TECHLINE
Properties and Use of Wood, Composites, and Fiber Products

Durability of Fire-Retardant-Treated Wood

Chemicals used in fire-retardant treatments are thermally stable for short periods at temperatures up to 330°F (150°C). However, recent Forest Products Laboratory research showed that for extended exposure, the limit of thermal stability for fire-retardant-treated material may be closer to 130 to 150°F (54 to 66°C). These findings will be reflected in future editions of references such as the Wood Handbook.

While fire-retardant-treated lumber and plywood have been used successfully for nearly 50 years in structures exposed to temperatures less than 100°F (38°C), failures have occurred in buildings that used fire-retardant-treated plywood as roof sheathing. Analysis of these failures showed that elevated temperatures induced by solar radiation caused some commercial fire-retardant-treated materials to undergo thermal decomposition.

The important factors involved in fire-retardant-related thermal degrade are the potential of the fire-retardant chemicals to dissociate to their acidic forms and the cumulative temperature–moisture history of the plywood. This underscores the importance of proper redrying. It also shows the potential negative consequences of excessive kiln temperatures during redrying, lack of required kiln drying, or rewetting in transport, in construction, or through design.

Recent American Society for Testing and Materials (ASTM) consensus standards quantify and qualify performance of plywood and lumber treated with proprietary commercial fire-retardant treatments to untreated material that has been historically and successfully used as roof sheathing and roof truss lumber.

Design Guidelines

Designers intending to use fire-retardant-treated materials in areas of elevated temperatures, such as roof decks, should ask suppliers the following questions:

1. Does the fire-retardant formulator/treater warranty the fire-retardant-treated material for the intended use?
2. What are the initial effects of fire-retardant formulations on wood strength, stiffness, and fastener corrosion?
3. Has the material been tested at elevated temperatures?
4. Has an approved third-party inspection agency certified compliance with all existing standards? AWPA implemented new formulation and treatment standards in 1996.
5. Was the material dried after treatment to required moisture content levels? (Drying to these moisture content levels is required for proper structural performance.)
6. Will precautions be used during shipping and at the job site to prevent moisture from rewetting the material? Will provisions be made to allow proper drying if the material is exposed to moisture?

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References

American Society for Testing and Materials. 1997. ASTM Standard D5516, Standard Test Method for evaluating the mechanical properties of fire retardant treated softwood plywood exposed to elevated temperatures. Annual Book of Standards, Vol. 4.10. West Conshohocken, PA.

American Society for Testing and Materials. 1997. ASTM Standard D5664, Standard Test Method for evaluating the effects of fire-retardant treatments and elevated temperature on strength properties of fire-retardant treated lumber. Annual Book of Standards, Vol. 4.10.West Conshohocken, PA.

American Wood Preservers' Association. 1997. AWPA Standard C20-96, Structural lumber: Fire-retardant treatment by pressure processes. Annual Book of Standards. Woodstock, MD.

American Wood Preservers' Association. 1997. AWPA Standard C27-96, Plywood: Fire-retardant treatment by pressure processes. Annual Book of Standards. Woodstock, MD.

Forest Products Laboratory. 1987. Wood handbook: Wood as an engineering material. Agric. Handb. 72. (Rev.) Washington, DC: U.S. Department of Agriculture. 466 p.

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VI-5
Issued 01/98