Strata-Sphere

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Christopher Szymberski

Design Build Directed Study: 2016

Burning Man Project: 'Frame of Mind'

Report on Project Completion

The intention of this project was to extend an exploration of building with wood, its unique characteristics as a material, and the use of wood joinery techniques. The result is a building system based on modular pieces of plywood joined by way of both compression and tension and an overlapping/underlapping method of attachment. Originally born from a studio project lead by AnnaLisa Meyboom, students were instructed to explore different wood products and methods of joining inspired by traditional knowledge and augmented by the application of new fabrication technologies and simulated modeling software.

The beginnings of the 'Frame of Mind' project came from an exploration of radial joining; how multiple pieces of wood can join at a single point. Through the duration of the studio, the building system evolved through multiple iterations; many of which were done through physical modeling as simulated modeling proved to be an inefficient form of exploration for this type of project. (material properties and responses being particularly difficult to simulate, as well as time consuming) At the end of the studio, the project had reached a stage that imparted a first level of understanding, leaving a large vista of questions to be asked and explored.

At the beginning of the summer of 2015, I endeavored to continue to explore the possibilities of the building system with the intention of bringing the project to the Burning Man festival located in the Black Rock Desert of Nevada. With the assistance of 3 other students (Stephanie Aitken, Heather Scott, and Kristina Strecker), new explorations were conducted to address the multitude of curious questions leftover from the initial studio project. The project's evolution came by way of many trial by error experiments with both scaled models and full scale attempts; resulting in broken material, dead ends, but always new knowledge gained.

The resultant building system is elegant; currently consisting of single repeating units that are capable of defining a variety of volumes depending on their arrangement. The building system is efficient. A secondary, self-imposed, criteria for the project was to be as efficient with materials as possible. This was achieved, as each modular plywood strip is cut from a sheet of plywood, with the only waste material being that which the saw blade removes. Thirdly, the project uses the inherent properties of wood to bend and resist bending to its advantage; allowing the modular strips to overlap their neighbor until a circuit is closed, resulting in both compression and tension which holds the building system aloft.

The project also opened several unforeseen paths, which were not initially anticipated. The project became a collaboration, and while much of the work is my own, the project would not be where it is if it were not for the invaluable input and assistance offered by my fellow students. It was not just with the physical project, but also the logistics of the project that became central to the tasks needed to be done.

Coordinating with the festival's art department; a lighting and power plan, as well as, seeking grants and funding became necessary as the project continued. We (Stephanie, Heather, Kristina, and I) submitted

for financing through SALA, and set up our own fundraising campaign, soliciting our friends and family for help. We needed to finish building the project, light it, and to fund our travels to the festival.

The project also enabled us to reach out to a community in Vancouver. Initially acquaintances and now very good friends, the people of Camp Headspace were essential in helping to realize the project. They helped significantly with the logistics of getting us and the project there and back, and, as one member owns a lighting business, were crucial in helping us to light and power the project.

Once we were at the burning man festival, we built the project amidst 50 mph winds in a dust storm. We lit it the first night we were there and celebrated with our new friends on the accomplishment of the project's realization. Despite the harsh environment, the project withstood the winds, sun, and people with minimal damage, requiring minor repairs, less than a handful of times.

Since our return, discussions with UBC's Campus and Community Planning began to find a way to incorporate the project into campus life somehow upon our return (This evolution of the project is still in motion and is scheduled to be installed soon). And, with the encouragement and support of my engineer father, we have begun the process to patent the building system as it can span scales and applications.

In conclusion, this has been a very worthwhile project. It was ad still is very satisfying to build, to explore material properties and uses, and to challenge myself in new ways. I was immensely empowered by the experience and have begun to explore a building system that still offers secrets to uncover. Despite many setbacks and hurdles, the project came to fruition with the help and support of faculty, friends, and family, as well as, the persevering spirit of myself and teammates.

Cities for Engaged Citizens

Stephanie Aitken & Christopher Szymberki

"The moments at which [citizens] are happiest are when they are… engaged in a challenging task and doing it well." (Kay)

After months of designing a project we traveled to Black Rock City, Nevada, where Burning Man, an arts and culture festival takes place. We journeyed there not just to build the project, but also to participate in an event known for radical self- expression. While the challenge of a design-build is a rewarding experience and could be the source of its own essay, we would like to discuss our first hand experience of a place with a rich and dynamic public realm, a place that perpetually offers opportunities for citizens of the temporary city to engage with the world around them. We feel this is important to share because upon returning home, we noticed that Vancouver felt very different from what we had experienced in the Nevada desert. There are many lessons to be learned from Black Rock City, which can be applied to the public realm of more traditional settlements, such as Vancouver, for a happier and more engaged citizen experience.

Vancouver is a city known around the world for its dramatic natural beauty, set amongst the scene of ocean and mountains. However, according to local urban planner Lance Berelowitz, if it were not for this scene of dramatic beauty, Vancouver's "public space would qualify as one of the more banal architectural constructs of any Canadian City" (140) Over the years, Vancouver's public life has moved away from its civic centers to the edges of the city and the waterfront. This translocation of public life away from traditional uses of civic space towards that of personal leisure, has turned them into "venues of consumption" threatening Vancouver's civic spaces as no longer being places of "vital, legitimate, political expression" (Berelowitz 258)

Compared to the eroding civic spaces of Vancouver, Black Rock City is a place made for self- expression and civic engagement. The uniqueness of Burning Man's temporary home in the Black Rock Desert is that it is devoid of traditional infrastructure set within an inhospitable environment, and would not exist were it not for people engaging and participating at every level of the community. From our observations, we offer three key elements that empower people to engage their city and citizen experience:

1. Regulations that empower: Despite popular belief, Burning Man is not a place of chaos. It is a city with operational departments; trained medical and assistance personnel; and, has clear published guidelines of conduct for its citizens. Submitting documents is necessary for art projects, serving food and alcohol, early entry, vehicle registration, burn permits, etc. While the documents are rigorous, they empower people to organize, coordinate, and ultimately to successfully participate through the means of freedom of expression and engagement.
2. Open Ended Design: Black Rock City is designed to be a setting of public and civic engagement through art, performance, workshops, etc. The city is built from what its citizens bring to it; populated with temporary homes, extraordinary artwork, and continual acts of generosity. It is a place full of spontaneous delight, evolving through the contributions of its participants, and existing by way of un-prescribed events, places, and citizen occupation. While its urban plan is

formally defined through a continuing framework, the individual elements of the city shift and adapt to the emerging and evolving cultural expressions of its people. Ultimately, it is a citizen determined landscape.

3. Ownership of experience: As the city is full of endless opportunities to express and engage, and has regulations that empower instead of inhibit; citizens are expected to take ownership of their experience. By ownership of experience we mean that each individual is responsible for themselves and the environment around them. For example, it is the participants' responsibility to know their physical abilities and limits while climbing, jumping, swinging, or engaging with art installations. In this, Burning man offers opportunities for safe risk taking behaviors that the contemporary urban realm prohibits. Also, citizens of Black Rock City take responsibility for M.O.O.P. (matter out of place) by picking up trash and adhering to a 'leave no trace' policy. These are two examples of how creating ownership of experience leads to a more adventurous and challenging public realm where people take care of themselves, their environment, and each other.

These key elements combined with the ephemeral conditions of Black Rock City make it a place that fosters engaged citizen experience. We recognize that Black Rock City cannot be replicated in Vancouver; however, we believe that these elements can and should be adapted to enrich and inspire a more vital and engaging public realm. It is our experience as citizens of Vancouver that the city is over-regulated, over-prescribed, and its citizens, therefore, do not take ownership or participate in the public realm. As Lance Berelowitz writes:

> *"Vancouverites are being turned into consumers of, rather than participants in, their own culture, tourists in their own city, and the forms of public space are quietly being appropriated. Meanwhile, more self-generated, unregulated expressions of public life are being increasingly marginalized, both physically and socially." (270)*

As Landscape Architects we have a responsibility to the public realm. We can look to Black Rock City as an evolving example of a place that allows people to truly engage and participate in the creation of their experience, empowering citizens to take responsibility and ownership of their city. As previously stated, an over-prescribed and over-regulated public realm demotes citizens to tourists in their own city, robbing them of the responsibility and civic participation that brings vitality and genuine happiness to them and the city. In order to establish a more vital and happy public realm in Vancouver, regulations that promote spontaneity and creative endeavors need to replace onerous rules and regulations. Public spaces should be open-ended where people can occupy and continually re-define the activities, organization, and content. Our goal should be to create a city for engaged citizens.

Sources:

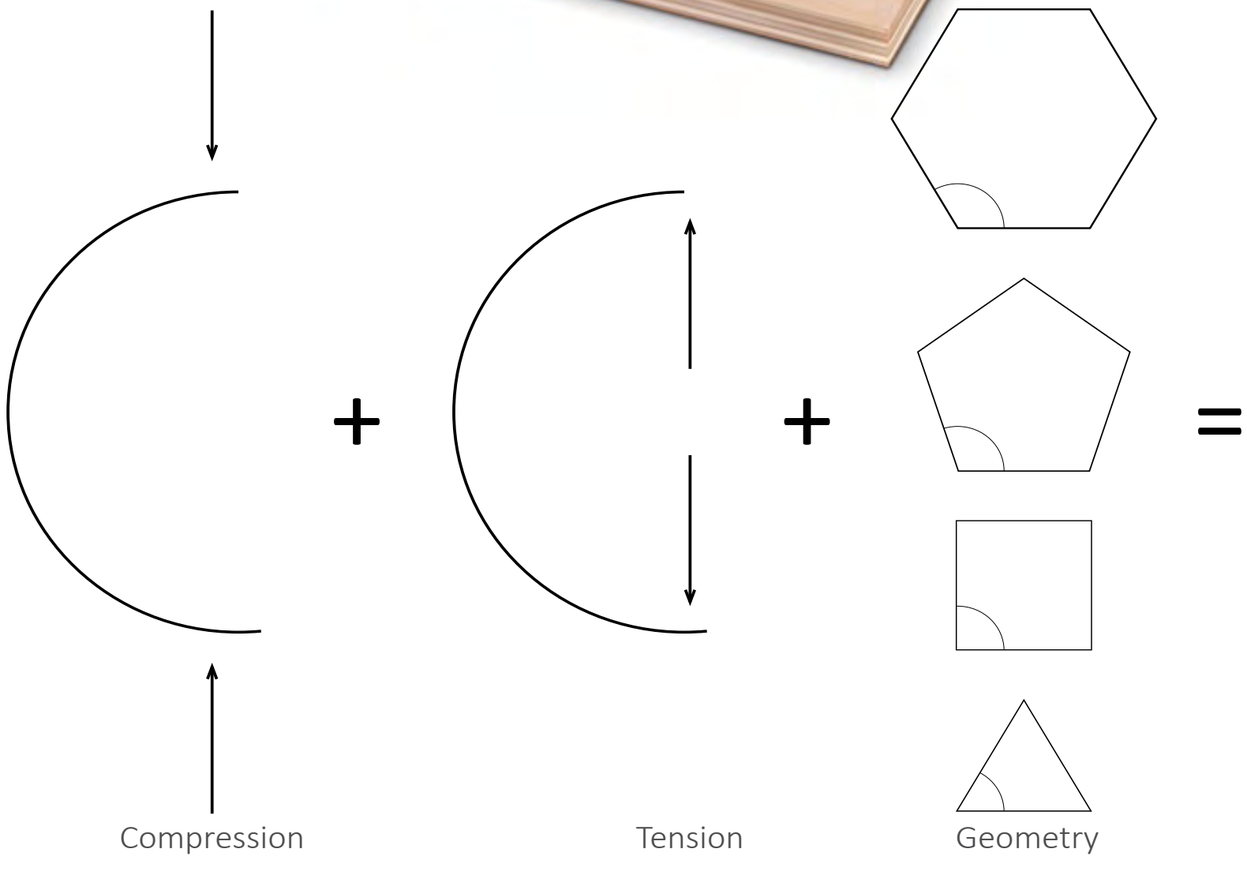
Berelowitz, Lance. *Dream City: Vancouver and the Global Imagination*. Vancouver, B.C.: Douglas & McIntyre, 2005. Print.

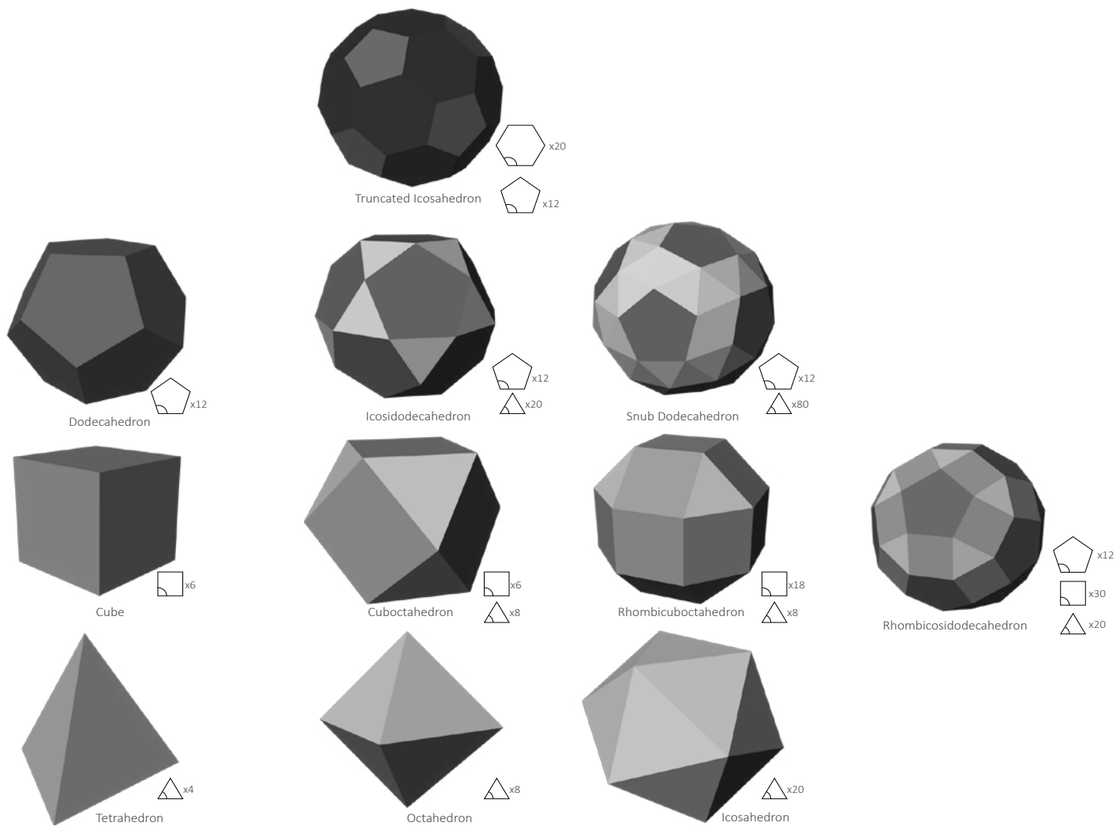
Kay, John. "Why the 'Happiest' Cities are Boring." *FT.com* (2015)*ProQuest.* Web. 15 Oct. 2015.

Frame of Mind

This project is an expansion of the ‘Aliquot’ studio, taught by AnnaLisa Meyboom, which was interested in timber and wood technologies. The original intention of the studio was to explore the novel characteristics of wood, in its various material forms, and expand on its use as a building material through the application of traditional wood joinery augmented by contemporary digital modeling and fabrication technologies.

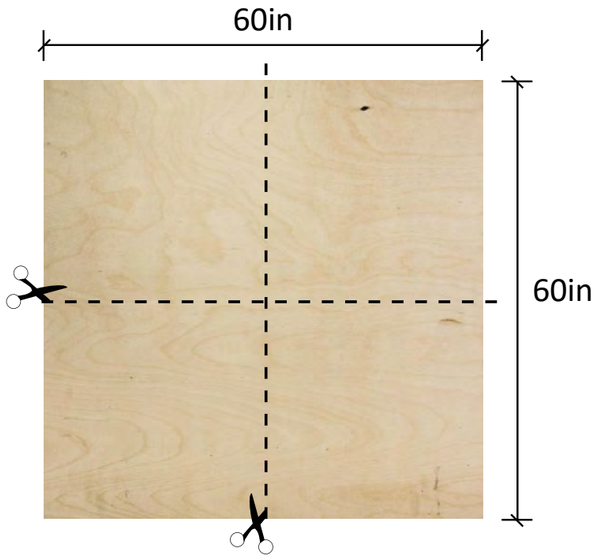
One of the primary objectives of the studio was to design a pavilion for the Burning Man arts and cultural festival. ‘Frame of Mind’ represents a stage of resolution arising from a deeper exploration of one of several iterations concerned with radial joining; how a number of wooden units can diverge from a common center. As the project progressed, an elegant joining system arose that makes use of wood’s ability to both bend and resist bending.



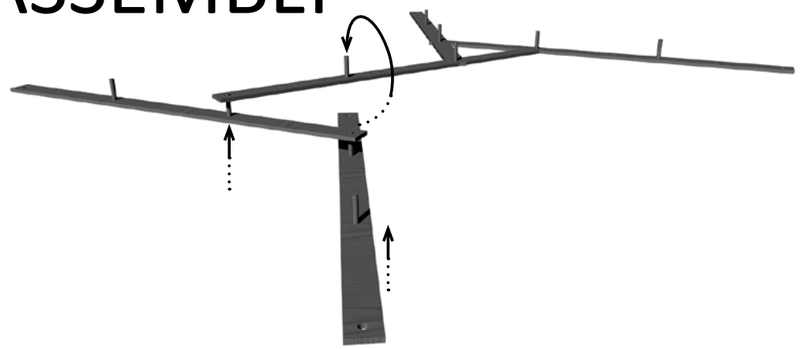


MATERIAL

The modular units are efficiently produced from square sheets of plywood, which are first cut into 4 ‘mini-sheets’ and then into strips. Each strip is equipped with two pegs and two holes - a pair at either end.



ASSEMBLY



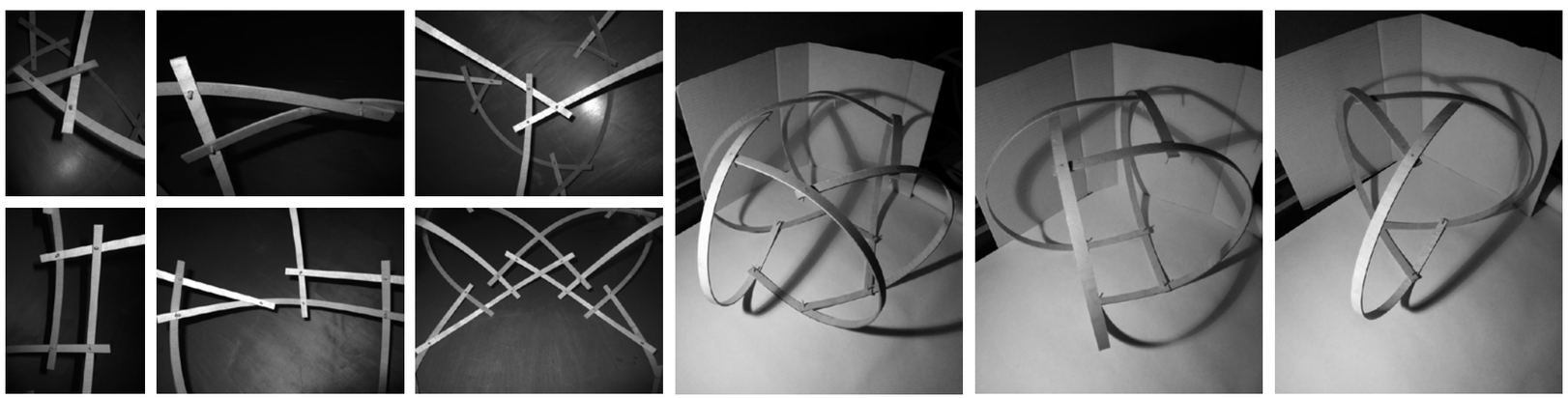
The assembly of the building system is simple; relying on a repeating pattern of overlapping strips of plywood arranged as segments around the center of a regular polygon. Requiring groupings of three or more, the strips are joined by overlapping a hole found at either terminus of the strip atop the peg of a neighboring strip. This process is repeated in either a clockwise or counter-clockwise manner until the circuit is closed, slotting the hole of the final strip atop the peg of the initial.

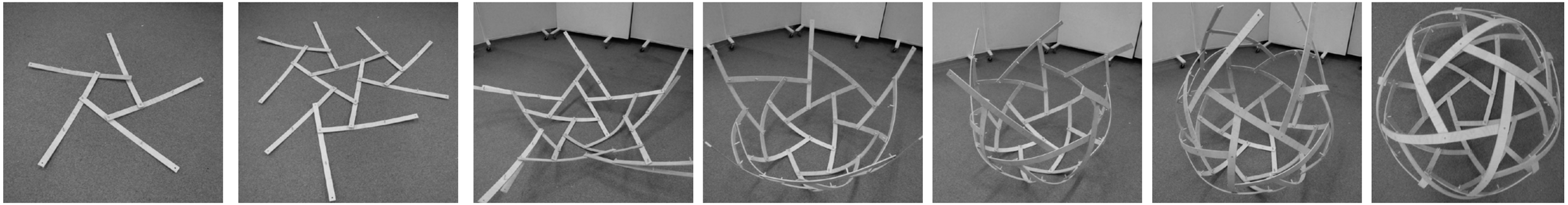
Upon closure, all of the strips will have formed a polygon. Triangles, squares, pentagons, hexagons and other polygons are all capable of being represented with this system. Continuing, a variety of polygons can then be arranged within repeating patterns that give form to progressively more complex polyhedra.

Orthographic

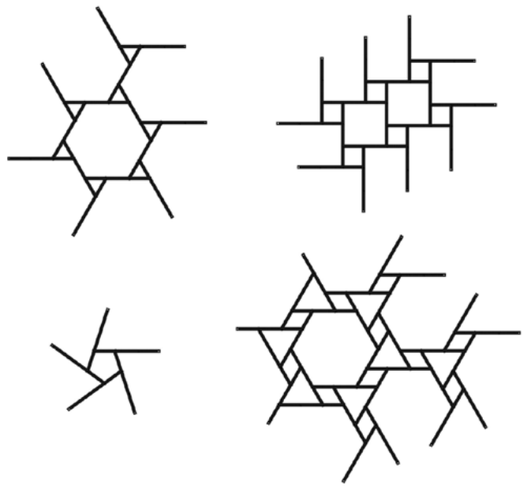
Perspective

Process Assemblies





Icosahedron Assembly

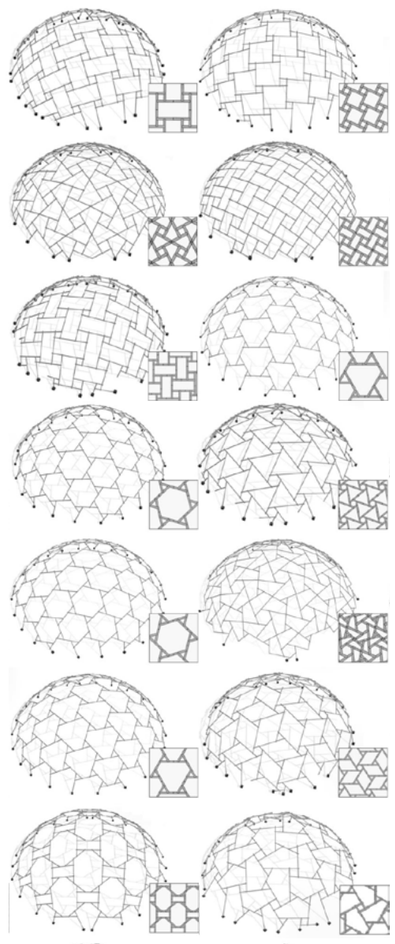


Genotypical Pattens

As the modular strips amalgamate forming regular polygons, different polyhedra begin to grow from their associated genotypical patterns. When bent, the strips exhibit a combination of tension and compression capable of forming a stable structure. Through material experimentation, a balace of flexion and resistant strength within the strips was found.

The subsequently formed structures embody a principle called tensegrity. This is exhibited where isolated components in compression exist inside a net of continuous tension. Unlike typical cable and rod systems used in tensegral structures, the strips in this system, through their unification, form the net of tension as each unit is held in compression by its neighbor.

Truncated Icosahedron Assembly



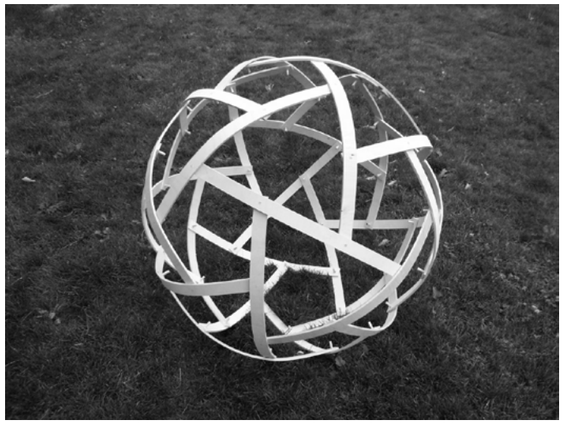
Precedent Assembly Patterns

Icosahedron

Faces 20 (triangles)

Edges 30

Axes 12

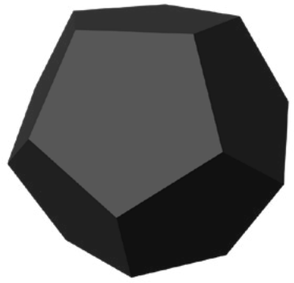


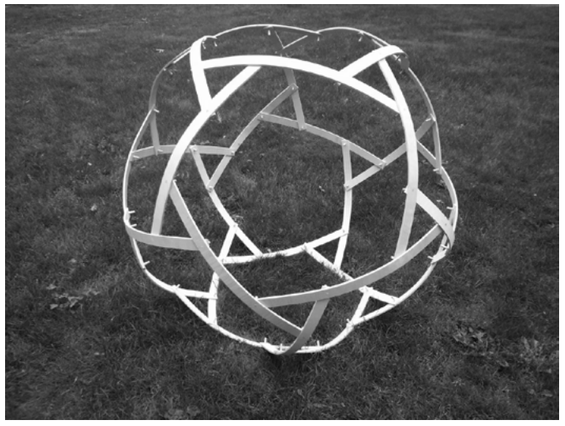
Dodecahedron

Faces 12 (pentagons)

Edges 30

Axes 20



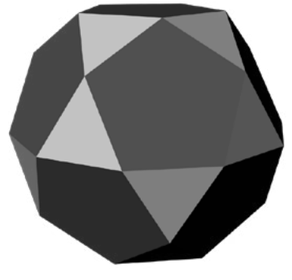


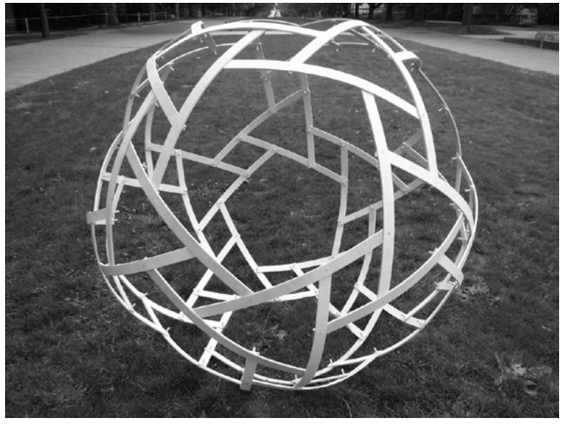
Icosidodecahedron

Faces 32 = (20 triangles) + (12 pentagons)

Edges 60

Axes 30





Burning Man 2015

Explorations In:

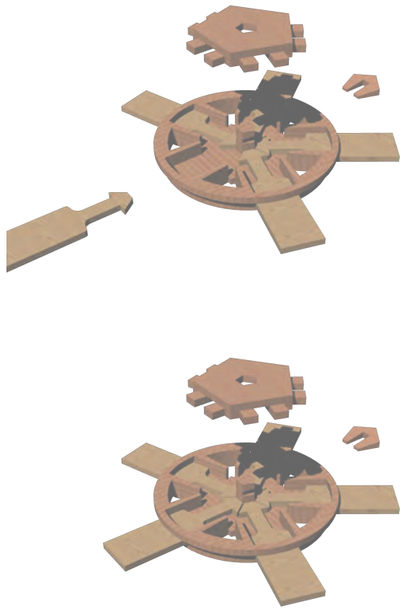
Wood Joinery (Radial Joining)

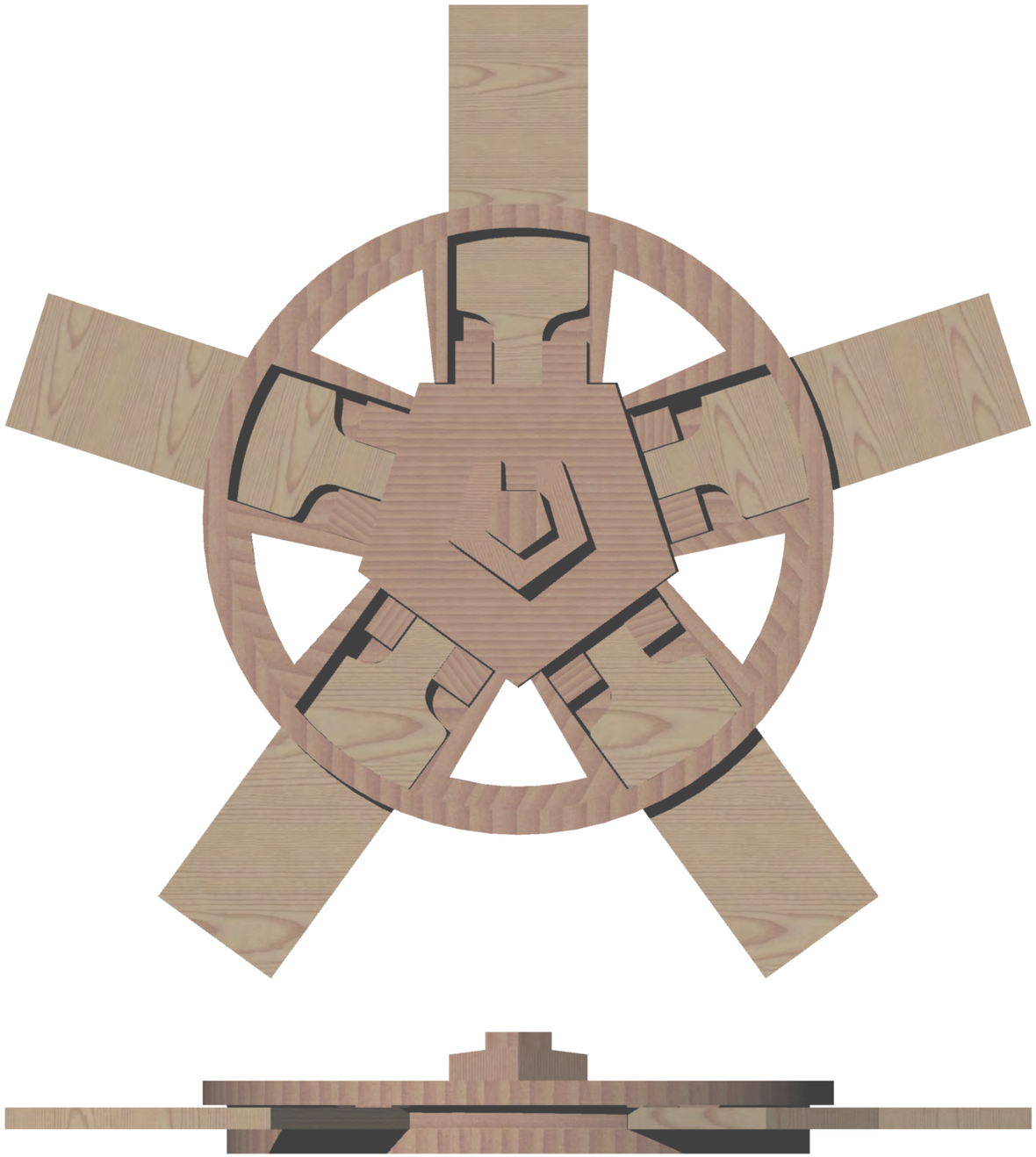
Parametric Software + 3D Modeling

Material Properties & Traits

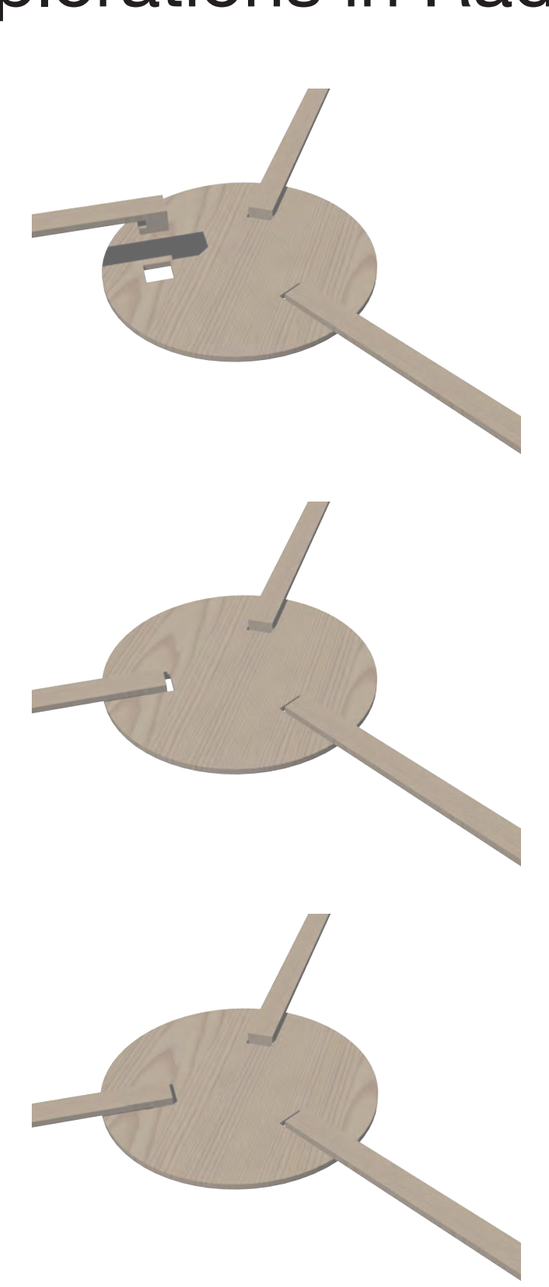
Harsh Environments And The Unknown...

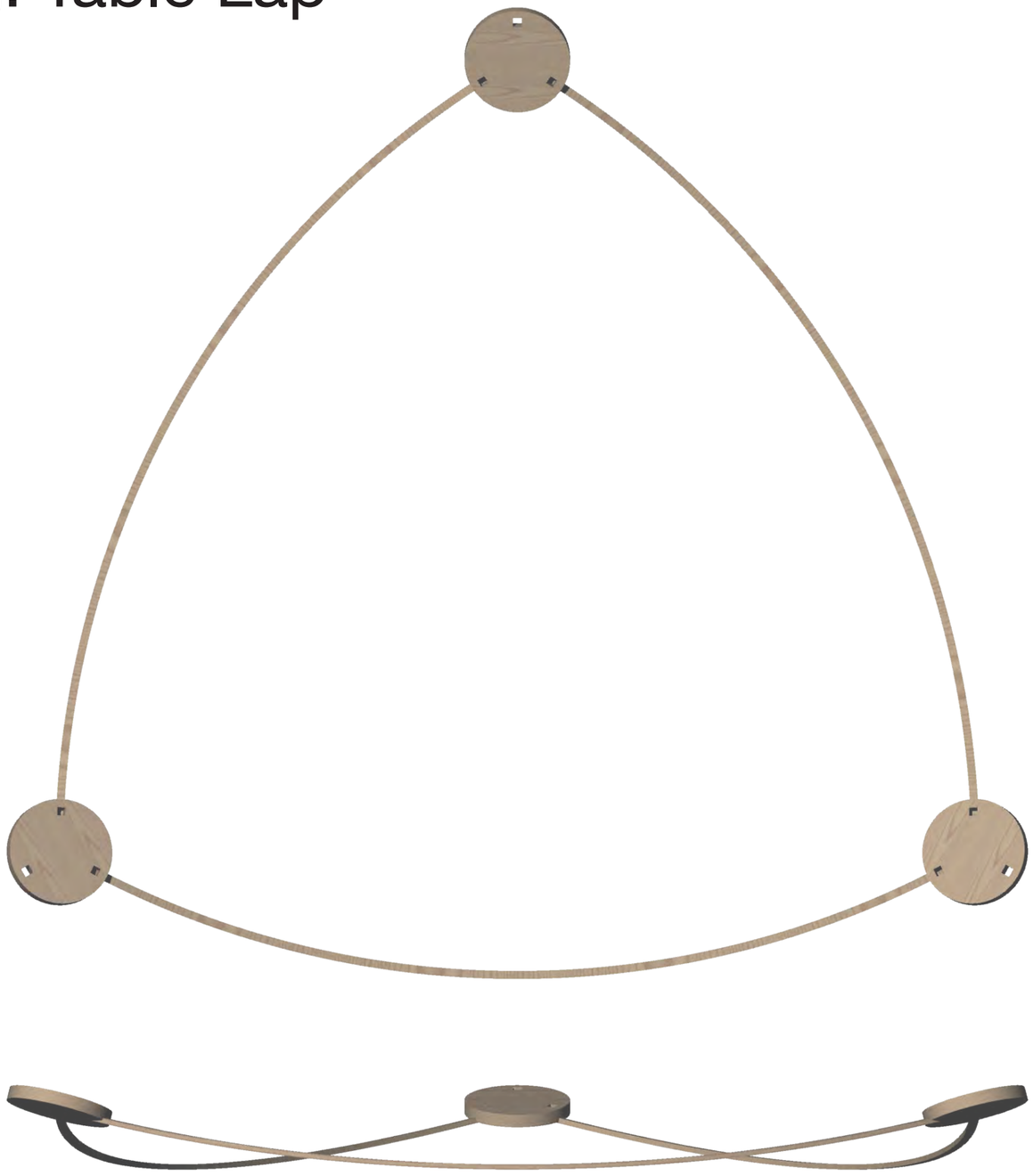
Explorations in Radial Joining: Goose Neck



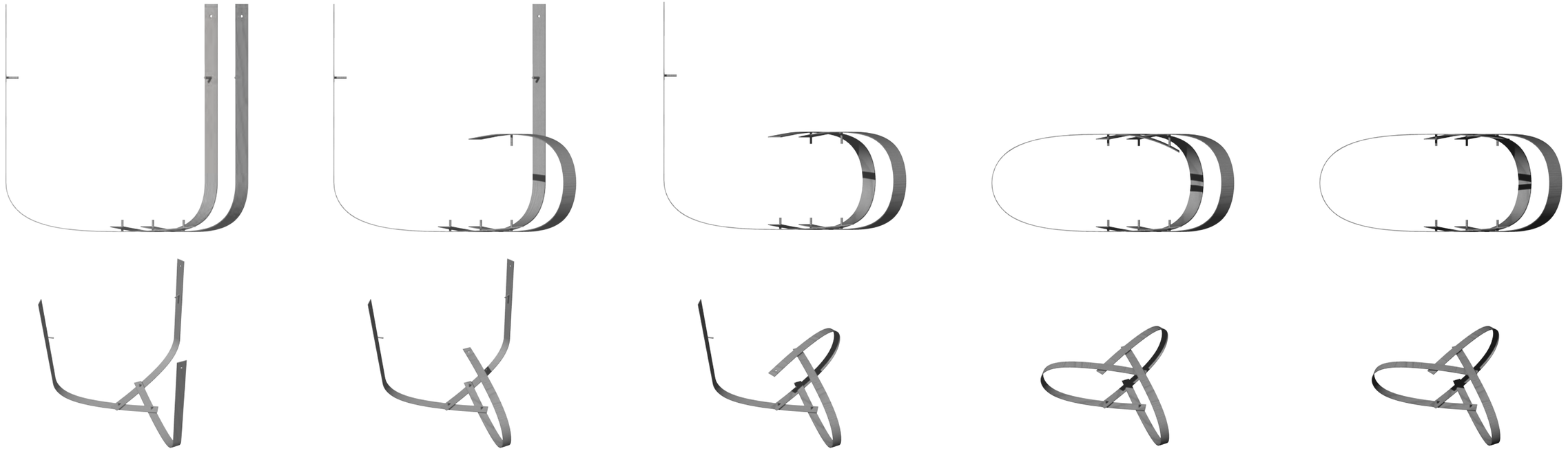


Explorations in Radial Joining: Table Lap

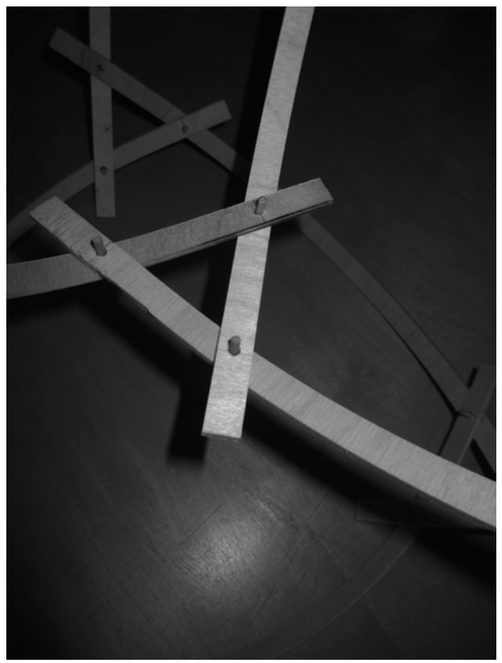


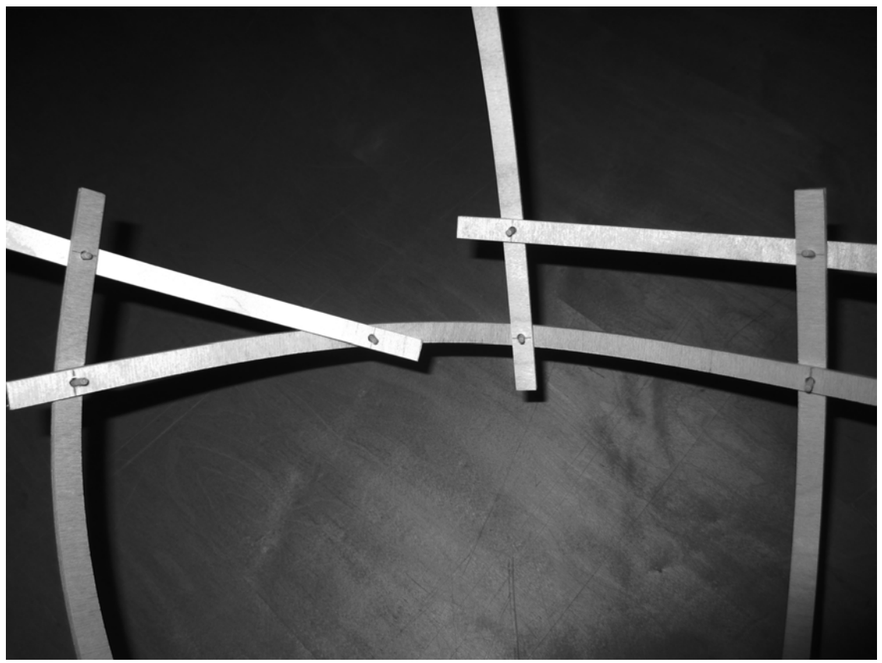


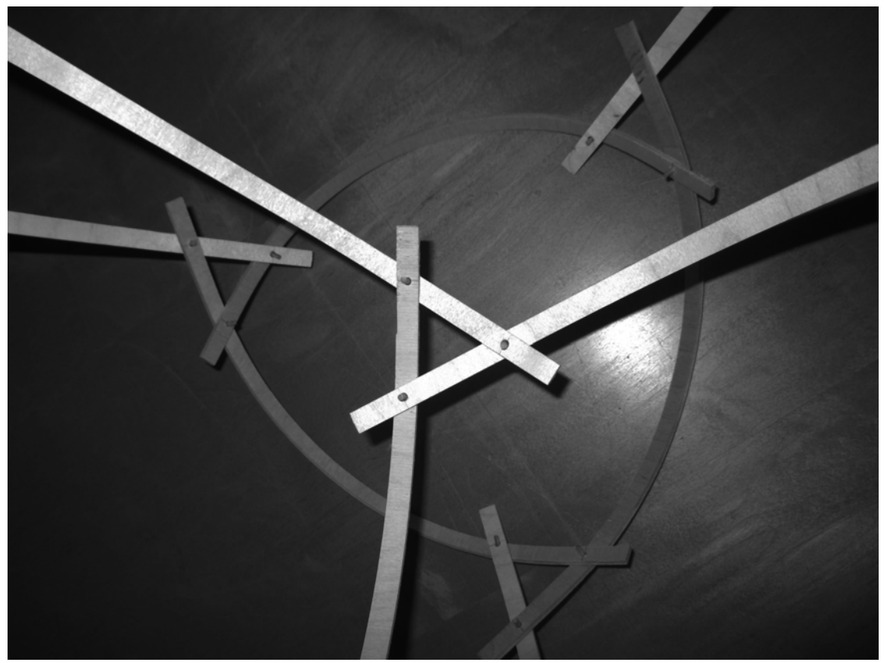
Explorations in Radial Joining: Dowel and Hole

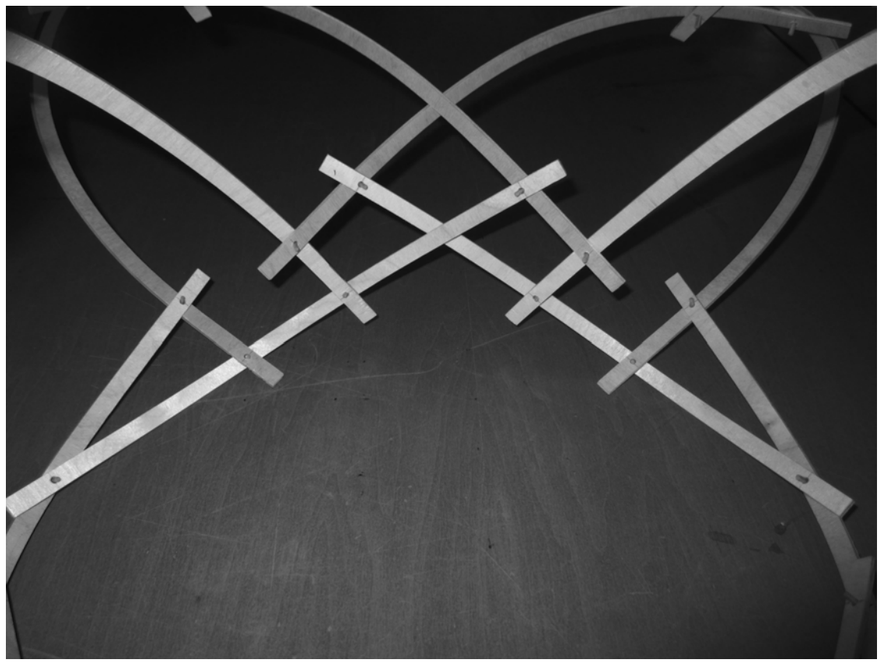


Dowel and Hole: Structural Possibilities

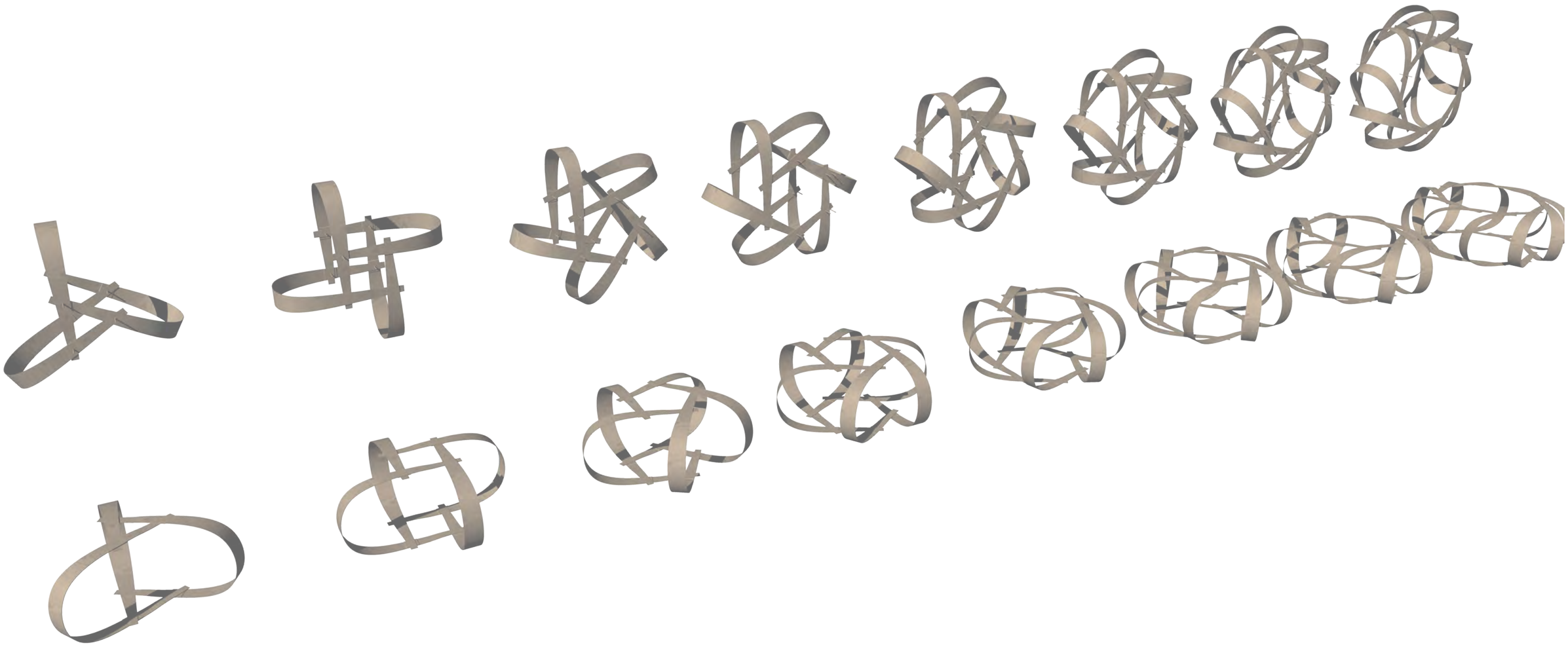




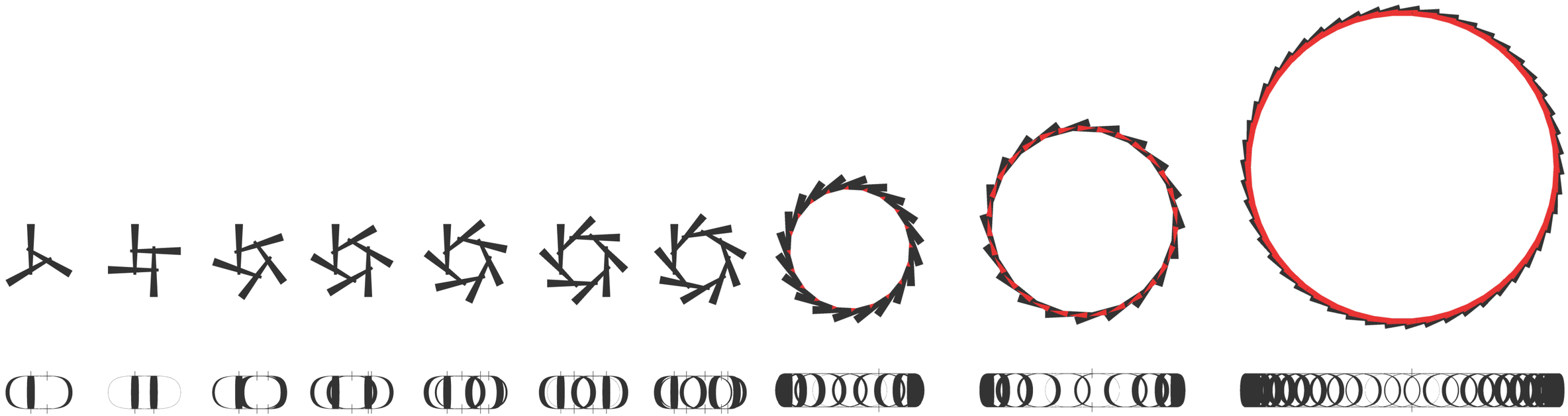




Dowel and Hole: Structural Possibilities



Dowel and Hole: Structural (Im)possibilities

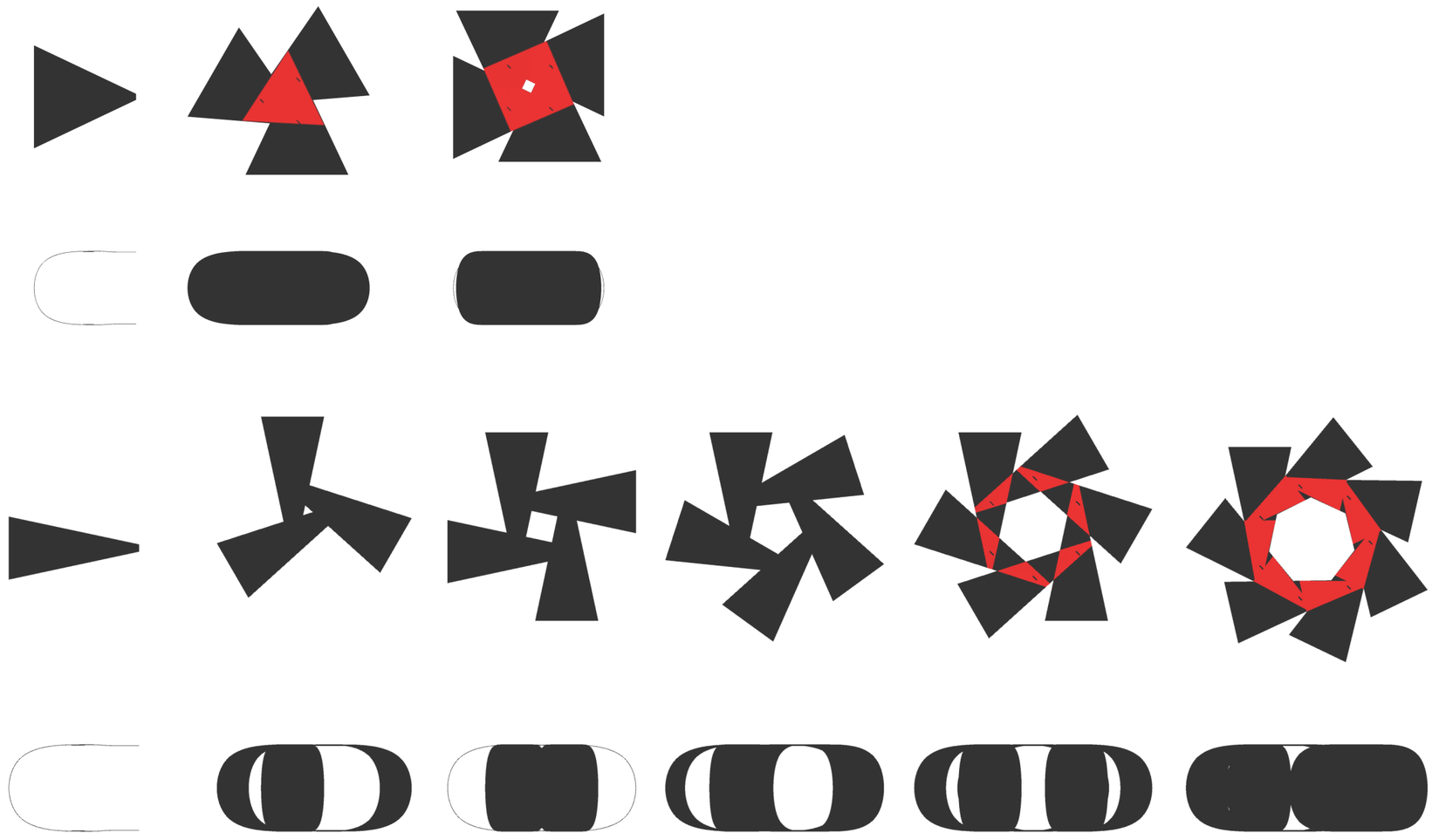


Interference

RADIAL POSSIBILITIES: $R = \frac{}{S}$

As # of sides increases the radius increases.

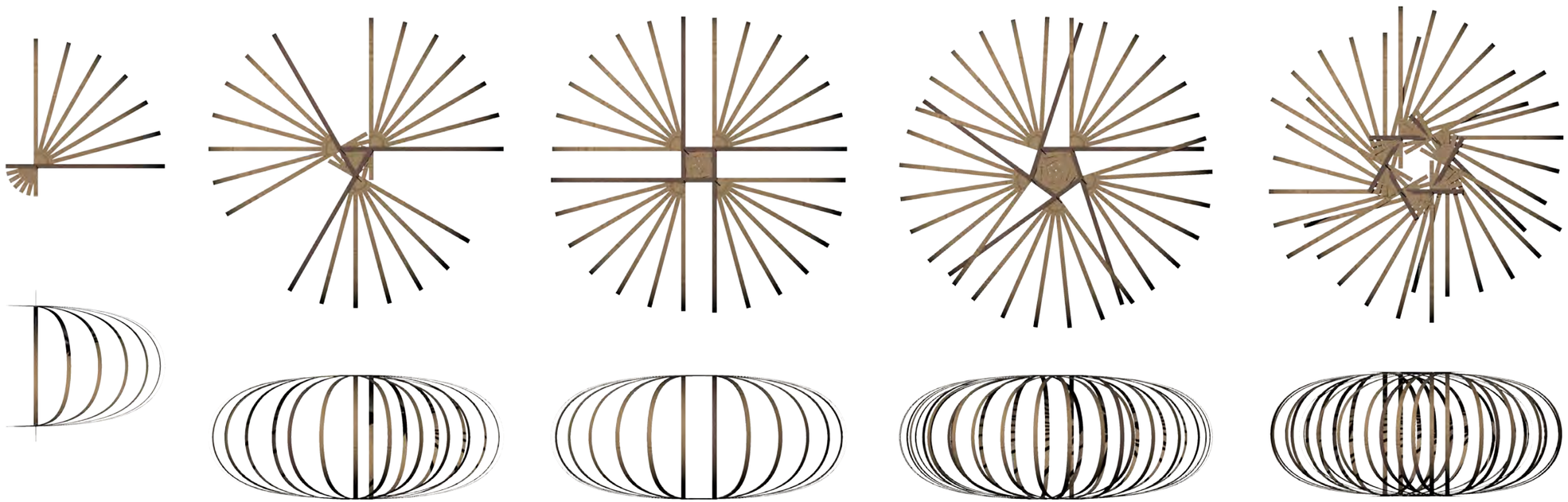
Developing Enclosure: The Skin



Expanded Rib?

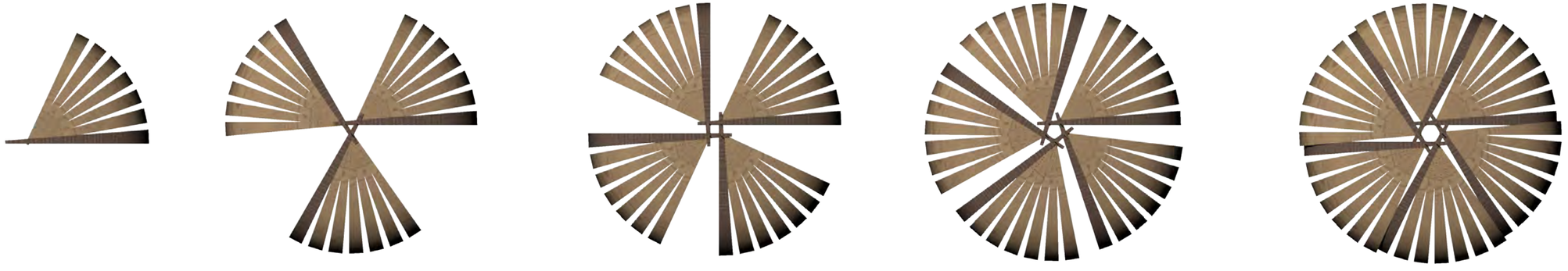
Interference

Developing Enclosure: The Onion



Nested

Developing Enclosure: The Onion



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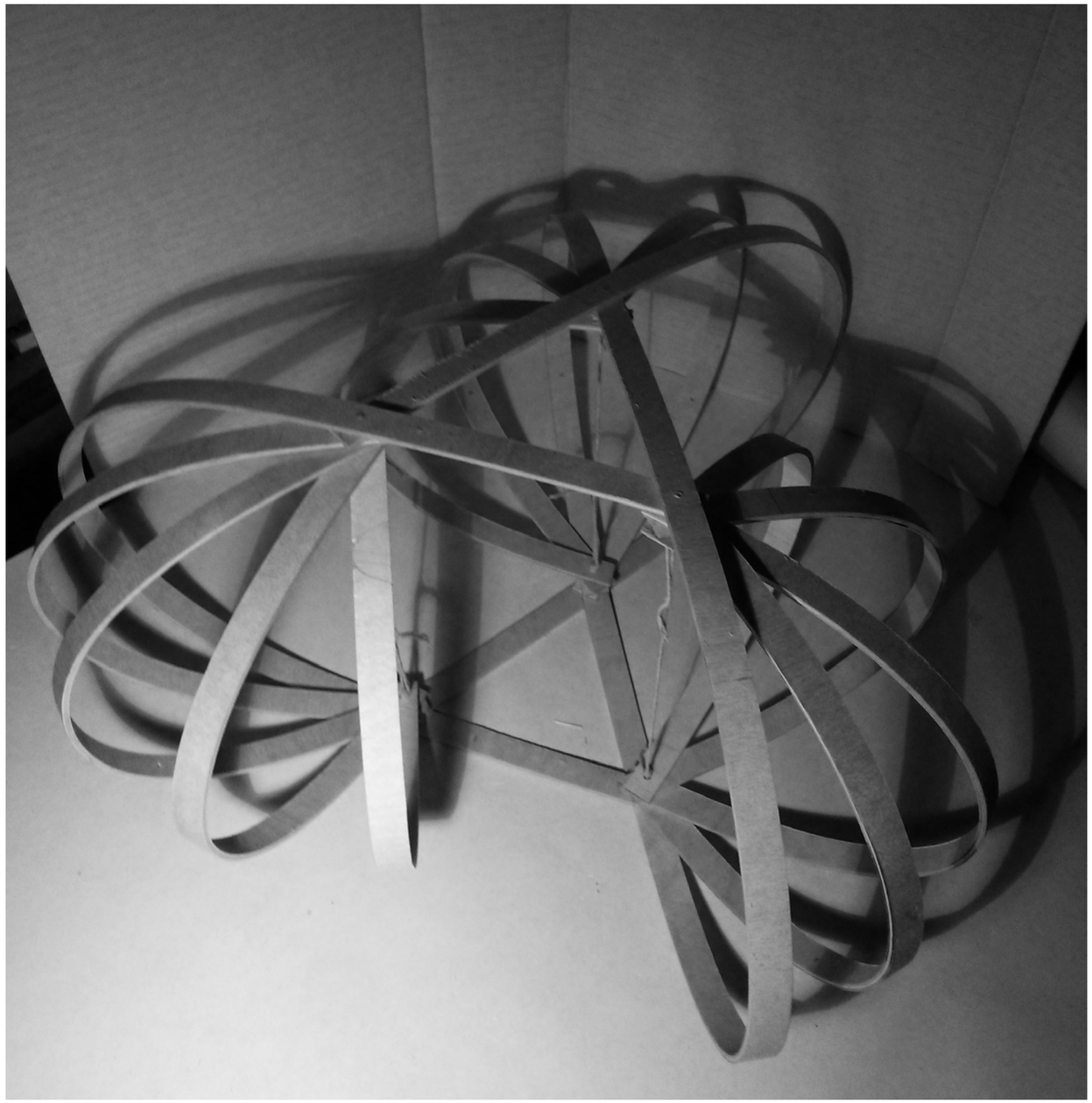
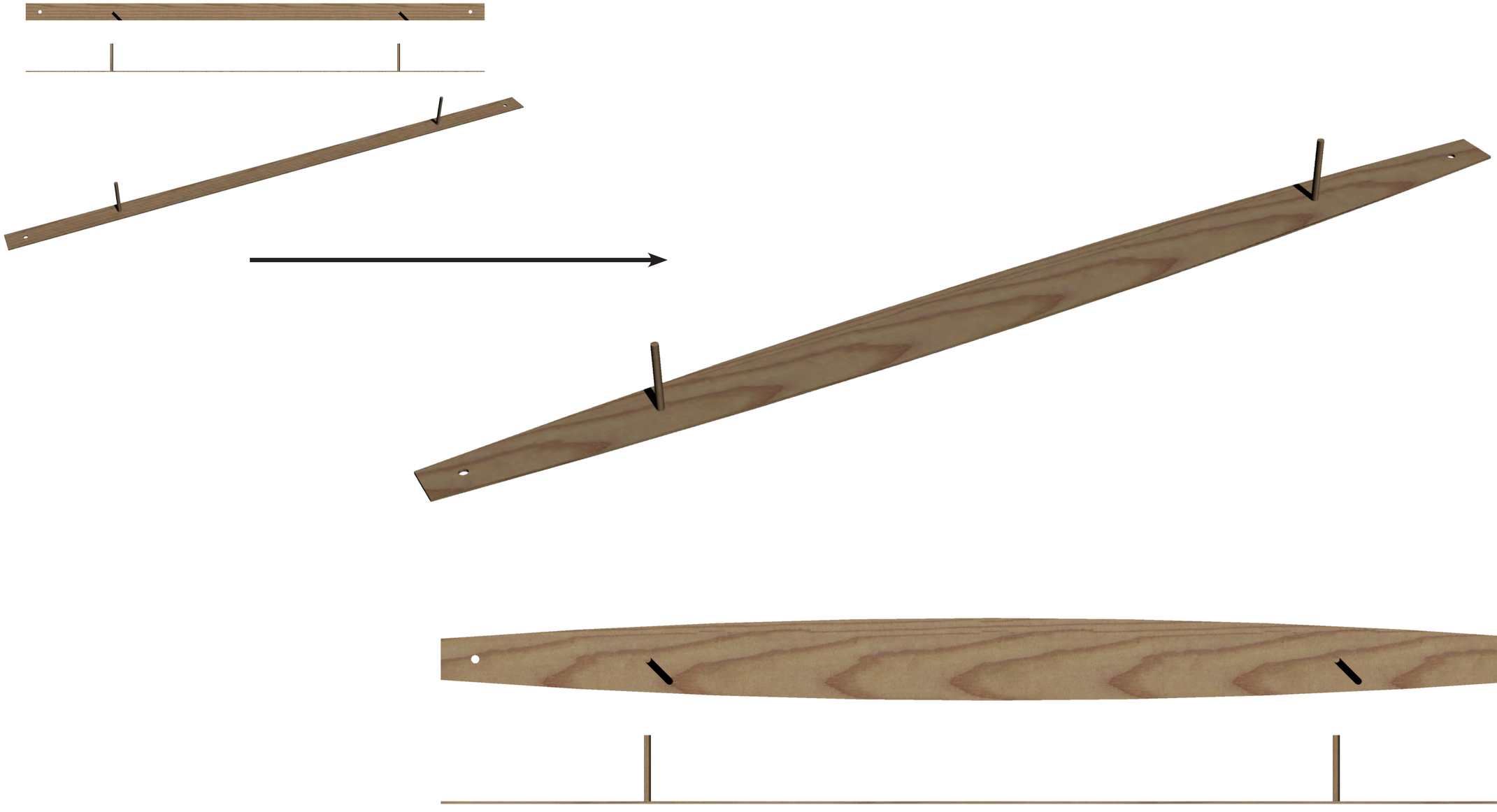
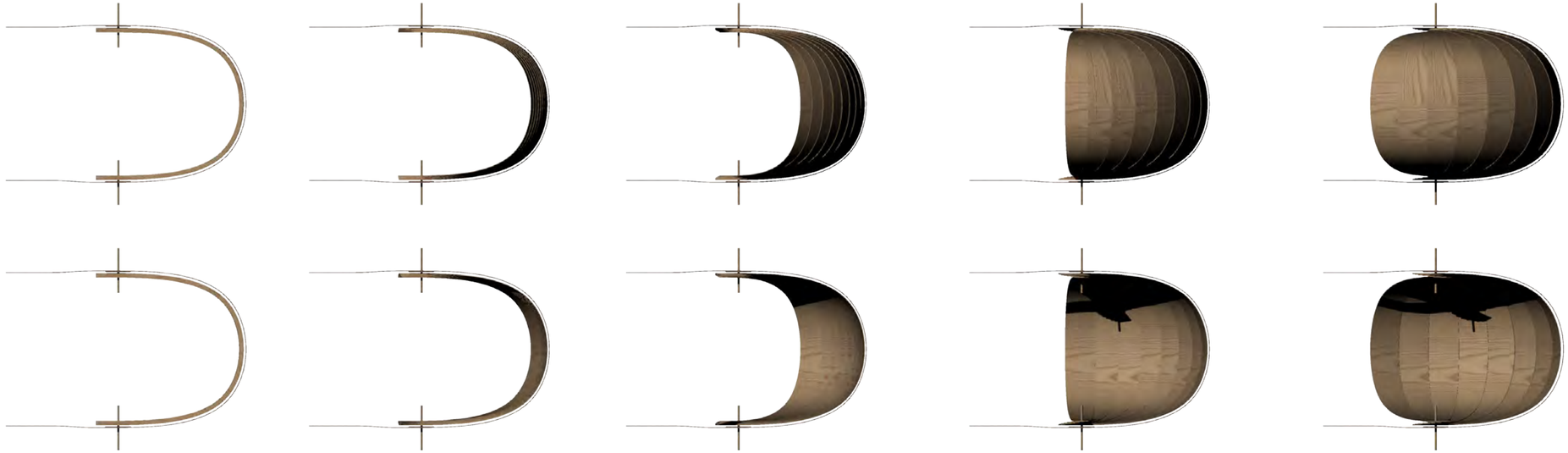
Developing Enclosure: The Onion

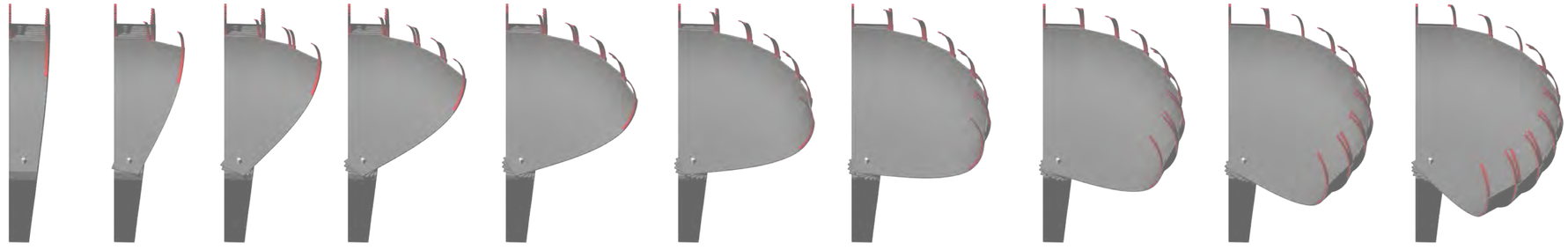


Developing Enclosure: Expanding the Ribs

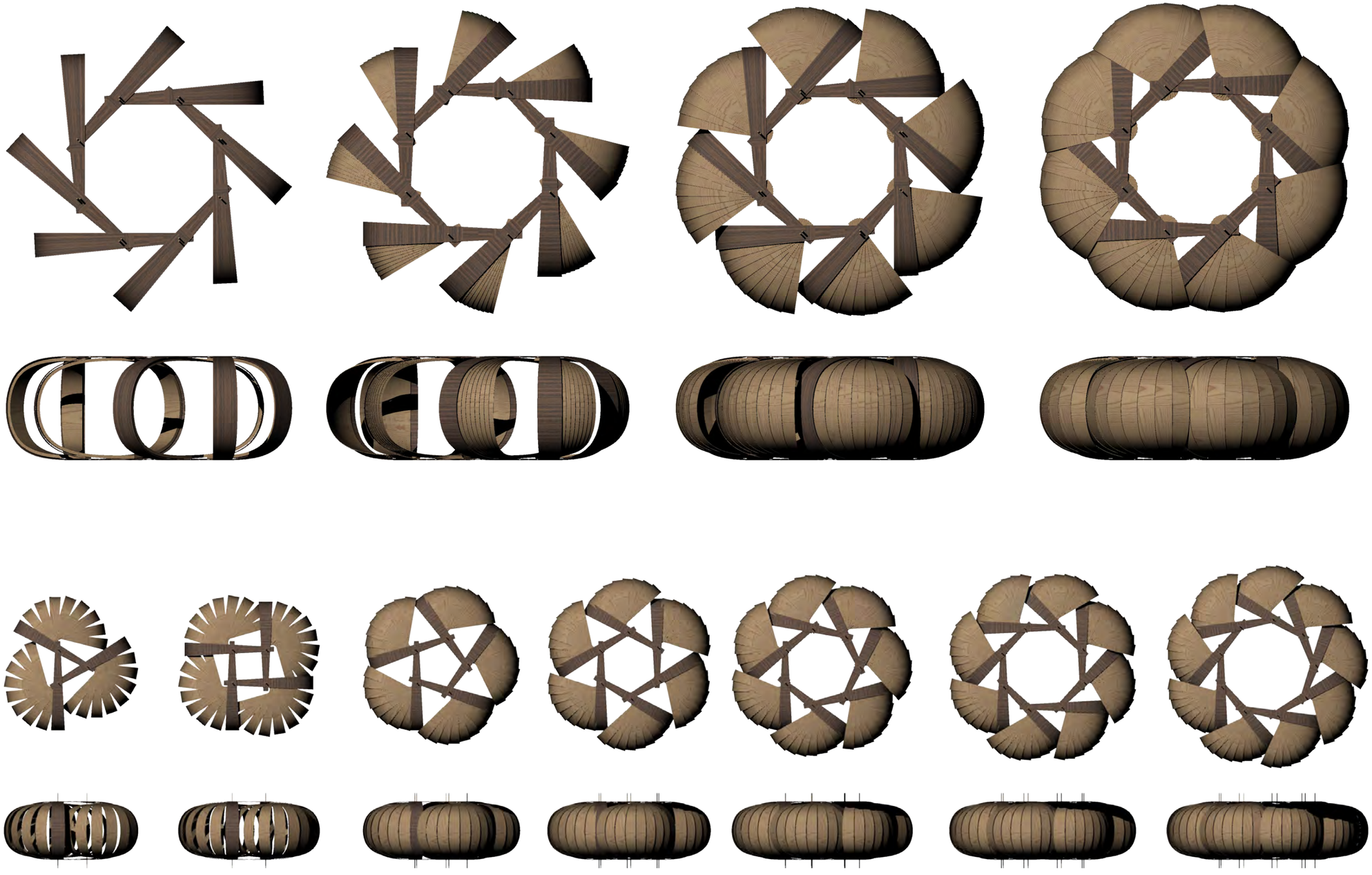


The Widened Rib and Nested Fan





The Widened Rib and Nested Fan

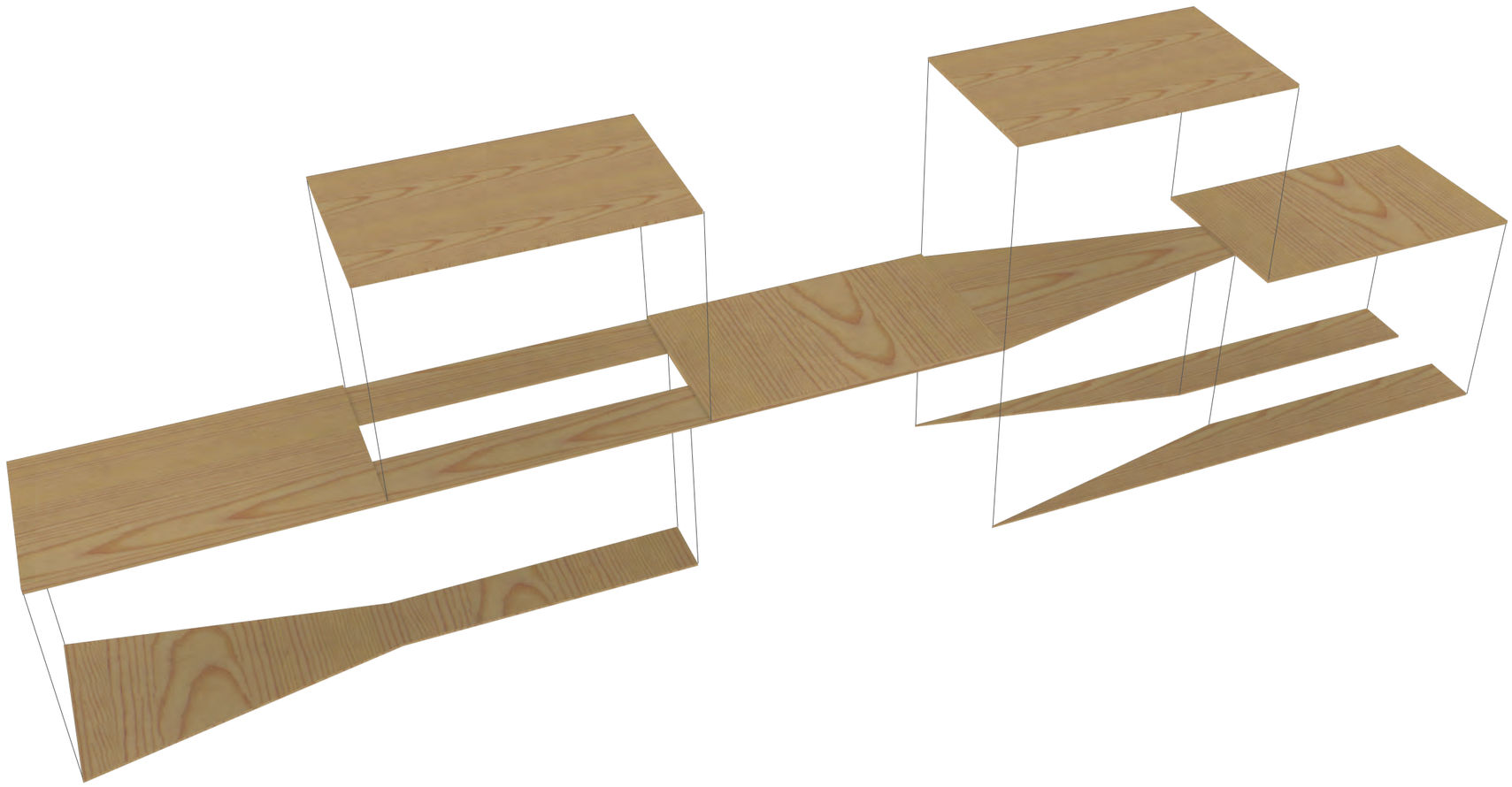


Problem
30ft plywood?

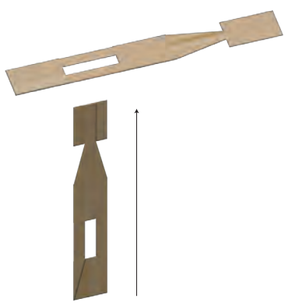
Solution: Interlocking Belt Buckle

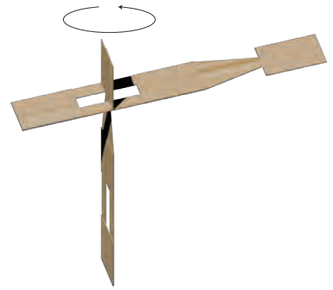
http://www.angelfire.com/oh3/civilwarantiques/cwimages/1209webcatFINAL-50.jpg

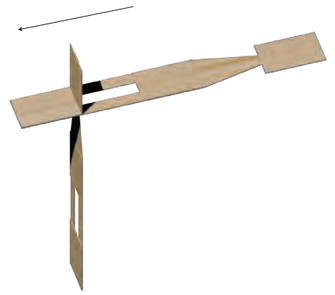
Interlocking Lap Joint

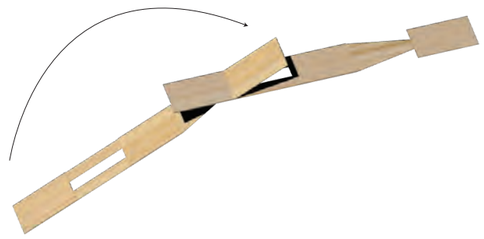


Interlocking Lap Joint

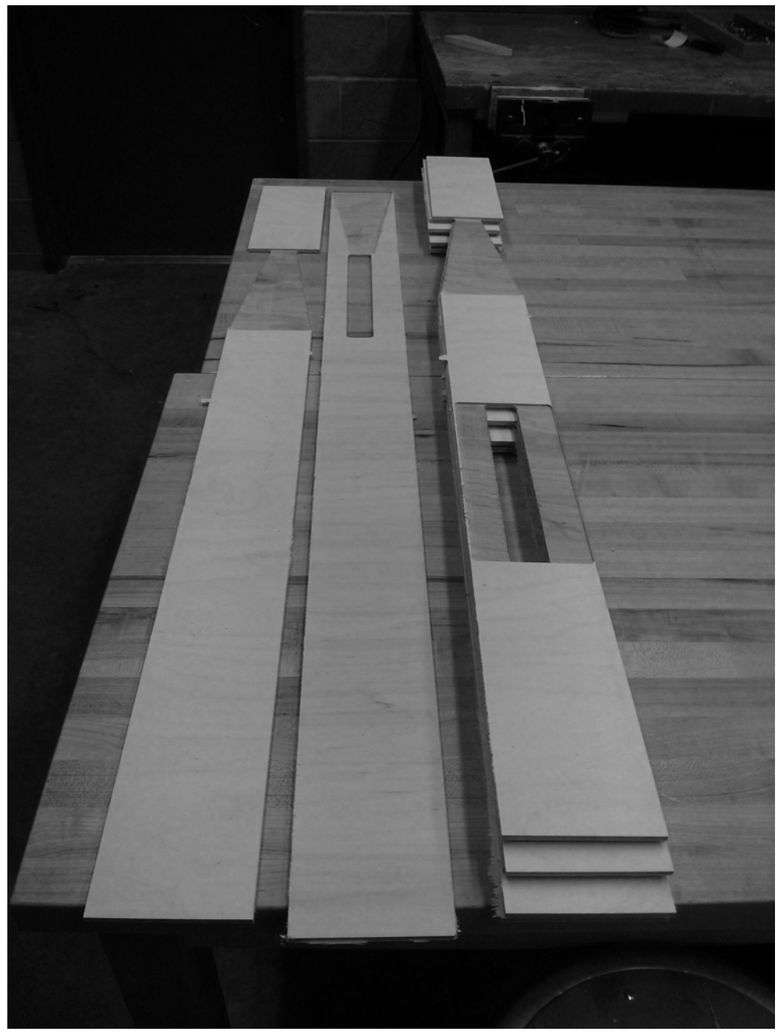








Interlocking Lap Joint



Interlocking Lap Joint

Can we continue?

Should we?

Solution: Change Scale + Sky Lanterns

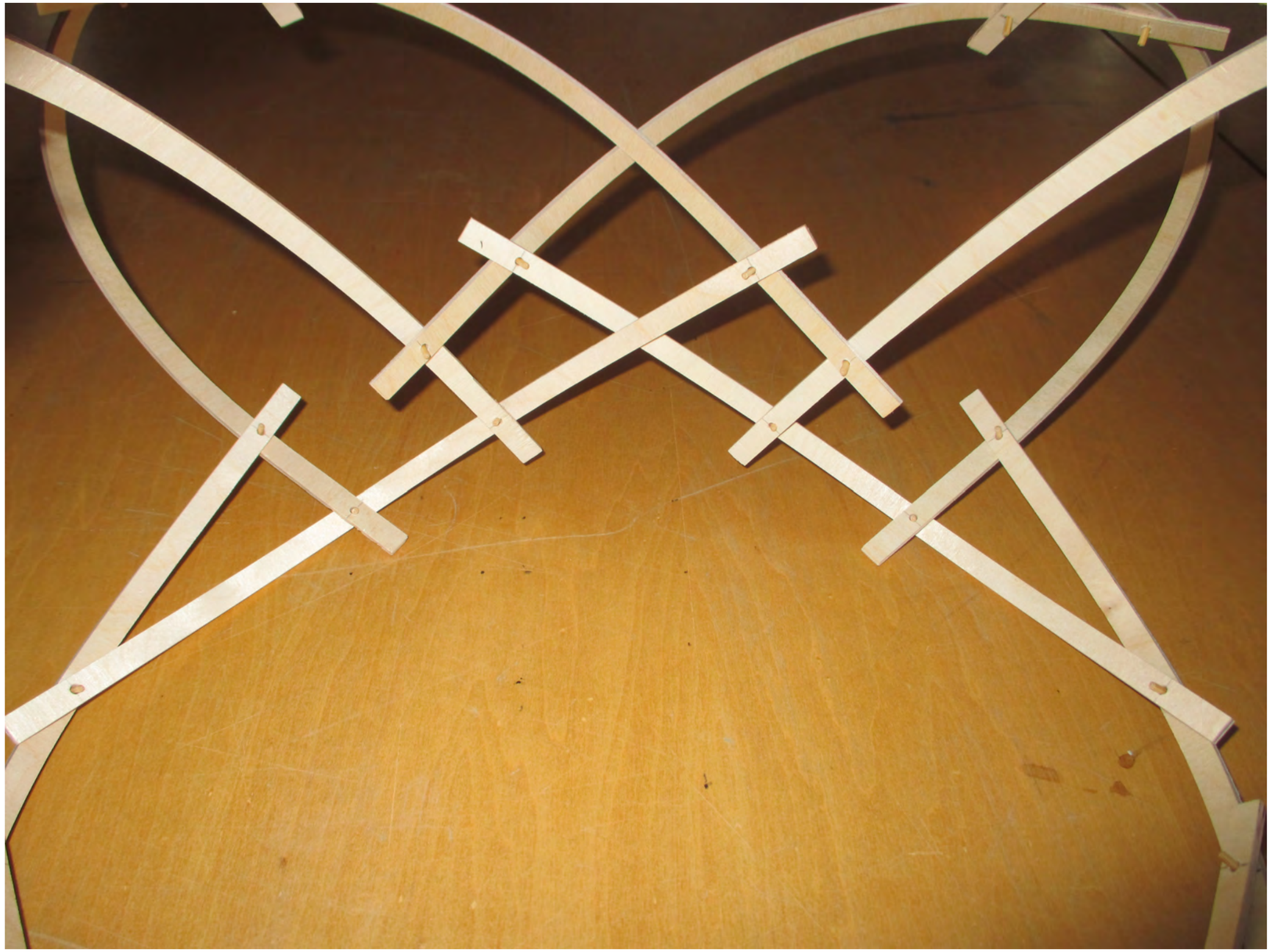
http://wildfiretoday.com/wp-content/uploads/2014/06/Sky-lantern-release-in-Chiang-Mai-Thailand-Photo-by-Takeaway.jpg

Sky Lanterns

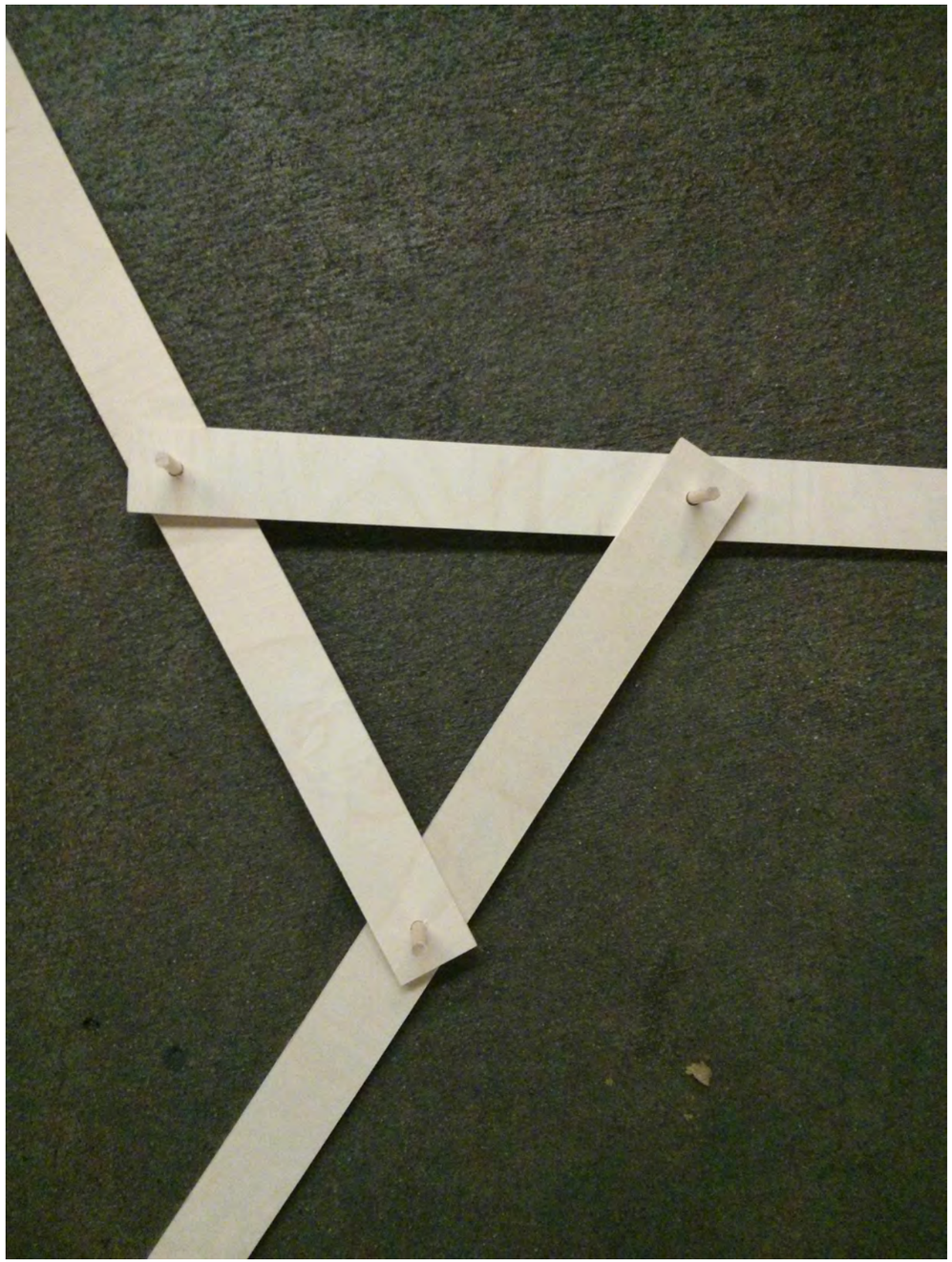
Can we continue?

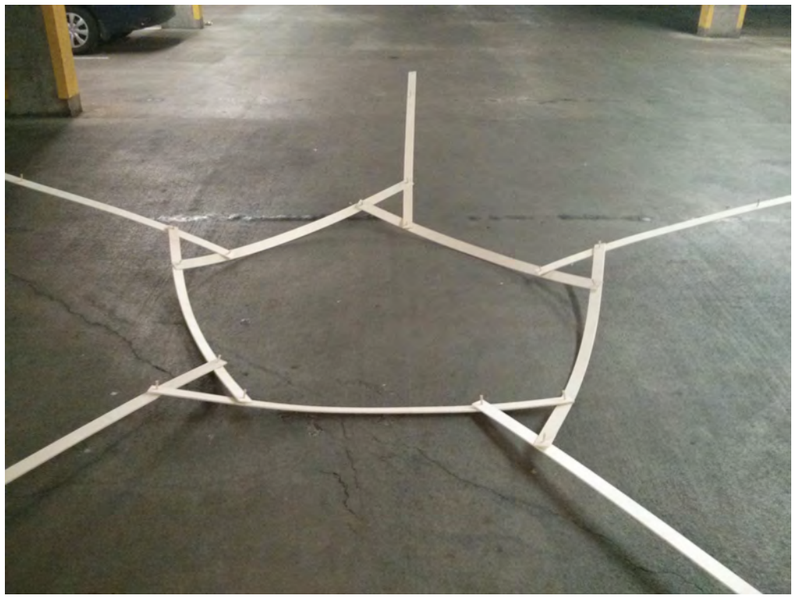
Should we?

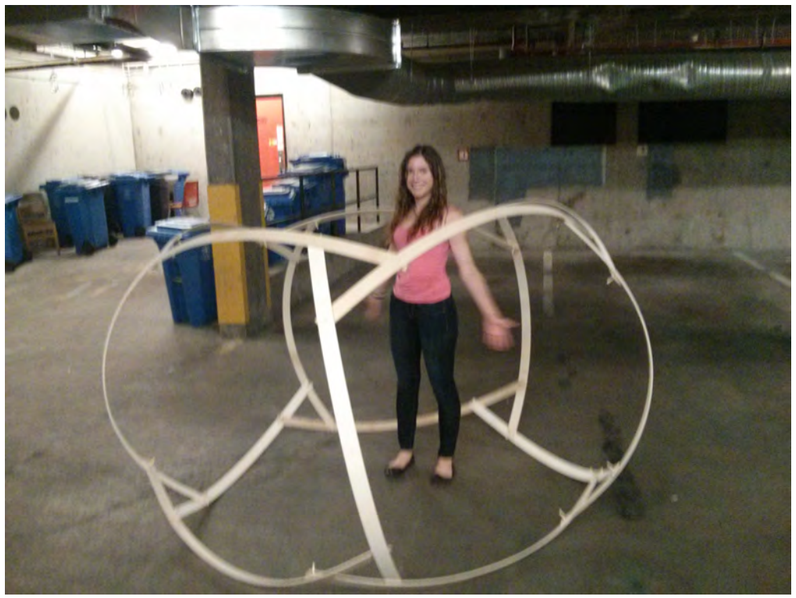
Solution: Change Scale + Previous Ideas + Agglomeration



Agglomeration



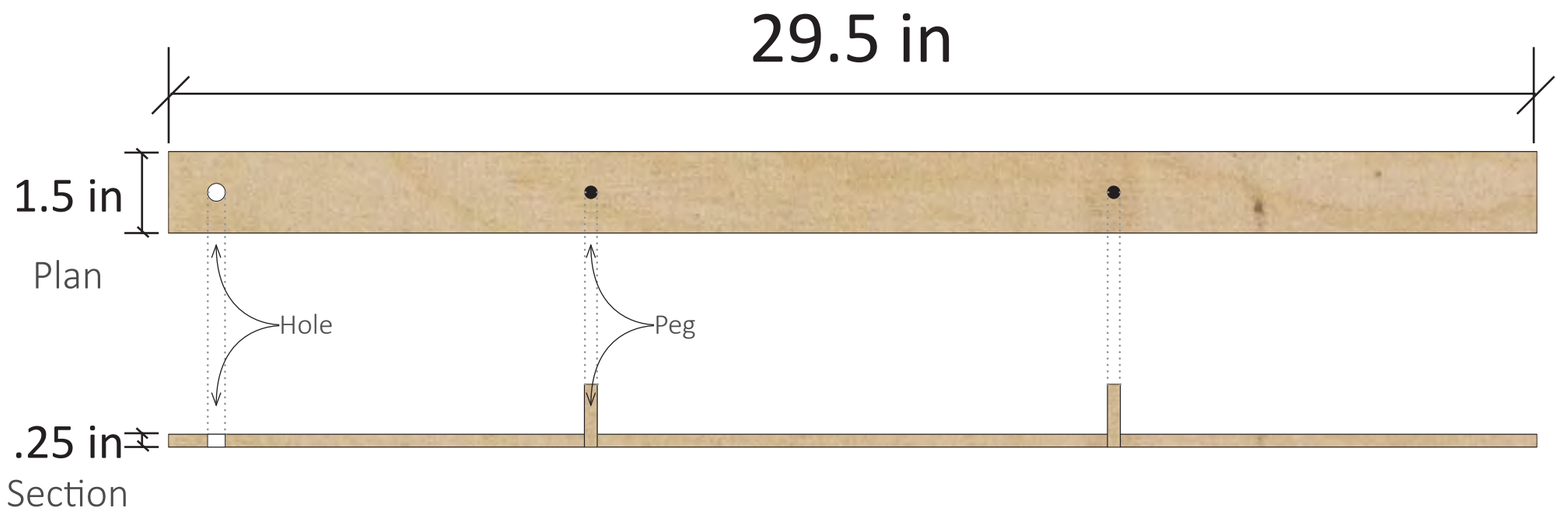




Can we continue?

Should we?

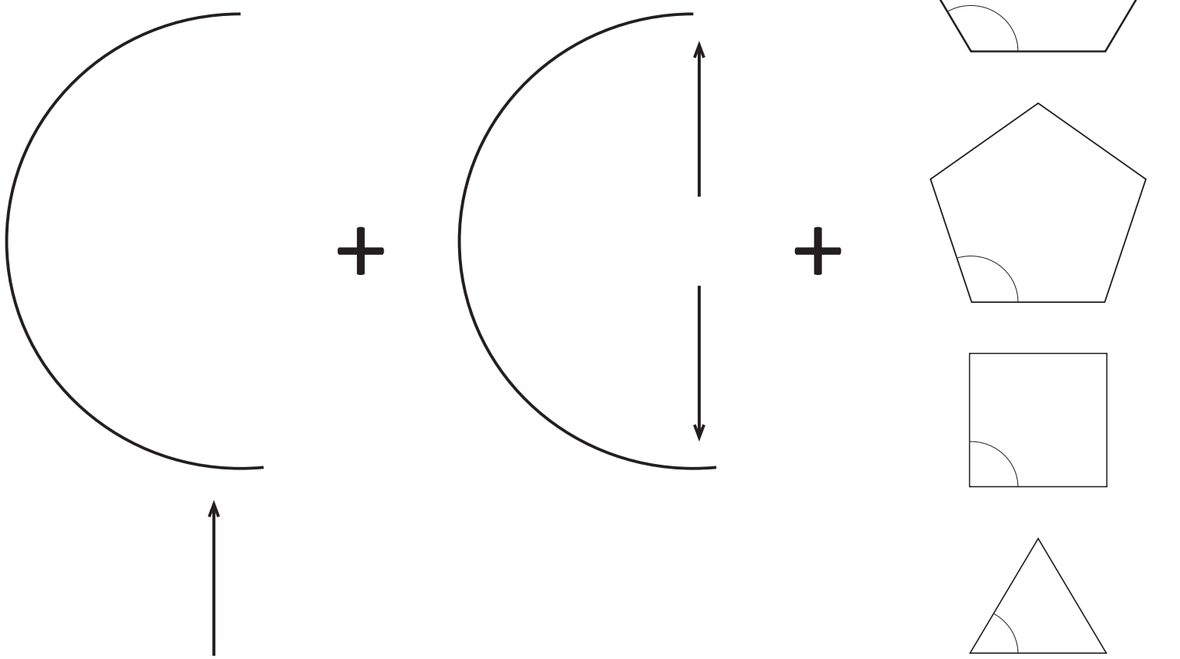
Solution: Change Scale of Material + Agglomeration

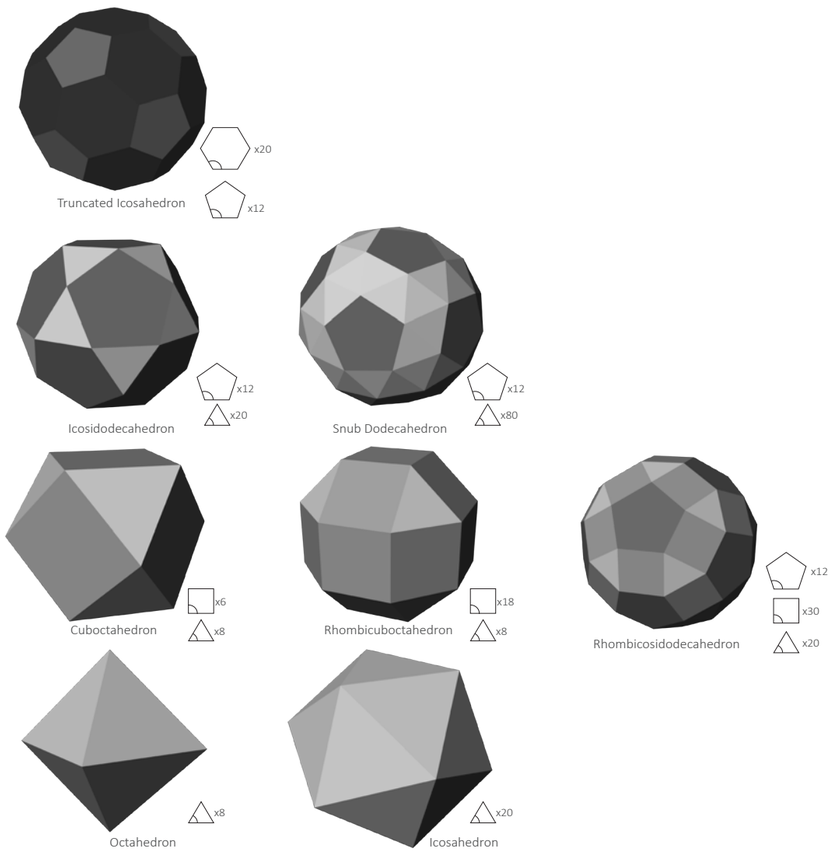


Frame of Mind

This project is an expansion of the ‘Aliquot’ studio, taught by AnnaLisa Meyboom, which was interested in timber and wood technologies. The original intention of the studio was to explore the novel characteristics of wood with its various material forms and expand on its use as a building material through the application of traditional wood joinery augmented by contemporary digital modeling and fabrication technologies.

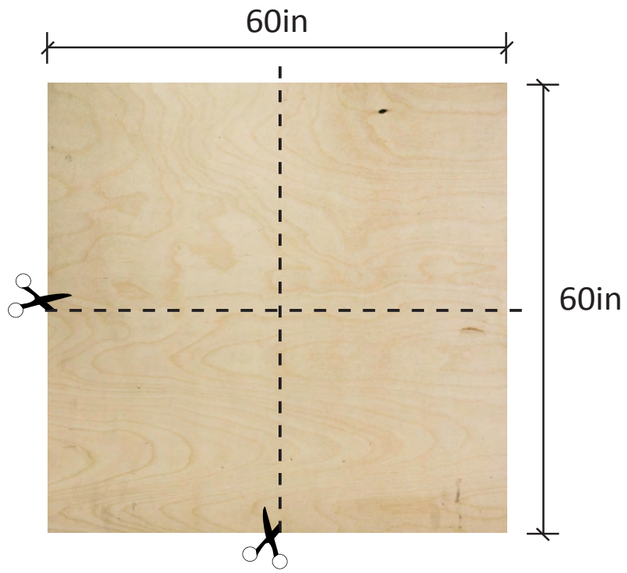
One of the primary objectives of the studio was to design a pavilion for the Burning Man arts and cultural festival. ‘Frame of Mind’ represents a stage of resolution arising from a deeper exploration of one of several iterations concerned with radial joining; how a number of wooden units can diverge from a common center. As the project progressed, an elegant joining system arose that makes use of wood’s ability to both bend and resist bending.

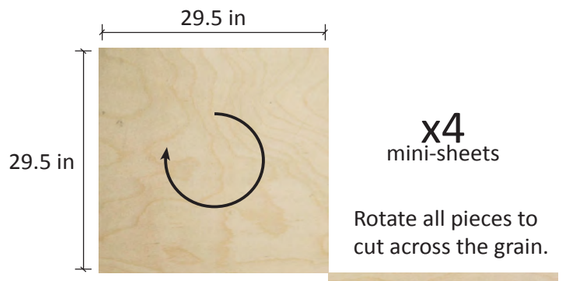


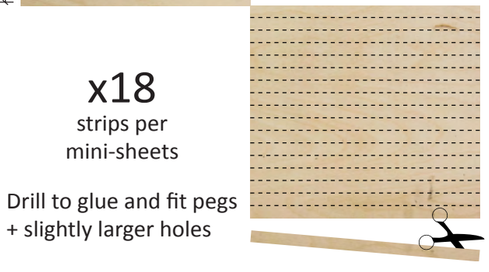


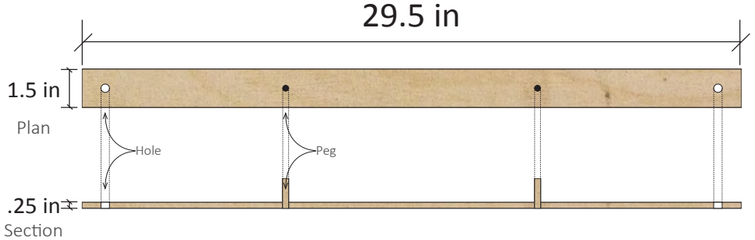
MATERIAL

The modular units are efficiently produced from square sheets of plywood, which are first cut into 4 ‘mini-sheets’ and then into strips. Each strip is equipped with two pegs and two holes - a pair at either end.

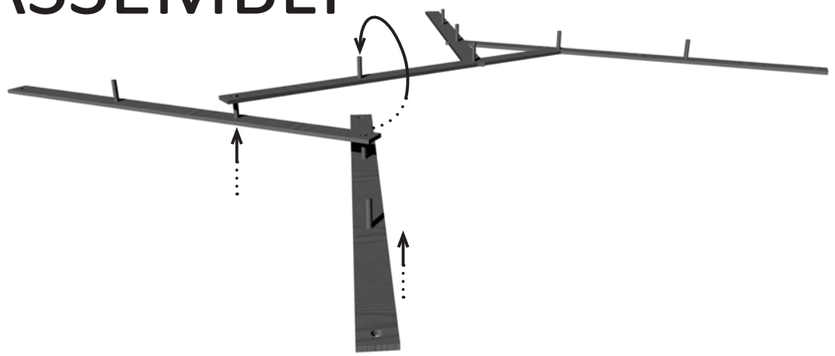




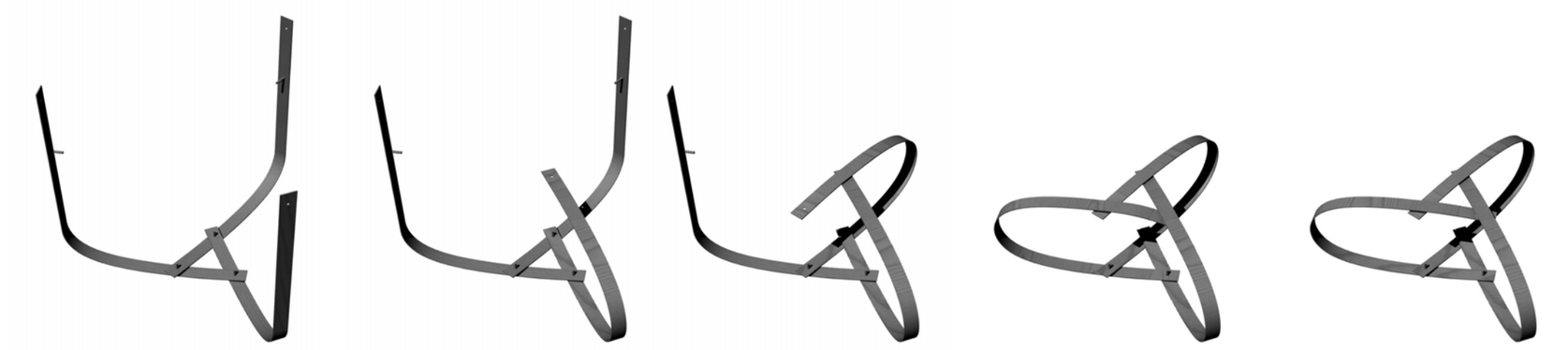




ASSEMBLY

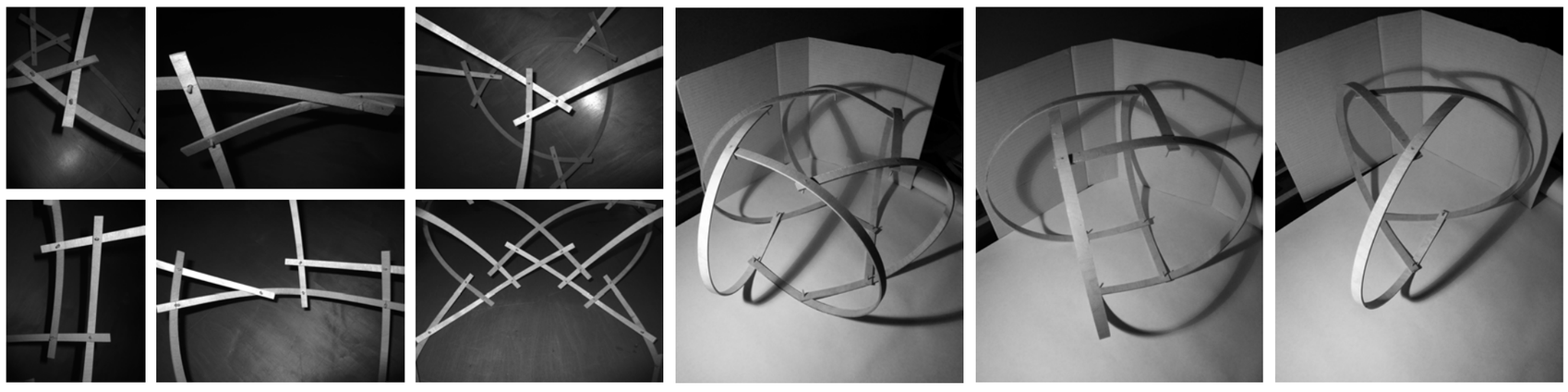


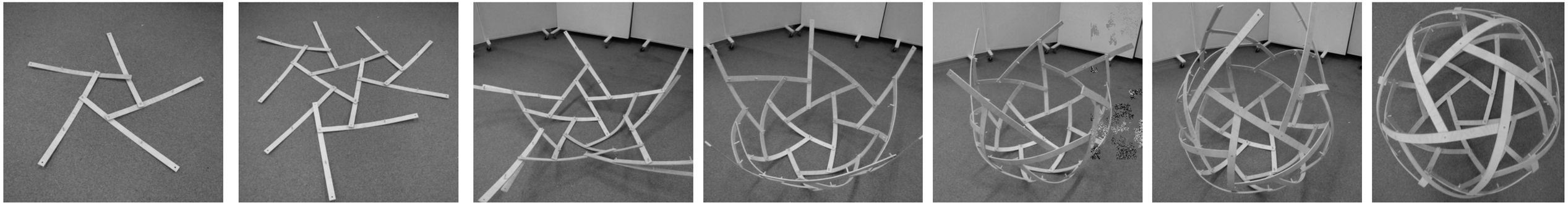
Orthographic



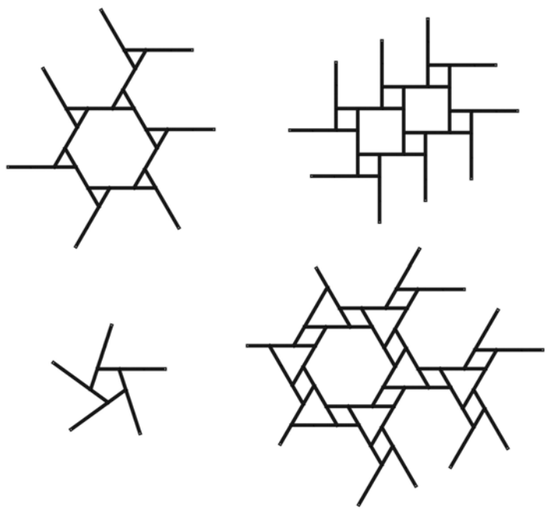
Perspective

Process Assemblies





Icosahedron Assembly

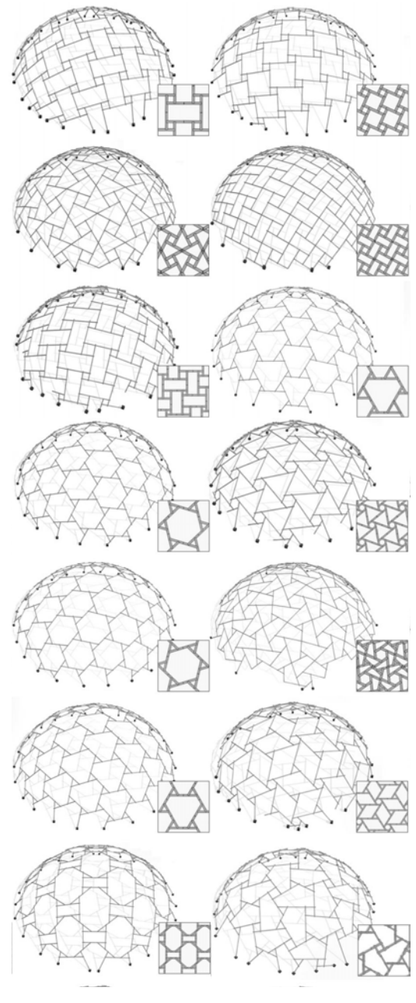


Genotypical Pattens

As the modular strips amalgamate forming regular polygons, different polyhedra begin to grow from their associated genotypical patterns. When bent, the strips exhibit a combination of tension and compression capable of forming a stable sturcture. Through material experimentation, a balace of flexion and resistant strength within the strips was found.

The subsequently formed structures embody a principle called tensegrity. This is exhibtited where isolated components in compression exist inside a net of continuous tension. Unlike typical cable and rod systems used in tensegral structures, the strips in this system, through their unification, form the net of tension as each unit is held in compression by its neighbor.

Truncated Icosahedron Assembly



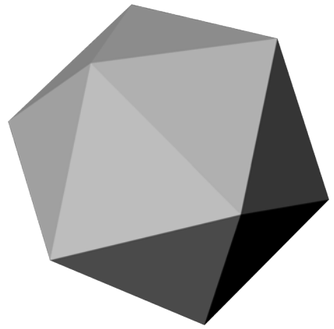
Precedent Assembly Patterns

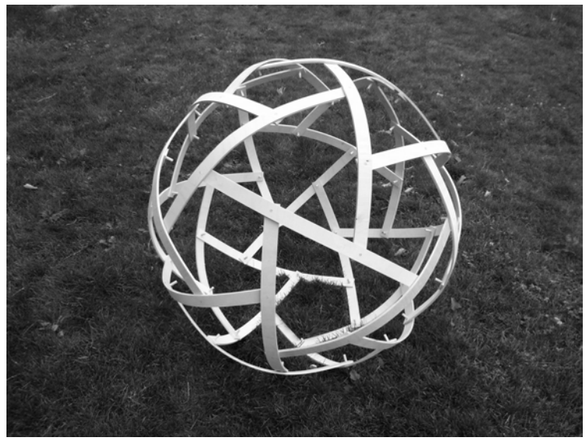
Icosahedron

Faces 20 (triangles)

Edges 30

Axes 12



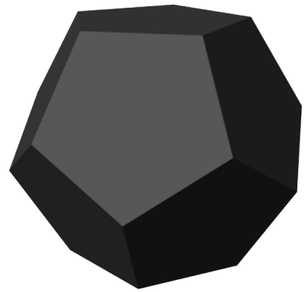


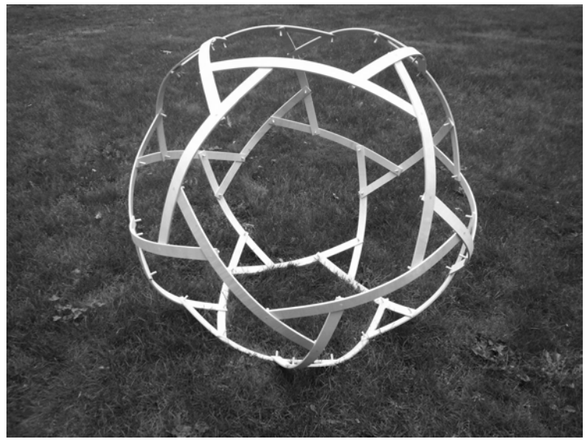
Dodecahedron

Faces 12 (pentagons)

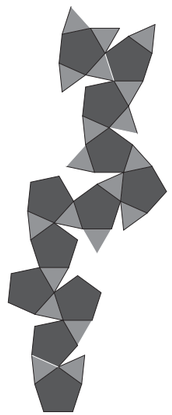
Edges 30

Axes 20





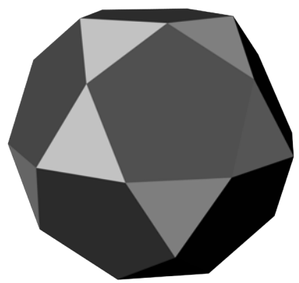
Icosidodecahedron

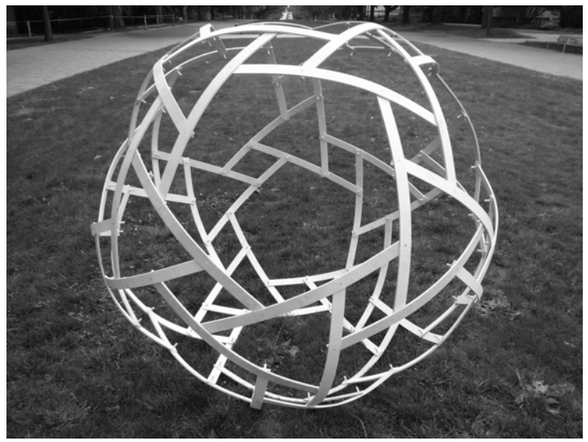


Faces 32 = 20 triangles
12 pentagons

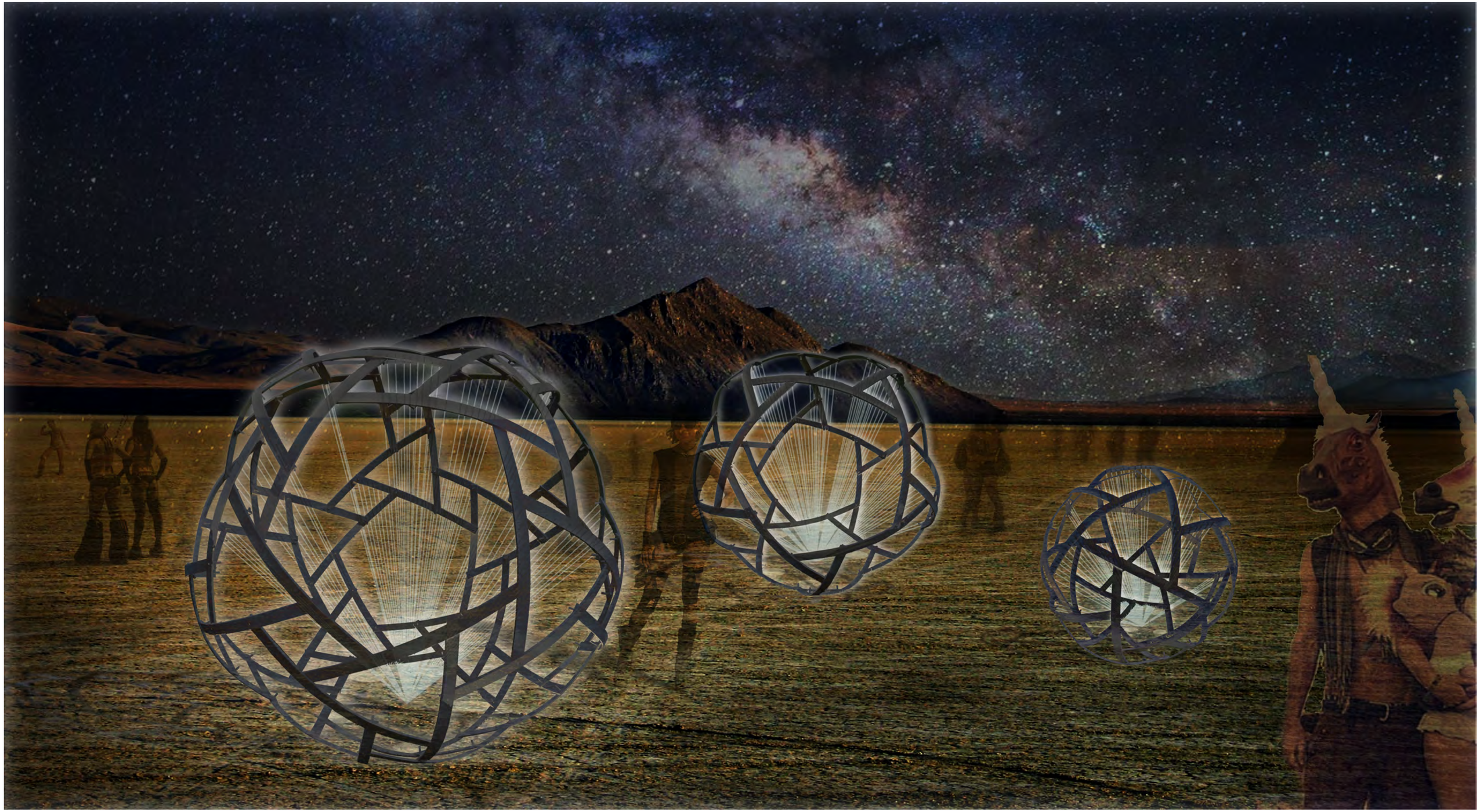
Edges 60

Axes 30



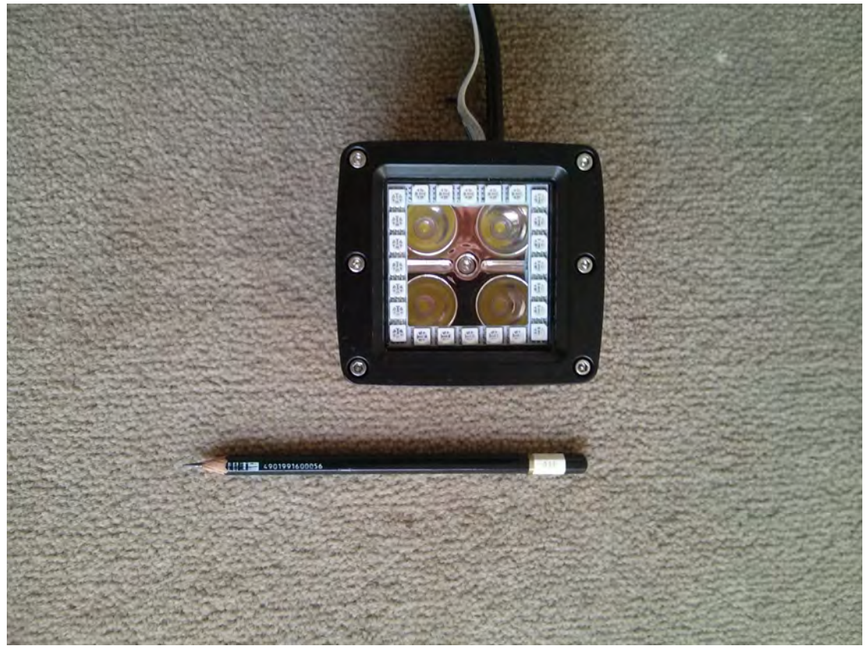


What about the lights?



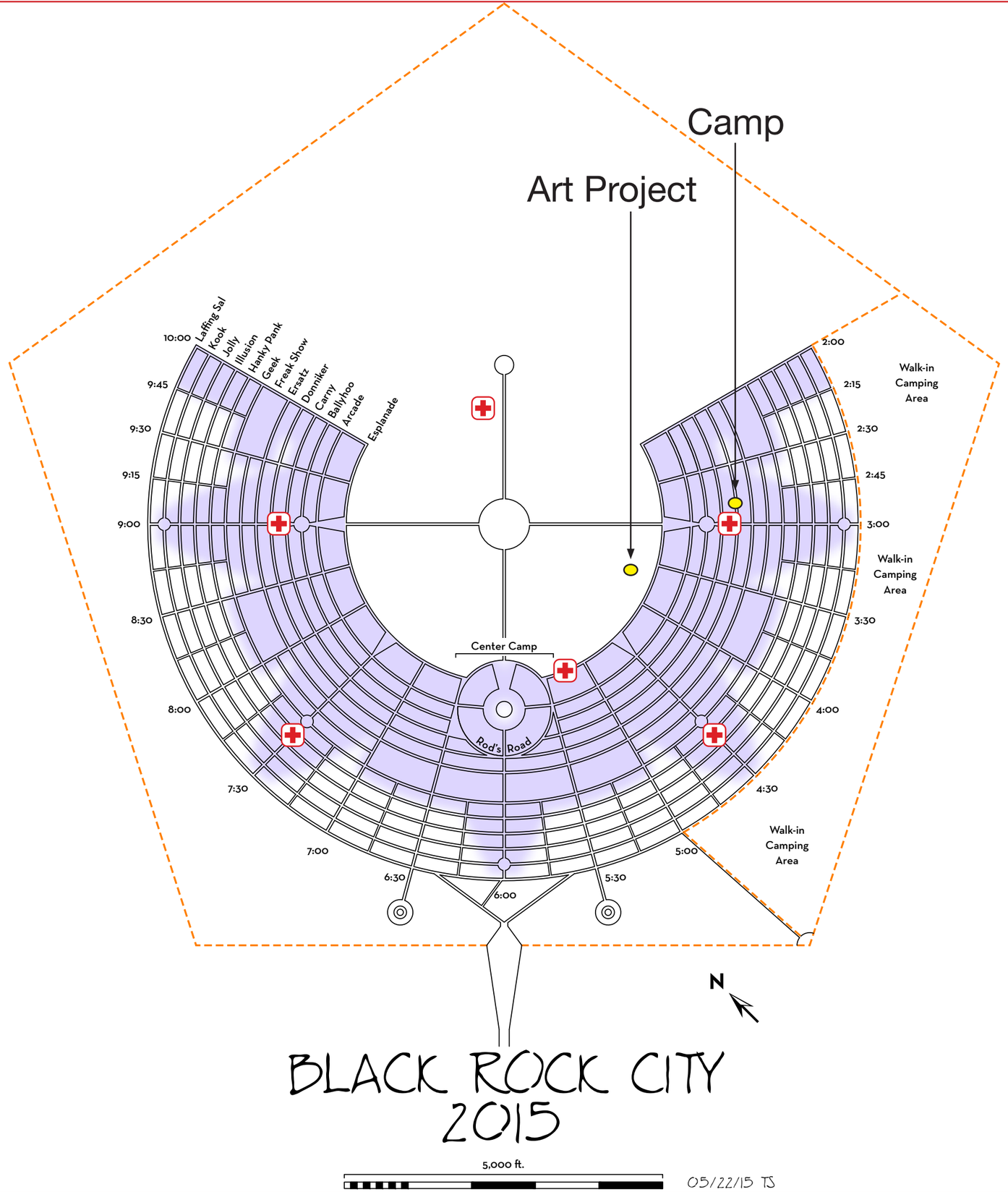
Lighting Trial

Lights Used



How will we get there?


HUFFY

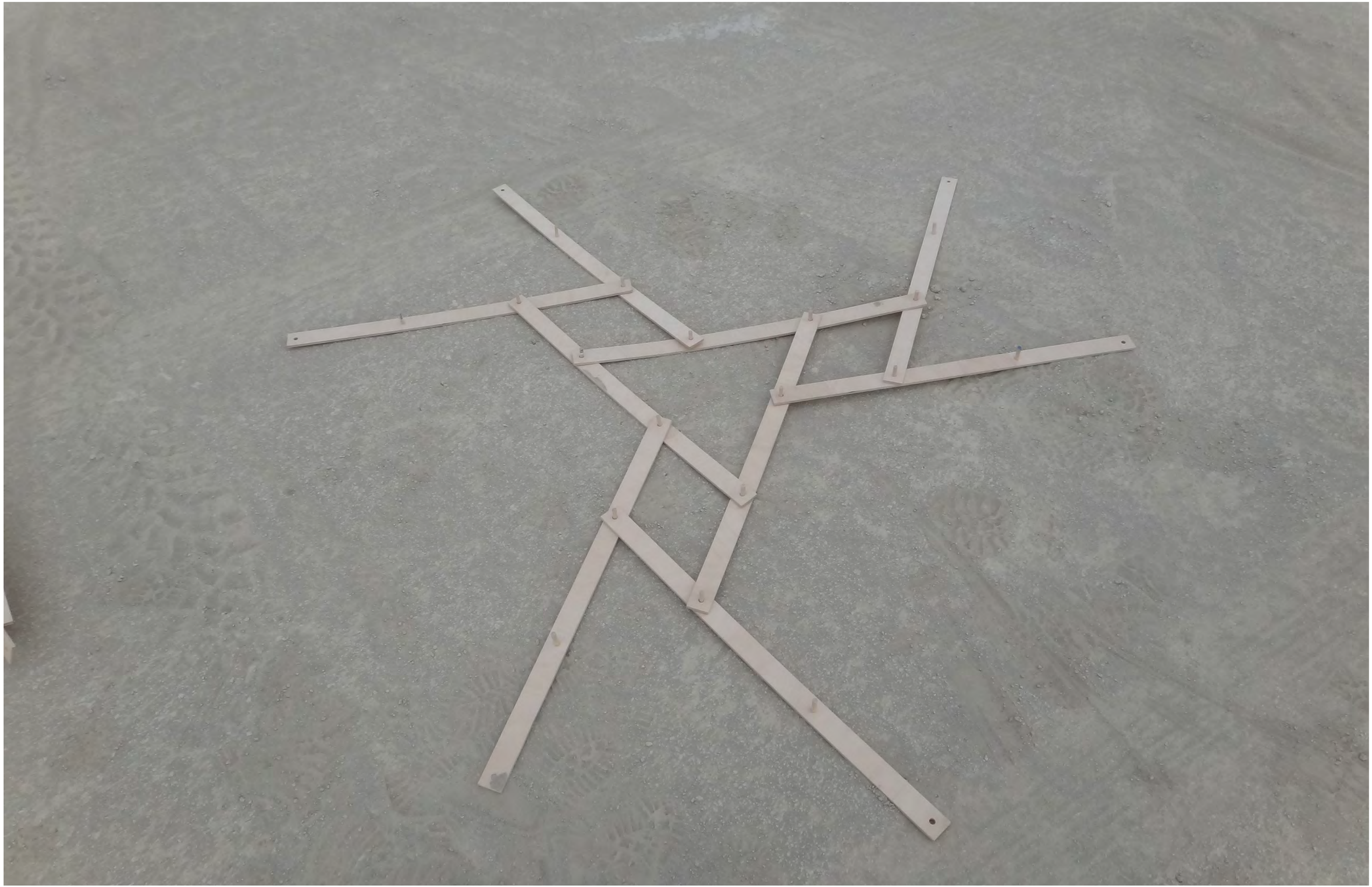


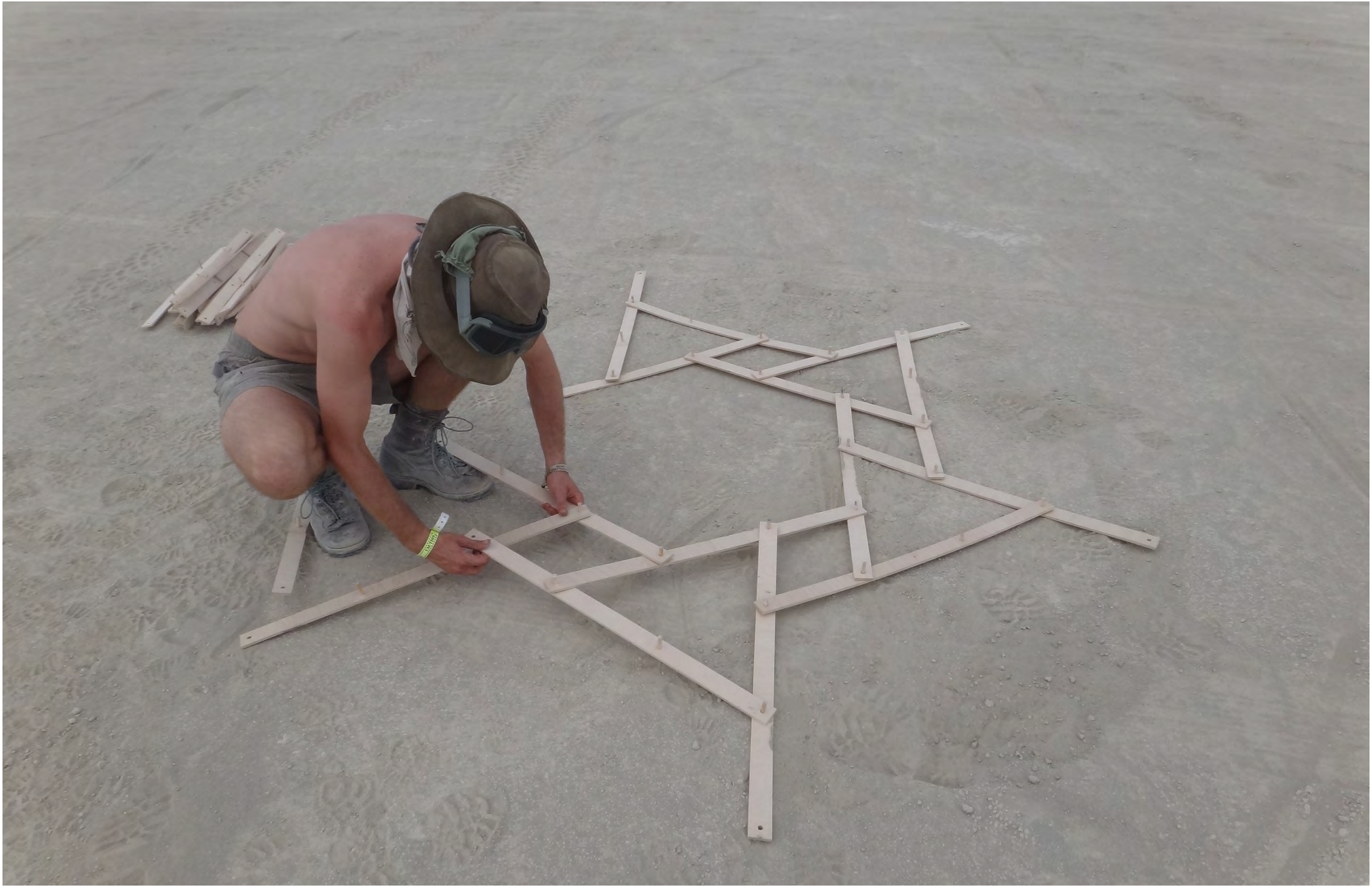
BLACK ROCK CITY 2015

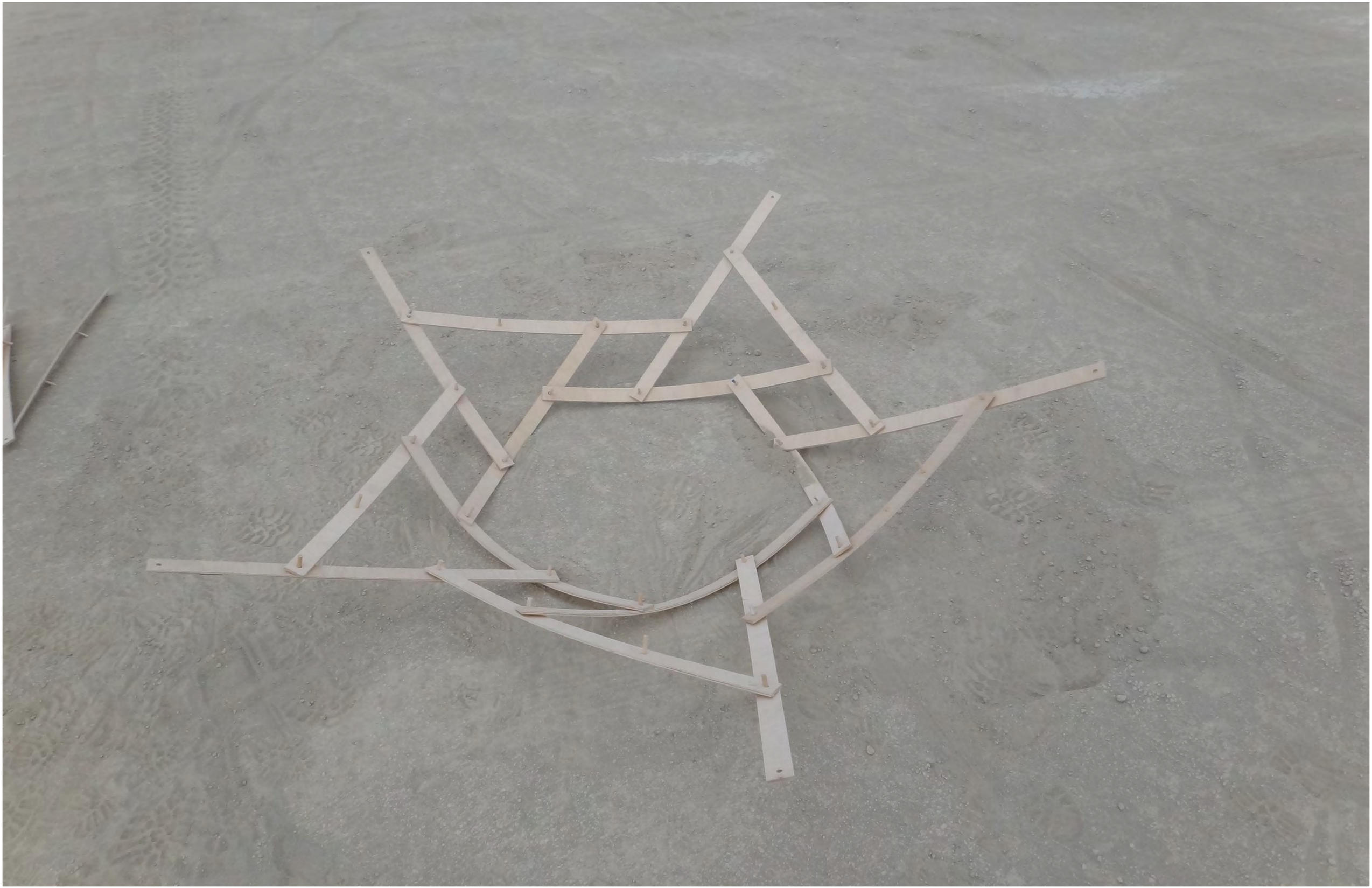
5,000 ft.

05/22/15 TS

Building on the Playa








CSLA CONGRESS '84
A CHANGE OF REASONS


U-HAUL
U-HAUL

Photo Credit: Andrew Lipsett

Lessons Learned

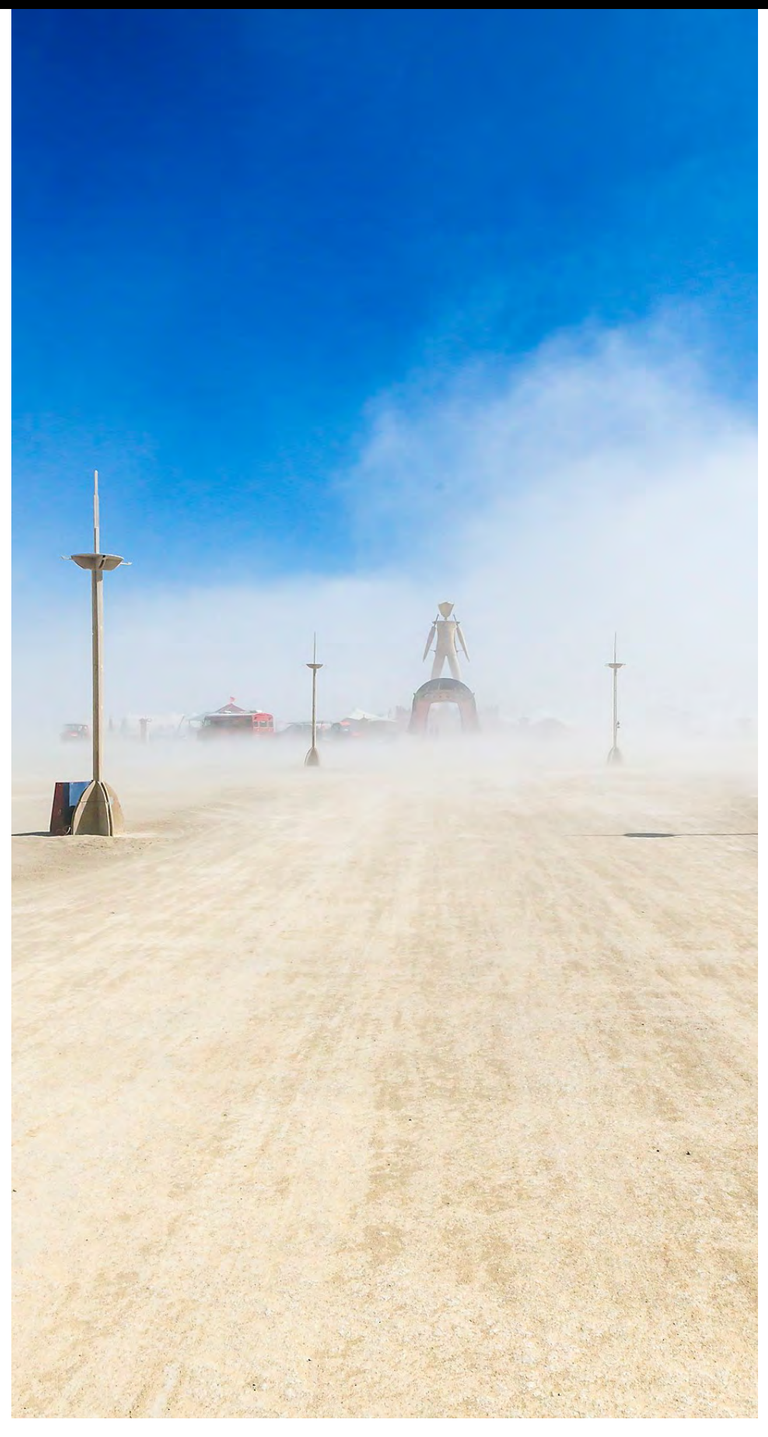
1. Community
2. Surprise and Delight
3. Wayfinding
4. Civic Engagement
5. Creative Potential
6. Safety 3rd
7. Humour
8. EMBRACE THE DUST!

1. Community

Photo Credit: Andrew Lipsett

2. Surprise and Delight

3. Wayfinding



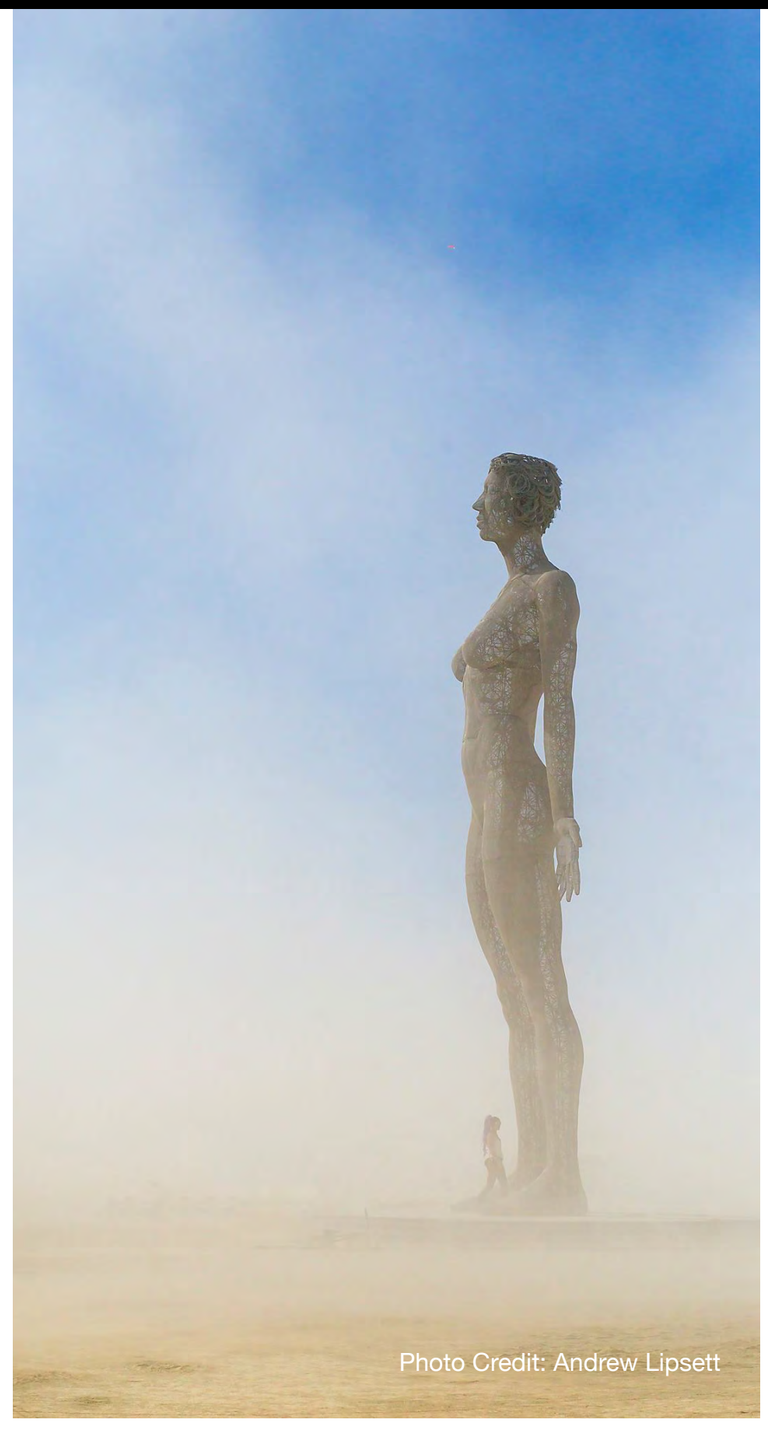


Photo Credit: Andrew Lipsett

4. Civic Engagement

5. Creative Potential

Photo Credit: Andrew Lipsett

Photo Credit: Andrew Lipsett

6. Safety 3rd

7. Humour

8. Embrace the Dust!