



2016 NAU ASCE CONCRETE CANOE

POLARIS

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Polaris

Inspired by Flagstaff

- First International Dark Sky City

Goal: Collaboration

- Open and fluid communication
- Collective decisions



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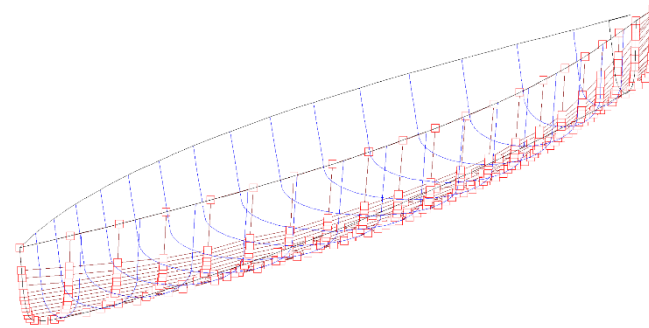
Hull Design & Structural Analysis

Hull Design

- Maximum Length: 21 ft
- Maximum Width: 27 in
- Rocker: Bow – 5 in, Stern – 3 in

Structural Analysis

- Hull Capacity: 1715.9 psi
- Transverse maximum moment: 266.4 lb/in
- Longitudinal maximum moment: 4593.8 lb/in



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Concrete Mix Design

Concrete Constituents (% volume)

- EkkoMaxx Fly Ash: 21.2%
- Poraver (0.5-1mm): 36.0%
- 3M Glass Bubbles (K20 & S32): 23.7%
- BASF Black Liquid Pigment: 2.9%
- MB AE 90 Air Entrainer: 0.1%
- Water: 10.5% (+4% additional)

Table I: Structural Mix Properties

Plastic/ Dry Unit Weight	66.1/ 59 pcf
28-day Compressive Strength	1950 psi
28-day Tensile Strength	190 psi
28-day Flexural Strength	1230 psi

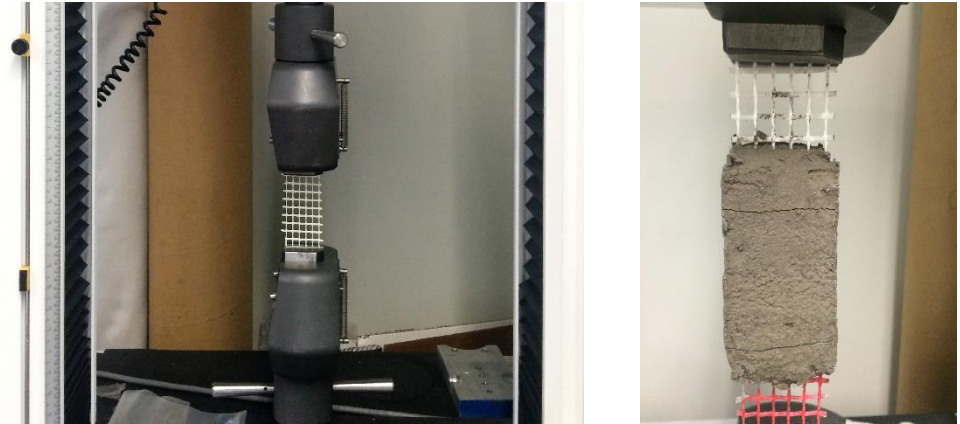


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Reinforcement and Post-Tensioning

Reinforcement

- SpiderLath Fiberglass Mesh
 - Strength: 756 lb
 - Elongation: 0.25 in
 - Overlap: 4 in
- $\frac{3}{4}$ in BASF MasterFiber M 100 Fibers



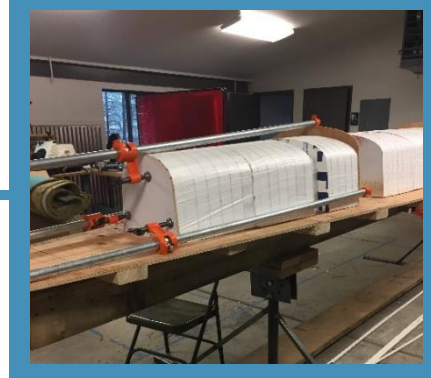
Post-Tensioning

- Reduces large cracking
- Total axial compression: 342 lbs
 - 6 – Galvanized steel cables w/ 57 lbs in each



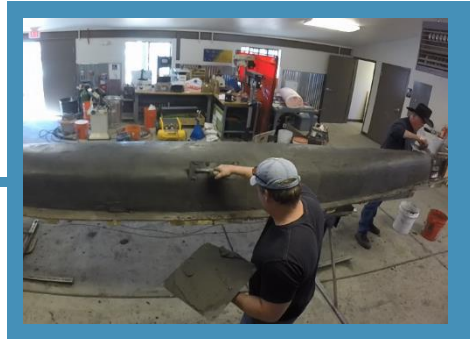
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Mold Construction



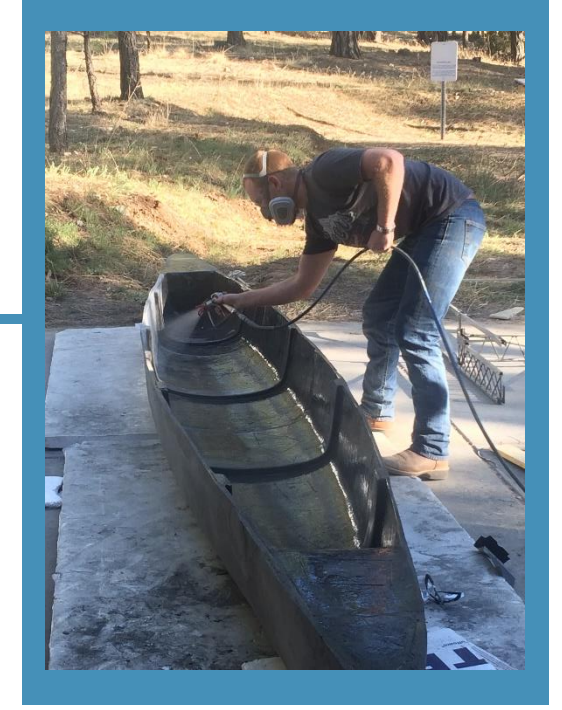
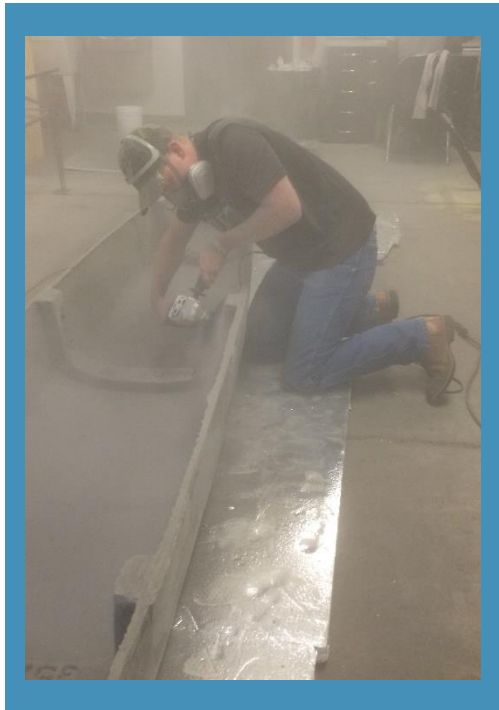
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Canoe Pour and Curing



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Finishing and Aesthetics



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Thank You

