Performance of FRT plywood

by **Tom Bollnow**

Q: *Have there been any significant efforts made to eliminate premature degradation of fire-retardant-treated (FRT) plywood used as roof decks?*

A: During the late 1980s, there was an outbreak of structural roof deck failures directly related to degradation of FRT plywood used as roof sheathing. Because the potential for FRT plywood degradation still exists, roofing professionals should be knowledgeable about FRT plywood properties so the likelihood of degradation occurring can be reduced.

FRT plywood is produced by pressure treating plywood with fire-retardant chemicals. During the mid-1980s, the search for lower hygroscopic (i.e., less moisture-absorbing) chemical compounds to treat plywood resulted in a change from ammonium sulfates that cause fastener corrosion to ammonium phosphate salts. Ammonium phosphate salts with additional treatments using buffers, such as Borax, and organic and less acidic chemicals were developed to decrease fastener corrosion and raise the threshold temperatures of fire-retardant materials.

FRT plywood's structural strength changes from 10 percent to 20 percent after an initial pressure-treatment procedure. The drying process follows the pressure-treatment procedure and is critical to achieving maximum product performance. Problems result if the kiln drying process is accelerated. Air drying causes fewer problems, but it is more time-consuming. Products should be marked "KDAT" if kiln dried after treatment or "ADAT" if air dried after treatment.

FRT plywood treatments are divided into three categories: exterior, interior Type A and interior Type B. A roof deck typically will be interior Type A because it is not exposed directly to outside elements. Type B treatments can cause excessive moisture to accumulate in wood, allowing chemicals to react with steel fasteners and connectors.

Building code authorities, such as the Building Officials and Code Administrators (BOCA) International Inc., have specific requirements for treatment processes and labeling. For example, plywood must be manufactured according to American Wood Preservers Association (AWPA) standards, and the treatment process must be evaluated by BOCA Evaluation Services, National Evaluation Services or an AWPA-approved, independent agency.

When a flame is removed from FRT plywood's surface, the plywood will char but not burst into flames.

In addition, each plywood piece must be labeled properly with its performance rating and design-strength adjustment values. FRT plywood must be used according to manufacturers' recommendations. It must be kept dry and used strictly within the parameters of design-load values.

Open flames' elevated temperatures activate fire-retardant chemicals that produce low-level acids (i.e., acid hydrolysis) in FRT plywood. The acids lower the temperature at which thermal degradation occurs, increase the amount of surface char and reduce the production of flammable volatiles (i.e., by-product gases that contribute to flame spread). The results are a reduction of the flame spread across a surface and capacity to support combustion. When a flame is removed from FRT plywood's surface, the plywood will char but not burst into flames.

Chemicals that produce low-level acids causing fire-retardant effects also cause premature FRT plywood degradation at lower temperatures. Untreated plywood experiences no major problems at temperatures up to 200 F (93 C). Roofing professionals should note that achieving fire retardancy at the expense of structural integrity is not desirable.

Acid hydrolysis and degradation can occur at lower elevated temperatures of about 130 F (54 C) to 180 F (82 C). Temperatures at the interface surface between a roof covering and deck can reach 200 F (93 C), with 150 F (66 C) commonly found. As a result, degradation can occur at temperatures that are below open-flame temperatures.

Roofing professionals should note that there are construction alternatives available that can eliminate the use of FRT plywood. But local codes (e.g., fire, building) first must be referenced to be sure the alternative construction is in compliance. These options include fully sprinkled interior systems; noncombustible decks; ⅝-inch- (16-mm-) thick water- and fire-resistant gypsum board beneath untreated plywood; and fire walls that extend through a roof system on a multitenant building (e.g., an apartment complex).

If FRT plywood is installed new or encountered during a re-cover situation, the use of light-colored shingles, a radiant-reflecting roof covering (e.g., white single-ply) or improved ventilation may diminish potential degradation. These materials may lower temperatures at a roof deck's surface. Roofing professionals should use caution and precise documentation when confronted with FRT plywood roof decks to avoid repercussions if failures occur. PR

Each month in this column, one of NRCA's technical services staff members will answer readers' technical questions. If you have a specific question you would like answered in this column, send it to Professional Roofing *magazine, 10255 W. Higgins Road, Suite 600, Rosemont, IL 60018-5607.*