Cordless Mat Locking® System

patent pending

Unless noted, all vinyl is Fire Retardant and meets the NFPA-701 (National Fire Protection Association) and CSFM (California State Fire Marshal) standards. All mats exceed minimum performance requirements of ASTM F2440-04 Standard Specification for Indoor Wall/ Feature Padding.

LOCKING YOUR WALL IS EASY!

Prevent the unauthorized use of your Traverse Wall with our revolutionary Mat Locking® System. This CORDLESS version is so easy to use! Simply hang the nylon webbing loops onto the specially-designed holds, push up the red security latch and lock it with a few turns of the security bolt. Mats velcro to one another and attach to the base of the wall with nylon tabs. Our "No Climbing" decal is printed on the outer side to serve as a notice that the wall is closed. Installation required.

Upgrade with SideLock™ holds

Add extra security to the Mat Locking® System with our new Sidelock™ holds. This patent-pending upgrade locks each end of your system and prevents someone from climbing in between the mats and the closed climbing wall. Loops on the sides of each end mat attach to an additional Mat Locking Hand Hold for complete closure of your wall.

MATERIAL SAFETY DATA SHEET
DRICON® FIRE RETARDANT TREATED WOOD AND LUMBER
October 15, 2001

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Identifier: Dricon® Fire Retardant Treated Wood And Lumber
General Use: Fire Retardant Treated Wood Products

MANUFACTURER:

Shaw Stewart Lumber Company
645 Johnson Street
Minneapolis, MN 55413-2535

EMERGENCY TELEPHONE NUMBERS:

Phone: 612-594-6130 or 800-886-6686
Fax: 612-362-8429

2. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS	PERCENT	CAS #	EXPOSURE LIMITS (mg/m^3)		
			OSHA-PEL	ACGIH-TLV	ACGIH-STEL
Boric Acid	<5	10043-35-3	NA	NA	NA
Guanylurea Phosphate	<10	17675-60-4	NA	NA	NA
Wood Dust			15.0 (softwood)	5.0 (softwood)	15.0 (STEL)

3. HAZARDS IDENTIFICATION

Inhalation: Airborne treated or untreated wood dust may cause nose, throat or lung irritation. Various species of untreated wood dust can elicit allergic respiratory response in sensitized persons.
Eye Contact: Treated or untreated wood dust may cause mechanical irritation.
Skin Contact: Handling wood may result in skin exposure to splinters. Prolonged and/or repeated contact with treated or untreated wood dust may result in mild irritation. Various species of untreated wood dust can elicit allergic type skin irritation in sensitized persons.
Ingestion: Not anticipated to occur. A single ingestion of a very large dose of treated wood dust may require immediate medical attention.
Chronic Wood Dust (treated or untreated) Effects: Wood dust, depending on species, may cause dermatitis on prolonged, repetitive contact. May cause respiratory sensitization and/or irritation.

4. FIRST AID MEASURES

Inhalation: Remove from wood dust exposure. If breathing has stopped administer artificial respiration. Seek medical aid if symptoms persist.
Eye Contact: Gently flush any particles from the eyes with large amounts of water for at least 15 minutes. DO NOT RUB THE EYES. Seek medical aid if irritation persists.
Skin Contact: Rinse wood dust off with water. DO NOT RUB. Once the skin is free of the wood dust, wash thoroughly with soap and water. Seek medical aid if severe irritation develops.
Ingestion: Rinse the victim's mouth out with water. Induce vomiting if directed by a physician or Poison Control Center.

5. FIRE FIGHTING MEASURES

Flash Point NA
Auto-ignition NA
Lower Explosive Limit NA
Upper Explosive Limit NA

Extinguishing Agents: Not applicable

5. FIRE FIGHTING MEASURES CONT'D

Fire-Fighting Procedures: This product resists burning. Fire from a separate fuel source may be intense enough to cause thermal decomposition releasing toxic fumes and/or gases. Wear complete fire service protective equipment, including full-face NIOSH/NFPA – approved self-containing breathing apparatus.
Fire and Explosion Hazard: High airborne levels of wood dust may burn rapidly in the air when exposed to an ignition source.

6. ACCIDENTAL RELEASE MEASURES

Spill or Leak Procedures: Not applicable.
Waste Disposal: See Section 13.

7. HANDLING AND STORAGE

Storage Conditions: Protect from physical damage. Maintain good housekeeping.
Caution: Whenever possible, sawing or machining treated or untreated wood should be performed outdoors to avoid accumulations of airborne wood dust. Wash hands thoroughly before eating, drinking, using tobacco products, and/or using restrooms.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Respiratory Protection: None normally required. When sawing or cutting treated or untreated wood, wear a NIOSH approved N95 or better dust mask.
Eye Protection: Wear safety glasses with side shields or safety goggles when sawing or cutting.
Skin/Foot Protection: Leather or comparable gloves to prevent splinters. Long sleeve shirt, pants and steel-toed shoes when handling treated or untreated wood.
Ventilation: Saw, cut or machine wood outdoors or in well ventilated areas. Ventilation should be sufficient to maintain inhalation exposures below OSHA PEL for particulates.
Other Protective Equipment: Wear ear plugs or muffs when using power tools.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Natural to slightly pink	**Specific Gravity (Water =1)**	NA
Odor	None	**Boiling Point**	NA
Solubility in Water	NA	**Vapor Density (Air=1)**	NA
Physical State	Solid	**Vapor Pressure**	NA
pH	NA	**Freezing Point**	NA

10. STABILITY AND REACTIVITY

Conditions contributing to instability: None known.
Incompatibilities: Strong acids, open flame and oxidizers.
Hazardous Reactions/Decomposition/Combustion Products: Combustion products may include smoke, toxic fumes or gases.
Hazardous Polymerization: Does not occur.

11. TOXICOLOGICAL INFORMATION

Carcinogenicity Data: IARC has classified untreated hardwood and hardwood/softwood mix wood dust as a Group I human carcinogen. The wood dust classification is based primarily on IARC's evaluation of increased risk in the occurrence of adenocarcinomas of the nasal cavities and paranasal sinuses associated with occupational exposures to untreated wood dust.

11. TOXICOLOGICAL INFORMATION CONT'D

In Smoke toxicity testing of Dricon® treated and untreated Douglas Fir showed no significant difference in toxicity. The median lethal dose (LC50) by breathing in the smoke from burning Dricon® treated wood was 4.8 g/Kg versus 4.9 g/Kg for untreated Douglas Fir.

12. ECOLOGICAL INFORMATION

No data available.

13. DISPOSAL CONSIDERATIONS

Disposal Guidance: Dispose of in accordance with local, state and federal regulations. State run hazardous waste programs may be more stringent. Typically this product can be disposed of in approved landfills.

14. TRANSPORT INFORMATION

DOT Hazardous Material Classification: This material is not regulated as a hazardous material by the DOT.

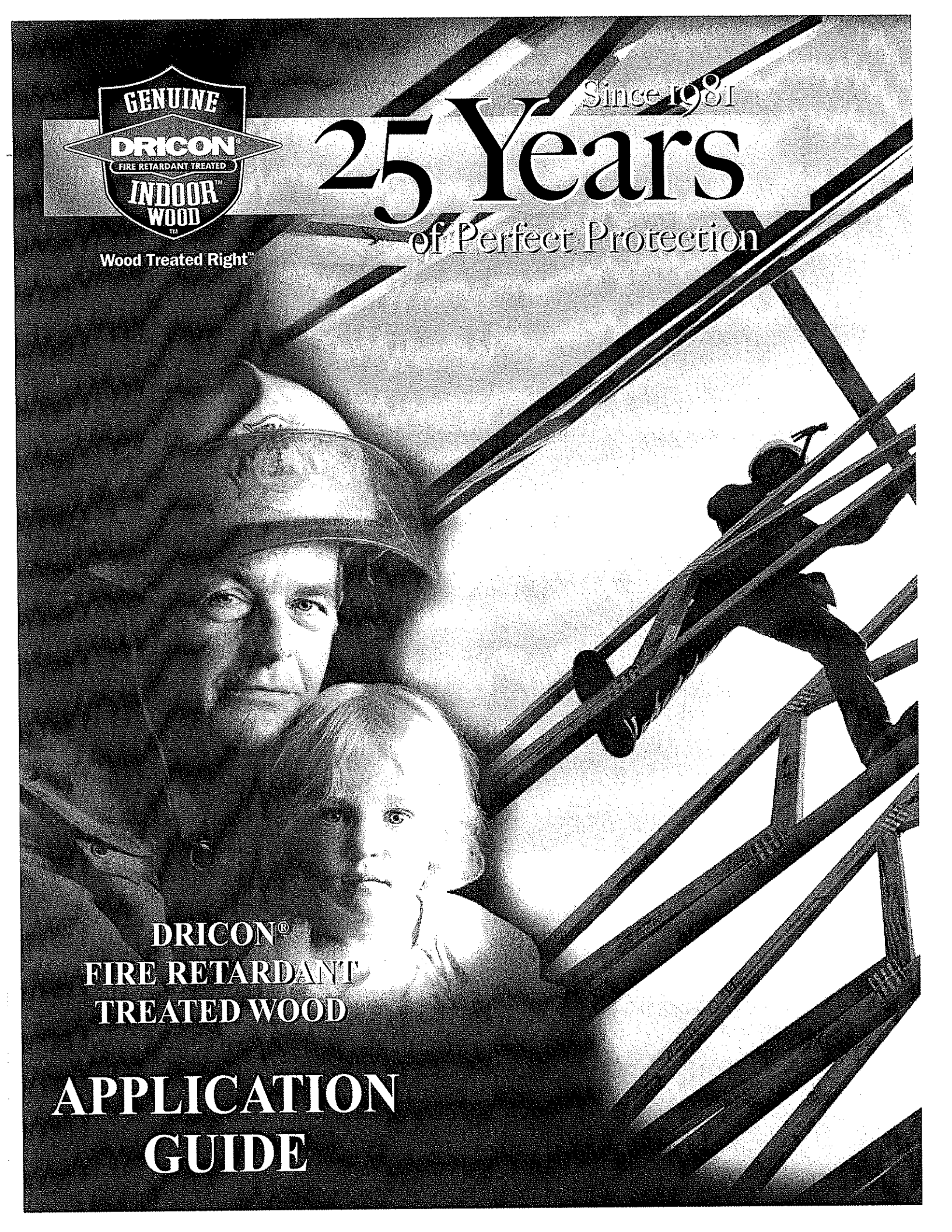
15. REGULATORY INFORMATION

OSHA (29 CFR 1910.1200): This product is regulated under the Hazard Communication Standard.

ABBREVIATIONS

OSHA	Occupational Safety and Health Administration
ACGIH	American Conference of Governmental Industrial Hygienists
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
SARA	Superfund Authorization and Reauthorization Act
PEL	Permissible Exposure Limit
TLV	Threshold Limit Value
STEL	Short-Term Exposure Limit
RCRA	Resource Conservation and Recovery Act
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health

NOTICE: While the information and recommendations set forth herein are believed to be accurate as of the date hereof, this manufacturer makes no guarantee or warranty, expressed or implied, as to the accuracy, reliability, or completeness of the information.


GENUINE
DRICON®
FIRE RETARDANT TREATED
INDOOR™ WOOD
Wood Treated Right™
Since 1981
25 Years
of Perfect Protection
DRICON®
FIRE RETARDANT
TREATED WOOD
APPLICATION
GUIDE

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Why Wood? ..... Back Cover

The developer of Dricon® fire retardant has adopted the principles of Responsible Care®, and launched an initiative called The Goal is Zero™. Health, safety, and environmental protection are integral parts of a product, from manufacture, marketing and distribution to use, recycling and disposal.

Note:

This information applies solely to Dricon® fire retardant treated wood. Not all fire retardant treated wood meets the high quality standards of Dricon® 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® FRT wood.

For AIA Continuing Education Units on fire retardant and preservative treated wood, see the Pressure Treated Wood course at www.ronblank.com/ce_course_home.htm. The course qualifies for 1 unit in the Health, Safety, Welfare area. Group courses are conducted by certified representatives of Arch Wood Protection.

Wood Treated Right™

There is no equal ⊘

Dricon® fire retardant treated wood offers an unmatched group of features.

- ⊘ Now with more than 25 years of effective protection
- ⊘ Class A fire retardant treated wood
- ⊘ Complies with the model codes
- ⊘ No more corrosive to fasteners and connectors than untreated wood
- ⊘ Backed by a 40-year limited roof system warranty
- ⊘ Backed by a 40-year limited preservative warranty
- ⊘ Backed by a 10-year limited truss manufacturers warranty
- ⊘ Earned the Good Housekeeping Seal and its two-year promise
- ⊘ 14 approved species of lumber
- ⊘ 5 approved species of plywood
- ⊘ Meets Factory Mutual's requirements for a Class 1 treated wood roof deck
- ⊘ Treating solution listed in current standards of the American Wood-Preservers' Association as FR-1 for fire retardant (Standard P17) and as SBX for preservative (Standard P5)
- ⊘ Treated wood meets requirements of AWPA Standard U1-approved for Use Categories UC1, UC2 and UCFA
- ⊘ Contains no halogens, sulfates, or ammonium phosphates
- ⊘ FR chemical classified as a UL Recognized Component
- ⊘ FR chemical registered with EPA as a preservative (#62190-9)
- ⊘ Can be used in contact with concrete that contacts the ground

Recognition

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

- AWPA T1 Section 8.8
- AWPA P17 (FR-1), P5 (SBX)
- AWPA U1 (UC1, UC2, UCFA) and former C9, C20, C27, C31
- Flamespread and Smoke Development Rating of 25 or Less
- Class A FRT wood
- UL Recognized Component
- NFPA 703, 101 Life Safety Code
- ICC-ES Legacy Report NER-303
- EPA registration (62190-9)
- UL Building Materials Directory
- NYC MEA 199-81-M, NYC MEA 200-81-M
- Factory Mutual Class I Roof Deck
- City of Los Angeles (RR 25122)
- FHA Minimum Property Standard #2600
- HUD Materials Release (1261)
- ASTM D 5516 & D 5664
- MIL-L-19140 Qualified Products List
- National Building Code of Canada
- Truss warranty program with Wood Truss Council of America

(All are subject to revision, re-examination)

INTRODUCTION

Dricon® (FRT) wood is an effective and economical material used to impede flamespread 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.

Introduced in 1981, Dricon® FRT wood is a development of Arch Wood Protection intended for interior and weather-protected applications. Since that introduction, Dricon® FRT wood has proven itself in countless structures of many different types. Plus, it is backed by three warranties and the Good Housekeeping Seal.

LIMITED WARRANTY TO CONSUMERS
Good Housekeeping
Promises
REPLACEMENT OR REFUND IF DEFECTIVE

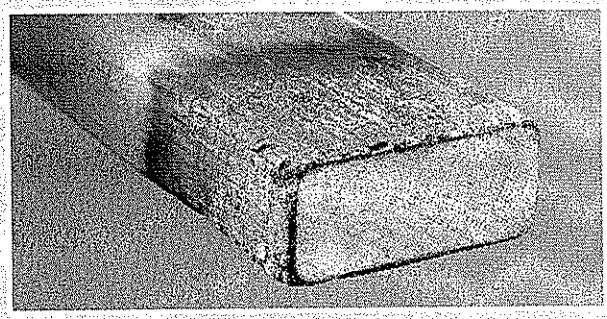
Engineers at the Good Housekeeping Institute deem Dricon® FRT lumber and plywood worthy of its seal.

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 FRT wood provides an extra measure of safety for these homeowners.

Dricon FRT wood 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® 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® FR chemical is inspected and tested to be sure it adheres to the specifications of Arch Wood Protection and Underwriters Laboratories. In addition, the Dricon® chemical meets current AWPA standards as both a fire retardant and as a preservative in above-ground, weather-protected uses.

How It Works — Passive Protection



An important feature of Dricon® FRT wood is that it reacts automatically when exposed 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 flamespread.

Preservative protection comes from the borate ingredient of the fire retardant solution. It renders the wood useless as a food source for termites and fungal decay, thereby avoiding damage caused by these organisms.

Model Specification/ Performance Demonstration

For an editable version of a model specification for Dricon® FRT wood, as well as a video demonstration, see **www.dricon.com.**

TYPICAL APPLICATIONS

Dricon® FRT wood 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® FRT wood 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, wall plates and fire stops with metal lath and plaster or dry wall construction for interior non-bearing walls and partitions where noncombustible construction is 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 electron systems.

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

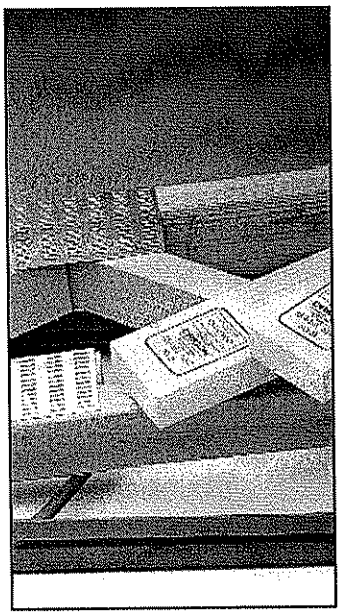
f. Wood members in fertilizer and chemical plants where highly corrosive conditions would require continuing maintenance of protective coatings on metal systems.

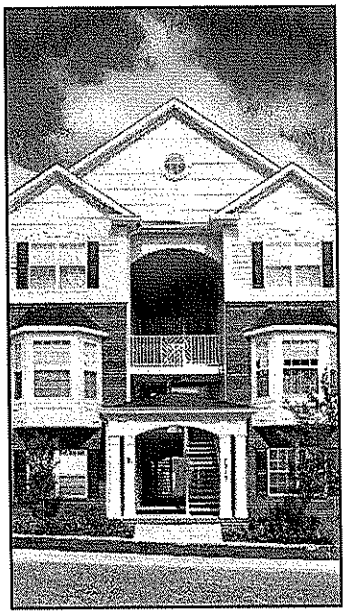
g. Buildings in recreation areas such as camps or lodges, which may be at a high fire risk because they are not inhabited during certain seasons or are in areas of inadequate fire protection services.

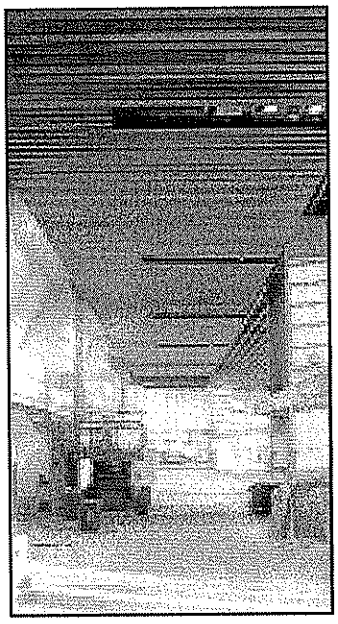
h. Architectural applications, such as interior siding and millwork.

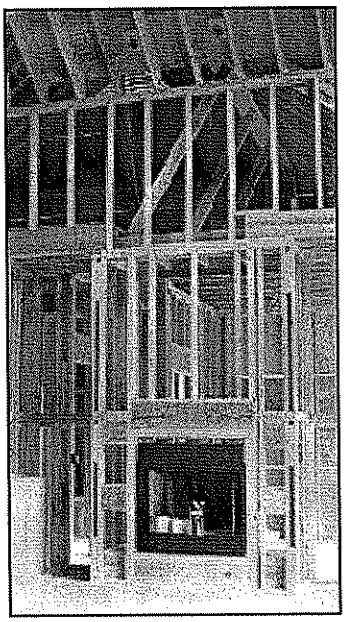
i. Sheathing that must meet missile-impact requirements in hurricane-prone areas.

Note: For applications where wood is exposed to weather, use FRX® exterior fire retardant treated wood. Information can be found at www.frxwood.com.









FIRE PERFORMANCE

Dricon® FRT wood has been tested for fire performance by several independent laboratories and meets model code requirements for a Class A/Class 1 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. Flamespread ratings of various species of untreated lumber range from 60 to 230. A flamespread index of 25 meets Class A requirements.

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

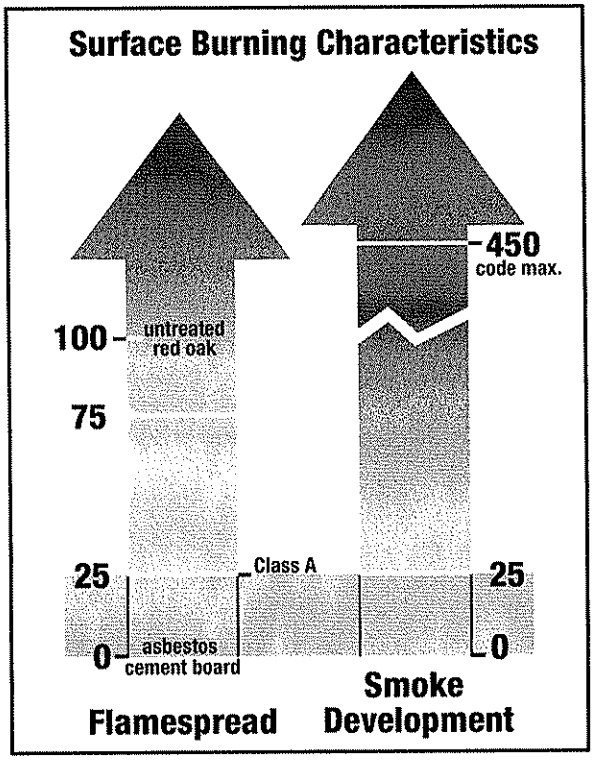
In the tunnel test, wood is placed over a burner shooting a 4 1/2 ft. flame along the underside of the wood. Flamespread and smoke development ratings are established during the first 10 minutes. However, unlike the test for fire retardant coatings, building codes require that the usual 10-minute test be extended to 30 minutes and the flamespread not progress more than 10 1/2 feet beyond the burners. To qualify, FRT wood may show no evidence of progressive combustion.

Dricon® FRT wood has a flamespread and smoke developed index of 25 or less when tested in the E-84 tunnel test and shows no evidence of progressive combustion in 30 minutes. The Dricon® treatment reduces the flamespread 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 E 84.
- ASTM E 84-Standard Test Method for Surface Burning Characteristics of Building Materials is essentially the same as UL 723. It also has been adopted by ANSI.
- NFPA 255-Method of Test for Surface Burning Characteristics of Building Materials is essentially the same as UL 723 and ASTM E 84.
- UBC Standard 8-1 Test Method for Surface-Burning Characteristics of Building Materials is based on Standard Test Method ASTM E 84.

Factory Mutual Research has also evaluated Dricon® FRT wood and found that it meets their requirements for a Class 1 treated wood roof deck per their FMRC calorimeter. The ASTM E 162 radiant panel test and NFPA 258 smoke density test have been conducted by the Hardwood Plywood Manufacturers Association and have demonstrated the acceptability of Dricon® FRT wood under Department of Transportation regulations for use in mass transit vehicles.



Various species of Dricon® FRT wood have values of 25 or less for flamespread and smoke development in a 10-minute tunnel test, plus no evidence of progressive burning when the test is extended to 30 minutes.

Tests

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

- ASTM D 1413
- ASTM D 3201
- ASTM D 3345
- ASTM D 5516
- ASTM D 5664
- ASTM E 84
- ASTM E 162
- ASTM E 72
- Boeing BSS 7239
- MIL-L-19140
- NFPA 255
- NFPA 258
- NFPA 259
- UL 723

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 and E 136. References such as the Underwriters Laboratories "Fire Resistance Directory" specifically point out that FRT wood may be substituted for untreated wood in any related assembly. Dricon® FRT wood can be used as a component of such assemblies in structures where the code does not permit the use of untreated wood.

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
- Uniform Building Code, including a listing of fire resistance rated assemblies

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® FRT wood. In a similar manner, by substituting Dricon® FRT wood for untreated wood, other one and two hour wall and ceiling assemblies can be used in non-combustible 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.

Calculating Hourly Ratings

For more information on CAM, see next page or contact the American Forest and Paper Association and ask for the brochure, "Component Additive Method (CAM) for Calculating and Demonstrating Assembly Fire Endurance," Publication T-20 (www.awc.org/Publications/dca/dca4/DCA4.pdf), or contact Arch Wood Protection.

One Hour Wood Truss 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 X gypsum wallboard applied directly to the bottom chord of the truss.

Dricon® FRT wood 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® wood construction is substituting for hourly rated steel or concrete construction.

FIRE PERFORMANCE (cont.)

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

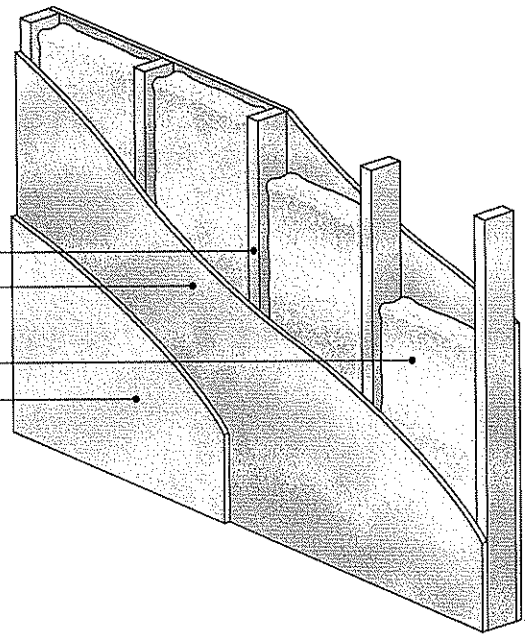
Review of existing fire testing reports resulted in CAM's "10 Rules" methodology, which combines the resistance ratings of individual components to obtain the fire resistance rating of the assembly.

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® FRT wood 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.

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® FRT plywood, 2x4 studs 16" on center, and rockwool or slag mineral wool batts. (Note: Listed values for untreated wood are applied to Dricon® FRT wood 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.



Component	Time/Min.
Dricon® studs 16" on center	20
5/8" Dricon® plywood - Interior	15
Rockwood or slag mineral wood batts weighing not less than 1/4 lb./sq. ft. of wall surface	15
1/2" gypsum board	15
Assembly Total	**1 hour 5 minutes**

By adding the values shown in the Tables below, 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.

For many years, design values for FRT wood have been adjusted from values for untreated wood to allow for the reduction in strength caused by the treating and kiln drying process.

These traditional strength adjustments are no longer applicable. Arch Wood Protection, manufacturer of Dricon® fire retardant chemical, has thoroughly evaluated the strength properties of Dricon® FRT wood 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® fire retardant treated wood products.

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

Always check applicable local codes to insure acceptability.

The design values shown below are based on unincised wood. Several species of Dricon® FRT wood are commonly incised prior to treatment. In applications where strength is critical, use only unincised lumber and apply the appropriate design factors.

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

	Tested Species			Other Species
Panel Thickness Factors	Southern Pine	Douglas Fir	Spruce	
Compression Parallel, Fc	0.94	0.91	0.95	0.91
Horizontal Shear	0.95	0.94	0.95	0.94
Tension Parallel	0.92	0.87	0.98	0.87
Bending: Modulus of Elasticity, E	0.98	0.98	0.98	0.98
Extreme Fiber Stress, Fb	0.89	0.90	0.98	0.89

Strength Design Factors for Dricon® Fire Retardant Treated Lumber Compared to Untreated Lumber Applicable at Service Temperatures Up to 150° F (66° C)

	Tested Species											
	Southern Pine Climate Zone			Douglas Fir Climate Zone			Spruce Climate Zone			Other Species Climate Zone		
Strength Design Factors	1A	1B	2	1A	1B	2	1A	1B	2	1A	1B	2
Compression Parallel, Fc	0.87	0.89	0.91	0.84	0.86	0.88	0.87	0.89	0.91	0.84	0.86	0.88
Horizontal Shear	0.87	0.89	0.91	0.86	0.88	0.90	0.87	0.89	0.91	0.86	0.88	0.90
Tension Parallel	0.87	0.89	0.91	0.82	0.84	0.86	0.87	0.89	0.91	0.82	0.84	0.86
Bending: Modulus of Elasticity, E	0.94	0.95	0.96	0.94	0.95	0.96	0.94	0.95	0.96	0.94	0.95	0.96
Extreme Fiber Stress, Fb	0.87	0.89	0.91	0.87	0.89	0.91	0.87	0.89	0.91	0.87	0.89	0.91

Climate Zone definitions:

1. Minimum design roof load or maximum ground snow load up to 20 psf
   A. Southwest Arizona, Southeast Nevada (Las Vegas-Yuma-Phoenix-Tucson triangle)
   B. All other qualifying areas of the continental United States
2. Minimum ground snow load over 20 psf

STRENGTH PROPERTIES (cont.)

Total Allowable Loads and Spans for Dricon® FRT Plywood Compared to Untreated Plywood Applicable at Service Temperatures Up to 170° F (66° C)

Plywood Panel Thickness	Untreated Span Rating Roof/Subfloor	Dricon® Roof Sheathing Max. Live Load (psf)				Dricon® Subfloor Span Rating (inches)
		Span (inches)	Climate Zone[3]			
			1A	1B	2	
5/16	12/0	12	69	93	126	0
5/16, 3/8	16/0	16	39	52	71	0
5/16, 3/8	20/0	20	25	33	45	0
3/8, 1/2	24/0	24	27	36	49	0
15/32, 1/2	32/16	24	38	51	70	16
19/32, 5/8	32/16	24	60	80	109	16
19/32, 5/8	32/16	32	34	45	61	16
23/32, 3/4	48/24	32	43	57	77	24
7/8	–	48	24	32	43	–
1 1/8	–	48	40	53	73	48

Climate Zone definitions:

1. Minimum design roof load or maximum ground snow load up to 20 psf
   A. Southwest Arizona, Southeast Nevada (Las Vegas-Yuma-Phoenix-Tucson triangle)
   B. All other qualifying areas of the continental United States
2. Minimum ground snow load over 20 psf

Notes:

1. Arch Wood Protection, Inc. does not recommend 5/16 or 3/8" panel thicknesses for roofing applications.
2. The loads shown are based on the most common one-and two-span conditions with strength axis perpendicular to supports. Other condition-load combinations exist. Consult with Arch for the allowable loads for those combinations.
3. The total allowable load (as shown above) is the sum of the live and dead loads. Dead loads should be subtracted from the above values to determine the live load. Dead loads typically range from 8–10 psf.
4. Allowable loads apply only to performance-rated plywood for Structural 1, Exposure 1 or Exterior, unsanded and treated with Dricon® Fire Retardant according to AWPA standards.
5. Subfloor applications are limited to 100 psf maximum live load.
6. Deflection of roof sheathing tabulated at maximum live load is less than 1/240 of the span, and under maximum live load plus dead load is less than 1/180 of the span.
7. 19/32 and 5/8" thick plywood shall be limited to performance-rated 4 or 5 ply plywood. 23/32 and 3/4" thick shall be limited to performance-rated 5 or 7 ply.
8. Gluelines shall be exterior and face plies shall be Group 1.
9. Panel edge support 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 span.

How Dricon FRT Wood Is Made...

Wood is pressure-impregnated with Dricon® FR chemical at a properly equipped, licensed pressure-treating plant. Following treatment, Dricon® FRT wood 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. Drying after treatment to these levels is required to comply with the model building codes.

Recognition

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

- AWPA T1 Section 8.8
- AWPA P17 (FR-1), P5 (SBX)
- AWPA U1 (UC1, UC2, UCFA) and former C9, C20, C27, C31
- Flamespread and smoke development rating of 25 or less
- Class A FRT wood
- UL Recognized Component
- NFPA 703, 101 Life Safety Code
- ICC-ES Legacy Report NER-303
- EPA registration (62190-9)
- UL Building Materials Directory
- NYC MEA 199-81-M, NYC MEA 200-81-M
- Factory Mutual Class I Roof Deck
- City of Los Angeles (RR 25122)
- FHA Minimum Property Standard #2600
- HUD Materials Release (1261)
- ASTM D 5516 & D 5664
- MIL-L-19140 Qualified Products List
- National Building Code of Canada
- Truss warranty program with Wood Truss Council of America

(All are subject to revision, re-examination)

Available Products

All common sizes of most construction species of lumber and plywood can be treated with Dricon® fire retardant. Size is generally limited only to the treating plant's ability to treat, dry, and handle large members. Western red cedar and red oak are limited to a maximum of 4/4" (1") while yellow poplar is limited to 8/4" (2") maximum thickness.

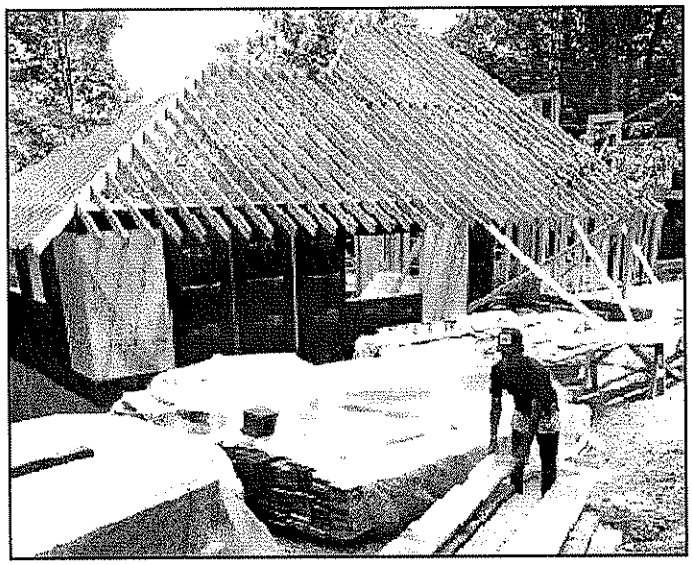
All thicknesses of plywood can be treated. However, to be covered by the warranties, sheets must be qualifying plywood at least 7/16" thick with at least 4 plies.

Engineered wood products, such as laminated veneer lumber (LVL) and glue-laminated lumber, are also available in some areas. In addition, an FRT wood backing system for steel studs is also made from Dricon® FRT wood. See Danback™ backers, page 25.

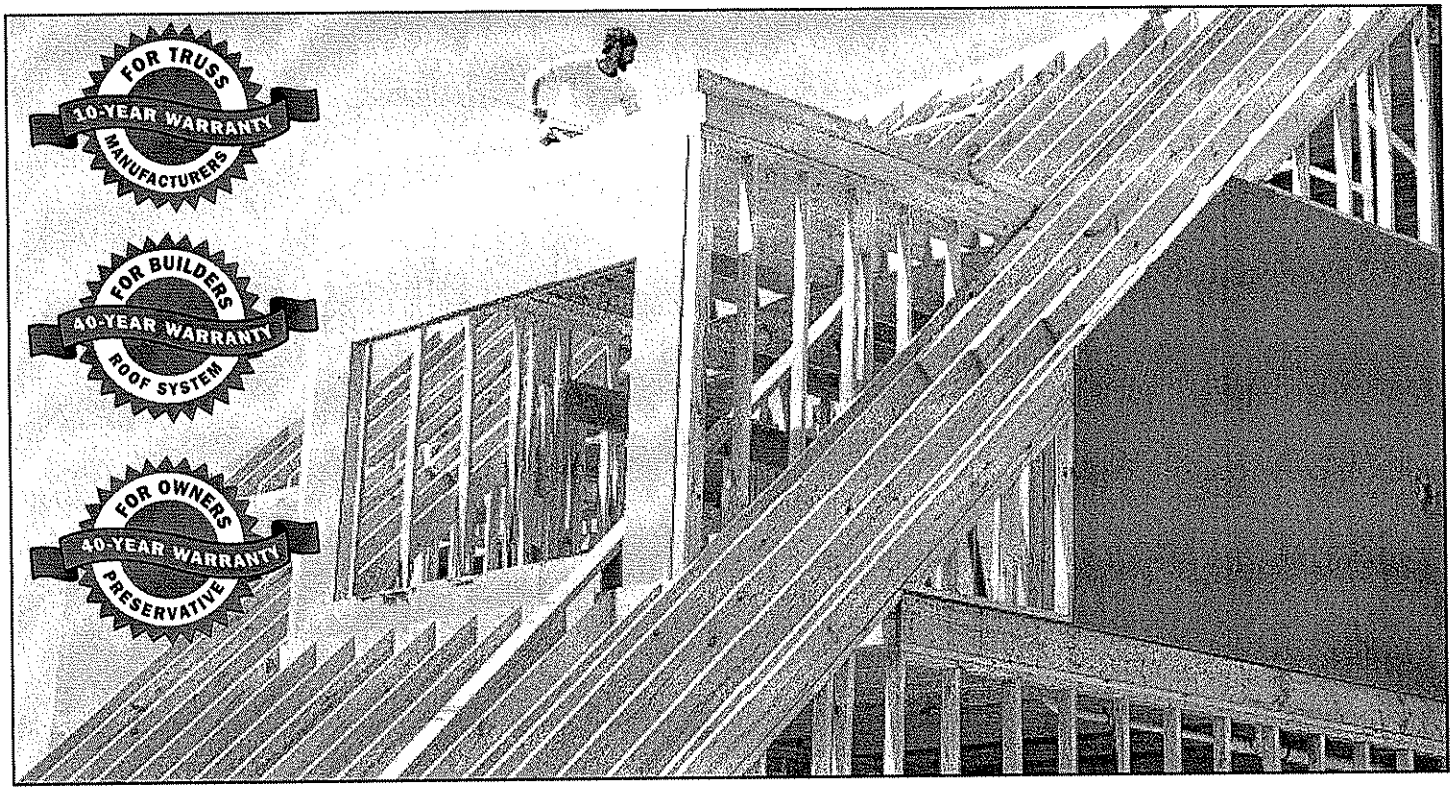
Treatment Leachability

Dricon® FRT wood 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 construction will not adversely affect the fire retardant performance of Dricon® FRT wood. However, all unnecessary exposure should be avoided. FRT wood on the job site should be stored off the ground and protected from the weather. Dricon® FRT wood is suitable for use as plate stock.



ADDITIONAL INFORMATION (cont.)



Warranties

Arch Wood Protection offers builders a 40-year limited warranty against heat degradation for Dricon® FRT wood in roofing systems. This warranty provides for repair and replacement of the roof system should Dricon® FRT wood degrade structurally due to heat and/or humidity exposure for up to 40 years. The warranty is non-prorated and requires only that roofs be built to the requirements (including proper ventilation and end use) of the building code having jurisdiction.The warranty resides with the builder, relieving the building owner, architect, and dealer of warranty responsibilities. Builders need only register with Arch Wood Protection once and build by the terms of the warranty.

Also available is a 40-year preservative limited warranty for building owners. This warranty covers structural failure due to damage by Formosan termites, subterranean termites, and/or fungal decay, and applies to southern pine lumber & plywood and Douglas fir plywood.

In addition, truss manufacturers can enroll for a 10-year limited warranty on truss lumber as well as for the 40-year roofing system warranty.

Details are available from licensed producers, Arch Wood Protection, and at www.dricon.com. Or call toll-free, 1-866-USE-FRTW (873-3789).

Quality Control

Comprehensive QC programs, conducted by third-party agencies, provide assurance that both Dricon® fire retardant chemical and Dricon® FRT wood are consistently produced to meet performance standards.

Factory Mutual Research Corporation & UL conduct their own annual audit of facilities producing Dricon® FRT wood. These independent agencies supplement the daily activities of the manufacturer, Arch Wood Protection.

Sources

To locate the supplier nearest you, contact Arch Wood Protection, at 1-866-USE-FRTW or go online at see **www.dricon.com/producers** for a list of approved licensed producers.

Preservative Properties

In addition to excellent fire retardant characteristics, Dricon® fire retardant treated wood effectively resists attack by termites and decay in above-ground, weather-protected use. This includes studs, flooring, joists, trusses, sill plates, interior trim, and other applications not exposed to direct wetting.

Dricon® fire retardant chemical is registered for use as a wood preservative with the U.S. Environmental Protection Agency. Some species of Dricon® FRT wood also meet the requirements of AWPA Standard U1 Commodity Specifications A (sawn products) and F (plywood), which means that this wood effectively withstands damage from decay and termites in appropriate applications.

Recent tests have shown that, at the retention levels present in most species, Dricon® FRT wood is protected against damage from even the Formosan termite. Dricon® FRT wood, processed to standards, will meet retention requirements for protection against subterranean and Formosan termites as established by the American Wood-Preservers' Association (0.28 pcf B_2O_3) in standard P5 under Inorganic Boron, SBX.

Appearance

Dricon® FRT wood, when specified, 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.

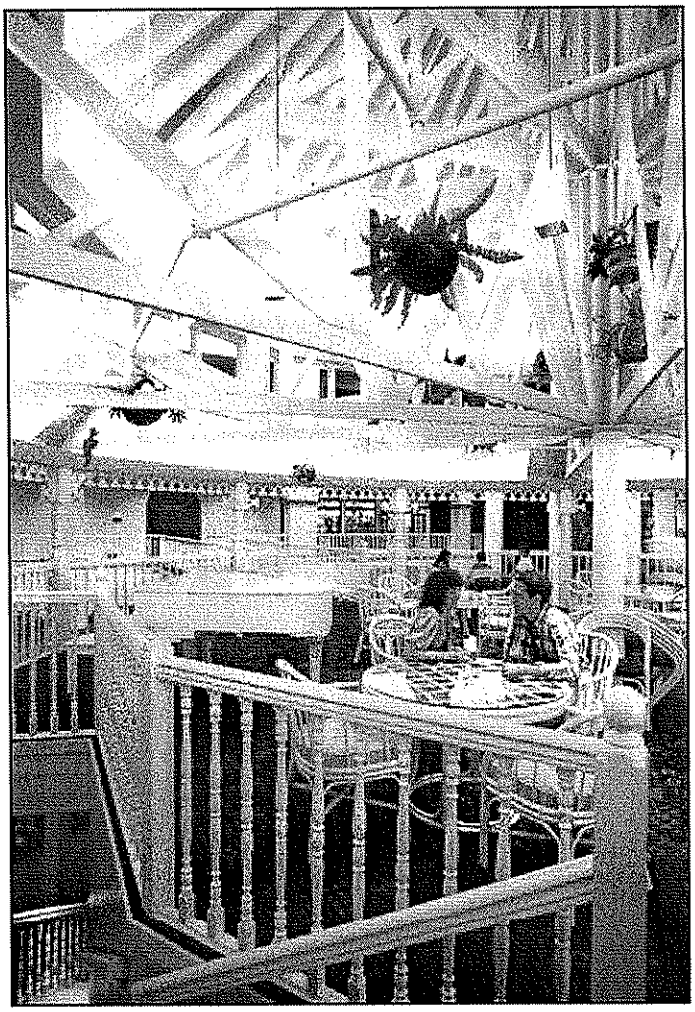
Also, Dricon® FRT wood will not stain plaster, wallboard, or other covering material. Dricon® FRT lumber is supplied at a moisture content of 19% or less (15% or less for plywood). When used as recommended, the excellent hygroscopic properties of Dricon® FRT wood will prevent any staining problems.

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® FRT wood without declassifying the finished product.

Limitations

Dricon® FRT wood can only be used in above-ground locations, protected from precipitation, regular condensation, or other wetting. Exposure of Dricon® treated wood to these conditions will, over a period of time, reduce its fire retardance and preservative effectiveness. However, Dricon® FRT wood used as sill plate or in contact with concrete that contacts the ground is an approved application and does not void the warranties.

The preservative effectiveness of treated wood is dependent on the retention and penetration of the treating chemicals.



ADDITIONAL INFORMATION (cont.)

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-Preservers' 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® FRT wood is listed as an interior Type A (HT) product by AWPA.

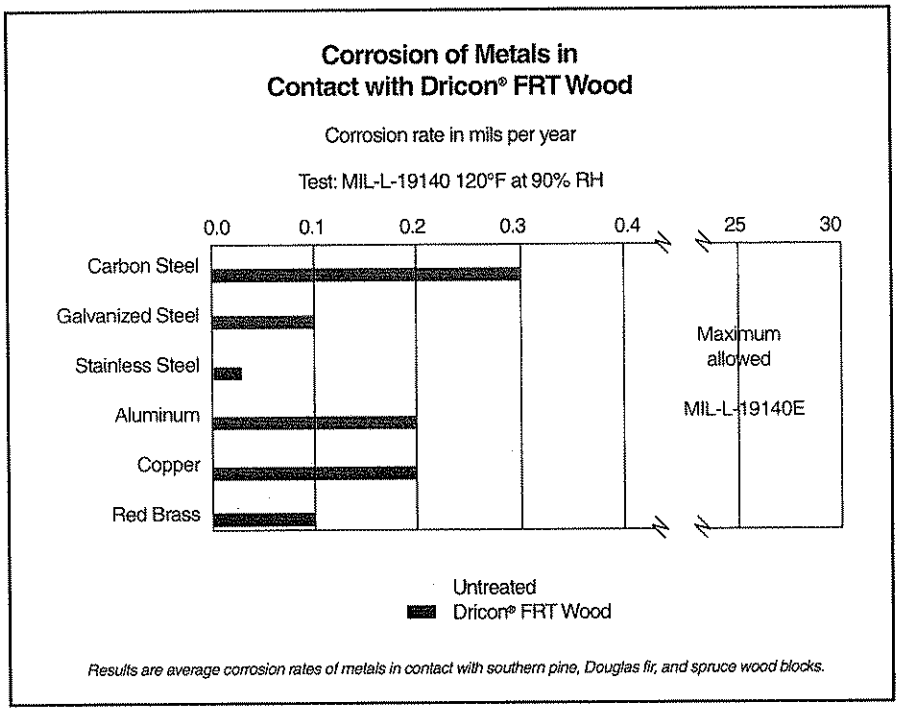
In tests conducted in accordance with ASTM D 3201, there was very little difference between the moisture content of Dricon® FRT wood and untreated wood. Even when the relative humidity was increased from the specified test level of 90% up to 96%, the difference remained slight. By comparison, typical conventionally treated samples had twice the moisture gain of untreated wood even below 85% relative humidity.

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® FRT wood, however, has demonstrated no greater corrosion rates than untreated wood.*

Accelerated tests following procedures of military specification MIL-L-19140 have demonstrated Dricon® FRT wood to be no more corrosive to various metals than untreated wood. Dricon® samples were tested in contact with aluminum, carbon steel, hot-dipped galvanized steel, copper, and red brass.

Other tests have demonstrated that Dricon® treatment may actually help reduce corrosion of the protective zinc layer on galvanized steel truss plates. If the exposure is such that moisture might condense between wood and the metal hardware, siding, or roofing, corrosion can be expected with either treated or untreated wood. Even with untreated wood, this type of environment requires back priming with a corrosion inhibitive paint on the surface of the metal in contact with the wood or use of a moisture barrier. The same precautions should be taken when using Dricon® FRT wood.



Safety Precautions

The chemicals in Dricon® FRT wood 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® wood 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® wood 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® wood, the material should be kept off the ground and covered to shield it from precipitation.
- When installing Dricon® FRT lumber and plywood it is important to utilize the design value adjustments published in NER-303 and this handbook.
- Dricon® plywood should be spaced and fastened as recommended in "Design and Construction Guide for Residential and Commercial Uses," 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® treatment. Ripping and milling of lumber are not recommended since they may alter the burning characteristics and invalidate the Underwriters Laboratories flame spread classification. Plywood may be cut in any direction.
- 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.
- Cutting to length, drilling holes, joining cuts, and light sanding are permissible. It is not necessary to field-treat cut ends to maintain flame spread rating.
- Ripping and milling are not permitted except on red oak and yellow poplar lumber. Surfacing to a depth of 1/16" is permitted on western red cedar lumber. On other species, these operations may alter the surface burning characteristics and will invalidate the UL label.
- Carbide tipped saw blades are recommended if extensive cutting operations are to be performed. However, Dricon® FRT wood is not as abrasive as many conventional fire retardants.
- Unlike FRT lumber, Dricon® *plywood* can be cut in either direction without loss of fire protection in that surface burning characteristics of plywood are unchanged.
- 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® FRT wood 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® FRT Lumber Compared to Untreated Lumber

Fasteners/Connectors		Southern Pine	Douglas Fir	Spruce	Other Species
Nails	Withdrawal	0.91	0.91	1.0	0.91
	Lateral	0.98	0.98	1.0	0.98
Wood Screws	Withdrawal	0.94	0.94	1.0	0.94
Bolted Joints	Parallel to Grain	0.92	0.92	1.0	0.92
	Perpendicular to Grain	0.96	0.96	1.0	0.96

Recommended Hardware

Galvanized steel hardware is recommended for use with Dricon® FRT wood. Although Dricon® treatment does not increase corrosion of bare or galvanized steel, the galvanizing provides an extra measure of protection of any treated wood.

SAFETY, USE & HANDLING (cont.)

Disposal

Under the Resource Conservation and Recovery Act (RCRA), it is the responsibility of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This product is typically not considered a hazardous waste but state-run waste programs may be more stringent. Check with your local or state regulators prior to disposal.

Finishing

Stains, sealers, varnishes, and paints can be used with Dricon® FRT wood. 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.

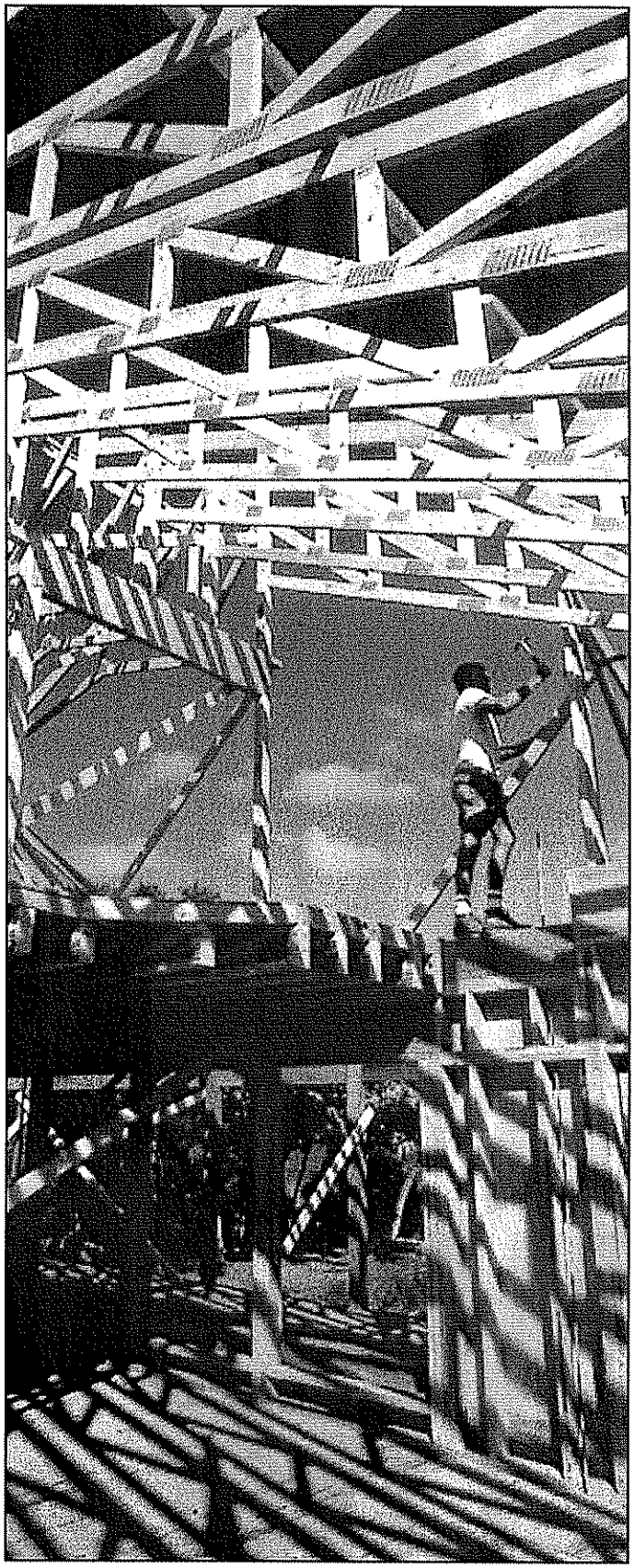
Take precautions at the job site to protect the treated product from exposure to rain or extreme dampness if finishes are to be applied. As with untreated wood, excessive surface moisture can cause finishing problems. It is recommended that finishes be tested in an unobtrusive area to insure satisfaction.

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® FRT wood.

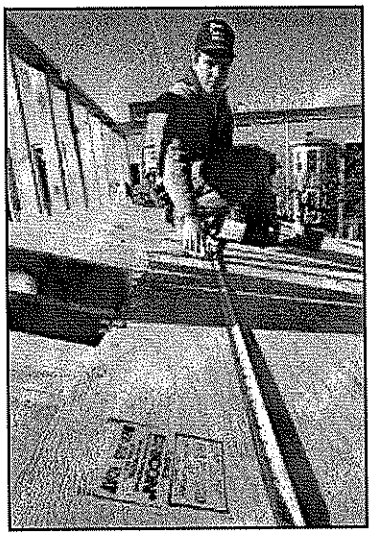
Gluing

The Dricon® treatment does not adversely affect the performance of nonstructural construction adhesives, mastics, or contact cements. No significant differences in effectiveness between Dricon® FRT wood 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® wood surface is clean and dry to obtain the best performance.



Standards of the American Wood-Preservers' Association



The American Wood-Preservers' 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

AWPA Recognition of Dricon® FRT Wood

Dricon® FR chemicals and Dricon® FRT wood are acceptable under in AWPA's P and U standards. As the AWPA does not permit the listing of trade names, Dricon® FR chemical is listed as "FR-1" in standard P17 for fire retardant formulations.

Dricon® FR chemical and Dricon® FRT wood are also recognized as an effective preservative system for above ground, weather-protected applications. As such, Dricon® fire retardant is also listed as an inorganic borate preservative and meets the requirements of AWPA standard P5, Waterborne Preservatives (section 9), and Dricon® FRT wood satisfies UC1 and UC2. For preservative applications, Dricon® FR and FRT wood are designated as "SBX" in the P and UCS standards.

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.

STANDARDS & BUILDING CODES (cont.)

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.

PROCESS STANDARD D-1
MONITORED BY:
TIMBER PRODUCTS INSPECTION
QA XXXX
SYP TREATED PLYWOOD
FLAMESPREAD / SMOKE DEVELOPED
25 OR LESS
ASTM E84 / AWPA U1 (UCFA)
INTERIOR TYPE A (HT) / KDAT
ESR XXXX
DRICON
Fire Retardant Treated Wood
COMPANY NAME
CITY, STATE
2007 / 2008

Sample ink stamp

Each piece of Dricon® FRT wood is marked with an ink stamp bearing the classification mark of a qualified testing laboratory, describing its surface burning characteristics. Themark further identifies the name and location of the treating plant and will show that the material complies with AWPA standards, has been dried after treatment, and qualifies as an Interior Type A, low hygroscopic product.

Evaluation Report Acceptance

In ICC Evaluation Service Legacy Report NER-303, the National Evaluation Service Committee found that Dricon® fire retardant treated wood complies with requirements for fire retardant treated wood described in the 2000 International Residential Code®, the BOCA® National Building Code/1999 Standard Building Code®, the 1997 Uniform Building Code™, the 2000 International Residential Code®, the 2001 Supplement to the International Codes®, and the 1998 International One and Two Family Dwelling 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.

Standard, Uniform, National, CABO, NBC Codes

The ICC and NFPA codes, outlined in the sections ahead, are now the national model codes that undergo regular revision. Many jurisdictions, however, still refer to past editions of SBCCI's Standard, ICBO's Uniform, or BOCA's National code. Information on FRT wood in these codes – and in the CABO One and Two Family Dwelling Code and National Building Code of Canada – can be found at www.dricon.com.

INTERNATIONAL BUILDING CODE

2003 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 pressure-impregnated with chemicals or other means during manufacture having a flame spread classification of 25 or less and showing no evidence of significant progressive combustion when the test is continued for an additional period of 20 minutes. In addition, the flame front shall not progress more than 10.5 feet beyond the center line of the burners at any time when tested in accordance with ASTM E 84. {Ref.: IBC Section 2303.2}

- All fire-retardant-treated lumber and wood structural panel products shall be properly labeled with the identi fying 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 2303.2.2 through 2303.2.5.. For fire-retardant-treated wood exposed to weather, damp or wet locations, include the words "No increase in the listed classification when subjected to the Standard Rain Test" (ASTM D 2898). {Ref.: IBC Section 2303.2.1}

- 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 2303.2.2.1}
    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 2303.2.2.2}

- Where fire-retardant-treated wood is exposed to the weather, damp or wet locations it shall be identified as "Exterior" to indicate there is no increase in the listed flame spread index as defined in Section 2303.2 when subjected to ASTM D 2898. Where fire-retardant-treat ed wood is exposed to exterior conditions, it shall be identified as "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. {Ref.: IBC Section 2303.2.3}

- 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 2303.2.4}

- 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 2303.2.5}

- 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 2303.2.6}

- Hardwood and decorative fire-retardant-treated wood plywood shall be manufactured and identified as required by Hardwood Plywood Veneer Association Standard HPVA HP-1. {Ref.: IBC Section 2303.3}

- Fasteners for fire-retardant-treated wood shall be of hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper. Fastenings for wood foundations shall be as required in AF&PA Technical Report No. 7. {Ref.: IBC Section 2304.9.5}

Not all FRT wood products perform alike.

See strength properties of Dricon® FRT wood on page 6.

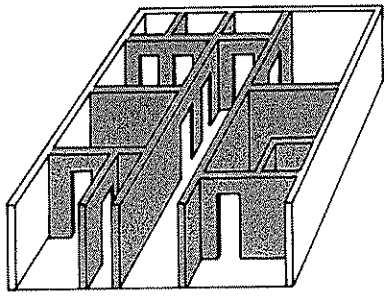
INTERNATIONAL BUILDING CODE (cont.)

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, Item 1, Sub-item 1.1}
2. Non-load bearing exterior walls where no fire rating is required. {Ref.: IBC Section 603.1, Item 1, Sub-item 1.2; See also IBC Table 602}

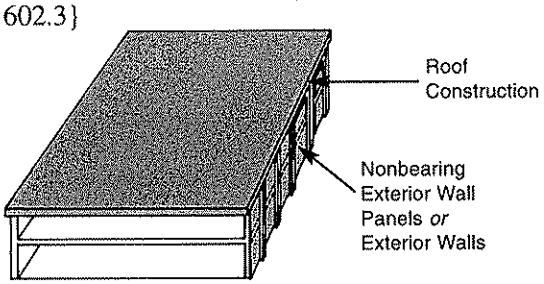


Note: Shaded areas indicate permitted uses of FRT wood.

3. Roof construction as permitted in Table 601, Note c, Item 3. {Ref.: IBC Section 603.1, Item 1, Sub-item 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 8}
5. Materials in concealed spaces are permitted in accordance with Section 717.5. {Ref.: IBC Section 603.1, Item 21}
6. Materials exposed within plenums complying with Section 602 of the International Mechanical Code (IMC). {Ref.: IBC Section 603.1, Item 22}

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. {Ref.: IBC Table 601, footnote f}

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 c, Item 1.}

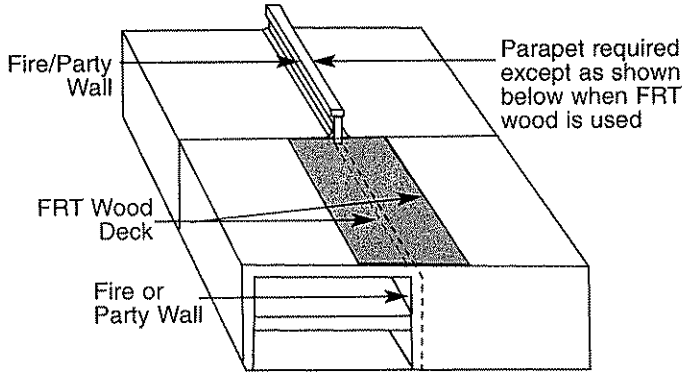
2. In Type I and II construction, fire-retardant-treated wood is allowed in buildings including girders and trusses as part of the roof construction when the building is:
   a) Two stories or less in height. {Ref.: IBC Table 601 footnote c, Item 3, Sub-item i}
   b) Type II construction over two stories; or {Ref.: IBC Table 601 footnote c, Item 3, Sub-item ii}
   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 c, Item 3, Sub-item iii}

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 704.11, Exception 5, Item 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 705.6, Exception 4, Item 4.3}



Miscellaneous Roof Structures

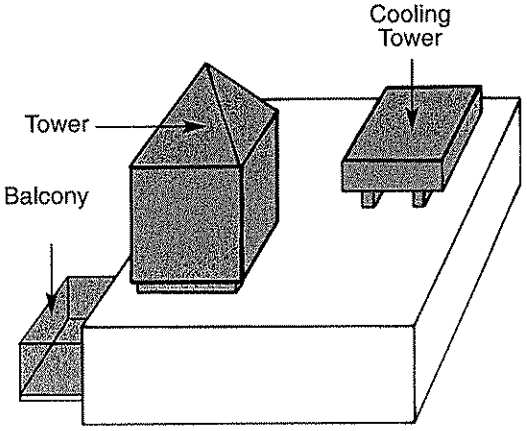
Towers, spires, domes and cupolas shall be not be less than the fire-resistance rating required for the building where attached and shall not be used for habitation or storage, except that:

- Any towers, spires, steeples or other roof structures 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 towers, spires, domes or cupolas 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 1509.5}

- Any towers, spires, domes or cupolas 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 1509.5.1}

- 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.: IBC Section 1509.5.2}



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 1509.4}

INTERNATIONAL BUILDING CODE (cont.)

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 10.}. 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 1406.3}

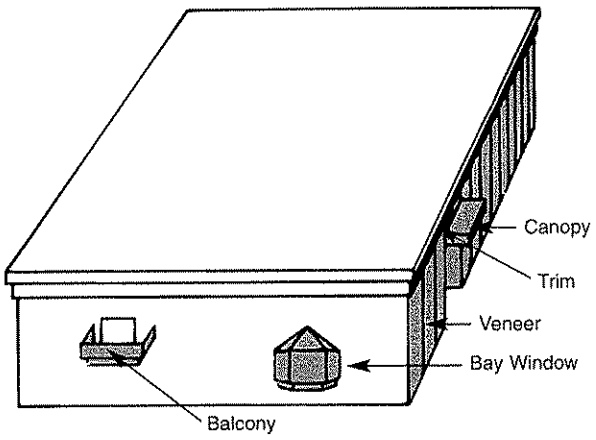
1. In Type I and II construction, balconies, porches, decks and exterior stairways not used as required exits on buildings that are not more than 3 stories in height are permitted to be constructed of fire-retardant-treated wood. {Ref.: IBC Section 1406.3, Exception 1}

2. In Type III, IV and V construction, balconies and similar appendages that are not protected by a sprinkler system may be constructed of fire-retardant-treated wood. {Ref.: IBC Section 1406.3, Exception 3}

3. Pickets and rails or similar guardrail devices greater than 42 inches in height may be constructed of fire-retardant-treated wood. {Ref.: IBC Section 1406.3, Exception 2}

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 1406.4.}



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 3105.3}

- 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 4. {Ref.: IBC Section 3105.4}

- 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) the canopy shall have at least one long side open; 3) the canopy width does not exceed 15 feet; and 4) the fire rating of exterior walls is not reduced. {Ref.: IBC Appendix D102.2.8}

Service Stations

Canopies and their supports over pumps of marine or motor vehicle stations 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. Combustible materials used in or on a canopy shall be shielded from the pumps by a noncombustible element of the canopy, or wood of Type IV sizes. Canopies over a vehicle drive-through area shall have a clear, unobstructed height of not less than 13 feet 6 inches (4115 mm) to the lowest projecting element. {Ref.: IBC Section 406.5.2}

Kiosks in Covered Malls

Combustible kiosks or other structures (temporary or permanent) are permitted to be located within a mall when constructed of fire-retardant-treated wood complying with Section 2303.2. However, they cannot exceed 300 square feet in size, must be provided with approved fire suppression and detection devices and the horizontal separation distance between kiosks or groupings or other structures in the mall must be at least 20 feet. {Ref.: IBC Section 402.10}

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 803.2.1.

- Interior walls and ceiling finish shall have a flame spread index no greater than that specified in Table 803.5 for the occupancy group and location designated. {Ref.: IBC Section 803.5}

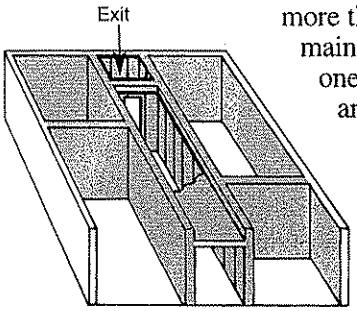
- Interior wall or ceiling finish materials greater than 1/4 inch thick shall be applied directly to a noncombustible backing except for Class A materials and suspended materials that are furred out from the noncombustible backing constructed of fire-retardant-treated wood. {Ref.: IBC Section 803.4.4}

- 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 803.4.1}

- 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 803.4.2}

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 410.4}



Combustibles in Concealed Spaces

Combustibles shall not be permitted in concealed spaces of buildings of Type I or II construction, except:

1. Fire-retardant-treated wood complying with Section 603, Item 8. {Ref.: IBC Section 717.5, Item 1}
2. Combustible materials complying with Section 602 of the International Mechanical Code (IMC). {Ref.: IBC 717.5, Item 2}
3. Class A interior finish materials. {Ref.: IBC Section 717.5, Item 3}

Note: Dricon(r) fire retardant treated wood is listed as "Interior Type A, high temperature (HT)" in accordance with AWPA C20 for lumber and AWPA C27 for plywood. {Ref.: See Section 3 Fire Performance 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

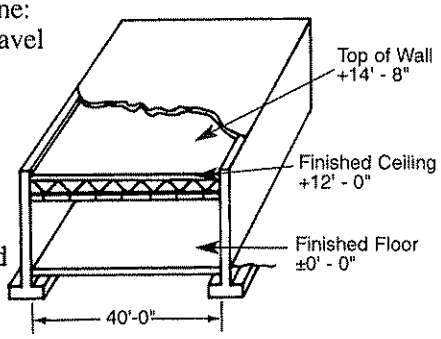
Design Considerations

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}

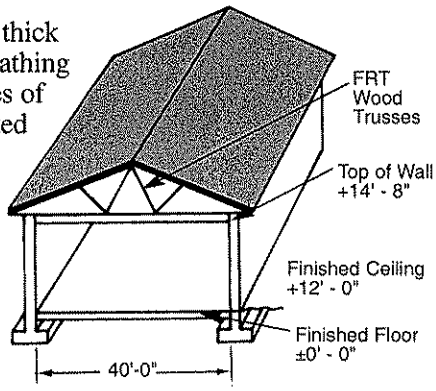
System A — Roof assembly with steel bar joists

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

2003 Edition, published by the International Code Council

Uses

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

Criteria

- 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. {Ref.: IRC Section R801.1}

- 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. {Ref.: IRC Section R802.1}

- Fire-retardant-treated wood is any wood product pres sure-impregnated with chemicals or other means during manufacture having a flame spread classification of 25 or less and showing no evidence of significant progres sive combustion for an additional period of 20 minutes, and the flame front not progressing more than 10.5 feet beyond the center line of the burners at any time when tested in accordance with ASTM E 84. {Ref.: IRC Section R802.1.3}

- 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). {Ref.: IRC Section R802.1.3.1}

- Design values for untreated lumber and wood structural panels shall be adjusted for strength taking into consid eration 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. {Ref.: IRC Section R802.1.3.2}

- The effect of treatment, re-drying method after treat ment, 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. {Ref.: IRC Section R802.1.3.2.1}

- 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. {Ref.: IRC Section R802.1.3.2.2}

- 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 classifica tion when subjected to Standard Rain Test," indicating the listed flame spread classification has not increased when subjected to ASTM D 2898. {Ref.: IRC Section R802.1.3.3}

- 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. {Ref.: IRC Section R802.1.3.4}

- 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.: IRC Section R802.1.3.5}

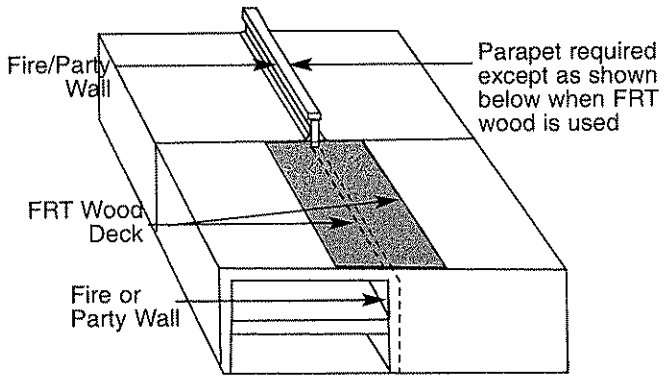
- Fasteners for fire-retardant treated wood shall be of hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper except for 1/2 inch diameter or greater steel bolts. {Ref.: IRC Section 319.3}

Applications

Dwelling Unit Separation

A. Parapets shall be provided for townhouses as an extension of the common exterior or walls where roof surfaces adjacent to the wall or walls are at the same elevation, the parapet shall extend at least 30 inches above the roof surface; and where roof surfaces are adjacent to the wall or walls are at different elevations and the higher roof is not more than 30 inches above the lower roof, the parapet shall extend not less than 30 inches above the lower roof surface.

Parapets are not required where 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 on each side of the wall, or a layer of 5/8 inch Type X gypsum board is attached to the underside of the roof decking or sheathing for a distance of 4 feet on each side of the wall or walls. {Ref.: IRC Section R317.2.2}



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 R317.1}

- When floor assemblies are required to be fire resistance rated by Section R317.1, the supporting construction of such assemblies shall have an equal or greater fire-resistive rating. {Ref.: IRC Section R317.1.1}

C. Garages shall be separated from the residence and its attic area by not less than 1/2 inch gypsum board applied to the garage side. Garages beneath habitable rooms shall be separated from all habitable rooms by not less than 5/8" Type X gypsum board or equivalent. Where the separation is a floor-ceiling assembly, the structure supporting the separation shall also be protected by not less than 1/2 inch gypsum board or equivalent. Ref.: IRC Section R309.2}

- 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

Where solar collectors are 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. Roof mounted solar collectors shall conform to the Chapter 9 requirements for roof coverings and the roof shall be constructed to support the loads imposed by roof-mounted solar collectors. {Ref. IRC Section M2301.2.2}

INTERNATIONAL MECHANICAL CODE

2003 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. {Ref.: IMC Section 603.1, Note 22}

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 603.4}

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 thereof, 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 degrees 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:

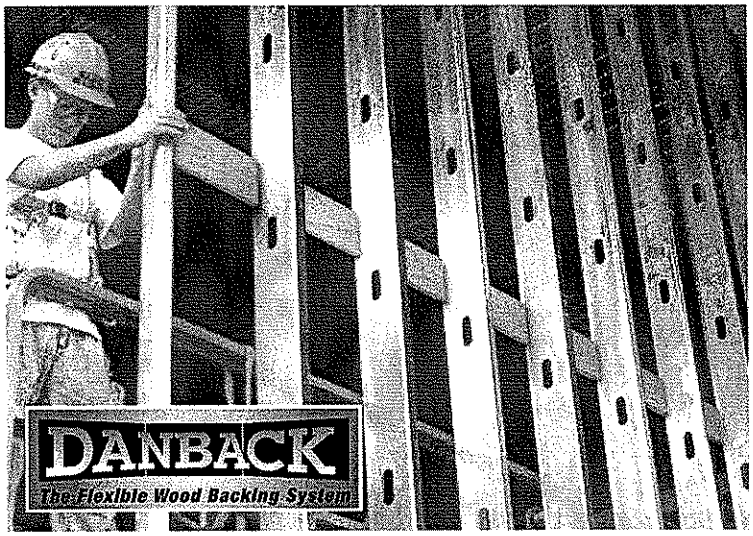
- Definition of all significant properties, or
- Listing of all acceptable manufacturers and/or products

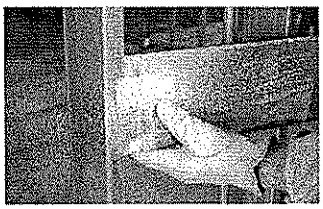
Sprinklers not needed in some concealed spaces

Section 8.14.1.2.11 of the NFPA 13 Standard, 2006 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."

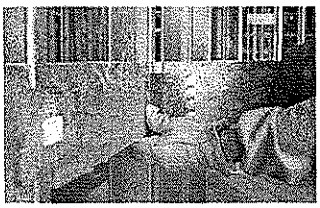
Dricon® FRT wood complies with NFPA 703,and thus eliminates the need for sprinklers in these spaces. This saves time for the builder and expense for his client, and it avoids the consequences of an accidental sprinkler activation.

Danback™ Flexible Wood Backing System



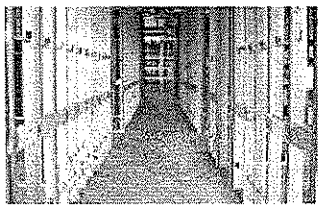


SNAP the Starter Edge into the open side of the stud flange



FLEX around stud flange using the flexible connector plate

SCREW each plate to the stud flange using two small pan or wafer head screws



It's that simple to reduce installation time by up to 90%

It's convenient. It's code compliant. It reduces backing installation time by 90%. And contractors love it. Backing steel studs for the attachment of cabinets, fixtures, and handrails has always been difficult, costly and time consuming. The patented Danback™ flexible wood backing plate actually flexes around the stud and snaps in place for a snug, perfect fit. No cutting, routing or notching is required.

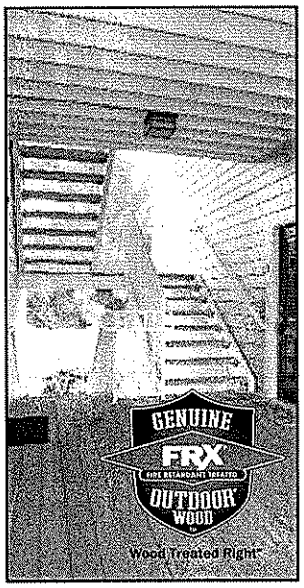
As an added benefit, now the wood portion is made with Dricon® FRT wood to impart fire resistance. The heavy-duty Danback™ flexible wood backing system can support handrails, shelves, and other wall fixtures. It's so easy, you'll see immediate savings in installation time.

Product Features

1. Used as backing plate for the attachment of fixtures in conjunction with metal stud walls.
2. Available in 48" sections, for 16" and 24" O.C. framing.
3. Meets all light gauge framing specifications for commercial and residential applications.
4. Reduces installation time up to 90%.
5. Provides extra screw pull-out strength for heavy-duty backing applications for hospitals, clinics, nursing homes, assisted living centers, institutional, and residential construction.
6. Made with code-compliant, Class A Dricon® fire retardant treated wood.

For pricing and availability of these products, contact Arch Wood Protection at 1-866-USE-FRTW.

FRX® Exterior Fire Retardant Wood



FRX® wood is pressure-treated lumber and plywood that is chemically treated to reduce the spread of flames and provide tested fire protection for applications directly exposed to weather. FRX® wood may be substituted for materials classified as noncombustible in certain building types designated by the model building codes and requiring ASTM D2898 conformance.

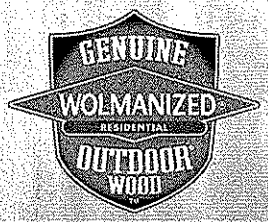
FRX® wood combines that beauty and versatility of wood with the fire safety and insurance advantages of noncombustible materials.

Typical Exterior Uses

- Wall coverings
- Stairways
- Sheds
- Roof coverings
- Canopies and awnings
- Eaves, soffits and fascia
- Scaffolding and scaffold planks
- Various residential uses such as stairways, porches, siding, shakes and shingles, and trim and molding
- Decks & Balconies
- Fences
- Gazebos
- Open-air roof systems
- Storefronts and facades
- Agricultural buildings and horse stalls
- Construction staging

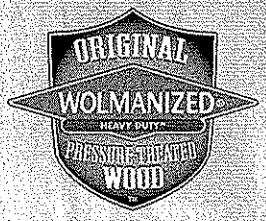
Other Products in the Wolmanized® Wood Family

Arch Wood Protection and Arch Treatment Technologies produce wood preservatives and additives that enhance the qualities of wood by pressure treatment processing. The companies are licensors of these respected brands of treated wood:



Wood Treated Right™

Wolmanized® Residential Outdoor® wood
www.wolmanizedwood.com
Preservative-treated wood commonly used for residential and commercial applications.



Wood Treated Right™

Wolmanized® Heavy-Duty™ pressure-treated wood
www.wolmanizedwood.com
Traditional treated wood for industrial, utility, highway, and marine applications.

Wood Treated Right™

FrameGuard® Mold-Resistant wood
www.frameguardwood.com
Coated to resist mold, termites and fungal decay.

Wood Treated Right™

Wolmanized® L³ Outdoor® wood
www.wolmanizedwood.com
Nonmetallic preservative-treated wood for above-ground applications.

© 2007 Arch Wood Protection, Inc.

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; 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.

Arch Wood Protection, Inc.
Arch Treatment Technologies, Inc.
1955 Lake Park Drive, Suite 100
Smyrna, GA 30080
Tel: 770.801.6600

DRI-2016-R7

Since 1923
RoyOMartin

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JAN 23
BY:

January 14, 2013

Dear Valued Customer:

With the New Year upon us, we take this opportunity to provide additional information to assist you in promoting proper installation and handling for RoyOMartin's quality line of OSB products. To minimize buckling risk, contractors should adopt the following techniques:

- **Product storage**
  - Provide covered storage, ensuring product remains at least 3 inches off the ground.
  - Cover panels loosely with a protective material, ensuring good air circulation and ventilation around the panels.
  - OSB exposed to moisture should be allowed ample drying time.
- **Panel acclimation**
  - Panels require 24 hours to acclimatize to the surrounding environmental conditions prior to installation.
- **Panel edge spacing**
  - 1/8" minimum spacing is required along all edges, although extended-length panels require up to 1/4".
- **Panel nailing**
  - Consult nailing patterns and local building codes.
  - Temporary nails, with "lighter-than-specified" nailing patterns, are required during the framing process to allow for continued acclimation prior to final nailing and installation of exterior covering.

Failure to follow responsible installation and handling instructions is not a manufacturing issue. If proper installation and/or handling procedures are not followed, it is not the responsibility of the manufacturer. Please visit APA - The Engineered Wood Association (www.apawood.org) for additional instructions and recommendations.

Additionally, we want you to be one of the first to know that **www.royomartin.com**, our corporate website, will be transitioning to a more product-focused website with product information, easily accessible to our valued customers, as well as end-users. This transition will take place throughout 2013; we welcome your feedback.

RoyOMartin values its relationship with you, and we always strive for continued improvement. Please do not hesitate to contact your RoyOMartin sales representative for any questions or concerns you may have about these or other RoyOMartin products. Thanks for helping us **"Build Better. Together."**

All our best in 2013,

Terry Secrest
Vice President, RoyOMartin-OSB

Enclosures:
TuffStrand® and TuffStrand®XL Installation Instructions
APA Document – Minimizing Buckling of Wood Structural Panels in High Risk Applications
APA Document – Buckling of Wood Structural Panel Sheathing
RoyOMartin Warranty & Claims Policy

2189 Memorial Drive P.O. Box 1110 Alexandria, LA 71309-1110 (800) 299 5174 or (318) 448 0405 (318) 443 0159 Fax www.royomartin.com

Product Information & Installation Instructions

TUFFSTRAND® OSB Sheathing

OSB Structural Panels from RoyOMartin

Installation Instructions: Site-Built and Modular Construction

Important Notice to Buyers and Users of RoyOMartin OSB: These instructions are not intended to cover every installation contingency. If any questions or problems arise concerning the installation of this product or its suitability for the purchaser's particular use, inquiries should be made to RoyOMartin (www.royomartin.com).

The information about the products and application instructions printed herein is current at the time of publication; however, in accordance with RoyOMartin's policy of constant product improvement, the right is reserved to vary these application instructions and product specifications without notice. Please ask for the most recent product information when placing your order.

DESCRIPTION

TuffStrand® is an oriented strand board (OSB) structural panel made of wood strands aligned in three layers. Alternate layers are positioned at approximately right angles to one another. The layers are blended with resins and formed into continuous mats and bonded by heat and pressure. The orientation of strands creates a stable panel with greater strength in the long panel dimension than across the width. OSB sheathing panels are manufactured to be free of knots, core voids, grain defects, splits, and other irregularities. The panels are coated with a seal on all four (4) edges for added moisture resistance and dimensional stability. The panels also feature a coarse or rough textured surface that provides safer footing on pitched roofs.

STORAGE & HANDLING

All OSB materials should be stored to avoid excessive moisture pick-up and must be covered and kept free from construction dust and moisture during storage and installation. Inspect the protective bag when received, if provided, for tears and repair with staples and/or tape before storing. Store in a warehouse under cover of a roof or on concrete floors three (3) inches off the ground, remembering to rotate unit inventories frequently. When stored outdoors, cover panels loosely with a protective material. Clear or similar-type plastic covering is not recommended. If plastic or tarps are used, anchor them on top of the unit, keeping them away from the sides and bottom to ensure good air circulation and ventilation around the panels. Cut the banding on the unit to prevent edge damage. Allow 24 hours for panels to acclimatize to the surrounding environmental

conditions prior to installation. Exposure to rain, snow or similar elements compromises product performance and may void the warranty.

TuffStrand® structural panels are intended for protected construction applications. If subjected to rain or standing water during normal construction, the panel edges may swell, and mild surface roughening may occur. These reactions are normal when compressed wood products are exposed to water. If edge swelling and surface roughening are encountered, touch-sand panels where necessary after they dry.

Use reasonable care to avoid dropping panels on the edges, as chipping and damages to corners may occur. If you expect to transport the panels with a forklift, put the product on a pallet or supports to minimize panel damage from fork tines.

WORKABILITY

Utilize standard woodworking tools to saw, drill, and rout TuffStrand® OSB structural panels.

CERTIFICATION

TuffStrand® OSB structural panels are certified by APA-The Engineered Wood Association and are manufactured in conformance with APA PRP-108 and U.S. Voluntary Product Standard PS2. The panels conform to the ICC Evaluation Service Legacy Report NER-108 for APA and are approved under the APA Rated Sheathing Standard.

FIRE RATING

TuffStrand® OSB is generically recognized as having a Class C or Class 3 fire rating without need for test or label by: HUD/FHA Manual of Acceptable Practices, Section 405-8 to the Minimum Property Standards. Interpretive Bulletin C-1-76 to the HUD Manufactured Home Construction and Safety Standards.

APPLICATIONS

TuffStrand® OSB structural panels are ideally suited for roof sheathing, wall sheathing, and two-layer sub-floors systems in commercial and residential building projects, and some utility applications.

CODE COMPLIANCE

TuffStrand® OSB structural panels meet or exceed APA requirements and are recognized in the Uniform Building Code, the International Building Code, and the International Residential Code, and by the HUD Use of Materials Bulletin Number UM-40c.

SIZE and THICKNESS

Thickness (product classes)		Width (nominal inches)	Length (nominal inches)	Pieces (unit)
3/8	9.5mm	48"	96"	88
3/8	9.5mm	48"	108"	90
3/8	9.5mm	48"	120"	92
7/16	11mm	48"	96"	84
7/16	11mm	48"	97 1/8'	84
7/16	11mm	48"	108"	82
7/16	11mm	48"	109 1/8"	82
7/16	11mm	48"	120"	87
7/16	11mm	48"	121 1/8"	87
7/16	11mm	48"	145 1/8"	58
15/32	12mm	48"	96"	74
15/32	12mm	48"	108"	74
15/32	12mm	48"	120"	76
1/2	12.5mm	48"	All	70
19/32	15mm	48"	All	63
23/32	18mm	48"	All	50

*Eclipse™ and Energy Guard piece count varies, please ask your sales representative.

SPAN RATINGS

3/8	(9.5mm)	24/0
7/16	(11mm)	24/16
15/32	(12mm)	32/16
1/2	(12.5mm)	32/16
19/32	(15mm)	40/20
23/32	(18mm)	48/24

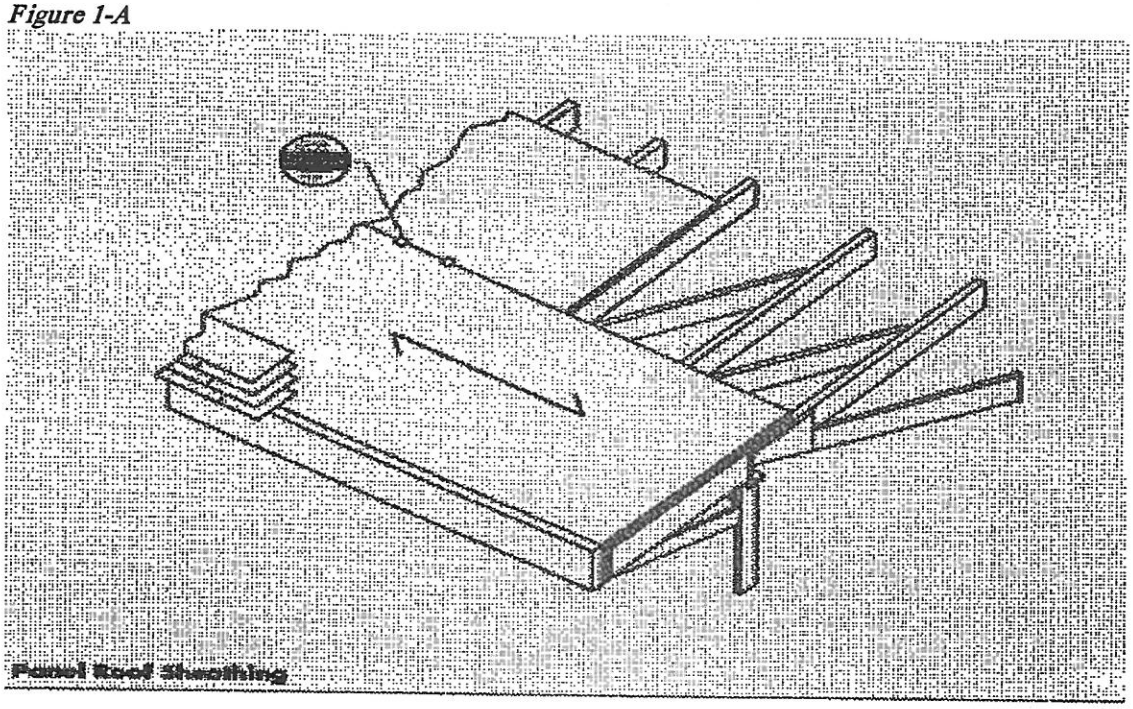
INSTALLATION

Roof Sheathing Installation

- Install with the long dimension or strength axis perpendicular to framing member, and with the panel continuous over two or more spans.
- Edge support shall be provided where indicated on drawings by use of panel clips. Metal spacer clips typically used as guides for spacing on roof-sheathing panels are not recommended for use with Eclipse™ Radiant Barrier OSB panels. If local building codes require spacer clips, synthetic or non-metallic spacer clips are recommended.
- Panel end joints shall occur over framing member. Provide 1/8" minimum gap along the 8' edge and 1/8" minimum gap along the 4' end (See figure 1-A).
- Stagger end joints in succeeding panel rows a minimum of one support spacing.
- Nail 6" O.C. along supported panel edges and 12" O.C. at intermediate supports. Use 8d common nails for panels up to 1". For panels exceeding 1", use 8d ring-shank or 10d common nails. Other code-approved fasteners may be used.
- Panels must be protected upon installation by an approved weatherproof material. An "approved weatherproof material" is material or a combination of materials such as asphalt-impregnated felt and asphalt shingles or similar materials currently accepted by model code authorities and existing standards for the intended application.
- TuffStrand® OSB may be extremely slippery when wet, covered with frost, ice or snow or when covered with sawdust. Installers should always place the skid-resistant side up, wear rubber soled or skid-resistant shoes, and exercise extreme caution when installing roof sheathing. www.apawood.org

**If OSB is exposed to moisture allow all the panels to dry before installing roofing materials. Do not install roofing materials over wet substrate.*

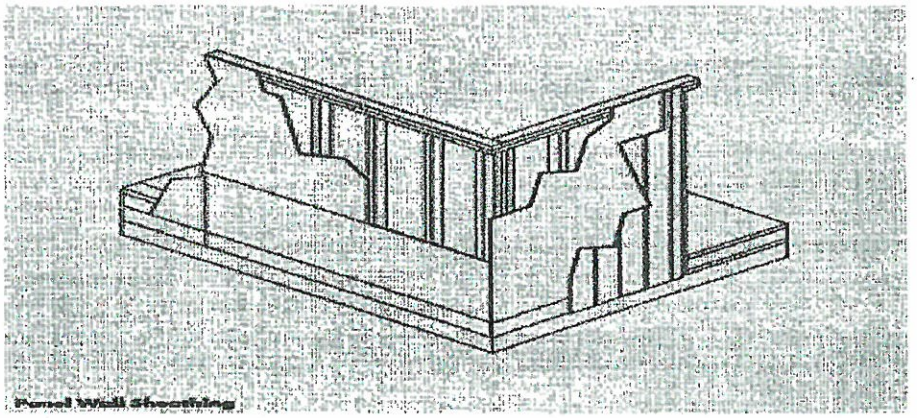
Figure 1-A



Wall Sheathing Installation

- OSB sheathing wall panels may be installed vertically or horizontally. In horizontal installations, stagger joints a minimum of one stud space.
- TuffStrand® OSB wall sheathing may be applied directly to studs without the need for corner bracing to resist racking loads.
- Provide a minimum 1/8" gap between panel edges. Provide a minimum 3/4" expansion joint where panels run continuous for 80' or more.
- Unless otherwise stated, for panels up to 1/2" thick, fasten with 6d common nails located 6" O.C. along supported panel edges, and 12" O.C.. over intermediate supports. For panels 1" and thicker, fasten with 8d common or ring shank nails spaced 6O.C. along supported panel edges and ends and 12" O.C. over intermediate supports. Other code approved fasteners may be used.
- Sheathing must be covered with a weather-resistant cladding, such as any commercially available exterior grade siding. www.apawood.org

**Note: TuffStrand® OSB structural panels are not recommended for residential siding or applications requiring surface primers or paint*



UTILITY

TuffStrand® OSB structural panels may be used for interior paneling and a wide range of non-code compliance applications. Use a fastener whose length will penetrate the framing member by at least 1". Space fasteners 6" O.C. at the perimeter and 12" O.C. at intermediate locations. Provide 1/8" minimum gap along the supported panel edges and ends.

Cutouts

Cutouts for plumbing and electrical components shall be oversized by at least 1/4" to avoid a force fit. DO NOT PUNCH HOLES IN TuffStrand ® OSB.

Fastening

Fasten panels to within 3/8" of panel edges using the fastener size and spacing recommended in the application tables.

APA PANEL ROOF SHEATHING

Recommended minimum Fastening Schedule (Increased nail schedules may be required in high wind zones and where roof is engineered as a diaphragm.)

	Nailing[2][3]		
	Maximum Spacing (in.)		
Panel Thickness (in.)	Size	Supported Panel Edges[4]	Intermediate
5/16-1	8d	6	12[1]
1-1/8	8d or 10d	6	12[1]

[1] For spans 48 inches or greater, space nails 6 inches at all supports

[2] Use common smooth or deformed shank nails with panels to 1 inch thick. For 1-1/8 inch panels, use 8d ring or screw shank or 10d common smooth shank nails.

[3] Other code approved fasteners may be used.

[4] Supported panel joints shall occur approximately along the centerline of framing with a minimum bearing of 1/2 inch. Fasteners shall be located 3/8 inch from panel edges.

Recommended Uniform Roof Live Loads for APA Rated Sheathing with Strength Axis Perpendicular to Supports

Panel Span Rating	Minimum Panel Thickness (in.)	Maximum Span (in.) With Edge Support[1]	Maximum Span (in.) Without Edge Support	Allowable Live Loads (psf)[4] Spacing of Supports Center-to-Center (in.) 12	16	20	24	32	40	48
APA Rated Sheathing[3]										
24/0	3/8	24	20[2]	190	100	60	30			
24/16	7/16	24	24	190	100	65	40			
32/16	15/32, 1/2	32	28	325	180	120	70	30		
40/20	19/32, 5/8	40	32	-	305	205	130	60	30	
48/24	23/32, 3/4	48	36	-	-	280	175	95	45	35

[1] Panel edge clips (one midway between each support, except two equally spaced between supports 48 inches on center or greater), lumber blocking, or other. See additional spans for low slope roofs in the APA Engineered Wood Construction Guide.

[2] 20 inches for 3/8-inch and 7/16-inch panels. 24 inches for 15/32-inch and 1/2-inch panels.

[3] Includes APA Rated Sheathing/Ceiling Deck

[4] 10 psf dead load assumed

APA PANEL WALL SHEATHING [1]
(For APA Rated Sheathing panels continuous over two or more spans.)

Panel Span Rating	Maximum Stud Spacing (in.)	Nail Size[2][3]	Maximum Nail Spacing (in.)[5] Supported Panel Edges[4]	Intermediate Supports
12/0, 16/0, 20/0 or Wall-16" o.c.	16	6d for panels 1/2" thick or less; 8d for thicker panels	6	12
24/0, 24/16, 32/16 or Wall-24" o.c.	24			

[1] See requirement for nailing panel sheathing when exterior covering is to be nailed to sheathing the APA Engineered Wood Construction Guide.

[2] Use common, smooth, annular, spiral-thread, or galvanized box nails.

[3] Other code-approved fasteners may be used.

[4] Fasteners shall be located 3/8 inch from panel edges.

[5] Increased nail schedules may be required where wall is engineered as a shear wall.

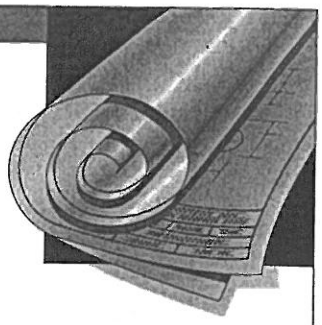
Note: *Please visit APA - The Engineered Wood Association (www.apawood.org) for additional instructions and recommendations on more aggressive nailing patterns to minimize buckling of wood structural panels. RoyOMartin's products are strength designed to work best with nailing patterns 6" on center on all panel edges and 12" in the intermediate portion of the panel. If local code nailing pattern require a tighter nailing pattern, please refer to APA's suggested nailing instruction. Nail to 12" or 24" on center at ends, edges and intermediate supports, allow panels to acclimate to normal local conditions and just before the finish wall covering is applied, then nail to local code's tighter nailing pattern. Failure to follow these guidelines will most commonly result in severe buckling and is not a result of manufacturing or product performance. In the case where these instructions cannot be followed, RoyOMartin recommends its 7/16" panel with a 24/16 span rating.*

Always nail panel edges 3/8" from panel edges, failure to nail to this requirement will result in a highlighted edge raising and in the case of more than normal wetting, severe edge swell and is not a result of manufacturing or product performance.

RoyOMartin's OSB is a wood-based product and caution should be used in storage of these products, as wetting will cause wood to swell. RoyOMartin's OSB is shipped, when provided, to these areas individually bagged; we suggest RoyOMartin panels be kept covered until point of installation.

Failure to follow responsible installation and handling instructions is not a manufacturing issue. If proper installation and/or handling procedures are not followed, it is not the responsibility of the manufacturer.

California Prop 65 Warning:
Drilling, sawing, sanding or machining wood products generates wood dust, a substance known to the State of California to cause cancer. Avoid inhaling wood dust or otherwise determine what safeguards or personal protection equipment may be necessary to prevent inhaling wood dust.



Minimizing Buckling of Wood Structural Panels

Form X480C
February 2012

Buckling of wood structural panel sheathing such as plywood and oriented strand board (OSB) occasionally results when moisture conditions cause the panels to expand. Although structural properties are not affected, the waviness affects the appearance and may cause concerns about serviceability. Builders can significantly reduce the potential for buckling by understanding the factors that contribute to buckling risk and by providing for the natural increase in panel dimensions that results from moisture exposure.

The tendency of expansion to cause buckling is related to mechanical and physical properties of the panels, natural variability of wood and installation techniques. Mechanical properties such as panel stiffness are important for resisting the stresses that develop as the panels try to expand. The physical properties of the panels, such as the orientation of veneers or strands, will influence the panels' dimensional response to moisture conditions. Installation practices, such as panel edge spacing and nailing sequence, are important to minimize the build-up of stresses that can cause buckling. The APA literature referenced at the end of this Technical Note provides basic installation recommendations.

Laboratory and field experience indicate that certain types of installation involve increased buckling risks that merit special attention. When one or more of the following factors are present, additional techniques should be considered to help assure best performance:

- Shear wall or diaphragm applications with edge nail spacing 4 inches o.c. or closer, and panels applied parallel to supports
- Use of 3-ply plywood panels with the face grain parallel to supports (i.e., walls)
- Use of oversized panels, such as 8' x 8' panels
- Panels installed within a few days of their manufacture
- Extended rainy weather where panels may become saturated with water

These applications can be high buckling risk because the conditions may reduce the standard panel edge gap's effectiveness in absorbing the panel expansion. This is because: 1) The increased nailing schedule in some diaphragms and shear walls may essentially prevent any panel expansion, 2) Low panel stiffness in spans between the supports can lead to buckling from relatively low moisture-induced axial loads, 3) An oversize panel dimension allows panel expansion to build up, 4) To facilitate proper gluing, all panels are very dry at the time of manufacture – a condition that can lead to higher-than-expected expansion after the panels are in place, 5) During long periods of wet weather, panels may pick up more moisture than anticipated by the normal 1/8-inch spacing recommendation.

APA

For these applications, the following techniques help offset the increased buckling risk:

Panel Acclimation: An effective step in the prevention of panel buckling is to acclimatize the sheathing panels to the building environment before installation. Including this step, whenever possible, reduces the amount of additional moisture absorption after panels are installed thereby reducing dimensional expansion between installation and end-use conditions, which in turn reduces buckling risk. This is especially important for newly manufactured panels, which are typically very dry and have a great potential for expansion. See *APA Builder Tip: Storage and Handling of APA Trademarked Panels,* Form U450, for more information.

Panel Edge Spacing: Additional attention to edge spacing may be required to mitigate the higher buckling risk. For newly manufactured panels, if the panels were not acclimated before installation, a 1/8-inch gap at edges and ends may be insufficient. **For example, for oversized panels and/or factory-dry panels, consider increasing the panel gaps at ends and edges to 1/4 inch.** This may require additional trimming of the panels to fit the framing module or by specifying a special size from the panel manufacturer (such as 1/4-inch undersized). Such special-cut panels may be denoted with edge gapping recommendations on the panels.

Panel Nailing: In applications where high-density nailing schedules are followed, such as some diaphragms and shear walls, simple edge gapping may not be effective. To allow for expansion of more densely nailed panels (nail spacing 4 inches o.c. or closer) and for panels subject to total jobsite water saturation, the following nailing sequence should be considered:

- Temporarily nail panels with a nail spacing of 12 or 24 inches o.c. at ends, edges and intermediate supports (rather than at the closer, specified shear wall or diaphragm schedule) during the framing phase of construction. For this initial nailing, use the nail size specified. With this lighter-than-specified nailing schedule, resultant panel expansion is more readily accommodated by the panel edge gaps.

After the panels become acclimated to jobsite moisture conditions and immediately prior to covering with siding or roofing, complete final nailing. Be aware that when the spaces between the panels close as the panels become acclimated, finish roofing materials installed too early in the moisture-absorption process may buckle upward over the closing panel-joint spaces. Waiting until the panels have absorbed the moisture will minimize the potential for shingle ridging or other types of buckling over panel joints.

Note: Panel spacing is an APA **Recommendation,** but not a model building code requirement, to provide installers with a means of minimizing the potential for panel buckling which can lead to an unsightly appearance and customer complaints. Panel buckling may be an aesthetic or serviceability issue but is not a structural deficiency. There is no reason to expect this recommended space to be maintained when the panels become acclimated after installation. Gaps that were initially present may have closed due to normal moisture-related expansion. If the flatness of sheathing or flooring panels is acceptable, APA generally recommends that any finish flooring, siding or roofing be installed as planned regardless of whether gaps are present.

References:

APA Builder Tip: Cut Callbacks with Proper Spacing and Nailing, Form M300
APA Engineered Wood Construction Guide, Form E30
APA Technical Note: Buckling of Structural Panel Sheathing, Form D481
APA Technical Note: Jumbo Panels for Nonresidential Roofs, Form W220

Minimize Buckling of Wood Structural Panels

We have field representatives in many major U.S. cities and in Canada who can help answer questions involving APA trademarked products. For additional assistance in specifying engineered wood products, contact us:

APA HEADQUARTERS
7011 So. 19th St. ▪ Tacoma, Washington 98466 ▪ (253) 565-6600 ▪ Fax: (253) 565-7265

www.apawood.org

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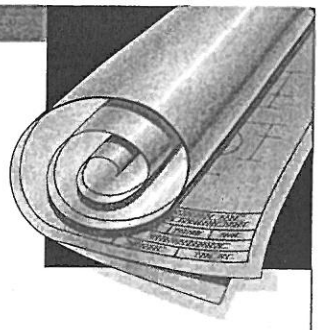

Buckling of Wood Structural Panel Sheathing

Number D481 • June 2005

Buckling of wood structural panel sheathing such as plywood or oriented strand board (OSB) occasionally results when increased moisture conditions cause the wood to expand. Such buckling may occur between supports or between nails along supports. Although structural properties are unaffected, the waviness affects the building's appearance and may lead to complaints. Builders can significantly reduce the potential for buckling by assuring minimal moisture-content increase in service and/or providing for its natural effects.

MECHANISM OF BUCKLING

All wood-based products absorb moisture from or give up moisture to the environment until they reach a moisture content in equilibrium with their surroundings. This results in swelling or shrinking of the wood. For solid wood, this expansion is 20 to 40 times as great across the grain as along the grain. Structural panels have good dimensional stability because the tendency of individual veneers or strands to swell or shrink crosswise is greatly restricted by the adjacent veneers or strands.

In typical sheathing applications, relative humidity might vary between 40% and 80%, with corresponding equilibrium moisture content of the panels ranging between 6% and 14%. Total dimensional change of an unrestrained 48" x 96" panel exposed to this range of conditions typically averages 1/8" in width or length. If the panel actually gets wet, dimensional change could be slightly greater. Dimensional change in installed panels is partially restrained by fasteners and framing.

The tendency of expansion to cause buckling in structural panels is related to mechanical properties, physical properties and natural characteristics of wood. It is also a function of not spacing panel ends and edges to allow for expansion. Mechanical properties such as panel stiffness relative to the length of span are important. For a given span, a thin panel has a greater tendency to buckle upon expansion than a thicker panel. Physical properties and characteristics of the panel include the natural growth variability of wood, moisture absorption rate of the wood, and panel variables such as species and orientation of veneers or strands. Some of these inherent panel properties are linked to the natural characteristics of wood and are generally either impossible or impractical to control. Therefore, the user should attempt to prevent high moisture conditions by providing adequate ventilation, and also to minimize the effects of moisture by using recommended panel joint spacing and adequate fastening.

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DESIGN AND CONSTRUCTION FEATURES THAT REDUCE BUCKLING

Moisture Control

The first step in the prevention of sheathing buckling is to provide adequate moisture control. Ventilation requirements for attics and roof structural spaces, as well as crawl spaces, are usually covered in the building codes. Typical is the One & Two Family Dwelling Code (OTFDC) which requires a *minimum* free area opening (after deducting for screening or louvers) of 1/150 the attic area for natural ventilation. The OTFDC also provides that the required vent area may be reduced by 50% when a ceiling vapor barrier is used, or when half of the required vent area is located in the upper half of the space to be ventilated. Note that these are *minimum* code requirements, which have been found to be adequate under most normal circumstances. However, ventilation in excess of these minimums may be necessary when unplanned moisture is introduced, as by venting an appliance, such as a clothes dryer, into the attic (not recommended), or when moisture-laden air is introduced to the attic by "whole-house" fans.

What may normally be adequate attic ventilation is sometimes inadvertently made ineffective or useless due to poor construction practices during new construction, remodeling or retrofit. It is not uncommon to find the ceiling insulation blocking off the soffit vents. Baffling should be provided at the eaves to prevent the insulation, particularly loose fill types, from drifting over the vent openings. Another poor practice is to vent kitchens or bathrooms directly into the attic, adding extra moisture-laden air that must be exhausted to the outside by ventilation. Instead, such venting should be ducted all the way through the roof, or walls, to the outside.

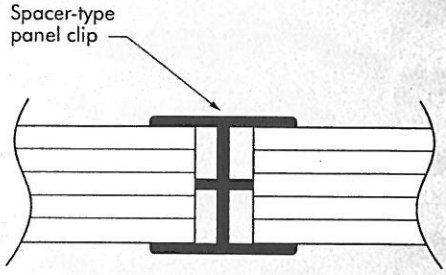
Some construction features, such as flat roofs, don't lend themselves to good circulation of air even where code-required vent openings are provided. In these cases an efficient ceiling vapor barrier is essential, installed so that any penetrations such as light fixtures are carefully sealed by caulk or tape to prevent moisture-laden air movement from the interior of the building.

PANEL INSTALLATION

Sheathing panels require aligned, level framing for a nailing surface. Any misalignment between adjacent trusses or rafters will cause the panel to bend, resulting in a wavy appearance. Many reported claims of panel buckling have, upon thorough field inspection, been traced to misaligned trusses or rafters. Misalignment of trusses or rafters can occur from faulty truss fabrication, poor workmanship during construction, or from warping, shrinking or swelling of lumber after construction. Regardless of the cause, misaligned trusses or rafters impact the long-term appearance of wood roofs.

It is important that end and edge joints be properly spaced during sheathing installation. No matter what steps are taken to protect or seal panel faces and edges, panels will expand or shrink slightly with changes in moisture content. If expansion is prevented by tightly butted joints, resulting compression of the panel could lead to buckling. Spacing of 1/8" is recommended at all panel edges and ends, or as required by the panel manufacturer.* Use of spacer-type panel clips, as shown in Figure 1, will assist in obtaining proper edge spacing. Some builders fashion a spacer tool to assure proper spacing.

FIGURE 1



Close attention should be paid to proper nail size and spacing and, of course, to assure that fasteners do not miss the supports. Fasteners should be 3/8 inch from panel ends and edges. For ordinary sheathing applications, nail spacings of 6" o.c. at all supported edges and 12" o.c. at intermediate supports have been found adequate to hold panels flat under most conditions. Other nail spacings may be required for engineered construction such as diaphragms.

To the extent possible, structural panel sheathing should be protected from direct moisture, both before and after installation. Cover sheathing with shingle underlayment (or No. 15 roofing felt) as soon as possible to minimize roof sheathing exposure to weather, unless otherwise recommended by sheathing manufacturer. Further equilibration with surrounding air is desirable prior to application of the roof covering (consult shingle manufacturer's recommendations).

Note: Panel spacing is an **APA RECOMMENDATION**, but not a code requirement,* to provide installers with a means of minimizing the potential for panel buckling which can lead to an unsightly appearance and customer complaints. Panel buckling may be an aesthetic or serviceability issue but is not a structural deficiency. There is no reason to expect this recommended space to be maintained when the panels become acclimated. Gaps that were initially present may have closed due to normal moisture-related expansion. If the flatness of sheathing or flooring panels is acceptable, APA would generally recommend that any finish flooring, siding or roofing be installed as planned regardless of whether gaps are present.

*Some manufacturers may require a space at the time of installation.

CORRECTION OF PANEL BUCKLING

If buckling has occurred, assure first that waviness is not actually caused by poor alignment or warping of framing members. Misaligned trusses or rafters make the sheathing appear wavy as if it has buckled. Check for proper alignment by using a taut line or straightedge. Also verify that the panels are properly fastened to the framing.

If panel buckling has indeed occurred, attempt to identify and correct the cause of increased moisture conditions. For example, if roof sheathing buckled prior to roofing, high moisture content due to extreme weather and/or inadequate spacing of panel joints may have been the cause and, once corrected, buckling would not be expected to happen again. However, if buckling occurs after roofing, and after the building is occupied, excessive moisture from within, or inadequate ventilation, should be suspected and the cause located and corrected.

No technique has yet been identified as 100% effective in correcting buckling once it has occurred. However, several techniques have met with some success:

1) Space heaters or fans may be used to dry sheathing quickly. Some recovery may be expected, perhaps enough to be acceptable.

2) Tightly butted edges or ends of structural panels may be saw-kerfed to relieve pressure and provide a gap for expansion.

3) Blocking may be added under unsupported panel edges or under buckled areas. Sheathing may then be flattened by nailing or screwing to the blocking.

4) A panel clip may be inserted at the joint between buckled panels to bring them into alignment. This may be done by cutting a small hole at the joint with a hole saw, as shown in Figure 2, inserting the clip and sliding it to the location desired.

Where roofing has already been applied, align panels by installing a cleat with screws from below, as in Figure 3.

5) Where buckling occurs between fasteners, more fasteners may be added to bring the panel down to supports. If buckling between fasteners is severe, a saw kerf might be cut from the panel edge inward for a short distance to relieve pressure, as shown in Figure 4.

FIGURE 2

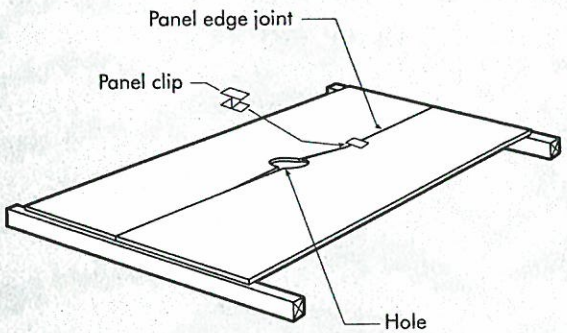


FIGURE 3

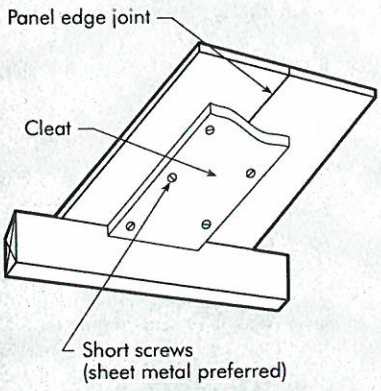
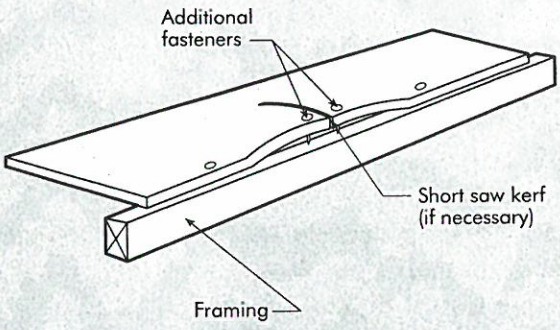


FIGURE 4



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Revised June 2005

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Since 1923
RoyOMartin

Warranty and Claims Policy for RoyOMartin Oriented Strand Board & Plywood

It is the policy and desire of RoyOMartin that all panels sold under TUFF-STRAND or SMARTCORE trademarks conform in all respects to the applicable ANSI and APA Rating Standards or otherwise agreed to in writing between buyer and seller in the form if product specification document. Whenever the end user or buyer suspects, notices or is aware of a potential grade defect or abnormal panel, the following procedures must be strictly followed:

1. Notify RoyOMartin as soon as possible (within five business days at the latest) by calling 1-800-299-5174 or 318-445-1973. Persons to contact are:

    - Jonathan Martin, CEO, RoyOMartin
    - Roy O Martin III, President, RoyOMartin
    - Terry Secrest, Vice President, OSB
    - Joe MacKay, Vice President, Plywood
    - Bobby Byrd, Sales Manager, OSB
    - Lori Byrd, Sales Manager, Plywood

    In addition to the verbal notification, RoyOMartin must receive from the buyer a written claim within five business days after first becoming aware of an alleged defect, stating the nature of the claim, approximate number of panels or footage involved, and the end use thereof. No claim will be honored on material that has been replaced, repaired or altered before RoyOMartin has been given the opportunity to inspect.

2. Grade or defect complaints may be made on panels only when they are in the form in which they were manufactured. Any changes in manufacturing or working relieves the sellers of responsibility for recognizing any grade complaint. Defective panels that are already installed on roofs, walls or floors will be replaced provided: A. The installation instructions were followed protection. B. RoyOMartin was properly notified according to item 1 above. C. Buyer has clearly established through legible grade marks or experience that the panels are indeed manufactured by RoyOMartin.

3. Request for inspection by RoyOMartin personnel will be honored whenever there is a reasonable doubt between both buyer and seller that the subject panels may be defective. RoyOMartin will make every effort to inspect alleged defective panels as soon as possible. Upon inspection, if the panels are found not to be defective or items 1 and 2 above are not followed, then the full cost of the inspection must be borne by the buyer, including time and expenses by RoyOMartin personnel.

4. In case of a complaint involving tally, the entire shipment must be held intact for re-tallying by a RoyOMartin representative. When the complaint relates to grade, size, working, or other defect and does not involve tally, the buyer is required to accept the portion which is of proper working, size, or grade, holding intact the portion in question.

5. Upon determination of defective panels, RoyOMartin will replace the F.O.B. jobsite through its local distributor. When less than an entire shipment is found to be of defective nature, then the buyer is obligated to keep the portion, which is not subject to a claim.

6. All claims will be honored promptly, without delay, to minimize interruption to buyer's operations or construction activities. Prompt notification of your local distributor will ensure that all claims are handled expeditiously.

7. Failure to completely comply with RoyOMartin's Claim Procedures:

   - A. Acts as Buyer's acceptance of any product which would otherwise be subject to a claim;
   - B. Forfeits the right of buyer to make a claim; and
   - C. Relieves RoyOMartin of the obligation to recognize and such claim.

8. Complete and timely compliance with RoyOMartin's Claim Procedure:
   - A. Acts as BUYER's rejection of any product subject to the claim;
   - B. Acts as an acceptance of any product not subject to the claim;
   - C. Creates an obligation on behalf of the BUYER to keep and maintain, as a product administrator, the product subject to claim.

Jonathan E. Martin, CEO
RoyOMartin

December 2, 2008

Mr. Robin Peterson
Shaw/Stewart Lumber
645 Johnson Street
Minneapolis, MN 55413

Re: Dricon® FRT Wood

Dear Robin,

I am sending this letter to your attention confirming that the Dricon® chemical does not ever leave the Dricon® lumber and plywood once it has been kiln dried at the treatment plant. The chemical is actually dissolved into hot water and then pressure injected into the wood.

Kiln drying then drives off the excess water leaving the dried chemical behind in the wood cells and fiber. The chemical is then trapped in the treated material, and has no means of leaving the wood, and will remain in it for the life cycle of the wood.

I hope this letter will clarify any issues you have related to our product and or its' composition. Please call if you have any questions.

Sincerely,

Bill Thomas
Technical Coordinator
Fire Retardants