

## University of Minnesota – 2006 Annual Report

### Overview

Currently, much of the University of Minnesota housing research is focused on building technology and environmental issues specific to the north central region of the United States. An informal network of approximately 15 researchers from a wide range of disciplines are concerned with solving problems associated with the design, construction, renovation, and operation of buildings in cold climates. There are several new initiatives at the University to increase research efforts in the housing arena. The HUD-COPC grant (see below) has been used to launch an Affordable Housing Initiative, led by the Center for Sustainable Building Research. The newly formed Bioproducts and Biosystems Engineering department has proposed an “advanced housing technologies and resource center” built around the existing Cold Climate Housing and Bioproducts Management programs. The Institute for Renewable Energy and the Environment and the new created university-wide Institute on the Environment have both announced support for programs focused on building efficiency. The University of Minnesota Extension has added a full-time Regional Extension Educator in Housing Technology and the Cold Climate Housing (CCH) program continues to serve as a focal point for regional research, technology transfer, and outreach to the home building industry.

### Part 1: Current Activities in Research

In 2006, industry provided substantial support for a number of important housing research activities at the University. While the research activity at the Cloquet Residential Research Facility was limited this year, several new projects have been funded and are scheduled for 2007. The Foundation Test Facility at Rosemount continues to be quite busy with a variety of privately sponsored foundation insulation system evaluations. On-going testing continues at the Jackson Street Village to provide additional insights on structural performance, energy analysis, and indoor air quality of this innovative project. The CCH staff continues to be active with the state and home building industry on both mandatory and voluntary building standards. The three primary issues of concern are residential mechanical ventilation, moisture intrusion, and basement insulation. Below are four highlighted research initiatives – both ongoing and new—for 2006.

**1. Moisture Impacts of Radon Resistant New Construction (MN Department of Health):** This demonstration project just finished its second and final year with a final report anticipated on June 30. It was designed to produce solid information on the moisture impacts of radon resistant new construction (RRNC) and to determine the effects of passive and active sub-slab depressurization on indoor moisture levels, as well as radon concentrations. We believe that this type of moisture management could have multiple benefits for the performance of the house and occupant well-being. We also believe that if this technique effectively addresses below-grade moisture sources, as well as radon levels, it will propel adoption rates for RRNC techniques by residential contractors and homeowners and increase the likelihood of such systems being used for retrofits of homes having moisture issues and thereby reducing radon levels in the home was well.

**2. Affordable Housing Initiatives (HUD Community Outreach Partnership Center):** This ongoing project is a design and research collaboration in affordable housing that brings together the Amherst H. Wilder Foundation, CDC's, and a team from the University of Minnesota with the building industry. The team's mission is to aggressively address the housing crisis by providing affordable housing that will ensure stability and improve the quality of life in low-income communities. This project targets a critical gap in affordable housing for those between the 40-60% median income level, which fall between the housing programs by Habitat for Humanity and the local CDCs. The overall goal of the project was to develop up to ten prototype houses that integrate affordability with sustainable design, healthy construction, social and cultural responsiveness, and design excellence. Phase One of the project, completed in fall 2003, involved the design, construction, and evaluation of House One in the Frogtown neighborhood of St. Paul, Minnesota. Two more houses were completed in 2005. In 2006, the group teamed up with the Minneapolis Public Housing Authority to design and begin construction on House 4. All of the houses utilize a new “studless” oriented strand board Structural Engineered Panel (SEP) building system combined with an exterior thermal and moisture management system.

### **3. Coalition for Advanced Housing and Forest Products Research (U.S. Forest Products Laboratory):**

In recognition of the need for more durable, energy efficient, disaster resistant, environmentally friendly, and affordable housing, leaders in the wood products and building systems research community have formed the Coalition for Advanced Housing and Forest Products Research (CAHFPR). The University of Minnesota's research has focused on Innovative Technologies for Affordable Housing. The emphasis for the first two years has been investigating the structural and hygrothermal behavior of the OSB "studless" building system.

### **4. Advanced Energy Efficient Roof Systems (U.S. Department of Energy):**

The University of Minnesota is collaborating with two private industry partners to develop and commercialize an innovative residential roof with the primary objective of creating a more energy efficient building envelope. The goal is to design, build, and evaluate a one-piece modular roof panel that uses a composite material or laminated structure that can be manufactured in a continuous process. The roof panel will be self-supporting, have an effective R-value at least 20% greater than that required by the 2003 International Energy Conservation Code (IECC), reduce infiltration and moisture condensation, and in some models integrate heat recovery, photovoltaics and/or solar hot water collectors. This innovative approach to roof construction will eliminate the need for additional roof support and provide conditioned space for HVAC equipment, storage, or living space in the attic. While Phase One, primarily consisting of a conceptual design and feasibility analysis, Phase Two selected the most desirable panel design and will complete a full-scale prototype for structural testing

## **Part 2: Current Activities in Teaching**

The Residential Building Science and Technology degree program continues to attract new students. An important component of the long-range plan for the program includes development of a marketing strategy to increase the number of undergraduates as well as to establish a viable graduate program. We are also developing a minor degree to attract more students, particularly those from disciplines such as architecture, housing, civil engineering, and mechanical engineering. Also, programs in architecture, housing, and construction management have all seen large increases in student enrollment over the past few years.

## **Part 3: Current Activities in Outreach**

Outreach continues to be strong. Industry requests for the Moisture Primer and Best Practices for Moisture Control curriculum has been strong. We have delivered this course several times over the past year to local and national audiences. The CCH and CSBR staffs continue to be involved in a variety of affordable housing technical assistance projects. CCHP faculty remain highly engaged in national technology transfer activities including DOE Building America, USDA Healthy Air for America's Homes and a variety of conferences including EEBA, Affordable Comfort, Better Buildings; Better Business, and the Energy Design Conference. In addition to the ongoing radon courses, several conferences on mold and mold remediation have been led by Bill Angell along with Marilou Cheple and Neil Carlson (Department of Environmental Services – U of MN). These conferences continue to draw professionals who have some responsibility for defining, testing and remediating mold problems in commercial, industrial, and residential buildings.

## **Major Plans for 2006**

We will continue to develop the new advanced housing research and resource center structure and research agenda within the new departmental and collegiate structure. We believe next year will be a good year for housing research activities, especially in the areas of energy improvements and moisture transport relating to durability and indoor air quality concerns. We will continue to rebuild capacity and strength in our interdisciplinary research and technology transfer efforts. Both public and private funding prospects for new housing research initiatives at the University of Minnesota look very promising for 2007.

## **Contacts**

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