The Facts About Airborne Fibers and Glass Fiber Air Transmission Systems

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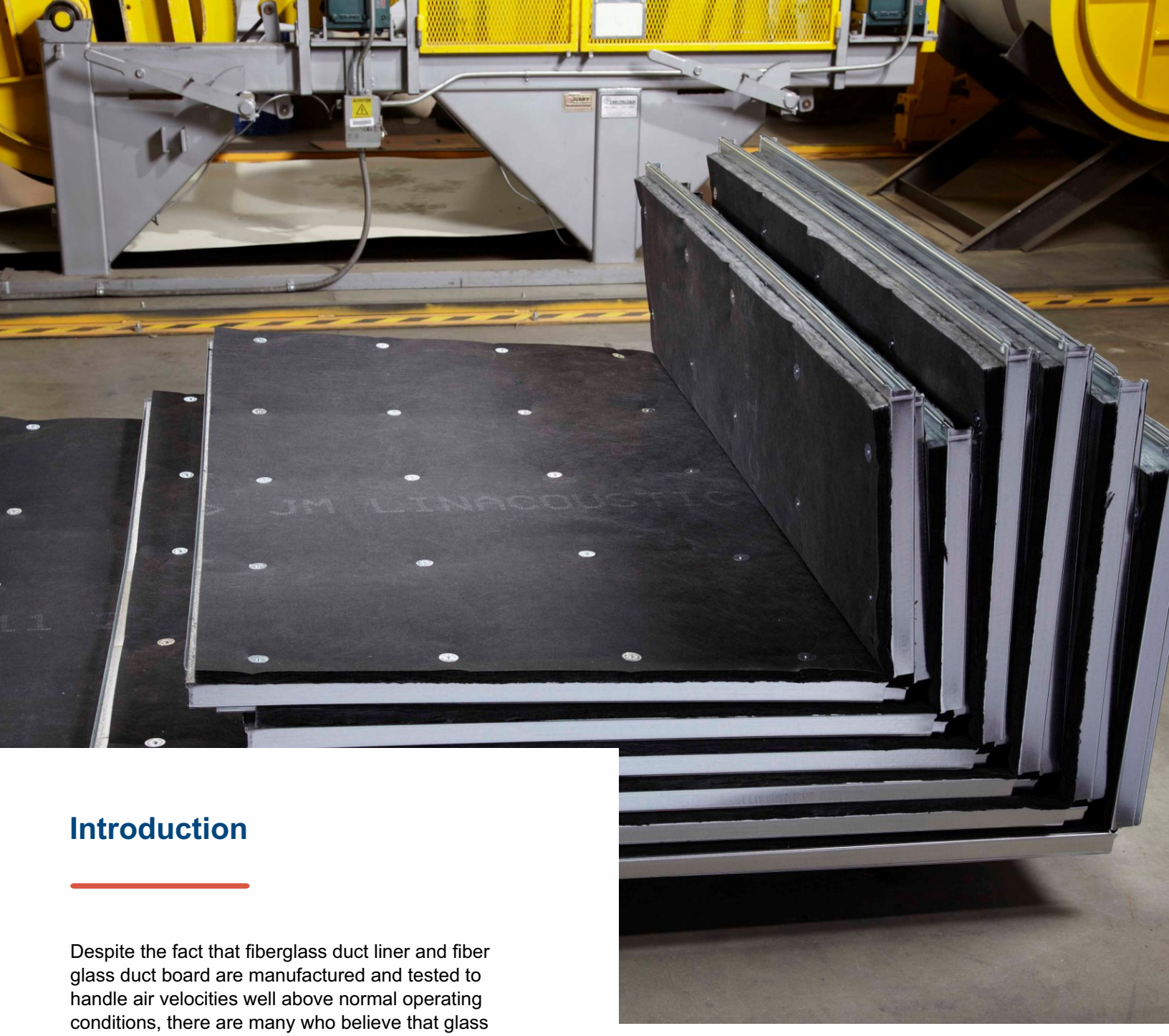
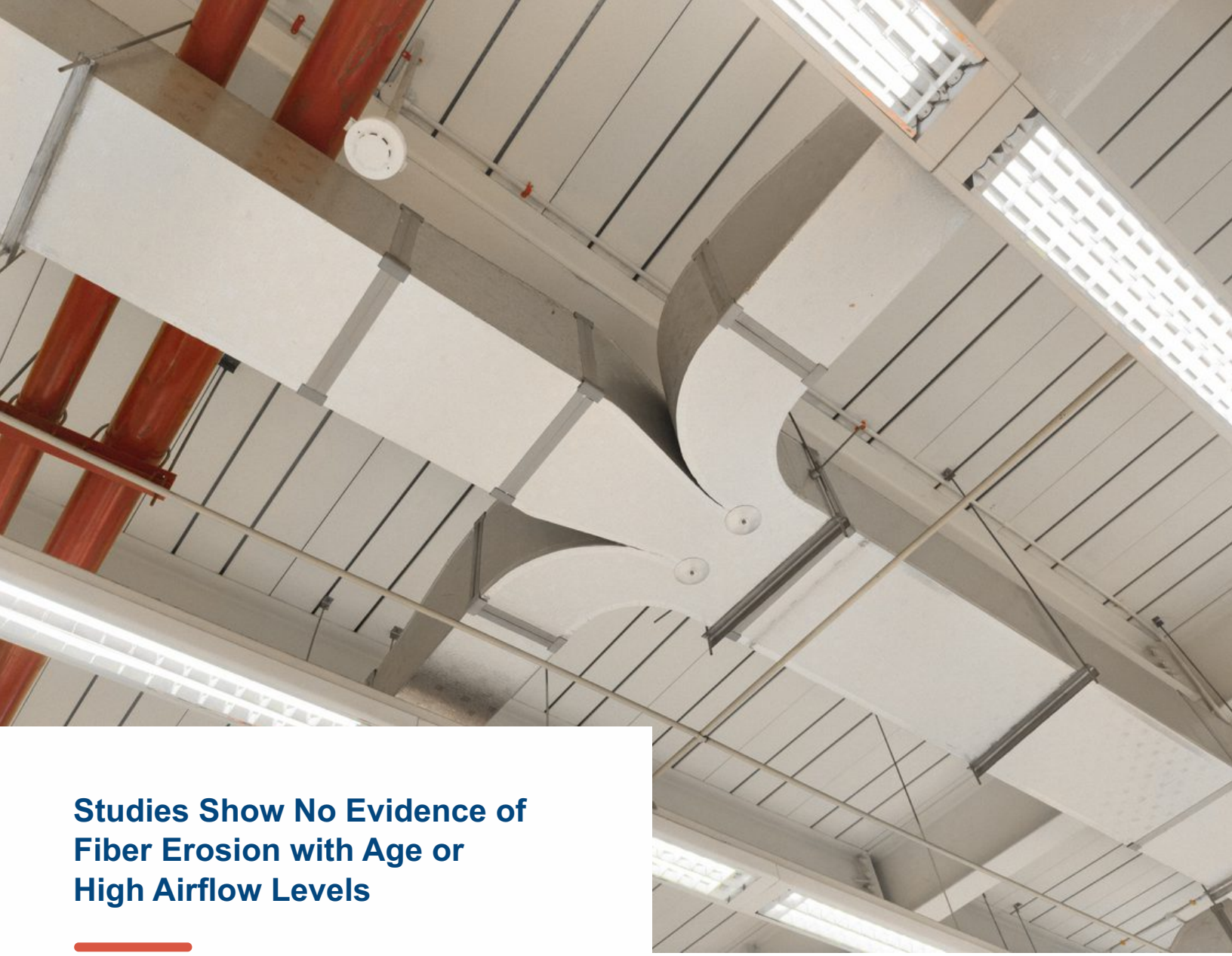


Introduction

Despite the fact that fiberglass 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 become an irritant to people in the occupied space. Studies conducted over a period of 35 years, however, show that fiberglass duct liner and fiberglass duct board exhibit little to no fiber erosion on surfaces in typical HVAC ducts. The results of these studies are presented below. While some of the studies date back to the 1990s, the science has not changed, and periodic updates are made to ensure accuracy.



Studies Show No Evidence of Fiber Erosion with Age or High Airflow Levels

Fiber Erosion Literature Review (1996)
In 1996, Dr. Jim Woods and A.K. Goodwin of Virginia Polytechnic Institute conducted a literature search and review on the subject of fiber erosion and presented their 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."[1]

[1] 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.

Studies Focused on Indoor Fiber Exposure Found Levels Equivalent to Outdoor Environments

World Health Organization Report (1988, 2024)
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.[2]

While there have been some studies of airborne glass fibers in the ambient (outdoor) air for comparison, Balzer et al. reported values for various areas in California at .0026 f/cc.[3]

In 2024, measurements of ambient fiber and fibrous glass concentrations near multiple fiberglass manufacturing facilities showed, with 134 samples collected, only one sample had a detectable glass fiber concentration at 0.0045 f/cc.[4] OSHA’s Permissible Exposure Limit (PEL) for SVF products is 1 fiber per cubic centimeter (1 f/cc), per 8 hour time weighted average.

International Conference on Indoor Air Quality and Climate (1993)
A 1993 International 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]

[2] Man-Made Mineral Fibres, 1988, Environmental Health Criteria No. 77, World Health Organization.
[3] Balzer, L., Cooper, W.C.; Fowler, D.P.: “Fibrous Glass-Lined Air Transmission Systems: An Assessment of Their Environmental Effects.” Am. Ind. Hyg. Assoc. J., 32, pp. 512-518 (1971).
[4] Allen, L., et al., “Measurement of ambient fiber and fibrous glass concentrations near three fiberglass wool manufacturing facilities in the United States,” Journal of Occupational and Environmental Hygiene, 1-9, 2024.
[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).

University of Nevada, Las Vegas Study (1996)
A 1996 study by the University of Nevada, Las Vegas,[6] addressed questions raised about the potential exposure to building occupants from SVFs when fiberglass 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 fiberglass ductwork, and the results were compared to those obtained from the room when it was supplied by bare metal ductwork. The study concluded that:

- Glass fiber counts in the room served by a duct board system were no greater than metal ductwork or ambient background air.
- Fiber counts in both rooms were comparable to ambient air fiber counts.
- Airborne fibers were below detection (0.0001 f/cc).

NAIMA Study (1997, 2023)
A 1997 study by the North American Insulation Manufacturers Association[7] examined the impact of SVFs on indoor air quality. A cooperative investigation was undertaken in spaces that utilize fiberglass duct liner or board 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 SVFs and total inorganic fibers could not be calculated, SVFs were found in only 2 of the 205 samples examined.

In 2023, an updated review of the findings of the 1997 NAIMA study was conducted. The updated article concluded that contemporary measurements of indoor SVF air concentrations are consistent with the findings in the 1999 NAIMA article and demonstrated that both air and surface concentrations of SVFs in ambient indoor settings are consistently much lower than exposure limits developed to prevent negative health outcomes in occupational settings.[8]

Duke University Study (2001)
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 there was no significant difference between lined and unlined systems.

[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] C.M. Carter, et al., "Indoor Airborne Fiber Levels of MMVF in Residential and Commercial Buildings," American Industrial Hygiene Association Journal, 60:794-800 (1999).
[8] Allen LH, Suder Egnot N, Allen H, Chan K, Marsh G, "Exposure to MMVF in residential and commercial buildings: A literature review and quantitative synthesis, Toxicology and Industrial Health, 2023, Vol. 33(9) 528-536.
[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.

Fiberglass Fibers Used for Building Insulation Do Not Appear on Any Official List of Carcinogens

Regulatory Agencies

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).

In June 2011, the U.S. National Toxicology Program ("NTP") removed from the Report on Carcinogens ("RoC") biosoluble glass wool fibers used in home and building insulation.[11] NTP stated that "not all glass wool fibers cause cancer."[12] In fact, the vast majority of glass fibers manufactured in the United States are not considered even possible carcinogens by NTP. Also, in 2011, California's Office of Environmental Health Hazard Assessment ("OEHHA") published a modification to its Proposition 65 listing to include only "Glass wool fibers (inhalable and biopersistent)."[13] Fiberglass fibers used in building insulation are not included on the Proposition 65 list.

The NTP and IARC decisions are consistent with the conclusions reached by Health Canada in 1993,[14] the Agency for Toxic Substances and Disease Registry ("ATSDR") in 2004,[15] and the U.S. National Academy of Sciences, which in 2000 found "no significant association between fiber exposure and lung cancer or nonmalignant respiratory disease in the MVF [man-made vitreous fiber] manufacturing environment."[16] These findings are further supported by one of the most comprehensive epidemiological studies ever created.[17]

Conclusion

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

[10] International Agency for Research on Cancer, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Man-Made Vitreous Fibres, Vol. 81 (Lyon, France: WHO/IARC, 2002).
[11] U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program, Report on Carcinogens, Twelfth Edition, 2011.
[12] National Institute of Environmental Health Sciences, National Toxicology Program, Fact Sheet, "The Report on Carcinogens," June 2011.
[13] 46-Z California Regulatory Notice Register, p. 1878 (November 18, 2011).
[14] Canada, Government of, Priority Substances List Assessment Report – Mineral Fibres (Man-Made Vitreous Fibres) (1993).
[15] Toxicological Profile for Synthetic Vitreous Fibers (U.S. Department of Health and Human Services, Public Health Services, Agency for Toxic Substances and Disease Registry), September 2004, pp. 1-11, 13.
[16] NRC Subcommittee on Manufactured Vitreous Fibers. 2000. Review of the U.S. Navy's Exposure Standard for Manufactured Vitreous Fibers. National Academy of Sciences, National Research Council, Washington, D.C.: National Academy Press.
[17] "Historical Cohort Study of US Man-Made Vitreous Fiber Production Workers," Journal of Occupational and Environmental Medicine, September 2001, Vol. 43, No. 9. Charles E. Rossiter, "Man-Made Vitreous Fibres: 25 years of epidemiological research on mortality and cancer incidence," Arbete Och Halsa, NR 2002:14.

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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. Through the Insulation Institute™, we leverage the collective insulation expertise of our organization and our members to empower homeowners and professionals to make informed insulation choices. Our mission is to enable a more comfortable, energy-efficient and sustainable future through insulation — and we are constantly working with building professionals, homeowners, government agencies, and public interest, energy and environmental groups to realize that vision.

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