INSULATION FACTS #50

NAIMA
North American Insulation Manufacturers Association

INSULATE TODAY SAVE TOMORROW

www.naima.org

Glass Fiber Air Transmission Systems:

The Facts About Airborne Fibers

Information from the NAIMA Air Handling Committee

In this issue we discuss the results of a number of studies conducted over a period of twenty-five years that show that glass fiber erosion from the airstream surface of fiber glass duct insulations is insignificant.

Introduction

Despite the fact that fiber glass duct liner and fiber glass duct board are manufactured and tested to handle air velocities well above normal operating conditions, there are many who believe that glass fibers can erode from the airstream surface and can be an irritant to people in the occupied space. Studies conducted over a period of 25 years, however, show that fiber glass duct liner and fiber glass duct board exhibit insignificant signs of fiber erosion on surfaces in typical HVAC ducts. The results of these studies are presented below.

UL 181 Tests

In late 1966, Underwriter's Laboratories (UL) conducted tests on new duct configurations to determine the quantities and nature of particulates, which could erode from a variety of fibrous glass materials. The UL standard for air ducts (UL 181)[1] states that "material of an air duct shall not break away, flake off, or show evidence of delamination when air is passed through typical sections at 2.5 times the rated velocity."

The UL tests confirmed that, during the test period, fiber glass duct systems and ducts lined with fiber glass duct liner showed no evidence of fiber erosion. The findings of the UL tests remain valid today.

Cholak and Schafer Study

To complement the UL lab tests, a field study of installed fiber glass systems was undertaken in 1971. The study examined fiber glass duct systems at six different sites which had been in service for a period of time. As was the case with the UL tests, air samples collected at the outlets of the installed duct systems showed no evidence of fiber erosion. The study, therefore, concluded that "the contribution of fibrous glass lined air transmission systems to the fiber content of indoor air is insignificant..."[2]

World Health Organization Report

In 1988, the World Health Organization issued a report on synthetic vitreous fibers (SVFs) containing the collective views of an international group of experts. Based on an analysis of these views, the report stated that "fibers were not a cause of adverse health effects in building occupants." The experts agreed that the level of fibers from SVF products in the indoor air is essentially equivalent to concentrations of airborne fibers measured in outdoor environments.[3]

While there have been few studies of airborne glass fibers in the ambient (outdoor) air for comparison, Balzer reported values for various areas in California at .0026 f/cc.[4]

International Conference on Indoor Air Quality and Climate

A 1993 Conference on Indoor Air Quality and Climate report concluded that airborne fiber levels in buildings with these products range from non-detectable to well below 0.01 f/cc.[5]

University of Nevada, Las Vegas Study

A 1996 study by the University of Nevada, Las Vegas[6] addressed questions raised about the potential exposure to building occupants from SVFs

when fiber glass insulation is used in air handling systems.

The study used an experimental room to simulate a residential environment. Air samples were taken from the room when it was supplied by new rigid fiber glass duct work, and the results were compared to those obtained from the room when it was supplied by bare metal duct work. The study concluded that:

- Glass fiber counts in the room served by a duct board system were no greater than metal duct-work or ambient background air.
- Fiber counts in both rooms were comparable to ambient air fiber counts.
- Airborne fibers were below detection (10^{-4} f/cc).

Fiber Erosion Literature Review

In 1996, Dr. Jim Woods of Virginia Polytechnic Institute conducted a literature search and review on the subject of fiber erosion and presented his findings at the 1997 Healthy Buildings Symposium. He reported that an analysis of the existing literature showed "...the use of fibrous glass duct lining and duct board can provide thermal and acoustical benefits while maintaining exposure to glass fibers in occupied spaces at or near background or outdoor air concentrations."[7]

NAIMA Study

A 1997 study by the North American Insulation Manufacturers Association[8] examined the impact of SVFs on indoor air quality. A cooperative investigation was undertaken to quantify indoor respirable fiber levels and to differentiate between fiber types (for example, glass fibers, carpet fibers, textile fibers, etc).

A total of 205 samples were collected using standard industrial hygiene methods in 51 residential and commercial buildings. Twenty-one simultaneous outdoor samples were collected at 19 buildings.

The study concluded that airborne respirable fiber levels in the buildings sampled were very low and that the respirable fibers present were primarily organic. While the relationship between SVF and total inorganic fibers could not be calculated, SVF fibers were found in only 2 of the 205 samples examined.

Duke University Study

A 2001 study by Duke University Medical Center[9] examined the relative contribution of a ventilation system *per se* to the total glass fiber burden of various occupied spaces. It concluded that fiber counts at the supply diffuser were extremely low (0.00015 f/cc average when present); that the HVAC system was not a significant source of glass fiber emissions; and that there was no significant difference between lined and unlined systems.

International Agency for Research on Cancer (IARC)

In October 2001, an international expert review by the International Agency for Research on Cancer (IARC)[10] re-evaluated the 1988 IARC assessment of glass fibers and removed glass, rock and slag wool fibers from its list of substances "possibly carcinogenic to humans." These fibers are now considered not classifiable as to carcinogenicity to humans (Group 3).

Conclusion

These studies and others clearly demonstrate that fiber shed from fiber glass insulation products is virtually non-existent. When properly installed, operated and maintained, these products do not increase airborne fiber levels in buildings.

References

1. UL Standard for Factory-Made Air Ducts and Air Connectors.
2. Jacob Cholak, ChE, and Lawrence J. Schafer, BSE (ChE), "Erosion of Fibers from Installed Fibrous-Glass Ducts." 1996, University of Cincinnati, Cincinnati, Ohio,
3. Man-Made Mineral Fibres, 1988, Environmental Health Criteria No. 77, World Health Organization.
4. Balzer, L., W.C. Cooper, D.P. Fowler: "Fibrous Glass Lined Air Transmission Systems: An Assessment of Their Environmental Effects." *Am. Ind. Hyg. Assoc. J.,* 32, pp. 512-518 (1971).
5. Fisher, M.: "Benefits and Risks from MMMF in Indoor Air." Indoor Air 93 Proceedings of the 6th International Conference on Indoor Air Quality and Climate, Published by Indoor Air '93, Helinski, Vol. 4 pp. 27-31 (1993).
6. Mark P. Buttner and Linda D. Stetzenback, L.D., "The Use of an Experimental Room for Monitoring of Airborne Concentrations of Microorganisms, Glass Fibers, and Total Particles." 1996, University of Nevada, Las Vegas.
7. J. E. Woods and A. K. Goodwin, "Glass Fiber Emissions From HVAC Ductwork: A Review Of The Literature," 1996, Virginia Polytechnic Institute and State University.
8. C.M. Carter, Johns Manville; C.W. Axten, NAIMA; C.D. Byers, USG Corp.; G.R. Chase, Consultant; A.R. Koenig, Celotex; J.W. Reynolds, CertainTeed Corp.; K. D. Rosinski, Owens Corning; "Indoor Airborne Fiber Levels of MMVF in Residential and Commercial Buildings." 1997, North American Insulation Manufacturers Association.
9. W.R. Thomann, J.J. Tulis, and J.Y. Chen, "Evaluation of the Contribution of the HVAC System to the Total Fiber Burden in Indoor Spaces." 2001, Duke University Medical Center, Durham, NC.
10. IARC Monograph, "Man-Made Vitreous Fibres" 9-16 October 2001, Vol. 81

About NAIMA

NAIMA is the association for North American manufacturers of fiber glass, rock wool, and slag wool insulation products. Its role is to promote energy efficiency and environmental preservation through the use of fiber glass, rock wool, and slag wool insulation, and to encourage the safe production and use of these materials.

For more information, contact:

NAIMA
44 Canal Center Plaza, Suite 310
Alexandria, VA 22314
Phone: 703-684-0084
Fax: 703-684-0427
Website: www.naima.org

NAIMA Air Handling Committee Members

CertainTeed Corp.
P.O. Box 860
Valley Forge, PA 19482
800-233-8990

Johns Manville
P.O. Box 5108
Denver, CO 80217
800-654-3103

Knauf Insulation
One Knauf Drive
Shelbyville, IN 46176
800-825-4434

Owens Corning
One Owens Corning Parkway
Toledo, OH 43659
800-GET-PINK