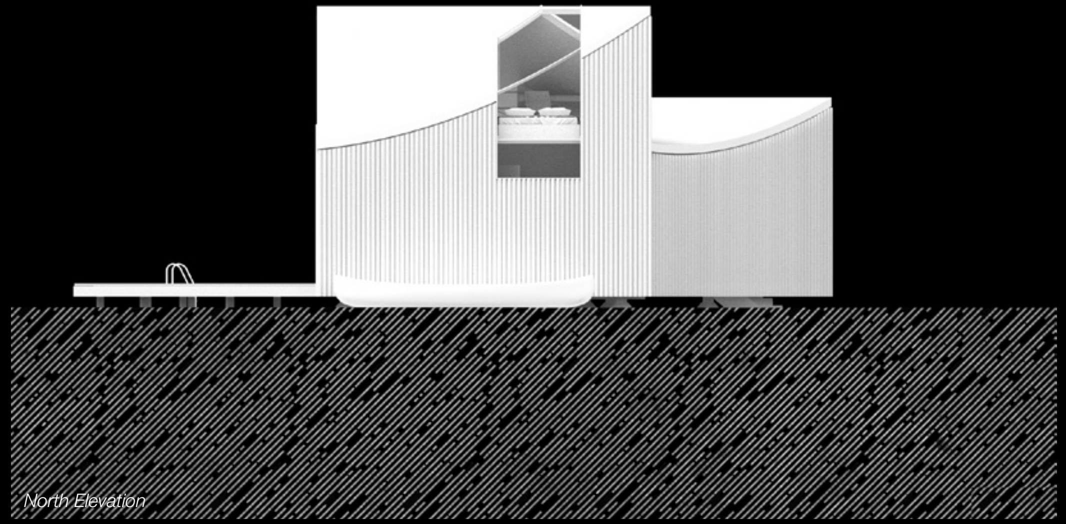
SIP construction (interior) - wood joists and beams (2.a)package the insulation (2.b) allowing for a modular assembly of the structure on the concrete slab.

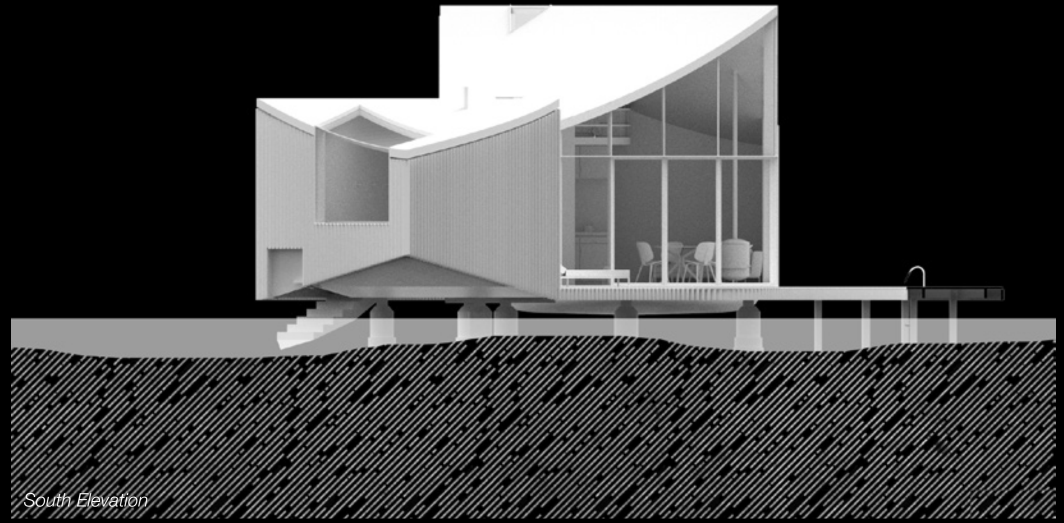
Concrete slab - designed to have a minimal footprint on the site, the slab (1.a) is elevated on a foundation (1.b) allowing the forest to pass underneath the house. This could also be substituted for a steel structure.

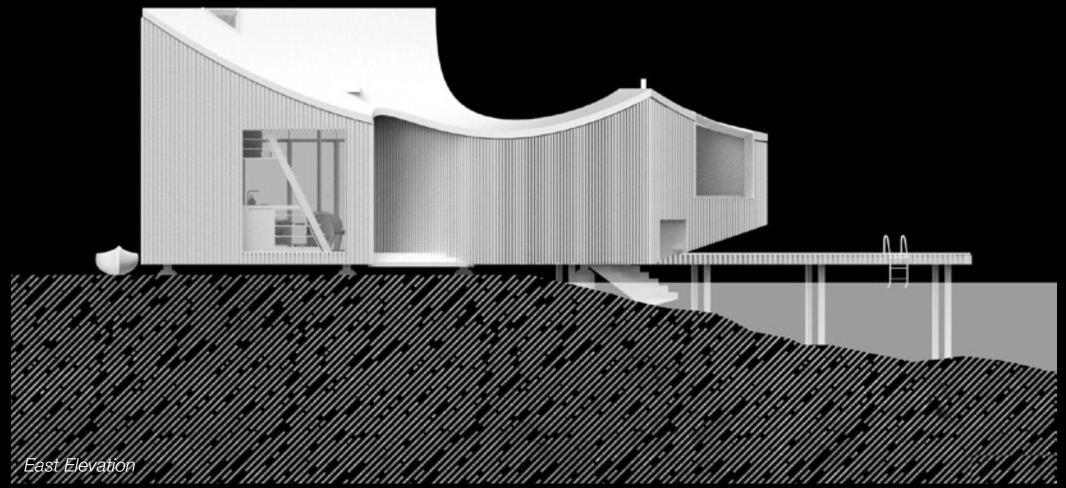
1.a - Concrete slab
1.b - Foundation
2.a - Wooden joists
2.b - Insulation
3.a - Plywood interior / exterior sheets
5.a - Facade wood slats
6.a - Roof



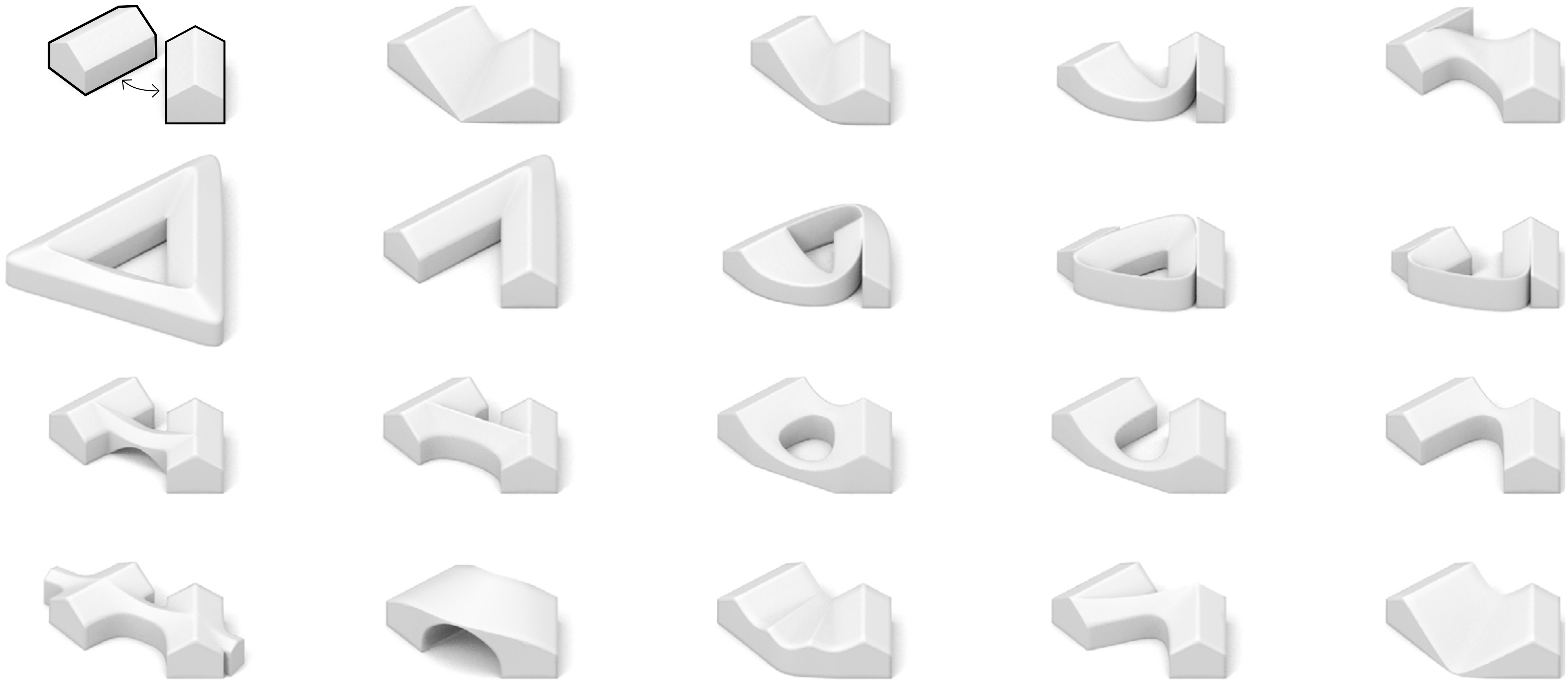

West Elevation

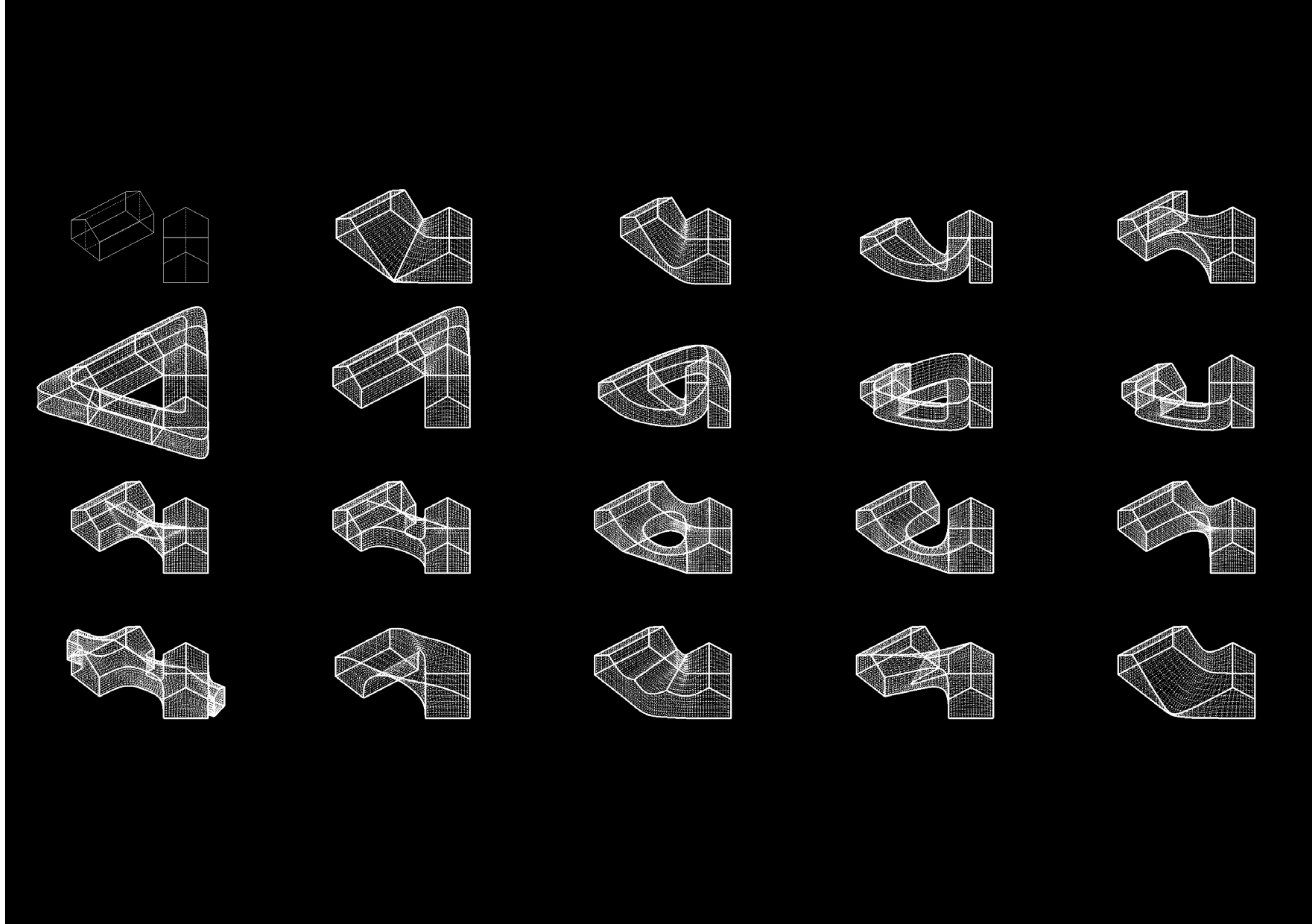

North Elevation


South Elevation


East Elevation

How to connect two houses.



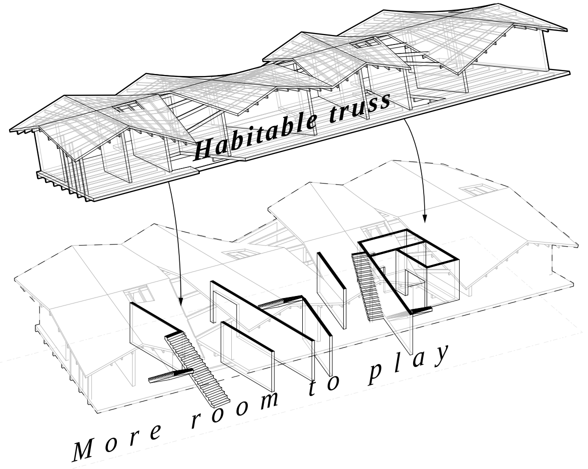


Case Study House 2021

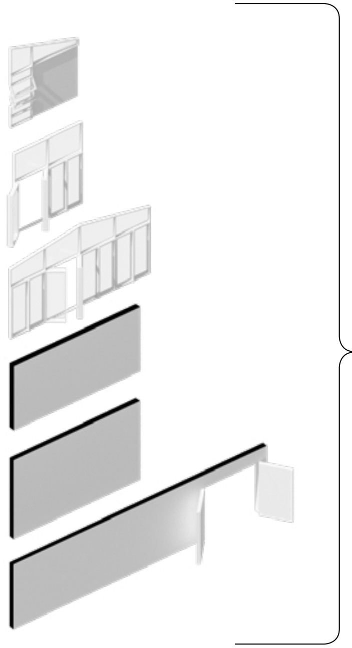
LOW-RISE: Housing Ideas for Los Angeles (FOURPLEX)

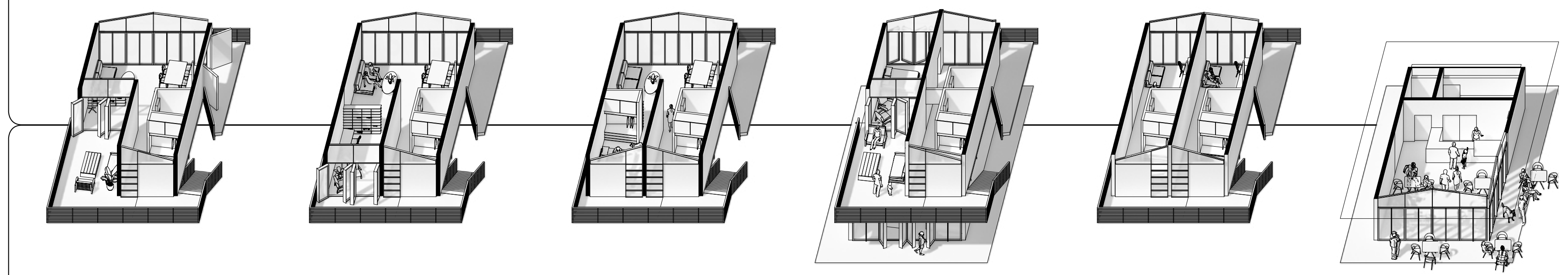
Los Angeles has a long history as an auto-centric metropolis, a fact that is no more apparent than in its housing and neighborhoods. This is a detriment to the health of the community. Los Angelenos need a new sustainable building prototype which both provides additional housing and creates resilient communities. Case Study House 2021 unites California's legacy of experimental architecture with this need for a new multi-unit housing typology, reconciling light and quality space with sustainability and density. Case Study House 2021 consists of a kit-of parts (structural mass timber) giving the project the flexibility to grow and adapt to the changing needs of its residents and surrounding community. This flexible design has its DNA rooted in Los Angeles's architectural vernacular, taking inspiration from Frank Lloyd Wright's Usonian pragmatism and incorporation of the environment, John Eichler's affordable and communal strategy, and the Eames' vision of versatility and openness.

Living sustainability (affordability and flexibility) - Providing high-quality affordable homes, increasing access to home-ownership, and flexible structures that can meet residents' changing needs to facilitate growth within the community and aging in place. This will be achieved by sharing amenities reduce the units' square footage and price and also creating a built-in unit expansion where each unit's outdoor patio serves as a pre-made framework for expansion, allowing the residents to have an affordable way to expand their houses to accommodate familial growth or spatial needs.

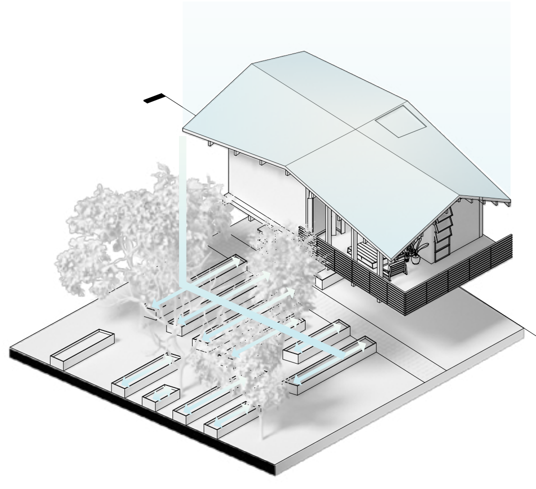


Unit Flexibility - simple reconfigurations allows architectural adjustments to residents life changes. Cross Laminated Timber (CLT) and glued laminated timber (glulam) are used to create a sustainable and lightweight structure that allows for versatile homes that can be continually rearranged in a non-destructive and non-wasteful way (i.e. a CLT panel can be moved or added to enclose another space when a family wants to expand out into its patio space).

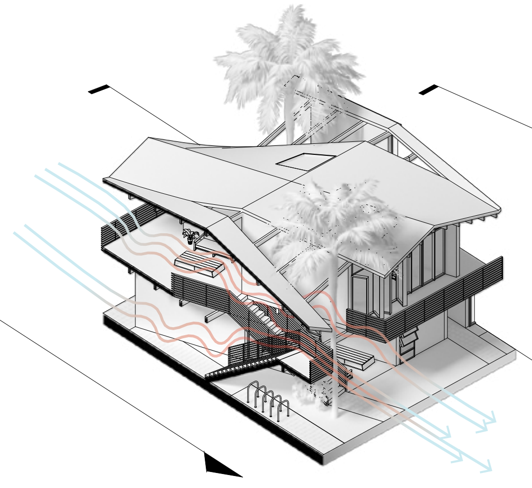




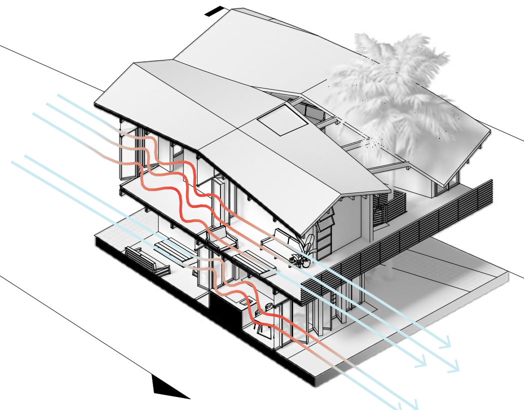
Kit of parts | *Single bedroom (500ft²)* | *Single bedroom w/ office (625ft²)* | *Double bedroom (625ft²)* | *Triple bedroom (1000ft²)* | *Double studio (625ft²)* | *Retail / commercial space (625ft²)*



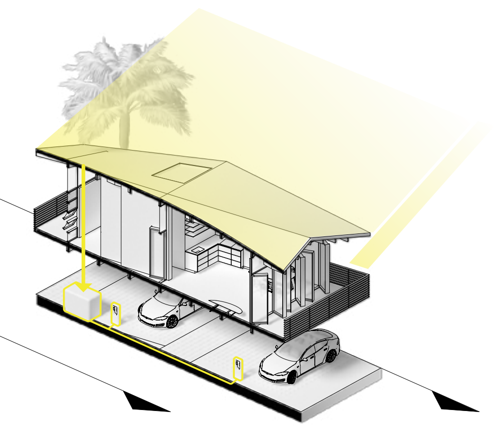
Captures rainfall for greywater storage and use in toilets and gardens.



The outdoor breezeways channel wind for passive cooling.

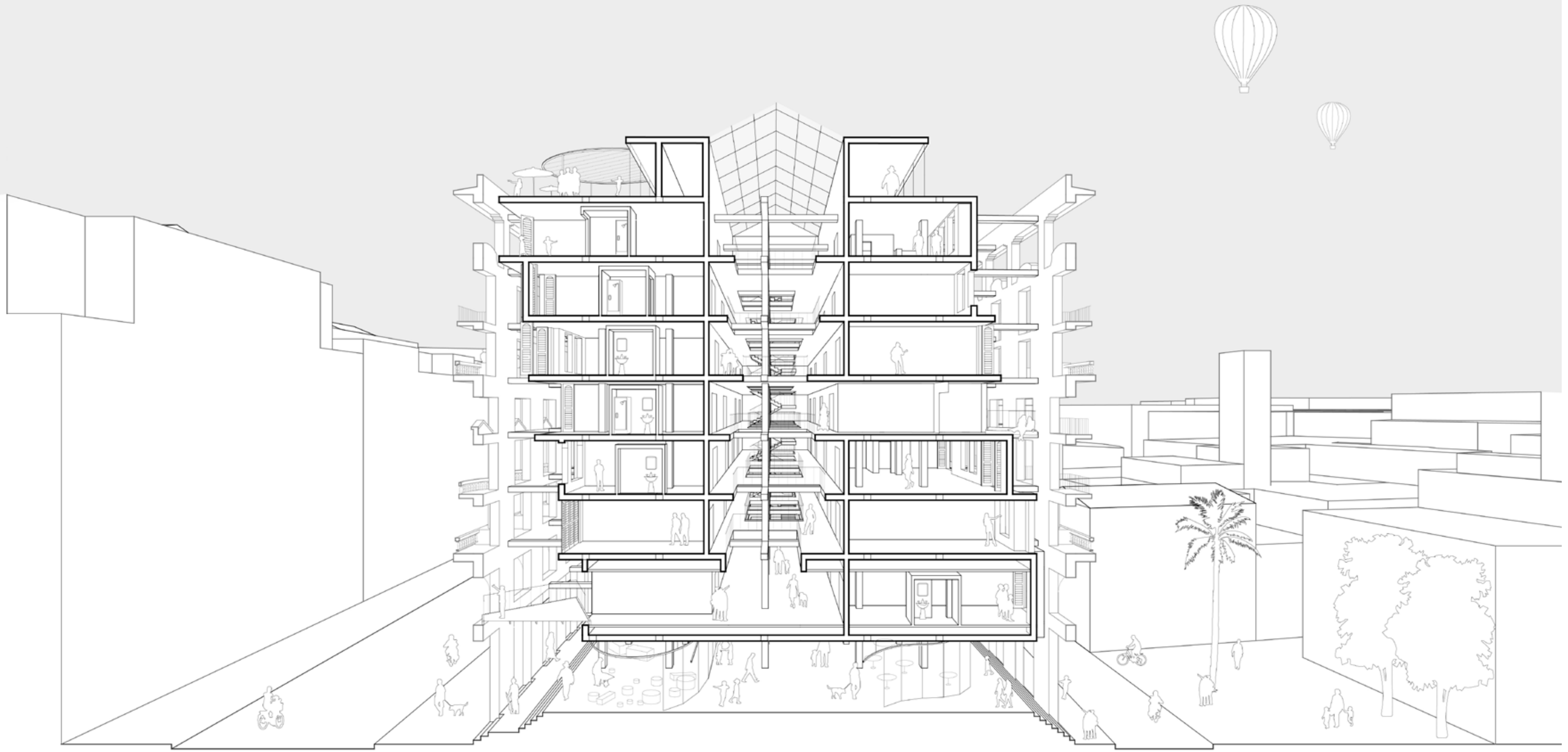


Inside, operable windows and doors allow for clear airflow through the spaces.



As well as providing shading, the roof is also composed of solar tiles (PV) which captures and stores the energy on site. Also for use with the EV chargers.

Obliquo

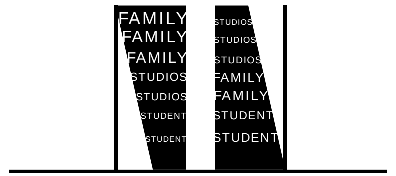


Architectural Competition // Winter 2017
Team: Sergio Salas & Andrew Friedenberg
The brief called for a transformation of an existing 20th century office building to new social housing project in the center of historical Barcelona.

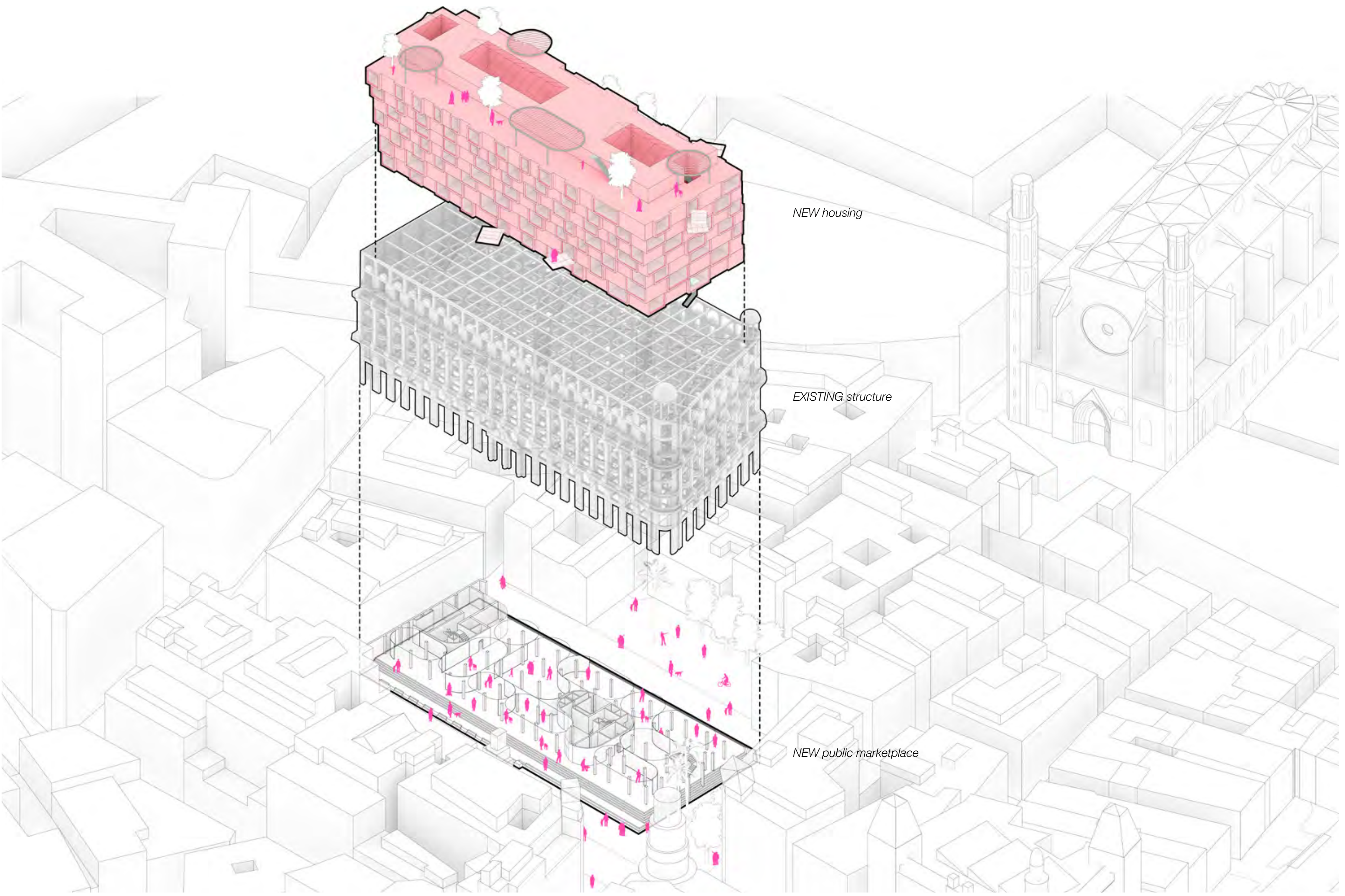
The existing building has a typical workplace layout with perimeter offices and a large central service core.

For a conversion to residential units, a much smaller core is necessary allowing a void to be made between the existing facade and the homes.

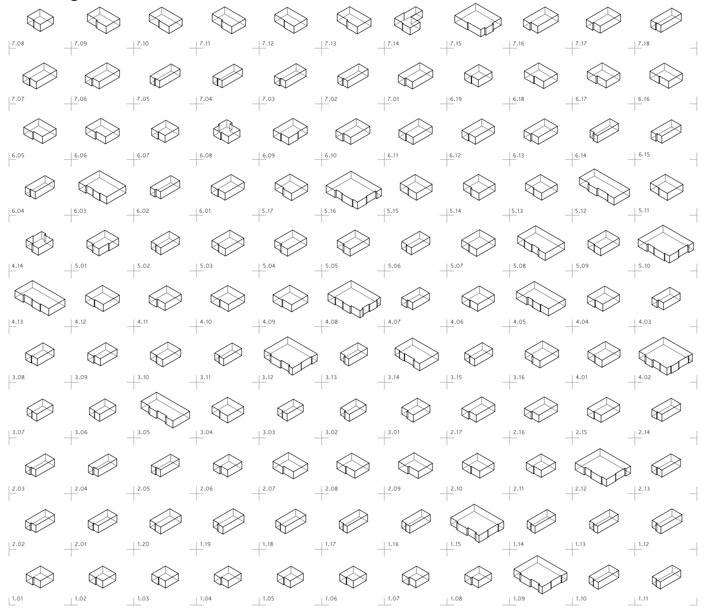
Shifting the stacked units creates ideal dimensions for the variety of inhabitants (small to large families, studios, and students) while forming 2 unique frontages to the building: a setback from the street to create an enhanced public space and a terraced facade facing the plaza to the North.



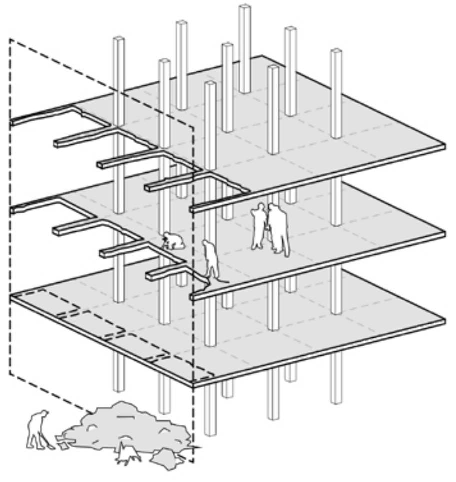
On ground level, closed individual commercial spaces are substituted for a permeable market space uniting the urban fabric.



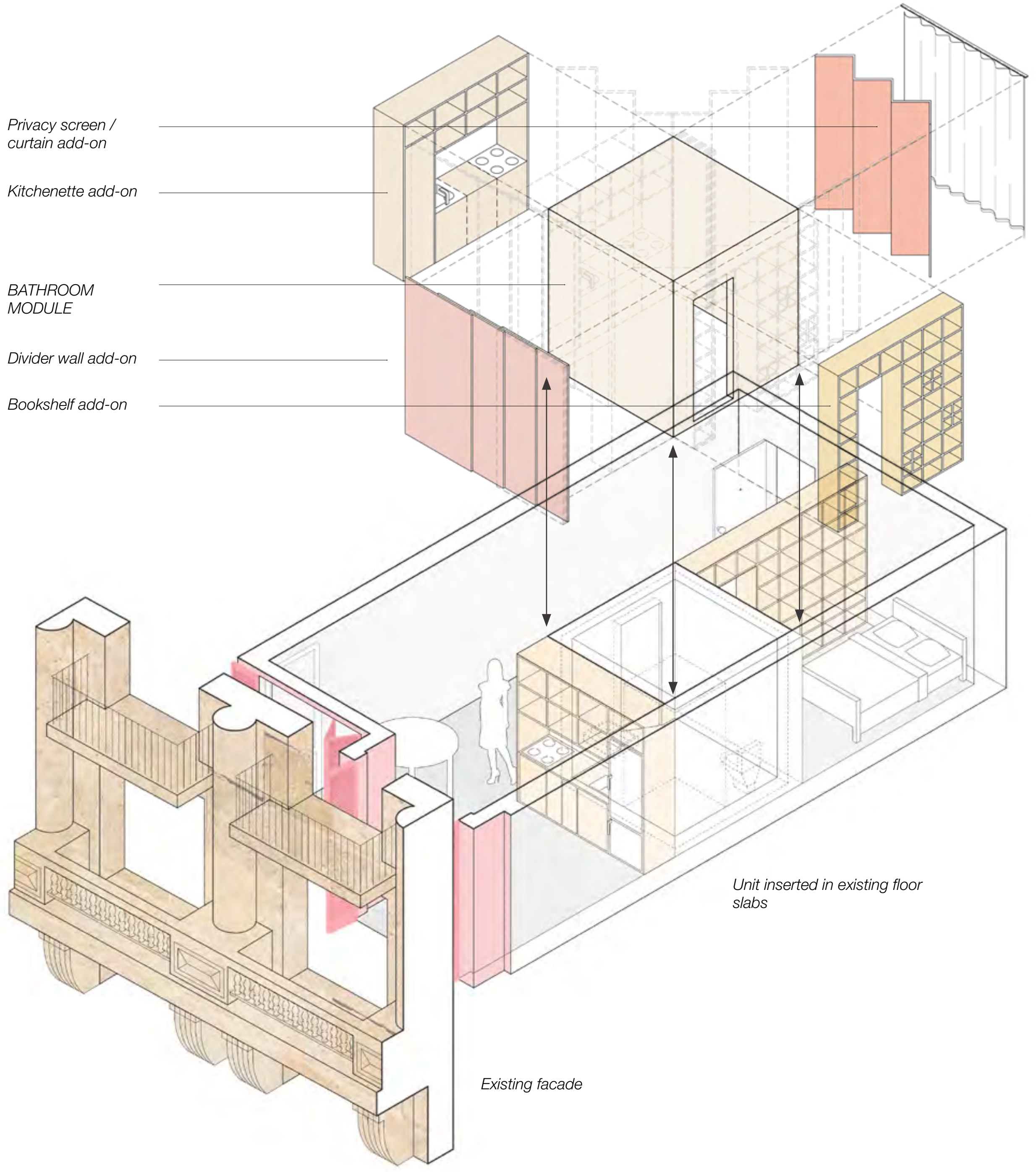
As seen below are the 160 unique units of varying scales for a diverse set of residents, from student accommodations to multi-generational family housing.



Preserving the facade and adapting the current structure to house OBLIQUO means removing non-essential areas of the existing floor plates to disseminate sunlight to the setback units while simultaneously creating a unique space and identity for the residents.



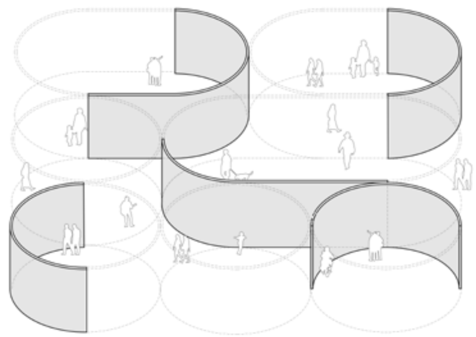
To the right is an exploded single unit showing the services module which can be reconfigured and personalized like a Swiss army knife to meet the needs of any user (i.e. sliding dividers for student dormitories).



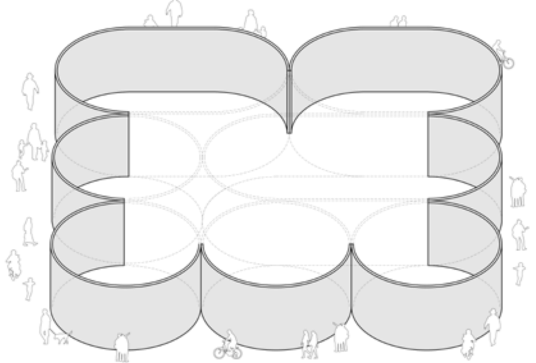
In a city of patterns and preplanned urbanism, our ground floor 'mercado' (as seen on the left) inspires images of the rationalized urban fabric surrounding it while allowing for a completely fluid space, defined by the occupants rather than the walls.

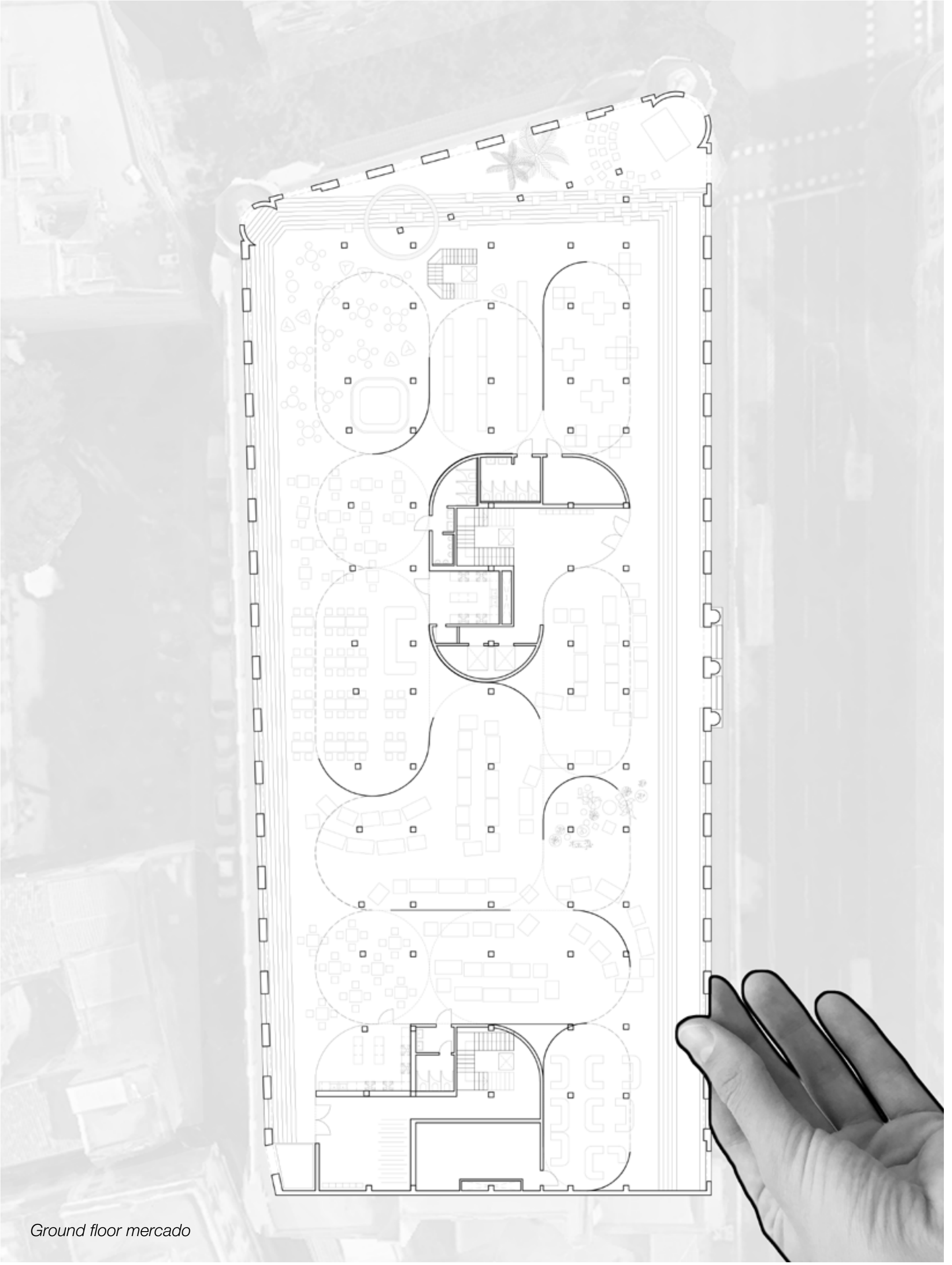
The public market place acts as a filter between the plaza and the street, creating a new porous public environment where an authoritarian obstacle once stood.

During the daytime the market fragments into a perpetual open public space made of reconfigurable metal screens...

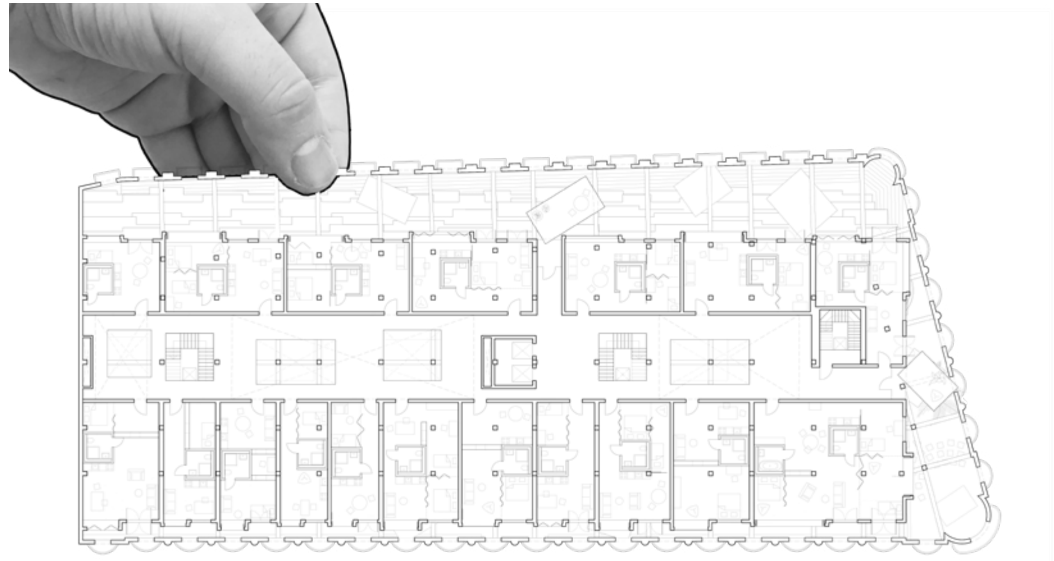


...and during the nighttime it retracts into a sealed zone protecting the merchandise from drunk tourists.

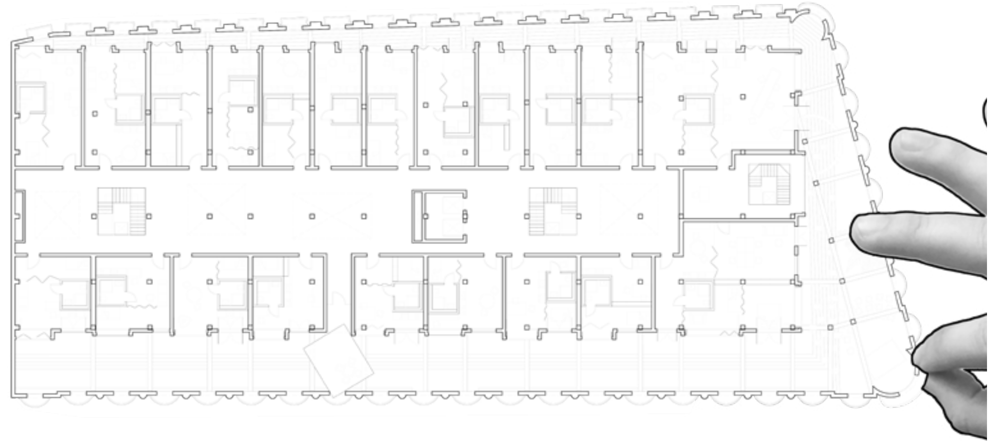




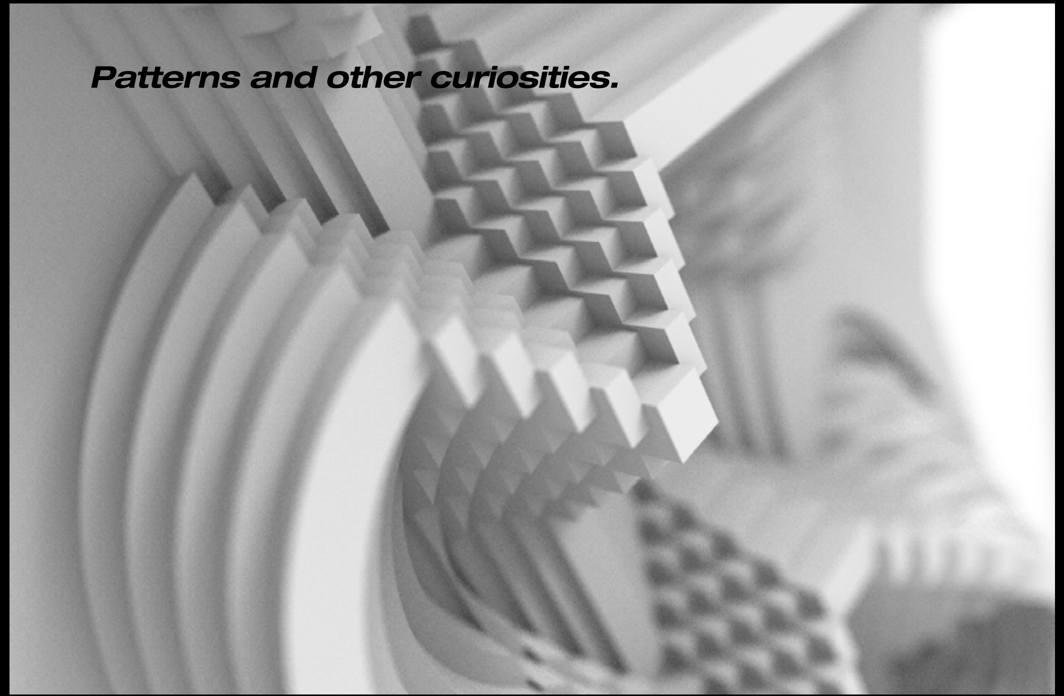
Ground floor mercado

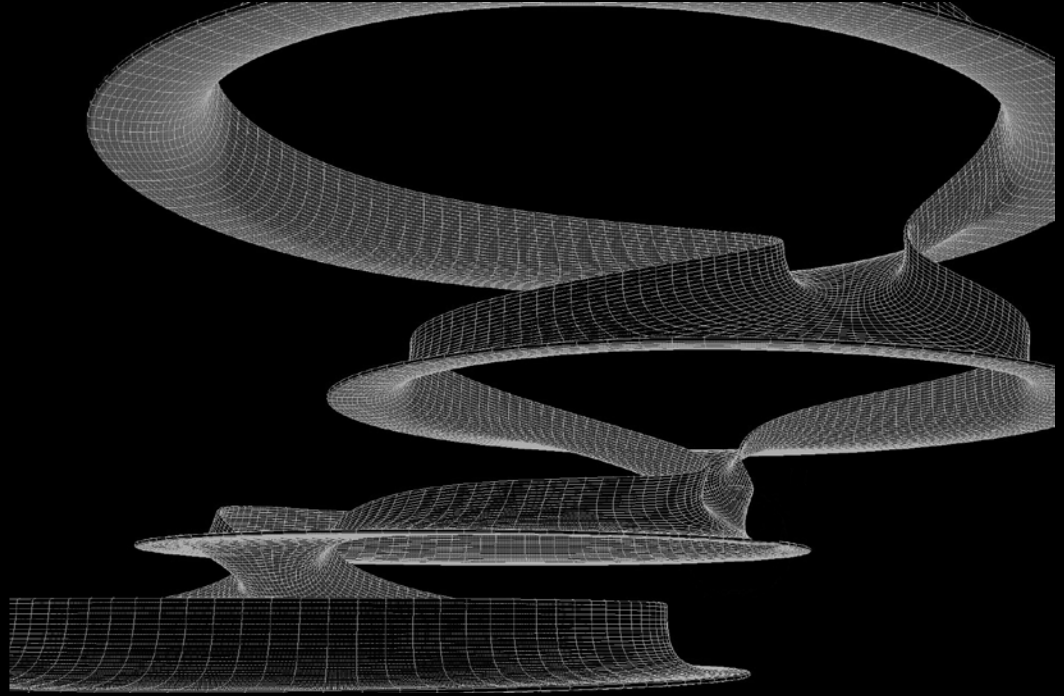


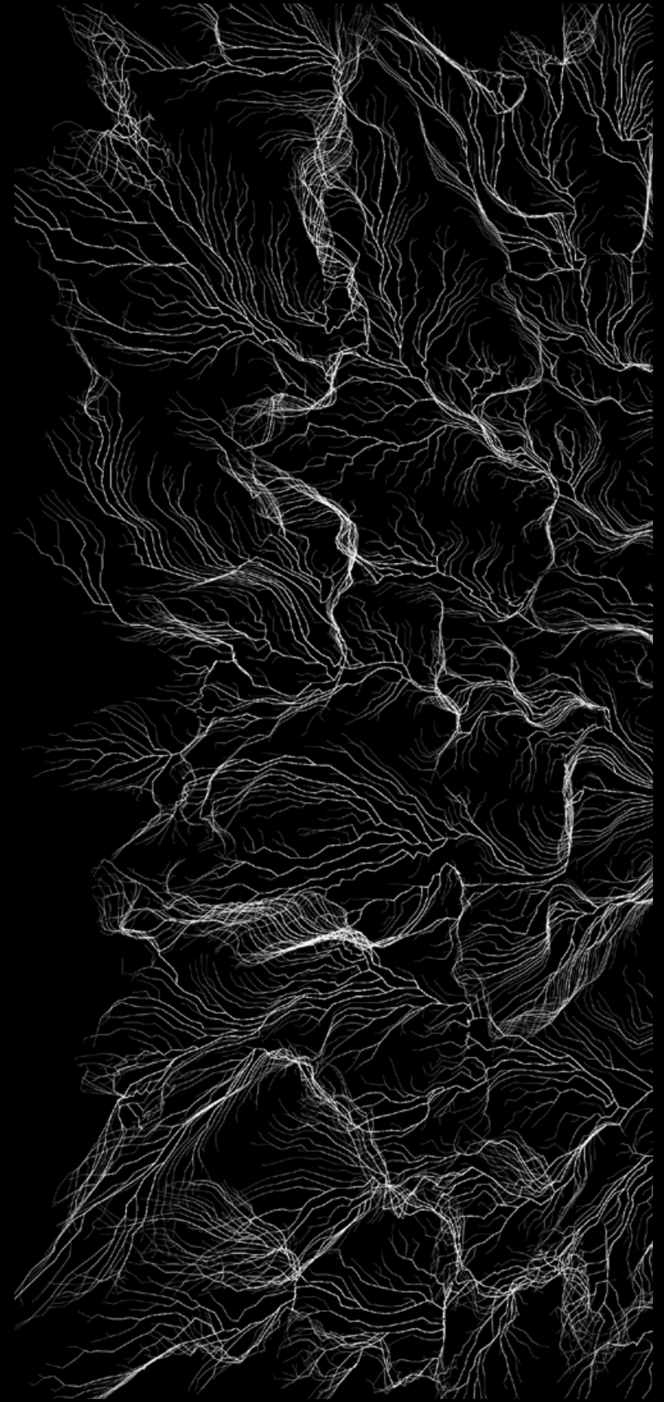
Eighth floor housing

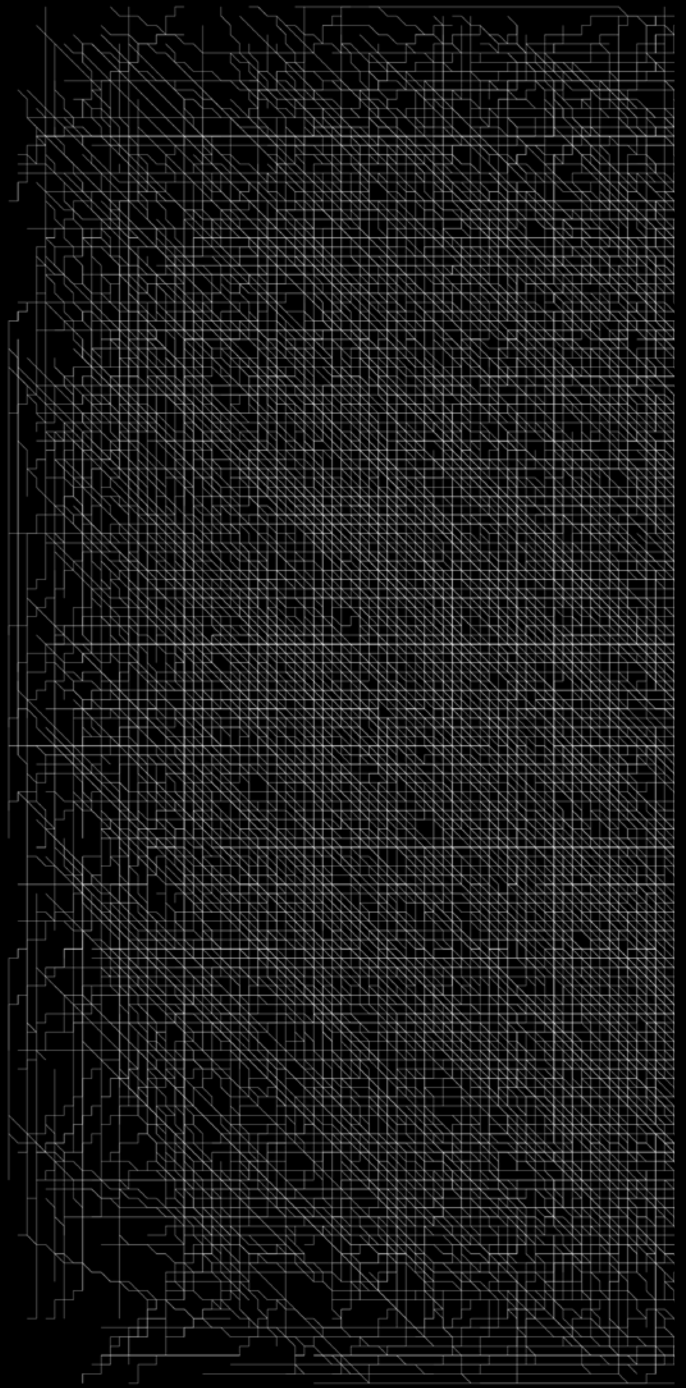


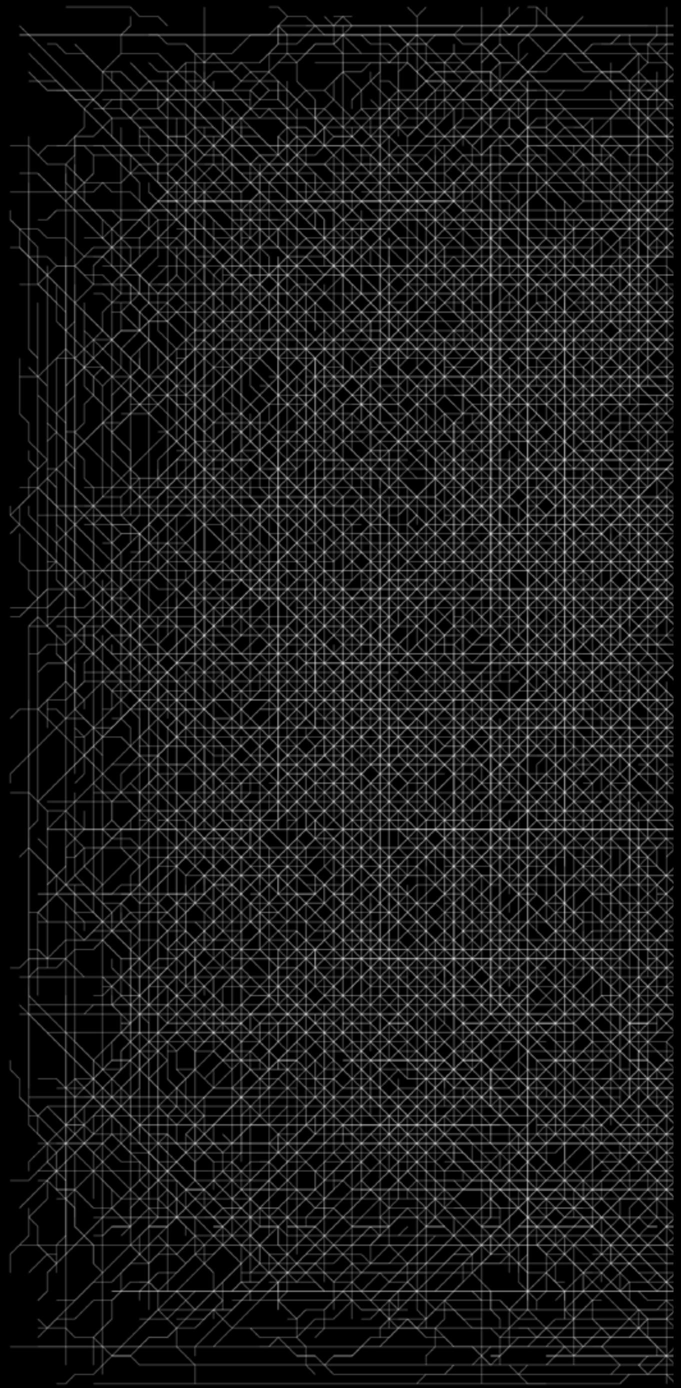
Second floor housing


Patterns and other curiosities.










Other curiosities...