

**3/17/11  
PRESENTATION  
COLD CLIMATE  
HOUSING  
RESEARCH  
CENTER**

<TARGET><BILL></BILL><SUBJECT>3-17-11 PRESENTATION  
COLD CLIMATE HOUSING RESEARCH  
CENTER</SUBJECT><COMM>HCRA27</COMM></TARGET>



*Research • Innovation • Education*



COLD CLIMATE HOUSING RESEARCH CENTER

**CCHRC**

COLD CLIMATE HOUSING RESEARCH CENTER

CCHRC



# Diverse Challenges





# Alaska Solutions, Global Sustainability

Shelter, food, water, and stewardship of resources are of global concern.

Alaskan rural communities face the challenges of tomorrow, today.

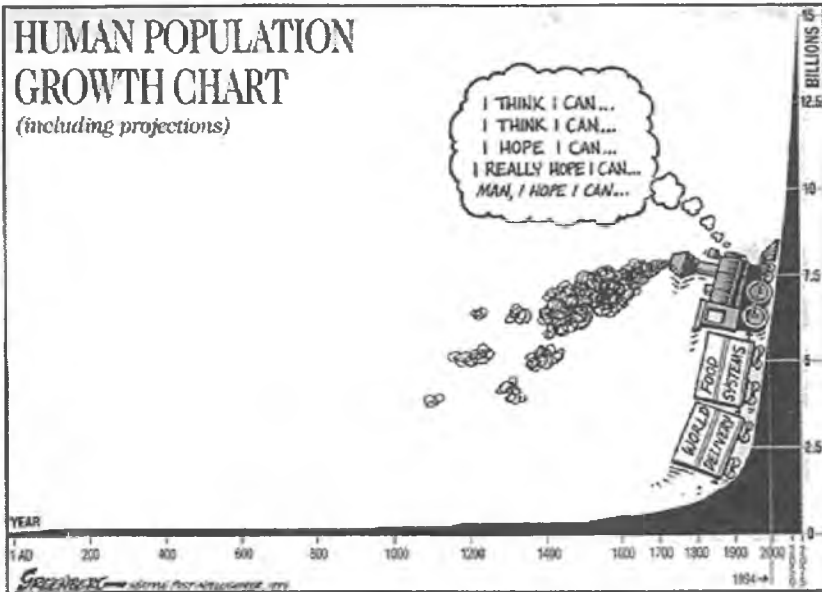
The solutions we apply here can be a model for the rest of the nation and the world.





# Looming Challenges

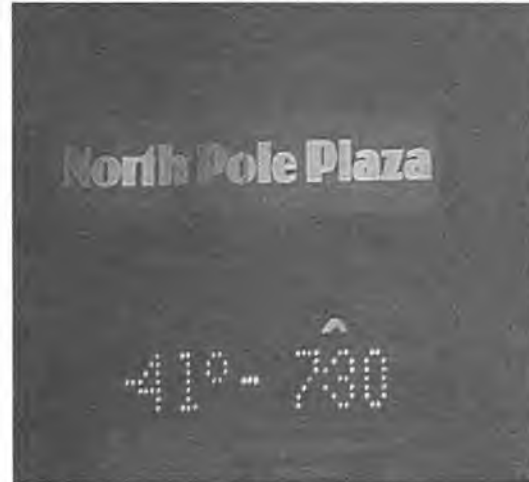
How do we provide food, water, and shelter for a growing population while developing and maintaining the infrastructure on which our society relies?





## CCHRC History

- Nonprofit founded in 1999 by member companies of the Alaska State Home Builders Association.
- Very little original housing research was being done to address Alaskan issues.
- Extreme settings tend to produce extreme consequences.





## CCHRC Company Overview

### Mission:

Promote and advance the development of healthy, durable, and sustainable shelter for Alaskans and other circumpolar people

### At a glance:

- 501(c)(3) nonprofit
- 11 member board of directors plus 6 ex-officio members
- Over 40 active projects
- Currently 18 different funding sources including state, federal, local, and private

Cold Climate Housing Research Center

CCHRC



# CCHRC's Approach



**Ideas**



**Partnerships**



**Projects**



**Results**



**Communication**



**Change**





## CCHRC's Research and Testing Facility

- CCHRC's 15,000 square feet Research and Testing Facility in Fairbanks, Alaska.
- Uses 50% less energy than the average building of the same size.
- Built for less per square foot than comparable buildings.
- Built to the highest LEED standard.
- Over 1,200 sensors throughout the building and ground to measure, temperature, humidity, CO2, soil temperature, and more.
- Built as a demonstration of practical building techniques that are affordable.





## CCHRC: Five Program Areas



- Applied Research and Product Testing
- Policy and Information
- Sustainable Northern Communities
- Hybrid Micro-Energy
- Education and Outreach



## Applied Research

- Certified Alaska Tough Development
- Testing Laboratory Development
- Reflective Insulations Performance in Cold
- Movable Window Insulation
- Passive Refrigeration
- Safe & Effective Ext. Insulation Retrofits
- Anchorage Foundation Insulation Study
- Heating Appliance Survey for Sierra Res.
- Wood Storage Best Practice for Sierra Res.
- Ak Ground Source Heat Pump Assess.
- Masonry Heater Efficiency Study
- Mag. Phosphate Cement Testing and App.
- Foam Moisture Study
- Anaktuvuk Sewage Treat. Plant Monitoring
- Ultra Low Energy House Monitoring





## Applied Research: Exterior Insulation

### Benefits

- Reduces costs for heating
- Reduces condensation potential
- Reduces air leakage

### Considerations

- Rigid foam insulation more expensive material
- Forces the home to be actively ventilated
- Don't forget windows, attic insulation, etc.





## Applied Research: Exterior Insulation

### Competing Concepts

- Exterior insulation acts as a vapor barrier
- Exterior insulation helps keep the wall warm



### Current Questions

- Potential double vapor barrier problems?
- How much exterior insulation do you need?



Cold Climate Housing Research Center

**CCHRC**



# Product Testing





## Product Testing: Building envelope issues

### Reflective Insulation

- Tested various types of reflective insulation to determine any performance attributes of the reflective surface.



### Movable Window Insulation

- Tested shutters, storm windows, rigid insulation, insulated blinds, plastic film.
- Goal of better understanding whether retrofitting or replacing windows is a better choice.





## Policy and Information

- Alaska End-use Energy Efficiency Policy Report
- AkWarm Modernization
- AkWarm Commercial Building Analysis
- 6-Star Green Program Development
- Building Energy Efficiency Standard
- Building Usage Data System (BUDS)
- Integration of Building Usage Data System (IBUDS)
- Rebate and Weatherization Program Evaluation Audit Process Development (PEAP)



### AkWarm

Program Version: 1.03d

**Alaska  
Housing**  
FINANCE CORPORATION

Copyright © 1993-1996, All Rights Reserved





## Policy and Information

### AkWarm

- Alaska developed, Alaska based energy modeling software.
- Used to assess building performance of new construction and retrofits.
- Being modernized to include more products, techniques, and eventually to extend to certain commercial buildings.

### ARIS

- Comprehensive database of information relating to the use of AkWarm.
- Provides valuable feedback regarding performance of energy efficiency applications.
- Will enable the incorporation of additional end use energy information.



## Policy and Information

### Six Star Green

- Would add a 6<sup>th</sup> star to the home rating system.
- Rating would consist of two components: energy analysis using AkWarm and green building analysis using an established standard such as those by ASHRAE, USGBC, or NAHB.
- May involve an incentive structure.

### Energy Policy

- Residential and commercial energy efficiency standards.
- State of Alaska Energy Efficiency Policy Study and Recommendations.
- Periodic Alaska Housing Assessment



## Sustainable Northern Communities

- Atqasuk SNS Home
- Quinhagak Prototype Home
- Point Lay SNS Home
- Metarvik Evacuation Center
- TNHA 6 Community Engage. & Const.
- Native Village of Barrow
- Rural CAP Self Help Project Quinhagak
- Anaktuvuk Pass Home Monitoring
- Quinhagak Prototype Hse Monitoring
- Prototype and Training with Chukchi  
Campus and Community of Buckland
- CCHRC Building Addition
- USKH Koyukuk Flood Evac. Center
- Shaktolik Community Evac. Center
- UAF – Sustain. Village Student Housing
- Ak Native Tribal Health Consort. MOU
- Elder Housing Long-term Care
- General Design and Consulting

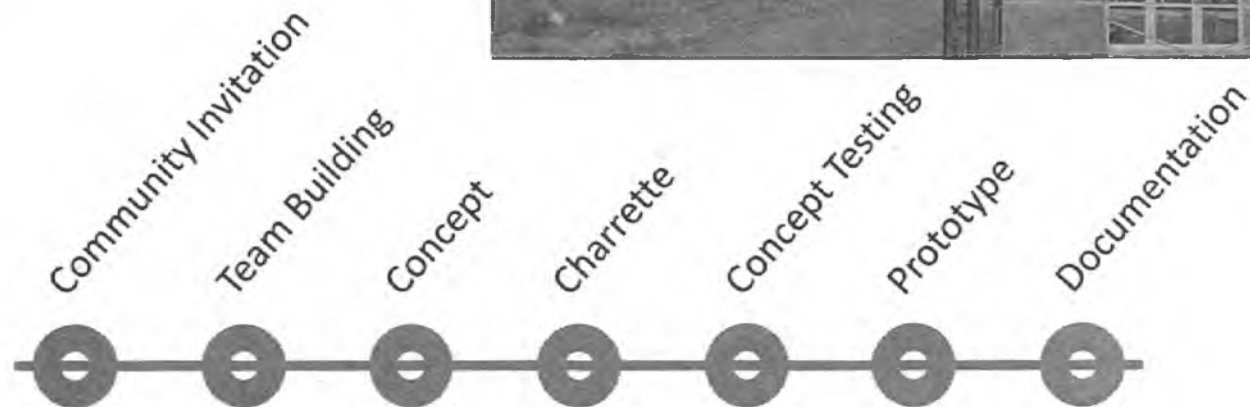




# Sustainable Northern Shelter

Multi-step process involving many stakeholders.

Define and document a housing development process that leads to affordable, durable, healthy, safe, and context-appropriate housing.



COLD CLIMATE HOUSING RESEARCH CENTER

CCHRC



# Learn from Each Other



COLD CLIMATE HOUSING RESEARCH CENTER

CCHRC



# Learn from Land



COLD CLIMATE HOUSING RESEARCH CENTER

CCHRC



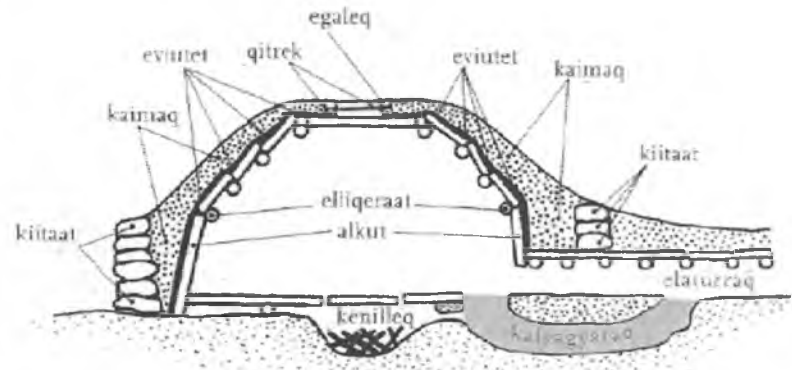
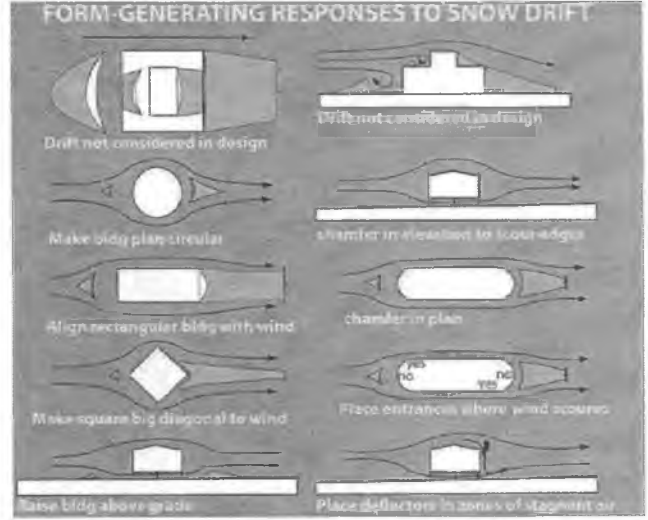
## Learn from Nature



RETAINING heat, not PRODUCING heat, is the most important part of an animal's survival



# Indigenous Wisdom

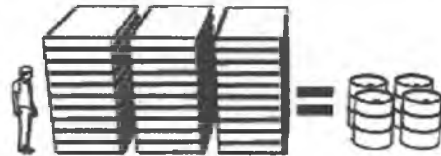


COLD CLIMATE HOUSING RESEARCH CENTER

CCHRC



# 21<sup>st</sup> Century Technology



WARM

COOL

COLD



COLD CLIMATE HOUSING RESEARCH CENTER

CCHRC



# Innovative Combinations





## SNC First Prototype: Anaktuvuk Pass

### Design Challenges

- 16,000 HDD
- No roads, rivers for access
- Electricity \$.60/kWh
- Heating Oil \$8/gallon
- 1,400 gallons/yr.
- Last house built ten years ago.
- Context-appropriate housing.



### Prototype Outcomes

- Completed in four weeks.
- Workforce training.
- Approximately 100 gallons/yr
- Green materials and technologies.
- On-site STP, solar PV and wind.
- Embraced by community.
- Monitoring performance



*"We need housing. Our young people have no place to live."*

George Paneak, Former Mayor of Anaktuvuk Pass



## Hybrid Micro-Energy

- Solar PV, Solar Thermal, and Wood Energy at the RTF
- Ground Source Heat Pump and Solar Thermal at Weller Elementary
- Small Scale Solar PV and Wind with Highly Efficient Demand Load





## Hybrid Micro-Energy Projects: AKP

**Anaktuvuk Pass prototype house energy use is less than 15% of the average house in Anaktuvuk Pass.**

### Energy Efficient Construction

- R-60 wall
- R-60 roof
- R-6.7 windows
- Insulated foundation
- Efficient lights and appliances

### Renewable Energy

- Solar PV array
- Wind turbine
- Efficient wood stove

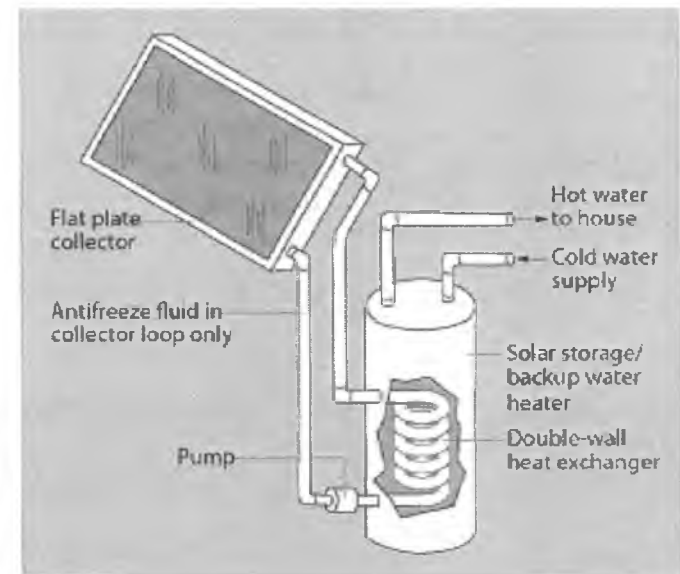
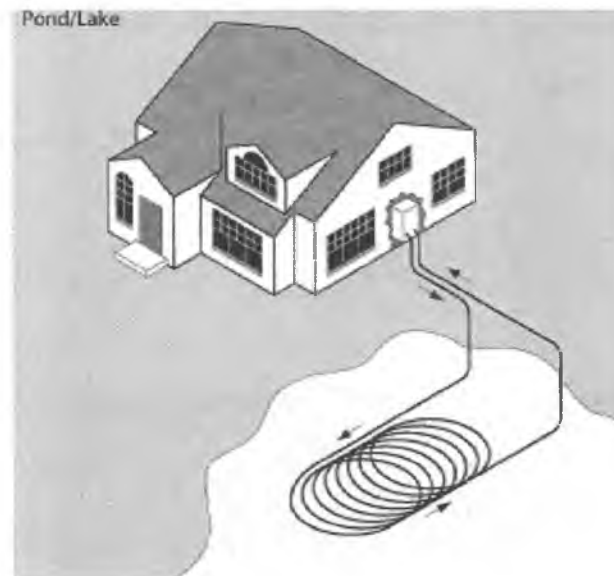




## Hybrid Micro-Energy Projects: GSHP and Solar Thermal

### Solar Thermal and GSHP Combination at Weller School

- GSHP will draw heat from the ground during the winter.
- Solar thermal collector will help recharge the ground temperature during the summer.





## Education and Outreach

- PORTAL on Retrofits Training and Loans
- HRV Education
- Crawl Space Moisture Control and Insulation in Cold Climates
- Permafrost Technology Foundation Library
- Website
- Publications

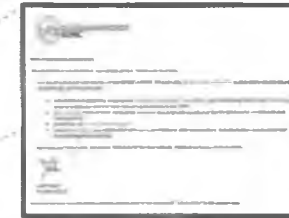




## Education and Outreach

### In the News

- Press conferences
- News stories about CCHRC
- Radio public service announcements
- Magazine and journal articles
- Videos & documentaries



*Monthly  
member  
updates*

### On the Web

- CCHRC website
- PORTAL website
- Sustainable Blog
- YouTube videos
- "ask@cchrc.org"

*Website*



### Education and Outreach

- Educational classes and events
- Conferences
- Consulting with the public **weekly**
- 80-90 building tours **yearly**
- Homeowner resource packets
- Monthly member updates



*Tours*

COLD CLIMATE HOUSING RESEARCH CENTER

CCHRC



## What's on the Horizon?

*"The Sustainable Northern Communities addition to CCHRC's facility in Fairbanks will provide a place for collaborations between agency stakeholders, CCHRC's talented staff and the diverse peoples of Alaska to create and apply adaptive responses that effectively address the daunting challenges Northern communities face from climate, economic and cultural change."*



1000 Fairbanks St.  
Fairbanks, AK 99709  
(907) 457-3454  
[www.cchrc.org](http://www.cchrc.org)

*Research • Innovation • Education*



COLD CLIMATE HOUSING RESEARCH CENTER

**CCHRC**