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OCCUPATIONAL HEALTH GUIDE

FIBROUS GLASS

One of a family of man-made mineral fibers, fibrous glass is used in more than 33,000 end products. It's main use is in insulation against heat, cold and noise, although it has many applications in building materials, manufactured products, textiles and reinforcements.

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METHODS OF COMPLIANCE

Engineering controls such as isolation, enclosure, exhaust ventilation and dust collection are the approved means of meeting exposure limits. Equipment that might produce or release dust must be provided with local exhaust ventilation systems whenever possible.[3]

PROTECTIVE EQUIPMENT

Employees are required to wear respiratory protective equipment whenever it can be anticipated that dust levels above permissible limits might be present. Acceptable respirators are those approved by the National Institute for Occupational Safety and Health for protection against nuisance dusts.[4] Respirators also may be required as extra protection in operations where there is a possibility of an accidental situation creating high dust levels.

No employee should be assigned to any job requiring use of a respirator if a physical examination shows he or she would not be able to function normally while wearing one.

GOOD WORK PRACTICES

WEAR LOOSE CLOTHING

Skin irritation can be minimized by wearing clothing loose at the neck and wrists. Long sleeve shirts and long trousers and caps will protect the skin areas from contact with glass fibers. Protective clothing such as gloves also may be required, depending on job conditions.

REMOVE DUST AT SOURCE

Mechanical dust collection systems should be used whenever fibrous glass materials are machine sawed or sanded. Hand cutting also should be done in a manner that will create the least amount of airborne dust.

DON'T RUB OR SCRATCH

If fibrous glass particles accumulate on exposed skin areas, do not rub or scratch. Remove the particles by thorough but gentle washing with warm water and mild soap. If water is not available,use dry wash materials.

PROTECT YOUR EYES

Whenever applying fibrous glass material in a manner that may cause loose particles to get into the eyes, workers should wear eye protection.

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a decrease in the number of fibers originally in the ambient air before passing through such systems. This can be attributed to the filtering effect of fibrous glass air transmission systems.

FINE DIAMETER FIBROUS GLASS

Various laboratory animal studies have been conducted with very thin diameter fibrous glass. Only when extremely large doses of thin fibrous glass were used and introduced into the animals by highly artificial methods, which bypassed normal defensive systems, were any adverse biological effects noted. In these implantation studies, it was shown that virtually all fibrous materials used of an appropriate size could cause tissue changes, including cancer, at the site of introduction into the laboratory animals. These experiments do not predict what the effect will be in humans during normal exposure, but do indicate the need for further study.

When very thin glass fibers were placed into the lungs of guinea pigs through the trachea, also an artificial method, the fibers produced slight pulmonary fibrosis. The biological effects produced by artificial methods of introduction into animals indicate the need for inhalation studies in animals, which are in progress.

REGULATIONS

The Federal Occupational Safety and Health Administration (OSHA) presently classifies fibrous glass as a nuisance dust and has set a workplace permissible limit of 50 million particles per cubic foot (50 mppcf) of air as determined by the impinger method or 15 milligrams per cubic meter (15 mg/M^3) of air as determined by the respirable gravimetric method of monitoring.[1]

OSHA was reviewing this standard in early 1977 to determine if it is adequate.

These exposure limits are referred to as "Threshold Limit Values" or "TLVs" and "represent conditions under which it is believed nearly all workers may be repeatedly exposed, day after day, without adverse effect."

MONITORING

To assure compliance with exposure limits in manufacturing operations, a program of industrial hygiene monitoring must be conducted. Both personal breathing zone and work area samples must be taken to verify compliance with the exposure limits for nuisance dusts. Commercial monitoring equipment to perform both of these measurements is readily available.[2]

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CHARACTERISTICS

Fibrous glass is a fiber manufactured from glass processed in a molten state. Originally developed in the early 1930's for use in furnace filters and home insulation, it has become one of the world's most useful basic materials.

Glass fibers will not burn, rot or absorb moisture or odors, are dimensionally stable and have high tensile strength. Fibrous glass is fire resistant and does not support mildew, mold or bacteria growth.

Major uses of fibrous glass are for:

NOISE CONTROL - it cushions and absorbs noise generated by mechanical equipment and air movement.

TEMPERATURE CONTROL - it controls heat loss or gain.

CONDENSATION CONTROL - it helps control condensation on the inside, and with a vapor duct barrier, on the outside of air conditioning systems.

FILTER MEDIA - it is used to remove impurities in air and other materials.

Fibrous glass generally is supplied in two forms - wool or textile fibers. *Wool-type fibers*, formed in various lengths, are used primarily for thermal and acoustical insulations. *Textile fibers*, produced in continuous strands or filaments, are used in fabrics and for reinforcing other materials such as plastics.

In recent years, manufacturers have been producing non-consumer grades of extremely thin fibrous glass materials for highly specialized products such as aerospace insulations, fine particulate filtration and other highly sophisticated product applications. These fine diameter glass fibers represent less than 1% of all fibrous glass production.

This guide will focus on the health aspects of wool and textile glass fibers, which contain few of the very thin type of fibers, and which comprise 99% of the market for fibrous glass.

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MAJOR USES

The wool-like form of fibrous glass is widely used as insulation for controlling temperature and sound. Its major applications are in building insulation, acoustical products, air handling ducts, pipe insulation, air filters, roof insulation and insulation for automobiles, airplanes, mobile homes, refrigerators, ranges and other appliances.

Textile-type glass fibers are most commonly used in curtains and draperies, screening, electrical yarns, built-up roofing and shingles, industrial fabrics and as reinforcements for plastics, papers, rubber and other products.

The extremely fine diameter glass fibers are used in such highly sophisticated applications as insulation for rockets, space shuttles, fine particulate filtration and other small volume product applications.

PRODUCTION

Wool type fibrous glass is produced by several processes. After the raw materials used to make glass are combined and melted in a furnace, a molten stream is directed to a variety of devices.

The molten stream may flow into an accelerator-type device containing small holes so that the glass flowing through the holes can be attenuated (made thinner) by blowers and covered with a binder before being collected on a conveyor. Another common process involves passing the molten material through a series of orifices, as done with textile fibers, and allowing the filaments to pass in front of high pressure gas jets which attenuate the fiber and blow it onto a conveyor.

Textile fibrous glass is manufactured by combining and melting glass raw materials in a furnace. The molten glass then flows into a series of small platinum tanks with hundreds of very small holes or orifices in the bottom. The glass flows through these orifices and the individual filaments are collected together in a strand, to which a binder is applied. The strand then is wound up on a rapidly rotating drum. This process enables production of fibers with very little variation in diameter.

Fine diameter fibrous glass is produced by a similar flame-attenuation process, utilizing special equipment and a special blend of glass.

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HEALTH ASPECTS

INHALATION

Epidemiological studies of work populations conducted so far have shown there is no chronic health effect in humans as a result of exposure to fibrous glass. Although much medical research has been done on health effects, there is no acceptable medical evidence of either chronic pulmonary disease, fibrogenesis, or carcinogenesis as a result of exposure to these insulation and textile glass fibers. There also is no medical evidence to indicate that the use of fibrous glass products present any other threat to human health. Accidental exposures resulting in inhalation of high concentrations of airborne fibrous glass may produce a non-specific, transitory lung condition - usually coughing, wheezing. The effects of these very high doses subside shortly after removal from exposure and there is no long-lasting health effect.

SKIN IRRITATION

Fibrous glass can cause mechanical skin irritation in some people, with fibers of large diameters more likely to cause this irritation. This irritation, in which fibers may become superficially embedded in the skin, is transitory in nature in that inflammation and irritation will pass with no long-lasting effects. Some persons exposed to fibrous glass may be more sensitive to mechanical irritation than are others and may be forced to seek other types of employment. Overall, skin reactions to fibrous glass vary directly with the size and thus the stiffness of the fiber being handled, are due largely to mechanical irritation from sharp, broken ends, and do not persist for any length of time. Normal washing with soap and water usually is sufficient to remove fibrous glass material from the skin.

ENVIRONMENTAL EXPOSURE

In addition to workplace studies, investigations also have been conducted to determine the ambient air exposure to occupants of public buildings in which fibrous glass products have been installed. These studies were prompted by the fact that air conditioning and air distribution ducts are often lined with fibrous glass to reduce noise and temperature losses.

All of the studies that have been conducted in this area have shown no significant erosion of fibers even under extraordinarily severe test conditions, and in some cases, there was actually

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WEAR RESPIRATORS

Whenever it might be anticipated that fibrous glass dust concentrations may exceed permissible limits, approved respiratory protective equipment should be worn.

WASH CLOTHES SEPARATELY

Work clothing worn in areas where exposure to fibrous glass is possible should be washed separately from other household laundry. Extensive concentrations of glass fibers on clothing may require pre-soaking and rinsing prior to washing. Thoroughly rinse the washing machine before doing normal household laundry.

BE A GOOD HOUSEKEEPER

Avoid unnecessary rehandling of scrap materials by locating disposal equipment as close to working areas as possible. Do not permit accumulations of scrap and debris on floors and other surfaces. An organized housekeeping program should be followed at all times.

EXPLANATORY NOTES:

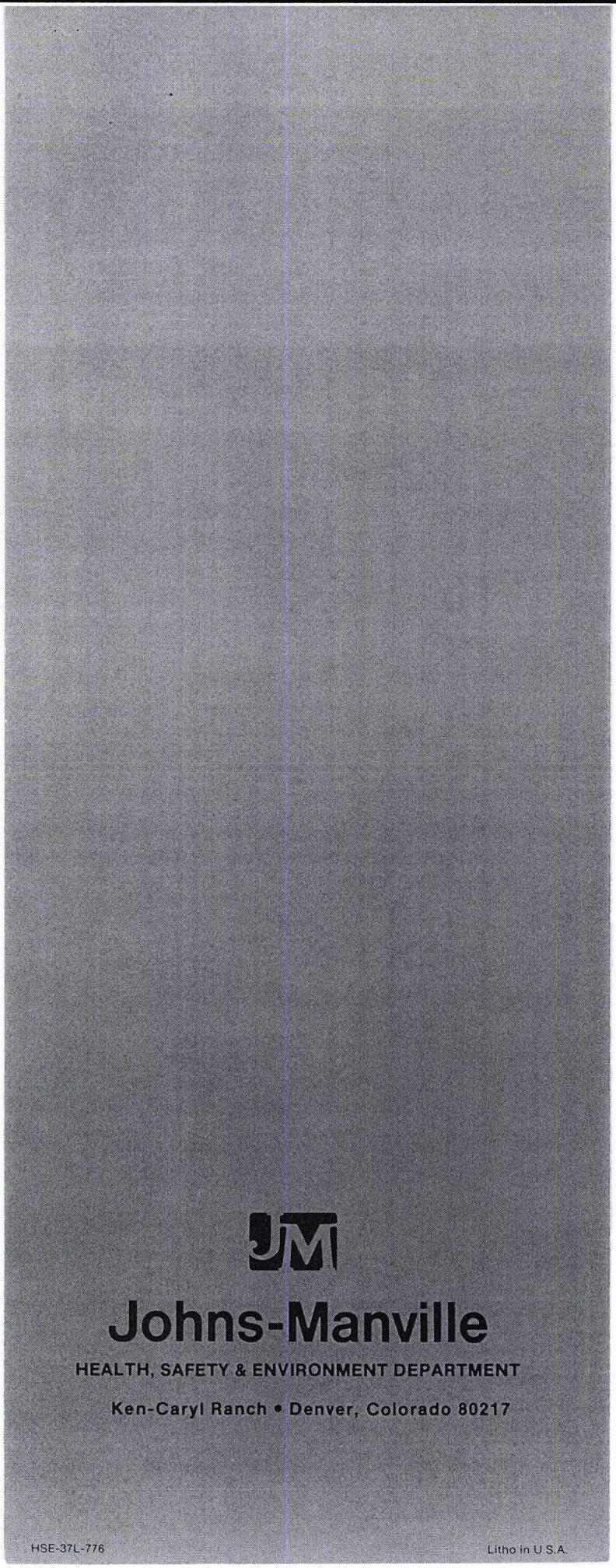
[1]Federal Register, 40 F.R., 23072, May 28, 1975, Part 1910, Subpart Z.

[2]Specifications for approved monitoring equipment can be obtained from the Manager of Occupational Environmental Control, Johns-Manville, Health, Safety & Environment Department, Denver, CO.

[3]American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2 - 1971.

[4]American National Standards Practices for Respiratory Protection, ANSI Z88.2 - 1969; or Director, Environmental Safety & Quality, Johns-Manville, Health, Safety & Environment Dept., Denver, CO.

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