PLAINTIFF'S
EXHIBIT
DUP-601

138

TOXICITY

MEASUREMENT AND CONTROL OF ASBESTOS DUST EXPOSURE

SAFETY
ENGINEERING STANDARD

ISSUED	APRIL 1973	S 4 T
THIS PAGE REVISED	JULY 1975	
STANDARD REAFFIRMED	JULY 1975	Page 1 of 5

This standard includes requirements of the Occupational Safety and Health Act of 1970 (OSHA) as published in the Federal Register. OSHA information is printed in red.

1. SCOPE

This standard presents the permissible asbestos dust exposure limits, methods of controlling asbestos dust exposures, respiratory protective equipment and method of sampling asbestos dust concentrations in the work area.

2. GENERAL

2.1 **Asbestosis and lung cancer** have long been associated with exposure to asbestos. Historically, the incidence of these diseases has been significantly higher among asbestos workers than among the general population.

2.2 **Principal sources** of exposure to airborne asbestos dust in Company operations have been:

a. Cutting asbestos insulation by power saws in fabrication shops

b. Opening boxes and removal of new asbestos insulation

c. Removing old insulation from lines and vessels

d. Mixing loose asbestos to form cement

e. Removal of clothing after completing asbestos insulating duties

f. Cutting asbestos cement (Transite) siding, roofing, pipe, etc

g. Spraying asbestos insulation or fireproofing

h. Asbestos materials used in production of Company products

2.3 **Suitable nonasbestos bearing materials** should be sought for substitution where asbestos contributes to a dust concentration exceeding the permissible exposure limits.

2.3.1 Materials used containing asbestos also should be investigated for their effect on asbestos dust concentration. For example, calcium silicate insulation may contain up to 20 percent asbestos, and talc also may contain asbestos.

2.3.2 For asbestos insulation substitutes, see SN-M series of insulation materials specifications.

3. PERMISSIBLE EXPOSURE LIMITS

3.1 Asbestos dust concentrations in air shall not exceed an 8-hour time-weighted average (TWA) of 5 fibers longer than 5 microns per cubic centimeter of air. At no time may the concentration exceed a ceiling of 10 fibers longer than 5 microns per cubic centimeter.

3.1.1 The 8-hour time-weighted average (TWA) is the average concentration occurring over a period of 8 continuous hours.

3.2 After July 1, 1976, the TWA is reduced from 5 to 2 fibers longer than 5 microns per cubic centimeter.

4. CONTROL OF ASBESTOS DUSTS

4.1 **Engineering controls**, such as but not limited to, enclosure, vacuum sweeping, and local exhaust ventilation, shall be used to meet the permissible exposure limits, in section 3. Use of respiratory equipment only is not sufficient, see section 5.

4.2 **Handling Asbestos Insulation**

4.2.1 Cartons of asbestos insulation are a potential source of severe dust exposure and should be handled with care. The nature of the material creates dust within the cartons.

4.2.2 Cartons of new asbestos insulation should be vacuumed upon opening, and prior to removal of material to remove dust accumulation.

4.2.3 Purchase of insulation with a glaze coating is recommended to reduce dusting.

4.3 **Asbestos Cutting Operations**

4.3.1 All hand-operated or power-operated tools which may produce or release asbestos fibers in excess of the permissible exposure limits shall be provided with a dust collection system, see 4.8.

4.3.2 All major power-cutting machines should be isolated in a separate working area.

Portions printed in red meet OSHA regulations, Section 1910.1001 (formerly .93a).

Vendors and merchandise designations are given to describe materials and may not include all acceptable products. Substitutions by suppliers are to be made only on approval of the local authority initiating the use of this standard.

SUBCOMMITTEE NO. 26

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4.3.3 The work area shall have a vacuum cleanup system. This can be a system of hoses connected to a central vacuum system. All parts of the room should have vacuum cleanup at least daily, to prevent accumulation of dust on ledges, shelves, floors, and machines.

CAUTION: No dry sweeping shall be performed. Air hose is not to be used as an aid in cleanup.

4.4 Asbestos-Material Mixing

4.4.1 Cement, mortar, coatings, grout, and plaster containing asbestos shall be mixed in closed bags or other closed containers.

4.4.2 Any dried-out cement should be discarded. Do not attempt to rework it.

4.5 Removal of Asbestos Insulation

4.5.1 Atmosphere supplying respirators (per 5.4) and special clothing (per 6.2) shall be worn by employees engaged in removal or demolition of asbestos insulation or covering.

4.5.1.1 This requirement does not apply to removal of insulation, fabricated and protected to withstand repeated removal and reinstallation for equipment maintenance or other reasons, providing the techniques employed have been demonstrated to maintain asbestos concentrations within allowable limits.

4.5.1.2 This requirement does not apply to removal for maintenance or alterations when precautions listed below are followed and sampling has shown the precautions maintain asbestos concentrations within allowable limits.

a. Dampen insulation prior to and during removal.

b. Remove fasteners with care. Support insulation temporarily until it can be put into proper containers (see 4.6). Do not drop.

c. Avoid sawing where possible. Knife cutting is preferred.

d. Maintain good housekeeping. Vacuum equipment shall meet requirements of 4.3.2.

e. Others to suit local conditions.

4.6 Waste Disposal. Asbestos waste, including items such as scrap, empty bags or clothing to be discarded, vacuum system collection, and other wastes which may create airborne dust concentrations, shall be collected and disposed of in sealed, impermeable bags or containers. Caution labels shall be attached conforming to 7.6 and Figure 2.

4.6.1 Asbestos contaminated clothing to be laundered shall be handled in sealed, labeled bags as in 4.6. Persons involved shall be instructed in proper handling.

4.7 Asbestos Spraying. Employees engaged in spraying asbestos for insulation or fireproofing shall wear atmosphere supplying respirators, see 5.4.

4.8 Exhaust ventilation and dust collection system shall be in accordance with ANSI Z9.2, Fundamentals Governing the Design and Operation of Local Exhaust Systems.

4.8.1 Caps or dampers should be provided in each intake hose and machine connection to maintain capacity of the system. However, care should be taken to assure that connections are open at the equipment being operated.

4.8.2 Discharge should be into a cyclone separator or into bag filters which meet the following criteria:

a. Cotton bag filters should have an air flow permeability not exceeding 20 cfm/sq ft

b. No bypass devices

c. No leakage of unfiltered air

d. Ability to empty hoppers without creating visible emissions of particulate matter

e. No torn or ruptured bags

f. No worn or threadbare bags

g. No improperly positioned bags

h. Dust samples shall be taken at the dust collection discharge periodically as necessary to assure satisfactory performance of the system, see section 3

5. RESPIRATORY EQUIPMENT

5.1 Respiratory protection shall be provided to all personnel in areas where the permissible exposure limits may be exceeded under the following conditions:

a. During the time necessary to install engineering controls and work practices per 4.1.

b. In situations when the above controls are technically not feasible or insufficient to meet the limits in section 3

c. In emergencies

Refer to S2H for general description and vendors of respirator equipment.

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5.2 **Mechanical filter-type respirators** are required when the TWA or ceiling concentrations are reasonably expected to exceed no more than 10 times the limits in section 3.

5.2.1 Filters shall meet Bureau of Mines Schedule 21C. Manufacturer's recommendations must be followed for their application and maintenance. Such filters should not be used where the oxygen falls below 19.5 percent.

5.3 **Powered filter-type respirators** are required when the TWA or ceiling concentrations are reasonably expected to exceed 10 times, but not 100 times, the limits in section 3.

5.3.1 These filters are seldom used on Company plants and those of 5.4 are substituted.

5.4 **Atmosphere supplying respirators** (Type "C" supplied air or self-contained) are required when the TWA or ceiling concentrations are reasonably expected to exceed 100 times the limits in section 3. Also, they are required for the spraying of asbestos. For removal or demolition, see 4.5.

5.4.1 Filters shall meet Bureau of Mines Schedule 19B.

5.5 **Respiratory Equipment Use and Testing.** A respirator program in accordance with the requirements of ANSI Z88.2 Practices for Respiratory Protection shall be established.

5.5.1 Each employee who may use a respirator shall be instructed in its use and in testing it for proper fit. He shall test it for proper fit prior to each use.

5.5.2 Respirators shall be cleaned and disinfected regularly. Those issued for the exclusive use of one worker should be cleaned at least after each day's work.

6. HYGIENE

6.1 **A change room and duplicate lockers** must be provided for employees exposed to concentrations which exceed either the TWA or the ceiling limit in section 3. This is to prevent contamination of employees' street clothes from their work clothes.

6.2 **Special clothing** shall be provided for employees exposed to concentrations which exceed the ceiling limit in section 3, and for those employees engaged in the spraying of asbestos. For removal or demolition, see 4.5.

6.3 **Food, gum, tobacco,** or other material placed in the mouth shall not be kept or consumed in work areas where asbestos is being handled or fabricated.

6.4 **Medical examinations,** controls, and records relative to asbestos dust exposure are directed by the Employee Relations Department Medical Division.

7. SAMPLING

7.1 **Monitoring** is required where employees are exposed to asbestos dust to determine the employee's exposure.

7.1.1 Sampling of each operation must be taken in a frequency and pattern to represent accurately the employee's exposure over his work period. If results indicate a level of asbestos dust in excess of the limit, the operation shall be reviewed to reduce exposure, see 4.1, and resampled. The initial sampling program must determine the 8-hour time weighted average. Intervals between samples shall not exceed six (6) months.

7.2 **Equipment.** Samples may be taken with a portable battery-operated air sampler attached to an employee's belt or placed in the work area.

CAUTION: Unless specifically approved for use in hazardous atmospheres, air samplers shall not be used in hazardous areas, as defined in DE1D, without a permit to use a spark-producing device.

7.2.1 **Pumps recommended.**

Bendix Model C11S or Microaire, available from:

Bendix Corp
Environmental Science Div
1400 Taylor Ave
Baltimore, MD 21204

or,

MSA Gravimetric, available from:

Mine Safety Appliances Co
400 Penn Center Blvd
Pittsburgh, PA 15235

Both units shall include pump, battery, and battery charger. Carrying case is optional. Cyclone is not required.

7.2.2 **Filter cassettes** are available from

Millipore Corporation
Bedford, MA 01730

Specify:

Millipore No. MAWP-037-A0 filter.
0.8 micron pore (white, nongridded)

(Nongridded are preferred but gridded are available.)

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he following adapter is recommended to ensure tight connection between the needle and the 1/4-inch tubing:

Catalog No. 8960-045 syringe needle
adapter to 1/4-inch tubing.
A. H. Thomas Co
Philadelphia, PA 19105

7.3 Procedure. Haskell Laboratory Field Services Group shall be contacted for specific recommendations as to duration, frequency, and technique for sampling prior to embarking on a sampling program.

7.3.1 Flow through the pump should be calibrated, with the filter in line for each pump.

7.3.2 Personnel Sampling. Filter holder is clipped to lapel or shirt pocket as close to breathing zone as possible. Filter shall have face horizontal or slightly downward, never up.

7.3.3 Environmental Sampling. These samples are taken from a fixed location to give a general pattern of exposure in a work position or area. Filter is placed as close to breathing zone representative of the work area.

7.4 Analysis. Completed samples (exposed filters) are placed in a mailing tube, sealed, and sent to a qualified laboratory with two copies of the sampling record.

7.4.1 It is recommended that an unexposed filter be included with each batch of samples for reference.

7.4.2 All determinations shall be made by the membrane filter method at 400-450X (magnification) (4mm objective) with phase contrast illumination.

7.4.3 Qualified Laboratories

G. W. Hiddemen
E. I. du Pont de Nemours & Co
Marshall Laboratory
3500 Grays Ferry Avenue
Philadelphia, PA 19146

Morton Corn, PhD
Attention: Felix Stein
Graduate School of Public Health
University of Pittsburgh
Pittsburgh, PA 15213

W. A. Burgess
38 Fox Hill Street
Westwood, MA 02090

7.5 Record Keeping. Records of personnel and environmental monitoring shall be maintained for three (3) years and made available upon the request of authorized representatives of OSHA and NIOSH (National Institute of Occupational Safety and Health).

7.6 Caution Signs and Labels

7.6.1 Caution signs conforming to Figure 1 shall be posted at all approaches to areas where asbestos concentrations may be above permissible exposure limits. They shall be placed at a sufficient distance to permit an employee to read the signs and take necessary precautions before entering the area.

7.6.2 Caution labels conforming to Figure 2 shall be used to identify containers of raw materials, scrap, waste, other products containing asbestos, and asbestos contaminated clothing.

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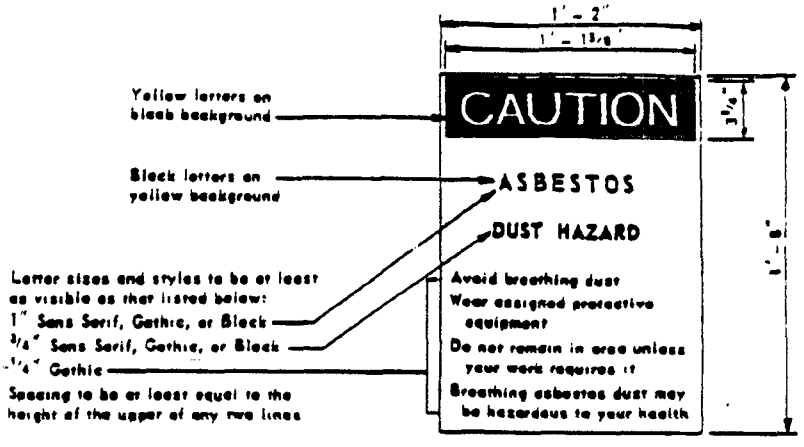
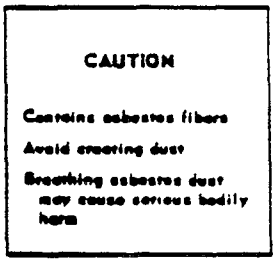


FIGURE 1 - CAUTION SIGN - ASBESTOS DUST



Label size and printing to be readily visible and legible.

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FIGURE 2 - TYPICAL CAUTION LABEL*

* Available from M & M Displays, Maiden Lane, Philadelphia, PA

Figures 1 and 2 meet OSHA requirements, Section 1910.1001 (formerly .93e).

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AIRBORNE DUST SAMPLE WORK SHEET

SITE: _____ DATE SAMPLED: _____
WEATHER: _____ TEMP.: _____ R.H.: _____
INSTRUMENT NUMBER: _____ WORK LOCATION: _____
SAMPLE TOTAL TIME: _____ HRS. VOL. SAMPLED: _____ CF

1. PUMP RATE: _____ CC/M TIME: _____ CHECKED BY: _____
SPECIFIC PRODUCT AND MATERIAL:
OPERATION:
VENTILATING CONTROL:
DRAFTS:

2. PUMP RATE: _____ CC/M TIME: _____ CHECKED BY: _____
SPECIFIC PRODUCT AND MATERIAL:
OPERATION:
VENTILATING CONTROL:
DRAFTS.

3. PUMP RATE: _____ CC/M TIME: _____ CHECKED BY: _____
SPECIFIC PRODUCT AND MATERIAL:
OPERATION:
VENTILATING CONTROL:
DRAFTS.

4. PUMP RATE: _____ CC/M TIME: _____ CHECKED BY: _____
SPECIFIC PRODUCT AND MATERIAL:
OPERATION:
VENTILATING CONTROL:
DRAFTS:

5. PUMP RATE: _____ CC/M TIME: _____ CHECKED BY: _____

6. PUMP RATE: _____ CC/M TIME: _____ CHECKED BY: _____
SPECIFIC PRODUCT AND MATERIAL.
OPERATION:
VENTILATING CONTROL:
DRAFTS:

7. PUMP RATE: _____ CC/M TIME: _____ CHECKED BY: _____
SPECIFIC PRODUCT AND MATERIAL:
OPERATION:
VENTILATING CONTROL:
DRAFTS:

8. PUMP RATE: _____ CC/M TIME: _____ CHECKED BY: _____
SPECIFIC PRODUCT AND MATERIAL:
OPERATION:
VENTILATING CONTROL:
DRAFTS:

9. PUMP RATE: _____ CC/M TIME: _____ CHECKED BY: _____

SAMPLE TAKEN BY: _____ DATE: _____
SIGNATURE

FIGURE 3 – TYPICAL SAMPLING RECORD FORM

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