

Ephemeral

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Abstract

Ephemeral

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Chair of the Supervisory Committee:

Associate Professor Rob Peña

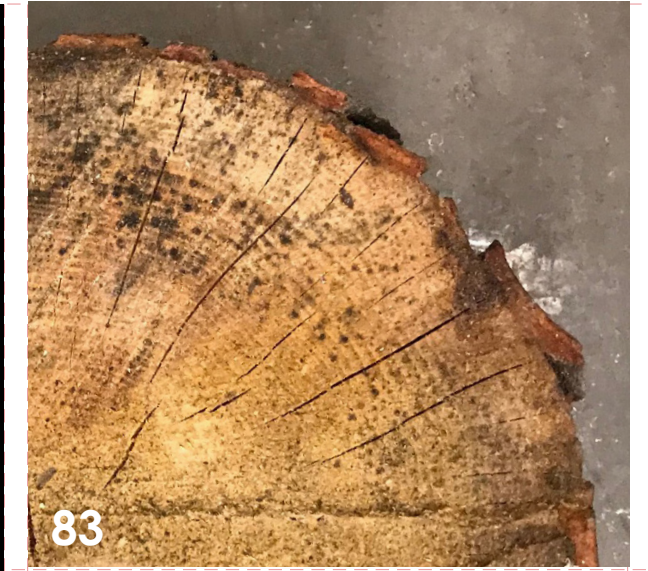
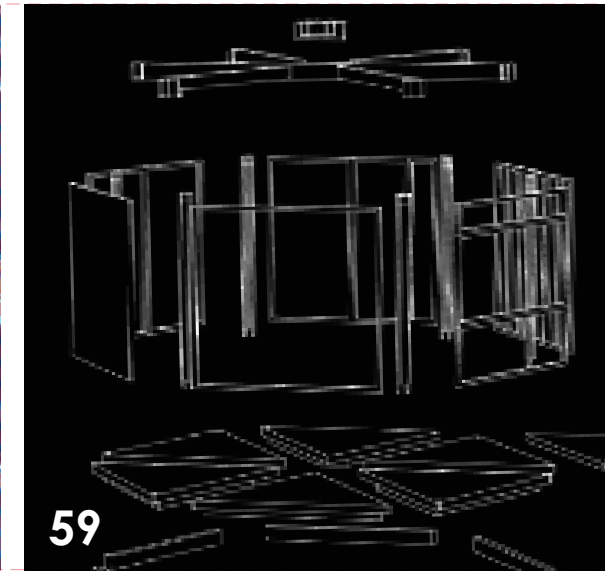
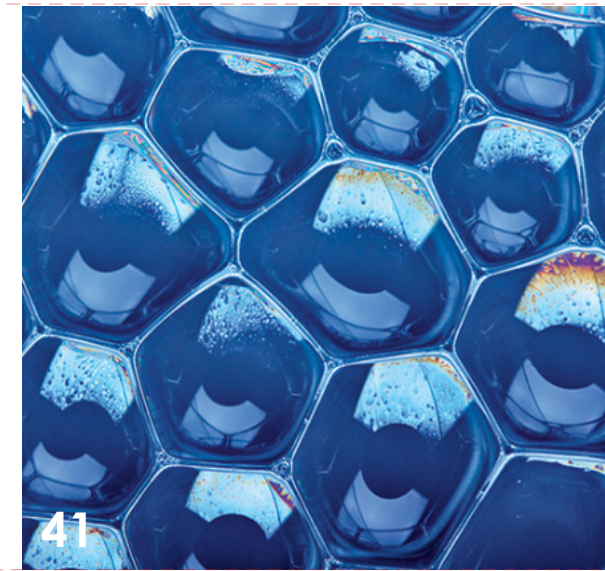
Department of Architecture

Have you ever noticed that in most cities there are empty building lots, vacant land and underutilized sites everywhere? Empty lots are not only a wasted resource, they can be an attractive nuisance for a neighborhood, even if they have a future purpose and are just temporarily vacant. Making productive use of under-utilized land in our cities is an opportunity to address several issues at once by converting unproductive land into a neighborhood resource that provides sustainable and affordable housing. These interventions might be small and temporary or might be the building blocks for larger, more permanent settlements. I call this approach “Ephemeral Architecture.” Ephemeral architecture reclaims under-utilized land and puts them into productive use without diminishing their long-term possibilities for future development.

LEFT Formosa map (fig. 1)
 RIGHT Vacant land in Formosa (fig. 2)
 OPPOSITE, LEFT UW E-Lot (fig. 3)
 OPPOSITE, MIDDLE Capitol Hill Station (fig. 4)
 OPPOSITE, RIGHT @ NE 45th St. & 7th Ave NE (fig. 5)

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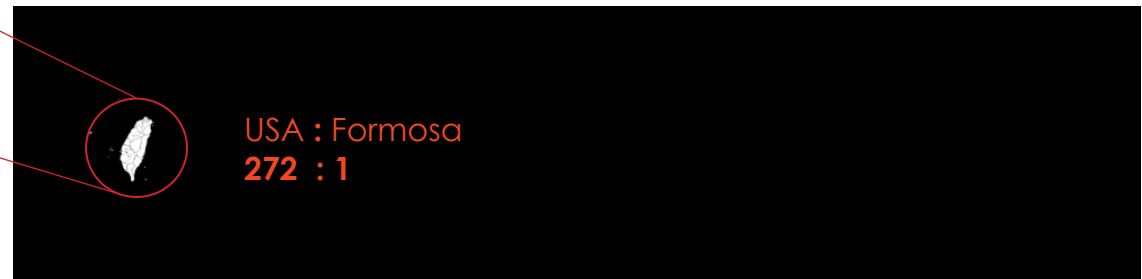
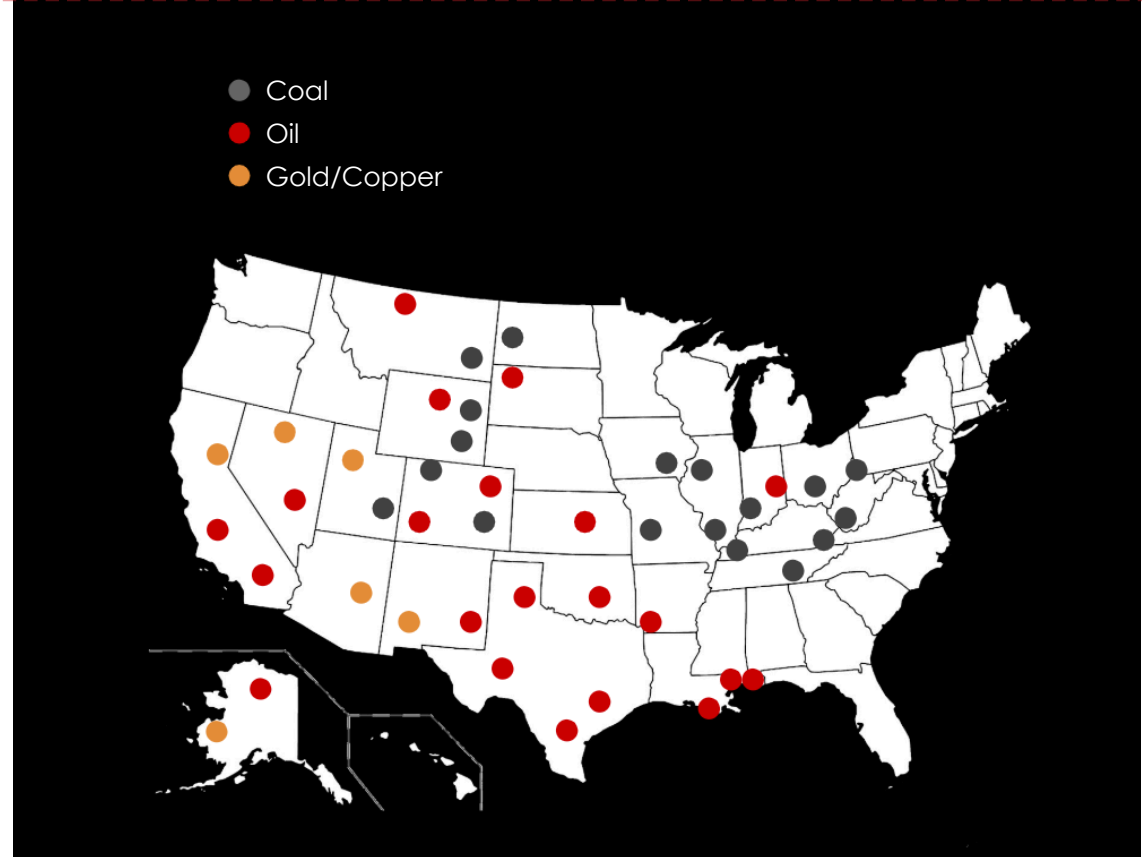
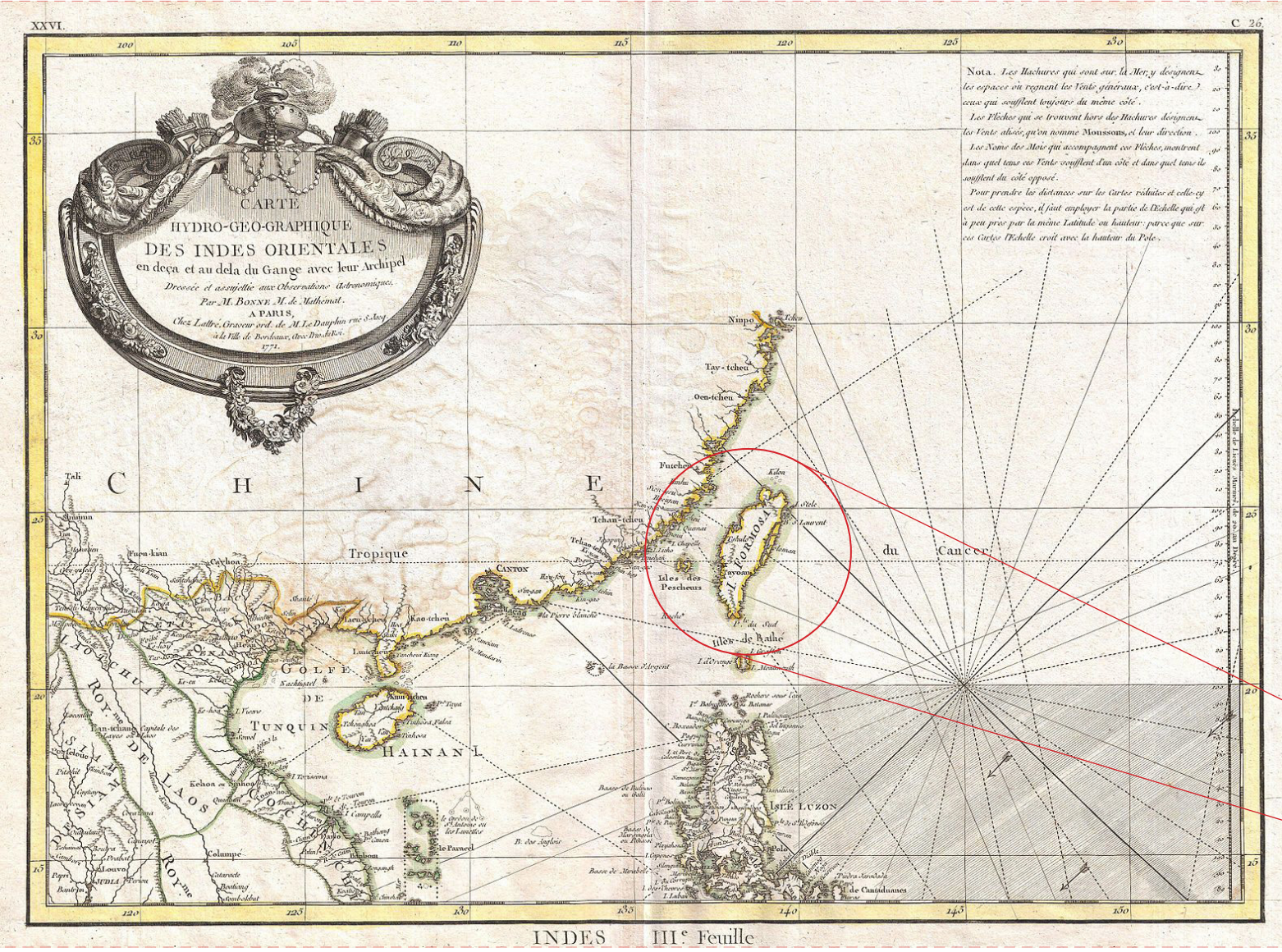
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CHAPTER ONE
INTRODUCTION

RIGHT Formosa map, 1771.¹ (fig. 6)
 OPPOSITE Natural resource map of USA.² (fig. 7)



EPHEMERAL

It doesn't have to be forever

This is where the story starts
 Red was born on an island; the island's name was Formosa. The size of Formosa is 272 times smaller than the States. One can imagine that Formosan people do not have as many resources as in the States, but they have more than enough. Red's parents have taught her that to keep one high quality product that has good performance and can be used for a long time is better than having three ordinary ones. Hence, Red has learned the significance of sustainability and high performance since she was little, long before she understood the meaning of the words. Red's parents also taught her that we should treasure what we have and make good use of them. We should not waste any resource.

BELOW Vacant land in Formosa. (fig. 8)
OPPOSITE, LEFT UW E-Lot. (fig. 9)
OPPOSITE, MIDDLE Capitol Hill Station. (fig. 10)
OPPOSITE, RIGHT @ NE 45th St. & 7th Ave NE. (fig. 11)



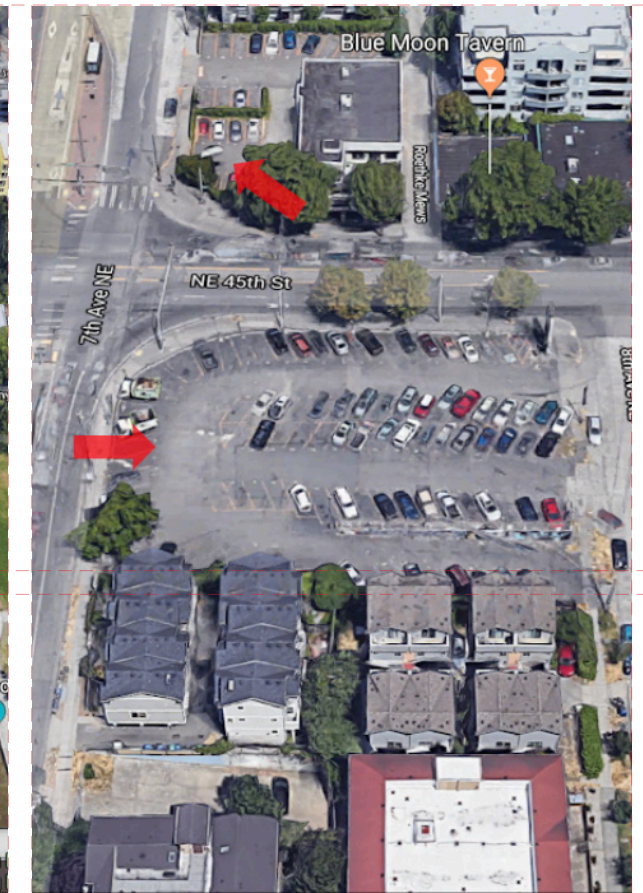
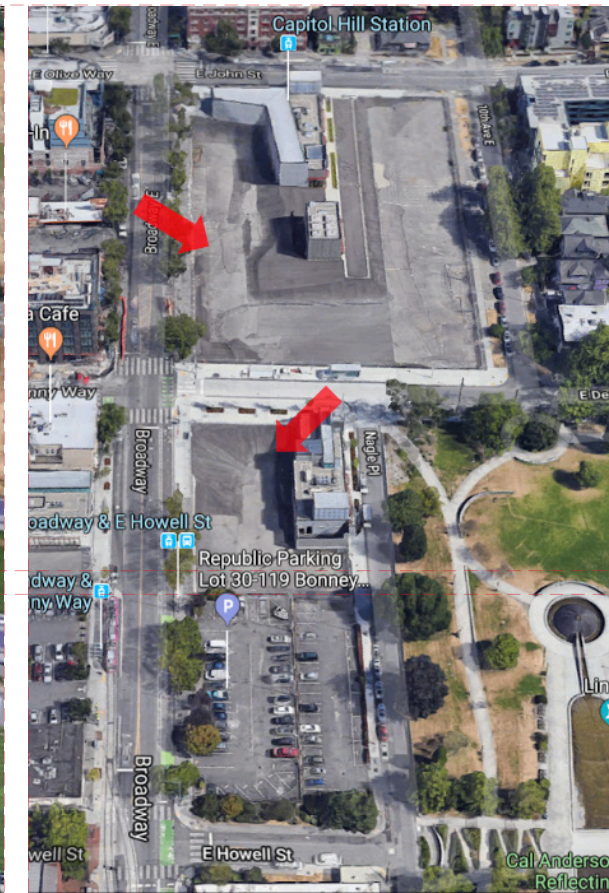
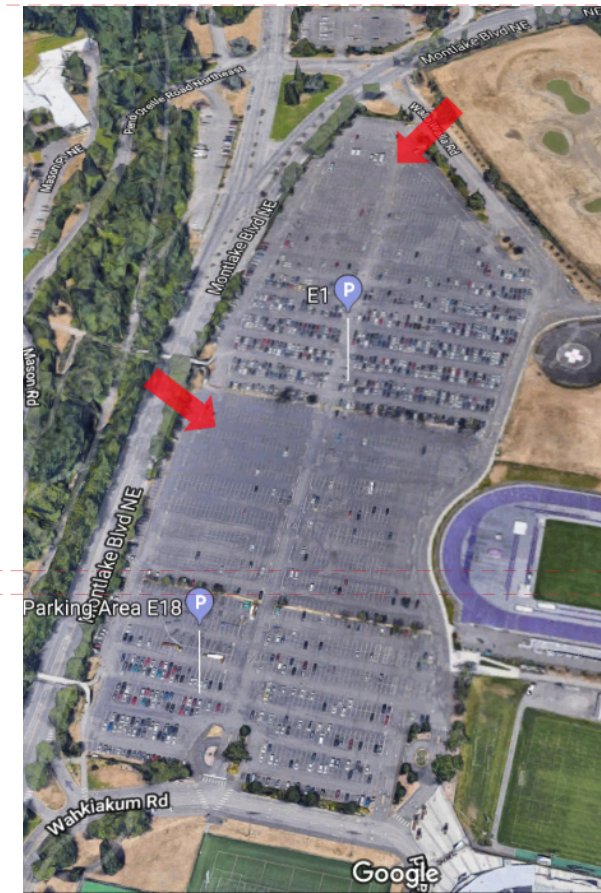
Red has learned that we should not waste any resource, but there is a vacant land in the back of Red's parents' house. This land has been vacant for over 28 years. To Red, that is a waste of resource. She once wished to buy this vacant land to build something on it. Actually, vacant land does not only exist in Red's country but also exists everywhere in the world,

including in Seattle.

The images on the opposite page represent a different scale of vacant and underutilized lands. The middle image was a vacant land at the Capitol Hill Station. It is under construction now, but it was vacant for more than two years. Vacant lands project problems. They attract criminal activities and result in

dangerous conditions for children and women, not to mention that they are unsightly blights on the urban landscape.

Other than vacant land, there are underutilized lands existing in the city as well, for instance, some parking lots. Have you ever noticed that a lot of meaningless vacant lands are underutilized for a long time?



According to a world cities report, "70% of the World's population will live in cities by 2030, while 60% of urban settlements remain to build."³ Does that mean we should move to suburban area? Surprisingly, the answer is no! Denis Hayes, the president of Bullitt center, believes that, "Cities represent our greatest hope for long-term survival, not only for humans but for all species. They offer the best chance to dramatically reduce carbon pollution."⁴ However, in cities worldwide, housing supply isn't keeping pace with housing demand, yet everywhere we see pockets of underutilized lands that many people could occupy, if only temporarily.

In response, cities keep changing and there is growing interest in up-zoning to

allow for greater density. As a result, many old buildings were demolished, and new architecture takes over in their place, especially in Seattle. "Seattle has the most cranes in the country for the third year in a row."⁵ People see cranes are all over the city.

The pace of this transformation is increasing. To adapt to this rapid change, architecture needs to fit somewhere between empty land and a permanent building; I call this the in-between condition, "ephemeral". Architecture doesn't have to be forever! Ephemeral architecture could be a pop-up building, just like a farmers' market, that afterwards feels like nothing ever happened, only the memories persist. Vacant or under-used lands are the perfect place to build ephemeral architecture.

BELOW Uptown upzone area. (fig. 12)
BOTTOM LEFT Seattle waterfront, then.⁶ (fig. 13)
BOTTOM MIDDLE Seattle waterfront, now.⁷ (fig. 14)
BOTTOM RIGHT Homeless people. (fig. 15)



FIG. 16 Farmers' market
FIG. 17 Cleaning farmers' market



notes

1. Formosa map. Digital image. Wikimedia Commons. [https://commons.wikimedia.org/wiki/File:1771_Bonne_Map_of_Tonkin_\(Vietnam\)_China,_Formosa_\(Taiwan\)_and_Luzon_\(Philippines\)_-_Geographicus_-_Formosa-bonne-1771.jpg](https://commons.wikimedia.org/wiki/File:1771_Bonne_Map_of_Tonkin_(Vietnam)_China,_Formosa_(Taiwan)_and_Luzon_(Philippines)_-_Geographicus_-_Formosa-bonne-1771.jpg)
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4. Hayes, Denis. "Cities Are The Greatest Hope For Our Planet." Living Proof Blog. Bullitt Center, Jun 08, 2019. <http://www.bullittcenter.org/2014/11/20/cities-are-the-greatest-hope-for-our-planet/>
5. Rosenberg, Mike. "Seattle still has the most cranes in America, and construction isn't losing much steam." Real Estate. The Seattle Times, Jun 08, 2019. <https://www.seattletimes.com/business/real-estate/seattle-still-has-the-most-cranes-in-america-and-construction-isnt-losing-much-steam/>
6. Seattle waterfront, then. Digital image. Wikimedia Commons. May 10, 2019. [https://commons.wikimedia.org/wiki/File:Crawford,_Harrington_and_Yesler%27s_wharves,_looking_west_toward_Elliott_Bay,_Seattle,_1882_\(PEISER_143\).jpeg](https://commons.wikimedia.org/wiki/File:Crawford,_Harrington_and_Yesler%27s_wharves,_looking_west_toward_Elliott_Bay,_Seattle,_1882_(PEISER_143).jpeg).
7. Seattle waterfront, now. Digital image. Cyrene Apartments. Feb 24, 2017. <https://medium.com/@cyreneaptsbmg/the-history-of-seattles-waterfront-then-now-630f5e0d2a1b>

Ephemeral Something that is fleeting or short-lived is ephemeral, like a fly that lives for one day. Hemera means “day” in Greek.



CHAPTER TWO
THEORETICAL FRAMEWORK

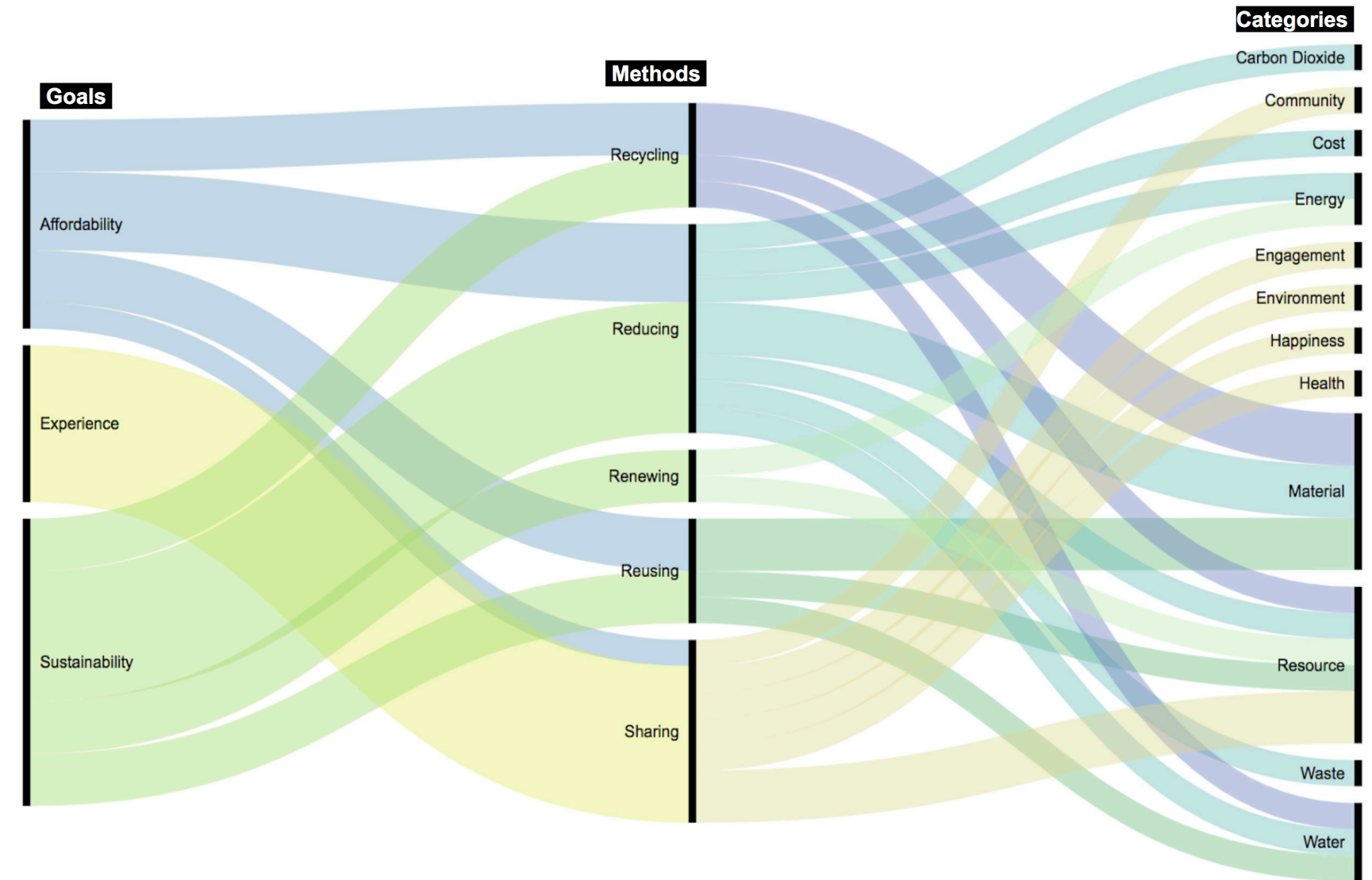
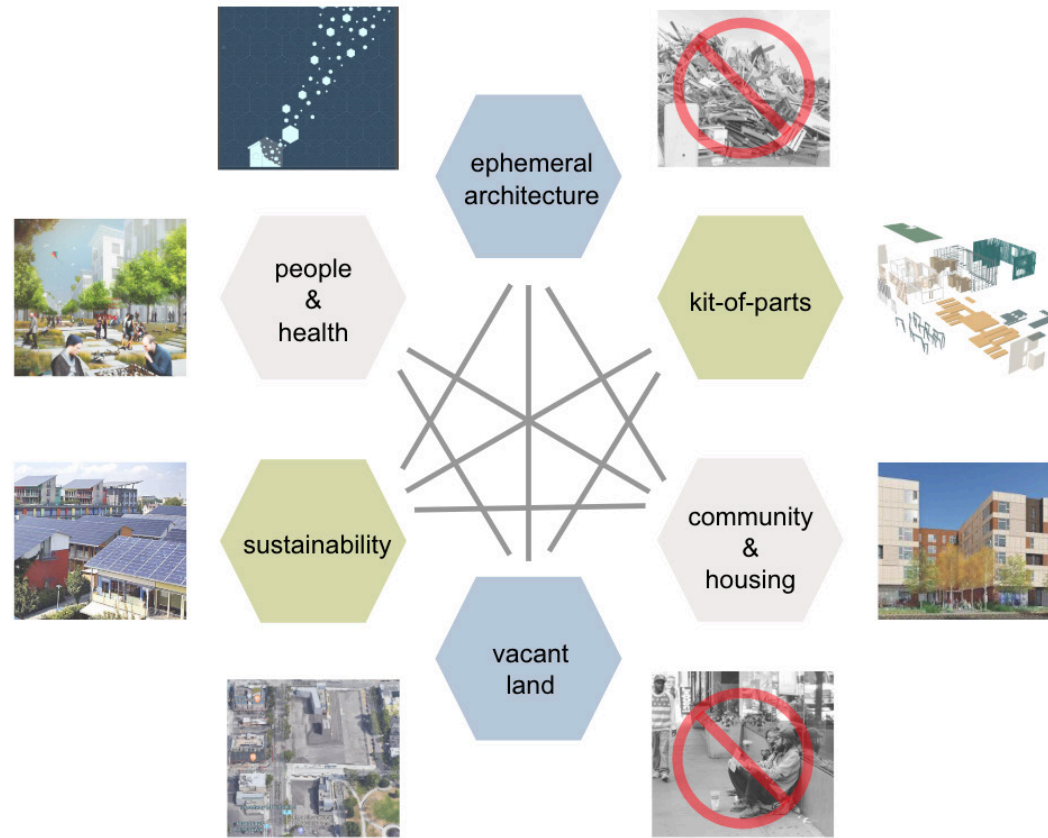


The concept of this project, Ephemeral Architecture, is to take advantage of the uncertainty of vacant lands to create ephemeral architecture in the fleeting moment. This will help mitigate the problem of housing shortages, while addressing many dimensions of sustainability.

Ephemeral Architecture started with applying "triple bottom line" principles, people, planet and profit, as a framework in order to create great value and better building performance. The goals are to achieve sustainability and affordability as well as addressing human health and well-being.

The principles and guidelines used to develop the idea of "Ephemeral Architecture" are illustrated in this alluvial diagram. The 3Rs, reduce, reuse, and recycle are the basic methods, but more importantly, a sharing network that people could use to share resources plays a big role toward achieving the goals. In particular, sharing has a great impact on both affordability and the human experience.

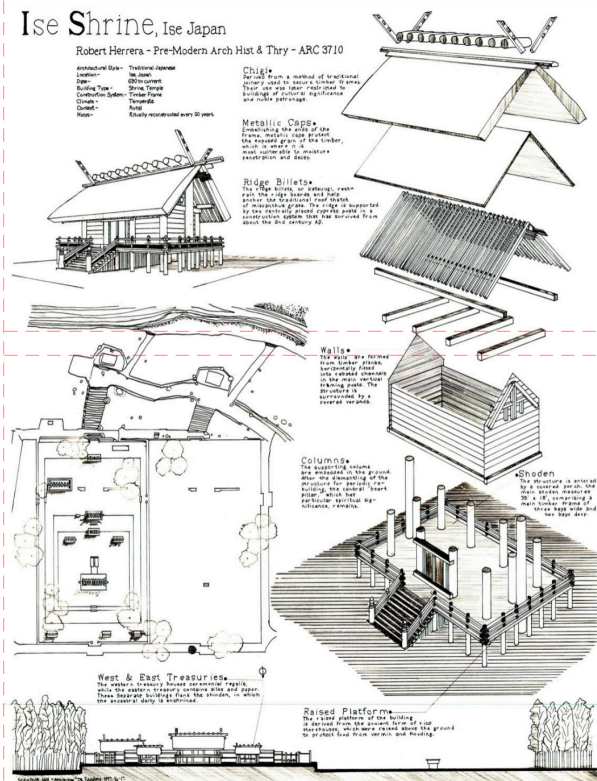
LEFT Triple bottom line. (fig. 18)
BELOW Theoretical framework diagram. (fig. 19)
OPPOSITE Alluvial diagram, theoretical framework. (fig. 20)



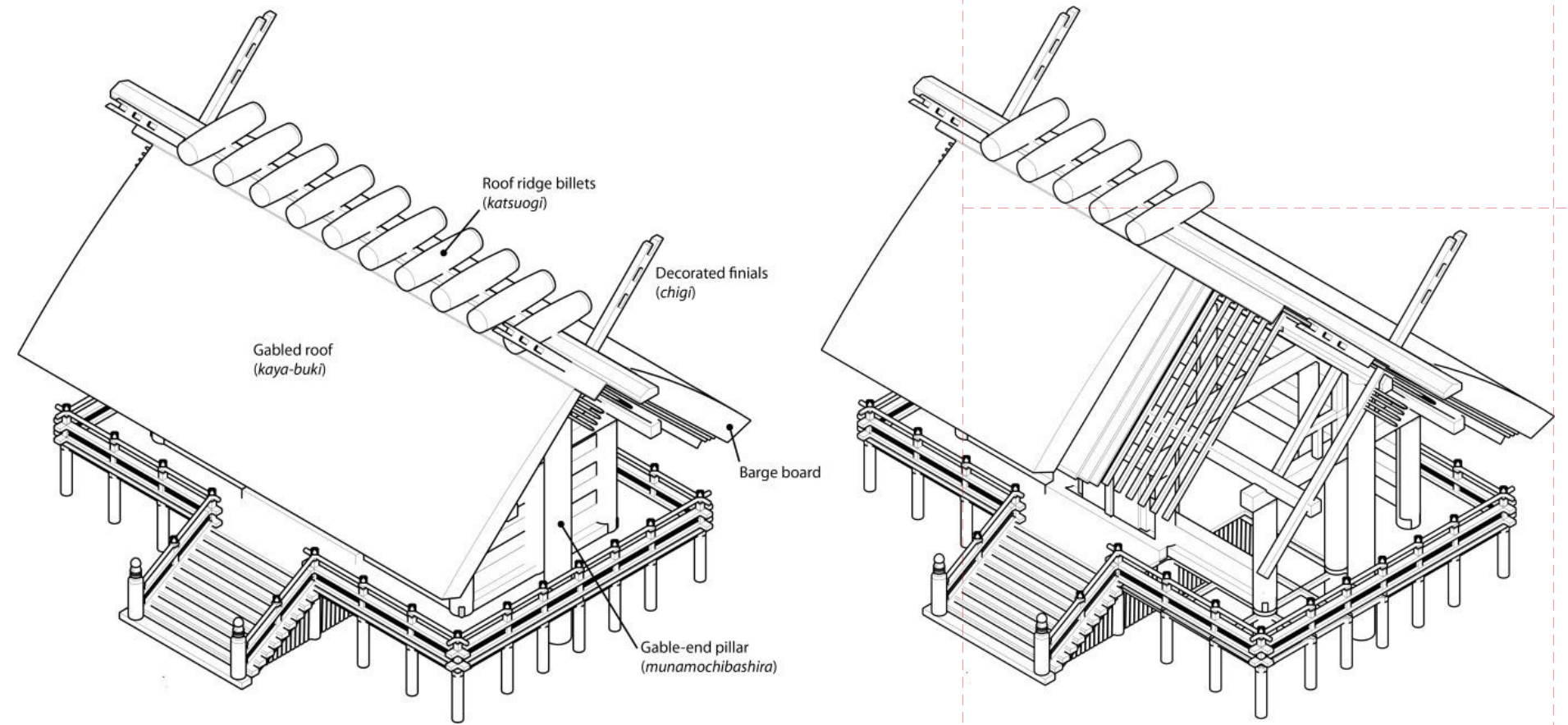
PRECEDENTS

Ise Grand Shrine

Ise Grand Shrine is sacred architecture that is impermanent. It is a kit-of-parts complex that is designed to be rebuilt every 20 years. The rebuilding process is to symbolize the Shinto belief of death and renewal in nature and the impermanence of all things. It is also part of the tradition of passing down architectural skills from one generation to the next.⁸ The ritual of deconstruction and construction is called Shikinen Sengu, which has been conducted 62 times, from year 690 to 2013.



OPPOSITE LEFT Ise Grand Shrine assembly. (fig. 21)
OPPOSITE RIGHT Ise Grand Shrine aerial view. (fig. 22)
BELOW Ise Grand Shrine details. (fig. 23)



Cellophane House

Kieran Timberlake used a kit-of-parts method to create the Cellophane House. As a prototype, the house used 32,245 lbs. of aluminum, and a disassembly strategy to create the mass-customized building. The off-site fabrication took thirteen weeks to complete. The frame and major pieces, 80% of the construction, was assembled and placed on-site in six days. The final 20%, including partitions, glazing and kitchen cabinetry took an additional eight days to install in place. The building was disassembled and removed from the site in two days.

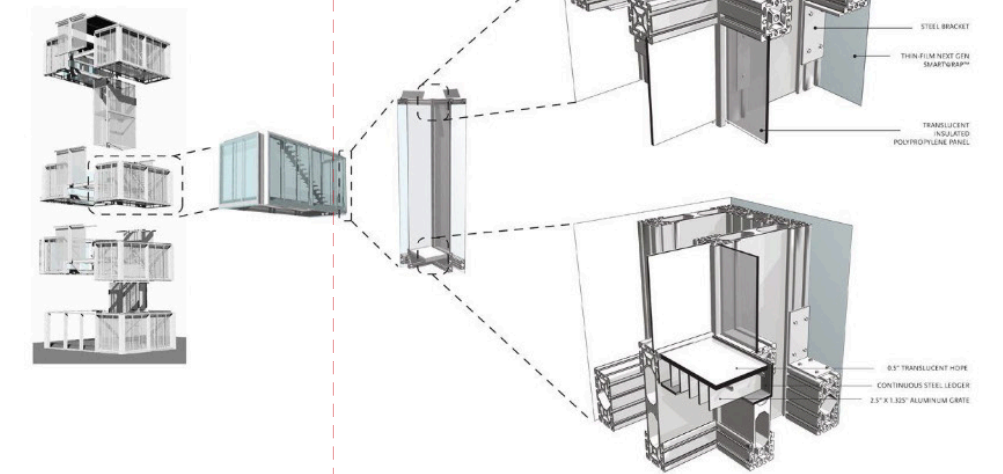
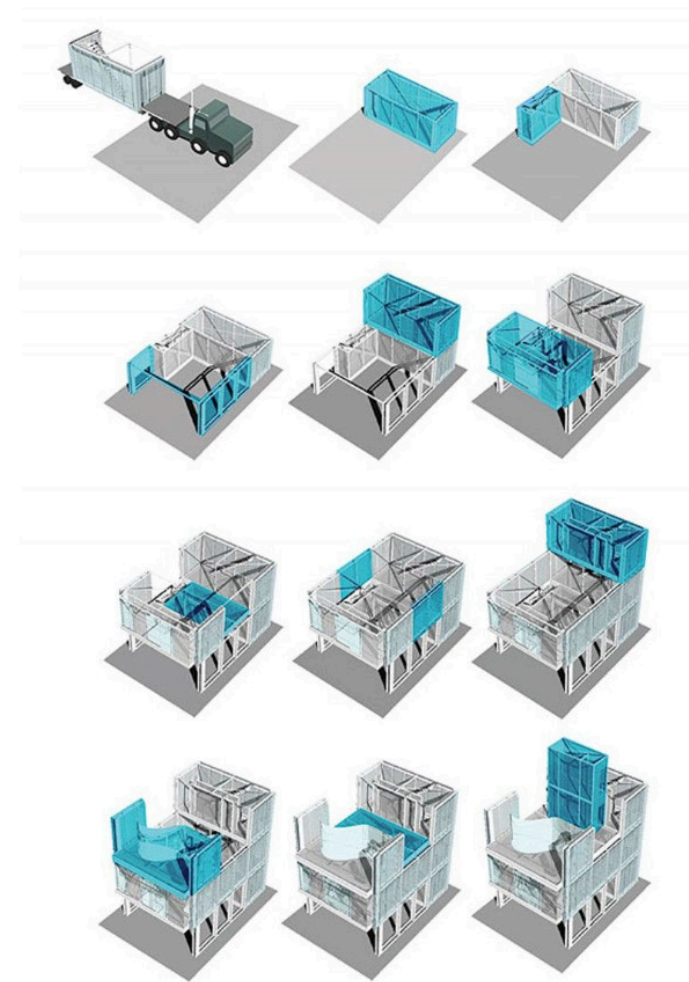


OPPOSITE, LEFT TOP Parallel opening window. (fig. 24)

OPPOSITE, LEFT BOTTOM The living space with abundant daylight. (fig. 25)

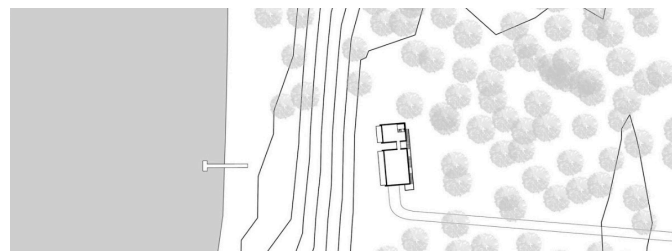
OPPOSITE, RIGHT The house lit with high-efficiency LEDs. (fig. 26)

BELOW Assembly diagrams and images. (fig. 27)



Loblolly House

The Loblolly House was made by a Kit-of-parts method, designed Kieran Timberlake. The house consists of 70 % prefabricated components. This house was assembled and lifted into place on-site in less than six weeks.

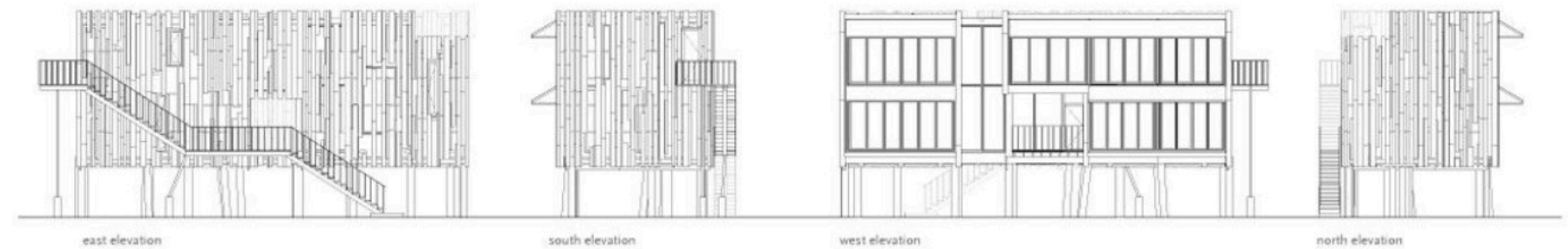


OPPOSITE, TOP The house lit at night. (fig. 28)

OPPOSITE, BOTTOM Site map. (fig. 29)

BELOW Side view and front view. (fig. 30)

BOTTOM Elevations. (fig. 31)



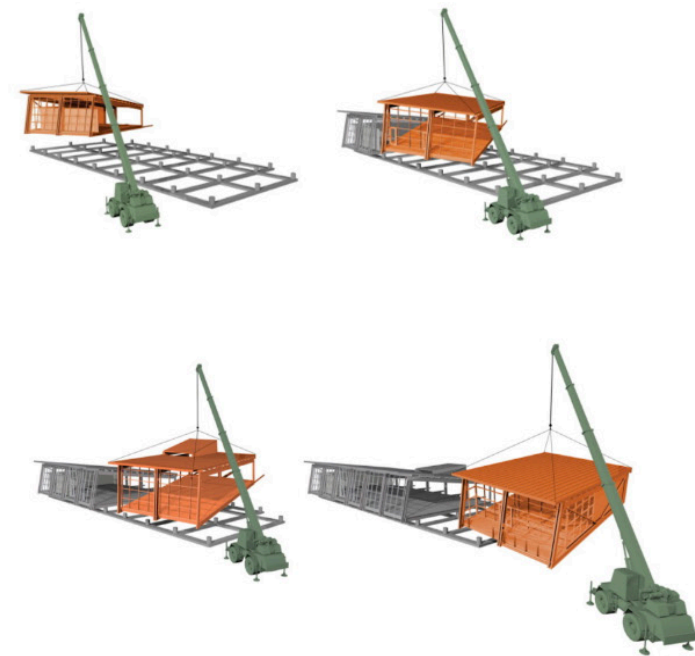
South Lake Union Discovery Center

South Lake Union Discovery Center is one flavor of ephemeral architecture. The repetition of structural bays and the open floor plan of interior space demonstrates flexibility in adapting to future needs. The hinged ramps were designed for relocating it to various site conditions, and a bio-retention swale was created to manage storm-water. This center was completed in 2005 and was made by modular units. The land owner knew that in the long term, this high-value property would be developed with a large, permanent structure. Hence, the building was intended to be temporary and built for disassembly. Sometimes "temporary" can be a relatively long time - this ephemeral architecture has been there for over 14 years. This precedent illustrates one potential market for ephemeral architecture.

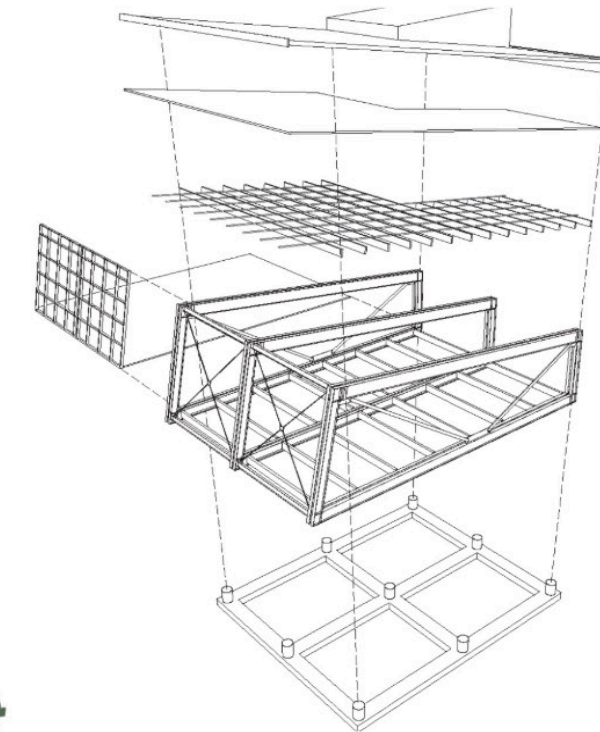


OPPOSITE, TOP Exterior view. (fig. 32)
OPPOSITE, LEFT BOTTOM Interior view. (fig. 33)
OPPOSITE, RIGHT BOTTOM Side view. (fig. 34)
BELOW Modular assembly and details. (fig. 35)

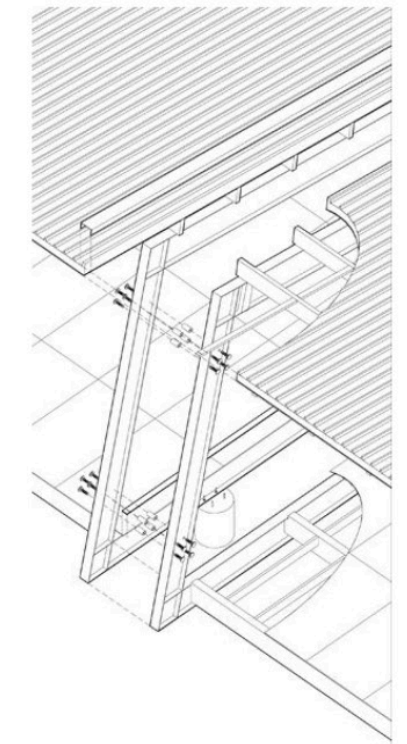
- > four-sided steel bents
- > bolted connections
- > prefabricated components
- > modular assemblies
- > metal walls / roof panels
- > detachable pumping system



sequence of building module relocation



six components of the envelope



structural connections for disassembly

FIG. 36 Loblolly House exterior
 FIG. 37 South Lake Union Discovery Center exterior



Additional methods of creating temporary architecture were explored, including shipping containers, pre-fabricated buildings, and other methods of industrialized building processes. South Lake Union Discovery Center and the Loblolly House demonstrate just two systems for making “ephemeral” architecture: modular and kit-of-parts. However, these two buildings are site oriented and their rectangular structures are specific to a particular site condition. Also, their façades are quite long, which would be inappropriate for many site conditions. These two case studies bring up the issue of reusability and adaptability. They cannot easily adapt to a new place or situation; they have limited sharing potential.



notes

1. The Miller Hull Partnership LLP. *The Miller Hull Partnership: Public Works*. New York: Princeton Architectural Press, 2009.
2. Hayes, Denis. “Cities Are The Greatest Hope For Our Planet.” *Living Proof Blog*. Bullitt Center, Jun 08, 2019. <<http://www.bullittcenter.org/2014/11/20/cities-are-the-greatest-hope-for-our-planet/>>
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4. Seattle waterfront, then. Digital image. Wikimedia Commons. May 10, 2019. [https://commons.wikimedia.org/wiki/File:Crawford,_Harrington_and_Yesler%27s_wharves,_looking_west_toward_Elliott_Bay,_Seattle,_1882_\(PEISER_143\).jpeg](https://commons.wikimedia.org/wiki/File:Crawford,_Harrington_and_Yesler%27s_wharves,_looking_west_toward_Elliott_Bay,_Seattle,_1882_(PEISER_143).jpeg).
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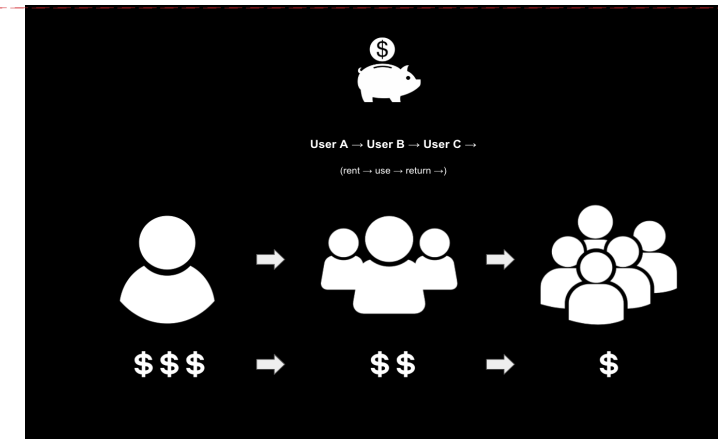
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SHARING SYSTEM

Sharing resources is an essential component of ephemeral architecture. E-car and e-bikes are the sharing system precedents investigated. Imagine that Ephemeral Architecture is like an "e-house" that people can share with other people, just like e-car or e-bike. People rent an e-house when they need it and return it when they don't need to use it anymore. Ephemeral Architecture is the e-car and e-bike sharing systems but operates at different time and scales.

Ephemeral Architecture	Short-Term 1-12 Months	Medium-Term 1-5 Years	Long-Term 5+ Years
Scale	Mini Scale 0-5 Modules 	Medium Scale 5-10 Modules 	Large Scale 10+ Modules
Community Size			
Walkway	 steel grates	 boardwalk	 stone pavers
Utilities			
Foundations			
E-Car / E-Bike	 Micromobility 0-5 Miles	 Medium Distance 5-15 Miles	 Long Distance 15+ Miles

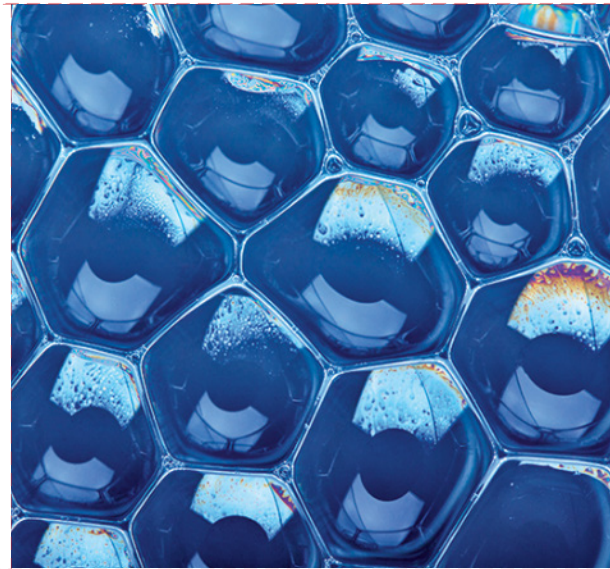
OPPOSITE Sharing system. (fig. 38)
BELOW Sharing diagram. (fig. 39)



Ephemeral Architecture is a building rental service that shares the resource of building components to provide multiple options for various clients with diverse needs, depending on the size of "vehicle" and the scale of time. And, the scale and time determines the kind of components needed, infrastructure, and other systems they would use. Basically, simple arrangements work for and smaller scale communities used for a short-term. In contrast, the large scale and long-term communities have more options, since more people share the cost. More importantly, all of these are reusable components, flexible and easy to install and easy to remove and reuse, and all of the components are designed to be easy to maintain and easy to access.

The distinction of this service is that the price gets lower and lower as the next user shares the cost with the previous users. It's like a second-hand car; it gets cheaper and cheaper.

THE SHAPE



If we could ask Nature for the best form to use, the answer might be the hexagon. Why does nature like hexagons? There are a number of reasons. One of the architectural reasons is that the junctions of 120° are the most mechanically stable arrangement, as the forces and the pull of tension in each direction are all in balance. Bees are experts at hexagons. When honeybees make hives, they begin by making round wax cells. And, as the wax is softened by heat from busy bees, it's pulled by surface tension into stable hexagonal shapes. Hexagons are more rigid. Just like bubbles, the best shapes are

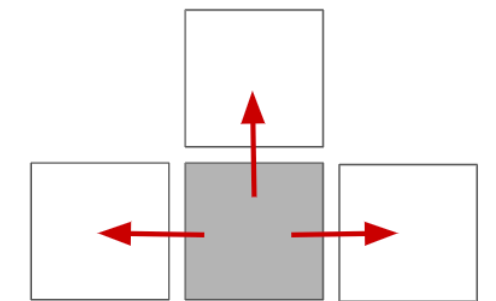
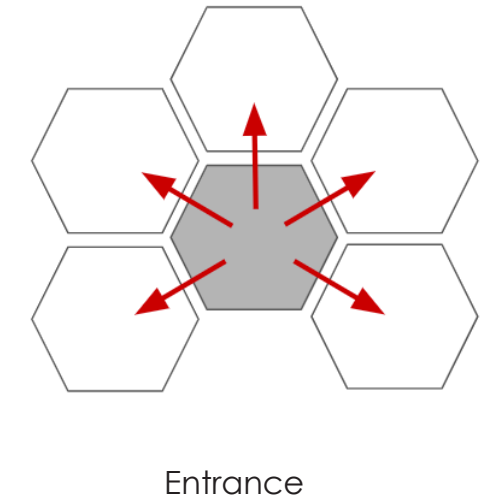
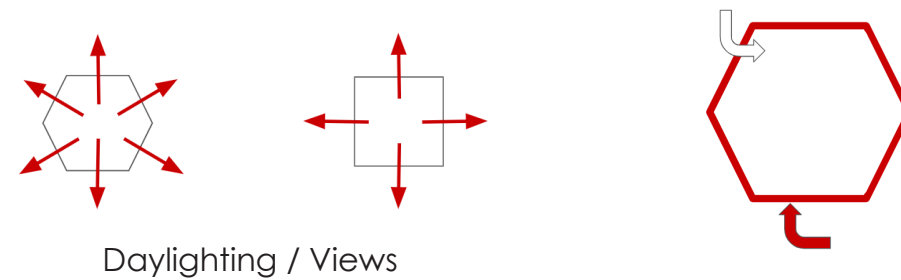
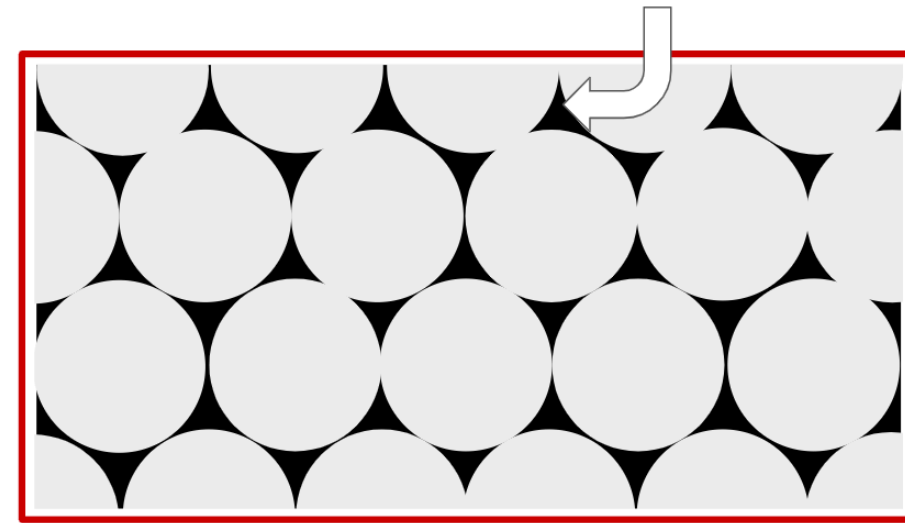
hexagons, because no long-range forces are necessary to form facets.

Also, a hexagon has six equal sides that provide more orientations and opportunities for views and daylighting. From a hexagonal room or courtyard, there are more points of access compared with a square. Hexagons are also more efficient for space planning.

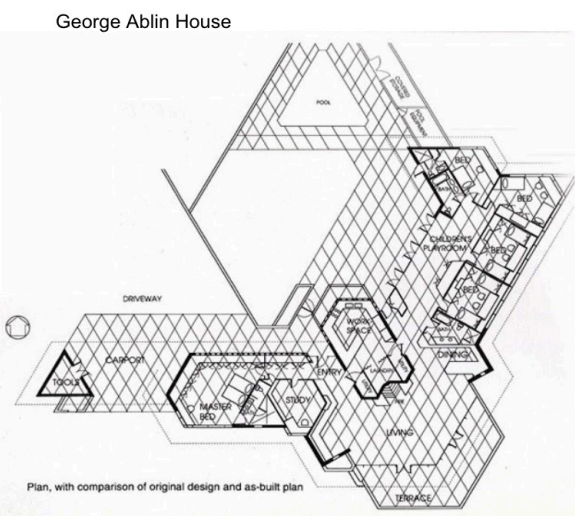
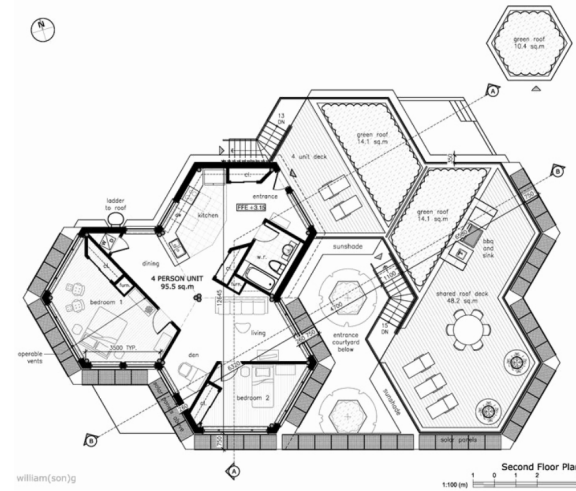
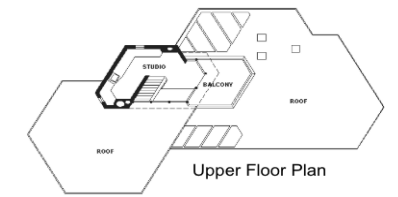
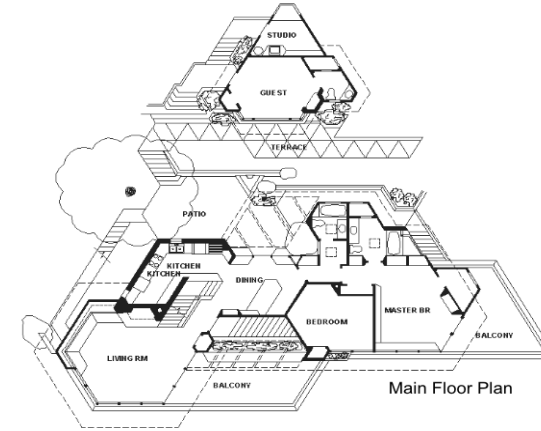
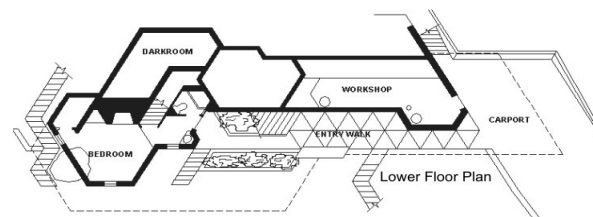
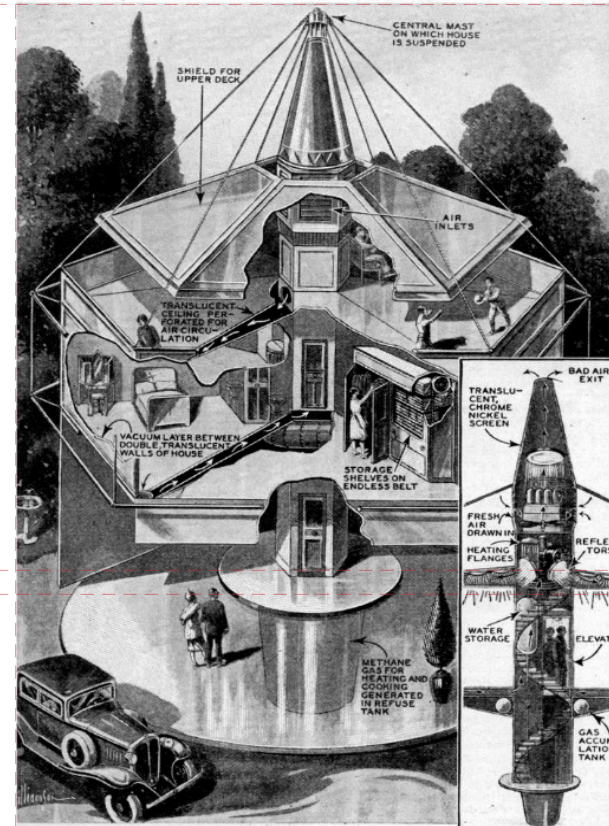
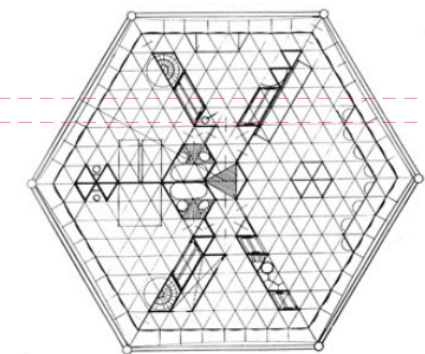
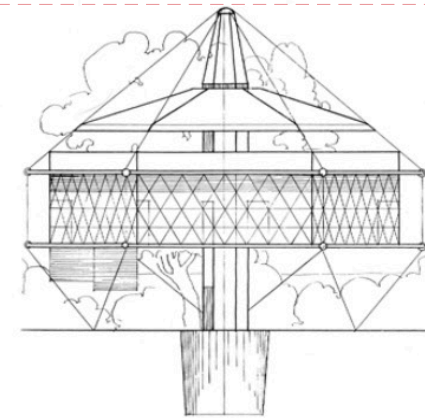
Additionally, there is a high-performance reason. Let's think of bubbles again. Bubbles are spheres, and spheres enclose the maximum volume with the least surface area, so thermally, a sphere is the most efficient volume for enclosing space.

Let's take a look at the cross-section of spheres—circles. When we pack circles together in a space, 90% are filled but 10% are empty. In contrast, there is no wasted area in hexagons. Like beehives, hexagons allow bees to have maximum storage area with minimal cell wall material. Architecturally speaking, hexagons allow us to use less material to enclose space, reducing the cost to create a given volume. Hexagons are a high-performance form.

OPPOSITE, LEFT Beehives. (fig. 42)
OPPOSITE, RIGHT Bubbles. (fig. 43)
BELOW Diagrams. (fig.44)



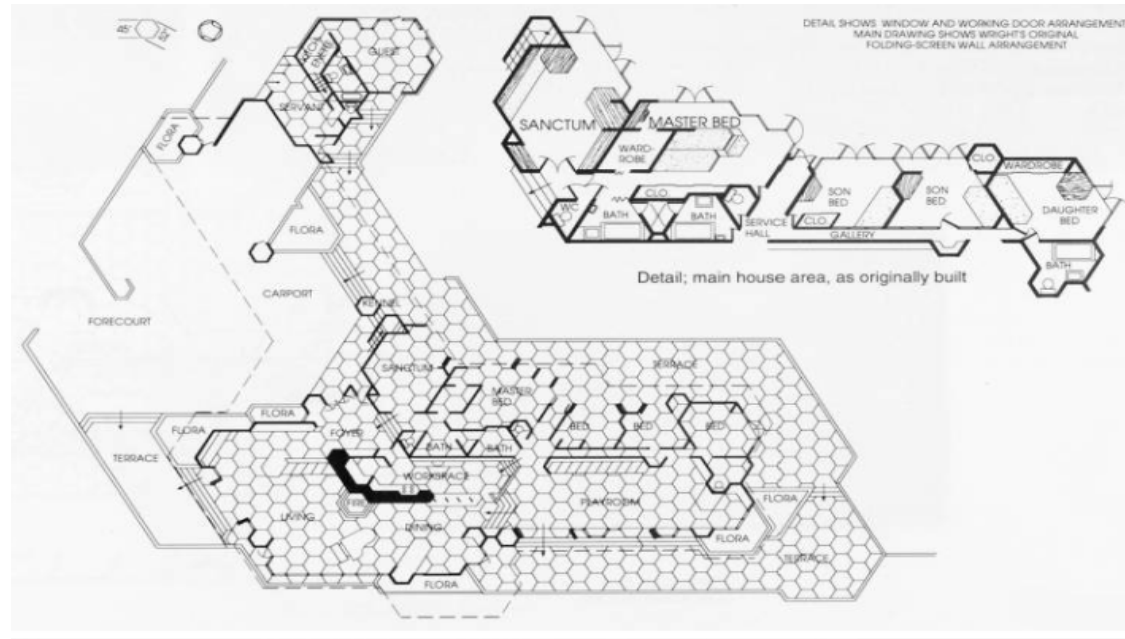
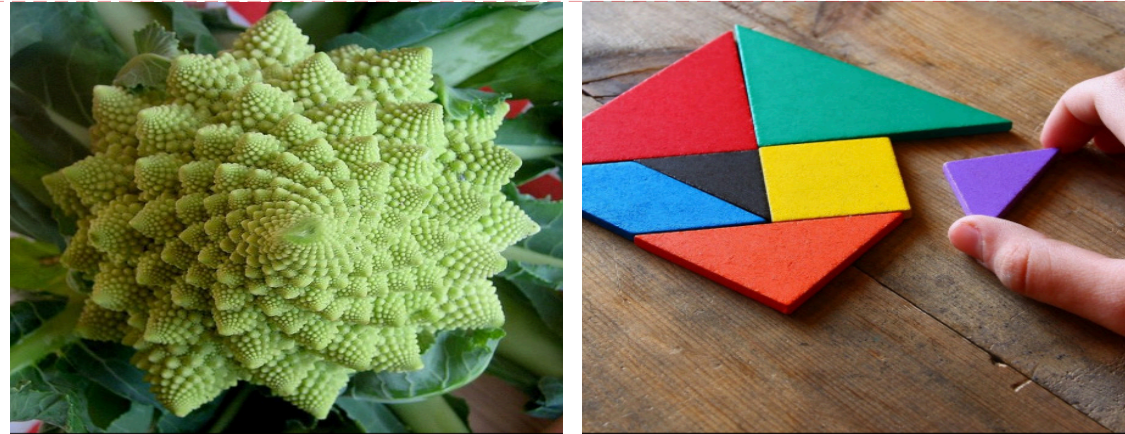
OPPOSITE Buckminster Fuller's Dymaxion House. (fig. 45)
BELOW Frank Lloyd Wright's architecture. (fig.46)



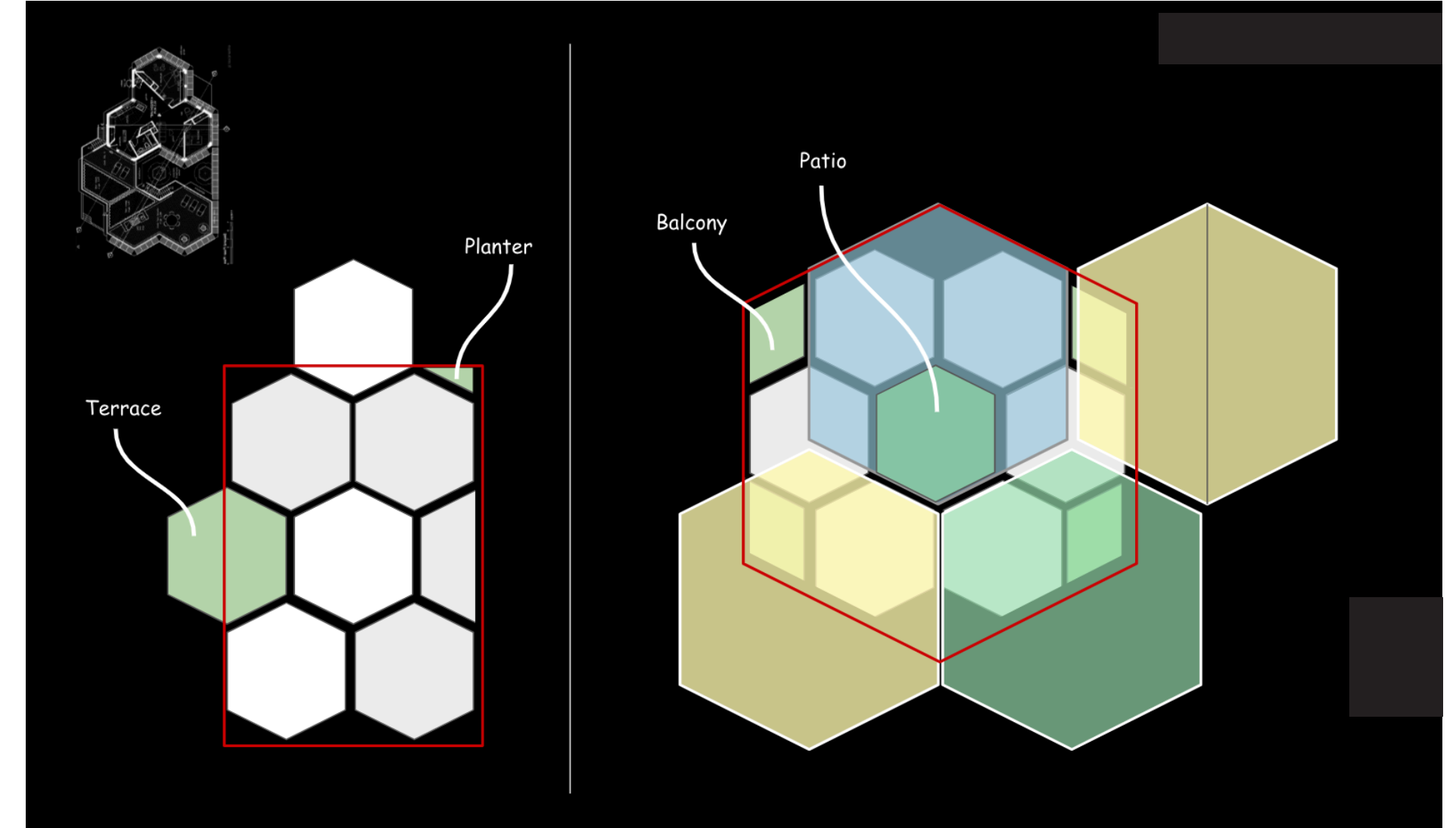
FORMS

Ephemeral Architecture is inspired by nature's elements. The geometric family of triangles, which hexagons belong to, is used to create tangram puzzle. We see this use of triangles in their many forms and configurations throughout architectural history. In the 20th century, its most prominent champion was Frank Lloyd Wright.

Hexagons appear in nature as fractals, elements that repeat at different scales and have self-similarity. The geometry creates unanticipated spaces in between and at different scales, allowing for wide range of open spaces that can support social interaction, green spaces, and a connection to nature. Biophilic design draws on these sorts of opportunities to enhance human experience in a manner that supports health, well being and happiness.

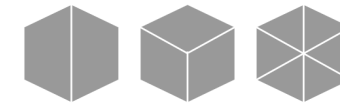
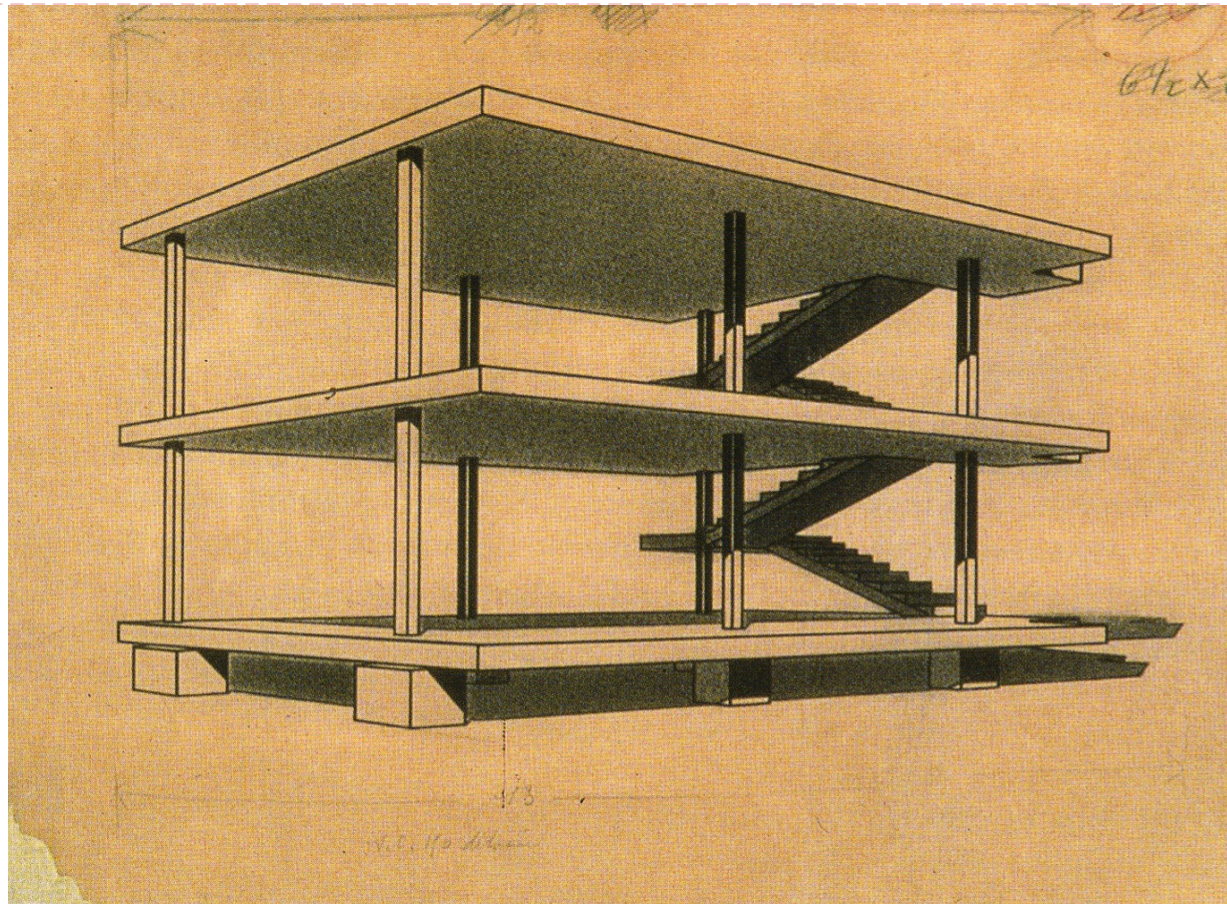


OPPOSITE, LEFT TOP Fractal Romanesco Broccoli. (fig. 47)
OPPOSITE, RIGHT TOP The tangram. (fig. 48)
OPPOSITE, BOTTOM Frank Lloyd Wright's Hanna House. (fig. 49)
BELOW Self-similarity diagrams. (fig. 50)



THE GRIDS

Le Corbusier was another inspiration. Like the Domino House, which uses the column grid to define space, Ephemeral Architecture adapts hexagonal grids to define space. This simple geometry can organize itself to make a lot of interesting shapes. The symmetry and fractality of hexagons not only empowers us to play with the shapes at different scales but also allow people to utilize the small portions of a hexagon to align the edges.



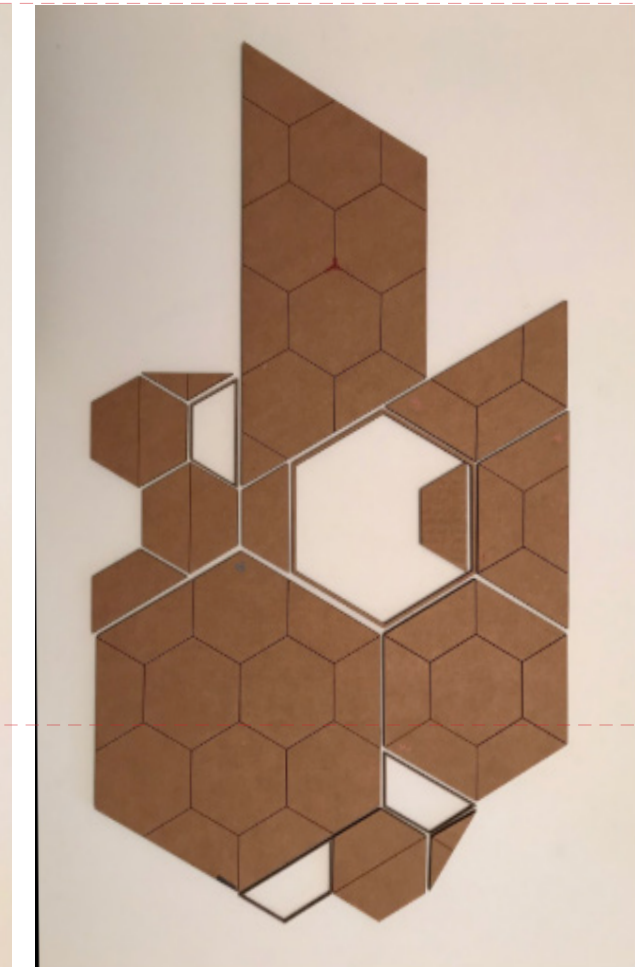
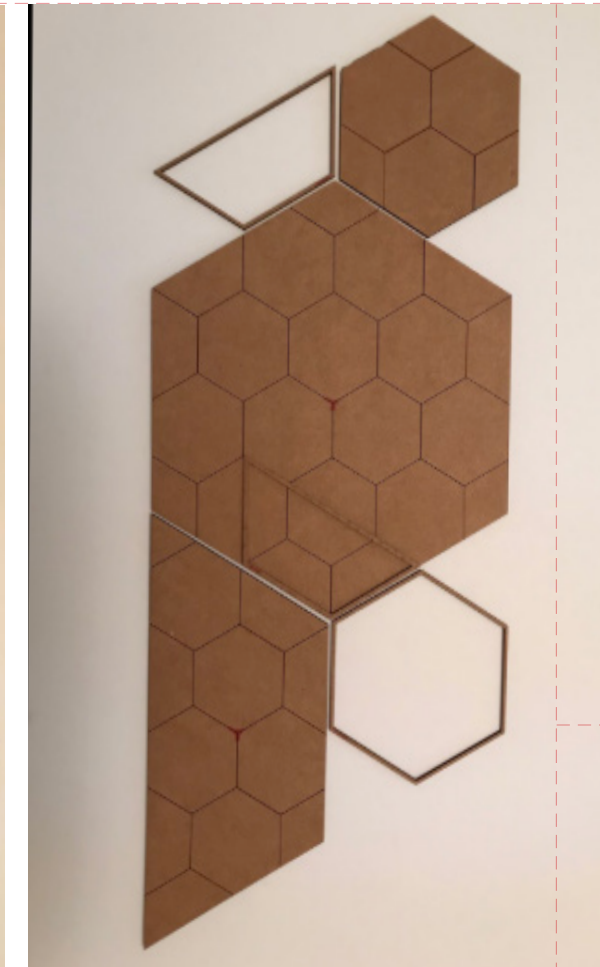
OPPOSITE Le Corbusier Dom-Ino House. (fig. 51)

LEFT TOP Hexagons. (fig. 52)

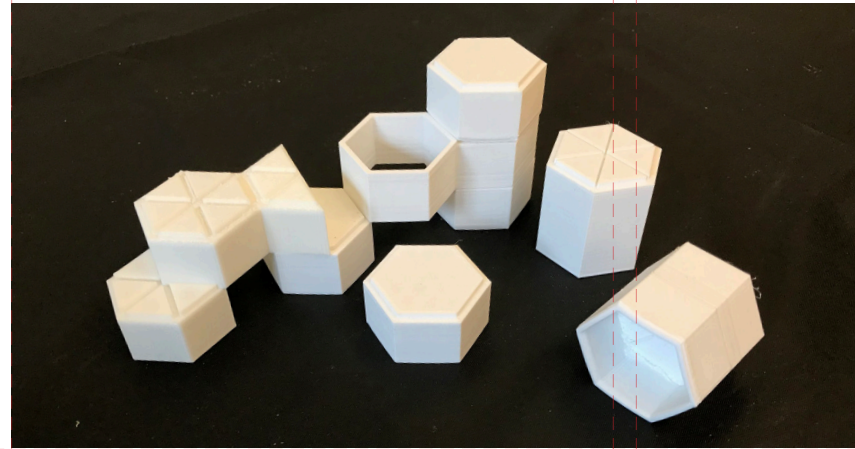
LEFT BOTTOM Walkway pattern. (fig. 53)

BELOW Floor plan pattern. (fig. 54)

RIGHT Floor plan pattern. (fig. 55)

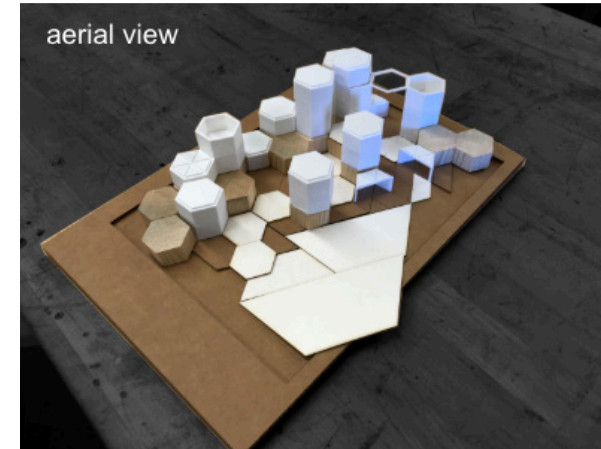
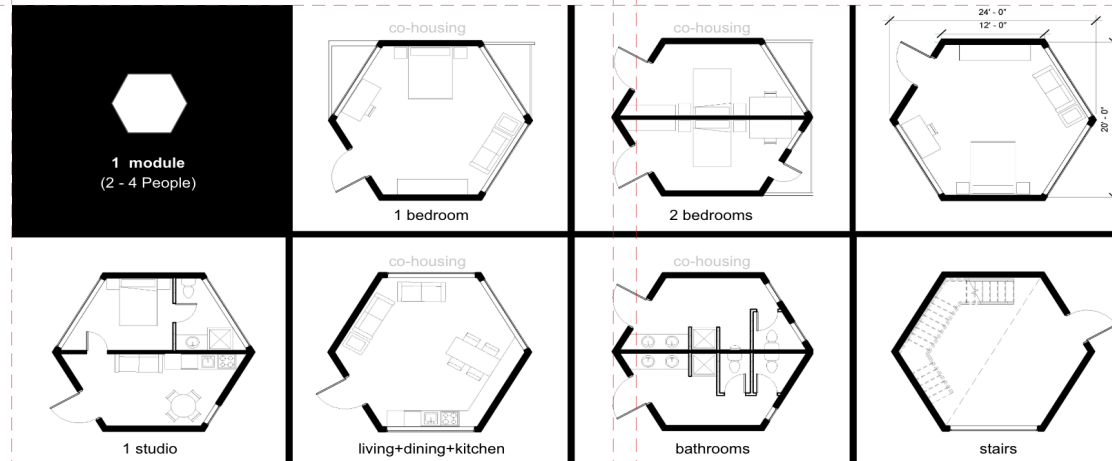


LEGO

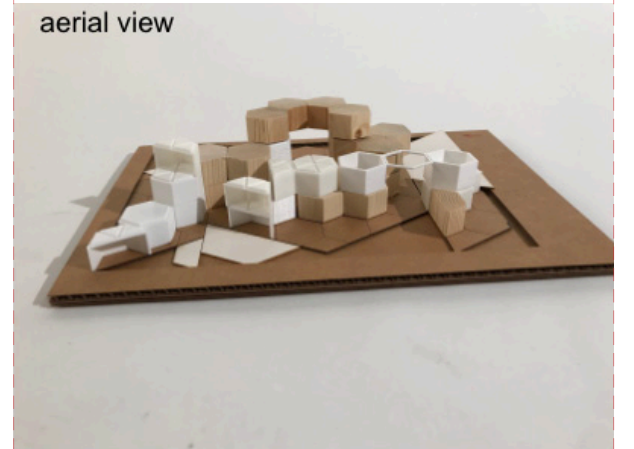
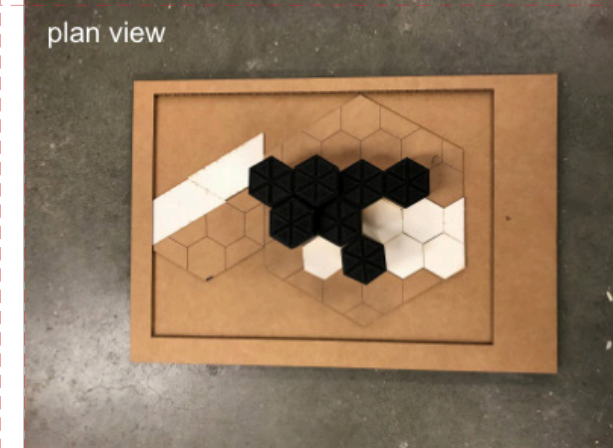
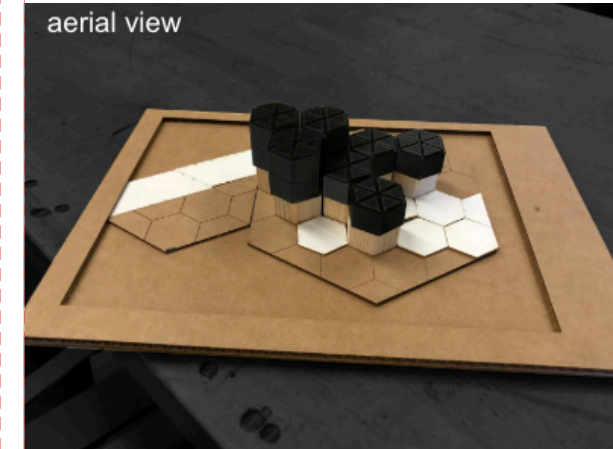


The hexagonal blocks can be manipulated and organized just like Lego. People can create a mini city within this city if they wanted, like the images on the right. People can play the game if they know the rules, which mostly means don't forget the vertical circulation and horizontal distribution.

In this project, one hexagon represents one module, which could be a studio, two bedrooms or a shared space for co-housing. There is no limitation on how to use the units; it depends on the clients' needs. The basic occupant density is around 100 square feet, per person.

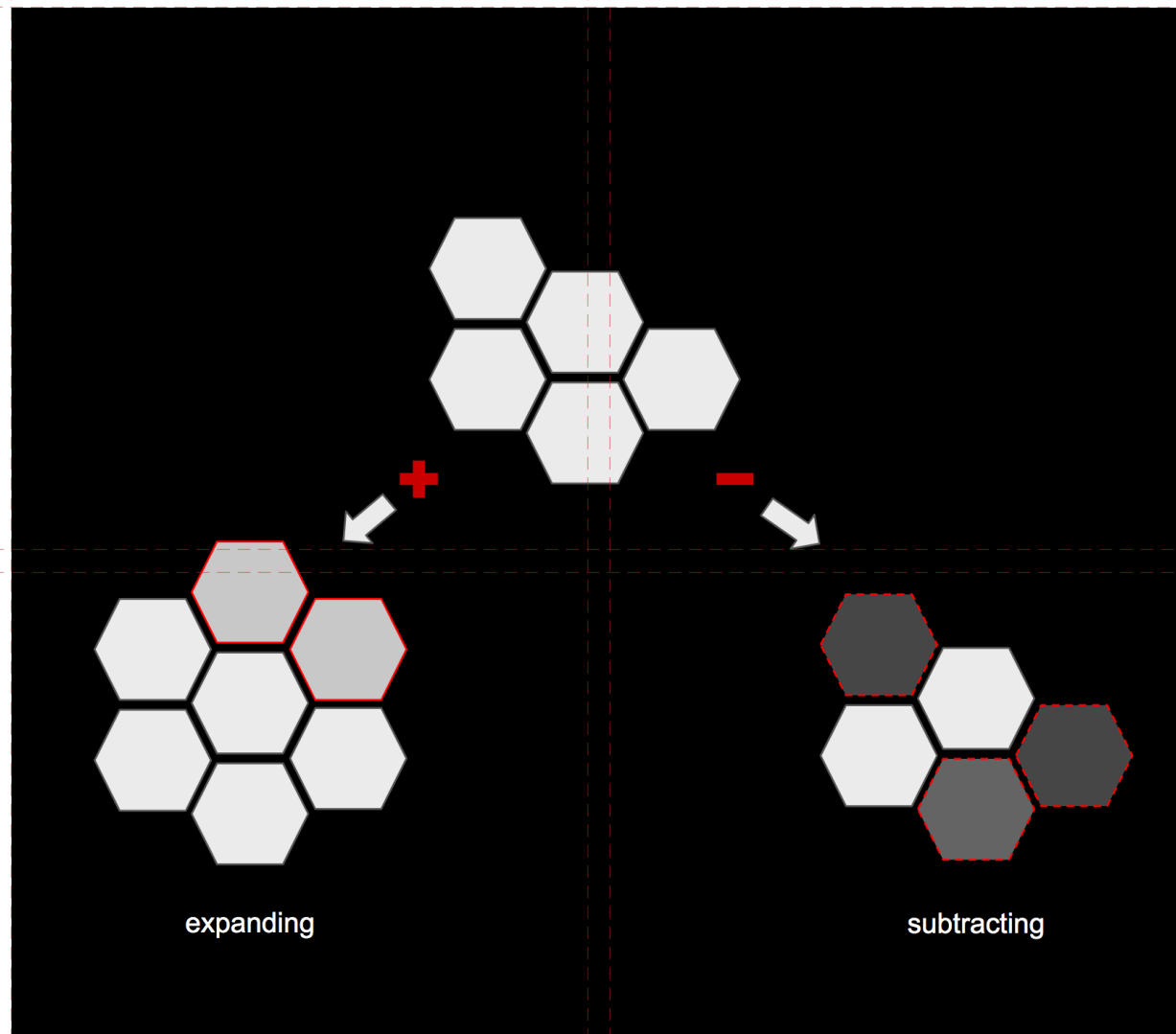


OPPOSITE, TOP Lego blocks (fig. 55)
OPPOSITE, BOTTOM The modules (fig. 56)
LEFT Lego city, created by Caleb Killian. (fig. 57)
BELOW Lego city, created by Penny Maulden. (fig. 58)
RIGHT Lego city, created by Chris Vander Haak (fig. 59)



MODULAR FLEXIBILITY

The Ephemeral Architecture system not only works for temporary architecture but also suits “permanent” housing at larger scales. Hexagons are cellular, and buildings are composed of multiple cells, which means a client can not only expand their units if their families grow but also subtract units as needed. Ephemeral Architecture has flexibility and scalability to match changing needs. Additionally, the same wall connectors used for exterior walls work as interior partitions, and this allows the Ephemeral Architecture system to have fewer parts with greater possibilities.



OPPOSITE Modules. (fig. 60)

BELOW Wall connectors/splines. (fig. 61)

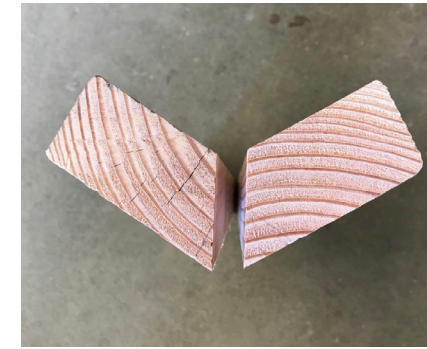


STRUCTURAL INSULATED PANEL (SIPs)

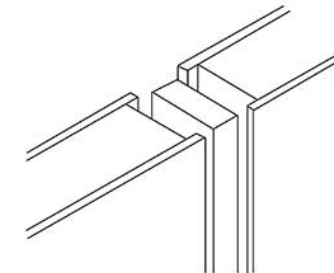
To achieve high thermal and structural performance while reducing the weight of the system, structural insulated panels (SIPs) are the primary panel material employed by Ephemeral Architecture. SIPs are great at keeping heat in and cold out—a SIP home can save 40% - 60% annually on heating energy. To create the 120° Spline in the Ephemeral Architecture system, you only need to cut a 2x6 wood stud into two pieces at 60° and glue them together. It's pretty simple.



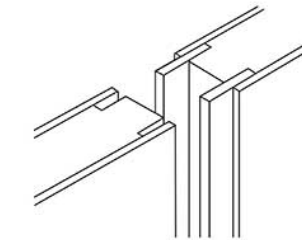
OPPOSITE SIPs assembly. (fig. 62)
BELOW 120° Spline. (fig. 63)
RIGHT Splines. (fig. 64)



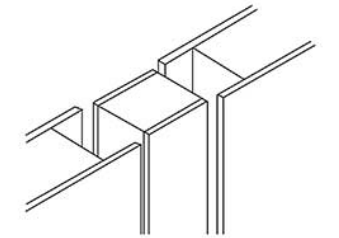
Dimensional timber spline



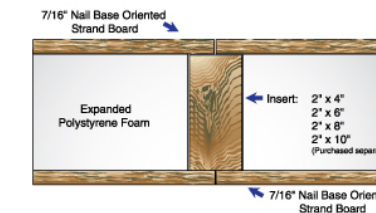
OSB thin-spline



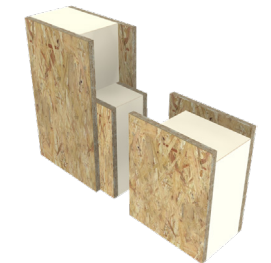
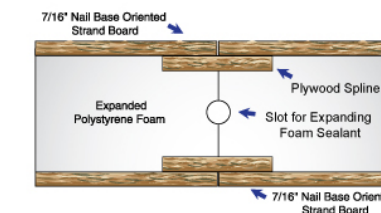
Mini-SIP spline



OSB Type A



OSB Type B





RAISED STRUCTURE

The World Cities Report claims that more and more people are coming to the cities. How do we build more buildings to accommodate the people moving into urban places, and provide outdoor green spaces for them at the same time? One way is to use the spaces beneath our buildings. Lifting up buildings is a strategy to allow

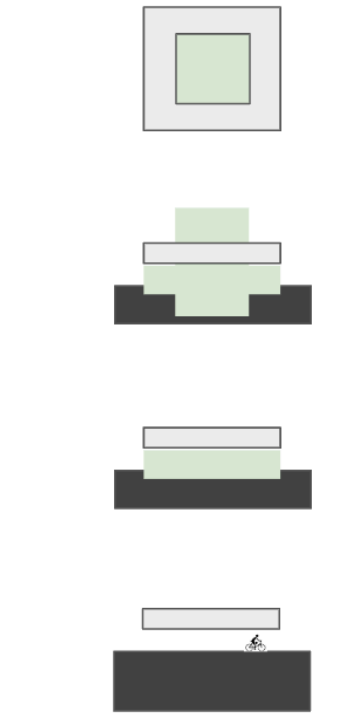
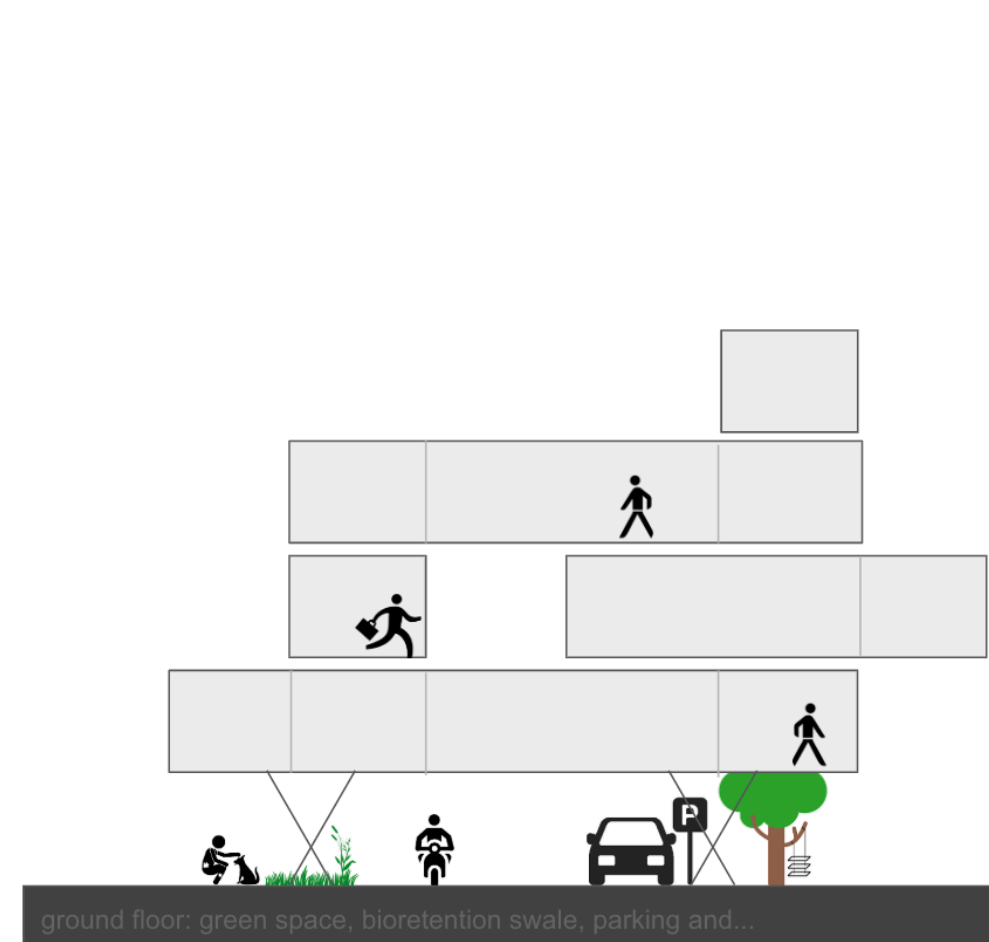


people to inhabit the space underneath. The column structure for some of these grander spaces could become a special marker, giving identity to the community and a celebration of the open space created. Lifting up the structure to create public space underneath was inspired by Le Corbusier and the Villa Savoye.

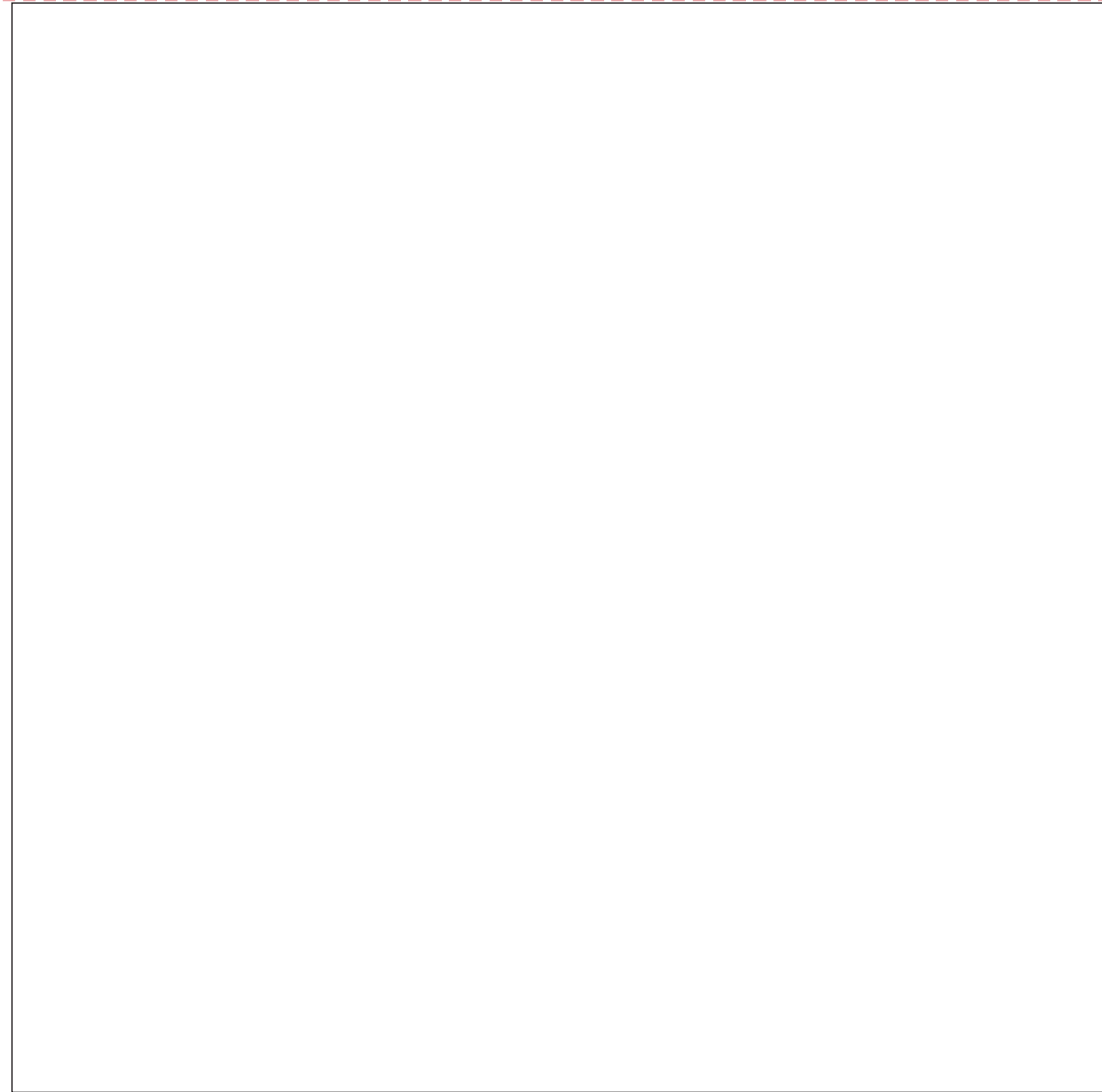


The diagram on the opposite page shows that lifting a building up not only creates habitable space but can also create open space for parking and human activity at the same time. Created as an organic form, this example of biophilic design could create a vital center that contributes to the social and physical well-being of the community.

OPPOSITE, LEFT Confluence Park, San Antonio, TX. (fig. 65)
OPPOSITE, RIGHT Bunjil Place, Australia. (fig. 66)
BELOW Raised structure diagram. (fig. 67)
RIGHT Green space diagrams. (fig. 68)



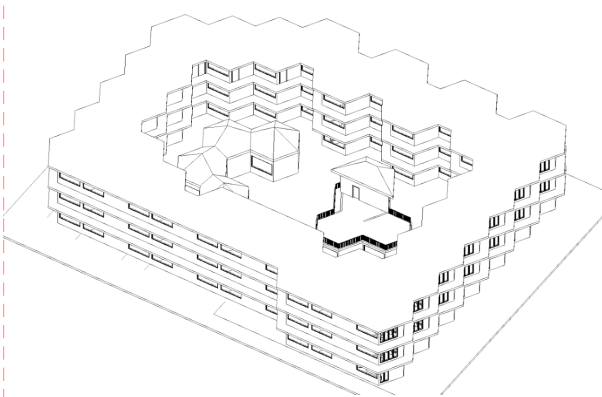
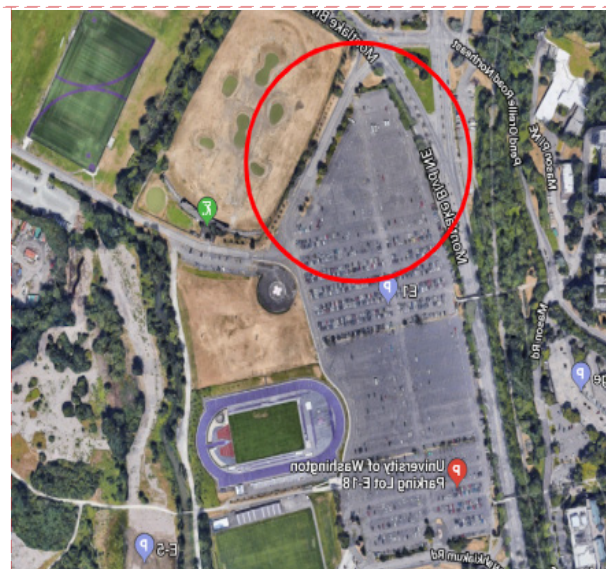
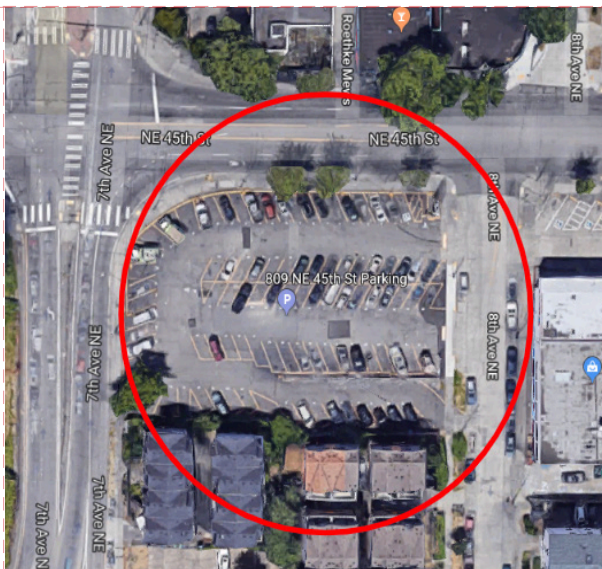
health + happiness



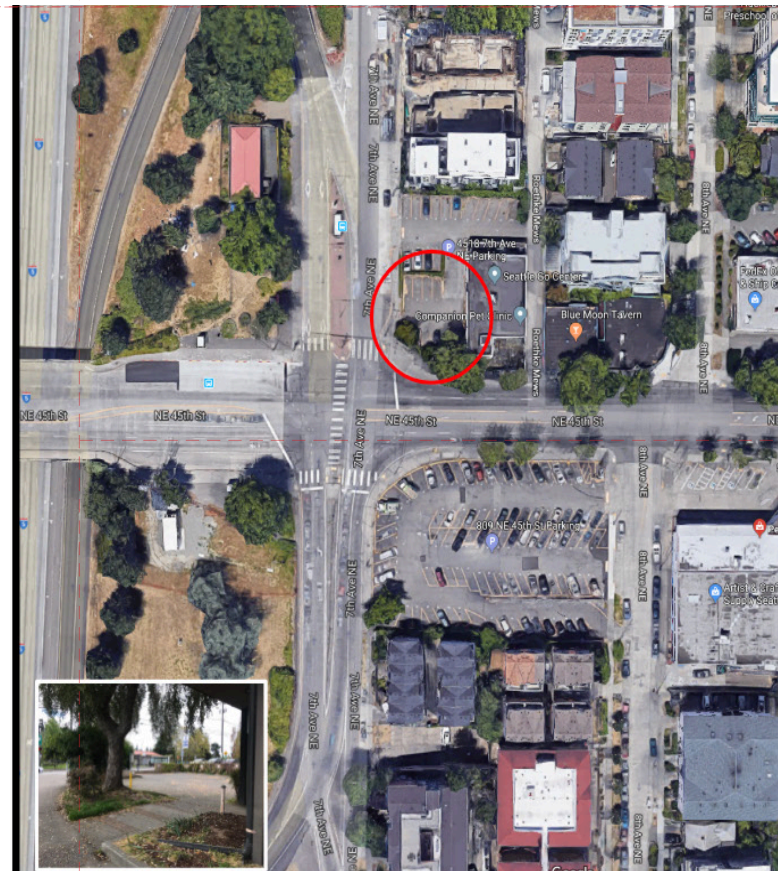
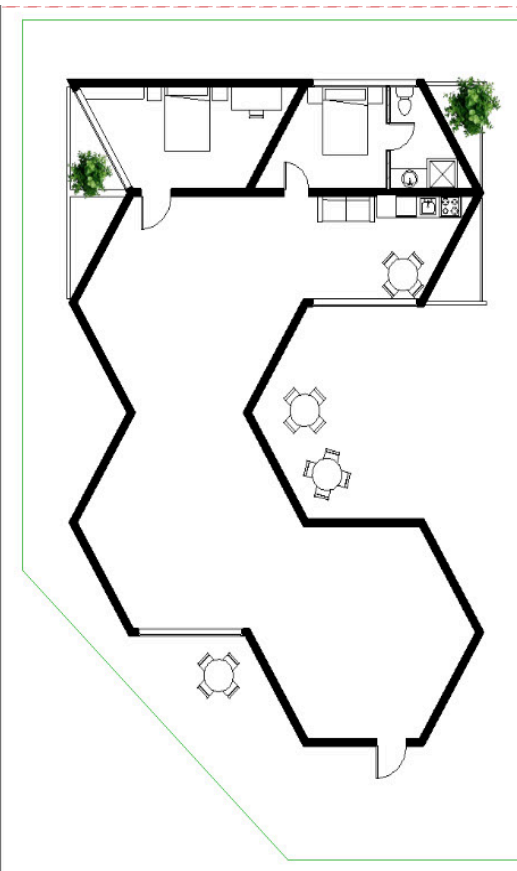
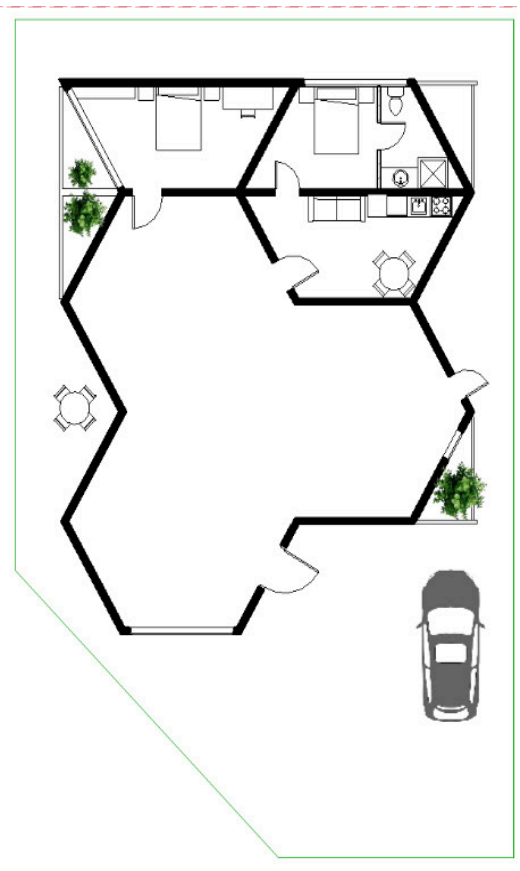
SITE SELECTION

For a small scale ephemeral community, a weird triangular site, or a funny little corner that barely fits a couple units, could be a site for a live-work retail project. Because Ephemeral Architecture is designed for quick assembly and disassembly, the tenants are able to change the shape of the building to fit their business. (see the opposite page)

A medium-scale, more permanent community can take the form of a courtyard community, facing inward, to separate the residential space from the noisy street. This represents a version that is less "ephemeral" and could be more of a "permanent" housing block. There are various possibilities in a large site. (see time line diagram on page 87)



OPPOSITE, LEFT TOP Medium-scale. (fig. 69)
OPPOSITE, RIGHT TOP Large scale. (fig. 70)
OPPOSITE, BOTTOM A courtyard community, facing inward. (fig. 71)
BELOW A live-work retail space. (fig. 72)
RIGHT Small scale. (fig. 73)



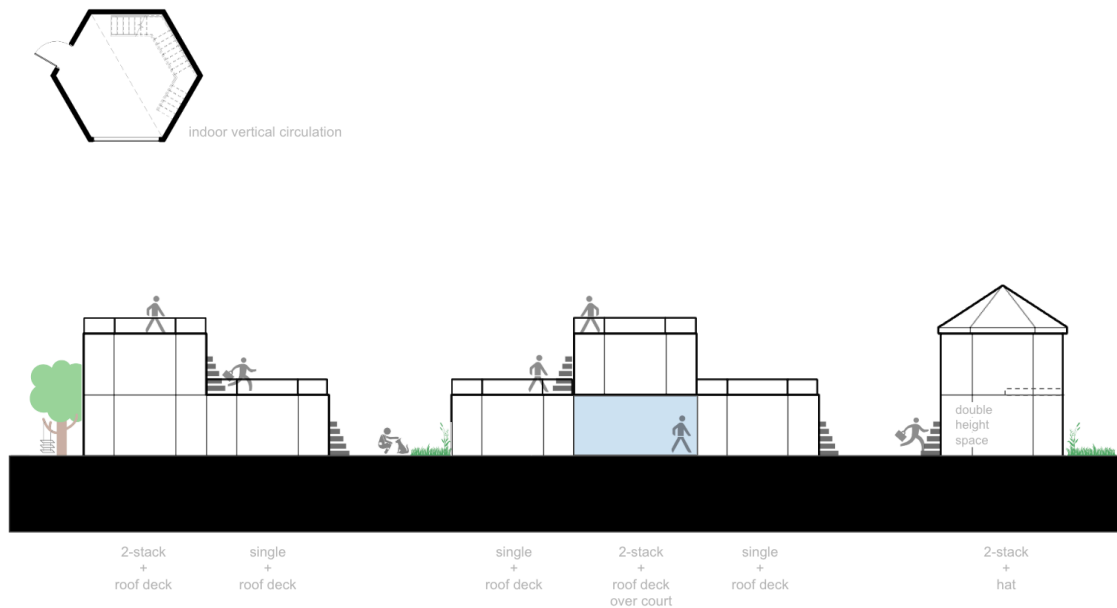
TPOLOGY

There are different possibilities to create various typologies. Ephemeral Architecture divides them by the scales— small, medium and large scales.

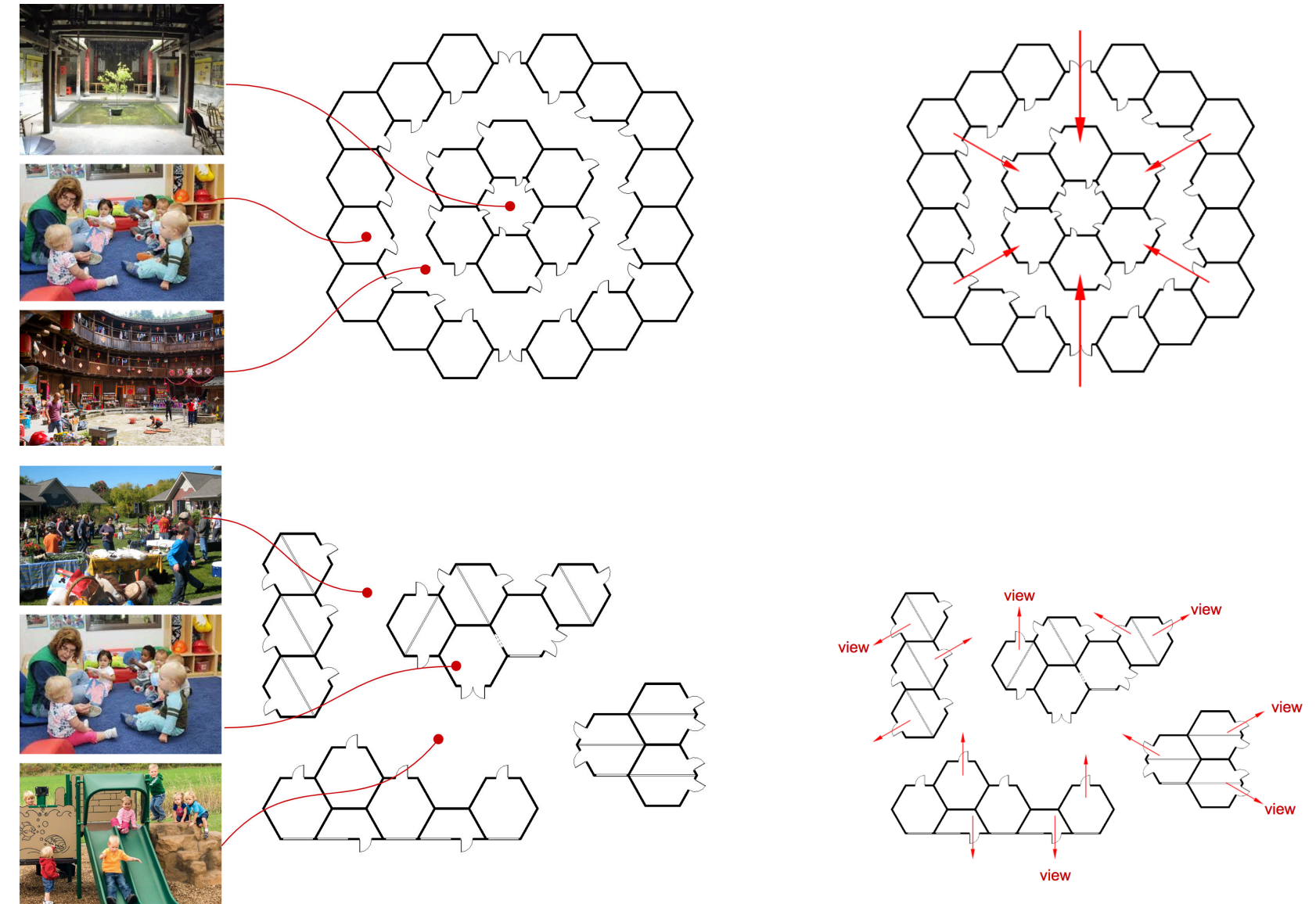
The small scale works more like a camp site of single units. People come and people go.

The medium scale has a couple units together and starts to form a community, which is facing outward, open to the community so that neighbors can join them to share the common area, including the playground and possibly a daycare center. Facing outward, this type could be arranged in a quiet neighborhood.

In contrast, facing inward is safer for children to play in the courtyard, and part of the central common units can be used as a daycare center. The facing inward style works for small scale as well if only 6 units form a circle together.

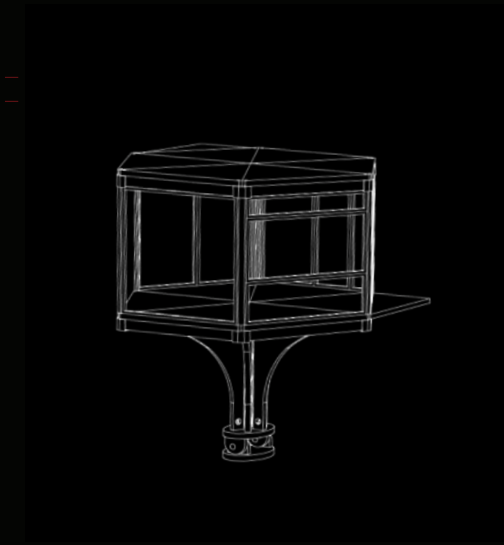


OPPOSITE Small scale. (fig. 74)
TOP Large scale, facing inward. (fig. 75)
BOTTOM Medium scale, facing outward. (fig. 76)

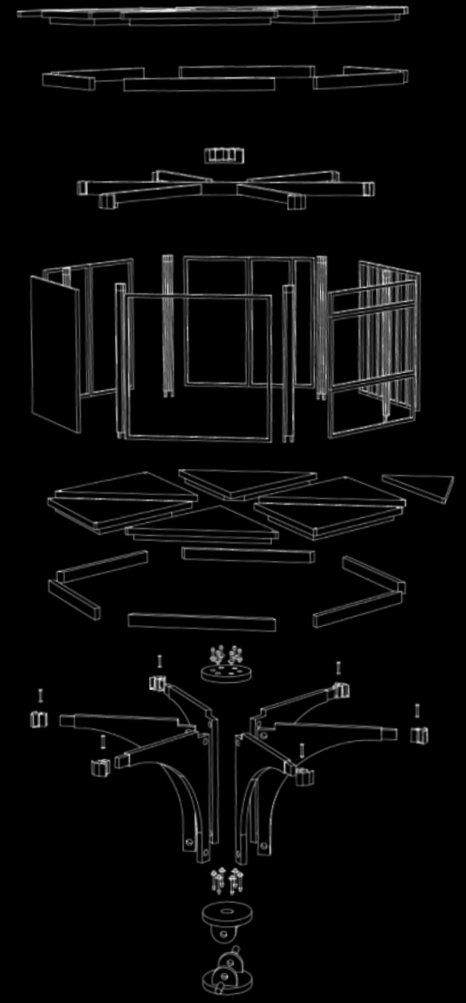
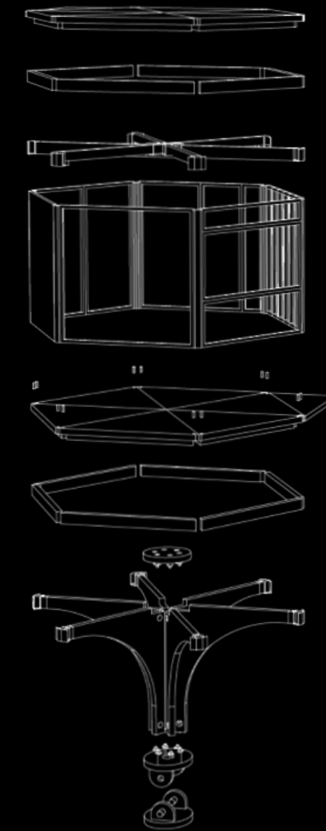
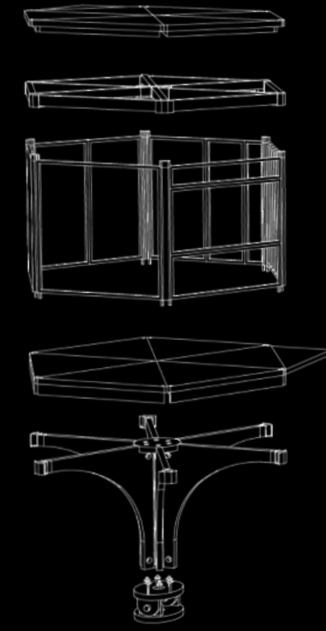


KIT-OF-PARTS

The explosion diagram shows the parts of the kit-of-parts. Note that the pedestal "part" requires adjacent units for lateral support.

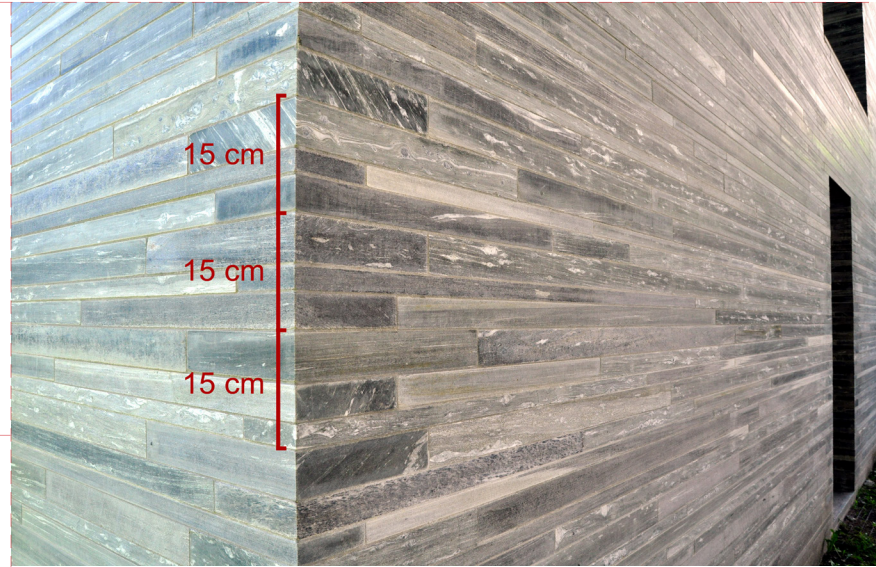


BELOW Explosion. (fig. 77)

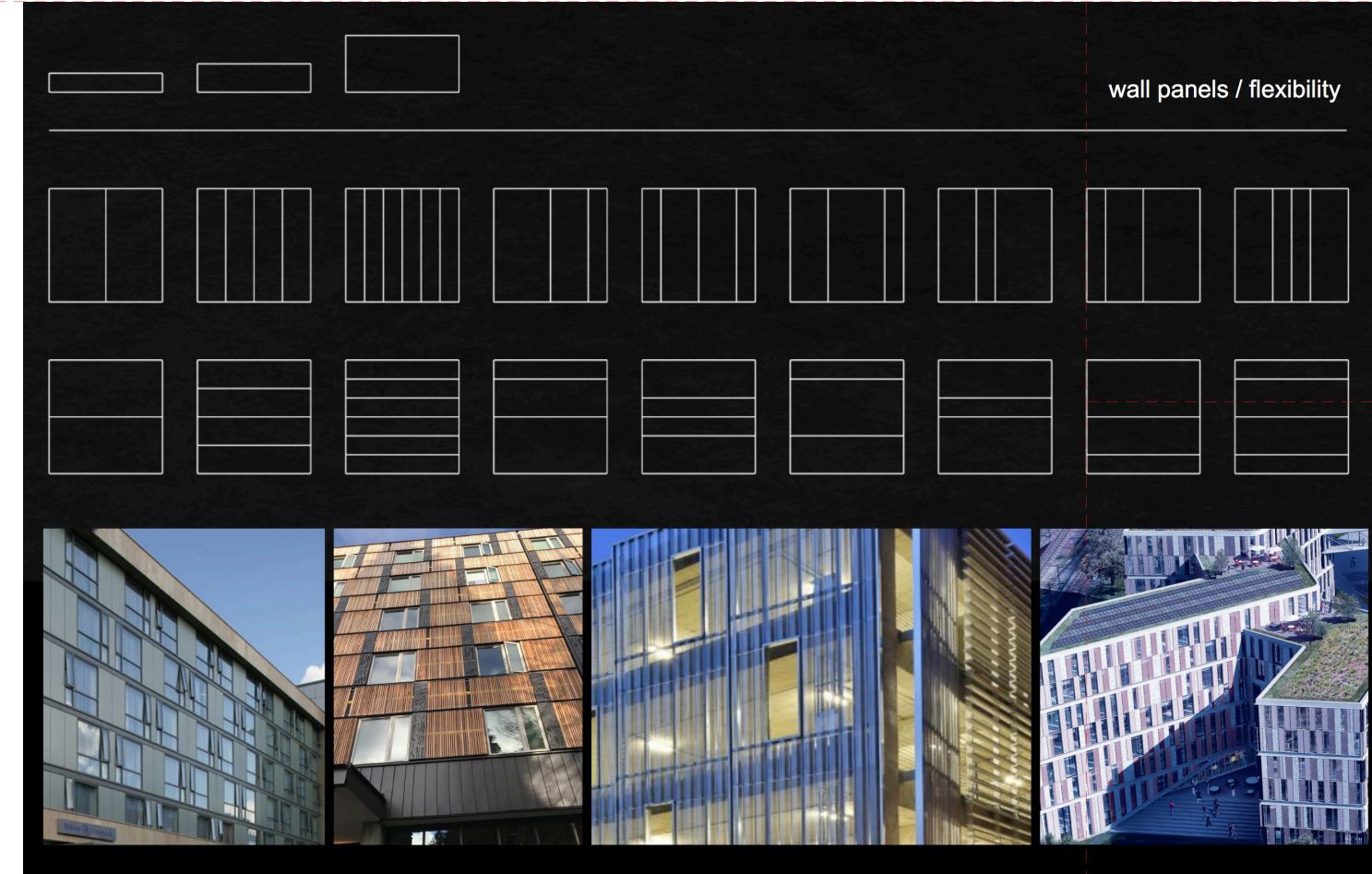


FLEXIBILITY

The design of wall panels is aimed at both performance and flexibility, and was inspired by Peter Zumthor. In Therme Vals, Zumthor uses only three elements to orchestrate the various patterns for the wall. Ephemeral Architecture's wall panels are based on three different proportions and are placed vertically or horizontally to create various panel types. With different choices of materials, there are innumerable possibilities. That's the flexibility of the façade treatment.

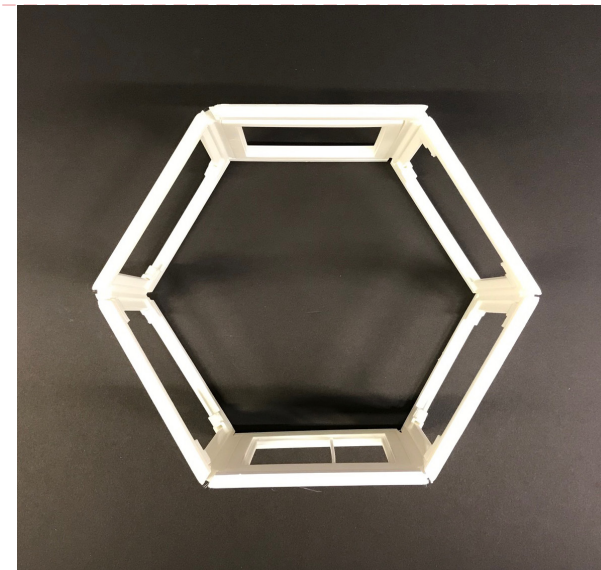
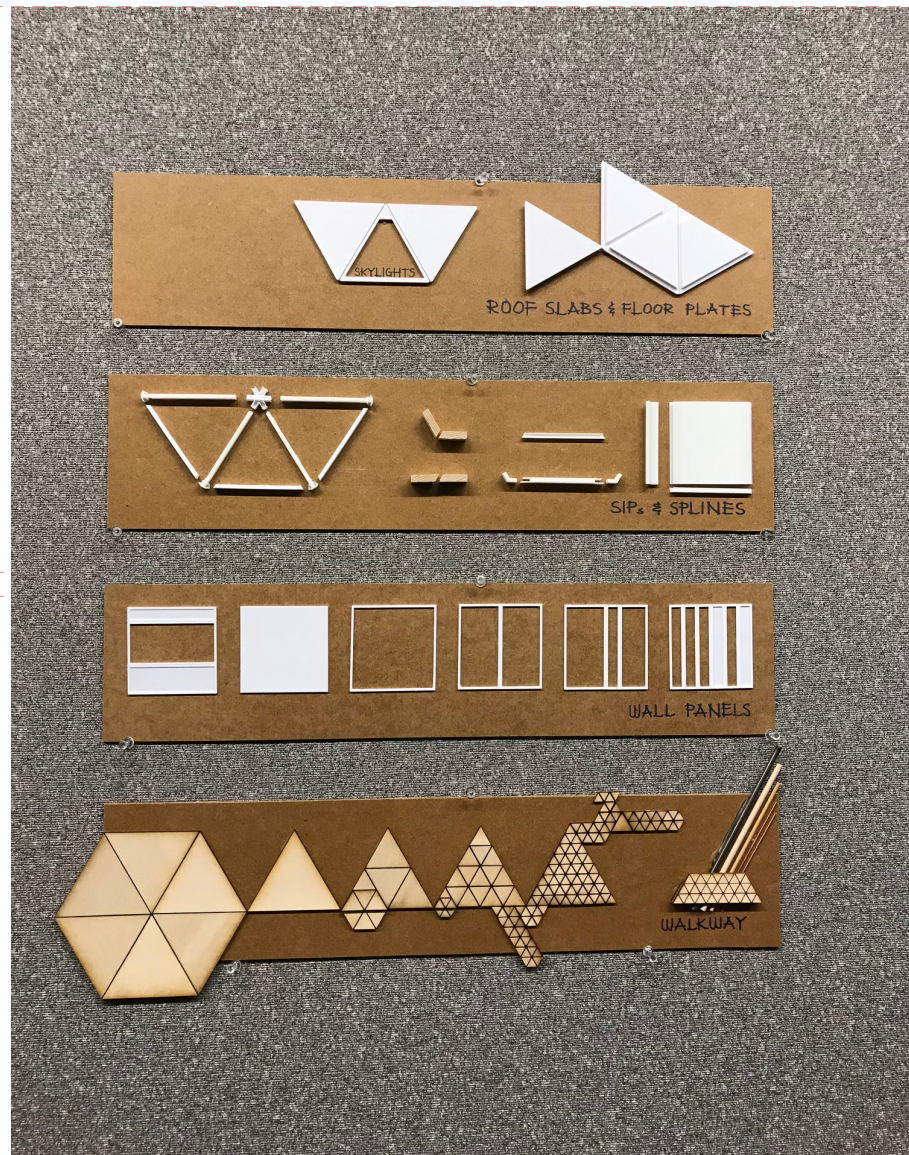


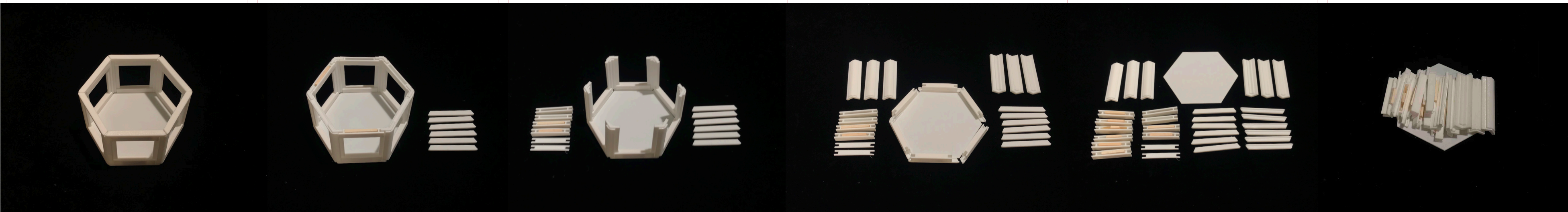
OPPOSITE Peter Zumthor's wall details. (fig. 78)
BELOW Variety of the wall panels. (fig. 79)

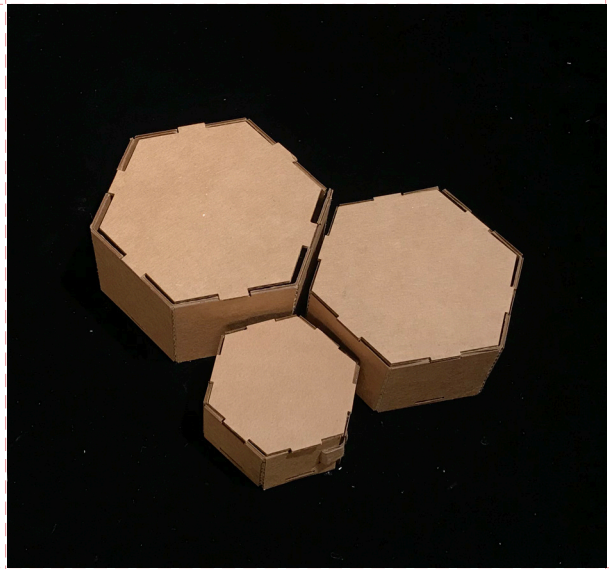
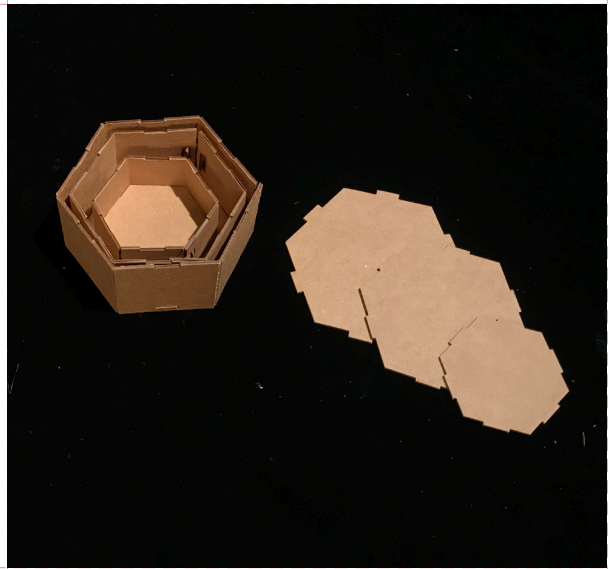
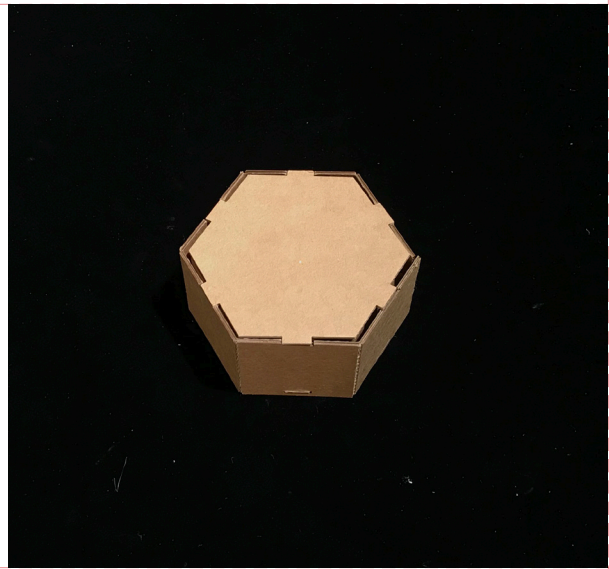
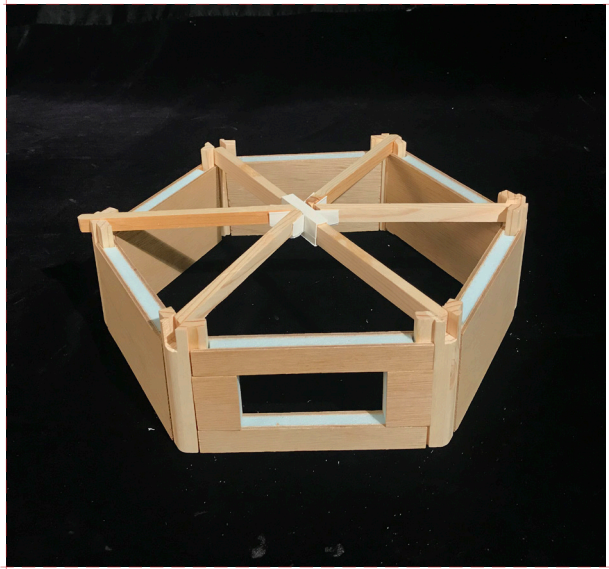
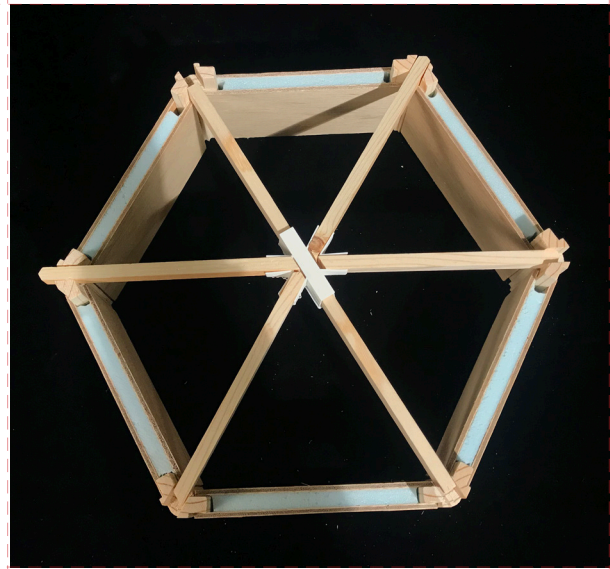
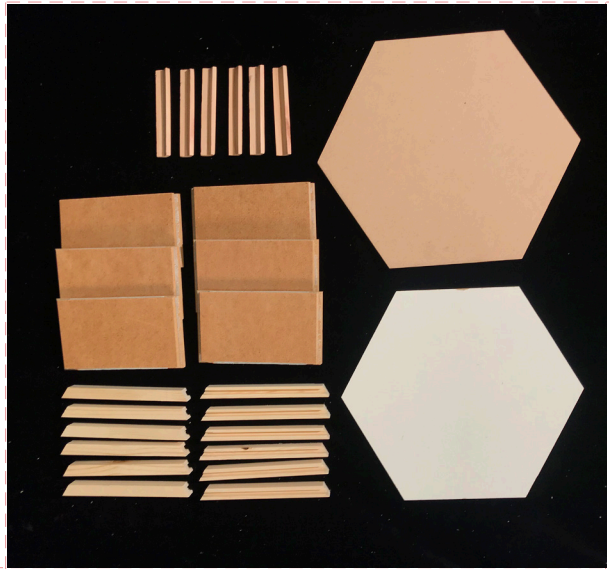
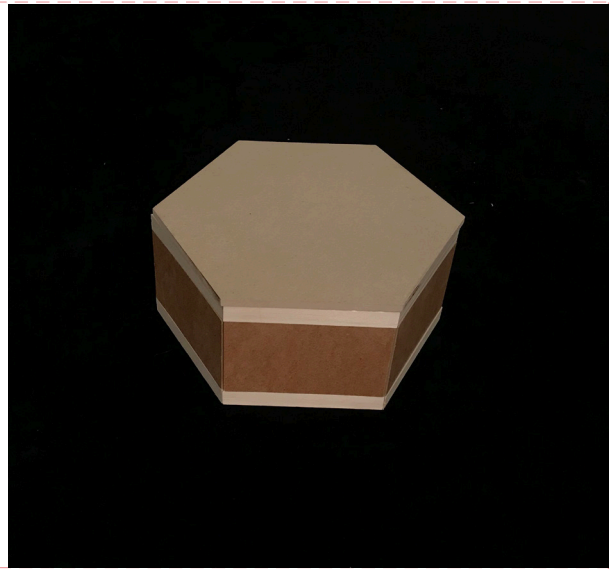
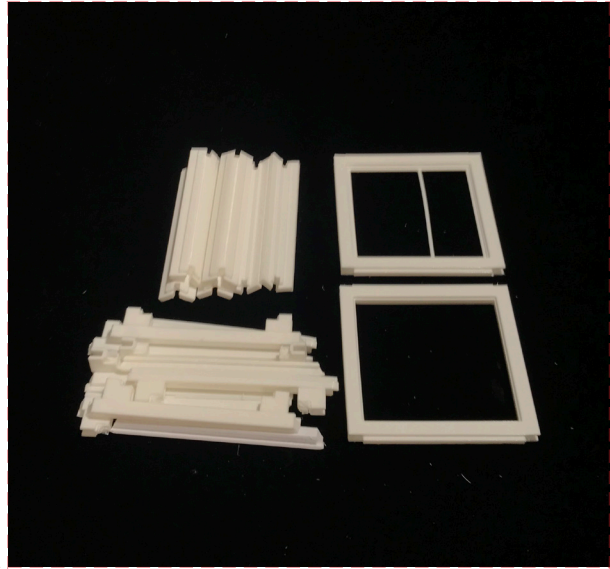
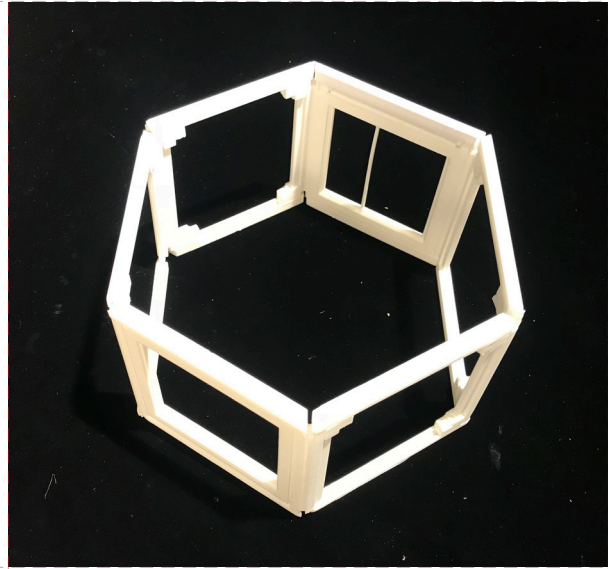


PROTOTYPING PARTS AT FURNITURE SCALE

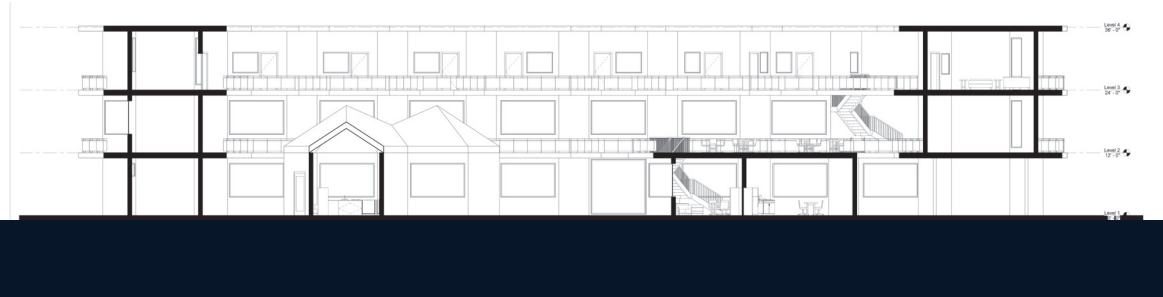
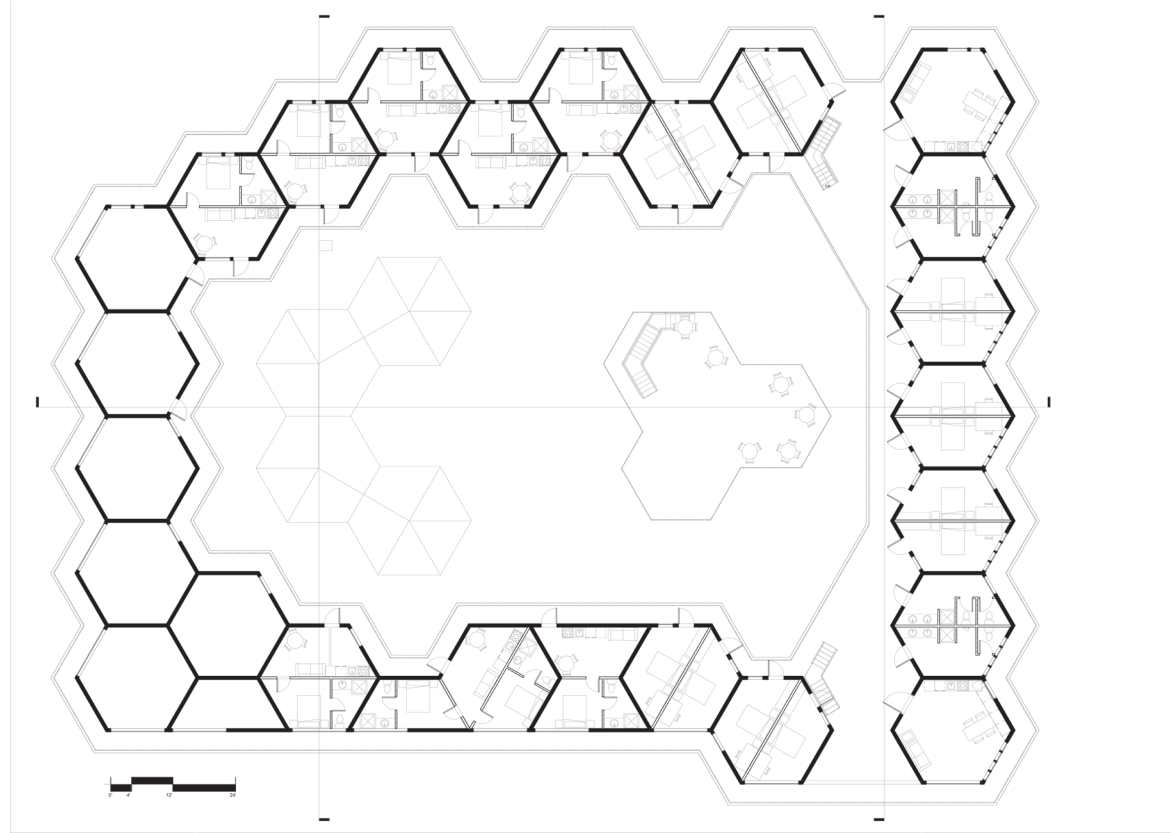
Prototyping parts at the scale of furniture, creating children's seating block and storage blocks, allowed me to explore the kit-of-parts idea at a smaller scale to work out some of the details. At this smaller scale it was easier to test how to design and fabricate parts that can easily be joined, separated and re-assembled with different parts. This furniture serves as a smaller scale analogue of a building, with fewer structural, thermal, and water-proofing complications of the building scale assemblies. In this case, a SIP assembly makes sense at the furniture and the building scale. Normally, when people buy a book shelf in Ikea, they are heavy. If we use a SIP system, the furniture is light and strong.



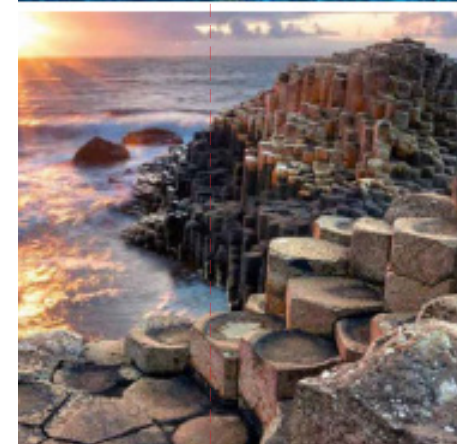
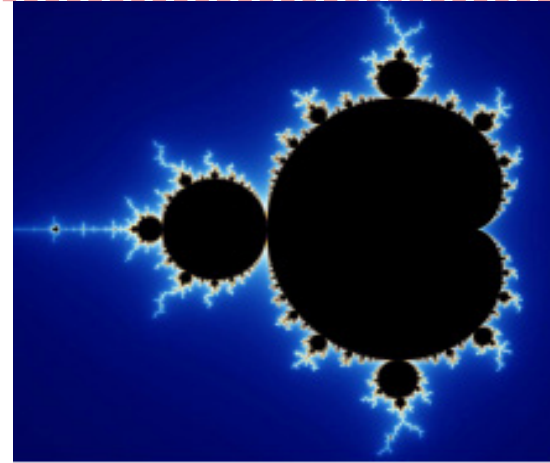
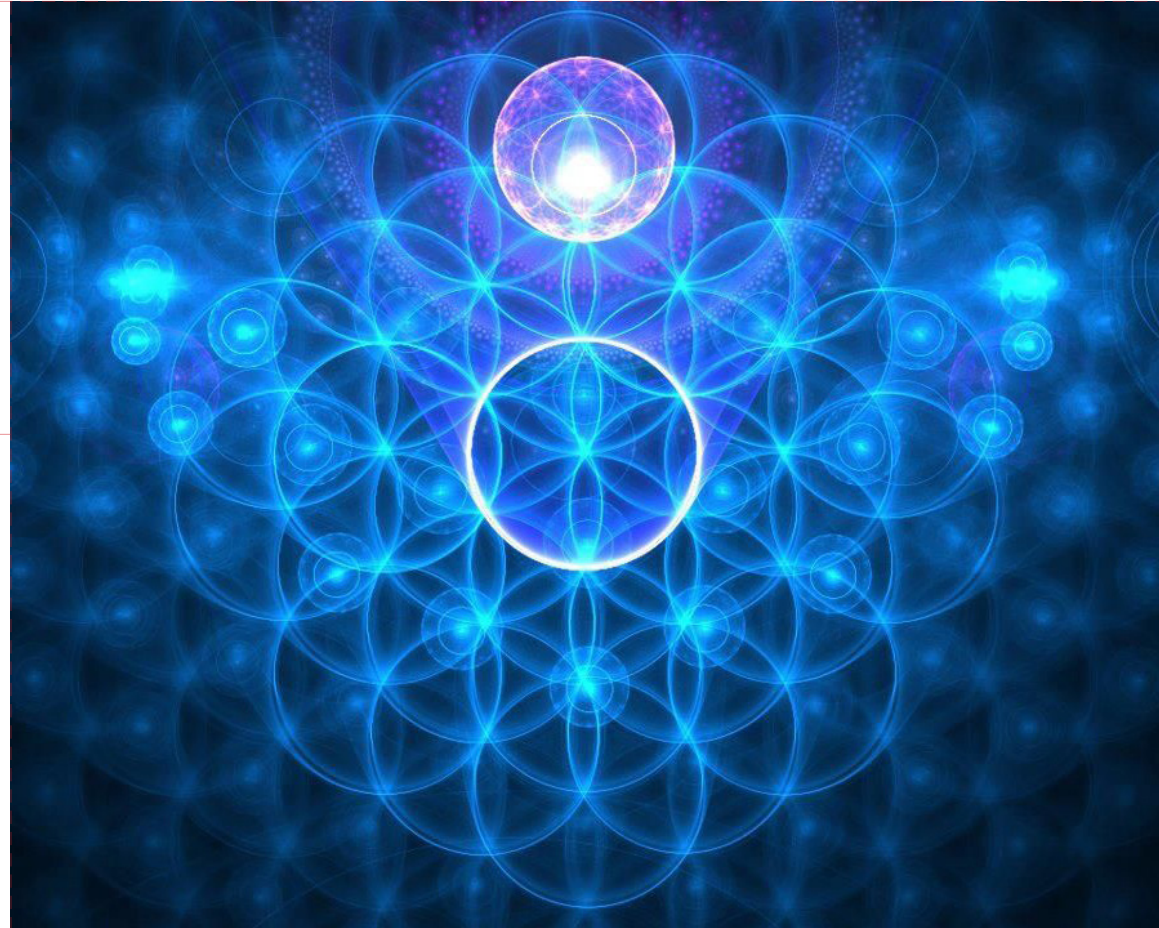








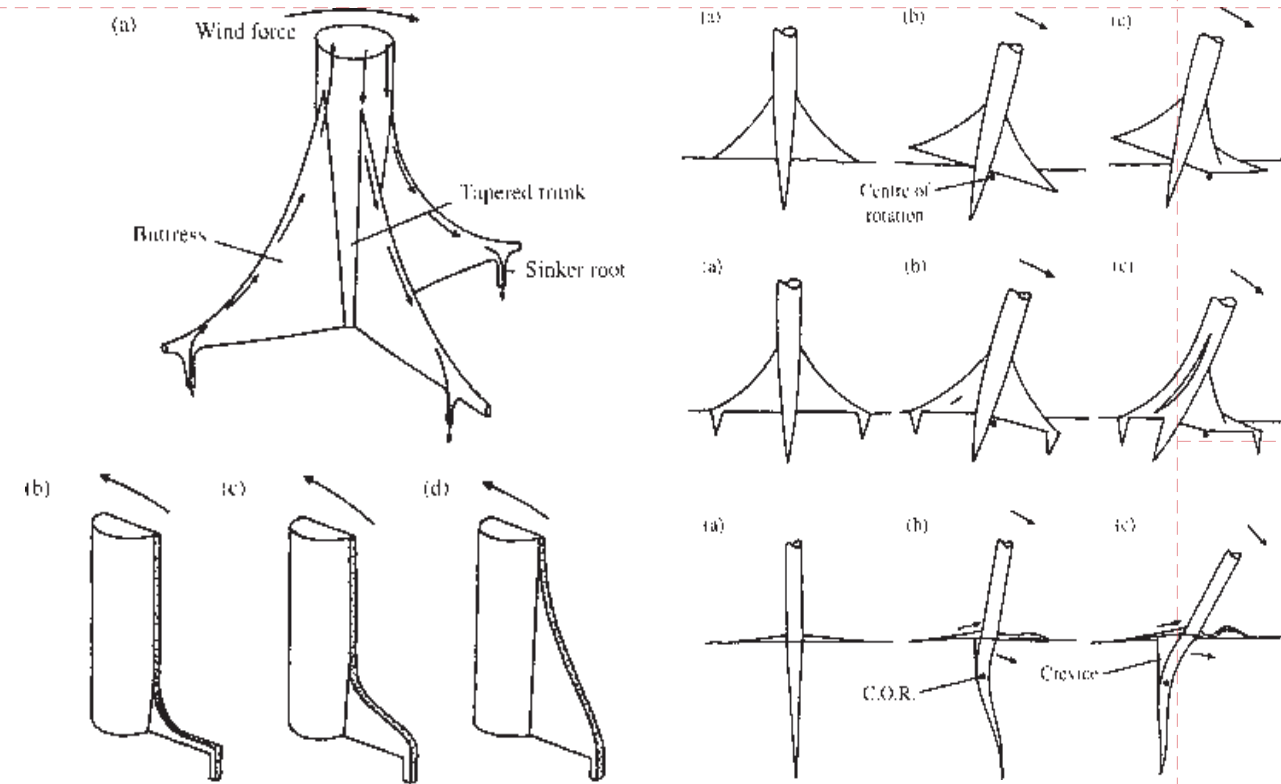
BIOMIMICRY DESIGN



BIOMIMICRY DESIGN



The column design adapts the Kapot tree.....
Nature always has simple but elegant way to solve the problem.



notes

1. https://www.researchgate.net/figure/Giants-of-the-rainforest-Trees-in-intact-rainforests-such-as-the-Tongkoko-Reserve_fig1_273782198
2. https://www.academia.edu/32391136/The_function_of_buttress_roots_a_comparative_study_of_the_anchorage_systems_of_buttressed_Aglaiia_and_Nephelium_ramboutan_species_and_non-buttressed_Mallotus_wrayi_tropical_trees
3. <https://www.climate-policy-watcher.org/rain-forest/trees-form-mechanics-and-hydraulics-tree-stature.html>

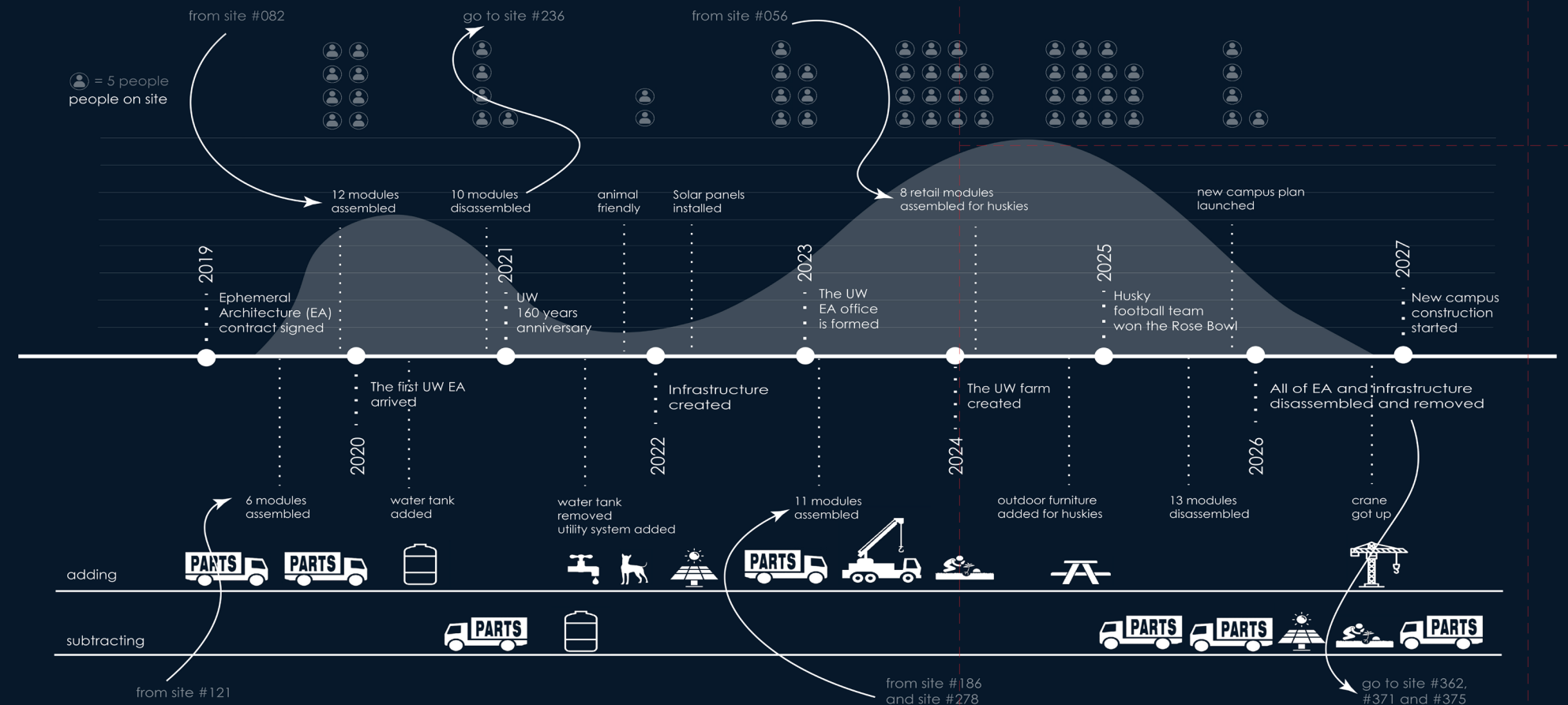
Memory the length of time over which
recollection extends

the memories of TIME



the memories of TIME
 the memories of nature
 the memories of machine
 the memories of architecture

OPPOSITE, LEFT BOTTOM The memories of nature.
 OPPOSITE, RIGHT BOTTOM The memories of machine.
 OPPOSITE, TOP The memories of nature and machine.
 BELOW Time line diagram.



Conclusion

Growing up in the island nation of Taiwan, I understood the idea of "carrying capacity" and finite resources. In an article on a Method of Defining "Sustainability," Andrew Basiago calls this planet the "Earth Island," which recognizes that resources are finite on this Island we inhabit. Ephemeral Architecture aims to create no waste, to find wasted

space and make it more useful, and to employ a re-usable kit-of-parts to create ephemeral architecture. If successfully applied to in a city, it can address the housing crisis, the problems of construction waste and demolition waste, eliminate the blight of vacant land, and create spaces that brings health and happiness to people and achieve

sustainability simultaneously. While Ephemeral Architecture is designed to be temporary, but it can also be the building blocks for more permanent inhabitations. This is the proposition of Ephemeral Architecture.