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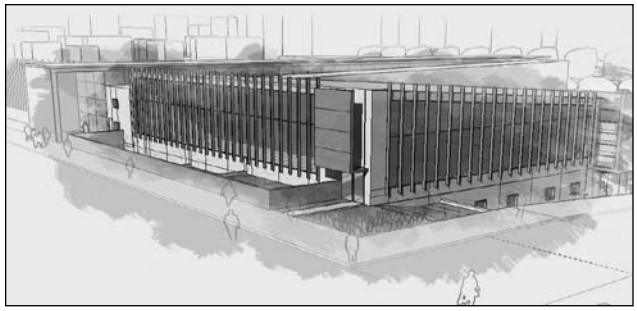
NEWSLINE
Forest Products Laboratory

The Forefront of Forest Products Research

New State-of-the-Art Facility Coming to FPL



Forest Products Laboratory MUL rendering.

By Rebecca Wallace, Public Affairs Specialist

The Forest Products Laboratory (FPL) has been an international leader in forest products research for nearly a century. But while FPL's research has evolved to meet the needs of modern society, much of the work is being conducted in outdated facilities.

As a result, a new combined research facility called the Multi-Use Laboratory (MUL) has been designed. Construction is slated to begin this summer, with completion estimated just in time for FPL's centennial in 2010.

"The Administration and the Congress have recognized the need to modernize our facilities," said Chris Risbrudt, Director of the FPL. "We appreciate their support, which will allow us to continue to develop innovations that benefit the American consumer."

The $36 million facility will house state-of-the-art equipment and laboratories for four major areas of research: wood preservation, durability, engineering mechanics, and composite sciences. All these laboratories are currently located in buildings that are not suitable for modern research.

(continued on pg. 6)

Economists project long-range Outlook for forest products industry

New model puts U.S. industry into a global context

By Andrea Ward, University of Wisconsin, Graduate Journalism Student

With wood-based imports at unprecedented levels and better technologies for developing biofuels from wood looming on the horizon, economists at the Forest Products Laboratory are creating a new economic model that will put the U.S. forest products industry outlook into a global context, with an eye toward evaluating a potential notable shift in uses of wood products in coming decades.

For the upcoming 2010 RPA assessment, economists at the Forest Products Laboratory are creating a new economic model that will put the U.S. forest products industry outlook into a global context. The model will evaluate potential shifts in uses of wood products in coming decades and how that could affect forest management practices.

"In a world where industry is increasingly global and with fewer restrictions on trade, we are asking what the affect will be on how we do forestry in the United States," said Ken Skog, Project Leader for Economics and Statistics Research Unit. "We'll also ask about the possibility for biofuels development and what that would mean for the forest industry and how forests are managed."

These questions will guide economic research for the upcoming 2010 RPA Forest Assessment, the latest edition of a comprehensive publication compiled by the Forest Service every 10 years on the status of the U.S. forest resource.

(continued on pg. 7)

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Check out our website at http://www.fpl.fs.fed.us

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Upcoming Events

15th International Symposium on Nondestructive Testing of Wood

September 10–12, 2007— Radisson Duluth Harborview Conference Center, Duluth, Minnesota. This symposium will bring together nondestructive testing (NDT) users, suppliers, international researchers, government agencies, and other groups to share research, products, and technology for using NDT to evaluate standing trees, logs, lumber, and wood structures. http://www.nrri.umn.edu/cartd/ndt2007/home.html

IUFRO All-Division-5 Conference: Forest Products and Environment – A Productive Symbiosis

October 29–November 2, 2007— Grand Hotel, Taipei, Taiwan. IUFRO Division 5 (Forest Products) will host a forum for the exchange of knowledge and experience in forest products research at national and international levels. Participants will discuss recent research progress, exchange information, and collaborate on research related to the conference theme. http://www.alldiv5iufro2007.org.tw/index.asp

Wood you Believe...

Planting trees and expanding parklands improve air quality. A total of 300 trees can counter balance the amount of pollution one person produces in a lifetime.

Trees lower air temperature by transpiring water and providing shade. Because they lower air temperatures, shade buildings, and block winds, they can help reduce energy costs.

If every family planted just one single tree, the amount of carbon dioxide in the atmosphere would be reduced by one billion pounds annually.

http://www.coloradotrees.org/

FPL Scientist Profile

FPL researcher looks to make the major leagues

Roland Hernandez

Editor's note: *Periodically in NewsLine we feature an FPL researcher who has made significant contributions in their area of research. In this issue we meet Roland Hernandez, a Research Engineer who has been at the Lab since 1990. Roland has studied the properties of engineered wood products for most of his career, specializing in advancing the use of glued-laminated timber beams (or "glulam," if you're in the building world).*

Glulam is a stress-rated engineered wood product made of wood laminations, or "lams," that are bonded together with strong, waterproof adhesives. Glulam components can be a variety of species, and individual "lams" are typically two inches or less in thickness.

Research projects Roland has been involved in include development of the highest strength glulam available in the industry today, utilizing non-traditional species such as hardwoods and ponderosa pine forest thinnings, and evaluating the performance improvements when glulam is reinforced with high-strength fiber-reinforced plastic composites. His current projects involve developing simulation models that predict the performance of straight and Tudor arch glulam members using lumber test data as input. He is also involved in a study on improving the performance of structural finger-jointed lumber through better grading and sorting methods.

Roland received his B.S. (1988) and M.S. (1991) degrees in Agricultural Engineering (Structures) from Texas A&M University. He is actively involved in technical committees of the American Institute of Timber Construction (AITC), the American Society for Testing and Materials (ASTM), and the North American Forestry Commission (NAFC), which has involved technical assistance visits to Mexico and Brazil. And perhaps most importantly, Roland is captain of the FPL softball team (more on why that's important later...).

–Gordie Blum, Communications Director

Alright, Roland, let's start with something easy. What is a Research Engineer, and how did you end up at FPL?

You can say that I was at the right place at the right time. As a graduate student at Texas A&M under Don Bender (now director of the Washington State University Wood Materials and Engineering Lab), I was assigned the industry-funded graduate project of developing a Monte Carlo simulation model to predict the strength of glulam beams. Monte Carlo simulation means that you take the distribution information of the lumber properties, and you predict the distribution information of the glulam beams. By simulating the distribution of beam strength, engineers can develop design values from this information. You can also run sensitivity analyses to check how much changing a certain lumber grade, or finger-joint strength, affects the overall performance of the glulam system. Furthermore, this was back in the day when simulation models were mostly written on large mainframe computers, and this model was developed to run on an office desktop. I say that "I was at the right place at the right time" because this project could have very easily been assigned to the grad student before me, or the grad student after me.

When the project was completed and ready for presenting, I traveled with Don to the American Institute of Timber Construction (AITC) meeting in Las Vegas, and in that group sat Russ Moody from FPL. Basically, over half the references in my Master's thesis involved FPL research papers by Russ Moody, and there he sat listening to my talk. You can imagine how nervous I felt.

Once again, I felt like I was at the right place at the right time. Just a few months after presenting my research, a job opening was announced at FPL (Russ's group), and I was hired right out of college. I remember coming for my interview in January (the temperature was zero), and passing Lake Monona on the way to Russ's house for dinner was the first time I had ever seen humans walk on water (frozen water, that is!).

What do you feel have been some of your career highlights?

What I have found extremely motivating is to see research actually get implemented into the marketplace. One of my first projects involved developing the highest strength (all-wood) glulam in the industry. We conducted field surveys of high-quality Southern Pine lumber and determined that a new grade could be developed that will allow glulam

Roland Hernandez working with glued-laminated beams.

Glulam beam test.

Mapping of failure propagations in glulam beams.

beams to reach new heights in design values. We produced some beams at a glulam plant and tested them here at FPL. Within a year, that glulam combination was adopted into the glulam standards, and soon after that, they were being marketed as the "PowerBeam" by Anthony Forest Products. That beam combination is still the highest strength (all-wood) glulam beam in the industry today.

Finding uses for unwanted material that needs to be thinned from our forests to reduce fuel loads is a big issue in the Forest Service. How happy have you been with the results of using some of this material in glulam?

One of the problems with lumber sawn from small-diameter forest thinnings is the amount of juvenile wood content, which is extremely prone to warping. Its use in glulam manufacture is actually a dimension-stabilizing process. Bonding that lumber, which would have warped as individual boards, into a laminated wood system produces a much more dimensionally stable structural wood product that can be used in residential and commercial applications.

What other product-driven research have you been involved with, and what were some of the results?

In the "early years," we evaluated glulam beams with high-performance fiber-reinforced plastic tension laminations. We found that beam stiffness could be improved by over 20% and beam strength could be improved by over 40% simply by applying a thin layer of this high-strength material.

What projects that you are involved in are you the most excited about right now?

I categorize all research conducted at FPL into one of three categories: analysis, utilization, and optimization. Analysis involves applying all our scientific knowledge to examine, decipher, model, and make sense of the data that we gather. Utilization involves finding value-added outlets for forest thinnings and/or underutilized species and is a necessary aspect of the Forest Service. Optimization is what really gets me most excited. I think that any time we can improve the performance of a wood product and make it a competitive product in the same market as steel, concrete, and other materials is the most exciting level of value-added engineering.

Since it's Summer, let switch gears momentarily. I understand that your love of wood has led you into some interesting hobbies, one of which involves our national pastime. Please tell our NewsLine readers how you got involved in making baseball bats and what is unique about them.

To make a long story short, I have had a side Internet business selling hardwood lumber to woodworkers and hobbyists since about 1999. For a couple years, I was selling 3×3×36-inch blanks of hard maple to bat manufacturers. A couple of those bat manufacturers actually became certified to sell to Major League Baseball while I was supplying them with wood. That quickly became too much demand for my small side business. So, I stopped selling the hard maple blanks to others and started sending those blanks to be made into hard maple baseball bats for our very own company. I had to come up with a name and settled on "RockBats," which stands for hard ROCK maple baseball BATS.

What is unique about RockBats is that each bat is tested, and we actually find the location of the sweet spot of the solid-wood bat. All of us at FPL know that no two pieces of wood are alike, and the same is true for the sweet spot of a solid-wood bat. So we put our logo on the sweet spot location, and this gives the batter information that no other bat manufacturer provides.

I'm sure our readers would also be interested to know that your bats have been certified by Major League Baseball (MLB), meaning that you can sell your bats to the big leaguers. What did that process involve, and what was it like working with MLB?

The first Major League Baseball player that has used and promoted RockBats is David Newhan of the New York Mets.

Top left: RockBats trademark display. Top right: Bats sold to the general public and Major League Baseball players. Bottom: General public bat samples wtih logos located at the sweet spot.

For about 3 years, our RockBats business was a hobby business. We basically sold these to amateur players from all over the country, and everyone loved them. In early 2006, however, we were approached by some entrepreneurs who were interested in further developing the baseball bat business. In the first year, RockBats grew from just a hobby business between my wife (Elaine) and me to an ownership group of 12 people. Those 12 people include the former team president of the Washington Nationals, 2 former Major League players, and several marketing specialists that have networked our RockBats into catalogs and onto store shelves of more than 250 retail stores.

We applied for and received certification into Major League Baseball in 2007. Our reps spent Spring Training introducing our bats to 11 Major League teams, and we now have a few pros swinging our bats. Even after all this, we still have not taken the Major Leagues by storm…we have to remind ourselves that this is still our first year. What we have found is that some players, or their agents, sign contracts with bat manufacturers to use their bats exclusively. This usually involves the biggest name players. We have had some big-name players try out (and like) our bats, but we have not yet convinced any to rip up their contracts and adopt our RockBats wholeheartedly. That day will come.

I understand you are captain of the FPL softball team. How successful have you been at making the team use wood rather than aluminum bats?

When we first put together our team, we had wood softball bats and most everyone was using them. As we started winning games, and we made it to our first championship game, several of our players defected and reached for their metal bats. Currently, there are only two players who still use wood 100% of the time. We may have to start charging a penalty for those who don't use a wood softball bat.

Final question, and it's an important one: For an engineer like yourself...as a kid...was it Legos, Lincoln Logs, or Tinker Toys?

No Legos, definitely not Tinker Toys, and not the off-the-shelf Lincoln Logs, but I do remember building a log cabin out of real sticks and gluing together small pebbles to make the chimney. But my official answer will have to be "bow and arrows" and "slingshots"…I built my own bows, arrows, and slingshots. There wasn't a Y-shaped tree branch in my backyard that did not get chopped off and converted into a slingshot.

For more information on Roland's work, check out his website at http://www.fpl.fs.fed.us/rwu4714/roland_hernandez.html

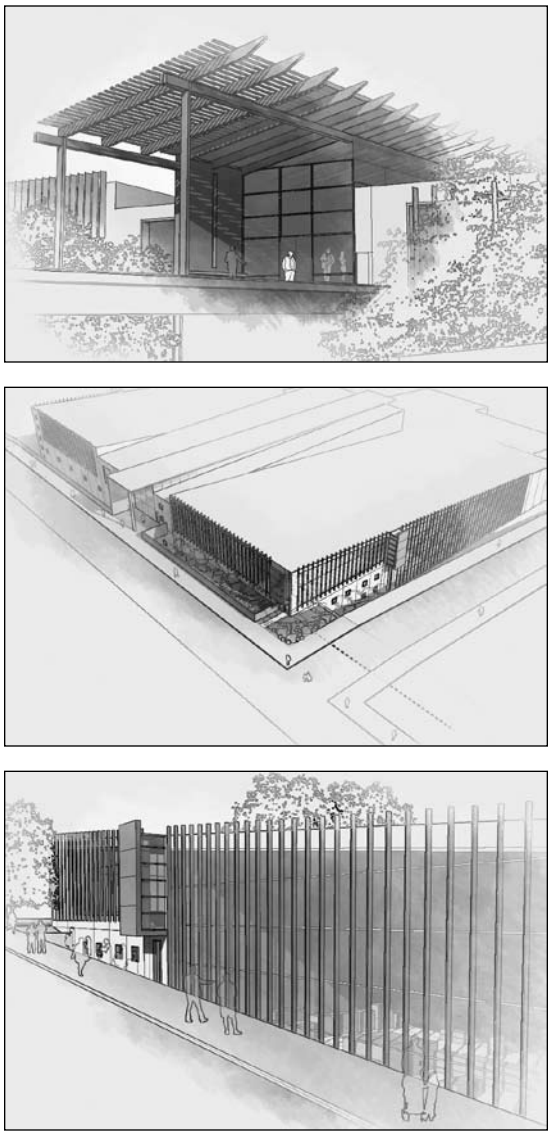
New State-of-the-Art Facility Coming to FPL *(continued from pg. 1)*

"The current buildings have simply outlived their useful lives when it comes to research," says FPL engineer Steve Kalinosky. "That's not to say the buildings aren't useful for other purposes, but they just don't have the capacity to fully support FPL's research projects."

Kalinosky says that the main reasons behind the development of a new research facility are safety concerns with the existing arrangement and the fact that the condition of the current facilities is putting limitations on what researchers are able to accomplish.

"The electrical and structural capacity of the current structures is insufficient for today's research," says Kalinosky. "Also, the lack of temperature and humidity controls, space limitations, and lack of material handling capabilities severely limits the efficiency of many research projects."

The buildings now housing these projects were not constructed with research in mind; in fact, composites research is currently performed in buildings constructed in the 1930s that were intended to serve as temporary structures.



Forest Products Laboratory MUL renderings.

The new MUL has been designed to keep similar situations from happening in the future. "This structure is being built not only for current research needs, but with the research of the next 50 years in mind," says Kalinosky.

The MUL will enable researchers to bring their projects to the forefront of forest products research, and each of the four research areas will have capabilities well beyond their current state.

The engineering mechanics laboratory will be constructed of strong wall and floor systems enabling researchers to perform full-scale testing of wood-framed building mock-ups and large wood structural members. Large open-bay floor areas will accommodate large testing equipment.

Composite sciences research will also benefit from the open-bay floor areas; they will accommodate large manufacturing equipment, including state-of-the-art compounders, extruders, injection-molders, and hot-presses.

The wood preservation laboratory will include microbiology and chemistry labs and a pilot-scale pressure treatment facility to replace the 75-year-old riveted vessels they currently employ. Potential safety concerns in the current preservation lab, including inefficient ventilation and pedestrian traffic flowing past test equipment, will be eliminated in the MUL.

Carol Clausen, Supervisory Microbiologist and project leader for durability and preservation research, comments on another important benefit the MUL will provide.

"The antiquated facilities currently in use limit the scope of collaborative research opportunities for FPL," says Clausen. "The MUL will not only benefit our scientists and their projects but will also attract new collaborations from industrial partners and visiting university scientists."

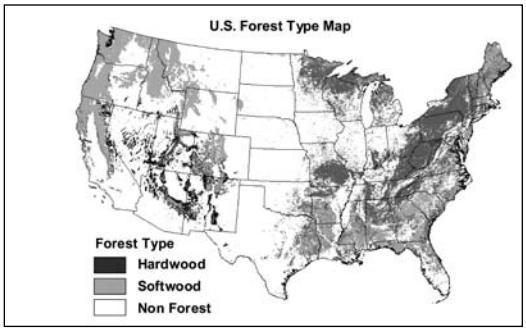
Durability research, which studies the effects of moisture on wood products, will utilize one of the most notable features of the new laboratory: a one-of-a-kind custom-made stainless steel weathering chamber that mimics actual weather conditions, including temperature, humidity, sunlight, wind, and rain. A laboratory designed to study moisture transport properties of wood products will also be constructed.

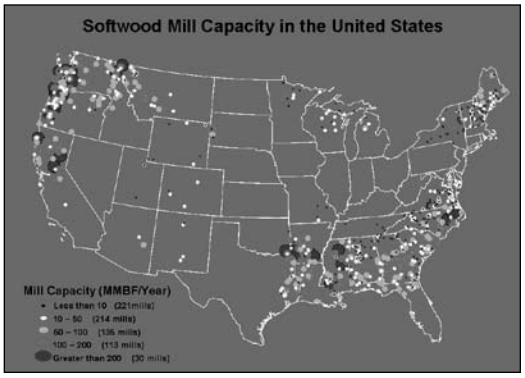
The building itself looks to be as impressive as the research being conducted inside. The combined steel and wood structure will provide approximately 90,000 square feet of space and will include an interior observation area as well as glazing along a main roadway to allow pedestrians a view of the interior functions.

The MUL was designed by Science Applications International Corporation (SAIC) Engineering, Inc., of Harrisburg, Pennsylvania, with HDR, Inc., of Omaha, Nebraska.

"We're now much more interested in how the forest industry and forests will be impacted by what happens in the rest of world," said Skog of the 2010 assessment. "By representing what's happening in other countries, we can understand better their impact on competition with the United States."

Peter Ince is the FPL economist leading development of a new U.S. forest sector model that will be used in combination with a global trade model to produce the new global long-range outlook for the forest products industry. For the first time, Ince says, the model will account for the possibility that improving technologies for producing biofuels from wood and other cellulosic materials will introduce a shift in the market for forest products in the United States.





The idea of making ethanol and other fuels from wood is not a new one, according to Ince. In fact, FPL research in the 1940s showed that it has been a possibility for decades. But because of inefficient production methods, especially compared with those used to produce corn grain ethanol, cellulosic biofuels have never threatened to have a discernible impact on the worldwide market for forest products, until recently.

"Advances in process technology are now thought likely to bring about efficiency gains such that these biofuels from wood may become economical," said Ince.

Two specific technologies for producing wood-based biofuels are running "head to head" in a race for efficiency, according to Ince. The "biochemical" approach involves the breakdown of cellulose—which Ince calls "nature's polymer"—into its constituent glucose molecules, and from there the fermentation of glucose into ethanol using yeast, much the way that ethanol is currently derived from corn grain. Enzymes and acids have proven effective in breaking down cellulose into glucose, but the technique remains far more costly than the corn grain ethanol process, which takes advantage of the more readily available glucose in corn starch.

Competing with the biochemical approach to producing cellulosic biofuels is the "thermochemical" approach—a messier, less-refined process, according to Ince. Heated to a high temperature in a process much like the one used in making charcoal, wood produces a mixture of gases including carbon monoxide and hydrogen, called "syngas," which can be burned directly or converted into liquid fuels. Though the petroleum industry has been converting syngas into fuels for decades, Ince says, the process of deriving syngas from wood is not yet efficient enough to be cost-effective on a large scale. Research at FPL is examining possibilities for using liquid metal to achieve cleaner and more efficient syngas production.

Whether the production of biofuels from wood becomes economically viable does not just depend upon making existing technology more efficient, Ince says. The wood must be available to biofuels plants in terms of quantities and price, which is where the new economic model for projecting the future of the forest resource enters the picture.

"We're pretty sure they wouldn't be able to compete by making ethanol out of, say, high-value saw-timber trees or old-growth trees or anything that's much more valuable in the market," said Ince. "But at the lower value end of the spectrum there could be some competition if the cost of making it gets low enough or the cost of energy gets high enough. We will try to answer several questions [using the economic model]: Will biofuels be developed in the future? If so, under what circumstances? If they are developed, what effect would that have on forest ecosystems and standing timber resources, and where in the country would that have an impact?"

Ince suggests that a more competitive wood-to-biofuels technology could spark higher demand for short-rotation woody crops (SRWCs) such as poplar and some willow hybrids, which would likely be planted in the greatest concentration on marginal agricultural land, particularly in the South and perhaps other regions where marginal agricultural lands are available for planting.

Neither Skog nor Ince are ready to formally predict the future impact of biofuels on the overall forest resource. "We don't know how markets might evolve until we pull these forces together in the model," Skog said. But their projections will be incorporated into the 2010 RPA Forest Assessment and are designed to aid both the Forest Service and the forest products industry in strategic planning over the long range.

"This information should allow better anticipation of the benefit of certain lines of technological research or the need for particular kinds of forest management in response to changes in demand," said Skog.

Ask FPL

We get thousands of inquiries each year. We print what we feel are some of the best questions. Here is one we recently received.

Questions?

Contact us at
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http://www.fpl.fs.fed.us

or write

mailroom_forest_products_laboratory@fs.fed.us

We can also be reached by telephone at

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I've recently heard about several businesses using small-diameter trees for their products. Are there benefits to using this material, and what can it be used for?

By Tivoli Gough, Editorial Assistant

Small diameter trees dominate many forests which can cause several potentially serious problems. As a result of many years of fire suppression, forests are massed with an abundance of dense, small-diameter trees and woody biomass. Problems resulting from this imbalance include an increased risk of catastrophic wildfire, insect infestation, and disease. One of the Forest Service's priorities is to improve forest health by thinning these trees and finding valuable uses for small-diameter lumber to offset the cost of thinning.

Thinning and removal of small-diameter timber offers many benefits.

- Quality mix of species and improved stand in forests
- Reduced risk of wildfires, insect infestation and spread of disease
- Increased fire resiliency
- Improved and protected watersheds
- Amplified supply of wood and fiber
- Healthier wildlife habitat over all

There is a perception that small-diameter trees are unusable because they produce substandard wood. However, small diameter timber has a multitude of uses.

- Structural roundwood material for bridges, boardwalks, cabins, trail structures, picnic shelters, storage sheds, and other buildings
- Lumber, glued-laminated timber, and engineered wood products
- Wood composites, such as siding or decking materials
- Pulp chips, mulch, or compost
- Energy and bio-fuels

For more information on uses of small-diameter timber, visit the Technology Marketing Unit website and check out two of our recent publications:

Technology Marketing Unit website

http://www.fpl.fs.fed.us/tmu/index.html

Small Diameter Success Stories I

http://www.fpl.fs.fed.us/tmu/resources/documents/sd_success_stories.pdf

Small Diameter Success Stories II

http://www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr168.pdf

Small-diameter-abundant forest before thinning and restoration.

Forest after thinning and restoration.

From House to Home

By Rebecca Wallace,
Public Affairs Specialist

A "House That Love Built" was dedicated to the Jessie and Cheryl Arredondo family of Canton, North Carolina through the Haywood Habitat for Humanity (HHFH) on June 24, 2007. Before being donated to Habitat for Humanity, the 1,200 square foot house was displayed on the National Mall in Washington, DC, during the Smithsonian Folklife Festival in 2005 to commemorate the 100th anniversary of the U.S. Forest Service and sustainable forestry. This Sustainable Resource House, as it was called while in DC, demonstrated the link between sustainable forestry, modern efficient wood products, and green building; the house also showcased sustainable wood products that the Forest Products Laboratory (FPL) developed or played a role in developing. In addition to FPL, sponsoring organizations included APA – The Engineered Wood Association, the Structural Insulated Panel Association, and the Southern Pine Council.

The completed HHFH home in Canton, NC.

The Arredondo family on the front porch of their new home.

Jessie and Cheryl Arredondo during the June 24 Open House and Dedication.

Mike Ritter, FPL, presents Marnette Colborne, Executive Director for HHFH, a Certification of Appreciation.

Walton Garrett, long-time HHFH volunteer, welcomes the family into their new home.

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