APPLICATION GUIDE

Dricon® Tempus®

Fire Retardant Treated Wood





Envision a world built with wood®

Our vision includes products enhanced with industry-leading technologies designed to extend the life of wood - the earth's most sustainable and versatile construction material.

For more than 80 years, Arxada's wood protection business unit has led the market in the delivery of trusted and innovative technologies. We are a long-time respected supplier in the field of wood protection, making wood resistant to mold and moisture, insects, fungi, smoke development and flame spread while enhancing its natural beauty.

Our approach to business is characterised by innovative products, valued global brands and exceptional customer service. Our brands instil confidence and provide peace of mind, as do our support services, which enable our customers to make the most of wood's unique and adaptable properties.

While our heritage runs deep, we continue to drive innovation. With a dedicated global in-house research & development team, we continually assess how our protection technologies can utilize modern actives to enhance the durability of wood as a sustainable resource.

As part of Arxada, we are something bigger. We can draw on a heritage of over 120 years of creating specialty ingredients and solutions that protect people, places and the planet. With unmatched expertise, Arxada is a leader in microbial control solutions covering hygiene, home, personal care, paints and coatings, crop protection, material protection and wood protection.

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Why Wood? ..... Back Cover

Note:
This information applies solely to Dricon® fire retardant treated wood. Not all fire retardant treated wood meets the high quality standards of Dricon® Tempus® FRT wood. They may require different handling practices and may exhibit other characteristics.

When used and handled properly, in accordance with these recommendations, we believe you will receive many years of service from your Dricon® Tempus® FRT wood.

PRODUCT FEATURES

Dricon® Tempus® Fire Retardant Treated Wood Has No Equal

Dricon® Tempus® fire retardant treated wood offers excellent features.

- From Arxada, the company that has more than 40 years of effective protection with fire retardant products
- Class A fire retardant treated wood
- Complies with the model building codes
- 40-year limited warranty
- 1-hour load bearing wall tested from the interior face
- 1-hour load bearing wall tested from the exterior face
- 2-hour load bearing wall tested from the interior face
- 2-hour load bearing wall when tested from the interior face and 1-hour rating when tested from the exterior face
- Approved for multiple lumber and plywood species
- Treated wood meets requirements of AWPA Standard U1, UCFA
- Dricon® Tempus® fire retardant is a proven successful formulation based on the American Wood Protection Association (AWPA) P50 Standard for Fire Retardants
- Dricon® Tempus® fire retardant chemical contains no formaldehyde, halogens, or sulfates
- Generates less smoke in the event of a fire
- No more corrosive to fasteners and connectors than untreated wood

Recognition

Dricon® Tempus® fire retardant or Dricon® Tempus® FRT wood complies with or has been granted the following:

- ASTM D 3201
- ASTM D 5516
- ASTM D 5664
- ASTM D 6305
- ASTM E 2768
- ASTM E 84 (30-minute test)
- ASTM E 119
- AWPA U1, UCFA
- AWPA E 12
- UL 723
- LARR 26119
- 40-year limited warranty

(All are subject to revision, re-examination)



INTRODUCTION

Model Specification/ Performance Demonstration

For an editable version of a model specification for Dricon® Tempus® FRTW, see dricon.com.

Dricon® Tempus® fire retardant treated wood (FRTW) is an effective and economical material used to impede flame spread and smoke development in the event of a fire. Building code organizations and related agencies recognize it as an alternative to materials classified as noncombustible for a range of applications.



Dricon® Tempus® FRTW from Arxada licensed manufacturers is intended for interior and weather protected applications. Dricon® Tempus® FRTW has proven itself in countless structures of many different types. Plus, it is backed by a 40-year limited warranty.

Fire retardant treated wood has been used for decades in multi-family housing and institutional buildings. As more homes are built near forests and wildlands, the threat of fire is increasing to residential property and inhabitants. Dricon® Tempus® FRTW provides an extra measure of safety for these homeowners.

Dricon® Tempus® FRTW also provides greater design latitude for the architect, engineer, and contractor, and removes many barriers associated with conventional noncombustible materials such as masonry and steel. The use of Dricon® Tempus® FRT wood can result in greater safety, reduced insurance rates, and easing of building code limitations. It offers all of the environmental and other advantages of wood, plus fire retardance and protection against termites and fungal decay.

Each batch of Dricon® Tempus® chemical is inspected and tested to ensure it adheres to the specifications of Arxada. In addition, the Dricon® Tempus® chemical meets current AWPA standards as a fire retardant. It does not include formaldehyde nor halogens, or sulfates.

How It Works — Passive Protection



An important feature of Dricon® Tempus® FRTW is that it responds to exposure to fire. Dricon® chemicals react with combustible gases and tars normally generated by untreated wood and convert them to carbon char and harmless carbon dioxide and water. Wood loses strength in a fire only as its cross section is reduced. The surface char acts to insulate underlying wood and slows the rate at which the cross sectional area is reduced in size. The carbon dioxide and water vapor dilute the combustible gases to help reduce flame spread.

TYPICAL APPLICATIONS



Dricon® Tempus® FRTW is ideal for use:

- Where other materials would permit a fire to spread without restriction from an ignition source.
- In areas of construction where there is inadequate water supply or fire protection.
- In indoor construction staging, scaffolds, workmen's shanties, etc., during construction or repairs of expensive equipment or multi-story buildings.
- In areas where sprinkler systems cannot be readily installed, such as framing under raised platforms or theater stages, floor framing, walls, stud areas enclosed under roofs and framing for all types of remodeling work.
- In health care facilities where a versatile and economical construction system is desirable, but life safety cannot be compromised.
- In homes located in wildfire-prone areas or anywhere fire safety is a concern. For example, Dricon® Tempus® FRTW can be used for residential roof sheathing, studs, blocking, trusses, stairways, and chimney wraps to provide homeowners an extra measure of fire protection.

Some Examples

a. Studs and fire stops with metal lath and plaster or dry wall construction for interior non-bearing walls and partitions where noncombustible construction required (see codes for specific details).

b. Roof systems including the deck, purlins, joists, and metal-plate-connected wood trusses.

c. Air return plenum framing in HVAC systems.

d. Studs, joists, and sheathing in sensitive areas housing computer and electronic systems.

e. Shelving, bins, tote boxes, work benches, pallets.

f. Wood members in fertilizer and chemical plants where highly corrosive conditions would require continuing maintenance of protective coatings on metal systems.

g. Buildings in recreation areas such as camps or lodges, which may be at a high fire risk because they are not inhabited during certain seasons or are in areas of inadequate fire protection services.

h. Architectural applications, such as interior siding and millwork.

i. Sheathing that must meet missile-impact requirements in hurricane-prone areas.

FIRE PERFORMANCE

Tests

Dricon® FRT wood has been tested in accordance with the following procedures:

- ASTM D 3201
- ASTM D 5516
- ASTM D 5664
- ASTM D 6305
- ASTM E 2768
- ASTM E84 (30-minute test)
- ASTM E 119
- AWPA U1, UCFA
- AWPA E 12
- UL 723

Dricon® Tempus® FRTW has been tested for fire performance by several independent laboratories and meets model code requirements for a Class A fire retardant.

Flame Spread & Smoke Developed Values

The tunnel test compares surface burning characteristics of tested materials to those of asbestos cement board and untreated red oak lumber. A rating of 0 is assigned to asbestos cement board and a rating of 100 is assigned to untreated red oak flooring. Flame spread ratings of various species of untreated lumber range from 60 to 230. A flame spread index of 25 meets Class A requirements.

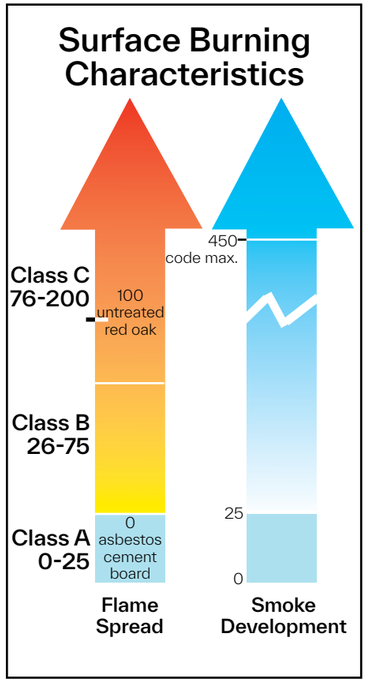
During this test, smoke emissions are also measured and ratings are assigned on the same scale.

In the tunnel test, wood is placed over a burner shooting a 4.5-foot flame along the underside of the wood. Flame spread and smoke development ratings are established during the first 10 minutes. However, unlike the test for fire retardant coatings, building codes require that the usual 10-minute test be extended to 30 minutes and the flame spread not progress more than 10.5 feet beyond the burners. To qualify, FRT wood may show no evidence of progressive combustion.

Dricon® Tempus® FRTW has a flame spread index of 25 or less when tested in the tunnel test and shows no evidence of progressive combustion in 30 minutes. The Dricon® Tempus® treatment reduces the flame spread of most species to less than 15, which is essentially the same as gypsum wallboard.

Standard tests for surface burning characteristics of materials referenced in the model codes as a basis of acceptance of fire retardant treated wood are all essentially the same:

- UL 723-Standard Test Method for Surface Burning Characteristics of Building Materials was developed by Underwriters Laboratories Inc., and subsequently adopted by ASTM as Standard E84.
- ASTM E84-Standard Test Method for Surface Burning Characteristics of Building Materials is essentially the same as UL 723. It also has been adopted by ANSI.
- UBC Standard 8-1 Test Method for Surface-Burning Characteristics of Building Materials is based on Standard Test Method ASTM E84.



Various species of Dricon® Tempus® FRTW have values of 25 or less for flame spread and smoke development of less than 50 for plywood and less than 200 for lumber in a 10-minute tunnel test, plus no evidence of progressive burning when the test is extended to 30 minutes.

Fire Resistance

Hourly Ratings

Fire retardant treated wood has a surface burning classification and, by itself, does not have a resistance rating in hours any greater than untreated wood. Fire ratings in hours are assigned to door, wall, or deck assemblies, following testing in accordance with ASTM E 119. References such as the Underwriters Laboratories "Fire Resistance Directory" specifically point out that FRT wood may be substituted for untreated wood in any rated assembly. Dricon® Tempus® FRTW can be used as a component of such assemblies in structures where the code does not permit the use of untreated wood. For additional building code guidance for fire retardant treated wood, please reference the 2018 International Building Code Chapter 6 for allowances based on construction classification.

Descriptions of fire resistance rated assemblies incorporating structural lumber are listed in several publications, with the following being those generally referenced in model building codes:

- Fire Resistance Directory, published by Underwriters Laboratories
- Fire Resistance Ratings, published by Engineering and Safety Service of the American Insurance Service Group
- Fire Resistance Design Manual, published by the Gypsum Association

For example, the Gypsum Association's "Fire Resistance Design Manual" shows a one hour wall or partition assembly (WP 3605) that has wood studs covered by 5/8" Type X gypsum board with specified nailing and positioning of the panels. This assembly could be used for interior, non-bearing partitions, requiring a one hour rating in a noncombustible structure if the studs were Dricon® Tempus® FRTW. In a similar manner, by substituting Dricon® Tempus® FRTW for untreated wood, other one and two hour wall and ceiling assemblies can be used in noncombustible type buildings. The model codes also permit use of ceiling assemblies with the top membrane omitted where only unused attic space is above.

Some model codes and local building officials will accept the Component Additive Method (CAM) for calculating fire resistance in lieu of actual assembly testing. The CAM concept entails adding the resistance rating of individual components to qualify the resistance rating of the assembly. See next page for an example.

The lumber and plywood used in rated assemblies or CAM listings are usually not identified as being untreated or FRT wood, but the model codes generally do require that any wood used in noncombustible types of construction be fire retardant treated.

Also, due to wood's natural ability to insulate, wood may be more acceptable than unprotected steel in fire resistant assemblies.

ICC ES

A technical revision to Arxada's ICC-ES Evaluation Report 5556 for Dricon® Tempus® FRTW was published. The revised report allows the use of Dricon® Tempus™ FRT wood as a component in fire-resistance-rated wall assemblies. Please view the revised report here: https://icc-es.org/report-listing/esr-5556/, on our website dricon.com.

One-Hour Wood Truss or Ceiling Assemblies

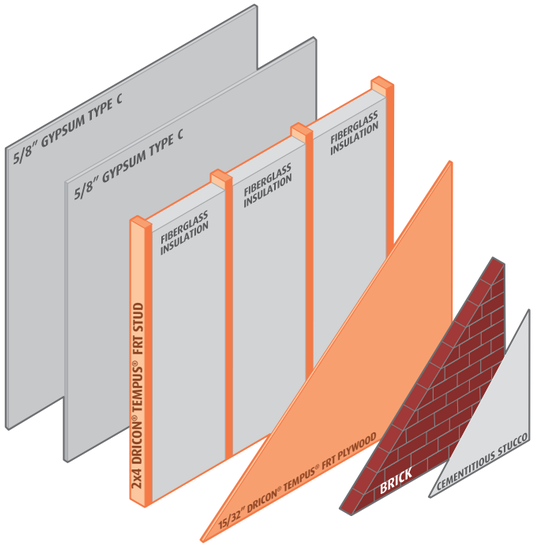
Recent testing has provided effective and competitive designs for one hour rated floor/ceiling and roof/ceiling metal-plate-connected wood trusses. Unlike earlier designs, the one hour rating can now be achieved with only one layer of 5/8" Type C gypsum wallboard applied directly to the bottom chord of the truss.

Dricon® Tempus® FRTW can be used in place of untreated wood in many of these designs and will enable the use of these assemblies in many building construction types that do not permit untreated wood. These new construction assemblies provide greater savings than ever before when Dricon® Tempus® wood construction is substituting for hourly rated steel or concrete construction.

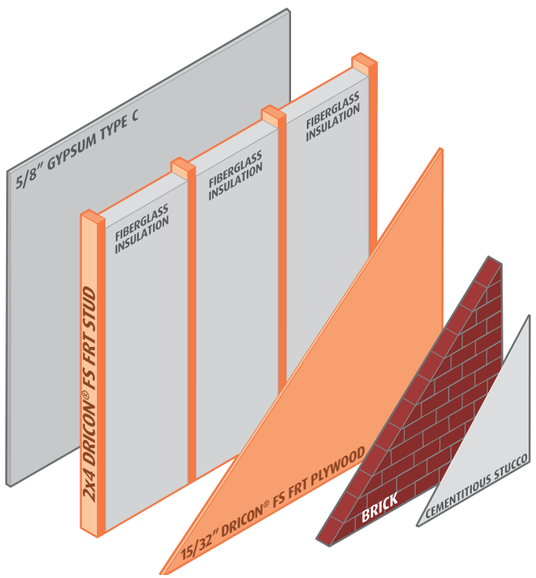
One- and Two-Hour Wood Wall Assemblies

Dricon® Tempus™ FRTW has received 1- and 2-hour fire resistance ratings for load-bearing exterior wall assembly. The materials of construction for the assemblies include 1 or 2 layers 5/8 Type C or Type X gypsum, fiberglass insulation, Dricon® Tempus® FRTW studs (2×4), 15/32 inch Dricon® Tempus® FRTW plywood and your choice of exterior finishes.

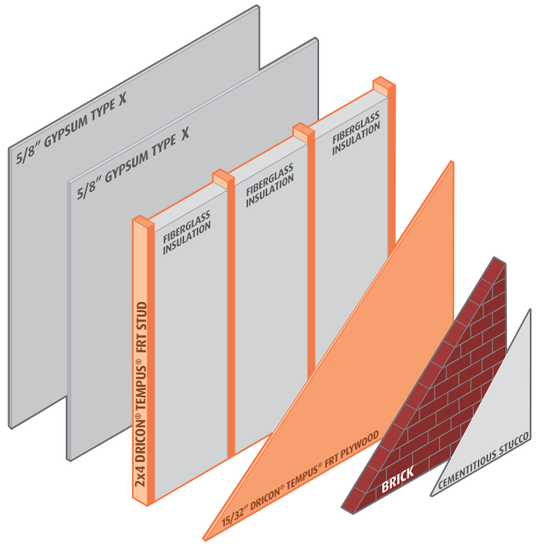
- 2-hour load bearing wall using gypsum Type X
- 2-hour load bearing wall when tested from the interior face and 1-hour rating when tested from the exterior face
- 1-hour load bearing wall tested from the interior face
- 1-hour load bearing wall tested from the exterior face



Two-Hour Wood Wall Assembly



One-Hour Wood Wall Assembly



Two-Hour Wood Wall Assembly (two sides)

When tested from the Interior Face (show what is the Interior Face (drywall)) the wall rating is 2 hours. When tested from the Exterior Face (Brick Stucco side) using brick or stucco in place of the siding, the rating is 1 hour.

Calculating Fire Resistance Ratings

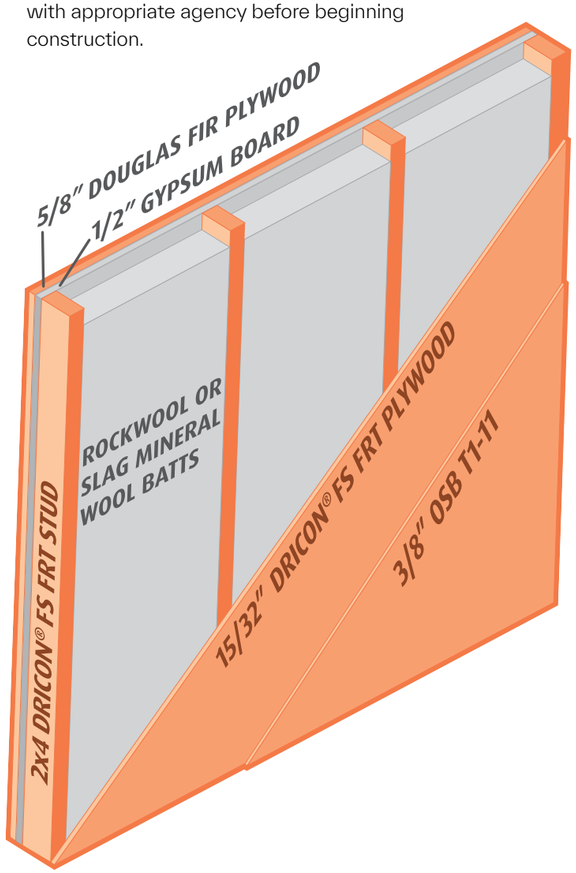
One method for deriving fire resistance ratings while avoiding expensive fire testing of countless assembly variations is the "Component Additive Method." Also known as CAM, this methodology was developed in the 1960s and has since become familiar and acceptable to many code officials.

How CAM Works

Review of existing fire testing reports resulted in CAM's "10 Rules" methodology, which combines the resistance ratings of individual components to obtain the fire resistance rating of the assembly.

Using CAM to Compute an Hourly Rating

The following illustrates how the CAM method is used to calculate an hourly rating in an assembly using: 5/8" Dricon® Tempus® FRT plywood, 2×4 studs 16" on center, and rockwool or slag mineral wool batts.
(*Note*: Listed values for untreated wood are applied to Dricon® Tempus® FRTW in this example.) This example, and use of CAM calculations in general, depends on acceptance by code officials with applicable authority. Check with appropriate agency before beginning construction.



Substitution of Values for Untreated Wood

Though values commonly cited for wood components in listed assemblies are typically for untreated wood, it is not normally acceptable to use untreated wood in buildings that require noncombustible construction. Therefore, in many instances, Dricon® Tempus® FRTW can be substituted to meet the requirements specified by the CAM, or in specific assemblies described in popular industry sources, such as the Gypsum Association's Fire Resistance Design Manual and the U.S. Department of Agriculture's Wood Handbook.

By adding the values in these Tables, you can compute the fire resistance rating of an assembly.

Time Assigned to Protective Membranes

Description of Finish	Time/Min.
3/8" Douglas Fir plywood, phenolic bonded	5
1/2" Douglas Fir plywood, phenolic bonded	10
5/8" Douglas Fir plywood, phenolic bonded	15
3/8" gypsum board	10
1/2" gypsum board	15
5/8" gypsum board	20
1/2" Type X gypsum board	25
5/8" Type X gypsum board	40
Double 3/8" gypsum board	25
1/2" + 3/8" gypsum board	35
Double 1/2" gypsum board	40

Time Assigned to Wood Frame Components

Description of Frames	Time/Min.
Wood studs, 16" on center	20
Wood joists, 16" on center	10
Wood roof and floor truss assemblies, 24"on center	5

Time Assigned for Additional Protection

Description of Additional Protection	Time/Min.
Wood stud walls: Rockwool or slag mineral wool batts weighing not less than 1/4 lb./sq. ft. of wall surface	15
Non load bearing wood stud walls: Glass fiber batts weighing not less than 1/4 lb./sq. ft. of wall surface	5

Source: National Forest Products Association Design for Code Acceptance: CAM Method for Calculating and Demonstrating Assembly Fire Endurance.

STRENGTH PROPERTIES

Arxada, manufacturer of Dricon® Tempus® fire retardant chemical, has thoroughly evaluated the strength properties of Dricon® Tempus® FRTW including high temperature exposures (in accordance with ASTM D 5664 and D 5516) that may occur during the life of a structure, and provides recommended strength value adjustments on behalf of all licensed producers of Dricon® Tempus® fire retardant treated wood products.

Racking shear wall tests (ASTM E 72) indicate that maximum loads and deflections for Dricon® Tempus® FRT plywood and untreated plywood panels are of the same magnitude and shape, but values for the Dricon® Tempus® FRT panels are approximately 10% less on average. Always check applicable local codes to ensure acceptability.

The design values shown below are based on unincised wood.

Maximum Loads and Spans for Dricon® Tempus™ Fire Retardant Treated Plywood at Service Temperatures up to 170°F (77°C)

Panel/Sheathing Thickness	Span Rating for Untreated Roof/ =Sub-Floor Sheathing	Dricon® Tempus™ Roof Sheathing Total Allowable Loads (psf) Climate Zone Maximum Span (In)	1A	1B	2	Dricon® Tempus™ Wall or Subfloor Span (In)
15/32, 1/2	32/16	24	29	42	60	16
19/32, 5/8	40/20	24 32	49 28	72 41	103 58	20 20
23/32, 3/4	48/24	32 48	40 18	59 26	84 37	24 24

1 All loads are based on two-span condition with strength axis perpendicular to supports.

2 Panel edge supports shall be required for roof sheathing. Panel edge clips when used shall be installed as follows: One midway between supports for 24-inch and 32-inch spans, two at 1/3-points between supports for 48-inch spans. Clips must be manufactured for the plywood thickness.

3 Fastener size and spacing shall be as required in accordance with the IBC or IRC for untreated plywood of the same thickness.

4 For low-sloped or flat roofs with membrane or built-up roofing having a perm rating of less than 0.2; use rigid insulation having a minimum R-value of 4.0 between the sheathing and the roofing, or use the next thicker panel than the tabulated for the span and load (example; 19/32 for 24; 23/32 for 32); and use a continuous ceiling air barrier and vapor retarder with a perm rating of less than 0.2 on the bottom of the roof framing above the ceiling.

5 Dricon® Tempus® fire retardant treated plywood must not be used as roof sheathing if a radiant shield is used beneath the roof sheathing.

6 The total allowable load is the sum of the live load and dead loads at maximum span. For allowable live loads, subtract dead (assumed to be 8 psf) from the total loads listed.

7 The 15/32 and ½-inch plywood is limited to 4-ply. 19/32 and 5/8-inch plywood is limited to performance rated 4-ply and 5-ply. 23/32 and 3/4-inch plywood is limited to performance rated 5-ply and 7-ply.

8 Uniform load deflection limitations 1/180 of span under live load plus dead load and 1/240 under live load only.

9 Subfloor is limited to 100 psf Maximum Load.

11 Climate Zone definitions:

Zone 1 — Minimum design roof live load or maximum ground snow load ≤ 20 psf (960 Pa)
Zone 1A — Southwest Arizona, Southeast Nevada (Area Bounded by Las Vegas-Yuma-Phoenix-Tucson)
Zone 1B — All other qualifying areas of the United States
Zone 2 — Maximum ground snow load > 20 psi (960 Pa)

12 For other load conditions, contact manufacturer.

Strength Design Factors for Dricon® Tempus® FRT Lumber Compared to Untreated Lumber Applicable at Service Temperatures up to 150°F (66°C)

	Climate Zone								
	Southern Pine			Douglas Fir			Spruce-Pine-Fir		
Strength Design Factors	1A	1B	2	1A	1B	2	1A	1B	2
Bending MOR	0.82	0.82	0.82	1.00	1.00	1.00	0.91	0.93	0.95
Bending MOE	0.88	0.88	0.88	1.00	1.00	1.00	0.96	0.96	0.96
Tension Parallel to Grain	0.89	0.93	0.98	1.00	1.00	1.00	0.95	0.97	0.99
Shear Parallel to Grain	0.89	0.93	0.98	1.00	1.00	1.00	0.95	0.97	0.99
Compression Parallel to Grain	0.87	0.91	0.96	0.98	0.98	0.98	0.92	0.94	0.96
Fasteners/Connectors	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90

1 Climate Zone definition:

Zone 1 — Minimum design roof live load or maximum ground snow load < 20 psf (960 Pa)
Zone 1A — Southwest Arizona, Southeast Nevada (area Bounded by Las Vegas-Yuma-Phoenix-Tucson)
Zone 1B — All other qualifying areas of the United States
Zone 2 — Maximum ground snow load > 20 psf (960 Pa)

2 Duration of load adjustments for snow load, 7-day (construction) loads, and wind loads as given in the National Design Specification for Wood Construction® (NOS) also apply.

Strength Design Factors for Dricon® Tempus® FRT Lumber Compared to Untreated Lumber Applicable at Service Temperatures up to 100°F (38°C)

Strength Design Factors	Southern Pine	Douglas Fir	Spruce-Pine-Fir
Bending MOR	0.82	1.00	0.96
Bending MOE	0.87	0.99	0.93
Tension Parallel to Grain	0.98	1.00	0.99
Shear Parallel to Grain	0.95	1.00	1.00
Compression Parallel to Grain	0.96	0.96	0.99
Compression Perpendicular to Grain	0.95	0.95	0.95
Fasteners/Connectors	0.90	0.90	0.90

ADDITIONAL INFORMATION

How Dricon® Tempus® FRTW Is Made

Wood is pressure-impregnated with Dricon® Tempus® chemical at a properly equipped, licensed pressure treating plant. Following treatment, Dricon® Tempus® FRTW is re-dried to a moisture content of 19% or less for lumber and 15% or less for plywood in accordance with current AWPA standards and the model building codes.

Available Products

All common sizes of most construction species of lumber and plywood can be treated with Dricon® Tempus® fire retardant. Size is generally limited only to the treating plant's ability to treat, dry, and handle large members.

All thicknesses of plywood can be treated. However, to be covered by the warranties, sheets must be qualifying plywood at least 7/16" thick with at least 4 plies.

Treatment Depletion

Dricon® Tempus® FRTW is designed for above ground applications, shielded from precipitation and direct wetting. In such locations, where the chemicals will not leach, the fire retardant chemicals are stable and will remain effective for the life of the structure.

Testing has demonstrated that short term exposure to the elements during a typical construction period will not adversely affect the fire retardant performance of Dricon® Tempus® FRTW. However, all unnecessary exposure should be avoided. FRT wood on the job site should be stored off the ground and protected from the weather.

Sources

This wood is available, either in stock or by special order, from thousands of building material outlets. To locate a producer near you, see dricon.com for a list of approved licensed producers.



Warranty

- 50-year limited warranty
- Coverage offered to the owner of the structure
- No registration requirement
- Dricon® Tempus® FRTW means plywood and other wood products properly treated with Arxada's Dricon® Tempus® fire retardant product and used in the construction of a structure built within the continental United States

The full warranty can be found at Dricon.com.

Quality Control

Comprehensive QC programs, conducted by third-party agencies, provide assurance that both Dricon® Tempus® chemical and Dricon® Tempus® FRTW are consistently produced to meet performance standards. Independent agencies that have ALSC oversight are required to provide third party follow-up on all QC measures required by the building code and Arxada.



Appearance

Deposits of Dricon® Tempus® solution may appear on the surface of wood ("efflorescence") or exude from the edges of plywood during drying ("intumescence"). This is a result of injection of adequate chemical to achieve desired fire protection, and is considered normal. On most species, discoloration is barely noticeable, however redwood lumber may darken and Douglas Fir may yellow. Grain raising will also occur occasionally.

Marks made by stickers, used to separate the layers of lumber during the kiln drying following treatment, will be noticeable on lumber. For structural use, this is not objectionable. The pressure treatment and subsequent drying may result in a slight waviness in plywood; for normal applications this is not objectionable as the plywood can be straightened when nailing.

Dricon® Tempus® FRTW can be special-ordered with the good face free of sticker marks, providing the thickness of the plywood is not more than 5/8". Slight irregular water marks may at times show on such material.

Also, Dricon® Tempus® FRTW will not stain plaster, wallboard, or other covering material. Dricon® Tempus® FRT lumber is supplied at a moisture content of 19% or less (15% or less for plywood). When used as recommended, the excellent hygroscopic properties of Dricon® Tempus® FRTW will prevent any staining problems.

Where high-appearance natural wood surfaces are desirable, as in large assembly areas such as courtrooms, most codes will allow 1/28" untreated veneer over Dricon® Tempus® FRTW without declassifying the finished product.

Green Building

Featuring the significant environmental benefits of wood itself (see back cover), Dricon® Tempus® FRT products can be produced using wood from certified forests. Typically this requires a special order from sources with chain-of-custody certification.

The Dricon® Tempus® does not contain urea formaldehyde and does not increase or decrease the emission of volatile organic compounds (VOCs) once pressure-impregnated into the lumber or plywood. Plywood commonly incorporates phenolic (not urea) formaldehyde in the adhesive between plies.

Limitations

Dricon® Tempus® FRTW can only be used in above-ground locations, protected from precipitation, regular condensation, or other wetting. Exposure of Dricon® Tempus® FRTW to these conditions will, over a period of time, reduce its fire retardance.

Hygroscopicity

A material which gains moisture from the atmosphere as the relative humidity increases is said to be hygroscopic. The more hygroscopic a material is, the more moisture it will pick up during periods of high humidity. Wood is naturally hygroscopic, and fire retardants can increase this property from very little to significantly. Thus, there is no such thing as non-hygroscopic FRT wood. Fire retardants which absorb excessive moisture can create problems with appearance, surface finishing, and corrosion of metal hardware.

The American Wood Protection Association standards differentiate between "low-hygroscopic" Type A products and other more hygroscopic Type B products. Type A products must remain at or below the fiber saturation point of wood (28% moisture content) when conditioned at 92% relative humidity and 80° F. Furthermore, Type A products are differentiated by their intended application, i.e., Type A high temperature (HT) and Type A low temperature (LT). Dricon® Tempus® FRTW is listed as an interior Type A (HT) product by AWPA.

In tests conducted in accordance with ASTM D 3201, there was very little difference between the moisture content of Dricon® Tempus® FRTW and untreated wood.

Corrosion

Corrosion is the tendency of a material to oxidize by chemical reaction. This process occurs more rapidly at higher moisture and temperature levels. Dricon® Tempus® FRTW, however, has demonstrated no greater corrosion rates than untreated wood.

Dricon® Tempus® samples were tested in contact with aluminum, carbon steel, hot-dipped galvanized steel, copper, and red brass.

SAFETY, USE, & HANDLING

Safety Precautions

The chemicals in Dricon® Tempus® FRTW are of very low toxicity and will not harm those involved in use and handling of the product. The same common sense precautions should be taken when handling Dricon® Tempus® FRTW as with untreated wood or other building materials. Dust masks and eye protection devices are recommended to avoid possible irritation from sawdust and wood chips. Gloves will help avoid splinters. Hands should be washed after doing construction work.

Tips on Use

Proper handling procedures should be followed when using Dricon® lumber and plywood.

- Dricon® Tempus® FRTW should not be installed where it will be exposed to precipitation, direct wetting, or regular condensation, or in contact with the ground.
- When storing Dricon® Tempus® FRTW, the material should be kept off the ground and covered to shield it from precipitation.
- When installing Dricon® Tempus® lumber and plywood it is important to utilize the design value adjustments published in ESR-5556 and this handbook.
- Dricon® Tempus® plywood should be spaced and fastened as recommended in “APA Engineered Wood Construction Guide” (Form E30), published by APA-The Engineered Wood Association.
- Normal carpentry practices are applicable. End cutting, drilling, joining, and light surface sanding will not significantly reduce the benefits of the Dricon® FS treatment. It is not necessary to field-treat cut ends to maintain flame spread rating. Ripping or milling of lumber is not permitted, except on red oak and yellow poplar lumber, since this may alter the burning characteristics and invalidate the flame spread classification. Surfacing to a depth of 1/16” is permitted on western red cedar lumber.
- Unlike FRT lumber, Dricon® Tempus® plywood can be cut in either direction without loss of fire protection; surface burning characteristics of plywood are unchanged.
- Carbide-tipped saw blades are recommended if extensive cutting operations are to be performed. However, Dricon® Tempus® FRTW is not as abrasive as many conventional fire retardants.
- When painting or staining, the paint or stain manufacturer’s recommendations should be followed. As with untreated lumber, the surface should be clean and dry.
- Do not burn treated wood.
- Do not use pressure-treated chips or sawdust as mulch.
- Dispose of treated wood in accordance with local, state and federal regulations.

Fastener Design Values

Dricon® Tempus® FRTW has recommended fastener design value adjustments based on full size independent testing completed at Virginia Polytechnic Institute. The adjustments for lateral and withdrawal loading of nailed, screwed, and bolted joints range from 0 to 8 percent reduction. FRT wood is not as abrasive as many conventional fire retardants.

Fastener Design Value Factors

Dricon® Tempus® FRT Lumber Compared to Untreated Lumber

Fasteners/Connectors		Southern Pine	Douglas Fir	Spruce
Nails	Withdrawl	0.90	0.90	0.90
	Lateral	0.90	0.90	0.90
Wood Screws	Withdrawl	0.90	0.90	0.90
Bolted Joints	Parallel to Grain	0.96	0.96	0.99
	Perpendicular to Grain	0.95	0.95	0.95

Recommended Hardware

Galvanized steel hardware is recommended — not required — for use with Dricon® Tempus® FRTW. Please reference national and local building codes for compliance measures. Although Dricon® Tempus® treatment does not increase corrosion of bare or galvanized steel, the galvanizing provides an extra measure of protection with any treated wood.

Disposal

Do not burn treated wood. Do not use pressure-treated chips or sawdust as mulch. Dispose of treated wood in accordance with local provincial and federal regulations. This product is typically not considered a hazardous waste but province-run waste programs may be more stringent. Check with your local provincial regulators prior to disposal.



Finishing

Stains, sealers, varnishes, and paints can be used with Dricon® Tempus® FRTW. Paint systems may be water- or oil-based. Stains, especially dark colored semi-transparent types, should be solvent-based to avoid possible surface crystallization of the fire retardant chemical. Flammability of finish should be considered prior to application. A light sanding and thorough wiping should be performed prior to the application of any finish to provide a clean surface and to smooth any raised grain. In the case of rough sawn lumber or textured plywood, brush the surface prior to staining.

Take precautions at the job site to protect the treated product from exposure to rain or extreme dampness if finishes are to be applied. As with untreated wood, excessive surface moisture can cause finishing problems. It is recommended that finishes be tested in an unobtrusive area to ensure satisfaction.

Normal marking from treatment will show unless surface preparation prior to finishing is conducted. When clear or semi-transparent finishes are to be used, take careful note of the appearance characteristics of Dricon® Tempus® FRTW.

Gluing

The Dricon® Tempus® treatment does not adversely affect the performance of nonstructural construction adhesives, mastics, or contact cements. No significant differences in effectiveness between Dricon® Tempus® FRTW and untreated wood have been found.

Some types of isocyanate and urethane adhesives have been found to perform well. In any type of gluing, and especially in structural applications, an evaluation should be made of the specific adhesive and materials to be glued. Be sure the Dricon® Tempus® wood surface is clean and dry to obtain the best performance.

STANDARDS & BUILDING CODES

Standards of the American Wood Protection Association

The American Wood Protection Association (AWPA) is the principal standards-writing body for the wood preserving industry in the United States. AWPA standards help ensure that treated wood products perform satisfactorily for their intended use. AWPA standards include Preservative Standards (P), which detail specifications for all AWPA-accepted wood preservatives and fire retardants, and User Specifications (U), which contain treatment specifications for different commodities and have replaced the former Commodity Standards (C).

AWPA Use Category System

The Use Category System (UCS) was developed as a format revision for the Commodity Standards and is not intended to make substantive technical changes to those standards. Detailed specifications for fire retardant treated wood are found in U1 Commodity Specification H.

The UCS includes:

- Definitions of the Use Categories
- Service conditions
- Treated wood use selection guide
- List of AWPA accepted preservative and fire retardant systems
- Guide to Use Categories
- Appendices relating to specific product types, e.g., sawn products, poles, FRT wood

Introduction to Building Codes

Building codes regulate the construction of buildings and structures by establishing minimum requirements to ensure public safety, health, and welfare.

An authority having jurisdiction (AHJ), such as a township, county, or state, may have a proprietary building code prepared, or it may adopt and/or adapt one of the major model building codes.

The model codes themselves were kept up to date by the authoring agencies through periodic supplements and revisions. Supplements and/or revisions do not automatically become part of a code as adopted or adapted by an authority having jurisdiction except by specific legal action. Thus, even if a new edition of a given model code is available, the edition in force may be a different one.

Generally, code requirements are subject to rather narrow and literal interpretations; that is, a particular provision under one set of conditions may not apply to another set of conditions.

The full text of a particular code should in all instances be used in making the final decision on the use of fire retardant treated wood or any other material or assembly.

Fire Retardant Treated Wood

The uses for fire retardant treated wood as an alternative to noncombustible materials are specifically noted in the model building codes, which have been included in this brochure.

Combustible vs. Noncombustible

The codes classify materials into these categories:

- Noncombustible materials which are thus by nature, and those qualifying under a referenced standard for noncombustibility, such as ASTM E 136-Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
- Combustible materials are those that do not qualify for a noncombustible rating.

In general, the codes permit the use of fire retardant treated wood in specific components and/or locations as an alternate for noncombustible materials in cases when combustible materials including untreated wood are not permitted.

Identification

The model building codes require that every piece of FRT wood bear the identification mark of an approved inspection agency.

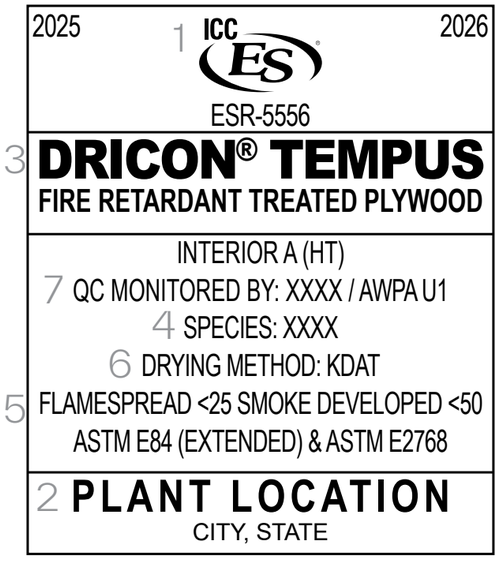
Each piece of Dricon® Tempus® FRTW is marked with an ink stamp bearing the classification mark of a qualified testing laboratory, categorizing its surface burning (flame spread and smoke developed) characteristics. The mark further identifies the name and location of the treating plant and shows that the material complies with AWPA standards, has been dried after treatment, and qualifies as an Interior Type A, low hygroscopic product.

What's on the stamp:

1. Identification mark of an ALSC approved agency
2. Identification of the treating manufacturer
   a. This could be the actual name of the treater or their plant number
3. Name of the fire-retardant treatment
4. Species of wood
5. Flamespread and smoke developed index
   a. Flamespread <50 and smoke developed <200
6. Method of drying after treatment (ADAT or KDAT)
7. AWPA – include AWPA U1 designation and if you are going to include (FR-2) on the stamp

Evaluation Report Acceptance

In Evaluation Report ESR-5556, ICC Evaluation Service found that Dricon® Tempus® FRTW complies with requirements for fire retardant treated wood described in the International Building Code® and International Residential Code®, subject to the "Conditions of Use" listed there. Evaluation reports provide guidance to code officials faced with approving the use of products under these codes.



Sample ink stamp

International Building Code

2018 Edition, published by the International Code Council®

Uses

1. Noncombustible Type Construction - Untreated wood is not permitted. Fire-retardant-treated (FRT) wood may be used in specific instances.

Criteria

- Fire-retardant-treated wood is any wood product which, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E 84 or UL 723, a listed flame spread index of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional 20-minute period. Additionally, the flame front shall not progress more than 10.5 feet (3200 mm) beyond the centerline of the burners at any time during the test. {Ref.: IBC Section 2303.2.1, 2303.2.2, 2303.2.3}
- All fire-retardant-treated lumber and wood structural panel products shall be properly labeled with the identifying mark of an approved testing agency, identification of the treating manufacturer, name of fire-retardant treatment, wood species treated, flame spread and smoke developed index, drying method used after treatment and conformance with appropriate standards as required by Section 2303.2.4. For fire-retardant-treated wood exposed to weather, damp or wet locations, include the words "No increase in the listed classification when subjected to 800" rain exposure" (ASTM D 2898). {Ref.: IBC Section 2303.2.6}
- Design values for untreated lumber and wood structural panels shall be adjusted for strength for fire-retardant-treated wood. Design value adjustments shall be based on an approved investigation method that considers the effect of the anticipated temperature and humidity that the fire retardant wood will be exposed to and the type of treatment and re-drying procedures used. {Ref.: IBC Section 2303.2.2}
  1. Fire-retardant-treated wood structural panels (softwood plywood) shall meet the requirements of ASTM D 5516 and ASTM D 6305 where applicable. Each manufacturer shall publish the allowable maximum loads and spans for floor and roof sheathing for its treatment. {Ref. IBC Section 2303.2.5.1}
  2. Fire-retardant-treated lumber shall meet the requirements of ASTM D 5664 for each species of wood treated. Each manufacturer shall publish the modification factors for service at temperature of not less than 80°F and for roof framing. The roof framing modification factors shall take in consideration the climatological location. {Ref. IBC Section 2303.2.5}
- Interior applications of fire-retardant-treated wood shall be marked "Type A" and not have a moisture content greater than 28 percent when tested using ASTM D 3201 procedures at 92 percent relative humidity. {Ref.: IBC Section 2303.2.5}
- Prior to use fire-retardant-treated wood shall be dried to a moisture content of 19 percent or less for lumber and 15 percent or less for wood structural panels. Wood kiln dried after treatment (KDAT) shall not exceed the kiln or drying temperatures used previously to dry the lumber and plywood. {Ref.: IBC Section 2303.2.8}
- Buildings of Type I and II construction have limited applications for fire-retardant-treated wood as required by IBC Section 603.1. {Ref.: IBC Section 2303.2.9}
- Fasteners for fire-retardant-treated wood shall be in accordance with manufacturer's recommendations. In the absence of manufacturer's recommendations, refer to Section 2304.10.5.3 for exterior exposure and section 2304.10.5.4 for interior use.

Not all FRT wood products perform alike.
See strength properties of Dricon® Tempus® FRT wood on pages 12 and 13.

International Code Council, International Building Code, International Residential Code, and International Mechanical Code are registered trademarks of International Code Council.

Applications

Type I and Type II Construction

Fire-retardant-treated wood is permitted in Type I and II construction in the following applications:

1. Non-load bearing partitions rated 2 hours or less. {Ref.: IBC Section 603.1, exception 1.1}
2. Non-load bearing exterior walls where no fire rating is required. {Ref.: IBC Section 603.1, exception 1.2; see also IBC Table 602}



Note: Shaded areas indicate permitted uses of FRT wood.

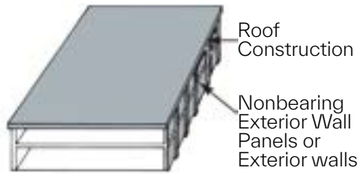
3. Roof construction as permitted in Table 601, Note b. {Ref.: IBC Section 603.1, exception 1.3}
4. Partitions separating the interior areas of stores, offices or similar spaces occupied by a single tenant may be constructed of fire-retardant-treated wood, 1 hour fire-rated construction or of wood panels or similar light construction up to 6 feet in height provided the partitions do not form an enclosed corridor with an occupant load of 30 or more. {Ref.: IBC Section 603.1, Item 11}
5. Materials in concealed spaces are permitted in accordance with Section 718.5. {Ref.: IBC Section 603.1, Item 24}
6. Materials exposed within plenums complying with Section 602 of the International Mechanical Code (IMC). {Ref.: IBC Section 603.1, Item 25}

Type III Construction

Fire-retardant-treated wood complying with Section 2303.2 shall be permitted for use as a substitute for noncombustible materials in exterior wall assemblies with a 2-hour fire resistance rating or less. {Ref.: IBC Section 602.3}

Type IV Construction (Heavy timber, HT)

Fire-retardant-treated wood complying with Section 2303.2 shall be permitted for use as a substitute for noncombustible materials in exterior wall assemblies with a 2-hour fire resistance rating or less. {Ref.: IBC Section 602.4}



Type V Construction

Structural elements, exterior walls and interior walls may be constructed of any materials permitted by the code, both combustible and noncombustible. {Ref.: IBC Section 602.5}

Exterior Walls and Roofs

Exterior nonbearing walls or wall panels and gable ends of roofs may be of noncombustible materials or fire-retardant-treated wood when the horizontal fire separation distance is more than 30 feet for all construction types and group designations. For horizontal fire separation distances less than 30 feet, refer to Table 602 for the fire resistance rating requirements of exterior walls based on the type of construction and group designation.

Roof Construction

Roof construction, including supporting beams and joists, may be constructed using fire-retardant-treated wood as follows:

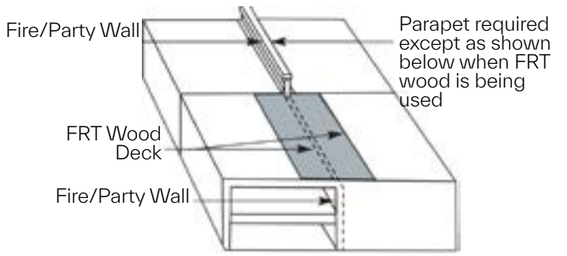
1. Except in Factory-Industrial (F-1), Hazardous (H), Mercantile (M) and Moderate-Hazard Storage (S-1) occupancies, fire protection of structural members shall not be required, including protection of roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members. {Ref. IBC Table 601, footnote b}
2. In Type I and II construction, fire-retardant-treated wood is allowed in buildings including girders and trusses as part of the roof construction when the building is:
   a) Two stories or less in height. {Ref.: IBC Table 601 footnote b}
   b) Type II construction over two stories; or {Ref.: IBC Table 601 footnote b}
   c) Type I construction over two stories in height and the vertical distance from the upper floor to the roof is 20 feet or more. {Ref.: IBC Table 601 footnote b}

Parapets and Fire Wall Extensions

A. Parapets shall be provided on buildings and have the same fire-resistance rating as that required for the supporting wall, and on any side adjacent to a roof surface, and shall have a noncombustible face for the uppermost 18 inches including counter flashing and coping materials. The height of the parapet shall be shall not be less than 30 inches above the point where the roof surface and wall intersect except that in Type III, IV and V construction of Residential Groups R-2 and R-3 as applicable per IBC Section 101.2, a parapet is not required on an exterior building wall when the wall is terminated at the roof sheathing or deck that is constructed of fire-retardant treated wood for a distance of 4 feet continuously on both sides of the exterior wall intersection and the roof covering is Class C minimum. {Ref.: IBC Section 705.11, exception 5.1}

Note for IBC Residential Group R-3: Detached one and two family dwellings (duplexes) and multiple single-family dwellings (town houses) separated a 2-hour fire-rated wall with a separate means of egress and not more than 3 stories in height shall comply with the International Residential Code (IRC). {Ref.: IBC Section 101.2}

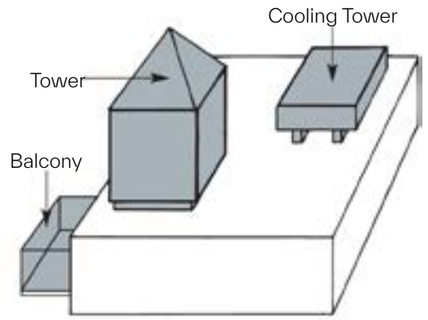
B. Fire walls shall extend from the foundation to a termination point at least 30 inches above both adjacent roofs, except that in buildings of Types III, IV and V construction, walls shall be permitted to terminate at the underside of fire-retardant-treated wood within 4 feet of each side of the fire wall where both buildings are provided with not less than a Class B roof covering. {IBC Section 706.6, exception 4.3}



Miscellaneous Roof Structures

Towers, spires, domes and cupolas shall be not be less than the fire-resistance rating required for the building where attached and shall not be used for habitation or storage, except that:

- Any tower, spire, steeple or other roof structure not used for habitation or storage shall be unlimited in height if of noncombustible materials and shall not extend more than 20 feet above the allowable height if of combustible materials. {Ref.: IBC Section 504.3}
- Any tower, spire, dome or cupola greater than 85 feet in height above the roof or greater than 200 square feet at any horizontal section, or which are used for any purpose other than a belfry or architectural embellishment, shall be constructed of and supported by Type 1 and II construction. {Ref.: IBC Section 1510.5}
- Any tower, spire, dome or cupola greater than 60 feet in height above the roof or greater than 200 square feet at any horizontal section, or which are used for any purpose other than a belfry or architectural embellishment, shall be constructed of and supported by noncombustible materials. Enclosed towers and spires shall have exterior walls and roofs of the same construction as required for the building walls and roofs. {Ref.: IBC Section 1510.5.1}
- Enclosed towers and spires such as church spires and other towers and spires of a similar nature shall have exterior walls and roof coverings as required for the main building to which they are attached. {Ref.: Section 1510.5.2}
- Penthouses complying with applicable provisions shall be considered as a portion of the story below, and shall be constructed with walls, floors and roof as required for the building. {Ref.: IBC Section 1510.2; see exceptions at 1510.2.4}



Cooling Towers

Non-load bearing framing of cooling towers greater than 250 square feet in base area or greater than 15 feet high and that do not exceed one-third of the supporting roof area in buildings greater than 50 feet in height may be of noncombustible construction. {Ref.: IBC Section 1510.4}

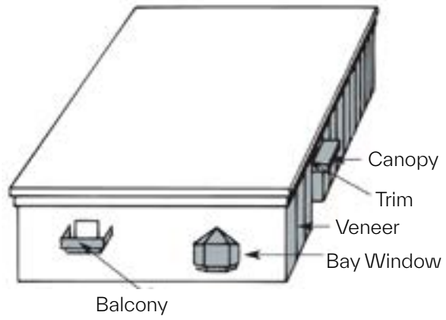
Balconies and Similar Projections

Balconies and similar projections of floors may be constructed of fire-retardant-treated wood in accordance with IBC Chapter 14. {Ref.: IBC Section 603.1, Note 13, 705.2} The aggregate length of balconies and similar projections on each floor cannot exceed 50% of the building perimeter unless the balcony areas are protected by fire sprinklers. {Ref.: IBC Section 705.2.3.1}

1. In Type I and II construction, balconies, porches, decks and exterior stairways not used as required exits on buildings that are not more than 3 stories in height are permitted to be constructed of fire-retardant-treated wood. {Ref.: IBC Section 705.2.3.1, exception 1}
2. In Type III, IV and V construction, balconies and similar appendages that are protected by a sprinkler system that can be of Type V construction. {Ref.: IBC Section 705.2.3.1, exception 3} Based on exception 1 and not protection provided by a sprinkler, fire-retardant-treated wood can be used.

Bay Windows and Oriel Windows

Bay windows and oriel windows in Type I, II, III and IV construction on buildings that are not more that 3 stories in height are permitted to be constructed using fire-retardant-treated wood. {Ref.: IBC Section 705.2.4}



Awnings and Canopies

- Awnings may have frames of noncombustible material, fire-retardant-treated wood, wood of Type IV size, or 1-hour construction with combustible or noncombustible covers and shall be either, fixed, retractable, folding or collapsible. {Ref.: IBC Section 3105.2}
- Canopies shall be constructed of a rigid framework with an approved covering that is flame resistant in accordance with NFPA 701 or has a flame spread index not greater than 25 when tested in accordance with ASTM E 84 or UL 723. {Ref.: IBC Section 3105.3 item 1, 2}
- Permanent canopies are permitted to extend over adjacent open spaces provided: 1) the canopy and its supports are of noncombustible material, fire-retardant-treated wood, Type IV construction or of 1-hour fire- resistance-rated construction; 2) any canopy covering, other than textiles, shall have a flame spread index not greater that 25 when tested in accordance with ASTM E 84 or UL 723 in the form intended for use; 3) the canopy shall have at least one long side open; 4) the canopy width does not exceed 15 feet; and 5) the fire rating of exterior walls is not reduced. {Ref.: IBC Appendix D102.2.8}

Service Stations

Canopies under which fuels are dispensed shall have a clear, unobstructed height of not less than 13 feet 6 inches (4115 mm) to the lowest projecting element in the vehicle drive-through area. Canopies and their supports over pumps shall be of noncombustible materials, fire-retardant-treated wood complying with Chapter 23, wood of Type IV sizes or of construction providing 1-hour fire resistance. {Ref.: IBC Section 406.7.2}

Kiosks in Covered Malls

Kiosks and similar structures (temporary or permanent) are permitted within a mall if constructed of fire retardant treated wood complying with Section 2303.2. Kiosks cannot exceed 300 square feet (28 m^2) in area, must be provided with approved fire suppression and detection devices and the horizontal separation between kiosks or kiosk groupings and other structures must be at least 20 feet (6096 mm). {Ref.: IBC Section 402.6.2}

Interior Finishes

Interior wall and ceiling finishes shall be classified by their flame spread and smoke-developed indexes in accordance with ASTM E 84. Such interior finish materials shall be grouped in the following classes in accordance with their flame spread and smoke-developed index as follows {Ref.: IBC Section 803.1}

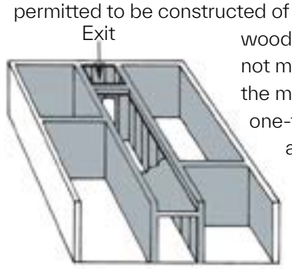
Class A: flame spread 0-25; smoke-developed 0-450
Class B: flame spread 26-75; smoke-developed 0-450
Class C: flame spread 76-200; smoke-developed 0-450
Except materials, other than textiles, tested in accordance with Section 803.1.2.

- Interior walls and ceiling finish shall have a flame spread index no greater than that specified in Table 803.13 for the occupancy group and location designated. {Ref.: IBC Section 803.13}
- Where walls and ceilings are required to be fire-rated or of noncombustible construction, the interior finish material shall be applied directly to such construction or to furring strips not more than.1-3/4 inches from such surfaces. {Ref.: IBC Section 803.15.1}

- Any hangers and assembly members of such dropped ceilings that are set-out (furred) below the main ceiling line shall be of noncombustible materials, except that in Type III and V construction, fire-retardant-treated wood is permitted. {Ref. IBC Section 803.15.1.1}

Permanent Platforms

In Type I, II, and IV construction, permanent platforms are permitted to be constructed of fire-retardant-treated wood where the platforms are not more than 30 inches above the main floor, are not more than one-third of the room floor area and are not more than 3,000 square feet in area. Where the space beneath the permanent platform is used for storage or any purpose other than equipment, wiring or plumbing, the floor construction shall not be less than 1-hour fire-resistant construction. Where the space beneath the permanent platform is used only for equipment, wiring or plumbing, the underside of the permanent platform need not be protected. Permanent platforms shall be constructed of materials as required for the type of construction of the building in which the permanent platform is located. {Ref.: IBC Section 410.3}



Combustibles in Concealed Spaces

Combustibles shall not be permitted in concealed spaces of buildings of Type I or II construction, except: {Ref.: IBC Section 718.5}

1. Fire-retardant-treated wood complying with Section 603, Item 8. {Ref.: IBC Section 718.5, Item 1}
2. Combustible materials complying with Section 602 of the International Mechanical Code (IMC). {Ref.: IBC 718.5, Item 2}
3. Class A interior finish materials. {Ref.: IBC Section 718.5, Item 3}

Note: Dricon® fire retardant treated wood is listed as "Interior Type A, high temperature (HT)" in accordance with AWPA UCFA for lumber and plywood. {Ref.: See Fire Performance section of this Application Guide} Common features of both:

1. 12" concrete block for bearing walls
2. 2' x 4' mineral fiber acoustic tile in exposed grid suspension system for ceilings
3. 4" concrete slab on grade for floor
4. Same floor-to-finished-ceiling height

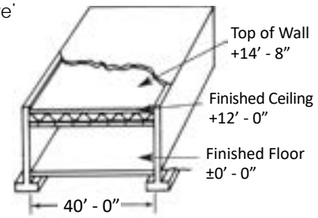
Design Considerations

Savings Using Fire Retardant Treated Wood Trusses in Lieu of Steel Bar Joists.

Two roof assemblies for the same basic one-story light commercial building are compared; both should be classified as Type II construction according to the provisions of the International Building Code (IBC). {Ref.: IBC Sections 602.1 and 602.2, Table 601}

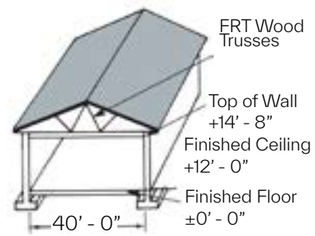
System A — Roof assembly with steel bar joists

1. Roofing membrane: 4-ply built-up, gravel surfaced
2. Insulation: 2-1/2" urethane with R=20
3. Metal roof deck: 1-1/2" deep, 22 gauge, galvanized
4. Steel bar joists: 24LH04 at 5'-0" on centers



System B — Roof assembly with FRT wood trusses

1. Roofing: Inorganic asphalt shingles over No. 15 felt underlayment
2. One layer of 1/2" thick FRT plywood sheathing
3. Light wood trusses of fire retardant treated lumber at 2'-0" on centers
4. Foil faced glass fiber insulation between trusses: 6" thick with R=19



Average cost of assembly B is about 5 percent less than assembly A, which does not include further savings for reduction in height of exterior walls while maintaining same finished-floor-to-ceiling height.

Advantages of System A over System B:

1. Venting of ceiling plenum not required
2. Extent of any required fire rated partition for tenant separation is less above finished ceiling

Advantages of System B over System A:

1. Lower cost of roof assembly
2. Exterior walls 2 feet lower
3. Positive roof drainage, less possibility of leakage
4. Less expensive roof drainage system
5. HVAC ducts may be run within truss space

International Residential Code

2018 Edition, published by the International Code Council

Uses

1. Combustible Type Construction: Untreated wood is permitted. Fire-retardant-treated (FRT) wood may be used in specific instances.

Criteria {Ref.: 802.1.5-802.1.5.10}

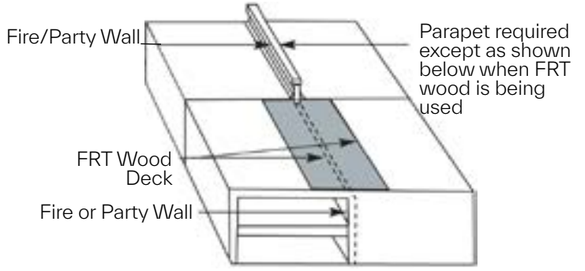
- The provisions for fire-retardant-treated wood in the International Residential Code (IRC) specifically apply to the design and construction of roof-ceiling systems as required by Section.R801.
- All fire-retardant-treated lumber and wood structural panel products shall be properly identified by a grade mark of an approved agency complying with DOC PS 20. A certificate of inspection issued by a lumber grading or inspection agency shall be accepted in lieu of a grade mark.
- Fire-retardant-treated wood is any wood product which, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E 84, a listed flame spread index of 25 or less and shows no evidence of significant progressive combustion when the test is continued for an additional 20-minute period. In addition, the flame front shall not progress more than 10.5 feet (3200 mm) beyond the centerline of the burners at any time during the test.
- Fire-retardant-treated lumber and wood structural panels shall be properly labeled to include the identification mark of an approved agency, treating manufacturer, name of fire-retardant treatment, wood species, flame spread and smoke developed rating, and method of drying after treatment, and must conform to any ASTM standards required. Fire-retardant-treated wood exposed to weather, damp or wet locations shall state "No increase in the listed classification when subjected to the Standard Rain Test" (ASTM D 2898).
- Design values for untreated lumber and wood structural panels shall be adjusted for strength taking into consideration the effect of the anticipated temperature and humidity exposure, method of treatment and re-drying procedures in accordance with ASTM D 5516 and ASTM D 5564.
- The effect of treatment, re-drying method after treatment, exposure to high temperature and high humidity exposure on the flexure properties of fire-retardant-treated softwood plywood shall be determined in accordance with ASTM D 5516. Wood structural panels shall be adjusted for maximum loads and spans, or both for untreated plywood design values in accordance with ASTM D 6305. Manufacturers must publish the allowable maximum loads and spans for service as floor and roof sheathing for their treatment.
- The effect of treatment, re-drying method after treatment, exposure to high temperature and high humidity exposure on the allowable design properties of fire-retardant-treated lumber shall be determined in accordance with ASTM D 5664. Each manufacturer shall publish the modification factors for service at temperatures of not less than 80°F (26°C) and for roof framing. The modification factors for roof framing shall take in consideration the climatologic location.
- Any fire-retardant-treated wood products exposed to the weather, damp or wet locations shall be identified as "Exterior" and "No increase in the listed classification when subjected to Standard Rain Test," indicating the listed flame spread classification has not increased when subjected to ASTM D 2898.
- Interior applications of fire-retardant treated wood shall be marked "Type A" and not have a moisture content greater than 28 percent at 92 percent relative humidity when tested using ASTM D 3201 procedures.
- Prior to use fire-retardant-treated wood shall be dried to a moisture content of 19 percent or less for lumber and 15 percent or less for wood structural panels. Wood kiln dried after treatment (KDAT) shall not exceed the kiln or drying temperatures used previously to dry the lumber and plywood.
- Fasteners for fire-retardant treated wood used in interior locations shall be in accordance with the manufacturer's recommendations. In the absence of the manufacturer's recommendations, Section R317.3.3 for exterior and wet or damp locations shall apply – hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper, and for fasteners other than nails and timber rivets, mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B 695, Class 55 minimum and Interior for Section 317.3.4.

Applications

Dwelling Unit Separation

A. Parapets constructed in accordance with Section R302.2.5 shall be constructed for townhouses as an extension of exterior walls or common walls. Where roof surfaces adjacent to the wall or walls are at the same elevation, the parapet shall extend not less than 30 inches (762 mm) above the roof surfaces. Where roof surfaces adjacent to the wall or walls are at different elevations and the higher roof is not more than 30 inches (762 mm) above the lower roof, the parapet shall extend not less than 30 inches (762 mm) above the lower roof surface.

   A parapet is not required when the roof is covered with a minimum class C roof covering, and the roof decking or sheathing is of noncombustible materials or approved fire-retardant-treated wood for a distance of 4 feet (1219 mm) on each side of the wall or walls, or one layer of 5/8-inch (15.9 mm) Type X gypsum board is installed directly beneath the roof decking or sheathing, supported by a minimum of nominal 2-inch (51 mm) ledgers attached to the sides of the roof framing members, for a minimum distance of 4 feet (1219 mm) on each side of the wall or walls. {Ref.: IRC Section R302.2.4 exception}



B. Walls that separate dwelling units in two-family dwellings (duplexes) shall be separated from each other by wall and/or floor assemblies having not less than 1-hour fire-resistance rating tested in accordance with ASTM E 119. Fire-resistance-rated floor-ceiling and wall assemblies shall extend to and be tight against the exterior wall, and wall assemblies shall extend to the underside of the roof sheathing except that a fire resistance rating of 1/2 hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13. {Ref.: IRC Section R302.3}

- When floor assemblies are required to be fire resistance rated by Section R302.1, the supporting construction of such assemblies shall have an equal or greater fire resistive rating. {Ref.: IRC Section R302.3.1}
- Fire-retardant-treated plywood equivalent to 1/2 inch gypsum board may be used to construct the access doors of folding pull down stairs installed in the garage ceiling assembly upon approval by the local building official or authority having jurisdiction.
- Fire-retardant-treated plywood equivalent to 1/2 inch gypsum board applied to the garage side may be used upon approval by the building official or authority having jurisdiction.

Roof-mounted collectors

The roof shall be constructed to support the loads imposed by roof-mounted solar collectors. Roof-mounted solar collectors that serve as a roof covering shall conform to the requirements for roof coverings in Chapter 9 of the IRC code. Where mounted on or above the roof coverings, the collectors and supporting structure shall be constructed of noncombustible materials or fire retardant treated wood equivalent to that required for the roof construction. {Ref. IRC Section M2301.2.2.1}

International Mechanical Code®

2018 Edition, published by International Code Council

Plenums

1. Any materials exposed within an enclosed plenum shall comply with the requirements of the International Mechanical Code (IMC) Section 602.

2. Any materials left exposed within an enclosed plenum located above a ceiling, below the floor, uninhabited crawl spaces, attic spaces or mechanical rooms shall be noncombustible or have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84. Note: ASTM E 84 is only tested for 10 minutes of duration during the flame spread. {Ref. IMC Section 602.2.1}

Nonmetallic Ducts

Nonmetallic ducts shall be constructed with Class 0 or Class 1 duct material in accordance with UL 181. Class 1 indicates a flame spread index not greater than 25 and a smoke-developed index of not greater than 50, when tested to ASTM E 84. {Ref.: IMC Section 603.5}

NATIONAL FIRE PROTECTION ASSOCIATION

NFPA 101-Life Safety Code

Published by National Fire Protection Association

Fire retardant treated wood is not specifically included in the code. Requirements for Class A interior finish specify a flame spread rating value of 0-25 and smoke developed of 450 or less — requirements which would be met by fire retardant treated wood. FRT wood booths are permitted in new assembly buildings (see chapter 8) and existing assembly buildings (see chapter 9).

NFPA 703-Standard for Fire Retardant Impregnated Wood

1. Fire retardant treated wood shall be defined as any wood product which, when impregnated with chemicals by a pressure process, or other means during manufacture, shall have, when tested in accordance with ASTM E 84-Standard Test Method for Surface Burning Characteristics of Building Materials, a flame spread index of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional 20 minute period. In addition, the flame front shall not progress more than 10.5 feet beyond the center line of the burner at any time during the test.
2. All fire retardant treated wood shall bear an identification mark showing the flame spread classification there of, issued by an approved agency having a re-examination service.
3. Where fire retardant treated wood is exposed to the weather, it shall be further identified to indicate that there is no increase in the listed flame spread classification as defined in Item 1 when subjected to ASTM D 2898-Standard Method for Accelerated Weathering of Fire Retardant Treated Wood for Fire Testing.
4. Where experience has demonstrated a specific need for use of material of low hygroscopicity, fire retardant treated wood to be subjected to high humidity conditions shall be identified to indicate that the treated wood has a moisture content of not over 28 percent when tested in accordance with ASTM D 3201-Test Method for Hygroscopic Properties of Fire-Retardant Wood and Wood-Base Products procedures at 92 percent relative humidity and 80° F.
5. Fire retardant treated wood shall be dried to a moisture content of 19 percent or less for lumber and 15 percent or less for plywood before use.

Note: Even though all fire retardant treated structural lumber and plywood, to be thus classified, must meet fire retardancy requirements of Item 1 above, other properties – such as strength, resistance to heat degradation, hygroscopicity – will vary between similar products of different manufacturers depending on the specific, proprietary treatment. Therefore, the use of an “or equal” clause is not appropriate when specifying fire retardant treated wood.

Specifications for fire retardant treated wood should therefore include:

- Definition of all significant properties, or
- Listing of all acceptable manufacturers and/or products

Sprinklers not needed in some concealed spaces

Section 8.15.1.2.11 of the NFPA 13 Standard, 2009 Edition: “Concealed spaces in which the exposed materials are constructed entirely of fire-retardant treated wood as defined by NFPA 703, Standard for Fire Retardant Impregnated Wood and Fire Retardant Coatings for Building Materials, shall not require sprinkler protection.”

Dricon® Tempus FRTW complies with NFPA 703, and thus eliminates the need for sprinklers in these spaces. This saves time for the builder and expense for his client, and it avoids the consequences of an accidental sprinkler activation.



Other Products in the Wolmanized® Wood Family

Arxada produces wood preservatives and additives that enhance the qualities of wood by pressure treatment processing. We license these respected brands of treated wood:



Wolmanized® Outdoor® Wood
www.WolmanizedWood.com

Preservative-treated wood commonly used for residential and commercial applications.



Wolmanized® Heavy Duty™ Treated Wood
www.WolmanizedWoodHD.com

Traditional treated wood for industrial, utility, highway, and marine applications.



FrameGuard® Total™ Mold-Resistant Wood
www.FrameGuardWood.com

Treated to resist mold, termites and fungal decay.



Wolmanized EraWood® Lumber
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Nonmetallic preservative-treated wood for above-ground applications.

It's Wood.

In addition to the treatments that enable the wood to last a long time or resist flames, our brands have all of the environmental and other advantages associated with wood itself. They extend forest resources; the source is a renewable resource grown on managed timberlands, requiring less energy to produce than alternative building materials and offering greater insulation value; trees absorb carbon dioxide and wood products sequester carbon, two features that reduce greenhouse gas; and, because of its lighter weight, wood can often be installed with lighter equipment having less environmental impact. Wood offers excellent workability with common construction skills and tools, plus it provides design flexibility and economy. Wood is generally less costly than alternative building materials and is considered easier to work with, and aesthetically preferable in many applications.

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