

*See Appendix  
1st syllable*

PLAINTIFF'S EXHIBIT

DOW-2924

H A N D B O O K  
F O R  
H A N D L I N G  
A S B E S T O S M A T E R I A L

SI0002863

THE DOW CHEMICAL COMPANY  
TEXAS DIVISION

Maintenance Department  
Supporting Services

July 1972 Rev.

# HANDBOOK FOR HANDLING ASBESTOS MATERIALS

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## PURPOSE

The purpose of this handbook is to define safe handling procedures for asbestos materials used in the Texas Division. The intent is to control the exposure of employees to asbestos dust through the proper use of safe work procedures and by the substitution of non-asbestos containing materials.

Asbestos is widely used as structural wall board, insulation, and roofing material. Asbestos fibers are used as a mechanical reinforcing matrix in insulation, roofing paper, certain piping systems, etc. However, Dow Engineering Specifications were revised to exclude asbestos-containing insulation prior to installation of Federal regulations controlling the use and handling of asbestos. Eventually, the use of asbestos will be eliminated as the ultimate solution to the problem.

The OSHA standards which became effective July 7, 1972, define the precautions required for asbestos handling and the allowable safe working limits.

Should a hazard exist, and these procedures appear insufficient, contact the superintendent of the Plant A or B Functional groups for exceptions or variations.

These procedures will be reissued prior to 7 December 72 to incorporate revisions dictated by results obtained from the Division Monitoring Program.

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## SAFETY

The health of those who breathe asbestos dust may be seriously affected. Results can be similar but more serious than those caused by the more commonly known materials such as silica and coal dust. This phenomena has been observed for many centuries. Current medical discoveries show that handling of asbestos by a confirmed cigarette smoker is especially hazardous in the area of potentially serious lung disorders. It is recommended that those persons handling asbestos not smoke cigarettes in any quantity.

When working with materials which contain asbestos fiber, care must be taken to eliminate as much loose dust as possible. Wetting, isolating the work area, or other suitable procedures to eliminate the dust hazard are absolutely necessary. The main problem areas will be in removal of old, deteriorated insulation and the sawing of Transite.

Respiratory protection, dust collectors, blowers, etc., will be mandatory where asbestos-containing materials must be handled.

The two "nose and mouth" dust respirators which have been approved by the Safety Department are: (1) MSA Dustfoe 77, Dow Stock No. 15-26005, Cartridge No. 15-23775, and (2) Wilson Dust Respirator, Dow Stock No. 15-25460, Cartridge No. 15-23790. *3-M. mask #8610 #8790 #5710*

Disposal of asbestos will be in polyethylene bags, Dow Stock No. 15-05080 for large bag and 15-04170 through 15-04185 for small bags.

As required, special protective clothing such as coveralls, head covering and gloves will be provided. Such requirements will be determined by the Division Monitoring Program.

Two lockers will be provided, so separated or isolated as to prevent contamination of the employee's street clothes from his work clothes.

Asbestos-contaminated clothing shall be placed in labeled, polyethylene bags for shipment to the laundry.

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USE OF HANDBOOK  
FOR  
HANDLING ASBESTOS MATERIALS

The Safe Work Procedures outlined in this handbook are minimum requirements for working with asbestos containing materials.

In some cases, job conditions may dictate more stringent requirements. These could include completely wetting down the area with water when removing old insulation, or completely isolating the work area with tarpaulins, etc. Specific requirements for each job will be detailed on the "Insulators Safety Check List."

Because Dow's Engineering Specifications have been revised to exclude use of asbestos-containing insulation, most of the Safe Work Procedures in this section of the Manual will seldom be referred to for new installations.

These procedures are to be used in conjunction with Plant Safety Rules, Maintenance Standard Safe Work Procedures for the Area, and Safety Standards.

ST0002867

## SAFE WORK PROCEDURE

Subject: Shop Fabrication With Asbestos Materials

### Minimum Safety Equipment Requirements:

1. Side Shield Goggles must be worn.
2. Approved "Nose and Mouth" Dust Respirator must be worn at all times. (See Page 3)
3. There shall be a Dust Collecting System on Power Equipment adequate to remove large amounts of dust generated.
4. An Insulator Safety Check List is to be filled out prior to the job and properly approved. Turn in to supervisor at completion of job.

### Special Precautions:

1. Do not breathe asbestos dust.
2. Do not operate equipment if provision cannot be made to eliminate dust in a safe manner.
3. Normal precautions must be taken for working with power equipment. (See specific Safe Work Procedure for Operating Power Driven Tools if in doubt).
4. When cleaning out the vacuum system of the machines, a respirator must be worn. Wet down dust prior to handling. Place the wet material in polyethylene bags, seal, label and notify Yard Department that asbestos waste is ready for proper disposal at landfill.
5. Good housekeeping in the shop area is to be practiced. Asbestos dust must be vacuumed throughout the shop area if and when such conditions exist.
6. Keep all personnel not directly involved in the fabrication operation away from the area unless they observe minimum safety requirements and have been apprised of the hazards involved.

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SAFE WORK PROCEDURE (

Subject: Mixing Material Which Contains Asbestos

Minimum Safety Equipment Requirements:

1. Side Shield Goggles must be worn.
2. Approved "Nose and Mouth" Dust Respirator must be worn at all times. (See Page 3)
3. An Insulator Safety Check List is to be filled out prior to the job and properly approved. Turn in to supervisor at completion of job.

Special Precautions:

1. Do not breathe asbestos dust.
2. When mixing whole sacks, do not open sacks and dump into open mixing tray. Moisten asbestos by adding water through a small hole in sack until danger of dust is eliminated. Then the material can be removed if necessary to complete mixing operation to desired consistency.
3. Slipping or falling is a hazard to be considered when working around wet asbestos mud.
4. Back strains from handling containers of mixed mud are also a hazard. A means of handling this mixture may need to be provided, depending on the circumstances.
5. Keep all personnel not directly involved in the mixing operation away from the area unless they observe minimum safety requirements and have been apprised of the hazards involved.
6. All contaminated bags, boxes, waste, etc., shall be wetted, placed in labeled polyethylene bags and sent to landfill.

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## SAFE WORK PROCEDURE

Subject: Handling and Storing Asbestos Materials

### Minimum Safety Equipment Requirements:

1. Side Shield Goggles must be worn.
2. Approved "Nose and Mouth" Dust Respirator must be worn at all times. (See Page 3)
3. An Insulator Safety Check List is to be filled out prior to the job and properly approved. Turn in to supervisor at completion of job.

### Special Precautions:

1. Do not breathe asbestos dust.
2. Handle materials in such a manner as to minimize exposure to dust. Moisten material with water spray before removing from container if material will not be damaged.
3. Areas used to store asbestos containing materials should be marked "Asbestos Material".
4. Cartons, boxes, etc., that have contained asbestos materials should be wetted, broken and placed in labeled polyethylene bags for disposal.
5. Good housekeeping of shop areas is to be practiced. Clean up all loose dust on floor, machines, shelves, etc., by vacuuming. Wet down, place in labeled polyethylene bags and dispose of dust while damp. Notify the ~~Waste~~ Department to dispose by landfill while material is still damp.

*waste disposal 2417*

ST0002870

## SAFE WORK PROCEDURE

Subject: Sawing and Cutting by Hand

### Minimum Safety Equipment Requirements:

1. Hard Hat must be worn.
2. Side Shield Goggles must be worn.
3. Approved "Nose and Mouth" Dust Respirator must be worn at all times. (See Page 3)
4. An Insulator Safety Check List is to be filled out prior to the job and properly approved. Turn in to supervisor at completion of job.  
*Notify Environmental Health Services (1281) before removal.*
5. All other safety equipment which is required by job location must be used. (Read Area Safe Work Procedures.)

### Special Precautions:

1. Do not breathe asbestos dust.
2. Wear the "Nose and Mouth" Dust Respirator when removing asbestos material from package, installing, or cutting.
3. Keep all personnel not directly involved in the operation away from the area unless they observe minimum safety requirements and have been apprised of the hazards involved.
4. Special precautions shall be taken when using "Skil-Saw" for sawing asbestos materials. To eliminate dust hazards and protect all people in the area, an air operated saw shall be used and the material shall be flooded with water.
5. If water will damage the material, a hand saw shall be used and sawdust collected with a portable vacuum whenever possible. If site work prohibits use of a vacuum pick-up, cuts should be made directly over a collection box or polyethylene bag.
6. All contaminated bags, boxes, waste, etc. shall be wetted, placed in labeled polyethylene bags and sent to landfill.

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## SAFE WORK PROCEDURE

Subject: Insulation Removal

### Minimum Safety Equipment Requirements:

1. Hard Hat must be worn.
2. Side Shield Goggles must be worn.
3. Approved "Nose and Mouth" Dust Respirator must be worn at all times. (See Page 3)
4. An Insulator Safety Check List is to be filled out prior to the job and properly approved. Turn in to supervisor at completion of job.  
*Notify Environmental Health Services (1281) before removal*
5. All other safety equipment which is required by job location must be used. (Read Area Safe Work Procedure.)

### Special Precautions:

1. Do not breathe asbestos dust.
2. Hazards from asbestos dust that falls, blows or may be scattered throughout the area must be eliminated.
3. Keep all personnel not directly involved in the insulation removal operation away from the area unless they observe minimum safety requirements and have been apprised of the hazards involved.
4. Use water to wet down the insulation before and during removal.
5. Seal all material in labeled polyethylene bags as removed. ~~The Yard Department~~ is to be notified for disposal at landfill.

*waste disposal (2471)*

ST0002872

JOB DESCRIPTION: \_\_\_\_\_ DATE \_\_\_\_\_

LOCATION \_\_\_\_\_

| AREA                                       | YES                      | NO                       |
|--------------------------------------------|--------------------------|--------------------------|
| 1. Safe Work Permit Received               | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Area Safe Work Procedure Known          | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Nearest Phone _____                     |                          |                          |
| 4. Nearest Eyebath and Safety Shower _____ |                          |                          |
| 5. Job Site in Safe Condition              | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Is Pipe or Equipment Safe to Work On?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Are Corrosive Chemicals Involved?       | <input type="checkbox"/> | <input type="checkbox"/> |
| a. Can lines or equipment be drained?      | <input type="checkbox"/> | <input type="checkbox"/> |
| Is Adjacent Piping and Equipment Safe      | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Red Tags Needed?                        | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Burn Hazards Present?                  | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. Craftsmen Lined Up With Check List?    | <input type="checkbox"/> | <input type="checkbox"/> |

Special Hazards \_\_\_\_\_

Special Safety Precautions \_\_\_\_\_

Checked and Approved By: \_\_\_\_\_

DATE: \_\_\_\_\_

Supt. \_\_\_\_\_

Foreman \_\_\_\_\_

Crewleader \_\_\_\_\_

Craftsman \_\_\_\_\_

## II. ASBESTOS WORK

|                                                   | YES                      |
|---------------------------------------------------|--------------------------|
| 1. Handbook for Handling Asbestos Materials Used? | <input type="checkbox"/> |
| 2. Signs and/or Barricades Up to Warn Others ?    | <input type="checkbox"/> |
| 3. Has Disposal of Debris Been Arranged ?         | <input type="checkbox"/> |
| 4. Is Water Needed to Control Dust ?              | <input type="checkbox"/> |
| 5. Stencil on Job to Denote Materials Used ?      | <input type="checkbox"/> |
| 6. Have all Involved Personnel Been Informed ?    | <input type="checkbox"/> |

## III. Special Safety Equipment. Require

|                          |                      |
|--------------------------|----------------------|
| <input type="checkbox"/> | Coveralls            |
| <input type="checkbox"/> | Chemical Goggles     |
| <input type="checkbox"/> | Face Shield          |
| <input type="checkbox"/> | Acid Hood            |
| <input type="checkbox"/> | Air Mask             |
| <input type="checkbox"/> | Dust Respirator      |
| <input type="checkbox"/> | Rubber Gloves        |
| <input type="checkbox"/> | Rubber Boots         |
| <input type="checkbox"/> | Slicker Coat         |
| <input type="checkbox"/> | Slicker Pants        |
| <input type="checkbox"/> | Safety Belt          |
| <input type="checkbox"/> | Hearing Protection   |
| <input type="checkbox"/> | Other: Specify _____ |

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## IV. Personnel on Job (Name)      Exposure Time-Hr

|    |       |       |
|----|-------|-------|
| 1. | _____ | _____ |
| 2. | _____ | _____ |
| 3. | _____ | _____ |
| 4. | _____ | _____ |
| 5. | _____ | _____ |
| 6. | _____ | _____ |

# THRESHOLD LIMIT VALUE

No employee shall be exposed at any time to airborne concentrations of asbestos fibers in excess of 10 fibers, longer than 5 micrometers, per cubic centimeter of air. The eight hour time-weighted average shall not exceed five (5) fibers per cubic centimeter.\*  
2

In order to assure compliance with these limits, the Environmental Health Group will make random samples. When special field testing is desired, call Environmental Health at 238-2121.  
7281

In order to keep asbestos dust concentration within the proper limits, any dusty conditions connected with the handling of asbestos materials must be kept to an absolute minimum. This must be done as outlined in the previous Safe Work Procedures by wetting down the area, pre-soaking the material, or vacuuming the material as it is cut. Each individual job should be planned with this uppermost in mind.

\* Effective 1 July 1976, this limited is reduced from five (5) to two (2) fibers per cubic centimeter.

ST0002874

# Latest word on asbestos won't be the last

Scientific evidence against asbestos continues to accumulate, and OSHA's much-delayed exposure standard goes on bringing criticism from all concerned parties. Meanwhile, millions of workers remain exposed to asbestos dust in plants throughout the world.

□ Bad news about asbestos continues to make headlines. In September, for instance, Joseph A. Califano, Secretary of Health, Education, and Welfare (HEW), drew attention to an alarming statistic in a new study by the National Cancer Institute (NCI) and the National Institute of Environmental Health Sciences (NIEHS): An astonishing 17% of all cancer deaths in the U.S. over the next few decades will be linked to some previous exposure to asbestos.

Speaking at the AFL-CIO National Conference on Occupational Safety and Health, Califano said that the NCI/NIEHS report definitely rejects the conventional estimate that 1 to 5% of all U.S. cancer incidence is related to occupational exposure to carcinogenic agents. Estimates of 20% to as high as 38% are not unreasonable, he added.

EXPOSURE THAT KILLS—The joint

study estimates that between 8 and 11 million U.S. workers have been exposed to asbestos since the beginning of World War II. Of these, about 4 million have been "heavily exposed,"—i.e., worked directly with the material most of the time—and 4 to 7 million have received "peripheral" exposure—e.g., of the sort that a maintenance worker would get in a plant where asbestos was being installed.

The NCI/NIEHS report assumes that 20 to 25% of those in the first group will die of lung cancer, 7 to 10% of pleural or peritoneal mesothelioma (a particularly lethal cancer), and 8 to 9% of gastrointestinal cancer. Assuming that the risk to the second group is 25% that of the first one, the report concludes that a total of 2.15 million workers will die over the next 30 to 35 years, or about 67,000 per year. This

represents a whopping 17% of all cancers detected annually in the U.S.

The joint study's figures on exposure for workers are taken from HEW estimates (the department believes that 1.5 to 2.5 million U.S. workers are still being exposed to asbestos), while the fatality percentages are borrowed directly from a World Health Organization (WHO) position paper issued in early 1977. This link with the WHO document is confirmed by Joseph Wagoner, special assistant for carcinogenesis with the Occupational Safety and Health Administration (OSHA), who was a member of the group of health experts that authored the WHO study.

Meanwhile, a spokesman for NCI/NIEHS says that the joint report is basically an update of epidemiological data on asbestos, in the light of new information uncovered in the past year.

Whatever its origin, the NCI/NIEHS work is attracting its share of criticism by way of an attack on Califano's recent statement. Some claim that the HEW secretary is unnecessarily alarming the public. Asbestos no longer causes widespread sickness because working conditions have changed, they say.

Dr. Irving J. Selikoff, a well-known authority on asbestos, and director of Mt. Sinai Medical Center's Environmental Health Laboratory (New York City), notes that "Califano's remarks are projections based on limited data, and probably represent an upper limit." But he warns that even if Califano's figures are off by a factor of two, the problem is enormous.

However, a spokesman for the American Cancer Soc. (ACS), New York City, feels that the NCI/NIEHS report does overstate the problem.

INDUSTRY RESPONSE—The Asbestos Information Assn. (AIA), Arlington, Va., an organization of asbestos processors, says that the NCI/NIEHS data are being analyzed by the group's scientific advisors, and that a statement will be issued when the study is complete. Meanwhile, an AIA press release calls the report "simply another extrapolation in statistical terms from the same data which have been available to the international scientific community for some time."

Another AIA press release, issued in response to a Califano statement (made in April) regarding a large



Fiberglass insulation, an alternative to asbestos, is considered safer

## U.S. firms still use it, despite its checkered career

The term "asbestos" comprises a group of impure magnesium silicate minerals—e.g., chrysotile, amosite—that occur in fibrous form. Reports of the toxic properties of asbestos date back to the 1920s in the U.S. However, it wasn't until the war broke out, when millions of workers were employed in shipyards insulating warships, that mass exposure to asbestos dust occurred in this country.

The material enjoyed wide popularity as an insulator in plants and buildings until 1970, when, in response to mounting evidence of its toxic properties, manufacturers stopped producing insulation made of loosely bound asbestos fiber.

The Asbestos Information Assn. says that the 3,000 asbestos products made today in the U.S. contain chemically and physically bound fibers that do not flake off. Current end-use breakdown: asbestos cement products (pipe, sheets), 22.4%; roofing products, 34.9%; asbestos paper, 4.3%; flooring products, 15.6%; packing and gaskets, 2.8%; thermal and electrical insulation, 1.2%; friction products (brake linings), 8.8%; coatings and compounds, 2.7%; plastics, 3.0%; textiles, 1.0%; and miscellaneous, 3.3%.

outbreak of asbestos-related diseases among World War II shipyard workers, explains that such a heavy exposure to asbestos existed before medical information revealed the dangers involved. Since then, millions of dollars have been spent in dust-control equipment by miners, millers, processors and manufacturers of asbestos.

In addition, note other asbestos-industry spokesmen, the type of products made in the past—e.g., asbestos thermal insulation—are no longer produced. They were phased out in the early 1970s, when the inherent hazards became apparent (see box).

Nevertheless, asbestos is still used as an insulator or fire retardant in more than 3,000 products ranging from water pipes to brake linings. And an estimated 500 million tons of the material are still around in plants and buildings throughout the U.S., according to Roy Steinfurth, administrator of the insulation health-hazards programs for the International Assn. of Heat and Frost Insulators and Asbestos Workers (Washington). Workers still exposed to asbestos are not adequately protected, charges Selikoff.

**CIGARETTE LINK**—Industry spokesmen also point out that exposure to asbestos alone may not be enough to cause lung cancer—the disease most commonly associated with the breathing of asbestos fibers—and that the connection between exposure and cigarette smoking has not been stressed enough. Says John A. McKinney, president of Johns-Manville Corp. (a

leading maker of asbestos products): "Clinical evidence shows that lung cancer in asbestos workers is virtually limited to those who smoke cigarettes, and that for practical purposes, lung cancer as an asbestos-related disease would not be a problem were it not for cigarette smokers."

AIA is currently on a vigorous campaign to persuade industry workers to stop smoking.

"There is no doubt that exposure and cigarette smoking have a synergistic effect," says an ACS spokesman, "but since so many workers included in past studies were smokers or ex-smokers, it's difficult to assess the risk to non-smokers."

The synergism is acknowledged in the WHO document. "Both cigarette smoking and exposure to asbestos independently cause lung cancer. However, when present together, they act in a multiplicative fashion." The NCI/NIH study agrees, and admits that it would be an error to attempt to blame each type of cancer mentioned in the report on an exclusive cause.

**A NEW STANDARD?**—The current flareup of the asbestos controversy is of more than marginal interest to OSHA, which has been trying to modify present rules governing exposure to the material (the agency is studying the NCI/NIH report).

For more than three years, OSHA has been pushing a proposal to reduce the permissible level of airborne fibers in the workplace from a present value of 2 fibers/cm<sup>3</sup> to 0.5 fiber/cm<sup>3</sup> on an

8-h, time-weighted basis, with a 15-min ceiling of 5 fibers/cm<sup>3</sup>. All limits apply only to fibers longer than 5 µm. (NIOSH, which serves in an advisory capacity, has recommended a limit of 0.1 fiber/cm<sup>3</sup>.)

OSHA is currently evaluating the economic impact of the proposed standard, which is bound to affect both processing and use of the material.

Predictably, industry response to the idea has not been favorable. AIA calls the 0.5-fiber/cm<sup>3</sup> limit "not technically feasible," and recommends instead the adoption of 2 fibers/cm<sup>3</sup> as a permanent standard—one that can be realized at a reasonable cost for dust control.

On the other side of the spectrum, Roy Steinfurth, the asbestos workers' spokesman, feels that the only acceptable level is no asbestos exposure at all. The union official says that, even if the exposure level is reduced to 0.5 fiber/cm<sup>3</sup>, a worker would breathe in 4 million fibers in an 8-h workday. He estimates that as many as 50% of the members of his organization will eventually die of asbestos-related diseases.

In Europe, there is also a move to cut down on the exposure level, which has been 2 fibers/cm<sup>3</sup> in the past few years. Italy, which lacks asbestos deposits, is attempting to phase out the material completely. Sweden moved to a 1-fiber/cm<sup>3</sup> standard a year ago, and U.K. authorities are clamoring for a reduction of the present limit.

Critics who complain that the OSHA proposal does not go far enough in protecting workers also question why the standard should apply only to fibers longer than 5 µm. Both Selikoff and Wagoner, for example, believe that the smaller fibers are even more active in producing lung tumors. And, according to Selikoff, "For each fiber longer than 5 µm, there may be as many as 100 shorter ones."

OSHA's Health Standards Project Officer William Warren says that the 5-µm length was the most practical alternative because detection equipment does not pick up anything smaller. Warren notes that available monitoring units detect only "from a few percent to 50%" of the actual number of fibers in a sample.

**INSULATION DANGER**—Spot checks with a number of U.S. insulation manufacturers turned up no one still making the asbestos-containing version. However, there are still tons of it

ST0002876

installed in chemical plants all over the world. Since the asbestos is loosely bound, the cutting, handling and tearing down of such insulation poses a health hazard.

"If the insulation is intact, there's no problem," says an engineer with Britain's ICI, Ltd., "Whenever maintenance requires stripping down and removal, we replace with a substitute material." He adds that the firm does not specify asbestos for any new plants.

"We stopped using asbestos for insulation about seven or eight years ago," claims the safety manager of a U.S. refinery. "Although it is cheaper and easier to apply, the health risks persuaded us to switch to fiberglass and calcium carbide." He further notes that although some asbestos is still used, it is of the bonded type, which does not present a potential dust hazard.

The indirect risks of asbestos insulation were highlighted in a recent study of maintenance workers at American Cyanamid's facility in Bound Brook, N.J. The survey, commissioned by the

International Chemical Workers Union (ICWU), Washington, and carried out by the Mt. Sinai Medical Center, identifies the risks faced by maintenance workers (other than insulation installers) when working in the vicinity of an insulation job.

According to Larry Ahern, director of health and safety for ICWU, the results show that 44% of all workers, regardless of job function, had some form of asbestos-related lung abnormality. One group of workers exposed for less than one month experienced a significant increase in the incidence of lung disease.

Worse, the researchers discovered that many of the workers' relatives, who had not been in direct contact with the material, were affected. "About 123 wives were sick," says Steinfurth.

**HOW ABOUT SUBSTITUTES?**—Such popular asbestos replacements as fiberglass, mineral wool and calcium silicate may have health hazards of their own, but these have yet to be identified.

In a criteria document issued in

April 1977, NIOSH said: "Fibrous glass seems to be considerably less hazardous than asbestos . . . and, until more information is available, the recommended standard can also be applied to other manmade mineral fibers." The NIOSH paper suggests a standard of 3 fibers/cm<sup>3</sup> for fibers of less than 3.5- $\mu$ m dia. Larger fibers are not thought to be respirable.

Ralph Zumwalde, an industrial hygienist at NIOSH, points out that most of the exposure to fiberglass involves fibers with diameters greater than 3.5  $\mu$ m, even though some special products contain thinner ones.

"Fiberglass is an irritant, and can cause skin irritation or upper respiratory irritation," says Dr. Donald J. Billmaier, assistant medical director of Owens-Corning Fiberglas Corp. (Toledo, Ohio, "but our studies show that there are no chronic adverse health effects from using the material."

Calcium silicate is classified as nuisance dust, not a fiber. The OSHA standard is 15 particles/cm<sup>3</sup> for the respirable fraction.

Vincent Cavasotto

## Gulf Coast buildup may ease olefin glut

□ A more hopeful outlook for ethylene derivatives is triggering major expansions in the Gulf Coast area, and these may help alleviate, at least locally, the ethylene surplus that is predicted through the early 1980s (*Chem. Eng.*, Mar. 27, p. 80).

Consider, for example, the current buildup at the Raporte, Tex., complex of the USI Div. of National Distillers and Chemical Corp. The company, which last year increased its high-density polyethylene (HDPE) capacity to 500 million lb/yr, boosted its low-density polyethylene (LDPE) capacity by 200 million lb/yr this spring. Another ethylene-consuming addition is under way—USI will complete early next year a vinyl acetate monomer expansion. This will raise monomer capacity from 375 million lb/yr to 600 million lb/yr. The three expan-

sions will consume a total of just under 500 million lb/yr of ethylene.

Shell has marked the tenth anniversary of its complex at Geismar, La., by inaugurating ethylene oxide and ethylene glycol trains, now about 60% completed. About a year ago, the company began work to increase oxide production from 300 to 700 million lb/yr, and glycol output from 150 to 350 million lb/yr. "This expansion will be ready for startup in early 1979," says plant manager Fred Foster. The ethylene oxide boost will require 340 million lb/yr of ethylene raw material.

Shell will also add flexibility to the Gulf Coast ethylene distribution system with a new 254-in ethylene pipeline that will run from Mont Belvieu (just east of Houston) to Napoleonville, La., near Shell's petrochemical

plant at Norco. The company is building a 1.5-billion-lb/yr ethylene plant there, which is expected to go onstream in 1981. Says A. R. Flora, Shell's olefins business manager, "The pipeline will help to eliminate spot shortages in Texas and Louisiana complexes, which are the heart of the petrochemical industry."

USI executives now speak more optimistically about the future of downstream products, and predict a better supply/demand balance. According to George Kappas, vice-president of National Petrochemicals Corp. (jointly owned by National Distillers and Owens-Illinois), HDPE is currently moving away from oversupply.

"At present," says Kappas, "there is a slight surplus of HDPE. However, producers are not building up year-end inventories, and demand is growing steadily. Consequently, in 1980 and 1981, supply and demand will be somewhat tighter than they are today." Kappas notes that domestic need for the resin has grown at an average annual rate of more than 11% since 1971. LDPE will be in balance by 1980, according to USI estimates.

ST0002878

## GUIDELINES FOR HANDLING OF SILICA DUST

### INTRODUCTION

These guidelines are provided to further alert our customers to the potentially harmful health effects and the increase of risk of serious disease caused by the inhalation of silica dust. The developing medical and scientific evidence strongly suggests that as the amount and/or duration of silica dust inhalation increases, the risk of serious and possibly fatal respiratory and other diseases also increases. Even a minimal inhalation of silica dust may pose a health hazard. While C-E is not in a position to agree or disagree with all the various scientific and medical studies, C-E does believe that various precautions could minimize whatever risk is associated with silica dust inhalation. These guidelines also provide information which may assist you in implementing, monitoring and evaluating your own industrial hygiene and dust control programs to minimize potentially harmful personnel exposures. While C-E cannot assure that these procedures will eliminate risk, they should tend to reduce the risk.

### CLASSIFICATION OF SILICA DUST

Free silica is uncombined silicon dioxide ( $\text{SiO}_2$ ). Silicates contain silicon and oxygen combined with other elements in a more complex molecule. With the exception of asbestos and some talcs, silicate dusts should not ordinarily cause disabling lung conditions such as is produced by free silica.

It is uncombined or free silica that is most important in industrial dust exposure. So that an exposure can be properly evaluated, the percentage of uncombined silica must be determined by petrographic analysis, preferably by x-ray diffraction or infra-red techniques.

### HARMFUL EFFECTS OF DUST

It has been generally stated that the size of the offending dust particles is of extreme importance in determining the concentration of particles that may be suspended in the air. The size of particles also determines the depth to which these particles penetrate into the lung along with the quantity that may become deposited and retained.

The particulates less than 10 microns in size are potentially the most harmful. Generally, when airborne particles are substantially larger than 10 microns in diameter, they are not of great concern because they are unable to penetrate into the lung where they could be damaging. Instead, they are removed, and collected, by the nasal passages or upper respiratory system.

Also, it has been generally stated that the duration of dust inhalation is of extreme importance. Persons who for many years have continuously inhaled free silica dust have a great likelihood of contracting a silica related or caused disease. Those who only intermittently inhale the dust have less risk of injury. In addition, those persons who smoke will increase the risk which otherwise exists.

### INSTALLATION AND TEAR-OUT

It is important to be aware that exposure to silica dust can occur during installation of products that contain free silica as well as during tear-out and repair of facilities where products containing free silica have previously been installed.

Protective measures should be taken during both installation and tear-out and repair operations.

### SILICOSIS

Inhalation of progressively excessive amounts of silica dust can produce rapidly-developing (acute) or chronic silicosis — a disabling lung disease. Typically, the lung tissue reacts to the presence of silica particles by forming fibrous matter around the particle. Evidence suggests that particles below one micron (one-millionth of a meter) in size may be the most dangerous since they may penetrate deeper into the lungs in high concentrations. In rapidly-developing silicosis, symptoms appear 8 to 18 months after the first exposure. Chronic silicosis, the type usually encountered in industry, generally is produced 5-20 years after the chronic silica inhalation.

Silicosis is generally classified in three separate stages by medical authorities.

The first stage of the disease produces no disability. The affected man can carry on his work as well as ever. Frequently, the individual is not aware that anything is wrong, and the disease is revealed only by opaque nodular shadows on a chest x-ray coupled with a known exposure to crystalline free silica.

In the second stage, respiration may be affected in some persons but not in all by any means. Labored breathing, on heavy exertion usually is noted first, and a dry cough also may be present.

The third stage can develop after the second stage even though the individual has been removed from exposure to silica dust. However, the progress of the disease will be slower without continued dust exposure. Breathing may become severely labored. The worker is far below normal physically and is susceptible to respiratory diseases. Chest x-ray may show an enlarged heart as a result of the body's attempts to overcome the resistance of restricted blood vessels in the lungs. Pulmonary tuberculosis and emphysema are frequent complications.

In addition to causing silicosis, the inhalation of silica dust can otherwise weaken the lungs and their natural cleansing process. As a result, the inhalation of silica dust may be a contribution factor leading to other respiratory diseases. Medical and scientific analysis is continuing, and the total effect of silica inhalation is not known. What is known strongly indicates that silica inhalation is hazardous to health.

### THRESHOLD LIMIT VALUE (TLV)

TLV's or Threshold Limit Values of mineral dusts are time weighted average concentrations considered permissible for exposures of eight hours per day, five days per week that are published by the American Conference of Governmental Industrial Hygienists (ACGIH) and have been promulgated as standards of OSHA.

These values have been obtained from the experience of many groups in industry and from laboratory studies on animals. They are reviewed annually and changed as necessary on the basis of experience. Copies of TLV's may be obtained by writing to:

American Conference of Industrial Governmental Hygienists  
U.S. Public Health Service  
P.O. Box 1937  
Cincinnati, OH 45201

For maximum safety, C-E does not recommend the inhalation of any silica dust.

### MEDICAL REQUIREMENTS

An effective medical control program for exposed personnel will help prevent occupational diseases. Such a program can also serve as a check on engineering controls because symptoms of exposure in a group of workers could indicate inadequate controls.

Examinations should be performed by, or under the supervision of a licensed physician and should be given to all personnel prior to their assignments to areas in which airborne concentrations of dust may exceed the permissible exposure limits.

These examinations should include as a minimum the following:

1. Medical and occupational history
2. Chest x-ray
3. Pulmonary function studies
4. Physical including body weight, height and age

### INDUSTRIAL HYGIENE MEASUREMENTS

Personnel dust exposures should be evaluated by dust measurements and a step-by-step analysis should be made to determine the conditions under which personnel are exposed to silica material. A standard procedure using personal sampling pumps should be employed in silica dust sampling. Sampling Data Sheet #S315 found in the "NIOSH" Manual of Sampling Data Sheets" may be used to sample respirable silica dust.

### ABATEMENT OF PERSONNEL EXPOSURES

#### VENTILATION

The primary means of controlling airborne dust is through use of proper ventilation. For detailed information refer to the ACGIH publication, "Industrial Ventilation, a Manual of Recommended Practices".

#### PROTECTIVE EQUIPMENT

Respiratory protection should be used by personnel working in dust environments where the ventilation system is inadequate or non-operational. A combination of both proper ventilation and respiratory protection would tend to eliminate most risks.

For details on use of respirators refer to the ANSI standard, Z88.2-1969 "Practices for Respiratory Protection".

ST0002879

ASBESTOS WORK  
INSULATOR CHECK LIST

JOB DESCRIPTION: \_\_\_\_\_

LOCATION: \_\_\_\_\_

| 1. AREA                                    | YES                      | NO                       |
|--------------------------------------------|--------------------------|--------------------------|
| 1. Safe Work Permit Received               | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Area Safe Work Procedure Known          | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Nearest Phone _____                     |                          |                          |
| 4. Nearest Eyebath and Safety Shower _____ |                          |                          |
| 5. Job Site in Safe Condition              | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Is Pipe or Equipment Safe to Work On?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Are Corrosive Chemicals Involved?       | <input type="checkbox"/> | <input type="checkbox"/> |
| a. Can lines or equipment be drained?      | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Is Adjacent Piping and Equipment Safe?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Red Tags Needed?                        | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Burn Hazard Present?                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. Craftsmen Lined Up With Check List?    | <input type="checkbox"/> | <input type="checkbox"/> |

SPECIAL HAZARDS \_\_\_\_\_

SPECIAL SAFETY PRECAUTIONS \_\_\_\_\_

|                  |       |
|------------------|-------|
| ISSUED BY:       | Date: |
| Supt. _____      | _____ |
| Foreman _____    | _____ |
| Crewleader _____ | _____ |
| Craftsman _____  | _____ |

| 11. ASBESTOS WORK                                | YES                      | NO                       |
|--------------------------------------------------|--------------------------|--------------------------|
| 1. Handbook for Handling Asbestos Materials Used | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Type of Material to be Removed Known          | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Signs and/or Barricades Up to Warn Others     | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Has Disposal of Debris Been Arranged          | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Is Water Needed to Control Dust               | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Stencil on Job to Denote Materials Used       | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Have All Involved Personnel Been Informed     | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Other _____                                   |                          |                          |

Special Safety Equipment

- |                          |           |
|--------------------------|-----------|
| 1. Chemical Goggles      | SI0002880 |
| 2. Face Shield           |           |
| 3. Acid Hood             |           |
| 4. Air Mask              |           |
| 5. Dust Respirator       |           |
| 6. Rubber Gloves         |           |
| 7. Rubber Boots          |           |
| 8. Slicker Coat          |           |
| 9. Slicker Pants         |           |
| 10. Safety Belt          |           |
| 11. Hearing Protection   |           |
| 12. Other. Specify _____ |           |

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

DESCRIPTION: \_\_\_\_\_

LOCATION: \_\_\_\_\_

I. HAZARD

- |                                            | YES                      | NO                       |
|--------------------------------------------|--------------------------|--------------------------|
| 1. Safe Work Permit Received               | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Area Safe Work Procedure Known          | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Nearest Phone _____                     |                          |                          |
| 4. Nearest Eyebath and Safety Shower _____ |                          |                          |
| 5. Job Site in Safe Condition              | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Is Pipe or Equipment Safe to Work On?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Are Corrosive Chemicals Involved?       | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Can lines or equipment be drained?      | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Is Adjacent Piping and Equipment Safe   | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Red Tags Needed?                       | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. Burn Hazards Present?                  | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. Craftsmen Lined Up With Check List?    | <input type="checkbox"/> | <input type="checkbox"/> |

Special Hazards \_\_\_\_\_

Special Safety Precautions \_\_\_\_\_

Issued By \_\_\_\_\_ Date \_\_\_\_\_

apt. \_\_\_\_\_

Foreman \_\_\_\_\_

Foreloader \_\_\_\_\_

Craftsman \_\_\_\_\_

II. ASBESTOS WORK

- |                                                  | YES                      |
|--------------------------------------------------|--------------------------|
| 1. Handbook for Handling Asbestos Materials Used | <input type="checkbox"/> |
| 2. Type of Material to Be Removed Known          | <input type="checkbox"/> |
| 3. Signs and/or Barricades Up to Warn Others     | <input type="checkbox"/> |
| 4. Has Disposal of Debris Been Arranged          | <input type="checkbox"/> |
| 5. Is Water Needed to Control Dust               | <input type="checkbox"/> |
| 6. Stencil on Job to Denote Materials Used       | <input type="checkbox"/> |
| 7. Have All Involved Personnel Been Informed     | <input type="checkbox"/> |
| 8. Other _____                                   |                          |

Special Safety Equipment

- |                         |  |
|-------------------------|--|
| 1. Chemical Goggles     |  |
| 2. Face Shield          |  |
| 3. Acid Hood            |  |
| 4. Air Mask             |  |
| 5. Dust Respirator      |  |
| 6. Rubber Gloves        |  |
| 7. Rubber Boots         |  |
| 8. Slicker Coat         |  |
| 9. Slicker Pants        |  |
| 10. Safety Belt         |  |
| 11. Hearing Protection  |  |
| 12. Other Specify _____ |  |

SI0002881