

THE LABORATORY USE OF ASBESTOS

Union Carbide Corporation
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TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
INTRODUCTION	1
ASBESTOS AND HEALTH	1
EMPLOYEE BRIEFING CHECKLIST	2
RECOMMENDED WORK PRACTICES	2
REQUIREMENTS OF THE OSHA ASBESTOS REGULATIONS	3
Exposure Limits	3
Monitoring	
Initial	4
Periodic	4
Compliance Details - Allowable Levels <u>Not</u> Exceeded	
Medical Examinations	4
Respirators	5
Caution Labels	5
Warning Signs	6
Housekeeping	6
Waste Disposal	6
Compliance Details - Allowable Levels Exceeded	6

423505

LABORATORY USE OF ASBESTOS

INTRODUCTION

Any occupational use of asbestos is subject to compliance with the Federal Occupational Safety and Health Standard CFR-29, 1910.1001, "Standard for Exposure to Asbestos Dust". No exceptions are made for the infrequent, low-level exposure conditions that normally exist in the laboratory situation so the applicable sections must be complied with by laboratory employees.

This manual is intended to provide the supervisor and the employee working with asbestos in the laboratory with the information needed to work safely and to meet the pertinent OSHA requirements. The present state of knowledge regarding the asbestos-health question is covered. A checklist of points of information needed for an employee working with asbestos is provided together with good work practices. Finally, certain specific actions needed to comply with the OSHA regulations are discussed. A copy of the OSHA regulations and the Union Carbide Material Safety Data Sheet for asbestos are also included.

ASBESTOS AND HEALTH

The hazards of asbestos have received a great deal of publicity over the past six years and continue to do so today. Much of this clamor is in the public press and tends to be both sensational and misleading. There is no question that asbestos, when handled without the proper precautions, can be a health hazard. Properly used it can be a safe and very valuable industrial material. This situation is true for a substantial portion of the materials used on the Niagara Falls property so that asbestos is not unique.

It is important that a person assigned to work with asbestos in the laboratory has a clear, balanced understanding of the extent and nature of

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the hazard this material presents. Four relevant documents on this subject are attached. The supervisor should be aware of the main points about asbestos-related diseases. He should discuss this subject with the worker assigned to use asbestos and give him copies of these documents for his own use. Providing the documents without explanation is not adequate.

EMPLOYEE BRIEFING CHECKLIST

In addition to the asbestos and health discussion just mentioned, an employee newly assigned to work with asbestos should be informed by his supervisor about the items in the following list. This information program should be repeated approximately annually to reinforce the emphasis on safety.

1. The specific nature of the operations which could result in exposure to asbestos fibers as well as any necessary protective steps;
2. The engineering controls and work practices associated with the employee's job assignment;
3. The purpose, proper use, and limitations of any respiratory protection equipment provided.
4. The purpose for, and a description of, the medical surveillance program.
5. A review and explanation of the portions of the Asbestos Standard that apply to the employee's job.

RECOMMENDED WORK PRACTICES

The principle hazards from asbestos arise from breathing of the asbestos dust. The primary consideration in the laboratory is to keep dust generation at the lowest practicable level and, in no event, creating exposure greater than that permitted in the current OSHA standard. The following guidelines must be followed:

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1. Any incoming bags or containers of asbestos should be inspected and if damaged, should be repaired immediately.
2. Large spills should be cleaned up wet or with a suitable vacuum cleaner. Small spills can be wiped up, carefully scraped, or brushed up in a manner to avoid serious dusting. Never blow asbestos off clothing with an air hose.
3. Asbestos-containing waste should be disposed of in sealed, dust-tight bags. The appropriate warning label must be attached whenever it is required by OSHA regulations.
4. Wherever practical, weighing and transfer of asbestos should be done in the fume hoods provided. In any case, handle fiber slowly and with care to minimize dusting.
5. For clean up of large spills or in situations where substantial puff of dust are likely to be generated, wear the respirator provided.
6. Pilot plant or other operations where substantial quantities of asbestos are used must be provided with proper hoods and engineering controls to keep airborne asbestos dust levels within the limits prescribed by the OSHA regulations.

REQUIREMENTS OF THE OSHA ASBESTOS REGULATIONS (1910.1001)

The following discussion will cover the main points in the regulations as they relate to typical laboratory operations. It is intended to highlight and supplement the regulations, not replace them. A copy of the regulations is attached. Any supervisor directly responsible for laboratories where asbestos is used must be familiar with them.

Exposure Limits

A maximum asbestos exposure of 2 fibers/cc $>5\mu$ for an eight-hour time-weighted average and 10 fibers/cc $>5\mu$ ceiling are permitted. Fiber levels

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must be determined by a prescribed sampling and counting procedure.

It has been our experience that normal laboratory operations do not produce ceiling concentrations in excess of 1 fiber/cc $>5\mu$. Asbestos is also only handled dry for a moderate part of the day so time-weighted averages are generally well below 0.5 fiber/cc $>5\mu$.

Monitoring

Initial: Every place of employment where asbestos fibers are released must be monitored in such a way as to determine whether every employee's exposure is below the prescribed limits. Both personal and environmental (area) samples are required.

Periodic: If the initial samples give results below the allowable levels and there is no reasonably foreseeable situation where they will exceed it in the future no further monitoring is required by the regulations. It is good practice, however, to monitor regularly and an annual survey should be made. If the initial samples give results above the allowable levels repeated samples at intervals not to exceed six months are required by law.

The Niagara Falls Laboratory has the equipment and trained personnel to conduct monitoring. All monitoring records should be forwarded to Mr. C. C. Masterman. They must be retained for at least 20 years.

Compliance Details - Allowable Levels Not Exceeded

If the monitoring results show that the allowable levels are not being exceeded the requirements discussed in this subsection must be satisfied.

Medical Examinations: Initial, annual, and termination medical examinations are required to be offered, at the employer's expense, to any employee in an occupation exposed to airborne concentrations of asbestos fibers. Note particularly that no minimum level of exposure is specified.

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"This taken literally has universal application since there are small quantities of airborne asbestos throughout the natural environment. OSHA generally has interpreted this to mean exposure above the background level, which is in itself a difficult standard to apply." It is our practice to provide annual physical examinations for all employees who work regularly in the asbestos laboratories pilot plant or encounter asbestos regularly in our customer's plants.

The medical examination must include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second ($FEV_{1.0}$). Medical examination records must be maintained for a period of at least 20 years by OSHA regulations. It is Union Carbide's policy to maintain such records indefinitely.

Respirators: Respirators are not required where concentrations are below the allowable limits. Respirators should be available, however, for use in emergencies. It is extremely unlikely that concentrations in excess of 100 fiber/cc $>5\mu$ and/or 20 fibers/cc $>5\mu$ T.W.A. will be encountered in the laboratory so reusable or single use air-purifying respirators are acceptable. Only respirators approved by NIOSH for asbestos may be used. The single use type has the advantage that it can be discarded and does not require maintenance. The reusable type must be stored in a dust-tight container, be cleaned after each use, and be inspected and if necessary repaired periodically. For either type, the employee must be instructed in when and how to use the respirator.

Caution Labels: These are required on all materials containing asbestos except where it has been modified in such a way that under any reasonably foreseeable circumstances no airborne concentrations of asbestos in excess of the allowable limits will be released. All bagged asbestos that moves in commerce should already have a warning label. It is our practice to place a

warning label on all samples sent out. Containers of asbestos stored on the property outside of the laboratories where asbestos is regularly in use should be labelled. It is not considered necessary to label every individual sample in such laboratories.

Warning Signs: Such signs are required where airborne concentrations of asbestos may be in excess of the exposure limits. Size and specific wording are prescribed by the regulations. Under normal laboratory conditions signs are not required.

Housekeeping: The regulation requires that all external surfaces shall be maintained free of accumulations of asbestos fibers if, with their dispersion, there would be an excessive concentration. This rather general requirement should be met in the laboratory by prompt, careful cleanup of any loose asbestos.

Waste Disposal: Any asbestos containing waste that under reasonably foreseeable circumstances could produce concentrations in excess of the allowable limits must be collected and disposed of in dust-tight bags or other dust-tight containers. The containers should bear the prescribed warning label.

Compliance Details - Allowable Levels Exceeded

If the monitoring results show that the allowable levels are being exceeded a program of engineering controls and work practices must be instituted immediately to reduce the exposure levels. Respirators and shift rotation may be used during the implementation period. Protective clothing and change rooms are required. It is extremely unlikely that this situation will arise in the laboratory. If it should, use of asbestos must be discontinued immediately until proper control procedures can be applied.

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possible health hazard of drinking water conveyed through these pipes.

It can be assumed that, if there is a relationship between gastrointestinal cancer and use of asbestos-cement pipe, there would be an increase in the cancer rate as use of the pipe has increased. U.S. Public Health Service records show, however, that incidence of GI cancer in the United States has steadily declined though the usage of asbestos-cement pipe has risen significantly.⁷

In a study of drinking water in nine cities that used asbestos-cement pipe for periods ranging from 8 to 17 years, not one of the water samples, either before or after passing through the asbestos-cement pipe, contained fibers that were visible under a light microscope. The highest asbestos content found in this study was 6 micrograms per gallon, about one five-millionth of an ounce. This means that if a man were to drink eight glasses of water a day he might swallow a total of twenty-seven ten-thousandths of an ounce (.0027) of asbestos in a lifetime of 70 years.^{8 9}

A special committee of asbestos-health experts convened by The American Water Works Association Research Foundation reviewed all available data and concluded that the "risk to health from the use of (asbestos-cement water pipe) systems is small—approaching zero."⁹

Reserve Mining Case

Perhaps the most widely publicized alleged health hazard from asbestos in water is the case of the Environmental Protection Agency vs. Reserve Mining Company. The case, involving the disposal of waste taconite tailings into Lake Superior, became a health issue when it was claimed that the tailings contained cummingtonite, said to be a form of asbestos.

Many experts were called for testimony during the proceedings. The court appointed witness, Arnold L. Brown, M.D., Chairman of the Department of Pathology and Anatomy, Mayo Clinic, Rochester, Minnesota, stated that there is no evidence of an excess of cancer in Duluth, Silver Bay, or other North Shore communities and further

testified: "Scientifically and medically I see no evidence for an increased incidence of cancer in those communities that could be attributed to the presence of asbestos fibers in air or water."¹⁰

Early in the trial, the court ordered an extensive study of tissues from deceased persons in the Duluth area to determine the presence of asbestos fibers. The study failed to disclose any asbestiform fibers which could have come from Reserve during the lifetimes of the subjects. The subjects had been selected by Court witnesses as representatives. Only tissues from persons inhaling Duluth air and ingesting Duluth water in excess of 15 years were examined.¹⁰

In a summary of medical testimony, before the Eighth Circuit Court of Appeals, it was stated: "There is no evidence that ingestion of asbestos in any amount has ever caused disease in anyone. Thus, there is no evidence that Reserve's discharge into Lake Superior (whether or not such discharge contains any asbestos) constitutes a present or future likelihood of disease."¹¹

In March 1975, the Court in its final ruling ordered the company to comply with all air and water discharge regulations, but noted, "the evidence is insufficient to support the kind of demonstrable danger to the public health that would justify the immediate closing" of the facility.

Asbestos Filters

Minute amounts of fiber in some beverages and parenteral (injectable) drugs filtered through asbestos-containing filters have also been detected. It is difficult to determine whether the minute asbestos fibers in some liquids come from the filter or are already in the water. There is evidence that asbestos filters remove asbestos material along with other particulates.

Asbestos-containing filters have been in worldwide use for many years. It is reasonable to inquire if beverages or food containing electron microscope-size mineral fibers, including asbestos, might expose large populations to a potential health hazard. Numerous studies have shown that, despite their long-term use, there is no evidence that anyone has ever contracted gastrointestinal cancer or mesothelioma from beverages or injec-

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table drugs filtered through asbestos filters.

A measurement of the normal "background" level of asbestos fibers provides a means of comparing the levels in beverages, and drugs filtered through asbestos containing filter pads. Studies in the United States and abroad have consistently shown that the asbestos content of various soft drinks, beers, wines, and parenteral drugs is no more than and, in many cases, less than the natural background level of asbestos detected in water.^{12 13}

Preliminary results of a 1973 survey made for the Food and Drug Administration showed that the use of asbestos-containing filters bears no relationship to the presence of asbestos fibers in the finished product.¹⁴ Thus, it is unlikely that the elimination of asbestos filters in the production of parenteral drugs will result in any reduction in asbestos content of the finished product.

Governmental Action

The Environmental Protection Agency has promulgated national waste water effluent standards for asbestos manufacturing operations to control the potential discharge of asbestos-bearing waste into our nation's waterways and publicly owned treatment works. The asbestos manufacturing industry in the United States participated in the development of these regulations.

In March 1975, the Food and Drug Administration published a regulation restricting the utilization of asbestos filters in the manufacture, processing or packaging of components of drug products for parenteral injection in humans. At the same time, however, FDA reaffirmed a previous decision made in September 1973 that "promulgation of regulations on the limitations or prohibition of the use of asbestos filters for the preparation of foods and non-parenteral drugs . . . is unwarranted until more reliable data can be obtained concerning these matters."¹⁵

SUMMARY

1. Asbestos exists naturally in small though detectable amounts in certain rock formations

materials to packing and gaskets are in daily use throughout the world. In the vast majority of these products, the asbestos is "locked-in" with cement, resins, or other binders which restrict fiber release during normal handling or use. In 1974, nearly 850,000 tons of asbestos, primarily chrysotile from Canada, was used in the United States. Worldwide production is about 5 million tons.

GI Cancer and Asbestos Exposure

Both human evidence and animal experimentation regarding a possible relationship between excessive asbestos exposure and an increased risk of gastrointestinal cancer is scanty and contradictory.² Some researchers have reported higher-than-normal rates of GI cancer among industry groups heavily exposed to airborne asbestos.³ Several major animal feeding experiments, however, produced no tumors in the GI tracts of the animals, even though the amounts of fiber fed to the animals were massive when compared with human occupational exposures known to result in respiratory disease.⁴

While some injection experiments have produced site and mesothelial tumors in test animals, the amount of fiber used in each case was so large as to render any attempted translation to human experience inappropriate. The studies strongly suggest that development of cancers in test animals is directly related to dose and, even more importantly, to the size of the fiber used in the experiment. Electron microscope-sized fibers (less than 5 microns in length) did not produce tumors in test animals.⁵

Medical opinion on the subject of gastrointestinal cancer and heavy occupational exposure is divided. Some experts consider the evidence inconclusive while others believe that only a "small risk" may exist.⁶

Asbestos-Cement Pipe

Asbestos-cement pipe has been used to convey potable water for more than half a century in North America, Europe and other parts of the world. The question has been raised as to the

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Asbestos in Water

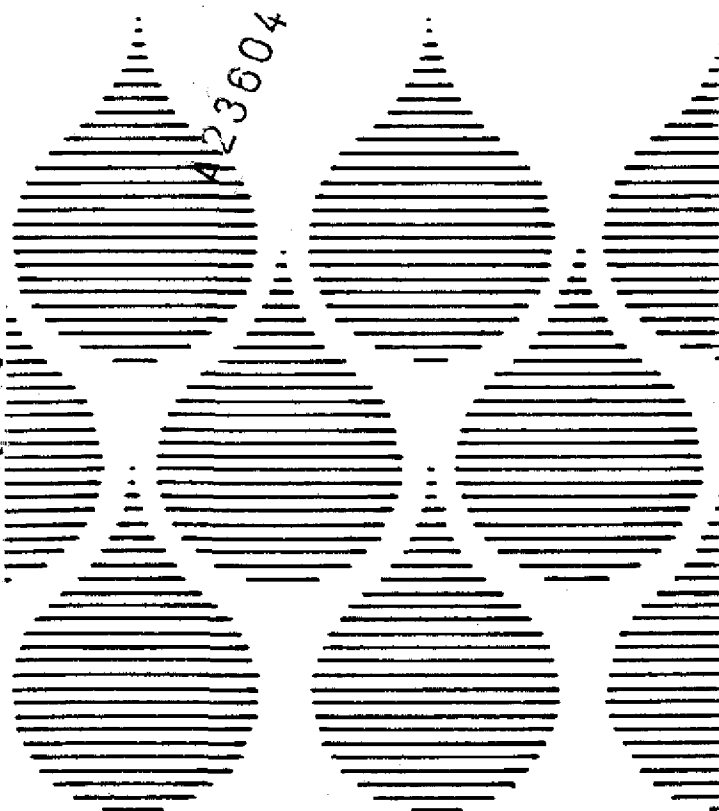
A hazard to health?

5. "The Locus of Pathogenicity of Asbestos Dust" by P. Gross, Archives of Environmental Health, Vol. 27, p. 240, 1973.
6. "Asbestos: The Need for and Feasibility of Air Pollution Controls," National Academy of Sciences, Committee on Biologic Effects of Atmospheric Pollutants, ISBN 0-309-01927-3, 1971.
7. "Asbestos-Cement Water Pipe and Health" A/C Pipe Producers Association, Washington, D.C., p. 4, 1973.
8. "A Study of the Problem of Asbestos in Water," The American Water Works Research Foundation, *American Water Works Association Journal*, Sept. 1974, p. 5.
9. "Asbestos-Cement Water Pipe and Health," A/C Pipe Producers Association, Washington, D.C., p. 3, 1973.
10. From testimony by Dr. Arnold Brown in Federal District Court as quoted in *Congressional Record*, Jan. 29, 1975, p. S1179.
11. From testimony in Federal District Court as quoted in *Congressional Record*, Jan. 29, 1975, P. S1180.
12. "Asbestos Fibers in Beverages and Drinking Water," by A.M. Cunningham and R. Pontefract, *Nature*, Vol. 232, p. 332-333, 1971.
13. Report to Food and Drug Administration by Mr. Philip McGrath, July 10, 1973.
14. Report to the Acting Director, Bureau of Drugs by Dr. J. Richard Crout, 1973.
15. *Federal Register*, March 14, 1975, p. 11867.



Additional copies of this pamphlet
are available.

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Introduction

Water supplies in various sections of the world contain infinitesimal amounts of asbestos fiber, along with other particulate matter. The fibers come primarily from natural sources, and secondly from man's activities, including the mining and milling of asbestos-bearing rock and the manufacture, use, and disposal of some asbestos-containing materials.

Inhalation of excessive quantities of airborne asbestos fiber in occupational settings is known to increase the risk of respiratory disease and certain types of cancer among industrial workers. There is also an indication of an increased incidence of gastrointestinal (GI) cancer among these workers. This has led to speculation as to whether the general public is subject to a health risk from the small amounts of asbestos fiber that may be found occasionally in water. In its report issued in 1973, the Advisory Committee on Asbestos Cancers to the Director of the International Agency for Research on Cancer, a division of the World Health Organization, stated that no evidence exists which would support the existence of an increased risk of cancer resulting from asbestos fibers present in water, beverages, food or in the fluids used in the administration of drugs.¹

Since the discovery of the risk to health from uncontrolled fiber, the asbestos industry has committed itself to the safe handling of the remarkable mineral in the workplace and to control its operations to eliminate the release of free fibers into the environment. A separate IIA/NA pamphlet discusses asbestos in air. This pamphlet is addressed to the issue of asbestos in water.

Asbestos Serves the World

Asbestos, used since antiquity, has widespread and important applications in our modern technological society. Because of its remarkable resistance to fire, heat, friction, and corrosion, approximately 3,000 different products containing asbestos, ranging from pot holders to brake linings, from asbestos-cement pipe and building

throughout the world and for millions of years has been released into the environment through erosion by wind and water.

2. The Advisory Committee on Asbestos Cancers of the International Agency for Research on Cancer has stated that evidence does not indicate a risk of cancer resulting from asbestos fibers present in water, beverages, food or fluids used in the administration of drugs. Levels of asbestos found in beverages, drugs, etc., have not been demonstrated to be hazardous to human health.

3. The evidence for a relationship between heavy occupational asbestos inhalation and increased risk of gastrointestinal cancer is inconclusive.

4. There is no existing evidence of a relationship between gastrointestinal cancer and drinking water carried through asbestos-cement pipe.

5. The asbestos content of various soft drinks, beer, wines and parenteral drugs filtered through asbestos containing filter pads is no more than and in many cases less than the natural background level of asbestos that may be found in the world's water sources.

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1. "Report of the Advisory Committee on Asbestos Cancers to the Director of the International Agency for Research on Cancer," *British Journal of Ind. Medicine*, Vol. 30, pp. 180-186, 1973.
2. "Report on Research at St. James' Hospital, Leeds, England" by L.M. Swinburne, Appendix 4, including report from Asbestos Research Council, October 1970-October 1971.
3. "Cancer Risk of Insulation Workers in the United States," a paper by I.J. Selikoff and E.C. Hammond presented at IARC Conference on the Biological Effects of Asbestos, Lyon, France, 1972.
4. "Feeding of Blue Asbestos to Rats" by F.M. Bonser and D.B. Clayton, 1967, Annual Report, British Empire Cancer Campaign for Research, p. 242.

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Regulations to Protect You

To insure the safety of all, occupational standards for exposure to asbestos dust have been established by the Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor. These standards are designed to protect you from exposure to potentially hazardous amounts of asbestos dust and are being carefully observed by the company.

Here is what these standards provide:

1A SAFE WORKPLACE

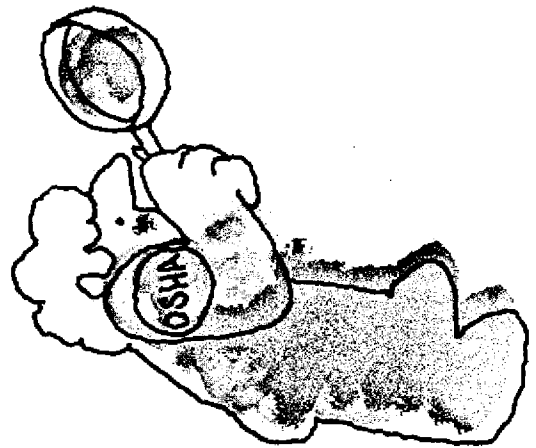
Your employer is required to make sure that no employee is exposed to more asbestos dust than permitted by the government standard. Your company will exert every effort to keep levels not only below permissible limits, but as low as possible.

2IN CASE OF RISK

If exposure limits are exceeded, the employee will be notified by his employer, and will be informed of the corrective measures being undertaken to reduce his exposure to permitted levels.

3CORRECTIVE ACTION

Engineering controls and safe work practices will be the approved methods of correction.



4IN THE MEANTIME

While corrective measures are being taken, the employee will be protected by other means, which may include the wearing of an approved respirator provided by his employer, or by shift rotation.

5TEMPORARY MEASURES

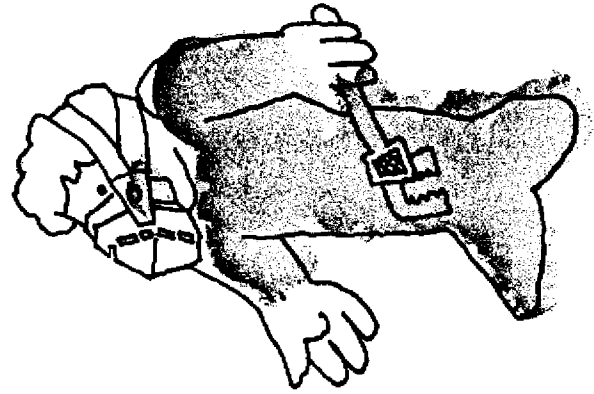
The use of respirators or shift rotation to achieve proper dust control will be permitted only (a) during the time necessary to install engineering controls or to institute safe work practices, (b) in situations where such controls or practices are not technically feasible, or (c) in emergencies.

6AND ONLY IF YOU PASS THE MEDICAL

No employee will be assigned to a task requiring the use of a respirator if his most recent yearly medical examination indicates that he would not be able to function properly while wearing one, or if the wearing of the respirator would create a hazard to the employee's health or safety.

7SPECIAL PROTECTION WHEN NEEDED

Protective clothing, change rooms, and separate clothes lockers will be provided for employees in situations where exposure standards are exceeded.



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8 CHECKING THE AIR

Monitoring of workplace air will be conducted by the employer to assure that government standards are being met. Employees may review results of the monitoring in their particular job areas.

9 SIGNS TO GUIDE YOU

Caution signs will be posted in work areas where airborne levels of asbestos may be in excess of the exposure limits, and where respiratory protection and special handling precautions are required. Employees should obey these signs at all times.

10 CAUTIONS ON PRODUCTS, TOO

Caution labels will be placed on asbestos-containing products which, during any reasonably foreseeable use, handling, application, machining or disposal may release asbestos fiber into the air in concentrations that exceed the exposure limits.

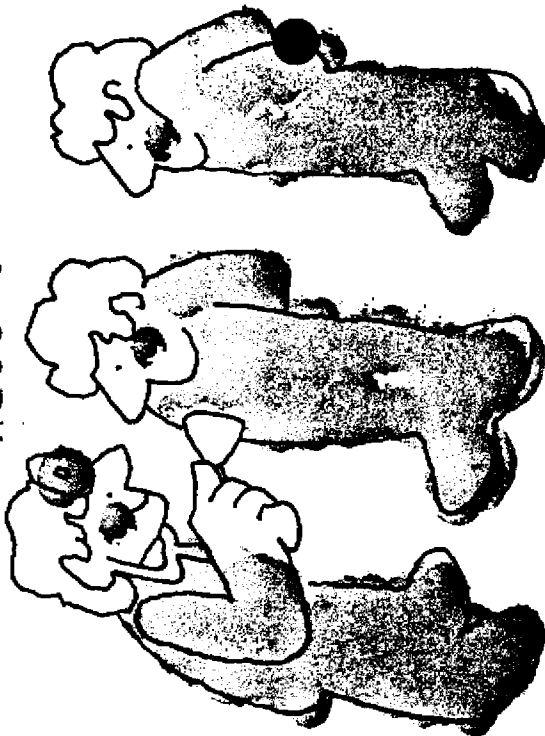
11 ANNUAL CHECK-UPS

The employer, at no cost to the employee, will provide yearly medical examinations for employees exposed to asbestos dust. Pre-employment and termination medical exams also are provided.

12 COUNSELING AND RESULTS AVAILABLE

Results of each employee's medical examination will be reviewed with him by a physician, and, at the worker's request, his own medical exam records will be made available to his family physician.

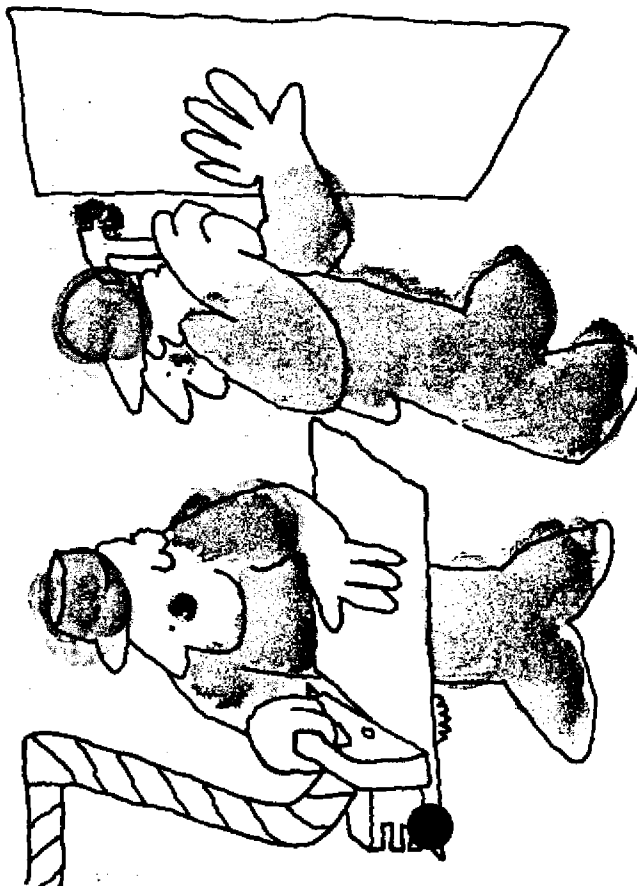
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If You Work in Field Operations

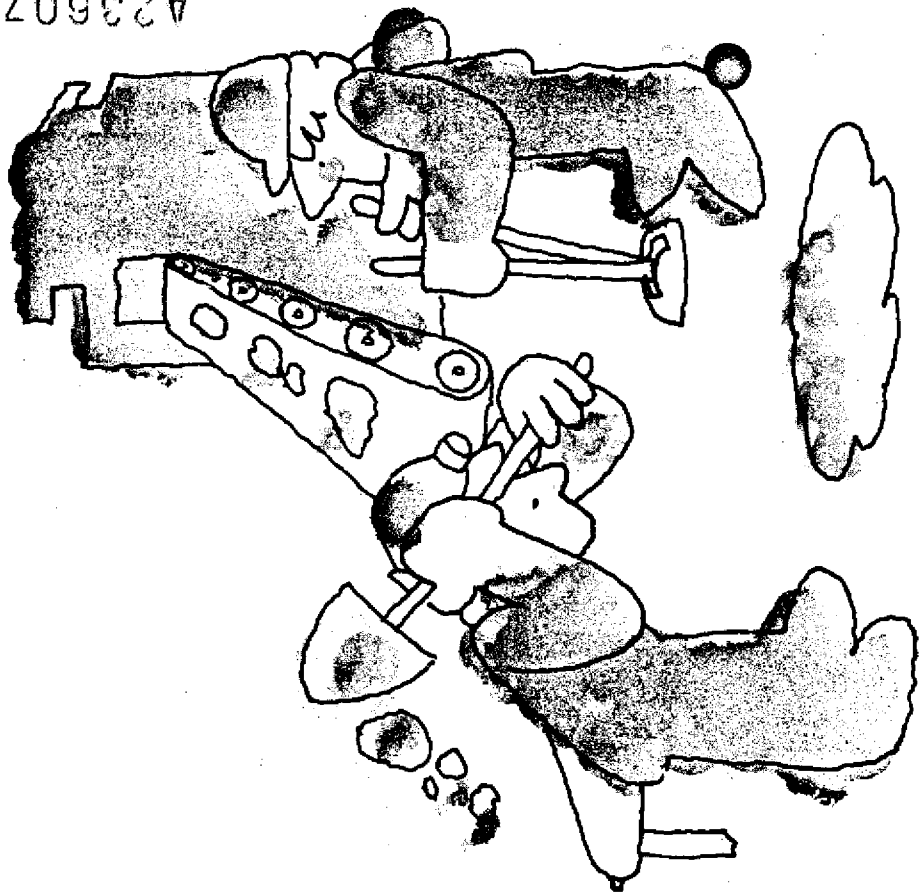
Most finished asbestos-containing products, when correctly used, will not produce dust levels high enough to be a hazard to workers. In more than 90% of the asbestos-containing products made in the United States, the asbestos fibers are "locked in" the product by means of cement, plastic or other binders. Consequently, the fibers are not easily released into the air, except during sawing or certain other machining operations. The tear-out, removal or demolition of old asbestos-containing insulations also can release fibers. Such operations must be carried out with approved methods of dust suppression and control.



5

If You Work in a Plant or Mine

Employees in asbestos mines, mills, or product manufacturing plants will be exposed to airborne asbestos fiber. But, when dust levels in mines, mills and factories are properly controlled, the asbestos content of the air will be low and within safe levels, and will not be a hazard to workers.



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And, Most Important . . .

Another word about smoking. First, an assurance. If you don't smoke cigarettes now and never have smoked them regularly, statistical studies show you have no greater chance of getting lung cancer than a nonsmoker who has never worked with asbestos.

But, on the advice of medical specialists: If you work with asbestos and you do smoke cigarettes, **quit smoking! If you work with asbestos and do not smoke, don't start!**

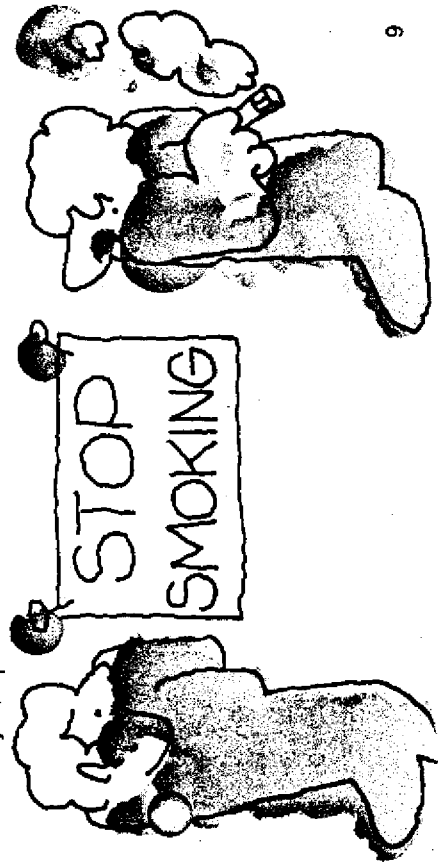
Your family and the company need you and your special abilities. Guard your health in every way, but particularly where cigarette smoking is concerned.

After You Leave Work

You also should take precautions to prevent taking asbestos home on any work clothes or other materials in order to protect members of your family from possible exposure to asbestos dust.

To reduce the possibility of carrying asbestos fibers home on your person and clothing, facilities for showering and changing from work to regular clothes may be provided by your employer. Work clothing taken home for laundering should be carried in a closed bag or container and then washed separately from other family clothing.

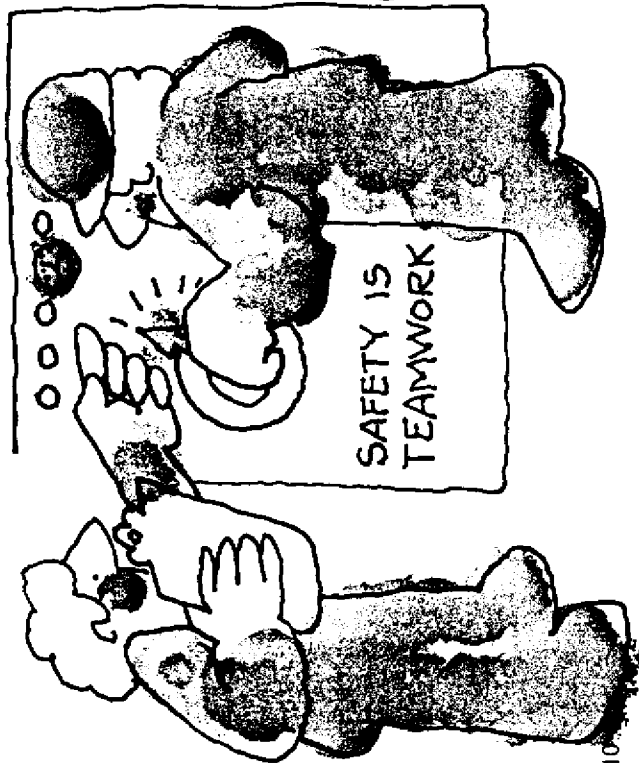
Never take loose fiber home. Your family should not be needlessly exposed to asbestos dust through any carelessness on your part.



What Else Can You Do?

Industrial safety and health can never be the responsibility of only one person. Both you and your employer must work together to provide a safe and healthy environment.

- For safety in specialized areas, detailed work practices must be instituted to make sure we are complying with government regulations. As an employee, it is your duty to follow these work practices at all times. Never take shortcuts that may endanger your health and that of others.
- If you see a possible hazard that your employer may have overlooked, bring it to his attention.
- If you can suggest more efficient and safer work practices, do so. If you are not sure how to handle a material or perform an operation without creating dust, talk with your supervisor first.



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These are the Facts

Exposure to asbestos fiber can increase the risk of developing certain diseases over a period of years. The four diseases associated with inhalation of asbestos fiber are: asbestosis — a non-malignant scarring lung condition; cancer of the lung, and to a lesser degree, cancer of the digestive tract; and mesothelioma — a rare cancer of the lining of the chest or abdominal cavities.

Reduction of asbestos dust exposure is at present the only known method of preventing disease among asbestos industry workers. Experience has shown that when dust levels are low, the risk to the worker and the incidence of asbestos-related disease is low.

Now . . . About Smoking

It has been established that cigarette smoking greatly increases the risk of developing lung cancer in persons exposed to asbestos. On the other hand, asbestos industry workers who do not smoke cigarettes — and who never have smoked regularly — have shown no greater frequency of lung cancer than the average person who does not smoke.

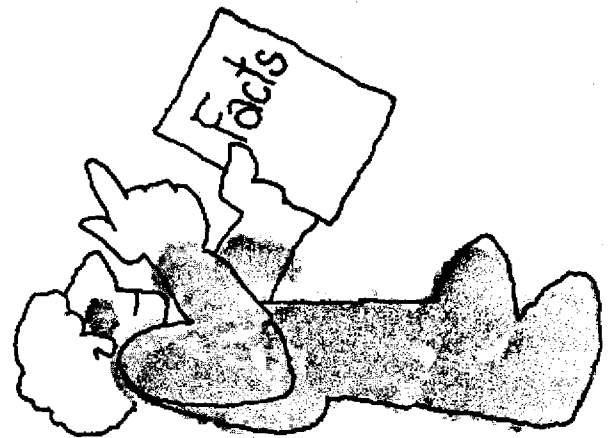


Frankly Speaking

You certainly are important to your family and loved ones, and you are important to the company. It makes good sense for the company to do everything possible to protect you in your working environment, and for you to take every precaution to avoid possible hazards to your health.

If your work involves the use of asbestos or asbestos-containing products, you should be aware of:

- What the health hazards can be.
- What obligations your employer has to protect you.
- What you can do as an individual to protect your own health and that of your fellow employees.



REMEMBER

Asbestos fiber may be hazardous to your health, and exposure to it, over a period of time, may increase your risk of developing asbestosis, cancer of the lung or digestive tract, or mesothelioma.

Every precaution should be taken by you and your employer to keep dust levels low and to avoid unnecessary exposure.

The asbestos industry is working hard to control dust exposure and to alert every worker to proper safety precautions. Government and company regulations designed to protect you and other workers against exposure to asbestos dust should be strictly followed by everyone.

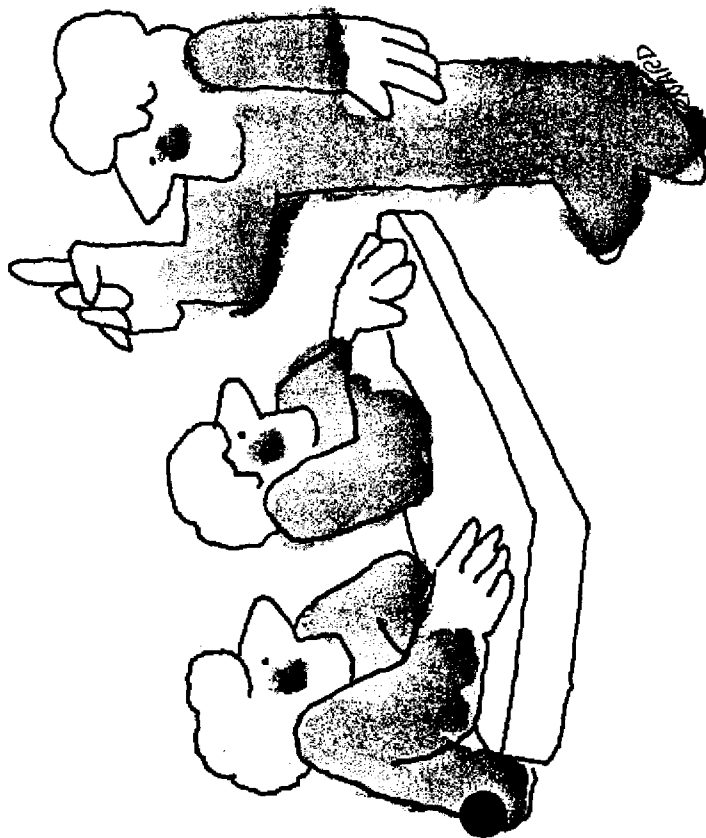
The vast majority of the thousands of finished asbestos products are not hazardous when properly handled or used, but workers who are engaged in their manufacture, fabrication or installation should be aware of possible dangers. Don't be careless — urge your fellow workers not to be.

Asbestos is used in some 3,000 products daily throughout the world . . . products that help prevent and control fire in our homes, schools, factories, offices, hospitals and theaters . . . products that help stop our cars and trucks . . . products that save fuel and energy in this important time of conservation. If we are to continue making these much-needed products, it is important that you and your employer cooperate in maintaining the highest standards of safety and health on the job.

What You Should Know About Asbestos And Health



ASBESTOS INFORMATION ASSOCIATION
1660 L Street, N.W., Washington, D.C. 20036



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Asbestos in the Atmosphere

A hazard to health?

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4. "Epidemiologic Surveillance of Mesothelioma in Canada" by A. D. McDonald and J. C. McDonald. CMA Journal, Vol. 109, pp. 359-362, 1973.
5. Background Information On Development Of National Emission Standards For Hazardous Air Pollutants: Asbestos, Beryllium, And Mercury. Environmental Protection Agency, EPA-APTD-1503, pp. 22-23, March 1973.
6. "Standard For Exposure to Asbestos Dust" Federal Register, Vol. 37, No. 110, pp. 11318-11322, June 7, 1972.

Additional copies of this pamphlet are available.

Asbestos Information Association/North America
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Washington, D. C. 20036



Small amounts of asbestos fiber can be detected in the atmosphere in many areas of the world. The fibers come primarily from natural sources and secondarily from the mining and milling of asbestos-bearing rock and the manufacture, application, use, removal, and disposal of some asbestos containing products. There is no evidence that these tiny amounts of asbestos in the ambient air are a danger to human health.^{1,2} Nevertheless, the asbestos industry is constantly improving its control of emission sources as part of a worldwide commitment to reduce environmental contamination.

Asbestos Serves the World

Asbestos, used since antiquity, has widespread and important applications in our modern technological society. Because of its remarkable resistance to fire, heat, friction, and corrosion, approximately 3,000 different products containing asbestos, ranging from pot holders to brake linings, from asbestos cement pipe and building materials to packings and gaskets are in daily use throughout the world. In the vast majority of these products, the asbestos is "locked-in" with cement, resins, or other binders which restrict fiber release during normal handling or use, except in machining operations. In 1974, nearly 850,000 tons of asbestos, primarily chrysotile asbestos from Canada, was used in the United States. Worldwide production is about 5 million tons.

Health Questions Arose

In the mid-sixties, questions were raised about the possible health effects of asbestos fibers in the atmosphere. By this time, it had been established that the inhalation of excessive quantities of asbestos fiber in occupational settings could lead to an increased risk of respiratory disease and cancer among industrial workers. Speculation about a possible public risk was heightened by (1) repeated findings of small amounts of asbestos fiber (among other particulate matter) in the lungs of city dwellers not known to have had occupational exposure to asbestos, and (2) the discovery of a small number of cases of mesothelioma, a rare form of cancer linked to asbestos exposure, among people living

in the immediate vicinity of uncontrolled asbestos sources. A few cases were found among the families of industrial employees who brought substantial quantities of fiber into their homes on their clothes and in their hair. These findings prompted numerous scientific investigations to determine the extent, if any, of the problem of non-occupational exposure.

No Risk to General Public

In 1971, the National Academy of Sciences asked a panel of seven asbestos-health experts to review the available evidence on asbestos in the ambient air. In their report, the experts concluded:

*"There is no evidence that the small numbers of fibers found in most members of the general population affect health or longevity."*¹

A similar conclusion was reached in a recent report of an Advisory Committee on Asbestos Cancers of the International Agency for Research on Cancer, a division of the World Health Organization. The report stated that at present, there is no evidence of lung damage from fibrosis by the low levels of asbestos exposure encountered by the general public in urban areas. Further, the report stated, with regard to mesothelioma: "There is no evidence of risk to the general public at present."²

Many Questions Answered

Among the more important facts upon which these conclusions were based are the following:

1. Asbestos exists naturally in small, though detectable, amounts in serpentine rock formations throughout the world and is constantly being released into the atmosphere through erosion by wind and water, and has been for millions of years.¹
2. Ambient concentrations of asbestos, even in urban settings, are many times lower than levels known to result in no excess in disease among occupationally exposed populations.²
3. No evidence has been found linking the presence of asbestos fibers in the lungs of the general public with an increase in disease, or with the cause of death of those whose lungs were examined.¹
4. Because of the long latency period of mesothelioma (30 years or longer), "neighborhood" cases being reported today result from conditions existing decades ago.³ Today, modern

dust control systems effectively prevent the emission of significant amounts of asbestos into the atmosphere from mining, milling, and manufacturing operations.

5. No cases of mesothelioma, except for those exposed occupationally or domestically to fiber-laden worker clothing, have yet been discovered within a 20-mile radius of the chrysotile asbestos mines and mills of Quebec, even though emissions in the past were probably heavy by today's standards.⁴ Chrysotile asbestos accounts for approximately 97 percent of the asbestos used in the United States today.

Government-Industry Actions

Despite these findings, both government and industry have sought ways to further reduce the amount of asbestos in the air. In April 1973, the U.S. Environmental Protection Agency (EPA) promulgated national emission standards for asbestos to assure that atmospheric concentrations could not increase to potentially hazardous levels in the future. In its justification document, EPA stated: "... the available evidence does not indicate that levels of asbestos in most community air cause asbestotic disease..." and "... in order to provide an ample margin of safety to protect the public health from asbestos, it is necessary to control emissions from major man-made sources of asbestos emissions into the atmosphere, but that it is not necessary to prohibit all emissions...."⁵

Among its major provisions, the EPA standard banned the spraying of asbestos-containing fireproofing in high-rise construction, known to be a dusty operation.

The U.S. Occupational Safety and Health Administration, in June 1972, promulgated occupational standards for exposure to asbestos dust in the workplace. Among the OSHA provisions is one designed to prevent employees from carrying asbestos fiber home in their clothes.⁶ To implement this provision, the asbestos industry provides change rooms, lockers, shower facilities, and, in some cases, disposable coveralls and headgear for employees where necessary.

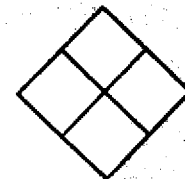
Dust, which can result from the processing of asbestos, can be controlled. The asbestos industry is dedicated to the safe handling of the remarkable mineral in the workplace and to control of the emission of asbestos fibers into the atmosphere.

UCC 025578

2193612A



Material Safety Data



September 1, 1976

UNION CARBIDE CORPORATION • 4625 ROYAL AVENUE • NIAGARA FALLS, NEW YORK • 14302
TELEPHONE: (716) 278-3376

PRODUCT: Chrysotile Asbestos

CHEMICAL FORMULA: $Mg_6(OH)_8Si_4O_{10}$

TRADE NAMES: "Calidria" Asbestos

I. PHYSICAL DATA

BOILING POINT AND MELTING POINT: Not Pertinent

SPECIFIC GRAVITY ($H_2O = 1$): 2.45

VOLATILE CONTENT: Absorbed Water 1 — 4% By Weight. Structural Water Approximately 13% by Weight.

APPEARANCE: Pellets or Fine White Powder. No odor. Very Slight Solubility in Water.

II. HAZARDOUS INGREDIENTS

Asbestos contains no hazardous ingredients. However, the material itself can be hazardous under certain conditions. (See V below.)

III. FIRE AND EXPLOSION HAZARD DATA

NON-COMBUSTIBLE MATERIAL: No Fire or Explosion Hazard.

IV. REACTIVITY DATA

INERT MATERIAL: No Decomposition or Polymerization Conditions.

V. HEALTH HAZARD DATA

PERMISSIBLE EXPOSURE TO AIRBORNE CONCENTRATION:

The current Occupational Safety and Health Standard (CFR 29, 1910.1001) contains the following exposure limits:

"The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed 2 fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the membrane filter method at 400-450 X magnification (4 millimeter objective) phase contrast illumination. 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, as determined by the method just noted."

EFFECTS OF EXPOSURE: CAUTION: Breathing asbestos may cause serious bodily harm.

EMERGENCY AND FIRST AID PROCEDURES: No acute toxicity. Use respirator if airborne asbestos fiber concentration exceeds OSHA limits.

VI. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Avoid inhalation of dust. Remove spilled material by vacuum cleaner or by water wash.

WASTE DISPOSAL:

Bags and waste and scrap materials should be disposed of in a manner which will avoid airborne concentrations of asbestos, such as the use of dust-tight trash bags or containers. Ensure that disposal complies with all applicable federal, state or local regulations.

A23613

Union Carbide Corporation assumes no responsibility and makes no warranty, expressed or implied, representation, promise, or statement as to completeness, accuracy, or currency of any data provided.

UCC 025579

VII. SPECIAL PROTECTION INFORMATION

VENTILATION:

Local exhaust for each operation is preferable. (See American National Standards Institute booklet, Z9.2 — 1971.) General area exhaust is acceptable. No special considerations.

PROTECTIVE GLOVES: None

EYE PROTECTION: None

RESPIRATORY PROTECTION ⁽¹⁾

The current Occupational Safety and Health Standard CFR 29, 1910.1001 contains the following requirements for respiratory protection.

AIRBORNE CONCENTRATION ⁽²⁾		MINIMUM REQUIRED MASK TYPE ⁽⁴⁾
8-HOUR EXPOSURE ⁽³⁾	CEILING CONCENTRATION	
2 maximum	10 maximum	Not required when allowable limits are not exceeded.
20 maximum	100 maximum	Reusable or single use air purifying respirator.
200 maximum	1000 maximum	Powered filter positive pressure.
Over 200	—	Type C positive pressure, air supplied.

- (1) Allowed only during the time required for installation of engineering controls, when engineering controls are not technically feasible or adequate, and in emergencies. Current OSHA standards require that no employee shall be assigned to tasks requiring the use of respirators if, based upon his most recent examination an examining physician determines that the employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or other employees will be impaired by the use of a respirator.
- (2) Fibers per milliliter greater than 5 microns in length, as determined by the membrane filter method at 400-450X magnification (4 millimeter objective) phase contrast illumination.
- (3) 8-Hour time-weighted average.
- (4) Only masks certified by NIOSH as acceptable for the exposures encountered may be used.

OTHER PROTECTIVE EQUIPMENT:

If the ceiling concentration limit is exceeded, clothing providing whole body covering shall be supplied and its use required.

VIII. SPECIAL PRECAUTIONS

Every place of employment where asbestos fibers are released must be monitored to determine exposure levels. If the permissible time-weighted average and ceiling concentration limits are not exceeded, no special precautions are required except:

- Bag damage and dusting should be minimized and dust inhalation avoided.
- A comprehensive medical examination is required for any employee exposed to airborne fibers within 30 days of first such employment, annually thereafter and on termination of employment.
- Personal work clothing can become contaminated with asbestos and may constitute an exposure hazard. Such clothing should be handled and laundered in a manner to avoid airborne concentrations of asbestos.
- Substantial medical evidence indicates that smoking will increase the risk from asbestos exposure. Those working with asbestos should not smoke.

Where exposure limits may be exceeded, reference should be made to the regulation CFR 29, 1910.1001 for details on caution signs, monitoring, change rooms, protective clothing laundering and record keeping.

ASBESTOS AND HEALTH

Asbestos, used since antiquity, has widespread and important applications in our modern technological society. Approximately 3,000 different products containing asbestos are in daily use throughout the world. Its increased use in the 20th century has lent urgency to the need to cope with occupational health problems related to the excessive inhalation of asbestos dust.

Such problems are not unique to the asbestos industry. Many substances and materials in common use today can be detrimental to the health and safety of industrial workers under uncontrolled conditions. A vital and widely used raw material, asbestos is but one of a number of potentially harmful substances used by industry.

Basically, the known facts about asbestos-related disease can be summed up as follows:

First, asbestos-related health risks today are almost exclusively confined to the occupational setting.

Second, the effects of excessive inhalation of asbestos are both time and dose related. This means that asbestos-related diseases may develop, generally, only after the inhalation of substantial amounts of asbestos dust over a substantial period of time. Thus, there are levels of exposure that will not result in any increased risk of disease.

Third, there is presently no evidence of risk to the general public from exposure to the minute amounts of asbestos that have been found in community air.

Fourth, because of the long latent period of asbestos-related disease, the disease being found today among some long-term industry employees is not an indication of present day conditions, but is a result of conditions existing decades ago, at a time when neither the industry, government, or the medical profession knew very much about the health effects of asbestos and even less about the proper means for their control.

These facts are well recognized by the asbestos manufacturing industry, which has made substantial progress over the years in protecting those who work with asbestos and in eliminating emissions of free asbestos fiber into the community air.

Known and Suspected Occupational Risks

There are three primary diseases known to be caused or exacerbated by prolonged and heavy inhalation of asbestos fibers. They are asbestosis, bronchogenic (lung) cancer, and mesothelioma. Prolonged heavy exposure does not necessarily result in disease and death—but there is little question that risks are significantly increased.

Asbestosis

This is an occupational disease characterized by lung scarring, and is one of the lung diseases called pneumoconioses. It is the most common of the three asbestos related illnesses and is found only among those who have worked regularly and continuously with asbestos under inadequately controlled conditions. The average time span from first exposure to the first clinical signs of asbestosis is 17 years, although some cases have been reported in as few as ten years.

Asbestosis is neither malignant nor necessarily fatal. Many asbestos workers with minor cases can and do continue to work and lead normal lives without difficulties. The asbestos

there are other causes of mesothelioma besides asbestos. Unfortunately, what those other causes might be is still unknown. Until these and other equally important factors are thoroughly investigated, the mesothelioma question will remain unresolved.

Other Tumors

Some researchers have reported higher-than-normal rates of gastrointestinal cancer among some heavily exposed industry groups. Other researchers have reported no increase of this type of cancer. The consensus of medical opinion is that the evidence is too scanty for a definitive conclusion.

Asbestos and the General Public

Medical reports of excess asbestos-related disease among occupationally exposed populations have been frequently cited by some writers, environmentalists, politicians and others as "proof" that the health of the general public is endangered by the minute amounts of asbestos dust being found in community air. "Neighborhood" and "household" cases of mesothelioma are cited extensively in this regard, as are the frequent reports of the findings of free asbestos fibers and so-called ferruginous bodies (which sometimes contain asbestos) in the lungs of some city dwellers at autopsy.

The truth is, however, that there is no evidence—either from experience or from scientific research—that anyone in the general public has ever contracted any asbestos-related disease from exposure to these minute amounts of airborne asbestos, which are many times lower than levels which have been demonstrated to result in no excess of disease in occupationally exposed populations.

This conclusion is supported by both the Asbestos Panel of the National Academy of Sciences' Committee on Biologic Effects of Atmospheric Pollutants, and the 33 member Advisory Committee on Asbestos Cancers of the International Agency for Research on Cancer, a division of the World Health Organization.

In its 1971 booklet, entitled "Asbestos: The Need For And Feasibility of Air Pollution Controls," the NAS Asbestos Panel, which consisted of seven of the nation's top experts on asbestos and health, stated that "there is no evidence that persons in the general population—without occupational, household or neighborhood exposures—have any increased risk of neoplasm, even though there may be ferruginous bodies or fibers in their lungs."

Warning against conclusions of the type frequently reached by the uninformed with regard to asbestos, the report further stated: "One cannot extrapolate from the mortality experience of, on the one hand, those who are directly and indirectly exposed to asbestos in their employment to, on the other hand, the general public, who have had moderate or slight exposures from ambient air."

The report concluded with the statement that "there is no evidence that the small numbers of fibers found in most members of the general population affect health or longevity."

The report of the IARC Advisory Committee represents the consensus of present world medical opinion on all aspects of the asbestos-health problem. Meeting immediately after the October 1972 Lyon Conference on the Biological Effects of Asbestos, the Committee, with representation from ten different countries, drafted the following opinions on asbestos-related disease and the general public:

Asbestosis: "There is at present no evidence of lung damage by asbestos to the general public. The amount of asbestos in the lungs of members of the general public is very small, compared to those occupationally exposed."

Lung Cancer: "The evidence . . . suggests that an excess lung carcinoma risk is not detectable when the occupational exposure has been low. These low occupa-

sponsoring a study at the Harvard School of Public Health on chest auscultation (breathing sounds) as an early detection device in the diagnosis of asbestos-related disease. While this needed additional information and data is being developed, the industry will take all steps necessary to assure a safe working environment for its employees and for applicators and fabricators of asbestos-containing products.

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RULES AND REGULATIONS

tions for an Occupational Exposure Standard for Asbestos by the National Institute for Occupational Safety and Health (NIOSH). Public notice was given of the receipt of the recommendations and their availability for inspection and copying. On or about February 25, 1972, the Advisory Committee on Asbestos Dust submitted its written recommendations to the Assistant Secretary of Labor for Occupational Safety and Health.

Pursuant to the notice of rule making, a hearing was held on March 14 through 17, 1972, for the purpose of receiving oral data, views, and arguments concerning the proposed standard. On or about March 31, 1972, the presiding hearing examiner certified to the Assistant Secretary of Labor for Occupational Safety and Health the record of the proceeding. The record includes prehearing written comments, a transcript of the oral presentations made at the hearing, and numerous exhibits received during the course of the hearing or within the period allowed after the close of the hearing.

The proposed standard dealt with (1) permissible concentrations of asbestos fibers; (2) methods of compliance; (3) warning signs; (4) monitoring; (5) medical examinations; and (6) recordkeeping. Each of these major proposals elicited comments, arguments, objections, and counterproposals. They all have been examined and considered.

1. *Acceptable concentrations of asbestos dust.* The proposed standard would limit occupational exposure to 8-hour time-weighted average (TWA) airborne concentrations of asbestos dust not exceeding five fibers longer than five micrometers per milliliter. Concentrations above five fibers but not to exceed 10 fibers (ceiling concentration) would be permitted up to 15 minutes in an hour, but for not more than 5 hours in any one 8-hour day.

NIOSH in effect has recommended that the five-fiber TWA and 10-fiber peak concentrations be permitted only for 2 years; thereafter, TWA concentrations should be not more than 2 fibers per cubic centimeter (cm.³) of air, and peak concentrations should not exceed 10 fibers/cm.³, with no time restriction. Numerous objections and counterproposals have been made, with regard to both the limits of asbestos fiber concentrations and the time periods to comply with them. Some, for example, have recommended return to a 12-fiber standard of an earlier day; i.e., a level adopted under the Walsh-Healey Public Contracts Act in 1969. Others have recommended a two-fiber standard to become effective in 6 months, then a one-fiber standard for 2 years, and finally a zero-fiber standard after 3 years. These recommendations give a fair indication of the wide spread of the counterproposals.

No one has disputed that exposure to asbestos of high enough intensity and long enough duration is causally related to asbestosis and cancers. The dispute is as to the determination of a specific level below which exposure is safe. Various studies attempting to establish quantitative relations between specific levels of

exposure to asbestos fibers and the appearance of adverse biological manifestations, such as asbestosis, lung cancers, and mesothelioma, have given rise to controversy as to the validity of the measuring techniques used and the reliability of the relations attempted to be established. Because of the long lapse of time between onset of exposure and biological manifestations, we have now evidence of the consequences of exposure, but we do not have, in general, accurate measures of the levels of exposure occurring 20 or 30 years ago, which have given rise to these consequences. There are also controversies concerning the relative toxicity of the various kinds of asbestos, and varying hazards in different workplaces.

It is fair to say that the controversy has centered in the area between a two-fiber TWA concentration and five-fiber TWA concentration, with variations on the time needed for compliance. Many employers support a five-fiber TWA. Most medical opinion is divided between a two-fiber standard and a five-fiber standard.

In view of the undisputed grave consequences from exposure to asbestos fibers, it is essential that the exposure be regulated now, on the basis of the best evidence available now, even though it may not be as good as scientifically desirable. An asbestos standard can be re-evaluated in the light of the results of ongoing studies, and future studies, but cannot wait for them. Lives of employees are at stake.

It is concluded that there should be one minimum standard of exposure to asbestos applicable to all workplaces exposed to any kind, or mixture of kinds, of asbestos. Reasons of practical administration preclude a variety of standards for different kinds of asbestos and of workplaces. Also, while the evidence tends to show that crocidolite, for instance, is more harmful than chrysotile, the evidence is not sufficient to establish separate standards for varieties of asbestos.

Because there must be one standard governing exposure to all varieties of asbestos, and in workplaces apparently more hazardous than others; because some present employees with regular exposure to asbestos have probably already accumulated great doses of asbestos fibers, due to higher levels of exposure in the past; because it appears that levels of exposure which may be safe with regard to asbestosis are not safe with regard to mesothelioma; because the statute requires the protection of every employee, even of one who may have regular exposure to asbestos during a working life which may reach, or even exceed, 40 years; and because of several other considerations which have been urged and are reflected in the record of the proceeding, the conflict in the medical evidence is resolved in favor of the health of employees. As of July 1, 1976, TWA concentrations of asbestos fibers longer than 5 micrometers will not be allowed to exceed two fibers/cc., with a ceiling value of 10 fibers/cc. The current TWA concentrations of five fibers, and

Title 29—LABOR

Chapter XVII—Occupational Safety and Health Administration, Department of Labor

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

Standard for Exposure to Asbestos Dust

On December 7, 1971, an emergency temporary standard concerning exposure to asbestos fibers was published in the *FEDERAL REGISTER* (36 F.R. 23207). In accordance with section 6(c)(3) of the Williams-Steiger Occupational Safety and Health Act of 1970, a notice of proposed rulemaking regarding a permanent standard for exposure to asbestos fibers was published in the *FEDERAL REGISTER* on January 12, 1972 (37 F.R. 466). The notice invited interested persons to submit both orally and in writing, data, views, and arguments concerning the proposal.

On or about January 24, 1972, the Advisory Committee on Asbestos Dust was established and requested to make written recommendations with regard to the proposed standard on asbestos. On or about February 1, 1972, the Department of Health, Education, and Welfare transmitted to the Secretary of Labor a criteria document containing Recommenda-

§ 1910.93 Air contaminants.

TABLE G-3—MINERAL DUSTS

Substance	Mppcf	Mg/M ³
Silica:		
Crystalline:		
Quartz (respirable).....	250 ¹	10mg/M ³ =
	%SiO ₂ +5	%SiO ₂ +2
Quartz (total dust).....		50mg/M ³
		%SiO ₂ +2
Cristobalite: Use ½ the value calculated from the count or mass formulae for quartz.		
Tridymite: Use ½ the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth.....	20	50mg/M ³
		%SiO ₂
Silicates (less than 1% crystalline silica):		
Alite.....	20	
Scoria.....	20	
Talc.....	20	
Portland cement.....	50	
Graphite (natural).....	15	
Coal dust (respirable fraction less than 5% SiO ₂).....		2.4mg/M ³ or 10mg/M ³
For more than 5% SiO ₂		%SiO ₂ +2
Inert or Nuisance Dust:		
Respirable fraction.....	15	5mg/M ³
Total dust.....	50	15mg/M ³

NOTE: Conversion factors—
mppcfX35.3 = million particles per cubic meter
= particles per c.c.

¹ Millions of particles per cubic foot of air, based on lumping samples counted by light-field techniques.

² The percentage of crystalline silica in the formula is the amount determined from air-borne samples, except in those instances in which other methods have been shown to be applicable.

³ As determined by the membrane filter method at 430 X phase contrast magnification.

⁴ Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

Aerodynamic diameter (unit density sphere)	Percent passing selector
2	90
2.5	75
3.5	50
5.0	25
10	0

The measurements under this note refer to the use of an AEC instrument. If the respirable fraction of coal dust is determined with a MRE the figure corresponding to that of 2.4 Mg/M³ in the table for coal dust is 4.5 Mg/M³.

2. A new § 1910.93a is added to Part 1910, reading as follows:

§ 1910.93a Asbestos.

(a) **Definitions.** For the purpose of this section, (1) "Asbestos" includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.

(2) "Asbestos fibers" means asbestos fibers longer than 5 micrometers.

(b) **Permissible exposure to airborne concentrations of asbestos fibers—**(1) **Standard effective July 7, 1972.** The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed five fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (c) of this section.

(2) **Standard effective July 1, 1976.** The 8-hour time-weighted average airborne concentrations of asbestos fibers

to which any employee may be exposed shall not exceed two fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (c) of this section.

(3) **Ceiling concentration.** 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, as determined by the method prescribed in paragraph (c) of this section.

(c) **Methods of compliance—**(1) **Engineering methods.** (i) **Engineering controls.** Engineering controls, such as, but not limited to, isolation, enclosure, exhaust ventilation, and dust collection, shall be used to meet the exposure limits prescribed in paragraph (b) of this section.

(ii) **Local exhaust ventilation.** (a) Local exhaust ventilation and dust collection systems shall be designed, constructed, installed, and maintained in accordance with the American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2-1971, which is incorporated by reference herein.

(b) See § 1910.6 concerning the availability of ANSI Z9.2-1971, and the maintenance of a historic file in connection therewith. The address of the American National Standards Institute is given in § 1910.100.

(iii) **Particular tools.** All hand-operated and power-operated tools which may produce or release asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section, such as, but not limited to, saws, scorers, abrasive wheels, and drills, shall be provided with local exhaust ventilation systems in accordance with subdivision (ii) of this subparagraph.

(2) **Work practices—**(i) **Wet methods.** Insofar as practicable, asbestos shall be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state sufficient to prevent the emission of airborne fibers in excess of the exposure limits prescribed in paragraph (b) of this section, unless the usefulness of the product would be diminished thereby.

(ii) **Particular products and operations.** No asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos shall be removed from bags, cartons, or other containers in which they are shipped, without being either wetted, or enclosed, or ventilated so as to prevent effectively the release of airborne asbestos fibers in excess of the limits prescribed in paragraph (b) of this section.

(iii) **Spraying, demolition, or removal.** Employees engaged in the spraying of asbestos, the removal, or demolition of pipes, structures, or equipment covered or insulated with asbestos, and in the removal or demolition of asbestos insulation or coverings shall be provided with respiratory equipment in accordance with paragraph (d) (2) (iii) of this section and with special clothing in accordance with paragraph (d) (3) of this section.

(d) **Personal protective equipment—**(1) Compliance with the exposure limits prescribed by paragraph (b) of this section may not be achieved by the use of respirators or shift rotation of employees, except:

(i) During the time period necessary to install the engineering controls and to institute the work practices required by paragraph (c) of this section;

(ii) In work situations in which the methods prescribed in paragraph (c) of this section are either technically not feasible or feasible to an extent insufficient to reduce the airborne concentrations of asbestos fibers below the limits prescribed by paragraph (b) of this section; or

(iii) In emergencies.

(iv) Where both respirators and personnel rotation are allowed by subdivisions (i), (ii), or (iii) of this subparagraph, and both are practicable, personnel rotation shall be preferred and used.

(2) Where a respirator is permitted by subparagraph (1) of this paragraph, it shall be selected from among those approved by the Bureau of Mines, Department of the Interior, or the National Institute for Occupational Safety and Health, Department of Health, Education, and Welfare, under the provisions of 30 CFR Part 11 (37 F.R. 6244, Mar. 25, 1972), and shall be used in accordance with subdivisions (i), (ii), (iii), and (iv) of this subparagraph.

(i) **Air purifying respirators.** A reusable or single use air purifying respirator, or a respirator described in subdivision (ii) or (iii) of this subparagraph, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed no more than 10 times those limits.

(ii) **Powered air purifying respirators.** A full facepiece powered air purifying respirator, or a powered air purifying respirator, or a respirator described in subdivision (iii) of this subparagraph, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average concentrations of asbestos fibers are reasonably expected to exceed 10 times, but not 100 times, those limits.

(iii) **Type "C" supplied-air respirators, continuous flow or pressure-demand class.** A type "C" continuous flow or pressure-demand, supplied-air respirator shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed 100 times those limits.

(iv) **Establishment of a respirator program.** (a) The employer shall establish a respirator program in accordance with

Institute for Occupational Safety and Health, and to authorized representatives of either.

(2) *Employee access.* Every employee and former employee shall have reasonable access to any record required to be maintained by subparagraph (1) of this paragraph, which indicates the employee's own exposure to asbestos fibers.

(3) *Employee notification.* Any employee found to have been exposed at any time to airborne concentrations of asbestos fibers in excess of the limits prescribed in paragraph (b) of this section shall be notified in writing of the exposure as soon as practicable but not later than 5 days of the finding. The employee shall also be timely notified of the corrective action being taken.

(j) *Medical examinations—(1) General.* The employer shall provide or make available at his cost, medical examinations relative to exposure to asbestos required by this paragraph.

(2) *Preplacement.* The employer shall provide or make available to each of his employees, within 30 calendar days following his first employment in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination, which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV_{1.0}).

(3) *Annual examinations.* On or before January 31, 1973, and at least annually thereafter, every employer shall provide, or make available, comprehensive medical examinations to each of his employees engaged in occupations exposed to airborne concentrations of asbestos fibers. Such annual examination shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV_{1.0}).

(4) *Termination of employment.* The employer shall provide, or make available, within 30 calendar days before or after the termination of employment of any employee engaged in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV_{1.0}).

(5) *Recent examinations.* No medical examination is required of any employee, if adequate records show that the employee has been examined in accordance with this paragraph within the past 1-year period.

(6) *Medical records—(i) Maintenance.* Employers of employees examined pursuant to this paragraph shall cause to be maintained complete and accurate records of all such medical examina-

tions. Records shall be retained by employers for at least 20 years.

(ii) *Access.* The contents of the records of the medical examinations required by this paragraph shall be made available, for inspection and copying, to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of NIOSH, to authorized physicians and medical consultants of either of them, and, upon the request of an employee or former employee, to his physician. Any physician who conducts a medical examination required by this paragraph shall furnish to the employer of the examined employee all the information specifically required by this paragraph, and any other medical information related to occupational exposure to asbestos fibers.

3. A new § 1910.19 is added to Subpart B of Part 1910, reading as follows:

§ 1910.19 Asbestos dust.

Section 1910.93a shall apply to the exposure of every employee to asbestos dust in every employment and place of employment covered by § 1910.12, § 1910.13, § 1910.14, § 1910.15, or § 1910.16, in lieu of any different standard on exposure to asbestos dust which would otherwise be applicable by virtue of any of those sections.

Effective date. Paragraph (b)(2) of § 1910.93a shall become effective July 1, 1976. All other provisions of §§ 1910.93a, 1910.93, and 1910.19 shall become effective July 7, 1972. The current emergency temporary standard remains in effect until July 7, 1972.

(Secs. 6, 8, 84 Stat. 1593, 1598; 29 U.S.C. 655, 657; 29 CFR 1910.4; Secretary of Labor's Order No. 12-71, 36 F.R. 8754)

Signed at Washington, D.C., this 2d day of June 1972.

G. C. GUENTHER,
Assistant Secretary of Labor.

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