targeting those with the most critical safety issues. Davids stressed that he and other UMaine researchers do not make any of the engineering decisions regarding actions taken on any of the state bridges.

"We provide the data, conduct analyses, and make recommendations that help them make good, informed engineering decisions," he says.

There are times when that information indicates that a bridge does need repairs, which points to a third prong of the UMaine civil engineering work on bridge safety with the transportation department. Under Davids' direction, a UMaine graduate student recently developed a repair technique using fiber-reinforced polymer (FRP) flexural retrofitting that has the potential to be a lightweight, lower-cost alternative that can extend the life of deteriorating concrete slab bridges by as much as 20 years.

The FRP technology is not new; it has been around for some 30 years, Davids says. But most of its application has used adhesives to attach the FRP sheets to the existing bridge structure, a method that can prove problematic with deteriorated concrete in Maine's challenging climate. The new technology includes design elements that allow the FRP strips to be bolted onto the existing structure. That method has attracted a lot of industry attention.

"The difference is that we used a mechanically fastened piece of FRP," Davids says. "There are relatively few people who have looked at that. There's a lot of interest in seeing how this works out."

There are still some challenges with the method and some questions to be answered, but Davids says the new techniques offers a lightweight, corrosion-resistant alternative that could extend the life of a bridge by 20 years and possibly much longer.

Work on the FRP technology put students through a full range of project research and development. Although the materials used to create the FRP retrofit pieces are readily available, UMaine researchers had to design the right combination of materials to create a product that was strong enough for the mechanical fastening technique, working closely with a Maine contractor who then manufactured the FRP sheets.

There were no industry guidelines for mechanically fastened FRPs, so the new project underwent extensive testing, under real-life conditions and in the Advanced Structures and Composites Center, where they tested 12-foot-long concrete beams reinforced with the FRP strips under static load and fatigue load conditions.

That UMaine project, as well as the many others, exposed students to the kinds of real engineering problems that they will be asked to solve in the workplace, Davids says, and it prepares them for their careers as engineers.

The high placement rate for civil engineer graduates indicates that that preparation is appreciated in the industry.

"Our students are prepared for this," he says. "They are going out there and they are finding jobs in Maine and outside Maine."

The work with the bridge safety project also puts students in regular contact with working engineers, many of whom are UMaine alumni. Davids notes that UMaine provides the only civil engineering degree program in the state, and more than 60 percent of the graduates take their first job in Maine.

There's a great demand for UMaine engineers, he says, and those graduates "don't forget where they came from."

There is a wide network of UMaine civil engineers who provide the civil engineering faculty with information on the industry, both informally and in regular on-campus meetings, and occasionally, as guest lecturers.

Davids was the UMaine valedictorian in 1989. He also received a master's degree in civil engineering from UMaine in 1991, and a Ph.D. in civil and structural engineering from the University of Washington in 1998. That year, Davids joined the UMaine College of Engineering faculty. He has chaired the Department of Civil and Environmental Engineering since 2012.

His many national, state and UMaine awards include the 2012 L.J. Markwardt Wood Engineering Award from the Forest Products Society and the George Marra Award from the Society of Wood Science and Technology.

In 2010, he was named the Civil Engineer of the Year by the Maine chapter of the American Society of Civil Engineers.

Davids also is UMaine's 2015 Distinguished Maine Professor, cited as a gifted, committed educator and outstanding researcher with a strong record of public service. His popular and rigorous upper-level undergraduate and graduate courses produce well-prepared structural engineers who truly understand how engineers design.

As a member of Maine's only civil engineering degree program, Davids says he feels a great responsibility to do the kind of work he does with MDOT on bridge safety, as well as public service research in other areas. It is an important part of the university's mission.

"I enjoy it and it's important work for us to do," he says. "We take this very seriously. It doesn't bring a lot of money into the university, but we are the University of Maine. This is the kind of work a state university needs to do."

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