

# Cold Climate Housing Research Center

## 2010 Annual Report





### Photo Captions

- Left: Admiring Quinhagak Bay
- Top left: Wood moisture research
- Top right: Installing the Quinhagak roof supports
- Bottom: Completed Quinhagak prototype home
- Far right: Working together on the Anaktuvuk Pass prototype home

All photos, unless otherwise noted, were taken by CCHRC staff.



# Message from Jack Hébert President/CEO

Dear CCHRC members and supporters:

I am pleased to present the 2010 Cold Climate Housing Research Center (CCHRC) annual report. After reading the report, I think you will agree that CCHRC continues to expand productivity while maintaining our mission of “promoting and advancing the development of healthy, durable, and sustainable shelter for Alaskans and other circumpolar people.” Global challenges, including increasing population, diminishing resources, economic instability, and changes in our natural environment are significant and daunting. We have a responsibility to address these challenges and contribute positively to a sustainable future for the planet. This will not be possible without a shared commitment to find and apply solutions. An inclusive and deliberate approach is critical. The collective wisdom of a diverse group will be our greatest tool for change and innovation. All of us at CCHRC share with you the conviction that together we can make significant progress toward ensuring a bright future for following generations. This organization is a contributor to the synergy that is developing to literally “change the world.” Solutions and innovation not yet imagined can happen if we share the conviction that the human spirit can guide us as we accomplish great things that lead to positive change. It is a time of opportunity. It is a time for partnership and collaboration across cultures, political affiliations, agencies, and regions in the great circumpolar North. It is the only way success can be achieved.

I am proud of our small but remarkable team at CCHRC. I am inspired by them, our members, and our many partners and look forward to working with all of you in this new decade.





## Message from Alan Wilson Chairman of the Board 2009-2010

This past year at CCHRC, the Board of Directors has focused on working with our partners to address the many challenges of building in Alaska while simultaneously strengthening the long-term stability of the organization. The Board began working with staff this summer to develop a strategic plan for the next five years, building on the goals set by the organization in 2005. The new plan will help CCHRC staff continue to focus on the mission of the organization, which is so essential to the future of residential home building in the North.

To accomplish the goals laid out in the plan, CCHRC will continue to grow its partnerships, diversify funding, foster our positive reputation, and make sure our work remains relevant. Still at the core of CCHRC are research projects that address the pressing needs of those with a role in the built environment.

In November, CCHRC members elected two new board members. I am very pleased to welcome Joe Beedle and Aaron Hines. As an ex-officio member to the Board we also welcome Dave Owens, the 2011 President of the Alaska State Home Building Association. I am grateful for the service to CCHRC of our two outgoing board members Brent LeValley, who had served on the CCHRC Board since 2006, Wally Smith, and John Straube.

With broad representation from throughout the state and building industry, and with the talents and passion of the CCHRC staff, this organization is poised for an outstanding 2011.

*Alan Wilson*

### 2010 Board of Directors

Alan Wilson, Chairman of the Board  
Dave Miller, CGP, Vice Chair  
Richard Green, Secretary/Treasurer  
Joe Beedle (incoming)  
Jess Dilts  
Jess Hall  
Jerry P. Herring, P.E.  
Aaron Hines (incoming)  
Brent LeValley (outgoing)  
Kelley Roth  
Bill Semple  
John Straube, Ph.D. (outgoing)  
Lauri Strauss, AIA, LEED AP

#### *Ex Officio Members*

Mike Buller  
Dan Duame  
Jack Hébert  
Walt Murphy  
Dave Owens (incoming)  
Pat Pitney  
Wally Smith (outgoing)

### 2010 Industry Advisory Council

Alaska Housing Finance Corporation  
ARXX Corporation  
Capitol Glass/Northern Windows  
Cardinal Glass Industries  
Demilec (USA)  
DuPont  
GW Scientific, Inc.  
Hoffer Glass

Interior Alaska Building Association  
Insulfoam  
Pioneer Glass, Inc.  
Siemens USA  
Spenard Builders Supply  
Thermo-Kool of Alaska, Inc.  
Wisdom & Associates

### 2010 Research Advisory Committee

Marquam George  
Andre Spinelli  
Thorsten Chlupp  
Jorge Simmons  
Jess Dilts





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CCHRC research staff examine building science both in the laboratory and in real-life situations, focused on bringing innovative building techniques to the attention of home builders, home owners, and industry members.

## **Product Testing Laboratory. . . . . Page 6**

Testing products and ideas new to cold climate construction, our Product Testing Laboratory seeks to determine the suitability of these products to the cold climate residential building market.

## **Sustainable Northern Communities . . . . . Page 8**

This ground-breaking program brings together the technical and design expertise of CCHRC staff and the input of the people of Alaska in a collaboration that is helping to improve the efficiency, functionality, and healthiness of homes in Alaska.

## **Policy Research . . . . . Page 10**

Working closely with local, state, and federal agencies, CCHRC research staff are helping to develop new tools for collecting, interpreting, and using home and commercial end-use data to improve energy efficiency.

## **Hybrid Micro-Energy Program . . . . . Page 14**

Generating low-cost energy is one of the major challenges facing Alaskans – urban and rural. CCHRC researchers are exploring a wide variety of developing technologies to find innovative ways of reducing energy costs.

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Visit [www.cchrc.org](http://www.cchrc.org) for detailed and up-to-date information on CCHRC.

# Applied Research

CCHRC uses applied research projects to help solve the unique challenges of building in Alaska's diverse climates. We use tests of existing homes and lab-based research to innovate, examine, and evaluate building techniques. Our goal is to provide home builders, home owners, and other stakeholders the information they need to improve shelter in the North. In 2010, CCHRC conducted applied research projects ranging from questions about the building envelope to novel cold climate heating systems.

We studied the effect of adding exterior foam insulation to an existing wall, with particular attention to determining its effect on moisture accumulation. Energy efficiency retrofit techniques that do not consider the home as a system can lead to mold or rot in the wall, a ubiquitous health concern for Alaskans.

help solve  
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climates

Because Alaskans are increasingly interested in heating systems that can save money and energy, CCHRC has initiated two studies on ground source heat pumps. We will monitor a residential-sized ground source heat pump and the thermal regime in the surrounding soils. Both of these projects benefit from our diverse partnerships.

These tests, and others like them, are adding to the industry's understanding of building science and are providing useful information to building professionals, home owners, and policy makers.

**Partners in 2010** included the Alaska Housing Finance Corporation, the Alaska Center for Energy and Power, Alaska Energy Authority, Associated Builders and Contractors, Inc., Demilec (USA), the Denali Commission, the Fairbanks North Star Borough, the Fairbanks North Star Borough School District, GW Scientific, MCM Roe, Inc., the National Renewable Energy Laboratory, PDC Inc. Engineers, REINA Alaska, Sierra Research, Inc., and Vertex Insulation Inc.



## Safe and Effective Exterior Insulation Retrofits

The "double-vapor barrier effect" has long been a concern in building science. **This project investigates whether exterior insulation retrofits can cause moisture accumulation in wood-frame structures.** The project employs multiple means of investigation, including: Mobile Test Laboratory experiments; a survey of homes with exterior insulation in Interior Alaska; and a comparison of findings to similar published studies. The study was initiated in the summer of 2009 and will continue through 2011. Preliminary findings show that when the amount of exterior insulation added is sufficient to prevent condensation within the wall framing, moisture concerns are significantly decreased. Data collection for the home survey began in Fall 2010 and Spring 2011, when wood framing in homes is expected to be the driest and wettest, respectively.

## Foam Moisture Study

In an effort to improve energy efficiency, many residential construction

Left: The CCHRC Mobile Test Lab, outfitted for testing  
Top center: Collecting wood moisture data  
Right: The REINA Alaska home during construction





techniques now include rigid and spray foam insulations, useful because of their high R-values and excellent air-sealing properties. There are few practical options for monitoring foam insulation for moisture content. This project enables CCHRC to **establish a method for measuring the moisture in foam insulation**, which will help us to better evaluate building science issues in modern building envelope designs.

## 21st Century Cement

CCHRC and industry partners are **analyzing the local market potential for geopolymer cements** including assessment of local materials, potential for local product manufacturing, and economic feasibility. The purpose of this project is to test the applicability of, and develop basic usage guidelines for, commercially

available magnesium phosphate cement and/or geopolymer-type materials. The application has been tested on the Residential Exterior Membrane Outside-insulation Technique (REMOTE) wall.

## Heating Appliance Use Survey

Current practices in air quality modeling can be improved by adequately accounting for the daily patterns of heating appliance use. The goal of this project is to **help identify patterns of wood and oil heating appliance use in the Fairbanks vicinity**. CCHRC monitored 12 homes during the winter of 2009-2010, measuring hourly frequency of wood and oil heating appliance use. The study was expanded to 30 homes during the 2010-2011 winter.

## Ultra-Low-Energy House Monitoring

CCHRC is **monitoring and evaluating the performance of low-energy houses** including the prototypes in Anaktuvuk Pass, Quinhagak, and, most recently, an ultra-low-energy home in Fairbanks built by REINA Alaska. Each home uses innovative construction techniques and products to reduce energy use. CCHRC is monitoring various aspects of the homes to advance building practices in Alaska. Innovative mechanical and thermal storage systems will be closely monitored for efficiency and performance.

## Wood Storage Best Practices

The use of firewood for space heating is a significant contributor to winter-season air pollution in Fairbanks and other northern communities, and burning inadequately cured firewood could be a contributing factor. Ensuring an adequate supply of dry firewood requires preparation and planning, including knowledge of appropriate storage methods and the time needed to achieve a full "cure." This study, begun in spring 2010, will **establish best practices for the storage and curing of wood in Fairbanks using local wood supplies**.



# Product Testing Laboratory

The Product Testing Laboratory (PTL) is unique within CCHRC for its focus on testing cold climate building products and systems. As a neutral research organization, CCHRC uses the PTL to identify superior cold climate building products and technologies for the public and building community. CCHRC is also developing the *Certified Alaska Tough* program, which will establish test requirements for the labeling of certified products. PTL staff helps inform the public about the potential for experimental technologies and helps separate fact from fiction in product claims.

The current phase of the PTL's development is the ability to perform comprehensive thermal and hygrothermal analyses using direct testing and computer simulation. Future phases of development will allow evaluation of heating appliances and ventilation systems. These independent tests can evaluate claims about a product's performance, investigate the suitability of product systems for cold climate construction, or provide a scientific basis to help steer construction best practices. The results from the PTL work are translated into publications for public officials, homeowners, the residential building community, and other users.

Through the PTL, CCHRC continues to expand its involvement with private industry. The Industry Advisory Council, comprised of our corporate members, helps direct us to issues of concern in the housing and infrastructure industry. CCHRC also plans to develop an independent testing lab to conduct fee-based testing for the home building industry. The work will contribute information to the industry and diversify CCHRC revenue.

**Partners in 2010** included the Alaska Housing Finance Corporation, ARXX Corporation, Capitol Glass/Northern Windows, Cardinal Glass Industries, Control Contractors, Inc., Demilec (USA), Dupont, GW Scientific, Inc., Hoffer Glass, Interior Alaska Building Association, Insulfoam, Pioneer Glass, Inc., Siemens USA, Spenard Builders Supply, Sun Frost, Thermo-Kool of Alaska, Inc., the University of Alaska Fairbanks, Wallace Research Foundation, and Wisdom & Associates.

identify  
superior cold  
climate building  
products and  
technologies



## Certified Alaska Tough

The Product Testing Lab is developing and will administer a product certification program, *Certified Alaska Tough*. The primary purpose of the program will be to identify building products that exhibit superior cold climate performance. Cer-



tified products will meet or exceed test criteria for measures of energy efficiency and cold weather operation and/or durability, as determined by accredited third-party test labs. Manufacturers of certified products will earn the right to use the trademark label of *Certified Alaska Tough* in their marketing. CCHRC and a working group from the Industry Advisory Council are working to establish the certification criteria for residential windows.

Left: Monitoring exterior window shutters

Above: *Certified Alaska Tough* logo

Center: Testing passive refrigeration methods

Top right: Testing paint's insulation value

Far right: Infrared camera measuring temperature



## Evaluating Paint's Insulating Value

We evaluated two coating products to **determine whether they add thermal insulation to a building envelope in a cold climate** such as Alaska. When tested using three methods of investigation, both products were found to have no discernable effect on reducing heat transfer or heating demand. A project "Snapshot" was published in 2010.



## Passive Refrigeration

This project explores ways to **use Alaska winter air to lower the electrical demand of residential refrigerators and freezers**. CCHRC, with industry, is testing a prototype of a "passive" appliance, designed to only use electricity when the out-

door air is too warm to sustain refrigerator temperatures. The partners are also working to determine the feasibility of retrofitting a conventional refrigerator to integrate passive components that use cold air temperatures. The energy-use performance of the retrofitted refrigerator will be compared to an unmodified version. Three refrigerator units are being monitored for interior temperature and energy consumption over the winter of 2010-2011.



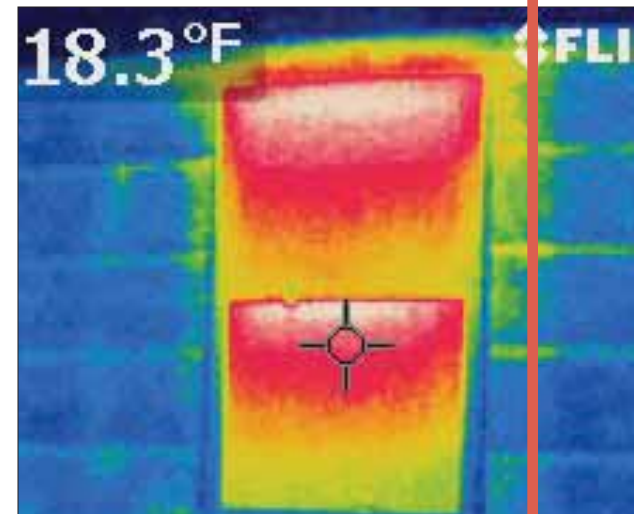
## Movable Window Insulation

During the winter of 2009-2010, PTL staff evaluated different strategies for retrofitting windows with movable insulation. The project goal is to **measure the thermal improvements of the insulation methods while considering the effect on condensation resistance of the window**. A report will also compare the costs, durability, and functionality of the window insulation meth-

ods and examine the potential and limitations for movable window insulation, both as a temporary and long-term option. The report will be complete in early 2011.

## Reflective Insulations

Can metallic, reflective surfaces on insulation products be valuable for insulating in cold climates? This project **studies the efficacy of reflective insulations in cold climate construction** by evaluating and comparing insulation products that include reflective surfaces, providing background on radiant heat transfer, and offering a concise literature review of previous research. Product testing for this study was conducted in 2009, and the final report will be complete in early 2011.



# Sustainable Northern Communities

Constructing homes and other structures that address the challenges of building in Alaska requires careful attention to the relationship between product choices, appropriate design, construction technique, and building science. Decisions that do not recognize this relationship can lead to inefficient and drafty buildings, moisture damage, mold, and durability and structural concerns.

a new pattern  
of building that is  
community-driven

These building challenges exist across Alaska, but are acute in rural areas where remote locations inflate construction and fuel costs, and the extreme climates create high energy consumption and difficult building science challenges. Recent history has shown a pattern of building designs and techniques that have not been well-adapted to Alaska's difficult environments.

To address these challenges, CCHRC developed the Sustainable Northern Communities Program, which engages willing communities and other partners in establishing a new pattern of building that is community-driven and reflects the people, their culture, lifestyle, resources, and local environment. This effort has been described by CCHRC President/CEO Jack Hébert as a blending of "indigenous wisdom and 21st century technology."

**Partners in 2010** included the Alaska Housing Finance Corporation, Association of Alaska Housing Authorities, Habitat for Humanity, Native Village of Kwinhagak, Tagiugmiullu Nunamiullu Housing Authority, USKH Inc., U.S. Department of Housing and Urban Development, the University of Alaska Fairbanks and many others working on related projects at CCHRC and through partnerships.



## Anaktuvuk Pass Update

The first project developed through the SNC program, a prototype home in Anaktuvuk Pass, was designed and constructed in cooperation with the village and the Tagiugmiullu Nunamiullu Housing Authority (TNHA). The home was completed during the summer of 2009 and cost 50% less than a typical new home in the community. In 2010, the home was extensively monitored for performance and **in winter 2009-2010 showed fuel consumption to be less than 90 gallons (more than a 90% reduction in energy use for space heating)**. CCHRC is currently working with TNHA and community members in other villages on Alaska's North Slope to expand the program.



Nowell, 1904

Left: Completed Anaktuvuk Pass prototype home  
Above: 1904 Mazinka House, Graphite Bay, Siberia  
Top center: Discussing Quinhagak building plans  
Top right: Building the Quinhagak foundation  
Bottom right: Raising the first Quinhagak home wall





## Quinhagak

The southwest region of Alaska is facing an urgent housing shortage, and up to one-third of the existing homes have significant structural degradation. Geographic isolation, limited economic opportunities, high winds, and frequent extreme weather events compound the challenge. However, creative local people, a rich subsistence resource, strong cultural values, and a commitment to Place all indicate a bright future for the people of the Yukon-Kuskokwim Delta.

The Native Village of Kwinhagak asked CCHRC to partner with its housing authority and community members to design a home that would be energy-efficient, affordable to build and maintain, and healthy. The home incorporated traditional design elements like the home's octagonal shape, an "arctic entry," and a low-profile design to reduce exposure to the wind. In Fall 2010, CCHRC and community members completed the construction of a prototype home. We expect the energy performance

and indoor environment to be similar to the Anaktuvuk prototype's results. CCHRC staff will remotely monitor the home during the winter and spring of 2011 to accurately assess its performance.

## TNHA – Community Engagement and Construction

CCHRC is working with the Tagiugmiullu Nunamiullu Housing Authority and several communities on the North Slope to build on the success of the prototype home built in Anaktuvuk Pass in 2009. For these projects, CCHRC will use the SNC community engagement process to develop the housing designs, and then remain in an advisory role during the construction phase. Construction is underway on three homes in the village of Atqasuk, and the communities of Wainright and Pt. Lay are working on home designs. Design development will begin with the village of Kaktovik in early 2011. **TNHA hopes to construct homes in all four villages as well as more new homes in Anaktuvuk Pass in the summer of 2011.**

## Association of Alaska Housing Authorities

In July 2010, CCHRC and the Association of Alaska Housing Authorities formalized their relationship by signing a memorandum of understanding. The document outlines a framework for working together to support the mutual goals of the organizations – to create affordable, durable, healthy, and energy efficient homes for Alaskans. The organizations intend **to communicate and coordinate our activities to complement each organization's viability and area of expertise in meeting our mutual goals.**

## Design and Consulting

CCHRC engages in a number of private design and consulting con-

tracts each year, often as part of a firm or organization's design team. CCHRC's strengths are helpful to those that have an interest in a deep examination of energy efficiency and building science issues unique to Alaska's extreme environments. **Design and consulting projects allow CCHRC to share what we have learned through research and experience with others in Alaska and elsewhere.**



# Policy Research

Participation in housing and energy policy discussions and development is essential to advancing change in housing and construction. CCHRC's Policy Research program seeks to support the organization's mission through research, consulting, advocacy, and information systems development. We work closely with key agencies and stakeholders to lay a durable foundation for energy efficiency and housing policy that is grounded in sound building science.

In 2010 we provided policy research and support for the Alaska Housing Finance Corporation, the Alaska State Legislature and Governor's Office, and the Fairbanks North Star Borough. Our policy projects have wide-ranging impact, including:

**a durable foundation  
for energy efficiency and  
housing policy grounded  
in sound building science**

- improving the home energy rating standards and systems used by builders, energy raters, and lenders;
- guiding the development of statewide energy efficiency policies through communication with Alaska's Governor and State Legislature;
- informing policy makers and housing authorities at local, state, and federal levels about the status of housing in Alaska;
- developing data collection capabilities for answering vital building science, economic, and policy questions long into the future.

Examples of policy work during 2010 include: participation on the House Energy Stakeholders Group that crafted the State Energy Plan passed in 2010; work on the initial phases of the Alaska Retrofit Information System (ARIS); modernization of AkWarm, the Alaska-based energy modeling software, and consulting with the Fairbanks North Star Borough on air quality.

**Partners in 2010** included the Alaska Energy Authority, Alaska Housing Finance Corporation, Alaska Map Science, Analysis North, Flattop Technical Services, Information Insights, Resource Data, Inc., and input from many professionals throughout the building industry.



## Alaska Retrofit Information System

The Alaska Retrofit Information System (ARIS) is a **database for collecting, managing, and accessing information about Alaska's building energy efficiency retrofit programs**. It includes information like building characteristics, retrofit energy data, cost savings, and demographics. The data will provide Alaskans with information about energy conservation effectiveness, estimated vs. actual costs, and economic impacts.

## AkWarm Modernization

These project updates **ensure that the program remains a useful tool for the building industry**. It is updated twice a year using input from energy raters, builders, and other industry members. Changes to AkWarm include user-interface improvements, improved energy calculations, new tools for rating flexibility and quality, and updated energy costs.

Left: John Davies speaks at a conference  
Top center: Blower door test for energy rating  
Bottom center: Discussing the AkWarm program  
Top right: AkWarm research





## AkWarm Commercial Building Analysis

CCHRC staff is working with partners to modify AkWarm, a tool for simplifying building analysis, for analyzing commercial buildings. CCHRC will develop a commercial building module that addresses commercial envelope construction techniques and materials, electrical loads, and commercial HVAC.

## AHFC Technical Energy Advisory Committee

CCHRC facilitates and supports ad-hoc committees of technical professionals, ensuring that the work is coordinated with other energy efficiency policy efforts in Alaska. This

project provides AHFC with technical advice for implementing energy-related policies and programs.

## Rebate and Weatherization Program Evaluation Audit Process (PEAP)

This project evaluates AHFC's weatherization and rebate programs to help improve each program. This work will begin in earnest in 2011 and will include analysis of program efficiencies, as well as energy, environment, and economic outcomes. Topics will include energy efficiency, affordability, safety, and durability outcomes by program.

## 6-Star Green Program

CCHRC is developing a program to add a sixth "star" in AHFC's home rating system. Two elements are under consideration: (1) an energy analysis using AkWarm; and (2) a green building analysis using the existing standards approved by AHFC. The program would include a builder rebate and a home owner mortgage rate reduction.

## Integration of Building Usage Data System (IBUDS)

A companion project to the AHFC Building Usage Data System, this project comprises the steps necessary to integrate AkWarm with the Alaska Retrofit Information System (ARIS) and the data collected.

## Building Energy Efficiency Standard (BEES)

BEES was established by the State of Alaska to encourage energy efficient construction by setting standards for thermal resistance, air leakage, moisture protection, and ventilation. This project will include recommendations for BEES changes, drafting



model recommendations for residential and commercial building codes, and estimating the energy-efficiency resources in the State of Alaska.

## Air Quality in Fairbanks

In 2009 CCHRC provided the Fairbanks North Star Borough with an estimate of the amount of PM2.5 emitted by residential heating devices. In 2010, CCHRC supported a series of Borough public meetings leading to adoption by the Assembly of a PM2.5 mitigation policy.



# Hybrid Micro-Energy

The deep cold and dark of Alaska's winters combine with high fossil fuel prices to make energy costs in Alaska extremely high. Concern over these costs is magnified in communities with low incomes and limited economies.

While CCHRC focuses on improving energy efficiency to reduce energy cost, we are also researching energy systems through our Hybrid Micro-Energy Program (HMEP) that takes advantage of locally available resources such as wood, wind, sun, water, and geothermal heat. HMEP identifies the challenges and opportunities in providing year-round heat and power when using small-scale renewable energy systems.

providing year-  
round heat and power  
when using small-scale  
renewable energy  
systems

The first HMEP project was the installation and monitoring of four solar photovoltaic (PV) arrays, two types of solar thermal systems, and several types of wood burning devices at CCHRC's Research and Testing Facility (RTF).

In 2010 additional HMEP projects included: an evaluation of the combination of wind and solar PV at the Anaktuvuk Pass prototype house; monitoring and evaluating the combination of a ground source heat pump and solar thermal collector at Weller Elementary School; a state-of-the-industry analysis of ground source heat pumps; and continued research on wood-burning devices including the effort to identify and procure a small-scale biomass combined heat and power (CHP) system.

Each of these projects will collect, and make available, information that can improve the success of applying small-scale energy systems in Alaska.

**Partners in 2010** included BP, the Denali Commission, Fairbanks North Star Borough School District, GW Scientific Inc., National Renewable Energy Laboratory, the University of Alaska Fairbanks, and the Yukon River Inter-Tribal Watershed Council.



## Anaktuvuk Pass

Yukon River Inter-Tribal Watershed Council installed a solar photovoltaic (PV) and a wind generator at the prototype home in Anaktuvuk Pass. A monitoring project, funded by the Denali Commission, will collect data relating to power production and energy usage in the home. **The goal of the project is to explore the potential for small-scale PV and wind, combined with highly energy efficient design, to reduce energy costs in Alaska.** Data collected at the Anaktuvuk prototype home is available on the CCHRC website.



Top left: Testing a wood-fired boiler

Above: Assembling a ground source heat pump coil

Bottom middle: Anaktuvuk Pass prototype home

Top right: Weller ground source heat pump coils

Bottom right: Putting together sensors for monitoring



## CCHRC Facility

We have installed four solar photovoltaic arrays, two solar thermal collectors, and several wood-heating devices with the goal of providing year-round heat and power to the Research and Testing Facility. With this project, in partnership with BP, we hope to demonstrate that **a combination of renewable systems can provide energy to residential markets at high latitudes year-round**. Performance analysis is still underway, although key observations have been made about the solar PV system. Data and updates are streamed on the CCHRC website.



## Biomass Combined Heat and Power (CHP)

CCHRC initiated a project in 2007 to **identify and procure a small-scale (1-50 kWe) biomass CHP system for testing and demonstration**, hoping to determine if such a system could provide reliable and economic heat and power in Alaska's extreme setting. CCHRC's search spanned more than 100 manufacturers worldwide across a range of platforms including gasification, Stirling engine, Organic Rankine Cycle, and Rankine Cycle. The search thus far has not yielded a suitable system and CCHRC is preparing a brief report describing its research and experience in this field.

## Ground Source Heat Pump Assessment

CCHRC and UAF's Alaska Center for Energy and Power are **evaluating ground source heat pumps used in cold climates**. This project will compile what is known about cold climate heating pump system performance from the literature and interviews with heat pump installers, designers, and experts. A preliminary economic assessment will estimate the cost of heat pump operation and fuel use.

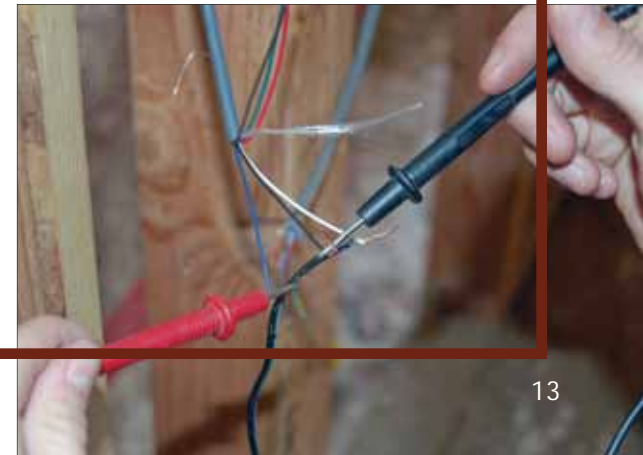


## Ground Source Heat Pump at Weller School

There is a lack of information on the long-term efficiency of ground source heat pumps operating in a cold climate and much speculation about the lack of adequate thermal recharge during the summer to overcome heat extraction from the ground during winter. As a test of heat pump feasibility, Weller Elementary School, in Fairbanks, installed a combined ground source heat pump and solar thermal system in 2010. **CCHRC will monitor the performance of the ground source heat pump and evaluate the effectiveness of "recharging" or heating the ground in the summer using solar thermal collectors.**

## Masonry Heater Study

CCHRC staff have collected data from the use of the organization's masonry heater for the last three years and have reviewed information about the performance of masonry heaters in other settings. The next step is to prepare a predictive model that can determine the efficiency of a variety of masonry heater designs and applications.



# Membership

CCHRC members are vital partners in achieving our mission. Member support broadens CCHRC's network and expertise through the many valuable connections to industry, peers, and supporters. CCHRC uses membership dues to advance many of the projects mentioned in the annual report and to support our operations as a non-profit organization. We extend an earnest "thank you" to our members in 2010 for their support and all we have been able to accomplish together.

## Corporate Members



## Foundation Members

Alaska State Home Building Association  
 Birchwood Homes  
 Denali State Bank  
 Edgetech I.G.  
 Fairbanks Natural Gas  
 Hébert Homes  
 Mt. McKinley Bank  
 NCP Design/Build, Ltd.  
 Northern Southeast Alaska Building Industry Assoc.

Rasmuson Foundation  
 Remote Power Inc.  
 Resource Data Inc.  
 Spinell Homes  
 Wells Fargo Bank

- ★ A special thanks to the University of Alaska Fairbanks for their continued partnership.
- ★ We also thank our Small Business and Individual members.

## Sustaining Members

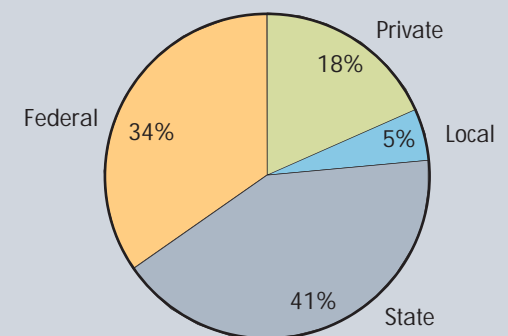
Award Windows  
 Golden Valley Electric Association  
 Patenaude-Trempe Inc.  
 Pike's Waterfront Lodge  
 Vertex Insulation, Inc.  
 Yukon Title

# Financials

CCHRC has continued to grow and diversify funding as we expand the way we address the challenges of building in Alaska. CCHRC's funding portfolio for 2010 includes federal, state, local, and private sources. As of July 2010, the organization's available funding totaled approximately \$3.5 million.

CCHRC's supporting partners include: the Alaska Housing Finance Corporation, contributing both state and federal stimulus funds; the Denali Commission; the U.S. Department of Agriculture; the U.S. Economic Development Administration; the State of Alaska Department of Community, Commerce, and Economic Development; the Fairbanks North Star Borough; the City of Fairbanks; the Wallace Research Foundation; and earned funding through contracts and membership.

## 2010 Funding Summary



# Highlights

## Smartest Building in America

In September, CCHRC won runner-up in the Siemens *Smartest Building in America Challenge*. The contest recognizes the use of Siemens APOGEE or TALON systems to reduce building costs and energy usage. CCHRC uses the APOGEE system to monitor and adjust building conditions at its Research and Testing Facility. CCHRC staff, with help from local artist Craig Buchanan, produced a three-minute video featuring the organization's use of Siemens technology.

## Research and Testing Facility Earns LEED Platinum

In December, the United States Green Building Council (USGBC) added CCHRC's Research and Testing Facility to its list of LEED Platinum buildings. As of this printing, the RTF is the most northern such building in the world. The USGBC requires entrants to complete a rigorous checklist designed to determine that the building "was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO<sub>2</sub> emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts."



# 2010 CCHRC Index

20,000	The number of readers CCHRC experts reach each week in the "Ask a Builder" column in the <i>Fairbanks Daily News-Miner</i> .
6,500	The number of new visitors to the CCHRC website, which was renovated in January to better serve the needs of those who use it – building professionals to home owners.
50	Active projects CCHRC staff and partners undertook in 2010.
3	Awards for building projects in which CCHRC was involved, including LEED Platinum, the U.S. Housing and Urban Development <i>2010 Green Homes</i> award to partner TNHA for the Anaktuvuk Pass prototype home; and Siemens' Smartest Building in America.
4	The number of Cascadia Fellows Awards given by the Cascadia Region Green Building Council in May. CCHRC President/CEO Jack Hébert was one of the 2010 awardees, for his "significant contributions to the green building movement ... [as a recognized leader] within the greater green design community."
5	The number of continuing education courses offered to builders in 2010. Topics ranged from building envelope and techniques for cold climates to bridging the gap between research and the marketplace.
5	The number of states CCHRC President/CEO Hébert will represent as an elected National Area Chairman for the National Association of Homebuilders, one of 15 seats in the US. He will represent the Pacific Northwest region (Washington, Oregon, Alaska, Montana and Idaho) during his two-year term.
1	In July, the <i>Journal of Light Construction</i> published, "Installing a Heat-Recovery Ventilator," a collaboration between CCHRC Building Educator Ilya Benesch and Ventilations Solutions President Richard Musick. This is the second article in as many years.
45	The organizations in Alaska that have joined to produce <a href="http://akenergyefficiency.org">akenergyefficiency.org</a> . CCHRC staff are on the working group developing the program.
56	In 2010, CCHRC staff made 56 presentations to organizations such as the U.S. Arctic Research Commission, the Alaska Rural Energy Conference and the Northern Housing Forum in Inuvik, Canada. Topics ranged from the Sustainable Northern Communities Program to the state of housing in the North.
1,800	(estimated) Number of visitors to the CCHRC Research and Testing Facility in 2010. Visitors attended public or school tours, volunteered in the green roof garden and met with CCHRC staff, among other activities.





# Sustainable Northern Communities Addition

In September, the US Department of Commerce Economic Development Administration announced a \$1.9 million grant to fund an addition to CCHRC's Research and Testing Facility (RTF). The Wallace Research Foundation contributed an additional \$100,000.

The 7,000-square-foot structure will add to CCHRC's existing 15,000-square-foot RTF and will house office, classroom, design, cooperative, and research space. The construction of the facility will also provide research and educational opportunities important to the Sustainable Northern Communities mission.

With strong emphasis on energy efficiency and sustainability, the structure will employ a variety of innovative construction techniques. A ground source heat pump operating in unison with both active and passive solar designs will also demonstrate viable alternative energy technologies.

As with the RTF, this anticipated LEED Platinum addition will be built with local work force resources. CCHRC Board Chair Alan Wilson, President and Owner of Alaska Renovators in Juneau said, "we are grateful to the EDA and the Wallace Foundation for investing in the Sustainable Northern Communities Center and in the vision of forming partnerships to improve sustainability and enhance economic opportunities."

Design, construction and project management will be accomplished primarily by CCHRC staff with board member participation. The addition is expected to be ready for occupation by the Summer of 2012.

The addition  
will provide a place for  
collaboration between agency  
stakeholders, CCHRC's staff  
and the diverse people  
of Alaska.

*"The Sustainable Northern Communities addition to CCHRC's facility in Fairbanks will provide a place for collaboration between agency stakeholders, CCHRC's talented staff and the diverse people of Alaska. We will be focused on creating and applying adaptive responses that effectively address the daunting challenges Northern communities face from climate, economic and cultural change."*

*Jack Hébert, CCHRC President/CEO*





COLD CLIMATE HOUSING RESEARCH CENTER

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