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Fire Safety

Introduction

Our industry hasn't always done a good job of explaining the fire resistance properties of cellulose insulation. This has resulted in a general misunderstanding of the product or lack of fully understanding its fire resistance benefits. Hundreds of thousands of dollars have been spent on studies testing and proving the fire resistance of cellulose insulation in structures. To those familiar with the product the results won't be surprising but to those not familiar, they will be surprising.

Depending upon the manufacturer, cellulose insulation is approximately 85% processed wastepaper and the balance is fire retardant chemicals. The Federal Government's Consumer Product Safety Commission (CPSC) established the fire resistance properties required for cellulose insulation. In addition, the building codes have put in place required fire resistance properties depending upon the application. Cellulose insulation is one of very few products with fire retardant chemicals as opposed to lumber, sheathing, kraft-faced fiberglass batts, asphalt based roofing materials, carpet, etc. that typically don't contain any fire treatments.

Because processed wastepaper is a material component, the initial assumption is "we must be having more fire related problems with a paper based cellulose insulation material". This is not true. The state of California conducted a study of 2 million fires and concluded concerning fire and insulation materials:

1) There does not appear to be a significant number of attic fires related to any particular manufacturer's product

2) Heat-producing devices and electrical short circuits were major factors in insulated-related fires.

A study by Oklahoma City Fire Department found that insulation-related fires paralleled market share of respective materials and that the common denominator was recessed lighting fixtures, not insulation materials.

Government Sponsored Research

Extensive fire research associated with various building materials and construction has been conducted by the research arm of the Canadian government (National Research Council, NRC). This testing has been done in conjunction with many major corporate sponsors such as Owens-Corning, Cellulose Insulation Manufacturers Association, Boise Cascade, Gypsum Association, Louisiana-Pacific, Roxul Inc., and others.

A July 1994 report of 48 small-scale fire resistance tests by NRC found that fiberglass had a "neutral effect on the fire resistance performance compared to a non-insulated assembly" when using Type X gypsum board. When lightweight gypsum board is used, it was found the fire resistance performance "was slightly lower than that of a non-insulated assembly". It also found that "the installation of cellulose fibre in the wall cavity provided an increase in the fire resistance performance of 22% to 55% compared to a non-insulated assembly".

Additionally an April 1998 NRC report of various 32 full-scale floor assemblies concluded very interesting results when varying the insulation material. Assemblies with solid wood joists with a single layer of gypsum board ceiling determined that "glass fibre insulation reduced the fire resistance by 20% while rock and cellulose fibre insulation increased the fire resistance by 33% and 31%, respectively, compared to a non-insulated assembly" For wood I-joists, "cellulose fiber increased the fire resistance by 24% compared to a non-insulated assembly". The following were detailed observations contained in the report.

1) "The glass fibre melted 2 to 3 min after the gypsum board fell off and was unable to compensate for the earlier failure of the gypsum board."

2) "However the rock and cellulose fibre insulations remained in place after the gypsum board fell off and were able to compensate for the earlier failure of the gypsum board and protected the wood joists and subfloor for a substantial period."

No cellulose insulation tests were done on steel joists however "the installation of glass fibre in the floor cavity reduced the fire resistance by 8% compared to a non-insulated assembly". Based upon the results from the above wood joist configurations, a logical assumption would be that cellulose insulation would increase the fire resistance of steel joists construction.

Furthermore, a 2001 study by NRC of 14 full-scale steel stud walls found wall failure at 56 minutes for fiberglass, 59 minutes for rock fiber insulation, and 71 minutes for cellulose insulation.

Building Codes

Based upon studies, the International Building Code (IBC) acknowledged the fire resistance benefits of cellulose insulation. The 2003 IBC allows cellulose insulation to contribute an additive 15 minutes to the fire resistance of an uninsulated 2 x4 wood stud wall while no additional minutes are allowed for standard fiberglass batts and foam insulation. These provisions are contained in "Section 703: Fire Resistance Rating and Fire Tests".

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The 2003 IBC further establishes fire resistance criteria for a product to be considered as a fire stop in Section 712 and a fire block in Section 717. In both applications, cellulose insulation testing meets the necessary criteria while typical fiberglass and foam cannot be considered as either. This is the result of "ASTM E119 Fire Tests of Building Materials and Construction" tests in 1999 and 2002 that exposed cellulose insulation to temperatures exceeding 1600 F to ensure the fire endurance ratings of the walls were meet or exceeded when insulated with cellulose insulation.

Tests conducted by Omega Point Laboratories in 1999 showed that cellulose insulation can be used safely with electrical boxes as close as 3-1/2 inches to each other on opposite sides in 2x4 fire-rated walls. The IBC accepts this with cellulose insulation while requiring 24-inches of separation in fiberglass insulated walls.

The building codes establish a maximum flame spread of 25 and smoke generation index of 450 for wall applications as tested under ASTM E84. Cellulose insulation will meet this criteria in its installed form while paper faced fiberglass batts are permitted to have the paper facing containing the asphalt-based adhesive removed to meet the same fire performance criteria.

Paper-faced batts are not treated for fire resistance and are not covered by the same stringent flammability standards that apply to cellulose insulation. For this reason paper-faced batts, which are among the most commonly used forms of insulation in the U.S., are no longer sold in Canada.

Consumer Product Safety Commission

The CPSC initially established the fire safety criteria of cellulose insulation. What wasn't understood at the time was the criteria resulted in an insulation material with superior fire resistance properties compared to fiberglass and foam insulation. These fire resistance properties are contained in 16 CFR Part 1209 (1) of the Federal Registry and must be complied with.

Full-Scale Fire Demonstrations

In 1978 the so-called "Big Burn" demonstration set fire to three structures; one insulated with fiberglass, one with cellulose insulation, and one with no insulation. The ceiling of the fiberglass insulated structure collapsed after 21 minutes while the ceiling of the cellulose insulated structure collapsed after 70 minutes. In June 1998 GreenStone Industries at the Maryland Fire Training Academy observed similar results in a demonstration burn.

Summary

According to Building Construction for Fire Suppression Forces, a publication of the National Fire Services Training Academy: "It is critical to recall that noncombustible does not mean 'safe'. And it certainly does not mean 'fireproof'. The concept of fire-resistance goes beyond that of noncombustibility. It refers to the capacity of a material or construction to withstand fire or give protection from it, characterized by its ability to confine a fire."

The fire retardants used in cellulose insulation result in the mass charring and remaining in place longer than fiberglass or foam. This delays the time period in which flames will reach the structural members or move through wall or floor cavities. This provides increased protection and an increased opportunity to escape the structure.

Looking at the role you should want building materials and construction to play in giving your family members a better opportunity to reach safety in the event of a fire, the above references create a very convincing argument for using cellulose insulation.

* If you would like copies of the referenced studies, please contact us.
* Should you like for us to meet with any local building or fire officials, we'd be pleased to do so.