A TRIBUTE TO EERO SAARINEN AND
THE NORTH CHRISTIAN CHURCH
MIT CHAPEL INSPIRATION
“I have always remembered one night on my travels as a student when I sat in a mountain village in Sparta. There was bright moonlight overhead and there was a soft, hushed secondary light around the horizon. That sort of bilateral lighting seemed best to achieve this other-worldly sense.”

- Eero Saarinen
ORGANIC + CALCULATED

Design Approach of Eero Saarinen
NORTH CHRISTIAN CHURCH INSPIRATION
“As one enters the light also changes, a changing environment, like a decompression chamber from the outside world.”

- Eero Saarinen
COMPRESSION + EXPANSION

Design Approach of Eero Saarinen
“...a building grows from its site.”

- Eero Saarinen
SITE ANALYSIS
CIRCULATION: OFFSITE APPROACH

.25 mile radius for likely pedestrian traffic

- Primary entrance
- Secondary entrance
- Vehicular traffic

Traffic generators:
1. 4-way intersection of Washington St. and N National Rd.
2. 4-way intersection of N National Rd. and Home Ave.
3. 4-way intersection of Home Ave. and 27th St.
4. Traffic from downtown Columbus
INSTALLATION LOCATION
INSTALLATION
INSTALLATION: EAST ENTRY ELEVATION
INSTALLATION : NORTH ELEVATION
INSTALLATION : WEST SECTION
INSTALLATION : LAYERS
INSTALLATION: BUILDING BLOCKS

1. UNIT

2. BLOCK

3. STACK

4. TRANSLATION
INSTALLATION : ASSEMBLY

TEMPLATE → CONNECTIONS → UNIT

- Folds
- Tabs
- 6mm connections
- 27" dimension
INSTALLATION : MATERIAL

CORRUGATED PLASTIC

- TRANSLUCENT
- 6mm THICK
- 48” x 96” FORMAT
- RECYCLABLE
- UV INHIBITOR
- WATERPROOF
- STRENGTH IN FOLDS AND LAYERS
## Installation: Budget

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PRICE</th>
<th>QUANTITY</th>
<th>ESTIMATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrugated Plastic Sheet 6mm</td>
<td>$1.2 per sheet</td>
<td>583 sheets</td>
<td>$7,000</td>
</tr>
<tr>
<td>Plastic Screws and Bolts</td>
<td>$0.12 per piece</td>
<td>16,000 pieces</td>
<td>$2,000</td>
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<tr>
<td>Vinyl Stickers</td>
<td>$10 per sticker</td>
<td>15 stickers</td>
<td>$150</td>
</tr>
</tbody>
</table>

**Estimated Total:** $9,150

**Budget:** $10,000
The figure above shows the optimized solutions for two conditions: Maximum bulk modulus and maximum shear modulus. Bulk modulus gives us an idea about how resistant to compression the structure is. The Shear Modulus gives us the likelihood of deformation when subjected to a shearing force.
These structures were obtained using separate optimization codes in MATLAB.

The results show that the outer edges of the structure should be solidified for sustaining the side loads. However, a more rigid design would require a solid base to support the structure against its own weight.

Fabrication:
1. The structure will consist of 756 bisymmetric hendecahedrons.
2. Each of the hendecahedron units shall be manufactured and then bolted remotely and the fabricated structure shall be shifted to the installation venue for final installation.
3. Since the objective is to have minimum compliance for the structure, the base elements used can be made solid.

Assembly:
1. To obtain a rigid installation after assembly, following possible alternatives are suggested: Add supports to base layer of units or solidify base units.
2. The hendecahedrons can be bolted using plastic/metal bolts. They can also be glued using an adhesive provided the material withstands the wind loads.
3. If necessary, supporting structures can be used at the outer edges of the structure in order to improve the load sustaining capacity.
Installation Form Material: Corrugated Plastic (Polypropylene)

1. Mechanical Properties (considering sheet of 6mm)
   - Unit weight = 1400 g/m^2
   - Flat crush resistance = 230 lb/in^2
   - Tensile strength = 38 MPA
   - Young’s modulus = 1250 MPA
   - Elongation at break (50mm/min) = 800%

2. Physical Properties
   - Water absorption = 0.03% in 24 hours
   - Melting temperature = 165 degree Celsius
   - Vicat softening point = 78-148 degree Celsius

Results

1. Deformation:
   - The maximum and minimum values for deformation were found to be -
     Max = 0.406 m
     Min = 0.005 m

2. Von Mises Stress:
   - Max = 5.52e6 Pa
   - Min = 4.614e6 Pa

Solutions

1. Brace layer 6 and up from interior
2. Create more rigid form to eliminate stress
EXPERIENCE
“...the congregation should have a positive feeling of being within the church, in a special, enclosed spiritual world.”

- Eero Saarinen
We would like to ask the remaining Disciples of Christ to write a sentence or two describing what the North Christian Church means to them.

Using vinyl stickers, we will put these responses on the red units within our installation.
INSTALLATION DESIGN BY:

Amy Cunningham
Anna Mui

STRUCTURAL ANALYSIS BY:

Atish Dahitule
Neeraj Jat
Shashank Alai
Shalem Shelke