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IS IT BROKEN?

A main goal of the wood science profession is to conserve forest resources by efficient and effective utilization of wood. This includes developing new materials, implementing processing technology improvements, introducing improved uses for wood materials, and developing new engineering approaches for wood in construction. Perhaps the best way to conserve forest resources is to create buildings that last for many years so that new forests do not have to be harvested to replace obsolete, deteriorated buildings.

With all the research being conducted on wood materials, surprisingly, we still have a problem with one of the biggest uses for wood—building construction. Doctors J. Bodig, F. Beall, and S. Smulski have all written editorials for this journal expressing their concern that technology transfer is lagging far behind the development of new products. *We* know how to do it properly, but how do we get the message into the hands of those who can use the information?

Historic buildings that have survived for hundreds of years provide many lessons that can be used in modern construction regarding what works and what fails. Many design details are almost universal in surviving historic buildings, including large roof overhangs to protect walls from weather, robust and decay-resistant species used in high hazard areas of the building, water-shedding designs that promote rapid drying, and "airy" building envelopes that minimize condensation, but at the expense of energy efficiency.

Again this spring, for their first class project, my senior students made photographs of proper uses and misuses of wood in new building construction. Then, for the second project, they made photographs of wood in existing buildings. The same problems in new construction have been seen for years and include improperly notched beams and joists, non-treated wood in masonry contact, poor nailing of roof, wall and floor sheathing to the house frame as evidenced by rows of nail points exposed next to a stud or rafter, improperly cut I-joists, improper storage of wood materials on the construction site, and improper deck construction. I have to wonder if a building inspector finds all these mistakes and requires them to be corrected.

These seemingly simple mistakes are often created by people who have had little or no training in wood building construction. I note that to cut hair professionally a person must be "certified" by the state. Plumbers and electricians must be "certified" to practice their trade. In most states, builders must be certified, but these individuals are often the owners of the business and are not actually "building" the structure. The person actually on-site doing the construction is not required to have any training except perhaps informal on-the job demonstrations. Being an optimistic person, I do not believe that today's carpenter wakes up in the morning and thinks "how can I screw up the construction today?" Rather, I believe the person simply has no knowledge about the importance of proper construction methods.

My students also see architectural designs that have little-or-no roof overhangs to protect the building from weather, often no gutters to direct water away from the foundation, and site drainage problems. We all wonder if other moisture problems have been unwittingly built into the

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structure as condensation problems due to improper vapor barriers.

On a new construction site, the wood is bright, shiny, and new. The seemingly little problems found in new construction can become big problems for the future owner. The students' second class project shows how buildings age and what problems may occur. They see how water-shedding designs protect buildings and how some buildings have few problems while others are high maintenance structures.

A common and very serious problem is the improper construction of wood decks. Nearly every week in the summer months, a deck collapses somewhere in the U.S, causing serious injuries or worse. This problem is totally preventable. The two main causes of deck-related injuries are failure of the deck-to-house connection, and failure of the deck guardrail. Failure of the deck-to-house connection is catastrophic, causing the entire deck to fall, dumping people onto the ground. The failure is often caused by improper fasteners such as nails, improper spacing or installation of fasteners such as bolts or lag screws, improper flashing leading to decay of non-decay-resistant or non-treated wood. A good solution is to construct a "free standing deck" that is fully supported by columns and not by bolts or lag screws attached to the house.

Guardrail failures on decks cause people to fall to the ground, often with life-threatening injuries. Guardrails often fail at the connection between a post and the deck, by splitting of notched posts, inadequate fasteners, and by fracture of decayed wood. The decades-long experience with CCA-treated wood used in decks showed relatively good performance if the deck was adequately constructed. On the other hand, the new preservative chemicals such as ACQ and CA-B have been found to be highly corrosive to iron fasteners and aluminum flashing. Even galvanized fasteners may corrode at a rapid rate when installed in the new treated wood products. Stainless steel fasteners are preferred because they show no corrosion even in treated wood. Do deck builders know this? Are consumers willing to pay the extra cost for a safe deck? I believe they will happily pay the extra cost if they understand the consequences.

Furthermore, in many regions of the U.S., the major home center stores no longer carry dimension lumber treated with preservatives to ground contact level of retention. For decks, there are many water-trapping joints, for example, between the deck boards and the joists, or between the deck ledger board and the house, that will promote rot because they stay wet for extended time periods. However, many consumers and builders do not realize that the treated wood used to construct their decks is only rated for "above ground" low hazard use. This situation leads me to believe that the deck safety problem will continue far into the future.

How can wood scientists contribute to solving this problem? Technology transfer is needed to get research results into the hands of the people who are constructing our buildings. And the results must be in a form that can be understood and applied by the workers. The big question is how can this be accomplished? There is a huge labor pool with almost no incentive to learn how to "do it right." There is no certification program. I fear that the system is "broken" and WE must strive to fix it.

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