Masons have begun constructing the Masonry Heater on the main floor of the office wing. The estimated total weight of the masonry and local river rock is about 12,000 pounds. Hydronic heating coils are being installed for space heating beyond the range of the radiant heat from the fireplace. Research will be implemented to determine combustion efficiency and potential for biomass as a fuel source in Alaska.

The west wing is totally closed in. The garden roofs over the labs and the clerestory and elevator lobby roofs are insulated and waterproofed. Most of the lab walls are insulated on the exterior with 4” expanded polystyrene foam. An additional 2” of rigid foam will be glued on all exterior walls in the spring. The electrical, mechanical plumbing, heating, and ventilation contractors are just ahead of the sheet rockers. The entire building should be sheet rocked and ready for taping and painting in March.
The Cold Climate Housing Research Center (CCHRC) commissioned John Freeman of *Sunrise Energy Works* to study the Skuttle ventilation technique in new housing in the Anchorage area during the winter and spring months of 2004. This study monitored nine houses in a new subdivision to assess the effectiveness of their Skuttle ventilation systems and compliance with the Alaska Building Energy Efficiency Standard (BEES) ventilation requirements.

The Skuttle system consists of a six-inch duct bringing outside air into the return side of the furnace plenum, thus pulling fresh air into the house when the furnace fan comes on. Either two or three bathroom fans exhaust stale air. Each bathroom exhaust fan had one of three different controls: a manual switch, a dehumidistat, or a timer. The control for each bathroom fan operated independently and none of the controls interconnected with the furnace fan. The bath fans operated a very small percentage of the time, thus, the Skuttle system operated primarily as a “supply only” ventilation system when the furnace fan is on.

This study compared the total effective ventilation rate calculated from measurements in each house to the BEES requirement. Each house in the study has a furnace-fan-integrated supply duct (Skuttle) and bathroom exhaust fans. During the study, motor loggers monitored the runtimes of the furnace and the bathroom fans. These fan runtimes and initial airflow measurements provided estimates of the mechanical ventilation rate in each house. Blower door tests of the houses were used to estimate the natural air leakage contribution. Results were used to calculate the daily averages of the total effective ventilation rate. All of the houses were occupied, and data recorded reflected the occupants’ normal living patterns.

The BEES allows for a combination of mechanical ventilation and natural air leakage to provide the required ventilation flow rates. AHFC testing policy excludes air coming through the crawl space and garage in calculating natural ventilation flow rates. That exclusion left an average of 38% of natural air leakage usable for ventilation.

The daily average mechanical ventilation airflow provided by the Skuttle ventilation system, as operated by participants in this study, ranged from 6.4 to 40.8 cubic feet per minute (CFM). The runtime for the furnace fan supply was more significant to the amount of mechanical ventilation than the type of bathroom fan control. The total mechanical ventilation flows alone did not provide the 90 to 140 CFM ventilation rates required by the Alaska BEES for these houses. Homeowners may turn off noisy fans, thereby reducing the contribution of bathroom fans to mechanical ventilation.

Estimates of the natural air leakage contribution to ventilation varied widely. Several participants left crawl space vents open for the study period, while vents were closed in other houses. The air leakage model assumes leakage is evenly distributed throughout the house envelope. If actual leakage is largely in the crawl space and the upper house is relatively tight, then airflow through the upper envelope will be reduced and will be overestimated by the model. Calculations of the daily average total effective ventilation were likely over-estimated for the houses in this study that had crawl space openings. Calculations ranged from 73 CFM to an unlikely high of 657 CFM.

To better assess ventilation effectiveness, several other indoor air quality (IAQ) parameters were monitored for the four-month study period. Measurements of carbon monoxide and benzene levels showed a pattern of garage-to-house pollutant transfer. Carbon dioxide (CO₂) accumulated in bedrooms at night, and decayed slowly. These results support the estimates of relatively low total effective ventilation. They also reinforce the probability that the higher estimates of natural infiltration misrepresent the actual contribution of infiltration to the total ventilation. The pollutant transfer pattern and the CO₂ buildup also indicate that mechanical ventilation is more important than natural infiltration in distributing ventilation air effectively.

If the system design had provided balanced flow by linking the bathroom exhaust fans and the furnace supply, it would have been possible for it to meet the BEES ventilation requirement. Balanced flow is possible with an interlocking control that operates the furnace supply and bathroom exhaust at the same time.

Balanced flow gives better source control for clean supply ventilation air. Exhaust-only ventilation (when just bath fans are on) tends to pull air from polluted crawl space and garage zones and likely increases ventilation needs. Supply-only ventilation (when just the furnace fan is on) tends to drive moisture into walls and ceiling assemblies.

The recommended improvements for the Skuttle system in this study are to provide interlocked control on the furnace supply and bathroom exhaust fans and to switch to low-noise bathroom exhaust fans. This would increase the effective ventilation flow rates with better distribution to bedrooms and give balanced ventilation with cleaner source air.

Information on all projects available at: www.cchrc.org
CCHRC Update  

Gail Koepf

So much has been accomplished since our last publication! Bringing the RTF project to this point has required so much time and attention that our former quarterly reporting has fallen behind. To reflect this reality, we have dropped the “Quarterly” from the title and will strive to get reports out as needed. The web site is available at all times and we attempt to keep that updated.

CCHRC held a groundbreaking ceremony for the RTF last July, and as we have reported here, the construction is well on the way to a summer 2006 completion. Our annual meetings were held along with the Alaska State Home Building Association meeting here in Fairbanks in October. At those meetings, we elected Richard Green to the board of directors and reluctantly said goodbye to one of our founding members and original directors—Richard Tilly.

As the RTF construction project progresses, CCHRC is making changes to help it through the coming transition. We are in the process of adding two seats to our board of directors to make a total of 11 directors.

We have added a new staff member to help with our research projects. Cole Sonafrank has joined us in the position of Assistant Research Director and will be helping to keep us organized and our research projects moving along.

The Capital Campaign has attracted sizable in-kind contributions from some of the housing industry’s biggest suppliers and also from local Alaskan suppliers. We have also received cash contributions from the Alaska State Home Building Association (ASHBA) and some of their locals along with many individuals. We are very grateful for all our many supporters and wish to thank them. Please see our website for a complete listing. Without all this support, the RTF would not be a reality. We hope they take the same pride in the RTF progress as we do. Their generous contributions have also allowed our application to the Rasmuson Foundation for a matching $500,000 to be used for equipment.

We have also initiated an Industry Advisory Council (IAC) for businesses who wish to have input on the direction of CCHRC research and to establish an ongoing association with CCHRC. We would like to recognize Thermo-Kool of Alaska as our first member at the Corporate level and therefore our first IAC member.

CCHRC plans to move into the new RTF office space sometime this summer and will hold an Opening Ceremony for the RTF on September 23, 2006. We certainly hope to see you all there. Also in the planning process is a Circumpolar Housing Conference to be held in March 2007 during the International Polar Year to introduce the potential of Alaska and the CCHRC Research and Testing Facility to the international housing industry. We have ambitious plans!

If your membership has lapsed, you will find a membership renewal form enclosed. Membership information is also available at our web site.

Message from the President/CEO  

Jack Hébert

Science wasn’t on the minds of most Interior homeowners last month. The average temperature in Fairbanks was minus 22 degrees Fahrenheit for January 2006 with plunges of sub 50 below temperatures. That cold spell put the need for reliable and durable shelter in perspective for all residents, and they were either grateful for their home’s performance or anxiously contending with one of the many things that can, and do, go wrong with furnaces, insulation and plumbing in the extreme cold. No one can deny that Alaska’s interior is a good place for perfecting building design, materials and techniques.

Over the past five years, CCHRC has developed strong private and public sector partners across Alaska, the nation and the world. This has resulted in a successful capital campaign to fund the construction of this $5.2 million dollar, world-class facility in Fairbanks.

Currently under construction on the University of Alaska Fairbanks campus, the RTF will be a lab for testing building materials and methods for Alaska’s weather—from the brutal cold of the Interior to the relentless rains of Southeast.

The building itself will serve as a model facility using cold climate construction methods and materials. While this is state-of-the-art science and research, the results will be practical and applicable. It will result in better products and better homes. Builders are already incorporating the results of our research to construct better houses. Additionally the research has implications for other cold climates worldwide. If something works well here, imagine how well it will work in Minnesota or at high altitude regions around the world. As our supply of available cheap energy declines, the energy use of the home is one of the biggest challenges to solve. As the concerns about global warming continue to grow, the energy use of the home must be addressed.

With the completion of the RTF construction this summer, CCHRC will have the ideal location and the building and equipment to conduct this necessary research and testing. What we learn from our research will allow more of our neighbors here and around the world to be thankful when nothing happens when the mercury plummets. Nothing except a warm and healthy home!
CCHRC has moved!
Please Note New Address

Internet Web Site:
www.cchrc.org

Come see us at the Home Shows

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<tr>
<th>DATE</th>
<th>EVENT</th>
<th>CCHRC REPRESENTATIVE</th>
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<tr>
<td>Mar. 3-5</td>
<td>Juneau Home Show</td>
<td>Mike Musick</td>
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<td>Mar. 17-19</td>
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<td>Mar. 31-April 2</td>
<td>Fairbanks Home Show</td>
<td>Mike Musick</td>
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<td>Mar. 31-April 2</td>
<td>Mat-Su Home Show</td>
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<td>Apr. 8-9</td>
<td>Kenai Home Show</td>
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The RAC is appointed by the Board of Directors to advise CCHRC on research projects. Contact a committee member in your area with your input and concerns.

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**Current Project List**

- Regional Housing Authority Consultation
- Health House VOC Monitoring
- Combustion Air/CO Study
- Strawbale House Monitoring Project
- Kenai Indoor Air Quality Study
- Frost Protected Shallow Foundation Study
- Housing Needs Study
- Permafrost Monitoring Study
- Mobile Test Lab Study
- BEES Study
- Cook Inlet Housing Authority Energy Efficiency Study

The CCHRC Report is sent to members, funding agencies and to those requesting information about CCHRC. Response to this report is welcome.