

2004 Annual Report

A. 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 10 to 12 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.

A new effort to re-establish an official housing research and resource center at the University of Minnesota supported through a private-public partnership using a combination of private, state, and federal funds was initiated in 2004. This new center will provide both a focus for the development of interdisciplinary research and a common source of information germane to cold climate buildings and their environments. It will continue to develop and transfer knowledge to appropriate public and private entities involved in the design, construction, and operation of buildings to enhance the quality of new and existing buildings in Minnesota and the surrounding region. Meanwhile, 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.

B. Current Activities in Research

In 2004, industry provided substantial support for a number of important housing research activities. The research activity at the Cloquet Residential Research Facility was limited this year. A series of tests on several innovative wall systems for affordable housing is being completed at the CRRF with primary funding support from the Wilder Foundation. The Foundation Test Facility at Rosemount continues to be quite busy with a variety of privately sponsored foundation insulation system evaluation. 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 five highlighted research initiatives – both ongoing and new— for 2004.

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 that, as far as practical, eliminate the biodegradation and fungal growth in the foundation system.

2. Jackson Street Village (Wilder Foundation): As a subcontractor to the American Lung Association (ALA), the CCHP faculty helped with the design and planning of a multifamily townhouse project to house formerly homeless and recovering chemically dependent families. In addition to using alternative mechanical systems (ground-source heat pumps), the housing was designed to meet ALA Health House standards. The structure of the three buildings was 2x4 standard wall framing with an exterior thermal and moisture management system roughly based on the PERSIST system (Pressure Equalized Rain Screen Insulated Structure Technique) developed in Canada several years ago. On-going testing of the completed units is currently underway for the structural performance, energy analysis, and indoor air quality.

3. Affordable Housing Initiatives (HUD Community Outreach Partnership Center): This new 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 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 local CDCs. 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. House One utilizes 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 Coalition for Advanced Housing and Forest Products Research (CAHFPR). This coalition 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 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 manufactured in a continuous process. 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 and storage in the attic.

C. 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 considering 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.

D. 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, several conferences on mold and mold remediation have been led by Bill Angell along with Marilou Cheple and Neil Carlson (Department of Health and 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.

E. Major Plans for 2006

In 2006, we will be finishing the new advanced housing research and resource center structure and research agenda. It is anticipated that the next year will be a good year for housing research activities, especially in the area of moisture transfer leading to durability and indoor air quality problems. 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 2006.

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