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Transforming Architecture: Engaging the Built Environment

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TRANSFORMING ARCHITECTURE

ENGAGING THE BUILT ENVIRONMENT

RYAN GREGORY HIER

TRANSFORMING ARCHITECTURE:
ENGAGING THE BUILT ENVIRONMENT

by
Ryan Gregory Hier

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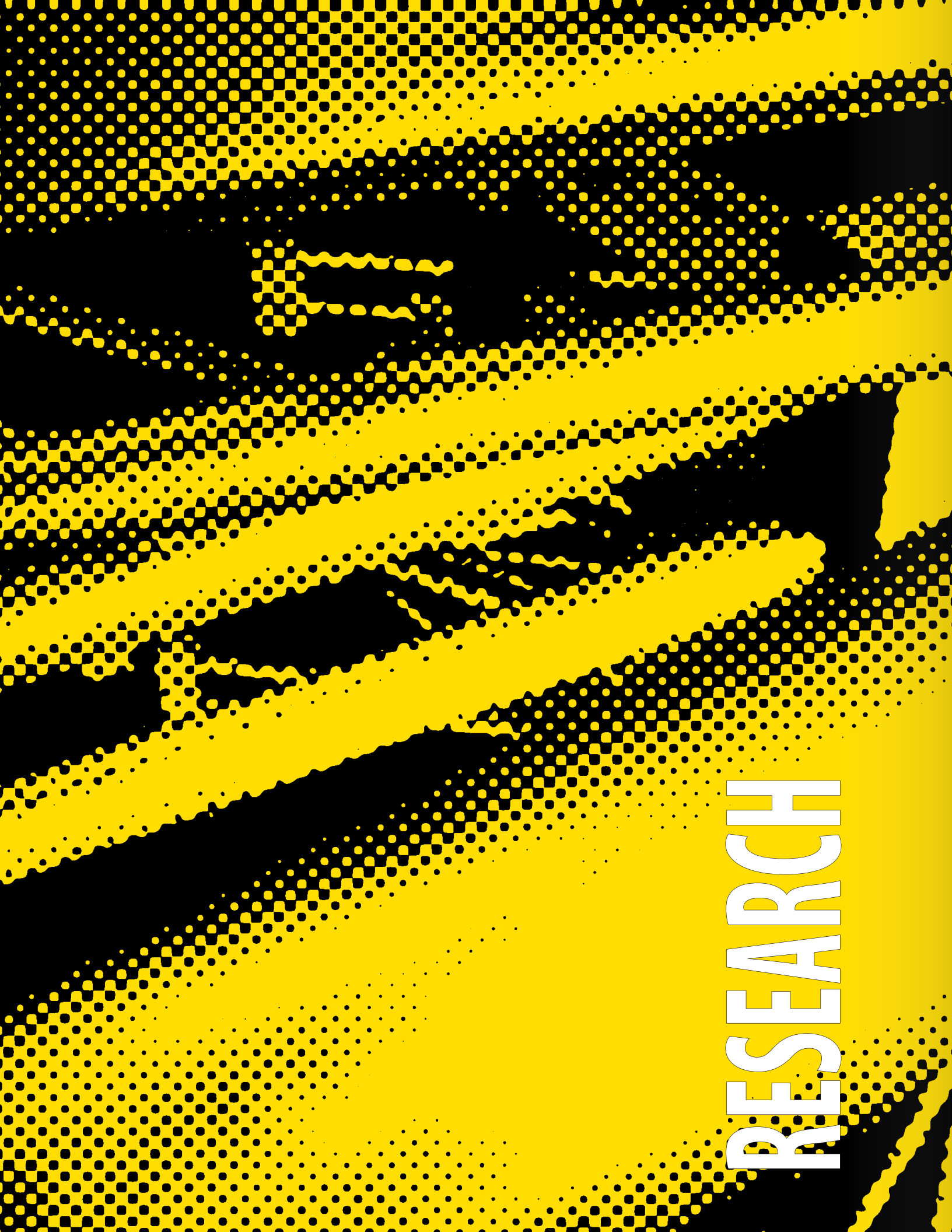
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Contemporary society is transfixed by the newest piece of technology. More often than not these devices serve as commodities; eliminating a certain amount of burden from daily life. The architectural realm is no different. Building design decisions are constantly scrutinized by their ability to perform, with respect to energy consumption and conservation. However, there is a different type of building performance worth considering: the act of transformation. Transformable architecture has the ability to change structure, space, and function through physical movement of the architecture.

In an age where technology succeeds in disengaging humans from interaction with each other, it can also succeed in the design and fabrication of architecture that facilitates active participation and engagement between users and the built environment.



RESEARCH

Technology increasingly becomes more prominent in society. Living in this era where the impossible is continuously made possible we find ourselves enthralled by instant communication, dramatic architectural wonders, and many other technological achievements. But what exactly is technology? Martin Heidegger, heralded founder of philosophical technology discourse asks these and other significant questions in his essay, "The Question Concerning Technology." Analysis and comprehension of Heidegger's philosophy is paramount in engaging with technology and its role in architecture, society, and human experience.

"Technology is not equivalent to the essence of technology...likewise, the essence of technology is by no means anything technological."¹ Heidegger introduces his question of technology by laying a framework of thought for guiding the discussion; the vastness of philosophical discourse on technology provides many areas of digression. Heidegger identifies two definitions for technology: "Technology is a means to an end" and, "Technology is a human activity."²

1 | Martin Heidegger, *The Question Concerning Technology and Other Essays* (New York: Harper & Row, Publishers, Inc, 1977), 4.

2 | *Ibid*, 4.

These two statements are in fact, one holistic definition: the act of determining a means to an end is a human activity. Physically speaking the production, use, and purpose of tools, equipment, and machines categorize the means.

Tools and human action required represent the instrumental and anthropological definitions of technology.³ Through these definitions, Heidegger accentuates the difference between what is correct and what is true. In order to more deeply understand the essence, the truth of technology, it is necessary to more fully understand the instrumental. Instrumentality is the fundamental means and end associated with technology. "A means is that whereby something is effected and thus attained."⁴ This statement summarizes the axiomatic cause and effect (means and end) relationship. Philosophy identifies four causes which comprise the premise of causality as it relates to instrumentality: material, form, function/end result, and effect produced. The function or end-state required determines material and formal specifications of an object. Produced or desired

3 | Martin Heidegger, *The Question Concerning Technology and Other Essays* (New York: Harper & Row, Publishers, Inc, 1977), 5.
4 | Ibid, 6.

effect is the bringing-forth, the physical manifestation of an initial idea. Heidegger uses the example of a chalice, a significant object present in many Christian rites. Material and formal characteristics are chosen based on the required end-state established by Christian rite. The effect of the chalice is produced by the amalgamation of the three initial causes; material, form, and function. The four causes are thus responsible for the manufactured end result as it relates to instrumentality.⁵

The interpretation of responsibility in relation to the four causes is synonymous with the act of bringing-forth. "Every bringing-forth is grounded in revealing. Bringing-forth, indeed, gathers within itself the four modes of occasioning-causality-and rules them throughout. Within its domain belong end and means, belongs instrumentality...the possibility of all productive manufacturing lies in revealing...technology is a way of revealing. It is the realm of revealing, i.e., of truth."⁶ Bringing-forth or revealing, deals with concealment. Specifically, revealing is taking what was once con-

5 | Ibid, 6-9.
6 | Ibid, 12.

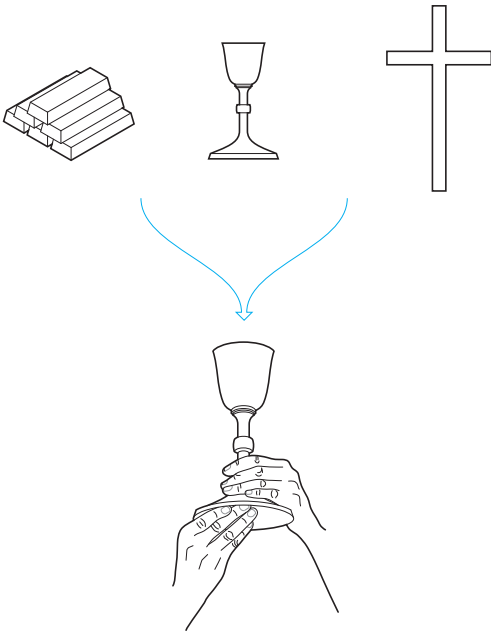


Figure 1

Figure 1 | The three causes: material, form, and function create the produced effect of the Christian chalice.

cealed (an idea, an object, etc.) and un-concealing; revealing it. Revealing relates to causality in that both correspond to physical manifestation of an object. Understood in this context, the essence of technology emerges. An instrumental and anthropological definition of technology as a means to an end is more accurately described as the process of making and creating.⁷

Heidegger distinguishes between technology and modern technology. How is modern technology more than a mere process of making and creating? "The revealing that rules in modern technology is a challenging, which puts to nature the unreasonable demand that it supply energy that can be extracted and stored."⁸ The challenging Heidegger speaks of relates to the role of man in achieving the essence of modern technology. Through his knowledge man is able to identify a stored potential present in all objects. Heidegger defines this process of identifying and exploiting the "standing reserve" as "enframing." To better understand revealing and enframing, it is helpful to envision an automo-

7 | Martin Heidegger, *The Question Concerning Technology and Other Essays* (New York: Harper & Row, Publishers, Inc, 1977), 10-12.

8 | Ibid, 14.

bile. When disassembled, an automobile is a collection of parts. Think of a wheel. By itself, the wheel is an instrument used in a variety of tasks usually involving transportation of objects or beings. Another automobile part, the frame (divorced from the context of automobiles) provides structure/support for other objects. The standing reserve of wheel and frame is the ability to become more than a transportation tool or structural support, respectively. When amalgamated into an assembly, the automobile is born. Each component part of the automobile has a stored potential to become a critical element of the automobile assembly. Enframing is the process of recognizing and producing that assembly.⁹

The essence of technology is the process of creating. Enframing is the process of assembling component parts to realize greater potential. Concurrently understanding revealing and enframing aids in situating technology in the context of contemporary society. Philosopher Don Ihde, comments on Heidegger, "...the essence of technology is not itself technological

9 | Ibid, 19-21.

but is existential.”¹⁰ It is essential to understand these principles when questioning the application of technology in architecture. Revealing and enframing-making and assembling—opens the door to rich discourse in architectural theory and application.

In his essay, “The Question Concerning Technology,” Heidegger began a discourse on the philosophical understanding of technology at its essence. While Heidegger’s findings contribute to the fundamentals of a technological dialogue, it is necessary to embed technology within the context of society and humanity to more accurately investigate its architectural implications. The philosopher Albert Borgmann offers a comprehensive analysis of society and technology in his philosophical inquisition, *Technology and the Character of Contemporary Life*. His breakdown of the benefits and shortcomings of technology and its impact on society presents a perspective worth investigation.

Borgmann begins his dissertation on technology and society by identifying the ill-defined nature of tech-

10 | Don Ihde, *Heidegger’s Technologies: Post Phenomenological Perspectives* (New York: Fordham University Press, 2010), 35.

nology. To give technology a more definitive backdrop, it is helpful to formulate three common theories typical of the phenomenon, which permeate throughout this dialogue. These are categorized as the substantive, the instrumentalist, and the pluralist views of technology. For purposes of this discourse, the substantive and instrumentalist views are most compelling considering the architectural ramifications of the different theories. Borgmann indicates the substantive view as, “...a comprehensive elucidation of our world by reducing its perplexing features and changes to one force or principle.”¹¹ In this case, the phenomenon of technology is given as the omnipotent explanation. Borgmann references the theorist, Jacques Ellul who correlates between the technical phenomenon and the employment of techniques. A technique is defined as any methodical procedure involving consciousness and judgment to achieve an end result, typically aligned with efficiency.¹² Under the guise of the substantive view, technology is the human process of solving problems—determining a means to an end. The instrumentalist view of technology

11 | Albert Borgmann, *Technology and the Character of Contemporary Life: A Philosophical Inquiry* (Chicago: The University of Chicago Press, 1987), 9.

12 | *Ibid*, 9.

relates to physical tools/machines and the human act of making and using those tools. This methodology is justifiably known as the anthropological approach to technology.¹³ Together, the means and end of the substantive view, and the fabrication and implementation of objects of the instrumentalist view, present a foundation for further exploration of technology.

While the substantive and instrumentalist views suffice as theories of technology, Borgmann introduces the purpose of technology. "Technology...promises to bring the forces of nature and culture under control, to liberate us from misery and toil, and to enrich our lives."¹⁴ Under these principles technology assumes a noble role in contemporary society. Liberation and enrichment each possess a common denominator—availability. For something to be liberating or enriching it needs to be easily accessible. Technology must be available, or as Borgmann says, "...instantaneous, ubiquitous, safe, and easy."¹⁵ Borgmann uses an example to further clarify this principle. Prior to the advent of central heating technology logs

13 | Albert Borgmann, *Technology and the Character of Contemporary Life: A Philosophical Inquiry* (Chicago: The University of Chicago Press, 1987), 10.

14 | *Ibid.*, 41.

15 | *Ibid.*, 41.

needed to be split, wood hauled and stacked, to create fires for garnering warmth. Central heating systems liberated man from the tedious process of collecting firewood, enriching life by eliminating the chore.

This scenario conveys a comprehensive view of technology's availability. However, further unpacking reveals a distinction between objects; the notion of "thing" and "device." Borgmann embeds a great deal of meaning into the "thing." "A thing...is inseparable from its context, namely, its world, and from our commerce with the thing and its world, namely engagement. The experience of a thing is always and also a bodily and social engagement with the thing's world."¹⁶ In essence, a thing involves an experience with the environment surrounding the thing in its natural location. Borgmann emphasizes the experiential aspects of interacting with the thing, engaging with its environment. For example, prior to central heating systems, fires were created in a wood stove or hearth. Embedded in the hearth were deeper themes of family togetherness and teamwork. Each member of the fam-

16 | *Ibid.*, 41.

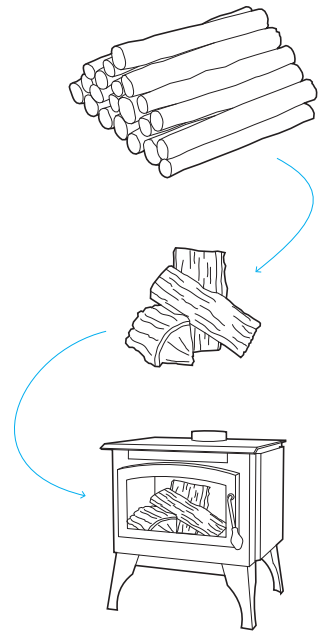


Figure 2

ily had their unique role in the manifestation of fire—mother built the fire, father chopped the wood, children gathered the wood, thereby actively engaging in the experience of the thing (fire/hearth).¹⁷ A thing indulges in process; the means, rather than simply the end result.

Things require physical engagement with an object. A device, on the other hand concerns itself with the purpose of technology; eliminating “unnecessary” processes, focusing on the end result. “A device...disburdens us of all other elements. These are taken over by machinery of the device. The machinery makes no demands on our skill, strength, or attention, and it is less demanding the less it makes its presence felt.”¹⁸ As a hearth requires human collection of firewood to fulfill the task of generating heat, the mechanisms embedded within a central heating device liberates humans from the physical chore. Under the pretexts of technology—liberating and enriching lives—reins the notion of commodity. A commodity is simply the purpose of a device. Beneath the umbrella of commodity, devices make goods and

17 | Albert Borgmann, *Technology and the Character of Contemporary Life: A Philosophical Inquiry* (Chicago: The University of Chicago Press, 1987), 42.

18 | *Ibid.*, 42.

Figure 2 | A thing embraces process, such as the process of chopping and gathering wood for a fire.

services available. The aspect of machinery and function are important to address regarding devices. Experiential qualities account for the means, giving depth to things. A broad understanding of a device neglects the means, while a focused analysis reveals the means and end relationship directly correlative to the machinery and function of the device, respectively. Contrary to that of a thing, changing the means (machinery) of a device does not change the end; the function remains intact. Mechanized improvements and elimination of the means becomes highly anticipated by society.¹⁹

To reiterate—things are concerned with the means; devices more predominantly with the end, or function. Throughout history and the advent of the technological and machine eras, devices gain an ever-present role in society, while things become more antiquated. Contemporary society gauges the success of a device on the degree to which an end can be enjoyed without engaging the means. This dissolution of means breeds the dissolution of social engagement between employers, workmen and clients, for example,

19 | *Ibid.*, 43-44.

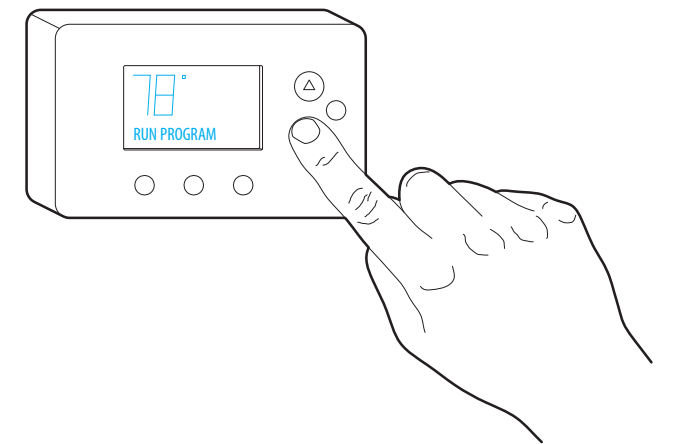


Figure 3

Figure 3 | A device creates a commodity, eliminating “unnecessary” processes.

once common in the pre-technological era. Real presence of things is replaced by the anonymity of concealed machinery in devices, successfully disconnecting users from any real understanding of context and experience.²⁰

Unpacking the distinction between things and devices, means and end, reveals the danger of anonymity with respect to people and their relation to the objects occupying daily life. Relying on and anticipating the availability of technologically innovative commodities, breeds a culture of illiteracy with respect to objects. It can be argued that further concealment of machinery and lack of worldly engagement can be credited to the evolution of thought and understanding of technology associated with devices. However, the level of technical skills and knowledge required to retain a progressive intellection of device technology is far too complex to be known by a large number of people.²¹ Recalling the purpose of technology, it is an attempt to liberate and enrich lives, not create a better understanding of the machinery behind devices. Perhaps the applica-

20 | Albert Borgmann, *Technology and the Character of Contemporary Life: A Philosophical Inquiry* (Chicago: The University of Chicago Press, 1987), 45-47.

21 | *Ibid.*, 47-48.

tion of technology, when carefully considering the means-end distinction and applied through the lens of the built environment, can more actively engage humanity.

Thing-ness celebrates human engagement while device-ness eliminates human engagement. With the amount of energy put forth into the conception and fabrication of new machine technologies, it is relevant to question the value of human engagement with the built environment. "Our bodies are in constant interaction with the environment; the world and the self inform and redefine each other constantly. The percept of the body and the image of the world turn into one single continuous existential experience; there is no body separate from its domicile in space, and there is no space unrelated to the unconscious image of the perceiving self."²² While experiencing a space, one develops a greater understanding of the space due to the relationship between the body and its surrounding environment. Humans learn best by experiencing, rather than simply observing space; engagement activates humans' mental and physical power allowing a more profound understanding and experience of built space.

22 | Juhani Pallasmaa, *The Eyes of the Skin: Architecture and the Senses* (London: Academy Editions, 1996), 44.



Figure 4

When presented the opportunity to engage a work of art, how do people react? The Mach.01 is a machine which includes a multitude of moveable armatures manipulated by the viewer. The idea behind this machine is to activate a space that is currently lacking engagement. There are intentionally few constraints to the Mach.01, placing control in the viewers' hands. Nothing required passersby to interact with the machine.



Figure 5



Figure 6

Figures 4-6 | The Mach.01 represented at three different states of movement.



Figure 7



Figure 8



Figure 9



Figure 10

Figures 7-10 | Various detail images documenting the design and construction of the Mach.01.

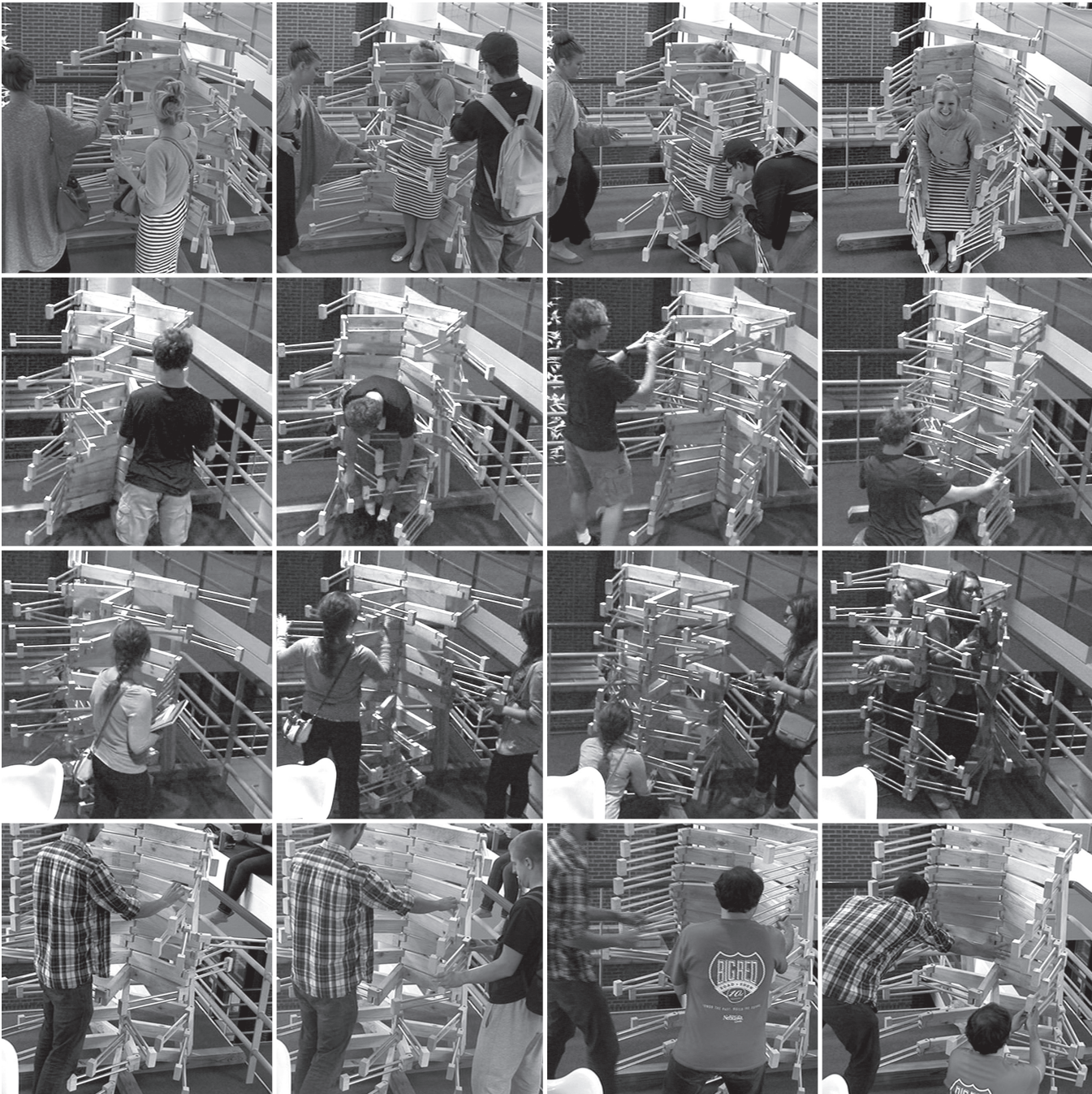


Figure 11
Figure 11 | An array of video captures of viewers engaging the Mach.01

The Mach.01 successfully activated the space and providing an opportunity for users to engage the machine. Its ability to move in a variety of positions facilitated creative exploration by those participating with the object. Over a 36-hour time period, multiple passersby stopped to investigate the machine supporting the hypothesis that, when given the opportunity, people seek engagement even if the object lacks functional purpose.

Despite the success of the Mach.01, there are a handful of characteristics that could have positively benefited the experiment. On one hand, the lack of constraints caused many people to disregard the presence of the machine. Without a perceivable purpose, users were forced to go out of their way to engage the object. While the inherent lack of purpose did benefit the experiment, the machine could have been embedded with multiple layers of interactivity, giving the user specific goals to reach when moving each arm. For example, the end face of each arm component could have been painted a different color creating a specific pattern when properly arranged.



When attempting to attain a holistic understanding of technology, it is necessary to engage this phenomenon through the guise of societal implications. Borgmann, in his discourse *Technology and the Character of Contemporary Life*, distinguishes an all-encompassing device paradigm which preoccupies contemporary society with the function of technology, degrading experiential processes into various mechanisms and machinery. Recognizing the short-comings of the device paradigm, Andrew Feenberg suggests an alternative scheme to the technological discussion. Feenberg's *Transforming Technology: A Critical Theory Revised*, critically analyses existing theories of technology, and more deeply questions the impact of technology on contemporary society.

Due to the subjective nature of the technological phenomenon, multiple technology theories exist with varying interpretations. Borgmann identified two fairly conclusive theories, the instrumental and substantive theories. Feenberg situates these theories in opposition to his "critical theory" of technology, introducing a more

pointed relationship between society and the respective treatises. In order to garner a greater understanding of Feenberg's critical theory it is necessary to fully understand the depth within the instrumental and substantive theories. Generally speaking, instrumental theory delineates society's most elementary understanding of technology; tools used to complete various operations. Beyond this axiom, "Technology is deemed 'neutral,' without valuative content of its own."²³ Further unpacking this neutrality reveal four principles implicit within the instrumental theory. The first neutrality principle simply outlines the emotional detachment between the instrument, technology, and the host of functions it can achieve. The second principle speaks to the universality of technology in the context of diverse societal constructs; technology is generally unconstrained by the specifics of social institutions. Similarly to the second, the third principle confronts social implications but at a much larger scale; because of the relative truth technology embodies, successful application of technology in society 'A' is as-

23 | Andrew Feenberg, *Transforming Technology: A Critical Theory Revisited* (Oxford: Oxford University Press, 2002), 5.

sumed to be successful in society 'B'. The final principle communicates the efficiency standards of technology. Empirically speaking, technology can be measured universally, thus providing identical technological improvements across diverse countries, eras and contexts.²⁴

Contrary to the instrumental theory of technology the substantive theory, most predominantly defined by Ellul and Heidegger, "...argues that technology constitutes a new cultural system that restructures the entire social world as an object of control."²⁵ Under the pretexts of this theory, technology is responsible for a drastic paradigm shift in which socio-cultural habits are redefined. To further illustrate this paradigm, Feenberg references the conception of the fast food industry. "The substitution of "fast food" for the traditional family dinner can serve as a humble illustration of the unintended cultural consequences of technology. The unity of the family, ritually affirmed each evening, no longer has a comparable locus of expression."²⁶ By no means does this illustration blame the fast

24 | Andrew Feenberg, *Transforming Technology: A Critical Theory Revisited* (Oxford: Oxford University Press, 2002), 5-6.

25 | *Ibid*, 6-7.

26 | *Ibid*, 7.

food industry for declining values among contemporary family units. Rather it brings to light a preoccupation with technology as a way of life. In contrast, instrumental theory recognizes ingesting food simply as an operation embedded within the human system; fast food is the tool for solving the problem of hunger. Eating food to provide the body with energy is distilled to a technical process, eliminating social rituals and traditions typical of human routine. Substantive theory suggests a dichotomy between tradition and modernity, in which efficiency is adopted in place of tradition; technology establishes a new social context. This social commentary alludes to the debate between a technological society and a morally conscious society. Critical theory of technology challenges the misconceptions that technology must be in opposition to social values and suggests a restructuring of technology in accordance with these moral principles.²⁷

Instrumental and substantive theories offer two drastically different approaches to technology, yet greatly differ from Feenberg's

27 | *Ibid*, 6-8.

critical theory. "Critical theory argues that technology is not a thing in the ordinary sense of the term, but an "ambivalent" process of development suspended between different possibilities. This ambivalence of technology is distinguished from neutrality by the role it attributes to social values in the design, and not merely the use, of technical systems."²⁸ In its essence, the critical theory of technology reveals the overtones of society and humanistic expression in the technological. This belief differs from the instrumentalist understanding of technology simply as a tool with no correlation to social constructs. Critical theory combats the negativity of substantive theory by suggesting technological advancements must be cognizant of societal implications and work towards bettering, rather than dehumanizing society.²⁹ Embedded within the social sphere, critical theory requires a more pointed definition of technology derived primarily from instrumentalist theory. Feenberg identifies "primary and secondary instrumentalizations" - primary instrumentalization encompassing the means and end revealing put forth by Hei-

28 | Andrew Feenberg, *Transforming Technology: A Critical Theory Revisited* (Oxford: Oxford University Press, 2002), 15.

29 | *Ibid*, 14-15.

degger; secondary instrumentalization situating the physical tools and machines of primary instrumentalization in the context of society.³⁰ This rebrand of technology affects its very essence and fundamental building blocks. Suddenly, what was once understood as technology becomes synonymous with humanistic value systems of society allowing a more pointed agenda of enriching human lives.

Feenberg identifies the inaccuracies of the two most widely accepted theories of technology, instrumental and substantive theories, and offers a third opinion, critical theory of technology. Analysis of the instrumental and substantive theories suggests a current preoccupation with devices and efficiencies, emphasizing the lack of attention to implications on societal constructs and values. Critical theory proposes a reevaluation of technology. Infusing core values of society with the essence of technology creates an inseparable bond between social constructs and technology, allowing this new system to further enhance the lives of humanity. The architectural implications of critical theory offer

30 | *Ibid*, 175.

an unparalleled critique of a large percentage of present-day applications of technology. In particular, technology is most commonly used as a means of disburdening, rather than a means of enhancing social values through the built environment. Incorporating Feenberg's discourse on technology in design of the built environment, could lead to the discovery of new archetypes in the architectural realm.

Contemporary application of technology in architecture primarily manifests in a disburdening way (building systems, performative facades, etc) classifying many buildings as devices. Negative effects of technology are also prevalent within architectural education. Design software enables rapid production of drawings, thereby eliminating the need to fully understand how to visualize a space and draw a profile section, for example. With the substantial impact of things and devices on contemporary society, how can architecture reorganize the value of things—engagement—in the context of a device-driven society and discipline? This is not to suggest

reverting to a lifestyle reflective of things. Rather, it involves embedding the device with the value system of the thing. By engaging society, architecture can start reorganizing engagement in society and the discipline of architecture. Architecture should engage society through transformation. Transformation is changing the surface, volume, or form of a built space—altering the nature and/or character of the space through physical movement of structure, skin, and/or internal surface—in order to empower.

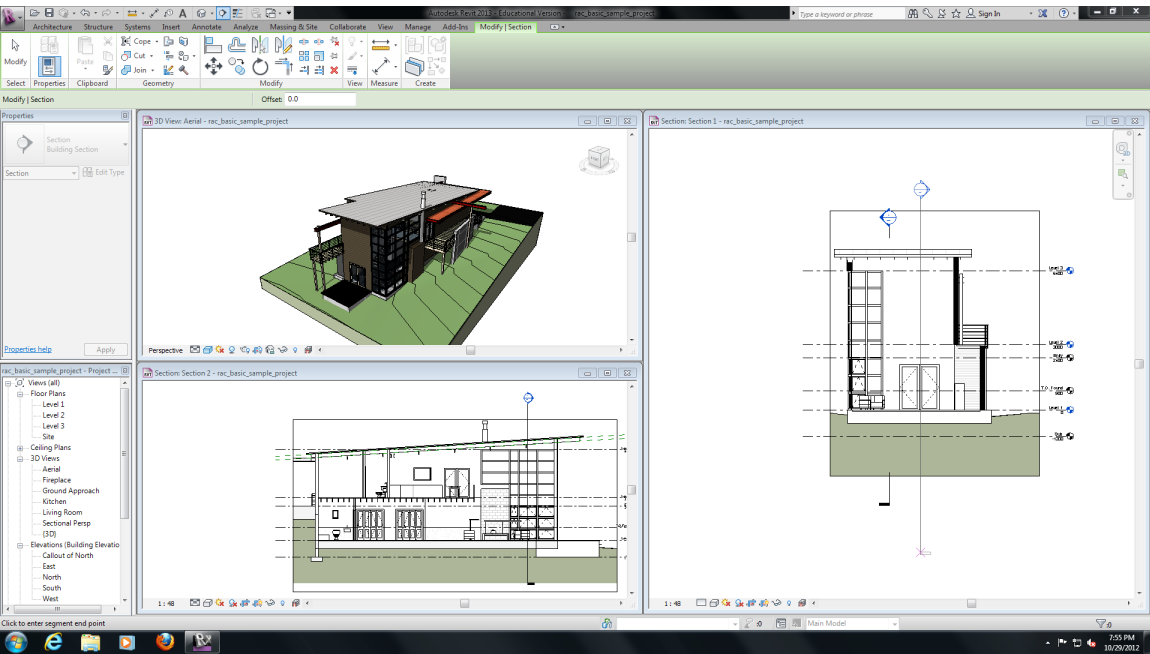


Figure 12
Figure 12 | Autodesk Revit interface documenting simplicity of using software to cut sections without understanding the fundamental processes involved.



Purposeful execution of transformation in the built environment results from the amalgamation of ethical, social, and poetic values saturating built space. Ethical values of transformation primarily concern themselves with efficiency and functionality of a space; transformation utilized for some measurable, quantifiable gain, such as amount of rainwater collected or square footage repurposed. Social values of transformation seek to provide and stimulate a new dimension of interaction and participation between humans and the built environment. Poetic values of transformation effect the overall nature and character of the architecture, "...in the sense that it becomes physically different and also that it realizes its potential in a way that mere conventional architecture cannot."³¹ Only through vigilant application of all three values—ethical, social, poetic—can architecture transcend transformation merely for sake of spectacle.

31 | Robert Kronenburg, *Flexible: Architecture that Responds to Change* (London: Laurence King Publishers, 2007), 155.

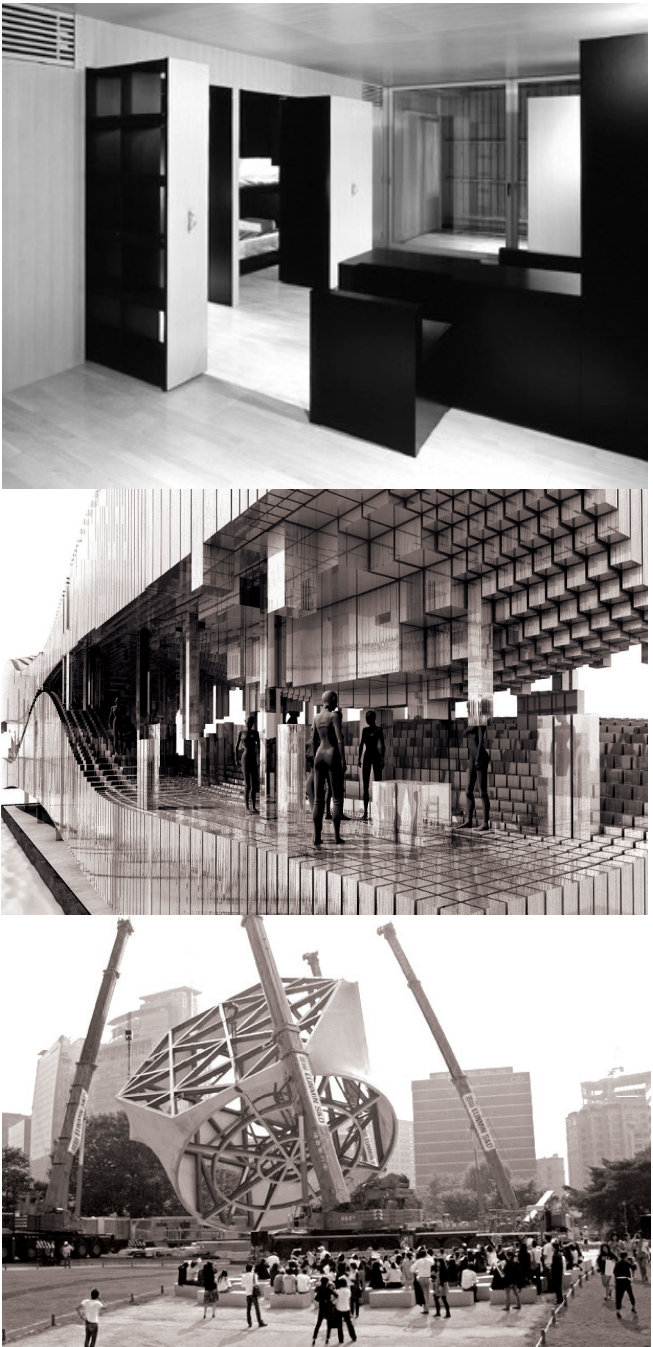




Figure 13



Figure 14

Figure 13 | "Closed" configuration | Arian Mostaedi, 202
Figure 14 | "Open" configuration | Arian Mostaedi, 202

The Drawer House, designed by Nendo, is located in Tokyo, Japan. The main parti behind the project relates to the dichotomy between activity and rest present within a residence. While at rest, it is unnecessary to have all of the typical residential furnishings and accessories sitting out. Nendo designed the house to conceal the clutter of typical residences when it is not needed. Ethical value of this project manifests in its ability to make the most of a residence with a relatively small footprint. Geographically speaking, Japan is at a minimum for space; conceiving of a design which capitalizes on a small footprint sets an example for future consideration.

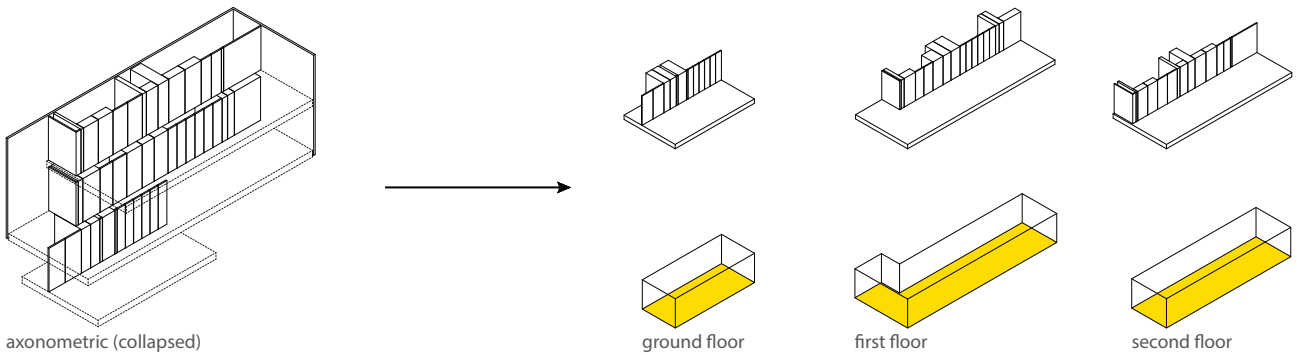


Figure 15

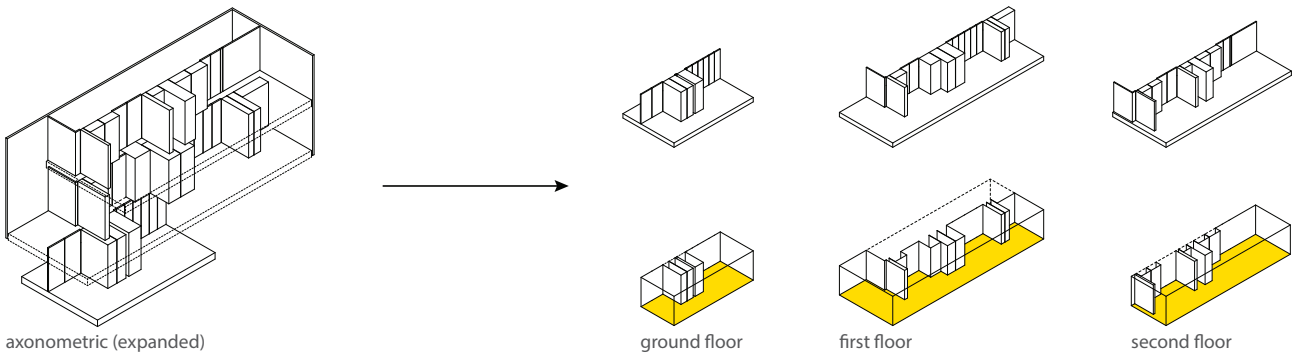


Figure 16

Figures 15-16 | Axonometric diagram of opening and closing operations within Drawer House.

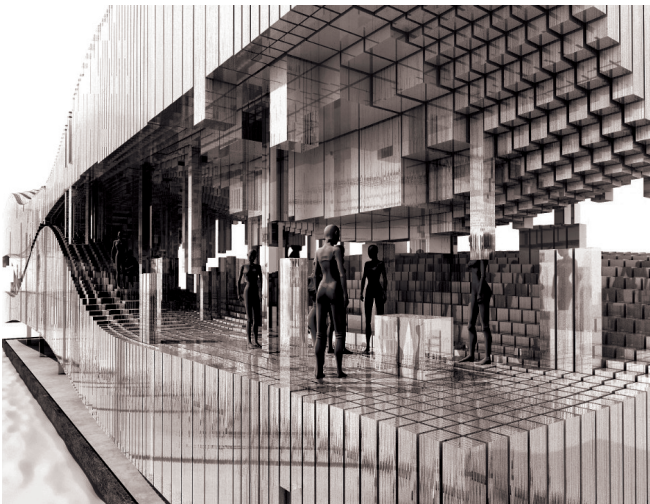


Figure 17

HiDrone is an adaptable architecture gallery project designed and developed by SPARC, a research team at the Massachusetts Institute of Technology. The HiDrone operates between two states: an open, habitable space and a closed, three-dimensional screen. Social value of HiDrone manifests in its ability to create various scales of social spaces, based on the individual units' response to the water cycles of the Thames River. These units control the amount of water contained within them through various pistons and mechanisms. Deformations occur on both the ceiling and floor planes, creating a multitude of unique, socially engaging spaces.

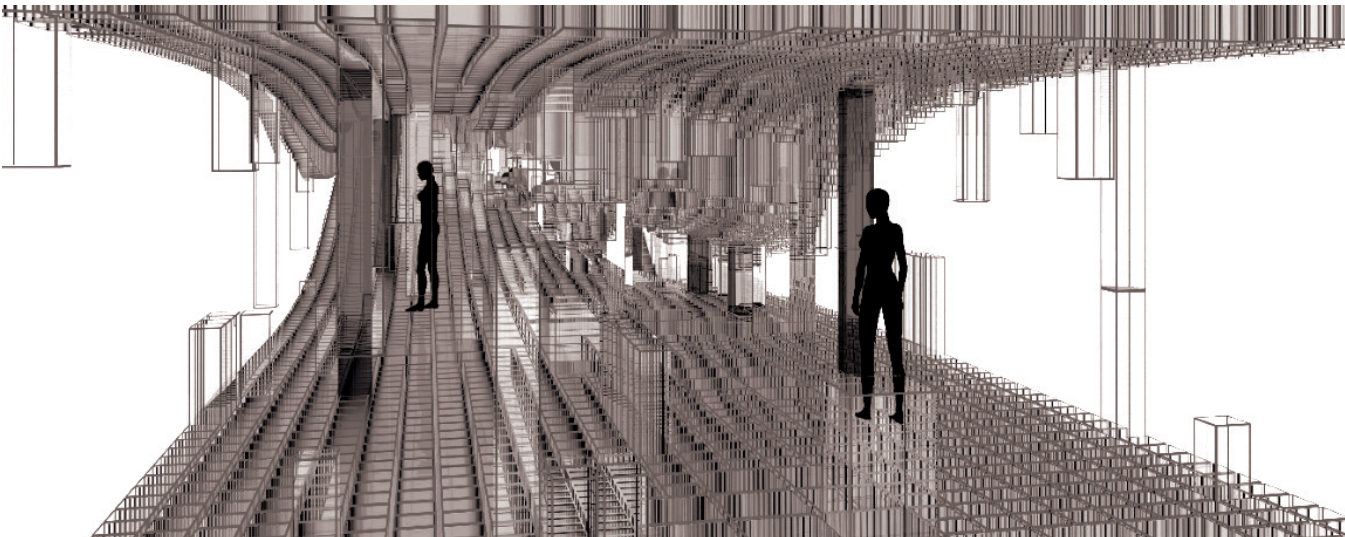


Figure 18

Figures 17-18 | Interior views of HiDrone creating social spaces. | www.archdaily.com/tag/sparc/

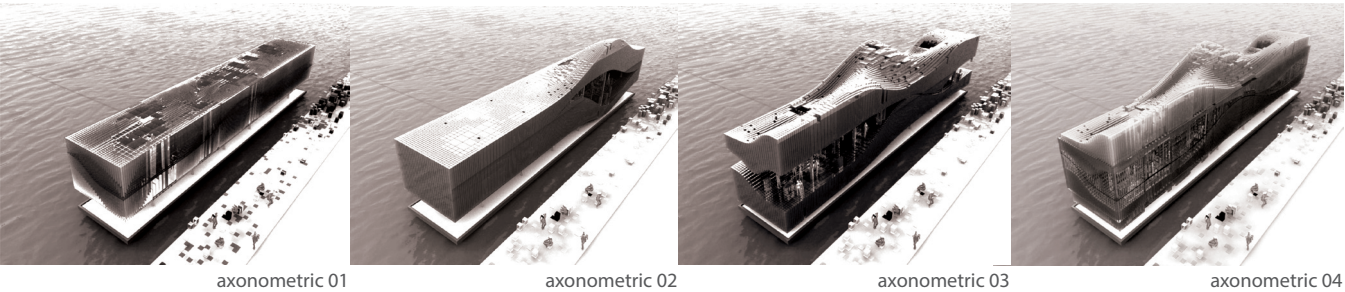


Figure 19

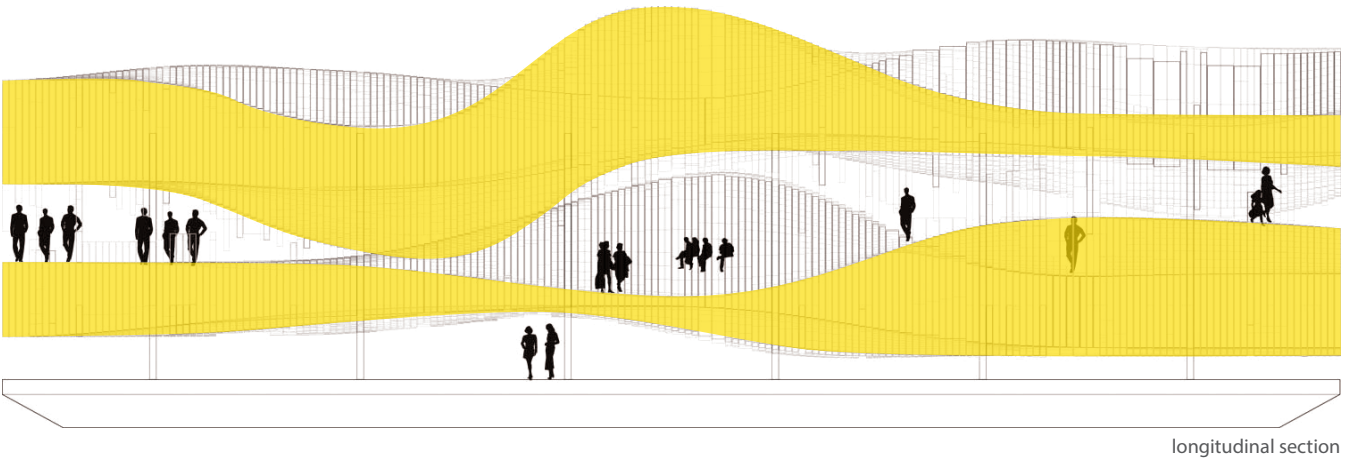


Figure 20

Figure 19 | An example of four different configurations. | www.archdaily.com/tag/sparc/
Figure 20 | Diagrammatic longitudinal section through HiDrone reveals the dynamic interior social spaces. | www.archdaily.com/tag/sparc/

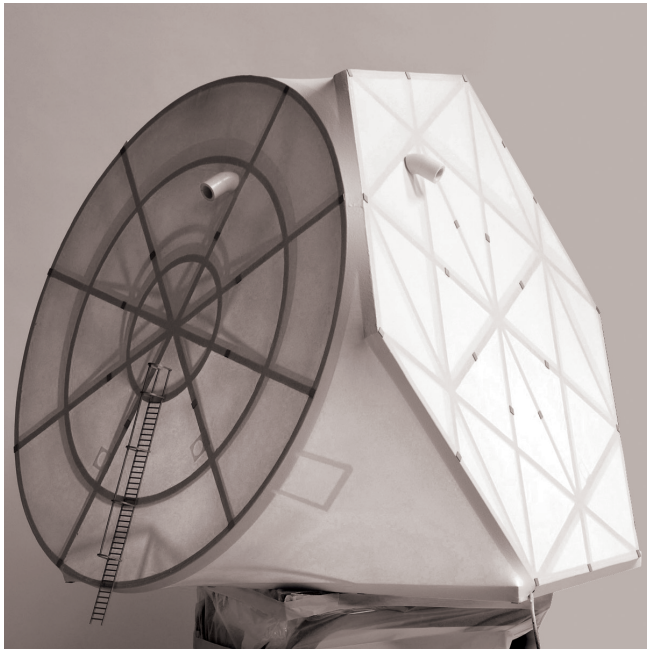


Figure 21

The Prada Transformer, designed by Rem Koolhaas and OMA is a temporary exhibition piece designed primarily for the Prada Fashion Show in Seoul, South Korea in 2008. The structure is designed so as to be transformed from one space to another by physically lifting and rotating the small enclosure using construction cranes. Prada Transformer is an example of the poetic value of transformation manifest in architecture. While interior surfaces remain intact, the beauty of this transformation comes from experiencing the floors, walls, and ceilings of one day being completely reversed the following day.

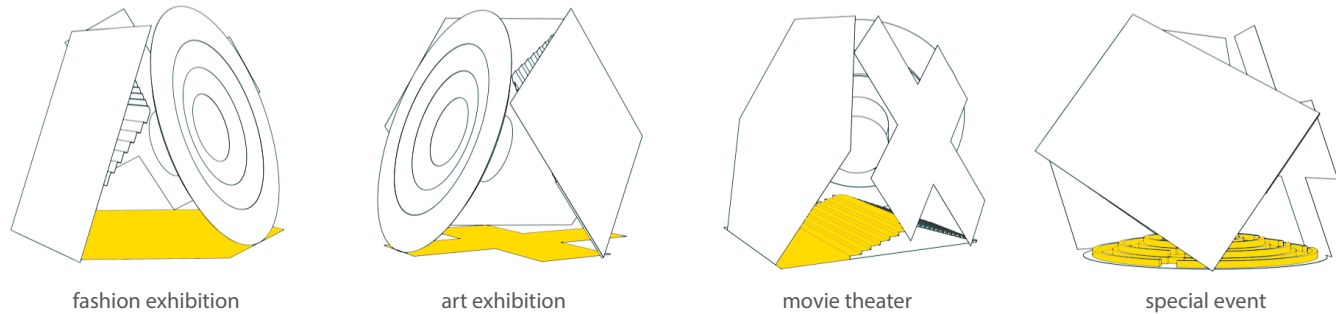


Figure 22

Figure 21 | Overall image of Prada Transformer. | www.prada-transformer.com
Figure 22 | Diagram of the four different configurations for Transformer | www.prada-transformer.com



Figure 24



Figure 23

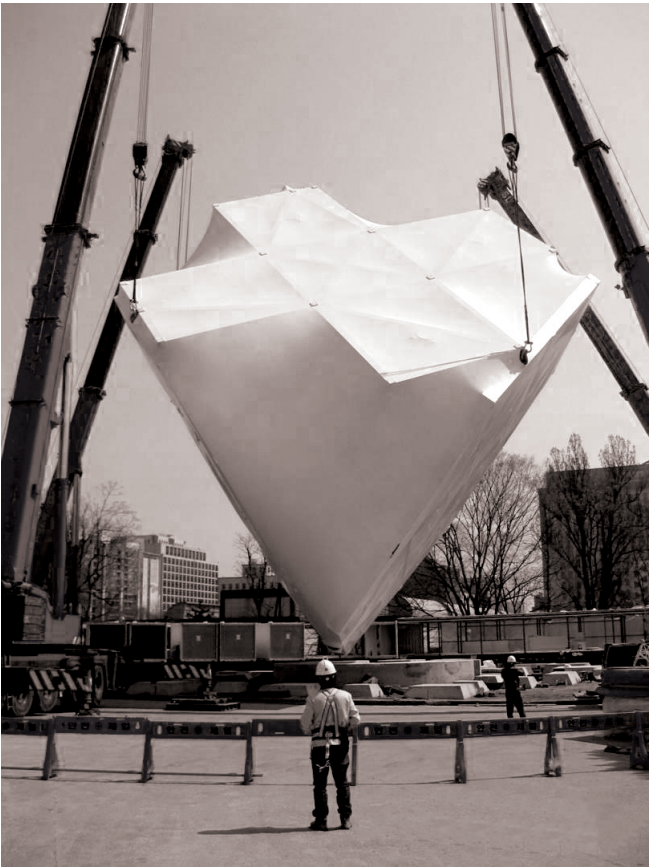


Figure 25

Figures 23, 25 | Prada Transformer process of transformation | www.prada-transformer.com
Figure 24 | Interior view of Transformer | www.prada-transformer.com



Figure 26

The Mach.02 begins addressing the issue of engagement at an architectural scale. Moving from art installation, this design for a bus stop, located on 14th and R streets in Lincoln, Nebraska couples a not-so-typical bus shelter with the social amenities to provide for a food truck. As the buses are only active between 6am and 6pm, a late-night food truck station seems to be a good amenity for the threshold between downtown Lincoln and the residence halls of the University of Nebraska-Lincoln city campus.

As a bus shelter, the design demands engagement with the shelter. When departing, as well as arriving, the path of travel moves through, rather than around the shelter. The enclosure maintains this physical relationship with food truck patrons, as well as providing social spaces—surfaces for sitting and eating. Subtle nuances embrace the ethical dimension by capturing rainwater for nearby plant-life, as well as sheltering occupants during inclement weather.

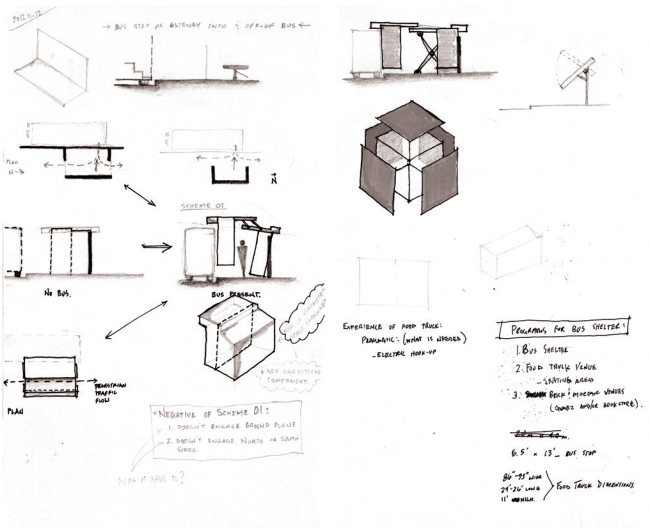


Figure 27

Figure 26 | Bus stop located at 14th and R streets on University of Nebraska-Lincoln campus.
Figures 27, 28 | Process sketches.

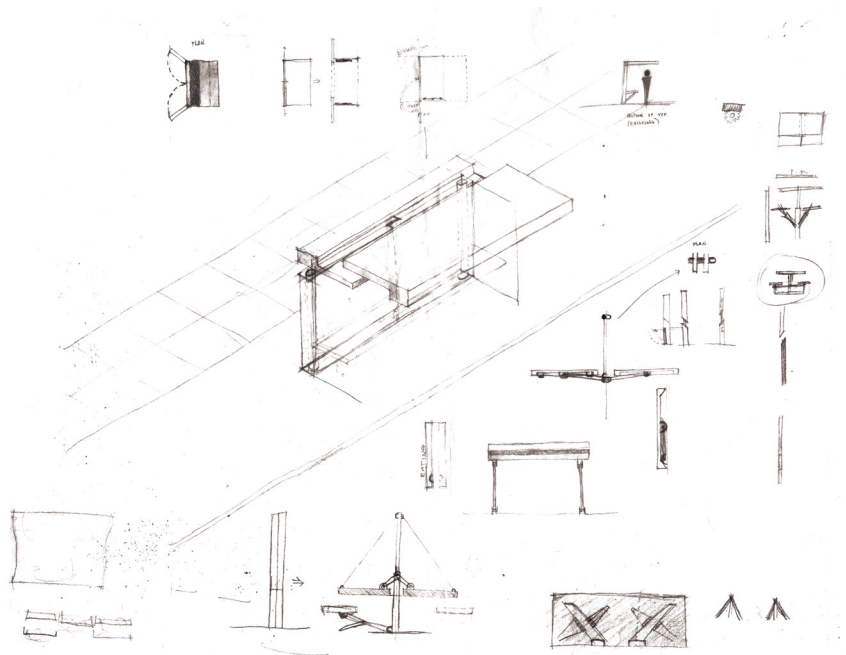


Figure 28

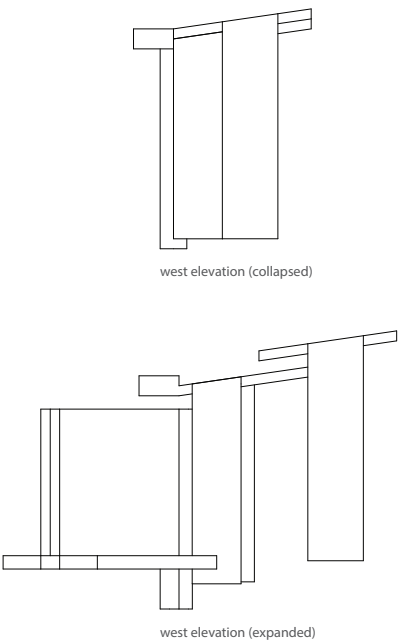
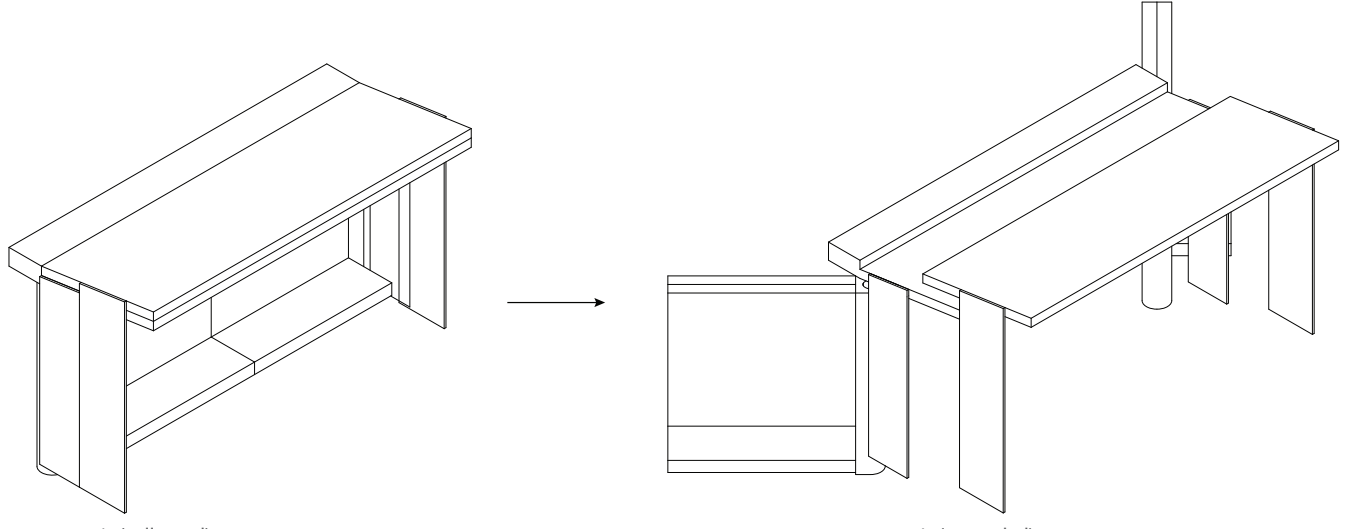


Figure 29



axonometric (collapsed)

axonometric (expanded)

Figure 30

Figures 29,30 | Drawings of bus stop concept.

WHY SHOULD ARCHITECTURE TRANSFORM?

HUMAN BEINGS ARE CONSTANTLY UNDERTAKING DAILY RITUALS AND TASKS IN THE INHABITATION OF BUILT ENVIRONMENTS. ARCHITECTURE SHOULD TRANSFORM TO CREATE SPACE THAT EMPOWERS PEOPLE TO ENGENDER A HIGHER QUALITY OF LIFE.

The left side of the page features a large, abstract graphic. It consists of various geometric shapes, including triangles and polygons, in bright yellow and black. These shapes are layered and overlap, creating a complex, high-contrast pattern. A halftone dot pattern is also visible, particularly in the lower-left and central areas, adding texture to the composition. The word "EXPERIMENT" is written vertically in large, white, sans-serif capital letters across the middle of this graphic.

EXPERIMENT

One way to achieve architecture that is capable of empowering people to engender a higher quality of life is through the process of rehabilitation. Exercise through daily living activities enables rehabilitation, skill-building, and empowerment. Empowerment involves equipping men and women with skills, methods, and knowledge needed to take self-reliant actions to improve their lives and the conditions of their communities. Wounded athletes, accident victims, and wounded veterans—many whom are now homeless—are just a few of the groups of people who would benefit from architecture that is able to aid in rehabilitation. Homeless veterans, once in peak physical and mental condition, are an effective user group for this experiment of transformation in architecture for sake of empowerment. Upon returning from service and warzones, many veterans suffer with mental illnesses and substance abuse. Common health issues among homeless veterans include arthritis, high blood pressure, post-traumatic stress disorder, and substance abuse. Treatments for these often reoccurring conditions include medication, counseling,

group therapy, and occupational therapy. According to the National Coalition for Homeless Veterans, “Veterans need a coordinated effort that provides secure housing, nutritional meals, basic physical health care, substance abuse care and aftercare, mental health counseling, personal development, and empowerment.”³²

32 | National Coalition for Homeless Veterans, “Background and Statistics,” <http://nchv.org> (accessed March 1, 2013).



Figure 31

EXPERIMENT:
Create a transitional living unit to enact transformation for the purpose of empowering homeless veterans through therapy in daily living activities and routines within the architecture.

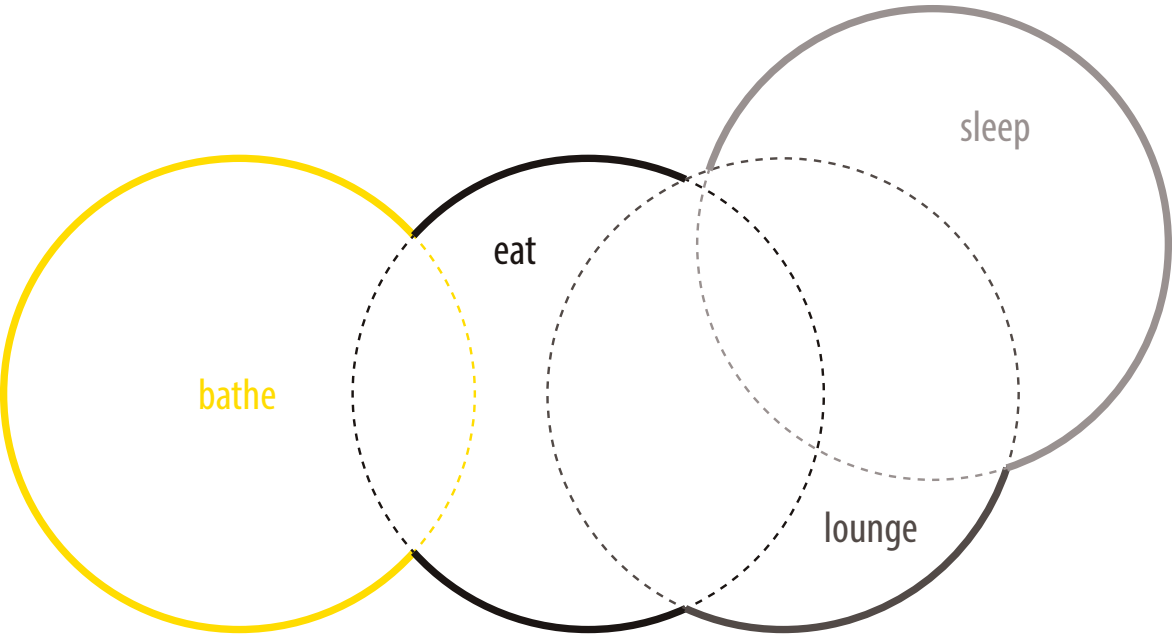


Figure 32

Figure 31 | Aerial image of proposed site.
Figure 32 | Programmatic diagram outlining spatial relationships of living unit.

The transitional living unit works in cooperation with non-profit organizations dedicated to the well-being and betterment of homeless veterans. In order to provide veterans with these living units, support from communities is anticipated. The transitional nature of these units provides for an intended occupancy of 6-24 months. During this occupation, the ideal situation suggests a family 'sponsors' a veteran, parking the living unit on their property. Various neighborhoods in Lincoln, Nebraska, such as the 7th and Garfield area provide long properties with front yard, as well as back yard access, via an alley. Home-owners locating the living units on these properties provide veterans the opportunity for physical rehabilitation as well as social engagement through neighborhood communities.

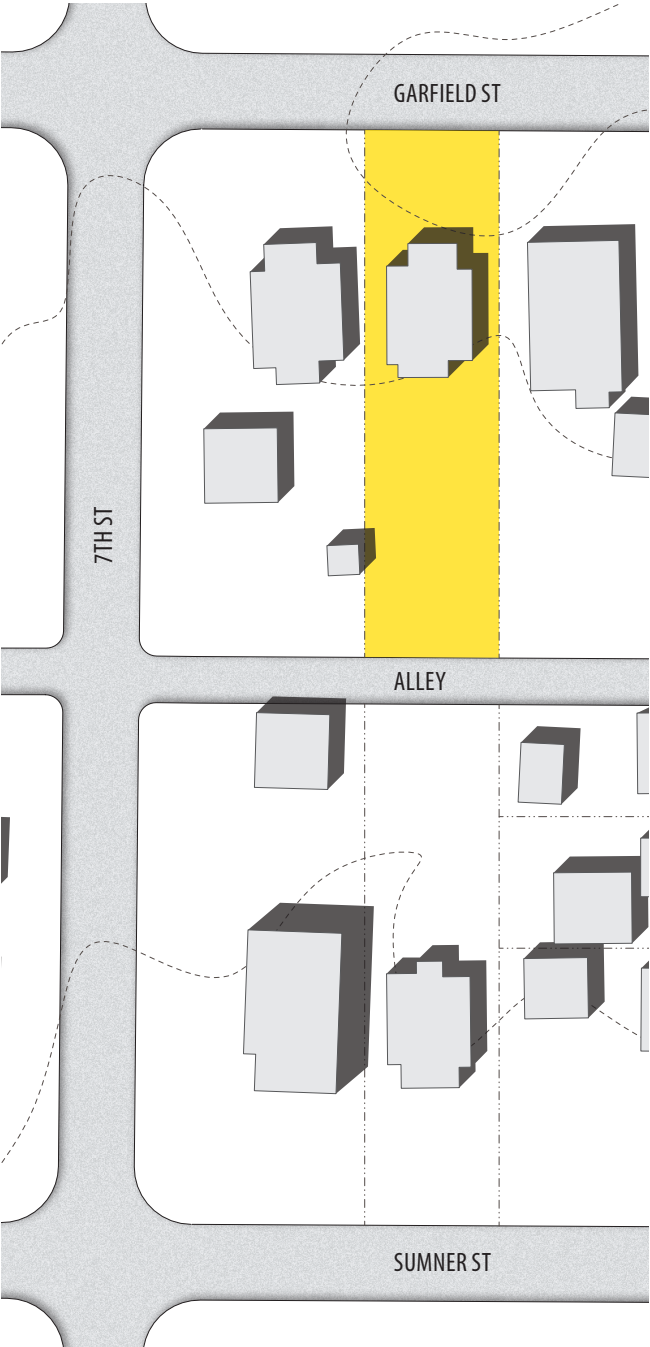
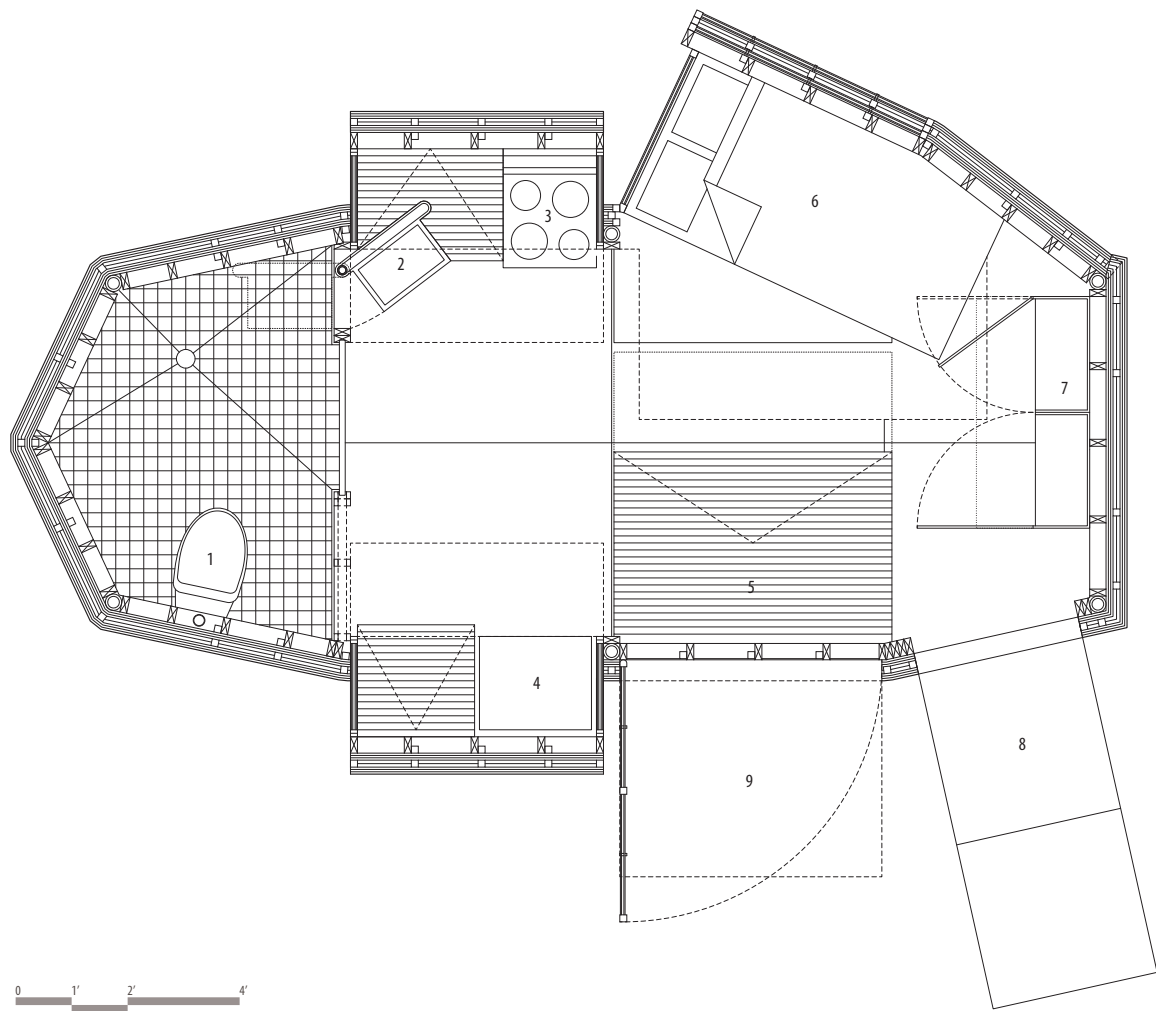
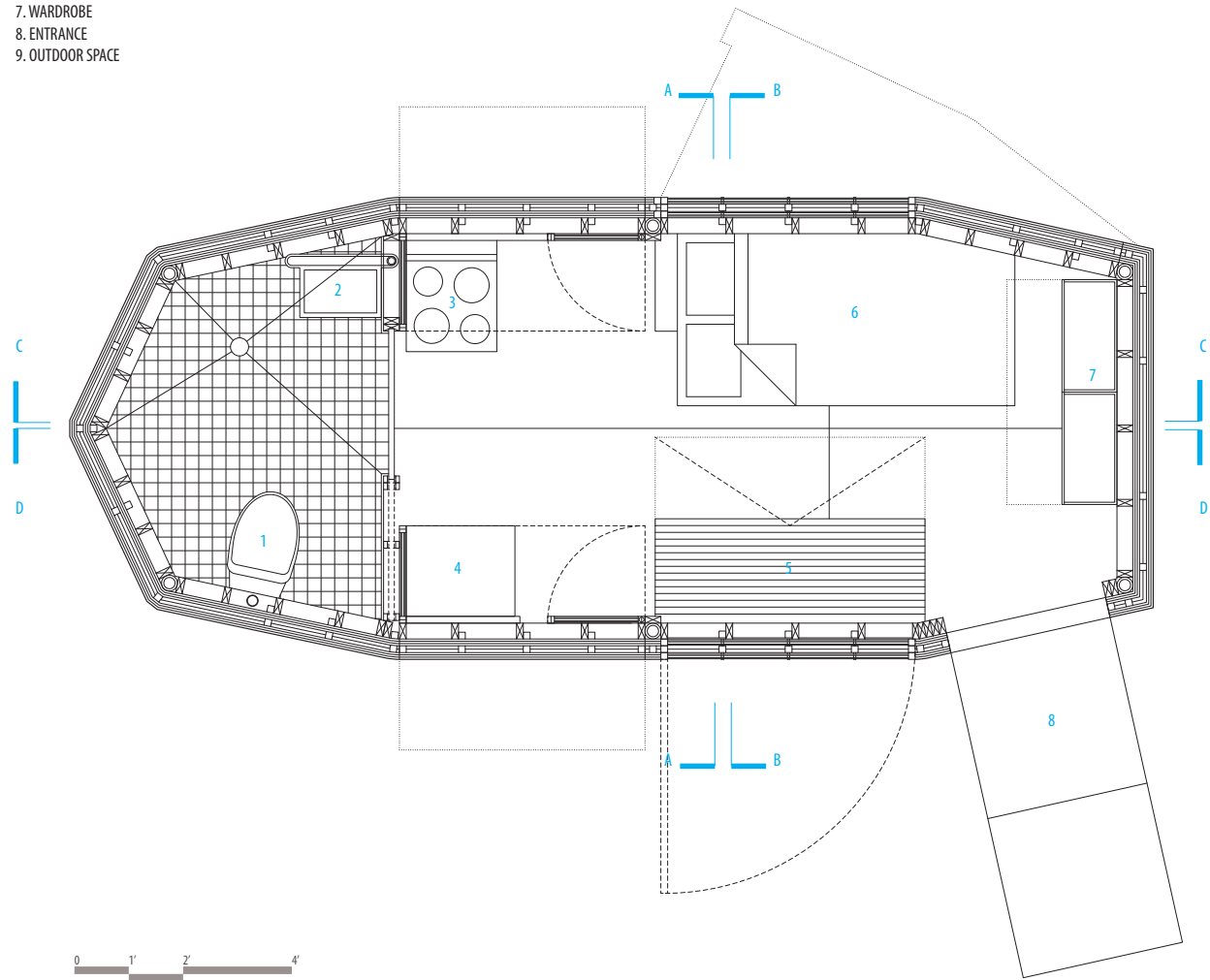
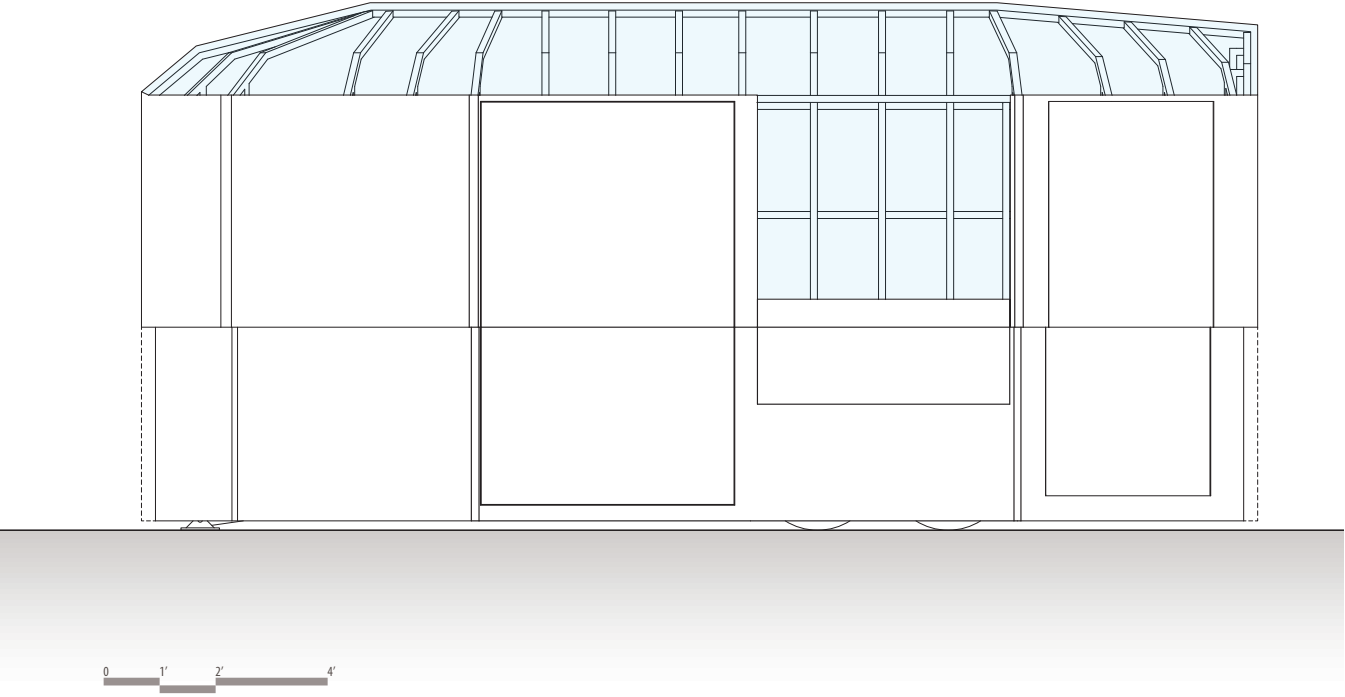
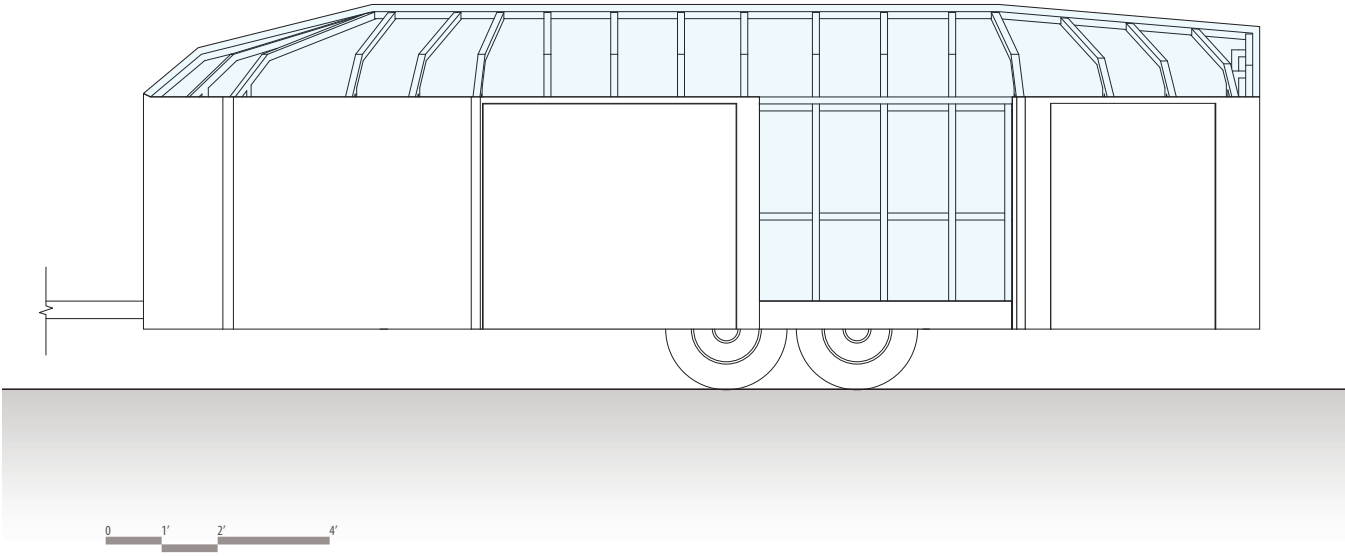


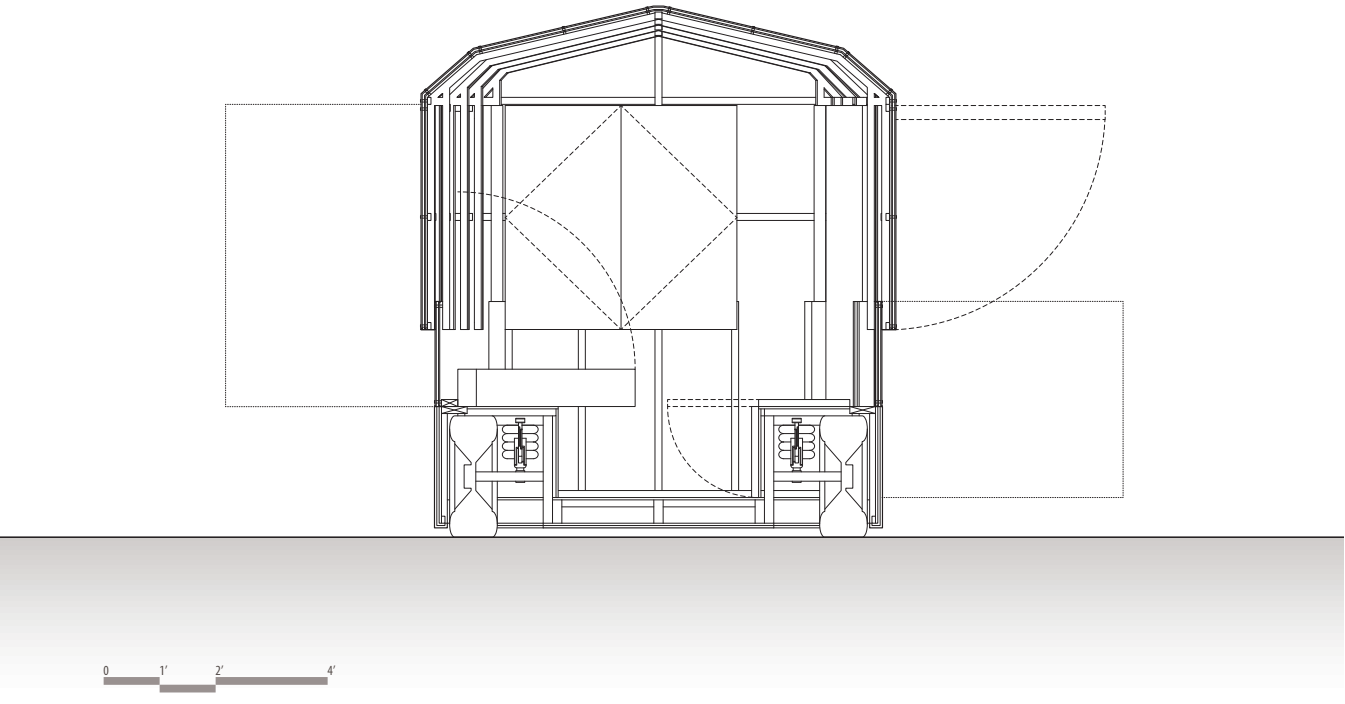
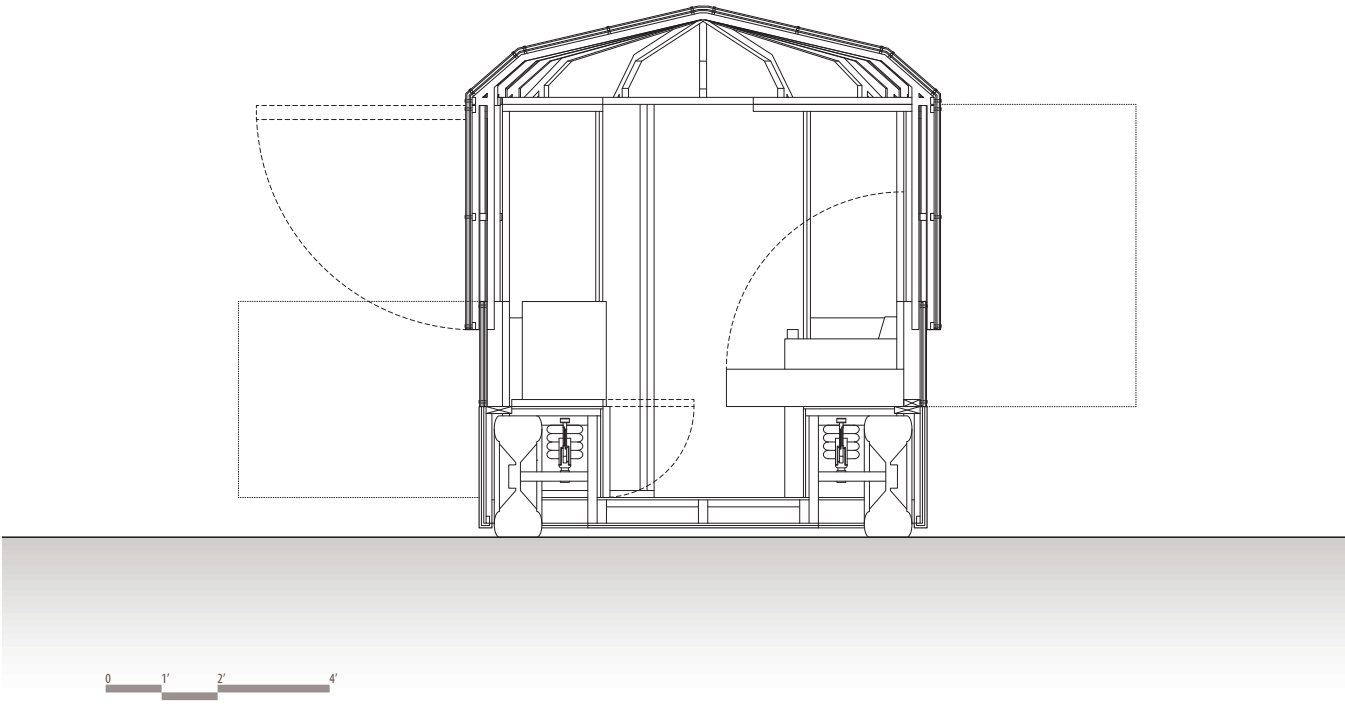
Figure 33

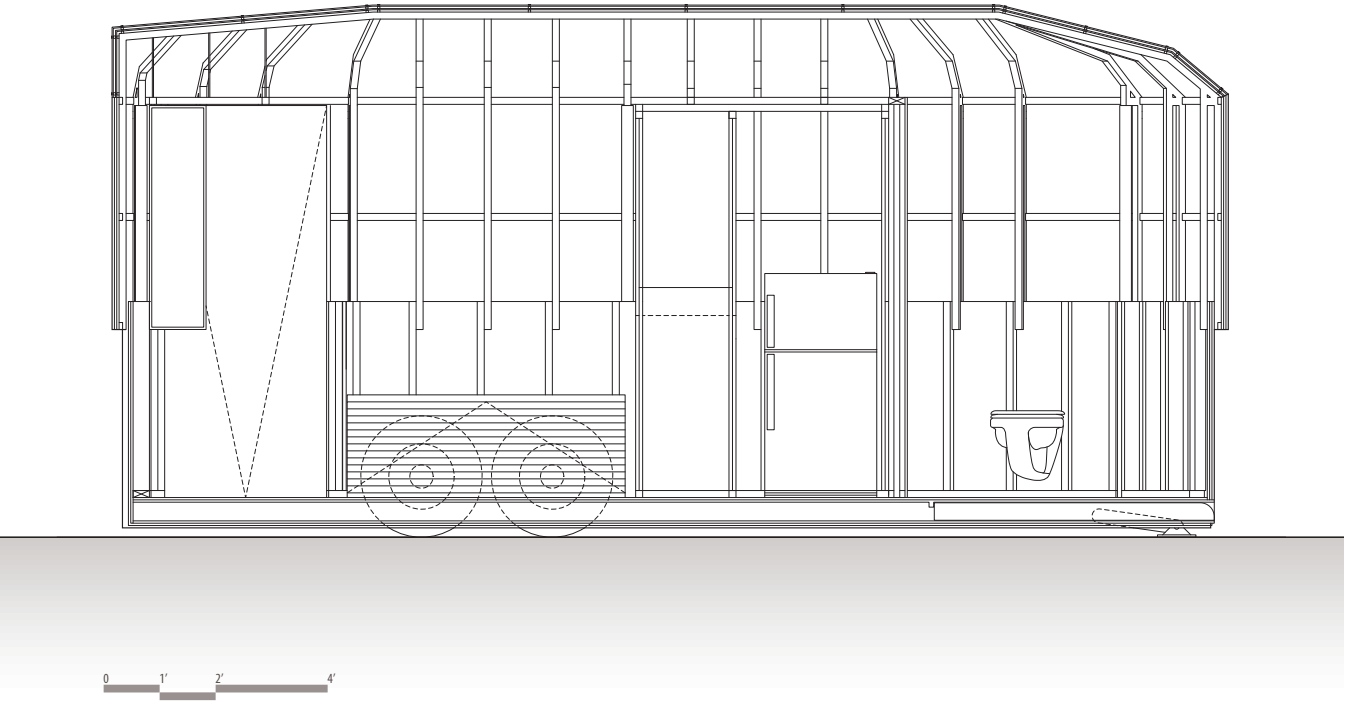
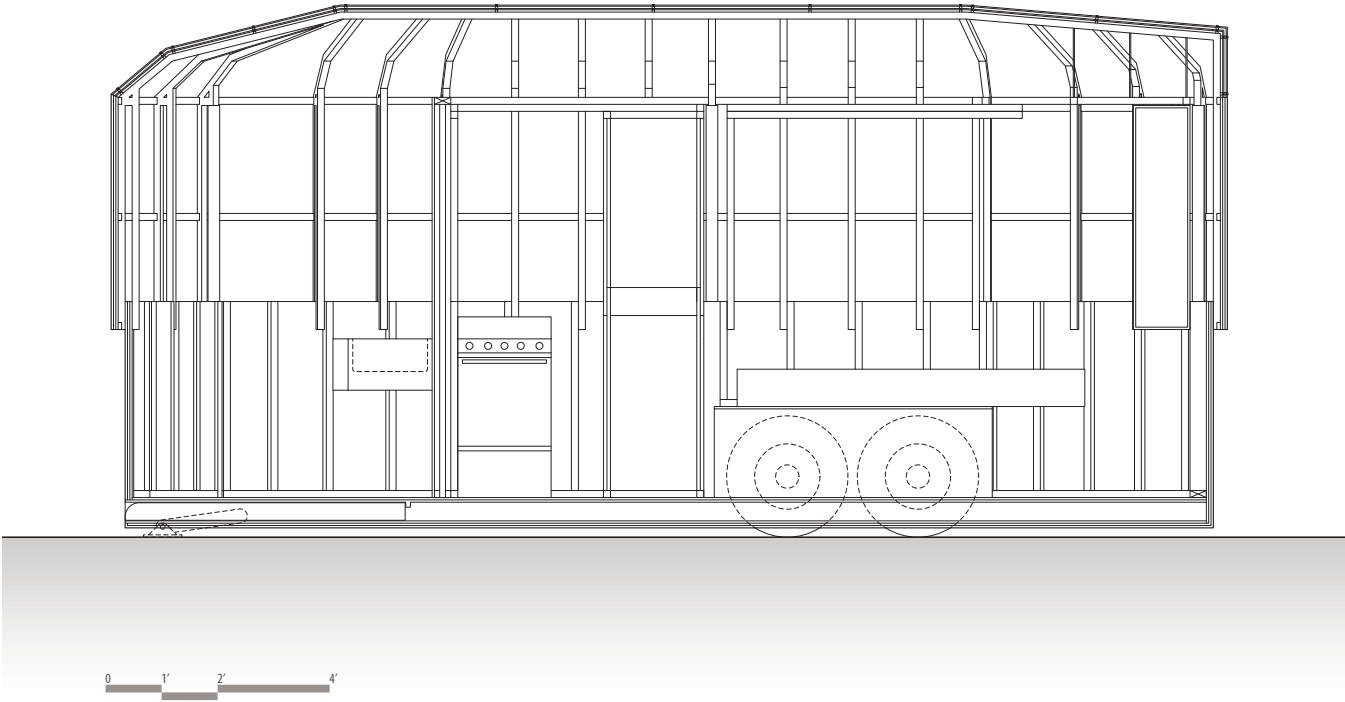
Figure 33 | Site drawing identifying specific site property.

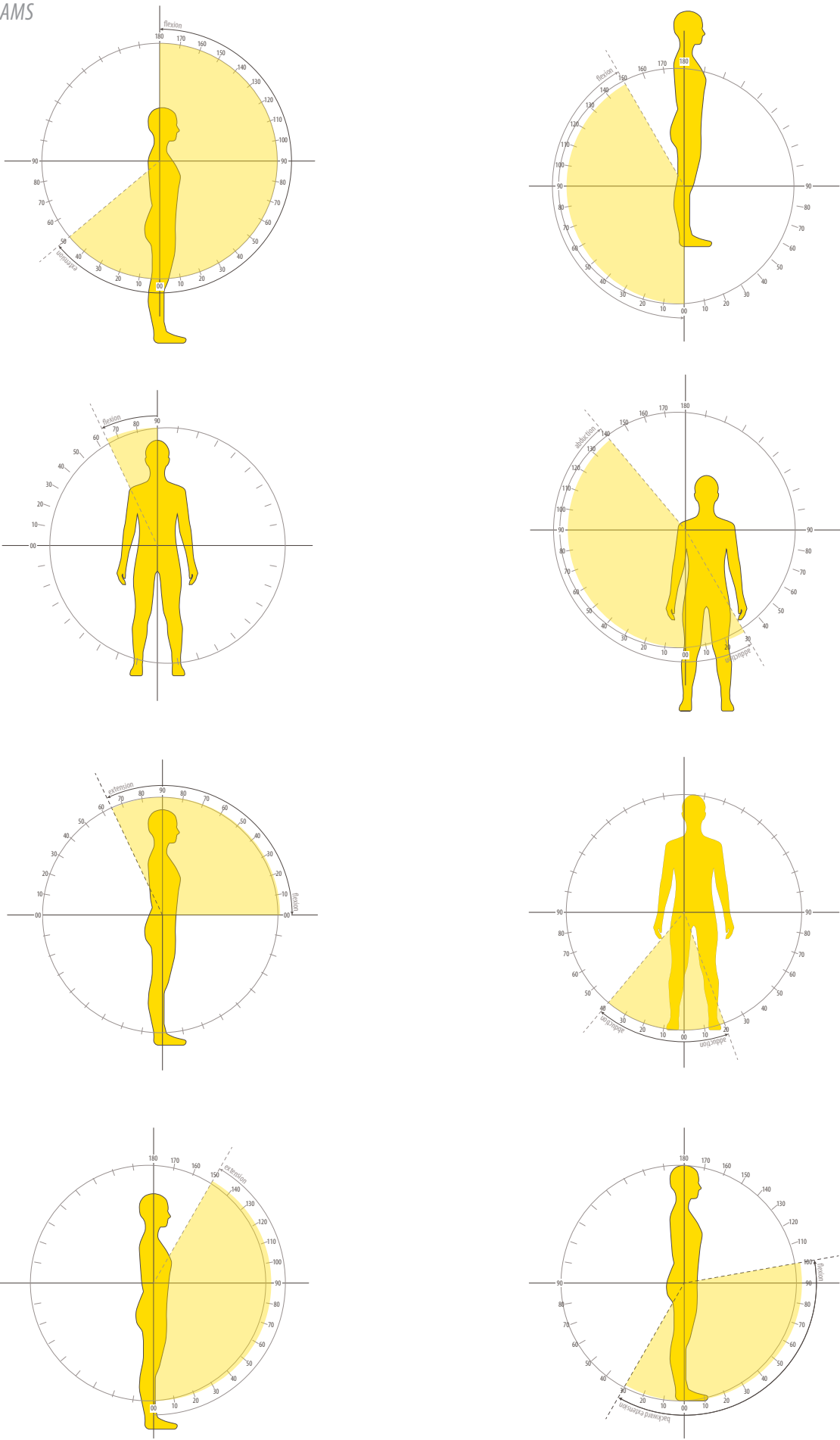
- 1. TOILET
- 2. SINK
- 3. RANGE
- 4. REFRIGERATOR
- 5. TABLE
- 6. BED
- 7. WARDROBE
- 8. ENTRANCE
- 9. OUTDOOR SPACE











There are a number of subcategories within the field of occupational therapy. The biomechanical (BIO-MECH) approach deals primarily with the body and its ability to move. Having established a datum for the range each joint should be able to move, therapists can measure a patient's range of motion (ROM) and prescribe treatment based on the gathered data. Therapists, Catherine Trombly and Anna Scott suggest, "Some significant limitations of range of motion can be ameliorated or corrected by activity or exercise utilizing the treatment principle of stretching."³³ The effectiveness of stretching in rehabilitative therapy lies in, "...stretching the tissue beyond its customary limit of motion."³⁴ Active and passive stretching are two strategies to consider in occupational therapy. Coupling active stretching with activities (and equipment) proves to be an effective way of executing stretching treatment; Trombly and Scott identify two scenarios in which activities related to patients' interests provide successful conduits for therapy. For example, if patient 'A' enjoys assembling jigsaw puzzles, relocating the puzzle

pieces just out of reach requires the patient to stretch in order to acquire the correct pieces to finish the puzzle. In another example, patient 'B' finds solace in carpentry; "...the therapeutic value of this activity is primarily in the process of sanding."³⁵ By utilizing active stretching through means of daily activities and the associated household appliances and furnishings, architecture becomes a tool for rehabilitating users of the space. In developing the transitional living unit, it is essential to embed the architecture with the logic of biomechanical range-of-motion (BIOMECH ROM) metrics. Eight joints and associated motions were selected and documented for experimentation within the transitional living unit. Overlaying the unit circle on a human silhouette represents a "goniometer" the tool used by therapists in determining range of motion. These diagrams are then transposed on the resultant architecture to illustrate the relationship between stretching techniques and the BIOMECH ROM unit.

33 | Catherine Trombly and Anna Scott, eds., *Occupational Therapy for Physical Dysfunction* (Baltimore, MD: Williams and Wilkins, 1977), 225.

34 | Ibid, 225

35 | Ibid, 225

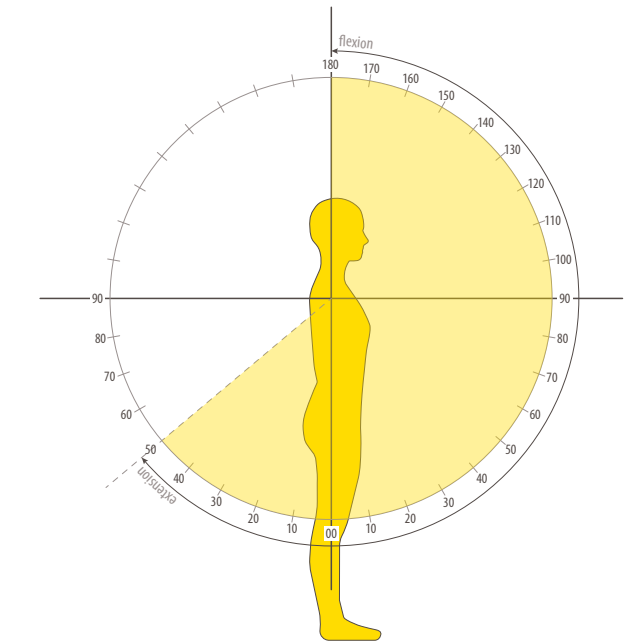
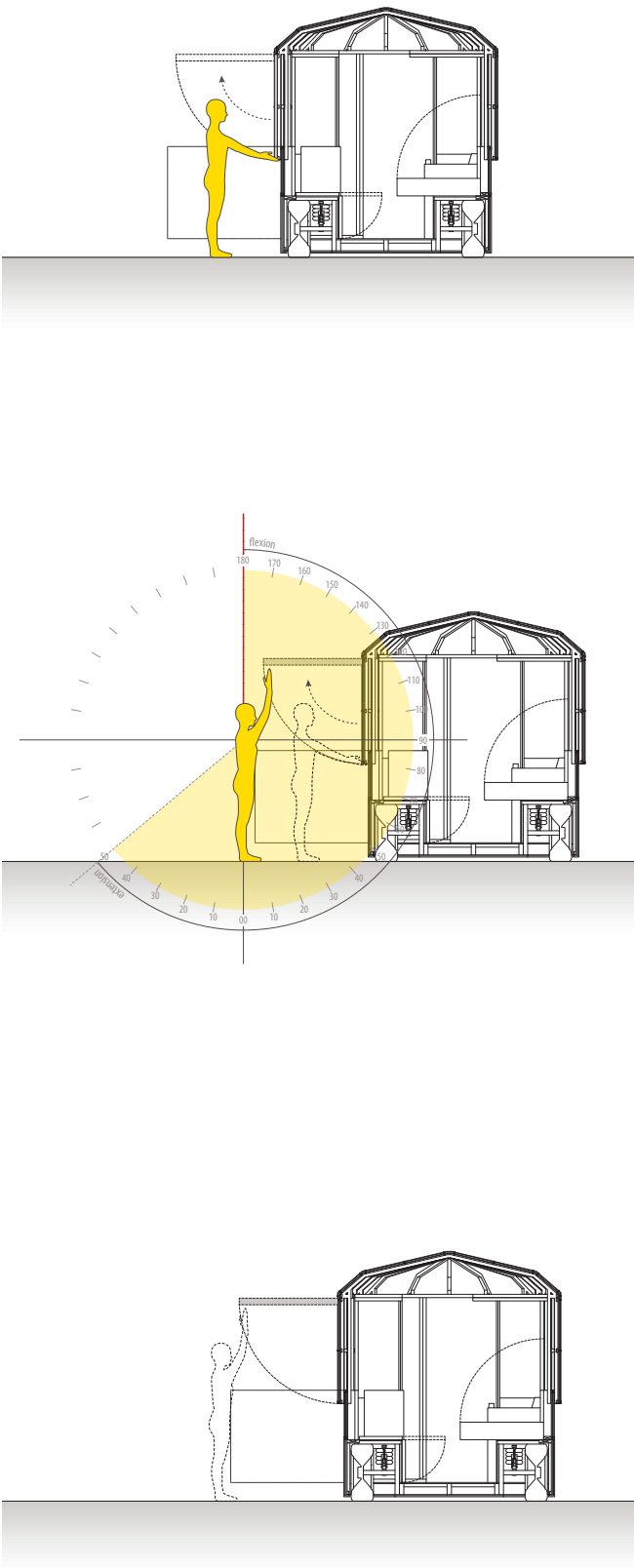


Figure 34
Shoulder flexion and extension is the ability of the arm to rotate backward and forward. ROM exercise manifests in the architecture by operating the exterior window. User begins by facing the exterior side of the window. Keeping feet flat on the ground, he raises or lowers the window to the desired position. As tissue strengthens and ROM increases, light resistance can be added to the window mechanism per patient and therapist request.

Figure 34 | Range of motion - shoulder flexion and extension.

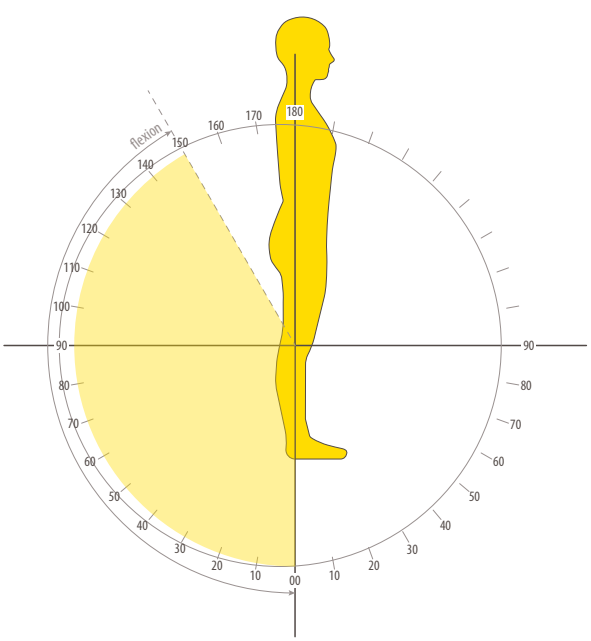
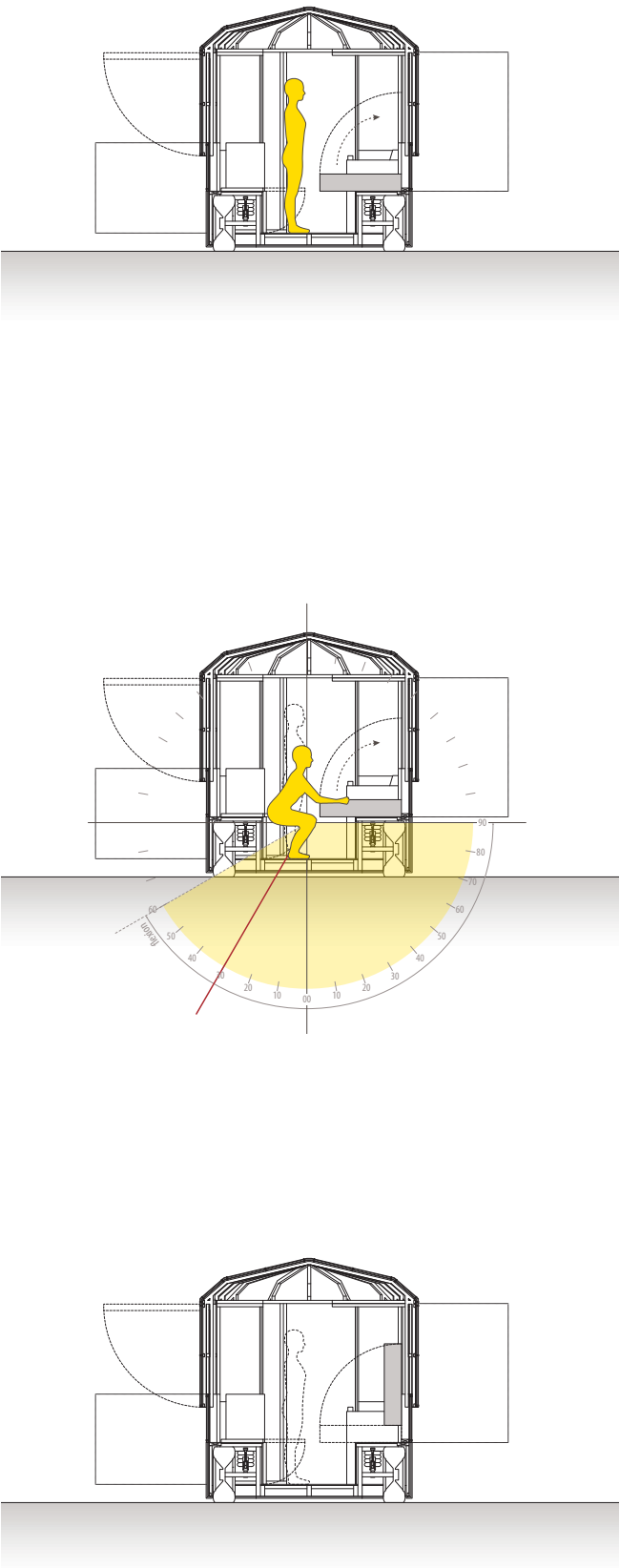


Figure 35
Knee adduction measures the ability of the knee to bend backward. ROM exercise manifests in the architecture by operating the bed assembly. User begins by facing the bed near the center of the unit. Keeping feet flat on the ground, he raises or lowers the bed to the desired position while keeping his back straight. As tissue strengthens and ROM increases, light resistance can be added to the bed assembly per patient and therapist request.

Figure 35 | Range of motion - knee adduction.



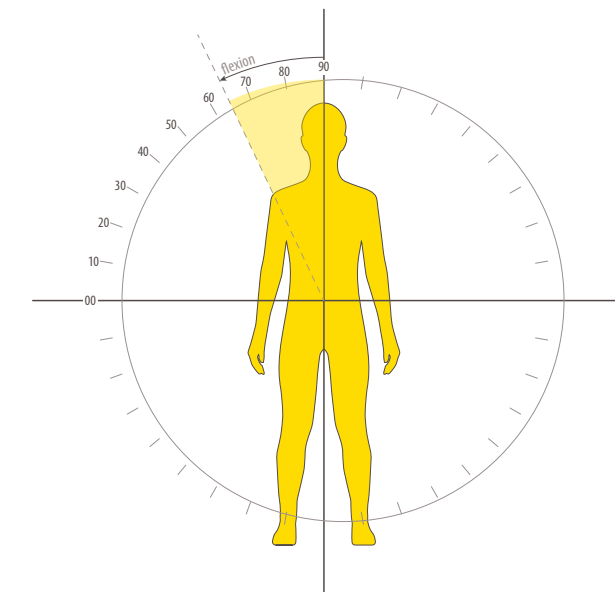
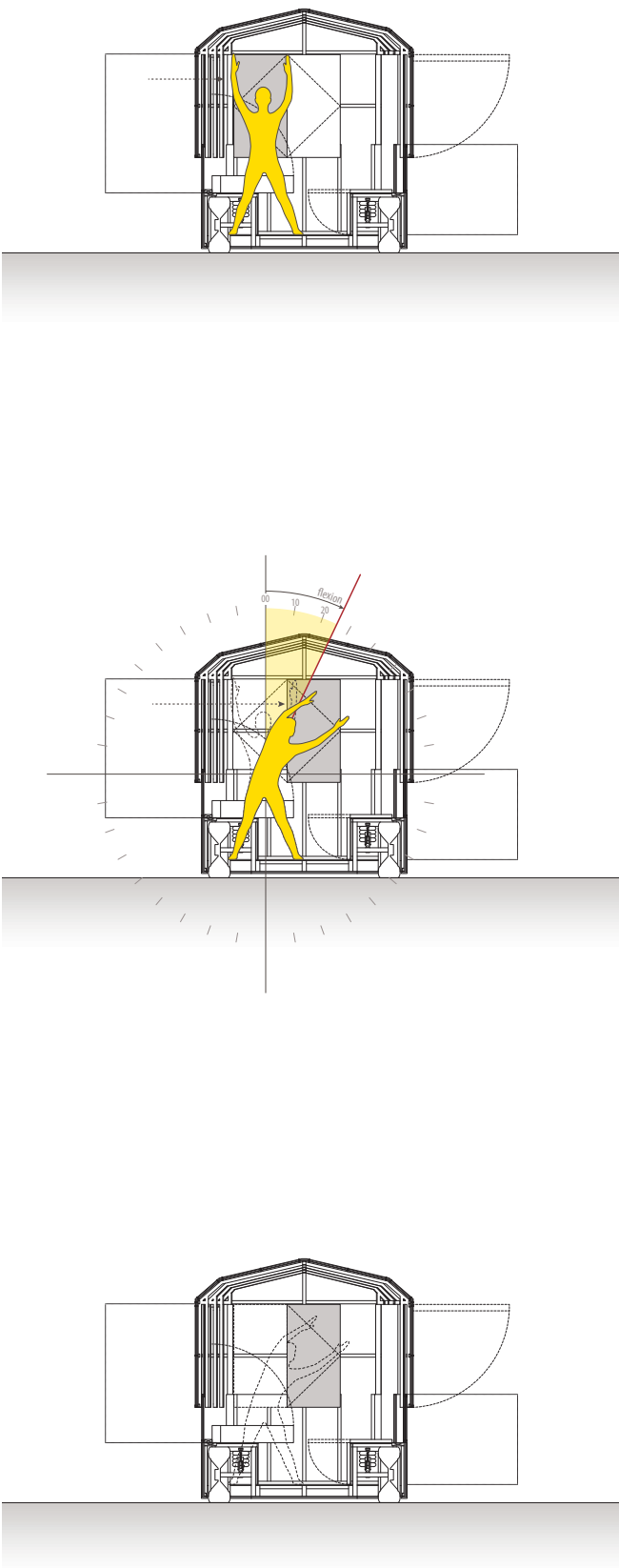


Figure 36
Lateral back flexion measures the ability of the back to bend coplanar to the front of the body. ROM exercise manifests in the architecture by operating the suspended shelving units. User begins by facing the shelving units near the center of the volume. Keeping feet flat on the ground, he slides the shelving unit(s) to the desired position by bending to the left or right. As tissue strengthens and ROM increases, light resistance can be added to the shelving units per patient and therapist request.

Figure 36 | Range of motion - lateral back flexion.

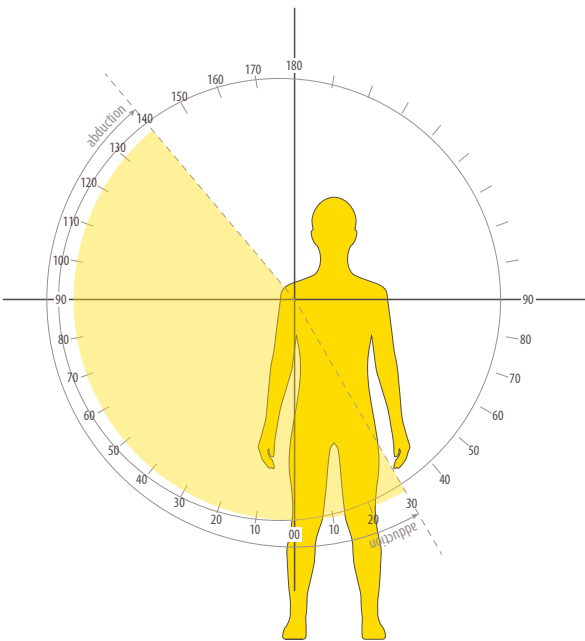
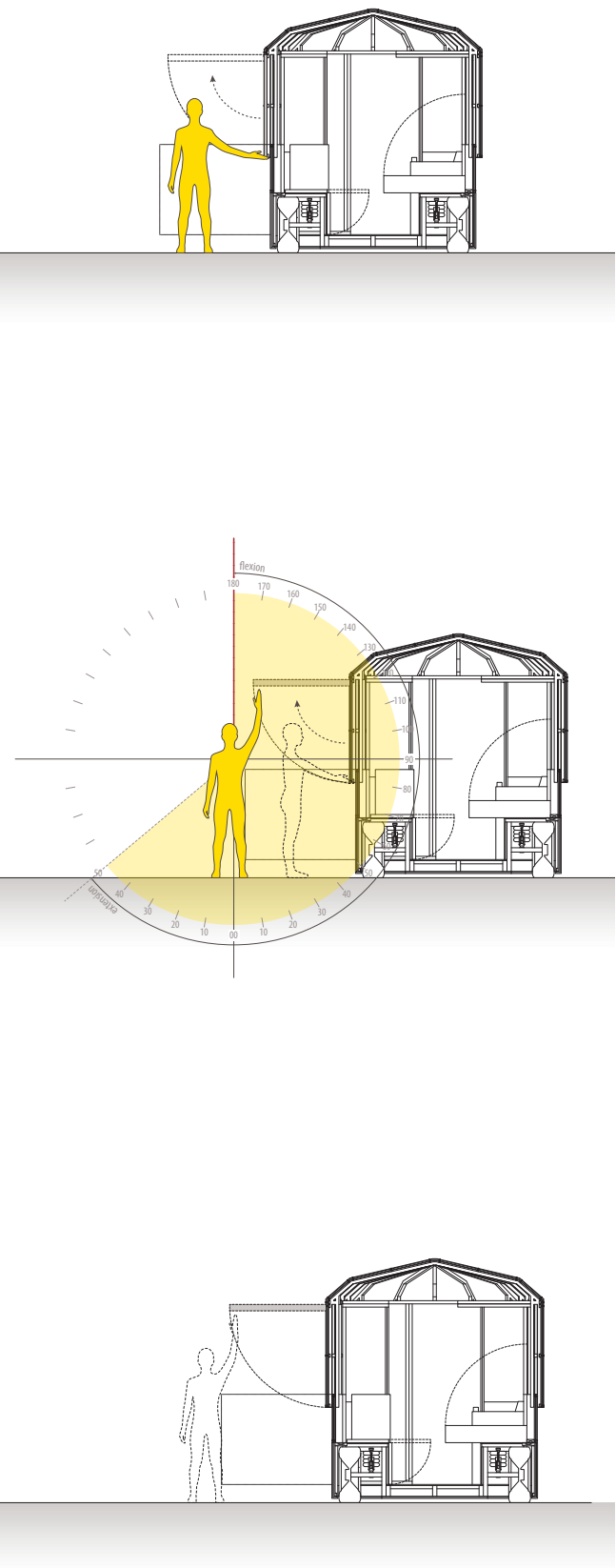


Figure 37
Shoulder abduction and adduction measures the ability of the shoulder to rotate coplanar to the front of the body. ROM exercise manifests in the architecture by operating the exterior window. User begins by standing perpendicular to the exterior side of the window. Keeping the arm straight at the elbow, he raises or lowers the window to the desired position. As tissue strengthens and ROM increases, light resistance can be added to the window mechanism per patient and therapist request.

Figure 37 | Range of motion - shoulder abduction and adduction.



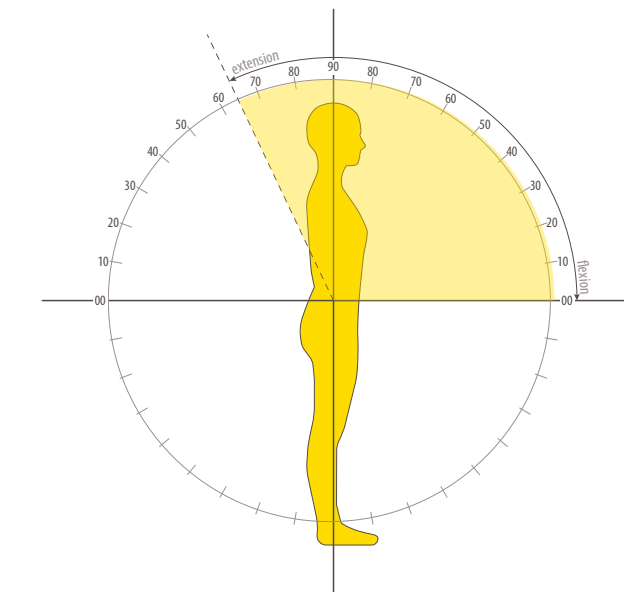
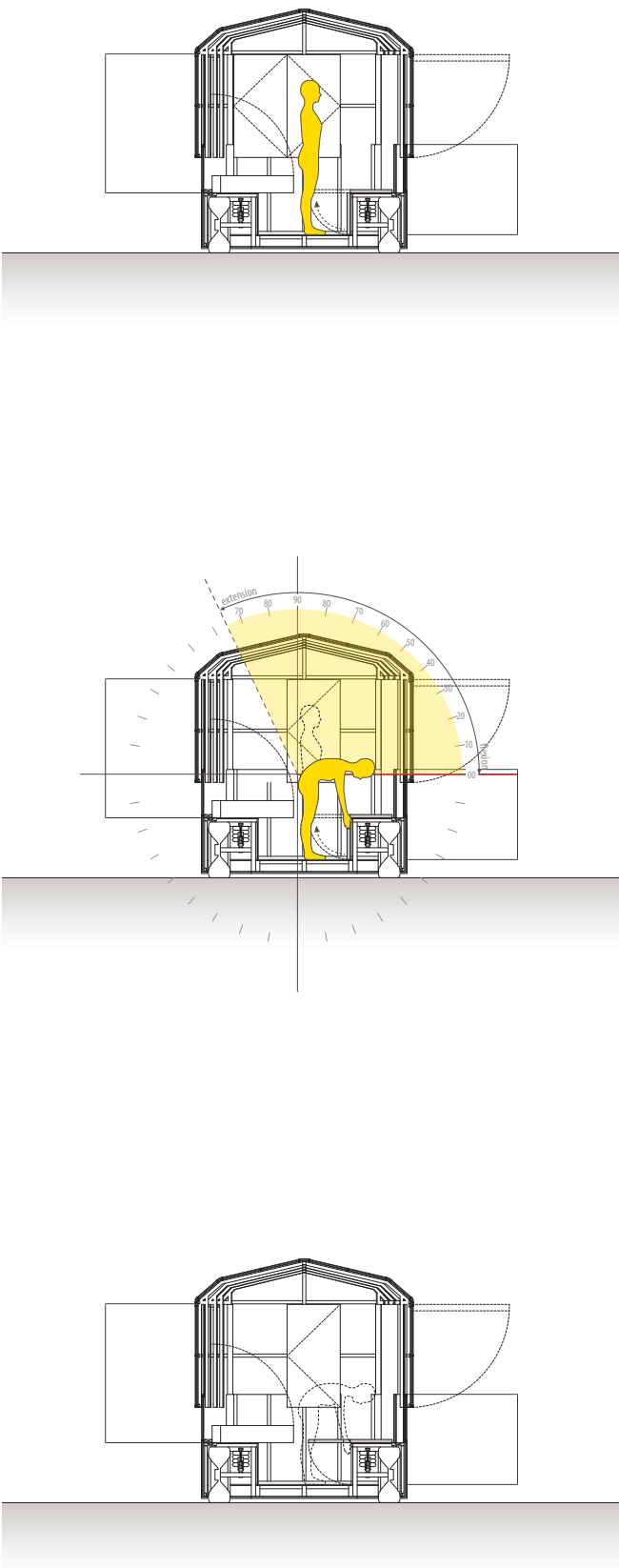


Figure 38
Back flexion and extension measures the ability of the back to bend forward and backward. ROM exercise manifests in the architecture by operating the multi-purpose table. User begins by facing the table near the center of the plane. Keeping legs straight and feet flat on the ground, he raises or lowers the table to the desired position by bending at his waist. As tissue strengthens and ROM increases, light resistance can be added to the table per patient and therapist request.

Figure 38 | Range of motion - back flexion and extension.

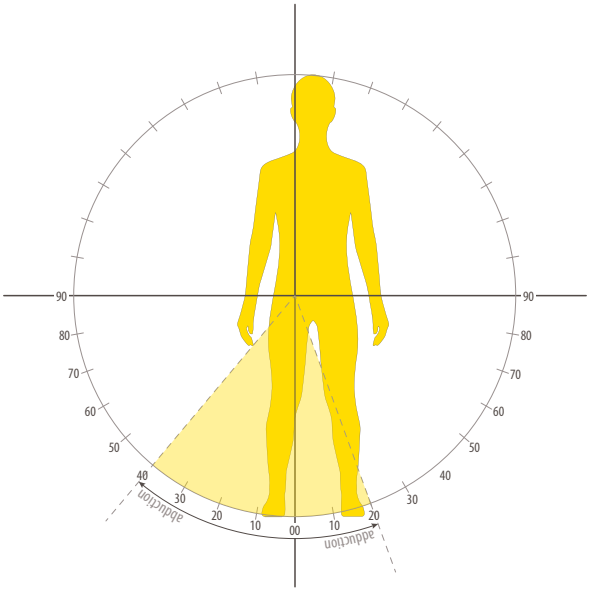
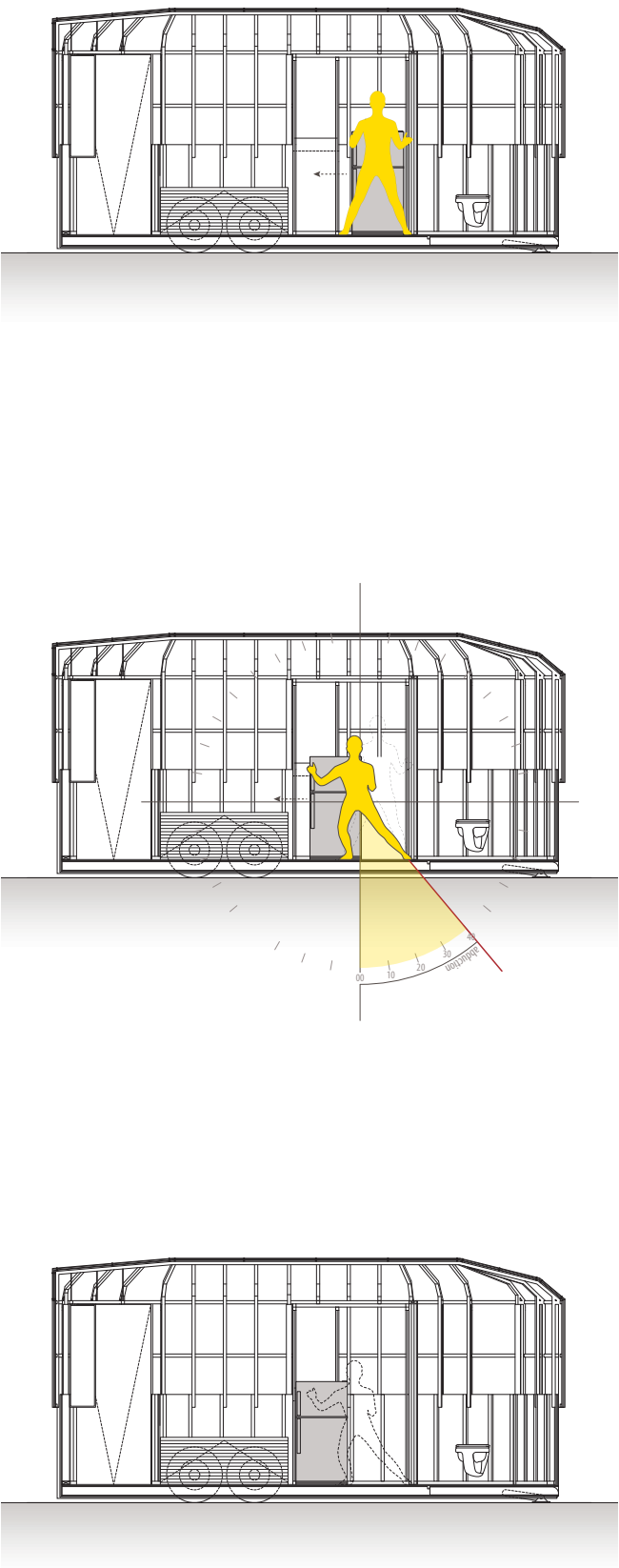


Figure 39
Hip abduction and adduction measures the ability of the hip to rotate coplanar to the front of the body. ROM exercise manifests in the architecture by operating the refrigerator assembly. User begins by facing the refrigerator near the center of the unit, feet spread wide. Lunging to the side, he slides the refrigerator to the desired position while keeping his back straight and knees facing forward. As tissue strengthens and ROM increases, light resistance can be added to the refrigerator assembly per patient and therapist request.

Figure 39 | Range of motion - hip abduction and adduction.



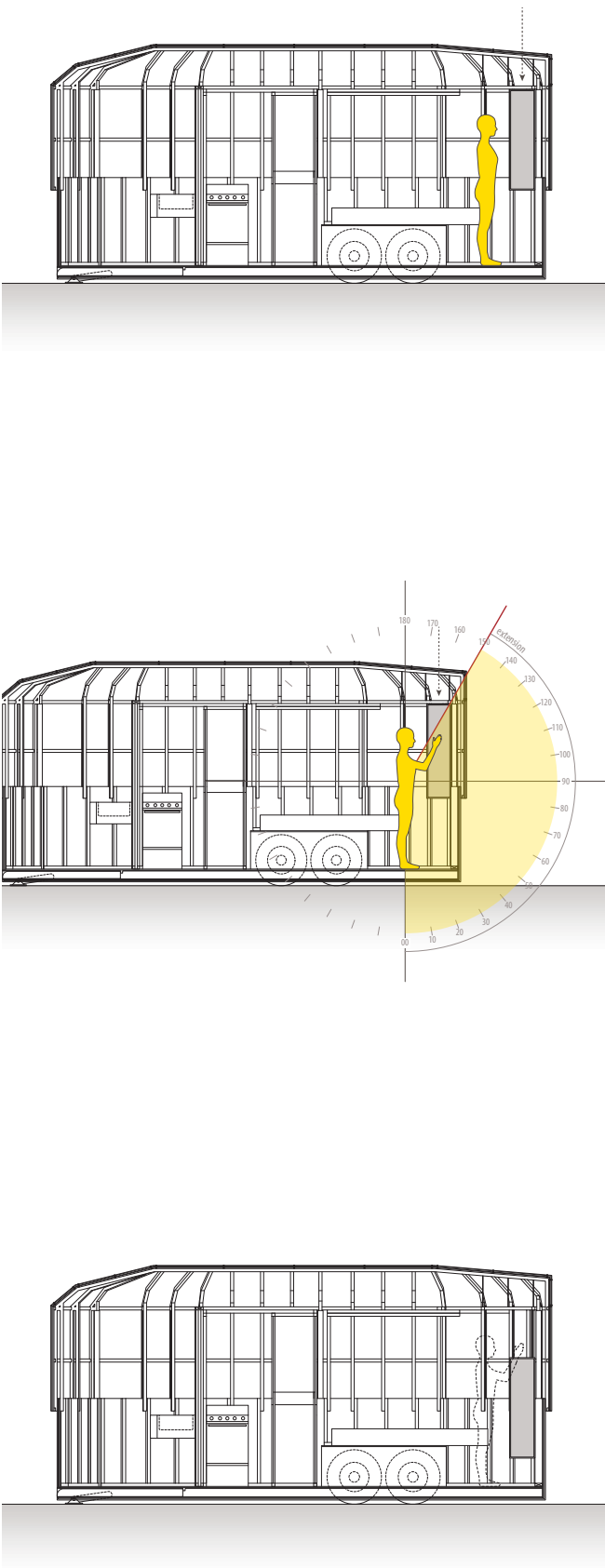


Figure 40
Elbow extension measures the ability of the lower arm to rotate upward or downward. ROM exercise manifests in the architecture by operating the suspended shelving units. User begins by facing the shelving units near the center of the volume. Keeping movement constrained to the elbow, he raises or lowers the units to the desired position. As tissue strengthens and ROM increases, light resistance can be added to the shelving units per patient and therapist request.

Figure 40 | Range of motion - elbow extension.

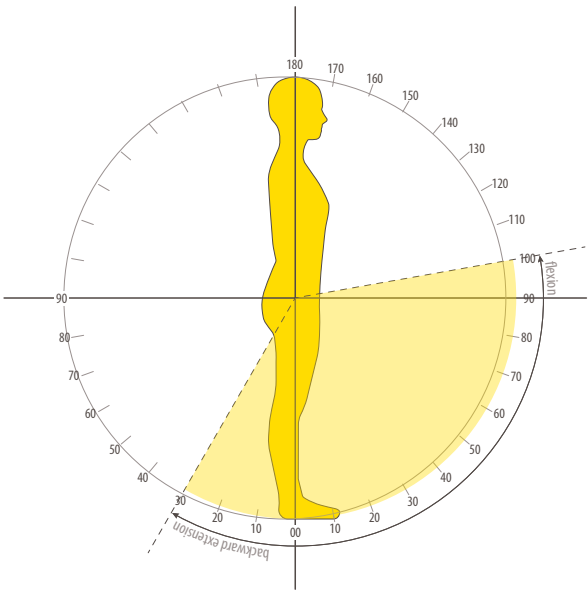


Figure 41
Hip flexion and backward extension measures the ability of the hip to rotate forward and backward. ROM exercise manifests in the architecture by operating the stove assembly. User begins by facing the side of the stove near the center of the volume. Keeping back straight and arms rigid in a pushing position, he slides the stove to the desired position by lunging forward. As tissue strengthens and ROM increases, light resistance can be added to the stove per patient and therapist request.

Figure 41 | Range of motion - hip flexion and backward extension.

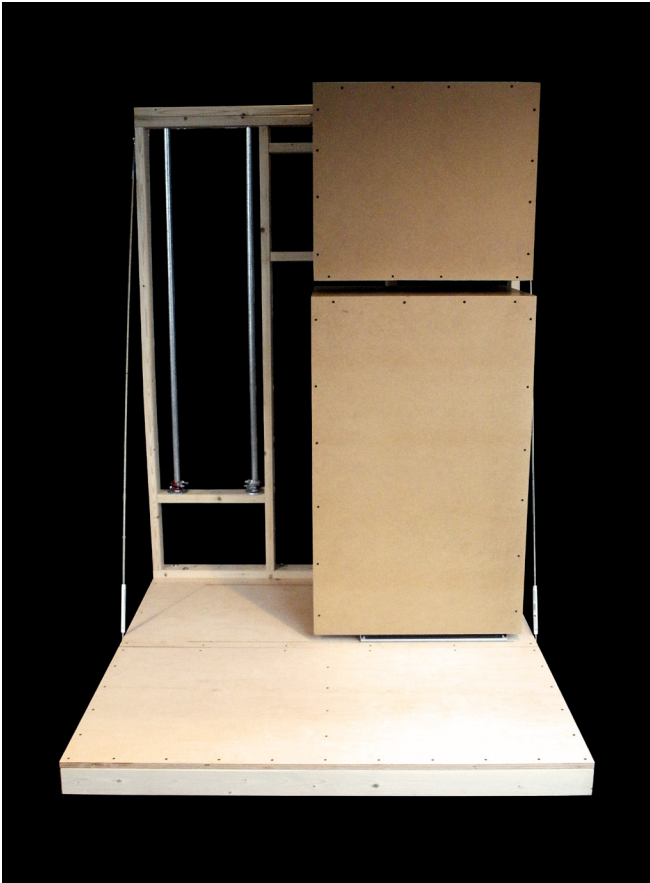


Figure 42

The MACH.03 manifest as a proto-
typical diagrammatic section model
of a typical floor mounted and wall
mounted component of the BIOMECH
ROM unit. MACH.03 allows users to
engage with the model in a simi-
lar manner as would be experienced
in the actual unit. Understanding
the relation of the body to each
volume is essential to fully com-
prehend the essence of the BIOMECH
ROM unit.

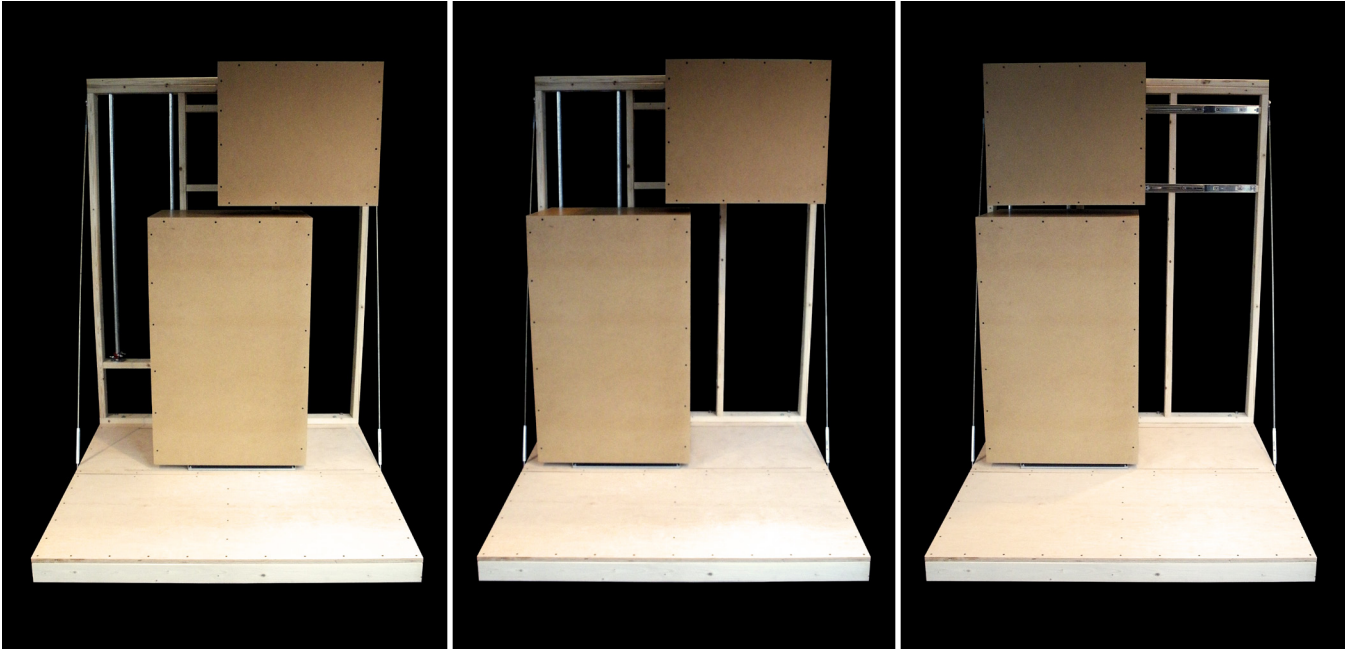


Figure 43

Figure 42 | Overall image of Mach.03.
Figure 43 | Process of moving each volume from one location to another.

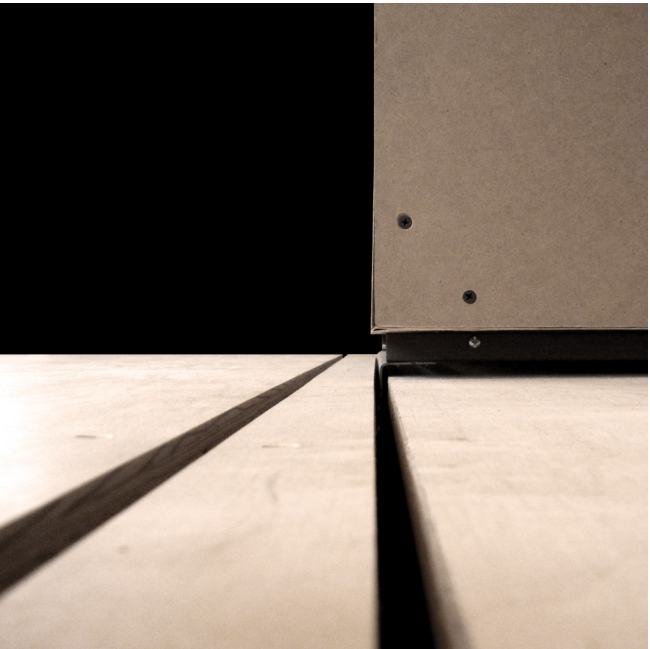


Figure 44

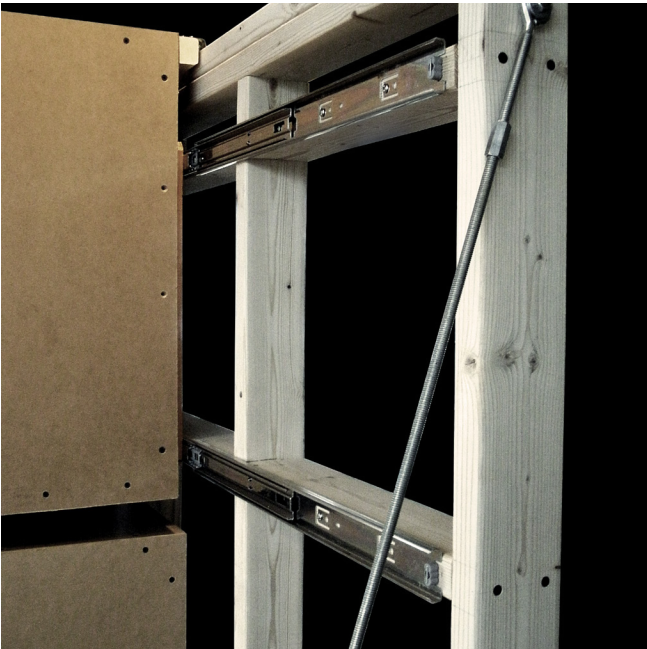


Figure 45

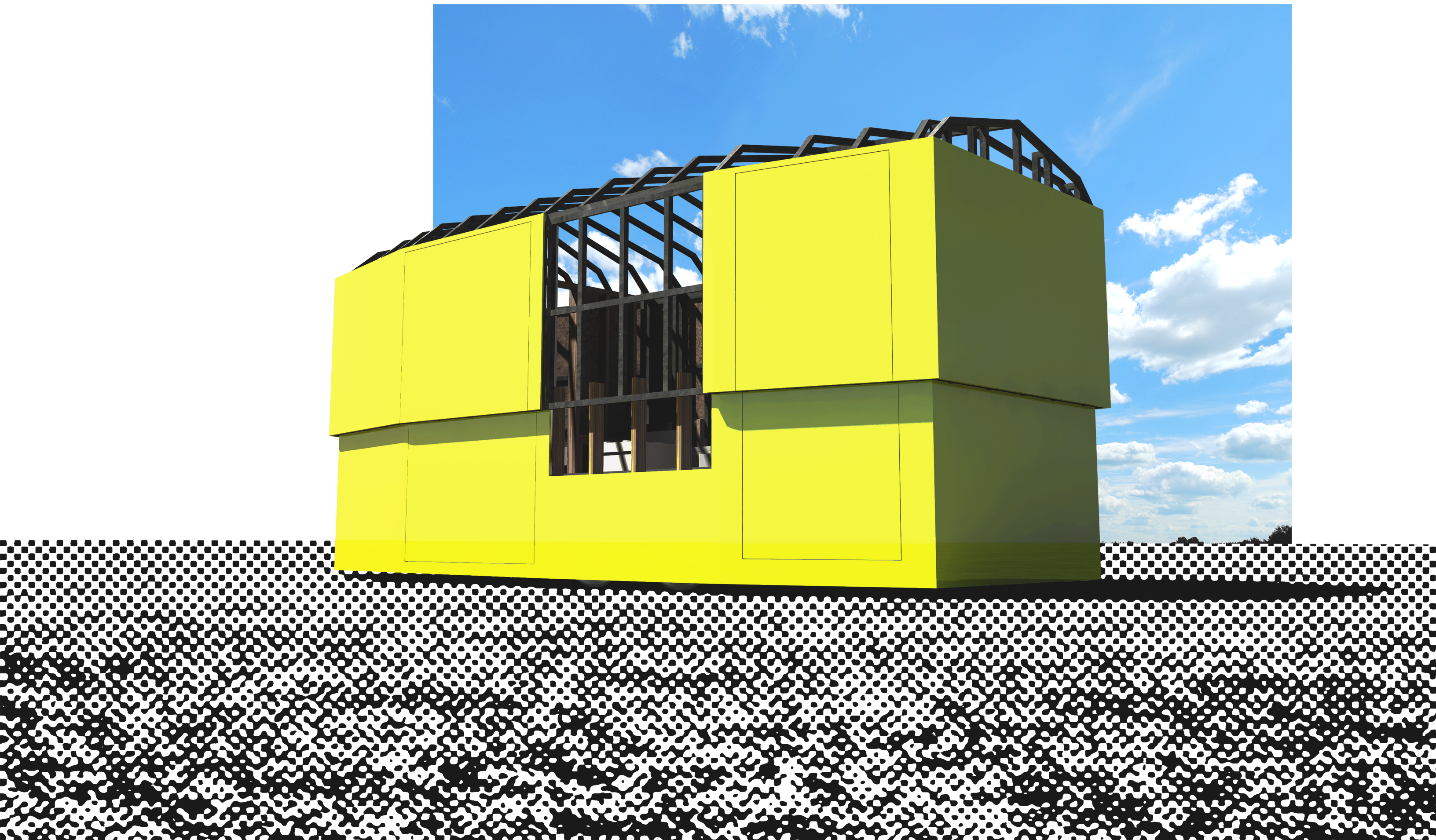


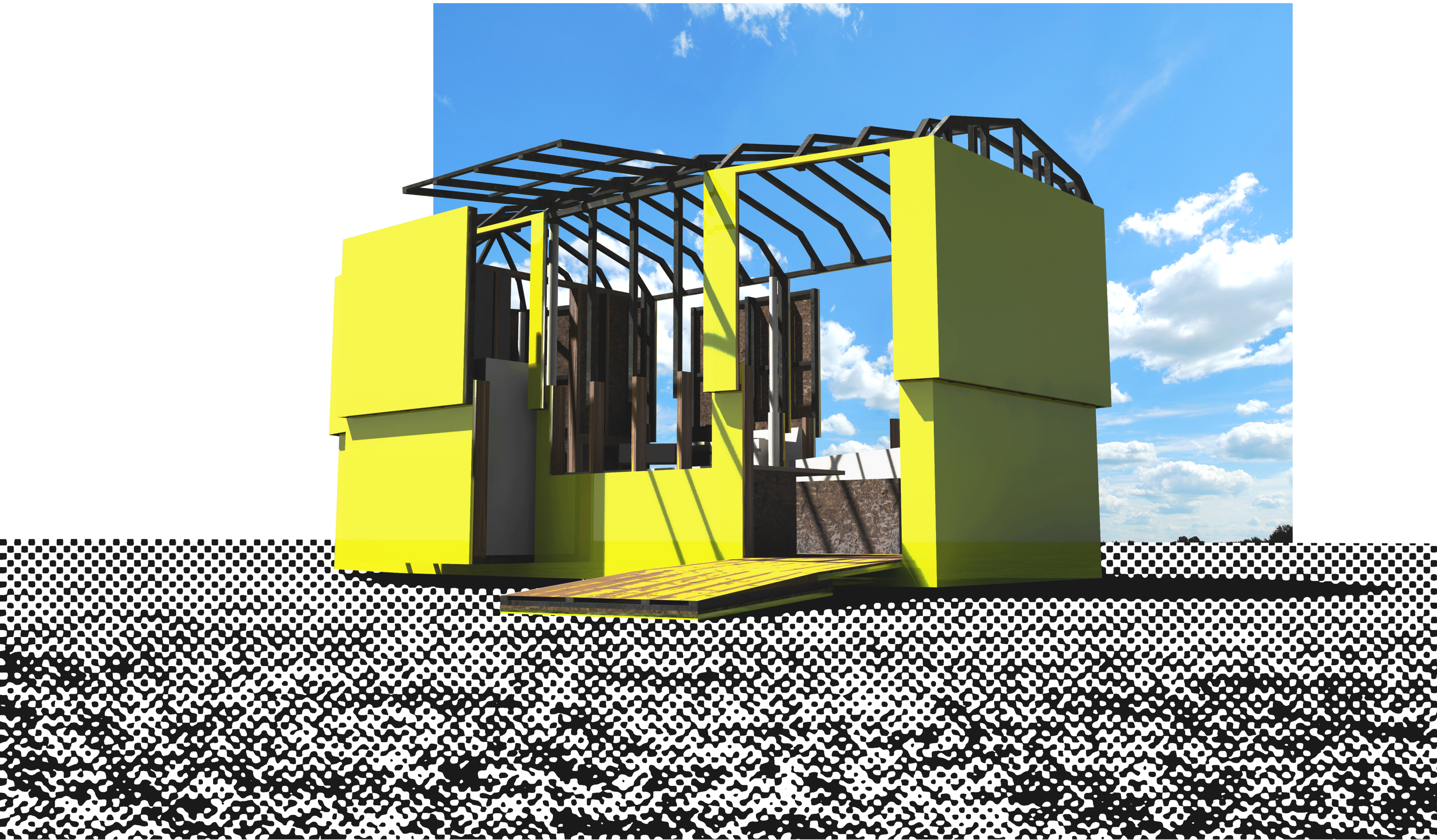
Figure 46

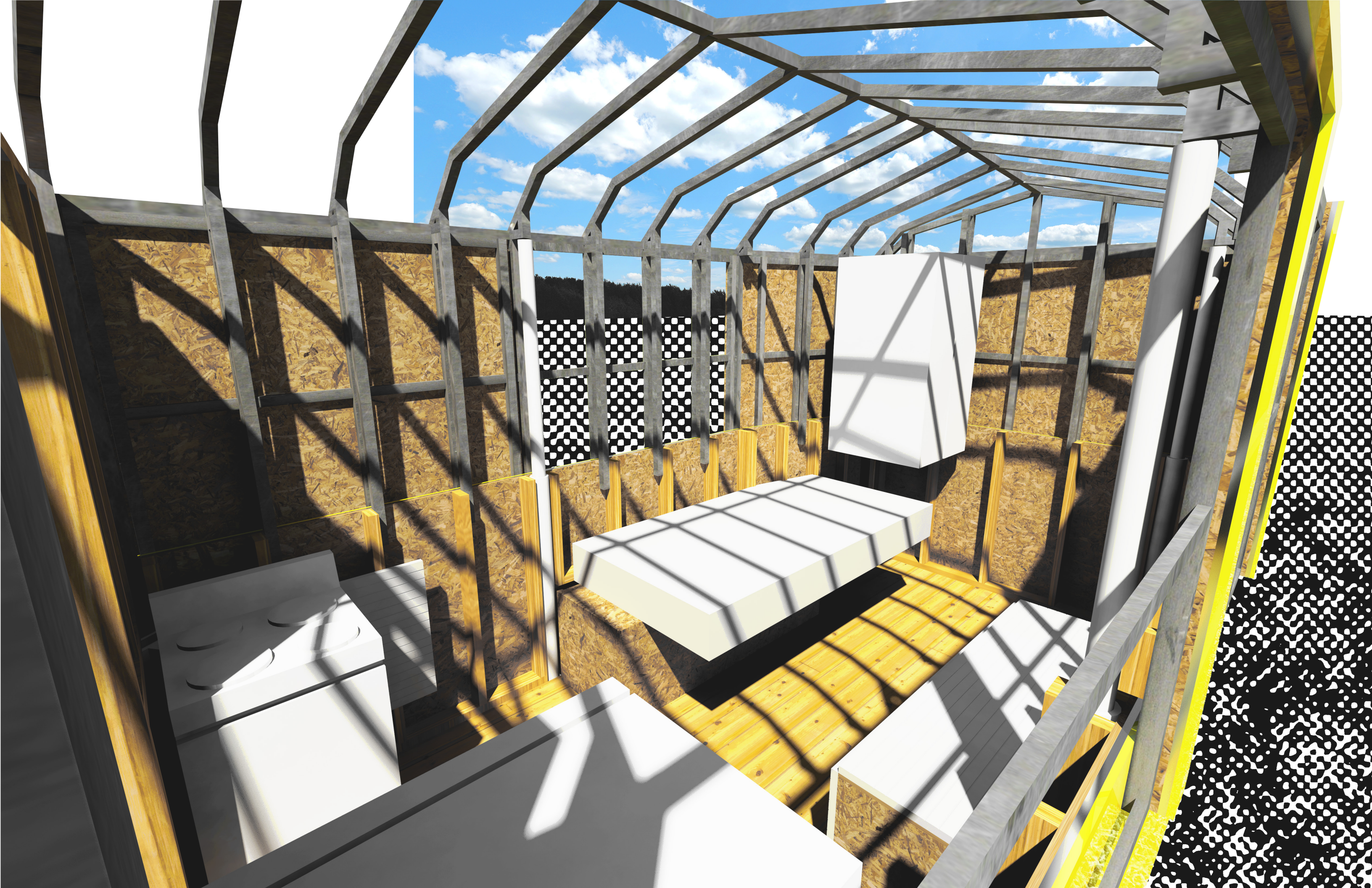


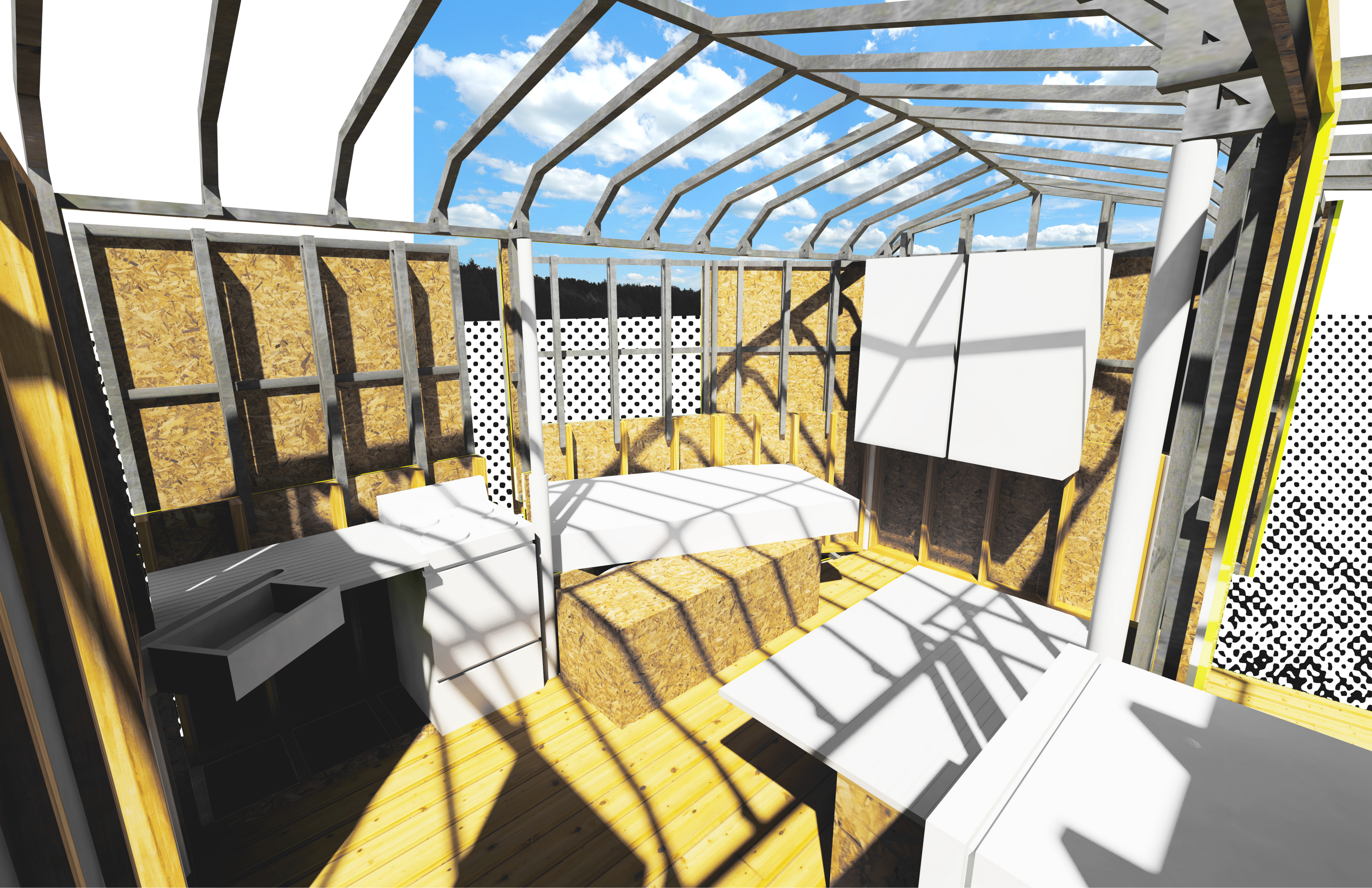
Figure 47

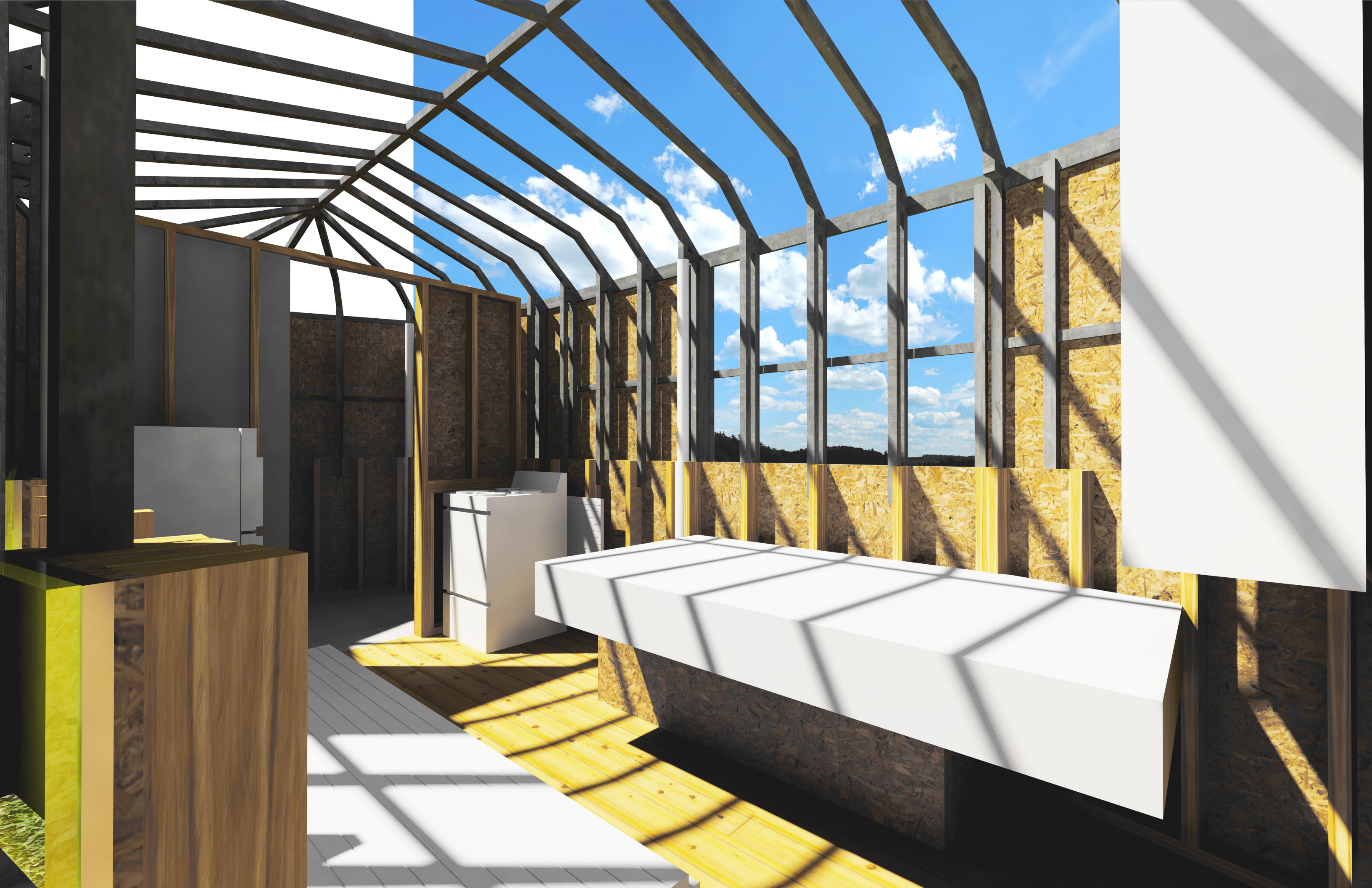
Figure 44-47 | Various detail images documenting the design and construction of the Mach.03.

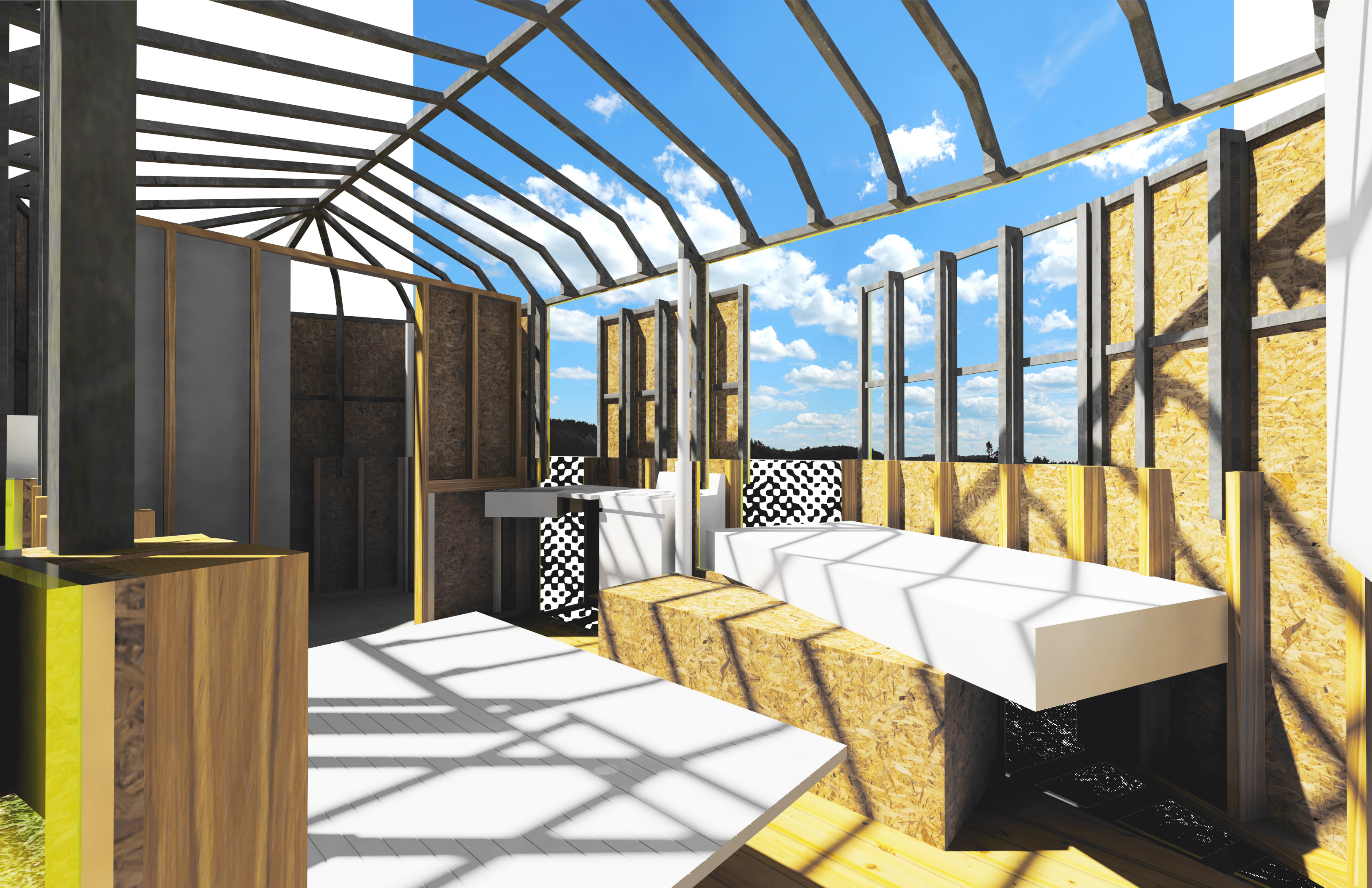


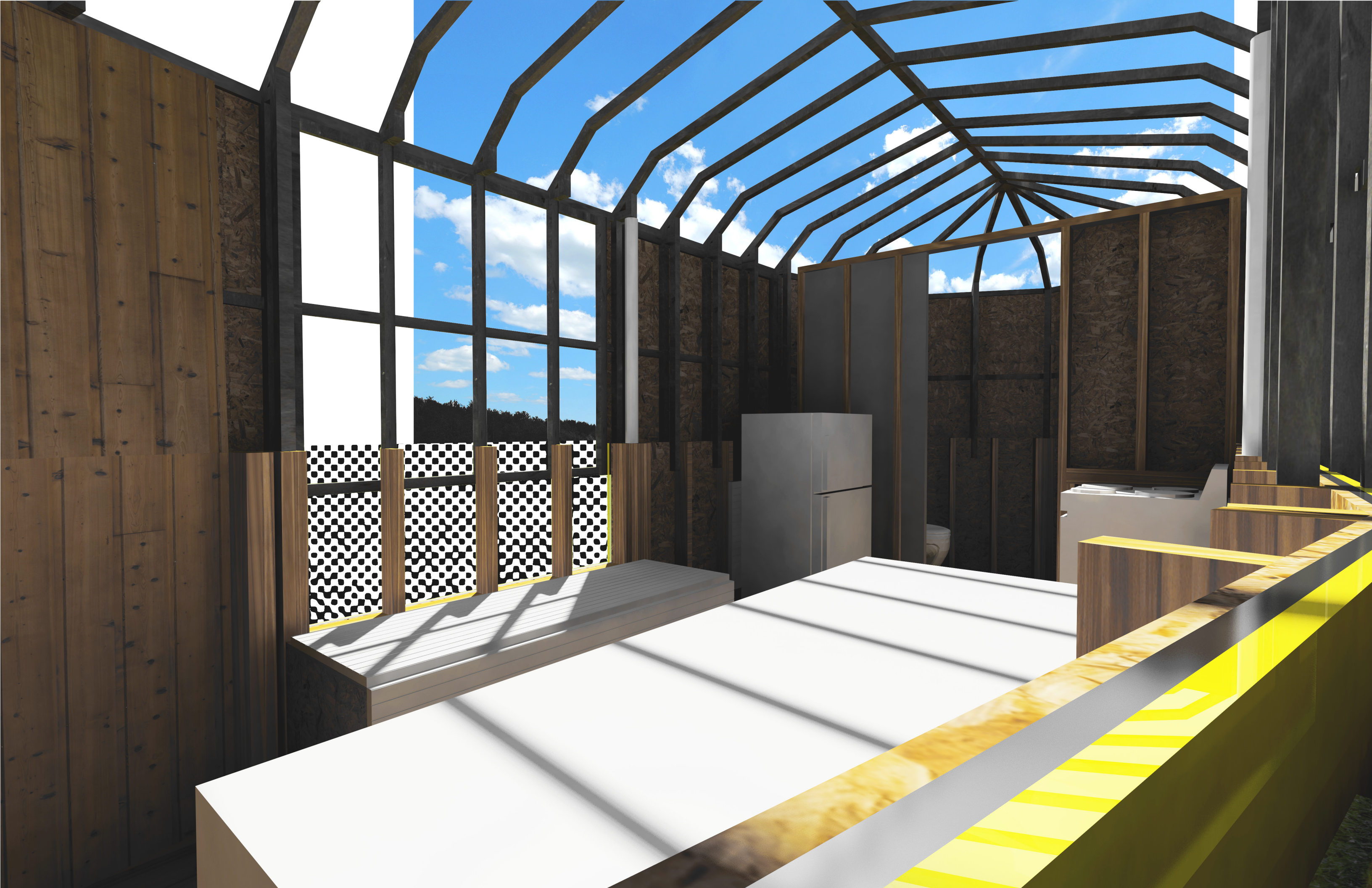


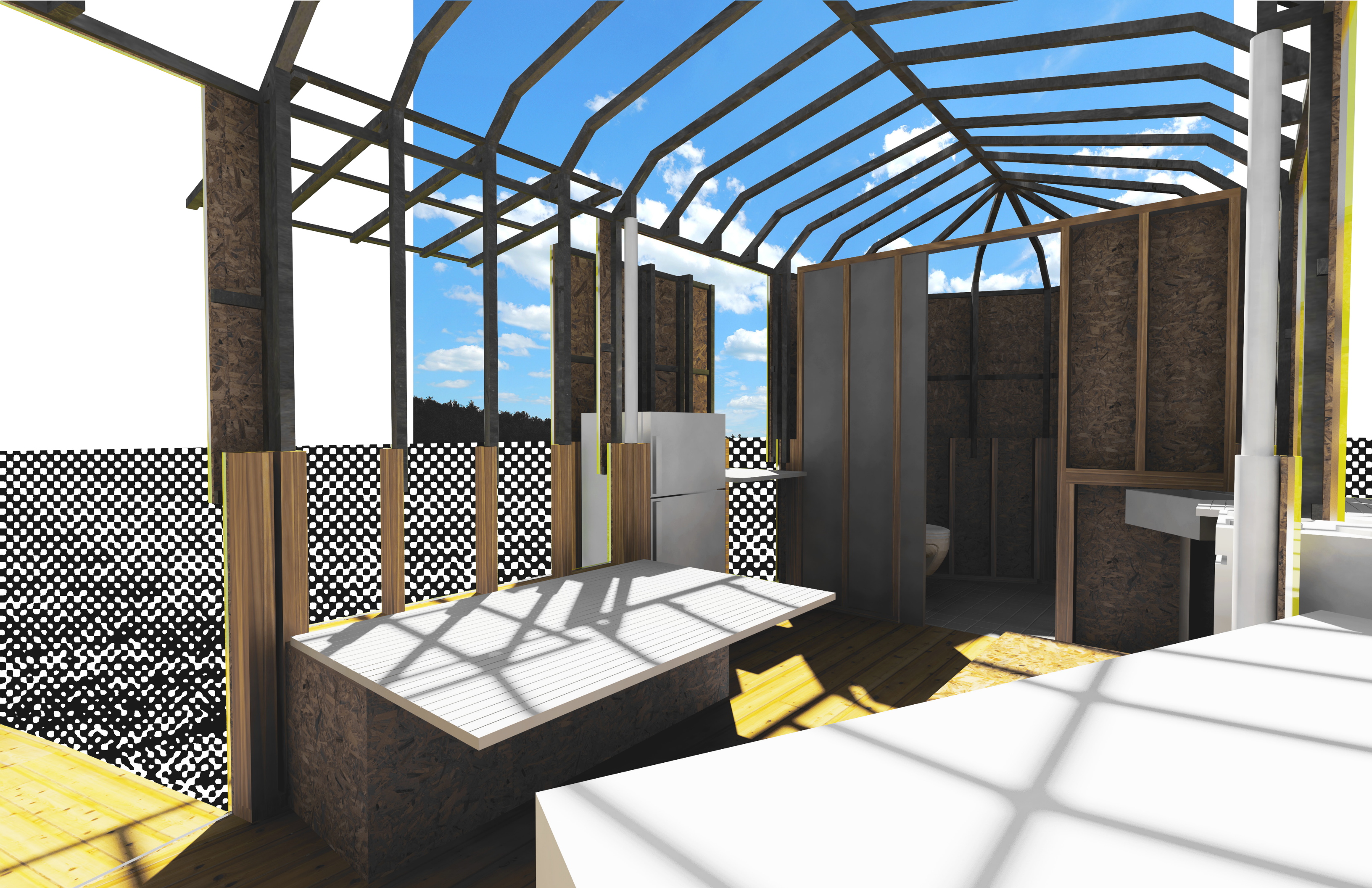


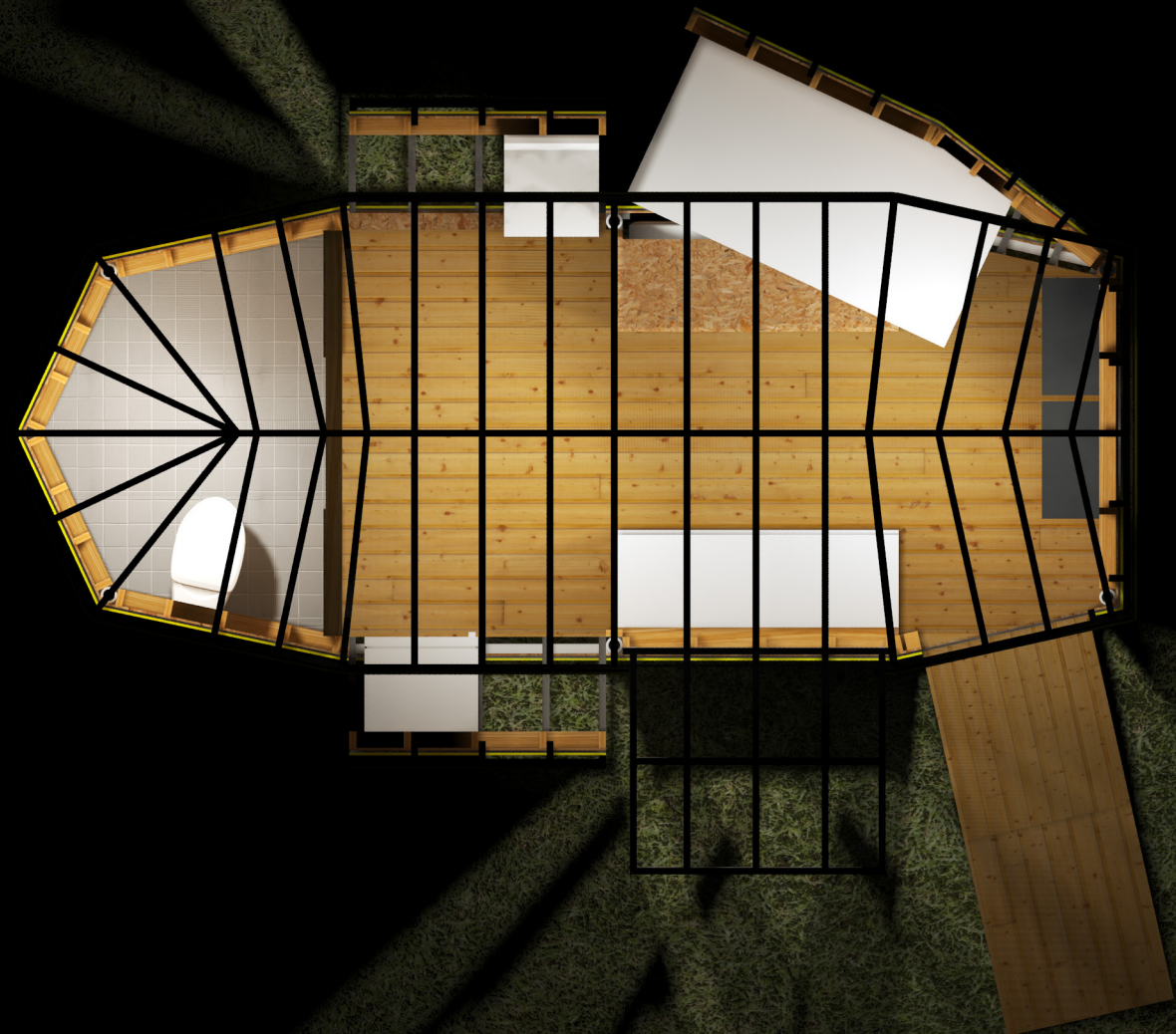


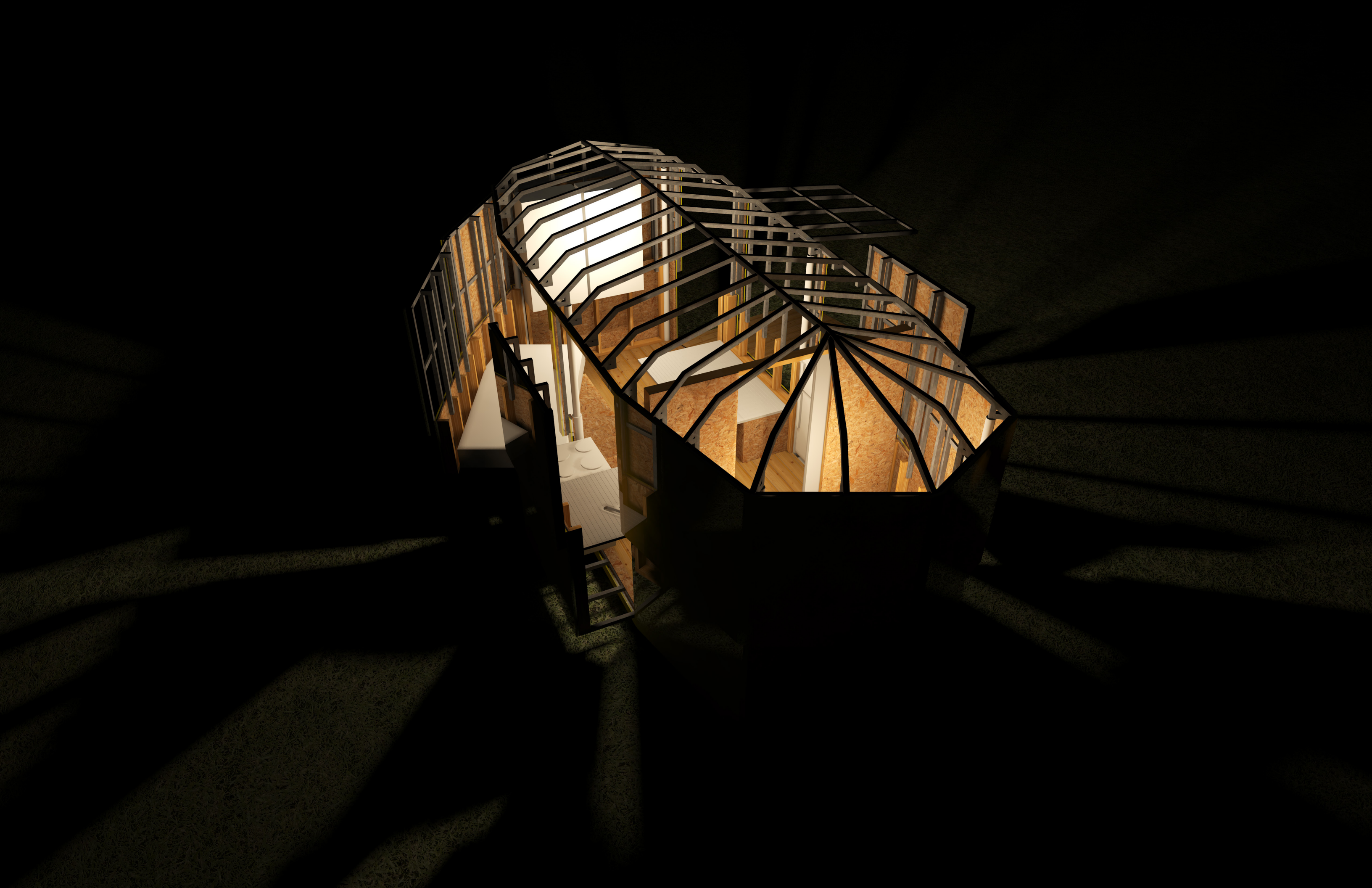






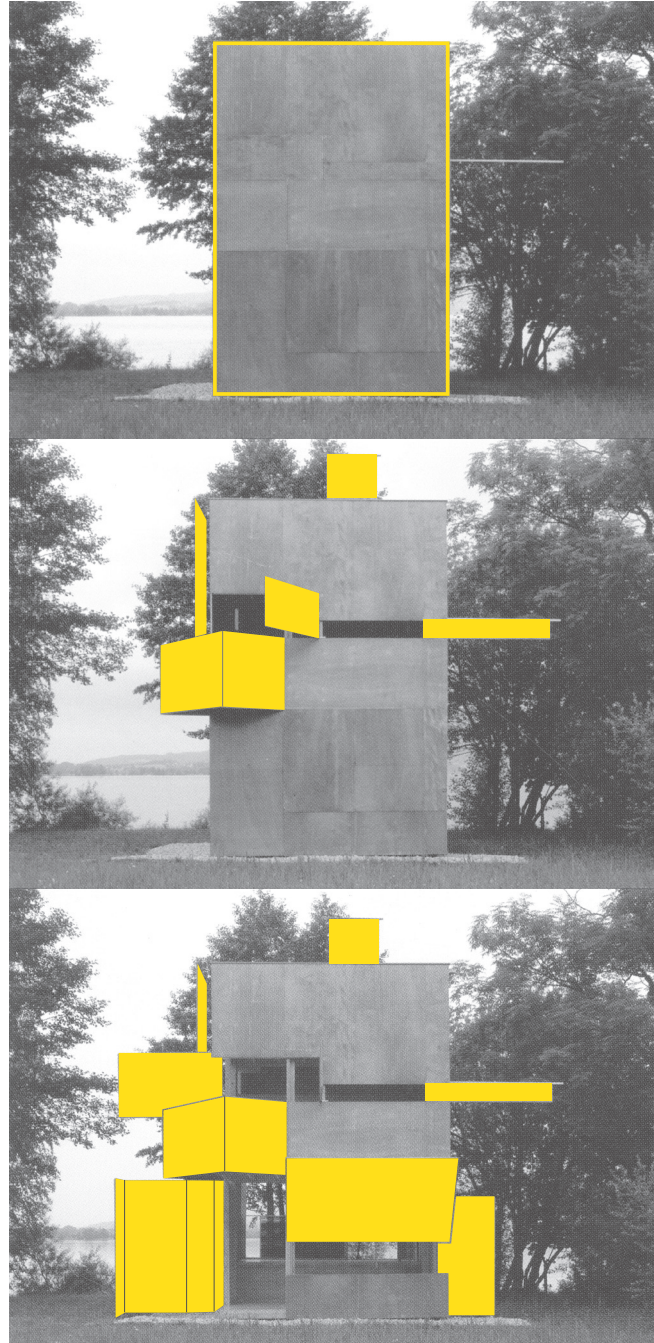






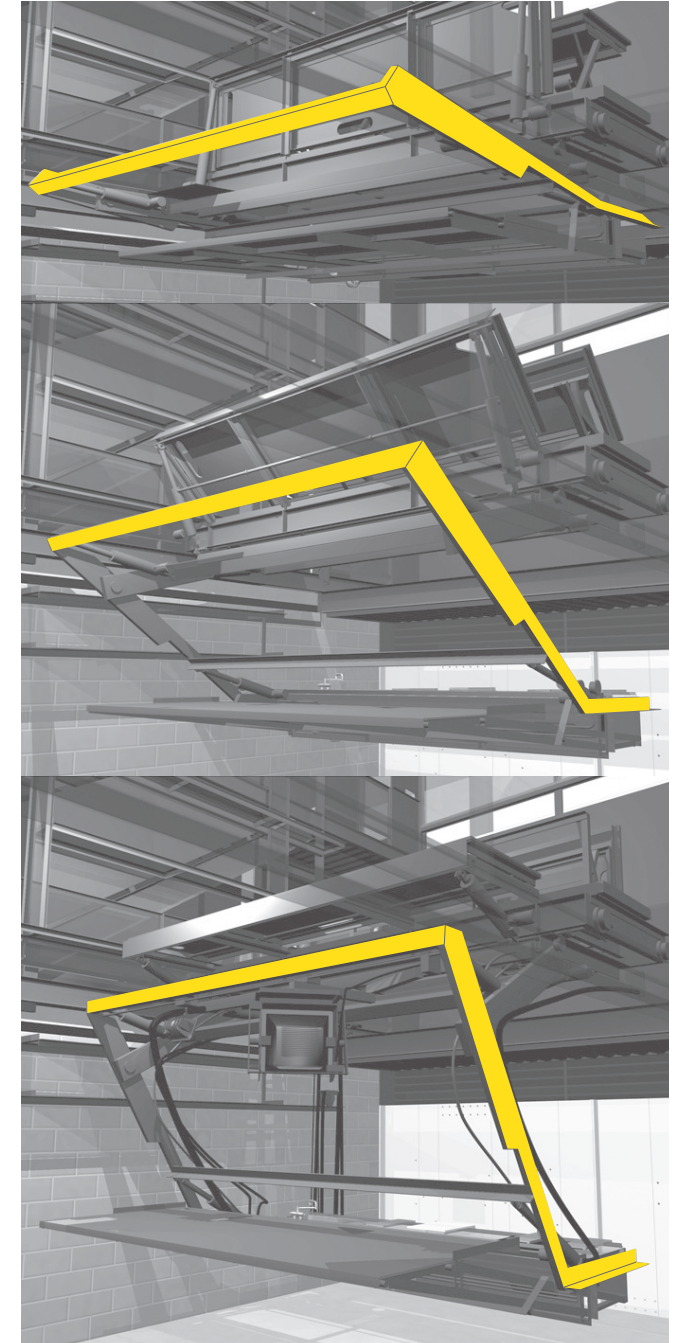


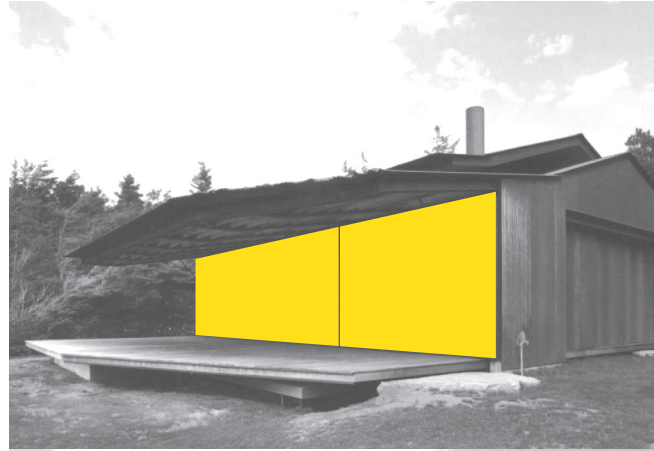
Reflecting upon the academic duration of this design thesis project, I am pleased with the start I made on the project. The final review was helpful and insightful in the continued development of this project. In the end, one aspect of how transformation and architecture could empower was presented. However, I neglected to clearly convey the big idea: architecture transforming so as to engage. In no way do I think I presented a finished project. As I consider Experiment 01, I believe it was successful in so much that it began investigating the issues of transformation for sake of empowering others. However, I believe the level of nuance achieved was slightly detrimental to the greater idea. At a certain point, work is produced for sake of completing a curricular requirement, rather than fully investigating an idea; a circumstance related to an academic project. In no way is this the end. Rather, it is only the beginning of the conversation.



Designed for the Austrian Festival of the Regions in 1993, the Gucklhupf is a pavilion constructed of plywood, stud-framing and fiber-board cladding. Addressing the festival theme of "strangeness", the parti of the pavilion was to create a built work exemplifying the idea of tension. Worndl's pavilion was intended to evoke a sense of permanent change manifest through a physical object.

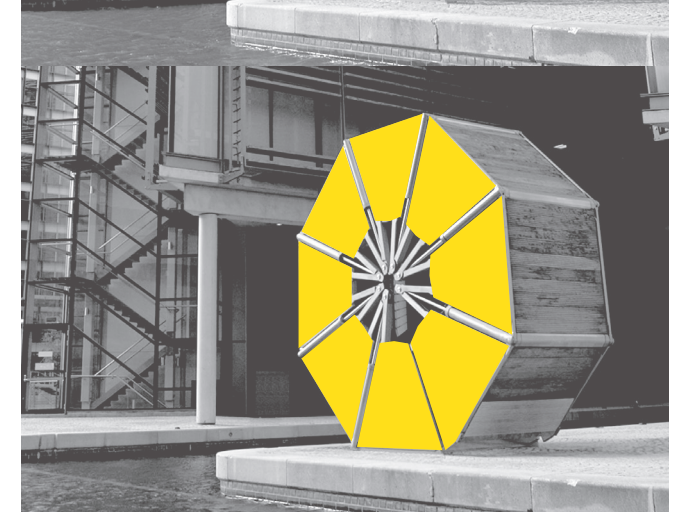
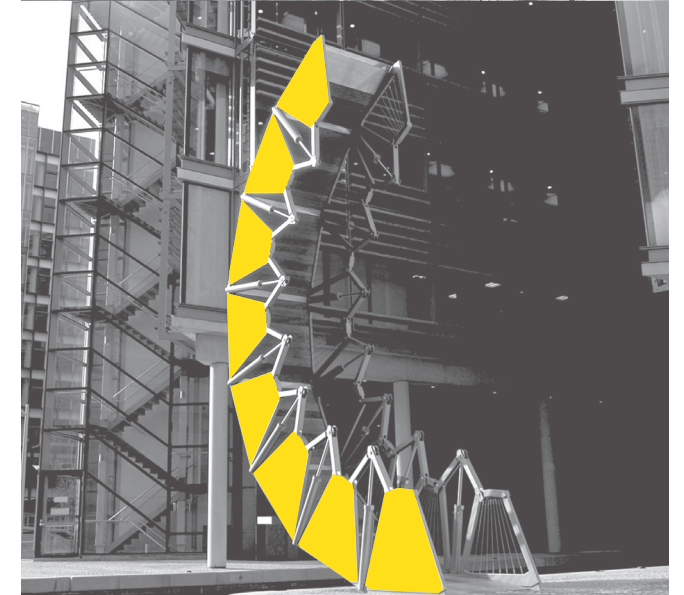
The Brill Residence includes a bicycle operated traveling bridge, for accessing an extensive drum collection, and a sliding rail privacy system. While paying homage to the needs of the client, the residence is a visible expression of the machine and mechanisms used to achieve the desired programmatic operations. The poetics of the machine permeate throughout visible, transformable elements found in the traveling bridge and sliding rail.

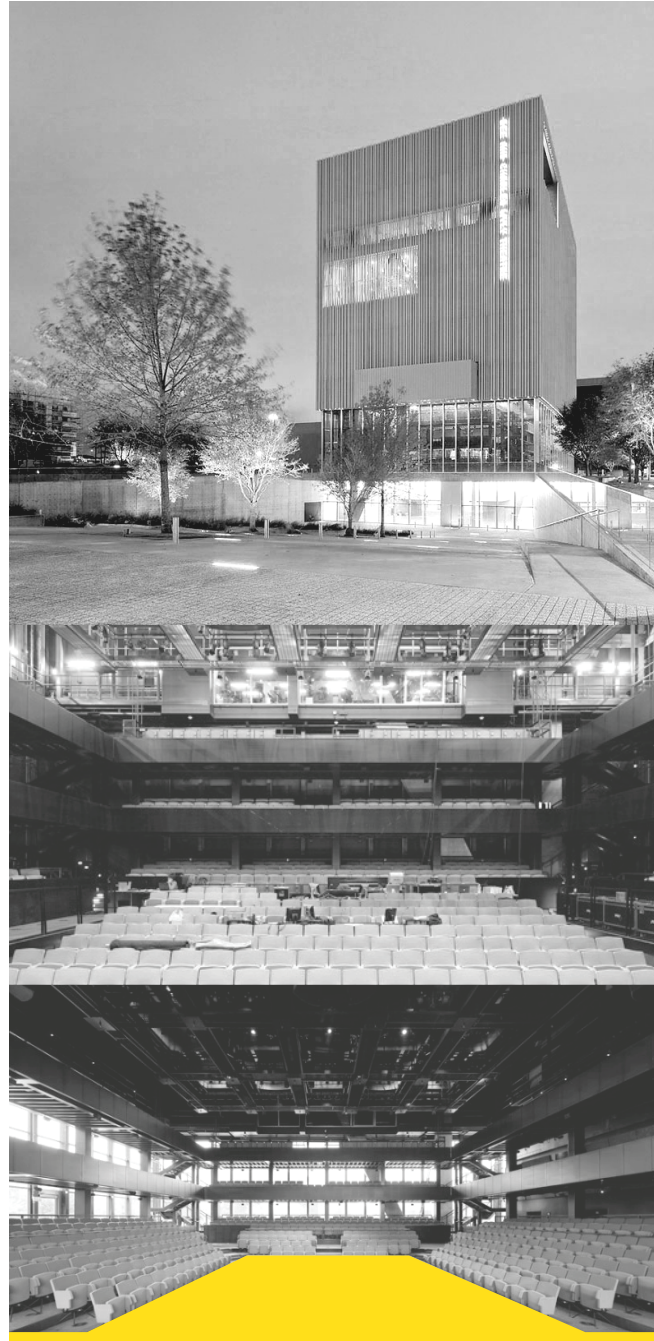




Shadowboxx aims to assimilate architecture with the natural surrounding context; interior volumes derived from natural conditions in the environment, such as wind patterns and scenic vistas. Operable exterior awnings can be opened or closed to accommodate user preference. Shadowboxx speaks to the full immersion of the inhabitant with the architecture, due to the tactile material qualities.

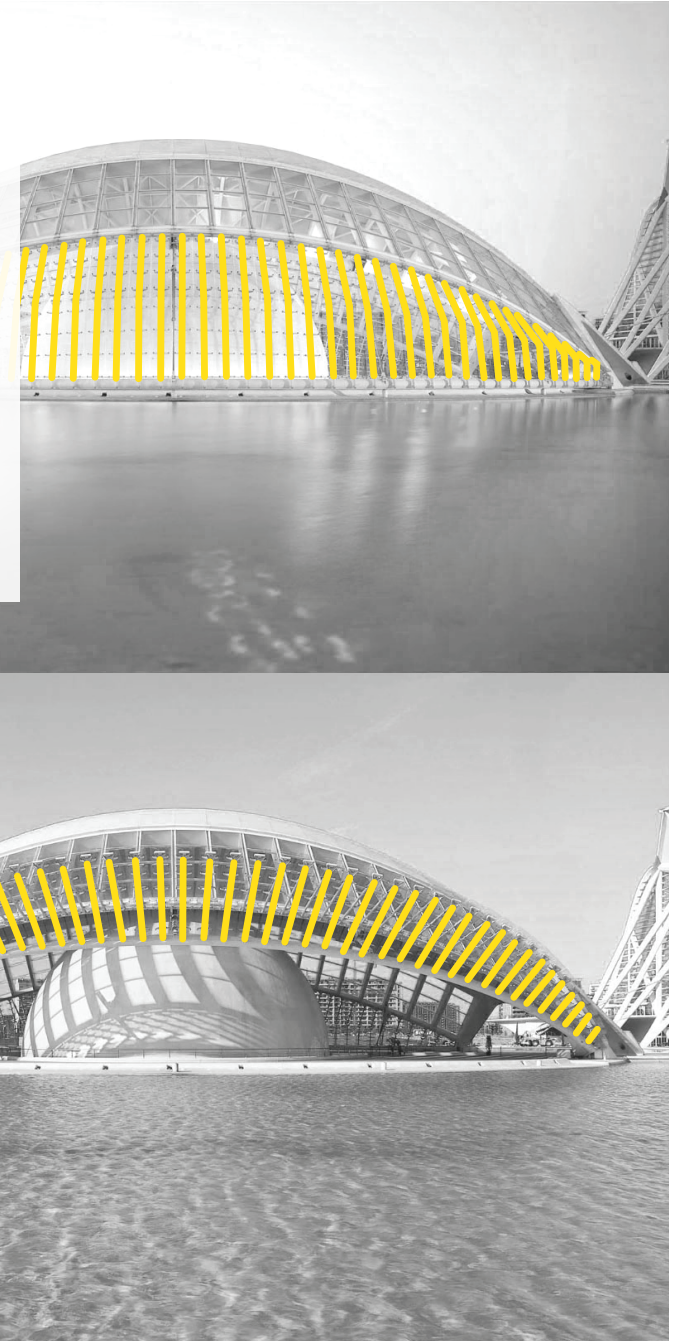
Heatherwick's Rolling Bridge challenges conventional opening bridges. For that reason, the parti behind the bridge focuses on allowing the movement to be the defining element. The curling form of the bridge formally reinterprets the notion of a draw-bridge. The bridge utilizes hydraulic rams to enact the transformation, acting independently across the eight segments. This design decision allows the bridge to be stopped at any position when curling or un-rolling.

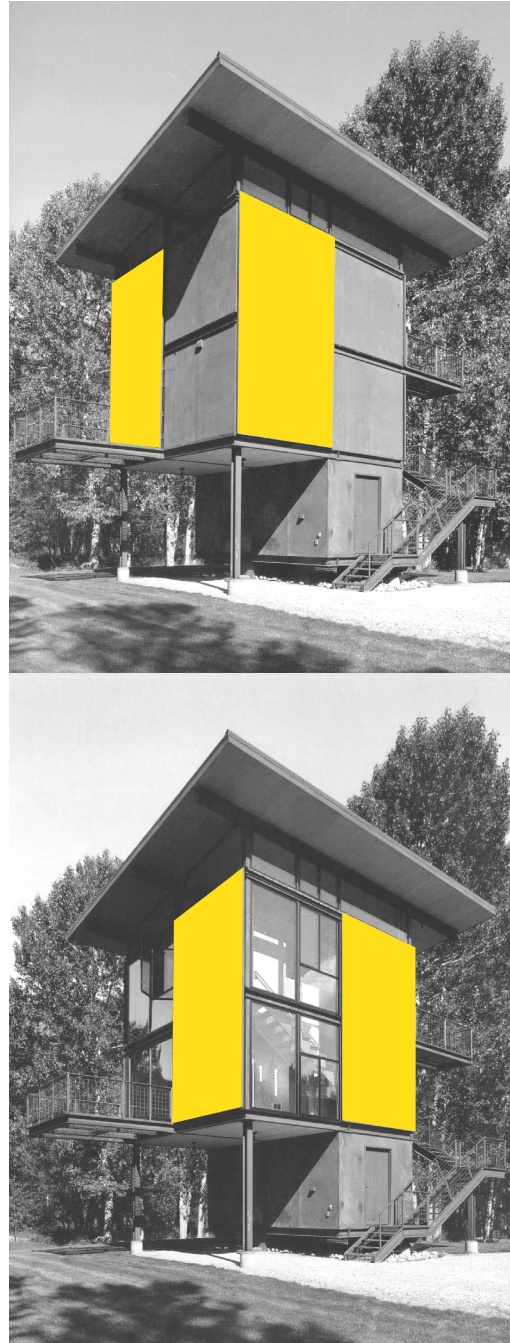




A result of collaboration between REX and OMA, the Wyly Theatre reinterprets conventional theatre design. Vertically stacking typical back-of-house and front-of-house program allows the reconfiguration of seating giving the theatre a multitude of spatial configurations. Transformations can be executed in a matter of hours with a small crew. The ground-level of the theatre was designed to allow zero-entry to the space, enhancing the programmed flexibility of the building.

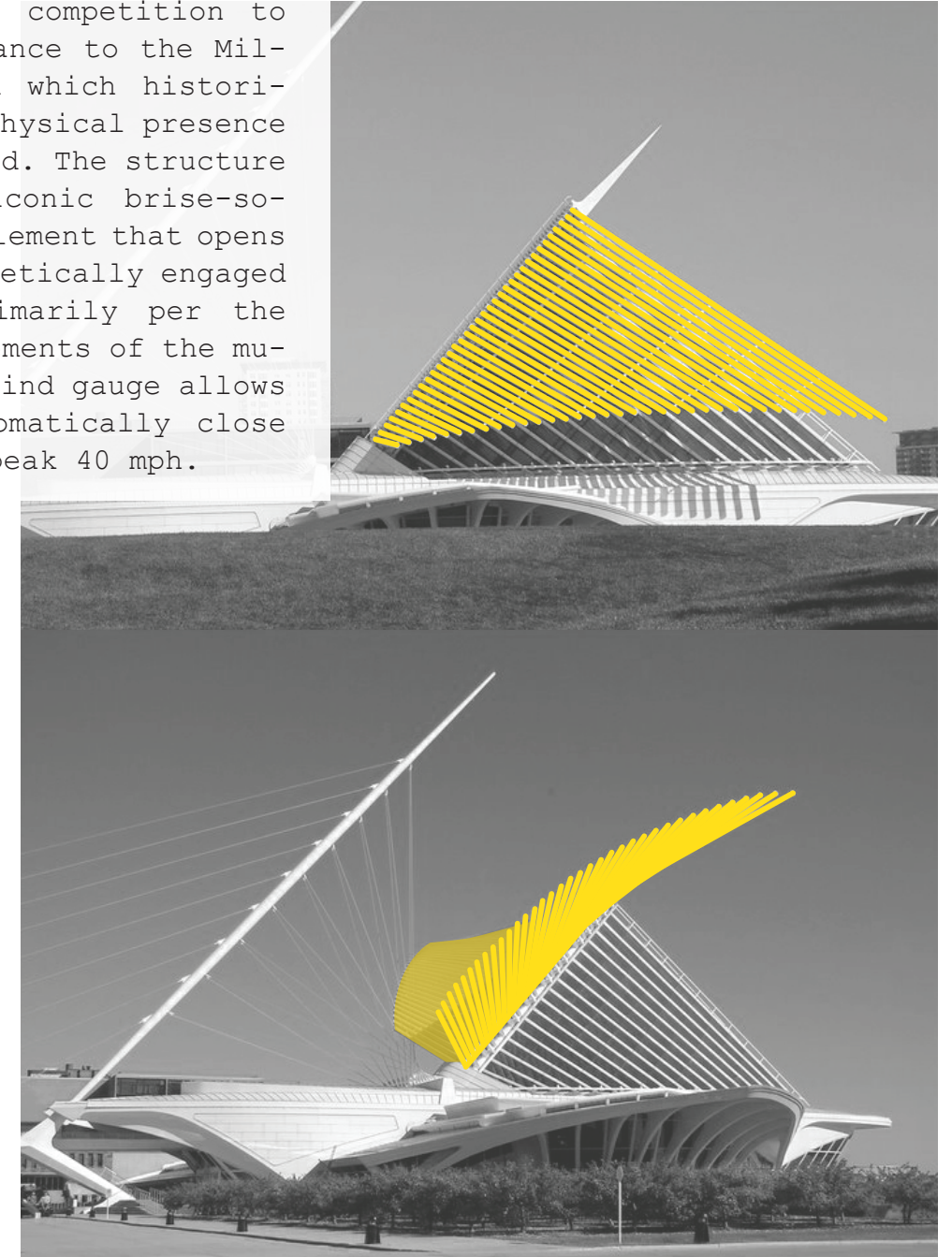
The planetarium is only one aspect of the City of Arts and Sciences development in Valencia, Spain. Calatrava designed a concrete shell encompassing the programmatic elements of the planetarium. To achieve movement in the design, a vertical louver system pivots in the middle of the assembly. The coupling of the lightweight shell with the bulkiness of the interior planetarium creates a harmonious relationship between both elements of the structure.

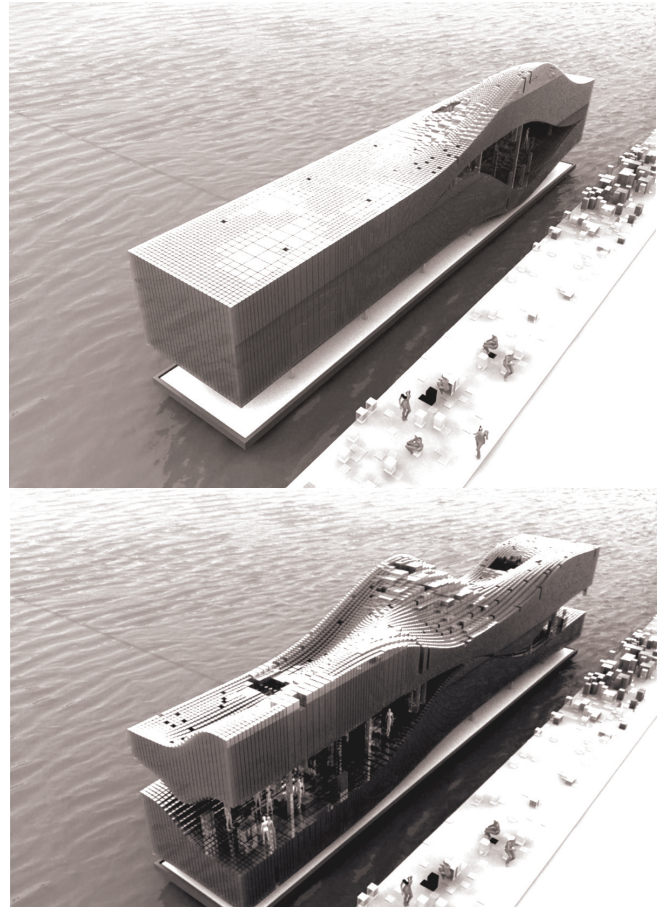




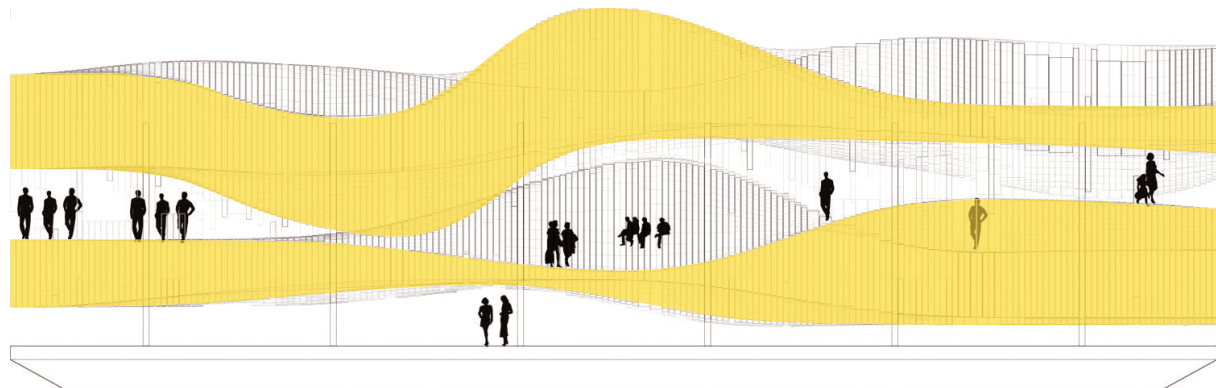
Created as a weekend cabin, the Delta Shelter stands majestically against the Washington landscape. Designed to defend against inclement weather, the Delta Shelter employs four double-height steel shutters that celebrate the act of opening and closing by working in tandem. The shutter mechanism utilizes sliding components operated by hand through a crank and wheel system, creating a direct relationship between the architecture and owner.

Calatrava won the competition to redesign the entrance to the Milwaukee Art Museum which historically lacked the physical presence the museum demanded. The structure now adorns the iconic brise-soleil; a moveable element that opens and closes. The poetically engaged wings operate primarily per the exhibition requirements of the museum. However, a wind gauge allows the wings to automatically close when wind speeds peak 40 mph.





HiDrone is an adaptable architecture gallery project designed and developed by an MIT research team named SPARC. The HiDrone operates between two states: an open, occupiable space and a closed, 3D screen. The social value of HiDrone manifests in its ability to create various scales of social spaces, based on the individual units' response to the water cycles of the Thames River. Various furnishings, as well as room volumes are capable of formation by the vertically moving units. Deformations occur on both the ceiling and floor planes, creating a multitude of unique, socially engaging spaces.



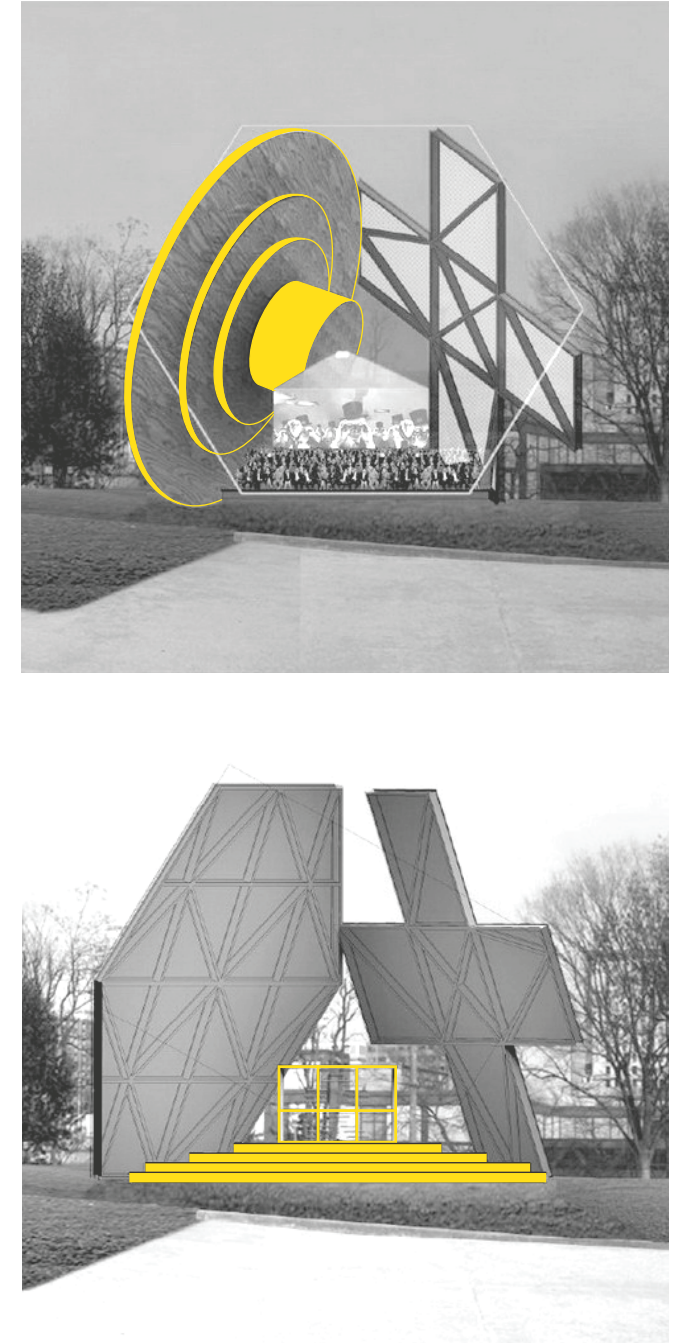
People are constantly moving. This idea permeates the reason for the Drawer House. Typically cluttered spaces are replaced by simple expansive areas. The Drawer House used the concept of concealing to hide and store various furnishings and accessories common in a residential unit. While this building occupies three floors, it maintains a significantly small square-footage.

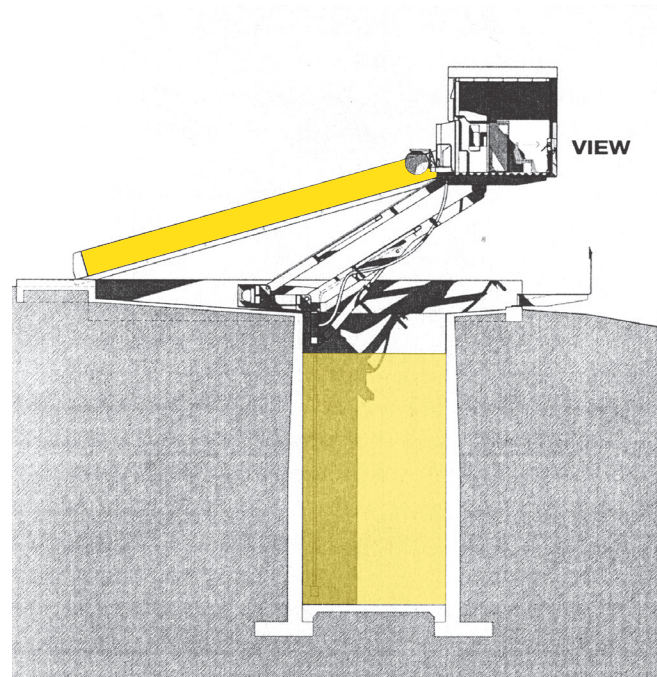




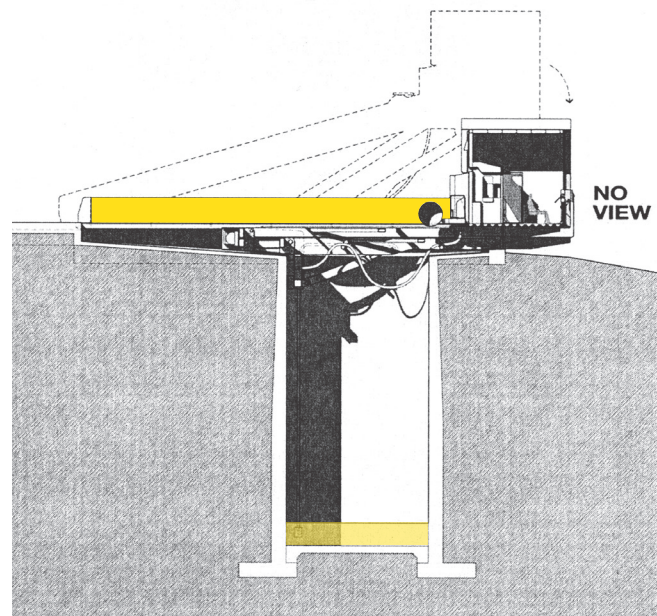
Gary Chang has lived in the same apartment building for most of his life. However, it has gone through quite the evolution. Based on a system of ceiling mounted tracks, Chang created moveable walls to access items when needed. The operation of the various moveable components allows a multitude of spatial configurations. Chang installed mirrors to help disguise the ceiling track system for his transformable wall panels.

OMA's Prada Transformer pushes the bounds of engineering and design. The entirety of the pavilion is able to be picked up and rotated, per the internal program. As a result of the rotation, what was once perceived as a wall plane, is now experienced as a floor plane. The Prada Transformer deals with large-scale transformation of space and enclosure, rather than simply transformable components.



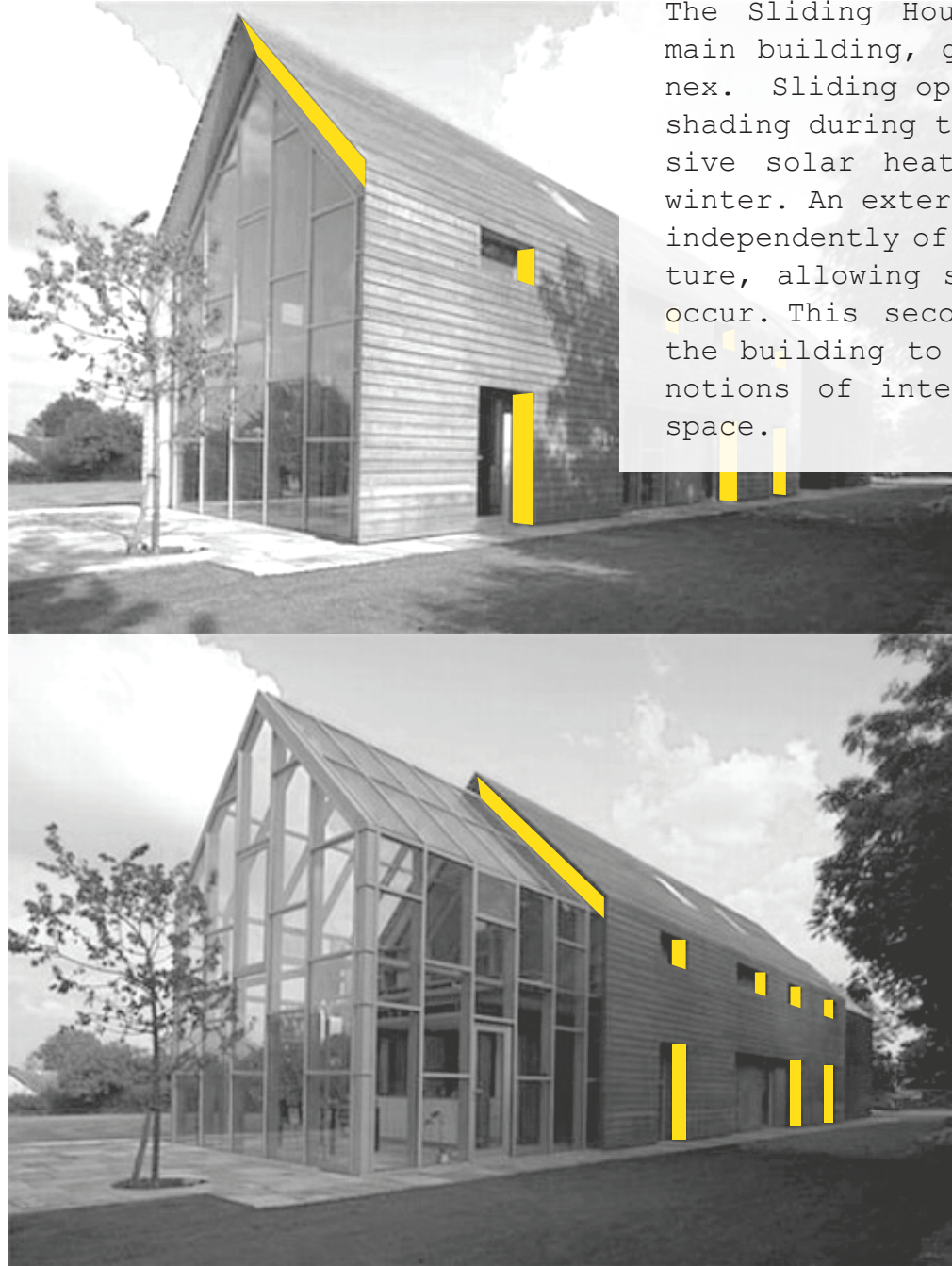


Doug Jackson's, Water Elemental offers a different interpretation of sustainability in architecture. Designed as a cabin, within a park outside Los Angeles, the Water Elemental is situated over its own fresh water well. A view of LA is offered when the well is full. The cabin is connected to the well; as the water level decreases, the view of LA is lessened.



This experimental housing prototype investigates the idea of flexible spaces in a small footprint. Programmatic spaces are juxtaposed directly on top of one another. Different sections are identified for specific pragmatic needs, including sleeping, eating, exercising, and studying. While small, this prototype begins making profound implications into the possibilities of transformable spaces.





The Sliding House consists of a main building, garage, and an annex. Sliding operations allow for shading during the summer and passive solar heat gain during the winter. An exterior shell operates independently of the overall structure, allowing sliding motions to occur. This secondary skin allows the building to challenge typical notions of interior and exterior space.

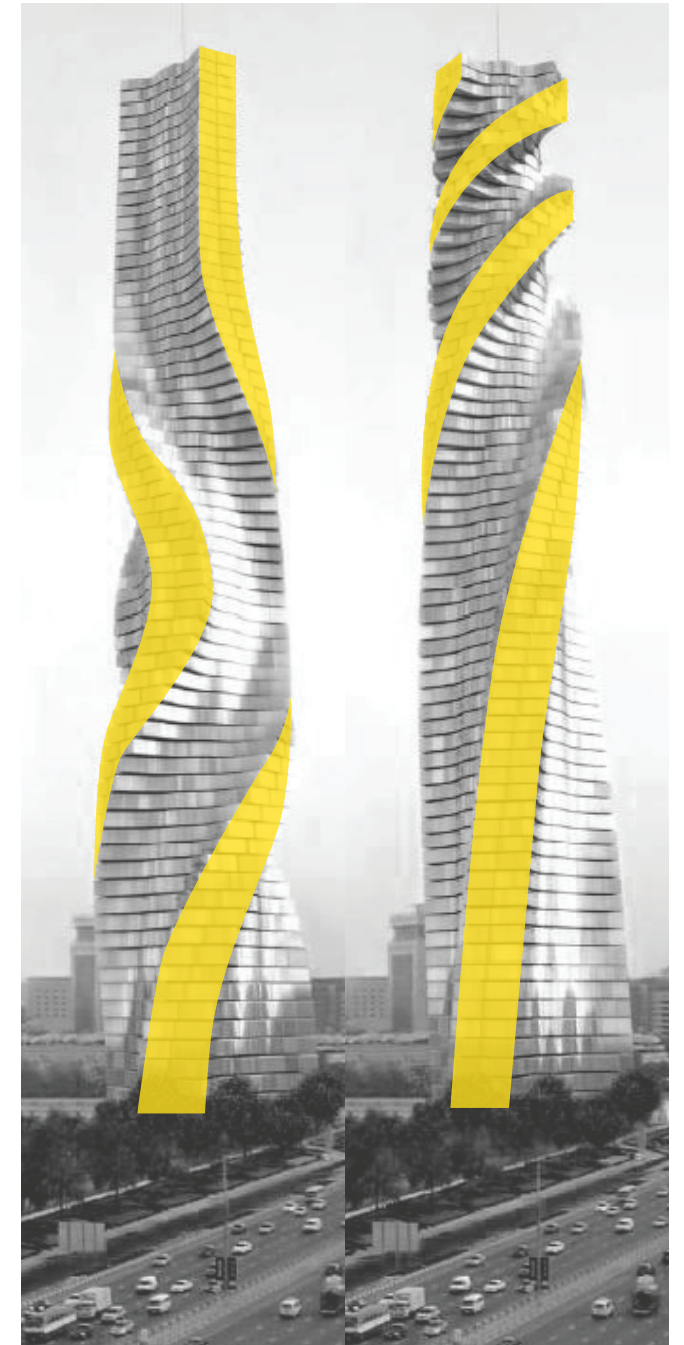
Aiming to capture the picturesque sandy beaches of New Zealand, the Hut on Sleds is designed as a compact weekend getaway. Operable shutters and doors allow the hut to be closed up when uninhabited. The vast operable "door" creates a sense of space on the exterior, fully opening the hut to the New Zealand landscape. Exterior cladding allows the hut to blend into the natural context.





The Southern California Institute of Architecture held a competition to redesign a conference room and event space within an old, historic freight terminal. Program required the amalgamation of three distinct functions. In order to preserve the historic structure, a drawer-like conference room slides between interior and exterior, per user requirements. An industrial elevator has been included in the design to assist in circulation as well as added flexibility per the various arrangements.

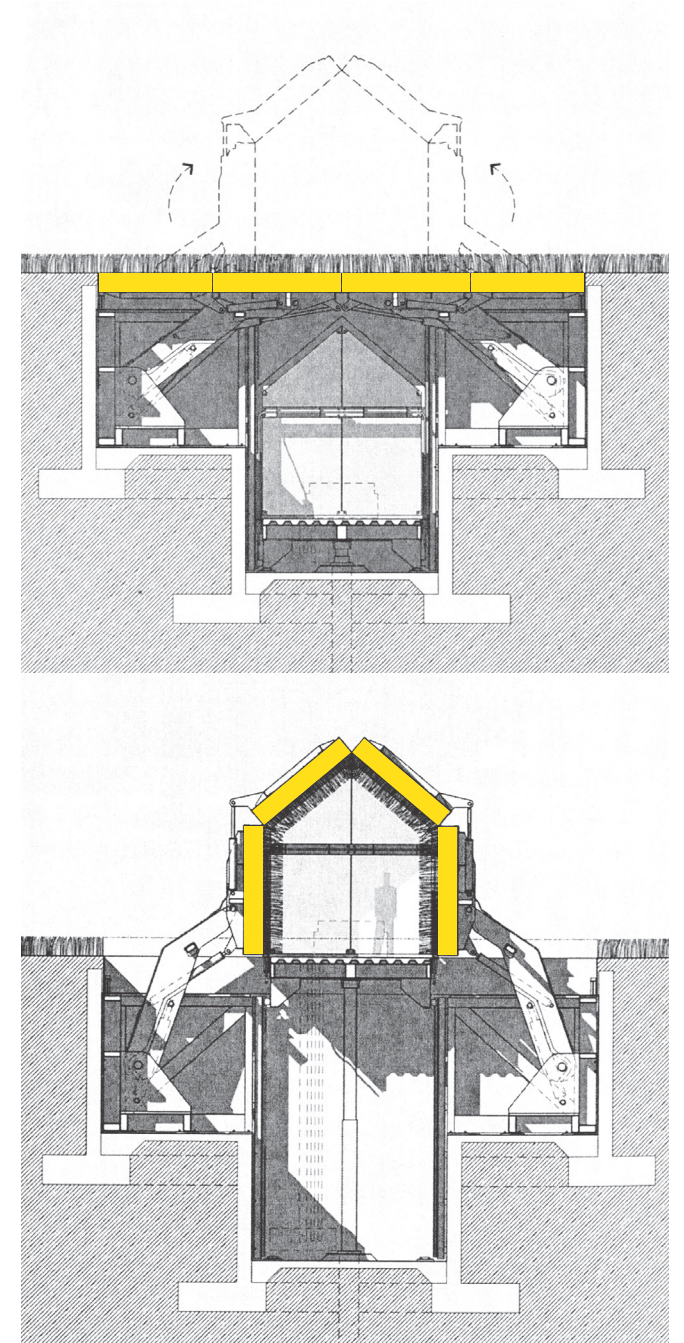
The Dynamic Tower, conceived by Dr. David Fisher is on the edge of redefining paradigms in architecture. Each floor of the tower will have the ability to move, independently of one another. Whether in response to climatic conditions or framed views, the user is given control of the unit's movement. This is also the first tower which is to be built utilizing prefabrication technologies.





Originally a storage room for a neighboring business, the Lego Apartment was converted to a studio apartment by Barbara Appoloni. The interior is a menagerie of moveable components that allows the space to be quickly reconfigured. The flexibility of the Lego Apartment allows for a variety of different experiences from users of the space.

Jackson's Ground Elemental is a commentary on the impact of the built environment on the natural world. A small cabin located in California, the Ground Elemental transforms to conceal the living unit within an underground chamber. When occupied, interior wall panels are made from the displaced earth and grass. Over time, as the grass panels continue revealing and concealing the cabin, the grass dies, falling to the floor.



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