

NAU ASCE CONCRETE CANOE 2026

PLUTO JACKS — Design A | Northern Arizona University

NAU CHAPTER PROFILE

Northern Arizona University ASCE Student Chapter, Flagstaff AZ.
Active in regional and national competitions. Committed to
sustainable infrastructure and hands-on engineering education.

PROTOTYPE SPECIFICATIONS

DIMENSIONS

Length	192" (16.0 ft)
Beam	32" (2.67 ft)
Depth	17" (1.42 ft)
Wall Thickness	0.5"

WEIGHT

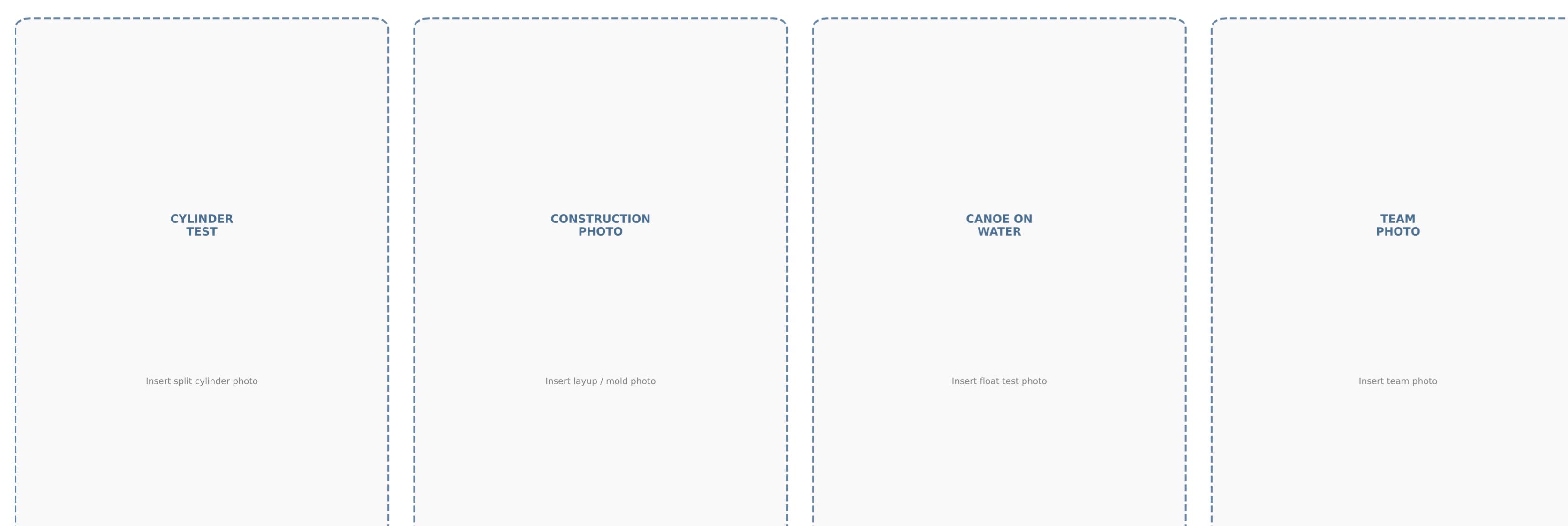
Total	174.3 lbs
Shell	163.1 lbs
PVA Mesh	8.2 lbs
Finish	3.0 lbs

STRUCTURAL

Flexural	1,500 psi
Compressive	2,000 psi
Safety Factor	2.30
Reinforcement	PVA 42% POA

ASCE COMPLIANCE

Requirement	Actual	Required	Status
Freeboard	11.4"	$\geq 6.0"$	✓ PASS
Metacentric Height	8.68"	$\geq 6.0"$	✓ PASS
Safety Factor	2.30	≥ 2.0	✓ PASS
Canoe Weight	174.3 lb	≤ 237 lb	✓ PASS
Cement Ratio	0.35	≤ 0.40	✓ PASS
Reinforcement POA	42%	$\geq 40\%$	✓ PASS



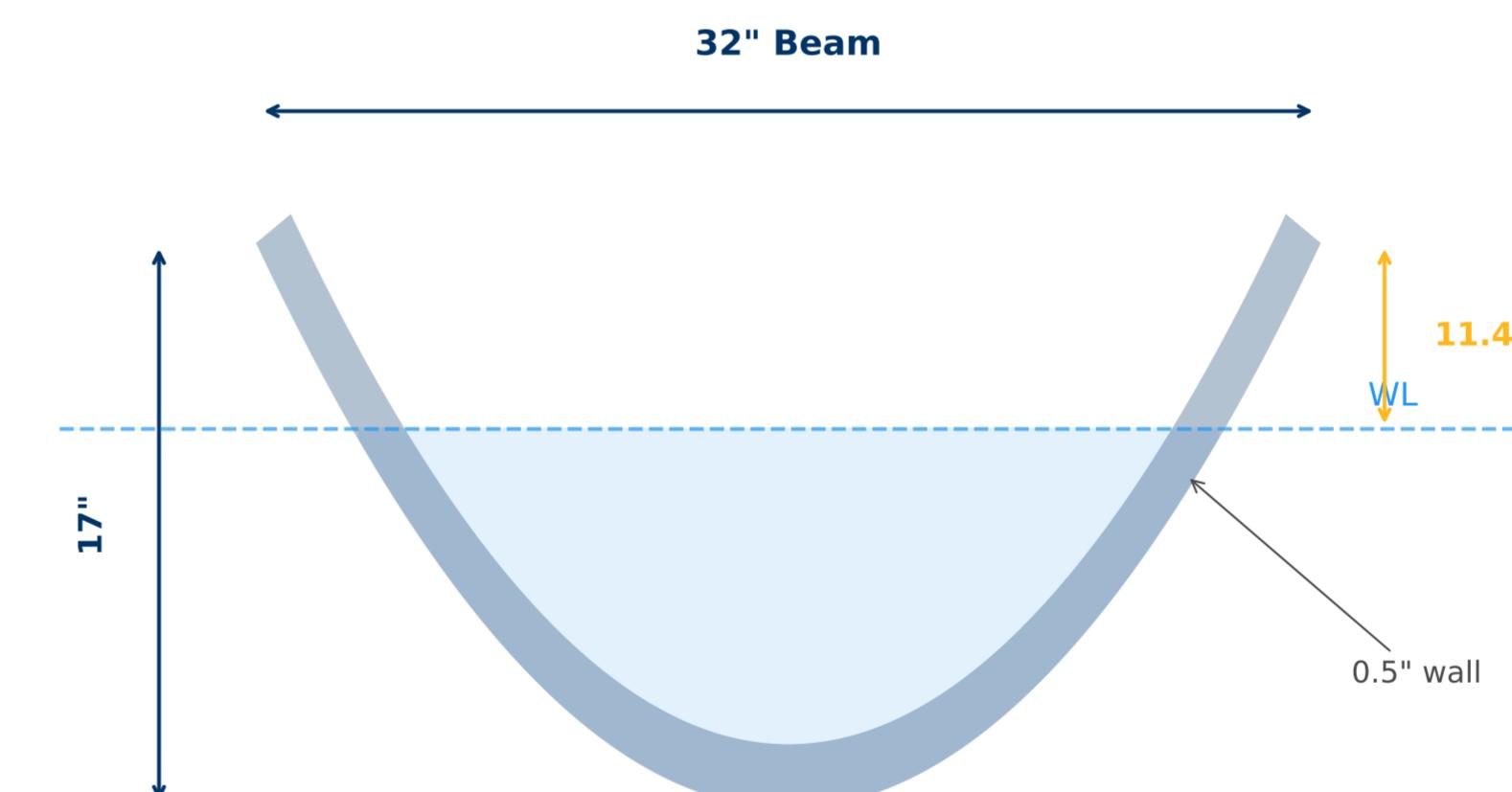
INNOVATIVE FEATURES

- Lightweight concrete with Poraver expanded glass aggregate
- Computational hull optimization exploring 3 candidate designs
- AI-assisted structural analysis and verification
- CO₂-cured mix design for improved sustainability
- PVA fiber mesh reinforcement (42% POA)

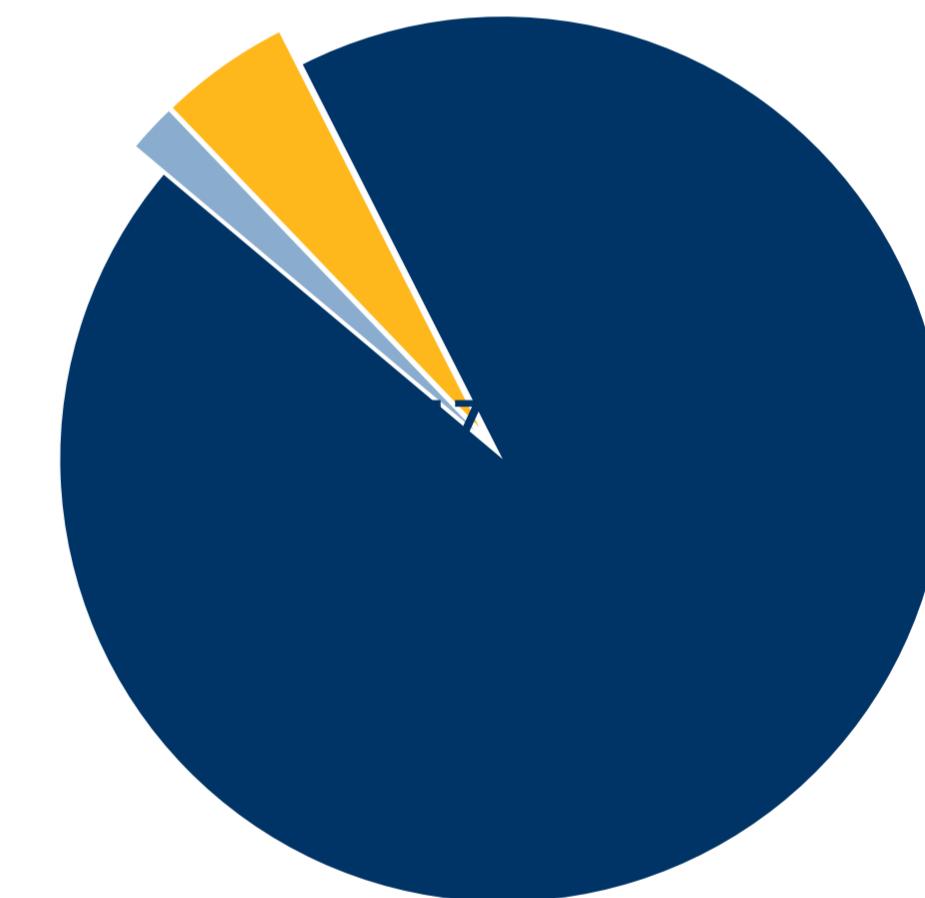
MIX DESIGN SPECIFICATIONS

Wet Density	~80 PCF
Oven-Dried Density	60 PCF
Slump	4 - 6 in.
Air Content	8 - 12%
Compressive Strength	2,000 psi
Flexural Strength	1,500 psi

Hull Cross-Section



Weight Breakdown



Concrete Shell — 93.6% (163.1 lbs)
Reinforcement (PVA) — 4.7% (8.2 lbs)
Finish / Sealant — 1.7% (3.0 lbs)