

NSF Early Career Award
Yadama Works to Develop Better Building Materials

Vikram Yadama, Assistant Professor and Extension Specialist in the Department of Civil and Environmental Engineering, recently received a prestigious National Science Foundation CAREER award for his work to develop unique, sustainable building materials from wood strands.

With the five-year, \$400,000 grant, Yadama and his colleagues aim to develop better sustainable building materials made from lignocellulosic fibers. In particular, they are working to expand knowledge on the design and manufacturing of wood-based composite products for use in net zero energy construction, particularly for the outer shell of buildings, which is called a building's envelope.



Buildings account for approximately 40 percent of all U.S. energy use, of which homes are 54 percent and commercial buildings use 46 percent. The U.S. government aims to increase the development of net-zero energy commercial buildings by 2015 and residential buildings by 2030, says Yadama.

A key to increasing energy efficiency in buildings is to reduce heating and cooling requirements. Maintaining a consistent and moderate temperature inside the building is determined by the properties of a building envelope. "If the interior temperature changes gradually, it is less burdensome on heating and cooling systems," he says.

Yadama's project will assess new design concepts that use panelized systems for residential construction to meet the structural and energy requirements of the building codes. In particular, Yadama is working on the development of lightweight, three-dimensional, lignocellulosic sandwich panels with complex geometries that will be more efficient than the oriented strand board or plywood that are currently used in the outer shell of buildings.

The work will include computer modeling to carefully analyze how different geometries affect energy efficiency and the material's behavior. While the materials will need to have optimal energy efficiency, they also will have to maintain the strength and stiffness needed to meet building codes, he says.

The materials will be designed and then eventually tested at WSU's natural exposure testing facility in Puyallup, assessing factors such as how moisture and temperature vary through wallsexposed to the natural elements.

Yadama also will be training engineering students to work with and gain better understanding of bio-based materials, so that they will bring this familiarity with the materials into their future careers in the building industry. He also hopes that the new type of materials will provide a way to use low-value wood feedstock to make a value-added product and thereby help the forest products industry.

by Tina Hilding, College of Engineering and Architecture