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Cellulose Insulation and Fire

New data on fire safety of aged cellulose insulation

Consumer Update: Insulation Effectiveness Bulletin

Cellulose insulation installed on the floors of residential attics in three cities showed no sign of losing its fire retardant properties eight years after installation, according to a report published in the Proceedings of the Tenth International Conference on Thermal Insulation.¹

The field study by researchers Donald J. Ferm and Kelvin K. Shen, of U.S. Borax, Inc., evaluated the permanence of boric acid and borax pentahydrate in cellulose insulation. Data collected over an eight year period showed no statistically verifiable loss of either chemical from insulation as actually installed in attics.

In addition to confirming the long-term performance of cellulose insulation in actual installations, the study also raised questions about the significance of previous chemical permanence research based on small samples. While there was no apparent loss of chemicals or changes in flammability test performance for attic floor samples, Ferm and Shen reported unexplained reduction of boric acid on the surface of some specimens aged in small boxes measuring 8x12x16 inches. Other researchers, notably the California Bureau of Home Furnishings, have reported similar changes in small specimens that don't closely replicate actual installations.²

The study began in 1983 when U.S. Borax, a large supplier of borates used as fire retardants in cellulose insulation, installed specially-formulated insulation in the attics of homes in Los Angeles, CA; Montvale, NJ; and Atlanta, GA. At the same time, laboratory samples were prepared in boxes and placed in the attics with the floor samples, and in attics in Memphis, TN; Cincinnati, OH; Dallas, TX; and Vancouver, BC. The researchers analyzed samples from the top, middle, and bottom layers of all specimens at intervals of one, two, three, five, and eight years. As the study progressed differences between the box specimens and the attic floor samples, which replicate the way cellulose insulation is actually installed, were noted. According to Ferm and Shen, after eight years: "Chemical analysis of these floor specimens indicates that there was no statistically verifiable loss of either boric acid or borax

pentahydrate." They also reported that none of the samples from any layer of the floor installations failed the critical radiant flux test.

The researchers were unable to account for the disparity. "The apparent performance differences between the floor and box specimens are not well understood," they wrote.

Duvon McGuire, technical chairman of the Cellulose Insulation Manufacturers Association, said that while the mechanism behind the different aging characteristics of small and actual installations has not been identified, the fact that there is a difference is important information for the design of any future chemical permanence studies that may be undertaken.

"One of the things that has puzzled many people is why some research has indicated chemical and flammability performance changes that didn't necessarily correlate with what we see in real attics," he said.

"The California Bureau of Home Furnishings study, which uses small samples, is a good example. In fact, after an extensive literature search the Forest Products Laboratory at the University of California at Berkeley concluded that the CBHF reports were 'the only credible research indicating possible chemical changes in cellulose insulation'³ Now we may have at least a partial answer. Apparently there are significant differences between the way cellulose insulation behaves in little boxes and in the real world of buildings for reasons we are only beginning to understand."

The sources of some previous studies have acknowledged the limited significance of tests that don't closely replicate actual installations. The author of one often-cited paper was quoted as saying that the results "don't necessarily relate to the real world of buildings."

In a recent letter to CIMA, officials of the California Bureau of Home Furnishings, whose small scale study of aged insulation has been widely referenced, also reported a lack of correlation between small aged cellulose insulation samples and real world experience.

According to Ray L. Hillier, CBHF Insulation Program manager, "Results of this study effort [by the Bureau] are inconclusive and variable, and certainly cannot be used to condemn this material, especially since the annual incidence of fires originating in cellulose have steadily declined, even though the numbers of installations have increased."

McGuire noted that even after eight years the critical radiant flux test results reported by Ferm and Shen were far above the pass/fail point specified by government and industry standards.

"When you look at the radiant panel results for the eight-year-old samples you find values consistently above 0.20 watts per square centimeter," he said. "That's about 100 percent above the 0.12 watts per square centimeter required by the federal and industry standards, and they have a 50% safety factor built in."

The Ferm and Shen paper includes a statistical analysis of the data by Dr. David W. Yarbrough, Chairman of the Department of Chemical Engineering at Tennessee Technological University.

Information on cellulose insulation and copies of relevant studies of cellulose insulation fire retardants are available from the Cellulose Insulation Manufacturers Association or Applegate Insulation Manufacturing.

References

- ¹ Ferm, Donald J., and Shen, Kelvin K., "Study on the Permanence of Borates in Cellulose Insulation," Proceedings of the Tenth International Conference on Thermal Insulation (1994).
- ² Fischer, S.J, Hillier, R.L., Damant, G.H., "Long Term Aging Studies on Loose-Fill Cellulose Insulation, Parts I-V," California Bureau of Home Furnishings
- ³ Beall, Frank C., Forest Products Laboratory, University of California at Berkeley, letter report to CIMA (May 16, 1994)

The truth about "disappearing fire retardants"

The Claims

"But recent tests show these chemicals [in cellulose insulation] may lose their effectiveness in as little as a few years."

CertainTeed Corp.
A fiberglass producer

"Tests by the California Bureau of Home Furnishings have shown that the concentrations of fire-retardant chemicals in shredded newspaper insulations [SIC] decline over time."

Owens-Corning
A fiberglass producer

The Truth

"Results of this study effort are inconclusive and variable and certainly cannot be used to condemn this material... Based on the data we received from the State Fire Marshall's office and our own observations of fire safety performance, we do not perceive cellulose as a hazard if properly manufactured and installed."

Ray L. Hillier
*State of California Bureau
of Home Furnishings*

Who do you believe? The fiberglass companies, or the researchers?

I will both lay me down in peace, and sleep: for thou, LORD, only makest me dwell in safety.
(Pslam 4:8)