re wood design course offerings in civil, architectural and agricultural engineering schools in the United States declining? Although the answer is not entirely clear, just maintaining the status quo could spell trouble for a wood products industry facing ever-greater competition from non-wood building materials.

University education about wood as an engineering material is primarily taught at two places: departments of wood science (or forest products/forestry) and departments of civil engineering (CE). And by some measures, wood education is in crisis at both. Enrollment in wood science programs has dropped substantially over the past two decades—from over 1,200 students in 1979 to about 500 in 2002—despite the fact that demand for wood science and technology graduates has consistently exceeded the supply.

Only half of CE programs offer a course in wood design as an elective. And the percentage of students required to take wood design courses dropped from 1978 to 1994. The American Society of Civil Engineers sponsored surveys of university civil engineering departments in 1978, 1984, 1989, and 1994. The first three surveys, with nearly 100 percent response rates, showed that about 13-14 percent of students were required to take wood design courses. The last survey showed that only 9 percent of students had the same requirement. This appears significant, although the smaller 73 percent response rate of the 1994 survey might have something to do with the results.

There hasn’t been a similar survey since 1994 and the state of university wood education in CE programs is difficult to assess with any precision.

“The current status of wood in engineering education is hard to nail down,” says Ken Fridley, head of civil and environmental engineering at the University of Alabama in Tuscaloosa. “There is no consistency, and this is one of the biggest problems.”

Weyerhaeuser Company Foundation sponsored a survey in 1985. Conducted by Keith Faherty, then a professor of civil engineering at Marquette University in Milwaukee and now professor emeritus, the survey showed that only 10 percent of the nation’s 194 civil engineering departments required a wood course. Wood design electives were offered at just 47 percent of schools. Today, says Faherty, “I think it’s probably about the same.”

Dave Pollock, assistant professor in civil and environmental engineering at Washington State University, Pullman, Wash., agrees. “I don’t believe that wood engineering education in civil engineering programs is in any worse—or better—condition than it was ten or 25 years ago. Some schools teach these topics, but many schools do not. This has always been the case and probably always will be.”

Conversely, Joe Kaiserlik, product development manager for engineered lumber at Georgia-Pacific Corporation in Roxboro, N.C., says, “It’s probably backsliding. It seems like it’s more and more difficult to find people with engineering backgrounds who know something about wood.” Kaiserlik says he knows of a number of jobs left unfilled because of the lack of wood design knowledge.
Kevin Cheung, technical services director of the Western Wood Products Association in Portland, Ore., says, “It seems to us that the offerings are in decline.” But he adds that wood design courses were “never part of the standard engineering curriculum.”

Fridley acknowledges, “There is a trend towards a decline, but it’s not on a steep slope. It’s hard to get your hands around. It changes year to year.”

Whatever the wood curricula numbers are, they are extremely low compared to the required non-wood material design courses. Some 70-80 percent of civil engineering programs have steel and concrete design course requirements.

Two other programs teach about wood at the university level, agricultural engineering (AgE) and architectural engineering (AE). Sixty percent of the AgE programs used to offer a course in wood design, but most AgE programs have changed their focus, and now only a few programs teach it. One-third of the AE programs teach a course in wood design and about three-fourths teach a course on wood as a building material.

Richard Behr, head of Penn State’s architectural engineering department (University Park, Pa.) and member of the education committee of the Architectural Engineering Institute, hasn’t noticed any decline in wood education in his field. “It’s definitely on the architectural engineering radar screen,” he says. “We don’t want to neglect it.”

Behr notes that a lack of wood courses won’t endanger a program’s accreditation, but an absence of concrete and steel courses will. As a result of the query for this article, Behr contacted 14 AEI-accredited programs in the U.S. to inquire about their wood design courses. Ten schools responded: one requires two courses, one requires one course, three offer electives, two include the material in other courses, and three offer no courses.

Agricultural engineering is a different story. “Most of what used to be agricultural engineering programs now have titles like ‘agriculture and biosystems engineering,’” says Steven Taylor, professor of biosystems engineering at Auburn University in Auburn, Ala. “They’ve changed their flavor from agriculture to biological systems. The change hasn’t helped regarding wood design. There are fewer places that emphasize structures and wood design. The programs are more interested in biology and environmental engineering and less in wood engineering.”

**Causes**

Assuming wood design education is in fact declining, the obvious next question becomes why?

The primary cause seems to be the increasing demands on student time, possibly pushing a civil engineering degree to a five-year undergraduate program or making it a master’s degree. Fridley says, “Curricula are changing in engineering education. Technology is changing. We want to include that content but keep the basics. At the same time, there is pressure to reduce or maintain the number of credit hours at a reasonable level. Adding content and reducing hours are opposing forces. So adding in options or electives gets harder.”

Another reason is shrinking teaching and research budgets. A lack of research funding for wood means engineering faculty members aren’t interested. Pollock says, “Most new faculty are hired based on their potential for bringing in research dollars to the university. If university administrators perceive that there is not much research funding available nationwide for wood, then they will not hire people with special expertise in wood, and wood engineering courses will probably not be taught at those universities.” Thus, when a faculty member with wood expertise retires, the replacement won’t have an interest in wood.

Fridley explains that the lack of research funding affects education: “Faculty interest at larger universities is often governed by the availability of research funds. Faculty with research funding in any area will lead to courses being taught in the area of research. They need students with expertise to help with the research.” Where schools can’t support the full program of undergraduate and graduate education and research, Fridley says the programs “are even more related to faculty interest and research money. This linkage is especially true for electives like wood.”

Still another cause is perception. Fridley says, “Young engineers suffer from the ‘Taj Mahal’ syndrome. They want to build the Golden Gate Bridge—big projects, big dollars. Wood doesn’t fall into that category.”

Larry Bell and Larry Ermis of Texas A&M University explained a second perceptual problem in their paper, “A Proper Education: Wood Science and Technology Programs in Growing Need of Industry-Academia Partnership,” (Engineered Wood Journal, Fall 1998). It’s the “plundering-the-planet” image of the forest products industry, which the authors say discourages students from pursuing wood-related careers.

**Consequences**

The recent trend in some programs is either to outsource various courses or to look for a sponsor to teach and financially support various courses. For example, two courses at Oregon State University, in masonry design and pre-stress concrete, are offered as electives that are taught by practicing professional engineers and fully supported financially by their respective industries. They cost the CE department no money. In 2002, wood design was also taught under a similar arrangement in which a consulting engineering firm provided the instructor and support. This is a dangerous trend. If outside support is not available for a particular course, the course may be dropped from the curriculum. The other consequence of wood design courses being offered as electives is that if there are budget problems electives are the first courses to be dropped.

The fallout of no training in wood design shows up in practice, where lack of training in wood design and construction can lead to performance problems. That, in turn, can give wood a bad reputation in the marketplace. Mike Baker, vice president of engineering at Trus Joist, Boise, Idaho, says, “Engineers leave school and they aren’t even...
aware of wood as an option for building. It’s not considered a serious structural product, which it is.”

Adds Kaiserlik, “If you go through an engineering program for four years and worked in steel and concrete, when you get out, you will do what you’re comfortable with. So you don’t think about working with wood or designing projects with it. You’ll go to the materials you have a background in.”

Tom Williamson, vice president of quality assurance and technical services at APA—The Engineered Wood Association and a former consulting engineer, explains that project fees typically are based on a percentage of the total contract. Learning how to use wood doesn’t enhance fees. Williamson says, “You are more efficient in your billing if you do what you know, which usually is not wood design.”

The entire forest products industry can lose market share as a result. Williamson says, “Steel and concrete dominate the nonresidential market, and they’re happy about it.” If engineers don’t even think about using wood for these markets, he says, “We’ll stay mired where we are and won’t gain any additional nonresidential market share.” The residential market is vulnerable, too, Williamson says. “The housing market shares we have now are under attack by the other products and are at continual risk.”

Solutions

“If we want wood design to be sustained,” says Fridley, “then we need to maintain faculty interested in it, and that requires research money to maintain the faculty. We need both the wood industry and government to provide funds for research and education.”

“Maybe industry could sponsor more scholarships or endow more faculty chairs,” suggests Steven Taylor. “This will change the outlook of faculty committees about replacing members.”

Money is also needed for faculty education. In 1988, Faherty led the Summer Institute on Wood Engineering Design Principles for College Faculty at Marquette, funded by the U.S. Forest Products Laboratory in Madison, Wis. from the bequest of a former lab employee. Of the 26 invited faculty members, nine had previously taught a course in wood. After the institute, 19 attendees taught courses.

If courses aren’t taught in the classroom or if there’s no local faculty to teach them, there are alternatives. Fridley says, “The Internet offers opportunities for distance education, ‘collaborative education.’ For example, the University of Alabama at Tuscaloosa has wood expertise, the University of Alabama at Birmingham doesn’t. So Tuscaloosa can provide remote courses to students at other universities.”

Fridley and Pollock, along with many student assistants, developed what Pollock describes as “a suite of timber Web modules to be used in conjunction with our Timber Design course here at WSU. We also made the modules available to faculty teaching Timber Design at other universities during the past few years. AF&PA, the primary financial sponsor of the work, is considering incorporating the Web modules into some of their Web-based education efforts targeted at practicing engineers.”

APA—The Engineered Wood Association also has picked up the education torch with its Wood University (www.wooduniversity.org), an online educational tool for aspiring and practicing architects and engineers, as well as construction and distribution professionals. The program at present includes a five-module course covering engineered wood basics. Additional courses are planned, but development budget is an issue, APA reports.

Lack of budget also has spelled the end, at least temporarily, of wood design teaching tool packages that for years were produced for and distributed to universities by the Wood Products Council (WPC), an alliance of wood product industry associations. WPC also recently investigated the feasibility of establishing an industry education foundation supported by manufacturers, but the response was insufficient to advance the idea. Both the Portland Cement Association and the Association of Iron and Steel Engineers, on the other hand, support educational foundations designed to attract

and support candidates in the field of engineering via scholarships, fellowships and other programs.

The Wood Products Council does sponsor a highly successful series of Wood Solutions Fairs around the U.S. and Canada, but these, like similar efforts by individual associations, attract primarily practicing professionals and therefore do little to train future design and engineering practitioners.

In the final analysis, if wood education is to maintain or expand its position in civil, architectural and agricultural engineering programs, a stronger partnership between the industry and educational institutions will be required. Industry’s role in such a partnership would be to:

• Help universities recruit more students into wood science programs by providing financial support and competitive salaries upon graduation.
• Sponsor and support a yearly summer institute to train university faculty in the teaching of wood design courses.
• Sponsor and support faculty members who specialize in wood engineering courses and research.
• Develop, maintain and disseminate a teaching tool package.
• Support wood-related research as a means to train future wood educators and researchers.

These activities could best be undertaken and coordinated through establishment of an industry educational foundation, such as those already in existence in the steel and concrete industries.

Bridget Mintz Testa is a Houston freelance writer with a degree in physics from the University of Houston. She can be reached at btesta@houston.rr.com. Rakesh Gupta is associate professor in the Department of Wood Science and Engineering at Oregon State University, Corvallis, and chair of the Wood Education Committee of the American Society of Civil Engineers Structural Engineering Institute. He can be reached at rakesh.gupta@orst.edu.