

Sustainable Northern Shelter Quinhagak

*Promoting and advancing the development of healthy, durable,
and sustainable shelter for Alaskans and other circumpolar people.*



CCHRC established the Sustainable Northern Communities (SNC) program in 2008 to work with willing communities to develop housing designs that are energy efficient, cost-effective to build and maintain, and healthy. Community members guide the design process to ensure the design reflects the people and place, and addresses local challenges. The Quinhagak home design meets the four major housing challenges of the area: material shipping cost, operating cost, moisture mitigation, and wind. It incorporates traditional design elements including the home's circular shape, an "arctic entry;" and a low-profile design to limit exposure to the wind. Construction of a prototype home began in autumn of 2010 and took approximately six weeks to complete.



Community



Quinhagak is a community of just over 700 people located on the Bering Sea, approximately 70 miles south of Bethel.



CCHRC staff worked with villagers to design a prototype home that is tailored to the location and needs of the community.

Testing



CCHRC researchers built a test wall section to determine the feasibility of the design.



The test wall was constructed on-site at the CCHRC facility and used spray foam insulation within a light steel frame.



Spray foam was chosen as an insulation due to its high R-value and low shipping bulk.



The wall was tested for its ability to resist wind-driven rain intrusion, a particular challenge in Quinhagak.

Construction



In Quinhagak, the prototype home was constructed on a gravel pad rather than posts like other homes in the community.



The foundation is made from light steel framing filled with spray foam, and thermally isolated from the ground.



All materials were carefully chosen to maximize strength and insulation value, while minimizing shipping costs.



The home is an octagon shape to prevent snow from drifting and piling up around and on the structure.



The roof is supported by a truss system tied into a truss tension bracket in the center of building.



The walls are off-set using plastic bracing, then filled with foam. The design will prevent heat conduction through the framing.



The roof assembly has spray foam between the trusses. This creates a high level of insulation and a complete thermal barrier from the winter cold.

Facts

- Total cost of construction: \$220,000, including air freight, less than the last low-income home built in the community
- The house used approximately 171 gallons of heating oil in the first year
- Average heating oil consumption in Quinhagak is 600-800 gallons per year (equal square footage)
- Wall insulation is R-40, foundation and roof insulation is R-60
- Uses a traditional home shape to help shed blowing snow and rain
- Built with local labor
- Monitored fuel use, electricity use, and indoor air quality



The prototype home was completed in November 2010. A family moved in in early 2011.

Partners: Native Village of Kwinhagak, Native Village of Kwinhagak Housing Authority, Qanirtuuq Inc., Alaska Housing Finance Corporation, Rural Community Development Consultants, GW Scientific, EE Internet, and Three Star Enterprises LLC.