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IS HOUSING A RESEARCH PRIORITY?[1]

In 1995, I wrote an editorial for *Wood and Fiber Science* lamenting the fact that we were not focusing our research on housing. As evidence of this, I counted the housing-related articles in *Wood and Fiber Science* over the previous 4 years, and found that just 5% were directly related to housing. Now that we're into 2002, I thought it would be interesting to see what "impact" the editorial had. To my surprise, with the same type of survey, there were–again–5% of the papers related to housing. If nothing else, this shows that we are consistent! But why the concern? First of all, a substantial portion of wood and wood-based materials go into housing construction and repair and remodeling. If we add non-residential structures, this use probably doubles. Clearly, it makes sense to concentrate research where the materials go. But there's another important side to the justification. Housing is, for most people, their greatest capital investment, and unfortunately a substantial sink for income. What does this factoid mean? Is it a sign that we don't do research related to housing or is it that those who do publish elsewhere? Or perhaps there are no housing issues of interest.

I thought it would be good to take a look around home (California) since we have more than our share of problems with housing durability and disasters. Just a few years ago, we had a seismic event at Northridge that caused about $12B damage to wood-frame structures alone. If we assume that these happen about every 10 years, then we could estimate losses at about $1B per year. Termite and decay damage cause another $1B loss per year. The damage to houses from wildfires, which seems to get most of the press, is on the order of $0.2B per year. And according to FEMA, flood damage is our greatest annual loss in housing! Now we're beginning to get into toxic mold problems, much of it attributable to making houses more energy-efficient by reducing leakage.

I've been sensitized to some of these problems by the emphasis in our Laboratory on issues related to end use of wood and wood-based materials in structures. I also inherited a course for undergraduate architects on performance of wood in structures. If we look at housing in the broadest perspective, the research opportunities for wood scientists are clearly abundant. For example, there are many *comparative performance* issues. I'd like to contrast that with *comparative properties,* where we research the inherent difference in materials and products, and leave performance in service to the litigation experts. Some examples of opportunities are:

Substitutes for dimension lumber. A recent report on surveys of builders' substitutes for softwood lumber, including wood-based materials, found that the number of substitutes increased 50% (from 8 to 12) in just 3 years (1995 to 1998). This indicates that we are in (or have gone through) a transition period and need to broaden our scope from traditional materials and forms of construction,

[1] This editorial is based on the acceptance speech by the 2002 recipient of the Distinguished Service Award of SWST. See page 670.

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and think about hybrid materials and subsystems.

Substitutes for plywood. Oriented strandboard (OSB) has now become the commodity structural panel material. Many researchers and builders feel that OSB is not equivalent to plywood in performance, but laboratory data alone are not sufficient to make this case. OSB properties can be manipulated to produce a wide range of commodity and specialty products. The manufacturing variables that affect these properties present substantial research opportunities for linking fabrication to in-service performance.

Sandwich panel wall construction. Modular construction in housing has been an unrealized dream of many. The advantages over stick-built construction are obvious, and the continued demise of construction skills and quality of materials would seem to be a market-driver. However, moving into systems construction, despite its economy and potential for quality, is a large step for a very fragmented industry.

There have been some positive efforts in structure-related issues. PATH (Partnership for Advancing Technology in Housing) was a notable effort at the national level to improve the quality, affordability, durability, and energy-efficiency of today's new and existing homes. Although it was a victim of administrative change in Washington, it nevertheless continues with private sector backing, and has a substantial list of accomplishments. Over the past several years, we have had conferences in Madison to address the wood-related issues for improving durability of, and mitigating disasters in, housing.

CORRIM (Committee on Research on Renewable Industrial Materials) was a landmark effort to develop useful information on the environmental impact. It was substantially ahead of its time and set the stage for broader and deeper life-cycle analyses. The son of CORRIM, CORRIM II, has progressed to the point of a major draft report, portions of which are to be presented at the 2002 Forest Products Society Annual Meeting.

Disaster mitigation has recently been the objective of FEMA-supported research. One such effort has been carried out by CUREe (California Universities for Research in Earthquake Engineering) on the performance of wood-frame housing. This was stimulated by the Northridge earthquake, in which many wood-frame structures were damaged, and has produced a number of important benchmark studies. In the study, a number of wood-frame structures built to current codes were tested under severe seismic exposure with little damage. Of course, this construction was done under controlled conditions, and the materials were not aged. Of particular interest to the wood science community should be the impacts of "as built" construction and aging on performance.

A lower profile effort has been underway to construct demonstration houses, some under PATH support and others at universities, to show builders innovative techniques and materials, and provide test beds for researchers. In the research area, this provides an opportunity to assess the long-term durability of materials and subsystems.

In the case of disasters, we have great opportunities to learn the shortcomings of "real materials" built to code. For example, after the Loma Prieta and Northridge earthquakes, a number of inspectors reported possible biodeterioration effects in shear walls. However, this was not part of the reporting format, and they were not qualified to make the assessment. Perhaps the next major event will permit authoritative examination. In post-damage assessment of urban-wildland interface fires, we are often faced with examining the causes of loss of the structure with virtually nothing left but the foundation.

In summary, it seems that there are endless opportunities for research on the materials and subsystems that make up our structures. Why the hesitancy to get into these areas? Perhaps it is the bewildering complexity of codes, practices, and choice of materials. Or, for many academics, an aver-

sion to "applied" research. Whatever the reason(s), we need to think about the consequences of not doing research on housing; we owe it to our profession and to society to take the lead in this important area. In 2008, my planned retirement year, I'll do the survey again, with hope that our profession is not as consistent as it has been over the past decade!

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