

Wind Winders

South Weymouth Naval Base

Client: City of Weymouth

Project: Summer Camp

Location: 10 Patriot Pkwy, Weymouth, MA

10 PATRIOT
PKWY





Date: 05-17-24

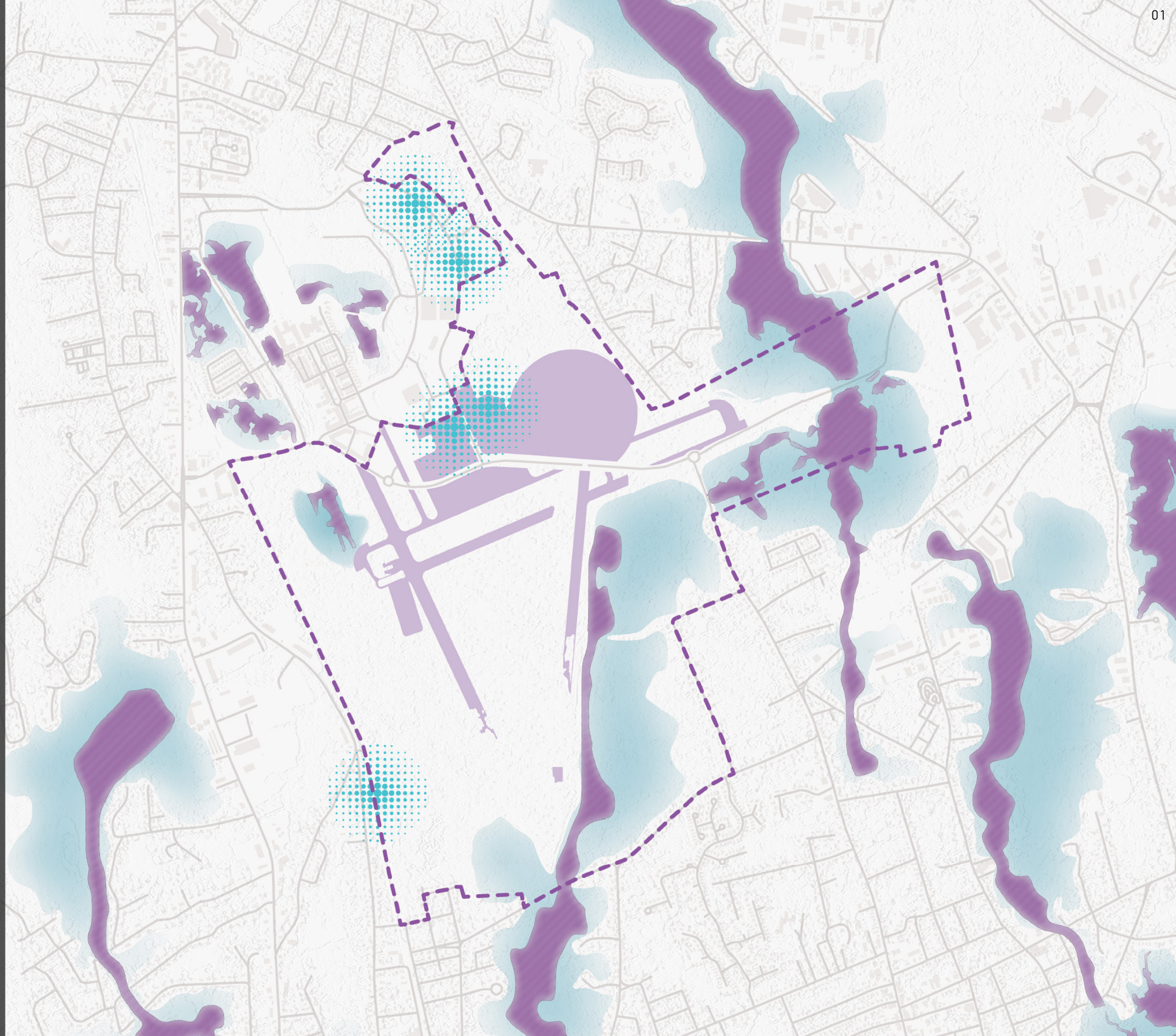
Designer: Jacob Barbarossa, M.Arch

Boomerang Gardens, formerly known as the South Weymouth Naval Base, served as a naval air station for the United States since 1942. During the terrors of World War II, the site was a critical defense against submersible threats and boasted an impressive fleet of blimps and aircraft.

Over 80 years later, with AUL dump sites scattered across the site and the pollutants from decades of aircraft exhaust have created a crisis in the soil. The pollutants are slowly decaying the site into a wasteland where the extremely acidic soil will soon be barren.

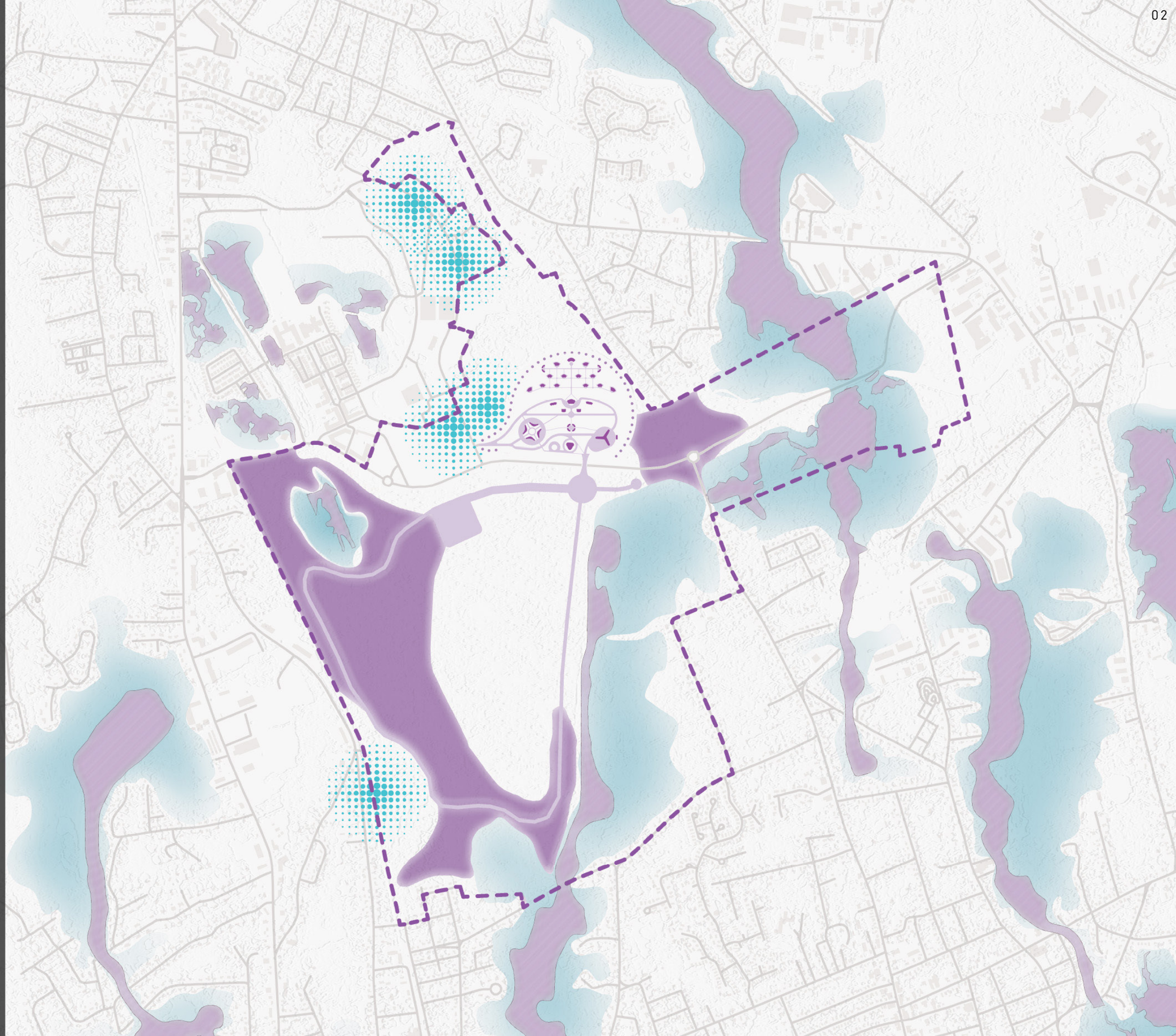
Unbeknownst at the time, the site is now home to rare wetland and aquatic species. Ignorant to their impending downfall, the future of these species is now in jeopardy as the years of soil contamination and lack of nutrients have created an environment that will soon be uninhabitable. Without food and shelter, the local rare species will be forced to migrate or face an uncertain future of hardship and struggle.

-  AUL Dump Sites
-  Core Habitats
-  Buffer Zones
-  Hardscapes



By introducing an abundance of native acidophile life such as blueberry bushes, we can bring back the life at Boomerang Gardens. Acidophile shrubs and trees are hardy species that can thrive in very acidic environments, bringing new growth and a promised future to the site. When the leaves and berries fall to the ground, the organic matter from the acidophiles decompose and absorb into the soil, generating healthy nutrients for continual growth. Slowly healing the years of neglect the site has endured.

By planting acidophiles in strategic positions within Boomerang Gardens, over 2,000,000 square feet of regrowth zones will separate the habitats from heavy contamination and the footprint of society. The regrowth zones will create a safe space where the local species can wander and expand upon their habitats. Creating an ecosystem that promotes future growth. Utilizing safe aggregates, the site will feature hiking trails around these zones that allow the communities of Weymouth to enjoy the natural environment of Massachusetts.



//////// Cabin Concept

Concept:

After analyzing solutions to revitalize the sites ecosystems, the concept of the proposed Boomerang Gardens cabins must be focused on reducing the carbon footprint of the construction process while respecting the surrounding area. Featuring structures that do not harm the delicate habitats found within.

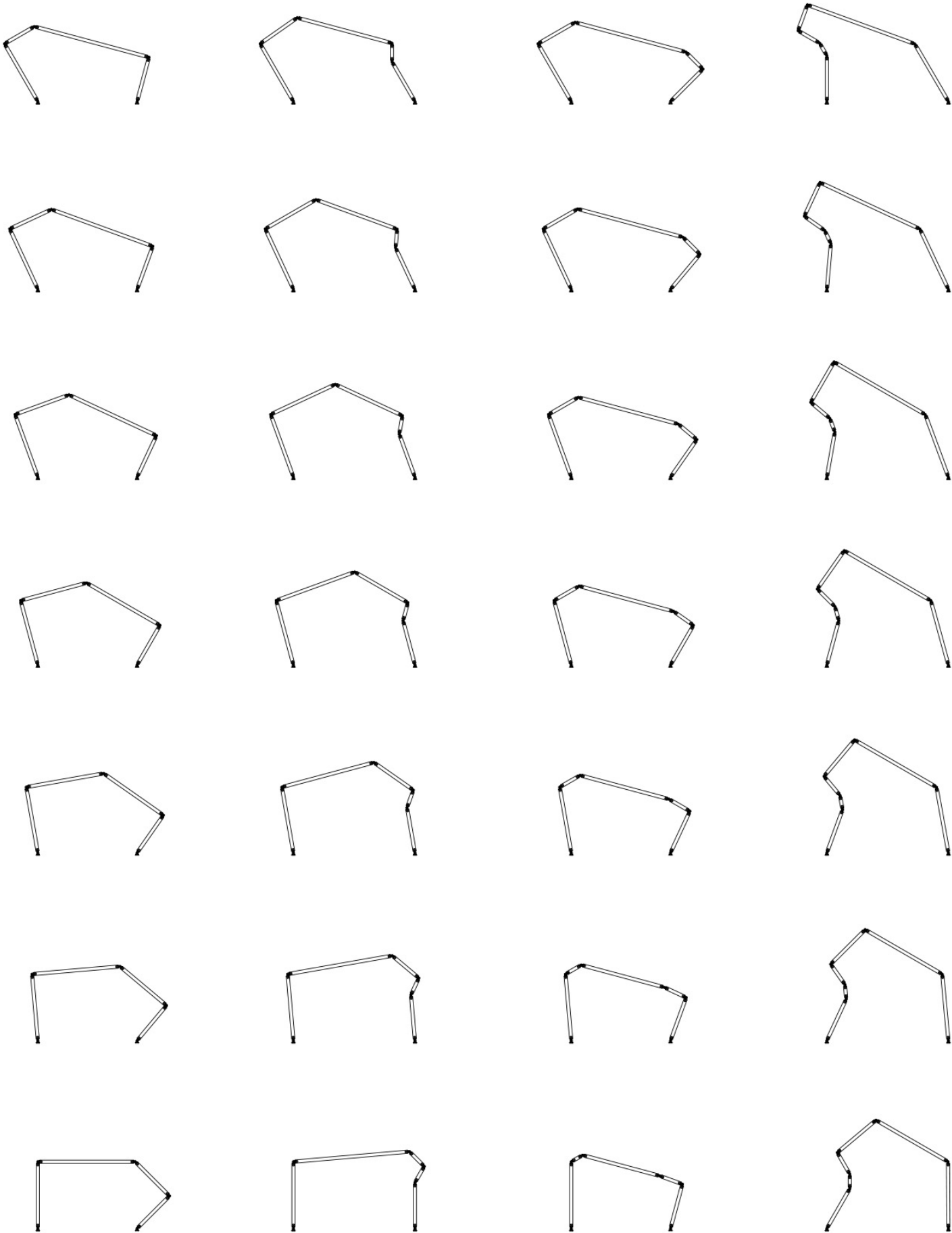
A simple way to protect the surrounding environment is by reducing the need for mechanical. The site will benefit from harnessing wind in the occupied period from June to September. Eliminating the carbon emissions found in most air conditioning systems.

In addition, the cabins must abide by a simple construction process as to eliminate as much need for heavy equipment as possible. Allowing staff members to easily erect the cabins without special machinery.

The cabins will harness wind, be simple to construct and utilize green building materials. They will be the product of modern day design principles merged with old building practices. Mixing old materials with modern materials in a fashion that can create an efficient green structure.

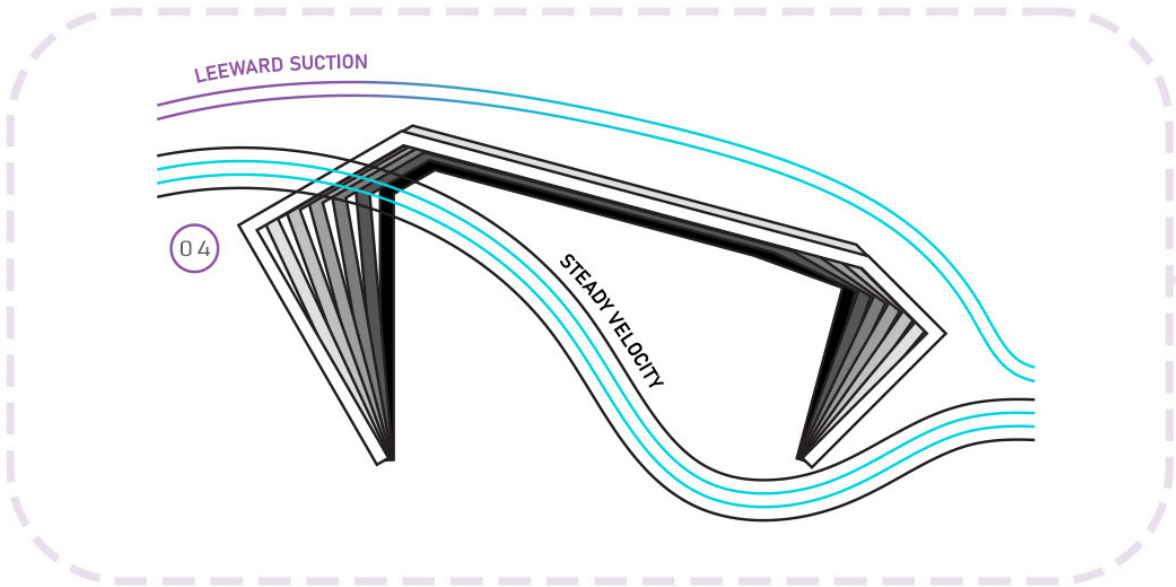
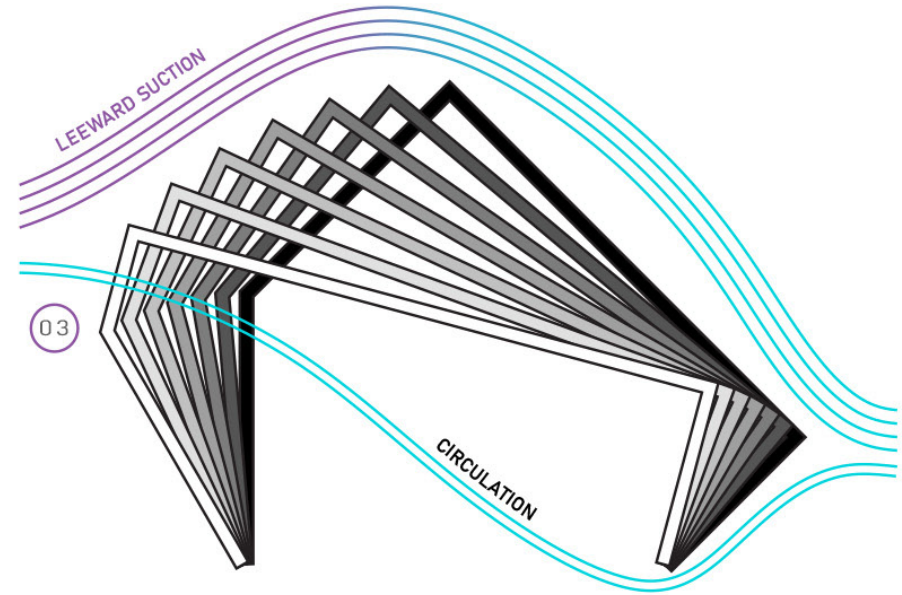
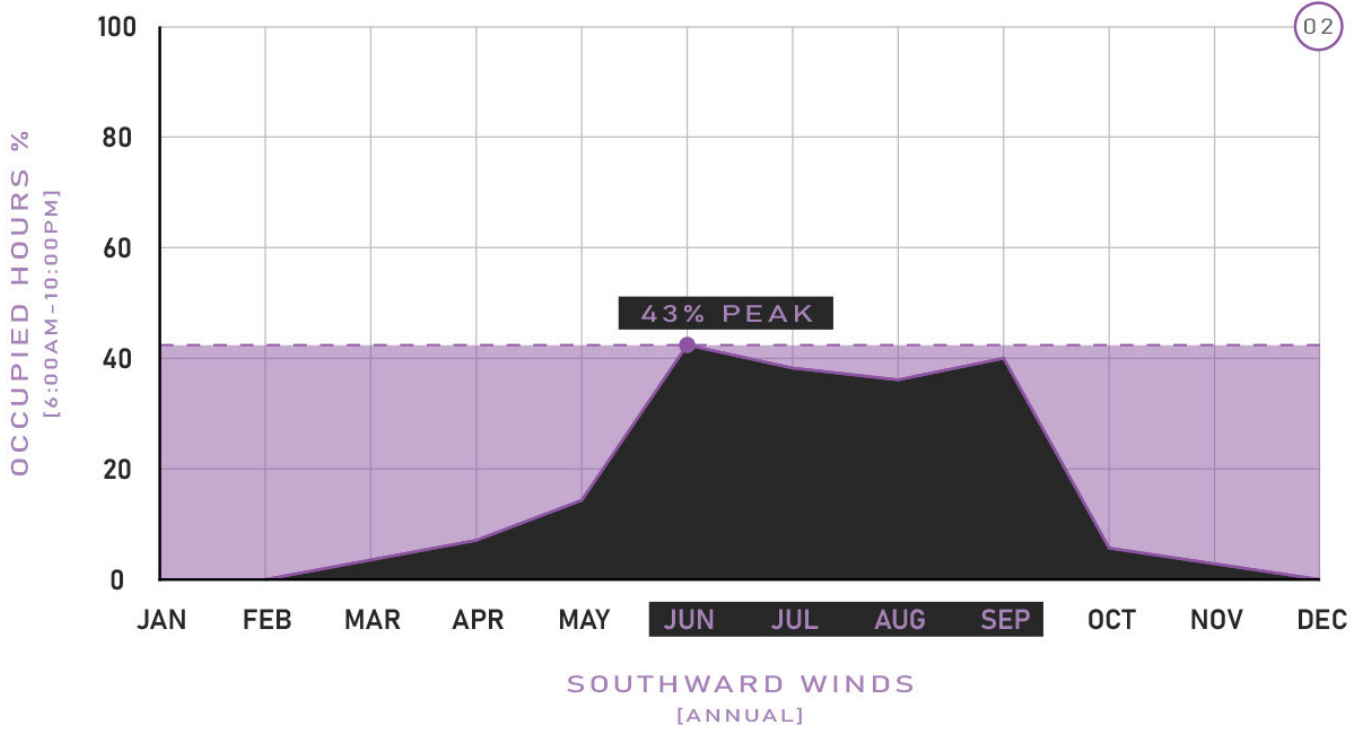
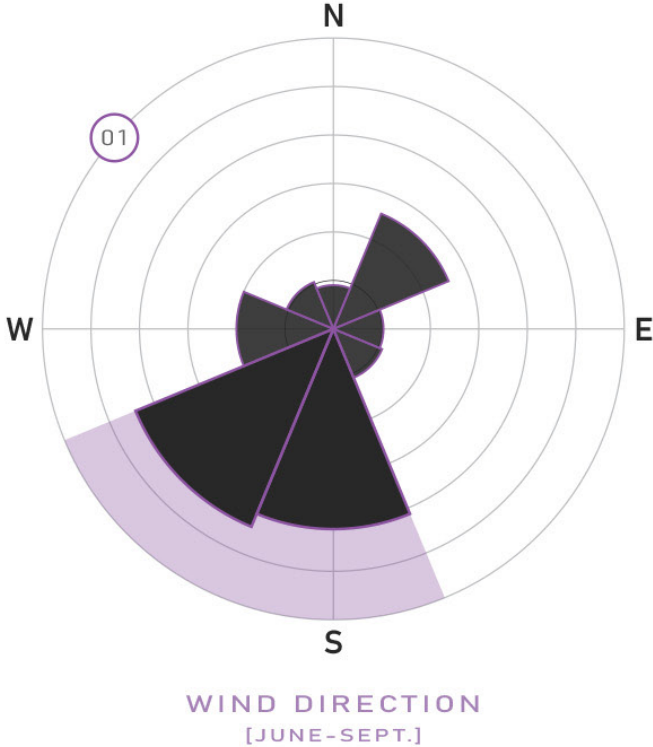
However, merging a complex geometric structure able to capture wind, with a simple construction process will not be typical. These “Wind Winders” must set fourth a simple yet repetitive set of parameters that can be achieved with little experience in the construction field.

“Complexity for Simplicity”.

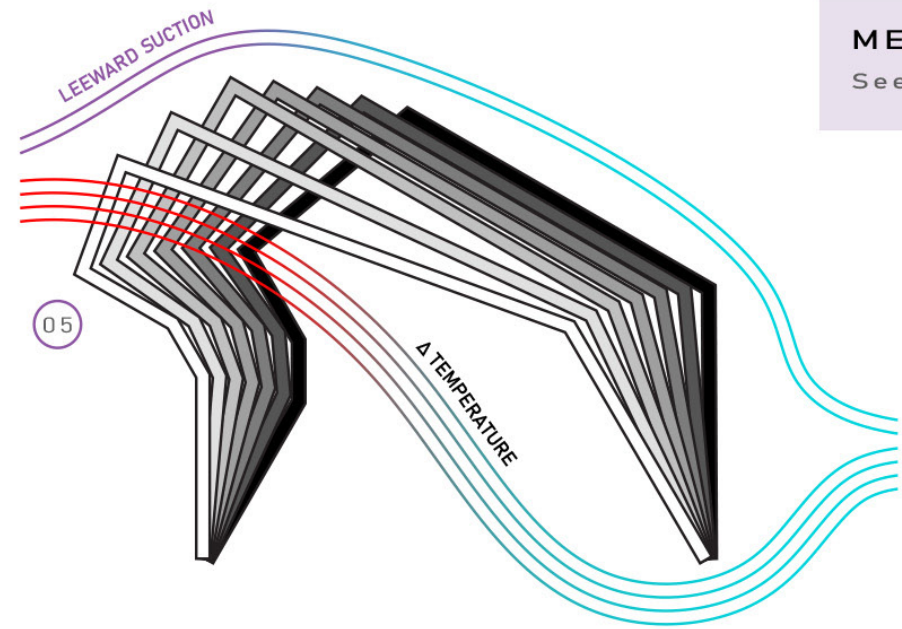


Wind Analysis & Function

- 01 Wind Direction**
Showing the average wind direction in South Weymouth during the summer months. The high-lighted zone shows the preferred orientation of the proposed design.
- 02 Occupied Hours**
This graph correlates to figure 01, showing the percent of occupied hours against the southward winds, reaching a peak of 43% of the cabins occupied hours.
- 03 Method 01**
Designed to amplify the leeward suction that occurs due to negative pressure. This suction will help aid the positive pressure through the structure, circulating fresh air.
- 04 Method 02**
A splitting windward face and low building height, allow a steady wind velocity by forcing them through the structure with minimal resistance. Aiding the buildings internal temperature.
- 05 Method 03**
Featuring a wide base and a tapered spout, this design is able to guide the incoming winds up and out of the structure. While the temperature of the air warms, the chimney effect of the structure guides the air up towards the leeward suction vents.



METHOD 02:
See Diagram 02.0

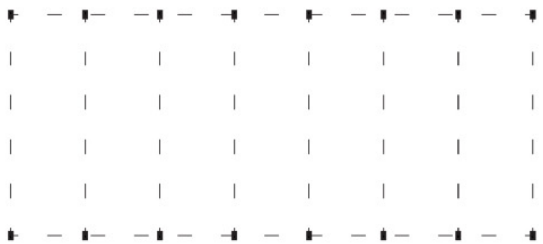




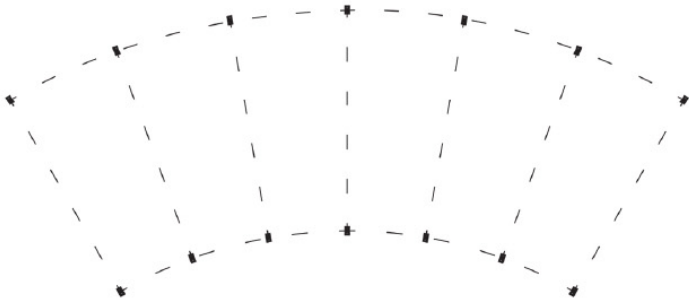
Variations

FOUNDATIONS

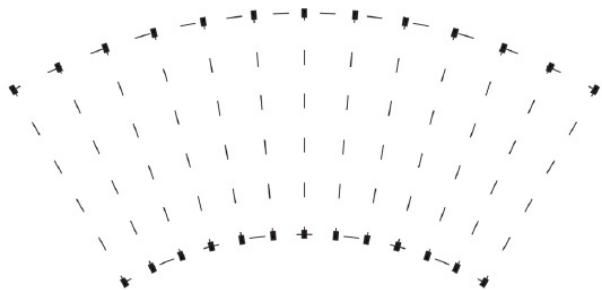
VAR. 01



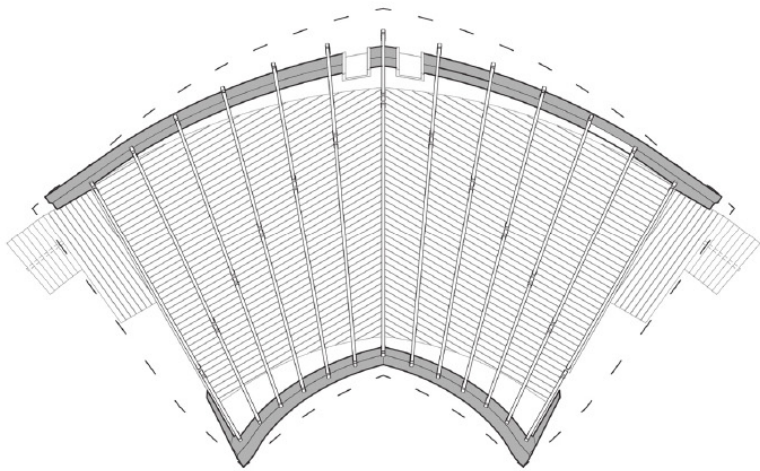
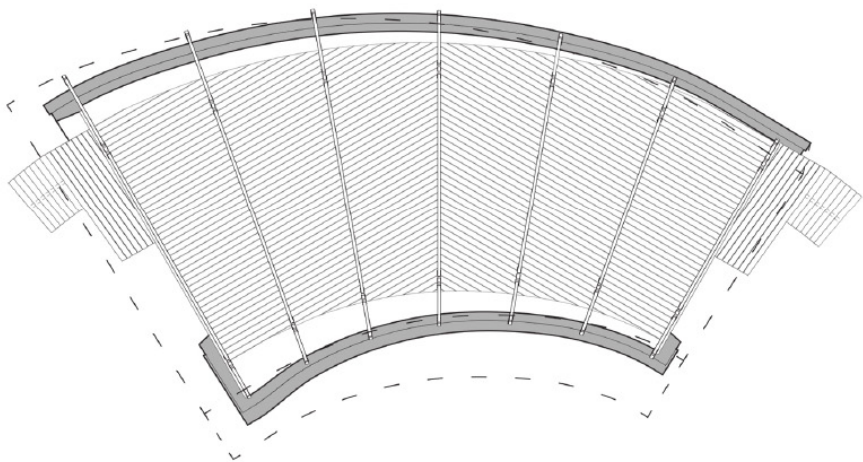
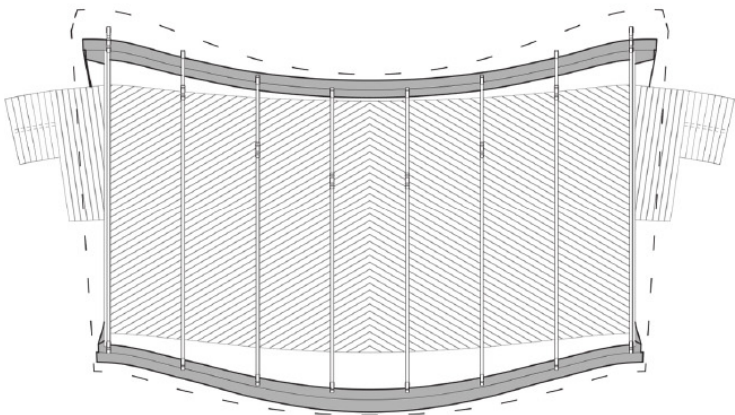
VAR. 02



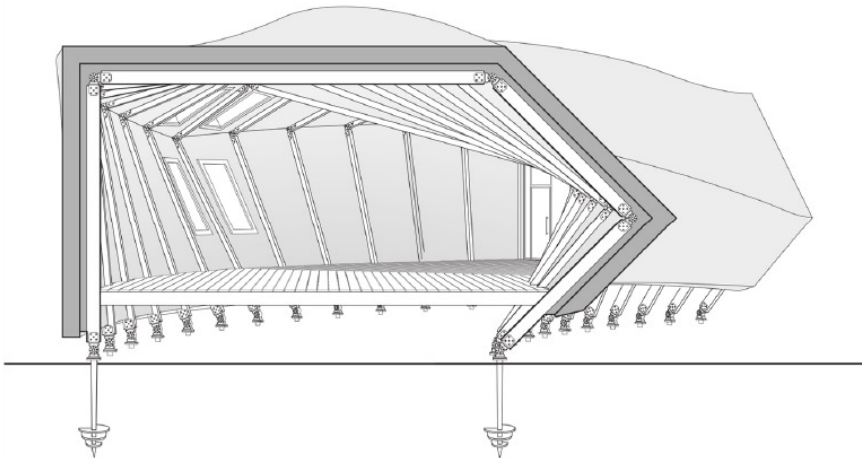
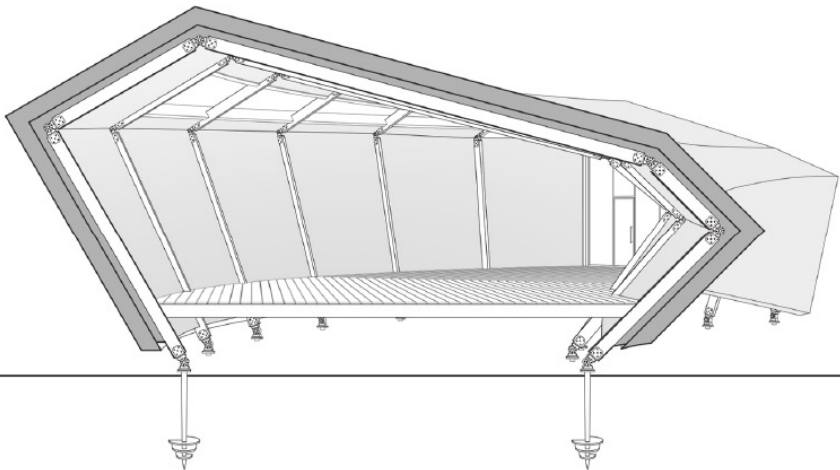
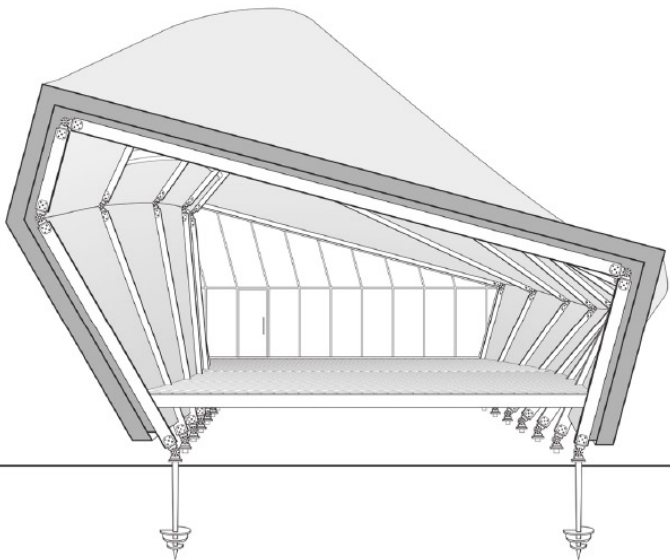
VAR. 03



PLANS



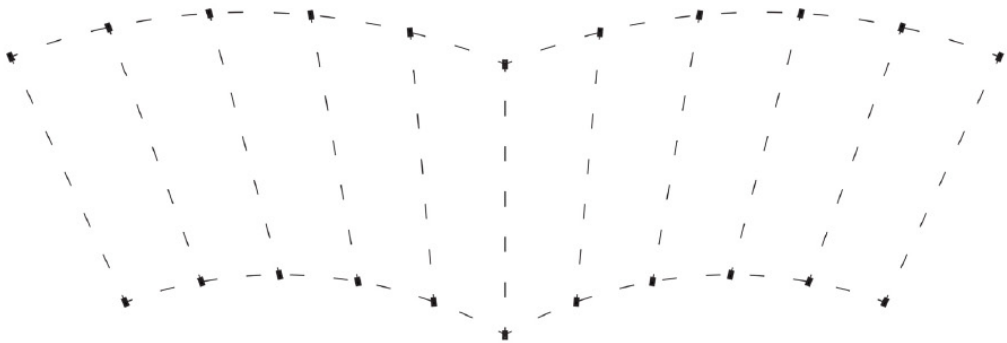
SECTIONS



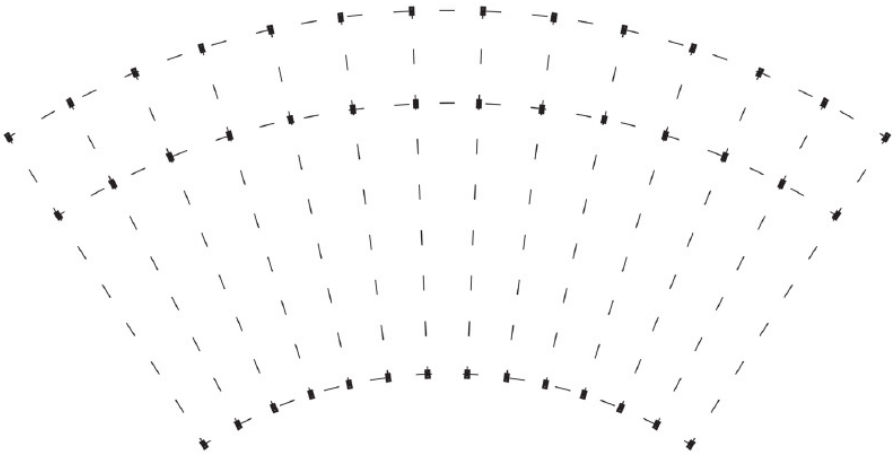


FOUNDATIONS

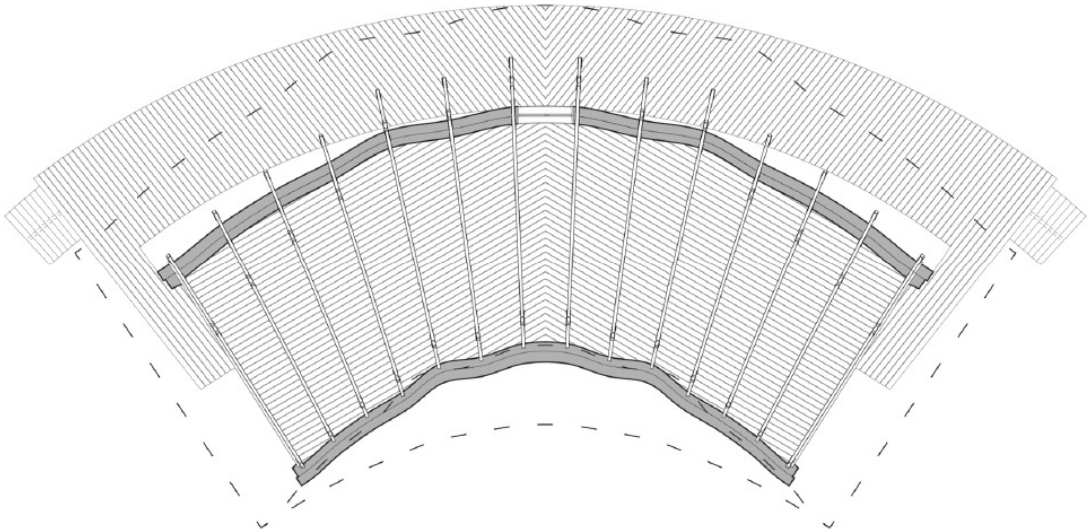
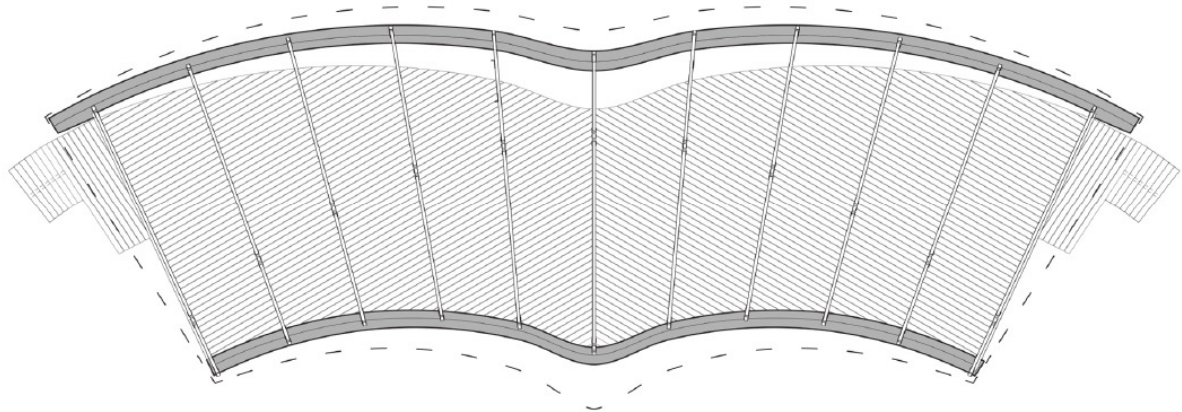
VAR. 04



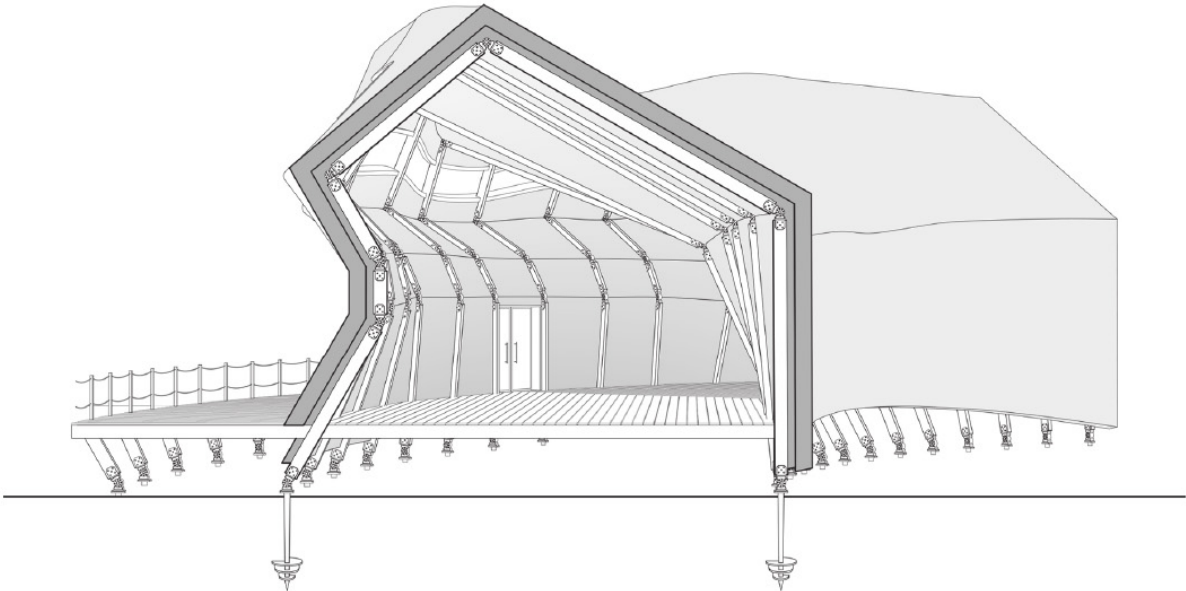
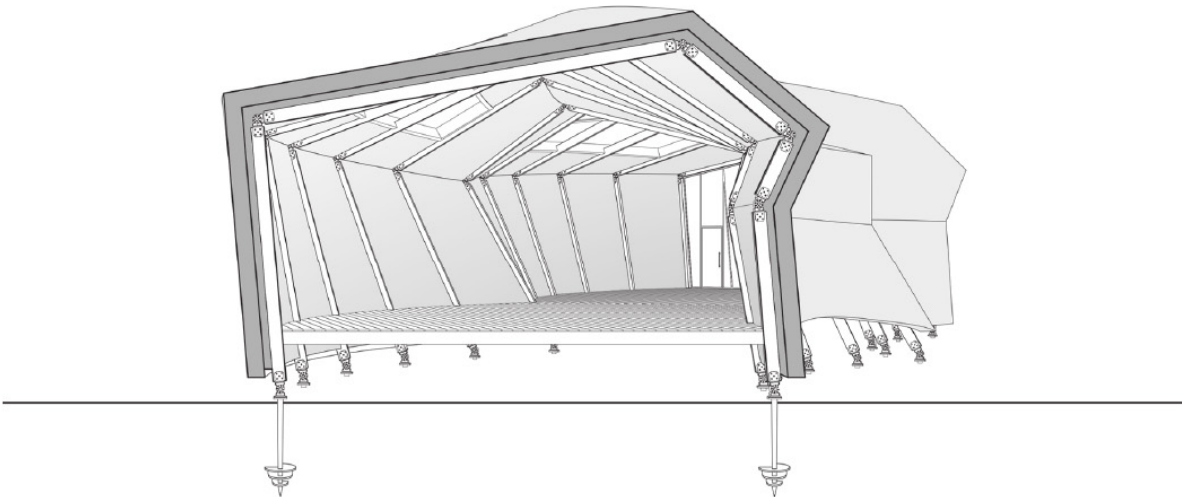
VAR. 05



PLANS



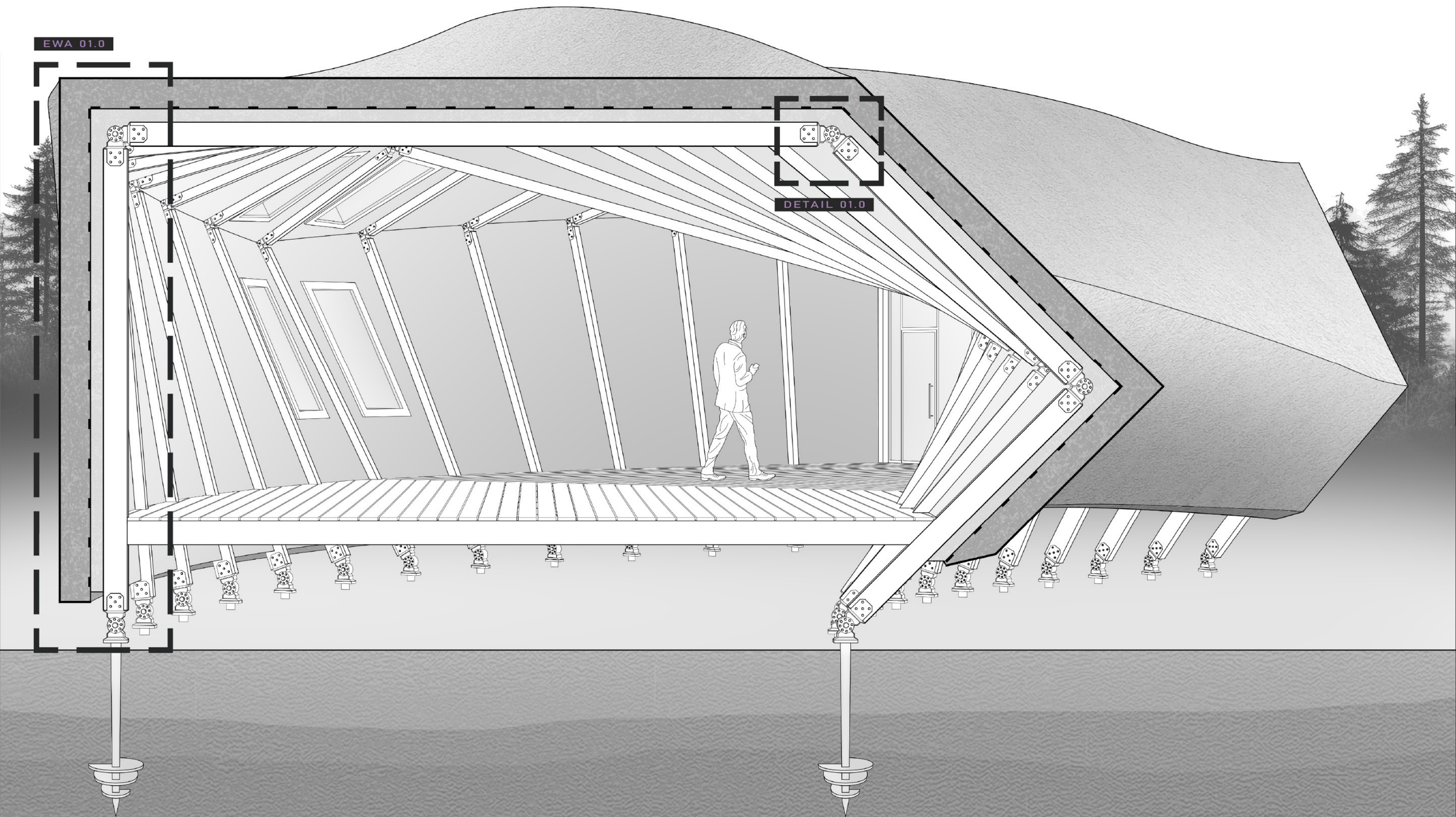
SECTIONS





EWA 01.0

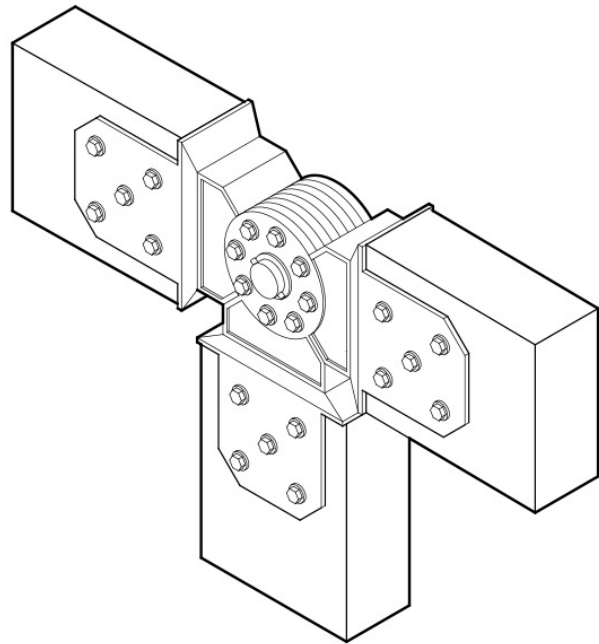
DETAIL 01.0



Wall Assembly

EWA 01.0 Section:

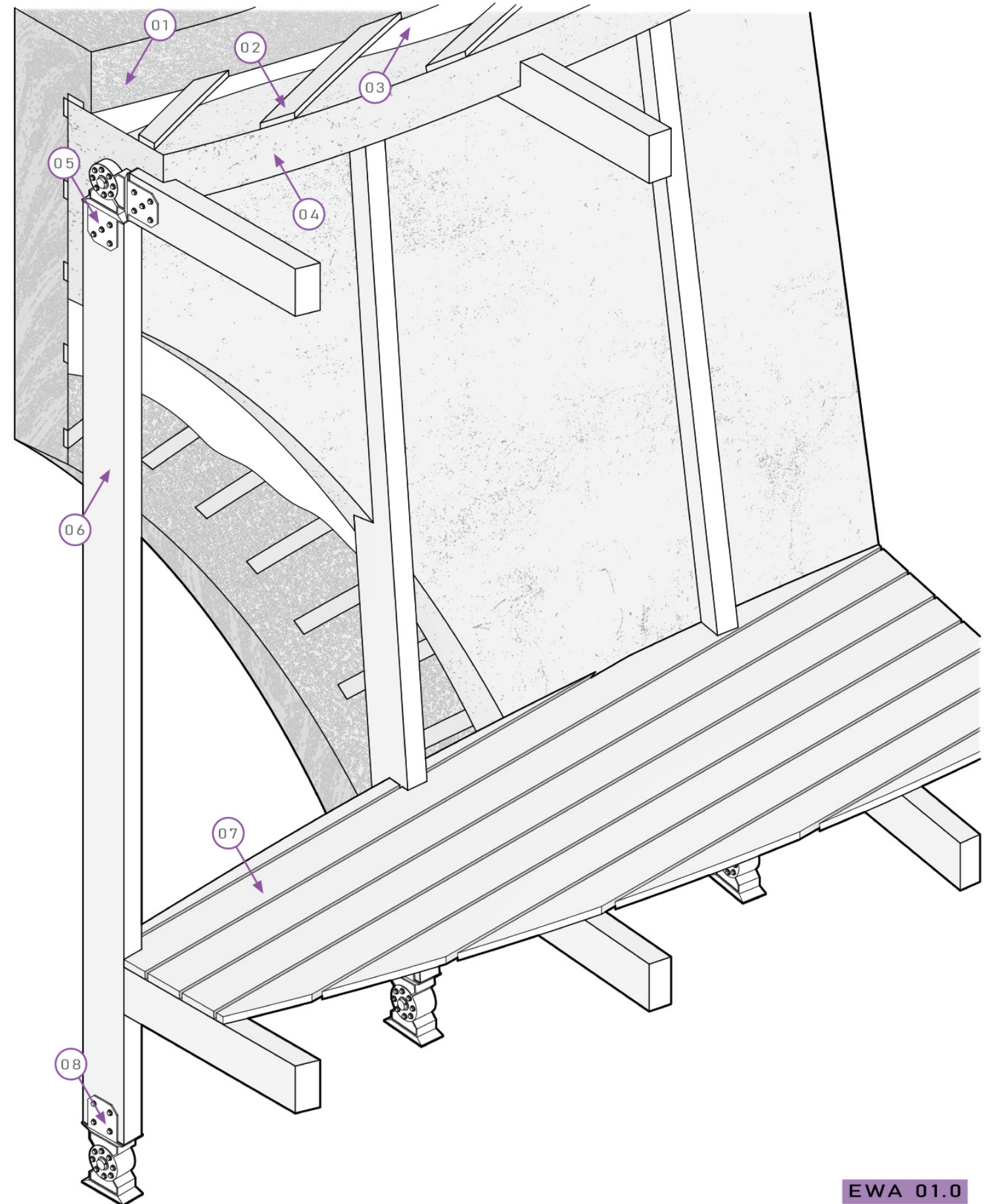
The 3D section shows 4x8 timber frames, capped with the Wind Winders special component 01.0. The frames are wrapped in 10" of hempcrete starting at the center point moving out. The hempcrete offers an R-value of 3.5, along with added strength to the structure. Resulting in a substructure with a total insulating value of approximately R-35. Upon the hempcrete is 1 x 3 strapping, adding lateral support to the frames while serving as a foundation point for the 12" of thatching. The 2 x 6 floor planks with a ½" spacing, offer enough strength to span between frames without joists, while also allowing the wind to pass through the structure.



Component 01.0:
See Diagram 01.0

EWA 01.0 ASSEMBLY

- 01 Thatching [12"]
- 02 Strapping [1x3]
- 03 Waterproof Membrane
- 04 Blown-Hempcrete [10"]
- 05 Component 01.0 [2x Joint]
- 06 4x8 Rough Sawn Lumber
- 07 2x6 Rough Sawn Lumber
- 08 Component 01.0 [Baseplate]



Component 01.0

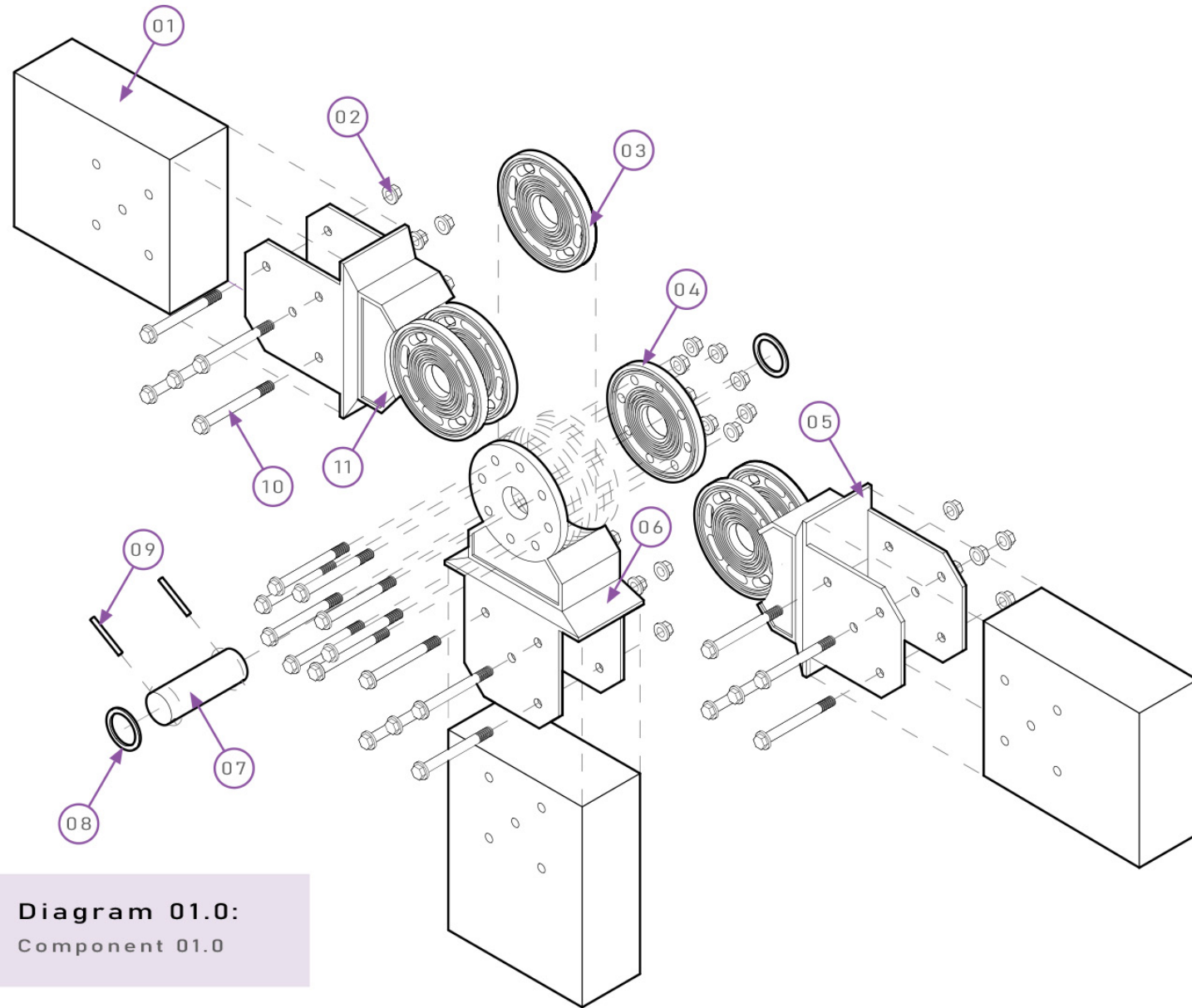
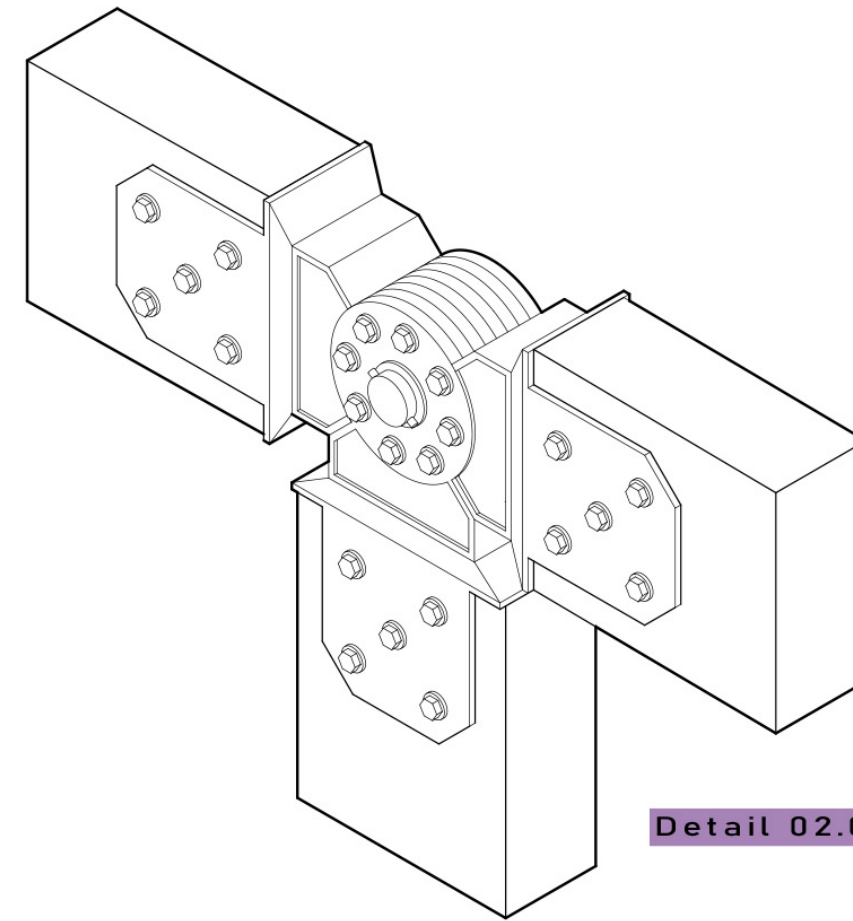


Diagram 01.0:
Component 01.0

Component 01.0:

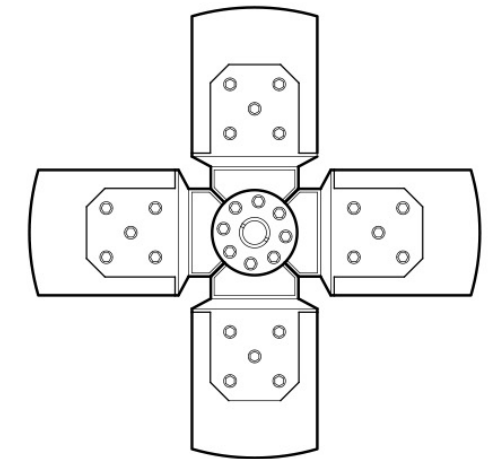
Component 01.0 allows for a 180° rotation within each junction point of each timber frame. This critical piece of the structure is designed to support up to 4 attachments at 90°, 3 attachments with 120° of motion, or 2 attachments with 180° degrees of motion. Featuring a universal base plate that can be swapped from the 5-hole timber mount to the 4-hole flat-mount. The system works with a 1.5" hardened steel shear rod at its core with ½" clutch plates featuring 7 friction rings that press upon each other. Each plate is slotted with 8 holes for ½" shaft bolts. The bolts are responsible for compressing the friction plates together, while the slots allow for a full 360° rotation around the shear rod. See Detail 01.0.



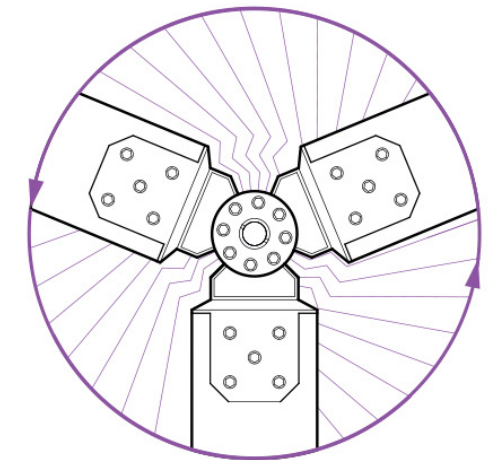
Detail 02.0

DETAIL 01.0 ASSEMBLY

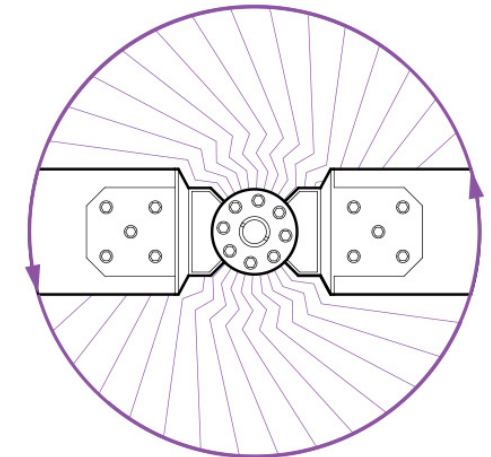
- 01 4x8 Rough Sawn Lumber
- 02 ASTM A194 Gr.8 Nut
- 03 Slotted Spacer Plate
- 04 Back Plate
- 05 Housing [C]
- 06 Housing [A]
- 07 Shear Rod
- 08 Shear Rod Washer
- 09 3/8" Shear Rod Pins
- 10 ASTM A194 Gr. 8 Hex Bolts
- 11 Housing [B]



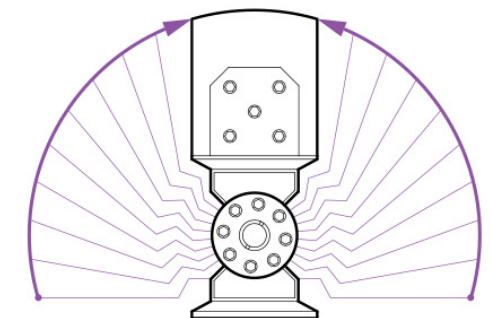
4x Joint



3x Joint

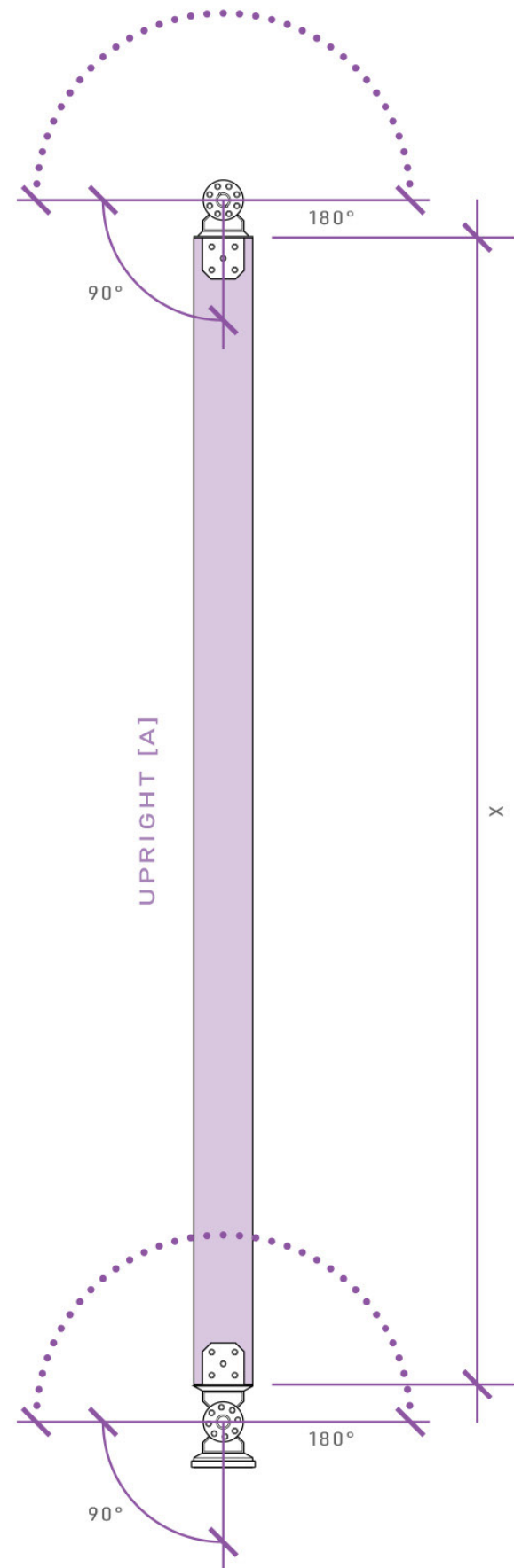


2x Joint



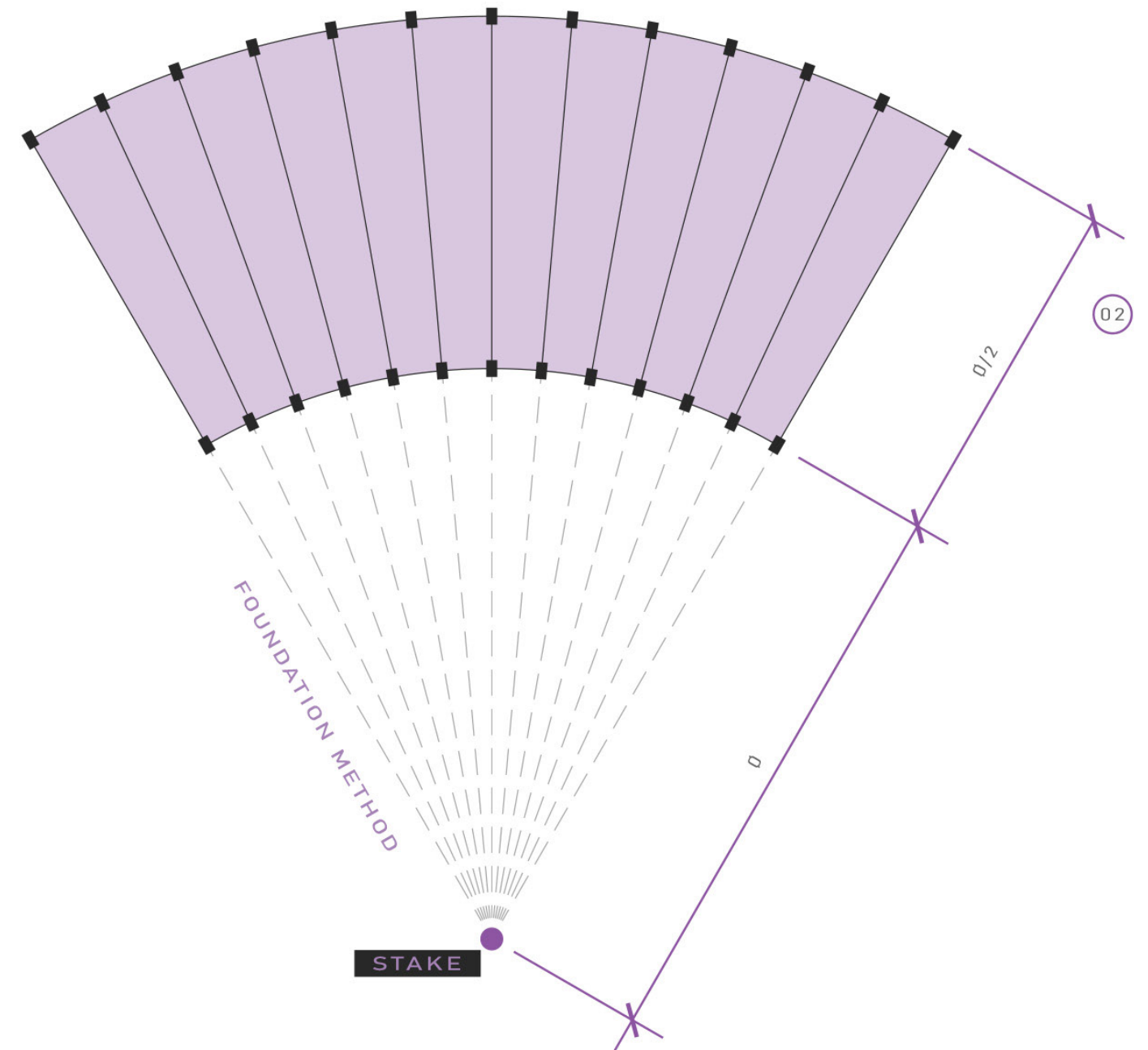
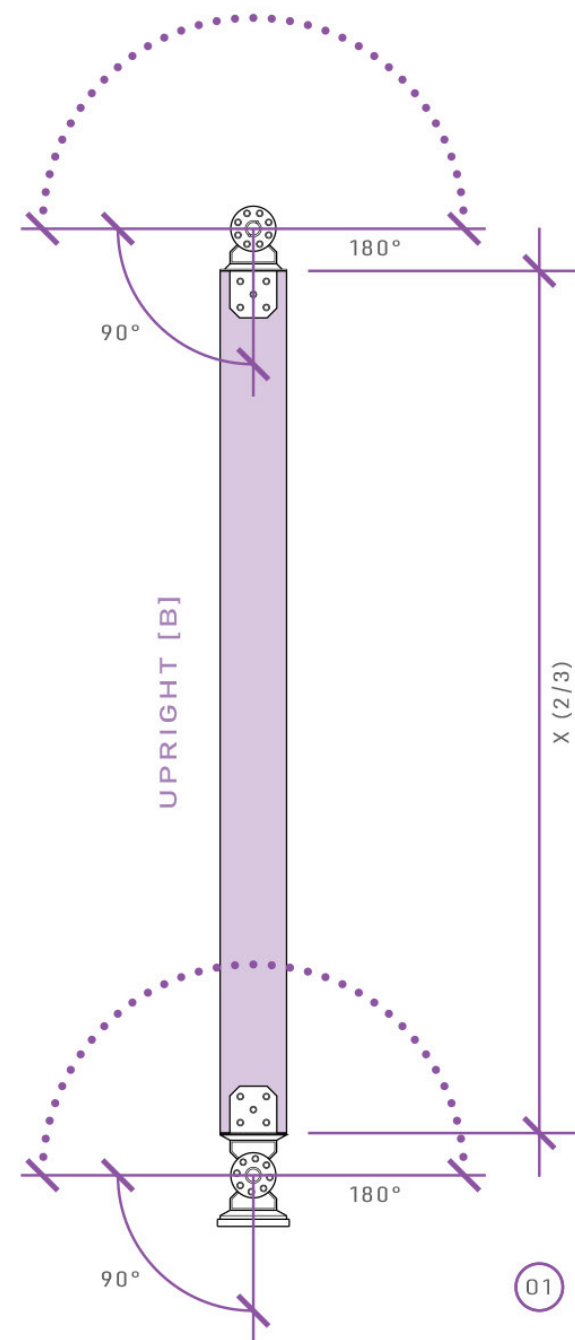
Basemount

Parameters



01 **Wall Parameters**
Wall A and Wall B are the starting uprights from the foundation ground-screws. The ratios shown are maintained for all variations of cabins.

02 **Foundation Parameters**
Shown in plan, all cabin ground-screws are mapped by following this technique. Allowing for a simple erection and maintained for all cabin variations.

**Construction:**

Keeping a simple construction in mind, each variation of the Wind-Winder maintains the exact ratio along its upright lengths. Wall [A] being X , and Wall [B] being $[X (2/3)]$. Allowing for a simple erection at the start of construction, while still being dynamic and versatile for wind harnessing. Also Demonstrated is the Component 01.0 ability of motion, both with the 5-hole timber mount and the 4-hole flat-mount at grade.

Maintaining a simple construction, all Wind Winder Cabin foundations can easily be mapped by marking a stake in the ground and drawing a tensioned line from it, followed by some simple calculations.

DIAGRAM 02.0:
Method 02

FUNCTIONS

- 01 Suction Vent
Responsible leeward suction,
allowing the air to circulate
throughout.
- 02 Ridge Wind Guide
Guiding the incoming wind
towards the leeward suction
vents.
- 03 Wind Splitter
Splitting the incoming wind
into two paths, creating pos-
itive and negative pressure.

- 04 Vented Floorboards
Allowing the wind to pass
through the structure,
circulating air.
- 05 Spillover Vent
Optional vent that can
increase or decrease air
circulation.
- 06 Upright [A]
- 07 Upright [B]

