INTERDISCIPLINARY STUDIO
PAVILION [ISP] 2019

FABRICATION MANUAL
FOR KALEÍDOSCOPE

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**MATERIALS**

Possible Sources:
- B&B steel - Aluminum Tubing
- The Home Depot - Fasteners, Polycarbonate
- McMaster Carr - Rail Systems

### IPD Material List

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Weight (LBS/Unit)</th>
<th>Unit Price</th>
<th>Total Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>2X2 Aluminum Tube (.125 wall)</td>
<td>1875</td>
<td>LF</td>
<td>1.091</td>
<td>$5.00</td>
<td>$9,375.00</td>
</tr>
<tr>
<td>Poly Carbonate Sheathing Lexan UV Resistant 46” x 96” x 0.125</td>
<td>1494</td>
<td>SF</td>
<td>1.25</td>
<td>$5.82</td>
<td>$8,695.08</td>
</tr>
<tr>
<td>.125 Aluminum Plate</td>
<td>100</td>
<td>SF</td>
<td>1.746</td>
<td>$6.05</td>
<td>$605.00</td>
</tr>
<tr>
<td>#12 x 1 in. Flange Hex Head Hex Drive Self-Drilling Screw with Neoprene</td>
<td>30</td>
<td>Box</td>
<td>1</td>
<td>$10.57</td>
<td>$317.10</td>
</tr>
<tr>
<td>Washer 1 lb. Box (80-Pack)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5/16 in.-18 x 3-1/2 in. Zinc Plated Hex Bolt</td>
<td>96</td>
<td>Ea</td>
<td>N/A</td>
<td>$0.47</td>
<td>$45.12</td>
</tr>
<tr>
<td>5/16 in. Zinc Flat Washer</td>
<td>192</td>
<td>Ea</td>
<td>N/A</td>
<td>$0.14</td>
<td>$26.88</td>
</tr>
<tr>
<td>5/16 in.-18 Zinc Plated Hex Nut</td>
<td>96</td>
<td>Ea</td>
<td>N/A</td>
<td>$0.13</td>
<td>$12.48</td>
</tr>
<tr>
<td>Hanger, Door, Track Wheels</td>
<td>6</td>
<td>Ea</td>
<td>N/A</td>
<td>$14.52</td>
<td>$87.12</td>
</tr>
<tr>
<td>Steel Track, Box Rail C-Channel 12ft</td>
<td>3</td>
<td>Ea</td>
<td>N/A</td>
<td>$74.42</td>
<td>$223.26</td>
</tr>
</tbody>
</table>

Total Weight (lbs) = 4117.725  Total Price = $19,387.04

Total Man Hours - 3 Working on the fabrication of this project should amount to
FABRICATION EQUIPMENT

—MITER SAW—
Note: aluminum tubing can be cut with a standard wood saw blade

—DRILL PRESS—
Note: more precise than a hand drill. This is helpful for framing connections.

—WELDER—
Note: welding aluminum requires more skill than welding steel

—IMPACT DRIVER—
Note: aside from securing polycarbonate panels, impact driver can be used to drill holes.
For all Framing and Truss fabrication:
Total Man Hours (3) persons should be about 26 hours.

Note: This structure is designed with repeatable systems. Broken into 3 main systems; The Frame/Truss System, Main Panel System, and Sliding Door System.

Note: Follow along to next pages for more details.
FRAMING AND TRUSS CONT.

Step 1. Use the Dimensions and Angles on page 5 to help with fabrication.

Step 2. Cut Aluminum with Miter Saw to replicate shape and size of the truss. Be sure to cut the connection point of the truss at a 30 degree Miter.

Step 3. Weld all mitered cut together to form Truss.

Step 4. Cut Aluminum with Miter Saw to replicate shape and size of the Triangle Truss.

Step 5. Weld all mitered cut together to form Truss.

Step 6. Repeat Steps 1-3, until six truss legs have been fabricated.

Note: For more detail reference Page 17-18.
For all Main Panel Fabrication:
Total Man Hours (3) persons should be about 60 hours.
MAIN PANEL CONT.

**Step 1.** Use the Dimensions and Angles on page 7 to help with fabrication.

**Step 2.** Cut Aluminum with Miter Saw to replicate shape and size of the Panel.

**Step 3.** Weld all mitered cut together to form Truss.

**Step 4.** Apply Polycarbonate sheathing using #12 x 1" Self Tapping Screws.

Note: For obtuse angles, use the formula to find the miter cut angle.

\[
\frac{180 \text{ degree} - \text{(the obtuse angle)}}{2} = \text{Miter Cut on Saw}
\]
Step 5. Repeat Steps 1-4 for all panel pieces.
MAIN PANEL CONT.
Step 6. Once an entire main panel has been fabricated. Repeat the process 2 more times so that you have (3) main panels in total.
125 Thick Aluminum Flat Plate on both sides.
For all Sliding Door Panel Fabrication:
Total Man Hours (3) persons should be about 45 hours.

Note:
Sliding Door is Symmetrical

Plate Angle is same as truss
See page 5 for Plate Angle
SLIDING DOOR PANEL CONT.

**Step 1.** Use the Dimensions and Angles on page 13 to help with fabrication.

**Step 2.** Cut Aluminum with Miter Saw to replicate shape and size of the Panel.

**Step 3.** Weld all mitered cuts together to form panel pieces.

**Step 4.** Apply Polycarbonate sheathing using #12 x 1" Self Tapping Screws.

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Note:
Sliding Door is Symmetrical

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Plate Angle is same as truss
Step 5. Once an entire Sliding Door Panel has been fabricated. Repeat the process 2 more time so that you have (3) Sliding Door Panels in total.
For the rail system, it will take some testing: Total Man Hours (3) persons should be about 10 hours.
Note: While fabricating the angled plates for the truss connections, this would be a good time to also fabricate the angled plates for the panels. (See Page 5 & 12)

The shape of the truss angled plates that connect to the triangle are shaped as so.
The owl utilizes layers and angles to achieve silent hunting through multiple avenues. One of their most used functions is the swoop to capture prey. They are able to achieve this by approaching the prey at a steep angle to help dampen the aerodynamic sound created by the movement. The steep angle allows for airflow to travel down the owl’s wings and break into smaller microflows which brings you to the sound dampening. The microflows are achieved by the wind traveling along the wing and then splitting by the grooves in the fringe that hangs along the wing. This creation of microflows allows for the owl to have a higher precision flight pattern and silent travel. Another function of the owl would be the funneling effect that the feathers along their eyes achieve. The near flat laying of feathers around the eyes allow for funneling of sound to the ears of the owl, heightening their ability to hear and locate prey.

How owl feathers allow sound dampening/funneling with the help of wind

The three-dimensional shape of serrations at barn owl wings: towards a typical natural serration as a role model for biomimetic applications. Journal of Anatomy, April 21, 2011. Thomas Bachmann, Hermann Wagner

Frays in the feathers allow for small micro-flows to occur along the wing in sharp angles.

1. Wind Turbines
Owls have flexible and porous feathers along the trailing edge of the wing that appear to mute the sound of airflow off the back of the wing, the same place where much of an aircraft’s noise is generated. Models have suggested that a flexible and porous trailing edge made of Mylar could reduce the roar off an aircraft’s wing tenfold.

2. Airplanes
Owls have flexible and porous feathers along the trailing edge of the wing that appear to mute the sound of airflow off the back of the wing, the same place where much of an aircraft’s noise is generated. Models have suggested that a flexible and porous trailing edge made of Mylar could reduce the roar off an aircraft’s wing tenfold.

3. Submarines
The barbed fibers of an owl’s down interlock with other feathers, creating a dampening buffer between the rough surface and the air flowing over it.

Recommended Spacing for self tapping screws, no more that 12" OC

POLYCARBONATE SHEATHING
TRANSPORTATION

Note: Each Panel and Truss has broken into repeatable parts in order to fit into a standard size box truck with the dimensions seen above.
**SAFETY AND SECURITY**

**Warning!** During all fabrication and while you are on the premises of the CAED Support Shop you are required to wear the necessary personal protection equipment.