FIRE-RETARDANT TREATED WOOD

Table of Contents

List of Figures

List of Tables

1.0 SCOPE

This data sheet applies to fire-retardant treated wood (FRTW), including lumber and plywood. It does not cover other wood-related products such as oriented strand board (OSB) or particle board.

1.1 Changes

April 2020. Interim revision. Section 1.0 Scope was revised and references to Data Sheet 1-51, *Fire-Retardant Coatings and Paints for Interior Finish Materials,* were removed because it was made obsolete.

2.0 LOSS PREVENTION RECOMMENDATIONS

2.1 Construction and Location

2.1.1 Use noncombustible or FM Approved Class 1 building materials.

There are currently (2019) no FM Approved Class 1 fire-retardant-treated wood products.

2.1.2 Use fire-retardant treated wood that has been kiln dried after treatment to limit the maximum moisture content to 19% for lumber and 15% for plywood.

2.1.3 As a suitable alternative to FM 4470 or FM 4880 use fire-retardant treated wood that, when tested in accordance with ASTM E84 or UL 723 meets a flame spread index of 25 or less for the 10-minute test and shows no evidence of significant progressive combustion when this test is continued for an additional 20-minute period. Additionally the flame front should not progress more than 10.5 ft (3.2 m) beyond the centerline of the burners at any time during the test.

2.1.4 Use fire-retardant treated wood identified as ″exterior grade″ where exposed to weather or damp or wet locations.

2.1.5 Use fasteners, anchors and hardware that are hot-dip galvanized or stainless steel to minimize corrosion potential.

2.2 Protection

Regardless of the use of fire-retardant wood even in accordance with the requirements and limitations of this standard, the combustibility of the occupancy may still dictate the need for automatic sprinkler protection.

2.2.1 If wood construction is to be utilized, install FM Approved fire-retardant treated wood if sprinkler protection is not provided. Provide sprinkler protection for any areas utilizing fire-retardant treated wood where the floor area or roof deck area exceeds 100,000 ft^2 (9300 m^2).

2.2.1.1 For fire-retardant treated wood installations as outlined in 2.2.1, supporting wood members greater than 7 1/2 in. (190 mm) in least dimension and spaced more than 6 ft (1.8 m) on center may be of untreated wood.

2.2.2 Where total floor or roof area on any one level exceeds 100,000 ft^2 (9300 m^2), one of the following methods may be used to subdivide the total into 100,000 ft^2 (9300 m^2) acceptable areas:

A. Install two rows of automatic sprinklers, 10 ft (3 m) apart, across the fire-retardant wood roof. Space sprinklers 10 ft (3 m) apart along each line. Ensure the water supply is adequate to supply 15 gpm (57 L/min) per sprinkler, while maintaining the required minimum end head pressures.

B. Create sections 30 ft (9.1 m) wide of noncombustible deck such as concrete or gypsum.

2.2.3 Where partitions are constructed of wood sheathing or plywood, use FM Approved fire-retardant treated wood or provide automatic sprinkler protection per Table 1.

Table 1. Sprinkler Protection for FRTW Partition Walls

	Building Height	
	30 ft (9.1 m) High	Over 30 ft (9.1 m) High
FRTW & Untreated Wood With Ceiling Sprinklers	No	No
FM Approved, E 84, UL Tested FRTW Without Ceiling Sprinklers	No	Yes, walls only
Untreated Wood With No Ceiling Sprinklers	Yes, walls Only	Yes, walls only

2.2.4 Where protection is for the wall alone, it can be provided by a single line of quick response sprinklers within 2 ft (0.6 m) of the wall and 10 ft (3 m) on center. Base the demand on supplying at least 20 gpm (76 L/min) to each of the hydraulically most remote 10 sprinklers, while maintaining the required minimum end head pressures.

2.2.5 For attics constructed of fire-retardant treated wood that is not FM Approved, provide sprinkler protection throughout the attic. Design sprinklers per DS 2-0, *Installation Guidelines for Automatic Sprinklers* and DS 3-26, *Fire Protection Water Demand for Non-Storage Sprinklered Properties*.

2.2.6 Where lumber in quantities that would justify sprinkler protection is used for trim, benches, shelving, cribbing, supporting structures, bin dividers or bleachers (i.e., tiered bench seating), and sprinkler protection will not be provided, use FM Approved fire-retardant treated lumber.

2.3 Operation and Maintenance

2.3.1 Do not rip or mill fire-retardant treated lumber. Cross cuts, joining cuts, and drilling holes are exceptions. Fire-retardant treated plywood may be cut in any direction.

2.3.2 Keep permanent records of fire-retardant wood on the site. The best records are copies of shipping vouchers or purchase orders along with construction drawings.

3.0 SUPPORT FOR RECOMMENDATIONS

3.1 General

Wood treated by impregnation to make it fire retardant is acceptable without automatic sprinkler protection for limited application if the lumber meets certain standards and has passed specific large-scale fire testing. The standards include reduction in combustibility, permanence of treatment, production quality control, and ready identification. There should be no other construction or occupancy in the area that would normally require sprinkler protection. Impregnated fire-retardant treated wood where the treatment has been provided through the entire dimensions of the lumber is very different and handled differently than lumber that has simply been surface coated. Fire-retardant coated products will not withstand a significant fire exposure to the same level that fire-retardant treated wood will.

3.2 Typical Applications

Fire-retardant-treated wood (FRTW) is used primarily in the following unsprinklered applications:

A. Flooring and supports having no combustibles in the vacant space below, such as in structures elevated slightly above grade (common in the southern United States). The absence of combustibles in the space below is very important.

B. Fixed or semi-fixed equipment, such as work benches, shelving, cribbing, supporting structures, bins, dividers for noncombustible materials, and bleachers (tiered bench seating) in auditoriums/gymnasiums.

C. Roof deck construction for moderately large areas where supporting members have no greater combustibility than the deck itself and where the occupancy is noncombustible and unlikely to change. It is advisable to limit the use of large areas of FRTW for unsprinklered roof decks and supporting members due to the uncertainty of the fire resistance of treated wood after long exposure to moisture, and the possibility of future introduction of combustibles and storage in other areas. Examples of acceptable occupancies are:

1. Pickling, plating, and chlorine cells where corrosion of sprinkler systems creates a serious problem. However, protection may be needed for the occupancy where plastic tanks and/or ducts are present.

2. Storage of noncombustible materials without combustible packaging or pallets.

3. Concealed spaces containing no combustibles and located above noncombustible suspended ceilings, such as over office occupancies.

4. Minimum-hazard areas such as gymnasiums, swimming pools, and water and sewerage pumping and treatment stations.

D. Frame and decks of cooling towers where the fill or other components do not need protection. (See Data Sheet 1-6, *Cooling Towers*)

E. Interior finish applications for walls and/or ceilings.

Although acceptable for the limited applications outlined, it is emphasized that fire-retardant treated wood does not provide the fire safety equivalent of automatic sprinkler protection.

3.3 Combustion of Fire-Retardant Wood

Fire safety for FRTW depends on the degree of exposure presented by other combustibles in the area. With an exposure of sufficient intensity and duration, the FRTW will burn and contribute to the fire, though at a slower rate than non fire-retardant treated wood. Large continued exposure will produce a self-sustaining fire that may spread beyond the exposed zone and eventually consume the FRTW. With small local exposure, FRTW directly involved may burn and be consumed, but there will usually be little or no spread of fire away from the initial exposure.

Limited acceptance is based on fire tests that show the heat contribution of the fire-retardant treated lumber does not appreciably exceed that of Class I insulated metal-deck construction (Fig. 1). The exposure required to bring about an extensively spreading fire under Class 1 metal deck construction is considered to be of such a size that there is small probability of occurrence in a normally noncombustible occupancy. Figure 1 shows that the fire-retardant treated lumber tested followed the Class 1 temperature curve for 30 minutes and thereafter continued to increase until burn-through, while the Class 1 curves started to drop. This performance is considered acceptable for the typical limited application recommended for fire-retardant treated lumber. The combustion of fire-retardant treated lumber produced only moderate smoke, which would not seriously hamper manual firefighting. Loss experience has been favorable.

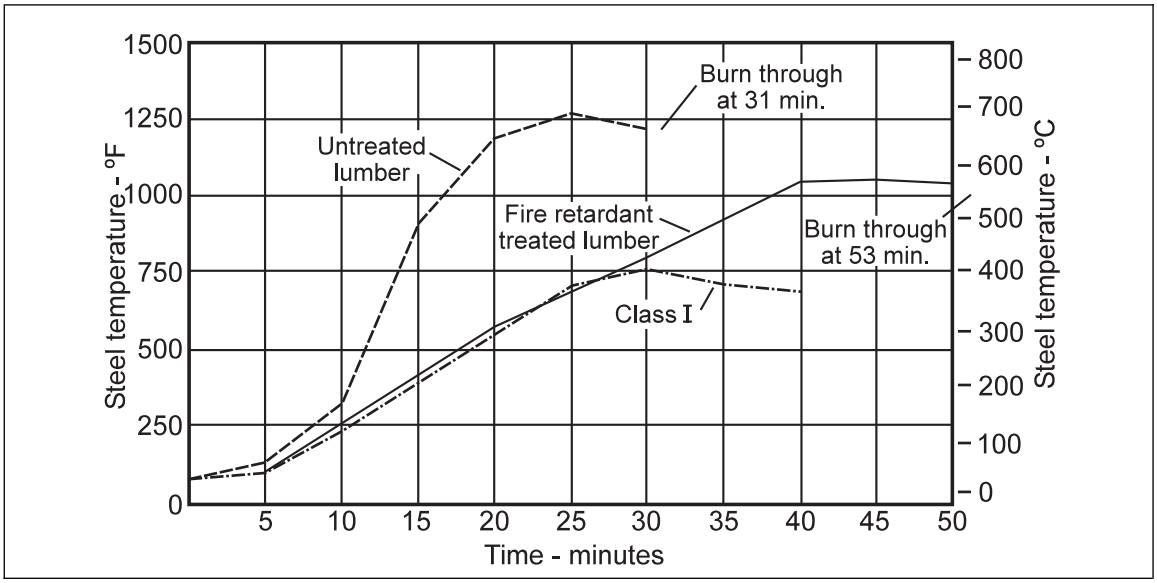

Fig. 1. Comparison of a fire-retardant treated lumber roof deck with a Class I insulated metal-deck roof and an untreated lumber roof when each was subjected to identical fire-test exposures. Temperatures were recorded in a piece of steel located 80 ft (24 m) from the firing end of the FM Global large-scale test structure.

3.4 Effect of Moisture and Elevated Temperature

The fire-retardant treatment is expected to retain its effectiveness indefinitely in normal interior atmospheres. However, most salts are water-soluble and can leach out if the treated lumber is used outdoors and exposed to the elements. Ammonium phosphate salts are used in the lumber treatment. Poor ventilation can also be an issue.

Many years ago there were concerns that the fire retardancy could degrade in high moisture or elevated ambient temperature situations. But newer generations of the FRTW product have addressed those concerns.

3.5 Effect of Surface Coating

There is no reason to believe that ordinary paint would materially reduce the fire resistance of impregnated lumber. Painting is likely to have a beneficial effect by reducing the leaching of the impregnating salts. Additionally, certain coatings might not be suitable for high-humidity occupancies or for other occupancies where combustible dust or oily residue deposits might accumulate, affecting the ability of the paint or coating to adhere to the substrate material.

3.6 Fire Testing Approaches

Building and fire codes stipulate that FRTW must have a flame spread index of less than 25 for the extended 30-minute ASTM E84 or UL 723 fire testing. This is far more severe than the 10-minute ASTM E84 test used for fire-retardant surface coatings and other building materials. Even though the ASTM E84 test evaluates a material positioned horizontally in the testing tunnel, the results are still valid for materials used on a sloped roof and, in some cases, vertical wall materials are also tested and certified via a horizontal ASTM E84 test. FM utilizes their roof calorimeter furnace test to evaluate treated wood decks, which is the same testing approach used to evaluate steel roof decks, and this testing protocol is also a 30-minute test.

When dealing with fire-retardant treated lumber and plywood it is important to determine what fire testing the product has received. There is a significant difference in the level of fire retardancy associated with a product that has passed the 10-minute fire test and wood products that have passed the 30-minute fire test. There is not a high level of confidence in a treated wood product that has only passed the 10-minute fire test, and these products should be considered combustible construction.

3.7 Fastener Corrosion With Treated Wood

As of 2004, wood preserver manufacturers voluntarily removed preservative-treated wood chemically treated with chromated copper arsenate (CCA) from consumer markets due to environmental concerns. Manufacturers have introduced a number of preservative-treatment substitutes for rot-resistance, including alkaine copper quant type C (ACQ-C), alkaline copper quant type D carbonate (ACQ-D carbonate), micronized copper quant (MCQ), copper azole (CBA-A, CA-B), ammoniacal copper zinc arsenate (ACZA), sodium borate disodium octaborate tetrahydrate (SBX/DOT), and zinc borate. A concern is that many of these newer wood preservatives are even more corrosive than CCA. As such, the preservative-treated wood industry recommends hot-dip galvanized or stainless-steel fasteners, anchors, and hardware be used to address the corrosion concern.

3.8 Protection of Attic Spaces

Sprinkler protection is recommended in attics where we don’t have the benefit of FM Approved fire-retardant treated wood being installed that has been tested to an FM large-scale fire test. Other concerns that exist within attics include inaccessibility for manual fire fighting as well as delayed response to a fire. The area and height of a typical attic also lends itself to the accumulation of combustibles over time.

4.0 REFERENCES

4.1 FM

Data Sheet 1-6, *Cooling Towers*
Data Sheet 1-12, *Ceilings and Concealed Spaces*
Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers*
Data Sheet 3-26, *Fire Protection Water Demand for Non-Storage Sprinklered Properties*

4.2 Other

ASTM International. *Standard Test Method for Surface Burning Characteristics of Building Materials*. ASTM E84.

ASTM International. *Standard Test Methods for Accelerated Weathering of Fire-Retardant Treated Wood for Fire Testing*. ASTM D2898.

National Fire Protection Association (NFPA). *Standard for Fire-Retardant Treated Wood and Fire-Retardant Coatings for Building Materials*. NFPA 703.

National Fire Protection Association (NFPA). *Standard Method of Fire Tests for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-Deck Roofing Components*. NFPA 276.

Underwriters Laboratories (UL). *Test for Surface Burning Characteristics of Building Materials*. UL 723.

APPENDIX A GLOSSARY OF TERMS

FM Approved: Product and services that have satisfied the criteria for FM Approval. For roofing products, refer to www.roofnav.com. For all other products, refer to the *Approval Guide*, an online resource of FM Approvals.

APPENDIX B DOCUMENT REVISION HISTORY

The purpose of this appendix is to capture the changes that were made to this document each time it was published. Please note that section numbers refer specifically to those in the version published on the date shown (i.e., the section numbers are not always the same from version to version).

April 2020. Interim revision. Section 1.0 Scope was revised and references to Data Sheet 1-51, *Fire-Retardant Coatings and Paints for Interior Finish Materials,* were removed because it was made obsolete.

January 2020. Interim revision. Minor editorial revisions were made.

July 2019. The following changes were made:

A. Indicated FM Global fire testing is the primary fire testing approach for FRTW, and other lab tests, such as UL 723 and ASTM E84, are alternatives.

B. Added class numbers for FM Approval (FM 4470 & FM 4880).

C. Added a sprinkler protection table for FRTW interior partitions.

D. Added detail to differentiate fire-retardant-treated and fire-retardant-coated wood products.

E. Acknowledged there are currently no FM Approved Class 1 FRTW products.

January 2011. The following changes were made:

- The title was changed from Impregnated Fire-Retardant Lumber to Fire-Retardant Treated Wood.
- The document was reorganized to align with current data sheet format requirements.
- Information on fastener corrosion was added.
- Information on FM Approval testing of fire-retardant treated wood was added.
- Information on various other testing approaches was added.

September 1998. This document was restructured for format purposes.

February 1979. This was the initial version of this document, which superseded information in the Handbook of Industrial Loss Prevention.