



NREL researcher Shanti Pless interacts with a digital twin of an automated cut-saw machine in a virtual reality environment at the NREL Insight Center as part of the Immersive Industrialized Construction Environments for Energy Efficiency Workforce pilot study. *Photo by Dennis Schroeder, NREL 63588*

# Circular Economy for Building Materials

**The building sector is the one of the largest consumers of raw materials and producers of waste in the United States. NREL is working to minimize waste from building construction by conducting research on new materials, construction, and building durability, as well as developing new design principles and modeling tools. These efforts are designed to help transform the “linear economy”—where materials are simply used and disposed—into a circular one.**

NREL’s work on developing a circular economy for building materials takes a multipronged approach. One key research area is the development of new materials and advanced construction methods designed to improve building performance and durability while minimizing waste. A second focus is gathering industry data to help architects and engineers better understand the impacts of their design decisions.

## Why Partner with NREL?

- NREL is focused on helping architects and engineers make informed design decisions by gathering industry data and developing new design principles and modeling tools.
- NREL’s research on new materials and advanced construction methods can offer significant gains in efficiency, waste reduction, and decarbonization.
- NREL is committed to ensuring our research gets to market—where it can improve everyday life and strengthen our economy. We have nearly 900 active agreements with almost 600 partners, over half of which are private-sector companies.

## Core Research Areas

- **Investigating New Building Materials**—Common building materials, such as concrete and steel, tend to be energy- and carbon-intensive to produce. To combat these issues, NREL has projects underway that explore the potential of wood—a natural, abundant, and renewable construction material with low cost—in building design and construction. One of these projects focuses on using cross-laminated timber as an alternative to reinforced concrete in building construction. Another effort proposes the use of a renewable, wood-based thermal energy storage composite to advance the use of thermal energy storage in buildings.
- **Reusing, Remanufacturing, and Recycling Building Materials**—End-of-life management is an important aspect of building material selection, but a lack of data, methodology, and design integration have hindered efforts to address reuse, remanufacturing, and recycling of materials in the building design process. NREL aims to address these limiting factors by creating an end-of-life database for building materials and components. In addition, NREL researchers are creating a consistent set of end-of-life standards and protocol as well as tools for design integration.
- **Developing Advanced Construction and Design Methods**—Another major research focus at NREL involves developing advanced construction methods and innovative designs to reduce the waste streams inherent in conventional construction. NREL researchers have developed a modular building system—New Iglu—that standardizes widely used components to allow system interoperability. The inherent flexibility of this building system allows users to replace, add, or upgrade panels with emerging technologies, reducing waste and allowing for reuse.

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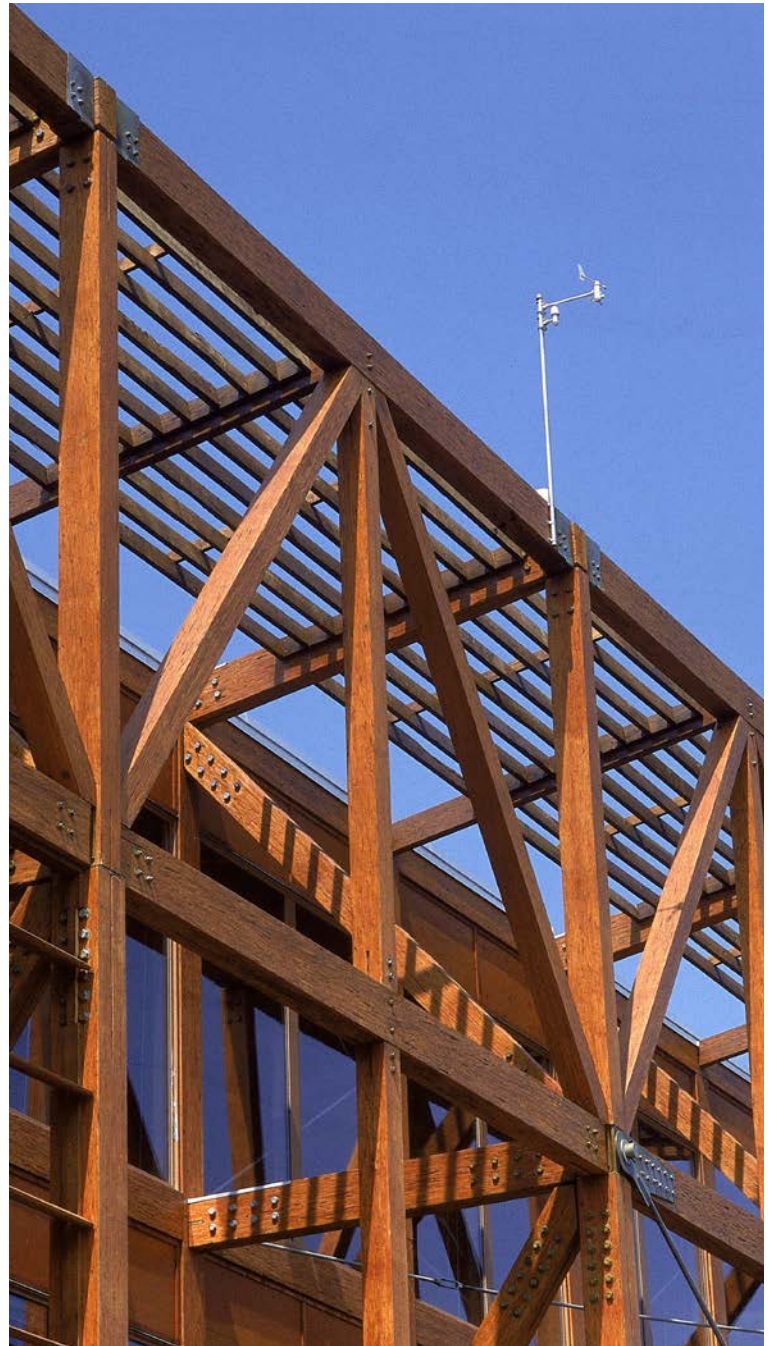
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NREL partnered with the Chesapeake Bay Foundation to analyze the energy performance of its Philip Merrill Environmental Center (pictured). The timber company engineered each beam for a specific role in the building. *Photo by Robb Williamson, NREL 10887*