

ecoMOD: Sustainable, Prefabricated and Affordable Housing Prototypes

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Overview

ecoMOD is a research and design / build / evaluate project at the University of Virginia School of Architecture, in partnership with the UVA School of Engineering and Applied Science. The goal is to demonstrate the environmental and economic potential of prefabrication, and to challenge the modular housing industry to explore this potential. Over the next several years, UVA students and faculty are designing and building several 600 to 1,400 square foot ecological, modular and affordable housing units. During this multi-year project, interdisciplinary teams of architecture, engineering, landscape architecture, historic preservation, business, environmental science, planning and economics students are participating in the design, construction and evaluation phases of the project.



The design process is rooted in the university's curriculum and is structured to maximize the educational opportunities. For each prototype, the schedule includes an academic year for design, a summer of construction, and another academic year for the evaluation of the unit – using building monitoring and rigorous environmental impact assessments. The teams

work closely with project advisors – including architects, engineers, contractors, fabricators, building trade professionals, prefabrication experts, landscape architects, affordable housing developers, housing counselors, planners, historic preservationists, environmental scientists, building department officials, business people, and sustainability experts on daylighting, material selection, indoor air quality, energy efficiency and renewable energy.

ecoMOD1 – the OUTin house

The first ecoMOD house was designed, prefabricated off-site, and then sited in a traditionally African-American, low-income neighborhood. It includes a rainwater collection system that delivers potable water, extremely energy efficient construction methods, a solar hot water collector, and a landscape of native, drought tolerant plants. Using life cycle assessments that take into account the environmental impact of the materials and methods of the OUTin house in the beginning (resource extraction and manufacturing of materials), middle (construction phase and building occupation) and end (demolition with materials going to a landfill or recycled), the ecoMOD1 evaluation team has determined that the house compares favorably with a conventional home of the same size. In particular, the tight building envelope, local sustainable materials, solar hot water panel and low or no VOC finishes significantly reduce the environmental impact. The engineering team has installed a building monitoring system to measure many aspects of the home. Monitoring will continue for the first year of occupation. One of the primary goals is to see if the occupants will see the predicted 60 to 70% savings in their utility bills.

ecoMOD2 – the preHAB house

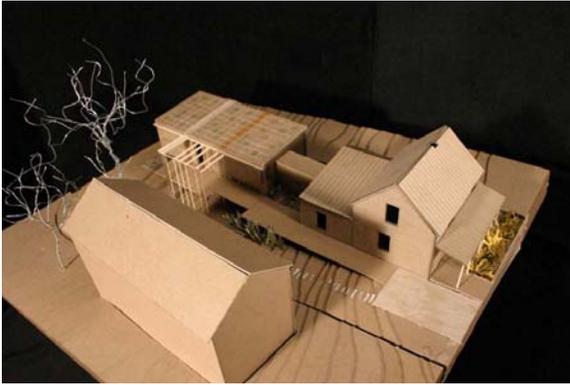
ecoMOD2, also known as the preHAB house, is a panelized design that houses a family displaced by Hurricane Katrina. With more than 200,000 homes destroyed by hurricanes in 2005, the Gulf Coast is in the early stages of a long rebuilding effort. The preHAB house was an opportunity for the design team to test and investigate contemporary design, environ-



mentally responsible strategies and pre-fabricated construction within the constraints and mission of Habitat for Humanity. The goal was to create a house that is adjustable to the climate and weather conditions of southern Mississippi. Partially enclosed exterior spaces are an integral element of the design, expanding the apparent size of the house, while simultaneously helping to passively cool it. By designing a home that utilizes natural ventilation and the selective use of natural light, the intention with the preHAB house is to make an efficient, modest house that feels larger than it actually is. The house incorporates a photovoltaic solar panel array and a heat pump / heat recovery system that will provide domestic hot water. The design can be pre-fabricated as panels, modules, or components, or any combination of all three.

ecoMOD3 – the SEAM house

The SEAM house, the third prototype in the ecoMOD project, is focused on three issues: housing for an aging population – to allow the occupants to ‘age in place;’ the historic preservation of a pre-Civil War home in a trad-



itionally African-American, low-income neighborhood; and a prototypical modular addition system that could be added to any home – emphasizing sustainability and affordability. The design explores the concept of the ‘seam’ between new and old; the connection between older and younger generations within a household; the ‘seam’ that connects modules together; and the seam between inside and outside. The final built home will yield two fully accessible condominium units that will be marketed to aging homeowners who qualify for subsidized affordable housing. The historic preservation team is doing extensive research and documentation on the existing pre-Civil War home, which may have been built as a slave quarters, or built by a freed slave.

Follow-through

All of the ecoMOD designs will be licensed, with the drawings and specifications made available for purchase by individuals and affordable housing organizations. Each of the homes in the ecoMOD project will carefully evaluated.

The most significant impact of this project is the degree to which this form of reality-based service-learning contributes positively to the professional lives of the students. From ecoMOD1, a former student recently returned from Sri Lanka where she participated in the post-Tsunami rebuilding effort as a UN employee; another is helping to build and register one of the first LEED certified homes; and a third has started a design / build business focused on sustainability. An economics student from the ecoMOD1

evaluation phase is working for a major renewable energy company, and another one has participated to two water purification projects in third world countries. One ecoMOD2 student is an Americorp volunteer helping to develop affordable housing, while another is working for a large historic preservation firm. As many as four former ecoMOD students have passed their LEED Accredited Professional exam, one has become a licensed architect, another a licensed landscape architect, and a third a certified electrician. They are taking the energy and interests that drew them to the project, and applying them in the professional world with a better understanding of how to practically implement their own ideas about design, efficiency, sustainability, prefabrication and affordability.

