Forest Products Laboratory

TechLine

Properties and Use of Wood, Composites, and Fiber Products

Thermal Degradation of Fire-Retardant-Treated Plywood

Between 1985 and 1995, approximately 750,000 multi-family housing units experienced roofing problems due to fire-retardant-treated (FRT) plywood sheathing failure (Figs. 1–3). The problem is caused by excessive exposure to solar radiation.

Research at the USDA Forest Service, Forest Products Laboratory (FPL), from 1988 to 1999 resulted in more than 20 technical papers and three national standards. The standards, developed by the American Society for Testing and Materials (ASTM) and American National Standards Institute (ANSI), form the scientific/technical basis for new performance-based qualification requirements for commercial FRT plywood roof sheathing.

- ASTM/ANSI D5516—Standard test method for thermal degrade of FRT plywood
- ASTM/ANSI D5664—Standard test method for thermal degrade of FRT lumber
- ASTM/ANSI D6305—Standard practice for developing engineering design adjustments for allowable properties of FRT plywood

Another result of FPL research was the development of models for strength loss over time (Fig. 4). Later, field service-life issues were evaluated, and predictive models (Fig. 5) were developed for the first time to predict residual service life of FRT constructions. Research on the further development of residual serviceability models is continuing.

Figure 1.Outside view of failed FRT plywood roof sheathing.

Figure 2. Inside view of failed FRT plywood roof sheathing.

Figure 3. Failed FRT plywood roof sheathing after removal.

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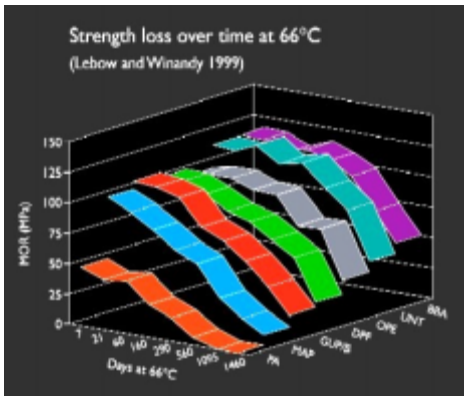

Figure 4. Isothermal degradation models for untreated and FRT wood after up to 4 years at 66°C. (PA, phosphoric acid; MAP, monoammonium phosphate; BBA, borax-boric acid; GUP/B, guanylurea phosphate/boric acid; DPF, dicyandiamide-formaldehyde-phosphoric acid;OPE, diethyl-N,N-bis(2-hydroxyethyl) aminomethyl phosphonate; UNT, untreated)

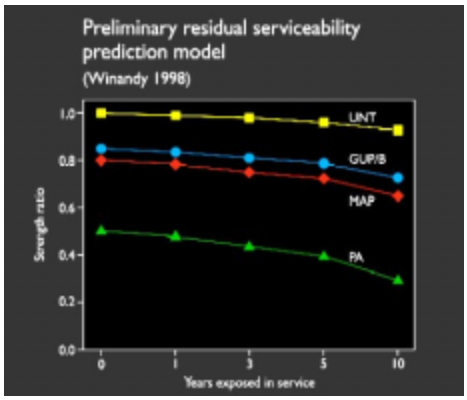

Figure 5. Residual service-life model for untreated and FRT wood used as roof sheathing after 10 years. (PA, phosphoric acid; MAP, monoammonium phosphate; GUP/B, guanylurea phosphate/boric acid; UNT, untreated)

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