

# BERGER FOUNTAIN

LORING PARK MINNEAPOLIS, MN



**Dunwoody College of Technology**  
**3<sup>rd</sup> Year B.Arch Studio**  
**Fall, 2018**

**Faculty: Paul Bierman-Lytle, AIA, LEED BD+C**

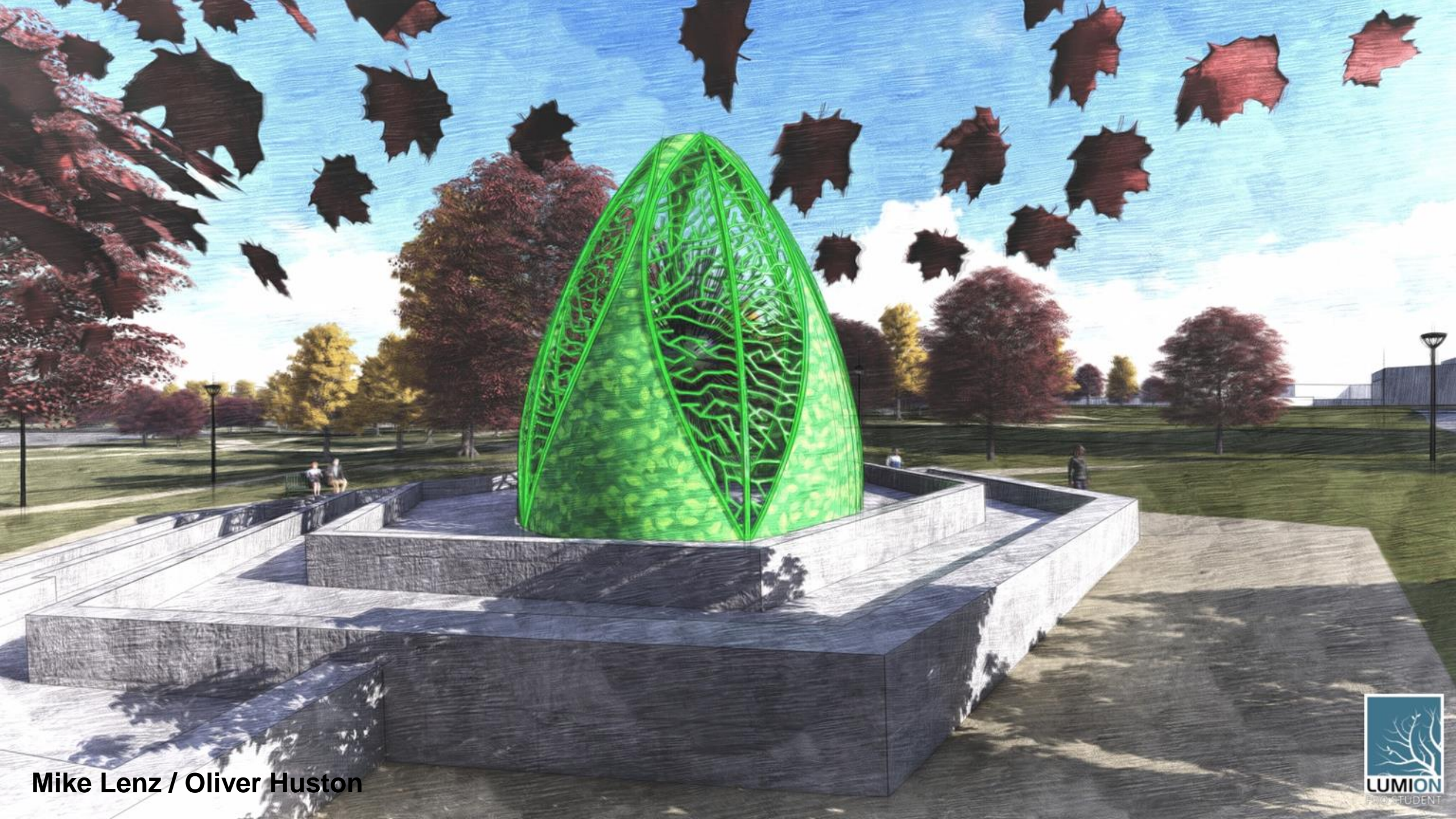
# ENCLOSURE



# CURRENT CONDITION

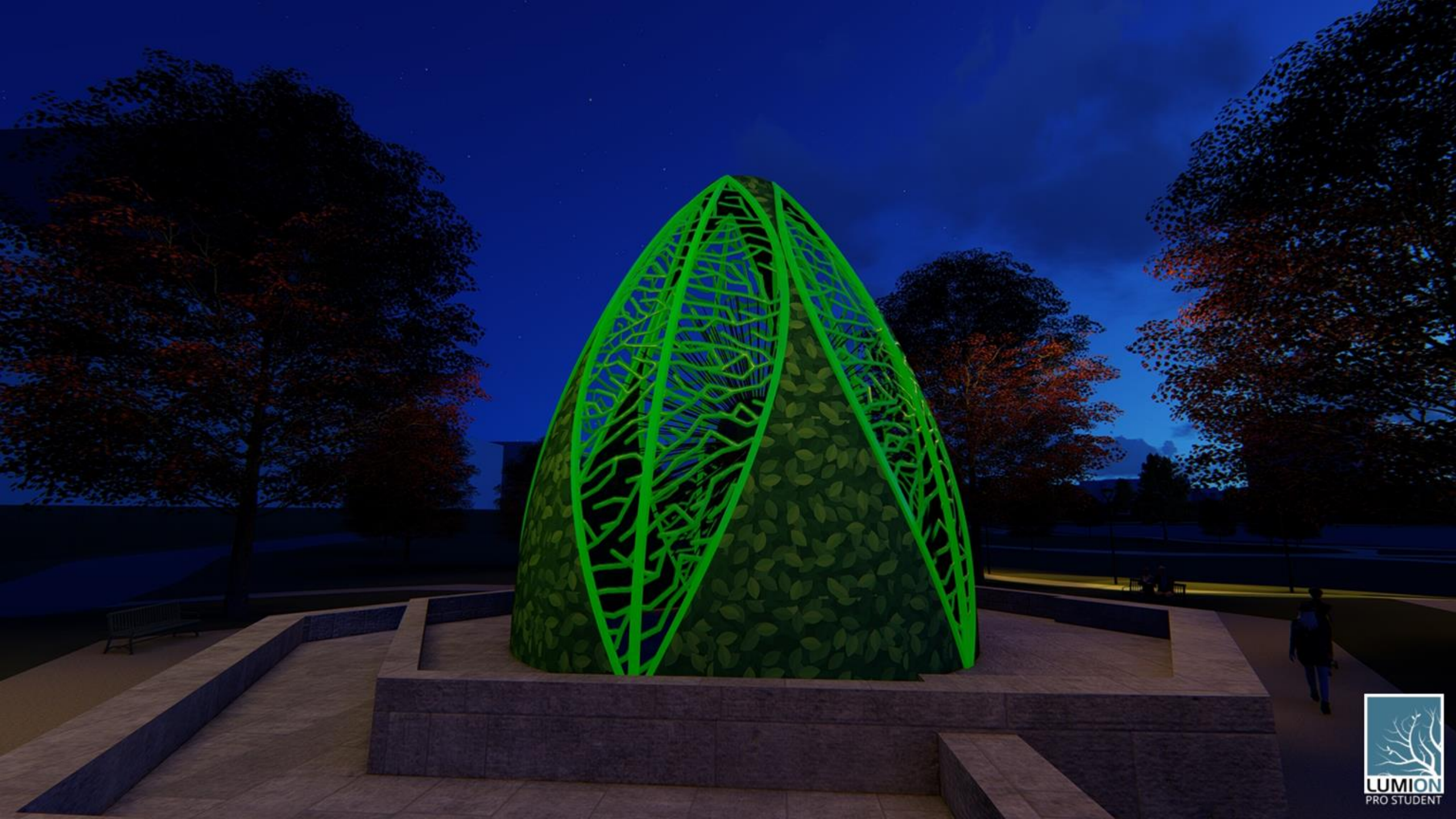






Mike Lenz / Oliver Huston



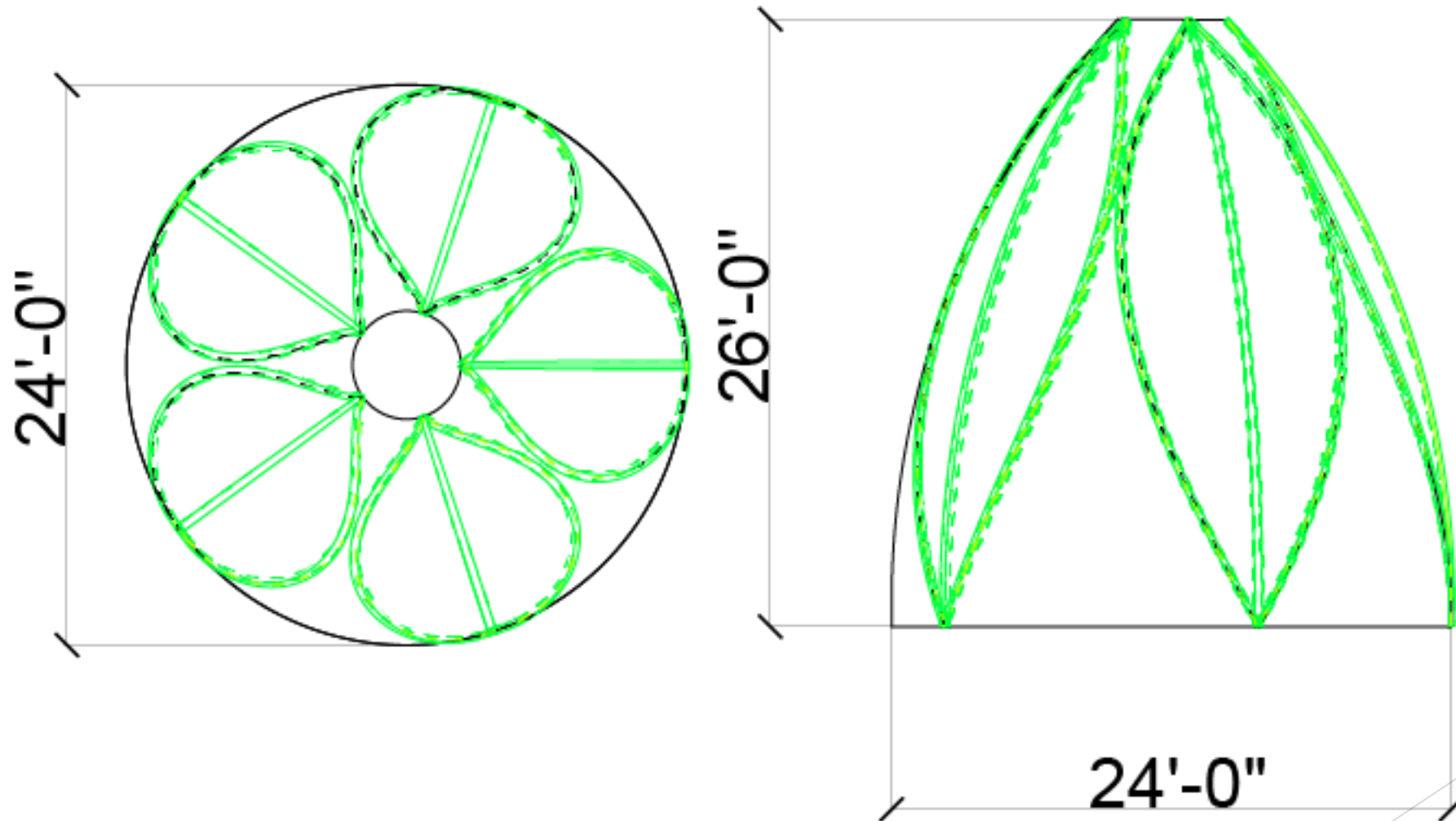








# Plan & Elevation

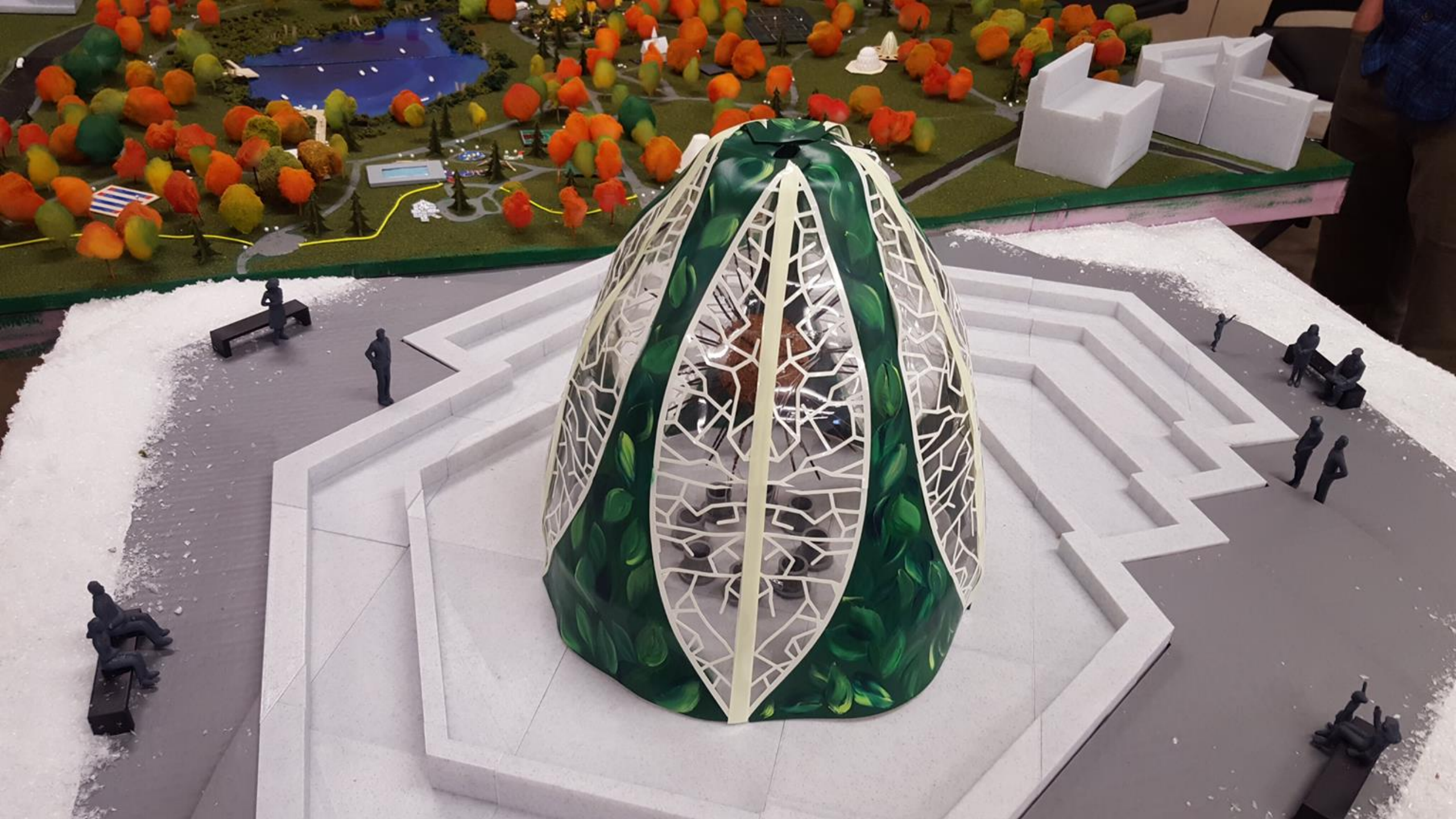




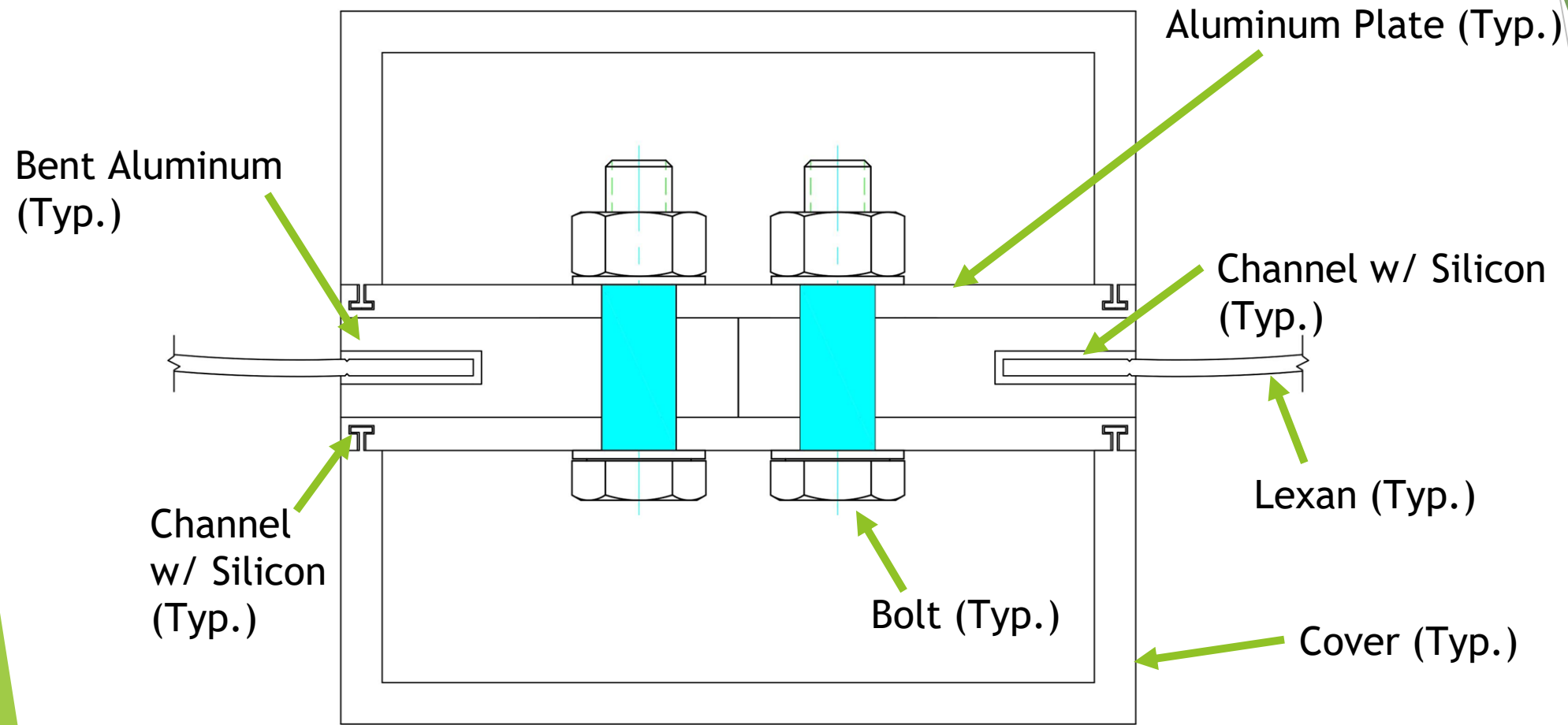


Mike Lenz / Oliver Huston









# Connection Detail



# Estimated Weight of Structure

Lexan = 1,975 lbs, 1,975 sq,ft,

Aluminum = 2,988 lbs, 447.5 lf

Center frame = 945 lbs, 142.5 lf

Outer 2 curved frames = 2043 lbs, 305 lf

5 Panels at 993 lbs per panel = 4,963 lbs

If not using aluminum for outer 2 curved frames -

5 Panels at 584 lbs per panel = 2,920 lbs





# Lexan (Polycarbonate)



# Estimated Price for Materials

Lexan = \$35,000

Aluminum

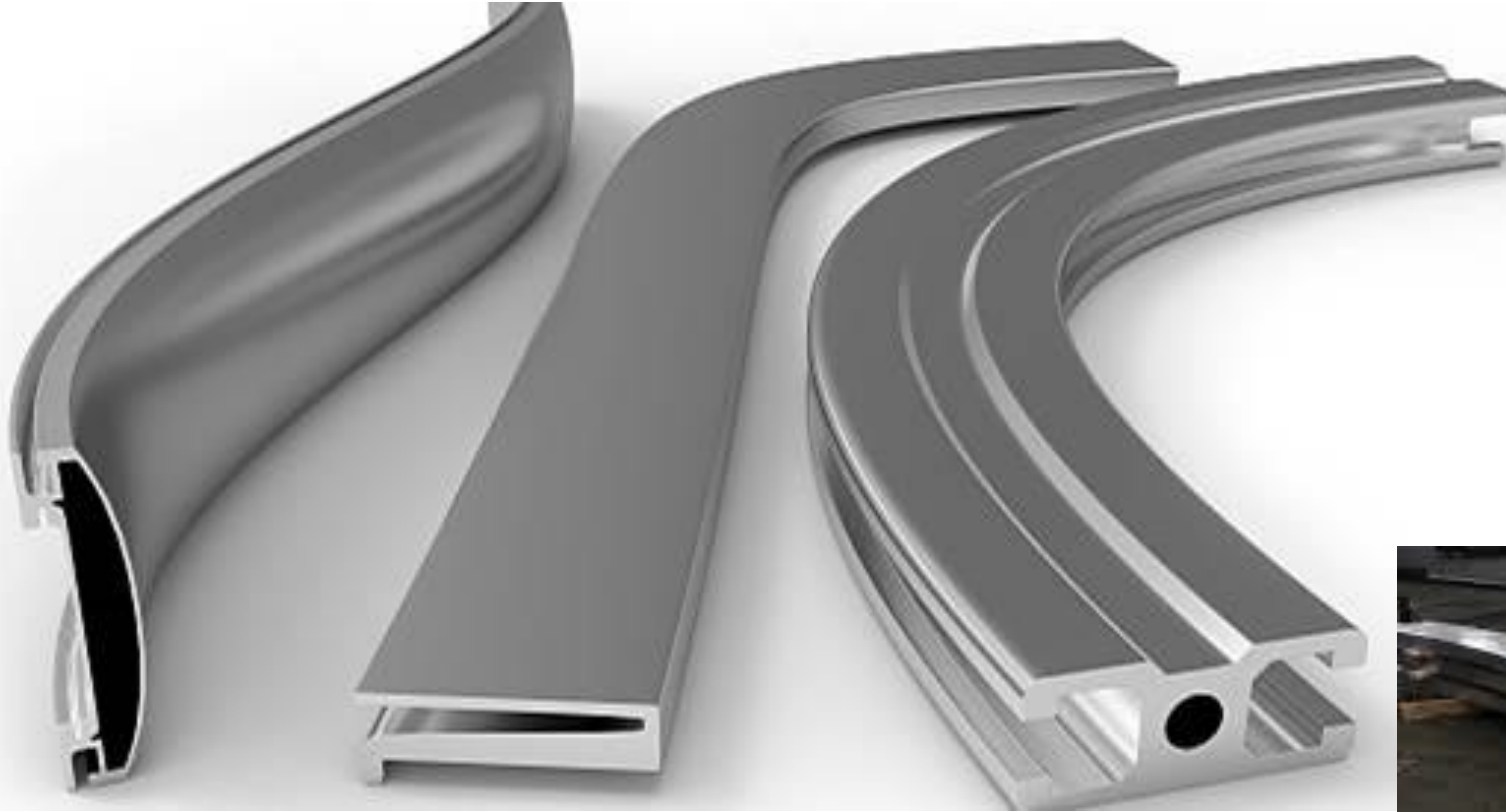
Center Frames = \$2,000

Outer Curved Frames = \$4,300

Paint/Tape/Lights = \$10,000

Total = \$47,000 to \$51,300 for materials





# Bent Aluminum Members





# Special Effects, Lighting, & Materials

**Mike Lenz / Oliver Huston**





# Glow-In-The-Dark Paint or Tape

## Option 1

Mike Lenz / Oliver Huston

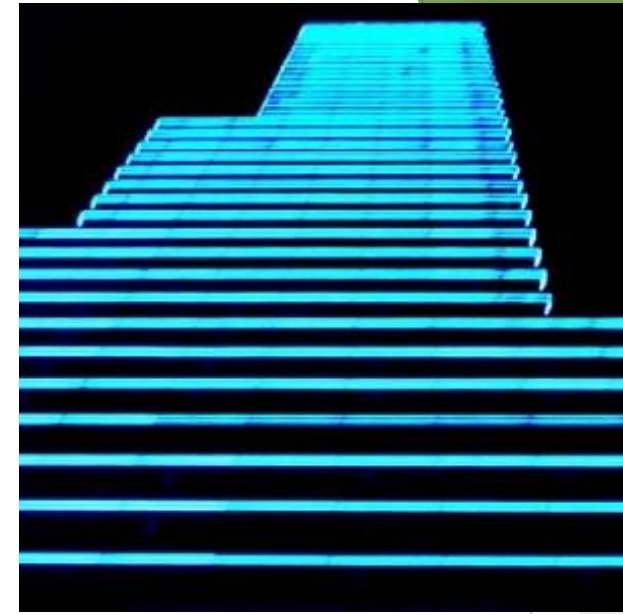




# Electroluminescent Tape, Wires, or Panels

## Option 2

Mike Lenz / Oliver Huston





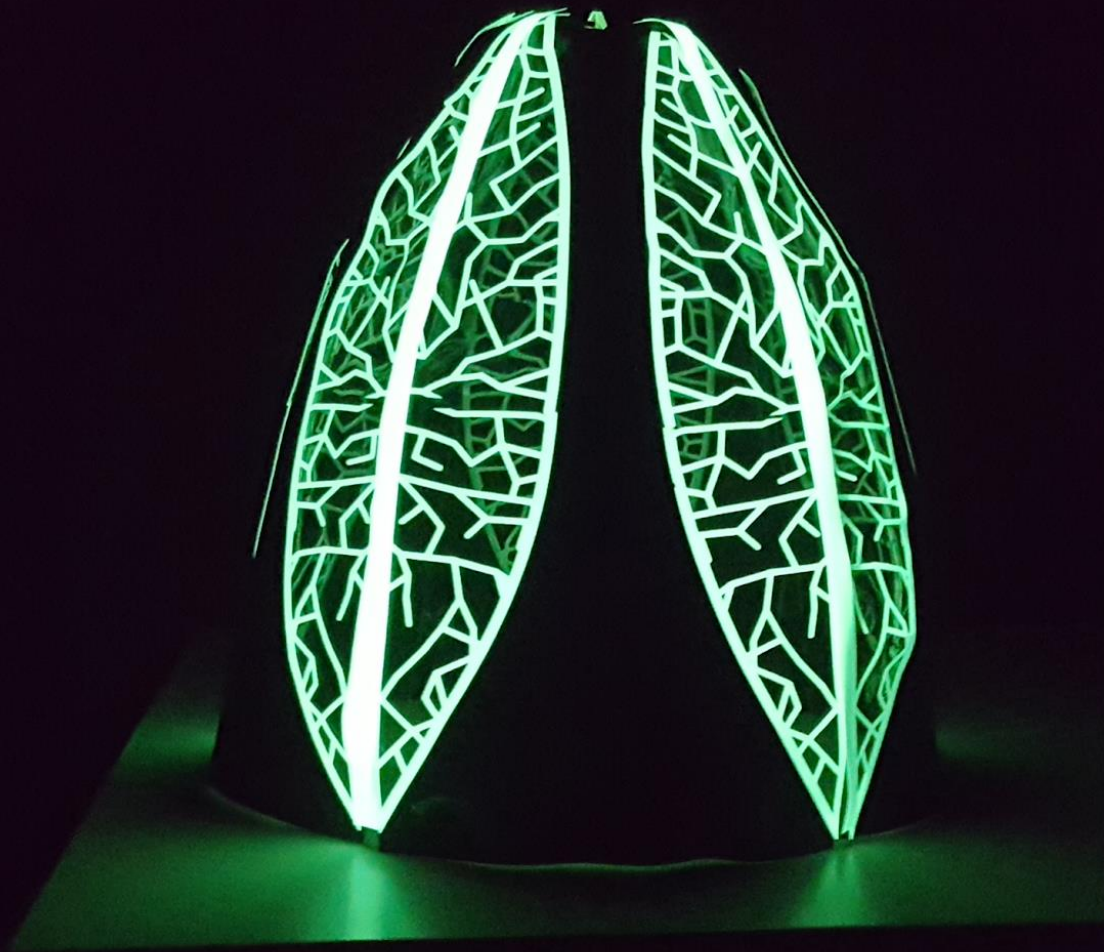


# LED Lighting

## Option 3

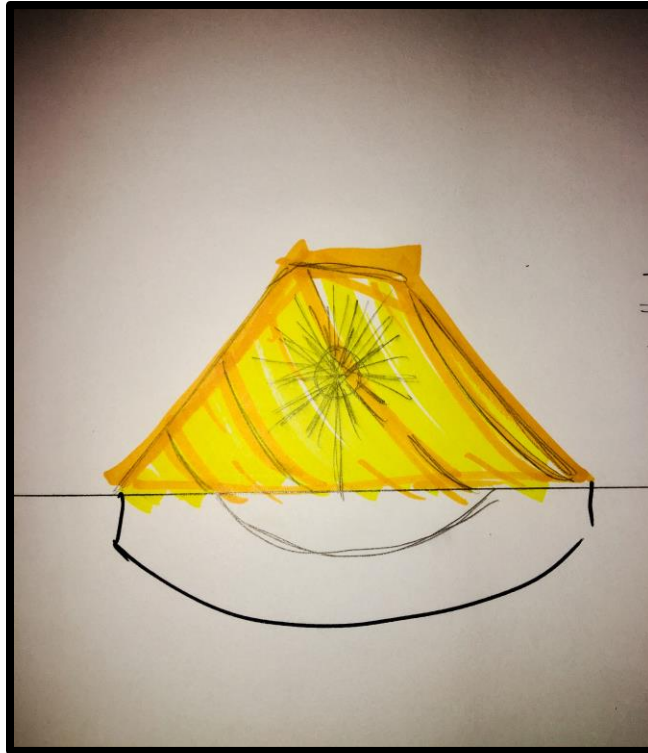
Mike Lenz / Oliver Huston





# Concept:

- Lightweight
- Inexpensive
- Easy Assembly
- Durable
- Relate to the Area



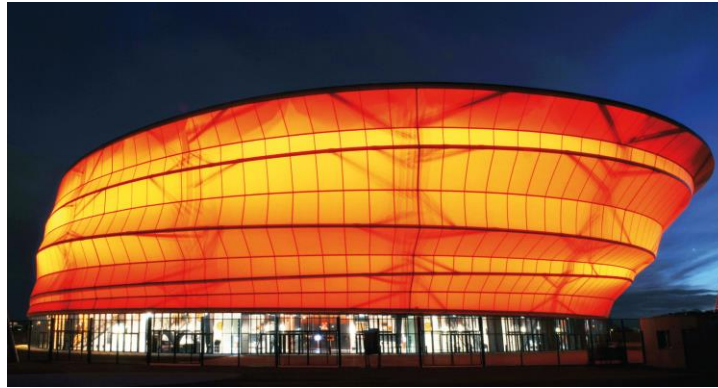
- Tensile With a Twisting Motion
- Fountain Shadow – (slightly transparent)
- Bright
- Changeable Lights
- Remain Key Feature at Loring



# Precedents:



**Denver Airport**



**Zenith by  
Massimiliano Fuksas**



**Sydney Vivid Festival**

Vivid Sydney 2018 Light Show

<https://www.youtube.com/watch?v=Zlvsl83hDnE&t=20s>

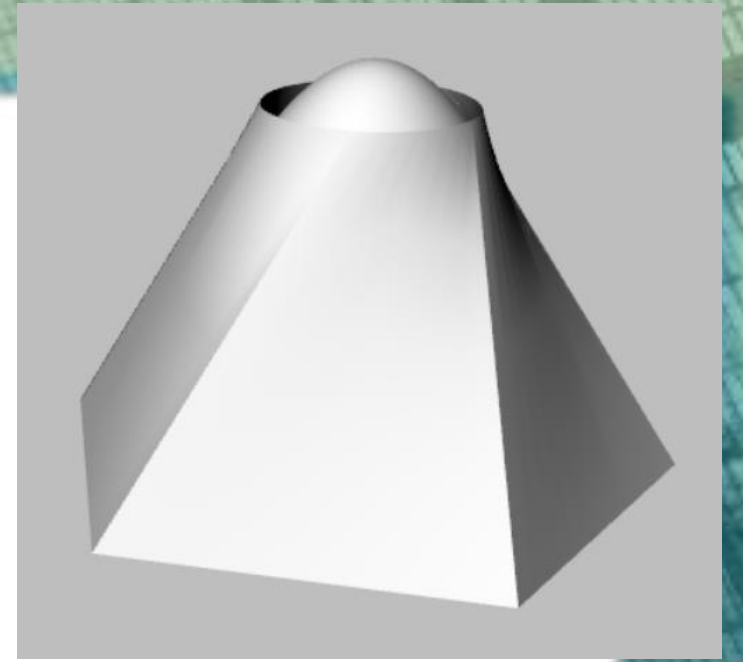
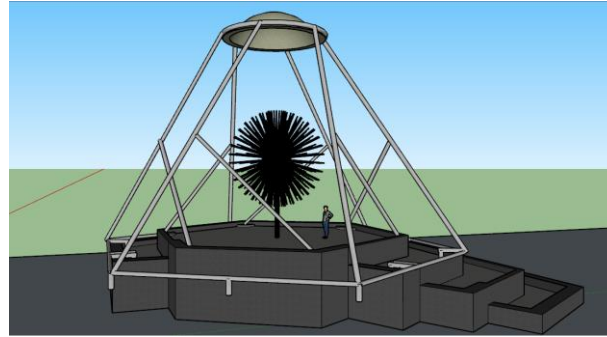
The Disney Tree of Life at The Animal Kingdom

<https://www.youtube.com/watch?v=dQE440tSwE>

**Please Watch**



# *Renderings*

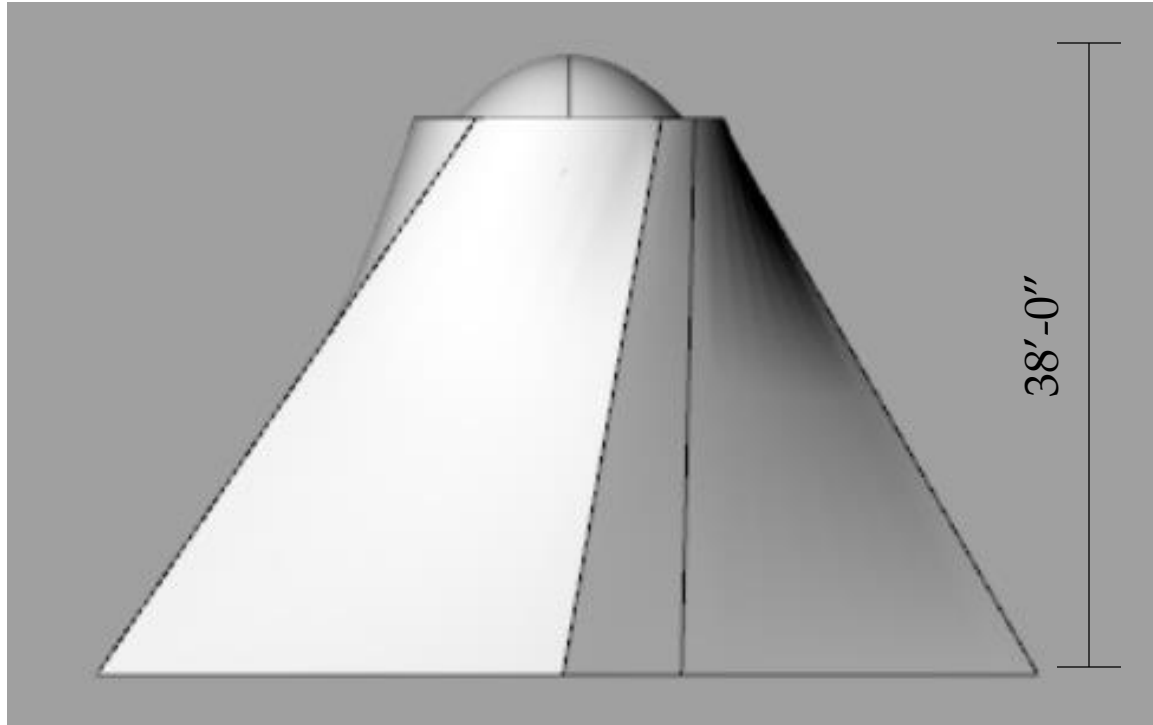
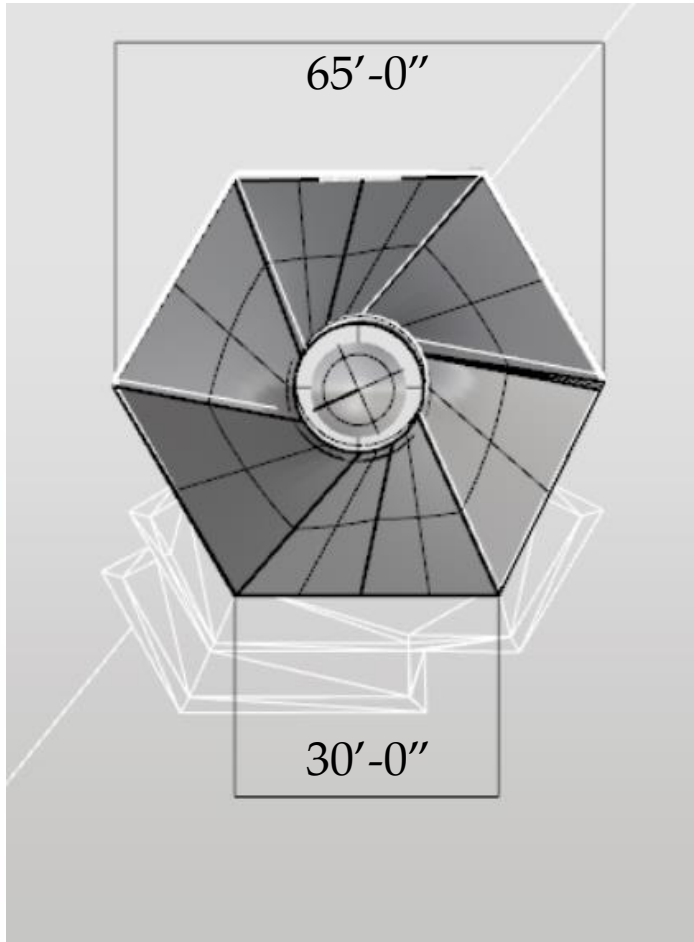




# The Form

- Uses Hexagonal shape from existing fountain base then the form twists upwards connecting to a circle with a dome.
- The twist allows for a kinetic looking structure when the projectors aren't running. It encourages people to move around the form and view it from all sides, creating interest. It would also work well if the visuals projected onto the canvas were circular and could use the form to the projections advantage.
- The dome can be seen as an oculus to look out into space (reconnecting with nature) or a spotlight to attract people in the area.
- The form blends with the existing base and can still be used (slightly modified) for a future remodel of the basin area.
- The form is very large and meant to be as tall as the trees to be seen from the walker, the convention center entrance, MCTC, and the highway nearby urging people to come check it out.

# Plans & Elevation





# Materials:

- ***Aluminum Piping (8" x .125")***

[https://www.onlinemetals.com/merchant.cfm?pid=7083&step=4&showunits=inches&id=71&top\\_cat=60](https://www.onlinemetals.com/merchant.cfm?pid=7083&step=4&showunits=inches&id=71&top_cat=60)

- ***Each slant (6) broken into two ~24' section. Each support is also 24'.  
(\$600/24' section x18 total = \$10,800)***
- ***Each Side for Hexagon base is 30'  
(roughly \$800 per. = \$4800)***
- ***(22) 1-2" Diameter Rods or Pegs on every other slant piece (spaced every 2') approx. 1-2 inches each  
(\$130/6ft rod)***
- ***18 foot diameter ring = 56 foot circumference  
(~ \$1600)***
- ***Extra for Base Connections  
(~ \$1800)***
- ***Extra for connection pieces  
(~\$5000)***

***= \$24,130 + Manufacturing & Labor Costs***

***10 lbs/ft x ~700 Linear Feet = 7,000 lbs***

## Materials

- ***Membrane or Fabric***

[https://www.sailrite.com/Fabrics/Marine-Fabric/Department/Fabric/Fabric-Material/Acrylic~100-PCT-/type/Products?order=custitem\\_popularity](https://www.sailrite.com/Fabrics/Marine-Fabric/Department/Fabric/Fabric-Material/Acrylic~100-PCT-/type/Products?order=custitem_popularity)

- ***Sail cloth***
  - ***~8000 square Feet or 900 sq yards (\$15-25/sq yard)***
  - ***= \$13,500 - \$22,500***
  - ***(0.50 lbs/sq yd)***
  - ***= 450 lbs***
- ***PVC Mesh Fabrics***
- ***Acrylic-Coated Polyesters***



## Materials

- ***3D Projector:***

***Extremely difficult to find specific prices. Very dependent on each project. This was one of the projectors I found I thought explained things clearly and might work well for this project.***

- ***<http://lumitrix.eu/#technology>***

# Materials

- ***Plastic Dome:***
  - ***Like this except not transparent more frosted or even colored white***
  - ***Another unknown cost. Most likely between \$15,000 - \$20,000***

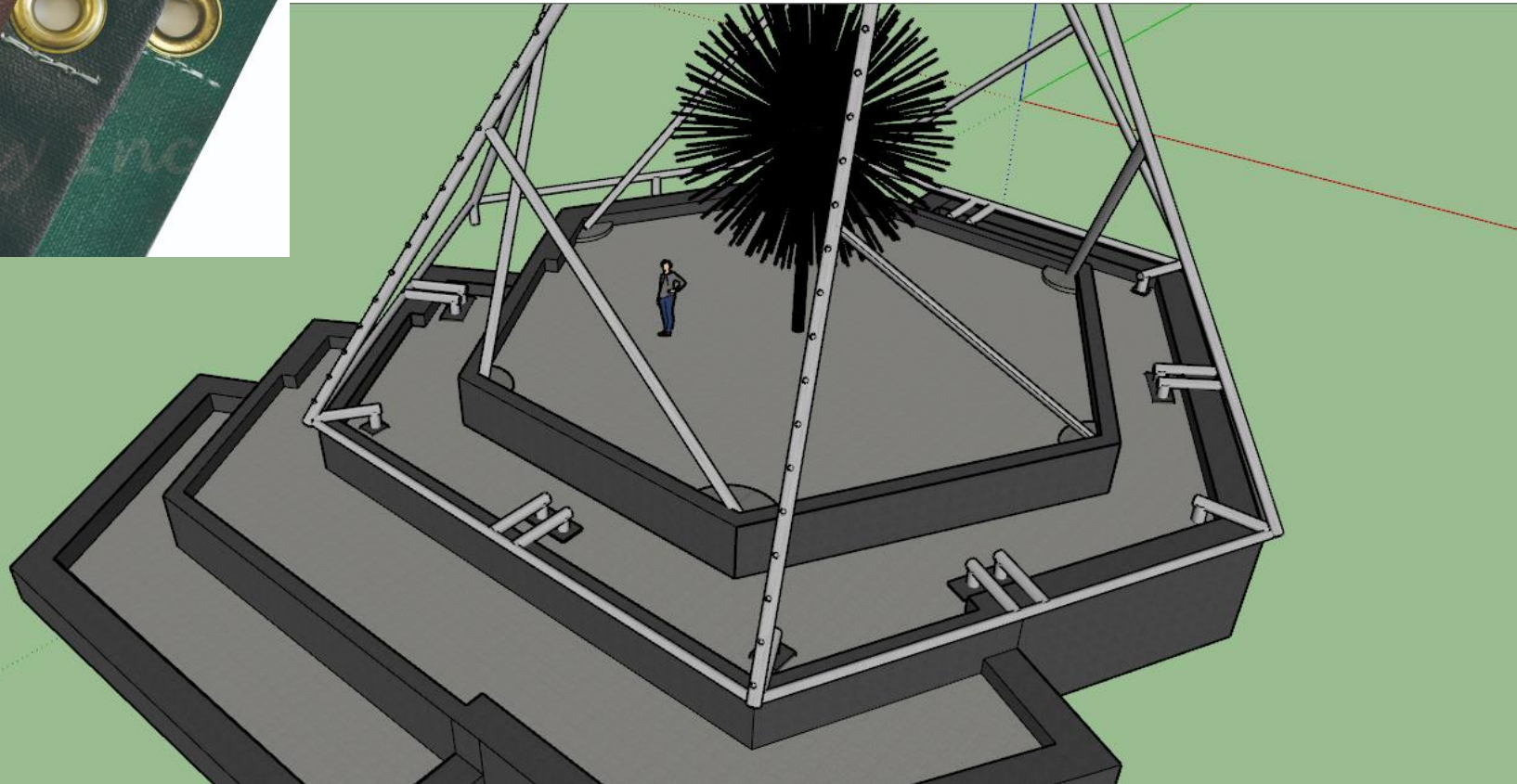




# Fabrication:

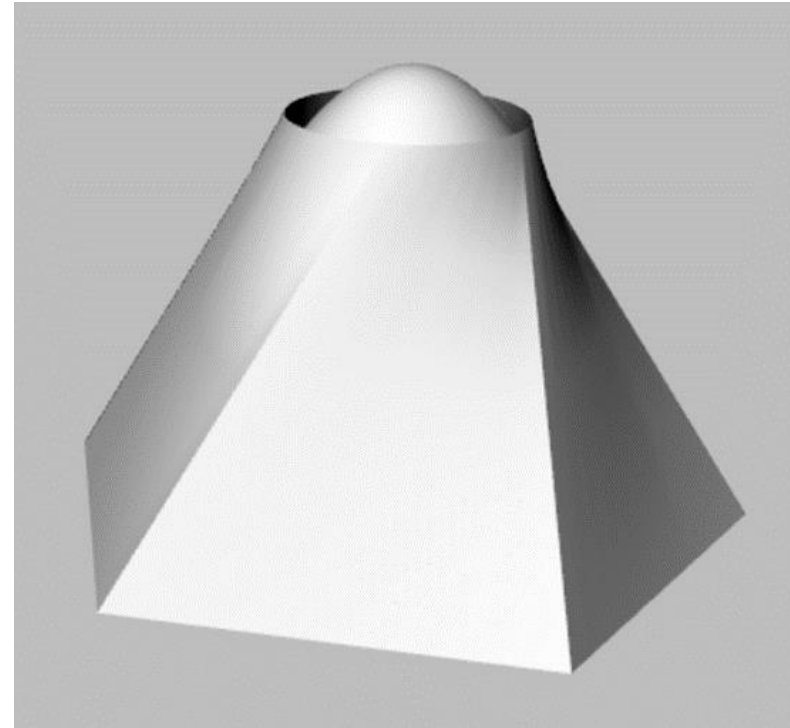


Grommet hooked  
on pegs,  
overlapped,  
capped, and an  
extra layer would  
cover the seam



# *Native American Involvement*

- Abstraction of a Tipi, encompasses all different style of Tipi to ensure inclusion
- Set-up/Tear-down Event W/ Volunteers
- Syd Bean (Videographer) + Blank Canvas = ART
- Opportunity to share perspectives and stories – hold special events
- Nature Integration

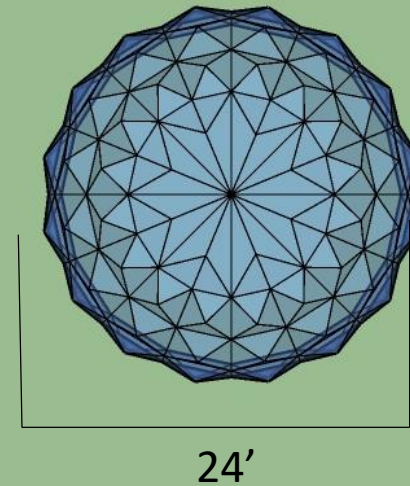
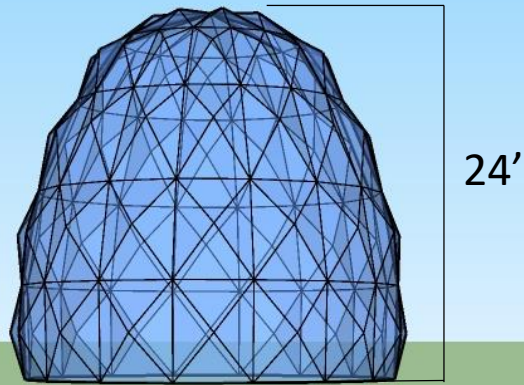




Jake Beaudet

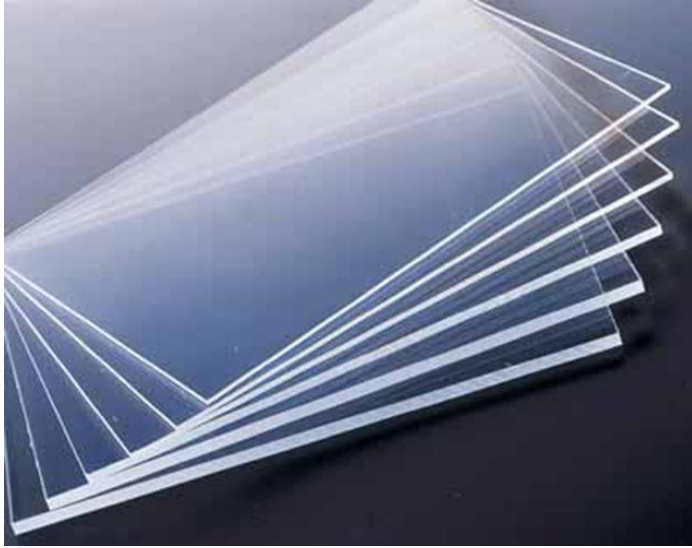


# Enclosure Measurements





# Materials - Weight - Cost

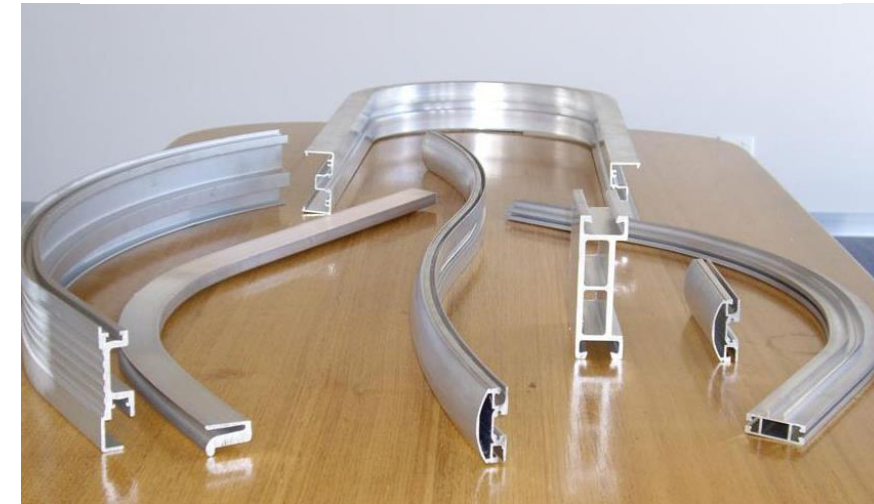
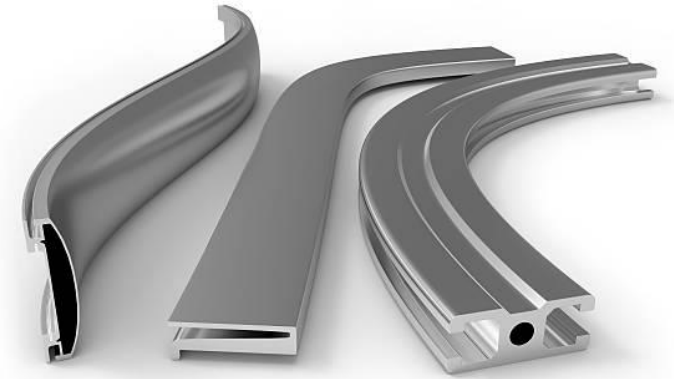


Aluminum Recyclable  
Light Weight and Strong  
Corrosion Resistance  
4" square ¼" thick with c- channel

Polycarbonate  
Works in a wide temperature range  
UV resistance  
Abrasion Resistant Coating  
Formability

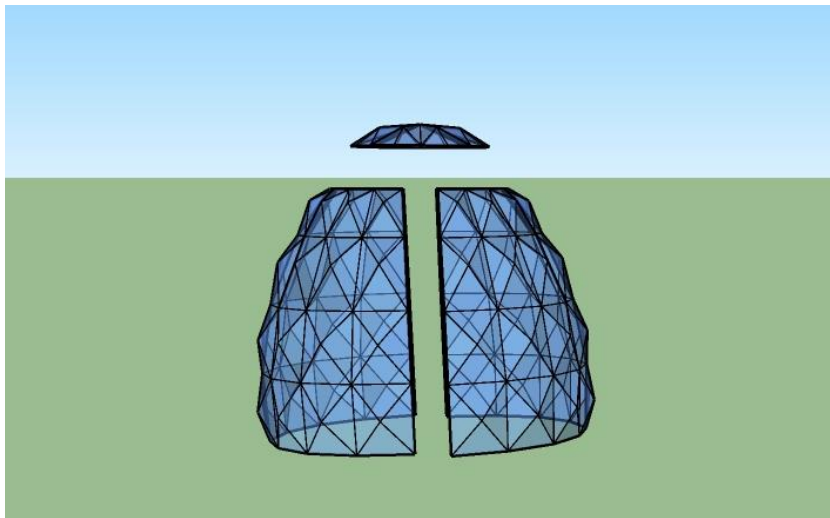
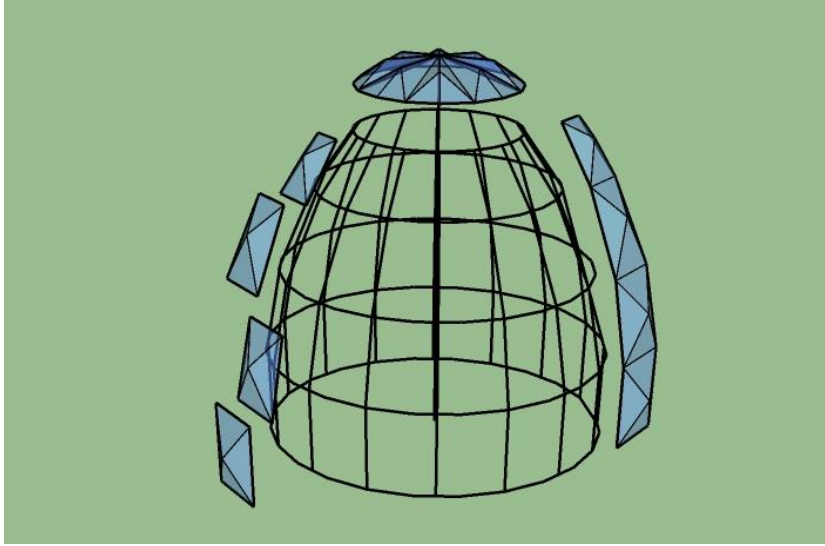
Estimated weight = 2,915lbs  
Aluminum 600lf @ 4.4lbs per lf = 2,640lbs  
Polycarbonate 1,700sf @ .75lbs per sf = 1,275lbs

Estimated cost for materials = \$66,400 – 101,600  
Polycarbonate \$5.00 – 10.00 per sf = \$8,500 – 17,000  
Forms cost \$10,00 - 15,000 each = \$50,000 – 75,000  
Aluminum \$13 - 16 per lf = \$7,900 – 9,600



Mitchell Olson

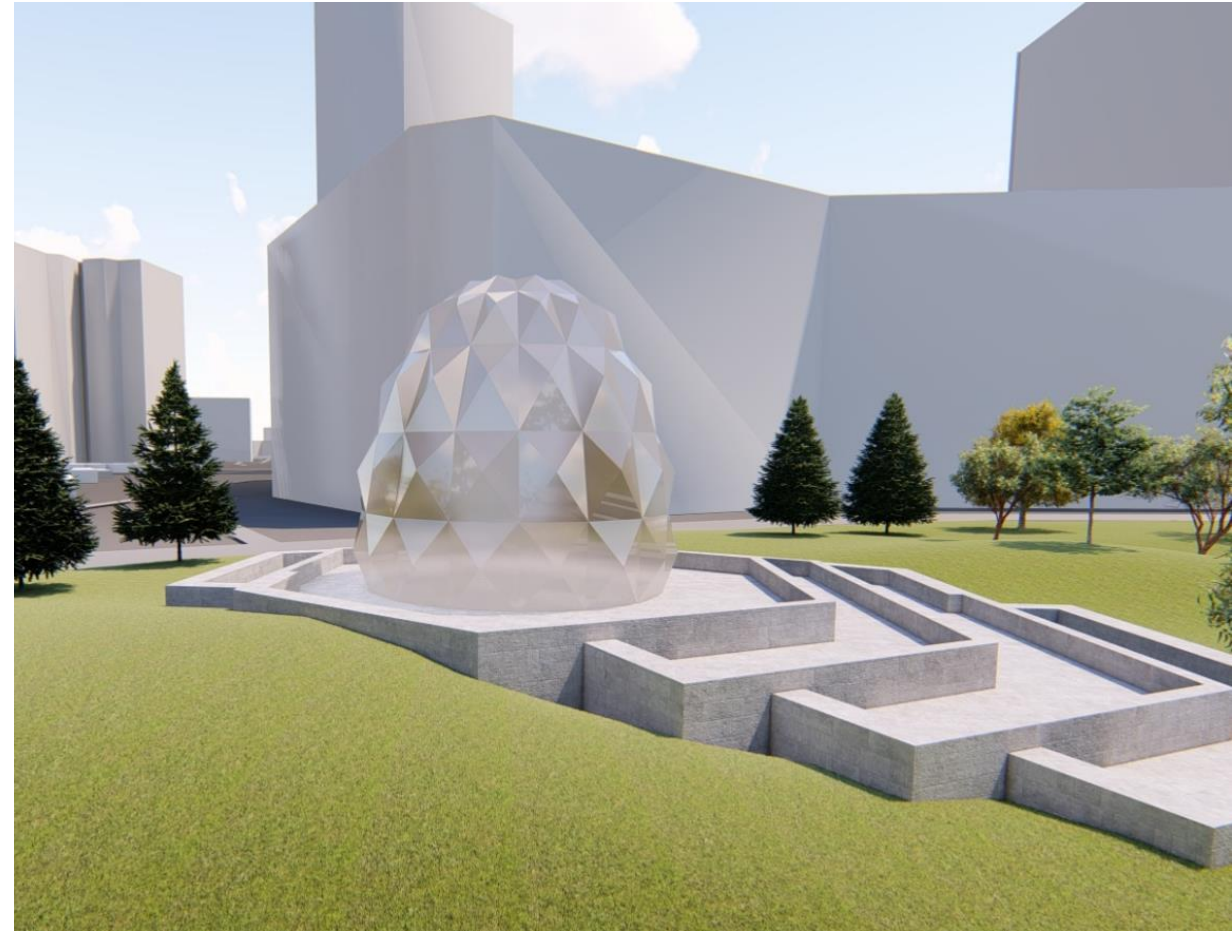
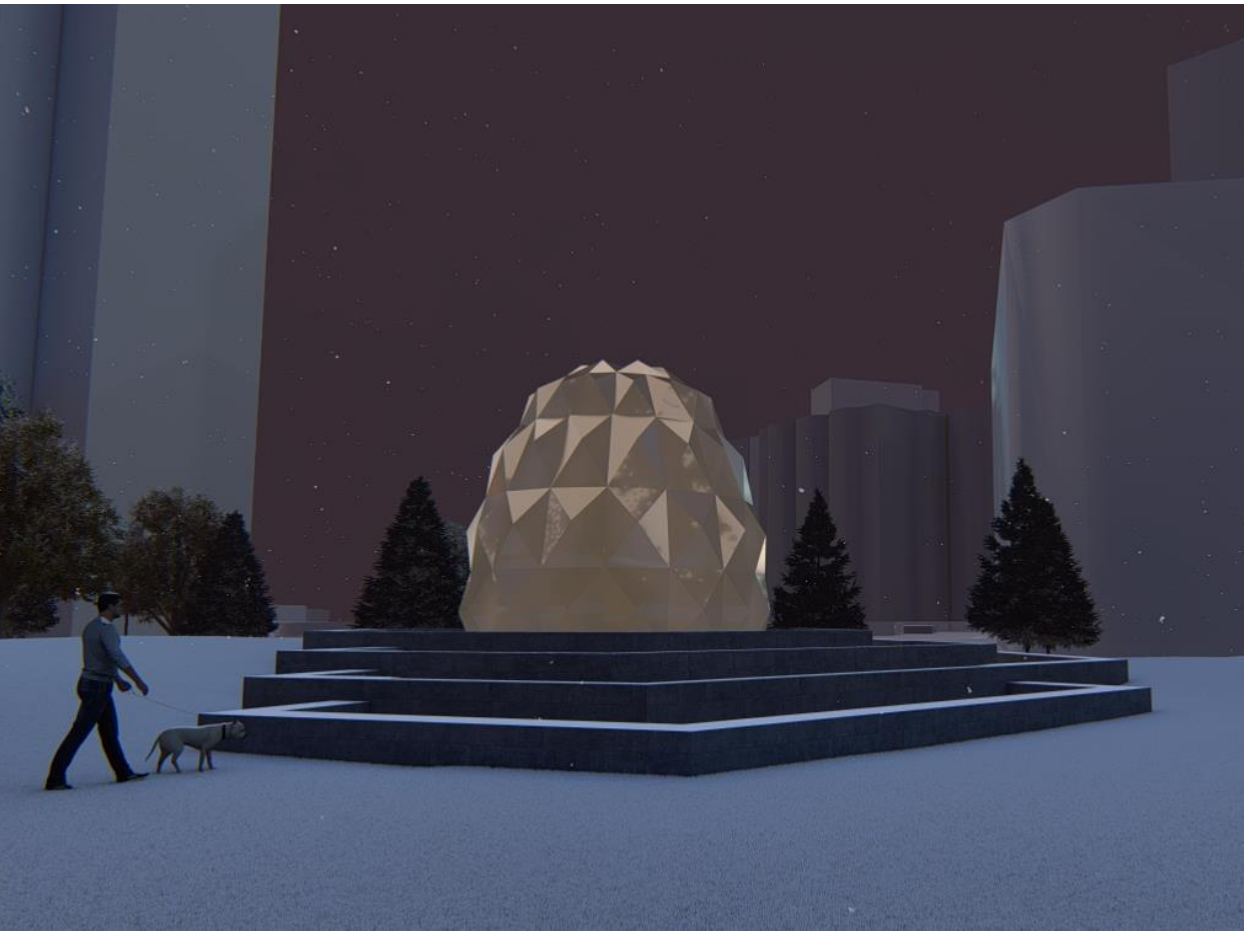
# Structure & Assembly





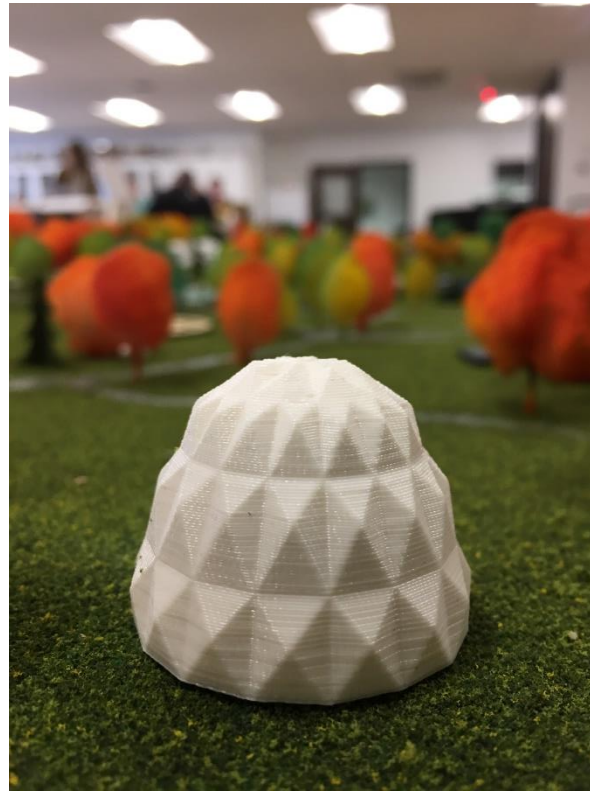
Mitchell Olson

# Renderings



Mitchell Olson

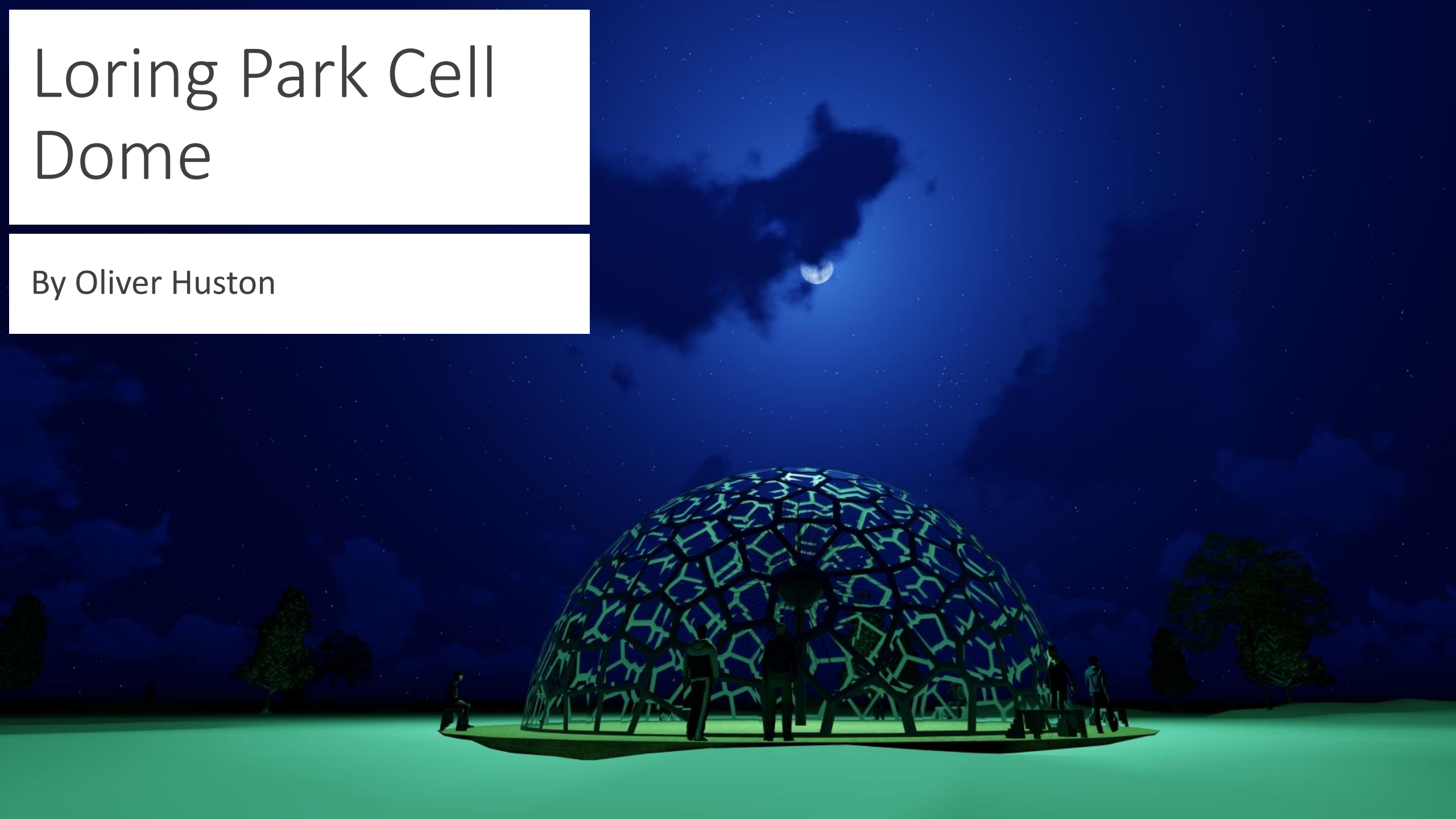
# Model

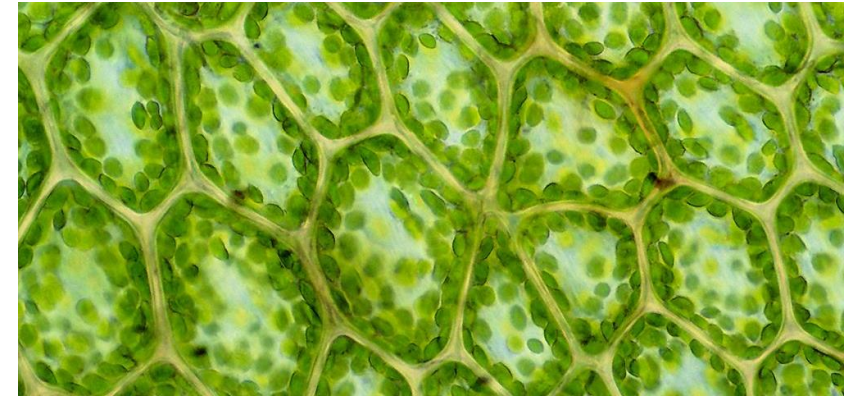
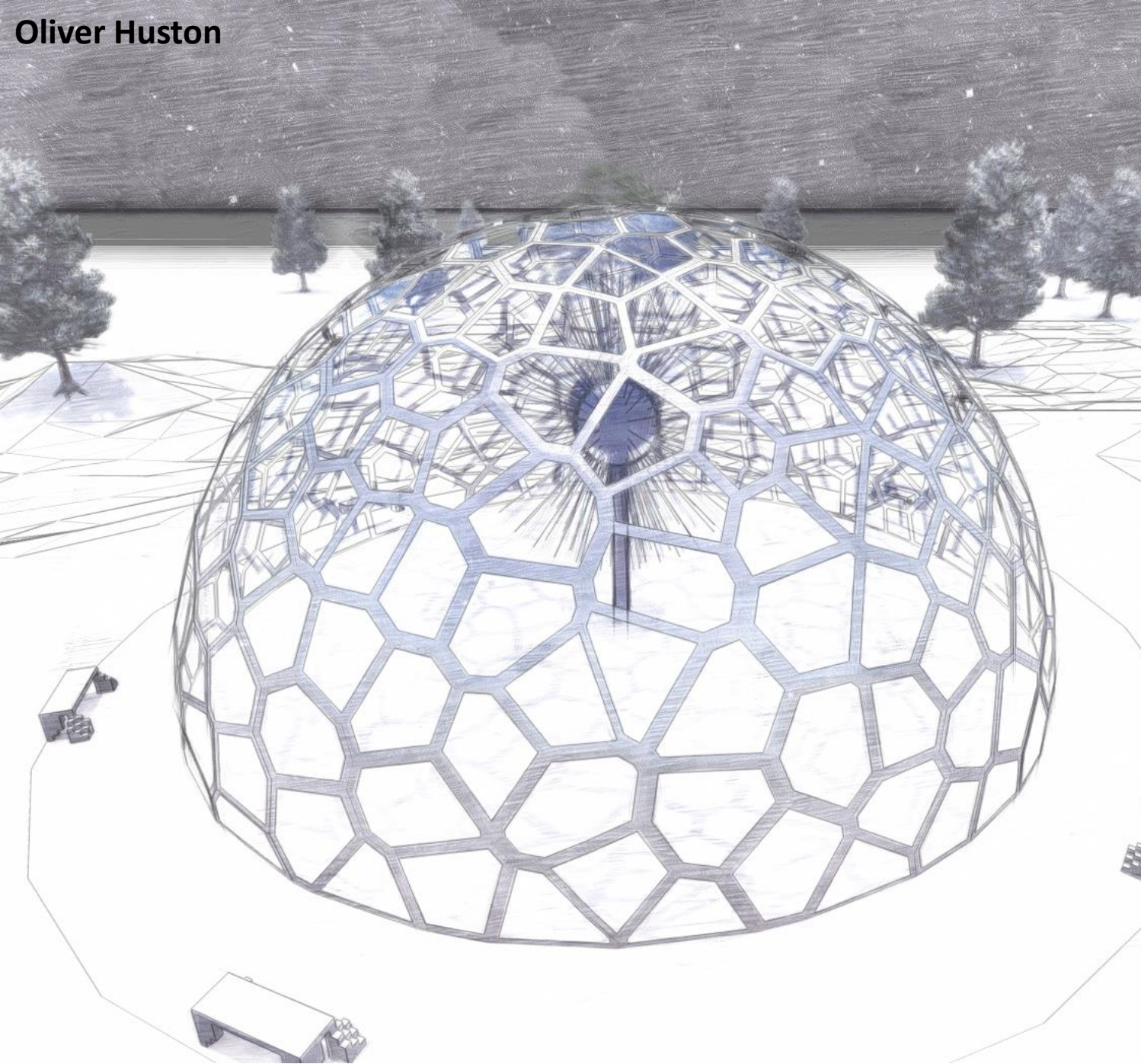




# Loring Park Cell Dome

By Oliver Huston





# Inspiration

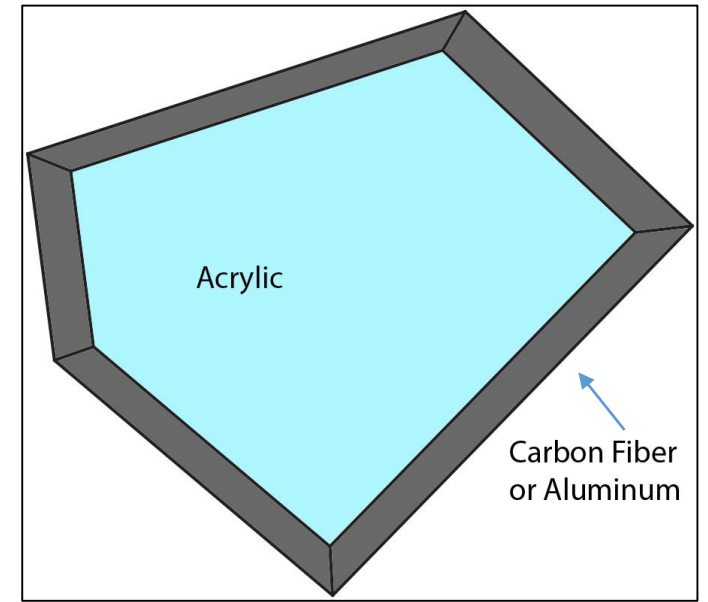
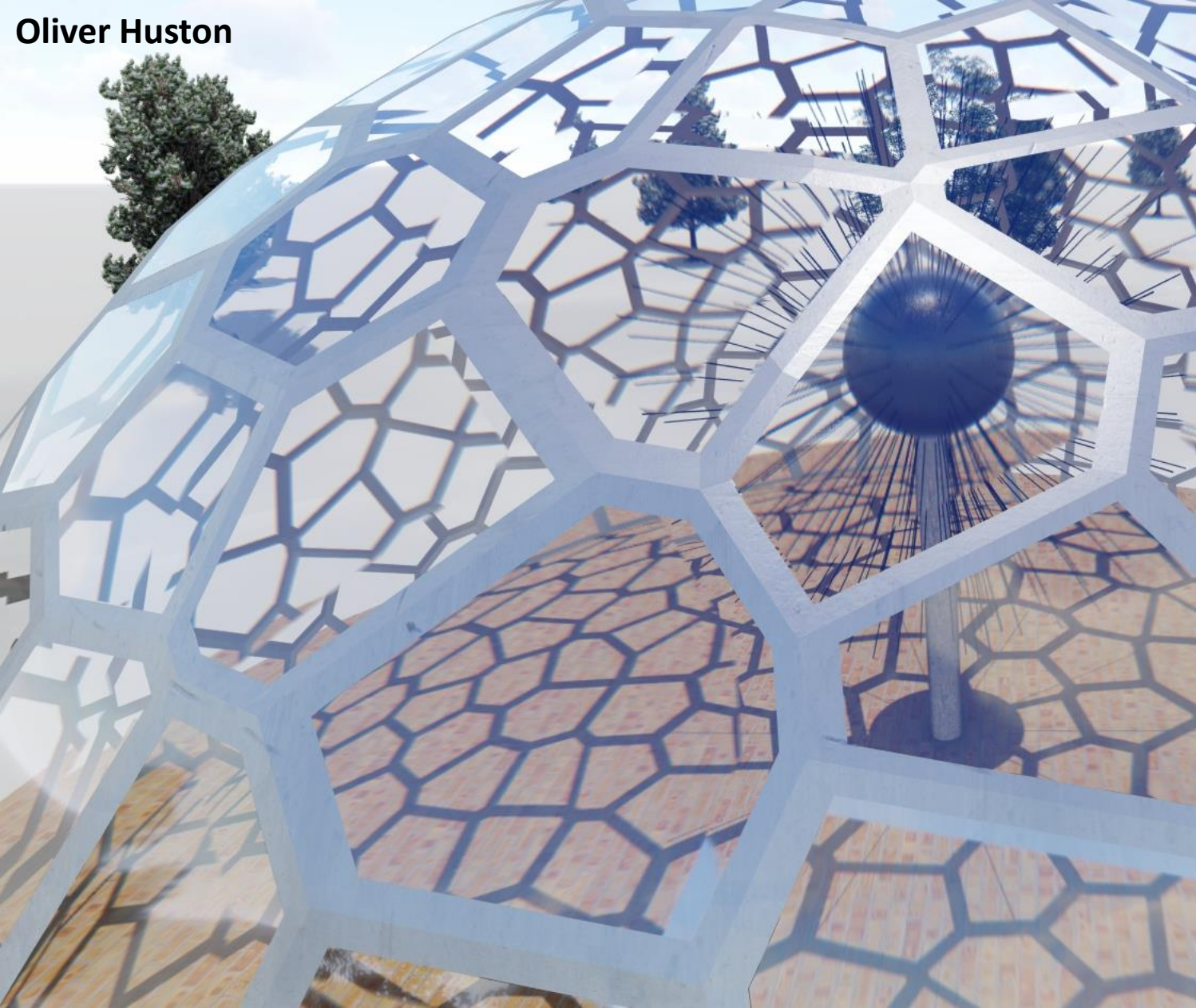
Plant cells





# Special Features

Colored lighting for night.  
Potential for greenhouse effect to keep surface free of snow.

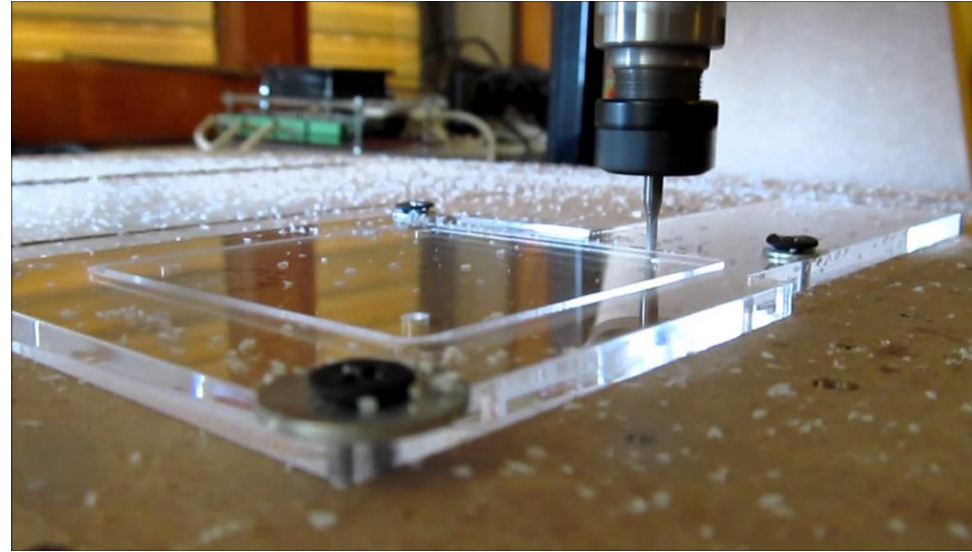
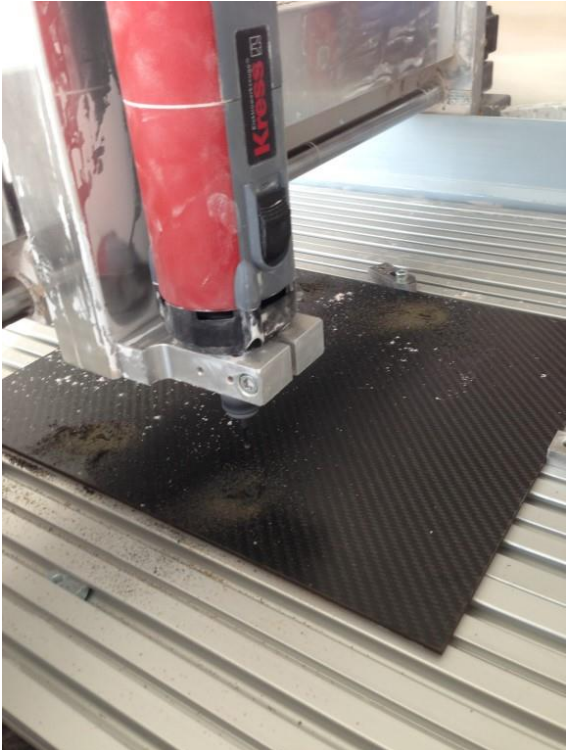
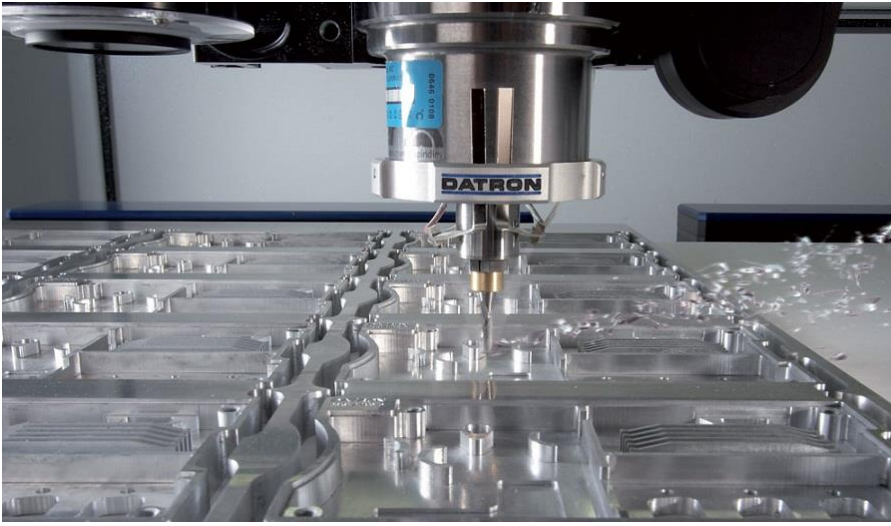


## Structure & Materials

Option 1: Carbon fiber & acrylic panels

Option 2: Recycled aluminum & acrylic panels





# Fabrication

CNC machining or equivalent  
precision fabrication.

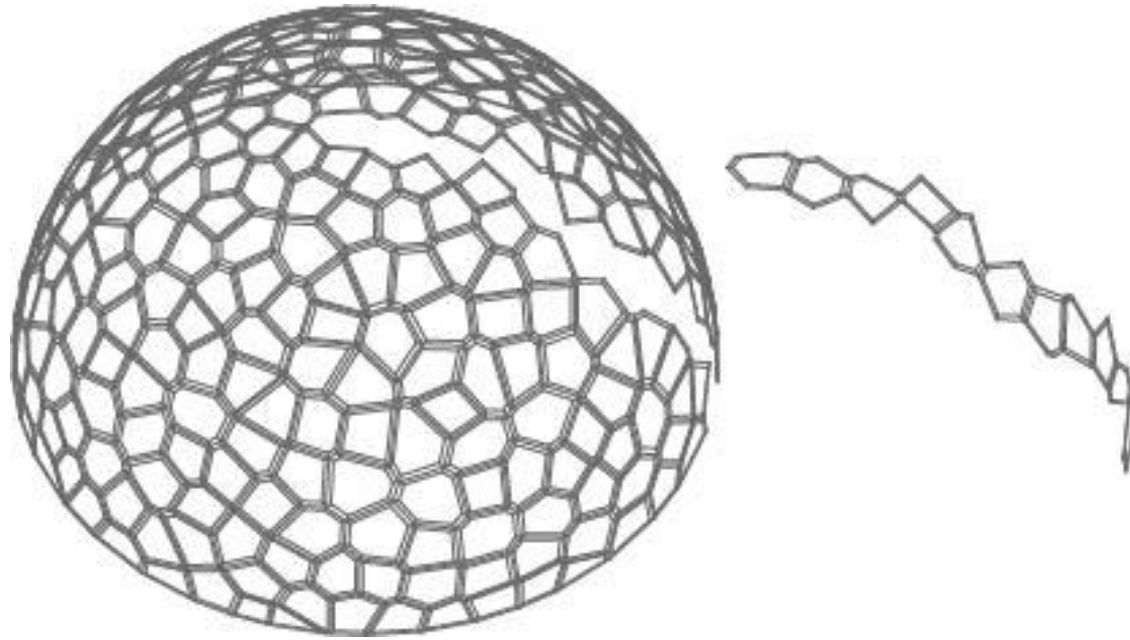




# Mobility

Possibility to be moved via crane to another part of the park during the summer.

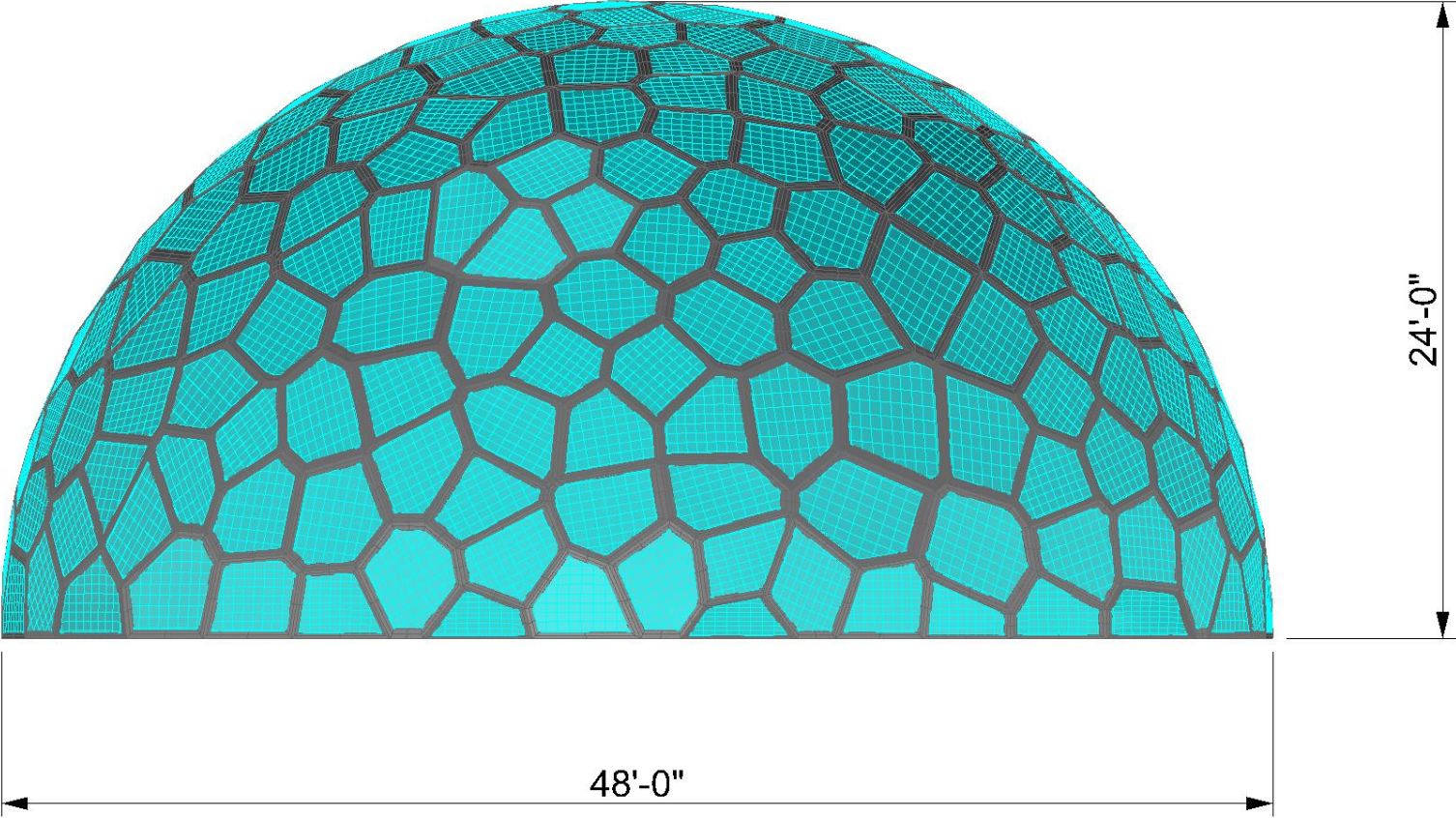




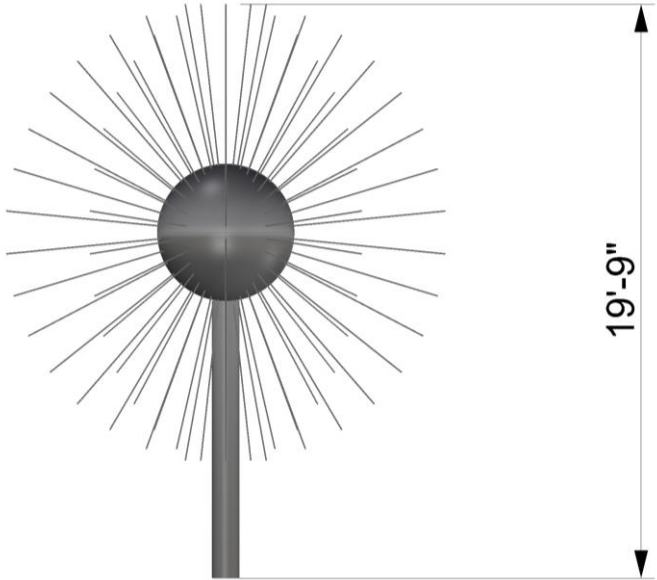
# Portability & Storage

Option 1: Disassembled into sections for storage.

Option 2: Disassembled into individual panels for storage.



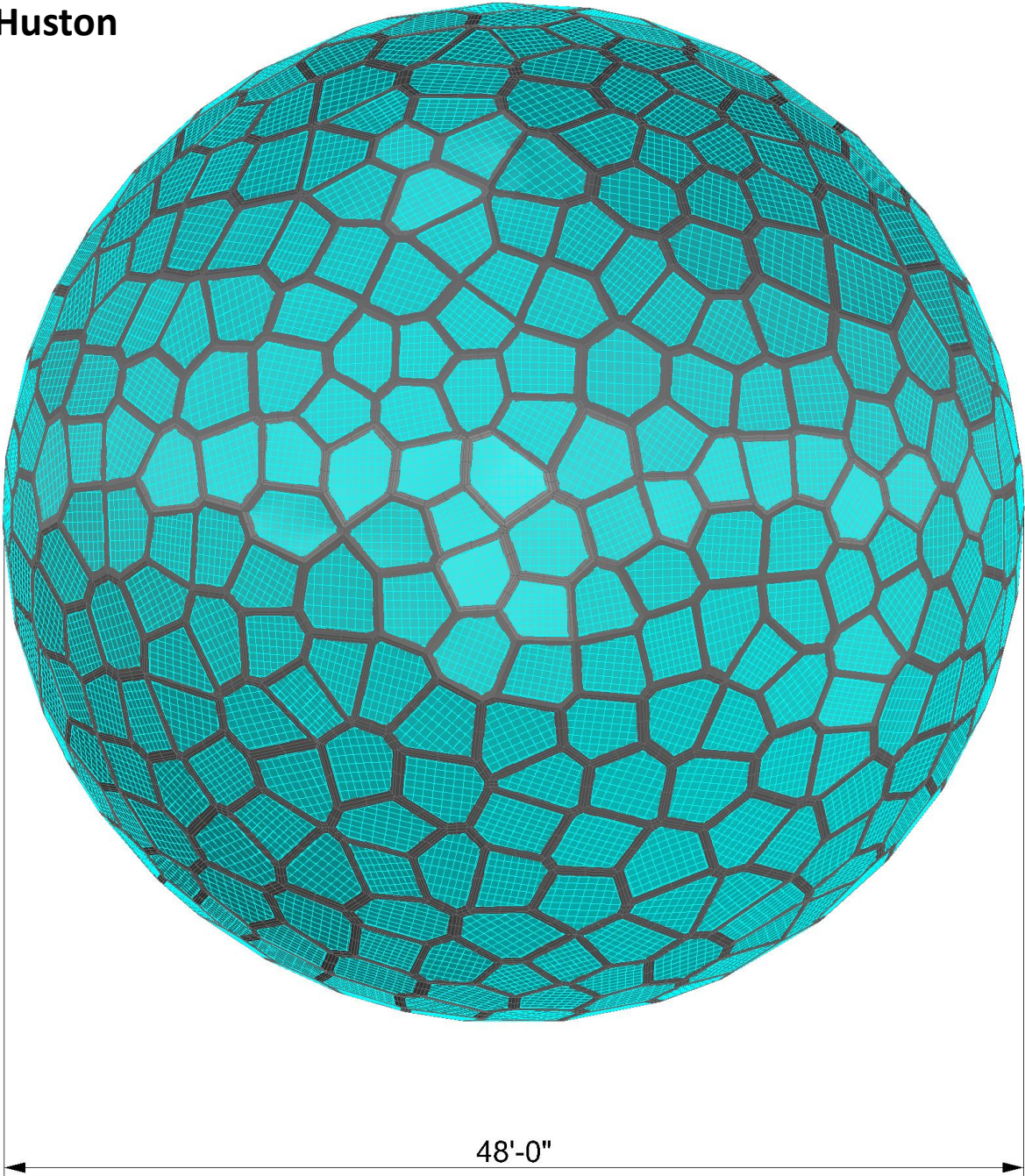
Not to scale



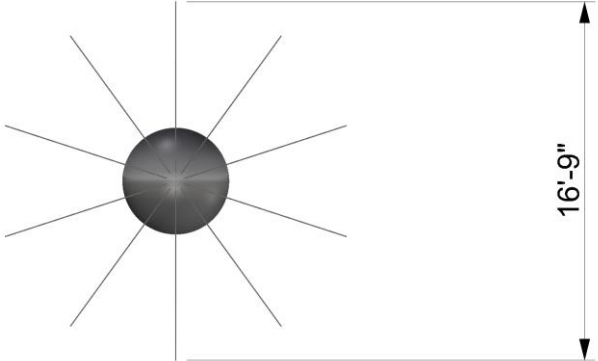
Not to scale

Elevation





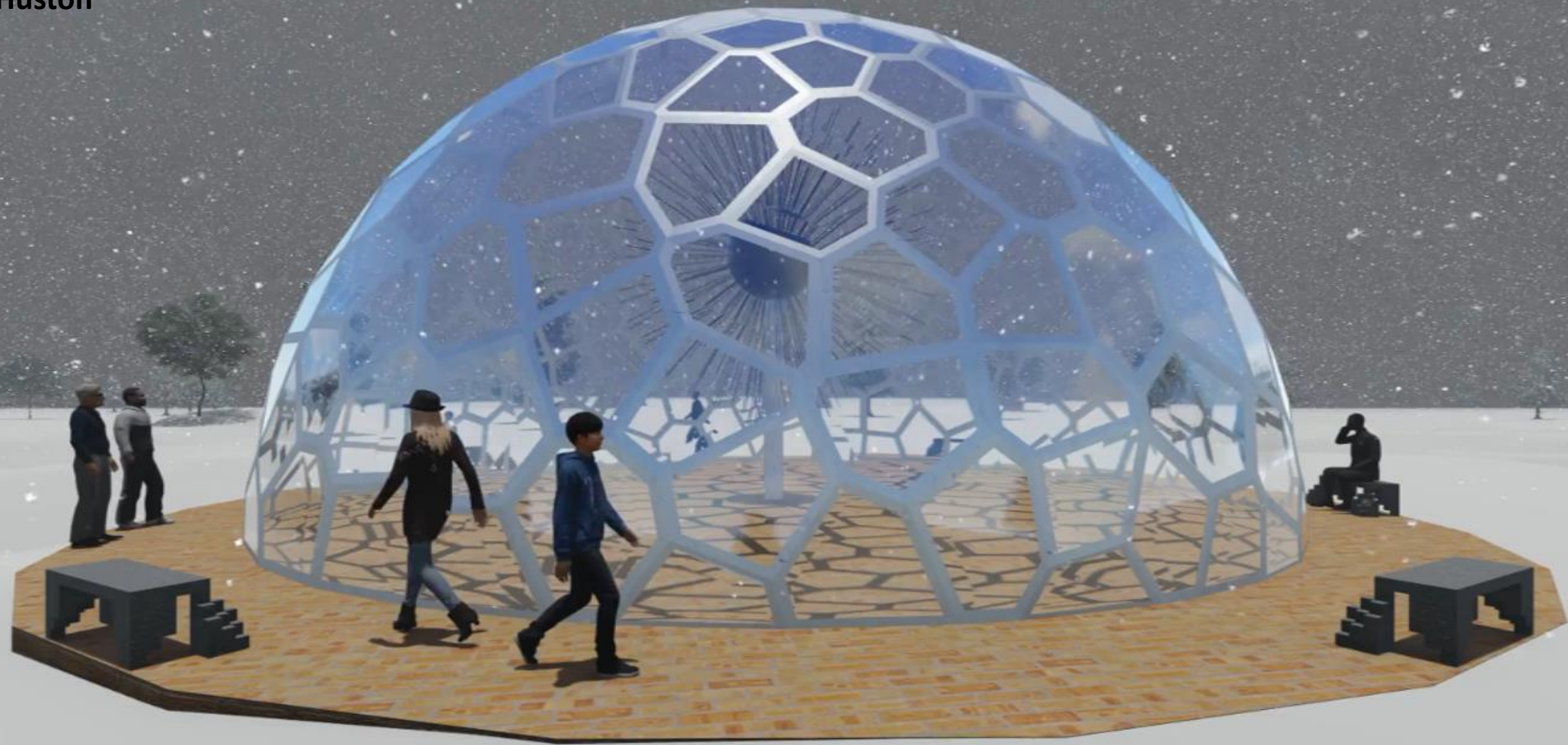
Not to scale



Not to scale

Plan







# Potential Sponsors



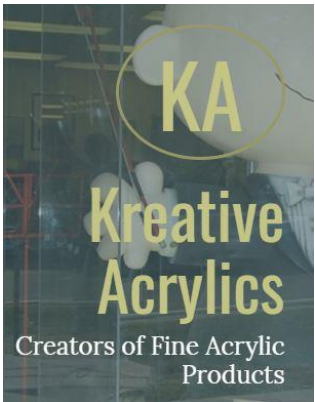
Morrissey Inc

Minnesota precision machining, stamping & complex metal fabrication company.



Clearwater Composite, LLC

Minnesota company that specializes in manufacturing carbon fiber tubes, plates and other parts.



Kreative Acrylics

Minnesota company that specializes in custom acrylic fabrication.



3M Company

3M Company is known for their innovation, manufacturing, & engineering.



Cargill

Cargill specializes in food, agricultural, financial and industrial products.

Reid Schumacher

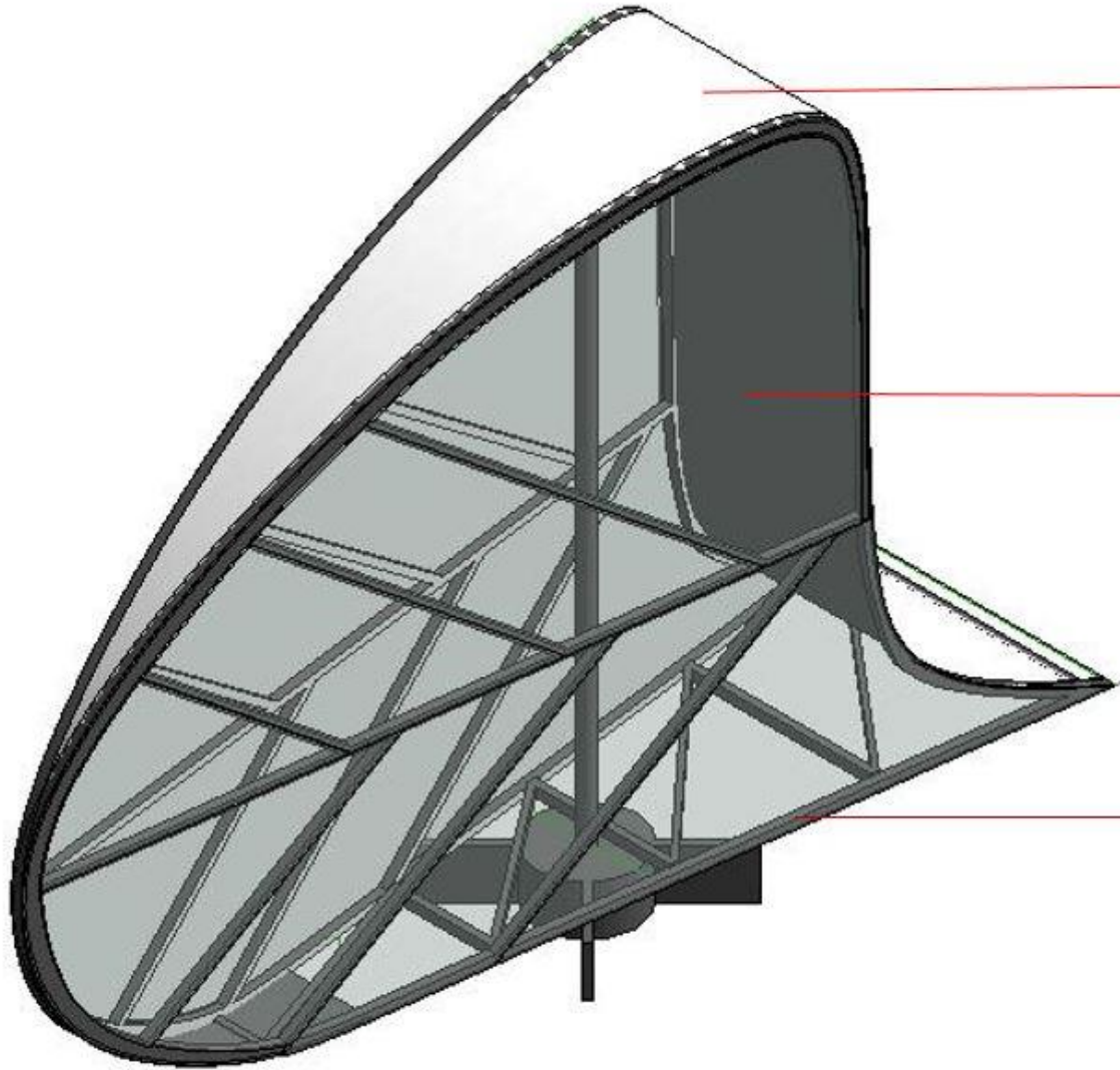
The Ice Sail is constructed based on removal of the dandelion “stems” as currently practiced. This reduces overall structure width resulting in significant cost reduction. Over 230 stems are stored in Community Center basement for cleaning and weather protection.





Reid Schumacher

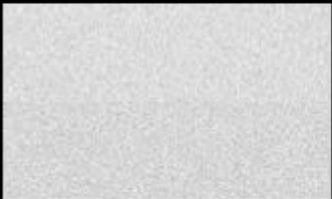




PVC STRIP FOR THE ROOF



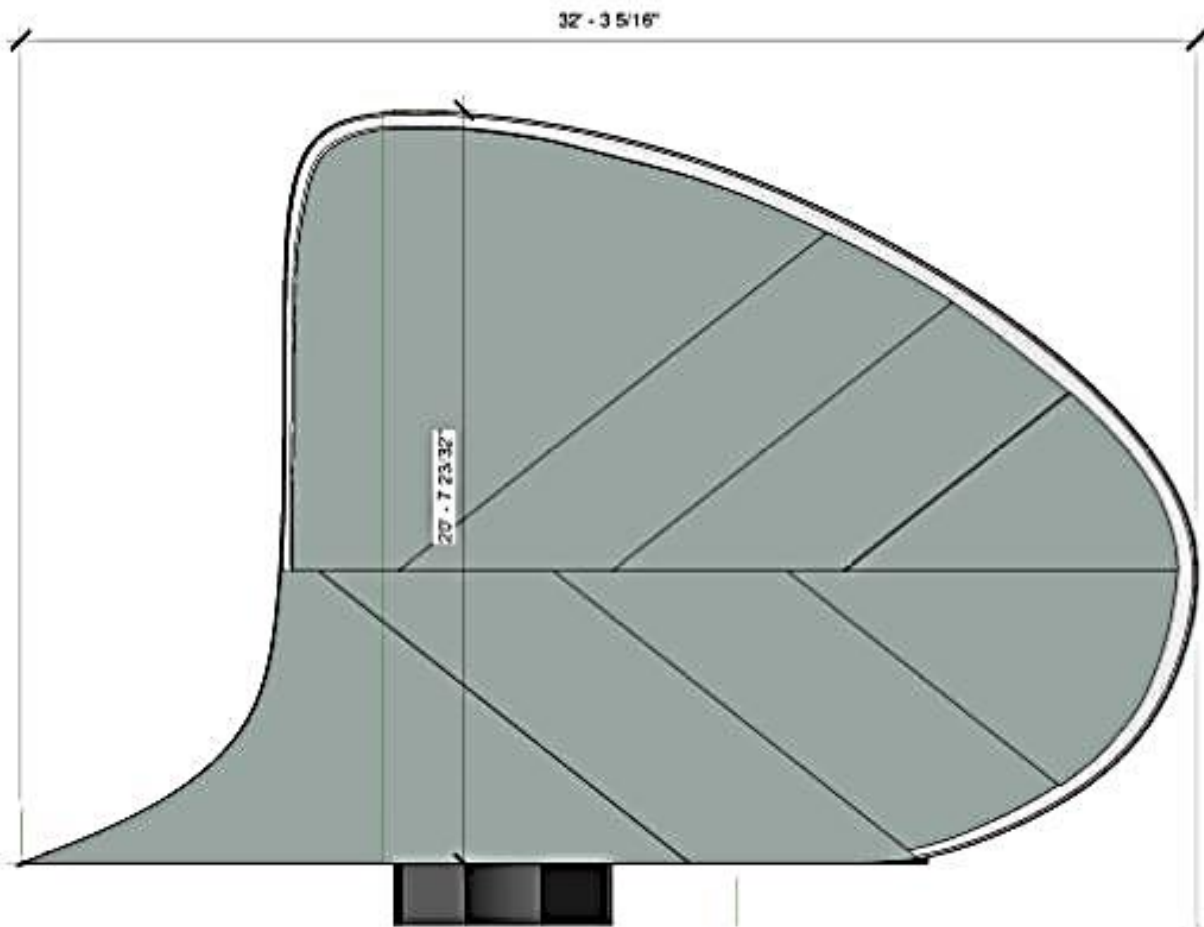
POLYCARBONATE



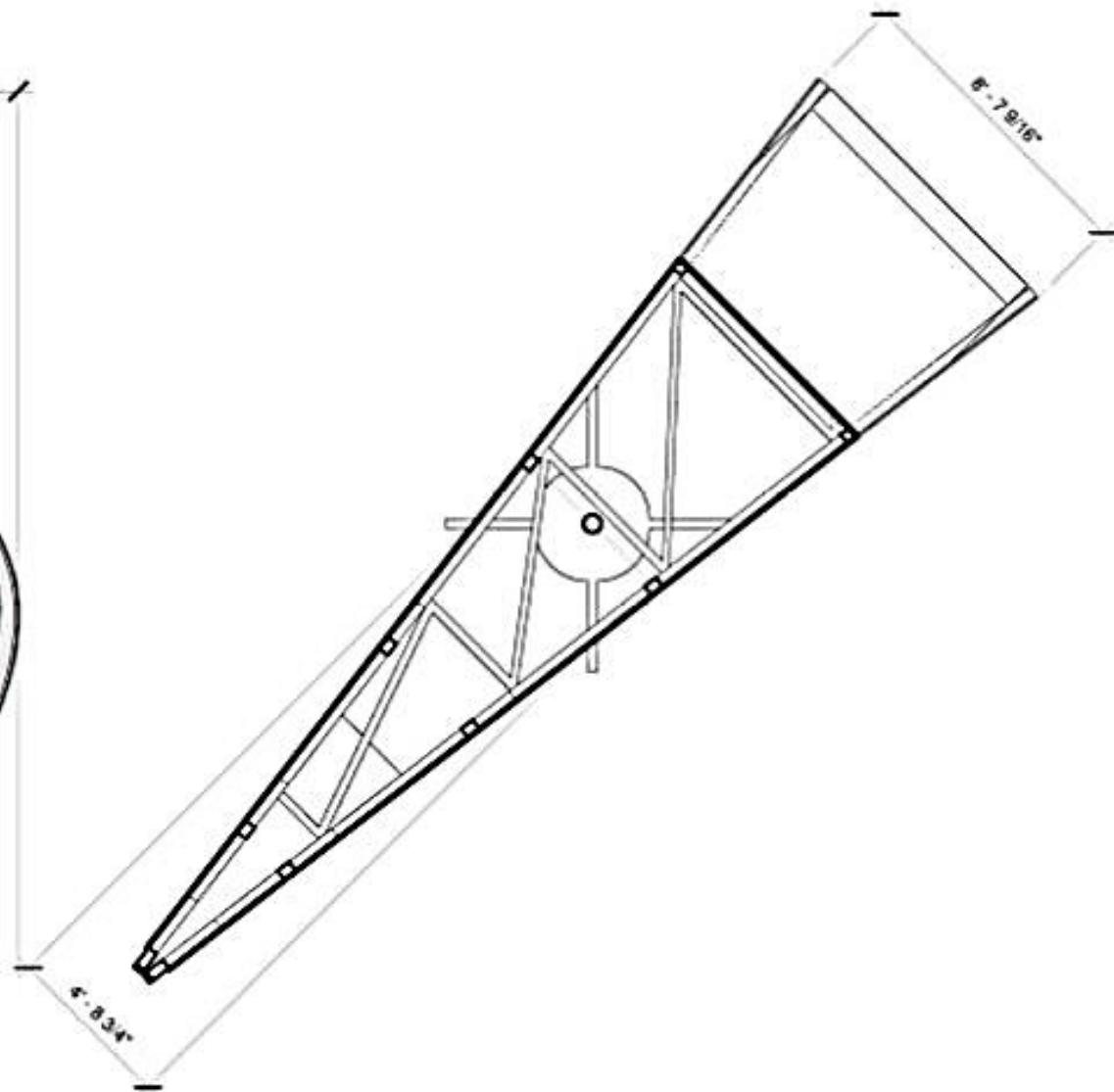
Aluminum Fabricated trusses  
That are assembled with push  
Pins. Think Tent assembly





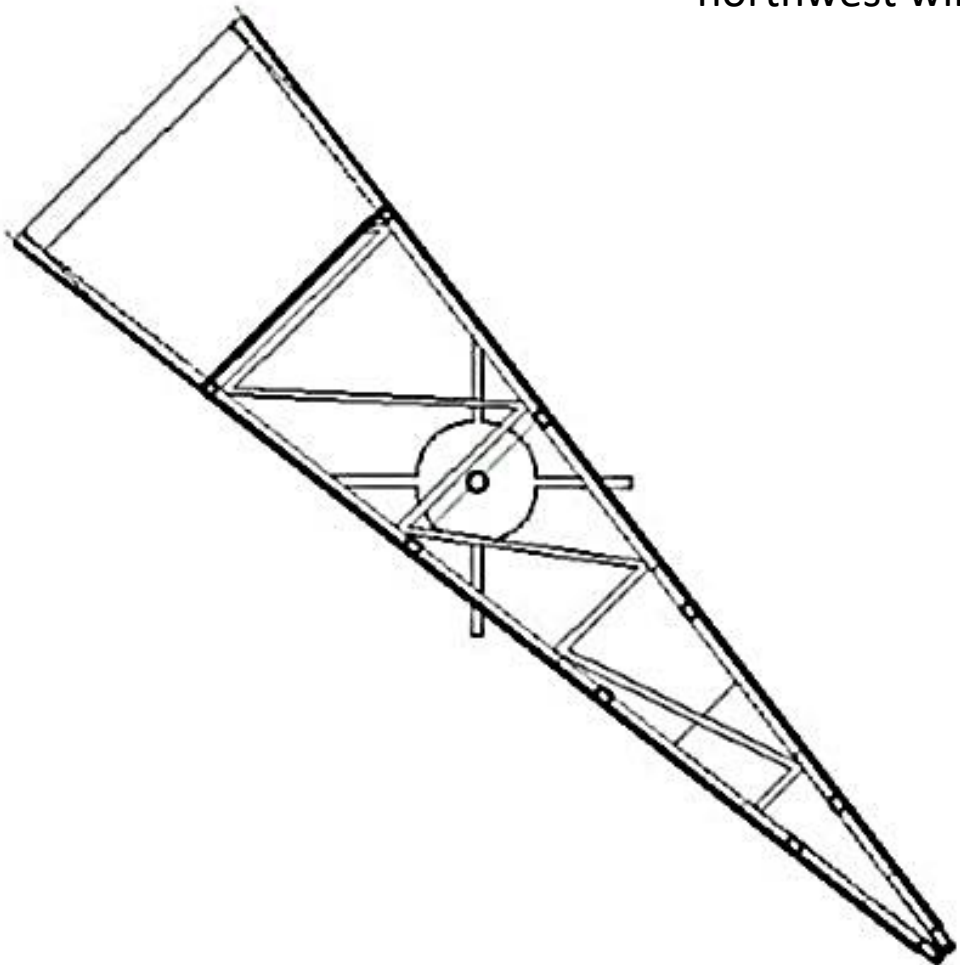


① Section 1  
1/4" = 1'-0"

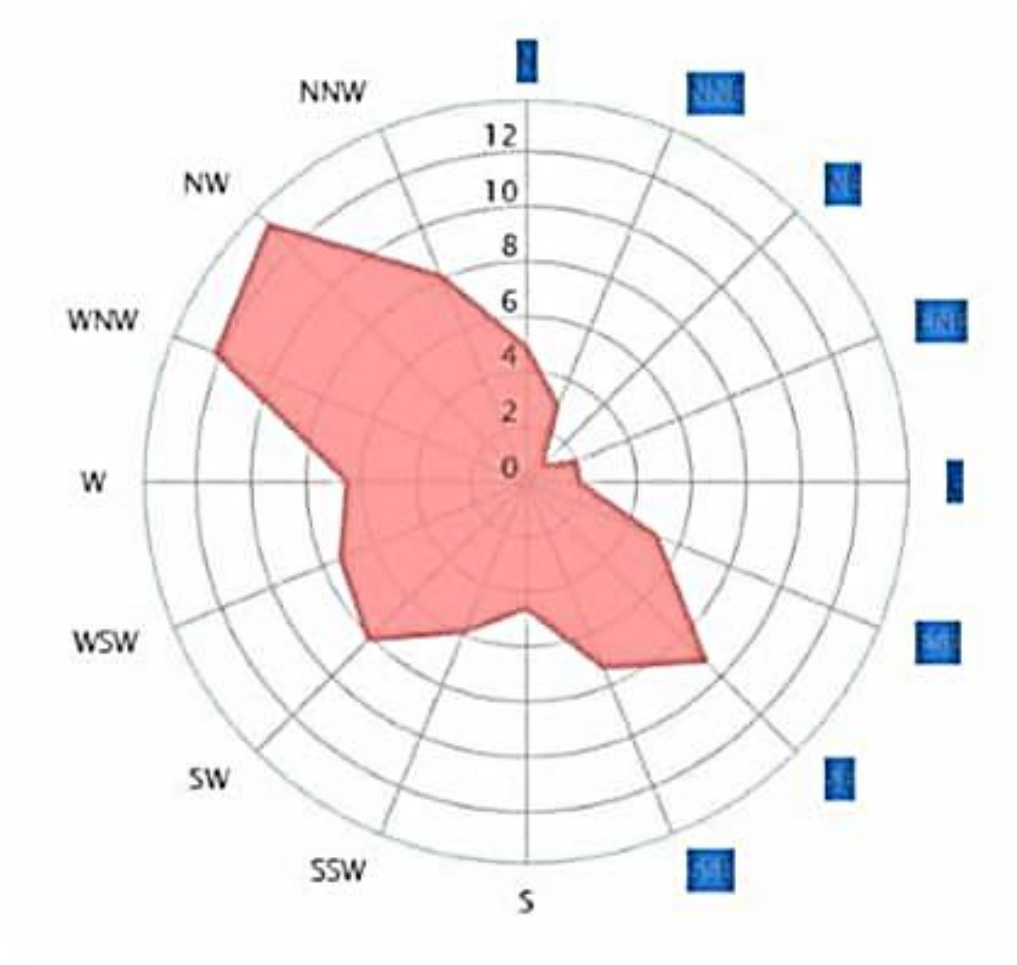


② Level 8  
1/4" = 1'-0"

Ice Sail shape is directed to funnel severe northwest winds



① Level 8 Copy 1  
1/4" = 1'-0"



Wind direction and volume



Base is constructed  
around existing  
fountain lights



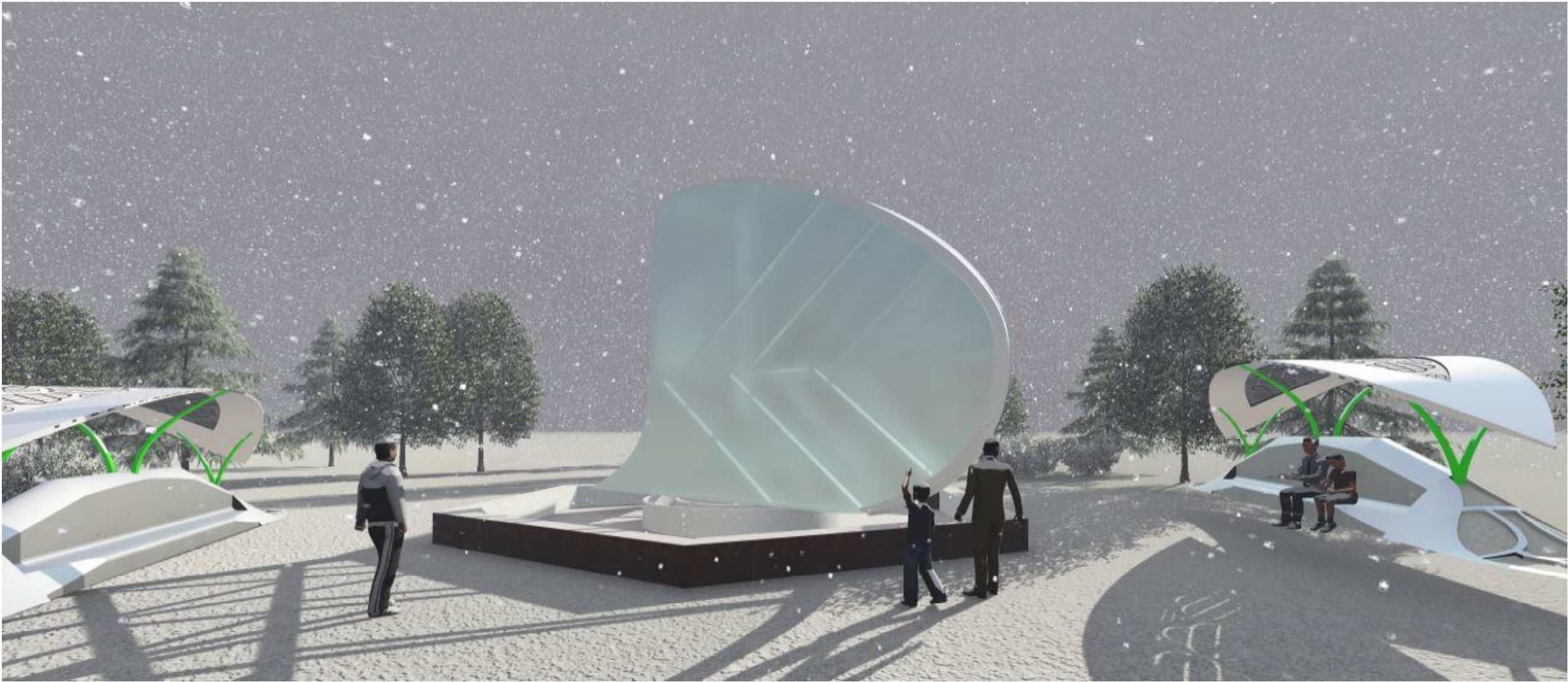
Space for lights

Center is used as a bin  
For the sandbags

This Part is also used for  
Sandbag storage

## WEIGHT

- 1 Square foot of polycarbonate will be .78 pounds
- One side of polycarbonate will only be 499 pounds
- Each Façade is divided into 8 polycarbonate panels to mitigate the weight
- Each panel will weigh 64 pounds.

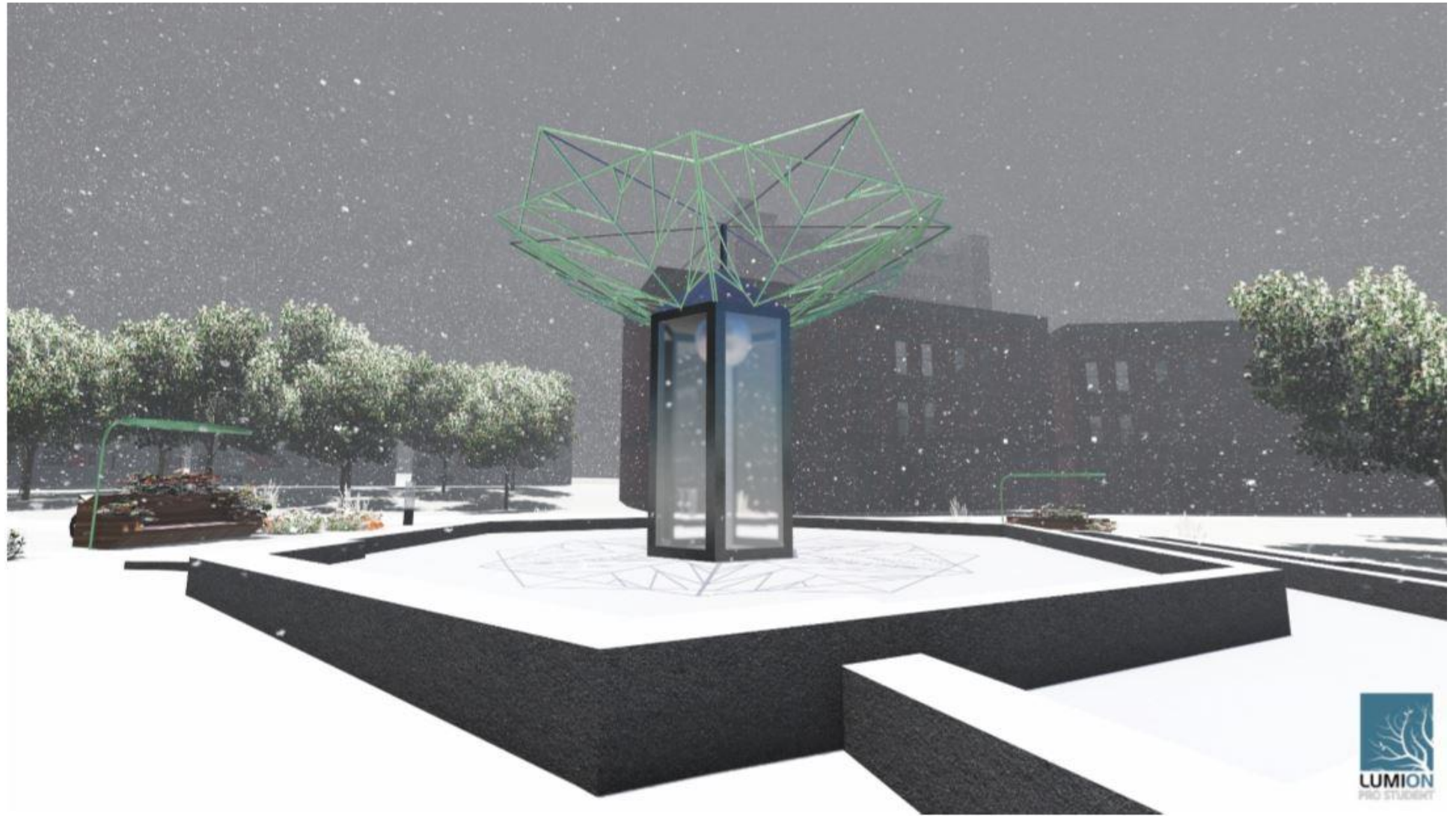




# Berger Fountain Enclosure

## *“Snow Flake Tree of Loring Park”*

The Snow Flake tree enclosure is reduced in size and cost by removing dandelion “stems”





# Design Factors

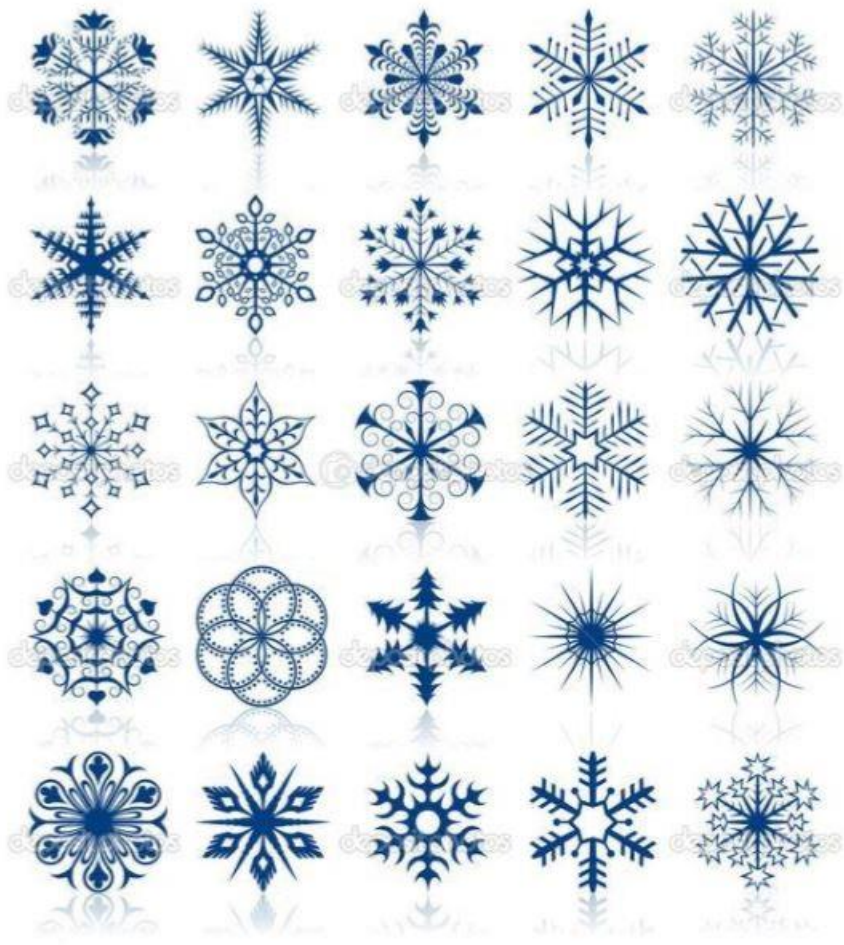
- Enclosure built without stems installed into fountain
- Smaller scale enclosure to reduce cost in materials and labor installation
- Durable and Lightweight material with modular assembly
- Tree form with a snowflake shape
  - Inspired by surrounding landscape and winter season
- Fountain is visible during winter season
- Ease of assembly to allow relocation of enclosure to another area of the park during off peak seasons as additional art sculpture
- 3-4 day assembly time
- 3-4 man team with use of lift and ladders



# Precedent



Super Tree in Singapore

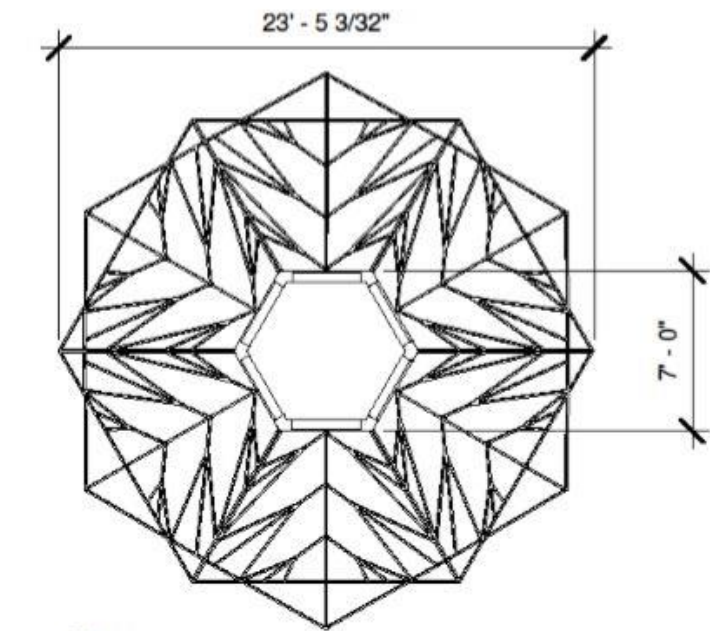


Snow Flakes

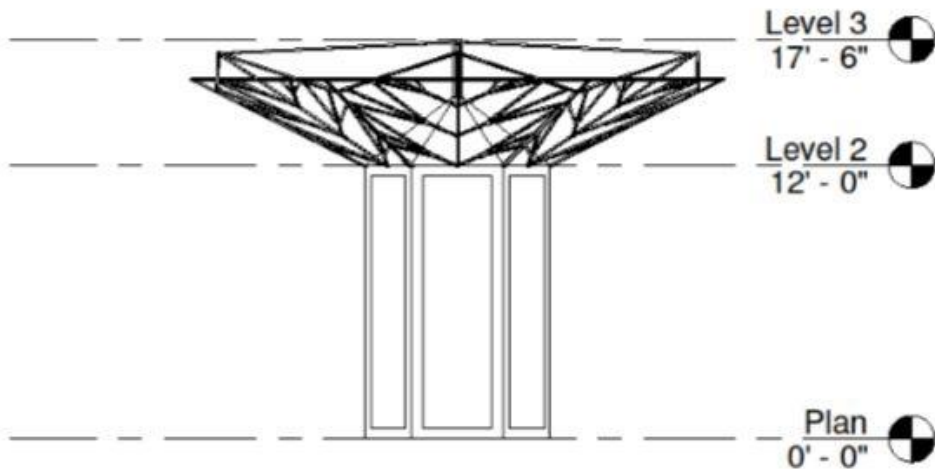


Tree of Life in Milan, Italy

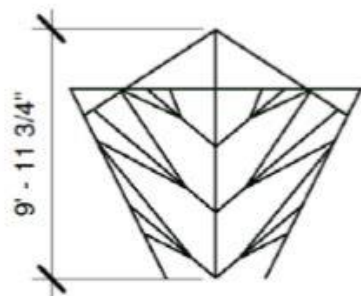
# Measurements



① Plan  
1/8" = 1'-0"



① North Elevation  
1/8" = 1'-0"



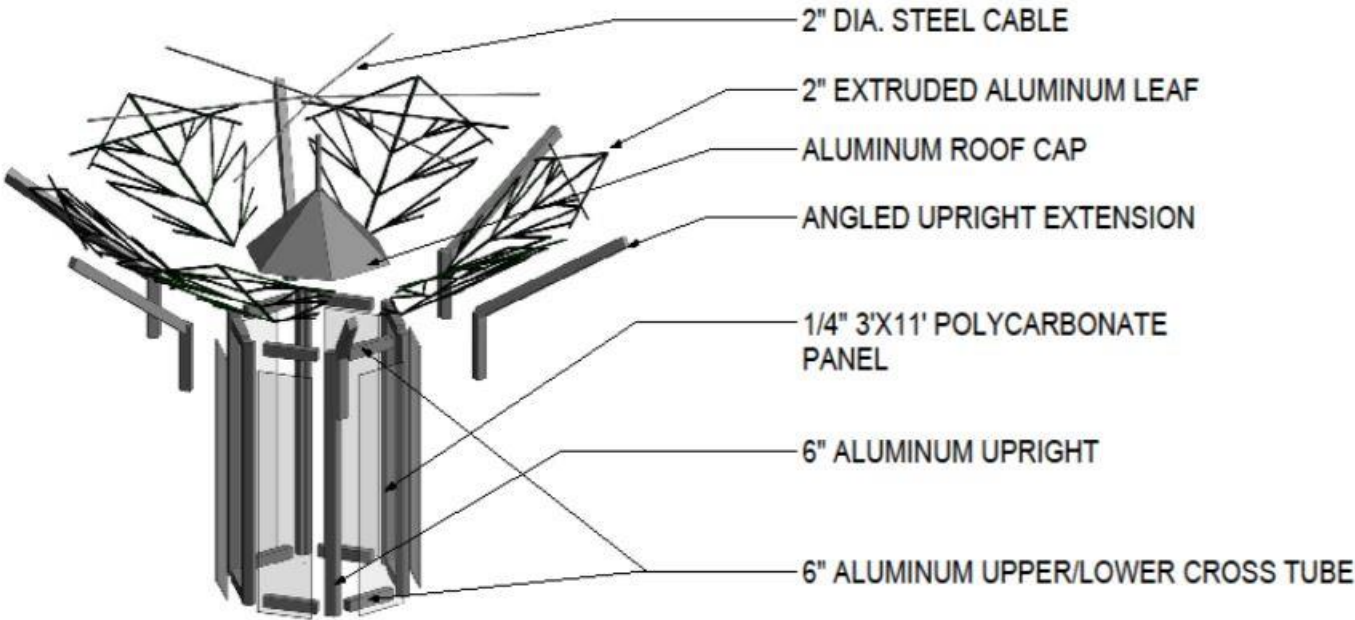
① Aluminum Leaf  
1/8" = 1'-0"



# Assembly

## Installation Instructions

1. Stand one aluminum upright post
2. Install one horizontal upper/lower cross tube into side key hole slots on aluminum upright
3. Insert polycarbonate panel into top and bottom flanges on upper and lower cross tube (Insert panel horizontally)
4. Stand second upright and insert top and bottom cross tube into side key hole slots
5. Repeat steps 1-4 for remaining upright post and polycarbonate panels
6. Set structure base assembly to final site location (base assembly should be centered around fountain, dimension in field prior to anchoring to slab)
7. Using 3/8" drill bit, drill into slab 2 3/4" deep into all predrill holes in aluminum upright base plates (clean out holes of debris)
8. Insert into predrill hole 3/8" expansion anchor bolt and tap down, fasten with nut
9. Repeat steps for all upright posts
10. Insert angled upright extension through upright tube post from top, bolted into upright post (ensure angled extension is fully flush to post)
11. Install roof top housing through tabs bolted into upper cross tube
12. 2" extruded aluminum leaf bolted into angular uprights and connected to center post of roof housing with 2" steel cables



General Note: Assembly to be installed clockwise

# Materials

- Aluminum Structure – 1,558 lb, \$10,000-\$15,000
  - 2” extruded aluminum leaf structure Finish: Green semi gloss
  - 6” vertical upright post with key hole system (6)  
Finish: Black Semi Gloss
  - 6” Black upper/lower cross tube (12)  
Finish: Black Semi Gloss
- 1/4” Makrolon GP-V Pebble Poly carbonate panels (6) - 158lb, \$15,000-\$20,000
- 2” Steel cables (6)
- 3/8”(dia.) x 3 3/4” (Length) Expansion Anchor Bolt (24)
- 4000 K LED Lights

Makrolon GP-V Pebble Poly carbonate panels



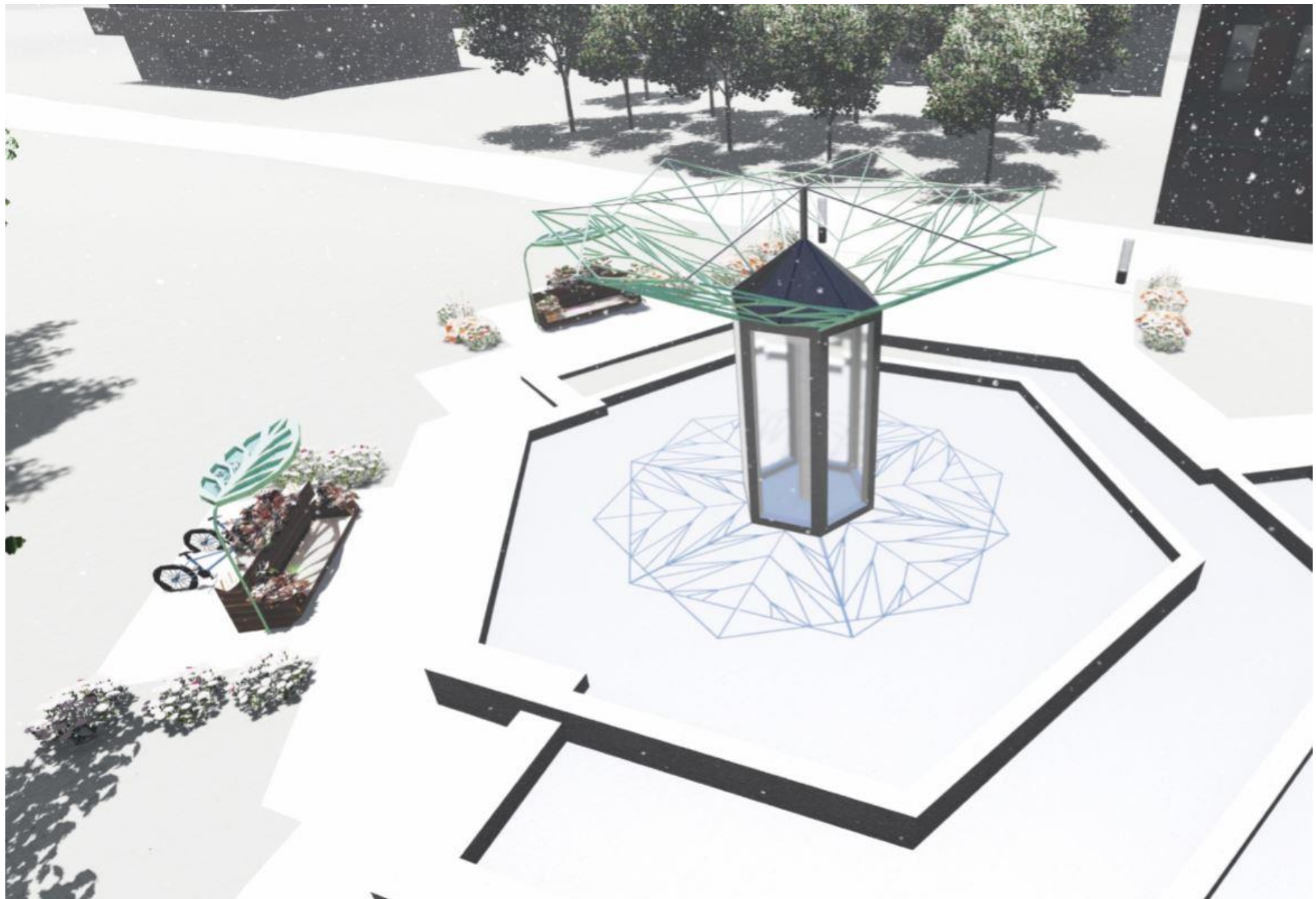
Expansion Anchor Bolt



Key Hole System





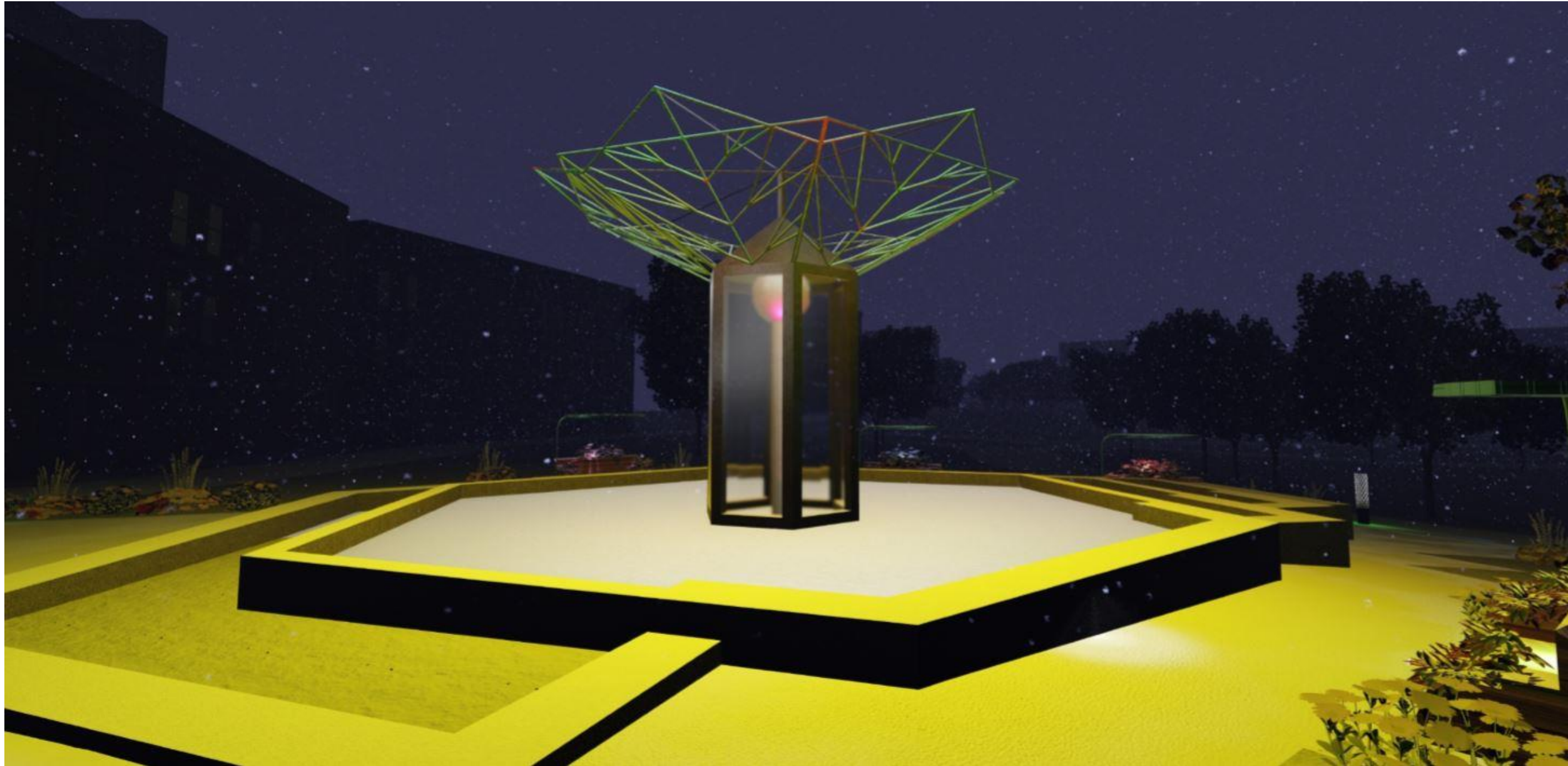






Crispin Vang







Erik Hall and Ted Tuggle

“fountain wind trail” is a kinetic enclosure with thin fins or “feathers” that move lightly with the wind

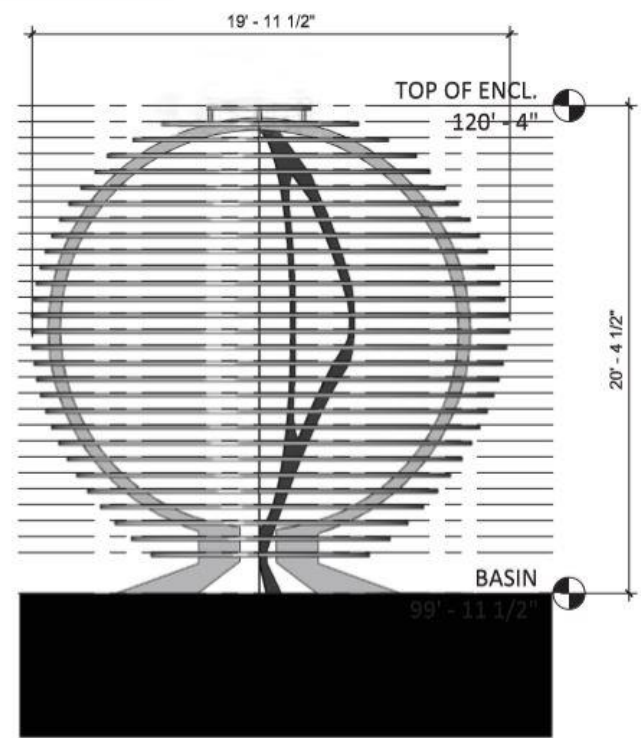
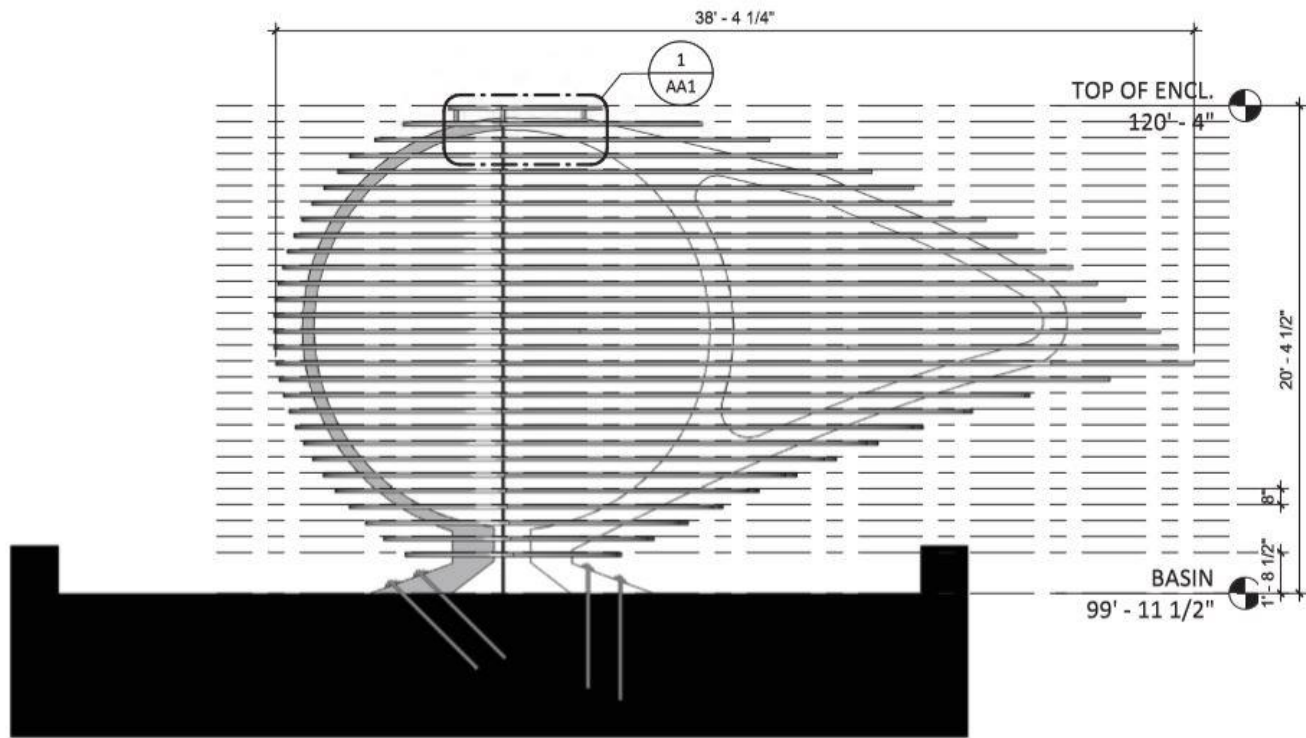
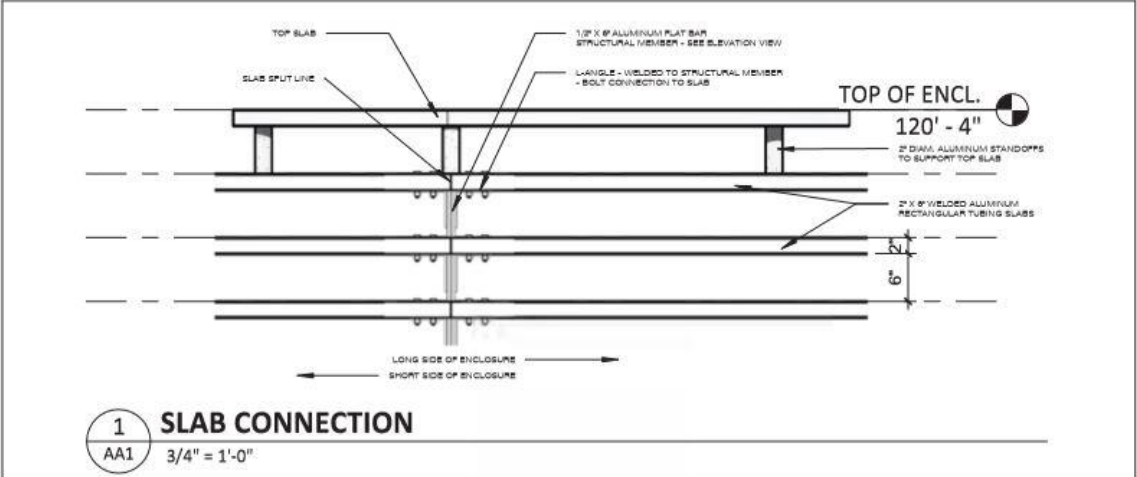
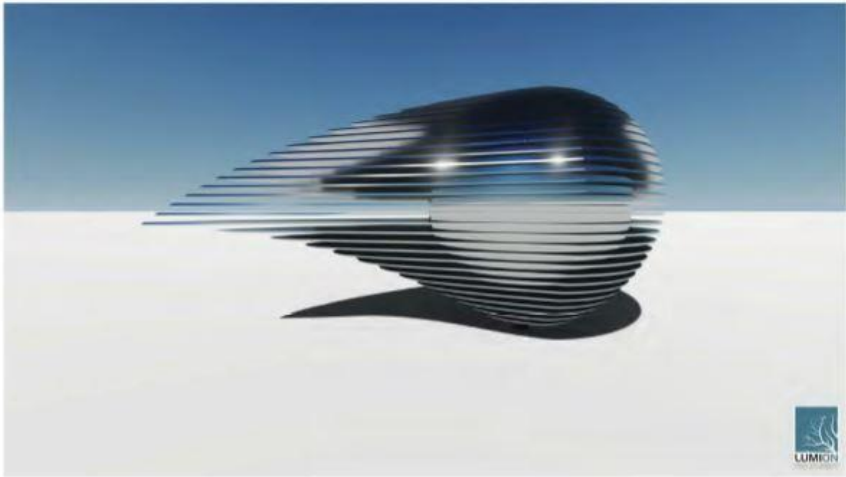




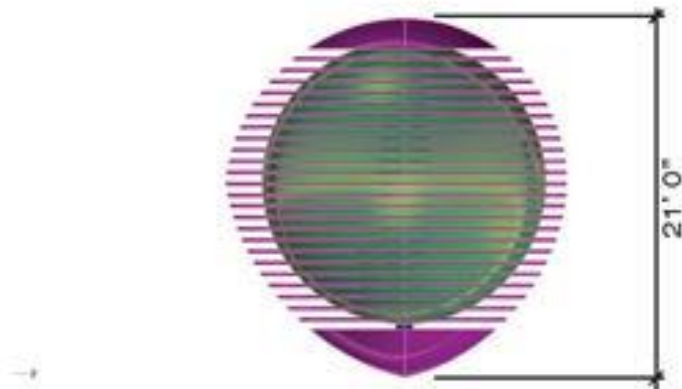
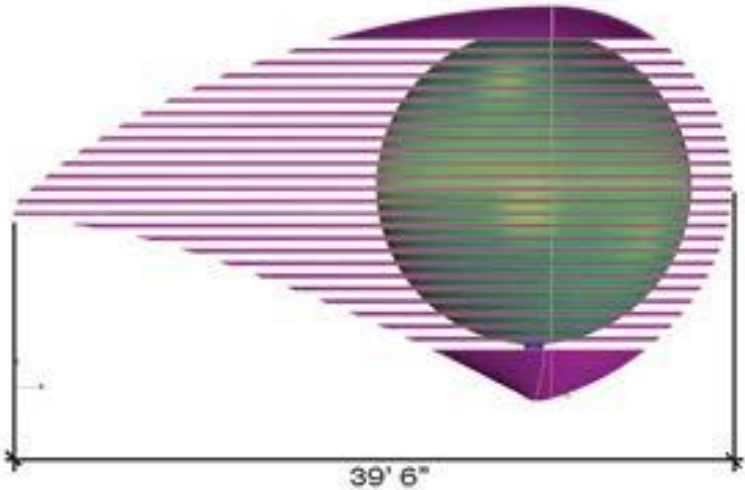
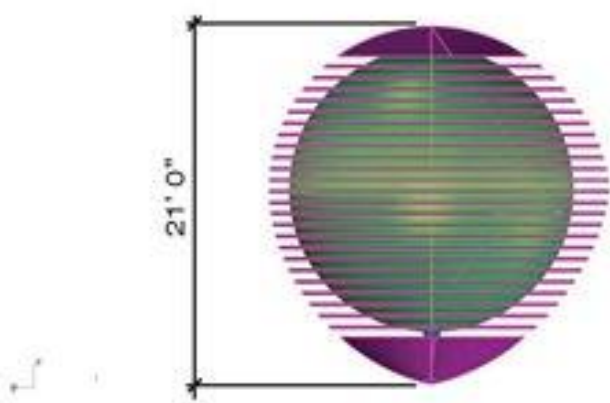
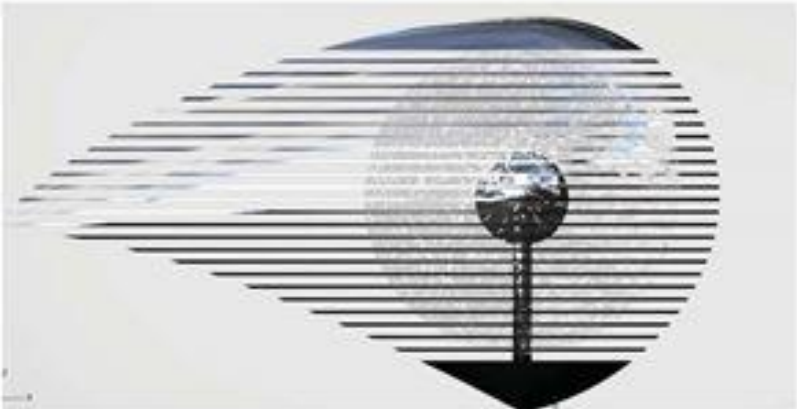
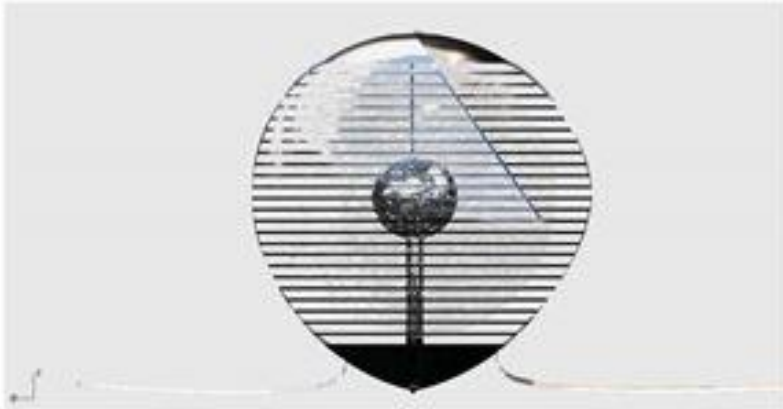




Erik Hall and Ted Tuggle

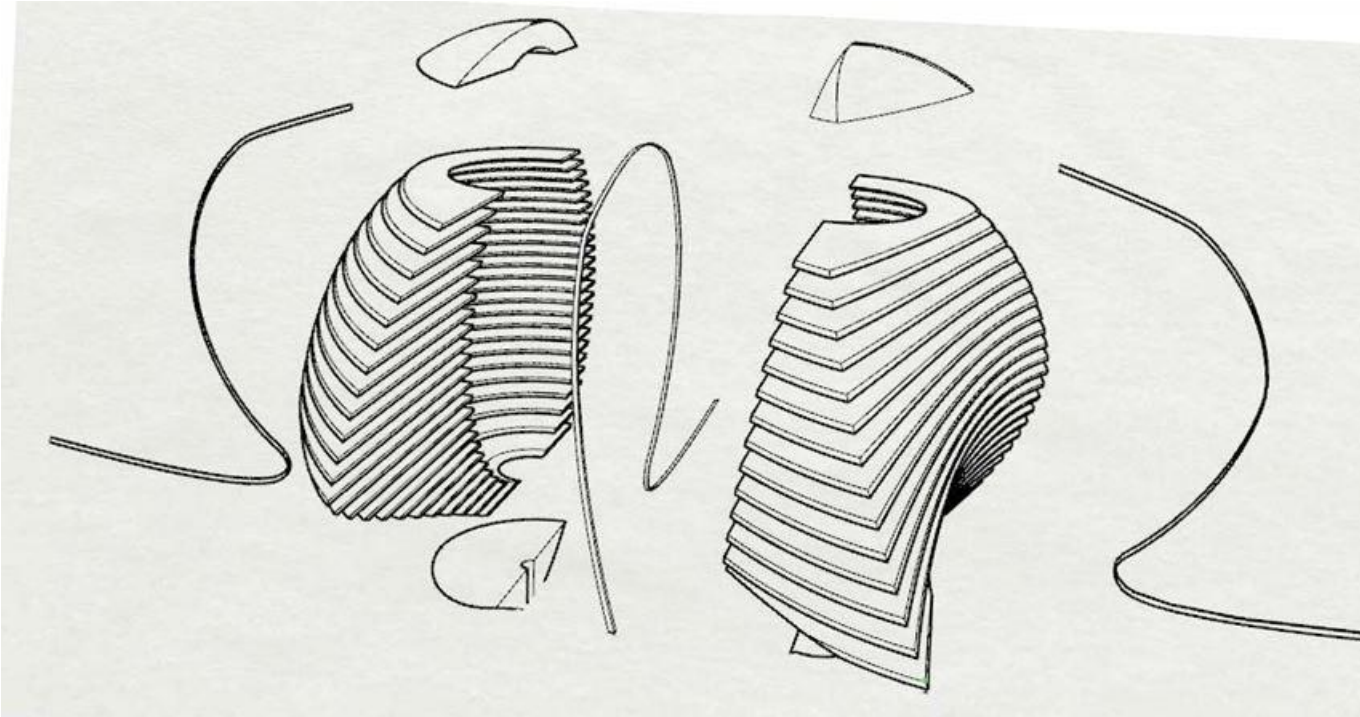
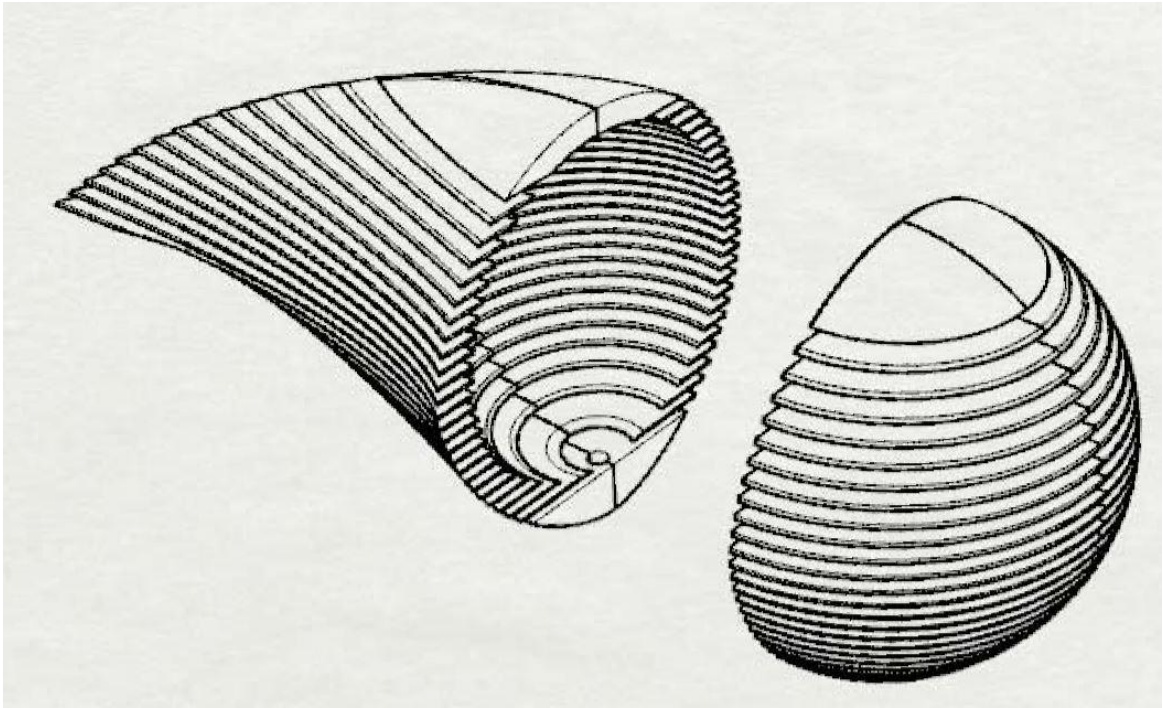


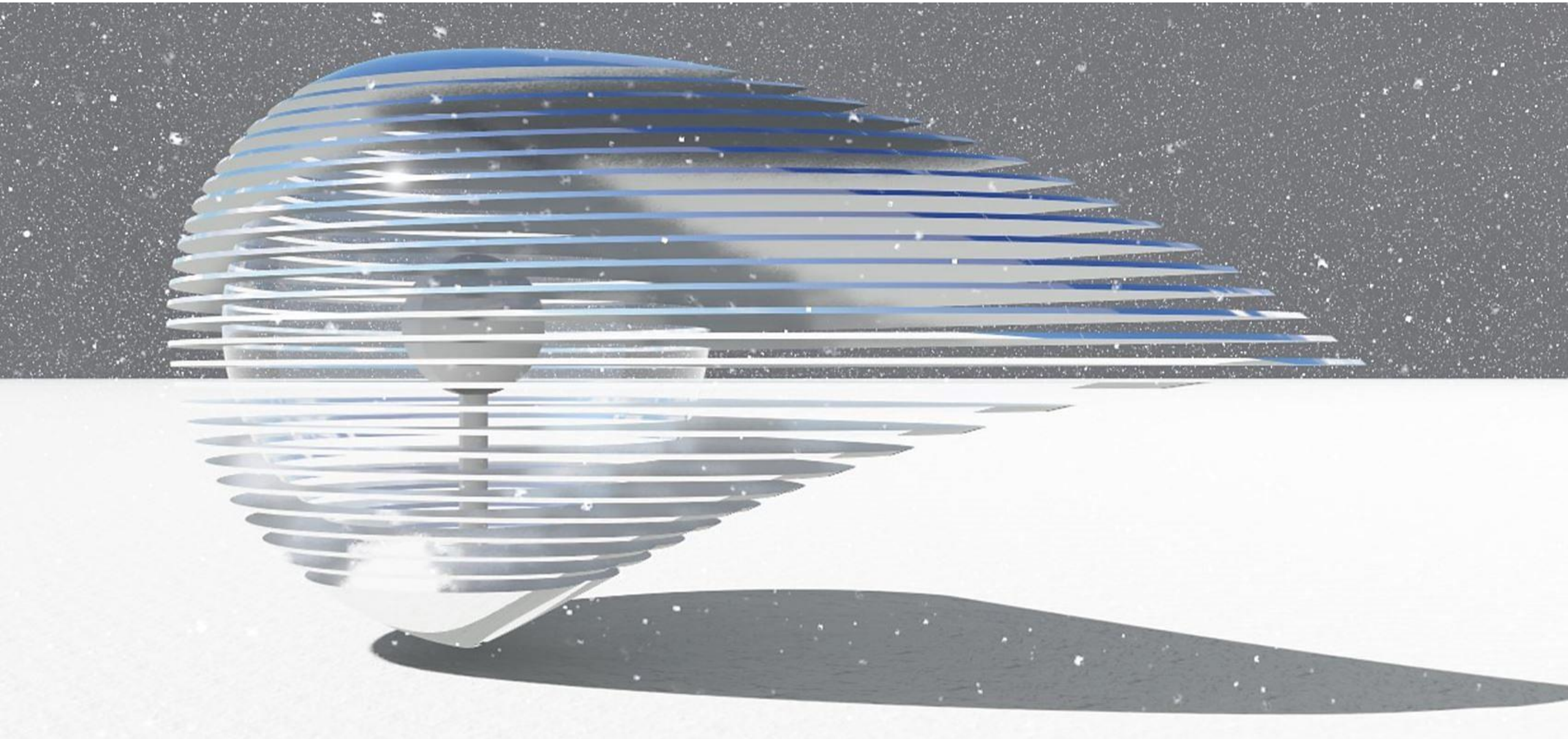
Erik Hall and Ted Tuggle





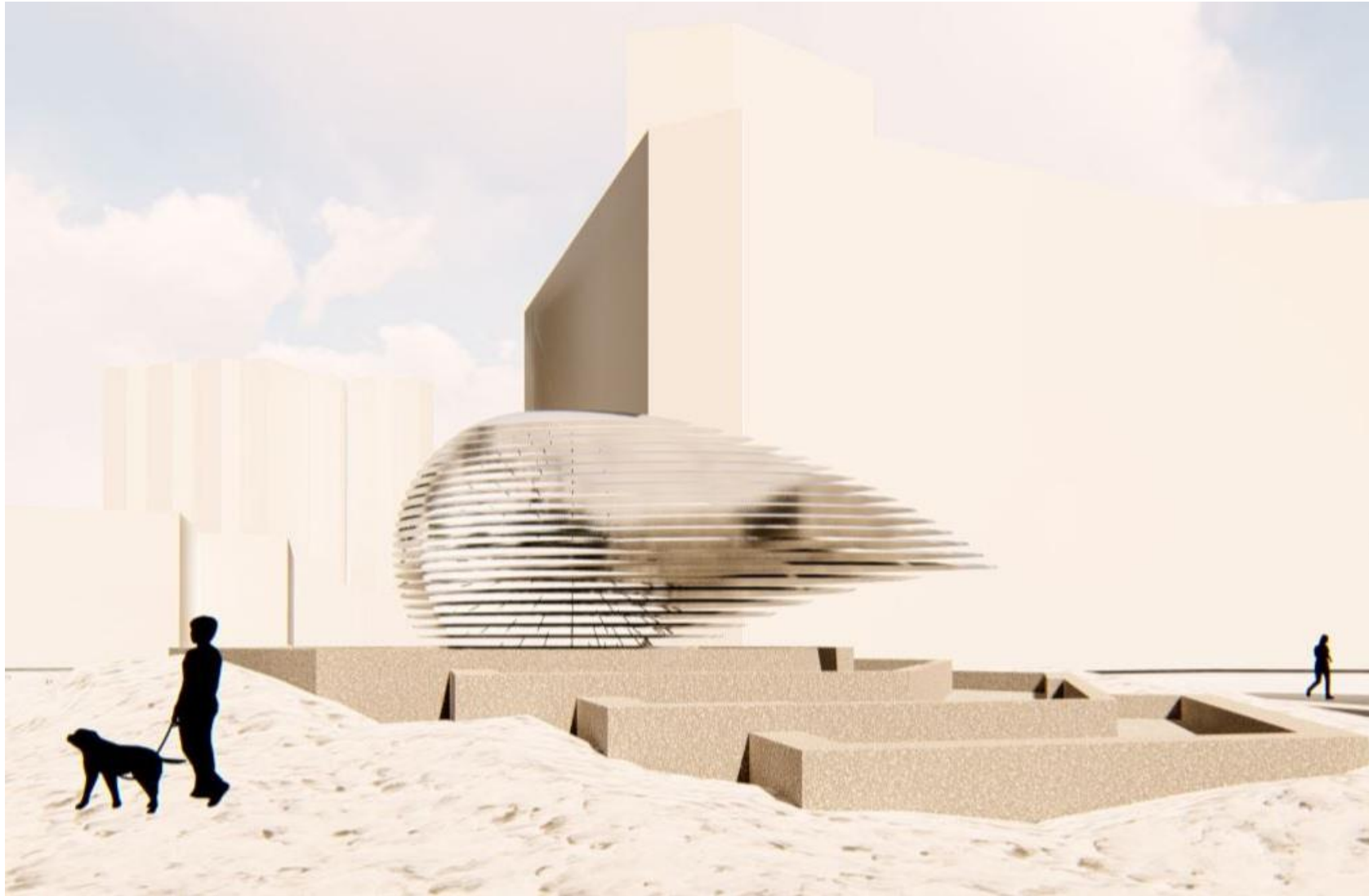
Erik Hall and Ted Tuggle



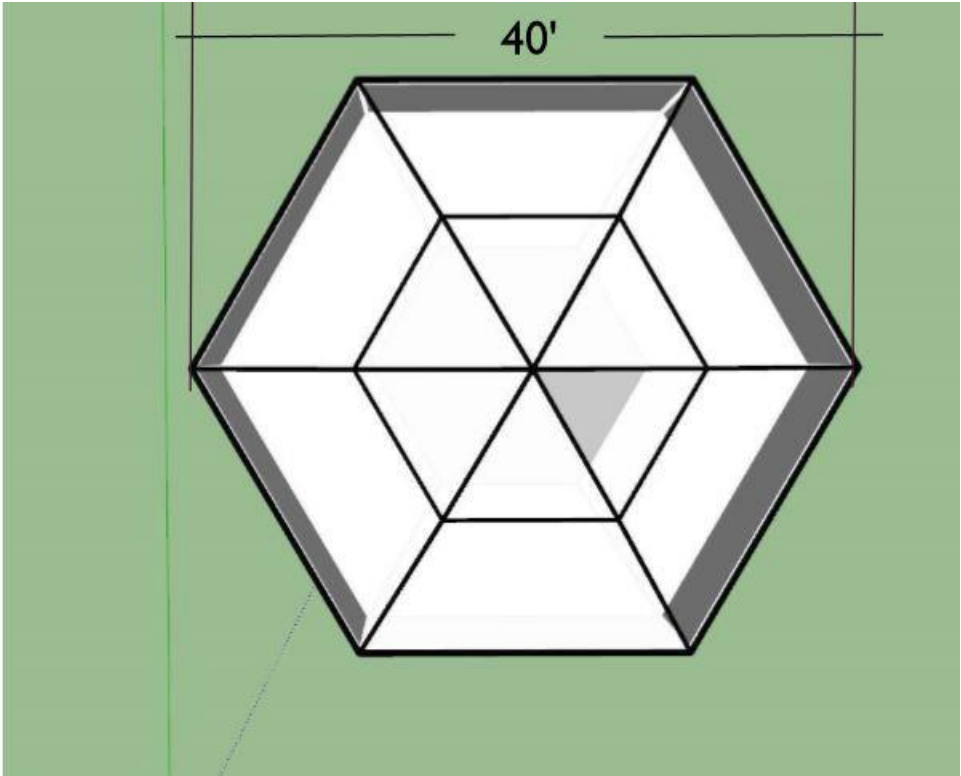
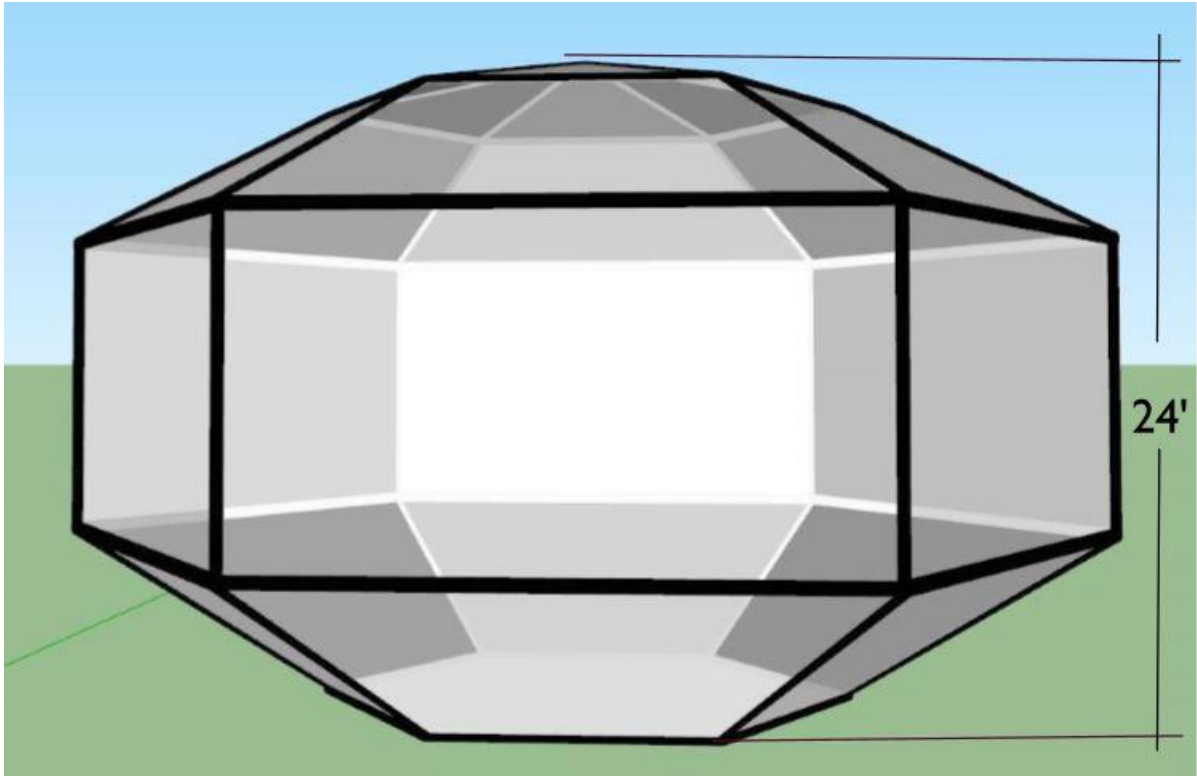




Erik Hall and Ted Tuggle



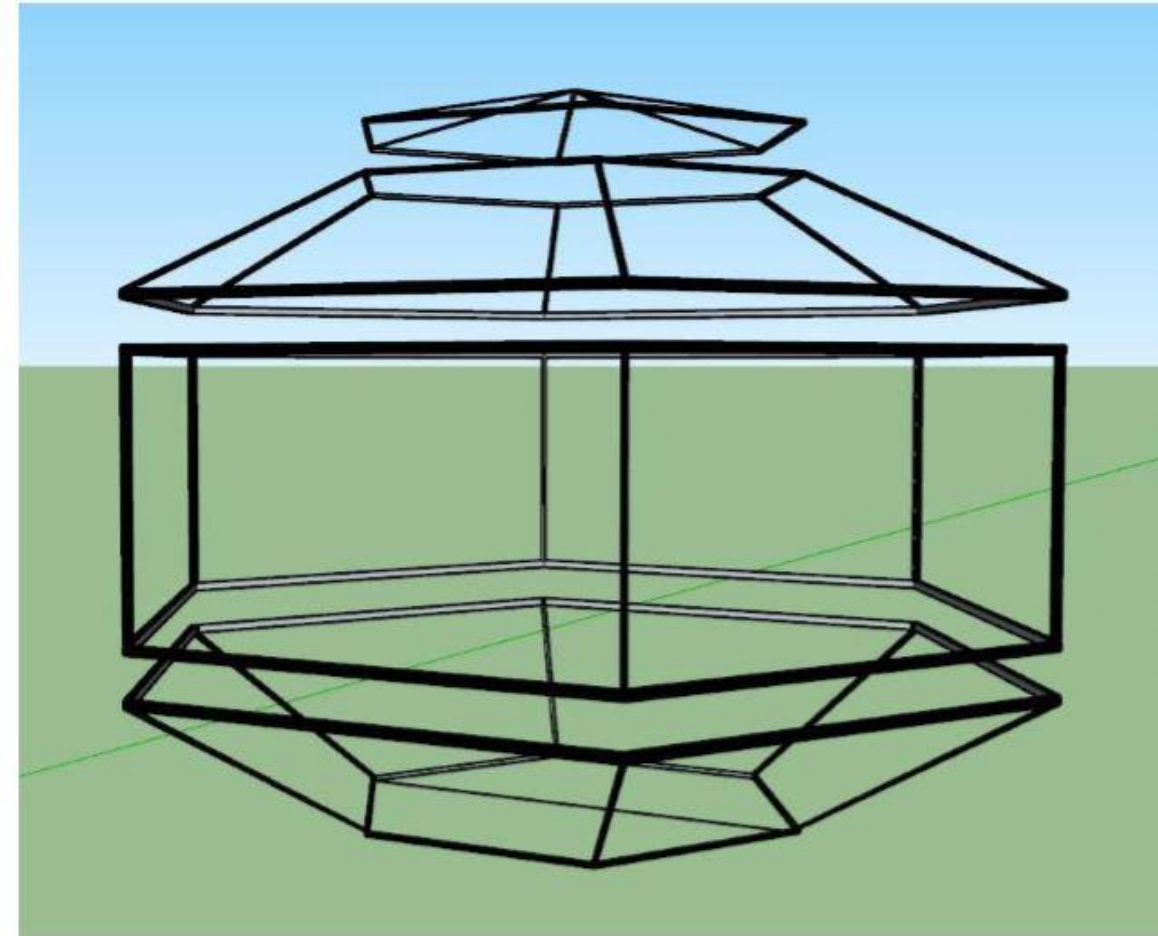
Kolang Vang





## ASSEMBLY

- Angled aluminum tubes for connection.
- 4 different sections, top is sloped at a small angle to prevent snow and water build up.
- Polycarbonate will be precut to desired size and bolted to the aluminum tubes.
- Design will have the same aspect as current plywood design: separate sections that would be stackable.



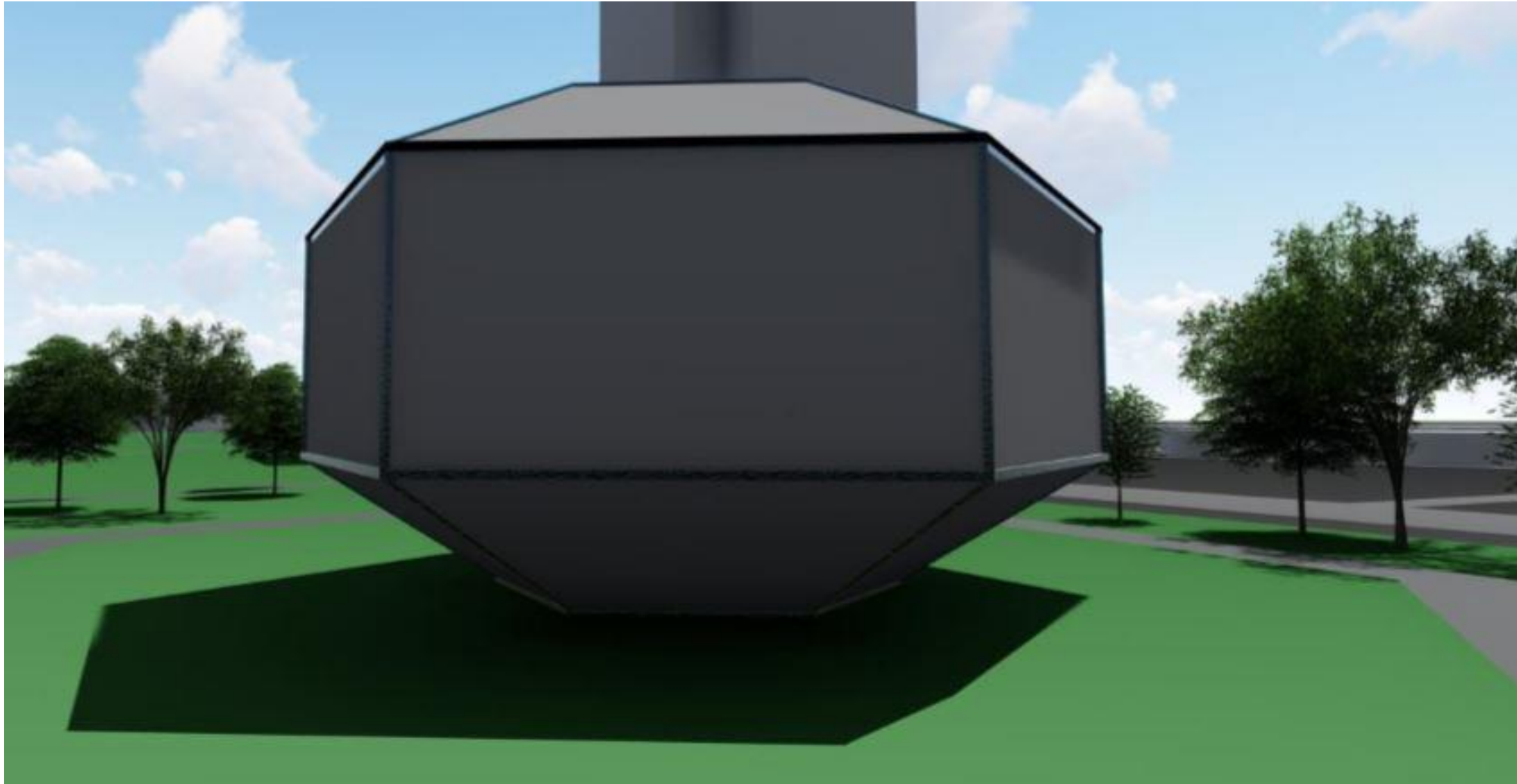
Kolang Vang



Weight: 1.717 Tons  
Self-weighted construction, no extra weight needed to weigh down structure

Cost of Polycarbonate: +/- \$34,350  
Cost of Aluminum: +/- \$10,000  
Total cost: (Relative): +/- \$44,350







## AS SCULPTURES

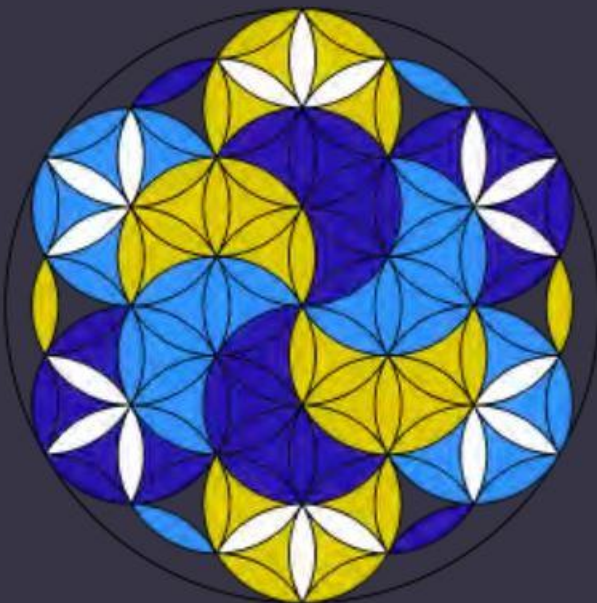
Each half can be dismantled and moved to frame the entry at Loring Greenway.

Anywhere is possible

Bolted down with concrete anchor

Taller one is about 24' high





# INSPIRATION

- Dandelions
- Hexagons
- Snow flakes
- Six-petaled flowers
- Existing plaza geometry
- Origami
- Sacred geometry







Karla Schmitt

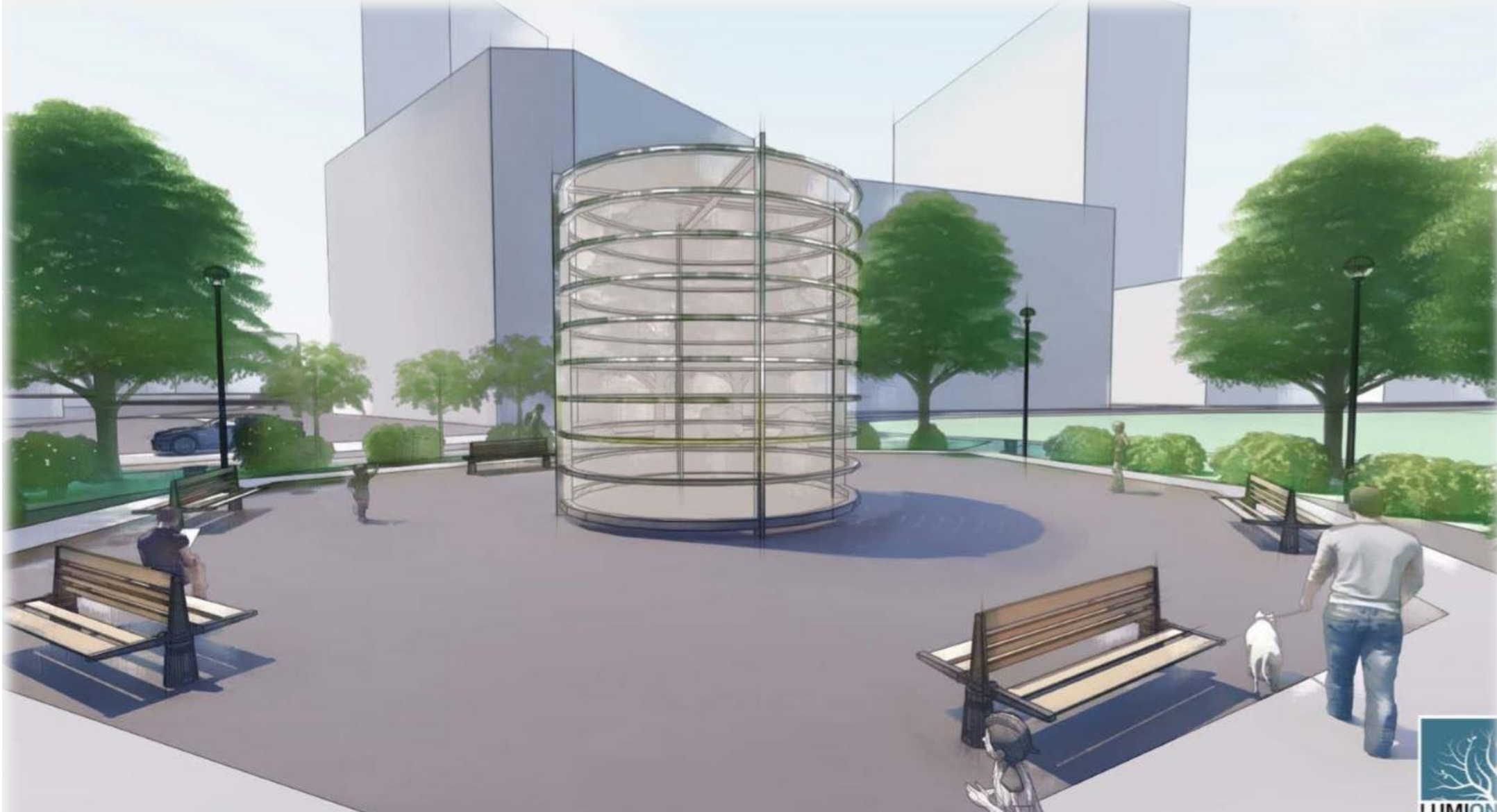








# PROPOSED ENCLOSURE

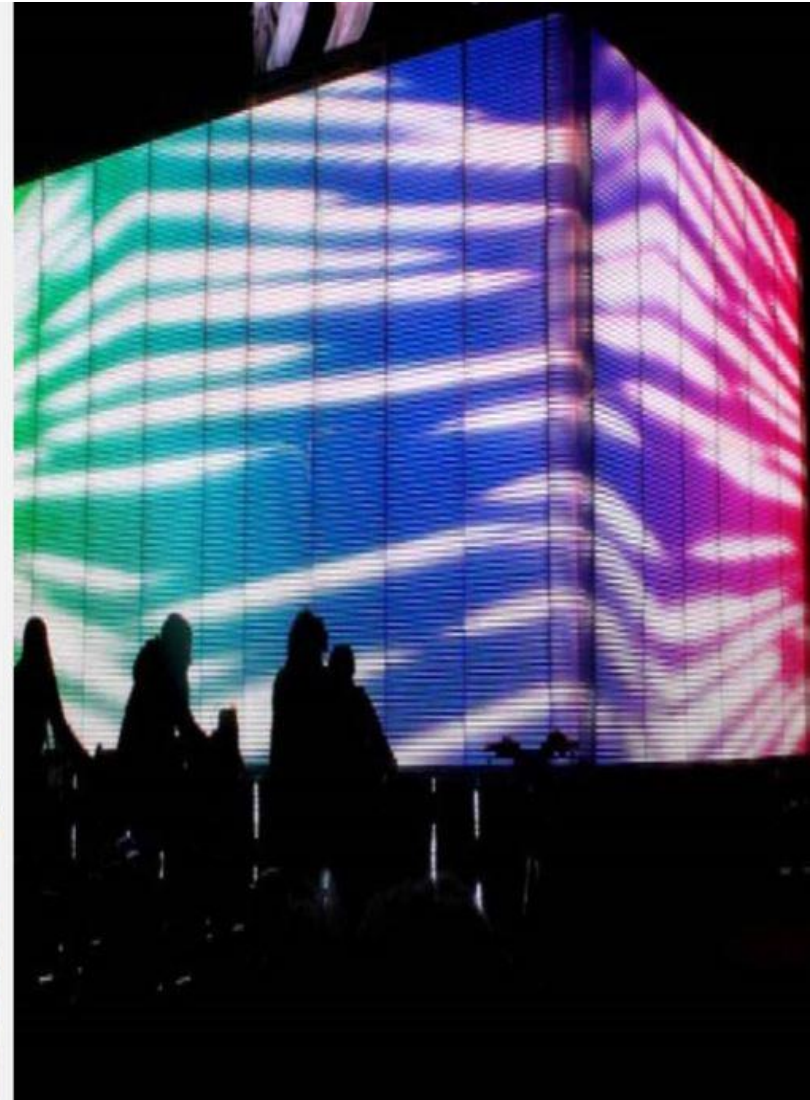


## Precedents



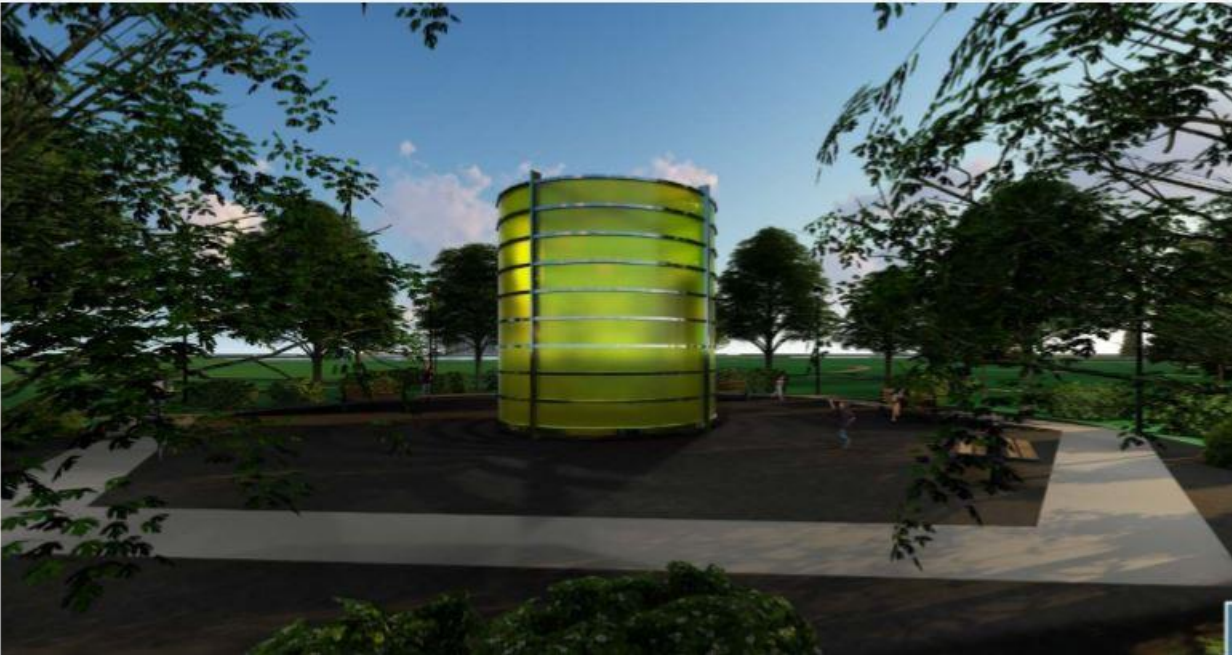
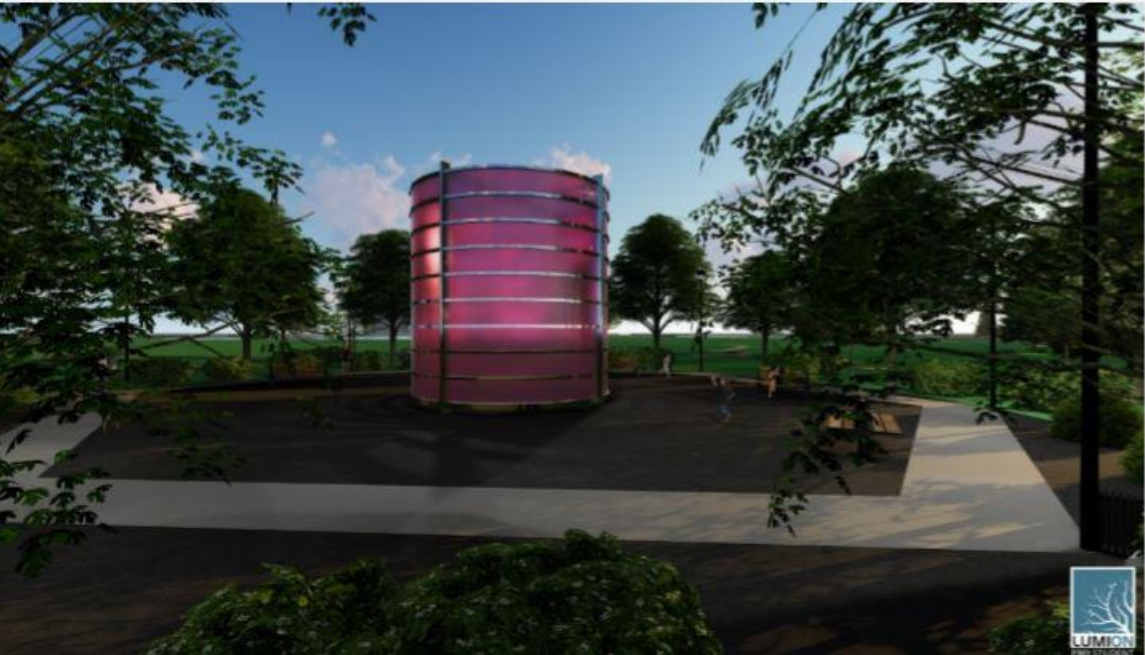
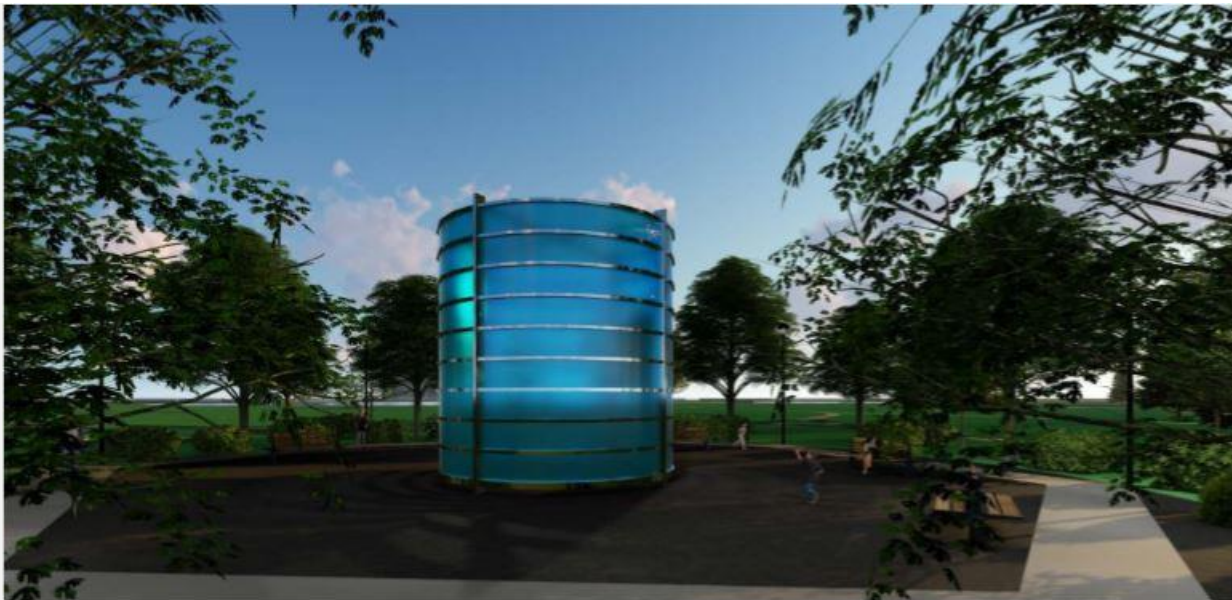


## Precedents



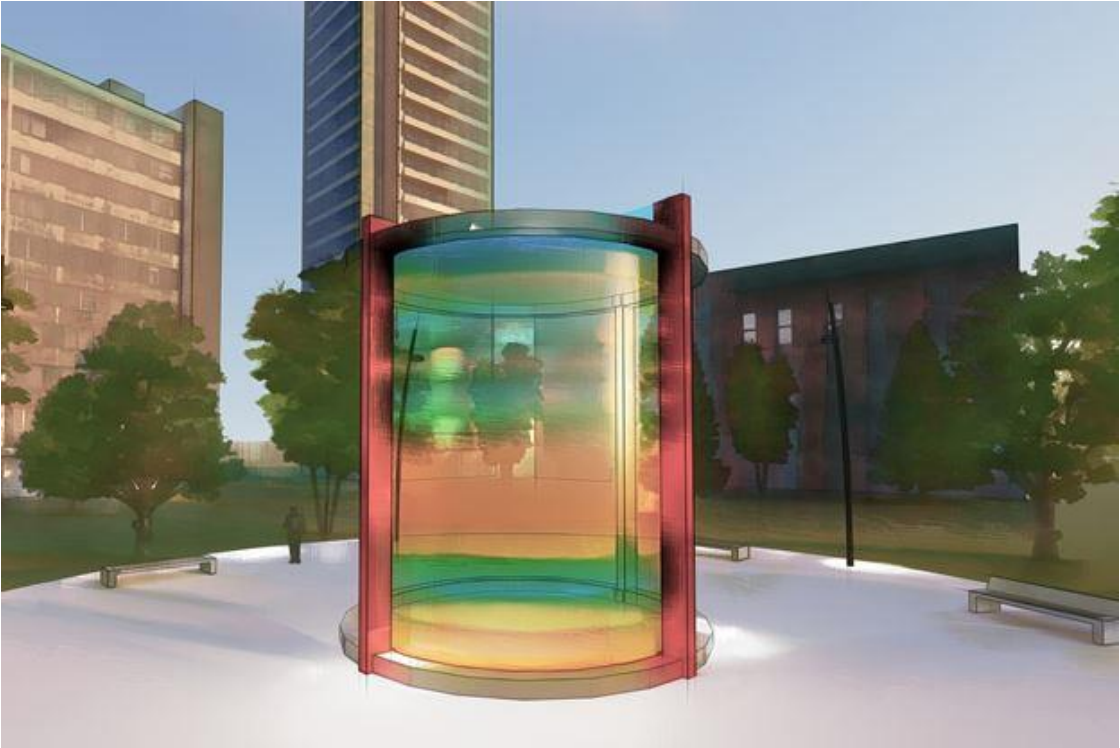
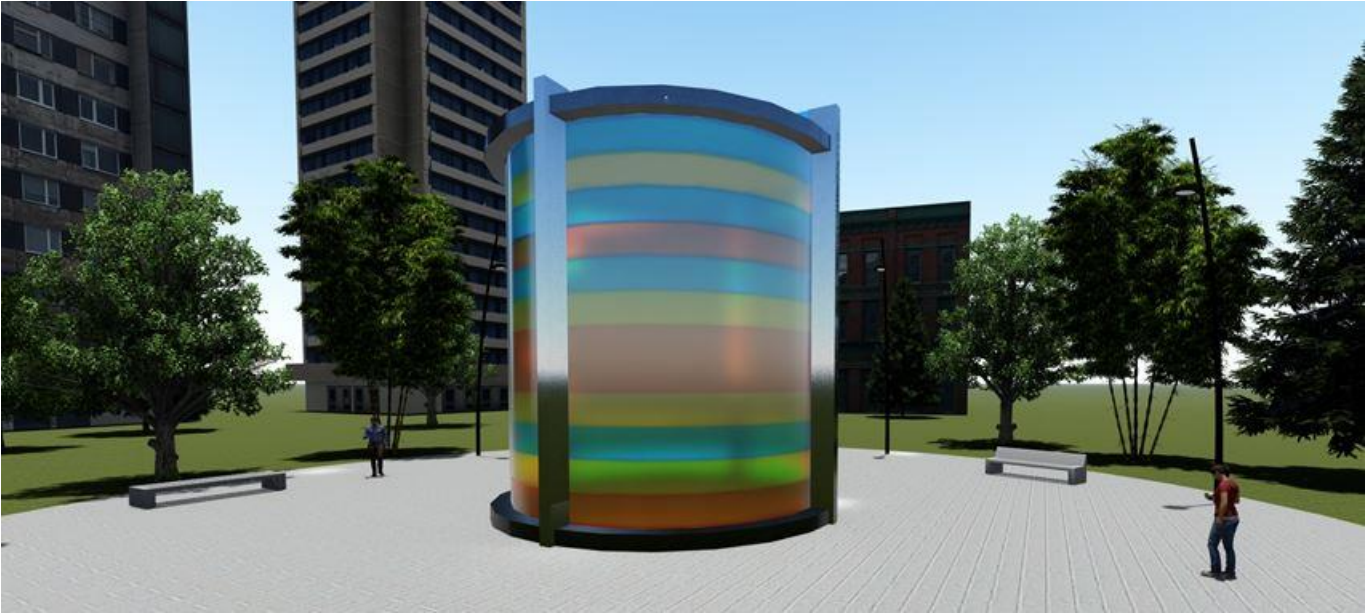


# COLOR/LIGHT OPTIONS





Marina Fooks



# MATERIALS

INTERIOR:  
ACRYLIC, POLYCARBONATE, PLAXIGLASS

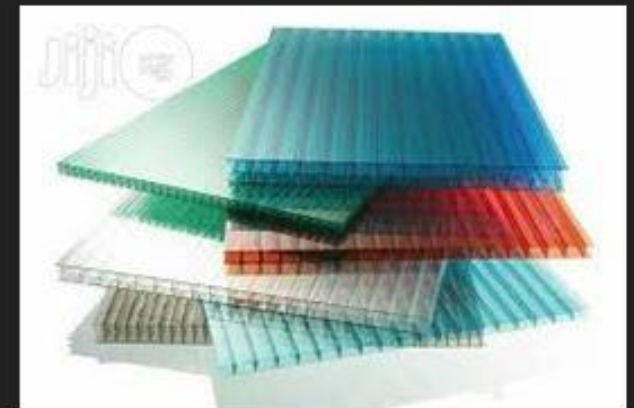
STRUCTURE:  
POLISHED STEEL OR ALUMINUM



<https://perspex.com/inspire-me/>



<https://www.regal-plastics.com/standard-acrylic-colors/>



<https://jiji.ng/ikeja/building-materials/polycarbonate-sheets-acrylic-perspex-aluco-boards-and-awning-6598512.html>



# MATERIALS

Materials: Extruded aluminum structure with polycarbonate enclosure. Polycarbonate can be frosted or colored.

An estimated weight:

Polycarbonate: ~1050 lbs

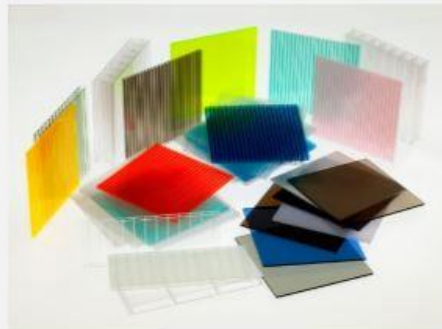
Aluminum: ~5,400 lbs

An estimated price:

Polycarbonate: \$5250 - \$10,500

Extruded Aluminum: \$ 64,800

## INTERIOR: POLYCARBONATE



## STRUCTURE:

### EXTRUDED ALUMINUM

#### VS45-22

Reference: 175-22

Lengths: Up to 292" (7417 mm)

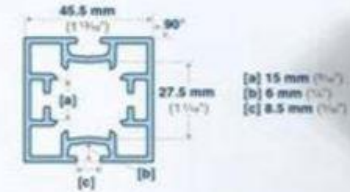
Finish: Clear anodized

To Scale: Page [F1.6](#)

Powder Coat: Colors [H1.1](#) Textures [H2.1](#)

Additional Media:

[View 3D Model](#)



#### PH1003B

Reference: 103B

Lengths: Up to 235" (5969 mm)

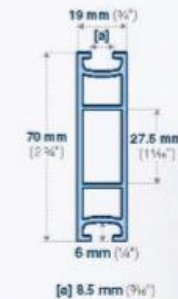
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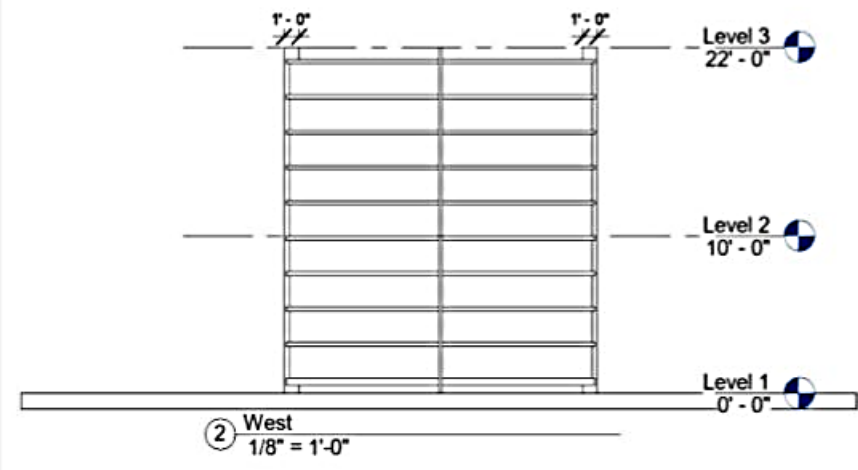
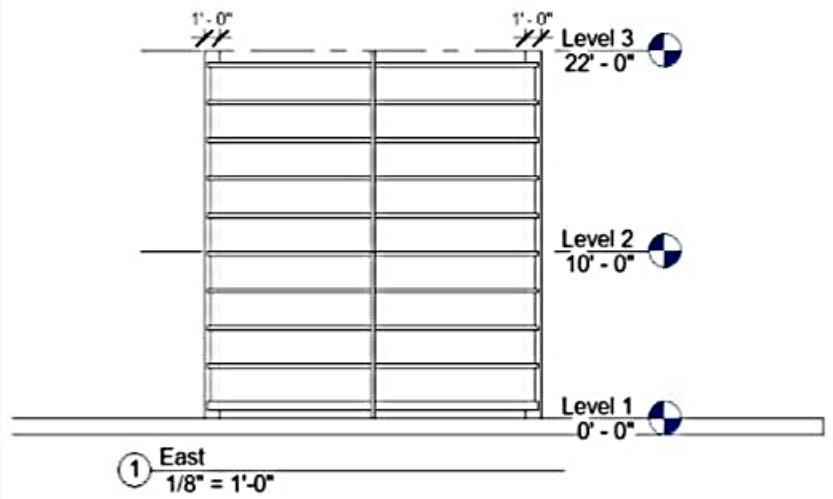
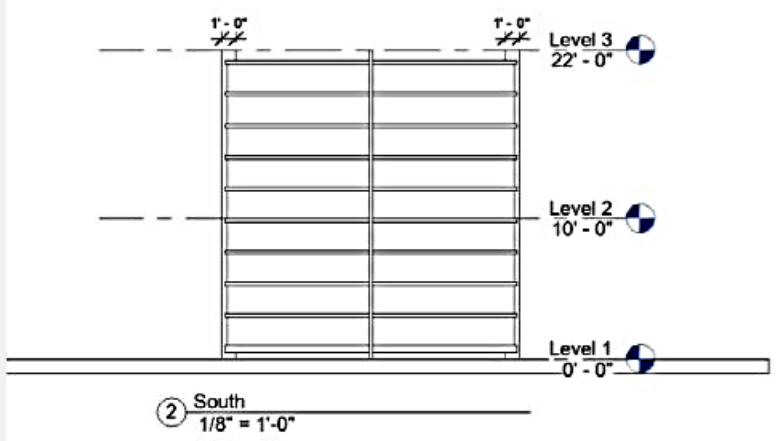
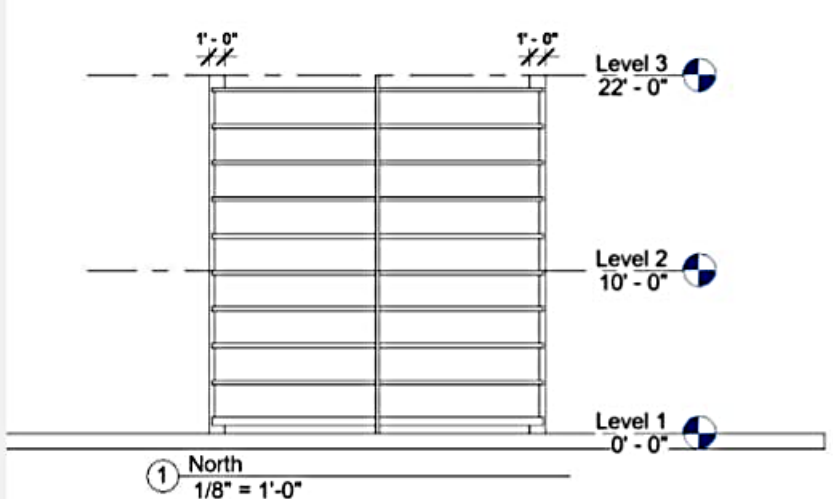
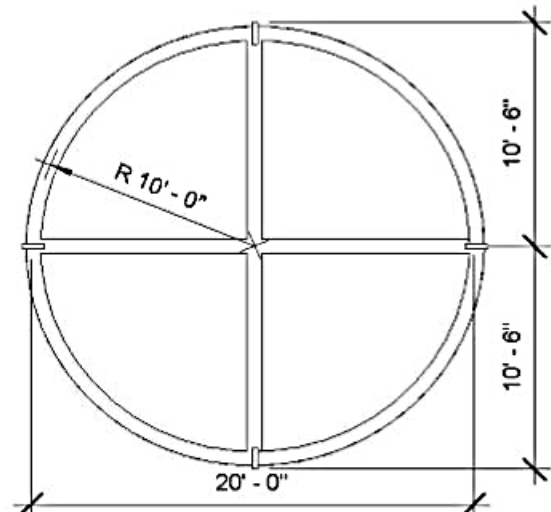
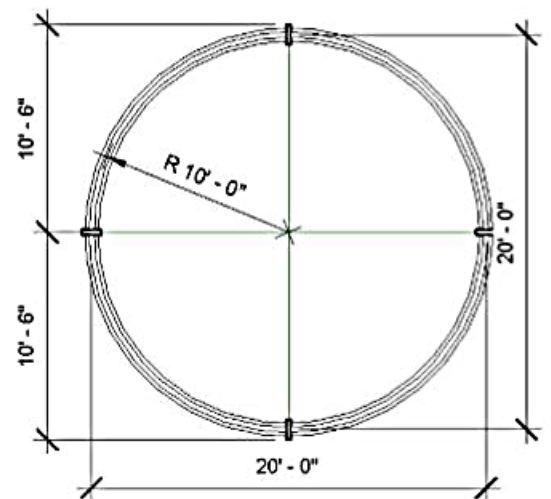
Powder Coat: Colors [H1.1](#) Textures [H2.1](#)

Additional Media:

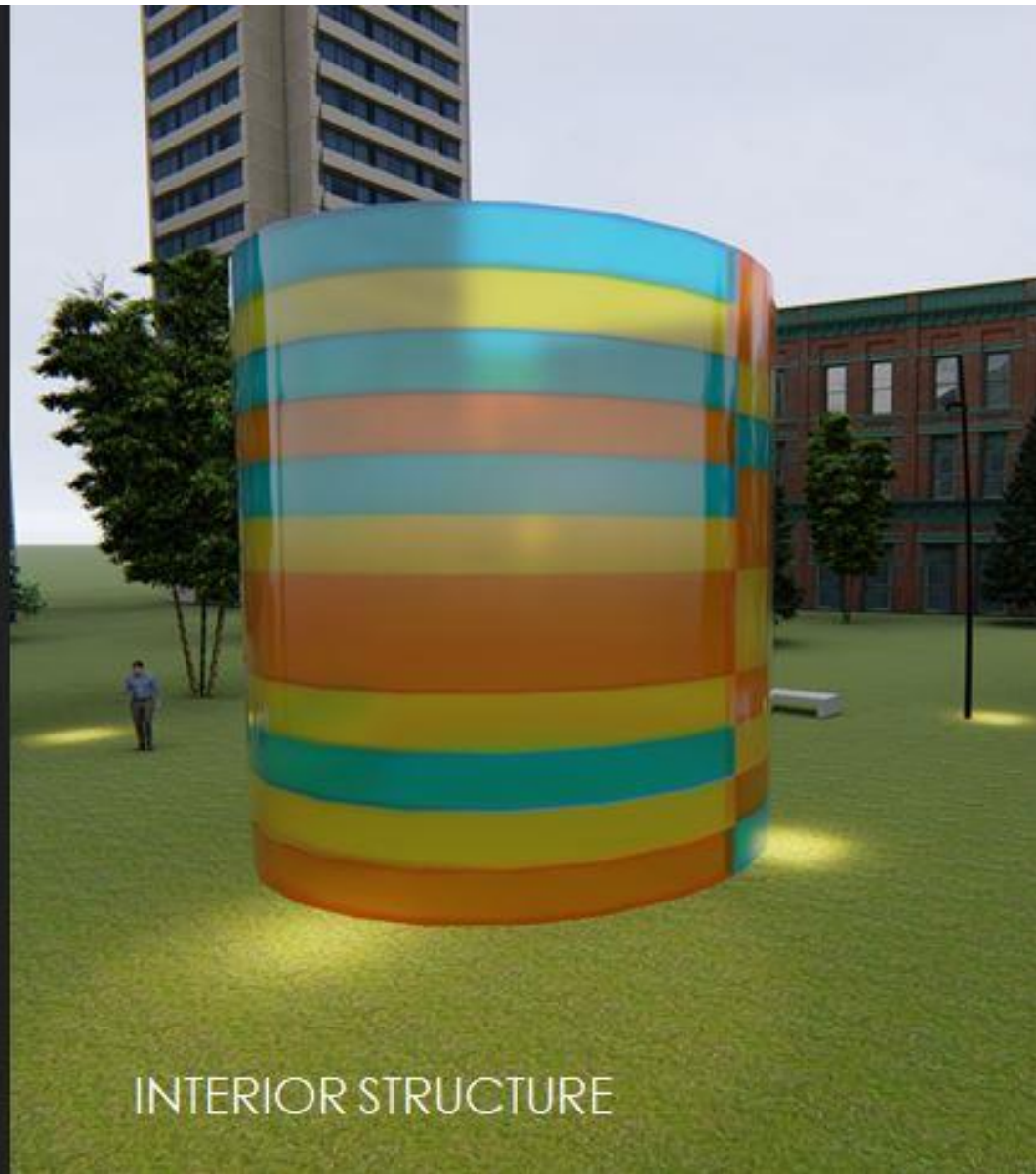
[View 3D Model](#)



# PLANS AND ELEVATIONS









Marina Fooks

