

## **2005 Annual Report University of Minnesota**

**Overview.** Much of the current housing research at the University of Minnesota is focused on building 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 involved with solving problems associated with the design, construction, renovation, and operation of buildings in cold climates.

The formation of a private-public advanced housing research and resource center at the University of Minnesota has been delayed due to a major repositioning and collegiate restructuring plan at the University. However, a concerted effort to establish a center for interdisciplinary research of cold climate buildings and their environments will be reestablished in the coming months. This center will develop and transfer knowledge to enhance the quality and performance of new and existing buildings in Minnesota. Meanwhile, the Cold Climate Housing (CCH) program continues efforts in research, technology transfer, and outreach to the home building industry.

**Current Activities in Research.** During 2005, industry provided substantial support for a number of important housing research activities at the University. Research activity at the Cloquet Residential Research Facility included a series of tests on several innovative wall systems for affordable housing with primary funding support from the Amherst H. Wilder Foundation. The Foundation Test Facility at Rosemount continues with a variety of privately sponsored foundation insulation system evaluation. On-going testing at the Jackson Street Village will provide insights on structural performance, energy analysis, and indoor air quality of this innovative project. The CCH staff continues to be active with the state of Minnesota and the state home building industry on both mandatory and voluntary building standards. Three primary issues of concern are residential mechanical ventilation, moisture intrusion, and basement insulation. Current and new research initiatives include:

**1. Building Foundation Insulation (State of Minnesota):** The objective of this ongoing project is to provide a solid research base to amend the foundation insulation rules in the Minnesota Building Code to achieve building foundation thermal energy performance meeting or exceeding that specified in the 2000 IECC. In attaining this performance, the foundation system specification must incorporate integral liquid water and water vapor management strategies to reduce biodegradation and fungal growth in the foundation system.

**2. Moisture Impacts of Radon Resistant New Construction (MN Department of Health):** This new demonstration project is designed to determine the moisture impact of radon resistant new construction (RRNC) and the effects of passive and active sub-slab depressurization on indoor moisture levels. This type of moisture management could have multiple benefits for the performance of the house and indoor air quality. If this technique effectively addresses below-grade moisture sources in addition to lowering 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 while reducing radon levels in the home was well.

**3. 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, the Greater Frogtown Community Development Corporation (GFCDC), a team from the University of Minnesota, and 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 for low-income families. This project targets a critical gap in affordable housing for those between the 40-60% median income level, which falls between the housing programs by Habitat for Humanity and local Community Development Corporations. The goal of the project is to develop 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. In 2005, two more houses were completed. 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.

**4. Coalition for Advanced Housing and Forest Products Research (U.S. Forest Service – Forest Products Laboratory):** In recognition of the need for more durable, energy efficient, disaster resistant, environmentally friendly, and affordable housing, leaders in the academic research community have joined together to form the (CAHFPR). The Coalition for Advanced Housing and Forest Products Research brings together leaders in our nation’s universities who are focused on residential wood product and systems research to a) identify, coordinate, and execute research and development activities that maximize the unique capabilities of the members; b) seek the most effective and efficient ways to conduct research and development efforts that directly respond to the current and future ways housing is constructed, financed, and marketed; and c) advocate for funding to support a coordinated research and development program.

**5. 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 to create a more energy efficient roof. The goal is to design, build and evaluate a one-piece modular roof panel using composite material or laminated structure. The roof panel will be self-supporting, have an effective continuous 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. Phase One, primarily consisting of a conceptual design and feasibility analysis, has been completed and several panel design will be developed and evaluated in Phase Two.

**Current Activities in Teaching.** Long-range plans of the Residential Building Science and Technology degree program include development of a marketing strategy to increase the number of undergraduates as well as to establish a viable graduate program. A new minor degree will attract more students from disciplines such as architecture, housing, civil engineering and

mechanical engineering.

**Current Activities in Outreach.** Industry requests for the Moisture Primer and Best Practices for Moisture Control curriculum has been strong. This course has been presented 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. CCH 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, several conferences on mold and mold remediation have been led by Bill Angell, Marilou Cheple and Neil Carlson (Department of Health and Environmental Services). These conferences draw professionals who test and remediate mold and mold issues in commercial, industrial and residential buildings.

**Major Plans for 2006.** The new advanced housing research and resource center structure and research agenda will be developed within the new collegiate structure. It is anticipated that the next year will be a good year for housing research activities, especially in the area of moisture transport leading to durability and indoor air quality problems. We will continue to rebuild capacity and strength in interdisciplinary research and technology transfer. Both public and private funding prospects for new housing research initiatives at the University of Minnesota have the potential to be quite strong.

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