FIRE RETARDANT TREATED WOOD (FRTW)

Wood, the Preferred Building Material

Wood has always been high among man's preferred building materials, for many reasons. It is highly workable in the shop or on site; it is both available and renewable; it is relatively inexpensive; and when manufactured into pre-engineered construction components, wood will carry an increased structural load without losing any of its desirable structural properties.

By treating with fire- retardant chemicals, wood will maintain its structural integrity at even higher temperatures than steel, without losing favorable construction properties. And Fire-Retardant Treated Wood (FRTW) maintains its fire retardant properties for the life of the structure.

Thus, pressure treating with a fire retardant chemical allows for expanded use of both dimensional lumber and plywood in the National Building Code, with no sacrifice in design flexibility or good carpentry practices. In fact, the reverse is true, since the use of FRTW allows the designer greater flexibility in dealing with some of the fire safety aspects of the code where wood is the preferred construction material, or where a potential fire hazard exists.

How FRTW Retards the Spread of Fire

No building is completely fireproof. However, the inherent integrity of FRTW in fire situations is a major point in its favor, compared to other, non-combustible construction materials. Intense heat can cause steel beams, girders and trusses to buckle and collapse. Steel begins to lose strength rapidly: at 550°C it has lost one-half of its breaking strength; at 750°C it has lost 90%. Most aluminum alloys are even more vulnerable to heat, losing half their original strength at 300°C and melting at 600°C.

Now consider the performance of interior FRTW in the event of fire. The fire retardant chemicals, impregnated into the wood under pressure, begin to react when the temperature approaches 272°C, the point where wood will ignite. These chemicals convert the wood tars to a carbon char, which in turn acts as a thermal barrier to retard the rate at which the cross-section is reduced by fire. Non-flammable gases and water vapor are formed and released at a slow, steady rate, to extinguish flammable gas normally produced when wood burns.

FRTW maintains its structural integrity much longer than even non-combustible materials in a fire situation. When the flame source is removed, the treated wood ceases to char, and since it will not support combustion, the flame will not spread. A further benefit: FRTW does not add to the production of smoke and toxic fumes, the major threats to human life in fire situations.

Wood Preservation Canada
Préservation du bois Canada

Produced under Stringent Controls

Fire retardant treated wood is manufactured in Canada by a group of experienced, reputable, financially stable companies who are, in turn, members of Wood Preservation Canada. Their financial integrity ensures they will fully support the products they offer, and allows them to undertake the rigorous testing required to pass Canada's building codes and standards.

The National Building Code of Canada (primarily Part 3) requires that all FRTW must be produced through a pressure impregnation method by a licensed treater, in accordance with specific CSA standards. For lumber, the standard is CSA O80.20, and for plywood O80.27. These two standards specify the condition of the material before and after treatment, and specify the UL standard, which determines the product's performance criteria. In fact these two standards should be written into a specification, to clarify the type of product to be installed, and to protect the architect against liability should the contractor mistakenly substitute another product such as one surface-treated with fire-retardant paint.

One final condition applies. To ensure its structural stability, all FRTW must be kiln- dried after treatment: lumber to 19% moisture content and plywood to 15% moisture content.

FRTW Passes Flamespread Test

All FRTW used in Canada must have earned the flamespread rating determined under the test know as "CAN4-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies". This performance test can be carried out only by an accredited third-party testing agency. At the same time, a smoke development rating is also assigned to FRTW. After testing, each species of wood is assigned flamespread and smoke development ratings. Ratings are then imprinted on the Underwriter's Laboratory of Canada label applied to every 100 board feet of FRTW lumber and every 32 square feet of plywood. Some manufacturers go the extent of coloring the wood to permit clear identification on the job site.

Typical Applications of FRTW

The design professional or contractor enjoys wide flexibility in the use of FRTW. Traditionally, interior applications include architectural millwork, paneling, roof assemblies/trusses, beams, interior load bearing and non-load bearing partitions.

Exterior-type fire retardants use different chemical formulations from those used for interior applications; generally, they are applied to shingles and shakes. Under the NBCC, a FRTW roof can be constructed of (a) solely FRTW, or (b) any combination of different structural supports such as non-combustible framework or a heavy timber support. Types of application include group assembly, mercantile, small business and light industrial buildings.

By using solely FRTW or any combination, the designer waives the mandatory 45-minute fire resistance rating required for a roof system in a building of combustible construction. Thus the designer is afforded a high degree of flexibility in both design and material specifications.

FRTW is currently finding strong acceptance in certain residential roof applications, such as government-funded senior citizens apartments, where the long-life economies of a pitched roof design are desired. Wall sheathing is an area where FRT plywood is finding favor, in installations, where standard drywall is subject to damage through day-to-day activities (e.g. warehousing facilities). Raised flooring in mercantile buildings such as restaurants and stage flooring in performing arts centers are other examples where FRTW can be used according to the code.

Major Design Benefits of FRTW

Architects and designers are finding that significant benefits can be derived by specifying FRTW, particularly in roof construction.

Versatility — A pleasing dome roof design was achieved in a recently built theatre attraction by screwing FRTW 2 x 4 members to a welded metal frame, then applying a plywood FRTW roof membrane, scored with relief cuts to allow it to bend to the required shape.

Economy — By using FRTW lumber and plywood in a new mall roof system, the designer was able to solve major cost problems in the design. If untreated materials had been used, the additional cost of a sprinkler system, and a heating system to protect the lines from freezing, would have made the design uneconomical. In addition, the FRTW system allowed the designers to waive the 45-minute fire resistance rating required in a one-storey building of this nature.

Flexibility— Installing sprinklers would have been extremely difficult in a recent school addition. However, by using FRTW in the new roof system, the designers were able to maintain the aesthetically desirable sloped.

Roofline and eliminate the need for sprinklers in the 7,000 square foot addition.

Avoiding “Heat Degradation” Problems

In the past, certain chemicals used in some formulas for fire retardant treatment in the United States led to a problem known as "heat degradation". This caused significant strength loss and increasing brittleness in plywood panels that were exposed to high heat and humidity in an improperly ventilated attic space. The acidic hydrolysis that resulted in these conditions disintegrated the wood fibers, which seriously reduced the panel's structural stability, and they took on a charred or decayed appearance.

FRTW Offers Job-Site Convenience

Fire-retardant treated wood can be crosscut to length (not ripped) and drilled for holes following treatment without reducing its effectiveness. End cuts in the field, whether exposed or butted tight, do not require treatment, since any untreated areas are relatively small compared to the overall surface and the flame spread rating remains unaffected. Plywood can be both crosscut and ripped without concern, since the chemical treatment has penetrated throughout the layers.

FRTW is not significantly corrosive to metal fasteners and other hardware in interior applications, even where relative humidity reaches as high as 95%. In fact, testing has demonstrated that FRTW is no more corrosive than untreated wood.