



## Alaska Applied Sciences, Inc. (AASI) 2009-10 RD&D

www.AlaskaAppliedSciences.com/thin-shell-concrete-structures

Juneau, Alaska Box 20993, 99802 Bill Leighty, Principal wleighty@earthlink.net

### Thin-shell Concrete Quasi-spherical Buildings: Structural, Thermal, and HVAC Analyses

#### Company Summary

Founded 1990. Bill Leighty, Principal. 25 years small 13-turbine Palm Springs windplant design, maintenance, operation. Energy consulting. 15 years, coauthor for nonprofits, research papers on renewable energy-to-H2 and to -NH3 lower-cost alternatives to electricity systems for RE transmission, storage, integration. Thin-shell concrete 2009-2025. Completed DOE RD&D contract in 2005: DE-FG36-03GO13140 Final: www.osti.gov/servlets/purl/859303-oXetpM/

#### Problem Statement

Worldwide and Alaska need durable, low-cost, low-Earth-impact structures, with low embodied and O&M energy, favoring thin-shell concrete structures. Proof-of-concept now needs NREL "Buildings" expertise to suggest technical & economic paths to commercialization: structural and mech systems and cost analyses to enable building permits, financing, and acceptance by all construction industries.

#### Requested National Lab

NREL

#### Background Information

DE-FG36-03GO13140 FTE employees: 1

#### Potential Work Scope & Deliverables

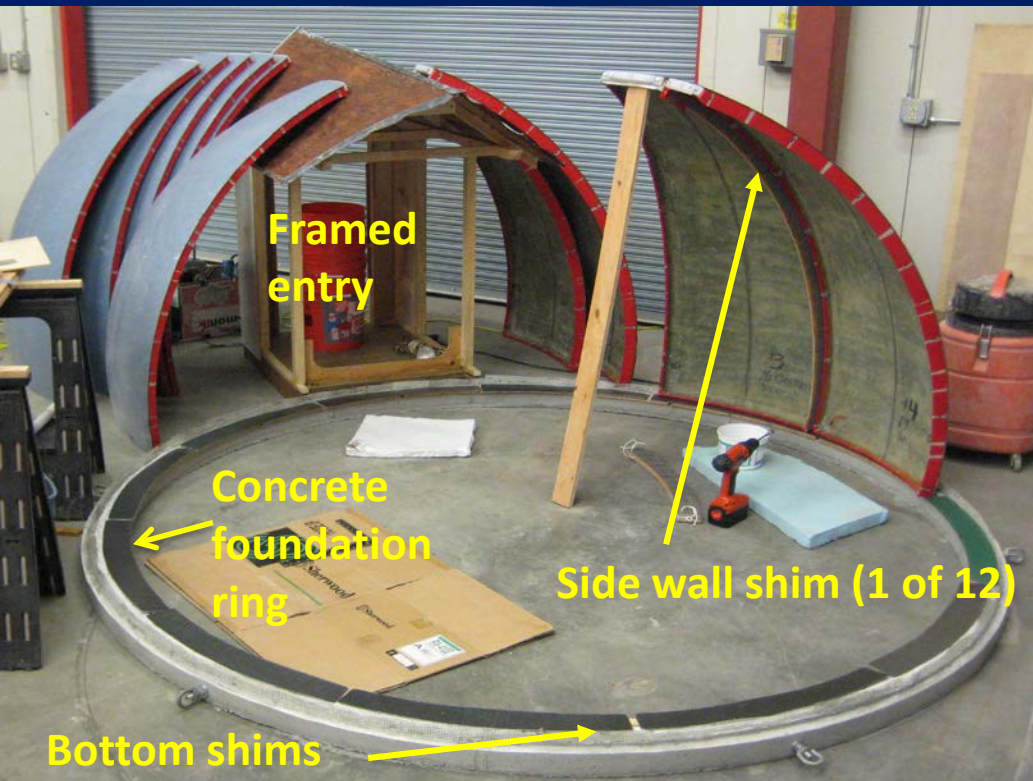
Task 1	<ul style="list-style-type: none"> <li>Structural &amp; mech systems analyses; engineering data, FEA</li> <li>Commercial paths to market, bldg codes, finance, insur</li> </ul>
Task 2	<ul style="list-style-type: none"> <li>Construction costs economic analyses for several levels of mechanical systems integration and finish, at diverse sites</li> <li>Suggest paths to markets: segments; acceptance; finance</li> </ul>

#### Technology / Project Impact

Humanity will need billions of these durable, noncombustible, low-cost, low-Earth-impact, Earth-shelterable, thin-shell (~1-2 cm thick), non-ferrous-reinforced homes and other small buildings to protect us from deadly heat, storm, fire, flood, earthslide, and even seismic dangers from rapid global warming. Millions of us will migrate, retreating underground among our sister species, to safety. This on-site manufacturing plan should deliver a completed "house" per week, per three-person crew; an enclosed, insulated envelope per week, saving lives. We now need \$ 600 K outside investment to scale-up forms sets to human-useful size (~ 6-7 m diam), to prove markets, to proliferate flexible-length house-school-clinic shelters. More engineering and test earns several markets' acceptance for building permits, financing, insurance -- for private sector, military, UN human ty deployments. Profitable biz plans: construction forms sale, rental, or franchise, via training and specialized materials supply; we're now ahead of the growth curve for robust, low-cost structures of minimum embodied and O&M energy; go now.



Scale model, proof-of-concept prototype: 3 m inside diameter; 1 cm thick, non-ferrous



- Fast on-site manufacturing:
- Pour foundation ring
  - Assemble 12 form segments + shims
  - Staple on C-Grid C-fiber epoxy mesh, SS staples
  - Apply rich sand mortar
  - Two-day form removal; 1cm thk concrete enclosed
  - Apply interior 2cm UR foam insulation + plaster
  - Install windows, doors
- Enclosed: interior finish



Apply sand-only mortar upon C-Grid