

Fire in Buildings and Building Life Safety with Fire-Retardant-Treated Wood

While efforts to reduce injuries and losses from fires continue to provide long-term improvements, fires continue to be numerous and costly hazard in the United States. In 2021, the National Fire Protection Association (NFPA) reported that local fire departments responded to 1,353,500 fires. This means a fire department in the United States responds to a fire somewhere in the nation every 23 seconds. These fires caused 3,800 civilian deaths and 14,700 civilian injuries.

NFPA estimates the damage caused by fires in 2021 to be almost \$15.9 billion. A fire occurs in a structure at the rate of one every 65 seconds, and a home fire occurs every 93 seconds. Seventy-five percent of all fire deaths were caused by home fires. This includes the 64 percent that resulted from fires in one- or two-family homes and the 11 percent caused by fires in apartments or other multi-family housing.

The development of building codes, both residential and commercial, is one of the ways in which communities have reduced damage and injury from fires. Current building codes rely on testing of building materials, structures, and finishes to ensure that construction materials and building systems either contain fires or contribute only minimally to the fuel for fires.

Fire Hazards

The hazards caused by fires are numerous. The most significant cause of death in building fires is smoke, which account for approximately 70% of fire-related deaths. However, fires also can cause structural collapse of buildings, and burns cause the remainder of fire deaths.

Fire is spread by many items that can be found in residential and commercial buildings. Examples include furniture, window and wall coverings, and wood structural members to name a few. Building and fire codes require that wall assemblies within these buildings resist the passage of flame and smoke for extended periods of time.

Special consideration is given to fire-retardant-treated wood (FRTW) structural members which are used in lieu of noncombustible materials for many code compliant wall assemblies.

Code-Required Fire Tests

Building codes in the United States depend mainly on three types of fire tests. These tests are as follows:

Flame Spread and Smoke Development: ASTM E84 (UL723) is the standard test method used for assessing the surface burning characteristics of building materials. During this 10-minute test, both a Flame Spread Index (FSI) and Smoke Developed Index (SDI) are determined. FSI is the measurement for the speed at which flames progress across the surface of the material, while SDI measures the amount of smoke a material emits as it burns. For the most fire-safe class of interior finish materials, the material must have a FSI of 25 or less and a SDI of 450 or less.

Fire Endurance of Wall Assemblies: ASTM E119 (UL 263) is the standard test method used to evaluate the length of time that various types of assemblies will contain a fire or retain their structural integrity, or both, depending on the type of assembly involved. It exposes an assembly to heat and flame on one side and tests for heat transmission, burn-through, and structural integrity. If flame and smoke are prevented from passing through the assembly during the test, then the assembly and materials used “pass” with an assigned hourly rating.

Fire Propagation of Exterior Wall Assemblies: NFPA 285 is the standard test method used to evaluate flame propagation of exterior wall assemblies. It determines if an assembly can inhibit flame-spread from the point of origin during a combined interior and exterior fire exposure. It is a pass/fail test and determines how an exterior wall assembly will perform if a fire occurs in a multistory application.

What do the Ratings Mean?

For each test, a rating provides some significance to an architect or code official. The flame spread and smoke development test allows architects to select building materials that have a lower fire hazard. The fire endurance tests demonstrated that wall assemblies will contain fires allowing evacuations to take place safely and prevents a fire that starts in one part of a building from damaging goods or causing injury elsewhere in the building. Finally, the fire propagation test demonstrates that a wall assembly can be safely used on exterior walls of buildings taller than 40 feet above grade.

Because NFPA 285 is different from ASTM E119, it is necessary for an exterior wall taller than 40 feet above grade to not only have a fire resistance rating, but also comply with NFPA 285. There are many wall assemblies that have a fire-resistance rating per ASTM E119 but do not pass NFPA 285. Similarly, there are walls that comply with NFPA 285 but may not have been tested to ASTM E119.

FRTW wall assemblies that have passed these tests are inherently fire-safe and meet the requirements of the fire and life safety codes. FRTW with a FSI of 25 or less can be used in these wall systems in lieu of noncombustible materials when the FRTW has been tested for an extended 30-minute period and the flame front does not progress more than 10 1/2 feet (3200 mm) beyond the centerline of the burners at any time during the test.

Testing Laboratories and Third-Party Listing Services

A concern of architects is liability and responsible building material selection. When it comes to fire safety, architects and professional engineers often turn to third-party testing and listing services to limit their liability in making appropriate product choices. By using products and systems that have been tested in an independent laboratory, the designer is assured that the building systems used are deemed safe by an organization that is recognized by building code officials.

One of these organizations is Underwriters’ Laboratories (UL). UL tests the fire performance of materials and provides a compliance Mark demonstrating that the material and assembly meet the stringent code performance criteria for fire safety. UL also publishes a list of building

materials and the performance of those materials and systems that have been tested in accordance with their standards.

PyroGuard™: The Fire Safe Solution

Hoover's PyroGuard™ fire-retardant-treated wood has been thoroughly tested for flame spread, smoke development, and fire performance in exterior wall systems. These tests were conducted by UL at their laboratories. The results of these third-party investigations show that Hoover's PyroGuard fire-retardant-treated wood labeled with the UL Classified Mark complies with the codes. In fact, PyroGuard™ is the only code-compliant solution for FRTW exterior wall assemblies exceeding 40 feet above grade. Refer to <https://iq.ulprospector.com> for complete details on the following listings:

UL Design No. V314 – ASTM E119 tested 2-hour bearing wall assembly
UL EWS0045 – NFPA 285 tested exterior wall system

For more information on PyroGuard, please see our web site at <http://www.frtw.com>. Or, if you prefer an in-depth technical discussion of building life safety with fire-retardant-treated, please contact our technical support team at 1-800-TEC-WOOD.