

Energy Efficient, Healthy Housing for our People

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COLD CLIMATE HOUSING RESEARCH CENTER

CCHRC

Cold Climate Housing Research Center Joined NREL to Expand Mission Impact



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

CCHRC

Research Areas

Building Envelopes &
Materials

Energy & Mechanical
Systems

Social & Economic
Analysis



Demonstration & Deployment



Sustainable Demonstration Homes
Designed for the north, by the north



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NREL at-a-Glance



2,926

Workforce, including

219 postdoctoral researchers
60 graduate students
81 undergraduate students



World-class

facilities, renowned
technology experts

More than
900

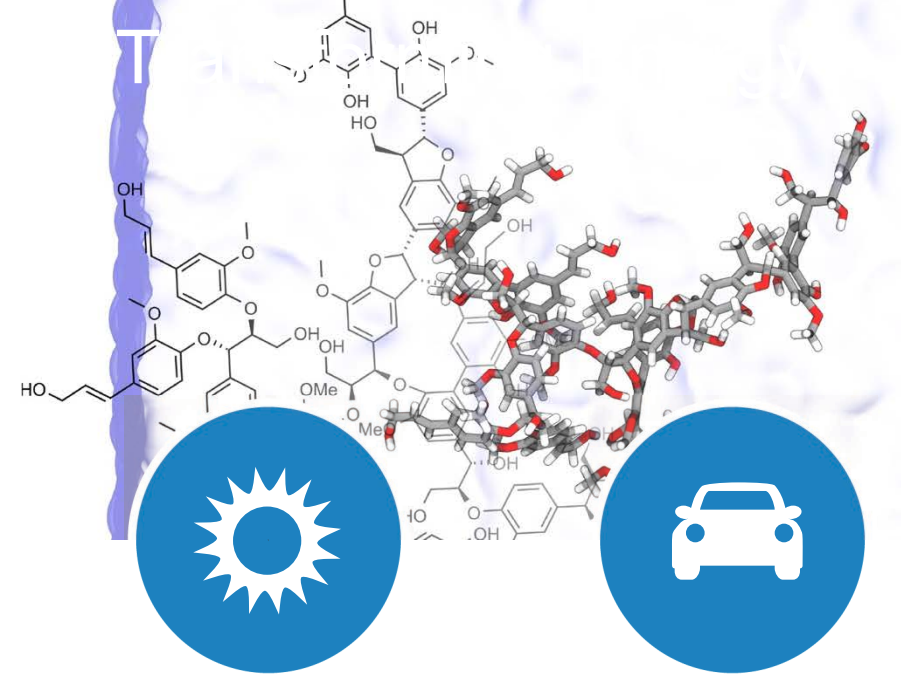
Partnerships

with industry,
academia, and
government



Campus

operates as a
living laboratory

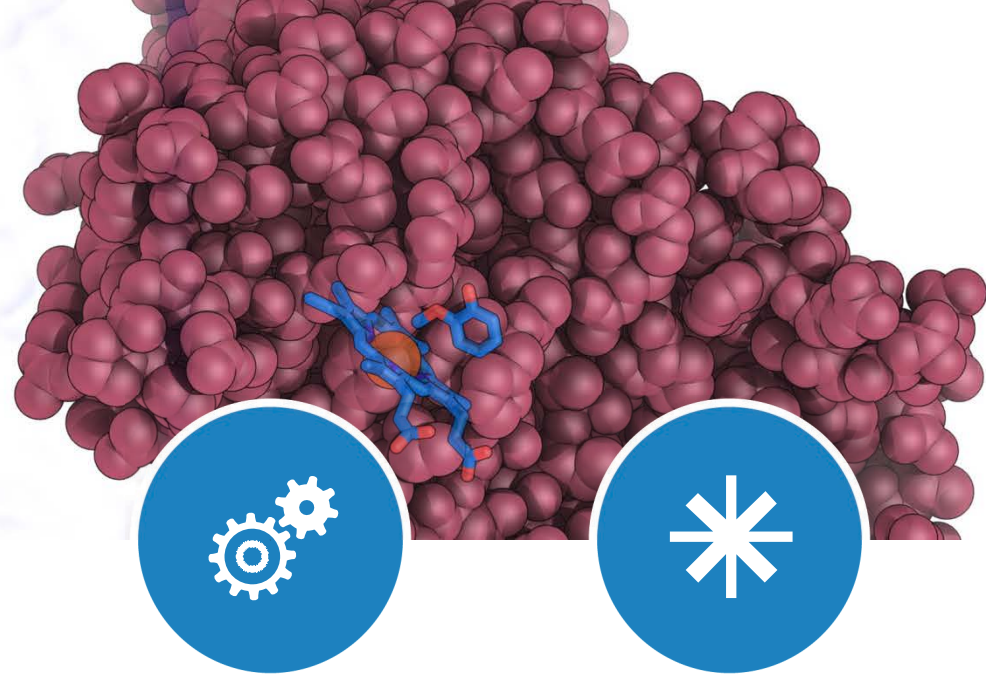


Renewable Power

Solar
Wind
Water
Geothermal

Sustainable Transportation

Bioenergy
Vehicle Technologies
Hydrogen



Energy Efficiency

Buildings
Advanced Manufacturing
Government Energy Management

Energy Systems Integration

Grid Integration
Hybrid Systems
Security and Resilience

Indigenous Wisdom

for our dilemma in time

FIRST NEEDS

- Water
- Food
- Shelter



Archives, University of Alaska, Fairbanks



Indigenous Wisdom for our dilemma in time

RESPONSIBILITY

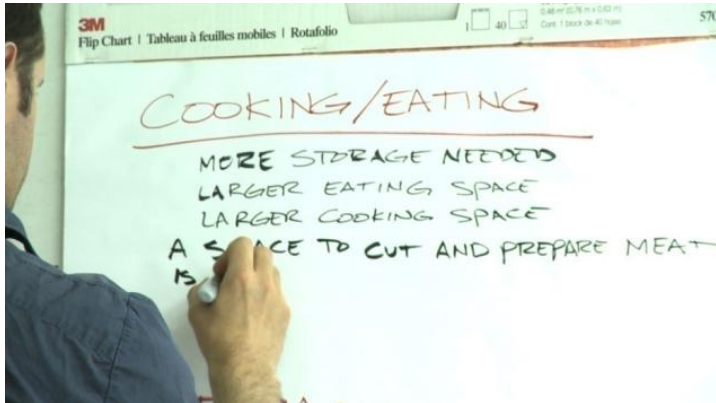


- Sustainability
- Culture
- Community





Indigenous Wisdom



21st Century Technology



Sustainable Northern Communities





The Need

32.5% of the housing stock is considered in need of major repair or falling apart.

74.4 % of households are considered drafty.

21.8% of households are unable to maintain 70° F on cold days in the winter.

37.4% of households reported having mold or mildew in the home.



Fuel oil prices reach as high as \$10/gallon.

55.9% of households have income less than \$20,000.

Arctic is changing, 184 Alaskan communities threatened by erosion

Natural disasters are becoming more frequent



Sustainable Northern Communities

INNOVATIVE COLABORATIVE HOUSING DESIGN

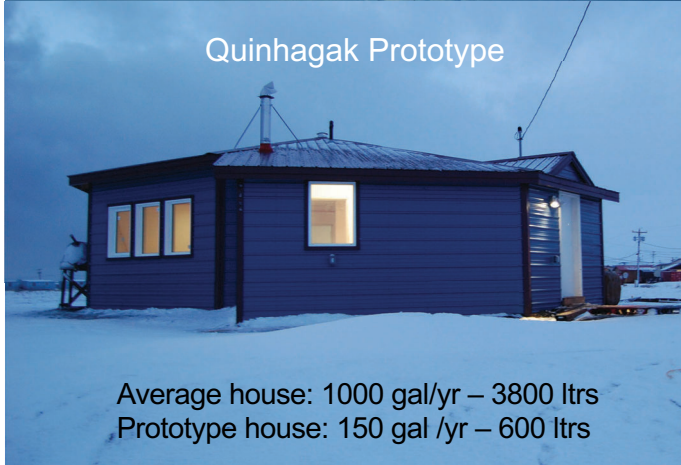
Anaktuvuk Pass Prototype



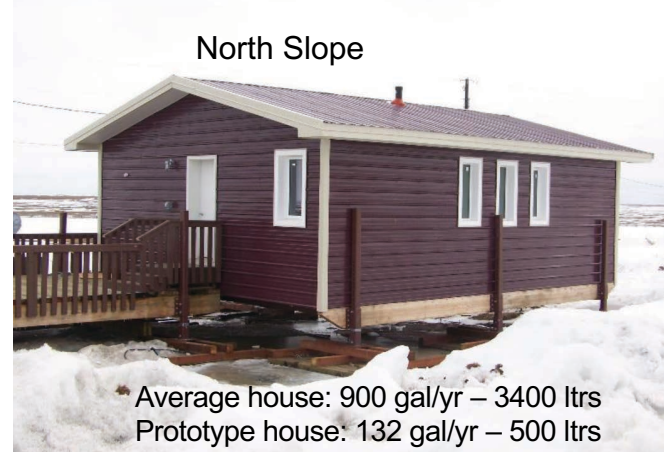
Atmautluak Prototype



Quinhagak Prototype



North Slope



Quinhagak

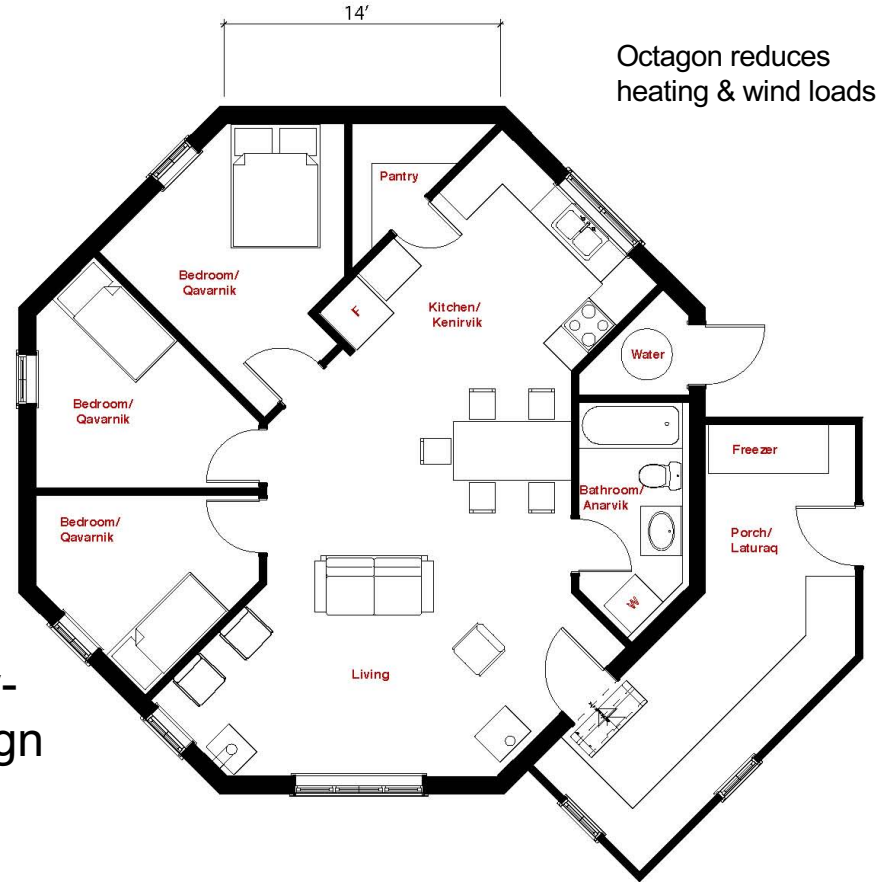
- Wet, windy climate
- 55 homes in structural failure



Quinhagak



Community-
driven design



Quinhagak



R-50 walls,
floor, roof



Constructability

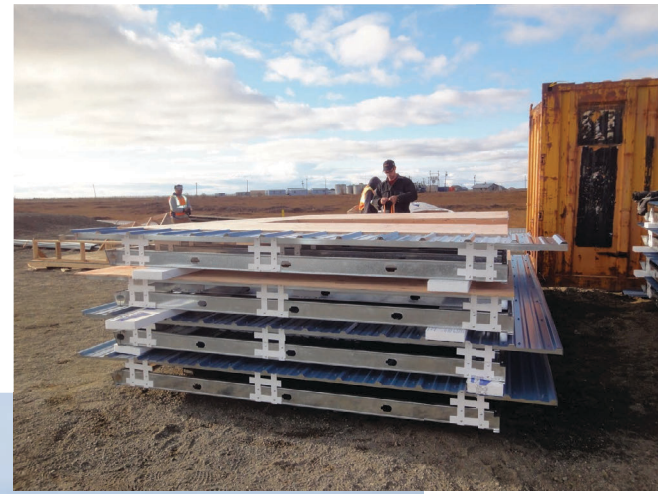


Prefab sections for
speed of assembly





Instruction of Local Workforce





Quinhagak House Performance

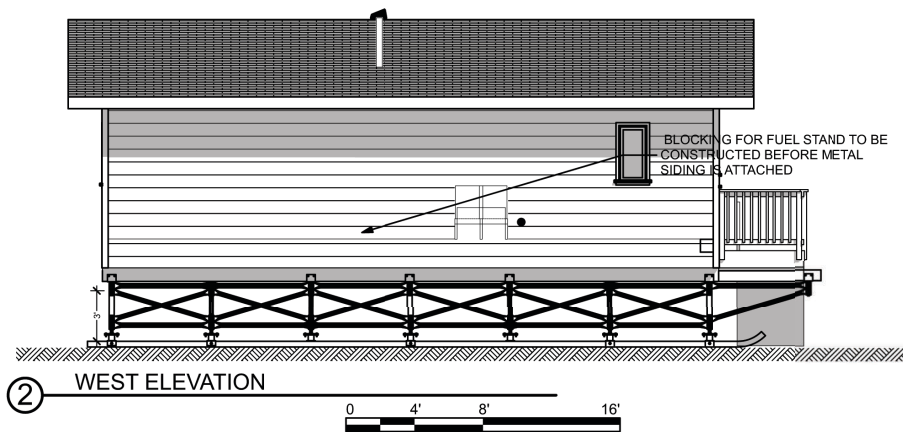
- 130 gal – 500 ltrs fuel oil first winter
- Superior indoor air
- Built in 6 weeks
- Local labor force
- Light materials
- High owner comfort
- Significantly less cost
- Durable



Newtok

Newtok





Newtok

Mertarvik

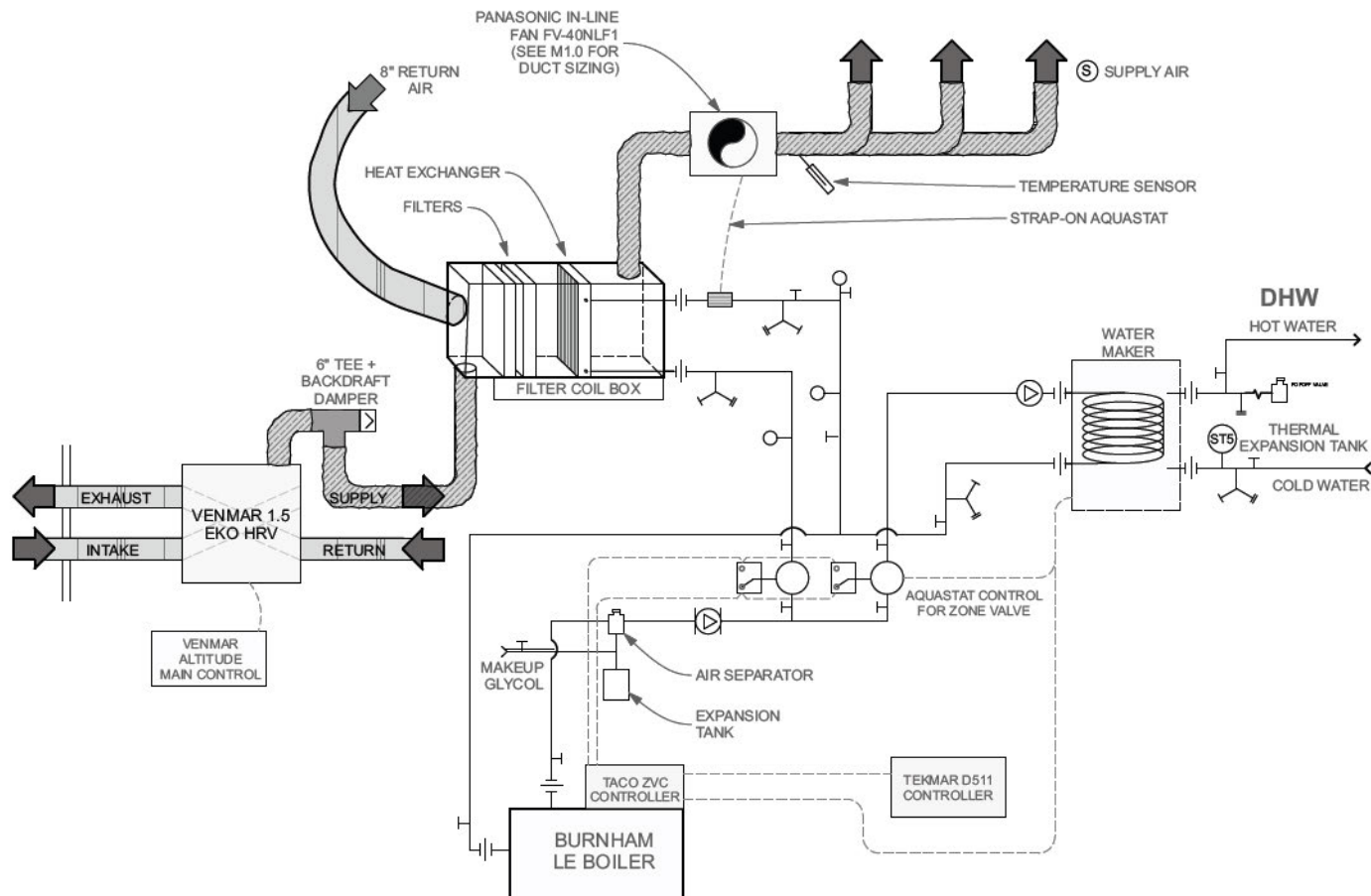




PASS- Portable Alternative Sanitation System



BRHEATHE SYSTEM SCHEMATIC



BrHEAThe- Warm and healthy air



Newtok/ Merktarvik





Merktarvik

Sustainable Northern Communities

A HOLISTIC APPROACH

Only through a holistic approach can we create healthy, thriving, sustainable communities.



Sustainable Northern Communities

A HOLISTIC APPROACH

SECURITY, RESILIENCY, SUSTAINABILITY

Community Engagement – Multi-agency Approach – Economic Development – Phased Prioritized Projects



Shishmaref, Alaska
Photo Credit: Arctic Photo



Kivalina, Alaska
Photo Credit: Flickr



Newtok, Alaska
Photo Credit: NYTimes



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Questions?



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