

HOW DURABLE IS FIRE-RETARDANT-TREATED PLYWOOD?



This is the first house in Florida built of fire-retardant-treated wood. It's Type-A rating from Underwriters Laboratories qualifies it for use in high-humidity environments.

by Steve Carlson

A handful of roof failures spawns a storm of controversy

Do the chemicals used to make plywood fire resistant also make it brittle and punky?

Reports of roof failures involving fire-retardant-treated (FRT) plywood are being examined by groups within both industry and government. But don't expect any firm conclusions for at least a couple of years.

Producers of FRT plywood readily agree that treatment inherently causes a slight structural weakening of the wood, which should be taken into account in a building's design. That's not a bad tradeoff, they say, for a convenient, relatively inexpensive product that can improve fire safety, meet code requirements, and reduce insurance premiums.

But a few (reportedly 16) roof failures involving the product have sent researchers scurrying. Are the failures flukes, or do they indicate a wide-reaching problem? The first public report on the problem was a 1987 bulletin issued by the American Plywood Association (APA). The bulletin ignited so much controversy within the industry that it was quickly withdrawn from circulation.

According to the APA bulletin, the problems appear to be industry-wide and not limited to specific brands. All have involved the "low-hygroscopic" treatments that have become standard in recent years. The panels appear to become charred, brittle or punky. Buckling sometimes occurs, and panel strength is reduced by as much as 50 percent. These problems sometimes show up during construction, but more often occur two or three years afterward.

Now the issue is considered so sensitive that officials of APA do not discuss their 1987 conclusions, and all inquiries are directed to Hugh Love, APA's director of communications.

"Our position is simply this," Love says. "Because treating is a secondary process, over which the producer has no control, the plywood producer cannot guarantee the product."

In other words, APA says that span ratings and design information about plywood apply only to untreated material, and become invalid after treatment with fire-retardant chemicals.

A government study of the issue is being carried out by the U.S. Forest Products Laboratory in Madison, Wisc. Susan LeVan, USFPL's project leader, says it will be about two years before findings are published. But her current hypothesis is that the problem is the result of three factors interacting with each other.

First, she notes, fire-retardant chemicals work by catalyzing the degradation of wood to its less flammable components—that is, charring the outer layer at a lower temperature. Char is less flammable, and less strong, than wood.

Second, the acid in the chemicals may interact with moisture to cause hydrolysis, breaking down the cellular chains that cement the wood together. Third, high temperatures can degrade any wood, and the documented problems have occurred with roof systems where temperatures sometimes reach 140 to 160 degrees. When those three factors are all present, LeVan says, "they seem to have a combined effect that's worse than the individual effects."

Meanwhile, analysis of the problem in the private sector is the focus of a task

group formed by the National Forest Products Association, with twelve members representing the treating, white lumber, and plywood industries.

"We're in the process of trying to determine what the problem is and what to do about it," says Rod Buchan, who chairs the group. Importantly, the task group is trying to establish a test protocol for FRT plywood, so that builders can be assured that strength is sufficient for specific designs.

It may be some time before a final report is made public, as it must be approved by a larger committee and the National Forest Products Commission after the task group completes its work. But meanwhile, Buchan maintains that there's no cause for alarm. "Over the years there have always been problems with individual building materials," he says. "This one doesn't appear to be of serious proportions."

Spokesmen for the treating industry take the position that the original APA bulletin was issued prematurely—with insufficient research to prove that the relatively small number of roof failures indicates a more widespread problem.

"There's a jillion feet of treated wood out there without any problems," exclaims George Eliades, president of the Society of American Wood Preservers. "There are occasional problems with any product—Cadillacs, even Mercedes Benzes. Like everything else, there may be an occasional bad batch [of FRT chemicals] but that's not normally what happens out there."

Richard Catchpole, who represents treaters on the industry task group, says all the reports of failures involved roofs with insufficient ventilation. Excessive heat and moisture can degrade any wood, he notes.

Despite strong differences of opinion on the severity of the problem, all sources we contacted agreed that the following precautions will help a prudent builder minimize the risks of an unexpected roof failure when FRT plywood is used:

1. Protect the wood from moisture. That's important with any decking material, but particularly so with FRT plywood.
2. Make sure that FRT plywood is protected from extreme heat. Good ventilation is particularly important. Hot tar, and perhaps even dark shingles, should be avoided.
3. Make sure the FRT plywood you are buying has an Underwriters Laboratory label certifying flame spread of less than 25 in the 30-minute test. This doesn't guarantee structural strength, but indicates that the plywood came from a reputable producer.
4. Examine the quality of the wood. Susan LeVan of USFPL notes, "If you treat good wood, you have a better product than if you treat lousy wood."
5. The methods and chemicals used in treatment are proprietary information. Therefore, to receive answers to questions about a specific brand of FRT plywood, you should contact the treater, whose name should be stamped on the product. The treater may, in some cases, refer you to the company that produced the chemical concentrates.

Meanwhile, watch for more specific findings and recommendations from the industry and government studies—probably within a couple of years. ■

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What is Fire-Retardant-Treated Wood?

by Glenn Wilson



Hoover Treated Wood Products

Fire-retardant treated wood must be tested for fire performance. These FRT cedar shakes are being tested for fire performance after spending 12 weeks in a weathering chamber.

Fire Retardant Treated Wood (FRTW) is a highly technical product which performs an important mission — protecting lives and property. Even though it has many applications in residential and commercial construction, FRTW is still an unfamiliar product to many because it is generally used only where it is mandated by building codes and insurance regulations.

Despite explicit code definitions and requirements, a significant amount of sub-standard fire retardant treated wood has found its way into the marketplace, often due to a lack of understanding of building-code requirements. This is unfortunate because it creates a great deal of confusion and because innocent parties can get hurt if a sub-standard FRTW is used.

What is Fire Retardant Wood? FRTW is lumber or plywood that has been vacuum-pressure treated in a closed-pressure cylinder with special water-borne chemical formulations, according to strict guidelines and inspection procedures, and then kiln-dried after treatment to remove water added during the treatment process. The result is wood that can be used in virtually any construction application where untreated wood is used, often as a substitute for non-combustible materials, and which will maintain its strength long after other materials have failed under similar fire conditions.

How does fire-retardant-treated wood retard fire? When exposed to fire, the fire-retardant chemicals form a layer of protective "char" on the surface of the wood. This protective layer prevents combustion of the underlying wood fibers and insulates the wood from the heat of the fire. This greatly prolongs the life of the wood member in a fire and inhibits the spread of the fire to other parts of the structure. FRTW also reduces the danger to firefighters, occupants, and contents by preserving the structural integrity of the building.

How can fire-retardant-treated wood be used? FRTW is available for both interior and exterior uses. The most advanced interior fire-retardant-treated wood (American Wood Preservers Association, Type A) can be used for any interior application where relative humidity will not exceed 95 percent and where it will not be heated above

150°F in normal use. Each piece must be clearly stamped or labeled to show in-plant follow-up inspection, flame-spread rating in the 30-minute flame test (ASTM E-84, extended) and kiln drying after treatment. In addition, for engineered structural uses such as roof and floor trusses, each piece must be stamped with a third-party stress-value certification mark in accordance with National Forest Products Association/National Design Specification for Wood Construction (NFPA/NDS).

Structural uses for interior-type FRTW include roof and floor trusses, roof decking, non-load bearing and load-bearing walls, and as a substitute for non-combustible materials in special code-designated uses.

Exterior-type FRTW can be used in high-humidity applications and in direct exposure to the weather. Typical applications include exterior siding, balconies, scaffold planks, and shakes and shingles. It retains its fire retardancy in spite of repeated wetting and drying. It must be stamped or labeled to show third-party in-plant inspection, flame-spread rating, accelerated weathering test, and kiln drying after treatment.

Can fire-retardant-treated wood reduce insurance premiums? Buildings constructed with FRTW throughout are often rated the same as non-combustible for insurance purposes, resulting in reduced fire insurance premiums for the structure.

Building codes and insurance regulations govern the requirements for using FRTW in order to qualify the building for reduced insurance rates. Applicable local code requirements and insurance rates may vary, and these should be taken into account by the architect or engineer in the design stages of the project.

With the use of FRTW, many building codes allow increased square footage, an extra story, or substitutions for a non-combustible building material (i.e. steel, masonry) in many uses, while providing the easy workability and natural beauty of wood.

How expensive is fire-retardant-treated wood? Due to production and testing codes, FRTW is more expensive than untreated wood; however, the additional material

cost is often recovered by the owners of the project through reduced insurance premiums. This payback is typically 2 to 3 years, and sometimes even less.

What about important structural applications? Strength is a critical factor in structural applications such as trusses and other load-bearing members. Fire-retardant treatment does result in a slight reduction in strength, and each FRTW manufacturer is required to conduct strength tests and provide certified strength values for its products. Third-party testing procedures are specified in the 1986 issue of the *National Design Specification for Wood Construction* (NDS), published by the National Forest Products Association (NFPA).

The NFPA/NDS policy requires independent third-party testing and certification of these strength values, as well as continuous monitoring of the production process by an approved third-party inspection agency.

How do you identify FRTW? FRTW is one of the major growth products in the lumber industry, and this growth has attracted cheap imitations and sub-standard fire-retardant treatments that do not meet code requirements. These imitations are finding their way into large residential and commercial projects where the potential liability for suppliers, architects, engineers, building inspectors, and property owners is extremely high.

In addition to sub-standard pressure treatments, there are also many spray-on coatings being marketed as FRTW. One must keep in mind that *only* pressure treatment in a closed pressure cylinder can result in effective, thorough impregnation of the wood with fire-retardant chemicals, and third-party quality control is the only way to assure consistency and quality. The safest approach is to specify FRTW that carries the Underwriters Laboratory label certifying flame spread less than 25 in the 30-minute test and kiln drying after treatment.

Are there any limitations on the use of fire-retardant-treated plywood as roof sheathing? Plywood roof sheathing is sensitive to high heat and high moisture conditions whether it is treated or untreated. Adequate roof ventilation and proper insulation practices should be used to assure that wood temperatures do not exceed 150°F and to prevent moisture accumulation. Controlling temperature and moisture requires more ventilation than the amount specified by building codes, and it requires that the entire underside of the roof be washed with a uniform flow of outside air in both summer and winter. Ventilation should receive attention in the design stages of any wood roof system. ■

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