

PARTICULATE MATTER IN AIR

Dust Breathed by the Employees While Cutting and Installing "Kaylo" Insulation

Plant-wide Survey - Plant 514

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Date: September 21, 1965
Project No.: IH-1G-65

Doctor Hull, Plant Medical Director, requested a plant-wide industrial hygiene study to determine the potential exposure of insulators to asbestos fiber dust concentrations. Table I gives the results of seven separate tests, including 24 breathing zone level air samples and shows an average dust concentration of 5.2 million particles per cubic foot of air. A "threshold limit value" of 20 mppcf of air has been suggested.¹

When three employees, or less, hand-cut and apply "Kaylo" insulation, the concentration of dust is considered safe from the health standpoint; however, with 6 men the dust count exceeds the TLV. It is at this phase of the operation that exhaust ventilation should be used. Excessive dust concentrations can be expected when the insulation is removed from piping and tanks. Again, exhaust ventilation should be used to move the dust away from the employees, if possible; otherwise, respirators are advised.

"Kaylo" insulation contains 12 to 13% asbestos and 5.6 to 7.4% crystalline-free silica.² This material is received in block and pipe form and the insulator measures and marks the material into appropriate sizes and cuts it with a hand saw. The insulation material is wired into position around the tank or pipe. The tasks of cutting and applying the "Kaylo" insulation are shown in Figures 1 and 2.

The air samples were collected with a midjet impinger and a Uni-jet sampler, drawing 0.1 cubic foot of air per minute through impinger flasks containing 10 milliliters of distilled water. Dust counts, made by the Light Field Microscopic Counting Technique, appear in Table I.

This study has revealed that further research work is needed to:

1. Attain an established figure for the "threshold limit value".
 2. Utilize exhaust ventilation to remove the dust from the work area.
 3. Determine the particle size of the asbestos fiber where the dust count exceeds 5 mppcf.
 4. Obtain Range Finding Tests on animals exposed to different percents of asbestos fiber.
 5. Continue our plant-wide study in support of these conclusions.
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1. Cook, Warren A., and Peele, Robert E., Letter dated February 12, 1962 - The University of Michigan School of Public Health.
 2. Peele, R. E., Industrial Hygiene Survey - Construction Insulation Shop, Building 511-2018. Report 62-IH-1-G-1 (March 21, 1962).

TABLE I
PARTICULATE MATTER IN AIR
Dust Breathed by Employees While Cutting and Installing
"Kaylo" Insulation

Date	Sample Number	Sampling Conditions at Breathing Level	Number of Employees	Dust Count MPPCF (1)
11-16-64	1	5-min. cutting, 5-min. application inside building	2	2.1
	2	Same	2	2.6
	3	Same	2	1.7
	4	7-min. cutting, 3-min. application	2	3.0
1-19-65	5	Cutting and application during entire sampling period - inside building	6	22.5
	6	Same	6	17.0
	7	Same	6	22.5
2-16-65	8	Same	2	3.6
	9	Same	2	1.6
	10	Application of insulation - no hand saw cutting	2	0.3
	11	Same	1	0.1
3-1-65	12	Cutting and application during sampling period - outside building	2	7.6
	13	Same	2	2.4
	14	Same	2	4.0
3-22-65	15	Application of insulating - no cutting - inside building	3	1.9
	16	Same	3	13.0
	17	7-min. cutting; 3-min. application	1	7.3
5-26-65	18	Clean up of insulation from floor - sweeping and shoveling - inside bldg.	2	0.8
	19	Same	2	0.1
	20	Same	2	2.5
6-14-65	21	Cutting and application during sampling period - inside building	2	1.0
	22	Same	2	5.0
	23	Same	2	2.5
	24	Same	2	1.1

(1) Million particles per cubic foot of air.

10-14-65

UCC 008357

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"Kaylo" Insulation

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Figure 1. Sawing block sections. Breathing zone level
air sample being collected in the background.

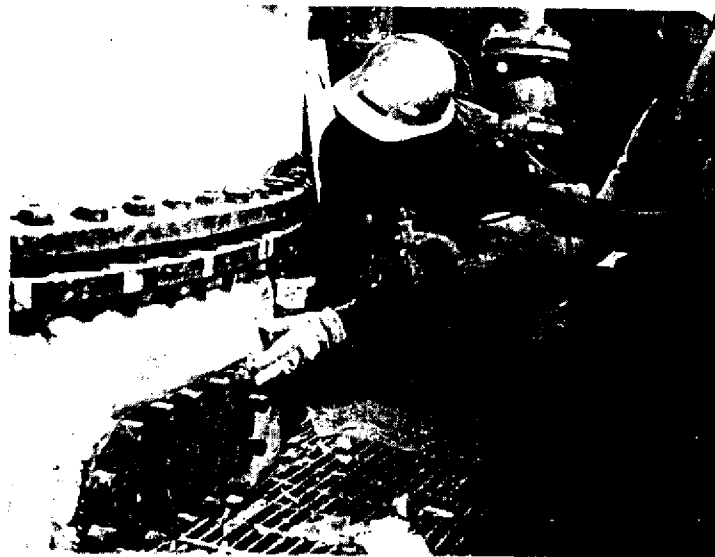


Figure 2. Applying insulation block. Breathing zone level
air sample being collected in the foreground.

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DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

WASHINGTON, D.C. 20201

April 25, 1978

SURGEON GENERAL
OF THE
PUBLIC HEALTH SERVICE

PHYSICIAN ADVISORY - HEALTH EFFECTS OF ASBESTOS

The results of recent studies of shipyard workers have increased concern about the health effects associated with previous occupational exposure to asbestos. This advisory notice will assist you in dealing with inquiries from your patients and other members of the public.

Asbestos refers to a group of widely used fibrous minerals. Significant exposure of men and women employed in shipyards is known to have occurred, even among those not directly working with asbestos. Exposure to asbestos can also occur in many settings, such as, direct mining and manufacturing; construction; insulation; roofing; demolition; brake lining; and the manufacture and installation of asbestos pipe, sheets, panels, paper products, friction materials, textiles, floor tiles, paints, and gaskets. The risk has been documented extensively for certain occupational exposures, and there are reports that asbestos-associated disease also occurs in household contacts of asbestos workers.

The primary effects of past asbestos exposure are asbestosis, a lung disease, and certain types of cancer, primarily lung cancer and pleural and peritoneal mesothelioma and, less frequently, gastro-intestinal and other cancers. It is now known that the health effects of asbestos appear after a long latent period (15, 25, 35 or more years) after the initial exposure. Exposures as short as a month may result in disease many years later, because the inhaled dust, being mineral, tends to remain in the tissues. It has been noted in studies of heavily exposed workers that approximately 20 to 25 of each 100 deaths among asbestos workers 20 or more years from onset of exposure are found to be from lung cancer, 7 to 10 from mesothelioma, 4 from cancer of the esophagus, stomach, colon/rectum, and some excess cancers of other sites (oropharynx, larynx, and kidney). In addition, in some groups, as many as 7 percent of workers die of a form of pneumoconiosis, asbestosis. Cigarette smoking significantly increases the lung cancer risk of asbestos exposure and aggravates asbestosis.

In dealing with your patients or other individuals who worked in shipyards or believe that they were otherwise exposed to asbestos, you may wish to consider the following issues:

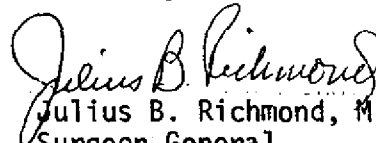
1. Occupational or Exposure History -- A detailed, lifetime history must be obtained. This is time consuming, but important because significant exposures may have been brief (one month) and may have occurred many years ago (i.e., during World War II). Because the World War II work force was comprised of many women as well as men, the potential for female patient involvement should not be overlooked.
2. Careful Management of Lung Disease -- A detailed history for symptoms such as shortness of breath or exertional dyspnea, physical examination, chest x-ray, and pulmonary function tests may be helpful in diagnosing the pneumoconioses associated with asbestos. Early x-ray changes are often subtle so x-rays must be reviewed carefully by experienced readers. Such readings should include a thorough search for pleural changes. Careful attention to and aggressive treatment of respiratory infections may be important in patients with asbestosis. The use of currently effective influenza and pneumococcal vaccines should be considered.
3. Emphasis on Smoking Cessation -- Discontinuation of smoking is an important step in the control of the sequelae of asbestosis and will assist in the prevention of lung cancer. Individuals who smoke and who have been exposed to asbestos have 30 to 90 times the risk of getting lung cancer of individuals who neither smoke nor have been exposed to asbestos and $7\frac{1}{2}$ to 30 times the risk of the non-smoking asbestos workers. Data are available which show that cessation of smoking will significantly diminish the risk of developing lung cancer among asbestos workers.
4. Cancer Surveillance -- The usefulness of screening asymptomatic, exposed individuals for lung, gastro-intestinal and other cancers is now under study in clinical trials. Individuals, however, should be carefully questioned regarding possible symptoms which could be related to cancer: chest pain, hoarseness, hemoptysis, weight loss, melena, etc. If such symptoms are present, an appropriate diagnostic workup should be undertaken.

It is important to note that many people exposed to asbestos -- perhaps a majority -- suffer no apparent ill effects. It is hoped that most of your patients will be in this category.

Current use of asbestos is regulated, but attention must be given to proper ventilation and engineering controls and the use of respirators -- all measures of primary prevention. In the past the dangers of asbestos exposure were not fully appreciated; much exposure occurred in previous decades, particularly in shipyards, where individuals often worked in confined quarters.

A discussion of asbestos and its health effects appears in the March/April issue of Ca, The Cancer Journal for Clinicians and is available through the American Cancer Society, 777 Third Avenue, New York, New York 10017. A more detailed physician information alert will be distributed by the National Cancer Institute through a number of medical journals within the next two or three months including the Journal of the American Medical Association. Additional information including a more detailed series of questions and answers can be obtained by writing to Asbestos, National Cancer Institute, 9000 Rockville Pike, Bethesda, Maryland 20014.

Sincerely,

A handwritten signature in dark ink, appearing to read "Julius B. Richmond". The signature is fluid and cursive, with the first name "Julius" being the most prominent.

Julius B. Richmond, M.D.
Surgeon General
Assistant Secretary for Health

DEC 15 1983

UNION CARBIDE CORPORATION
Silicones & Urethane Intermediates
PERSONNEL SAFETY AND HEALTH
SOUTH CHARLESTON, WEST VIRGINIA

MEMORANDUM

December 15, 1983

To: T. G. Swanson

cc: W. E. Ballard
C. E. Fry
R. W. Holland, Jr., M.D.
D. G. Moshier
Maintenance Area Superintendents
Maintenance Department Heads
W. E. Williams

Subject: Amended Asbestos
Standard

From: W. C. Young

Salient points of OSHA's emergency temporary standard on asbestos exposure most likely to impact on plant operations are listed below. The amended standard became effective November 4, 1983. At the end of a six-month period OSHA intends to adopt the new provisions permanently.

Please call me if there are any questions or if I can assist in compliance which, incidentally, may be achieved by any feasible combination of engineering controls, work practices, and personal protective equipment according to OSHA.

CHANGE

PLANT STATUS

1. Reduction of 8-Hr permissible exposure limit from 2 to 0.5 fibers per cc of air.
2. Information/training for all employees exposed > 0.5 f/cc.
3. The ETS limits use of our disposable respirators to airborne concentrations "not to exceed 5 f/cc or 10 x PEL." (This is a reduction from 20 f/cc, TWA₈.)

Plant exposure monitoring data appear substantially low and agree with the estimated range by OSHA (see attachment).

Although not required on the basis of exposure monitoring, this is an on-going 327 Dept. activity. (A recommendation for consideration is that future training include elements of the amended standard. Outline attached.)

The magnitude of most asbestos-related jobs and relatively short duration of exposure potential are primary reasons that measured concentrations are within limits. (To ensure compliance in all cases will, in my judgement, require strict adherence to established procedures, especially use of effective wet methods for removal/demolition work. The latter practice is not consistently followed.)

Table 1 (Cont.)

USHA Estimate of Employee Exposure to Asbestos

Industry Segment	Number ^a of Exposed Workers	Number ^a of Plants	Current Exposure level f/cc
Repair and Maintenance			
Drywall removal, renovation, and demolition ^b	12955	1296	20.0
	38866	3887	0.2
Repair and maintenance involving asbestos removal	14845	1485	0.15
Maintenance workers in schools, chemical plants electrical generating plants and foundries	N/A	N/A	0.15
TOTAL WORKERS EXPOSED ABOVE 0.5 f/cc ^f			48,644
TOTAL EXPOSED WORKERS			375,399

^a Population and facility estimates were based on the K11 report (Ex. 64-009) and updated to 1983 employment levels by JKB Associates.

^b The number of plants in the SIC codes making up Secondary Fabricators (2451, 3357, 3523, 3531, and 3842) was derived by JKB Associates by taking the number of establishments with 20 or more employees, as listed in the Economic Information Systems data base for 1983, and expanding that number by the percent of establishments with fewer than 20 employees, as listed in County Business Patterns, 1980. Not knowing exactly how the 17,204 Secondary Fabrication (SF) workers and 4,304 SF plants were distributed among the 4 types of SF facilities, OSHA assumed that the workers and plants were distributed equally among the 4 types of SF facilities.

^c Assumed that 20% of 3045 shipbuilding/repair workers are not in compliance with current respirator requirements. Hence, the number of workers was adjusted to reflect the 20% of exposed workers.

^d Assumed average firm employs 9-10 workers as is true of SIC 17 (construction, special trade contractors).

^e Assumed that 25% of 51820 drywall removal, renovation, and demolition workers are not in compliance with current respirator requirements. Hence, the number of workers was adjusted to reflect the 25% of exposed workers.

^f This figure excludes segments that are in compliance with 0.5 PEL such as floor tile, brake repair, roofing felts, and repair and maintenance.

BILLING CODE 4510-28-C

respirators, and to assure that all such employees participate in the program and are informed of specified categories of information. OSHA considers this provision to be "necessary" within the meaning of section 6(c) of the Act, to reduce the grave danger faced by asbestos exposed employees. The absence of a training program requirement in the asbestos standard has been pointed out as one of the serious deficiencies of the current standard. OSHA believes that participation in an adequate training program is essential for the protection of employees because most protective provisions enlist the employee as an active participant. For example, many employees handling asbestos depend on effective work practices. Without training in applying these work practices, employee protection would be inadequate. Where the employee plays a more passive role in his protection such as where engineering controls are relied on, training is also essential, because the employee must know the sources of workplace asbestos contamination, and the health hazards of asbestos exposure, in order to assess his own exposure situation and to help recognize when engineering controls are not operating properly. Certainly where housekeeping plays an important role in control, instruction about housekeeping methods, for example, frequent vacuuming, is essential. Perhaps most importantly, where employee protection depends upon respirator use, OSHA's experience shows that training employees in the use, fitting and limitations of respirators is critical to the effectiveness of respirator protection. Accordingly this requirement applies where airborne concentrations are reasonably expected to exceed 0.5 f/cc, even if employees use respirators to reduce breathing zone concentrations and thereby comply with the ETS.

As set forth in paragraph (k)(4) the employer must inform the employee of the health effects of asbestos exposure; the relationship between asbestos and smoking in producing lung cancer; the operations exposing employees to asbestos fibers and necessary protective steps to minimize exposure; the purpose, proper use, fitting instructions and limitations of respirators, and the contents of all the provisions of the Asbestos Standard at 1910.1001.

5. *Paragraph (k)(5) Respiratory protection during the ETS.* The ETS adds a new paragraph (k)(5) which includes a table which ties respirator selection to the 0.5 f/cc PEL. Under the ETS, the concentration cut-offs for various kinds of respirators are

multiples of the reduced PEL of 0.5 f/cc, rather than multiples of the previous 2 f/cc permissible limit. For example, approved air purifying respirators may be used only where asbestos concentrations are not expected to exceed 5 f/cc (10 x the PEL). Before the ETS, because the PEL was 2 f/cc, such respirators could be used where asbestos concentrations would not have exceeded 20 f/cc (10 x the PEL of 2 f/cc).

Similarly, powered air purifying respirators may be used where asbestos concentrations do not exceed 100 times the PEL, which at the new level of 0.5 f/cc is 50 f/cc. Previously, employers could have used such respirators at concentrations up to 200 f/cc.

It is likely that the main impact of the reduced PEL on respirator choice will be in operations and industries where exposure levels are between 5 f/cc and 20 f/cc. Formerly, employees exposed in this range could use half-mask air purifying respirators; now they must be protected by a powered air purifying respirator or a full facepiece respirator, or they may use a supplied air respirator.

6. *Paragraph (k)(6). Warning signs during the ETS.* The ETS requires that legible signs warning of the health hazards of asbestos be displayed at locations where airborne concentrations of asbestos fibers exceed the reduced exposure limit of 0.5 f/cc. No specific legend is required signs for newly posted during the ETS. OSHA wishes to make as practicable as possible the rapid posting of signs, especially in workplaces where there has been previous non-compliance and in areas where asbestos concentrations were formerly below the 2.0 f/cc PEL.

XI. Public Participation

Interested persons are invited to submit written data, views and arguments with respect to the revisions to the asbestos standard made by the ETS. These comments must be postmarked on or before January 3, 1984 and sent to the Docket Officer, Docket No. H-033C, Occupational Safety & Health Administration, U.S. Department of Labor, 200 Constitution Avenue, NW., Room S-6212, Washington, D.C. 20210.

The data, views and arguments that are submitted will be available for public inspection and copying at the above address. All timely written submissions will be made a part of the record of the proceeding.

List of Subjects in 29 CFR Part 1910

Occupational safety and health
Asbestos, Health, Emergency temporary standard, Cancer.

Authority and Signature

This document was prepared under the direction of Thorne G. Auchter, Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue, NW, Washington, DC 20210. Pursuant to Sections 6(b), 6(c), 8(c) and 8(g) of the Act, 29 CFR 1910.1001 is amended by adding a new paragraph (k) as set forth below.

(Secs. 6(b), 6(c), 8(c) and 8(g). Pub. L. 91-596, 84 Stat. 1593, 1596, 1599, 1600; 29 U.S.C. 655, 657; Sec. 107, Pub. L. 91-54, 83 Stat. 96 [40 U.S.C. 333]; 29 CFR Part 1911; Secretary of Labor's Order No. 9-83 [48 FR 35736])

Signed at Washington, D.C., this 2nd day of November 1983.

Thorne G. Auchter,

Assistant Secretary of Labor.

PART 1910—[AMENDED]

Section 1910.1001 of Part 1910 of Title 29 of the Code of Federal Regulations is hereby amended by adding a new paragraph (k) reading as follows:

§ 1910.1001 Asbestos.

(k) *Emergency temporary standard effective November 4, 1983.*—(1) *Scope.* This emergency temporary standard is issued pursuant to section 6(c) of the Act and applies to all workplaces where employees may be exposed to asbestos in all industries covered by the Act, including, general industry, construction and maritime. Except to the extent modified by this emergency temporary standard all provisions of § 1910.1001 remain in effect.

(2) *Permissible levels of exposure.* The 8-hour time-weighted average airborne concentration of asbestos fibers to which any employee may be exposed shall not exceed one-half (0.5) fiber, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(3) *Methods of compliance with the emergency temporary standard.* Notwithstanding any other requirements of this section, compliance with the reduced exposure limit of 0.5 f/cc shall be achieved by any feasible combination of engineering controls, work practices, and personal protective equipment and devices.

(4) *Employee information and training.*—(i) As soon as possible, but not later than thirty (30) days from the effective date of this emergency temporary standard, the employer shall institute a training program for all employees exposed to airborne concentrations of asbestos in excess of

0.5 f/cc, without regard to the use of respirators and shall assure their participation in the program during the effective period of this emergency temporary standard.

(ii) The employer shall assure that each such employee is informed of the following:

(A) The health effects associated with asbestos exposure;

(B) The relationship between asbestos and smoking in producing lung cancer;

(C) The nature of operations which could result in exposure to asbestos and necessary protective steps to minimize exposure including, as applicable, engineering controls, work practices, respirators, housekeeping and protective clothing;

(D) The purpose, proper use, fitting instructions and limitations of respirators permitted by the standard; and

(E) A review of all the provisions contained in 1910.1001.

(5) *Respiratory protection during the ETS.* Notwithstanding any other requirement of this section, where respirators are used to achieve the permissible exposure limit of 0.5 f/cc they shall be selected according to Table 1.

(6) *Warning signs during the ETS.* In addition to the requirements of

paragraph (g)(1) of this section, legible signs warning of the health hazards of asbestos shall be provided and

displayed at each location where airborne concentrations of asbestos fibers may exceed 0.5 f/cc.

TABLE 1

Respiratory Protection

For Airborne Concentrations of Asbestos

<u>Airborne Concentration of Asbestos (TWA)</u>	<u>Required Respirator¹</u>
Not in excess of 5 f/cc (10 X PEL)	Reusable or single use air purifying respirator
Not in excess of 50 f/cc (100 X PEL)	Full facepiece air purifying respirator, or a powered air purifying res- pirator
Greater than 50 f/cc	A type "C" continuous flow or pressure demand, supplied air respirator.

¹ Respirators specified for high concentrations may be used at lower concentrations of asbestos.

(Secs. 6(b), 6(c), 8(c) and 8(g), Pub. L. 91-596,
84 Stat. 1593, 1595, 1599, 1600; 29 U.S.C. 655,
657; Sec. 107, Pub. L. 91-54, 83 Stat. 96 (40

U.S.C. 333); 29 CFR Part 1911, Secretary of
Labor's Order No. 9-83 (48 FR 35736))
[FR Doc. 83-30073 Filed 11-2-83; 1:45 pm]