Michael Ritter
Assistant Director, Wood Products Research
Forest Products Laboratory
Madison, Wisconsin

June 2004
Interviewer: Sandra Forney

Michael Ritter (MR): Michael Ritter. R-I-T-T-E-R. I work for the Forest Products Laboratory in Madison. I'm the assistant director for wood products research. My address is One Gifford Pinchot Drive, Madison, Wisconsin 53726. Telephone number is 608-231-9493. And e-mail: mritter@fs.fed.us.

Okay, we're in the basement of our house here in the Forest Products Lab. The thing that's unique about this basement is that it's one hundred per cent wood. There's no concrete whatsoever in the walls and the floor system. This is basically a system that was developed here at the Forest Products Lab a number of years ago. They've been very widely used across the country. The thing that's unusual is the wood floor. Normally these would have concrete floor, but this basement has a wood floor. The purpose that we built the house for was to look at moisture and moisture concerns such as mold and indoor air quality durability. To do that we've got a number of sensors in the wall. If you look to my left here you can see one of our data logger units and all the wires that feed into this. Through this system we're measuring the moisture content of the wood in the walls; we're looking at the relative humidity within the wall cavity; the pressure, and also the temperature. So by collecting this data and looking at the performance in the winter time and in the summertime, and looking at the different types of constructions that we've used, we hope to come up with recommendations on how to better build housing in the United States. Moving around, you'll notice that these joists up here, these are eye {joists?}, these are engineered wood products. You can see that the span on these is fairly long, probably in the neighborhood of twenty to twenty-two feet. We use these because we can't get the conventional solid {sawn?} material anymore; it used to be say, four by sixteen. So what we can do now is we can manufacture these eye {joists?} that are stronger and stiffer than what solid {sawn?} lumber would be, and yet allow it to use a much higher percentage of the material that comes off the forest. This is very important with engineered wood products because now we can use species that were considered to be trash species fifteen years ago. We can also use the smaller materials such as out West when we go through forest thinnings to improve forest health and reduce the fire hazard. This is another product; laminated timber that is also an engineered wood product. This is basically nominal one-and-a-half inch thick lumber that is glued together with water proof structural adhesives. The bond between the material, between the wood is actually stronger than the wood itself, and is a hundred per cent waterproof.

We move over here. Notice our floor here; this is treated plywood flooring. And right here we have a cut-out that shows you how this rests. Basically we have two inch wide stringers that sit on top of a gravel foundation with a vapor barrier to eliminate the moisture migration up into the basement. And it just sits right on the ground.

This is a typical example of what we have in the walls. Here we have some of the instrumentation. You can both thermocouples and moisture pins. Then we have a cellulose material for insulation, which is basically recycled newspaper. This is a material which is placed in damp; it's got an adhesive in it to prevent settling; it's also got a borate treatment to help reduce the fire hazard and reduce the potential for biotic attack or deterioration.

These are some of the engineered wood products again that we've used in the house. As I mentioned previously, we've an eye joist here that is an oriented strand board material in the web, and laminated veneer lumber on the top and bottom {phalanges?}. Again, this is intended to allow us to use smaller trees. Materials from the forest to be able to simulate a much smaller solid sawn lumber member. Then we've got... half of the siding on the house looks like wood on the outside but when you flip it over it's an oriented strand board material manufactured from aspen. This too is treated with a borate treatment to help eliminate any sort of attack from insects or decay fungi or mold. The exterior walls are all two by sixes, and the interior walls are two by four. All the material is finger-jointed studs as you see here. You can see the finger joint in the material. And these are studs made from relatively short-length pieces of material-- some of these are down to ten or eleven inches—that typically would have been discarded in a land fill. Now we can finger joint these together, join them into longer sections, and actually this is what was used to build the entire house.

Then we've got a bunch of other materials such as the southern pine flooring. This is tongue in groove flooring which you typically see. This is the flooring on one side, and then on the opposite side we have a beading, so that the flooring can be used, for example, as the roof, the ceiling over the porch outside, which we used in this house. You can also use it in vertical applications for wainscoting.

So we've got quite a mix, including, and I shouldn't forget, conventional solid sawn lumber like this two by eight southern pine member here. So we've used a wide mix of products, and I think the most important thing we're talking about here in engineered wood products, and how they fit in with our environmental wishes to maximize the efficiency of the material that we get out of our forests. One thing that I should mention about all these engineered wood products that we're talking about is that the Forest Products Laboratory here played a very significant role in the development of most of these materials, including the development of design values in initial testing. So we have a long history with a lot of these products here, and will continue to have this type of history as new products are developed in the future.

Another example of a glue-laminated timber beam. In this example it's used as a beam rather than a column. And here are the {eye joists?} suspended which support the upstairs floor. The other thing that's interesting to notice here is the use of a {mastic?} sealer to seal joists. A large percentage of the efficiency of your heating or cooling system can be lost if the joists aren't sealed in the duct work. This is a tape sealer here, which is also good, but the best sealer is this {mastic?} coating that you see here.

Moving on around, we also have a number of different products in the house here, that are intended to minimize the environmental footprint that we make. One of these is the compact fluorescent lighting which you see here. And you'll notice this is much brighter than what we've

conventionally been exposed to. These been a lot of advances in the product line here. They also save energy and last considerably longer than the conventional incandescent bulbs. For the hot water system we've got a conventional, direct vent gas hot water heater, which we have in many houses today, that is high efficiency. We also have an electric tankless hot water heater here. The difference between the two is that the gas system employs a reservoir of water that's kept heated, whereas the electrical system here, the tankless hot water heater, heats only on demand. And that is available with both gas and electric units. We have this copper series of tubes that's a GFX drain water heat recovery system, which is designed to get sixty to seventy per cent out of the drain water before it goes down through to the sewer. We do this so we can recycle it back through and in one sense pre-heat the water that's coming in to our water heating system. Then we have an on-demand, high-efficiency water softener system in a reverse osmosis water filtration system here that feeds in to the kitchen.

On this side, this is an air-to-air heat exchanger, where we bring fresh air into the house and exhaust air that's in the house. What this unit does is provide a baffle so that we can pre-heat the air. As the air goes out it can pre-heat the air that comes in. Or in summertime we can pre-cool the air that comes in. And again, this allows us to save energy, and with this type of unit we have fresh air in the house, which helps significantly with the indoor equality.

Moving around the corner, this is a high-efficiency gas heating system. It's equipped with an electrostatic air cleaner to help clean the air in the house. It also has a built-n humidifier for wintertime applications when we want to increase the humidity in the air, very often done for health reasons.

[MR in another part of the house]

This is a desk that was manufactured using small diameter round timber from thinnings in the Shasta Trinity National Forest out in California. This is one of the local community-based businesses that could be established to help utilize this material, and is being effectively and economically used out in California.

The flooring in this room is manufactured from small diameter Douglas fir. And again this is a big problem within the Forest Service, is what to do with the small diameter timber that we have to remove from the forest to help improve forest health and reduce the hazard of fire. So we've been looking at a number of ways to be able to develop value-added products to help offset the cost of removing this material from the forest. And we focused on a range of different value-added applications, which may be solid sawn material such as this, engineered wood products that we talked about before, and then using residuals for things like wood/plastic composites or water filtration systems or mulch mats. And I'll show you some wood/plastic composites in a few minutes.

Another area we've been looking in is being able to deconstruct buildings and re-use the wood that's in the buildings. I think most people know that we've been fairly good in this country and are getting better at recycling paper. But we actually recycle a very, very small amount of our solid wood products. We've been looking at the deconstruction of military buildings; and there's thousands of military buildings in this country that have millions of board feet of lumber in them

that are being torn down and in many cases the material's going straight to the land fill. So we've been involved in a number of projects with the Department of Defense, Habitat for Humanity, and others, to look at what we can do to deconstruct the buildings and re-use the wood. This is one example. This is siding that was removed from some military barracks at Fort Ord, California. And the material has lead-base paint on it. We've developed a system to be able to safely remove the lead-base paint, and then allow this material to be re-manufactured into a number of other products, such as siding, such as this four-inch piece here. Then we've got wainscoting, which can be put in vertically along the sides of a room. And last but not is flooring which is signified here. Now this room is also floored with deconstructed lumber, and you'll notice that it has a lot of character, not only from the variation in the color, but also the nail holes that you see. We intentionally left those in to give it character. They could be eliminated or sawn out during the sawing process.

This is an example here of a wood/plastic composite material. This is actually a piece of the roofing that we used on this house. It's manufactured from recycled milk jugs and waste wood fiber. It's molded and colored to look like cedar shakes. We'll show some pictures of it from the outside when we get out there. This whole area of wood/plastic composites is going to be growing more and will provide us with a real good opportunity to look at recycling products, not only from the wood standpoint but from the standpoint of plastics and other materials. These are some shims that were made using again using wood/plastic composites with one hundred percent recycled content.

[Next segment begins in mid-sentence]

...the blown-in cellulose insulation, again recycled newspapers that's placed over the grate room. The blue Styrofoam pieces you see at the end are vents that cover up or prevent the roofings that we've got. Ventilation's very important obviously for circulation of the air and keeping things dry.

[Close-up of a door panel]

This is just showing the studs in here are all finger-jointed two by fours.

[MR in another room. Recording begins in mid-sentence]

...that we're using to show proper construction techniques oriented primarily toward builders or apprentices that are coming up in the building trades. This is all based primarily on the Build A Better Home program that APA and the engineered wood association developed. We also have another data collection point here, with wires coming in from around the house. And the significance is that the wall here on the other side of the basement is stucco. Where the other walls that we showed outside were wood in one form or another. So we're looking at the differences here between a stucco wall on the outside and a wood-faced wall, and how that performs in the wintertime, when we look at moisture. Again, we've got the displays.

OSB is just a material where strands are removed, flakes. They're oriented in a particular direction depending on their wood properties that you want, and they're bonded together with

adhesives. So that we can make applications similar to what plywood would be, and use them in applications such as siding, roofing, flooring, just about anything you could use plywood for. This material here is the siding I showed you downstairs, with the OSB; and again this just has a face on it, which is accentuated by the dirt on this house, that shows the grain here to simulate the look of real wood.

Okay, this is the roof system that we have here, that looks like cedar shakes but is actually a wood/plastic composite. Again made from recycled milk jugs and waste wood fiber. The front of the house here has a brick veneer front, and this side of the house is stucco, the white stucco. And again we did this, together with two other wood sides which I'll show you in just a few minutes, to look at the relative performance of these when they're subjected to cold temperatures and high indoor humidity. See what the performance inside the wall cavity is and how it varies from one material to another.

T-111 is just a plywood that has a finished surface. You can see here, it's got the grooves put in; it's got a roughened surface, so it gives an attractive appearance. And this is a very commonly-used siding material for housing. And this is the first of two wood-based products that we have for exterior cladding. Just for your own information, this is where the water harvesting equipment's going to go to do the purification. We've got a passive solar design that we shouldn't have to heat at all in the winter. And we can collect rain water and use it in the house as potable water.

This is the final wood product that we use. This is the OSB siding material that looks like wood on the front. Again it's treated with borate treatment to help reduce the hazard, potential hazard from biotic attack. And then we've got some research in progress here. You can see some moisture pins in the side of the house, to look at the different variations of moisture content around this window location, and how that may affect the performance of the siding and some of the other materials that we have, that we've used in the house here.

Accessibility has always been a concern that we've had here, and that's allowing everybody to be able to come in and take a look at the house. Because of the nature of the research right now, we can't put an elevator in to allow access to the basement or the second floor, but that's something we have planned for the future. For first floor access we're going to build an ADA compliant rampway that will come off the porch here, and will come down and access both the walkways on the left and the parking lot on the right. The significance of this will be that we'll be building it out of small diameter round timber and we'll use a number of different decking materials on the top to evaluate their performance long-term. This will include not only some imported tropical hardwood but some native species to the U.S. and various formulations of wood/plastic composites. We hope t have that done by this summer so we'll have it open and available to everyone else. In the meantime we do have on the first floor a videotape that talks about the house and allows people to view remotely what we've got going on in the basement, until we get the other material installed.

[MR seated in office]

Sandra Forney (SF): hey, good afternoon Mike.

MR: Good afternoon.

SF: Tell me a little bit about your background profession and what you're doing here at Forest Products Lab.

MR: Well, going back to the early days, I got my degree at Cal Poly San Luis Obispo in California. Went to work for the Forest Service in 1977 on the Happy Camp Region District of the Klamath National Forest, working as a civil engineer for the national forest system. I spent two years in that position, transferred to Region Ten, which is Alaska, worked in the regional office for six years. Served as a regional structural engineer, bridge engineer, and the programs engineer. I spent about four years working in budget process. And then I transferred here to beautiful Madison, Wisconsin, America's number one city, to write a timber bridge manual. I was assigned to the Washington office division of engineering. Stationed at the Forest Products Lab, which was the best of all worlds because my nearest boss was in Washington, D.C. And I decided after that point to stay. Worked actively in the timber bridge research program for about ten years, and for the last several years I've been assistant director for wood products research. All of it u, my whole technical background is engineering. And that's about it.

SF: Very good. Why did you choose a career in engineering?

MR: Well, I figured I had to make money somehow, and... I can't tell you why I did.

SF: [Laughs] Okay.

MR: All my buddies were getting forestry jobs and nobody was hiring foresters. So I decided to go into engineering. Because I enjoyed it. Because I wanted to help humanity.

SF: Why did you pick the, or choose the Forest Service as an employer? Or maybe the Forest Service chose you?

MR: Well, I got a job offer from the Forest Service and decided to accept it over other offers that I had, primarily because of the work locations, and where you could live. I wasn't interested in living in a big city, and I thought the Forest Service presented a multitude of opportunities in some very nice locations.

SF: What kinds of skills do you have or tools that you use in your work, your research?

MR: Well I don't do any research any m ore. I do, but it's not my primary thing. I'm a bureaucrat now. I'm an engineer, as I said, by training, buy I don't use much of my engineering knowledge anymore. I push papers. They make papers over on that side and push them over here.

SF: And earlier today you showed us around the demonstration house. What kind of ideas do you have relative to showing this work, demonstrating the house on the Mall with the Folklife Festival, representing the Forest Service in their hundredth anniversary in 2005?

MR: Well I think, the important thing is, I did mention before that we took this whole building house on the Mall concept all the way through the permitting stage, had the plans done, and weren't able to do it because of a conflict with another event on the Mall. Didn't allow us time to remove the house. But the Forest Service is obviously about forests and products that we get from our national forests and multiple use, and here at the Forest Products Lab we focus on the products side. And a lot of what we do goes into research to provide the maximum benefit to the American public, while also maximizing the efficiency that we have in the products that we make and use every day, so that the impacts are minimal on our forests. So the thing that's interesting about the house is that, first, a house is the biggest purchase that most Americans will ever make; and what's in a house is always interesting to all people, whether it's the kitchen cabinets or wood/plastic composite roofs. So people are drawn naturally to a house. And the thing that's nice about a house from our perspective is they can show a very wide range of various types of products that we get from the forest: everything from our conventional solid sawn material, to our many different types of engineered wood products, to the new composites that are coming out. And it all ties in with the Forest Service mission and our need to maintain healthy forests and forests that are free from significant or catastrophic fire damage. That wasn't one sentence.

SF: Thank you very much. Is there anything else you'd like to share with me and the folks at the Folklife Festival, relative to our hundred year celebration on the Mall?

MR: Not that I can think of right off the bat.

SF: Okay. Well I know you're a very busy man. Thank you so much for your time.

END OF INTERVIEW